



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Environmental and Social Impact Assessment

Proposed Metro Manila
BRT Line - 1 Project

DRAFT

Draft Report

March 2015



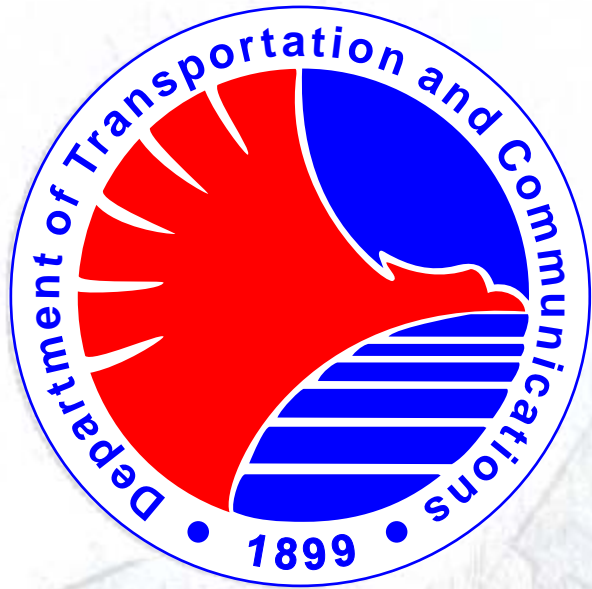


Table of Contents

TABLE OF CONTENTS
Environmental and Social Impact Assessment (ESIA)
Metro Manila BRT Line-1 Project

COVER LETTER		Page
SECTION		
1.0	EXECUTIVE SUMMARY	1-1
2.0	POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK	2-1
2.1	Governing National Laws On Environmental Assessments	2-1
2.2	General Policies and Laws on Land Transportation	2-2
2.3	Related Policies to Social Impact Assessment	2-3
	2.3.1 Laws and Standards Related to Accessibility and PWDs	2-3
	2.3.2 Policies on Elderly or Senior Citizens	2-4
	2.3.3 Gender Related Policies and Standards	2-5
	2.3.4 Policies on Land Acquisition and Resettlement	2-6
2.4	Gaps between Philippine Government and World Bank policies on key issues	2-7
3.0	PROJECT DESCRIPTION.....	3-1
3.1	Project Background.....	3-1
3.2	Project Rationale and Objectives	3-1
3.3	The BRT Corridor and Location	3-1
3.4	Project Components	3-4
	3.4.1 Segregated Bus Running Way.....	3-4
	3.4.2 Bus Stations	3-4
	3.4.2.1 Components of Bus Stations	3-7
	3.4.2.2 Outline Specification of Bus Station.....	3-9
	3.4.3 Intelligent Transport Systems.....	3-11
	3.4.4 Ticketing	3-13
	3.4.5 Vehicles	3-15
	3.4.5.1 Recommendations for vehicle configuration	3-15
	3.4.5.2 Functional and technical specification	3-17
	3.4.5.3 Finalizing the bus specification	3-18
	3.4.6 Bus Depot	3-19
	3.4.7 Branding	3-20
3.5	Bus Operation Service Plan	3-20
3.6	Operational Management	3-20
	3.6.1 Role of the System Management Company.....	3-21
	3.6.2 Operations Management Requirements.....	3-22
	3.6.3 Organizational Structure for System Operations Management	3-22
3.7	Project Cost	3-25
3.8	Implementation Schedule	3-25
4.0	ENVIRONMENTAL BASELINE DATA.....	4-1
4.1	Physical Environment	4-1
	4.1.1 Geology and Geomorphologic Characteristics	4-1
	4.1.1.1 Stratigraphy	4-1
	4.1.1.2 Seismic activity	4-3
	4.1.2 Soil Characteristics	4-4
	4.1.3 Topography and Slope	4-4
	4.1.4 Drainage Pattern.....	4-4
	4.1.5 Flooding	4-5
	4.1.6 Water Quality	4-9

4.1.7	Climatology	4-11
4.1.8	Ambient Air Quality	4-14
4.1.8.1	Air Quality Monitoring (from DENR).....	4-14
4.1.8.2	On-site Air Sampling and Measurement	4-16
4.1.9	Air Quality Modeling.....	4-22
4.1.10	Current Year GHG Emissions	4-29
4.1.11	Land Use.....	4-30
4.1.12	Archaeological and Cultural Resources.....	4-34
4.1.13	Alignment Sheets.....	4-35
4.1.14	BRT Corridor Existing Condition	4-35
4.2	Biological Environment	4-54
4.2.1	Flora and Fauna.....	4-54
4.2.2	Ecologically Sensitive Landscape	4-55
4.3	Social Environment	4-56
4.3.1	Economic Structure	4-56
4.3.2	Health	4-57
4.3.3	Social Services / Utilities.....	4-57
4.3.3.1	Transportation	4-57
4.3.3.2	Power Supply	4-58
4.3.3.3	Communication Infrastructure.....	4-58
4.3.3.4	Water Supply	4-58
4.3.3.5	Roads and Traffic	4-58
4.3.4	Local Government Units.....	4-60
4.3.4.1	Local Government of Quezon City.....	4-60
4.3.4.2	Local Government of Manila	4-61
4.3.5	Commuters and Traffic Forecast.....	4-62
4.3.6	Public Utility Vehicle Sector.....	4-65
4.3.6.1	PUJ and PUB Routes and Units Operating.....	4-65
4.3.6.2	Socioeconomic Profiles.....	4-67
4.3.7	Affected Commercial Establishments and Close to Stations	4-74
4.3.8	Senior Citizens, PWDs and Women	4-75
5.0	ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES	5-1
5.1.	Potential Environmental and Social Impacts Associated with the Project.....	5-1
5.1.1	Physical and Biological Impacts	5-1
5.1.2	Social Impacts.....	5-2
5.1.3	Cumulative, Indirect and Induced Environmental Impacts.....	5-2
5.1.3.1	Cumulative Impacts.....	5-2
5.1.3.2	Indirect Impacts	5-2
5.1.3.3	Induced Impacts	5-2
5.1.4	ESMP Approach	5-3
5.2	Positive Impacts of the Proposed Project	5-3
5.2.1	Socioeconomic Benefit	5-3
5.2.2	Quantified Economic Benefits	5-5
5.2.3	Environmental Benefits.....	5-6
5.3	Negative Impacts of the Proposed Project.....	5-7
5.3.1	Adversely Affected Sectors	5-7
5.3.2	Economic Dislocation of PUJ Drivers and Operators.....	5-7
5.3.3	Economic Dislocation of PUB Drivers and Operators	5-9
5.3.4	Summary of Social Impacts.....	5-9
5.4	EMP for Physical and Biological/Ecological Impacts.....	5-11
5.4.1	ESMP During Design Stage (Pre-Construction Phase)	5-11
5.4.1.1	Design / Pre-Construction Phase	5-11
5.4.1.2	Design Measures and Project Disclosure	5-11
5.4.1.3	Project Boundaries Change near Sensitive Receivers	5-13
5.4.1.4	Environmental Capacity Development of DOTC/PIU	5-13
5.4.1.5	Preparation of Site-specific ESMPs.....	5-13
5.4.1.6	Environmentally Responsible Procurement	5-14

5.4.1.7	Utilities Coordinating Committee.....	5-14
5.4.1.8	Ambient Environmental Baseline Data (Air quality and Noise).....	5-15
5.4.1.9	Enhancements through Urban Greening.....	5-15
5.4.2	ESMP During Construction Phase.....	5-16
5.4.2.1	ESMP Activation and Securing of Permits and Licenses	5-16
5.4.2.2	Orientation of Contractor.....	5-16
5.4.2.3	Loss of Trees/Deforestation and Impacts to Fauna	5-16
5.4.2.4	Drainage and Hydrology	5-18
5.4.2.5	Utilities Management.....	5-18
5.4.2.6	Materials Exploitation and Management	5-19
5.4.2.7	Spoil Disposal.....	5-21
5.4.2.8	General Construction Waste Management	5-22
5.4.2.9	Hazardous Materials and Hazardous Waste Disposal	5-23
5.4.2.10	Asphalt Hot Mix Plant, Rock Crushing and Bitumen Supply	5-24
5.4.2.11	Noise and Dust.....	5-25
5.4.2.12	Vibration.....	5-26
5.4.2.13	Excavation and Protection, Runoff Control and Protection of Works.....	5-26
5.4.2.14	River Protection, Road Reconstruction/Demolition and Replacement	5-27
5.4.2.15	Water Quality.....	5-27
5.4.2.16	Water Resources.....	5-28
5.4.2.17	Construction Camps and Canteen Facilities	5-28
5.4.2.18	Sanitation and Disease Vectors.....	5-29
5.4.2.19	Occupational Health and Safety	5-29
5.4.2.20	Community Health and Safety	5-29
5.4.2.21	Traffic Management	5-30
5.4.2.22	Physical Cultural Resources Management Plan.....	5-34
5.4.2.23	Enhancements through Urban Greening.....	5-35
5.4.3	ESMP during Operational Phase	5-35
5.4.3.1	Noise.....	5-35
5.4.3.2	Gaseous Emissions.....	5-35
5.4.3.3	Particulate Emissions	5-35
5.4.3.4	Domestic Waste Generations	5-35
5.4.3.5	Driving Conditions and Community Safety.....	5-36
5.5	Social Management Plan (SMP)	5-36
5.5.1	Options Addressing Economic Dislocation in the PUV Sector	5-36
5.5.2	Desire for Flexibility to co-exist with the BRT	5-37
5.5.3	Scrapping or wholesale purchase of old PUJ units by the government	5-37
5.5.4	Participation in the BRT System as Investors	5-37
5.5.5	Provision of alternative livelihood/TESDA training to and preferential of affected drivers/personnel and/or members of affected households.....	5-38
5.5.6	Analysis of SMP Options Presented	5-36
5.5.7	Custom-Made SMPs for PUJ Drivers and Operators.....	5-38
5.5.7.1	The Case of Tropang Tsuper.....	5-38
5.5.7.2	The Case of HEQFAJODA	5-42
5.5.7.3	The Case of COMMTRANSDECO	5-44
5.5.7.4	Other PUJ/PUB Organizations	5-45
5.5.8	Social Management Framework for the Affected Commercial Establishments.....	5-45
5.5.8.1	Entitlement Eligibility.....	5-45
5.5.8.2	Identification, Tagging and Appraisal.....	5-46
5.5.8.3	Consultations with PAPs and Compensation.....	5-47
5.5.9	Gender Action Plan.....	5-47
5.5.10	SMP Measures to address accessibility to PWDs, elderly and students	5-47
6.0	ANALYSIS OF ALTERNATIVES.....	6-1
6.1	No-Project Alternative	6-1
6.2	With Project Alternative.....	6-1

6.3	Project Alternatives	6-2
6.3.1	Alternative BRT Routes	6-2
6.3.2	BRT System over LRT System	6-5
6.3.3	Other Alternatives Studied for the Project	6-6
7.0	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)	7-1
7.1	ESMP Safeguard Compliance.....	7-1
7.1.1	Responsibilities for ESMP Implementation.....	7-2
7.2	Environmental Management Plan (EMP).....	7-6
7.3	Social Management Plan (SMP) and Monitoring Works	7-6
7.3.1	Cost of Social Management Measures	7-86
7.4	Environmental Monitoring Works	7-87
7.4.1	Compliance Monitoring.....	7-87
7.4.1.1	Design Stage	7-87
7.4.1.2	Pre-construction Stage.....	7-88
7.4.1.3	Construction Stage.....	7-88
7.4.1.4	Operational Stage	7-88
7.4.2	Reporting and Monitoring Parameters	7-88
7.5	Environmental Monitoring Costs	7-88
7.6	Environmental Capacity Building and Training	7-89
7.7	Conclusions.....	7-90
8.0	CONSULTATION, INFORMATION DISCLOSURE, & GRIEVANCE REDRESS MECHANISM.....	8-1
8.1	Stakeholder Identification	8-1
8.1.1	Direct Stakeholders	8-1
8.1.2	Indirect Stakeholders	8-1
8.2	Public Consultations during DTS Stage.....	8-1
8.2.1	Local Government Units	8-2
8.2.2	Public Utility Vehicles (PUV) operators and drivers	8-2
8.2.3	Special interest groups	8-3
8.3	Public Consultations during the ESIA Stage.....	8-4
8.3.1	Meetings with the PUJ/PUB Sectors.....	8-7
8.3.2	Meetings with the PWD Sector	8-7
8.4	Future Public Consultations.....	8-8
8.5	Community Relations and Participation Plan (CRPP).....	8-8
8.5.1	Civil Society Consultative Committee (CSCC)	8-8
8.5.2	Public Relations and Communication Group.....	8-8
8.5.3	Information Dissemination and Stakeholder Enhancement Plan	8-8
8.5.4	Community Support	8-10
8.6	Grievance Redress Mechanism (GRM).....	8-10
8.6.1	Designation of Grievance Officer (GO) and Formation of Grievance Redress Committee (GRC)	8-11
8.6.2	Grievance Reporting and Resolution	8-11
8.6.3	Grievance Mechanism Disclosure	8-12
9.0	LIST OF REFERENCES	

ANNEXES

Annex 1:	Tabulated Air Quality and Noise Survey Results
Annex 2:	Water and Air Quality Laboratory Results
Annex 3:	Alignment Sheets
Annex 4:	Chance Find Procedure
Annex 5:	Supporting Documents – Tropang Tsuper
Annex 6:	Supporting Documents – HEQFAJODA
Annex 7:	Supporting Documents – COMMTRANSDECO
Annex 8:	Public Consultation Meetings
Annex 9:	Tabulated Caline-4 Output
Annex 10:	DAO 2015-04 – Implementation of Vehicle Emission Limits for Euro 4/IV, and In-Use Vehicle Emission Standards

LIST OF TABLES

Table 1.1.1	Estimated Capacity Building, ESMP and Community Plan Cost	1-4
Table 2.4.1	Comparative Analysis between Philippine policies and laws on entitlements to project affected persons (PAPs) with WB's social safeguard policies	2-7
Table 3.3.1	Proposed BRT Stations with Corresponding Geographical Location	3-2
Table 3.4.1	Technical Specifications of BRT Vehicles.....	3-17
Table 4.1.1	Comparative Seismicity Risk Level	4-3
Table 4.1.2	Water Sampling Locations.....	4-9
Table 4.1.3	Results of Analysis of Water Quality Survey.....	4-11
Table 4.1.4	Climatological Normal Values.....	4-12
Table 4.1.5	Climatological Extreme Values.....	4-12
Table 4.1.6	Annual values of TSP at four sites in NCR	4-15
Table 4.1.7	Values of PM10 at two sites close to BRT alignment.....	4-16
Table 4.1.8	Location and Description of Air and Noise Sampling Stations	4-17
Table 4.1.9	Measured Air Quality for BRT Project	4-19
Table 4.1.10	National Ambient Air Quality Guidelines/Standards for Selected Air Pollutants.....	4-20
Table 4.1.11	Measured Noise Level for BRT Project.....	4-21
Table 4.1.12	DENR Standards for Noise in General Areas.....	4-21
Table 4.1.13	Expected Noise Levels from Construction Equipment, dB(A).....	4-22
Table 4.1.14	UK - Road Transport Emission Factors: 2008 NAEI For Urban Driving	4-23
Table 4.1.15	Vehicle Flows along the Espana Avenue and Quezon Avenue.....	4-26
Table 4.1.16	Estimate Vehicle Flows along the Espana Avenue and Quezon Avenue	4-26
Table 4.1.17	Computed 2013 and 2018 Emission	4-26
Table 4.1.18	Predicted GLC for Espana Avenue Road Link	4-27
Table 4.1.19	Predicted GLC for Quezon Avenue Road Link.....	4-27
Table 4.1.20	Observed Concentration for CO, NOx and PM2.5 during Baseline Survey (Feb. 4-9, 2015)	4-28
Table 4.1.21	Baseline Concentration and Predicted GLC for Espana Avenue Road Link.....	4-28
Table 4.1.22	Baseline Concentration and Predicted GLC for Quezon Avenue Road Link	4-28
Table 4.1.23	National Ambient Air Quality Standard Values(NAAQV).....	4-29
Table 4.1.24	Current greenhouse gas emission factors derived from IVE model	4-29
Table 4.1.25	Annual GHG Emissions	4-30
Table 4.1.26	Areas of growth, land use and expected changes and effect of the project	4-32
Table 4.1.27	Inventory of Affected Trees, Utilities and Structures	4-41
Table 4.1.28	Summary of Potential Issues and Management Measures along the Proposed BRT Station	4-43
Table 4.3.1	Number of Motor Vehicles Registered, New-renewal, By Type: Annual 2013.....	4-59
Table 4.3.2	Westbound aggregated vehicle count by time period and location	4-62
Table 4.3.3	Eastbound aggregated vehicle count by time period and location	4-62
Table 4.3.4	Westbound aggregated passenger count by time period and location.....	4-62
Table 4.3.5	Eastbound aggregated passenger count by time period and location.....	4-63

Table 4.3.6	Average PUV Speeds, C5 to Lawton	4-64
Table 4.3.7	PUJ Routes Affected by the Manila BRT Project	4-68
Table 4.3.8	List of PUJ and PUB Organizations	4-69
Table 4.3.9	Age Grouping of PUJ Drivers	4-70
Table 4.3.10	Household Size and Average Daily Income of Drivers.....	4-70
Table 4.3.11	Other Skill of PUJ Drivers.....	4-71
Table 4.3.12	Common Illness of PUJ Drivers	4-72
Table 4.3.13	Commercial establishments too close to BRT stations	4-74
Table 4.3.14	Estimated population of vulnerable groups in Metro Manila	4-75
Table 5.1.1	Project Impacts Associated with the Proposed MM BRT Line-1 Project.....	5-1
Table 5.2.1	Expected social benefits, issues and considerations, and expected impact, Metro Manila BRT Line-1 Project.....	5-4
Table 5.2.2	Projected Economic Benefits (PhP current prices) 2016 to 2030.....	5-5
Table 5.2.3	Accident Benefits	5-6
Table 5.3.1	PUJ routes, franchises, and operating units traversing 12 km or more along the Metro Manila BRT Line-1 Corridor	5-8
Table 5.3.2	Summary of Potential Social Impacts of the Project.....	5-10
Table 5.4.1	Proposed Traffic Diversion Routes	5-32
Table 5.4.2	Elements of Traffic Management Plan and Mitigating Measures	5-33
Table 5.5.1	Analysis of SMP Options for the PAPs in the PUJ and PUB Sector	5-39
Table 5.5.2	Eligibility Entitlement Matrix, Affected Establishments on BRT Stations, QC- Manila BRT Project	5-45
Table 6.3.1	Evaluation of Alternative Bus Route Options via (1) Nicanor Reyes and CM Recto Avenue and (2) Lerma Avenue and Quezon Boulevard	6-4
Table 6.3.2	Comparative analysis of BRT and LRT Systems.....	6-5
Table 6.3.3	Summary of Various Alternatives Studied	6-7
Table 7.1.1	Responsibilities for ESMP Implementation.....	7-2
Table 7.1.2	Other Entities that may be involved in ESMP Implementation	7-6
Table 7.2.1	Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project.....	7-7
Table 7.3.1	Social Impact Management Measures and Activities	7-74
Table 7.3.2	Cost of Social Management Measures	7-86
Table 7.5.1	Estimated Annual Environmental Monitoring Cost	7-89
Table 7.6.1	Estimated Annual Capacity Building and EMP Cost.....	7-90
Table 8.1.1	Public consultation meetings during DTS Phase, Metro Manila BRT Line-1 Project	8-1
Table 8.2.1	Summary of Consultation Meetings Held, ESIA for the Metro Manila BRT Line-1	8-5
Table 8.5.1	Stakeholder Communications Plan and Responsibilities	8-9
Table 8.6.1	Grievance Classification Criteria and Responsibilities.....	8-11

LIST OF FIGURES

Figure 3.3.1	Vicinity Map of the Proposed BRT with Respect to Land Use Map.....	3-3
Figure 3.4.1	Station Platform: Centre Median	3-5
Figure 3.4.2	Station Platform: Curb Side	3-6
Figure 3.4.3	Operationally Efficient Depot Arrangement.....	3-19
Figure 4.1.1	Geologic Map of Metro Manila.....	4-2
Figure 4.1.2	Flood Risk Map of Metro Manila.....	4-7
Figure 4.1.3	Proposed Components and Measures in DICAMM Project	4-8
Figure 4.1.4	Water Quality Sampling Stations	4-10
Figure 4.1.5	Climatological Normal Values Map	4-12
Figure 4.1.6	Location of Air Quality and Noise Sampling Stations	4-18
Figure 4.1.7	España and Lacson Street	4-24
Figure 4.1.8	Quezon Avenue and EDSA	4-25
Figure 4.1.9	Land Use Map of Quezon City and Manila City	4-31
Figure 4.1.10	Multi-centered neighbourhood/connected urban development, City of Manila	4-32
Figure 4.1.11	Growth Centers Map, Quezon City	4-33
Figure 4.1.12	Map of Physical and Cultural Properties and Historical Landmarks	4-37
Figure 4.1.13	Map of Major Hospital Located near and along the Proposed BRT Corridor	4-38
Figure 4.1.14	Schools/Universities Located near and along the Proposed BRT Corridor	4-39
Figure 4.1.15	Malls and Supermarkets Located near and along the Proposed BRT Corridor	4-40
Figure 4.3.1	Existing Travel Speeds along Metro Manila Road Network	4-60
Figure 4.3.2	Passenger Mode Share by Direction	4-63
Figure 4.3.3	PUJs and PUBs Route Map.....	4-66
Figure 4.3.4	Breakdown of surveyed PUJ.....	4-67
Figure 5.4.1	Map of Existing PUJ Routes	5-41
Figure 5.4.2	Proposed New PUJ Routes	5-43
Figure 6.3.1	Strategic Mass Transit Network in Metro Manila Proposed by DOTC.....	6-3
Figure 6.3.2	Alternative BRT Routes via (1) Nicanor Reyes and CM Recto Avenue and (2) Lerma Avenue and Quezon Boulevard	6-4
Figure 7.1.1	Proposed Metro Manila BRT Line -1 Organizational Chart (for ESMP Implementation).....	7-5

ABBREVIATIONS

ALPHA	
ATCS	Area Traffic Control System
AUV	Asian Utility vehicle
AWWA	
BOD	Biological Oxygen Demand
BP	Batas Pambansa
BPH	Buses Per Hour
BRT	Bus Rapid Transit
CA	Commonwealth Act
CCTV	Closed-Circuit Television
CEMP	Contractor's Environmental Management Plan
CENRO	City Environment and Natural Resources Office
CH ₄	Methane
CHB	concrete hollow blocks
CLUP	Comprehensive Land Use Plan
CMTS	Cellular Mobile Telephone Service
CNG	Compressed Natural Gas
CO	Carbon monoxide
COD	Chemical Oxygen Demand
CO ₂	Carbon dioxide
CO ₂ e	CO ₂ equivalent
COMMTRANSDECO	Commonwealth Transport Service and Development Cooperative
CPC	Certificates of Public Convenience
CPITC	CPI Total Corporation
CRPP	Community Relations and Participation Plan
CSCC	Civil Society Consultative Committee
CSR	Corporate Social Responsibility
dB	decibel
DBM	Department of Budget and Management
DED	Detailed Engineering Design
DENR	Department of Environment and Natural Resources
DENR-EMB	Department of Environment and Natural Resources- Environmental Management Bureau
DILG	Department of Interior and Local Government
DMP	Drainage Management Plan
DO	Department Order
DOLE	Department of Labor and Employment
DOTC	Department of Transportation and Communications
DOTC-PMO	Department of Transportation and Communication- Project management Office
DPs	Displaced Persons
DPWH	Department of Public Works and Highways
DTS	Detailed Technical Study
EA	Environmental Assessment
ECA	Environmentally Critical Areas
ECC	Environmental Compliance Certificate
ECPs	Environmentally Critical Projects
EDSA	Epifanio de los Santos Avenue
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Plan
EO	Executive Order
EPC	Engineering Procurement and Commissioning
EPRCP	Excavation Protection and Runoff Control Plan
ESC	Environment and Safety Committee

ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EST	Environmentally Sustainable Transport
Et al	And others
Etc.	And other things/ and the rest
FD	Final Design
FMB	Forest Management Bureau
FS	Feasibility Study
g/km	Gram per kilometer
GAD	Gender and Development
GHG	Green House Gas
GIS	Geographic Information Systems
GCC	General Conditions of the Contract
GO	Grievance Officer
GOP	Government of the Philippines
GPS	Global Positioning System
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HEQFAJODA	Hypermart EDSA Quezon Boulevard Fairview Jeepney Operators and Drivers Association, Inc.
HIV-AIDS	Human Immunodeficiency Virus Infection - Acquired Immunodeficiency Syndrome
HLURB	Housing and Land Use Regulatory Board
HOT	High occupancy/ toll
HOV	
i.e.	that is
IT	Information Technology
ITP	Integrated Transport Planning, Limited
ITS	Intelligent Transportation Systems
IVE	International Vehicle Emissions
KAPCOMJODA	
LED	light-emitting diodes
LGU	Local Government Unit
LRT1	Light Rail Transit System Line 1
LTO	Land Transportation Office
LTFRB	Land Transportation Franchising & Regulatory Board
MMDA	Metropolitan Manila Development Authority
MMP	Materials Management Plan
MMT	Multi-Partite Monitoring Team
MRT3	Metro Rail Transit Line 3
MSDS	Material Safety Data sheet
MW	Megawatt
N ₂ O	Nitrous Oxide
NAAQGV	National Ambient Air Quality Guideline Values of Philippines
NCCA	National Commission of Culture and Arts
NCCSP	National Center for Commuter Safety and Protection
NCDA	National Council for Disability Affair
NCRFW	National Commission on the Role of Filipino Women
NDCP	Noise and Dust Control Plan
NEDA	National Economic and Development Authority
NGOs	Non-Government Organizations
NLEX	North Luzon Expressway
NM	National Museum
NO _x	Nitrogen oxide compound
NPCC	National Pollution Control Commission
OD Survey	Origin Destination Survey
OHSAS	Occupational Health and Safety Assessment System

OP	Operational Policy
PAPs	Project Affected Persons
PC	Public Consultation
PCR	Physical Cultural Resources
PCW	Philippine Commission on Women
PD	Presidential Decree
PDPW	Philippine Development Plan for Women
PEISS	Philippine Environmental Impact Statement System
PIU	Project Implementing Unit
PLA	Philippines Labor Act
PM	Particulate Matter
PME	Powered Mechanical Equipment
PMO	Project Management Office
PMU	Project Management Unit
PNP	Philippine National Police
PPE	Personal Protective Equipment
PPGD	Philippine Plan for Gender-responsive Development
ppm	Parts per million
PT	Public Transport
PUB	Public Utility Bus
PUJ	Public Utility Jeepney
PUV	Public Utility Vehicle
PVR	Peak Vehicle Requirement
PWD	People With Disability
RA	Republic Act
RCP	Runoff Control Plan
ROW	Right-Of-Way
SEMPs	Specific Environmental Management Plans
SIA	Social Impact Assessment
SJDM	San Jose Del Monte
SMC	System Management Company
SMP	Social Management Plan
SOx	Sulfur oxide compounds
SPAR	Social and Poverty Assessment Report
SPC	Special Purposes Company
SRs	Sensitive Receivers
SUV	Sport Utility Vehicle
TCRP	Tree-Cutting and Replanting Plan
TESDA	Technical Education and Skills Development Authority
TMP	Traffic Management Plan
TOR	Terms Of Reference
TSCs	Technical Support Consultants
TSP	Total Suspended Particulates
TSS	Total Soluble Solids
TTMP	Temporary Traffic Management Plan
TTTSCI	Tropang Tsuper Transport Cooperative Services, Inc.
TWC	Technical Working Committee
UMP	Utilities Management Plan
UN	United Nations
UN ECE	United Nations Economic Commission for Europe
USD	United States Dollar
VACC	Volunteers Against Crime and Corruption
veh/hr.	Vehicle per hour
VOC	Volatile Organic Compound
WB	World Bank
WHO	World Health Organization
WLAN	Wireless Local Area Network
WMP	Waste Management Plan

WMSDP	Waste Management and Spoil Disposal Plan
WPSP	Workers and Public Safety Plan
WSMP	Waste and Spoil Management Plan
$\mu\text{g}/\text{m}^3$	Microgram per cubic meter



Chapter 1:

Executive Summary

1.0 EXECUTIVE SUMMARY

1. An environmental and social impact assessment was undertaken for the proposed Metro Manila Bus Rapid Transit (BRT) Line 1 Project of the Department of Transportation and Communication (DOTC), the project's executing agency. The Metro Manila BRT Line 1 project is the first BRT in Metro Manila and second in the Philippines, next to the Cebu BRT project. Relative to the significance of impacts and risks, Metro Manila BRT Line 1 project falls under Project Category A as defined under Operating Policy (OP) 4.01 of the World Bank (WB). This environmental assessment study was carried in accordance with pertinent WB's safeguards policies including OP 4.01, Environmental Assessment, and OP 4.12, Involuntary Resettlement.

2. The Environmental and Social Management Plan (ESMP) has taken cognizant of the policy, legal, and administrative frameworks relevant to environmental assessment of transport-related projects in the Republic of the Philippines, the WB social and environmental safeguards as provided in its applicable operating policies, and international standards addressing issues and concerns related to vulnerable stakeholders, including women, persons with disabilities (PWDs), and the elderly. For environmental impact assessment, of particular importance are the following laws and regulations: (i) PD 1586 - Establishing the Philippine Environmental Impact Statement System, (ii) Republic Act No.9275 - Philippine Clean Water Act of 2004, (iii) RA 6969 -Toxic substances & Hazardous & Nuclear Waste Control Act of 1990, (iv) RA 8749 - Philippine Clean Air Act of 1999, and (v) RA 9003 - Act Providing for an Ecological Solid Waste Management Program, (v) Batas Pambansa (BP) Blg. 344 s. 1983 (Accessibility Law), (vi) Republic Act 9994 s. 2010 (Expanded Senior Citizens Act of 2010), (vii) RA 9710 or the Magna Carta on Women, (viii) Republic Act No. 8974 (2000), (ix) DOTC Department Order No. 2009-18. For social impact assessment, general policies and laws on land transportation, accessibility and PWDs, elderly and senior citizens, gender and land acquisition and resettlement were considered.

3. *Project Description.* The Department of Transportation and Communications (DOTC), in collaboration with various government and multilateral agencies ventures, plan to develop solutions and alternatives to help eliminate traffic congestion in Metro Manila and other metropolis in the country. In 2013, a Detailed Technical Study (DTS) was undertaken to examine the feasibility of developing a Bus Rapid Transit (BRT) System along España - Quezon Avenue - Commonwealth Avenue corridor dubbed as Metro Manila BRT Line-1 Project. The España-Quezon-Commonwealth Avenue corridor is a main strategic transport route cutting diagonally through the upper half of Metro Manila. It is not currently served by any form of mass transit system. The corridor's strategic importance and its connections with LRT1, MRT3 and the Philippine National Rail lines, together with its high volume of travel, would suggest that the corridor has justification as a form of mass transit route. The DTS revealed that the project is technically, financially, and economically feasible. It has the capacity of decongesting traffic flow, resulting in increased vehicular speed along the corridor, improved public mass transportation convenience, reduced travel time, decreased vehicle operating costs, savings in greenhouse gas emissions and reduced transport accident occurrences.

4. The BRT corridor will have an approximately 27.7-km long corridor extending from Manila City Hall in the southwest to SM Fairview in the northeast of Quezon City. The estimated construction period is three (3) years. BRT services would be supplemented by jeepneys operating in a "feeder" mode and providing lateral access/egress to/from adjacent communities. At full build-out, there will be three major passenger interchange terminals (Quirino Highway, EDSA and Lawton) and 28 other terminal stations and bus stops. The project would incorporate footpaths, both parallel and penetrating the neighborhoods in the corridor as well as improved street lighting. During the BRT operation, the project will employ substantial Intelligent Transportation Systems (ITS), in order to provide real time passenger information, assist in managing and operating public transport services, collect fares, and manage general traffic.

5. The project shall include (i) a segregated busway between Philcoa and Manila City Hall; (ii) a non-segregated busway between Philcoa and SM/Ayala Malls in Fairview; (iii) stations and terminals along the segregated and non-segregated busway route; (iv) depots for the garaging of buses designated to operate as BRT services; (v) an Area Traffic Control System (ATCS) to facilitate priority run times within the corridor and give citywide benefits of improved traffic flow; (vi) an open service plan that ensures BRT services between Fairview in Quezon City and Manila City Hall; (vii) traffic management

measures to improve traffic flow outside of the corridor that are seen to complement the BRT and maximizes its benefits; (viii) parking management measures that will similarly complement BRT and improve traffic flow; and, (ix) urban planning improvements consisting of public realm augmentations, and enhanced integration of transport and land use. The estimated construction period is three (3) years.

6. *Environmental and Socioeconomic Conditions.* The proposed BRT corridor is within highly urbanized sections of Metro Manila which characterizes the socioeconomic baseline condition of the corridor. These urbanized sections are predominantly of residential, institutional and business commercial uses. Major public transportation modes along the corridor are Public Utility Jeepneys (PUJs), Public Utility Buses (PUBs), and Asian Utility Vehicles (AUVs). In terms of environmental conditions, the proposed BRT corridor is currently experiencing localized air pollution from huge numbers of public and private vehicles that are spewing air pollutants from exhaust emissions. During construction phase, the Project implementation is expected to cause environmental impacts due to air pollution emissions from construction equipment and vehicular service, wastewater generation from construction activities, ground contamination from construction hazardous materials and supplies, nuisance, disturbance and reduction in road mobility due to road construction works, and solid waste generation. These impacts shall be managed through the implementation of appropriate and site specific EMP.

7. During operation phase, the Project shall implement the use of Euro 4 fuel to comply and reduce emissions to Euro 4 standards. Euro 4 fuel is known to have low sulfur content of only about 50ppm compared to currently utilized Euro 2 fuel having sulfur content of 500ppm thus lower levels of particulate and gaseous emissions from BRT buses are expected. At the depot and bus terminal sites, built in pollution control measures shall be provided to avoid and manage solid wastes, treat wastewater, and prevent water pollution and groundwater contamination. With EMP in place and implemented, the impacts of BRT are eliminated or reduced at acceptable levels.

8. Along the proposed BRT corridor, there are a number of PUJ and PUB routes that may be affected by the Project operation. Social impacts on livelihood and income displacement for PUJ and PUB drivers, operators and workers may range from income reduction to franchise cancellation or deletion to give way to BRT operation. As part of the social management plan, these PUV operators/drivers/employees will be provided with a menu of options that will mitigate and minimize social impacts such as rerouting or modification of franchises and provision of skills training and livelihood replacement, among others.

9. *Impacts, EMP and SMP.* Screening for environmental impacts is made through a review of the parameters associated with bus rapid transport system against the existing mode of public transport in Metro Manila, which are dominated by full-sized buses, jeepneys, mini-buses and shuttle services, AUVs, and taxis to as small as tricycles, multi-cabs and pedicabs. Jeepneys comprise more than 50 percent of the vehicle traffic stream on major roadway corridors.

10. The introduction of the proposed BRT project can be considered as an enhancement of the existing transport system to highly developed landscapes of the proposed BRT corridor and in Metro Manila in general. The issue on impacts and risks during construction to the surrounding natural environment and the BRT's highly urbanized proposed corridor is anticipated to be limited and manageable.

11. The social benefits that are expected from the Metro Manila BRT Line 1 Project are (a) more efficient and safer public transport alternative; (b) safer orderly loading and unloading system, particularly for the vulnerable stakeholders; (c) creation of direct employment as a result of BRT construction and operation; (d) enhanced land use along the corridor due to the resulting efficient transportation service; (e) improved public transport regulations; and (f) provision of transport supportive of women. Economic benefits include reduced travel time and cost savings, reduced vehicle operating costs, savings in GHG and CO₂ emissions, and reduction in accident occurrences.

12. The most pressing social impact is the economic dislocation of PUV drivers, operators and workers due to perceived loss of livelihood. This is a result of (1) reduced passenger volume for Public Utility Vehicles (PUV); (2) cancellation of the present PUV routes that are along the projected corridor; and (3) dislocation of PUV drivers, operators and workers. In addition, there are commercial

establishments that are within the proposed limits of BRT stations. They may not be dislocated but they may potentially be blocked by the proposed BRT stations by losing their frontage, customer access, parking space, or display areas. These physical restrictions might have a negative impact on the livelihood of the owners and their employees.

13. The social management plan (SMP) options presented to the affected PUV drivers and operators include (1) route relocation, modification and truncation; (2) co-existence with the BRT or remain on their route, despite the impact of the QC-Manila BRT; (3) scrapping or wholesale purchase of old PUV units by the government; (4) formation of concessionaire group among operators to become part of the BRT consortium/investors; and (5) provision of alternative livelihood/TESDA training/preferential hiring to affected drivers/personnel and/or members of affected households. Commercial establishments that will be affected close to the BRT stations are entitled to protection and benefits enshrined in social safeguards policies of the Philippine government and the World Bank. The project architects and engineers will, based on meaningful consultations with the affected people, integrate innovative approaches and solutions during the detailed architectural and engineering design stage of project implementation, in order to prevent any disturbance or any negative impact to these establishments. In the event that negative impacts cannot be avoided, these establishments are entitled to receive compensation as a full replacement cost for the physical structures to be affected by the project and loss of income in accordance with compensation guidelines under Philippine laws and the WB social safeguard policies.

14. The most pressing concerns for women in the Public Transport (PT) sector are (1) the harassment that they encounter in over-crowded PT vehicles; and (2) difficulty in boarding and alighting. Women employees are also not well-represented in the PT sector where drivers and conductors are predominantly men. Integrating these concerns in the implementation of the Metro Manila BRT-Line 1 project requires the following action plans: (1) the BRT system shall be designed for ease of boarding and alighting with buses and the stations at the same level; (2) the system shall address the issue of encumbrances of passengers, including over-crowding by provision of sufficient space passengers and cargo; and (3) creating a policy environment that promotes equal employment opportunity for women in the BRT system.

15. The BRT system shall integrate appropriate public transportation design standards that will address safety and accessibility for persons with disabilities, elderly, and students based on existing laws and policies of the Philippine government and international covenants and standards. Students, senior citizens, and PWDs shall be afforded discounted fares based on applicable regulations on passenger fares.

16. During detailed design and pre-construction phase, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions addressing these issues. Although there are no anticipated issues related to historical and cultural assets, a precautionary measure shall be taken by inclusion of provisions in tender and construction contract documents requiring the contractor to immediately stop excavation activities, and promptly inform the National Commission of Culture and Arts (NCCA) and the concerned Local Government Units (LGU), if archaeological and cultural assets are discovered.

17. Environmental impacts during pre-construction phase may be addressed by preliminary engineering works that could be incorporated in the Final Design of the project. Among the important issues that require attention are (i) disturbance of vehicular traffic and pedestrians; (ii) Interruption to power, water, telecom and other utility systems and services; (iii) removal of affected structures; and, (iv) removal of trees and other vegetation.

18. Environmental impacts during construction are temporary and can easily be mitigated. There will be no massive construction activities that can damage the environment. BRT carriageway construction is a low impact construction activity. Typical construction issues are manageable with the implementation of the EMP and site management plan for: (i) air and water pollution due to solid and liquid wastes, hazardous wastes and excavations spoils generations (ii) soil erosion and disturbance of existing land features or landscape, (iii) noise and vibration, and, (iv) traffic congestion, disturbance and public hazards.

19. Environmental problems due to operation of proposed project can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. .

20. Social impacts include economic dislocation of PUV drivers, operators and workers due to routes cancellation and reduced passenger volume due to shift in passenger patronage from PUV to BRT. Economic displacement is likewise anticipated to few commercial establishments which are situated within the proposed bus stations. Impact during land acquisition for the BRT depots is also anticipated. To negate these social impacts, a menu of social impact management plan options are offered to the affected stakeholders to ensure their rightful entitlements under applicable Philippine laws and WB safeguard standards.

21. An Environmental and Social Management Plan (ESMP) is developed to effectively manage the environmental and social issues and concerns. The plan includes (i) mitigating measures to be implemented; (ii) required monitoring associated with the mitigating measures; and (iii) implementation arrangement. Institutional set-up discusses the requirements and responsibilities during pre-construction, construction, and operation phases. The plan includes tabulated information on (i) required measures for each environmental impact that requires mitigation; (ii) locations where the measures apply; (iii) associated cost; and (iv) responsibility for implementing the measures and monitoring.

22. Summary costs for Capacity Building, ESMP and Communication Plan are as follows:

Table 1.1.1: Estimated Capacity Building, ESMP and Communication Plan Cost

Particulars	Details	Implementation Period	Amount (US Dollars)
1. Capacity Building	Includes capacity building on EMP, SMP and monitoring	During construction and operation phases	44,000.00/yr
2. Environmental Monitoring Cost	Includes monitoring works for water, air and noise	During construction and operation phases	25,000.00/yr
3. EMP	Cost is to be shouldered by the Contractor (during construction phase); Cost to be shouldered by the SPC during operation phase	During construction phase; During operation phase	Part of the Contractor's Cost; Part of the SPC's Operation and Maintenance (O&M) Cost;
4. SMP	Various activities at different project phases; except for ROW and relocation cost (if there is any), cost is to be shouldered by the Contractor	During construction and operation phases	697,720.00 Additional cost shall be earmarked by the SPC during operation phase
5. Communication Plan	To be shouldered by DOTC; Estimates are provided in Table 8.5.1: Stakeholder Communications Plan,	During pre-construction, construction and operation and	Part of the cost per activity to be prepared by the Safeguard Officers and GO

	Responsibilities and Cost	decommissioning phases	and to be approved by DOTC.
--	---------------------------	------------------------	-----------------------------

23. *Consultation and Participation.* Project planning and the subsequent impact assessment document preparation for the proposed project recognized the need for public consultation and participation as central to effective environmental safeguard. Within the context of “meaningful consultation”, DOTC initiated a process of consultation during project preparation, and then intend to continue it during the construction phase.

24. During the DTS phase, face-to-face meetings were conducted with representative from the local governments of Manila City and Quezon City, officers of the public utility jeepneys operators and drivers’ associations on the nine (9) routes that were initially identified to be potentially affected by the implementation of the project, and special interest groups.

25. During the environmental and social impact study phase, DOTC and CPI Total Corporation (CPITC) conducted a total of 19 public consultation meetings. Majority of these meetings targeted the affected PUV drivers, operators and workers that are plying along the proposed BRT corridor. In terms of consultation coverage for affected PUVs, almost all PUV organizations and associations were invited and attended the public consultation meetings. All PUJ organizations and one PUB company were represented in these consultations. However, only three PUJ organizations participated in the preparation of appropriate social management plan. During these meetings, information disclosure with affected stakeholders was done by providing them with details of the project and their views to minimize and mitigate environmental and social impacts, among others, were solicited and discussed. In general, these project stakeholders expressed support to the proposed project provided that DOTC will address their expressed concerns during implementation.

26. Project disclosure activities were also done during the conduct of the DTS from January 2013 to August 2013. A series of meetings were participated in by representatives from various public transport groups, special interest groups, and the Local Government Units of Manila and Quezon City. *During* detailed design, DOTC will again conduct public consultations and information disclosure initiatives. DOTC shall keep records of environmental and social complaints received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues.

27. For future public consultations and public disclosures, a Stakeholder Communications Plan (SCP) was prepared. SCP listed the activities to be undertaken during pre-construction, construction and O&M phases, the timing of each activity and the responsible entities to execute the SCP.

28. *Grievance Redress Mechanism (GRM).* Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB’s Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB’s independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank’s attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank’s corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

29. DOTC shall disclose the proposed GRM during public consultations. Low to medium grievances about environmental and social performance of the project during the construction phase is proposed to be handled by the Grievance Officer (GO) while highly sensitive grievances will be handled by the Grievance Redress Committee (GRC). Both GO and GRC are expected to provide expeditious resolutions of complaints. Complaints during operation phase can be brought to the attention of the BRT operator or SPC. SPC/DOTC shall address promptly, at no costs to the

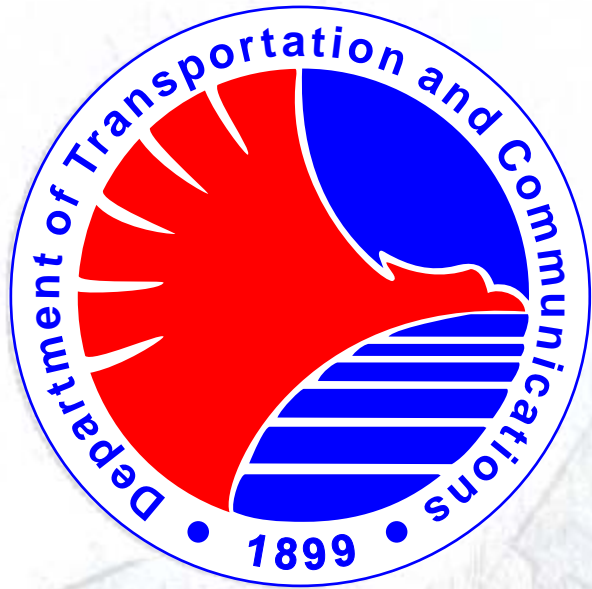
complainant and without retribution, any complaints and concerns. GRC shall be chaired by DOTC with members from multi-sectoral organizations. Creation of GRM and its operationalization shall be included in appropriate sections of the project's civil works contract.

30. Aggrieved parties or complainants may also submit their complaints to DENR-EMB. EMB is mandated by PD 1586 to act on complaints about environmental and social performance of projects issued with environmental compliance certificates (ECC).

31. *Conclusion and Recommendation.* The BRT project is essential for Metro Manila's economic development as it will address the Metro's sustainable urban transport development. Once the project is implemented, Metro Manila BRT Line-1 project will serve as a catalyst in the development of an efficient and seamless public transport system, not only in Metro Manila but in the entire country, where it will service more commuters and eventually encourage the modal shift to efficient low-carbon emissions public transport system.

32. With the undertaking of a comprehensive ESIA and the subsequent identification of significant environmental and social impacts, the recommended ESMP will help reduce and mitigate these adverse environmental and social impacts arising from the location, design, construction, operation, and maintenance of the proposed BRT project. For socially affected stakeholders, a menu of highly feasible SMP shall be implemented to mitigate and address the needs of affected stakeholders. The proposed SMP measures to address economic dislocation in the PUV sector includes, among others, relocation or modification of franchises and provision of TESDA skills trainings. Concerns of interest groups such as from the PWD, elderly and women's group sectors relevant to the project are also addressed in the SMP. The proposed ESMP implementation follows the hierarchy of mitigation measures, such as: (1) mitigation/elimination through design; (2) site / technology choice; and (3) application of best practice.

33. The ESMP is doable which include tailor-made environmental protection measures and social impact mitigating measures for all potential environmental and social adverse impacts. It also designates each relevant organization to fully implement environmental protection responsibilities and the planned social impact mitigating measures. The ESMP ensures implementation of the environmental and social mitigation measures and monitoring during construction and operation stages of BRT. Therefore, the Project can be implemented in an environmentally sound and socially acceptable manner.



Chapter 2: Policy, Legal and Administrative Framework

2.0 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 Governing National Laws On Environmental Assessments

34. The policy, legal, and administrative frameworks relevant to the environmental assessment of transport-related projects in the Republic of the Philippines have long been established by the following laws and regulations:

- (i) PD 1586 - Establishing the Philippine Environmental Impact Statement System and its Implementing Rules and Regulations (IRR);
- (ii) Republic Act No.9275 - Philippine Clean Water Act of 2004 and its IRR;
- (iii) RA 6969 -Toxic substances & Hazardous & Nuclear Waste Control Act of 1990 and its IRR;
- (iv) RA 8749 - Philippine Clean Air Act of 1999 and its IRR;
- (v) RA 9003 - Act providing for an Ecological Solid Waste Management Program and its IRR;
- (vi) RA 10066 - the National Cultural Heritage Act of 2009 and its IRR; and,
- (vii) RA 7160 - Local Government Code of 1991

35. As indicated, each of these national laws has its own implementing rules and regulation (IRR) in the form of Administrative Orders (AO). Within the implementing agencies of the laws, each agency may further issue Executive Orders (EO) and Memorandum Circulars (MC), among other legal instruments, to provide specific clarifications and explanations on the provisions of the laws. Some examples of these instruments are as follows:

- (i) AO 42, rationalizing the implementation of the Philippine EIS System and giving authority in addition to the Secretary of the DENR, to the Director and Regional Director of the EMB to grant or deny the issuance of ECCs.
- (ii) DAO 2003-30, streamlining the EIS System and to strengthen the processes for its implementation.
- (iii) DENR Administrative Orders 34 and 35 (1990) which embodies the environmental quality guidelines on water quality.
- (iv) MO 2012-02 – Uniform Replacement Ration for Cut and Relocated Trees.
- (v) Joint MC 2014-01 – Guidelines for the implementation of the DPWH-DENR-DSWD partnership on the Tree Replacement Project.
- (vi) DAO 2015-04 – Implementation of Vehicle Emission Limits for Euro 4/IV, and In-Use Vehicle Emission Standards.

36. At the local levels, each LGU issues ordinances and directives to enhance existing laws and regulations which form part of the compliance requirements.

37. Presidential Decree 1586 or the Philippine Environmental Impact Statement System (PEISS), established the Environmental Impact Assessment (EIA), process to enhance planning and decision making in projects involving transport-related investments. The Philippine environmental assessment system conforms to WB's OP 4.01 on environmental assessment requirements.

38. Through the EIA process, adverse environmental impacts of the proposed project are considerably reduced through the formulation, and subsequent implementation of applicable Environmental Management Plan (EMP). Under the PEISS, a project categorized as "not covered" are certain projects with no significant impacts, regardless of location or threshold/project size, arising from inherent benign or clean technology and the very nature of the project's mitigation of environmental issues or enhancement of the quality of the environment. This type of project shall be issued a "Certificate of Non-coverage" when necessary by DENR. A project categorized as "covered" project, which have been originally declared as Environmentally Critical Project (ECPs) or projects within an Environmentally Critical Areas (ECAs) having significant impacts on the quality of the environment, shall be issued an Environmental Compliance Certificate (ECC). The Metro Manila BRT Line-1 Project falls under "covered" project because of the magnitude of its potential impacts to the livelihood of existing PUV drivers and operators. It also falls under the ECP categorization of projects as it entails modification of existing roads or highways.

39. For this Project, it is contingent that it should be able to comply with pertinent provisions of other national environment laws, department orders and LGU ordinances governing the management of social environment, ecosystems, solid waste, water quality, air quality, and hazardous wastes.

2.2 General Policies and Laws on Land Transportation

40. *Executive Order No. 125-A*. Amending *Executive Order no. 125*, entitled "reorganizing the ministry of transportation and communications. Defining its powers and functions, and for other purposes." defines the scope and powers of DOTC as they relate to the implementation of the SMP.

41. *Executive Order No. 202* - creating the Land Transportation Franchising and Regulatory Board defines the scope and powers of LTFRB as they relate to the operation of PUJs and PUBs – the adversely affected stakeholders in the Metro Manila BRT Line-1 project. LTFRB's primary responsibilities are, among others:

- a) to prescribe and regulate routes of service, economically viable capacities, and zones or areas of operation of public land transportation services provided by motorized vehicles, in accordance with the public land transportation development plans and programs approved by the Department of Transportation and Communications;
- b) to issue, amend, revise, suspend or cancel 'Certificates of Public Convenience' or permit authorizing the operation of public land transportation services provided by motorized vehicles, and to prescribe the appropriate terms and conditions therefore; and
- c) To coordinate and cooperate with other government agencies and entities concerned with any aspect involving public land transportation services with the end in view of effecting continuing improvement of such services.

Of particular concern is the moratorium issuance of modified or new PUV franchises to adversely affected PUV drivers and operators in light of the current moratorium on the acceptance of applications for issuance of Certificate of Public Convenience (*LTFRB Memorandum Circular No. 2010-015*)

42. *Land Transportation Office-Land Transportation Franchising and Regulatory Board (LTO-LTFRB) Joint Administrative Order 2014-01* defines a colorum unit as a private vehicle that operates as a public utility vehicle without a franchise, a PUV that operates differently from its authorized denomination (bus, jeep, van or taxi), a PUV that operates outside of its authorized route, or a PUV that continues operation despite a suspended, cancelled or expired franchise.

43. *Republic Act (R.A.) No. 4136 (Land Transportation and Traffic Code)* - an act to compile the laws relative to land transportation and traffic rules, to create a land transportation commission and for other purposes. The provisions of this Act shall control (as far as they apply) the registration and operation of motor vehicles, and the licensing of owners, dealers, conductors, drivers, and similar matters.

44. *R.A. 7924 – The Metropolitan Manila Development Authority (MMDA) Law* – this defines the functions and powers of MMDA. Among which are to enforcement of such traffic laws and regulations, the provisions of R.A. 4136, and P.D. 1605, in Metro Manila.

45. *Quezon City Ordinance SP No.-2068, S-2011* - an ordinance prohibiting any person (natural or juridical), from occupying or constructing any structures, edifices or shanties in any portion of the streets, alleys, sidewalks, open spaces and other public places and/or using the same as dwelling places, vending sites, places of business and commerce or recreational areas, except those allowed by the government.

2.3 Related Policies to Social Impact Assessment

46. This section presents the applicable laws and international policy standards that served as a guide in the conduct of the SIA, and in formulating the SMP. Review of policies and international standards and conventions focused on land transportation laws including existing franchising regulations for PUVs, accessibility laws, and provisions for persons with disabilities (PWDs), women and gender policies related to transportation and development, transport-related policies dealing with senior citizens, land acquisition, and resettlement policies.

2.3.1 Laws and Standards Related to Accessibility and PWDs

47. Batas Pambansa (BP) Blg. 344 s. 1983 (Accessibility Law), Republic Act No. 7277 s. 1991 as amended by Republic Act No. 9422 s. 2006 (Magna Carta for Disabled Persons). BP 344 is more commonly known as the Accessibility Law, this requires full access to all persons with disabilities and has thus imposed sanctions upon persons and entities which fail to provide physical access, as well as access to opportunities, growth and development to all PWDs. Meanwhile, RA 9422 (which amended RA 7277) further provided benefits to all PWDs to ensure the latter's role in nation-building and a quality of life befitting any other decent human being.

48. LTFRB Memorandum Circular No. 2011-004- 2011 Revised Terms and Conditions of Certificates of Public Convenience (CPC). The relevant passages are the following:

- a) The PUV operators shall grant fare discounts as prescribed by law, policies, rules and regulations to Senior Citizens, and persons with disability.
- b) The PUV operator shall display the International Symbol of Accessibility in their units and shall designate seats in all their units specifically for the use of Persons with Disabilities as follows:

For PUBs:

- Regular buses shall have at least five (5) designated seats for PWDs near entrance doors;
- Air-conditioned buses shall have at least four (4) designated seats for PWDs near entrance doors;
- For regular and air-conditioned city buses, other passengers may use those designated seats if not occupied but shall yield them to incoming PWD's whenever the occasion arises;
- For provincial buses other passengers may use those designated seats if no PWDs shall occupy these seats at the start of the trip; and
- Owners or operators of PUBs operating in highly urbanized cities shall install in their units audio-visual aids such as buzzers, bells flashing lights to inform the driver of any alighting passenger.

For Bus Terminals and Stations:

- Widen doors/access to comfort rooms to be able to allow the entry of wheelchairs;
 - Provide ramps for easy access by wheel chair to the waiting lounges; and
 - Mark a bench or space for the use of PWDs in waiting lounges. This may be used by others if there are no PWDs using it.
- c) It shall be considered discriminating for PUV operators and their drivers/personnel to charge higher fare or to refuse to convey a PWD, his/her orthopedic devices, personal effects and merchandise by reason of his disability.

49. DOTC Department Order No. 2014-013 – Policies on Transport Accessibility. This sets forth the rules and regulations to provide for minimum requirements and standards to make public transportation facilities and utilities accessible to PWDs pursuant to the objectives of BP 344.

50. United Nations Convention on the Right of Persons with Disabilities - as a signatory to the convention, the Philippines is bound to ensure that its development policies, programs, projects, and activities complies with the agreements set forth in the convention. The following relevant passages underscore the need for the SMP to consider with emphasis on PWDs that are likewise covered by other necessities and special considerations:

- a) Recognizing the valued existing and potential contributions made by persons with disabilities to the overall well-being and diversity of their communities, and that the promotion of the full enjoyment by persons with disabilities of their human rights and fundamental freedoms. Moreover, full participation by persons with disabilities will result in their enhanced sense of belonging and in significant advances in the human, social and economic development of society and the eradication of poverty;
- b) Recognizing that women and girls with disabilities are often at greater risk, both within and outside the home of violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation; and
- c) Recognizing that children with disabilities should have full enjoyment of all human rights and fundamental freedoms on an equal basis with other children, and recalling obligations to that end undertaken by States Parties to the Convention on the Rights of the Child.

51. Social Analysis and Disability: A Guidance Note. Incorporating Disability-Inclusive Development into Bank-Supported Projects. Social Development Department in Partnership with the Human Development Network's Social Protection, Disability & Development Team, the World Bank, March 2007. This offers a practical guide to integrating social analysis and disability-inclusive development into sector and thematic projects and programs of the World Bank. It provides an easy-to-access resource for the social analysis of disability; examines disability via sectors, cross-cutting issues, as well as by each of the Bank's Regions; and demonstrates how to ensure disability-inclusive development in the project cycle.

2.3.2 Policies on Elderly or Senior Citizens

52. Republic Act 7 432 s. 1992 as amended by Republic Act 9257 s. 2003 and further amended by Republic Act 9994 s. 2010 (Expanded Senior Citizens Act of 2010). This is concerning the recognition, promotion and protection of the role, rights and benefits of elder persons in nation-building, community life, and personal living. Among the salient benefits that must be provided to senior citizens are the discounts on fares, medicines, etc.

53. U.N. General Assembly Resolution No. 46/91 or Implementation of the International Plan of Action on Ageing and related activities - recognizing in the Charter of the United Nations the fundamental human rights, the dignity and worth of the human person, the equal rights of men and women and of nations large and small and to promote social progress and better standards of life. It encourages governments to incorporate the pertinent principles into their national programs whenever possible. These pertinent principles include: Independence, participation, care, self-fulfillment, and dignity. Older persons should have access to adequate food, water, shelter, clothing and health care through the provision of income, family and community support and self-help; should have the opportunity to work; should have access to appropriate educational and training programs; and should be able to live in environments that are safe and adaptable to personal preferences and changing capacities. Older persons should remain integrated in society by participating actively in national policy formulation and implementation; should develop service opportunities for the community and serve as volunteers; and should be able to form movements or associations for older persons. Older persons should benefit from family and community care and protection; should have access to health care and services; should have access to social and legal services; should be able to utilize appropriate levels of institutional care; and enjoy human rights and fundamental freedoms when residing in any shelter, care or treatment facility. Older persons should be able to pursue opportunities for the full development of their potential; and should have access to the educational, cultural, spiritual and recreational resources of society. Older persons should be able to live in dignity and security and

free from exploitation and physical or mental abuse; and should be treated fairly regardless of age, gender, racial or ethnic background, disability or other status, and be valued independently of their economic contribution.

54. The Madrid International Plan of Action on Ageing and the Political Declaration adopted at the Second World Assembly on Ageing in April 2002 – the plan offers agenda for handling the issue of ageing in the 21st-century. It focuses on three priority areas: older persons and development; advancing health and well-being into old age; and ensuring enabling and supportive environments. It is a resource for policy-making, suggesting ways for governments, non-governmental organizations, and other actors to reorient the ways in which their societies perceive, interact with and care for their older citizens.

2.3.3 Gender Related Policies and Standards

55. Harmonized Gender Guidelines, NEDA series of 2007. The guideline aims to provide a common set of analytical concepts and tools for integrating gender concerns into development programs and projects; and help achieve gender equity in, and empower women through, projects and programs. In 1993 the NEDA and the National Commission on the Role of Filipino Women (NCRFW) produced the Guidelines for Developing and Implementing Gender-Responsive Programs and projects that aims to (1) assist line or implementing agencies in complying with RA 7192 and its IRR; (2) integrate the GAD perspective in development planning and programming; and (3) address the issue of inadequate sex-disaggregated data in planning.

56. Executive Order No. 273 s. 1995 Philippine Plan for Gender-responsive Development (PPGD), 1995-2025. Three years after the promulgation of RA 7192, and immediately after the expiration of the Philippine Development Plan for Women, 1989-1992 (PDPW), the PPGD was approved and adopted through EO 273 by then President Fidel V. Ramos. The PPGD provided the basic socio-cultural, economic, political and legal framework as well as the basic goals, development strategies, and policies to ensure that the spirit and substance of RA 7192 is enacted. In 2010, RA 9710 or the Magna Carta on Women carried the seminal work of PDPW and ensured that PPGD is implemented.

57. DPWH Department Order No. 48, s. 2011 Guidelines for Mainstreaming Gender Equality Actions in Road Infrastructure Projects. This was in response to DBM-NEDA-NCRFW's Joint Circular No. 2004-1, of putting into place a client-focused response to gender issues and concerns involving clients and stakeholders related to the construction, maintenance and management of road infrastructures and related facilities. The DO is consistent with the Framework Plan for Women, wherein agencies including DPWH are encouraged to promote gender-responsive governance, protect and fulfill women's human rights, and promote women's economic empowerment. It specified that gender equality actions are to be executed at the planning, design, pre-construction, construction, and maintenance stage, and it will be guided by gender tools provided in the Toolkit for Making Road Infrastructure Projects Gender Responsive.

58. A Toolkit on Making Road Infrastructures and Related Facilities Gender Responsive, DPWH & World Bank publication. This presents the principles, approaches and procedures for making road infrastructures and related facilities sensitive to the differing travel needs and patterns of women and men, especially those from low income sectors who rely solely on public and intermediate modes of transport.

59. World Bank Operational Policy 4.20 Gender and Development. This policy is concerned with the bank's objective of assisting member-countries reduce poverty and enhance economic growth, human well-being and development effectiveness by addressing inequalities and disparities on gender. The policy also aims to help member countries to formulate and implement gender and development goals.

60. The 'Elimination of All forms of Discrimination against Women (CEDAW)'. The Convention defined "discrimination against women" as any distinction, exclusion, or restriction made on the basis of sex which has the effect or purpose of impairing/nullifying the recognition, enjoyment or exercise by women, irrespective of their marital status, on a basis of equality of men and women, of human rights

and fundamental freedoms in the political, economic, social, cultural, civil or any other field, and enjoins States Parties to condemn discrimination against women in all its forms and to pursue by all appropriate means and without delay, a policy of eliminating discrimination against women.

2.3.4 Policies on Land Acquisition and Resettlement including WB OP 4.12

61. Under the Philippine setting, there is no single policy that governs all aspects of land acquisition, compensation and resettlement. On the other hand, 4.12 on Involuntary Resettlement governs issues related to economic displacement, land acquisition, compensation and resettlement. Below are the enumeration of key legal and administrative instruments most relevant to involuntary resettlement that are currently in force locally:

- a) The Bills of Rights of the Constitution of the Republic of the Philippines states: In Article III, Section 1, "No person shall be deprived of life, liberty, or property without due process of law, nor shall any person be denied the equal protection of the laws." In Article III, Section 9, "Private property shall not be taken for public use without just compensation."
- b) Executive Order No. 1035 (1985) requires conducting of feasibility studies, public information campaign, parcellary survey, and assets inventory. It also provides for compensation for acquired land at fair market value based on negotiations between owner and appraiser; relocation assistance to tenants, farmers and other occupants; financial assistance to farmers and agricultural tenants equivalent to the average harvest for the last three years but not less than P15,000/hectare; disturbance compensation to agricultural lessees equivalent to 5 times the average gross harvest during the last 5 years; and compensation for improvement on land acquired under Commonwealth Act No. 141 (CA 141).
- c) Commonwealth Act No. 141 (CA 141) and Public Land Act (1936) institute classification and means of administration, expropriation and disposition of alienable lands of the public domain.
- d) Supreme Court Ruling (1987) defines just compensation as fair and full equivalent to the loss sustained to enable affected household to replace affected assets at current market prices.
- e) Republic Act No. 6389 provides for disturbance compensation to agricultural leases, equivalent to 4 times the average gross harvest in the last 5 years.
- f) Republic Act No. 8974 (2000) which facilitates the acquisition of Right of Way (ROW), site or location for National Government Infrastructure Projects and for other Purposes. Implementing Rules and Regulations of RA8974 was also issued. This mandates the use of replacement value of land and structures (without depreciation).
- g) Republic Act No. 7279 (1992) "Urban Development and Housing Act" mandates the provision of a resettlement site, basic services, and safeguards for the homeless and underprivileged citizens.
- h) Republic Act No. 7160 (1991) "Local Government Code" which allows the local government units to exercise the power of eminent domain for public use.
- i) DOTC Department Order No. 2009-18 – Guidelines and Procedures in the Acquisition of Right-of-Way, Site or Location for DOTC Infrastructure Projects. This department order provides guidelines in land acquisition for DOTC projects taking into consideration the IRR for RA 8974;
- j) DOTC Department Order No. 2013-05 – Creation of a Technical Working Committee for the Acquisition of Sites/Right-of-Way for the Department's Infrastructure Projects.
- k) WB OP 4.12, Involuntary Resettlement. Provides WB safeguard policies addressing involuntary resettlement arising from land acquisition and development.

2.4 Gaps between Philippine Government and World Bank policies on key issues

62. For the SIA component of the ESIA, which also includes the Resettlement Plan under a separate volume, the key issues that were probed in determining policy gaps are the following:

- a) persons considered as PAPs;
- b) loss of income or sources of livelihood;
- c) treatment of informal settlers;
- d) taxes, duties, transaction costs;
- e) valuation of affected land; and
- f) treatment of renters.

63. Gaps between Philippine government policies and laws on entitlements to project affected persons (PAPs) and the WB's social safeguard policies contained in OP 4.01, Environmental Assessment and OP 4.12, Involuntary Resettlement were identified by comparative analysis. Measures to fill the gaps were proposed based on the principle that whichever applicable policy is best for the overall welfare of the PAP shall govern and shall be adopted in crafting the ESMP. The comparisons of these policies are described in **Table 2.4.1**.

Table 2.4.1: Comparative Analysis between Philippine policies and laws on entitlements to project affected persons (PAPs) with WB's social safeguard policies¹

Key Issues	Philippine Policy	World Bank Policy	Measures To Fill Gaps
Persons Considered as Project-Affected Persons (PAPs)	PAPs consist of all members of a household who will be adversely affected by the project because their real property shall be acquired for government infrastructure projects	Persons/People impacted by Involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets; (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location.	Everyone who occupies land or structure and those that conduct livelihood activities at cut-off date within the ROW limits shall be identified and properly recorded including their condition in life, and their personal circumstances. Each person so identified shall be considered PAP and shall be classified accordingly to determine eligibility for any compensation or support towards a sustainable living condition.
Loss of Income or Sources of Livelihood	Silent regarding loss of income directly resulting from land acquisition.	Loss of income and transfer costs to a new site will be part of the entitlement of displaced persons.	The project should pay for any loss of income and transfer costs directly resulting from project-related or induced land acquisition.
Treatment of Informal Settlers	R.A. 7279 states that eligible homeless and poor informal settlers in urban areas are entitled to resettlement if they are affected by development projects. However, R.A. 7279 limits this to residential informal	For informal settlers, the payment of replacement cost for affected structures plus transfer costs, and costs of rehabilitation in the new site.	The project should implement a beneficiary award criteria system which prioritizes the award of lots and replacement housing to informal settlers who are actual occupants of affected land/structures. The project should announce a cut-off date to prevent further entry into the project area.

¹ Key discussions were gathered from Cebu Bus Rapid Transit Resettlement Action Plan, Department of Transportation and Communications, November 2012.

Table 2.4.1: Comparative Analysis between Philippine policies and laws on entitlements to project affected persons (PAPs) with WB's social safeguard policies¹

Key Issues	Philippine Policy	World Bank Policy	Measures To Fill Gaps
	settlers and is silent on informal structures on public or private land used for commercial purposes.		For structures that encroach on public lands and used for purely commercial purposes, compensation will be equivalent to the loss of business income only.
Taxes and Transaction Costs involved in the Transfer of Real Property	Current practice is to deduct capital gains tax, documentary stamp tax, transfer tax, registration fees and administrative expenses from compensation of affected land and structures	Taxes, administrative fees, and other transaction costs are not to be deducted from the total compensation due the affected person/s	Since this is not a willing seller- willing buyer transaction type, the project should cover the cost of taxes, administrative fees, and other transaction costs.
Valuation of Affected Land	Philippine Constitution states that private lands expropriated or taken for the public interest shall be paid just compensation. The Supreme Court defines —just compensation as current market value less the cost of any future benefits the landowner may derive from residual land. In negotiated settlements, government offers compensation based on the schedule of market values of the LGU or BIR zonal valuation before proceeding with expropriation.	Uses replacement cost without deduction of any future benefits the landowner may derive from the residual land	The project should use replacement cost for the valuation of land, which for urban land is defined as — the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Treatment of Residential and Business Renters	Fixed improvements introduced by renters on the land or structures automatically belongs to the land owner, unless there is a specific provision that the owner will compensate the renter for any fixed improvements introduced by the latter. The practice is to ask the landowner	Renters do not receive compensation for fixed structures; however, assistance will be provided to them for transfer of residence and/ or business and lost income due to temporary closure while transfer is ongoing.	Compensation for fixed improvements introduced by the renter shall not be provided. However, the renter will be allowed to remove his improvements before dismantling.

Table 2.4.1: Comparative Analysis between Philippine policies and laws on entitlements to project affected persons (PAPs) with WB’s social safeguard policies¹

Key Issues	Philippine Policy	World Bank Policy	Measures To Fill Gaps
	to sign a waiver, allowing the renter to be paid compensation for any fixed improvements.		

64. Based on the analysis of the respective policy provisions, the major gaps were found in the treatment of informal settlers. WB policies require that the internationally accepted best practice should be adopted. In the Cebu BRT Resettlement Action Plan document, DOTC concurred to the notion of taking the side that provides more advantage for the PAPs where the gap exists and recommends the adoption of the policy measure that best protect and promote the rights and welfare of the PAPs. Furthermore, the CBRT RAP cited a jurisprudence supporting the opinion that in the event the Philippine government enters into agreement with World Bank to provide financing for the Metro Manila BRT Line-1 project, the provisions of WB’s applicable operating policies would prevail over Philippine law where there are conflicts or where gaps exist but not necessarily WB policy all the time. Except for compensation and treatment for disturbed livelihood, there are no more relevant policy gaps identified between Philippine laws and WB social safeguard policy.

65. For OP 4.11 (Physical Cultural Resources) there were no observed gaps and therefore were not included in the discussions in **Table 2.4.1**.



Chapter 3: Project Description

3.0 PROJECT DESCRIPTION

3.1 Project Background

66. Heavy traffic congestion within the roads of Metro Manila has been a part of everyday living of almost all residents in this city. This problem in our roads not only wastes our time, money, and energy, but also damages our health and environment. If heavy traffic will be lessened, or possibly eliminated, the country will benefit from improved mobility and reduced transportation costs resulting to increased economic productivity and development.

67. The Department of Transportation and Communications (DOTC) in collaboration with various government and multilateral agencies ventures, plan to develop solutions and alternatives to help eliminate traffic congestion in Metro Manila and other metropolis in the country.

68. The España-Quezon-Commonwealth Avenue corridor is a main strategic transport route cutting diagonally through the upper half of Metro Manila. It is not currently served by any form of mass transit system, although, the planned MRT Line 7, if approved, will serve the northern half of the corridor between Fairview and Elliptical Road. The corridor's strategic importance and its connections with LRT1, MRT3 and the Philippine National Rail lines, together with its high volume of travel, would suggest that the corridor has justification as a form of mass transit route.

69. In 2013, a Detailed Technical Study (DTS) was undertaken to examine the feasibility of developing a Bus Rapid Transit (BRT) System along España - Quezon Avenue - Commonwealth Avenue corridor dubbed as Metro Manila BRT Line-1 Project. The study revealed that the project is technically, financially, and economically feasible. The transit system has the capacity of decongesting traffic flow resulting to increased vehicular speed along the corridor, improved public mass transportation convenience, reduced travel time, decreased vehicle operating costs, savings in greenhouse gas emissions, and reduced transport accident occurrences.

70. BRT is a bus-based mass transit system that is sometimes described as a "surface subway". BRT has the combined capacity and speed of a light railway system with the flexibility, built at a much lower cost and a simplicity of a bus system.

3.2 Project Rationale and Objectives

71. The primary objective of the Project is to provide better travel experience for public transport within the Manila-BRT Line-1 corridor. The Project shall provide (1) customized BRT transport design, services and infrastructure that will improve transport system quality, and; (2) variability proof transport system that will minimize or remove the typical causes of delay as a result of traffic congestion.

72. The Project also seeks to improve the level of service to the passenger while in the vehicle, waiting for the vehicle, and making their way to/from the vehicle. In this sense, a holistic approach is adopted, treating the bus as part of a system where improvements can enhance customer satisfaction and access, as well as achieving significant operational efficiencies.

73. In terms of overall environmental quality within the corridor, the Project supports the Philippine National Environmentally Sustainable Transport (EST) Strategy by addressing the impacts of climate change through GHG emission reduction from vehicular emissions and unsustainable transport system, with the end view of minimizing road accidents and improving the quality of life.

3.3 The BRT Corridor and Location

74. BRT Line-1 Project will connect Manila City Hall (Longitude 120°58'51.30"E and Latitude 14°35'28.59"N) and SM Fairview in Quezon City (Longitude 121° 3'26.70"E and Latitude 14°44'6.68"N) through España, Quezon and Commonwealth avenues with a total length of 27.7 km consisting 13 km stretch from Manila City Hall to Philcoa and 14.7 km Commonwealth Avenue from Philcoa to Fairview. These streets are considered the main roads connecting Quezon City and Manila and therefore a large percentage of commuters of both cities will benefit from the project.

75. The BRT project will have 31 strategic stations (northbound and southbound) within the stretch of the aforementioned streets. **Table 3.3.1** is the list of the proposed BRT Stations with their corresponding geographical locations. **Figure 3.3.1** shows the vicinity map of the listed BRT Stations.

Table 3.3.1: Proposed BRT Stations with Corresponding Geographical Location

Name of Stations		Technical Description	Station Location	
			Curb side	Center Median
1	Quirino Highway*	14°44'6.68"N,121° 3'26.70"E	√	
2	Belfast*	14°44'1.52"N,121° 3'20.10"E	√	
3	Bronx	14°43'0.14"N,121° 3'40.06"E	√	
4	Atherton	14°42'29.37"N,121° 3'46.29"E	√	
5	Regalado	14°42'22.72"N,121° 4'1.32"E	√	
6	Pearl Drive	14°42'19.07"N,121° 4'24.62"E	√	
7	Don Fabian	14°42'16.63"N,121° 4'57.77"E	√	
8	North Batasan Hills	14°41'55.84"N,121° 5'13.21"E	√	
9	Commonwealth Market	14°41'43.33"N,121° 5'13.57"E	√	
10	COA	14°41'27.73"N,121° 5'13.27"E	√	
11	Don Antonio	14°40'42.90"N,121° 4'59.40"E	√	
12	Zuzuarregui	14°40'7.32"N,121° 4'30.21"E	√	
13	Tandang Sora	14°39'52.26"N,121° 4'7.11"E	√	
14	Central Avenue	14°39'40.69"N,121° 3'49.56"E	√	
15	UP Ayala Technohub	14°39'27.08"N,121° 3'29.28"E	√	
16	Philcoa	14°39'13.23"N,121° 3'10.56"E		√
17	Lung Center	14°38'57.42"N,121° 2'45.02"E		√
18	EDSA	14°38'37.32"N,121° 2'13.51"E		√
19	Sct. Borromeo	14°38'22.55"N,121° 1'48.51"E		√
20	Timog	14°38'15.58"N,121° 1'37.36"E		√
21	Roosevelt	14°37'58.84"N,121° 1'10.25"E		√
22	Sto. Domingo	14°37'28.74"N,121° 0'33.48"E		√
23	Banawe	14°37'20.79"N,121° 0'24.59"E		√
24	Blumentritt	14°36'57.43"N,120°59'59.04"E		√
25	PNR España	14°36'45.22"N,120°59'45.69"E		√
26	Lacson	14°36'36.50"N,120°59'36.03"E		√
27	P. Noval	14°36'24.27"N,120°59'22.43"E		√
28	Quiapo	14°36'1.85"N,120°59'4.33"E		√
29	LRT Central*	14°35'34.06"N, 120°58'53.83"E	√	
30	Manila City Hall*	14°35'28.59"N, 120°58'51.30"E	√	
31	Lawton*	14°35'34.37"N, 120°58'49.13"E	√	

Note: * One - way traffic (one side station only)

76. The Metro Manila BRT Line-1 project seeks to enhance the accessibility and quality of travel within its area of influence through better quality vehicles and infrastructure, but most importantly through competitive and reliable journey times. In doing so it seeks to replicate some of the functional characteristics of a Bus Rapid Transit (BRT) system, and in determining conceptual design, due reference is made to worldwide experiences in BRT design and operation.

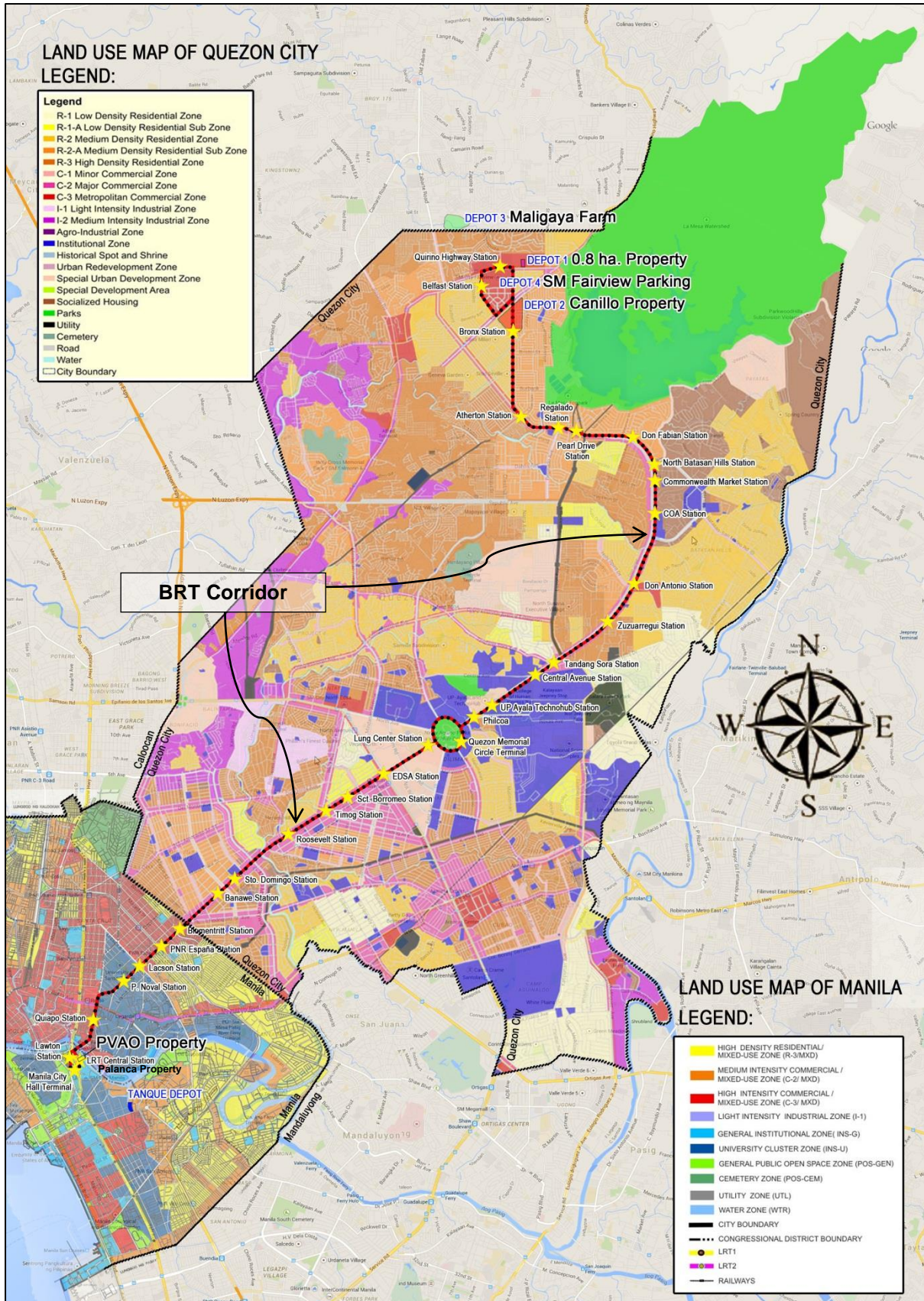


Figure 3.3.1
Vicinity Map of the Proposed BRT with Respect to Land Use Map

77. Streets included in this section of the corridor are as follows:

- Quirino Ave.
- Belfast St.
- Mindanao Ave.
- Regalado Ave.
- Commonwealth Ave.
- Elliptical Road
- Quezon Ave.
- España Boulevard
- Lerma Ave.
- Quezon Boulevard
- A. Villegas St.
- Natividad Almeda-Lopez St.
- Padre Burgos St.

3.4 Project Components

3.4.1 Segregated Bus Running Way

78. A segregated running way enables buses to maintain preferential and reliable journey times, protected from the varying levels of congestion that might exist along the route. It is desirable that the running way is continuous, but not necessarily, as such a route will be examined to identify where delay occurs and physically where full segregation is desirable and achievable.

79. Where full segregation is not offered other means of priority will be sought primarily through the use of traffic signals. The corridor is relatively wide and flanked with development, much of which takes access directly from the main road. These conditions prevent the use of bilateral segregated lanes and as such median lanes are proposed.

3.4.2 Bus Stations

80. Stations will be located according to identified demand with respect to achieving safe and efficient accessibility. Median bus stations will be located in the center of the road so that a single station may serve both directions of travel. Others shall be located at the edge or curb side with a separate station serving each direction. For curb side bus station, the stations will follow asymmetric design or positioned alternate and not opposite to each other.

81. Minimization of right of way and acquisition for curb bus stations is a primary consideration during concept development and shall provide the following advantages:

- Ability to minimize cross section width
- Ease of pedestrian management where pedestrians are channeled to the central area
- Requirement for vehicle to have doors on the right only.

82. The station structure itself should satisfy the basic needs of giving shelter, facilitating efficient passage between platform and vehicle, and giving appropriate levels of information about the service offered. Functions beyond this can be kept to a minimum as long as they serve essential passenger needs. The architectural form should be one that is able to be quickly and efficiently erected, with preference for a pre-fabricated modular construction. Potential expansion, both physically and in terms of the functions it provides, should be considered.

83. Two types of stations: a.) median or center running curb stations, which are located at the center median of the road, and b.) curb stations which are stations located along the sides of a major thoroughfare. Reference drawings in **Figures 3.4.1 & 3.4.2**.

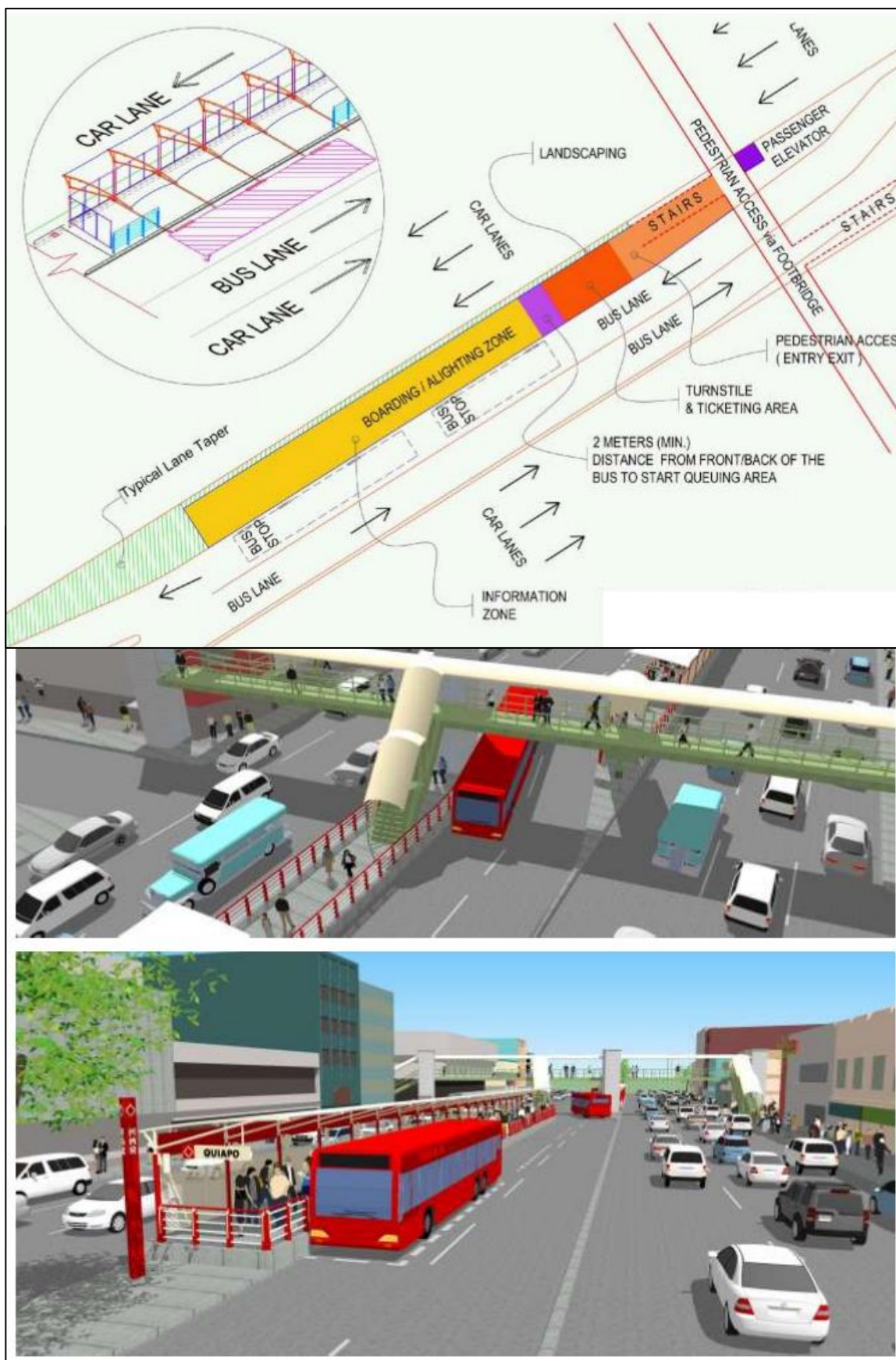


Figure 3.4.1: Station Platform: Centre Median



Figure 3.4.2: Station Platform: Curb Side

84. Both types of stations use the asymmetrical elevated station platform which allow passenger loading and unloading on one-side only. Hence, each station platform can only service buses or bus units travelling in a single direction. While curb stations are placed at opposite sides of the road usually along the sidewalks, the median station is usually composed of two platforms (one for each direction of travel) arranged in an off-set and in-line manner in order to minimize the number of car lanes given up to the station.

85. A modular design allows flexibility, ease of fabrication, assembly and replacement of building parts, faster construction and allows re-use of materials should a station be re-located in the future. The stations can easily be lengthened and shortened to accommodate shifting passenger volumes or changes in bus type or size.

86. Two types of station are proposed:

Light. Constructed without the steel railings and turnstiles. This will be used between Philcoa and Fairview where the bus operates in mixed traffic.

Full. Fully specified and located between Manila City Hall and Philcoa

3.4.2.1 Components of Bus Stations

Bus Way

87. Busways at stations will be 3.5m wide. There will only be a single bus lane for each platform. Limited bypass lanes will be developed at stations due to the limited RROW of the corridor. Buses will stop at the front edge of the platform on a “first come, first serve” basis. A maximum of two (2) 18m long buses can be accommodated at one time. Limiting to only two parked buses at a time allows space for a seating area and information board at the center of the station. In accordance, with platform design standards, the front edge of the first bus shall be 2.0m from the edge of the elevated platform. A marker may be painted on the ground surface of the bus way as guide for bus drivers where to stop.

Elevated Platform

88. The typical platform dimensions for the station is 4.0m wide and 45.0m long. An additional 8.0m is allotted for the stairs (connected to the pedestrian overpass) and approach ramp/waiting area for the elevator. “Tapers” at the front/rear edges of the platform vary in length per station and serve as the acceleration/deceleration zones for the buses.

89. The effective platform area is 4.0m wide by 37.0 m long and 0.61 m above the surface pavement of the bus way. This is the designated passenger waiting, pick-up (loading) and set-down (unloading). The basic module for platform design is 4.0 m. wide by 3.0 m. The 3.0 meter bay spacing (on-center spacing between column supports) was deemed most economical since the selected bay spacing is a factor of 6.0 and 12.0 m., which are the more common manufactured lengths of steel materials in the country. There are a total of 15-bays over the entire length of the platform: 12-bays for the effective passenger waiting platform and other 3-bays for the turnstiles and queuing area and the ticketing booth and queuing area.

Structural Foundation System

90. The structural system of the stations will be a combination of reinforced concrete and steel. Foundations shall be reinforced concrete. An integrated system of independent column footings and footing tie beams shall provide the structural foundation of the elevated platform. The tie beams which connect the column footings for stability at the edges of the column footings also serve as wall footings for the concrete hollow blocks (CHB) wall that delineate the edges of the station platform along its long sides. The interior space will be filled with gravel and sand before a top layer of checkered steel plate is laid out. A pre-cast edge curb mounted atop the CHB holds the steel flooring in place.

Structural Columns

91. The structural columns shall be circular steel pipes with 5" in diameter. Each steel column will be directly fastened or attached to the column footing by way of a 30 cm x 30 cm x 6 mm steel plate anchored onto the reinforced concrete footing. Stiffeners will be welded onto both the steel pipe and the plate to stabilize the connection.

Structural Roof Framing System

92. For ease of assembly, construction and design flexibility, the main structural components of the station shall be made of steel. Circular steel columns will support the tubular roof framing system. Tubular steel shall act as stiffener beams connecting the trusses to one another. Another set of rectangular-steel tubes will act as stiffener for the steel columns, electrical cable tray and mounting support for signage. The roof frame will be a pre-assembled circular steel frame; the top tubular member will be inclined towards the side opposite the bus-bay, while a bottom member will further stabilize the top chord as it distributes the roof load to a lower portion of the vertical member of the truss.

Roof Cover and Design

93. Heat from the sun is hot and bothersome in the Philippines. Shade or protection from the sun is therefore important for waiting passengers. It helps that the station is an open structure with no enclosure at the sides to allow cross-ventilation. Heat absorbed by the roofing material is released to the area below it but is quickly dissipated by cross winds. The ideal roofing material for the station is one that can simply provide shade and protection from the sun's rays. Metal roofing sheets and tensile fabric materials (tensile membrane) can effectively provide protection. However, a tensile membrane is preferred because of its durability, low maintenance and ease of installation. It also requires minimal roof framing support which make it more economical.

Line Identification Pole

94. There will be two (2) bus line identification poles on either end of the station platform. The Identification Pole is approximately 5.10 m tall to make it visible and easily identifiable from a distance. The Identification Pole allows potential commuters to identify the route. Instead of assigning letters and/or numbers to identify a specific route, a color designation is preferred; colors are readily identifiable and universal. Numbers and letters are not readable especially for non-English speaking commuters.

Lighting and Power System

95. LED lighting or light-emitting diodes is the lighting fixture of choice. At an approximate 7 watts per fixture, all lighting requirements within a station can be powered by the solar panels. An additional 1 kW can be allotted to power the other electrical components within the station such as electronic signage(s), such as the next bus, etc.

Environmentally Conscious Design

96. *Preservation of trees* - as much as possible, retention of trees along the BRT route shall be prioritized. Station design may be adjusted to integrate the trees into the platform design. One approach is to build the station platform around existing trees by providing a hole within the station platform; the tensile roof will be discontinued in the area of tree(s) to create space for its crown. Another approach is to adjust the position of the station platform to avoid the trees; extensions to the platform will be constructed to connect the platform to the busway.

97. *Steel as main structural framework* - steel is one of the more durable materials in the building industry. A structure made of steel may be disassembled and re-assembled in another location. Steel can also be re-cycled. So in terms of its re-use, steel merits a high mark in sustainability. The proposed Metro-Manila BRT station design uses steel columns and steel roof trusses.

98. *Block pavers as floor surface of station platform* – block pavers made from recycled materials shall be preferred. Block pavers as the platform surface finish provides flexibility in design, promotes re-use and allows groundwater recharge as a pervious floor material. Sub-base of the block pavers can utilize the rubble obtained from breaking the center island of Quezon Ave.

99. *Tensile membrane roofing* - tensile membranes made from recycled materials shall be preferred. Tensile membranes are lightweight. therefore requiring less and smaller framing members. It can easily be removed and re-used thereby promoting sustainability.

100. *Solar panels* - solar panels will reduce a station's dependence on the grid for power. Lighting, electric/electronic information signs, turnstiles, computerized BRT operational systems, etc. are just some of the components and equipment in the station with requirements for power. Each station can use a solar panel system with a maximum capacity of 2 kilowatts.

101. *LED Lighting* – use of light-emitting diodes (LED) lighting will improve energy efficiency of the lighting fixtures used in the station. Each LED light bulb is 7 watts, so the entire station lighting of a station will only use up less than 1kilo-watts of energy.

102. *Groundwater recharge* - a strip of landscaped area (softscape) shall be placed on the side opposite the busway. With the roof sloping towards this side, rainwater can be captured within this planting strip to promote aquifer recharge. For stations at the center of the road, there should be a narrow strip of landscaped area between the edge of the station platform and the road of the opposing traffic. Rainwater will seep into the underground to re-charge the aquifer.

103. *Re-directing rainwater to tree roots* - a variant to groundwater recharge is to redirect the same water to areas where the trees are situated. Instead of a landscaped strip at the side opposite the busway, a gutter will guide rainwater towards the nearest tree to water its roots.

3.4.2.2 Outline Specification of Bus Station

Elevated Station Platform

104. Dimensions: width: 4.00m.; length: 45.00m.; surface finish: 1200 mm x 2400 mm x 6 mm thick checkered steel plates with a sub-base of 50mm gravel and sand; platform will be elevated 0.61m above road level of bus way to enable level boarding/alighting of the vehicle.

Approach Ramp

105. Dimensions: width: 4.00m; length: 4.20m.; 100 mm thick and inclined at a slope of approximately 8.00+%; reinforced concrete slab Class B 2500 psi; 12 mm dia. deformed bars @ 0.60m on-center (oc) both ways.

Access Platform

106. Dimensions: width: ranges from 3.30 to 4.00m; length: 8.25m; surface finish: 1200 mm x 2400 mm x 6 mm thick checkered steel plate with a sub-base of gravel and sand; platform will be elevated 0.61m above road level of bus way.

Column Footing

107. Quantity: 16 units; 0.40m wide x 3.90m long x 0.80m. high; reinforced concrete Class B 2500 psi; steel reinforcements; main deformed bars of 20 mm dia. at top and bottom with 10 mm dia. web reinforcements.

Tie Beams

108. Quantity: 2 units per bay; 0.20m wide by 0.30m high reinforced concrete beam mounted 10 cm. above the bottom of column footing; reinforced concrete Class B 2500 psi; steel reinforcements:

main deformed bars of 16mm dia. at top & bottom with 10mm dia. web reinforcements.

Columns

109. Sixteen (16) units of five (5) inch dia. circular steel tube (standard); mounted on base plate with stiffeners and anchored to RC column footing; painted finish on epoxy primer; stiffener beams of 2 – 2" x 6" C-steel channels welded back to back will be anchored onto the top end of each just below the trusses; likewise, these beams will be painted finish on epoxy primer.

Roof Framing

110. Modified half truss on a single column; stiffener beams or lateral ties in-between half-trusses; 3" dia. circular steel tube (standard); lateral tie: 2.5" dia. circular tube steel; painted finish on epoxy primer.

Roofing Material

111. Tensile fabric/membrane made from recycled materials; white colour.

Steel Railing

112. Main railing posts: multiple flat bar 1" x 4" (2 to 3 units); horizontal bars: flat bar 1 x 3; steel railing: circular tube 3" dia.; "System Branding" lettering ½" or ¾" square bar: all steel members will be painted over an epoxy primer base coat.

Identification Pole

113. Circular steel tube 12 inch dia. mounted on steel plate with stiffeners bolted onto concrete column footing; metal or aluminium panels or expanded metal panels mounted on steel framing provide external cladding to the circular column.

Protection Fence

114. A protection fence will be installed on the side opposite the busway. The protection fence will prevent passengers to exit the platform at areas that can be hazardous or life-threatening. It will also prevent unwelcome access or entry into the platform. For the center median station, a protection fence opposite the busway will suffice. But for the curb-side station, it is necessary to continue the protective fence around the short-side opposite the approach ramp. The fence will prevent and discourage entry from the sidewalk side away from the ticket booth and the turnstiles.

115. For a typical 3.0 m wide bay, there will be three (3) panels of 0.90m. wide and 1.55 m. wide. Each panel will be made of either perforated metal or tubular steel slats to allow cross-ventilation.

116. For a typical bay within the designated information board zone, there will be a bay composed of one panel with information on the service, one panel showing the whole system and another showing the BRT route. A second bay can be composed of 3 advertisement panels. All panels will be uniform 0.90 m wide and 1.55 m high.

Solar Panels

117. Two (2) units of 1.0 m. x 1.6 m solar panels can deliver 1 kW of power; for 2 kW power, a total of 4 panels will be needed with an inverter for every two panels. All lighting fixtures shall be powered by the solar panels.

Furnishings

118. Furnishings are the movable/detachable items within the station. The following presents the preliminary specifications for the ticket booth and storage/electrical room.

Ticket Booth

119. Dimensions: 1.20 m x 1.50 m x 2.20 m high (edge of platform position for asymmetrical stations); Metal or aluminum panels/slats on light-gauge framing as enclosure; glass window at front for ticket sales; metal or aluminum slats all around if booth will not be air- conditioned; insulated metal panels on light-gauge metal frame if booth will be fitted with air- conditioning unit; symmetrical stations; elevated flooring will be cement bonded boards on steel floor joists.

Storage/Electrical room

120. Dimensions: 0.60m deep x 1.20m wide x 2.20m high (edge of platform position for asymmetrical stations); metal or aluminum panels on light-gauge metal framing as enclosure; flooring will be cement-bonded boards on steel floor joists.

Turnstiles

121. A maximum of 3 turnstiles may be accommodated within the full station design in a single platform; however, only 2 may be installed if a lane for PWDs is installed. The installation of turnstiles is dependent upon the adoption of an appropriate ticketing system.

Information System

122. Appropriate passenger information will be provided consisting of static display of travel options and real time information of approaching buses.

Waste Receptacles

123. The design of waste receptacles may be integrated with the over-all design theme of the station if only to strengthen the branding.

3.4.3 Intelligent Transport Systems

124. MMDA are increasing the number of junctions signalized along the corridor and providing local linking to enable both selective detection for buses and optimize signal stages to minimize delay for all traffic. To facilitate this, buses will be tagged to ensure that their presence is detected. Once a vehicle is tagged it allows information to be sent to a control center so that the vehicle fleet can be monitored and headways managed remotely as well as providing fault reporting systems. Knowledge of the vehicles' presence also enables information regarding arrivals to be transmitted to the waiting passenger at; stations, terminals, on the internet and on mobile devices; and to the travelling passenger within the vehicle to show location and upcoming stations. This level of system architecture should be a feature of the corridor and should not be onerous upon delivery risk, as outlined above.

125. The System utilizes the following supporting systems:

- Control Centre systems
- Vehicle location devices on all the system related buses
- Communications system
- CCTV at the bus-stop areas
- Closed Wireless Local Area Network at each bus stop

126. The System Control Centre System consists of the following elements:

Computer hardware which includes:

- Central server hosting databases and processing real-time data sent and received;
- Workstations for display of route, vehicle and bus-stop status, CCTV images, reported maintenance issues and management of passenger information system displays; and
- Computer to support database interrogation and analysis

Computer software which includes:

- An application for analysis of vehicle location and route conditions;
- An application to support route, stop, on-bus and off-route information displays;
- An application to manage the images and display from the CCTV units;
- An application to manage a real-time System fault-reporting system; and
- Databases to store information being consumed by these software applications, expose appropriate data feeds to private and public information sources through APIs, and for strategic operations and maintenance analysis

Communications equipment which includes:

- Voice and data communications to System personnel and locations;
- Voice and data communication to external entities associated with System operations;
- Data communication to other third parties, including public information sources; and

The In-vehicle unit has the following elements:

- GPS device which identifies vehicle location at regular (e.g. 3 to 5 second) intervals;
- GSM/GPRS/3G/HSDPA device to relay data and voice communications to the server in the System control room at predetermined regular intervals (e.g. every 30 seconds);
- Hands-free voice communication for the driver;
- Display screen for the driver, which will be compact, but easily visible to the driver; and
- Function buttons for the driver (e.g. to request assistance), which could form part of a Graphical User Interface (GUI) on a touchscreen device such as a tablet PC

127. A closed Wireless Local Area Network (WLAN) would be required at each bus stop in order to facilitate the System Station Manager's use of a personal communication device in order to report maintenance issues and minor operational exceptions more cost-effectively than by voice calling. As noted above, it is envisaged that the provision of this local WLAN network at each stop would be fed from the data connection required for the fare collection, passenger information and CCTV systems at each bus stop. It would not be available for members of the public (i.e. in the form of free public Wi-Fi) so as to avoid the potential dilution of bandwidth available to the station manager.

128. Information at the stations will be focused on the needs of people making journeys from a given stop within the next 5-10 minutes, on the basis that travelers will already have consumed pre-trip information through the channels identified in the previous section. This will deliberately focus the purpose of the space within the station on the needs of people making journeys, and subtly discourage the use of stations by people seeking general pre-trip information.

129. Information will be presented in a manner so that it is as accessible as possible for the local population, and for disabled and older people using the System. As a general rule, this will include the replication of information through audible announcements and visual displays.

130. The following information will be displayed in stations:

- Fare and ticket information
- Transit network and bus route maps
- Next bus times and destination
- Current service information
- Nearby attractions and destinations

The following information will be displayed inside the vehicle:

- Transit network and system route maps
- Next stop and time to next stop
- Estimated arrival time at bus destination

- System service exemptions
- Older and disabled people priority seating

131. Providing on-demand SMS text alerts on system service status is also part of the system. The HTTP SMS gateway be used as a way of providing System service status information via SMS text. Short messages would be sent in reply to SMS requests from members of the public (either to a specific number or prefixed with INFO) notifying potential System travelers of the current operating status of the system. The types of messages which could be conveyed include:

- Next bus arriving in XX minutes
- Normal service is currently operating
- Expect delays of up to XX minutes
- Partial service: Line closed at XXXX
- System closed

132. This type of service would leverage similar technologies required for open-311 fault reporting (as described above) and would provide a simple way for the System Management Company to keep large numbers of people informed about the current status of the system without the need for direct customer contact. Helpfully, the One Bus Away platform already supports this type of SMS text message information provision and would provide a sound basis from which to customize system information that can be accessed by SMS text messages. One Bus Away¹ is an Open Source platform for Real Time Transit Info that offers a suite of application programming interfaces (APIs) that facilitate the support the development of a wide range of third party applications, based on actual vehicle locations and on scheduled and predicted arrival times.

133. It includes a robust, secure, scalable back end that accepts, stores, archives and interprets real-time vehicle location data in combination with transit schedules and other related data.

3.4.4 Ticketing

134. DOTC are planning to introduce a smart ticketing system for public transport in Metro Manila. Implementation will start with LRT/MRT where the closed nature of the system makes system entry payments relatively easy to administer. As a higher order bus route, the bus based system developed within this report has a mass transit function and operational control regime similar to that of LRT/MRT. As such it will be desirable and entirely possible to adopt the same ticketing approach.

135. Fare collections must be undertaken efficiently and effectively to enable financial transfer within the adopted institutional structure that manages the operation of the BRT Project. It must also be a form that supports effective system operation, that is, it should enable passengers to board and alight without introducing overt system delay.

136. A distance-related charging basis is recommended as this is the standard in transit systems (managing migration issues), it also does not overtly penalize either short or long distance trips. Customers will be charged for the total distance travelled on a trip, from first boarding to last alighting. This will be independent of whether a transfer is required. In other words, the customer will be charged as though (s) he could take one bus directly through to the destination, even if the route configuration requires one or more transfers.

137. The fare collection equipment for will consist of the following:

- Smart cards: As described above.
- Smart cards issuers and encoders: These are specialist reader devices, held at the back-office of the card issuer. They are used to enable or initialize the cards prior to issue, add applications, add/modify the security features, personalize cards, carry out testing, etc. They are supported by specialist software, configured to the requirements

¹ <http://onebusaway.org/>

of the specific card system. Depending on the functions to be performed and the logistics, about 10 such readers may be required.

- Smart card value adding readers: These readers add stored value to the customers' cards, and may also add or modify travel pass validity periods. They are located primarily at the points of sale, which include the ticket kiosks at the stations, ticket sales offices, and designated ticket/value agents. They are normally simple devices, connected to the main server, and acting as the 'front end' for online secure transactions – i.e. the transaction is being processed securely on the main server, not on the station or agent's PC. Normally, there would be one device per sales point, which equates to one for each of the stations, plus one for each of the designated sales agents.
- Smart card validators: These are readers which read the information on the smart card, determine whether they are good for travel, deduct the appropriate value, and record transaction data both on the card and on the reader or associated device.
- Station ticket issuing machines: Each station will have a ticket issuing machine located at the ticket kiosk. The precise configuration will be determined in the RFP and offer stage of the fare collection system. The required number of equipment sets will be one per station.
- Portable ticket issuing machines: These ticket machines are intended primarily for use by conductors and/or drivers on feeder buses, and any other buses that operate away from the designated stations. They are compact hand-held devices, with a keyboard, printer, control electronics and memory.
- Ticket machines chargers: These are 'cradles' into which the portable ticket machines are placed at the end of the working day. Their main function is to recharge the battery, but they also provide a suitable secure storage location and assist stock control. One per machine is required. They may be supplied as part of the ticket machine package.
- Data transfer units: These are simple connections between the portable ticket machine and the depot PC, allowing the transfer of data at the end of the shift. This configuration is normally used when the conductor/driver should pay-in, submit a waybill, and account for any anomalies. Alternative arrangements are to embed the data transfer connector in the machine charger so that data transfer and recharging take place together; or to include a GPRS facility in the ticket machine allowing the data to be uploaded/downloaded remotely. They are not required for the station ticket machines, since these will be connected to the station PC during normal use mode. The cost of these connectors should be negligible, as USB connector cables would probably suffice.
- Portable smart card readers: These readers will mostly be used by Revenue Protection staff to check cards and record information. They will also be used by technical staff for testing. About 20 units should be sufficient.
- Back-office software: This software is the core of the system, so it will be relatively complex with high security requirements. Among other things, it must support the card issue and management system, system administration, card administration, customer administration, stored value management and accounting, the security keys, revenue management and reporting, revenue apportionment, and integrity surveillance.
- Data bases and associated data management tools: This is separate from but related to the back-office software. There will be extensive databases for cards, customers, and transactions. There will also be configuration databases. All of the databases will require management tools, including reporting, analysis and audit facilities.

- Spares: The normal level of spares would be 10%. This could be optimized by having modular components so that only the component needs to be changed (e.g. reader device, power source, memory unit), and not the entire equipment set.

3.4.5 Vehicles

138. The bus vehicle is the primary creator of the system image – it represents the direct interface between passenger and the bus system and it represents the largest investment throughout the life of the project. The bus must be practical and reliable but also must adhere to the travelers' aspiration of quality and the system promoters' vision of image, and role of its contribution to environmental sustainability. In practical terms it must provide the required system capacity.

3.4.5.1 Recommendations for vehicle configuration

Saloon floor height

139. Given that the proposed system will feature bilateral stations both in its trunk section and on its tributary routes, there is no requirement for doorways on both sides of the bus. As such, it is only necessary to consider issues of passenger accessibility, interior seating configuration, and operational implications such as wading in flood water.

140. Whilst it is technically possible to procure a bus that has a saloon floor height set to match the international standard entry step height of 360 millimeters, this presents a challenge for durability wherever road conditions are less than perfect (as might be expected on the tributary routes). Our analysis suggests that this option is rarely selected for that reason, as well as the restrictions on ground clearance that it imposes and the implications for any wading in flood-water.

141. A disadvantage of super-low-floor buses is that their wheel-boxes occupy a disproportionate floor area that cannot be used for the carriage of seated or standing passengers. With the generous requirement in the registration criteria, this would have a significant effect on passenger capacity, and hence it can impact on both operational and commercial performance. It is estimated that 10 seats are lost from a 2-axle bus, and up to 20 from a 3-axle bus, in comparison with a semi-low-floor bus.

142. Finally a super-low-floor bus precludes the design option of a front-mounted engine, or other means of moving chassis weight forward onto the front axle, so as to avail of its relatively generous load limit provided for in the Land Transportation and Traffic Code. As such, the achievable gross vehicle weight of the bus is reduced by some 700 kilograms, and accordingly its capacity by 10 passengers.

143. An acceptable floor height for passenger accessibility is no more than 860 millimeters, reached by two entry-step risers of no more than 250 millimeters, each from the 360 millimeter entry. Such buses allow for front-mounted engines and standard drive axles, and can be the traditional body-on-chassis type or of semi-integral construction depending on the country of origin. The former provides greater flexibility in adapting the bus to specific local requirements, such as alternative fuels and power-train options, and repositioning componentry so as to optimize weight distribution.

144. However, a preferable floor height would be 610 millimeters, reached either by a single step riser or direct access from an elevated platform. This was the traditional standard in Europe until the advent of the super-low-floor bus, but typically engines then were rear mounted. It was always possible though, to employ a front-mounted engine with an adapted drive axle, and this design approach has recently been revived in India for example. As such, the two key objectives of good passenger access, and good weight distribution between the axles, can be achieved together.

Door Numbers and Positions

145. If the driver is to verify payment, there needs to be an organized flow of passengers through the vehicle from boarding at one end to alighting at the other. Conventional practice is for the entry

door to be opposite the driver in the front over-hang of the bus. In this location, there is no loss of passenger capacity arising from the step-well, as standing passengers are barred from the area so as not to obstruct driver vision.

146. With a 900 millimeter wide doorway (800 millimeters between handrails), this enables an angle of approach of up to 10 degrees as would be required where good road conditions cannot be guaranteed on the tributary routes. In turn, this suggests that the front overhang of the bus should be in the order of 2,250 millimeters so as to provide for a deformable body structure ahead of the doorway to absorb minor accident damage.

147. An additional rear door would be conventionally located in the rear overhang of the bus, though it would be possible to place an additional door immediately ahead of the rear axle(s). However, the loss of seats from the additional step-well probably outweighs the potential saving in station dwell-time from faster passenger egress, and would not be justified unless a full-sized doorway could not be fitted alongside a rear-mounted engine.

Vehicle Size and Capacity

148. An 11.0 m twin-axle bus could have an estimated, comfortable, capacity of 76 passengers, of whom 43 would be seated, in this case, the governing factor is the tare weight of the bus in relation to permissible axle weights. However this would involve a light-weight chassis design, whereas Philippine operators have shown a preference for heavy-duty units with high tare weights. Such vehicles appear to have been registered without due reference to the Land Transportation and Traffic Code, but enforcing its conditions would result in a significant reduction in their capacity.

149. A 13.7 m three-axle bus would have an estimated capacity of 95 passengers, of whom 59 could be seated; capacity could be increased to 100 passengers by restricting seat numbers. In this case, the governing factor is the available floor area for standing passengers, and there would be considerable spare capacity in relation to permissible axle weights. As such, heavy-duty chassis technology could be deployed without any consequent reduction in passenger capacity.

150. An 18.0 m articulated bus could have an estimated capacity of 121 passengers, of whom 70 would be seated; in this case, the governing factor is again the tare weight of the bus in relation to permissible axle weights. However the use of heavy-duty technology, typical for such vehicle types, would then reduce the passenger capacity significantly.

151. All three sizes of bus could have similar efficiency in the utilization of road space, at 7 passengers per meter of body length, provided that light-weight technology was deployed. However, the tri-axle bus has the potential to raise this level if a higher standee ratio is adopted, whereas the other two bus types do not, and its capacity is not sensitive to the tare weight of the technology adopted. Further, as the tri-axle bus has potential unutilized axle capacity, either alternative-fuel or hybrid power-train options could be pursued without reducing passenger numbers.

152. Accordingly, the 13.7 m three-axle bus is the recommended option for the Manila BRT Project, such vehicles could legally extend to 14.0 m under the provisions of the Land Transportation and Traffic Code, but that is not an international standard dimension and so supply options would likely be very restricted.

Power-Plant Rating

153. The primary power requirement is taken as enabling a steady speed of 80 km/h up a 2% grade at the predicted gross vehicle weight; for the 13.7m tri-axle bus, that equates to 166 kW which must be added the power consumption of the air-conditioning and electrical systems, totaling 21 kW for this size of bus. The total power requirement of 187 kW equates to 250 horsepower nominal.

154. However the selected performance parameter might be perceived as generous, and 122 kW would provide for 1% gradeability at 80km/h; the performance would still be practical in a relatively flat city such as Manila. The total power requirement would reduce to 143 kW, or 190 horsepower nominal, and that would be the target rating for a hybrid bus.

Power-Plant Fuelling and Emissions Standards

155. At this point in time, there is no realistic alternative to conventional diesel fuelling for the primary power plant. Natural gas is not yet readily available in Manila, though provision could be made for conversion to this fuel type in the future. Pure electric vehicles are precluded by the axle weight restrictions, and are not a particularly 'green' option with the current power mix in the Philippines. However, fixed-route operation, such as proposed, could allow for opportunity-charged battery-electric vehicles with lower tare weights that might just prove viable.

156. Recently, the DENR has issued DENR Administrative Order (DAO) No. 2015-04 which provides a directive requiring the use of cleaner fuel and imposing stricter emission standards for all vehicles starting this July 2015. The DAO provides the new vehicle emission standards to be complied with by new and in-use vehicles starting July 1, 2015. The Order also enjoins the Department of Energy to ensure the availability of Euro 4 fuels by this date.

157. For this project, BRT buses shall use Euro 4 fuel which is considered as a cleaner fuel. It has sulfur content of only 50 parts per million (ppm) for both diesel and gasoline, compared with 500 ppm for Euro 2. Benzene in Euro 4 gasoline, on the other hand, is only 1% by volume compared to 5% in Euro 2. As for aromatics, Euro 4 fuel contains only 35% by volume compared to Euro 2 which prescribes no limit.

Hybrid Options

158. Hybrid bus development has been driven by the desire to reduce fuel consumption and greenhouse gas emissions in intensive stop / start urban operation. However, the system is so designed as to minimize such service characteristics, and the potential benefit is hence much less than examples quoted from other cities.

159. Nevertheless, there may be a case for a limited procurement of mild-parallel hybrid buses within the initial fleet to investigate the costs and benefits of this technology in the Manila circumstances. The means of energy storage adopted may depend on the research and development initiatives of the selected bus supplier, but would probably focus on the use of electrical super-capacitors or hydraulic accumulators. In both cases, there would be a significant tare weight advantage in comparison with the more widespread battery energy storage in hybrid applications.

Transmission

160. The operational characteristics of the system defined in a relatively flat city suggest that an appropriately rated clutch and mechanical transmission should provide adequate durability whilst minimizing fuel consumption. However, experience with rear-engined buses suggests that an automated mechanical transmission would be essential for this configuration, and would be preferable even with a front-mounted engine.

3.4.5.2 Functional and technical specification

161. The following table represents the recommended outline functional and technical specification for vehicles operating within the proposed Manila BRT Project:

Table 3.4.1: Technical Specifications of BRT Vehicles

Specification parameter	Bus requirement
International classification – UN ECE R36	Class I
Overall length, m	13.7 ± 0.3
Overall width, m	2.55 ± 0.05
Front overhang, m	± 2.25
Wheelbase (to bogie turning center), m	± 7.65

Turning circle radius, outer / inner, m	12.5 / 5.3
Angles of approach / departure (laden),deg.	≥ 10 / ≥ 8
Number of doorways – curbside	2, in overhangs
Width of doorway(s), between handrails, mm	≥ 800
Height of first step above road (unladen), mm	≤ 360 (kneeling allowed)
Height of internal step risers, mm	≤ 250
Number of internal step risers	2 maximum; 1 preferred
Seating configuration (where feasible)	2 x 2
Seat pitch, mm	≥ 650
Width of individual seating space, mm	≥ 450
Width of twin seating space, mm	≥ 850
Width of gangway, mm	≥ 600
Clear height in aisle, mm	≥ 2000
Driver compartment ventilation	Fan-assisted A/c
Passenger saloon ventilation	Air-conditioned
Destination display	Dot matrix
Maximum governed road speed, km/h	≤ 80
Minimum gradeability in 2nd gear, %	≥ 15
Engine environmental standard	Euro IV
Engine rating, kW	± 190
Engine rating, mild parallel hybrid, kW	± 145
Engine location	Front preferred, rear lowed
Clutch diameter, mm	≥ 380
Transmission type	Automated mechanical
Hybrid transmission option	Mild parallel
Hybrid energy storage	Hydraulic or super-capacitor
Suspension characteristic, front axle	Full air, optional front- engine
Suspension characteristic, rear axles	Full air, with anti-roll bar
Fuel tank capacity, l	≥ 210
Driver information display	Electronic

162. Further, DAO 2015-04 also provides more stringent emission standards for carbon monoxide (CO), hydrocarbon, oxides of nitrogen, and particulate matter to be complied with by new passenger, and light- and heavy-duty vehicles. Emission standards to be complied with by the BRT buses are enumerated under DAO 2015-04 (**see Annex 10** for the copy of the DAO).

3.4.5.3 Finalizing the bus specification

163. What has been derived herein is an idealized bus product that conforms to national standards and meets the needs of the project. The bus is carefully matched to the infrastructure with respect to passenger demand there are however variables that can be applied to the final; vehicle choice. The floor height of 610 mm cannot be changed without changes to the platform height of stations. Any changes to the vehicle length must be made with reference to the capacity requirements defined.

164. The purchaser and operator of the buses will have a significant role to play in finalizing bus specification and issues such as point of purchase, import duties. and any desire to localize construction will also play a part.

3.4.6 Bus Depot

165. The depot will be the bus system operating base. It will provide parking accommodation, servicing and maintenance facilities for vehicles, an administrative function, and facilities for staff. Depending upon procurement and operating structure it may be a facility provided by the operator.

166. As a pre-requisite the depot must provide the following features required to operate efficiently:

- Direct and secure access of highway through suitable and efficient intersection design;
- Bus parking area, based on sawtooth arrangement; thus allowing independent movement of vehicles;
- Employee/visitor parking;
- Taxi/PUJ drop off/pick up area;
- Administration offices, canteen and rest areas for staff;
- Bus fuelling/wash area;
- Fuel storage area; and
- Inspection and maintenance area.

167. The layout of a bus depot should create efficiency processing and storage of vehicles. **Figure 3.4.3** shows standard depot layout to achieve functional efficiency.

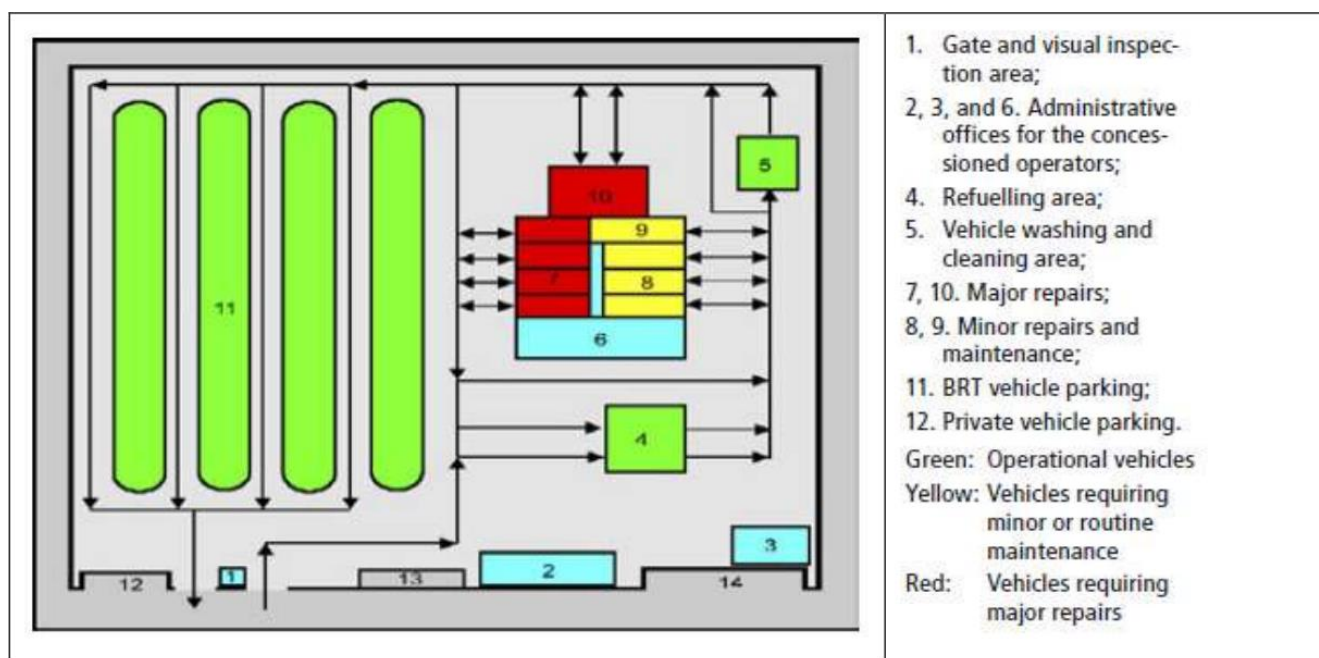


Figure 3.4.3: Operationally Efficient Depot Arrangement

168. An area of approximately 3.2 Ha will be required to cover the vehicle requirement (148 buses) for the Manila - Fairview service; and an area of approximately 1.9 Ha to cover the vehicle requirement (90 buses) for the Manila - Philcoa service. DOTC has not yet made a decision on the depot locations.

3.4.7 Branding

169. Branding of a new form of bus service can be an important way of engaging the public in a new means of travel. Much has been published about the positive effects of branding within BRT services and in Cebu ITP undertook a comprehensive brand identification programme involving the people and businesses of the city. Within this study no brand research has been undertaken due to the restriction on consultation during the project development work programme. It is however strongly recommended that a branding exercise be pursued following NEDA approval of the project. At this stage it is recommended that the following branding principles apply:

- Use of strong colors to give a recognizable and positive image. The color should be non-political. For the purposes of this report we have chosen Red.
- A name for the system that sits alongside the MRT/LRT systems and has a relationship to the intended road transit rationalization. This should refer to system values and be something that is 'owned' by users. It could reference environmental qualities, sustainability, comfort and/or speed of travel.
- A symbol that represents the brand values of the system and related to system name. This symbol would be used on all information relating to the system and appear at all stations/terminals used by the system.
- Marketing campaign that is staged to embrace the scheme development, implementation and operational stages. It is particularly important during construction phases to relieve those that suffer impacts, most especially to those affected enough to deserve resultant service improvements. During early days/months of operation, the marketing campaign will aim to establish the brand and build patronage.

3.5 Bus Operation Service Plan

170. The service plan for the BRT buses is summarized as:

1. Fairview - Manila City Hall (Express along Commonwealth Avenue)
2. Fairview – Manila City Hall (Stopping Service)
3. Philcoa – Manila City Hall

These will operate at the following peak headways in order to meet forecast demand.

Service	Buses per hour	Headway
SM Fairview – MCH	30	2 mins
SM Fairview – MCH	30	2 mins
Philcoa – MCH	60	1 min

3.6 Operational Management

171. Management of the transport services and the infrastructure are primarily of the operations management and the collection of revenues. These each consist of strategic and tactical. The institutional structure developed to support the Cebu BRT and subject to on-going discussion between the World Bank and DOTC, has been assumed to exist and provide a basis for managing the scheme developed within this report. In summary the following has been proposed and largely agreed:

- System Management is carried out at the Operational Level. A System Manager is established, which has the responsibility for the performance of the bus system, such as service quality and schedule adherence. The bus services are operated by private operators under service contracts.
- The System Manager provides all co-ordination and higher-order activities, which may be procured or done by direct operation.

- The bus services are operated under 'Gross Cost' contracts. The System Owner specifies the required service offer in some detail, and the operator is then rewarded for supplying this. Revenues are collected by (or on behalf of) the System Owner, and used (either in whole or in part) to pay the operator.
- The fare structure is based on a 'honeycomb' structure at network level. The passenger pays a fee according to the number of zones passed through on the trip, these being split both radially and orbitally. When there is a single bus line, the fare structure appears as a distance-based structure.
- Transfers are permitted within the system developed. The passenger pays once for his total journey but can then use the ticket on any route or operator that forms part of the system.
- Fare prices seek to recover the bus operating costs, vehicle operating costs, system management costs, and infrastructure maintenance costs. The fare price is not expected to recover the original infrastructure investment costs.
- Fare prices are set at the network level, not at the individual route level. This provides a consistent pricing based on distance travelled.
- Ticketing is based on machine-readable devices, primarily smart cards with stored value, supplemented by single-journey tickets that are printed/encoded at point of issue.
- Revenue protection is managed at network level, under the control of the System Manager.

3.6.1 Role of the System Management Company

172. In the DTS, it is proposed that a BRT management entity will be formed. For the purposes of this section, it will be referred to as the System Management Company² (SMC). The SMC is expected to have at least the following areas of responsibility relevant to Operations, which SMC may perform in-house or it may procure services from others:

- Operations Management
- Incident and emergency management
- Safety and security
- Fare collection
- Revenue protection
- Customer support and information
- Infrastructure maintenance and cleaning
- Implementation of the O&M's ESMP which will be guided by in house Environmental and Social Management System (ESMS) that is compliant with local and international safeguard standards.

173. The following key assumptions are made in relation to bus operations:

- Only designated routes will operate within the segregated part of the system
- The routes will let out by competitive tendering, negotiations or through other means to one or more operators
- Only large buses (over 11m) will be allowed to use the segregated sections
- Only approved urban buses may operate normal services within the system

² In this section, SMC is used in order not to alter the discussions provided in the DTS. However, in the succeeding chapters of this document, SMC is replaced with Special Purpose Company (SPC). In essence, both SMC and SPC refer to the same entity.

- The System Management Company will establish the service quality, vehicle outline specification, and other responsibilities of the operator(s). These will be included in the route contracts or running way access agreements.
- Buses will be purchased, owned and maintained by the operators. It is their responsibility to ensure that buses and drivers are fit for service.
- The normal mode of fare collection and validation at designated and ancillary stations will be off-vehicles at the bus stops. Away from the designated stations, fares may be collected inside the vehicle subsequent to entry.
- Where fares are collected prior to entry, fare collection staff will be employees either of SMC or of a special purpose company engaged by SMC.

3.6.2 Operations Management Requirements

174. The system must work efficiently and effectively. This has five main components, which are independent of the network design, service design, and pricing:

- Transport all customers who present themselves for travel
- Offer a fast and reliable service
- Offer a comfortable service both at waiting places and in the vehicles
- Be safe at all points in the system
- Optimize resource utilization and avoid costs in excess of the planned costs

175. There are five key operational challenges, which are the direct responsibility of SMC.

- Avoid excessive build-up of customers at stops, clear the stops of waiting passengers
- Prevent congestion within the segregated sections of buses at stops and in the lane
- Clear blockages within the segregated sections immediately
- Respond immediately to all emergency situations and minimise negative impacts
- Minimize the disruptive effect of operations in non-segregated sections

176. There are four basic sets of circumstances, all of which must be managed well when they occur. This requires well developed and documented procedures, appropriate organizational structure and staffing, an effective chain of command, and common understanding by all personnel of their roles and responsibilities. It also requires ability to appraise the situation, to switch operational mode when required, and rapid response to events as they occur:

- Normal operation, which includes daily variances and moderate disruptions;
- Spikes and unusual levels of demand on specific days, which must be managed immediately;
- Temporary degraded operation (maximum two hours) during which services must be managed and then restored while recovering from one or more significant incidents; and
- Extended degraded operations, during which whatever level of service is possible must be offered and managed, while also managing customers who have no realistic prospect of being transported within the normal timescale or conditions.
- Prolonged shut-down operation is defined as an extended period of service stoppage which could be a result of political, financial/economic, natural events, or regulatory reasons. Remedial measures will be explored and instituted during this period.

3.6.3 Organizational Structure for System Operations Management

177. The following structure and staffing is based on good international practice in Operations Management. It is intended as a robust, practical organizational and management structure that can deal with both normal and exceptional events.

- a) The System Operations Manager is a key position in the SMC. The System Operations Manager will have overall responsibility for ensuring that the System Operations functions effectively. The System Operations Manager has the needed authority, staff and budget to achieve the task, and is personally accountable for the operations performance. The System Operations Manager is expected to:
- be thoroughly familiar with all operational aspects
 - set up the needed information flows and systems
 - develop procedures and training programs, and assure that these are effectively delivered to be proactive in identifying and resolving problems that might impact on operational performance
 - spend a significant amount of time on-site
 - liaise with external support organizations such as police, traffic control and emergency services
- b) A System Control Centre will be established. A System Control Centre Manager will be appointed who is responsible for the performance of the Control Centre. The primary functions of the Control Centre are:
- To monitor the operations, especially timekeeping and headways on routes, bus-stop status, and to identify any emerging deviations or risk situations
 - To make service interventions as required, ranging from modest service adjustments to taking direct control of operations in case of serious disruptions
 - To respond to all blockages, emergency and other incidents
 - To co-ordinate all the information from the various dedicated personnel at bus-stops, on vehicles and along the route
 - To direct and support various system personnel
 - To liaise with external agencies, and to request their assistance as required
 - To review procedures in the light of experience, and to ensure that lessons learned are transformed into revised procedures and related training
- c) The System Control Centre is manned at all times. It is organized around a set of workstations that have responsibility to monitor and manage sections of the System plus a master workstation.
- d) Support Staff manage the Mobile Supervisory Units, manage the databases and reporting, and provide technical support the System Control Centre.
- e) The Bus Stop Supervisor is in charge of each bus stop at all times. The Bus-Stop Supervisor is responsible for:
- the efficient functioning of the bus-stop to which they are assigned
 - ensuring that buses respect the dwell time rules and leave on time
 - ensuring that bay assignment and passenger management is functioning effectively
 - first-line intervention for any blockages or disruption at the bus-stops, exits and approaches
 - bringing problems and potential problems to the attention of the System Control Centre
 - implementing instructions from the System Control Centre
 - supervision of all personnel working at the bus-stop
 - liaison with Revenue Protection Unit as required

178. Each Bus-Stop Supervisor is responsible for an individual bus stop location (i.e. normally one for each direction). Every 6 months, Bus-Stop Supervisors will be re-assigned to different stops. The system will improve their skills development by facing different conditions, it will also reduce the risk of collusion in relation to either the fare collection staff or the drivers.

- a) A *Customer Care Agent* is assigned at all times to each bus-stop to support the Bus-Stop Supervisor. The primary focus of the Customer Care Agent is on the customers passing through the station. They have the task to:
- Direct customers who are waiting for buses to the appropriate location
 - Direct alighting customers to from the vehicles to the exit, by the route which causes least disruption to boarding and waiting passengers
 - Inform and marshal customers where there are conflicting boarding and alighting customers, especially at busy times
 - Inform and marshal customers when there is a change of bus-bay allocation or other change to normal arrangements
 - Provide information to customers, including how to use the system, where to alight, how to get to their destination from the stations, etc.
 - Proactively assist people in wheelchairs and with reduced mobility, elders, vulnerable customers, and anyone in need of additional support. Encourage other customers to make space for them, allow them board first, give them a seat, etc.
 - Assist the Bus-Stop Supervisor in other ways as directed and as per procedure
 - Assist the Security Guard in dealing with customers and situations arising, within the limits of defined procedures and training
 - Assist in case of emergency, including evacuation of the bus-stop or of buses.
 - Receive, document and submit complaints or suggestions from customers
- b) A *Security Guard* is assigned to each stop at all times. The Security Guard is expected to form part of the bus-stop team and to assist in customer support to the extent that he can do so without compromising his security role. This will require Security Guards to have training in customer care, System service information, and System operations procedures. They have the task to:
- Manage security at the bus-stop to which they are assigned
 - Maintain law and order at the bus stop and its immediate environs, and ensure that customers behave in an orderly manner
 - Maintain planned liaison with police and emergency services
 - Take the lead to resolve any emergency, security or anti-social events at the bus stop
 - Assist in customer support and provision of travel information, to the extent that the security role and actions are not compromised
 - Review security-related issues at the bus stop and submit suggestions as relevant
- c) *Terminus Dispatchers* are assigned to the route termini. They are equipped with the needed communication devices. They have the task to:
- organize the vehicles at the termini
 - ensure that vehicles depart on time
 - implement the directives from the System Control Centre to change the running order, advance or delay the departure times to adjust the frequency
 - insert additional vehicles from the reserve
 - resolve operational problems at the termini
- d) A *System Mobile Supervisory Unit* is established, reporting directly to the System Operations Manager. This consists of personnel equipped with vehicles and with communications links to the System Control Centre. They are organized as teams of two persons corresponding to the six workstations at the System Control Centre, but can move among the sections as required. Their task is to cover the System running way and bus-stops, and to identify and resolve problems as they arise. They provide temporary support to individual bus-stops as required, and are the main personnel to deal with blockages and other incidents on the running way. They also receive basic maintenance training so that they can provide first-line assessment of any problems with vehicles and request Maintenance support.

- e) A Reserve Pool of buses is established. This equates to 5-10% of the total fleet. The core 90-95% of the fleet operates on pre-assigned routes and timings. By contrast, the Reserve Pool are under the direction of the System Control Centre. They operate normally, except that they can be assigned among routes during the day as demand requires. In addition, a small Hot Reserve will be available to insert into the service directly at stations where the queues are not being cleared and potentially dangerous conditions are arising.
- f) A *Mobile Maintenance Crew* is established. These are employees of the operator(s) at operators' own cost, and are under the direction of the System Control Centre. This consists of a small group of maintenance workers who can carry out minor repairs at the termini, and get buses back into service without losing time going to the depots. The crew can also be dispatched to buses which will encounter problems along the route. An additional mobile unit is located at a location (to be determined) which only serves vehicles with problems on-route. It should be noted that the scale of the maintenance support will be the minimum prudent level. The philosophy is that operators should provide buses which are fit for a full day's service, and operators would be penalised for break-downs, with heavy penalties for breakdowns along the route.
- g) Contracts are made for *Tow Truck Services*. It is not intended that the System Management Company would own any such trucks. A number of suitable tow truck operators along the route are offered contracts. They are paid a good retainer, plus a call-out fee. They are paid a bonus if they reach the requested point within 5 minutes, and lose their contract if it takes more than 10 minutes to arrive.

3.7 Project Cost

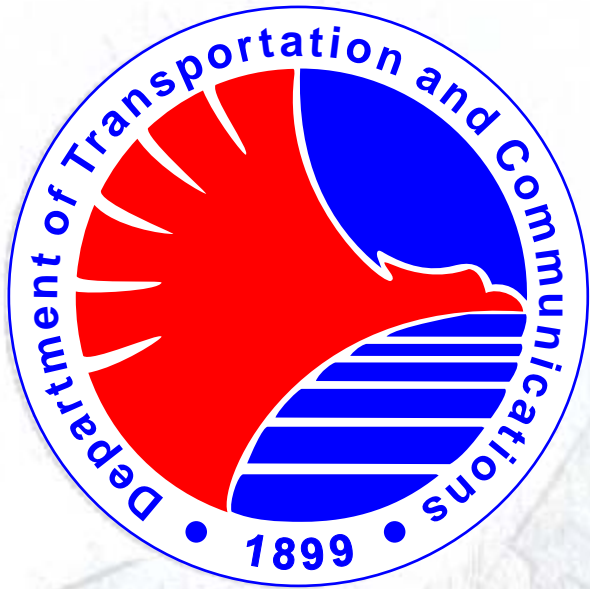
179. Total project capital cost was estimated at \$110,973,000 (PHP 4,881,723,000). This equates to a total expenditure of \$4.0m per Km. Cost is broken down below:

	COSTS	
Capital costs	PHP 2,180,067,018	USD 49,558,241
Land Acquisition & Resettlement	PHP 625,000,000	USD 14,207,774
Cost and Price Contingency	PHP 701,266,754	USD 15,941,504
Other Project Costs	PHP 1,375,389,621	USD 31,265,961
TOTAL	PHP 4,881,723,393	USD 110,973,480

3.8 Implementation Schedule

180. The target year for operation is 2016; it is difficult to place a clear timescale upon these activities since project programme related risks are the approvals and negotiation with the existing transport sectors. To achieve the desired target schedule, the following key dates must be adhered to:

- Vehicles ordered September 2015 – 2016
- Detailed design starts early part of 2015
- Construction starts September 2015
- Construction finishes last quarter of 2016
- Project operates before 2016 ends



Chapter 4: Environmental Baseline Data

4.0 ENVIRONMENTAL BASELINE DATA

4.1 Physical Environment

181. The study area covers Manila City and Quezon City located at the northern portion of Metro Manila covering road network from Manila City Hall located east of Manila Bay and extending westward toward Fairview in Quezon City through the España Avenue – Quezon Avenue – Commonwealth Avenue route. The physical environment and features of project area can be referred from the general physical features of Metro Manila.

4.1.1 Geology and Geomorphologic Characteristics

182. Metro Manila is the capital in the Philippines consisting of 920 sq. km. land area. It has been industrialized with bustling factories, facilities and infrastructures. Its proximity to the sea and major waterways makes it a strategic location for trade and commerce.

183. Manila and Metro Manila lies on a shelf which has been basically formed by a ridge of volcanic tuff to the west. The ridge is bounded by fluvial deposits of sand, gravel and clay. Similar deposits found in the east of the ridge are transported by the Marikina River towards a valley formed by downward and tilted fracture or fault. Two main geological formations exist. The Guadalupe tuff (adobe) characterizes the hilly areas, while quaternary alluvium or recent fluvial deposits of deltaic sediment characterize the low-lying areas. See **Figure 4.1.1** for the Geologic Map.

184. The Metro Manila region is divided into three general physiographic zones: the coastal margin, the Guadalupe Plateau, and the Marikina-Laguna lowlands. Gervasio (1967) refers to the coastal margin as the Manila Deltaic Plain. The Guadalupe Plateau is high topographically; it is also a dominant physiographic feature of Metro Manila. The plateau separates the coastal margin of Manila from the western region of the Marikina-Laguna de Bay Lowlands.

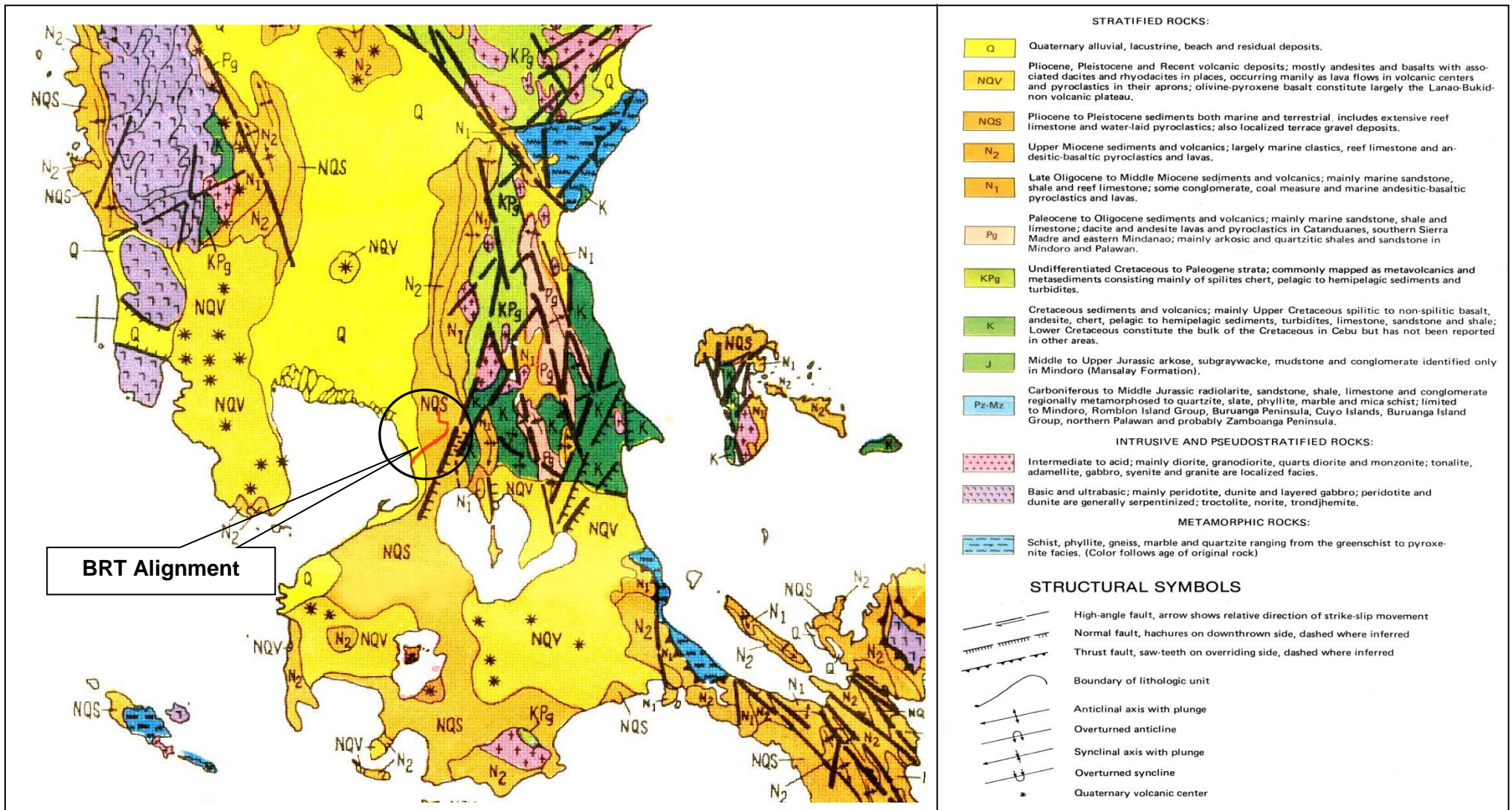
4.1.1.1 Stratigraphy

185. The Guadalupe Plateau forms the backbone of Metro Manila; this north-south trending topographic high extends from Novaliches in the north to Parañaque in the south. The Guadalupe formation is initially defined for the pyroclastic deposits of rock and ash found in the Metro Manila Area (Purser and Diomampo, 1995). It includes a lower conglomerate member (Alat Conglomerate) and an upper tuffaceous member known as the Diliman Tuff (Purser and Diomampo, 1995). Gervasio (1968)¹ described the Guadalupe Formation as mostly water laid and the bulk of the formation consists of lithified volcanic ash, lapilli and crystal sand. Gervasio (1968) also noted the presence of beds rich in sand that are not directly derived from volcanic activity. This he said is common in the upper stratigraphic section, in addition, thick beds of partly welded agglomeratic tuff occur intermittently in the Blue Ridge area in Quezon City to Novaliches, while in the vicinity of Bagong Ilog, Pasig, thin beds of fluvial gravel are intercalated with the tuff. The bedding planes of the Guadalupe Formation have a regional dip of 5 to 10 degrees to the west (Gervasio, 1968). Approximately 85% of the study area is located in the Guadalupe Plateau.

186. To the west of the Plateau is the coastal margin, which is made up of unconsolidated alluvial materials. This series of alluvial deposit makes up the Manila Deltaic Plain.

187. Manila to Pasay City and coalesces with the beach and lagoonal deposits of Parañaque. Northwards, the delta connects with the estuarine deposits and beach and sand bar deposits of Caloocan City and Malabon. Gervasio (1968) further specified the extent of the deltaic plain, which includes the areas of Balut in Tondo, Binondo, San Nicolas, Santa Cruz, Sampaloc, Quiapo, Intramuros, Pandacan, and western part of Mandaluyong, Ermita, Paco, Malate and Pasay City. These areas are said to be the result of the progressive accumulation and subsequent piling up of transported sediments due to the coalescing of the deltas. The delta deposit is estimated by Gervasio to be about 70 meters

¹ Gervasio, F. The Geology, Structures and Landscape Development of Manila and Suburbs. The Philippine Geologist Vol. XXII, No. 4, December 1968.



Source: MGB

Figure 4.1.1: Geologic Map of Metro Manila



thick along the coast and tapers landward. The delta deposit consists of sand, pebbly gravel, silt, mud and clay of various colors and plasticity. It conformably overlies the tuffaceous formation.

188. Recognizing the geological features of the BRT corridor, it is imperative that geotechnical investigations should be undertaken within the proposed locations of the depots and bus stations/terminals. Relevant geological features are liquefaction and ground settlement. A geotechnical site investigation is the process of collecting information and evaluation of conditions underneath the soil for the purpose of designing and constructing the foundations for the bus stations and other appurtenant structures. A design baseline from geotechnical data will be generated which will summarize all the assumptions and basis of calculations as designed parameters to address risks of liquefaction and ground settlement considerations.

4.1.1.2 Seismic activity

189. The City of Manila is physically vulnerable to earthquake related hazards such as liquefaction and ground shaking. The July 1968 earthquake proved devastating to the business community and the public in general. Earthquakes greatly affect both economic and social interaction; hence, earthquake resistant technologies or sophisticated structural measures should be applied in the construction of buildings and structures.

190. To delineate high and low seismic risk areas from a foundation engineering perspective, a detailed geological study² was conducted. Extensive foundation drilling and soil tests of the Metro Manila area were conducted and based on the results of these tests, Metro Manila could be divided into zones of varying vulnerability to ground-shaking induced by high intensity earthquakes. **Table 4.1.1** shows the comparative seismicity risk level within Metropolitan Manila.

191. The zonal classifications are defined by the types of soil or rock material present, the depth of the adobe bedrock (or thickness of the soil) which in turn controls the resonance of swaying of a structure, especially high rise buildings. The very high risk category is assigned to areas underlain by very thick layers greater than 15 meters) of soft clay or loose sand such as those found at the mouth of the Pasig River and Marikina River. Very low risk areas are those where the adobe bedrock is exposed or covered by no more than a couple of meters of soil.

Table 4.1.1: Comparative Seismicity Risk Level

Very Low Risk Zones	Low Risk Zones	High Risk Zones	Very High Risk Zones
Caloocan	Pasay City	South East	Downtown Manila, Quiapo, Intramuros, Sta Cruz
East	Sampaloc	Marikina	Binondo, Port Area
Malabon	Pandacan	Ermita	Reclamation Area Along Roxas Blvd
Valenzuela	East Marikina	Malate	Pasig
Novaliches	..	Navotas	Pateros
Quezon City	..	South Marikina	East Taguig
San Juan	..	..	Coastal Town of the Marikina Valley Plain
Mandaluyong	..	..	..
Makati	..	..	..
Paranaque	..	..	..

Source: City Profile of Manila, 2000

192. Recognizing that downtown Manila and Quiapo are listed as very high seismic risk zones, the Project design consultant shall identify or assign values for minimum Peak Ground Acceleration (A) that will be used in the structural design of the Project structures. The design criteria and load for the BRT structures should comply with the requirements of the National Structural Code of the Philippines and AASHTO Standard Specifications for Roads and Highways (1998).

² An excerpt from the City Profile of Manila, 2000

193. Incorporating the seismic features of the BRT corridor and the selection of the level of earthquake to be considered at design and service stages, the ultimate goal is to ensure that structures could withstand an earthquake (at a specified return period) with no significant damage or repairable damages.

4.1.2 Soil Characteristics

194. Major soil types in Manila along BRT alignment consist of Eutropepts³. Both soil units belong to the order inceptisols. The Eutropepts is characterized by deep to very deep well-drained dark yellowish brown to dark brown alluvial soils with loam, silt loam, clay loam, silty clay loam, or sandy loam textures and occur on level to gentle slopes having high base saturation. These soils have moderate to high fertility with soil pH of medium acid to neutral.

195. Within the Quezon City area, soil type along BRT alignment is predominantly of Novaliches loam clay series which is commonly called “adobe”. It is mainly characterized as hard and compact and covers 81.31% of whole Quezon City land area.

4.1.3 Topography and Slope

196. The topography of Metro Manila slopes moderately towards the west where it merges with the coastal margin. The westerly sloping topography is influenced by the westerly dipping strata of volcanoclastic rocks that make up the Guadalupe Plateau. In contrast, the eastern margin of the plateau is characterized by a very steep slope, especially its northern segment from Montalban to Pasig. The steep slope sharply drops to the northern portion of the Marikina-Laguna Lowland (i.e. Marikina Valley). This eastern limit of the plateau is interpreted to coincide with the fault scarp of the West Marikina Valley Fault. However, extension of the fault scarp south of Pasig City is not as well defined. From this section and southwards, the eastern margin of the Guadalupe Plateau is a moderate slope as it meets the narrow coast of Laguna de Bay (part of the Marikina-Laguna Lowlands).

197. The topography of Metro Manila can be classified as low relief, with flat to rolling terrain. The plateau reaches a maximum elevation of about 60 m asl in the vicinity of Katipunan, Quezon City and gently declines towards the north and the south. The western limit of the Guadalupe plateau is interpreted to correspond with the 5 m contour line (based on NAMRIA’s topographic map). The coastal margin is flat with elevation of 0-5 m asl. Within the City of Manila and Quezon, the coastal margin is now built up.

198. The topography of Manila is relatively flat with some portions below sea level. During high tide, the seawater goes about two kilometers inland along the Pasig River towards its source, the Laguna de Bay. Quezon City, on the other hand, is situated on a Guadalupe Plateau wherein topography is largely rolling with alternating ridges and lowlands. The southern part of the city has a low grade terrain while the northern half is undulating that terminates at the Novaliches Reservoir or La Mesa Dam where the water supply for most of the National Capital Region is impounded.

199. Slope along BRT alignment is generally undulating to rolling. Most of these parts are of Novaliches clay which is further categorized as follows: Urban Land Complex (NvucC/D)⁴ with 5-15% slope (47.16%); Novaliches Urban Land Complex (NvucB) with 2-5% slope (7.26%); Novaliches Clay (NvC1) with 5-8% slope (10.91%), and Novaliches Clay (NvD1) with 5-8% slope (1.5%).

4.1.4 Drainage pattern

200. There are four principal river basins that drained Quezon City, namely:

- San Juan-San Francisco River,
- Marikina River,
- Tullahan River and

³ Sourced from the Manila Comprehensive Land Use Plan and Zoning Ordinance, Physical Characteristics, City of Manila, 2005-2020

⁴ Sourced from Quezon City Socio Economic Profile, 2010.

- Meycauayan River.

201. Within Quezon City, the BRT alignment shall be drained by San Juan River and Tullahan River. San Juan River traverses the central and southern sections of the city and sloped down to Pasig River, while Tullahan River traverses the Novaliches area discharging to Tenejeros River in Malabon and serves most of the Novaliches district from Batasan to Caloocan City including Fairview.

202. Within Manila area, the drainage system ranges from the river systems (Pasig-Manila Bay segment) to the river tributaries and creeks or “esteros” and large storm sewers to the smallest drains that run along roadsides to the receiving water body. The BRT alignment is drained by Pasig River through several “esteros” and into the Manila Bay.

203. The Pasig river system consists of Marikina River and San Juan River. Pasig river system is part of the Pasig-Laguna River Basin, one of the 18 major river basins (MRBs) in the country. Pasig River connects Laguna de Bay with Manila Bay. The tributaries of Pasig River include the San Juan River and Marikina River. The Marikina River drains the southwestern side of the Sierra Madre Mountain Range. The Pasig River System has a catchment area of about 78,793 hectares (excluding the catchment of Laguna de Bay) (SNC-Lavalin, 1995)⁵. The catchment of Pasig River is highly urbanized, draining a large section of Manila, Quezon City and San Juan. It is only the headwater of Marikina River that now remains undeveloped. However, the Metro Manila urban sprawl has encroached into this area.

204. All these drainage systems drain into Manila Bay.

205. The estuary of this river system has changed significantly over the last two decades due to reclamation, although drainage channels between the mainland and the Manila Bay Reclamation area have been provided, it is still suspected that the reclamation contributes to the flooding of certain parts of the city of Manila. The flooding situation is confounded by the conversion of the wetlands along the Manila-Parañaque coastal margins.

4.1.5 Flooding

206. According to Besana and Daligdig (1993)⁶, four types of flooding occur in Metro Manila. These are (1) flash floods which result from rapid accumulation of run-off; (2) riverine floods which occur when river water exceeds bankfull capacity; (3) standing flood which is due to accumulation of water in concreted areas like roads; and (4) coastal flood which results from storm surges during high tide.

207. Among the places in Metro Manila that they have identified to be prone to flooding are Manila, part of Makati and Pasay, and some parts of Quezon City. Coastal flooding affects Parañaque, Las Piñas and the City of Pasay while riverine flooding affects the downstream portion of Parañaque River. Cited reason for flooding is inadequate drainage system vis-à-vis the extensive development within the middle and upper reaches of Parañaque and Las Piñas Rivers.

208. **Figure 4.1.2** shows the depths of flood water that may befall within flood prone areas of Metro Manila. Based on this map, the BRT corridor will traverse areas that are prone to flooding with depths ranging from 0.5 m to 1.5 m and deeper. These areas are located at sections within España Avenue in Manila and Quezon Avenue in Quezon City.

209. The project corridor has zero risk of casualty due to flooding as set out by the Master Plan for Flood Management in Metro Manila and surrounding areas published in 2013, except for the following sections:

5 EIS for the Light Rail Transit Line 1 South Extension Project, LRTA-SNC Lavalin/Ecosys Corp.

⁶ Dailigdig, J.A. and G.M. Besana (1993), "Seismological hazards in Metro Manila", Natural Disaster Prevention and Mitigation in Metropolitan Manila, 9-41

- Immediately surrounding the bridge over the San Juan River (along Quezon Avenue approximately 240 m north east of the junction with Araneta Avenue) – medium to high risk
- Along the frontage of Santo Tomas University – low risk
- From Quiapo Church to Manila City Hall Terminal – predominantly low, but high at the area immediately adjacent to Quezon Bridge.

210. Refer to **Figure 4.1.2** for the Flood Risk Map by overflow from major rivers. The figure also shows the risk level on danger of casualty relative to flooding of major rivers that will be traversed by the alignment of proposed BRT corridor. As can be seen from the map, three major rivers will be traversed by the BRT alignment, namely: Tullahan River intersected by Commonwealth Avenue in Fairview, San Juan River crossed by Quezon Avenue and Pasig River intersected by Quezon Bridge in Manila. As mentioned in the preceding section, all these rivers drain towards Manila Bay.

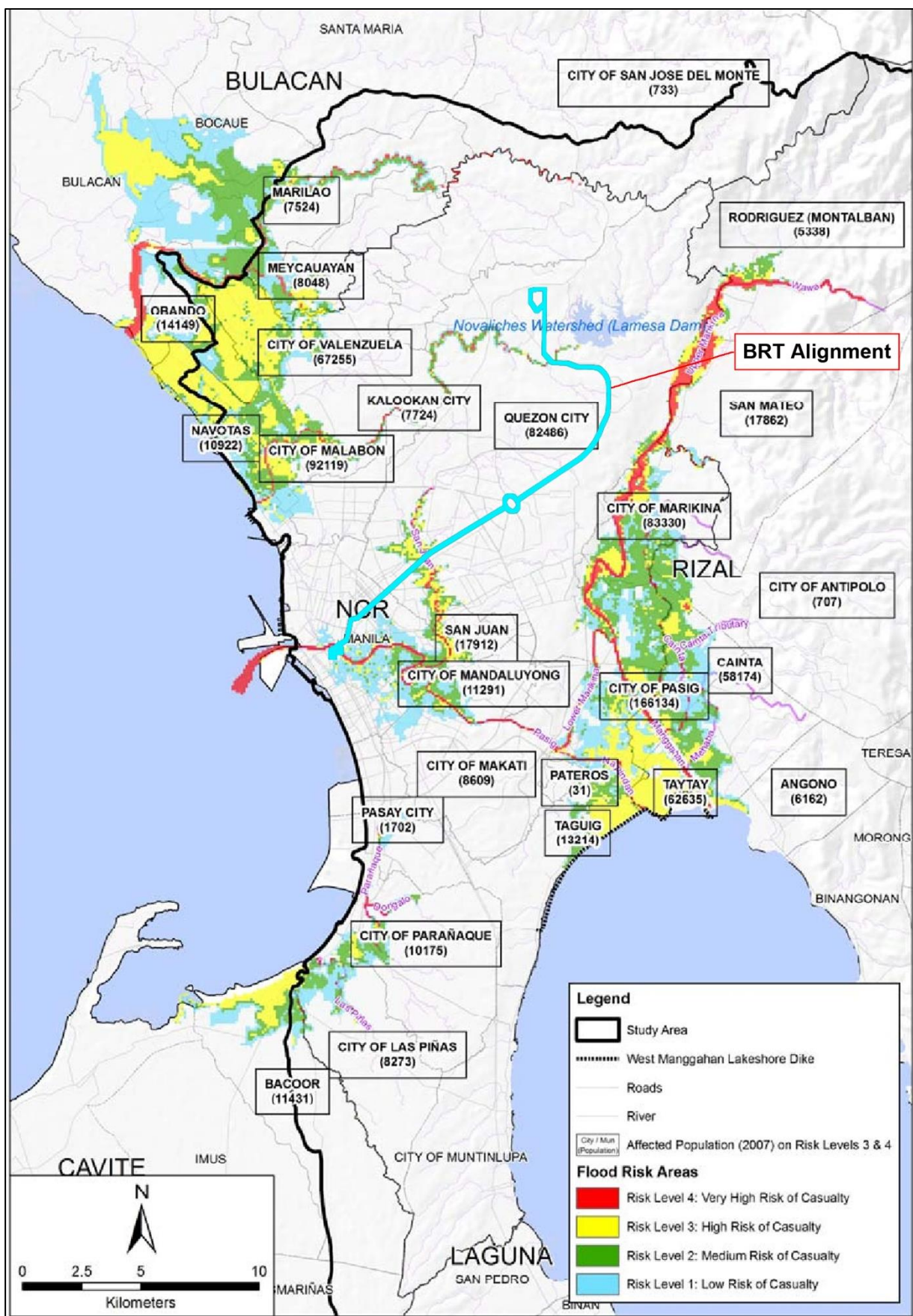
211. In the proposed BRT corridor especially along Espana Boulevard in Manila and Quezon Avenue in Quezon City, it is recognized that localized cause of flooding is mainly due to drainage capacity constraints. This type of flooding is made possible by (1) constricted waterways and esteros; (2) siltation and obstructions due to garbage and other solid wastes; and (3) presence of settlement communities and other man-made obstructions. The flooding problem is exacerbated by piles of solid wastes which lessen the suction capacity of the pumping stations.

212. Recognizing the localized causes of flooding along Espana Boulevard and Quezon Avenue, the project shall implement proper mitigation measures during construction stage to avoid siltation through the implementation of excavation and runoff control plan and drainage management plan. Prevention of dumping of garbage into the drainage system through the implementation of waste management and spoil disposal plan will also be carried out.

213. To address the perennial problem of flooding in Metro Manila, the DPWH has prepared a Flood Management Master Plan for Metro Manila and Surrounding Areas. This master plan can be considered as a link project for the proposed BRT project. Under this Master Plan, one of the proposed components and measures is the so called Drainage Improvement in the Core Area of Metropolitan Manila or DICAMM. DICAMM project has the following components:

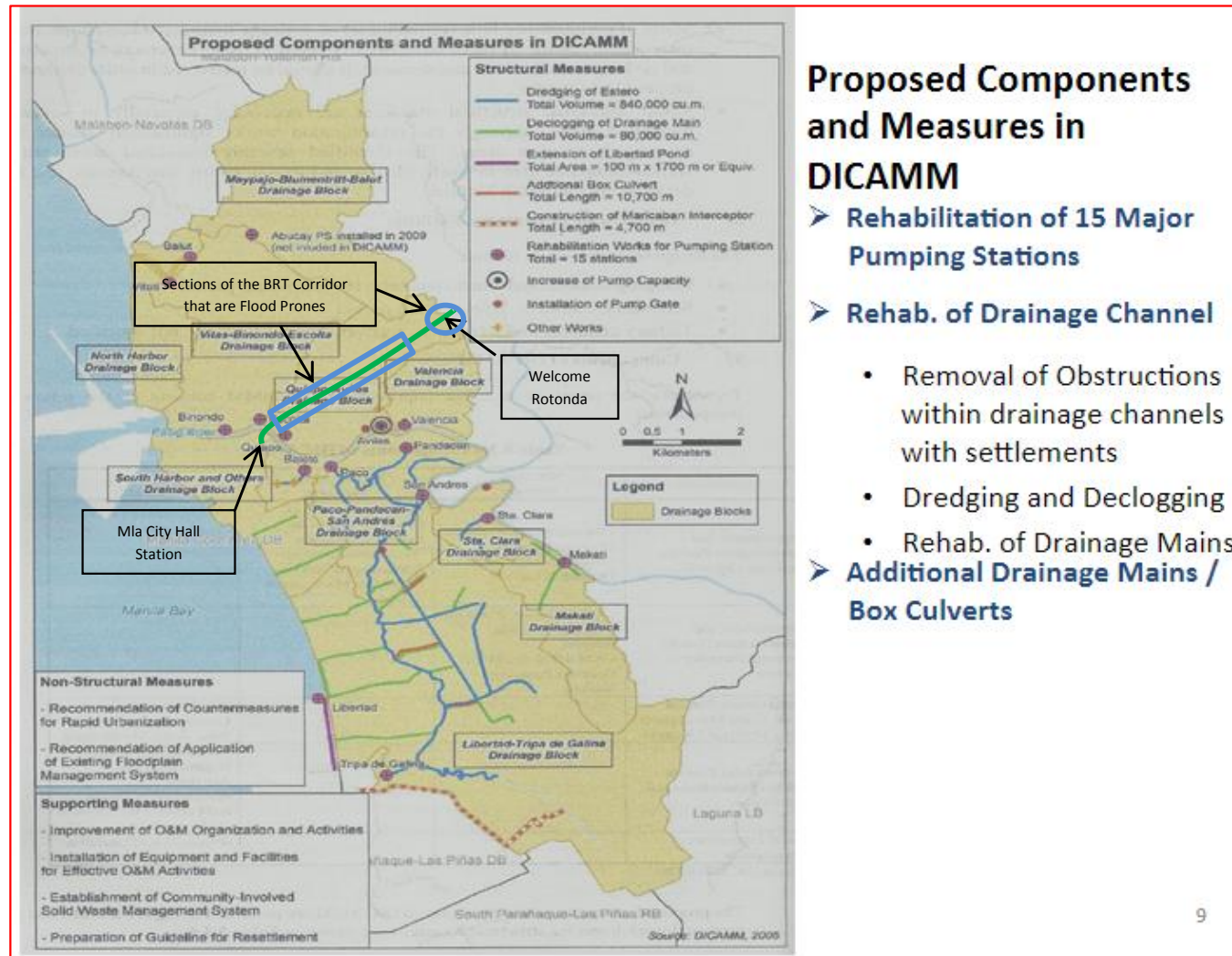
1. Rehabilitation of 15 Major Pumping Stations
2. Rehabilitation of Drainage Channel
 - Removal of Obstructions within drainage channels with settlements
 - Dredging and Declogging
 - Rehabilitation of Drainage Mains
3. Additional Drainage Mains/Box culverts

214. The area coverage and components of the DICAMM project is graphically presented in **Figure 4.1.3**. This plan covers the sections of the BRT corridor from Quezon Avenue up to the Manila City Hall. In this case, DICAMM will address the potential flooding problems in BRT corridor sections along Espana Avenue and Quezon Avenue.



Source: Master Plan for Flood Management in Metro Manila, 2012

Figure 4.1.2: Flood Risk Map of Metro Manila



Proposed Components and Measures in DICAMM

- Rehabilitation of 15 Major Pumping Stations
- Rehab. of Drainage Channel
 - Removal of Obstructions within drainage channels with settlements
 - Dredging and Declogging
 - Rehab. of Drainage Mains
- Additional Drainage Mains / Box Culverts

Figure 4.1.3. Proposed Components and Measures in DICAMM Project

4.1.6 Water Quality

215. Water quality survey was conducted on January 29, 2015. In this study, water samples were collected from the three major rivers traversed by BRT alignment, namely, San Juan River, Tullahan River, and Pasig River. Water samples were taken from the upstream and downstream portions of the rivers approximately 20 meters away from the BRT alignment using grab sampling method. The weather condition before and during sampling is dry and sunny with temperature of 37°C. The sampling locations of water quality survey are listed in **Table 4.1.2** and shown in **Figure 4.1.4**.

Table 4.1.2: Water Sampling Locations

Sample #	Sampling Date and Time	Location	Coordinates
WS-1	29 Jan. 2015 (9:30AM)	San Juan River (Upstream)	14°37'49.83"N; 121° 0'53.74"E
WS-2	29 Jan. 2015 (9:35AM)	San Juan River (Downstream)	14°37'44.59"N; 121° 0'56.16"E
WS-3	29 Jan. 2015 (10:25AM)	Pasig River (Upstream)	14°35'45.73"N; 120°58'52.12"E
WS-4	29 Jan. 2015 (10:35AM)	Pasig River (Downstream)	120°58'52.12"E; 120°58'52.12"E
WS-5	29 Jan. 2015 (1:10PM)	Tullahan River (Upstream)	14°42'25.26"N; 121° 4'0.07"E
WS-6	29 Jan. 2015 (1:25PM)	Tullahan River (Downstream)	14°42'21.44"N; 121° 3'59.56"E

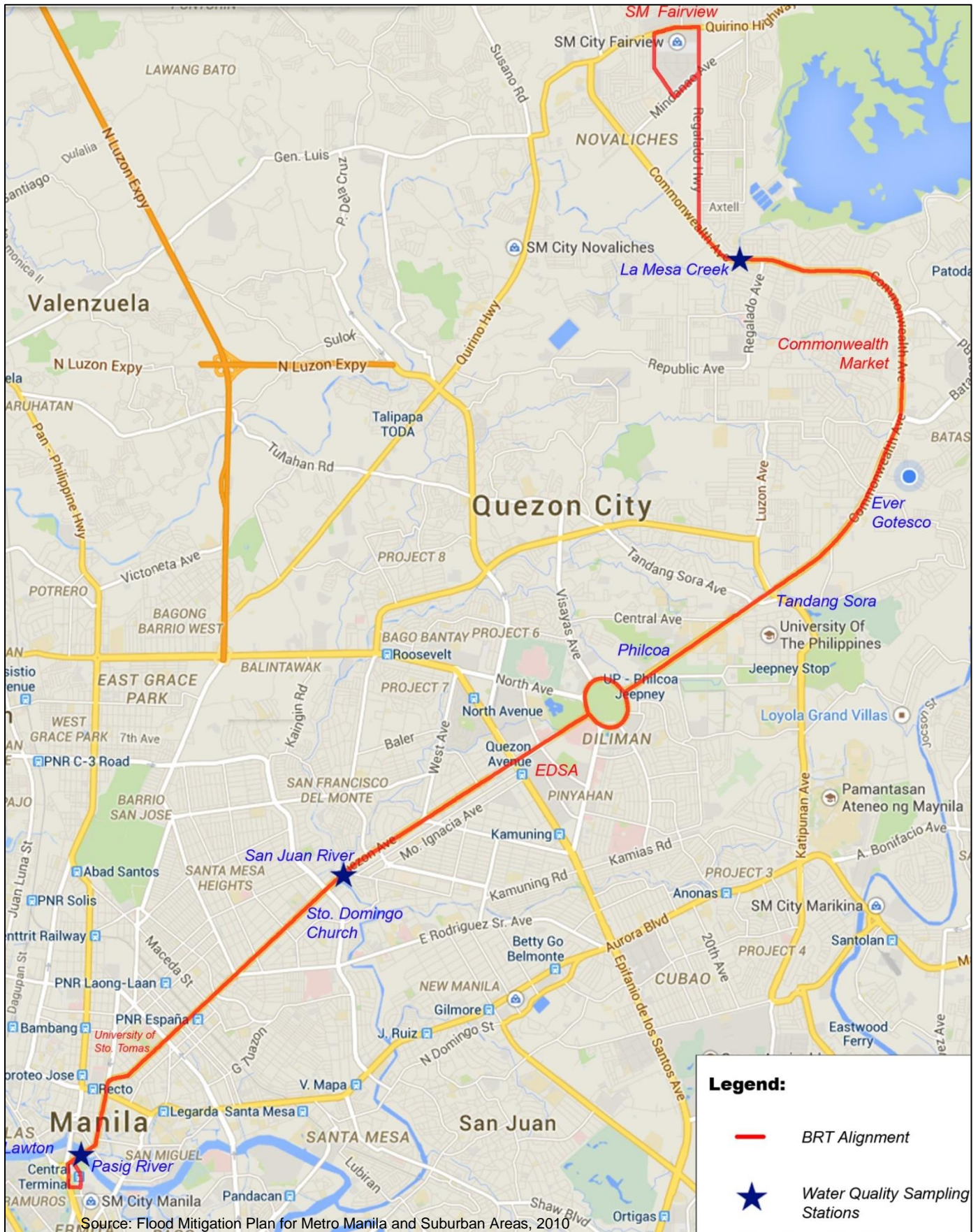
216. The water samples collected were delivered to Echem Environmental Testing Laboratory for physical and chemical analyses. **Annex 2** shows the results of laboratory analyses and the DENR Accreditation Certificate of Echem Environmental Testing Laboratory.

217. Water samples were analyzed for the following laboratory parameters and procedures:

- pH (APHA 4500-H Electrometric Method)
- Color (APHA 2120B Visual Comparison Method)
- BOD₅ (APHA 5210B Azide Modification Technique)
- COD (APHA 5220B Open Reflux Method)
- TSS (APHA 2540D Gravimetric Method)
- Oil and Grease (APHA 5520B Petroleum Ether extraction/Gravimetric Method)

218. For comparison purposes, the quality of these water samples was compared with the standards set for Class C. By definition provided under DENR DAO 34, water assigned as Class C is usually used for manufacturing processes or Industrial Water Supply Class I.

219. **Table 4.1.3** presents the results of the water quality survey together with the DENR standards for Class C.



Source: Google Map

Figure 4.1.4: Water Quality Sampling Stations

Table 4.1.3: Results of Analysis of Water Quality Survey

Parameter	Unit	DENR Standard Class C	Water Sample (WS)					
			WS 1	WS 2	WS 3	WS 4	WS 5	WS 6
			San Juan River		Pasig River		Tullahan River	
			Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
Date of Collection	---	---	29 Jan.'15	29 Jan.'15	29 Jan.'15	29 Jan.'15	29 Jan.'15	29 Jan.'15
Temperature**	°C	3° rise*	25.5	25.5	25.5	25.5	25.5	25.4
pH	-	6.5-8.5	7.46	7.48	7.08	6.74	7.62	7.47
Color, apparent	PCU	(c)	100	80	100	125	40	40
BOD ₅	mg/L	10	40	28	14	13	9	9
TSS	mg/L	(g)	45	42	56	69	33	37
Oil & Grease	mg/L	2.0	3	2	<1	<1	<1	4

Legend: (c) – no abnormal discoloration from unnatural causes
(g) – not more than 30 mg/L increase
(h) – not more than 60 mg/L increase
-- No standards specified

Note: Colored cell indicate that sample did not meet the DENR standard

220. Based from the results (Table 4.1.3), temperature of water sample range from 25.4 to 25.5°C that is typical to sunny weather. The pH ranges from 6.74 to 7.62 for all water samples and fall within the DENR standards for Class C water.

221. For BOD, only water samples from Tullahan River registered BOD values within the DENR Standards for Class C waters. BOD values of Pasig River and San Juan River exceeded the DENR Standard with values measured at 14 and 13 (upstream/downstream) and 40 and 28 mg/L, correspondingly. Although dissolved oxygen (DO) levels of these rivers were not measured, expected value for this parameter is inversely correlated to BOD values.

222. The measured concentration levels of total suspended solids (TSS) in mg/L ranged from 33 to 69 mg/L. These concentration levels of TSS would serve as baseline value for future monitoring references.

223. Only upstream of San Juan River and downstream of Tullahan River registered oil and grease parameter values exceeding DENR Standards for Class C waters at 3.0 and 4.0 mg/L, respectively.

4.1.7 Climatology

224. The synoptic station of PAGASA closest to the project is located in Science Garden in Quezon City. The entire BRT Corridor falls under Type I under the modified Corona's classification of Philippine climate (see **Figure 4.1.5**). This type of climate is characterized by two pronounced seasons: dry season from November to April and wet season from May to October. These two seasons are caused by the northeast monsoon from November to February, two trade winds from March to May and May to June and southwest monsoon from June to October.

225. **Table 4.1.4** shows the climatological normals or averages for a 30-year record (1981-2010) while **Table 4.1.5** shows the climatological extremes as obtained from the PAGASA-Science Garden Station in Diliman, Quezon City.

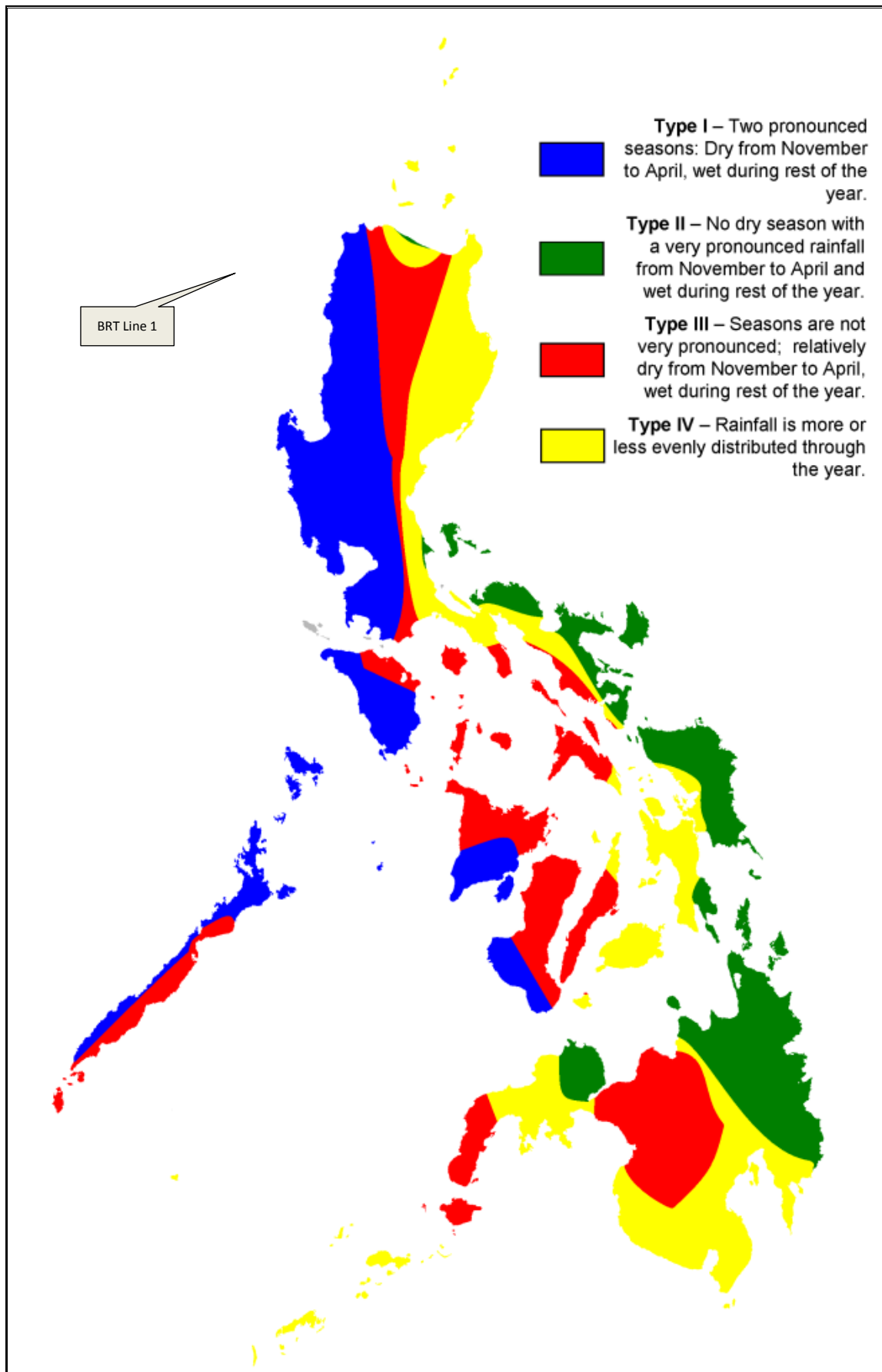


Table 4.1.4: Climatological Map of the Philippines

Table 4.1.4: Climatological Normal Values

Station Name : Science Garden, Quezon City										Latitude : 14.6 N		Elevation: 43.0 m				
Period : 1981 - 2010										Longitude: 121.0 E						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
	Rainfall		Temperature							Wind			No. Days w/			
Month	Amount	No. of	Max	Min	Mean	Dry Bulb	Wet Bulb	Dew Pt.	Vapor Pressure	Rel. Hum.	MSLP	DIR	SPD	Cloud Amount	TSTM	LTNG
	(mm)	RD	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(mbs)	%	(mbs)	(16 pt)	(mps)	(okta)		
JAN	18.5	4	30.6	20.8	25.7	25.3	22.2	20.9	24.6	76	1012.3	N	1	5	1	0
FEB	14.6	3	31.7	20.9	26.3	26.0	22.3	20.8	24.4	73	1012.0	NE	1	5	0	0
MAR	24.8	4	33.4	22.1	27.8	27.6	23.2	21.5	25.4	69	1011.3	SE	1	4	2	1
APR	40.4	5	35.0	23.7	29.4	29.2	24.4	22.7	27.2	67	1009.7	SE	1	4	4	2
MAY	186.7	12	34.7	24.7	29.7	29.3	25.3	23.9	29.5	72	1008.5	S	1	5	12	8
JUN	316.5	18	33.1	24.6	28.8	28.4	25.5	24.5	30.6	79	1008.1	SW	1	6	17	9
JUL	493.3	22	31.9	24.1	28.0	27.5	25.2	24.4	30.5	83	1007.7	SW	2	6	19	9
AUG	504.2	23	31.3	24.2	27.8	27.3	25.2	24.5	30.6	84	1007.4	SW	2	7	17	6
SEP	451.2	22	31.6	24.0	27.8	27.2	25.1	24.4	30.4	84	1010.6	SW	1	6	18	9
OCT	296.6	18	31.6	23.5	27.6	27.0	24.7	23.9	29.5	83	1008.8	N	1	6	11	6
NOV	148.8	14	31.4	22.7	27.1	26.5	24.1	23.2	28.4	82	1010.1	N	1	5	5	1
DEC	78.7	8	30.5	21.6	26.0	25.5	22.8	21.7	25.9	79	1011.5	N	1	5	1	0
ANNUAL	2574.4	153	32.2	23.1	27.7	27.2	24.2	23.0	28.1	78	1009.8	N	1	5	107	51

Source: PAGASA, 2015

Table 4.1.5: Climatological Extreme Values

STATION: SCIENCE GARDEN, QUEZON CITY										LATITUDE : 14°38'41.35"N					
YEAR: AS OF 2014										LONGITUDE : 121°02'40.45"E					
										ELEVATION : 43m					
MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (MM)		HIGHEST WIND (MPS)			SEA LEVEL PRESSURES (MBS)					
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE		
JAN	34.7	01-17-1998	15.5	01-27-1987	55.8	01-16-1988	24	ESE	01-17-1972	1021.4	01-21-2005	998.8	01-22-1989		
FEB	35.6	02-24-1967	15.1	02-04-1987	61.7	02-22-2013	22	SSE	02-02-1992	1020.1	02-08-1973	1002.3	02-09-1985		
MAR	36.8	03-26-1983	14.9	03-01-1963	65.0	03-31-2012	26	S	03-16-1992	1021.0	03-05-2005	997.8	03-28-1988		
APR	38.0	04-25-1998	17.2	04-05-1963	47.2	04-23-1985	26	SSE	04-07-1992	1016.9	04-05-1998	1001.4	04-16-2007		
MAY	38.5	05-14-1987	17.8	05-03-1962	166.0	05-20-1966	40	N	05-10-1992	1015.1	05-28-1986	992.4	05-17-1989		
JUNE	38.0	06-02-1993	18.1	06-27-1961	334.5	06-07-1967	37	SW	06-25-1972	1014.9	06-07-1997	978.7	06-26-1993		
JULY	36.2	07-20-1998	17.7	07-23-1961	246.4	07-07-2002	36	NNW	07-09-1977	1015.0	07-01-1979	989.2	07-15-1978		
AUG	35.8	08-10-1962	17.8	08-23-1964	391.4	08-07-2012	32	N	08-22-2000	1015.3	08-23-2002	994.2	08-24-1978		
SEP	35.4	09-04-1988	20.0	09-08-1964	455.0	09-26-2009	35	NE	09-28-2006	1016.0	09-28-1997	987.4	09-30-1995		
OCT	35.4	10-09-2003	18.6	10-31-1967	209.3	10-18-1975	30	SE	10-11-1989	1016.0	10-25-1986	978.7	10-23-1988		
NOV	35.0	11-01-2001	15.6	11-12-1962	169.9	11-20-1966	50	NNW	11-03-1995	1019.1	11-18-1979	883.1	11-02-1995		
DEC	34.7	12-15-1997	15.1	12-13-1988	87.2	12-22-1994	22	SE	12-22-1997	1020.0	12-27-2001	998.1	12-02-2004		
ANNUAL	38.5	05-14-1987	14.9	03-01-1963	455.0	09-26-2009	50	NNW	11-03-1995	1021.4	01-21-2005	883.1	11-02-1995		
Period of Record	1961 - 2014				1961 - 2014		1961 - 2014			1961 - 2014					

Source: PAGASA, 2015

226. The variation of mean daily air temperature is shown in **Table 4.1.4**. The range of variation of monthly averages ranged from 23.1°C to 32.2°C. January is the coldest month with mean daily temperature of about 25.7°C while May is the warmest month with mean daily temperature of 29.7 °C. The minimum daily air temperatures range from 20.8°C to 24.7°C. The maximum daily values range from 30.5°C to 35.0°C. The mean annual temperature is 27.7°C.

227. According to the 1961-2014 records from PAGASA, the highest recorded temperature at the nearest station was 38.5°C and this was observed on May 14, 1987. The lowest temperature, on the other hand, was observed on March 1, 1963 at 14.9°C (**Table 4.1.5**).

228. The highest average monthly rainfall in the Project areas occurs during the month of August with an average of 504.2 mm. The lowest monthly average rainfall in the area is during the month of February, with an average of 14.6 mm (Table 4.1.4). The rainy season coincide with the occurrence of the Southwest Monsoon in the months of June to September; the dry season on the other hand, is experienced in the months of November to April. The average annual number of rainy days in the area is 153. The most number of rainy days occurred in July to September with rainy days ranging from 22-23 days. A rainy day is defined as a period of 24 hours beginning at 0800 to 0800 hours of the following day during which more than 0.1 mm of rainfall depth is recorded.

229. For the record, the highest amount of rainfall recorded from the period of 1961-2014 on the area was on September 26, 2009 at 455.0 mm. (Table 4.1.5)

230. Based on the projected seasonal rainfall change, the average rainfall for the period of June to August is projected to increase in 2020 and 2050 to 1269.7 mm and 1419.5 mm, respectively. While, for the period of December to February, a decrease to 93.7mm and 66.1 mm is projected in 2020 and 2050, respectively⁷.

231. At current precipitation levels in the project area, periodic episodes of flooding along Espana Boulevard and Quezon Avenue are being experienced. With the projected increased in precipitation for the year 2020 and 2050, the project area may be subjected for more severe flooding episodes. Although not part of the proposed project scope, it is imperative that flood control mitigation projects should be implemented in order to address said future flooding problems along the BRT corridor.

232. The problem of rises in temperature is worldwide in scope wherein greenhouse gas emissions are said to be the main cause. The implementation of the BRT project is a small step for the country to reduce greenhouse gas emissions through the use of more efficient mass transport system coupled with the use of cleaner fuels. The modal shift in mass transportation from current traditional transport system to more efficient and cleaner systems, like the BRT, in the country could be translated to lesser greenhouse gas emission.

233. The dominant air streams that significantly affect the study area are the Northeast Monsoon, Southwest Monsoon, and the North Pacific Trades. The Northeast Monsoon prevails from October to May, while the Southwest Monsoon occurs during June to September. The North Pacific Trades is the southern portion of the North Pacific anticyclone. Having passed over a vast expanse of the North Pacific Ocean, this air stream is classified as a maritime tropical air mass.

234. In addition to the above seasonal characteristics, Metro Manila is directly influenced by tropical cyclones. An average of 20 of these disturbances affects the country each year. Of this number, 9 make a landfall and cross the country. According to a study conducted by PAGASA, the Manila Bay area lies in a region with an average of 5 tropical cyclone passages every 3 years. The typhoon-related maximum winds that may be observed in the area have greater frequencies in the months of July, October, and November. Floods are often caused by tropical cyclones in Metro Manila.

4.1.8 Ambient Air Quality

4.1.8.1 Air Quality Monitoring (from DENR)

Total Suspended Particulate (TSP)

235. During the conduct of the Detailed Technical Study, secondary data from two air quality monitoring stations of DENR which were located close to the BRT corridor were utilized to evaluate the impacts on local air quality along the BRT route. These monitoring stations record Total Suspended Particulate (TSP) and the results of these recordings are published by the DENR Environmental Management Bureau each year.

⁷ Lifted from EIS of LRT Line 1 Cavite Extension Project, 2012

236. The locations of the monitoring stations of DENR within Metro Manila are as follows:

- ❖ National Ecology Centre Compound, East Avenue (close to the corridor)
- ❖ National Printing Office Compound, EDSA (close to the corridor)
- ❖ Mandaluyong City Hall Compound, Maycilo Circle (control areas)
- ❖ Makati Bureau of Fire Compound, Ayala Ave. cor Buendia (control areas)

237. With limited monitoring stations within Metro Manila and correspondingly limited data for use in this ESIA works especially along the BRT corridor, the ESIA study team has designated ten air quality sampling stations which are all located along the proposed BRT corridor. Parameters measured include sulfur dioxide, nitrogen dioxide, carbon monoxide, total suspended particulates and particulate matter less than 2.5. Details of the results are presented in Section 4.1.8.2 (On-site Air Sampling and Measurement). To further establish the air quality condition along the BRT corridor, future air quality monitoring works shall be done and shall form part of the ESMP for this Project.

238. **Table 4.1.6** presents the recorded annual values in ug/NCM of TSP for the four monitoring stations of EMB.

Table 4.1.6: Annual values of TSP at Four Monitoring Sites of EMB

All readings are Micrograms/ Normal Cubic Metre (ug/NCM)	2004	2005	2006	2007	2008	2009	2010	2011	2012
National Ecology Centre Compound, East Avenue	163	156	140	131	134	130	150	118	119
National Printing Office Compound, EDSA	164	163	138	125	144	89	152	103	96
Mandaluyong City Hall (control area)	133	124	121	134	125	104	138	136	148
Makati Bureau of Fire Compound (control area)	211	183	153	146	134	145	160	128	135

Source: Detailed Technical Study, Manila-Quezon Corridor Improvement Project, 2013

Particulate Matter (PM10)

239. Secondary data on air quality for Particulate Matter 10 (PM10) was also taken from EMB monitoring station located along the proposed BRT alignment. The location of the EMB station is along Commonwealth Avenue near the Crissant Tower and another one is located at Timog EDSA close to BRT corridor, see below:

- ❖ Commonwealth Avenue, Quezon City (along the BRT corridor)
- ❖ DPWH, Timog EDSA, Quezon City (close to BRT corridor)

240. The Commonwealth Avenue monitoring station is along the proposed BRT corridor, thus capable of capturing the particulate matter concentration on this section of the BRT corridor. On the other hand, data from Timog EDSA monitoring station was used to represent the air quality condition of the nearest BRT corridor which is the EDSA – Quezon Avenue area. Although there may be differences in actual registration of levels of particulate matter, exhaust emissions for both areas are similar which are mostly diesel exhaust particles.

241. This ambient air quality monitoring is done to provide the public updated information on the quality of air, specifically on particulate matter, in various locations of Metro Manila. Particulate Matter (PM) is a type of air pollutant in the form of solid particles in the air that is produced by many sources, including burning of diesel fuels by vehicles, fossil fuels, mixing and application of fertilizers and pesticides, road construction, industrial processes, and wood burning. These microscopic particles, when breathed into the lungs, can increase respiratory disease and lung damage.

242. Latest monitoring results are presented in **Table 4.1.7**:

Table 4.1.7: Values of PM10 at two sites close to BRT alignment

Station Name	Location	Date	PM10 Value (Status)
Commonwealth Avenue, Quezon City	(Beside MMDA Rescue Shelter) Commonwealth Avenue, Quezon City (Roadside Ambient)	Oct. 9, 2014	23 µg/Ncu.m (Good)
DPWH, Timog-EDSA, Quezon City	Timog EDSA, Quezon City (Roadside Ambient)	Mar. 10, 2015	27 µg/Ncu.m (Good)
National Ambient Air Quality Guideline Value for PM10 (NAAQGV): Short Term: 24 Hours			150 µg/Ncu.m

Source: <http://www.emb.gov.ph/ambientair/>

243. The October 9, 2014 and March 10, 2015 results indicate a PM10 level of Good Air Quality Index which a concentration that range from 0-54 µg/Ncm.

244. The outputs of each of the monitoring stations will be collated and recorded post-implementation for a period of 5 years in order to assess whether there are any changes to TSP and PM10 recordings which can be attributable to the implementation of BRT project.

4.1.8.2 On-site Air Sampling and Measurement

245. The air quality parameters measured were Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Particulate Matter 2.5 (PM_{2.5}) and Total Suspended Particulates (TSP). The equipment used in collection of Total Suspended Particulates was Staplex High Volume Sampler, SKC Deployable Particulate Sampler for PM_{2.5}, SKC Airchek Gas Sampler for Sulfur Dioxide and Nitrogen Dioxide and LASCAR EL-USB-CO detector for Carbon Monoxide. The methods used in analyses of TSP and PM_{2.5} concentrations were determined by gravimetric method, pararosaniline method for sulfur dioxide and Griess-Saltzman method for nitrogen dioxide. For carbon monoxide, the direct reading CO concentrations were recorded in the built-in memory bank of the CO detector sampler. All methods used are prescribed methods under DAO 2000-81 or the IRR of the Philippine Clean Air Act of 1999. The sample collections were done in conformity with the National Ambient Air Quality Standard (NAAQS) as specified by Department of Environment and Natural Resources (DENR) Administrative Order No. 14. All samples were submitted to ELARSI Inc.⁸, an EMB-accredited testing laboratory.

246. Air sampling was undertaken at four stations for 24-hours period and six stations for 1-hour period and noise sampling was taken also at ten stations along the proposed BRT alignment from Manila Central Terminal in Manila to Fairview Terraces Mall – Quirino Highway in Quezon City. The location and its description of ambient air and noise sampling stations are shown in **Table 4.1.8** while the location map of sampling stations is shown in **Figure 4.1.6**.

⁸ <http://www.elarsi.com>. The website presents the various accreditation credentials of the company.

Table 4.1.8: Location and Description of Air and Noise Sampling Stations

Station No.	Location	Remarks
1 Philcoa Area	Located along the sidewalk area of Commonwealth Avenue - west bound. Fronting the Philcoa Wet Market.	Light to moderate traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
2 Tandang Sora Area	Located along the sidewalk area of Commonwealth Avenue adjacent the fence east bound area. Fronting the KFC restaurant.	Light to moderate traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
3 Fairview Center Mall Area	Located along the sidewalk area of Commonwealth Avenue - east bound besides the waiting shed area.	Moderate traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
4 Ever Gotesco Mall Area	Located along the outer lane of Commonwealth Avenue - east bound, beside the BPSO traffic station.	Moderate traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
5 Santo Domingo Area	Located along the sidewalk area at the corner of Quezon Avenue and Santo Domingo Street west bound area.	Light to moderate traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
6 Manila Central Terminal Area	Located along the sidewalk at the Taft Avenue west bound area. Fronting the Main entrance University of Manila.	Light to moderate traffic was observed at the area during the air quality sampling.
7 UST Area	Located along the sidewalk at the corner of España Avenue and Lacson Avenue west bound area.	Moderate to heavy traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
8 EDSA-Quezon Avenue Area	Located along the sidewalk on Quezon Avenue near EDSA west bound area.	Moderate to heavy traffic was observed at the area during the air quality sampling. Outer lane is for private vehicle passageway.
9 Commonwealth Market Area	Located along the outer lane of Commonwealth Avenue west bound area beside the Police Sub-Station station.	Moderate to heavy traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.
10 Quirino Highway Area	Located along the Quirino Highway sidewalk and Plant box of Fairview Terraces Mall - east bound area.	Moderate to heavy traffic was observed at the area during the air quality sampling. Loading and unloading of passengers.

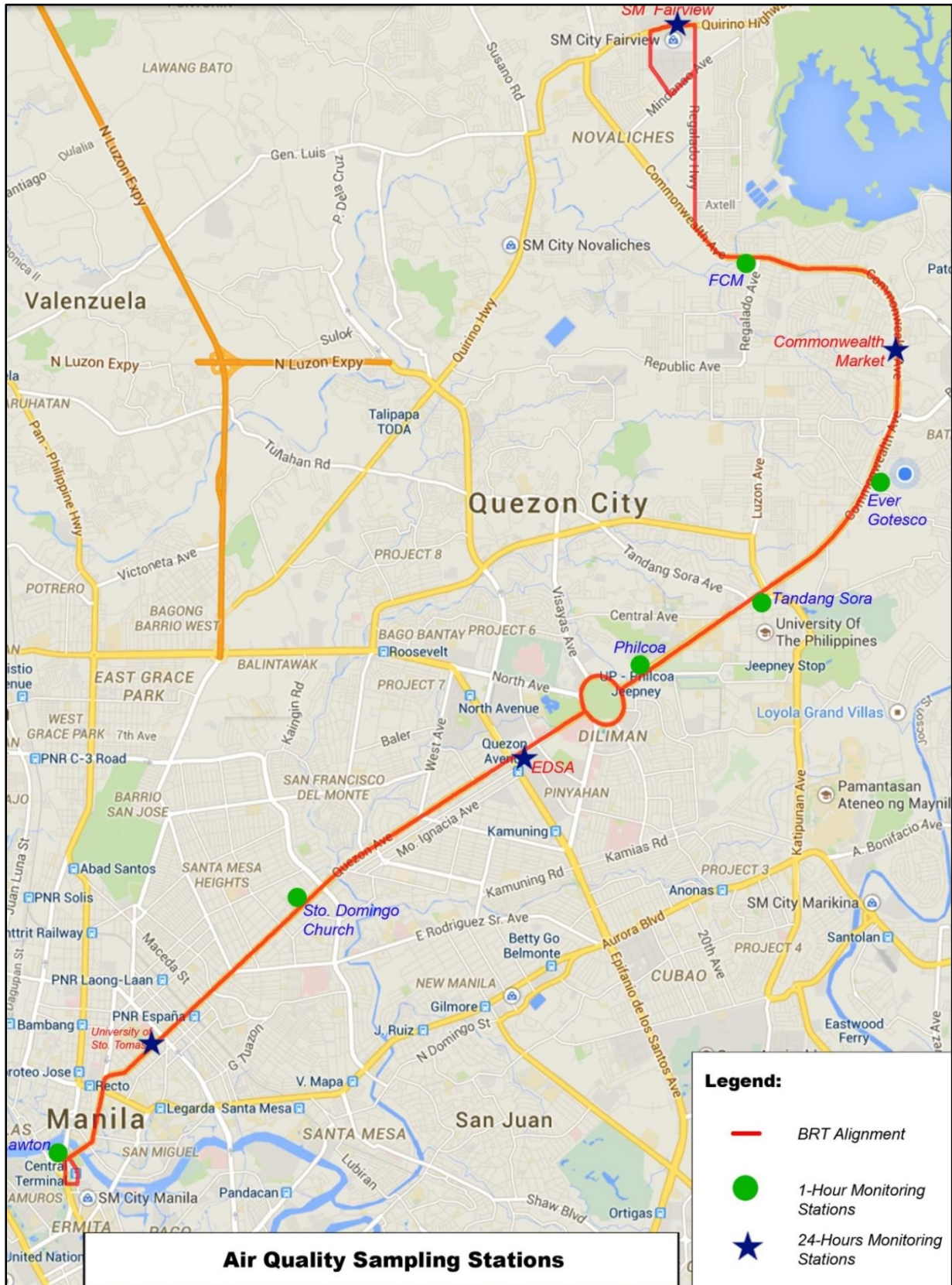


Figure 4.1.6: Location of Air Quality and Noise Sampling Stations

Source: Google Map

247. Justifications for the selection of the above enumerated air quality observation areas are the following:

- Many commuters and road users are around the area;
- The observation area is fronting the outside lane stretch of these road sections where loading and unloading for PUJs and PUBs are located;
- Inner lane of these road sections are dedicated for private car mobility, thus exhaust emissions from both idle and mobile vehicles can be captured in this area; and,
- All ten observation sites correspond to the proposed location of BRT station.

248. Along Commonwealth Avenue, dominant sources of exhaust emissions are jeepneys, buses, private cars and trucks while dominant sources of noise are from road traffic comprising of engine noise, accelerating / braking vehicles and honking vehicles.

249. From Edsa Quezon Avenue to Manila City Hall, dominant source of exhaust emissions are PUJs and private cars and few buses while dominant sources of noise are from road traffic comprising of engine noise, accelerating / braking vehicles and honking vehicles.

250. The measured air quality ambient concentration in the proposed BRT project alignment is shown below (Table 4.1.9):

Table 4.1.9: Measured Air Quality for BRT Project

STATION	Concentrations				
	Sulfur Dioxide (SO ₂) in µg/Ncm	Nitrogen Dioxide (NO ₂) in µg/Ncm	Carbon Monoxide (CO) in ppm	Total Suspended Particulates (TSP) in µg/Ncm	Particulate Matter less than 2.5 (PM2.5) in µg/Ncm
One Hour Sampling					
1	16.77	13.29	0.84	116	68.1
2	20.03	15.96	0.62	93	51.1
3	14.87	21.28	1.02	196	86.7
4	10.51	24.65	0.04	136	68.6
5	19.04	31.75	2.02	204	85.2
6	15.92	29.24	0.89	218	103.0
24-Hours Sampling					
7	21.20	45.22	1.5	424	11.4
8	14.95	54.34	1.1	299	9.9
9	29.45	24.90	1.1	589	22.4
10	15.95	20.31	0.3	319	14.4
DENR Standard Limit:					
24-Hours	180.0	150.0	9.0*	230.0	75.0
1-Hour	340.0	260.0	30.0	300.0	

Note: Highlighted values in yellow exceeded the ambient standards
* for 8-hrs average

251. The baseline measurement for air quality and noise level was conducted last February 4 to 9, 2015 at selected sampling station along BRT alignment from Manila Central Terminal to Quirino Highway-Fairview Terraces Mall. The observed concentration for total suspended particulates (TSP) showed above the 230 µg/Ncm DENR standard limit for 24-hours average with concentration levels from 299 to 589 µg/Ncm. The TSP levels for 1-hour average sampling are below the 300 µg/Ncm DENR standard limit with observed concentration values of 93 to 218 µg/Ncm.

252. For gaseous pollutants, the ambient concentration for sulfur dioxide 24-hours average are 14.95 to 29.45 µg/Ncm below the DENR standard limit of 180 µg/Ncm while the 1-hour average concentration levels are 10.51 to 20.03 µg/Ncm below the DENR 1-hour standard limit of 340 µg/Ncm. The nitrogen dioxide 24-hours concentration is from 20.31 to 54.34 µg/Ncm less than the DENR standard limit of 260 µg/Ncm and the 1-hour average DENR standard of 260 µg/Ncm concentration is above the measured

NO₂ 1-hour concentration from 13.29 to 31.75 µg/Ncm. The carbon monoxide (CO) 1-minute running average concentration is from 0.3 to 1.5 ppm for the 24-hours sampling and from 0.04 to 2.02 ppm for the 1-hour sampling. The maximum CO level recorded for the 1-hour sampling ranged from 1.5 to 11.0 ppm from 1-minute running average concentration, and for the maximum 24-hour sampling ranged from 3.5 to 35.5 ppm. Tabulated data for carbon monoxide are shown in **Annex 1**. The DENR standard for sulfur dioxide, nitrogen dioxide and carbon monoxide pollutants were not exceeded for the ten sampling locations. The sulfur dioxide and nitrogen dioxide standards are 180 µg/Ncm and 150 µg/Ncm, respectively. **Table 4.1.10** shows the DENR standard for National Ambient Air Quality Guidelines/Standards for Selected Air Pollutants (NAAQGS).

Table 4.1.10 National Ambient Air Quality Guidelines/Standards for Selected Air Pollutants

Pollutant	Standard Maximum GLC		Averaging Time
	µg/Ncm	Ppm	
Sulfur Dioxide (SO ₂)	180	0.07	24 hrs
	340	0.13	1 hr
	470	0.18	30 min
Nitrogen Dioxide (NO ₂)	150	0.08	24 hrs
	260	0.14	1 hr
	375	0.20	30 min
Carbon Monoxide (CO)	35,000	30	8 hrs
	10,000	9	1 hr
*Particulate Matter 2.5µ (PM2.5)	75	--	24 hrs
	--	--	1 hr
Total Suspended Particulates (TSP)	230	---	24 hrs
	300	---	1 hr

Source: DENR AO No. 2000-81: "Implementing Rules and Regulations for Republic Act 8749"

* DENR AO No. 2013-13: "Provisional National Ambient Air Quality Guidelines Values for Particulate Matter 2.5 (PM2.5)"

253. Results of the assessment show that ambient air quality in the project site and its environment is generally good in terms of gaseous pollutant and moderately high for total suspended particulate.

Existing Noise Level Conditions

254. The noise measurements were conducted using a Center Data logging Sound Level Meter on A-weighting scale following ISO standard. The unit used is Extech Instrument Model HD600 (Digital Datalogging Sound Level Meter). Self-calibration of the sound level meter (SLM) used follows the unit operation manual. In this case, transport-generated noise is measured in terms of equivalent sound level or Leq. This metric is A-weighted and accounts for all of the sound energy occurring during a 30-second interval. Leq includes peak sounds as well as "valleys" within a particular time frame. Leq could identify the average noise level over a period of time and can be easily measured with sound equipment. Measurements would therefore be in terms of Leq dB (A). An 'A' weighted scale with a slow response was chosen because it has been universally adopted for measurement of transport noise to compensate human hearing characteristics. This scale simulates the response of the ear at low levels and has been found to correlate well with subjective response to noise.

The noise average is calculated using the following logarithmic equation:

$$L_{eq} = 10 \log_{10} \left\{ \frac{1}{n} \left[10^{L_1/10} + 10^{L_2/10} + 10^{L_3/10} + \dots + 10^{L_n/10} \right] \right\}$$

Where: L_{eq} is the average energy sound level in dB(A), and

L_1, L_2, \dots, L_n are the observed/measured noise levels from period 1 to period n.

255. From about 1-m from the edge of the road, ambient noise measurements were made four times within a 24-hour period for different time category as morning, daytime, evening and nighttime periods. The time series of noise levels in 30-seconds intervals are shown in Annex 1. Summary of average noise levels for the ten sampling station is shown below (Table 4.1.11):

Table 4.1.11: Measured Noise Level for BRT Project

Station	Area Classification	Daytime Period	Evening Period	Nighttime Period	Morning Period
1	Commercial	77.0	-	-	-
2	Commercial	78.7	-	-	-
3	School	81.5	-	-	-
4	Commercial	-	78.8	-	-
5	School/Hospital (Church)	76.3	-	-	-
6	School	76.6	-	-	-
7	School	78.9	80.2	77.6	77.3
8	Commercial	74.7	72.0	70.3	77.3
9	Commercial	78.1	77.7	78.2	79.6
10	Commercial	74.6	77.8	70.1	77.2
<i>DENR Standard:</i>					
<i>School/Hospital</i>		50	45	40	45
<i>Residential</i>		55	50	45	50
<i>Commercial</i>		65	60	55	60
<i>Light Industrial</i>		70	65	60	65

Note: Highlighted values in yellow exceeded the ambient standards

256. All ten sampling stations exceeded the allowable noise limit for four different time periods for residential areas and commercial area category. Exceedances maybe attributed to the combined noise generated by vehicular traffic, human activities and absence of vegetation as natural noise buffers. The commercial noise level limits are 65 and 55 dBA for daytime and night time period, respectively. The observed daytime average noise levels are from 74.6 to 81.5 dBA and the nighttime average noise level is from 70.1 to 78.2 dBA.

257. Table 4.1.11 shows the DENR Standards for noise in general areas while Table 4.1.12 shows the expected Noise Levels from Construction Equipment in dB(A). Daytime standards for noise are higher than morning/evening and nighttime standards of DENR. Noise levels in Table 4.1.12 may be used to determine the appropriate time to operate the construction equipment given their expected noise levels by distance to receptors. For instance, using a frontloader during daytime located 240 meters away from residential area is acceptable since the equipment will generate a noise level of 51 dB(A) which is less than the 55 dB(A) DENR standard for noise on daytime in residential areas. In case a frontloader will be used about 60 meters away from residential area, the equipment will generate 63 dB(A) which exceed the 55 dB(A) daytime standard. Therefore, mitigation measures through the use of noise barrier or limiting the hour of operation of the equipment will be necessary.

Table 4.1.12: DENR Standards for Noise in General Areas

Area	Maximum Allowable Noise Level, dB(A)		
	Daytime	Morning/Evening	Nighttime
Schools, Hospitals	50	45	40
Residential	55	50	45
Commercial	65	60	55
Light Industrial	70	65	60
Heavy Industrial	75	70	65

Source: National Pollution Control Commission Memorandum Circular No. 002 Series of 1980: "Ambient Noise Quality and Emission Standard"

Table 4.1.13: Expected Noise Levels from Construction Equipment, dB(A)

Equipment	Distance, meters				
	15	30	60	120	240
Earthmoving equipment					
Front loaders	75	69	63	57	51
Backhoes	85	79	73	67	61
Graders	88	82	76	70	64
Trucks	91	85	79	73	67
Materials Handling					
Concrete mixers	82	79	73	67	61
Cranes	83	77	71	65	59
Stationary sources					
Generators	78	72	66	60	54
Compressors	81	75	69	63	57
Pumps	76	70	64	58	52
Impact Equipment					
Pile drivers	101	95	89	83	77
Jackhammers	88	82	76	70	64

Source: USEPA, 1971: "Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances"

Note: Sound level Reduction over Distance: The decrease in sound level from any single noise source normally follows the "inverse square law." Sound levels decrease equally with the distance from the sound source with 6 dB per doubling of distance.

http://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf

4.1.9 Air Quality Modeling

258. The modeling will use the CALINE-4 Dispersion Model for predicting the air pollutant concentrations near roadways. The CALINE-4 model is based on the Gaussian diffusion equation and employs a mixing zone concept to characterize pollutant dispersion over the roadway. The CALINE-4 model can predict pollutant concentrations for receptors located within 500 meters of the roadway given the source strength, meteorology, and site geometry.

259. In this study, roadway is divided into individual links into a series of element from which incremental concentrations area computed and then summed to form a total concentration estimate for a particular receptor location.

260. CALINE-4 is the most recent version of the CALINE model series developed by the California Department of Transportation. It embeds the concept of mixing zone and uses modified Gaussian distributions. CALINE-4 uses a series of equivalent finite line sources to represent the road segment, and models the whole region of finite line sources as a zone with uniform emissions and turbulence. The concentration at a point with coordinates (x,y,z) is calculated based on equation as shown below.

$$C(x, y, z) = \frac{q}{2\pi u \sigma_y \sigma_z} \left\{ \exp\left(\frac{-[z - H]^2}{2\sigma_z^2}\right) + \exp\left(\frac{-[z + H]^2}{2\sigma_z^2}\right) \right\} \int_{y_1}^{y_2} \exp\left(\frac{-y^2}{2\sigma_y^2}\right) dy$$

where q is the linear source length, u is the wind speed, and σ_y, σ_z are the horizontal and vertical Gaussian dispersion parameters, H is the source height, y_1 and y_2 are the y -coordinates of finite line source endpoints.

261. Among all the variables, σ_y is a function of the x -coordinate of the point where the concentration is calculated and horizontal wind angle standard deviation; σ_z is modified by incorporating the effects of vehicle-induced heat.

262. The Emission Factor used for NOX, CO and PM_{2.5} based on an urban roadway driving was summarized in **Table 4.1.14**.

Table 4.1.14: UK - Road Transport Emission Factors: 2011 NAEI For Urban Driving

Parameters	All Car s	All LGVs (Bus, Light Trucks)
CO, g/km (g/mi)	2.867 (5.2)	1.267 (2.3)
NOX, g/km (g/mi)	0.423 (0.8)	0.982 (1.8)
PM2.5, g/km (g/mi)	0.015 (0.03)	0.059 (0.11)

263. Above emission factors are based on hot exhaust and cold start emission. The tailpipe emissions in g/km from a vehicle with its engine warmed up to its normal operating conditions.

264. The basis of road transport emissions is U.K. setting and may differ slightly from Philippine experience due to probable differences in legislated emission standards and fleet composition. Emission sources are provided as either cars or LGVs (large good vehicles) and these vehicle categories are used in assuming fleet composition of vehicular traffic for the study.

265. Vehicle flows along the BRT alignment are shown in **Tables 4.1.14** and **4.1.15**. The assumption on vehicle type is of 80% cars and 20% are bus plus light trucks. Assumption of traffic growth along the Espana Avenue and Quezon Avenue from 2013 to year 2018 about 30% increase in 5 years (expected BRT operational phase).

266. The road link sections considered in modeling are shown below:

ESPANA (UST) **Figure 4.1.7:** Espana and Lacson Street
QUEZON AVE **Figure 4.1.8:** Quezon Avenue and EDSA

267. It will be assumed that during the operational phase of BRT project on the year 2018, the reduction of vehicle (public utility jeep – PUJ) is estimated 40% of total light vehicles (cars).

268. The computed 2013 and 2018 emission will be summarized in **Table 4.1.15**. To simplify the input requirements of CALINE-4 model, the maximum value of emission factor for different pollutants (CO, NOx and PM2.5) will be used and the total maximum traffic flow at considered road link. The summary of maximum predicted ground level concentration (GLC) in ppm using the CALINE-4 air quality model for each section with the following traffic information are shown in **Tables 4.1.16** and **4.1.17**.

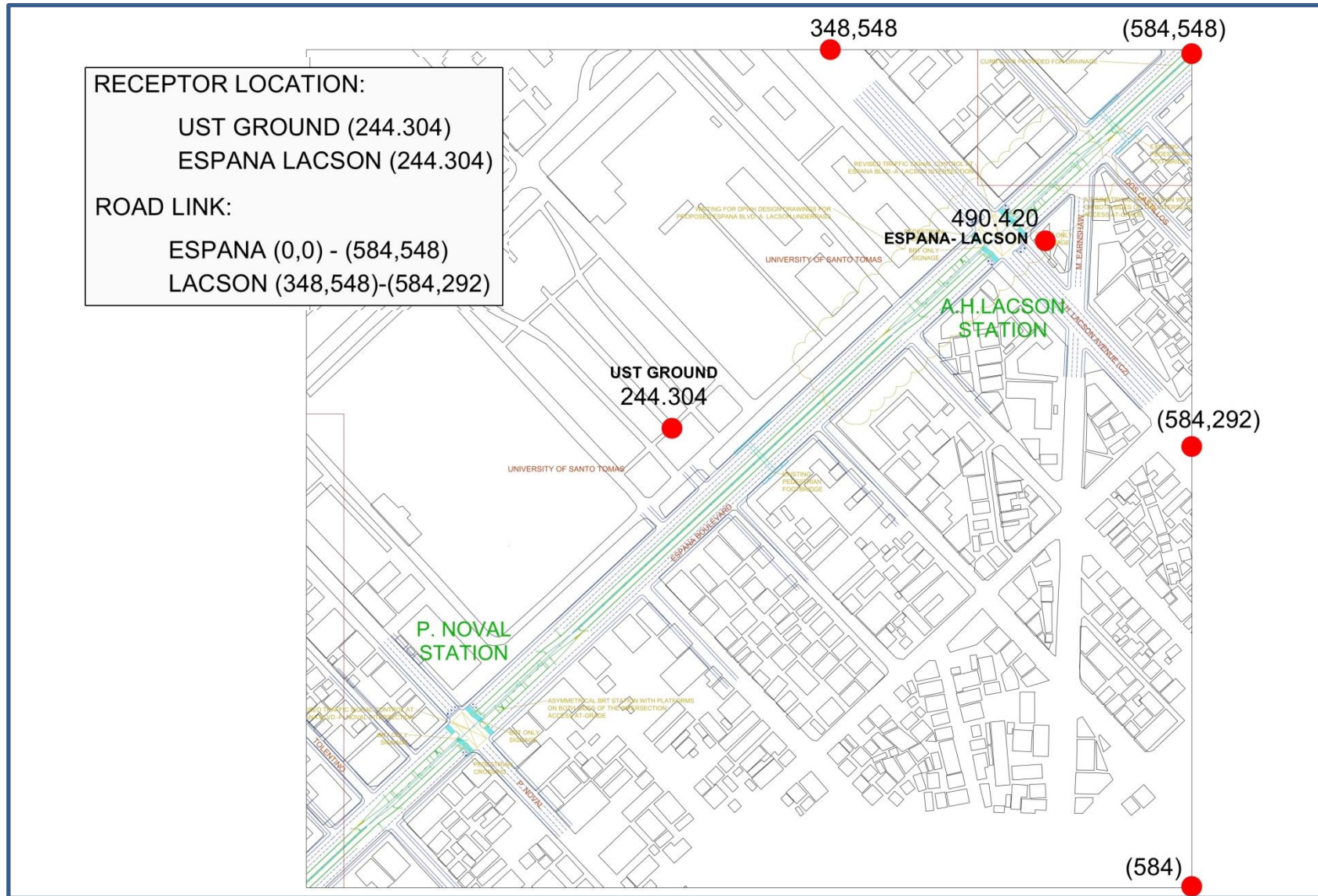


Figure 4.1.7: Espana and Lacson Streets

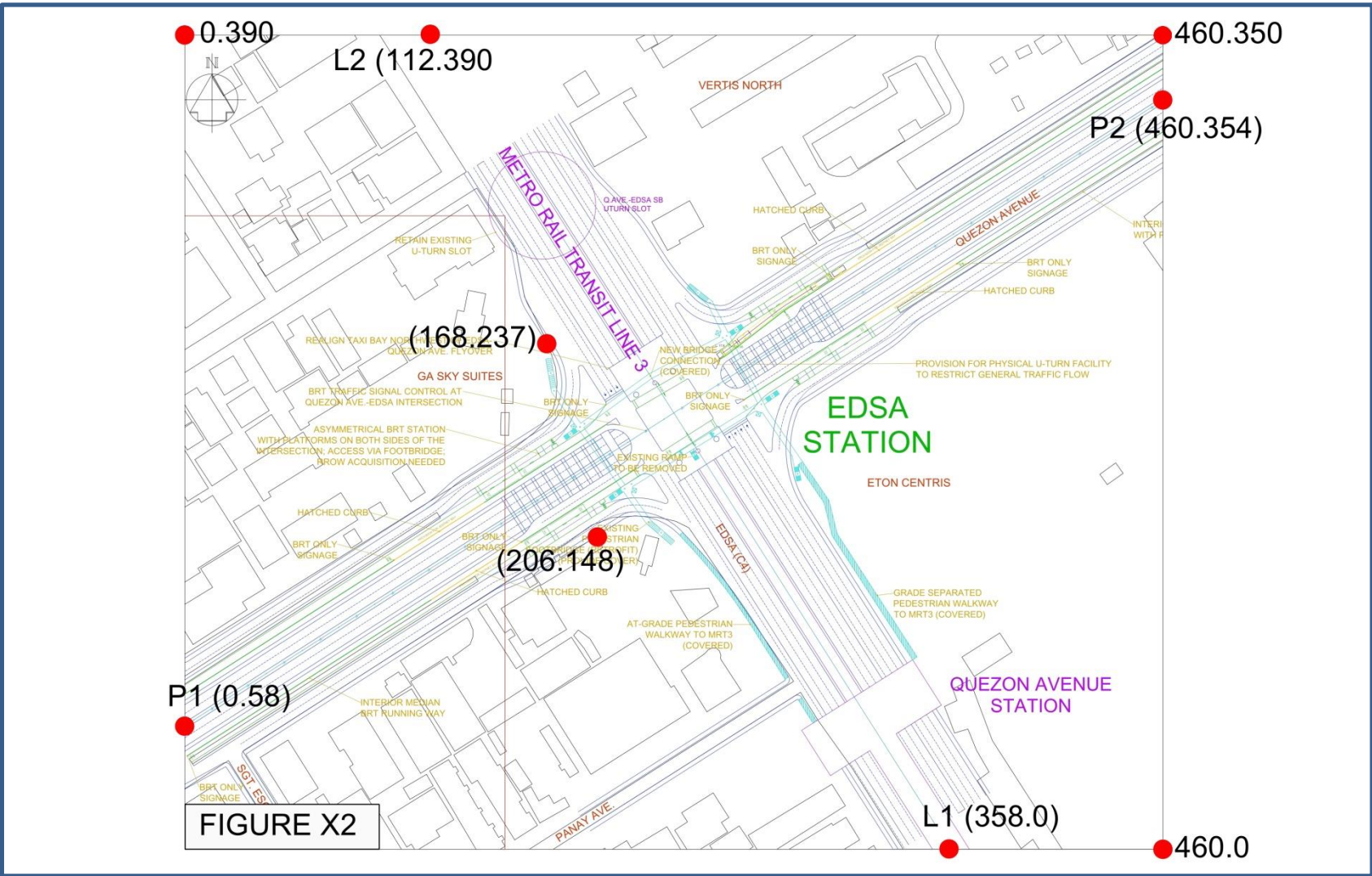


Figure 4.1.8: Quezon Avenue and EDSA

**Table 4.1.15: Vehicle Flows along the España Avenue and Quezon Avenue
(Source: Manila-Quezon Corridor Improvement Project Report: 2013)**

West Bound	Location	
	University of Santo Tomas	West of EDSA
AM Peak (3hr Av)	2047	3550
PM Peak (2hr Av)	1390	2375
24 Hour	29439	47202
East Bound	Location	
	University of Santo Tomas	West of EDSA
AM Peak (3hr Av)	1448	2312
PM Peak (2hr Av)	1449	2354
24 Hour	27195	42086

**Table 4.1.16: Estimate Vehicle Flows along the España Avenue and Quezon Avenue
(Source: Estimate for 2018)**

West Bound	Location	
	University of Santo Tomas	West of EDSA
AM Peak (3hr Av)	2661	4615
PM Peak (2hr Av)	1807	3088
24 Hour	38271	61363
East Bound	Location	
	University of Santo Tomas	West of EDSA
AM Peak (3hr Av)	1856	3006
PM Peak (2hr Av)	1884	3060
24 Hour	35354	54712

Table 4.1.17: Computed 2013 and 2018 Emission

Year 2013 (Based Year – Pre BRT Phase)				Estimated % Traffic		
	AM Peak WB	AM Peak EB	Total	80% Cars	20% LGVs	
UST Area	2047	1448	3475	2780	695	
EF in g/mi				Emission by Type		Total
	Cars	LGVs				
CO	5.2	2.3		14456.0	1598.5	16054.5
NOx	0.8	1.8		2224.0	1251.0	3475.0
PM2.5	0.03	0.11		83.4	76.5	159.9
West EDSA				Estimated % Traffic		
	AM Peak WB	AM Peak EB	Total	80% Cars	20% LGVs	
West EDSA	3550	2312	5862	4690	1172	
EF in g/mi				Emission by Type		Total
	Cars	LGVs				
CO	5.2	2.3		24388.0	2695.6	27083.6
NOx	0.8	1.8		3752.0	2109.6	5861.6
PM2.5	0.03	0.11		140.7	128.9	269.6
Year 2018 (Based Year – Post BRT Phase)				Estimated % Traffic		
	AM Peak WB	AM Peak EB	Total	80% Cars	20% LGVs	
UST Area	2661	1856	4517	3614	903	

	EF in g/mi			Emission by Type		Total
	Cars	LGVs				
CO	5.2	2.3		18792.8	2076.9	20869.7
NOx	0.8	1.8		2891.2	1625.4	4516.6
PM2.5	0.03	0.11		108.4	99.3	207.7
	AM Peak WB	AM Peak EB	Total	80% Cars	20% LGVs	
West EDSA	4615	3006	7621	6097	1524	
	EF in g/mi			Emission by Type		Total
	Cars	LGVs				
CO	5.2	2.3		31704.4	3505.2	35209.6
NOx	0.8	1.8		4877.6	2743.2	7620.8
PM2.5	0.03	0.11		182.9	167.6	350.5

Table 4.1.18: Predicted GLC for España Avenue Road Link

Receptor	Year 2013 Predicted Concentration		
	CO in ppm (µg/Ncm)	NOx in ppm (µg/Ncm)	PM _{2.5} in µg/Ncm
UST Ground (244,304)	0.6 (700.0)	0.01 (18.6)	13.6
Espana-Lacson (490,430)	0.4 (466.7)	0.01 (18.6)	10.1
Receptor	Year 2018 Predicted Concentration		
	CO in ppm	NOx in ppm	PM _{2.5} in µg/Ncm
UST Ground (244,304)	0.7 (816.7)	0.01 (18.6)	17.7
Espana-Lacson (490,430)	0.5 (583.3)	0.01 (18.6)	13.1

Table 4.1.19: Predicted GLC for Quezon Avenue Road Link

Receptor	Year 2013 Predicted Concentration		
	CO in ppm	NOx in ppm	PM _{2.5} in µg/Ncm
UST Ground (244,304)	1.7	0.01 (18.6)	18.4
Espana-Lacson (490,430)	0.6	0.01 (18.6)	6.2
Receptor	Year 2018 Predicted Concentration		
	CO in ppm	NOx in ppm	PM _{2.5} in µg/Ncm
UST Ground (244,304)	2.2	0.02 (37.1)	23.9
Espana-Lacson (490,430)	0.7	0.01 (18.6)	8.1

269. The predicted carbon monoxide levels at selected receptor locations (UST Ground and Espana-Lacson Street), specifically at España Road Link (see Figure 4.1.6), for year 2013 to 2018 ranged from 0.4 to 0.7 ppm. The nitrogen dioxide levels ranged 0.01 ppm and the particulate matter 2.5 micro ranged from 10.1 to 17.7 ug/Ncm. Tabulated CALINE-4 outputs are shown in **Annex 9**.

270. For Quezon Avenue Road Link, the selected receptor location are Quezon Avenue –East and Quezon Avenue west bound (see **Figure 4.1.7**), the 2013 to 2018 predicted CO GLC ranged from 0.6 to

1.7 ppm and the nitrogen oxide (as nitrogen dioxide) ranges from 0.01 to 0.02 pp. The particulate matter 2.5 micro concentration level from 6.2 to 23.9 ug/Ncm for 2013 to 2018.

271. The tabulated maximum concentrations for baseline air quality measurement conducted last Feb 4-9, 2015 are in **Table 4.1.20**.

Table 4.1.20: Observed Concentration for CO, NOx and PM2.5 during Baseline Survey (Feb. 4-9, 2015)

Sampling Location	Measured Maximum Concentration		
	CO in ppm	NOx in ug/Ncm	PM2.5 in ug/Ncm
UST Area (España-Lacson Street)	1.5	45.22	11.4
Quezon Avenue - EDSA	1.1	54.34	22.4

272. The total ground level concentration for baseline (ambient) and predicted concentration (CALINE-4 Model) is presented in **Tables 4.1.21 and 4.1.22**.

Table 4.1.21: Baseline Concentration and Predicted GLC for Espana Avenue Road Link

Receptor	Year 2013 Predicted Concentration		
	CO in ppm (µg/Ncm)	NOx in ppm (µg/Ncm)	PM _{2.5} in µg/Ncm
UST Ground (244,304)	0.6 + 1.5 = 2.1	18.6 + 45.22 = 63.82	13.6 + 11.4 = 25.0
Espana-Lacson (490,430)	0.4 + 1.5 = 1.9	18.6 + 45.22 = 63.82	10.1 + 11.4 = 21.5
Receptor	Year 2018 Predicted Concentration		
	CO in ppm	NOx in ppm	PM _{2.5} in µg/Ncm
UST Ground (244,304)	0.7 + 1.5 = 2.2	18.6 + 45.22 = 63.82	17.7 + 11.4 = 29.1
Espana-Lacson (490,430)	0.5 + 1.5 = 2.0	18.6 + 45.22 = 63.82	13.1 + 11.4 = 24.5

Table 4.1.22: Baseline Concentration and Predicted GLC for Quezon Avenue Road Link:

Receptor	Year 2013 Predicted Concentration		
	CO in ppm	NOx in ppm	PM _{2.5} in µg/Ncm
UST Ground (244,304)	1.7 + 1.1 = 2.8	18.6 + 54.34 = 72.94	18.4 + 22.4 = 40.8
Espana-Lacson (490,430)	0.6 + 1.1 = 1.7	18.6 + 54.34 = 72.94	6.2 + 22.4 = 28.6
Receptor	Year 2018 Predicted Concentration		
	CO in ppm	NOx in ppm	PM _{2.5} in µg/Ncm
UST Ground (244,304)	2.2 + 1.1 = 3.3	37.1 + 54.34 = 91.44	23.9 + 22.4 = 46.3
Espana-Lacson (490,430)	0.7 + 1.1 = 1.8	18.6 + 54.34 = 72.94	8.1 + 22.4 = 30.5

273. The resulting values (baseline and predicted concentration) are still below the ambient standard the national ambient air quality standard (NAAQS) as shown in **Table 4.1.23**.

Table 4.1.23: National Ambient Air Quality Standard Values(NAAQV)

Pollutants	Concentration	Time Averaging
PM _{2.5}	75 ug/Ncm	24 hours
	0	1 hour
NO ₂	150 ug/Ncm	24 hours
	260 ug/Ncm	1 hour
CO	10 mg/Ncm	8 hours
	35 mg/Ncm	1 hour

4.1.10 Current Year GHG Emissions

274. The Greenhouse Gas emissions study was taken from the Detailed Technical Study conducted for Manila-Quezon Corridor Improvement project by the ITP. The study was conducted in order to prepare a greenhouse gas emissions inventory for the urban transport sector in congested cities in the Philippines, as well as a corridor-specific inventory, based on a proposed bus rapid transit (BRT) route; and develop a descriptive baseline urban transport growth scenario for the city.

Vehicle – kilometre inputs

275. The study has calculated the vehicle – kilometre calculation, wherein the number of vehicle-km travelled by different vehicle types within the defined study boundary area was a key input to the current year (2012) emissions inventory calculation and to future year forecasts. The inputs came from the transport model that was developed and calibrated based on an extensive data collection exercise in Cebu in 2012, and were seen as transferable to the current situation in Manila.

Current year emission factor determination

276. Determination of appropriate greenhouse gas (GHG) emission factors to use in the Manila analysis was undertaken using the International Vehicle Emissions (IVE) model, this took account of the drive cycle and vehicle technology fleet breakdown characteristics determined for Manila.

277. Greenhouse gas emission factors for the six main current vehicle types were derived from the IVE emissions model based on the analysis of current driving conditions in congested Philippine city, as shown in **Table 4.1.24**. The final column of the table shows the overall greenhouse gas emission factor as “CO₂ equivalent” (or CO_{2e}) based on widely accepted values of the relative global warming power of each individual gas¹.

Table 4.1.24. Current greenhouse gas emission factors derived from IVE model

Vehicle type	Road-type	Current Emission factors (g/km)			
		CO ₂	N ₂ O	CH ₄	CO ₂ equiv
Car / light vehicle	Highway	357.496	0.002	0.933	377.826
	Arterial	386.081	0.003	1.021	408.317
	Residential	466.568	0.003	1.244	493.648
Taxi		393.020	0.001	2.246	440.632
Jeepney		1563.799	0.008	0.000	1566.359
Bus		1876.469	0.004	0.000	1880.853
Motorcycle/ tricycle		61.854	0.000	2.794	120.532
Truck		1164.752	0.008	0.000	1167.078

Source: ITP Detailed Technical Study for Manila-Quezon Corridor Improvement Project, 2013

278. All emission factors used are average values across the day (in general, higher factors are appropriate when conditions are busiest and lower factors at other times). The IVE model analysis yielded different values by road type for cars, which were applied to the vehicle-km travelled on those road types.

279. For trucks, the emission factors shown are a weighted average of factors determined using the IVE model for medium duty trucks and heavy duty trucks. This was based on an estimated split

of two-thirds medium trucks and one-third heavy duty trucks. This split appears reasonable in the light of the limited amount of detailed classified count data available to the team from previous studies.

Total GHG emissions

280. The annual GHG emissions (2013) of all modes of transport in Metro Manila is 1,725,812 tonnes CO₂e. This emission is categorized according to vehicle type, as shown in **Table 4.1.25**.

Table 4.1.25: Annual GHG Emissions

Vehicle Type	Annual GHG emissions (Tonnes CO ₂ e)
Cars & Light vehicles	654,302
Taxis	150,055
PUJ	545,500
PUB	158,689
Motorcycles	81,269
Trucks	135,997
Total	1,725,812

Source: ITP Detailed Technical Study for Manila-Quezon Corridor Improvement Project, 2013

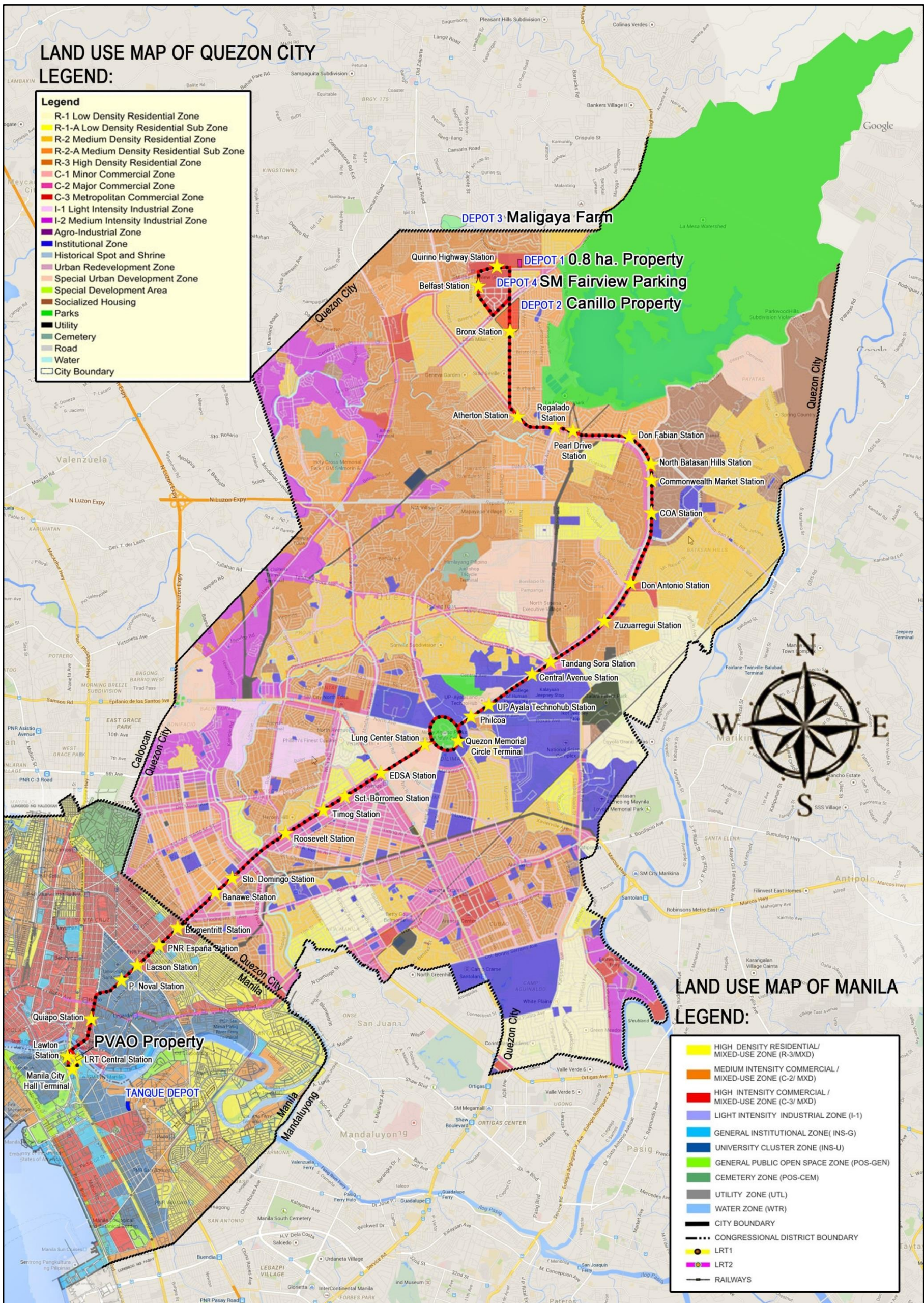
4.1.11 Land Use

281. The Project is located mainly along National Highways that form busy commercial urban thoroughfares. The project starts at Manila City Hall in southwest and runs along the loop at Padre Burgos-Natividad Almeda-Lopez-A. Villegas Streets, going to west along Quezon Boulevard, Lerma Avenue, España Boulevard, Quezon Avenue, Elliptical Road and Commonwealth Avenue up to Fairview in Quezon City. The whole of this section of the alignment is built up on either side. The dominant land use activity is commercial that has been developed over many years. There are also key institutional centers, shopping complexes, and occasional churches. At intervals, there are also drainage channels and sinkhole structures some way off the main thoroughfare. Very occasionally there are undeveloped lots with trees and jeepney stopping lay-bys. Refer to **Figure 4.1.9** for the existing Land Use map of Manila and Quezon City.

282. According to the Manila city's profile, the City of Manila has developed as the center of Metro Manila and capital of the Philippines. Various urban functions such as business, commerce, and culture have been concentrated in the center of the city, thus, a single-core concentration type of urban development (at Binondo-Escolta-Sta.Cruz) was formed with transport and road networks radiating from the central business district (**Figure 4.1.10**). The proposed plan intends to reform this single-core urban structure into a balance multi-core structure. Based on current and proposed land use, the commercial land use has considerably increased from 13.44 percent to 41.01 percent in 2005 for the benefit of encouraging a healthy economy, while residential and open space uses have decreased from 35.84 percent to 20.69 percent and from 7.95 percent to 6.17 percent respectively, due to its mixed use in nature.

283. With the presence of Metro Manila BRT Line – 1, improvement in public transportation along Quezon Avenue and España Boulevard will further increase commercial land use in the identified commercial subcenters of Manila due to better consumer access. As commuting becomes faster and convenient, residential developments become spatially wider, easing inner city residential land uses demands. The BRT is therefore perceived to alleviate congestion in Manila.

284. In Quezon City, residential land use accounts for the biggest increase, from 26.29 percent to 27.23 percent in 2009 due to development of new residential lands, this is followed by increased commercial land use from 5.93 percent to 6.26 percent with the conversion of former industrial sites into mixed-use commercial-residential development. Vacant lands or open spaces have been decreasing due to development of residential projects. Many parks also were either developed or rehabilitated in the last eight years, including the major parks in Quezon City like La Mesa Eco Park, Quezon Memorial Circle and Balara Park and the neighborhood or community parks. On the other hand, multi-centered growth areas are considered in the proposed land use plan of Quezon City.



Source: Google Map; Land Use Map of Manila City, 2003; Land Use Map of Quezon City, 2013

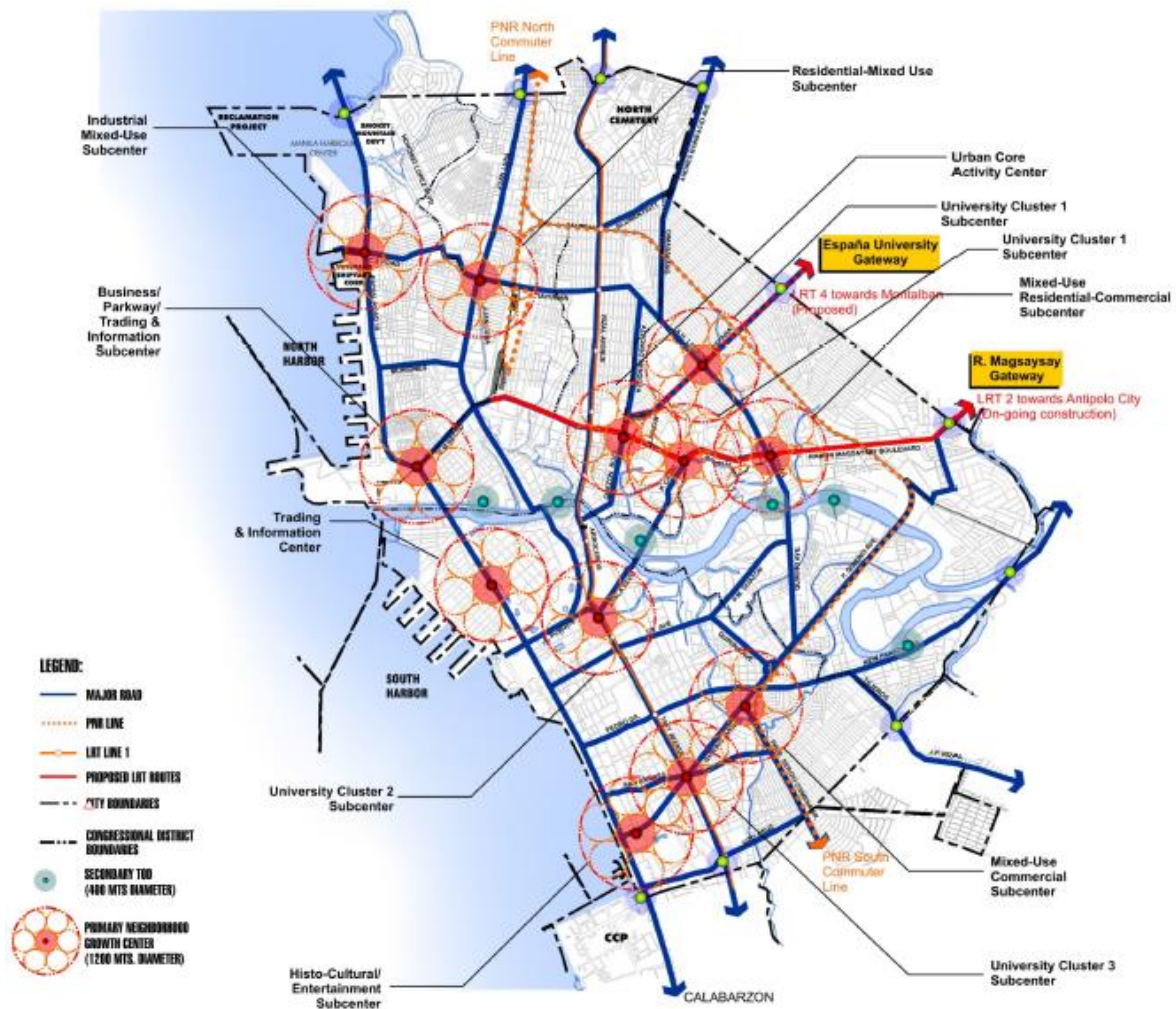


Figure 4.1.10. Multi-centered neighbourhood/connected urban development, City of Manila⁹

285. The Quezon City CLUP 2011 identified the five (5) growth areas (Figure 4.1.11) for Quezon City as follows:

1. The CBD-Knowledge Community District;
2. Cubao Growth Center
3. NGC-Batasan Growth Center
4. Novaliches-Lagro Growth Area
5. Balintawak-Munoz Growth Center

286. These growth areas are envisioned to absorb the bulk of new private investments and expansion of businesses and commercial establishments. Employment opportunities will create demands for residential land uses within their vicinities that will spur developments of residential buildings and opening up of new residential areas. The BRT corridor passes through the CBD-Knowledge Community District and the NGC-Batasan Growth Center while it is close to Cubao Growth Center such that it will have significant bearing in the future on the changes in its physical landscape. While the other two remaining growth areas (Novaliches-Lagro and Balintawak-Munoz) will also be affected as a result of the new mode of public transportation in Quezon City, the project's

⁹ Source: Manila City Land Use Plan and Zoning Ordinance 2005-2020.

impacts on these growth centers are not seen as significant as the impacts on the first three growth areas.

287. **Table 4.1.26** presents the land use pattern within and around the first three envisioned growth areas in Quezon City and how the proposed Metro Manila BRT Line – 1 Project will bear on the expected changes in the land use.

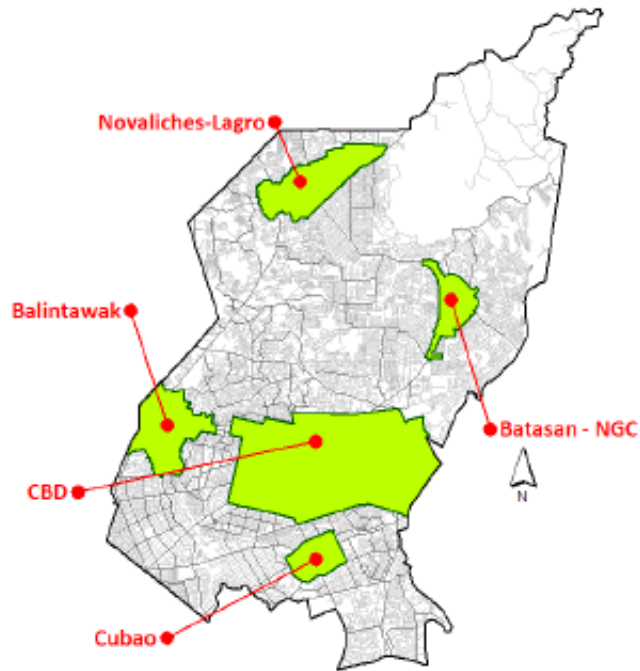


Figure 4.1.11. Growth Centers Map, Quezon City¹⁰

Table 4.1.26. Areas of growth, land use and expected changes and effect of the project.

Directly Affected Growth Area	Land Use and Expected Changes	Effect of the Project
<p>1. The CBD-Knowledge Community District</p>	<p>It embraces the proposed CBD comprising of the North and East Triangles and the Veterans Memorial Medical Center; the vicinity of SM North EDSA; UP Campus including the UP-Ayala Techno Hub; the campuses of Ateneo De Manila and Miriam College; Balara Filtration Plant; and the residential communities of UP Village, Teachers' Village, Pinyahan, Krus na Ligas, Loyola Heights and Xavierville.</p> <p>Due to its strategic location, magnitude and high value assets and resources, the proposed CBD covering a total area of 250.6 hectares will play the most crucial role in the realization of a Knowledge Community in the City. It is expected to</p>	<p>The BRT project complements the envisioned changes in land use pattern. As PT becomes more efficient commuting becomes faster and convenient. Demands for residential developments become spatially wider contributing to a much faster and wider urban sprawl towards the adjoining municipalities of Bulacan close to Fairview including San Jose Del Monte, for instance. Demand for inner city residential land uses is eased by the BRT and thus contributing to alleviating congestion in the metropolis.</p>

¹⁰ Source: Quezon City CLUP, 2011

Directly Affected Growth Area	Land Use and Expected Changes	Effect of the Project
	<p>assert the role of Quezon City in the metropolitan economy particularly in serving the demand for regional access, mass transit and infra-structure efficiency; large scale mix development; services for ICT, education, health, media and recreation; and employment. It is envisioned to be a model of good urban environment and urban renewal/redevelopment practices.</p>	<p>Many commercial establishments will become recipients of economic benefits from the BRT as a result of greater patronage and ease in consumer access.</p>
<p>2. Cubao Growth Center</p>	<p>Cubao growth area covers in part or in whole 9 barangays (Immaculate Concepcion, Kaunlaran, E. Rodriguez, Socorro, San Martin de Porres, Silangan, San Roque, Bagong Lipunan ng Crame,, Pinagkaisahan) of Districts III and IV. Araneta Center, the city's old CBD is the nucleus of the growth area.</p> <p>International investors and big private groups will transform Araneta Center into an entertainment, retail and business center. The center's location is very convenient. It is flanked by both the EDSA MRT station, which runs from North to South, and the LRT-2 station which runs from East to West. The great mass of people who visit the area however, are just passing through and do not generate much business.</p>	<p>The BRT will easily connect commuters from the BRT corridor to the available mass transport system along EDSA going to the Cubao Growth Center, and thus the BRT is deemed complementary with the envisioned changes in land use in this part of Quezon City.</p>
<p>3. NGC-Batasan Growth Center</p>	<p>This growth area is located at the northeastern part of Quezon City. It is bounded on the north by lot deep northeastern portion of Commonwealth Avenue, then lot deep northern portion of Batasan Road; on the east by lot deep eastern portion of Batasan Road; on the south lot deep south eastern portion of Batasan Road going westward to lot deep Commonwealth Avenue down to Capitol Homes Drive; and on the west by lot deep western side of Commonwealth Avenue from Holy Spirit Drive up to creek.</p> <p>The stretch of Commonwealth Avenue is characterized mainly by commercial development which is a mixture of retail and wholesale establishments. Existing growth pattern is expected to continue in the future and will exert pressure for more developments of commercial areas.</p>	<p>The BRT will contribute to the development of the NGC-Batasan Growth Center. The BRT project complements the expected changes in land use pattern. As PT becomes faster and convenient, residential developments become spatially wider contributing to a wider urban sprawl. Demand for inner city residential land uses is eased by the BRT and thus contributing to alleviating congestion in the metropolis.</p> <p>Many commercial establishments will benefit from the BRT as a result of greater patronage and ease in consumer access.</p>

4.1.12 Archaeological and Cultural Resources

288. Metro Manila plays a significant role in the political, economic, social, cultural and sporting life and activities of the country. This is the most important center of entertainment in the country, with numerous cinemas, theatres and musical entertainments. The metro is dotted with monuments,



museums, libraries, art galleries, clubs, parks and restaurants. With more than 11 million populations, Metro Manila has numerous public universities plus numerous private study colleges in and around the greater metropolitan area. There are several hundred schools and colleges and over hundred primary, middle and high schools covering the metropolitan area. Manila is known for its churches, many of which are built in the Spanish style and date back to the Spanish period. Metro Manila is also famous for its archaeological and historical sites such as the Luneta Park, also built during Spanish period, and Quezon City Memorial Circle, which was started in 1952 and was completed in 1978. Other known historical parks of Quezon City are the Pugad Lawin Shrine, Tandang Sora Shrine, A. Bonifacio Monument, Gen. Geronimo Monument, Bantayog ng mga Bayani, and the People's Power Monument.

289. **Figure 4.1.10** reveals existing physical cultural and historical landmarks along the BRT alignment. It was found out that several cultural sites including old theaters, churches, historical monuments, old hospitals, and government institutions are located along and/or in close proximity to the BRT route. These landmarks will not be displaced by the construction of the BRT components; however, access to these landmarks could be temporarily affected by the possible worsening of traffic flow during the construction phase.

4.1.13 Other Miscellaneous Landmarks

290. Along the proposed BRT corridor, there are existing schools and universities and shopping malls as well as hospitals located within close proximity to the BRT route. These were also identified and mapped as shown in **Figures 4.1.12 to 4.1.15**. During construction phase, traffic congestion along the BRT corridor is expected to be worsen, thus, patrons of these landmarks may experience problem on accessibility during construction phase. . However, in the long term, these landmarks shall experience the positive benefits of being serviced by BRT during project operation.

291. The Proposed BRT system is proposed to be designed that is to be accessible to all. For instance, PWDs may come and go to these landmarks without hitches through the provision of special access for them. In the case of hospitals like the Philippine Orthopedic Hospital in Banawe and National Kidney Institute along Quezon Avenue for instance, BRT system shall provide special access for people or patients using mobility aids such as wheelchairs. Further, each bus stations shall be provided with passenger amenities such as benches. Benches provide resting spots for senior citizens or others who may become easily fatigued or have difficulty standing for periods of time. The bus stations shall be provided with good lighting combined with large print and legible information so that people with low vision can also navigate the BRT system.

4.1.14 Alignment Sheets

292. An inventory of affected trees, utilities and structures was prepared for each of the BRT station locations. Trees were categorized according to diameter at breast height (DBH). Utilities covered are light posts, electric posts, utility/telecom posts, water utilities and road signs. Structures inventoried are fenced private lots or boundaries, commercial establishments and structures, and waiting sheds. In all stations, there are a total of 286 trees that will be affected consisting of 185, 82, and 19 trees with DBH of less than 25 cm, 25 to 50 cm, and more than 50 cm, respectively. Affected utilities totalled 213 consisting of 134 light posts, 27 electric posts, nine (9) telecom posts, 14 water utilities, and 29 road signs. There are 49 structures that encroach on the BRT stations consisting of 6, 34, and nine (9) private lots, commercial establishments, and building structures, respectively. **Table 4.1.27** presents the summary of affected trees, utilities and structures by BRT station.

293. Potential issues on every BRT stations were assessed and observed (**Table 4.1.28**). Issues identified are the presence of narrow sidewalks, narrow center-island, presence of utilities, encroaching commercial establishments, private lots within six (6) meters from the edge of the roadway, with busy intersection, and presence of a commercial driveway. Major issues were highlighted, so appropriate management and design measures were proposed. The presence of utilities was observed in 26 stations while trees are found in 18 locations. Other prevalent problems are narrow sidewalks (13 stations), busy intersections (11 stations), and presence of commercial driveways (11 stations).

294. **Annex 3** shows the alignment sheets for each station and the locations of the above inventories of trees, utilities, and structures. Locations and dimensions of identified structures posing as problems or issues on the BRT stations are also marked on the alignment sheets.

4.1.15 BRT Corridor Existing Condition¹¹

295. Below is the description of the existing situation of the BRT corridor or alignment that runs from Manila City Hall in the south west of Manila to the Quezon City Memorial Circle in the north east and extended further to the north east to Fairview.

Philcoa - Manila City Hall: Corridor Description

296. The Quezon City from/to Manila corridor that extends from Philcoa footbridge in Commonwealth Avenue in Quezon City to the Andres Bonifacio Memorial area loop in Manila City has a length of 13.0 km. from a planned perspective, this 13.0 km section forms the core improvement corridor with comprehensive infrastructure and enhanced bus priority lane.

¹¹ An excerpt from the Detailed Technical Study for Manila-Quezon Corridor Improvement Project, 2013.

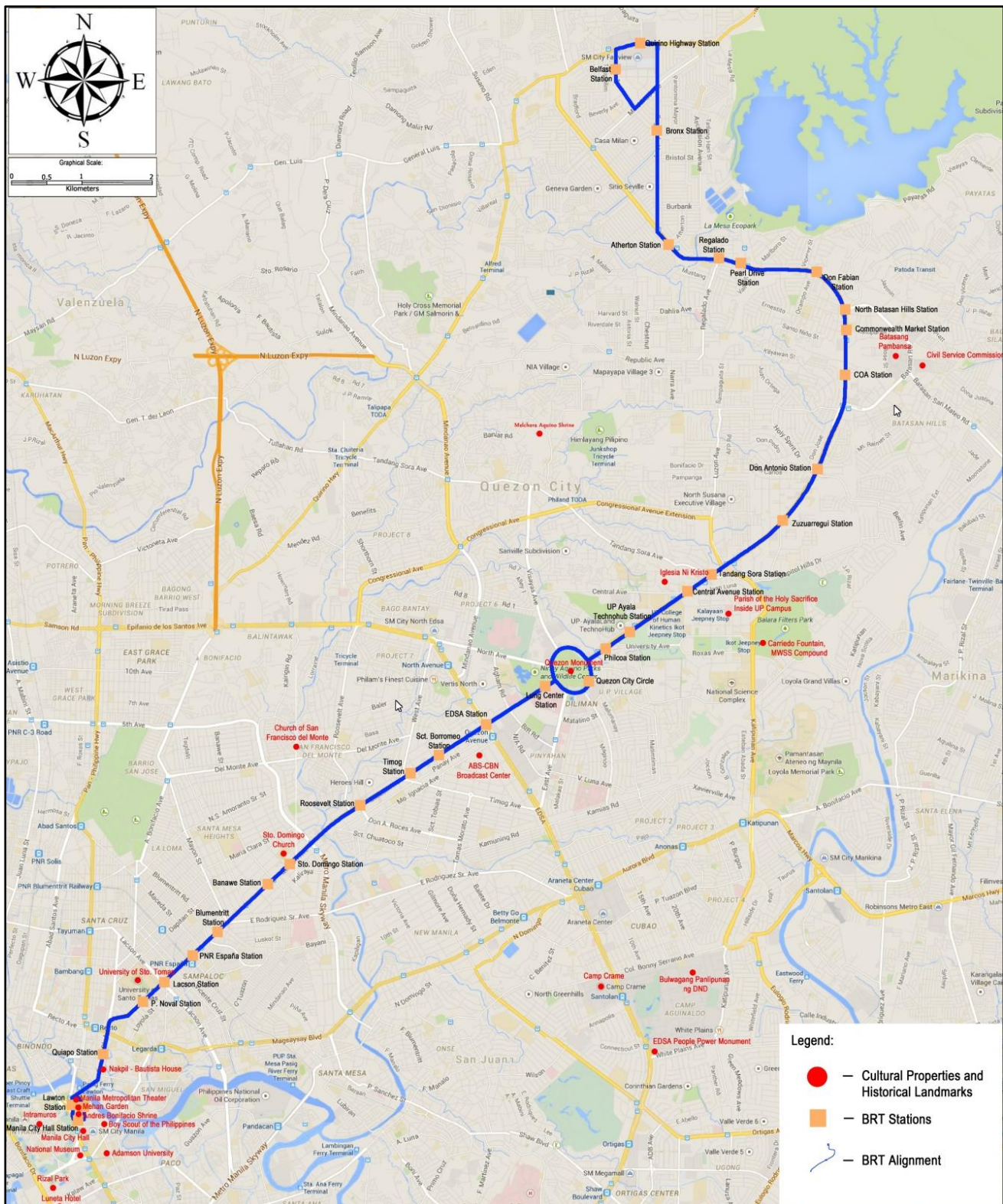


Figure 4.1.12: Map of Physical and Cultural Properties and Historical Landmarks

Source: Google Map

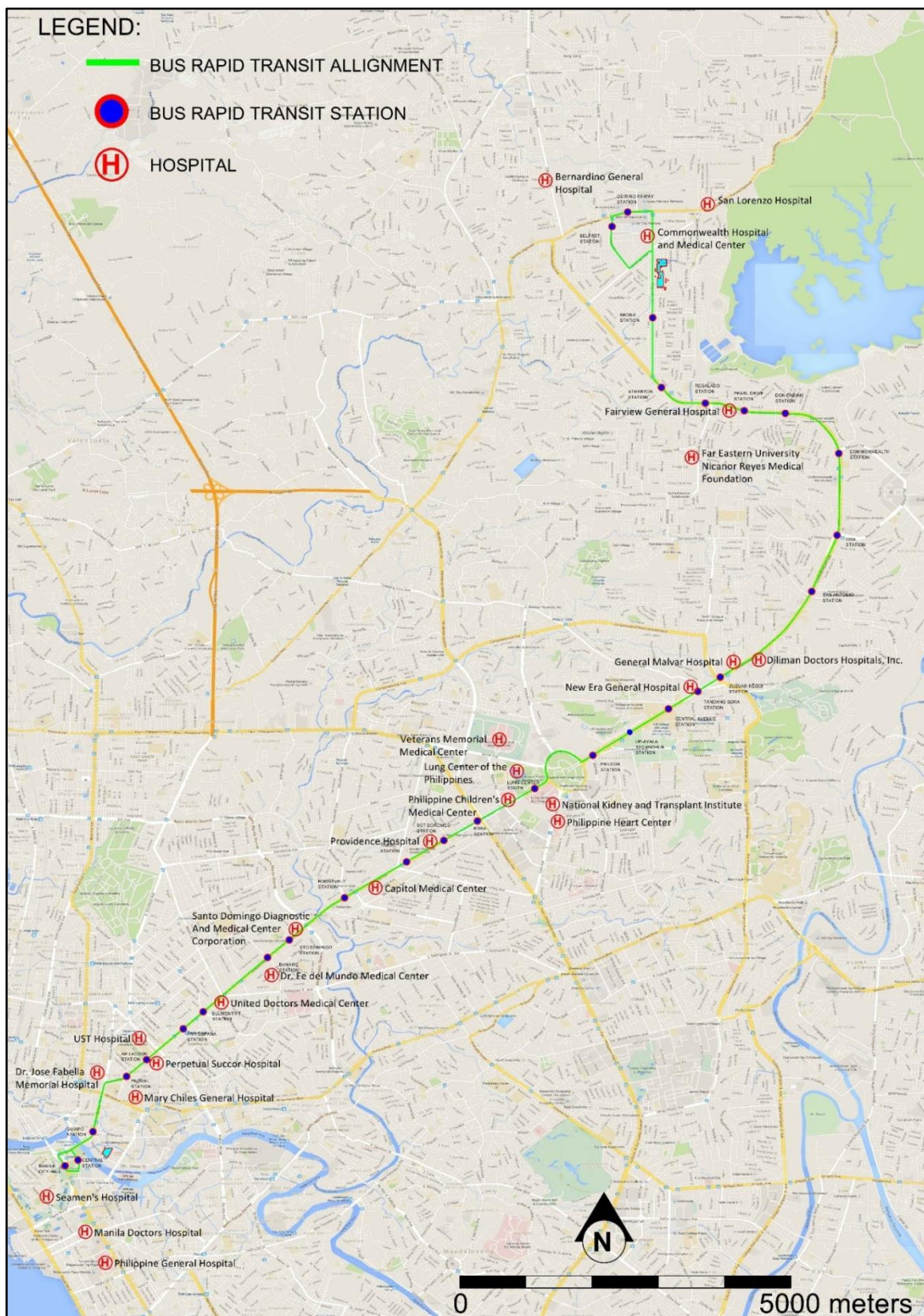


Figure 4.1.13: Map of Major Hospital Located near and along the Proposed BRT Corridor

Source: Google Map

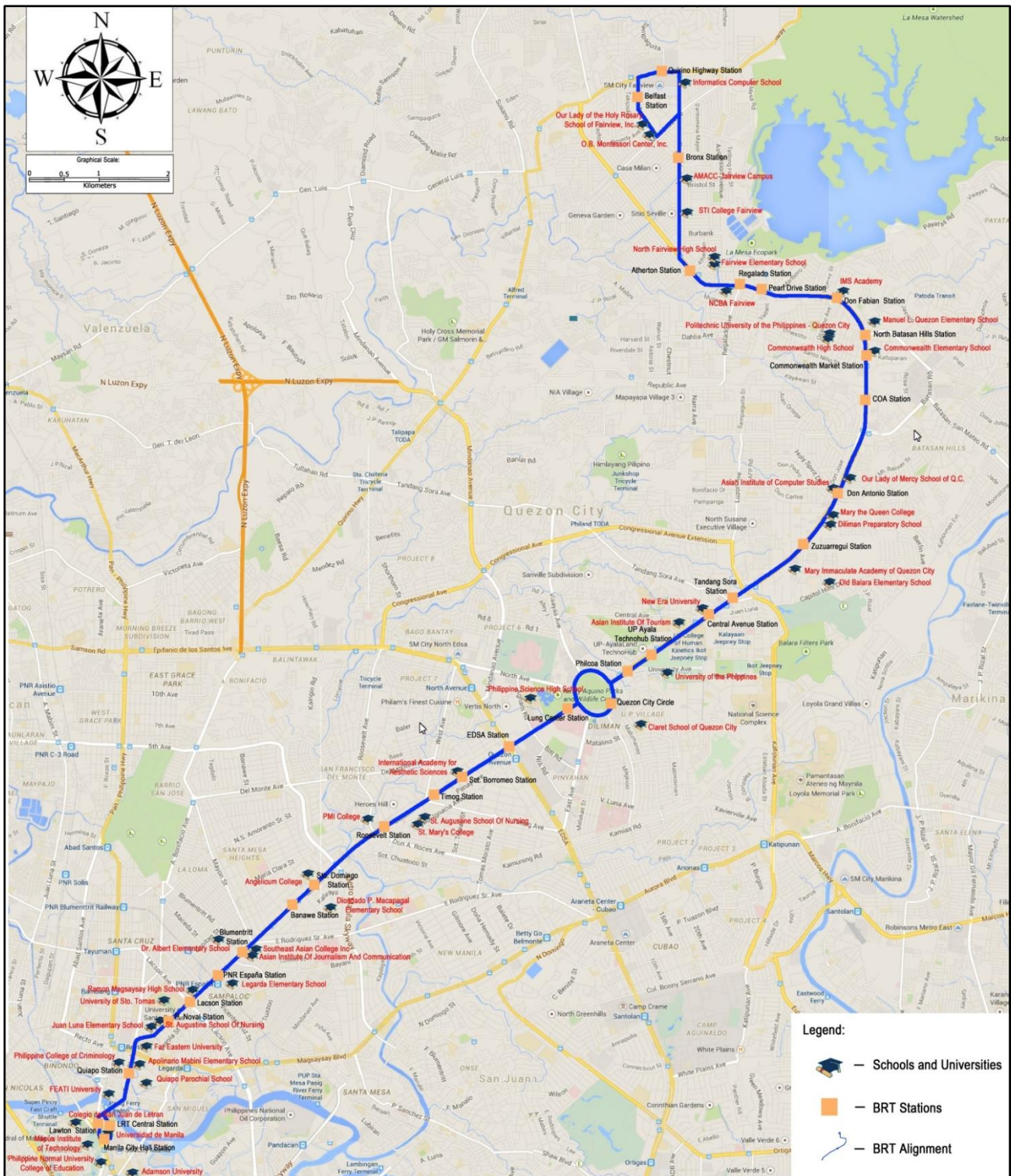


Figure 4.1.14: Schools/Universities Located near and along the Proposed BRT Corridor

Source: Google Map



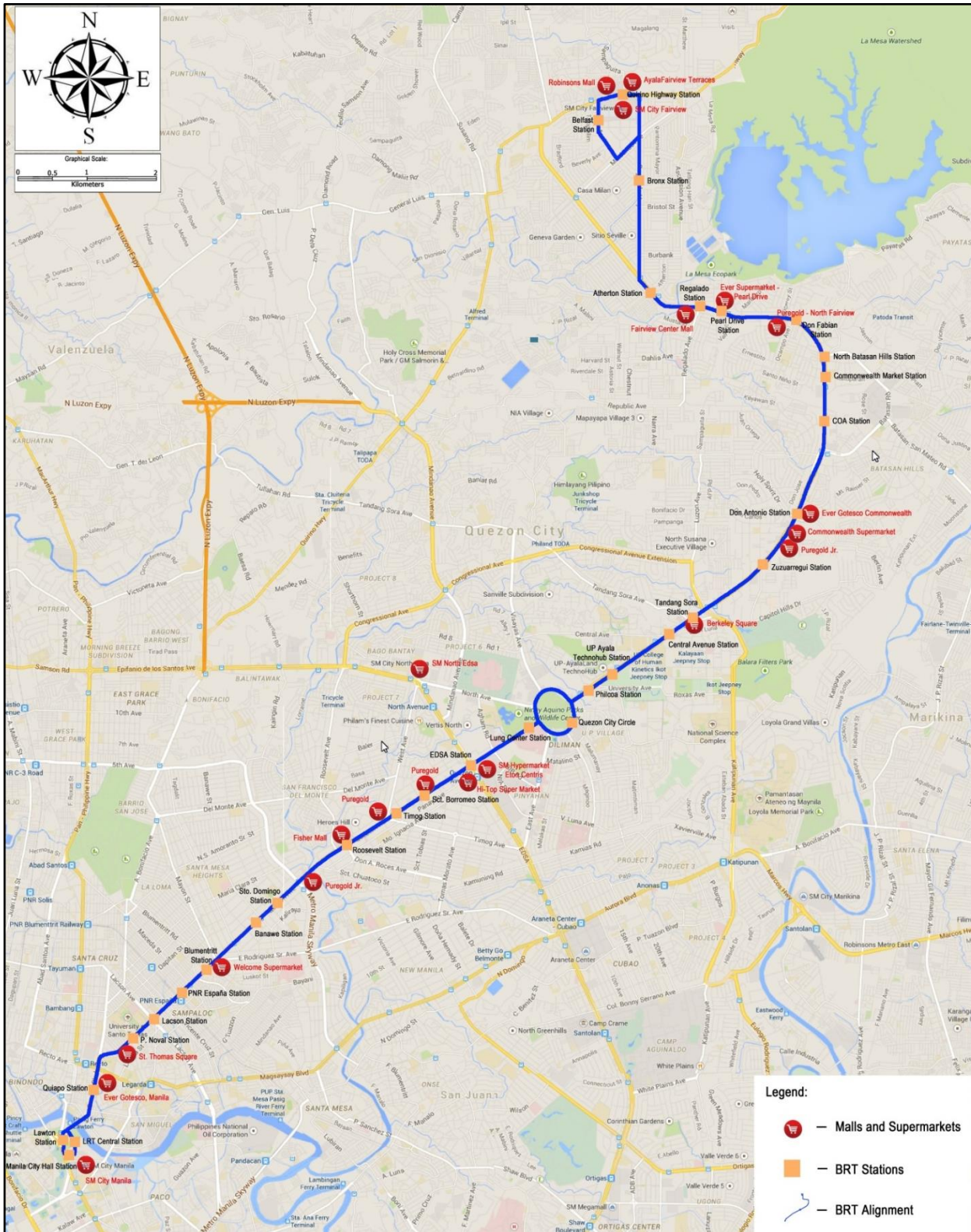


Figure 4.1.15: Malls and Supermarkets Located near and along the Proposed BRT Corridor

Source: Google Map

Table 4.1.27: Inventory of Affected Trees, Utilities and Structures

BRT Stations		Trees (estimate DBH)				Utilities						Structures		
		< 25cm	25 - 50cm	> 50cm	Subtotal	Light Posts	Electric Posts	Utility/Telecom Posts	Water Utilities	Road Signs	Subtotal	Private Lot	Commercial	Waiting Shed
1	Quirino Hiway	5	0	0	5	0	4	0	0	0	4	0	0	0
2	Belfast	5	2	0	7	2	0	0	1	0	3	1	0	0
3	Bronx	0	1	0	1	3	2	1	0	1	7	1	3	0
4	Atherton	3	9	1	13	0	1	0	0	1	2	2	2	2
5	Regalado	0	0	0	0	0	3	0	0	3	6	0	8	1
6	Pearl Drive	3	0	5	8	1	3	0	0	0	4	1	0	0
7	Don Fabian	0	0	0	0	0	1	0	0	0	1	1	1	0
8	North Batasan Hills	0	0	0	0	0	2	2	0	0	4	0	0	1
9	Commonwealth Market	0	0	0	0	0	0	0	0	0	0	0	0	0
10	COA	0	1	1	2	1	2	0	0	0	3	0	8	0
11	Don Antonio	9	1	0	10	2	0	0	0	0	2	0	0	0
12	Zuzuarregui	5	0	0	5	1	0	0	0	0	1	0	0	0
13	Tandang Sora	4	0	0	4	7	1	1	0	2	11	0	0	1
14	Central Ave.	6	0	0	6	2	0	0	0	1	3	0	0	0
15	UP-Ayala Technohub	1	0	0	1	1	0	0	0	4	5	0	0	1
16	Philcoa	76	11	6	93	14	2	0	0	4	20	0	0	0
17	QMC	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Lung Center	13	5	1	19	9	0	0	0	0	9	0	0	0
19	EDSA	0	0	0	0	8	0	0	0	0	8	0	0	3
20	Sct. Borromeo	12	13	1	26	10	2	0	0	1	13	0	0	0
21	Timog	20	13	2	35	12	1	1	6	0	20	0	0	0

BRT Stations		Trees (estimate DBH)				Utilities						Structures			
		< 25cm	25 - 50cm	> 50cm	Subtotal	Light Posts	Electric Posts	Utility/Telecom Posts	Water Utilities	Road Signs	Subtotal	Private Lot	Commercial	Waiting Shed	
22	Roosevelt	7	6	0	13	7	0	1	0	3	11	0	0	0	
23	Sto. Domingo	9	6	2	17	10	1	1	7	1	20	0	0	0	
24	Banawe	7	5	0	12	10	2	0	0	4	16	0	0	0	
25	Blumentritt	0	0	0	0	8	0	0	0	0	8	0	0	0	
26	PNR Espana	0	0	0	0	7	0	0	0	1	8	0	0	0	
27	Lacson	0	0	0	0	4	0	0	0	2	6	0	0	0	
28	P. Noval	0	0	0	0	6	0	2	0	1	9	0	0	0	
29	Quiapo	0	0	0	0	6	0	0	0	0	6	0	0	0	
30	Lawton	0	0	0	0	3	0	0	0	0	3	0	0	0	
31	Manila City Hall	0	9	0	9	0	0	0	0	0	0	0	0	0	
32	LRT Central	0	0	0	0	0	0	0	0	0	0	0	12	0	
Total		185	82	19	286	134	27	9	14	29	213	6	34	9	49

Table 4.1.28: Summary of Potential Issues and Management Measures along the Proposed BRT Station

	<u>Stations</u>	<u>Observations</u>								<u>Major Issues</u>	<u>Management Measures</u>
		with narrow sidewalk (3-5m wide only)	with narrow center island (1-3m wide only)	with trees	with utilities	with encroached commercial establishments	Private lot within the 6-m	with busy intersection	with commercial driveway		
1	Quirino Hiway Station			•	•					mall entrance restructure	coordinate with mall owner regarding the project
2	Belfast Station	•		•	•		•		•	3m wide available area/subdivision driveway	bus station design relaxation
3	Bronx Station	•		•	•	•	•			3.5m wide available area/obstruction of school parking lot and entrance	bus station design relaxation
4	Atherton Station	•		•		•	•	•		3.2m wide available area / subdivision wall/busy intersection/with trees >25cm DBH	bus station design relaxation
5	Regalado Station	•			•	•		•	•	3-4m wide available area / with commercial establishments/mall entrance relocation	bus station design relaxation and coordination with business owner regarding the effect of BRT project on their business
6	Pearl Drive Station	•		•	•		•		•	5m wide available area /busy commercial driveways/with trees >25cm DBH	bus station design relaxation
7	Don Fabian Station	•			•	•	•		•	3.2m wide available area / with commercial establishment/school driveway	bus station design relaxation
8	North Batasan Hills Station	•				•		•		market stalls along RoW/ busy intersection	provision for traffic signaling device and coordination with local government regarding ambulant vendors
9	Commonwealth Market Station	•				•			•	market stalls along RoW/ busy market driveway	provision for traffic signaling device and coordination with local government regarding ambulant vendors
10	COA Station	•		•	•	•			•	5m wide available / with commercial establishments/COA driveway	bus station design relaxation
11	Don Antonio Station			•	•				•	obstruction by driveway and mall entrance	provision for traffic signaling device

<u>Stations</u>		<u>Observations</u>							<u>Major Issues</u>	<u>Management Measures</u>	
		with narrow sidewalk (3-5m wide only)	with narrow center island (1-3m wide only)	with trees	with utilities	with encroached commercial establishments	Private lot within the 6-m	with busy intersection			with commercial driveway
1 2	Zuzuregui Station			•	•				•	hospital and commercial establishment driveway	provision for traffic signaling device
1 3	Tandang Sora Station	•		•	•	•			•	4m wide available area / mall fence/mall driveways	bus station design relaxation
1 4	Central Ave. Station			•	•						
1 5	Technohub Station				•						
1 6	Phicoa Station		•	•	•					many trees with diameter at breast height (DBH) of >25cm along proposed station/1.5m wide center island only	
1 7	QMC Station										
1 8	Lung Center Station			•	•					station to design for PWDs/ with trees >25cm DBH	provision for PWD pedestrian walk way
1 9	EDSA Station	•			•				•	busy intersection	provision for traffic signaling device
2 0	Sct. Boromeo Station			•	•				•	reopening of intersection may obstruct BRT lane	
2 1	Timog Station			•	•				•	busy intersection/with trees >25cm DBH	provision for traffic signaling device
2 2	Roosevelt Station			•	•				•	busy intersection/with trees >25cm DBH	provision for traffic signaling device
2 3	Sto. Domingo Station			•	•					with trees >25cm DBH	
2 4	Banawe Station	•		•	•					1.5-2m sidewalk only/may obstruct RoW with pedestrian overpass/with trees >25cm DBH	
2 5	Blumentritt Station		•		•					1.5m wide center island only	
2 6	PNR-España Station		•		•				•	1.5m wide center island only	provision for traffic signaling device
2 7	Lacson Station		•		•				•	1.5m wide center island only	provision for traffic signaling device
2 8	P. Noval Station		•		•				•	1.5m wide center island only	provision for traffic signaling device

	<u>Stations</u>	<u>Observations</u>								<u>Major Issues</u>	<u>Management Measures</u>
		with narrow sidewalk (3-5m wide only)	with narrow center island (1-3m wide only)	with trees	with utilities	with encroached commercial establishments	Private lot within the 6-m	with busy intersection	with commercial driveway		
2	Quiapo Station		•		•					1.5m wide center island only	provision for traffic signaling device
3	LRT Central Terminal Station	•				•			•	commercial establishments along the area	
3	Manila City Hall Station			•							
3	Lawton Station				•				•	Lawton terminal driveway obstruction	
	No. of Stations Affected	13	6	18	26	9	5	11	11		

297. The corridor shall traverse high density commercial areas and key institutional centers including a number of important medical facilities and high density residential centers. All are dependent on the provision of mass public transport system.

298. Streets included in this corridor section are:

- Commonwealth Avenue
- Elliptical Road
- Quezon Avenue
- España Boulevard
- Lerma Avenue
- Quezon Boulevard
- A. Villegas Street
- Natividad Almeda-Lopez Street
- Padre Burgos Street

299. The last three streets form a loop returning to Quezon Boulevard.

Route Context

300. Route context description of the corridor is link by link below.

301. U-turns are present along the existing corridor. During peak traffic, these U-turns effectively restrict road and frequently reducing running speed of two full traffic lanes. These U-turn slots will be eliminated under the proposed Metro Manila BRT Line 1 and to be replaced by complimentary intersection control.

Commonwealth Avenue

302. This corridor extends from a turning loop at north portion of Philcoa footbridge southwest to the junction with Elliptical Road. It is a dual carriageway with five lanes in each direction. This section

of the route is an extremely busy interchange on both side and around each end of Philcoa footbridge. Mode of transport includes provincial and city buses, taxis, AUVs and jeepneys.



Commonwealth Avenue, viewed on its approach to Elliptical Road

Elliptical Road

303. Elliptical Road is a ten lane gyratory forming a node for several major roads including Commonwealth Avenue, Visayas Avenue, North Avenue, Quezon Avenue, East Avenue and Kalayaan Avenue. It encloses a public open green space with exercise, retail and restaurant facilities as well as the Quezon Monument and Museum. Extensive car parking is provided within the Circle. Frontages on the outside of Elliptical Road include Quezon City Hall, the Department of Agriculture, the Department of Agrarian Reform and the Philippine Coconut Authority.

304. Despite having 10 traffic lanes, the gyratory still suffers heavy congestion particularly during peak hours; with traffic flows typically exceeding 10,000 vehicles an hour.

Quezon Avenue (Elliptical Road to Start of EDSA Underpass)

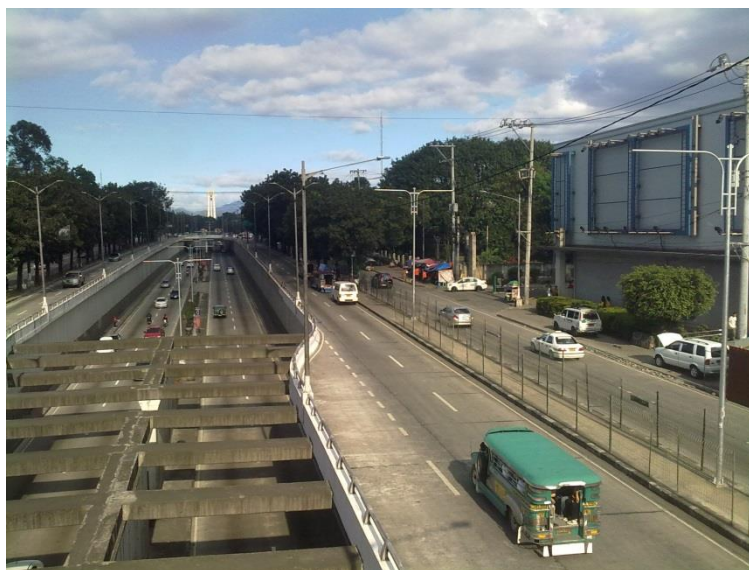
305. This section of Quezon Avenue is fronted on the south by medical facilities and the north by Ninoy Aquino Parks and Wildlife, with few turning movements to access the facilities either to the north or south.

Quezon Avenue (Start of Underpass to Junction with EDSA)

306. This symmetrical section of carriageway comprises EDSA underpass (dual two-lane) with two parallel side roads running at grade either side. The side roads are each two-lane and divided by a longitudinal island which is planted for up to approximately 70 m from the signalized EDSA junction.

307. Generally the inner side road is used by public transport vehicles, mainly jeepneys, and occasionally general traffic wishing to U-turn at EDSA junction.

308. This section of road is fronted on either side mainly by commercial buildings and the Manila Seedling Bank



Quezon Ave, looking towards Elliptical Road from EDSA.

Quezon Avenue/EDSA Junction

309. The Quezon Avenue-EDSA junction is one of the busiest junctions in Manila with over 20,000 vehicles making various turning and straight through movements in the morning peak hours. Straight through movement for Quezon Avenue is via an underpass running under EDSA; while at the junction straight through movement is restricted with only right turn and U-turn movements allowed under the flyover structure in going to Quezon Avenue from EDSA. U-turn slots are located immediately north and south of the junction.

310. The area blocking the straight through movement at the junction is almost continuously occupied by waiting taxis and, more occasionally, by provincial buses laying over.

311. A shopping mall, Centris, is located at the south east corner of the junction with Quezon Avenue Station (MRT 3) located approximately 100m south along EDSA. A busy shopping area is located at the southwest corner. Both north quadrants are relatively quiet with the northwest quadrant under (currently halted) large commercial office development and the north east quadrant occupied by a large garden centre which is accessed via Agham Road.

312. Pedestrian access between all quadrants is via footbridges – two footbridges across EDSA either side of Quezon Avenue, and one footbridge across Quezon Avenue immediately to the north east of EDSA. These footbridges also connect bus and jeepney stops on Quezon Avenue either side of EDSA. Access to Quezon Avenue MRT station is via at grade footpath.

Quezon Avenue (EDSA to End of Underpass)

313. This section is basically a mirror image of that described in “Quezon Avenue (Start of Underpass to Junction with EDSA)” above.



Quezon Avenue, looking towards Manila, from EDSA.

Quezon Avenue (End of EDSA Underpass to Timog/West Avenue)

314. This section of the corridor is a dual carriageway separated by a tree lined median and generally comprising five lanes on the south west bound carriageway and four lanes on the north east bound carriageway. U-turns are located between Eugenio Lopez and Scout Borromeo; and between Scout Borromeo and Scout Santiago.

315. A variety of retail outlets, restaurants, banks, fuel stations etc. front both sides of the highway with particularly busy areas at the Scout Borromeo and Timog/West Avenue junctions.



Quezon Ave, at Timog Avenue intersection.

Quezon Avenue (Timog/West Avenue to Start of Araneta Underpass)

316. This section has a similar context to the preceding road section but it widens in places – up to six lanes in the south west bound carriageway and up to five lanes in the north east bound carriageway. The section also contains a gentle curve as it approaches the Araneta Underpass. The San Juan River runs under this section as it runs in to Araneta Underpass.

U-turns are provided between Scout Reyes and Scout Magbanua; between Scout Magbanua and Don A Roces Jr; and between Dr. C Garcia and Scout Chualoco.

317. Frontages are similar to the section described immediately above.



Quezon Avenue, on approach to Araneta intersection

Quezon Avenue (Araneta Underpass)

318. Araneta Underpass is a dual two-lane carriageway taking Quezon Avenue under Araneta Avenue. Parallel at-grade two-lane roads lead Quezon Avenue to a signalized junction with Araneta Avenue.

319. Although the frontages are similar to preceding sections described above, car dealers are more prevalent in this section. A sanctuarium on the south west corner of the junction provides a major landmark but is not a key traffic demand mode.



Quezon Avenue, looking towards the recently constructed Araneta Underpass

Quezon Avenue (Araneta Underpass to Mabuhay Rotunda)

320. This section of the corridor comprises a dual carriageway (five lanes north east bound; 4 lanes south west bound) with a tree-lined median. Key junctions include Banawe and D Tuazon.

321. Vehicle U-turns are provided between Victory Avenue and Banawe; between Banawe and Cordillera; between Cordillera and D Tuazon; and a double U-turn between D Tuazon and Mabuhay Rotunda.

322. Frontages are similar to preceding sections. An additional large mall, Fisher Mall, form part of the major attraction in the area.

Mabuhay Rotunda

323. Mabuhay Rotunda, which marks the boundary between the cities of Quezon and Manila, acts largely as a conventional roundabout with five arms – Quezon Avenue, España Boulevard, E Rodriguez Sr. Avenue, Nicanor Ramirez and Mayon Street.

324. Currently, traffic entering the roundabout from E Rodriguez Sr. Avenue is restricted to a right turn (into Quezon Avenue heading north east). Should this traffic need to exit on other arms, it must use the vehicle U-turn along Quezon Avenue approximately 200 m north east of the roundabout. Moreover, traffic wishing to use the roundabout from Nicanor Ramirez must turn right onto E Rodriguez Avenue, immediately U-turn and carry out the same maneuver as above.

325. The restrictions described above reduce conflict on the Rotunda and generally allow non-conflicted running for Quezon Avenue in both directions.

326. Shops, restaurants and the South East Asia College can be found around the Rotunda, but the most significant development is the major high rise residential complex (with a mall) on the northwest corner of the Rotunda.



Mabuhay Rotunda fronting España Avenue

España Boulevard (Mabuhay Rotunda to Lacson Avenue)

327. This section forms a straight dual four-lane carriageway with a median planter soon giving way to an ornamental iron barrier. Either side of the road are concrete planters containing a range of vegetation from small plants to established trees.

328. All significant junctions along this section (Blumentritt, Maceda, Vicente Cruz, Dela Fuente and Lacson) are signalized with no U-turns.

329. España Boulevard crosses the Philippine National Railway (PNR) at a signalized, barrier crossing between Antipolo and Algeciras junctions.

330. Frontage is characterized by small shops set back from the edge of the carriageway with a wide footpath providing pedestrian access.

331. Lacson junction is due to undergo major revision with preliminary design drawings indicating España Boulevard under passing Lacson Avenue. Design drawings are being sought from DPWH.

332. Frontage is dominated by Santo Tomas University campus and student accommodation. It is also characterized by small shops set back from the edge of the carriageway with a wide footpath providing pedestrian access.

Lerma (España Boulevard to Quezon Boulevard)

333. This short stretch of road (approximately 250m) connects España Boulevard to Quezon Boulevard with a signal light at junction of España Boulevard, Lerma and Nicanor Reyes at which all turns are permitted.

334. The three-lane south west bound carriageway continues at grade from España Boulevard with the two-lane north east bound carriageway rising from Quezon Boulevard (at underpass level) to España Boulevard with retaining walls either side.



España Boulevard, on approach to Lacson Avenue

España Boulevard (Lacson Avenue to Lerma)

335. A one-lane service road runs at grade and parallel to Lerma on its south side.

336. The frontage on the north side of Lerma comprises derelict buildings and informal residences. On the south side small shops adjoin the service road.

España Boulevard (Underpass Section)

337. The north section of España Boulevard comprises a dual three-lane underpass running under Claro M Recto Avenue reaching grade approximately 200m south of Claro M Recto Avenue. At-grade two-lane service roads run parallel on either side.

338. Small arcade type shops front on to the service road on either side. This is a very busy retail area.



España Boulevard, looking towards underpass and Recto Avenue

Quezon Boulevard (End of Underpass to Start of Quezon Bridge Viaduct)

339. From the end of its underpass section Quezon Boulevard is an at-grade five lane dual carriageway with a jersey barrier type median containing some small plants.

340. This section is fronted by a busy shopping area on either side, as well as Quiapo Church on the West side – a major attractor. The shops and church combine to attract heavy parking take up and many stopping taxis, AUVs and jeepneys.

Quezon Bridge (Including Viaduct Approaches)

341. Approximately 50 m from the south end of Quiapo Church, Quezon Boulevard rises up on a viaduct to Quezon Bridge, crossing the Pasig River and sloping down to its junction with A Villegas with two lanes in each direction. On the north east viaduct side, roads remain at grade either side of Quezon Boulevard and provide a U-turn under the viaduct for traffic not wishing to cross Quezon Bridge.

342. The only “frontage” on the viaduct and bridge is a footpath either side.



Quezon Bridge

A Villegas (Quezon Boulevard to Cecilia Munoz Palma)

343. A Villegas is a recently repaired two-way carriageway with no central separator. It has two lanes in each direction until it reaches Central Terminal where it narrows to three lanes.

344. Key features on the route include the Manila Metropolitan Theatre (west side), Arroceros Forest Park (east side), Central Terminal (LRT1) (west side), Manila City Court (east side), and the University of Manila (west side).

Cecilia Munoz Palma (A Villegas to Padre Burgos)

345. This section is approximately 7m wide road connects A Villegas to Padre Burgos with a length of approximately 135m.

346. Adjacent to the north is the University of Manila, and adjacent to the south is the Andres Bonifacio Memorial.

Padre Burgos (Cecilia Munoz Palma to Quezon Boulevard)

347. Padre Burgos is a busy dual carriageway comprised of six lanes in each direction. The key feature for this project is the provincial bus and jeepney interchange at Park & Ride Lawton on the east side. The road also narrows here to two lanes to pass Manila Metropolitan Theatre on the east side

Philcoa – Fairview: Corridor Description

348. The streets included in this corridor are:

- Mindanao Avenue
- Belfast
- Quirino Highway
- Regalado Highway
- Commonwealth Avenue

349. As with the previous section, the route context is set out link by link below. Key features are described by sections to cover number of lanes, type of median, frontage, etc.

350. There are several U-turns along the corridor. In peak traffic, their provision effectively restricts road width, frequently reducing through running by two full traffic lanes. Under the Metro Manila BRT Line 1, proposals of these U-turns will be eliminated.

Mindanao Avenue

351. Between Belfast and Regalado Highway, Mindanao Avenue forms the south leg of the SM/Ayala Malls one way (eastbound) loop. It is a dual two lane carriageway carrying traffic from beyond Belfast and that leaving the SM/Ayala Malls area.

Belfast

352. Belfast forms the west leg of the SM/Ayala Malls one way loop, it is a one-way (southbound) four-lane carriageway carrying traffic from the SM/Ayala Malls area, running past the PUJ/AUV interchange south of SM Mall.

Quirino Highway

353. Quirino Highway forms the north leg of the SM/Ayala Malls one way loop. It is a one way (westbound) six lane carriageway serving the SM/Ayala Malls area.

Regalado Highway (between Quirino Highway and Mindanao Avenue)

354. This section forms the east leg of the SM/ Ayala Malls one way loop. It is a four-lane one-way (northbound) carriageway carrying traffic continuing from the section of Regalado Highway south of Mindanao Avenue and approaching the SM/Ayala Malls area.

Regalado Highway (between Mindanao Avenue and Commonwealth Avenue)

355. This section is a single carriageway road with two lanes in each direction with few junctions. The frontage is generally low rise residential.

Commonwealth Avenue (between Regalado Highway and Junction with Dona Carmen Avenue)

356. The section of Commonwealth Avenue between Regalado Highway and its junction with Dona Carmen Avenue comprises a dual four lane carriageway with, generally, a tree lined median. Many streets intersect Commonwealth Avenue with junctions generally signalized. Frontage is mainly low rise residential with some significant retail centers.

Utilities

357. A careful visual inspection of the route has been carried out with detailed positions of high voltage power poles, low voltage power poles, telecommunications poles, water pipe/fire hydrant covers and street lighting poles catalogued. Refer to the alignment sheet in Annex 3.

358. For the entire corridor, the only utilities within the median are drainage and street lighting. It is proposed that street lighting be relocated out of the median to the sides of the carriageway. Median drainage will not be affected by the proposed scheme (see separate section on drainage below).

4.2 Biological Environment

4.2.1 Flora and Fauna

359. The vegetation of Manila and Quezon City has a variety of indigenous and exotic species, especially in parks and gardens. Of these parks and gardens, those directly affected by the project works include Quezon City Memorial Circle, tree-lined boulevards and sidewalks along Commonwealth Avenue, Quezon Avenue and España Avenue where local species and some exotic species were planted. The goal is for the beautification of the city in the early 19th and 20th century.

360. Built-up vegetation along the BRT corridor consists of ornamentals and native species found in the settled areas, as well as used roadside and median planting. Some of the identified species are: *Bougainvillea spectabilis* (Bougainvillea), *Hibiscus rosa-sinensis* (gumamela), *Acacia auriculiformis* (Japanese acacia), *Samanea saman* (acacia), *Acacia mangium* (mangium), and *Pterocarpus indicus subsp indicus* (narra), *Syagrus romanzoffiana* (palm tree), *Leucaena glauca* (Lynn) (ipil-ipil), *Muntingia calabura* Linn. (aratiles), *Alstonia scholaris* (dita), *Mangifera indica* (mango), *Swietenia macrophylla* (mahogany), *Tecoma stans* (yellow bell), *Cocos nucifera* (coconut), *Ficus septica* (hauili), *Chrysophyllum cainito* (kaimito), *Melaleuca quinquenervia* (paper tree), *Melia dubia* Cav. (Meliac) (bagalunga), *Carica papaya* (papaya), *Sandoricum koetjape* (santol), *Livistona rotundifolia* (anahaw), *Cassia fistula* (golden shower), *Syzygium cumini* (duhat), *Areca catechu* L.(betle nut), *Ixora coccinea* (santan).

361. Since the BRT alignment will traverse highly urbanized and mostly built-up areas, detailed identification of terrestrial fauna was no longer conducted. Common birds and domesticated animals like the common house cats and dogs were noted during field observation. The most commonly observed bird species are *Passer montanus* (tree sparrow), *Cypselus subfurcatus* *Apus affinis* (house swift), and *Apus pacificus* (white-rumped swift). *Passer montanus* is known to have been introduced into Manila from Japan or Formosa during the 1930's. *Apus pacificus* may be observed throughout the archipelago migrating from Eastern Siberia to Australia. Nevertheless, most poisonous snakes and non-poisonous snakes have disappeared but a few species including cobra are occasionally encountered. Reptiles, amphibians and fishes have also declined. The biodiversity of fish species has been reduced severely due to pollution of surface water. The fauna of Metro Manila has suffered from deforestation and growing population pressure in the metropolis.

362. The whole project area is an urban development and there are no rare, threatened, or endangered species of terrestrial and aquatic flora and fauna in the primary impact zone of the Project. The main BRT corridor, the depots and terminals are not within areas protected for the natural habitats for rare or endangered species.

4.2.2 Ecologically Sensitive Landscape

363. National parks in Metro Manila are Rizal Park and Paco Park in Manila and the Quezon Memorial National Park in Quezon City. Fort Santiago in Intramuros is a designated National Historical Landmark. The Rizal Park and Paco Park are managed by the National Parks and Development Committee. The Fort Santiago is now under the Intramuros Administration, and the Quezon Memorial National Park is now managed by the Quezon City Government.

364. There are three protected areas within the National Capital Region, namely, the Rizal Park in the City of Manila, the Ninoy Aquino Parks & Wildlife Center in Quezon City, and the Manila Bay Beach Resort.

365. The nature parks of Metro Manila include Manila Zoological and Botanical Garden in the City of Manila, the La Mesa Ecopark and the Ninoy Aquino Parks & Wildlife Center in Quezon City. These are important nature reserves in the country. The oldest Manila zoo was established in 1959 having a population of 832 animals.

366. All of these national parks and nature parks are very much accessible and located in close proximity to the BRT alignment. The Ninoy Aquino Parks and Wildlife Center (NAPWC) is located at the southwest of the Quezon Memorial Circle wherein both serve as major parks and open spaces that are habitat to numerous species of flora and fauna. The NAPWC is the only zoological and botanical garden in Metro Manila with an area of 19.29 hectares. According a 2009 report of the NAPWC, it housed 2,443 trees commonly found in Philippine forests, representing some 38 species of trees and shrubs. It also kept various species of endemic and endangered birds, mammals, reptiles and amphibians in the open-air Mini-zoo and Wildlife Rescue Center.

367. The La Mesa Reservoir and its Watershed is the last remaining forest in Metro Manila, it was declared as watershed reservation with the issuance of Presidential Proclamation No. 1336 on July 25, 2007 under the joint administrative jurisdiction, supervision and control of the Metropolitan Manila Waterworks and Sewerage System (MWSS) and the Department of Environment and Natural

Resources (DENR). It has an area of about 2,500 hectares and its forest is home to numerous species of flora and fauna, some of which are categorized as threatened, endangered or critically-endangered. The reservation should be perpetually pre-served and protected to ensure the integrity of the city's environment.

368. These natural parks and nature parks will not be affected by the BRT alignment and corridor improvement, but only those individual trees planted for street beautification at either side of the BRT within the ROW and just outside the ROW.

369. In order to obtain permission from the forest authority, all trees to be affected by the Project must be subject to a detailed inventory carried out by FMB and DENR. Therefore, it is recommended by the FMB that a detailed inventory be carried out as soon as practicable to identify all trees within the BRT footprint (including the depot, terminals and stations). A Tree Replacement and Compensatory Planting Plan will need to be developed at the detailed design stage. The first stage will be the presentation of the EIA and the identification of the locations where trees must be replaced based on the up to date designs.

370. The necessary permits must be obtained before tree cutting. However, the tree locations and ownership (if in private lots) will need to be identified at the detailed design stage and agreed between FMB and DENR and also National Parks and Development Committee and the concerned Local Government Unit. For infrastructure projects in the metropolis the requests that specimen or centennial trees or champion trees be avoided wherever possible and that the project proponent (DOTC) should plant replacement trees such as on any available land under DOTC control. Therefore, a tree cutting and compensatory plan will need to be agreed between DOTC and FMB and DENR at the detailed design stage. Any cut trees will probably go for local use but if trees are to be cut for the BRT there will be a need for the forest authority to mark and agree with DOTC during the detailed design stage.

4.3 Social Environment

4.3.1 Economic Structure¹²

371. Metro Manila is the center of commerce and trade, culture, education, and government of the Philippines; its economy is diverse and multifaceted. Metro Manila was listed by Pricewaterhouse Coopers in 2011 as the 28th largest economy of all urban agglomerations in the world and the 2nd in Southeast Asia.

372. For the manufacturing sector, there are various manufacturers of industrial-related products such as chemicals, textiles, clothing, and electronic goods. Food, beverages and tobacco products are also produced. The food-processing industry is one of the most stable major manufacturing sectors in the Metro Manila. On the other hand, the primary commodities for export are rope, plywood, and refined sugar, copra, and coconut oil.

373. However, the service sector remains as the largest contributor to NCR's economy. Metro Manila is now the second-most preferred destination for outsourcing services (business outsourcing services) according to the investment advisory firm Tholons' Top 100 Outsourcing Destinations for 2014. For 2013, initial estimates indicated revenue to reach \$15.5 billion with full-time employees of around 900,000.

374. Metro Manila is the shopping center of the Philippines. Three "megamalls" are located in this region and these are SM Mall of Asia, SM Megamall and SM City North EDSA which is the 2nd largest mall in the world. Makati is regarded as the main central business district of Metro Manila, while Ortigas City is the second most important business district in Metro Manila.

375. In terms of educational institutions, there are 511 elementary schools and 220 secondary schools in Metro Manila. There are around 81 colleges and universities, thus it is considered as the

¹² Source: Socio-economic profile of Metro Manila, 2013

educational center of the country. Many students from all parts of the Philippines head to Metro Manila to study.

4.3.2 Health

Local Health Condition

376. According to the national record on health by the Department of Health (DOH), the top ten leading causes of mortality in the country (as of Yr2010) are acute respiratory infection (rate: 1371.3 per 100,000 population), followed by acute lower respiratory tract infection and pneumonia (rate: 623.5 per 100,000 population), followed by bronchitis (rate: 373.5 per 100,000 population) and hypertension (367.4 per 100,000 population). For the last five years and more, these respiratory illnesses remain the leading cause of mortality in the country (since 2003).

377. In Quezon City, the upper respiratory tract infection (URTI) also remains to be the number one cause of illness for the last 5 years (2009 to 2013). In 2013, URTI was reported to rate at 2620 per 100,000 population, followed by pneumonia with a rate of 350 per 100,000 population, and pulmonary tuberculosis ranked third with a rate of 268 per 100,000 population. In mortality, bronchopneumonia was consistently recorded as the leading cause of child death for the past five years, while, pulmonary tuberculosis is the top ten leading cause of death for all ages.

378. The trend could be attributed to the persistent air pollution from smoke, dust, and vapors. This also suggests that air quality situation in the region and in Metro Manila is not improving and that particulate matter (PM10) and tropospheric ozone are of serious concern.

4.3.3 Social Services / Utilities

4.3.3.1 Transportation

379. Metro Manila has a well-integrated transport system, consisting of roads, ports and airports. Intra-provincial movements are catered by land transport, air transport and to a lesser extent by water transport. The Ninoy Aquino International Airport (NAIA) is the main international gateway consisting of four terminals, namely NAIA 1, Centennial Terminal 2, NAIA 3, and Terminal 4 (Manila Domestic Airport). Officially, NAIA is the only airport serving the Manila area. However, both NAIA and Clark International Airport, located in the Clark Freeport Zone in Angeles, Pampanga serve the Manila area.

380. The Port of Manila is the chief seaport of the Philippines; it primarily serves the city's commercial needs. It is composed of 3 major facilities namely Manila North Harbor, Manila South Harbor and the Manila International Container Terminal.

381. The metropolis is also served by the Manila Light Rail Transit System (LRT-1 and LRT-2), the Manila (MRT-3) and the Philippine National Railways (PNR Metro Commuter).

382. A water-based transportation, the Pasig River Ferry Service, operates 17 stations along the Pasig River from Plaza Mexico in Intramuros to Pasig. The ferry service is the only water-based transportation that cruised the Pasig River.

383. Metro Manila has a complex mode of intra-city transportation system. It consist of public utility jeepneys, buses, AUVs, trains, taxi, vehicles for hire (SUVs), and motorized tricycles. These modes of transportation are essentially the basic system in transporting residents, employees and students of Metro Manila to their destination within and outside the metropolis. Buses are the primary mode of public transportation in going to other provinces in Luzon.

384. Metro Manila's rapidly increasing population and economic activities resulted in increased traffic volume that consequently created traffic and transport problems. One of the most pressing transport problems is traffic congestion especially during peak periods, where travel speed is slow with trips averaging at speed below 20 km/hr. Capacity improvement of the road network such as completion of C5 or this Project is identified as one of the measures to address traffic congestion.

4.3.3.2 Power Supply

385. Power supply in Metro Manila is sourced from the National Power Corporation and other independent power producers in Luzon. The sole electric distributor is the Manila Electric Company or Meralco, its original name is Manila Electric Railroad and Light Company. Meralco is the largest distributor of electrical power in the Philippines, holding power distribution franchise for 22 cities and 89 municipalities including the whole NCR and exurbs of Mega Manila.

4.3.3.3 Communication Infrastructure

386. All major means of mass communication services are available in Metro Manila. Cable connections from several cable TV providers are available throughout Metro Manila. Major newspapers, dailies, broadsheets and other publications are likewise easily accessed. Telephone services are provided by Philippine Long Distance Telephone Co. (PLDT) and mobile phone service providers such as Globe and Smart. Mail and parcel delivery services are provided by both public and private entities such as Philippine Postal Office and its postal stations located throughout Metro Manila and by LBC and JRS, or FEDEX, respectively.

4.3.3.4 Water Supply

387. Metro Manila water supply is the responsibility of Metropolitan Waterworks and Sewerage System (MWSS) through its private distribution concessionaires, the Maynilad Water Services, Inc. (MWSI) and Manila Water Co. (MWC). MWSI is servicing the west zone covering the City of Manila (excluding the southeastern part of the city), Caloocan, Las Pinas, Malabon, Muntinlupa, Navotas, Paranaque, Pasay, Valenzuela and some parts of Makati and Quezon City. MWC is servicing the east zone covering Mandaluyong, Marikina, Pasig, Pateros, San Juan, Taguig and large areas of Makati and Quezon City. Water uses are for domestic, commercial, industrial and institutional. The classification of water supply systems generally follows the HLURB planning standard.

4.3.3.5 Roads and Traffic

388. Metropolitan Manila has an extensive system of highways connecting the various cities and municipalities estimated to measure 5,092 kilometers long. Of this total, 1,087 kilometers are national roads; 2,366 kilometers are city, municipal, or barangay roads; 1,639 kilometers are subdivision roads; and 37 kilometers are privately run toll expressways.

389. The major roads in Metro Manila include ten radial roads, which branch out from central Manila and five circumferential roads which form a series of concentric semi-circular arcs around downtown Manila. Most of these roads are very important transportation arteries, one is the C-4 (Circumferential Road 4), also called Epifanio de los Santos Avenue, or more popularly as EDSA. It is the major thoroughfare in Metro Manila connecting its five cities, namely: Pasay, Makati, Mandaluyong, Quezon City, and Caloocan. The MRT-3 line of Manila's metro network runs down the middle of EDSA between the roads opposite running lanes. A major alternative to EDSA is Circumferential Road 5 (C-5). Some other important roads are R-1 (Radial Road 1) better known as Roxas Boulevard and the Manila-Cavite Expressway (Coastal Road) connecting to Cavite province in the southwest; R-3 or the South Luzon Expressway (SLEX) connecting to Laguna province in the southeast; R-6 (Aurora Boulevard and Marcos Highway) connecting to Rizal province in the east; and R-8 or the North Luzon Expressway (NLEX) connecting to Bulacan province in the north. One of its newest roads, the Diosdado Macapagal Boulevard, runs along the reclamation area along the coast of Manila Bay parallel to R-1.

390. Metro Manila is infamous for its traffic jams. A trip that should take 20 minutes will last an hour or more especially during rush hour. The increasing population and economic activities coupled with increasing car ownership have contributed to the traffic congestion in Metro Manila. As of 2013, a total number of 1,975,223 motor vehicles were registered at the Land Transportation Office (see **Table 4.3.1**).

Table 4.3.1: Number of Motor Vehicles Registered, New-renewal, By Type: Annual 2013

CITY	CARS	UV	SUV	TRUCKS	BUSES	MC/TC	TRAILERS	TOTAL
CITY OF MANILA	57,810	78,911	28,902	8,934	72	103,717	3,260	281,606
CITY OF MANDALUYONG	17,872	17,053	9,005	4,480		13,891	1,513	63,814
CITY OF MARIKINA	25,612	30,689	8,929	2,602	12	58,874	166	126,884
CITY OF PASIG	31,716	30,948	10,438	3,889	-	52,632	242	129,865
QUEZON CITY	122,144	178,919	46,226	24,657	12,013	161,870	2,926	548,755
CITY OF SAN JUAN	13,919	15,592	7,691	1,154	397	17,105	158	56,016
CALOOCAN CITY	13,286	28,341	6,072	7,508	35	37,294	2,093	94,629
CITY OF MALABON	4,731	12,744	2,214	2,328	15	24,137	2,079	48,248
CITY OF NAVOTAS	6,020	7,753	2,740	2,102	69	17,953	971	37,608
CITY OF VALENZUELA	11,315	17,945	4,066	3,561	17	37,452	261	74,617
CITY OF LAS PIÑAS	29,916	30,957	10,855	2,523	64	41,359	201	115,875
CITY OF MAKATI	29,776	29,762	13,248	2,470	97	35,941	900	112,194
CITY OF MUNTINLUPA	23,363	23,864	8,482	2,535	564	27,602	130	86,540
CITY OF PARAÑAQUE	18,838	17,352	6,429	1,497	5	31,732	303	76,156
PASAY CITY	12,607	17,144	5,131	2,248	387	18,843	188	56,548
PATEROS	<i>no data</i>							
TAGUIG CITY	11,358	13,501	4,741	79	-	35,571	618	65,868
GRAND TOTAL	430,283	551,475	175,169	72,567	13,747	715,973	16,009	1,975,223

Source: Land Transportation Office

391. Accordingly, the Metropolitan Manila Development Authority (MMDA) has implemented many infrastructure projects to decongest traffic, such as flyovers (elevated roads), interchanges, loading bays for Public Utility Vehicles (PUVs), emergency bays, and U-turn slots over various intersections and thoroughfares, installation of additional signalling systems, and the completion of the comprehensive railway system. It has also been engaged in road widening with the support of the Department of Public Works and Highways. MMDA has also utilized projects for the pedestrians such as the installation of footbridges, waiting sheds, and men's urinals to various roads in the metropolis. The agency has also implemented various schemes for motorists such as (1) Uniform Vehicular Volume Reduction Scheme (UVVRS), more popularly known as "color-coding", where vehicles whose plate numbers end in different digits are banned from traveling on different days, (2) Yellow Lane scheme, where yellow-plated PUBs (Public Utility Buses) will only use the two outermost lanes in EDSA, (3) Motorcycle Lane scheme along major road network and the Organized Bus Route (OBR) for Metro Manila.

392. However, despite these measures to ease traffic flow and alleviate traffic congestion, Metro Manila still suffers severe traffic congestion especially during peak hours where the average travel speed goes down to as low as 6 to 8 kilometers per hour (see **Figure 4.3.1**). In a recent 2013 JICA study, it was estimated that the Philippines is losing P2.4 billion a day in potential income due to traffic congestion that eats up time that could have been used for productive pursuits. In this view, the Government intends to prioritize national roads to address traffic congestion and safety in designated strategic tourism destination and urban centers.

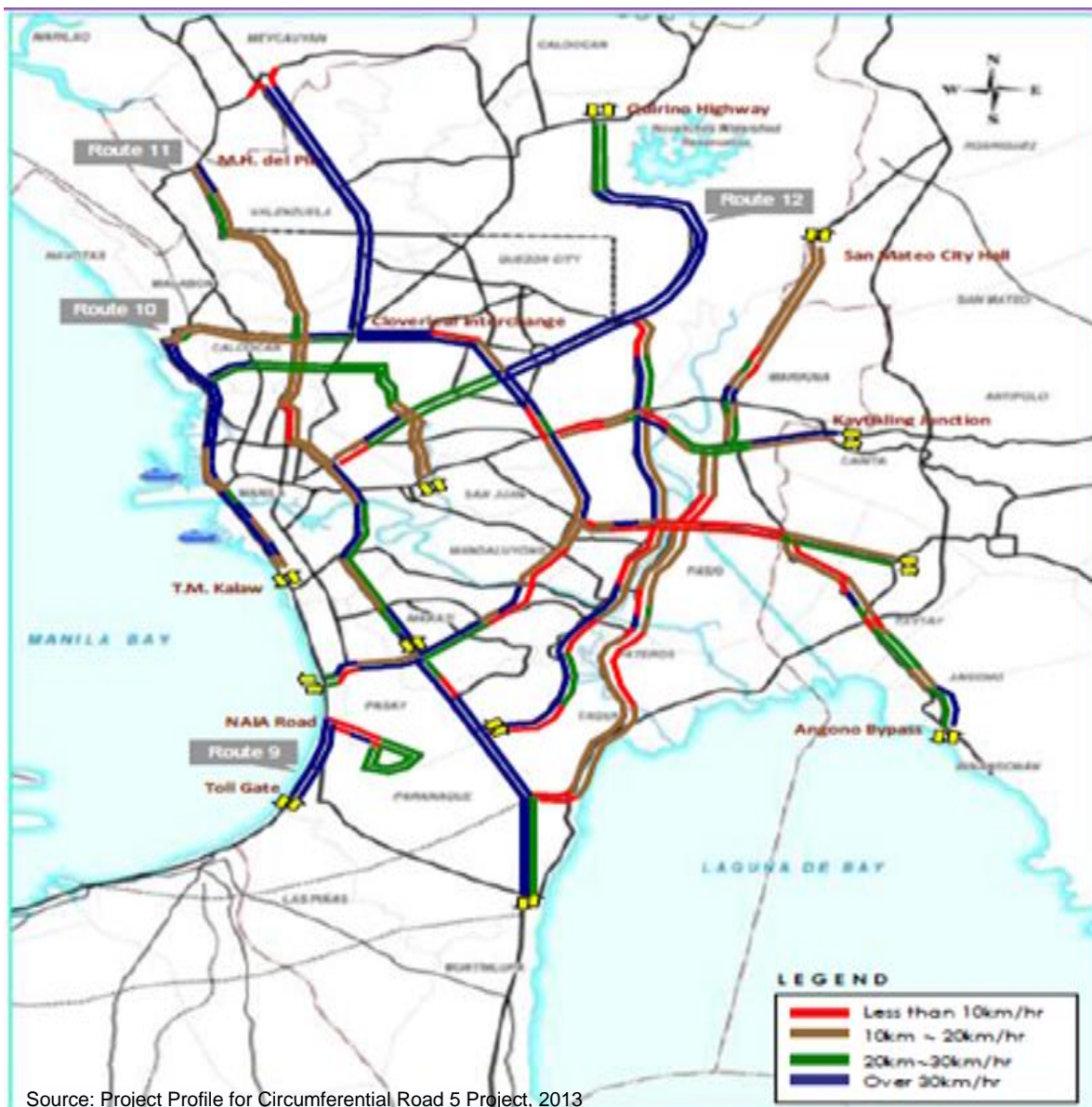


Figure 4.3.1: Existing Travel Speeds along Metro Manila Road Network

4.3.4 Local Government Units

4.3.4.1 Local Government of Quezon City

a) City Government

393. Quezon City is governed by a mayor and a vice mayor elected to three-year terms. The Mayor is the chief executive, while the Vice Mayor is the presiding officer of the legislative body, called the City Council or *Sangguniang Panglungsod*. The Council has 24 regular council members who are joined by the president of the city chapter of the *Liga ng mga Barangay* and the president of the *Panglungsod na Pederasyon ng Sangguniang Kabataan*.

394. The chief executive of the present administration is Mayor Herbert Constantine M. Bautista while the Vice-Mayor is Josefina G. Belmonte. Quezon City is divided into 142 barangays organized into four congressional districts where each district is represented by a congressman in the House of Representatives.

b) Land area

395. With a land area of 161.126 sq. km. or 16,112.8 hectares, Quezon City is more than four times the size of Manila, nearly six times the expanse of Makati, and more than 14 times bigger than Mandaluyong. It is almost one-fourth the expanse of Metro Manila.

c) Geography

396. Quezon City is located near the center of Metro Manila, towards its northeastern portion, it is bordered by Manila to the southwest, by Caloocan City and Valenzuela City to the west and northwest. Towards the south, lies San Juan and Mandaluyong City, while Marikina City and Pasig City borders Quezon City to the southeast. Towards the north, across Marilao River, lies San Jose del Monte City in the province of Bulacan, and towards the east, lies Rodriguez and San Mateo, both in the province of Rizal.

397. Located at the heart of Metro Manila, Quezon City is also its strategic convergence point for the metropolitan road and transportation networks, making the City an ideal distribution hub. It is easily accessible from the major highways, thoroughfares and mass rail transit systems of the metropolis.

d) Population

398. 2012 estimate is 3,179,536 people, with a 2.92% annual growth rate. It is the most populated city of the Philippines. The city is a melting pot of cultures with hundreds of constituents from other parts of the country migrating to it every year. Population density is 19,933 persons per kilometer.

e) Other Demographics

399. Quezon City has a female population of 1.63M (51%) and a male population of 1.55M (49%). It has a total number of households of 706,564. Generally, a young population (less than 21 years old) comprises 38% of the total population. Religion is predominantly Roman Catholic (99%). The common spoken language is the national language (Filipino), but English is also widely spoken. English is the primary language of trade, government, media and education, as is the case in the entire Philippines.

400. Quezon City has a literacy rate of 98 percent with school-age population (3-21 years) of 1,211,914; pre-school age population (3 to 5 years) of 269,610; elementary-age population (6 to 11 years) of 577,002; high school-age population (12 to 15 years) of 241,363; and college level-age population (16 to 21 years) of 393,549.

4.3.4.2 Local Government of Manila

a) City Government

401. Like all cities of the Philippines, Manila is governed by a mayor who heads the executive department of the city. The current mayor is a former President of the Philippines, Joseph Ejercito Estrada. The city mayor is restricted for three consecutive terms (nine years), although he can be elected again after an interruption of one term. Isko Moreno, the city's vice-mayor heads the legislative arm which is composed of the elected city councilors, six from each of the city's six congressional districts.

402. The city is divided into 897 barangays, which are the smallest unit of local government in the Philippines. Each barangay has its own chairperson and councilors. For administrative convenience, all the barangays in Manila are grouped into 100 zones and which are further grouped into 16 administrative districts. These zones and districts have no form of local government.

403. The city further has six representatives popularly elected to the House of Representatives, the lower legislative branch of the Philippines. Each representative represents one of the six Congressional districts of Manila.

b) Geography and Land Area

404. Manila is the capital city of the Philippines. It is bounded in the east by the Philippine Sea and the Pacific Ocean. Manila is located in Luzon, the biggest island. The city occupies an area of 38.55 square kilometers with a 2010 population of 1,652,171 down from 1,660,714 in 2007. It is bounded by the west by the Manila Bay. It is part of the Metro Manila or National Capital Region composed on 16 cities and 1 municipality.

c) Demographics

405. According to international sources, Manila is the second densest city in the world in 2013; previously the densest city in 2007 43,079 per square kilometers (111,576/sq.mile). However, the official country records show that the population density of Manila in year 2010 was 66,140 persons/km², an increase of its 2000 population density of 63,294 persons/km². In 2010, Manila's population of 1,652,171 registered a 0.44% of its 2000 population of 1,581,082.

4.3.5 Commuters and Traffic Forecasts (Public transportation and private car users)¹³

a) Traffic Flow

406. Vehicle flows along the corridor are in the order of 1,150-3,500 per hour over the AM and PM peak periods, while passenger flows of 4,600-13,300 per hour are seen over the AM and PM peak periods. The aggregated average vehicle counts are shown in the tables below by direction, broken down by time period and survey location.

Table 4.3.2: Westbound aggregated vehicle count by time period and location

WB	España Avenue		Quezon Avenue	
	Quezon Bridge	University of St Tomas	Banawe Avenue	West of EDSA
AM Peak (3hr Av)	2420	2047	2327	3550
PM Peak (2hr Av)	1678	1390	2210	2375
24 Hour	34955	29439	37008	47202

Table 4.3.3: Eastbound aggregated vehicle count by time period and location

EB	España Avenue		Quezon Avenue	
	Quezon Bridge	University of Sto. Tomas	Quezon Bridge	University of Sto. Tomas
AM Peak (3hr Av)	1553	1428	2034	2312
PM Peak (2hr Av)	2186	1449	2174	2354
24 Hour	33298	27195	37885	42086

407. The corresponding aggregated passenger flow statistics are summarized in the tables below on a similar basis.

Table 4.3.4: Westbound aggregated passenger count by time period and location

WB	España Avenue		Quezon Avenue	
	Quezon Bridge	University of Sto. Tomas	Quezon Bridge	University of Sto. Tomas

¹³ Lifted from the Detailed Technical Study.

AM Peak (3hr Av)	13167	13394	12433	12785
PM Peak (2hr Av)	8180	4662	8934	6981
24 Hour	164976	130842	141262	134146

Table 4.3.5: Eastbound aggregated passenger count by time period and location

	España Avenue		Quezon Avenue	
EB	Quezon Bridge	University of St Tomas	Quezon Bridge	University of St Tomas
AM Peak (3hr Av)	6546	4856	6485	7490
PM Peak (2hr Av)	12826	8867	10544	9538
24 Hour	148555	115341	132758	127784

408. It is noted from the results that a higher volume of vehicles travelled in the WB direction towards EDSA in the morning peak as compare to EB direction. It is also noted that passenger cars remains the highest in terms of volume and make approximately 38% of the total traffic. Slightly higher vehicle flow is noted in the EB direction in the PM peak. Passenger cars make up nearly 40 percent of the total traffic in both directions. Jeepneys make approximately 20 to 25 percent of the total traffic.

b) Mode share

409. The volume of passengers travelling by public transport makes up 77 percent in westbound and 79 percent in the eastbound direction. It is notable that whilst buses account for just three percent (3%) of vehicle flow, they carry about a quarter of all passenger movements along the corridor. Conversely, private car vehicles make up over 40 percent of vehicle movements but carry just 15 percent of travellers.

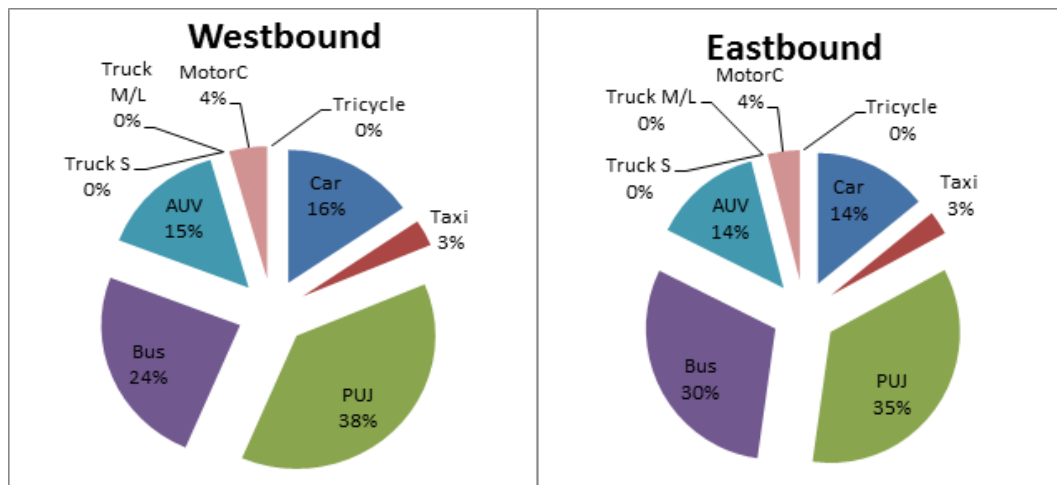


Figure 4.3.2: Passenger mode share by direction

c) Travel speeds on corridor

410. Average Travel Speeds along the corridor have been recorded through GPS based ‘floating vehicle surveys’, these record second by second vehicle location and can therefore map the speed of progress very accurately. Journey time for PUV modes have been derived from the time intervals between stops on the 10 Boarding and Alighting surveys conducted by NCTS.

411. **Table 4.3.6** details Average speeds for the PUJ, PUB and Car. It is assumed that AUV have the same journey time as cars, and therefore AUV speed should be read as such. The speed displayed in this table is an average speed taken over the whole length of the corridor between C-5 and Lawton both Eastbound and Westbound. Comparisons made with the 2012 MMPTPSS Study show little variation in speeds for each of the peak periods and as such the data is considered robust.

Table 4.3.6: Average PUV Speeds, C5 to Lawton

	Westbound			Eastbound		
	Car	PUJ	PUB	Car	PUJ	PUB
AM	20.2	16.1	20.3	21.3	18.5	21.8
Inter-peak	18.9	15.0	21.5	18.4	14.8	20.5
PM	20.7	14.9	19.7	13.9	14.0	14.3
Night - Free Flow	27.7			30.0		

412. PUB speeds are in general faster than PUJ, however, lower speeds are recorded at the same points along the corridor owing to popular interchange points such as EDSA and Rotunda. The highest speeds are recorded north of Philcoa on Commonwealth owing to fewer Speeds drop as vehicles get toward Manila City again owing to AM peak congestion around Lacson and Padre Noval.

413. PUB heading Eastbound have faster speeds in general over the whole route however areas around Padre Noval and Lacson are heavily congested and speeds drop considerably around Padre Noval and Lacson. As with PUJ, Eastbound speeds indicate a clear Westbound tidal movement in the AM peak.

d) Summary of Traffic Forecast

414. Demand forecasts were produced for an opening year of 2016, and future design years of 2020, 2025, 2035 and 2040 to enable economic and financial appraisal. Future year forecasts took full account of growth in the demand for travel and population growth. Key model outputs are summarized below.

Considerations	2016
Peak (point) Load	10,260 passengers
Peak total	22,023 passengers
Daily total	279,476 passengers
Yearly total	88,314,416 passengers
Average journey time	26.5 minutes
Average fare	PHP19.98

	2016 AM - Do Nothing		2016 AM - Do Something	
	Westbound	Eastbound	Westbound	Eastbound
Journey Time				
Manila City Hall – Philcoa	48.2	47.6	43.8	39.3
Philcoa–Fairview (stopping)	102.3	82.2	97.3	74.5
Philcoa– Fairview (express)			90.5	67.9

e) Service Plan

415. The above-forecast is based on the service plan for the three bus services proposed below:

1. Fairview - Manila City Hall (Express along Commonwealth Avenue)
2. Fairview – Manila City Hall (Stopping Service)
3. Philcoa – Manila City Hall

These will operate at the following peak headways in order to meet forecast demand.



Service	Buses per hour	Headway
SM Fairview – MCH (Express)	30	2 mins
SM Fairview – MCH (Stopping)	30	2 mins
Philcoa – MCH	60	1 min

4.3.6 Public Utility Vehicle Sector

4.3.6.1 PUJ and PUB Routes and Units Operating

416. The Detailed Technical Study, Appendix A, presents a list of franchises and respective number of vehicle units from LTFRB that are seen to interact with the Metro Manila BRT Line-1 Project corridor, it was derived from a listing of 550 routes or close to 33,000 franchises for the entire Metro Manila. The DTS identified a total of 64 PUJ routes and one (1) PUB route traversing the corridor. These were studied using the PUJ and PUB route map shown in **Figure 4.3.3**. Using the route map, the inventory of routes is sorted by length (in km) each route traverses along the BRT corridor (**Table 4.3.7**). Those that are using 12 km or more of the corridor were proposed in the study to be deleted or are recommended for route relocation. Those using less than 12 km of the corridor may also be considered for route relocation, route modification or route truncation from traffic depending on the degree of congestion along their respective areas or the section of BRT corridor they operate. Some may be allowed to coexist while others will have their routes modified or truncated.

417. For the PUB sector, the SM-Fairview-Baclaran (via Quezon Avenue) bus route overlaps with the Metro Manila BRT Line-1 Project. About 260 units ply the BRT route, operated by 22 operators. Bus operators on the route have an average fleet size of 12 units, with three companies having 20 or more authorized bus units. The driver to unit ratio for the PUBs is assumed to be similar to that of the PUJs with one regular driver and an alternate driver during days off. Using this assumption, the total number of affected bus drivers will be 520. An equal number of bus conductors are also affected.

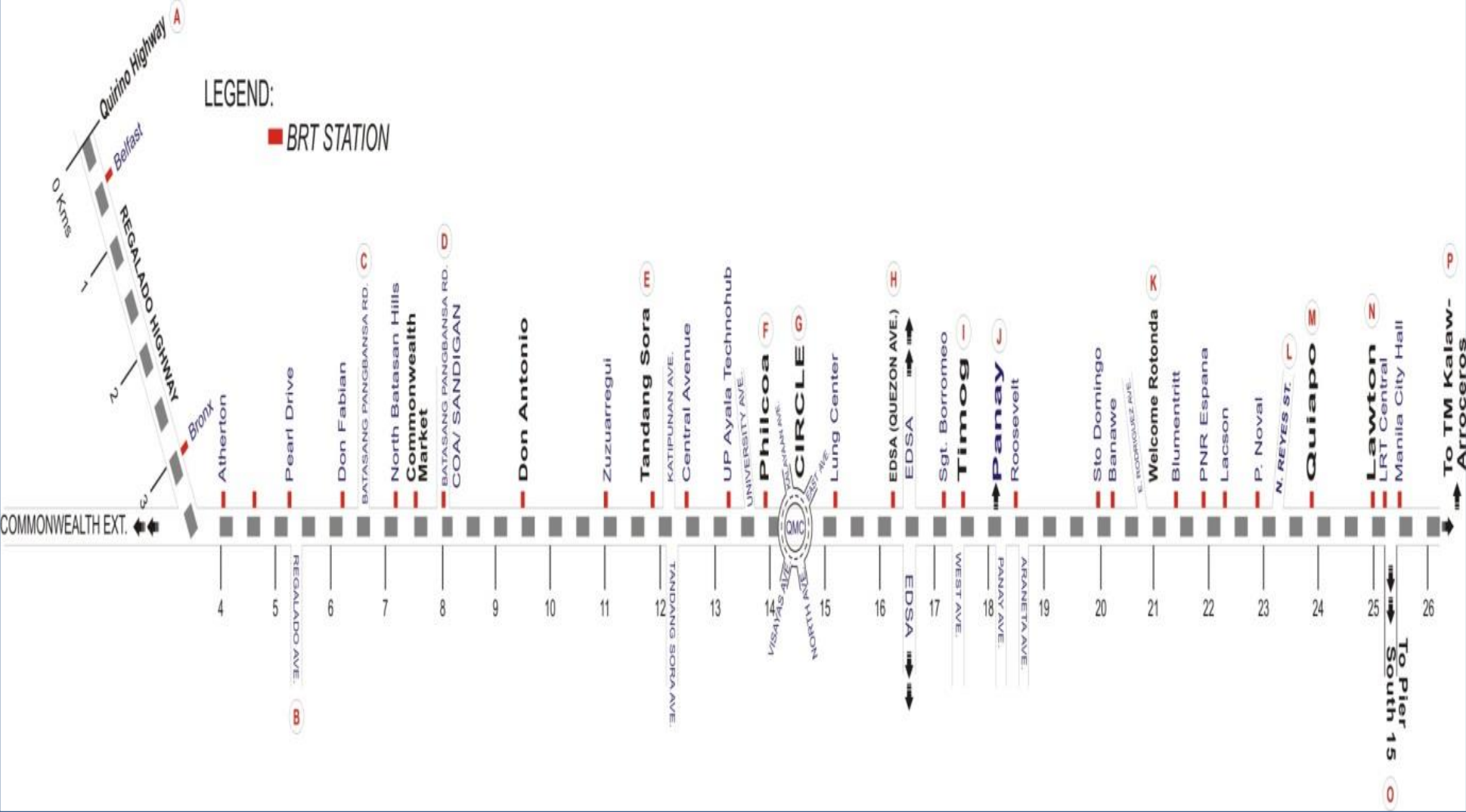


Figure 4.3.3 PUJs and PUBs Route Map



4.3.6.2 Socioeconomic Profiles

PUJ and PUB operator and driver organizations

418. PUJ drivers and operators are clustered into associations or cooperatives according to the routes they operate. Size of membership range from a low of 35 among newly organized group to as high as 600 members for old established routes. **Table 4.3.8** lists the name of PUJ and PUB operator and driver associations and companies (for the PUBs), the routes their members have franchises to operate, and the size of their membership. Also shown is the total number of drivers interviewed from each organization during the social survey.

419. **Figure 4.3.4** presents the breakdown of interviewed members by PUJ organization. There are a few organizations whose officers and members refused to participate in the survey or did not show up in any of the series of public consultation meetings held.

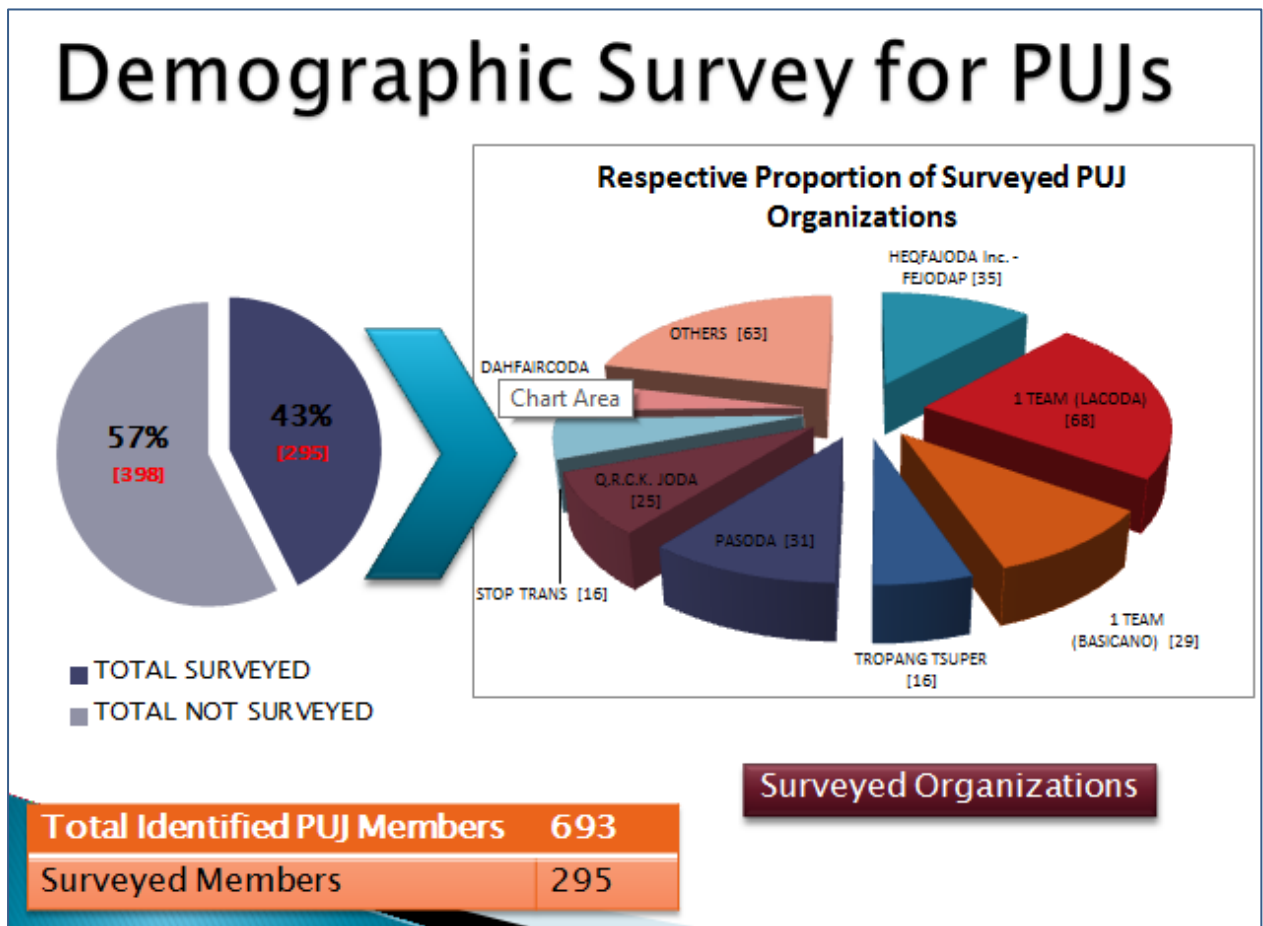


Figure 4.3.4 Breakdown of surveyed PUJ

Table 4.3.7: PUJ Routes Affected by the Manila BRT Project

PUJ Routes	Origin	Destination	km Traversed along BRT Route
Fairview-Arroceros	B	P	21.0
Almar-Welcome Rotonda (TT)	A	K	21.0
Fairview-Kalaw	B	P	21.0
Lagro - Welcome Rtd (HEQFAJODA)	A	K	21.0
Dahlia - Arroceros (HEQFAJODA)	B	P	20.0
Fairview-Quiapo	B	M	19.0
Jordan Plains - Welcome Rotonda	B	K	19.0
Zabarte- Panay (TT&HEQFAJODA)	A	J	18.0
Lagro- Panay (TT&HEQFAJODA)	A	J	18.0
Almar - Panay (HEQFAJODA)	A	J	18.0
Lagro-Cubao	A	G	14.5
Fairview-Cubao	A	G	14.5
Zabarte -Philcoa	A	F	14.0
Philcoa - Bagong Silang	A	F	14.0
Ever Green Subd - Philcoa via Comm	A	F	14.0
Lagro - Philcoa (HEQFAJODA)	A	F	14.0
Philcoa-Kalaw (HEQFAJODA)	F	P	12.0
Philcoa-Arroceros	F	P	12.0
Balara-Arroceros/Quiapo	F	P	12.0
Philcoa-Pier South	F	P	12.0
Lagro - SM North	B	G	11.0
Philcoa-Quiapo	F	M	10.0
Pagasa - Pier	I	P	9.0
Project 8 - Arroceros	J	P	8.0
Project 8 - Kalaw	J	P	8.0
Project 7 - Arroceros	J	P	8.0
Project 7 - Kalaw	J	P	8.0
Project 8 - Pier	J	O	7.0
Project 7 - Pier	J	O	7.0
Project 6 - Quiapo	J	M	6.0
Project 8 - Quiapo	J	M	6.0
Project 7 - Quiapo	J	M	6.0
Project 6 - Arroceros	J	P	6.0
Project 6 - Pier	J	O	6.0
Maly - Philcoa	D	F	6.0
Project 6 - Kalaw	I	P	6.0
Project 2,3 - Kalaw	K	P	5.0
Cubao - Arroceros	J	P	5.0
Cubao - Kalaw	J	P	5.0
Project 2,3 - Remedios	K	P	5.0
Project 2,3 - South Pier 15	K	O	4.0
Cubao - Pier South 15	K	O	4.0
Project 2,3 - Welcome Rotonda	I	K	4.0
Project 2,3 - Quiapo	K	M	3.0
Cubao - Quiapo	K	M	3.0

Table 4.3.8: List of PUJ and PUB Organizations

Name of the Organization	List of Routes	No. of Members	Total Survey Respondent	Percentage of Respondents
HYPERMART EDSA QUEZON CITY BLBD. FAIRVIEW JEEPNE OPERATORS AND DRIVERS ASSOCIATION INC. (HEQPA JODA INC.) FEJODAP	Zabarte – Panay; Almar – Welcome; Lagro – Panay; Lagro – Welcome	101	35	26
TROPANG TSUPER TRANSPORT COOPERATIVE SERVICES (TTTSC)	Zabarte – Panay; Almar – Welcome; Lagro - Panay	139	16	15
COMMONWEALTH TRANSPORT SERVICE AND DEVELOPMENT	Jordan Plains (Novaliches) – Welcome; San Rafael (Rizal) – Quezon City Hall; Balara – Arroceros; Fairview – Philcoa; Zabarte/Quirino Hi-way – Panay Ave.	68		
KAMIAS TRANSPORT	Project 2,3 – Welcome; Welcome – Q. Mart; Project 2,3 –Q. Mart	42		
OFFICE TRANSPORT COOPERATIVE GISIS (OTC)	Abra – Luzon; Pag-asa – Highway; Project 7 –Quiapo; Project 7- Arroceros; Project 8 – Quiapo; Kalaw – Pier	1115		
STOP TRANS	Philcoa – Kalaw; Philcoa – Pier	38	16	30
HI WEST TRANSPORT SERVICE COOPERATIVE	Project 6 – Kalaw; Project 7 – Quiapo; Project 7 – Arroceros; Project 8 – Quiapo; Kalaw - Pier	100		
C-JODA PISTON (CUBAO JEEPNEY OPERATORS DRIVER ASSOCIATION)	Cubao – Pier; Kalaw – Vito Cruz Cubao – Recto; Cubao – Remedios	101		
PASODA (PASIKLAB OPERATOR DRIVERS ASSOCIATION)	Philcoa – Kalaw; Philcoa – Pier Balara – Arroceros, Quiapo	88	31	26
PROMDOA – ALTIDAP/ 1-UTAK	Project 2,3 – Welcome; Project 2,3 – Kalaw; Project 2,3 – South Pier 15; Project 2,3 – Remedios	100		
Q.R.C.K. JODA (QUIRINO REGALADO CUBAO KALAYAAN)	Lagro – Cubao- Kalayaan	90	25	22
BASICANO (BAGONG SILANG CAMARIN NOVALICHES)	Novaliches – Bagong Silang; Bagong Silang – Philcoa; Evergreen – Philcoa; Camarin – Balintawak; Bagong Silang – Kaliwa (Robinson)	600	29	5
DAHFAIRCODA	Dahlia Fairview-Cubao ; Kamuning Araya	70	12	
HEAVEN BLESSED BUS TRANSPORT	Fairview- Quiapo	98	30	23
LACODA	Lagro - Cubao		68	
BAJODA	Novaliches – Bagong Silang Philcoa –Bagong Silang Maligaya –Commonwealth	200		
SANLICOM JODA (SAN ISIDRO –LITEX COMMONWEALTH)	San Isidro -Commonwealth	65		
(LSMNE JODAI) LAGRO SM NORTH EDSA JODAI	Lagro – SM north	100		
COMMON TRANSPORT SERVICE COOPERATIVE	San Isidro –Commonwealth	35		
NEW SUJODA INC	San Isidro Rodriguez/Montalban –Commonwealth	35		
(NEW SIGLICOM) NEW SAN ISIDRO GRAVELPIT – COMMONWEALTH MARKET	San Isidro – Commonwealth	35		
Total		3220	262	8

420. There are about 500 AUV operating on the BRT corridor. However, social impact on this sector is not considered as adverse as that on the PUB and PUJ sectors because the only route ends are prescribed but the routes are flexible. Therefore they were not considered among the project stakeholders.

Age Grouping

421. Most of the PUJ and PUB drivers are under the age bracket of 31 to 40 years old (36%), followed by those who are a little older (41-50 years old), comprising 29 percent of surveyed drivers, 20 to 30 years old consist 21 percent, 51- to 60-year-old drivers are 12 percent while the remaining three percent (3%) are senior citizens (**Table 4.3.9**)

Table 4.3.9: Age Grouping of PUJ Drivers

Name of Organization	Total Respondent		Age of Respondent				
			20 - 30 yrs old	31 - 40 yrs old	41 - 50 yrs old	51 - 60 yrs old	61 yrs & above
PASODA	No.	30	3	10	9	6	3
	Percent (%)	100%	10%	33%	30%	20%	10%
Stop Transport	No.	15	1	1	7	6	1
	Percent (%)	100%	6%	6%	44%	38%	6%
DAHFAIRCODA	No.	12	3	7	2	0	0
	Percent (%)	100%	25%	58%	17%	0%	0%
HEQFA JODA	No.	35	7	9	14	3	2
	Percent (%)	100%	20%	26%	40%	9%	6%
Tropang Tsuper	No.	16	5	5	4	2	0
	Percent (%)	100%	31%	31%	25%	13%	0%
LACODA	No.	68	17	29	13	6	3
	Percent (%)	100%	25%	43%	19%	9%	4%
1 Team (BASICANO)	No.	29	6	4	18	0	1
	Percent (%)	100%	21%	14%	62%	0%	3%
QRCK JODA	No.	25	8	9	5	3	0
	Percent (%)	100%	32%	36%	20%	12%	0%
Heaven Blessed Transport	No.	30	8	13	8	1	
	Percent (%)	100%	27%	43%	27%	3%	0%
Individuals	No.	63	12	27	14	9	1
	Percent (%)	100%	19%	43%	22%	14%	2%
Individuals from diff. Association	No.	24	3	10	6	5	0
	Percent (%)	100%	13%	42%	25%	21%	0%
TOTAL	No.	347	73	124	100	41	11
	Percent (%)	100%	21%	36%	29%	12%	3%

Household size and income

422. The average household size of the surveyed population is 4.8 (Table 4.3.10). The average daily income from driving ranges from a low of PhP488 among the members of DAHFAIRCODA to a high of PhP1,042 among LACODA and PhP1,041 among BASICANO members. BASICANO and LACODA are part of One Team - a management company for PUJ operators paying a flat daily rate to its drivers. The overall average daily income for all drivers regardless of route or organization is PhP750.00 (Table 4.3.12).

Table 4.3.10. Household Size and Average Daily Income of Drivers

Name Of Organization	Total Respondent	House Hold Size Average	Average Daily Income From Driving (PhP)
PASODA	30	4.9	695.00
Stop Transport	16	5.0	546.88

Name Of Organization	Total Respondent	House Hold Size Average	Average Daily Income From Driving (PhP)
DAHFAIRCODA	12	not declared	562.92
HEQFA JODA	35	4.8	646.00
Tropang Tsuper	16	5.4	737.50
LACODA	68	4.7	1,041.91
1 Team (BASICANO)	29	4.9	1,041.38
Q.R.C.K JODA	25	4.8	546.00
Heaven Blessed Transport	30	4.6	807.00
Individual	63	5.0	601.51
Individuals from diff. Association	24	4.9	562.50
AVERAGE	348	4.7	750.20

Other skills

423. Most of the surveyed drivers are also skilled mechanics (82%). About a fourth of them can also work as welders, electrician, construction workers or carpenters/masons (**Table 4.3.11**).

Table 4.3.11: Other Skill of PUJ Drivers

Name Of Organization	Total Respondent	Mechanics	Helper Mechanics	Electricians	Welder	Construction Worker	Carpenter	Others
PASODA	31	25	1	5	5	11	2	Agriculture, farmer, mason, salesman, porter, truck driver, porter
	100%	81%	3%	16%	16%	35%	6%	
Stop Transport	16	12	4	3	4	3	4	Tailor, cook, security guard, farmer, mason, delivery helper, vendor
	100%	75%	25%	19%	25%	19%	25%	
DAHFAIRCODA	12	5	1	1	6	5	6	Warehouseman, delivery helper, security guard, mason, janitorial, waiter
	100%	42%	8%	8%	50%	42%	50%	
HEQFA JODA	35	33	3	15	9	10	7	Security guard, mason, barber, baker, vulcanizing, farmer, delivery man, technician
	100%	94%	9%	43%	26%	29%	20%	
Tropang Tsuper	16	16		4	6	4	3	Tubero, mason, security guard, cook, agricultural, fisherman
	100%	100%	0%	25%	38%	25%	19%	
LACODA	68	61	1	25	6	14	15	Mason, farmer, factory worker, tubero, computer technician, factory worker, printing press, mirror installer, cook, pump attendant, company driver, machinery, waiter
	100%	90%	1%	37%	9%	21%	22%	

Name Of Organization	Total Respondent	Mechanics	Helper Mechanics	Electricians	Welder	Construction Worker	Carpenter	Others
1 Team (BASICANO)	29	22		7	9	4	3	Mason, textile, tricycle driver, security guard, janitor, cook, operator, painter, carwasher
	100%	76%	0%	24%	31%	14%	10%	
Q.R.C.K JODA	25	24	1	4	17	9	10	Farmer, factory worker, miner, painter, mason, bell boy, janitor, wood curver
	100%	96%	4%	16%	68%	36%	40%	
Heaven Blessed Transport	30	20	0	10	6	11	8	Office clerk, janitor, service crew, waiter, security guard, farmer, furniture worker, messenger, sales boy
	100%	67%	0%	33%	20%	37%	27%	
Individual	63	51	2	6	21	23	17	Mason, fisherman, cook, messenger, farmer, security guard, operator, painter, trucking, tubero, baker, tailor, barber, cook, food handler, bagger
	100%	81%	3%	10%	33%	37%	27%	
Individuals from diff. Association	24	18	1	2	10	8	4	Mason, food handler, farmer, barber, warehouse man, pump attendant, waiter, factory worker, delivery boy, tailor, farmer, baker, furniture worker
	100%	75%	4%	8%	42%	33%	17%	
Total	349	287	14	82	99	102	79	
	100%	82%	4%	23%	28%	29%	23%	

Common illnesses from driving

424. Back pain is the most common illness drivers endure from driving (54%). Other illnesses from driving are flu (10%), kidney disease (9%), rheumatism (5%), arthritis (4%), asthma (4%), and tuberculosis (3%) (Table 4.3.12).

Table 4.3.12: Common Illness of PUJ Drivers

Name of Organization	Total Respondent	Asthma	Flu	Back Pain	Kidney Disease	Arthritis	Rheumatism	Tuberculosis	Others
PASODA	30	1	4	13	2	3	1	2	Pneumonia, Appendicitis, High Blood, Cough, Fever.
	100%	3%	13%	43%	7%	10%	3%	7%	
Stop Transport	15	1	1	6	6	1	0	1	Pneumonia, Over fatigue
	100%	7%	7%	40%	40%	7%	0%	7%	
DAHFAIRCODA	12	0	0	4	2	2	0	0	Pneumonia, Over Fatigue.
	100%	0%	0%	33%	17%	17%	0%	0%	

Name of Organization	Total Respondent	Asthma	Flu	Back Pain	Kidney Disease	Arthritis	Rheumatism	Tuberculosis	Others
HEQFA JODA	35	3	4	19	5	0	1	0	Cough, Headache, UTI, Cold, Allergy, Acidic, UTI, Pneumonia, Spot On Lungs, High Blood
	100%	9%	11%	54%	14%	0%	3%	0%	
Tropang Tsuper	16	0	4	11	1	0	2	0	UTI, Lung Disease, Headache, Ulcer, Fever, Cough
	100%	0%	25%	69%	6%	0%	13%	0%	
LACODA	68	0	8	46	0	2	4	0	Cough, Headache, UTI, Cold, Allergy, Acidic, UTI, Pneumonia, High Blood, Ulcer, Over Fatigue, Eye Problem
	100%	0%	12%	68%	0%	3%	6%	0%	
1 Team (BASICANO)	29	1	4	20	0	1	1	0	Fever, Anemic, Over Fatigue, Cough, UTI, Headache
	100%	3%	14%	69%	0%	3%	3%	0%	
Q.R.C.K JODA	25	1	1	17	3	2	0	2	Ulcer, Cough, UTI, Head Ache
	100%	4%	4%	68%	12%	8%	0%	8%	
Heaven Blessed Transport	30	0	0	17	0	0	3	0	Allergy, Over Fatigue, Fever, Headache, Cough, High Blood, Lung Disease, UTI.
	100%	0%	0%	57%	0%	0%	10%	0%	
Individual	63	5	5	24	7	3	3	5	Headache, Tonsilitis, Allergy, Cough, Ulcer, Pneumonia.
	100%	8%	8%	38%	11%	5%	5%	8%	
Individuals from diff. Association	24	2	3	9	4	1	1	0	Allergy, Tonsilitis, Fever, Headache, Cough, High Blood, Lung Disease
	100%	8%	13%	38%	17%	4%	4%	0%	
TOTAL	347	14	34	186	30	15	16	10	
	100%	4%	10%	54%	9%	4%	5%	3%	

4.3.7 Affected commercial establishments close to stations

425. There are commercial establishments that are too close to some of the proposed BRT stations. A few are already encroaching on the public right-of-way. Some of them might benefit from the increased foot traffic in the vicinity of their businesses. Some might however lose their frontage, parking spaces, display areas, or pedestrian circulation around their establishments. These commercial establishments were identified in ten (10) BRT proposed stations, as shown in **Table 4.3.13**.

Table 4.3.13: Commercial establishments too close to BRT stations

BRT Station	Commercial Establishment/s	Remarks	Potential Impacts/Mitigating Measures
1. Bronx (Northbound Station)	STI Building	an educational institution whose front entrance will directly open to the northbound BRT station.	Blockage of entrance. Maybe mitigated by moving the station a few meters off the entrance.
2. Atherton (Northbound Station)	A beauty parlor A videoke bar (M2)	The station will be directly covering their frontages, obstructing customer access to the establishments. The customer parking space, which is part of the R-O-W will be taken up by the BRT station.	Blockage of entrance. Maybe mitigated by moving the station toward the outermost lane of Commonwealth Avenue or moving the station off the entrance.
3. Regalado	Fairview Center Mall and NCBA on the Southbound Five (5) small establishments on the North-bound station (2 xerox shops, a lamination shop, a notary service, and a burger stand)	The entrances to this big buildings might be blocked by the station These small establishment will lose their customer circulation area as they are too close to the BRT station. They may have to give themselves some easements by moving away a couple of meters from the sidewalk.	Integrating the station entrance/exit points with the entrance/exit of the mall and designing a narrower station to avoid the small establishments.
4. Don Fabian (Northbound)	Carinderia with a Salon	Informally occupying the R-O-W. Don Fabian may be developed as a smaller station due to very low projected volume of alighting and boarding passengers on this station. In this case, these informal occupants may remain.	Closure of Carinderia if a regular station is built on site. A smaller station may be developed to avoid the establishment.
5. North Batasan Hills (Northbound)	Presence of temporary market stalls or makeshift sheds serving as <i>ukay-ukay</i> stalls	These occupants are already occupying the public right-of-way and may have to be moved to make the location aesthetically better..	Closure of stalls. Moving the BRT station to cut on the outermost lane of the highway is feasible since Commonwealth Ave is such a wide highway
6. Commonwealth Market (Southbound)	On-going construction of makeshift stalls very close to the sidewalk.	Stalls are made of G.I. sheets and poles and encroaching on the sidewalks.	Closure of stalls.

BRT Station	Commercial Establishment/s	Remarks	Potential Impacts/Mitigating Measures
7. COA (Southbound)	2 videoke bars; a small residential/commercial structure; furniture shop; sari-sari store; computer shop; and a tire shop.	Encroaches on the R-O-W.	Closure of stalls. BRT station may be moved into the outer lane of the road so as not to disturb the businesses.
8. Zuzuaregui (Northbound)	3 Furniture Shops	Existing R-O-W is used as customer parking by the shops. BRT station might block customer access to the shops.	Loss of frontage. Providing customer access to these shops to be integrated in detailed design.
9. Tandang Sora (Northbound)	Robinson's parking area	BRT Station might cut a few meters inside Robinson's parking space.	Loss of parking space. Station may be made narrower than the standard/ typical station design.
10. LRT Central (Southbound)	12 carinderias renting from one concessionaire of LRT commercial space at about PhP4000 to PhP6000 monthly.	Eating areas of these small eateries/restaurants intentionally encroach the pedestrian R-O-W due to the very cramped space of the carinderias.	Loss of customer space. Reducing rental spaces to on six (6) to provide areas for customers.

426. The DTS offers some engineering solutions like asymmetric station design to avoid disturbing the commercial activities in some of the stations. Hence, a more accurate prediction of the social impact may only be done during or after the detailed engineering design stage of the project.

4.3.8 Senior Citizens, PWDs and Women

427. A sub-group within the commuters group is the vulnerable group composed of senior citizens, persons with disabilities (PWD) and the women. It is estimated that there are 830,994 senior citizens and 150,312 PWDs in Metro Manila this year (2015). Working mothers (either as employee or housewife taking care of children) are estimated at 3.25 million. Population who are poor or living below poverty level in Metro Manila is 3.15 million. **Table 4.3.14** shows the demographics of vulnerable groups.

Table 4.3.14: Estimated population of vulnerable groups in Metro Manila

Vulnerable Groups	% Share of Population	Estimated 2015 population in Metro Manila
PWDs (National Rate)	1.23%	150,312
Senior Citizens	6.8%	830,994
Women (15-49)	26.56%	3,245,765
Population below poverty line	25.8%	3,152,889



Chapter 5:

ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

5.0 ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

5.1 Potential Environmental and Social Impacts Associated with the Project

428. This section discusses the potential environmental impacts of the proposed BRT Project and identifies mitigation measures to minimize the impacts in the design, construction and operational phases. Environmental analysis covered potential direct, indirect, cumulative, and induced impacts but primarily focusing on the physical impacts within the BRT corridor.

429. The project has various components that may generate physical, biological and social disturbance to the existing environment. The list of each of the project activities and component are enumerated below with corresponding impact generation.

Table 5.1.1: Project Impacts Associated with the Proposed Metro Manila BRT Line-1 Project

Activity / Project Components	Activities will exert:			Significant impacts
	Physical impacts	Biological/Ecological impacts	Social impacts	
1) Segregated Busway	X (-)	X (-)	X (-)	<ul style="list-style-type: none"> • Physical impacts: Air, noise, water pollution, utility disturbance, • Biological impacts: urban flora loss • Social impacts: economic and business disturbance, economic displacement, traffic, utility services disruption • Traffic improvement • Enhanced social order
2) Highway Reconstruction	X (-)	X (-)	X (-)	
3) Intersection Improvement	X (-)		X (+)	
4) Land Acquisition (for the Depots)	X (-)	X (-)	X (-)	
5) Stations	X (-)	X (-)	X (-)	
6) Terminals	X (-)	X (-)	X (-)	
7) Depots	X (-)	X (-)	X (-)	
8) Traffic Management			X (+)	
9) Pedestrian Crossings	X (-)		X (+)	
	X (+)	X (+)		
10) Urban Realm Enhancements				
11) ATC (SCATS Upgrade)			X (+)	
12) BRT / Intersection signal control (in addition to SCATS)			X (+)	
13) ITS			X (+)	

5.1.1 Physical and Biological Impacts

430. The EIA Study Team has prepared the BRT corridor's alignment sheets to determine the extent of physical and biological that may arise from the implementation of the Project. It is notable to mention that even during the DTS stage, impacts of the proposed project are managed through the following approaches: (i) design flexibility based on existing local conditions such as land availability, existence of barriers or physical structures; (ii) flexibility on the of station site; and (iii) application of best practice that are derived from previous BRT experiences from other countries.

431. During construction phase, the following physical attributes shall be affected during Project construction: light posts, electrical posts, telecommunication posts, utility posts, traffic light and signages, road drainages, road pavement, culvert and manholes, waiting sheds and water utilities. These physical attributes that are inside the proposed location of bus stations and access to the bus stations. In this case, implementation of EMP on impact avoidance, reduction and minimization are

necessary. For instance, the following EMP among others are provided in this ESIA document: re-provisioning electric power lines, water mains, drains and telecommunication cables, planning temporary traffic management measures, management of waste and spoil disposal, materials supply, temporary drainage, prevention of flooding and protection of the construction works, managing tree-cutting and replanting, controlling noise and dust and managing workers and public safety.

432. Biological impacts would be mainly due to the removal of trees and other plants that are inside or within the proposed BRT stations. However, the alignment sheets provide the account or inventory of the number of vegetation that will be affected during construction phase and a corresponding mitigation measures were also crafted.

433. In summary, most of the construction phase impacts are temporary and reversible and manageable. During operation phase, impacts of the projects are mostly beneficial. These impacts are presented in Section 5.2.3.

5.1.2 Social Impacts

434. While most significant social impacts include economic displacements for affected PUJs and PUBs that are currently plying along the proposed BRT corridor. For social impact, the restitution of livelihood source for economically displaced PUJs and PUBs workers is the main issue.

5.1.3 Cumulative, Indirect and Induced Environmental Impacts

5.1.3.1 Cumulative Impacts

435. There are a number of other infrastructure and transportation projects planned for Metro Manila or nearby the proposed BRT corridor. Some of these projects are on-going while many are still in the planning stages. As of this ESIA, there is no attempt to determine the detailed quantification of direct cumulative impacts or indirect or induced impacts. However professional judgment suggests that there may be some cumulative direct impacts in the construction phases where these project interface with the proposed BRT. These impacts will require temporary transport management arrangements and other mitigation not too dissimilar to the EMP for the proposed BRT Line-1 Project. However, in principle, all of these projects should have overall cumulative beneficial impacts and contribute to more efficient transportation in the long run. Although it is difficult to identify specific cumulative negative impacts such impacts are likely to be mainly construction related, relatively short lived and can be mitigated by implementing mitigation measures and a suite of temporary transport management arrangements and other mitigation similar to those identified in the ESMP.

5.1.3.2 Indirect Impacts

436. There may be some adverse and beneficial environmental impacts which cannot be immediately traced to the project activities but can be causally linked. For example, the improvement in the road system in Metro Manila will potentially lead to growing traffic and commercial activities that may lead to additional pollution and thus indirectly affecting air quality. Conversely the use of more fuel efficient vehicles, more efficient running cycles and the development of better sealed roads will improve the system overall and reduce some of the pollution arising and therefore have some indirect benefits on the respiratory health of some of those living near the roads.

5.1.3.3 Induced Impacts

437. The proposed BRT Line-1 will be carried out on existing main roads and expectation is that there will be many more traveling passengers as the BRT system develops. The origins and destinations of the traveling public may remain much the same in the existing transport corridor but overall pattern of movements will change and the BRT and road upgrading should make that travel more efficient. The statutory provisions under the laws of country cover pollution control. These laws are established but institutional strengthening is required and improvements in resources are needed to achieve better enforcement to support strategic management of transport-related pollution control in the long term. The controls on the BRT operations will provide a good example of a clean efficient mass transport. Therefore overall, there would appear to be some opportunity for beneficial induced

impacts although it is difficult to foresee unplanned developments caused by the project that may occur later or at different locations. As induced by the project, there will be a better strategic transport planning, an area wide traffic management system, and a general improvement to the transportation network overall.

5.1.4 ESMP Approach

438. The comprehensive ESMP presented in this section is aimed at providing more than a means of compliance with current legislation but rather comprehensive environmental management as a fundamental part of project risk management. It can therefore significantly improve the overall success of a project in terms of cost and programme and promote greater understanding and benefits.

439. Where feasible the following hierarchy of mitigation measures is applied to reduce, where possible, the significance of impacts to acceptable levels: (i) mitigation / elimination through design; (ii) site / technology choice; and (iii) application of best practice.

440. Where impacts exceed accepted environmental standards, mitigation measures are proposed in order to reduce residual impacts to acceptable levels and achieve the expected outcomes of the project. The criteria for assessment are in line with WB Policy OP 4.01, or if the GOP standard is stricter, the national standards and criteria set by GOP. Where GOP has no set of standard or guideline, the standards given in World Bank's Environmental Health and Safety Guidelines (2007) are used. The ESMP provides a matrix of mitigation and monitoring measures to prevent or minimize the impacts. For purposes of this assessment it is assumed that DOTC through its Project Implementation Unit (PIU) will cover or engage consultants to cover all detailed Engineering, Procurement, Construction Management and Supervision during both the detailed design and construction supervision phases. In the execution of the ESMP, the Contractor is expected to execute most of the ESMP.

5.2 Positive Impacts of the Proposed Project

5.2.1 Socioeconomic Benefits

441. The proposed BRT Line-1 Project is part and parcel of Metro Manila's urban development initiative of the government. The project promotes better mobility, which in turn brings economic and social benefits to the community.

442. The success of BRT system in many major cities in the world and the need to modernize the ailing public transportation in the metropolis served as the impetus for the government to adopt and pursue the development of BRT system in Philippine cities. One to serve as a Philippine BRT demonstration project is currently being undertaken in Cebu. The Metro Manila BRT Line-1 Project is the second BRT system that will be implemented in the country. In general, transport projects that improve overall accessibility and reduce transportation costs tend to increase economic productivity and development. They improve businesses' ability to provide goods and services, and people's ability to access education, employment, utilities, and services. Efficient public transportation also results to shorter travel time, lower vehicle operating costs, lower road and parking facility costs, and reduced accident and pollution damages. These development impacts are translated more congruently into the following project benefits that are expected from the Metro Manila BRT Line-1 Project:

- a) More efficient and safer public transport alternative – it will offer a better PT option to the commuters with advantages such as a fare structure lower than the existing PUJ fare rates, more reliable waiting time, faster travel time, and safe and efficient travel;
- b) Safer and orderly loading and unloading system, particularly for the vulnerable stakeholders – the difficulty in boarding and alighting PUBs and PUJs will be eliminated with the BRT buses stopping at designated stations only. The design is based on national and international guidelines for people with limited mobility particularly including the principle of at-grade access in the design;

- c) Creation of direct employment as a result BRT construction and operation and induced economic development due to improvement in overall accessibility and reduction of transportation costs;
- d) Enhanced land use along the corridor due to the resulting efficient transportation service along the corridor improving accessibility of employees to their places of work and people's accessibility to goods and services close to the BRT route. Improved efficiencies of various establishments along the corridor results to better land use in the vicinity.
- e) Improved public transport regulations - the implementation of the project will provide the government an opportunity to rationalize the existing public transportation system in Metro Manila and reduce, if not completely eradicate, illegal operators.
- f) Provision of transport supportive of women - taking public transportation poses a challenge to women due to the limited space in PUVs and the penchant of PUV drivers to overload, which create opportunities for harassment due to the cramped space inside the vehicle.

443. The expected socioeconomic benefits of the Metro Manila BRT Line-1 Project, as were also discussed in the DTS, are summarized in the table below.

Table 5.2.1: Expected socioeconomic benefits, issues and considerations, and expected impact, Metro Manila BRT Line-1 Project

More efficient and safer public transport alternative	The current public transportation system in Metro Manila suffers from operational inadequacies which create disincentives for private car users to shift to public transportation. These include unreliable waiting and travel time, improper boarding and alighting, overloading, and high incidence of involvement in traffic accidents.	The project will improve the options available to the commuters. With the fare structure similar to the existing PUJ fare rates, commuters can enjoy more reliable waiting time, faster travel time, and safe and efficient travel.
Safe and orderly loading and unloading system, particularly for the vulnerable stakeholders	One of the most cited transportation problems during the stakeholder consultation is the practice of drivers to pick up and drop off passengers anywhere, even at prohibited areas. To avoid apprehension, they keep their vehicles in motion while the passengers are boarding and alighting, making it more difficult and dangerous for women with children and other encumbrances, elderly people and those with limited mobility.	The danger of falling off the vehicle while boarding or alighting will be eliminated with the buses stopping at designated stations only. The design is based on national and international guidelines for people with limited mobility. The principle of at-grade access has been adopted, except where this presents an adverse effect upon safety or an unacceptable compromise upon capacity. Where at-grade access is not possible alternative provision will be made for the mobility impaired. Access between station and bus will be step-less benefiting all users.
Create direct employment and induce economic development	Poor transportation can have various adverse impacts on a community's economic development objectives, such as low productivity, high rate of unemployment, sluggish business activity, inhibits investment growth and low tax revenues.	In general, transport projects that improve overall accessibility (i.e., they improve businesses ability to provide goods and services, and people's ability to access education, employment and services) and reduce transportation costs (including travel time, vehicle operating costs, road and parking facility costs, accident and pollution damages) tend

		to increase economic productivity and development.
Enhanced land use along the corridor	High volume of traffic as a result of inefficient public transportation system increases travel time and urban congestion. Business establishments are at risk of losing customers who would instead patronize establishments in areas where travel time is reasonable and public transportation is more conducive.	The proposed Metro Manila BRT Line-1 Project is envisioned to enhance the operations of the establishments along the route and within its influence area. It has minimal requirement for right-of way acquisition and will not affect any structure.
Improved public transport regulations	The current state of public transportation regulations and enforcement have layers of imperfections - from the irregularities in the application processing of PUV franchises at the LTFRB level to the proliferation of colorums at the ground level.	During consultations with the key stakeholders, it was expressed that the implementation of the Corridor Improvement Project will provide the government an opportunity to rationalize the existing public transportation system and reduce, if not completely eradicate, illegal operators.
Provision of transport supportive of women	Women, in general, perform a multitude of tasks in her travel during the day, including ferrying young children to and from school or other activities and doing grocery shopping. Taking public transportation poses a challenge due to the limited space in PUJs and the penchant of PUJ drivers to overload, which create opportunities for harassment due to the cramped space inside the vehicle. On the other hand, women commuters have expressed that most public utility buses (PUB) currently serving the metropolis only have one door for boarding and alighting, making it difficult to get off when with children or with bags, especially when one is seated or standing at the rear end of the bus and the aisle is full with standing passengers.	The new system is designed for ease of boarding and alighting with buses and the stations at the same level. This makes it easier to load and unload strollers. Where necessary, drop down ramps may be provided. The system is focused on customer service and seeks to address the issue of encumbrances of passengers by provision of space for cargo.

5.2.2 Quantified Economic Benefits¹

444. These economic benefits are quantified in the DTS for the purpose of determining the economic viability of the Metro Manila BRT Line-1 Project. The economic benefits for PT users, non-users (consumers) and for producers (operator) are shown in the summary table below for each of the modeled years to 2030.

Table 5.2.2: Projected Economic Benefits (PhP in current prices), 2016 to 2030

Economic Benefits	2016	2020	2025	2030
PT User Benefits				
In-vehicle Time Reduction (PhP)	-503,195,099	-149,136,324	-515,053,916	1,362,365,483
Walk Time Reduction (PhP)	-309,661,985	-691,075,702	-563,536,540	-536,685,447
Wait Time Reduction (PhP)	725,442,163	1,202,267,263	1,956,718,088	1,244,418,978

¹ Values and economic benefit explanations were directly from the Detailed Technical Study.

Economic Benefits	2016	2020	2025	2030
Interchange Reduction (PhP)	-143,459,732	-413,179,769	92,764,224	389,239,649
Fare Reduction (PhP)	-278,010,589	-693,628,622	-500,525,136	-302,372,863
Generalized Cost Reduction (PhP)	-508,885,242	-744,753,154	470,366,721	2,156,965,801
PT Operator Benefits				
Vehicle Operating Cost Reduction (PhP)	951,512,964	1,460,262,671	1,208,745,697	1,270,823,949
Total Internal Benefits	477,507,857	775,778,835	1,717,184,155	3,454,823,206
Non User Benefits				
Car	-1,074,055,904	-2,856,795,278	2,996,097,569	14,670,280,762
Taxi	-186,600,473	-462,634,783	-98,244,886	591,448,098
Motorcycle	-170,222,292	-457,919,534	172,652,014	1,694,379,020
AUV	-121,825,720	-242,356,211	696,709,580	2,150,709,109
Truck	-676,107,319	-2,141,088,049	-569,728,588	4,045,505,729
Generalized Cost Reduction (PhP)	-2,228,811,708	-6,160,793,855	3,197,485,690	23,152,322,719
Externalities				
Greenhouse Gas Reduction (PhP)	9,517,454	-20,353,343	159,397,285	399,567,719
Accident Reduction (PhP)	1,213,422,485	1,808,793,418	1,443,794,423	1,577,871,785
Total External Benefits	-1,005,871,769	-4,372,353,780	4,800,677,397	25,129,762,223
Total Benefits	-528,363,911	-3,596,574,946	6,517,861,552	28,584,585,429

445. The early years of the scheme, overall benefits are observed to be negative due to the impact of road space reallocation on traffic levels. However, as demand for the system increases, and general background traffic levels deteriorate, the corridor improvements provide an overall benefit to travelers.

446. The "Accident Reduction" figures in the **Table 5.2.3** below is based in the expected reduction in fatalities, serious injuries, slight injuries and property damage caused by vehicles per km and them monetized based on the Value of Life/Value of Serious Injury/Value of Minor Injury or in Value per Property Damage, respectively.

Table 5.2.3: Accident Benefits

Accident Reduction		2016	2020	2025	2030
Fatality	<i>number</i>	0.002	0.003	0.003	0.003
	<i>PhP</i>	964,627,400	1,437,926,039	1,147,764,900	1,254,351,605
Serious Injury	<i>number</i>	0.004	0.006	0.005	0.005
	<i>PhP</i>	208,968,129	311,499,235	248,641,361	271,731,337
Slight Injury	<i>number</i>	0.010	0.015	0.012	0.013
	<i>PhP</i>	38,699,737	57,687,929	46,047,000	50,323,135
Property Dam age	<i>number</i>	0.006	0.010	0.008	0.008
	<i>PhP</i>	1,127,166	1,680,215	1,341,162	1,465,708
Total Accident Reduction (PhP)		1,213,422,485	1,808,793,418	1,443,794,423	1,577,871,785

5.2.3 Environmental Benefits

447. The proposed BRT Project will can impact the quality of environment and life, productivity, health, and safety of people living in Quezon, Manila City and nearby town and cities.

448. Lower Greenhouse Gas Emission. On the assumption that a the BRT will use more efficient fuel and a significant number of car users will transfer to the BRT meaning fewer vehicles on the road the emission of greenhouse gases would be expected to decrease thereby lowering the air pollution level, resulting in a healthier local environment.

449. Public Health Benefits. The proposed BRT system can provide valuable public health benefits by reducing road fatalities, crashes and injuries; reducing personal exposure to harmful air pollutants; and increasing physical activity for BRT users. With the anticipated use of a cleaner vehicle technologies and fuels such Euro 4 fuel standards, BRT buses are expected to emit lower concentration of ambient air pollution. By providing faster travel translated to time savings, passenger exposures to air pollution are reduced at stations or inside the bus. Exposure reduction to air pollutants would eliminate, for instance, days of lost work due to air pollution related illnesses. With ease of access and confidence that BRT users can reach their destinations on time, passengers may be willing to walk from their point of origin (usually residences) to the nearest BRT stations thus increases their daily walking time as a form of physical exercise.

5.3 Negative Impacts of the Proposed Project

5.3.1 Adversely Affected Sectors

Public Utility Vehicle Sector

450. The implementation of the Metro Manila BRT Line-1 Project as a trunk line mass transportation system will re-define the role of the current public transportation modes plying the route. The key transmission channels of the impact on the sector will be through access to employment and assets. The impacts are as follows:

- 1) Reduced passenger volume for Public Utility Vehicles (PUV);
- 2) Cancellation of the present PUV routes that are along the projected corridor; and
- 3) Dislocation of PUV drivers and operators.

451. These impacts are intertwined and of these concerns, the economic dislocation of PUV drivers and operators due to perceived loss of livelihood was considered the most pressing, thus need to be managed properly.

Commercial Establishments

452. In addition, there are commercial establishments that are within the proposed limits of BRT stations. They may potentially be blocked by the proposed stations losing their frontage, customer access, parking space, or display areas. These physical restrictions might have negative impact on the livelihood of the owners and their employees. Descriptions of these establishments are presented in the previous section (Section 4.5, above).

5.3.2 Economic Dislocation of PUJ Drivers and Operators

453. The sector is composed mostly of small-scale operators owning one or two units who operate independently or belong to cooperatives. However, these cooperatives are more administrative in nature, granting short-term loans and facilitating renewal of individual franchises.

454. The DTS estimated that there are currently 3,000 PUJ units servicing the proposed BRT route. However, for the optimal operations of the Metro Manila BRT Line-1 Project, the DTS suggested the removal of nine (9) PUJ routes, such as:

1. Fairview-Arroceros
2. Fairview-Cubao
3. Fairview-Pier South 15
4. Fairview-Quiapo
5. Fairview-TM Kalaw
6. Philcoa-Arroceros
7. Philcoa-Pier South 15
8. Philcoa-TM Kalaw
9. Balara-TM Kalaw

455. These routes are serviced by about 361 operators with 430 authorized units. Assuming that they are two drivers per vehicle, this will translate to about 860 displaced PUJ drivers according to the DTS.

456. The above figures were verified from the LTFRB list of franchises and apparently, the calculation in the DTS is inaccurate. The actual number of franchises granted to operate along the above nine (9) routes is 453 with 576 authorized units. This is translated to 1152 drivers as project affected persons (PAPs).

457. Based on detailed evaluation of PUJ and PUB routes through the use of the route map and looking at the length each route will traverse through the BRT corridor (**Table 5.3.1**), it was found out that the above nine (9) routes that were proposed for deletion in the DTS were those that are traversing the corridor for 12 km or more. Given the same criteria, it was realized that there are thirteen (13) more PUJ routes that run at least 12 km along the corridor. With the same argument in the DTS for choosing routes that are to be eliminated, these routes are proposed to be deleted likewise:

1. Almar - Rotunda
2. Lagro - Rotunda
3. Dahlia - Arroceros
4. Jordan Plains - Rotunda
5. Zabarte - Panay
6. Lagro - Panay
7. Almar - Panay
8. Lagro - Cubao
9. Zabarte - Philcoa
10. Philcoa - Bagong Silang
11. Evergreen Subd - Philcoa via Commonwealth
12. Lagro - Philcoa
13. Balara - Arroceros/Quiapo

458. In all these routes, the estimated number of franchises and units operating are 1,530 and 1,844, respectively. These may be translated to a total of 1,530 operators and 3,688 drivers or a total of 5,218 PAPs in the proposed routes that are for deletion.

459. PUJs traversing short distances or less than 12 km along the corridor will also be affected by the BRT project due to loss in ridership that are expected to be captured by the BRT.

460. Average daily income from driving is PhP750 based on the survey conducted among PUJ drivers with 319 respondents. Given the above numbers, the estimated potential loss of income among the affected PUJ drivers is approximately PhP2.77 million daily or translated to an economic loss of about PhP1.0 billion yearly. Assuming that an operator earns approximately the same amount as the driver, this economic loss is then doubled. This amounts to about PhP2.0 billion annually.

Table 5.3.1: PUJ routes, franchises, and operating units traversing 12 km or more along the Metro Manila BRT Line-1 Corridor

Route	Franchises Issued	No. of Units Operating	Estimated No. of Drivers
A. From Detailed Technical Study			
Balara-TM Kalaw	26	30	60
Fairview-Aroceros	10	14	28
Fairview-Cubao	49	105	210

Fairview-Pier South 15	10	10	20
Fairview-TM Kalaw	50	57	114
Philcoa-Arroceros	9	11	22
Philcoa-Pier South 15	89	101	202
Philcoa-TM Kalaw	209	247	494
Fairview-Quiapo	1	1	2
Subtotal	453	576	1152

B. Additional Routes Identified for Deletion

Almar - Rotunda	147	164	328
Lagro - Rotunda	70	106	212
Dahlia - Arroceros 1/	16	20	40
Jordan Plains - Rotunda 1/	200	250	500
Zabarte - Panay	424	453	906
Lagro - Panay 1/	12	15	30
Almar - Panay 1/	16	20	40
Lagro - Cubao 1/	12	15	30
Zabarte - Philcoa 1/	80	100	200
Philcoa - Bagong Silang 1/	16	20	40
Evergreen Subd - Philcoa 1/	16	20	40
Lagro - Philcoa 1/	12	15	30
Balara - Arroceros/Quiapo 1/	56	70	140
Subtotal	1077	1268	2536
TOTAL	1530	1844	3688

1/ Estimates only, based on interviews with officers of PUJ associations plying these routes.

5.3.3 Economic Dislocation of PUB Drivers and Operators

461. For the PUB sector, the SM Fairview-Baclaran (via Quezon Avenue) bus route overlaps with the BRT corridor. About 260 units ply this route, operated by 22 operators. The driver to unit ratio for the PUBs is assumed to be similar to that of the PUJ, with one regular driver and an alternate driver during days off. Using this assumption, the total number of affected bus drivers will be 520. Considering that there is usually one conductor for every driver, and if support personnel (mechanics, janitors, and office staff) are at 10 percent of the number of drivers and conductors, the PAPs are estimated at 1144.

462. Bus drivers earn a daily average income of PhP807 based on the survey conducted consisting 30 respondents. If conductors earn about P500 daily, the estimated economic displacement cost among drivers and conductors in the PUB sector is PhP679,640 or PhP248.0 million annually. Assuming that the support personnel are also earning the average of the drivers and conductors income, the total economic displacement cost for all affected PUB employees is PhP272.9 million. This value does not include loss of income of operators.

5.3.4 Summary of Social Impacts

463. The magnitudes or intensities of impacts are categorized into low, medium or high and are defined as follows:

1. A low intensity impact is an impact that is localized to a specific location within the project's site boundary and is temporary or unlikely to occur with no detectable effect on the well-being of people or a business entity so that the socio-economic baseline remains consistent;
2. A medium intensity impact is an impact that may affect the well-being of a number of people and/or households or businesses, or occurs exceptionally, mostly within the project area of influence and does not extend beyond the life of the project; and
3. A high intensity impact is an impact that affects the well-being of groups of many people or business entities within a widespread area beyond the project life.

464. The following table summarizes the potential social impacts on the various key stakeholders of the proposed project.

Table 5.3.2. Summary of Potential Social Impacts of the Project

Commuters	Positive	Medium to high	<ul style="list-style-type: none"> • Reduction of in-vehicle travel time • Reduction of waiting time due to high frequency of buses • Better customer service
Senior Citizens	Positive	Medium to high	<ul style="list-style-type: none"> • Easier boarding/ alighting since bus floor is at the same level as station • Safer and more convenient walk to the stations due to wider sidewalks • Senior citizens' discount can be integrated in the ticketing system
Persons with Disability (PWD)	Positive	Medium to high	<ul style="list-style-type: none"> • Easier boarding/ alighting since bus floor is at the same level as station • Safer and more convenient walk to the stations due to wider, unobstructed sidewalks
Women/Working mothers	Positive	Medium to high	<ul style="list-style-type: none"> • Protection from undue physical harassment due to cramped space inside the public transportation vehicle • Enhanced convenience and comfort when bringing small children due to step-less boarding and alighting
Business establishments/ Residents along the proposed Route/ Community-at-large	Positive	Medium to high	<ul style="list-style-type: none"> • Improvement of ambient air quality along the corridor due to the reduction of PUV units
Business establishments along the proposed corridor	Positive	Medium	<ul style="list-style-type: none"> • Improvement of accessibility to business establishments • Better commercial opportunities
	Positive	Medium	<ul style="list-style-type: none"> • Opportunity to rationalize

Government (as regulator of public transport system)			public transportation system and reduce number of colorum operations
PUV Operators	Negative	High	• Potential loss of income
PUV Drivers	Negative	High	• Potential loss of income
Business establishments close to the BRT stations (as identified in subsection 4.5, above.	Negative	Medium to high	• Potential loss of income

5.4 EMP for Physical and Biological/Ecological Impacts

5.4.1 ESMP During Design Stage (Pre-Construction Phase)

5.4.1.1 Design / Pre-Construction Phase

465. The proposed project involves design and construction and operation of the proposed BRT Line-1 that will share the ROW with multiple carriageways of the existing road. As the existing alignment of the road will be followed, route selection is established but there may be some later adjustment of alignment to avoid existing structures in the ROW. There are a number of mitigation measures that will need to be carried out by the design and supervision consultant to avoid construction impacts and by good design to minimize operational environmental impacts.

5.4.1.2 Design Measures and Project Disclosure

466. DOTC will prepare the detailed designs and detailed management plans to address the requirements listed below including all items in the ESMP

- i) Land acquisition, resettlement and environmental impacts will be avoided or minimized by basing the detailed designs within the ROW as proposed in the feasibility designs;
- ii) Where project design necessitates land acquisition and resettlement, the recommended social management plan under Resettlement Policy Framework, which is being submitted under a separate volume, shall be used to address social impacts;
- iii) Where impacts on commercial establishments can not be avoided during project design, the Social Management Framework under Section 5.5.8, shall serve as a guide in addressing social impacts;
- iv) Potential solution spaces to ensure sufficient disposal space for cut surface of the existing road and spoil materials will be identified in advance and approved by PIU and the local community before bidding;
- v) Arrangements will be made to facilitate the timely production and supply of construction materials (aggregates, etc.) and bitumen based materials for construction and to avoid impacts due to unnecessary stockpiling near the BRT route.
- vi) Hydrological and drainage impacts during construction will be minimized by including a hydrological study prior to the detailed design phase in order to plan the early phasing of replacement of side drains, culverts and other infrastructure. Extensions and improvements of drainage culverts for BRT drainage and the adjacent road will be based on the hydrological study and designed to account for increased rain due to a once in 100 year return storm event. In this case, the detailed design will be required to ensure that the BRT can cope with flooding from a 100 year return storm event. Leonardo Liongson² studied the historical flood

² Flood Mitigation in Metro Manila, October 2010. Academician, National Academy of Science and Technology and Professor, Institute of Civil Engineering, UP Diliman. This paper was presented in various forums and discussed with DPWH, DOST, DENR, JICA and ADB among other agencies. He mentioned that based on rainfall statistics prior to TS Ondoy, the nearly 150-year-return-period 1-day-duration rainfall of 406.6 mm was experienced in 1970 (at 403.1 mm), while the nearly 100-year-return-period 1-day-duration rainfall of 383.8 mm was experienced in 1976 (at 371.6 mm) at Port Area, Manila. Hence,

occurrence in Metro Manila. He rationalized the use and basis of using 100 year return period is the occurrence of Tropical Storm (TS) Ondoy which brought very intense and heavy rainfall to Metro Manila and nearby regions. This means that the project will be subjected into a hydrological study using 100 year return period and determine if the Project will be affected by a record amounts of rains that fell over a short time period of 12 hours to 24 hours which was experienced during TS Ondoy.

- vii) In line with WB policy on environmentally responsible procurement, opportunities to provide environmental enhancements will also be identified in the detailed design as well as routine matters such as avoiding unnecessary removal of trees and compensatory and enhancement planting.
- viii) Disruption to current facilities for water supply will be avoided and facilities will be retained or re-provisioned before construction works commence; provisions will be made to preserve the operation of current facilities for water supply in sufficient quantity in agreement with the local community.
- ix) Disruption to current power supply will be avoided and movement of power lines and supporting pylons and poles will be planned well in advance. Power distribution circuitry will be re-provisioned before construction works commence; provisions will be made to preserve the operation of current facilities for power supply in sufficient quantity in agreement with the local power supply company.
- x) Disruption to telecommunications will be avoided and movement of telecommunication lines will be planned well in advance and especially to take account of where telecom lines are supported (or piggy-backed) on power pylons and poles will be planned well in advance. Telecommunications lines will be re-provisioned before construction works commence; provisions will be made to preserve the operation of current facilities for telecommunications in sufficient quantity in agreement with the local telecommunication companies.
- xi) Plans to minimize disturbance of vehicular traffic and pedestrians during construction will be included in the detailed designs as embodied in the Traffic Management Plan. The plan will be discussed and agreed with the concerned LGUs and MMDA. Plans to avoid or minimize disturbance of vehicular traffic and pedestrians during construction will be included in the detailed design. Phasing and programming for construction will retain passing lanes along the road during construction and avoid community severance.
- xii) Acquisition of land will be minimized for temporary facilities (if needed) by selecting preferred locations in the detailed designs for construction yards and asphalt plant on barren or marginal land and agree terms with local community.
- xiii) Enhancements will be provided in line with good practice and WB policy on environmentally responsible procurement. Negative impacts due to unnecessary removal of trees will be avoided. Compensatory tree planting and cutting will be implemented in line with the statutory requirements and a required by DENR.

467. The roads upon which the BRT Line-1 will run requiring improvement are part of the existing road corridor. There are sections of the ROW that is generally wide enough (specifically along Commonwealth Avenue) and narrow enough (España Boulevard and Quezon Boulevard) that may result to the disturbance of existing structures and economic activities in the area. Nonetheless, land acquisition and disturbance along the BRT corridor may be avoided through sound DED;

468. The final alignment plan will be disclosed to DENR under the PEISS requirements and to WB and a check will be made at the detailed design stage that the BRT alignment has been designed as planned to avoid and mitigate significant social and environmental impacts. The ESIA/ESMP shall be updated by the SPO/TSC and resubmitted to WB incorporating any recommendations and requirements from the DENR, should there be additional social and environmental impacts not identified in this ESIA and for which appropriate mitigation measures have not been included in the ESMP. Further, if during detailed design there are any changes to project design (such as change in alignment) that would result to environmental and social impacts or risks that are not within the scope of the current EIA, the SPO/TSC during the detailed design phase shall update the ESIA (together with the ESMP) or prepare a new environmental and social assessment report for submission to WB. Prior to preparation of the updated or new environmental assessment report, the proposed Project

the rainfall history of Manila, as recorded, has been very near the extreme 100-year rainfall experience in the record of 1907-2000. Today in 2010, it is only natural as well as logical to admit and accept a 100-year rainfall experience, given a historical record dating back to 1907.

change(s) shall be screened by WB for potential environmental and social impacts and risks to determine the appropriate extent and type of environmental and social assessment to be undertaken. During Project implementation, either an updated EIA, an updated ESMP or a new environmental and social assessment report shall be submitted to WB for clearance, if any unanticipated environmental and social risks and impacts arise, the appropriate document for submission shall be determined by WB. SPO will also establish the Grievance Redress Mechanism at this stage before site works commence.

5.4.1.3 Project Boundaries Change near Sensitive Receivers

469. The alignment runs mainly through mixed commercial areas and will not run through a residential developed area, but the alignment is subject to detailed design and some affected persons may have their business structures or properties be disturbed. The places of worship, educational institutions and residential sensitive receivers on the roads either side of the BRT are set back sufficiently for traffic fumes to be dispersed and road traffic noise will not increase sufficient to affect the sensitive receivers. The World Bank criterion of 3dB(A) above background at the sensitive receiver for new noise sensitive developments such as residences, schools, colleges and hospitals will be achieved. Noise and dust in construction will need to be controlled. There are some medical facilities near and along the BRT corridor, as well as educational establishments, and places of worship along the corridor but the sensitive facades are also generally set some way back from the road.

470. As with most transportation projects, there will be some as yet unidentifiable refinements to the alignment at the detailed design stage that mean the works must take place over a slightly different area. Therefore, the assessment will need to be updated at the detailed design stage when the final footprint and alignment and the relative location of the bus stations and depots are known. As mentioned above, a new environmental assessment or an updated ESIA (together with the ESMP) shall be prepared by SPC/TSC if refinements or changes to the project alignment, based on the detailed design, would result to environmental impacts or risks that are not within the scope of the current ESIA. Such documents shall be submitted for DOTC's and WB's review before changes are implemented.

5.4.1.4 Environmental Capacity Development of DOTC/PIU

471. The PIU as an organization (from the implementation agency) will ensure that their staff are trained and prepared to ensure that future contractors will be primed to cooperate with the implementing agency, project management, SPC/TSC and local population in the mitigation of social and environmental impacts. This means that PIU should will designate safeguard officers (Environmental and Safety Officer and Social Safeguard Officer) to oversee and undertake compliance to ESMP works. These staff will have qualifications and experience in environmental management. For instance, in this kind of Project, the Government side is expected to to be fully in-charge of the major social issues and concerns of the project such as livelihood provision for affected PUV drivers, workers and operators among others as embodied in the SMP. The PIU should be able to ensure the execution of the SMP

5.4.1.5 Preparation of Site-specific ESMPs

472. The Contractor will be primed by including the Environmental Guidelines or Terms of Reference for the Execution of the ESMP in the bidding and contract documentation. Prior to bidding, DOTC will produce a series of method statements or site-specific environmental management plans (ESMP) that the contractor(s) will subsequently be required to update. The broad content of the ESMP is included in the construction mitigation section. The ESMP will demonstrate the manner (location, responsibilities, schedule/ timeframe, budget, etc.) in which the Contractor will implement the mitigation measures specified in the ESMP.

473. Based on the ESMP, the following method statements shall be drafted by DOTC for incorporation in the bidding documents in the preconstruction/detailed design stage for updating by the contractor before construction commences:

- Tree-cutting and Replanting Plan (TRP) to ensure indiscriminate tree-cutting shall be avoided by clearly defining areas where tree removal is necessary based on Project requirements and that replanting shall be done to compensate for lost trees;
- Utilities Management Plan (UMP) to minimize interruption to power, water and telecom systems;
- Traffic Management Plan (TMP) to minimize disturbance of vehicular traffic and pedestrians during construction. Entree arrangements for vehicles accessing the Project area will be formulated based on a traffic impact assessment including requirements from the district transport police forces such that this will avoid community disturbance and severance and will at least retain necessary passing lanes along all roads used during construction;
- Waste Management and Spoil Disposal Plan (WMSDP) for handling, storage, treatment, transport and disposal of solid and liquid wastes, hazardous materials, hazardous wastes and excavation spoils;
- Materials Management Plan (MMP) detailing arrangements to be made to facilitate the timely production and supply of construction materials to avoid impacts due to unnecessary stockpiling inside and near the Project site area.
- Drainage Management Plan (DMP) to ensure that construction works will not cause ponding/flooding within the Project site, construction camps, borrow/quarry areas, other areas used for project-related activities and areas adjacent to the Project;
- Excavation Protection and Runoff Control Plan (EPRCP) to ensure that construction works are protected and will not cause excessive runoff and siltation of waterways adjacent or within the Project site, have sufficient provisions to protect the works, ensure stabilization of exposed soils and other runoff-prone areas, minimize hydrological impacts, flooding and uncontrolled runoff to adjacent areas and to protect the works under construction;
- Noise and Dust Control Plan (NDCP) to minimize impacts to sensitive receptors (educational establishments, hospitals, residential areas, etc.) due to construction works, sourcing and transport of construction materials, and other project-related activities;
- Workers and Public Safety Plan (WPSP) to identify interfaces between the works and public and ensure worker and public safety prevent accidents due to the construction works and report all accidents due to the Project activities.

5.4.1.6 Environmentally Responsible Procurement

474. All ESMP related works and plans shall be agreed in advance by DOTC in the project preparation phase and shall be included in contract bidding documentation. The requirements in the contract will include full implementation of the ESMP to ensure contractors are fully aware in advance of their environmental responsibilities and obligations. DOTC shall ensure that the ESMP and above plans are included in the bid and contract documents for civil works.

475. During construction phase, the DOTC and SPO shall require the contractor to engage capable and trained staff or site agents to take responsibility for the environmental and social management at the working level and to audit the effectiveness of the contractor's ESMP and review mitigation measures as the project proceeds. The effective implementation of the ESMP will be audited as part of the loan conditions and the executing agency (DOTC) will be prepared for this. In this regard, DOTC-PMO will also prepare to allow sufficient resources for their PIU to fulfill the requirements of the law. The safeguard specialist(s) in the SPC will train the PIU's environmental and safety and social safeguard officers to guide the contractors on the environmental aspects of Project construction. Any recent recommendations and initiatives from DENR or other local environmental authorities will be incorporated in the ESMP and updated and audited as necessary as the Project is rolled out.

5.4.1.7 Utilities Coordinating Committee

476. Considering the number of Government and private agencies that need to be involved in implementing the reprovisioning of electrical power, water supply, telecom systems and drainage, it is recommended that a steering group or coordinating committee be set up early at the commencement of the detailed design stage. This will facilitate the identification of all foreseeable constraints and preparation of the Utility Management Plan (UMP) by the SPC. The objective will be to identify all potential hindrances to construction in the field and the 'lead time', and processes necessary to ensure reprovisioning of the utilities in good time. The process will establish preparedness of the

utilities to facilitate reprovisioning. The aim will be to include the UMP (as part of the ESMP) in the bidding documents so that contractors are fully aware of the constraints. The bidding process can subsequently establish preparedness of contractors to facilitate reprovisioning by the utilities of the electrical power, water and gas supply, and telecom systems in order to minimize any interruptions to service and avoid delays in the commencement of construction works due to lack of preparation.

477. The coordinating committee should be set up under the Chairmanship of DOTC with PIU as secretary with specialized working groups regularly at least monthly during for the first six months of the design period. The membership should include all interested groups. As the Project moves into the construction phase, additional coordinating committee meetings should be conducted as necessary if problems occur. As the Project construction gears up awareness workshops should be conducted periodically by the SPC as every new contractor is engaged to ensure awareness of the constraints and processes needed to ensure reprovisioning of utilities and to share experience in the implementation of the works in case unexpected difficulties occur.

5.4.1.8 Ambient Environmental Baseline Data (Air quality and Noise)

478. Baseline data on air quality and noise levels shall be collected before commencement of civil works. Such data will help in assessing project impacts during implementation. SPC/TSC shall collect baseline data on ambient air quality (TSP, PM_{2.5}, NOx, and SOx) and noise at locations along the alignment in the calendar month before the construction commences. Ten (10) locations for air quality and noise measurements shall be taken at least two weeks before commencement of civil works. Field sampling ambient air quality (TSP, PM_{2.5}, NOx, and SOx) and noise shall be conducted at the same ten sampling stations used in base lining air quality and noise along the corridor. Field measurements shall be carried out using the prescribed methodology prescribed by DENR.

479. Noise impacts may be of short duration, although they can be very intrusive if not controlled properly. Noise measurement shall be undertaken at the same sites sampled for ambient air quality and shall follow the methodology specified by DENR. Noise shall be measured in dB (A) over a 24 hours covering the different periods (i.e., 6h to 18h, 18h to 22h and 2h to 6h). Measurement will also be taken to establish if the World Bank criterion of Leq55dB (A) 1-hour is exceeded at the measurement points and at what time of day / night it is exceeded. If the Philippines criterion is exceeded by the existing noise, (as seems very likely based on background spot measurements made for this EIA), the World Bank criterion of background +3dB (A) will be applied in the monitoring. The criterion of Leq50dB (A) can be used where background is below Leq50dB (A) 1hour. Works are not expected to be carried out at night but if this is unavoidable for unexpected reasons separate measurements will also be taken before construction commences to establish if the Philippines night time criteria are exceeded and the monitoring assessment criteria will be established accordingly.

480. Information such as recent rainfall will be documented as part of the baseline measurement. The sampling report will also specify if the sampling was undertaken during the rainy or dry season. Time and date of sampling, sources of dust and noise emissions during the sampling period, comparison of results to applicable standards shall also be included in the report. Actual location of the sampling stations shall be described in the report and plotted on a map together with GPS readings. The noise and ambient air quality baseline monitoring will be reported by SPC/TSC at the end of the detailed design period, either in the detailed design report or in a dedicated baseline monitoring report before the bidding documents are completed.

5.4.1.9 Enhancements through Urban Greening

481. Opportunity for tree and vegetation planting especially around stations, terminals, depots and parking areas shall be done. These locations may provide a chance to create some local soft landscaping where successful planting of trees and shrubs could be accomplished and should be investigated at the detailed design stage. This practice should be in addition to tree replacement required by DENR (for mandatory tree replacements) and should be encouraged as far as practicable and to foster goodwill with the local community. Other opportunities for enhancements can be assessed prior to construction and proposed enhancements should be discussed with the local population to identify stewardship of any planting and also to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations.

Based on initial survey, there are around 300 trees that can be potentially affected by the BRT construction. In terms of mitigation, the Project Proponent must follow the DENR's Guidelines and Procedures on the Planting, Maintenance and Removal of Trees in Urban Areas and in Areas Affected by Government Infrastructure Projects. Under this regulation, for a 30-cm diameter tree and above to be cut, it has to be replaced with 50 trees while for trees with 29-cm diameter and below to be cut, it has to be replaced with 40 trees. Plantation area has to be mutually decided by DENR and the Project proponent. As a preliminary estimate, with the assumption that the Project will affect 100% of the inventoried tree along the BRT corridor, the Project Proponent may be required to plant around 12,000 to 15,000 trees.

5.4.2 ESMP During Construction Phase

482. The source of the construction impacts from BRT will include (i) construction of the BRT pavement, stations, terminals and depots, (ii) excavation and reconstruction of the road (iii) excavation and reconstruction of the side drains and lead off drains and upgrading road drainage, (iv) ensuring drainage and access near adjacent street developments and at other key areas is unimpaired by construction/extension of numerous culverts; (v) ensuring security of supply and reprovisioning of electrical power and water supply mains and telecommunications lines to adjacent street developments and at other key areas, (vi) installing signals, signs, road markings, landscaping and accessories. Reconstruction of the adjacent BRT road will also give rise to a lot of surface cutting which will give rise to large amounts of spoil for disposal. For purposes of this assessment it is assumed that the Design and Supervision Consultant will cover both detailed design and construction supervision.

5.4.2.1 ESMP Activation and Securing of Permits and Licenses

483. The SPC/TSC will comply with WB policy on environmentally responsible procurement. The SPC/TSC will train and supervise the contractors to carry forward the environmental mitigation measures and enhancements identified in the detailed designs. On behalf of PIU the SPC/TSC will assist Contractors to prepare updates of the management guidelines/ESMP prepared by SPC/TSC at the design stage. The benchmark for monitoring and reporting on the contractor's environmental performance are the updated ESMP, which will consist all the mitigation measure in the ESMP and any additional mitigation measures that may be included by the SPC/TSC during detailed design stage. Prior to commencement of construction, the updated ESMP/management guidelines shall be approved by the PIU. PIU shall ensure that Contractor(s) and their suppliers comply with all statutory requirements for permits from DENR with regard to use of mechanical equipment, establishment and operation of construction plants such as asphalt plant, concrete batching plant, spoils disposal, etc. PIU shall ensure that Contractor(s) and their suppliers use licensed sources of aggregates materials that comply with all statutory permits and DENR requirements.

5.4.2.2 Orientation of Contractor

484. SPC/TSC shall orient the Contractor(s) on implementation of construction mitigation measures in the ESMP/management plans and all other construction phase mitigation measures included in the Project ESMP (i.e., ESMP included in the EIA) and any mitigation measures that may be included by the SPC/TSC during detailed design stage. The SPC/TSC will monitor the implementation of mitigation measures by the Contractor(s) and if the required measures are not installed, payments will be withheld as per the bidding documents, this will include implementation of health and safety education in line with social plans and the requirements for health and sanitation awareness and prevention program to be implemented under the Project. These requirements including the ESMP table on mitigation measures will be included in the Particular Specification for the contract.

5.4.2.3 Loss of Trees/Deforestation and Impacts to Fauna

485. The plan will address the protection of endangered ecological communities, threatened flora and fauna, aquatic species and other areas of conservational significance located in the road reserve and adjoining land affected by the project. Along the BRT corridor, line of trees along the stretch of Quezon Avenue towards the direction of Quezon Memorial Circle (QMC) is considered an endangered ecological community. Trees and vegetations inside the QMC is also an endangered

ecological community. In case these ecological communities are to be affected by the Project, coordination works with the concerned LGU offices must be undertaken to arrive at acceptable mitigation measures.

486. Environmentally sensitive areas (such as native vegetation and cultural heritage) within the construction site will be marked on Sensitive Area maps, demarcated and signposted where necessary. Information will be made available during all on-site inductions to construction personnel

487. The Tree-Cutting and Replanting Plan (TCRP) designed by the SPC/TSC will be prepared with the designs. The plan will be agreed with DENR and concerned LGUs prior to commencement of construction. Contractors are engaged and before any tree cutting is undertaken. The TCRP shall be updated by the Contractor (assisted by the SPC/TSC) as part of ESMP. Road excavation will be designed not to undercut or destabilize adjacent tree lined pavements and verges, and clearing of trees will be minimized in ESMP. The local DENR Forest Management Bureau (FMB) will be informed in advance and based on the tree cutting and replanting plan may monitor marking of trees that will be removed under its jurisdiction.

488. The SPC/TSC will supervise and monitor to check if the contractors have carried forward the mitigation measures and environmental enhancements identified in the ESMP, as well as routine matters such as avoiding unnecessary removing of trees and compensatory and enhancement planting. The SPC/TSC will supervise and monitor to check if the contractors will remove any trees not covered by tree-cutting and replanting plan during construction, unless agreed in advance with the SPC/TSC and DENR. All cut trees shall be surrendered and stored to the premises of DENR Forest Management Bureau (FMB) compound.

489. The SPC/TSC will supervise and monitor a ban on the use of local trees for timber. Workers shall be prohibited from using cut trees for firewood. During replanting/revegetation works, new alien plant species (i.e., species not currently established in the region of the project) shall not be used unless carried out with the existing regulatory framework for such introduction. Only native or local species of trees shall be used during tree replacement activities. All replanting, compensatory planting and tree relocation will be planned in full agreement with DENR-FMB

490. The contractor will not use or permit the use of wood as a fuel for the execution of any part of the works, including but not limited to the heating of bitumen and bitumen mixtures. To the extent practicable the Contractor shall utilize reusable shuttering for concrete works and shall ensure that fuels other than wood are used for cooking, and water heating in all his camps and living accommodation. The Contractor shall not buy or use wood from the illegal sources (that come from the illegal logging). Since fire can possibly originate from the use of wood materials, the Contractor will keep a fire watch at all times and immediately suppress any fire.

491. The Contractor will take all precautions necessary to ensure that damage to vegetation is avoided due to execution of the works. The Tree-Cutting and Replanting Plan (TCRP) will include as a minimum consideration of:

- Identification of trees to be cut and its locations
- Ban on use of timber for fuel.
- Justification for tree cutting as an alternative to BRT realignment.
- Permissions from DENR for tree cutting.
- Methods for marking, protection of uncut cut trees and limitations to cutting.
- Methods and timing for safe cutting to minimize interference with normal traffic.
- Methods to remove trees and cut timber and avoid stockpiling cut wood on site.
- Methods to avoid under cutting adjacent tree lined pavements.
- Program for cutting trees and enhancement planting.
- Compensatory tree planting program agreed with authorities
- Discussion of the SPC/TSC/PIU inspection/monitoring role.
- Agreement on publicity/public consultation requirements.

5.4.2.4 Drainage and Hydrology

492. Historically, the sections of the BRT corridor within the jurisdiction of Manila City and portion of roads within the periphery of Araneta Avenue are subject to frequent flooding events and these have been recorded over the last 20 years. The BRT Line-1 Project, in combination with other reasonably foreseeable construction and operational activities, could potentially result in adverse cumulative impacts on hydrology and water quality. However, by designing and implementing mitigation measures, the project will minimize the works contribution to adverse cumulative hydrology and water quality impacts.

493. Technical due diligence will be undertaken to include identified flood hazard zones within the sphere of BRT Line-1 corridor. Structures will be designed in such a way as to minimize the impedance or redirection of flood flows.

494. Disruption of natural hydrology is to be expected if no design is implemented to mitigate the impacts of the construction. Therefore, quantity control in design will be applied with the intent of limiting disruption of the natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from storm water run-off, and eliminating contaminants.

495. Some of the design mitigation measures may include the following:

- reduce the amount of hard standing area to encourage natural infiltration;
- mitigate storm water run-off by designing retention ponds or vegetated filter strips;
- Installation of mechanical filtration devices or rainwater cisterns that allow sediment to settle rather than clog the natural waterways.

496. Where feasible, facilities will be located outside of identified flood hazard areas, facilities constructed within a flood hazard area will be designed and engineered to withstand a 100-year flood event. For facilities with potential to impede or redirect flood flows, a floodplain investigation will also be completed that identifies the change in flood elevations as a result of the project facilities.

497. The drainage system and water resources on surrounding lands will be affected by construction activities as follows: a) local water supplies will need to be tapped to meet work campsite and construction requirements, so bringing project based water use into competition with local use; b) surface and subsurface water resources in the Project area could be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at construction campsites; c) rebuilding drainage channels crossing the works areas and required reprovisioning, (d) natural streams are few but adjacent drainage pathways may become silted by borrow material (earth) in the runoff from the construction area, workshops and equipment washing-yards.

498. The contractors will incorporate the following design features into the ESMP after review of the detailed design to minimize alterations in the project corridor's surface drainage patterns as far as possible:

- Contractors will review the detailed designs for side and cross-drainage structures provided with the tender and assess and agree with PIU/SPC/TSC if redesign is required or if new structures will be constructed or existing ones will be repaired;
- Contractors will update the Drainage Management Guidelines as required;
- In areas close to the sensitive receiver, appropriate drains would be constructed so that the outfalls of the surface run-off from the carriageway are diverted away from the sensitive receiver; and,
- Measures will also be taken during the construction phase to ensure that storm drains and highway drainage systems are regularly cleared to maintain storm water flow.

5.4.2.5 Utility Management

499. The BRT corridor's right-of-way (ROW) traverses through densely populated residential areas and main roads aligned with overhead transmission lines along with underground sewer and water lines. Therefore, one of main concerns during construction is the disruption to the existing utilities. The

TSC and the Contractor will produce an effective Utility Management (UM) plan so that the effect on local communities will be minimized and constantly monitored.

500. In cooperation with the utility providers affected by the alignment such as MERALCO, PLDT, Maynilad Water Services Inc., National Grid Corporation Philippines and Local Government units, the UM plan will be strictly implemented.

501. During the Pre-Construction Phase, all as-built plans of existing utilities along the alignment will be obtained from all relevant utility providers. Once collected, an in-depth study of the utilities against the alignment will be made. All conflicts will be summarized and discussed with the affected provider. It will then be decided if the utility will be relocated or terminated, whichever is overall the more cost effective.

502. Pillars and foundation system of the alignment that may conflict with existing utilities will be relocated as far as possible to minimize the complication of diversion

503. During construction, especially when undertaking excavation, major works will stop if any previously unknown utility is found to be in conflict with any civil work. The relevant provider will be contacted for the swift removal or diversion of the utility. Once the area is cleared, work will proceed.

504. Utility relocation may impose discomfort to the affected communities. To minimize the negative impact of the relocation, the public will be informed prior to the planned activities. This will be strategically scheduled to minimize the effect on the community's activities.

505. During construction, besides the equipment operator, guards and safety personnel will be deployed to watch over the areas being excavated. During equipment mobilization, flagmen and riggers will be deployed to ensure no utilities are hit and damaged. At every tool box meeting, workers will be informed of the procedure regarding utilities.

506. Prior to construction, the contractor will:

- Discuss with SPC/TSC and update Utility Management Plan
- Reconfirm power, water supply and telecommunications systems likely to be interrupted by the works.
- Contact all relevant local authorities for utilities and local community groups to plan reprovisioning of power, water supply and telecommunications systems.
- Relocate and reconnect utilities well ahead of commencement of construction works and coordinate with relevant utility company and allow sufficient lead time at the provincial and district levels for relocation and reconnection well before works commence.
- Inform all hospitals, schools, places of worship and affected communities well in advance.
- Arrange reconnection of utilities and telecommunications systems in the shortest practicable time before construction commences.
- If utilities are damaged during construction it shall be reported to the SPC/TSC and utility authority and repairs shall be arranged immediately at the contractor's expense.

5.4.2.6 Materials Exploitation and Management

507. The SPC/TSC will produce a Materials Management Plan (MMP) in draft in the detailed design stage for confirmation in the pre-construction phase and for updating in the construction phase (ESMP) by the contractor. The MMP will seek as far as is reasonably practicable to minimize the use of non-renewable resources and rock based materials, also to balance cut and fill requirements and contribute to the minimization of impacts due to extraction of rock based materials. As a first priority, where surplus materials arise from the removal of the existing surfaces these will be used elsewhere on the project for fill (if suitable) before additional rock, gravel or sand extraction is considered.

508. The Materials Management Plan will include as a minimum consideration of the following:

- Required materials, potential sources and estimated quantities available.
- Impacts to identified sources and availability

- Excavated slope material for reuse and recycling methods to be employed.
- Endorsement from DENR, concerned LGUs and local groups for use of sources.
- Methods of transportation to minimize interference with normal traffic.
- Constraints of regular delivery schedule to reduce stockpiling on site.
- Program for reuse of underground excavated material for reuse
- Program for delivery of quarry and borrow materials.
- Discussion of the PIU/SPC/TSC inspection/monitoring role.
- Agreement on publicity/public consultation requirements.

509. In the detailed design stage, the SPC/TSC will produce a draft mass haul chart for the aggregate and asphalt materials needed for the construction works. The mass haul chart will also be updated and modified as necessary by the Contractor(s) as part of the ESMP before construction commences to produce a materials management plan (MMP) including mitigation for the extraction of materials, to specify (i) the methods to be employed prior to and during the extraction and transportation of rock based materials for construction, (ii) all other measures to be employed to mitigate nuisances to local residents, and (iii) any additional measures needed (such as compensatory planting when considered necessary, if trees have to be removed for gravel extraction or quarries). Contractual clauses will be included to require the contractor(s) to update the draft MMP regularly and report monthly to monitor the production and use of materials. The Contractor will be responsible for updating the cut and fill estimates in the MMP and reporting to PIU. The MMP can then be used to plan for asphalt and aggregates management and to provide an overall balance for asphalt and cut and filled materials and minimize impacts on other local resources outside the road corridor. The Contractor will be responsible to:

- Update draft Materials Management Guidelines from the detailed design phase.
- Balance cut and fill requirements to minimize impacts from extraction of aggregates.
- Procure materials only from DENR authorized quarries and borrow sites.
- Prioritize use of existing quarry sites with suitable materials and update the list of quarries and borrow pits monthly in MMP and report to PIU and minimize impacts on other local resources.
- If the contractor shall operate the quarry site, required environmental permits shall be secured prior to operation of quarry/borrow areas.
- Borrow/quarry sites shall not be located in productive land and forested areas.
- Follow compensatory planting plan if trees have to be removed.
- Stockpile topsoil for later use and fence and re-contour borrow pits after use
- Topsoil, overburden, and low-quality materials shall be properly removed, stockpiled near the site, and preserved for.
- Use quarry with highest ratio between extractive capacity (both in terms of quality) and loss of natural state.
- Use quarry sites lying close to the alignment, with a high level of accessibility and with a low hill gradient.
- Do not use quarries in areas of natural woodland or near rivers which provide food and shelters for birds and other animals.
- Damaged access roads due to transport of quarry/borrow materials, other construction materials and due to various project-related activities shall be reinstated upon completion of construction works at each section.
- During quarry/borrow site operation; provide adequate drainage to avoid accumulation of stagnant water.
- It is preferable to avoid or reduce the sections of quarry sites located on river bed. If it is not possible to locate quarries out of river beds, quarry sites lying on small rivers and streams shall be avoided.
- Alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological conditions, shall be preferred.
- Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favorable for mosquito breeding
- To avoid drowning when pits become water-filled, measures such as fencing, providing flotation devices such as a buoy tied to a rope, etc. shall be implemented.
- Upon completion of extraction activities, quarry and borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks.

5.4.2.7 Spoil Disposal

510. The works will require road cutting and reconstruction along the segregated busway to construct BRT Line-1 project. It is expected that there will surplus of road demolition debris and soil based materials for reuse or disposal as spoil elsewhere. The disposal of this surplus in advance is necessary to avoid impacts and environmental degradation due to the improper disposal of these materials.

511. In some locations, the use of this immediately available material will minimize the need for additional extraction of rock based materials. The surplus material should be graded and cut materials suitable for reuse will be explored. The surplus can then be stockpiled at locations agreed with local authorities for use on other local district projects or other nationally planned infrastructure. This will reduce the need for construction materials or the need for a separate disposal site.

512. The surplus concrete and soil based materials for disposal must be controlled to avoid potential impacts due to improper disposal. A Waste and Spoil Management Plan (WSMP) will be required to ensure waste from BRT construction is managed properly and to reduce, reuse and recycle waste wherever possible. Contractors will initially review the SPC/TSC's options for stockpiling and disposal locations for cut surface materials in the draft WSMP and reconfirm or propose alternative disposal locations for agreement with PIU and local authorities. The Contractor will prepare the WSMP (with the assistance of the SPC/TSC) one month before the commencement of construction including disposal sites identified for agreement by SPC/TSC/PIU and local authorities. The WSMP will cover all aspects of construction waste disposal. It is preferred that Government land is used for dumping of material. If private land is to be used for the purpose of dumping, it shall commence only after written permission from the land owner is checked and recorded by the SPC/TSC/PIU and agreeable to DENR.

513. Contractual clauses will be included to require the contractor(s) to update the draft WSMP one month before construction commences to identify all the agreed disposal sites and to balance cut and fill as far as practicable for the duration of the works.

514. Mitigation measures will seek to control the impacts at source in the first place. The SPC/TSC will be responsible to report the update of the cut and fill estimates in conjunction with asphalt and aggregate materials planning (MMP) between the different areas and contractors and advise on overall balancing for cut and fill materials to minimize impacts on local resources. (Mitigation measures for cut areas are covered under runoff control).

515. In the execution of the Construction Waste Disposal section of the Waste and Spoil Management Plan (WSMP), the Contractor is expected to make timely coordination works with local barangay officials as activities may impact locality's traffic flow, noise and public health and welfare. In conveying the execution plan for WSMP to the barangay officials, the following items must be clearly explained and discussed:

- Locations and quantities of spoil arising from the construction works.
- Agreed locations for disposal / endorsement from DENR and local groups.
- Methods of transportation to minimize interference with normal traffic.
- Establishment of acceptable working hours and constraints.
- Agreement on time scale and program for disposal and chain of custody.
- Programming issues including the time of year and available resources.
- Discussion of the PIU/SPC/TSC inspection/monitoring role.
- Establishment of complaints management system for duration of the works
- Agreement on publicity/public consultation requirements (advance signing etc.).

516. Mitigation measures will seek to prevent surface collapse impacts and control the impacts at source in the first place. The SPC/TSC will be responsible to monitor the progress of excavations and the implementation of mitigation measures to minimize impacts. The mitigation measures in the Spoil Disposal section of the WSMP will include but not necessarily be limited to:

- Spoil will not be disposed of in rivers and streams or other natural drainage path;

- Spoil will not be disposed of on slopes, flood ways, wetland, farmland, forest, religious or other culturally sensitive areas or areas where a livelihood is derived;
- Surplus spoil will be used where practicable for local repair works to fill eroded gullies and depression areas and degraded land in consultation with local community;
- Spoils shall only be disposed to areas approved by local authority;
- Spoil disposal will be monitored by SPC/TSC/PIU and recorded using a written chain of custody (trip-ticket) system to the designated disposal sites;
- Spoil will be disposed of to disused quarries and abandoned borrow pits where practicable;
- Disposed spoil will be spread in 15cm layers and compacted to optimum moisture content, covered with topsoil, landscaped and provided with drainage and vegetation to prevent runoff in line with best practice;
- Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas;
- Under no circumstances will spoils be dumped into watercourses (rivers, streams, drainage, etc.); and,
- The spoils disposal site shall be located at least 50 m from surface water courses and shall be protected from runoff by avoiding formation of steep slopes and grassing.

5.4.2.8 General Construction Waste Management

517. Construction activities will generate solid and liquid wastes. Predicted wastes include waste of construction materials such as unused and excess material generated during site excavation, site clearance, road re-construction, wood, plaster, metals, plastics, and insulation, communal waste, machine oil, etc. Significant quantities of rock and soil materials may be generated from earth moving during construction activities. Improper handling of on-site wastes and response to spills, excavated soil materials and other types of waste could result in negative effects on the local environment including groundwater, surface waters, soil and local residents.

518. Mitigation measures will seek to reduce, recycle and reuse waste as far as practicable. The SPC/TSC will be responsible to monitor the contractor's progress of updating the WSMP and the implementation of mitigation measures to minimize impacts.

519. The General Waste section of the WSMP will include consideration of all matters related to solid and liquid waste disposal including the following:

- Expected types of waste and quantities of waste arising.
- Waste reduction, reuse and recycling methods to be employed
- Agreed reuse and recycling options and locations for disposal / endorsement from DENR and local groups.
- Methods for treatment and disposal of all solid and liquid wastes.
- Methods of transportation to minimize interference with normal traffic.
- Establishment of regular disposal schedule and constraints for hazardous waste.
- Program for disposal of general waste / chain of custody for hazardous waste.
- Discussion of the PIU/SPC/TSC inspection/monitoring role.
- Establishment of complaints management system for duration of the works
- Agreement on publicity/public consultation requirements (advance signing etc.).

520. The Contractors mitigation measures in the waste management guidelines will include but not necessarily be limited to the measures listed below. The contractors shall ensure implementation of these measures.

- Update the draft WSMP (in ESMP, assisted by SPC/TSC) to cover all aspects of waste storage, disposal and accidental spills, all to be approved in writing by the SPC/TSC one month prior to starting works.
- Areas for disposal to be agreed with local authorities and checked and recorded and monitored by the SPC/TSC/PIU.
- Segregation of wastes shall be observed. Organic (biodegradables - such as tree trimmings) shall be collected and disposed of onsite by composting (no burning is allowed on site).
- Recyclables shall be recovered and sold to recyclers.

- Residual and hazardous wastes shall be disposed of in disposal sites approved by local authorities.
- Construction/workers' camps shall be provided with garbage bins.
- Burning of construction and domestic wastes shall be prohibited.
- Disposal of solid wastes into canals, rivers, other watercourses, agricultural field and public areas shall be prohibited.
- There will be no site-specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in local waste disposal sites.
- Waste disposal areas approved by local authorities shall be rehabilitated, monitored, catalogued, and marked.

5.4.2.9 Hazardous Materials and Hazardous Waste Disposal

521. Use of hazardous substances such as oils and lubricants operations can cause significant impacts if uncontrolled or if waste is not disposed correctly. Mitigation measures will seek to control access to and the use of hazardous substances such as oils and lubricants and control waste disposal. The SPC/TSC will be responsible to monitor the contractor's progress of updating the Spoil and Waste Management Guidelines to include implementation of mitigation measures, to minimize impacts from hazardous substances such as oils and lubricants.

522. The Contractors mitigation measures in the Hazardous Materials and Waste section of the Waste and Spoil Management Plan of the ESMP will include but not necessarily be limited to the following measures. The contractors shall ensure implementation of such measures.

- Ensure that safe storage of fuel, other hazardous substances and bulk materials are agreed by PIU/SPC/TSC and have necessary approval/permit from DENR and local authorities.
- Hydrocarbon, toxic material and explosives will be stored in adequately protected sites consistent with national and local regulations to prevent soil and water contamination.
- Equipment/vehicle maintenance and refueling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency.
- The Contractor shall identify named personnel in the WSMP/ESMP in-charge of these sites and ensure they are properly trained to control access to these areas and entry will be allowed only under authorization.
- Fuel and other hazardous substances shall be stored in areas provided with roof, impervious flooring and bund/containment wall to protect these from the elements and to readily contain spilled fuel/lubricant.
- Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations.
- Ensure all storage containers are in good condition with proper labeling.
- Regularly check containers for leakage and undertake necessary repair or replacement.
- Store hazardous materials above possible flood level.
- Discharge of oil contaminated water shall be prohibited.
- Used oil and other toxic and hazardous materials shall be disposed of in an authorized facility off-site.
- Adequate precautions will be taken to prevent oil/lubricant/ hydrocarbon contamination of drainage channel beds.
- Ensure availability of spill cleanup materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored.
- Spillage, if any, will be immediately cleared with utmost caution to leave no traces.
- Spillage waste will be disposed at disposal sites approved by local authorities and approved by SPC/TSC.
- All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulation. In addition, copy of the updated copies of the Materials Safety Data Sheet (MSDS) of all the hazardous materials stored should be made available.

5.4.2.10 Asphalt Hot Mix Plant, Rock Crushing and Bitumen Supply

523. Construction of BRT will require rock based material and asphalt. Although the emissions from powered mechanical equipment that supply crushed rock and asphalt will be rapidly dispersed, they will need to be sited carefully to avoid complaints.

524. In order to maintain the existing air quality of the project area in a condition acceptable to the local population, compliance with the following mitigation measures will be needed:

- If available, cement batching and aggregate mixing plant will be strategically situated near the project site to provide ready mixed concrete requirements. However, it shall be located as far as possible from sensitive receptors in order to spare these receptors from nuisances that may arise from the operation for these facilities. If an open area that is not close to pollutant receptors is not available, the contractor may opt to use an enclosed area in order to reduce noise and emissions from the batching plant.
- All conditions of DENR permits and local guidelines shall be observed.
- Dust suppression equipment shall be installed at cement and aggregate mix plants.
- Areas of construction on the BRT roads as well as the haul road shall be maintained damp by watering the construction area.
- Where local roads are used for haulage they shall be kept in serviceable condition and any damage shall be repaired promptly without interference to local travel routes.
- Storage sites, mixing plants, and asphalt (hot mix) plants will be at least 500m downwind of the nearest human settlements or as otherwise required under DENR permits and guidelines.
- All hot-mix plants, crushers, and batching plants will be located in agreement with the local district or municipality and installed on a sealed area only after receiving approval from the relevant local authority and DENR.

525. Fumes from asphalt chemicals are likely to be well dissipated in the wide open street and the criteria in the standards should not be exceeded. However, phenol compounds in the bitumen have a very low odor threshold and extremely low concentrations can cause nuisances. These are unlikely to accumulate to toxic levels but the plant for the supply of molten bitumen should be sited well away from rivers and streams, schools, health clinics and other sensitive receivers.

526. Bituminous materials will generally be applied using machines supplied from the asphalt plant, but if bituminous compounds are to be applied by hand labor methods and melted in heaters, the fuel used shall be kerosene, diesel, or gas fuel. Fuel wood shall not be used for heating bitumen, neither will bitumen be used as fuel.

527. Bitumen drums will be stored in a dedicated area, not scattered along the works and any small accidental spills of bitumen or chemicals should be cleaned up immediately. The waste, including the top 2 cm of any contaminated soil, should be disposed of as chemical waste to an approved landfill or approved local authority disposal site.

528. Bitumen plant and rock crusher activities (if required) will be controlled (e.g. hot-mix plants should not be located within 500m of any sensitive receiver, river bank but located at convenient sites nearby but downwind of and at least 500m from sensitive receptors such as schools.

529. It is possible that contamination of soil may occur from oils and chemicals at asphalt / bitumen plant sites, workshop areas, and equipment washing-yards. The contamination may limit the future use of land for agricultural purposes.

530. The following practices will be adopted to minimize the risk of soil contamination:

- The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.
- Debris generated by the dismantling of existing pavement will be recycled subject to the suitability of the material.

- Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated off-site waste disposal sites identified and agreed with PIU, local community and local authorities.

531. In an event where soil contamination is not avoided, measures that will remediate the contaminated area/s and means to dispose of contaminated soil shall be implemented. In this case, the Contractor shall (1) submit environmental site assessment (ESA) and site remediation measures and disposal plan to DENR and DOTC; (2) undertake by themselves the plan or engage the services of a third party with specialization on site remediation and disposal of contaminated materials; and, (3) submit final documentation on the results of the remediation and disposal undertaken.

5.4.2.11 Noise and Dust

532. Powered mechanical equipment such as generators, excavators, bulldozers, piling rigs, stabilizers, drills, stone crushers, graders, vibratory rollers, concrete-mixing plants, and screening plants will generate noise and vibration. Whereas various modern machines are acoustically designed to generate low noise levels and acoustically insulated plant may be available in Philippines, the cumulative effects from several machines can be significant and may cause significant nuisances.

533. To minimize impacts, the contractors should be required by the PIU and SPC/TSC to (i) provide evidence and certification that all equipment to be used for construction is fitted with the necessary air pollution and noise dampening devices to meet DENR requirements, (ii) maintain and service all equipment to minimize noise levels, and (iii) locate equipment to minimize nuisances and (iv) install acoustic insulation or use portable noise barriers where practicable to limit noise at sensitive receivers. Insulation should be provided to minimize noise impacts such that the measured noise at the edge of the works nearest residential areas will be less than 50 dB(A)Leq during night time (9 p.m. to 6 a.m.) and 70 dB(A) Leq at other times during the day.

534. There are some schools, educational establishments, and medical facilities near the project. The commercial premises have no easements from the likely working areas for the project. Where schools are nearby, the contractor shall discuss with the school principals the agreed time for operating machines and completely avoid machine use near schools during examination times. Where noise is a major consideration (say, outside places of worship), construction should be avoided at sensitive times. As a fall back option to control noise, portable barriers can be introduced such as foam concrete cement, wood concrete cement, and absorbant or noise suppression materials. In addition to the physical effect of mitigating dust and noise, the installation of such measures should be discussed with the local population.

535. Earthworks which include road demolition, rehabilitation and/or reconstruction and BRT stations erections along the BRT corridor will be the main sources of dust. In some locations, there will be some buffer distance between the work corridor and the existing sensitive receivers such that no significant impact is expected from the construction works on residential and other sensitive receivers in terms of noise, vibration, and dust. However, in BRT corridor sections from Welcome Rotonda to Manila City Hall, there will little practicable buffer distance in many areas between the work corridor and the commercial premises. In this case, noise and dust construction impacts are expected from the construction works on numerous commercial premises that line the route.

536. Although construction noise and dust were recognized as nuisances by the local population they were also considered acceptable nuisances in view of the potential benefits from the BRT and future improved road conditions. Nevertheless, it is good practice to control all dusty materials at source so that nuisances do not occur, so that visibility on the adjacent road is not impaired and so that road safety can be maintained or improved. Water is available in the study area and sufficient surplus water should be available to suppress dust at all locations in the dry season. In addition, as a general approach, it is recommended that if works are within 10m of any sensitive receivers, the contractor should install dust barrier segregation between the works at the road edge and the sensitive receivers. A fixed metal site hoarding will not be practical in this situation at the edge of the road. The segregation should be easily erectable barrier >2.5m high and designed to retain dust and provide a temporary visual barrier to the works, the materials could be plastic or tarpaulin sheets. Where dust is the major consideration the barrier can take the form of tarpaulins or fences strung between two poles mounted on a concrete base. These can be moved along the road as the work

proceeds. In some cases it will be necessary to seal the doors and windows with tarpaulins for the duration of the works to keep dust out as far as practicable. The other mitigation measure will include:

- If the surface is dry water will be sprinkled on the road and exposed surfaces when work is carried out within 50 m of residences or roadside food stalls.
- No work will be carried out within during the night (2100hrs to 0700hrs).
- If works have given rise to complaints over dust, the contractor shall investigate the cause, report it to the Grievance Facilitation Unit and in the monthly progress reports and review and propose alternative mitigation measures before works recommence.
- All heavy equipment and machinery shall be fit in full compliance with the national and local regulations
- Fuel-efficient and well-maintained haulage trucks will be employed to minimize exhaust emissions. Smoke belching vehicles and equipment shall not be allowed and shall be removed from the project.
- Vehicles transporting soil, sand and other construction materials will be covered with tarpaulin sheets to avoid impact from dust. Speed limits of such vehicles within the works site and on unpaved edge areas of the Project roads will be established and agreed with the PIU.

537. The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles should not be located within 100 m of educational establishments, public amenities and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust. If large stockpiles (>25 m³) of crushed materials are necessary they should be enclosed with side barriers and also covered when not in use.

538. SPC/TSC shall undertake semi-annual monitoring of ambient air quality (TSP, PM_{2.5}, PM₁₀, CO, NO_x, and SO_x) and noise at the stations which were sampled during pre-construction phase. Field measurements shall also be carried out, as necessary, to validate complaints.

5.4.2.12 Vibration

539. Along the proposed BRT corridor, most surface materials for demolition and/or rehabilitation can be removed with powered mechanical equipment (PME). It is therefore anticipated that powered mechanical equipment and a lot of local labor with hand tool methods will be used. When any PME is used, it could generate noise/vibration despite limited time frame over which it takes place. Under this project, the use of PME is not expected to generate vibration levels that can damage existing structures. However, it is expected that vibration level can achieve the audible and feelable ranges in adjacent structures very close to the site.

540. In order to mitigate construction vibration, phase demolition of existing surface road should be undertaken as vibration level could be less when each vibration sources operates separately. If necessary, the Contractor will need to undertake assessment of any important or fragile building structures within the work areas with respect to their capacity to withstand construction vibrations.

5.4.2.13 Excavation and Protection, Runoff Control and Protection of Works

541. Engineering controls that include runoff protection measures will be designed and installed to control soil runoff both at all the constructed works and in peripheral areas, particularly in borrow areas and along haul tracks. Before construction commences the contractor will update the draft Runoff Control Plan (RCP) produced by the SPC/TSC and implement excavation stabilization measures proposed in the detailed designs and maintained during construction to protect the works.

542. The Excavation Protection and Runoff Control Plan will include consideration of the following:

- i) Climate and rainfall for the area and checking weather forecasts.
- ii) Terrain and typical locations susceptible to runoff and runoff.
- iii) Protection of the works and potential impacts to the environment.
- iv) Runoff control methods to be employed, locations and installation timing.
- v) Limits to stockpiling on sites near waterways.
- vi) Discussion of the SPC/TSC/PIU inspection/monitoring role.
- vii) Agreement on publicity/public consultation requirements.

543. Mitigation measures for excavated areas will be required by the contractors to prevent surface collapse. These will include but not necessarily be limited to:

- (i) Minimize damage of surrounding facilities during excavation formation.
- (ii) Protect the excavation and install final structures and surfaces as soon as practicable after excavation.
- (iii) Prevent runoff and protect the excavation with temporary or permanent drainage as soon as practicable after excavation.

544. In order to preserve the constructed excavations and other works from runoff, the contractors will also be required to include appropriate measures for excavation protection, i.e. finish concrete works as soon as practicable as required in the detailed construction drawings and implement them accordingly.

545. Payments will be linked to the completion of the works as indicated by the installation of runoff and excavation control measures to protect the works to the satisfaction of SPC/TSC/PIU.

5.4.2.14 River Protection, Road Reconstruction/Demolition and Replacement

546. There are around 3 river crossings (Tullahan River, San Juan River and Pasig River) along the BRT corridor. Careless construction and poor materials control can cause blockage to rivers. Therefore in areas along and near the river the following will be carried out:

- Earth and stones will be properly disposed of so that they do not block the river, resulting in adverse impact on water quality and flow regime.
- In road reconstruction and demolition sites, the demolition debris will not be dropped into the river but alternative means will be used to avoid dropping the debris into these rivers.
- Silt fences, sediment barriers or other devices will be used as appropriate based on the design to prevent migration of silt during excavation.
- Other runoff control and excavation control measures and covering open surfaces with concrete to reduce runoff will be implemented as early as possible in construction.
- Demolition materials will be properly disposed of so that they do not block the road, resulting in adverse impact on pedestrian movements and traffic flow.

5.4.2.15 Water Quality

547. Water quality from incidents affecting the river crossings and drainages along the BRT alignment and possible sources of water supply disruption will be investigated and where the complaint can be substantiated, water samples should be taken and analyzed based on the baseline monitoring results in the preconstruction stage. Samples will be taken as soon after the complaint as possible and analyses immediately and again two weeks after the complaint to determine if water quality has been restored. The following precautionary measures will be undertaken by the contractors:

- Lubricants will be stored in dedicated enclosures with a sealed floor/base >50m from water bodies.
- Solid waste from construction activities will not be thrown in ditches or ponds or rivers and shall be disposed of as per the WMP and there will be no burning of waste.
- Construction storage/stockpiles shall be provided with bunds to prevent silted run-off.
- Stockpiled materials will be covered to reduce run-off.
- Stockpiling or borrow sites will not be allowed within 50m of a water body.
- Stockpile areas and storage areas for hazardous substances shall be located away from water bodies.
- If complaints occur there will be monitoring and investigation of water quality.
- Work in rivers will be scheduled during dry season and work duration shall be as short as possible.
- Bare ground shall be stabilized immediately after works completed.
- Washing of machinery and vehicles in surface waters shall be prohibited.

- At designated washing areas for machinery and vehicles, oil and water separators shall be installed in order to avoid discharge of oil and grease pollutants.
- At campsites, drains for food entrails shall be installed with oil and grease traps.

5.4.2.16 Water Resources

548. The contractors will carry out the following measures to mitigate the impact of using local community water resources, where required:

- In all areas availability of water will be assessed to evaluate the impact on community resources. In areas where water pressure is low or in areas that are experiencing frequent water supply interruptions, project water will be brought in by tanker without competing or depleting local water supplies;
- The contractors will be required to maintain close liaison with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.
- Guidelines will be established to minimize the wastage of water during construction operations and at campsites.
- Re-provision drainage channels affected by works two weeks before commencement of works; and,
- In case of obstruction or damage and ponds shall be cleaned or repaired immediately.

5.4.2.17 Construction Camps and Canteen Facilities

549. The requirement for contractors construction camps and maintenance yards is not yet known but contractors will be required to adopt good management practices to ensure that fuels and chemicals, raw sewage, wastewater effluent, and construction debris/scarified material is disposed of in controlled conditions to reduce the risk of contamination. The proposed measures include:

- Worker camp location and facilities located >500m away from residential areas and agreed with local communities with facilities approved by SPC/TSC and PIU and camps managed to minimize impacts.
- Construction camp will be established in areas with adequate drainage in order to prevent water logging at the camp and formation of breeding sites for mosquitoes in order to facilitate flow of the treated effluents.
- Potable water, clean water for showers, hygienic sanitation facilities/toilets with sufficient water supply, worker canteen/rest area and first aid facilities will be provided. Separate toilets shall be provided for male and female workers.
- Hire and train as many local workers as possible.
- Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas.
- Portable lavatories shall be installed and open defecation shall be prohibited and use of lavatories encouraged by cleaning lavatories daily and by keeping lavatory facilities clean at all times.
- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before discharging it into natural streams. Oil and grease residues shall be stored in drums awaiting disposal in line with the agreed WSMP.
- Predictable wastewater effluent discharges from construction works shall have the necessary permits from DENR and local authorities before the works commence.
- Camp site will be cleaned up to the satisfaction of ESC and local community after use.
- All waste materials shall be removed and disposed to disposal sites approved by local authorities
- Land used for campsites shall be restored to the original condition as far as practicable and the area shall be restored to a condition acceptable to the local community and SPC/TSC (planted with appropriate trees / shrubs as practicable) after it is vacated and cleaned.

5.4.2.18 Sanitation and Disease Vectors

550. Potential sanitation and impacts from disease will need to be controlled by maintaining hygienic conditions in the worker camps and along the construction sites, implementing the social and health programs for the Project. The contractor will ensure that:

- Measures to prevent dengue shall be implemented (e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid formation of stagnant water, etc.).
- Standing water will not be allowed to accumulate in the temporary drainage facilities or along the roadside to prevent proliferation of mosquitoes.
- Temporary and permanent drainage facilities will be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.
- Dengue control will be implemented in line with social plans for the Project.
- HIV/AIDS awareness and HIV/AIDS education and prevention program shall be implemented in line with social management plan.

5.4.2.19 Occupational Health and Safety

551. Worker occupational health and safety is generally governed by the Philippines Labor Act 2006. A Worker and Public Safety Plan will be submitted by the contractor in the ESMP to establish routine safety measures as required by the Philippines Labor Act and by good engineering practice as well as to provide first aid facilities. The contractors shall adhere to all provisions stated in Department of Labor and Employment (DOLE) Department Order No. 13, Series of 1998 or the Guidelines Governing Occupational Safety and Health in the Construction Industry and other applicable laws. In addition, the contractors shall follow the operational principles under OHSAS 18000, an international occupational health and safety management system specification.

552. Facilities for workers and public safety, construction site offices and canteen will be regulated in line with the Philippines Labor Act 2006. Complaints will be monitored and investigated and mitigation measures will be revised, and the ESMP will be updated as necessary if unexpected impacts occur. All measures related to workers' safety and health protection shall be free of charge to workers. The worker occupational health and safety plan to be submitted by the contractor before construction commences and in tandem can be extended to cover public safety and approved by PIU/SPC/TSC.

5.4.2.20 Community Health and Safety

553. Public safety, particularly of pedestrians and children can be threatened by the excavation of the trenches for side drain construction and station access tunnels. Fencing will be installed prior to excavation work commencing on all sides of temporary and permanent excavations. The plans will include provisions for site security and guards, trench barriers and covers to other holes and any other safety measures as necessary. The contractor will provide warning signs at the periphery of the site warning the public not to enter and define this in the ESMP. The contractor will restrict the speed of project vehicles and also control traffic by contra-flow and provide flag men and warning signs at either side/end of the works areas where the traveling lanes must be temporarily reduced. The safety measures for the public in the Worker and Public Safety Plan will include:

- Barriers (e.g., temporary fence), shall be installed at construction areas to deter pedestrian access to the roadway except at designated crossing points.
- The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation and these sites will have a watchman at the entrance to keep public out.
- Speed restrictions shall be imposed on Project vehicles and equipment traveling within 50m of sensitive receptors (e.g. residential, schools, temples, etc.).
- Upon completion of construction works, borrow areas will be backfilled or fenced.
- Provisions for site security, trench barriers and covers to other holes and any other safety measures as necessary.

- Provide warning signs at the periphery of the site warning the public not to enter and define this in the ESMP.
- Strict imposition of speed limits along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.
- Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances (fuel and oil) and other construction materials during transport.

554. The contractor will provide information boards near the work sites to inform and instruct the public on how to conduct themselves and to be aware of their surroundings if they must approach the works. The Public Safety section of the Worker and Public Safety Plan will include but not necessarily be limited to the following:

- Statement of contractor's safety policy for Workers and Public.
- Legal requirements (**Philippines Labour Act 2006**).
- Works safety issues and public safety issues.
- Training the workforce and informing the public on works safety issues.
- Establishment and monitoring of acceptable working practices to protect safety.
- Overlap with traffic and road safety (e.g. traffic flow/delay requirements).
- Discussion of the SPC/TSC/PIU inspection/monitoring role.
- Establishment of complaints management system for duration of the works
- Agreement on publicity/public consultation requirements.
- Reporting of accidents.
- Complaints management

555. Construction activities can impact the local barangays in terms of security, safety and health. The significance of impact is minimized to negligible if awareness among local communities or barangays is considered.

556. At barangay levels, the Contractor should be able to discuss, explain and coordinate with the local Barangay Officials its Worker and Public Safety Plan. These initiatives by the Contractor will allow the local communities participate wholly or in part in their community emergency preparedness and response plan that will likewise optimize any available local community infrastructures.

557. Further, there are a number of activities in the construction phase that require orientation and briefing to the local barangay units by the Contractor to the which if not mitigated are likely to cause disturbance to their locality. These include but not limited to the following:

- Project hauling trucks and vehicle movements will increase existing traffic volumes and is predicted to cause congestion in some locations. Journey times for local road users are likely to therefore increase. Increased traffic may also result in road safety risks, especially in areas where there are pedestrians and cyclists on the road, near schools where children are waiting for transport or are walking home.
- In terms of site security, there will be a health and safety risk to the local community posed by the existence of construction sites and the storage and use of construction materials all of which will require effective management.

558. Discussions and consultations with the local barangay should include construction timing and site specific mitigation measures.

5.4.2.21 Traffic Management

559. *Objective.* TMP is important to managed construction traffic and traffic on the existing highway network; to maximize construction efficiency and safety while minimizing risk, inconvenience and nuisance to the general public. This will be achieved through careful management, programming and coordination of all works on the existing highway network and traffic accessing the corridor, including general traffic.

560. During construction of BRT Line-1, there will inevitably be an impact on traffic, pedestrians, roads and pavements near construction work. In order to minimize the impact on vehicular and

pedestrian traffic, careful planning, appropriate construction methods and effective organization will be required from the early stages of the project.

561. By utilizing planning and evaluation methods to ascertain how pedestrian and vehicular traffic can be affected during construction, DOTC will seek to minimize inconvenience and delay to vehicular traffic, pedestrians, properties and businesses adjacent to the construction sites.

562. All necessary diversions, some using temporary road and pavement surfaces, will be clearly signed in order to segregate the public from construction activities.

563. Planning for temporary road works and diversions will proceed in a structured set of phases. All proposals for closures and diversions will require the approval of the relevant stakeholders and will be presented to those interested parties well in advance of the temporary works to obtain their timely agreement.

564. The following procedures will be used to co-ordinate and plan the traffic management activities to minimize delay and inconvenience whilst maximizing public safety during construction.

- Prior to construction, the Contractor will present all necessary Traffic Management Plans, with the assistance of the DOTC, to all interested stakeholders, including Barangay LGUs, in order to obtain the necessary approvals and permissions.
- The Contractor shall coordinate with the relevant agencies regarding the release of information on road closures/diversions to the public and agree upon the most effective means of communication.
- Following construction, the Contractor will reinstate all road and pavement surfaces, as necessary, where they have been affected by the project civil work.
- The Contractor and DOTC will plan a public relations campaign to inform road users, pedestrians, businesses and homeowners affected by the construction works. Early information to the public will be important in alleviating the impact on traffic in the affected areas. All parties will need to take a coordinated approach to traffic management, and all public relations and local traffic management needs to be effective and subject to continuous revision and evaluation.

565. The alignment will traverse along major roads such as Regalado Avenue, Commonwealth Avenue, Elliptical Road, Quezon Avenue, España Boulevard and Quezon Boulevard. Evidently, one of the biggest impacts of construction is on traffic, therefore, to ensure smooth operations and to minimize the effect on motorists and pedestrians, a comprehensive Traffic Management Plan is a necessity. Together with the various local authorities and Metropolitan Manila Development Authority (MMDA), the project's schedule will be configured based on land use, road use and most importantly traffic peak. To mitigate the impacts, and in addition to the information campaign outlined above, the Contractor and DOTC will address the traffic issues as follows:

- Project scheduling will be carefully planned and organized so that construction areas can be utilized effectively with minimal impact on people.
- Construction area boundaries will be planned and coordinated in order to isolate the minimum area appropriate to the construction schedule in that location
- Movement and transportation of material delivery and construction equipment will be planned and organized to avoid the morning and evening peak hours
- Sufficient traffic control personnel to monitor the movement of vehicles in and around construction sites.
- Concrete barriers will be installed to act as a boundary for construction sites. The use of these, together with vinyl sheet panels, will minimize noise and dust pollution from site.
- Where possible, temporary road surfaces will be used to compensate for lane loss during construction.
- Warning signs, flashing lights, temporary traffic banners and traffic control lights will be installed where necessary. Clear signage will be displayed along public footpaths informing pedestrians of safe walking routes near construction areas.

- Sufficient temporary lighting will be installed to replace existing lighting that may need to be removed because of construction activities. All lighting will be reinstated following the construction period
- Coordinate closely with the affected police precincts and responsible entities in order to facilitate traffic movements, ensure pedestrian mobility and safety, and reduce the risk of accidents.
- Traffic diversions will be used, where possible, to completely avoid construction areas. Impact to local businesses and effects on road traffic will be carefully considered when planning these.
- Regular checks and maintenance will be carried out on vehicles and equipment used during construction to ensure they are in a fit condition for their purpose and that their exhaust and noise emissions are not excessive.
- Public transportation is an essential part of the local transportation system and has a direct effect on passengers; The Contractor will seek to minimize the impact of construction on the corridor and will constantly liaise with transport operators to agree plans, e.g., for temporary stops and any required service diversions.

566. Prior to construction, the Contractor and DOTC will advise communities regarding the future activities so that motorists can avoid the roads affected by the construction. Activities that require large equipment and material movement will be undertaken at night to lessen the impacts on traffic flow. The Contractor will deliver materials including girders from the yard to the site and, where practical, transport concrete, rebar cages and fill materials at night. For the construction of the guideway traversing along the main roads, temporary road or lane closures will be implemented. Piling, formworks installation, excavation works and other activities that do not require constant equipment mobilization will be done during the day but with the required section temporarily closed. Closures will be by sections so as not to heavily affect the normal traffic flow.

567. Alongside the traffic management plans, signs will be placed and kept in proper position, clean and legible at all times. These will include regulatory, warning and guide signs. The layout, shape, size, height, and location will conform to all standards practiced in the Philippines. Warning signs will be installed a minimum of 750 feet in advance of areas affected. All signs will be 5 to 7 feet above the ground. Illuminators and reflective surfaces will also be used to ensure safety during the night. Signs such as “Road Construction Ahead”, “Diversion”, “One-Way or Two-Way Lane” and speed limit signs will be deployed along the alignment where construction is ongoing. Barricades will also be placed at areas closed to the public. Cones or drums will also be strategically placed to guide motorists along the barricades. Floodlights and electric lights will also be used at night to facilitate traffic management. Lastly, throughout the construction period, flagmen will be deployed around the construction area and along the road to assist passing vehicles.

568. *Hours of Work:* Site working hours will be between 0800 - 1800 hours Monday to Friday and 0800 - 1300 hours on Saturdays. No construction work will take place during Sundays or public holidays. In order to maintain these working hours, the appointed contractor(s) may require a period of up to half hour before and up to one hour after normal working hours for start-up and close-down activities. This period should include the operations of plant machinery, giving rise to local noise and air disturbance. In *exceptional* circumstances, for safety and operational reasons it may be necessary to work outside these hours. Where this occurs, the hours and duration of work would be subject to consultation with the client.

569. *Proposed Traffic Diversion Routes during Construction:* In order to minimize the traffic impact during construction, the following highway routes are proposed as alternative vehicle routes (Please see **Table 5.4.1**).

Table 5.4.1: Proposed Traffic Diversion Routes

Purpose	Alternative Route
Alternative, and strategic road access for vehicles going to Manila from Quezon City and vice-versa	1) EDSA via Bonifacio Avenue to Manila and vice versa; 2) EDSA to Aurora Boulevard to Nagtahan Road to Manila and vice versa;

	3) Edsa-Munoz to del Monte Avenue to Bonifacio Avenue to Bonifacio Avenue and vice versa
--	--

570. *Highway Link Construction and Micro Management:* It is proposed that the construction is phased into several separate phases of construction within a predefined highway link along the BRT corridor, and can be summarized as follows:

- 1 Divert main-line traffic (both streams) onto single side of mainline carriageway; thus releasing opposite side (non-traffic) for civil construction work
- 2 Clear / grub highway / sidewalk and remove central median where applicable
- 3 Construct busway and reconstruct adjoining highway / sidewalk
- 4 Re-divert main-line traffic back onto newly constructed highway, and busway
- 5 Clear / grub highway / sidewalk on opposite side of highway, following re-divert of traffic
- 6 Construct busway and reconstruct adjoining highway / sidewalk on opposite side of highway
- 7 Partially re-open highway in each direction
- 8 Install BRT segregation kerbing
- 9 Fully re-open highway

571. During construction and operation phase, the Contractor in coordination with the local traffic office shall review, update and provide details of the TMP. It is likewise expected that the Contractor shall factor-in the following factors which can be looked as guides for the proponent of the BRT system to ensure that the negative impacts of the BRT system during construction will be minimal if not appropriately addressed. Likewise, these can also be helpful in ensuring that the impacts on current flow of traffic, notably during construction will be minimal and that the LOS of the affected corridors will not be severely affected. TMP elements mitigating measures are summarized in **Table 5.4.2.**

Table 5.4.2: Elements of Traffic Management Plan and Mitigating Measures

TMP Element	Mitigating Measure
a) Traffic circulation	<ul style="list-style-type: none"> • Rationalize re-routing of affected PT routes (jeepneys, buses, etc.) • Re-routing of affected traffic flows of private vehicles • Provision of appropriate information guide for the temporary re-routing • Traffic enforcement support for the re-routing • Responsive traffic control to manage re-routing
b) Pedestrian circulation	<ul style="list-style-type: none"> • Provision of temporary pedestrian facilities along the affected corridors • Pedestrian information system • Safety measures for pedestrians • Provision of pedestrian facilities at affected institutions and establishments
c) Transport of heavy equipment	<ul style="list-style-type: none"> • Ensure the time and route of transporting heavy equipment have minimal impacts on traffic circulation and flow in the affected corridors • Safety measures need to be in place • Traffic management in place
d) Parking facilities	<ul style="list-style-type: none"> • Provision of temporary parking for establishments and institutions affected by the construction • Proper management of parking to ensure minimal impacts • Separate parking facilities for construction
e) Disposal of construction wastes	<ul style="list-style-type: none"> • Temporary location of wastes at construction site/s • Proper management of construction wastes • Ensure transport of construction waste have minimal impacts on traffic

TMP Element	Mitigating Measure
	circulation
f) Other concerns	<ul style="list-style-type: none"> • Address concerns on PWDs, • Ensure minimal impacts on special events along affected corridors of the proposed BRT system (e.g., Sunday mass, funeral march, parades, festivals, etc. • Others that may be affected by the BRT construction/ development should be addressed

5.4.2.22 Physical Cultural Resources Management Plan

Project Impact on Physical Cultural Resources

There is no anticipated impact on the physical cultural resources as a result of the project except for some temporary obstructions, noise and vibrations during construction activities. During detailed design stage of the project, a more precise construction work impacts will be identified.

Management Plan

When the project is expected to cause significant impacts on the physical and cultural resources, the PIU Social Safeguard Specialist will ensure that OP 4.11 of the World Bank is adhered to in protecting these resources. The following activities will be undertaken:

1. Consultation with relevant project-affected groups, concerned government authorities, and relevant non-governmental organizations will be undertaken to document the presence and significance of physical cultural resources, to assess potential impacts, and to explore avoidance and mitigation options.
2. Baseline and impact assessment will be done to include (a) an investigation and inventory of physical cultural resources likely to be affected by the project; (b) documentation of the significance of such physical cultural resources; and (c) assessment of the nature and extent of potential impacts on these resources.
3. When the project may have adverse impacts on physical cultural resources, appropriate measures for avoiding or mitigating these impacts will be planned and implemented.
4. When necessary, depending on the extent of impact, capacity assessment will be undertaken for implementing the proposed mitigating measures and for managing chance finds, and where appropriate, recommends capacity building measures.

Archaeological and Cultural Artifacts Chance Finds

572. The City of Manila has a rich archaeological heritage and archaeological site. As a fall back measure the contractor will take the following precautions to avoid disturbance of any as yet undiscovered archaeologically valuable artifacts:

- Site agents will be instructed to keep a watching brief for relics in excavations.
- Should any potential items be located, the SPC/TSC will immediately be contacted and work will be temporarily stopped in that area.
- If the SPC/TSC determines that the item is of potential significance, an officer from the National Commission of Culture and Arts (NCCA) will be invited to inspect the site and work will be stopped to allow time for inspection in line with the compliance to Republic Act 10066 or the National Cultural Heritage Act of 2009;
- Until NCAA has responded to this invitation work will not re-commence in this location until agreement has been reached between NCAA and PIU/DOTC as to any required mitigation measures, which may include structured excavation.

573. Detailed Chance Find Procedure is presented in **Annex 4**.

5.4.2.23 Enhancements through Urban Greening

574. Environmental enhancements such as tree planting near the road will be explored in the detailed designs and included in the Tree-cutting and Replanting Plan. Enhancements shall be re-assessed prior to construction and proposed enhancements should be discussed by the contractor with the local population to identify stewardship of any planting and also to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations.

5.4.3 ESMP during Operational Phase

5.4.3.1 Noise

575. The Philippines noise criteria are formerly presented in Chapter 4. The main noise source in most areas is traffic noise. The project is believed to be sustainable in terms of noise. No operational mitigation measures are required based on the current alignments.

5.4.3.2 Gaseous Emissions

576. Gaseous emission will result from the fuel consumed by the BRT buses but this will be much less than at present for the equivalent number of passengers. Although there is no realistic alternative to conventional diesel as a fuel of choice for the BRT buses at the moment, provisions could be made for the conversion to natural gas in the future. The level of environmental performance that is apparent during project operation may be based on Euro IV emissions standards with the use of 50ppm sulfur fuel.

577. Hybrid bus development is also envisioned to reduce fuel consumption and GHG emissions in intensive stop/start operation. Although the system is designed so as to minimize such service characteristics, it may be integrated in the procurement plan to acquire a limited number of mid-parallel buses within the initial fleet to investigate the costs and benefits of this technology in Metro Manila.

578. The modal shift in public transportation from the current PUVs to BRT will essentially result to better air quality attributed to reduced gaseous emissions along the BRT corridor. Associated human health damage of air pollution will be reduced. Gaseous emissions to be measured that are expected to decline during operational phase on a per passenger basis include TSP, PM_{2.5}, NO_x, and SO_x. Modeling results projecting changes on these air quality parameters are presented in Section 4.1.9.

579. If the BRT Line-1 Project is implemented in Metro Manila, it would give significant greenhouse gas emission benefits. Reduction in GHG is given in the DTS. Speed improvements of up to one (1) kph are also anticipated by year 2015. GHG savings over 30 years as a result of the BRT project is 6.21 million tons or a yearly GHG savings of 207,000 tonnes. Across the city, GHG emissions per person-km would be kept below current levels for around 9 years from 2015. Under the baseline scenario by contrast, emissions per person-km would exceed current levels within 3 to 4 years from 2015 and then continue to rise throughout the 20 year period.

5.4.3.3 Particulate Emissions

580. Vehicle emissions such as dust and fumes are the main source of air pollution during operation phase. However, vehicular emissions along the BRT corridor should be less likely under the improved conditions with BRT implemented and are unlikely to accumulate or create worse impacts than at present under the local conditions. Dust from the existing road will be reduced due to the better asphalt surface for the sides of the new road. Therefore, the project is believed to be sustainable in terms of particulate emissions and no operational mitigation measures are required.

5.4.3.4 Domestic Waste Generations

581. During operation phase, domestic solid wastes and domestic wastewater are expected to be generated by the Project.

582. For domestic wastewater, the Project is expected to comply with the Effluent Standards set by DENR for domestic wastewater management. The Project operator is likewise expected to secure the necessary Discharge Permit from DENR for the management of domestic wastewater.

583. On the other hand, applicable provisions of RA 9003 (Ecological Solid Waste Management Act) must be complied with for domestic solid waste management. For domestic solid waste management, it is expected that a MOA between DOTC and the concerned LGUs (City of Manila and Quezon City) shall be executed to effect periodic collection of the domestic solid wastes to be generated by the Project and allow the Project to use the existing garbage disposal site of these LGUs.

584. The project is not expected to generate hazardous wastes during operation phase except for busted lumps. Disposal of these busted lumps can be done by employing third party waste treaters which are duly accredited by DENR for the wastes proper collection and disposal.

585. At the depot site, hazardous wastes other than busted lamps may be generated as a result if the motor pool and fuel stations to be operated at the depot sites. The following mitigation are proposed:

- All toxic and hazardous material being used during depots operation shall be stored and secured;
- Vehicles including BRT buses and equipment shall be maintained in good operable condition, ensuring no leakage of oil or fuel;
- All workshops will have waste disposal bins to store hydrocarbons from filters, rags, waste oil for disposal at approved locations;
- Sanitations arrangements will be made at depot sites ensuring that no raw sewage is released into drains;
- The locations and sewage treatment methods for sanitation facilities shall be indicated on specific plans and submitted to DENR during the securing Discharge Permit;

5.4.3.5 Driving Conditions and Community Safety

586. The introduction of the BRT and widening of the usable width of the existing road along the BRT corridor road will improve traveling conditions. Increase in traffic flow indicate that additional future traffic should be moderate and unlikely to create many community safety issues. The road improvements will be monitored, MMDA and the concerned LGUs of City of Manila and Quezon City will monitor accidents in the operational phase and conduct awareness campaigns. Overall the condition of the road facilities will be enhanced and driving conditions should improve. Routine safety measures, signage and road markings will be introduced to reduce driving risk further in accident prone areas and provide enhancements to driving conditions near and along the BRT corridor.

5.5 Social Management Plan (SMP)

5.5.1 Options Addressing Economic Dislocation in the PUV Sector

587. The PUV drivers are considered more vulnerable to economic dislocation than the operators, particularly PUJ drivers. Their capacity to adapt to this reform in the public transportation sector is potentially hampered by low levels of education (elementary and high-school levels) and lack of alternative skills. Such a situation could translate to widespread displacement of this sector and render their families vulnerable to negative socio-economic consequences.

588. The options presented to the affected PUJ drivers and operators include:

- 1) Route relocation, modification and truncation;
- 2) Co-existence with the BRT or remain on their route, despite the impact of the Metro Manila BRT Line-1 Project;
- 3) Scrapping or wholesale purchase of old PUJ units by the government;
- 4) Formation of concessionaire group among operators to become part of the BRT consortium/investors; and

- 5) Provision of alternative livelihood/TESDA training/preferential hiring to affected drivers/personnel and/or members of affected households.

589. Preferred Option: Route relocation, modification or truncation

590. The operators showed preference for the options on route relocation, modification, and truncation. Three participating associations such as the Tropang Tsuper, HEQFAJODA, and Commonwealth Transport Service Cooperative have worked with the Project Team to map new PUJ routes to where they can transfer operation. Some of the routes will serve as feeder routes to the BRT Line-1 system. Presentation of custom-made social management plans or solutions for these three associations are presented below.

5.5.2 Desire for Flexibility to co-exist with the BRT

591. Despite that they are willing to relocate their operation to the new routes they have identified, the operators wish to keep the option of remaining on their existing franchise routes until it is no longer economically viable for them to operate. They wish to be given the chance to compete in the new public transportation environment. They will offer the commuting public an alternative mode of transportation by continuing using the PUJs in the advent of the BRT system. This flexibility will allow them to find new viable modes to operate along the BRT route where their existing franchises overlap.

592. This is a test for the BRT system to operate in a competitive market environment. Preferences of public transportation users will serve as a measure of the BRT's efficiency. If it is indeed the more efficient PT alternative, commuters will definitely be abstracting from riding PUJs/PUBs, and there is a wholesale shift from PUJ/PUB use to the BRT system among the commuting public that may be anticipated.

593. If the BRT is indeed the better alternative for all classes of commuters, PUJs will lose their passengers, and thus will be forced out from the BRT corridor. In such a case, they have the option of transferring to the untested new routes or modified routes that they have identified as part of their social entitlement package as PAPs. As one by one of these PUJs are moving out from the BRT corridor, there is a possibility of arriving at an optimal number of PUJs that can remain, to operate viably, and be an integral part of the new public transport system.

5.5.3 Scrapping or wholesale purchase of old PUJ units by the government

594. Some PUJ operators have expressed that they are willing to forego their old jeepneys (at least 14 years old) if the government is willing to purchase them as scraps at an agreeable price. Scrap values that came up during the discussions put the values of these old PUJs from PhP 80,000 to PhP 150,000. The government will also have to re-purchase the franchises from them at a price that equates the actual cost of getting a franchise in the black market.

595. The proceeds from these scraps may be used by members to participate in the BRT system by investing as a cooperative or as a transport organization. This is an incentive considered by DOTC to those who are investing their proceeds in the BRT system, so that their respective organizations may be able to pool enough financial resources to make a meaningful investment participation.

5.5.4 Participation in the BRT System as Investors

596. The PUB operators are deemed to have higher absorptive capacity for this option, compared to the PUJ operators. The latter will have to rely on their federations/organizations to pool resources adequate for participating in the System Company. The options for the drivers are more limited: either continue driving PUVs in restructured routes or undergo re-training for employment with the Metro Manila BRT Line-1 Project or elsewhere. DOTC may provide bonus points to bidders who are bringing in or may make it mandatory to bidders to bring in as part of their bidding consortium transport cooperatives or organizations whose membership in general are PAPs.

5.5.5 Provision of alternative livelihood/TESDA training to and preferential of affected drivers/personnel and/or members of affected households

597. Opportunities may be explored through the Technical Education and Skills Development Authority (TESDA) which offers three- to six-month courses under the Technical-Vocational Education and Training (TVET) program for unemployed persons who are actively looking for work and would want to improve their chances of landing into jobs that are in-demand. This will include displaced workers because of closure of establishments, retrenchments or laying off due to economic or other related reasons. It was estimated that the total cost for training one person is PhP 15,000. To facilitate reallocation of displaced drivers who choose to be re-trained, it is important that:

- 1) Clear guidelines for qualifying for the program be developed;
- 2) Easy registration system be available;
- 3) identification of employment placement after the training; and
- 4) Phased Program for shifting from public utility driver to new employment

598. PUJ and PUB drivers and support personnel identified and listed among the PAPs should be given preferential considerations in the hiring of manpower for the BRT construction, whenever practical, and for the BRT operation. This preferential hiring may be extended to one qualified member of a PAP household. Employment opportunities exists for various positions where most of PAPs or their family members may qualify including, among others, the following:

- 1) Bus drivers
- 2) Mechanics
- 3) Helper Mechanics
- 4) Electricians
- 5) Janitors
- 6) Ticketing Attendants
- 7) Customer Service Representatives
- 8) Office Support Personnel
- 9) Security Guards
- 10) Company Drivers
- 11) Facility Maintenance Staff

5.5.6 Analysis of SMP Options Presented

599. **Table 5.5.1** provides an analysis of the above SMP Options in terms of their advantages and disadvantages and the opportunities and challenges for each option.

5.5.7 Custom-Made SMPs for PUJ Drivers and Operators

600. During the public consultation meetings conducted, key issues and concerns were collected from the participating drivers and operators. The most pressing issue brought up is the potential loss of their livelihood as a result of the BRT project operation, these stakeholders have expressed their approval of the BRT project as one important measure to modernize public transportation in the country. The stakeholders expressed full cooperation in the ESIA undertaking and identified custom-made solutions to prevent the loss of livelihood in their ranks by proposing new routes where they can operate, under the assumption that the government, particularly the LTRFB through the intercession of DOTC, the Implementing Agency for the Metro Manila BRT Line-1 Project, will grant them the necessary franchises to operate on their proposed new routes.

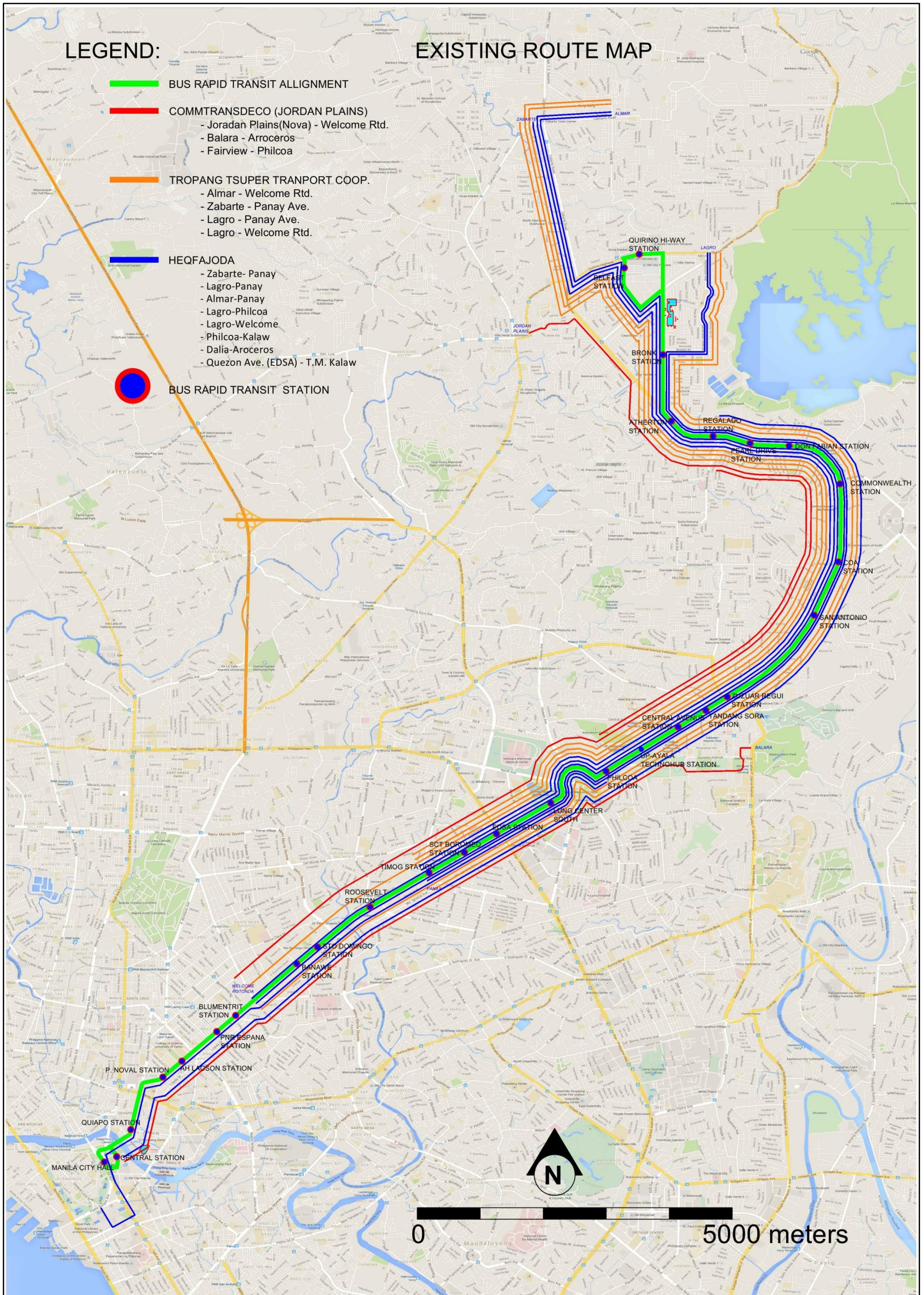
5.5.7.1 The Case of Tropang Tsuper

601. The Tropang Tsuper Transport Cooperative Services, Inc. (TTSCI) has a membership totaling 214 drivers or approximately 110 PUJ units plying the routes (1) Zabarte – Panay; (2) Almar – Welcome Rotunda; and (3) Lagro – Panay. These routes are shown in **Figure 5.4.1**.

Table 5.5.1: Analysis of SMP Options for the PAPs in the PUJ and PUB Sector

OPTION	BENEFICIARY	ADVANTAGES/ OPPORTUNITIES	DISADVANTAGES/ CHALLENGES
1. Route relocation, modification or truncation	PUJ/PUB Operators and Drivers	<p>Jeepneys would be plying much shorter routes which translate into higher income and less fuel consumption and the potential for greater operational efficiencies.</p> <p>Drivers would experience less stress and fewer traffic violations as competition for passengers would be actively managed through efficient and up to date market reactive, operational planning of jeepney terminals.</p> <p>In addition, the designation of new routes will improve the overall efficiency of the transportation system as more areas will have access to public transportation</p>	<p>New routes are not tested and there are no guarantee that transferred operations will be economically viable.</p> <p>Modification results to alteration of franchise routes that might conflict with other road users resulting to congestion and stiffer competition among PUJs/PUBs</p> <p>Truncation shortens the route the PUJ/PUB may ply which could potentially result to lower number of passengers served by PUJs arising to stiffer competition among them and will potentially result to withering income</p>
2. Co-existence with the BRT or remain on their route, despite the impact of the Metro Manila BRT Line-1 Project;	PUJ/PUB Operators and Drivers	<p>Opens the PT system to a competitive market environment. Competitive market results to efficiency and beneficial to the consumers or service users.</p>	<p>Retaining the jeepneys alongside the BRT segregated busways would not address the congestion on the road. Congestion contributes to longer travel times, leading to losses in productivity, increased GHG emissions, deterioration in air quality, and increase in respiratory diseases, and diminished competitiveness and liveability.</p>
3. Scrapping or wholesale purchase of old PUJ/PUB units by the government	PUJ/PUB Operators	<p>Removes old units from the roads resulting to decrease congestion and reduce gas emissions</p> <p>PUJ/PUB Operators can raise funds through this option to participate in the BRT system as investors</p>	<p>Loss of income from the continuous operation of the old PUB/PUJ</p> <p>Loss of employment for the drivers, conductors (if PUBs),</p> <p>Loss of franchise to operate in the old route or rights to be transferred at a new or modified route</p> <p>Potential problem in disposal of old vehicles</p>
4. Participation in the BRT System as Investors	<p>PUJ/PUB Operators</p> <p>PUJ/PUB Drivers as members of participating cooperatives/ organizations</p>	<p>Provides an opportunity to the PUJ/PUB operators and drivers to become part of the BRT as a new transport system and have a sense of ownership</p> <p>Reduces the impact of feeling of being displaced by the BRT from the route they used to operate</p> <p>Opportunity to be trained as an</p>	<p>Lack of adequate financial resources of PUB/PUJ operators/drivers and their organizations is a prohibiting factor.</p> <p>Lack of exposure and experience investing in similar undertaking may create management problems later on.</p>

OPTION	BENEFICIARY	ADVANTAGES/ OPPORTUNITIES	DISADVANTAGES/ CHALLENGES
		investor and opportunity to earn profit from investment	
5. Provision of alternative livelihood/TESDA training/ preferential hiring to affected drivers/personnel and/or members of affected households	PUB/PUJ drivers and other displaced personnel	<p>Will benefit most PUB drivers to a preferential hiring for them as BRT bus drivers. Other PUJ drivers may also qualify to drive the BRT buses.</p> <p>Many positions in the BRT may be filled up by PAPs or a member of their families.</p> <p>Training provided for free to PAPs or a member of their families may open employment opportunities for which they received the training and can offer a substitute income to the PAP households.</p>	<p>Trainings are not very attractive to drivers and operators who are displaced as a result of the BRT. Drivers usually wish only to drive for a living.</p> <p>Loss of earnings while on training and no guarantee of employment after training</p> <p>Lack of requisite skills or qualification among PUJ/PUB drivers may prevent them from getting hired for the BRT operation.</p>



Source: Google Map

Figure 5.4.1: Map of Existing PUJ Routes

602. All three routes overlap with the BRT corridor. During the public consultation meetings conducted by the Project Team and in light of the potential impact of the BRT project on their livelihood, the officers and members of this organization proposed new routes where they can relocate their operations.

603. They conducted reconnaissance surveys to ensure that these routes are economically viable for their operation. It was also ensured that no current PUJ franchises overlap with the routes. This is to prevent conflict with other franchisees and to avoid potentially competing with existing PUJ operations. New routes identified and proposed by Tropang Tsuper are as follows:

Origin	Destination	No. of Units
Commonwealth Market	Brgy. San Isidro, Rodriguez, Rizal	45
Pure Gold Mall Fairview	Licao-Licao, San Jose del Monte, Bulacan	45
North Fairview/Atherton St.	Karuhatan, Valenzuela	45
Novaliches Robinson	Urduja, Vicas, North Caloocan	45
<i>Total No. of Units</i>		<i>180</i>
Total No. of Drivers		360

604. These proposed new routes are shown in **Figure 5.4.2**

605. These new routes will serve as feeder routes to the BRT, carrying passengers from the inner residential areas to the BRT stations and vice-versa. Each of the above routes will be able to accommodate 45 PUJ units based on the organization's estimates. In total, these new routes will be able to absorb all their PUJs, avoiding any loss of livelihood or economic displacement within their organization.

606. Tropang Tsuper has prepared a petition to DOTC/LTFRB requesting relocation to the new route. A master list of their affected members for which new operating franchises should be issued are also included in their petition (**Annex 5**)

5.5.7.2 The Case of HEQFAJODA

607. The Hypermart EDSA Quezon Boulevard Fairview Jeepney Operators and Drivers Association, Inc. (HEQFAJODA) has about sixty (60) units operating in the following routes:

- 1) Zabarte – Panay;
- 2) Lagro – Panay;
- 3) Almar – Panay;
- 4) Lagro – Philcoa;
- 5) Lagro – Welcome Rotunda;
- 6) Philcoa – Kalaw; and
- 7) Dahlia Arroceros.

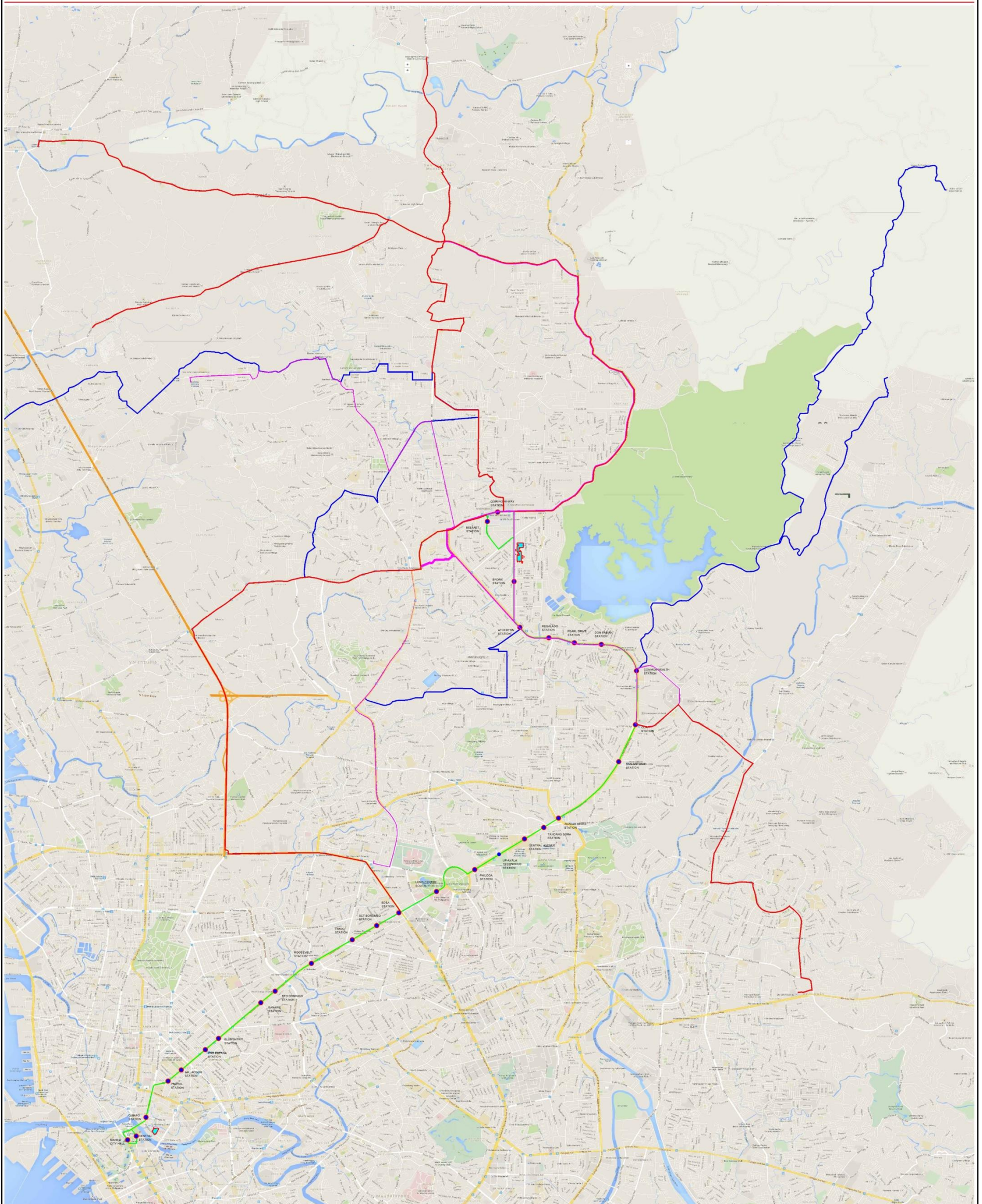
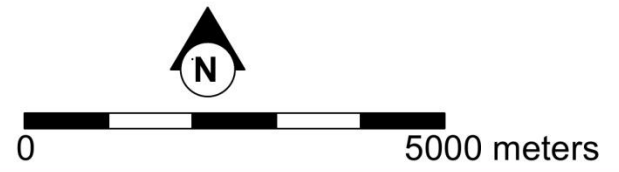
608. These routes are also shown in Figure 5.4.1.

609. It was reported that HEQFAJODA has a total of 108 drivers operating along these routes, all of which, overlap with the proposed BRT corridor. The organization requests that they be relocated to the following new routes:

LEGEND:

PROPOSED ROUTE MAP

- BUS RAPID TRANSIT ALIGNMENT
- BUS RAPID TRANSIT STATION
- COMMTRANSDECO (JORDAN PLAINS) (PROPOSED ROUTE ALIGNMENT)
- TROPANG TSUPER TRANSPORT COOP. (PROPOSED ROUTE ALIGNMENT)
- HEQFAJODA (PROPOSED ROUTE ALIGNMENT)



Source: Google Map

Figure 5.4.2: Proposed New PUJ Routes

Origin	Destination	No. of Units
SM Fairview to Sta. Maria (via Quirino Highway)	Municipal Hall of Sta, Maria	50
SM Fairview to Divine Mercy, Marilao (via Quirino Highway)	Divine Mercy of Marilao	50
SM Fairview to SJDM/Sta. Maria (via Maligaya)	SJDM Sta. Maria	50
Quezon Ave to Malinta Exit (via NLEX)	Malinta Exit	50
<i>Total No. of Units</i>		<i>200</i>
<i>Total No. of Drivers</i>		<i>400</i>

610. These proposed new routes are shown in Figure 5.4.2.

611. Similar with the routes identified by Tropang Tsuper, these new routes do not overlap with existing PUJ franchise operations. Each route can accommodate 50 PUJ units or a total of 200 PUJ units for all four new routes. Potential number of driver-beneficiaries is 400, which is more than the total affected drivers from their organization of only 108.

612. **Annex 1** presents the master list of affected members from HEQFAJODA and other organizational documents.

5.5.7.3 The Case of COMMTRANSDECO

613. The Commonwealth Transport Service and Development Cooperative (COMMTRANSDECO) operates a total of 163 PUJ units in the following routes:

- 1) Jordan Plains (Novaliches) – Welcome Rotunda
- 2) San Rafael (Rizal) – Quezon City Hall
- 3) Balara – Arroceros
- 4) Fairview – Philcoa
- 5) Zabarte/Quirino Highway – Panay Avenue

614. These routes are shown in Figure 5.4.1.

615. COMMTRANSDECO reportedly has 500 members comprised of PUJ operators, drivers, and support personnel. The organization wish to relocate its operations on the following alternate or feeder routes:

Origin	Destination	No. of Units
Jordan Plains (Novaliches)	Pearl Drive BRT Station	50
Jordan Plains (Novaliches)	SM Fairview (<i>Iko</i>)	25
Novaliches (Grotto)	Bulacan	25
SM Fairview	Trinoma via Quirino Hiway	50
SM Fairview	SM Marilao	50
San Rafael (Rodriguez, Rizal)	Sandigan (Batasan)	70
Jordan Plains (Novaliches)	Commonwealth Market	25
Sandigan (Batasan)	Modesta, San Mateo, Rizal	25
<i>Total No. of Units</i>		<i>320</i>
<i>Total No. of Drivers</i>		<i>640</i>

616. These proposed new routes are shown in Figure 5.4.2.

617. As shown above, the new routes can more than accommodate the 163 PUJ units of the organization and may be able to absorb other PUJs from other organizations or affected routes.

618. **Annex 1** shows the letter request from COMMTRANSDECO to be allowed to operate in the above identified routes as well as their list of affected franchises by the BRT.

5.5.7.4 Other PUJ/PUB Organizations

619. Continued consultations with affected PUJ/PUB organizations have to be carried out to develop custom-made SMPs for the PAPs and mitigate project adverse impacts and prevent economic dislocation in the PUV sector. DOTC and LTRFB has to provide a policy to accommodate these operators and drivers on their identified routes by first validating the economic viabilities of these routes and assisting the PUJs, without any transfer cost, relocate their operations. By continuing working with PUB/PUJ organizations in identifying new, modified, truncated or feeder routes, and in assisting them obtain from the government agencies the requisite permits or operational clearances to operate under this new scheme, this SMP option alone will suffice as a social safeguard for the PUV industry.

5.5.8 Social Management Framework for the Affected Commercial Establishments

5.5.8.1 Entitlement Eligibility

Commercial establishments that will be affected close to the BRT stations are entitled to social safeguards under applicable Philippine laws and WB safeguard standards. The project architects and engineers will integrate innovative approaches and solutions during the detailed architectural and engineering design stage of project implementation to prevent any disturbance or negative impacts to these establishments. In the event that negative impacts cannot be avoided, these establishments are entitled according to the following entitlement matrix

Table 5.5.2: Eligibility Entitlement Matrix, Affected Establishments on BRT Stations, Metro Manila BRT Line-1 Project

Type of Loss	Magnitude and Characteristic	Eligible Persons	Entitlement
A. Land	Full	Owner	Full cash compensation at replacement cost without deduction for capital gains, documentary stamp, transfer taxes, and other directly related transaction costs
	Partial	Owner	Full cash compensation at replacement cost for the affected portion without deduction for capital gains, documentary stamp, transfer taxes, survey costs, cost of new subdivision plan, and other transaction costs.
B. Structure	Full	Owner-Occupant	Full cash compensation at replacement cost for the affected structure without deduction for (i) salvaged/salvageable materials; (ii) depreciation. Replacement cost includes not only the cost of materials but also the cost of (i) architectural services; (ii) hauling cost of materials; (iii) labor cost; (iv) cost of reinstalling utilities; (v) contractor's profits; and (vi) cost of processing or securing the necessary government permits. Cost of transferring to the new structure, including any loss of wages or income incurred in the process.
		Renters	Full cash compensation at replacement cost for any fixed improvements introduced. Cost of transferring to the new structure, including any loss of wages or income incurred in the process.
	Partial	Owner-Occupant	Full cash compensation at replacement cost for the affected portion of the structure without deduction for (i) salvaged/ salvageable materials; (ii) depreciation. Replacement cost includes not only the cost of materials but also the cost of (i) architectural services; (ii) hauling cost of materials; (iii) labor cost; (iv) cost of reinstalling utilities; (v) contractor's profits; and (vi) cost of processing or

Type of Loss	Magnitude and Characteristic	Eligible Persons	Entitlement
			securing the necessary government permits. If owner occupant requires a separate dwelling, while repair is ongoing, a rental subsidy equivalent to the estimated time it will take to repair the structure. Cost of transferring to the provisional structure and returning to the repaired structure, including any loss of wages or income incurred in the process.
		Renter	Full cash compensation at replacement cost for the fixed improvements introduced by the renter. In consultation with the owner, guarantee to continue renting the facility upon completion of repair. Rental period will be equivalent to the unutilized portion of the contract and same rental rates will apply. If renter requires a separate dwelling, while repair is ongoing, a rental subsidy equivalent to the estimated time it will take to repair the structure. Cost of transferring to the provisional structure and returning to the repaired structure, including any loss of wages or income incurred in the process. If renter does not opt to return, the project will shoulder the cost of transferring to the new structure, including any loss of wages or income incurred in the process.
	Informal (Commercial)	Encroachers on public ROW	No compensation for structures; loss of business income capped at a maximum of five (5) days while structure is reorganized or transferred; Retention of ownership of salvaged materials.
	Utilities	Private Utility Company	If facilities are located in public ROW, utility company usually shoulders the cost of relocation to a new site or reconstruction in the new site. If facilities are located in private land, the project shoulders the cost of transferring or reconstruction, if the facility needs to be demolished.
C. Income	Temporary closure as business is relocated off-site.	Workers	Lost wages for days without work due to closure and transfer of the enterprise to new site. The maximum is one (1) month.
		Enterprise Owners-Renters	Lost net income for days of business closure due to transfer of the enterprise to the new site. The maximum is one (1) month.
		Land and/or Structure - Owner	Rental contracts usually stipulate forfeiture of deposit (1 or two months) if contract is pre-terminated; therefore no compensation for lost rental income is given.
	Permanent Closure	Workers (Temporary; Daily Wage)	Compensation for lost wages equivalent to the remaining days in the contract (usually less than six months).
		Workers (Permanent or Tenured)	The entitlements for permanent workers found in the Labor Code or the Collective Bargaining Agreement (if the establishment has one) will be followed

5.5.8.2 Identification, Tagging and Appraisal

620. During the detailed engineering design, a cut-off date for inclusion as PAPs shall be set and affected establishments will be identified and tagged. A professional appraiser will appraise the replacement value of the structures to be affected and determine appropriate compensation based on the above entitlement matrix.

5.5.8.3 Consultations with PAPs and Compensation

621. During the detailed engineering design and after the affected establishments have been identified, tagged and appraised, the meetings will be organized to inform the DPs of the project impact on their establishment. Their suggestions and recommendations that may facilitate the implementation of the compensation program will be heard. Detailed information about the DPs including names, address, contact numbers, detailed explanation for reasons of their displacement and the breakdown of compensation and entitlements shall be compiled in a database.

622. PAPs shall be compensated or be given their entitlement package as determined by a professional appraiser prior to commencement of any construction works.

5.5.9 Gender Action Plan

623. The most pressing concerns for women in the PUBLIC TRANSPORT sector are as follows:

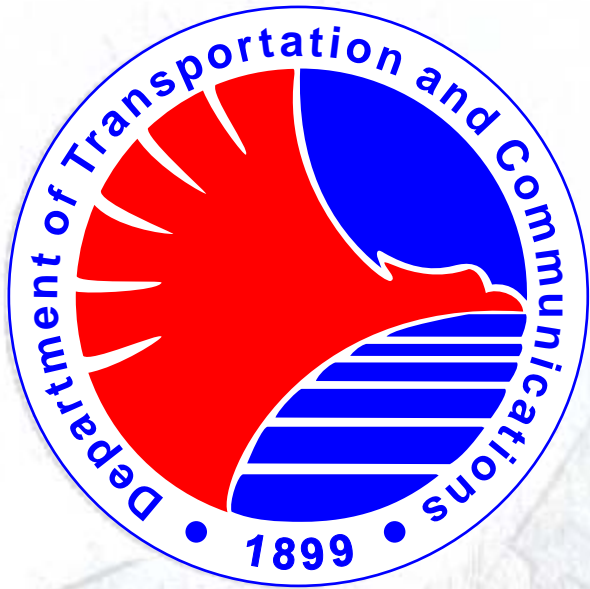
- 1) the harassment that they encounter in over-crowded PUBLIC TRANSPORT vehicles – this is prevalent not only PUJs and PUBs but also occurs in railway vehicles such as the MRT and LRT in Metro Manila;
- 2) difficulty in boarding and alighting – this is experienced by women primarily on public utility buses (PUB) currently serving the metropolis with only have one door for boarding and alighting, making it difficult to get off when with children or with bags, especially when one is seated or standing at the rear end of the bus and the aisle is full with standing passengers.

624. Women employees are also not well-represented in the PUBLIC TRANSPORT sector where drivers and conductors are predominantly men. Integrating these concerns in the implementation of the Metro Manila BRT-Line 1 project requires the following action plans:

- 1) The BRT system shall be designed for ease of boarding and alighting with buses and the stations at the same level. This makes it easier to load and unload strollers. Where necessary, drop down ramps may be provided.
- 2) The system shall address the issue of encumbrances of passengers including over-crowding by provision of sufficient space passengers and cargo. When over-crowding persists, the BRT shall provide separate areas and doors for women; and
- 3) Creating a policy environment that promotes equal employment opportunity for women in the BRT system.

5.5.10 SMP Measures to address accessibility to PWDs, elderly and students

625. The BRT system shall integrate appropriate public transportation design standards that will address safety and accessibility for persons with disabilities, elderly and students based on existing laws and policies of the Philippine government and international covenants and standards as spelled out in the legal and policy framework. Students, senior citizens, and PWDs shall be afforded discounted fares based on applicable regulations on passenger fares. Among others, Batas Pambansa (BP) Blg. 344 s. 1983 (Accessibility Law), Republic Act No. 7277 s. 1991 as amended by Republic Act No. 9422 s. 2006 (Magna Carta for Disabled Persons) and DOTC Department Order No. 2014-013 – Policies on Transport Accessibility, which sets forth the rules and regulations to provide for minimum requirements and standards to make public transportation facilities and utilities accessible to PWDs pursuant to the objectives of BP 344, must be incorporated in the design and operating guidelines of the BRT Project.



Chapter 6: Ananalysis of Alternatives

6.0 ANALYSIS OF ALTERNATIVES

626. The purpose of this section is to describe and analyze by comparison the general characteristics of the No Project alternative and the With Project alternative.

6.1 No-Project Alternative

627. The BRT Project will catalyze Metro Manila's urban road network to cope with traffic demands expected in conjunction with other complementary development plans. Without the BRT Project, the existing transport system and road network will be insufficient in capacity to accommodate existing and future traffic demands.

628. The No-Project Alternative would mean maintaining the status quo with which only routine activities such as road maintenance and repair shall be undertaken on the proposed BRT corridor. Safety improvements in the existing transport system would only occur as the need arises or over the next several years. It is assumed that the No-Project Alternative does not include improvements that would increase roadway capacity, reduce congestion, or improve safety meaningfully.

629. The No-Project Scenario would likewise mean the continuation of the current public transport system which is dominated by inefficient buses, jeepneys, mini-buses, shuttle services, and taxis. In some sections of the roadway, tricycles, multi-cabs and pedicabs are also among the current inefficient public transportation options of the commuting public. Current motorized vehicles in the metropolitan roads and highways represent anthropogenic sources of greenhouse gases (GHG) that would occur in the absence of the proposed BRT project. Without the BRT project, Metro Manila and its people will be completely deprived of the benefits that may be generated by the BRT project. These benefits include reduced CO₂ and GHG emissions, reduced traffic congestion, improved traffic safety, potential reduction in travel time, and transport cost savings accruing to the public as end users.

630. Under the No Project scenario, travel demand will increase while no additional capacity is provided. Traffic volume as expressed in terms of vehicle kilometers (v-km) across the Metro Manila, is forecast to increase from around 755,000 v-km in 2013 to around 1,775,000 v-km in 2040. With no increase in network capacity, the result is rapid deterioration in traffic speeds, from around 20.3 km per hour (kph) in 2012 to just 3.8 kph in 2040.³ The low speeds forecast represents an untenable situation in the future and thus require interventions including demand management, highway improvements, and public transport improvements that must be introduced in the short- and medium-terms.

6.2 With Project Alternative

631. In the face of growing vehicular congestion and slowing travel time, there is a clear need for transport interventions along the corridor. With the proposed BRT project, savings of up to 12 percent in v-km volume are expected to accrue starting 2025 arising from the better efficiency in public transportation system.⁴ Speed improvements of up to one (1) kph are also anticipated by year 2015. GHG savings over 30 years as a result of the BRT project is 6.21 million tons or a yearly GHG savings of 207,000 tonnes.

632. In general, transport projects that improve overall accessibility and reduce transportation costs, such as in the case of Metro Manila BRT Line 1, tend to increase economic productivity and development. They improve businesses' ability to provide goods and services, and people's ability to access education, employment, utilities, and services. Efficient public transportation also results to shorter travel time, lower vehicle operating costs, lower road and parking facility costs, and reduced accident and pollution damages. Accidents are also expected to drop as a result of efficient public transportation system.

³ Figures from the Detailed Technical Study

⁴ Vehicle-km savings is from the Detailed Technical Study.

633. The proposed BRT system is considered generally as a public transport mode that provides almost same levels-of-service (LOS) of a mass transit system that is rail-based (e.g., LRT). The rail-based system however entails high cost of construction, operation and development. The BRT system has almost same exclusive ROW as the LRT, but is cheaper than a rail-based mass transportation system to develop while it has the capacity to provide same efficient commuting service to the public.

634. In the context of reducing the negative impacts of transport system to the environment, specifically on air quality, the BRT system can provide, to some extent, same levels of mitigation to that of LRT, as shown in various cities with BRT systems. Given again the experiences in other countries, it was shown that BRT system can significantly reduce carbon footprints in urban or metropolitan areas. The BRT system is a much better alternative when compared to the current public transport systems with respect to providing green ambiance and a better physical landscape to the urban setting. As such, the introduction of the BRT system is therefore anticipated to contribute positively in the overall transport system in Metro Manila.

6.3 Project Alternatives

6.3.1 Alternative BRT Routes

635. With the help of various government agencies and international groups, DOTC has come up with a strategic mass transit network within Metro Manila and nearby cities (see **Figure 6.3.1**) with the purpose of easing traffic in Metro Manila. Part of this plan is the implementation of a BRT system at selected routes within Metro Manila. The other BRT routes under the plan are along Commonwealth Ave and Quezon – Espana Boulevards (BRT 1), Ortigas Ave (BRT 2), and C-5 Road (BRT 3).

636. The Commonwealth - Quezon - España Boulevard corridor is a main strategic transport route cutting diagonally through the upper half of Metro Manila. It is a route that is not currently served by any form of mass transit although the planned MRT Line 7, if approved, will also serve the northern half of the corridor between SM Fairview and Elliptical Road. The corridor's strategic importance and its connections with LRT1, MRT3 and Philippine National Rail together with its high volume of travel would suggest that the corridor has justification as a form of mass transit route.

637. In 2013, a detailed technical study was conducted to examine the España - Quezon Avenue - Commonwealth Avenue corridor. Study revealed that traffic congestion is concentrated in España and Quezon Avenues between Manila City Hall and Philcoa. However, Commonwealth Avenue between Philcoa and Fairview is wide and large, at present, without congestion. It may also be served by MRT7 if approved which will further increase traffic mobility in the serviced areas.

638. During the course of the DTS, an option to route the BRT alignment via Nicanor Reyes and CM Recto Avenue; rather than Lerma Avenue and Quezon Boulevard was explored. This alternative is outlined in **Figure 6.3.2**.



Figure 6.3.1: Strategic Mass Transit Network in Metro Manila Proposed by DOTC



Figure 6.3.2: Alternative BRT Routes via (1) Nicanor Reyes and CM Recto Avenue and (2) Lerma Avenue and Quezon Boulevard

639. An evaluation of this alternative option compared to the current proposed option is set out in **Table 6.3.1**, below.

Table 6.3.1: Evaluation of Alternative Bus Route Options via (1) Nicanor Reyes and CM Recto Avenue and (2) Lerma Avenue and Quezon Boulevard

Route Option	Advantages	Disadvantages
Nicanor Reyes/CM Recto (Alternative)	<ul style="list-style-type: none"> Serves STARC and FEU (on Nicanor) Serves retail on Nicanor and CM Recto 	<ul style="list-style-type: none"> Takes up one lane of only two at N end of Nicanor S bound at grade road parallel to Quezon Boulevard has many market stalls N bound at grade road heavily trafficked

Route Option	Advantages	Disadvantages
		<ul style="list-style-type: none"> • Heavy traffic conflict on exit from/and entry to median on Quezon Boulevard • Swept path Nicanor/CM Recto clashes with substantial LRT column
Lerma Avenue/ Quezon Boulevard (Current)	<ul style="list-style-type: none"> • Minimal traffic conflict • Higher speeds 	<ul style="list-style-type: none"> • Less educational facilities and shops served • Mixed running on NE bound turn into Lerma Avenue

640. The issue of clashing with the LRT support on CM Recto outweighs the advantages of this route and the proposed Lerma Ave/Quezon Boulevard route is chosen.

6.3.2 BRT System over LRT System

641. One approach in addressing traffic congestion (and deterioration of the environment due to impacts of transport systems) is the introduction of an efficient high occupancy public transport system that is in the form of a mass transit system. Two alternatives mass transport system that are commonly used in cities around the world are the LRT and BRT systems. The LRT and BRT systems have done great help to decrease and ease traffic along their respective locations. While generally agreed that the two systems deliver more or less the same service, the BRT is significantly cheaper to build and maintain. Whereas light rails and subways have a larger capacity and are favored in more developed countries, BRT systems are much cheaper and quicker to build, and are thus favored in the cities and megacities of the developing world. A comparison of LRT and BRT systems in terms of capital cost, operating cost and speeds reflects the advantage of the latter as an alternative mass transportation system (Table 6.3.2)

Table 6.3.2: Comparative analysis of BRT and LRT Systems⁵

Capital Cost	Bus Rapid Transit has a clear capital cost advantage over light-rail systems, in the identified three main locations of BRT implementation: Busways, HOV lanes, and arterial streets. While the fixed costs of building these three options varied, with busways being the most expensive, each option was less expensive per mile than light rail. Light rail costs an average of \$34.8 million per mile (\$21.6 million per km) to build, whereas busways cost \$13.5 million per mile (\$8.4 million per km), or 60.2 percent less than light rail. HOV lanes and arterial streets built for BRT use cost even less, at \$9.0 million per mile (\$5.6 million per km) and \$680,000 per mile (\$422,000 per km), respectively. These systems cost 61 percent, 74 percent and 98 percent less than light-rail systems
Operating Cost	Proper consideration of the cost of one system compared to another must include not only the burden of initial construction, but the ongoing costs of operation, as well. The operating costs of these two systems clearly demonstrate a vast difference. Estimate for Denver's BRT system is that BRT costs 80.8 percent less per mile to operate than light rail.
Speed	There is a marked difference in speed between Bus Rapid Transit and light rail systems. In five cities that use both systems (Dallas, Denver, Pittsburgh, San Diego and San Jose), the average speed of BRT service is

⁵ Bus-Rapid Transit Is Better Than Rail: The Smart Alternative to Light Rail by Joseph P. Kubala, P.E. and Scott Barton, Center for the American Dream, Independence Institute, Issue Paper #10-2003, December 16, 2003.

	<p>faster than light rail, sometimes much faster. On average, the speed of BRT systems in these cities is 47 percent faster than light rail. In Denver, it was found that bus-rapid transit runs about 69 percent faster than light rail. The speed advantages of BRT are largely the result of running buses on highway HOV lanes, less loading times, and technological improvements to bus service. It was concluded that BRT is not only faster, it is more convenient due to fewer transfers and closer delivery to the consumers' destinations.</p>
<p>Other Benefits</p>	<ul style="list-style-type: none"> • BRT is much more flexible than light rail. Since rail lines are fixed, they cannot respond to changes in employment and land use, whereas BRT service can be rerouted and shifted over time to correspond with the changing transportation needs of a city. • BRT systems can provide long-distance service without requiring transfers. This advantage allows BRT to overcome a serious disincentive to transit • systems like light rail that usually require transfers between buses or automobiles. • BRT systems can be phased in step by step. Improvements can be made gradually and operations can begin before every element is in place, unlike light rail, which must be fully completed before service can begin. • BRT systems that use HOV lanes can be easily converted to high-occupancy/toll (HOT) lanes to decrease congestion in regular lanes and to generate capital. The shared use of facilities between BRT, HOV, and HOT lanes yields more utility at no or minimal expense, less conflict between technologies, and the opportunity to generate revenue.

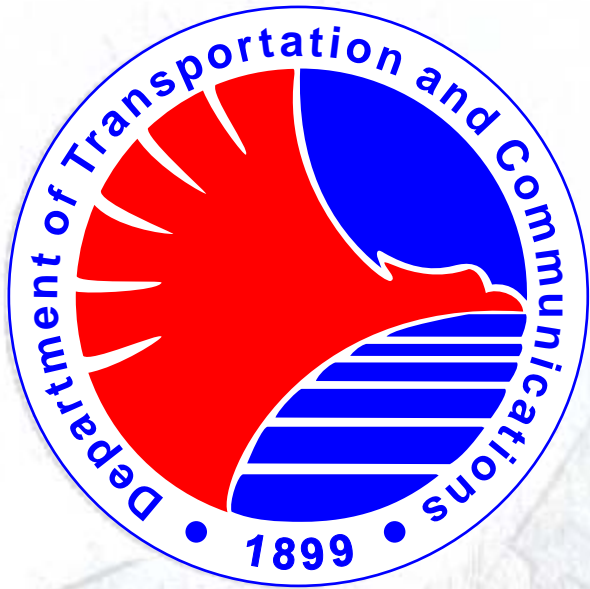
6.3.3 Other Alternatives Studied for the Project

642. **Table 6.3.3** provide the summary of various alternatives that were considered in coming up with the specification of the proposed BRT project. Justifications on the recommended alternatives for each of the items were likewise provided.

Table 6.3.3: Summary of Various Alternatives Studied

Concept Issue	Option	Linkage	Recommendation	Justification/Information
Configuration of running lanes	Median with median stations Median with bilateral stations Median with cross over Median with tidal flow Bilateral	Median with median stations Median with bilateral stations Median with cross over Median with tidal flow Bilateral	Median operation with median stations	Limited roadway width, lack of service lanes, proliferation of roadside activity result in median operation recommendation. Median stations are recommended to reduce cross section and hence right of way acquisition.
Pedestrian crossing	At grade Via skywalk Mixed	Accessibility	Mixed according to Location	Minimizing passenger inconvenience is paramount with respect to issues of safety and impact upon overall road capacity
Regulation	Closed to non BRT Open to all	Configuration Trunk/direct Ticketing Vehicles	BRT way closed to all non BRT specified vehicles. BRT route has some regulatory protection.	A form of regulatory control is required to protect against competition. Some service overlap is desirable
Trunk (closed) or direct (open) service	Trunk-feeder Direct	Configuration Vehicles	A mixed trunk and direct (tributary) system	Demand has shown significant trip origins outside of the defined BRT infrastructure. Efficient service of that demand requires some direct services.
Accessibility	Step free access throughout Some steps Steps	Pedestrian crossing Vehicles Stations	Platform to bottom step height (350mm)	Higher platforms to achieve step free access would effectively require a closed (trunk-feeder) system and potentially closed stations. Proposal offers significant assistance to many with mobility problems.
Ticketing	On board Off board Paper Magnetic Smartcard	Vehicle Stations	Tentatively, off board smartcard within the BRT with on board payment system for tributary services. Further consideration at Feasibility Stage required.	Ease of payment, manageable technology risk and association with high technology.
Number of lanes	Single Twin	None	Single lane system with by pass lanes at some stations to facilitate express services	High demand is forecast and benefits in operating express services identified.
Vehicle type	11.0m twin-axle bus 13.7m three-axle bus 18.0m articulated bus Diesel LPG/CNG Hybrid High floor (2 step) High floor (1 step) Low floor	Configuration Accessibility	13.7m three-axle bus with 610mm floor.	Good passenger access and good weight distribution between the axles. The tri-axle bus has potential unutilized axle capacity, either alternative-fuel or hybrid power train options could be pursued without reducing passenger numbers.
Stations	Open Closed	Configuration Vehicles	Closed stations within the BRT system, Open stations to serve tributaries	To facilitate efficient boarding/alighting to reduce vehicle dwell times and enhance run times.

Source: DTS for the Manila – Quezon Corridor Improvement Project, Final Report, December 2013, V1.0.



Chapter 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

7.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

643. The ESMP that are described and provided in this document serves as guidance only to the DOTC (as Executing Agency) and the Contractor/s for the eventual construction of the project. In the absence of the project Detailed Engineering Design (DED), various environmental management plans are stated akin to guidelines which will form part of the TOR for the DED Consultant to ensure that these guidelines are updated into management plans together with the DED. Specific and/or detailed management plans for each area of concern shall be formulated and customized based on the results of the DED subject to the final approval of DOTC.

7.1 ESMP Safeguard Compliance

644. For this BRT Line-1 Project, 2-levels of environmental and social safeguards review and approvals will be undertaken under the (1) WB Safeguard Policy and (2) country's Philippine Environmental Impact Statement System (PEISS).

645. The WB Safeguard Policy that are triggered are as follows::

Safeguard policy	Triggered?	Explanation
Environmental Assessment OP/ BP 4.01	Yes	<ul style="list-style-type: none"> • The project is expected to generate adverse environment and social impacts from civil works (dusts, wastes, noise and vibration) • The project shall contribute to the traffic problem during construction; • Some trees shall be removed during bus stations constructions; • The project will result in loss of income for (a) vendors and business establishments along the corridor; and (b) PUJ and PUB operators and drivers
Involuntary Resettlement OP/BP 4.12	Yes	<ul style="list-style-type: none"> • Project requires land taking for its north and south depots' • However, OP 4.12 may not be triggered for the siting of and constructions of bus stations as ROW acquisition avoidance will be strictly implemented.

646. PEISS was established in 1977 by virtue of presidential decrees PD1152 and PD1586 and a series of subsidiary legislation, administrative orders and memoranda that regulate the operations of the system. The Department of Environment and Natural Resources (DENR) is the authority and DENR regulates Administrative Order 30 Series of 2003 (DAO 03-30) contains the Implementing Rules and Regulations of the of GOP The Government of the Philippines (GOP) requires all projects categorized as environmentally critical (ECPs) or within environmentally critical areas (ECAs) to go through an assessment process referred to as the EIS System that requires Environmental Impact Assessment (EIA). DENR will review the environmental assessment and clearance certification before construction can commence.

647. The PMO through its PIU is required to obtain approval and the Environmental Clearance certificate (ECC) from the Department of Environment and Natural Resources (DENR) following environmental assessment and public consultation. It has been clarified by DENR that under the Environmental Impact System of the Philippines (EIS) the project requires EIA, and PMO/PIU should disclose the scale and scope of the project works under the provisions of the EIS prior to the detailed design stage in a timely manner so that DENR can reconfirm procedures that need to be completed under the environmental laws in Philippines so as not to delay implementation of the project.

Environmental quality standards for the protection environment are provided by relevant national laws and regulations.

7.1.1 Responsibilities for ESMP Implementation

648. A Technical Working Group has been established for the Project by DOTC to provide policy guidance and interagency coordination. Department of Transport and Communications will be the executing agency for the proposed project. DOTC shall be assisted by its PMO and PIU in overseeing the implementation of the project.

649. Under PPP scheme, DOTC shall delegate the implementation of the project to a Special Purposes Company (SPC) comprised of the Engineering, Procurement and Commissioning (EPC) and the Technical Support Consultant (TSC) and eventually by a Technical Services provider who will be responsible in the operations and maintenance of the BRT Line-1 system.

650. For purposes of this assessment it is assumed that DOTC will engage or designate a Special Purposes Company (SPC) to (i) ensure coordination among all implementing agencies during construction; and (ii) design and negotiate the business model of BRT Line-1 project and monitor its future operations. The SPC will be created under and will report directly to DOTC. Throughout the project implementation, the SPC will be supported strongly by the EPC and Technical Support Consultants.

651. The EPC (under the SPC) will cover engineering, procurement, construction management and supervision and will be engaged to undertake detailed design and supervise the construction. The consulting packages will include capacity building.

652. The SPC will be created for the construction and operation of the BRT Line-1 and will be responsible for overall project management and coordination. The SPC will engage consultants such as the TSC as necessary for project management and coordination, detailed design and construction supervision. The SPC with assistants of the consultants will engage the contractors for construction.

653. **Table 7.1.1** defines the responsibilities for ESMP implementation while the proposed Organizational Chart for Metro Manila BRT Line-1 (with respect to ESMP formulation and implementation) is shown in **Figure 7.1.1**.

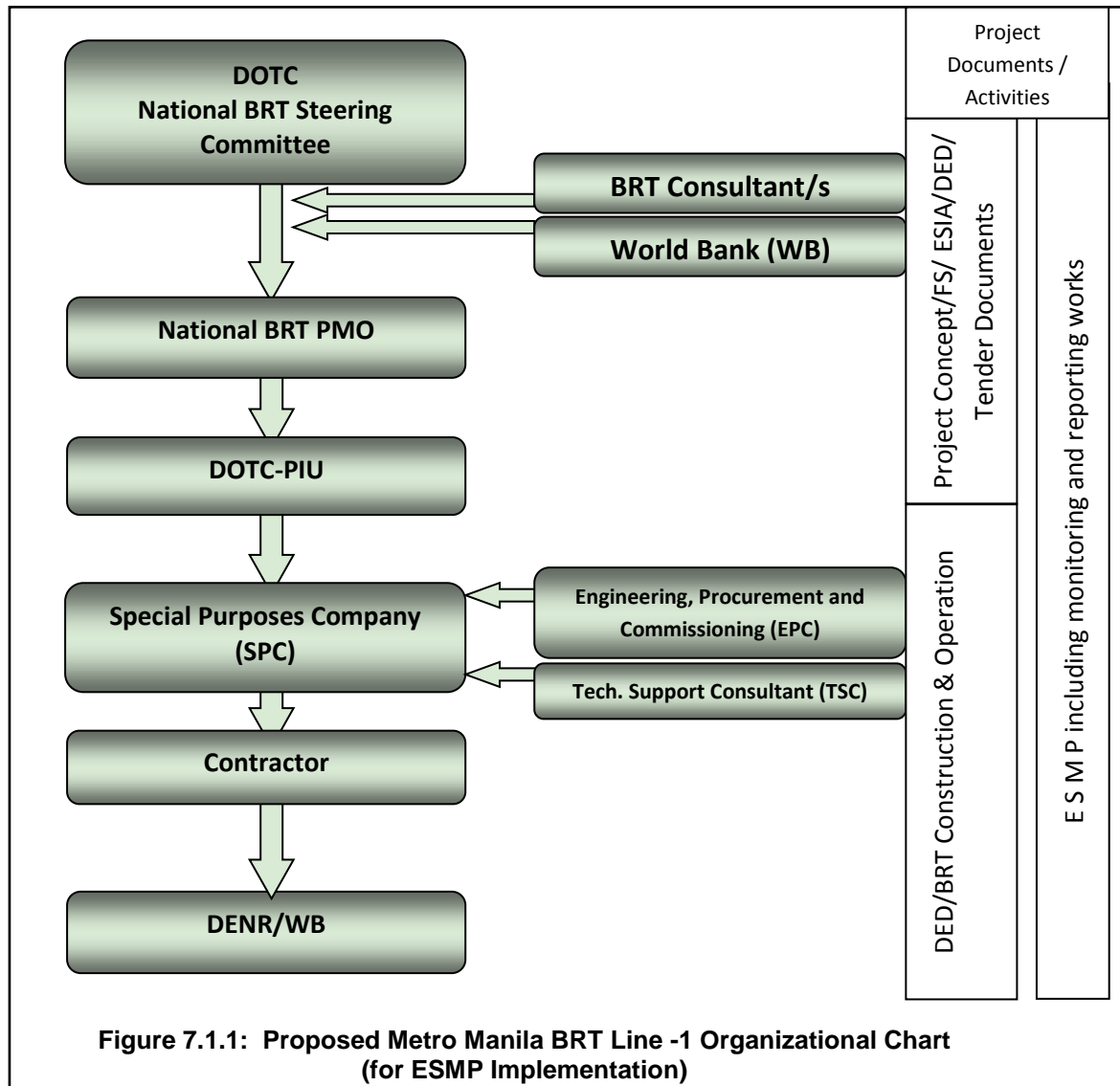
Table 7.1.1: Responsibilities for ESMP Implementation

Agency	Responsibilities
Department of Transport and Communications and Project Management Office (PMO)	<ul style="list-style-type: none"> • Executing agency with overall responsibility for BRT Line-1 Project implementation. • Ensure that sufficient funds are made available to Special Purposes Company (SPC) to properly implement the ESMP • Ensure that SPC, regardless of financing source, complies with the provisions of the ESMP and <i>WB environmental policies and particularly WB POLICY OP 4.01</i> • Ensure that SPC complies with Government environmental policies and regulations. • For project duration ensure that the SPC retain dedicated Technical Support Consultants including environment and safety and social safeguard officers to oversee ESMP implementation. • Ensure that SPC monitors environmental protection and mitigation measures in the ESMP and ESMP are incorporated in the detailed designs • Ensure that SPC applies the necessary resources to obtain environmental clearances certification under EIS from DENR prior to award of civil works contracts • Ensure that SPC establishes and implements an environmental grievance redress mechanism, as described in the ESIA, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance • Ensure that SPC confirms that bidding and contract documents include the

Agency	Responsibilities
	<p>ESMP.</p> <ul style="list-style-type: none"> • Ensure that SPC submits semi-annual monitoring reports on ESMP implementation to WB.
Special Purposes Company (SPC)	<ul style="list-style-type: none"> • Implementing agency with overall responsibility for project construction and operation • Ensure that sufficient funds are available from DOTC to properly implement the ESMP. • Ensure that Project, regardless of financing source, complies with the provisions of the ESMP and <i>WB environmental policies and particularly WB POLICY OP 4.01</i> • Ensure that Project implementation complies with Government environmental policies and regulations • For project duration ensure that commencing from the detailed design phase the Technical Support Consultants (TSC) commit and retain dedicated environment and safety and social safeguard officers to oversee ESMP implementation. • Ensure that environmental and social protection and mitigation measures in the ESMP are incorporated in the detailed designs • Obtain necessary environmental clearances certification from DENR prior to award of civil works contracts • Establish and implement an environmental grievance redress mechanism, as described in the ESIA, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance • Confirm that bidding and contract documents include the ESMP • Submit semi-annual monitoring reports on ESMP implementation to WB.
Project Implementation Unit (PIU).	<ul style="list-style-type: none"> • Ensure that bidding and contract documents include the ESMP • Submit monthly and semi-annual monitoring reports on ESMP implementation to SPC • Include in the Project ESMP and specify requirement for preparation and implementation of method statement/site specific ESMPs by the contractors as described in the ESIA • Ensure that ESMP provisions are strictly implemented during various project phases (design/pre-construction, construction and operation) to mitigate environmental impacts to acceptable levels. • Ensure that Project implementation complies with WB's environmental policy OP 4.01 and the principles and requirements therein • For project duration, commit and retain a dedicated staff within each PIU as environment and safety and social safeguard officers to oversee ESMP implementation • Check that environmental protection and mitigation measures in the ESMP are incorporated in the detailed designs • Check that necessary environmental clearances and approval(s) from DENR prior to award of civil works contracts • Participate in an environmental grievance redress mechanism, as described in the ESIA, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance • Undertake monitoring of the implementation of the ESMP (mitigation and monitoring measures) with assistance from TSC. • Report to WB on all aspects of environmental and social management and monitoring at six month intervals, based on the results of ESMP monitoring • With support from TSC, prepare semi-annual environmental and social monitoring reports for submission to WB. • Based on the results of ESMP monitoring, identify environmental and social corrective actions and prepare a corrective action plan, as necessary, for submission to WB

Agency	Responsibilities
Technical Support Consultant (TSC) and Engineering, Procurement and Commissioning (EPC)	<ul style="list-style-type: none"> • Incorporate into the project design the environmental protection and mitigation measures identified in the ESMP for the design stage; • Update the ESIA and ESMP based on detailed design. • Assist SPO/PIU to ensure that all environmental and social requirements and mitigation measures from the ESIA and ESMP are incorporated in the bidding and contracts documents • During detailed engineering phase, prepare draft method statement/ESMPs (Traffic Management Plan, Utilities, Runoff Control Plan, Waste Management and Spoil Disposal Plan, Noise and Dust Control Plan, etc.) described in the ESIA/ESMP. • Prior to construction, review and approve in writing the updated ESMPs/method statements prepared in consultation with contractors • Implement all mitigation and monitoring measures for various project phases specified as TSC's tasks in the ESMP • Work within PIU to execute any additional environmental assessment prior to project construction as required in the ESMP (e.g., preparation of new or supplementary environmental assessment in case of change in alignment that will result to adverse environmental impacts that are not within the scope of the ESIA prepared during loan processing, etc.) • On behalf of SPC prepare and submit statutory ESIA and obtain environmental clearance certification prior to project construction as required in the ESMP (Also preparation of new or supplementary environmental assessment in case of change in alignment that will result to adverse environmental impacts that are not within the scope of the ESIA prepared during loan processing, etc.) • Assist SPC and PIU in obtaining environmental approvals and certification (e.g., ECC) under PEISS from DENR prior to award of civil works contracts. • Undertake environmental management capacity building activities for SPC and BRT PIU as described in the ESIA and ESMP • Engage environment and, safety and social safeguard specialists to ensure proper implementation of ESMP provisions. Through these specialist, the TSC shall: (i) ensure proper and timely implementation of TSC tasks specified in the ESMP, (ii) conduct environmental training as specified in the ESIA/ESMP for SPC and BRT PIU (iii) conduct contractors workers' orientation on ESMP provisions, (iv) undertake regular monitoring of the contractor's environmental performance, as scheduled in the ESMP (v) conduct field measurements for dust and noise as required in the ESMP, and (v) prepare environmental baseline report and environmental semi-annual environmental monitoring reports , as specified in the ESMP, for SPC submission to WB
Contractor	<ul style="list-style-type: none"> • Recruit qualified environmental and safety and social safeguard officers to ensure compliance with environmental statutory and contractual obligations and proper implementation of the ESMP • Implement Traffic Management Plan with relevant authorities • Implement Utility Management Plan in close coordination with relevant authorities and agencies. • Implement Noise and Dust Control Plan with relevant authorities • Prior to start of construction, update the draft ESMPs for approval by TSC and PIU. • Provide sufficient funding and human resources for proper and timely implementation of required mitigation measures in the ESMP and segregate these sums in the bidding documents • Implement additional environmental mitigation measures for unexpected impacts, as necessary
Department of Environment and	<ul style="list-style-type: none"> • Review and approve environmental assessment reports required by the Government. • Issue environmental clearance certification for the Project based on their

Agency	Responsibilities
National Resources	mandate and regulations <ul style="list-style-type: none"> Undertake monitoring of the project's environmental performance based on their mandate
Manila City, Quezon City and Barangay LGUs	<ul style="list-style-type: none"> Participate in the review and approval of environmental assessment reports required by the Government; Issue local business permits and based on their mandate and regulations Participate in the monitoring of the project's environmental performance based on their mandate



654. To facilitate the ESMP implementation, during construction the contractors must be prepared during the tendering and pre-construction phase to cooperate with SPC/TSC, PIU and the local population in the mitigation of impacts. However, experience suggests that contractors may have little impetus or interest in dealing with environmental problems in the absence of performance-related criteria. Therefore, as previously mentioned, the Contractor will be required (with the assistance of the TSC) to update the draft site specific ESMP prepared by the TSC during detailed design phase. Clearances for payments will include certification from the TSC and PIU as to the effective implementation of the ESMP and all other mitigation measures specified in the ESMP. The completion of implementation of mitigation measures will therefore be linked to payment milestones.

655. Other government agencies that may be involved in the implementation of the ESMP are presented in **Table 7.1.2**.

Table 7.1.2: Other Entities that may be involved in ESMP Implementation

City Environment and Natural Resources Office (CENRO)	<ul style="list-style-type: none"> Undertake monitoring of the project's environmental performance based on their mandate
Department of Public Works and Highways	<ul style="list-style-type: none"> Has overall jurisdiction over national highways Coordinate with the PIU and the Contractor in the overall conduct of construction activities along the corridor including providing work permits that pertain to civil works required for the BRT system along Commonwealth and Quezon Avenue Of particular significance are the construction of ramps, signages, and other structures or provisions for PWDs, elderly, and women.
Metro Manila Development Authority (MMDA)	<ul style="list-style-type: none"> In coordination with LTFRB, update travel lines for the restructured routes and manage traffic in keeping with its mandate.
Land Transportation Office (LTO)	<ul style="list-style-type: none"> In coordination with LTFRB and MMDA, will oversee the issuance of registration of vehicles and issuance of licenses of PUV drivers.
Land Transportation Franchising and Regulatory Board (LTFRB)	<ul style="list-style-type: none"> In coordination with MMDA, manage the migration of PUJ operators and drivers to restructured/new routes Issuing Certificate of Public Convenience for affected PUVs to operate on new routes or modified routes.
Technical Education and Skills Development Agency	<ul style="list-style-type: none"> Skills training provider to PAPs or members of affected household as part of the SEMP.

7.2 Environmental Management Plan (EMP)

656. The anticipated environmental impacts and mitigation measures discussed in the previous section are presented in **Table 7.2.1**. The table also shows responsibilities and timeframe/schedule for implementation of mitigation measures and monitoring.

657. Table 7.2.1 also shows that most mitigation activities during pre-construction are to be implemented by the DOTC PMO/PIU assisted by the SPC/TSC while during construction, measures shall be primarily implemented by the Contractors. During operation stage, the BRT Line-1 operator shall undertake environmental mitigation and monitoring requirements specified in the ESMP. To ensure implementation of mitigation measures during construction, the ESMP shall be included in the tender and contract documents for civil works. Contractors' conformity with environmental contract procedures and specifications shall be regularly monitored by PIU with assistance from TSC and results shall be reported semi-annually to WB and DENR.

7.3 Social Management Plan (SMP) and Monitoring Works

658. **Table 7.3.1** presents the summary of social impact management measures according to project phases (i.e., pre-construction, construction, and operation) and target population or stakeholder group. The implementing institution or agency for each social management measure and the source of financing are also indicated. The corresponding monitoring and evaluation mechanism are also provided for each activity.

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
DESIGN & PRE-CONSTRUCTION										
1. Design update and project disclosure	<ul style="list-style-type: none"> Incorporate design measures in the project design to minimize environmental impacts. Compliance with local statutory environmental assessment process. Establishment of Grievance Redress Mechanism (GRM) 	1. Secure the services of the Design and Supervision Consultant (TSC) to update designs and design requirements; 2. Update ESIA and ESMP based on detailed design and submit to WB for review and approval. 3. Ensure ESMP are included in bidding and contract documents 4. Notify Project to DENR and identify and obtain environmental permits / certificates under statutory environmental assessment process. 5. Implement plan for Grievance Redress Mechanism as described in the ESIA and inform local authorities 6. Based on the Project ESIA, prepare the following draft statements/site-	1 to 4 and 7: PIU 5 & 6 (i to ix): Design and Supervision Consultant (TSC)/PIU	1 to 3: Start of detailed design. 4: Before start of civil works 5 & 6 (i to ix): During detailed design phase	All BRT Line-1 route.	Cost included in PIU and TSC staffing and contracts for the undertaking of project design and DED	Environmental approval for the Project obtained from DENR. Response from DENR on permits. Require in TSC contract. check at DD. Complete check of items 1 to 7. Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 7.	Completed detailed design/prior to start of site works. Once.	PIU/SPC	Cost incurred by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		specific ESMP for updating by the contractor before construction commences: Waste Management and Spoil Disposal Plan, Materials Management Plan, Drainage Management Plan, Runoff Control Plan, Tree-cutting and Replanting Plan, Traffic Management Plan, Utilities Reprovision Plan, Noise and Dust Control Plan, and Workers and Public Safety Plan. These ESMP will demonstrate the manner (location, responsibilities, schedule/ timeframe, budget, etc.) in which the contractor will implement the mitigation measures specified in the Project ESMP, and other measures identified during detailed design. Further details that should be included in the above ESMP are provided in the								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		subsequent sections of this table and in Chapter 5 of the ESIA. 7. Incorporate/undertake the following measures in the project design: i. Land acquisition, resettlement and environmental impacts will be avoided or minimized by basing the detailed designs within the ROW as proposed in the preliminary designs. Assist affected PAPs from PUJ and PUB sector in shifting to alternative livelihood; ii. Potential solution spaces to ensure sufficient disposal space for cut surface spoil materials will be identified in advance by the TSC and approved by PIU and the local community before bidding. iii. Arrangements will be made to facilitate the timely production and supply of rock and bitumen based materials for construction and to avoid impacts due to unnecessary stockpiling near the								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		BRT Line -1 route. iv. Extensions and improvements of drainage culverts for BRT Line-1 drainage and the adjacent road will be designed to account for increased rain due to a once in 100 year return storm event. v. Hydrological and drainage impacts during construction will be minimized by including in the detailed design the early phasing of replacement of side drains, culverts and other infrastructure. vi. Disruption to current facilities for water supply will be avoided and facilities will be retained or re-provisioned before construction works commence; provisions will be made to preserve the operation of current facilities for water supply in sufficient quantity in agreement with the local community. vii. Disruption to current power supply will be avoided and movement of power lines will be planned								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>well in advance. Power distribution circuitry will be re-provisioned before construction works commence; provisions will be made to preserve the operation of current facilities for power supply in sufficient quantity in agreement with the local power supply company.</p> <p>viii. Disruption to telecommunications will be avoided and movement of telecommunication lines will be planned well in advance. Telecommunications lines will be re-provisioned before construction works commence; provisions will be made to preserve the operation of current facilities for telecommunications in sufficient quantity in agreement with the local power supply company.</p> <p>ix. Plans to minimize disturbance of vehicular traffic and pedestrians during construction will be included in the detailed designs. Plans will be discussed and agreed</p>								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>with the police authorities and other local authorities along the project corridor. Plans to avoid or minimize disturbance of vehicular traffic and pedestrians during construction will be included in the detailed design. Phasing and programming for construction will retain passing lanes along the road during construction and avoid community severance.</p> <p>x. Aim to provide enhancements under WB policy on environmentally responsible procurement and avoid negative impacts due to unnecessary removal of trees. Include compensatory tree planting as requested by Commissioner of Forests.</p> <p>xi. Include vendor spaces within station designs as source of livelihood for economically displaced PAPs</p>								
2. Project boundaries/location change	ESMP can avoid or minimize impacts and	1. Design BRT Line -1 and road upgrading works within ROW, to	SPC/ EPC/ TSC	Detailed design	Entire BRT Line-1 route	Included in SPC/ EPC/ TSC cost.	Require in TSC contract. Check at	Once, during detailed design.	SPC/PMO/PIU	Cost met by SPC/ PMO/ PIU

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
	compliance required for environmental laws.	avoid schools, hospitals and other sensitive receptors 2. Make the detail design of alignment to minimize loss of trees and other vegetation. 4. Detailed designs to provide for enhancement (e.g., landscaping, tree replanting) where practicable. 5. Make plans for tree replacement in coordination with local authorities DENR-Forest Management Bureau. 6. Update the ESMP should there be additional environmental impacts identified during detailed design and for which appropriate mitigation measures have not been included in the ESMP. Submit updated ESMP to WB for review before start of civil works. 7. Prepare a new or supplementary environmental assessment report in compliance with the WB's WB					Detailed design. Complete check of items 1 to 7 on detailed design. Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 7.			project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		Environmental Policy 4.01 if there are any additional components or modifications in the Project such as change in specific location/alignment, among others, that will result to adverse environmental impacts and are not within the scope of the environmental assessment report prepared during loan processing. Submit the report to WB for review before start of related civil works.								
3. Environmental capacity development	Develop environmental management capacity of and PMO/PIU to ensure proper ESMP implementation and promote environmental awareness among workers.	1. PIU to commit and retain dedicated environmental, safety and social safeguard officers staff for project duration to oversee ESMP implementation 2. TSC to train PMO/PIU to build their capacity on ESMP implementation, monitoring and reporting using workshops and on-the-job training techniques and case studies. 3. Conduct workers' orientation on ESMP provisions. Such	1: SPC/ PIU / TSC	Initiate during detailed design phase and continue throughout project construction	Key stakeholders throughout the BRT corridor (DOTC PMO/PIU, LGUs, GRC, etc.)	Cost included in SPC and TSC cost	Require in TSC contract. Check at DD. Complete training and check before and during construction. Complete check of items 1 to 3. Expected outputs/ outcome is compliance	Prior to start of site works and throughout construction phase.	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		orientation shall be periodically conducted by the TSC as every new contractor is engaged.					with all the ESMP mitigating measures in items 1 to 3.			
4a. Traffic Management Plan	Minimize traffic disruption and congestion.	1. Contact all relevant local authorities (MMDA and concerned LGUs) to implement Traffic Management Plan (TMP) during construction (to be updated later by the contractor) to minimize disturbance of vehicular traffic and pedestrians during construction. Access arrangements for vehicles accessing the Project area will be formulated such that this will avoid community disturbance and severance and will at least retain a passing lane along all roads used during construction. The plan will include consideration of the following i) Lane availability and minimizing interference with traffic flows past the works site.	TSC	Detailed design phase (before bidding)	Throughout the BRT corridor and immediate adjacent areas	Cost included in design fees.	Require in TSC contract. Check at DD Complete check of items 1 and 2. Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 and 2.	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		ii) Establishment of acceptable working hours and constraints. iii) Agreement on time scale and establishment of traffic flow/delay requirements. iv) Programming issues including the time of year and available resources. v) Discussion of the TSC/PIU inspection/monitoring role. vi) Establishment of complaints management system for duration of the works vii) Agreement on publicity/public consultation requirements (advance signing etc.).								
4b. Protect and re-provision power utilities and telecommunications	Minimize interruption to power and water supply and telecommunications	1. Identify all power and water supply, telecommunications systems likely to be interrupted by the works. 2. Contact all relevant local authorities for utilities and local district groups to plan	TSC	Detailed design phase (before bidding)	Throughout the BRT corridor	Cost included in design fees.	Require in TSC contract. Check at DD Complete check of items 1 to 3. Expected outputs/outcome is	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		reprovisioning of power and water supply and telecommunications. 3. Prepare a draft Utilities Reprovisioning Plan (to be updated later with contractor) to minimize interruption to power and water supply and telecoms.					compliance with all the ESMP mitigating measures in items 1 to 3.			
4c. Plan Waste and Spoil Disposal	Minimize waste; avoid pollution.	1. Re-use of waste materials & spoil disposal locations included in bid and contract documents. 2. Prepare a draft Waste Management Plan and Spoil Disposal Plan (to be updated by contractor later). The plan shall cover handling, storage, treatment, transport and disposal of solid and liquid wastes, hazardous materials, hazardous wastes and excavation spoils. 3. The General Waste section of the draft Waste Management Plan and Spoil Disposal Plan will include consideration of all matters related to	TSC	Detailed design phase (before bidding)	Throughout BRT Corridor and nearby areas	Cost included in design fees.	Require in TSC contract. Check at DD Complete check of items 1 to 5. Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 5.	Once, detailed design phase	SPO/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		solid and liquid waste disposal including the following: i) Expected types of waste and quantities of waste arising. ii) Waste reduction, reuse and recycling methods to be employed iii) Agreed reuse and recycling options and locations for disposal / endorsement from DENR and local groups. iv) Methods for treatment and disposal of all solid and liquid wastes. v) Methods of transportation to minimize interference with normal traffic. vi) Establishment of regular disposal schedule and constraints for hazardous waste. vii) Program for disposal of general waste / chain of custody for hazardous waste. viii) Discussion of the PIU/TSC								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		inspection/monitoring role. ix) Establishment of complaints management system for duration of the works x) Agreement on publicity/public consultation requirements (advance signing etc.). 4. The draft Waste Management Plan and Spoil Disposal Plan shall include a section on Hazardous Materials and Waste section. This will detail the mitigation measures, organizational arrangements, resources, facilities, etc. to avoid environmental as well as health and safety impacts due to use and disposal of hazardous materials/substances. 5. The Spoil Disposal section of the Waste Management Plan and Spoil Disposal Plan will include consideration of the following:								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		i) Locations and quantities of spoil arising from the construction works. ii) Agreed locations for disposal / endorsement from DENR and local groups. iii) Methods of transportation to minimize interference with normal traffic. iv) Establishment of acceptable working hours and constraints. v) Agreement on time scale and program for disposal and chain of custody. vi) Programming issues including the time of year and available resources. vii) Discussion of the PIU/TSC inspection/monitoring role. viii) Establishment of complaints management system for duration of the works ix) Agreement on publicity/public consultation requirements (advance								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		signing etc.).								
4d. Plan construction materials management	Avoid stockpiling of rock based materials and runoff.	<p>1. Designs to balance cut and fill where possible.</p> <p>2. Prepare a draft Materials Management Plan (to be updated by contractor later). The plan shall detail the arrangements to be made to facilitate the timely production and supply of construction materials to avoid impacts due to unnecessary stockpiling outside the Project site. As a minimum, the plan shall consider the following:</p> <p>(i) Required materials, potential sources and estimated quantities available,</p> <p>(ii) Impacts to identified sources and availability, (iii) Excavated slope material for reuse and recycling methods to be employed,</p> <p>(iv) Endorsement from DENR and local groups for use of sources.</p>	TSC	Detailed design phase (before bidding)	Throughout all the BRT corridor	Cost included in design fees.	<p>Require in TSC contract. Check at DD Complete check of items 1 to 3.</p> <p>Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 3.</p>	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		(v) Methods of transportation to minimize interference with normal traffic. (vi) Constraints of regular delivery schedule to reduce stockpiling on site. (vii) Program for reuse of slope excavated material for reuse (viii) Program for delivery of quarry and borrow materials. (ix) Discussion of the PIU/TSC inspection/monitoring role. (x) Agreement on publicity/public consultation requirements. 3. Prepare a draft mass haul chart for the aggregate and asphalt materials needed for the construction works.								
4e Drainage and Hydrological Impacts	To minimize hydrological impacts flooding and runoff of river banks	1. Designs culverts sufficient to control flooding with appropriate drainage structures to cater for worst case flow and rainfall from 100 year return storm and to dissipate energy of	TSC	Detailed design phase (before bidding)	Throughout all BRT corridor and immediate adjacent areas	Cost included in design fees.	Require in TSC contract. Check at DD Complete check of items 1 to 4. Expected outputs/	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		flow to reduce runoff. 2. Design embankment and drainage to address current flooding problems Ensure that rehabilitated road will not cause flooding of adjacent areas. 3. Prepare draft DRAINAGE MANAGEMENT PLAN (to be updated by contractor later). The plan shall detail measures and other provisions to ensure that construction works will not cause ponding/flooding within the Project site, construction camps, borrow/quarry areas, other areas used for project-related activities and adjacent areas.					outcome is compliance with all the ESMP mitigating measures in items 1 to 4.			
4f Runoff Control and Flooding	To minimize hydrological impacts, flooding damage to the works and runoff of river banks.	1. Incorporate runoff control and works stabilization measures in the engineering design such as side ditches and berms, rock lining and slope walls, where	TSC	Detailed design phase (before bidding)	Throughout all the BRT corridor and immediate adjacent areas	Cost included in design fees.	Require in TSC contract. Check at DD Complete check of implementation of items 1 to 7.	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		appropriate. 2. Cut areas of works designed not to undercut or destabilize adjacent trees. 3. Temporary drainage works are to be designed based on the historical flood data and flood forecasting. 4. Ensure design includes prevention of flooding in adjacent areas during or construction of bridges. 5. Incorporate in the design side drainage structures to divert the stream water at construction sites. 6. Design incorporates sufficient sizes of drains to take design flows. 7. Prepare a draft RUNOFF CONTROL PLAN (to be updated later by the contractor). The plan shall detail the arrangements/provisions to ensure that construction works will, not cause excessive runoff and siltation of waterways adjacent to					Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 7.			

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		the Project site, have sufficient provisions to ensure stabilization of cut areas of the works and other runoff-prone areas, minimize hydrological impacts, flooding and runoff of river banks and adjacent areas and to protect the works under construction. The plan will consider the following: i) Climate and rainfall for the area and checking weather forecasts. ii) Terrain and typical locations susceptible to runoff and runoff. iii) Protection of the works and potential impacts to the environment. iv) Runoff control methods to be employed, locations and installation timing. v) Limits to stockpiling on sites near waterways. vi) Discussion of the TSC/PIU inspection/monitoring role.								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		vii) Agreement on publicity/public consultation requirements.								
4g. Tree cutting	Minimize tree cutting	<p>1. Contact Forest Management Bureau, concerned LGUs and interested groups (for instance NGO) to plan tree cutting and replanting.</p> <p>2. Prepare a draft Tree Cutting and Replanting Plan (to be updated later by contractor) to avoid indiscriminate tree-cutting. The plan shall clearly define areas where tree removal is necessary based on Project requirements and shall have provisions for replanting to compensate for lost trees. The plan shall prohibit introduction of invasive species and shall specify that new alien plant species (i.e., species not currently established in the City) shall not be used unless carried out within the existing regulatory framework</p>	TSC	Detailed design phase (before bidding)	Throughout all the BRT corridor and immediate adjacent area	Cost included in design fees.	<p>Require in TSC contract. Check at DD Complete check of items 1 and 2.</p> <p>Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 and 2.</p>	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		for such introduction.								
4h. Noise and dust management	Minimize noise and dust	1. Reconfirm all noise and dust sensitive receivers likely to be affected by construction works. 2. Contact local district groups to plan mitigation in advance. 3. Prepare a draft Noise and Dust Control Plan (to be updated later by contractor) to minimize impacts to sensitive receptors (residential areas, schools, temples, hospitals, etc.) due to construction works, sourcing and transport of construction materials, and other project-related activities..	TSC	Detailed design phase (before bidding)	Throughout all the BRT corridor and immediate adjacent areas	Cost included in design fees.	Require in TSC contract. Check at DD Complete check of contractor's implementation of items 1 to 3. Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 3.	Once, detailed design phase	SPC/PIU	Cost met by SPC/PIU project staffing
4i. Workers and public safety	Avoid accidents due to construction works	Prepare a draft Workers and Public Safety Plan (to be updated later by contractor) to identify interfaces between the works and the public, formulate measures to	TSC	Detailed design phase (before bidding)	Throughout all the BRT corridor and immediate adjacent areas	Cost included in design fees.	Require in TSC contract. Complete check at DD.	Once, detailed design phase	SPCPIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		ensure safety of workers and the public, and prevent accidents due to the construction works.								
5. Environmentally responsible procurement	EMP provisions are properly implemented by selected contractor.	1. EMP is included in bidding and contract documents to ensure that mitigation measures are budgeted and to prepare the contractor for environmental responsibilities. 2. Specify in bid document that Contractor shall engage capable and trained staff or site agent(s) to take responsibility for the environmental management and safety issues at the working level and to monitor the effectiveness and review mitigation measures as the project proceeds. 3. Contractors (assisted by TSC) submit updated specific environmental management plans or ESMPs for approval by TSC (i.e., management	1 & 2: TSC for PIU 3: Preparation of ESMPs – Contractor, Approval of ESMPs- TSC 4: Contractor	1 & 2: Bid preparation 3 & 4: Before start of civil works	Throughout all the BRT corridor and immediate adjacent areas	Included in bid cost	1 & 2: Inclusion in bid docs 3 & 4: Check compliance	Bid preparation stage. Before start of site works	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		plans such as Runoff Control Plan, Noise and Dust Control Plan, etc.). 4. Contractors recruit qualified staff to oversee implementation of environmental and safety measures specified in the EMP.								
6. Coordinating Utility Management Plan	Utilities & telecoms remain in service during construction. Only minor / unavoidable interruptions to utilities & telecoms.	1. Set up Coordinating Committee early in the detailed design stage. 2. Identify all potential hindrances to construction in the field 3. Identification of foreseeable constraints and identify lead time 4. Establish preparedness of the utilities to facilitate reprovisioning. 5. Facilitate Utilities and Telecoms Reprovisioning Plan (URP) 6. Include the URP (as part of the EMP) in the bidding documents 7. Coordinating committee Chairmanship of DOTC/SPC with /PIU as secretary 8. Monthly meetings for first six months of design.	1 to 10: SPC/PIU 11 & 12: TSC 11: Contractor	1 to 10: During detailed design and bid preparation 11 & 12 Before start of civil works and periodically during construction	Throughout all the BRT corridor and immediate adjacent areas.	Included in SPC and TSC costs	1 to 10: Inclusion UMP in EMP in bid docs 11 & 12 Security of utilities and telecoms connections	Bid preparation stage. Before start of and throughout site works	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>9. Membership Implementing agency (SPC, TSC), all utilities, police and local authorities as necessary. As the Project</p> <p>10. Additional coordinating committee meetings in construction phase if problems occur.</p> <p>11. Contractors inducted construction gears up through awareness workshops conducted periodically by the TSC</p> <p>12. TSC share experience in the implementation of the works in case unexpected difficulties occur.</p>								
7. Ambient air, water quality and noise monitoring	Establish baseline air water and sediment quality and noise levels to help in assessing project impacts during implementation.	<p>1. Collect baseline data on air quality at three locations along the alignment in the calendar month before the construction commences.</p> <p>2. Collect baseline data on noise at six locations along the alignment in the calendar month before the construction commences.</p> <p>3. Collect baseline</p>	<p>1 to 3: TSC</p> <p>4. TSC notifies DENR</p>	To be completed no later than the calendar month before the construction commences	<p>1. For air quality and noise, ten (10) throughout all the BRT corridor</p> <p>2. For water quality, two (2) locations 50m up and downstream of the rivers.</p>	Included in TSC costs	<p>1. Total suspended particulates (TSP), PM_{2.5}, NO_x and SO_x</p> <p>2. Noise levels Leq15mins dB(A)</p> <p>3. pH, temperature, turbidity, dissolved oxygen (DO), oil and</p>	To be completed no later than the calendar month before the construction commences.	SPC/PIU	Cost met by SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		water quality at the sections where the rivers of Tullahan, San Juan and Pasig cross the BRT LINE-1 Alignment before the construction commences.					grease, and total suspended solids (TSS)			
CONSTRUCTION STAGE										
1. Activate management plans and secure permits / licenses.	Avoid impacts from unplanned activities.	1. Update and activate ESMP for waste and spoil disposal, materials management, drainage, runoff control, tree-cutting and replanting, traffic and utilities management, noise and dust control and workers and public safety. 2. Contractor(s) and their suppliers comply with all statutory requirements for permits from DENR with regard to use of mechanical equipment, establishment and operation of construction plants such as concrete batching plant, rock	1: Contractor to prepare updated ESMPs, TSC to assist and approve 2: Contractor	1. One month before start of site works 2. Before start of site works.	1.	Cost included in contractors fees	1. Complete check and approve before construction. 2. Complete check of all necessary environmental approvals/permits.	Before start of site works.	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		crusher, spoils disposal, etc.								
2. Orientation for Contractor, Workers on environmental and social management.	Contractor & workers trained to implement mitigation measures and better implementation of EMP.	1. Contractors clearly separate resources applied to mitigation measures. Tenders identify named staff to supervise management's plans. 2. TSC shall conduct training/orientation involving construction workers and /PIU with regard to implementation of mitigation measures in the updated management guidelines/ESMP, Project ESMP (i.e., those specified in the ESIA) and any additional measures identified during detailed design phase. 3. Implement dengue controls and HIV-AIDS education and prevention program in line with social plans.	1: Contractor 2: TSC 3: Contractor	1: Before start of site works 2: Within one month of start of site works 3. Upon deployment of workers to project site	Project site	Cost included in contracts for TSC and Contractor	Complete check of implementation of items 1 to 3. Expected outputs/ outcome is compliance with all the ESMP mitigating measures in items 1 to 3.	1: Before start of site works 2: Within one month of start of construction 3: Monthly during construction.	TSC & SPC/EPIU	Cost met by TSC & SPC/PIU project staffing
3. Loss of Trees	Minimize impacts to flora and fauna	1. In coordination with local officials and forestry authority, update the draft Tree-Cutting and Replanting Plan (TCRP) before	1: Contractor to prepare updated TRP, TSC to approve	1: One month before start of site works 2 to 3:	BRT corridor.	Cost included in contracts	Check implementation of items 1-12 and TRP provisions	1 to 3: Prior to and during construction (monthly) 4 to 12: Monthly	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>tree clearing is undertaken. Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement TCRP provisions.</p> <p>2. Monitoring and marking of vegetation that will not be removed agreed with forest authority prior to commencement of construction.</p> <p>3. Forest authority to approve replacement of cut trees to be undertaken based on the tree cutting and replanting plan.</p> <p>4. Clearing of trees minimized based on Tree-cutting and Replanting Plan.</p> <p>5. Prohibit cutting of trees for firewood and for use in Project.</p> <p>6. During replanting works, new alien plant species (i.e., species not currently established in the City) shall not be used unless carried out with the existing regulatory</p>	<p>2: Contractor, FMB, TSC</p> <p>3: FMB/local forestry office</p> <p>4 to 12: Contractor</p>	<p>Before tree-cutting is implemented</p> <p>4 to 12: Throughout construction phase</p>						

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		framework for such introduction. Invasive species shall not be introduced into new environments. 7. As much as possible, civil works will be scheduled in dry season to minimize adverse impacts to river water quality and other aquatic resources. 8. The contractor will not use or permit the use of wood as a fuel for the execution of any part of the Works, including but not limited to the heating of bitumen and bitumen mixtures, and to the extent practicable shall ensure that fuels other than wood are used for cooking, and water heating in all his camps and living accommodations 10. Contractor shall not buy or use wood from the illegal sources (that come from the illegal logging) 11. Contractor will take all precautions								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works. The Contractor will immediately suppress the fire, if it occurs, and shall undertake replanting to replace damaged vegetation.								
4. Drainage and Hydrological Impacts	To minimize hydrological impacts flooding and runoff of river banks.	<p>1. Review detailed designs for cross-drainage and side-drainage structures, assess and agree with PIU/TSC if redesign is required or if new structures would be constructed or existing ones would be repaired.</p> <p>2. Before start of site works, update draft Drainage Management Guidelines prepared by TSC during detailed design phase. Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement provisions of DMP.</p> <p>3. Implement agreed</p>	<p>1: Contractor</p> <p>2: Contractor to update DMP, TSC to assist and approve.</p> <p>3 to 8: Contractor</p>	<p>1 & 2: One month before start of site works</p> <p>3 to 8: Throughout construction phase</p>	Throughout project site and all areas considered prone to flooding.	Cost included in design	Check implementation of items 1-8 and DMP provisions	<p>1 & 2: Before start of site works</p> <p>3 to 8: Monthly</p> <p>Implementation of DMP provisions: Monthly</p>	TSC, SPC/PIU	Cost met by TSC, SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>designs culverts sufficient to control flooding as designed and to dissipate energy of flow to reduce runoff.</p> <p>4 Protect lead off streams that may become silted by construction runoff, workshops or equipment washing-yards.</p> <p>5. Minimize alterations in the project corridor's surface drainage patterns as much as possible:</p> <p>6. Drains to be constructed so that the outfalls of the surface run-off from the carriageway are diverted away from the sensitive receivers.</p> <p>7 Ensure that storm drains and highway drainage systems are periodically cleared to maintain storm water flow during construction.</p>								
5. Utilities	Prevent interruption of services such as electricity and	1. Before start of site works, update draft Utility Management Plan (UMP) prepared	1: Contractor to update UMP, TSC	1: One month before start of site	Throughout project site	Cost included in contracts	Check implementation of items 1-8 and UMP	1 to 6: Before construction 7 & 8: Monthly	TSC, SPC/PIU	Cost met by TSC and SPC/PIU



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
	water during relocation of the utilities line /connections. Repair damaged access roads.	by TSC during detailed design. Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement URP provisions. 2. Reconfirm power, water supply and telecommunications systems likely to be interrupted by the works. 3. Contact all relevant local authorities for utilities and local village groups to plan reprovisioning of power, water supply and telecommunications systems. 4. Utilities shall be relocated and reconnected well ahead of commencement of construction works and contractor shall coordinate with utility company for relocation and reconnection well before works commence. 5. Affected	to assist and approve 2 to 8: Contractor	works 2 to 6: Before start of construction 7 & 8: During construction			provisions			project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		communities shall be properly informed in advance. 6. Reconnection of utilities shall be completed at the shortest practicable time before construction commences. 7. Utilities damaged during construction shall be reported to the TSC and utility authority and repairs arranged immediately. 8. Access roads damaged during transport of construction materials and other project-related activities shall be reinstated upon completion of construction works at each section								
6. Materials exploitation	Minimize impacts from materials extraction, transportation and storage.	1. Update draft Materials Management Guidelines (which will also include a mass haul chart) prepared by TSC during detailed design phase. Updated plan to be approved in writing by TSC one month prior to starting	1: Contractor to update MMP, TSC to approve 2 to 17: Contractor	1: One month before start of site works, MMP to be updated regularly (monthly or as required	Project site, quarry and borrow sites	Cost included in contract	Check implementation of items 1-17 and MMP provisions	1: Before construction 2 & 17: Monthly Implementation of MMP provisions: Monthly	TSC & SPC/ESSU	Cost met by TSC & SPC/ESSU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring				
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost	
		works. Contractor to agree & implement MMP provisions. 2. Balance cut and fill requirements to minimization impacts from extraction of aggregates. 3. Prioritize use of existing quarry sites with suitable materials and update the list of quarries and borrow pits monthly in MMP and report to SPC/PIU and minimize impacts on other local resources. 4. Procure materials only from DENR authorized quarries and borrow sites. 5. If the contractor shall operate the quarry site, required environmental permits shall be secured prior to operation of quarry/borrow areas. 6. Use quarry with highest ratio between extractive capacity (both in terms of quality) and loss of natural state; 7. Use quarry sites		by TSC) 2 to 13: Throughout construction 14 to 17: Upon completion of materials extraction							

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		lying close to the alignment, with a high level of accessibility; 8. Do not use quarries in areas of natural woodland or near rivers which provide food and shelters for birds and other animals. 9. Borrow/quarry sites shall not be located in productive land and forested areas. 10. During quarry/borrow site operation, provide adequate drainage to avoid accumulation of stagnant water. 11. It is preferable to avoid or reduce the sections of quarry sites located on river bed. If it is not possible to locate quarries out of river beds, quarry sites lying on small rivers and streams shall be avoided. Alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>conditions, are preferred;</p> <p>12. Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favorable for mosquito breeding</p> <p>13. Upon completion of extraction activities, quarry and borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks.</p> <p>14. To avoid drowning when pits become water-filled, measures such as fencing, providing flotation devices such as a life buoy tied to a rope, etc. shall be implemented.</p>								
7. Spoil Disposal	Control spoil and construction waste disposal, oily and hazardous wastes.	1. Update Spoil Disposal section in draft Waste Management and Spoil Disposal Plan (WMSDP) prepared by the TSC. The updated section shall cover all	1: Contractor to update WMSDP, TSC to assist and approve 2 to 12:	1: One month before start of site works 2 to 12: Throughout construction	Project site and spoils disposal sites	Cost included in contracts	Check implementation of items 1-12 and WMSDP provisions Spoils disposal will	1: Before construction 2 & 12: Monthly Implementation of WMSDP provisions:	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		aspects of spoil removal, storage, disposal and monitoring, Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement WMSDP provisions. 2. Areas for disposal to be agreed with land owner and DENR checked and recorded by the TSC/PIU and monitored 3. Spoil disposal areas to be rehabilitated monitored, catalogued, and marked. 4. Spoil will not be disposed of in rivers and streams or other natural drainage path. 5. Spoil will not be disposed of on fragile slopes, flood ways, wetland, farmland, forest, religious or other culturally sensitive areas or areas where a livelihood is derived. 6. Surplus spoil will be used where practicable for local repair works to	Contractor	phase			be monitored by TSC/PIU/ and recorded using a written chain of custody (trip-ticket) system to the designated disposal sites.	Monthly		

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		fill eroded gullies and depression areas and degraded land in consultation with local community. 7. Spoils shall only be disposed to areas approved by local authority. 8. Spoil will be to disposed of to disused quarries and abandoned borrow pits where practicable. 9. Disposed spoil will be spread in 15cm layers and compacted to optimum moisture content, covered with topsoil, landscaped and provided with drainage and vegetation to prevent runoff in line with best practice. 10. Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas. 11. Under no circumstances will spoils be dumped into								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		watercourses (rivers, streams, drainage, etc.) 12. The spoils disposal site shall be located at least 50 m from surface water courses and shall be protected from runoff by avoiding formation of steep slopes and grassing.								
8. General Construction Waste Disposal	Reduce, reuse and recycle waste and contamination due to poor waste disposal practices.	1. Update the Waste Management section of the draft Waste Management and Spoil Disposal Plan prepared by the TSC, one month before construction to cover all aspects of waste storage, disposal and accidental spills to be approved in writing by TSC one month prior to starting works. Contractor to implement WMSDP provisions. 2. Areas for disposal to be agreed with land owner and DENR checked; and recorded and monitored by the TSC/SPO/PIU. 3. Waste disposal areas approved by	1: Contractor to update WMSDP, TSC to assist and approve 2 to 10: Contractor	1: One month before start of site works 2 to 10: Throughout construction phase	Project site and waste disposal areas	Cost included in contracts	Check implementation of items 1-10 and WMSDP provisions	1: Before construction 2 & 10: Monthly Implementation of WMSDP provisions: Monthly	TSC & SPO/PIU	Cost met by TSC & SPO/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		local authorities shall be rehabilitated, monitored, catalogued, and marked. 4. Segregation of wastes shall be observed. Cleared foliage, shrubs and grasses can be given to local farmers for fodder and fuel. Organic (biodegradables) shall be collected and disposed of on site by composting (no burning on site). 4. Recyclables shall be recovered and sold to recyclers. 5. Residual and hazardous wastes shall be disposed of in disposal sites approved by local authorities. 6. Construction/workers' camps shall be provided with garbage bins. 7. Burning of construction and domestic wastes shall be prohibited. 8. Disposal of solid								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		wastes into canals, rivers, other watercourses, agricultural field and public areas shall be prohibited. 9. There will be no site-specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in local waste disposal sites. 10. Solid waste generated during construction and at campsites to be treated and safely disposed only in demarcated off-site waste disposal sites identified and agreed with TSC/PIU, local community and local authorities.								
9. Use of hazardous substances and hazardous waste disposal	Minimize contamination due to use and storage of hazardous substances	1. Update Hazardous Waste section of Waste Management and Spoil Disposal Plan prepared by the TSC, one month before construction. Updated plan to be approved in writing by	1: Contractor to update WMSDP, TSC to approve 2 to 17: Contractor	1: One month before start of site works 2 to 17: Throughout construction phase	Throughout Project site, storage areas, equipment and vehicle maintenance and refueling areas	Cost included in contracts	Check implementation of items 1-17 and WMSDP provisions	1: Before construction 2 & 17: Monthly Implementation of WMSDP provisions: Monthly	TSC & SPO/PIU	Cost met by TSC & SPO/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		TSC one month prior to starting works. Contractor to implement WMSDP provisions. 2. Ensure that safe storage of fuel; other hazardous substances and bulk materials are agreed by SPO/PIU/TSC and have necessary approval/permit from DENR and local authorities. 3. Hydrocarbon, toxic material and explosives will be stored in adequately protected sites consistent with national and local regulations to prevent soil and water contamination. 4. Equipment/vehicle maintenance and refueling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas shall be provided with drainage leading to an oil-water separator that will be regularly								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		skimmed of oil and maintained to ensure efficiency. 5. Fuel and other hazardous substances shall be stored in areas provided with roof, impervious flooring and bund/containment wall to protect these from the elements and to readily contain spilled fuel/lubricant. 6. Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations. 7. Ensure all storage containers are in good condition with proper labeling. 8. Regularly check containers for leakage and undertake necessary repair or replacement. 9. Store hazardous materials above flood level. 10. Discharge of oil								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		contaminated water shall be prohibited. 11. Used oil and other toxic and hazardous materials shall be disposed of in an authorized facility off-site. 12. Adequate precautions will be taken to prevent oil/lubricant/hydrocarbon contamination of channel beds. 13. Ensure availability of spill cleanup materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored. 14. Spillage, if any, will be immediately cleared with utmost caution to leave no traces. 15. Spillage waste will be disposed at disposal sites approved by local authorities and approved by TSC. 16. All areas intended								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulation. 17. The Contractor shall identify named personnel in the management plan/ESMP in-charge of these sites and ensure they are properly trained to control access to these areas and entry will be allowed only under authorization.								
10. Asphalt plant rock crushers, bitumen usage and soil contamination	Avoid air pollution, nuisances, traffic obstacles and contamination	1. Locate asphalt plant, rock crushers and bitumen supply off road and (wherever practicable) at least 500m from nearest sensitive receivers (residential areas, schools, hospital, etc.) and rivers and install and maintain dust suppression equipment. 2. Bitumen should not be used as fuel. Fuel	Contractor	1: During selection of locations for asphalt plant, rock crusher, bitumen storage 2 to 9: Throughout construction phase	Throughout the entire BRT corridor.	Cost included in contracts	Check implementation of items 1-9	1: Before establishment of facilities 2 & 9: Monthly	TSC, SPO/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		wood not for bitumen heating. Bitumen drums stored in dedicated area not scattered along BRT corridor. 3. Bitumen will not be allowed to enter either running or dry streambeds and nor will be disposed of in ditches or small waste disposal sites prepared by the contractor. 4. Bitumen storage and mixing areas shall be protected against spills and all contaminated soil must be properly handled according to applicable national and local laws and regulation. As a minimum, these areas must be contained, such that any spills can be immediately contained and cleaned up. Any petroleum products used in the preparation of the bitumen mixture must also be carefully managed to avoid spills and contamination of the								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		local water table. 5. Fuel wood shall not be used for heating bitumen and bitumen shall be not used as fuel. 6. Bitumen drums shall be stored in a dedicated area, not scattered along the works 7. All accidental spills of bitumen or chemicals should be cleaned up immediately with the top 2cm of any contaminated soil underneath and disposed of as chemical waste to a site approved by the local authority. 8. Prevent soil contamination requiring contractors to instruct and train their workforce on storage and handling of materials and chemicals that can potentially cause soil contamination. 9. Recycle debris generated by dismantling of existing								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		pavement subject to the suitability of the material.								
11. Noise and dust nuisances	To minimize air impacts effectively and avoid complaints due to the airborne dust.	<p>1. Before construction starts, update the draft Noise and Dust Control Plan (NDCP) prepared by the TSC. Include requirements for controlling noise and dusty materials at source. Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement NDCP provisions.</p> <p>2. Restrict works to daylight hours within 500m of residential settlements and hospitals.</p> <p>3. Powered mechanical equipment and vehicle emissions to meet national TCVN standards. All construction equipment and vehicles shall have valid certifications indicating compliance to vehicle emission standards.</p> <p>4. Construction</p>	<p>1: Contractor to update NDCP, TSC to approve 2 to 16: Contractor</p>	<p>1: One month before start of site works 2 to 16: Throughout construction phase</p>	Throughout all the BRT corridor	Cost included in contracts	Check implementation of items 1-16 and NDCP provisions	<p>1: Before construction 2 & 16: Monthly and spot checks Implementation of NDCP provisions: Monthly and spot checks</p>	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		equipment and vehicles will be maintained to a good standard and shall be provided with muffler silencers. Machinery causing excessive pollution will be banned from construction sites. 5. Monitor and investigate complaints; propose alternative mitigation measures. 6. Keep stockpiles moist 7. Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid or minimize spills and dust emission. 8. On rainless day undertake watering, at least twice per day, on dusty and exposed areas at construction yards, materials stockpile, construction sites, access roads, quarry areas, borrow sites and other project areas where residential sites and other sensitive receptors								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		such as schools, hospital, etc. are located nearby. If works are within 15m of any sensitive receivers, the contractor shall install dust barrier between the works at the road edge and the sensitive receivers (e.g. 2.5 m high temporary walls, etc.) 9. Mixing and crushing plants operations will be equipped with dust suppression devices such as water sprays. 10. Clean up road surfaces after work. 11. Temporary noise barriers shall be used, as necessary, in sites where sensitive receptors are present, such as residential areas, schools, hospitals, temples, etc. 12. To protect buildings and structures from vibration, non-vibrating roller shall be used in construction sites near buildings and structures.								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		<p>13. Structures which are damaged due to vibration caused by the Project shall be repaired immediately as directed by TSC.</p> <p>14. Machinery shall be turned off when not in use.</p> <p>15. Pile driving during to be schedule for day time if construction site is near sensitive receptors or approved by DENR, local authority and TSC.</p> <p>16. Impose speed limits on construction vehicles to minimize dust emission along areas where sensitive receptors are located (houses, schools, hospitals, etc.).</p>								
13. Runoff control / run-off	Protect established works.	1. Update the draft Runoff Control Plan (RCP) produced by the TSC and implement excavation stabilization measures specified in the detailed designs and maintained during construction to protect the works. Updated plan to be approved in	1: Contractor to update ECP, TSC to assist and approve 2 to 12: Contractor	1: One month before start of site works 2 to 12: Throughout construction phase	Throughout project site and all vulnerable slopes agreed with TSC.	Cost included in contracts	Check implementation of items 1-12 and ECP provisions	1: Before construction 2 & 12: Monthly Implementation of ECP provisions: Monthly	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		writing by TSC one month prior to starting works. Contractor to implement provisions of RCP. 2. Establish permanent surfaces immediately after completion of works in each stretch / sector. 3. Check weather forecasts and minimize work in wet weather. 4. Include and implement appropriate measures for excavation protection, i.e. shoring up as required in the detailed construction drawings. 5. Prevent runoff and protect the excavations with temporary or permanent drainage as soon as practicable after cutting. 6. Payments will be linked to the completion of the works as indicated by the installation of runoff control measures to protect the works to the satisfaction of TSC/PIU.								
14.River protection	Protect rivers and	In sections along and	Contractor	At all times	All rivers and	Cost	Check	Monthly	TSC &	Cost met



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
and bridge construction	maintain river flow	<p>near the intersections of BRT Line-1 alignment and rivers of Tullahan, San Juan and Pasig:</p> <p>1. Rocks and stones will be disposed not to block rivers and streams.</p> <p>2. In bridge repair and demolition, the bridge structure will not be dropped into the river but alternative means will be used to avoid "dropping the bridge" into rivers/streams. This will be done by "sawing" appropriate sections of the bridge and using cranes to lift these sections away or alternatively by construction of a platform onto which the bridge could be lowered.</p> <p>3. Cofferdams, silt fences, sediment barriers or other devices will be used as appropriate based on the design to prevent migration of silt during excavation and boring operations within</p>			streams with repair and reconstruction works.	included in contracts	implementation of items 1-4		SPC/PIU	by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		streams. If cofferdams are used, these will be dewatered and cleaned to prevent siltation by pumping from cofferdams to a settling basin or a containment unit. 4. Other runoff control measures above and covering open surfaces with grasses and creepers to reduce runoff will be implemented as early as possible in construction.								
15. Water quality	Prevent water quality impacts due to negligence and ensure unavoidable impacts managed effectively.	1. Store lubricants, fuels in dedicated enclosures >50 m from water bodies. 2. Solid waste from construction activities and workers camps will not be thrown in rivers and other water courses (drainage, etc.) 3. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off. 4. Stockpiled materials will be covered to reduce silted run-off.	Contractor	Throughout construction phase	Throughout project site	Cost included in contracts	Check implementation of items 1-10	Monthly	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		5. No stockpiling or borrow sites <100m of water body. 6. Work in rivers will be scheduled during dry season and work duration shall be as short as possible. 7. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off. 8. Stockpile areas and storage areas for hazardous substances shall be located away from water bodies. 9. Washing of machinery and vehicles in surface waters shall be prohibited.								
16. Water resources	Mitigate the impact of using local community water resources.	1. Assess availability of water and evaluate impact on use of local water resources to ensure that water utilization for Project shall not deplete local village supplies. 2. Bring in project water by tanker as necessary. 3. Worker camps will be located as agreed	Contractor	Throughout construction phase	Throughout project site, construction camps	Cost included in contracts	Check implementation of items 1-11	Monthly	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		with local community authority to prevent the unplanned consumption of community-owned water resources. 4. Maintain close liaison with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly. 5. Establish and implement guidelines to minimize the wastage of water during construction and at campsites. 6. Avoid or minimize use of river bed for construction materials. 7. Confine winning river materials to 20% of river width in any location and keep away from river banks. 8. Reinstate river banks if necessary, and 10. In case of accidental obstruction or damage, drainage ditches and ponds								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		shall be cleaned or repaired immediately.								
17. Operation of workers camps and workshops / yards.	Worker facilities not to cause nuisance.	<p>1. Worker camp location and facilities located and agreed with local communities and facilities approved by TSC and managed to minimize impacts.</p> <p>2. Construction camps will be established in areas with adequate natural drainage.</p> <p>3. Hire and train as many local workers as possible.</p> <p>4. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas.</p> <p>5. Portable lavatories (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and prevented by cleaning lavatories daily and by keeping lavatory facilities clean at all times.</p> <p>6. Provide separate hygienic sanitation facilities/toilets and</p>	Contractor	<p>1 & 2: During selection of locations for workers camps.</p> <p>3 to 16: Throughout construction phase</p>	Project site, construction camps	Cost included in contracts.	Check implementation of items 1-16	<p>1 & 2: Once for each location, prior to establishment of facilities</p> <p>3 to 16: Monthly</p>	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		bathing areas with sufficient water supply for male and female workers. 7. Wastewater effluents from contractors' workshops and equipment washing-yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed discharging it into natural streams. Oil and grease residues shall be stored in drums awaiting disposal in line with the agreed Waste Management Plan and consistent with national and local regulations. 8. Predictable wastewater effluent discharges from construction works shall have the necessary permits from DENR and local authorities before the works commence. 9. Borrow pits and natural depressions with pre-laid								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		impervious liners will be used to dispose of scarified/scraped asphalt, and then covered with soil. This will check potential groundwater contamination. 10. Options for completely or partially recycling scraped scarified materials will also be taken into account. 11. Camp site will be cleaned up to the satisfaction of and local community after use. 12. Solid and liquid waste will be managed in line with Waste Management Plan. 13. All waste materials shall be removed and disposed to disposal sites approved by local authorities 14. Land used for campsites shall be restored to the original condition as far as practicable and the area if required tin the TCRP shall be planted with appropriate trees /								

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		shrubs as soon as practicable after it is vacated and cleaned.								
18. Sanitation and Diseases	Control of infectious diseases.	<p>1. Standing water will not be allowed to accumulate in the temporary drainage facilities or along the roadside to prevent proliferation of mosquitoes.</p> <p>2. Temporary and permanent drainage facilities will be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.</p> <p>3. Dengue control ((e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid formation of stagnant water, etc.) and HIV-AIDS education will be implemented in line with social plans for the project.</p> <p>4. HIV/AIDS awareness and prevention program</p>	Contractor	Throughout construction	Throughout project site, workers camps	Cost included in contracts.	Check implementation of items 1-4	Monthly	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		shall be implemented in line with social plans under the Project								
19. Safety Precautions for the Workers	Ensure worker safety.	<p>1. Contractor to update draft Worker and Public Safety Plan (WPSP) prepared by TSC and instruct workers in health and safety matters. Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement WPSP provisions.</p> <p>2. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers.</p> <p>3. Scheduling of regular (e.g., weekly tool box talks) to orient the workers on health and safety issues related to their activities as well as on proper use of PPE.</p> <p>4. Fencing on all excavation, borrow pits and sides of temporary</p>	<p>1: Contractor to update WPSP, TSC to assist and approve. 2 to 10: Contractor</p>	<p>1: One month before start of site works 2 to 10: Throughout construction phase</p>	All construction sites	Cost included in contracts	<p>Check implementation of items 1-10 and WPSP provisions</p> <p>Check compliance to Philippines Labor Act (2006).</p>	<p>1: Before construction 2 & 10: Monthly</p> <p>Implementation of WPSP provisions: Monthly</p>	TSC, SPC/PIU	Cost met by TSC and SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		bridges 5. Workers shall be provided with appropriate personal protective equipment (PPE) such as safety shoes, hard hats, safety glasses, ear plugs, gloves, etc. at no cost to the employee. 6. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles. Another measure is to install channeling devices (e.g., traffic cones and barrels) to delineate the work zone. 7. Workers shall be provided with reliable supply of potable water. 8. Construction camps shall be provided with adequate drainage to avoid accumulation of stagnant water. 9. Construction camps shall be provided with toilets/sanitation								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained to allow effective operation. 10. Ensure reversing signals are installed on all construction vehicles.								
20. Public safety	Prevent accident with public in local community	1. Include in WSPSP for barriers (e.g., temporary fence), shall be installed at construction areas to deter pedestrian access to the roadway except at designated crossing points. 2. The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation and such sites have a watchman to keep public out. 3. Speed restrictions shall be imposed on Project vehicles and	Contractor	At all times throughout construction phase	Locations identified and agreed by TSC	Cost included in contracts	Check implementation of items 1-4	Monthly	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		equipment when traveling within 50m of sensitive receptors (e.g. residential, schools, temples, etc.). 4. Upon completion of construction works, borrow areas will be backfilled (if suitable materials are available, e.g., excavation spoils) or fenced.								
21. Traffic Conditions	Minimize disturbance of traffic and traffic congestion	1. Prior to start of site works, update and implement Traffic Management Guidelines prepared by TSC during detailed design phase. Updated plan to be approved in writing by TSC one month prior to starting works. Contractor to implement TTMP provisions. 2. Communicate to the public through local officials regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions. 3. In coordination with local traffic authorities,	1: Contractor to update TTMP, TSC to assist and approve 2 to 8: Contractor	1: One month before start of site works 2 to 8: Throughout construction phase	Entire BRT Line-1 route	Cost included in contracts	Check implementation of items 1-8 and RRMP provisions	1: Before construction 2 & 8: Monthly Implementation of TTMP provisions: Monthly	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		implement appropriate traffic diversion schemes to avoid inconvenience due to project operations to road users, ensure smooth traffic flow and avoid or minimize accidents, traffic hold ups and congestion 4. In coordination with local traffic officials, schedule transport of materials to avoid congestion, set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up. 5. Provide safe vehicle and pedestrian access around construction areas. 6. Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous conditions (24 hours, as necessary) 7. Provide sufficient								



Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
		lighting at night within and in the vicinity of construction sites. 8. Designate traffic officers in construction sites.								
22. Archaeological and cultural artifacts.	Preservation of chance finds of cultural and archaeological relics. identified during construction	1. Site agents instructed to keep a watching brief for relics 2. Should any potential items be located, the site TSC will immediately be contacted and work will be temporarily stopped in that area. 3. If the site supervisor determines that the item is of potential significance, an officer from the National Museum (NM) will be invited to inspect the site and work will be stopped. 4. Until NM has responded to this invitation work will not re-commence in this location until agreement has been reached between NM and DOR as to any required mitigation measures, which may include excavation.	Contractor	Throughout construction Check and report on same day.	All areas.	Cost included in contracts.	Check implementation of items 1-4	Before construction and monthly check.	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
23 Enhancements	Provide environmental enhancement of the project	Contractor to reconfirm and implement enhancements (e.g., landscaping, tree replanting) identified at the detailed design stage.	Contractor	Throughout construction	All areas.	Cost included in contracts.	Confirmed implementation of required enhancements	Before construction and monthly check.	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing
24 Disruption to access and business activity	Provide continued access to shops, residences, mosques, etc., during construction period.	Contractor to provide planks and d continued access during construction period. Night works to be considered in areas with high density commercial activity.	Contractor	Throughout construction	All areas.	Cost included in contracts.	Confirmed implementation of required enhancements	Before construction and monthly check.	TSC & SPC/PIU	Cost met by TSC & SPC/PIU project staffing
OPERATIONAL STAGE										
1. Road Safety	Minimize road accidents.	1. Undertake road safety awareness campaigns for local residents and other road users of BRT Line-1 route. 2. Install and maintain road warning signs and markings. 3. Monitor road accidents and implement necessary preventive measures (awareness campaigns, provision of appropriate road furniture to enhance road safety and control traffic).	BRT Line-1 Operator, local (district) traffic authority	During operation.	Throughout Entire BRT-Line 1 route.	Included in operation and maintenance cost	Throughout operations and maintenance	Semi-annual	BRT Line-1 Operator	Cost met by for SPC/PIU staffing

Table 7.2.1: Environmental Mitigation and Environmental Performance Monitoring Plan for Metro Manila BRT Line-1 Project

Environmental Concern	Objective	Impact mitigation					Performance and Impact monitoring			
		Proposed Mitigation Measures	Responsible entity to Implement	Timing to Implement	Locations to Implement	Mitigation Cost	Parameter to monitor	Frequency & Verification	Responsible to Monitor	Monitoring Cost
2. Tree survival	Ensure survival of planted trees.	Monitor survival of replanted trees, also transplanted / compensatory planting trees) and replant, as necessary.	BRT Line-1 Operator and FMB	During operation.	Throughout Entire BRT Line-1 route .	Included in operation and maintenance cost	First three years of operation	Semi-annual for 1 st 3 years of operation	BRT Line-1 Operator and FMB	Cost met by for SPC/PIU staffing

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
Pre-Construction Phase					
Accessibility and proximity	Elderly	Meaningful and active participation in the planning and design phase	DOTC PMO/PIU SPC	DOTC	<p>Number of public consultations and minutes of meetings monitored every three months</p> <p>Integration of concerns in project documents</p> <p>Adherence of design criteria and parameters to existing laws and applicable international standards.</p>
	PWDs				
	Women				
	Children				
	Other commuters				
Livelihood	PUJ/PUB Drivers, Operators and Support Personnel	<p>Commissioning of Social and Environmental Consultants to continue consultations with the affected PUJ/PUB operators and drivers;</p> <p>Continued public consultation to identify new routes, modified or truncated routes, or feeder routes;</p> <p>Formulation of policy environment that will provide for timely transfer of operation of PUJs/PUBs to the new, modified or truncated routes;</p> <p>Route verification, traffic analysis, economic viability studies on the proposed new, modified and truncated routes;</p>	DOTC PMO/PIU SPC LTO LTFRB	DOTC	<p>Commissioning of social and environmental consultants done after Project Appraisal. Progress to be monitored on a weekly basis.</p> <p>Number of public consultations and minutes of meetings monitored every three months</p> <p>Monitor number of PAPs allocated with new, modified, and truncated routes</p> <p>Monitor progress on the project studies on a</p>

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		Project studies for the scrapping of old PUJs/PUBs; Project preparation studies on the provision of central PUV terminal			weekly basis
	Affected Commercial Establishments on BRT Stations	Engineering and architectural designs that will avoid or minimize impacts to commercial establishments Tagging of affected commercial establishments Appraisal of replacement costs of structures and income based on the entitlement matrix or social management framework Compensation to Displaced Persons (DPs)	DOTC PMO/PIU SPC	DOTC	Evaluate engineering designs and impact on establishments during and after detailed engineering designs Monitor tagging and appraisal of entitlements per entitlement matrix Monitor timely compensation to affected establishments prior to construction phase
Construction Phase					
Accessibility and proximity	Elderly	Posting of traffic aides to assist in street crossings and riding in public transport	DOTC PMO/PIU SPC Contractor	DOTC	Conduct of compliance audit with operating rules and traffic guidelines on a monthly basis. Compliance audit against establish community support and communications plan on a monthly basis.
	PWDs				
	Women				
	Children	Safety signage written in bold letters and made very visible to avoid accidents and preferably with sounds			
	Other commuters	Implement a traffic management plan to avoid traffic confusion Billboards and public			

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		announcement should be put up to provide information to public			
Livelihood	PUJ/PUB Drivers and Support Personnel	Technical or skills training under TESDA Preferential hiring for BRT operation Employment Assistance	DOTC PMO/PIU/ SPC Contractor TESDA	DOTC	Number of trainings provided to be monitored every two months. Cross-checking of training beneficiaries against database of PAPs
Operation Phase					
Accessibility and proximity	Elderly	Provide feeder transport to bus stations and terminals Provide at-grade pedestrian crossings at strategic locations (i.e. schools, markets, churches, etc.) Put up adequate and large traffic signs with flashing lights Posting of traffic aides to assist in street crossings Road curbs should be smooth and yet not cause slippage nor become slippery when wet, preferably with hand rails at points of crossing “Courtesy Lanes” at bus stations and terminal Ramps on buses for easy and safe boarding/off-boarding	BRT Operator, FESCAP (Federation of Senior Citizens Association of the Philippines)	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		<p>Provide special “passenger cards” to be distributed through OSCA incorporating 20% discount</p> <p>Designated seats for the elderly in buses within the immediate proximity of bus door for easy ingress and egress</p>			
	PWDs	<p>Provide feeder transport to bus stations and terminals</p> <p>Provide at-grade pedestrian crossings at strategic locations (i.e. schools, markets, churches, etc.)</p> <p>Put up adequate and large traffic signs with flashing lights and sounds/alarms</p> <p>Posting of traffic aides to assist in street crossings</p> <p>Road curbs should be smooth and yet not cause slippage nor become slippery when wet, preferably with hand rails at points of crossing</p> <p>“Courtesy Lanes” at bus stations and terminal</p> <p>Ramps on buses for easy and safe boarding/off-boarding</p>	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		<p>Provide special “passenger cards” incorporating 20% discount</p> <p>Hand and guard rails within easy reach of PWD</p> <p>Designated seats for PWDs in buses within the immediate proximity of bus door for easy ingress and egress</p> <p>Ensure enough space in the bus to accommodate assistive devices of PWDs</p> <p>Passenger instructions written in Braille could be installed to allow the blind or sight-impaired persons to find his way without needing special assistance</p>			
	Women	<p>Provide feeder transport to bus stations and terminals</p> <p>Provide at-grade pedestrian crossings at strategic locations (i.e. schools, markets, churches, etc.)</p> <p>Put up adequate and large traffic signs with flashing lights</p> <p>Posting of traffic aides to assist pregnant women and mothers with infants/small children in street crossings, or going into/coming from</p>	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		the bus station “Courtesy Lanes” for pregnant women/mothers with infants/small children at bus stations and terminal Ramps on buses for easy and safe boarding/off-boarding and not cause strain on pregnant women Designated seats/space for pregnant women, lactating mothers or mothers with infants/small children, and unescorted ladies Special “for women only” buses during peak hours Bus stations ideally to be within the proximity of markets, schools and churches			
	Children	Provide feeder transport to bus stations and terminals Provide at-grade pedestrian crossings at strategic locations Put up adequate and large traffic signs with flashing lights Posting of traffic aides to assist in street crossings or going into/coming from the bus stations as well as oversee if there may be suspicious characters in and around	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		the vicinity of the bus stations Signage reminding commuters not to crowd-out children while boarding, off-boarding and inside the bus must be installed Hand and guard rails must be within easy reach of children. Children must not be allowed to seat or stand near bus doorways: signage must be installed to remind everyone about this			
	Other commuters	Provide feeder transport to bus stations and terminals Provide at-grade pedestrian crossings at strategic locations for access to short-distance trip for the affected barangays	BRT Operator	RT Management	Quarterly monitoring against established standards, rules, and regulations
Affordability	Elderly PWDs Children Women Other commuters	Ensure affordable but competitive fare rate Provide mandated discounts Ensure affordable but competitive fare rate	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations
Safety and Security	Elderly	Install adequate security measures within the bus station and its immediate environ to serve as both deterrent as well as facilitating mechanism in the arrest of potential	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		<p>petty criminals</p> <p>Install intelligent traffic signaling devices to help in regulating the flow of people and vehicles within the bus station/terminal</p> <p>Post traffic aides to enhance the circulation as people and motorists can see authority figures</p> <p>Place security officers to ensure pre-emptive visibility</p> <p>Ensure adequate ventilation to help ease the discomfort of over-crowded space</p> <p>Install special waiting lounge/space for the elderly in bus stations and terminals</p>			
	PWDs	<p>Install adequate security measures within the bus station and its immediate environ to serve as both deterrent as well as facilitating mechanism in the arrest of potential petty criminals</p> <p>Install intelligent traffic signaling devices to help in regulating the flow of people and vehicles within the bus station/terminal</p> <p>Post traffic aides to enhance the circulation as people and motorists</p>	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		<p>can see authority figures</p> <p>Place security officers to ensure pre-emptive visibility</p> <p>Ensure adequate ventilation to help ease the discomfort of over-crowded space</p> <p>Install special waiting lounge/space for PWDs in bus stations and terminals</p>			
	Women	<p>Install adequate security measures within the bus station and its immediate environ to serve as both deterrent as well as facilitating mechanism in the arrest of potential petty criminals</p> <p>Install intelligent traffic signaling devices to help in regulating the flow of people and vehicles within the bus station/terminal</p> <p>Post traffic aides to enhance the circulation as people and motorists can see authority figures</p> <p>Place security officers to ensure pre-emptive visibility</p> <p>Ensure adequate ventilation to help ease the discomfort of over-crowded space</p>	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		Install special waiting lounge/space for pregnant women/ mothers with infants or small children in bus stations and terminals			
	Children	<p>Install adequate security measures within the bus station and its immediate environ to serve as both deterrent as well as facilitating mechanism in the arrest of potential petty criminals</p> <p>Install intelligent traffic signaling devices to help in regulating the flow of people and vehicles within the bus station/terminal</p> <p>Post traffic aides to enhance the circulation as people and motorists can see authority figures</p> <p>Place security officers to ensure pre-emptive visibility</p> <p>Ensure adequate ventilation to help ease the discomfort of over-crowded space</p> <p>Install special waiting lounge/space for children in bus stations and terminals to avoid being crowded-out/in by adults</p>	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations
	Other commuters	Install adequate security measures within the bus station and its immediate environ to serve as both deterrent as well as facilitating	BRT Operator	BRT Management	Quarterly monitoring against established standards, rules, and regulations

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		<p>mechanism in the arrest of potential petty criminals</p> <p>Install intelligent traffic signaling devices to help in regulating the flow of people and vehicles within the bus station/terminal</p> <p>Post traffic aides to enhance the circulation as people and motorists can see authority figures</p> <p>Place security officers to ensure pre-emptive visibility</p> <p>Ensure adequate ventilation to help ease the discomfort of over-crowded space</p>			
Livelihood	<p>Individual PUJ/PUB Drivers and Operators PUJ Organizations/ Cooperatives PUB Companies/ Cooperatives Support Personnel in the PUV sector (<i>i.e.</i>, barkers, mechanics, janitors, office personnel, etc.)</p>	<p>SMP Options: Route relocation, modification and truncation; Co-existence with the BRT or remain on their route, despite the impact of the Metro Manila BRT Line-1 Project; Scrapping or wholesale purchase of old PUJ units by the government; Formation of concessionaire group among operators to become part of the BRT consortium/investors; and Provision of alternative livelihood/TESDA training/preferential hiring to affected drivers/personnel and/or</p>	<p>BRT Operator, DOTC, LTFRB, LTO, TESDA</p>	<p>DOTC, LTFRB, LTO,</p>	<p>Monitor number of PAPs allocated with new, modified, and truncated routes on a weekly basis.</p> <p>Monitor number of PAPs benefited with SMP options on a weekly basis</p> <p>Conduct of social surveys to determine income and livelihood of PAPs three months from BRT operation</p>

Table 7.3.1: Social Impact Management Measures and Activities

Social Risk/Impacts	Target Population	Management Measures	Implementing Agency/ Organization	Source of Fund	Monitoring and Evaluation Mechanism
		members of affected households.			
	PUJ/PUB Drivers and members of affected households	Skills/technical trainings under TESDA Preferential hiring for BRT operation Employment assistance	BRT Operator, TESDA	DOTC, BRT Management, TESDA,	Monitor number of PAPs provided with TESDA training Track TESDA training beneficiaries and determine training effectiveness/ labor force absorption Monitor number of PAPs employed in the BRT system
Misinformation/ lack of project awareness	Other commuters/commuting public	Information and Education Campaign 1) Tri-Media; 2) Public Forum; 3) Flyer distribution in public bulletin boards	BRT Operator Civil Society Consultative Committee (CSCC)	DOTC, BRT Management	Conduct of compliance audit with operating rules and traffic guidelines on a quarterly basis. Compliance audit against establish community support and communications plan on a quarterly basis.

7.3.1 Cost of Social Management Measures

659. The costs of social management measures are presented in **Table 7.3.2**.

Table 7.3.2: Cost of Social Management Measures

A. PRE-CONSTRUCTION PHASE		
1. Consultation Meetings with Vulnerable Stakeholders (PWDs, women, elderly, children and other commuters)	2 meetings @ USD1000 per meeting	2,000
2. Commissioning of Environmental and Social Management Consultants	<ul style="list-style-type: none"> • Social Safeguards Specialist (3 man-months @ USD8,000 per man-month) • Environmental Specialist (1 man-month @ USD8,000 per man-month) • Support Staff (9 man-months @ USD2400 per man-month) • Out-of-Pocket Expenses (LS – USD10,000) • Taxes (15%) 	73,400
3. Route verification, traffic analysis, economic viability studies on the proposed new, modified and truncated routes;	<ul style="list-style-type: none"> • Traffic Modeling and Management Specialist (3 man-months x USD8,000) • Economist (2 man-months x USD8,000) • Support Staff (6 man-months x USD2400) • Out-of-Pocket Expenses (LS – USD5000) • Taxes (15%) 	68,310
4. Project Studies for Scrapping of old PUVs	<ul style="list-style-type: none"> • Economist (1 man-month x USD8000) • Environmental Specialist (1 man-month x USD8000) • Institutional Management Specialist (0.5 man-month x USD8000) • Support Staff (2 man-months x USD2400) • Out-of-Pocket Expenses (LS – USD2,000) • Taxes (15%) 	30,820
5. Project preparation studies on the provision of central PUV terminal	<ul style="list-style-type: none"> • Economist (2 man-month x USD8000) • Environmental Specialist (1 man-month x USD8000) • Infrastructure Planner (1 man-month x USD8000) • Institutional Management Specialist (0.5 man-month x USD8000) • Support Staff (4 man-months x USD2400) 	58,190

	<ul style="list-style-type: none"> • Out-of-Pocket Expenses (LS – USD5000) • Taxes (15%) 	
6. Appraisal of Replacement Cost and Compensation for Affected Establishments	LS	10,000
7. Monitoring and Evaluation	LS	25,000
8. Compensation to Affected Establishments		TBD
B. CONSTRUCTION PHASE		
1. Information Dissemination and Communications	LS	100,000
2. TESDA Trainings	500 pax x USD500	250,000
3. Monitoring and Evaluation	LS	20,000
C. OPERATION PHASE		
Impact Monitoring and Evaluation	LS	60,000
Total SMP Cost		697,720

660. The above cost summary does not include compensation and resettlement cost for any commercial establishment that may be affected by the project. Impact monitoring and evaluation cost is only for the one-time post implementation impact monitoring and evaluation study to be conducted. Cost of recurrent monitoring and evaluation studies are not included.

7.4 Environmental Monitoring Works

661. The main objective of environmental monitoring works is to ensure that the environmental and social mitigation measures during construction are implemented by the Contractor through a systematic supervision by DOTC PMO/PIU with assistance from SPO-TSC during the construction phase. Environmental issues are also anticipated to be identified in advance for avoidance and ensure timely completion of the project. Consequently, the environmental monitoring framework for this project will form part of the basis of the TOR for the Contractor, General Conditions of the Contract (GCC), Technical specifications and the project ESIA/ESMP.

7.4.1 Compliance Monitoring

662. Table 7.2.1 also shows the program for monitoring the compliance on various provisions of the ESMP during pre-construction, construction and operation phases. DOTC PMO/PIU and TSC needs to implement a number of measures during detailed design phase (e.g., incorporation of environmental design measures into the detailed design, preparation of draft method statements/ESMPs, etc.) and this will be confirmed by TSC/PIU to WB. During construction, most of the mitigation measures shall be implemented by the Contractors and their environmental performance, in terms of implementation of such measures, shall be monitored by PIU and TSC. The timing or frequency of monitoring is also specified in Table 7.2.1. During operation ESMP implementation shall be the responsibility of the BRT Line -1 Operator.

7.4.1.1 Design Stage

663. DOTC PMO/PIU and SPC shall ensure that ESMP measures for the design stage are incorporated in the detailed design. The bidding documents for TSC candidate consultants will also include the ESMP. The effective incorporation of the ESMP in the civil works contracts shall also be ensured by PMO/PIU with assistance from TSC and this, along with implementation of ESMP provisions, shall be audited by WB as part of the loan conditions.

664. Prior to implementation of the Project, the ESIA and ESMP will be updated and amended, as necessary, by TSC after the detailed designs are complete and contracting arrangements are known. Such updating shall be based on reconfirmation and any additional information on the assumptions made at this feasibility stage on location scale and expected conditions of the Project. For example, in

this case if there is additional land required (although not confirmed as yet) the designs may be amended and the environmental significance must be reviewed. Although no major additional impacts would be anticipated based on the information provided to date, the performance and evaluation schedules to be implemented during project construction can be reviewed, updated, and costs estimates can be revised if necessary.

7.4.1.2 Pre-construction Stage

665. Implementation of construction of the Project will need to comply with environmental requirements and from clearance that has been obtained from DENR. TSC will also need to confirm that Contractor(s) and their suppliers have complied with all statutory requirements for permits from DENR and provincial authorities. TSC shall also check if that Contractor(s) have all the necessary valid licenses and permits for use of powered mechanical equipment if necessary and the use of local water supplies (and to construct or operate plant such as for cement batching or asphalt/bitumen (if required) in line with all environmental regulations and environmental clearance certification conditions from designated authorities.

7.4.1.3 Construction Stage

666. The updated ESMP to be prepared by contractors, with assistance from the TSC, will be reviewed and approved by PIU before any construction activity is initiated to take account of any subsequent changes and fine tuning of the draft ESMP prepared by TSC. The TSC shall undertake regular monitoring of the contractor's implementation of mitigation measures specified in the ESMP.

7.4.1.4 Operational Stage

667. BRT Operator shall implement the ESMP mitigation and monitoring requirements during operation such as monitoring of runoff control measures, survival of planted trees, etc. Accidents along BRT road shall also be monitored as basis for implementation of mitigation measures to improve road safety.

7.4.2 Reporting and Monitoring Parameters

668. As shown in Table 7.2.1, TSC shall undertake baseline environmental monitoring for air quality, noise and surface water quality. One-time sampling shall be conducted prior to start of site works at the specified locations. During construction, TSC shall undertake quarterly monitoring of surface water quality and semi-annual monitoring of air quality and noise in the same locations sampled during pre-construction. Additional sampling occasions shall be carried out and additional parameters shall be analyzed (as necessary) to validate complaints and/or investigate pollution events caused by the project.

669. SPC/PIU shall submit the following environmental monitoring report to WB and DENR.

670. *Baseline Monitoring Report:* The results of baseline data collection carried out by TSC on air quality and noise (as specified in the ESMP) shall be submitted to WB prior to commencement of civil works.

671. The environmental monitoring reports shall cover the status of the ESMP implementation in terms of required mitigation measures for different project phases, results of environmental effects monitoring (air quality, noise and surface water quality), necessary remedial actions to effectively address negative environmental impacts due to project implementation, status of environmental capacity building activities as well as documentation of complaints received and corresponding action/resolution. The environmental monitoring reports will be submitted to WB and DENR semi-annually during the construction period and annually for two years after completion of construction.

7.5 Environmental Monitoring Costs

672. As part of good engineering practices in the Project, there have been several measures as spoil management, safety, signage, dust prevention, noise mitigation, etc. the costs for which will be

included in the design costs of the Project. Cost for various ESMPs are embedded to the Contractors' cost.

673. The EIA costs include monitoring costs during construction and capacity building costs on environmental management of which are either absorbed into TSC or contractors works packages (See **Table 7.5.1**).

Table 7.5.1: Estimated Annual Environmental Monitoring Cost

Project Stage	Parameters	Quantity	Details	Amount (US Dollars)
Air Quality				
Pre-Construction	PM ₁₀ , PM _{2.5} , NO _x , SO _x , CO	10 sampling sites @ one time prior to construction	10 sampling sites @ US\$1,500/sampling site x 1	1,500.00
Construction	PM ₁₀ , PM _{2.5} , NO _x , SO _x , CO	10 sampling sites @ twice a year	10 sampling sites @ US\$1,500/sampling site x 2	3,000.00
Operation	PM ₁₀ , PM _{2.5} , NO _x , SO _x , CO	10 sampling sites @ twice a year	10 sampling sites @ US\$1,500/sampling site x 2	3,000.00
Noise				
Pre-construction	Noise levels on dB(A) scale	10 sampling sites @ one time prior to construction	10 sampling sites @ US\$1,500/sampling site x 1	1,500.00
Construction	Noise levels on dB(A) scale	10 sampling sites @ twice a year	10 sampling sites @ US\$1,500/sampling site x 2	3,000.00
Operation	Noise levels on dB(A) scale	10 sampling sites @ twice a year	10 sampling sites @ US\$1,500/sampling site x 2	3,000.00
Water Quality				
Pre-Construction	pH, color, TSS, BOD, COD, oil & grease,	6 sampling sites (upstream and downstream of river crossing) @ one time prior to construction	6 sampling sites @ US\$ 2,000 x 1	2,000.00
Construction	pH, color, TSS, BOD, COD, oil & grease	6 sampling sites (upstream and downstream of river crossing) @ twice a year	6 sampling sites @ US\$ 2,000 x 2	4,000.00
Operation	pH, color, TSS, BOD, COD, oil & grease	6 sampling sites (upstream and downstream of river crossing) @ twice a year	6 sampling sites @ US\$ 2,000 x 2	4,000.00
<i>Exchange rate: 1\$ = PhP 40</i>				

7.6 Environmental Capacity Building and Training

674. The costs for training proposed include the costs incurred towards the site visits, travel to the training program by the participants, printing of training materials, and other logistic arrangements. The budget for the environmental management costs for the Project is presented in **Table 7.6.1** below. The government counterpart funding will require covering the costs for environmental permitting and tree planting, these are included as a separate line item under the total project costs.

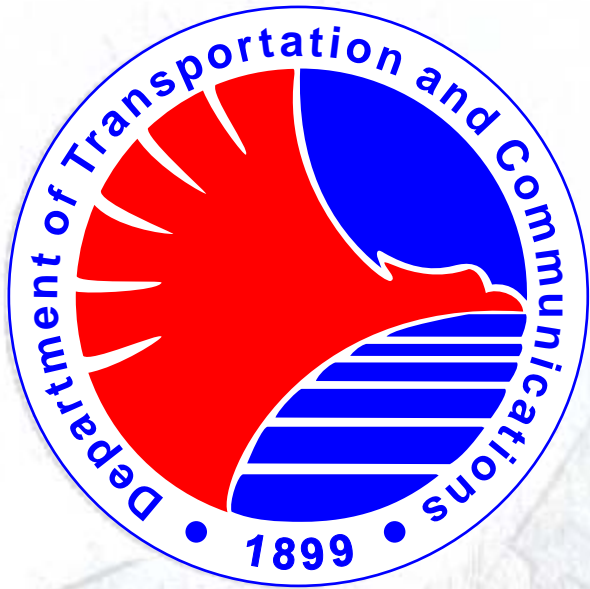
Table 7.6.1: Estimated Annual Capacity Building and EMP Cost

EMP	Details	Amount (US Dollars)
1. Capacity Building	Includes hiring of third party entities; Cost is to be shouldered by the Contractor; Quarterly @ US\$4,000/occasion	16,000.00
2. Monitoring	Cost during pre-construction and construction phases is to be shouldered by the Contractor; Quarterly @ US\$3,000/occasion	16,000.00
3. EMP	Cost is to be shouldered by the Contractor	Part of the project cost
<i>Exchange rate: 1\$ = PhP 40</i>		

7.7 Conclusions

675. As always mentioned, the BRT Line-1 Project is for the entire Metro Manila's transportation modernization and economic development. The EIA revealed that the Project could have adverse environmental impacts but are by large manageable.

676. The ESMP will reduce adverse environmental impacts to acceptable levels, it includes specifications for environmental protection measures for each potential environmentally adverse impact and includes a detailed monitoring plan. It also spells out responsibilities for each relevant organization in the implementation of the ESMP. The ESMP ensures implementation of the environmental mitigation measures and monitoring during pre-construction, construction and operation. Therefore, the Project will be implemented in an environmentally sound manner and will effectively contribute to the sustainable urban development of Quezon City and City of Manila.



Chapter 8: Consultation, Information Disclosure, & Grievance Redress Mechanism

8.0 CONSULTATION, INFORMATION DISCLOSURE, & GRIEVANCE REDRESS MECHANISM

8.1 Stakeholder Identification

8.1.1 Direct Stakeholders

677. Within the proposed BRT Corridor, the most affected stakeholders are the PUJ and PUB drivers, workers and operators that are plying within the BRT corridor and some business establishments or entities that are located within the proposed BRT terminals and stations. These stakeholders are considered as direct stakeholders because these stakeholders are economically displaced people. The design of major public consultations undertaken for this Project have targeted these key stakeholders.

8.1.2 Indirect Stakeholders

678. Indirect stakeholders can be defined as those persons or organisations that may, be interested in or able to influence the outcome of the Project, either because they can contribute knowledge or improve Project design or mitigate social and/or environmental impacts, or because they have regulatory function and political influence in the Project that needs to be considered. For this Project, indirect stakeholders include the DOTC-LTFRB, local government units, special interest groups, public transportation groups with routes outside of the proposed BRT corridor, local communities, local commuters, civil society, NGOs, DPWH, DENR, press and media, among others.

8.2 Public Consultations during Detailed Technical Study (DTS) Stage

679. For the Metro Manila BRT Line 1 Project, various activities were carried out related to information disclosure, public consultation (PC), and public participation. These initiatives were undertaken during the Detailed Technical Study (DTS) and ESIA Phases of the project. Information disclosure and public participation were achieved by employing various modes of public communications.

680. During DTS Phase of the project, face-to-face meetings were conducted with representative from the local governments of Manila City and Quezon City, officers of the public utility jeepneys operators and drivers' associations on the nine (9) routes that will be potentially affected by the implementation of the project, and special interest groups. These public consultations are summarized in **Table 8.1.1**.

Table 8.1.1: Public consultation meetings during DTS Phase, Metro Manila BRT Line-1 Project

STAKEHOLDER	DATE OF MEETING	NO. OF PARTICIPANTS (excluding study team members)
LOCAL GOVERNMENT UNITS		
Quezon City	May 20, 2013	□ Gen. Elmo San Diego, Head of the Dept. of Public Order and Safety and staff (3)/
	August 7, 2013	□ QC Management Committee
Manila City	August 5, 2013	Vice Mayor Isko Moreno
PUBLIC TRANSPORTATION OPERATORS		
Pasiklab Operators-Drivers Association (PASODA)	July 10, 2013	6
Kalaw-Arroceros-Pier-Commonwealth Jeepney Operators-Drivers Association (KAPCOMJODA)	July 17, 2013	3

SPECIAL INTEREST GROUPS		
National Center for Commuter Safety and Protection (NCCSP)	January 18, 2013	Elvira Medina Chairperson
Philippine Commission on Women	April 23, 2013	6

8.2.1 Local Government Units

681. The concept of the project was presented on different occasions to the Head of the Department of Public Safety and Order as well as the Management Committee of Quezon City and to Vice Mayor Isko Moreno of Manila City.

Views on the project

682. The participants from the two local government units that will be traversed by the proposed Metro Manila BRT Line-1 project acknowledge its potential benefits to their residents.

Mayor Herbert Bautista, Quezon City: "I have seen and experienced similar approaches in Bogota and Curitiba and I believe that proposed project will be good for Quezon City"

683. The participants from Quezon City also believe that the implementation of the proposed project will enhance the businesses along the corridor.

Gen. Elmo San Diego, DPOS, Quezon City: "This is very good for the business boom that is happening right now along Quezon Avenue"

Impact to the Environment

684. One of the key issues that were raised by the participants was on the kind of buses and fuel that will be used within the project.

Gen. Elmo San Diego, DPOS, Quezon City: "The fuel that will be used by the buses is an important consideration in view of our current thrust for a greener QC (Quezon City)"

8.2.2 Public Utility Vehicles (PUV) operators and drivers

685. Round table discussions were held with officers of the two associations identified for the 9 PUJ routes that will be affected by the proposed Metro Manila BRT Line-1 Project. These associations are as follows:

- (1) Pasiklab Operators-Drivers Association (PASODA) whose members are servicing the following PUJ routes:
 - a) Philcoa – Pier;
 - b) Philcoa – Kalaw;
 - c) Fairview – Dahlia – Kalaw; and
 - d) Fairview – Dahlia – Pier; and

- (2) Kalaw-Arroceros-Pier-Commonwealth Jeepney Operators and Drivers Association (KAPCOMJODA) which plies the following routes:
 - a) Balara-TM Kalaw;
 - b) Fairview-Arroceros;
 - c) Fairview-Quiapo; and
 - d) Philcoa-Arroceros.

Views on the Project

686. Upon the presentation of the key features and examples of similar systems in other parts of the world as well as the proposed alignment, the participants acknowledge the potential benefits this would have on addressing the problem of congestion and organizing road transport. However, the participants expressed that the implementation of the BRT project will hurt them financially.

PASODA member: "Driving/Operating PUJs is our main source of income. We depend on this for our family's daily needs, including tuition of our children. With this project, I worry about our children's future"

687. However, the participants expressed that the essence of the jeepney as a symbol of being a Filipino must be maintained, although it was not clear how this was to be done.

KAPCOMJODA member: "The jeepney has come to symbolize the Filipinos and our colorful way of life, thus it should be retained, even with the implementation of the project"

Other issues/concerns raised

688. The participants were open to the possibility of becoming part of the project as part of management or feeder routes. The participants asked whether they could still retain their organizations for stronger positioning to participate in the project.

689. The participants were also receptive to the possibility of serving as feeder services to the corridor on new routes that will be opened. "The rationalization of the PUJ routes and the opening new ones for un-served passenger demand is something that needs to be done by LTFRB"

690. The participants opined that the reason colorum operations have proliferated is because that government has not been 'policing' the routes properly. Some operators have valid franchises for routes other than the actual ones they are serving.

691. Another concern raised was the potential competition with the tricycles in serving as feeders to the corridor. They were assured that the appropriate mode of transport in each area will be promoted.

692. Participants from both groups expressed their concern that bus operations will be managed by businessmen whose main agenda will be profit.

PASODA member: "Is there any assurance that the proposed system will not be run by capitalists?"

693. It was explained to the participants that the government will be regulating the operating management company which will include existing public transport operators who are qualified.

694. The participants accept that there will be a change in the way that public transportation will be operated in the future, although there are still misgivings as to what will happen to them. However, they express that the preparations for this change should be properly managed to ensure that none will be put at an undue disadvantage.

695. Other concerns raised were on the kind of fuel that will be used by buses; kind and capacity of buses; operating time of buses; and financing for the system

8.2.3 Special interest groups

National Center for Commuter Safety and Protection (NCCSP)

696. From the perspective of the commuters as articulated by the Chairperson of the National Center for Commuter Safety and Protection, other major problems with the current public transportation system are:

- 1) Lack of security and exposure to risk of commuters - According to Ms. Medina, there is no law or system in place that commuters can use when they feel at risk during travel using public

transportation. Thus, in response to the latter, the National Center for Commuter Safety and Protection (NCCSP) is launching a project with the Department of Interior and Local Government (DILG) and several non-government organizations such as the Volunteers against Crime and Corruption (VACC) called 'Mata ng Kalsada' (Eye of the Street). It seeks to provide commuters an accessible and efficient channel for reporting crimes through a mobile hotline number (117) and to document these instances.

- 2) Poor quality of service - NCCSP perceives that commuters are not served well by the current public transportation drivers and are subjected to discourteous behaviors of drivers at times.

Elvira Medina, NCCSP: "The commuter should be treated as king (or queen), but sadly this is not happening right now"

Philippine Commission on Women (PCW)

697. The meeting was attended by 6 staff members of the Philippine Commission on Women (PCW) who commute daily. According to the participants, their Executive Director considered it suitable that those who will participate are those who experience taking public transportation daily, thus making the discussion more meaningful. Views of the project can be summarized as:

- 1) Opportunity of the government to remove colorum vehicles and phasing out non-road worthy vehicles;
- 2) The participants believe that the implementation of bus improvements in Metro Manila will provide an opportunity for the government to weed out colorum and non-roadworthy vehicles;
- 3) Reduce congestion at stations - the high frequency of buses in the stations reduces waiting time and avoids the need for people to push one another as they get into the vehicle.
- 4) Benefits of lane separation - the participants acknowledge that with the separate busways, travel will be faster.
- 5) Other questions were raised by the participants, include:
 - a) Exclusive buses for females only - one issue raised was whether there will be buses that will be exclusively for females, say one every hour. According to the participants, women are subject to physical harassments in public transportation due to over-crowding.
 - b) Ticketing System - Will the ticket booths dispense change for the payments? Are tickets available for purchase at convenience stores?
 - c) On security in stations - Will there be security guards at stations? Will there be CCTVs at the stations? Will there be physical barriers between the platform and the busways?
 - d) On bus services - Will there be designated seats for those with special needs (ex. PWDs, pregnant women)? Will there be standees? Will the bus system be vulnerable to transport strikes?

8.3 Public Consultations during the ESIA Stage

698. During the ESIA stage, the Project Team held 19 public consultation meetings with the affected PUV sector and two (2) meetings with the PWD sector. During these public consultation meetings, the Project Team provided the following to the attendees:

1. A multi-media presentation of the BRT system;
2. An explanation of the BRT corridor, station designs, and some characteristics of BRT vehicle; and
3. Discussion on the environmental and social impacts of the project.

699. After providing above information, the attendees were asked to fill out a form asking them of the potential issues or concerns they have about the BRT project implementation. They were also asked to provide their recommendations on issues and concerns raised.

700. All public consultation meetings held were voice recorded or video-taped. These were then transcribed. **Annex 8** presents the highlights, attendance sheets, and photo documentations of the consultation meetings.

Table 8.2.1: Summary of Consultation Meetings Held, ESIA for the Metro Manila BRT Line-1

Nov. 24, 2014	Philcoa Terminal, Commonwealth Avenue	STOP TRANS. (Samahan ng mga Tsuper at Operator sa Philcoa)	1 officer and several members/ operators
Jan. 10, 2015	Agham Road, Quezon City	HEQFA JODA INC. FEJODAP (Hypermart EDSA Quezon Blvd. Fairview Jeepney Operators and Drivers Association Inc.)	52 attendees: officer/ members
Jan. 22, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	LACODA TRANSPORT	President of LACODA
Jan. 24, 2015	Multi-Purpose Hall, New Capitol States 1, Brgy. Batasan Hills, Quezon City	HEQFAJODA (Hypermart EDSA Quezon Blvd. Fairview Jeepney Operators and Drivers Association Inc.	5 attendees/ officers
		TROPANG TSUPER	5 attendees/ officers
		Q.R.C.K (Quirino Regalado Cubao Kalayaan Joda)	2 attendees/ officers
		Heaven Blessed Bus Line Express Inc.	1 member and officers
Jan. 29, 2015	Multi-Purpose Hall, New Capitol States 1, Brgy. Batasan Hills, Quezon City	HEQFAJODA (Hypermart EDSA Quezon Blvd. Fairview Jeepney Operators and Drivers Association Inc.	7 attendees/ officers
		TROPANG TSUPER	4 attendees/ officers
Jan. 31, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	Q.C.F.D	1 member and officers
		TROPANG TSUPER	1 officer
		B.A.I. (Bagyo Association Inc.)	1 officer
Jan. 31, 2015	Basicano Field Office- Zabarte	1 Team (BASICANO)	President, Vice-president, Chairman, Treasurer
Feb. 04, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	TROPANG TSUPER representatives	7 officers
Feb. 06, 2015 (Morning)	Barangay 177, Zabarte Road, Camarin, Caloocan City	Heaven Blessed Bus Line Express Inc.	16 Drivers 27 conductor
Feb. 06, 2015 (Afternoon)	Caloocan City Hall Annex	Basicano Transport	3 officers
		SM-BASIJODA TRANSPORT	2 officers

		EVASTRANGCO TRANSPORT	2 officers
Feb. 07, 2015	Multi-Purpose Hall, New Capitol States 1, Brgy. Batasan Hills, Quezon City	HEQFAJODA INC.	3 officers
		SHENOVA JODA	3 officers
		B.A.I.	2 officers
		TROPANG TSUPER	2 officers
Feb. 11, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	TROPANG TSUPER	3 officers
Feb. 12, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C	HEQFA JODA INC. FEJODAP	President
Feb. 14, 2015 (Morning)	Multi-Purpose Hall, New Capitol States 1, Brgy. Batasan Hills, Quezon City	KAMIAS TSC	1 officer
		MONITORIN GROUP	1 officer
		PROGDOA PISTON	3 officers
		HEQFA JODA INC.	2 officers
		A.C.T.O LAGRO.SM	2 officers
		SHENOVA JODA	3 officers
		NODEBA JODA	2 officers
		AGUILA GROUP	1 officer
		TROPANG TSUPER	2 officers
Feb. 14, 2015 (Afternoon)	Multi-Purpose Hall, New Capitol States 1, Brgy. Batasan Hills, Quezon City	Tropang Tsuper (Informal Transport Group)	6 attendees/ officers
Feb 16, 2015	NCDA Building, Isidora Street, Barangay Holy Spirit, Diliman, Quezon City	National Council on Disability Affairs	Executive Director and two staff
Feb. 22, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	TROPANG TSUPER	6 attendees/ officers
Feb. 25, 2015	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	NEW SIGLI COM	1 officer
		NEW-SI SUJODA INC.	3 attendees/ officers
		SANLICOM	2 attendees/ officers
		COMMON TRANSPORT SERVICES COOPERATIVE	2 attendees/ officers
Feb. 28, 2015 (morning)	Commonwealth Extension Brgy. Pasong Putik	COMTRANSDECO (Commonwealth Transport Service and Development Cooperative)	9 attendees/ officers
Feb. 28, 2015 (afternoon)	GECC Office, Blk 14, Lot 3 Lapu-Lapu St., NCE1, Batasan Hills, Q.C.	TROPANG TSUPER	5 attendees/ officers
		Common TSC	2 attendees/ officers
March 02, 2015	NCDA Building, Isidora Street, Barangay Holy Spirit, Diliman, Quezon	National Council on Disability Affairs	34 attendees/ representatives

City

8.3.1 Meetings with the PUJ/PUB Sectors

701. The main issues and concerns raised during the meetings by operators and drivers are as follows:

- 1) The BRT project might result to loss of livelihood to the operators and drivers;
- 2) Will the government help them relocate or find new routes to operate?
- 3) Will they be allowed to co-exist with the BRT?
- 4) If they operate on feeder routes to the BRT, will DOTC be willing to provide them a central PUJ/PUB Terminal?
- 5) Will there be a way for them to participate as investors in the BRT?
- 6) Can they or a member of their households be given preference to work in the BRT system;
- 7) Can they avail of trainings to enhance their skills and employability.
- 8) Will the government be willing to purchase their old vehicles for scrapping?

702. These consultation meetings were important in crafting the SMP for the PUJ/PUB sector as provided in detail in the previous section.

8.3.2 Meetings with the PWD Sector

703. The following were the general concerns raised during the open forum at the stakeholder consultation with PWDs held through the National Council for Disabilities Affairs (NCDA):

- 1) The introduction of an additional fleet of 300 buses might lead to more congestion on the corridor.
- 2) Incessant flooding along España might pose problems for the BRT. There must be measures to address this.
- 3) Persons with disabilities hopefully will be given a discount on the bus fare.
- 4) The concept design addresses the needs of persons with mobility impairments, but there seems to be none for those with sensory impairments. Announcement might just be audio, but hopefully there can be visuals also for the deaf. There must also be tactile floor services for the blind. Persons with disabilities must not need to walk too far.
- 5) The buses and stations have to be accessible. Is the BRT adopting the principle of universal access or BP 344 (Accessibility Law)?
- 6) There must be ample allocated/reserved seats or space for persons with disabilities, with special ones for those in wheelchairs. There must be strict compliance with these reserved seats or spaces.
- 7) The transfer from the BRT to other modes must be seamless and easy for persons with disabilities.
- 8) If those in wheelchairs have a ramp, how about those with crutches? It is harder for the latter to move. They should be given priority on elevators or on the buses as well.
- 9) Hopefully, CCTVs will be installed on the buses and stations.
- 10) Will there be provisions for luggage?
- 11) Will the BRT operate 24/7?
- 12) Hopefully, even persons with disabilities with ample skills can be hired to staff the BRT.
- 13) Every bus should have allocated seats or spaces for persons with disabilities. They do not want to be segregated on one bus at a time.
- 14) There must be designated staff to help persons with disabilities.
- 15) Audiovisuals will greatly help persons with disabilities.
- 16) Get data about senior citizens and persons with disabilities. Do not rely on LGU counts alone, as these are not accurate (as averred by the Acting Executive Director of NCDA).
- 17) All kinds of persons with disabilities must be taken into consideration, and all existing modes hopefully can do the same.

704. All in all, the attending PWDs want a very accessible BRT system, which was raised over and over during the forum, as well as audiovisuals and other aids that are suited to the various sensitivities of people with disabilities and the elderly.

8.4 Future Public Consultations

705. Two more public consultations will be held during the ESIA stage. These public consultations will be done before and after the submission of the Draft Final ESIA. Representatives of project stakeholders shall be invited and are expected to attend these consultation meetings.

8.5 Community Relations and Participation Plan (CRPP)

706. The CRPP involves (i) the establishment of a civil society consultative committee, (ii) procedures and mechanisms for information dissemination and community access to project management and; (iii) support to communities for improving streets affected by construction and traffic detours; and (iv) community information mechanisms regarding work schedules, traffic detours, and disruption of urban services.

8.5.1 Civil Society Consultative Committee (CSCC)

707. A CSCC shall be organized by the Project Implementing Unit (PIU) to be composed of the PIU Communications Specialist as Chair, representatives from the LGUs (Quezon City and City of Manila), representatives from special interest groups including NCDA, NCCSP, and PCW, MMDA, PNP Traffic Management Group, barangay officials, and transport sector representatives. The committee shall identify and discuss issues and concerns from various sectors of society with regards to the BRT project construction and operation and to develop a means of communication so that such issues and concerns are taken into consideration during project implementation or are properly addressed in a timely manner either during project construction or during BRT operation.

8.5.2 Public Relations and Communication Group

708. A Public Relations and Communications Group shall be created under the PIU to be staffed by a Communications Specialist, graphic designer, and support staff. The Group shall be the PIU's representative or secretariat for the Civil Society Consultative Committee. Its tasks will also include preparation of project information materials and ensuring information and communication requirements for the BRT project are met.

8.5.3 Information Dissemination and Stakeholder Enhancement Plan

709. In order to keep the stakeholders abreast about the Project, the Project will undertake a public consultation and disclosure activities and mechanisms to continue beyond the ESIA process throughout the lifecycle of the Project. In this sense, DOTC shall provide periodic reports to the stakeholders that will describe the progress of the project implementation especially on issues that involve risks or impacts.

710. Project information dissemination will be done through the use of the following:

1. Leaflets showing the project and its features;
2. Billboards as a form of promoting public awareness about the project;
3. Facebook showing the various features of the project and soliciting comments and suggestions from the public towards a better BRT project implementation and operationalization;
4. Posters as another form of promoting public awareness;
5. Radio, TV, and online announcements community information mechanisms regarding work schedules, traffic detours, and disruption of urban services; and
6. SMS messaging.

711. **Table 8.5.1** provides the Stakeholder Communications Plan, Responsibilities and Cost

Table 8.5.1: Stakeholder Communications Plan and Responsibilities

Activity	Timing	Responsibility	Estimated Cost (in PHP)
A. Preconstruction Phase			
1) Community liason and grievance recording	Appointment of the Project's safeguard officers and Grievance Officer (GO) in time for consulattaion during the DED stage of the Project and consultation and disclosure activities concerning the final ESIA document	DOTC Project Team, Safeguard Officers and GO	<ul style="list-style-type: none"> • Actual salary of the safeguard officers and GO • Actual community liasoning and coordination cost • Cost per activity shall be prepared by the Safeguard Officers and GO prior to the undertaking of the activity to be approved by DOTC
	Immediate consultation and socio-economic profiling of additional PAPs as found out in the ESIA validation	Consultant (individual or a firm) to be hired by DOTC	<ul style="list-style-type: none"> • Actual cost of services (as bid or as allocated by DOTC)
B. Construction Phase			
1. Community liason and grievance recording	<ul style="list-style-type: none"> ✓ Day to day interactions with stakeholders ✓ Visiting local communities for informal consultation once a week at minimum ✓ Weekly grievance reporting ✓ Discussing progress of implementation of project action plans and issues that involve ongoing risks or impacts (as needed, but atleast annually). 	DOTC PIU, SPC, Safeguard Officers and GO	Part of the cost per activity to be prepared by the Safeguard Officers and GO.
2. Community consultation events	<ul style="list-style-type: none"> ✓ Prior to the start of construction ✓ Prior to the completion of the construction ✓ Project website to be regularly updated 	DOTC PIU, SPC, Safeguard Officers and GO	Part of the cost per activity to be prepared by the Safeguard Officers and GO.
3. Media notifications about Project progress	<ul style="list-style-type: none"> ✓ At least one to two weeks prior to the community 	DOTC PIU, SPC, Safeguard Officers and GO	Cost of the engagement of Media

	consultation meetings ✓ Regularly updated on website or newspaper of local circulation		Personnel; and, Cost of publication of news items.
4. Updating of Stakeholder Communications Plan	✓ Following each of the community consultation events	DOTC, SPC, Safeguard Officers and GO	Part of the cost per activity to be prepared by the Safeguard Officers and GO.
C. Operation and Decommissioning Phase			
1. Grievance logging, resolution and reporting	✓ Ongoing logging and resolution ✓ Bi-annual reporting	DOTC, SPC, Safeguard Officers and GO	Part of the cost per activity to be prepared by the Safeguard Officers and GO.
2. Decommissioning consultation event with affected staff and communities	✓ With staff prior to retrenchment Proceedings ✓ With communities prior to ceasing operations	DOTC, SPC, Safeguard Officers and GO	Part of the cost per activity to be prepared by the Safeguard Officers and GO.

8.5.4 Community Support

712. Community support during project construction and traffic detours brought about by the BRT project implementation will include the following:

- 1) Providing a health and safety specialist to assess public health and safety concerns arising from the project;
- 2) Develop health and safety plans including a community communications plan addressing the health and safety concerns and information needs of the community;
- 3) Provide adequate traffic management support including signages and traffic aide personnel and enforcers during project construction and traffic detours; and
- 4) Providing proper waste disposal methods to ensure sanitation and orderliness at construction sites.

8.6 Grievance Redress Mechanism (GRM)

713. A grievance redress mechanism (GRM) for the Project shall be established by DOTC as part of the overall project management system in order to address community concerns and complaints. Through this mechanism, queries, problems, and complaints about the social and environmental performance of the proposed project in its preparatory, actual, and post-implementation phases will be answered, resolved effectively, and addressed expeditiously.

714. A grievance can be defined as an actual or perceived problem that might give grounds for complaint. For this project, anyone can submit a grievance in the form of comments and suggestions if a person believes that any project related activity has any detrimental impact on the environment, the community, and on their quality of life.

715. The following could be considered grievances:

- ✓ Financial loss, physical harm and nuisance which are negative impacts on a person or a community;

- ✓ Dangers to the environment or health and safety;
- ✓ Failure of DOTC, its Contractors and sub-contractors to comply with standards or legal obligations;
- ✓ Criminal activity and harassment of any nature;
- ✓ Unethical behavior;
- ✓ Impropriety or fraud or financial malpractice; and,
- ✓ Attempts to conceal any of the above.

8.6.1 Designation of Grievance Officer (GO) and Formation of Grievance Redress Committee (GRC)

716. DOTC shall designate a Grievance Officer who will be the main point of contact for all grievance related concerns. The grievance inquiries or complaints shall be directed to the following:

Grievance Officer	Full Name Contact Numbers: Landline: Mobile Number: Email:	Complete Address of the GRC Office Tel. No.: Fax No.: Email:
-------------------	--	---

717. The name and contact details of the GO shall be disclosed at the city and community levels through future public consultation meetings, Project website and/or any written information given to the stakeholders. Functions of the GO shall include, among others, (1) organize and manage grievance mechanism and processes; and, (2) responsible for disseminating information regarding construction schedules or program on a timely basis to communities that are likely to be directly affected; and (3) the establishment of a logging system of all grievances that will contain the following information: (i) Date of the grievance or comment; (ii) name and contact address of the complainant; (iii) brief description of the complaint; (iv) brief description of the action taken by DOTC to investigate the cause of the complaint and bring about corrective action; and (v) date of reply to the complainant, with a file reference to any correspondence.

718. For grievances that will not be resolved by the GO, such grievances shall be elevated to the attention of the Grievance Redress Committee (GRC). The functions of the GRC include the addressing of “high level” legitimate concerns, grievances of the local communities and affected parties who may consider themselves deprived of appropriate treatment under the project DOTC shall facilitate the establishment of GRC prior to the Project’s work mobilization.

719. The GRC may be comprised of representative from DOTC, SPC, local government units of Quezon City and Manila City, affected PUJs and PUBs, the Contractor’s Social and Environment Safeguard Specialist, and the Project’s Environment and Social Safeguard Specialist. The role of the GRC is to address the project related grievances of the affected parties which are unable to be resolved satisfactorily through the initial stages of the Grievance Redress Mechanism (GRM).

720. All important procedures to be adopted in the operation of the GRM shall be provided in an orientation meeting to be convened by the DOTC at community level. The meeting shall be attended by GRC members, contractor/s, local government representative/s and other interested parties from government agencies and non-government organizations (NGOs).

8.6.2 Grievance Reporting and Resolution

721. To delineate the responsibilities of the GO and the GRC in the addressing of grievances, **Table 8.6.1** provides the grievance classification criteria and responsibilities.

Table 8.6.1. Grievance Classification Criteria and Responsibilities

Grievance Classification	Risk Level	Validity	Responsible Party and Expected Response	Response time
Low	Negligible to low	Unsubstantiated	GO; GO will conduct	Within ten (10) working days;

			investigation, document findings and provide a response.	unless there are exceptional circumstances
Medium	Possible risk and likely one off event	Possible substantiation	GO; GO together with the Contractor and community representative will conduct investigation. They may decide to stop work during the investigation to allow the corrective preventative actions to be determined. The GO will provide a response.	Within twenty (20) working days; unless there are exceptional circumstances
High	Probable risk and could re-occur	Probable substantiation	GRC; The GRC will organize a major investigation team (from among its members) for prompt investigation and resolution. Work will be stopped in the affected area. The GO will provide a response.	Within thirty (30) working days; or until the person or organisation is satisfied with the resolution or remedial actions

722. The GO will summarize grievances to report on Project performance; weekly during construction and biannually during operation, removing identification information of complainants to protect their confidentiality and guaranteeing anonymity. Biannual grievance analysis and reporting will be undertaken where logs will be reviewed to identify repeat grievances.

723. Aggrieved parties or complainants may submit their complaints to DENR-EMB. In this Project, EMB is expected to require the formation of a multi-partite monitoring team (MMT) to oversee the ESMP's implementation and execution. EMB is mandated by PD 1586 to act on complaints about environmental and social performance of projects issued with environmental compliance certificates (ECC).

724. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may also submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org

725. Both the project level GRM and the GRS ensure that complaints received are promptly reviewed in order to address project-related concerns.

8.6.3 Grievance Mechanism Disclosure

726. Prior to the start of the main construction activities, the GO contact details and information material about the grievance redress mechanism will be disclosed in the local communities at group meetings, on the Project website and in any written information given to stakeholders.



List of References

BIBLIOGRAPHY / REFERENCES

- Clean Air Initiative for Asian Cities (CAI-Asia) Center. Draft Report on Environmental and Health Benefits of the Cebu City BRT Corridor. August 2012
- Detailed Technical Study, Manila-Quezon Corridor Improvement Project, 2013
- DPWH (2003). Infrastructure Right of Way Procedural Manual
- DPWH (2007). Land Acquisition, Resettlement, Rehabilitation and Indigenous Peoples Policy (3rd edition)
- EMB-DENR .Ambient Air Quality Monitoring, TSP Monitoring Dashboard, 2015.
<http://www.emb.gov.ph/ambientair/>
- Environmental Assessment Studies, Cebu BRT Project, 2012
- ITP "Auto-CAD Drawing of CBRT Alignment", July 31, 2012
- ITP. Draft Final Report on Cebu BRT Feasibility Study. August 2012
- ITP. Draft Final Report on Cebu Traffic Management Study. August 2012
- ITP. Study and Concept Plan for a Demonstration Bus Rapid Transit Corridor: FINAL REPORT V2.1. and V.2.2 2010
- ITP-WB. Final Report on Cebu City Urban Transport Greenhouse Gas Emissions Study. July 2012
- Katsumi, K. et al. Strong Motion Observation in Metro Manila, Philippines, 1931
Leading causes of morbidity, Department of Health, Republic of the Philippines
- Manila Comprehensive Land Use Plan and Zoning Ordinance, 2005-2020
- Quezon City Comprehensive Land Use Plan, 2011-2030
- Quezon City Zoning Map, 2013
- The World Bank, CTII/WCI, Master Plan for Flood Management in Metro Manila and Surrounding Areas, June 2012
- World Bank (2008). Philippines Involuntary Settlement: Policy and Institutional Framework, Practices and Challenges (Discussion Paper)

Webliography:

- http://en.wikipedia.org/wiki/Metro_Manila
- http://en.wikipedia.org/wiki/Metro_Manila#Water_and_electricity
- http://en.wikipedia.org/wiki/Quezon_Memorial_Circle
- <http://www.chanrobles.com/virtuallibrary1.htm>
- <http://www.doh.gov.ph/kp/statistics/morbidity.html#2010>
- <http://www.dpwh.gov.ph/>
- <http://www.iitk.ac.in/nicee/wcee/article/1931.pdf>
- <http://www.worldbank.org/>
- <https://www.ifc.org/>

<http://www.quezoncity.gov.ph/>

