

CHAPTER 10

FUTURE ROAD NETWORK DEVELOPMENT PLAN

10.1 SUMMARY OF PROBLEMS OF EXISTING ROAD NETWORK

Problems of existing road network were discussed in Chapter 5 and summarized hereunder:

Problems of Existing Road Network

Study Area

- A comb type of road network is formed. Along the coastal line, Bacolod Coastal Road (NS-1) runs in the north-south direction, which functions as a base of road network.
- Bacolod-Murcia-San Carlos Road which is the inter-city road connecting the west coast with the east coast in the Island branches off from NS-1.
- Another east-west direction roads branch off from NS-1, however, these are not connected with each other except by NS-1, therefore, all inter-city or inter-municipal traffic has to pass on NS-1.
- Road density is still very low.
- There are 5 sugar mills, 4 within the Study Area and 1 adjacent to the Study Area. Heavily loaded sugar trucks moving at slow speed travel on NS-1, thus affecting travel speed of other vehicles.
- Trip desire line shows that the majority of trips concentrates to Bacolod City from the rest of areas in Metro Bacolod.

Inside Bacolod City Circumferential Road (BCCR)

- A mesh type road network is formed. Most of component roads of a mesh have 4-lanes.
- Roadsides have been densely built-up, thus possibility of further widening is less due to anticipated social impact.
- Bacolod City identified three priority areas for urban development. Two areas are located along BCCR and the other is at outside BCCR, where a new road is required to guide the planned urbanization.

LOS E : Short section of coastal road

- LOS D :
- North and South Extension of the above short section of the Coastal Road
 - Bacolod Circumferential Road
 - Bacolod-Granada Road
 - Roads in CBD of Bacolod

10.2 FUTURE PROBLEMS OF EXISTING ROAD NETWORK (Analysis of “Do Nothing” Case)

In order to identify future problems of the existing road network, “Do Nothing” case analysis was undertaken. “Do Nothing” case means that if no investment is made for road network improvement, but traffic grows as predicted, what would be the traffic situation on the road network. In other words, traffic demand in year 2022 was assigned to the 2003 road network. Traffic assignment result is shown in Figure 10.2-1. Level of service of roads in Bacolod City under “Do Nothing” case in is shown in Figure 10.2-2.

Future Problems of Existing Road Network

- Due to effect of new Airport, Bacolod-Silay Section of NS-1, Silay-Guimbalaon Road (NS-1-New Airport Section) will carry heavy traffic, exceeding traffic capacity.
- Two-lane section of Bacolod City Circumferential Road (BCCR) will attract more traffic than its capacity.
- Priority area for urban development outside BCCR will generate heavy traffic, thus new roads are required.
- Bacolod-Granada Road will attract heavy traffic. Section outside BCCR will exceed its traffic capacity.
- Within Bacolod Circumferential Road, most of roads will exceed their capacity and level of service will be aggravated to D, E and F. However, further widening of the existing 4-lane road is difficult.



FIGURE 10.2-1 FUTURE TRAFFIC VOLUME (Do Nothing) IN 2022

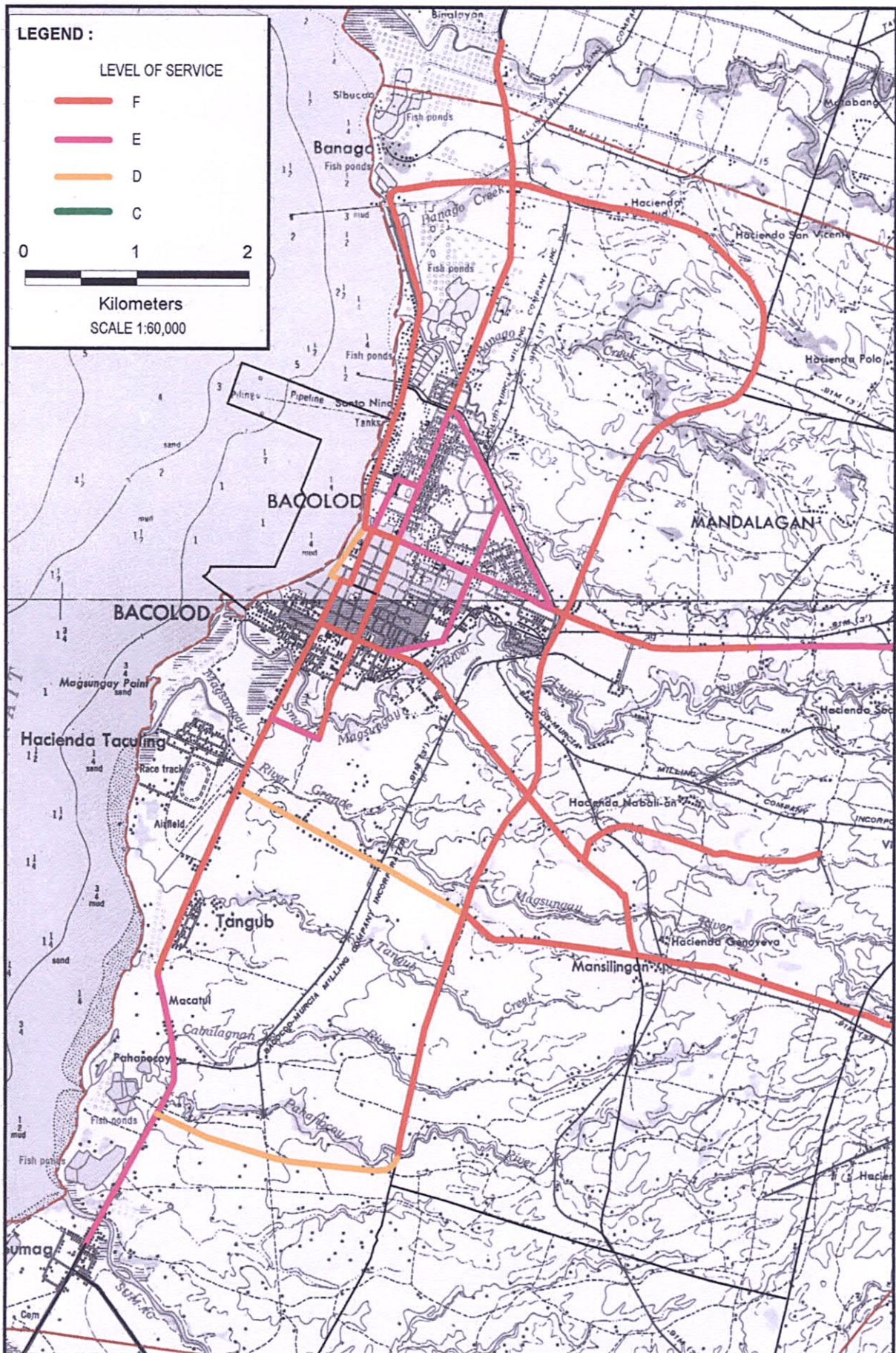


FIGURE 10.2-2 LEVEL OF SERVICE OF ROADS IN BACOLED CITY : DO NOTHING CASE IN 2022

10.3 DEVELOPMENT OBJECTIVES AND STRATEGIES

10.3.1 Development Objectives

Objectives of the approaches are summarized as follows.

Road Network Development Objectives

- a) Reduction of traffic congestion in the city proper area.
- b) Road network which will guide and support planned urban development.
- c) Formation of flexible road network which will provide alternative routes to road users.
- d) Road network which will contribute to the economic development of the Study Area as well as its hinterland.
- e) Road network which will enhance international and domestic investment in the Study Area as well as its hinterland.
- f) Road network which will realize expected investment effects of related projects.
- g) Road network development with environmental and social considerations.

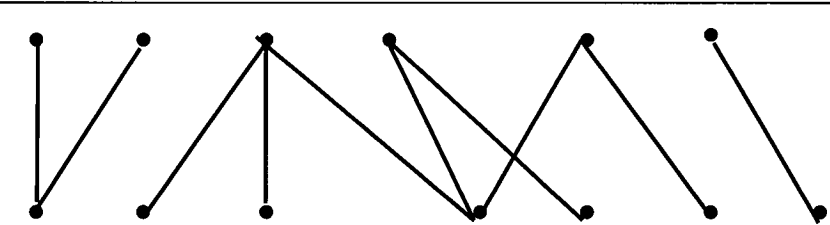
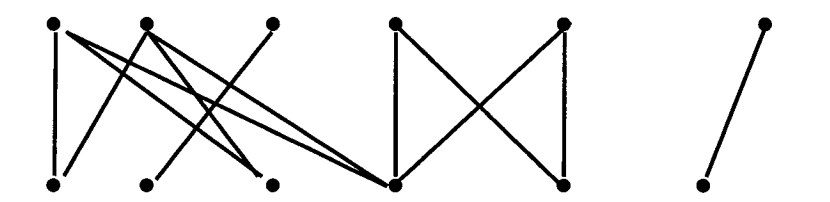

10.3.2 Development Strategies

To formulate the project of a master plan, the following strategies are considered.

- Removal of unnecessary traffic to pass through the city proper area;
- Full utilization of existing road stock in the city proper area;
- Providing new roads at the strategic areas;
- Improvement of transport efficiency of the routes that connect production to consumer zones, agricultural production to agro-industry area, and production and export facilities;
- Securing of accessibility to a new airport and sea ports; and
- Avoiding road network development in the environmentally and socially critical areas.

Road network development objectives, strategies and measures to be adopted are shown in Table 10.3-1.

TABLE 10.3-1 ROAD NETWORK DEVELOPMENT OBJECTIVES, STRATEGIES AND MEASURES

<u>Development Objective</u>		<u>Development Strategies</u>		<u>Measures To Be Taken</u>
Reduction of traffic congestion in the City Proper area.		Removal of unnecessary traffic to pass through the City Proper area.		Construction of Parallel Road.
Formulation of flexible road network which will provide alternative routes to road users.		Full utilization of existing road stock in the City Proper area.		Construction of bypass roads.
Formulation of flexible road network which will provide alternative routes to road users.		Providing new roads at the strategic areas.		Strengthening of traffic management.
Road network which will contribute to the economic development of the Study Area as well as its hinterland.		Improvement of transport efficiency of the routes which connect agricultural production area, agro-industry area and export		Improvement and/or widening of existing roads.
Road network which will enhance international and domestic investment in the Study Area as well as its hinterland.		Strengthening of accessibility to new airports, and ports.		Improvement of existing road , which connect agricultural production area with port facility.
Road network which will realize expected investment effects of related projects.		Avoiding road network development in the environmentally and socially critical areas.		Proper selection of road alignment and proper road design.
Road network development with environmental and social considerations.				

10.4 FUTURE ROAD NETWORK ALTERNATIVES

10.4.1 Basic Road Network Planning Concept

The following concepts were adopted to formulate the road project of a master plan.

(1) Inside of Bacolod City Circumferential Road

- Present road network is maintained, since existing road sides have been fully developed, widening of existing roads and/or construction of new roads are not practical due to negative social impacts.

(2) Outside of Bacolod City Circumferential Road

- Road network type is to be converted from a present comb type to a ladder type to realize flexible road network for road users.
- To form a ladder type of road network, one or two parallel roads to NS-1 in the north-south direction is to be constructed.
- Urbanization in Talisay and Silay is planned along NS-1 towards the east with the width of about 3 to 3.5 km. A road which will guide the planned urban expansion is to be provided.
- A road which will support and guide the planned urbanization Bacolod City outside BCCR is to be provided.
- A road which will efficiently connect sugar mills with sugar cane production area is to be provided to support the sugar industry which is the major and the most important industry of the Island.
- A road which provides efficient access to a new airport is to be provided.

10.4.2 Road Network Development Alternatives

Alternatives depend on where and to what extent north-south direction roads parallel to NS-1 be placed.

1) Alternative – 1 (Figure 10.4-1)

- Additional two parallel roads are provided to form flexible road network which will provide alternative routes to road users.
- NS-2 is provided by extending BCCR up to Silay in the north and up to Sum-ag-Abuanan Road in Bago City in the south.
 - to support urbanization of Talisay City, Silay City and adjacent area of Bacolod City in Bago City.
 - to provide efficient access to new airport in Silay City.
- NS-3 is a so-called “Sugar Road”. Inside Bacolod City, an alignment follows the one proposed in the “Comprehensive Land Use Plan, 2010”, then is extended up to proposed Victorias Bypass. In the south, the existing road is extended up to Maa.
 - to support the economic development of the Study Area, particularly sugar industry.
 - to support planned/urbanization in Bacolod City
- NS-4 is provided to link Murcia Conception.

2) Alternative – 2 (Figure 10.4-2)

- Same concept as Alternative – 1 is adopted.
- NS-2 is further extended up to Victorias City in the north.
- NS-3 is planned to provide efficient access to sugar mills. In Bacolod City and Talisay City, a mesh type network is planned to be formed.

3) Alternative – 3 (Figure 10.4-3)

- Instead of providing two parallel roads, only one parallel road is provided, which runs throughout the Study Area.
- Access to a new airport from Bacolod City is provided at the backside of a new airport.

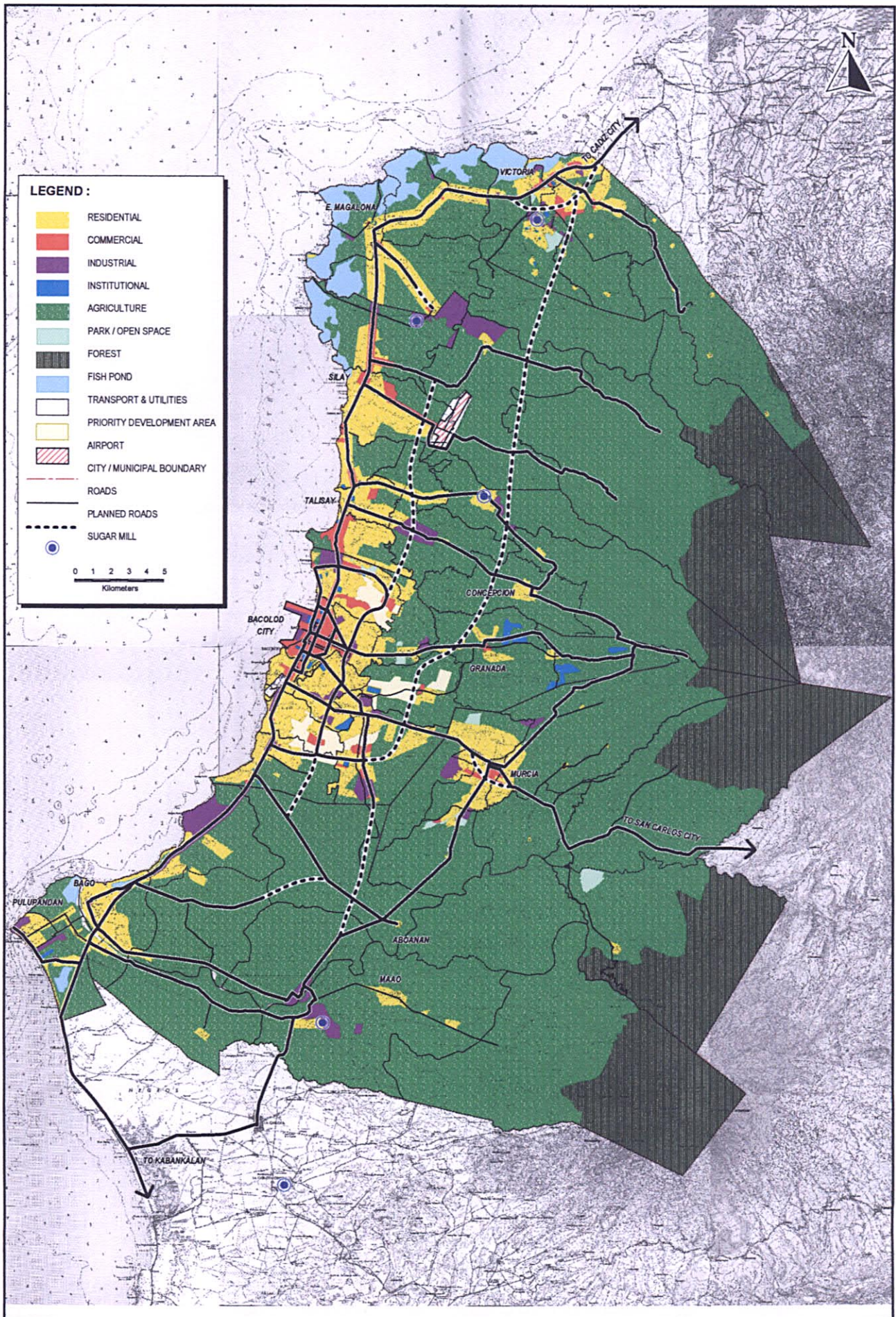


FIGURE 10.4-1 FUTURE ROAD NETWORK : ALTERNATIVE - 1

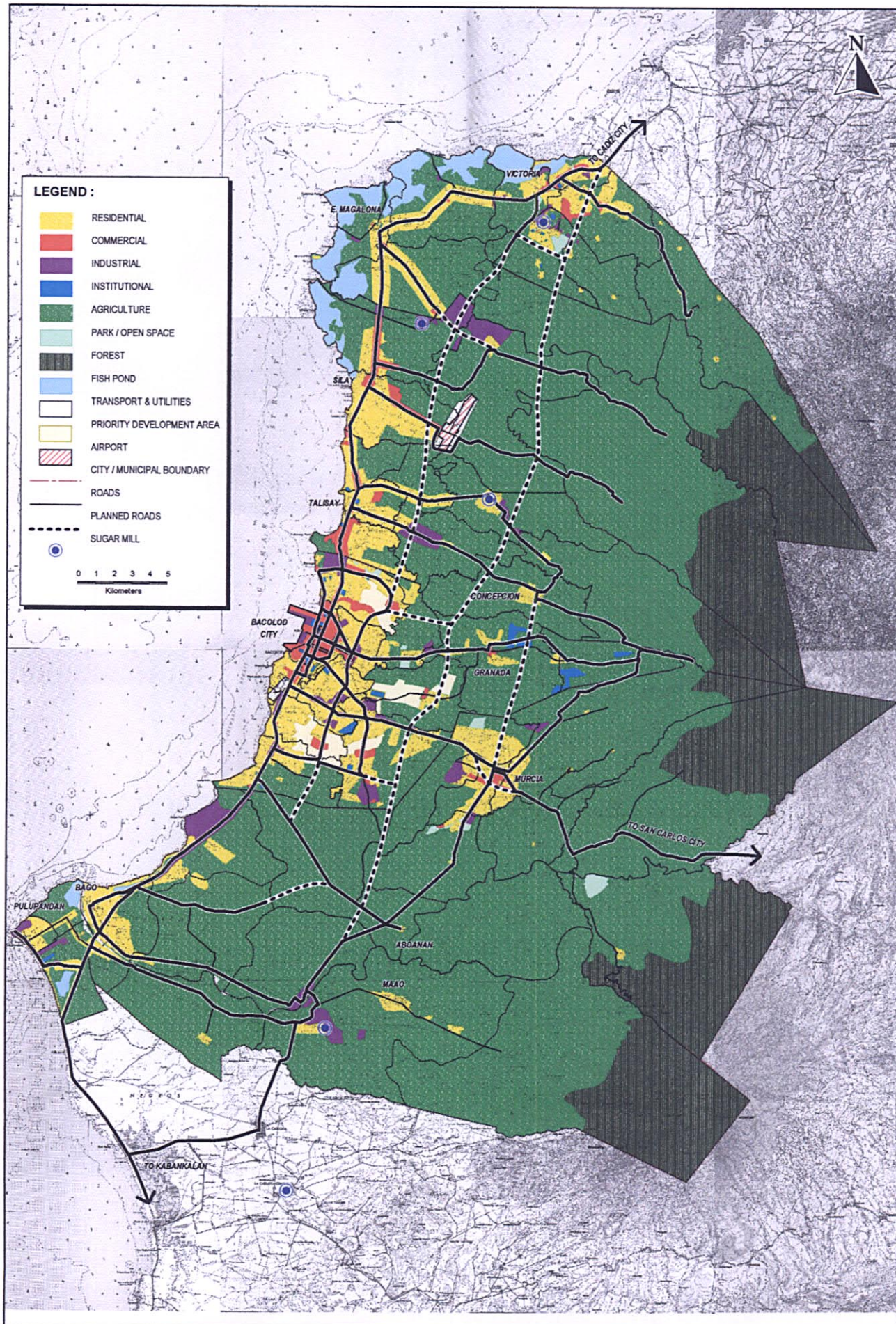


FIGURE 10.4-2 FUTURE ROAD NETWORK : ALTERNATIVE - 2

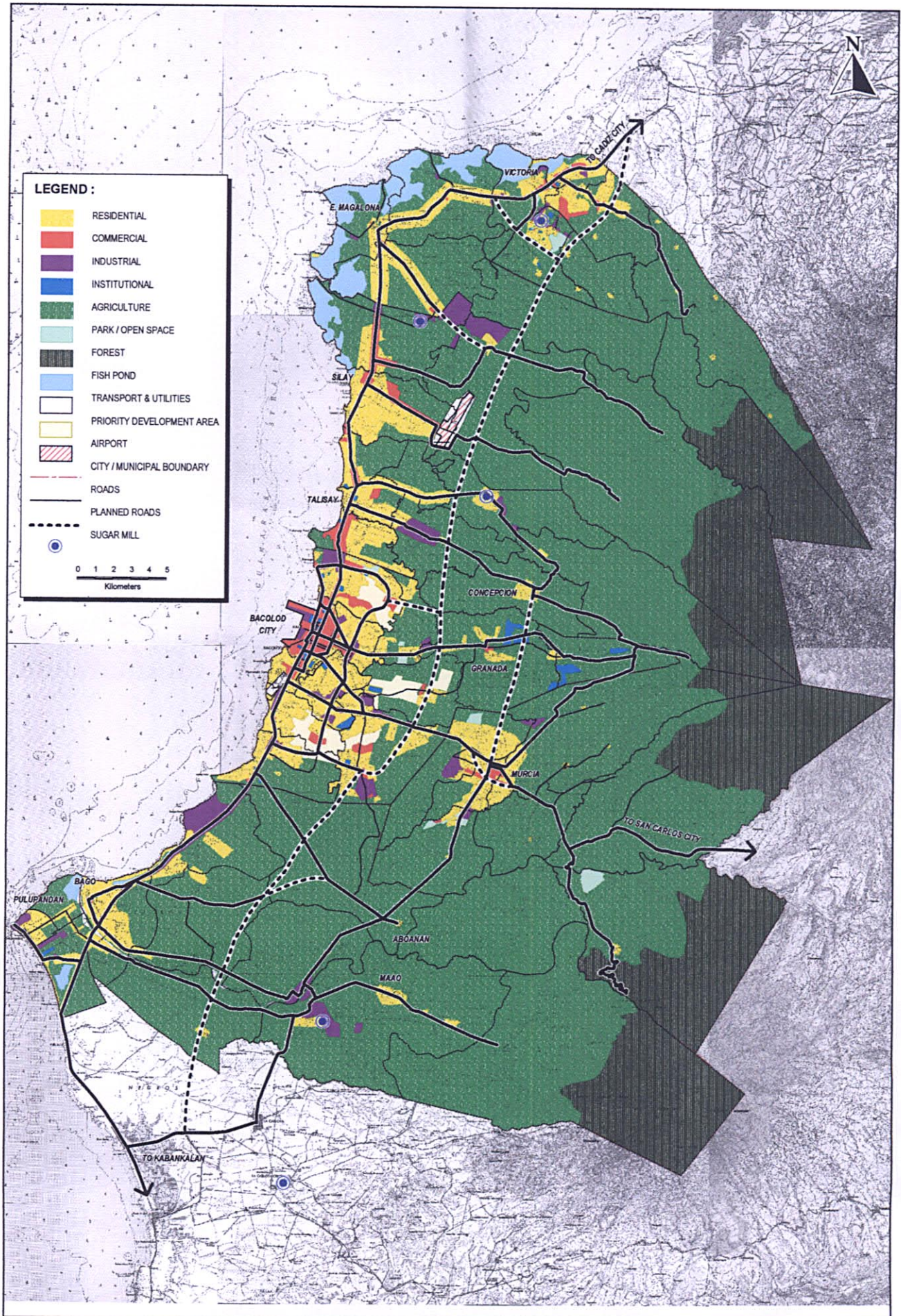


FIGURE 10.4-3 FUTURE ROAD NETWORK : ALTERNATIVE - 3

10.5 EVALUATION AND SELECTION OF FUTURE ROAD NETWORK

10.5.1 Traffic Assignment Results

Traffic demand in 2022 was assigned to road network of each Alternative, and results are shown in Figure 10.5-1 to Figure 10.5-3. Traffic efficiency of each Alternative is discussed in the succeeding section.

10.5.2 Evaluation of Road Network Alternatives

Evaluation of road network alternatives is shown in Table 10.5-1.

Alternative-2 was recommended for the future road network in Metro Bacolod in view of the following:

- Best scheme in terms of traffic efficiency.
- Planned urbanization will be properly guided.
- Sugar industry will be vitally supported.
- Requires the highest investment, however, compensated by traffic cost savings.
- New Airport Access Road and NS-3 Sugar Road are strategically placed by connecting urban centers



FIGURE 10.5-1 TRAFFIC ASSIGNMENT IN METRO BACOLOD -2022- [ALTERNATIVE-1]



FIGURE 10.5-2 TRAFFIC ASSIGNMENT IN METRO BACOLOD -2022- [ALTERNATIVE-2]



FIGURE 10.5-3 TRAFFIC ASSIGNMENT IN METRO BACOLOD -2022- [ALTERNATIVE-3]

TABLE 10.5-1 EVALUATION OF ROAD NETWORK ALTERNATIVES : METRO BACOLOD

		Do Nothing Case	Alternative - 1	Alternative - 2	Alternative - 3
<p>Basic Concept for Road Network Formation</p> <ul style="list-style-type: none"> A ladder type of network is formed to realize flexible road network for road users. Road network to support planned urbanization. Road network to support sugar industry. Efficient access to a new airport. 		—	<ul style="list-style-type: none"> Two parallel roads and up to Silay in the north and up to Sum-ag-Abuanan Road in Bago in the south. NS-3 Inside Bacolod City, an alignment follows City's recommendation. Victorias Bypass proposed by the City Government. 	<ul style="list-style-type: none"> Two parallel roads NS-2 extended up to Victorias in the north. NS-3 planned to provide efficient access to sugar mills. In Bacolod City and Talisay City, a mesh type network to be formed. 	<ul style="list-style-type: none"> One parallel road NS-2 is provided throughout the Study Area.
Road Component	New Roads Existing Roads Total	— — —	61.40 (1.00) 411.10 (1.00) 472.50 (1.00)	106.80 (1.74) 411.10 517.90 (1.10)	97.60 (1.59) 411.10 508.70 (1.08)
Estimated Cost (Million P)	Civil Work	—	5,556.00 (1.00)	7,036.30 (1.27)	6,811.90 (1.21)
	ROW Acquisition	—	178.40 (1.00)	228.30 (1.28)	182.70 (1.03)
PCU-Km (x1,000)	Total	—	5,734.40 (1.00)	7,264.60 (1.23)	6,994.60 (1.21)
	Inside BCCR	1,832	1,566	1,417	1,454
	Outside BCCR	5,253	4,905	4,716	4,677
	Whole Study Area	7,085	5,471	6,133	6,131
PCU-Hour (x1,000)	Inside BCCR	74	41	36	37
	Outside BCCR	213	132	114	120
	Whole Study Area	287	173	150	157
	Total	31	51	53	51
Traffic Efficiency (Year 2022)	Volume/Capacity Ratio inside BCCR	12	3	0	3
	(in Km)	12	1	1	1
	Volume/Capacity Ratio, Study Area	344	489	499	475
	(in Km)	62	24	11	13
Travel Speed (km / hr)	Average	24.8	38.2	39.4	39.3
	Inside BCCR	24.7	37.2	41.4	39.1
	Outside BCCR	24.7	37.4	41.1	39.1
	Whole Study Area	14,259	11,199	10,209	10,130
Traffic Cost (1,000 P/day)	VOC	6,023	3,639	3,064	3,209
	Total	20,282	14,838	13,273	13,339
Economic Return	Single Year B/C Ratio	—	7.01	7.17	7.04
Other Factors		<ul style="list-style-type: none"> NS-3 alignment in Bacolod City is not so good for urbanization. Victorias Bypass needs to pass through the area further than proposed one. 	<ul style="list-style-type: none"> Best scheme in terms of traffic efficiency. Planned urbanization will be properly guided. Sugar industry will be vitally supported. Requires the highest investment, but compensated by traffic cost savings. Implementation schedule must be so planned to meet possible fund allocation. 	<ul style="list-style-type: none"> Access to a new airport is not improved. Planned urbanization in Bacolod City, Talisay City and Silay City is not supported. NS-2 in the south passes through rice fields in Bago, where urbanization should be controlled. 	
	Ranking and Recommended Alternative	2	1 (Recommended)	3	Δ

Note: Compensation cost is not included yet.

10.6 FUNCTIONAL ROAD CLASSIFICATION AND STANDARD ROAD CROSS-SECTIONS

10.6.1 Present Road Classification in the Philippines

1) Administrative Classification

In the Philippines, the present road classification has been established by a series of Executive Orders, Republic Acts and/or Presidential Decrees. Of these the most fundamental was the Republic Act No.917 or "The Philippine Highway Act", which provided five categories of classification of roads.

- National Highway/Roads
- Provincial Highway/Roads
- City Roads
- Municipal Roads
- Barangay Roads

In 1955, the classification was more clearly re-defined by the Executive Order No.113 (EO). Under this EO, the Department of Public Works and Highways (DPWH) has responsibility of National Roads in terms of planning, construction and maintenance; whereas Local Government Units (Province, City, and Municipality) are responsible for provincial roads, city roads, municipality roads, barangay roads within their jurisdictions, respectively. The Provincial, City, or Municipality Engineers Offices execute the road planning, construction, and maintenance. Thus the administrative road classification is clearly defined and shown in Table 10.6 -1.

TABLE 10.6-1 ADMINISTRATIVE CLASSIFICATION

Road Category	Level of Responsibility	Definition
National Road	DPWH	Road continuous in extent that form part of the main trunk link system; all roads leading to national air ports, national seaports, parks or coast-to-coast roads.
Provincial Road	Provincial Government	Roads connecting one municipality with another; all roads extending from a municipality or from a provincial or national road to a public wharf or railway station; and any other roads to be designated by the Province.
City Road	City Government	Road/streets within the urban area of the city to be designated by the City.
Municipal Road	Municipal Government	Roads /streets within the poblacion (populated) area of a municipality to be designated by the Municipality.
Barangay Road	Barangay Road	Rural roads located either outside the urban area of city or outside industrial, commercial, or residential subdivisions that act as feeder farm-to-market roads, and which are not otherwise classified as national, provincial, city, or municipality road. Roads located outside the poblacion area of municipality and those roads located outside the urban area of a city to be designated as such by the Barangay Council concerned.

Source: DPWH, JICA, *Roads in the Philippines 2003*

2) Functional Classification for National Road

The DPWH adopts a functional road classification of the national roads; National Arterial roads and Secondary roads. The national arterial roads are sub-classified into three groups:(1) North –South Backbone; (2) East-West Laterals; and (3) Other Strategic Roads. These classifications are summarized in Table 10.6-2

TABLE 10.6-2 FUNCTIONAL CLASSIFICATION OF NATIONAL ROADS

Functional Classification		
Arterial Road	North-South Backbone	A backbone road network in consideration of road and sea (ferry) linkages. This covers also interconnection of primary centers and road leading to growth corridor.
	East-West Laterals	Arterial roads which inter-link the North-South Backbone road network in an east-west lateral orientation across the country with an interval of 50 to 200 kilometers.
	Strategic Road	Roads which connect other primary entries and all secondary and tertiary centers. These also interconnect the above category roads in an appropriate interval as well as forming a closed network and alternative roads. It includes also island circumferential and cross-island road.
Secondary National Road	National Roads Other than Above	

Source: DPWH, JICA, *Roads in the Philippines 2003*

As for the Provincial, City, Municipal, and Barangay roads, there is no clear functional road classification.

10.6.2 Functional Classification of Roads in the Study Area

1) Functional Road Classification Criteria

The Study Area consists of urban and rural areas. Majority area in Iloilo City is urban and the rest of the Study Area is predominantly rural. Thus, most of roads pass through both urban and rural areas. Under such situation, functional road classification criteria under this Study were established as shown in Table 10.6-3.

TABLE 10.6-3 FUNCTIONAL ROAD CLASSIFICATION CRITERIA AND ADMINISTRATIVE RESPONSIBILITY

Road Classification	Criteria	Responsibility	
		DPWH	Provincial/City Government
Primary Arterial Road	<ul style="list-style-type: none"> Constitute a backbone in overall road network. Primarily carries through traffic with long trip length. Provides direct access to major transport facilities such as an airport and/or a port 	⊙	—
Arterial Road	<ul style="list-style-type: none"> Connects major sources of traffic generation with primary arterial roads. Carries relatively long trip traffic. 	⊙	—
Collector Road	<ul style="list-style-type: none"> Connects arterial roads with local roads for collection and distribution of traffic. Carries relatively short trip traffic. 	⊙	⊙
Local Road	<ul style="list-style-type: none"> Provides access to roadsides and local communities. Primarily carries local traffic and limits through traffic. 	—	⊙

Based on the criteria, roads in the Study Area were classified by function as shown in Figure 10.6-1.

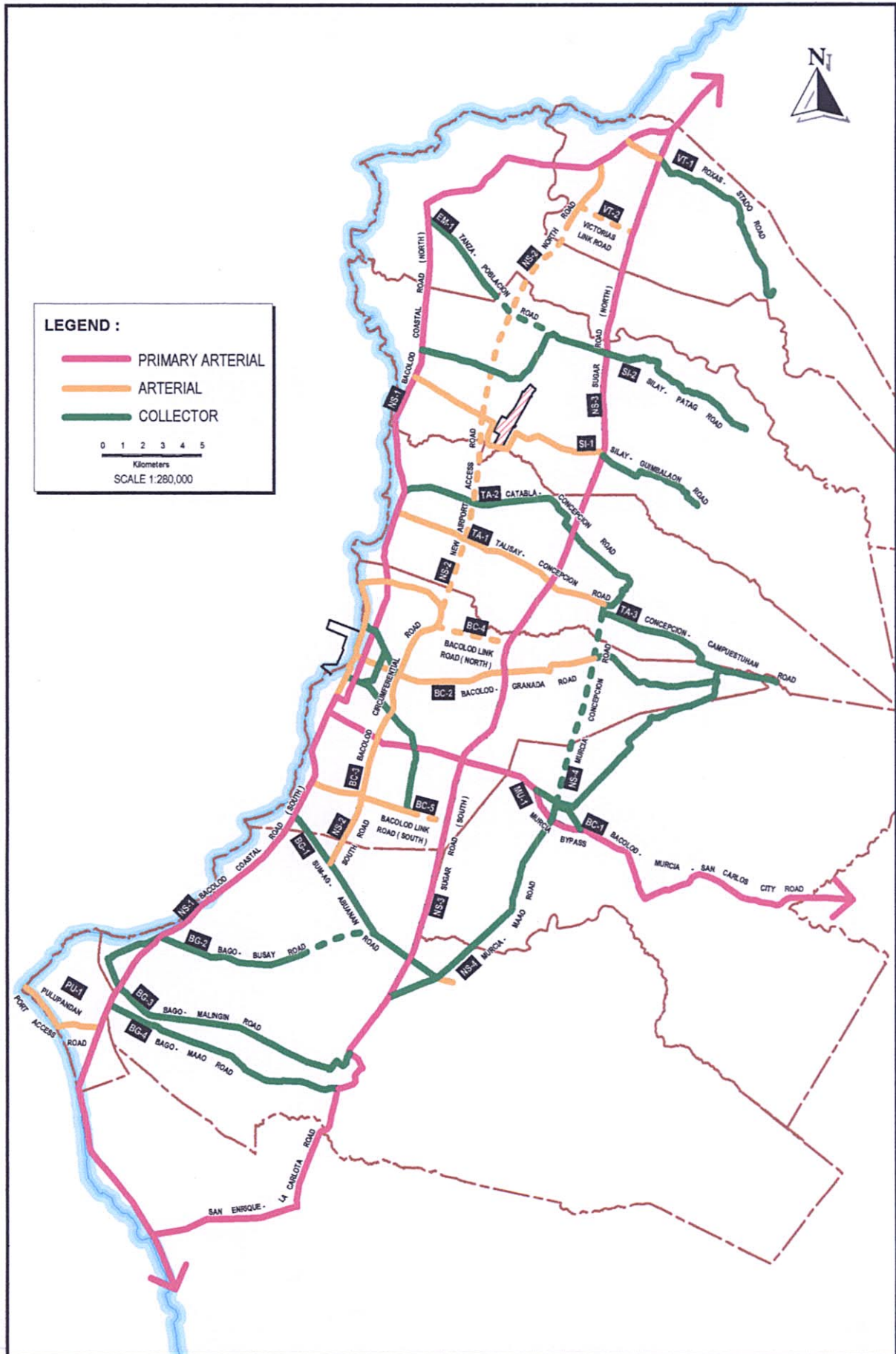


FIGURE 10.6-1 ROAD CLASSIFICATION BY FUNCTION

10.6.3 Proposed Design Criteria and Standard Road Cross-Section by Function

Table 10.6-11 presents proposed design criteria and Figure 10.6-2 shows standard road cross-section.

TABLE 10.6-11 RECOMMENDED ROAD CLASSIFICATION AND CROSS-SECTION

Road Function	Area		Design Speed	Lane Width	Right-of-Way
Primary Arterial	Urban	UG	80	3.50	40
		I	80	3.50	30
	Rural	I	80	3.50	30
		II	80	3.50	20+
Arterial	Urban	II	60	3.25	30
		III	60	3.25	20
	Rural		60	3.25	20+
Collector	Urban		60,50,40	3.00	16
	Rural		60,50,40	3.00	10+

Note: The above cross-section will be adopted taking the existing existing and possible ROW into consideration. Some variation in shoulder, sidewalk, median except lane width be applicable.

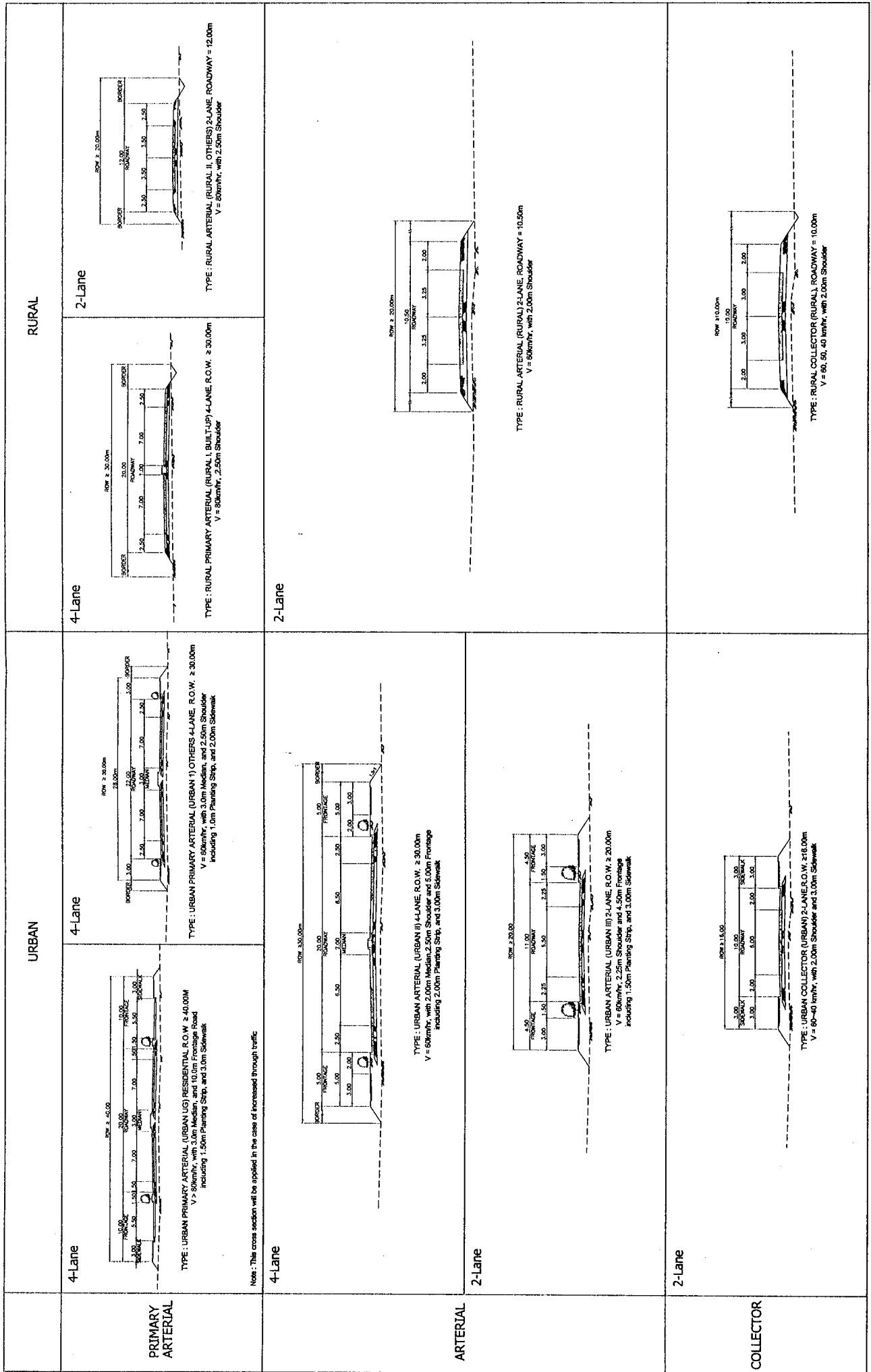


FIGURE 10.6-2 STANDARD CROSS SECTION

10.7 ROAD PROJECTS AND COST ESTIMATE

10.7.1 Road Projects

1) Road Project Identification Criteria

Road project identification criteria were established as follows:

<u>New or Existing Road</u>	<u>Identification Criteria</u>	<u>Type of Work</u>
New Road	<ul style="list-style-type: none"> • Based on the future road network plan 	<ul style="list-style-type: none"> • New construction
Existing Road	<ul style="list-style-type: none"> • Existing pavement type is gravel or earth 	<ul style="list-style-type: none"> • Improvement from gravel to PCC or AC pavement
	<ul style="list-style-type: none"> • Existing pavement is PCC or AC, of which condition is bad or very bad. 	<ul style="list-style-type: none"> • Rehabilitation of pavement
	<ul style="list-style-type: none"> • Existing road will have traffic capacity problem 	<ul style="list-style-type: none"> • Widening (see Note)
	<ul style="list-style-type: none"> • Existing road has minor problems such as narrow shoulder, no sidewalk, no drainage, etc. 	<ul style="list-style-type: none"> • Minor improvement

Note: Roadsides of most of existing roads in the urbanized area have been densely developed or built-up, therefore, widening needs to be planned to minimize adverse social impacts.

2) Identified Road Projects

Identified road projects are shown in Table 10.7-1. Type of road cross-section to be adopted is shown in Figure 10.7-1, together with applied cross-section to the future road network in Figure 10.7-2, and proposed bridge location map in Figure 10.7-3..

TABLE 10.7-1 ROAD PROJECTS FOR METRO BACOLOD

Road No.	Road Name		Admi. Class.	Road Length (km)	Existing Condition		Type of Improvement	Additional ROW	Type of Cross section	Remarks
					No. of Lane	Pavement Condition				
NS-1	Bacolod Coastal Road	North Section	NR	28.9	4	AC (Fair)	No work	0 (30)		
		South Section	NR	15.8	2	PCC (Fair)	Widening to 4-lane (Undivided)	0 (30)	1	
NS-2	New Airport Access Road	up to Bago Bypass	NR	20.5	4/2	PCC (Good)	4-lane = 15.6m, 2-lane = 4.9km of which widening is on-going.	0 (30)		
		up to Study Brdy.	NR	9.0	2	PCC (Good)		0 (30)	2	
NS-3	North Road			14.5			New construction (4-lane divided)	30		
		South Road		3.8			New construction (2-lane)	30	3	
NS-4	Murcia-Concepcion Road	North Section		26.8			New construction (2-lane)	30	5	
		South Section		10.0			New construction (4-lane divided)	35	4	
BC-1	Murcia-Miao Road	North Section	NR	9.1			New construction (2-lane)	30	5	
		South Section	NR	9.9			New construction (2-lane)	20	6	
BC-2	Bacolod-Granada Section	Jct. Bacolod Coastal Road-Jct. Bacolod Circumferential Road Section	NR	18.5	2	PCC (Good)	No work	0 (20)		
		Jct. Bacolod Circumferential Road-Granada Proper-End of the Road	NR	8.9	4	PCC (Good)	No work	0 (20)		
BC-3	Bacolod Circumferential Road	Murcia-Study Area Bdry. Section	NR	3.7	2	PCC (Good)	No work	0 (20)		
			NR	14.5	2	PCC (Good)	No work	0 (20)		
BC-4	Bacolod Link Road (North)	Jct. Bacolod Coastal Road-Jct. Bacolod Circumferential Road Section	NR	0.8	4	PCC (Good)	No work	0 (20)		
		Jct. Bacolod Circumferential Road-Granada Proper-End of the Road	NR	8.6	2	PCC (Good)	Widening to 4-lane	0 (20)	7.1, 7.2	Removal of encroached structures needed.
BC-5	Bacolod Link Road (South)		NR	12.7	2	PCC (Good)	Improvement from gravel to PCC/AC pavement (L=2.4km)	0 (20)	12	
			NR	2.7	4	PCC (Good)	No work	0 (30)		
TA-2	Catabla-Concepcion Road		NR	15.4	2	PCC (Good)	Widening to 4-lane	0 (30)	8	Removal of encroached structures needed.
			NR	4.3	0		New construction (4-lane divided)	30	9	
TA-3	Concepcion-Campustuhan Road		NR	5.0	0		New construction (2-lane)	30	10	
			City	11.7	2	PCC (Good)	No work	0 (15)		
ST-1	Silay-Guimbalaoon Road		City	15.9	2	PCC (Good)	Pavement (AC) Rehabilitation	0 (15)		
			City	7.7	2	PCC (Good)	Improvement from gravel to PCC/AC pavement L=1.2km	0 (15)	11.4	
ST-2	Sila-Patag Road		City	16.6	2	PCC (Good)	Improvement from gravel to PCC/AC pavement (G) L=15.6km (Bad)=1.2km	0 (20)	11.1,11.2,11.3, 11.4	Component of Airport Proj.
			City	3.0			Re-alignment due to airport construction	20		
EM-1	Tanza-Poblacion Road		Provincial	16.2	2	PCC (Fair)	No work	0 (20)		
			Provincial	5.3	2/1	PCC (Good)	Improvement from gravel to PCC pavement L=3.5km	0 (20)	11.4	
VT-1	Roxas-Stado Road		Provincial	3.4			New construction	20	11	
			Private	3.5	2	AC (Good)	No work	(20)	3	
BG-1	Sum-ag-Abuanan Road		Private	12.3	2	Gravel (Bad)	Improvement from gravel to PCC/AC pavement	20	11.4	
			NR	5.0	0		New construction (2-lane)	20	3	
BG-2	Bago-Busay Road		NR	12.2	2	PCC (Fair)	No work	(20)		
			City	7.5	2	PCC (Good)	No work	(15)		
BG-3	Bago-Mallingin Road		City	3.8			New construction	(15)	12	
			City	13.4	2	PCC (Good)	Improvement from gravel to PCC / AC pavement L=3.4km	(15)	11.4	
PU-1	Pulupandan Port Access Road		NR	28.0	2	PCC (Bad)	Pavement rehabilitation (PCC & AC)	(20)		
			NR	3.9	2	AC (Good)	Not required	(20)		
MU-1	Murcia Bypass		NR	3.5			New construction (2-lane)	30	3	

Note: Road pavement condition was surveyed in March 2003.

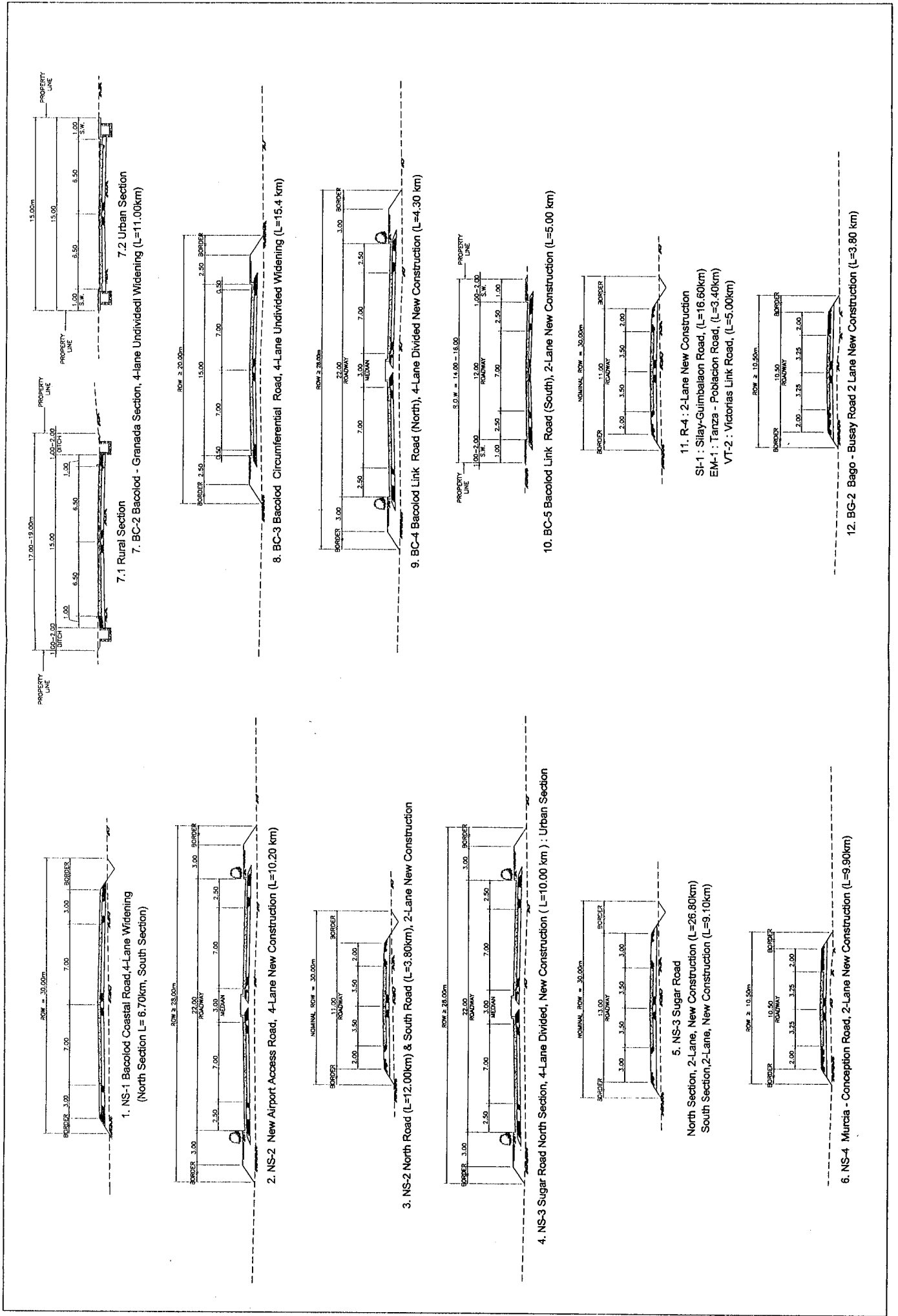


Figure 10.7-1 Metro Bacolod : Proposed Cross-Section for New Road and Widening

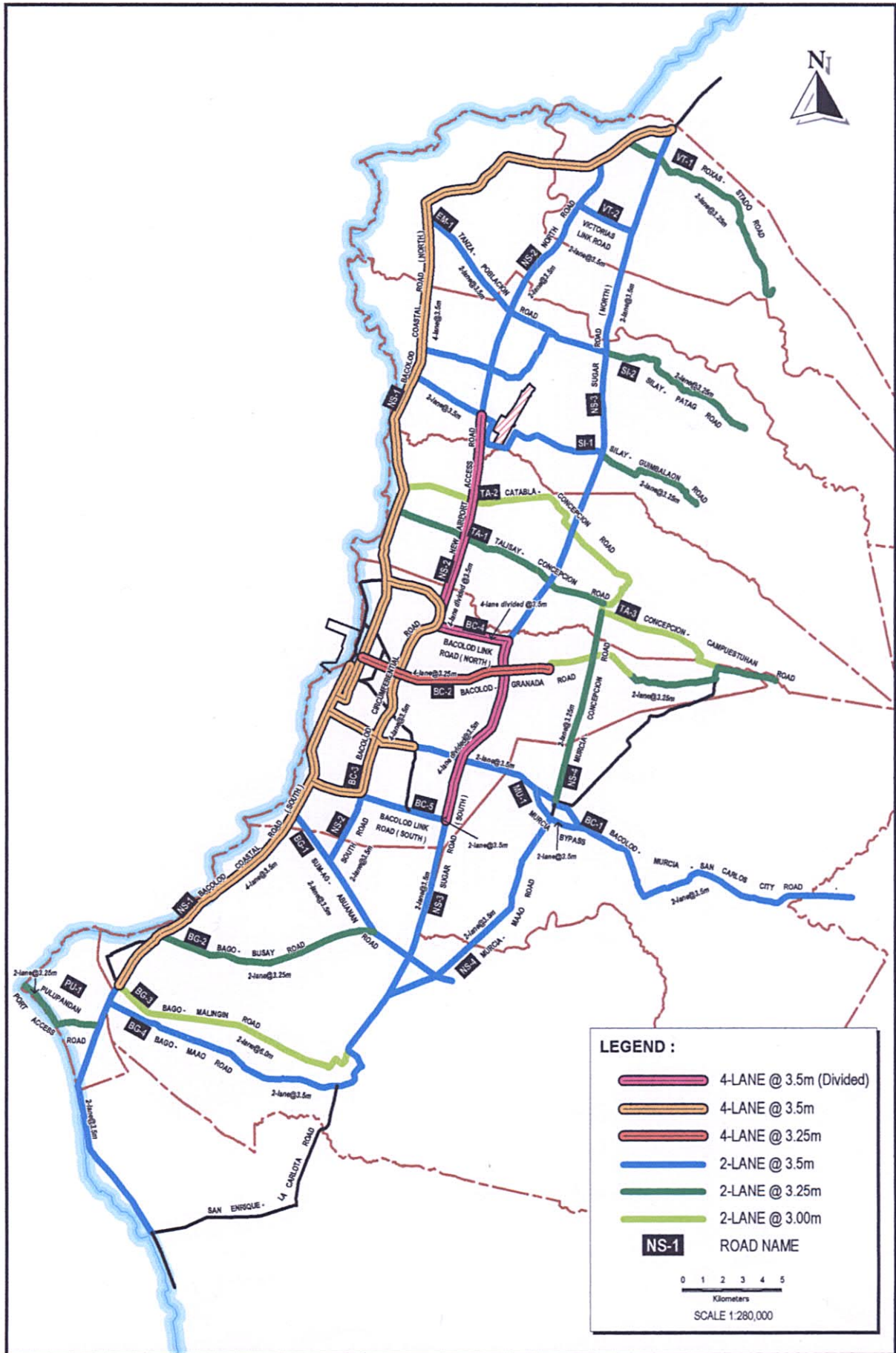


FIGURE 10.7-2 METRO BACOLOD APPLIED CROSS-SECTION TO FUTURE ROAD NETWORK

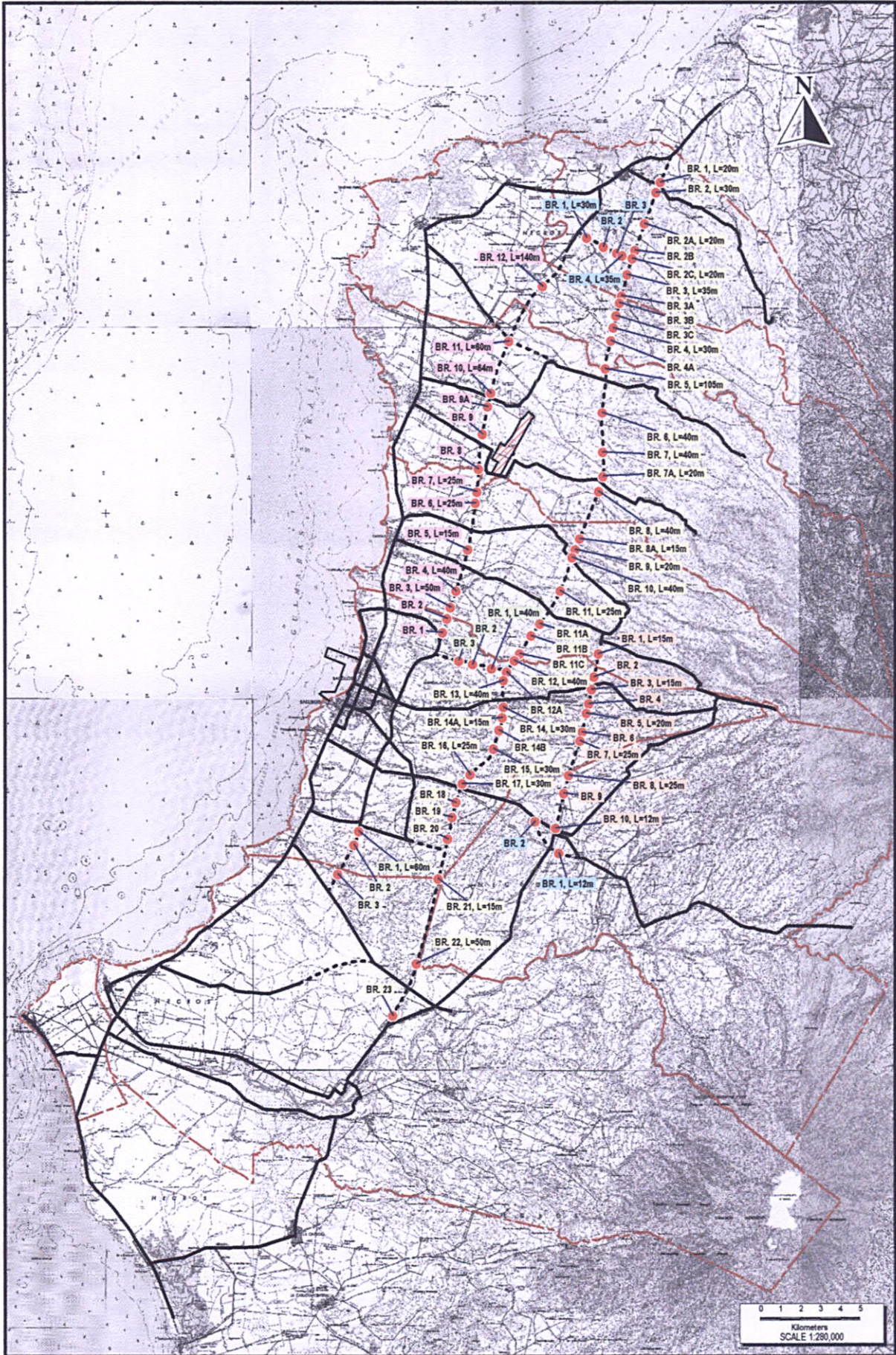


FIGURE 10.7-3 METRO BACOLOD PROPOSED ROADS BRIDGE LOCATION MAP

10.7.2 Cost Estimate

1) Procedure of Project Cost Estimate

The procedure of project cost estimate is shown in Figure 10.7-4. Based on the collected unit prices of construction materials, labor costs and equipment costs, unit costs of major construction items were examined and compared with latest prices of on-going projects. Quantity estimate for each type of work was conducted and each construction cost per km (or per meter for bridges) was estimated for each type of cross section based on the determined unit cost of major construction items.

Engineering service cost was estimated by using the percentage (%) of construction cost. ROW acquisition costs for new roads and widenings were estimated by the prevailing land cost.

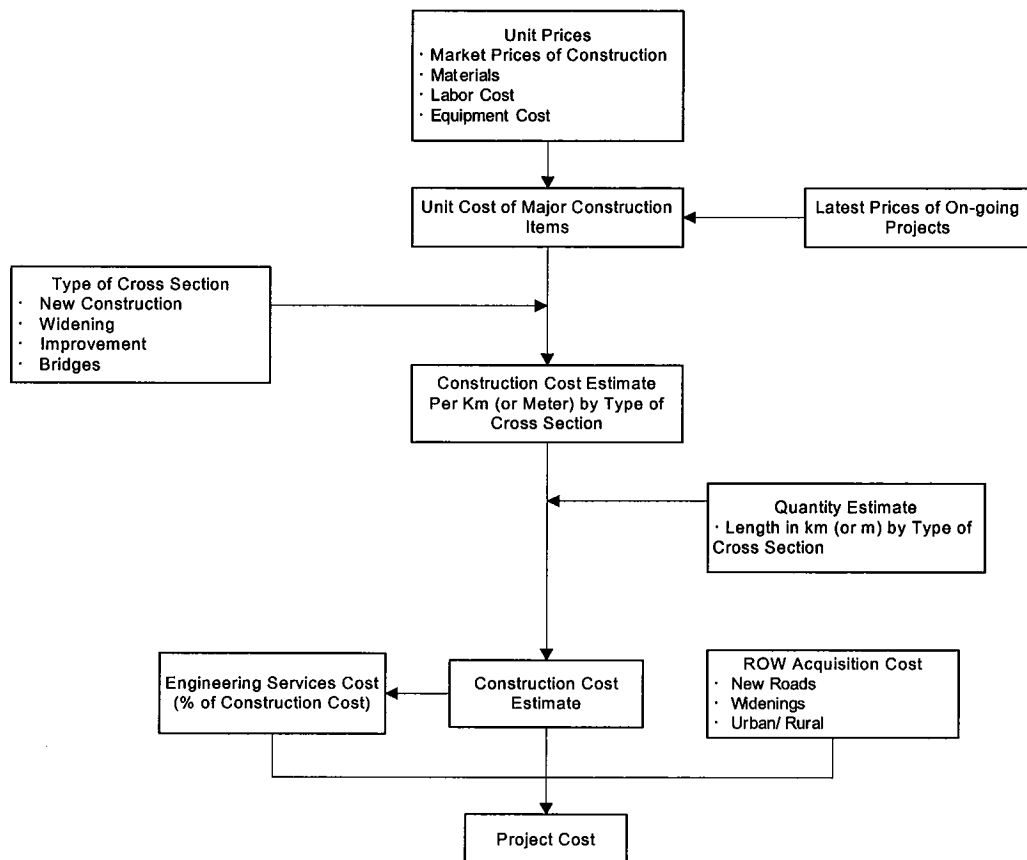


FIGURE 10.7-4. PROCEDURE OF PROJECT COST ESTIMATE

2) Unit Cost

Unit cost of construction Items is shown in Table 10.7-2.

TABLE 10.7-2 UNIT COST OF CONSTRUCTION

DESCRIPTION	UNIT	UNIT COST	FOREIGN COMPONENT	%	LOCAL COMPONENT	%	TAXES	%
EARTHWORK								
Clearing and Grubbing	P/ha.	61,000.00	29,019.00	57	13,719.00	27	8262.00	16
Removal of Existing Asphalt Pavement	P/m ²	35.00	9.49	27	19.57	56	5.95	17
Removal of Existing Concrete Pavement	P/m ²	120.00	32.52	27	67.08	56	20.40	17
Removal of Existing Pipe Culverts & Other Drainage Str.	P/m	1,320.00	726.00	55	237.60	18	356.40	27
Unsuitable Excavation	P/m ³	168.00	97.52	59	28.55	17	38.94	24
Surplus Common Excavation	P/m ³	165.00	99.50	60	40.26	24	25.25	16
Structure Excavation	P/m ³	310.00	178.25	58	83.70	27	48.05	16
Bridge Excavation (AWL)	P/m ³	200.00	105.60	53	62.80	31	31.60	16
Bridge Excavation (BWL)	P/m ³	750.00	382.50	51	252.00	34	115.50	15
Foundation Fill (Granular Materials)	P/m ³	780.00	266.76	34	387.66	50	125.68	16
Pipe Culverts and Drain Excavation	P/m ³	280.00	160.44	57	76.44	27	43.12	15
Embankment from Roadway Excavation	P/m ³	200.00	116.00	58	52.60	26	31.40	16
Embankment from Borrow	P/m ³	460.00	257.80	56	135.70	30	66.70	15
Selected Borrow for Topping	P/m ³	500.00	120.00	24	295.00	59	85.00	17
Subgrade Preparation (Common Material)	P/m ²	17.00	9.76	57	4.51	27	2.74	16
Breaking of Existing Concrete Pavement	P/m ²	75.00	20.33	27	41.93	56	12.75	17
SUBBASE AND BASE COURSE								
Aggregate Subbase Course	P/m ³	680.00	355.08	54	209.88	32	95.04	14
Aggregate Base Course	P/m ³	700.00	369.60	53	232.40	33	98.00	14
Crushed Aggregate Base Course	P/m ³	750.00	405.75	54	236.25	32	108.00	14
Portland Cement Stabilized Road Mix Base Course	P/m ³	940.00	678.10	62	221.84	24	140.06	15
Asphalt Stabilized Road Mix Base Course	P/m ³	1,320.00	840.84	64	248.16	19	231.00	18
SURFACE COURSE								
Bituminous Prime Coat (MC-70 Cut-Back Asphalt)	P/l	25,000.00	16,175.00	65	4,350.00	17	4475.00	18
Bituminous Tack Coat (Emulsified Asphalt Grade SS-1)	P/l	25,000.00	16,150.00	65	4,375.00	18	4475.00	18
Bituminous Concrete Surface Course, Hot Laid	P/m ²	3,500.00	2,229.50	64	644.00	18	626.50	18
Portland Cement Concrete Pavement	P/m ²	450.00	280.80	62	101.70	23	67.50	15
Thickness=0.10m	P/m ²	620.00	386.88	62	140.12	23	93.00	15
Thickness=0.23m	P/m ²	770.00	480.48	62	174.02	23	115.50	15
Thickness=0.25m	P/m ²	820.00	511.68	62	185.32	23	123.00	15
BRIDGE CONSTRUCTION								
Precast Concrete Piles, Furnished and Driven (0.4m x 0.4m)	P/m	3,200.00	1,568.00	49	1,184.00	37	448.00	14
Cast-in Place Concrete Bored Piles	P/m	16,500.00	6,270.00	38	7,425.00	45	2805.00	17
φ1000	P/m	30,000.00	11,400.00	38	13,500.00	45	5100.00	17
φ1500	P/m	2,500.00	800.00	32	1,375.00	55	325.00	13
Railings	P/kg	35.00	17.50	50	12.95	37	4.65	13
Reinforcing Steel, Grade 60	P/kg	33.00	16.50	50	12.21	37	4.29	13
Reinforcing Steel, Grade 40	P/m ²	5,200.00	1,768.00	34	2,600.00	50	832.00	16
Structural Concrete Class "A" (for Heavily Reinforced)	P/m ³	3,500.00	1,198.00	34	1,750.00	50	580.00	16
Structural Concrete Class "A" (for Substructure)	P/m ³	4,500.00	1,530.00	34	2,250.00	50	720.00	16
Structural Concrete Class "B" (for Plain or Lightly reinforced)	P/m ³	4,300.00	1,462.00	34	2,150.00	50	698.00	16
Structural Concrete Class "C" (for thin member)	P/m ³	5,800.00	2,030.00	35	2,842.00	49	928.00	16
Structural Concrete Class "P" (for Prestressed Concrete)	P/m ³	2,750.00	1,182.50	43	1,017.50	37	350.00	20
Lean Concrete	P/m ³	2,750.00	1,182.50	43	1,017.50	37	350.00	20
Prestressed Structural Concrete Members								
AASHTO Type IV Prestressed I-Girder, 26-meter span	P/ea.	400,000.00	284,000.00	71	66,000.00	17	48,000.00	12
AASHTO Type IV-A Prestressed I-Girder, 30-meter span	P/ea.	550,000.00	390,500.00	71	93,500.00	17	66,000.00	12
AASHTO Type IV-A Prestressed I-Girder, 35-meter span	P/ea.	780,000.00	553,800.00	71	132,600.00	17	93,600.00	12
AASHTO Type IV-A Prestressed I-Girder, 40-meter span	P/ea.	1,050,000.00	745,500.00	71	178,500.00	17	126,000.00	12
Elastomeric Bearing Pads								
400 x 300 x 50	P/ea.	15,000.00	3,150.00	21	9,600.00	64	2,250.00	15
600 x 310 x 60	P/ea.	23,000.00	4,830.00	21	14,720.00	64	3,450.00	15
DRAINAGE AND SLOPE PROTECTION STRUCTURES								
Reinforced Concrete Pipe Culvert, 610mmφ (Extra. Str.)	P/m	2,030.00	1,142.89	56	574.49	28	312.62	15
Reinforced Concrete Pipe Culvert, 910mmφ (Extra. Str.)	P/m	4,650.00	2,631.90	57	1,297.35	28	720.75	16
Reinforced Concrete Pipe Culvert, 1070mmφ (Extra. Str.)	P/m	6,660.00	3,796.20	57	1,636.16	28	1,026.64	15
Reinforced Concrete Headwall, 1-610mmφ RCPC	P/ea.	7,800.00	2,184.00	28	4,446.00	57	1,170.00	15
Reinforced Concrete Headwall, 1-910mmφ RCPC	P/ea.	19,300.00	5,404.00	28	11,001.00	57	2,895.00	15
Reinforced Concrete Headwall, 1-1070mmφ RCPC	P/ea.	22,000.00	6,600.00	30	12,100.00	55	3,300.00	15
Reinforced Concrete Box Culvert 1.5m x 1.5m	P/m	8,400.00	3,536.40	42	3,578.40	43	1,285.20	15
Reinforced Concrete Box Culvert 1.0m x 1.5m	P/m	3,500.00	1,473.50	42	1,491.00	43	535.50	15
Reinforced Concrete Headwall, Box Culvert 1.5m x 1.5m	P/ea.	22,500.00	9,945.00	44	9,112.50	41	3,442.50	15
Catch Basin for RCPC φ610	P/ea.	18,000.00	6,912.00	38	8,298.00	46	2,790.00	16
Catch Basin for RCPC φ910	P/ea.	24,700.00	9,484.80	38	11,386.70	46	3,828.50	16
Catch Basin for RCPC φ1,070	P/ea.	28,900.00	11,097.60	38	13,351.80	46	4,450.60	16
Drop Inlet Manhole for RCPC φ610	P/ea.	9,200.00	2,852.00	31	4,968.00	54	1,380.00	15
Drop Inlet Manhole for RCPC φ910	P/ea.	13,500.00	4,185.00	31	7,290.00	54	2,025.00	15
Drop Inlet Manhole for RCPC φ1,070	P/ea.	15,200.00	4,712.00	31	8,208.00	54	2,280.00	15
Concrete Post for Guardrail	P/m ²	2,250.00	1,085.75	48	816.75	36	346.50	15
Grouted Riprap, Class "A"	P/m ³	2,380.00	1,300.36	55	700.92	30	358.72	15
Stone Masonry	P/m ³	3,506.43	1,791.79	51	1,178.16	34	536.48	15
Gabions	P/m ³	3,506.43	1,791.79	51	1,178.16	34	536.48	15
MISCELLANEOUS STRUCTURES								
Concrete Curb (200*450)	P/m	640.00	371.84	58	174.72	27	93.44	15
Combination Concrete Curb and Gutter (675*364)	P/m	1,095.00	636.20	58	296.94	27	159.87	15
Metal Guardrail (Metal Beam)	P/m	7,800.00	4,531.80	58	2,129.40	27	1,136.80	15
Guardrail End Pieces	P/ea.	7,700.00	4,473.70	58	2,102.10	27	1,124.20	15
Concrete Post for Guardrail	P/ea.	1,400.00	813.40	58	362.20	27	204.40	15
Warning Signs	P/ea.	16,800.00	9,760.80	58	4,586.40	27	2,452.30	15
Regulatory Signs	P/ea.	14,800.00	8,134.00	58	3,822.00	27	2,044.00	15
Informatory Signs	P/ea.	15,400.00	8,947.40	58	4,204.20	27	2,248.40	15
Reflectorized Thermoplastic Pavement Markings	P/m ²	590.00	342.79	58	161.07	27	86.14	15
Sodding	P/m ²	191.95	105.71	58	49.67	27	26.56	15
Trees (Furnishing and Transplanting)	P/ea.	800.00	464.80	58	218.40	27	116.80	15
Street Lighting Pole (Single lamp)	P/ea.	62,500.00	36,312.50	58	17,062.50	27	9,125.00	15
Street Lighting Pole (Double lamp)	P/ea.	78,000.00	45,318.00	58	21,294.00	27	11,388.00	15
Other Miscellaneous for 2-Lane	L/S.		1,452,500.00	58	682,500.00	27	365,000.00	15
Other Miscellaneous for 4-Lane	L/S.		2,324,000.00	58	1,092,000.00	27	584,000.00	15

3) Construction Cost per Km.

Construction cost per km for each type of cross section was estimated (refer to Appendix 10.7-1) and summarized as shown in Table 10.7-3.

TABLE 10.7-3 CONSTRUCTION COST PER KM.

TYPE OF CROSS-SECTION	COST PER KM
Bacolod TYPE-1	20.3
Bacolod TYPE-2	67.2
Bacolod TYPE-3	26.0
Bacolod TYPE-4	68.1
Bacolod TYPE-5	29.1
Bacolod TYPE-6	25.0
Bacolod TYPE-7-1	38.3
Bacolod TYPE-7-2	27.2
Bacolod TYPE-8	31.2
Bacolod TYPE-8	67.2
Bacolod TYPE-10	26.0
Bacolod TYPE-11.1	5.8
Bacolod TYPE-11.2	14.3
Bacolod TYPE-11.3	14.4
Bacolod TYPE-11.4	14.4
Bacolod TYPE-11.12	25.0

4) Project Cost

Estimated civil work cost and the ROW acquisition cost were estimated for the identified road projects and shown in Table 10.7-4. (Estimated costs of other road network development alternatives are presented in Appendix 10.7-2).

Engineering services cost was estimated as follows:

- Detailed Design ----- 4.0% of civil work cost
- Construction Supervision ----- 8.0% of civil work cost

Project cost of selected future road network plan is summarized as follows:

Project Cost of Selected Future Road Network Plan		
Civil Work Cost	-----	7,104.9
ROW Acquisition Cost	-----	856.3
Engineering Services Cost	-----	852.5
- Detailed design	-----	284.1
- Construction Supervision	-----	568.4
Total Project Cost	-----	8,813.7

TABLE 10.7-4 ROAD AND BRIDGE CONSTRUCTION COST FOR METRO BACOLOD FUTURE ROAD NETWORK PLAN (ALTERNATIVE-2)

Road No.	Road Name	Adm. Dist.	Road										Bridge										Civil Work										Total Cost				
			Target Road		Use the New		Present Road		New		Target Bridge		New		Widening		New		Project		ROAD		ROAD		ROAD		ROAD		ROAD		ROAD			ROAD		ROAD	
			Length (km)	Type of Cross-section	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	No.	Widening (m)	New Construction 2-Lane (m)	New Construction 4-Lane (m)	No.	Widening (m)	New Construction 2-Lane	New Construction 4-Lane	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL	FINANCIAL		FINANCIAL	FINANCIAL	FINANCIAL	
NS-1	Baccolod Coastal Road	NR	25.9	1-1	136.1	136.1	0.0	0.0	218.6	79.9	218.6	79.9	218.6	79.9	154.1	128.3	62.3	354.7	154.1	128.3	62.3	354.7	154.1	128.3	62.3	354.7	154.1	128.3	62.3	354.7	154.1	128.3	62.3	354.7			
NS-2	New Airport Access Road	NR	9.0	2	65.2	65.2	0.0	0.0	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9			
NS-3	North Road	NR	14.5	3	31.4	31.4	0.0	0.0	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8			
NS-4	South Road	NR	12.4	4	65.1	65.1	0.0	0.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0	207.0			
NS-5	North-South Road	NR	18.5	6	247.0	247.0	0.0	0.0	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8	78.8			
BC-1	Baccolod-Hurad Section	NR	8.9	1	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1			
BC-2	Baccolod-Granada Section	NR	14.5	3	361.3	361.3	0.0	0.0	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6			
BC-3	Baccolod-Campustan Road	NR	11.7	2	130.2	130.2	0.0	0.0	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8		
BC-4	Baccolod-Link Road (North)	NR	4.3	1	288.9	288.9	0.0	0.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0			
BC-5	Baccolod-Link Road (South)	NR	5.0	1	130.2	130.2	0.0	0.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0			
TA-2	Talisay-Conception Road	CR	11.7	2	304.2	304.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
TA-3	Conception-Campustan Road	CR	15.9	3	17.3	17.3	0.0	0.0	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4				
SI-1	Silay-Gambuhon Road	CR	16.6	3	162.2	162.2	0.0	0.0	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8			
SI-2	Silay-Peñon Road	CR	3.0	1	50.5	50.5	0.0	0.0	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7			
VI-1	Victory-Pobocan Road	PROV	3.5	1	88.5	88.5	0.0	0.0	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5			
VI-2	Victory-Link Road	PROV	3.0	1	65.5	65.5	0.0	0.0	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8			
BC-1	Sum-ag-Alubano Road	NR	12.2	2	78.1	78.1	0.0	0.0	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3			
BC-2	Bago-Buaya Road	CR	7.5	1	141.7	141.7	0.0	0.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0			
BC-3	Bago-Mallig Road	CR	13.4	3	49.0	49.0	0.0	0.0	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2			
PH-1	Philippines Port Access Road	NR	3.9	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
MU-1	Murcia Bypass	NR	42.5	3	5278.2	5278.2	140	116	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7	400.7			
	Total																																				

Note: Unit price of bridge construction = 450,000 / km
 2-Lane new bridge = 500,000 / km
 4-Lane new bridge = 500,000 / km
 Widening of 2 lane bridge = 300,000 / km

10.8 IEE OF ROAD PROJECTS

1) Project Screening

The Project Screening Table for the Metro Iloilo Study Area indicates the type of environmental study that the proposed development/rehabilitation of the road sections would require in order to merit the issuance of an Environmental Compliance Certificate. (ECC). For projects that will not entail any significant adverse impacts to the environment, a Certificate of Non-Coverage (CNC) is recommended. The criteria used for assessing the type of EIA report to be prepared are based on the documents of Memorandum of Agreement between DPWH and DENR, and the Initial Environmental Examination (IEE) Checklist Guide to Proponents.

A summary of the results of project screening undertaken for Metro Bacolod Area is shown in Table 10.8-1.

TABLE 10.8-1 SUMMARY RESULT OF PROJECT SCREENING FOR THE METRO BACOLOD AREA

Road No.	Road Name	No. of PAH	Type of EIA Study
Improvement of Existing Roads			
NS-1	Bacolod Coastal Road North Section	44	IEE
BC-2	Bacolod-Granada Section	75	
	Jct. Bacolod Circumferential Road-Granada Proper		IEE
BC-3	Bacolod Circumferential Road	698	EIS Regional
Proposed New Construction			
NS-2	New Airport Access Road	5	EIS Regional
NS-2	North Road	5	EIS Regional
NS-2	South Road	17	EIS Regional
NS-3	Sugar Road-North Section	29	EIS Regional
NS-3	Sugar Road-South Section	5	EIS Regional
NS-4	Murcia-Conception Road	44	EIS Regional
BC-4	Bacolod Link Road (North)	0	EIS Regional
BC-5	Bacolod Link Road (South)	22	EIS Regional
EM-1	Tanza-Poblacion Road	16	EIS Regional
VT-2	Victorias Link Road	10	EIS Regional
BG-2	Bago-Busay Road	9	EIS Regional

Note: PAH : Project Affected Houses

2) Type of EIA Study

Type of Environmental Impact Assessment (EIA) are summarized in Table 10.8-2.

TABLE 10.8-2 TYPES OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Environmental Study	Major Criteria
1) Certificate of Non-Coverage (CNC)	<ul style="list-style-type: none"> The study area is outside ECA No resettlement is required.
2) IEE Checklist - Project Description Checklist	<ul style="list-style-type: none"> The study area is outside ECA. New road construction <ul style="list-style-type: none"> Road length is less than 10km Improvement or Rehabilitation <ul style="list-style-type: none"> ROW acquisition is required for more than 50% of the present ROW
3) IEE	<ul style="list-style-type: none"> ECA values are less than 5 Required resettlement population is less than 200 or 40 families.
4) Environmental Impact Statement	<ul style="list-style-type: none"> ECA values are 5 and more Required resettlement population is 200 or 40 families and more

Note: ECA: Environmentally Critical Area

Rating for Environmentally Sensitive/Critical Areas Values

National Parks / watersheds / sanctuaries	5
Aesthetic potential tourist spots	2
Endangered species	4
Unique historic / archeological / scientific areas	3
Indigenous culture communities	5
High Incidence of natural hazards	1
Critical slopes >40%	5
Prime agricultural land	3
Recharge areas for aquifer	2
Protected water bodies	2
Mangrove areas	4
Coral reefs	5