



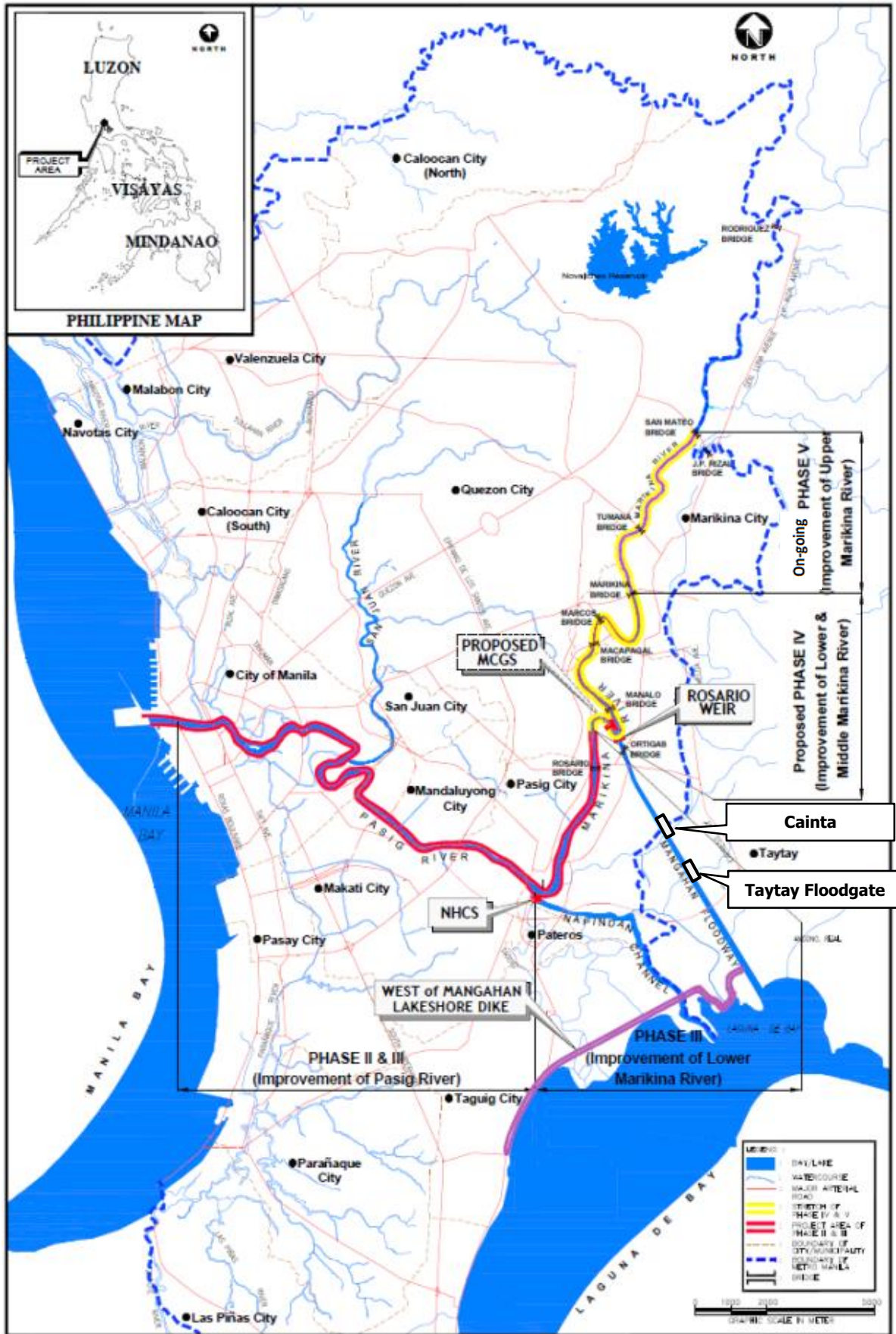
**REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND
HIGHWAYS**

**PASIG-MARIKINA RIVER CHANNEL
IMPROVEMENT PROJECT
(PHASE IV)**

**SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT**

**IN ACCORDANCE WITH
JICA GUIDELINES FOR ENVIRONMENTAL AND
SOCIAL CONSIDERATIONS**

JUNE 2018



PROJECT LOCATION MAP

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ABBREVIATIONS

ADB	: Asian Development Bank
AIDS	: Acquired Immune Deficiency Syndrome
AO	: Administrative Order
ARAP	: Abbreviated Resettlement Action Plan
BOD	: Biochemical Oxygen Demand
CCA	: Climate Change Adaptation
CCEP	: Construction Contractor's Environmental Program
CENRO	: Community Environment and Natural Resources Office
CITES	: Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLENRO	: City Local Environment and Natural Resource Office, LGU
CLUP	: Comprehensive Land Use Plan
CNC	: Certificate of Non-Coverage
COD	: Chemical Oxygen Demand
C/S	: Construction Supervision
CTI	: Construction Technology Institute (Consultant)
DAO	: DENR Administrative Order
dBA	: A-Weighted Decibel (Unit of Noise Level)
D/D	: Detailed Design
DENR	: Department of Environment and Natural Resources
DO	: Dissolved Oxygen
DOH	: Department of Health
DOLE	: Department of Labor and Employment
DPWH	: Department of Public Works and Highways
DRR	: Disaster Risk Reduction
DSWD	: Department of Social Welfare and Development
DTI	: Department of Trade and Industry
EC	: Electric Conductivity
ECA	: Environmentally Critical Area
ECC	: Environmental Compliance Certificate
ECP	: Environmentally Critical Project
EIA	: Environmental Impact Assessment
EIS	: Environmental Impact Statement
EISS	: Environmental Impact Statement System
EMB	: Environmental Management Bureau
EMoP	: Environmental Monitoring Plan
EMP	: Environmental Management Plan
U.S. EPA	: Environmental Protection Agency, USA
EPRMP	: Environmental Performance Report and Management Plan
ESSD	: Environmental and Social Safeguard Division, DPWH
ESSO	: Environmental Social Services Office, DPWH
FCMC	: Flood Control Management Cluster
F/S	: Feasibility Study
GA	: Government Agency
GOJ	: Government of Japan
GOP	: Government of the Philippines
HIV	: Human Immunodeficiency Virus

HH	: Household
ICC	: Indigenous Cultural Communities
ICP	: Information Campaign and Publicity
IEC	: Information Education and Campaign/Communication
IEE	: Initial Environmental Examination
IP	: Indigenous People
IUCN	: International Union for Conservation of Nature and Natural Resources
ISF	: Informal Settler Family
JBIC	: Japan Bank for International Cooperation
JICA	: Japan International Cooperation Agency
LGU	: Local Government Unit
LIAC	: Local Inter-Agency Committee
LLDA	: Laguna Lake Development Authority
MCGS	: Marikina Control Gate Structure
MGB	: Mines and Geosciences Bureau
MMDA	: Metro Manila Development Authority
MMT	: Multipartite Monitoring Team
MOA	: Memorandum of Agreement
MPN	: Most Probable Number
M/P	: Master Plan
MWCI	: Manila Water Company Incorporated
MWSI	: Maynilad Water Services Incorporated
N/A	: Not Applicable
NAAQS	: National Ambient Air Quality Standard
NAIA	: Ninoy Aquino International Airport
NCIP	: National Commission of Indigenous People
NCR	: National Capital Region
ND	: Not Detected
NEDA	: National Economic Development Agency
NGO	: Non-Government Organization
NHA	: National Housing Authority
NHCS	: Napindan Hydraulic Control Structure
NIPAS	: National Integrated Protected Area System
NPCC	: National Pollution Control Commission
NSO	: National Statistics Office
NTU	: Nephelometric Turbidity Unit
ODA	: Official Development Assistance
PAF	: Project Affected Families
PAGASA	: Philippine Atmospheric, Geophysical and Astronomical Services Administration
PMRCIP	: Pasig Marikina River Channel Improvement Project
PAP	: Project Affected People/Person
PAWB	: Protected Areas and Wildlife Bureau
PD	: Presidential Decree
PDR	: Project Description Report
PEISS	: Philippine Environmental Impact Statement System
PEPRMP	: Programmatic Environmental Performance Report and Management Plan
PHIVOLCS	: Philippine Institute of Volcanology and Seismology
PM ₁₀	: Particulate matter with diameter of not less than 10 microns

PMRCIP	:	Pasig-Marikina River Channel Improvement Project
PRRC	:	Pasig River Rehabilitation Commission
PVC	:	Polyvinyl Chloride
RA	:	Republic Act
RAP	:	Resettlement Action Plan
RCBC	:	Reinforced Concrete Box Culvert
RCP	:	Reinforced Concrete Pipe
ROW	:	Right of Way
SAPROF	:	Special Assistance for Project Formation, JICA
SM	:	Shoemart (retail store)
SSP	:	Steel Sheet Pile
STD	:	Sexually Transmitted Disease
STP	:	Sewage Treatment Plant
T-C	:	Total Coliform
TCLP	:	Toxicity Characteristics Leaching Procedure
TDS	:	Total Dissolved Solids
TESDA	:	Technical Education and Skills Development Authority
TOR	:	Terms of Reference
TSP	:	Total Suspended Particulates
TSS	:	Total Suspended Solids
UPMO	:	Unified Project Management Office
VAT	:	Value Added Tax
μg/NCM	:	Micro gram per normal cubic meter
μS/cm	:	micro Siemens per centimeter

MEASUREMENT UNITS

(Length)

mm : millimeter(s)
cm : centimeter(s)
m : meter(s)
km : kilometer(s)

(Area)

mm² : square millimeter(s)
cm² : square centimeter(s)
m² : square meter(s)
km² : square kilometer(s)
ha : hectare(s)

(Weight)

g, gr : gram(s)
kg : kilogram(s)
ton : ton(s)

(Time)

s, sec : second(s)
min : minute(s)
h, hr : hour(s)
d, dy : day(s)
y, yr : year(s)

(Volume)

cm³ : cubic centimeter(s)
m³ : cubic meter(s)
l, ltr : liter(s)
mcm : million cubic meter(s)

(Speed/Velocity)

cm/s : centimeter per second
m/s : meter per second
km/h : kilometer per hour

CHAPTER 1 INTRODUCTION

1.1 Background

The Pasig-Marikina River Channel Improvement Project (hereafter “the Project” or “PMRCIP”) was formulated through the update/review of the master plan and feasibility study (JICA, 1990) under the Special Assistance for Project Formation (SAPROF) (JBIC, 1998). The project implementation has been programmed in the following four phases under the financial assistance of Japanese ODA:

- 1) Phase I: Detailed Design for the Overall Project (from Delpan Bridge to Marikina Bridge: 29.7 km) completed in July 2002
- 2) Phase II: Construction of Stage I: Channel Improvement Works for Pasig River (from Delpan Bridge to immediate vicinity of Napindan Hydraulic Control Structure-NHCS: 16.4 km) completed in May 2013
- 3) Phase III: Construction of Stage II: Channel Improvement Works for Lower Marikina River including Construction of Marikina Control Gate Structure (MCGS) (Junction with Napindan Channel to Manggahan Floodway: 7.2 km)
- 4) Phase IV: Construction of Stage III: Channel Improvement Works for Upper Marikina River (Manggahan Floodway to Marikina Bridge; 6.1 km)

During the Phase I above, the feasibility study of the channel improvement works for the Upper Marikina River section from Marikina Bridge (upper end of Phase IV) to San Mateo Bridge was conducted under PMRCIP Phase I in the 2002 D/D (Detailed Design). This improvement works is tentatively called as “Phase V”.

As for the aspect of environmental consideration, environmental impact statement (EIS) was prepared for the Project in June 1998 (hereafter “EIS (1998)”). Environmental Compliance Certificate (ECC) for the PMRCIP was granted in the same year, dated Dec. 14, 1998, with an official code of “ECC-98-NCR-301, 9807-128-120,” as attached in ANNEX-1.

During the construction phase of the Project Phase II, environmental management and monitoring were undertaken following the condition of the said ECC (1998). In 2010, JICA preparatory survey was conducted for reviewing the river improvement plan of the Phase III, where the rehabilitation and repair of 16.4 km of Pasig River which was damaged by Tropical Storm "Ondoy" as well as the sections not covered by Phase II were included. The construction of MCGS was moved into Phase IV at the same time.

Supplemental environmental study for reviewing the EIS (1998) was conducted focusing on the Phase III stretch, which prepared the “Supplemental Environmental Impact Statement (Aug. 2011).” In the following year, the D/D Study for Phase III was undertaken with a grant from JICA and completed on March 2013, in which EIA Study was also conducted for the proposed disposal site for dredged materials as part of compliance with the ECC issued in 1998 for PMRCIP. DENR-EMB-NCR granted the ECC (ECC-NCR-1301-0035) to DPWH-PMO-MFCP (refer to in ANNEX-2).

In the meantime, the riverine areas along the Upper Marikina River have been urbanized and occupied by a lot of houses/buildings. The developments of roadways and sub-divisions are programmed by LGUs and private entities. Due to the expansion of urbanization and industrial development along the Upper Marikina River, the flooding may bring about bigger damages and impacts to the economy and environment in Metro Manila. Therefore, the implementation of Phase IV shall be expedited especially after the experience of the flooding disaster due to the Tropical Storm “Ondoy” in September 2009.

Further, the flood damage has increased with urbanization in low-lying areas adjacent to the junctions of Cainta and Taytay rivers along the East Bank of Manggahan Floodway due to backflows from the Floodway. The construction of floodgate to prevent the backflows at the junctions are therefor

included in the works of Phase IV since the construction of MCGS may increase the backflow discharges.

To realize the full objective of the Pasig-Marikina River Channel Improvement Project, it is urgently necessary to complete the overall scheme of PMRCIP to protect Metro Manila and surrounding areas together with the feasibility study for Marikina Dam and Retarding Basin without a lapse of time.

Extending the improvement work of PMRCIP up to San Mateo Bridge, the implementation phasing has been revised as follows:

Table 1.1.1 Implementation Phase of PMRCIP

Implementing Phase	Works	Length to be Improved (Design Discharge)
II ^{1/}	Pasig River Channel Improvement (1) (Delpan Bridge to Napindan Channel)	13.1 km on both banks (1,200/600 m ³ /s)
III ^{1/}	Lower Marikina River Channel Improvement (Napindan Channel to downstream of MCGS)	5.4 km channel length (550 m ³ /s)
	Pasig River Channel Improvement (2) (Remaining Sections between Delpan Bridge and Napindan Channel)	9.9 km on both banks (1,200/600 m ³ /s)
IV	Lower/Middle Marikina River Improvement & Construction of MCGS (Lower Marikina R. (Sta.5+400) - Marikina Bridge) Construction of Cainta and Taytay Floodgates	8.0 km channel length (2,900 m ³ /s)
V ^{2/}	Upper Marikina River (Marikina Bridge – San Mateo Bridge)	5.8 km channel length (2,900 m ³ /s)

^{1/}: Completed, ^{2/}: On-going

1.2 Necessity of Review and Updating EIS Prepared in 1998

As described in the previous section, EIS was prepared for the Project in June 1998 and ECC for the Project was granted in the same year, dated December 14, 1998. After the issuance of ECC, construction works commenced from the river stretch of the Pasig River (Phase II) in 2009 and proceeded to the river stretches of the Lower Marikina River (Phase III) in April 2013, and the construction works was commenced in 2014 and completed in March 2018.

After twenty (20) years have passed from the issuance of ECC, the environmental status along the river has drastically changed due to the expansion of urbanization and industrial development along the Marikina River. It is, therefore, necessary to review and update the EIS (1998) for the river stretch of the Middle Marikina River (Phase IV). It is also aimed to comply with JICA Guidelines for Environmental and Social Considerations (revised in April 2010 and hereafter “JICA Guidelines”) for the proposed implementation of Phase IV of the PMRCIP.

The said EIS and its ECC (December 14, 1998) may not cover the construction of Cainta and Taytay, so that the application for ECC will be separately undertaken from that of PMRCIP Phase IV.

1.3 Scope of Work

The EIS and ECC (1998) were reviewed and updating baseline conditions survey and impact analysis were conducted in this Study for the Phase IV of the Project. The review and updating survey and analysis are conducted focusing on following:

- 1) Validity of ECC,
- 2) Compatibility of the EIS (1998) with current Philippines’ regulatory requirements,
- 3) Compatibility of the EIS (1998) with JICA Guidelines, and
- 4) Providing reviewed and updated information in accordance with JICA Guidelines for EIS (1998), if necessary, for implementation of Phase IV:
 - Baseline conditions of environment and society of concerned area,
 - Philippines’ legal and policy framework,

- Environmental impact assessment,
- Alternatives,
- Environmental management plan (Mitigation measures),
- Environmental monitoring plan,
- Stakeholder meeting, and
- Preparation of environmental checklist.

CHAPTER 2 PROJECT DESCRIPTION

2.1 Project Information

Basic information about the Project (PMRCIP, Phase IV) is presented in the Table 2.1.1 and 2.1.2 below.

Table 2.1.1 Project Information

Project	Middle Marikina River Improvement Project (PMRCIP, Phase IV)
Administrative Area of the Project	Pasig City, Marikina City, and Quezon City, NCR, and Municipalities of Cainta and Taytay, Rizal Province, Region IV-A due to additional works of construction of Cainta and Taytay Floodgates, including the following barangays: Pasig City: Rosario, Manggahan, and Santolan; Marikina City: Industrial Valley, Barangka, Tañong, Jesus De La Peña, Calumpang, San Roque, Santa Elena (Pob.), and Santo Niño.; and Quezon City: Ugong Norte, Bagumbayan, Libis, and Blue Ridge B. Cainta: San Andres Taytay: Santa Ana
Nature of the Project	Flood control
Scope of Work	Construction of parapet wall/revetment, piling work, gate structure (Marikina Control Gate Structure) and drainage outlets, dredging/excavation of river channel/riverbanks, and replacement of Manalo Bridge* Construction of two floodgates
Limits	River stretch from upstream of Rosario Bridge to Marikina Bridge with a total length of approx. 8.0 km. Junctions of Cainta and Taytay rivers to the Mangahan Floodway

*: Replacement of Manalo Bridge is implemented by the Government of the Philippines as its urgency, therefore, it is not included as a project component of the Project.

Table 2.1.2 Proponent Profile

Proponent	Department of Public Works and Highways, Unified Project Management Office, Flood Control Management Cluster (DPWH-UPMO-FCMC)
Address	2 nd Street, Port Area, Manila
Authorized Signatory /Representative to Apply for ECC and/or Certificate of Non-Coverage (CNC) for the construction of Cainta and Taytay Floodgates	
Contact Person	Mr. Patrick C. Gatan
Designation	Project Director, UPMO-FCMC
Contact Details	Landline No: 02-304-3813 Fax No: 02-304-3829 Email: mfcdp_2@yahoo.com

2.2 Project Location and Area

The project area is located in the Pasig-Marikina River basin, which is situated in the eastern and central Metro Manila (refer to PROJECT LOCATION MAP) The Pasig-Marikina River has a catchment area of 639 km² (the whole watershed area). The river originates from the Sierra Madre mountain range at the highest elevation of about 1,380m in the municipality of Rodriguez (formerly Montalban), Rizal, and flows down to the south through the Municipality of San Mateo, Rizal and Metro Manila, and finally empties into Manila Bay.

Target site of the Pasig-Marikina River Channel Improvement Project (PMRCIP) is the river stretch from upstream of Rosario Bridge with a length of approx. 8.0 km to Marikina Bridge, which is named as Phase IV section of the Project as presented in Figure 2.2.2. In this document, the river stretch is also referred to as “the Middle Marikina River.” Further, the two sites for floodgate construction are located at the junctions of Cainta and Taytay Rivers to the Mangahan Floodway, as shown in Figure 2.2.1, below:

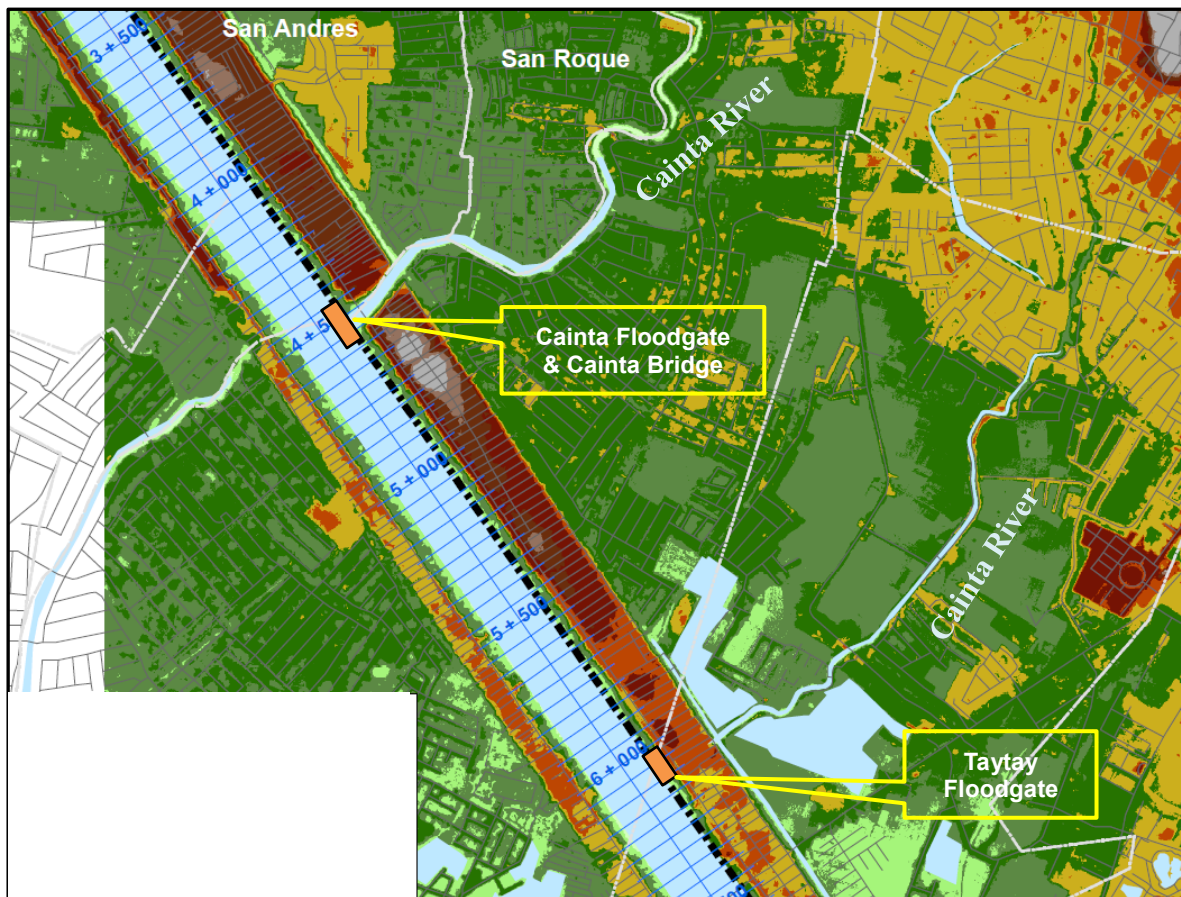


Figure 2.2.1 Locations of Proposed Cainta and Taytay Floodgates

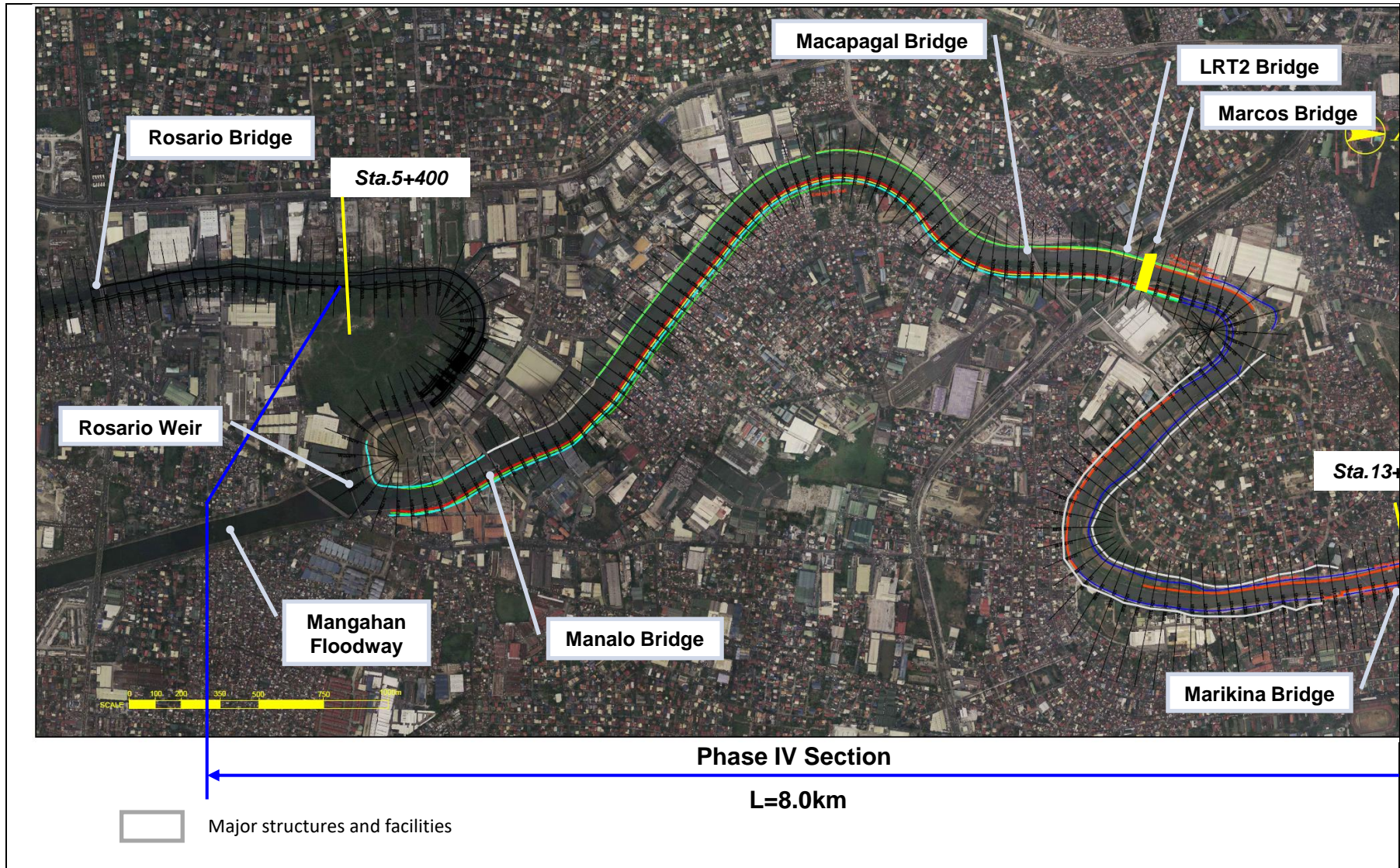


Figure 2.2.2 Current Status of River Channel Alignment of Project Phase IV Section

2.3 Project Plan

2.3.1 Components of the Project

The components of the Project, Phase IV are as follows:

- Dredging/Excavation of river channel and riverbanks;
- Earth embankment dike;
- Construction of parapet wall and revetment;
- Construction of MCGS (Marikina Control Gate Structure);
- Construction of drainage outlets; and
- Construction of Cainta and Taytay Floodgates and Replacement of Cainta Bridge

2.3.2 Design Criteria for River Channel Improvement

(1) Design Discharge

The design discharge of the objective river sections of Phase IV stretch is 2,900 m³/s upstream of Rosario Weir, 2,400 m³/s on the Manggahan Floodway and 500 m³/s at the downstream stretch of Manggahan Floodway, of which flood scale is updated to be a 30-year return period as shown in Figure 2.3.1:

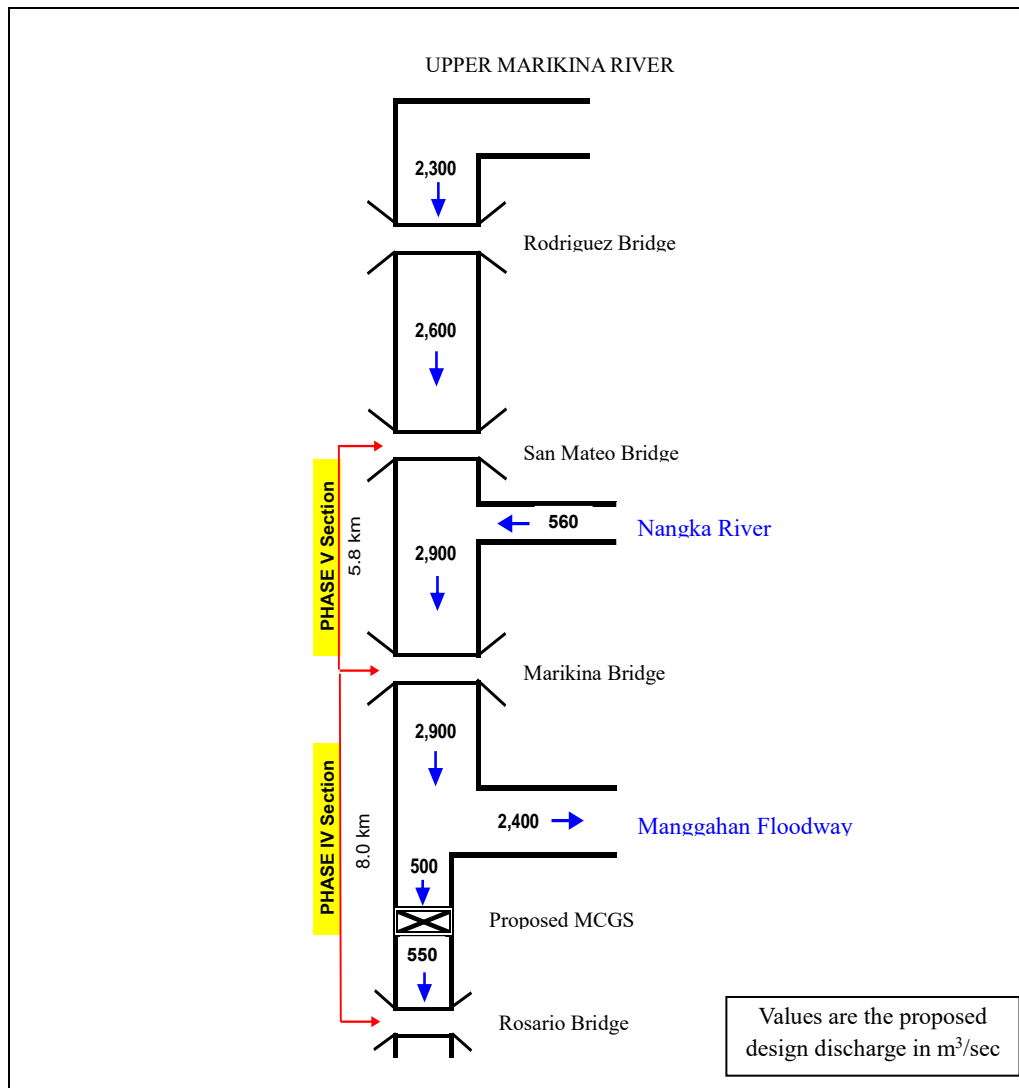


Figure 2.3.1 Design Discharge of the Marikina River

(2) River Channel Alignment

The current river channel is adjacent to residential areas in Metro Manila. The river channel alignment, therefore, basically follows the existing alignment since a drastic change in alignment is not possible due to the difficulty of land acquisition and house relocation, except for such river stretches that enlarging the river flow capacity is needed and where there are encroachments of the river area.

(3) Longitudinal Riverbed Profile

Design longitudinal riverbed profile of the Middle Marikina River is basically determined on the basis of existing riverbed profile. The stretches where the flow capacity is insufficient have to be enlarged by dredging/excavation.

(4) Design Flood Level (DFL)

The Design Flood Level (DFL) is ideally set at the level equal to or lower than the existing ground level so as to minimize the flood damage potential and not to create drainage problems inside the embankment, except in low-lying areas where the highwater level of the river cannot be lower than the ground elevation.

(5) Channel Cross Section

Cross section of the river channel is to be determined based on the flow capacity. The design minimum width of Lower Marikina River (the stretch of Phase III) is 40 m considering the existing width. The designed minimum cross section of Middle Marikina River (Phase IV) is 90 m wide for the low water channel.

(6) Design Freeboard

Design freeboard above the design high water level for the structures such as dike, floodwall, bridge, etc., is determined in accordance with the “Design Guidelines, Criteria and Standard” of DPWH. The value of design freeboard of the Middle Marikina River stretch is set at 1.2 m.

2.3.3 Project Facility Plan and Works

The main works of the Project, Phase IV are the river channel improvement consisting of dredging/excavation, construction of parapet wall/ revetment, drainage outlet works and their related works. The quantity of each work is summarized in the table below and facility plan is described in the following sections:

Table 2.3.1 Specification of Project Facility/Works of Phase IV

Works/ Facility	Volume	Remarks
Dredging/ Excavation	1,673,500 m ³	1,360,000 m ³ **
Earth embankment	164,000 m ³	
SSP	10.8 km	
RC Flood Wall (new construction)	8.4 km	
Marikina Control Gate Structure (MCGS)	1 site	
Replacement of Manalo Bridge*	1 site	By GOP
Drainage outlet	218 nos.	
Cainta and Taytay Floodgates and Replacement of Cainta Bridge	2 sites	

Note) *: Due to the urgency, DPWH is implementing the work.

** : Additional dredging work has been undertaken for the heavily silted section from Sta. 5+400 (Upper end of Phase III) to Sta. 6+750 (Rosario Weir) under Phase III.

(1) General Layout Plan

Based on the design criteria described in the previous section, the proposed plan of river improvement is shown on Figure 2.3.2 to Figure 2.3.4.

(2) Typical Cross Section

Based on the design criteria for the channel cross section described in the previous section, proposed typical cross sections are shown in Figure 2.3.5 to Figure 2.3.8, with the following features:

- Since the width of existing channel between Sta. 6+700 (diversion point of Mangahan Floodway) and Sta. 7+400 is only 70 m, widening of channel by 20 m is needed.
- Typical channel width between Rosario Weir and SM City Marikina is 90 m for the low water channel and total river width required ranges between 130 m and 160 m.
- In the upstream section (SM City Marikina to Marikina Bridge), 80 m wide low water channel is planned.
- There is an S-curved channel in the upstream of Marcos Bridge. Channel width at the curves should be wider than design width as much as possible to flow smoothly.
- No high floodwall is provided along the both banks of Marikina River in the immediate downstream of Marikina Bridge. It is aimed to consider the current status that residents and establishments therein accept a temporal flooding rather than being aparted from the river, and a 6-m high floodwall would become an obstacle for easy access to the river, if constructed.
- Clearance above the calculated a highwater level of Marcos Bridge and Marikina Bridge is 0.87 m and 1.01 m, respectively. This is lower than required design freeboard of 1.2 m. According to the design freeboard, reconstruction of said two bridges is necessary to secure the clearance of 1.2 m. However, it is deemed that there will be no reconstruction in this Project considering the difficulty in bridge construction activities due to heavy traffic volume.

(3) Structural Design

Since the project site is located in the congested urban area in Metro Manila, it is very difficult to acquire land space for dike embankment. In this case, alternatively, dike is constructed using steel and/or reinforced concrete to minimize space requirements. Thus, reinforced concrete floodwall on steel sheet piling is proposed in the downstream portion from Sta. 6+700 to Sta. 11+000 around.

In the upstream portion, steel sheet piling is proposed for construction of low water channel. Overflow on right bank is protected by strengthening the existing wall and/or construction of new reinforced concrete wall.

Floodwall on steel sheet piling is supported by embankment. A paved maintenance road with 3 m width is provided on this embankment for river patrol/inspection.

(4) Dredging and Excavation Works¹

Dredging and excavation works will be applied for the riverbed and riverbanks to secure the necessary river flow capacity based on the hydraulic analysis. The depth and area of necessary dredging and excavation works are shown on Figure 2.3.5 to Figure 2.3.8. The total volume of the dredged/excavated materials is calculated to be approx. 1,680,000 m³.

¹ Due to heavy siltation upper and lower sections of confluence with the Mangahan Floodway, dredging work has been undertaken from Sta. 5+400 (Upper end of Phase III) to Sta. 6+750 (Rosario Weir) under Phase III. Total dredging volume is estimated at approx. 320,000 m³, then the dredged/excavated material under Phase IV will be approx. 1,360,000 m³.

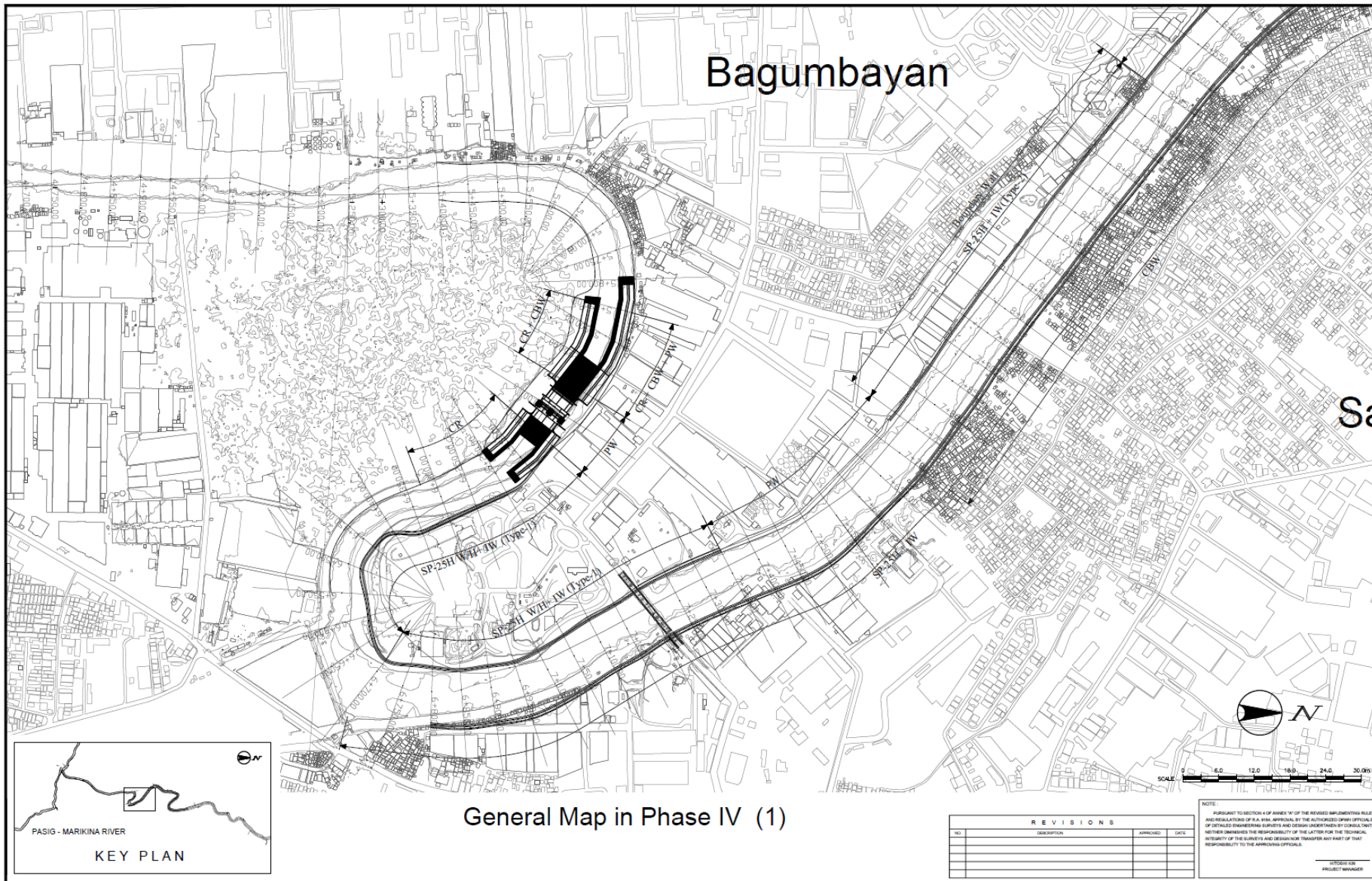


Figure 2.3.2 Plan of Phase IV Section (1)

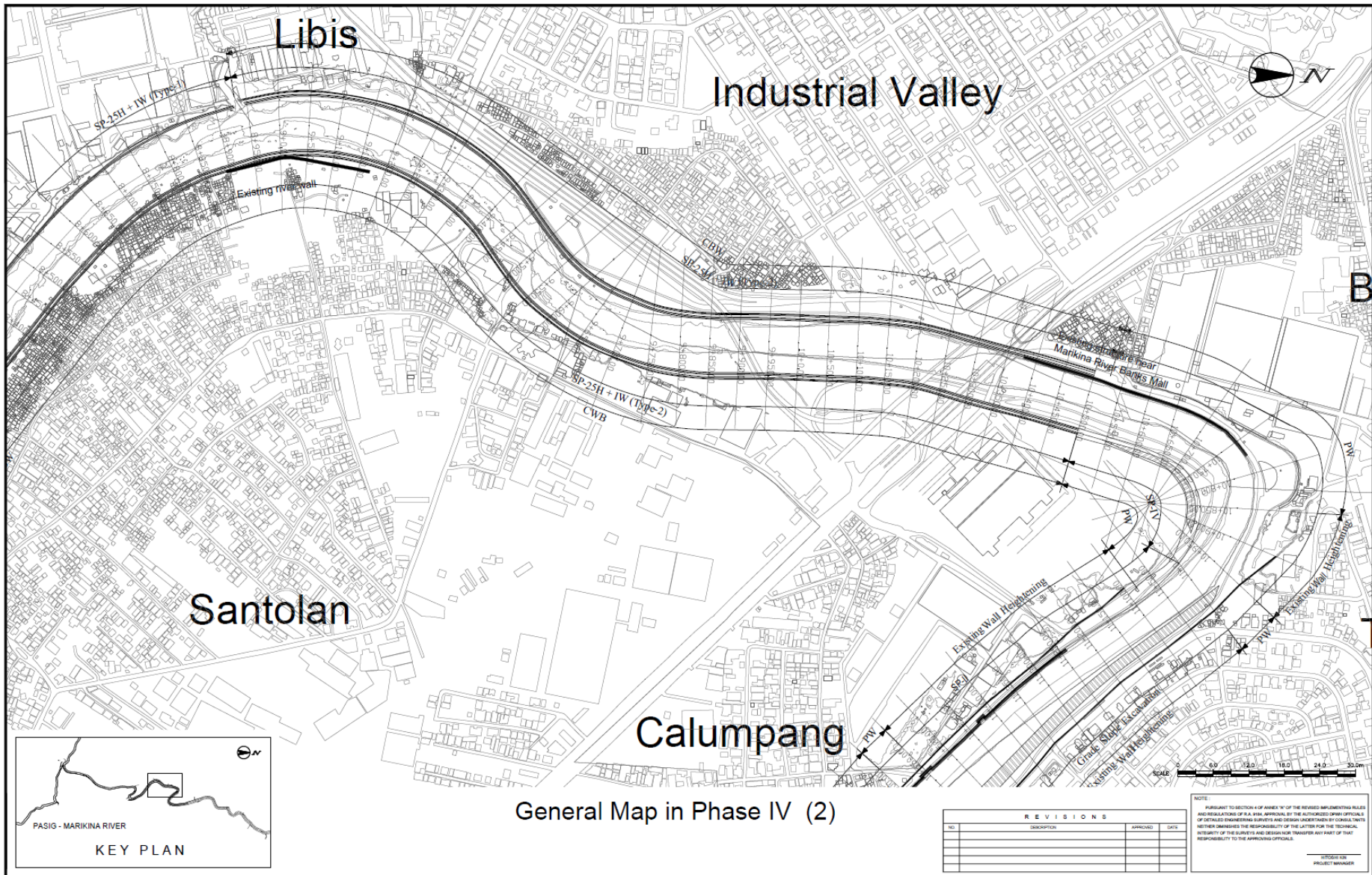


Figure 2.3.3 Plan of Phase IV Section (2)

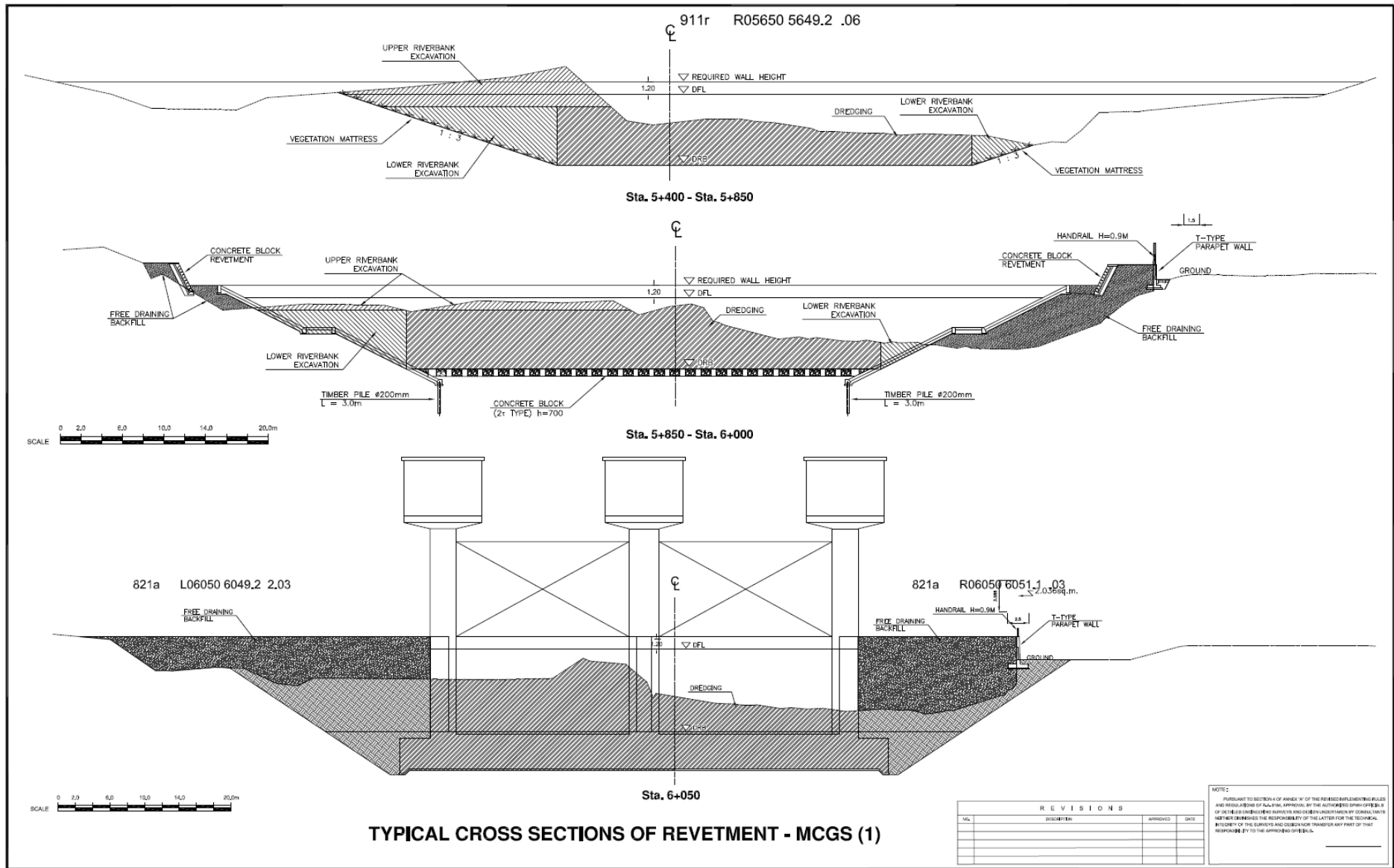


Figure 2.3.5 Typical Cross Section in Phase IV Section (1)

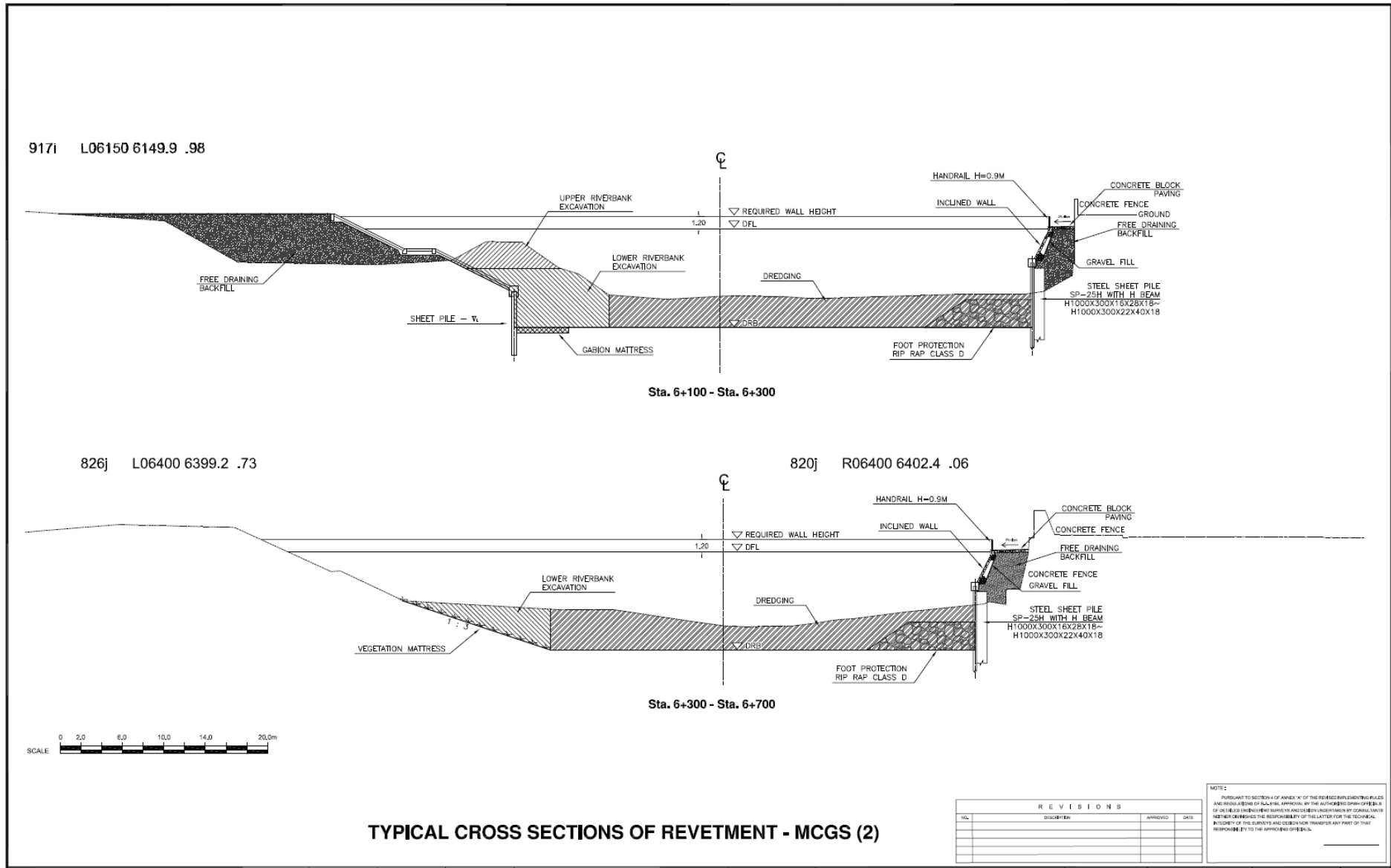


Figure 2.3.6 Typical Cross Section in Phase IV Section (2)

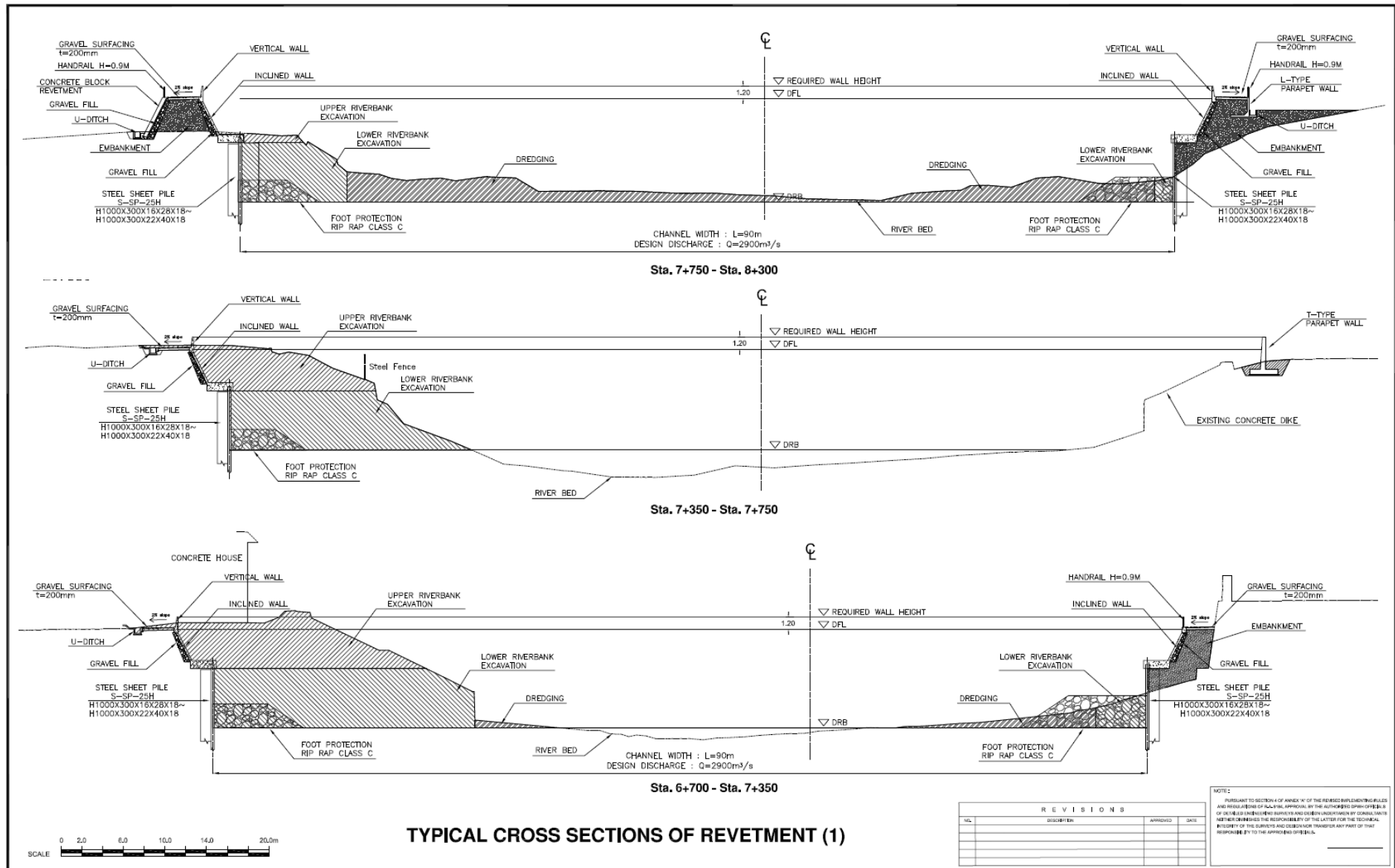


Figure 2.3.7 Typical Cross Section in Phase IV Section (3)

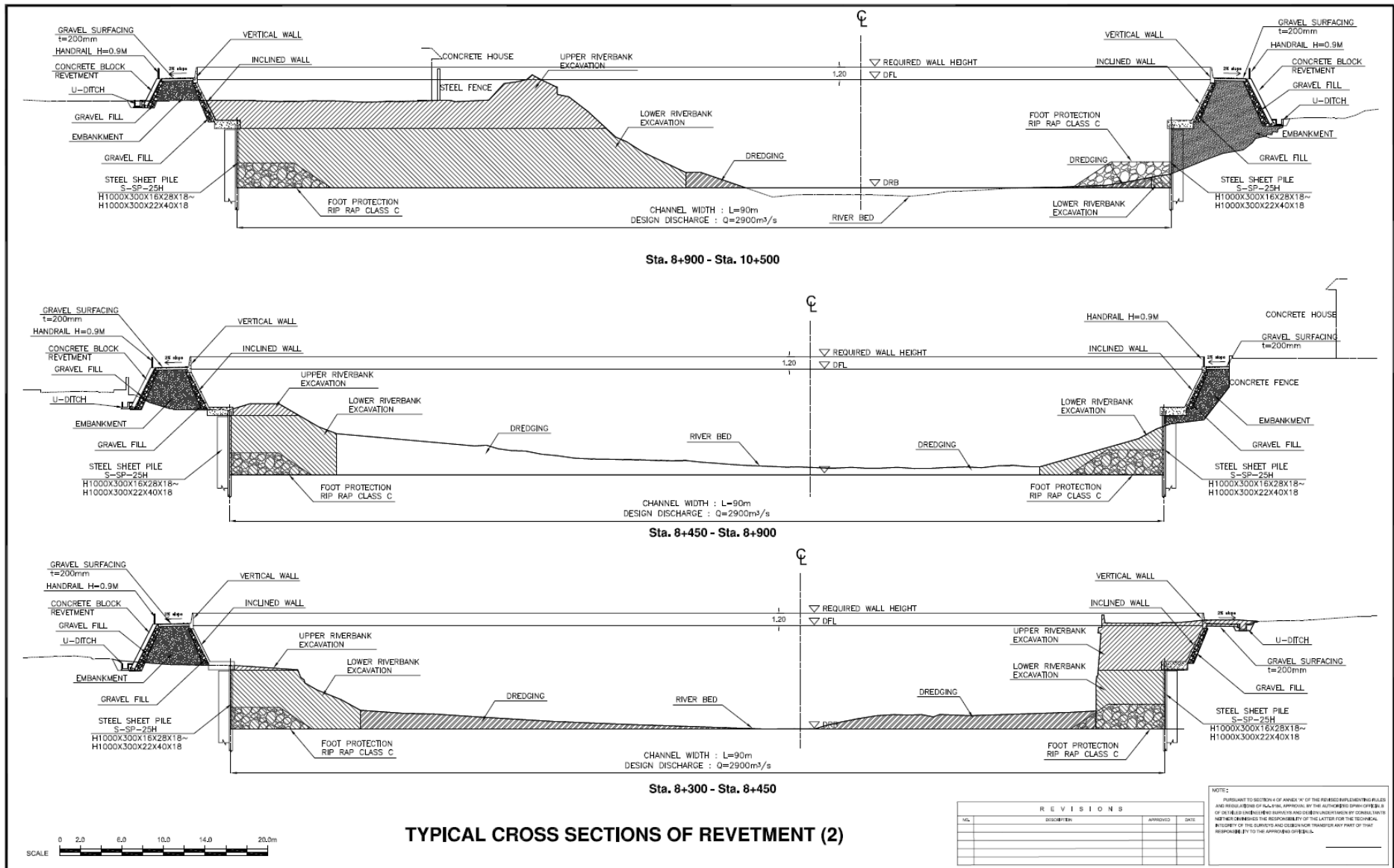


Figure 2.3.8 Typical Cross Section in Phase IV Section (4)

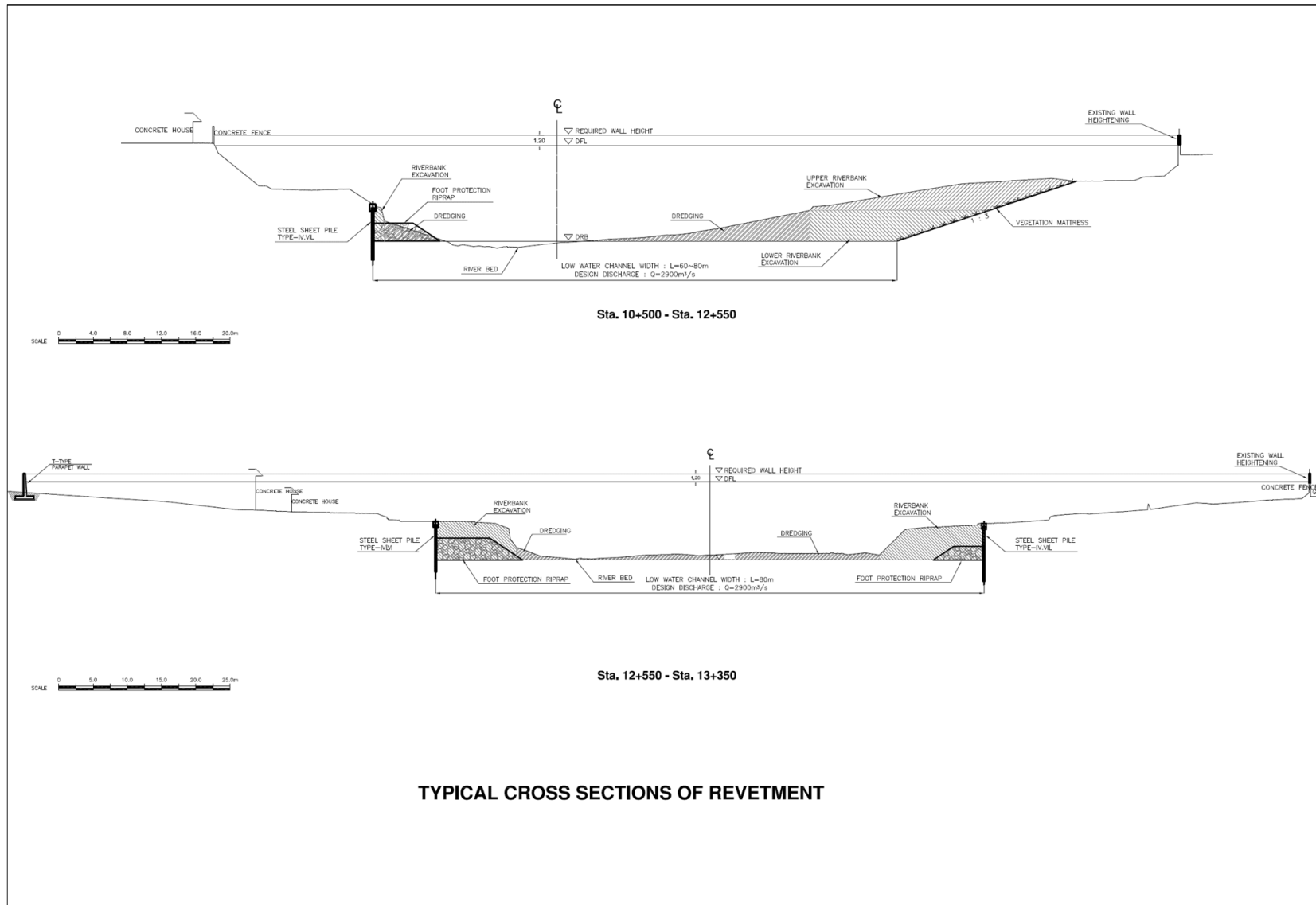


Figure 2.3.9 Typical Cross Section in Phase IV Section (5)

(5) Marikina Control Gate Structure (MCGS)

MCGS will be constructed on the Lower Marikina River downstream of Rosario Weir to control the flood diversion discharge through the operation of floodgate. Among the several alternative locations, ALT2 shown on Figure 2.3.10 was selected considering the result of hydraulic analysis on backwater effect, operational performance together with Rosario Weir, cost effectiveness, social environment impact, etc.

Design of MCGS has the following dimensions and elevations based on the detailed design in 2002:

- Sill elevation : EL +8.00 m;
- Crest elevation of gate (closed condition) : EL +19.00 m;
- Type of gate : Roller Gate;
- Height of gate (DL+19.00 m-DL+8.00 m) : 11.00 m;
- Width of gate : 20.00 m width x 2 gates;
- Design Water Level (Upstream side) : EL.17.40 m; and
- Design water level (downstream side) : EL.15.00 m.

River channel profile and subsoil condition at the changed location for MCGS is the same as the conditions of original location as a result of topographic survey and soil investigation conducted in the study (2015). Therefore, original design of MCGS conducted in D/D Study in 2002 can be used in this study. Figure 2.3.11 shows the proposed profiles of MCGS.

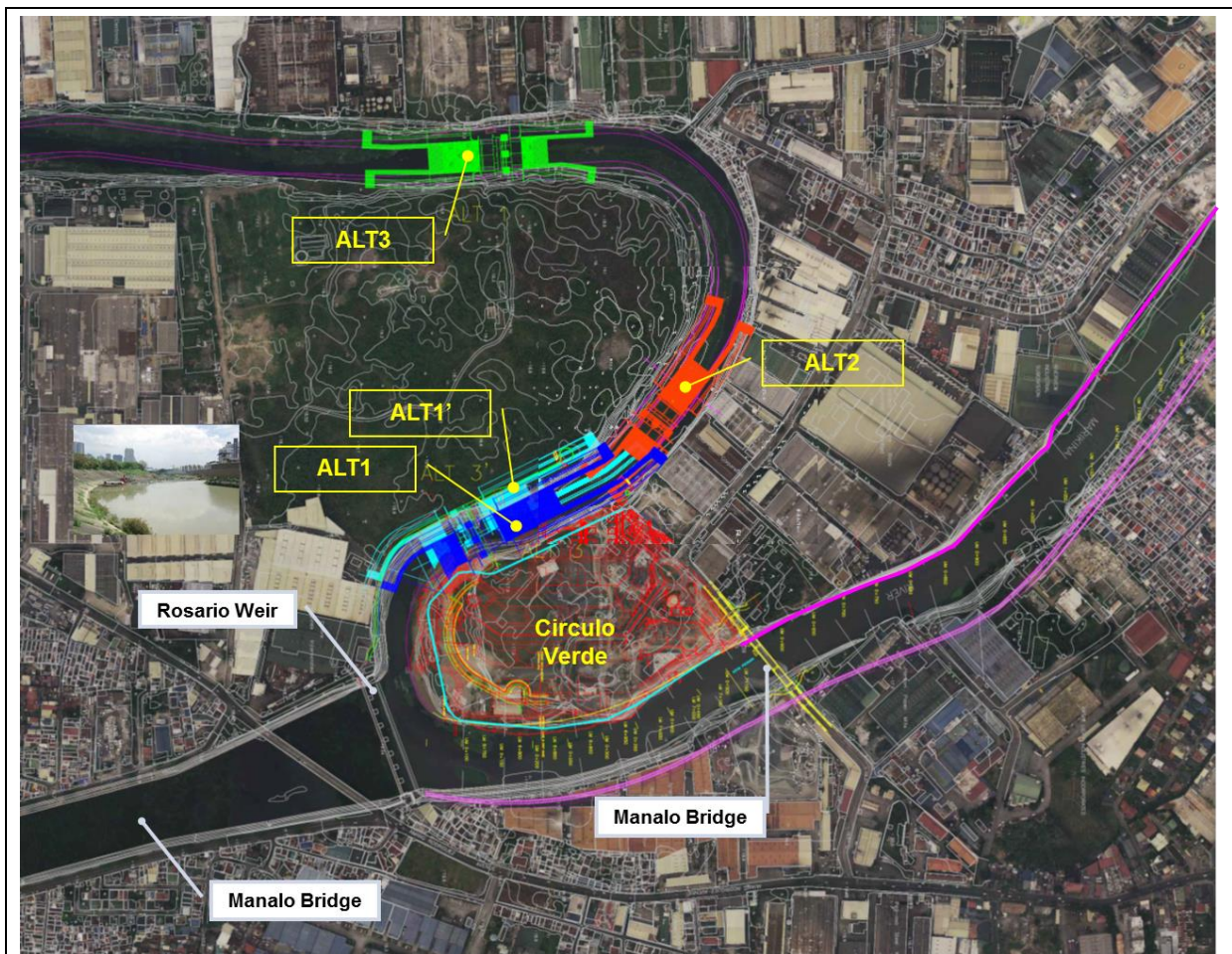


Figure 2.3.10 Location of Marikina Control Gate Structure (MCGS)

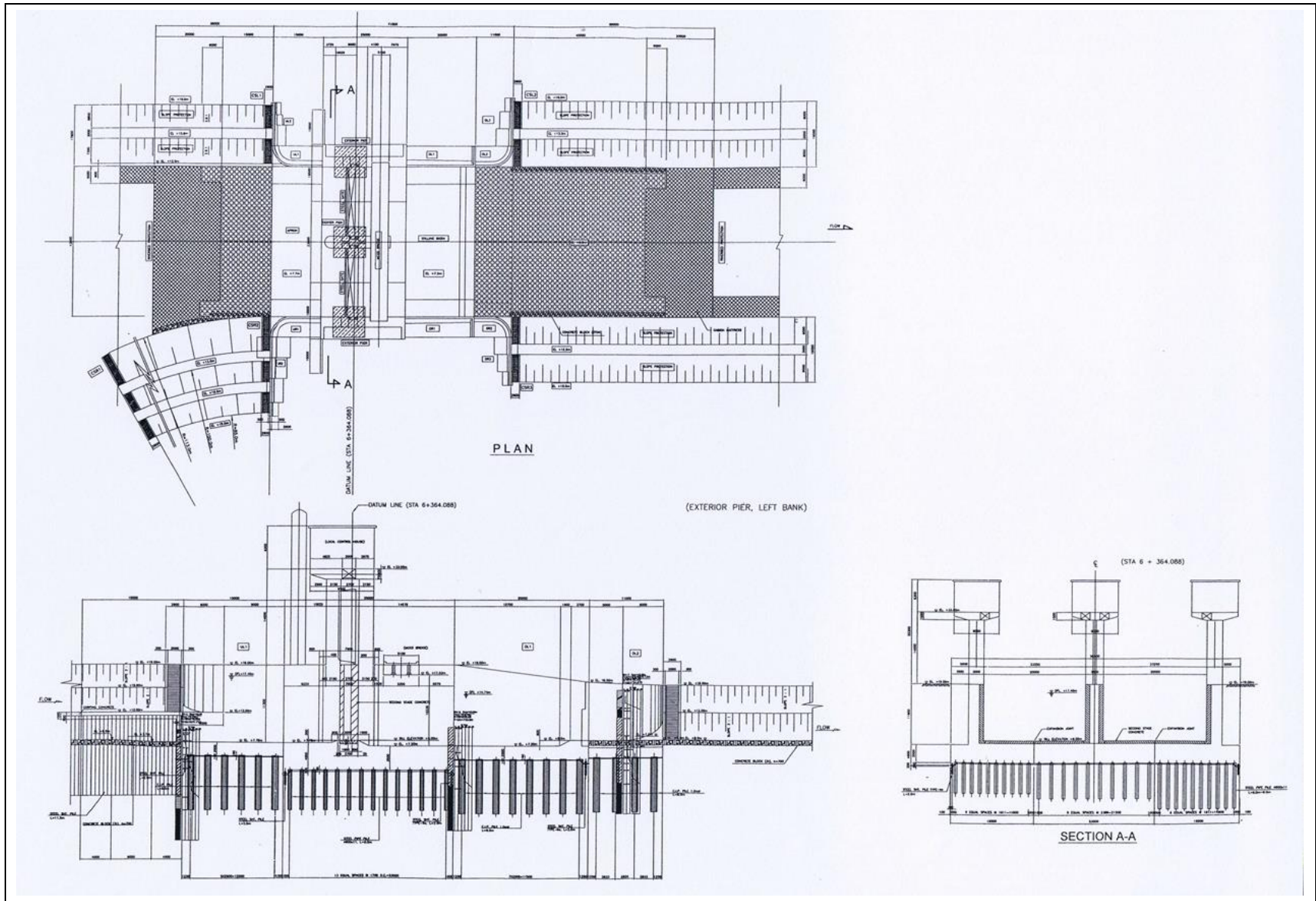


Figure 2.3.11 Layout Plan and Cross Section of MCGS

(6) Replacement of Manalo Bridge

The replacement of Manalo Bridge will be implemented by the Government of the Philippines because of its urgency, therefore, the replacement work is not included as a component of the Phase IV.

The widening of river channel is required to secure the necessary river flow capacity of 2,900 m³/s as design discharge of the river section. The replacement plan of Manalo Bridge with the layout plan and cross-section are presented on Figure 2.3.12.

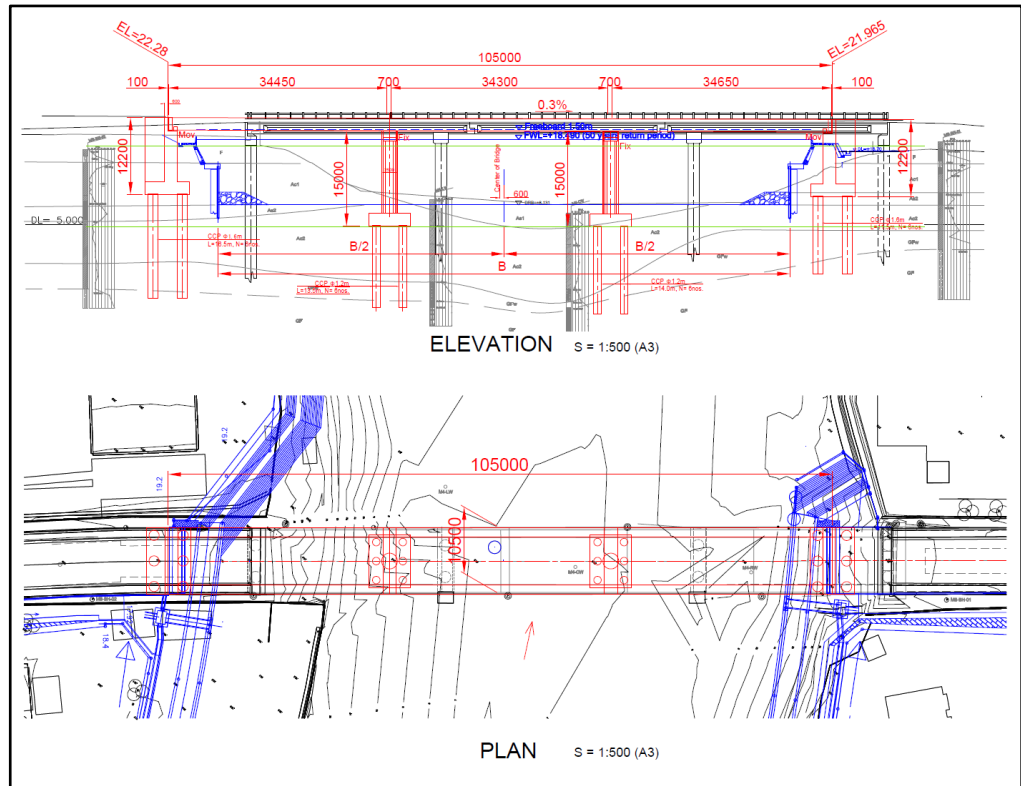


Figure 2.3.12 Layout Plan and Cross Section of Manalo Bridge

(7) Drainage Facility

Drainage facility to discharge inland water during rain events will be constructed/improved. The design scale of the drainage facility of the Project, Phase IV is in accordance with DPWH Memorandum, issued in June 2011. Table 2.3.2 summarizes the drainage facility plan.

Table 2.3.2 Summary of Proposed Drainage Facilities for Phase IV

Proposed Facility	Quantity	Dimension
Outlet	98 RCP Locations	910 mm ~ 1800 mm
	18 RCBC Locations	1620 mm x 1700 mm ~ 2770 mm x 6000 mm
Manhole	253 Locations	Varying dimensions
Collector Pipe:		
RCP	975 m	910 mm
PVC	1160 m	150 mm ~ 300 mm
Flap Gate	102 Locations	Circular type: 910 mm ~ 1520 mm
		Rectangular type: 1200 mm x 1200 mm ~ 2000 mm x 2000 mm

(8) Construction of Cainta and Taytay Floodgates

Floodgates will be provided to prevent backflows from the Floodway at the junctions of Cainta and Taytay rivers. The floodgates at Cainta River and Taytay River are to be closed when the water levels of the Floodway is higher those of Cainta River and Taytay River, respectively. With the construction of Cainta Floodgate, the existing Cainta Bridge (tentative name) crossing Cainta River along the East Bank road will be replaced.

The construction site and required area for Cainta Floodgate which are in the Mangahan Floodway area as shown below:

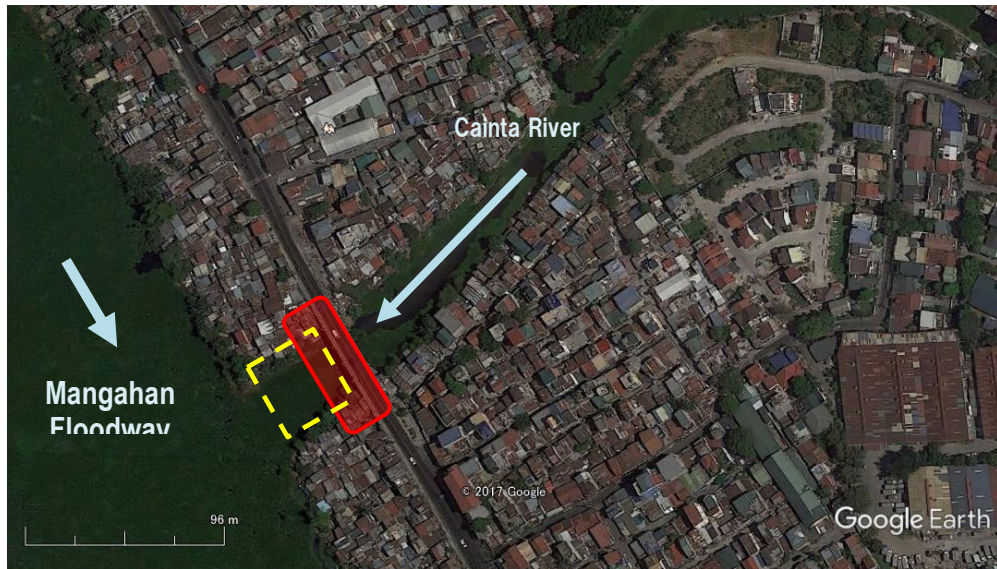


Figure 2.3.13 Proposed Cainta Floodgate Site



Figure 2.3.14 Proposed Taytay Floodgate Site

Cainta Floodgate has a total width for water flow estimated at 24 m because of the river width of 20 m to 25 m. The dimensions of the floodgate is 4 gates x 6.0 m wide x 7.6 m high of a roller gate as shown in Figure 2.3.15. Cainta Bridge is of PC girder with 1 span x 10m (width) x 40m (length).

Taytay Floodgate is to adjust the existing three-ream box culvert, the dimensions of roller gate is 3 gates x 2.5 m wide x 2.0 m high of a roller gate as shown in Figure 2.3.16.

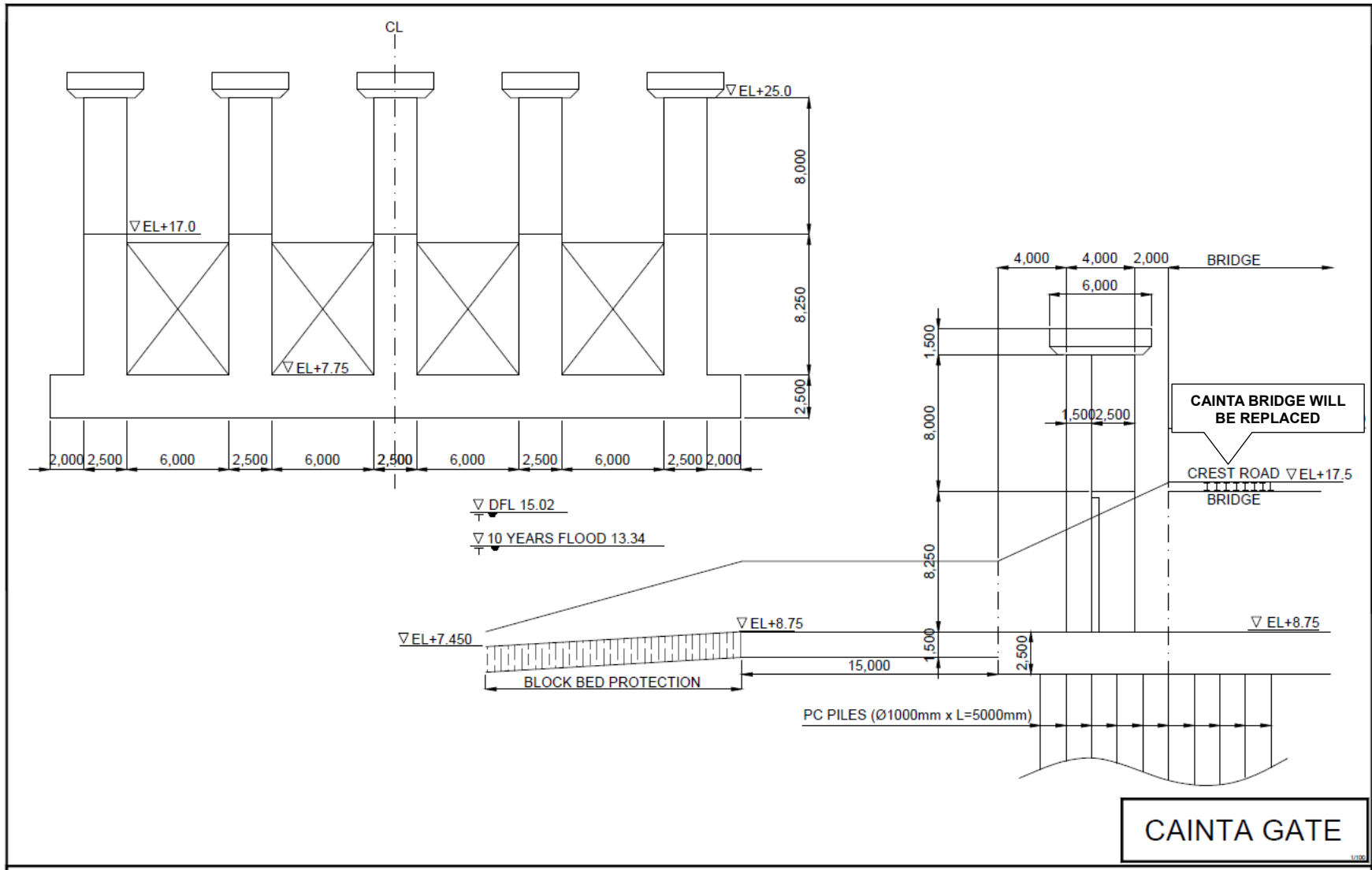


Figure 2.3.15 Plan of Cainta Floodgate

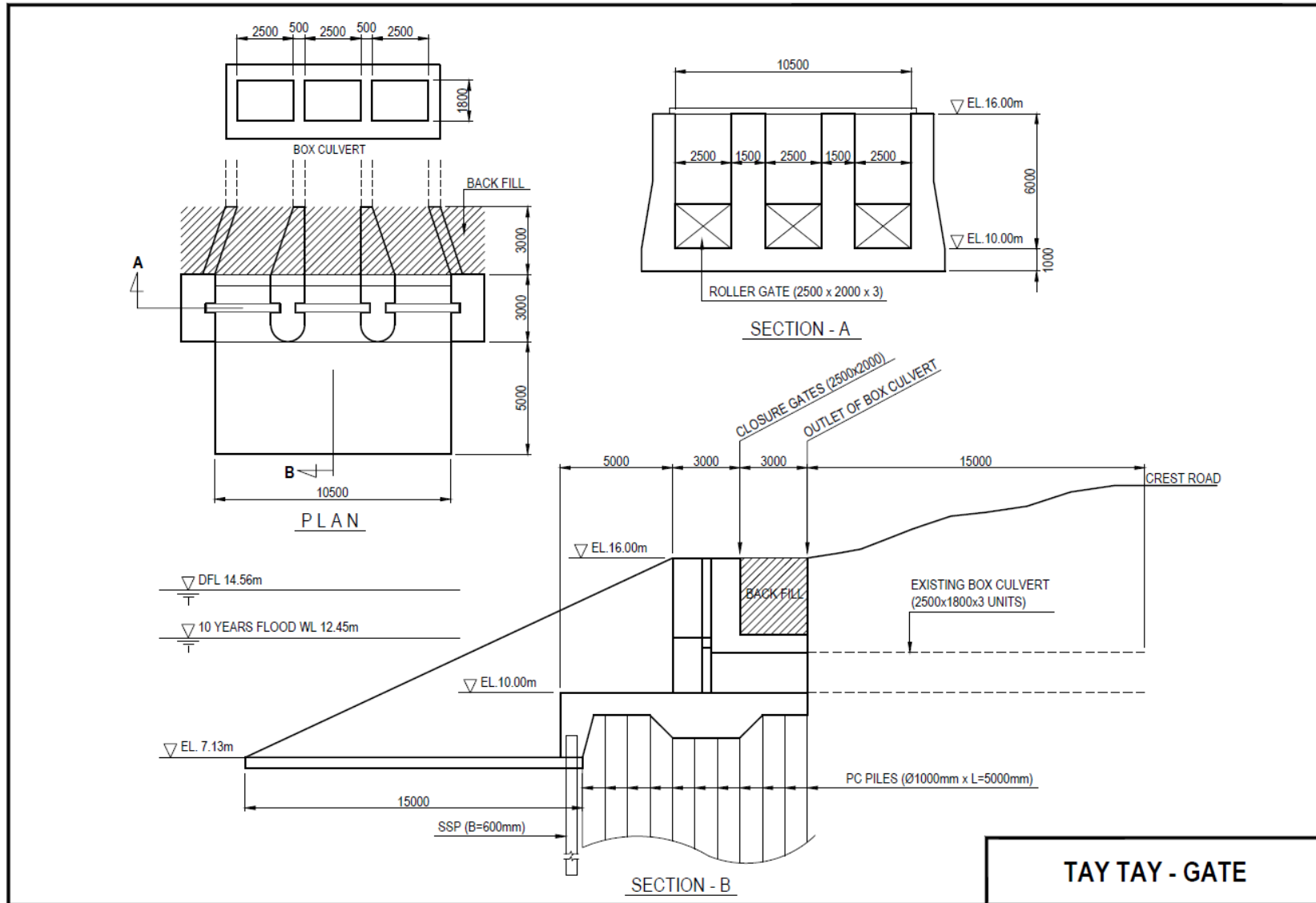


Figure 2.3.16 Plan of Taytay Floodgate

2.4 Project Phases and Construction Plan

2.4.1 Project Phases

(1) Planning Phase

The Supplemental EIS was prepared under the Supplemental Agreement No. 1 (S.A. No. 1) for the Consulting Engineering Services for Assistance to Procurement of Civil Works and Construction Supervision on the JICA-Assisted Pasig-Marikina River Improvement Project, Phase III (PH-252), which was carried out from July 2014 to June 2015. S.A. No. 1 included river surveys and investigations, and review of the river channel improvement plan which was conducted in 2002 D/D.

(2) Detailed Design Phase

After the procurement of the Consultant for detailed design and construction supervision, the detailed design will be started in 2020 and completed in 2021. Resettlement Action Plan of the Project Affected Families (PAFs) living in the Project Phase IV area will be updated in this stage based on the parcellary survey for the affected areas. Resettlement of Project Affected Families (PAFs) will commence in this stage based on the RAP for Marikina River. Land acquisition of ROW will be also conducted as well in this phase.

(3) Preparation Phase for Construction Work

Procurement of Construction Contractor will be conducted in this phase. This phase is expected to be carried out starting in the end of detailed design until in mid-2022.

(4) Construction Phase

Procurement of Construction Contractor will commence in early 2020. Construction works of the Project will commence in mid-2022 and completed within 2026. The construction works is to be divided into several packages as follows:

- Contract package 1: Construction of MCGS and revetment near the gate (Sta. 5+400 – Sta. 6+700): 1.3 km
- Contract package 2: Construction of SSP Revetment/Floodwall (Sta. 6+700 to Sta. 8+200): 1.5 km
- Contract package 3: Construction of SSP Revetment/Floodwall (Sta. 8+200 to Macapagal Bridge): 1.7 km
- Contract package 4: Construction of SSP Revetment/Floodwall (Macapagal Bridge to Marikina Bridge): 3.4 km
- Contract package 5: Construction of Cainta Floodgate and Taytay Floodgate including replacement of Cainta Bridge

(5) Operation Phase

Upon the completion of project facilities and works, the operation and maintenance may be implemented by MMDA based on the agreement between DPWH and MMDA on 09 July 2002.

2.4.2 Construction Plan and Schedule

(1) Major Construction Works

The Project, Phase IV includes the following construction works:

- Steel sheet piling work and construction of parapet wall / revetment;
- Dredging / Excavation works;
- Construction of Marikina Control Gate Structure (MCGS);
- Drainage outlet works; and
- Construction of Cainta and Taytay Floodgates and replacement of Cainta Bridge

(2) Construction Site

The construction site is from upstream point of Rosario Bridge (Sta.5+400) to Marikina Bridge (Sta.13+370) for river channel improvement of the Middle Marikina River with a length of about 8.0 km inclusive of the site for Marikina Control Gate Structure (MCGS) is at Sta.6+065 (ALT-2), and two sites along the East Bank in the Mangahan Floodway for construction of Cainta and Taytay Floodgates.

(3) Quantity of Major Works

The principal quantities of major works are summarized in Table 2.4.1.

Table 2.4.1 Work Quantities of Major Construction Works for Full Scheme

No.	Major Work Item	Component	Work Quantity
1	SSP Revetment and RC Floodwall	a) SSP with H-beam b) SSP w/o H-beam c) Coping Concrete d) RC Floodwall e) Riprap	a) 7.8 km b) 3.0 km c) 10.8 km (17,000 m ³) d) 8.4 km (11,800 m ³) e) 10.8 km (203,800 m ³)
2	Reinforcement of Existing Floodwall	a) RC Floodwall	a) 6.1 km (13,000 m ³)
3	Channel Dredging/Excavation	a) Dredging b) Excavation	a) 180,000 m ³ b) 1,180,000 m ³
4	Maintenance Road	a) Earth Embankment b) Concrete Pavement c) Concrete Block for Slope d) Drainage Ditch	a) 164,000 m ³ b) 8.9 km (22,100 m ²) c) 5.4 km d) 5.9 km
5	Drainage Outlet	a) Box Culvert with Sluice Gate b) Drainage Outlet with Flap Gate c) Drainage Outlet w/o Flap Gate	a) 18 Locations b) 102 Locations c) 98 Locations
6	MCGS	a) Foundation Piles b) RC Works c) Mechanical and Electrical Work	a) 460 pieces b) 14,500 m ³ c) 1 lump sum
7	Cainta and Taytay Floodgates including Replacement of Cainta Bridge	a) Foundation Piles b) RC Works c) Hydromechanical Works d) Bridge Works	a) 200 pieces (Cainta) 45 pieces (Taytay) b) 5,200 m ³ (Cainta) 700 m ³ (Taytay) c) 200 m ² (Cainta) 20 m ² (Taytay) d) 1 span (40 m long) PC beam

(4) Possible Access Roads to Construction Sites

Accessible routes to the construction site are summarized in the Table 2.4.2 and Figure 2.4.1.

Table 2.4.2 Possible Access to Construction Sites

No.	Location	Accessibility
1	Endpoint of Phase III to Manalo Bridge: 1.8 km from Sta.5+400 to Sta.7+200	Accessible from area of Rosario Weir via river channel or from vacant area on left bank.
2	Manalo Bridge to Military Camp (Camp Atienza) :1.8 km from Sta.7+200 to Sta.9+000	On the right bank, it is accessible from one public road. On the left bank, it is accessible from some private roads. Also temporary embankment road is necessary in channel.
3	Military Camp to Marikina Bridge: 4.4 km from Sta.9+000 to 13+400	Accessible to any sites from public road because there are a lot of vacant area along the river banks.

(5) Disposal Site

There are several candidates of disposal sites for excess excavated materials. Those are located in San Mateo, upper Marikina River area, Antipolo and Laguna Lakeshore area. The one at Laguna Lakeshore is most feasible and estimated distance from construction site is about 12 km.

As a part of possible disposal site along Laguna Lakeshore area, the 4 ha in Taytay Municipality was identified for disposal site of dredged material from the on-going dredging work under PMRCIP Phase III (refer to Figure 2.4.2). On April 23, 2018 the ECC was issued (see ANNEX-6).

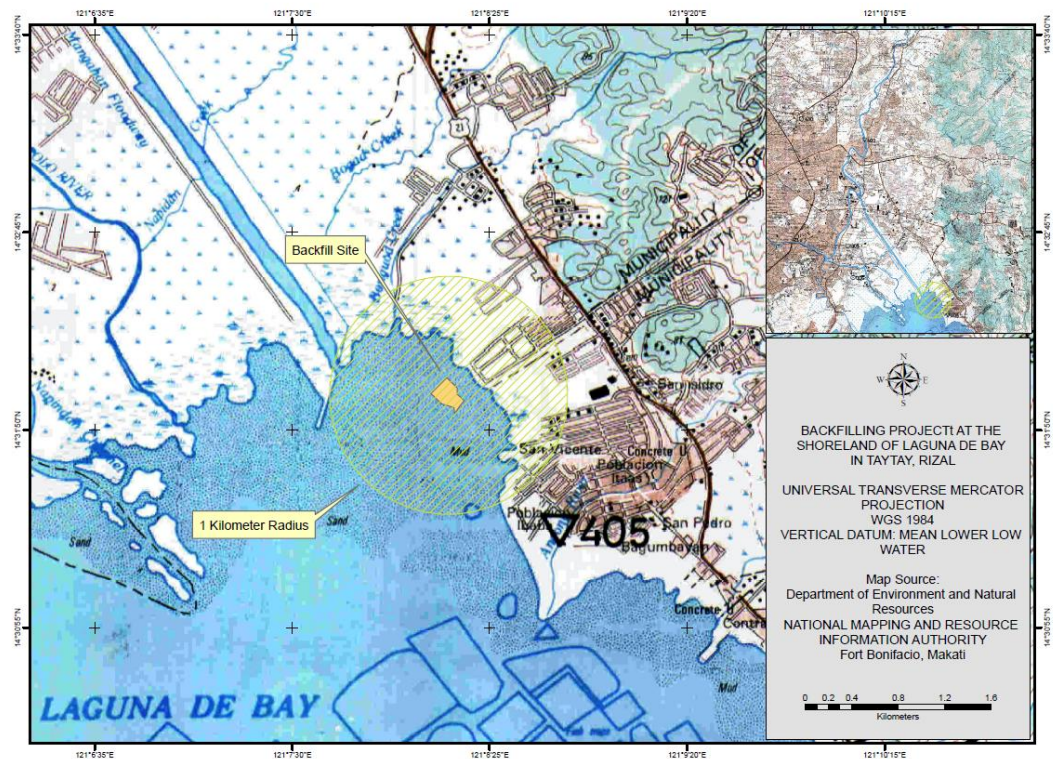


Figure 2.4.2 New Disposal Site of 4 ha in Taytay Municipality

(6) Construction Method

1) Piling Work

Steel sheet pile with H-beam has to be driven into hard strata. Therefore, special technology, i.e., the vibro-hammer together with water jet, will be applied for the smooth implementation of the construction works and minimize the construction noise and vibration. For harder strata, CRID Method which is an advanced method of Down-the-Hole will be employed. Estimated accomplishment is 10 sheets (20 m) per day according to the experience in Phase II and Phase III. Since the river channel is shallow for the construction activities on boats/barges, the construction work is carried out on temporary construction road embankment in the channel along the banks.

The top elevation of steel sheet piling is designed to be above the normal water level so that the pile driving and coping concrete works can be conducted at any time.

2) Floodwall and Drainage Outlet Works

After the piling works and the coping concrete are completed, the earth backfilling works, and inclined wall rebar installation and concrete works will follow. In parallel, the drainage outlet work is executed. The drainage improvement work consists of the drainage outlet with/without gate, collector pipe and junction manhole. Normally a

temporary linear cofferdam with dewatering for dry work will be carried out in front of the proposed drainage outlet prior to the major works.

3) Dredging and Excavation Works

Dredging/excavation works shall consist of removal of all sediment/soil materials along the river channel in accordance with the designed lines and grades. For this type of work, 1-unit of backhoe shall be positioned on a barge to dredge the river bottom up to the design depth as specified on the plan. The dredged soil shall then be dumped into a scow (flat hull pontoon or barge).

4) Transportation of Dredge/ Excavated Materials

The collected sediment/soil materials are transported to the Laguna Lakeshore using a motorized barge and transferred to the location (upstream site) of Rosario Weir through the channel of Marikina River. Then, the materials will then be transported by dump truck through the Manggahan Floodway to the disposal site to be located around the Laguna Lakeshore area near the Floodway mouth.

5) Construction of Maintenance Road

Behind the flood wall of high water channel, maintenance road of 3 m width and concrete block or asphalt pavement shall be provided. Embankment works shall consist of a bulldozer for laying/leveling while compaction works is performed by tire roller. The embankment crest will be covered by concrete block pavement. The sidewalk of 4 m width shall be provided along both sides of proposed low water channel. The sidewalk shall be paved with concrete paving block.

6) Construction Work of Marikina Control Gate Structure (MCGS)

Construction work of MCGS shall be executed on condition that (1) the construction site is dry, (2) the existing flood carrying capacity is maintained, and (3) the maintenance flow is assured in the downstream section of construction site to avoid adverse river water quality. There are four (4) options of construction method as below:

Table 2.4.3 Comparison of MCGS Construction Method

	Option 1	Option 2	Option 3	Option 4
Construction Method	Total closer of river by cofferdam and installation of pipe for maintenance flow	Hal closure of river by cofferdam – multistage construction	MCGS is constructed on newly-diverted river and filling the existing river	Total closure by cofferdam with diversion channel
Construction Period	5-6 years (Non-flood season)	7 years (Non-flood season)	3 years (Whole year)	3-4 years (Whole year)
Area of Construction Yard	2 ha	2 ha	15 ha (including stockpile yard)	10 ha (including stockpile yard)
Estimated Cost for Temporary Work	PHP 50 mil. x 5 times = PHP 250 mil.	PHP 81 mil. x 7 times = PHP 567 mil.	PHP 386 mil.	PHP 278 mil.
Issues	Risk of work suspension due to unexpected floods	Complicated construction procedure and construction joints	Necessary permits of land owner to acquire/swap land for new river	Necessary permit of land owner to rent land for diversion channel and stockpile yard
Evaluation	Recommended	Fair	Fair	Recommended

As of May 2018, Option 1 and 4 have been recommended, while Option 4 is shorter construction period and less risk comparing to Option 1.

Four (4) Options are shown in Figure 2.4.3 below:

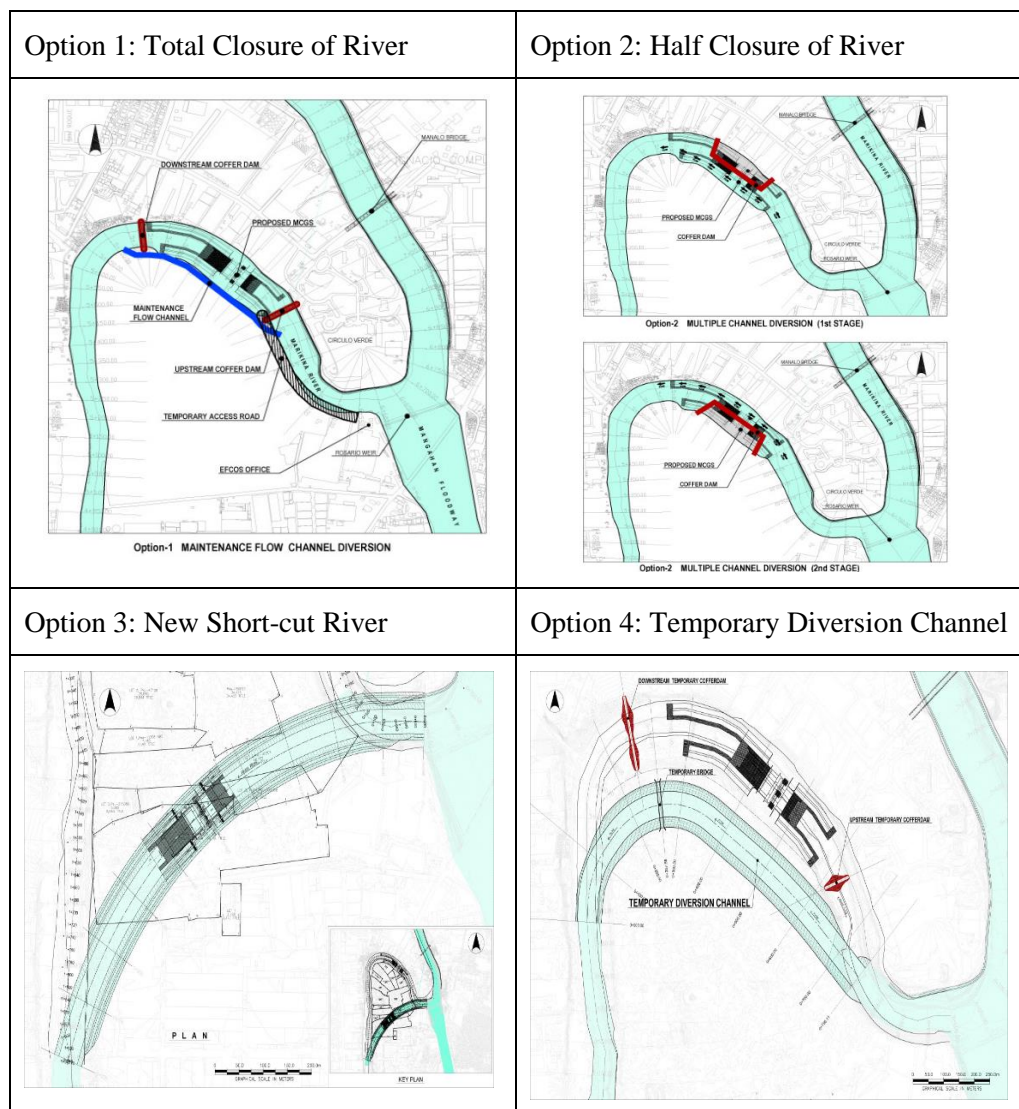


Figure 2.4.3 Construction Plans of MCGS

(7) Construction Equipment

Major categories of construction equipment required for the Project works are classified as follows in line with the construction method described above:

- Earthmoving equipment;
- Pile driving/drilling/extracting equipment;
- Equipment for concrete works; and
- Lifting equipment.

Pile driving works need to utilize crawler crane, vibro-hammer, generator, truck mounted crane, etc. Concrete pump, transit mixer and internal vibrator are adopted for concrete works. Special driving equipment such as earth-drilling machine to penetrate hard core strata (Guadalupe Formation) may be procured abroad.

Dredging and excavation work require the use of backhoe mounted on barge, scows (flat hull pontoon) serving as material barge and tugged by motorized banca to transfer dredged materials to the river bank and loaded to dump trucks. Concreting works will use ready mixed concrete to maintain good quality mix. All construction equipment can be procured in Metro Manila.

(8) Construction Materials

Most of the construction materials, such as reinforcing bars, ready-mixed concrete, aggregates, cement, and formwork materials can be procured in Metro Manila or the surrounding areas.

Filling or backfilling materials are selected from the excavated materials or purchased. Most of the selected earth materials are available from suppliers in Metro Manila. Rock materials are used for riprap, wet stone masonry and repair of existing flood dike. Suppliers for small volume works can be found easily in Metro Manila. Big volume of rocks is available/ transportable from the Bataan area, which is 50 km from the construction site.

Materials of steel sheet piles for revetment/floodwall, such as steel sheet piles with H-beam, are to be imported from abroad, especially, Japan. Mechanical and electrical works for MCGS and Cainta/Taytay Floodgates are also imported from Japan. In addition, flap gates to be installed at designated drainage outlets will be imported from Japan to insure the quality and durability.

(9) Implementation Schedule

Figure 2.4.4 presents the updated implementation schedule of PMRCIP, Phase IV.

2.5 Comparison with Project Plans in EIS (1998)

The design discharge of the objective river sections of the Phase IV is the same as that in the SAPROF (1998) on which EIS was prepared for ECC (1998).

Regarding project components, proposed facilities/works included in the original plan during SAPROF are basically the same in the reviewed plan although the details of the facilities and work volumes are examined in detail and provided in the design review. There is, however, a couple of differences: the one is replacement of Manalo Bridge instead of one span extension, which was not included in the plan incorporated in the EIS (1998). The other is the location of MCGS, which is shifted to upstream point. This revision is not significant but minor one in terms of environmental and social considerations.

Consequently, it is concluded that the reviewed design discharge, facility components and project works are basically the same except for the expansion of one span of Manalo Bridge.

In addition to the above scope of Phase IV, the construction of Cainta and Taytay Floodgates is included in Phase IV. The environmental impacts of the additional floodgates will be assumed as the project of CNC (Certificate of Non-Coverage) since (1) Locations of the proposed floodgates are in the Mangahan Floodway, and (2) Objectives of the Floodgates are to prevent the backflows from the Floodway to mitigate the flood damage in the low-lying area adjacent to the floodgates.

CHAPTER 3 REVIEW OF ECC AND EIS (1998)

3.1 Validity of ECC

Environmental Impact Statement (EIS) for the Pasig-Marikina River Channel Improvement Project was conducted in 1998. An Environmental Compliance Certificate (ECC-98-NCR-301-9807-128-120) was granted on December 14, 1998 to the Project Proponent (DPWH) based on the submitted EIS (refer to ANNEX-1 showing copy of ECC). Ten years after the ECC was issued, when the Phase II proceeded to construction phase, the validity of the ECC was confirmed by Department of Environment and Natural Resources - Environmental Management Bureau (DENR-EMB) on March 7, 2008.

Once a project is implemented, the ECC remains valid and applicable for the life time of the Project, if the Project contents were basically not changed. The conditions and commitments stated in the ECC are permanently relieved from compliance only upon validation of the EMB of the successful implementation of the Abandonment/Rehabilitation/Decommissioning Plan. The ECC automatically expires if a project has not been implemented within five (5) years from ECC issuance, or if the ECC was not requested for extension within three (3) months from the expiration of its validity.

3.2 Compatibility of EIS (1998) with PEISS Requirements

The EIS (1998) has some lacks of information such as Social Development Framework; Information Education Campaign (IEC) Framework; Emergency Response Policy and Generic Guidelines; Engineering Geological and Geohazard Assessment; Promotion of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA); Environmental Monitoring Plan; Self-Monitoring Plan; Multi-sectoral Monitoring Framework; Environmental Guarantee and Monitoring Fund Commitment; and the attached documents hereinafter of Impact Assessment and Environmental Management Plan (EMP) and Supportive Information.

However, these missing parts of EIS document are included in two supplemental documents/reports prepared when the Project, Phase II and Phase III had entered to the construction phase. These two items are (1) Construction Contractor's Environmental Program (CCEP) and (2) Environmental Monitoring and Management Reports (to be submitted quarterly and semi-annual) to the competent authority, or DENR-EMB-NCR. Hence the gaps between the EIS (1998) and PEISS requirements are eliminated throughout the actual construction phases. Thus, The EIS (1998) along with supplemental documents/reports satisfies PEISS requirements.

3.3 Compatibility of EIS (1998) with JICA Guidelines

3.3.1 Overall Compatibility of EIS (1998) with JICA Guidelines

The EIS (1998) lacks some requirements given by the JICA Guidelines for Environmental and Social Considerations (2010).

The following items of JICA Guidelines are lacking in the EIS (1998):

- 1) Legal Framework of Environmental and Social Considerations;
- 2) Alternative Study of Project Components; and
- 3) Involuntary Resettlement.

The following items of JICA Guidelines are not always described enough in terms of scope of environmental components, and depth and detail of examination:

- 1) Description of environmental standards stipulated by laws and regulations;
- 2) Study on environmental baseline and impacts assessment of the following components;
- 3) Environmental Pollution such as land subsidence; offensive odor;

- 4) Natural environment such as coastal zone; protected area; global warming; and
- 5) Social Environment such as poverty group; ethnic minority/indigenous people; social institutions; misdistribution of benefits and damage; cultural heritage, historical and religious sites; rights of children; infectious diseases such as HIV/AIDS; and labor environment.

However, these lacks, or insufficient components were examined and described in the CCEP or Environmental Monitoring and Management Reports of Phase II and III. In addition, a study for Supplemental Environmental Impact Statement (EIS) was carried out focusing on Phase III by JICA (2011) to cover these lacks or insufficient components. Thus, the overall contents of the EIS (1998) including the supplemental documents basically meet the requirements of the JICA Guidelines (2010), and it is, therefore, not necessary that the EIS (1998) be totally revised.

3.3.2 Comparison of Scopes among Environmental Study and Monitoring

The following table shows overall comparison results for environmental items to be assessed between the EIS (1998) and the JICA Guidelines.

Table 3.3.1 Comparison of Scopes between EIS (1998) and JICA Guidelines

Phase of the Project		EIS (1998)*	Phase II (Environmental Monitoring and Management, 2008-2013)	Phase III (Supplemental EIS, 2011 RAP and D/D Study, 2013)	Phase IV	
JICA Guideline Items					Examination	Method of review/ updating
Environmental Pollution	1 Air Pollution	+/-	+/-	+/-	✓	⊙
	2 Water Pollution	Water pollution due to dredging work	Water pollution during construction works.	Water pollution during construction works.	✓	⊙
	3 Solid Wastes (including dredged material)	Generation and disposal of dredged material	Generation of excavated materials	Generation of dredged materials	✓	⊙
	4 Soil Contamination	+/-	Possibility of soil contamination at disposal site of excavated materials	Possibility of soil contamination at backfill site of dredged materials	✓	⊙
	5 Noise and Vibration	Noise pollution due to construction works	Generation of noise and vibration form construction work sites	Generation of noise and vibration form construction work sites.	✓	⊙
	6 Land Subsidence	N/A	N/A	No impact	✓	○
	7 Offensive Odor	+/-	N/A	Generation of offensive odor during dredging work	✓	⊙
	8 Riverbed Sediment	+/-	N/A	Generation of dredged materials	✓	⊙
Natural Environment	1 Topography and Geographical Features	+/-	N/A	+/-	✓	⊙
	2 Soil Erosion	+/-	N/A	No impact	✓	○
	3 Groundwater	+/-	N/A	No impact	✓	○
	4 Hydrological Regime	Improve river flow conditions and prevent flooding	N/A	No negative impact on hydrological regime	✓	○
	5 Coastal zone	N/A	N/A	No impact	N/A	-
	6 Flora, Fauna and Biodiversity	+/-	Minor impact to cut/trim trees for construction work	Minor impact to cut/trim trees for construction work	✓	⊙
	7 Protected Area	N/A	N/A	No impact	✓	○
	8 Meteorology	+/-	N/A	+/-	✓	○
	9 Global Warming	N/A	N/A	N/A	N/A	-
Social Environment:	1 Involuntary Resettlement	Relocation of ISFs	Relocation of ISFs was done without any big problem.	There are 95 ISFs to be relocated due to the Project.	✓	⊙
	2 Poverty Group	N/A	N/A	No poor people who owes their livelihood to the river.	✓	○
	3 Ethnic Minority / Indigenous People	N/A	N/A	No indigenous or minority in the project area.	✓	○
	4 Local Economy such as Employment and Livelihood	Income increase by employment as construction workers	Not monitored.	No negative impact.	✓	⊙
	5 Land Use and Utilization of Local Resources	Increase of land value	Not monitored.	No negative impact	✓	○
	6 Water Use / River Dependency including Water Rights	Impact on river navigation	No significant impact on river navigation was detected	No people who depends on the river water.	✓	⊙

Phase of the Project		EIS (1998)*	Phase II (Environmental Monitoring and Management, 2008-2013)	Phase III (Supplemental EIS, 2011 RAP and D/D Study, 2013)	Phase IV	
JICA Guideline Items					Examination	Method of review/ updating
7	Existing Social Infrastructures and Services	Intense usage due to influx of labor Influx of ISFs	No significant impact was detected through IEC activity of the Project.	River navigation and existing river parks might be affected.	✓	○
8	Social Institutions such as Social Infrastructure and Local Decision - making Institutions	N/A	N/A	No negative impact	✓	○
9	Misdistribution of Benefits and Damage (Social Cost)	N/A	N/A	No negative impact	✓	◎
10	Local Conflicts of Interest	Housing/Influx of labor / squatter	No significant impact was detected through IEC activity of the Project.	No negative impact	✓	◎
11	Cultural Heritage, Historical and Religious Sites (Sensitive Facilities)	+/-	N/A	No negative impact	✓	○
12	Landscape	+/-	N/A	No negative impact	✓	◎
13	Gender / Socially Vulnerable Group	+/-	No significant impact was detected through IEC activity of the Project.	N/A	✓	○
14	Rights of Children	N/A	N/A	N/A	✓	○
15	Infectious Diseases such as HIV/AIDS	N/A	Not monitored	No impact	✓	○
16	Labor Environment (Including Occupational Safety)	N/A	N/A	Possibility of construction related accidents	✓	○

*EIS (1998) did not use JICA's method to evaluate the impact using A,B,C, and D, +/-: *Minor impact*, N/A: *Not discussed*, ✓: *To be applied in this study*

◎: Data collected from primary data collection by field survey, sampling and laboratory analysis.

○: Secondary data, general information, literature/published data.

CHAPTER 4 STAKEHOLDER CONSULTATION

4.1 Previous Consultation and Scoping

The JICA Guidelines require that “Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected (in scoping session), and when the draft report is being prepared (Appendix 2 of JICA Guidelines).”

(1) Public Consultations

The scoping of the Project was done through several consultation meetings in 1998 when EIS (1998) was prepared.

a) 1st Consultation

An initial scoping session was held with DPWH-NCR office in February 26, 1998, prior to the scoping session which was opened to other stakeholders. The initial scoping session was carried out by DPWH, JBIC SAPROF Study Team, and representatives of DENR-NCR EIA division. The purpose of the initial scoping session was to obtain DENR’s concerns which must be addressed in the EIS. A scoping matrix being prepared by JBIC SAPROF Study Team was used as a base of the discussion.

b) 2nd Consultation

The second scoping session was held on February 27, 2008 with concerned government agencies, LGUs, and NGOs in DPWH Training Room. In this session, various concerns and suggestions were given to the DPWH and SAPROF Team. The participants were from DPWH, SAPROF Team, MMDA, NGOs and other interest groups.

c) Other Meetings

In addition to the two aforementioned consultation meetings, a KICK-OFF MEETING (February 11, 1998), a STEERING COMMITTEE MEETING (April 20, 1998), and a SEMINAR (May 10, 1998) were held, mostly for government agencies and other interest groups.

Most of the concerns of the above meetings were regarding social and environmental impacts via dredging activities, impacts on Laguna Lake and Manila Bay by operation of MCGS, and informal settlers situating along the Project sites (the Pasig-Marikina River and Manggahan Floodway). Through the scoping session, a scoping matrix was formed for major concerns that were raised by the attendances.

As DAO 96-37 ordered, and as the DENR emphasized in the initial scoping meeting public participation, obtaining full support from the public is very critical to carrying out the Project successfully. However, names of Barangay captains and ordinary persons who live in the areas where the Project takes place and might be relocated for the Project were not listed on the attendance sheets.

Although two consultation meetings were held (which was the minimum number of meetings required by the World Bank’s standard), none of them were about the EIS Final Report.

(2) Scoping

Both the possible positive and negative significant environmental impacts were identified through the scoping sessions. Agreed-upon items of concern with possible negative impacts were (1) dredging activities, (2) construction of the river improvement works along the banks (construction of revetments and river walls), (3) construction of the MCGS, (4) operation of the MCGS, and (5) operation of the Rosario Weir.

(3) Information Disclosure

DAO 2003-30, Section 5.3 defines a public hearing as part of EIS review, i.e. information disclosure. For those who did not participate in public hearings and scoping sessions, DAO 97-24 assures the provision of “public access to all official data or information.” However, the general public faces difficulty in accessing EIS Reports because DAO 97-24 Section 3.1.5 treats some of these reports as “Confidential” and forbids their review.

There is weak evidence in the EIS (1998) regarding the social and environmental concern were disclosed properly and adequately in accordance with JICA guidelines:

- 1) An information dissemination meeting was held at the Bayview Hotel in Manila in 1998. Most of the people who attended the meeting were those of the government agencies, LGUs, ADB, and SAPROF. No residents of areas affected by the project were included.
- 2) The EIS (1998) was written in English which is an official language of the Philippines. Since most of the people living in the Project Affected Area use either non-English (52% Households in directly affected area use only Tagalog) or a mixture of some English (48% use mixture of Tagalog or Filipino and non-standard English) with native tongue, it is deemed to be not easily accessible to the information in the EIS.

4.2 Stakeholder and Public Consultation Meetings

The review and update of EIS for the PMRCIP Phase IV engineering plans and project alignment, in this Supplemental EIS have been achieved through close collaboration and consultation with the LGUs of Marikina City, Pasig City and Quezon City. Moreover, each LGU’s development plans, land use plans as well as natural conditions were reviewed, along with ocular inspections of construction sites.

A series of joint ocular surveys with representatives of the three LGUs indicated the initial degree of impact in each area. Afterwards, rigorous consultation dialogues and meetings with the residents and local officials in Marikina and Quezon cities were undertaken where inputs from the participants were considered to minimize the environmental impacts, as enumerated below.

For residents in Brgy. Santolan, the stakeholder meeting for PMRCIP Phase IV was postponed to avoid misinformation on the floodwall construction being undertaken by Pasig City. Since the construction of floodwall has been continued by Pasig City, DPWH has agreed to convene the stakeholder meeting for residents in Santolan after the design to modify the constructed floodwall, while stakeholder meeting for PMRCIP Phase IV with 8 business-establishments to be affected and subject to land acquisition/compensation in Brgys. Santolan and Mangahan was undertaken on August 31, 2018.

In the stakeholder meeting, twelve seven (7) representatives of 8 business-establishments attended with the representatives of DPWH-UPMO-FCMC, Pasig City LGU and the Consultant. After presentations of PMRCIP Phase IV and Legal Background/Current Practice for Land Acquisition/Compensation, the meeting has proceeded for open discussion which the stakeholders conveyed their queries and suggestions, and DPWH made clarifications and answers to them.

Summarizing the discussion, main points were:

- (a) Plan and design of PMRCIP Phase IV will be finalized in the detailed engineering design which is scheduled in 2019-2020.
- (b) During the detailed engineering design, the consultation meeting with the stakeholders will be convened to minimize social impacts such as land acquisition and compensation for smooth implementation of the Project.
- (c) On the other hand, it is assured that the business/income loss to be caused by the land acquisition and relocation of structures will be compensated.
- (d) The construction of floodwall by Pasig City LGU will be well adjusted and coordinated.

- (e) Any progress of the project development and related information shall be well disseminated to the stakeholders.

(2) 1st PCM at Barangay Jesus De La Peña, Marikina City

Venue: Barangay Jesus dela Pena, Multipurpose Hall

Time: June 01, 2015

Participants: 69 (Local Residents: 55, Proponents: 14)

Topic No.	Comment/ Answer	Name/Position	Remarks
1	Comment/ Question	Ma. Corazon P. Lim/ Secretary of Provident Village	Ms. Cora asked the estimated budget of the Project. She also queried how the loan of the Project will be done. She expressed concern since it is the future generation who will be paying for this loan.
	Answer	Proponent	The unofficial estimate is around PHP14 Billion, and may increase or decrease depending upon the results of the detailed design. The loan agreement will be entered between the Philippine Government and JICA and will be finalized early next year based from the tentative schedule.
2	Comment/ Question	Ma. Corazon P. Lim/ Secretary Provident	She also asked if the bicycle/jogging lane along Marikina River will be affected by the project.
	Answer	Proponent	The jogging lane along the Marikina River will not be removed totally. There will be some sections though that will be affected.
3	Comment/ Question	Ma. Corazon P. Lim/ Secretary Provident	She inquired if the water lilies at the Marikina River will be removed during project implementation as these pose as an obstacle to the river flow. (Note: people normally refer to water lily and water hyacinth as one; water lily was the actual term used, this should be water hyacinth instead)
	Answer	Proponent	In case the water lilies will pose as a problem during construction, these will be removed. Water lilies normally live in dirty water not in clean water. They do not survive in salt water too, the reason why there are no water lilies in Manila de Bay. So if the Marikina River will be cleaned up, water lilies will not thrive. It is necessary then that people should also help in cleaning up the river to address the problem with water lilies.
4	Comment/ Question	George Milla/ Provident Village Resident	Mr. George inquired if the project construction would be 24/7(continuous for 24 hours in a day and 7 days in a week).
	Answer	Proponent	Construction works will not be entirely 24/7. There will be times when work will still continue beyond the regular working hours as needed.
5	Comment/ Question	George Milla/ Provident Village Resident	Regarding the proposed additional vertical wall, he raised the concerned about their assurance of the strength of the heightening of the wall. Based from experience with Typhoon Ondoy, the river dike with a width of 1 meter was destroyed.
	Answer	Proponent	The heightening of the vertical wall will be based on the difference of the height of the existing wall to the height of the designed flood level. For the structural strength, the proposed design is double walling following the required standards.

Topic No.	Comment/ Answer	Name/Position	Remarks
6	Comment/ Question	George Milla/ Provident Village Resident	Security in the area was raised during the construction phase. He inquired if the road to be built can help address the congestion problem in their area.
	Answer	Proponent	Regarding security, there will be a temporary security fence to be placed. For the congestion problem, the road to be built will just be a maintenance road and not meant for vehicular traffic.
7	Comment/ Question	Manny Sarmiento /Barangay Captain of J. Dela Peña	He suggested that Contractors should get working permit in their Barangay for the proper identification of workers and for security purposes.
	Answer	Proponent	The suggestion was considered. Workers will get barangay permit, and workers will have proper uniform to facilitate their identification.
8	Comment/ Question	Roche Rigos/ Provident Village Resident	He inquired if there is any improvement or restoration of the Old Wawa Dam.
		Proponent	Wawa Dam is no longer operational. As part of the flood control system, there is a proposed Marikina Dam.
	Comment/ Question	Roche Rigos/ Provident Village Resident	He asked the exact location of the Marikina Dam.
	Answer	Proponent	There is no exact location yet for the planned Marikina Dam but it will be somewhere near the current Wawa Dam.
9	Comment/ Question	Marie Angelie Tan/Marikina City Planning Development	She asked if there have been dredging activities being done by the Proponent as she observed some big trucks in the Jogging Lane area. The drivers of those trucks identified DPWH as the Proponent of the project.
	Answer	Proponent	The dredging in that area is not part of PMRCIP Phase IV, it might be from the DPWH District Office.
10	Comment/ Question	Ma. Corazon P. Lim/ Secretary Provident	She asked clarification regarding the height of the flood wall being proposed.
	Answer	Proponent	The maximum elevation of the flood wall in the Nangka area is more than 23 meters. [Note: Nangka area is part of Phase V.]
	Comment/ Question	Ma. Corazon P. Lim/ Secretary Provident	Based from Typhoon Ondoy experience, the flood in Provident Village reached the 2 nd floor of most houses. She raised concern whether the Project considered this in the design.
		Proponent	The ground elevation should first be determined in order to compare the house level with the design flood level. [Note: There was confusion in this part as Ms. Lim asserted that the flood level during Ondoy reached 23ft. Based from news articles, it was 23m and not 23ft.]
11	Comment/ Question	George Milla/ Provident Village Resident	He queried if there will be noise barriers to be installed during construction.
	Answer	Proponent	Noise barriers will be needed depending upon the equipment to be used. Maintenance of the construction equipment is part of the Environmental Management Plan to mitigate the impact of noise.
12	Comment/ Question	Roche Rigos/ Provident Village Resident	He raised the possibility of noise coming from the pile hammer during construction.
	Answer	Proponent	Ordinary pile driver (hammer) will not be used in the construction. A pile vibratory hammer will be used instead similar to Phase III as this produces less noise.

(3) 2nd PCM at Barangay Kalumpang, Marikina City

Venue: Barangay Kalumpang, Multipurpose Hall

Time: June 03, 2015

Participants: 63 (Local Residents: 48, Proponents: 15)

Topic No.	Comment/ Answer	Name/Position	Remarks
1	Comment/ Question	Bernardo B. Santos/Resident of Brgy. Kalumpang	He inquired if the ongoing dredging activities in their area is being facilitated by the DPWH or the DENR.
	Answer	Proponent	The on-going dredging activities along Marikina River is not part of the PMRCIP Phase IV since the Project will still commence in 2018. The on-going river dredging is facilitated by the DPWH Engineering District and is funded locally.
2	Comment/ Question	Nikki S. Reas/Brgy. Kalumpang Councilor	He asked for the distinction between the DPWH Main Office from the District Office in order for them to determine which office to proceed to seek help whenever necessary.
	Answer	Proponent	PMRCIP Phase IV is under the Unified Project Management Office Flood Control Management Cluster of the Department of Public Works and Highways (DPWH-UPMO-FCMC). The office is located at the Port Area and is under the office of Director Patrick Gatan as stated in the brochures distributed. The on-going dredging activities mentioned is under the DPWH District Engineering Office.
3	Comment/ Question	Kaye Noll Andres-Garcia/ Brgy. Kalumpang Brgy. Capt.	She expressed concern that people might be affected by the Project. In addition, she queried about the Project engineering details such as the river width incorporated in the design.
	Answer	Proponent	PMRCIP Phase IV river channel width is 90 meters. There was no Project Affected People (PAP) identified in Marikina City for Phase IV. The only area with PAPs in Phase IV are in Barangay Bagumbayan which is located in Quezon City.
4	Comment/ Question	Nikki S. Reas/Kagawad	He queried how the existing sheet piles along the river will be affected.
	Answer	Proponent	The existing sheet piles at the right side of the river has already been considered in the proposed Detailed Design. There are some sheet piles though that will be removed due to some excavation works. Removed sheet piles in good working conditions will be re-used in the Project.
5	Comment/ Question	Bernardo B. Santos	He raised concern about the existing "strong" river dike which was constructed in 1954. With the Project, the strength of the dike might be compromised due to the vibration during the construction phase.
	Answer	Proponent	The height of the existing river dike is actually below the proposed design flood level. The height of the flood wall will be increased if it is determined to be structurally sound, otherwise it will be replaced totally.
6	Comment/ Question	Ardi Gonzaga/ Brgy. Kalumpang Resident	He asked clarification if the on-going project of the DPWH District Office will be stopped when PMRCIP Phase IV will be implemented. Further, he asked if the Project is

Topic No.	Comment/ Answer	Name/Position	Remarks
			funded by the LGU of Marikina City.
	Answer	Proponent	Normally the timeline of DPWH projects are posted near the project site. Construction works for PMRCIP Phase IV on the other hand will still start in 2018, so most likely the contract of the on-going dredging works may have been finished by then. For the source of funds of the on-going project, since it is the Project of the DPWH District Office, it is still within DPWH, and therefore from the National Government.
	Comment	Kennedy Sueno/ Marikina City Engineer	For clarification, there is an on-going project being implemented by the Park Development Office, funded by the Marikina City Hall, which is separate from the on-going dredging works, a Project of DPWH under First Metro Manila District Engineering Office.
7	Comment	Salome Aquino	She suggested that the on-going DPWH dredging activities should be finished immediately as the upcoming rainy season will erode the soil that was removed from the river.
		Proponent	This concern will be forwarded to the DPWH First Metro District Office.

(4) 3rd PCM at Barangay Bagumbayang, Quezon City

Venue: Barangay Bagumbayang, Multipurpose Hall

Time: June 05, 2015

Participants: 112 (Local Residents: 102, Proponents: 10)

Topic No.	Comment/ Answer	Name/Position	Remarks
1	Comment/ Question	Jose Mendiola/ Bagumbayan Deputy Brgy. Peace & Security Officer	He asked the extent of the parapet wall that will be constructed as a component of the project.
	Answer	Proponent	[The lay-out plan of the Project was flashed in the screen] A new floodwall will be constructed from Rosario Weir up to Marcos Bridge, and from that area up to Marikina Bridge there will be heightening of the existing floodwall. The parapet wall will be the structure on top of the revetment.
2	Comment/ Question	Ms. Leny Pasco/ Capt. of Brgy. Libis	Someone from the DPWH said that they will not be affected by the ongoing project of the 51 st Brigade on the retaining wall located near the creek between Brgy. Bagumbayan and Brgy. Libis.
	Answer	Proponent	That scope of work is beyond PMRCIP Phase IV.
3	Comment/ Question	Rizaldy Masangkay/ Brgy. Bagumbayan Resident	He asked how many families will be affected and where will be the relocation site be possibly located. There are talks it is located in Bulacan.
	Answer	Proponent	The official results are not yet out, but once the report is finished, it will be presented to the Quezon City government. For the relocation site, it cannot be confirmed as it is the NHA (National Housing Authority) who has the authority to decide on such matters.

Topic No	Comment/ Answer	Name/Position	Remarks
4	Comment/ Question	Gil Ofina/ Ortigas North Association Representative	He asked if the Project will only involve dredging but not widening of the river. Can the industries along Marikina River have a discussion with DPWH to address the sustainable development of the area?
	Answer	Proponent	Regarding the first question some portions of the river may be widened following the 90-m river channel width. Aside from dredging, there will be construction of flood wall along the river. For the second question, several meetings will be held after this public consultation, and the suggestion to have a meeting with DPWH to promote sustainable development in the area would be taken into consideration while the detailed design is being finalized.
5	Comment/ Question	Alex Cruz/ Brgy. Bagumbayan Kagawad	In what station will the construction start? How will the boundary/starting point of construction be determined?
	Answer	Proponent	The construction program is not yet finalized, but the proposed scheme is from downstream going to upstream. The other specifications may be determined once the detailed engineering design is done.
6	Comment/ Question	Mr. Elmer Maturan/ Brgy. Captain, Brgy Bagumbayan	He wanted to request DPWH –ESSD that all affected Informal Settler Families (ISFs) be given a good relocation site with basic social services such as electricity and water. Further, he hoped that this Project is also anchored with the preparations being done to reduce the disaster risks related to the movement of the West Valley Fault. In case of an earthquake which will most likely affect the structures of Angat Dam, will the Project be able to withstand the flood caused by the bursting of Angat Dam?
	Answer	Proponent	Regarding the resettlement of ISFs, the guidelines specified by the existing laws on resettlement and relocation shall be followed. Regarding Angat Dam, this is located in Bulacan and in case it will be affected by the earthquake, the water will be directed towards Novaliches, Quezon City. It will not have an effect to the Pasig-Marikina River. The only dam connected with Marikina River is the Wawa Dam which is located in Montalban, Rizal [Rodriguez is the new name of Montalban]. This dam however is currently non-functional.
7	Comment/ Question	Jeanette E. Celmar/Brgy. Bagumbayan Resident	If the situation will call for a resettlement, she suggested that the house be big enough so she can put a sari-sari store. In addition, she hoped there will be a nearby school so her children's education will not be affected.
	Answer	Proponent	These suggestions will be taken into consideration following the resettlement guidelines imposed by our existing laws.
8	Comment/ Question	Nilo Jovero/ Alcos Global Corporation Representative	He queried if the design of the flood control structure be altered so as to avoid the existing structure currently occupied by the company he is working at.
	Answer	Proponent	The answer could not be provided as the Project is not yet done with the detailed design stage.

Topic No	Comment/ Answer	Name/Position	Remarks
9	Comment/ Question	Mr. Elmer Maturan/ Brgy. Capt., Brgy. Bagumbayan	He asked for clarification how to avoid duplication of data in the census survey. There was a case about a house owner who went out of town during the conduct of the census survey due to an emergency reason. The owner wanted his/her name to be reflected in the census survey and not the name of the house care-taker who was present during the survey.
	Answer	Proponent	Pertinent documents are normally presented to show the authenticity of the ownership of the house. Validation and documentation are done to establish the proper ownership of the house.

CHAPTER 5 CURRENT LEGAL FRAMEWORK OF THE PHILIPPINE EIS SYSTEM

5.1 Legal Framework

In the Philippines, any project or activity that may potentially have a negative impact on the environment is subject to an Environmental Impact Assessment (EIA) under the Philippine Environmental Impact Statement System (PEISS). The PEISS was initially set up by Presidential Decree (PD) No. 1151 in 1977, known as the Philippine Environmental Policy. It stipulates the necessity of the preparation of EIS for the proposed project and/or undertakings which might cause significant environmental impacts. In the following year, PD No. 1586 was promulgated to formalize the EIS System under the PD No. 1151.

The EIS process applies to proposed projects that are identified as Environmentally Critical Projects (ECPs) and proposed projects to be located in Environmentally Critical Areas (ECAs), two of which are presumed to have significant impacts on the environment. The ECPs and ECAs have been defined and identified in the Presidential Proclamation (PP) No. 2146 (1981) and PP No. 803 (1996). The implementing rules of the EIS System was stipulated in the DENR Administrative Order No. 37 in 1996 (DAO No. 96-37), which was revised to partly simplify the procedures by AO No. 42 (2002) and DAO No.03-30 (2003). In November 2011, Memorandum Circular 005 was issued by DENR-EMB to streamline EIA requirements and include climate change adaptation and disaster risk reduction into the EIA. In 2014, another Memorandum Circular (2014-005) was issued by DENR-EMB, in which coverage screening and standardized requirements were updated. Table 5.1.1 summarizes the legal framework of the PEISS.

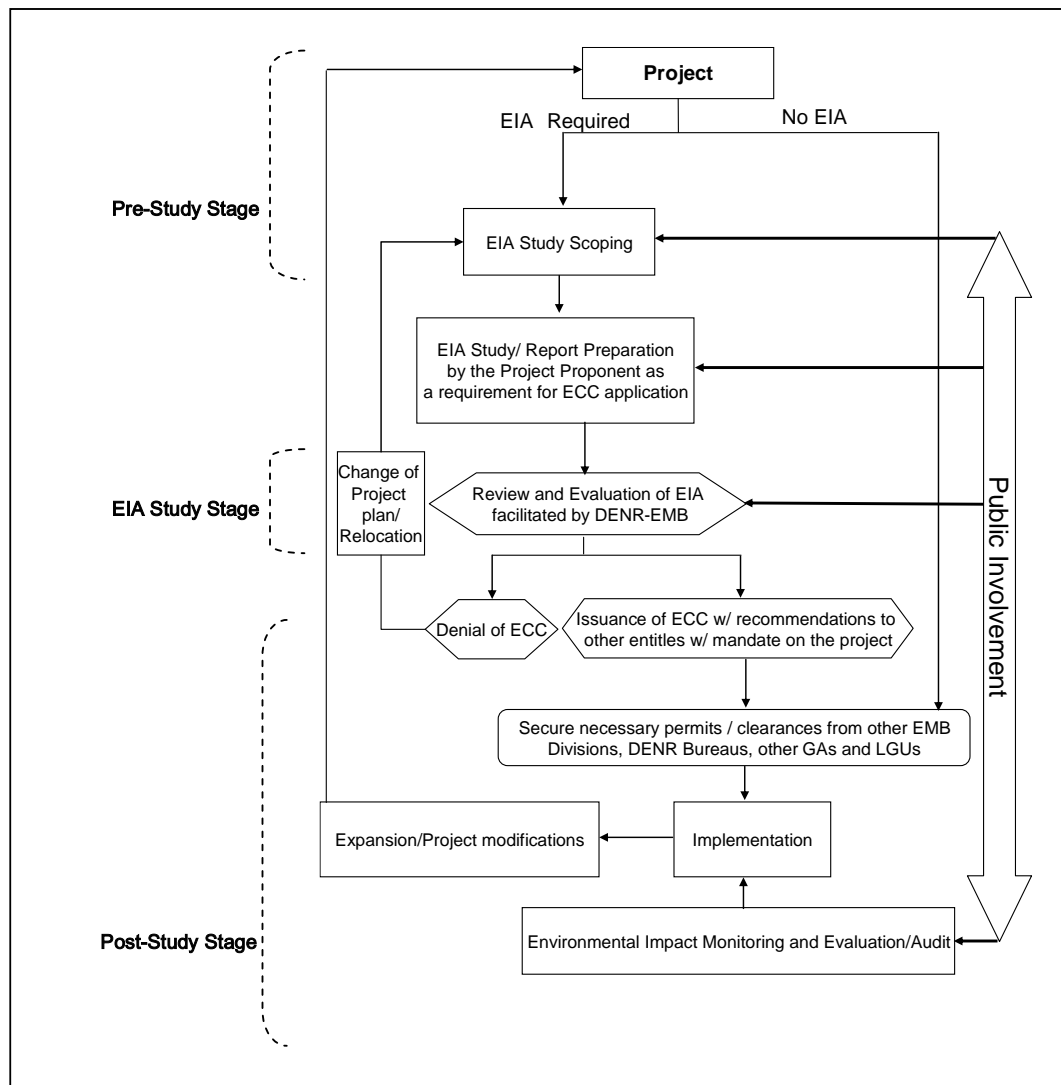
Table 5.1.1 List of Laws and Regulations/Guidelines for PEISS

Subject/Coverage		No./Title of laws, regulations or administrative order	Contents / Points related to the Project (PMRCIP)
1	PEISS (Philippine Environmental Impact Statement System)	Environmental Impact Statement System (EISS), Presidential Decree No. 1586 (1978)	An act establishing and centralizing the Environmental Impact Statement (EIS) System
2	Screening Process of PEISS	Presidential Proclamation No. 2146 (1981) and No. 803 (1996)	Environmentally Critical Projects (ECPs) to cause significant impact on the quality of environment and Environmentally Critical Areas (ECAs)
3	Further strengthening of PEISS	DENR Administrative Order No. 37 Series of 1996 (DAO 96-37)	Emphasis on promoting maximum public participation in EIA process for social acceptability of the project.
4	Timeframe of PEISS	Administrative Order (AO) No. 42 (2002)	Streamlining the ECC application processing procedures and strengthening the implementation of the PEISS
5	Implementation Rules and Procedures of PEISS	DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007)	Implementation rules and regulations of Presidential Decree No. 1586 (above). Also, provided detailed definitions of technical terms and detailed information regarding procedures, related laws and regulations
6	Climate change adaption and disaster risk reduction	DENR-EMB Memorandum Circular 005 (2011)	Promotion of Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) and streamlining EIA Requirements.

Subject/Coverage		No./Title of laws, regulations or administrative order	Contents / Points related to the Project (PMRCIP)
7	Coverage Screening and Standardized Requirements	DENR-EMB Memorandum Circular 005 (2014)	Providing project types within the ECP category as well as clearer and updated technical definition of ECAs description of activities / undertakings.

5.2 Procedures of PEISS

As shown in Figure 5.2.1, the procedures of EIA can be grouped into three major stages, including (1) pre-study stage (screening and scoping), (2) EIA study stage and (3) post-study stage (review, decision-making and monitoring).



Legend:

- Proponent driven
- DENR-EMB driven
- Proponent driven but the EIA process as requirements are under the mandate of other entities

Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

Figure 5.2.1 Summary Flowchart of EIA Process

5.3 Projects Covered by PEISS

The four (4) ECP project types and twelve (12) ECA categories declared under Proclamation No. 2146 (1981) and Proclamation No. 803 (1996) are summarized in Table 5.3.1 and Table 5.3.2, respectively.

Table 5.3.1 Summary of Environmentally Critical Projects (ECPs)

Main Categories	Sub Category
I. Heavy Industries	Non-Ferrous Metal Industries, Iron and Steel Mills, Petroleum and Petrochemical Industries, Smelting Plants.
II. Resource Extractive Industries	Mining and Quarrying Projects, Forestry Projects, Dikes for /and Fishpond Development Projects.
III. Infrastructure Projects	Dams, Power Plants, Reclamation Projects, Road and Bridges.
IV. Golf Course Projects	Golf Course

Source: Revised Guidelines for Coverage Screening and Standardized Requirements under PEISS, EMB Memorandum Circular , 004, July 2014

Table 5.3.2 Summary of Environmentally Critical Areas (ECAs)

ECA Categories	Examples
1. Areas declared by law as national parks, watershed reserves, wildlife preserves, and sanctuaries	<ul style="list-style-type: none"> - Areas declared as such under Republic Act No. 7586 or National Integrated Protected Areas System (NIPAS) Act, - Areas declared as such through other issuances from pertinent national and local government agencies such as presidential proclamations and executive orders, local ordinances and international commitments and declarations.
2. Areas set aside as aesthetic, potential tourist spots	<ul style="list-style-type: none"> - Aesthetic potential tourist spots declared and reserved by the LGU, DOT or other appropriate authorities for tourism development, - Class 1 and 2 cases as cited in EMB MC 2014-004 and defined under DENR MC 2012-03 and significant cases as may be determined by BMB and EMB.
3. Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)	<ul style="list-style-type: none"> - Areas identified as key biodiversity areas (KBAs) by BMB, - Areas declared as Local Conservation Areas (LCA) through issuances from pertinent national and local government agencies such as presidential proclamations and executive orders, local ordinances and international commitments and declarations.
4. Areas of unique historic, archeological, geological, or scientific interests	<ul style="list-style-type: none"> - All areas declared as historic site under RA 10066 by NHCP, - The whole barangay or municipality, as may be applicable, where archaeological, paleontological and anthropological sites/ reservations are located as proclaimed by the National Museum. - The whole barangay or municipality, as may be applicable, of cultural and scientific significance to be the nation as recognized through national or local laws or ordinances (e.g. declared geological monuments and scientific research areas and areas with cultural heritage significance as declared by the LGUs or NCCA).
5. Areas which are traditionally occupied by cultural communities or tribes	<ul style="list-style-type: none"> - Areas issued Certificate of Ancestral Domain Title (CADT) or Certificate of Ancestral Land Title (CALT) by National Commission on Indigenous Peoples (NCIP), - Areas issued Certificate of Ancestral Domain Claim (CADC) or Certificated Ancestral Land Claim (CALC) by the DENR, - Areas that are historically/ traditionally occupied as ancestral lands or ancestral domains by indigenous communities as documented in reputable publications or certified by NCIP.
6. Areas frequently visited and or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.	<p>The areas shall be so characterized if any of the following conditions exist:</p> <p>6.1 Geologic hazard areas:</p> <ul style="list-style-type: none"> - Areas classified by the MGB as susceptible to landslide;

	<ul style="list-style-type: none"> - Areas identified as prone to land subsidence and ground settling; areas with sinkholes and sags as determined by the MGB or as certified by other competent authorities. 6.2 Flood-prone areas: <ul style="list-style-type: none"> - Areas with identified or classified by MGB or PAGASA as susceptible or prone to flood. 6.3 Areas frequently visited or hard-hit by typhoons: <ul style="list-style-type: none"> - For purposes of coverage, depressions, storms and typhoons will be covered in the category; - This shall refer to all provinces affected by a tropical cyclone in the past. 6.4 Areas prone to volcanic activities/ earthquakes: <ul style="list-style-type: none"> - This refers to all areas around active volcanoes designated by Philippine institute of Volcanology and Seismology (PHIVOLCS) as Permanent Danger Zone as well as areas delineated to be prone to pyroclastic flow hazard, lava flow hazard, lahar hazard and other volcanic hazard as found applicable per active volcano. - This refers to all areas identified by Philippine institute of Volcanology and Seismology (PHIVOLCS) to be transected by active faults and their corresponding recommended buffer zones, as well as areas delineated to be prone to ground-shaking hazard, liquefaction hazard, earthquake-triggered landslide hazard and tsunami hazard.
7. Areas with critical slope	This shall refer to all lands with slope of 50% or more as determined from the latest official topographic map from NAMRIA.
8. Areas classified as prime agricultural lands	Prime Agricultural lands shall refer to lands that can be used for various or specific agricultural activities and can provide optimum sustainable yield with a minimum of inputs and developments costs as determined by DA, NIA or concerned LGU through their zoning ordinance.
9. Recharged areas of aquifers	<ul style="list-style-type: none"> - Recharge areas of aquifers shall refer to sources of water replenishment where rainwater or seepage actually enters the aquifers. - Areas under this classification shall be limited to all local or non-national watersheds and geothermal reservations.
10. Water bodies	All natural water bodies (e.g., rivers, lake, bay) that have been classified or not.
11. Mangrove Areas	Mangrove areas as mapped identified by DENR.
12. Coral Reefs	Coral reefs as mapped or identified by DENR and/or DA-BFAR.

Source: Revised Guidelines for Coverage Screening and Standardized Requirements under PEISS, EMB Memorandum Circular , 004, July 2014

The PMRCIP belongs to the infrastructure category in the Table 5.3.1 (ECPs). However, this Project is not included in the sub-category of the table. On the other hand, the Project is included in Category 6 (sub-categories of 6.2 and 6.3) and 10 in Table 5.3.2 (ECAs).

5.4 Required Documents under PEISS

Projects are classified into five major groups depending on the type and location of the project as shown in table below:

Table 5.4.1 Project Groups for EIA under PEISS

Group	Definition
I	Environmentally Critical Projects (ECPs) in both Environmentally Critical Areas (ECAs) and Non-Environmentally Critical Areas (Non-ECAs)
II	Non-Environmentally Critical Projects in Environmentally Critical Areas
III	Non-Environmentally Critical Projects in Non-Environmentally Critical Areas.
IV	Co-located projects in either Environmentally Critical Areas (ECAs) or Non-Environmentally Critical Areas (Non-ECAs); A group of single projects, under one (1) or more Proponents/Locators, which are located in a contiguous area and managed by one (1) Administrator, who is also the ECC Applicant (e.g., Economic Zones)
V	Unclassified projects which are not listed in any of the groups above, e.g., projects using new processes/ technologies with uncertain impacts (interim category)

Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

There are seven different types of reports required under the PEISS, including:

- 1) Environmental Impact Statement (EIS),
- 2) Programmatic EIS (PEIS),
- 3) Initial Environmental Examination Report (IEER),
- 4) Initial Environmental Examination Checklist (IEEC),
- 5) Project Description Report (PDR),
- 6) Environmental Performance Report and Management Plan (EPRMP), and
- 7) Programmatic EPRMP (PEPRMP).

For new projects, EIA-covered projects in Group I, II and IV in Table 5.4.1 are required either of EIS, PEIS, IEER or IEEC. For non-covered projects in Group II and III, PDR is the appropriate document to secure a Certificate of Non-Coverage (CNC) from DENR-EMB.

For operating projects with an existing Environmental Compliance Certificate (ECC) but planning to modify/expand or re-start operations, the requirement is EPRMP for a single project and PEPRMP for co-located project is applied.

The following is the outline of the EIS according to *Revised Procedural Manual* of DENR Administrative Order No. 30 Series of 2003:

Table 5.4.2 EIS Outline based DAO No. 2003-30

Project Fact Sheet
Table of Contents
Executive Summary
1) Brief Project Description
2) Brief Summary of Project's EIA Process
3) Summary of Baseline Characterization
4) Summary of Impact Assessment and Environmental Management Plan
5) Summary of Environmental Monitoring Plan
6) EMF and EGF Commitments
DRAFT MAIN EIS
1. BASIC PROJECT INFORMATION
2. DESCRIPTION OF THE PROJECT'S EIA PROCESS
2.1. Terms of Reference of the EIA Study
2.2. EIA Team
2.3. EIA Study Schedule
2.4. EIA Study Area
2.5. EIA Methodology
2.6. Public Participation
3. PROJECT DESCRIPTION
3.1. Project Location and Area
3.2. Project Rationale
3.3. Project Alternatives
3.4. Project Development Plan, Process/Technology Options and Project Components
3.5. Description of Project Phases (Activities/Environmental Aspects, Associated Wastes and Built-in Pollution Control Measures)
3.5.1. Pre-construction/ Pre-operational phase
3.5.2. Construction/Development phase
3.5.3. Operational phase
3.5.4. Abandonment phase
3.6. Manpower Requirements
3.7. Project Cost
3.8. Project Duration and Schedule
4. BASELINE ENVIRONMENTAL CONDITIONS, IMPACT ASSESSMENT AND MITIGATION
4.1. The Land (Discuss only relevant modules)
4.1.1. Land Use and Classification
4.1.2. Pedology
4.1.3. Geology and Geomorphology
4.1.4. Terrestrial Biology
4.2. The Water (Discuss only relevant modules)
4.2.1. Hydrology & Hydrogeology
4.2.2. Oceanography
4.2.3. Water Quality

4.2.4. Freshwater Biology
4.2.5. Marine Biology
4.3. The Air (Discuss only relevant modules)
4.3.1. Meteorology
4.3.2. Air Quality and Noise
4.4. The People
5. ENVIRONMENTAL RISK ASSESSMENT (WHEN APPLICABLE)
6. ENVIRONMENTAL MANAGEMENT PLAN
6.1. Impacts Management Plan
6.2. Social Development Framework
6.3. IEC Framework
6.4. Emergency Response Policy and Generic Guidelines
6.5. Abandonment /Decommissioning /Rehabilitation Policies and Generic Guidelines
6.6. Environmental Monitoring Plan
6.6.1. Self-Monitoring Plan
6.6.1. Multi-sectoral Monitoring Framework
6.6.1. Environmental Guarantee and Monitoring Fund Commitment
6.7. Institutional Plan for EMP Implementation
7. BIBLIOGRAPHY/REFERENCES
8. ANNEXES
8.1. Scoping Checklist
8.2. Original Sworn Accountability Statement of Proponent
8.3. Original Sworn Accountability Statement of Key EIS Consultants
8.4. Proof of Public Participation
8.5. Baseline Study Support Information
8.6. Impact Assessment and EMP Support Information

Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

5.5 Public Participation in PEISS

(1) Information, Education and Communication (IEC) and Public Scoping

DENR Administrative Order No. 30 Series of 2003 (DAO 03-30) states that an IEC of Local Government Unit (LGU) is required at the minimum of EIS-based applications as part of the social preparation process at Pre-Scoping. IEC serves as a basis for preliminary identification of stakeholders and related issues in preparation for the Public Scoping. For EIS-based applications, Public Scoping is one of the processes to obtain community inputs prior to the technical scoping of EIA Review Team with the proponent, conducted before signing-off of the Scoping Checklist mentioned, which comprises the final TOR of the EIA Study.

(2) Public Hearing/Consultation

For the disclosure of the EIA findings, Public Hearings shall be required for all new ECPs for which Public Scoping was undertaken. A waiver of the Public Hearing requested by the Proponent may be granted by the DENR-EMB if there is no mounting opposition or written request for one with valid basis. In such cases, a Public Consultation might be conducted instead.

(3) Participation of Indigenous Peoples for Decision-making Process

In 2006, NCIP Administrative Order No.1, namely, the Free and Prior Informed Consent (FPIC) guidelines, was promulgated by the National Commission of Indigenous People (NCIP). The objective of the guideline is to ensure genuine participation of Indigenous Cultural Communities (ICC) and Indigenous Peoples (IPs) in decision-making as well as to protect the rights of ICCs/IPs in the introduction and implementation of activities that will impact upon their Ancestral Domains/Lands (ADs/ALs).

The guideline also details the process for conducting Field Based Investigation (FBI) and obtaining the Certification Precondition from the NCIP attesting that the applicant has complied with the requirements for securing the affected ICC/IP's FCIP. It is required for the EIS (Environment Impact Statement)-based projects which can affect the ADs to follow the FCIP procedures.

NCIP regional office is responsible for receiving applications for the issuance of Certificate Precondition as well as implementing FBI and overseeing the process to obtain the FPIC from the IPs/ICCs.

5.6 Responsibility of Relevant Organizations

5.6.1 DENR-EMB

The Department of Environment and Natural Resources (DENR) is responsible for the conservation, management, and development of the environment and natural resources in the Philippines. As the main government agency tasked to promote sustainable development, its core function is to formulate and implement environmental policies or guidelines for environmental management, as well as pollution prevention and control. The DENR also regulates the exploration, development, extraction and disposition of natural resources in the Philippines, which includes water bodies, forests, lands, minerals and wildlife.

Pollution prevention and control, environmental protection and environmental impact assessments are carried out by DENR through its line bureau, the DENR Environmental Management Bureau (DENR-EMB). The DENR-EMB is mandated to implement national environmental laws, namely, the Environmental Impact Statement (EIS) System (PD 1586), Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990 (RA 6969), Clean Air Act of 1999 (RA 8749), Ecological Solid Waste Management Act of 2000 (RA 9003), Philippine Clean Water Act of 2004 (RA 9275), and the Environmental Awareness and Education Act of 2008 (RA 9512). Technical and regulatory assistance is provided by DENR-EMB, which includes the issuance of environmental permits, clearances and environmental compliance monitoring. Various environmental parameters, including air quality, water quality and noise, are monitored and assessed using environmental standards set by the DENR-EMB. In line with its mandate of implementing the EIS System, the issuance of an ECC for proposed projects that will pose significant risks or impacts on the environment, such as mining, agricultural or infrastructure projects, including flood risk management projects.

The DENR-EMB operates at the central, regional, provincial and community level. It is headed by the DENR-EMB Director at the national level and supported by seven divisions. The secretariats for the National Solid Waste Management Commission and the Pollution Adjudication Board are under the DENR-EMB. Regional DENR-EMB offices have five supporting divisions that allow each region to function independently.

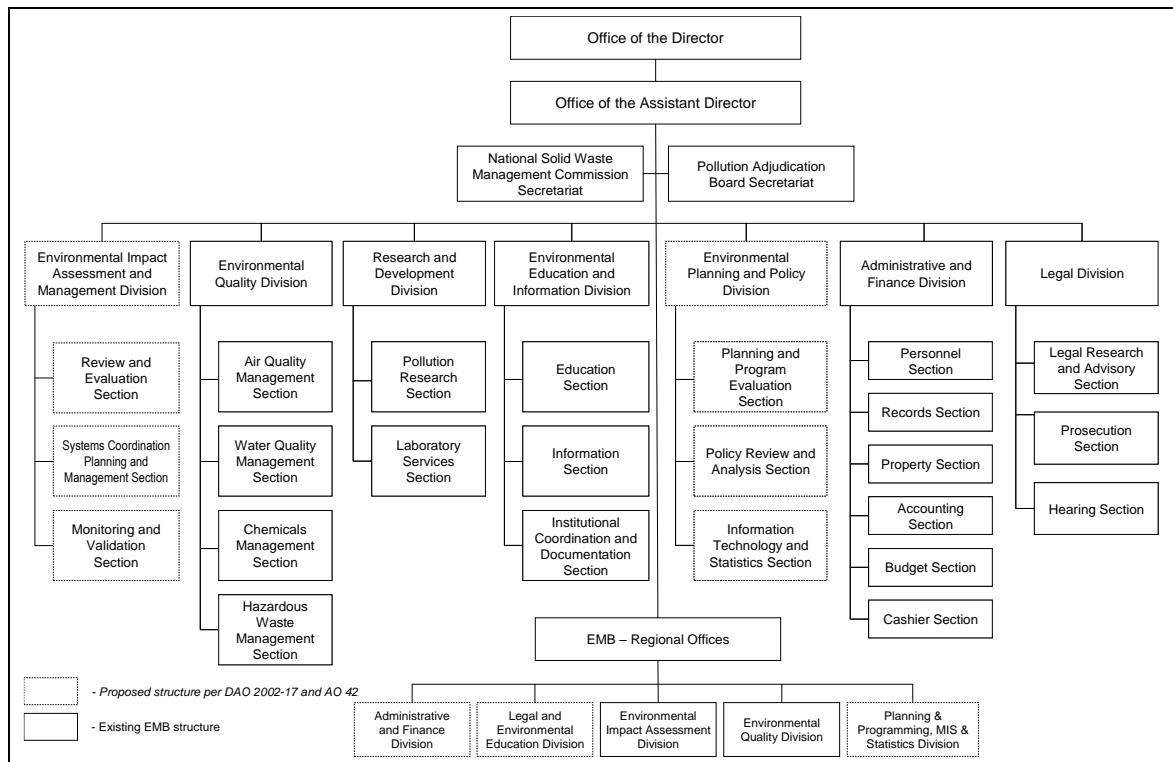


Figure 5.6.1 Organization Chart of DENR-EMB Central Office

5.6.2 DENR-EMB-NCR

EMB-NCR is headed by a Regional Director who manages and sets direction to the over-all operation of the Regional Office. She is backed up with four (4) Divisions, namely the Pollution Control Division (PCD), the Environmental Impact Assessment and Management Division (EIAMD), the Administrative and Finance Division (AFD) and the Planning and Programming, Management Information System and Statistics Division (PPMISSD), all of which are composed of several sections. The EIAMD, AFD, and PPMISSD are ad hoc Division headed by the regular personnel whose position items belong to the Environmental Quality Division (EQD), which is the lone regular division created under Executive Order 192. The ad hoc divisions were created in the consonance with converted the EMB from a staff bureau to a line bureau.

The main task of the Regional Office involves enforcement of environmental laws within Metro Manila. It however, has no Legal Division. Legal Officers hired under a “Contract of Service” term provides legal assistance in the pursuance of cases involving violation of environmental laws. Penalties for violation of Presidential Decree 1586 are imposed strictly based on set guidelines in the Procedural Manual prepared specifically for PD 1586 implementation.

Other critical ECC related cases are endorsed to EMB-Central Office Legal Division. Cases involving non-compliance to the provision of RA 6969 are as much as possible resolved through the conduct of technical conferences within the regional office. On the other hand, cases involving violation of the Clean Air Act and Clean Water Act are endorsed to the Pollution Adjudication Board (PAB). The Environmental Education Unit which is mandated to undertake information dissemination on environmental issues and concerns reports directly to the Regional Director. It regularly conducts seminar/ lectures to various stakeholders of the region.

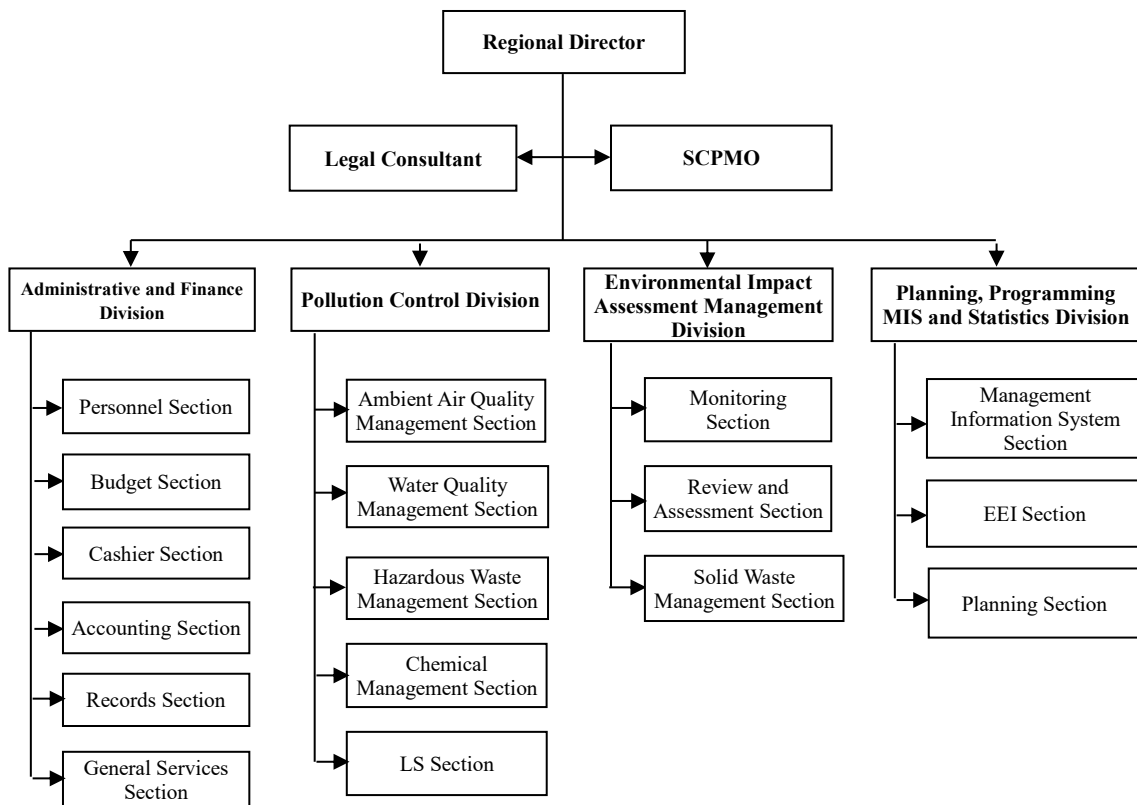


Figure 5.6.2 Organizational Chart of DENR-EMB-NCR

5.6.3 DPWH-ESSD

Formerly known as the Environmental and Social Service Office of the Department of Public Works and Highways (DWPW-ESSO), the Environmental and Social Safeguard Division (DPWH-ESSD) is under the Planning Service of the DPWH Assistant Secretary. The DWPW-ESSD oversees environmental and social considerations for proposed DPWH projects and has worked with international donors like JICA, ADB and WB, for various development projects. Aside from fulfilling requirements from international aid donors, DPWH-ESSD uses the Philippine EIS as a guide to understand environmental and social conditions at proposed project sites. More specifically, DPWH-ESSD performs the following:

- Assessments for environmental and social impacts, as well as land acquisition.
- Preparation of various documents required by the PEISS for proposed projects, including reports for IEE, EIA, Environmental Management Plans (EMP) and Resettlement Action Plans (RAP).
- Monitoring for environmental parameters, RAP implementation and post-project implementation.
- Guidance for DPWH-PMO regional and district offices for the preparation of the abovementioned PEISS documents, project monitoring and implementation
- Facilitation of consultations and information dissemination to project stakeholders.
- Maintenance and update of Geographical Information System (GIS) and data bank.
- Training at the regional, district and local level for environmental and social consultation, RAP implementation, environmental management planning, monitoring, and other EIA tools.
- Coordination with other DPWH Offices, government agencies, LGUs, NGOs and other stakeholders regarding environmental concerns on DPWH projects.

The organizational structure of DPWH-ESSD is found under Figure 5.6.3. There are three offices supporting DPHW-ESSD, including the National Sewerage and Septage Management (NSSM) Office, the Environmental Section and Social and Gender Section.

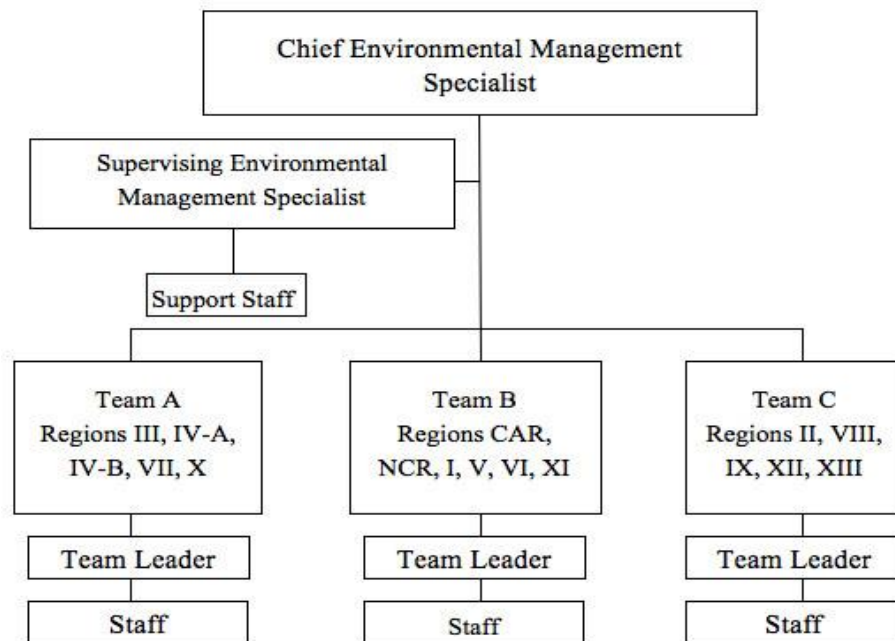


Figure 5.6.3 Organizational Chart of DPWH-ESSD

5.7 Regal Framework on Environmental and Social Considerations

5.7.1 Environmental Protection and Quality Standards

(a) Presidential Decree (PD) No. 984 (1976): Pollution Control Law

The Act serves as the foundation for managing industrial activities which deteriorate air and water quality. It empowers the DENR to impose ex-parte cease and desist orders (CDO) on the grounds of immediate threat to life, public health, safety or welfare, or to animal or plant life when wastes or discharges exceed the normal amounts. Penalties for the National Pollution Control Commission (NPCC) of the prohibited acts are also stipulated including fines, imprisonment, closure or stoppage of operations as well as payment of damages.

(b) Presidential Decree (PD) No. 1152 (1977): Philippine Environmental Code

The Decree is known as the Philippine Environment Code, and it launches a comprehensive program on environmental protection and management. It also provides for air, water quality, land use, natural resources and waste management for fisheries and aquatic resources; wildlife; forestry and soil conservation; flood control and natural calamities; energy development; conservation and utilization of surface and ground water and mineral resources.

(c) Republic Act (RA) No. 8749 (1999): Clean Air Act

The Act outlines the government's measures to reduce air pollution and incorporate environmental protection into its development plans. It relies heavily on the polluter pays principle and other market-based instruments to promote self-regulation among the population. It sets emission standards for all motor vehicles and issues pollutant limitations for industry. It also imposes the appropriate punishments for violators of the law.

(d) Republic Act (RA) No. 9275 (2004): Clean Water Act

The Act aims to protect the country's water bodies (natural and manmade) of fresh, brackish, and saline waters, and includes but not limited to aquifers, groundwater, springs, creeks, streams, rivers, ponds, lagoons, water reservoirs, lakes, bays, estuarine, coastal and marine waters. It provides for a comprehensive and integrated strategy to prevent and minimize pollution through a multi-sectoral and participatory approach involving all the stakeholders.

(e) DAO No. 2000-81: Implementing Rules of Regulations for RA No. 8749

DAO No.2000-81 is IRR for RA No. 8749, known as the "Philippine Clean Air Act of 1999." It provides the National Ambient Air Quality Guideline Values necessary to protect public health and safety and general welfare.

(f) Memorandum Circular of National Pollution Control Commission (NPCC), 1980

The Memorandum Circular provides the ambient noise level by category of areas, i.e., the section or area which requires quietness, residential, commercial, light industrial and heavy industrial areas, and by time regime in a day, i.e., morning, daytime, evening and night time.

(g) DAO No. 1990-34: Revised Water Usage and Classification/Water Quality Criteria

DAO No. 1990-34 provides water usages and classification for Fresh Surface Waters (rivers, lakes, reservoirs, etc.) and Coastal and Marine Waters (Section 68), and Water Quality Criteria for Fresh Waters (the same) and Coastal and Marine Waters Criteria (Section 69).

(h) DAO No.1990-35: Revised Effluent Regulations of 1990, Revising and Amending the Effluent Regulations of 1982

DAO No. 1990-35 applies to all industrial and municipal wastewater effluents. It provides effluent standards, or maximum limits, of toxic and other deleterious substances for the protection of public health, and of conventional and other pollutants, etc.

5.7.2 Solid Waste Management and Disposal

(a) Presidential Decrees (PD) No.856 (1975): Code on Sanitation of the Philippines

PD No. 856, known as “Code on Sanitation of the Philippines,” prescribes guidelines, requirements and restrictions to ensure cleanliness in various establishments such as restaurants, hospitals, hotels, funeral parlors etc. The purpose of the law is to promote the health of the people and to codify and integrate the scattered sanitary laws to ensure that they are in keeping with modern standards of sanitation.

(b) Presidential Decrees (PD) No.1152 (1977): Philippine Environmental Code

PD No. 1152, known as “Philippine Environment Code,” defines the policy objectives and the strategies for the various aspects of environmental management, including waste management. It gives the Department of Internal and Local Government (DILG) the task of promulgating guidelines for the formation and establishment of waste management programs. Further, it mandates each local government unit to provide measures to facilitate the collection, transportation, processing and disposal of waste within its jurisdiction in coordination with other government agencies concerned.

(c) Republic Act (RA) 6969 (1990): Toxic Substances and Hazardous and Nuclear Wastes Control Act

The Act, known as “Toxic Substances and Hazardous and Nuclear Wastes Control Act,” covers the importation, manufacture, processing, handling, storage, transportation, sale, distribution, use and disposal of all unregulated chemical substances and mixtures in the Philippines, including the entry, even in transit, as well as the keeping or storage and disposal of hazardous and nuclear wastes into the country for whatever purpose.

(d) Republic Act (RA) No.9003 (2001): Ecological Solid Waste Management Act

The Act, known as “Ecological Solid Waste Management Act of 2000,” seeks to adopt a systematic, comprehensive and ecological solid waste management program. It stipulates guidelines and targets for solid waste avoidance and volume reduction through source reduction and waste minimization measures, including composting, recycling, reuse, recovery, green charcoal process, and others, before collection, treatment and disposal. The Act also ensures the proper segregation, collection, transport, storage, treatment and disposal of solid waste. The LGUs shall be primarily responsible for the Act.

(e) DAO No. 2013-22, DAO 36 Series of 2004 (DAO 04-36): Procedural Manual on Hazardous Wastes

DAO No. 04-36 is a procedural manual on hazardous wastes of DAO No.92-29, Implementing Rules and Regulations of RA 6969. DAO No. 2013-22 is a revised procedural manual on hazardous wastes of DAO No. 04-36, which provides a table for the classification of hazardous waste and lays down the requirements for proper hazardous waste management.

5.7.3 Protected Areas and Protected Species

(a) Republic Act (RA) No. 7586 (1992): National Integrated Protected Areas System (NIPAS)

The Act, known as National Integrated Protected Areas System (NIPAS), aims to protect and maintain the natural biological and physical diversities of the environment, notably areas with biologically unique features to sustain human life and development as well as

plant and animal life. It establishes a comprehensive system of integrated protected areas to encompass (1) outstandingly remarkable areas and biologically important public lands that are habitations of rare and endangered species of plants and animals, (2) biogeographic zones and (3) related ecosystems, whether terrestrial, wetland or marine.

(b) DAO No. 2008-26 Revised IRR of RA No. 7586

The DAO is the Revised Implementing Rules and Regulations of the NIPAS Act of 1992, stipulates the procedures for the establishment, administration, management and development of the System. It sets the categories and criteria in the determination of appropriate category of a protected area, including strict nature reserve, natural park, natural monument, wildlife sanctuary, protected landscape and seascape, resource reserve, natural biotic areas, and other categories.

(c) Republic Act (RA) No.9147 (2001): Wildlife Resources Conservation and Protection Act

The Act, known as the "Wildlife Resources Conservation and Protection Act," provide for the conservation and protection of wildlife resources and their habitats, appropriating funds therefore and for other purposes. The provisions of this Act shall be enforceable for all wildlife species found in areas of the country, including protected areas under RA No. 7586 (NIPAS). This Act shall also apply to exotic species which are subject to trade, are cultured, maintained and/or bred in captivity or propagated in the country.

(d) DAO No. 2004-15: List of Threatened Species and Other Wildlife

The DAO establishes a list of terrestrial threatened species and their categories, and the list of other wildlife species pursuant to Republic Act No. 9147, otherwise known as the Wildlife Resources Conservation and Protection Act of 2001 (listed above).

(e) DAO No. 2007-01: Protected Species

The DAO establishes a list of threatened Philippines plants and their categories, and the list of other wildlife species, pursuant to Republic Act No. 9147, otherwise known as the Wildlife Resources Conservation and Protection Act of 2001 (listed above).

5.7.4 River Area, Land Acquisition and Resettlement

(a) The Water Code (Presidential Decree No. 1067, 1976)

The Code covers underground water, water above the ground, water in the atmosphere and the waters of the sea within the territorial jurisdiction of the Philippines. It establishes the basic principles and framework relating to the appropriation, control and conservation of water resources to achieve the optimum development and rational utilization of these resources. The Code administers river areas in Article No. 51 as follows: The banks of rivers and streams and the shores of the seas and lakes throughout their entire length and within a zone of three (3) meters in urban areas, 20m in agricultural areas, and 40m in forest areas along their margins, are subject to the easement of public use. No person shall be allowed to build structures of any kind or to stay in this zone longer than necessary for recreation, navigation, floatage, fishing, or salvage

(b) Urban Development and Housing Act (UDHA) (RA 7279, 1992)

The Act is a piece of legislation that essentially calls for the provision for a comprehensive and continuing urban development and housing program, and to establish the mechanism for its implementation. Also informally known as the Lina Law after its author, former senator Jose D. Lina, the law mandates the local governments, with the support of the national government, to undertake urban development and renewal, paying attention to underprivileged and homeless citizens. It also sets the guidelines and the procedures in the eviction of informal settlers and demolition of their dwellings (Section 28) and resettlement (Section 22, 23 and 29).

(c) An Act to Facilitate the Acquisition of Right-Of-Way (ROW), Site or Location for National Government Infrastructure Projects and for other Purposes (RA 8974, 2000)

The Act is aiming at facilitating the acquisition of real property needed as right-of-way, site or relocation for any national government infrastructure project through donation, negotiated sales, expropriation or any other mode of acquisition as provided by law (Section 3). The law and its IRR also prescribe that the valuation of improvements and/or structures shall be determined using the replacement cost method (Section 5).

(d) Executive Order No. 708 (2008) – Amending EO 152, s. 2002

The Order devolves the functions of the Presidential Commission for the Urban Poor (PCUP) as the clearing house for the conduct of demolition and eviction activities involving the homeless and underprivileged citizens to the local government units (LGUs) (Section 1), mandates the creation of Local Housing Boards by virtue of a local ordinance (Section 2) and the PCUP retaining its monitoring and reporting units (Section 3).

(e) Executive Order No. 69 (2012). Strengthening the Presidential Commission for the Urban Poor

The Order and its IRR is aimed to strengthen the Presidential Commission for the Urban Poor (PCUP), by transferring the PCUP under the Office of the President of the Philippines to effectively coordinate, formulate, and evaluate policies and programs concerning the urban poor (Section 1), to undertake social preparation activities related to the urban poor (Section 2), and to designate the PCUP as a member of the Local Inter Agency Committee (LIAC), the Housing and Urban Development Coordinating Council (HUDCC), the Local Housing Board and other key shelter agencies (Section 3).

CHAPTER 6 ENVIRONMENTAL BASELINE CONDITIONS

6.1 Scope of Updated Environmental Baseline Conditions

6.1.1 Scope of Environmental Components

Seventeen (17) years have passed since the EIS (1998) was prepared for this Project. Hence the environmental and social situations in the project areas of Phase IV have changed due to the urbanization along the Marikina River. Some of such changes are estimated to affect the appropriateness of the results of environmental impact assessment and the Environmental Management Plan (EMP) developed in the EIS (1998). In order to prepare the proper way for impact prediction and assessment as well as to cope with the anticipated negative impacts, it is necessary to review/ update the environmental baseline conditions, on which the environmental impact shall be conducted. Scope of the reviewing/ updating components of the baseline conditions are listed in the table below. The key points of the survey are as follows:

- Focusing on the areas to be affected by construction works and flood control structures of the Project, Phase IV, which may cause potential negative impacts.
- Focusing on the current status of environmental and social conditions which have changed from the time when EIS was prepared (1998) in the potential impact areas mentioned above,
- Updating and adding some information that can be used to anticipate environmental and social impacts by the implementation of the Project.

Table 6.1.1 Scope of Environmental Components Reviewed/ Updated

No.	Category	Components
1	Physical-chemical Environment	Air quality, Noise, River water quality, Riverbed sediment quality, Solid waste, Land subsidence, Offensive odor.
2	Natural Environment	Meteorology and climate, Pedology, topography and geology, Hydrology, Terrestrial flora, Terrestrial fauna, Aquatic biota, Protected areas and Environmentally Critical Areas (ECAs).
3	Socio-economic Environment	Demography, Land use, Infrastructure and social services, Socio-economic and livelihood conditions, Water use, River dependency, Cultural and historical heritage, Social issues, Religion and worship, Public health and infectious diseases including HIV/AIDS, Gender, vulnerable people and rights of children, Ethnic minority and indigenous people, Perception of Location People for PMRCIP.

Note) Components listed in this table are not exactly correspondent to those listed in Table 3.3.1. These components will be discussed in Section 6.1 Potential Negative Impacts without Mitigation.

6.1.2 Objective Area of Environmental Survey

The LGUs that cover the riverine area facing to the Middle Marikina River are chosen as a project-affected area of the Project, Phase IV. These LGUs are shown within the boundary line in Figure 6.1.1.

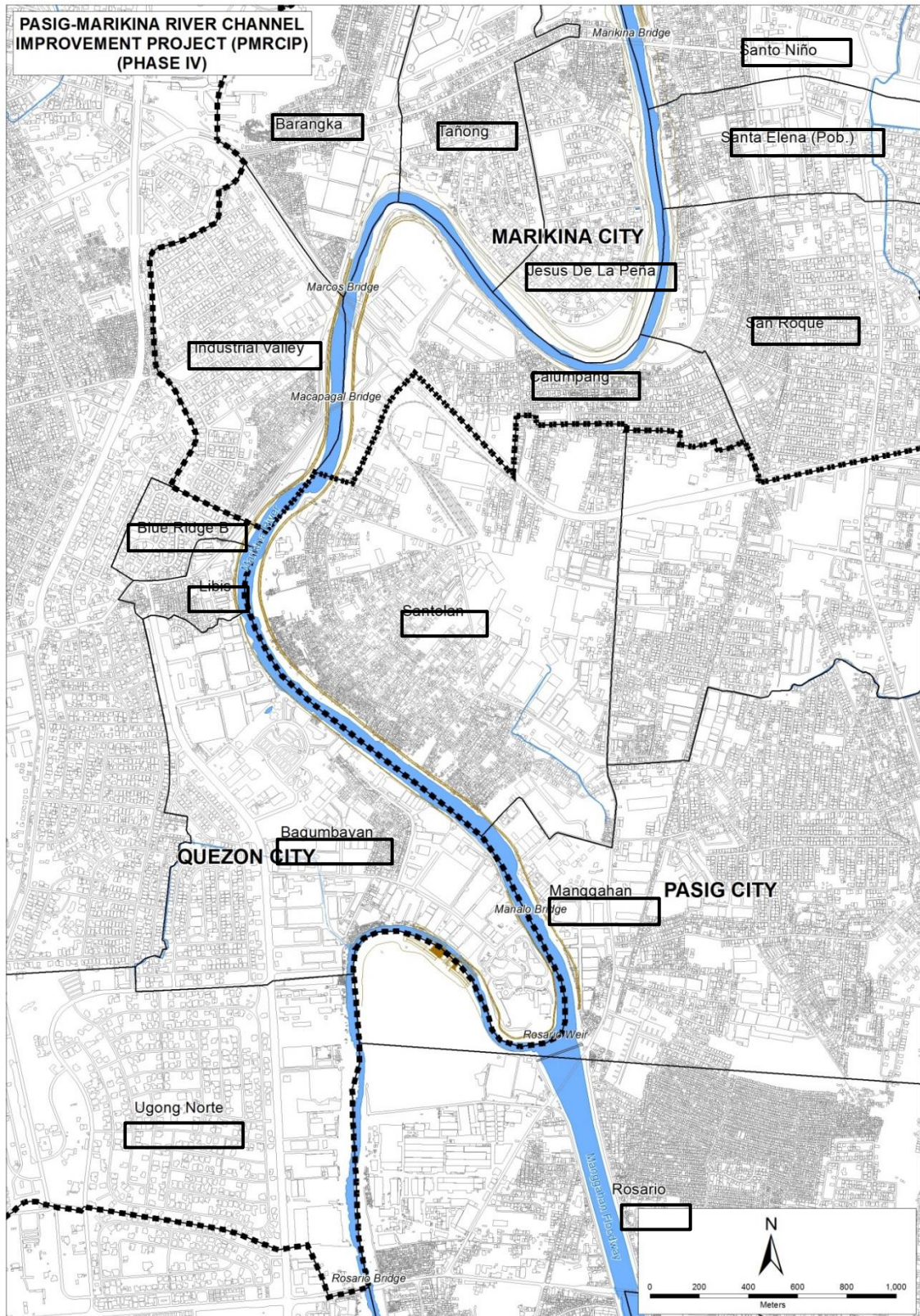


Figure 6.1.1 LGUs along the Marikina River in Affected Area of the Phase IV

Regarding the Project, Phase II, construction works for river channel improvement of the Pasig River were continued from 2009 to 2013. During the construction stage, necessary environmental measures were taken. Environmental monitoring was also conducted in timely manner and inspected by Multi-partite Monitoring Team (MMT) consisting of the stakeholders, including DPWH (Proponent), DENR-NCR, LGUs, LLDA, MMDA and NGOs.

As for the Project, Phase III, consisting of the two packages; Contract Package 01 (CP-1) covering the Pasig River and Contract Package 02 (CP-2) covering the Lower Marikina River, construction works have commenced in 2014 and will be completed in 2017. The baseline environmental condition surveys were conducted from July 2014.

Environmental monitoring locations, including air quality, noise, water quality and aquatic biota in the Phase II and III are shown in Figure 6.1.2. Figure 6.1.3 and 6.1.4 show the sampling locations and survey area of primary data for the review / updating of EIS (1998) for Phase IV.

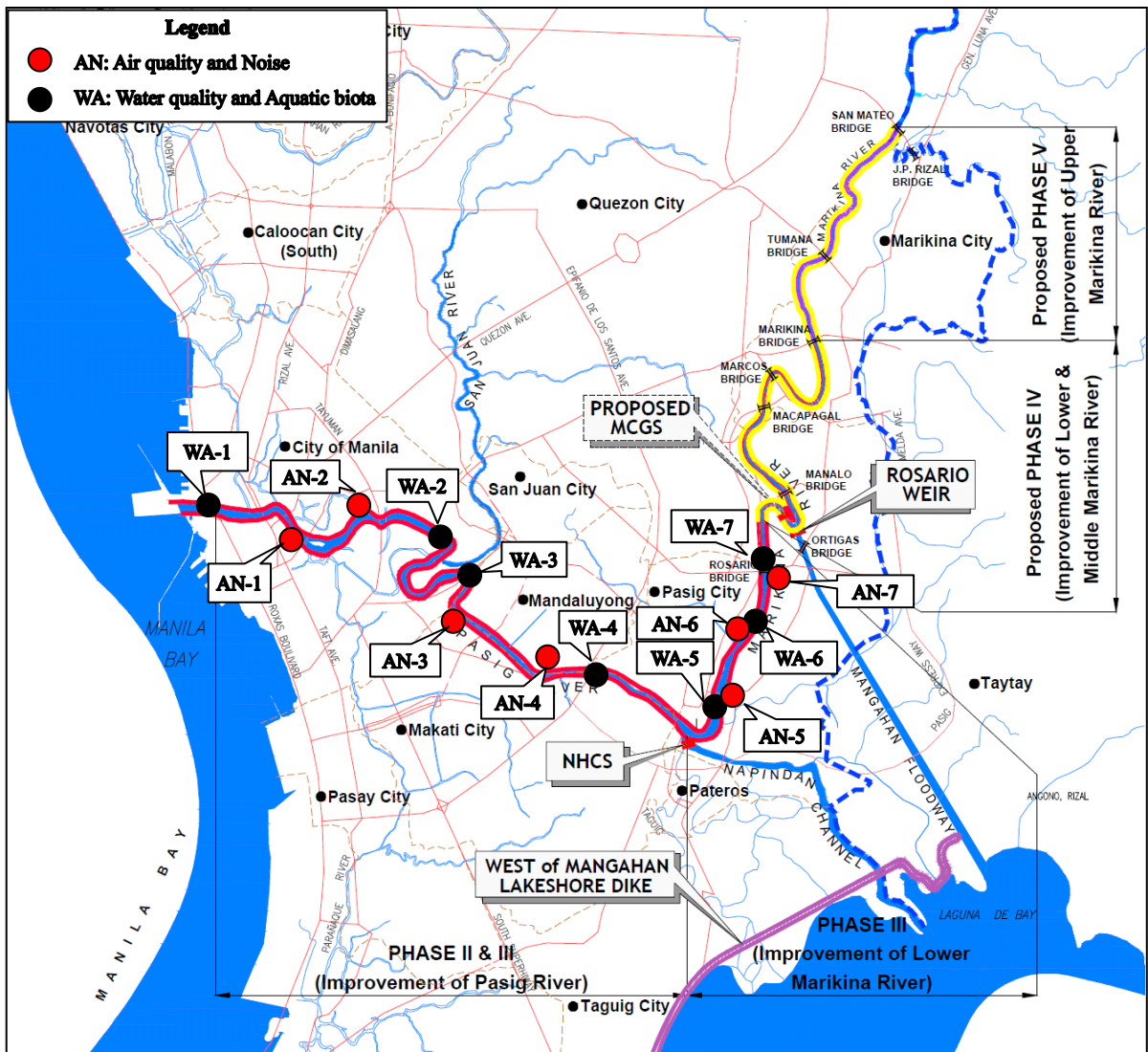


Figure 6.1.2 Environmental Monitoring Stations for the PMRCIP, Phase II and III

Laguna Lake is connected to Marikina River by the Mangahan Floodway and has been used as a buffer to temporarily store the major part of flood discharge from Marikina River. The construction of MCGS which is a significant component of Phase IV will regulate the flood diversion, and hence bring more flood discharge to the Lake. Although it is evaluated that the environmental impacts to the Lake by MCGS are minimal and negligible, the present environmental conditions of Laguna Lake is given in Annex – 8 as a reference.

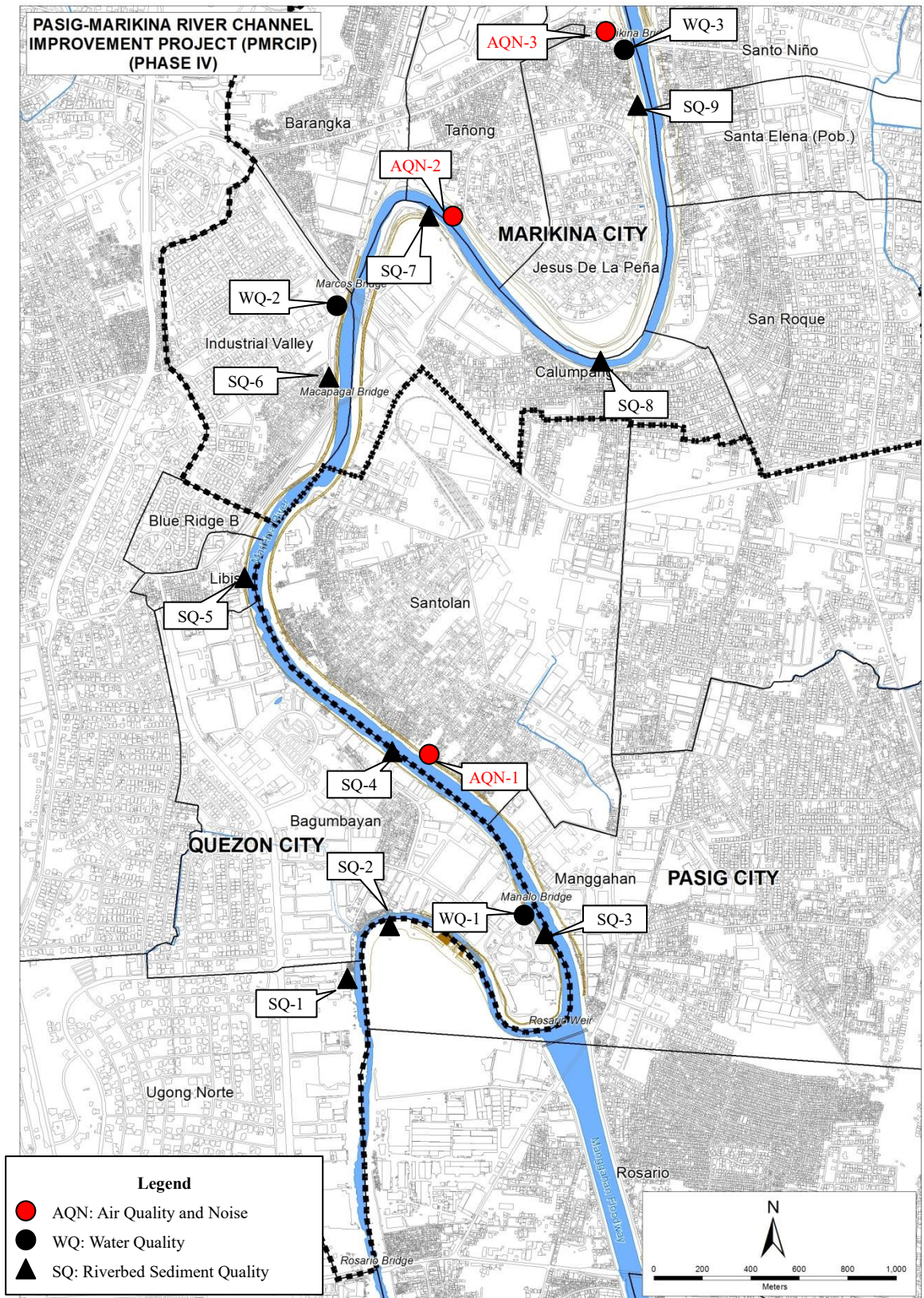


Figure 6.1.3 Sampling Locations for Primary Data on Air Quality, Noise, Water quality and Riverbed Sediment Quality for Phase IV

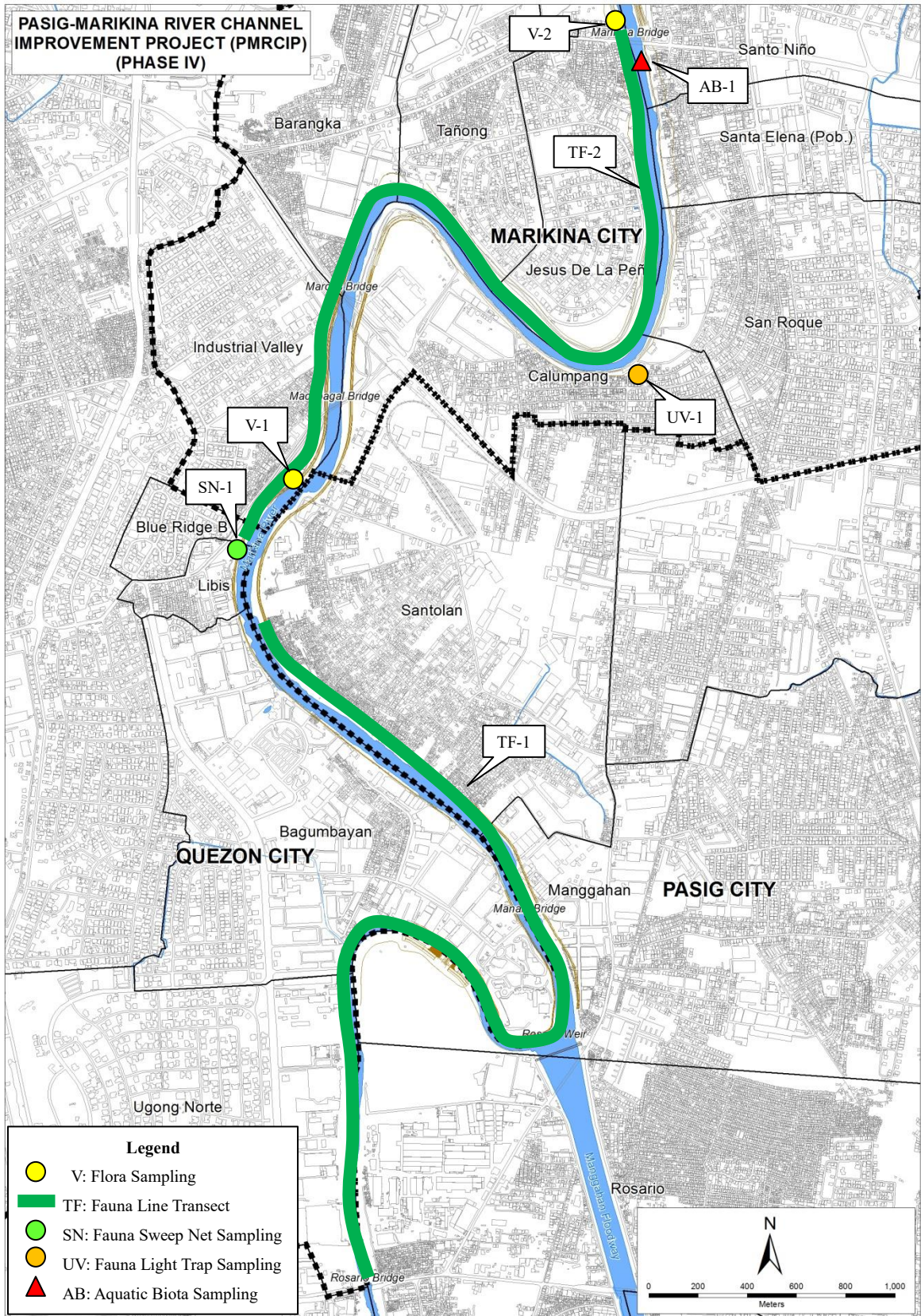


Figure 6.1.4 Sampling Locations and Survey Area for Primary Data on Terrestrial Flora and Fauna, Aquatic Biota for Phase IV

6.2 Physio-chemical Environment

6.2.1 Air Quality

(1) Environmental Standard

Quality standard of ambient air quality is shown in Table 6.2.1 as National Ambient Air Quality Guideline (NAAQG) for Criteria Pollutants provided by the DENR.

Table 6.2.1 National Ambient Air Quality Guideline (NAAQG) for Criteria Pollutants

Pollutant	Short Term		(a)	Long Term		(b)
	µg/NCM	ppm	Ave. Time	µg/NCM	ppm	Ave. Time
Suspended Particulate Matter (e)						
TSP	230 (f)		24 hours	90	--	1 year (c)
PM-10	150 (g)		24 hours	60	--	1 year (c)
Sulfur Dioxide (SO ₂) (e)	180	0.07	24 hours	80	0.03	1 year
Nitrogen Dioxide (NO ₂)	150	0.08	24 hours	--	--	--
Photochemical Oxidants	140	0.07	1 hour	--	--	--
As Ozone	60	0.03	8 hours	--	--	--
Carbon Monoxide	35 mg/NCM 10 mg/NCM	30 9	1 hour 8 hours	-- --	-- --	-- --
Lead (d)	1.5	--	3 mo. (d)	1.0	--	1 year

Note) (a) Maximum limits represented by (98%) values not to be exceeded more than once a year,
 (b) Arithmetic Mean,
 (c) Annual Geometric Mean,
 (d) Evaluation of this guideline is carried out for 24- hours averaging time and averaged over three moving calendar months,
 (e) SO₂ and Suspended Particulates are sampled once every 6-days when using the manual method,
 (f) With mass median diameter less than 25-50 µm,
 (g) With mass median less than 10 µm.

Source: National Ambient Air Quality Guideline values stipulated by DAO No. 81 series of 2000.

(2) Baseline Condition

a. Primary data

Baseline condition of ambient air quality was monitored on Sep. 6 and Oct. 13, 2014 at three stations as follows and shown on Figure 6.1.3:

- AQN-1: Residential area in Barangay Santolan, Pasig City,
- AQN-2: Residential area in Barangay Tañong, Marikina City, and
- AQN-3: Residential area near Marikina Bridge in Barangay Jesus De La Peña, Marikina City.

Monitoring results of ambient air quality are summarized in the table below, indicated that the concentration of SO₂, NO₂ and TSP (dust) are complied with the quality standards (NAAQG) stipulated by DAO No. 81 series of 2000.

Table 6.2.2 Baseline Condition of Ambient Air Quality

Location	Monitored value (µg/Nm ³)		
	SO ₂	NO ₂	TSP
AQN-1: Residential area in Barangay Santolan	2.83	<0.01	199
AQN-2: Residential area in Barangay Tañong	0.45	6.3	126
AQN-3: Residential area near Marikina Bridge	1.41	11.3	181
Quality Standards (NAAQG)	180	150	230

Note) 1) Sampling date: Sep. 6, 2014 (AQN-2, AQN-3) and Oct. 13 (AQN-1)
 2) Monitored value: Results of 24-hour continuous monitoring.
 3) Quality Standards (NAAQG) are representative of the short-term 24-hours average time in µg/Nm³.
 Source: Primary data obtained in this survey, 2014

b. Secondary data

Table 6.2.3 and 6.2.4 show the monitoring results of ambient air quality during the implementation of the Project, Phase II and Phase III, respectively, at the monitoring stations shown on Figure 6.1.2.

Based on the monitoring results of Phase II, it is indicated that the NO₂ and SO₂ are well below the standard values stipulated by DAO No. 2000-81 while most of monitored values of TSP (Dust) exceeded the standard value during the construction stage of the Project, Phase II. The main cause of the air pollution is estimated to be brought about by daily economic activities, including transportation by vehicles, construction works, re-suspension of soil particles, etc.

Monitoring results along the Lower Marikina River of the Project, Phase III showed that all the monitored values are well within the standard values, including those of TSP, which is not consistent with the situation of the Phase II.

Table 6.2.3 Results of Air Quality Monitoring for the Phase II (2009 - 2013)

Sta. No.	Parameter	Quality Standard	May 2009	Nov-Dec 2009	Jun 2010	Nov 2010	Jun-Jul 2011	Dev-Dec 2011	Apr-May 2012	May 2013	Ave.
AN-1	SO ₂	180	-	-	111	94	53	110	65	50.9	81
	NO ₂	150	-	-	83	81	17	61	38	33.6	52
	TSP	230	233	256	496	388	337	339	299	267	327
AN-2	SO ₂	180	-	-	96	89	40	98	62	38.7	71
	NO ₂	150	-	-	59	77	15	59	35	23.4	45
	TSP	230	196	215	316	271	240	207	234	181	233
AN-3	SO ₂	180	-	-	106	101	47	104	83	64.1	84
	NO ₂	150	-	-	74	73	19	73	50	45.2	56
	TSP	230	438	229	402	376	368	470	462	497	405
AN-4	SO ₂	180	-	-	112	112	61	134	88	59.6	94
	NO ₂	150	-	-	81	90	22	89	48	38.8	61
	TSP	230	180	308	583	575	484	556	470	301	432

Note)

1) Station: AN-1) Coast guard checking point, AN-2) No. 361 Matienza Street, AN-3) Trabajo-Sultana Street, AN-4) Ojales Pharmacy - Coronado Street (Refer to Figure 6.1.2).

2) Quality Standard: National Ambient Air Quality Guideline values stipulated by DAO No. 81 series of 2000.

3) Bold figures show non-compliance with the quality standard.

Source: Completion Report, Environmental Monitoring and Management, PMRCIP, Phase II, 2013

Table 6.2.4 Results of Air Quality Monitoring for the Phase III (2014)

Parameter	Environmental Standard	AN-5	AN-6	AN-7	Range (min. – max.)	Average
SO ₂	180	14.2	8.9	15.7	8.9 – 15.7	12.9
NO ₂	150	13.9	9.6	12.1	9.6 – 13.9	11.9
TSP	230	184.6	135.2	125.5	125.5 – 184.6	148.4

Note)

1) Station: AN-5) Near Rizal High School (near Vargas Bridge), AN-6) At Alfonso-Sandoval Bridge, AN-7) Downstream of Rosario Bridge (Refer to Figure 6.1.2).

2) Quality Standard: National Ambient Air Quality Guideline Values stipulated by DAO No. 81 series of 2000.

Source: Environmental Management and Monitoring, Baseline Condition, PMRCIP, Phase III, Contract Package 02, 2014.

Table 6.2.5 shows the ambient air quality monitoring results obtained by DENR-EMB. The monitored values of TSP in NCR show inconsistency with the standard values, which is the similar situation as that obtained by the Project, Phase II described above in terms of the consistency with the quality standard of TSP.

Table 6.2.5 TSP Level in Metro Manila (Monitoring Results of DENR-EMB)

Stations/ Year	2004	2005	2006	2007	2008	2009	2010	2011
1 Valenzuela	220	169	191	146	156	164	162	121
2 Edsa NPO	169	169	144	125	144	89	152	103
3 [EDSA] East Ave. Q.C.	188	136	105	102	107	90	105	74
4 Ateneo KAT., Q.C.	106	87	80	65	74	62	79	58
5 Mandaluyong	141	130	121	134	125	104	138	136
6 Pasig	116	109	94	92	84	126	ND	ND
7 Makati	211	183	153	146	134	145	160	128
8 EDSA, Mrt	236	323	316	257	282	283	294	219
9 Marikina	-	-	-	-	-	121	125	125
10 Manila, Rizal Ave.	148	150	111	110	138	103	132	101
Average	171	162	146	131	138	129	150	118

Note)

- 1) TSP National Ambient Air Quality Guideline values for one (1) year averaging time (long term) – 90 µg/NCM,
- 2) Bold figures show non-compliance with the quality standard.

Source: CY 2011 Accomplishment Report, DENR-EMB

(3) Evaluation of Baseline Condition

Based on the primary and secondary data, baseline condition of ambient air quality along the Marikina River and its surrounding area is summarized as follows:

- Monitored values (primary data) of SO₂, NO₂ and TSP (dust) at all the locations are complied with the quality standards (NAAQG) stipulated by DAO No. 81 series of 2000.
- SO₂ and NO₂ are complied with the quality standards at all the monitored locations along the Pasig-Marikina River during the Project, Phase II and III.
- TSP (Dust) is not complied with the quality standard at most of the monitored locations of the Project, Phase II and III, and the data of DENR-EMB.

In the EIS (1998), no detailed description on ambient air quality was provided with showing the monitored value. The description in EIS (1998) was such that there was an increasing trend of suspended particulate matter which was beyond the standard level, and that SO₂ had decreasing trend.

In this survey, it was revealed that all the values of SO₂ and NO₂ were complied with the quality standards in both the primary and secondary data. As for TSP (dust), the primary data were complied with the standard while the secondary ones were not. This is attributed to that the monitoring stations of primary data are located less urbanized area compared with those of secondary data.

6.2.2 Noise

(1) Environmental Standard

Quality standard of ambient noise is provided by the DENR as shown in Table 6.2.6.

Table 6.2.6 Standards for Noise Level in General Areas

Unit: dBA

Time regime	Class				
	AA	A	B	C	D
0500H (05:00 am) to 0900H (09:00 am) : morning	45	50	60	65	70
0900H (09:00 am) to 1800H (06:00 pm) : daytime	50	55	65	70	75
1800H (06:00 pm) to 1000H (10:00 pm) : evening	45	50	60	65	70
1000H (10:00 pm) to 0500H (05:00 am) : night time	40	45	55	60	65

Note) Class AA: a section of contiguous area which requires quietness, such as areas within 100 meters from school sites, nursery schools, hospitals and special homes for the aged,
 Class A: a section or contiguous area which is primarily used for residential purposes,
 Class B: a section or contiguous area which is primarily a commercial area,
 Class C: a section primarily zoned or used as light industrial area,
 Class D: a section which is primarily reserved, zoned or used as a heavy industrial area.
 Source: Memorandum Circular of the National Pollution Control Commission (NPCC), 1980.

(2) Baseline Condition

a. Primary data

Baseline condition of ambient noise level was monitored on Sep. 6 and Oct. 13, 2014 at three stations as follows and shown on Figure 6.1.3:

- AQN-1: Residential area in Barangay Santolan, Pasig City,
- AQN-2: Residential area in Barangay Tañong, Marikina City, and
- AQN-3: Residential area near Marikina Bridge in Barangay Jesus De La Peña, Marikina City.

Monitoring results of noise level are summarized in the table below, indicated that the noise levels are not complied with quality standards except for those of Morning and Daytime at the monitoring station QAN-2.

Table 6.2.7 Baseline Condition of Ambient Noise

Time Regime	Unit (noise level)	Quality Standard (Class A)	AQN-1	AQN-2	AQN-3
Morning (05:00 – 09:00)	dBA	50	58.5	49.4	62.0
Daytime (09:00 – 18:00)	dBA	55	59.6	54.2	63.0
Evening (18:00 – 22:00)	dBA	50	60.2	56.8	62.2
Nighttime (22:00 – 05:00)	dBA	45	56.7	49.3	61.2

Note) 1) Monitoring date: Sep. 6, 2014 (AQN-2, AN-3) and Oct. 13 (AQN-1)
 2) Monitoring locations: AQN-1) Barangay Santolan, AQN-2) Barangay Tañong, AQN-3) Residential area near Marikina Bridge (Figure 6.1.3).
 3) Quality Standard: Memorandum Circular of the National Pollution Control Commission (NPCC), 1980.
 4) Class A: A section or contiguous area which is primary used for residential purposes.
 Source: Primary data obtained in this survey, 2014

b. Secondary data

Table 6.2.8 and 6.2.9 show the monitoring results of ambient noise level during the implementation of the Project, Phase II and Phase III, respectively. Monitored locations are the same as those of air quality monitoring described in the previous section as shown on Figure 6.1.2.

The monitoring results indicate that all the monitored noise levels were not complied with the quality standard in residential areas along the Pasig River and Lower Marikina River. The main cause of the noise pollution is estimated to be brought about by daily economic activities, including

transportation by vehicles, barges and ferry boats, daily activities of the people near the monitoring locations.

Table 6.2.8 Results of Noise Level Monitoring for the Phase II (2009-2013)

Station	24-Hour Period	Unit (noise level)	Quality Standard (Class A)	May 2009	Jun 2010	Jun-Jul 2011	Apr-May 2012	May 2013	Ave.
Coast guard checking point (AN-1)	Morning	dBA	50	75.5	61.7	62.2	59.5	57.2	63.2
	Daytime	dBA	55	68.5	65.2	64.0	61.7	58.1	63.5
	Evening	dBA	50	71.6	65.4	64.3	62.3	62.9	65.3
	Nighttime	dBA	45	80.5	62.3	60.0	58.7	56.1	63.5
	Average				74.0	63.7	62.6	60.6	58.3
No. 361 Matienza Street (AN-2)	Morning	dBA	50	73.6	56.3	55.6	56.7	57.8	60.0
	Daytime	dBA	55	83.7	57.2	58.8	58.3	56.7	62.9
	Evening	dBA	50	72.5	58.3	57.7	56.2	58.7	60.7
	Nighttime	dBA	45	70.1	56.3	53.4	48.7	56.0	56.9
	Average				75.0	57.0	56.4	55.0	57.3
Trabajo-Sultana Street (AN-3)	Morning	dBA	50	72.0	65.1	61.2	63.7	60.1	64.4
	Daytime	dBA	55	78.4	66.5	62.9	66.3	63.1	67.4
	Evening	dBA	50	66.6	64.5	61.1	62.2	64.3	63.7
	Nighttime	dBA	45	66.9	60.6	57.5	62.4	57.4	61.0
	Average				71.0	64.2	60.7	63.7	61.2
Ojales Pharmacy - Coronado Street (AN-4)	Morning	dBA	50	72.2	67.5	63.1	64.4	59.8	67.6
	Daytime	dBA	55	82.2	69.0	67.3	68.7	62.3	69.9
	Evening	dBA	50	74.2	69.5	66.0	66.0	65.6	68.3
	Nighttime	dBA	45	76.9	63.4	61.0	62.6	56.7	67.8
	Average				76.4	67.4	64.4	65.4	61.2

Note)

1) Monitoring locations are shown on Figure 6.1.2.

2) Quality Standard: Memorandum Circular of the National Pollution Control Commission (NPCC), 1980.

3) Class A: a section or contiguous area which is primary used for residential purposes.

Source: Completion Report, Environmental Monitoring and Management, PMRCIP, Phase II, 2013

Table 6.2.9 Result of Noise Level Monitoring for the Phase III (2014)

Time Regime	Unit (noise level)	Quality Standard (Class A)	AN-5	AN-6	AN-7	Ave.
Morning (05:00 – 09:00)	dBA	50	65.1	52.8	62.4	60.1
Daytime (09:00 – 18:00)	dBA	55	66.5	62.9	67.5	65.6
Evening (18:00 – 22:00)	dBA	50	66.5	61.7	67.0	65.1
Nighttime (22:00 – 05:00)	dBA	45	64.7	50.8	65.5	60.3
Average			65.7	57.1	65.6	62.8

Note)

1) Monitoring locations: AN-5) Near Rizal High School (near Vargas Bridge), AN-6) At Alfonso-Sandoval Bridge, AN-7) Downstream of Rosario Bridge (Refer to Figure 6.1.2).

2) Quality Standard: Memorandum Circular of the National Pollution Control Commission (NPCC), 1980.

3) Class A: a section or contiguous area which is primary used for residential purposes.

Source: Environmental Management and Monitoring, Baseline Condition, PMRCIP, Phase III, Contract Package 02, 2014

(3) Evaluation of Baseline Condition

Based on the primary and secondary data, baseline condition of ambient noise level along the Marikina River and its surrounding area is summarized as follows:

- Primary data of ambient noise level along the Marikina River stretch of the Project, Phase IV showed that ambient noise level does not comply with environmental standard in almost all the time regime in a day.
- Monitoring results during the Project, Phase II and III along the Pasig-Marikina River stretch also showed the same situation, exceeding the quality standard.

In the EIS (1998), no description of baseline data on ambient noise was provided. Comparison or trend analysis, therefore, is not always applicable between the EIS (1998) and the updated data.

Most the updated data of both primary and secondary ones in this survey indicated that ambient noise level is not complied with the standard value. Considering the basic feature of ambient noise, the updated data is estimated to have increased than 1998 along with the increased economic activities in recent years.

6.2.3 River Water Quality

(1) Environmental Standard

The Marikina River is classified as Class C Fresh Water bases on DAO No. 08 series of 2016², of which Water Usage and Classification are listed as below:

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

Quality standard of Fresh Water Class C is stipulated as shown in Table 6.2.10.

Table 6.2.10 Water Quality Criteria for Fresh Waters of Class C

Parameter	Unit	Class C	Remarks
Color	PCU	(c)	(c) means no abnormal discoloration from natural causes
Temperature (max. rise in °C)	°C Rise	3	Allowable temperature rises over the average ambient temperature for each month. Its rise shall be the average of maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one month.
pH (range)		6.5 – 8.5	
Dissolved Oxygen (minimum)	% satn mg/L	60 5.0	Sampling taken between 9:00 a.m. and 4:00 p.m.
5-Day 20 °C BOD	mg/L	7(10)	Values enclosed in the parenthesis are maximum values.
Total Suspended Solids	mg/L	(g)	(g) means not more than 30 mg/L increase
Total Dissolved Solids	mg/L	-	No limit specified
Surfactants (MBAS)	mg/L	0.5	
Oil/Grease (Petroleum Ether Extracts)	mg/L	2	
Nitrate as Nitrogen	mg/L	10	Applicable only to lakes or reservoirs and similarly impounded water.
Phosphate as Phosphorus	mg/L	0.4	When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L.
Phenolic Substances as Phenols	mg/L	0.02	Not present in concentrations to affect fish flavors/taste
Total Coliform	MPN/100 ml	5,000	These values refer to the geometric mean of the most probable number of coliform organism during a 3-month period and that the limit indicated should not be exceeded in 20% of the samples taken during the same period.

² The environmental standards for river water quality was the amended from DAO 34 and DAO 35 series of 1990 to DAO No. 08 series of 2016 effective on June 14, 2016.

Chloride as Cl	mg/L	350	
Copper	mg/L	0.05	Limit is in terms of dissolved copper
Arsenic	mg/L	0.05	Do not apply if natural background is higher in concentration. The latter will prevail and will be used as baseline.
Cadmium	mg/L	0.01	Do not apply if natural background is higher in concentration. The latter will prevail and will be used as baseline.
Chromium (Hexavalent)	mg/L	0.05	Do not apply if natural background is higher in concentration. The latter will prevail and will be used as baseline.
Cyanide	mg/L	0.05	
Lead	mg/L	0.05	Do not apply if natural background is higher in concentration. The latter will prevail and will be used as baseline.
Total Mercury	mg/L	0.002	Do not apply if natural background is higher in concentration. The latter will prevail and will be used as baseline.
Organophosphate	mg/L	nil	Extremely low concentration and not detectable by existing equipment.

Source: DAO No. 34 Series of 1990

(2) Baseline Condition

a. Primary data

Baseline condition of water quality in the Marikina River was monitored on Aug. 29, 2014 at three stations as follows and shown on Figure 6.1.3:

- WQ-1: Manalo Bridge
- WQ -2: Marcos Bridge, and
- WQ -3: Marikina Bridge.

Monitoring results of river water quality are summarized in the table below, indicated that the monitored values are complied with quality standards except for DO at WQ-1 and WQ-2, and total coliform at all locations. Inconsistency of DO with quality standard, i.e., the deficit of dissolved oxygen indicates the water quality is not appropriate for aquatic biota. As for total coliform, monitored values are the extremely high comparing with the quality standard, which indicates that river water contains high number of bacteria/ micro-organisms. Presence of bacteria is common and is not always harmful, but their presence suggests that pathogenic micro-organisms might also be present and pose a health risk.

These monitoring results are consistent with secondary data as described below although the parameters of non-compliance with the quality standards are limited to only DO and total coliform. Regarding toxic substance such as heavy metals, no contamination was detected, which is consistent with the secondary data.

Table 6.2.11 Baseline Condition of River Water Quality

Parameter	Unit	Quality Standard (Class C)	WQ-1	WQ-2	WQ-3	Range (min.-max.)	Ave.
pH	--	6.5 - 8.5	7.0	7.1	7.1	7.0 – 7.1	7.1
Temperature	°C	Rise 3	20.3	19.4	20.8	19.4 – 20.8	20.2
Color	PCU	(c)	25	25	40	25 - 40	30
Turbidity	NTU	-	40	39	29	29 – 40	36
Conductivity	µS/cm	-	375	372	367	367 – 375	371
Dissolved Oxygen (DO)	mg/L	5.0	3.1	3.7	5.8	3.1 – 5.8	4.2
Biochemical Oxygen Demand (BOD)	mg/L	<10	3	5	3	3 – 5	4.8
Total Dissolved Solids (TDS)	mg/L	-	278	276	262	262 – 278	272
Surfactants (MBAS)	mg/L	0.5	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenols	mg/L	0.02	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Total Suspended Solids (TSS)	mg/L	(g)	32	24	23	23 – 32	26
Oil & Grease	mg/L	2	1.7	1.8	1.4	1.4 – 1.8	1.6

Parameter	Unit	Quality Standard (Class C)	WQ-1	WQ-2	WQ-3	Range (min.-max.)	Ave.
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.8	0.8	0.9	0.8 – 0.9	0.8
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	0.1	0.1	0.08	0.08 – 0.1	0.1
Salinity as NaCl	mg/L	350	14	8.3	13	8.3 – 14	11.8
Total Coliform	MPN/ 100 ml	5,000	9.2x10⁵	1.6x10⁶	9.2x10⁵	9.2x10⁵ – 1.6 x10⁶	1.2x10⁶
Hexavalent Chromium (Cr ⁶⁺)	mg/L	0.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Cyanide (CN)	mg/L	0.05	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Arsenic (As)	mg/L	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium (Cd)	mg/L	0.01	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006
Lead (Pb)	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Mercury (T-Hg)	mg/L	0.002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Note)

- 1) Sampling date: Aug. 29, 2014.
- 2) Monitoring locations: QW-1) Manalo Bridge, QW-2) Marcos Bridge, QW-3) Marikina Bridge (Figure 6.1.3).
- 3) Quality Standard: Class C waters of DAO No. 34 series of 1990
- 4) (g): Not more than 30 mg/L increase.
- 5) Bold figures show non-compliance with the quality standard.

Source: Primary data obtained in this survey, 2014

b. Secondary data

There are several major secondary data sets providing river water quality of the Pasig-Marikina River such as those obtained under PMRCIP and other government organizations (GOs).

Regarding the data sets under PMRCIP, the first one is the data obtained during D/D Study for the whole PMRCIP conducted in 2001, and the second one is those obtained during construction stage of the Phase II from 2009 to 2013, and the third one is those obtained during construction stage of the Phase III which started in 2014. These three data sets cover the river sections listed below:

Table 6.2.12 Source of Secondary Data for River Water Quality

No.	Data source	Monitored year	Pasig River	Lower Marikina River	Middle to Upper Marikina River
1	Environmental Survey Report, Water Quality and Riverbed Materials, D/D, PMRCIP, Dec. 2001	2001	✓	✓	✓
2	Completion Report, Environmental Monitoring and Management, PMRCIP, Phase II, 2013	2009-2013	✓		
3	Environmental Management and Monitoring, Baseline Condition, PMRCIP, Phase III, 2014	2014		✓	

Tables 6.2.13 to 6.2.15 show monitored values of typical parameters of river water quality. Monitoring results of the three data sets are summarized as below:

Pasig River: Monitoring results indicate that the river water is suffering from organic pollutants being characterized by high coliform counts, high BOD and TSS, and low DO, most of which exceeds the quality standards. Coliform counts are extremely high exceeding 10⁵ MPN/100ml. The level of the water pollution is such that the river water is not adequate for aquatic biota, and for water use such as washing, bathing, or recreation activities. River water often generates offensive odor, or obnoxious smell and show high turbidity in terms of aesthetics. Oil and grease occasionally shows high value exceeding the quality standard, and nutrient salts of Phosphate as Phosphorus (PO₄-P) also showed high concentration exceeding the quality standard in 2001 but decreased in recent years. The main cause of the water pollution (pollution source) is brought about by direct drainage of waste water from individual houses and factories located along the river. It is also observed that the garbage is thrown directly into the river from riparian people.

However, the concentration of toxic substances including Arsenic (As), Cadmium (Cd), Hexavalent Chromium (Cr⁶⁺), Cyanide (CN), Lead (Pb), Total Mercury (T-Hg), and Organophosphate in the

river water are far below the quality standards at almost all the monitored cases according to the monitoring results.

Marikina River: Monitoring results indicate the similar situation to that of the Pasig River; the river is suffering from organic pollutants, which are indicated by high BOD and TSS, low DO and extremely high coliform counts. Most of monitored values of these parameters exceeded the quality standards. Oil and grease, Nutrient salts of Nitrate as Nitrogen (NO₃-N) and Phosphate as Phosphorus (PO₄-P) also shows similar situation as the Pasig River. All these pollutants are estimated to attribute to the sewerage from individual households without treatment which is the same as the Pasig River.

As for the toxic substances the monitored values are all below the detection limits indicating far below the quality standards at almost all the monitored cases, which is the same situation as the Pasig River.

Table 6.2.13 Monitoring Results of Water Quality along the Pasig-Marikina River (2001)

Parameter	Unit	Environmental Standard (Class C)	Dry season		Wet season	
			(min. – max.)	Average	(min. – max.)	Average
(1) Pasig River						
pH	--	6.5 - 8.5	7.0 – 7.21	7.16	7.17 – 8.25	7.49
Dissolved Oxygen (DO)	mg/L	5.0	0.29 – 2.22	1.62	2.29 – 4.59	3.18
Biochemical Oxygen Demand (BOD)	mg/L	<10	ND – 4.7	2.0	2 - 5	3.3
Total Suspended Solids (TSS)	mg/L	(g)	11 - 127	35	5 - 73	39
Oil & Grease	mg/L	2	0.8 – 10.60	5.1	0.4 – 2.0	0.9
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.93 – 2.5	1.7	0.3 – 7.5	4.0
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	3.0 – 10.11	5.4	0.03 – 1.8	1.1
Total Coliform	MPN/100 ml	5,000	35x10³ - 30x10⁵	66x10⁴	800 - 50x10⁵	13x10⁵
(2) Lower Marikina River						
pH	--	6.5 - 8.5	7.0 – 7.41	7.12	7.22 – 7.36	7.31
Dissolved Oxygen (DO)	mg/L	5.0	0.27 – 3.37	1.75	1.38 – 2.63	2.17
Biochemical Oxygen Demand (BOD)	mg/L	<10	ND – 3.4	1.3	4 - 5	4.4
Total Suspended Solids (TSS)	mg/L	(g)	26 - 86	39	10 - 21	14
Oil & Grease	mg/L	2	0.8 – 10.9	4.3	0.4 – 1.1	0.6
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	1.1 – 3.0	2.1	1.2 – 6.1	3.5
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	4.0 – 9.2	5.7	0.91 – 1.18	1.0
Total Coliform	MPN/100 ml	5,000	30x10² - 16x10⁵	5.2x10⁵	24x10³ - 10x10⁴	42x10³
(3) Upper Marikina River						
pH	--	6.5 - 8.5	7.0 – 7.44	7.23	6.89 – 8.34	7.32
Dissolved Oxygen (DO)	mg/L	5.0	0.57 – 5.63	2.56	1.49 – 4.67	2.92
Biochemical Oxygen Demand (BOD)	mg/L	<10	ND – 7.5	2.1	1.0 - 23	9.8
Total Suspended Solids (TSS)	mg/L	(g)	14 - 79	45	8 - 57	26
Oil & Grease	mg/L	2	0.6 – 22.0	5.5	0.4 – 2.8	1.2
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.4 – 2.8	2.0	0.2 – 18.1	4.5
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	<0.001 – 10.83	5.5	0.49 – 5.30	1.6
Total Coliform	MPN/100 ml	5,000	24x10² - 90x10⁴	18x10⁴	50x10² - 70x10⁵	93x10⁴

Note) 1) Environmental standard: Class C waters of DAO No. 34 series of 1990.

2) (g): Not more than 30 mg/L increase.

3) Data of Pasig River consist of those at 9 stations with an interval of 2.0 km from the river mouth to Napindan channel.

4) Data of Lower Marikina River consist of those at 7 stations with an interval of 1.0 km from Napindan channel to Rosario weir.

5) Data of Middle to Upper Marikina River consists of those at 17 stations with an interval of 1.0 to 2.0 km from Rosario weir up to 26.8 km point from the river mouth.

6) Bold figures show non-compliance with the quality standard.

Source: Environmental Survey Report, Water Quality and Riverbed Materials, D/D Study, PMRCIP, Dec. 2001.

Table 6.2.14 Monitoring Results of Water Quality along the Pasig River (2009-2013)

Station / Parameter	Unit	Environmental Standard (Class C)	Feb. 2009	Feb 2010	Feb 2011	Feb 2012	May 2013	Min-Max	Ave.
(1) Jones Bridge Station (WA-1)									
pH	--	6.5 - 8.5	7.5	6.9	7.1	7.7	7.7	6.9-7.7	7.4
Dissolved Oxygen (DO)	mg/L	5.0	2.1	1.26	1.86	1.44	6.0	1.26-6.0	2.53
Biochemical Oxygen Demand (BOD)	mg/L	<10	12	20	16	4	50	4-50	20.4
Total Suspended Solids (TSS)	mg/L	(g)	88	100	31	104	7	7-104	66
Oil & Grease	mg/L	2	<1.0	4.4	<1.0	<1.0	<1.0	<1.0- 4.4	<1.7
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.44	<0.01	0.10	0.34	0.01	<0.01-0.44	<0.18
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	0.28	0.14	0.39	0.27	0.58	0.14- 0.58	0.33
Total Coliform	MPN/100 ml	5,000	35x10³	23x10⁴	79x10⁵	17x10⁴	35x10⁴	135x10³-79x10⁵	17x10⁴
(2) Pandacan-Zamora Bridge Station (WA-2)									
pH	--	6.5 - 8.5	6.8	7.5	6.7	7.7	7.6	6.7-7.7	7.3
Dissolved Oxygen (DO)	mg/L	5.0	1.8	2.07	1.62	2.10	4.0	1.62-4.0	2.3
Biochemical Oxygen Demand (BOD)	mg/L	<10	7	7	24	4	16	4-24	11.6
Total Suspended Solids (TSS)	mg/L	(g)	76	172	31	106	24	24-172	82
Oil & Grease	mg/L	2	1.4	4.3	<1.0	<1.0	<1.0	<1.0- 4.3	<1.7
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.66	<0.01	0.07	0.49	<0.01	<0.01-0.66	<0.25
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	0.26	0.12	0.27	0.29	0.92	0.12- 0.92	0.37
Total Coliform	MPN/100 ml	5,000	54x10⁴	33x10⁴	23x10⁴	11x10⁴	92x10⁴	11x10⁴-92x10⁴	43x10⁴
(3) Lambingan Bridge Station (WA-3)									
pH	--	6.5 - 8.5	6.8	7.6	6.7	8.0	7.9	6.7-8.0	7.4
Dissolved Oxygen (DO)	mg/L	5.0	3.0	2.16	1.92	2.31	6.0	1.92-6.0	3.1
Biochemical Oxygen Demand (BOD)	mg/L	<10	8	8	24	4	29	4-29	14.6
Total Suspended Solids (TSS)	mg/L	(g)	60	127	28	82	19	19-127	63
Oil & Grease	mg/L	2	<1.0	3.3	<1.0	<1.0	<1.0	<1.0- 3.3	<1.5
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.57	<0.01	0.02	0.53	0.19	<0.01-0.57	<0.26
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	0.19	0.10	0.21	0.27	1.00	0.10- 1.00	0.35
Total Coliform	MPN/100 ml	5,000	92x10³	23x10⁴	23x10⁴	49x10⁴	54x10⁴	92x10³-54x10⁴	32x10⁴
(4) Guadalupe Bridge Station (WA-4)									
pH	--	6.5 - 8.5	7.2	8.1	6.6	7.9	7.9	6.6-8.1	7.5
Dissolved Oxygen (DO)	mg/L	5.0	2.6	2.69	3.07	2.96	5.0	2.6-5.0	3.3
Biochemical Oxygen Demand (BOD)	mg/L	<10	16	7	14	3	50	3-50	18.0
Total Suspended Solids (TSS)	mg/L	(g)	71	106	30	73	96	30-106	75.2
Oil & Grease	mg/L	2	<1.0	2.9	<1.0	<1.0	1.5	<1.0- 2.9	<1.5
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	0.15	<0.01	0.08	0.53	<0.01	<0.01-0.53	<0.16
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	0.49	0.04	0.17	0.25	1.25	0.04- 1.25	0.44
Total Coliform	MPN/100 ml	5,000	35x10⁴	11 x 10⁴	49x10⁴	11 x 10⁴	24x10⁴	11x10⁴-49x10⁴	26x10⁴

Note)

1) Environmental standard: Class C waters of DAO No. 34 series of 1990.

2) (g): Not more than 30 mg/L increase.

3) Monitoring locations are shown on Figure 6.1.2.

4) Bold figures show non-compliance with the quality standard.

Source: Completion Report, Environmental Monitoring and Management, PMRCIP, Phase II, 2013

Table 6.2.15 Monitoring Results of Water Quality along the Lower Marikina River (2014)

Parameter	Unit	Environmental Standard (Class C)	WA-5	WA-6	WA-7	Min-Max	Ave.
pH	--	6.5 - 8.5	7.0	6.9	6.9	6.9 - 7.0	6.9
Dissolved Oxygen (DO)	mg/L	5.0	2.1	2.6	2.9	2.1 - 2.9	2.5
Biochemical Oxygen Demand (BOD)	mg/L	<10	11	15	15	11 - 15	14
Total Suspended Solids (TSS)	mg/L	(g)	38	58	20	20 - 58	39
Oil & Grease	mg/L	2	0.9	1.1	1.1	0.9 - 1.1	1.0
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	<0.02	<0.02	<0.02	< 0.02	< 0.02
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	0.4	0.3	0.2	0.2 - 0.4	0.3
Total Coliform	MPN/ 100 ml	5,000	92x10⁵	24x10⁴	35x10⁴	24x10⁴ - 92x10⁵	33x10⁵

Note)

1) Environmental standard: Class C waters of DAO No. 34 series of 1990.

2) (g): Not more than 30 mg/L increase.

3) Monitoring stations: WA -5: Vargas Bridge, WA-6: Alfonso-Sandoval Bridge, WA-7: Rosario Bridge (Refer to Figure 6.1.2.)
Sampling date: Jul. 9, 2014

4) Bold figures show non-compliance with the quality standard.

Source: Environmental Management and Monitoring, Baseline Condition, PMRCIP, Phase III, Contract Package 02, 2014

Among the secondary data of river water quality of other GOs, the representative one is those monitored by Pasig River Rehabilitation Commission (PRRC). Table below shows river water quality from 2009 to 2013 at the Marikina Bridge. The monitored data shows that most of parameters are not complied with quality standards, which is the same status as that monitored under the PMRCIP as presented in the previous section. The data, however, showed that the concentrations of Oil and grease, and nutrient salts (NO₃-N and PO₄-P) are higher than those monitored under PMRCIP (Phase II and III) as a whole.

Table 6.2.16 Monitoring Results of River Water Quality at Marikina Bridge by PRRC

Parameter	Unit	Environmental Standard (Class C)	2009	2010	2011	2012	2013	Min-Max	Ave.
pH	--	6.5 - 8.5	7.84	7.75	7.23	7.07	7.43	7.07 - 7.84	7.46
Dissolved Oxygen (DO)	mg/L	5.0	5.22	3.93	3.04	3.94	3.22	3.04 - 5.22	3.87
Biochemical Oxygen Demand (BOD)	mg/L	<10	14.50	10.29	11.44	7.33	14.92	7.33 - 14.92	11.70
Total Suspended Solids (TSS)	mg/L	(g)	27.57	132.0	9.25	11.67	13.58	9.25 - 132.0	38.8
Oil & Grease	mg/L	2	2.11	1.65	2.19	1.48	1.11	1.11 - 2.19	1.71
Nitrate as Nitrogen (NO ₃ -N)	mg/L	10	10.10	2.24	2.16	2.60	2.98	2.16 - 10.10	4.02
Phosphate as Phosphorus (PO ₄ -P)	mg/L	0.4	1.14	0.48	7.75	6.20	6.20	0.48 - 7.75	4.35
Total Coliform	MPN/ 100 ml	5,000	3.04x10⁵	4.03x10⁶	1.12x10⁷	1.30x10⁶	3.63x10⁷	3.04x10⁵ - 3.63x10⁷	1.06x10⁷

Note)

1) Environmental standard: Class C waters of DAO No. 34 series of 1990.

2) (g): Not more than 30 mg/L increase.

3) Bold figures show non-compliance with the quality standard.

Source: Pasig River Unified Monitoring, Pasig River Rehabilitation Commission (PRRC), 2009 - 2013

(3) Evaluation of Baseline Condition

Updated water quality of the Marikina River based on the primary and secondary data is summarized by the following features:

- River water is suffering from organic pollutants being characterized by high BOD and TSS, and low DO, most of which do not comply with quality standards.
- High concentration of compounds of nutrient salts showed high concentration during D/D study in 2001, exceeding quality standards but decreased within the standard values in 2012.
- Extremely high coliform counts suggest the pollution of pathogenic bacteria in the river water.
- No contamination by toxic substances such as heavy metals.

Table 6.2.17 shows the comparison of baseline condition of river water quality between EIS (1998) and recent years, indicating that there is no significant change, meaning the same situation as EIS (1998).

Table 6.2.17 Evaluation of Updated Baseline Condition

Viewpoints of comparison	Baseline condition, EIS (1998)	Updated baseline condition by this study	Comparison / Evaluation
Pollution source	Liquid and solid domestic wastes, and industrial wastes	Waste water from individual houses and factories, as well as direct dumping of garbage	Almost same situation
Water quality (basic parameters such as DO, BOD, pH, Total Coliform)	Not complying (exceeding) the quality standards at most of monitored cases except for pH	Exceeding the quality standards in most of cases except for pH	Almost same situation
Contamination by toxic substances (heavy metals)	Heavy metals were not detected in suspended in the river water	Toxic substances are not detected or far below the quality standard.	Almost same situation

6.2.4 Riverbed Sediment Quality

(1) Environmental Criteria

a. Criteria to evaluate sediment quality

No environmental standards for the degree of contents of toxic substances in the sediment or soil are stipulated by law or regulation in the Philippines. Instead, sediment quality is evaluated in terms of contamination risk during dredging of the sediment in the water body, or contamination risk of surface water or groundwater at the disposal site of the sediment.

Regarding the former risk, i.e., the contamination risk during the dredging of sediment, “Elutriate Test” is applied for the sediment materials, and the test results are to be evaluated with standard values provided in DAO No. 93-34 or DAO No.93-35.

As for the latter risk, i.e., the contamination risk of the surface water, groundwater, or soil at the disposal site, “TCLP Test” is applied for the sediment materials, and the test results are to be evaluated with the standard values provided in DAO No.13-22: Revised Procedural Manual on Hazardous Waste DAO No. 04-36.

Tables 6.2.18 and 6.2.19 show the standard values for toxic substances stipulated in these administrative orders.

Table 6.2.18 Quality Standard for Toxic Substances in the River Water

Parameter	Unit	Quality Standard* (Class C, DAO 90-34)	Quality Standard* (Class C, DAO 90-35)
Arsenic (As)	mg/L	0.05	0.2
Cadmium (Cd)	mg/L	0.01	0.05
Lead (Pb)	mg/L	0.05	0.3
Total Mercury (T-Hg)	mg/L	0.002	0.005
Cyanide (CN ⁻)	mg/L	0.05	0.2
Chromium (Hexavalent) (Cr ⁶⁺)	mg/L	0.05	0.1
PCBs	mg/L	-	0.003
Organophosphate pesticide (OPP)	mg/L	nil	-
Formaldehyde	mg/L	-	1.0

Note: * Environmental standard: Class C waters of DAO No. 90-34 series and DAO No. 90-35 series of 1990
 -: Not stipulated, nil: Extremely low concentration and not detectable by existing equipment

Table 6.2.19 Quality Standard for Toxic Substances on Hazardous Wastes

Parameter	Unit	Quality Standard* (DAO No. 04-36 / DAO No.13-22)
Arsenic (As)	mg/L	1
Cadmium (Cd)	mg/L	0.3
Lead (Pb)	mg/L	1
Total Mercury (T-Hg)	mg/L	0.1
Total Chromium (T-Cr)	mg/L	5

Note: * Environmental standard: DAO No.2013-22: Revised Procedural Manual on Hazardous Waste
 DAO No. 2004-36

b. Description of Elutriate Test and TCLP tests

The Elutriate Test was originally developed by the Engineers of U.S. Army Corps to simulate a situation that occurs during the dredging work by testing if the target parameters will be leached out in the process. It is, therefore, often used as an extraction method to predict the potential release of contaminants from sediment at the point of dredging the riverbed sediments; and at confined disposal area when the materials touch with water or rain.

The TCLP Test, on the other hand, is as shown in the U.S. EPA Method for Evaluating Solid Waste (SW-846) - Method 1311. It is an extraction method for chemical analysis that simulates leaching in a landfill during backfilling / reclamation process of materials (sediments). It aims, therefore, to determine if the waste to be disposed of is characteristically hazardous or not, or whether these wastes need further treatment before disposal.

(2) Current Status

a. Primary data

i) Methodology

Baseline condition of riverbed sediment quality in the Marikina River was monitored on Sep. 17, 18 and Oct. 9, 2014 at nine (9) stations as follows and shown on Figure 6.1.3:

- SQ -1: River channel at downstream end of the Phase IV stretch,
- SQ -2: River bank at Barangay Bagumbayan,
- SQ -3: River bank at downstream of Manalo Bridge,

- SQ -4: River bank at downstream of Barangay Santolan,
- SQ -5: River bank at upstream of Barangay Santolan,
- SQ -6: River bank between Marcos and Diosdado Macapagal Bridge,
- SQ -7: River bank at Marikina Riverbanks Mall,
- SQ -8: River bank at Barangay Calumpang,, and
- SQ -9: River channel at downstream of Marikina Bridge.

Riverbed sediment was taken from riverbank (right or left) or the river channel. As for sampling at the riverbank, sediment samples were taken at the surface of river bank and at 1-m depth and then mixed them as sediment samples for laboratory analysis. As for sampling at river channel, sediment samples were taken at the riverbed surface at the center of river channel for laboratory analysis.

ii) Survey Results

Monitoring results of Elutriate Test for riverbed sediment quality are summarized in Table 6.2.20. Monitoring results present that all the monitored values are below the Method Detection Limit (MDL) being complied with quality standards. All these results are complied with quality standards and indicate that the contamination risk during the dredging of riverbed sediment will be minimal.

Table 6.2.20 Baseline Condition of Riverbed Sediment Quality (Elutriate Test)

Location	Arsenic	Cadmium	Lead	Total Mercury	Cyanide	Hexavalent Chromium	PCBs	OPP
SQ -1	ND	ND	ND	ND	ND	ND	ND	ND
SQ -2	ND	ND	ND	ND	ND	ND	ND	ND
SQ -3	ND	ND	ND	ND	ND	ND	ND	ND
SQ -4	ND	ND	ND	ND	ND	ND	ND	ND
SQ -5	ND	ND	ND	ND	ND	ND	ND	ND
SQ -6	ND	ND	ND	ND	ND	ND	ND	ND
SQ -7	ND	ND	ND	ND	ND	ND	ND	ND
SQ -8	ND	ND	ND	ND	ND	ND	ND	ND
SQ -9	ND	ND	ND	ND	ND	ND	ND	ND
Method Detection Limits (MDL)	0.01	0.006	0.05	0.0001	0.02	0.003	0.0005 – 0.001	0.001 – 0.002
Quality Standard (Class C, DAO 90-34)	0.05	0.01	0.05	0.002	0.05	0.05	-	nil
Quality Standard (Class C, DAO 90-35)	0.2	0.05	0.3	0.005	0.2	0.1	0.003	-

Note) Unit: mg/L

1) ND: Not detected (below MDL).

2) Sampling date: Sep. 17, 18 and Oct. 9, 2014.

3) Monitoring locations shown on Figure 6.1.3.

Source: Primary data obtained in this survey, 2014

Monitoring results of TCLP Test for riverbed sediment quality are summarized in Table 6.2.21. Monitoring results present that all the monitored values are below the Method Detection Limit (MDL) of the laboratory test except for Arsenic (As) at SQ-5. All these results are complied with quality standards including Arsenic (As) at SQ-5. The test results indicate that the contamination risk of the surface water or groundwater at the disposal site will be minimal.

Table 6.2.21 Baseline Condition of Riverbed Sediment Quality (TCLP Test)

Location	Arsenic (mg/L)	Cadmium (mg/L)	Lead (mg/L)	Total Mercury (mg/L)	Total Chromium (mg/L)
SQ -1	ND	ND	ND	ND	ND
SQ -2	ND	ND	ND	ND	ND
SQ -3	ND	ND	ND	ND	ND
SQ -4	ND	ND	ND	ND	ND
SQ -5	0.003	ND	ND	ND	ND
SQ -6	ND	ND	ND	ND	ND
SQ -7	ND	ND	ND	ND	ND
SQ -8	ND	ND	ND	ND	ND
SQ -9	ND	ND	ND	ND	ND
Method Detection Limits (MDL)	0.001	0.006	0.05	0.0001	0.02
Quality Standard (DAO No. 04-36 / No. 13-22)	1	0.3	1	0.1	5

Note)

1) ND: Not detected (below MDL).

2) Sampling date: Sep. 17, 18 and Oct. 9, 2014.

3) Monitoring locations shown on Figure 6.1.3.

Source: Primary data obtained in this survey, 2014

b. Secondary data

There are two major sets of secondary data on riverbed sediment quality of the Pasig-Marikina River. One is the data obtained during D/D Study for the whole PMRCIP conducted in 2001, and the other is those obtained during D/D Study for Phase III in 2012 and its monitoring results during construction stage from 2014.

Riverbed sediment analysis conducted during D/D Study in 2001 consists of content test and elutriate test for the sediment samples taken from the river mouth (Pasig River) up to 26.8 km point (Upper Marikina River).

The results of content tests were evaluated as the following: In the absence of guidelines or standards in the Philippines relating to contaminated sediment or dredged materials disposal, it is difficult to make any generalization or judgment to analysis results under Philippine conditions. However, while the sediment analysis results show that the riverbed sediment of the Pasig-Marikina River contain some heavy metals, they are not in such excessive quantities as to go beyond the maximum tolerable limits set by other countries.

The results of elutriate tests, which are summarized in Table 6.2.22, are evaluated as the following: The concentration of the analyzed toxic substances in the sediment samples from the Pasig-Marikina River stretches are well within the maximum allowable limit of the DENR DAO No. 90-35. The very low concentration of the substances indicates that the probability that these toxic substances may leach out from the sediment and contaminate the river water during dredging or construction works may be considered minimal or negligible. Hence, it may be considered that the sediments, when dredged or excavated are safe for use as filling materials unless the river conditions are changed until the actual dredging / excavation operation.

Table 6.2.22 Results of Elutriate Analysis during D/D Study (2001)

Parameter	Unit	Quality Standard (Class C, DAO 90-35)	Pasig River (min. – max.)	Lower Marikina River (min. – max.)	Upper Marikina River (min. – max.)
Alkyl Mercury	mg/L	NA	ND	ND	--
Total Mercury (T-Hg)	mg/L	0.005	nil	nil	nil
Cadmium (Cd)	mg/L	0.05	0.0002 - 0.0025	0.0003 - 0.0022	0.0003 - 0.0026
Lead (Pb)	mg/L	0.3	nil - 0.0231	nil - 0.0993	nil - 0.1552
Chromium (Hexavalent) (Cr ⁶⁺)	mg/L	0.1	<0.001 - 0.0223	<0.001 - 0.0033	<0.001 - 0.0090
Copper (Cu)	mg/L	NA	nil - 0.0404	nil - 0.0222	0.0040 - 0.1196

Parameter	Unit	Quality Standard (Class C, DAO 90-35)	Pasig River (min. – max.)	Lower Marikina River (min. – max.)	Upper Marikina River (min. – max.)
Arsenic (As)	mg/L	0.2	nil - 0.0022	nil - 0.0028	nil - 0.0020
Cyanide (CN)	mg/L	0.2	nil - 0.028	nil - 0.020	nil - 0.0040
Zinc (Zn)	mg/L	NA	0.0088 - 0.2575	0.0127 - 0.1814	0.0127 - 0.3904
Organophosphate (OPP)	mg/L	NA	ND	ND	ND
PCBs	mg/L	0.003	ND	ND	ND
Formaldehyde	mg/L	1.0	ND	ND	ND

Note)

- 1) Environmental standard: Class C waters of DAO No. 90-35 series of 1990.
- 2) Data of Pasig River consists of those at 9 stations with an interval of 2.0 km from the river mouth up to Napindan channel.
- 3) Data of Lower Marikina River consists of those at 7 stations with an interval of 1.0 km from Napindan channel to Rosario weir.
- 4) Data of Upper Marikina River consists of those at 17 stations with an interval of 1.0 to 2.0 km from Rosario weir up to 26.8 km.
- 5) ND: Not Detected, NA: Not Applicable, --: Test was not required.

Source: Environmental Survey Report, Water Quality and Riverbed Materials, D/D Study, PMRCIP, Dec. 2001.

The other data sets obtained during D/D Study specified for Phase III river stretch in 2012 and monitoring during the construction stage in 2014 are shown in Table 6.2.23 and 6.2.24. Both of which carried out the sediment sampling at 100 m interval along the river. Monitored values of toxic substances in the riverbed sediment applied with both elutriate and TCLP tests showed that all the parameters were not detected (ND) or far below the standard values stipulated in Class C waters of DAO No. 90-34 and 90-35 for elutriate test results, and DAO No. 04-36 and DAO No.13-22 for TCLP test results. These monitored results were consistent with the analysis results obtained during D/D Study in 2001.

Based on these results, it is concluded that there will be no probability of toxic substances in the toxic substances in the riverbed sediment to leach out during the dredging operation or at the site of filling / disposal site and to contaminate the water of Pasig-Marikina River or the surrounding areas of filling / disposal site.

Table 6.2.23 Results of Elutriate Test for Project Phase III (2012)

Parameter	Unit	Quality Standard (Class C, DAO 90-34)	Quality Standard (Class C, DAO 90-35)	Lower Marikina River D/D Study, 2012 (min. – max.)	Lower Marikina River Construction stage, 2014 (min. – max.)
Arsenic (As)	mg/L	0.05	0.2	ND	ND
Cadmium (Cd)	mg/L	0.01	0.05	ND	ND
Lead (Pb)	mg/L	0.05	0.3	ND	ND
Total Mercury (T-Hg)	mg/L	0.002	0.005	ND – 0.0009	ND
Cyanide (CN ⁻)	mg/L	0.05	0.2	ND – 0.57 (1 st test) / ND (re-test)	ND
Chromium (Hexavalent) (Cr ⁶⁺)	mg/L	0.05	0.1	ND	ND
PCBs	mg/L	-	0.003	ND	ND
Organophosphate pesticide (OPP)	mg/L	nil	-	ND – 4.5 (1 st test) / ND (re-test)	ND

Note)

- 1) Environmental standard: Class C waters of DAO No. 90-34 series and DAO No. 90-35 series of 1990.
- 2) ND: Not Detected, -: Not stipulated.

Source: Completion Report on Environmental and Social Considerations, The Detailed Design of Pasig-Marikina River Channel Improvement Project (Phase III), Jan. 2013

Table 6.2.24 Results of TCLP Test for the Project Phase III (2014)

Parameter	Unit	Quality Standard (DAO 2004-36/ 2013-22)	Lower Marikina River D/D Study, 2012 (min. – max.)	Lower Marikina River Construction stage, 2014 (min. – max.)
Arsenic (As)	mg/L	1	ND – 0.008	ND – 0.008
Cadmium (Cd)	mg/L	0.3	ND	ND
Lead (Pb)	mg/L	1	ND	ND
Total Mercury (T-Hg)	mg/L	0.1	ND – 0.0003	ND
Total Chromium (T-Cr)	mg/L	5	ND	ND

Note)

1) Environmental standard: DAO No.2013-22: Revised Procedural Manual on Hazardous Waste DAO No. 2004-36,

2) ND: Not Detected

Source: Environmental Test Results for Dredged Materials at Lower Marikina River, PMRCIP (Phase III), Construction, Package 2.

(3) Evaluation of Baseline Condition

Updated riverbed sediment quality of the Marikina River stretches of the Project, Phase IV based on the primary and secondary data is summarized by the following features:

- Results of elutriate and TCLP tests for toxic substances shows that the concentration of leachate water were ND (not detected) or far below the standard values.
- These test results indicate that the possibility of the toxic parameters to leach out to the environment during dredging operation or at disposal site is minimal.
- The test results also indicate the dredged materials are not categorized as hazardous materials based on DAO No. 04-36/ No. 13-22 and can be utilized as filling material.

Table 6.2.25 shows the comparison of baseline condition of riverbed sediment quality between EIS (1998) and recent years, indicating that the updated condition is the same situation, or showing that the riverbed sediment is categorized as non-hazardous based on this study.

Table 6.2.25 Evaluation of Updated Baseline Condition

Viewpoints of comparison	Baseline condition, EIS (1998)	Updated baseline condition by this study	Comparison / Evaluation
Results of Elutriate test	Test results showed the concentration of toxic substances were ND (not detected) or below the standard value.	Test results showed the concentration of toxic substances were ND (not detected) or far below the standard value.	Same situation
Results of TCLP test	TCLP test was not applied in EIS (1998)	Test results showed the concentration of toxic substances were ND (not detected) or far below the standard value.	Not available for comparison but updated results show that the riverbed sediment is non-hazardous.

6.2.5 Solid Waste

(1) Legal Basis

Among relevant regulations of solid waste and hazardous waste management in the Philippines, the following two are the most important ones.

Republic Act No.9003 (2001); Ecological Solid Waste Management Act:

The Act, known as “Ecological Solid Waste Management Act of 2000,” seeks to adopt a systematic, comprehensive and ecological solid waste management program. The implementing rules and regulations (IRRs) of RA No.9003 were issued in Dec. 2001 as DENR Administrative Order No.2001-34. It stipulates guidelines and targets for solid waste avoidance and volume reduction through source reduction and waste minimization measures, including composting, recycling, reuse, recovery, green charcoal process, and others, before collection, treatment and disposal. The Act also ensures the proper segregation, collection, transport, storage, treatment and disposal of solid waste.

According to the Act, different levels of local government are responsible for various aspects of waste management. The barangays are responsible for ensuring segregation at source, collection of the bio-degradable and recyclable components, and setting up materials-recovery facilities. The city or municipality takes care of collecting the residual non-biodegradable and hazardous waste, and its final disposal, except in Metro Manila where disposal is within the mandate of the Metro Manila Development Authority.

RA No.6969 (1990); Toxic Substances, Hazardous and Nuclear Wastes Control Act:

The Act, known as “Toxic Substances and Hazardous and Nuclear Wastes Control Act,” covers the importation, manufacture, processing, handling, storage, transportation, sale, distribution, use and disposal of all unregulated chemical substances and mixtures in the Philippines, including the entry, even in transit, as well as the keeping or storage and disposal of toxic substances, hazardous and nuclear wastes into the country for whatever purpose. Under the Act, the hazardous waste are defined as;

- 1) Substances that are without any safe commercial, industrial, agricultural or economic usage and are shipped, transported or brought from the country of origin for dumping or disposal into or in transit through any part of the territory of the Philippines.
- 2) By-products, side-products, process residues, spent reaction media, contaminated plant or equipment or other substances from manufacturing operations, and as consumer discards of manufactured products.

In addition, the criteria of hazardous wastes are provided in DAO No. 2013-22 and DAO No. 2004-36: Procedural Manual on Hazardous Wastes. DAO No. 2004-36 is a procedural manual on hazardous wastes of DAO No.92-29, Implementing Rules and Regulations of RA 6969. DAO No. 2013-22 is a revised procedural manual on hazardous wastes of DAO No. 04-36, which provides a table for the classification of hazardous waste and lays down the requirements for proper hazardous waste management. The excavated/dredged materials in the river can be evaluated based on these regulations.

(2) Current Status

a. Collection, Transportation and Disposal System

As described above (Section (1) Legal Basis), LGUs are responsible for collection, transportation and disposal of solid wastes based on RA No. 9003 (2001). The collection of city/municipal solid wastes is done in two ways, either by self-administration or through private contractors. According to the Brown Report 2005-2007, out of the 17 LGUs in Metro Manila, 11 have contracted collection. The collection service covers between 80%-100% of their respective jurisdiction, with some barangays and subdivisions having their own collection regimens. The most common form of collection is through door to door wherein the collection trucks pass through a designated community route or via curbside collection. As shown in Table 6.2.26, the collection efficiency in

NCR is approx. 97%, meaning almost all of the people utilize the garbage collection system provided by respective LGUs.

Regarding the disposal of solid wastes, LGUs are still operating their open dumpsites, even though it is prohibited by RA No.9003. According to National Solid Waste Management Commission (2011), there are 790 were open dump sites, notwithstanding that these are usually located along river banks which are considered as inappropriate location for a disposal facility and cause pollution problems of contamination of soil and water. In Metro Manila, however, no open dumpsite is reported to locate.

b. Garbage Disposal in NCR

Table 6.2.26 shows the household number by usual manner of garbage disposal in 2010. It indicates that more than 98% of all the households in the three cities of Pasig, Marikina and Quezon are categorized as “picked up by garbage truck,” meaning almost all households utilize the garbage disposal system provided by the ULGs. Others are very few percentages. Comparing with the figure of NCR (96.69%), the ratios of “picked up by garbage truck” are higher in the three cities, meaning that garbage disposal system well works in the three cities although the deviation is very little. The second category is “dumping in individual pit (not burned),” indicating that there still throwing the garbage in the pit set in individual houses.

Table 6.2.26 Households by Usual Manner of Garbage Disposal (2010)

Usual Manner of Garbage Disposal	Pasig City		Marikina City		Quezon City		NCR	
	Number	%	Number	%	Number	%	Number	%
Picked up by garbage truck	152,847	98.63	91,181	99.75	626,077	98.70	2,668,519	96.69
Dumping in individual pit (not burned)	1,606	1.04	171	0.19	4,677	0.74	52,532	1.90
Burning	274	0.18	39	0.04	2,419	0.38	23,506	0.85
Composting	34	0.02	-	-	298	0.05	2,304	0.08
Burying	6	0.00	5	0.01	141	0.02	2,812	0.10
Feeding to animals	127	0.08	6	0.01	466	0.07	3,013	0.11
Others	76	0.05	12	0.01	269	0.04	7,149	0.26
Total Households	154,970	100.0	91,414	100.0	634,346	100.0	2,759,829	100.0

Note) Figures are based on 20-percent sample households. Details may not add up to total due to rounding off.

Source: National Statistics Office (NSO), 2010

c. Result of Interview with Local People

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that 97.5% of respondents are using the Solid Waste Collection and Disposal System made available to them by their distinct LGU. But there are some people who are directly dumping into nearby open space or the river although they are very few (1.5%) (Ref. ANNEX-4: Perception Survey).

d. Solid Waste Management Profile by LGU

Pasig City:

Garbage collection is administered by the City Government of Pasig through the private company IPM Construction and Development Corporation (IPMCDC). The City only provides collecting trucks to support IPMCDC when needed or requested. IPMCDC is in charge of collecting garbage from households and business entities, and transportation to their operated Material Recovery Facilities (MRFs) prior to disposal at a sanitary landfill. Collection and disposal of Industrial waste is managed by IPMCDC, too. The amount of collection is around 52,000 m³ per month according to the interview with the city official in charge. Hazardous wastes such as hospital waste are collected and disposed by another contractor accredited and approved by DENR-CENRO. The collection was done in daily base.

The garbage is segregated between biodegradable and non-biodegradable wastes. Non-biodegradable waste is further segregated between recyclable and non-recyclable materials. The IPMCDC operates its own MRF to segregate the collected garbage at household level prior to

disposal at landfill. Each barangay additionally operates an MRF to assist in initial garbage segregation. Private junk shops also serve as function of MRF which provide additional support in segregation of non-biodegradable waste. The operations of both MRF systems are managed by Green Heart Savers Program of Pasig City.

Residual waste after segregation is disposed by the contractor (IPMCDC) at the Rodriguez Sanitary Landfill in Rodriguez, Rizal which is operated by the MMDA. The IPMCDC and Pasig City have a Memorandum of Agreement (MOA) with the Municipality of Rodriguez to transport the waste for disposal to the Rodriguez Sanitary Landfill.

Marikina City:

Garbage collection is administered by the City Government of Marikina through the City Environmental Management Office (CEMO). All manpower and equipment utilized for the collection are owned and maintained by the City. The garbage collection is done in the manner of “door-to door” and in being segregated: biodegradable (twice a week), non-biodegradable (once a week), used cooking oil (once a month) and *kuyagot*, or bulky wastes (Sunday, upon requested). The annual amount of garbage collection in 2013 was 287,764 m³, which has increased from 211,558 m³ in 2003 according to the interview with the city official in charge.

Marikina City, with a policy of “No segregation, No collection,” is among the first to implement a waste segregation program through Enactment of City Ordinance 046, series of 2002, a local law which mandates the segregation of biodegradable from the non-biodegradable garbage, and operation of Materials Recovery Facilities (MRFs), which is the destination for non-biodegradable wastes for processing, and Transfer Stations, which is the destination for residual and biodegradable wastes in the city.

Marikina City disposes unprocessed and residual wastes at the Rodriguez Rizal Sanitary Landfill. The transport and delivery of wastes to the dumpsite is being done through contract. Integrated Solid Waste International Management Specialists (ISWIMS) is the city waste contractor for the disposal of waste from MRFs and Transfer Station to the Rodriguez Rizal Sanitary Landfill.

Quezon City:

Garbage collection is administered by the City Government of Quezon through sub-contracting to the waste hauler to deploy dedicated collection equipment for the separate collection of waste. Domestic wastes are properly segregated into biodegradable and non-biodegradable prior to collection from household, commercial, industrial and institutional sources. The collection was done twice a week for biodegradable wastes, once a week for non-biodegradable wastes, and every Sunday for bulky wastes. The amount of waste generation in Quezon City is calculated as 2,036 tons per day, which is 0.66 kg per capita per day.

Garbage is segregated between biodegradable and non-biodegradable waste, and non-biodegradable waste is further segregated between recyclable and non-recyclable materials. City’s waste composition is such that Biodegradable: 48%, Non-biodegradable: 52%, Recyclable: 39%, consisting of Plastic: 16%, Paper: 17%, Glass: 3%, Metal: 3%, and Residual: 13%. Material Recovery Facilities (MRFs) and private junk shops are supporting the segregation and processing for separating the garbage into recyclable and residual.

Residual wastes are transported and dumped at the Quezon City Sanitary Landfill located in Barangay Payatas. A new Sanitary Landfill was developed in 2011 and the residual solid wastes are disposed in the new sanitary landfill.

(2) Evaluation of Updated Baseline Condition

Information on solid wastes including waste collection system, criteria for hazardous wastes, etc. is not discussed in the EIS (1998). The current status of legal basis, solid waste disposal performance and issues, and collection systems in the country and relevant LGUs in the Phase IV area was clarified in this survey and it can be the basis for impact assessment of solid wastes.

6.2.6 Land Subsidence

(1) Current Status

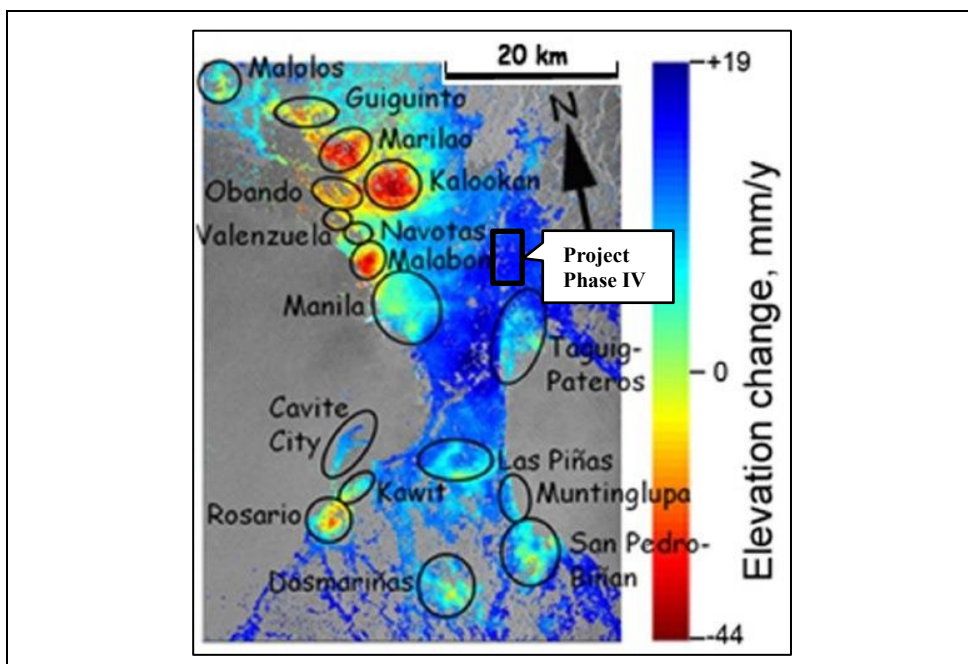
Land subsidence is observed mainly attributed to excessive groundwater withdrawal particularly at the coastal regions surrounding Manila Bay (Rodolfo and Siringan, 2006). These resulted in the accelerated compaction of underlying sediment materials and consequently, the lowering of elevation in the affected areas.

A preliminary assessment of land subsidence potential was undertaken between 2003 and 2006 for Metro Manila and nearby areas (Philippine Science Letters, 2014). Observed subsidence rates were varied across different locations, according to radar measurements (Philippine Science Letters, 2014). Coastal areas in Metro Manila have recorded a rate of as high as 9 cm/yr., and in Caloocan City, a subsidence rate of 8 cm/yr. was recorded in 2004 and 2005. The area of the proposed Manila Bay reclamation project by the Philippine Reclamation Authority (PRA) has recorded a rate of up to 6 cm/yr.

Figure 6.2.1 presents the areas in Metro Manila and surrounding regions where notable land subsidence has been observed. Subsidence rate is reported to be highest in the areas of Manila, Malabon, Navotas, Valenzuela and Caloocan, all of which are located in Metro Manila; the cities of Obando, Marilao, Guiguinto and Malolos, all located in Bulacan Province; and the cities of Rosario and Kawit in the province of Cavite. All of these affected areas are located along the coast of Manila Bay.

Other areas with reports of moderate subsidence include the following: Taguig-Pateros, Las Piñas and Muntinlupa in Metro Manila; Dasmarinas and Cavite City in Cavite Province; and San Pedro-Binang in Laguna Province.

The area of Project, Phase IV is adjacent to the subsidence-affected area of Taguig-Pateros. It is, however, classified to have a zero-subsidence potential as it is outside the boundary of the affected area. There was no sign or report on land subsidence along the Phase IV section of the Middle Marikina River during field observation.



Source: Lagmay, A (2011) and Eco, et. al., (2013), through Rodolfo, K., Philippine Science Letters 2014

Figure 6.2.1 Land Subsidence Map of Metro Manila and Nearby Areas

(2) Evaluation of Updated Baseline Condition

Assessment for land subsidence is not specified as part of requirements of EIS (1998). It was, however, introduced as part of the Engineering, Geological and Geohazard Assessment Report (EGGAR) under DAO No. 2000-28. The EGGAR was subsequently required as part of the new PEISS through DENR Memorandum Circular No. 2007-001. Recent information on land subsidence presents the absence of its occurrence and low potential in Project, Phase IV area as described above.

6.2.7 Offensive Odor

In the Philippines, environmental quality guideline, standard or criteria for pollutants/substances or concentration of offensive odor has yet to be established. Hence, the baseline survey was carried out focusing on the identification of the sources of and perception on offensive odor along the Project area.

(1) Current Status

The baseline condition of the generation of offensive odor along the Marikina River was surveyed through site reconnaissance and observation during field surveys. In addition, gathering of relevant information on actual generation of offensive odor was performed. The data gathering of baseline condition are as follows:

- Information gathering on existing offensive odor generating sources along the Marikina River stretch of Phase IV,
- Observation on odor generation perceived during site reconnaissance along the Marikina River stretch of Phase IV,
- Observation of odor generation perceived during field surveys, including river water sampling, aquatic biota sampling and riverbed sediment sampling,

According to the several times of site reconnaissance and field survey, there are sources to generate offensive odor along the Marikina River stretch of Phase IV, including the following:

- Solid wastes and garbage scattering along the river,
- Small creeks and tributaries of the Marikina River,
- Drains from individual houses and factories at the shore of the Marikina River,
- Marikina River mainstream as a receiver of the above sources of offensive odor.

There are a lot of solid wastes and garbage scattering in and along the Marikina River, some of which are thrown from nearby residents and the others are drained from upstream area and accumulated at the river bank of the Project area. These solid wastes and garbage act as source of offensive odor especially immediately after the heavy rain. Small creeks (*estero*) and tributaries are also the source of foul smell because they contain waste water drained from individual houses along the riverine area without treatment. This situation is also applied with the drains at the river shore from individual houses and factories. The photos below show such sources of offensive odor. The Marikina River mainstream also often acts as the source of offensive odor because it receives all these sources of odor accumulated at the riverbed. The magnitude of offensive odor becomes worse as it goes to downstream stretch and during the dry season except during the occurrence of “black turbidity” which cause high level of water pollution immediately after the period of heavy rain.



(2) Evaluation of Updated Baseline Condition

The current status of offensive odor is such that there are several sources of the odor perceived along the Marikina River stretch of Phase IV, including solid waste and garbage, small creeks and tributaries flowing into the Marikina River, drains from individual houses and factories, and the Marikina River itself. The offensive odor is perceived worse in the downstream river stretch and during dry season.

In the EIS (1998), no description of baseline condition on the offensive odor, which, however, does not always mean that there was no issue or source of offensive odor along the Marikina River. The status of offensive odor seems not to have changed but to be similar ones between EIS (1998) and recent years.

6.3 Natural Environment

6.3.1 Meteorology and Climate

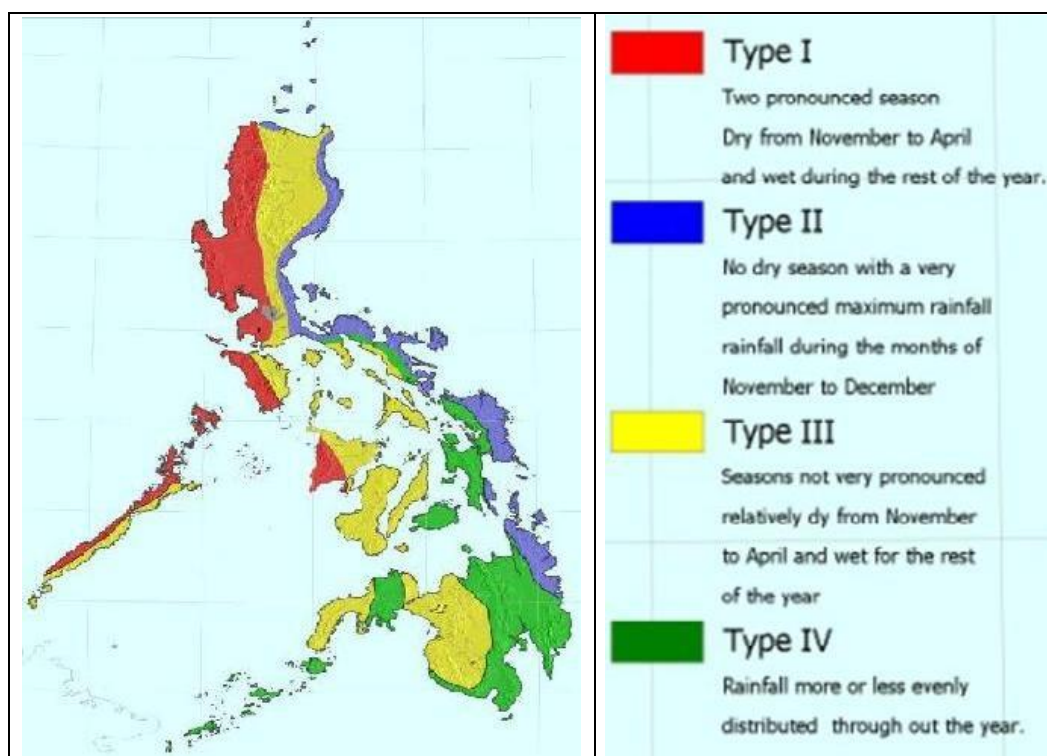
(1) Current Status

a. Climate Type

The Philippines is divided into four climatic types, depending on how rainfall is distributed throughout the year (Refer to Figure 6.3.1).

- Type 1 – Two pronounced seasons, dry from November to April and wet during the rest of the year.
- Type II – No dry season, with a very pronounced maximum rainfall during the months of November to December.
- Type III – Seasons not very pronounced, relatively dry from November to April and wet for the rest of the year.
- Type IV - Rainfall more or less distributed throughout the year.

The western part of Luzon, Palawan, and the Visayas islands have Type I climate, with pronounced dry and wet seasons. Rainfall in these areas occurs mostly during the southwest monsoon season. The central areas of Luzon and Visayas islands and Mindanao are classified as Type III climate, with seasons not very pronounced. According to the map, the watershed of the Pasig-Marikina River is located in the areas of Type I and partly in the areas of Type III climate.



Source: Philippine Atmospheric, Geographical & Astronomical Services Administration (PAGASA)

Figure 6.3.1 Climate Map of the Philippines

b. Climate Data

(i) Rainfall

Table 6.3.1 shows the average monthly rainfall (Normal Values) at three (3) stations in Metro Manila. The driest month, or least rainfall is recorded in Feb. to Mar. while the wettest month, or most rainfall is recorded in Aug. at the three stations. Annual average rainfall is ranged from 1,767.8 mm at Ninoy Aquino International Airport (NAIA), Pasay City, to 2,574.4 mm at Scientific Garden, Quezon City. Rainy days records most in Aug. while least in Feb. to Mar. at the three stations.

Table 6.3.1 Monthly Rainfall and Rainy Days at Three Stations (Normal Values)

Station	Parameter	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Port Area	Rainfall	17.3	14.2	15.8	23.7	147.2	253.5	420.5	432.4	355.1	234.8	121.7	67.4	2103.6
	Rainy days	4	3	3	4	10	17	21	21	20	17	12	7	139
Scientific Garden	Rainfall	18.5	14.6	24.8	40.4	186.7	316.5	493.3	504.2	451.2	296.6	148.8	78.7	2574.4
	Rainy days	4	3	4	5	12	18	22	23	22	18	14	8	153
NAIA	Rainfall	6.8	4.2	4.0	16.0	70.4	265.2	316.7	418.4	255.2	283.4	99.0	28.6	1767.8
	Rainy days	2	1	1	1	6	14	16	19	16	14	8	3	101

Note) Period of data: From 1981 to 2010 (30 years).

Unit: Rainfall; mm, Rainy days: number of days which 0.1 mm of rain is recorded

Source: Philippine Atmospheric, Geographical & Astronomical Services Administration (PAGASA)

(ii) Temperature

Table 6.3.2 shows the average temperature (Normal Values) at three (3) stations in Metro Manila. The highest temperature is recorded in Apr. to May while the lowest one is recorded in Jan. Annual average temperature is ranged from 27.7 °C at Scientific Garden, Quezon City, to 28.4 °C at Port Area, Manila City.

Table 6.3.2 Average Temperature at Three Stations (Normal Values)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Port Area	26.7	27.4	28.7	30.1	30.0	29.3	28.5	28.3	28.4	28.4	28.0	27.0	28.4
Scientific Garden	25.7	26.0	27.8	29.4	29.7	28.8	29.0	27.8	27.8	27.6	27.1	26.0	27.7
NAIA	26.1	26.7	28.0	29.5	29.7	28.8	28.0	27.7	27.8	27.7	27.4	26.5	27.8

Note) Period of data: From 1981 to 2010 (30 years).

Unit: Temperature; °C

Source: Philippine Atmospheric, Geographical & Astronomical Services Administration (PAGASA)

(iii) Humidity

Table 6.3.3 shows the average relative humidity (Normal Values) at three (3) stations in Metro Manila. The highest humidity is recorded from Aug. to Sep. while the lowest humidity is recorded from Mar. to Apr. Annual average humidity is ranged from 74 % at Port Area, Manila City to 78 % at Scientific Garden, Quezon City.

Table 6.3.3 Relative Humidity at Three Stations (Normal Values)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Port Area	72	69	67	66	71	76	79	81	80	78	75	74	74
Scientific Garden	76	73	69	67	72	79	83	84	84	83	82	79	78
NAIA	75	72	68	67	72	77	81	83	83	80	78	76	76

Note) Period of data: From 1981 to 2010 (30 years).

Unit: Relative Humidity; %

Source: Philippine Atmospheric, Geographical & Astronomical Services Administration (PAGASA)

(iv) Wind

Table 6.3.4 shows the wind direction and speed (Normal Values) at three (3) stations in Metro Manila. The prevailing wind direction of Port Area, Science Garden and Ninoy Aquino International Airport (NAIA) is South West (SW), North (N) and East (E), respectively. Wind direction reflects climate of each station: During wet season from Jun. to Sep., prevailing wind direction is SW or W while it changes to N or E during dry season from Nov. to Apr. Wind speed of Scientific Garden is lowest ranging from 1 to 2 m/s while it shows relatively high up to 4 m/s at other two stations.

Table 6.3.4 Prevailing Wind Direction and Speed at Three Stations (Normal Values)

Station	Parameter	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Port Area	Direction	N	E	SE	SE	SW	SW	SW	SW	SW	SW	N	N	SW
	Speed	2	3	3	3	3	3	3	4	3	3	3	2	3
Scientific Garden	Direction	N	NE	SE	SE	S	SW	SW	SW	SW	N	N	N	N
	Speed	1	1	1	1	1	1	2	2	1	1	1	1	1
NAIA	Direction	E	E	E	ESE	W	W	W	W	W	E	E	E	E
	Speed	3	3	4	4	3	3	3	3	2	2	2	2	3

Note) Period of data: From 1981 to 2010 (30 years).

Unit: Wind speed; m/s

Source: Philippine Atmospheric, Geographical & Astronomical Services Administration (PAGASA)

c. Climate Change

Climate change is observed at many meteorological stations in the world. In the Philippines, PAGASA pointed out the increase of annual mean temperature by approx. 0.57°C during the last 59 years. Hot days and warm nights are increasing while cold days and cold nights are decreasing. Extreme events are also becoming more frequent. These changes are consistent with the global trends.

PAGASA has made a projection on changes of precipitation and temperature by the years 2020 and 2050 for several cities and provinces in the country. The results of projection, focusing on those in NCR, are shown in the table below.

In 2020 scenario, mean temperature is predicted to rise by 0.9 to 1.1 °C for 2020, and by 1.8 to 2.1 °C for 2050. As for rainfall, on the other hand, it will increase during JJA and SON, while decrease in DJF and MAM, meaning that rainfall will increase in wet season and decrease in dry season, which could cause more extreme climate and water deficit in the future.

Based on PAGASA’s projection, it is very likely that hot temperature will continue to become more frequent in the future. The number of days with temperature more than 35 °C is expected to increase in 2020 and further in 2050. Extreme rainfall event with more than 300 mm/day is also predicted to increase as shown in the table.

Table 6.3.5 Projected Changes of Rainfall and Temperature in Metro Manila

Station	Observed baseline (1971 – 2000)				Change in 2020 (2006 -2035)				Change in 2050 (2036 -2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Mean Temp. (°C)	26.1	28.8	28.0	27.4	1.0	1.1	0.9	1.0	2.0	2.1	1.8	1.9
Rainfall (%)	107.5	198.5	1,170.2	758.7	-12.8	-33.3	8.5	0.0	-17.3	-38.5	21.3	3.7
No. of days w/ Tmax. >35 °C	Port Area: 299 Science Garden: 1,095				Port Area: 1,176 Science Garden: 1,984				Port Area: 2,112 Science Garden: 3,126			
No. of days w/ Rainfall >300mm	Port Area: 12 Science Garden: 9				Port Area: 12 Science Garden: 13				Port Area: 13 Science Garden: 17			

Note) DJF: Dec., Jan, and Feb.; MAM: Mar., Apr., and May; JJA: Jun., Jul., and Aug.; SON: Sep., Oct., and Nov.
Source: Philippine Atmospheric, Geographical & Astronomical Services Administration (PAGASA)
([http://web.pagasa.dost.gov.ph/component/content/article/116-climate-change-in-the-philippines/595-climate-projections#Climate Projection for Provinces](http://web.pagasa.dost.gov.ph/component/content/article/116-climate-change-in-the-philippines/595-climate-projections#Climate%20Projection%20for%20Provinces))

JICA has studied the influence of global climate change, focusing on the maximum daily rainfall. Table 6.3.6 shows five (5) year averages of maximum daily rainfall based on the result of the JICA Study. It also shows the projected values for the period from 2045 to 2065. According to the JICA Study, annual increase of maximum daily rainfall is projected to increase by 0.22 mm / year. This means that the rainfall intensity is expected to gradually increase in the future, which suggest there will be severe event of rainfall and high risk of flood.

Table 6.3.6 Five Year Averages of Recorded Maximum Daily Rainfall

Category	Period	Five (5) year averages of maximum daily rainfall (mm/d)
Observed	1971 – 1975	152.3
	1976 – 1980	212.5
	1981 – 1985	116.3
	1986 – 1990	150.1
	1991 – 1995	126.6
	1996 – 2000	168.7
	2001 – 2005	150.4
	2006 – 2010	151.8
Projection	2045 – 2050	186.4
	2051 – 2055	214.8
	2056 – 2060	174.0
	2061 – 2066	203.4

Source: Final Report, Pasig-Marikina River Rainfall Analysis, JICA, 2013

(2) Evaluation of Updated Baseline Condition

During these 17 years after the preparation of EIS (1998), the annual rainfall is not changed as a whole, based on the annual rainfall data observed by the meteorological station in NCR. However, the rainfall intensity in one rain event, especially those with extremely high or maximum daily rainfall a year has increased supposedly due to the climate change based on the projection by PAGASA and JICA study.

6.3.2 Pedology, Topography and Geology

(1) Current Status

a. Pedology

The pedology of the Project Phase IV area is represented by four major soil series, namely: the (1) San Manuel Series, (2) Marikina Series, (3) Burgos Series, and (4) Pinagbuhatan Series, according to the information from the pedological map of the Bureau of Soils and Water Management (1980). All four series occur within an alluvial landscape setting. Figure 6.3.2 presents the distribution of the soil series within Project, Phase IV area. The key features of these series are summarized as follows:

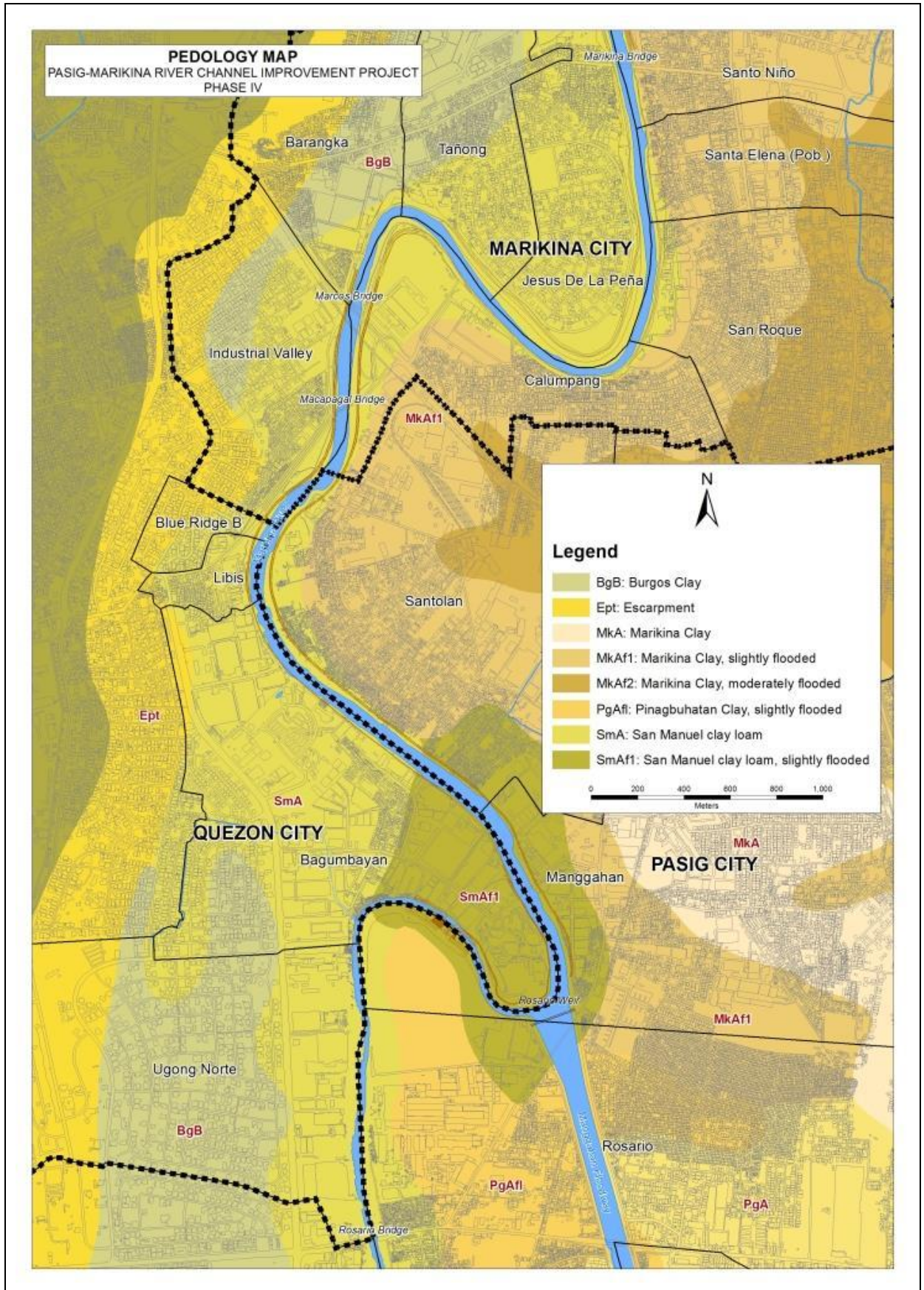
- The San Manuel Series is represented by San Manuel Clay Loam, present in minor alluvial plain areas with a slope of 0-2%. These soils are deep, well-drained, and occurring on river terraces or levees of minor alluvial plains. The upper horizon/layer of this soil is brown, brown to dark brown, dark yellowish brown, yellowish brown friable to firm clay loam, silty clay loam, silty clay or silt loam.

This series is represented by two soil mapping units, namely: the (1) SmA (clay loam) and (2) SmAf1 (slightly flooded clay loam variant). The SmA exists as a strip bordering the east bank of the Marikina River except at Manggahan area, and at all lowland plains west and north of the river. The occurrence of SmAf1 is limited at the surrounding area of Rosario Weir.

- The Marikina Series is represented by the Marikina Clay Loam, occurring in minor alluvial plain areas with 0-2% slope. These soils are deep and poorly drained, occurring on level to nearly level minor alluvial plains. The upper layer is gray, light gray to gray, greenish gray clay with strong brown yellowish red, brown to dark brown mottles.

This soil series is represented by three mapping units, namely: the (1) MkA (clay loam), (2) MkAf1 (slightly flooded clay loam variant), and (3) MkAf2 (moderately flooded clay loam variant). The MkA is limited at the northeastern part of Manggahan and southeastern part of Santolan. On the other hand, the MkAf1 is present at the lowlands bordering the eastern boundary of the San Manuel Series. The MkAf2 is represented at the eastern part of Santolan and the inner plains south of Calumpang and San Roque.

- The Burgos Series is represented by the Burgos Clay, occurring in alluvial fan terrace areas bordering some of the escarpments with 0-2% slope. These minor soils develop from colluvium and normally appear poorly drained. This soil unit is represented by the mapping unit BgB, and found between the western boundary of San Miguel Series and escarpment areas.
- The Pinagbuhatan Series is represented by the Pinagbuhatan Clay, occurring in minor alluvial plains with a slope of 0-2%. These minor soils are developed from alluvium and poorly drained. In Project, Phase IV area, this soil is represented by mapping unit PgAf1, a slightly flooded clay loam variant of the series. It is present at the inner section of the land bound by the Marikina River and Manggahan Floodway.
- The north-south trending escarpment area with slopes of 15% to more than 50% defines the western boundary of the San Manuel and Burgos Series. It is represented by the mapping unit Ept.



Source: Bureau of Soils and Water Management (BSWM), 1980

Figure 6.3.2 Pedology Map of the Project, Phase IV Area

b. Topography

The topography of Project, Phase IV area is expressed into two landform regions, the Marikina Valley and Diliman Plateau (Figure 6.3.3). The Marikina Valley comprises the north-south oriented lowland areas traversed by the Marikina River. The entire valley is essentially a wide floodplain where the Marikina River meanders through the lowland area around the Manggahan Floodway. The Diliman Plateau, on the other hand, comprises all the rolling hills and low ridges located west of the Marikina Valley. The boundary of these two land features is defined by the western segment of the Marikina Valley Fault System (MVFS), marked by sloping terrain (escarpment) and elevation contrast between the valley and the plateau (Punongbayan, 2003 and Rimando, 2006).

The elevation in the Project, Phase IV area varies from 10-80 meters according to the DPWH Mean Lower Low Water Level (DPWH-LLWL) standard. Elevation along the Marikina River and lower floodplains ranges from 10-20 meters. Areas with elevation range of 20-30 meters occur in parts of Calumpang, San Roque, Santa Elena, Santo Nino, Santolan and Manggahan, as well as the area between the escarpment region and lower floodplains west of the river. The narrow escarpment area has an elevation range of 20-40 meters. The Diliman Plateau has a general elevation range of 40-60 meters.

Within the project area, some topographic modification, even though limited area, is observed due to commercial development along the Marikina and encroachment into the river channel, including the embankment at Circulo Verde and Olandes Sewerage Treatment Plant.

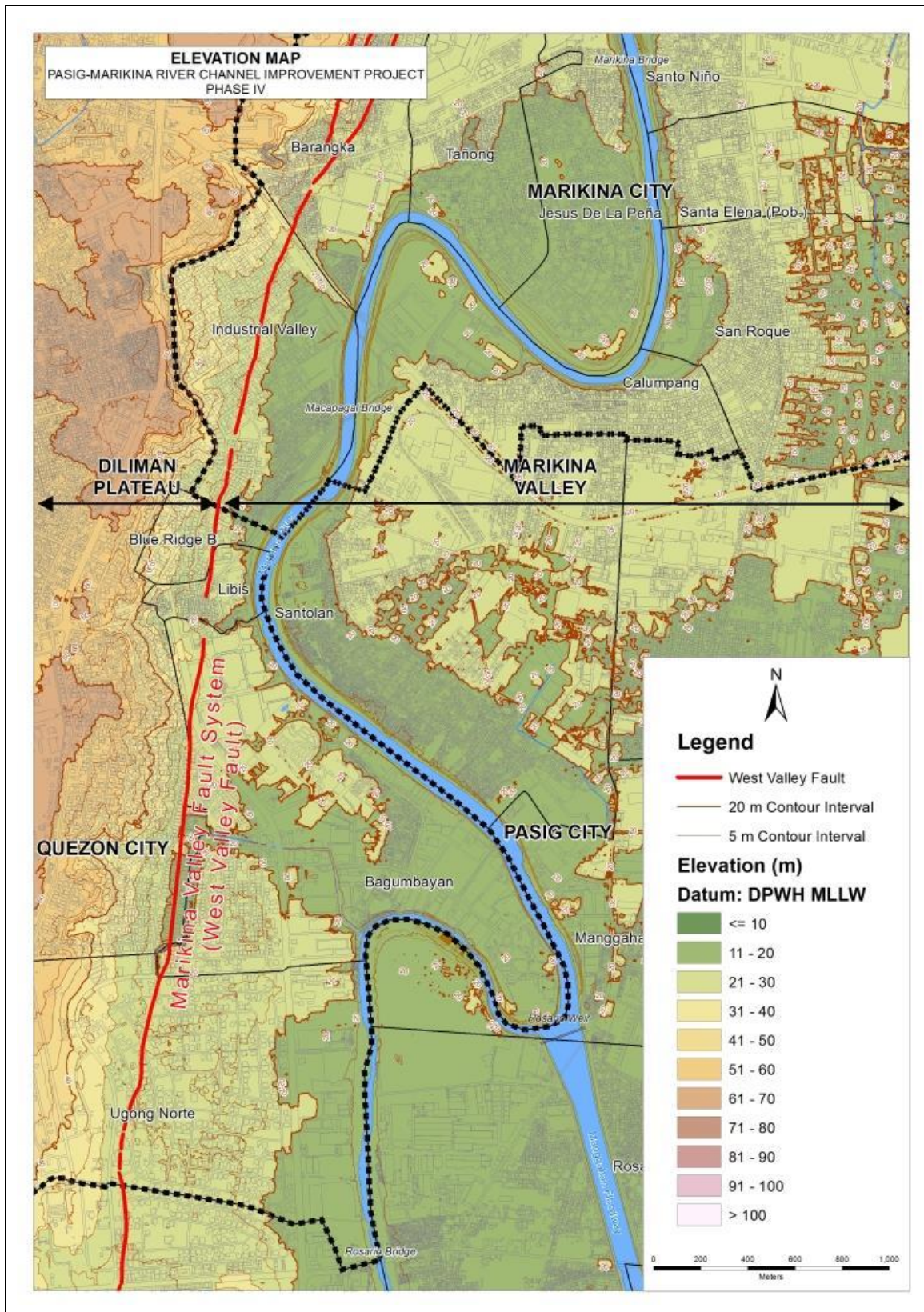
The slope of the Project, Phase IV area is presented on Figure 6.3.4 and its distribution is summarized in Table 6.3.7. Level to nearly level slopes (0-2%) exist in the barangays of Santolan, Manggahan, Santa Elena, San Roque, Calumpang, Santo Niño and Bagumbayan. Areas with 2-5% slopes include Tañong, Jesus de la Peña and Libis. Barangays with slopes of 5-8% include Rosario, Barangka, Blue Ridge and Ugong Norte. Gently rolling to rolling slopes (8-15%) exists in the area of Industrial Valley.

The extensive steep slopes bordering both banks of the Marikina River define the sharp difference in the elevation between the river channel and the surrounding floodplains and lowlands. The steep slopes at the western part of the Project, Phase IV area are the escarpments marking the boundary of the Diliman Plateau and Marikina Valley. This boundary also defines the relative location of the west segment of the MVFS.

Table 6.3.7 Slope Distribution in Project Phase IV Area

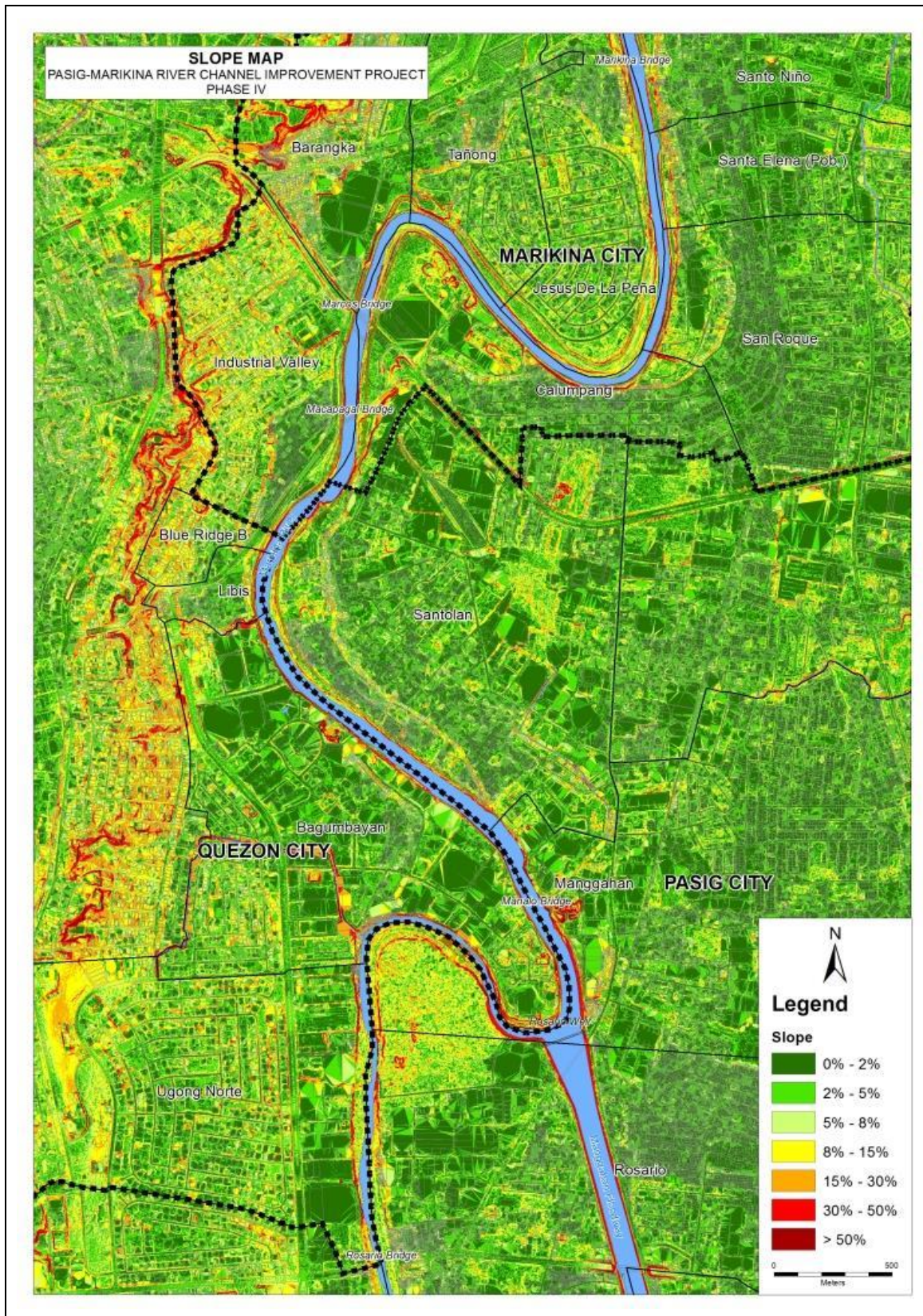
Average Slope	Description	Barangay
0-2%	Level to nearly level	Santolan
		Manggahan
		Santa Elena
		San Roque
		Calumpang
2-5%	Gently sloping to gently undulating	Santo Niño
		Bagumbayan
		Tañong
5-8%	Undulating to gently rolling	Jesus de la Peña
		Libis
		Rosario
8-15%	Gently rolling to rolling	Barangka
		Blue Ridge
		Ugong Norte
		Industrial Valley

Source: Slope analysis in this survey (CTI, 2014)



Source : Philippine Institute of Volcanology and Seismology (PHIVOLCS) for topographic feature, Elevation Analysis in this Survey (CTI, 2014).

Figure 6.3.3 Landform and Elevation in the Project Phase IV Area



Source: Slope Analysis in this Survey (CTI, 2014)

Figure 6.3.4 Slope Map of Project Phase IV Area

c. Geology

The Philippine archipelago is situated within the Circum-Pacific Volcanic-Earthquake Belt, characterized by earthquakes and volcanic activity and defined by key geologic structures across

the archipelago (Rangin, 1991). This is marked by the north-northwest trending segment of the active Philippine Fault Zone (PFZ), with its fault splays traversing across the Sierra Madre Mountain Range in Luzon, through Samar-Leyte islands and through Mindanao along the Eastern Mindanao Range. The archipelago is bound by the Manila Trench (MT) and Negros-Panay Trench to the west, and to the east by East Luzon Trough (ELT) and Philippine Trench. In Luzon, other active faults include the offshore Lubang Fault about 120 km south of Manila, and the Marikina Valley Fault System (MVFS), traversing the western and eastern boundaries of the Marikina Valley (Geotecnica, 2003).

The geology of the Project, Phase IV area is represented by the following geological units, in order of ascending age: Quaternary Alluvium, Manila Formation, and Guadalupe Formation (Table 6.3.8). Figure 6.3.5 presents the geological map of the Project Phase IV area and adjacent regions of Metro Manila and Rizal Province.

Table 6.3.8 Geological Units within Project Phase IV Area

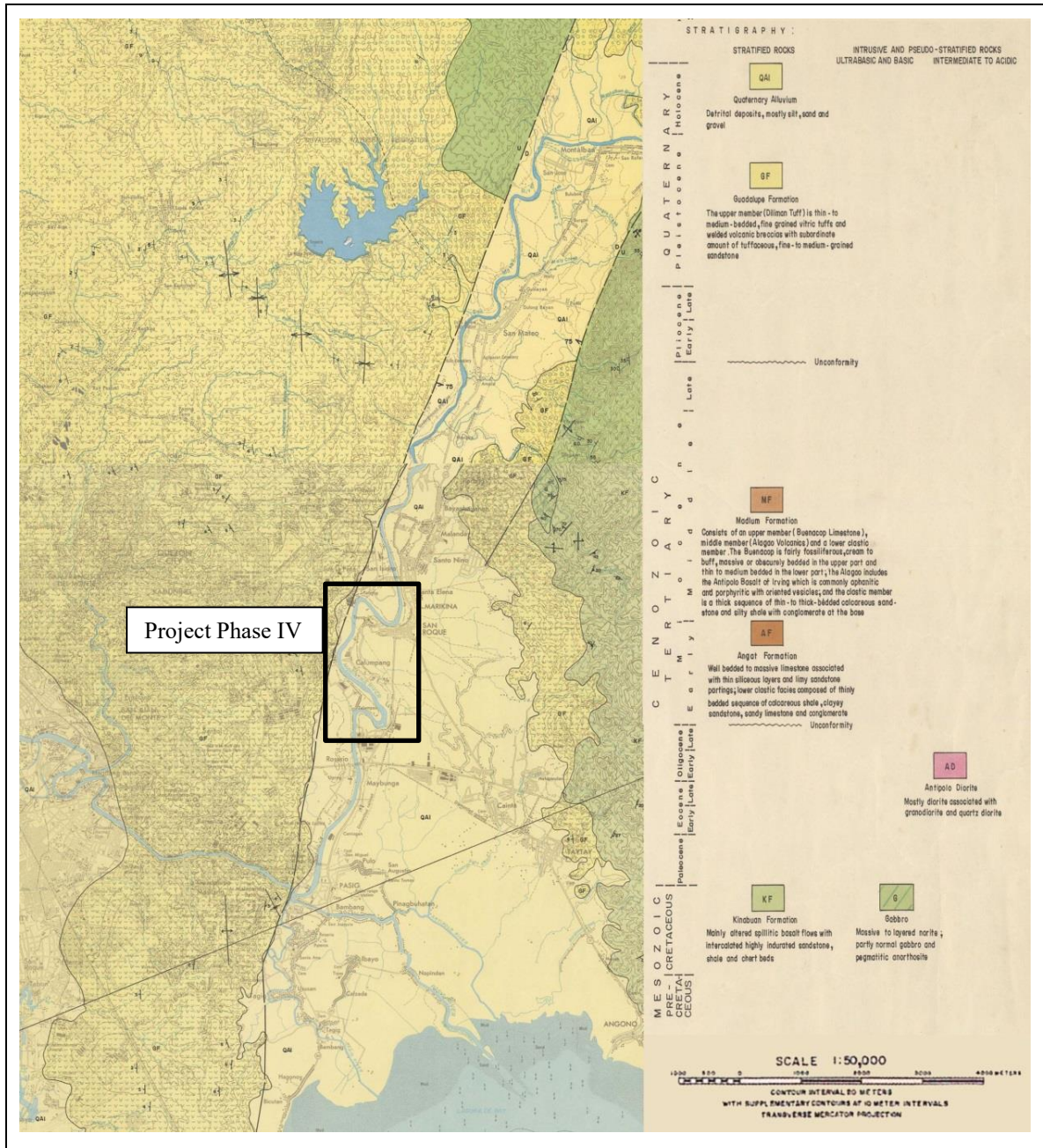
Geologic Age	Geological Unit	Lithology
Holocene (10,000 years b.p.*)	Quaternary Alluvium (Marikina Alluvial Plain)	clay, silt and sand
	Manila Formation	clay, silt, gravelly sand, tuffaceous silt
Pleistocene (10,000-1.6 million years b. p.*)	Guadalupe Formation	(a) Alat Conglomerate - conglomerate, sandstone, mudstone (b) Diliman Tuff - tuff, pyroclastic breccia, tuffaceous sandstone

Note) b.p.* : before present

Source: Mines and Geosciences Bureau (MGB), 2010

The Quaternary Alluvium in the Project Phase IV and adjacent areas is represented by the Marikina Alluvial Plain deposit, consisting of clay, silt and sand material (MGB, 2010). On the other hand, The Manila Formation refers to the sequence of unconsolidated fluvial, deltaic and marine deposits overlying the Diliman Tuff. The unconsolidated deposits consist of clay, silt, gravelly sand, and tuffaceous silt found in the areas of Marikina and Pasig City as well as parts of Rizal.

The Guadalupe Formation refers to the underlying bedrock in most of Metro Manila and adjacent areas of Bulacan and Rizal Province, consisting of two lithological units, the Diliman Tuff and Alat Conglomerate (MGB, 2010). The Diliman Tuff is the dominant unit, underlying the areas of Pasig, Makati and Quezon City, and southern parts of Rizal. It consists of whole sequences of flat-lying, medium to thin bedded tuff, fine-grained vitric tuffs and welded pyroclastic breccia, with minor fine-to-medium-grained tuffaceous sandstone. According to previous studies these are most likely derived from a volcano on the central lobe of Laguna de Bay in the south based on its aerial distribution pattern and lithological similarity (Wolfe and Self, 1983). The Alat Conglomerate, on the other hand, underlies parts of northern Quezon City and Bulacan, consisting of a sequence of conglomerates, sandstones and mudstones.



Source: Mines and Geoscience Bureau (MGB), 1983

Figure 6.3.5 Geological Map of Metro Manila and Nearby Areas

d. Geological Hazards

Studies regarding geological hazards within Metro Manila have been conducted by government agencies such as the Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the Mines and Geosciences Bureau (MGB) to provide reference information to the public. The geological hazards include earthquakes, liquefaction, land subsidence, flooding and landslides.

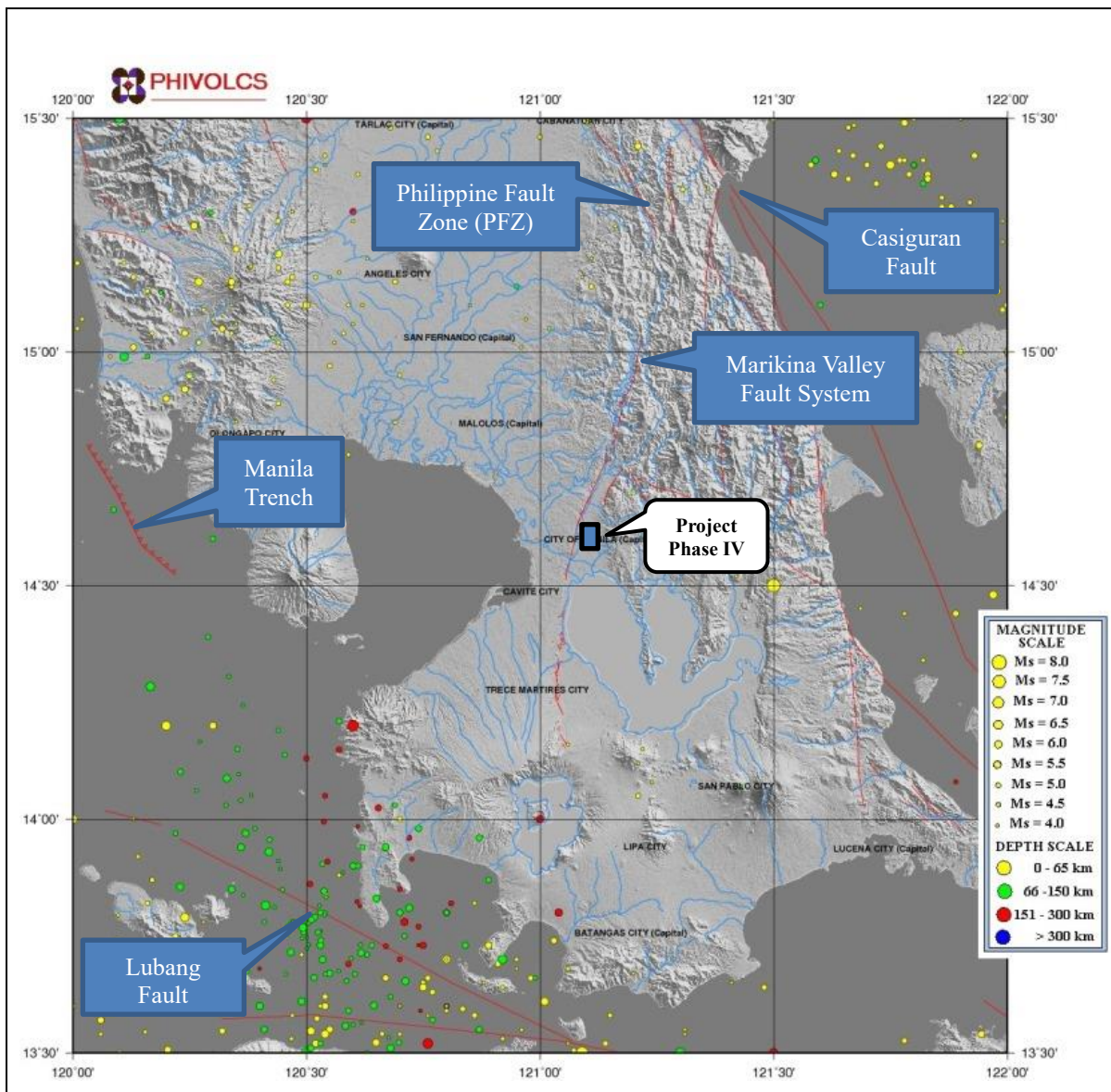
(i) Earthquake

Metro Manila is susceptible to earthquakes due to the nearby active faults. The location of active faults and seismicity within the area of Southern Luzon and Metro Manila is presented in Figure 6.3.6. Most of the earthquakes with magnitudes of 4.0 and greater are observed to cluster along the Lubang Fault and east of the Casiguran Fault. On the other hand, inland earthquakes occur dispersed at mountain ranges northwest of the Manila Trench.

For Project Phase IV area, the potential seismic sources are the Marikina Valley Fault System (MVFS), Philippine Fault Zone (PFZ), Lubang Fault, Casiguran Fault, and the Manila Trench (PHIVOLCS, 2014).

The MVFS is the nearest active fault system to the Project, Phase IV area, consisting of two northeast-southwest trending structures, the West Marikina Valley Fault (WMVF) and East Marikina Valley Fault (EMVF) (Remando, et. al., 2004). A rough estimate of possible recurrence interval for large-magnitude earthquake at least along the northern portion of MVFS is between 200-400 years (Daligdig, et. al., 1997), with high potential to cause earthquakes of magnitude 6-7 (Nelson, et. al., 2000). However, no recent seismic activity has been recorded at the MVFS. However, in case of a large-magnitude earthquake occurring along any of the MVFS structures, it may have an impact to the Project, Phase IV and surrounding areas.

The PFZ is a left-lateral strike slip fault and has recorded the highest seismic activity and historically powerful earthquakes such as the 1990 Luzon (M 7.7, 1990) and Masbate (M 6.2, 2003) earthquakes. Earthquakes generated from the other active faults (Manila Trench, Lubang and Casiguran) were similarly recorded with less significant effects to Metro Manila and adjacent areas.



Source: Philippine Institute of Volcanology and Seismology (PHIVOLCS), 2014

Figure 6.3.6 Active Faults and Seismicity in Metro Manila and Southern Luzon

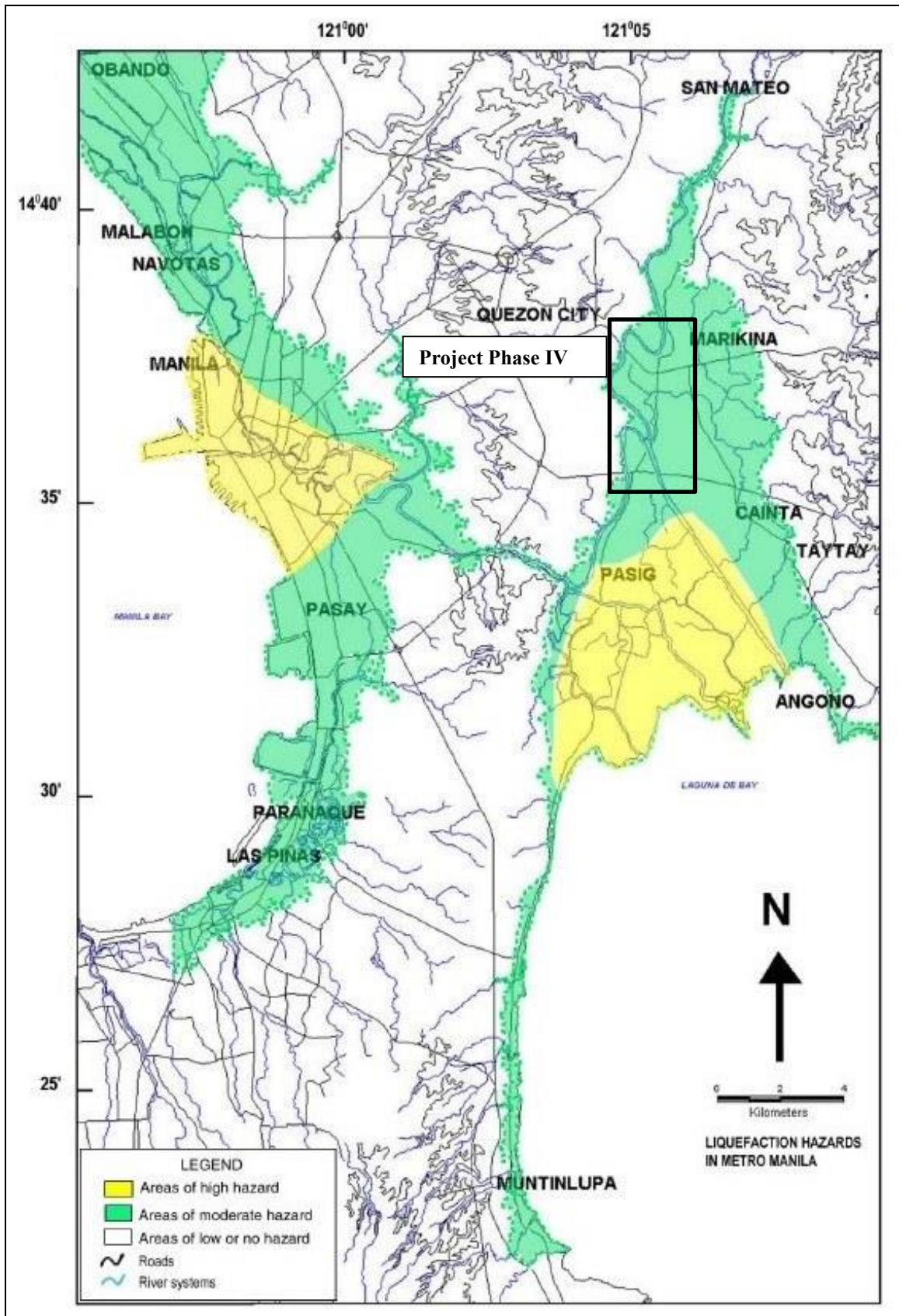
(ii) Liquefaction

Liquefaction is a phenomenon wherein soil or ground strength is reduced during an earthquake or weight loading. It particularly affects water-saturated soils and unconsolidated alluvial sediments. The map for liquefaction hazard in Metro Manila is presented in Figure 6.3.7. The assessment identified two general areas with considerable liquefaction potential (MMEIRS, 2004). One of these is the shoreline area along Manila Bay, and the other is the lowland region of the Marikina Valley.

Within the Project, Phase IV, all areas east of the Marikina River, as well as the whole of Barangay Tañong, Jesus de la Peña and the lower half of Barangay Bagumbayan are considered to have moderate susceptibility to liquefaction. All areas west of the boundary between the Diliman Plateau and Marikina Valley, however, have low to zero susceptibility (PHIVOLCS, 2010).

(iii) Land Subsidence

According to the preliminary assessment of land subsidence potential undertaken between 2003 and 2006 for Metro Manila and nearby areas (Philippine Science Letters, 2014), the area of the Project, Phase IV has a zero-land subsidence potential although adjacent Taguig-Pateros is evaluated as the subsidence-affected area. The details of current status of land subsidence are discussed in Section 6.2.6 Land Subsidence.



Source: Philippine Institute of Volcanology and Seismology (PHIVOLCS), 2010

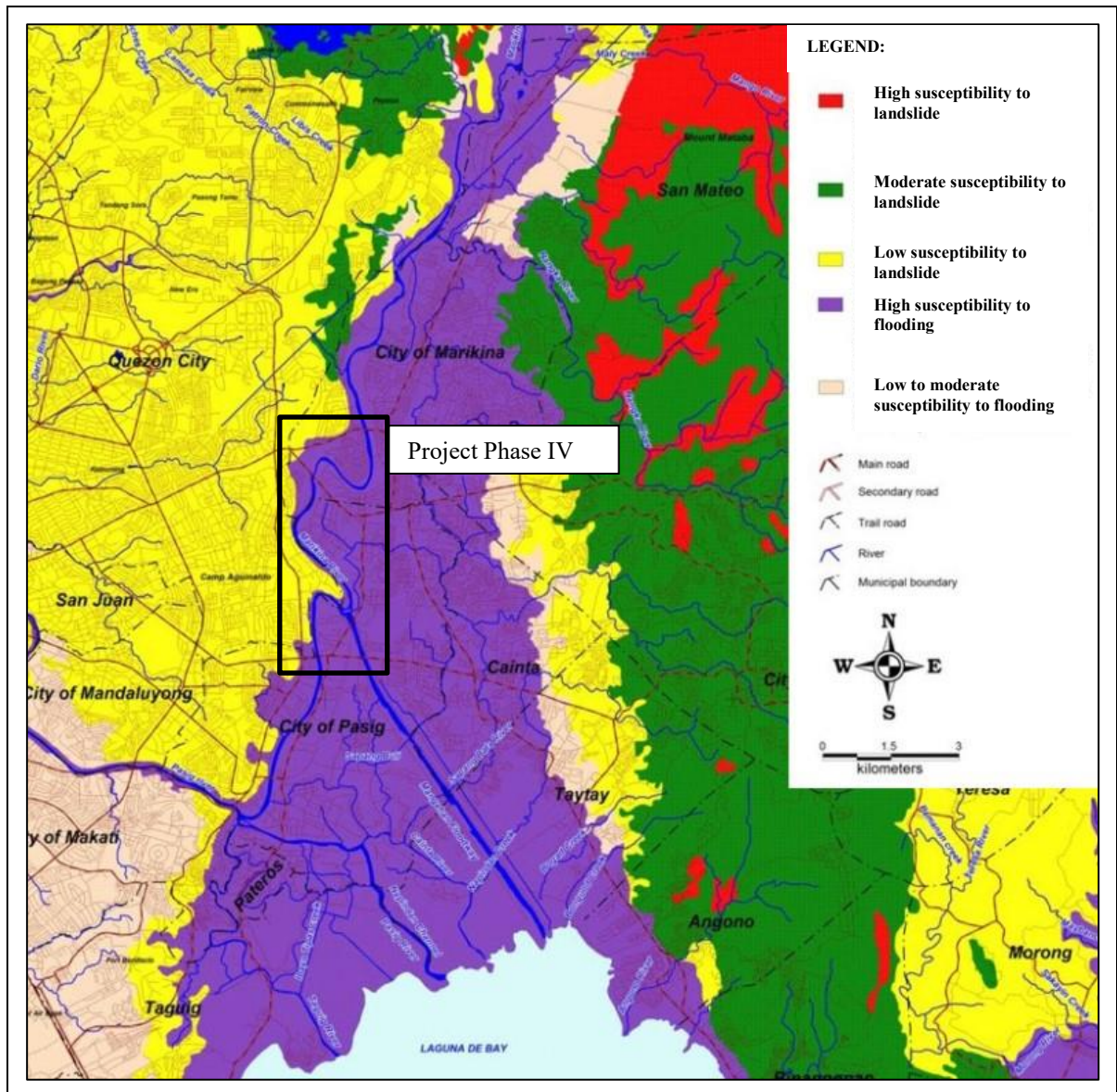
Figure 6.3.7 Liquefaction Hazard Map of Metro Manila and Nearby Areas

(iv) Flooding and Landslide

Published flooding and landslide susceptibility maps by MGB (2010) emphasize the flooding risk at the Marikina Valley where the Project, Phase IV area is located (Figure 6.3.8). Details of flood disaster records having affected Metro Manila is discussed in Section 6.3.3 Hydrology.

Landslide susceptibility is absent within the Project, Phase IV area since it is largely flat. Low susceptibility is noted at its west side, which is mainly at the escarpment marking the relative location of the west segment of the MVFS between Marikina and Quezon City.

Earthquake-induced landslide hazard maps for Metro Manila prepared by PHIVOLCS (2013) indicates the areas at the boundary of the Diliman Plateau and Marikina Valley as low to moderately susceptible to such hazard. In the Project, Phase IV, this is located at the escarpment areas at the western boundary of Libis, Blue Ridge, Industrial Valley and Barangka. These landslide hazard areas are consistent with those identified by MGB as described above.



Source: Mines and Geoscience Bureau (MGB), 2010

Figure 6.3.8 Flooding and Landslide Hazard Map of Metro Manila and Nearby Areas

(2) Evaluation of Updated Baseline Condition

Survey results of pedology, topography and geology revealed that the Project, Phase IV area is represented by four (4) major soil series: San Manuel, Marikina, Burgos and Pinagbuhatan series. The topography of the project area is composed of two (2) landform regions: Marikina Valley and Diliman Plateau. The elevation of these landforms is 10 to 30 m along the Marikina River with the slope of 0 – 5 % at most of the low land area except for the river banks. The project area is represented by three (3) geological units: Quaternary Alluvium, Manila Formation and Guadalupe Formation.

Basically there is no change in the status of pedology, topography or geology including the geological hazards from the EIS (1998), except for limited change in case of development activities entailing excavation or embankment. Within the project area, topographic modification due to embankment and encroachment into the river is observed at limited area including embankment at Circulo Verde commercial development and Olandes Sewerage Treatment Plant.

Assessment for geological hazards is not specified as part of requirements in the EIS (1998). It was, however, introduced as part of the Engineering, Geological and Geohazard Assessment Report (EGGAR) under DAO No. 2000-28. The EGGAR was subsequently required in the 2007 Revised Procedural Manual for DAO No. 2003-30 as part of the new PEISS through DENR Memorandum Circular No. 2007-001. Based on the survey results, the project area has potential hazards of earthquake, liquefaction, and flooding.

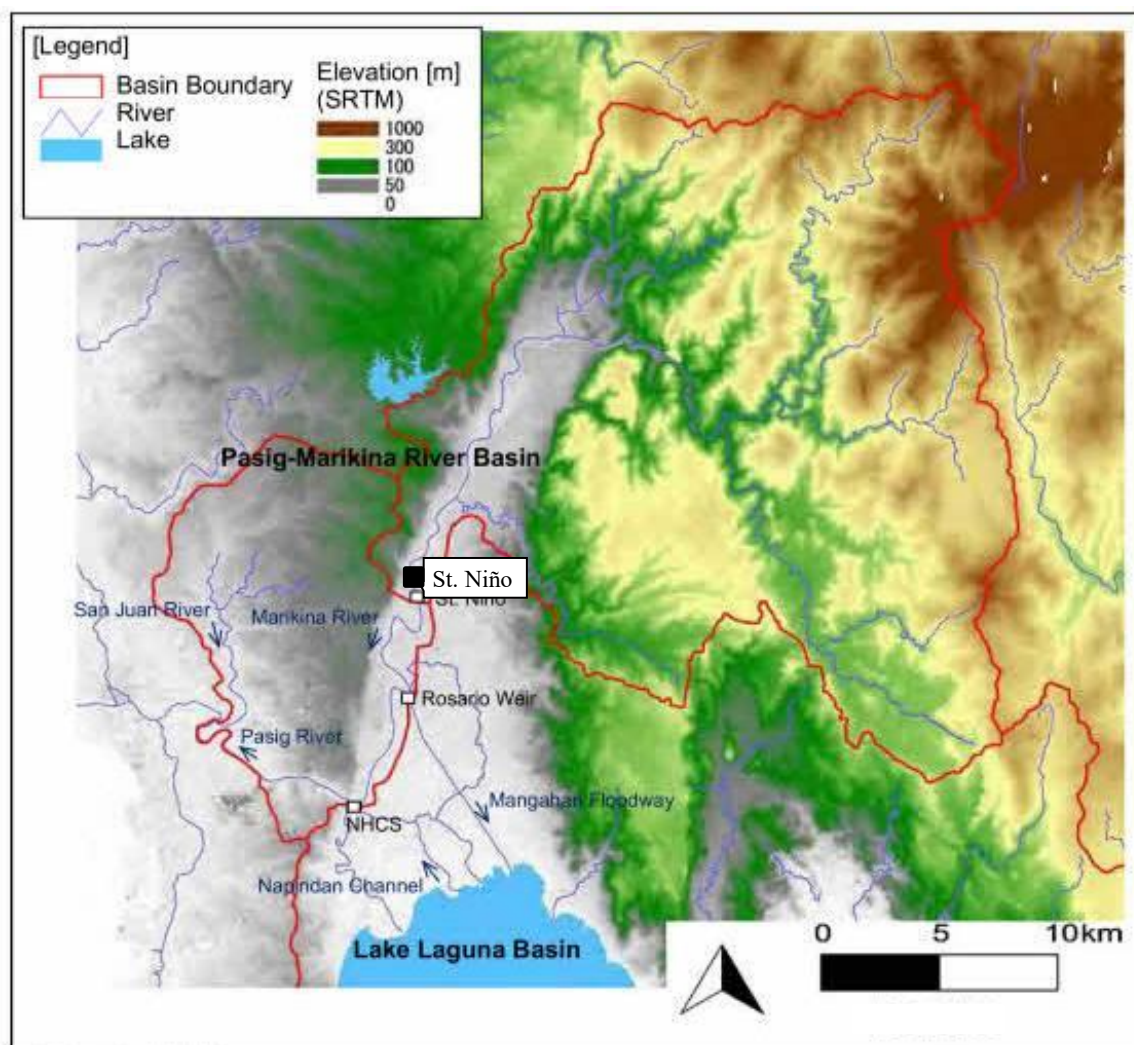
6.3.3 Hydrology

(1) Current Status

a. Pasig-Marikina River System and Watershed

The Pasig-Marikina River has a catchment area of 635 km² (the whole catchment area). The river flows originating from the Sierra Madre mountain range at the highest elevation of approx. 1,380m in the municipality of Rodriguez (formerly Montalban), Rizal, and flow down to the south through the Municipality of San Mateo, Rizal and Metro Manila, and finally flows into Manila Bay (Refer to Figure 6.3.9).

The river has a gentle channel bed slope of 1/46,000 to 1/24,000 along the Pasig River Section. Riverbed slope increases to 1/4,900 along the Lower Marikina River, and 1/2,800 to 1/1,600 along the Upper Marikina River.



Source: Final Report, Pasig-Marikina River Rainfall Analysis, JICA, 2013

Figure 6.3.9 Watershed of the Pasig-Marikina River

b. River Discharge

Table 6.3.9 shows the annual average and maximum discharge of the Marikina River at St. Niño Station (refer to Figure 6.3.9). The annual average discharge during recent 10 years ranges from 40.8 to 175.4 m³/s, while the recorded maximum discharge during the same period also ranges from 438 to 3,511 m³/s in the same period. The highest discharge was recorded during the Tropical Storm Ondoy in September 2009.

Table 6.3.9 Annual Average and Maximum Discharge at St. Niño Station

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Ave./Max.
Ave.	40.8	48.0	60.1	49.7	51.8	110.9	80.8	120.9	175.4	112.2	85.1 (Ave.)
Max.	1,906	796	896	1,064	1,012	3,511	438	1,928	2,545	782	3,511 (Max.)

Unit: m³/s

Source: This Study of the Project, Phase IV, 2014

Table 6.3.10 shows the monthly average discharge of the Marikina River at St. Niño Station from 2011 to 2013. River discharge records the minimum in Mar. or May, and then it increases up to Aug. or Sep. in general. The recorded minimum discharge during recent three years was 6.4 m³/s in 2011, and recorded maximum one in the same period 542.1 m³/s in 2012.

Table 6.3.10 Monthly Average Discharge at St. Niño Station during Recent Three YearsUnit: m³/s

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2011	17.9	16.9	10.8	6.4	42.4	178.8	150.3	210.8	238.1	179.7	155.4	147.4
2012	74.2	47.4	40.6	18.7	12.3	124.6	262.3	542.1	301.1	226.2	144.0	73.2
2013	67.5	63.3	55.3	76.5	65.0	128.6	99.2	99.2	254.0	213.0	-	-

Note) -: No available data.

Source: This Study of the Project, Phase IV, 2014

c. Flood Disaster

Lowland areas of the Pasig-Marikina River watershed has high risk of flooding caused by high water level and overflowing of river banks during heavy rains or typhoons in wet season. High flood risk areas include the following:

- The alluvial lowland area of Marikina River (Marikina flood plain) with altitude of 5 to 30 m along the Marikina River, which are bounded by the Sierra Madre mountains to the east down to Manila Bay. The Project, Phase IV area belongs to this area.
- The low-lying areas along the Pasig River down to Manila Bay with altitude of three (3) meters at the core of Metro Manila,
- The Laguna Lake Plain which is the marshy land from Rosario Weir through the lowland area along the Manggahan Floodway to the vast areas around the lake.

Table 6.3.11 summarizes the flooding disasters which caused tremendous damages in NCR during the recent five (5) years. It indicates that NCR is suffering from flooding disasters every year. The worst two cases are Tropical Storm Ondoy and Typhoon Pepeng hit in 2009, both of which had casualties (dead) of more than 460 and affected persons of more than 4 million.

Table 6.3.11 Destructive Typhoons/Storms Hit NCR in Recent Five Years (2009 – 2013)

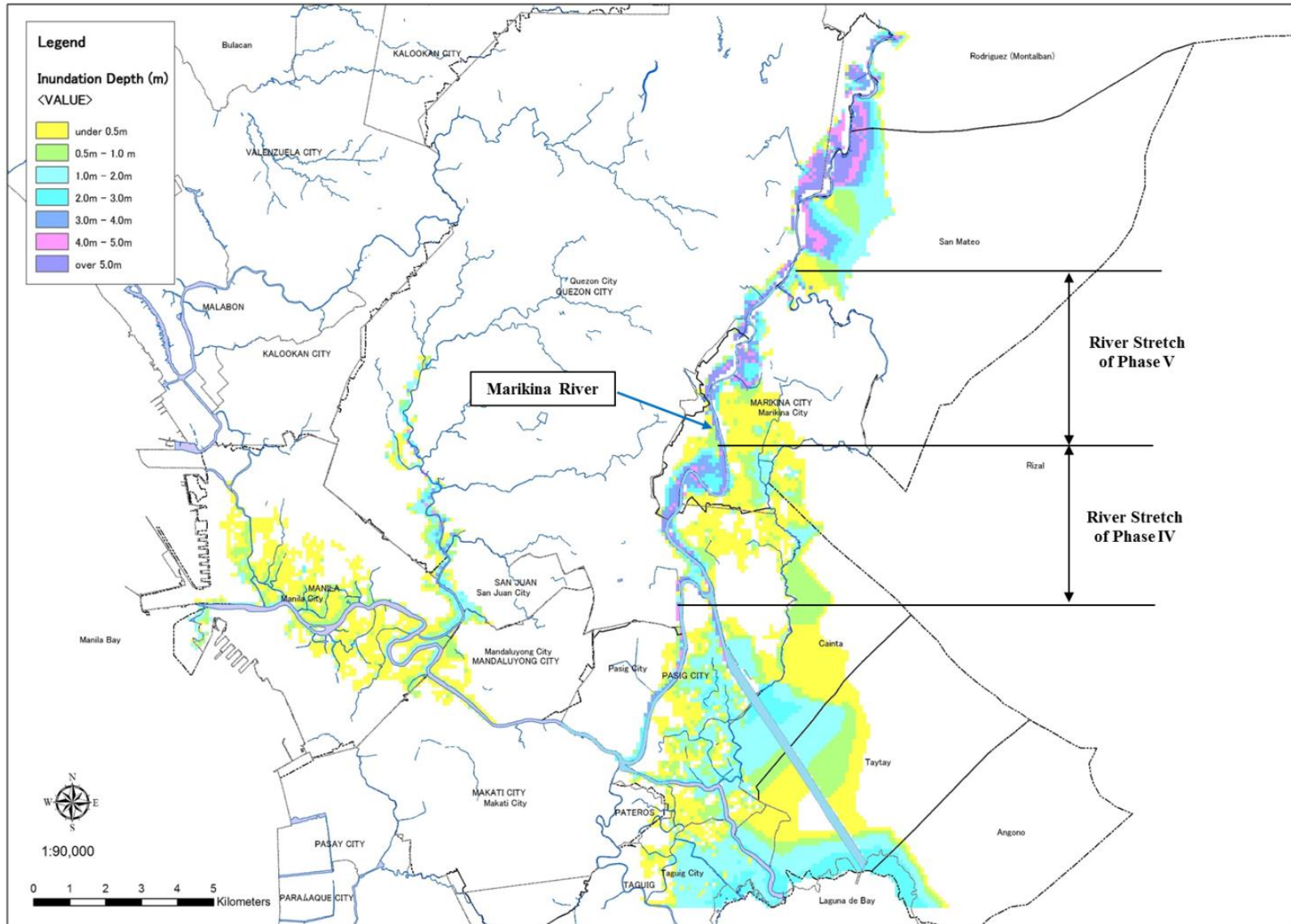
Year	Disaster	Dates	Casualties (Dead)	Affected (Persons)	Damaged Houses (Nos.)	Cost of Damages (PHP)
2009	Typhoon Feria	Jun. 23 - 26	17	150,491	1,340	232,073
	Tropical Storm Isang	Jul. 14 - 18	5	248,057	5	39,531
	Typhoon Kiko	Aug. 7	27	122,056	443	873,447
	Tropical Storm Ondoy	Sep. 24 - 27	464	4,901,234	30,082	10,952,198
	Typhoon Pepeng	Sep. 30 – Oct. 10	465	4,478,284	6,253	27,296,722
	Typhoon Santi	Oct. 28 – Nov. 1	34	802,155	4,104	704,997
2010	Typhoon Basyang	Jul. 12 - 15	102	585,383	73,286	377,976
	Tropical Storm Ester	Aug. 7 - 9	2	1045	-	-
	Typhoon Juan	Oct. 16 - 21	31	2,008,984	30,048	12,013,990
2011	Tropical Depression Egay	Jun. 14 - 20	2	37,837	8	0
	Tropical Storm Falcon	Jun. 21 - 25	12	1,792,376	165	646,852
	Tropical Storm Juaning	Jul. 25 - 28	77	1,285,906	11,196	4,441,798
	Tropical Storm Kabayan	Jul. 28 - Aug 5	8	93,888	11	2,500
	Typhoon Mina	Aug. 21 - 29	36	411,468	159	2,089,349
	Typhoon Pedring	Sep. 24 - 28	85	3,105,355	7,491	15,552,587
2012	Tropical Depression Gener	Jul. 28– 31	54	948,696	1,424	728,331
	Tropical Depression Karen	Sep. 11 - 15	1	13,033	0	25
2013	Tropical Storm Maring	Aug 17 - 21	32	3,110,218	654	1,394,650

Source: National Disaster Risk Reduction and Management Council

Figure 6.3.10 shows the estimated inundation area due to Tropical Storm Ondoy. The inundation areas are located along the Marikina River until the Laguna Lake, including the Project, Phase IV area. The maximum depth of inundation was calculated to be more than ten (10) m, having affected to 4.9 million people, and damaged more than 30,000 houses in total.

(2) Evaluation of Updated Baseline Condition

The Pasig-Marikina river system and hydrological conditions have not been significantly changed since the preparation of EIS (1998). However, it was pointed out that the rainfall intensity of big rain events has increased along with the climate change, which was described in Section 6.3.1 Meteorology and Climate. The risk of flood disaster due to a heavy rain, therefore, is supposed to have increased in recent years. A flood disaster in NCR caused by Tropical Storm Ondoy in September 2009 is representative one, which had casualties (dead) of more than 460, affected persons of more than 4 million.



Source: Final Report, The Preparatory Study for Pasig-Marikina River Channel Improvement Project (Phase III), 2011

Figure 6.3.10 Inundation Area due to Tropical Storm Ondoy, Sep. 2009

6.3.4 Terrestrial Flora

(1) Current Status

a. Primary Data

i) Methodology

Baseline condition survey for terrestrial flora was conducted along the Project area, aiming to describe flora assemblage along the Project area in terms of species richness, abundance, evenness, diversity and distribution. The survey was conducted on September 30, and October 4 and 5, 2014.

Survey locations: Ocular survey for recording the flora species in and around the project area was conducted to cover the whole stretch of the Phase IV along the Marikina River. The transect survey for identifying the flora species in the relatively dense vegetation in detail was conducted at two (2) locations as shown on Figure 6.1.4.

Survey Method: Ocular survey was carried by walking through the whole stretch of the Project area along the Marikina River to assess the vegetation community. Common and noteworthy flora species and composition were noted.

Belt transect method, with a 100-m long and 10-m wide, was applied for sampling of vegetation for the areas with trees while line transect method, with a 100-m long, was applied to assess grasses. All flora species were recorded and identified through published taxonomic keys and field guides, etc. up to species level or at least genus level.

Calculation of Index:

Biodiversity indices that were used to analyze the collected data are as follows:

$$\begin{aligned} \text{Shannon Diversity Index (H)} &= - \sum (n_i/N) \ln (n_i/N) \\ \text{Pielou's Evenness Index (J)} &= H / \ln S \end{aligned}$$

where: n_i = the total number of individuals in each species
 N = the total number of all individuals
 S = total number of species

ii) Survey Result

Vegetation Community: There are three (3) major vegetation communities along the river stretch of the Phase IV: namely shrub land, urban green spaces (i.e., Marikina River Park) and cultivated lands. The shrub land is located in a private land along Barangay Manggahan near the Rosario Weir. The urban green spaces are located along the stretch of the Marikina River from Marikina Bridge downstream to Barangay Libis, and the cultivated lands are located on the banks of the Marikina River alongside with the urban green spaces.

Identified Species: There is a total of 54 flora species recorded through ocular survey and belt transect along the river stretch of Phase IV (refer to ANNEX-3). All of the species were identified at most to species level except for one alibangbang (*Bauhinia sp.*) which was only identified to genus level due to absence of flowers and fruits during the time of survey.

Most of the flora species recorded are introduced (29) followed by native (19), and Philippine endemic (5). The Philippine endemic species recorded are alagaw (*Premna odorata*), is-is (*Ficus ulmifolia*), Manila palm (*Adonidia merrillii*), dila-dila (*Cynometra cf. inaequifolia*) and niogniogan (*Ficus pseudopalma*). There was a high number of introduced species recorded along Phase IV of the Project since a large portion of the river stretch (Marikina River Park) was deliberately planted by the locals with introduced species and the area is generally located in an urban setting where source of propagules (e.g. seeds, spores, etc.) are mostly from nearby introduced species.

For the belt transects, the most abundant was the mahogany (*Swietenia macrophylla*) with 46 individuals followed by fire tree (*Delonix regia*) with 21 individuals, robles (*Senna siamea*) with 13 individuals and African tulip (*Spathodea campanulata*) with 13 individuals which are all introduced species. The other flora species recorded along Phase IV have abundance ranging from one to nine individuals.



Note) top row (left to right) – Tuai (*Bischofia javanica*) and Bitaog (*Calophyllum inophyllum*);
bottom (left to right) – Robles (*Senna siamea*) and Tangisang-bayawak (*Ficus variegata*)

Figure 6.3.11 Some Flora Species Recorded along Phase IV Area (1)



Note) top row (left to right) – Mmulberry (*Morus alba*) and Binuang (*Octomeles sumatrana*);
bottom (left to right) – Bangkal (*Nauclea orientalis*) and Is-is (*Ficus ulmifolia*)

Figure 6.3.12 Some Flora Species Recorded along Phase IV Area (2)

Biodiversity Index: Shannon Diversity Index was calculated as 2.14 and 1.91 for the two belt transects, indicating low values, which are similar with the overall calculated diversity index (2.34) for the two belt transects (For Shannon Diversity Index, an index ranging from 2.0 to 2.49 means a low diversity). The low diversity index can be attributed to high abundance of deliberately planted introduced species compared to other tree species present along Phase IV of

the Project. For the Pielou's Evenness Index, overall calculated evenness index and evenness index for each of the two belt transects was high ranging from 0.71 to 0.83 (In Pielou's Evenness Index, an index of 0.75 to 1.00 means a very high evenness). This is because most of the flora species recorded along the transects have the abundance range almost similar to each other even with the presence of several flora species having high abundances.

Threatened Species: There are six (6) threatened species recorded along Phase IV which falls under threatened categories of the National List of Threatened Philippine Plants and their Categories and List of Other Wildlife Species (DAO 2007-01), IUCN Red List of Threatened Species and/or listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as listed in Table 6.3.12. Though the introduced species mahogany (*Swietenia macrophylla*) was categorized vulnerable under IUCN and listed in the CITES, these only applies to its home distribution range in the neotropical countries where it is heavily exploited for commercial timber. It was observed through the survey that among the threatened species below, only *Ficus ulmifolia* grows spontaneously under natural condition.

Table 6.3.12 Threatened Flora Species Recorded along the Phase IV Section

Species Name	Common name	DAO 2007-01	IUCN	CITES
<i>Adonidia merrilli</i>	Manila palm	Endangered	Near threatened	Not listed
<i>Cynometra cf inaquifolia</i>	dila-dila	Vulnerable	Vulnerable A1d	Not listed
<i>Ficus ulmifolia</i>	is-is	Not included	Vulnerable A1cd	Not listed
<i>Pterocarpus indicus</i>	Narra	Critically endangered	Vulnerable A1d	Not listed
<i>Swietenia macrophylla</i>	Mahogany	Not included	Vulnerable A1cd+2cd	Appendix II / NC
<i>Vitex parviflora</i>	Molave	Endangered	Vulnerable A1cd	Not listed

Source: Primary data obtained in this survey, 2014

b. Secondary Data

Based on the assessment report of the Pasig River Rehabilitation Commission (PRRC, 2009), "Biodiversity Assessment of Pasig River and Its Tributaries: Ecosystems Approach (Phase One) Terminal Report 2009," for the trees and other vegetation present along the stretch of Pasig River, there were presence of 118 species which belong to 94 genera and 42 families. Mango, banana and ipil-ipil were the most dominant in the right embankment from upstream to downstream direction of the river with species diversity index of 3.43. On the left embankment is dominated by ipil-ipil, coconut and salisi or Ficus with a species diversity index of 3.22. Table 6.3.13 shows the summary of dominant species of trees including its diversity index. Although species diversity may be considered high based on Fernando's scale of Biodiversity, types of trees present along the Pasig River are more closely associated with human habitation. Of the species present, approximately 69% are exotic, 29% are indigenous and only 2% are endemic to the Philippines according to the report.

Table 6.3.13 Summary of Survey on Terrestrial Flora along the Pasig River

Stations	Total Population	Total # of Families	Total # of Species	Shannon Diversity (ni/N)/n(ni/N)	Dominant Species		
					Common name	Scientific Name	Family Name
Right Embankment	3043	36	94	3.43			
1. Napindan to Bambang	385	20	42	3.1	Banana	<i>Musa sp.</i>	Musaceae
2. Bambang to Hulo	655	26	59	3.11	Ipil-ipil	<i>Leucaena leucocephala</i>	Fabaceae
3. Hulo to Lambingan	803	22	55	3.06	Salisi	<i>Ficus benjamina</i>	Moraceae
4. Lambingan to PUP	325	22	43	2.85	Niog	<i>Cocos nucifera</i>	Arecaceae
					Ipil-ipil	<i>Leucaena leucocephala</i>	Fabaceae
5. PUP to Escolta	875	33	58	2.39	Ipil-ipil	<i>Leucaena leucocephala</i>	Fabaceae

Stations	Total Population	Total # of Families	Total # of Species	Shannon Diversity (ni/N)/n(ni/N)	Dominant Species		
					Common name	Scientific Name	Family Name
Left Embankment	3220	34	83	3.22			
1. Kalawaan to San Joaquin	780	23	49	2.75	Banana	<i>Musa sp.</i>	Musaceae
2. San Joaquin to Guadalupe	234	23	40	3.09	Salago	<i>Wikstroemia ovata</i>	Thymeliaceae
3. Guadalupe to Valenzuela	293	44	21	2.79	Blue palm	<i>Brahea armata</i>	Arecaceae
4. Valenzuela to Sta. Ana	432	22	43	3.07	Banana	<i>Musa sp.</i>	Musaceae
5. Sta. Ana to Lawton	1228	29	73	3.35	Ipil-ipil	<i>Leucaena leucocephala</i>	Fabaceae
6. Lawton to Plaza Mexico	253	22	43	3.13	Big-leaf mahogany	<i>Swietenia macrophylla</i>	Meliaceae

Source: Biodiversity Assessment of Pasig River and Its Tributaries: Ecosystems Approach (Phase One) Terminal Report (2009), PRRC

The riverbanks serve also as habitat for a few thriving natural plants, the majority of which are *Ficus* species (PMRCIP, Phase III Report, 2011). Similar with the terrestrial vegetation found during the PRRC study, agricultural fruit trees and ornamental plants were observed on both banks of the Pasig River. Based on the PMRCIP, Phase III Report, among the commonly encountered plants in the riverbanks are *Ficus religiosa* (Bo tree), *Leucaena leucocephala* (ipil-ipil), *Terminalia catappa*, *Sandoricum koetjape* (santol), *Swietenia macrophylla* (big leaf mahogany), *Cocos nucifera* (niog), *Ficus septic* (hauili), *Trema orientalis* (anabiong), *Ficus balet* (balete) and *Gmelina arborea* (gmelina). Other species were also recorded but not frequently encountered include *Vitex parviflora* (molave), *Carica papaya* (papaya), *Pterocarpus indicus* (narra), *Premna odorat* (alagau), *Chrysophyllum cainito* (caimito), *Cannax generalis* (canna lily) and *Macaranga tanarius* (binunga). These plants and trees were either planted for bank enhancement and shade or occurring naturally through seed dispersal agents as wind, insects and birds. All species of plants and trees found during the PMRCIP, Phase III study were also found during the PRRC study except for *Cannax generalis* and *Macaranga tanarius*.

(2) Evaluation of Updated Baseline Condition

In EIS (1998) of the Project, there was no survey result or description on terrestrial flora except for such expression that vegetation along the Pasig-Marikina River is very limited to that observed in a highly urbanized city. There is no name of flora species or no information on threatened species in the EIS, either.

As the result of this environmental survey, current status of the terrestrial flora was clarified, including vegetation, existing flora species, biodiversity and threatened species, all of which can be a basis for assessment of the potential impacts of the Project, Phase IV on the terrestrial flora.

(3) Estimated Trees to be Cut by the Implementation of Phase IV

Based on the experiences in the implementation of Phase III, trees and plants along the river bank will be cut and removed to undertake the construction works. Approx. 1,800 trees are estimated for the cutting, earth-balling and trimming/pruning in the implementation of Phase IV. Before conduct of tree-cutting activities, (1) trees to be affected by the construction shall be incorporated in the design of Phase IV, (2) Joint inventory of trees and plants shall be conducted, and (3) Permit of tree-cutting by DENR shall be acquired.

Further, replacement of seedlings shall be made by a certain ratio to the number of trees to be cut/removed pursuant to the order of DENR.

6.3.5 Terrestrial Fauna

(1) Current Status

a. Primary Data

i) Methodology

Baseline condition survey for terrestrial fauna was conducted along the Project area, aiming to describe fauna assemblage along the Project area of the Marikina River in terms of species richness, abundance, evenness, diversity, distribution, population status and habitat association. The survey was conducted on September 30, and October 4 and 5, 2014.

Survey locations: Survey area of the terrestrial fauna was the river stretch of the Phase IV area along the Marikina River. Survey locations of the line transect, light trapping and sweep netting were shown on Figure 6.1.4.

Survey Method: Line transect method was applied for recording the vertebrate fauna species along the river stretch in the Project area. Observers walked these established routes at a pace of about 250-m/15 min from 0600h to 0900h thereby completing the whole stretch in approximately 2-hrs. More observation time (five to 10 min.) was given to mixed feeding flocks to ascertain identities of individual species. For point observation, strategic points or areas along the Marikina River was established which depends on availability of areas where fauna especially birds tend to flock or aggregate.

Night-flying arthropods were collected using the Hallux F10/T8 ultraviolet light. These were installed vertically in the center of four baffles of vertically-framed plastic sheets provided with a cone-shaped galvanize funnel at the bottom. Light traps were operated for an exposure time of about four hours (1800h to 0600h) and set-up within the range of the designated areas.

In addition, sweep netting for foliage-dwelling arthropods was conducted along suitable areas coinciding with the stretch of the fauna transect. Arthropods were collected following the conventional double-stroke sweep (DSS) net system. In each of the sampling points, 40 DSS (=80 sweeps) was collected and samples were killed inside bottles containing 95% ethanol.

All fauna individuals observed and/or heard was noted using the following information: species name and number of individuals. As much as possible, all individuals were identified up to the species level.

Calculation of Index:

Biodiversity indices that were used to analyze the collected data are as follows:

$$\begin{aligned} \text{Shannon Diversity Index (H)} &= - \sum (n_i/N) \ln (n_i/N) \\ \text{Pielou's Evenness Index (J)} &= H / \ln S \end{aligned}$$

where: n_i = the total number of individuals in each species
 N = the total number of all individuals
 S = total number of species

ii) Survey Result

A total of 45 fauna species was recorded along Marikina River which will be covered by Project areas of Phase IV. It is composed of four (4) amphibians, one (1) reptile, 37 birds and three (3) mammals (refer to ANNEX-3). The number of recorded fauna species depended on the fauna species most likely to be active for the prevailing weather conditions during the time of the survey. Most of the fauna species recorded are common, resident and non-forest associated species which reflect the types of habitat along Phase IV such as built up areas (residential and industrial), cultivated lands, urban green spaces and shrub land. The details of the identified species area as follows:

Amphibians and Reptiles: There are five (5) amphibian and reptile species in total recorded indicating low diversity brought about by the heavily disturbed habitats. It is composed of three frogs, one toad and one lizard. These are the common sun skink (*Eutropis multifasciata*), banded bull frog (*Kaloula pulchra*), common tree frog (*Polypedates leucomystax*), puddle frog (*Occidozyga laevis*) and marine toad (*Rhinella marina*). Three out of the five species recorded are native species (common sun skink, common tree frog and puddle frog) while the other two species are invasive introduced species (banded bull frog and marine toad). All of the species recorded are common and abundant in terms of population status.

Birds: A total of 37 bird species were recorded. In terms of bird families, the most represented is Ardeidae followed by Sylviidae and the other families have one to two species representatives. The abundance of species representatives for Ardeidae (bitterns, egrets and herons) reflect the wetland habitat type. In terms of species, the most abundant is the whiskered tern (*Chlidonias hybrida*) followed by Eurasian tree sparrow (*Passer montanus*) and Pacific swallow (*Hirundo tahitica*).

Majority of the birds recorded are resident breeders with 22 species followed by migrants with nine species, migrants with resident populations with three species, Philippine endemic with two species and Luzon endemic with one species. Most of the birds recorded are associated with non-forested habitats with 14 species followed by birds associated with non-forest to forest habitats with 12 species and birds associated with wetlands with 11 species.

In terms of population status, majority of the birds are common under various categories (i.e. common, fairly common and locally common) with 35 species followed by uncommon with two species. This means that most of the birds recorded along Phase IV are commonly found along similar habitats across the country.

Shannon Diversity Index of recorded birds was 2.21 as overall for the whole stretch, and those for each transect is 2.24 and 1.98, all of which indicate low diversity. It is due to the heavily disturbed urban setting where majority of the stretch is residential and industrial with just some few areas of deliberately planted urban green spaces and cultivated lands. The low diversity can also be attributed to the presence of certain species having very high abundance compared to other species. In terms of the Pielou's Evenness Index, the evenness indices are high with 0.60 and 0.67 for the two transects and an overall evenness index of 0.61.



Note) top (left to right) Black-crowned night heron (*Nycticorax nycticorax*) and Little egret (*Egretta garzetta*); bottom (left to right) – Whiskered tern (*Chlidonias hybrida*) and Intermediate egret (*Egretta intermedia*)

Figure 6.3.13 Some Fauna Species Observed along Phase IV Area

Mammals: There are three (3) small mammal species recorded, composed of two (2) rodents and one (1) shrew. All of which are introduced species namely the Oriental house rat (*Rattus tanezumi*), common rat (*Rattus norvegicus*) and the Asian house shrew (*Suncus murinus*).

These introduced species are common commensal species relying on readily available food sources such as along agricultural areas, cultivated lands and nearby residential areas. There are no medium to large-sized mammals observed along Phase IV due to the urban setting along the Marikina River.

Arthropods: A total of 87 arthropod taxa composed of 699 individuals were recorded. Of these arthropods, the most abundantly represented orders are Diptera (32.47%), Coleoptera (24.03%), and Hemiptera (20.89%). The most abundant taxa are the rove beetles, *Paederus sp.*, which accounts for 15% of all arthropods collected. *Paederus*, along with other rove beetles (Family Staphylinidae) are predatory beetles feeding on other insects like fly maggots. Most of the collected arthropods are disturbance-tolerant species and are common pests to crops.

Most of the arthropods collected are associated with plant crops such as corn. These would include pest species such as, the Asiatic Corn Borer (*Ostrinia furnaalis*, ACB), Corn Planthopper (*Stenocranus pacificus*, CPH) and other herbivores. Aquatic insects were also collected on the area, including predaceous diving beetles (Family Dystiscidae, Hydrophilidae), predatory bugs (Family Pleidae, Veliidae), a mayfly (Family Ephemeridae) and a damselfly (Family Coenagrionidae).

Shannon Diversity Index for the sweeping and light trapping method was 3.18 and 2.27, respectively. Overall index for the sweeping and light trapping method was high with an index of 3.46. High diversity for sweeping is due to the presence and abundance of various flora species present along the Marikina River.

Threatened Species: None of the recorded fauna species is listed under any threatened categories of the List of Terrestrial Threatened Species and Their Categories, and the List of Other Wildlife Species (DAO No. 2004-15), IUCN Red List of Threatened Species and/or the CITES.

b. Secondary Data

Pursuant to DENR Administrative Order (DAO) No. 2004-15, the National List of Threatened Fauna was prepared with the aim to determine species of wild birds, mammals, and reptiles which shall be declared as priority concern for protection and conservation. It shall be prohibited to collect and/or trade any of the species in the list unless in possession of a permit granted by the DENR. The list includes 146 species composed of 33 species of mammals, 80 species of birds, 18 species of reptiles and 15 species of amphibians.

According to the National List of Threatened Fauna, six (6) species of mammals, four (4) species of birds, and five (5) species of reptiles are listed in and around Metro Manila as shown in Table 6.3.14. No protected habitat of endangered species is declared within the Phase IV project area.

Table 6.3.14 List of Threatened Fauna in and around Metro Manila Area

Taxonomy	Scientific Name	Common Name	Conservation Status	Distribution area
Mammals	<i>Macaca fascicularis</i>	Philippine Monkey	OTS	Throughout the Philippines
	<i>Cervus mariannus</i>	Philippine brown deer	VU	
	<i>Pteropus vampyrus</i>	Giant flying fox	OTS	
	<i>Dugong dugon</i>	Dugong	CR	Manila, Taytay
	<i>Acerodon jubatus</i>	Golden-crowned fruit bat	EN	Manila, Quezon
	<i>Pteropus leucopterus</i>	White-winged fruit bat	VU	Quezon
Birds	<i>Ptilinopus marchei</i>	Flame-breasted fruit dove	VU	Quezon
	<i>Ptilinopus merrilli</i>	Cream-bellied fruit dove	VU	Quezon
	<i>Grus antigone</i>	Sarus crane	CR	Quezon
	<i>Sterna bernsteini</i>	Chinese crested tern	CR	Manila Bay (1905)
Reptile	<i>Hydrosaurus postulatus</i>	Philippine sailfin lizard	OTS	Quezon
	<i>Eretmochelys imbricata</i>	Hawksbill turtle	CR	Quezon
	<i>Crocodylus mindorensis</i>	Philippine crocodile	CR	Quezon

	<i>Varanus olivaceus</i>	Gray's monitor lizard	VU	Quezon, Manila
	<i>Varanus salvator marmoratus</i>	Malay monitor lizard	VU	Northern Philippine

Note: Conservation Status: CR (Critically Endangered), EN (Endangered), VU (Vulnerable), OTS (Other Threatened Species).

Source: 2004 Statistics on Philippines Protected Areas and Wildlife Resources, Protected Areas and Wildlife Bureau (PAWB), DENR

Based on the Biodiversity Assessment of Pasig River and Its Tributaries: Ecosystems Approach (Phase One) Terminal Report (PRRC, 2009), a total of 39 species of birds belonging to 33 genus and 21 families were recorded. Of these, 54% are resident species, 31%, migratory species, and only 15% are endemic. The whole stretch of Pasig River particularly the vegetated areas such as the linear parks and forest gardens is an important urban bird area basically for roosting and feeding. The species recorded therefore, could be considered as urban adaptable species.

(2) Evaluation of Updated Baseline Condition

In EIS (1998) of the Project, there was no survey result or description on terrestrial fauna. There is no name of fauna species inhabiting along the Pasig-Marikina River or no information on threatened species in the EIS, either.

As the result of this environmental survey, current status of the terrestrial fauna was clarified, including observed fauna species, biodiversity and no threatened species identified, all of which can be a basis for assessment of the potential impacts of the Project, Phase IV on terrestrial fauna.

6.3.6 Aquatic Biota

(1) Current Status

a. Primary Data

i) Methodology

Survey on aquatic biota in the river stretch of the Marikina River was conducted on Sep. 5, 2014 at the Marikina Bridge (refer to Figure 6.1.4). The sampling was done aiming to collect and identify phytoplankton, zooplankton, macro-benthos (macro-invertebrate), nekton (fish) and macro-phytes (aquatic plant).

Phytoplankton and Zooplankton: Plankton net was used to collect water samples from the surface water while the boat is moving. Phytoplankton samples were preserved with Lugol's solution, while samples of zooplankton were fixed with 10% formalin immediately after collection. For plankton samples, a 1-mL aliquot subsample was placed in a Sedgewick-Rafter cell counter and was examined under photomicroscope for counting and photo documentation. Phytoplankton were counted and identified to the lowest taxonomic level (genera) possible using standard taxonomic guide. Zooplankton was identified to major groups using available references.

Macro-benthos: Sediment samples were obtained in the river channel using an improvised Ekman grab. The collected sediment was sieved in-situ through a 1-mm mesh size sieve plate and collected and put in a screwed plastic jar with 70% ethyl alcohol. Samples were washed in the laboratory with tap water to get rid of excess preservative. A stereo zoom microscope was used to sort and identify the benthos specimens. Identified organisms were placed in vials containing 70% alcohol and classified.

Nekton: Free swimming fish in the river was collected using a conventional gillnet, being placed carefully into the water and set for a minimum of 30 minutes before harvest. Caught fish was carefully removed from the net and properly documented for identification.

Macro-phytes: Modified transect method was used for surveying the large aquatic plants along the Marikina River. Using a motorized boat, all aquatic plants encountered were recorded and identified up to genus level.

ii) Survey Result

Phytoplankton: Table 6.3.15 lists the identified phytoplankton species in the Marikina River. There were fifteen (15) species classified under two phytoplankton groups, Bacillariophyceae and Chlorophyceae. Among the identified species, *Navicula sp.* and *Nitzschia sp.* are the two species of diatoms with the highest species abundance with 24% and 12% respectively. *Navicula* and *Nitzschia* are the species of diatoms that holds a very high pollution factor based on Palmer's scoring (Palmer, 1969). These diatoms are pollution tolerant species heavily dwelling in an environment with high organic deposits.

Table 6.3.15 Identified Phytoplankton Species in the Marikina River

Group/Species	Middle Marikina River						Mean	Dominance (%)
	Sample 1		Sample 2		Sample 3			
	Count	Cells/ml	Count	Cells/ml	Count	Cells/ml		
Barcillariophyceae								
<i>Cocconeis sp.</i>	1	3	2	7	0	0	3	3
<i>Cymatopleura sp.</i>	2	7	2	7	1	3	6	5
<i>Diatoma asp.</i>	1	3	1	3	1	3	3	3
<i>Ellerbeckia sp.</i>	2	7	3	10	2	7	8	7
<i>Flagellaria sp.</i>	2	7	2	7	2	7	7	6
<i>Melosira sp.</i>	1	3	4	13	3	10	9	8
<i>Navicula sp.</i>	8	27	10	33	7	23	28	24
<i>Nitzschia sp.</i>	2	7	4	13	6	20	13	12
<i>Peronia sp.</i>	1	3	1	3	1	3	3	3
<i>Pinnularia sp.</i>	1	3	1	3	0	0	2	2
<i>Stauroneis sp.</i>	3	10	3	10	2	7	9	8
<i>Synedra sp.</i>	2	7	2	7	2	7	7	6
<i>Cyclotella sp.</i>	2	7	2	7	2	7	7	6
<i>Gomphonema sp.</i>	0	0	0	0	0	0	0	0
Chlorophyceae								
<i>Pandorina sp.</i>	3	10	3	10	4	13	11	10
Total							116	100

Source: Primary data obtained in this survey, 2014

Zooplankton: There were only four (4) zooplankton species under Phylum Arthropoda and Protozoa identified in the survey as listed in the table below. Among the identified species, *Didinium sp.*, categorized as Protozoan, has the highest species density of 37 individuals per ml of water followed by another protozoan *Paramecium sp.* with a density of 13/ml. *Didinium* and *Paramecium* dwell heavily in an aquatic environment with high levels of decomposing organic matter, supporting the high level of organic pollution status of the Marikina River. Arthropod species *Bosmina sp.* on the other hand has a mean abundance of 4 cells/ml or 8% dominance and *Cyclop sp.* has the least density 2%.

Table 6.3.16 Identified Zooplankton Species in the Marikina River

Species	Zooplankton in Middle Marikina River						Mean	Dominance (%)
	Sample 1		Sample 2		Sample 3			
	Count	Cells/ml	Count	Cells/ml	Count	Cells/ml		
Arthropoda								
<i>Bosmina sp.</i>	2	7	1	3	1	3	4	8
<i>Cyclop sp.</i>	1	3	0	0	0	0	1	2
Protozoan								
<i>Didinium sp.</i>	10	33	15	50	8	27	37	66
<i>Paramecium sp.</i>	5	17	5	17	2	7	13	24
Total							56	100

Source: Primary data obtained in this survey, 2014

Macro-benthos: Benthic organisms collected from the bottom soil in the Marikina River are limited only to *Oligochaetes* or marine worms. These worms are dependent on the organic deposits. The absence of other benthic organisms like shellfish and bottom dweller arthropods indicates poor water quality of the river.

Nekton: The only fish species observed during the sampling activity was the Janitor fish or *Pterygoplichthys disjunctivus*, a pollution tolerant fish. Janitor fish is under the catfish family that is considered as an invasive and exotic species introduced in the Philippines. It was since 1990 that the Pasig River including the Marikina River was reported to have been infested with Janitor fish that became a threat to other local fish like Ayungin (*Leiopotherapon plumbeus*), Biya (*Gobius criniger*) and Tilapia (*Oreochromis niloticus*).

Marco-phytes: Water spinach or commonly known as kangkong (*Ipomea aquatica*) was the only species of aquatic plants observed along the Marikina Bridge during the survey. This water

spinach was cultured by river side dwellers using floaters for propagation to be sold in the nearest community market.

Threatened Species: Among the identified species of aquatic biota, there is no species listed under any threatened categories of the List of Terrestrial Threatened Species and Their Categories, and the List of Other Wildlife Species (DAO No. 2004-15), IUCN Red List of Threatened Species and/or the CITES.

b. Secondary Data

Secondary data on aquatic biota consists of those obtained during the implementation of Phase II and III of the Project. In addition, the data described in existing reports, studies, such as EIS of other project, and literatures also provide some information.

i) Monitoring results during the Project, Phase II

Table 6.3.17 shows the monitoring results (number of identified species) of aquatic biota during the implementation of the Project Phase II in Pasig River from 2008 to 2013. Monitored locations are shown on Figure 6.1.2.

Table 6.3.17 Result of Aquatic Biota Monitoring in the Pasig River (Phase II)

Station*	Sep. 2008 (pre-construction)	Oct. 2010 (during construction)	Jun. 2013 (post construction)
Phytoplankton	3 phylum, 14 species	3 phylum, 17 species	5 phylum, 21 species
Zooplankton	3 phylum, 6 species	4 phylum, 11 species	1 phylum, 5 species
Macrobenthos	3 phylum, 6 species	4 phylum, 11 species	1 phylum, 5 species
Nekton (Fish)	1 phylum, 1 species	1 phylum, 4 species	1 phylum, 1 species
Macrophytes	1 phylum, 4 species	1 phylum, 3 species	1 phylum, 1 species

Source: Completion Report, Environmental Monitoring and Management, PMRCIP, Phase II, 2013

Phytoplankton: The phytoplanktons were represented by 14 to 21 species classified under three to five main groups, which include Cyanophyta or blue-green algae, Chlorophyta or green algae and Bacillariophyta or diatoms.

Zooplankton: Species of zooplanktons collected from Pasig River were generally classified into two (2) phyla: Rotifera and Arthropoda. Among the species identified, the *Tropodiptomus sp.* and *Thermocyclops sp.* have the densest population of zooplanktons in the water of Pasig River.

Macrobenthos: Macrobenthos acts as biological indicators of the present condition of a water system for they are being affected by the changes that may occur in their habitat. Identifies species include snails, bivalves, insect, shrimp and worm.

Nektons (Fish): Janitor fish, or armored catfish species in the Philippines are reported as *Pterygoplichthys disjunctivus* is dominant in the river. Other fishes inhabiting in the Pasig River include Kinife fish (*Chitala ornata*), Tilapia (*Oreochromis niloticus*), Kanduli (*Arius manilensis*), and jack fish (*Caranx sp.*).

Macrophytes (Aquatic Flora): The Pasig River was overgrown by Water Hyacinth (*Eichhornia crassipes*) suspected to be coming from the tributaries of Marikina River and Laguna de Bay. Other plants growing along the river but are rarely seen are Kangkong (*Ipomea aquatic*) and Quiapo (*Pistia sp.*)

ii) Monitoring results during the Project, Phase III

Recent monitoring results of aquatic biota during the implementation of the Project Phase III in Pasig-Marikina River in Dec. 2013 are shown in the following sections.

Phytoplankton: Table 6.3.18 shows the monitoring result of phytoplankton in the Pasig-Marikina River. Among the observed species, it was revealed that *Microcystis sp.* And *Ulothrix sp.* significantly dominated, indicating the nutrient-rich and oxygen-poor conditions in the river.

Table 6.3.18 Monitoring Result of Phytoplankton in Dec. 2013 (Phase III)

Phylum	Species	Pasig River	Lower Marikina River
Cyanobacteria	<i>Pediastrum sp.</i>	✓	
	<i>Anabaena sp.</i>	✓	
	<i>Microcystis sp.</i>	✓	✓
	<i>Gomphosphaeria sp.</i>	✓	✓
	<i>Anacystis sp.</i>	✓	
	<i>Lyngbya sp.</i>	✓	✓
Chlorophyceae	<i>Microspora sp.</i>	✓	
	<i>Ulothrix sp.</i>	✓	✓
	<i>Cladophora sp.</i>	✓	
	<i>Spirogyra sp.</i>		✓
	<i>Pyrobotrys sp.</i>	✓	
	<i>Euglena</i>	✓	✓
Bacillariophyceae	<i>Melosira</i>	✓	
	<i>Navicula sp.</i>	✓	✓
	<i>Nitzschia sp.</i>	✓	✓
Total		3 phylum, 14 species	3 phylum, 8 species

Source: Baseline Condition Report, Environmental Management and Monitoring, PMRCIP, Phase III (2014)

Zooplankton: Table 6.3.19 shows the monitoring result of zooplankton in the Pasig-Marikina River. Among the observed species, it was revealed that *Bosmina longinostris* significantly dominated followed by *Cyclop stemmuus*.

Table 6.3.19 Monitoring Result of Zooplankton in Dec. 2013 (Phase III)

Phylum	Species	Pasig River	Lower Marikina River
Arthropoda	<i>Asellus sp.</i>	✓	✓
	<i>Bosmina longinostris</i>	✓	
	<i>Cyclop stemmuus</i>	✓	
	<i>Pseudodiaptomus sp.</i>	✓	
	<i>Acartia sp.</i>	✓	
	<i>Mesocyclops sp.</i>	✓	
	<i>Thermocyclops sp.</i>	✓	
Total		1 phylum, 7 species	1 phylum, 1 species

Source: Baseline Condition Report, Environmental Management and Monitoring, PMRCIP, Phase III (2014)

Macrobenthos: Table 6.3.20 shows the monitoring result of macrobenthos in the Pasig-Marikina River. The most of observed species are pollution tolerant species and accordingly indicates that river water quality of the Pasig-Marikina River is very poor.

Table 6.3.20 Monitoring Result of Macrobenthos in Dec. 2013 (Phase III)

Species	Pasig River	Lower Marikina River
<i>Pomacea canaliculata</i>	✓	✓
<i>Physella sp.</i>	✓	
<i>Thiara scabra</i>	✓	
<i>Corbicula manilensis</i>	✓	
<i>Pea clam</i>	✓	
<i>Planorbarius sp.</i>	✓	
<i>Leech</i>	✓	
<i>Freshwater shrimp</i>	✓	
<i>Damsel fly nymph</i>		✓
<i>Stratiomyiid larvae</i>		✓
Total	8 species	3 species

Source: Baseline Condition Report, Environmental Management and Monitoring, PMRCIP, Phase III (2014)

Nekton (Fish): The identified species of nekton (fish) was only Janitor fish (*Pterygoplichthys disjunctivus*) during the survey. There are other several fishes supposedly inhabiting and often caught in the river including Knife fish (*Chitala ornate*), Biya (*Glossogobius giuris*), Kanduli (*Arius manilensis*) as shown in the figure below:



Top-Left: Knife fish (*Chitala ornate*), Top-Right: Biya (*Glossogobius giuris*),
Bottom-Left: Janitor fish (*Pterygoplichthys disjunctivus*), and Bottom-Right: Kanduli (*Arius manilensis*)

Figure 6.3.14 Fish Species Caught in Pasig-Marikina River (Dec. 2013)

Macrophytes (Aquatic Flora): The identified species of macrophytes (aquatic plants) were two: Water Hyacinth (*Eichhornia crassipes*) and Kangkong (*Ipomea aquatic*), both of which are the most common and widely observed in the Pasig-Marikina River and their tributaries.

EIS for Manila Third Sewerage Project (Feb. 2005) carried out the survey on aquatic biota. It indicates that Janitor fish is a common and abundant aquatic life found in all parts of the Marikina River. Fish species in the river include Tilapia (*Oreochromis sp.*), Bighead carp (*Aristichthys nobilis*), Goby or biya (*Glossogobius giuris*), Snakehead or dalag (*Ophicephalus striatus*), Native catfish or hito (*Arius macrocephalus*) and Gourami or gurami (*Trichogaster sp.*). As to macrophytes, Kangkong is grown on both banks of the Marikina River and kangkong harvest is sold in public markets all over Metro Manila.

There is description that the Janitor fish, or armored catfish species in the Philippines are reported as *Pterygoplichthys disjunctivus* and *P. pardalis* by Philippine Council for Aquatic and Marine Research and Development (PCAMRD). It was introduced in 1970 – 1979 as an ornamental species, according to Journal of Environmental Science and Management (Vol. 10, No.1, 2007).

(2) Evaluation of Updated Baseline Conditions

In the EIS (1998), enough discussion on aquatic biota in the Pasig-Marikina River was not provided with applying the inventory survey. It pointed out the ecologically poor condition of the river in the highly urbanized region, which prevents the migration of fish into Laguna de Bay through the Pasig River.

In this survey, detailed inventory surveys clarified inhabiting species of phytoplankton, zooplankton, macrobenthos, nekton and macrophytes. Identified species are the environmental indicators of the habitat, namely the Marikina River, and they suggest that the poor water quality and low diversity in the Marikina River. This river environment becomes a constraint for the many species of aquatic organisms to inhabit in the Pasig-Marikina River. In attrition, none of the

species are recorded in this survey under any of threatened categories of the List of Terrestrial Threatened Species and Their Categories, and the List of Other Wildlife Species (DAO 2004-15), IUCN Red List of Threatened Species and/or the CITES.

6.3.7 Protected Areas and Environmentally Critical Areas

(1) Current Status

a. Protected Area

Protected areas in the Philippines are established by Republic Act No. 7586 (1992), titled the National Integrated Protected Areas System (NIPAS) Act. It prescribes the following eight (8) categories of protected areas: (1) strict nature reserve, (2) natural park, (3) natural monument, (4) wildlife sanctuary, (5) protected landscapes and seascapes, (6) resource reserve, (7) natural biotic areas and (8) other categories established by law, conventions or international agreements which the Philippine Government is a signatory.

Protected areas located relatively near the Project, Phase IV include the following:

- 1) Quezon Memorial;
- 2) Ninoy Aquino Parks and Wildlife Center;
- 3) Upper Marikina River Basin Protected Landscape; and
- 4) Pamitinan Protected Landscape.

The status of these four is as follows: Quezon Memorial is a registered national park; Ninoy Aquino Parks and Wildlife Center is a national park under proclamation; both Upper Marikina River Basin Protected Landscape and Pamitinan Protected Landscape are a protected landscape under proclamation. The details of these protected areas are as follows:

Quezon Memorial: The Quezon Memorial Circle is a registered national park and a national shrine located in Quezon City. The park is located inside a large traffic circle in the shape of an ellipse and bounded by the Elliptical Road. It is located in the city center of Quezon and the distance from the Project area is approx. 4 km.

Ninoy Aquino Parks and Wildlife Center: The Ninoy Aquino Parks & Wildlife Center is a 22.7ha (List of Protected areas, 2012) zoological and botanical garden, under proclamation, located in Diliman, Quezon City. It is located side by side in the city center of Quezon. The distance from the Project area is approx. 4 km.

Upper Marikina River Basin Protected Landscape: Upper Marikina River Basin Protected Landscape, with the area of 26,125.64 ha (List of Protected Area, 2012), is located administratively in Antipolo City and municipalities of Baras, Rodriguez (Montalban), San Mateo and Tanay, Rizal. It is situated in upstream areas of the Project area with a distance of approx.. 15 km (refer to Figure 6.3.15).

Pamitinan Protected Landscape: Pamitinan Protected Landscape, proclaimed as a protected area through Presidential Proclamation No. 901 dated 10 December 1996, with the total area of 600 hectares which is located in upstream area of the Marikina River basin at approx. 16 km away from the Project area (refer to Figure 6.3.15).

As for designated areas under international treaties, there are four (4) sites in the Philippines designated by The Convention on Wetlands of International Importance (Ramsar, Iran, 1971), otherwise known as the Ramsar Convention is an intergovernmental treaty. But none of them are located in NCR or surrounding regions. Regarding other important areas for biodiversity, there are several areas nominated as Important Bird Areas (IBAs) by Bird Life International, such as Candaba Swamp (located in Pampanga), Angat Watershed (Bulacan), Mount Irid – Mount Angilo (provinces of Bulacan, Quezon and Rizal), and bird area of Manila Bay (Cavite). All of which are located more than 20 km distant from the Project area.

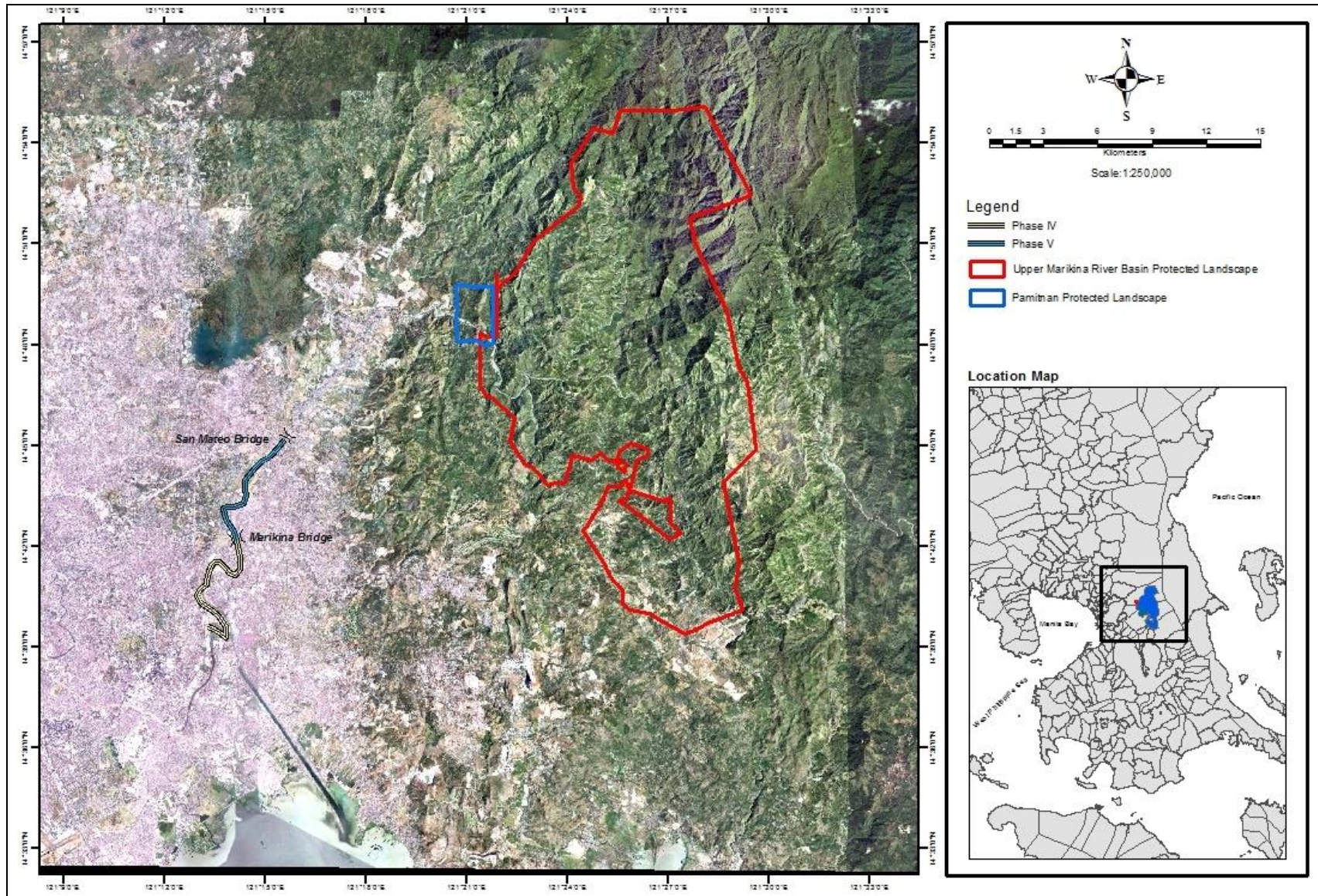


Figure 6.3.15 Location Map of Protected Areas near Phase IV Area

b. Environmentally Critical Area

The Project, Phase IV area is classified as an Environmentally Critical Area (ECA) defined under Presidential Proclamation (PP) No. 2146 (1981). As an ECA, the Project, Phase IV area is categorized as:

- Category 6; Areas frequently visited and or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc., and
- Category 10; All natural water bodies (e.g., rivers, lake, bay) that have been classified or not.

(2) Evaluation of Updated Baseline Condition

Project Phase IV area is located out of the Protected Areas designated by NIPAS Act (1992). There are four (4) Protected Areas located around the Project Area. The nearest protected areas is located in the center of Quezon City, but these are city parks and no direct relation with the Project in terms of environmental impact. Meanwhile, the Project area is categorized as the Environmentally Critical Area (ECA), specifically Category F: Areas frequently visited and or hard-hit by natural calamities.

Information on the protected area or Environmentally Critical Areas (ECAs) was not included in the EIS (1998). The current status of the Project Phase IV area has been clarified based on the results of this study and it can be the basis for impact assessment of natural environment.

6.4 Socio-economic Environment

6.4.1 Administrative Boundary

Table 6.4.1 lists LGUs binding the stretch of the Marikina River of the Project Phase IV. Administrative boundary for the Phase IV is shown in Figure 6.4.1.

Table 6.4.1 LGUs Covering the Project Phase IV Area

City/Municipality	Barangay
Pasig City	Rosario
	Mangahan
	Santolan
Quezon City	Ugong Norte
	Bagumbayan
	Libis
	Blue Ridge B
Marikina City	Industrial Valley
	Barangka
	Tañong
	Jesus De La Peña
	Calumpang
	San Roque
	Santa Elena (Pob.)
	Santo Niño
3 cities	15 barangays

Source: National Statistics Office (NSO)

6.4.2 Demography

Table 6.4.2 lists the population of the whole nation, NCR and the three cities where the Project, Phase IV is located. It is revealed based on the table that average annual growth rate ranges 0.81 to 2.86 % among the three cities. The annual growth rate of Pasig City is the largest and that of Marikina City is the least. On the contrary, however, the population density of the three cities shows that Marikina City has the largest one and the Pasig City has the least one. Sex ratio of the three cities is the same, or 95 %, meaning the number of female outnumbers in these cities, although that of the whole nation is 102, meaning vice versa.

Table 6.4.2 Population for the Philippines, NCR and Cities in the Phase IV Area

Area	Population				Population density (nos./km ²)	
	2000	2010	Average Annual Growth Rate (%)	Sex Ratio* in 2010 (%)	2000	2010
Philippines	76,506,928	92,337,852	1.90	102	255	308
NCR	9,932,560	11,855,975	1.78	96	16,032	19,137
Pasig City	505,058	669,773	2.86	95	10,422	13,821
Quezon City	2,173,831	2,761,720	2.42	95	12,660	16,084
Marikina City	391,170	424,150	0.81	95	18,177	19,710

Note) *: Sex ratio is the number of males per 100 females in a given population.

Source: National Statistics Office (NSO)

Table 6.4.3 lists the household data, ratio of senior citizen and dependency ratio. It is revealed that the average household size decreased during these 10 years from 2000 to 2010, ranging from 4.3 to 4.6 in 2010. Ratio of the senior citizen of the three cities ranges from 5.52 to 7.09, of which the Marikina City shows the largest. Dependency ratios of the three cities are almost the same, indicating 47 to 48, although that of the whole nation is 61, meaning that the number of working age people from 15 to 64 occupies relatively large in these LGUs.

Table 6.4.3 Household Data for the Philippines, NCR and Cities in the Phase IV Area

Area	Number of Households		Average Household Size (nos.)		Ratio of senior citizen* (%)	Dependency ratio**
	2000	2010	2000	2010	2010	2010
Philippines	15,278,808	20,171,899	5.0	4.6	6.77	61
NCR	2,132,989	2,759,829	4.6	4.3	5.75	48
Pasig City	107,835	154,970	4.7	4.3	5.80	47
Quezon City	480,624	634,346	4.5	4.3	5.52	48
Marikina City	80,180	91,414	4.9	4.6	7.09	47

Note) *: Ratio of senior citizen is the percentage of those aged 60 years and over in a given population.

** : Dependency ratio is the sum of the number of persons under 15 years old and persons aged 65 and over divided by the number of persons 15 to 64 years old and multiplied by 100.

Source: National Statistics Office (NSO)

Table 6.4.4 lists the population and average annual growth rate by barangay in the Project area. The average annual growth rate ranges from -1.11 to 2.92 %. There are four barangays in Marikina City of which growth rate recorded minus figure, meaning that the population has decreased during these 10 years from 2000 to 2010. These barangays are Barangka, Tañong, Jesus De La Peña and Santo Niño, all of which are located around the river stretch from Marcos Bridge to Marikina Bridge, where the community suffered from the damage of Tropical Storm Ondoy in 2009.

Table 6.4.4 Population by Barangay in the Phase IV Area

City	Barangay	Population		
		2000	2010	Average Annual Growth Rate (%)
Pasig City	Rosario	48,998	56,283	1.40
	Manggahan	32,615	39,459	1.92
	Santolan	37,055	42,865	1.47
Quezon City	Ugong Norte	6,959	8,755	2.32
	Bagumbayan	7,597	9,219	1.95
	Libis	4,425	5,902	2.92
	Blue Ridge B	1,345	1,692	2.32
Marikina City	Industrial Valley	13,366	14,263	0.65
	Barangka	19,466	19,222	-0.13

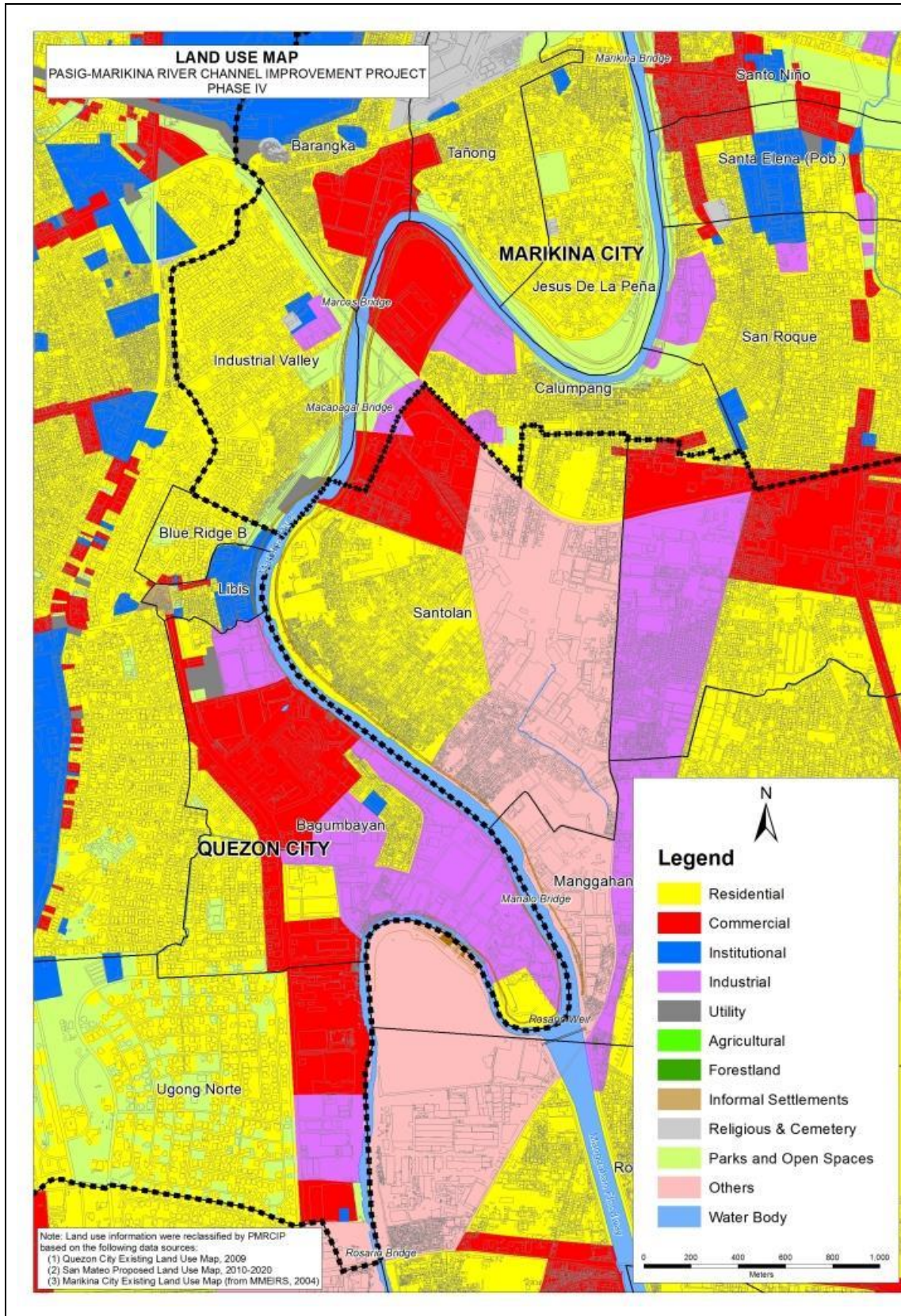
City	Barangay	Population		
		2000	2010	Average Annual Growth Rate (%)
	Tañong	9,477	8,479	-1.11
	Jesus De La Peña	9,796	9,465	-0.34
	Calumpang	14,552	14,879	0.22
	San Roque	18,021	18,252	0.13
	Santa Elena (Pob.)	5,704	6,954	2.00
	Santo Niño	27,602	26,120	-0.55
3 cities	15 barangays	256,978	281,809	0.93

Source: National Statistics Office (NSO)

6.4.3 Land Use

(1) Current Status

Existing land use around Project Phase IV area is shown on Figure. 6.4.1. Details of land use are described in the following sections by the city of Pasig, Marikina and Quezon.



Source: Pasig City Proposed Land Use Map, 2002; Quezon City Existing Land Use Map, 2009; Marikina City Existing Land Use Map, 2004

Figure 6.4.1 Land Use Map of Phase IV Area

1) Pasig City

a. Existing Land Use

The area of Pasig City occupies the left bank side in the downstream half of the Marikina River of the Phase IV. Land use is described to be made up of residential, industrial, small commercial and open spaces. The land use along the Marikina River is characterized as follows (see photos below):

- The residential zones make up the left bank side in Barangay Santolan, consisting of one to two story houses. There are relatively abundant trees and plants at the narrow strip between the residential area and the river channel.
- The industrial zones are located along the left bank side of Barangay Manggahan, from the area around Manalo Bridge up to the Rosario weir. Residential facilities (more than 5 stories) occupy the right bank area around the Manalo Bridge. Small tree vegetation exists along the river side immediately below the bridge.
- Large open space with trees and vegetation and industrial area exist in Barangay Rosario, at the downstream of Rosario Weir.



Area data of existing land use of barangays within the Project, Phase IV area is presented in Table 6.4.5. The combined land area for the three barangays is 939.98 ha and among these, Rosario has the largest area with 414.52 ha, and Santolan has the smallest with 199.25 ha. Residential zones comprise the largest existing land use at 648.25 ha, or 68.96% of the total area. Commercial zones are second largest with 133.67 ha or 14.22% of the total land. Industrial zones in the barangays account for combined total of 123.23 ha, or 13.11% of total area. Parks and open spaces constitute only 34.71 ha or 3.69% of the combined barangay area.

Table 6.4.5 Existing Land Use in Barangays of Pasig City in Phase IV Area

Land Use	Barangay Area (in hectares)			
	Rosario	Manggahan	Santolan	Total
Residential	270.25	257.19	120.81	648.25
	65.20%	78.84%	60.63%	68.96%
Commercial	89.76	8.81	35.10	133.67
	21.65%	2.70%	17.62%	14.22%
Industrial	41.60	38.52	43.11	123.23
	10.04%	11.81%	21.64%	13.11%
Park, Open Space or Recreation	12.91	21.69	0.11	34.71
	3.12%	6.65%	0.06%	3.69%
Institutional	-	-	0.12	0.12
	-	-	0.06%	0.01%
Total	414.52	326.21	199.25	939.98

Source: Analysis on land use area in this survey, 2014

b. Development Trend and Land Use Plan

Medium Term Development Plan and Investment Program (MTDPIP) for 1997-2000 and Long Term Perspective Plan (LTPP) for 2001-2005 for Pasig City identified Barangay Santolan as a key development area. It proposes redevelopment of the industrial block bounded by Marikina River, Marcos Highway and E. Amang Rodriguez Avenue. The proposed Marikina Central Business District (CBD) north of Marcos Highway and completion of the LRT 2 System section in Santolan was considered to complement the proposed redevelopment.

The Santolan riverside which is a 20 ha strip along the one-kilometer riverbank length of the Marikina River was identified by the Pasig River Rehabilitation Council (PRRC) as subject of urban renewal (Pasig City CLUP, 2000). This includes the development of river easement as part of Environmental Protection Areas (EPA), and the development of infrastructure such as parks, community facilities, drainage system and road widening. A minimum of 10 meters easement was declared as reservation along the Marikina River as part of the EPA and the development of linear parks along the river (Pasig City CLUP, 2000). In Barangay Santolan, a wider easement on top of the 10-meter reservation was prescribed to allow for natural river accretion and further development of the proposed linear park.

2) Quezon City

a. Existing Land Use

The area of Quezon City occupies the right bank side in the downstream half of the Marikina River of the Phase IV. Land use consists of commercial and industrial zones, residential and institutional zones. Land use along the Marikina River is characterized as follows (see photos below):

- River side area of the Marikina River is occupied by the commercial and business zones such as the Eastwood City in Barangay Bagumbayan and Libis and industrial zones between Calle Industria and Rosario Bridge in Barangay Ugong Norte. Eastwood City in particular is a large mixed-use commercial zone consisting of high-rise buildings and a commercial complex and condominium.
- The residential zone is represented by El Circulo Verde high-rise development at the Rosario Weir area, which is currently under construction. It presents a sharp contrast between the dense and low housing residents at the opposite bank in Santolan.
- There is institutional zone represented by the military facility Camp Atienza in Barangay Libis, located at the northern most area along the right bank side of Phase IV.



The Eastwood City commercial center along the right bank of the Marikina River



Industrial areas located beside Eastwood City and right bank of the Marikina River

Area data of existing land use for the Quezon City barangays located within the Project, Phase IV area is presented in Table 6.4.6. The combined land area of all barangays is 446.06 ha, with Ugong Norte having the largest land area at 266.53 ha, and Libis with the smallest at 11.58 ha. Residential zones account for the largest land use at 196.29 ha or 44.01% of the total land area. Commercial

zones have an area of 87.57 ha or 19.63% of land area, and industrial zones account for 70.50 ha or 15.81% of the total. Parks and open spaces are notable as these areas occupy 72.82 ha or 16.33% of the land.

Table 6.4.6 Existing Land Use in Barangays of Quezon City in the Phase IV Area

Land Use	Area (in hectares)				
	Ugong Norte	Bagumbayan	Libis	Blue Ridge B	Total
Residential	140.88	42.29	2.67	10.46	196.29
	52.86%	27.32%	23.06%	79.49%	44.01%
Commercial	39.06	47.80	0.42	0.29	87.57
	14.66%	30.88%	3.62%	2.23%	19.63%
Industrial	11.31	59.04	0.15	-	70.50
	4.25%	38.14%	1.32%	-	15.81%
Institutional	7.16	0.66	6.97	0.87	15.65
	2.69%	0.43%	60.21%	6.58%	3.51%
Park, Open Space or Recreation	68.12	2.90	0.28	1.53	72.82
	25.56%	1.87%	2.40%	11.61%	16.33%
Utility	-	2.13	-	-	2.13
	-	1.37%	-	-	0.48%
Informal Settlements	-	-	1.09	0.01	1.10
	-	-	9.40%	0.09%	0.25%
Total	266.53	154.80	11.58	13.16	446.06

Source: Analysis on land use area in this survey, 2014

b. Development Trend and Land Use Plan

In 2000, the Eastwood City Cyberpark was established as part of the Eastwood City development in the barangays Bagumbayan and Libis to build up capacity for entry of Business Process Outsourcing-Call Center Industries, IT infrastructure & educational programs in the city (Quezon City Socio-Economic Profile, 2010). It was cited as the first and the biggest IT park in the country also in 2000. However, according to the Quezon City CLUP of 2011-2030, the Eastwood area is no longer seen as a growth center on account of built-in site limitations. Access to the area is limited to the C-5 Highway, and expansion is limited by the Marikina River on its eastern boundary. The previous intensive development of Eastwood City on the Libis side is not projected to be duplicated in future investments in the southern portion of barangay Bagumbayan. Future development is forecast to be limited to mixed use, largely residential projects, with future services designed to cater to local residents.

In addition to an easement of three meters on both sides of creeks, streams and esteros shall be provided for public use based on Water Code (Presidential Decree No. 1067, 1976), Quezon City Zoning Ordinance (2000) has declared under Section 15 that a ten-meter strip shall be established as an Environmental Protection Area (EPA) and easement on both sides of the Marikina River.

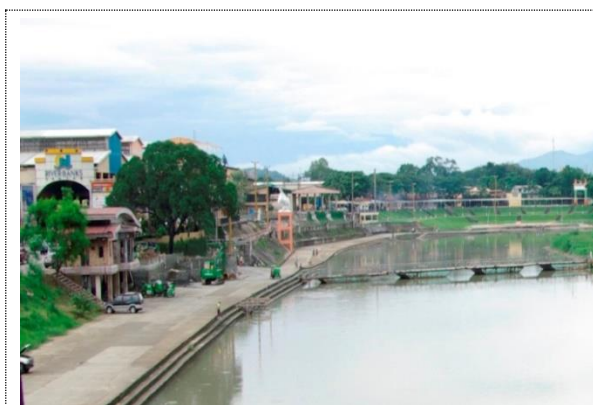
3) Marikina City

a. Existing Land Use

The area of Marikina City occupies the both sides of the Marikina River in the upstream half of the Project, Phase IV. Land use at both river banks consists of residential, commercial and industrial zones, and open parks. Land use along the Marikina River is characterized as follows:

- The residential zones are represented by the villages at Barangays Jesus De La Peña and Industrial at the right bank side, and homes at Calumpang, Santa Elena and San Roque on the left bank side.
- The commercial zones consist of the Marikina Riverbanks Center occupying the right bank side of Barangay Tañong and Barangka at north of Marcos Bridge, and the SM Marikina at the immediate opposite at left bank side of Barangay Calumpang. Commercial areas immediately adjacent to the left bank of the river also exist at Barangay Santo Niño.

- Industrial zones consisting of leather industries for shoes, belts and bags, etc., are located at left bank side of Barangays San Roque and Calumpang.
- The riverine park known as Marikina River Park comprise the easements located on both sides of the river. Developed in late 1990's until early 2000's, it extends from the Marikina Bridge up to Marcos Bridge, consisting of park attractions and agricultural lots at the area along the right bank side of Jesus De La Peña.



Riverine park is located at both sides of the river between the Marikina Bridge and Marcos Bridge



Agricultural lots located along the river in barangay Jesus De La Peña

Area data of existing land use for the barangays in Marikina City located within the Project, Phase IV is presented in Table 6.4.7. The total land area of the barangays is 756.85 ha, with Santo Niño being the largest at 163.89 ha and Santa Elena being the smallest at 56.51 ha. Residential zones represent the biggest land use in Marikina City, accounting for 57.86% of the total land. Commercial zones have a combined area of 72.51 ha or 9.58% of the total land, and industrial zones occupy 39.90 ha or 5.27%. Parks and open spaces represent the second largest land use, with a size of 121.84 ha or 16.10% of the total land area.

Table 6.4.7 Existing Land Use in Barangays of Marikina City in the Phase IV Area

Land Use	Barangay Area (in hectares)								Total
	Industrial Valley	Calumpang	San Roque	Santa Elena	Santo Niño	Jesus De La Peña	Tañong	Barangka	
Residential	58.04	31.69	82.60	23.94	95.44	57.81	45.90	42.46	437.88
	73.42%	39.10%	76.06%	42.37%	58.24%	61.53%	53.58%	48.17%	57.86%
Commercial	0.25	22.98	7.57	10.05	13.99	-	2.50	15.17	72.51
	0.31%	28.36%	6.97%	17.79%	8.54%	-	2.92%	17.21%	9.58%
Industrial	2.35	12.81	9.45	0.88	6.01	6.61	1.80	-	39.90
	2.97%	15.81%	8.70%	1.56%	3.66%	7.04%	2.10%	-	5.27%
Institutional	1.04	0.42	4.48	9.56	5.53	0.58	0.52	21.32	43.44
	1.31%	0.52%	4.12%	16.92%	3.38%	0.62%	0.60%	24.18%	5.74%
Park, Open Space or Recreation	16.96	13.14	4.25	10.49	42.43	28.59	5.95	0.04	121.84
	21.45%	16.22%	3.91%	18.57%	25.89%	30.44%	6.94%	0.043%	16.10%
Religious and Cemetery	0.43	-	0.26	0.84	-	0.35	29.01	8.24	39.13
	0.54%	-	0.24%	1.48%	-	0.38%	33.86%	9.35%	5.17%
Utility	-	-	-	0.74	-	-	-	0.92	1.66
	-	-	-	1.30%	-	-	-	1.05%	0.22%
Informal Settlements	-	-	-	-	0.49	-	-	-	0.49
	-	-	-	-	0.30%	-	-	-	0.07%
Total	79.05	81.05	108.60	56.51	163.89	93.95	85.67	88.14	756.85

Source: Analysis on land use area in this survey, 2014

b. Development Trend and Land Use Plan

Under the Marikina City CLUP (2000), the area bound by Marcos Highway and A. Bonifacio Avenue was proposed as the Marikina Central Business District (CBD). It was then proposed as

commercial development integrating business, residential, shopping and leisure facilities with a natural setting by the river. Part of this plan is to develop link roads to Libis in Quezon City via C-5 Highway Bypass and FVR Road, to construct a new bridge crossing from Marcos Highway, and to improve Marcos Highway Interchange. The Marikina Riverbanks Center and SM Marikina currently occupies parts of this CBD, and the C-5 Highway Bypass, Diosdado Macapagal Bridge and Marcos Highway Interchanges have been completed. In addition, the LRT-2 station at the neighboring barangay of Santolan, Pasig City was similarly completed in 2003.

Under Section 45 of the Marikina City Zoning Ordinance 303 (2000), all waterways throughout their entire length are declared to have an easement zone with a minimum of 10 meters for rivers and streams and 3 meters for creeks from the shore. Public use is allowed for this easement in the interest of recreation, navigation, floatage, fishing and salvage. In addition, the whole length of the Marikina River is declared as no-build zone within 96 meters from the centerline of the water. This ordinance enabled the establishment of the Marikina River Park in 2000 to aid the rehabilitation of Marikina River and transform it into a sports and recreational park. This also aims at development and expansion of amenities, reclamation of lands within the 96-meter river easement, by securing these from informal settler colonies (Marikina City CLUP, 2000).

(2) Evaluation of Updated Baseline Condition

In the EIS (1998), no detailed description on land use by LGU located in the Project area was provided with showing its characteristics of exiting land use, development trend or land use plan. Existing land use condition in this survey presents the changes in land use that took place along the Marikina River segment of the Project, Phase IV after the EIS (1998). The enactment of local government ordinances after 1998 by the cities of Pasig, Quezon and Marikina allowed for the changes in zoning conditions particularly along the river, such as the declaration of easement on both banks of the river, and facilitation and restriction of development along the Marikina River.

6.4.4 Infrastructure and Social Services

(1) Current Status

a. Infrastructure

Table 6.4.8 lists the major infrastructures along the Marikina River in the Project, Phase IV area. Locations of the major infrastructures and social service facilities are shown on Figure 6.4.2.

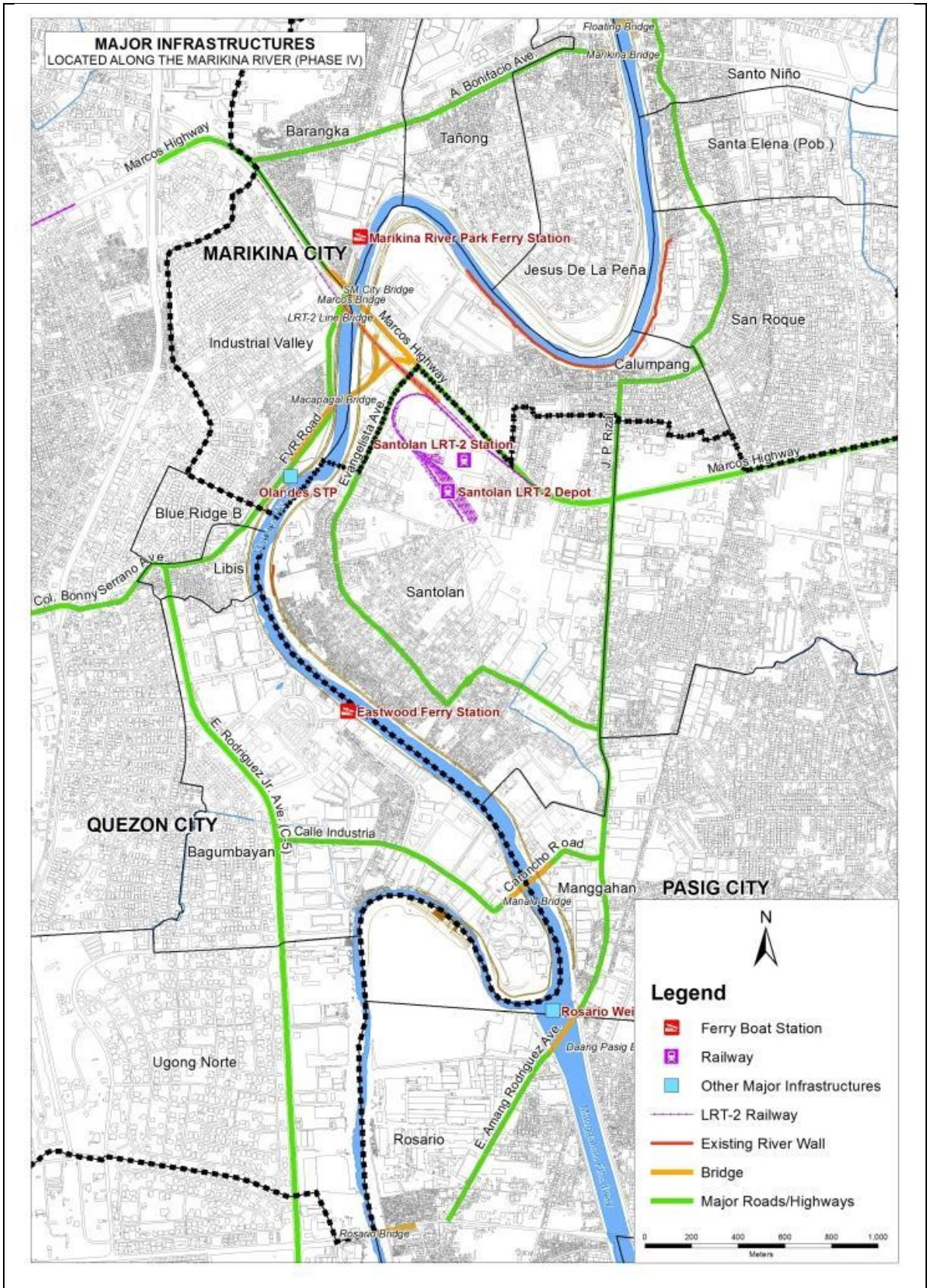
Table 6.4.8 Major Infrastructures Located along the Marikina River (Phase IV)

Category	Name	Location
Major Roads / Highway	A. Bonifacio Road	Marikina City
	Col. Boni Serrano Ave.	Marikina City
	Calle Industria Road	Marikina City
	J.P. Rizal Road	Marikina City
	Riverbanks Road	Marikina City / Quezon City
	Marcos Highway	Marikina City / Pasig City
	E. Amang Rodriguez Ave.	Pasig City
	Evangelista Ave.	Pasig City
	Caruncho Road	Pasig City
	E. Rodriguez Jr. Ave (C-5)	Quezon City
Railway	LRT2- Line	Marikina City
	Santolan LRT2 Station	Marikina City
	Santolan LRT 2 Depot	Pasig City
Bridge	Marikina Bridge	Marikina City
	Floating Bridge	Marikina City
	SM City Bridge	Marikina City
	Marcos Bridge	Marikina City
	LRT2-Line Bridge	Marikina City
	Diosdado Macapagal Bridge	Marikina City
	Manalo Bridge	Pasig City / Quezon City
	Daan Pasig Bridge	Pasig City
	Rosario Bridge	Pasig City / Quezon City
Ferry Boat Station	Marikina River Park Ferry Terminal	Marikina City
	Eastwood Ferry Station Parking	Pasig City
Others	Olandes Sewerage Treatment Plant	Marikina City
	Rosario Weir and Manggahan Flood Gate	Pasig City
	Santolan Flood Control Dike*	Pasig City

Note) *: Under construction at the time of this study

Source: Pinoy Map, Metro Manila, 2009; Google Earth, 2014

Main roads along the Project, Phase IV area, such as Marcos Highway; E. Amang Rodriguez Avenue; E. Rodriguez Jr. Avenue (C-5 Highway); and A. Bonifacio Road, are the major public infrastructures that are part of the Metro Manila traffic artery. Some of these roads cross the Marikina River through the bridges presented on Figure 6.4.2. The LRT Line 2 is also a major public infrastructure along the Marikina River, consisting of its train depot, the Santolan Station, and connecting link to the LRT-2 System. The Ferry Boat stations, while existing, have not been operational for some time as a result of indefinite suspension of river ferry operations. The Olandes Sewerage Treatment Plant beside Riverbanks Road built and operated by the Manila Water Company (MWCI) processes domestic wastewater from parts of Marikina and Quezon City before draining into the Marikina River.



Source: Pinoy Map, Metro Manila, 2009; Google Earth, 2014

Figure 6.4.2 Location of Major Infrastructures within Phase IV Area

b. Social Services

Table 6.4.9 lists the major social service facilities located within approximately 500 meters distance from the Marikina River in the Project, Phase IV area.

Table 6.4.9 Major Social Service Facilities located along the Marikina River (Phase IV)

Category	Name	Location
Barangay Hall	Manggahan Barangay Hall	Pasig City
	Santolan Barangay Hall	Pasig City
	Marikina City Hall	Marikina City
	Industrial Valley Barangay Hall	Marikina City
	Barangka Barangay Hall	Marikina City
	Tañong Barangay Hall	Marikina City
	Calumpang Barangay Hall	Marikina City
	San Roque Barangay Hall	Marikina City
	Santa Elena (Pob.) Barangay Hall	Marikina City
	Bagumbayan Barangay Hall	Quezon City
	Libis Barangay Hall	Quezon City
	Blue Ridge B Barangay Hall	Quezon City
	School	Sto. Tomas de Villanueva High School
Santolan Elementary School		Pasig City
Lily of The Valley Christian School		Marikina City
Leodegario Victorino Elementary School		Marikina City
Tañong High School		Marikina City
Industrial Valley Elementary School		Marikina City
Barangka Elementary School		Marikina City
Entrepreneur School of Asia		Quezon City
Church	Sto. Tomas de Villanueva Church	Pasig City
	Sta. Lucia Parish	Pasig City
	San Antonio De Padua Parish	Marikina City
	Provident Village Church	Marikina City
	Church of Jesus Christ of Latter-Day Saints	Marikina City
	The Marikina United Methodist Church	Marikina City
	Our Lady of Abandoned Church	Marikina City
	Jesus De La Pena Chapel	Marikina City
	Our Lady of Mount Carmel Chapel	Quezon City
	Nativity of Our Lady Parish	Quezon City
Iglesia Ni Cristo Church	Quezon City	
Hospital / Clinic	Che Midwife Lying In-Clinic	Pasig City
	Marikina Doctors Hospital and Medical Clinic*	Pasig City
	Sta. Monica Hospital	Marikina City
	Maternity Clinic	Marikina City
Recreational Spot	Evangelista Covered Court	Pasig City
	Pasig Square Garden	Pasig City
	Glass Garden	Pasig City
	Santolan Sports Complex	Pasig City
	Kalumpang Gymnasium	Marikina City
	River Bank's Convention Center	Marikina City
	Palaruang Lambak ng Marikina	Marikina City

(Note) * Under construction at the time of this study

Source: Pinoy Map, Metro Manila, 2009; Google Earth, 2014

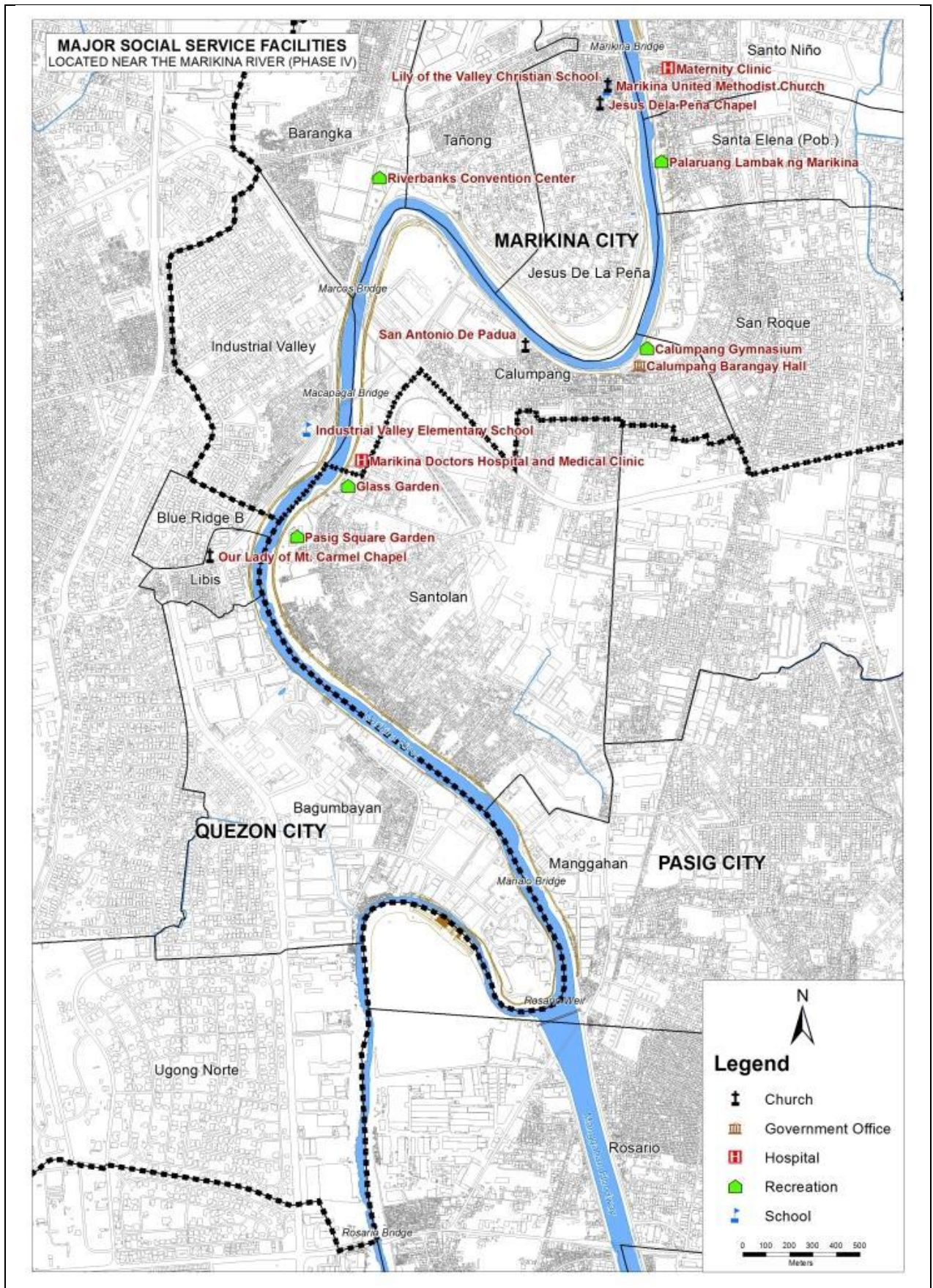
Social service facilities located along the Marikina River include barangay halls, schools, churches, hospitals and clinics, recreational spots. Of which, those located in the vicinity (within approximately 100 meters) of the Marikina River channel include one barangay hall, two schools, four churches, one clinic, one hospital, and five recreational spots. Locations of the major social

service facilities are shown on Figure 6.4.3. These are the following, in order of location from the upstream to downstream ends of Project Phase IV area: (1) Maternity Clinic; (2) Lily of the Valley Christian School; (3) Marikina United Methodist Church; (4) Jesus De La Peña Chapel; (5) Palaruang Lambak ng Marikina; (6) Calumpang Gymnasium; (7) Calumpang Barangay Hall; (8) San Antonio De Padua Parish; (9) Riverbanks Convention Center; (10) Industrial Valley Elementary School; (11) Marikina Doctors Hospital and Medical Clinic; (12) Glass Garden; (13) Pasig Square Garden, and (14) Our Lady of Mount Carmel Chapel.

The Lily of the Valley Christian School, Marikina United Methodist Church and Jesus De La Peña Chapel are within the same location at the right bank near the Marikina Bridge. The Maternity Clinic, on the other hand, is located on the opposite left bank near Marikina Bridge. The Palaruang Lambak ng Marikina is similarly situated on the left bank, about 400 meters due south of the Maternity Clinic.

The Calumpang Barangay Hall and Gymnasium are both in the same area at the left riverbank side which is less than 50 meters away from the project area. The San Antonio De Padua Parish is similarly less than 50 meters from the left riverbank and also adjacent to the Calumpang Barangay Hall, which is about 500 meters to the east.

The Riverbanks Convention Center is situated on the right bankside, about 400 meters upstream of Marcos Bridge. The Industrial Valley Elementary School along FVR Road has about the same distance downstream of Marcos Bridge. The Marikina Doctors Hospital and Medical Clinic, Pasig Glass Garden and Pasig Square Garden are all within a 300-meter section of the Evangelista Road, about 50 meters away from the opposite left bank side of the project area. The Chapel of Our Lady of Mount Carmel is located inside the premises of Camp Atienza military compound, which is within 100 meters away from the right riverbank side.



Source: Pinoy Map, Metro Manila, 2009; Google Earth, 2014

Figure 6.4.3 Location of Major Social Service Facilities within Phase IV Area

(2) Evaluation of Updated Baseline Condition

Information on infrastructures and social service facilities was provided with less detail in the EIS (1998). In the period between 1998 and 2014, new infrastructures have been built in and around the Project, Phase IV area, including the following: The construction and completion of LRT Line 2 infrastructure in 2003 (LRTA, 2014) introduced the railway system into the Project, Phase IV area. The ferry boat system which was operational from 2007 to 2008, has indefinitely suspended its operations due to financial losses (MMDA, 2014). Infrastructures built recently along the Marikina River bank include the Olandes Sewage Treatment Plant of MWCI in 2011. Construction of Santolan Flood Control Dike is on-going along left bank of the Marikina River by the Pasig City Government.

As for the social services facilities, four new ones have been built after the EIS (1998), including the Palaruang Lambak ng Marikina and the Riverbanks convention center in 2000, the Glass Garden in 2008, and the currently on-going construction of Marikina Doctors Hospital and Medical Clinic.

6.4.5 Socio-economy and Livelihood Conditions

(1) Current Status

a. Pasig City

Working Population and Dependency Ratio:

The number of working and dependent populations for Pasig City is presented in Table 6.4.10. There are 454,163 persons or 67.93% of employable population in the city. The number of young and old dependents in the city are 191,804 (28.69%) and 22,602 (3.38%), respectively. It should be noted that the male population is outnumbered by female in the working age. Dependency ratio is 47.2, meaning that dependents exist for every 100 persons in the working population (National Statistics Office, 2010).

Table 6.4.10 Population by Age Group and Dependency Ratio in Pasig City

Age Group	Population		
	Total	Male	Female
Younger Dependent Population (ages 14 and below)	191,804 28.69%	99,236 30.44%	92,568 27.02%
Working Age Population (ages 15-64)	454,163 67.93%	217,705 66.79%	236,458 69.02%
Older Dependent Population (ages 65 and above)	22,602 3.38%	9,011 2.76%	13,591 3.97%
Total	668,569	325,952	342,617
Dependency Ratio*	47.2	-	-

Note) *: Dependency ratio is the sum of the number of persons under 15 years old and persons aged 65 and over divided by the number of persons 15 to 64 years old and multiplied by 100.

Source: National Statistics Office (NSO), 2010

Business Profile:

The number of establishments in Pasig City by sector and business type in 2010 and 2011 is presented in Table 6.4.11. Pasig City has 25,319 registered business establishments in 2011 (Pasig City Profile, 2013), which has increased from 19,393 in 2010 by 30.6%. Among the sectors, commercial establishments prominently increased. The increase in the business establishments is complemented by the development and expansion of Pasig Public Market and Ortigas Commercial Center. The agricultural, fishing and forestry sector, on the other hand, is considered practically non-existent according to the City Profile.

Table 6.4.11 Number of Business Establishments by Sector and Type in Pasig City

Business Sector	Business Type	Number of Establishments	
		2010	2011
Commercial	Administration Office	1,092	1,183
	Lessor/Computer	2,434	1,286
	Public Markets	1,751	2,824
	Restaurants	371	414
	Retailer	3,036	3,264
	Sari-sari Store	746	790
	Services	4,642	5,105
	Warehouse	227	250
	Wholesale	1,585	1,700
	Banks	89	85
	Insurance Agency	529	599
	Foreign Exchange	69	87
	Pawnshop	109	93
	Travel Agencies	90	91
Others	2,036	6,985	
Subtotal (Commercial)		18,806	24,756
Industrial	Big Scale Manufacturer	229	226
	Essential Commodities - Manufacturer	21	17
	Exporter/Manufacturer	17	19
	Printing Press	65	53
	Small Scale Manufacturer	255	248
Subtotal (Industrial)		587	563
Total		19,393	25,319

Source: Pasig City Profile, 2013

The increase in the number of establishments in commercial sector is recognized from 1990's. Between 1994 and 2000, the rate of increase in commercial establishments is almost 100% according to the City Treasurer's office business tax and statistical records (Pasig City Medium Term Development Plan, 2000). Commercial growth is reflected in the development of shopping centers and high rise, mixed-use development in different parts of the city and within the Central Business District of Ortigas Center. The increased commercial activity is forecasted to promote lead growth and economy and expected to surpass economic gains made during the peak industrial period of Pasig City (the same). Increasing demand for upscale condominium units to complement commercial expansion recognized the need of more areas for commercial high-rise development and expansion of the Central Business District (CBD).

Industries have registered a low rate of increase which is below 30% in year 2000 (Pasig City Medium Term Development Plan, 2000). Closed old factories had been redeveloped into warehouses to complement the increase in commercial activities, 158 of which were registered in 2000. Expansion of operations had not been recorded in the remaining industrial facilities where many are located in high-value, prime real estate land. Development of new large or medium-sized industries were similarly absent, indicating that industries have become less viable or profitable resulting from the high cost of land, particularly in areas with high-value commercial development. The industrial dispersal policy of the national government and rise of new growth centers outside NCR area have been gradually absorbing established industries away from Pasig City, and in year 2000 about 3.5% of industrial zones had been converted to commercial use (Pasig City Medium Term Development Plan, 2000).

Housing Profile:

Pasig City recorded a total of 140,844 households residing in 136,017 dwelling units in 2007, indicating an average household size of 4.9 persons (Pasig City Profile, 2013). The city has a median livable floor area of 33 m². Tenurial status information from the National Statistics Office survey (2000) showed that single detached housing made up 62.90% of the total dwelling units, followed by multi-dwelling units (25.26%), the duplexes (10.03%), and commercial, industrial

and institutional quarters (0.36%). A total of 43.76% of households own or amortize their residential units, and 31% rent their homes. About 12.11% of households occupy rent-free homes with owner consent, and 4.73% are rent-free without owner approval or consent.

The number of occupied housing units according to outer wall and roof construction materials is presented in Table 6.4.12. About 75.86% of housing units had roofs made of galvanized iron, with 56.02% had outer walls made of concrete, bricks or stone. About 17.36% had wooden walls, and 25.53% have half-concrete, brick, stone or half-wood walls. The percentages of the housing units of tile/concrete/clay tile and half-galvanized/iron and half-concrete are relatively low.

Table 6.4.12 Number of Household Units by Construction Materials in Pasig City

Construction Materials of the Outer Walls	Occupied Housing Units	Construction Materials of the Roof		
		Galvanized Iron/ Aluminium	Tile/ Concrete/ Clay Tile	Half-galvanized/ Iron and Half-Concrete
Concrete/ Brick/ Stone	67,653	57,819	5,780	3,205
		56.02%	85.74%	18.29%
Wood	24,802	17,920	361	2,261
		17.36%	5.36%	12.91%
Half Concrete/ Brick/ Stone and Half Wood	39,807	26,354	541	11,469
		25.53%	8.03%	65.46%
Galvanized Iron/ Aluminium	1,218	535	33	502
		0.52%	0.49%	2.87%
Bamboo/ Sawali/ Cogon/ Nipa	107	34	-	5
		0.03%	-	0.03%
Asbestos	36	6	7	5
		0.01%	0.10%	0.03%
Glass	54	28	5	6
		0.03%	0.07%	0.03%
Makeshift/ salvaged/ improvised materials	792	307	-	10
		0.30%	-	0.06%
Others/Not Reported	1,538	204	14	58
		0.20%	0.21%	0.33%
No walls	10	10	-	-
		0.01%	-	-
Total	136,017	103,217	6,741	17,521
	100%	75.86%	4.96%	12.88%

National Statistics Office (NSO), 2007

Income and Livelihood Conditions:

The average family income and expenditure for Pasig City is presented in Table 6.4.13. It can be recognized that the city household income is higher, and expenses are lower than the NCR average in 2000 although the city-level information is not available after 2000.

Table 6.4.13 Household Income and Expenditure in Pasig City (2000-2006)

Year	Income (monthly, in thousand pesos)			Expenditure (monthly, in thousand pesos)		
	Philippines	NCR	Pasig City	Philippines	NCR	Pasig City
2006	14,394	25,916	-	12,263	21,500	-
2003	12,324	22,204	-	10,308	18,159	-
2000	12,093	25,025	26,425	9,903	22,204	21,117

Source: National Statistics Office (NSO), 2007

Detailed average family income and expenditure information is not available for Pasig City but only for NCR in 2009 as shown in Table 6.4.14. In the table, consumption pattern of the low-income families (the poor) was presented for those with monthly average income of less than

16,100 pesos (income threshold of the poor) according to NSO (2009). In 2012, the monthly poverty threshold in NCR has increased up to P 20,344, with poverty incidence among families in the population at 2.6% (NSO, 2012).

Table 6.4.14 Consumption Pattern of All Families and Low-income Families in NCR

Expense Item	All families (%)	Low-income families*(%)
Food, beverage and tobacco	37.2	58.2
Housing and repair	18.8	13.5
Fuel, light and water	8.0	9.6
Personal Care	-	4.9
Transport and communications	9.0	4.7
Clothing	2.1	2.3
Education	4.2	-
Other major expenditures	20.7	6.7

Note) *: Average monthly income of less than 16,100 pesos (income threshold of the poor).

Source: National Statistics Office (NSO), 2009

b. Quezon City

Working Population and Dependency Ratio:

The number of working and dependent populations in Quezon City is presented in Table 6.4.15. There are 1,857,723 persons or 67.51% of employable population in the city. The number of young and old dependents in the city are 802,864 (29.18%) and 90,992 (3.31%), respectively. It should be noted that the male population is outnumbered by female in the working age. Dependency ratio is 48.1, meaning that dependents exist for every 100 persons in the working population (National Statistics Office, 2010).

Table 6.4.15 Population by Age Group and Dependency Ratio in Quezon City

Age Group	Population		
	Total	Male	Female
Younger Dependent Population (ages 14 and below)	802,864	415,179	387,685
	29.18%	30.92%	27.52%
Working Age Population (ages 15-64)	1,857,723	892,555	965,168
	67.51%	66.46%	68.52%
Older Dependent Population (ages 65 and above)	90,992	35,179	55,813
	3.31%	2.62%	3.96%
Total	2,751,579	1,342,913	1,408,666
Dependency Ratio*	48.1	-	-

Note) *: Dependency ratio is the sum of the number of persons under 15 years old and persons aged 65 and over divided by the number of persons 15 to 64 years old and multiplied by 100.

Source: National Statistics Office, 2010

Business Profile:

According to Quezon City Socio-ecological Profile (2010), the services sector account for the highest share at 91.6%, followed by the industry sector with 8.4%. Quezon City is considered a highly urbanized city and any existing agricultural activity such as backyard farming and livestock growing have a small contribution to the city economy.

Table 6.4.16 presents the registered business establishments in Quezon City. In 2013, there are 64,515 registered businesses establishments, consisting of those in services and commercial (93.88%) and industrial ones (6.12%). In service and commercial establishments, those engaged in wholesale, retail and motor vehicle repairs account for 43.28%, followed by the real estate, renting and business activities (27.07%). On the other hand, the industrial sector consists of manufacturing, construction and utility companies.

Table 6.4.16 Registered Business Establishments in Quezon City

Sector	No. of establishments	Ratio (%)
Industrial	3,947	6.12
Manufacturing	2,233	3.46
Utility (Electricity, Gas and Water Supply)	5	0.01
Construction	1,709	2.65
Services and Commercial	60,568	93.88
Wholesale/Retail Trade; Repair of Motor Vehicles and Motorcycles	27,922	43.28
Hotels and Restaurants	4,318	6.69
Transport, Communication and Storage	1,872	2.90
Financial Intermediation	2,855	4.43
Real Estate, Renting and Business Activities	17,461	27.07
Education	919	1.42
Health and Social Work	1,274	1.97
Other Community, Social and Personal Activities	3,947	6.12
Total	64,515	100

Source: Quezon City Planning and Development Office, 2013

The decline in the industry sector was noted as a result of a national policy of dispersion of big industries outside of Metro Manila (Quezon City CLUP, 2010). The trend of conversion of industrial zones into commercial use such as the areas around Eastwood City development in Barangay Libis has resulted in diminishing industrial sector and is perceived to continue in the future.

Registered business establishments in the barangays located within Project Phase IV area are presented in Table 6.4.17. Bagumbayan has the most number of business establishments among the four barangays with 1,685 nos., followed by Ugong Norte (860 nos.). The wholesale and retail is the dominant business type, followed by the real estate, and hotel and restaurant businesses.

Table 6.4.17 Business Establishments in Phase IV Area in Quezon City

Business Type	Bagumbayan	Blue Ridge B	Libis	Ugong Norte	Total
Manufacturing	31	2	0	8	41
Electricity, Gas and Water Supply	0	0	0	0	0
Construction	22	0	2	3	27
Wholesale/Retail Trade; Repair of Motor Vehicles and Motorcycles	637	9	23	462	1,131
Hotels and Restaurants	186	1	2	110	299
Transport, Communication and Storage	39	2	10	10	61
Financial Intermediation	102	3	3	37	145
Real Estate, Renting and Business Activities	527	7	11	151	696
Education	12	2	0	12	26
Health and Social Work	33	0	0	16	49
Other Community, Social and Personal Activities	96	2	3	51	152
Total	1,685	28	45	860	2,618

Source: Quezon City Planning and Development Office, 2013

Housing Profile:

Quezon City has 594,832 households residing in 571,812 dwelling units in 2007, indicating an average household size of 4.5 persons (National Statistics Office, 2007). Quezon City houses have

a median floor of 31 m² (Quezon City Socio-ecological Profile, 2010). Tenurial status information from the National Statistics Office survey (2000) indicated single detached housing made up 56.77% of total dwelling units. Multi-dwelling units comprised 31.79%, duplexes with 8.46%, and commercial, industrial and institutional living quarters made up 2.98%.

Occupied housing units according to outer wall and roof construction materials are presented in Table 6.4.18. In 2007, 88.21% of housing units had roofs made up of galvanized iron, and 58.94% had outer walls made of either concrete, bricks or stone. About 27.37% of home units have half-concrete/brick/stone and half-wood walls, and 11.88% with wood only. The percentages of the housing units of tile/concrete/clay tile and half-galvanized/iron and half-concrete are relatively low.

Table 6.4.18 Number of Household Units by Construction Materials in Quezon City

Construction Materials of the Outer Walls	Occupied Housing Units	Construction Materials of the Roof		
		Galvanized Iron/ Aluminium	Tile/ Concrete/ Clay Tile	Half-galvanized Iron and Half-Concrete
Concrete/ Brick/ Stone	316,394	297,297	12,247	4,521
		58.94%	83.30%	11.95%
Wood	67,176	59,906	361	2,599
		11.88%	2.46%	6.87%
Half Concrete/ Brick/ Stone and Half Wood	172,063	138,056	1,931	29,552
		27.37%	13.13%	78.10%
Galvanized Iron/ Aluminium	6,783	8,100	101	1,022
		1.61%	0.69%	2.70%
Bamboo/ Sawali/ Cogon/ Nipa	394	258	-	20
		0.05%	-	0.05%
Asbestos	74	34	1	3
		0.01%	0.01%	0.01%
Glass	96	59	13	8
		0.01%	0.09%	0.02%
Makeshift/ salvaged/ improvised materials	4,514	2,443	-	54
		0.48%	-	0.14%
Others/Not Reported	4,287	1,069	42	57
		0.21%	0.29%	0.15%
No walls	31	16	7	2
		0.01%	0.05%	0.01%
Total	571,812	504,394	14,703	37,838
	100%	88.21%	2.57%	6.62%

National Statistics Office (NSO), 2007

Income and Livelihood Conditions:

The average family income and expenditure is presented in Table 6.4.19. It can be recognized that the household income and expenses in Quezon City are higher than the NCR average in 2000 although the city-level information is not available after 2000.

Table 6.4.19 Household Income and Expenditure in Quezon City (2000-2006)

Year	Income (monthly, in thousand pesos)			Expenditure (monthly, in thousand pesos)		
	Philippines	NCR	Quezon City	Philippines	NCR	Quezon City
2006	14,394	25,916	-	12,263	21,500	-
2003	12,324	22,204	-	10,308	18,159	-
2000	12,093	25,025	32,757	9,903	22,204	29,577

Source: National Statistics Office, 2007

The 2000 average family income and expenditure is presented according to their income classes in Table 6.4.20. A big disparity in income exists between the income classes, wherein the high-

income class registered a monthly average of P 107,607, significantly higher than the two other classes. Middle-income families constitute the largest number of households in the city at 73.4% of the city total, with a median monthly average income of P 19,585. Low-income families account for 10.13% with a monthly income of P 6,702. It should be noted that the monthly average expenditure is almost the same level as income level, meaning that the household savings are small on average.

Table 6.4.20 Number of Families by Income Class in Quezon City

Unit: PHP.

Income Class (Annual)	Class of Income Level	No. of Families	%	Monthly Average Income	Monthly Average Expenditure
Below 100,000	Low Income	45,582	10.1	6,702	6,850
100,000 - 500,000	Middle Income	330,527	73.4	19,585	17,504
500,000 and over	High Income	74,033	16.4	107,607	97,469
Total		450,142	100.0	32,757	29,577

Source: National Statistics Office, 2000

Table 6.4.21 shows the percent distribution of total family expenditures by area in 2000. Quezon City's monthly family expenditure pattern of households has allotted a major portion of family income on basic necessities such as: 1) Food (31.9%); 2) Shelter (25.6%); 3) Transportation and communication (10.5%); 4) Fuel, light and water (5.5%); and 5) education (3.8%).

Table 6.4.21 Family Expenses by Expenditure Item

Expenditure Item	Family Expense (%)		
	Philippines	NCR	Quezon City
Food	43.1	35.8	31.9
Shelter (expense for occupied dwelling unit)	13.1	21.6	25.6
Transportation and communication	1.3	9.0	10.5
Fuel, light and water	6.5	6.4	5.5
Education	4.0	4.2	3.8
Personal care and effects	3.9	3.4	3.1
Miscellaneous Expenditures	3.8	2.5	1.9
Other expenditures	2.9	2.1	1.7
Clothing, footwear and other wear	2.9	2.4	2.1
Durable furniture, equipment	2.6	2.5	4.4
Household operations	2.2	2.9	3.5
Medical care	2.2	1.6	1.3
Taxes paid	2.1	3.2	1.9
Others (Tobacco, Alcohol, House maintenance and minor repairs, recreation, non-durable furnishings)	3.2	2.4	1.8
Total	100.0	100.0	100.0

Source: National Statistics Office, 2000

Families living below the poverty line or those in the lowest income brackets are observed to have little income to cope with increasing cost of living and meet their basic needs such as food, clothing, shelter, mobility, and education. They spend more than or equal to 55% of family earnings for foods and the remaining 45% for other basic needs (Quezon City Socio-ecological Profile, 2010). These groups commonly resort to borrowings or seek other income sources to meet their financial requirements particularly during times of crisis involving health or times of illness, accidents, disasters, etc. The city provides assistance to these families through employment and financial assistance, livelihood programs and projects such as soft and hard skills training (e.g. food processing, sewing, etc.) as an alternative means to augment their financial problems.

The 2003 Family Income and Expenditures Survey (FIES) of the National Statistics Office identified about 128,009 or 28.44% families in Quezon City have income below poverty threshold of P 8,857.00.

c. Marikina City

Working Population and Dependency Ratio:

The number of working and dependent populations for Marikina City is presented in Table 6.4.22. The city has 288,330 employable persons or 67.98% of the whole population, and the number of young and old dependents are 117,680 (27.44%) and 18,140 (4.28%), respectively. It should be noted that the male population is outnumbered by females in the working age. Dependency ratio is 47.1, meaning that dependents exist for every 100 persons in the working population (National Statistics Office, 2010).

Table 6.4.22 Population by Age Group and Dependency Ratio in Marikina City

Age Group	Population		
	Total	Male	Female
Younger Dependent Population (ages 14 and below)	117,680 27.74%	60,516 29.26%	57,164 26.30%
Working Age Population (ages 15-64)	288,330 67.98%	139,137 67.27%	149,193 68.65%
Older Dependent Population (ages 65 and above)	18,140 4.28%	7,168 3.47%	10,972 5.05%
Total	424,150	206,821	217,329
Dependency Ratio*	47.1	-	-

Note) *: Dependency ratio is the sum of the number of persons under 15 years old and persons aged 65 and over divided by the number of persons 15 to 64 years old and multiplied by 100.

Source: National Statistics Office NSO, 2010

The number of unemployed in Marikina City in 2012 has been monitored by the Marikina City Community-Based Monitoring System (2012) and is presented in Table 6.4.23. The city has recorded 6,195 unemployed households comprising 8,747 individuals. Among the barangays within the Project Phase IV area, barangay Santo Niño has recorded the highest number of unemployed.

Table 6.4.23 Number of Unemployed People of Labor Force by Barangay in Phase IV

Barangay	Households		Population	
	Magnitude	Proportion (%)	Magnitude	Proportion (%)
Barangka	616	17	748	12.1
Calumpang	329	13.3	439	10.1
Jesus De La Peña	210	14.6	293	11.1
San Roque	369	12.6	483	9.6
Sta. Elena	85	8.6	46	5.7
Santo Niño	866	18.8	1,171	14.1
Tañong	143	10.4	689	13.2
Industrial Valley	385	14.2	516	11.3
Barangay sub-total	3,003	13.7	4385	10.9
City Total	6,195	14.0	8,747	11.2

Source: Marikina City Community-Based Monitoring System, 2012

Business Profile:

There are 15,064 registered commercial and industrial entities in Marikina City in 2012 (Table 6.4.24). It is made up of 14,582 commercial businesses and 482 industrial establishments. Commercial establishments engaged in sales have the highest number of entities at 7,489, followed by services (2,997) and property lease (2,597). Agricultural entities were not recorded as agricultural areas have become limited resulting from the conversion of most of this zone into other land uses (Marikina City CLUP, 2000).

Table 6.4.24 Registered Business Establishments in Marikina City

Sector	Establishments and Firms	Number of registered entities
Commercial	Amusement	650
	Eateries	849
	Services	2,997
	Sales	7,489
	Properties for Lease	2,597
	Sub-total	14,582
Industrial	Manufacturing	482
Total	-	15,064

Source: Marikina City Comprehensive Development Plan, 2012

Regarding industry, on the other hand, 482 registered industry firms are presented according to the type of industry as shown in Table 6.4.25. Shoe manufacturing firms have the most number, reflecting the historically dominant industry in the city and gave its name “Shoe capital of the Philippines” (Marikina City CLUP, 2013). The footwear industry continues to remain as the major business contributor to Marikina City (Marikina City CLUP, 2000). The development of the Marikina Riverbanks Center in particular was focused to serve as a primary outlet for local shoes and leather goods manufacturers. On the other hand, heavy industries such as iron and motor works consist of 34 firms, which are mostly located in barangay Fortune and Parang (Marikina CDP, 2012).

Table 6.4.25 Number of Registered Manufacturing Firms by Type in Marikina City

Type of Industry	Number of registered entities
Shoe manufacturing	135
Slipper manufacturing	21
Bag manufacturing	40
Food/Bakery	32
Handicrafts	8
Garments	22
Furniture/Woodcraft	19
Cigarettes	1
Iron/Motor Works	34
Other manufacturing	77
Other industry	93
Total	482

Source: Marikina City Comprehensive Development Plan, 2012

The decrease in the size of residential areas and conversion to commercial and industrial use has been noted by the Marikina City LGU from year 2000 (Marikina City CLUP, 2000). Manufacturing firms have relocated or expanded their operations in designated industrial zones of the city including Barangay Calumpang, Sto. Niño, Concepcion Uno, Fortune and Marikina Heights area. The improvement and expansion of public infrastructures and facilities has contributed to the development of new commercial areas. This commercial expansion complemented the nodal development of the Marikina Riverbanks Center and SM Marikina in Barangka, and the People’s Mall in Sta Elena. In the meantime, the decline in agricultural activities and conversion of these lands into different land use has also contributed to the increased commercial and industrial activities in the city.

Housing Profile:

The city has recorded 108,958 households in 2013, with an average household size of 4.7 persons (National Statistics Office, 2007). The Marikina Zoning Ordinance number 303 (2000) has defined density limits for houses and residential areas to avoid deterioration of residential areas into depressed communities and maintain the livability of Marikina City. There is no available data on median livable floor area in the city’s documents including CLUP. However, residential

houses in subdivisions as well as townhouses are allowed a minimum lot area of 100 square meters, and socialized housing areas with 24 square meters.

The number of occupied housing units according to outer wall and roof construction materials is presented in Table 6.4.26. About 85.07% of housing units had roofs made up of galvanized iron, and 63.74% had outer walls made of either concrete, bricks or stone. About 25.26% of home units have half-concrete/brick/stone and half-wood walls, and 9.67% with wood only. The percentages of the housing units of tile/concrete/clay tile and half-galvanized/iron and half-concrete are relatively low.

Table 6.4.26 Number of Household Units by Construction Materials in Marikina City

Construction Materials of the Outer Walls	Occupied Housing Units	Construction Materials of the Roof		
		Galvanized Iron/ Aluminium	Tile/ Concrete/ Clay Tile	Half-galvanized Iron and Half-Concrete
Concrete/ Brick/ Stone	49,650	47,217	817	1,400
		63.74%	61.94%	15.11%
Wood	9,491	7,165	213	910
		9.67%	16.15%	9.82%
Half Concrete/ Brick/ Stone and Half Wood	26,275	18,709	242	6,770
		25.26%	18.35%	73.05%
Galvanized Iron/ Aluminium	950	697	42	159
		0.94%	3.18%	1.72%
Bamboo/ Sawali/ Cogon/ Nipa	68	31	-	11
		0.04%	-	0.12%
Asbestos	4	1	-	-
		0.01%	-	-
Glass	6	1	-	3
		0.01%	-	0.03%
Makeshift/ salvaged/ improvised materials	292	150	-	13
		0.20%	-	0.14%
Others/Not Reported	335	103	5	2
		0.14%	0.38%	0.02%
No walls	3	2	-	-
		0.01%	-	-
Total	87,074	74,076	1,319	9,268
	100%	85.07%	1.52%	10.64%

National Statistics Office, 2007

Income and Livelihood Conditions:

The average family income and expenditure for Marikina City is presented in Table 6.4.27. It can be recognized that the household income and expenses in Marikina City is lower than the NCR average in 2000 although the city-level information is not available after 2000.

Table 6.4.27 Household Income and Expenditure in Marikina City (2000-2006)

Year	Income (in thousand pesos)			Expenditure (in thousand pesos)		
	Philippines	NCR	Marikina City	Philippines	NCR	Marikina City
2006	14,394	25,916	-	12,263	21,500	-
2003	12,324	22,204	-	10,308	18,159	-
2000	12,093	25,025	19,568	9,903	22,204	16,249

Source: National Statistics Office, 2007

The number of waged working family members and their average wages for 2012 in Marikina City and barangays within Project Phase IV is presented in Table 6.4.28. There are 86,410 waged members in the city with average earnings of P 152,816 pesos. Sto. Niño recorded the most number of waged family members at 6,135, as well as the highest total wages at P 999,279,403.

Sta. Elena on the other hand has the least number of waged members at 1,175; however it also has the highest average wage at P 236,012 per year and at P 19,668 per month.

Table 6.4.28 Number of Waged People and Wages by Barangay in Phase IV Area

Barangay	Number of Waged People	Total and Average Wages (in pesos)		
		Magnitude (total)	Proportion (per year)	Proportion (per month)
Marikina City	86,410	13,204,871,727	152,816	12,735
Barangka	4,494	735,002,160	163,552	13,629
Calumpang	3,325	453,598,850	136,421	11,368
Jesus De La Peña	1,883	307,400,606	163,250	13,604
San Roque	3,779	575,290,917	152,234	12,686
Santa Elena (Pob.)	1,175	277,313,625	236,012	19,668
Santo Niño	6,135	999,279,403	162,882	13,573
Tañong	1,483	225,812,010	152,267	12,689
Industrial Valley	3,478	611,672,846	175,869	14,656

Source: Marikina City Community Based Monitoring System, 2012

The 2012 monthly poverty threshold in NCR at P 20,344 and poverty incidence among families in the population at 2.6% (National Statistics Office, 2012) is applicable to Marikina City. The Marikina City Community Based Monitoring System (CBMS) assessed the number of households with incomes below poverty threshold for 2012 for each barangay. Table 6.4.29 presents the assessed barangays within the Project Phase IV area.

Table 6.4.29 Number of Households below Poverty Threshold by Barangay in Phase IV Area

Barangays	Number of poor families	Number of poor people	Proportion (%) based on the number of households
Barangka	305	1,260	7.06
Calumpang	309	1,510	11.15
Jesus dela Peña	194	912	11.95
San Roque	279	1,425	8.42
Sta. Elena	126	639	11.33
Sto. Niño	577	3,100	11.05
Tañong	143	689	10.39
Industrial Valley	270	1,370	9.19
Marikina City	9,188	47,939	10.81

Source: Marikina City Community Based Monitoring System, 2012

There are 9,188 recorded poor households in the city consisting of 47,939 persons. Barangay Sto. Niño has the most number of poor households with 577, or 3,100 persons. Barangay Sta. Elena has the least number with 126 poor households consisting of 639 persons. In terms of proportion, Jesus Dela Peña recorded the highest with 11.9% of households. On the other hand, Barangka has the lowest proportion at 7.1%.

(2) Evaluation of Updated Baseline Condition

In the EIS (1998), socio-economic study was conducted covering demography, dependency ratio, income level, and housing profile, etc. Regarding demography, the review results are described in Section 5.4.1 Demography. Review results of other components are briefed hereunder:

Dependency ratio of the cities and municipalities located along the Pasig-Marikina River was shown as 52 in the EIS (1998) while those of Pasig, Quezon and Marikina City in 2010 are presented as 47.2, 48.1 and 47.1, respectively. This indicates that the dependency burden is slightly lessened after the EIS up to 2010. As to income level, monthly average household income of the whole Metro Manila in 1995 was P. 14, 467 while that of 2006 was P. 25, 916, which shows 80% of increase up to 2006. With regard to housing profile, concrete/brick/stone are widely used as the outer wall of stiff housing units. The ratio of usage of these materials in the barangays along the Pasig-Marikina River and in Metro Manila in 1995 was 40% and 30%, respectively while

those of Pasig, Quezon and Marikina City in 2007 was 49.7%, 55.3% and 57.0%, respectively. This shows the increase of economic level is reflected the usage of housing material. Thus, these evidences reflect recent economic growth of the Philippines and shows that the socio-economic status has been gradually and steadily improved.

6.4.6 Water Use

(1) Current Status

a. Potable Water

The main source of household potable water supply for the three cities of Marikina, Pasig and Quezon in the year 2010 is presented on Table 6.4.30. More than 70% of the households in each city have access to individual home or communal water service of potable water supplied by a utility service provider. This is followed by bottled water with the ratio of between 22 to 25 %. Other water sources such as groundwater, spring water, lake water, rain, etc. for potable water is limited to less than one (1) % each.

Table 6.4.30 Households by Source of Water Supply for Drinking

Source		Marikina City		Pasig City		Quezon City	
		Number	%	Number	%	Number	%
Water Utility Service	Own use faucet, community water system	63,040	69.0	105,143	67.8	394,111	62.1
	Shared faucet, community water system	6,397	7.0	11,712	7.6	66,268	10.4
Groundwater	Own use tubed / piped deep well	243	0.3	343	0.2	1,608	0.3
	Shared tubed / piped deep well	210	0.2	338	0.2	2,602	0.4
	Tubed / piped shallow well	51	0.1	37	0.0	938	0.1
	Dug well	20	0.0	33	0.0	481	0.1
Other natural source	Spring, lake, river, rain, etc.	-	-	6	-	-	-
Others	Delivered water	585	0.6	494	0.3	2,692	0.4
	Bottled water	20,320	22.2	35,888	23.2	160,641	25.3
	Others	547	0.6	976	0.6	5,005	0.8
Total Households		91,414	100.0	154,970	100.0	634,346	100.0

Note) Figures are based on 20-percent sample households. Details may not add up to total due to rounding off.
Source: National Statistics Office (NSO), 2010

The primary water source of Metro Manila including Marikina, Pasig and Quezon City comes from collected stream flows into the Angat and Ipo Dams in Bulacan. The collected bulk water is diverted to La Mesa Dam Reservoir for secondary storage and treatment. The treated water is supplied to costumers in Metro Manila through the Manila Waterworks and Sewerage System (MWSS).

The MWSS divided the Metro Manila area into two concession zones, the East Zone and West Zone, by contracting to a private company for operation and utilities management. The West Zone is managed by Manila Water Company Incorporated (MWCI), and the East Zone by Maynilad Water Services Incorporated (MWSI). Marikina and Pasig City belong to the East Zone, where MWCI exclusively provides the water utility services. Quezon City, on the other hand, is divided into the West and East Zones given its large area, and MWCI and MWSI both provide water utility services in their respective zones.

No water use case taken from the Marikina River is observed along the Project, Phase IV area for potable water supply.

b. Water Use of the Marikina River

Only limited data is available on the use of Marikina River. In the three cities of Marikina, Pasig and Quezon, no official records exist along Project, Phase IV area regarding the water use from the Marikina River for domestic activities such as for laundry, vehicle washing, as well as for

watering to plants and gardens. Communications with some of local residents during site reconnaissance of this survey did not identify any use of river water for such domestic purposes. During the site reconnaissance, however, bathing and playing in the water were observed in several places along the Marikina River as shown in the photos below.



The Marikina City declared under the City Zoning Ordinance Section 45 allowing access for recreational purposes to the river area. Pasig City has a similar measure under Section 20 and 43 of his Zoning Ordinance. In Quezon City, however, no similar zoning ordinance exists for recreational use in their jurisdictional section of the Marikina River.

c. Result of Interview with Local People

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that only few people (3.3%) use river water, including such water use as “taking river water for garden/irrigation,” “washing clothes,” “bathing in the river.” (Ref. ANNEX-4)

(2) Evaluation of Updated Baseline Condition

There is no water use case for portable water supply taken from the Marikina River. Water use for washing clothes and play ground was observed along the Marikina River during the site reconnaissance of this survey.

Information on water use taken from/in the Marikina River was not included or discussed in detail in the EIS (1998). Water use described in the EIS was the water source for drinking. The ratio of usage of faucet (water supply system) of barangays along the Pasig-Marikina River and the Metro Manila was 92% and 54% respectively. Ratio of well water use of these two areas was 5% and 41%, respectively. On the other hand, ratio of the usage of water supply system of Pasig, Quezon and Marikina City in 2010 increased up to more than 70%, and well water use has decreased to minimal (less than 1 %). But the usage of other type of source, bottled water for drinking, instead, has increased up to more than 20%. Thus, the situation of water use has drastically improved and at the same time, it was revealed that the feature of water source has been changed in recent years.

6.4.7 River Dependency

(1) Current Status

a. Fishing

Some of the local residents of Pasig and Marikina City were reported to enjoy fishing in the Marikina River along the Phase IV area. Tilapia, mudfish, carp and catfish are reported to be caught in the river (CLUP, Marikina City, 2001). Additionally others also reported the presence of small shrimps, freshwater turtles and some freshwater shellfish. However, no official fish catch data exists on record in any of the two cities or Quezon City. Site reconnaissance observations

indicate some fishing activities, such as subsistence and sport fishing as shown in the photos below.



Subsistence fishing by local residents onboard improvised rafts in the Marikina River.



Local resident undertaking sport fishing using hook and line at the banks of the Marikina River.

b. Farming

Most areas where the Project, Phase IV is located were urbanized or built up, with minimal to absent open area to allow for any agricultural activities to take place as shown in the photo below. Among the three cities concerned, only Marikina City maintains agricultural strip, which are located at the area along the Marikina River Park.

The agricultural strip was developed based on Marikina City Ordinance Section 37, 2000. It is leased to local residents for subsistence farming, and the water for crops seems to be obtained from the Marikina River in addition to rainfall. No data, however, is available to determine the volume of water used for watering to the agricultural strip.



Tañong agricultural strip along Marikina River managed by Marikina City Parks Development Office and leased to local residents

c. Transportation

The Pasig River Rehabilitation Council (PRRC), together with the Marikina City and Eastwood City Estates Association, Inc. (ECEA) previously made a memorandum of agreement in 2008 to revive the Pasig River Ferry Service Project. This led to the construction of the terminals at Eastwood City and Marikina River Park complementing the downstream Pasig River Terminals. The ferry boat station locations are similarly proposed for Santolan (along Pasco Avenue) and Rosario (along Ortigas Avenue). Operations are currently suspended, however, due to factors such as poor passenger turnout, financial viability, and the depth of the river becoming too shallow for commercial boats to navigate after the Tropical Storm Ondoy in Sep. 2009.

Private boat services plying the route between Marikina Bridge and Marikina Riverbanks were observed during the site reconnaissance. Boats are also utilized to transport people across the river

between Barangay Santolan (Pasig City) and Camp Atienza (Quezon City). Small individual rafts and boats are similarly observed to navigate through the river between Rosario Weir and Marikina Bridge (photos below).



A boat transporting through the Marikina River observed near the Marikina Bridge.



Boats to transport people across the Marikina River between Barangay Santolan (Pasig City) and Camp Atienza (Quezon City)

d. Tourism

Only Marikina City has an existing tourism and park development program to improve their 220-hectare section of the Marikina River under their jurisdiction. This was covered by a Zoning Ordinance under Section 45 passed in 2001, providing a 96-meter no-build zone easement from the Marikina River centerline. The existing Marikina River Park complemented by the Marikina Riverbanks area provide amenities such as bike and jogging lanes along the river banks, floating bridges, picnic/camping grounds, park and benches which cater to both resident and non-resident visitors and tourists.



Marikina River Park, looking upstream. Commercial establishments are located on the left bank side.



Marikina River Park, looking downstream. Amenities and markers are located at the open spaces on both river banks.

e. Result of Interview with Local People

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that only few people (3.3%) depend on the river in daily life while most of them (92.0%) answered they do not depend on the river. The way of dependence includes “taking river water for garden/irrigation,” “washing clothes,” “bathing in the river,” according to the survey (Ref. ANNEX-4).

(2) Evaluation of Updated Baseline Condition

Several types of river dependency on and relation with the Marikina River between local residents were recognized, including fishing, farming, transportation, and tourism.

Information on river dependency on the Marikina River was included in the EIS (1998) only focusing on river navigation plying through the Pasig River ferry boats. The survey clarified the current status of the several types of river dependency along the river stretch of Marikina River and it can be the basis for impact assessment of social components.

6.4.8 Cultural and Historical Heritage

(1) Current Status

There is no historical and/or cultural heritage sites which are listed by the National Historical Commission of the Philippines (NHCP), located within the Project, Phase IV section and its vicinity. Table 6.4.31 lists the local cultural and historical heritage sites in the three cities located within approx. 500 meters distance from the Marikina River in the Project, Phase IV area. These sites include statues, gazebos, gardens, museums, performing arts or cultural venues, religious sites, shrines and monuments, which are all presented in Figure 6.6.4.

Table 6.4.31 Local Heritage Sites Located near the Marikina River (Phase IV)

Category		Name	Location
Cultural Heritage	Statues / Gazebos / Garden	Anchor Lady *	Marikina City
		Big Shoes Marker*	Marikina City
		Chinese Gazebo*	Marikina City
		Roman Garden*	Marikina City
		Carabao Statues*	Marikina City
	Museum	Shoe Museum*	Marikina City
Performing Arts Center/ Cultural Venue	Marikina Riverbanks Amphitheater**	Marikina City	
	La Tora's Garden	Marikina City	
Historical Heritage	Church/ Religious Site	Our Lady of Lourdes Grotto	Marikina City
		Jesus De La Peña Chapel	Marikina City
	Shrine	Kapitan Moy's Residence	Marikina City
	Monument	Santolan Monument	Pasig City

Note) *: Located at Marikina River Park area

***: Located at Marikina Riverbanks Center

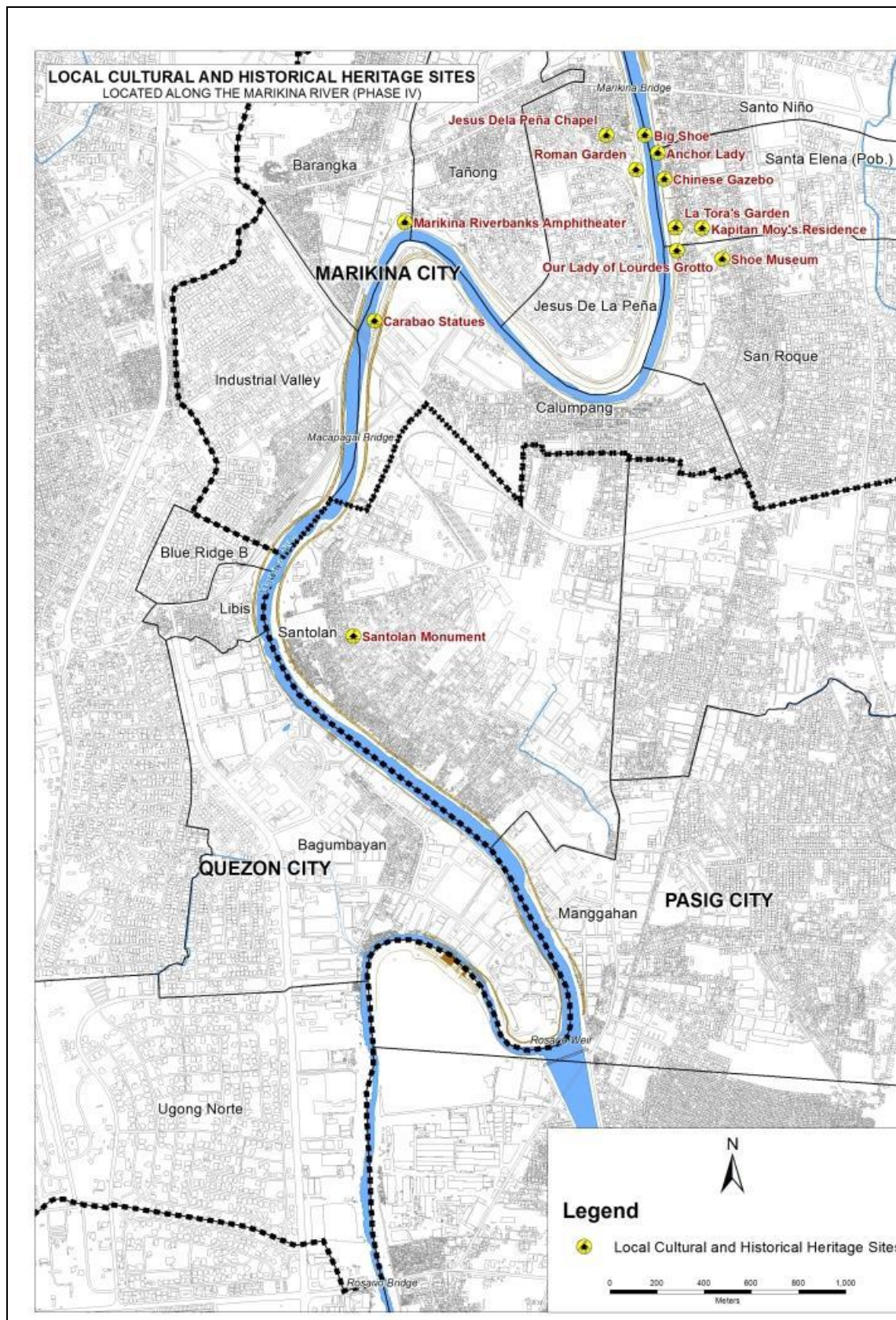
Source: Pinoy Map, Metro Manila, 2009; Google Earth, 2014

In 2000, the Marikina River Park was established through the Marikina City Ordinance 303 (2000) as part of their linear park program. It is located along the Marikina River, extending from the Marikina Bridge up to the Marikina Riverbanks Center on the right bank, and up to Marcos Bridge on the left bank. Six of the heritage sites are located in this park and are described as presented in this park and are described as follows: (1) Big Shoes Marker; (2) Anchor Lady Statue, (3) Roman Garden; (4) Chinese Gazebo; (5) Shoe Museum and (6) Carabao Statues. The Marikina Riverbanks Center, completed in 1999, is a mixed commercial center and recreational park area located along the right riverbank, at immediately north of Marcos Bridge. The Marikina Riverbanks Amphitheater is located in this the Marikina Riverbanks Center.

The other heritage sites are presented in order of location from north to south ends of Project Phase IV: (1) Jesus De La Peña Chapel; (2) La Tora's Garden; (3) Kapitan Moy's Residence; (4) Our Lady of Lourdes Grotto; and (5) Santolan Monument. All are located within the area of Marikina City except for the Santolan Monument which is in Pasig City.

There are two important heritage sites in regional level; the Jesus De La Peña Chapel and Kapitan Moy's Residence. The Jesus De La Peña Chapel is both a historical and religious marker built to commemorate the first mass in 1630 held in Marikina (National Historical Commission, 1970). Reconstruction works on the old chapel was completed in 1988. Kapitan Moy's Residence, on

the other hand, was the home of shoemaking pioneer Don Laureano “Kapitan Moy” Guevarra and became Marikina’s first shoe factory in 1887 (Marikina Facts and Figures, 2013).



Source: Pinoy Map, Metro Manila, 2009; Google Earth, 2014

Figure 6.4.4 Location of Local Cultural and Historical Heritages within Phase IV Area

(2) Evaluation of Updated Baseline Condition

Information on cultural and historical heritage sites was not included in the EIS (1998). The development of the Marikina River Park through City Zoning Ordinance 303 (2000) of Marikina City and the commercial development brought by the Marikina Riverbanks Center in their respective locations introduced the new cultural heritage sites located along the banks of Marikina River. The current status of the heritage sites has been clarified in this survey and it can be the basis for impact assessment of social components.

6.4.9 Social Issues

(1) Current Status

a. Internal Community Conflicts

No documentation exists in the official records of the three cities regarding internal community conflicts and disputes in any of their constituent barangays within the Project, Phase IV area.

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that more than 40% of respondents have the perception that there is no social issue such as gender discrimination, child abuse, agitation, possible infiltration of radical groups into the community. At the same time, 38% of respondents answered there are such social issues mentioned above, including other issues such as drug abuse, noise, criminality and conflicts among neighbors (Ref. ANNEX-4).

b. Informal Settlers and Professional Squatters

The number of informal settler families living in the three LGUs is presented on Table 6.4.32. Informal settlers typically occupy idle, public and private lands, easements, riverbanks, waterways and even public infrastructures such as bridges. The number of informal settlers in Quezon City in 2007 was recorded at 218,802 families, and Marikina City has recorded 729 informal settler families in 2012. Regarding Pasig City, there is no available data after 2000 in the city's official documents such as CLUP, City Profile, etc.

Table 6.4.32 Magnitude of Informal Settlers by Area Classification

Area Classification		Quezon City (2007)	Marikina City (2012)
1. Danger Areas	Waterways	10,262	208
	Transmission Line	2,888	14
	Dumpsite	767	
	Under the Bridge	711	-
2. Gov't Infrastructure	Road Right of Way	8,138	28
	MWSS	2,898	21
3. Government Lands	City-owned	5,181	120
	National Gov't Corporations	55,000	64
	Other National Gov't Property	23,424	244
4. Priority Dev't Area (APD)		14,595	-
5. Private Property		93,677	30
6. Open space		834	-
Total		218,375	729

Source: Urban Poor Affairs Office, Quezon City Socio-economic profile, 2010;
Marikina City Facts and Figures, 2012

Marikina City has developed 106 hectares for the resettlement of about 22,226 informal settlers under the Community Mortgage Program (CMP). It curbed the proliferation of informal settlers (squatters) due to city immigration in-migration, increasing commercialization of land, subsequent high land values and unaffordable housing units for low-income earners (Marikina City CLUP, 2002). The Quezon City, on the other hand, undertakes resettlement projects through the Urban Poor Affairs Office (UPAO) with the implementation of Direct Sale Program (DSP)

and CMP. The Pasig City LGU has a similar CMP plan which aims to resettle the informal settlers and reduce the increase in their population (Pasig City Profile, 2013).

In Project, Phase IV area, informal settlements exist mainly in the Bagumbayan and Santolan areas, particularly along the banks of the Marikina River. The presence of professional squatters (individuals or groups who are illegally occupying lands or have been previously awarded with housing units but have sold, leased and transferred such housing unit to continue settling illegally in the same land or another urban area) in these areas was indirectly mentioned by some of the local residents during site reconnaissance (personal communication). Information regarding such issue was not preferred to be openly discussed by local respondents to avoid negative feedback or reprisal from personalities or families suspected of doing such activity.

c. Public Order and Safety

Public order and safety in Metro Manila is managed by the Philippine National Police (PNP) National Capital Region Police Organization (NCRPO), of which jurisdiction is divided into five major districts, namely: Quezon City Police District (QCPD); Eastern Police District (EPD), Northern Police District (NPD), Southern Police District (SPD) and Manila Police District (MPD). The Quezon City area is served by the QCPD, and the cities of Marikina and Pasig are served by the EPD.

Fire protection and management in Metro Manila is likewise provided by the Bureau of Fire Protection (BFP), divided into four key districts and a separate Fire District for Quezon City. The cities of Marikina and Pasig are served by Fire District IV.

The standard police-population ratio for urbanized areas is ideally set at 1:500 (Marikina City CLUP, 2000). This is, however, not attained due to large population size in each of the three cities and not enough number of police recruits. All cities similarly exceed the acceptable standard firemen-to-population ratio of 1:2000 as well as the standard firemen-to-land ratio of 1:4 sq.km.

The Police and Fire stations located within one-kilometer distance from Project Phase IV area is presented in Table 6.4.33. This presents the police/firefighting officers on duty who can respond to any public disturbance or fire incidents that can occur in the area.

Table 6.4.33 Police and Fire Stations within One-km Distance from Phase IV Area

City	Police Station	Fire Station
Quezon City	1) Quezon City Police District Station 8 (Project 4) - Tuazon Street, Project 4, Quezon City - PCP1 – Libis/E. Rodriguez - PCP2 – P. Tuazon 2) Quezon City Police District Station 9 (Anonas) - Anonas Street, Project 2 - PCP1 – Aurora Boulevard corner Katipunan 3) Quezon City Police District Station 12 (Eastwood) – C5 Road cor. Orchard Road, Eastwood, Bagumbayan	1) QC Fire Station III - Marilag Fire Sub-station - Libis Fire Sub-station
Pasig City	1) Eastern Police District Station 2 – Pasig City - PCP11 – C. Raymundo St., Rosario - PCP12 – East Bank Rd., Manggahan Barangay Hall - PCP13 – Evangelista St., Santolan - PCP14 – F. Mariano St., Santolan Barangay Hall	2) Fire District IV - Pasig Fire Station - Santolan Fire Sub-station - Manggahan Fire Sub-station - Rosario Fireboat Sub-station
Marikina City	1) Eastern Police District Station 1 – Marikina city - PCP1 – Calderon Street, Calumpang - PCP2 – Shoe Avenue, San Roque - PCP3 – Oriole Street, Sta. Elena - PCP4 – Shoe Avenue, Sports Parks - PCP6 – JP Rizal, Concepcion 1 - PCP11 – Riverside Ave., Barangay Jesus dela Peña - PCP12 – Boni Avenue, Tañong - PCP13 – Barangka Barangay Hall - PCP14 – Maj. Dizon Street, Industrial Valley	3) Fire District IV - Marikina Central Fire Station - Nangka Fire Sub-station - IVC Fire Sub-station

Source: www.police.contactnumbersph.com

Note: PCP – Police Community Precincts

In Quezon City, the lack of police units is augmented by the Barangay Security and Development Officers (BSDOS) who are tasked to maintain peace and order within the barangays and provide rescue operations assistance and disaster prevention and mitigation (Quezon City Socio-Economic Profile, 2010). In Marikina City, the Bantay Bayan is the barangay civilian volunteer counterpart of Quezon City's BSDOS. In addition, the RESCUE 161 response unit was established to guarantee the arrival of emergency (fire, police or paramedic) services within 5 minutes upon call for assistance anywhere in Marikina City (Marikina City Facts and Figures, 2012). To augment the fire-fighting forces in Metro Manila, the BFP taps volunteer fire brigades from the business sector and Filipino-Chinese Fire Brigades. In Pasig City, a community-oriented public safety system was implemented to improve the relationship between the police personnel and community residents in crime prevention and resolution (Pasig City Medium term Development Plan, 2000). It is complemented by the participation of NGOs and socio-civic groups that participate in peace and order campaign.

d. People's Organizations

Survey on Basic Environmental and Social Consideration for Flood Management Plan in Metro Manila (JICA, 2013) reported people's organizations (POs) and Non-Government Organizations (NGOs) which have opinions on resettlement plan for the Project, including the following:

- a) Akbayan
- b) Ugnayan ng mga Samahan para sa Alternatibong Pagbabago (USAP),
- c) Bagong Alyansang Makabayan (Bayan) or New Patriotic Alliance,
- d) Kilusang Mayo Uno, and
- e) Anakbayan

Here, these are summarized supplemented by below including additional information based on relevant web-sites (Kilusang Mayo Uno: <http://www.kilusangmayouno.org/>, Bayan: <http://www.bayan.ph/>, Anakbayan <http://www.anakbayan.org/>)

Akbayan:

This organization advocates a democratic, accountability and participatory governance, and represents the sectors of youth, women, fishermen, farmers, elderly, teachers, gays and lesbians, Muslims and workers. It has 2,000 chapters at different barangays across the country, and it occupies three seats in the Philippine Congress. The organization was reported to have supported the opposition of ISF communities against resettlement programs, as well as lobbying for a moratorium on demolition (Gyros-Pacet, 2013).

USAP:

The Ugnayan ng Samahan para sa Alternatibong Pagbabago (USAP) is an Urban Poor Organization accredited by the Presidential Commission on Urban Poor (PCUP). The PCUP was tasked to assert genuine representation in the Local Housing Board and mandated by law to formulate the Local Shelter Plan. In a statement during the Quezon City Mayorality election debate, it mentioned that the LGUs in NCR are not ready to comply with the stated policy of the Joint Memorandum Circular (JMC) because the LGUs have no Comprehensive Shelter Plans approved in the Local Development Plan that will provide necessary information like inventory of possible on-site, in-city and near-city relocation site for ISFs (Gyros-Pacet, 2013).

Bayan:

The Bagong Alyansang Makabayan (Bayan) or New Patriotic Alliance is a national political organization with similar organizational structure with Akbayan. It is comprised of multisectoral groups with a slogan for the struggle for national and social liberation against imperialism, feudalism and bureaucrat capitalism. In a public press statement, it mentions that the government has not laid out a sustainable mass housing plan and continues to lag in meeting the massive

national housing backlog (Gyros-Pacet, 2013). They have also pointed out that the current administration cannot assure the relocation of 195,000 families that will be removed from Metro Manila waterways and Laguna de Bay, given that the national housing backlog in NCR is almost 1.08 million are in Metro Manila. It was also mentioned that many relocatees have left the relocation sites due to lack of livelihood and essential services like water and electricity.

KMU:

The Kilusang Mayo Uno (KMU) is a political organization with party-list structure similar to Akbayan and Bayan. It presents itself as an independent labor-centered organization in the Philippines which promote genuine, militant and anti-imperialistic trade unionism. This organization presented in a media statement that the existence of so-called illegal structures is not one on the main reasons for flooding in metro manila. It was rather the lack of disaster preparedness, excessive logging and mining activities, dam owners' greed, failure to desilt Laguna de Bay and other waterways, and unplanned urban development (Gyros-Pacet, 2013).

Anakbayan:

The Anakbayan is a party-list organization similar to Akbayan, with political agenda similar to the KMU and Bayan. It represents itself as a comprehensive, national democratic mass organization of the Filipino Youth, aiming for a National Democratic Struggle which seek to realize true liberation for the country and the realization of the democratic rights of the people. In a public news statement, the group cited the case of 3,000 ISFs demolished and relocated in Kasiglahan Village, Montalban, Rizal. It mentioned the relocation area stood on a reclaimed river, and a substandard dike failed following persistent rains which caused the water to rise at unprecedented levels. It is against the funding for DPWH's flood control and mitigation master plan worth 352 billion pesos worth of taxpayer's money to be used for violent demolitions and evictions (Gyros-Pacet, 2013).

Result of Interview with Local People:

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that 70 respondents (out of 399 in total), or 17.5 % are a membership of any community organization. Of which, 17 respondents belongs to "Homeowner's Association," a recognized organization of the people living inside a common subdivision. There was no respondent who belongs to the aforementioned people's organizations (POs) and/or Non-Government Organizations (NGOs) which have opinions on resettlement plan for the Project.

(2) Evaluation of Updated Baseline Condition

Discussions on social issues within the Project, Phase IV area are not included in the EIS (1998). In this survey, community conflict, informal settler, public order and safety, and people's organizations were surveyed and clarified the current status. These information and data can be used as the basis for impact assessment of social components.

6.4.10 Religion and Worship

(1) Current Status

The population by religious affiliations among the cities of Marikina, Pasig and Quezon is presented in Table 6.4.34. Christianity is practiced by more or less 95% of population in the three cities. Within the Christian religion, the Roman Catholic denomination is the dominant form of worship, accounting for 87.90 to 90.96% of the population in the three cities. Other religious minorities with relatively big representations include the Iglesia ni Cristo, the Protestants and Born Again groups.

Table 6.4.34 Population by Religion in Pasig, Marikina and Quezon City

Religious Affiliation		Marikina (2000)		Pasig City (2000)		Quezon City (2000)	
		Total	Raito (%)	Total	Raito (%)	Total	Raito (%)
Christian	Roman Catholic	347,046	89.04	458,175	90.96	1,904,222	87.90
	Iglesia ni Cristo	11,143	2.86	13,144	2.61	78,924	3.64
	Born Again Christian	-	-	-	-	23,229	1.07
	Protestants / Methodists / Baptists / Pentecost	6,485	1.66	7,347	1.46	39,528	1.83
	Aglipay	3,470	0.89	578	0.11	-	-
	Subtotal	368,144	94.45	479,244	95.14	2,045,903	94.44
Islam		862	0.22	2,464	0.49	-	-
Others*		18,007	4.62	16,428	3.26	81,697	3.77
Unknown		2,470	0.63	5,348	1.06	37,497	1.73
None		182	0.05	196	0.04	1,223	0.06
Total		389,765	100	503,680	100	2,166,320	100

Note) *: Others include Buddhism and Hindu, etc., - : No available data.

Source: National Statistics Office (NSO) 2000

Table 6.4.35 and 6.4.36 present the population by religion in each of the barangays of Pasig City and Marikina City, respectively. Quezon City does not have similar information for the barangays within the Project, Phase IV area.

In the barangays of Pasig City, the Roman Catholic religion is dominant, consisting of 87.55% in Rosario and 89.59% in Santolan. It has, however, a lower percentage in Manggahan, accounting for 83.11% of the barangay population. In Marikina City, Roman Catholic is similarly dominant in all of the barangays. Santo Niño has a lower percentage at 87.82% of the barangay population, whereas in all other Barangays, Roman Catholic consists of more than 90% of their respective populations.

Table 6.4.35 Population by Religion by Barangay in Phase IV Area (Pasig City)

Religion	Santolan	Manggahan	Rosario	Total
Roman Catholic	24,335	61,429	28,688	114,452
	89.59%	83.11%	87.55%	85.52%
Iglesia ni Cristo	683	1,836	993	3,512
	2.51%	2.48%	3.03%	2.62%
Islam	21	274	87	382
	0.08%	0.37%	0.27%	0.29%
Born again	970	4,652	1,400	7,022
	3.57%	6.29%	4.27%	5.25%
Others (Buddhism, Hindu, etc.)	1,154	5,718	1,598	8,470
	4.25%	7.74%	4.88%	6.33%
Total	27,163	73,909	32,766	133,838

Source: Pasig Research Center, 2014

Table 6.4.36 Population by Religion by Barangay in Phase IV Area (Marikina City)

Religion	Barangka	Calumpang	Jesus dela Peña	San Roque	Sta Elena	Sto Niño	Tañong	Industrial Valley	Total
Roman Catholic	14,402	10,152	5,849	11,520	3,980	19,212	4,851	10,692	80,658
	92.71%	94.03%	91.84%	94.11%	92.41%	87.82%	91.88%	91.82%	91.61%
Protestant	162	36	62	49	20	109	73	80	591
	1.04%	0.33%	0.97%	0.40%	0.46%	0.50%	1.38%	0.69%	0.68%
Iglesia ni Cristo	206	227	48	132	40	754	28	153	1,588
	1.33%	2.10%	0.75%	1.08%	0.93%	3.45%	0.53%	1.31%	1.80%
Aglipay	18	8	80	14	34	396	5	19	574
	0.12%	0.07%	1.26%	0.11%	0.79%	1.81%	0.09%	0.15%	0.65%
Islam	107	3	28	11	62	68	22	10	311
	0.69%	0.03%	0.44%	0.09%	1.44%	0.31%	0.42%	0.09%	0.35%
Born again	477	336	214	420	98	1,038	239	527	3,349
	3.07%	3.11%	3.36%	3.43%	2.28%	4.75%	4.53%	4.53%	3.80%
Mormons	6	0	19	1	8	40	7	27	108
	0.04%	0%	0.30%	0.01%	0.18%	0.18%	0.13%	0.23%	0.12%
Jehovah's witness	38	12	20	12	3	81	18	55	239
	0.24%	0.11%	0.31%	0.10%	0.07%	0.37%	0.34%	0.47%	0.27%
7th-day adventists	35	5	6	6	7	16	16	1	92
	0.23%	0.05%	0.09%	0.05%	0.16%	0.07%	0.30%	0.01%	0.10%
Others (Buddhist, Hindi, etc.)	83	19	43	76	33	161	20	81	516
	0.53%	0.18%	0.68%	0.62%	0.77%	0.74%	0.38%	0.70%	0.59%
None	0	0	0	0	22	0	1	0	23
	0%	0%	0%	0%	0.51%	0%	0.02%	0%	0.03%
Total	15,534	10,798	6,369	12,241	4,307	21,875	5,280	11,645	88,049

Source: Community Based Monitoring System (CBMS), Marikina City, 2012

The Our Lady of Peace and Good Voyage, also known as Lady of Antipolo and Virgin of Antipolo, is a 17th Century Roman Catholic statue of the Virgin Mary venerated by Filipino Roman Catholics and currently enshrined at the Antipolo Cathedral in Rizal Province (CBCP Online, 2014). This image was reported to have made historic passages along the Marikina River during religious processions from Intramuros in Manila up to the Antipolo Cathedral until 1926 (Pasig City Profile, 2013). After World War II until modern times, however, no special activity related to any religious belief has been taking place along the Marikina River.

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that the Roman Catholic dominated 83.7% among the respondents followed by Iglesia Ni Cristo (7.3%). Other Christian organization accounted 8.5%. Muslim and Buddhism are only one respondent each and there are none for Hinduism (Ref. ANNEX-4).

(2) Evaluation of Updated Baseline Condition

Information on the status of religion and worship affiliations is not discussed in the EIS (1998). Based on the latest available information such as the document of National Statistics Office (NSO), the latest CLUPs of Pasig and Quezon City, Community Based Monitoring System (CBMS), Marikina City, the population by religious affiliations within the Project, Phase IV area was clarified in this survey as described above.

6.4.11 Public Health and Infectious Diseases including HIV/AIDS

(1) Current Status

a. Hospital and Health Center

The three cities binding the Project, Phase IV area have different number of hospitals and health centers as shown in Table 6.4.37. It shows that Quezon City has the most number of hospitals followed by Pasig City and Marikina City while its number per 100,000 of population is more or less 2.0 in each LGU. Regarding the health center, Quezon City has the most number followed by Pasig City and Marikina City while its number per 100,000 of population is vice versa.

Table 6.4.37 Hospital and Health Center by LGU in Phase IV area

LGU	Population (2010)	Hospital		Health Center	
		Total Number.	Nos. / 100,000 persons	Total Number.	Nos. / 100,000 persons
Quezon City	2,761,720	57	2.06	54	1.96
Pasig City	669,773	13	1.94	38	5.67
Marikina City	424,150	9	2.12	26	6.13

Source: NSO (2010), Quezon City CLUP (2010), Pasig City CLUP (2009), Marikina City CLUP (2000)

b. Morbidity and Mortality in the Philippines and Three Cities

Table 6.4.38 to 6.4.41 presents the leading cases of morbidity and mortality in the Philippines and three cities. On the national level, heart disease is constantly the leading cause of mortality followed by vascular system disease, malignant neoplasm (cancer) and finally by pneumonia (Philippine Health Statistics, 2010). Meanwhile, the leading cause of morbidity is the acute respiratory infection followed by the acute lower respiratory tract infection and pneumonia and the bronchitis or bronchiolitis.

On the local level in LGUs binding the Project area, the leading causes of mortality include pneumonia, cancer, hypertensive vascular disease, and heart disease, etc. Meanwhile, those of morbidity include pneumonia, acute gastro enteritis/diarrhea hypertension, acute upper respiratory tract infection, and tuberculosis, etc.

Table 6.4.38 Morbidity and Mortality Cases in the Philippines

Morbidity			Mortality		
Causes	Number	Ratio (cases/100,000 people)	Causes	Number	Ratio (cases/100,000 people)
Acute Respiratory Infection	1,289,168	1,371.3	Diseases of the heart	102,936	109.5
Acute Lower Respiratory Tract Infection and Pneumonia	586,186	623.5	Diseases of the vascular system	68,553	72.9
Bronchitis/Bronchiolitis	351,126	373.5	Malignant neoplasms	49,817	53.0
Hypertension	345,412	367.4	Pneumonia	45,591	48.5
Acute Watery Diarrhea	326,551	347.3	Accidents	36,329	38.6
Influenza	272,001	289.3	Tuberculosis, all forms	24,714	26.3
Urinary Tract Infection	83,569	88.9	Chronic lower respiratory diseases	22,877	24.3
TB Respiratory	72,516	77.1	Diabetes mellitus	21,512	22.9
Injuries	51,201	54.5	Nephritis, nephrotic syndrome and nephrosis	14,048	14.9
Diseases of the Heart	37,589	40.0	Certain conditions originating in the perinatal period	12,086	12.9

Source: Philippine Health Statistic, 2010

Table 6.4.39 Morbidity and Mortality Cases in Quezon City

Morbidity			Mortality		
Causes	Number	Ratio (cases/100,000 people)	Causes	Number	Ratio (cases/100,000 people)
Pneumonia	25,880	1,149	Pneumonia	2,732	121
Acute Gastro Enteritis/Diarrhea	14,564	647	Cancer	1,426	63
Pulmonary Tuberculosis	4,854	216	Ischemic Heart Disease/Myocardial Infarction	1,360	60
Upper Respiratory Tract Infections	-	142	Cardio Vascular accidents	1,148	51
Bronchitis	-	82	Accidents	803	36
Hypertension	-	44	Pulmonary Tuberculosis	753	33
Cardiovascular Disease	-	27	Heart Disease	703	31
Measles	-	26	Hypertension	544	24
Influenza	-	26	Septicemia/ Sepsis	524	23
Dengue/Hemorrhagic Fever	-	25	Diabetes Mellitus	466	21

-: No data available

Source: Quezon City CLUP, 2010

Table 6.4.40 Morbidity and Mortality Cases in Pasig City

Morbidity			Mortality		
Causes	Number	Ratio (cases/100,000 people)	Causes	Number	Ratio (cases/100,000 people)
Acute Upper Respiratory Tract Infection	60,320	10,375	Acute Myocardial Infarction (AMI)	532	92.0
Acute Gastroenteritis (AGE)	6,648	1,143	Hypertensive Vascular Disease (HCVD)	462	79.4
Bronchitis <15 years old	5,789	-	Pneumonia	355	61.0
Acute Tonsillo Pharyngitis (ATP)	4,745	816	Cancer	337	57.9
Hypertension	4,708	810	Pulmonary Tuberculosis	287	49.36
Systemic Viral Infection	3,673	632	Diabetes Mellitus (DM)	225	38.7
Animal Bite	3,625	624	Accidents	127	21.8
Pneumonia	2,792	480	Septicemia	108	18.5
Urinary Tract Infection	2,470	425	Acute Renal Failure	72	12.3
Influenza	2,352	405	Liver Cirrhosis	59	10.1

-: No data available

Source: Pasig City CLUP, 2009

Table 6.4.41 Morbidity and Mortality Cases in Marikina City

Morbidity			Mortality		
Causes	Number	Ratio (cases/1,000 people)	Causes	Number	Ratio (cases/1,000 people)
Pneumonia	5,771	14.5	Cardiovascular Disease	210	0.53
Diarrhea	3,183	8.0	Pneumonia	199	0.50
Hypertension	3,071	7.7	Hypertension	148	0.37
Influenza	1,725	0.4	Cancer	120	0.30
Bronchitis	1,385	3.5	PTB	85	0.21
Skin Disease	1,229	3.0	Fetal Death	49	0.12
PTB	975	2.5	Neonatal Death	58	0.15
Dog bite	571	1.4	Kidney Diseases	34	0.08
Intestinal Parasitism	612	1.5	Heart Diseases	27	0.07
Static Asthmatic	362	0.9	Diabetes	35	0.09

Source: Marikina City CLUP, 2000

a. Sexual Transmitted Diseases including HIV/AIDS

According to the World Health Organization (2013), Sexually Transmitted Diseases (STD) are transmitted mainly through sexual contact including skin-to-skin sexual contact, through pregnancy, etc. STDs are caused by more than 30 different viruses, parasites and bacteria. Currently, only four identified infections have cure such as syphilis, gonorrhea, chlamydia and trichomoniasis.

Table 6.4.42 summarizes the cases of STD in the Philippines per type of infection in 2013. A person infected with STD usually increases the risk of acquiring of HIV by three-fold or more. Unfortunately, in the Philippines, monitoring on the cases of STDs is weak and the data available is still on nationwide level. The types of infections being monitored in the Philippines are Gonorrhea, Non Gonococcal Infection, Trichomoniasis, Syphilis, Bacterial Vaginosis, Warts and Herpes where about 28,379 cases were reported.

Table 6.4.42 STD Cases in the Philippines (2013)

Sexually Transmitted Diseases (STDs)	Total Tested	Total Cases	Total Treated
Gonorrhea	155,701	2,436	38,095
Non Gonococcal Infection	109,040	17,924	
Trichomoniasis	142,692	811	
Syphilis	29,697	223	
Bacterial Vaginosis	147,628	6,551	
Warts	-	373	
Herpes	-	61	
Total	584,758	28,379	

Note) -: No available data for the number of treated of each infection
Source: DOH, 2014

Table 6.4.43 to 6.4.45 presents the summary of the occurrences of HIV/AIDS in the four localities of the project area. According to the Department of Health (DOH) – National Epidemiology Center (2014), from 1984 to 2014, the National Capital Region (NCR) has been recorded with 9,470 HIV and AIDS (including asymptomatic) cases where 1,853 of infected individuals was recorded from January to September 2014.

A total of 2,204 individuals, or 23.27% of the total case in NCR are accounted in Quezon City. The highest occurrence of the case are found in people within age group of 25-34 years old (52.45%) and 15-24 years old (25.16%) while most of the affected people are male (96.50%).

Pasig City account for 620 individuals, or 6.55% of the total number of cases in NCR. Out of which, 52.26% of the cases occur between the age group of 25-34 years old and 29.03% from the age group of 15-24 years old. The male population dominates the figure with about 97.10%.

In Marikina City, 331 individuals, or 3.50% of the total number of cases in NCR are recorded since 1984. Similar to the other two cities, number of infected male population are higher (95.17%) compared to female population (4.83%). It was also found that the highest contributor of the cases came from the population with the age group of 25-34 years old (55.89%) and 15-24 years old (29.31%).

Table 6.4.43 Occurrence of HIV/AIDS by City in Phase IV Area

Local Government Unit (LGU)	HIV/AIDS Cases							
	2014 (January to September)				1984 to Present			
	AIDS	Asymptomatic	Total cases	Percent Share (%)	AIDS	Asymptomatic	Total cases	Percent Share (%)
NCR	149	1,704	1,853	-	703	8,767	9,470	-
Quezon City	41	390	431	23.26	156	2,048	2,204*	23.27
Pasig City	4	144	148	7.99	29	591	620	6.55
Marikina City	8	63	71	3.78	25	306	331	3.50

Note) *: This figure is not harmonized among the tables in the original data source.
Source: Department of Health (DOH), 2014

Table 6.4.44 Gender Distribution with HIV/AIDS Infection

LGU	2014 (January to September)						1984 to Present					
	Male		Female		Total		Male		Female		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Quezon City	426	98.84	5	1.16	431	100	2,126	96.50	77	3.50	2,203*	100
Pasig City	145	97.97	3	2.03	148	100	602	97.10	18	2.90	620	100
Marikina City	69	97.18	2	2.82	71	100	315	95.17	16	4.83	331	100

Note) *: This figure is not harmonized among the tables in the original data source.
Source: Department of Health (DOH), 2014

Table 6.4.45 HIV/AIDS Cases per Age Group, 1984-Present

Age Group	Quezon City		Pasig City		Marikina City	
	No.	%	No.	%	No.	%
<15	4	0.18	1	0.16	0	0.00
15-24	554	25.16	180	29.03	97	29.31
25-34	1,155	52.45	324	52.26	185	55.89
35-49	421	19.12	105	16.94	45	13.60
50 & older	68	3.01	10	1.61	4	1.21
Total	2,202*	100.00	620	100.00	331	100.00

Note) *: This figure is not harmonized among the tables in the original data source.
Source: Department of Health (DOH), 2014

(2) Evaluation of Updated Baseline Condition

Discussion on public health in the EIS (1998) was made only on mortality. The leading causes at that time include pneumonia, cancer and vascular disease. In this survey, morbidity was also surveyed. In addition, status of sexually transmitted diseases (STD) including HIV/AIDS is surveyed as well. These information and data can be used as the basis for impact assessment of social components.

6.4.12 Gender, Vulnerable People and Rights of Children

(1) Current Status

a. General Situation in the Whole Country

Gender Features: The Philippines ratified the Committee on the Elimination of Discrimination against Women (CEDAW) in 1980. The Philippine Constitution of 1987 stipulates that the State recognizes the role of women in nation-building and shall ensure the fundamental equality before the law of women and men. The Philippines is one of the countries that the gender related index is high in Southeast Asian nations. For instance, the Gender Empowerment Index (GEM) of the Philippines is ranked 45th in the 177 countries, whereas the Human Development Index (HDI) is still 90th of the world. The women exceed the man in several indexes such as the projected life expectancy at birth and basic literacy rate.

Though the gender index is averagely excellent in the entire country, the situation of gender consciousness and the status of women are totally different between income classes. The women in the upper-income class tend to free from the women's traditional roles, whereas the women in the low-income class tend to engage in the women's traditional roles such as housework and child care. Moreover, recently the proportion of women of Overseas Filipino Workers (OFWs) is increasing that account for about half of them. This means that women's role is shifting from a traditional housewife to income provider to support their family. Many OFW women were

reported to suffer the difficulty like a psychological stress that they have to work abroad for many years without their family or human-rights abuse in the workplace.

Vulnerable People: Medium-Term Philippine Development Plan 2004-2010 cites a growing number of vulnerable groups in the country who are continuously threatened and marginalized by social, economic and environmental pressures as well as by natural disasters and economic shocks. Social vulnerable groups include women in especially difficult circumstances, children in need of social protection, disadvantaged youth, persons with disabilities, older persons, workers in the informal sector, indigenous peoples and upland settlers, dysfunctional families, victims of disasters and calamities, landless farmers/rural workers/farm workers, etc. However, there are no accurate statistical data of them, the Department of Health (DOH) in its National Objectives for Health Philippines 2005-2010, enumerated some of the vulnerable population groups in the Philippines using the defining characteristics of age, sex, ethnicity and location. It can be found that there are a large number of children (>20 million) and woman (> 23 million) who are vulnerable. Moreover, socially vulnerable groups are the population groups more vulnerable to disease because of one or a combination of factors other than poverty: stage of physiologic development, socio-cultural behavioral patterns and lack of access to mainstream health services.

Issues of Children: The continuation of a high level of poverty and lack of access to quality education tend to perpetuate the problem of child labor in the Philippines in hazardous types of employment. Many of these children work in conditions that are extremely unfavorable to their development and detrimental to their health. Out of 24.9 million of children population, four million (16.2%) of these children were economically active in October 2001. Of which, more than two-thirds (69.8%) of the working children were found in the rural areas (Website of ILO-SEAPAT (South-East Asia and the Pacific Multidisciplinary Advisory Team)).

a. Results of Interview with Local People

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that 29.5% of respondents (among 399 nos. in total) are woman-headed households in the surveyed area. Among the surveyed barangays Santolan and Jesus Dela Peña accounted for relatively high percentage (more than 36%) of woman-headed households. The survey results also indicated that 5.5% of respondents answered there are such social issues as gender discrimination, child abuse in the survey area (Ref. ANNEX-4).

(2) Evaluation of Updated Baseline Condition

Discussions on social issues within Project area are not included in the EIS (1998). In this survey, gender features, vulnerable people and issues of children were surveyed, and the current status was clarified. These information and data can be used as the basis for impact assessment of social components.

6.4.13 Ethnic Minority and Indigenous People

(1) Current Status

a. Information on Ethnicity

Population by ethnicity in the cities of Marikina, Pasig and Quezon is presented in Table 6.4.46. Available information on ethnicity is varied among the three cities: Marikina City provides more detail information while both Pasig and Quezon City provides only limited one as shown in the table.

Tagalog is the dominant ethnicity, accounting for 65.36% (Quezon City), 71.39% (Marikina City) and 74.94% (Pasig City) of the population in each LGU. Among the other ethnicities having relatively large percentage include the Bicolano, Bisaya/Binisaya, and Ilocano. These account for 2 to 7 % in each city.

Metro Manila is a part of the Tagalog Region of Southern Luzon, and the three cities are therefore part of this original ethnic group. Non-Tagalog populations are considered immigrants that have

assimilated to the dominant ethnicity, but retain some or all of their original culture, as well as the ability to speak their original language.

Table 6.4.46 Population by Ethnicity in Pasig, Marikina and Quezon City

Ethnicity	Marikina City (2000)		Pasig City (2000)		Quezon City (2000)	
	Total	Ratio (%)	Total	Ratio (%)	Total	Ratio (%)
Tagalog	278,266	71.39	377,471	74.94	1,415,874	65.36
Ilocano	15,289	3.92	13,668	2.71	112,258	5.18
Cebuano	7,603	1.95	-	-	68,573	3.17
Bicolano	26,392	6.77	24,678	4.90	108,293	5.00
Bisaya / Binisaya	15,779	4.05	20,077	3.99	94,225	4.35
Ilonggo	9,668	2.48	12,891	2.56	-	-
Kapampangan	4,756	1.22	-	-	-	-
Waray	9,175	2.35	-	-	-	-
Pangasinan	6,470	1.66	-	-	-	-
Masbateño	2,823	0.72	-	-	-	-
Others*	9,576	2.48	46,837	9.30	279,098	12.88
Foreign	102	0.03	1,419	0.28	-	-
Not reported	3,865	0.99	6,709	1.33	87,999	4.06
Total	389,764	100	503,680	100	2,166,320	100

Note) -: No available data.

*: Others in Pasig and Quezon City include data regarding other ethnicities presented in the table (such as Ilonggo, Kapampangan, etc.)

Source: National Statistics Office (NSO), 2000

b. Indigenous People

Regarding the Indigenous Peoples (IPs), the National Commission on Indigenous Peoples (NCIP) does not provide information regarding IPs residing within Metro Manila and in particular the three cities bound by the Project, Phase IV. Thus, no accounts of IPs representing the original inhabitants among the three cities have been recorded. In addition, no ancestral domains exist in any of the cities of Pasig, Marikina and Quezon according to NCIP.

c. Result of Interview with Local People

Results of perception survey conducted in the course of this environmental survey along the Marikina River in Oct. 2014 indicate that 76.4 % of respondents answered Tagalog as their original ethnicity, followed by Bisaya (6.0%), Bicolano (5.8%), and Ilocano (4.0%) (Ref. ANNEX-4).

(2) Evaluation of Updated Baseline Condition

Information with regards to ethnicity and IPs were not presented or discussed in the EIS (1998). The survey results clarified that there is no ethnic minority or indigenous people (IPs) in the Project, Phase IV area. No ancestral domain areas are located in the Project area, either.

Under the new PEISS, the documentation of IPs is required for a project located in the areas of ancestral domain determined by the NCIP. This documentation together with the whole the EIS will be provided to the NCIP for review and consideration prior to the issuance of Free Prior Informed Consent (FPIC) document. No specific conditions are required in the documentation of IPs, on the contrary, in case that a project is located outside the ancestral domain areas. Since no ancestral domains exist in any of the cities of Pasig, Marikina and Quezon, the Project, Phase IV is exempted from this condition.

6.4.14 Perception of Local People for PMRCIP

(1) Method of the Perception Survey

An interview survey was conducted using questionnaire with local residents living along the Marikina River which often generates flood disaster. The target areas of the interview survey were the barangays which experienced the flood during Tropical Storm Ondoy in September 2009 located along the Middle and Upper Marikina River, which are the sections of the Project, Phase IV and V, respectively. The details of the survey method are presented in ANNEX-4.

The number of interviewee, or respondents, was 399, which originally planned at 400 but there was one missing case because of the incomplete/inadequate answer form the one respondent. Table 6.4.47 shows the number of respondents by barangay and Project phase.

Table 6.4.47 Number of the Respondents by Barangay and by Project Phase

No.	Surveyed Area		No. of Respondents	
	Barangay	City/ Municipality	By Barangay	By Project Phase
No.1	Banaba	Municipality of San Mateo	30	Phase V: 229
No.2	Nangka	Marikina City	19	
No.3	Tumana		60	
No.4	Malanday		120	
No.5	Tañon		20	
No.6	Jesus De La Peña		30	Phase IV: 170
No.7	Santolan	Pasig City	100	
No.8	Bagumbayan	Quezon City	20	
Total	-	-	399*	399*

Note) *: Intending the total respondents as 400 at the beginning of the survey.

(2) Results of the Survey

Among the results of the survey, the perception for the Project is summarized as follows. The details of the whole survey are presented in ANNEX-4.

a. Awareness of the Project

About 44% of respondents are aware of the Project composed of “Aware” and “Slightly Aware” of the Project while more than half (52.9%) are “Not Aware” of the Project. Among the Phase IV and V areas, the ratio of awareness is slightly higher in Phase V area.

Table 6.4.48 Awareness of the Project

Awareness of PMRCIP	Phase IV	%	Phase V	%	Total	%
Aware	53	31.2	89	38.9	142	35.6
Slightly Aware	15	8.8	18	7.9	33	8.3
Not Aware	92	54.1	119	52.0	211	52.9
No Response	10	5.9	3	1.3	13	3.3
TOTAL	170	100.0	229	100.0	399	100.0

b. Source of Information about the Project

As a source of information about the Project, Government/Barangay Officials and Radio/ TV/ Newspaper are equally dominant (53.1% each) in total, followed by Neighbors/Relatives (33.1%), and Barangay Meetings/Consultation (12.6%). Among the Phase IV and V areas, the ratios of Government/Barangay Officials and Neighbors/Relatives are higher in Phase IV area while the ratio of Radio/ TV/ Newspaper is higher in Phase V area.

Table 6.4.49 Source of Information about the Project

Source of Information about Project	Phase IV	%*	Phase V	%*	Total	%*
Government/Barangay Officials	39	57.4	54	50.5	93	53.1
Neighbors/Relatives	27	39.7	31	29.0	58	33.1
DPWH Officials	1	1.5	8	7.5	9	5.1
Radio/TV/Newspapers	33	48.5	60	56.1	93	53.1
Barangay meetings/consultation	7	10.3	15	14.0	22	12.6
Surveys and research	4	5.9	17	15.9	21	12.0
Bulletin Boards/Poster/Flyer	0	0.0	2	1.9	2	1.1
Others	1	1.5	0	0.0	1	0.6
No Response	3	4.4	2	1.9	5	2.9
TOTAL	115	-	189	-	304	-

Note) *: Percentage reflects the ones divided by the number of respondents who answered “Aware” or “Slightly Aware” of the Project in the previous question.

c. Perception on Positive or Negative Effects of the Project

Regarding perception on the positive effect of the Project, Less Flooding is the most (49.4%) in total, followed by Progress in the City (39.3%), and Clearer Surroundings (32.3%). Among the Phase IV and V areas, Progress in the City is much higher in Phase V.

Table 6.4.50 Positive Effects of the Project

Positive Effects of PMRCIP	Phase IV	%*	Phase V	%*	Total	%*
Creation of jobs and livelihood opportunities	5	2.9	16	7.0	21	5.3
Progress in the city	55	32.4	102	44.5	157	39.3
Opportunities for local vendors and businesses	32	18.8	38	16.6	70	17.5
Less flooding in our area	82	48.2	115	50.2	197	49.4
Cleaner surroundings	55	32.4	74	32.3	129	32.3
Improved river water quality	28	16.5	49	21.4	77	19.3
Better aesthetics around the river	14	8.2	21	9.2	35	8.8
I don't know	21	12.4	35	15.3	56	14.0
No Response	15	8.8	11	4.8	26	6.5
TOTAL	307	-	461	-	768	-

Note) *: Percentage reflects the ones divided by the number of respondents in Phase IV (170), Phase V (229) or the total (399).

Regarding the negative effect of the Project, on the other hand, Loss of Property is dominant (55.1%) in total, followed by Loss of Plants/ Natural Habitat (15.8%) and Loss of Jobs or Livelihood (10.0%). Among the Phase IV and V areas, Percentages of environment related items such as Loss of Plants/ Natural Habitat, Water Pollution and Air Pollution are higher in Phase V, supposedly because nature is much remained along the Phase V Section and the local residents are more conscious about the environmental conservation.

Table 6.4.51 Negative Effects of the Project

Negative Effects of PMRCIP	Phase IV	%	Phase V	%	Total	%*
Loss of property	91	53.5	129	56.3	220	55.1
Air pollution	5	2.9	18	7.9	23	5.8
Water pollution	4	2.4	22	9.6	26	6.5
Loss of plants/ natural habitats	15	8.8	48	21.0	63	15.8
Increase in traffic congestion	4	2.4	15	6.6	19	4.8

Negative Effects of PMRCIP	Phase IV	%	Phase V	%	Total	%*
Loss of jobs or livelihood	15	8.8	25	10.9	40	10.0
Noise pollution	0	0.0	1	0.4	1	0.3
I don't know	29	17.1	41	17.9	70	17.5
Others	3	1.8	0	0.0	3	0.8
No Response	37	21.8	38	16.6	75	18.8
TOTAL	203	-	337	-	540	-

Note) *: Percentage reflects the ones divided by the number of respondents in Phase IV (170), Phase V (229) or the total (399).

d. Benefits of the Project to the Community

Regarding perception on the benefits of the Project to the community, Lessen Flood Incidents and Impacts is the most (24.8%) in total, followed by Improve the River Flow (19.3%) and Project will Benefit Everybody (10.5%). Among the Phase IV and V areas, Lessen Flood Incidents and Impacts is much higher in Phase IV area while Project will Benefit Everybody is much higher in Phase V area.

Table 6.4.52 Benefits of the Project to the Community

How can the Project help the LGU and its Residents	Phase IV	%	Phase V	%	Total	%
Improve flow of River / Widening the channel / Increasing the Depth of the River	32	18.8	45	19.7	77	19.3
Lessen Flood Incidents and Impacts	56	32.9	43	18.8	99	24.8
Resettle People living along the River	11	6.5	18	7.9	29	7.3
Increase Business Opportunities	1	0.6	7	3.1	8	2.0
Improve Transportation	2	1.2	0	0.0	2	0.5
Improve Drainage	9	5.3	12	5.2	21	5.3
Coordinate with Barangay	4	2.4	0	0.0	4	1.0
Project will benefit everybody	5	2.9	37	16.2	42	10.5
Use of River for Recreational purposes	1	0.6	2	0.9	3	0.8
Clean Surroundings	7	4.1	12	5.2	19	4.8
Provide Information on Floods, impacts and warning signs	6	3.5	0	0.0	6	1.5
Livelihood Projects	7	4.1	1	0.4	8	2.0
I don't know	10	5.9	39	17.0	49	12.3
No Response	19	11.2	13	5.7	32	8.0
TOTAL	170	100.0	229	100.0	399	100.0

e. If Supporting for the Project

Most of respondents (78.2%) presented Supporting for the Project, while 17.3% answered Not Supporting for the Project. Among the Phase IV and V areas, the ratio for Supporting for the Project is slightly higher in Phase V but at the same time, the ratio of Not Supporting for the Project is also slightly higher in Phase V.

Table 6.4.53 If Support for the Project

Support for the Project	Phase IV	%	Phase V	%	Total	%
Yes	130	76.5	182	79.5	312	78.2
No	28	16.5	41	17.9	69	17.3
Neutral	10	5.9	4	1.7	14	3.5
No Response	2	1.2	2	0.9	4	1.0
TOTAL	170	100.0	229	100.0	399	100.0

c. Reason for Supporting / Non-supporting for the Project

As the reason for supporting for the Project, Resolve Flooding Issue is the most (79.8%) in total, followed by Improve Civil Facilities along the River (34.6%), and Pollution will be Reduced in the Area (34.3%). Among the Phase IV and V areas, the ratio for Pollution will be Reduced, Improve Civil Facilities and Encourage Business and Jobs are slightly higher in Phase IV.

Table 6.4.54 Reason for Supporting for the Project

Reason for Supporting the Project	Phase IV	%	Phase V	%	Total	%
Resolve flooding Issue	104	80.0	145	79.7	249	79.8
Improve civil facilities (roads, walkways) along the river	47	36.2	61	33.5	108	34.6
Encourage business and jobs in the area	20	15.4	21	11.5	41	13.1
Pollution will be reduced in the river	48	36.9	59	32.4	107	34.3
Others	1	0.8	6	3.3	7	2.2
No Response	1	0.8	2	1.1	3	1.0
TOTAL	221	-	294	-	515	-

Note) *: Percentage reflects the ones divided by the number of respondents who answered “Yes” in the previous question.

As the reason for not supporting for the Project, Loss of Property of PAPs is the most (36.2%) in total, followed by Loss of Jobs/ Livelihood Problems for PAPs (18.8%) and Necessity of Resettlement (11.6%). Among the Phase IV and V areas, the ratio of Loss of Jobs/ Livelihood Problems for PAPs is much higher in Phases IV while Loss of Property of PAPs and Necessity of Resettlement are much higher in Phase V.

Table 6.4.55 Reason for Not Supporting for the Project

Reason for not supporting the project	Phase IV	%	Phase V	%	Total	%
It would necessitate resettlement of the people living near the river	1	3.6	7	17.1	8	11.6
It would cause loss of property of PAPs	6	21.4	19	46.3	25	36.2
It would cause loss of jobs/livelihood problems to PAPs	8	28.6	5	12.2	13	18.8
It would cause environmental problems such as pollution, loss of vegetation, traffic congestion etc.	3	10.7	3	7.3	6	8.7
I do not agree with this project/construction of flood control structure to mitigate flooding	1	3.6	2	4.9	3	4.3
Others	1	3.6	0	0.0	1	1.4
No response	8	28.6	5	12.2	13	18.8
TOTAL	28	100.0	41	100.0	69	100.0

(3) Evaluation of the Survey Result

Perception survey through interview with local residents along the Pasig-Marikina River was conducted in the EIA Study in 1998. Table 6.4.56 presents the comparison between the survey in 1998 and this perception survey (2014).

Awareness of the Project was only 30% in 1998 while 44% in 2014, but the percentage has not always increased enough for these 16 years. Regarding the information source for the Project, the ratio of media has increased a lot in 2014. Position for the Project is similar between 1998 and 2014. The reasons for supporting and not supporting the Project show similar ones although the ratios of each answer are not always proportional.

Table 6.4.56 Comparison on Perception for the Project between EIA Study (1998) and the Review Study (2014)

Topic/ Question	EIA Study (1998) (no. of respondents = 103)	Review Study (2014) (no. of respondents = 399)
Awareness of the Project	30%	43.9%
Source of information about the Project*	Local government: 59% Informal sources: 24% National government: 14%	Government/ Barangay official: 53.1% Media: 53.1% Neighbors/Relatives: 33.1%
Position for the Project	For the Project: 83% Against the Project: 17%	Support the Project: 78.2% Not support the Project: 17.3%
Reason for supporting the Project*	Improve living condition: 67% Flood reduction: 21% Risk reduction: 4%	Resolve the flood issue: 79.8% Improve civil facilities: 34.6% Reduction of the pollution: 34.3%
Reason for not supporting the Project	Easement provision (loss of property): 100%	Loss of property: 36.2% Loss of job/ livelihood: 18.8% Necessity of resettlement: 11.6%

Note) *: Number of respondents in the Review Study (2014) reflects the plural answers.

Source: EIS (1998) and the Review Study (2014)

CHAPTER 7 POTENTIAL IMPACTS WITHOUT MITIGATION

7.1 Potential Negative Impacts without Mitigations

7.1.1 Physio-chemical Environment (Pollution)

(1) Air Quality

Potential impacts on the air quality of the Project are as follows:

- Air pollution to be caused by dust (TSP) during the construction works, and
- Air pollution to be caused by emission gas from the heavy equipment and vehicles during construction works.

These impacts are inevitable as long as the construction works are implemented although the impacts will be brought about only during construction stage. During operation stage, there will be no source of air pollution from the flood control structures to be constructed in the Project. The impacts are described in more detail below:

1) Air pollution to be caused by dust (TSP) during the construction works

Dust (TSP) pollution will be generated during the construction works of flood control structure such as dike, revetment, etc., demolition of existing structures, earth works (excavation and reclamation), and transportation of construction and spoil materials. This impact will happen in the vicinity of these activities along most of the river stretch of the Phase IV in dry season. It will cause public nuisance in residential areas including Barangay Santolan, Tañong and Jesus De La Peña, in particular. But the period of the impact will be limited in the only time of construction works at respective locations.

2) Air pollution to be caused by emission gas from the heavy equipment and vehicles

During the construction works, heavy equipment and transportation vehicles including Backhoe, Bulldozer, Crawler Crane, Dump Truck, etc. will generate emission gases including SO₂, NO₂ and CO, and so on, which may adversely affect the health condition of local residents. However, the impact will not occur simultaneously at every construction site but intermittently along with the progress of the construction works.

(2) River Water Quality

Potential impacts on the river water quality of the Project are as follows:

- River water pollution in the Middle Marikina River due to the construction works in and along the river,
- River water pollution due to the waste water from construction work sites, contractor base camp, construction yards, offices, etc.,
- Increase of water pollution in Manggahan Floodway and in the vicinity of outlet of the Floodway in the Laguna de Bay due to the increased flood discharge during construction period of MCGS.

1) River water pollution due to construction works

Water pollution by re-suspension of sediments and release of sediment pollutants in the Middle Marikina River will be caused by construction works in the river and along the river side, including excavation/dredging and construction of flood control structures. These activities will increase turbidity and TSS of the river water. This impact may cause an increase of BOD and reduction of DO, which may affect the habitat of aquatic biota. This impact, however, will be limited in the immediate downstream of the construction activity and will be diminished as the river flow goes downstream stretch.

2) River water pollution due to waste water drainage from construction work sites

River water pollution due to waste water drainage from construction work sites is another potential negative impact on the water quality of the Middle Marikina River. Potential sources of this impact includes waste water (effluent) generated from the contractor base camp, construction yards and offices. As potential sources of water pollution, oil and other chemicals might be included in case of accidental spillage or during the piling works.

Regarding the hazardous liquid wastes including oil, chemicals, solvents, etc., in case of being used and generated, these wastes are supposed to be temporarily stocked under the strict management. However, they can become potential pollution source unless appropriate management is provided.

3) Increase of water pollution in Manggahan Floodway and in the Laguna de Bay

During construction period of MCGS, a diversion channel will be constructed for draining the river water traversing the construction site of MCGS. The capacity of diversion channel, however, is not always enough to drain all the flood water to downstream river stretch. It is, therefore, the flood water will be drained through Rosario Weir to the Laguna de Bay via Manggahan Floodway while flooding. This situation is basically the same under the current system, but the frequency will increase since the discharge capacity of the diversion channel is less than the river channel.

Potential impact of water pollution in the Manggahan Floodway and the area in the vicinity of outlet of Manggahan Floodway in the Laguna de Bay is not significant because the situation is similar to present one as described above.

(3) Solid Wastes

Potential impacts of solid wastes to be generated in the Project are as follows:

- Garbage and construction wastes including plastics, woods and debris, etc. to be generated from the contractor base camp, offices, and construction sites, and
- Dredged/ excavated materials from the river channel and river banks.

1) Garbage and construction wastes to be generated in the Project sites

Garbage and construction waste shall be appropriately gathered, treated and disposed based on the proper water collection and disposal system in the Philippines following RA 9003 and RA 6969. If the necessary treatment and disposal procedures are not followed by the Project, the adverse impacts such as littering, aesthetic degradation, environmental contamination, increase of health risks, etc. would occur.

2) Dredged/ excavated materials from the river channel and river banks

In the implementation of the Phase IV, approximately 1.67 million of dredged/ excavated materials will be generated. They shall be monitored its chemical quality if the toxic substances will be leaching out during dredging/ excavation and/or after disposal. The results of chemical analysis in this survey showed that there will be no possibility of such contamination of toxic substances, as a preliminary investigation based on the limited location of the analysis. Accordingly, it will be analyzed in Detail Design stage in more detailed analysis.

(4) Soil Contamination/ Riverbed Sediment Contamination

The Project includes excavation/ dredging of riverbed sediment in the Middle Marikina River channel as project activity. Due to this intervention, following potential impacts would occur:

- Contamination of river water and riverbed sediment due to excavation/ dredging work,
- Soil and/or groundwater contamination at around the disposal site of the excavated /dredged materials.

1) Contamination of river water and riverbed sediment

The results of sediment quality analysis (elutriate test) conducted in this environmental survey suggests no risk of contamination of river water and riverbed sediment due to leaching out of toxic substances and/or re-suspension of them. However, it cannot be totally denied the possibility of the river water or riverbed sediment contamination because the sediment analysis in the survey is applied only for limited locations.

2) Soil and groundwater contamination at around the disposal site

According to the TCLP test results, the riverbed sediment is categorized as non-hazardous materials which can be utilized as the reclamation and/or backfill materials. Thus, it is predicted that no contamination of soil or groundwater will occur at around the disposal site due to dumping the excavated/ dredged materials. However, according to the same reason above, it cannot be totally denied the possibility of the soil and groundwater contamination at around the disposal site because the sediment analysis in the survey is applied only for limited locations.

(5) Noise and Vibration

a. Noise

Potential impact of the Project is the generation of noise associated with the construction works using heavy equipment and transportation of construction and spoil materials. The increase of noise will cause nuisance to the local residents living near the construction work sites, particularly to schools, hospitals/medical clinics and religious places which need to be silencequiet. As the same case as air pollution, this impact is inevitable as long as the construction works are implemented although the impacts will be brought about only during construction stage. During operation stage, there will be no source of noise pollution.

Noise level from the heavy equipment was calculated using the mathematical model, theoretical propagation equation from point noise source:

$$L_n = PWL - 20 \log_{10} X - 8 - \alpha_d$$

Where L_n : Noise level at the distance of X meter (dBA)

PWL: Power Level of the noise source (dBA)

X: Distance between noise source and receiver (m), and

$-\alpha_d$: Noise level decrease due to diffraction (dBA)

(α_d was not considered because of safety side prediction)

Table below shows the projected noise level from the individual equipment and vehicles which are estimated to be used for construction works. Based on the results, it is predicted that the noise from heavy equipment may reach up to 60 m with the magnitude of 70 dBA (similar noise level to that inside a shopping mall) at the highest.

Table 7.1.1 Projection Noise Level from Individual Equipment and Vehicle

Unit: dBA

No.	Heavy equipment / vehicles*	Power level** (dBA)	Distance (m)							
			10	20	30	40	50	60	80	100
1	Backhoe	104	76.0	70.0	66.5	64.0	62.0	60.4	57.9	56.0
2	Bulldozer	111	83.0	77.0	73.5	71.0	69.0	67.4	64.9	63.0
3	Crawler Crane	110	82.0	76.0	72.5	70.0	68.0	66.4	63.9	62.0
4	Pile Vibratory Hammer	115	87.0	81.0	77.5	75.0	73.0	71.4	68.9	67.0
5	Dump Truck	102	74.0	68.0	64.5	62.0	60.0	58.4	55.9	54.0

Note) *: Representative equipment and vehicles estimated to be used in the construction work,

** : Data Source; Handbook of mitigation measures for noise and vibration from construction works, 2001.

Source: This survey of the Project Phase IV, 2014

Since the noise from a point source can be exponentially decremented as the distance increases from the source. If the distance between the operating heavy equipment and the recipient is more

than 60 m, the impacts can be tolerable in case of Pile Vibratory Hammer. But the distance is less than 20 m, the noise pollution would become intolerable as the period of exposure continues.

Consequently, it is predicted that the noise pollution from the heavy equipment and vehicles during the construction stage may cause significant nuisance in the vicinity of the construction work if it continues for long time (if exposure to noise continues).

b. Vibration

Same as the noise level, projection of vibration level was done based on the data of vibration level from heavy equipment and vehicles to be used for the construction works of the Project. Vibration level from the equipment was calculated using mathematical model, theoretical propagation equation from point vibration source:

$$L_x = L_0 - 8.7 \lambda (r - r_0) - 20 \log_{10} (r/r_0)^n$$

- Where L_x : Vibration at the distance of r meter (dB)
- L_0 : Vibration level at the distance of r_0 meter (dB),
- λ : Internal vibration constant of the ground (m), $\lambda = 0.037$ (for unconsolidated ground), and 0.003 (for consolidated ground),
- n: A constant depending on vibration wave (in case of wave, $n = 0.5$)

In case of this Project, the project site is unconsolidated ground, and therefore, 0.037 was applied for internal vibration constant of the ground (λ).

Table below shows the projected vibration level from the individual equipment and vehicle which are estimated to be used for construction works. Based on the results, it is predicted that the vibration from heavy equipment (Pile Vibratory Hammer) may reach up to 50 m with the magnitude of 60 dBA (similar vibration level at which everybody starts to perceive ground swaying) at the highest.

Table 7.1.2 Projection of Vibration Level from Individual Equipment and Vehicle

Unit: dBA

No.	Heavy equipment / vehicles*	Power level**(dBA) / reference point (m)	Distance (m)							
			10	20	30	40	50	60	80	100
1	Backhoe	70 / 5.0	65.4	59.2	54.2	49.7	45.5	41.5	33.8	26.4
2	Bulldozer	65 / 5.0	60.4	54.2	49.2	44.7	40.5	36.5	28.8	21.4
3	Crawler Crane	45 / 7.0	42.5	36.3	31.3	26.8	22.6	18.6	10.9	3.5
4	Pile Vibratory Hammer	85 / 7.0	82.5	76.3	71.3	66.8	62.6	58.6	50.9	43.5
5	Dump Truck	56 / 7.0	53.5	47.3	42.3	37.8	33.6	29.6	21.9	14.5

Note) *: Representative equipment and vehicles estimated to be used in the construction work,
 **: Data Source; Handbook of mitigation measures for noise and vibration from construction works, 2001.

Source: This survey of the Project Phase IV, 2014

Since the vibration from a point source can be exponentially decremented as the distance increases from the source. If the distance between the operating heavy equipment and the impact recipient is more than 50 m, the impacts can be tolerable in case of Pile Vibratory Hammer. But the distance is less than 20 m, the vibration would become intolerable as the period of exposure continues.

Consequently, it is predicted that the vibration from the heavy equipment during the construction works may cause significant nuisance in the vicinity of the construction work if it continues for long time (if exposure to vibration continues).

(6) Land Subsidence

Project Phase IV area is located in the area of “zero subsidence potential” according to a preliminary assessment of land subsidence potential undertaken between 2003 and 2006 for Metro Manila and nearby areas (Philippine Science Letters, 2014).

In the Project, large amount of pumping of groundwater, deep excavation work for pit, or tunneling work is not included in the process of its construction works for flood control structures. No land subsidence, therefore, is anticipated during both construction and operation stage.

(7) Offensive Odor

The Project includes excavation/ dredging of riverbed sediment in the Middle Marikina River channel as project activity. Due to this intervention, following potential impacts would occur:

- Generation of offensive odor during construction works, especially excavation/ dredging operation in the river, and
- Generation of offensive odor during drying excavated/ dredged materials in staging area and/or dumping the excavated/ dredged materials in the disposal site.

Based on results of baseline condition, it was indicated that there observed several sources of offensive odor such as wastes, and garbage accumulated in the river and at the river banks. Due to the operations of excavation and dredging in the river, there will be a possibility to generate offensive odor to the surrounding areas.

The generation of offensive odor is also anticipated when the excavated/ dredged materials are dried in the staging area and while dumping them in the disposal site.

The magnitude of the impacts is estimated to be relatively large during the operation of excavation/ dredging than the time of drying in the staging area or dumping in the disposal site. It is because offensive odor is relatively less as the source materials of foul smell become dry in general. These impacts or modifications mentioned are imperative to some extent as long as excavation/ dredging works are implemented. Potential impact of offensive odor, however, is limited to a certain period only for these activities. Thus, the impacts are evaluated as not significant.

(8) Riverbed Sediment

As discussed in (4) Soil Contamination/ Riverbed Sediment Contamination, the results of sediment quality analysis (elutriate test) suggests no risk of contamination of river water and riverbed sediment due to leaching out of toxic substances and/or re-suspension of them. However, it cannot be totally denied the possibility of riverbed sediment contamination because the sediment analysis in the survey is applied only for limited locations, and it requires more data for totally denying its possibility.

7.1.2 Natural Environment

(1) Pedology, Topography and Geological Features/ Erosion

Impact sources on pedology, topography, geology and soil erosion due to the implementation of the Project include the following:

- Clearing of vegetation for the construction of flood control structures,
- Excavation and dredging operations in the river and embankment for construction of flood control structures, and
- Temporary stock of construction/backfilling materials in the construction yard.

All these impact source activities are those to occur during construction stage, but the locations of these sources are limited to within the river area. These are also limited to a certain period only at earth works during construction stage. Thus, the potential impacts are predicted not to be adversely affected to the surrounding areas out of the project site and evaluated to be minimal.

(2) Groundwater

In the Project, pumping of large volume of groundwater, deep excavation work for pit, or tunneling work is not included as project activity. Potential impacts on groundwater due to the implementation of the Project include the following:

- Depletion of groundwater level due to the excavation in the river channel/ river banks, and
- Obstruction of groundwater flow of shallow groundwater due to flood control structures (sheet piles) to be constructed along the river banks.

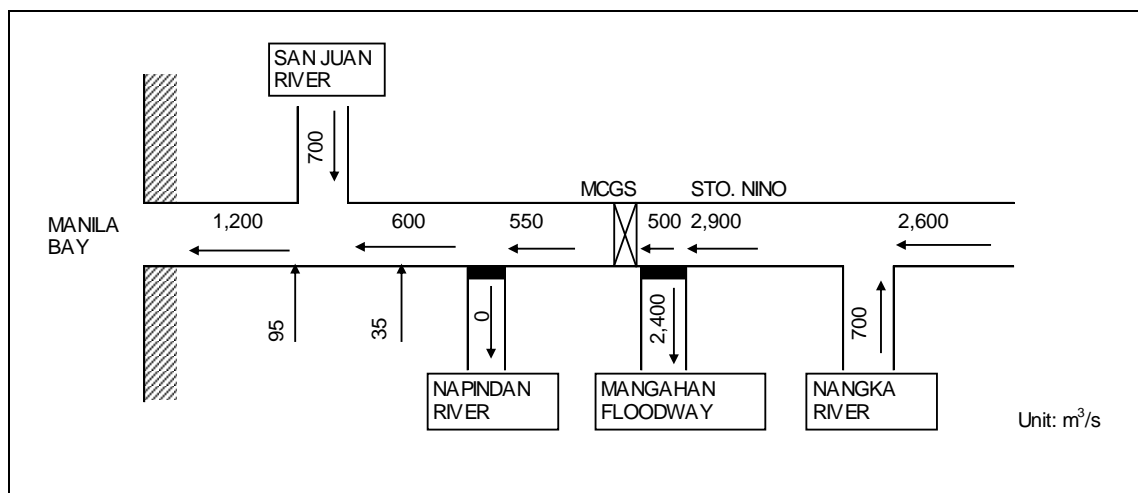
Regarding the depletion of groundwater level due to the excavation, the excavation will be done in the river channel or along the river banks. The depletion of the groundwater, therefore, will be limited only in the vicinity of the excavation points and confined within the river area. Thus, the impact on groundwater will be minimal.

As for the obstruction of groundwater flow, the impact can be discussed as follows: Groundwater flow of shallow groundwater is directed from higher to lower elevation following the topographic slope direction in general. In the project area along the Middle Marikina River, therefore, it is estimated that shallow groundwater flows from north to south direction in parallel with the flow direction of the river as a whole. This means that the direction of the sheet piling and the groundwater flow have basically the same direction, which suggests that the possibility to obstruct the groundwater flow is minimal. This is also supported by such that the depth of sheet piling is approx. 12 m depending on the geological situation, and that sheet piling locations are not continuous throughout the river stretch but intermittent along the river channel. Thus, the impact on groundwater flow will be negligible.

(3) Hydrological Regime

1) Change of Hydrological Regime

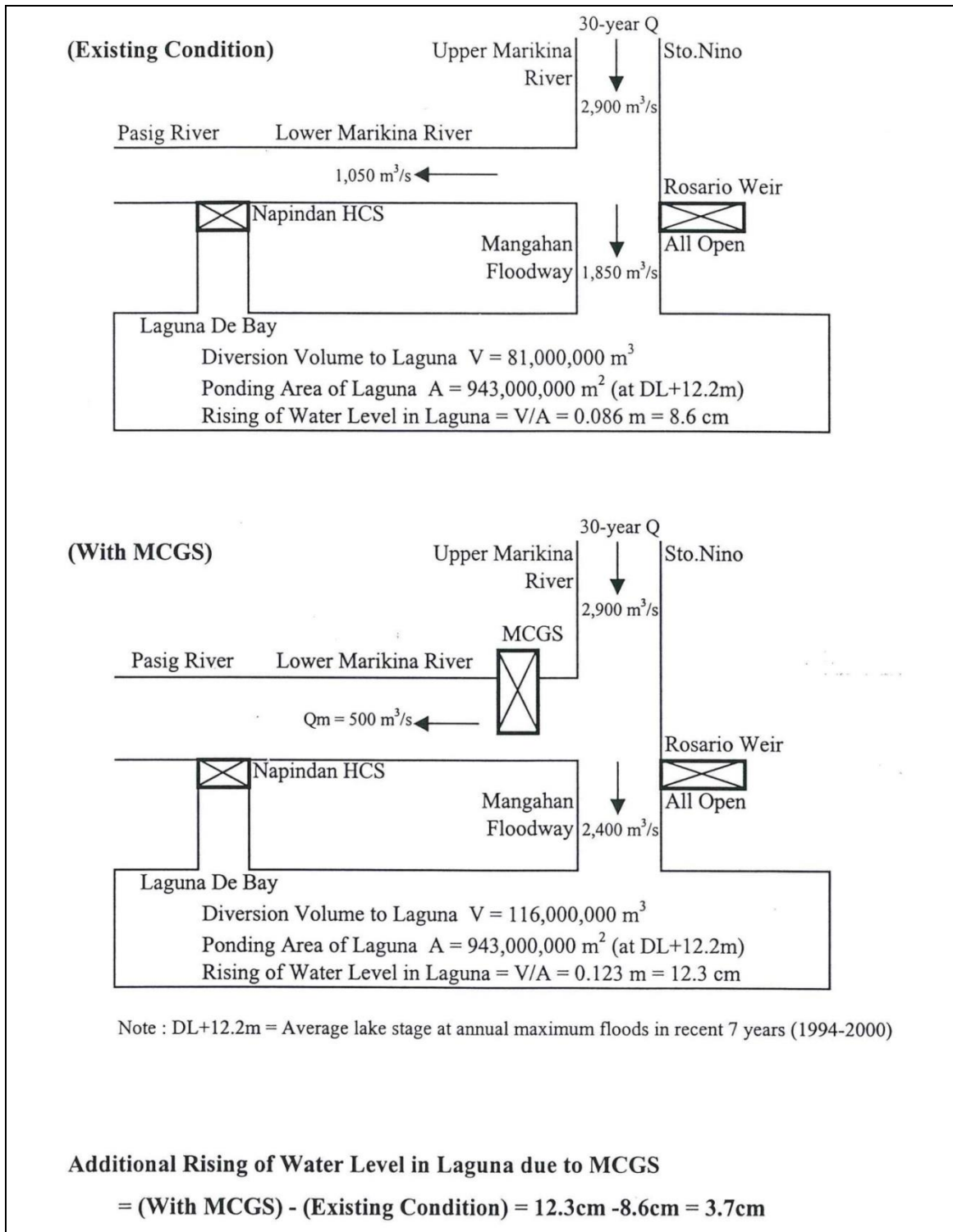
The PMRCIP aims to mitigate the flood risks of Metro Manila especially along the Pasig-Manila River stretches. It will mitigate the risk of flooding during heavy rains by construction of flood control structures and diversion of flood discharge into the Laguna de Bay through Manggahan Floodway by coordinated operation of MCGS and Rosario Weir. After the completion of flood control structures of PMRCIP, the design discharge in the river channel in case of rain event with 30-year return period, will be increased as shown in the figures below:



Source: Inception Report, PMRCIP, Phase IV and V, 2015

Figure 7.1.1 Design Flood Discharge Distribution for River Improvement (30-Year Return Period)

Due to the diversion of the flood discharge through Rosario Weir and Manggahan Floodway, the flood water will flow into the Laguna de Bay. This intervention will cause the water level rising in the lake. This impact was studied during the 2002 Detail Design Study, in which water level rising in the lake was calculated by comparing the existing situation and after the completion of MCGS under coordinated operation with Rosario Weir. The table below shows the results of calculation, which indicates the additional water level rising of 3.7 cm in the lake in case of a rain event with the return period of 30-years.



Source: Hydrology, Detailed Engineering Design, PMRCIP, 2002

Figure 7.1.2 Additional Rising of Water Level in the Laguna de Bay

2) Potential Impacts

The potential impacts due to the water level rising in the lake to be caused by the diversion of flood discharge through Manggahan Floodway under coordinated operation of MCGS and Rosario Weir includes the following:

- Impacts on land use and existing facilities in the Laguna de Bay, and

- Impacts on land use and existing facilities in the Manggahan Floodway.

a) Impacts on land use and existing facilities in the Laguna de Bay

As described above, the magnitude of water level rising is estimated as 3.7 cm comparing with current status. It will, however, not always occur throughout the year, but limited only in the heavy rain events with the return period of 30-years. Considering that the land use around the outlet of Manggahan Floodway is limited to farmland of Kangkong and fish pen, the impact of water level rising in the lake due to the coordinated operation of MCGS and Rosario Weir is not anticipated to be significant.

b) Impacts on land use and existing facilities in the Manggahan Floodway

Along the Manggahan Floodway, temporary water level rising will occur during the diversion of flood discharge through Rosario Weir. Diversion water volume will increase under the coordinated operation of MCGS and Rosario Weir. The Increase of water volume in the Manggahan Floodway will also cause reverse flow along the tributaries flowing into the Manggahan Floodway. Unless no mitigation measures are figured out for the reverse water, flooding risk along the tributaries will increase.

Along the Manggahan Floodway, there are three (3) major tributaries flowing into it; namely Buli River, Cainta River, and Taytay River. For Buli River, the gate and pump have been installed by Pasig City, and the construction of two floodgates for Cainta and Taytay rivers are included in PMRCIP Phase IV so that the reverse flow can be prevented. Thus, the impact of MCGS and coordinated operation with Rosario Weir can be avoided.

(4) Coastal Zone

The Phase IV section, or the Middle Marikina River is located at approx. 23 km from the river mouth at the Manila Bay. During the construction stage, excavation and dredging activities will generate turbid water but it will be limited to temporary in terms of time period and spatial length in immediate downstream along the river. After completion of flood control structures, they will not cause any impact on the coastal zone because the structures will not act as pollution source. Thus, the impact on coastal zone will not occur.

(5) Terrestrial Flora

The potential negative impacts of the Project on the terrestrial flora are as follows:

- Removal and loss of vegetation cover due to land clearing for the construction of flood control structures,
- Damage to plants during construction works, and
- Impact on important local species and/or protected species of plants.

1) Removal and loss of vegetation cover due to land clearing

Trees/plants within the project site shall be cut/removed to give way to the construction of flood control structures as well as excavation along the river banks. The clearing of vegetation would also be carried out for establishment of temporary facilities such as construction yard, access roads and offices of construction contractors, etc.

Trees/plants removal and loss, however, is likely insignificant since most of the portions of the Middle Marikina River (Phase IV section) is characterized by urban settings (i.e. residential, commercial and industrial), while there shall be replaced/replanted in accordance the order/guideline of DENR.

2) Damage to plants during construction works

Clearing of vegetation and other construction works could give trauma physically by inflicting injuries to some vegetative parts (i.e. stems, leaves, roots, etc.) or even at some point the totality of plants. Injuries incurred could be fatal to plants since it could disrupt the physical and physiological processes in occurring in plants.

In addition, an increase in Total Suspended Particulates (TSP), i.e. dust, concentration may affect the photosynthetic activities of plants once the particulate matter settles on the leaves. This will tend to hinder/ disrupt the photosynthetic process of plants with the clogging of micro particles into the stomata of the leaves, limiting intake of oxygen and hence, hampering the evapotranspiration process. In worst cases, the effect could go as far as to result in stunted growth of the affected plants or cause them to wither.

These impacts on plants, however, will be only limited in the vicinity of the construction work sites. Thus, the impact is evaluated as not significant.

3) Impact on important local species and/or protected species of plants

Among the flora species recorded in the survey, there are several species recognized as locally important endemic species. Besides, six (6) species falls under threatened categories of the National List of Threatened Philippine Plants and their Categories and List of Other Wildlife Species (DAO 2007-01), IUCN Red List of Threatened Species and/or listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). These species would be affected if the locations of protected species are superimposed of the planned flood control structures in this Project unless an appropriate measure is provided.

However, the threat to locally important endemic and threatened species of flora is not significant since most of these flora species are deliberately planted by the locals for greening along the banks of the Middle Marikina River. Inevitable clearing of these species can be compensated by replanting the same species or native species in a suitable area along or nearby the Marikina River as a mitigation measure.

(6) Terrestrial Fauna

The potential negative impacts of the Project on the terrestrial fauna are as follows:

- Disturbance and/or loss of habitat of terrestrial fauna,
- Loss of individuals of terrestrial fauna species due to construction works, and
- Impact on important local species and/or protected species.

1) Disturbance and/or loss of habitat of terrestrial fauna

Clearing of vegetation and temporary denudation of top soil for the construction or planned flood control structures of the Project would cause disturbance and/or loss of habitat of terrestrial fauna species. However, this area is not significant comparing with the whole area of forests and vegetation along the Marikina River and its surrounding areas over the upstream watershed. In addition, the Project IV area is highly urbanized settings and already heavily disturbed and fragmental. Thus, the impact on the habitat of terrestrial fauna is not significant.

2) Loss of individuals of fauna species due to construction works

Clearing of vegetation during the construction stage will cause terrestrial fauna species to leave their current habitat. In some cases, mortality may be observed due to stress or accidents while construction works. However, the case of such accidents and reach to death of individuals will not be many as they are highly mobile and can easily disperse to nearby habitats before the construction works commence from their habitat. Thus, the impact is likely insignificant.

3) Impact on important local species and/or protected species

Based on the primary data collection in this survey along the Marikina River, none of the recorded fauna species are included under any threatened categories of the DAO 2004-15, IUCN Red List of Threatened Species or the CITES. Regarding important local species, three endemic bird species was recorded. These species, however, are highly mobile and can easily disperse to suitable habitats, and hence they will not be affected significantly during construction works.

(7) Aquatic Biota

The potential negative impacts of the Project on the aquatic biota are as follows:

- Disturbance of habitat of aquatic biota due to excavation/ dredging operation,
- Loss of individuals due to removal of riverbed sediment, and
- Impact on important local species and/or protected species.

1) Disturbance of habitat of aquatic biota due to excavation/ dredging operation

Due to excavation and dredging operation, water pollution and sedimentation will occur, which may have negative impacts on aquatic biota. However, the water quality of the Middle Marikina River is not always adequate for aquatic biota under baseline condition, and therefore, this impact is anticipated to be minimal.

2) Loss of individuals due to removal of riverbed sediment

Removal of the riverbed sediment, especially dredging in the riverbed and excavation works along the riverbank, may result in a decline of aquatic biota. This impact is applied for macro-benthos species in the river, in particular. However, the results of inventory of macro-benthos indicates poor status of aquatic biota, i.e., only few species being identified. Thus, the impact on aquatic biota is anticipated as minimal.

3) Impact on important local species and/or protected species

Based on the primary data collection in this survey along the Marikina River, none of the recorded aquatic organisms are included under any threatened categories of the DAO 2004-15, IUCN Red List of Threatened Species or the CITES. No important local species are identified; either, and thus, no impact will be anticipated.

(8) Protected Area and Environmental Critical Areas (ECAs)

There is no protected area designated by Republic Act No. 7586 known as NIPAs Act (1992) in and around the Project area. The nearest protected areas are Quezon Memorial (registered national park) and Ninoy Aquino Parks and Wildlife Center (national park under proclamation), both of which are city parks located approx. 4 km from the Phase IV section. There are two other protected areas in the watershed of the Marikina River: Upper Marikina River Basin Protected Landscape and Pamitinan Protected Landscape, both of which are located at the distance of more than 15 km in the upstream area. It is, therefore, no impact of the implementation of the Project will be anticipated on the protected area.

As for Environmental Critical Areas (ECAs), the Phase IV area is located in areas frequently visited and or hard-hit by natural calamities (Category 6), and all natural water bodies (Category 10) under Presidential Proclamation (PP) No. 2146 (1981). This Project is aimed at mitigating the flood disaster caused by the hard-hit of typhoons. Therefore, the purpose of the Project will totally consistent with the current situation and no negative impact is anticipated.

(9) Meteorology and Climate

The components of the Project are not related to meteorology or will not cause any climate change in local, regional or country levels. Thus, no impact on meteorology and climate will be anticipated.

7.1.3 Socio-economic Environment

(1) Involuntary Resettlement

There will be approx. 40 residential buildings, or 71 households (estimation based on the survey results as of end of March 2015) necessary for involuntary resettlement/ relocation, all of which are informal settler families (ISFs), in the Phase IV (as of the survey result by the end of March 2015) as listed in Table 7.1.3. Thus, the impact of involuntary resettlement is evaluated as not minor. As for business establishment, a total of six (6) establishments will be affected by the Right-Of-Way and/or river channel alignment.

Table 7.1.3 Number of Project-Affected Residential Buildings, Informal Settler Families and Business Establishments in the Phase IV Area

City	Barangay	Project-affected no. of residential buildings	Project-affected no. of ISFs (households) *	Project-affected no. of business establishments
Quezon	Ugong Norte	0	0	0
	Bagumbayan	40	71	1
	Libis	0	0	0
	Blue Ridge B	0	0	0
Pasig City	Manggahan	0	0	2
	Santolan	0	0	3
Marikina City	Industrial Valley	0	0	0
	Calumpang	0	0	0
	Barangka	0	0	0
	Tañon	0	0	0
	Jesus de la Peña	0	0	0
	San Rogue	0	0	0
	Santa Elena	0	0	0
	Santo Niño	0	0	0
Total		40	71	6

Note) *: Estimated number based on the number of affected residential buildings.

Source: Socio-economic Survey of the Project, Phase IV, 2014/2015

(2) Poverty Group

The poverty group is less resilient and more vulnerable to the impacts of the Project in general because resources are limited in the first place and there will be little, or nothing left for contingency including the case of relocation.

Results of perception survey indicates that 40.6% of respondents who live along the Phase IV section of the Middle Marikina River answered that the income level is less than PhP.3,000/month, followed by the ranges of PhP. 5,000-10,000 (19.4%), PhP. 10,000-15,000 (12.4%), and PhP. 3,000-5,000 (9.4%). This figure might be rather conservative one, but the income level of the local residents is estimated to be lower than the average value of family income of this area.

There will be 71 households necessary for involuntary resettlement/ relocation, all of which are informal settler families (ISFs), in the Phase IV (as of the survey result by the end of March 2015) as listed in Table 7.1.3. ISFs are classified as poverty group in general, who are at a higher risk of falling into poverty or may be pushed below or even further down the poverty line. Thus, the impact of the Phase IV on the poverty group is anticipated to be not minor. But the magnitude of it is not always predictable.

(3) Ethnic Minority/ Indigenous People

Metro Manila is a part of the Tagalog Region of Southern Luzon, and the three cities where the Phase IV section of the Middle Marikina River is located, are therefore a part of this original

ethnic group. Non-Tagalog populations are considered immigrants who have assimilated to the dominant ethnicity. Thus, there is no ethnic minority in the Project area. There is no Indigenous Peoples (IPs) residing within Metro Manila and in the three cities, in particular. In addition, no ancestral domains exist in any of the cities of Pasig, Marikina and Quezon according to NCIP. There will be, therefore, no possibility of impacts of the Phase IV on ethnic minority or indigenous people.

(4) Local Economy such as Employment and Livelihood

Resettlement may cause loss of current income source since the resettlement site are not always near the current settlement sites, but often it is located out of the city (off-city). In such a case, economic situation of resettled families will be adversely affected and the local economy near the project affected areas will also be affected in terms of loss of labor and skilled workers. After resettlement to off-city, livelihood recovery will be a challenging problem in general.

In case of the Phase IV, there will be approx. 50 households to be affected necessary for resettlement (as of the survey result by the end of March 2015) as listed in Table R 9.3.3. Thus, the impact will be not minor but the magnitude of it is not always predictable.

(5) Land Use and Utilization of Local Resources

The Phase IV section is located in Environmentally Critical Areas (Category 6: Areas frequently visited and/or hard-hit by natural calamities (typhoons), and Category 10: Natural water body) defined under Presidential Proclamation (PP) No. 2146 (1981). The river channel improvement works in the Project is aimed to mitigate the flood problem and rather enhance the environmental conditions of the area. The project works will be done in the river channel to accomplish the said purpose but will not lose any water surface in the river. In terms of ECAs, the Project is in accordance with the condition mentioned above. In addition, the Project does not contradict with the existing land use or development plans in LGUs bound by the Phase IV Area.

Table 7.1.4 summarizes the necessary land acquisition by LGU and affected structures and business establishments in the Project Phase IV area. A total of 124,089 m² is needed as land acquisition for ROW (Right-Of-Way) of the flood control structures and river channel improvement.

Thus, the impacts on land use and utilization of local resources are evaluated as not minor.

Table 7.1.4 Area of Affected Private Land and Improvement in the Phase IV Area

No.	Affected Private Properties	Location	Affected Land Area	Affected Floor Area
			(sq.m)	(sq.m)
1.	Ignacio Complex 1 & 2	Mangahan, PC	11,276	2,603
2.	ReadyCon	Mangahan, PC	3,123	46
3.	Hansson Paper Co.	Mangahan, PC	6,959	3,020
4.	Jentec Storage	Mangahan, PC	4,681	753
5.	Eastwood Ferry & Reclamation	Bagumbayan, QC	-	117
6.	Portland Cement	Santolan, PC	3,644	840
9.	Other Land Acquisition-QC side	-	29,057	-
10.	Other Land Acquisition-PC side	-	27,469	-
11.	Other Land Acquisition-MC side	-	37,880	-
			124,089	7,379

Source: Socio-economic Survey for RAP for Marikina River, June 2018

(6) Water Use and River Dependency

There is no water use case for potable water supply currently taken from the Phase IV section. But water use for washing clothes and as playground was observed during the site reconnaissance of this survey. There are two cases of river crossing ferry along the Middle Marikina River.

Besides, several types of river dependency on the Middle Marikina River of local residents are observed, such as fishing, subsistence farming, river transportation and tourism although only 3.3% of respondents answered they are dependent on the river as major source of livelihood.

Due to the implementation of the Project, this water use and dependency on the Middle Marikina River will be temporarily affected/ obstructed during the construction stage since the accessibility to the river is constrained by the construction activities. These impacts of the construction works of the Project, however, will not be continuous but rather shifting one location to another along longitudinal direction of the river. Therefore, the constraint of accessibility is limited in terms of affected time period. Thus, the magnitude of this impact is not significant but likely to be minor.

During the operation stage, there will be some constraint in the accessibility to the river by the flood control structures, such as revetment and parapet walls constructed in the Project.

(7) Existing Social Infrastructures and Services

Social infrastructures located along the Project Phase IV section include roads, railway, bridges, etc. as described in Section 5.4.4. Some of these structures are located across the Middle Marikina River. Social service facilities located along the Middle Marikina River include barangay halls, schools, churches, hospitals and clinics, recreational spots. Out of these, there are several ones located near the river (within approx. 50 meters from the river) such as Calumpang Barangay Hall, Gymnasium Marikina Doctors Hospital, Medical Clinic, Pasig Glass Garden, and Pasig Square Garden, etc.

Due to the implementation of the Phase IV, Manalo Bridge will be replaced by a new, while the reconstruction of new Manalo Bridge has been undertaken by the Government of the Philippines, as the work is recognized to be urgent as the bridge site may hamper smooth flood flows. To facilitate the existing traffic conditions during construction work, the existing bridge will be utilized as a temporary bridge, then will be replaced by a new bridge.

An extension of Pasig Ferry Boat Operation has been proposed to the Phase IV section (Middle Marikina River) by MMDA and PRRC, the location and design of the proposed ferry terminals are required to adjust with the design of dike/revetment in Phase IV. Further, two (2) of river crossing boat operation will be affected as well.

With close coordination during the design of Phase IV, particularly by providing steps/stairs to cross the dike/revetment, difficulties in accessing to the said terminal/station will be mitigated. The impacts on these infrastructure and public service facilities will be temporary ones in terms of inconvenience and constraint in accessibility to them during construction work. The magnitude of the impacts, therefore, is not significant considering the period of impact occurrence. Regarding other infrastructures and social service facilities, none of relocation or demolition of the facilities will be required owing to the adjustment of construction site/ method of the flood control structures.

(8) Social Institutions

This Project aims at flood risk mitigation and alleviation of flood damages, resolved by DPWH and determined by GOP. The LGUs in the NCR as well as the local community along the Pasig-Marikina River who are suffering from flood disasters so far are all supporting this Project. Thus, no impact will be anticipated on the social institutions such as social infrastructures and local decision-making institutions.

(9) Misdistribution of Benefits and Damage (Social Cost)

River channel improvement works by the construction of flood control structures will mitigate flood risks in riverine area of the Pasig-Marikina River, which, at the same time, will require land acquisition along the river although the number of Involuntary Resettlement is none and necessity of relocation of the Project Affected Buildings are limited.

Construction of MCGS and its coordinated operation with Rosario Weir, aiming to divert flood water to the Laguna de Bay through Manggahan Floodway, will also mitigate the flood risks in

the downstream area of the Pasig-Marikina River. At the same time, however, this intervention would raise the water level along the Manggahan Floodway and the Laguna de Bay although the rising of water level is estimated to be minimal (3.7 cm) even at the heavy rainfall with the return period of 30 years (refer to Section 6.1.2, (3) Hydrological Regime).

Thus, the Project would be a cause of misdistribution of benefit (beneficiaries) and social cost (social cost bearers). But the magnitude of this misdistribution is not significant.

(10) Local Conflicts of Interest

Local conflicts might occur between beneficiaries and social cost bearers mentioned above. In addition, as for the compensation for PAPs of the Project, provision of compensation is mandated by law for all project affected people as well as other entitlements depending on eligibility. The amount of compensation is equitable and commensurate to the value of the assets lost, whether permanent or temporary. Loss of assets like land, structures, improvements, plants, etc. is not limited to ownership but to usage. In the procedures of providing the compensation, there might be conflict between the government agency, LGUs and PAPs. The magnitude of these social conflicts, however, is not always predictable.

(11) Cultural Heritage, Historical and Religious Sites (Sensitive Facilities)

There is no historical and/or cultural heritage sites which are listed by the National Historical Commission of the Philippines (NHCP), located within the Project, Phase IV section and its vicinity. There are however several minor heritage sites near the Project site, including statues, gazebos, gardens, museums, performing arts or cultural venues, religious sites, shrines and monuments. Some of these are located in the vicinity (within 100 m distance) of the Phase IV Section of the river. Among others, Jesus De La Peña Chapel and Kapitan Moy's Residence, are evaluated as relatively important in terms of historical church and residence.

These cultural and historical heritage sites will not be directly affected/ damaged by the construction works although they might be temporarily affected in terms of inconvenience in accessibility during construction stage. The magnitude of the impact, however, is minimal considering that the period of impact occurrence is limited and none of relocation or demolition of the heritage sites will be required owing to adjustment of construction site/ method of the flood control structures.

(12) Landscape

The Project Phase IV components include the construction of flood control structures such as dike, revetment, parapet wall, drainage outlet, etc. for the river improvement of the Middle Marikina River. This will change the aesthetics of the river landscape throughout the river stretches of the Phase IV. However, the change of river landscape would not adversely affect or deteriorate the entire landscape combined with riverine land use, but rather contribute to create more urbanized landscape as a whole.

(13) Gender/ Socially Vulnerable Groups

Socially vulnerable groups such as disabled, elderly, female-headed, solo parent and child-headed, etc. often fall into poverty, and therefore there is higher possibility for them to be in difficulty to maintain livelihood when they need to be relocated by a development project in general. Their standard of living may be worse-off after project implementation.

In case of the Phase IV, there will be 71 involuntary resettlement cases of informal settler families (ISFs) due to the implementation of the Project (refer to Table 6.1.3). ISFs can be classified as socially vulnerable group, who are at a higher risk of falling into poverty or may be pushed below or even further down the poverty line. The poverty group is less resilient and more vulnerable to the impacts of the development projects in general. In this sense, the possibility of the adverse impact of the Project is not negligible. But the magnitude of the impact is not always predictable.

(14) Rights of Children

Rights of children include the rights to education and to live in a healthy and safe environment to support well-rounded development. In case of resettlement, in general, it may cause disruption of schooling and affect their psycho-social well-being since they will be uprooted from a community they were accustomed with to a new and unfamiliar environment.

In case of the Phase IV, there will be 71 involuntary resettlement cases of informal settler families (ISFs) due to the implementation of the Project (refer to Table 6.1.3). It is estimated that many children are included in the affected ISFs. The rights of children will be affected in terms of changing schools, psychological impacts, etc., which might become problems and be taken care of. The magnitude of the impacts, however, is not always predictable.

(15) Infectious Diseases such as HIV/AIDS

Influx of construction workers would have a possibility of infectious disease. However, the possibility is low for the Project Phase IV because the employment of laborers for construction works will be prioritized to and mobilized from the local people, which is the same condition as the Project, Phase II and III.

(16) Labor Environment (Including Occupational Safety)

During the construction stage of the Project, there will be a probability of incidents or accidents happening at the work sites, particularly at night and during the rainy season. Some common construction site-related accidents and incidents are toppling down of heavy equipment, falls, slips, struck by, electrocution, tripping, and cuts or wounds due to construction machinery. In this Project, flash flood, bank erosion and fall into excavation areas are also potential hazards.

The foregoing emphasizes the need for the implementing agencies of construction projects to strictly implement the occupational safety and health standards, particularly the rules governing safety in the construction industry.

The safety and health of the construction workers and the public will be safeguarded, and accidents or incidents can be minimized with consistent implementation and compliance with the requirements of DOLE DO No. 13. Even though, accidents cannot be completely prevented but might happen.

7.1.4 Summary of Potential Negative Impacts

Table 7.1.5 presents the summary of the possible negative impacts without mitigations based on discussions in the previous sections.

Table 7.1.5 Potential Negative Impacts without Mitigation

Environmental components			Evaluation of impacts w/o mitigation		Explanation for the evaluation
			EIS (1998)	Review/Updating (2015)	
Physio-chemical Environment (Pollution)	1	Air Pollution	B-	B-	[Construction] Air pollution due to dust during earth works as well as emission gas by construction equipment and vehicles will occur although the magnitude of pollution is temporary and localized. [Operation] There will be no source of air pollution from the river improvement structures after completion.
	2	Water Pollution	B-	B-	[Construction] Re-suspension of sediments and release of sediment pollutants will occur as a result of dredging/ excavation or construction works in the river. Waste water from contractor base camp and/or office would also cause water pollution. [Operation] There will be no pollution source of water quality from the river improvement structures after completion.
	3	Solid Wastes (including Dredged/ Excavated Material)	A-	B-	[Construction] Wastes from the contractor base camp and office, debris from demolished structures existing along the river, and dredged/excavated materials will be generated. [Operation] There will be no wastes to be generated from the river improvement structures after completion.
	4	Soil Contamination	-	C-	[Construction] Disposal of dredged/ excavated materials would cause soil contamination at disposal site if the riverbed sediment is contaminated. [Operation] There will be no pollution source of soil contamination from the river improvement structures after completion.
	5	Noise and Vibration	B-	B-	[Construction] Noise and vibration caused by construction activities and transportation will occur. It would be significant if the exposure to noise/ vibration continues for long time. [Operation] There will be no source of noise or vibration from the river improvement structures after completion.
	6	Land Subsidence	-	D	No land subsidence is anticipated during both construction and operation stage because large scale of groundwater extraction, deep excavation work, or tunneling work is not included in the project activities.
	7	Offensive Odor	D	B-	[Construction] Offensive odor would occasionally occur during dredging/excavation works at the sludge area of the river. [Operation] There is no possibility to increase offensive odor from the river improvement structures after completion.
	8	Riverbed Sediment	D	C-	[Construction] Dredging/Excavation works might cause suspension of sediment pollutants, if the riverbed sediment is contaminated, and re-sedimentation on the riverbed will occur. [Operation] There is no possibility to increase riverbed sediment contamination from the river improvement structures after completion.
Natural Environment	1	Pedology, Topography and Geographical Features	D	D	[Construction] Construction of flood control structures for river improvement including excavation of river channel will cause the topographic modification. It is, however, limited to the river area, and therefore, will not cause adverse impact on surrounding areas. [Operation] There is no topographical or geological change after completion of river improvement.

Environmental components		Evaluation of impacts w/o mitigation		Explanation for the evaluation
		EIS (1998)	Review/Updating (2015)	
2	Soil Erosion	D	D	[Construction] Erosion due to vegetation clearing, excavation and embankment for the construction of flood control structures might occur at the rainy season or rainfalls with high intensity during construction period. It is, however, limited to the river area, and therefore, will not cause adverse impact on surrounding areas. [Operation] There will be no soil erosion from the river channel improvement structures made of concrete or covered by vegetation.
3	Groundwater	D	D	No pumping of groundwater, deep excavation work for pit, or tunneling work is included as the Project components. Sheet pile to be constructed along the river banks will not cause obstruction of groundwater flow, either.
4	Hydrological Regime	D	D	Construction of MCGS and coordinated operation with Rosario Weir will raise the water level in Manggahan Floodway and Laguna de Bay by 3.7 cm during heavy rain with return period of 30-years comparing with existing situation. The impact, however, will be only limited during rainfall event with such intention, and thus the impact will be minimal.
5	Coastal Zone	-	D	[Construction] No damage to coastal zone is anticipated because the Project site (at the downstream end of Phase IV stretch) is far enough (approx. 23 km) from the river mouth. [Operation] There will be no impact source.
6	Terrestrial Flora, Fauna and Biodiversity	D	B-	[Construction] Vegetation along the Marikina River will be partially cleared for the construction of flood control structures, which will cause adverse impacts on terrestrial flora and fauna although the magnitude of impacts is not significant. Several threatened flora species were identified to grow in the Project area and would be affected by land clearing during construction works. Most of them, however, do not grow spontaneously under the natural condition but are deliberately planted, and hence, the impact is not significant. [Operation] There will be no impacts on terrestrial flora and fauna.
7	Aquatic Biota	D	D	[Construction] Dredging/ Excavation works of in the river would disturb the habitat of aquatic biota. However, the current status of aquatic biota is ecologically poor due to the highly polluted water quality. No threatened species of aquatic organisms are recorded, either. Hence, the impact of the implementation of the Project will be minimal. [Operation] There will be no activities after completion of river improvement structures.
8	Protected Area and Environmentally Critical Areas (ECAs)	-	D	There will be no impact because no protected area exists in and around the Project area.
9	Meteorology	-	D	No impact will be caused by the construction works or project components of the Project.
10	Global Warming	-	D	No impact will be caused by the construction works or project components of the Project.

Environmental components		Evaluation of impacts w/o mitigation		Explanation for the evaluation	
		EIS (1998)	Review/Updating (2015)		
Social Environment:	1	Involuntary Resettlement	-	B-	There will be 71 households necessary for involuntary resettlement/ relocation, all of which are informal settler families (ISFs), in the Project Phase IV (as of the survey result by the end of March 2015). In addition, there will be six (6) project-affected business establishments (the same), one of which is under examination/ negotiation for the necessity of relocation. Thus, the impact is not critical but not evaluated to be minor.
	2	Poverty Group	-	C-	The poverty group is less resilient and more vulnerable to the impacts of the development projects in general. In case of the Phase IV, there will be approx. 50 households to be affected necessary for resettlement. Thus, the impact of the Phase IV on the poverty group is anticipated to be not minor. But the magnitude of it is not always predictable.
	3	Ethnic Minority, Indigenous Peoples	-	D	No ethnic minority or indigenous peoples are observed along the river stretch of the Phase IV area, and no impact will be anticipated.
	4	Local Economy such as Employment and Livelihood	D	C-	A total of 71 households will be required to resettle due to the Phase IV. Their employment and livelihood condition will be affected, accordingly. In case of resettlement site is located out of the city (off-city resettlement), the livelihood recovery will be a challenging problem.
	5	Land Use and Utilization of Local Resources	D	B-	The land use along the Phase IV section of the Marikina River is the mixture of residential, commercial, business and industrial areas. The area along the river will be acquired for ROW (Right-Of-Way) and of the flood control structures and river channel improvement. A total area of land acquisition will be calculated as 124,089 m ² . The impact on land use and utilization of local resources are evaluated as not minor.
	6	Water Use and River Dependency	B-	B-	[Construction] Water use, and river dependency of local community are observed along the Phase IV section. They will be temporarily affected but accessibility will be still remained even during the construction stage. Thus the impact on water use and river dependency is not significant. [Operation] During the operation stage, there will be some constraint in the accessibility to the river by the flood control structures, such as revetment and parapet walls constructed in the Project.
	7	Existing Social Infrastructures and Services	B-	B-	[Construction] Social infrastructures and social service facilities will be temporarily affected in terms of inconvenience in accessibility during construction stage, including Manalo Bridge, and two of river crossing boat services. However, the magnitude of the impact is not significant owing to the adjustment of construction site and method of the flood control structures. [Operation] The situation will return to normal and there will be no impact source.
	8	Social Institutions such as Social Infrastructure and Local Decision - making Institutions	-	D	This Project aims at flood risk mitigation and alleviation, resolved by DPWH and determined by GOP. The LGUs in the NCR as well as the local community along the river who are suffering from flood disasters are all supporting this Project. Thus, no impact will be anticipated on the social institutions.

Environmental components		Evaluation of impacts w/o mitigation		Explanation for the evaluation
		EIS (1998)	Review/Updating (2015)	
9	Misdistribution of Benefits and Damage (Social Cost)	-	B-	River improvement works by the construction of flood control structures will mitigate flood risks, which, at the same time, require land acquisition along the river. Construction of MCGS and its operation will mitigate the flood risks in the downstream area but at the same time it would raise the water level along the Manggahan Floodway and around the Laguna de Bay. Thus, the Project would be a cause of misdistribution of benefit (beneficiaries) and social cost (social cost bearers) but the magnitude is not significant.
10	Local Conflicts of Interest	B-	C-	Local conflicts might occur between beneficiaries and social cost bearers mentioned above. During the determination and process of compensation to PAPs, there might be conflict between the government agency, LGUs and PAPs. The magnitude of these social conflicts, however, is not always predictable.
11	Cultural Heritage, Historical and Religious Sites (Sensitive Facilities)	D	D	There is no historical and/or cultural heritage sites which are listed by the National Historical Commission of the Philippines (NHCP), located within the Project, Phase IV section and its vicinity.
12	Landscape	D	D	The construction of flood control structures for the river improvement of the Middle Marikina River would change the aesthetics of the river landscape into more urbanized one. But this change does not always mean adverse impact.
13	Gender / Socially Vulnerable Groups	-	C-	There will be 50 involuntary resettlement cases of informal settler families (ISFs) due to the implementation of the Phase IV. ISFs are classified as socially vulnerable group, who are at a higher risk of falling into poverty or may be pushed below or even further down the poverty line. The poverty group is less resilient and more vulnerable to the impacts of the development projects in general. In this sense, the possibility of the adverse impact of the Project is not negligible. But the magnitude of the impact is not always predictable.
14	Rights of Children	-	C-	There will be 50 involuntary resettlement cases of informal settler families (ISFs) due to the implementation of the Phase IV. It is estimated that many children are contained in the affected ISFs. The rights of children will be affected in terms of changing schools, psychological impacts, etc., which might become problems and be taken care of. The magnitude of the impacts, however, is not always predictable.
15	Infectious Diseases such as HIV/AIDS	-	D	Influx of construction workers would have a possibility of infectious disease. However, the possibility is low because the employment of laborers for construction works will be prioritized to the local people.
16	Labor Environment (Including Occupational Safety)	-	B-	The possibility of accidents during construction works can be minimized if the Contractor appropriately follows the guidelines stipulated by DOLE DO No.13. Even though, accidents cannot be completely prevented.

Note)

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Possibility of impact and its magnitude are unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)

D: No impact is expected.

EIS (1998) did not use JICA's method to evaluate the impact using "A,B,C and D" so the evaluation results of EIS (1998) were converted to meet JICA's method.

7.2 Overall Evaluation on Potential Negative Impacts

EIS (1998) concluded that the overall environmental impact would be positive and that the overall benefit to society would outweigh the overall negative impact.

Zero option (without the Project) would not help the community to prevent/ mitigate flood damage. In contrast, although with-project option would have certain extent of adverse impacts on Physio-chemical, natural and social environments, it would help to prevent flood damage in Metro Manila, which is the center of politics, economics, and culture of the Philippines. Hence, the Project will contribute to stable economic development of the country. Since the environmental and social impacts will be alleviated by the mitigation measures prepared in EIS (1998) and this updated EIS (refer to Chap. 7), the total benefits to be derived will overwhelmingly outweigh the effects of the adverse impacts.

CHAPTER 8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 Mitigation Measures Proposed in EIS (1998)

The following table shows the suggested mitigation measures proposed in the EIS (1998) for the possible negative impacts:

Table 8.1.1 Mitigation Measures in EIS (1998)

Project Impact	Mitigation Measures
Air pollution	Regularly adjusting the engines of construction machinery
	Watering to prevent dust generation when necessary during dry season
River water quality change (turbidity increase)	Preventing accidental discharge of excavated / demolished soil / materials during repair / rehabilitation works.
Noise generation	Adjusting working time to avoid early morning and night and holiday as much as possible
	Regularly adjusting the engine and muffler of heavy equipment to keep an appropriate function
	Adopting less noise generation type of heavy equipment, when necessary
Impair river navigation	Adjusting mobilization and formation of vessel for piling work to avoid navigation route
Influx of outside labor and their households	Close and advance contact with LGU officials to disseminating about mobilization of labor
	Conduct of Information, Education and Communication (IEC)
Increase of demand for housing and associated utilities (water supply, toilet, etc.) of outside construction crew	Prioritizing to employ local people to reduce outside workers to immigrate and demand housing and utilities
Deterioration of sanitation level	Prioritizing to employ local people to reduce outside workers to immigrate and reside around construction site
Land acquisition and relocation / resettlement of Project Affected Families (PAFs)	Enough dialogue through Information Campaign and Publicity
	Facilitation of resettlement program to be launched by PRRC and LGUs
	Appropriate procedures for eviction/relocation of informal settlers

8.2 Environment Management Plan for Potential Negative Impacts

The following tables show the environmental management plans for the potential negative impacts with the magnitude of Significant (A-), To some extent (B-) or Unknown (C-) (refer to Table 8.1.5) including mitigation measures for the impacts:

Table 8.2.1 Environmental Management Plan for Potential Negative Impacts on Physical-Chemical Environment

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
1. Air Pollution				
(1) Construction	Air pollution by dust due to earth works such as excavation work	<ul style="list-style-type: none"> • Excavation materials must be properly stockpiled and properly disposed of from the construction site, • Provision of covers to stockpiles that will be left idle for a long time, • Dust generation will be mitigated with watering at dusty place during dry season, • Provision of covers to the load of trucks by tarpaulin, and • Periodical and timely cleaning of the spilled materials on roads or other public spaces along the transportation route of construction materials and spoil materials. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	Included in the construction cost
	Air pollution by emission gas due to the operation of construction equipment and vehicles	<ul style="list-style-type: none"> • Regular maintenance of heavy equipment and vehicles, and • Consideration of operation manner of the equipment due to the regular education to the operators. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	Included in the construction cost
2. Water Pollution				
(1) Construction	Water pollution of the river water due to earth works near the river bank, excavation/ dredging works in the river	<ul style="list-style-type: none"> • To avoid the construction works during rainy season or rainy day as much as possible, • Installation of temporary embankment and drainage at the boundary of periphery of project site, • Installation of sedimentation pond at appropriate location to avoid the turbid water discharge for settlement the laden with soil particles, • Selection of less agitation method of dredging and its proper implementation when applicable. Employing soil screen at the site of dredging works if necessary. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	Included in the construction cost

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
	Water pollution by waste water (effluent and used oil) from construction yards and offices, and accidental oil spill	<ul style="list-style-type: none"> To ensure not to directly drain the waste water from construction yard and offices to the river, Waste water shall be properly treated and disposed using septic tank or other appropriate treatment method, Provision of portable toilet (portalet) for the workers at the construction work site, To ensure not to cause accidental oil spill and other chemicals in the construction site, and Hazardous wastes, in case of usage, shall be strictly controlled based on RA 6969. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	Included in the construction cost
	Increase of water pollution in Manggahan Floodway and around the outlet of the Floodway in the Laguna de Bay	<ul style="list-style-type: none"> Monitoring of water quality in Manggahan Floodway and around the outlet of the Floodway in the Laguna de Bay shall be done in timely manner for immediate and appropriate action to minimize the adverse impact on such recipient as fish pen, when necessary. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	Included in the construction cost
3. Solid Waste				
(1) Construction	Garbage and construction wastes to be generated in the Project sites	<ul style="list-style-type: none"> Solid wastes to be generated in the Project site shall be segregated for facilitation of reduction, reuse and recycle following RA 9003 and applicable ordinances of LGUs, and The non-recyclable wastes shall be disposed of by sub-contracting to the accredited waste contractor. 	<u>Implementation organization:</u> <u>Contractor,</u> <u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-CENRO, and Concerned LGUs	Included in the construction cost
	Dredged/ excavated materials from the river channel and river banks	<ul style="list-style-type: none"> Confirmation of riverbed sediment quality through sediment quality analysis by increasing the sampling points (e.g., once pre 100 m along the river stretch) during the Detail Design stage for further clarification of the possibility of soil contamination, and In case to develop a new disposal area, necessary permission including ECC shall be appropriately acquired before the construction works in timely manner based on 	<u>Implementation organization:</u> <u>Contractor,</u> Proponent and Consultant <u>Responsible (supervisory) organization:</u> DENR-EMB	Included in the Detail Design Study, construction cost as well as operation and maintenance cost

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
		the requirement of PEISS and instruction of the authority (DENR-EMB-NCR)		
4. Soil Contamination				
(1) Pre-construction, construction and operation	Riverbed sediment during dredging/ excavation works, and/or groundwater, or soil contamination at the disposal site by dumping of dredged/ excavated materials	<u>Mitigation measures:</u> <ul style="list-style-type: none"> Confirmation of riverbed sediment quality through sediment quality analysis by increasing the sampling points (e.g., once pre 100 m along the river stretch) during the Detail Design stage for further clarification of the possibility of soil contamination. 	<u>Implementation organization:</u> Contractor, Proponent and Consultant <u>Responsible (supervisory) organization:</u> DENR-EMB	Included in the Detail Design Study, construction cost as well as operation and maintenance cost
5. Noise and vibration				
(1) Construction and operation	Noise and vibration during construction works due to operation of heavy equipment and vehicles	<ul style="list-style-type: none"> Surveying and identifying buildings/facilities necessary for special attention such as schools, hospitals/medical clinics and religious facilities nearby working sites. Good maintenance of heavy equipment and dump trucks to be used for construction works, Education of drivers and operators to observe and respect driving and operation manners, Adjustments in the operation time of heavy equipment and dump trucks, transportation route, transportation method (by land or river), etc., Regular communication with local residents near the construction sites about the methodology and implementation schedule of construction works, and Installation of sound abatement wall during construction work in the vicinity of sensitive facilities such as schools ,hospitals, and settlement areas, if necessary. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	Included in the construction cost as well as operation and maintenance cost
6. Offensive Odor				
(1) Construction	Generation of offensive odor during construction	<ul style="list-style-type: none"> Regular communication with local residents near the dredging/ excavation sites about methodology and 	<u>Implementation organization:</u> Contractor	Included in the construction cost

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
	works, such as dredging / excavation, drying at staging area and dumping of dredged/excavated materials	implementation schedule of construction works, including the possibility of offensive odor for understanding, and <ul style="list-style-type: none"> Careful selection of staging area for minimizing the potential impacts of offensive odor, especially for sensitive facilities such as hospital, schools, etc. 	<u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-EMB	
7. Riverbed Sediment				
(1) Pre-construction, construction and operation	Riverbed sediment contamination associated with excavation and dredging	<u>Mitigation measures:</u> <ul style="list-style-type: none"> Confirmation of riverbed sediment quality through sediment quality analysis by increasing the sampling points (e.g., once pre 100 m along the river stretch) during the Detail Design stage for further clarification of the possibility of soil contamination. 	<u>Implementation organization:</u> Contractor, Proponent and Consultant/ <u>Responsible (supervisory) organization:</u> DENR-EMB	Included in the Detail Design Study, construction cost as well as operation and maintenance cost

Table 8.2.2 Environmental Management Plan for Potential Negative Impacts on Natural Environment

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation organization / Responsible (supervisory) organization	Cost
1. Terrestrial Flora				
(1) Construction	Removal and loss of vegetation cover due to land clearing	<ul style="list-style-type: none"> Compliance with the conditions stipulated in the permits/ clearances (e.g. ECC, Tree Cutting Permit, Excavation Permit, etc.) issued for the Project, Providing a temporary fencing to vegetation to protect it for minimizing vegetation clearing as much as possible, and Appropriate plant species for greening and compensation shall be planted. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-PAWB, Concerned LGUs	Included in the construction cost
	Damage to plants during construction works	<ul style="list-style-type: none"> Using markers and fences to direct heavy equipment in the construction site and minimize damage to trees/ vegetation, and 	<u>Implementation organization:</u> Contractor,	Included in the construction cost

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation organization / Responsible (supervisory) organization	Cost
		<ul style="list-style-type: none"> In case that the tree leaves are heavily covered by dust around the construction sites, especially reclamation work sites, watering on the trees shall be done. 	<u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-PAWB, Concerned LGUs	
	Impact on important local species and/or protected species of plants	<ul style="list-style-type: none"> Fencing of important species of plants such as those considered as endemic and threatened species in considerable size or length away from direct disturbance of construction equipment, and In case of inevitable clearing of these species, transplantation of the affected individuals and/or compensation by the same species shall be done in a suitable area. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-PAWB, Concerned LGUs	Included in the construction cost
2. Terrestrial Fauna				
(1) Construction	Disturbance and loss of habitat of terrestrial fauna	<ul style="list-style-type: none"> Compliance with the conditions stipulated in the permits/ clearances (e.g. ECC, Tree Cutting Permit, Excavation Permit, etc.) issued for the Project, Limiting land and land clearing as much as possible by considering the construction method, To enhance the general environment of the project site, by greening (re-vegetation) after land clearing shall be implemented, and Using markers and fences to direct heavy equipment in the construction site and minimize damage to the habitat of wild animals. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-PAWB, Concerned LGUs	Included in the construction cost
	Loss of individuals of fauna species due to construction works	<ul style="list-style-type: none"> Hunting of animals near or within the project sites shall be avoided and enforced with the personnel staying in the Project site, and Construction activities during night time should be minimized to avoid artificial lighting and noise disturbances. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-PAWB, Concerned LGUs	Included in the construction cost

Environmental Component / Project Phase	Potential Impact	Mitigation Measures	Implementation organization / Responsible (supervisory) organization	Cost
	Impact on important local species and/or protected species	<ul style="list-style-type: none"> A policy of no hunting or collection of fauna species shall be applied to all project-related laborers and other personnel during construction. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, DENR-PAWB, Concerned LGUs	Included in the construction cost

Table 8.2.3 Environmental Management Plan for Potential Negative Impacts on Social Environment

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
1. Involuntary Resettlement				
(1) Pre-Construction and Construction				
	Relocation of affected persons from the project area (Right-Of-Way (ROW) and river area), if any	<ul style="list-style-type: none"> Appropriate resettlement action plan (RAP) must be prepared and implemented based on RA 7279 and RA 10752, so that displaced persons shall be provided with resettlement sites and alternative livelihood measures, Grievance redress system must be established and implemented to timely receive and properly solve complaints and grievances of PAPs, Adequate public consultations and IEC must be designed, planned and conducted prior to construction of the project in order to minimize social impacts and increase acceptability of relocation and the project, and Living status of displaced persons must be regularly monitored by responsible agencies and concerned LGUs, in order to maintain and improve the level of quality of living of displaced persons. 	DPWH Concerned LGUs NHA DSWD DTI TESDA DOLE	To be determined in RAP

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
(2) Operation				
	Relocation of PAPs from the project area (Right-of-Way and river area), if any	<ul style="list-style-type: none"> Living status of displaced persons must be regularly monitored by responsible agencies and concerned LGUs, in order to maintain and improve the level of quality of living of displaced persons. 	DPWH Concerned LGUs NHA, DSWD DTI, TESDA, DOLE	To be determined in RAP
2. Poverty Group				
(1) Pre-Construction and Construction				
	Increased vulnerability of impoverished PAPs to disruptive impacts of project implementation	<ul style="list-style-type: none"> Provision of additional income and livelihood measures specifically targeting poor households affected by the project. Measures include skills training, job placement, and access to capital, etc. Offer mental health and psychosocial support services. 	Concerned LGUs NHA DSWD DTI DOLE	To be determined in RAP
(2) Operation				
	Increased vulnerability of impoverished PAPs to disruptive impacts of project implementation	<ul style="list-style-type: none"> Regular monitoring of poor project affected households' standard of living by responsible agencies and local government unit. 	Concerned LGUs NHA DSWD DTI DOLE	To be determined in RAP
3. Local Economy				
(1) Pre-Construction				
	Loss of business in the local communities	<ul style="list-style-type: none"> Provide PAPs whose business was affected with assistance measures to restore their business and its income and employment including opportunities to restore their business and contribute to business restoration in local communities. 	Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
(2) Construction				
	Loss of business in the local communities	<ul style="list-style-type: none"> Implement and monitor measures to restore local economy through providing assistance to affected local business. 	Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP
(3) Operation				
	Loss of business in the local communities	<ul style="list-style-type: none"> Further implement and monitor measures to restore local economy through providing assistance to affected local business, since restoration may still take time after construction is completed. 	Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP
4. Land Use and Utilization of Local Resources				
(1) Pre- Construction				
	Land acquisition for Project site (ROW and river area), and necessary modification of land use	<ul style="list-style-type: none"> Appropriate land acquisition must be implemented based on RA 10752, so that the compensation for affected land and other properties shall be properly conducted, Dissemination of necessity of project and expected contribution to Metro Manila and the whole country for understanding the justification of the Project through Public Consultation and IEC activities, and Provide all PAPs with appropriate compensation and entitlements depending on eligibility as mandated by law, and as commensurate to value of assets lost. 	DPWH Concerned LGUs DENR DTI	To be determined in RAP

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
5. Water Use and River Dependency				
(1) Pre-Construction and Construction				
	Limited accessibility to water use and/or river area usage	<ul style="list-style-type: none"> Appropriate consultation and coordination must be made among all concerned agencies and communities to be affected about the constraint in accessibility to the river as well as possible measure/s for mitigation and/or compensation. 	DPWH Concerned LGUs The Contractor	To be included in the construction cost
(2) Operation				
	Limited accessibility to water use and/or river area usage	<ul style="list-style-type: none"> Design and installation of stairs or other appropriate facilities on the flood control structures for improving accessibility to the river. 	DPWH Concerned LGUs The Consultant for D/D	To be included in the maintenance cost
6. Existing Social Infrastructure and Services				
(1) Pre-Construction and Construction				
	Limited accessibility to social infrastructures and services located within or vicinity of the project area	<ul style="list-style-type: none"> If the social facilities are not required to be relocated, but located near to construction site, construction plan and method shall be well prepared and carefully implemented so that sensitive facilities must not to be damaged, and Appropriate consultation and coordination must be made among all concerned agencies and communities for further seeking possible measures not to relocate and if not, for seeking measures for proper relocation. 	DPWH Concerned LGUs The Contractor	To be included in the construction cost
(2) Operation				
	Limited accessibility to social infrastructures and services located within or vicinity of the project area	<ul style="list-style-type: none"> Status of relocated facilities and its activities and operations be monitored by the proponent and concerned LGUs in order to assist in improving activities and operations. 	DPWH Concerned LGUs	To be included in the maintenance cost

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
7. Misdistribution of Benefits/ Local Conflicts of Interest				
(1) Pre-Construction/ Construction and Operation				
	Misdistribution of benefits and social cost among local residents	<ul style="list-style-type: none"> Dissemination of necessity of project and expected contribution to Metro Manila and the whole country for understanding the justification of the Project through Public Consultation and IEC activities, Provide all PAPs with appropriate compensation and entitlements depending on eligibility as mandated by law, and as commensurate to the value of assets lost, and Offset income loss with appropriate monetary compensation, assistance in the form of skills training, job placements, or other livelihood programs, as applicable. 	DPWH Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP
	Differing severity of adverse impacts, and unequal compensation among PAPs	<ul style="list-style-type: none"> Provide all PAPs with just and equitable compensation and entitlements depending on eligibility as mandated by law, and as commensurate to the value of assets lost, Offset income loss with appropriate monetary compensation, assistance in the form of skills training, job placements, or other livelihood programs, as applicable, Disseminate grievance procedures to PAPs, and Offer mental health and psychosocial support services. 	DPWH Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP
8. Gender and Socially Vulnerable Groups				
(1) Pre-Construction and Construction				
	Vulnerable households at a higher risk of falling into poverty	<ul style="list-style-type: none"> Provide appropriate compensation or sustainable income generating programs necessary for vulnerable groups to counteract the disadvantages inherent to their circumstances. 	DPWH Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
		<ul style="list-style-type: none"> Ensure adequate access to services in the resettlement sites, including livelihood options, schools, health facilities, water supply, and transport to mitigate adverse effects of relocation for vulnerable groups. Offer mental health and psychosocial support services. 		
(2) Operation				
	Vulnerable households at a higher risk of falling into poverty or becoming financially worse-off after project implementation.	<ul style="list-style-type: none"> Regular monitoring of relocated project affected vulnerable groups. 	DPWH Concerned LGUs NHA DSWD DOLE DTI	To be determined in RAP
9. Rights of Children				
(1) Pre-Construction and Construction				
	Disruption of schooling and possible harm to children's well-being.	<ul style="list-style-type: none"> Ensure decent housing and presence of fully functional basic utilities/facilities like schools and clinics before project-affected children are relocated. Include open spaces for play and recreation in the relocation sites. Offer mental health and psychosocial support services. 	Concerned LGUs NHA DSWD DOLE DTI	To be included in the construction cost
10. Labor Environment (including Occupational Safety)				
(1) Construction				
	Accidents during construction works	<u>Mitigation measures:</u> <ul style="list-style-type: none"> Preparation of Health and Safety Plan to be prepared by the Contractor prior to start of construction referring to DOLE D.O 13, Monitoring of health and safety performance and indicators by the Contractor, 	DPWH The Contractor Concerned LGUs TESDA	To be included in the construction cost

Environmental Component / Project Phase	Impact	Mitigation Measures	Implementation Organization / Responsible (supervisory) Organization	Cost
		<ul style="list-style-type: none"> • Provision of safety education to construction workers, • Provision and mandatory requirement for workers to wear PPEs, • Posting of appropriate safety signs and traffic advisories at strategic areas in the construction site, and • Provision of sufficient lighting at unsafe areas during nighttime. 	DOLE DTI	

8.3 Compliance with ECC Conditions

The conditions described in the ECC (1998) shall be followed and fulfilled by the proponent (DPWH) as stated. Compliance with ECC shall be monitored by the DPWH and a Multipartite Monitoring Team (MMT) to be set up in the proposed Phase IV Project. Construction contractor/s is also mandated to comply with the ECC conditions. For each ECC conditions, the following actions are proposed to be taken:

Table 8.3.1 List of ECC Conditions and Action to be Taken for Compliance

No.	ECC Conditions (EIS 1998)	Action to be Taken												
I. Pre-construction and Construction Stage														
1	<p>This Certificate covers only the improvement of Pasig and Marikina river channel including construction and operation of water front amenities and Marikina Control Gate Structures having the following project activities/components;</p> <table border="1"> <thead> <tr> <th>River Stretch</th> <th>Scope of Work</th> </tr> </thead> <tbody> <tr> <td>Pasig River: 6.84 km (River mouth to Sun Juan River)</td> <td>Raising of existing parapet wall and rehabilitation of revetment.</td> </tr> <tr> <td>Pasig River: 9.76 km (San Juan River to Napindan Channel)</td> <td>Raising of existing parapet wall and rehabilitation of revetment.</td> </tr> <tr> <td>Lower Marikina River: 5.58 km (Napindan Channel to Marikina Control Gate Structure; MCGS)</td> <td>Dredging/excavation, provision of new parapet wall and rehabilitation of revetment.</td> </tr> <tr> <td>MCGS and Upper Marikina River: 1.21 km (MCGS to Mangahan Floodway)</td> <td>Construction of MCGS, dredging/excavation, raising of embankment.</td> </tr> <tr> <td>Upper Marikina River: 6.43 km (Mangahan Floodway to Sto. Nino)</td> <td>Excavation and raising of embankment.</td> </tr> </tbody> </table>	River Stretch	Scope of Work	Pasig River: 6.84 km (River mouth to Sun Juan River)	Raising of existing parapet wall and rehabilitation of revetment.	Pasig River: 9.76 km (San Juan River to Napindan Channel)	Raising of existing parapet wall and rehabilitation of revetment.	Lower Marikina River: 5.58 km (Napindan Channel to Marikina Control Gate Structure; MCGS)	Dredging/excavation, provision of new parapet wall and rehabilitation of revetment.	MCGS and Upper Marikina River: 1.21 km (MCGS to Mangahan Floodway)	Construction of MCGS, dredging/excavation, raising of embankment.	Upper Marikina River: 6.43 km (Mangahan Floodway to Sto. Nino)	Excavation and raising of embankment.	
River Stretch	Scope of Work													
Pasig River: 6.84 km (River mouth to Sun Juan River)	Raising of existing parapet wall and rehabilitation of revetment.													
Pasig River: 9.76 km (San Juan River to Napindan Channel)	Raising of existing parapet wall and rehabilitation of revetment.													
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MCGS and Upper Marikina River: 1.21 km (MCGS to Mangahan Floodway)	Construction of MCGS, dredging/excavation, raising of embankment.													
Upper Marikina River: 6.43 km (Mangahan Floodway to Sto. Nino)	Excavation and raising of embankment.													
2	All other permits from pertinent government agencies shall be secured before project implementation. Likewise, the proponent should submit a Memorandum of Agreement (MOA) with Local Government Units (LGUs) pertaining to the preparation of maps identifying/showing the flood prone barangays, profile of the poor which include the families living in high risk location along the Pasig-Marikina Rivers, preparation of disaster management plan including response to flooding and greening and maintenance of project amenities as well as with the Pasig River Rehabilitation Project relative to the resettlement plan for the affected families.	To be complied by DPWH in assistance with the services of the Consultant employed by DPWH.												
3	A detailed construction design and contract documents shall be submitted to this Office one (1) month prior to the start of construction.	To be compiled upon the conclusion of Contract between DPWH and Contractor, prior to the start of construction.												
4	A Construction Contractor's Environmental Program (CCEP) shall be submitted to this Office for approval 30' days before the start of construction which should contain among others, definite mitigation measures such as proper disposal of spoils and waste materials, excess concrete and wash water from transit mixers and others.	To be complied by the Construction Contractor in accordance with the Conditions/Technical Specification of the Contract between the Contractor and DPWH.												
5	The project proponent shall conduct orientation for resident engineers and	To be complied through the Project Consultant employed by DPWH. Multi-media information												

No.	ECC Conditions (EIS 1998)	Action to be Taken
	contractor who will undertake and implement the project, to apprise them of the conditions/stipulations of the ECC and the necessary measures that will mitigate adverse environmental impacts, and submit reports of such orientation to this Office, copy furnished the Multipartite Monitoring Team (MMT).	education campaign is one of scope of services of Consultant.
6	A multi-media information education campaign shall be implemented by the proponent covering the immediate areas as well as adjacent and affected cities. The target public will include the local government unit officials and residents concerned, basic sectors which will include NGOs and POs.	To be complied through the Project Consultant employed by DPWH. Multi-media information education campaign is one of scope of services of Consultant.
7	A billboard measuring 0.5 meters by 1.0 meter bearing "ECC-98-NCR-QC301 issued pursuant to P.D. 1586" shall be displayed in a conspicuous location at the project site for identification and guidance.	To be complied by the Contractor in accordance with the Conditions/Technical Specification of the Contract between the Contractor and DPWH.
8	In case that the construction of the project temporarily stopped due to financial reason or forced majeure, measures to project and safeguard the adjacent properties and the general public should be strictly observed.	To be complied by the Contractor in accordance with the Conditions/Technical Specification of the Contract between the Contractor and DPWH.
II. Operation Stage		
9	All restoration works/grading of the exposed grounds shall be immediately undertaken after construction all in accordance with the Technical Specifications of the Contract.	To be complied by the Contractor in accordance with the Conditions/Technical Specification of the Contract between the Contractor and DPWH.
10	Planting of trees/shrubs/ornamental plants or landscape activities shall be undertaken to contribute to the aesthetic value of the area and to compensate for the lost capability of the area to absorb carbon dioxide.	To be complied by inclusion in the detailed design and conditions/technical specification of the Contract with the Contractor.
III. Others		
11	A separate Initial Environmental Examination (IEE) or an Environmental Impact Statement (EIS) shall be prepared and submitted to this Office for the designated/chosen disposal site.	To be carried out by the consultant during the detailed design, including coordination with concerned agencies, collection data/information, site reconnaissance, data consolidation, etc.
12	The proponent shall set up/provide a Contractor's All Risk Insurance (CARI) and Quick Response Fund (QRF) to compensate/ cover expenses for indemnification of damages to life, health, property and environment caused by the project and further environmental assessment. The QRF shall be established and committed through a Memorandum of Agreement (MOA) between and among the proponent, the LGU concerned, Non-governmental Organization's (NGO) and	Submitted on May 27, 1999.

No.	ECC Conditions (EIS 1998)	Action to be Taken
	affected parties within sixty days (60) after the issuance of the ECC.	
13	The Department of Public Works and Highways (DPWH) Environmental Unit (EU) together with the Project Management Office and Technical Consultants shall supervise the contractors, implement the EMP and other measures that may be required by this Office during construction and operation phases.	To be complied by DPWH. DPWH EU is Environmental and Social Service Office. Project Management Office is PMO-Major Flood Control Projects, Cluster I. Environmental monitoring is one of scope of works of consultancy services of the Consultant to be employed by DPWH.
14	All the proposed environmental management measures contained in the submitted documents shall be effected.	To be complied by DPWH.
15	Project implementation and maintenance throughout its lifespan shall strictly conform with the submitted documents, any modification from the approved project scope shall be covered by another ECC application.	To be complied by DPWH.
16	Should adverse impact occur as a result of project operations, all the activities causing the same shall be immediately stopped, remedial measures shall be effected and all damages to life and property will be properly compensated to all aggrieved parties.	To be complied by DPWH.
17	The project proponent shall allocate funds or provide the financial requirements of the Multipartite Monitoring Team (MMT) and shall allow the same to conduct inspection/monitoring in the entire project area without prior notice to oversee compliance to ECC conditions and to determine the residual impacts to the environment.	To be complied by DPWH. (Environmental monitoring including preparation and operation for MMT is one of scope of works of consultancy services of the Consultant to be employed by DPWH.)
18	Additional ECC condition(s) shall be imposed if findings to protect the environment warrants.	To be complied.
19	Any false information contained in the submitted documents and non-disclosure of vital information which led to the issuance of the ECC shall render the same null and void and a ground for filing of appropriate legal charges.	To be complied.
20	This Certificate shall be posted in a conspicuous place in the Field Office for easy reference and guidance.	To be complied.
21	The project proponent shall submit to this Office a quarterly environmental monitoring report based on the submitted/approved environmental monitoring plan.	To be complied. (Environmental monitoring including preparation of quarterly environmental monitoring reports is one of scope of works of consultancy services of the Consultant to be employed by DPWH.)
22	In case the project proponent cannot comply with any of the conditions for technical reasons, a written approval from the DENR-NCR shall be secured first prior to implementation.	To be complied.

8.4 Possible Required Environmental Permission for Phase IV

The following table shows the environmental permissions to be possibly required for the implementation of Phase IV:

Table 8.4.1 Environmental Permissions to be Possibly Required

No.	Necessary Permission	Approved by	Requested by	Schedule for Application
1	<p><u>ECC for Disposal of Excavated/Dredged Materials</u></p> <p>As per conditioned in the ECC for EIS (1998) that any modification from the approved project scope shall be covered by another ECC application, in case to develop disposal/backfill site for excavated materials in the Phase IV, it is deemed that an amendment of the ECC or separate ECC is required. DPWH, the Proponent, shall secure a separate ECC during the stage of Detailed Design Study.</p>	DENR-EMB-NCR	DPWH	Upon completion of the Detailed Design Study. Prior to start of construction.
2	<p><u>LLDA Clearance</u></p> <p>Project proposed by DPWH within the Laguna de Bay Region is required to secure LLDA Clearance in accordance with Resolution No.223, Series of 2004, including clearance for disposal of excavated/dredged materials.</p>	LLDA	DPWH	Prior to start of construction.
3	Disposal/Backfilling of Excavated/Dredged Materials	LGU (where the disposal/backfill site is bound)	DPWH	Pre-construction Stage.
4	Permission for Passage of Heavy Construction Equipment/Barge	PCG (Philippine Coastal Guard) MMDA LGUs	DPWH with Contractor	Prior to start of construction activities.
5	Construction Activities	LGUs	Contractor	Prior to start of construction activities.

8.5 Information Disclosure and Implementation of IEC

(1) Stakeholder Meetings

DPWH, with assistance of the review survey team for Phase IV, coordinated stakeholder meetings in the concerned LGUs and agencies as shown in the table below. The meetings were held mainly aimed at dissemination and consultation on the river channel alignment, social impacts of the project, census tagging, socio-economic survey, necessity of resettlement and RAP, etc. As results of a series of stakeholder meetings so far, river channel alignment was basically agreed and no significant disagreement or objection from the stakeholders including the project affected community.

Table 8.5.1 Record of Stakeholder Meetings (Including Both Phase IV and V)

No.	Date	Time	Target Area/ Stakeholder	Venue	Participants	Discussion Topic
1	January 5, 2015	10:00 – 11:30	Municipality of San Mateo	Municipality Hall of San Mateo	City Engineer	Briefing of project plan and necessity of community consultation
2	January 13, 2015	15:00 – 17:00	Barangay Banaba, San Mateo	Barangay Banaba Multipurpose Hall	Informal Settlers (50 nos.) and Homeowners' Board Members, San Mateo	Briefing of project plan, Necessity of displacement of people who are living in the river channel alignment, and commencement of census tagging and socio-economic survey
3	January 22, 2015	09:35 – 12:05	Marikina City	Marikina City Hall	City Mayor, City Engineer, City Official	Briefing of project plan, river channel alignment, potential impacts on existing social infrastructures, consultation on Resettlement Action Plan (RAP).
4	January 29, 2015	09:00 – 11:45	Pasig City	Pasig City Hall	City Mayor, City Engineer	Briefing of project plan, river channel alignment, potential impacts on existing social infrastructures and development plans such as Circulo Verde.
5	February 4, 2015	09:00 – 12:12	Quezon City	Quezon City Hall	City Mayor, City Engineer	Briefing of project plan, river channel alignment and commencement of census tagging and socio-economic survey, RAP preparation, necessity of community consultation.
6	February 6, 2015	09:15 – 10:55	Pasig City	Pasig City Hall	City Engineer, City Official (Urban Poor Affairs Office)	Conduct of a survey of river channel alignment and potential impact on Informal Settler Families (ISFs).
7	February 16, 2015	10:00 – 11:25	Joint LGU Meeting (Quezon, Marikina, San Mateo)	Quezon City Hall	City Engineer, City Official (Urban Poor Affairs Office)	Consultation for finalization for river channel alignment and facility design.
8	February 24, 2015	13:30 – 16:20	Joint LGU Meeting (Quezon, Marikina, San Mateo)	Luxent Hotel, Quezon City	City Engineer, City Official	Consultation for finalization for river channel alignment and necessity of land acquisition and resettlement of project affected people due to the project.

No.	Date	Time	Target Area/ Stakeholder	Venue	Participants	Discussion Topic
9	March 3, 2015	13:30 – 15:20	Joint LGU Meeting (Quezon City, Marikina City, San Mateo)	Marikina City Hall	City Engineer, City Official (Community Development Office, CSWDO, Urban Poor Assess Office, etc.)	Presentation/consultation on river channel alignment and impacts on related LGUs of the project.
10	March 10, 2015	10:30 – 12:00	Pasig City	Pasig City Hall	City Official (City Housing Regulatory Unit)	Information exchange on potential social impacts of the project in the area of Pasig City.
11	March 10, 2015	13:30 – 16:00	Joint LGU Meeting (Quezon, Marikina, San Mateo) and MWCI	Sulo Riviera Hotel, Quezon City	City Engineer, City Official, Engineer of MWCI	Presentation of revised river channel alignment after ground survey and social impacts of the project.
12	March 17, 2015	13:30 – 15:30	Joint LGU Meeting (Marikina, San Mateo) and MWCI	Marikina City Hall	City Engineer, City Official, Engineer of MWCI	Consultation for agreement on revised river channel alignment at Malanday area and Nangka River.
13	March 23, 2015	13:40 – 15:15	MWCI	MWCI building	Engineer, Official of MWCI	Consultation on river channel alignment and alignment of MWCI water pipelines

*: Number in () means number of female participants.

(2) Public Consultation Meetings

A series of Public Consultation Meeting (PCM) was held in the project affected areas along the Phase IV section. A total of four (4) times of PCM was planned, consisting of two (2) times in Marikina City, one (1) time in Pasig City and one (1) time in Quezon City. Of which three (3) times of PCM was held including 2 times in Marikina City and one (1) time in Quezon City. Regarding Pasig City, PCM has yet to be held as of the end of June 2015 and postponed for a while following the request of the city government to avoid the potential conflict among community stakeholders and the city government.

There were 244 participants to the three (3) PCMs in total including those from proponent side as shown in the table below. After two presentations regrading (1) project description and (2) environmental and social considerations aspect were made, an open forum was held, in which active discussions were held, in each PCM. There were no strong opinions on objection for the Project. The details of the PCM were incorporated in ANNEX-5.

Table 8.5.2 Summary of Public Consultation Meetings (PCM) for Phase IV

No.	Date	Time	Target Area	Venue	Participants
1	June 1, 2015	14:00 – 16:27	Barangays Jesus De La Peña, Tañong, Barangka, Industrial Valley, Marikina City	Barangay Jesus Dela Peña, Multipurpose Hall	Total: 69 LGU Official: 8 Local Community: 47 Proponent Side: 14
2	June 3, 2015	14:00 – 16:23	Barangays Sto. Nino, Santa Elena (Pob.), San Roque, Calumpang, Marikina City	Barangay Calumpang, Multipurpose Gym	Total: 63 LGU Official: 10 Local Community: 38 Proponent Side: 15

No.	Date	Time	Target Area	Venue	Participants
3	June 5, 2015	09:00 – 11:45	Barangays Blue Ridge B, Ibis, Bagumbayan, Ugong Norte, Quezon City	Barangay Bagumbayan, Multipurpose Hall	Total: 112 LGU Official: 7 Local Community: 95 Proponent Side: 10

(3) Other Information Disclosure

Information on not only environmental and social concerns but also structural design will be disclosed properly and adequately in accordance with JICA Guidelines for Environmental and Social Considerations.

Stakeholders can access the information such as EIS (1998) for PMRCIP, this updated EIS for Phase IV (2015), results of detailed design, etc., at the following agencies. In this regard, stakeholders may request the explanation with local language (Tagalog).

- a) DPWH-UPMO-FCMC (Unified Project Management Office for Flood Control Management Cluster) in Port Area, Manila City.
- b) DPWH-ESSD (Environmental and Social Safeguards Division), Central Office of DPWH, Port Area, Manila City, including website of ESSD.
- c) LGUs: Pasig, Marikina and Quezon Cities.

There are also disclosed at barangay halls of the affected barangays in each city. Such disclosure shall start as soon as this updated EIS for Phase IV is completed and last until completion of the project. The document shall be available at any time for perusal by project stakeholders such as local residents during project's life and copying is permitted. Disclosure of EIS report shall be informed through public distribution of brochures.

(3) Implementation of IEC

Perception survey for the project conducted in the source of the environmental survey revealed that only 44 % of respondents aware of the Project (Refer to Section 5.4.14), suggesting there is need of dissemination about the Project to local community. This need can be responded to with a campaign activity for information dissemination.

The Information Education and Communication (IEC) activity shall have the following objectives:

- a) To disseminate vital information about the Project, objectives, phased implementation, activities involved, and impacts,
- b) To reach as wide an audience among major stakeholders of the Project,
- c) To provide a venue for these stakeholders to discuss the Project,
- d) To enable the affected residents to have a sense of ownership of the Project, which will lead to a greater support and cooperation from the public, and
- e) To encourage community participation in responding to flooding as a major community problem.

Cost for IEC is to be included in the cost of consulting engineering services for the Phase IV as the same as ongoing Phase II and III. In the scope of consulting engineering service for PMRCIP Phase II and III, the consultant has continuously been conducting various information campaigns in the Project area that belongs to Manila City, Mandaluyong City, Makati City, and Pasig City. The campaigns are coordinated for various target groups such as government officials, general public, and students. The contents of the campaign cover many educational subjects such as importance of flood control, and necessity of river bank management work, etc.

For Phase IV, the IEC shall be planned and carried out based on the performance for Phase II and III and evaluation result of its effectiveness.

8.6 Institutional Plan for Environmental Management and Monitoring

The institutional plan intends to delineate the roles and responsibilities of the key players who will be directly involved in the implementation of environmental management and monitoring of the Project in general and the EMP in particular.

It is reasonable to continue using the existing organizational structure and MMT of Phase III for the proposed Phase IV, but it needs to meet the LGUs binding the Project IV area and additional/new members for disposal/ backfilling site to be developed for the dredged/ excavated materials (Refer to Chapter 9).

The following shown on Figure 8.6.1 is institutional relationship expected for Phase IV of PMRCIP for environmental management and monitoring.

(1) DPWH-UPMO-FCMC (Proponent)

EIS (1998) concluded that the overall environmental impact would be positive and that the overall benefit to society would outweigh the overall negative impact.

DPWH-UPMO-FCMC as proponent of the Project must appoint Environmental Officer (EO) who is responsible for environmental issue of the Project. The EO shall be tasked with the followings:

- To coordinate with the LGUs and the DENR on all the environmental aspect during pre-construction and construction stages of the Project,
- To monitor all activities relative to the ECC conditions to ensure compliance of all requirements,
- To coordinate with the DENR on all environmental monitoring activities,
- To actively participate in the periodic consultations with all concerned LGUs and GAs on the various environmental impact issues of the Project,
- To maintain records on all matters concerning the environmental aspects of the Project,
- To prepare environmental status reports of the Project during the construction stage and consolidate these reports for periodical submittal to the DENR, and
- To prepare an environmental completion report of the project after the completion of construction works of the Project, Phase IV.

(2) Construction Supervision (C/S) Consultants

The C/S Consultants, personnel/s in charge of environmental management and monitoring in particular, will assist the Proponent, DPWH-UPMO-FCMC, in facilitating all the necessary tasks and activities concerning the environmental aspects of the Project. The C/S Consultants shall assign Environment Expert.

(3) Contractor

The Contractor shall be bound by the Contract Agreement with DPWH to implement the sound environmental protection, remedial and safety measures in the execution of the construction works, and to comply with all requirements of ECC conditions and EMP. To ensure this, the Contractor shall have in its employ an Environmental Officer / Safety Officer who should be an expert in environmental engineering/ management system and safety in the construction works site.

(4) Concerned LGUs

The LGUs related with Phase IV, Pasig, Marikina, Quezon, and Taguig cities, shall be aptly represented in the MMT. It should coordinate closely with the DPHW, the Proponent and DENR-EMB-NCR, the Regulatory Agency, and Community Stakeholders for ensuring sound management of the Project for mitigation of environmental adverse impacts in their respective administrative areas.

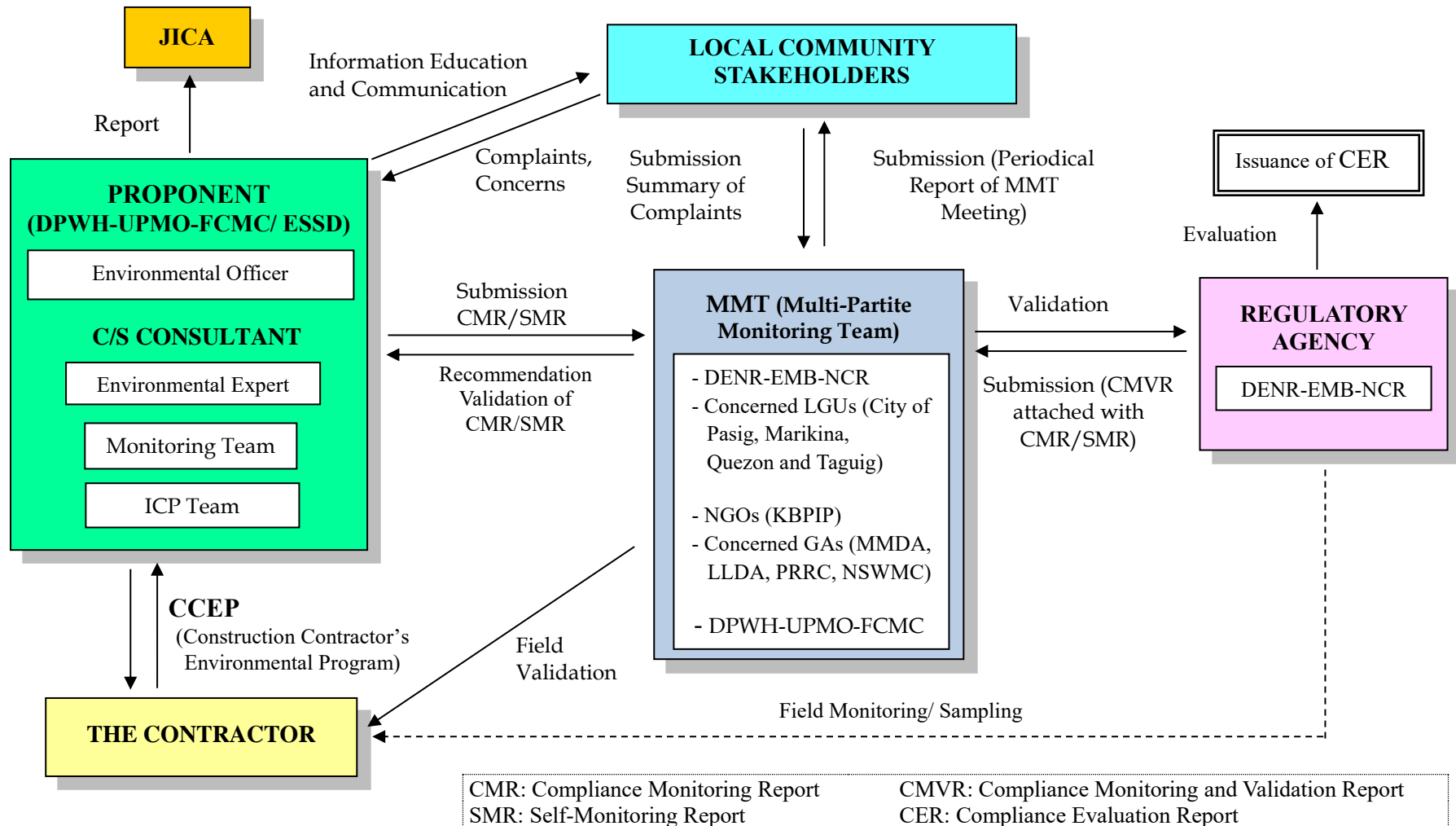


Figure 8.6.1 Institutional Relationship for Environmental Management and Monitoring for PMRCIP, Phase IV

(5) Concerned GAs

The GAs related with Phase IV, MMDA, LLDA, PRRC and NSWMC, shall be aptly represented in the MMT. It should coordinate closely with the DPHW, the Proponent and DENR-EMB-NCR, and the Regulatory Agency for ensuring sound management of the Project for mitigation of environmental adverse impacts in their respective mandates and jurisdictions.

(6) MMT

The Multipartite Monitoring Team (MMT) is a multi-stakeholder body shall be organized to monitor compliance with ECC conditions, measures set out in the EMP and pertinent DENR rules and regulations. The MMT shall also serve as an independent evaluator that will provide check, balance and objectivity to the entire environmental monitoring process. It is to be chaired by DENR-EMB-NCR, the Regulatory Agency for the environmental impacts of project. The table below shows expected constituents and its roles:

Table 8.6.1 Expected MMT Constituents

Constituents	Roles
DENR-EMB-NCR	MMT Chairperson
DPWH-UPMO-FCMC (Proponent)	MMT Vice Chairperson/ Secretariat
LGUs: Pasig City Quezon City Marikina City Taguig City	Member Member Member Member
Concerned Government Agencies: MMDA LLDA PRRC NSWMC (Add or replace them with most appropriate government agencies for Project Phase IV)	Member Member Member Member
Non-Governmental Organization (NGOs) KBPIP	Member

Necessary operation costs of EMP and MMT shall be borne by DPWH as cost for consulting services of Phase IV in the Project Cost.

(7) Local Community Stakeholders

Homeowners Associations and People’s Organizations as well as industrial and/or commercial establishment associations in the barangays along Marikina River could be considered as Local Community Stakeholders in relation to the environmental management and monitoring for PMRCIP Phase IV. Currently, MMT is formed of members without local community stakeholders although PEIS has been encouraging public participation, promoting vigilance amongst stakeholders and providing appropriate check and balance mechanisms in monitoring the project implementation.

From the institutional views, the local community stakeholders could be represented by the barangay officials so that MMT shall send the periodical report on environmental monitoring and receive the summarized complaints at periodical meeting of MMT.

CHAPTER 9 ENVIRONMENTAL MONITORING PLAN

9.1 Overview of Environmental Monitoring for Phase IV

The Environmental Monitoring Plan for the Phase IV will cover the pre-construction, construction and operation phases of the Project. This summarizes what important parameters will be monitored and where, which methodologies will be used in monitoring, and how frequent will be for measurements.

The Monitoring Plan will basically cover the following:

- a) Compliance monitoring for ECC conditions issued for EIS (1998) and EMP in this Updated EIS,
- b) Environmental Quality Monitoring (air quality, water quality, solid wastes (volume of excavated materials), soil contamination (quality of riverbed sediment and excavated materials), noise and vibration, terrestrial flora and fauna), and
- c) Socio-economic Monitoring (potential impacts due to land acquisition and resettlement including land use, water use and river dependency, existing social infrastructures and services, misdistribution of benefit and damage/ local conflicts of interest, and labor environment).

Monitoring frequencies and parameters of the Phase IV are set referring to those for Phase II and III. Additional monitoring activities, which are to be conducted in the vicinity of respective construction sites, will be included in Construction Contractor's Environmental Program (CCEP) which is mandated for a contractor to submit to the proponent (DPWH-UPMO-FCMC).

9.2 Environmental Monitoring Plan

The following tables show the environmental monitoring plans for the potential negative impacts with the magnitude of Significant (A-), To some extent (B-) or Unknown (C-) (refer to Table 9.1.5) based on river channel improvement works and RAP of the Project Phase IV:

Table 9.2.1 Environmental Monitoring Plan for Physical-Chemical Environment

Environmental Component / Monitoring item	Methodology	Monitoring Locations	Monitoring Period / Frequency	Implementation organization / Responsible (supervisory) organization	Cost* (Direct survey cost)
1. Air Quality					
Dust (TSP), NO ₂ , SO ₂	Sampling and laboratory analysis	Nearest receptor from the project site and sensitive facilities / 4 locations (residential area near the project site): Near Marikina Bridge, Provident village, Brgy. Santolan, and Near MCGS.	<p><u>Pre-construction Phase:</u></p> <ul style="list-style-type: none"> Once immediately before the construction work as baseline condition <p><u>Construction Phase:</u></p> <ul style="list-style-type: none"> Quarterly (once / 3 months) throughout the construction phase <p><u>Operation Phase:</u></p> <ul style="list-style-type: none"> Once within 3 months after completion of construction work 	<p><u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR</p>	To be estimated in D/D Study of Phase IV
2. Water Quality					
DO, BOD, TSS, Oil and Grease	Sampling and laboratory analysis	Phase IV Stretch of Marikina River / 4 locations: Same as stationary monitoring below: Marikina Bridge, Marcos Bridge, Manalo Bridge, and Downstream of MCGS.	<p><u>Construction Phase:</u></p> <ul style="list-style-type: none"> Bi-monthly (once / 2 months) throughout the construction phase 	<p><u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR</p>	To be estimated in D/D Study of Phase IV
Color, Temp. pH, DO, BOD, TSS, TDS, Oil and grease, MBSA, Nitrate as N, Phosphate as P, Phenols, Total Coliform,	Sampling and laboratory analysis	Phase IV Stretch of Marikina River / 4 locations (stationary monitoring):	<p><u>Pre-construction Phase:</u></p> <ul style="list-style-type: none"> Once immediately before the construction work <p><u>Construction Phase:</u></p>	<p><u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR</p>	To be estimated in D/D Study of Phase IV

Environmental Component / Monitoring item	Methodology	Monitoring Locations	Monitoring Period / Frequency	Implementation organization / Responsible (supervisory) organization	Cost* (Direct survey cost)
Chloride, 7 parameters of heavy metals (Copper (Cu), Chromium (Cr), Mercury (Hg), Lead (Pb), Cadmium (Cd), Cyanide (CN) and Arsenic (As)), Organophosphate Pesticide (OPP), Turbidity, Salinity, and Conductivity		Marikina Bridge, Marcos Bridge, Manalo Bridge, and Downstream of MCGS.	<ul style="list-style-type: none"> Semi-annually (once / 6 months) throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> Once within 3 months after completion of construction work 		
Ditto	Sampling and laboratory analysis	Phase IV Stretch of Marikina River / 2 locations (downstream of dredging/excavation site)	<u>Construction Phase:</u> Intensive monitoring (3 times) during the construction phase	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR	To be estimated in D/D Study of Phase IV
3. Solid Wastes					
Generation of solid wastes (type, volume, treatment (re-use, recycle, etc.) and disposal method, including those of dredged/excavated materials and demolished structures)	Checking the data and consolidation on waste generation and disposal to be sub-contracted to accredited waste contractor	All the construction works sites	<u>Construction Phase:</u> <ul style="list-style-type: none"> Continuously (when generated the solid wastes) throughout the construction phase 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR	To be included in the construction cost
4. Soil Contamination / Riverbed Sediment (Excavated Materials Quality)					
Arsenic (As), Cadmium (Cd), Lead (Pb), Total Mercury (T-Hg), Cyanide (CN-), Hexavalent Chromium (Cr ⁶⁺), PCB	Sampling and laboratory analysis (Elutriate test)	80 locations along the Phase IV stretch of Marikina River at the locations of excavation /	<u>Detailed Design Stage</u> <ul style="list-style-type: none"> Once during the D/D Stage <u>Pre-construction Phase:</u> <ul style="list-style-type: none"> Depends on the monitoring results of D/D Study 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR	To be included in the cost for D/D Study

Environmental Component / Monitoring item	Methodology	Monitoring Locations	Monitoring Period / Frequency	Implementation organization / Responsible (supervisory) organization	Cost* (Direct survey cost)
and Organophosphate Pesticides (OPP)		dredging works are to be conducted.	<u>Construction Phase:</u> <ul style="list-style-type: none"> Depends on the monitoring results of D/D Study <u>Operation Phase:</u> <ul style="list-style-type: none"> Depends on the monitoring results of D/D Study 		
Arsenic (As), Cadmium (Cd), Lead (Pb), Total Mercury (T-Hg), Cyanide (CN-), Total Chromium (T-Cr)	Sampling and laboratory analysis (TCLP test)	80 locations along the Phase IV stretch of Marikina River at the locations of excavation / dredging works are to be conducted.	<u>Detailed Design Stage</u> <ul style="list-style-type: none"> Once during the D/D Stage <u>Pre-construction Phase:</u> <ul style="list-style-type: none"> Depends on the monitoring results of D/D Study <u>Construction Phase:</u> <ul style="list-style-type: none"> Depends on the monitoring results of D/D Study <u>Operation Phase:</u> <ul style="list-style-type: none"> Depends on the monitoring results of D/D Study 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR	To be included in the cost for D/D Study
5. Noise and Vibration					
Noise level and vibration (vibration level, displacement velocity, acceleration, frequency)	Field measurement	Nearest receptor from the project site and sensitive facility / 4 locations: (residential area near the project site): Near Marikina Bridge, Provident village, Brgy. Santolan, and Near MCGS.	<u>Pre-construction Phase:</u> <ul style="list-style-type: none"> Once immediately before the construction work <u>Construction Phase:</u> <ul style="list-style-type: none"> Monthly (once / months) throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> Once within 3 months after completion of construction work 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR	To be included in the cost for D/D study

Environmental Component / Monitoring item	Methodology	Monitoring Locations	Monitoring Period / Frequency	Implementation organization / Responsible (supervisory) organization	Cost* (Direct survey cost)
6. Tree Cutting/Re-planting					
Number, size and species of trees to be cut/removal	Field suvey and measurement	Project affected area (River stretch of Phase IV)	<u>Pre-construction Phase:</u> <ul style="list-style-type: none"> Once before the construction work for survey/inventory and field measurement during D/D Study <u>Construction Phase:</u> <ul style="list-style-type: none"> Before the construction work from section to section <u>Operation Phase:</u> <ul style="list-style-type: none"> Location, number and species of tree planting and/or provision of siddlings. 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR	To be included in the cost for D/D Study and construction.

Table 9.2.2 Environmental Monitoring Plan for Natural Environment

Environmental Component /Monitoring Item	Methodology	Monitoring Locations	Monitoring Period / Frequency	Implementation organization / Responsible (supervisory) organization	Cost
1. Terrestrial Flora and Fauna including Threatened species.					
Affected area (area of vegetation clearing)	Checking the ROW and affected trees by inventory survey	All the project area (ROW and the river area for clearance)	<u>Pre-construction Phase:</u> <ul style="list-style-type: none"> • Once before the construction work for inventory during D/S Study <u>Construction Phase:</u> <ul style="list-style-type: none"> • At any time throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> • Once within 3 months after completion of construction work 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-CENRO, and concerned LGUs	Included in the construction cost
Terrestrial flora and fauna and biodiversity, including threatened species/individuals	Transect and census surveys)	Project affected area (River stretch of Phase IV)	<u>Pre-construction Phase:</u> <ul style="list-style-type: none"> • Once before the construction work during D/D Study <u>Construction Phase:</u> <ul style="list-style-type: none"> • Once in the middle of construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> • Once within 3 months after completion of construction work 	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and Consultant, and DENR-PAWB	To be included in the cost for D/D study
2. Aquatic Biota					
Aquatic biota	Sampling and laboratory analysis	Project affected area (River stretch of Phase IV)	<u>Pre-construction Phase:</u> <ul style="list-style-type: none"> • Once before the construction work during D/D Study <u>Construction Phase:</u>	<u>Implementation organization:</u> Contractor, <u>Responsible (supervisory) organization:</u> Proponent and	To be included in the cost for D/D study

Environmental Component /Monitoring Item	Methodology	Monitoring Locations	Monitoring Period / Frequency	Implementation organization / Responsible (supervisory) organization	Cost
			<ul style="list-style-type: none"> • Once in the middle of construction phase <u>Operation Phase:</u> Once within 3 months after completion of construction work	Consultant, and DENR-PAWB	

Table 9.2.3 Environmental Monitoring Plan for Social Environment

Environmental Component	Methodology	Monitoring Location	Monitoring Period / Frequency	Responsible Entity / Supervision	Cost
1. Involuntary Resettlement					
Status of resettlement/relocation of project affected persons (PAPs) from the project area (within river channel alignment)	Validation in site and checking documents on ID and interview survey	Existing locations of PAPs	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly during preparation stage of construction <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 	DPWH and D/D&C/S Consultants, Concerned LGUs, NHA	To be estimated in D/D Study and C/S of Phase IV
Status and level of living standard and livelihood, Conditions of resettlement sites, etc.	Interview survey using a monitoring form to be developed through both internal and external monitoring	Resettlement sites	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of bi-monthly to quarterly after resettlement <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of quarterly to semi-annually throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> Two years after the completion of the resettlement 	DPWH and C/S Consultant, Concerned LGUs, NHA	To be estimated in D/D Study of Phase IV
2. Poverty Group					
Status and level of living standard and income level / Measures for increasing income and assistance to	Interview survey using a monitoring form to be developed.	Resettlement sites	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly after resettlement <u>Construction Phase:</u>	DPWH and C/S Consultant, Concerned LGUs, NHA	To be estimated in D/D Study of Phase IV

Environmental Component	Methodology	Monitoring Location	Monitoring Period / Frequency	Responsible Entity / Supervision	Cost
be launched for poverty groups of PAPs			<ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 		
3. Local Economy such as Employment and Livelihood					
Status and level of living standard and employment / Measures for skill-up training and other assistance for livelihood support of PAPs	Interview survey using a monitoring form to be developed.	Resettlement sites	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly after resettlement <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 	DPWH and C/S Consultant, Concerned LGUs, DSWD	To be estimated in D/D Study of Phase IV
4. Land Use and Utilization of Local Resources					
Land acquisition for Project site (ROW and river area), and necessary modification of land use	Checking the result of land purchase of project-affected area (within river channel alignment)	ROW and river area of the Project	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly 	DPWH-IROW and C/S Consultant, Concerned LGUs,	To be estimated in D/D Study of Phase IV
5. Water Use and River Dependency					
Limited accessibility to water use and/or river area usage	Interview survey with local residents and barangay offices	The barangay where the water use and/or river area usage is affected / limited due to the project.	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> Once before the construction phase <u>Construction Phase:</u>	DPWH-UPMO and C/S Consultant, Concerned LGUs	To be estimated in D/D Study of Phase IV

Environmental Component	Methodology	Monitoring Location	Monitoring Period / Frequency	Responsible Entity / Supervision	Cost
			<ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 		
6. Social Infrastructure and Services					
Limited accessibility to social infrastructures and services located within or vicinity of the project area / Status of recovery and restoration of activities and operations	Interview survey with local residents and barangay offices	The barangay where the affected infrastructures / public services are located	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> Once before the construction phase <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of quarterly to semi-annually throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 	DPWH-UPMO and C/S Consultant, Concerned LGUs	To be estimated in D/D Study of Phase IV
7. Misdistribution of Benefits / Local Conflicts of Interest					
Misdistribution of benefits and social cost among local residents / Differing severity of adverse impacts, and unequal compensation among PAPs	Checking the number of complaints, cases escalated to courts of law, resolved cases dealing with complaints over valuation, etc. filed with the DPWH, concerned LGUs and other government agencies	Offices of concerned government agencies and LGUs	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 	DPWH-UPMO and C/S Consultant, Concerned LGUs	To be estimated in D/D Study of Phase IV
8. Gender and Socially Vulnerable Groups					

Environmental Component	Methodology	Monitoring Location	Monitoring Period / Frequency	Responsible Entity / Supervision	Cost
Vulnerable households at a higher risk of falling into poverty or becoming financially worse-off after project implementation.	Interview survey using a monitoring form to be developed.	Resettlement sites	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly after resettlement <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 	DPWH-UPMO-FCMC and C/S Consultant, DSWD	To be estimated in D/D Study of Phase IV
9. Rights of Children					
Disruption of schooling and possible harm to children's well-being / Possible harm to children's well-being.	Interview survey using a monitoring form to be developed.	Resettlement sites	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly after resettlement <u>Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> One year after the completion of the construction work 	DPWH-UPMO-FCMC and C/S Consultant, DSWD	To be estimated in D/D Study of Phase IV
10. Labor Environment					
Accidents during construction works / Preparation of Health and Safety Plan to be prepared by the Contractor	Checking the safety measures launched during the construction works / accidents during construction works	Construction sites	<u>Pre-Construction Phase:</u> <ul style="list-style-type: none"> At the frequency of every month to quarterly after resettlement <u>Construction Phase:</u>	DPWH-UPMO-FCMC and C/S Consultant, DOLE	To be estimated in D/D Study of Phase IV

Environmental Component	Methodology	Monitoring Location	Monitoring Period / Frequency	Responsible Entity / Supervision	Cost
			<ul style="list-style-type: none"> • At the frequency of every month to quarterly throughout the construction phase <u>Operation Phase:</u> <ul style="list-style-type: none"> • One year after the completion of the construction work 		

CHAPTER 10 PRELIMINARY ENVIRONMENTAL STUDY FOR DISAPOSAL SITE FOR EXCAVATED/ DREDGED MATERIALS

10.1 Necessity of Environmental Impact Assessment for the Disposal Site

As one of the project works of the Phase IV, excavation/ dredging in the river channel and river banks are included. Total volume of the excavation/ dredging is estimated to be approx.1.67 million m³ from the Phase IV section (Refer to Chapter 2).

In the meantime, a separate IEE or EIS is required for acquiring a separate ECC in case of developing a disposal site for the excavated/ dredged materials in PMRCIP, which is a condition stipulated in the ECC granted for the whole Project 1998 (Refer to Section 7.3).

Thus, it is necessary to conduct an EIA study for development of disposal site to receive/ contain the excavated/ dredged materials from the Phase IV section.

10.2 Candidate Areas for Disposal Site

There are two candidate areas for developing the disposal site for excavated/ dredged materials from the Phase IV section of PMRCIP: one is open/ vacant lot(s) located along the Marikina River and the other is open/ vacant lot(s) located along Manggahan Floodway from the geographical point of view, or distance from the Project site. The former is aimed at transportation by land using dump truck and the latter is aimed at transportation by water using barge.

In the course of this environmental survey, several sites were considered as candidate sites for disposal site for excavated/ dredged materials along the Manggahan Floodway and/or near the shoreland area of Laguna de Bay in municipality of Taytay.

10.3 Laws and Regulations related to Dredged Materials

There are no laws or regulations to directly control or regulate the dredged materials in the Philippines. However, the following laws and regulation shall be applied:

(1) For the dredged materials which do not contain hazardous substances

Republic Act 9003 “Ecological Solid Wastes Management Act of 2000”: for the management of no-hazardous or non-toxic waste, this law seeks to adopt a systematic, comprehensive and ecological solid waste management program which shall;

- a) Ensure the protection of public health and environment, and
- b) Utilize environmentally sound methods that maximize the utilization of valuable resources and encourage resource conservation and recovery.

(2) For the dredged materials which contain hazardous substances

Republic Act 6969 (1990) “Toxic Substances and Hazardous and Nuclear Wastes Control Act.” which is a law designed to respond to increasing problems associated with toxic chemicals and hazardous and nuclear wastes. RA 6069 mandates control and management of import, manufacture, process, distribution, use, transport, treatment, and disposal of toxic substances and hazardous and nuclear wastes in the country. The Act seeks to protect public health and the environment from unreasonable risks posed by these substances in the Philippines.

DENR Administrative Order 29 (1992): RA 6969 designates the DENR as the implementing agency and clothes the same with specific functions, powers, and responsibilities. The Implementing Rules and Regulations of RA 6969 were issued under DAO No. 29 Series of 1992.

DAO No. 2013-22, DAO 36 Series of 2004 (DAO 04-36): Procedural Manual on Hazardous Wastes: DAO No. 04-36 is a procedural manual on hazardous wastes of DAO No.92-29, Implementing Rules and Regulations of RA 6969. DAO No. 2013-22 is a revised procedural

manual on hazardous wastes of DAO No. 04-36, which provides a table for the classification of hazardous waste and lays down the requirements for proper hazardous waste management.

(3) Other Related Laws and Regulations

Table 10.3.1 List of Related Laws and Regulations on Disposal Site

No. of Law/Regulation	Year	Title/Description
Presidential Degree (PD) 825	1975	Providing penalty for improper disposal of garbage and other forms of uncleanliness and for other purposes.
PD 856	1975	Code on sanitation of the Philippines which prescribes guidelines, requirements and restrictions to ensure cleanliness in various establishments such as restaurants, hospitals, hotels, etc.
PD 1152	1977	Philippine Environmental Code. Providing a basis for an integrated waste management regulation starting from waste source to methods of disposal. PD 1152 has further mandated specific guidelines to manage municipal wastes (solid and liquid), sanitary landfill and incineration, and disposal sites in the Philippines.
DAO 34	1990	Revised water usage and classification for water quality criteria amending Section Nos. 68 (Water Usage and Classification) and 69 (Water Quality Criteria), Chapter III of the 1978 NPCC Rules and Regulations.
DAO 35	1990	Revised Effluent Regulations of 1990, revising and amending the effluent regulations of 1982.
DAO 26-A	1994	Philippine Standard for Drinking Water 1993 under the revision of Chapter II, Section 9 of PD 856 (Code on Sanitation of the Philippines).

(4) In case of reclamation in the shoreland of Laguna de Bay

Resolution Providing Policy Guidelines on Reclamations within the Shorelands of Laguna De Bay (LLDA Resolution No. 283, Series of 2006): shall cover reclamation of shoreland areas, public or private, below 12.50 MLLW (Mean Lower Low Water), stipulating terms and conditions for reclamation in the shoreland area, environmental requirement, etc.

10.4 Environmental Issues on the Disposal Site

10.4.1 General Issues on Environmental Impacts of Disposal Site

There are several environmental issues on potential negative impacts on the surrounding areas of the disposal site:

Table 10.4.1 Possible Environmental Issues on the Disposal Site

Category	Component	Description
Pollution	Air pollution	Dust generation and emission gas from construction equipment and vehicles during transportation and dumping and leveling/ grading of excavated/ dredged materials in the disposal site.
	Noise	Noise pollution to be generated from construction equipment and vehicles during dumping and leveling/ grading of excavated/ dredged materials in the disposal site.
	Water pollution	Water pollution in the downstream areas / Laguna de Bay due to the discharge of excavated/ dredged materials to surrounding areas of the disposal site, especially in wet season due to heavy rain.
	Soil/ Groundwater contamination	Possibility of soil contamination and groundwater contamination in case the excavated/ dredged materials are contaminated with toxic substances. (preliminary survey indicate that there is low possibility of contamination in excavated/ dredged materials)
	Land subsidence / deformation of ground surface	Occurrence of land subsidence and/or deformation of ground surface in and around the disposal site due to filling operation of excavated/ dredged materials.
Natural Environment	Flora and Fauna	Clearing of existing vegetation, and disturbance of terrestrial flora and fauna species, and their habitats.

Category	Component	Description
	Aquatic biota	Disturbance of the habitat of aquatic organisms in the water body around the disposal site.
Socio-economic Environment	Land acquisition / relocation of existing structure and residents	Necessity of land acquisition, relocation of existing structures and residents in case there are existing structures, houses, private lands in the disposal site.
	Traffic	Disturbance of traffic (land and water) during transportation of excavated/ dredged materials.

10.4.2 Status of Riverbed Sediment Quality

Among the environmental issues enumerated above, the issues of riverbed sediment quality will be described in more details as follows because the issue is one the most significant ones:

Status of riverbed sediment quality was described in Section “5.2.4 Riverbed Sediment Quality,” in which the results of primary data collection in the Phase IV section was presented. In addition, the results of secondary data collection conducted for Phase III section was described in the section.

(1) Riverbed sediment quality for Phase IV Section

Sampling of riverbed sediment and/or river bank soil was conducted in approx. 1.0 km interval along all through the river stretch of the Phase IV. Both elutriate test and TCLP test were applied for the riverbed sediment/ river bank soil samples.

Survey results indicate that all the monitored values of elutriate tests are below the Method Detection Limit (MDL). All these results are complied with quality standards and indicate that the contamination risk during the dredging of riverbed sediment will be minimal.

The results also indicate that all the monitored values of TCLP test are below the Method Detection Limit (MDL) of the laboratory test except for Arsenic (As) at the location: SQ-5. All these results, including Arsenic (As) at SQ-5, are complied with quality standards stipulated in Class C waters of DAO No. 90-34 and 90-35 for elutriate test results, and DAO No. 04-36 and DAO No.13-22 for TCLP test results. The test results indicate that the contamination risk of the surface water or groundwater at the disposal site will be minimal.

(2) Riverbed sediment quality for Phase III Section

Sampling of riverbed sediment was conducted at 100 m interval along all through the river stretch of the Phase III during Detailed Design Study (2012) and another sampling was conducted in the same interval at the initial stage of dredging works in 2014. Both elutriate test and TCLP test were applied for the riverbed sediments in 2012 and 2014 for the two sample sets.

Survey results during D/D Study in 2012 and initial construction stage in 2014 indicate that monitored values of toxic substances in the riverbed sediment applied with both elutriate and TCLP tests were not detected (ND) or far below the standard values stipulated in Class C waters of DAO No. 90-34 and 90-35 for elutriate test results, and DAO No. 04-36 and DAO No.13-22 for TCLP test results.

Based on these results, it is concluded that there will be no probability of toxic substances in the riverbed sediment to leach out during the dredging operation or at disposal site, or to contaminate the water of Pasig-Marikina River or the surrounding areas of disposal site.

10.5 Process and Scope for Environmental Impact Assessment for Disposal Site

Based on the ECC condition for the EIS of PMRCIP in 1998, it is necessary to conduct EIS for the disposal site of the excavated materials for Phase IV section pursuant to PEISS. The process and scope of environmental impact study for the disposal site is set forth as follows:

Table 10.5.1 Process of EIA to be Applied for Disposal Site

No.	Process/ Work	Description / Details
1	Screening	<ul style="list-style-type: none"> Necessary type of study and required documents (IEE/EIS, etc.) shall be determined based on location and area of the disposal site following DAO No. 03-30 and EMB Memorandum Circular No. 14-005.
2	Scoping	<ul style="list-style-type: none"> Preparation of Project Description for Scoping (PDS) and submission to the competent DENR-EMB, Conduct of Technical Scoping joined by Environmental Impact Assessment Review Committee (EIARC) and Public Scoping in the concerned LGUs.
3	EIA Study (survey and analysis)	<ul style="list-style-type: none"> Field survey (sampling and measurement) and secondary data collection will be conducted for the selected components based on the scoping process mentioned above, Considering the proposed works of the disposal site, potential impacts will be examined and analyzed.
4	EIA Report Preparation	<ul style="list-style-type: none"> In addition to the study results mentioned above, Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) shall also be formulated. EIA report shall be prepared based on all the results of survey, analysis and evaluation.
5	EIA Report Review and Evaluation	<ul style="list-style-type: none"> EIA report will be evaluated by either of EIA Review Committee (EIARC) for EIS based application, or DENR-EMB internal Specialists (Technical Committee) for IEE based application
6	Decision Making on ECC Issuance	<ul style="list-style-type: none"> Based on the evaluation of EIA Report, decision making will be done for issuance of an ECC.

With regard to EIA Study, the following table summarizes the proposed scope of works of the survey (data collection) and analysis based on the environmental issues enumerated in the previous sections.

Table 10.5.2 Proposed Scope of Works for Survey and Analysis in EIA Study for Disposal Site

Category	Component	Data gathering / Survey item on baseline condition	Impact prediction and assessment
1. The Land	(1) Land use and classification	<ul style="list-style-type: none"> Current status of land use, Development trend, LGUs' land use plan 	<ul style="list-style-type: none"> Consistency with land use plan
	(2) Pedology, Topography and Geology	<ul style="list-style-type: none"> Current status of pedology, topography and geology, and their features, Current status of geohazard (liquefaction, land subsidence, land slide, soil erosion etc.). 	<ul style="list-style-type: none"> Modification of geology, topography and geology, Possibility on geohazard.
	(3) Terrestrial flora and fauna	<ul style="list-style-type: none"> Existing vegetation, Current status of flora and fauna (existing species, terrestrial ecology and biodiversity), Protected species/ protected areas. 	<ul style="list-style-type: none"> Clearing of vegetation, Disturbance / loss of habitat, and terrestrial ecology, Impacts on protected species/ protected areas.
2. The Water	(1) Hydrology/ Hydrogeology	<ul style="list-style-type: none"> River system / watershed, Water level/ discharge, Water use and water resources. 	<ul style="list-style-type: none"> Impact on hydrology/ hydrogeology (groundwater).
	(2) Water quality	<ul style="list-style-type: none"> Current status of surface water quality/ groundwater quality, Current status groundwater quality. 	<ul style="list-style-type: none"> Possibility of degradation of surface water / groundwater quality.
	(3) Sediment quality	<ul style="list-style-type: none"> Quality (re: toxic/ hazardous substances) of excavated/ dredged materials from Phase IV section, Soil quality in disposal site. 	<ul style="list-style-type: none"> Possibility of leaching out of toxic/ hazardous substances and contamination in and around the disposal site.

Category	Component		Data gathering / Survey item on baseline condition	Impact prediction and assessment
	(4)	Aquatic biota	<ul style="list-style-type: none"> Current status of aquatic biota (existing species and aquatic ecology and biodiversity), Protected species/ protected areas. 	<ul style="list-style-type: none"> Disturbance/ loss of habitat, Impacts on protected species/ protected areas.
3. The Air	(1)	Meteorology/ Climatology	<ul style="list-style-type: none"> Rainfall, temperature, wind, humidity, etc. Meteorological/ climatological features. 	<ul style="list-style-type: none"> Possibility of change in local climate, Possibility to contribute to greenhouse gas emission.
	(2)	Air quality and noise	<ul style="list-style-type: none"> Baseline condition of air quality, Ambient noise level 	<ul style="list-style-type: none"> Degradation of air quality, Increase in ambient noise level.
4. The People	(1)	Demography	<ul style="list-style-type: none"> Demographic profile (population, households, family size, etc.) of concerned LGUs. 	<ul style="list-style-type: none"> Impact on demographic profile.
	(2)	Socio-economy	<ul style="list-style-type: none"> Income level and livelihood status, Economic activities. 	<ul style="list-style-type: none"> Impact on income, livelihood and/or economic activity.
	(3)	Public health and sanitation	<ul style="list-style-type: none"> Morbidity and mortality, Health facilities. 	<ul style="list-style-type: none"> Impact on public health and sanitation.
	(4)	Water supply / power supply	<ul style="list-style-type: none"> Water supply system, Power supply system. 	<ul style="list-style-type: none"> Impact on water supply and power supply system.
	(5)	Traffic and transportation	<ul style="list-style-type: none"> Existing road network system, Road traffic and water traffic (ferry, ship, etc.) during transportation of the excavated/ dredged materials as well as around the disposal site. 	<ul style="list-style-type: none"> Impact on traffic and transportation.
	(6)	Perception for the project	<ul style="list-style-type: none"> Awareness for proposed backfilling project. 	<ul style="list-style-type: none"> Possibility of conflict between the project and the community.

10.6 Implementation Schedule

EIA Study for the disposal site will be implemented during Detailed Design stage for the Phase IV section. The proposed implementation schedule is shown in the table below:

Table 10.6.1 Proposed Implementation Schedule of EIA Study for Disposal Site

No.	Process	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month
1	Determination of Disposal Site	▲					
2	Screening	■					
3	Scoping	■					
4	Survey and Data Collection	■					
5	Report Preparation			■			
6	Submission of Draft EIS to DENR-EMB					▲	
7	EIA Report Review and Evaluation for ECC					■ (40 working days)	
8	ECC Acquisition						▲

CHAPTER 11 CONCLUSIONS AND RECOMMENDATIONS

The EIS (1998) has concluded that the proposed project can be implemented in an environmentally acceptable manner. The total benefits to be derived will overwhelmingly outweigh the effects of the potential adverse impacts. Environmentally, the proposed project is beneficial since it is actually a mitigating measure against the annual adverse impacts of a natural hazard of flooding.

In addition to the EIS (1998), the environmental survey for preparing this Updated Report for Environmental Impact Statement (EIS) has been conducted to comply with the JICA Guideline for Environmental and Social Considerations (2010) for the proposed implementation of Phase IV. As the results of the environmental survey and reviewing EIS (1998), it is concluded that the Project, Phase IV can be implemented in an acceptable manner complying with environmental standard in the Philippines.

Through the examinations and evaluation of the potential impacts, the following are recommended to be done before commencement of the construction of Phase IV:

- 1) Detailed and appropriate testing and quality analysis for excavated/ dredged materials along the Phase IV section should be conducted to clarify the characteristics of the materials in accordance with DENR's Administrative Orders (DAO No. 90-34, 90-35, 04-36 and 13-22, etc.) in such way that the Project Phase III did during its D/D Study;
- 2) A separate IEE or EIS for backfill site (disposal site) of the excavated/ dredged materials shall be prepared for acquiring a separate ECC following the condition stipulated in ECC (1998) for the PMRCIP;
- 3) Project's information dissemination and communication shall be provided to PAPs via a mobile ICP (information, communication and publicity) team once the construction starts in such way that the Project Phase II did and III is doing;
- 4) ICP team uses local language in communicating with PAPs instead of solely depending on a written report of EIS and RAP. Essence of the Project shall be informed in this manner; and
- 5) Multipartite Monitoring Team (MMT) shall be established for the Phase IV to comply with ECC (1998) for ensuring the Project's environmental management and monitoring activities in such way that the Project Phase II did and III is doing.

CHAPTER 12 ENVIRONMENTAL CHECKLIST

Environmental checklists for the Project based on a JICA Environmental Checklist for River Channel Improvement Project Form are shown as follows:

Table 12.1 JICA Environmental Checklist for Phase IV

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
1. Permits and Explanation	(1) EIA (EIS*) and Environmental Permits * NB: In the Philippines, "EIA" system is called "EIS (Environmental Impact Statement)"	(a) Have EIA reports been officially completed?	Y	"The Pasig-Marikina River Channel Improvement Project Environmental Impact Statement (Final Report), 1998" was complied with PEISS requirement and endorsed by DENR.
		(b) Are the EIA reports written in the official or widely used language?	Y	Approved EIS report is written in English which is official language in Philippines. Updated EIA report (updated EIS) for Phase IV is also prepared in English. Summary brochures of the EIS will be prepared in Tagalog, which most of the Project Affected Families can understand, for consultation meetings with PAPs.
		(c) Have EIA reports been approved by authorities of the host country's government?	Y	EIA report was approved by the DENR-EBM-NCR of Government of the Philippines. Environmental Compliance Certificate (ECC) was issued in 1998. Validation of the ECC was confirmed in 2008. Another EIA report was approved by the DENR-EMB-NCR for the Backfill Site for the dredged materials of the Project, Phase III in 2012. Additional ECC was issued for the EIS in Feb. 2013. For Phase IV, updated EIS was prepared in 2015.
		(d) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	Y	EIA report has been approved conditionally in the ECC. DPWH-UPMO-FCMC, the Proponent, complies with all the conditions during the implementation of the Project. MMT monitors the compliance with ECC conditions for Phase II and III of the Project so far.
		(e) Are the EIA reports available at all times for perusal by project stakeholders such as local residents, and is it allowed to make photocopy of it?	Y	The hard copy of RAP, the approved EIS including the Environmental Compliance Certificate (ECC), and the Supplemental EIS for Phase III was disclosed, together with summary documents/brochures of these written in Tagalog, at DPWH-UPMO-FCMC, DPWH-Environmental and Social Safeguard Division (ESSD), LGUs of Manila, Pasig, and Makati City. Besides, the brochures were disclosed at Barangay Halls of one of the affected Barangay in each LGU. Disclosure of these documents was informed to the public by distribution of the brochures to Project Affected Families (PAFs) through concerned barangay. The same manner of disclosure is to be done for this updated EIS for Phase IV.
		(e) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of	Y	EIS for backfill Site for the dredged materials was required as per the condition of ECC (1998). The EIA study, therefore, was conducted during Detailed Design (D/D) phase in 2012, and ECC was granted to the Project in Feb. 2013.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
		the host country's government?		In addition, the clearance of Laguna Lake Development Authority (LLDA) and Taguig City is required prior to the construction works of Phase III. Tree cutting permit is required to acquire from DENR and concerned LGUs. For the Project Phase IV, the same clearance is to be completed for its implementation. All necessary documents will be submitted and approved by the concerned agencies including DENR, LLDA and concerned LGUs.
	(2) Explanation to the Public	(a) Have contents of the project and its potential impact been adequately explained to local stakeholders based on appropriate procedures, including information disclosure? Has understanding of Local stakeholders been obtained?	Y	Since the beginning of the Project, stakeholders have been informed and involved; Such stakeholders are: LGUs, PRRP, Star Craft Ferry Corp., DENR-NCR office, EMB, MMDA, NGOs, LLDA, etc. A public awareness meeting was held on May 20, 1998 in Manila to disseminate information about the entire Project. All the concerns were taken care of and/or considered through the Scoping workshop. Multi-party Monitoring Team (MMT) has been holding semi-annual meetings to explore, consider the environmental management measures in the Phase II. Information Campaign and Publicity (ICP) Team carries out periodic activities in order to disseminate information regarding the Project under the implementation of Phase II since 2008. A total of 17 times of stakeholder meetings have been held in 2011 for Phase III, and the contents of approved EIS and the supplemental EIS was explained. Most of the participants were supportive to the Project, and no objection or request for additional EIS study was heard during the consultation meetings. As for Phase IV, public consultation meetings were held from June 2015 in the source of this environmental survey until the mid of 2015. Most of the participants were supportive to the Project, Phase IV.
		(b) Have the dates and places of stakeholder consultation been informed to the local stakeholders prior to the consultation meeting?	Y	Date and venue of public consultation meetings were informed through barangay chairman by posting them in barangay halls and informing to concerned households, etc. prior to the meetings.
		(c) Have the project been explained to the public in the language which local stakeholders can understand?	Y	Brief description of the project and its impacts were explained through the public consultation meetings in Tagalog, which most of the community stakeholders can understand.
		(d) Have the minutes of stakeholder consultations been prepared?	Y	Minutes of the stakeholder consultations were prepared and attached to the EIA report and the supplemental EIA reports so far. In this updated EIS for Phase IV, the minutes of meetings will be prepared as soon as public consultation meetings are held.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
		(b) Have comments from stakeholders (such as local residents) been reflected to the project design?	Y	Various opinions and suggestions were exchanged at the stakeholder meetings. Comments raised at the meetings were integrated in the final EIA report and the supplemental EIA report as well as project design accordingly. As for resettlement, it will be implemented according to RAP for Phase III, which complies both with Law and Regulations in Philippines and with the JICA Guidelines for Environmental and Social Considerations. In this EIA report for Phase IV, comments from the stakeholders were also incorporated including those about the width of the river, alignment and design of flood control structures, management measures for informal settlers, etc.
	(3) Examination of Alternatives	Have alternative project plans been examined in light of social and environmental considerations?	Y	Several alternatives have been examined including zero (without-project) option. EIS (1998) concluded that the zero option would not help the community to prevent chronic flood damage. In contrast, although with-project option would have certain adverse impacts to some extent, it would help to prevent flood damage in Metro Manila, the center of the Philippines, and hence contribute to stable economic development of the country. Since the environmental and social impacts are alleviated by the mitigation measures prepared in original EIS and supplemental EIS, the total benefits to be derived will be outweighed the anticipated adverse impacts. Besides, several alternatives plans of river channel alignment of flood control structures and location of Marikina Control Gate Structure (MCGS) have been studied to minimize the social impacts including land acquisition and resettlement.
2. Pollution Mitigation Measures	(1) Water Quality	Is there a possibility that changes in river flow downstream (mainly water level drawdown) due to the project will cause areas to not comply with the country's ambient water quality standards?	N	The project helps in controlling river water flow in a flood event which itself does not change water quality. During the construction period, it might temporarily increase suspended solids by working in and on the river bank and dredging. However, the adverse effects caused by construction activities can be negligible when compared with existing water pollution levels. Riverbed sediments were applied with chemical analysis in Phase II, III and IV. As a result, it was concluded that there will be no possibility of toxic substances in the riverbed materials to leach out in the river water during dredging/excavation.
	(2) Wastes	In the event that large volumes of excavated/dredged materials are generated, are the excavated/dredged materials properly treated and disposed of in accordance with the country's standards?	Y	Basically, the riverbed sediments in the Marikina River was tested and evaluated as non-hazardous as described above. The dredged/excavated materials are to be disposed in accordance with regulations (Republic Act No. 9003 for ecological solid waste management, and Republic Act No. 6969 for the control of toxic and hazardous wastes) in the Philippines.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
				They will be transported, treated by mixture of cement and used as filling-material in the backfill site located in Taguig City. EIA study for the backfill site was conducted during Detailed Design (D/D) study for the Phase III in 2012, and ECC was granted to the Project in Feb. 2013 as mentioned above. For Phase IV, similar procedures will be undertaken in terms of quality analysis of excavated/ dredged materials and ECC acquisition for disposal site for the materials.
	(3) Subsidence	Is there a possibility that the excavation of waterways will cause groundwater level drawdown or subsidence? Are adequate measures taken, if necessary?	N	No effect or a negligible effect on groundwater and subsidence will be caused by the excavation / dredging operation since these works will be done in the river channel, which will not cause drawdown of river water level or groundwater level along the river.
3. Natural Environment	(1) Protected Areas	Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	N	According to Republic Act No. 7586 (1992), titled the National Integrated Protected Areas System (NIPAS) Act, there are four (4) protected areas around the Project Phase IV area: 1) Quezon Memorial; 2) Ninoy Aquino Parks and Wildlife Center; 3) Upper Marikina River Basin Protected Landscape; and 4) Pamitinan Protected Landscape. The former two are located at the distance of about 4 km, but they are a city part, not the ones established for nature preservation purpose. The latter two are a protected landscape under proclamation by the Act. They are located upstream areas in the Marikina River basin with a distance more than approx. 8 km from the project site. Thus, there will be no impact of the Project on the protected areas.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	N	These are no primeval forests, tropical rain forests, or ecologically valuable habitats in or around the Project site. Some mangrove areas exist in Manila Bay, but it is far from the river mouth of the Pasig-Marikina River and no impact will be spawned by the project. Results of this environmental survey for Phase IV indicate that the terrestrial flora and fauna are affected by highly urbanized land use. Inhabiting species of aquatic organisms suggests the poor water quality and low diversity in the Marikina River.
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	N	No protected habitat of endangered species designated by the country's laws or international treaties and conventions has been reported in EIS (1998), environmental monitoring for Phase II or supplemental EIS and environmental monitoring for Phase III. During the supplemental survey for Phase IV, several species of terrestrial flora designated as protected species were recorded to grow along the

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
				Marikina River. Most of them, however, are not growing under natural conditions.
		(c) If significant ecological impact is anticipated, are adequate protection measures taken to reduce the impact on the ecosystem?	Y	It is not anticipated that the project or its construction activities will cause a significant ecological impact since the terrestrial and aquatic biota exists along the Phase IV stretch of Marikina River under highly urbanized area and survey results indicate ecologically poor condition in terms of river water quality and low diversity as a whole.
		(d) Is there a possibility that hydrologic changes, such as reduction of river flow or seawater intrusion upriver will adversely affect downstream aquatic organisms, animals, vegetation, and ecosystems?	N	The construction of river walls is on the edges of river banks and has a very negligible effect on downstream ecosystems. Construction of MCGS will reduce the river discharge for alleviation of flood risks of downstream area but it will be done only during flooding period. It is, therefore, no effect to accelerate/ prevent seawater intrusion or downstream aquatic organisms or other ecosystems.
		(e) Is there a possibility that changes in water flows due to the project will adversely affect aquatic environments in the river? Are adequate measures taken to reduce the impacts on aquatic environments, such as effects on aquatic organisms?	N	The ecological condition of aquatic biota of the Phase IV stretch of the Marikina River is poor and low diversity in terms of water quality as a whole as mentioned above. The Project does not change the river's flow regime or volume of the river by flood control structures to be constructed on the river banks. There is no change in catchment area as well by the Project. Regarding the MCGS mentioned above, it will affect the flow regime only during flooding by heavy rain. Thus, the project Phase IV will not adversely affect the aquatic organisms in the river.
	(3) Hydrology	Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	N	There is no change in catchment area and there is no negative impact on the surface water or groundwater anticipated by the Project. In contrast, the Project is expected to regulate the flood discharge and alleviated the flood risks of riparian area of the Marikina River and downstream areas along the Pasig River.
	(4) Topography and Geology	Is there a possibility that excavation of rivers and channels will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas?	N	No significant change in topography is anticipated: dredging and excavation will deepen the riverbed of the Marikina River so as to enhance the capacity of river flow. This excavation/dredging, however, will be done within the river area, namely the river channel and river banks, and thus it will not cause a large-scale of alteration.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impact of resettlement?	Y	Number of affected houses is minimized by reflecting the results of preliminary social survey to river design during the study process. As the results, approximately 40 houses are remained as inevitable social impacts. All the PAPs are informal settler families (ISFs) who are living on the river bank. The ISFs are also being subjects of a resettlement project by the LGU (Quezon City) at the same time.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
				Socio-economic surveys will be completed by the end of May 2015. Besides the ISF housings, there are four business establishments whose main buildings are required to modify by the Project, and minor modifications are necessary in three establishments' auxiliary facilities.
		(b) Is adequate explanation regarding relocation and compensation given to affected persons prior to resettlement?	Y	The DPWH-UPMO-FCMC conducted information dissemination meetings in every barangays with PAFs in 2011 and 2012 for Phase III. Explained contents in the meetings included the entitlement matrix, mechanism and the procedure of grievance redress, monitoring plan of implementation of RAP and schedule of implementation of resettlement. As for Phase IV, the same series of dissemination meetings will be conducted in 2015.
		(c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards, developed based on socioeconomic studies on resettlement?	Y	Abbreviated Resettlement Action Plan (ARAP) which will include the resettlement implementation plan to be compiled by Quezon City based on the results of socio-economic studies. ARAP will include necessary assistances for restoration of livelihoods and living standards of resettles.
		(d) Is compensation going to be paid prior to resettlement?	Y	The appropriate amount compensations will be paid thoroughly prior to the resettlement.
		(e) Are compensation policies prepared in document?	Y	Compensation policies are set forth in RA8974 (Land Acquisition, Resettlement, Rehabilitation and Indigenous People's Policy: LARRIPP,2007) and Infrastructure Right of Way Procedural Manual (April, 2003), DPWH
		(f) Does the resettlement action plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people living below the poverty line, ethnic minorities, and indigenous peoples?	Y	Although there are no indigenous peoples or ethnic minorities living in the affected houses, the PAP are all ISFs; and therefore, should be considered as socially weak group of people. All of the ISFs who are identified as PAPs would be the subject of Republic Act 7279 (Urban Development and Housing Act of 1992).
		(g) Are agreements with the affected persons obtained prior to resettlement?	Y	Yes, it is specified in Infrastructure Right of Way Procedural Manual (April, 2003), DPWH
		(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	Y	Resettlement works are primarily the Quezon City's project which has been conducted under Memorandum Order No. 57, Malacañang Palace, since 2011. This project intends to provide, safe, decent, affordable housing for those ISFs living in danger zone along river. 10 B. PHP is reserved for this project every year. * Provision of R.A.7279 stipulates that ISF resettlement is responsible by responsible LGU and NHA.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
				* DPWH is supporting this project by providing drawings and maps of flood prone area, and identifying ISFs.
		(i) Have any plans been developed to monitor the impact of resettlement?	Y	DPWH-UPMO-FCMC and DPWH-ESSD, with assistance of C/S Consultant, will be the Internal Monitoring Agent (IMA). IMA will conduct internal monitoring in coordination with Local Inter-Agency Committee (LIAC) and summarize the results of internal monitoring in quarterly reports.
		(j) Is the grievance redress mechanism established?	Y	Grievance redress mechanism is already functioning in Quezon City's LIAC. Installation of grievance redress mechanism is mandatory as it is stipulated in LARRIPP, 2007.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	Y	There are almost no adverse effects on living conditions of residences of along Phase IV section of Marikina River because two clusters of ISF houses are scheduled to be resettled by other project prior to the implementation of PMRCIP Phase IV
		(b) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely the downstream fisheries and other water uses?	N	The Project regulates river water but does not use it, and there is no commercial fishing ground downstream of the Project site in the Pasig Marikina River.
		(c) Is there a possibility that waterborne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced?	N	Cleaning of the river banks and constructing flood control structure will result in reduction of mosquito breeding places and thus reduction of mosquito infestation and related spread of disease.
	(3) Heritage	Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures taken to protect these sites in accordance with the country's laws?	N	There is no historical and/or cultural heritage sites which are listed by the National Historical Commission of the Philippines (NHCP), located within the Project, Phase IV section and its vicinity. There are however several local heritage sites near the Project site. None of the heritage sites, however, will be affected by the implementation of the Project Phase IV by means of adjustment of construction methods.
	(4) Landscape	Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken to deal with such adverse effects?	N	River banks of the Marikina River often serve as river parks, river walks and provide amenity functions for the local residents. During construction stage, some areas will be adversely affected in terms of degradation of aesthetics due to turbidity increase in the river, dust generation, etc. But it is temporary and limited to narrow area. Thus, the impacts of the temporary degradation will be recovered after completion of the construction works.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
	(5) Ethnic Minorities and Indigenous Peoples	(a) Does the project comply with the country's laws regarding rights of ethnic minorities and indigenous peoples?	N/A	No ethnic group or indigenous people have been identified in the project area.
		(d) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	N/A	No ethnic group or indigenous people have been identified in the project area.
	(6) Working Conditions	(a) Is the project proponent violating any laws or ordinances associated with the working conditions in the country which the project proponent should observe in the project?	N	The Project is not violating national laws or ordinances. During construction, the site engineers of DPWH-UPMO-FCMC are in charge of working conditions of construction workers. The Contractor has a pollution control officer and/or environmental, health and safety officer on site under the supervision of C/S Consultant.
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	Y	Following Construction Contractor's Environmental Program (CCEP), safety considerations were accomplished in Phase II and III. Phase IV will be carried out in the same manner in accordance with DOLE DO 13 and applicable Rules of the Occupational Safety and Health Standard (OSHS). Fences, warnings, notice-of-construction billboards and information campaigns are also provided. Proper environmental training is given to construction workers by contractors. Personal Protective Equipment (PPE) is worn by construction workers. Occupational safety training is continuously and periodically provided and appropriate safety measures are always in place.
(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health programs, and safety training (including traffic safety and public health) for workers, etc.?		Y	In accordance with CCEP, DOLE DO 13 and OSHS, proper environmental training is given to construction workers by construction contractors. PPE are worn by construction workers. Occupational safety training is continuously and periodically provided and safety measures are in place at all times as mentioned above.	
		(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	N/A	Security guard is assigned at the importance construction site including storage units and HQ office. Barangay officials assure safety of local residents.
5. Others	(1) Impact during Construction	(a) Are adequate measures undertaken to reduce impact during construction (e.g., noise, vibrations, turbid water,	Y	An appropriate and reasonable amount of countermeasures to reduce construction-related nuisances, such as noise, vibration, dust (TSP), water pollution, etc., are to be undertaken.

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
		dust, exhaust gases, and wastes)?		<p>Phase II construction has already proved the effectiveness of counter measures that have been taken during construction of flood control structures. In Phase III construction work, environmental management has been properly conducted and no complains on environmental adverse impacts were raised by local residents so far.</p> <p>Environmental monitoring on noise and vibration, dust (TSP), water quality, riverbed sediment quality, groundwater quality, etc. has been carried and in Phase II and III. Solid wastes were segregated for re-use and recycle, and finally disposed of by subcontracting to accredited contractor.</p> <p>The same monitoring activity will be conducted and management will be properly performed based on Construction Contractor's Environmental Program (CCEP) which will be prepared pursuant to Technical Specification of the Project.</p>
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures taken to reduce the impact?	Y	The Project shall use adequate technology to reduce suspension in river water during dredging works. It should be noted that water quality of the Marikina River is already beyond Class C water criteria in terms of organic pollutants. Most of original aquatic organisms cannot inhabit in the river and thus it shows ecologically poor condition.
		(c) If construction activities adversely affect the social environment, are adequate measures undertaken to reduce the impact?	Y	<p>Staff of the Project Office of DPWH-UPMO-FCMC, ICP Team of the Consultant, MMT members as well as Barangay Officials are to receive and handle complaints from local residents affected by the construction and relocatees to the resettlement site of the Project.</p> <p>Most construction workers are hired locally from the nearby Barangay of Project sites where construction takes place, with the exception of a few skilled technicians and engineers. In hiring local workers, gender equity and appropriateness of assigning position are considered.</p>
		(d) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	Y	CCEP in accordance with DOLE DO 13 and applicable rules of OSHS mentioned above are followed to ensure safety and health of both residents and workers.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring programs for environmental items considered to have potential impact?	Y	<p>DPWH through C/S Consultant prepared the Environmental Monitoring Plan (EMoP), same as those for Phase II and III.</p> <p>The EMoP covers the whole monitoring activities of the Project Phase IV, consisting of those for Middle Marikina River stretch and disposal of excavated materials from the river.</p> <p>Under this EMoP, semi-annual monitoring reports which cover quarterly reports are prepared and submitted to DENR-EMB-NCR.</p>

Category	Item	Main Check Item	Yes / No	Confirmation of Environmental Considerations (Reasons/Mitigation Measures)
		(b) Are the items, methods and frequencies included in the monitoring program judged to be appropriate?	Y	Items and methods follow the Philippines and JICA Guideline's requirements. The items are air quality, noise, vibration, water quality, and excavated materials quality, etc. The frequency is properly set as shown in the Monitoring Form for EMO P (refer to Chapter 9 of this updated EIS).
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget) to sustain the monitoring framework?	Y	Multipartite Monitoring Team (MMT), the Proponent (DPWH) through the C/S Consultant and the Contractor engaged in the environmental monitoring of entire Project during the Phase II and III. It will be done in the same manner for the Phase IV. The Contractor will monitor the environmental impacts in the vicinity of the construction work sites. The Consultant will do rather stationary monitoring along the Marikina River and the Disposal Site to be specified during Detail Design Study. The budget will be allocated properly in the budget of construction work and construction supervision (C/S), respectively by DPWH.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	Y	The Proponent of the Project (DPWH) shall conduct environmental monitoring and its reporting to DENRE-EMB-NCR. The environmental monitoring activities consist of (1) Compliance Monitoring and (2) Environmental Monitoring. The results of monitoring are to provide a basis for timely decision and implementation of necessary countermeasures and actions necessary for the mitigation of the adverse impacts. DPWH is to also submit the environmental monitoring report to JICA Philippines Office as a part of Progress Report quarterly during construction until completion of the Project.
6. Note	(1) Reference to Checklist of other Sectors	Where necessary, pertinent items described in the Forestry checklist should also be checked.	N/A	
	(2) Note on Using Environmental Checklist	If necessary, the impact on trans-boundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	N/A	

ANNEXES

ANNEX-1: ECC for PMRCIP (1998)



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL CAPITAL REGION
AARONN II Building, 20 G, Aroneta Ave. Ext., O.C.
Tel. Nos.: 712 52-78 • 731-76-65 • 731-70-85 • 743-31-26



14 December 1998

The Director
Project Management Office
Major Flood Control Projects
Department of Public Works & Highways
2nd Street, Port Area, Manila

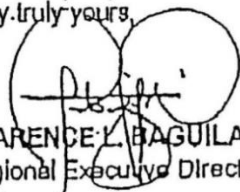
Sir:

This has reference to your *Pasig-Marikina River Channel Improvement Project*.

After evaluation of the documents submitted on the aforesaid project, this Office has decided to grant the same an Environmental Compliance Certificate (ECC).

You may proceed with the project implementation after securing all the necessary permits from the pertinent government agencies. Please be advised, however, that this Office will be monitoring the project periodically to ensure your compliance with the stipulations cited in the attached ECC. Further, any expansion of currently approved operations will be subjected to the Environmental Impact Assessment (EIA) requirements.

Very truly yours,


CLARENCE L. BAGUILAT
Regional Executive Director

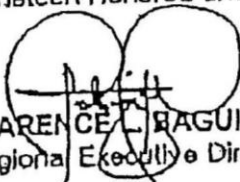
Grow a Tree for Legacy

4. That a Construction Contractor's Environmental Program (CCEP) shall be submitted to this Office for approval 30 days before the start of construction which should contain among others, definite mitigation measures such as proper disposal of spoils and waste materials, excess concrete and wash water from transit mixers and others;
 5. That the project proponent shall conduct orientation for resident engineers and contract ... will undertake and implement the project, to apprise them of the conditions/stipulations of this ECC and the necessary measures that will mitigate adverse environmental impacts, and submit reports of such orientation to this Office, copy furnished the Multiparite Monitoring Team (MMT);
 6. That a multi-media information education campaign shall be implemented by the proponent covering the immediate areas as well as adjacent and affected cities; The target publics will include the local government unit officials and residents concerned, basic sectors which will include NGOs and POs;
 7. That a billboard measuring 0.5 meters by 1.0 meter bearing "ECC-98-NCR-QC-301 Issued pursuant to P.D. 1586" shall be displayed in a conspicuous location at the project site for identification and guidance;
 8. That in case that the construction of the project temporarily stopped due to financial reason or forced majeure, measures to protect and safeguard the adjacent properties and the general public should be strictly observed;
- II. Operation Stage:
9. That all restoration works/grading of the exposed grounds shall be immediately undertaken after construction all in accordance with the Technical Specifications of the Contract;
 10. That planting of trees/shrubs/ornamental plants or landscape activities shall be undertaken to contribute to the aesthetic value of the area and to compensate for the lost capability of the area to absorb carbon dioxide;
- III. Others:
11. That a separate Initial Environmental Examination (IEE) or an Environmental Impact Statement (EIS) shall be prepared and submitted to this Office for the designated/chosen disposal site;
 12. That the proponent shall set up/provide a Contractor's All Risk Insurance (CARI) and Quick Response Fund (QRF) to compensate/cover expenses for indemnification of damages to life, health, property and environment caused by the project and further environmental assessment. The QRF shall be established and committed through a Memorandum of Agreement (MOA) between and among the proponent, the LGU concerned, Non-governmental Organization's (NGO) and affected parties within sixty days (60) after the issuance of this ECC;
 13. That the Department of Public Works and Highways (DPWH) Environmental Unit (EU) together with the Project Management Office and Technical Consultants shall supervise the contractors, implement the EMP and other measures that may be required by this Office during construction and operation phases;

14. That all the proposed environmental management measures contained in the submitted documents shall be effected (please refer to Annex A);
15. That project implementation and maintenance throughout its lifespan shall strictly conform with the submitted documents, any modification from the approved project scope shall be covered by another ECC application;
16. That should adverse impact occur as a result of project operations, all the activities causing the same, shall be immediately stopped, remedial measures shall be effected and all damages to life and property will be properly compensated to all aggrieved parties;
17. That the project proponent shall allocate funds or provide the financial requirements of the Multipartite Monitoring Team (MMT) and shall allow the same to conduct inspection/monitoring in the entire project area without prior notice to oversee compliance to ECC conditions and to determine the residual impacts to the environment;
18. That additional ECC condition(s) shall be imposed if findings to protect the environment warrants;
19. That any false information contained in the submitted documents and non-disclosure of vital information which led to the issuance of the ECC shall render the same null and void and a ground for filing of appropriate legal charges;
20. That this Certificate shall be posted in a conspicuous place in the Field Office for easy reference and guidance;...
21. That the project proponent shall submit to this Office a quarterly environmental monitoring report based on the submitted/approved environmental monitoring plan; and
22. That in case the project proponent cannot comply with any of the conditions for technical reasons, a written approval from the DENR-NCR shall be secured first prior to implementation.

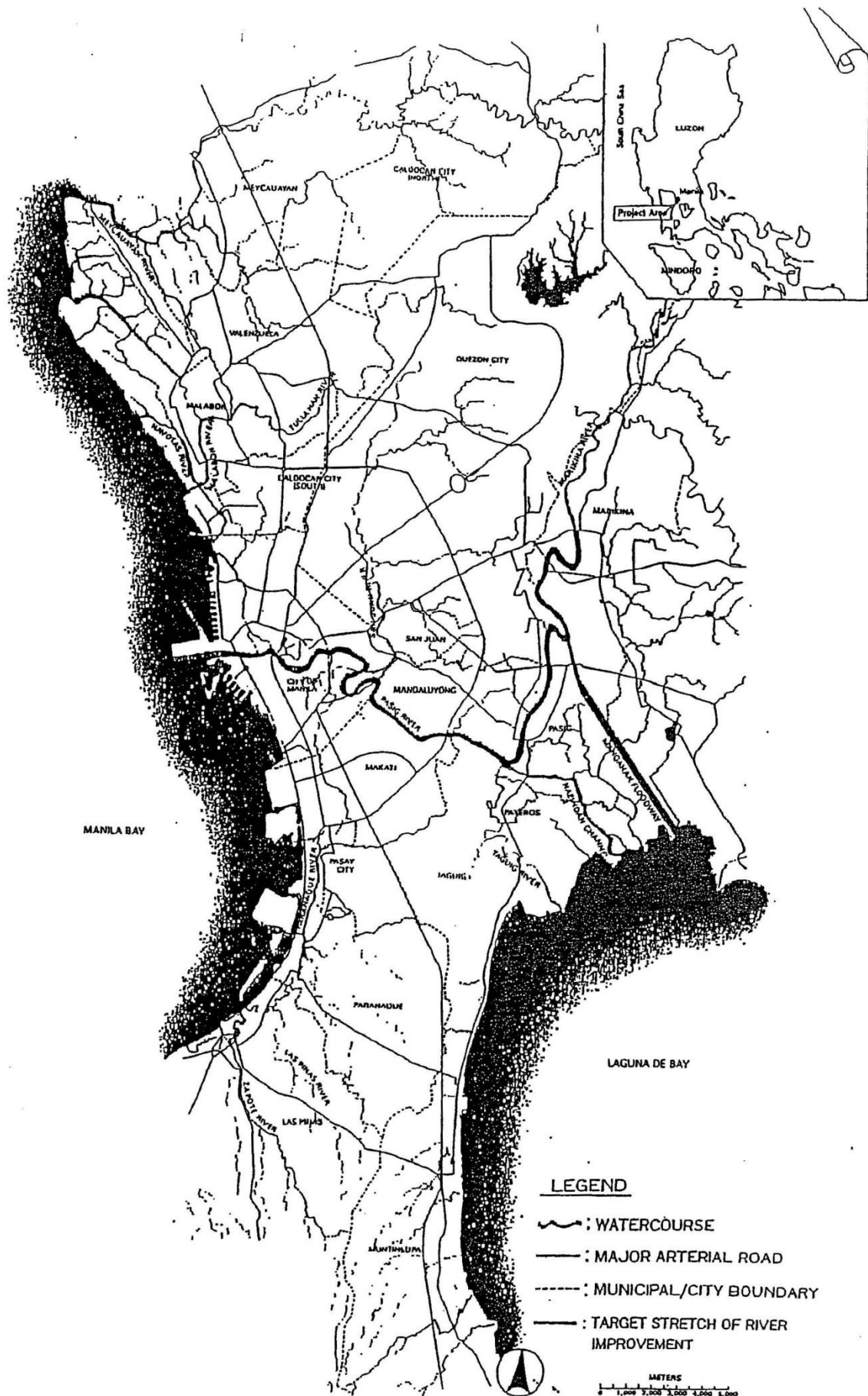
Non-compliance with any of the above stipulations will be sufficient cause for the suspension or cancellation of this Certificate and/or imposition of a fine in an amount not to exceed Fifty Thousand Pesos (P50,000.00) for every violation thereof pursuant to Article IX, Section 6.0, DENR Administrative Order No. 37, Series of 1996.

Given this 15th day of Dec. Nineteen Hundred and Ninety Eight.


CLARENCE C. BAGUILAT
Regional Executive Director

Recommending Approval:


SIXTO E. TOLENTINO, JR.
OIC, Regional Technical Director
Environment Sector
cc-pasig-marikina d-dor



STUDY AREA

ANNEX-2: ECC for the Proposed Backfill Site for the Dredged Materials of PMRCIP Phase III (2013)



Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
NATIONAL CAPITAL REGION
5F Hizon Bldg. 29 Quezon Ave., Quezon City
Tel. Nos. 781-0482/83, 781-0484/85, 781-0471, 781-0497, 749-9828/29
Telefax. 781-0497, 781-0482, 781-0485

FEB 04 2013

Ref. Code: ECC-NCR-1301-0035

MS. SOFIA T. SANTIAGO

Project Manager III
Department of Public Works and Highways
Major Flood Control Projects
Project Management Office
2nd Street, Port Area, City of Manila

Subject: **Certificate of Environmental Compliance Commitment (ECC)**

Dear Ms. Santiago:

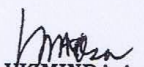
This refers to the ECC application for the proposed **Backfill Site for the Dredged Materials of the Pasig-Marikina River Channel Improvement Project (PMRCIP) Phase III** located in Barangays Ibayo-Tipas and Napindan, Taguig City, Metro Manila.

After satisfying the requirements in the said application and upon recommendation of the Environmental Impact Assessment Review Committee, this Office has decided to grant an ECC to the above-mentioned project.

With the issuance of this **Planning Tool**, you are expected to implement the measures presented in the Environmental Impact Statement (EIS), intended to protect and mitigate the project's adverse impacts on community health, welfare and the environment. Environmental considerations shall be incorporated in all phases and aspects of the project. You may **only** proceed with project implementation **after** securing all the necessary permits from other pertinent government agencies. This Office will be monitoring the project periodically to ensure your compliance with stipulations cited in the attached ECC.

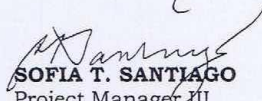
Please be guided accordingly.

Very truly yours,

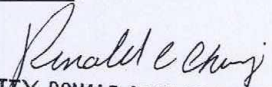

ENGR. VIZMINDA A. OSORIO
OIC, Regional Director

SWORN STATEMENT OF OWNER

I, **Sofia T. Santiago**, proponent of this **Backfill Site for the Dredged Materials of the Pasig-Marikina River Channel Improvement Project (PMRCIP) Phase III** located in Barangays Ibayo-Tipas and Napindan, Taguig City, Metro Manila, takes full responsibility in complying with all conditions contained in this Environment Compliance Commitment (Environmental Compliance Certificate or ECC).


SOFIA T. SANTIAGO
Project Manager III
Department of Public Works and
Highways - Major Flood Control
Projects - Project Management Office

Subscribed and sworn to before me this FEB 01 2013, the
above-named affiant taking oath presenting _____
issued on _____ at _____.


ATTY. RONALD SEGUNDINO C. CHING
Secretary of the Office of the
City Engineer, Metro Manila
ADM NO. 2013-008 / UNTIL DEC. 31, 2014
ROLL NO. 50899
IBP NO. 876586 NOV. 12 2012 / MANILA
PTR NO. 1911540 -1-2-13 / MANILA
MCLE COMPLIANCE NO. III-0016-300

Doc. No. 180
Page No. 56
Book No. 22
Series of 2013

ECC No. : ECC-NCR-1301-0035
Project Name : Backfill Site for the Dredged Materials of the Pasig-Marikina River
Channel Improvement Project (PMRCIP) Phase III
Proponent Name: DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS - MAJOR
FLOOD CONTROL PROJECTS - PROJECT MANAGEMENT OFFICE



Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
NATIONAL CAPITAL REGION
5F Hizon Bldg. 29 Quezon Ave., Quezon City
Tel. Nos. 781-0482/83, 781-0484/85, 781-0471, 781-0497, 749-9828/29
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ENVIRONMENTAL COMPLIANCE COMMITMENT
(Environmental Compliance Certificate)
(Issued under Presidential Decree 1586)
ECC-NCR-1301-0035

THIS IS TO CERTIFY THAT PROPONENT **DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS - MAJOR FLOOD CONTROL PROJECTS - PROJECT MANAGEMENT OFFICE**, represented by its Project Manager III, Ms. Sofia T. Santiago, is granted this ECC for the proposed **Backfill Site for the Dredged Materials of the Pasig-Marikina River Channel Improvement Project (PMRCIP) Phase III**, located in **Barangays Ibayo-Tipas and Napindan, Taguig City, Metro Manila**, by the Department of Environment and Natural Resources (DENR), through the Environmental Management Bureau - National Capital Region.

SUBJECT ONLY to the conditions and restrictions set-out in this ECC and in the attached document labeled as Annex A. Recommendations have been provided in Annex B as guidance to concerned government agencies and local government units for consideration in their decision making process.

PROJECT DESCRIPTION

The ECC covers the proposed **Backfill Site for the Dredged Materials of the Pasig-Marikina River Channel Improvement Project (PMRCIP) Phase III** located within 45 hectares in Barangays Ibayo-Tipas and Napindan, Taguig City, Metro Manila.

The project shall involve backfilling using the excavated sediment materials from the Lower Marikina River. The estimated volume of dredged sediments including the expected over cut volume is about 1,000,000 cubic meters. The proposed backfill site shall have the following components/facilities:

- Surrounding periphery ditch
- Temporary jetty
- Access road from the jetty to the backfill site
- Temporary road network within the backfill area
- Temporary surface drainage trenches
- Temporary pre-mixing plant for fine/clayey dredged materials
- Temporary sand basin/settling pond
- Box culvert
- Monitoring wells
- Property monuments

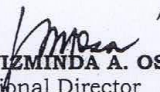
[Signature] This **Planning Tool** is issued pursuant to the provisions of Presidential Decree No. 1586, in accordance to Department Administrative

[Signature]


Order No. 2003-30. Non-compliance with any of the provisions of this ECC shall be sufficient cause for its cancellation or suspension and/or imposition of a fine in an amount not to exceed Fifty Thousand Pesos (PhP 50,000.00) for every violation thereof. The Bureau, however, is not precluded from reevaluating, adding, removing, and correcting any deficiencies or errors that may be found to be inconsistent with the Revised Procedural Manual of DAO 2003-30 after issuance of this ECC.

Issued at EMB-NCR, 5th Floor Hizon Bldg., No. 29 Quezon Avenue, Quezon City this FEB 04 2013.

Approved:


ENGR. VIZMINDA A. OSORIO
OIC, Regional Director

Recommending Approval:


ENGR. EMILIANO P. KEMPIS, JR.
Chief, Environmental Impact
Assessment & Management Division

ECC No. : ECC-NCR-1301-0035
Project Name : Backfill Site for the Dredged Materials of the Pasig-Marikina River
Channel Improvement Project (PMRCIP) Phase III
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FLOOD CONTROL PROJECTS - PROJECT MANAGEMENT OFFICE

1. CONDITIONS

A. ENVIRONMENTAL MANAGEMENT and MONITORING PLAN (EMMoP)

1. The proponent shall ensure that all commitments, appropriate mitigating/enhancement measures and monitoring requirements especially those contained in the EMMoP in the Environmental Impact Statement (EIS), its modifications and additional information as approved by the EMB-NCR during the EIA Report review shall be instituted and strictly implemented throughout the project implementation.
2. Implement the Social Development Plan for the proposed project.
3. Undertake a continuing Information, Education and Communication (IEC) Program to explain to all stakeholders the final approved EMMoP and the conditions of this ECC as well as update of project status including any significant changes on the EMMoP, and over-all performance against this ECC.
4. Submit an Abandonment Plan to the EMB-NCR at least 30 days prior to the project's abandonment. The plan shall include rehabilitation measures/clean-up, remediation of areas affected by the project and proposed alternative projects in the area.

B. GENERAL CONDITIONS

5. That a billboard containing this message: **"Notice to the Public, This Project, BACKFILL SITE FOR THE DREDGED MATERIALS OF THE PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PMRCIP) PHASE III of DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS - MAJOR FLOOD CONTROL PROJECTS - PROJECT MANAGEMENT OFFICE, has been issued an Environmental Compliance Certificate (ECC-NCR-1301-0035) by the Environmental Management Bureau - National Capital Region of the Department of Environment and Natural Resources on FEB 04 2013"** must be installed at the project site.
6. That reworks/grading of the exposed grounds and planting of trees/shrubs/ornamental plants shall be undertaken for ecological enhancement purposes and in support of the National Greening Program.
7. The proponent shall tap the existing Multipartite Monitoring Team (MMT) of Pasig-Marikina River Channel Improvement Project to monitor the backfilling activity and allocate an Environmental Monitoring Fund (EMF) to cover all costs attendant to the operation of the MMT relative to this project.

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8. The constructions/backfilling activities will conform to the applicable provisions of RA 6969 (Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990), RA 8749 (Philippine Clean Air Act of 1999), RA 9003 (Ecological Solid Waste Management Act of 2000), and RA 9275 (Philippine Clean Water Act of 2004).
9. An Environmental Unit (EU)/Pollution Control Officer (PCO) must be established/appointed to handle the environment-related aspects of the project in addition to the monitoring requirements as specified in the Environmental Management Plan (EMP)/Environmental Monitoring Plan (EMoP). The EU/PCO shall:
 - 9.1 Monitor actual project impacts vis-à-vis the predicted impacts and management measures in the EIS;
 - 9.2 Submit semi-annually an ECC Compliance Report to the EMB-NCR on or before 15 August and 15 February of each year. Each report must show the summary of cumulative performance of Proponent against previous years' requirements and commitments.
10. That the project proponent shall allow EMB-NCR personnel with proper identification card and mission/travel order to conduct inspection/monitoring in the entire premises without prior notice to oversee compliance to ECC conditions.

II. RESTRICTIONS

11. In case of transfer of ownership of this project, these same conditions and restrictions shall apply and the transferee shall be required to notify the EMB-NCR within fifteen (15) days as regards to the transfer of ownership.
12. No other activities should be undertaken other than what was stipulated in the EIS. Should there be any planned expansion of the project beyond the project description in the submitted documents; or any planned change in the activity, a request for an ECC amendment must be made prior to implementation of any project expansion/modification.

OR No. : 9975992
 Processing Fee: PhP 4,000.00
 Date : 10 December 2012

OR No. : 9978756
 Processing Fee: PhP 15.00
 Date : 10 December 2012

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PROJECT ASSESSMENT PLANNING TOOL

For the assistance of the Proponent, other DENR Divisions/Bureaus, other concerned government agencies and LGUs in the management of the project and for better coordination in mitigation on the impact of the project on its surrounding areas and to the environment.

By way of recommendation, the following have been taken notice of by the EIA Review Committee and are forwarding these recommendations to the parties and authorities concerned for proper appreciation and action, and integration into their decision-making process.

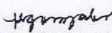
A. RECOMMENDATIONS TO CONCERNED GOVERNMENT AGENCIES/LGUS	CONCERNED PERMITTING, DECIDING MONITORING ENTITIES
Department of Public Works and Highways - Major Flood Control Projects - Project Management Office shall:	
1. Conduct geotechnical investigation to address bearing capacity, settlement and liquefaction potential of the project area prior to its construction.	Mines and Geosciences Bureau Taguig City Government
2. Ensure that a social participation process is undertaken with the local government units and stakeholders prior to implementation of the proposed project.	Taguig City Government
3. Secure Locational Clearance prior to implementation of the proposed project.	Taguig City Government
4. Ensure resolution of tenurial issues (e.g., obtaining permit to enter, certificate of no objection) prior to any development or project activities in affected areas.	Taguig City Government Registry of Deeds
5. Implement segregation, collection, recycling, and disposal mechanism for solid waste.	Taguig City Government
6. Coordinate with the concerned government agencies relative to the Traffic Survey Report to address the project's contribution to local traffic.	Taguig City Government Metro Manila Development Authority
7. Implement an effective Environmental, Health and Safety Program for the proposed projects.	Department of Labor and Employment
8. Secure permit for the construction of an appropriate drainage system to mitigate/abate adverse effect (i.e. flooding) to the adjacent areas.	Taguig City Government Metro Manila Development Authority

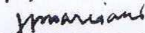
ECC No. : ECC-NCR-1301-0035 *A*
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B. ENVIRONMENTAL PLANNING RECOMMENDATIONS FOR THE PROPONENT

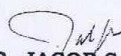
Department of Public Works and Highways - Major Flood Control Projects - Project Management Office shall undertake close monitoring of the project to maintain a high level of safety and efficiency at all stages of the construction, and to immediately address any environmental hazard/change that may take place. It is strongly recommended that the same be strictly complied.

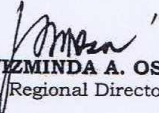
For dissemination and proper action of the parties concerned.

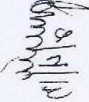

ENGR. FLORENCE L. GONZALES
Sr. Evtl. Management Specialist


ENGR. JOYCE J. MARCIANO
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ENGR. EMILIANO P. KEMPIS, JR.
Chief, Evtl. Impac. Assessment
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DR. JACOB S. TIO
EIARC Chairman


ENGR. VIZMINDA A. OSORIO
OIC/Regional Director



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ANNEX-3: Terrestrial Flora and Fauna Species Identified in the Survey

List of Terrestrial Flora Species Recorded along Phase IV of the Project

Species	Common name	Distribution	DAO 2007-01	IUCN	CITES
<i>Acacia mangium</i>	mangium	introduced	not included	not yet assessed	not included
<i>Adonia merrillii</i>	Manila palm	Philippine endemic	endangered	Near threatened	not included
<i>Artocarpus cf altilis</i>	kamansi	native	not included	not yet assessed	not included
<i>Artocarpus heterophyllus</i>	langka	introduced	not included	not yet assessed	not included
<i>Azadirachta indica</i>	neem	introduced	not included	not yet assessed	not included
<i>Bauhinia sp.</i>	alibangbang	-	-	-	-
<i>Bischofia javanica</i>	tuai	native	not included	not yet assessed	not included
<i>Calophyllum inophyllum</i>	bitaog	native	not included	Least concern	not included
<i>Cananga odorata</i>	ilang-ilang	native	not included	not yet assessed	not included
<i>Caryota cumingi</i>	fish tail palm	introduced	not included	not yet assessed	not included
<i>Cassia siamea</i>	robles	introduced	not included	not yet assessed	not included
<i>Cassia siamea</i>	robles	introduced	not included	not yet assessed	not included
<i>Ceiba pentandra</i>	kapok	introduced	not included	not yet assessed	not included
<i>Chrysophyllum cainito</i>	caimito	introduced	not included	not yet assessed	not included
<i>Cocos nucifera</i>	niog	native	not included	not yet assessed	not included
<i>Cynometra cf inaquefolia</i>	dila-dila	Philippine endemic	vulnerable	Vulnerable A1d	not included
<i>Delonix regia</i>	fire tree	introduced	not included	Least concern	not included
<i>Eucalyptus cf camaldulensis</i>		introduced	not included	not yet assessed	not included
<i>Ficus benjamina</i>	balete	native	not included	not yet assessed	not included
<i>Ficus concinna</i>	balete	native	not included	not yet assessed	not included
<i>Ficus microcarpa</i>	balete	introduced	not included	not yet assessed	not included
<i>Ficus pseudopalma</i>	niog niogan	Philippine endemic	not included	not yet assessed	not included
<i>Ficus religiosa</i>	bo tree	introduced	not included	not yet assessed	not included
<i>Ficus septica</i>	hauili	native	not included	not yet assessed	not included
<i>Ficus ulmifolia</i>	is-is	Philippine endemic	not included	Vulnerable A1cd	not included
<i>Ficus variegata</i>	tangisang-bayawak	native	not included	not yet assessed	not included
<i>Genus indet</i>		native	not included	not yet assessed	not included
<i>Gmelina arborea</i>	yemane	introduced	not included	not yet assessed	not included
<i>Jatropha curcas</i>	tubang-bakod	introduced	not included	not yet assessed	not included
<i>Lagerstroemia speciosa</i>	banaba	native	not included	not yet assessed	not included
<i>Leucaena leucocephala</i>	ipil-ipil	introduced	not included	not yet assessed	not included
<i>Mangifera indica</i>	mangga	introduced	not included	Data deficient	not included
<i>Morus alba</i>	mulberry	introduced	not included	not yet assessed	not included
<i>Muntingia calabura</i>	aratis	introduced	not included	not yet assessed	not included
<i>Nauclea orientalis</i>	bangkal	native	not included	not yet assessed	not included
<i>Octomeles sumtrana</i>	binuang	native	not included	Least concern	not included
<i>Pithecellobium dulce</i>	camachile	introduced	not included	not yet assessed	not included
<i>Plumeria alba</i>	kalachuchi	introduced	not included	not yet assessed	not included
<i>Polyalthia longifolia</i>	lanutan	introduced	not included	not yet assessed	not included

Species	Common name	Distribution	DAO 2007-01	IUCN	CITES
<i>Premna odorata</i>	alagaw	Philippine endemic	not included	not yet assessed	not included
<i>Psidium guajava</i>	bayabas	introduced	not included	not yet assessed	not included
<i>Pterocarpus indica</i>	narra	native	critically endangered	Vulnerable A1d ver2.3	not included
<i>Samanea saman</i>	rain tree	introduced	not included	not yet assessed	not included
<i>Sandoricum koetjape</i>	santol	introduced	not included	not yet assessed	not included
<i>Sesbania grandiflora</i>	katuray	introduced	not included	not yet assessed	not included
<i>Spathodea campanulata</i>	african tulip	introduced	not included	not yet assessed	not included
<i>Sterculia foetida</i>	kalumpang	native	not included	not yet assessed	not included
<i>Swietenia macrophylla</i>	big-leaf mahogany	introduced	not included	Vulnerable A1cd+2cd ver2.3	II/NC
<i>Syzygium cumini</i>	duhat	native	not included	not yet assessed	not included
<i>Tabernaemontana divaricata</i>	pandakaking tsina	introduced	not included	not yet assessed	not included
<i>Terminalia catappa</i>	talisay	native	not included	not yet assessed	not included
<i>Trema orientalis</i>	anabiong	native	not included	not yet assessed	not included
<i>Triplaris cumingiana</i>	palo-santo	introduced	not included	not yet assessed	not included
<i>Vitex parviflora</i>	molave	native	endangered	Vulnerable A1cd ver2.3	not included

List of Terrestrial Fauna Species Recorded along Phase IV of the Project

Family	Species	Common name	Residence	Population Status	Habitat Association	DAO 2004-15	IUCN	CITES
Amphibians and Reptiles								
Scincidae	<i>Eutropis multifasciata</i>	common sun skink	Resident	Common	non-forest to forest	not included	Least concern	not included
Microhylidae	<i>Kaloula pulchra</i>	banded bull frog	introduced	Common	non-forest	not included	Least concern	not included
Dicroglossidae	<i>Occidozyga laevis</i>	puddle frog	Resident	Common	non-forest to forest	not included	Least concern	not included
Rhacophoridae	<i>Polypedates leucumystax</i>	common tree frog	Resident	Common	non-forest to forest	not included	Least concern	not included
Bufoidea	<i>Rhinella marina</i>	marine toad	introduced	Common	non-forest	not included	Least concern	not included
Birds								
Sturnidae	<i>Acridotheres cristatellus</i>	crested myna	resident	Common	non-forest	not included	Least concern	not included
Sylviidae	<i>Acrocephalus orientalis</i>	oriental reed-warbler	Migrant	Common	non-forest	not included	Least concern	not included
Scolopacidae	<i>Actitis hypoleucos</i>	common sandpiper	Migrant	Common	wetlands	not included	Least concern	not included
Alcedinidae	<i>Alcedo atthis</i>	common kingfisher	Migrant	Common	wetlands	not included	Least concern	not included
Rallidae	<i>Amauornis pheoniceus</i>	white-breasted waterhen	Resident	Common	non-forest	not included	Least concern	not included
Motacillidae	<i>Anthus novaeseelandiae</i>	Richard's pipit	Resident	Common	non-forest	not included	Least concern	not included
Ardeidae	<i>Bubulcus ibis</i>	cattle egret	Resident/ Migrant	Locally common	wetlands	not included	Least concern	not included
Ardeidae	<i>Butorides striatus</i>	little heron	Resident/ Migrant	Fairly common	wetlands	not included	Least concern	not included
Charadriidae	<i>Charadrius dubius</i>	little-ringed plover	Resident/ Migrant	Common	wetlands	not included	Least concern	not included
Sternidae	<i>Chlidonias hybrida</i>	whiskered tern	Migrant	Common	wetlands	not included	Least concern	not included

Family	Species	Common name	Residence	Population Status	Habitat Association	DAO 2004-15	IUCN	CITES
Sylviidae	<i>Cisticola exilis</i>	bright-capped cisticola	Resident	Common	non-forest	not included	Least concern	not included
Apodidae	<i>Collocalia esculenta</i>	glossy swiftlet	Resident	Common	non-forest to forest	not included	Least concern	not included
Corvidae	<i>Corvus macrorhynchos</i>	large-billed crow	Resident	Common	non-forest to forest	not included	Least concern	not included
Picidae	<i>Dendrocopos maculatus</i>	Phil. pygmy woodpecker	Philippine endemic	Common	non-forest to forest	not included	Least concern	not included
Dicaeidae	<i>Dicaeum australe</i>	red-keeled flowerpecker	Philippine endemic	Common	non-forest to forest	not included	Least concern	not included
Ardeidae	<i>Dupetor flavicollis</i>	black bittern	Resident	Uncommon	wetlands	not included	Least concern	not included
Ardeidae	<i>Egretta garzetta</i>	little egret	Migrant	Common	wetlands	not included	Least concern	not included
Ardeidae	<i>Egretta intermedia</i>	intermediate egret	Migrant	Locally common	wetlands	not included	Least concern	not included
Rallidae	<i>Gallirallus torquatus</i>	barred rail	Resident	Common	non-forest	not included	Least concern	not included
Columbidae	<i>Geopelia striata</i>	zebra dove	Resident	Common	non-forest	not included	Least concern	not included
Sylviidae	<i>Gerygone sulphurea</i>	golden-bellied flyeater	Resident	Locally common	non-forest to forest	not included	Least concern	not included
Alcedinidae	<i>Halcyon chloris</i>	white-collared kingfisher	Resident	Common	non-forest	not included	Least concern	not included
Hirundinidae	<i>Hirundo tahitica</i>	Pacific swallow	Resident	Common	non-forest	not included	Least concern	not included
Ardeidae	<i>Ixobrychus sinensis</i>	yellow bittern	Resident	Common	wetlands	not included	Least concern	not included
Laniidae	<i>Lanius cristatus</i>	brown shrike	Migrant	Common	non-forest to forest	not included	Least concern	not included
Laniidae	<i>Lanius schach</i>	long-tailed shrike	Resident	Common	non-forest	not included	Least concern	not included
Estrildidae	<i>Lonchura atricapilla</i>	chestnut munia	Resident	Common	non-forest	not included	Least concern	not included
Estrildidae	<i>Lonchura punctulata</i>	scaly-breasted munia	Resident	Common	non-forest	not included	Least concern	not included
Sylviidae	<i>Megalurus palustris</i>	striated grassbird	Resident	Common	non-forest	not included	Least concern	not included
Motacillidae	<i>Motacilla cinerea</i>	grey wagtail	Migrant	Common	non-forest to forest	not included	Least concern	not included
Nectariniidae	<i>Nectarinia jugularis</i>	olive-backed sunbird	Resident	Common	non-forest to forest	not included	Least concern	not included
Ardeidae	<i>Nycticorax</i>	black-crowned night heron	Migrant	Uncommon	wetlands	not included	Least concern	not included
Oriolidae	<i>Oriolus chinensis</i>	black-naped oriole	Resident	Common	non-forest to forest	not included	Least concern	not included
Ploceidae	<i>Passer montanus</i>	Eurasian tree sparrow	Resident	Common	non-forest	not included	Least concern	not included
Pycnonotidae	<i>Pycnonotus goiavier</i>	yellow-vented bulbul	Resident	Common	non-forest to forest	not included	Least concern	not included
Muscicapidae	<i>Rhipidura javanica</i>	ped fantail	Resident	Common	non-forest to forest	not included	Least concern	not included
zosteropidae	<i>Zosterops meyeri</i>	lowland white-eye	Luzon endemic	Common	non-forest to forest	not included	Least concern	not included
Mammals								
Muridae	<i>Rattus norvegicus</i>	common rat	introduced	Common	non-forest	not included	Least concern	not included
Muridae	<i>Rattus tanezumi</i>	Oriental house rat	introduced	Common	non-forest to forest	not included	Least concern	not included
Soricidae	<i>Suncus murinus</i>	Asian house shrew	introduced	Common	non-forest	not included	Least concern	not included

List of arthropod taxa recorded along Phase IV of the PMRCIP

Arthropod Taxa	Light Trap	Sweeping	Total
ACARINA		3	3
ARA: Araneidae		3	3
ARA: Oxyopidae		54	54
ARA: Pholcidae	1		1
ARA: Salticidae		1	1
ARA: Thomisidae sp1		1	1
ARA: Thomisidae sp2		4	4
COL: Anobiidae	1		1
COL: Anthicidae	2		2
COL: Bruchidae		1	1
COL: Carabidae	21		21
COL: Cryptophagidae	12		12
COL: Dytiscidae sp1	1		1
COL: Eucnemidae	2		2
COL: Hydrophilidae	1		1
COL: Limnichidae	1		1
COL: Melolonthinae	1		1
COL: <i>Micraspis</i>		1	1
COL: <i>Paederus</i> sp.1	110		110
COL: Pselaphidae	2	1	3
COL: Scolytidae	1		1
COL: Staphylinidae sp1	1		1
COL: Staphylinidae sp2	2		2
COL: Staphylinidae sp3	1		1
COL: Staphylinidae sp4	4		4
COL: Staphylinidae sp5	2		2
COLL: Entomobryidae		28	28
DIP: Anthomyiidae	1		1
DIP: Ceratopogonidae	3	39	42
DIP: Chironomidae	2	19	21
DIP: Chloropidae sp1		17	17
DIP: Chloropidae sp2		2	2
DIP: Cryptochetidae		6	6
DIP: Curtonotidae		48	48
DIP: Diastatidae	6		6
DIP: Dolichopodidae		1	1
DIP: Drosophilidae		7	7
DIP: <i>Musca domestica</i>		5	5
DIP: Mycetophilidae	1		1
DIP: Ottitidae		6	6
DIP: Pipunculidae		16	16
DIP: Sciomyzidae		1	1
DIP: Tachinidae		47	47

Arthropod Taxa	Light Trap	Sweeping	Total
EPH: Ephemeroidea	4		4
HEM: Anthocoridae sp1		1	1
HEM: Anthocoridae sp2		1	1
HEM: Aphididae		4	4
HEM: Aradidae		2	2
HEM: Cercopidae		3	3
HEM: Cicadellidae		1	1
HEM: Cixiidae	2	1	3
HEM: Corixidae	1		1
HEM: <i>Stenocranus pacificus</i>		10	10
HEM: <i>Cyrtorhinos lividipennis</i>	1	10	11
HEM: <i>Dalbulus</i>		2	2
HEM: Delphacidae	5		5
HEM: Lygaeidae		14	14
HEM: Machaerotidae		1	1
HEM: <i>Microvelia</i> sp.	27		27
HEM: <i>Nephrotettix</i>	1	43	44
HEM: <i>Peregrinus maidis</i>		13	13
HEM: Pleidae	2		2
HEM: Ricaniidae		1	1
HYM: <i>Brachymeria</i>		1	1
HYM: Dryinidae		1	1
HYM: Eucosmidae	1		1
HYM: Formicidae	2		2
HYM: Ichneumonidae		1	1
HYM: <i>Paratrechina longicornis</i>		6	6
HYM: Pteromalidae		2	2
HYM: Scelionidae		2	2
HYM: <i>Solenopsis geminata</i>	2	1	3
HYM: <i>Tapinoma melanocephala</i>	1	7	8
ISOPOD		2	2
LEP: <i>Ostrinia furnaalis</i>		5	5
LEP: Limacodidae		1	1
LEP: Lymantriidae		1	1
LEP: Noctuidae	2		2
LEP: Pyralidae	2		2
ODO: <i>Agriocnemis</i>		1	1
ORT: Acrididae		2	2
ORT: <i>Atractomorpha</i>		1	1
ORT: Gryllidae	3		3
ORT: <i>Gryllotalpa orientalis</i>	1		1
ORT: Tettigoniidae sp1		1	1
ORT: Tettigoniidae sp2		9	9
TYP: Thripidae		1	1
Total	236	463	699

ANNEX-4: Perception Survey

4-1 Survey Report

1. Introduction

The Pasig-Marikina River Channel Improvement Project (PMRCIP: the Project), under the supervision of the Department of Public Works and Highways (DPWH) and technical assistance and funding from the Japan International Cooperation Agency (JICA), aims to address the perennial threat of destructive flooding, most devastatingly illustrated by the passage of Typhoon Ondoy in 2009 and of typhoons and monsoons over the succeeding years, in the Greater Manila Area by improving the flow of the Pasig and Marikina Rivers through the dredging, deepening, and widening of the rivers channels and the construction of flood control structures along their banks.

After the issuance of the Environmental Compliance Certificate (ECC) in 1998, PMRCIP Phase I (Detailed Engineering Design Study for the Project) was done in 2001/02, PMRCIP Phase II (River Channel Improvement Works along the Pasig River) was implemented during 2007 to 2013, and PMRCIP Phase III (River Channel Improvement Works along the Lower Marikina River as well as the remaining parts of the Pasig River) commenced in 2013 and still on-going at present (2015).

Furthermore, the PMRCIP Phase IV covers the Middle Marikina River and Marikina Control Gate Structure (MCGS) (upstream point of Rosario Bridge to Marikina Bridge) with a total of 8.0 km channel length of improvement works. The PMRCIP Phase IV involves the updating of environmental data by the conduct of baseline environmental study along its project area. The PMRCIP Phase IV covers the Pasig-Marikina River Channel that traverses fifteen (15) barangays in three (3) cities. These include Barangays Rosario, Manggahan and Santolan in Pasig City, Barangays Ugong Norte, Bagumbayan, Libis and Blue Ridge B. in Quezon City, Barangays Industrial Valley, Barangka, Tañong, Jesus de la Peña, Calumpang, San Roque, Santa Elena (Pob) and Santo Niño in Marikina City.

On the other hand, PMRCIP Phase V covers the Upper Marikina River from Marikina Bridge to San Mateo Bridge with a total of 5.8 km channel length of improvement. PMRCIP Phase V is currently in the process of applying for an Environmental Compliance Certificate (ECC) by undertaking an Environmental Impact Assessment (EIA) Study. PMRCIP Phase V covers the Pasig-Marikina River Channel that traverses eight (8) barangays in two (2) cities and one municipality. These include Barangays Matandang Balara and Batasan Hills in Quezon City, Barangays Jesus de la Peña, Santo Niño, Malanday, Tumana and Nangka in Marikina City and Barangay Banaba in the Municipality of San Mateo, Rizal.

Both PMRCIP Phases IV and V necessitate the information on community's perception on the Project, however, not all barangays covered by the two project phases were included in the perception survey but only target barangays. **Section 3** explains the selection of the barangays from which the respondents in the perception survey study were sourced from.

2. Objective

The main objective of this socio-economic perception survey is to capture basic demographic information, socio-economic indicators and residents' viewpoints on their community and the project using a pre-tested survey instrument. The specific objectives of the socio-economic survey are the following:

- Gather basic demographic, and socio-economic information of residents within the project-affected area;
- Gather viewpoints/opinion/perception of the community on the project; and
- Provide information dissemination to community regarding the project

3. Methodology

This survey sourced respondents from the eight barangays in the five cities and one municipality. Inundated areas during the passage of Typhoon Ondoy were marked out and overlaid with digital maps of the river channel and the proposed improvements. Areas with residents living well inland, approximately 100 meters beyond the banks of the river channel, but who were still affected by the flooding were identified as the primary source of respondents for the survey. The number of residents living within these areas was then calculated in proportion to the barangays' populations (refer to **Table 3.1**). From this, 127,000 possible respondents were identified.

Table 3.1 Population in Inundation Areas

Barangay	Inundation Depth (m)								Total (a)	Whole barangay (b)	Ratio (a/b)	Population in whole barangay (2010)	Estimated population in inundation areas
	< 0.5	0.51 to 1	1.01 to 2	2.01 to 3	3.01 to 4	4.01 to 5	>5	Inundated Area (Ha)					
	Santolan	90.1	27.8	9.6	6.2	6.7	3.8	12.8					
Bagumbayan	12.8	8.6	14.6	5.9	1.9	2.4	16.5	62.6	154.8	0.40	9,219	3,700	
Tumana	72.9	20.4	6.0	28.4	21.9	16.9	29.3	195.8	394.1	0.50	39,204	19,500	
Jesus De La Peña	9.1	12.7	3.0	24.0	17.9	1.9	23.5	92.1	93.9	0.98	9,465	9,300	
Malanday	63.3	18.6	1.0	8.0	7.4	2.1	14.7	115.1	146.1	0.79	51,956	40,900	
Nangka	3.1	1.2	5.0	5.9	2.4	0.9	2.0	20.5	160.6	0.13	40,731	5,200	
Tañong	17.3	4.3	6.1	8.6	17.4	4.5	5.0	63.3	85.7	0.74	8,479	6,300	
Banaba	22.3	4.9	9.9	5.0	4.9	0.3	2.0	49.3	126.4	0.39	21,553	8,400	
TOTAL	290.9	98.5	55.2	92.0	80.5	32.8	105.8	755.7	1,360.8	4.72	223,472	127,000	

*Areas were based on the GIS data (source: MMEIRS, 2003 project by JICA, MMDA, PHIVOLCS) and may differ from the LGU's official data. This is mainly due to discrepancies in the administrative boundaries from various sources (even from the same LGU itself).

With the population of respondents identified, the sample size was then calculated for a confidence level of 95% and a margin of error of $\pm 5\%$ using the following formulae:

$$ss = \frac{Z^2 * (p) * (1 - p)}{c^2}$$

$$new\ ss = \frac{ss}{1 + \frac{ss-1}{pop}}$$

Where: ss = sample size
 Z = Z value (e.g. 1.96 for 95% confidence level)
 p = percentage picking a choice, expressed as decimal (0.5 used for sample size needed)
 c = confidence interval, expressed as decimal (e.g. 0.04 \pm 4)
 pop = population

The calculated result was a sample size of 383 respondents. To factor in for enumerator and encoding errors this was increased to 400 respondents. These were then allocated to the target barangays in proportion with the actual population of each community (**Table 3.2**).

Table 3.2 Allocation of Respondents per Barangay

No.	Barangay	Population	Ratio (%)	Required no. of respondents*	Proposed no. of respondents	
					By barangay	By survey area
1	Banaba	8,404	6.6	26	30	50
2	Nangka	5,186	4.1	16	20	
3	Tumana	19,481	15.3	61	60	180
4	Malanday	40,922	32.2	129	120	
5	Tañong	6,265	4.9	20	20	50
6	Jesus De La Peña	9,275	7.3	29	30	
7	Santolan	33,783	26.6	106	100	120
8	Bagumbayan	3,731	2.9	12	20	
TOTAL		127,047	100.0	400	400	400

The survey was carried out from 16 to 19 October 2014. The team of enumerators was deployed to each community that has previously been identified as inundation areas. Further, the interview interval was designed to about 7 to 10 homes to allow for as varied a sample of respondents as possible. After the completion of the survey proper and at the end of the encoding process, where the contents of the survey forms were entered into a spreadsheet program as data, one of the forms was rejected as incomplete because of the lack of responses on at least half of the survey forms and thus, the presentation of tables that follows has a final count of 399 respondents.

4. Survey Results

<A. Personal Information>

Q1. Gender

Table 4.1 Respondents by Gender

Gender	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Male	28	10	9	12	42	31	8	7	147	36.84
Female	72	10	11	18	78	29	11	23	252	63.16
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q2. Age

Table 4.2 Respondents by Age

Age	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
11-15	0	0	0	0	0	0	0	1	1	0.25
16-20	4	0	0	0	4	4	2	0	14	3.51
21-25	9	0	1	1	3	5	0	2	21	5.26
26-30	10	1	3	1	16	8	1	3	43	10.78
31-35	6	3	1	5	11	9	1	1	37	9.27
36-40	12	0	5	7	12	7	2	3	48	12.03
41-45	10	2	4	2	14	10	3	6	51	12.78
46-50	11	3	1	2	10	7	3	5	42	10.53
51-55	8	6	1	4	17	2	2	4	44	11.03
56-60	12	0	2	2	11	3	2	2	34	8.52
61-65	10	3	1	1	8	3	3	1	30	7.52
66 and older	8	2	1	5	14	2	0	2	34	8.52
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q3. Religion

Table 4.3 Respondents by Religion

Religion	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Roman Catholic	88	17	15	27	103	44	16	24	334	83.71
Iglesia ni Cristo	4	0	2	1	8	11	2	1	29	7.27
Other Christian Organization	7	3	3	2	9	4	1	5	34	8.52
Muslim	0	0	0	0	0	1	0	0	1	0.25
Buddhism	1	0	0	0	0	0	0	0	1	0.25
Hinduism	0	0	0	0	0	0	0	0	0	0.00
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q4. Education Attainment

Table 4.4 Educational Attainment

Educational Attainment	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Kindergarten	0	0	1	0	0	0	1	0	2	0.50
Elementary	13	2	1	2	18	7	3	2	48	12.03
High School	50	15	13	16	76	35	13	20	238	59.65
Vocational	6	0	0	2	8	6	0	2	24	6.02
College	30	3	5	9	17	12	2	6	84	21.05
Post Graduate	1	0	0	0	1	0	0	0	2	0.50
No Response	0	0	0	1	0	0	0	0	1	0.25
Total	100	20	20	30	120	60	19	30	399	100.00

Q5. Employment

Table 4.5 Employment Status

Employment	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Employed	22	3	6	6	35	30	11	7	120	30.08
Self-Employed	35	8	8	9	38	13	1	8	120	30.08
Non-Working	39	9	6	14	46	15	6	15	150	37.59
Student	0	0	0	0	1	0	0	0	1	0.25
No Response	4	0	0	1	0	2	1	0	8	2.01
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q6. Occupation

Table 4.6 Occupation

Occupation	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Farming	1	1	0	0	0	0	4	0	6	2.50
Government employee	4	0	1	0	5	2	7	4	23	9.58
Private employee	4	2	3	1	11	11	0	2	34	14.17
Entrepreneur/business owner	15	2	4	3	26	6	1	5	62	25.83
Self-employed	1	1	1	2	7	4	0	0	16	6.67
Laborer	5	0	1	3	9	5	0	0	23	9.58
Others	5	3	4	1	5	5	0	0	23	9.58
No Response	22	2	0	5	10	10	0	4	53	22.08
TOTAL	57	11	14	15	73	43	12	15	240	100.00

Q6.1.Types of Farmers

Table 4.6.1 Types of Farmers

Type of Farmer	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Owns a Farm	1	0	0	0	0	0	0	0	1	16.67
Tenant Farm	0	0	0	0	0	0	0	0	0	0.00
Farm Laborer	0	0	0	0	0	0	0	0	0	0.00
No Response	0	1	0	0	0	0	4	0	5	83.33
TOTAL	1	1	0	0	0	0	4	0	6	100.00

Q7. Are you the Household Head?

Table 4.7 Affirmation on Household Head

Household Head	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	57	12	12	19	63	38	11	16	228	57.14
No	41	8	8	11	47	19	8	14	156	39.10
No Response	2	0	0	0	10	3	0	0	15	3.76
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Additional Information:

Table 4.7.1 Information on Woman-headed Household

Barangay	Woman-headed household	Percentage of Woman-Headed Household per Barangay
Santolan	36	36.0
Bagumbayan	2	10.0
Tañong	4	20.0
Jesus Dela Peña	11	36.7
Malanday	32	26.7
Tumana	21	35.0
Nangka	3	15.8
Banaba	9	30.0
TOTAL	118	29.5

Q8. How many persons are there in your household?

Table 4.8 Household Size

Household Size	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
1-2	10	5	1	7	26	20	1	6	76	19.1
3-4	43	9	12	17	56	33	4	13	187	46.9
5-6	32	6	6	6	31	5	10	8	104	26.1
7-8	13	0	1	0	7	2	3	1	27	6.1
9-10	1	0	0	0	0	0	1	0	2	0.5
11 or more	1	0	0	0	0	0	0	2	3	0.8
TOTAL	100	20	20	30	120	60	19	30	399	100.0
Total number of family members	458	71	77	101	456	184	103	134	1,584	
Average Household Size*	4.58	3.55	3.85	3.37	3.80	3.07	5.42	4.47	3.97	

*Average household size was computed by dividing the 'total number of family members' to the 'total number of respondents per barangay'.

Q9. How much do you earn per month?

Table 4.9 Income Level

Household Income per Month	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Less than PhP 3,000	38	4	5	22	54	21	3	6	153	38.35
PhP 3,001-5,000	12	1	1	2	12	7	7	5	47	11.78
PhP 5,001-10,000	18	8	5	2	20	15	3	8	79	19.80
PhP10,001- 15,000	10	3	5	3	13	9	5	7	55	13.78
PhP 15,001-20,000	9	2	1	1	8	6	0	0	27	6.77
more than PhP 20,001	6	0	1	0	2	1	1	1	12	3.01
No Response	7	2	2	0	11	1	0	3	26	6.52
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q10. Do you have other sources of income?

Table 4.10 Affirmation on Alternative Sources of Income

Affirmation on Alternative Sources of Income	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	37	8	8	8	50	15	7	12	145	36.34
No	54	11	9	22	68	42	11	16	233	58.40
No Response	9	1	3	0	2	3	1	2	21	5.26
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q10.1. If Yes, what is the other source of income?

Table 4.10.1 Alternative Sources of Income

Alternative Sources of Income	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Sari-sari Store/ Small-scale Retail	9	1	2	3	19	5	4	7	50	34.48
Rentals	2	2	2	0	1	1	0	0	8	5.52
Home Service/Business	12	2	2	3	10	4	3	0	36	24.83
Pension	1	1	2	1	0	2	0	3	10	6.90
Remittances	13	4	1	1	16	4	0	2	41	28.28
TOTAL	37	10	9	8	46	16	7	12	145	100.00

Q11. Were you born in this Barangay/Village?

Table 4.11 Affirmation if Born in the Barangay/Village

Affirmation if born in the barangay/village	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	16	7	11	3	38	16	2	4	97	24.31
No	72	13	9	26	79	43	9	21	272	68.17
No Response	12	0	0	1	3	1	8	5	30	7.52
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q11.1 If Yes, for how long have you been living in this Barangay/Village?

Table 4.11.1 Period of Residency in the Current Barangay/Village

Period of Residency in the Barangay	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
1-10 years	1	0	0	0	1	1	0	0	3	3.09
11-20 years	1	0	0	0	3	0	1	1	6	6.19
21-30 years	5	1	2	1	10	2	0	2	23	23.71
31-40 years	2	0	3	2	5	2	1	0	15	15.46
41-50 years	2	1	3	0	5	6	0	0	17	17.53
More than 51 years	5	4	3	0	14	5	0	1	32	32.99
No response	0	1	0	0	0	0	0	0	1	1.03
TOTAL	16	7	11	3	38	16	2	4	97	100.00

*Period of residency' divided by 97 (total number of respondents who were born in their respective barangay/village).

Q11.1.1 What is your main reason for staying in this area?

Table 4.11.1.1 Reason for Staying in the Barangay/Village

Reason for Staying in the Barangay	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Work/livelihood	11	5	9	1	27	14	1	0	68	70.1
Education of children	6	3	8	0	16	12	0	0	45	46.4
Area is safe/secure	5	3	1	0	6	4	0	0	19	19.6
Access to productive resources/opportunities	2	6	6	0	6	5	0	0	25	13.6
Access to Government Services	1	0	0	0	2	2	0	0	5	5.15
Others	1	1	2	1	7	0	1	3	16	16.5
No Response	1	0	0	1	2	1	0	1	6	6.19
TOTAL	27	18	26	3	66	38	2	4	184	**

*Reason for staying in the barangay/village divided by 97 (total number of respondents who were born in the community).

**Total percentage does not add up to 100% because one or more person/s may have more than one reason for staying in the area.

Q11.2 If No, how long have you been living in this barangay?

Table 4.11.2 Period of Residency of Migrant Respondents in the Barangay

Period of Residency	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
1-10 years	23	3	1	8	24	23	1	6	89	32.72
11-20 years	19	1	2	9	18	7	4	7	67	24.63
21-30 years	21	2	5	2	20	9	3	6	68	25.00
31-40 years	7	5	0	3	9	2	0	2	28	10.29
41-50 years	1	1	1	2	6	0	1	0	12	4.41
more than 51 years	1	1	0	2	1	1	0	0	6	2.21
No Response	0	0	0	0	1	1	0	0	2	0.74
TOTAL	72	13	9	26	79	43	9	21	272	100.00

*Period of residency of migrant respondents' divided by 272 (total number of respondents who migrated in the community).

Q11.2.1. Where is your original hometown?

Table 4.11.2.1 Original Hometown of Migrants

Region	Province/City	Santolan	Bagumbayan	Taňong	Jesus Dela Pena	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Cordillera Administrative Region (CAR)	Abra	0	0	0	0	0	1	0	0	1	0.37
	Benguet	0	0	0	0	1	0	0	0	1	0.37
	Kalinga	1	0	0	0	1	0	0	0	2	0.74
Region I (Ilocos Region)	Ilocos*	1	1	0	1	1	1	0	1	6	2.21
	Ilocos Norte	1	0	0	0	1	0	0	0	2	0.74
	Ilocos Sur	0	0	0	1	1	0	0	0	2	0.74
	Pangasinan	3	2	1	0	3	3	0	0	12	4.41
Region II (Cagayan Valley)	Cagayan	0	1	0	1	0	0	0	0	2	0.74
	Isabela	0	0	0	0	1	0	0	0	1	0.37
	Nueva Vizcaya	0	0	0	1	0	0	0	1	2	0.74
Region III (Central Luzon)	Bataan	1	0	0	0	0	0	0	0	1	0.37
	Bulacan	3	0	1	0	0	2	0	2	8	2.94
	Nueva Ecija	0	0	0	0	3	1	1	0	5	1.84
	Pampanga	0	0	0	0	1	1	0	0	2	0.74
	Tarlac	0	0	0	0	2	2	0	0	4	1.47
	Caloocan	1	0	0	0	4	1	0	1	7	2.57
National Capital Region (NCR)	Makati	1	0	0	0	2	0	0	0	3	1.10
	Mandaluyong	0	0	0	1	0	1	0	0	2	0.74
	Manila	1	1	0	0	6	0	0	3	11	4.04
	Marikina	11	0	1	8	6	3	5	1	35	12.87
	Muntinlupa	1	0	0	1	0	1	0	0	3	1.10
	Pasay	0	0	0	0	1	0	0	0	1	0.37
	Pasig	8	2	0	0	2	2	0	0	14	5.15
	Quezon City	7	0	1	0	8	5	0	0	21	7.72
	San Juan	1	0	0	0	0	0	0	0	1	0.37
	Taguig	0	0	0	1	0	0	0	0	1	0.37
	Valenzuela	1	0	0	0	0	0	0	0	1	0.37
	Region IV-A (CALABARZON)	Batangas	1	1	0	0	2	0	0	1	5
Cavite		0	0	0	0	5	0	0	1	6	2.21
Laguna		1	0	0	0	2	3	0	0	6	2.21
Quezon		3	0	0	0	2	2	0	0	7	2.57
Rizal		2	0	0	0	1	2	0	0	5	1.84
Region IV-B (MIMAROPA)	Mindoro*	0	0	0	0	2	0	0	0	2	0.74
	Palawan	1	0	0	0	0	0	0	0	1	0.37
	Romblon	0	0	0	0	1	0	0	0	1	0.37
Region V (Bicol Region)	Albay	1	0	0	0	1	0	0	0	2	0.74
	Bicol*	3	1	1	1	2	2	1	4	15	5.51
	Camarines*	0	0	0	0	0	1	0	0	1	0.37
	Camarines Norte	1	0	0	0	2	0	0	0	3	1.10
	Camarines Sur	0	0	1	0	2	1	0	1	5	1.84
	Masbate	2	0	0	2	0	0	0	0	4	1.47
Region VI (Western Visayas)	Sorsogon	0	0	0	0	0	0	1	1	2	0.74
	Aklan	0	0	1	0	0	0	0	0	1	0.37
	Antique	0	0	0	1	0	0	0	0	1	0.37
	Capiz	0	0	0	0	0	1	0	0	1	0.37
	Iloilo	1	0	0	2	0	0	0	2	5	1.84
Region VII (Central Visayas)	Negros*	1	0	0	0	0	0	0	0	1	0.37
	Bohol	0	0	0	1	0	0	0	1	2	0.74
	Cebu	1	1	0	0	1	1	0	0	4	1.47
Region VIII (Eastern Visayas)	Negros Oriental	1	0	0	2	0	0	0	0	3	1.10
	Leyte	3	0	0	0	1	2	0	1	7	2.57
Region IX (Western Mindanao)	Samar	1	1	1	0	4	0	0	0	7	2.57
	Zamboanga	1	0	0	0	0	1	0	0	2	0.74
Region XI (Davao region)	Davao*	1	0	0	1	1	1	0	0	4	1.47
	Davao del Norte	0	0	1	0	0	0	0	0	1	0.37
Region XII (Soccsksargen)	North Cotabato	1	0	0	0	1	0	0	0	2	0.74
Region XIII (CARAGA)	Agusan Del Sur	0	0	0	0	0	1	0	0	1	0.37
	Surigao del Norte	1	0	0	0	0	0	0	0	1	0.37
Autonomous Region of Muslim Mindanao (ARMM)	Maguindanao	0	0	0	0	1	0	0	0	1	0.37
Others	Visayas	0	1	0	0	0	0	0	0	1	0.37
	Western Visayas	0	0	0	0	1	0	0	0	1	0.37
	Mindanao	0	1	0	1	2	0	0	0	4	1.47
	Province	0	0	0	0	0	0	1	0	1	0.37
No response		3	0	0	0	1	1	0	0	5	1.84
TOTAL		72	13	9	26	79	43	9	21	272	100.00

Note: The municipalities and barangays stated by the respondents were included in the province where they originally belong.

*Actual name of the province not identified

Q11.2.2 What is your main reason for moving into this area?

Table 4.11.2.2 Reason for Migrating/Moving to the Area

Reason for Migrating to Area	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Work/livelihood	49	9	7	19	63	35	3	10	195	71.69
Education of children	17	2	5	11	25	12	0	0	72	26.47
Area is safe/secure	3	1	0	4	3	5	0	1	17	6.25
displaced by natural calamities	1	0	0	0	0	1	0	0	2	0.74
displaced by conflict	0	0	0	0	0	0	0	1	1	0.37
access to productive resources/opportunities	2	4	2	0	10	3	0	0	21	7.72
there is enough government intervention/services in the area	0	0	0	0	0	1	0	0	1	0.37
Others	12	2	2	6	11	8	0	2	43	15.81
No Response	3	0	0	1	6	2	6	8	26	9.56
TOTAL	87	18	16	41	118	67	9	22	378	**

*Reason for migrating into the area' divided by 272 (total number of respondents who were not born in the community).

**Figure does not necessarily sum up to 100%.

Q11.3 To what ethnic group, clan or indigenous group does you and your family belong?

Table 4.11.3 Ethnic Group, Clan or Indigenous Group of the Respondents

Ethnic Group, Clan or Indigenous Group	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Tagalog	80	11	15	24	100	53	7	15	305	76.44
Bisaya	4	1	2	1	6	2	6	2	24	6.02
Bicolano	4	0	2	2	4	1	3	7	23	5.76
Ilocano	2	2	0	1	5	3	1	2	16	4.01
Ilonggo	0	0	0	2	1	0	1	2	6	1.50
Pangasinense	1	2	0	0	1	0	0	0	4	1.00
Waray	0	0	0	0	1	0	0	1	2	0.50
Cebuano	1	0	0	0	0	1	0	0	2	0.50
Kapampangan	0	0	0	0	1	0	0	0	1	0.25
Muslim	1	0	0	0	0	0	0	0	1	0.25
Caviteño	0	0	0	0	0	0	0	0	0	0.00
Aeta	0	0	0	0	0	0	0	0	0	0.00
Igorot	0	0	0	0	0	0	0	0	0	0.00
Badjaw	0	0	0	0	0	0	0	0	0	0.00
Maranaw	0	0	0	0	0	0	0	0	0	0.00
Mangyan	0	0	0	0	0	0	0	0	0	0.00
Others	0	0	1	0	0	0	0	0	1	0.25
No Response	7	4	0	0	1	0	1	1	14	3.51
TOTAL	100	20	20	30	120	60	19	30	399	100.00

*Percentage was computed by dividing the 'ethnic group, clan or indigenous group's values with 399 (total number of respondents).

Q12. Are you a member of any community organization?

Table 4.12 Affirmation on Membership in Community Organization

Affirmation if member of a Community Organization	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	18	5	5	1	20	6	7	8	70	17.54
No	81	11	9	29	89	54	12	15	300	75.19
No Response	1	4	6	0	11	0		7	29	7.27
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q13. What is the name of your organization?

Table 4.13 Name of Community Organization

Name of Community Organization	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
AKKAPP	1	0	0	0	0	0	0	0	1	1.43
Aerobics	0	1	0	0	0	0	0	0	1	1.43
BLU Ladies	0	0	0	1	0	0	0	0	1	1.43
Buklod Tao	0	0	0	0	0	0	0	2	2	2.86
COOP	1	0	0	0	0	0	1	0	2	2.86
Couples for Christ	1	0	0	0	0	0	0	0	1	1.43
Eusebayos Angel	1	0	0	0	0	0	0	0	1	1.43
4P's	1	0	0	0	1	0	2	0	4	5.71
POWER	1	0	0	0	0	0	0	0	1	1.43
WAVE	3	0	0	0	0	0	0	0	3	4.29
Magic Five Delta Sigma	1	0	0	0	0	0	0	0	1	1.43
Gabriela	0	0	0	0	0	0	1	0	1	1.43
Help Ladies	0	0	0	0	0	0	0	2	2	2.86
Homeowner's Association	1	0	1	0	12	1	0	2	17	24.29
Kilusang Mayo Uno	0	1	0	0	0	0	0	0	1	1.43
Kiwanis Club	0	0	1	0	0	1	0	0	2	2.86
Ladies Badminton	0	1	0	0	0	0	0	0	1	1.43
NAPASODA	0	0	0	0	0	0	1	0	1	1.43
Magdalo	0	0	0	0	0	0	1	0	1	1.43
Makatao	0	0	0	0	1	0	0	0	1	1.43
Overseas Workers Welfare Administration	0	0	0	0	0	1	0	0	1	1.43
Pink Ladies	0	0	0	0	0	0	3	0	3	4.29
SamaKa Ba	0	0	0	0	0	0	0	4	4	5.71
Santolan Bay Association	1	0	0	0	0	0	0	0	1	1.43
Santolan Biker Association	1	0	0	0	0	0	0	0	1	1.43
SA CHURCH	1	0	0	0	0	0	0	0	1	1.43
Senior Citizen	3	2	2	0	4	3	0	0	14	20.00
SKK	1	0	0	0	0	0	0	0	1	1.43
Todammi Tri Association	0	0	0	0	1	0	0	0	1	1.43
No Response	0	0	1	0	1	0	0	0	2	2.86
TOTAL	18	5	5	1	20	6	9	10	74	**

*Percentage reflects the 'name of organization' divided by the total number of respondents who belong in community organization

**Total percentage does not add up to 100% because one or more person/s may have more than one community organization he/she is part of.

Q14. What is your position or function?

Table 4.14 Position in Community Organization

Position in Community Organization	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Officer	5	1	0	0	0	1	0	2	9	12.86
Member	13	4	4	0	18	5	7	5	56	80.00
No Response	0	0	1	1	2	0	0	1	5	7.14
TOTAL	18	5	5	1	20	6	7	8	70	100.00

<B. Perception about the Project>

Q15. Have you ever experienced property damages due to flood?

Table 4.15 Affirmation of Property Damage due to Flooding

Affirmation of Property Damage due Flooding	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	80	8	18	29	114	47	19	29	344	86.22
No	18	12	2	1	6	13	0	1	53	13.28
No Response	2	0	0	0	0	0	0	0	2	0.50
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q16. If yes, what is the cause of flooding?

Table 4.16 Perception on Causes of Flooding

Cause of the Flooding	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Overflow of the Marikina River main stream	66	8	17	26	97	31	16	27	288	72.18
Overflow of the creek (tributary of the Marikina River)	4	0	0	2	3	10	2	0	21	5.26
Water stagnation due to in adequate drainage system	6	3	3	2	7	11	1	1	34	8.52
Others	6	0	0	0	7	4	0	1	18	4.51
No Response	18	9	0	0	6	4	0	1	38	9.52
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q17. How frequent are you suffering from flood disaster on average?

Table 4.17 Frequency of Flood Disaster

Frequency of Flooding	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Several times or more every year	5	2	5	10	28	6	1	7	64	16.04
Once or twice per year	11	2	2	6	19	8	15	10	73	18.30
Once per several years	12	3	2	3	27	8	1	3	59	14.79
Rarely	56	1	10	11	41	24	2	7	152	38.10
None, so far	11	12	1	0	5	14	0	2	45	11.28
No Response	5	0	0	0	0	0	0	1	6	1.50
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q18. How did you respond to the flooding issue?

Table 4.18 Response to Flooding Issue

Response to Flooding	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Raise to Gov't and LGU	13	1	9	10	30	7	1	0	71	17.79
Move/Resettle to another area	39	4	8	19	65	23	15	11	184	46.12
Pay Attention to PAGASA warning for early evacuation	44	6	12	8	56	31	0	16	173	43.36

Response to Flooding	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Do Nothing	7	1	3	1	7	4	1	1	25	6.27
Not Applicable	4	8	0	0	3	3	0	0	18	4.51
No Response	10	0	0	1	4	2	2	2	21	5.26
TOTAL	117	20	32	39	165	70	19	30	492	**

*Percentage reflects the 'response to flooding' divided by the total number of respondents (399)

**Total percentage does not add up to 100% because one or more person/s may have more than one response to flooding.

Q19. Are you aware of the proposed Pasig Marikina River Channel Improvement Project (PMRCIP)?

Table 4.19 Affirmation on Awareness of the Project

Affirmation on Awareness of PMRCIP	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	31	5	7	10	53	25	0	11	142	35.59
Slightly Aware	8	5	1	1	14	0	1	3	33	8.27
No	56	7	11	18	51	34	18	16	211	52.88
No Response	5	3	1	1	2	1	0	0	13	3.26
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q20. If Yes or Slightly Aware, how did you know about the project?

Table 4.20 Source of Information about the Project

Source of Information about the Project	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Government/Barangay Officials	26	1	2	10	34	16	0	4	93	53.14
Neighbors/Relatives	16	5	0	6	19	9	0	3	58	33.14
DPWH Officials	0	0	0	1	4	3	1	0	9	5.14
Radio/TV/Newspapers	17	5	5	6	37	17	0	6	93	53.14
Barangay meetings/consultation	4	0	3	0	8	6	0	1	22	12.57
Surveys and research	3	0	0	1	15	2	0	0	21	12.00
Bulletin Boards/Poster/Flyer	0	0	0	0	2	0	0	0	2	1.14
Others	1	0	0	0	0	0	0	0	1	0.57
No Response	2	1	0	0	2	0	0	0	5	2.86
TOTAL	69	12	10	24	121	53	1	14	304	**

*Percentage reflects the 'response to the source of information' divide it by the total number of respondents who said they are aware and slightly aware of the PMRCIP (175)

**Total percentage does not add up to 100% because one or more person/s may have more than one response to the source of information.

In your opinion, what are the possible effects of the proposed PMRCIP?

Q20.1 Positive:

Table 4.20.1 Opinion on the Positive Effects of the Project

Positive Effects of PMRCIP	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Creation of jobs and livelihood opportunities	5	0	0	0	11	5	0	0	21	5.26
Progress in the city	32	3	11	9	68	26	0	8	157	39.35
Opportunities for local vendors and businesses	20	3	8	1	30	7	0	1	70	17.54
Less flooding in our area	44	18	18	2	67	28	0	20	197	49.37
Cleaner surroundings	35	7	13	0	42	29	1	2	129	32.33
Improved river water quality	14	6	8	0	30	18	0	1	77	19.30
Better aesthetics around the river	4	3	6	1	21	0	0	0	35	8.77
I don't know	15	0	0	6	8	8	14	5	56	14.04
No Response	4	0	0	11	4	3	4	0	26	6.52
TOTAL	173	40	64	30	281	124	19	37	768	**

*Percentage reflects the 'response to the positive impact of the project' divided by the total number of respondents (399).

**Total percentage does not add up to 100% because one or more person/s may have more than one response to the positive impact of the project

Q20.2 Negative:

Table 4.20.2 Opinion on the Negative Effects of the Project

Negative Effects of PMRCIP	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Loss of property	57	12	11	11	73	34	0	22	220	55.14
Air pollution	4	1	0	0	12	5	1	0	23	5.76
Water pollution	3	0	1	0	14	8	0	0	26	6.52
Loss of plants, natural habitats	14	0	0	1	27	20	0	1	63	15.79
Increase in traffic congestion	3	0	0	1	7	8	0	0	19	4.76
Loss of jobs or livelihood	13	1	0	1	16	9	0	0	40	10.03
Noise pollution	0	0	0	0	0	1	0	0	1	0.25
I don't know	22	1	0	6	16	3	14	8	70	17.54
Others	0	3	0	0	0	0	0	0	3	0.75
No Response	14	4	8	11	22	12	4	0	75	18.80
TOTAL	130	22	20	31	187	100	19	31	540	**

*Percentage reflects the 'response to the negative impact of the project' divided by the total number of respondents (399).

**Total percentage does not add up to 100% because one or more person/s may have more than one response to the negative impacts of the project.

Q21. In your opinion, how can PMRCIP help the barangay/ city and its residents?

Table 4.21 Opinion on Benefits of the Project to Community

Perceived Benefits of PMRCIP to the Community	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Improve flow of river / Widening channel / Increasing depth of river	16	5	7	4	25	12	8	0	77	19.30
Lessen flood incidents and impacts	34	2	6	14	37	0	1	5	99	24.81
Resettle people living along the river	6	2	2	1	5	6	6	1	29	7.27
Increase business opportunities	0	0	1	0	4	3	0	0	8	2.01
Improve transportation	1	0	1	0	0	0	0	0	2	0.50
Improve drainage	8	0	1	0	6	6	0	0	21	5.26
Coordinate with barangay	4	0	0	0	0	0	0	0	4	1.00
Project will benefit everybody	0	0	1	4	24	13	0	0	42	10.53
Use of river for recreational purposes	0	0	1	0	0	1	1	0	3	0.75
Clean surroundings	7	0	0	0	0	1	1	10	19	4.76
Provide information on floods and warning signs	6	0	0	0	0	0	0	0	6	1.50
Livelihood projects	7	0	0	0	0	1	0	0	8	2.01
I don't know	0	10	0	0	14	15	0	10	49	12.28
No response	11	1	0	7	5	2	2	4	32	8.02
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q22. Do you generally support the proposed PMRCIP?

Table 4.22 Affirmation on Support for the Project

Support for the Project	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	75	16	18	21	97	40	15	30	312	78.20
No	19	1	0	8	19	20	2	0	69	17.29
Neutral	6	3	1	0	3	0	1	0	14	3.51
No Response	0	0	1	1	1	0	1	0	4	1.00
TOTAL	100	20	20	30	120	60	19	30	399	100.00

Q22.1 If Yes, why do you say so?

Table 4.22.1 Reason for Supporting the Project

Reason for Supporting the Project	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Resolve flooding Issue	56	15	17	16	87	35	1	22	249	79.81
Improve civil facilities (roads, etc.) along the river	23	9	8	7	31	11	11	8	108	34.62
Encourage business and jobs in the area	5	5	9	1	19	2	0	0	41	13.14
Pollution be reduced in the river	26	9	10	3	43	14	2	0	107	34.29
Others	1	0	0	0	3	2	1	0	7	2.24
No Response	0	0	0	1	1	1	0	0	3	0.96
TOTAL	111	38	44	28	184	65	15	30	515	**

*Percentage reflects the 'response to the reason for supporting the project' divided by the total number of respondents who support the project (312).

**Total percentage does not add up to 100% because one or more person/s may have more than one response to the reason for supporting the project.

Q22.2 If No, what is the reason?

Table 4.22.2 Reason for not supporting the Project

Reason for not supporting the project	Santolan	Bagumbayan	Tañong	Jesus Dela Pena	Malanday	Tumana	Nangka	Banaba	Total	Percentage *
It would necessitate resettlement of the people living near the river	1	0	0	0	3	4	0	0	8	11.59
It would cause loss of property of PAPs	5	0	0	1	8	11	0	0	25	36.23
It would cause loss of jobs/livelihood problems to PAPs	3	1	0	4	3	2	0	0	13	18.84
It would cause environmental problems such as pollution, loss of vegetation, traffic congestion etc.	2	0	0	1	2	1	0	0	6	8.7
I do not agree with this project/ construction of flood control structure	1	0	0	0	0	0	2	0	3	4.35
Others	1	0	0	0	0	0	0	0	1	1.45
No response	6	0	0	2	3	2	0	0	13	18.84
TOTAL	19	1	0	8	19	20	2	0	69	100.00

*Percentage reflects the 'response to the reason for not supporting the project' divided by the total number of respondents who do not support the project (69).

Q22.3 If No, what measures would be necessary to make the Project acceptable for you?

Table 4.22.3 Measures to accept the Project

Measures to Accept the Project	Santolan	Bagumbayan	Tañong	Jesus Dela Pena	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Personal initiative of cleaning	1	0	0	0	0	0	0	0	1	1.20
Assurance of no corruption	0	2	0	0	0	0	0	0	2	2.41
Unity or relocation	0	1	0	0	0	0	0	0	1	1.20
Finish the project fast	0	1	0	0	0	0	0	0	1	1.20
Transparent budget	0	0	1	0	0	0	0	0	1	1.20
Inform about the project and its help to the public	0	0	0	0	1	0	0	0	1	1.20
Improve the riverside	0	0	0	0	0	0	1	0	1	1.20
No response	24	0	0	8	21	20	2	0	75	90.36
TOTAL	25	4	1	8	22	20	3	0	83	100.00

*Percentage reflects the 'response to the measure to be undertaken to support the project' divided by the total number of respondents who are neutral and do not support the project (83).

Q23. Do you and your family depend on the Marikina River as a source of livelihood support?

Table 4.23 Dependence on River

Dependence on River	Santolan	Bagumbayan	Tañong	Jesus Dela Pena	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Yes	3	1	1	4	1	1	2	0	13	3.26

No	91	19	19	26	112	58	15	27	367	91.98
No response	6	0	0	0	7	0	3	3	19	4.76
TOTAL	100	20	20	30	120	59	20	30	399	100.00

Q23.1 If Yes, what exactly do you (your family) depend on the Marikina River?

Table 4.23.1 Way of Dependence on the River

Way of Dependence on the River	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Taking water from the river for garden/irrigation	1	1	1	2	1	0	2	0	8	61.54
Taking water from the river for washing clothes, cars, etc.	1	0	0	2	0	0	0	0	3	23.08
Bathing in the river	1	0	0	0	0	0	0	0	1	7.69
No response	0	0	0	0	0	1	0	0	1	7.69
TOTAL	3	1	1	4	1	1	2	0	13	100

*Percentage reflects the 'response on how they depend on the river' divided by the total number of respondents who depend on the river (13).

Q24 How / where do you (and your family) dispose of your solid wastes/garbage?

Table 4.24 Solid Waste Disposal

Solid Waste Disposal	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
Utilizing solid waste collection and disposal system provided by LGUs	99	20	20	28	119	60	18	25	389	97.49
Direct dumping into the river	0	0	0	0	0	0	0	1	1	0.25
Direct dumping into the nearby open space	0	0	0	1	0	0	0	4	5	1.25
Other (pls. specify)	0	0	0	0	0	0	0	0	0	0.00
No Response	1	0	0	1	1	0	1	0	4	1.00
TOTAL	100	20	20	30	120	60	19	30	399	100.00

*Percentage reflects the 'response to the solid waste disposal' divided by the total number of respondents (399).

Q24.1 How / where do you (and your family) discharge your waste water or effluent?

Table 4.24.1.1 Wastewater Disposal

Wastewater Disposal	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage*
STP system provided by MWCI	17	10	7	3	31	19	0	0	87	21.80
Septic tank	43	8	7	11	62	29	0	18	178	44.61
Direct discharging into the river	34	2	3	11	17	11	17	8	103	25.81
Other (pls. specify)	5	0	0	1	9	0	0	3	18	4.51
No Response	1	0	3	4	1	1	2	1	13	3.26
TOTAL	100	20	20	30	120	60	19	30	399	100.00

*Percentage reflects the 'response to wastewater disposal' divided by the total number of respondents (399).

Q25 Do you have the following social issue(s) in your community/barangay?

Table 4.25 Social Issues in Community

Social Issues in Barangay	Santolan	Bagumbayan	Tañong	Jesus Dela Peña	Malanday	Tumana	Nangka	Banaba	Total	Percentage
Agitation / Disturbance by radical group	12	1	0	9	0	0	0	0	22	5.51
Gender issues such as discrimination against women, non-equal work opportunities	4	0	0	0	1	0	2	0	7	1.75
Abuse of children such as child labor, child prostitution, abandonment	3	0	0	0	6	2	0	4	15	3.76
Issues on Sexuality transmitted disease (HIV, AIDS) including presence/reports of STD in your community/barangay, discrimination against the people with HIV/AIDS	2	1	0	0	1	1	0	1	6	1.50
Other (pls. specify)	31 Drug addicts (17) Gambling (4) Snatchers (6) Neighbors (1) Noise (1) Canal overflow (1) Gang riots (1)	11 Thieves (4) Gossips (5) Videoke (1) Animal noise (1) Vehicular noise (1)	11 Drug addicts (3) Car engine noises (2) snatchers (3) children noises (1) swindlers (1) air pollution (1)	2 Garbage (1) Neighbors (1)	24 Government has a good governance (1) Thieves (13) Drug addicts (2) Flood (3) Fraternity war (2) Drunkards (2) snatchers (1)	8 Drug addicts (3) Thieves (3) Noise (2)	9 Drug addicts (3) Corrupt (1) Low income (1) Communicable diseases (1) Flooding (1) Garbage (2)	5 Thieves (1) addicts (1) Noise (1) Garbage and flooding (1) Lack of medicines (1)	101	25.31
None of these	11	2	9	19	68	42	5	6	162	40.60
No Response	37	5	0	0	20	7	3	14	86	21.55
TOTAL	100	20	20	30	120	60	19	30	399	100.00

5. Conclusion and Recommendations

Based on the perception survey, majority of the respondents experience flooding. Most of them perceive that the main reason of flooding is the overflowing of Marikina River. Their usual response to flooding incidence is to temporarily move /resettle to another area.

Almost half of the respondents are already aware of the Project. They have learned mostly about the Project from the information provided by the government and/or barangay officials. In terms of positive effect of the project, near half of the total number of respondents think that the Project will lessen/mitigate the flooding in their area. However, in terms of perception on the negative effects of the project, majority think that the project will cause potential loss of property.

Majority of the respondents expressed their support for the project because they perceive that the project will resolve the flooding issue in the area but among those who do not support the project thinks that it would cause loss of property damage and livelihood to project-affected families. Some expressed their concerns on resettlement issues.

Generally, the respondents do not depend largely on the river. They only use the river for irrigation purposes/gardening and some use it for washing clothes. The respondents claimed that they follow the solid waste collection and disposal system provided by the LGU. They also either utilize the sewage treatment plant (STP) provided by a private water company (MWC) or have their own septic tanks, based on the survey.

To increase project awareness specifically on project scope and benefits, a more intensive information, education and communication (IEC) activities shall be conducted to achieve better understanding of the project more importantly by community stakeholders. This may include information caravan, distribution of pamphlets/flyers, and conduct of public consultation, among others. Close coordination with relevant local government units (LGUs) must be continuously undertaken making them as “partners” in this project will ensure meeting project goals and objectives.

4-2 Questionnaire

PERCEPTION SURVEY FORM

No: _____ Date: _____ Starting Time: _____ End: _____

DIRECTION: Check (✓) the appropriate box [] next to the interviewee's response, or write on the blank if the response is not among the choices provided.

Name of Respondent: _____

Address: _____

A. **PERSONAL INFORMATION:**

1. **Q1.** Gender (NO NEED TO ASK): [a] Male [b] Female
2. **Q2.** Age (*Edad*): _____
3. **Q3.** Religion (*Relihiyon*):
[a] Roman Catholic [b] Iglesia Ni Cristo [c] Other Christian Organization
[d] Muslim [e] Buddhism [e] Hinduism
[f] Others (please specify) **Q3.1** _____
4. **Q4.** Educational Attainment (*Edukasyong Tinapos*):
[a] Kindergarten [b] Elementary [c] High School
[d] Vocational [e] College [f] Post-graduate (Masteral, Doctoral etc.)
5. **Q5.** Employment (*Trabaho*)
[a] Employed (*May Trabaho*) [b] Self-Employed (*Walang Trabaho*)
[c] Non-Working (*Walang Trabaho*) [d] Student (*Mag-aara*)
Q6. If employed, please indicate below the occupation (*ano ang trabaho?*):
[a] Farming
Q6.1 If yes, [] Own a farm [] Tenant Farmer [] Farm Laborer
[b] Fishing
Q6.2. If yes, [] Own a boat [] Rent a boat [] Fishery laborer
[c] Government employee (e.g. barangay official, health worker, etc.)
[d] Private employee (e.g. manager, clerk, messenger, secretary, etc.)
[e] Entrepreneur/business owner (e.g. sari-sari store, vendor, etc.)
[f] Self-employed (e.g. tailor, laundry, driver, etc.)
[g] Laborer (e.g. construction worker, factory worker, etc.)
[h] Others: _____

6. **Q7.** Are you the Household Head (*Kayo po ba ang Puno ng Pamilya*)?

[a] Yes [b] No

7. **Q8.** How many persons are there in your household? (*Ilan po ang miyembro ng inyong pamilya*): _____ household members, including the household head

Full Name (<i>buong pangalan</i>)	Age (<i>Edad</i>)	Educational Attainment (<i>Edukasyong tinapos</i>)
Q8.1.1	Q8.2.1	Q8.3.1
Q8.1.2	Q8.2.2	Q8.3.2
Q8.1.3	Q8.2.3	Q8.3.3
Q8.1.4	Q8.2.4	Q8.3.4
Q8.1.5	Q8.2.5	Q8.3.5
Q8.1.6	Q8.2.6	Q8.3.6

8. **Q9.** How much do you earn per month? (ESTIMATE ONLY) (*Magkano po ang inyong kinikita bawat buwan*):

[a] Less than Php 3,000 [b] Php 3,001-5,000 [c] Php5,001-10,000
 [d] Php10, 001- 15,000 [e] Php15,001-20,000 [f] more than Php20,000

9. **Q10.** Do you have other sources of income (*Mayroon po baka yong ibang na pagkukuhanan ng kita*)?

[a] Yes [b] No

Q10.1 If Yes, what is the other source of income (*Kung Oo, ano pa po ang inyong ibang pinagkukuhanan ng kita*)? _____

10. **Q11.** Were you born in this Barangay/Village? (*Dito po ba sa barangay na ito kayo ipinanganak?*) _____

Q11.1 If Yes, for how long have you been living in this Barangay/Village (*Kung oo, gaano na kayo katagal nakatira sa barangay na ito*)? _____ month/s _____ year/s

Q11.1.1 What is your main reason for staying in this area (*Kung oo, ano po inyong pangunahing dahilan upang manatili dito*)?

[a] Work/livelihood
 [b] Education of children
 [c] Area is safe/secure
 [d] Access to productive resources/opportunities
 [e] There is enough government intervention/service in the area
 [f] Others (specify): _____

Q11.2 If No, how long have you been living in this barangay (*Kung hindi, ilang taon na po kayo nakatira sa barangay na ito*)? _____ month/s _____ year/s

Q11.2.1 Where is your original hometown (Saang bayan/barangay po kayo nakatira dati)? _____, and

Q11.2.2 What is your main reason for moving into this area (Ano po ang inyong naging dahilan upang lumipat sa lugar na ito)?

[a] Work/livelihood

[b] Education of children

[c] Area is safe/ secure

[d] Displaced by Natural Calamities

[e] Displaced by Conflict

[f] Access to productive resources/opportunities

[g] There is enough government intervention/service in the area

[h] Others (specify): _____

Q11.3 To what ethnic group, clan or indigenous group does you and your family belong (Sa anong tribo, katutubo o lahi kayo napapabilang)? _____

[a] Tagalog [b] Bisaya [c] Ilocano [d] Kapampangan [e] Pangasinense

[f] Caviteño [g] Bicolano [h] Waray [i] Ilonggo [j] Cebuano

[k] Aeta [l] Igorot [m] Badjaw [n] Muslim [o] Maranaw

[p] Mangyan [q] Others (specify): _____

12. Membership in community organization

Q12. Are you a member of any community organization? (Kayo po ba ay miyembro ng inyong lokal na organisasyon?)

[a] Yes [b] No

Q13. What is the name of your organization (Ano po ang pangalan ng inyong organisasyon?): _____

Q14. What is your position or function? (Ano po ang inyong posisyon o katungkulan?): _____

B. PERCEPTION ABOUT THE PROJECT:

1. Experience on flood disasters

Q15. Have you ever experienced property damages due to flood (Nakaranas na po ba kayo ng mga pinsala sa kagamitan dulot ng baha)?

[a] Yes [b] No

Q16. If Yes, what is the cause of flooding (Kung oo, ano ang sanhi ng pagbabaha)?

[a] Overflow of the Marikina River main stream (Pag-apaw ng tubig ng Ilog)

[b] Overflow of the creek (tributary of the Marikina River) (Pag-apaw ng tubig mula sa mga sapa)

[c] Water stagnation due to in adequate drainage system (Hindi dumadaloy na tubig dahil sa kulang na pasilidad)

[d] Other (pls. specify) _____

Q17. How frequent are you suffering from flood disaster on average (Sa inyong tantya, gaano kayo kadalas nakakaranas ng pagbaha)? _____

[a] Several times or more every year (Madalas at sobra pa bawat taon)

[b] Once or twice per year (isa o dalawang beses kada taon)

[c] Once per several years (isang beses sa ilang taon)

[d] Rarely (bibihira)

[e] None, so far (wala)

Q18. How did you respond to the flooding issue (Paano po kayo nag-riposte sa pagbabaha)?

[a] Raised the necessity of launching measure to GOs/LGUs

[b] Moved (Resettled) to safer place

[c] Pay attention to get warning message provided by PAGASA or others for early evacuation

[d] Usually do nothing special so far

[e] Not applicable (not within the flood prone area)

2. **Q19.** Are you aware of the proposed Pasig Marikina River Channel Improvement Project (PMRCIP) (May alam po ba kayo tungkol sa PMRCIP)?

[a] Yes [b] Slightly Aware [c] No

3. **Q20.** If Yes or Slightly Aware, how did you know about the project? (CHECK AS MANY RESPONSES GIVEN) (kung OO, paano o saan po ninyo ito nalaman?)

[a] Government/Barangay Officials

[b] Neighbors/Relatives

[c] DOTC Officials

[d] Radio/TV/Newspapers

[e] Barangay meetings/consultation

[f] Surveys and research

[g] Bulletin Boards/Poster/Flyers

[h] Others _____

4. In your opinion, what are the possible effects of the proposed PMRCIP?

(PROBE TO GET AS MANY RESPONSES AS POSSIBLE)

(sa inyong pananaw, anu-ano ang mga maaaring maidulot ng proyektong PMRCIP?)

Q20.1 Positive:

- [a] Creation of jobs and livelihood opportunities(such as? _____)
- [b] Progress in the city
- [c] Opportunities for local vendors and businesses
- [d] Less flooding in our area
- [e] Cleaner surroundings
- [f] Improved river water quality
- [g] Better aesthetics around the river
- [h] I don't know
- [i] Others _____

Q20.2 Negative:

- [a] Loss of property
- [b] Air pollution
- [c] Water pollution
- [d] Loss of plants, natural habitats
- [e] Increase in traffic congestion
- [f] Loss of jobs or livelihood
- [g] Noise pollution
- [h] I don't know
- [i] Others _____

6. **Q21.** In your opinion, how can PMRCIP help the barangay/ city and its residents (Sa inyong pananaw, sa paanong paraan maaaring makatulong ang PMRCIP sa pamayanan ng barangay/ siudad at mga residente)?

7. **Q22.** Do you generally support the proposed PMRCIP? (Sa pangkalahatan, sumusuporta ka ba sa PMRCIP?)

- [a] Yes [b] No [c] Neutral

Q22.1 If Yes, why do you say so? (kung OO, paano mo ito nasabi?)

[a] It would resolve flooding issues along the river. (Mawawala na ang pagbaha sa tabi ng ilog)

[b]It would improve civil facilities (roads, walkways) along the river. (Gaganda ang mga pampubliko pasilidad sa tabi ng ilog)

[c] It would encourage business and jobs in the area. (Dadami ang negosyo at trabaho sa lugar)

[d] Pollution will be reduced in the river. (Mababawasan ang polusyon at dumi sa ilog)

[e] others, please specify (Iba pa) _____

Q22.2 If No, what is the reason (Kung HINDI, ano ang dahilan)?

[a] It would cause loss of property of PAPs (magdudulot ng kawalan ng mga ari-arian ng mga PAPs)

[b] It would cause loss of jobs / livelihood problem to PAPs (magdudulot ng kawalan ng trabaho at kabuhayan)

[c] It would cause environmental problem such as pollution, loss of vegetation, traffic congestion, etc. (magdudulot ng problema sa kapaligiran lalong lalo na sa polusyon, pagkatanggal ng mga halaman, paglala ng trapiko atbp.)

[d] I do not agree with this Project, or construction of flood control structure to mitigate flooding

[e] Other (pls. specify) _____

Q22.3 If No, what measures would be necessary to make the Project acceptable for you? (Kung HINDI, ano sa inyong palagay ang mga maaaring gawin upang ang proyekto ay maging mas katanggap-tanggap?)

8. **Q23** Do you and your family depend on the Marikina River as a source of livelihood support (Naka depende ba kayo ng pamilya mo sa mga serbisyong naibigay ng Ilog na pinanggagalingan ng pangkabuhayan)?

[a] Yes [b] No

Q23.1 If Yes, what exactly do you (your family) depend on the Marikina River (Kung OO, sa anong aspeto kayo nakadepende sa Ilog ng Marikina)?

[a] Taking water from the river for garden/irrigation (pandilig ng mga halaman)

[b] Taking water from the river for washing clothes, cars, etc. (panlaba at panlinis ng sasakyan)

[c] Bathing in the river (paliguan)

[d] Using river as playground

[e] Fishing (using net or fishing rod, etc.)

[f] Transportation

[g] Recreational Activities

[h] Traditional/religious ceremony in the river

[i] Other special use (pls. specify) _____

9. Experience with environmental problems within the community (Mga nararanasang problema sa kapaligiran sa loob ng pamayanan)
- Q24** How / where do you (and your family) dispose of your solid wastes/garbage (Paano at saan nyo itinatapon ang inyong mga basura)?
- [a] Utilizing solid waste collection and disposal system provided by LGUs (Gamit ang serbisyo ng lokal na gobyerno na nangongolekta ng basura)
- [b] Direct dumping into the river (Itinatapon sa ilog)
- [c] Direct dumping into the nearby open space (itinatambak sa bakanteng lote)
- [d] Other (pls. specify) _____
- Q24.1** How / where do you (and your family) discharge your waste water or effluents (Paano at saan ninyo itinatapon ang mga madumi at gamit na tubig)?
- [a] Utilizing STP system provided by MWCI (Manila Water Company Inc.)
- [b] Septic tank
- [c] Direct discharging into the river (Marikina River / creek) through drain
- [d] Other (pls. specify) _____
10. **Q25** Do you have the following social issue(s) in your community/barangay (Ang mga sumusunod na panlipunang problema ba ay nararanasan sa inyong komunidad/barangay)?
- [a] Agitation / disturbance by radical/critical sided political group
- [b] Gender issues such as discrimination against women, non- equal work opportunities,
- [c] Abuse of children such as child labor, child prostitution, abandonment (physical/mental),
- [d] Issues on Sexually transmitted diseases (HIV, AIDS), including presence/reports of STD in your community/barangay, discrimination against the people w/ HIV/AIDS.
- [d] Other (pls. specify) _____

Thank you very much for your attention.

ANNEX-5: Record of Public Consultation Meeting (PCM)

5-1 Tarpaulin (Poster) of PCM

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
Unified Project Management Office
Flood Control Management Cluster

JICA **CTI** **WCI**

Japan International Cooperation Agency

Pasig Marikina River Channel Improvement Project (Phase IV)

Public Consultation Meeting

June 2015

Pasig City: Brgy. Rosario, Manggahan, Santolan
Quezon City: Brgy. Ugong Norte, Bagumbayan, Libis, Blue Ridge B.
Marikina City (Left Bank of Marikina River): Brgy. Industrial Valley, Barangka, Taftong, Jesus De La Peña
Marikina City (Right Bank of Marikina River): Brgy. Kalumpang, San Roque, Santa Elena, Santo Niño

Perennial flood risks along Marikina River (photo taken in Sept. 2014 during T/S Mario)

Lay-out Plan of PMRCIP Phase IV with the Major Structures and Facilities of the area

Pasig River (Makati City side) before and after implementation of PMRCIP Phase II

Initial presentation of the Project Design in Marikina City Hall last January 2015

Initial presentation of the Project Design in Pasig City Hall last January 2015

Initial presentation of the Project Design in Quezon City Hall last Feb 2015

5-2 Program

Time	Program
10 minutes	1. National Anthem and Prayer
5 minutes	2. Welcome Address (by Concerned LGU)
30 minutes	3. Presentation 1: Project Description (by DPWH-UPMO-FCMC)
30 minutes	4. Presentation 2: Environmental and Social Considerations (by DPWH-ESSD)
45 minutes	5. Open Forum
5 minutes	6. Closing Remarks

5-2 Brochure of PMRCIP, Phase IV

(1) English Version

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

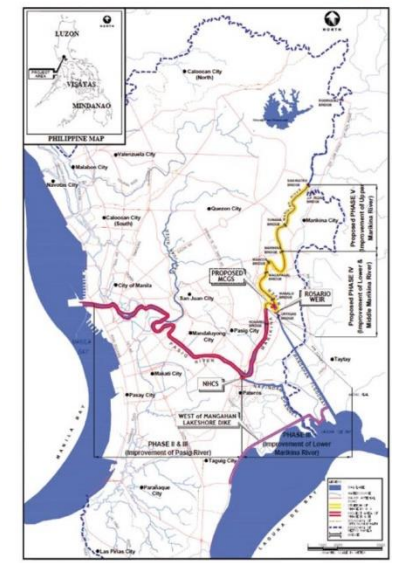
The project will implement the environmental management plan (EMP) for the potential negative impacts as listed below:

Category	Environmental Component	Environmental Management Measures (Major Examples)	
Physico-chemical Environment (Pollution)	Air Pollution	Watering at dusty area in the project area during dry season.	
	Water Pollution	Waste water shall be properly treated and disposed.	
	Solid Wastes	Solid wastes shall be properly segregated and disposed.	
	Soil Contamination	Additional sediment quality test shall be conducted in Detailed Design stage.	
	Noise and Vibration	Appropriate maintenance of construction equipment.	
	Offensive Odor	Dissemination of implementation schedule of dredging to local community.	
	Riverbed Sediment	Additional sediment quality test shall be conducted in Detailed Design stage.	
	Natural Environment	Terrestrial Flora and Fauna	Inventory of cut trees and replanting for compensation.
		Socio-economic Environment	An appropriate Resettlement Action Plan (RAP) shall be prepared, and adequate public consultation shall be done.
	Socio-economic Environment	Involuntary Resettlement	Provision of livelihood restoration measures and regular monitoring of the relocatees at resettlement site.
Poverty Group		Provision of livelihood restoration measures and regular monitoring of the relocatees at resettlement site.	
Local Economy (Employment and Livelihood)		Provision of livelihood restoration measures and regular monitoring of the relocatees at resettlement site.	
Land Use and Utilization of Local Resources		Provision of appropriate compensation and entitlements depending on eligibility.	
Water Use and River Dependency		Appropriate consultation and coordination shall be made with affected people to minimize the impact.	
Social Infrastructures and Services		Appropriate coordination and adjustment of construction method to minimize the impact.	
Misdistribution of Benefits and Damage		Offset income loss with appropriate monetary compensation and livelihood recovery.	
Local Conflicts of Interest		Provision of appropriate compensation and entitlements depending on eligibility.	
Gender / Socially Vulnerable Groups		Offer mental health and psychosocial support services.	
Rights of Children		Ensure presence of functional basic utilities and facilities such as schools and clinics at resettlement site.	
Labor Environment		Preparation of Health and Safety Plan based on DOLE DO 13.	



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PROJECT NAME

Pasig-Marikina River Channel Improvement Project (PMRCIP), Phase IV

PROJECT LOCATION

River stretch of the Marikina River from the upstream point of Rosario Bridge to Marikina Bridge with a length of 8.0 km, bound by the administrative areas of Pasig City, Marikina City, and Quezon City

PROJECT DESCRIPTION

The Pasig-Marikina River, which is the main natural drainage way of the National Capital Region with a total catchment area of 635 km², runs through the center of Metro Manila and empties into the Manila Bay. It contributes largely to the flooding in the Metropolis brought about by riverbank overflow of floodwaters, thereby, hampering its socio economic development.

To cope with such flooding problems, the DPWH formulated a master plan for flood control and drainage improvement in Metro Manila including a Feasibility Study for the Pasig-Marikina River called "The Study on Flood Control and Drainage Project in Metro Manila" which was carried out in 1988-1990 with technical assistance from the Japan International Cooperation Agency (JICA).

The Pasig-Marikina River Channel Improvement Project (PMRCIP) is divided into four (4) phases:

- Phase I** - covered the detailed engineering design stage of the whole PMRCIP that started in 2000 completed in 2002, which was financed by the Japan Bank for International Cooperation (JBIC).
- Phase II** - involved the construction and improvement of selected priority critical sections of the Pasig River Channel (from Delpan Bridge to immediate vicinity of the Napindan Hydraulic Control Structure-NHCS), which was financed by Japan International Cooperation Agency (JICA). Construction works started in July 2009 and completed in May 2013.
- Phase III** - covers improvement works along the Lower Marikina River (from Napindan Channel to the upstream point of Rosario Bridge). The remaining sections under the PMRCIP (Phase II), which were not part of the original scope, was also included under this phase. The construction works started in June 2014 with target completion in 2017.
- Phase IV** - involves improvement works along the Middle Marikina River (from the upstream point of Rosario Bridge to Marikina Bridge). The construction of the Marikina Control Gate Structure (MCGS), originally included under the PMRCIP (Phase III), is included under this phase.

PROJECT OBJECTIVE

To mitigate flood damages along the adjacent areas traversed by the Pasig-Marikina River, caused by channel overflow due to its insufficient discharge capacity, by providing appropriate and necessary countermeasures thereby facilitating urban development and enhancing favorable environment of the National Capital Region.

PROJECT WORKS - PHASE IV

Channel improvement for the Middle Marikina River (Phase IV Section) from the upstream point (St. 5+400) of Rosario Bridge to Marikina Bridge with a length of 8.0 km, including the following civil works: Dredging/Excavation (approx. 1.7 million m³), Earth Embankment (approx. 160,000 m³), Steel Sheet Pile (SSP) (10.7 km), Reinforced Concrete (RC) Flood Wall (8.35 km), Construction of Marikina Control Gate Structure (MCGS) (1 site), Expansion of Bridge Span (Manalo Bridge) (1 span), and Drainage Outlet (116 sites).

IMPLEMENTATION SCHEDULE - PHASE IV

Preparation works including detailed design study are scheduled until 2017. Civil works are scheduled to commence in 2018 with target completion in 2022.

LAYOUT PLAN - PHASE IV



ENVIRONMENTAL ASPECT OF THE PROJECT

The PMRCIP, which is categorized as an "infrastructure project," follows the Philippine Environmental Impact Statement System (PEISS). Pursuant to the PEISS, the Environmental Impact Assessment (EIA) Study was conducted in 1998.

Based on the EIA Study, Environmental Impact Statement (EIS) was submitted to the Department of Environment and Natural Resources (DENR) National Capital Region (NCR). The DENR-NCR granted the Environmental Compliance Certificate (No. ECC-98-NCR-301-9807-128-120) to the Project on December 14, 1998. The ECC contains several conditions that must be strictly complied with to secure environmental and social considerations.

An Environmental Team was assigned to ensure that potential environmental impacts to be caused by the implementation of the Project-Phase II and III during construction works are minimized. As such, monitoring of air quality, noise level, water quality, disposal of excavated materials, aquatic biota, etc. are being implemented in the entire stages of the Project.

A Multipartite Monitoring Team (MMT), composed of representatives from the concerned stakeholders, was established for inspection of the project's environmental management and monitoring activities.

POTENTIAL IMPACTS OF THE PROJECT-PHASE IV

The Project is expected to alleviate the flood risks along the Pasig-Marikina River and contribute to sustainable urban economic development of the National Capital Region. However, it will, at the same time, bring about some potential negative impacts as listed below:

Category	Environmental Potential Negative Impact Component (Major Examples)		
Physico-chemical Environment (Pollution)	Air Pollution	Dust and emission gas due to construction works.	
	Water Pollution	Increase of turbidity in river water quality due to dredging operation.	
	Solid Wastes	Generation of construction wastes.	
	Soil Contamination	Possibility to induce soil contamination due to dredging operation.	
	Noise and Vibration	Generation of noise and vibration from construction works.	
	Offensive Odor	Generation of offensive odor during dredging operation.	
	Riverbed Sediment	Possibility to induce contamination of riverbed sediment.	
	Natural Environment	Terrestrial Flora and Fauna	Vegetation clearing and disturbance of habitats of wildlife.
	Socio-economic Environment	Involuntary Resettlement	Generation of involuntary resettlement due to land acquisition for the project.
		Poverty Group	Potential adverse effect on poverty group along with resettlement.
Local Economy (Employment and Livelihood)		Potential adverse effect on local economy along with resettlement.	
Land Use and Utilization of Local Resources		Necessity of land acquisition for flood control structures of the project.	
Water Use and River Dependency		Constraint to accessibility to river water use of local community.	
Social Infrastructures and Services		Constraint to accessibility to social infrastructures due to construction works.	
Misdistribution of Benefits and Damage		There will be benefit/odverse impact of the project depending on impact recipient.	
Local Conflicts of Interest		Conflicts might occur during resettlement/compensation for land acquisition.	
Socio-economic Environment	Gender / Socially Vulnerable Groups	Potential adverse effect along with resettlement.	
	Rights of Children	Potential adverse effect along with resettlement.	
	Labor Environment	Possibility of accidents during construction works.	

(2) Tagalog Version

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Ang Proyekto ay ipapatupad ang environmental management plan (EMP) para sa mga potensyal na mga negatibong epekto na nakalista sa ibaba.

Kategorya	Pangkapoligirang Bahagi	Mga Panukala sa Pamamahala ng Kapaligiran (Pangunahing Halimbawa)
Pisikal at Kimikal na Kapaligiran (Polusyon)	Polusyon sa Hangin	Pagbibigay sa mga makababaw na lugar sa panahon ng taglayo
	Polusyon sa Tubig	Maayos na itatapon ang maduming tubig
	Basura	Maayos na paghahwa-hiwalayin at itatapon ang mga basura
	Kontaminasyon sa Lupa	Karagdagang test para sa kalidad ng lupa ang dapat sagawa sa panahon ng pag-aaral sa detalyadong disenyo
	Ingay at pagyenyeng	Wastong pagpapatali ng mga kagamitang pangkonstruksiyon
	Mabahong amoy	Diinmanipon ng pagpapatali sa lokal na komunidad
	Lupa sa lalim ng ilog	Karagdagang test para sa kalidad ng lupa ang dapat sagawa sa panahon ng pag-aaral sa detalyadong disenyo
Likas na Kapaligiran	Panglupang hayop at halaman	Imbestiyon ng mga napatungul pumot at ang pagpapatali ng mga lokal na hayop
Panglupang Ekonomiya ng Kapaligiran	Di pagkasunod ng pagpapatali (RAT) ay dapat handa at magpapalaganap ang mga pangpublikong konsultasyon	
	Grupo ng Maralita	Pagpapatali ng mga panukala sa pagpapatali ng kabuhatian at regular na pagbabayad sa mga re-allocates sa resettlement site
	Lokal na Ekonomiya (Trabaho at Kabuhatian)	Pagpapatali ng mga panukala sa pagpapatali ng kabuhatian at regular na pagbabayad sa mga re-allocates sa resettlement site
	Paggamit ng lupa at lokal na yaman	Pagpapatali ng mga panukala sa pagpapatali ng kabuhatian at regular na pagbabayad sa mga re-allocates sa resettlement site
	Paggamit ng tubig at pagpapende sa ilog	Nararapat na konsultasyon at koordinasyon ay dapat gawin sa mga apertadong tao upang mabawasan ang mga epekto
	Panglupang serbiyo at imprastruktura	Nararapat na konsultasyon at pag-aaral ng parang ng konstruksiyon upang mabawasan ang mga epekto
	Maling pamamahagi ng benepisyo at danyos	Palikan ang pagkawala ng kita nang naaangkop na kabuhatian at pagpapatali ng kabuhatian
	Kasarian / mahihirang grupo ng lipin	Pagpapatali ng mga panukala sa pagpapatali ng kabuhatian at regular na pagbabayad sa mga re-allocates sa resettlement site
	Karapatan ng mga kabatahan	Pagpapatali ng mga panukala sa pagpapatali ng kabuhatian at regular na pagbabayad sa mga re-allocates sa resettlement site
	Lugar ng pinagtatrabahuan	Pagpapatali ng mga panukala sa pagpapatali ng kabuhatian at regular na pagbabayad sa mga re-allocates sa resettlement site



PARA SA KARAGDAGANG INFORMASYON MAARING TUMAWAG SA MGA SUMUNOD

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DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
JAPAN INTERNATIONAL COOPERATION AGENCY
JICA



PANGALAN NG PROYECTO

Pasig-Marikina River Channel Improvement Project (PMRCIP), Phase IV

LOKASYON NG PROYECTO

Kahabaan ng Ilog Marikina mula sa itaas na bahagi ng Tulay ng Rosario hanggang sa Tulay ng Marikina na may habang 8.0 km na sumasaklaw sa mga lugar ng Pasig City, Marikina City, and Quezon City.

ANG PROYECTO

Ang Ilog ng Pasig-Marikina ay may kabuuang sukat na 635 km². Ito ang pangunahing likas na daluyan ng tubig na nagmumula sa kabundukan ng Sierra Madre at karatig na lugar. Ang mga nasabing ilog ay dumadagdag at nagkasama sa gitna ng Metro-Manila at natatapos sa Manila Bay na nagdadulot din ng pagbaha sa kalakhang Metro-Manila sa hindi nakasama sa nagdadulot ng tubig baha na nakakalakip sa paglulitad ng ekonomiya sa nasabing rehiyon.

Dahil sa nasabing suliranin sa pagbaha, ang Kagawaran ng Pangpublikong Gawain at Lainsang ng Department of Public Works and Highways (DPWH) ay naglalathala ng masusang pagpapatali at pag-aaral sa mga nasabing ilog upang malisan o mabawasan ang pagbaha kasama na ang pagsasagawa o pagpapatali ng mga daluyan ng tubig (mas kilala sa tawag na "Drainage") sa kalakhang Metro-Manila. Ang pagpapatali o pag-aaral na ito ay tinawag na "The Study on Flood Control and Drainage Project in Metro-Manila" na nagmula noong 1988 at natapos noong 1990 sa tulong teknikal ng Japan International Cooperation Agency (JICA).

Pagkatapos ng nasabing pag-aaral, nagkaroon ng modipikasyon sa pagbuo ng proyekto na tinawag na "Pasig-Marikina River Channel Improvement Project" o PMRCIP at ito ay hinati sa apat na bahagi (phase):

Unang Bahagi (Phase I) – Ang PMRCIP (Phase I) ay patungkol sa pag-aaral ng Detalyadong Disenyong Teknikal (Detailed Engineering Design) ng kabuuang proyekto na nagmula noong 2000 at natapos noong 2002 sa tulong pinansyal ng Japan Bank for International Cooperation (JBIC).

Pangalawang Bahagi (Phase II) – Ang PMRCIP (Phase II) ay patungkol sa unang yugto ng aktwal na pagsasagawa o pagsasakatuparan ng Proyekto. Ang bahaging ito ay binubuo ng pagsasagawa/pagpapatali sa Mabahang Ilog ng Marikina (magmula sa pinagsangahan ng Napindan Channel hanggang 5.4 km paitaas ng ilog). Ang mga natirang bahagi o seksyon ng Ilog Pasig na hindi nakasama sa pagsasagawa/pagpapatali ng PMRCIP (Phase II) ay minungkahing makasama rin sa PMRCIP (Phase III). Ang pagsasakatuparan ng bahaging ito ay nagmula noong Hunyo 2014 at inaasahang matatapos ng taong 2017.

Pangatlong Bahagi (Phase III) – Ang PMRCIP (Phase III) ay patungkol sa ikalawang yugto ng aktwal na pagsasagawa o pagsasakatuparan ng Proyekto. Ang bahaging ito ay binubuo ng pagsasagawa/pagpapatali sa Mabahang Ilog ng Marikina (magmula sa pinagsangahan ng Napindan Channel hanggang 5.4 km paitaas ng ilog). Ang mga natirang bahagi o seksyon ng Ilog Pasig na hindi nakasama sa pagsasagawa/pagpapatali ng PMRCIP (Phase II) ay minungkahing makasama rin sa PMRCIP (Phase III). Ang pagsasakatuparan ng bahaging ito ay nagmula noong Hunyo 2014 at inaasahang matatapos ng taong 2017.

Pang-apat na Bahagi (Phase IV) – Ang PMRCIP (Phase IV) ay patungkol sa ikatlong yugto ng aktwal na pagsasagawa o pagsasakatuparan ng Proyekto. Ang bahaging ito ay binubuo ng pagsasagawa/pagpapatali sa Gitnang Ilog ng Marikina (Middle Marikina River) (magmula sa itaas ng Rosario Bridge hanggang sa Tulay ng Marikina). Ang pagsasagawa o pagsasakatuparan ng Marikina Control Gate Structure (MCGS) na orihinal na kasama sa PMRCIP (Phase III) ay minungkahing makasama rin sa bahaging ito ng Proyekto.

LAYUNIN NG PROYECTO

Ang nasabing Proyekto ay naglalayong malisan o mabawasan ang mga pinsala na dulot ng pagbaha mula sa pag-apaw ng tubig na sa hindi nakatutal ng sapat na kapasidad ng Ilog Pasig at Marikina. Ito ay makakamtam sa pamamagitan ng pagbibigay ng naayon at naaangkop na pamamahala ng makatutal upang magabilis ang pag-unlad ng pamumuhay at mabuti ang kapaligiran sa Pambansang Kabiserang Rehiyon.

SAKLAW NG PROYECTO – PHASE IV

Ang pagsasagawa/pagpapatali ng Gitnang Ilog ng Marikina magmula sa itaas ng Rosario Bridge (SL 5+400) hanggang sa Tulay ng Marikina na may kabuuang haba na 8.0 km ay kinabibilangan ng mga sumusunod na sili na mga gawain: Dredging/Excavation (approx. 1.7 million m³), Earth Embankment (approx. 160,000 m³), Steel Sheet Pile or SSP (10.7 km), Reinforced Concrete or RC Flood Wall (8.35 km), Konstruksiyon ng Marikina Control Gate Structure or MCGS (1 site), Expansion of Bridge Span ng Tulay ng Marikina (1 span), Drainage Outlet (116 sites).

PAGPAPATUPAD NG ISKEDYUL - PHASE IV

Ang paghahandang gawain kasama ang pag-aaral ng detalyadong disenyong teknikal ay nakatatalaga matapos hanggang taong 2017. Ang gawain sili ay nakatatalaga magmula ng taong 2018 at inaasahang matatapos sa taong 2022.

PLANO NG PROYECTO - PHASE IV



PANGKAPALIGIRANG ASPETO NG PROYECTO

Ang Pasig-Marikina River Channel Improvement Project (PMRCIP) ay isang uri ng "infrastructure project" na kinakailangang sumunod sa Philippine Environmental Impact Statement System (PEISS). Dahil sa sistemang ito, isang pag-aaral (o EIA Study) ang kinakailangan noong taong 1998 na tumatalakay sa maging epekto ng Proyekto sa kapaligiran.

Batay sa EIA Study, pinasa ang Environmental Impact Statement (EIS) sa Kagawaran ng Kapaligiran at Likas na Kayamanan o mas kilala sa tawag na DENR. Matapos ang pagpasiyasa sa dokumento ng Kagawaran para sa kalakhang Maynila (DENR-NCR), pinagkaloob ang Environmental Compliance Certificate (No. ECC-98-NCR-301-9807-128-120) sa Proyekto noong Disyembre 14, 1998. Ang ECC ay naglalaman ng mga kondisyon na kailangang sundin para sa pagsasalang-alang sa kapakanan ng kapaligiran at panglupunan.

Ang Environmental Team ay naatasan upang siguraduhin na ang mga posibleng negatibong epekto sa kapaligiran na sa hindi ng konstruksiyon ay mababawasan. Ang Team ay magasagawa ng monitoring ng kalidad ng hangin, antas ng ingay, kalidad ng tubig, aquatic biota (seda, halaman, suse at iba pa) at ang parang ng pagtatapon ng basura mula sa konstruksiyon sa kabuuang yugto ng Proyekto. Ang Multipartite Monitoring Team (MMT) na kinabibilangan ng mga kinatawan mula sa mga nasasakopang mahaing lokal, ahensya ng pamahalaan at di-pridong organisasyon ay itatag para magasagawa ng inspeksyon sa pagiging pamamahala ng kapaligiran at mga gawain ng pamamahala ng Proyekto.

MGA POSIBLENG NEGATIBONG EPEKTO NG PROYECTO

Ang Proyekting Ito ay inaasahang makakabawas sa panganib ng pagbaha sa kahabaan ng Ilog Pasig at Marikina at makakaabang sa pagpapatali ng ekonomiya sa Pambansang Kabiserang Rehiyon. Ito ay magdadulot din ng mga posibleng negatibong epekto na nakalista sa ibaba:

Kategorya	Pangkapoligirang Bahagi	Posibleng Negatibong Epekto (Pangunahing Halimbawa)
Pisikal at Kimikal na Kapaligiran (Polusyon)	Polusyon sa Hangin	Akikabok at uap mula sa konstruksiyon
	Polusyon sa tubig	Pagbibigay ng tubig sa paghuhukay sa ilog
	Basura	Basura mula sa gawain ng konstruksiyon
	Kontaminasyon sa Lupa	Posibilidad na magdulot ng kontaminasyon sa lupa sa paghuhukay ng ilog
	Ingay at pagyenyeng	Ingay at pagyenyeng mula sa gawain ng konstruksiyon
	Mabahong amoy	Mabahong amoy habang sinusagawa ang paghuhukay sa ilog
	Lupa sa lalim ng ilog	Posibilidad na magdulot ng kontaminasyon sa lupa sa lalim ng ilog
Likas na Kapaligiran	Panglupang hayop at halaman	Panglupang hayop at pagpapatali sa halaman ng mga hayop
Panglupang Ekonomiya ng Kapaligiran	Di pagkasunod ng pagpapatali	Pagkaroon ng di pagkasunod ng pagpapatali ng pagkaha sa lupa na kinakailangan ng Proyekto
	Grupo ng Maralita	Posibleng negatibong epekto sa grupo ng maralita na may kinilalan sa pagpapatali
	Lokal na Ekonomiya (Trabaho at Kabuhatian)	Posibleng negatibong epekto sa lokal na ekonomiya na may kinilalan sa pagpapatali
	Paggamit ng lupa at lokal na yaman	Pangangailangan sa pagkaha ng lupa para sa istrukturang pangkontrol ng baha
	Paggamit ng tubig at pagpapende sa ilog	Pagimbita sa paggamit ng lokal na komunidad ng tubig sa ilog
	Panglupang serbiyo at imprastruktura	Pagimbita sa paggamit ng mga panglupang imprastruktura sa hindi konstruksiyon
	Maling pamamahagi ng benepisyo at danyos	Magkaroon ng benepisyo o negatibong epekto ang proyekto depende sa maipetuhang mga ito
	Di pinagkasunod ang achian na panglokal	Ang di pinagkasunod ay maaring mangyari habang sinusagawa ang pagpapatali o pagbabayad para sa paghuhukay ng lupa
	Kasarian / mahihirang grupo ng lipin	Posibleng negatibong epekto na may kinilalan sa pagpapatali
	Karapatan ng mga kabatahan	Posibleng negatibong epekto na may kinilalan sa pagpapatali
	Lugar ng pinagtatrabahuan	Posibleng aksidente habang sinusagawa ang konstruksiyon

5-3 Presentation materials

(1) Project Description


2015/6/10

Pasig-Marikina River Channel Improvement Project (PMRCIP) Phase IV

Presentation on Project Background and Facility Plan


June 01, 2015

Barangay Jesus Dela Peña Multipurpose Hall
Marikina City


 Republic of the Philippines
 DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

1

PMRCIP Location Map and Project Phases



- (1) **Phase I:** Detailed Design from Delpan Bridge to Marikina Bridge completed in July 2002
- (2) **Phase II:** River Channel Improvement Works from Delpan Bridge to Napindan Channel completed in May 2013
- (3) **Phase III:** River Channel Improvement Works from Napindan Channel to downstream of proposed Marikina Control Gate Structure (MCGS) from 2014 to 2017

River Channel Improvement Works for remaining weak/damaged sections from Delpan Bridge to Napindan Channel from 2014 to 2017

- (4) **Phase IV:** River Channel Improvement Works from downstream of proposed MCGS to Marikina Bridge including construction of MCGS

2

PMRCIP Phase II (Manila City)



Before



After

3

PMRCIP Phase II (Makati City)



Before



After

4

PMRCIP Phase II (Mandaluyong City)



Before



After

5

PMRCIP Phase III




On-going construction of parapet wall

6

PMRCIP Phase III

Riprap activities in progress

On-going dredging works

7

Destructive Typhoons/Storms to Hit NCR (2009-2013)

Year	Disaster	Date	Casualties (Dead)	No. of Affected Persons	No. of Damaged Houses	Cost of Damages (PHP)
2009	T. Felix	Jun. 25 - 26	17	150,401	1,340	222,075
	T/S Isang	Jul. 14 - 18	5	249,037	5	38,531
	T. Rika	Aug. 7	27	122,056	443	873,447
	T/S Ondoy	Sep. 24 - 27	464	4,901,254	30,062	10,952,198
	T. Pepeng	Sep. 30 - Oct. 10	465	4,476,264	6,253	27,296,722
2010	T. Santol	Oct. 26 - Nov. 1	34	302,155	4,104	754,997
	T. Basyang	Jul. 12 - 15	102	985,383	73,286	377,976
	T/S Estar	Aug. 7 - 9	2	1046	-	-
	T. Juan	Oct. 16 - 21	31	2,008,664	30,048	12,013,990
	T/D Egay	Jun. 14 - 20	2	37,857	6	0
2011	T/S Falcon	Jun. 21 - 25	12	1,792,376	165	849,852
	T/S Jaaming	Jul. 25 - 28	77	1,285,906	11,196	4,441,798
	T/S Kobayon	Jul. 26 - Aug. 5	6	93,888	11	2,900
	T. Mira	Aug. 21 - 29	36	411,468	150	2,983,349
	T. Poding	Sep. 24 - 26	85	3,105,355	7,491	15,553,587
2012	T/D Genar	Jul. 29 - 31	54	949,666	1,424	738,331
	T/D Karim	Sep. 15 - 16	1	15,033	0	25
2013	T/S Marikina	Aug. 17 - 21	32	3,110,218	654	1,394,650

Source: National Disaster Risk Reduction and Management Council
 T = Typhoon, TS = Tropical Storm, TD = Tropical Depression

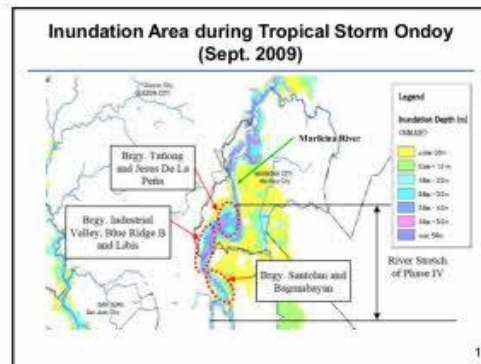
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Impact of Tropical Storm Ondoy in Marikina City (September 2009)

Rescuers from the Philippine Navy carry a victim in Marikina City the day after T/S Ondoy.

A man takes a break from cleaning a house swamped by flash floods in Marikina City two days after T/S Ondoy.

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Impact of Tropical Storm Mario in Marikina City (September 2014)

Rescuers use a rubber boat to rescue trapped residents after continues heavy monsoon rains spanned by Tropical Storm Mario flooded Marikina City.

Flood victims wade to a rescue boat as they wade chest deep, through a flooded road in Marikina City.

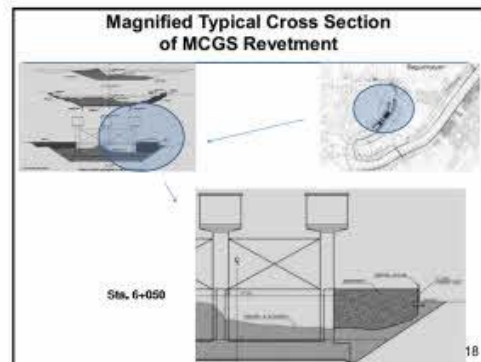
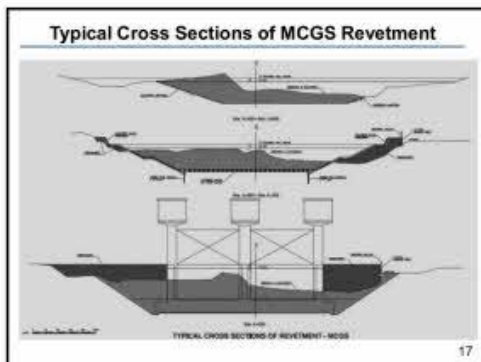
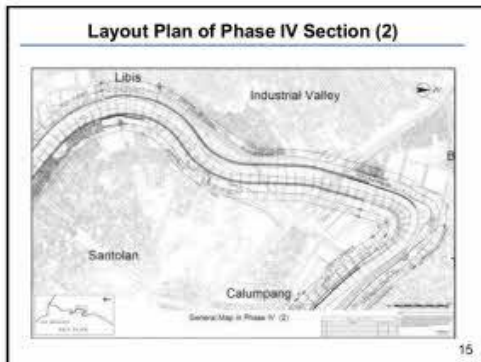
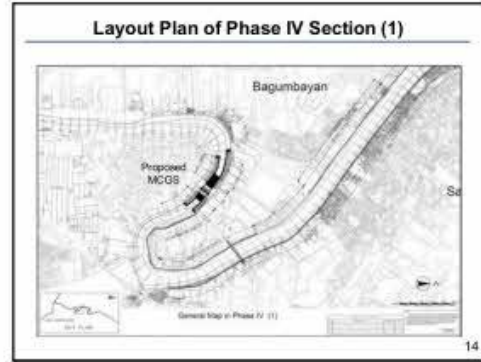
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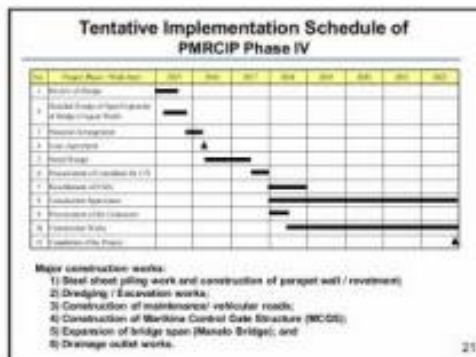
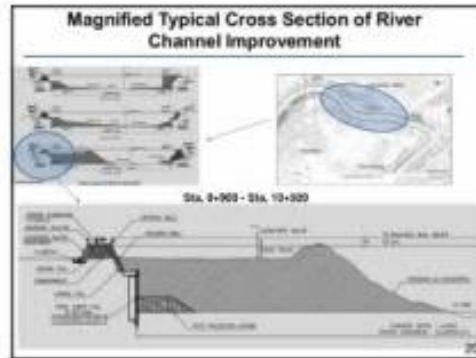
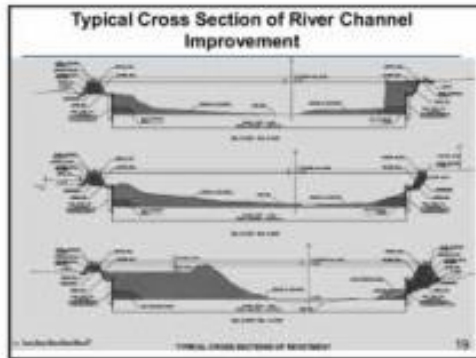
Implementation Phases of PMRCIP

Phase	Works	Length to be Improved (Design Discharge)	Current Status
I	Detailed Design Study	The whole river sections from Phase I to V	Completed (2001 - 2002)
II	Roady River Channel Improvement (1) (Dipang Bridge to Napandan Channel)	13.1 km on both banks (1,200,000 m ³)	Completed (2009 - 2013)
III	Lower Marikina River Channel Improvement (Napandan Channel to downstream of MCCG)	5.4 km channel length (260 m ³)	Ongoing (2014 - 2017)
	Remaining weak/damaged sections between Dipang Bridge and Napandan Channel	8.9 km on both banks (1,300,000 m ³)	Ongoing (2014 - 2017)
IV	Lower/Middle Marikina River & MCCG (Lower Marikina R. (Sta. 4+00) to Marikina Bridge)	8.2 km channel length (2,500 m ³)	Review Study (2014 - 2016)
V	Upper Marikina River (Marikina Bridge to San Mateo Bridge)	8.8 km channel length (2,300 m ³)	Detailed Design Study (2015)

Design Flood Discharge Distribution (30-Year Return Period)

12





Thank you very much for your attention.

22

(2) Environmental and Social Considerations

Pasig-Marikina River Channel Improvement Project (PMRCIP) Phase IV

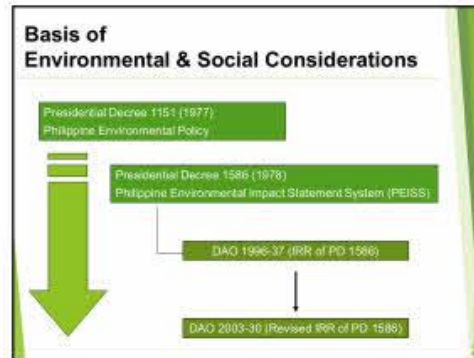
Public Consultation Meeting

Environmental and Social Considerations

June 01, 2015

Barangay Jesus de la Peña, Marikina City

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)



Basis of Environmental & Social Considerations

- **Environmental Impact Assessment (EIA) Pursuant to PD 1586**
 - EIA Study in the form of an EIS (Environmental Impact Statement) submitted to DENR-EMB-NCR in June 1998.
- **ECC (Environmental Compliance Certificate)**
 - ECC of PMRCIP was issued by DENR-EMB-NCR in Dec. 1998.
 - ECC remains valid and active since the Project is continuously being implemented and the baseline conditions have not significantly changed.
- **PMRCIP Phase II & III Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP)**
 - PMRCIP Phase II: implemented from 2009 to 2013.
 - PMRCIP Phase III: being implemented since 2014.

Basis of Environmental & Social Considerations

- ◆ PMRCIP Phase IV is a JICA funded project
- ◆ JICA's Guidelines on Environmental and Social Considerations
 - 1) Coverage:
 - a) **Physicochemical environment (pollution):** air quality, noise, water quality, wastes, land subsidence, offensive odor, etc.
 - b) **Natural environment:** meteorology and climate, pedology, topography, geology, hydrology, flora and fauna, protected area, etc.
 - c) **Socio-economic environment:** land use, livelihood conditions, water use, historical heritage, religion, public health, gender, vulnerable people, ethnic minority and indigenous people, etc.
 - 2) **Accountability and Public participation**
JICA ensures accountability when implementing projects and asks stakeholders for their participation.

PMRCIP Phase IV Affected Areas

- **Pasig City:**
 1. Rosario
 2. Manggahan
 3. Santolan
- **Quezon City:**
 1. Ugong Norte
 2. Bagumbayan
 3. Lilibis
 4. Blue Ridge B.
- **Marikina City:**
 1. Industrial Valley
 2. Barangka
 3. Tañong
 4. Jesus De La Peña
 5. Kalumpang
 6. San Roque
 7. Santa Elena
 8. Santo Niño

Physicochemical Environment Field Survey

Air quality and noise: 3 locations.
Water quality: 3 locations.
Sediment quality: 9 locations.

Natural Environment Field Survey

Flora sampling: 2 locations,
Fauna line transect: 2 transects,
Fauna sweep net sampling: 1 location,
Fauna light trap sampling: 1 location,
Aquatic biota sampling: 1 location.

Impact Assessment

Physicochemical Environment (Pollution)

No.	Environmental Components	Potential Negative Impacts (major examples)
1	Air Pollution	Dust and emission gas due to construction works
2	Water Pollution	Increase of turbidity in river water quality due to dredging operation
3	Solid wastes	Generation of construction wastes
4	Soil Contamination	Possibility of soil contamination due to dredging operation
5	Noise and Vibration	Generation of noise and vibration from construction works
6	Lad Subsidence	No possibility of land subsidence
7	Offensive Odor	Generation of offensive odor during dredging operation
8	Riverbed Sediment	Possibility to induce contamination of riverbed sediment

Impact Assessment

Natural Environment

No.	Environmental Components	Potential Negative Impacts (major examples)
1	Pedology, Topography and Geology	Minor changes in pedology, topography or geology
2	Soil Erosion	Minor occurrence of soil erosion
3	Groundwater	Minor change in groundwater level or groundwater flow
4	Hydrological Regime	Change in river hydrology (positive impact)
5	Costal Zone	No potential impact
6	Terrestrial Flora and Fauna	Vegetation clearing and disturbance of habitats of wildlife
7	Aquatic Biota	Minor disturbance of habitat
8	Protected area	No potential impact
9	Meteorology	No potential impact
10	Global warming	No potential impact

Impact Assessment

Socio-economic Environment:

No.	Environmental Components	Potential Negative Impacts (major examples)
1	Involuntary Resettlement	Generation of involuntary resettlement due to land acquisition for the project
2	Poverty Group	Potential adverse effect on poverty group along with resettlement
3	Ethnic group/ Indigenous people	No ethnic group/ indigenous people to be affected
4	Local Economy (Employment and Livelihood)	Potential adverse effect on local economy along with resettlement
5	Land Use and Utilization of Local Resources	Necessity of Land acquisition for flood control structures of the project
6	Water Use and river dependency	Constraint to accessibility to river water use of local community
7	Social infrastructures and Services	Constraint to accessibility to social infrastructures due to construction works
8	Social institutions	No potential negative impact

Impact Assessment

Socio-economic Environment (continued):

No.	Environmental Components	Potential Negative Impacts (major examples)
9	Misdistribution of Benefits and Damage	There will be benefit or adverse impact depending on impact recipient
10	Local conflicts of interest	Conflicts might occur during resettlement/ compensation for land acquisition
11	Cultural Heritage, Religious Sites	No potential negative impact
12	Landscape	No potential negative impact
13	Gender / Socially Vulnerable Groups	Potential adverse effect, along with resettlement
14	Rights of Children	Potential adverse effect, along with resettlement
15	Infectious Diseases such as HIV/AIDS	No potential negative impact
16	Labor environment	Possibility of accidents during construction works

Environmental Management Plan (EMP)

Physicochemical Environment (Pollution)

No.	Environmental Components	Environmental Management Measures (major examples)
1	Air Pollution	Watering at dusty areas in the project area during dry season
2	Water Pollution	Waste water shall be properly treated and disposed
3	Solid wastes	Solid wastes shall be properly segregated and disposed
4	Soil Contamination	Additional sediment quality test shall be conducted in Detailed Design stage
5	Noise and Vibration	Appropriate maintenance of construction equipment
6	Lad Subsidence	N/A
7	Offensive Odor	Dissemination of implementation schedule of dredging operation to the local community
8	Riverbed Sediment	Additional sediment quality test shall be conducted in Detailed Design stage

5-4 Record o PCM

(1) 1st PCM at Barangay Jesus De La Peña, Marikina City

a. Minutes of Meeting

I. Venue : Barangay Jesus Dela Peña Multipurpose Hall, General Malvar St.
Marikina City

II. Date/Time: 01 June 2015 /14:00 – 16:27

III. No. of Participants: 69

Local Participants: 55

LGU Official: 8

Local Community: 47

Proponent Side: 14

DPWH: 4

Consultants: 10

IV. Welcome Remarks: Hon. Manuel E. Sarmiento, Brgy. Capt. of Jesus Dela Peña

Brgy. Capt. Sarmiento gave a warm welcome to the participants of the Public Consultation Meeting, firstly to the organizers and then to the officials of Marikina City Hall and the representatives of Barangays Industrial Valley Complex, Tañong, Barangka, and Jesus Dela Peña. He emphasized the importance of this meeting as it aims to inform the impacts of the Project to the people. He encouraged the participants to take part in the discussions and thanked them for their attendance.

V. Open Forum

Topic No.	Comment/Answer	Name/Position	Remarks
1	Comment/Question	Ma. Corazon P. Lim/ Secretary of Provident Village	Ms. Cora asked the estimated budget of the Project. She also queried how the loan of the Project will be done. She expressed concern since it is the future generation who will be paying for this loan.
	Answer	Proponent	The unofficial estimate is around PHP14 Billion, and may increase or decrease depending upon the results of the detailed design. The loan agreement will be entered between the Philippine Government and JICA and will be finalized early next year based from the tentative schedule.
2	Comment/Question	Ma. Corazon P. Lim/ Secretary Provident	She also asked if the bicycle/jogging lane along Marikina River will be affected by the project.
	Answer	Proponent	The jogging lane along the Marikina River will not be removed totally. There will be some sections though that will be affected.

Topic No.	Comment/ Answer	Name/Position	Remarks
3	Comment/Question	Ma. Corazon P. Lim/ Secretary Provident	She inquired if the water lilies at the Marikina River will be removed during project implementation as these pose as an obstacle to the river flow. (Note: people normally refer to water lily and water hyacinth as one; water lily was the actual term used, this should be water hyacinth instead)
	Answer	Proponent	In case the water lilies will pose as a problem during construction, these will be removed. Water lilies normally live in dirty water not in clean water. They do not survive in salt water too, the reason why there are no water lilies in Manila de Bay. So if the Marikina River will be cleaned up, water lilies will not thrive. It is necessary then that people should also help in cleaning up the river to address the problem with water lilies.
4	Comment/Question	George Milla/ Provident Village Resident	Mr. George inquired if the project construction would be 24/7(continuous for 24 hours in a day and 7 days in a week).
	Answer	Proponent	Construction works will not be entirely 24/7. There will be times when work will still continue beyond the regular working hours as needed.
5	Comment/Question	George Milla/ Provident Village Resident	Regarding the proposed additional vertical wall, he raised the concerned about their assurance of the strength of the heightening of the wall. Based from experience with Typhoon Ondoy, the river dike with a width of 1 meter was destroyed.
	Answer	Proponent	The heightening of the vertical wall will be based on the difference of the height of the existing wall to the height of the designed flood level. For the structural strength, the proposed design is double walling following the required standards.
6	Comment/Question	George Milla/ Provident Village Resident	Security in the area was raised during the construction phase. He inquired if the road to be built can help address the congestion problem in their area.
	Answer	Proponent	Regarding security, there will be a temporary security fence to be placed. For the congestion problem, the road to be built will just be a maintenance road and not meant for vehicular traffic.
7	Comment/Question	Manny Sarmiento /Barangay Captain of J. Dela Peña	He suggested that Contractors should get working permit in their Barangay for the proper identification of workers and for security purposes.

Topic No.	Comment/Answer	Name/Position	Remarks
	Answer	Proponent	The suggestion was considered. Workers will get barangay permit, and workers will have proper uniform to facilitate their identification.
8	Comment/Question	Roche Rigos/ Provident Village Resident	He inquired if there is any improvement or restoration of the Old Wawa Dam.
		Proponent	Wawa Dam is no longer operational. As part of the flood control system, there is a proposed Marikina Dam.
	Comment/Question	Roche Rigos/ Provident Village Resident	He asked the exact location of the Marikina Dam.
	Answer	Proponent	There is no exact location yet for the planned Marikina Dam but it will be somewhere near the current Wawa Dam.
9	Comment/Question	Marie Angelie Tan/ Marikina City Planning Development	She asked if there have been dredging activities being done by the Proponent as she observed some big trucks in the Jogging Lane area. The drivers of those trucks identified DPWH as the Proponent of the project.
	Answer	Proponent	The dredging in that area is not part of PMRCIP Phase IV, it might be from the DPWH District Office.
10	Comment/Question	Ma. Corazon P. Lim/ Secretary Provident	She asked clarification regarding the height of the flood wall being proposed.
	Answer	Proponent	The maximum elevation of the flood wall in the Nangka area is more than 23 meters. [Note: Nangka area is part of Phase V.]
	Comment/Question	Ma. Corazon P. Lim/ Secretary Provident	Based from Typhoon Ondoy experience, the flood in Provident Village reached the 2 nd floor of most houses. She raised concern whether the Project considered this in the design.
		Proponent	The ground elevation should first be determined in order to compare the house level with the design flood level. [Note: There was confusion in this part as Ms. Lim asserted that the flood level during Ondoy reached 23ft. Based from news articles, it was 23m and not 23ft.]
11	Comment/Question	George Milla/ Provident Village Resident	He queried if there will be noise barriers to be installed during construction.
	Answer	Proponent	Noise barriers will be needed depending upon the equipment to be used. Maintenance of the construction equipment is part of the Environmental Management Plan to mitigate the impact of noise.
12	Comment/Question	Roche Rigos/ Provident Village Resident	He raised the possibility of noise coming from the pile hammer during construction.
	Answer	Proponent	Ordinary pile driver (hammer) will not be used

Topic No.	Comment/ Answer	Name/Position	Remarks
			in the construction. A pile vibratory hammer will be used instead similar to Phase III as this produces less noise.

VI. Closing Remark: Hon. Manuel Sarmiento, Barangay Captain of Jesus Dela Peña

The Barangay Captain of Jesus Dela Peña thanked those who attended the meeting. He emphasized the importance of the Public Consultation as an opportunity to raise concerns about the Project. He wished that people get to appreciate the Project as it tries to address the frequent flooding problem in the area.

b. Attendants List

PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
 Public Consultation Meeting
 Jesus De La Peña Multi-Purpose Hall



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Jesus De La Peña Multi-Purpose Hall
June 1, 2015



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Jesus De La Peña Multi-Purpose Hall
June 1, 2015



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Jesus De La Peña Multi-Purpose Hall
June 1, 2015



CTI/DPWH

PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Jesus De La Peña Multi-Purpose Hall
June 1, 2015



c. Photos



Opening/ Prayer



Welcome Remark



Open Forum 1



Open Forum 2



Open Forum 3



Closing Remark

(2) 2nd PCM at Barangay Kalumpang, Marikina City

a. Minutes of Meeting

I. Venue : Barangay Kalumpang Multipurpose Hall/Gym, 1 Kap. Temyong St., Marikina City

II. Date/Time: 03 June 2015 /14:00 – 16:23

III. No. of Participants: 63

General Participants: 48

LGU Official: 10

Local Community: 38

Proponent Side: 15

DPWH: 3

Consultants: 12

IV. Welcome Remarks: Hon. Kaye Noll Andres-Garcia, Brgy. Capt. of Kalumpang

Brgy. Capt. Andres-Garcia acknowledged the presence of the representatives of DPWH and the Consultants, the Officials of Marikina City Hall, and the representatives of Barangays San Roque, Sto. Niño, Sta. Elena, and Kalumpang. She mentioned that the environmental impacts of the Project will be discussed in the Public Consultation Meeting as well as the corresponding mitigation measures. She encouraged everyone to be more attentive and actively participate so that they will be more informed of the consequences of the Project.

V. Open Forum

Topic No.	Comment/Answer	Name/Position	Remarks
1	Comment/Question	Bernardo B. Santos/Resident of Brgy. Kalumpang	He inquired if the ongoing dredging activities in their area is being facilitated by the DPWH or the DENR.
	Answer	Proponent	The on-going dredging activities along Marikina River is not part of the PMRCIP Phase IV since the Project will still commence in 2018. The on-going river dredging is facilitated by the DPWH Engineering District and is funded locally.
2	Comment/Question	Nikki S. Reas/Brgy. Kalumpang Councilor	He asked for the distinction between the DPWH Main Office from the District Office in order for them to determine which office to proceed to seek help whenever necessary.
	Answer	Proponent	PMRCIP Phase IV is under the Unified Project Management Office Flood Control Management Cluster of the Department of Public Works and Highways (DPWH-UPMO-FCMC). The office is located at the Port Area and is under the office of Director Patrick Gatan as stated in the brochures distributed. The on-going dredging activities mentioned is under the DPWH District Engineering

Topic No.	Comment/ Answer	Name/Position	Remarks
			Office.
3	Comment/Question	Kaye Noll Andres-Garcia/ Brgy. Kalumpang Brgy. Capt.	She expressed concern that people might be affected by the Project. In addition, she queried about the Project engineering details such as the river width incorporated in the design.
	Answer	Proponent	PMRCIP Phase IV river channel width is 90 meters. There was no Project Affected People (PAP) identified in Marikina City for Phase IV. The only area with PAPs in Phase IV are in Barangay Bagumbayan which is located in Quezon City.
4	Comment/Question	Nikki S. Reas/Kagawad	He queried how the existing sheet piles along the river will be affected.
	Answer	Proponent	The existing sheet piles at the right side of the river has already been considered in the proposed Detailed Design. There are some sheet piles though that will be removed due to some excavation works. Removed sheet piles in good working conditions will be re-used in the Project.
5	Comment/Question	Bernardo B. Santos/	He raised concern about the existing “strong” river dike which was constructed in 1954. With the Project, the strength of the dike might be compromised due to the vibration during the construction phase.
	Answer	Proponent	The height of the existing river dike is actually below the proposed design flood level. The height of the flood wall will be increased if it is determined to be structurally sound, otherwise it will be replaced totally.
6	Comment/Question	Ardi Gonzaga/ Brgy. Kalumpang Resident	He asked clarification if the on-going project of the DPWH District Office will be stopped when PMRCIP Phase IV will be implemented. Further, he asked if the Project is funded by the LGU of Marikina City.
	Answer	Proponent	Normally the timeline of DPWH projects are posted near the project site. Construction works for PMRCIP Phase IV on the other hand will still start in 2018, so most likely the contract of the on-going dredging works may have been finished by then. For the source of funds of the on-going project, since it is the Project of the DPWH District Office, it is still within DPWH, and therefore from the National Government.
	Comment	Kennedy Sueno/ Marikina City Engineer	For clarification, there is an on-going project being implemented by the Park Development Office, funded by the Marikina City Hall, which is separate from the on-going dredging works, a Project of DPWH under First Metro Manila District Engineering Office.

Topic No.	Comment/ Answer	Name/Position	Remarks
7	Comment	Salome Aquino	She suggested that the on-going DPWH dredging activities should be finished immediately as the upcoming rainy season will erode the soil that was removed from the river.
		Proponent	This concern will be forwarded to the DPWH First Metro District Office.

VI. Closing Remark: Ms. Lalaine Catulong, Senior Environmental Management Specialist, DPWH Environment and Social Safeguards Division

Ms. Lalaine Catulong gave thanks to those who the attended Public Consultation Meeting. She assured the participants that the meeting has been recorded, and that all the concerns that were raised in the discussions will be forwarded to the DPWH.

b. Attendants List

PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

Barangay Kalumpang



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

Barangay Kalumpang



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

Barangay San Roque



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

Barangay Sta. Elena



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

Barangay Sto. Niño



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

Marikina City Hall Offices



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Kalumpang Multi-Purpose Hall/Gym
June 3, 2015

DPWH and Consultants



c. Photos



Opening/ Prayer



Welcome Remark



Open Forum 1



Open Forum 2



Open Forum 3



Closing Remark

(3) 3rd PCM at Barangay Bagumbayang, Quezon City

a. Minutes of Meeting

I. **Venue** : Barangay Bagumbayan Multipurpose Hall/Gym, 55 San Roque St.,
Quezon City

II. **Date/Time:** 05 June 2015 /09:00AM - 11:45AM

III. **No. of Participants: 112**

General Participants: 102

LGU Official: 7

Local Community: 95

Proponent Side: 10

DPWH: 2

Consultants: 8

IV. **Welcome Remarks: Hon. Elmer Maturan, MD., Brgy. Capt. of Bagumbayan**

Brgy. Capt. Maturan welcomed the participants of the Public Consultation Meeting. He emphasized that the meeting aimed to inform the people of the scope of the project. The areas to be affected during project implementation will be discussed, and therefore, the affected families will have the opportunity to ask the DPWH on what action needs to be taken prior to project implementation.

V. **Open Forum**

Topic No.	Comment/Answer	Name/Position	Remarks
1	Comment/Question	Jose Mendiola/ Bagumbayan Deputy Brgy. Peace & Security Officer	He asked the extent of the parapet wall that will be constructed as a component of the project.
	Answer	Proponent	[The lay-out plan of the Project was flashed in the screen] A new floodwall will be constructed from Rosario Weir up to Marcos Bridge, and from that area up to Marikina Bridge there will be heightening of the existing floodwall. The parapet wall will be the structure on top of the revetment.
2	Comment/Question	Ms. Leny Pasco/ Brgy. Capt. of Brgy. Libis	Someone from the DPWH said that they will not be affected by the ongoing project of the 51 st Brigade on the retaining wall located near the creek between Brgy. Bagumbayan and Brgy. Libis.
	Answer	Proponent	That scope of work is beyond PMRCIP Phase IV.
3	Comment/Question	Rizaldy Masangkay/ Brgy. Bagumbayan Resident	He asked how many families will be affected and where will be the relocation site be possibly located. There are talks it is located in Bulacan.

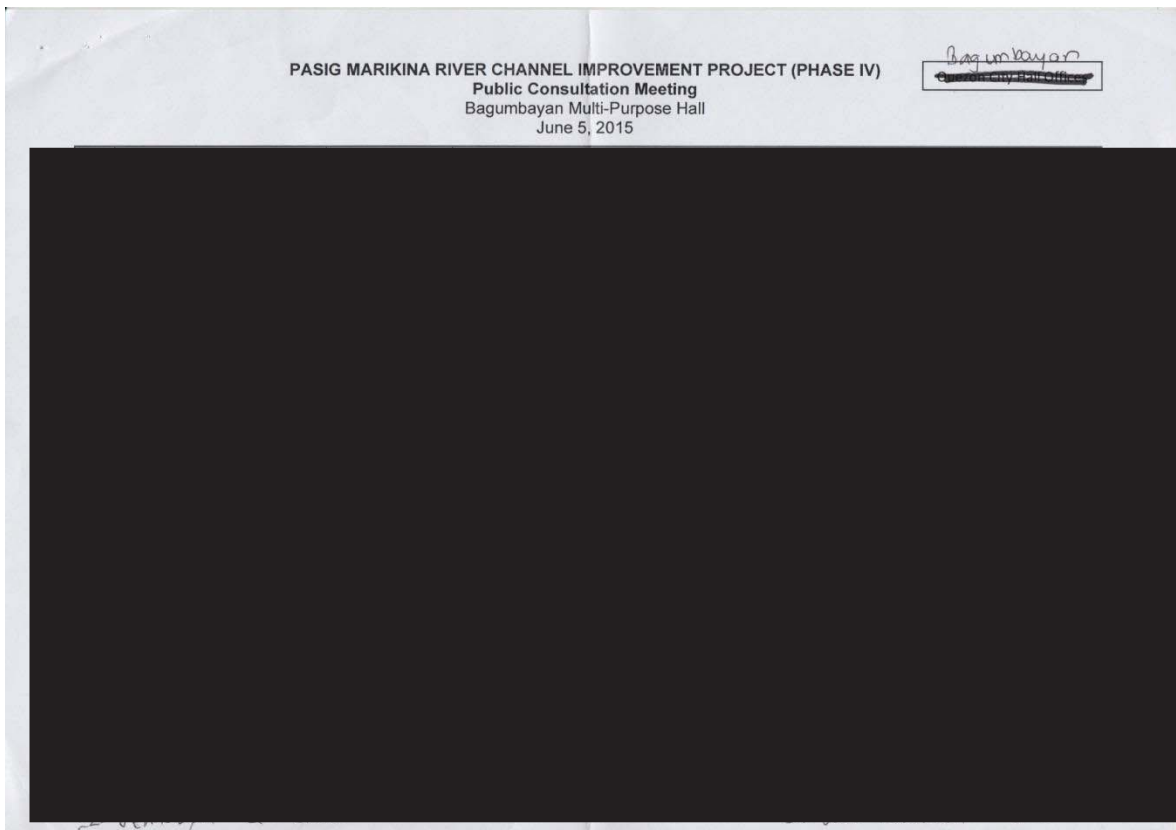
Topic No.	Comment/ Answer	Name/Position	Remarks
	Answer	Proponent	The official results are not yet out, but once the report is finished, it will be presented to the Quezon City government. For the relocation site, it cannot be confirmed as it is the NHA (National Housing Authority) who has the authority to decide on such matters.
4	Comment/Question	Gil Ofina/ Ortigas North Association Representative	He asked if the Project will only involve dredging but not widening of the river. Can the industries along Marikina River have a discussion with DPWH to address the sustainable development of the area?
	Answer	Proponent	Regarding the first question some portions of the river may be widened following the 90-m river channel width. Aside from dredging, there will be construction of flood wall along the river. For the second question, several meetings will be held after this public consultation, and the suggestion to have a meeting with DPWH to promote sustainable development in the area would be taken into consideration while the detailed design is being finalized.
5	Comment/Question	Alex Cruz/ Brgy. Bagumbayan Kagawad	In what station will the construction start? How will the boundary/starting point of construction be determined?
	Answer	Proponent	The construction program is not yet finalized, but the proposed scheme is from downstream going to upstream. The other specifications may be determined once the detailed engineering design is done.
6	Comment/Question	Mr. Elmer Maturan/ Brgy. Captain, Brgy Bagumbayan	He wanted to request DPWH –ESSD that all affected Informal Settler Families (ISFs) be given a good relocation site with basic social services such as electricity and water. Further, he hoped that this Project is also anchored with the preparations being done to reduce the disaster risks related to the movement of the West Valley Fault. In case of an earthquake which will most likely affect the structures of Angat Dam, will the Project be able to withstand the flood caused by the bursting of Angat Dam?
	Answer	Proponent	Regarding the resettlement of ISFs, the guidelines specified by the existing laws on resettlement and relocation shall be followed. Regarding Angat Dam, this is located in Bulacan and in case it will be affected by the earthquake, the water will be directed towards Novaliches, Quezon City. It will not have an effect to the Pasig-Marikina River. The only dam connected with Marikina River is the Wawa Dam which is located in Montalban, Rizal [Rodriguez is the new name of Montalban]. This dam however is

Topic No.	Comment/Answer	Name/Position	Remarks
			currently non-functional.
7	Comment/Question	Jeanette E. Celmar/Brgy. Bagumbayan Resident	If the situation will call for a resettlement, she suggested that the house be big enough so she can put a sari-sari store. In addition, she hoped there will be a nearby school so her children's education will not be affected.
	Answer	Proponent	These suggestions will be taken into consideration following the resettlement guidelines imposed by our existing laws.
8	Comment/Question	Nilo Jovero/ Alcos Global Corporation Representative	He queried if the design of the flood control structure be altered so as to avoid the existing structure currently occupied by the company he is working at.
	Answer	Proponent	The answer could not be provided as the Project is not yet done with the detailed design stage.
9	Comment/Question	Mr. Elmer Maturan/ Brgy. Capt., Brgy. Bagumbayan	He asked for clarification how to avoid duplication of data in the census survey. There was a case about a house owner who went out of town during the conduct of the census survey due to an emergency reason. The owner wanted his/her name to be reflected in the census survey and not the name of the house care-taker who was present during the survey.
	Answer	Proponent	Pertinent documents are normally presented to show the authenticity of the ownership of the house. Validation and documentation are done to establish the proper ownership of the house.

VI. Closing Remark: Hon. Elmer Maturan, MD., Brgy. Capt. of Bagumbayan

Brgy. Capt. Maturan thanked those who came over to the Public Consultation Meeting. He hoped the participants were now more enlightened with the Project details. Before dismissing the crowd, he invited the residents of Brgy. Bagumbayan to attend the upcoming seminar on disaster risk reduction related to earthquake and West Valley Fault.

b. Attendants List



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Bagumbayan Multi-Purpose Hall
June 5, 2015

Barangay Bagumbayan



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Bagumbayan Multi-Purpose Hall
June 5, 2015

Barangay Bagumbayan

Office or Organization



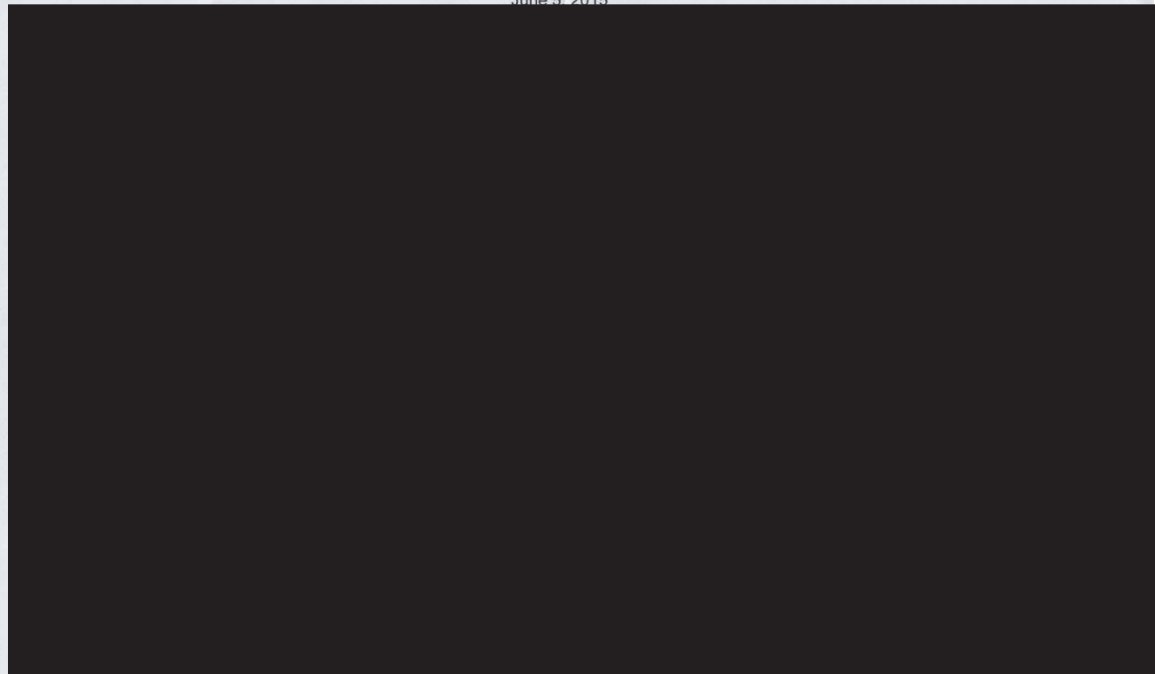
PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Bagumbayan Multi-Purpose Hall
June 5, 2015

Barangay Blue Ridge B



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Bagumbayan Multi-Purpose Hall
June 5, 2015

Barangay Ugong Norte



PASIG MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT (PHASE IV)
Public Consultation Meeting
Bagumbayan Multi-Purpose Hall
June 5, 2015

DPWH and Consultants



c. Photos



Opening/ Prayer



Welcome Remark



Open Forum 1



Open Forum 2



Open Forum 3



Closing Remark

**ANNEX-6: Environmental Compliance Certificate (ECC) for
Proposed Backfill Site along Laguna Lakeshore area in Taytay
Municipality**



Republic of the Philippines
Department of Environment and Natural Resources
Environmental Management Bureau CALABARZON
6/F DENR Building, 1515 Roxas Boulevard, Ermita, Manila
Tel. No. (02) 536-9784/536-2808 Fax No. (02) 536-9784/522-8177/536-3095
Visit us at <http://www.calabarzon.emb.gov.ph>

April 23, 2018

ECC-OL-R4A-2018-0246

MR. PATRICK B. GATAN
Project Director
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
UNIFIED PROJECT MANAGEMENT OFFICE
FLOOD CONTROL MANAGEMENT CLUSTER
NCR Compound, 2nd Street
Port Area, Manila 1018

Subject: **ENVIRONMENTAL COMPLIANCE CERTIFICATE**

Dear **Mr. Gatan**:

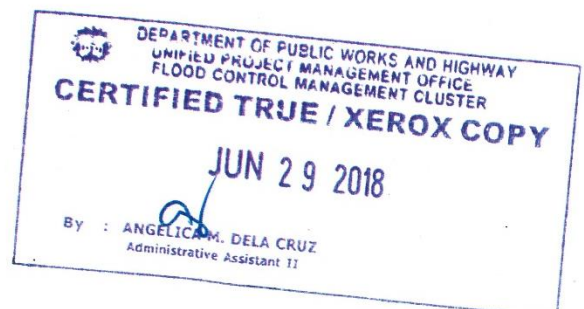
This refers to the Environmental Compliance Certificate (ECC) application for the **BACKFILLING ACTIVITY AT THE LAGUNA DE BAY SHORELAND PROJECT** located **within the boundaries of Barangays Muzon and San Juan, Taytay, Rizal**. After satisfying the requirements of the said application, this Bureau has decided to grant an ECC for the above-mentioned project.

With the issuance of this ECC, you are expected to implement the measures presented in the Initial Environmental Examination (IEE) Checklist Report, intended to protect and mitigate the project's adverse impacts on community health, welfare and the environment. Environmental considerations shall be incorporated in all phases and aspects of the project. You may proceed with the project implementation after securing all the necessary permits from other pertinent Government agencies. This Office will be monitoring the project periodically to ensure your compliance with stipulations cited in the attached ECC.

Please be guided accordingly.

Very truly yours,


DIR. NOEMI A. PARÁNADA
OIC - Regional Director





ENVIRONMENTAL COMPLIANCE CERTIFICATE
 (Issued under Presidential Decree 1586)
ECC-OL-R4A-2018-0246

THIS IS TO CERTIFY THAT THE PROPONENT, **DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS UNIFIED PROJECT MANAGEMENT OFFICE FLOOD CONTROL MANAGEMENT CLUSTER** is granted this Environmental Compliance Certificate (ECC), for **BACKFILLING ACTIVITY AT THE LAGUNA DE BAY SHORELAND PROJECT** located within the boundaries of **Barangays Muzon and San Juan, Taytay, Rizal**, by the Department of Environment and Natural Resources (DENR), through the Environmental Management Bureau (EMB), CALABARZON Region.

This Certificate is being issued for the project, with the following details:

PROJECT DESCRIPTION		
The Backfilling Activity at the Laguna De Bay Shoreland Project shall be located at the shoreland area of Laguna de Bay within the boundaries of Barangays Muzon and San Juan, Taytay, Rizal with the following geographic coordinates:		
Corner	Geographic Coordinates	
	Latitude	Longitude
1	14° 31' 54.72"N	121° 08' 15.15" E
2	14° 31' 56.43"N	121° 08' 16.55" E
3	14° 31' 58.45"N	121° 08' 17.64" E
4	14° 32' 03.37"N	121° 08' 12.50" E
5	14° 31' 57.23"N	121° 08' 06.38" E

The project components shall include the following: Forty Thousand (40,000) square meters of reclaimed area, Eighty Three Thousand Three (83,300) square meters of excavated and dredged materials from the Marikina riverbanks and riverbed including concrete debris, Ten Thousand Four Hundred Ninety Five (10,495) square meters of temporary yard (stockpile area, heavy equipment yard, parking area, office, warehouse, tool box meeting area, fuel tank, wash bay, deep well) and other related support facilities.

This Certificate is issued in compliance to the requirements of Presidential Decree No. 1586, in accordance to Department Administrative Order No. 2003-30. The Bureau, however, is not precluded from reevaluating, adding, removing, and correcting any deficiencies or errors that may be found after issuance of this Certificate.

DEPARTMENT OF PUBLIC WORKS AND HIGHWAY
 UNIFIED PROJECT MANAGEMENT OFFICE
 FLOOD CONTROL MANAGEMENT CLUSTER
CERTIFIED TRUE / XEROX COPY
 JUN 29 2018
 By : ANGELICA M. DELA CRUZ
 Administrative Assistant II

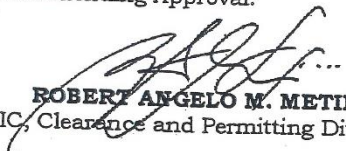


Environmental Compliance Certificate
 Backfilling Activity at the Laguna de Bay Shoreland
 Barangays Muzon and San Juan Taytay, Rizal Province
 Department of Public Works and Highways Unified Project Management Office
 Flood Control Management Cluster

This is to certify, further, that in issuing this **CERTIFICATE**, it should be understood that the same is a **PLANNING TOOL** and **NOT A PERMIT**. It is expected that the proponent will diligently secure pertinent **PERMITS/CLEARANCES** from all concerned government agencies (i.e. PRA, LLDA, HLURB, NWRB, DOH, LGUs, DTI, DOLE, DTI, DPWH, DOTr, DOE, MGB, PMRB, etc.) prior to the implementation of the project to be submitted to this Office within sixty (60) working days upon receipt thereof; otherwise this Office shall be constrained to take appropriate legal action. The issuance of the ECC shall not be construed as resolving issues within the mandate of other government agencies.

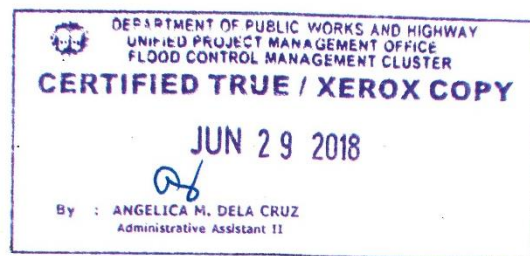
Issued at EMB CALABARZON Region this **April 23, 2018**.

Recommending Approval:


ROBERT ANGELO M. METIN
OIC, Clearance and Permitting Division

Approved by:


DIR. NOEMI A. PARANADA
OIC - Regional Director




SWORN STATEMENT OF OWNER/PROPONENT

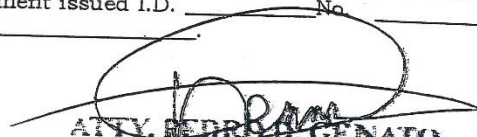


Environmental Compliance Certificate
Backfilling Activity at the Laguna de Bay Shoreland
Barangays Muzon and San Juan Taytay, Rizal Province
Department of Public Works and Highways Unified Project Management Office
Flood Control Management Cluster



Under the provisions of Presidential Decree 1586, I, **PATRICK E. GATAN**, do hereby certify that the information provided to the Department of Environment and Natural Resources (DENR) - Environmental Management Bureau (EMB), CALABARZON Region pertaining to the **BACKFILLING ACTIVITY AT THE LAGUNA DE BAY SHORELAND PROJECT** located within the boundaries of Barangays Muzon and San Juan, Taytay, Rizal are true and correct to the best of my personal knowledge and based on the records in my possession. Hence, I shall take full responsibility in complying with all conditions and restrictions contained in this Environmental Compliance Certificate (ECC).


PATRICK E. GATAN
 Project Director
**DEPARTMENT OF PUBLIC WORKS
 AND HIGHWAYS UNIFIED PROJECT
 MANAGEMENT OFFICE FLOOD
 CONTROL MANAGEMENT CLUSTER**
 TIN: _____

SUBSCRIBED AND SWORN TO before me this 15 MAY 2018, the above-named affiant taking oath presenting his government issued I.D. No. _____ issued on _____ at _____


ATTY. PEDRO B. GENATO
 Notary Public Until Dec. 31, 2019
 Notary Office No. 011 Mia.
 IBP# 012432 Paig 7-27-17 until 2019
 PTR# Mia 6993998 - 1-4-2018
 Roll# 12048, TIN# 132-436-687
 VCLC Compl. No. V-0065132 until 4-14-18

Doc No. 182
 Page No. 37
 Book No. 6
 Series of 2018


 DEPARTMENT OF PUBLIC WORKS AND HIGHWAY
 UNIFIED PROJECT MANAGEMENT OFFICE
 FLOOD CONTROL MANAGEMENT CLUSTER
CERTIFIED TRUE / XEROX COPY
 JUN 29 2018
 BY :  ANGELICA M. DELA CRUZ
 Administrative Assistant II

I. CONDITIONS

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The proponent shall strictly implement the following mitigating, enhancement, and rehabilitating measures:

1. That the proponent shall undertake greening/landscaping and planting of native tree species within the project area to help attenuate noise levels, abate heat and absorb some pollutant emissions.
2. That proper Air Pollution Source and Control Installations (APSCI) shall be provided by the proponent to avert pollutant emission.



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3. That the proponent shall strictly manage all operational, spillage, excessive surface runoff, erosion, siltation, dust and occupational & health hazards identified in the Initial Environmental Examination (IEE) Checklist Report and, in case of emergency episodes, appropriate response activities shall be immediately undertaken for the protection of the workers/personnel, host and nearby communities and the receiving environment.
4. That effective and adequate drainage system and Wastewater Treatment Facility (WWTF) shall be installed by the proponent and that all effluents shall conform with the DENR Effluent Standards. The plans and designs of the proposed STF shall be submitted one (1) month upon receipt of the ECC with a completion period of six (6) months.
5. That in support of the concern of the government to phase-out mercury from all possible sources and to address global warming, the proponent shall install environment-friendly lighting fixtures (i.e. light-emitting diode lamps, compact fluorescent lamps, etc.).
6. That preservation and easement retention of natural drainage/waterways shall be undertaken and shall conform with the provisions of the DENR Administrative Order No. 97-05 (Procedures in the Retention of Areas within certain distances along the Banks of Rivers, Streams, and Shores of Seas, Lakes and Oceans for Environmental Protection). If disturbed, an appropriate replacement drainage system shall be constructed within two (2) months from the disturbance.
7. That the proponent shall properly implement the following:
 - a) Effective Information, Education and Communication (IEC) Plan shall be implemented in all project phases including communication of environmental risks of the project implementation.
 - b) Beneficial Social Development Program (SDP) among the employees/workers, host barangay and affected communities which shall cover livelihood training and employment, including assistance in the setting-up of social welfare programs for health and education that will ensure the participation of youth and women.
 - c) Appropriate wastes management scheme as provided in the Environmental Management Plan (EMP) shall be continuously implemented.
 - d) Portalets/temporary sanitation facilities shall be provided before the start and during the construction works.

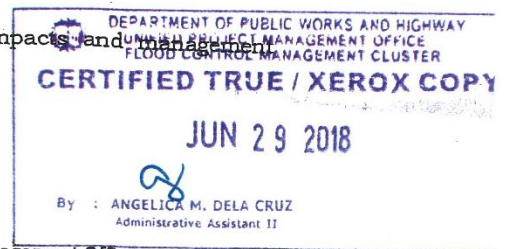
GENERAL CONDITIONS

Further administrative conditions for the grant of this Certificate shall be strictly complied:

8. That the proponent shall religiously comply with the applicable provisions of P.D. 1586 (Philippine Environmental Impact Statement System), R.A. 9003 (Ecological and Solid Waste Management Act of 2000), R.A. 6969 (Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990), R.A. 8749 (Philippine Clean Air Act of 1999) and R.A. 9275 (Philippine Clean Water Act of 2004) and other existing and applicable Philippine Laws.
9. That the proponent shall set-up a competent Environmental Unit and shall be duly accredited by this Office in accordance with DAO No. 2014-002, series of 2014 (Revised Guidelines for Pollution Control Officer Accreditation). The Environmental Unit shall be integrated in the proponent's organizational chart to handle all environment related aspects of the project implementation in addition to the monitoring requirements as specified in the Environmental Management Plan (EMP)/Environmental Monitoring Plan (EMoP) such as but not limited to the following:
 - a) Monitor actual project impacts vis-à-vis the predicted impacts and management measures in the submitted IEE Checklist Report.



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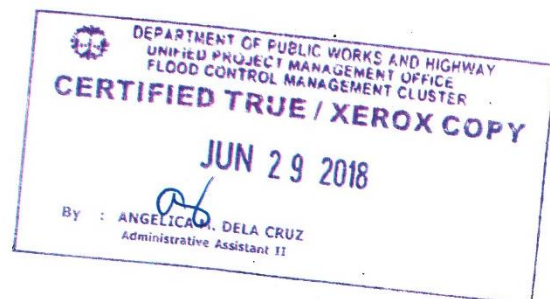
- b) Regular submission of semi-annual ECC Compliance Monitoring Reports (on or before January 15 and July 15 of each year the project is implemented) provided with supporting documents pursuant to the guidelines set forth in DAO 2003-30 (IRR of P.D. 1586).
 - c) Ensure that all post-assessment permits/clearances from other concerned government agencies are secured and in place relative to the implementation of the project.
 - d) Submit a quarterly environmental monitoring report using the prescribed format of the Self-Monitoring Report (SMR) pursuant to DAO 2003-27.
 - e) Submit an Abandonment Plan Two (2) months prior to abandonment. It shall include rehabilitation measures/clean-up, remediation of areas possibly contaminated with toxic substances and presentation of options on proposed alternative projects in the area.
10. That monitoring wells shall be installed and maintained within the project site and identified impact areas, which shall include the following:
 - a) A periodic groundwater quality sampling shall be conducted and the results of the same shall be submitted to this Office.
 - b) Cisterns/water tanks shall be installed to minimize the extraction of groundwater for domestic purposes.
 11. That proper health and sanitation practices shall be observed in all phases/stages of the project and safety & personal protective equipment/gadgets shall always be provided to the personnel within the premises of the project site to prevent health and occupational hazards.
 12. That prior to project implementation, the proponent shall coordinate with the Mines and Geosciences Bureau CALABARZON Region regarding the conduct of a detailed geological assessment within the project area. All recommendations and mitigating measures on geological, volcanic and hydrologic hazards identified in the geological assessment must be appropriately accomplished by the proponent.
 13. That in compliance to Kyoto Protocol Agreement and R.A. 9367 (Bio-Fuels Act of 2006) to deal with the reduction program on activities potential to contribute greenhouse gases or global warming, the proponent shall establish a carbon sink program or initiate an energy conservation program such as the use of alternative fuels (i.e. bio-fuel liquefied petroleum gas, etc.).
 14. That any authorized DENR-EMB personnel, with proper identification card and travel/mission order, shall be allowed unconditional access to conduct an on-the-spot inspection/monitoring to oversee compliance to the ECC without the need for prior notice to the proponent.
 15. That when the implementation of the project causes adverse environmental impacts and/or pose nuisance to public health and safety, the proponent shall immediately suspend its project operation until such time that appropriate remedial measures are effected and/or any damage to persons and/or properties resulting from the same are properly compensated
 16. That a billboard containing this message: **"Notice to the Public, This BACKFILLING ACTIVITY AT THE LAGUNA DE BAY SHORELAND PROJECT OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS UNIFIED PROJECT MANAGEMENT OFFICE FLOOD CONTROL MANAGEMENT CLUSTER has been issued an Environmental Compliance Certificate (ECC-OL-R4A-2018-0246) by the Department of Environment and Natural Resources - Environmental Management Bureau CALABARZON Region on April 23, 2018"** must be installed at all entry/exit points and at all perimeters of the project facing the road to inform the general public within thirty (30) days from receipt of the ECC.



Environmental Compliance Certificate
 Backfilling Activity at the Laguna de Bay Shoreland
 Barangays Muzon and San Juan Taytay, Rizal Province
 Department of Public Works and Highways Unified Project Management Office
 Flood Control Management Cluster

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
 UNIFIED PROJECT MANAGEMENT OFFICE
 FLOOD CONTROL MANAGEMENT CLUSTER
CERTIFIED TRUE / XEROX COPY
 JUN 29 2018
 By : ANGELICA M. DELA CRUZ
 Administrative Assistant II

17. That a copy of the ECC shall be posted in a conspicuous location at the field office of the project site clearly visible to the public and shall be adequately framed or otherwise protected against damage and at the barangay bulletin board of the host barangay.



Environmental Compliance Certificate
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Flood Control Management Cluster

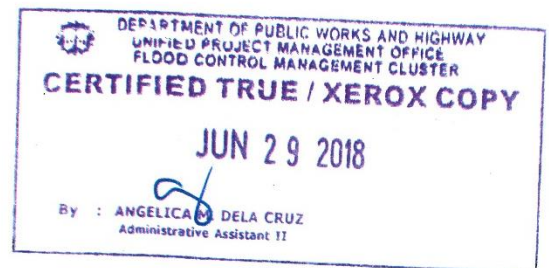
I. RESTRICTIONS

The proponent is strictly subject to the following restrictions:

1. That no other activities shall be undertaken other than what was stipulated in the IEE Checklist Report. Should there be an expansion or deviation of the project beyond the project description, construction of other structures beyond those stated in the IEE Checklist Report; transfer of location or any change in the activity, shall be made subject to a new EIA requirements.
2. That no trees shall be affected in all phases of the project, or if there is any, necessary documents such as "Tree Cutting Permit", "Balling Permit" and other permits/clearances, shall be secured from the concerned DENR sector pertaining to the implementation of the project.
3. That during the construction phase of the project, the proponent shall install a temporary 2-stage settling pond for wastewater prior to its final disposal into the local sewer and drainage system.
4. That in case of transfer of ownership/management of this project, these same conditions and restrictions shall apply and the transferee shall be required to notify this Office within fifteen (15) days as regards to the transfer of ownership/management.
5. That the proponent (**DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS UNIFIED PROJECT MANAGEMENT OFFICE FLOOD CONTROL MANAGEMENT CLUSTER, as represented by its Project Director, Mr. Patrick B. Gatan**) shall be jointly and severally accountable for any misrepresentation and failure to state material information in the submitted documents.

The conditions stipulated in this Certificate shall be deemed final within fifteen (15) days from receipt hereof and all conditions set forth above shall be complied with by the herein grantee. This ECC is deemed expired if not implemented within five (5) years from the date of issuance and the proponent shall have to apply for a new ECC if it intends to pursue the project.

Non-compliance with any of the provisions of this Certificate shall be a sufficient cause for the cancellation or suspension of this Certificate and/or imposition of a fine in an amount not to exceed Fifty Thousand Pesos (PhP 50,000.00) for every violation thereof.



PROJECT ASSESSMENT PLANNING TOOL



Environmental Compliance Certificate
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Barangays Muzon and San Juan Taytay, Rizal Province
Department of Public Works and Highways Unified Project Management Office
Flood Control Management Cluster

For the assistance of the Proponent, LGUs and other concerned government agencies (GAs) in the management of the project and for better coordination in mitigation on the impacts of the project on its surrounding areas and to the environment.

By way of recommendation, the following have been taken notice of by this Office and are providing these recommendations to the parties and authorities concerned for proper action and integration into their decision making-process.

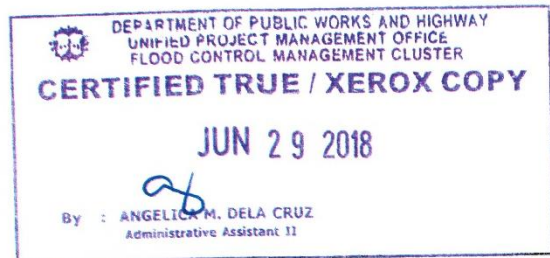
Regulatory Conditions	Concerned Agency
1. The proponent shall comply with, but not limited to the following: 1.1 P.D. 856 "Sanitation Code of the Philippines"; 1.2 P.D.442 "Labor Code of the Philippines including occupational health and safety"; 1.3 R.A. 6541 or the National Building Code of the Philippines including adequate storm drainage system and other flood control measures and compliance to the Fire Safety and Emergency Preparedness; 1.4 P.D. 1067 or the Water Code of the Philippines;	DOH DOLE-Bureau of Working Condition Municipal Planning & Dev't. Office /Building Official/BFP/LGU Concerned DPWH/NWRB
ENVIRONMENTAL PLANNING RECOMMENDATIONS FOR THE PROPONENT	
2. Close monitoring of the project should be undertaken by the proponent to maintain a high level of safety and efficiency at all stages of the project, and to immediately address any environmental hazard/ change that may take place.	

For dissemination and proper action of the parties concerned.


ROBERT ANGELO M. METIN
 OIC, Clearance and Permitting Division


DIR. NOEMI A. PARANADA
 OIC - Regional Director

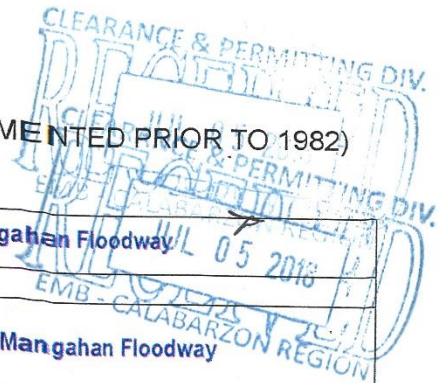
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 Trxn Seq. No. : 35090 Date : 04/10/2018





Environmental Compliance Certificate
 Backfilling Activity at the Laguna de Bay Shoreland
 Barangays Muzon and San Juan Taytay, Rizal Province
 Department of Public Works and Highways Unified Project Management Office
 Flood Control Management Cluster

ANNEX-7: Application to Certificate of Non-Coverage for Cainta and Taytay Floodgate Construction

PART 1. FOR APPLICATIONS (CATEGORY D 6 PROJECTS IMPLEMENTED PRIOR TO 1982) AND EVALUATION OF CATEGORY C PROJECTS



1. Name of the Project	Construction of Cainta Floodgate and Taytay Floodgate along Mangahan Floodway		
2. Project Location	Street/Sitio/Barangay	Zone/Classification	
	San Andres (Cainta) and Sta. Ana (Taytay)	On the channel bank inside of Mangahan Floodway	
	City/Municipality	Province	Region
	Cainta and Taytay	Rizal	IV-A
3. Proponent Name	Unified Project Management Office-Flood Control Management Cluster Department of Public Works and Highways		
4. Proponent Address	NCR Compound, 2 nd Street, Port Area, Manila		
5. Contact Person	Name:	Designation:	
	Norman Gamboa	Engineer II	
6. Proponent Means of Contact	Landline No: 546-5184 or 304-3813	Fax No.	
	Mobile No.: 0917-1182591	Email	
7. Project Type/ Undertaking	Construction of Floodgates in Flood Control Project		
8. Project Size	Capacity/Others:	Space Allocation/Area	
	Cainta Floodgate: 4 units x 6.0m wide x 7.6m high Taytay Floodgate: 3 units x 2.0m wide x 2.0m high	1,500 sq.m (Cainta Floodgate) + 500 sq.m (Taytay Floodgate) = 2,000 sq.m	
	Quantity to be Processed: n.a.		
	Production Rate: n.a.		
9. Description of Project Activities	Construction of two (2) floodgates at the joining sections of Cainta and Taytay rivers to Mangahan Floodway to prevent back flows from Mangahan Floodway.		
	Prepared/Submitted by:	Concurred/Approved by:	
	 Resito V. DAVID, MNSA	 Patrick B. GATAN, CESO III	
	Signature over Printed Name	Owner's/Proponent's Signature over Printed Name	

PART II: FOR EVALUATION OF CATEGORY C PROJECTS, IN ADDITION TO PART I, THE FOLLOWING SHALL BE INCLUDED AS ATTACHMENT:

1. Description of how the project enhances the environment or address environmental issues.

The floodgates prevent backflows from Mangahan Floodway so that flooding in and around the low-lying area along the East Bank of the Floodway.

2. Project Component List – identify proposed project components (facilities/infrastructures, other single projects supporting the main project): specify which are already in existence.

(1) Cainta Floodgate: Roller type, 4 units x 6.0 m wide x 7.6 m high

(2) Taytay Floodgate: Roller type, 3 units x 2.5 m wide x 2.0 m high

(3) Replacement of Cainta Bridge

3. Description of Project Phases – focus on activities and processes which may cause residual impacts (For Unclassified/Unlisted Technology Projects: focus on critical activities and processes per phase which place a demand on local resource uses and which generate emissions, effluents, hazardous waste, solid waste, other wastes)

There will be no critical activities and processes to generate emissions, effluents, hazardous wastes, solid wastes, other wastes.

4. Project Emissions/Effluent/Hazardous/Solid Waste – Present integrated summary of types of wastes: estimate waste generation rate; Identify built-in waste management measures and facilities planned or committed to be built into the project design)

There will be construction yards, structural excavation of approx. 40,000 m³ and access roads to be constructed along the East Bank, of which waste management measures and facilities will be prepared during Detailed Design and implemented in Construction Phase.

5. Project Cost and Duration

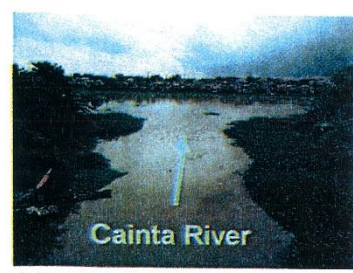
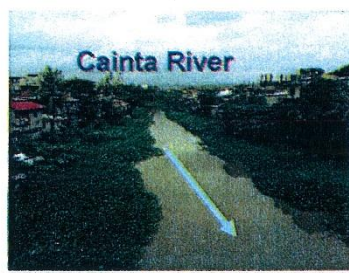
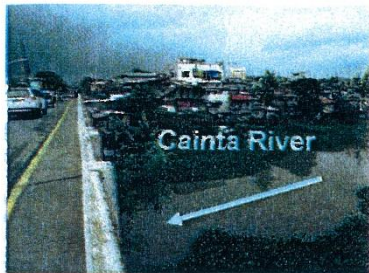
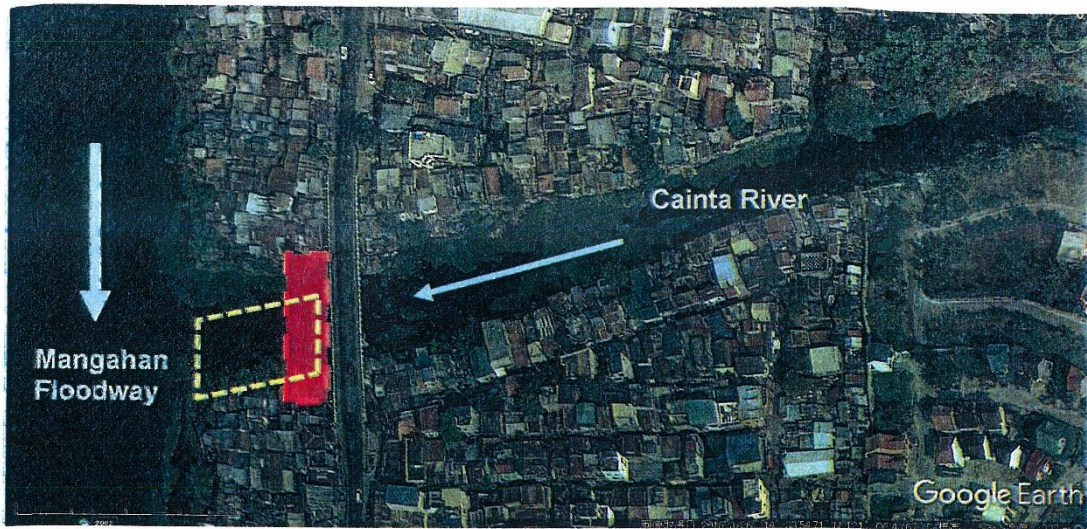
Total construction cost for Cainta and Taytay floodgates is estimated at Php 702 million pesos, as its breakdown is presented in Table-1.

6. 1 page: Collage of photos or plates of proposed project site.

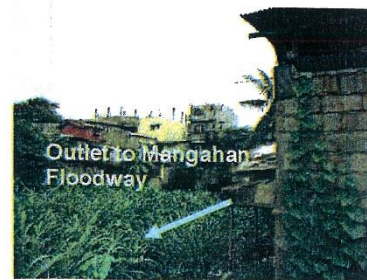
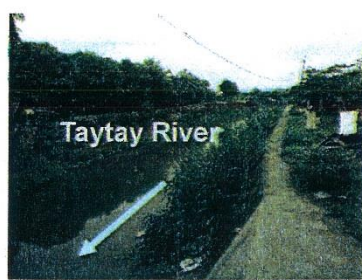
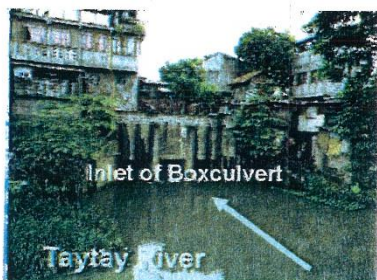
Shown in Figure-1.

Figure-1 Photos of Floodgates Construction Sites

1. Cainta River



2. Taytay River



**ANNEX-8 : Present Conditions of Natural Environment of
the Laguna de Bay**

PRESENT CONDITIONS OF NATURAL ENVIRONMENT OF THE LAGUNA DE BAY

Current natural environmental conditions of the Laguna de Bay Basin are described and explained below based on the reports previously prepared by JICA and/or other agencies.

1. Outline of Laguna de Basy Basin

The coastal area of Laguna de Bay extends about 220 km and the lake area is about 900 km². The catchment area is about 3,820 km² including the Marikina River Basin (about 540 km²) is connected by the Mangahan Floodway. More than 100 rivers and drainage canals are flowing into Laguna de Bay.

On the other hand, the natural exit from Laguna de Bay to Manila Bay is only the Napindan River-the Pasig River located on the north bank of the lake. As watershed for the Laguna de Bay, there are 24 river basins including the Marikina river basin and Mangahan Area of target of the Project as shown in Table L-1 and Figure L-1. The catchment area of the Marikina River Basin (538km²) accounts for about 14% of the whole of catchment of Laguna de Bay Basin (3,775km²).

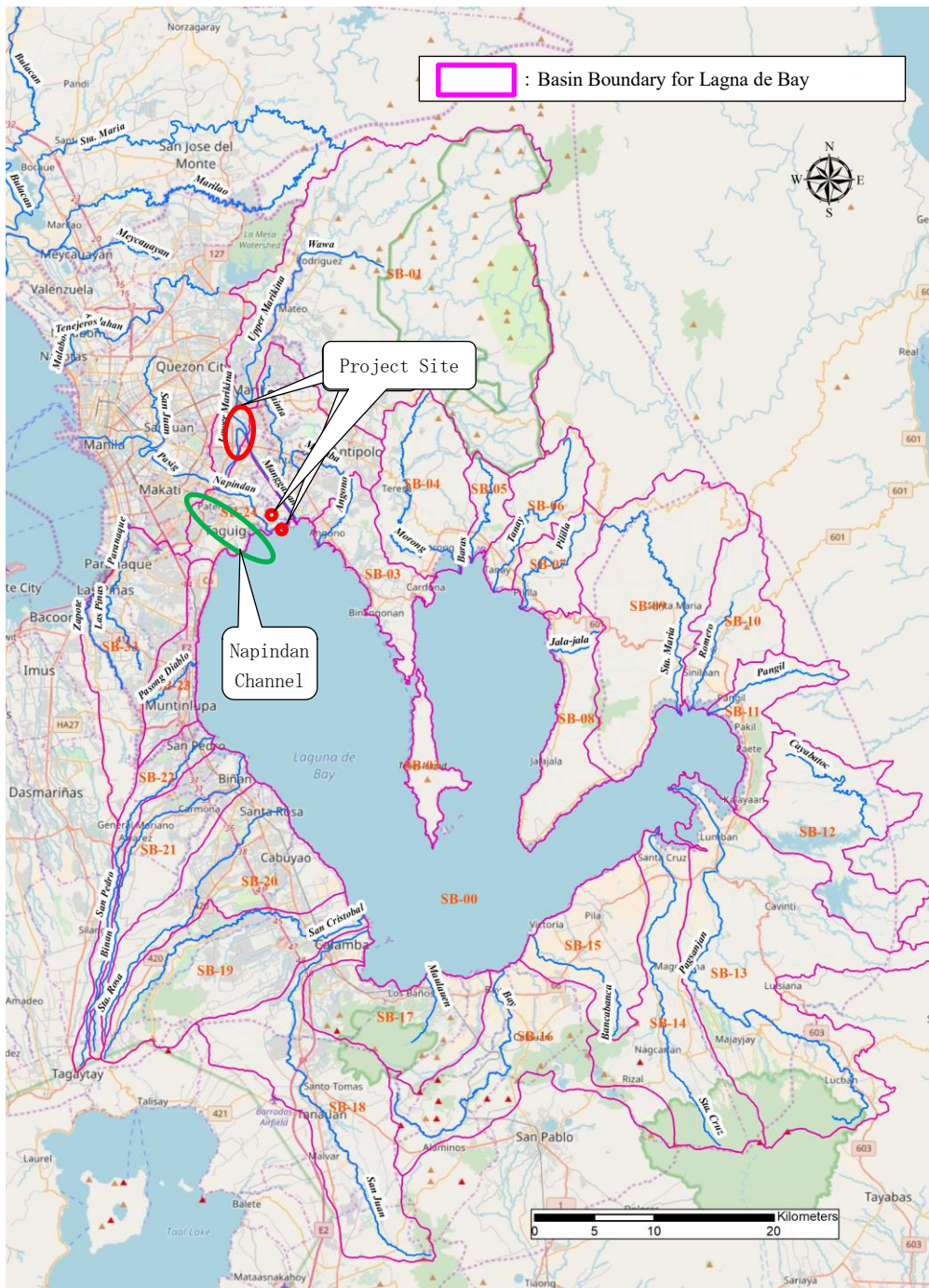
Table L-1 Basin Specification of Laguna de Bay Basin

SB_ID	NAME	Main River Name*	Area (km ²)*2
SB-00	Laguna Lake Surface	-	904.0
SB-01	Marikina	Marikina River	538.1
SB-02	Mangahan	Mangahan Flood way	91.8
SB-03	Angono	Angono River	86.6
SB-04	Morong	Morong River	95.9
SB-05	Baras	Baras River	21.7
SB-06	Tanay	Tanay River	52.2
SB-07	Pililla	Pililla River	40.4
SB-08	Jala-jala	Jala-jala River	70.6
SB-09	Sta. Maria	Sta Maria River	202.2
SB-10	Siniloan	Romeo River	71.7
SB-11	Pangil	Pangil River	50.1
SB-12	Caliraya	Caliraya River	128.8
SB-13	Pagsanjan	Pagsanjan River	301.2
SB-14	Sta. Cruz	Sta. Cruz River	146.7
SB-15	Pila	Pila River	89.3
SB-16	Calauan	Calauan River	154.5
SB-17	Los Banos	Los Banos River	102.1
SB-18	San Juan	San Juan River	191.7
SB-19	San Cristobal	San Cristobal River	140.6
SB-20	Sta. Rosa	Sta. Rosa River	119.8
SB-21	Binan	Binan River	84.8
SB-22	San Pedro	San Pedro River	46.0
SB-23	Muntinlupa	Alaban River	44.1
SB-24	Taguig	Napindan Channel	44.5
合計 (SB00-SB23)			3,774.9

*1: Major river is shown for each sub-basin

*2: The catchment area is not the catchment area of the river but the area of the basin divided by the small basin.

Source: Data Collection Survey on Parañaque Spillway in Metro Manila(JICA, 2018)



Source: Data Collection Survey on Parañaque Spillway in Metro Manila(JICA, 2018)

Figure L-1 Basin Boundary of Laguna de Bay Basin

2. Utilization of Local Water Resources in Laguna Lake

Laguna de Bay is under jurisdiction by LLDA established in 1969. For the land along Laguna de Bay, Presidential Decree No. 813 (1975) stipulates the elevation of 12.5 m or less as a public land.

Under the management and control by the LLDA, the lake is utilized for inland fishery (fishing and aquaculture), and lake water is used for irrigation, hydropower generation, industrial (cooling) and transportation.

2.1 Fishery

Fishery in Laguna Lake is divided into fishing (open lake fishery) and aquaculture. Output of open lake fishery has been increasing in recent years: it has increased from 81 billion tons in 2008 to 90 billion tons in 2013. (Laguna Lake Master Plan, 2016)

Aquaculture in Laguna Lake is carried out in the forms of fish pen and fish cage. Fish pen is an artificial enclosure made up of bamboo poles constructed within a body of water for culturing fish. Fish cage is an enclosure which is either stationary or floating made up of nets or screens. The area of fish pen and fish cage was 12,0643ha as of 2015, accounts for approx. 13% of surface of lake water (900km²), composed of 10,386.86ha (86.1%) of fish pen and 1,677.77ha (13.9%) of fish cage. Gross output of the two was 149,271MT in 2008 and 155,518MT in 2013, accounting for slight increase. Main cultured fish species include Milkfish (Bangus), Tilapia and Carp.

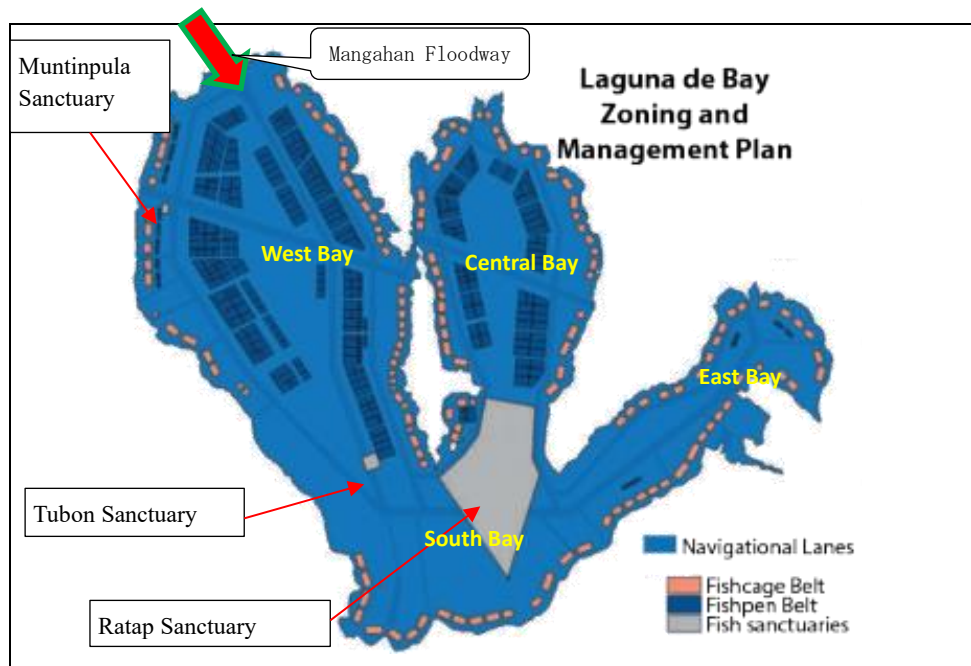
2.2 Zoning and Management Plan (ZOMAP)

Fish pen was introduced in Laguna Lake in 1973 and has rapidly proliferated because of its high productivity. Consequently, too many fish pens and fish cages have scattered, which resulted in diminishing productivity.

Under such circumstances, these socio-economic and environmental problems in Laguna Lake prompted LLDA to formulate and approve the Zoning and Management Plan (ZOMAP) on January 1996. Through the ZOMAP, lake resources are equitably delineated and allocated to various users for aquaculture operations, navigation, and open fishing. Figure L-2 shows the ZOMAP in 1999, which shows that fish cages are distributed along the lake shore and fish pens inside. It is shown in the figure that fish pens are located only in West Bay and Central Bay but very few in East Bay.

The ZOMAP is currently being reviewed and will be revised in January 2018 according to LLDA. It is because of over usage beyond the lake's carrying capacity under the current ZOMAP. After the ZOMAP is revised, the total area of fish pen and fish cage will be approx. 9,000ha according to an official of LLDA. (Sited from website of LLDA so far) Based on the such conditions, any fish pen and fish cage has not been installed at the area around outlet of the Mangahan Floodway.

Fish sanctuaries are established in Laguna Lake aiming at the protection of fish resources in the lake. There are three fish sanctuaries in the lake stipulated in LLDA Board Resolution No. 136 (2000) as shown in Figure L-2. All of three (3) sanctuaries designated in the Lagna de Bay are located far away from the outlet of the Mangahan Floodway as shown in Figure L-2.



Source: Web site of LLDA

Figure L-2 Zoning and Management Plan (ZOMAP) of Laguna Lake (1999)

2.3 Water Use for Irrigation, Domestic, Industrial and Hydropower Generation

Lake water in Laguna Lake is used with the issuance of Water Permits.

Water Permits are exclusively managed and issued by the National Water Resources Board (NWRB). Forty (40) Water Permits have been issued for usage of lake water, consisting of 37 for irrigation, and three others (domestic water supply, industrial water and hydropower). Intake points of each Water Permit are distributed, namely; two in Metro Manila Area (one for domestic water supply and another one for irrigation), three in Laguna Province (two for irrigation and one for hydropower generation), and 35 in Rizal Province (34 for irrigation and one for industrial water).

3. Ecosystem in Laguna Lake

3.1 Overview

Laguna Lake is the largest lake in the Philippines with an area of approx. 900km². It is the third largest in South-East Asia following the largest, Toba Lake in Indonesia, and the second largest Songkhla Lake in Thailand. Average depth of the lake is shallow, namely, 2.5m, but the volume/capacity is 3.2 billion m³ and the length of lakeshore line amounts up to 220km. Laguna Lake is bounded by Laguna Province at west, south and east shore, bounded by Rizal Province at north-east and north shore, and bounded by Metro Manila at north-west shore. The lake is divided into four areas: West Bay, Central Bay, East Bay and South Bay (Figures L-1 and L-2). Around 100 rivers and streams drain into the lake. On the other hand, there is only one outlet, the Napindan Channel, which drains lakewaters through the Pasig River into the Manila Bay. (Website of LLDA)

3.2 Biodiversity

Laguna Lake is endowed with rich natural resources and has a variety of organisms that comprise its biodiversity pool. Of note are the 31 species of fishes belonging to 16 families and 19 genera, the most dominant and important species were ayungin (*Therapon plumbeus*) and white goby (*Glossogobius giurus*), 154 species of phytoplankton, 36 species of zooplankton, and 24

species of macrophytes. Other organisms thriving in the lake include different species of mollusks, crustaceans, and birds that feed on the lake's resources. Commercially important fishes include white goby (*Glossogobius giurus*), mudfish (*Ophicephalus striatus*), ayungin (*Therapon plumbeus*), milkfish (*Chanos chanos*), catfish (*Clarias sp.*), kanduli (*Tilapia mossambica*), tilapias (*T. nilotica*), common carp (*Cyprinus carpio*), and plasalit (*Trichogaster sp.*). (Website of LLDA)

The freshwater prawn (*Macrobrachium sp.*) is also harvested commercially. A wide variety of waterfowl occur: the common species of which include yellow bittern (*Ixobrychus sinensis*), cinnamon bittern (*Ixobrychus cinnamomeus*), grey heron (*Ardea cinerea*), luzon rail (*Rallus mirificus*) (a species endemic to the Philippines), purple swamphen (*Porphyrio porphyrio*), *fulica ama*, black-winged stilt (*Himantopus himantopus*) and little tern (*Sterna albitrons*). Laguna Lake comprises a stopover for migratory birds, thanks to its rich ecosystem. (Website of LLDA)

3.3 Degree of Ecosystem Health of Laguna Lake

Water quality and aquatic ecosystem in Laguna Lake is characterized by a Laguna de Bay ecosystem health report card developed based on the water quality data of 2013. The ecosystem health report card was developed aiming at facilitating the understanding of ecosystem and water quality in the lake in collaboration with relevant organizations funded by UNEP and GEF.

Specifically, the ecosystem health of the lake for each zone (namely West Bay, Central Bay, East Bay and South Bay) is to be evaluated based on DENR environmental standards of water quality given to Laguna Lake (Class C) focusing on representative Water Quality Indicators: WQI (DO, BOD, Nitrate, Total Coliform, Phosphate, and Chlorophyll a) and Fisheries Indicators: FI (Native fish species, Zooplankton, and Catch per unit effort). Result of the evaluation is shown in Table L-2, revealing that water quality of the lake is evaluated to the levels of water quality C to D (degree of conformance: 70 to 83%)³, and fisheries indicators of F (degree of conformance: 0 to less than 70%). It is concluded that ecosystem health is evaluated as high in terms of water quality but not high in terms of fisheries indicators.

Table L-2 Degree of Ecosystem Health of Laguna Lake (2013)

Section	WQI		FI		Remarks
	Score (%)	Evaluation	Score (%)	Evaluation	
West Bay	76	C	55	F	Outlet
Central Bay	71	D	65	F	
East Bay	81	C	28	F	
South Bay	77	C	43	F	
Laguna Lake (whole area)	76	C	48	F	

注) Score and evaluation based on consistency with DENR standard (Class: C):

A: 91 – 100 %, B: 83 – 91 %, C: 75 – 83 %, D: 70 – 74 %, F: 0 – 70 %

出典: Laguna de Bay 2013 Scosystem Health Report Card,

http://ian.umces.edu/pdfs/ian_report_card_500.pdf#search=%272013+Ecosystem+Health+report%27

³ Of the water quality parameters, DO, BOD, Nitrate and Total Coliform conformed with the environmental standard, but Phosphate showed a wide range of conformance degree and Chlorophyll failed to conform with the standard at all areas.

ANNEX-9 : Draft Environmental Monitoring Form

MONITORING FORM (Draft) for EMoP

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
ex.) Responses/Actions to Comments and Guidance from Government Authorities on Noise, Air, Odor, etc.	

2. Monitoring in Pre-Construction Phase & Construction Phase

The Monitoring plan in construction phase and operation phase are shown below.

2.1 Monitoring Program

[Marikina River]

Item	Parameter	Frequency and Duration	Locations (Minimum quantity)
Noise	Noise level	One time before construction and Quarterly during construction (24 hours/time)	8 Points (Marikina River)
Vibration	Displacement Velocity Acceleration	At least 4 times during piling works	8 Points (Marikina River)
Air Quality	SO ₂ , NO ₂ , Dust	One time before construction and Quarterly during construction (24hours/time)	8 Points (Marikina River)
River Water Quality	DAO No.34 (All the parameters in Table1 and Table2)	Regular sampling :2 times/year Intensive monitoring upon the first dredging	8 Points (Marikina River)
River Water Flow	River Water Flow (m ³ /s)	2 times/year during Construction	8 Points (Marikina River)
River Water Quality (BOD,TSS)	BOD,TSS	One time before construction and one time every two months during construction	8 Points (Marikina River)
Aquatic Biota	-Density and Diversity of phytoplankton and zooplankton - Density and Diversity of macro benthic organisms -Nekton(fish) -Aquatic flora	One time before construction and Once during construction	8 Points (Marikina River)
Tree Cutting	-Specy -Size (diameter) -Location	One time before construction and one time after replanting	Along the both banks of Marikina River

[Dredged Material Treatment Yard]

Item	Parameter	Frequency and Duration	Locations (Minimum quantity)
Noise	Noise level	One time before construction and Quarterly during construction (24 hours/time)	4 Points
Air Quality	Dust Hydrogen Sulfide Lead Ammonia	One time before construction and Quarterly during construction (24hours/time)	4 Points
Effluent	DAO No.35 Parameters in Table1 and 2 (Class C)	Once/month during construction	Discharge Point(s)
Excavated/Dredged Material(Before Dredging)	Amount of Excavated/Dredged Material	One sample for every 5,000m ³ Excavated/Dredged Material	All the Excavated/Dredged Material
	Items in DAO No.35 (See the form)		
	Items in DAO92-29 (See the form)		
Disposal/Re-use of Excavated/Dredged Material (After treatment if treatment is necessary)	Items in DAO No.34 (See the form)	One sample for every 5,000m ³ Disposal/Re-use of Excavated/Dredged Material	All the Excavated/Dredged Material
	Items in DAO92-29 (See the form)		

Note: Excavated/Dredged Material will be checked by the Contractor.

[Backfill site]

Item	Parameter	Frequency and Duration	Locations (Minimum quantity)
Noise	Noise level	One time before construction and Quarterly during construction (24 hours/time)	4 Points
Air Quality	Dust, Lead	One time before construction and Quarterly during construction (24hours/time)	4 Points
Groundwater	PD856	One time before construction and semi-annually during construction	At least 2 points

2.2 Monitoring form

2.2.1 Marikina River

2.2.1.1 Noise:

DENR Standards for Noise (Presidential Decree No.984) is applied.

Follow the methodology in PD984.

Unit: (dBA)

Time	Class				
	AA	A	B	C	D
Daytime (0700-1700Hr)	50	60	65	70	75
Evening (1700-2100Hr)	45	50	60	65	70
Nighttime (2100-0500Hr)	40	45	55	60	60
Morning (0500-0700Hr)	45	50	60	65	70

Class AA – a section of contiguous area which requires quietness, such as areas within 100 meters from school sites, nursery schools, hospitals and special homes for the aged.
 Class A – a section or contiguous area which is primarily used for residential purposes.
 Class B – a section or contiguous area which is primarily a commercial area.
 Class C – a section primarily zoned or used as light industrial area.
 Class D – a section which is primarily reserved, zoned or used as a heavy industrial area

Location	Construction Activity	Distance from Construction site	Date of monitoring	Monitoring Time Regime	Monitoring Result	
					Max	Average
				Daytime		
				Evening		
				Nighttime		
				Morning		

Note:

Morning..... 5:00 A.M. to 7:00 A.M
 Daytime..... 7:00 A.M to 5:00 P.M.
 Evening..... 5:00 P.M. to 9:00 P.M
 Nighttime..... 9:00 P.M. to 5:00 A.M

2.2.1.2 Vibration

The maximum allowable peak particle velocity shall be established during D/D as in Phase IV.

Location	Construction Activity	Distance from Construction site	Date of Monitoring	Monitoring Result		
				Displacement (mm)	Velocity (mm/s)	Acceleration (m/sec ²)

2.2.1.3 Air quality:

Republic Act No.8749 is applied.

Unit: ($\mu\text{g}/\text{m}^3$)

Pollutants	Short Term			
	$\mu\text{g}/\text{m}^3$	ppm	Averaging time	Remarks
SO ₂	180	0.07	24hours	-
NO ₂	150	0.08	24hours	-
Dust	230	-	24hours	-

Point:

Date :

Item	Unit	Measured Value (Average)	Measured Value (Maximum)
SO ₂	$\mu\text{g}/\text{m}^3$		
NO _x	$\mu\text{g}/\text{m}^3$		
TSP	$\mu\text{g}/\text{m}^3$		

2.2.1.4. River water quality:

DAO No.34 is applied

Point:

Date:

Item	Unit	Country standard (C)	Measured Value	Remarks
Color	PCU	3		
Temperature	°C	-		
pH	-	6.5-8.5		
DO	mg/l	5.0		
BOD	mg/l	10		
TSS	mg/l	Not more than 30mg/L increase		
TDS	mg/l	-		
MBAS	mg/l	0.5		
Oil/Grease	mg/l	2		
Nitrate as N	mg/l	10		
Phosphate as P	mg/l	0.4		
Phenol	mg/l	0.02		
Total Coliforms	MPN/100ml	5000		
Chloride as Cl	MPN/100ml	350		
Copper	mg/l	0.05		
As	mg/l	0.05		
Cd	mg/l	0.01		
Cr ⁶⁺	mg/l	0.05		
CN	mg/l	0.05		
Pb	mg/l	0.05		
Total-Hg	mg/l	0.05		
Organophosphate	mg/l	Nil		
Turbidity	NTU	-		
Salinity	‰	-		
EC	uS/cm	-		

Note: The country standard here is a maximum value

2.2.1.5. River Water Flow

Date :

Location	Unit	Date of Monitoring	River Water Flow (m ³ /s) / (Water Level: m)
Rodriguez Bridge	m ³ /s		
San Mateo Bridge	m ³ /s		
Nangka	m ³ /s		
Marikina Bridge	m ³ /s		

2.2.2. Dredged Material Treatment Yard

2.2.2.1 Noise:

DENR Standards for Noise (Presidential Decree No.984) is applied.

Follow the methodology in PD No.984.

Unit: (dBA)

Time	Class				
	AA	A	B	C	D
Daytime (0700-1700Hr)	50	60	65	70	75
Evening (1700-2100Hr)	45	50	60	65	70
Nighttime (2100-0500Hr)	40	45	55	60	60
Morning (0500-0700Hr)	45	50	60	65	70

Class AA – a section of contiguous area which requires quietness, such as areas within 100 meters from school sites, nursery schools, hospitals and special homes for the aged.
 Class A – a section or contiguous area which is primarily used for residential purposes.
 Class B – a section or contiguous area which is primarily a commercial area.
 Class C – a section primarily zoned or used as light industrial area.
 Class D – a section which is primarily reserved, zoned or used as a heavy industrial area

Location	Construction Activity	Distance from Construction site	Date of monitoring	Monitoring Time Regime	Monitoring Result	
					Max	Average
				Daytime		
				Evening		
				Nighttime		
				Morning		

Note:

Morning.....	5:00 A.M. to 7:00 A.M
Daytime.....	7:00 A.M to 5:00 P.M.
Evening.....	5:00 P.M. to 9:00 P.M
Nighttime.....	9:00 P.M. to 5:00 A.M

2.2.2.2 Air quality

Republic Act No.8749 is applied.

Unit: ($\mu\text{g}/\text{m}^3$)

Pollutants	Short Term			Remarks
	$\mu\text{g}/\text{m}^3$	ppm	Averaging time	
Dust	230	-	24hours	-
H2S	-	0.07	30minutes	-
Pb	20	-	30minutes	-
Ammonia	200	0.28	30minutes	-

Point:

Date :

Item	Unit	Measured Value (Average)	Measured Value (Maximum)
Dust	$\mu\text{g}/\text{m}^3$		
H2S	$\mu\text{g}/\text{m}^3$		
Pb	$\mu\text{g}/\text{m}^3$		
Ammonia	$\mu\text{g}/\text{m}^3$		

2.2.2.3 Effluent

DAO No.35 is applied

Point:

Date:

Item	Unit	Country standard (Class C)	Measured Value	Remarks
Cd	mg/l	0.05		
Cr ⁶⁺	mg/l	0.1		
Pb	mg/l	0.3		
Hg	mg/l	0.005		
PCB	mg/l	0.003		
CN	mg/l	0.2		
As	mg/l	0.2		
Formaldehyde	mg/l	1.0		
Color	PCU	150		
pH	-	6.5-9.0		
COD	mg/l	100		
BOD	mg/l	50		
TSS	mg/l	70		
Oil/Grease	mg/l	5.0		
Phenolic Substances as Phenol	mg/l	0.1		
Total Coliforms	MPN/100ml	10,000		

2.2.2.4. Excavated/Dredged Material

(1) Heavy Metal Concentration

DAO No.35 is applied

Point:

Date:

Item	Unit	Country standard (Class C)	Measured Value	Remarks
Cd	mg/l	0.05		Elutriate Test
Cr ⁶⁺	mg/l	0.1		
Pb	mg/l	0.3		
Hg	mg/l	0.005		
PCB	mg/l	0.003		
CN	mg/l	0.2		
As	mg/l	0.2		
TSS	mg/l	70		

(2) Disposal and re-use of excavated soil amount

Date:

CHAPTER 1 REA OF DREDGING WORK CHAPTER 2 STA.NO.)	Excavated/Dredged Amount Approx.('000 m³)	Name of Disposed Site/re-used area	Disposed/re-used Amount Approx. ('000 m3)	Remarks

Note: Hazardous material shall be separately filled in.

(3) Heavy Metal Concentration (TCLP test)

DAO 92-29 is applied

Point:

Date:

Item	Unit	Country standard (Hazardous)	Measured Value	Remarks
Cd	mg/l	5		TCLP test
Cr ⁶⁺	mg/l	5		
Pb	mg/l	5		
Hg	mg/l	0.2		
Se	mg/l	1.0		
Ba	mg/l	100		
As	mg/l	5		

2.2.2.5. Disposal/Re-use of Excavated/Dredged Material

(After treatment if treatment is necessary)

(1) Heavy Metal Concentration (Elutriate test)

DAO No.34 is applied

Point:

Date:

Item	Unit	Country standard (Class C)	Measured Value	Remarks
Cd	mg/l	0.01		Elutriate Test with fresh water
Cr ⁶⁺	mg/l	0.05		
Pb	mg/l	0.05		
Hg	mg/l	0.002		
CN	mg/l	0.05		
As	mg/l	0.05		
Organophosph hate	mg/l	nil		

(2) Heavy Metal Concentration (TCLP test)

DAO 92-29 is applied

Point:

Date:

Item	Unit	Country standard (Hazardous)	Measured Value	Remarks
Cd	mg/l	5		TCLP test
Cr ⁶⁺	mg/l	5		
Pb	mg/l	5		
Hg	mg/l	0.2		
Se	mg/l	1.0		
Ba	mg/l	100		
As	mg/l	5		

2.2.3 Reclamation site

2.2.3.1 Noise:

DENR Standards for Noise(Presidential Decree No.984) is applied.

Follow the methodology in PD No.984.

Unit: (dBA)

Time	Class				
	AA	A	B	C	D
Daytime (0700-1700Hr)	50	60	65	70	75
Evening (1700-2100Hr)	45	50	60	65	70
Nighttime (2100-0500Hr)	40	45	55	60	60
Morning (0500-0700Hr)	45	50	60	65	70

Class AA – a section of contiguous area which requires quietness, such as areas within 100 meters from school sites, nursery schools, hospitals and special homes for the aged.
 Class A – a section or contiguous area which is primarily used for residential purposes.
 Class B – a section or contiguous area which is primarily a commercial area.
 Class C – a section primarily zoned or used as light industrial area.
 Class D – a section which is primarily reserved, zoned or used as a heavy industrial area

Location	Construction Activity	Distance from Construction site	Date Of monitoring	Monitoring Time Regime	Monitoring Result	
					Max	Average
				Daytime		
				Evening		
				Nighttime		
				Morning		

Note:

Morning..... 5:00 A.M. to 7:00 A.M
 Daytime..... 7:00 A.M to 5:00 P.M.
 Evening..... 5:00 P.M. to 9:00 P.M
 Nighttime..... 9:00 P.M. to 5:00 A.M

2.2.3.2 Air quality

Republic Act No.8749 is applied.

Unit: ($\mu\text{g}/\text{m}^3$)

Pollutants	Short Term			Remarks
	$\mu\text{g}/\text{m}^3$	ppm	Averaging time	
Dust	230	-	24hours	-
Pb	20	-	30minutes	-

Point:

Date :

Item	Unit	Measured Value (Average)	Measured Value (Maximum)
Dust	$\mu\text{g}/\text{m}^3$		
Pb	$\mu\text{g}/\text{m}^3$		

2.2.3.3 Groundwater

Point:

Date :

Item	Unit	Country standard	Measured Value	Remarks
E. Coli or Thermotolerant (fecal) coliform bacteria	No./100ml	0		
Biological Organisms	count/ml	10		
Sb	mg/l	0.005		
Ar	mg/l	0.01		
Ba	mg/l	0.7		
B	mg/l	0.3		
Cd	mg/l	0.003		
Cr	mg/l	0.05		
CN	mg/L	0.07		
F	mg/L	1		
Pb	mg/L	0.01		
Total-Hg	mg/L	0.001		
Nitrate as in NO ₃ -	mg/L	50		
Nitrate as in NO ₂ -	mg/L	3		
Se	mg/L	0.01		
Aldrin & Dieldrin	ug/L	0.03		
Chlordane	ug/L	0.2		
DDT	ug/L	2		
Endrin	ug/L	0.2		
Heptachlor and Heptachlor epoxide	ug/L	0.03		
Lindane	ug/L	2		
Methoxychlor	ug/L	20		
Petroleum oils & grease	ug/L	nil		
Toxyphane	ug/L	5		
2,4 - D	ug/L	30		

2,4,5 - T	ug/L	9	
Taste	-	Unobjectionable	
Odor	-	Unobjectionable	
Color	TCU	5	
Turbidity	NTU	5	
Al	mg/L	0.2	
Cl	mg/L	250	
Cu	mg/L	1	
Hardness	mg/L	300	
H2S	mg/L	0.05	
Fe	mg/L	1	
Mg	mg/L	0.5	
pH	mg/L	6.5-8.5	
Na	mg/L	200	
S	mg/L	250	
TSS	mg/L	500	
Zn	mg/L	5	

3. Monitoring in Operation Phase

The Monitoring plan in operation phase is shown below.

3.1 Monitoring program

[Marikina River]

Item	Parameter	Frequency and Duration	Locations (Minimum quantity)
Aquatic Biota	-Density and Diversity of phytoplankton and zooplankton - Density and Diversity of macro benthic organisms -Nekton(fish) -Aquatic flora	Once	8 Points(Marikina River)

[Reclamation Area]

Item	Parameter	Frequency and Duration	Locations (Minimum quantity)
Groundwater	PD856	Twice/year for 2 years	At least 2 points

3.2 Monitoring Form

3.2.1. Marikina River

3.2.1.1 Aquatic Biota

Point:

Date:

Species	Number of Species	Abundance/Density	Remarks

3.2.2 Reclamation site

3.2.2.2. Ground water quality

Point:

Date:

Item	Unit	Country standard	Measured Value	Remarks
E. Coli or Thermotolerant (fecal) coliform bacteria	No./100ml	0		
Biological Organisms	count/ml	10		
Sb	mg/l	0.005		
Ar	mg/l	0.01		
Ba	mg/l	0.7		
B	mg/l	0.3		
Cd	mg/l	0.003		
Cr	mg/l	0.05		
CN	mg/L	0.07		

F	mg/L	1	
Pb	mg/L	0.01	
Total-Hg	mg/L	0.001	
Nitrate as in NO3-	mg/L	50	
Nitrate as in NO2-	mg/L	3	
Se	mg/L	0.01	
Aldrin & Dieldrin	ug/L	0.03	
Chlordane	ug/L	0.2	
DDT	ug/L	2	
Endrin	ug/L	0.2	
Heptachlor and Heptachlor epoxide	ug/L	0.03	
Lindane	ug/L	2	
Methoxychlor	ug/L	20	
Petroleum oils & grease	ug/L	nil	
Toxyphane	ug/L	5	
2,4 - D	ug/L	30	
2,4,5 - T	ug/L	9	
Taste	-	Unobjectionable	
Odor	-	Unobjectionable	
Color	TCU	5	
Turbidity	NTU	5	
Al	mg/L	0.2	
Cl	mg/L	250	
Cu	mg/L	1	
Hardness	mg/L	300	
H2S	mg/L	0.05	
Fe	mg/L	1	
Mg	mg/L	0.5	
pH	mg/L	6.5-8.5	
Na	mg/L	200	
S	mg/L	250	
TSS	mg/L	500	
Zn	mg/L	5	