# CHAPTER 12
# FEASIBILITY STUDY OF NEW AIRPORT ACCESS ROAD

## 12.1 OBJECTIVES OF THE PROJECT

New Airport Access Road is planned to provide direct access to new Bacolod Airport from Bacolod City. The objectives of the project are as follows:

**Objectives of the Project**

- To provide smooth access to new Bacolod Airport from Bacolod City.
- To reduce traffic congestion of Bacolod Coastal Road : North Section.
- To form flexible road network.
- To guide and support sound urbanization of Bacolod City, Talisay City and Silay City.

## 12.2 PHYSICAL FEATURES OF THE PROJECT SITE

The terrain of the project site is relatively flat with gentle slope declining from the east to the west. The ground elevation varies from 18m to 29m from the mean sea level. There are six (6) small to medium scale rivers crossing the route. They form a valley with a depth of about 10m.

General geological condition is characterized as volcanic and sedimentary rock. Sand and gravel or sandstone layers with N-value of over 50 can be expected at the depth of 12 to 15 meters from the ground. Cover soils are mostly silty clay or silty sand with N-value from 5 to 20.

The route traverses sugar cane land and no urban development is made yet, except the section near Bacolod Circumferential Road.

## 12.3 ENGINEERING SURVEYS CONDUCTED

The following three surveys were undertaken:

- Aerial Photography and Orthophoto Mapping
- Road Alignment Survey
- Geo-technical survey and Soils/Material Sources Survey

1) Aerial Photography and Orthophoto Mapping

| | | |
|---|---|---|
| Aerial photography | : | Photo scale = 1/15,000<br>Coverage = 2km width along the route |
| Orthophoto mapping | : | Scale = 1/5,000 |

2) Road Alignment Survey

- Control points survey
- Center line survey (50m interval)
- Profile survey (50m interval)
- Cross-section survey (50m interval, width=60m)

- River profile / cross-section survey (large rivers only)

3) Geo-technical survey and soils/material source survey

- Bridge site geo-technical survey (depth = 30~50m)
- Soils / material sources survey (3 locations)

## 12.4 SELECTION OF ROUTE ALIGNMENT

The route alignment was planned based on the following:

- A route is selected almost parallel to and about 3 to 4km east of Bacolod Coastal Road. It traverses at the fringe of planned urban area of Talisay City and Silay City.
- It branches off from existing Bacolod Circumferential Road and ends at Silay-Guimbalaon Road at about 500m west of the proposed Airport.
- There is no major control point or obstacle along the corridor, except small residential areas.
- An alignment is so selected that it intersects with roads and rivers at almost right angle.

Three alternative alignments were developed for comparison as follows (see Figure 12.4-1) :

Alternative – 1 : To achieve minimal social impact.
Alternative – 2 : To achieve the best horizontal alignment.
Alternative – 3 : To achieve minimal river crossings.

Three alternatives were assessed as shown in Table 12.4-1.

**TABLE 12.4-1 ASSESSMENT OF ALTERNATIVE ALIGNMENTS**

| | Alternative-1 | Alternative-2 | Alternative-3 |
|---|---|---|---|
| 1) Road Length (km) | | | |
| - Road Section | 9.92 | 9.77 | 10.68 |
| - Bridge Section | 0.28 | 0.33 | 0.22 |
| - Total | 10.20 | 10.10 | 10.90 |
| 2) No. of Structures Affected | 8 | 26 | 47 |
| 3) Construction Cost (Million P) | | | |
| - Road Section | 257.9 | 254.0 | 277.7 |
| - Bridge Section | 126.0 | 148.5 | 99.0 |
| - Total | 383.9 | 402.5 | 376.7 |
| | (0.00) | (+18.6) | (-7.2) |
| 4) ROW Acquisition/Compensation Cost (Million Pesos) | 200.4 | 203.2 | 255.9 |
| | (0.00) | (+2.8) | (+55.5) |
| Assessment | • Good horizontal alignment<br>• Least negative social impact<br>• Lowest investment (3+4) | • Best horizontal alignment<br>• Medium negative social impact<br>• Medium investment | • Not so good horizontal alignment<br>• Highest negative social impact<br>• Highest investment |
| Recommendation | * Recommended | — | — |

**Alternative–1** is recommended for the alignment of this road.

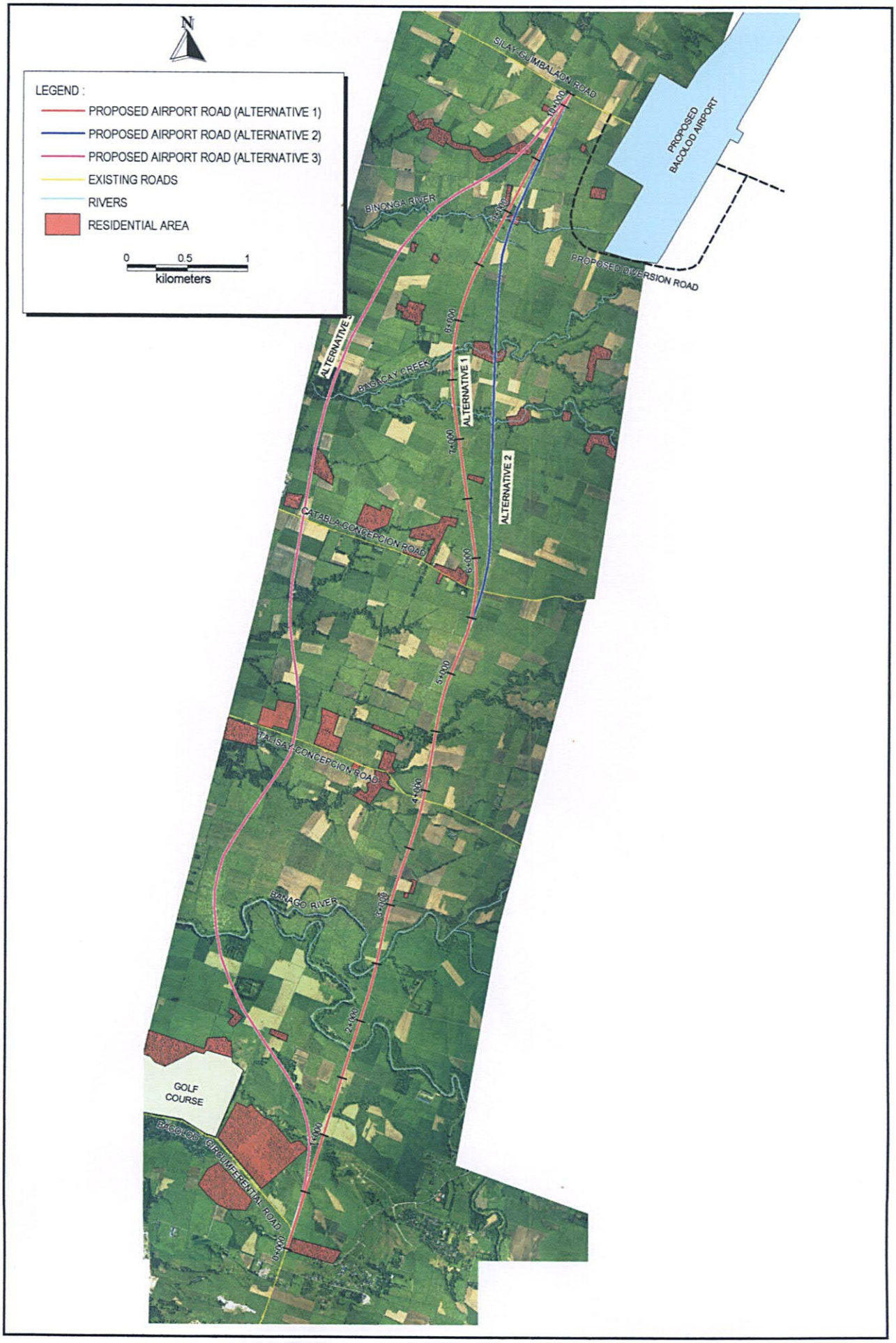



**FIGURE 12.4-1 AIRPORT ACCESS ROAD ALTERNATIVE ALIGNMENTS**

## 12.5 TRAFFIC FORECAST

Result of traffic forecast is shown in Table 12.5-1. Number of lanes required is shown in Figure 12.5-1.

New Bacolod Airport is scheduled to open in 2008. In the Master Plan, this road is planned completed by the end of 2011 as a 2-lane road and widening of the road to a 4-lane divided road is planned to be completed by the end of 2022.

All sections attract almost same volume of traffic. In year 2016, Section-1 attracts about 25,700 pcu/day of which 13,700 pcu/day are airport related traffic.

In your 2022, Sections 1 and 2 will exceed traffic capacity of a 2-lane road, while Section-3 approaches its traffic capacity.

Thus, it is recommended that the project be implemented by stages, i.e. the initial stage as a 2-lane road and the ultimate stage as 4-lane divided road.

Bacolod Coastal Road runs almost parallel to this road and some of traffic will be diverted to this road. With the completion of this road, Bacolod Coastal Road will not suffer traffic congestion.

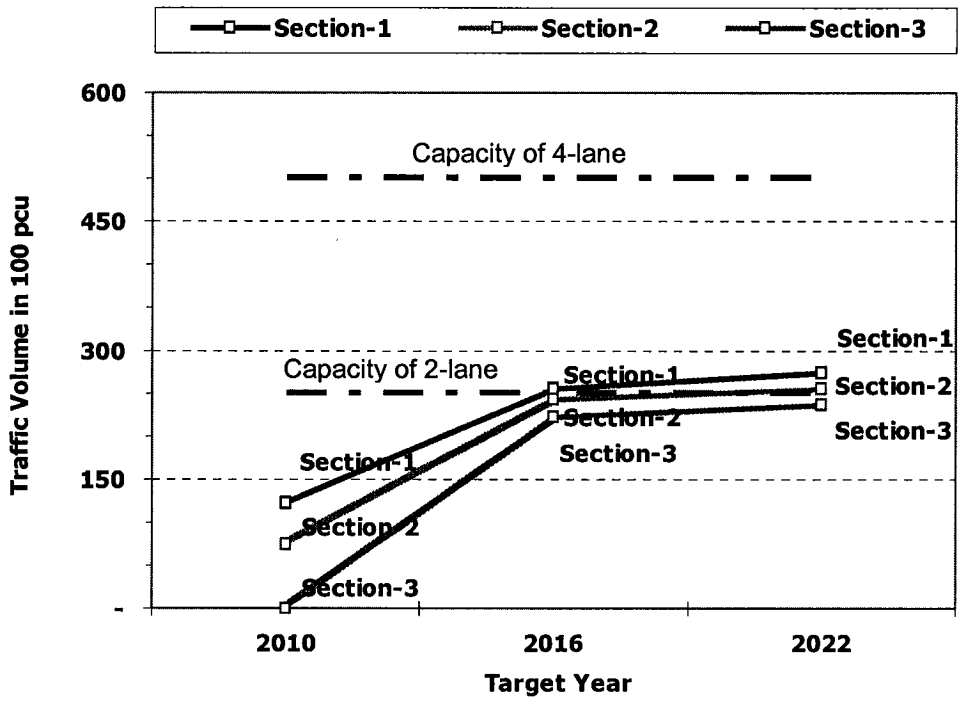



**FIGURE 12.5-1 NUMBER OF LANES REQUIRED**

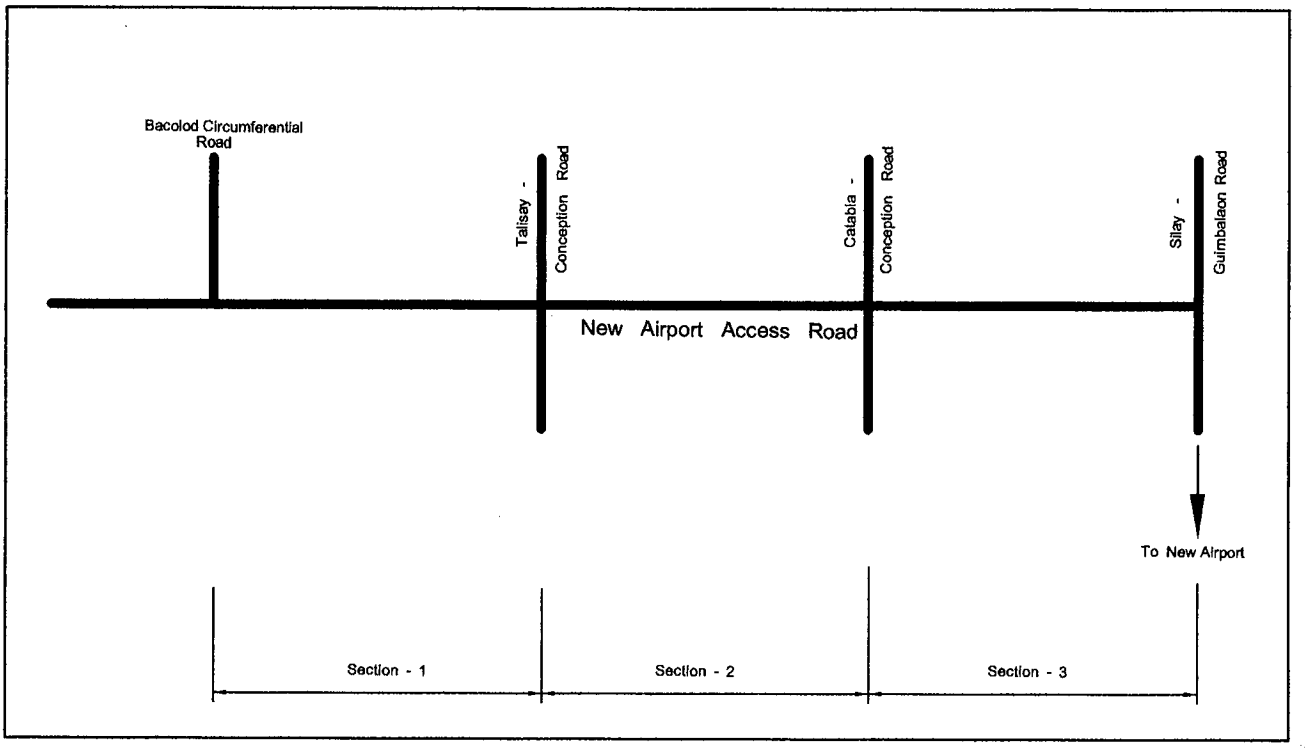



**TABLE 12.5-1 ESTIMATED TRAFFIC VOLUME AND VOLUME/CAPACITY RATIO**

| Conditions & Section | | | Section-1 | | Section-2 | | Section-3 | |
|---|---|---|---|---|---|---|---|---|
| | | | NS-1 | *NH* | NS-1 | *NH* | NS-1 | *NH* |
| Traffic Volume in 100 pcu | 2010 | | **123 (23)** | *417* | **74 (14)** | *380* | **- (0)** | *437* |
| | 2016 | | **257 (137)** | *403* | **244 (138)** | *312* | **223 (141)** | *311* |
| | 2022 | | **274 (159)** | *411* | **256 (159)** | *277* | **237 (161)** | *279* |
| Volume / Capacity Ratio (V/C) | 2-lane | 2010 | **0.49** | - | **0.30** | - | - | - |
| | | 2016 | **1.03** | - | **0.98** | - | **0.89** | - |
| | | 2022 | **1.10** | - | **1.02** | - | **0.95** | - |
| | 4-lane | 2010 | **0.25** | *0.83* | **0.15** | *0.76* | **0.00** | *0.87* |
| | | 2016 | **0.51** | *0.81* | **0.49** | *0.62* | **0.45** | *0.62* |
| | | 2022 | **0.55** | *0.82* | **0.51** | *0.55* | **0.47** | *0.56* |

*Note: Figures in the bracket ( ) indicate airport related traffic*

*Figures in Italic indicate traffic on existing National Highway*

## 12.6 CONSTRUCTION PHASING

This road is proposed to be initially constructed as a 2-lane road, then widened to a 4-lane divided road in line with increase of traffic demand.

Initial Stage : 2-lane road to be completed by 2011.

Ultimate Stage : widened to a 4-lane divided road by 2022.

## 12.7 PRELIMINARY DESIGN

### 12.7.1 Design Concepts and Criteria

1) Design Concepts

This road provides the direct access to New Bacolod Airport in Silay City, thus mobility oriented design should be adopted.

This road also guides and supports future urbanization in Bacolod City, Talisay City and Silay City.

In view of above, the design concepts were established as follows:

**Design Concept**

- Mobility-oriented design is adopted with the design speed of 80 km/hour.
- Left turn lanes are provided at major intersections.
- Intersections with Radial Roads are so designed that left-turn lanes are provided.
- To allow future urbanization along the roadsides, road elevation is designed as low as possible to avoid high embankment.

2) Road and Intersection Design Criteria

Highway design criteria and intersection design criteria are shown in Table 12.7-1 and Table 12.7-2, respectively.

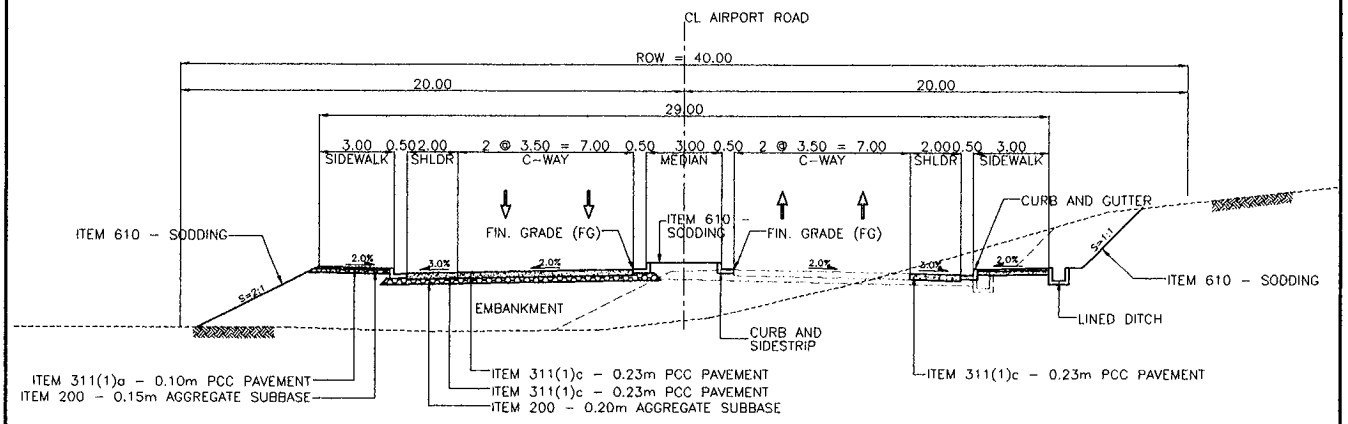
Typical cross-sections for the initial stage and the ultimate stage are shown in Figure 12.7-1.

**TABLE 12.7-1 HIGHWAY DESIGN CRITERIA**
**- Bacolod Airport Access Road -**

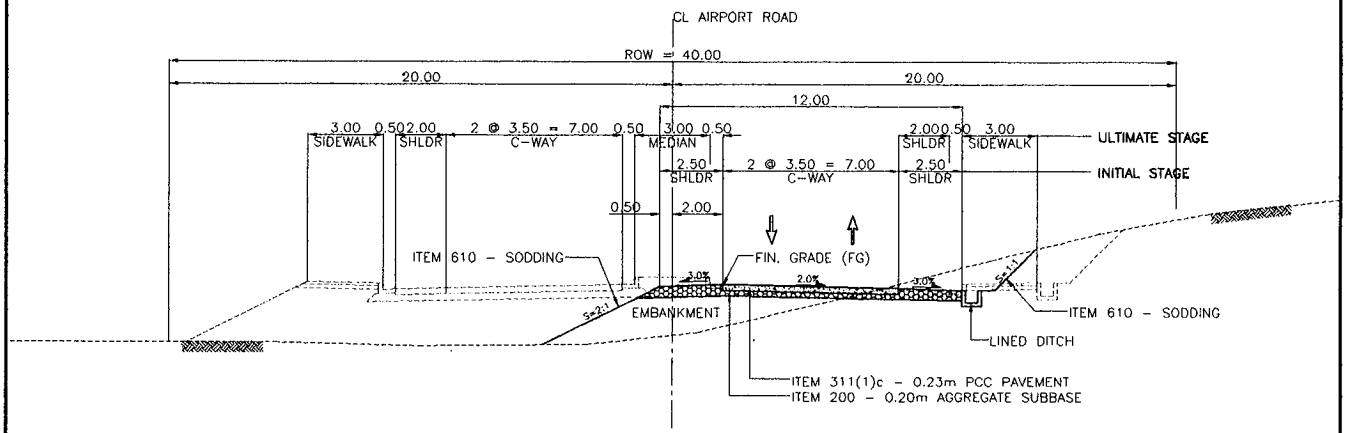
| Classification | Unit | Initial Stage | Ultimate Stage |
|---|---|---|---|
| Design Speed | Km/h | 80 | |
| Number of Lane | | 2 | 4 |
| Type of Pavement | | PCCP | |
| Lane Width | m | 3.5 | |
| Shoulder Width | m | 2.5 | |
| Median | m | - | 3.0 |
| Side Walk | m | - | 3.0 |
| Stopping Sight Distance | m | 110 | |
| Passing Sight Distance | m | 560 | |
| Minimum Radius | m | 230 | |
| Minimum Radius for Normal Cross Slope | m | 2500 | |
| Maximum Grade | % | 4 | |
| Minimum Length of Vertical Curve | m | 60 | |
| Minimum "K" for Crest | | 30 | |
| Minimum "K" for Sag | | 24 | |
| Maximum Superelevation | % | 6 | |
| Normal Cross Slope | % | 2 | |
| Vertical Clearance | m | 4.3 | |

**TABLE 12.7-2 INTERSECTION DESIGN CRITERIA**

| Classification | Unit | Intersection | |
|---|---|---|---|
| | | Signal Control | |
| | | Urban | Rural |
| Design Speed | Km/h | 40 | 60 |
| Sight Distance | m | 100 | 240 |
| Minimum Radius | m | 60 | 150 |
| Maximum Grade | % | 2.5 | |
| Width of Left Turn Lane | m | 3.0 ~ 3.5 | |
| Length of Teper | m | 50 ~ 100 | |
| Length of Storage Lane | m | 30 ~ 50 | |
| Minimum Radius Curve | m | 12 | 15 |
| Width of Pedestrian Crossing | m | 3 | |




**ULTIMATE STAGE** – STA. 0+000.000 TO STA. 10+117.284




**INITIAL STAGE** – STA. 0+000.000 TO STA. 10+117.284

**FIGURE 12.7-1**

# TYPICAL CROSS-SECTION
## Bacolod New Airport Access Road

3) Bridge and Structures

*(a) Design Standards and Specifications*

The design of bridges for stream or river crossings will be based on the recommendations of the following standards and specifications:

[1] Design Guidelines, Criteria and Standards for Public Works and Highways, Volumes I & II, Department of Public Works and Highways (DPWH),

[2] Standard Specifications for Highway Bridges, American Association of State Highway and Transportation Officials (AASHTO), 17th Ed., 2002, and

[3] Highway Drainage Guidelines, American Association of State Highway and Transportation Officials (AASHTO), 1999 Metric Ed.

*(b) Materials*

The basic materials used for bridge and structures shall be:

- Concrete, Reinforced $f'_c$ = 24Mpa
- Concrete, Prestressed $f'_c$ = 41Mpa
- Steel Reinforcement (Grade 60) $f_y$ = 415Mpa
- Prestressing Steel (Grade 270) $f_u$ = 1862Mpa

*(c) Design Loads*

- **Dead Load (*DL*)**

  The dead load shall consist of the weight of the entire structure, including the roadway, sidewalks, car tracks, pipes, conduits, cables, and other public utility services

- **Live Load (*LL*)**

  The carriageway live loading shall be the AASHTO MS 18 (HS20-44) Standard Truck or Lane Loading.

- **Seismic Forces**

  The method of analysis for the bridge structures follows the recommendations of AASHTO 2002 Division I-A Seismic Design using the Single mode or the Multimode Spectral Analysis Method.

**Seismic Design Coefficients**

| Seismic Design Item | Metro Iloilo | Metro Bacolod |
|---|---|---|
| Acceleration Coefficient, A | 0.40 | 0.40 |
| Importance Classification, IC | I (Essential) | I (Essential) |
| Seismic Performance Category, SPC | D | D |
| Soil Type | III (Soft to Medium Stiff Soil) | I (Stiff Soil) |
| Site Coefficient | 1.5 | 1.0 |

*(d) Clearances*

- **Vertical Clearances**

The following vertical clearances for structures shall be maintained for all bridges crossing major roads, access roads and streams or rivers:

**Vertical Clearance**

| LOCATION | MIN. VERTICAL CLEARANCE (m) | REMARKS |
|---|---|---|
| River/Stream Crossing Freeboard Considering Debris Passage Below Bridge | 1.50 | Max. Flood Water Level to Lowest Structure Member |
| River/Stream Crossing Freeboard Without Considering Debris Passage Below Bridge | 1.00 | Max. Flood Water Level to Lowest Structure Member. To be applied also to irrigation canals. |

*(e) Bridge Planning*

| | | |
|---|---|---|
| Design Flood Frequency | : | 50 year return period |
| Minimum Span Lengt | : | $L \geq 20 + 0.005Q$ ($Q > 500$ cum/sec) |
| Pier Width on River Section | : | Encroachment < 5% of river section |
| Bridge Length | : | Decided by discharge and Max. Flood Water Level |

4) Drainage and Cross Drainage Facilities

*a) Design Standards and Guidelines*

Drainage design shall be carried out in accordance with the recommendations in "*Part-3 Highway Design, Volume-II of the "DPWH Design Guidelines, Criteria and Standards for Public Works and Highways*". Where there is no relevant provision in the DPWH Guidelines, reference shall be made to the recommendations of "*A Policy on Highway Drainage", June- 1987, Japan Road Association; (JRA) and "Highway Drainage Guidelines", Metric- Edition, American Association of State Highway and Transportation Official; (AASHTO), 1999*".

In the design of drainage facilities, approved "Standard Drawings" by DPWH, prepared by the Bureau of Design (BOD) will also be considered.

**Design Frequency (Return Period)**

The design frequencies adopted in this project are adhering to the recommendation found in the DPWH Design Guidelines as shown below.

**Design Frequencies**

| Type of Structure | Return Periods |
|---|---|
| Bridges | 1 in 50 years |
| Box Culverts | 1 in 25 years |
| Road Embankment | 1 in 10 years |
| Drain Pipes and Pipe Culverts | 1 in 10 years |
| Side Ditches | 1 in 2 years |
| Surface Drainage | 1 in 2 years |

## Cross-Drainage

### Type and Size of Cross-Drainage Structure

Figure 12.7-2 presents the proposed methodology to choose the most reasonable drainage structure among pipe culverts, box culverts and bridges based on the drainage capacity of these structures and the maximum runoff discharge value of the each defined catchment area. This methodology is based on the DPWH requirements in which the selection starts by using a single pipe culvert having 910 mm diameter, since the minimum size of pipe culvert recommended is 910mmϕ for ease of maintenance. The larger diameters 1070 mmϕ, 1220 mmϕ and up to 1520 mmϕ are used as far as the rate of flow will require. If the rate of flow is greater than the capacity of 1520 mmϕ single pipe, then the capacities of the double 910 mmϕ to 1520 mmϕ pipes are checked. When the rate of flow is greater than the capacity of the double 1520 mmϕ diameter pipes, then the box culvert is chosen to drain the water. Different standard size of box culverts are used to accommodate the drained water as long as the rate of flow is not more than 40 $m^3$/sec including single, double and up to triple vents. When the rate of flow is greater than 40 $m^3$/sec, a bridge is recommended.

During the above analysis, the Rational Method of analysis is adopted when the catchment area is not more than 20 $km^2$. For the areas more than 20 $km^2$, the Unit Hydrograph Method is used.

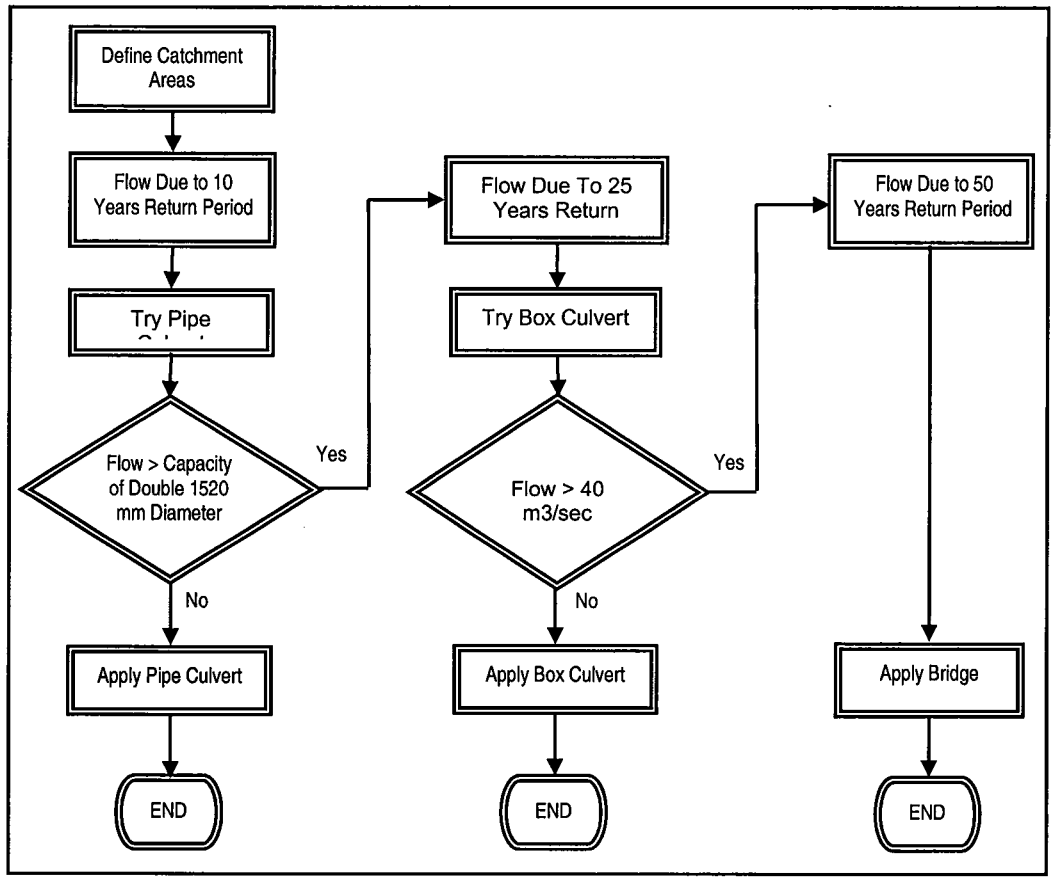



**FIGURE 12.7-2 SELECTION OF TYPE OF CROSS DRAINAGE STRUCTURE**

Reinforced Concrete Pipe Culverts (RCPC)

Pipe culverts are provided at the following locations:

- Locations defined by the catchment area analysis,
- Locations of existing irrigation channels, and
- Locations in flat terrain where water flow direction cannot be certainly defined. Flat cross-pipe is provided to avoid bypass acting as a dam at this location.

After the required pipes are provided at the abovementioned locations, the spacing between the successive pipes is checked. If the spacing is greater than 250 m, an additional pipe is located in between. This maximum spacing is considered in order to create the facilities to drain the surface water runoff discharge within a reasonable length.

Height of Backfill of RCPC

Based on the DPWH Design Guidelines, (Vol.-II, Item 500.3.6 "Backfilling") the minimum backfilling elevation is 0.3 m. However, based on the requirements of structural design, the minimum height of backfill should be 0.6 m. The finished grade of the project road shall consider the required invert elevation levels of inlets and outlets of the cross drainage structures. The invert elevations shall be modified as far as the standard requirements can be maintained. Otherwise, the finished bypass grade will be modified to coincide with the cross drainage inlets and outlets invert elevations requirements.

Reinforced Concrete Box Culverts (RCBC)

Reinforced concrete box culverts are rigid frame structures with square or rectangular opening. The height and span of the box vary from 1.0m to 3.0m. It is recommended for economy of design to keep the span to the height ratio from 1:1 to 1:1.5.

In areas where the discharge is small and where the road will span a body of water less than or equal to 9m, an RC box culvert is applied. For the proposed three bypasses, the box culverts span mostly irrigation canals and small streams. Considerations are given to the expected maximum flood level at the proposed locations of box culverts.

### 12.7.2 Road and Intersection Design

1) Horizontal Alignment

Horizontal alignment was designed to satisfy the design speed of 80 km/hour. Horizontal alignment is shown in Figure 12.7-3. Among various horizontal curves, minimum one is 1,500m in radius with super elevation of 2%.

2) Vertical Alignment

Control points for vertical alignment design were as follows:

- Elevation of existing intersecting road
- Proposed bridge elevation
- Minimum depth of 0.6m from road surface to the top of pipe culvert to avoid reinforcement of pipe culvert.

3) Intersection

All major intersections were provided with left turn lanes. Major intersections are as follows:

- Intersection with Bacolod Circumferential Road (See Figure 12.7-4)
- Intersection with Talisay-Conception Road
- Intersection with Silay-Guimbalaon Road

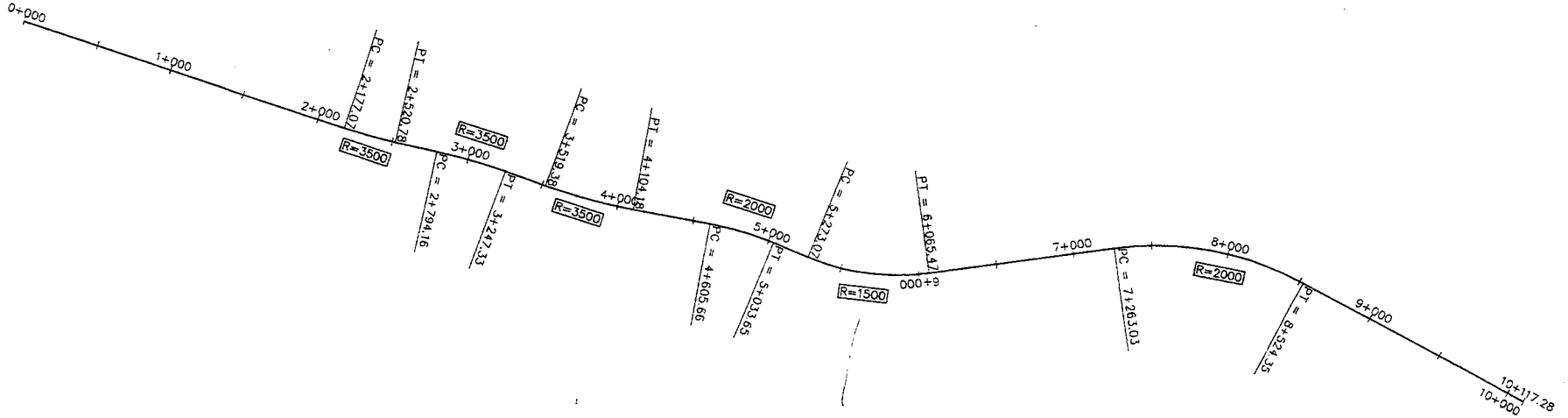



**FIGURE 12.7-3**

BACOLOD AIRPORT ACCESS ROAD HORIZONTAL ALIGNMENT

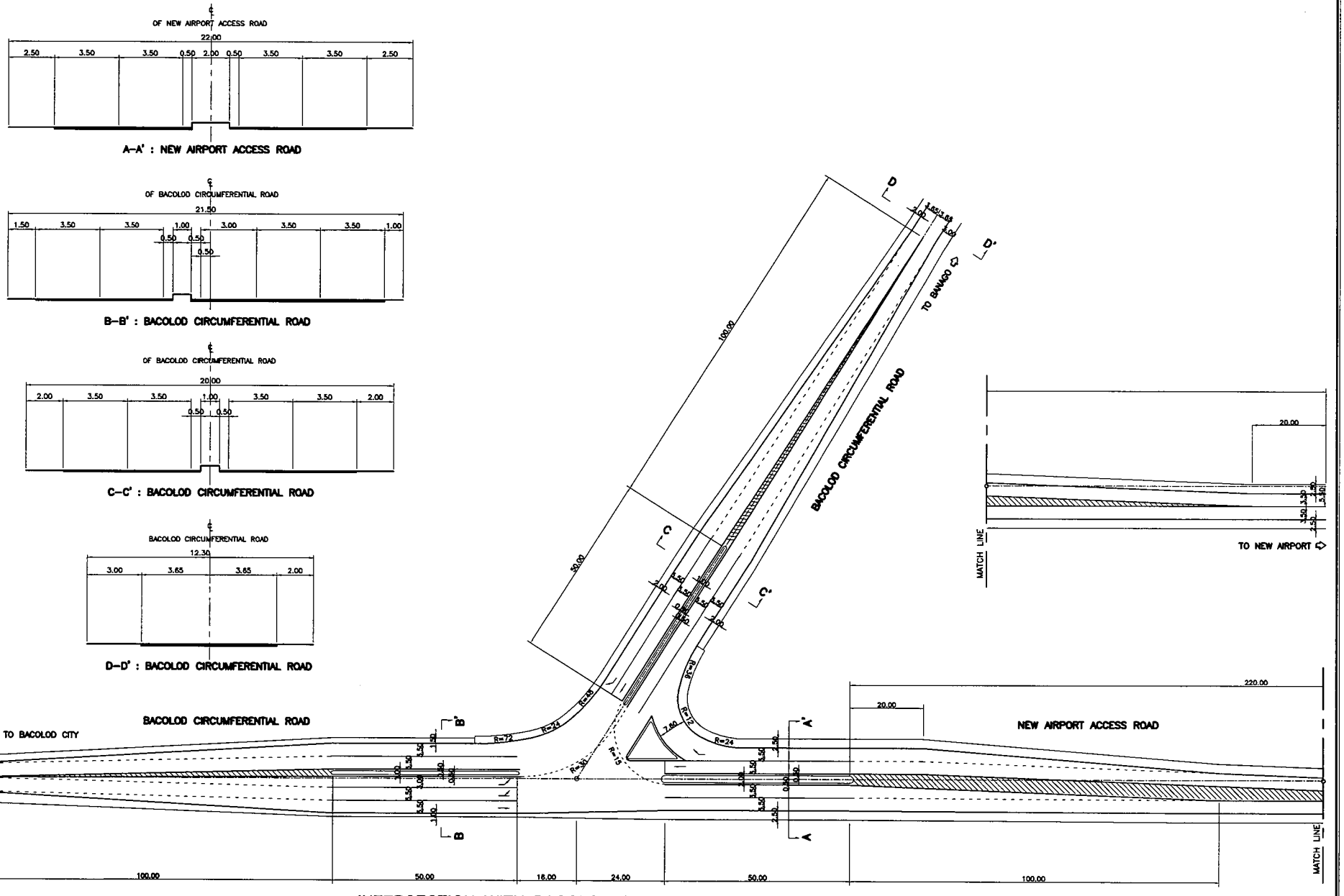



FIGURE 12.7-4 INTERSECTION WITH BACOLOD CIRCUMFERENTIAL ROAD (TYPE I)
STA. 0+171.178, BEG. OF NEW AIRPORT ACCESS ROAD

### 12.7.3 Pavement Design

Pavement design was made in accordance with the AASHTO Guide for Design of Pavement Structures, 1993.

Table 12.7.3-1 shows the design requirements. Bus and truck factors were assumed as follows:

Bus factor (number of ESAL per bus) : 0.8
Truck factor (number of ESAL per truck) : 1.8

Soft ground is found along the project road, and settlement after construction of pavement is anticipated. For this kind of ground condition, flexible type of pavement is preferred to cope with expected settlement. AC pavement was selected.

Table 12.7.3-2 shows traffic loading. Cummulative ESAL is 9.7 Million for 20 years.

Required pavement thickness is as follows:

Subbase Course : 20cm
PCC pavement : 25cm

**TABLE 12.7.3-1 DESIGN REQUIREMENT (Airport)**

| Category | Description |
|---|---|
| a. Design Variable | |
| a.1 Time Constraints<br>· Initial Performance Period | PCCP : 20 years |
| a.2 Traffic Loading | Directional Distribution Factor : 0.5<br>Lane Distribution Factor : 0.6 |
| a.3 Bus and Truck Factor | Bus : 0.8<br>Truck : 1.8 |
| a.4 Reliability | $Z_R$ = 1.037 for 85% Reliability<br>So = 0.35 (Rigid) |
| b. Performance Criteria | |
| b.1 Serviceability | (Rigid) PSI = Po - Pt = 4.5 - 2.5 = 2.0 |
| c. Material Properties for Structural Design | |
| c.1 Effective Modulus of Subgrade Reaction | K-Value (pci) ; 410pci (CBR : 5%, Subbase : 20cı |
| c.2 Pavement Layer Materials Characterization | $E_C$ = Modulus of Elasticity of PCC (4.20 x $10^6$ psi) |
| c.3 PCC Modulus of Rupture (Rigid)<br>(Flexural Strength) | S'c = 797 psi , Sc = 690 psi |
| d. Pavement Structural Characteristics | |
| d.1 Drainage | Rigid CD = Drainage Coefficient ; 1.0 |
| d.2 Load Transfer (Rigid) | J = 3.8 (Plane jointed, Untied Shoulder) |
| e. Required Pavement Thickness | |
| e1. PCC Pavement | t = 23cm |
| e2. Subbase Course | t = 20cm |

**TABLE 12.7.3-2 TRAFFIC LOADING (Bacolod Airport)**

| Year | AADT | | Cumulative ESAL |
|---|---|---|---|
| | Bus | Track | |
| 2012 | 115 | 1,491 | 506,584 |
| 2013 | 116 | 1,521 | 1,023,131 |
| 2014 | 117 | 1,551 | 1,549,839 |
| 2015 | 118 | 1,582 | 2,086,911 |
| 2016 | 120 | 1,614 | 2,634,551 |
| 2017 | 121 | 1,646 | 3,192,969 |
| 2018 | 122 | 1,679 | 3,762,379 |
| 2019 | 123 | 1,713 | 4,342,999 |
| 2020 | 125 | 1,747 | 4,935,051 |
| 2021 | 126 | 1,782 | 5,538,763 |
| 2022 | 127 | 1,818 | 6,154,365 |
| 2023 | 128 | 1,845 | 6,529,211 |
| 2024 | 130 | 1,872 | 6,909,624 |
| 2025 | 131 | 1,901 | 7,295,685 |
| 2026 | 132 | 1,929 | 7,687,481 |
| 2027 | 134 | 1,958 | 8,085,096 |
| 2028 | 135 | 1,987 | 8,488,616 |
| 2029 | 136 | 2,017 | 8,898,130 |
| 2030 | 138 | 2,047 | 9,313,727 |
| 2031 | 139 | 2,078 | 9,735,498 |
| **TOTAL** | **2,532** | **35,778** | **9,735,498** |

## 12.7.4 Structure Design

The New Airport Access Road is a new road construction 10.12kms long. Six (6) river bridge crossings are identified along the alignment with lengths ranging from 30m to 69m. Considering the site to be rolling topography, some bridge lengths tend to be longer than that required by river discharge.

This section discusses the preliminary design aspects of the proposed bridges crossing waterways along the alignment.

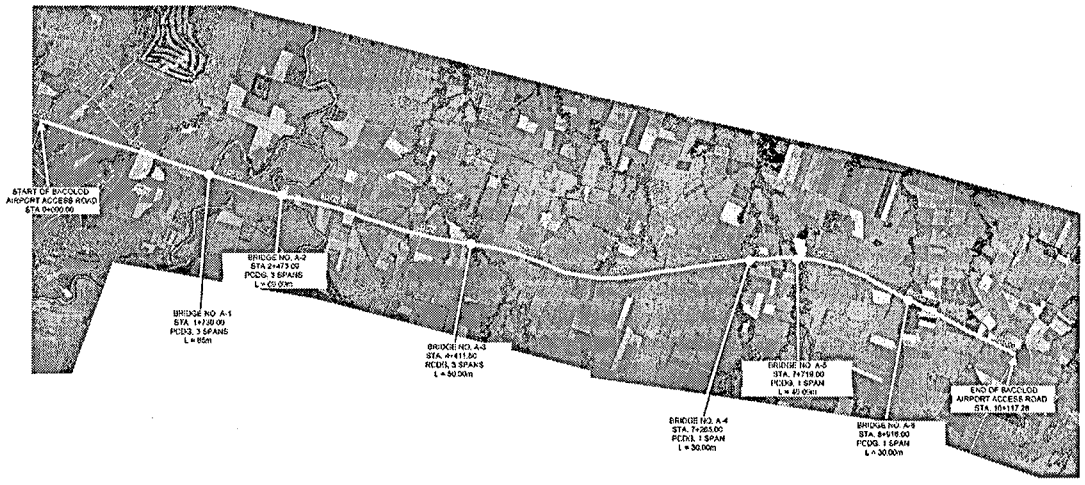



**FIGURE 12.7.4-1 BRIDGE LOCATION MAP**

### 12.7.4.1 Present Condition of the Proposed Bridge Sites

Site investigation was carried-out to verify the conditions of waterways along the alignment and determine the appropriate type and span of bridge suitable for each site. Figure 12.7.4-1 shows the locations of bridges while Figure 12.7.4-2 presents the conditions of the six rivers and streams along the proposed New Airport Road alignment.

The following features describe briefly the proposed bridge sites:

**Topography**

- The proposed alignment passes over mostly sugarcane fields on relatively rolling terrain.
- Since the proposed alignment is in rolling terrain, river bank height varies from 6m to 10m while bank widths varies from 28m to 78m.
- Under this condition, flood water is confined within the river section.

**Rivers/Streams**

- Almost all waterways along the alignment have meandering courses for both the upstream and downstream sides of the proposed bridge.
- Bank conditions are found stable for bridge locations A-1, A-3 and A-6 while bank scouring is observed on bridge locations A-2, A-4 and A-5.

- Boulders are usually seen on river beds with diameters averaging to 600mm.
- Large debris are not observed on the river courses, only small bamboos and sugar canes.

The river discharge for a 50-year return period is calculated for each proposed bridge site and presented in Table 12.7.4-1.

**TABLE 12.7.4-1 RIVER DISCHARGE FOR PROPOSED BRIDGE SITES**

| BRIDGE NO. | RIVER NAME | 50-YEAR DISCHARGE (cu.m/sec) | MFWL (EL. +m) | VELOCITY (m/s) | BRIDGE SPAN (m) | |
|---|---|---|---|---|---|---|
| | | | | | Minimum | Provided |
| A-1 | Logoy | 397.13 | 19.20 | 2.73 | 22.0 | 25 |
| A-2 | Banago | 454.26 | 18.50 | 3.88 | 22.3 | 25 |
| A-3 | Minulang | 75.56 | 14.80 | 1.86 | - | 20 |
| A-4 | Catabla | 57.48 | 15.50 | 1.77 | - | 30 |
| A-5 | Bagacay | 41.48 | 15.70 | 1.47 | - | 40 |
| A-6 | Guinhalaran | 40.34 | 18.00 | 1.60 | - | 30. |

**Geotechnical**

- Geotechnical investigations carried-out for the proposed bridge sites revealed that the road alignment and bridge sites are generally characterized by an upper layer consisting of alluvial deposits of sands, silts and clays with thickness varying from site to site. The deposits are generally underlain by sedimentary rocks and boulders at varying depth.
    - Very dense soil layer with N-values greater than 30 are found at depths from 3m to 10m but N-values of 50 or more occurs at around 20m depth.
    - The bearing layer thus varies at different sites but on general can be established between 3m to 10m deep.

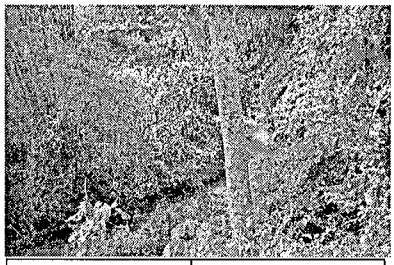
### 12.7.4.2 Design Concept for Structures

#### (1) Superstructure

The superstructure preliminary design basically adheres to the following concepts:

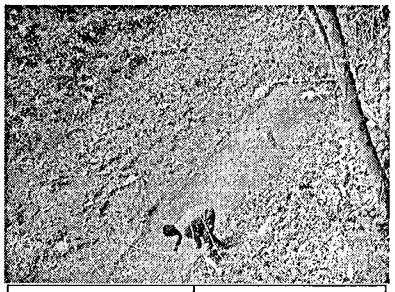
**Bridge Deck Section**

- The bridge deck section should conform with the travelway/carriageway width of the highway for both the initial and ultimate stages of the project. Typical bridge section is illustrated in Figure 12.7.4-3. Since the New Airport Access Road is to be implemented at two stages with four lanes of travelway at the ultimate stage, the initial two-lane road will have a single cross-slope. The bridge follows the same configuration as the road with provision for the additional two lanes to be carried by a separate or second bridge.
- A 1.5m wide shoulder is provided on one side of the deck to allow space for cars stopping on the bridge.
- Since the New Airport Road will traverse an urbanized area, a 2.0m sidewalk is proposed on one side of the deck and 0.75m wide sidewalk on the other side.



| | |
|---|---|
| STATION : | 8 + 916.00 |
| BRIDGE NO. : | A6 |
| RIVER NAME : | Guinhalaran River |
| 50 YEARS DISCHARGE | 40.34 cu.m/sec |
| MAX. FLOOD WATER LEVEL | EL. 18.00m |

END OF PROJECT

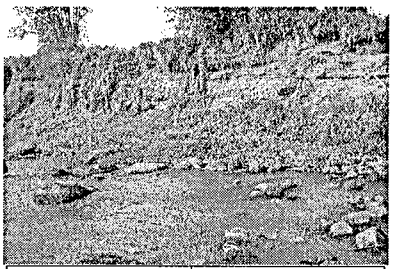


| | |
|---|---|
| STATION : | 7 + 719.00 |
| BRIDGE NO. : | A5 |
| RIVER NAME : | Bagacay Creek |
| 50 YEARS DISCHARGE | 37.75 cu.m/sec |
| MAX. FLOOD WATER LEVEL | EL. 15.70m |

| | |
|---|---|
| STATION : | 7 + 265.00 |
| BRIDGE NO. : | A4 |
| RIVER NAME : | Catabla River |
| 50 YEARS DISCHARGE | 57.48 cu.m/sec |
| MAX. FLOOD WATER LEVEL | EL. 15.50m |

| | |
|---|---|
| STATION : | 4 + 411.50 |
| BRIDGE NO. : | A3 |
| RIVER NAME : | Minuluang River |
| 50 YEARS DISCHARGE | 76.56 cu.m/sec |
| MAX. FLOOD WATER LEVEL | EL. 14.80m |

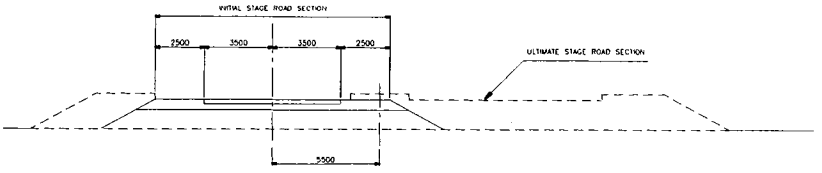
| | |
|---|---|
| STATION : | 2 + 473.00 |
| BRIDGE NO. : | A2 |
| RIVER NAME : | Banago River |
| 50 YEARS DISCHARGE | 454.26 cu.m/sec |
| MAX. FLOOD WATER LEVEL | EL. 18.50m |



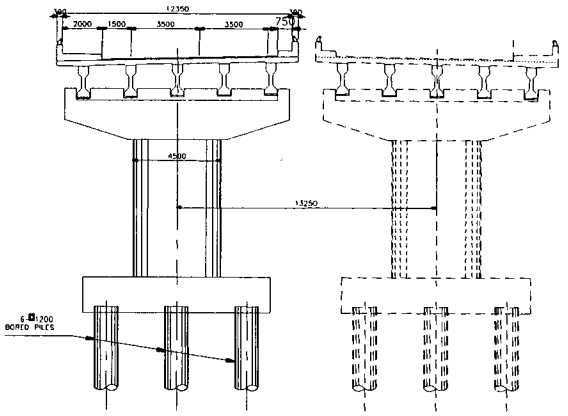
| | |
|---|---|
| STATION : | 1 + 730.00 |
| BRIDGE NO. : | A1 |
| RIVER NAME : | Logoy River |
| 50 YEARS DISCHARGE | 397.13 cu.m/sec |
| MAX. FLOOD WATER LEVEL | EL. 19.20m |

START OF PROJECT

**FIGURE 12.7.4-2 RIVER CONDITION AT PROPOSED BRIDGE SITES**




PROPOSED NEW AIRPORT ROAD SECTION




NEW AIRPORT ROAD BRIDGE SECTION

**FIGURE 12.7.4-3 TYPICAL NEW AIRPORT ROAD BRIDGE SECTION**

**Girder Types**

- Two types of superstructures are proposed for the bridges:
  - Prestressed Concrete (PCDG), AASHTO Girder type for spans greater than 20m, and
  - Reinforced Concrete Deck Girder (RCDG) for spans less than or equal to 20m
- To enhance seismic performance, PCDG are made continuous over the intermediate piers allowing transfer of superstructure forces directly to the substructure. On the other hand, RCDG are made rigid with the pier columns to minimize the depth of superstructure.

**Vertical Clearance**

- Since debris are not expected on bridge sites, a minimum flood water vertical clearance of 1.0m is provided.

### (2) Substructures

**Piers**

- Preliminary design for substructures considers the seismic design requirements based on the AASHTO Div. I-A Seismic Design recommendations.

- Plastic hinges are expected to form at pier substructures so that design forces of foundations will utilize the said forces.
- Single column piers are proposed for the PCDG structures (oval shape).
- On the other hand, a two-column pier is used for the RCDG superstructure (as recommended by BOD). Since the columns are rigidly connected with the girders, plastic hinging is expected at the top and bottom of the columns. The two-column pier will result in a cheaper substructure cost.

**Pile Foundation**

- Since the soil condition is relatively good in this area, shallow foundations can be utilized to support the bridge structures. Candidate types of foundations include spread footing, short length bored piles and caisson foundation.
- The bored pile foundation is preferred over the other types due to:
  - The seismic requirement (plastic forces) for spread footing will result in relatively very large footing size which will overlap with the foundations of the ultimate stage bridge.
  - Caisson foundation tends to become very expensive.
  - Footing size can be reduced by utilizing the tension (pull-out) capacity of the piles.
  - Bored pile foundation is more stable to river scouring.
- Likewise, foundation for the abutment utilizes bored pile foundation.

**Abutments**

- Abutment type is the inverted T cantilever wall seat type abutment. This type, being a closed type abutment is more reliable since it is difficult to guarantee the stability of slope in front of the abutment.
- Abutment preliminary design basically follows the AASHTO Div. I-A recommendations using Mononobe-Okabe formulation to calculate seismic forces due to retained earth.
- Expansion joints for the superstructures are provided at abutment locations.

### 12.7.4.3 Proposed Bridges

Details of the proposed bridges crossing rivers and streams, with a total length of 284m are presented in Table 12.7.4-2 below.

**TABLE 12.7.4-2 PROPOSED BRIDGES FOR NEW AIRPORT ACCESS ROAD**

| BRIDGE NO. | RIVER NAME | STATION | | BRIDGE LENGTH (m) | SUPERSTRUCTURE | | | SUBSTRUCTURE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | PIER | | ABUTMENT | |
| | | BEG. | END | | TYPE | SPAN | SKEW (deg) | COLUMN TYPE | FOUNDATION | TYPE | FOUNDATION |
| A1 | Logoy River | Sta. 1+730.00 | Sta. 1+795.00 | 65.00 | PCDG AASHTO Type IV-B | 20+25+20 | 75.00 | Wall Type 1500x4500 | ϕ1000 Bored Pile N=6 ; L=10m | Closed Inverted-T Cantilever | ϕ1000 Bored Pile N=6; L=11m |
| A2 | Banago River | Sta. 2+473.00 | Sta. 2+542.00 | 69.00 | PCDG AASHTO Type IV-B | 22+25+22 | 125.00 | Wall Type 1500x4500 | ϕ1000 Bored Pile N=6 ; L=10m | Closed Inverted-T Cantilever | ϕ1000 Bored Pile N=6; L=12m |
| A3 | Minuluang River | Sta. 4+411.50 | Sta. 4+461.50 | 50.00 | RCDG | 15+20+15 | 125.00 | 2 - Column ϕ1500 | ϕ1000 Bored Pile N=6 ; L=10m | Closed Inverted-T Cantilever | ϕ1000 Bored Pile N=6; L=11m |
| A4 | Catabla River | Sta. 7+265.00 | Sta. 7+295.00 | 30.00 | PCDG AASHTO Type V | 1 @ 30 | 75.00 | - | - | Closed Inverted-T Cantilever | ϕ1000 Bored Pile N=6; L=11m |
| A5 | Bagacay Creek | Sta. 7+719.00 | Sta. 7+759.00 | 40.00 | PCDG AASHTO Type VI | 1 @ 40 | 110.00 | - | - | Closed Inverted-T Cantilever | ϕ1200 Bored Pile N=6; L=11m |
| A6 | Guinhalaran River | Sta. 8+916.00 | Sta. 8+946.00 | 30.00 | PCDG AASHTO Type V | 1 @ 30 | 75.00 | - | - | Closed Inverted-T Cantilever | ϕ1000 Bored Pile N=8; L=14m |

TOTAL BRIDGE LENGTH : 284 m

### 12.7.5 Drainage Design

#### 12.7.5.1 Principle and Methodology

The standard used in the study is in accordance to the Design Guidelines of Department of Public Works and Highways (DPWH).

A Policy on Highway Drainage of the Japan Road Association (JRA) and Highway Drainage Guidelines of the American Association of State Highway and Transportation Official (AASHTO).

#### 12.7.5.2 Hydrological and Hydraulic Analyses

The method used in the hydrological analyses is the Rational Method for catchment's areas less than twenty (20) sq km and the Unit Hydrograph for areas greater than twenty (20) sq km. The hydrological analyses utilized the rainfall intensity-duration frequency data shown at Table 12.7.5-1 of the Philippines Atmospheric Geophysical and Astronomical Services Administration (PAGASA) station of Iloilo City to determine the rainfall intensity. The topographic maps of National Mapping and Resources Information Agency (NAMRIA) were used to delineate the catchment areas of the road.

In the hydraulic analysis, the procedure applied for establishing the bridge's design flood level is by the Manning's Formula and for the design of the culvert dimensions are the hydraulic monographs of the US Bureau of Public Roads.

#### 12.7.5.3 Results of Hydrologic Analyses

The hydrologic analyses reveal sixteen (16) drainage catchment areas shown in Figure 12.7.5-1 for the proposed New Airport Access Road. Two (2) areas are greater than twenty (20) sq km and all the other less .The analyses also reveal that there are six (6) areas where the discharge are more than forty (40) cu m per sec. The result of the hydrological analyses is shown in Table 12.7.5-2.

#### 12.7.5.4 Results of Hydraulic Analyses

The hydraulic analyses reveal that six (6) bridges and thirty one (31) culverts are needed for the drainage structures in the road.

Refer to Section 12.7.3 for the bridges schedule and Table 12.7.5-3 Hydraulic Analysis for the list of proposed culverts.

#### 12.7.5.5 Flood Flow Analysis

The flood flow analysis is conducted for the six (6) catchment areas where the discharge is more than forty (40) cu m per sec. The results of the analysis are shown in Table 12.7.5-4.

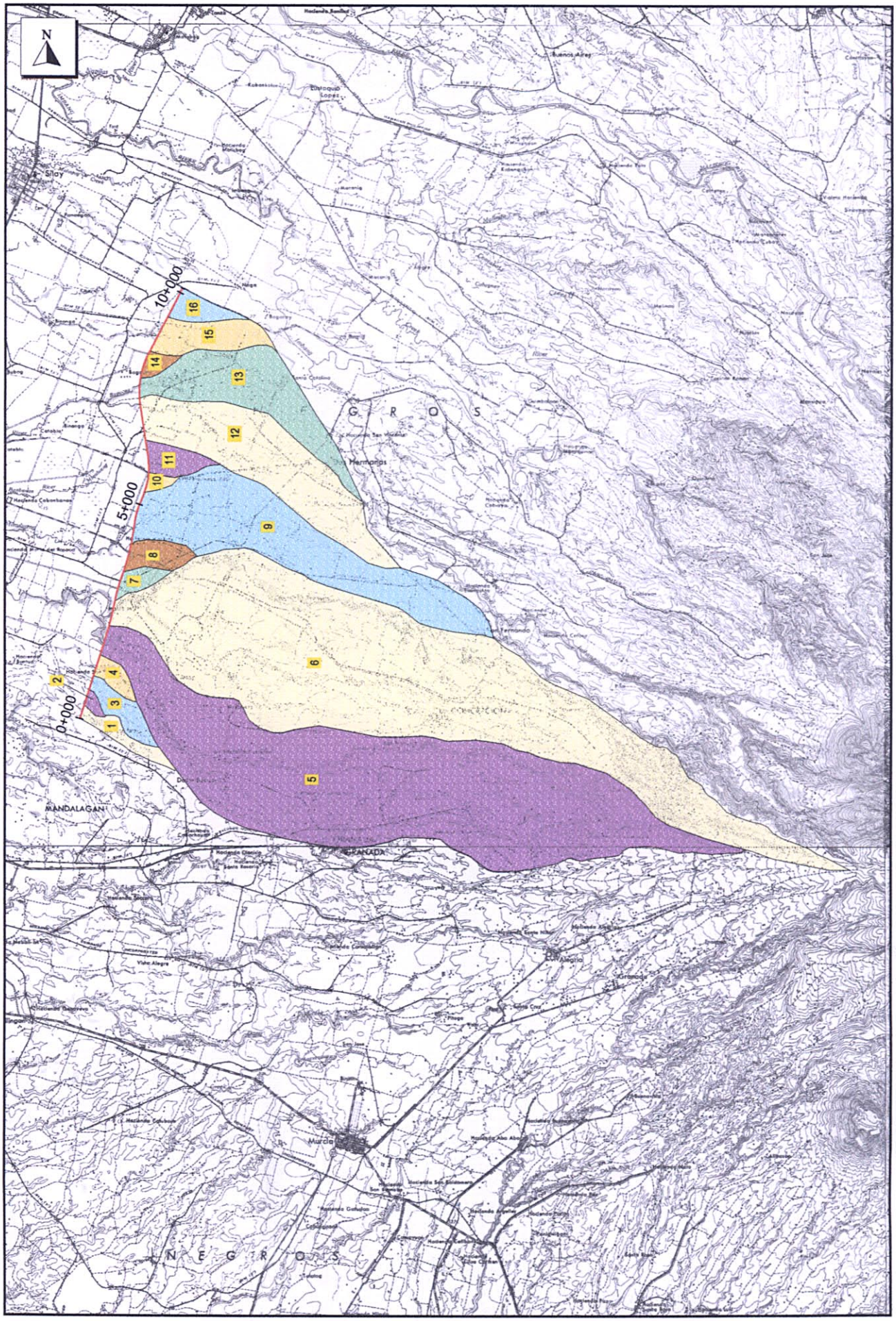



FIG. 12.7.5-1 NEW AIRPORT ACCESS ROAD (CATCHMENTS AREA MAP)

TABLE 12.7.5-1

RAINFALL INTENSITY-DURATION-FREQUENCY DATA
for
ILOILO CITY, ILOILO

Based on 45 years of record

COMPUTED EXTREME VALUES (in mm) OF PRECIPITATION

| Return Period (yrs) | 5 mins | 10 mins | 15 mins | 20 mins | 30 mins | 45 mins | 60 mins | 80 mins | 100 mins | 120 mins | 150 mins | 3 hrs | 6 hrs | 12 hrs | 24 hrs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 11.2 | 17.5 | 22.6 | 27.0 | 34.1 | 40.1 | 44.1 | 50.3 | 55.2 | 59.6 | 64.9 | 69.3 | 86.5 | 105.0 | 119.3 |
| 5 | 14.2 | 22.4 | 28.8 | 34.7 | 43.7 | 50.8 | 56.3 | 64.9 | 71.0 | 76.2 | 83.1 | 88.5 | 111.1 | 136.1 | 155.4 |
| 10 | 16.2 | 25.7 | 33.0 | 39.7 | 50.1 | 57.9 | 64.4 | 74.6 | 81.5 | 87.2 | 95.1 | 101.2 | 127.3 | 156.8 | 179.3 |
| 15 | 17.3 | 27.5 | 35.3 | 42.6 | 53.7 | 61.9 | 69.0 | 80.0 | 87.4 | 93.4 | 101.9 | 108.4 | 136.5 | 168.4 | 192.8 |
| 20 | 18.1 | 28.8 | 36.9 | 44.6 | 56.3 | 64.7 | 72.2 | 83.9 | 91.6 | 97.8 | 106.6 | 113.4 | 142.9 | 176.5 | 202.3 |
| 25 | 18.7 | 29.8 | 38.2 | 46.1 | 58.2 | 66.9 | 74.7 | 86.8 | 94.8 | 101.1 | 110.3 | 117.3 | 147.9 | 182.8 | 209.6 |
| 50 | 20.6 | 32.8 | 42.0 | 50.8 | 64.2 | 73.5 | 82.3 | 95.9 | 104.6 | 111.5 | 121.6 | 129.2 | 163.1 | 202.1 | 232.0 |
| 100 | 22.4 | 35.8 | 45.9 | 55.5 | 70.2 | 80.1 | 89.8 | 104.9 | 114.3 | 121.7 | 132.7 | 141.0 | 178.2 | 221.3 | 254.3 |

EQUIVALENT AVERAGE INTENSITY (in mm/hr) OF COMPUTED EXTREME VALUES

| Return Period (yrs) | 5 mins | 10 mins | 15 mins | 20 mins | 30 mins | 45 mins | 60 mins | 80 mins | 100 mins | 120 mins | 150 mins | 3 hrs | 6 hrs | 12 hrs | 24 hrs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 134.4 | 105.0 | 90.4 | 81.0 | 68.2 | 53.5 | 44.1 | 37.7 | 33.1 | 29.8 | 26.0 | 23.1 | 14.4 | 8.8 | 5.0 |
| 5 | 170.4 | 134.4 | 115.2 | 104.1 | 87.4 | 67.7 | 56.3 | 48.7 | 42.6 | 38.1 | 33.2 | 29.5 | 18.5 | 11.3 | 6.5 |
| 10 | 194.4 | 154.2 | 132.0 | 119.1 | 100.2 | 77.2 | 64.4 | 56.0 | 48.9 | 43.6 | 38.0 | 33.7 | 21.2 | 13.1 | 7.5 |
| 15 | 207.6 | 165.0 | 141.2 | 127.8 | 107.4 | 82.5 | 69.0 | 60.0 | 52.4 | 46.7 | 40.8 | 36.1 | 22.8 | 14.0 | 8.0 |
| 20 | 217.2 | 172.8 | 147.6 | 133.8 | 112.6 | 86.3 | 72.2 | 62.9 | 55.0 | 48.9 | 42.6 | 37.8 | 23.8 | 14.7 | 8.4 |
| 25 | 224.4 | 178.8 | 152.8 | 138.3 | 116.4 | 89.2 | 74.7 | 65.1 | 56.9 | 50.5 | 44.1 | 39.1 | 24.7 | 15.2 | 8.7 |
| 50 | 247.2 | 196.8 | 168.0 | 152.4 | 128.4 | 98.0 | 82.3 | 71.9 | 62.8 | 55.8 | 48.6 | 43.1 | 27.2 | 16.8 | 9.7 |
| 100 | 268.8 | 214.8 | 183.6 | 166.5 | 140.4 | 106.8 | 89.8 | 78.7 | 68.6 | 60.9 | 53.1 | 47.0 | 29.7 | 18.4 | 10.6 |

# TABLE 12.7.5-2
# HYDROLOGICAL ANALYSIS

Road Section: *NEW AIRPORT ACCESS ROAD*

| Basin Number | STATION | | DISCHARGE | | | |
|---|---|---|---|---|---|---|
| | BEGINNING | END | 2 year | 10 year | 25 year | 50 year |
| | | | $m^3$/sec. | $m^3$/sec. | $m^3$/sec. | $m^3$/sec. |
| 1 | 0 + 000.00 | 0 + 350.00 | 5.64 | 8.23 | 9.55 | 10.51 |
| 2 | 0 + 350.00 | 0 + 700.00 | 2.75 | 4.01 | 4.64 | 5.11 |
| 3 | 0 + 700.00 | 0 + 950.00 | 9.46 | 13.80 | 16.01 | 17.62 |
| 4 | 0 + 950.00 | 1 + 450.00 | 4.64 | 6.78 | 7.85 | 8.65 |
| 5 | 1 + 450.00 | 2 + 050.00 | | | | 397.13 |
| 6 | 2 + 050.00 | 2 + 650.00 | | | | 454.26 |
| 7 | 2 + 650.00 | 3 + 500.00 | 3.66 | 5.34 | 6.19 | 6.82 |
| 8 | 3 + 500.00 | 4 + 320.00 | 8.64 | 12.60 | 14.62 | 16.09 |
| 9 | 4 + 320.00 | 4 + 550.00 | 40.75 | 59.79 | 69.45 | 76.56 |
| 10 | 4 + 550.00 | 5 + 700.00 | 3.29 | 4.80 | 5.56 | 6.12 |
| 11 | 5 + 700.00 | 7 + 210.00 | 10.01 | 14.61 | 16.93 | 18.64 |
| 12 | 7 + 210.00 | 7 + 650.00 | 30.59 | 44.89 | 52.14 | 57.48 |
| 13 | 7 + 650.00 | 7 + 800.00 | 22.04 | 32.37 | 37.60 | 41.48 |
| 14 | 7 + 800.00 | 8 + 150.00 | 1.83 | 2.67 | 3.09 | 3.40 |
| 15 | 8 + 500.00 | 9 + 400.00 | 21.64 | 31.59 | 36.65 | 40.34 |
| 16 | 9 + 400.00 | 10 + 117.29 | 11.38 | 16.61 | 19.22 | 21.17 |
| | | | | | | |

## TABLE 12.7.5-3
## HYDRAULIC ANALYSIS

***NEW AIRPORT ACCESS ROAD***

| BASIN NUMBER | STATION ( km ) | SIZE | | LENGTH | REMARKS / RECOMMENDATION |
|---|---|---|---|---|---|
| | | RCPC | RCBC | | |
| | | mmØ | SPAN X HEIGHT | ( m ) | |
| 1 | 0 + 060.00 | | 1 - 2.40 X 2.40 | 16.00 | REPLACE EXISTING RCPC |
| | 0 + 330.00 | 1 - 910 | | 16.00 | |
| 2 | 0 + 550.00 | 2 - 1220 | | 23.00 | |
| | 0 + 620.00 | 1 - 1070 | | 22.00 | |
| 3 | 0 + 900.00 | | 2 - 2.40 X 2.40 | 21.00 | |
| 4 | 1 + 220.00 | | 3 - 1.50 X 1.50 | 16.00 | |
| 5 | 2 + 130.00 | 2 - 910 | | 16.00 | |
| | 2 + 280.00 | 1 - 910 | | 17.00 | |
| | 2 + 365.00 | 1 - 1070 | | 25.00 | |
| 7 | 2 + 780.00 | 1 - 910 | | 16.00 | |
| | 3 + 050.00 | 1 - 1070 | | 20.00 | |
| | 3 + 395.00 | 2 - 1220 | | 18.00 | |
| 8 | 3 + 640.00 | 2 - 910 | | 16.00 | |
| | 3 + 820.00 | 1 - 1070 | | 20.00 | |
| | 4 + 200.00 | | 1 - 2.40 X 2.40 | 16.00 | |
| 10 | 4 + 650.00 | 1 - 910 | | 16.00 | |
| | 4 + 810.00 | 1 - 1070 | | 16.00 | |
| | 5 + 070.00 | 1 - 1070 | | 16.00 | |
| | 5 + 510.00 | 2 - 1220 | | 16.00 | |
| 11 | 6 + 010.00 | 2 - 910 | | 16.00 | |
| | 6 + 220.00 | 2 - 910 | | 16.00 | |
| | 6 + 400.00 | | 3 - 1.50 X 1.50 | 16.00 | |
| | 6 + 890.00 | 2 - 910 | | 17.00 | |
| 12 | 7 + 540.00 | 1 - 910 | | 15.00 | |
| 14 | 8 + 000.00 | 1 - 910 | | 16.00 | |
| | 8 + 250.00 | 2 - 1070 | | 17.00 | |
| 15 | 8 + 780.00 | 1 - 1220 | | 25.00 | |
| | 8 + 860.00 | 1 - 1070 | | 19.00 | |
| | 8 + 935.00 | | | | |
| | 9 + 030.00 | 1 - 910 | | 16.00 | |
| 16 | 9 + 545.00 | | 2 - 2.40 X 2.40 | 16.00 | |
| | 9 + 880.00 | 1 - 910 | | 17.00 | |

## TABLE 12.7.5-4 FLOOD FLOW ANALYSIS

## NEW AIRPORT ACCESS ROAD , METRO BACOLOD

| HIGHWAY STATION (km) | BRIDGE NUMBER | BRIDGE NAME | CATCHMENT AREA (km2) | DISCHARGE 50 YEARS (cms) | VEL (mps) | DFL (m) | M.F.L. FROM FIELD SURVEY (m) | WATER WIDTH (m) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| 1+762 | A-1 | Logoy | 28.85 | 397.13 | 2.73 | 19.20 | 19.35 | 55.88 | |
| 2+508 | A-2 | Banago | 32.60 | 454.26 | 3.88 | 18.50 | 18.30 | 47.23 | |
| 4+436 | A-3 | Minuluang | 9.39 | 76.56 | 1.86 | 14.80 | 15.00 | 39.80 | |
| 7+290 | A-4 | Catabla | 7.20 | 57.48 | 1.77 | 15.50 | 15.70 | 17.94 | |
| 7+739 | A-5 | Bagacay | 5.27 | 41.48 | 1.47 | 15.70 | 15.80 | 27.11 | |
| 8+931 | A-6 | Guinhalaran | 2.25 | 40.34 | 1.60 | 18.00 | 17.90 | 12.06 | |

## 12.8 COST ESTIMATES

### 12.8.1 Construction Cost

(1) Unit Cost Analysis

The project cost was estimated based on the January 2004 prices with breakdown of foreign and local currency components and a tax component.

The foreign exchange rates used were as follows:

1 US $ = 55.36 P = 106.85 Yen

A market price survey was conducted to obtain information on market or prevailing prices of construction materials, labor cost and equipment cost. Based on these prices, a unit cost analysis was conducted to develop unit costs for construction items. Unit prices of major construction items are presented in Tables 12.8-1, 2, 3 and 4, respectively.

(2) Construction Cost

Estimated construction cost is presented in Table 12.8-5. Detailed cost estimate is presented in Appendix 12.8-1. The construction cost of New Airport Access was estimated at 378.0 Million pesos, composing of 51.4% a foreign currency component (or 194.4 Million pesos), 33.8% of a local currency component (or 127.9 Million pesos) and 14.8 % of a tax component (or 55.7 Million pesos).

**TABLE 12.8-5 CONSTRUCTION COST**

(Million Pesos)

| | Foreign | Local | Tax | Total |
|---|---|---|---|---|
| Amount | 194.4 | 127.8 | 55.7 | 378.0 |
| | 51.4% | 33.8% | 14.8% | 100.0% |

**TABLE 12.8-1 MARKET PRICE OF CONSRUCTION MATERIALS IN BACOLOD**

(January 2004 Prices)

| Price No. | Description | Unit | Unit Price (P) |
|---|---|---|---|
| 1 | Portland Cement | bag | 182.00 |
| 2 | Reinforcing Steel Bar, Gr. 40 | kg. | 25.00 |
| 3 | Reinforcing Steel Bar, Gr. 60 | kg. | 27.00 |
| 4 | Gasoline, Premium | lit. | 23.94 |
| 5 | Gasoline, Regular | lit. | 22.40 |
| 6 | Diesel | lit. | 18.11 |
| 7 | Lumber | bd.ft. | 36.00 |
| 8 | Ordinary Plywood 1/2" | pc | 580.00 |
| 9 | Emulsified Asphalt SS-1 | tonne | 23,500.00 |
| 10 | Asphalt Cement Pen. 85-100 | tonne | 21,500.00 |
| 11 | Thinner | gal. | 137.00 |
| 12 | Tie Wire #16 | kg. | 60.00 |

*SOURCE:*

- *Study Team Survey*

**TABLE 12.8-2 LABOR COST**

(January 2004 Prices)

| Labor Category | Hourly Rate (Pesos) | Daily Rate (Pesos) |
|---|---|---|
| Foreman | 46.00 | 368.00 |
| Operator | 41.00 | 328.00 |
| Driver | 38.00 | 307.00 |
| Carpenter | 41.00 | 328.00 |
| Re-Bar Worker | 43.00 | 340.00 |
| Masonry | 45.00 | 358.00 |
| Blaster | 40.00 | 320.00 |
| Welder | 47.00 | 376.00 |
| Painter | 40.00 | 320.00 |
| Mechanic | 40.00 | 323.00 |
| Electrician | 41.00 | 325.00 |
| Skilled Labor | 40.00 | 320.00 |
| Unskilled Labor | 32.00 | 252.00 |

*SOURCE:*

- *DPWH - Iloilo City District Engineering Offices*
- *National Health Insurance Program*
- *Social Security System*

**TABLE 12.8-3 HOURLY (OR DAILY) COST OF CONSTRUTION EQUIPMENT**

(January 2004 Prices)

| | Construction Equipment | Unit | Cost (P) |
|---|---|---|---|
| 1 | Tractor, crawler w/dozer (Bulldozer, 15t) | hr | 2,243.00 |
| 2 | Tractor, crawler w/dozer (Bulldozer, 21t) | hr | 3,623.00 |
| 3 | Backhoe, hydraulic, crawler, 0.61m3 | hr | 1,295.00 |
| 4 | Backhoe, hydraulic, crawler, 0.80m3 | hr | 1,766.00 |
| 5 | Dump Truck, 6.0-9.0 cu-yds (4.6-6.9m3) | hr | 807.00 |
| 6 | Motor Grader, 3.71m | hr | 1,748.00 |
| 7 | Vibratory Tandem Smooth Drum 10.6t | hr | 1,622.00 |
| 8 | Four Tamping Foot Wheels (Tire Roller) 16t | hr | 1,583.00 |
| 9 | Water Wagon/Pump Truck 500-1000 gal | hr | 968.00 |
| 10 | Asphalt Paver/Finisher, 4.7m | hr | 1,974.00 |
| 11 | Truck Mixer 5.0-6.0 cu-yds | hr | 1,066.00 |
| 12 | Concrete Batch Plant 40m3/hr with silo | hr | 1,990.00 |
| 13 | Crawler Drill | hr | 428.00 |
| 14 | Concrete Vibrator *(operator not included)* | day | 456.00 |
| 15 | Concrete Cutter *(operator not included)* | day | 1,080.00 |
| 16 | Concrete Paver/Finisher | hr | 870.00 |
| 17 | Truck Crane, Hydraulic 21-25t | hr | 1,297.00 |
| 18 | Concrete Pump Vehicle 100cu-yds/hr (76.5m3/hr) | hr | 1,668.00 |
| 19 | Air Compressor 456-500 cfm | hr | 876.00 |
| 20 | Aggregate Crusher 100t/hr *(operator not included)* | hr | 2,730.00 |
| 21 | Trailer 20t | hr | 1,588.00 |
| 22 | Welding Machine 250A | hr | 300.00 |
| 23 | Generator 51-100 kW *(operator not included)* | day | 3,310.00 |
| 24 | Bar Bender *(operator not included)* | day | 1,310.00 |
| 25 | Electric Bar Cutter | day | 1,310.00 |

*SOURCE: Associated Construction Equipment Lessors (ACEL)*

# TABLE 12.8-4 UNIT COST OF MAJOR CONSTRUCTION ITEM (1/2)

| Item No. | Description | Unit | Unit Cost (Peso) | Component(%) | | |
|---|---|---|---|---|---|---|
| | | | | Foreign | Local | Tax |
| | **PART C - EARTHWORK** | | | | | |
| 100(1) | Clearing and Grubbing | ha. | 55,100.00 | 57 | 27 | 16 |
| 101 | Removal of Existing Sidewalk, Railings, Etc. for Bridge Widening | LS | | 48 | 28 | 24 |
| 102(1) | Unsuitable Excavation | m3 | 179.00 | 59 | 17 | 24 |
| 102(2)a | Surplus Common Excavation | m3 | 179.00 | 60 | 24 | 15 |
| 103(2)a | Bridge Excavation, Common (AWL) | m3 | 202.00 | 53 | 31 | 16 |
| 103(2)b | Bridge Excavation, Common (BWL) | m3 | 763.00 | 51 | 34 | 15 |
| 104(1)a | Embankment from Excavation | m3 | 196.00 | 54 | 20 | 26 |
| 104(1)b | Embankment from Borrow | m3 | 397.00 | 56 | 30 | 15 |
| 104(1)c | Selected Borrow for Backfilling | m3 | 573.00 | 54 | 20 | 26 |
| 105(1) | Subgrade Preparation (Common Material) | m2 | 17.00 | 57 | 27 | 16 |
| | Plastic-board drain (@2.5m * 2.5m triangle, Depth 20.0m) | m2 | 151.00 | 65 | 20 | 15 |
| | **PART D - SUBBASE AND BASE COURSE** | | | | | |
| 200 | Aggregate Subbase Course | m3 | 561.00 | 54 | 32 | 14 |
| 201 | Aggregate Base Course | m3 | 662.00 | 53 | 33 | 14 |
| 202 | Crushed Aggregate Base Course (AC) | m3 | 763.00 | 54 | 32 | 14 |
| | **PART E - SURFACE COURSE** | | | | | |
| 301(1) | Bituminous Prime Coat (MC-70 Cut-Back Asphalt) | t | 24,500.00 | 65 | 17 | 18 |
| 302(2) | Bituminous Tack Coat (Emulsified Asphalt Grade SS-1) | t | 24,500.00 | 65 | 18 | 18 |
| 310 | Bituminous Concrete Surface Course, Hot Laid | t | 3,430.00 | 64 | 18 | 18 |
| 311(1)a | PCC Pavement(Plain) (t=0.10m) | m2 | 420.00 | 62 | 23 | 15 |
| 311(1)c | PCC Pavement(Plain) (t=0.23m) | m2 | 720.00 | 62 | 23 | 15 |
| 311(1)d | PCC Pavement(Plain) (t=0.25m) | m2 | 763.00 | 62 | 23 | 15 |
| 311(2) | PCC Pavement(Reinforced) for Approach Slab, t=300mm | m2 | 4,440.00 | 62 | 23 | 15 |
| | **PART F - BRIDGE CONSTRUCTION** | | | | | |
| 400(4) | Precast Concrete Piles (0.45m×0.45m), Furnished and Driven | m | 3,190.00 | 52 | 28 | 20 |
| 400(15) | Test Piles (0.45m×0.45m) | m | 371.00 | 52 | 35 | 13 |
| 400(16)a | Cast-in-Place Concrete Bored Piles, f 1000mm | m | 23,800.00 | 38 | 45 | 17 |
| 400(16)b | Cast-in-Place Concrete Bored Piles, f 1200mm | m | 32,500.00 | 38 | 45 | 17 |
| 400(19) | Piles Shoes for 0.45m×0.45m Piles | ea | 1,750.00 | 55 | 30 | 15 |
| 401 | Concrete Railings | m | 2,240.00 | 38 | 49 | 13 |
| 404(1) | Reinforcing Steel, Grade 40 (Fy=275Mpa) | kg | 39.00 | 50 | 37 | 13 |
| 404(2) | Reinforcing Steel, Grade 60 (Fy=415Mpa) | kg | 40.00 | 50 | 37 | 13 |
| 405(1) | Structural Concrete Class"A1" for Substructure (f'c=24Mpa) | m3 | 3,200.00 | 34 | 50 | 16 |
| 405(2) | Structural Concrete Class"A2" for Superstructure (f'c=24Mpa) | m3 | 5,040.00 | 34 | 50 | 16 |
| 405(3) | Structural Concrete Class"A3" for Others (f'c=21Mpa) | m3 | 4,130.00 | 34 | 50 | 16 |
| 405(6) | Structural Concrete "Lean Concrete" (f'c=17 Mpa) | m3 | 2,480.00 | 43 | 37 | 20 |
| 406(1)a | Prestressed Concrete Girder, AASHTO Type Ⅳ-B, L=20m | ea | 309,840.00 | 22 | 62 | 16 |
| 406(1)b | Prestressed Concrete Girder, AASHTO Type Ⅳ-B, L=22m | ea | 332,398.00 | 22 | 62 | 16 |
| 406(1)c | Prestressed Concrete Girder, AASHTO Type Ⅳ-B, L=25m | ea | 392,428.00 | 25 | 59 | 16 |
| 406(1)d | Prestressed Concrete Girder, AASHTO Type Ⅳ-B, L=26m | ea | 406,293.00 | 22 | 62 | 16 |
| 406(1)e | Prestressed Concrete Girder, AASHTO Type Ⅳ-B, L=27m | ea | 419,645.00 | 22 | 62 | 16 |
| 406(1) f | Prestressed Concrete Girder, AASHTO Type Ⅳ-B, L=28m | ea | 442,641.00 | 20 | 65 | 15 |
| 406(1)g | Prestressed Concrete Girder, AASHTO Type Ⅴ, L=30m | ea | 504,177.00 | 20 | 65 | 15 |
| 406(1)h | Prestressed Concrete Girder, AASHTO Type Ⅴ, L=31m | ea | 519,776.00 | 20 | 65 | 15 |
| 406(1)i | Prestressed Concrete Girder, AASHTO Type Ⅴ, L=34m | ea | 622,080.00 | 17 | 69 | 14 |
| 406(1)j | Prestressed Concrete Girder, AASHTO Type Ⅵ, L=35m | ea | 647,400.00 | 19 | 67 | 14 |
| 406(1)k | Prestressed Concrete Girder, AASHTO Type Ⅵ, L=40m | ea | 816,687.00 | 17 | 69 | 14 |
| 407(1)a | Elastomeric Bearing Pad, 400×350×60 (Duro 60) | ea | 18,100.00 | 21 | 64 | 15 |
| 407(1)b | Elastomeric Bearing Pad, 500×350×60 (Duro 60) | ea | 21,100.00 | 21 | 64 | 15 |
| 407(2) | Expansion Joint, 50mm Gap | m | 46,300.00 | 21 | 64 | 15 |
| 407(4) | Metal Drain (f 150mm G.I. Drain Pipe) | m | 985.00 | 21 | 64 | 15 |
| | **PART G - DRAINAGE AND SLOPE PROTECTION STRUCTURES** | | | | | |
| 500(1)a | Reinforced Concrete Pipe Culvert, 610mmf (Extra. Str.) | m | 4,434.00 | 57 | 28 | 16 |
| 500(1)b | Reinforced Concrete Pipe Culvert, 910mmf (Extra. Str.) | m | 6,600.00 | 57 | 28 | 16 |
| 500(1)c | Reinforced Concrete Pipe Culvert, 1070mmf (Extra. Str.) | m | 10,000.00 | 57 | 28 | 15 |
| 500(1)d | Reinforced Concrete Pipe Culvert, 1220mmf (Extra. Str.) | m | 10,600.00 | 57 | 28 | 15 |
| 500(1)e | Reinforced Concrete Pipe Culvert, 1520mmf (Extra. Str.) | m | 18,700.00 | 57 | 28 | 15 |
| 500(3)a1 | Reinforced Concrete Box Culvert 1-1.5m x 1.5m | m | 16,200.00 | 42 | 43 | 15 |
| 500(3)a2 | Reinforced Concrete Box Culvert 2-1.5m x 1.5m | m | 25,600.00 | 42 | 43 | 15 |
| 500(3)a3 | Reinforced Concrete Box Culvert 3-1.5m x 1.5m | m | 35,800.00 | 42 | 43 | 15 |
| 500(3)b1 | Reinforced Concrete Box Culvert 1-2.4m x 2.4m | m | 27,300.00 | 42 | 43 | 15 |
| 500(3)b2 | Reinforced Concrete Box Culvert 2-2.4m x 2.4m | m | 46,100.00 | 42 | 43 | 15 |
| 500(3)b3 | Reinforced Concrete Box Culvert 3-2.4m x 2.4m | m | 65,400.00 | 42 | 43 | 15 |
| 500(3)c1 | Reinforced Concrete Box Culvert 1-3.0m x 3.0m | m | 37,300.00 | 42 | 43 | 15 |
| 500(3)c2 | Reinforced Concrete Box Culvert 2-3.0m x 3.0m | m | 65,300.00 | 42 | 43 | 15 |
| 500(3)c3 | Reinforced Concrete Box Culvert 3-3.0m x 3.0m | m | 92,000.00 | 42 | 43 | 15 |
| 500(3)d1 | Reinforced Concrete Box Culvert 2-4.0m x 2.5m | m | 79,300.00 | 42 | 43 | 15 |
| 502(2)b1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-910mmf RCPC | ea. | 18,800.00 | 28 | 57 | 15 |
| 502(2)b2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-910mmf RCPC | ea. | 25,200.00 | 28 | 57 | 15 |

# TABLE 12.8-4 UNIT COST OF MAJOR CONSTRUCTION ITEM (2/2)

| Item No. | Description | Unit | Unit Cost (Peso) | Component(%) | | |
|---|---|---|---|---|---|---|
| | | | | Foreign | Local | Tax |
| 502(2)c1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-1070mmf RCPC | ea. | 21,500.00 | 30 | 55 | 15 |
| 502(2)c2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-1070mmf RCPC | ea. | 31,300.00 | 30 | 55 | 15 |
| 502(2)d1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-1220mmf RCPC | ea. | 26,700.00 | 31 | 54 | 15 |
| 502(2)d2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-1220mmf RCPC | ea. | 37,500.00 | 31 | 54 | 15 |
| 502(2)f1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 1-1520mmf RCPC | ea. | 36,200.00 | 33 | 52 | 15 |
| 502(2)f2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, 2-1520mmf RCPC | ea. | 51,700.00 | 33 | 52 | 15 |
| 502(10)a1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 1-1.5m x | ea. | 49,900.00 | 44 | 41 | 15 |
| 502(10)a2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-1.5m x | ea. | 59,800.00 | 45 | 40 | 15 |
| 502(10)a3 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 3-1.5m x | ea. | 70,700.00 | 45 | 40 | 15 |
| 502(10)b1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 1-2.4m x | ea. | 102,000.00 | 44 | 41 | 15 |
| 502(10)b2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-2.4m x | ea. | 122,000.00 | 45 | 40 | 15 |
| 502(10)b3 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 3-2.4m x | ea. | 141,000.00 | 45 | 40 | 15 |
| 502(10)c1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 1-3.0m x | ea. | 148,000.00 | 44 | 41 | 15 |
| 502(10)c2 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-3.0m x | ea. | 178,000.00 | 45 | 40 | 15 |
| 502(10)c3 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 3-3.0m x | ea. | 201,000.00 | 45 | 40 | 15 |
| 502(10)d1 | Reinforced Concrete Headwall,Wingwall,Bottom Slab, Box Culvert 2-4.0m x | ea. | 197,000.00 | 45 | 40 | 15 |
| 502(3)a1 | Catch Basin for RCPC 1-f 610 | ea. | 16,700.00 | 38 | 47 | 15 |
| 502(3)b1 | Catch Basin for RCPC 1-f 910 | ea. | 24,300.00 | 38 | 47 | 15 |
| 502(3)b2 | Catch Basin for RCPC 2-f 910 | | 37,900.00 | 39 | 46 | 15 |
| 502(3)c1 | Catch Basin for RCPC 1-f 1070 | ea. | 28,400.00 | 38 | 47 | 15 |
| 502(3)c2 | Catch Basin for RCPC 2-f 1070 | | 45,500.00 | 39 | 46 | 15 |
| 502(3)d1 | Catch Basin for RCPC 1-f 1220 | ea. | 37,100.00 | 38 | 47 | 15 |
| 502(3)d2 | Catch Basin for RCPC 2-f 1220 | | 60,900.00 | 39 | 46 | 15 |
| 502(3)e1 | Catch Basin for RCPC 1-f 1520 | ea. | 47,500.00 | 38 | 47 | 15 |
| 502(3)e2 | Catch Basin for RCPC 2-f 1520 | | 80,300.00 | 39 | 46 | 15 |
| 504(5) | Grouted Riprap, Class "A" | m3 | 2,120.00 | 48 | 36 | 15 |
| 505(1) | Stone Masonry | m3 | 2,200.00 | 55 | 30 | 15 |
| 505(2) | Gravity Type Retaining Wall(H=1.0~1.5m) | m3 | 5,220.00 | 44 | 41 | 15 |
| 507 | Steel Sheet Pile (85x400x8mm), Furnished and Driven | m | 1,430.00 | 55 | 30 | 15 |
| 509 | Gabions | m3 | 3,620.00 | 51 | 34 | 15 |
| 510 | Rubble Concrete Slope Protection, t = 350mm | m3 | 1,940.00 | 51 | 34 | 15 |
| 511(a) | Concrete Side Dicth (0.5 x 0.5) | m | 2,230.00 | 38 | 47 | 15 |
| | | | | | | |
| | **PART H - MISCELLANEOUS STRUCTURES** | | | | | |
| | | | | | | |
| 600(1)a | Concrete Curb, Type A (200x450mm) | m | 629.00 | 58 | 27 | 15 |
| 600(1)c | Concrete Curb for Edge of Sidewalk(200*500) | m | 741.00 | 58 | 27 | 15 |
| 600(3)a | Combination Concrete Curb & Gutter/Side Strip, Type A (675x364mm) | m | 1,050.00 | 58 | 27 | 15 |
| 602(2) | Maintenance marker post | ea. | 1,140.00 | 24 | 64 | 12 |
| 602(3) | Kilometer post | ea. | 1,520.00 | 24 | 64 | 12 |
| 602(4) | Guide post | ea. | 1,250.00 | 24 | 64 | 12 |
| 603(3)a | Metal Guardrail | m | 2,360.00 | 58 | 27 | 15 |
| 610 | Sodding | m2 | 200.00 | 58 | 27 | 15 |
| 611(1) | Trees (Furnishing and Transplanting) | ea. | 1,260.00 | 58 | 27 | 15 |
| SPL620(1) | Traffic Signal (3-way intersection) | ea. | 2,082,000.00 | 65 | 20 | 15 |
| SPL620(2) | Traffic Signal (4-way intersection) | ea. | 2,268,500.00 | 65 | 20 | 15 |
| | Other Miscellaneous Fascilities (Road Signs, Pavement Stud, etc.) | km | 1,500,000.00 | 70 | 20 | 10 |
| | | | | | | |
| | **PART A,B - ENGINEER'S FACILITY AND MOBILIZATION / DEMOBILIZATION** | | | | | |
| | (5% of PART C to H) | | | | | |
| | | | | | | |
| | **CONTINGENCY** | | | | | |
| | (10% of PART A to H) | | | | | |

### 12.8.2 ROW Acquisition and Compensation Cost (Bacolod NB-02)

#### 1) Unit Price

Unit prices for road right-of-way acquisition and compensation are obtained from respective municipality/city Assessor's Offices and regional office of BIR. The Republic Act 8974 provides that compensation cost for land shall be BIR zonal value that is normally far lower than prevailing market prices. Since the agricultural land around the study area has strong potential demand for residential use, price of the land currently transacted around area is fairly higher than zonal value. For the purpose of obtaining practical cost estimate for the project, prevailing market prices are adopted in this study.

Prices of structures are determined based on schedule of prices available in the Assessor's Office. The unit prices of structures are determined without any depreciation to obtain replacement cost of structures.

Unit prices are summarized in **Table 12.8-6.**

**TABLE 12.8-6 UNIT PRICES OF LAND ACQUISITION AND COMPENSATION**

| Item | Zonal Value Assessed Value ($P/m^2$) | Prevailing Market Price ($P/m^2$) |
|---|---|---|
| **Land Acquisition** | **Zonal Value** | |
| Residential | 1,200 - 2,000 | 2,000 - 3,500 |
| Sugar Land | 23 - 30 | 250 |
| Fruit Orchard | 18.5 – 29.0 | 100 |
| **Structures (floor area in $m^2$)** | **Assessed Value** | |
| Concrete House | 6,000 – 6,300 | |
| Semi Concrete House | 4,800 – 5,000 | |
| Light Material House | 3,000 – 3,500 | |

#### 2) Compensation Cost

Land area to be acquired is computed by present land use based on aerial-photo map and verified by field survey. Number of structures is tentatively obtained from aerial-photo map and will be verified by field investigation during social impact survey.

Summary of compensation is presented in **Table 12.8-7.** Detailed cost estimate is presented in Appendix 12.8-2.

**TABLE 12.8-7 COST ESTIMATE OF LAND ACQUISITION AND COMPENSATION COST**

| Item | Quantity | Amount (Million Pesos) |
|---|---|---|
| **Land Acquisition** | **303,480 $m^2$** | **198.1** |
| Residential | 45,000 | 133.5 |
| Sugar Land | 250,380 | 62.6 |
| Fruit Tree | 2,400 | 0.6 |
| Chicken Hutch | 5,700 | 1.4 |
| **Structures** | **8 structures** | **0.3** |
| **Other Compensation** | | **2.3** |
| **Total** | | **200.7** |

### 12.8.3 Detailed Engineering and Construction Supervision Cost

Engineering services cost for a detailed design ranges form 3 to 5% of construction cost, and a construction supervision from 5 to 9%. An average of 4% of construction cost was adopted for the detailed design and 8 % for the construction supervision for this project.

**TABLE 12.8-8 ENGINEERING SERVICE COST**

Unit: Million Pesos

| | Component | | | TOTAL |
|---|---|---|---|---|
| | Foreign | Local | Tax | |
| Detailed Design | 18.9 (55%) | 12.0 (35%) | 3.4 (10%) | 34.3 (100%) |
| Construction Supervision | 16.6 (55%) | 10.6 (35%) | 3.0 (10%) | 30.2 (100%) |
| **Total** | **35.5 (55%)** | **22.6 (35%)** | **6.4 (10%)** | **64.5 (100%)** |

### 12.8.4 Summary of Project Cost

Project cost is summarized in Table 12.8-9.

**TABLE 12.8-9 SUMMARY OF PROJECT COST**

Unit: Million Pesos

| | Component | | | TOTAL |
|---|---|---|---|---|
| | Foreign | Local | Tax | |
| Detailed Design | 18.9 | 12.0 | 3.4 | 34.3 |
| ROW/Resettlement | - | 180.6 | 20.1 | 200.7 |
| Construction | 194.4 | 127.9 | 55.7 | 378.0 |
| Construction Supervision | 16.6 | 10.6 | 3.0 | 30.2 |
| **Total** | **229.9** | **331.1** | **82.2** | **643.2** |

### 12.8.5 Maintenance Cost for New Airport Access

(1) Road and Bridge Conditions

Road and bridge conditions and EMK factors are determined as follows.

| Item | Conditions | EMK Factor |
|---|---|---|
| Road Length (km) | 9.8 | - |
| Traveled Way Width (m) | 2-lane < 7.5m | 1.0 |
| Bridge Length (total) (l.m) | 284 | 0.01 |
| AADT (2010) | 14,000 | 1.14 |
| Opening Year | 2012 | |

*Note: AADT is estimated by PCU divided by 1.3. EMK factor is limited at 1.38 for 2-lane and 1.48 for 4-lane road. Total EMK=Road Length (km) x (Width F. x Surface Type F.) + Bridge Length x (Bridge F.)*

(2) Base Cost

| Item | Unit | Financial Cost (Peso) | Economic Cost (Peso) |
|---|---|---|---|
| Routine maintenance (PCC Paved: good condition) | km/year | 84,482 | 63,868 |

(3) Maintenance Cost

Maintenance cost is estimated based on EMK and base costs of routine and periodic maintenance, and shown in Table 12.8-10.

**TABLE 12.8-10 MAINTENANCE COST OF NEW AIRPORT ACCESS**

| | Calendar Year | AADT | Lane | Factor Bridge | EMK | Financial Cost (x1000Peso) Routine | Periodic | Total | Economic Cost (x1000Peso) Routine | Periodic | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2012 | 1.15 | 1.00 | 2.84 | 14.18 | 1,198 | 0 | 1,198 | 906 | 0 | 906 |
| 2 | 2013 | 1.16 | 1.00 | 2.84 | 14.27 | 1,205 | 0 | 1,205 | 911 | 0 | 911 |
| 3 | 2014 | 1.17 | 1.00 | 2.84 | 14.35 | 1,212 | 0 | 1,212 | 916 | 0 | 916 |
| 4 | 2015 | 1.18 | 1.00 | 2.84 | 14.43 | 1,219 | 0 | 1,219 | 922 | 0 | 922 |
| 5 | 2016 | 1.19 | 1.00 | 2.84 | 14.52 | 1,226 | 0 | 1,226 | 927 | 0 | 927 |
| 6 | 2017 | 1.20 | 1.00 | 2.84 | 14.60 | 1,233 | 0 | 1,233 | 932 | 0 | 932 |
| 7 | 2018 | 1.20 | 1.00 | 2.84 | 14.69 | 1,241 | 0 | 1,241 | 938 | 0 | 938 |
| 8 | 2019 | 1.21 | 1.00 | 2.84 | 14.77 | 1,248 | 0 | 1,248 | 943 | 0 | 943 |
| 9 | 2020 | 1.22 | 1.00 | 2.84 | 14.86 | 1,255 | 0 | 1,255 | 949 | 0 | 949 |
| 10 | 2021 | 1.23 | 1.00 | 2.84 | 14.94 | 1,262 | 0 | 1,262 | 954 | 0 | 954 |
| 11 | 2022 | 1.24 | 1.00 | 2.84 | 15.03 | 1,269 | 0 | 1,269 | 960 | 0 | 960 |
| 12 | 2023 | 1.25 | 1.00 | 2.84 | 15.11 | 1,277 | 0 | 1,277 | 965 | 0 | 965 |
| 13 | 2024 | 1.26 | 1.00 | 2.84 | 15.20 | 1,284 | 0 | 1,284 | 971 | 0 | 971 |
| 14 | 2025 | 1.27 | 1.00 | 2.84 | 15.28 | 1,291 | 0 | 1,291 | 976 | 0 | 976 |
| 15 | 2026 | 1.27 | 1.00 | 2.84 | 15.37 | 1,298 | 0 | 1,298 | 981 | 0 | 981 |
| 16 | 2027 | 1.28 | 1.00 | 2.84 | 15.45 | 1,305 | 0 | 1,305 | 987 | 0 | 987 |
| 17 | 2028 | 1.29 | 1.00 | 2.84 | 15.54 | 1,312 | 0 | 1,312 | 992 | 0 | 992 |
| 18 | 2029 | 1.30 | 1.00 | 2.84 | 15.62 | 1,320 | 0 | 1,320 | 998 | 0 | 998 |
| 19 | 2030 | 1.31 | 1.00 | 2.84 | 15.71 | 1,327 | 0 | 1,327 | 1,003 | 0 | 1,003 |
| 20 | 2031 | 1.32 | 1.00 | 2.84 | 15.79 | 1,334 | 0 | 1,334 | 1,009 | 0 | 1,009 |

## 12.9 ENVIRONMENTAL IMPACT ASSESSMENT

### 12.9.1 General Characteristics of the Project Road

The project road is proposed to be constructed to provide direct access to proposed new Bacolod Airport from Bacolod City Proper. Total road length is estimated at 10.1km. Land use along the proposed alignment is mostly sugar cane plantation with spotted residential areas mainly for sugar cane plantation workers. Bunch of fruit trees, mostly not productive, are found along residential areas and riverbanks. The proposed project is a construction of new two-lane highway named "New Airport Access Road" to be widened to four-lane in the future when traffic flow will be saturated. Required right-of-way (ROW) is estimated at 30m including ROW for future widening. Six (6) bridges with total length of 344m are proposed to be constructed over major creeks and rivers.

The Initial Environmental Examination conducted in July 2003 reported that there are no significant environmentally critical spots, such as historical structures, religious institutions and other environmentally critical areas, along the proposed road alignment. However, required ROW along entire stretch of the road shall be acquired from owners of sugar cane plantation.

### 12.9.2 Social Acceptability

The criterion provided by the DENR DAO 96-37[1] for evaluating the social acceptability of a project has been considered during the course of the study to a certain extent. **Table 12.9-1** shows the action taken to ascertain social acceptability at the feasibility study level.

**TABLE 12.9-1 ACTION TAKEN BY THE STUDY TEAM TO ASCERTAIN SOCIAL ACCEPTABILITY**

| Criteria | Action Taken |
|---|---|
| 1) Consistency with land use plan | . Provincial and municipal land use plans and infrastructure development plan are obtained and examined. The proposed widening project is confirmed with the local infrastructure development plan. |
| 2) Public Participation | . Officials from regional offices of national government (NEDA, DENR, DOTC), local government units and private sector were consulted during selection the project road and its improvement level.<br>• Public consultation meeting involving the communities along the project road were held by barangay level. |
| 3) Promotion of Social Equity | . Preferential hiring of local labor and provision of alternative means of livelihood are included in this report as mitigating and enhancement measures to address adverse socio-economic impacts. |
| 4) Mitigating and Enhancement Measures | • Included in **Table 12.9-8** |
| 5) Involve Women and Vulnerable Groups | • Active participation of women and vulnerable groups, such as informal settlers and tenants/renters are considered as mitigating and enhancement measures to address adverse socio-economic impacts. |
| 6) Environmental Monitoring and Evaluation | • Included in **Table 12.9-9** |

[1] Department of Environment and Natural Resources, Administrative Order No. 37, Series 1996. This Administrative Order provides detailed procedures of the EIA System.

### 12.9.3 Data Gathering for Baseline Information

The parameters of baseline data needed to establish historical trends and present condition of the physical, biological, and socio-economic environment of the project area were presented to DENR Regional Office. It was agreed that the preparation of EIS was not needed since length project roads are less than 20km. However, IEE report that contains the following parameters were agreed to be surveyed.

1. Physical Environment
   a. Climate
   b. Terrain
   c. Air Quality
   d. Hydrology
   e. Water Quality
   f. Noise Level
   g. Land Use
2. Biological Environment
   a. Flora and Fauna
3. Socio-Economic Environment
   a. Demography
   b. Health
   c. Other Social Services/Utilities
4. Social Acceptability

Based on the agreed parameters, the collection of baseline information has been carried out in March 2004. The result of baseline survey is discussed in the next section.

### 12.9.4 Description of Existing Environmental Condition

#### 1) Physical Environment

**Climate**

The nearest synoptic meteorological station in the project area is located in Dumaguete City, Negros Oriental. Based on the Modified Corona's Classification, the climate in the project area belongs to Type I which is characterized by two (2) pronounced seasons, the wet and dry. The project area experiences a relatively dry period from January to May. Wet months on the other hand are from June to December.

The climate characteristics of the project area are summarized in **Table 12.9-2**.

**TABLE 12.9.-2 SUMMARY OF CLIMATE CHARACTERISTICS**

| Data Type | Monthly Normals | | | Remarks |
|---|---|---|---|---|
| | Max | Min | Mean | |
| Rainfall | 168.5 mm (Oct.) | 41.6 mm (Mar.) | - | Annual Rainfall 1,200.6 mm |
| Temperature | 32.0°C (May) | 24.3°C (Feb., Aug., Sept.) | 27.8°C | |
| Humidity | 82% (Jan.) | 73% (May) | 80% | |
| Wind | NE 3 m/s | NE 1 m/s | NE 2 m/s | |

The most significant natural calamity observed in Metro Bacolod is flooding during heavy rains mostly observed in low-lying and coastal areas. The area along proposed alignment has average elevation of 25m rarely experienced inundations.

## Terrain

Terrain of the project area is generally flat (0-2%) with average elevation of 25m. Elevation of the ground goes up gently toward the inland with average slop of 2-3%. Several rivers and creeks originate from Mt. Mandalagan cross the proposed alignment. Channel of these rivers are meandering but flow is observed to be stable and no inundation is experienced along project area.

## Air Quality

One site was selected as the sampling stations (Sampling Station 1) for the ambient air quality measurements specifically for total suspended particulates (TSP). The site is located in Barangay Matab-ang, Talisay City (Sampling Station 1). Results of the sampling activity indicate that the concentration recorded was only 120.0 micrograms per normal cubic meter. This concentration is way below the standard established by the Department of Environment and Natural Resources at 230.0 micrograms per normal cubic meter.

**TABLE 12.9-3 RESULTS OF AMBIENT AIR QUALITY MEASUREMENTS**

| Sampling Station | Sampling Time | Parameter | Concentration (μ/Ncm) | Standard (μ/Ncm) |
|---|---|---|---|---|
| **1** | **24** | **TSP** | **120** | **230** |
| 2 | 24 | TSP | 59 | 230 |
| 3 | 24 | TSP | 110 | 230 |

## Water Quality

One station (Station 3) established for the measurement of water quality in the selected waterway that will be traversed by the alignment. The parameters include the following parameters as shown in **Table 12.9-4**.

**TABLE 12.9-4 RESULTS OF PHYSICAL AND CHEMICAL ANALYSIS OF WATER**

| Parameters | Sampling Station Number | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| **Color, units** | 20.0 | 5.0 | **20.0** |
| **Temperature, $^0$C** | 28.5 | 28.5 | **27.0** |
| PH | 8.5 | 8.5 | **8.6** |
| Dissolved Oxygen (DO), mg/L | 8.0 | 8.0 | **7.3** |
| BOD (5 day), 20 $^0$C mg/L | 2.0 | 2.0 | **2.0** |
| Total Suspended Solids, mg/L | 100.0 | 80.0 | **40.0** |
| Total Dissolved Solids, mg/L | - | - | - |
| Oil and Grease, mg/L | - | - | - |
| Settleable Solids, mg/L | < 1 | < 1 | **< 1** |
| Total Coliforms, MPN/100 ml | - | - | - |
| Fecal Coliforms, MPN/100 ml | - | - | - |

Notes: **Station 1** – Km 13+00 Imbang River at Barangay Dos Hermanas, Talisay City
**Station 2** – Km 23+250 Malogo River at Barangay E. Lopez, Silay City
**Station 3 – Km 3+900 Barangay Matab-ang, Talisay City**

## Noise Level

One sampling site was also established in Barangay Matab-ang, Talisay City (Sampling Station 3) for noise level measurements using a Noise Level Meter. Readings were taken for the evening, nighttime, morning, and daytime periods. The average readings taken at the time of sampling is as shown in **Table 12.9-5**. By comparing with the standards established for the purpose, all readings for the station with the exception of one during the daytime fell below standards.

**TABLE 12.9-5 NOISE LEVEL MEASUREMENTS**

| Trial Readings | Morning | | | | Daytime | | | | Evening | | | | Nighttime | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 AM - 9 AM | | | | 9 AM - 6 PM | | | | 6 PM - 10 PM | | | | 10 PM - 5 AM | | | |
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | 43.9 | 69.8 | **46.4** | 83.6 | 57.0 | 88.8 | **70.7** | 60.1 | 44.3 | 47.0 | **55.2** | 57.8 | 59.6 | 84.4 | **45.1** | 57.6 |
| 2 | 46.2 | 78.3 | **45.6** | 86.0 | 44.2 | 83.0 | **62.3** | 53.1 | 55.4 | 48.3 | **48.0** | 80.4 | 48.2 | 50.4 | **50.9** | 63.1 |
| 3 | 42.2 | 82.6 | **48.5** | 62.5 | 63.4 | 81.3 | **56.7** | 62.5 | 43.9 | 48.9 | **50.2** | 71.1 | 48.1 | 49.7 | **45.5** | 48.8 |
| 4 | 57.3 | 82.9 | **44.7** | 85.9 | 49.9 | 56.1 | **81.4** | 56.9 | 43.5 | 58.6 | **44.3** | 59.1 | 60.9 | 44.1 | **50.1** | 83.9 |
| 5 | 62.5 | 65.4 | **54.4** | 83.5 | 60.5 | 86.5 | **76.1** | 57.8 | 59.7 | 66.2 | **41.9** | 67.4 | 46.4 | 84.8 | **52.0** | 51.8 |
| 6 | 47.6 | 79.1 | **55.2** | 64.0 | 50.6 | 77.6 | **59.2** | 54.2 | 64.4 | 60.2 | **50.2** | 82.4 | 51.7 | 57.4 | **52.0** | 51.5 |
| 7 | 60.0 | 83.1 | **46.7** | 71.3 | 50.6 | 77.6 | **83.4** | 59.2 | 62.1 | 52.8 | **42.8** | 50.2 | 46.9 | 50.2 | **45.8** | 69.3 |
| | | | | | | | | | | | | | | | | |
| Minimum | 42.2 | 82.9 | **44.7** | 64.0 | 44.2 | 56.1 | **56.7** | 53.1 | 43.5 | 47.0 | **41.9** | 57.8 | 46.4 | 44.1 | **45.1** | 45.1 |
| Maximum | 62.5 | 65.4 | **55.2** | 86.0 | 63.4 | 88.8 | **83.4** | 60.1 | 64.4 | 66.2 | **55.2** | 82.4 | 60.9 | 84.8 | **50.9** | 50.9 |
| Average | 51.4 | 77.3 | **48.8** | 76.7 | 53.7 | 78.7 | **70.0** | 57.7 | 53.3 | 54.6 | **47.5** | 66.9 | 51.7 | 60.1 | **48.8** | 60.9 |
| Standard | 50.0 | 50.0 | **50.0** | 50.0 | 55.0 | 55.0 | **55.0** | 55.0 | 50.0 | 50.0 | **50.0** | 50.0 | 45.0 | 45.0 | **45.0** | 45.0 |
| Variance | 2.8 | 54.6 | **-2.4** | 53.4 | -2.3 | 43.1 | **27.2** | 4.9 | 6.7 | 9.1 | **-5.0** | 33.8 | 14.9 | 33.7 | **8.4** | 35.2 |

Note: **Station 1** – Barangay Dos Hemanas, Talisay City
**Station 2** – Barangay XXI, Victorias City
**Station 3 – Barangay Matab-ang, Talisay City**
**Station 4** – Barangay Mansilingan, Bacolod City

## Land Use

Land use along project road is mostly agricultural composed of sugar cane plantation and limited area of fruit tree groves. Some residential areas are spotted along exiting feeder roads and riverbanks, mainly employees and laborers of sugar cane plantation. There are no other establishments is observed. At the end of project road, a new Bacolod Airport that meets standards set by International Aviation Organization (ICAO).

## 2) Biological Environment

### Vegetation and Wildlife

Two (2) sampling sites were established for the road alignment. These are located in Hacienda Binunolan, Barangay Matab-ang, Talisay City – Site 1; and Access Road Entrance, Bacolod City – Site 2. Each site involved two transects. Site 1 has the following coordinates: 499586 E and 1186138 N/499589 E and 1186140 N; and 505118 E and 499580 E and 1186131 N.

Site 1 exhibits partially closed vegetation along the creek with considerable number of tall trees (e.g. "binunga", *Macaranga tanarius* and bamboo, *Bambusa blumeana*), and shrubs such as "madre de cacao", *Gliricida sepium* creating a semi-dark understorey condition, however, some parts contain low patches under full sun. Species include a combination of cultivated and wild species (fruit trees, timber trees, vegetables, and others). The sugar cane field (*Saccharum officinale*) has stretched to the edge of the creek with barely a few meters left for vegetation. The area near the river is cool even during summer as ecologically indicated by species of ferns, lichens, fungi, and mosses. Butterflies, dragonflies, fruitflies, bees, moths, beetles, ants, and spiders were abundant in the area.

Birds such as the sparrows and egrets were common. Snails, lizards, toads, and tree frogs were also present.

Site 2 also exhibit open vegetation but with few patches of tall bamboos (*Bambusa blumeana*) and many newly grown fruit trees of different species such as avocado, mango, chico, and guava. Dominated by wild species of vines, herbs and shrubs such as *Chrysanthemum sp.*, *Mimosa pudica, Stachytharpeta jamaicensis*, *Chromolaena odorata*, and *Solanum sp.* The open vegetation mostly grassland with patches of shrubs and under-shrubs are dominated by "hagonoy" (*Chromolaena odorata).* Remains of crop plants include those of corn and cassava shoots regularly spaced among the grassy underbrush. A number of tree species were also present. These were mostly coconut trees, ipil-ipil, bananas, and *Artocarpus.* Butterflies, dragonflies, beetles, bees, grasshoppers, mosquitoes, moths, ants, spiders were abundant. Birds and few domesticated animals were observed. Snails, frogs, toads, lizards, and snakes were also present.

Major animal groups identified in the area include invertebrates as well as vertebrate taxa. A total of 85 species were recorded; only 14 of which are vertebrates. Animals belonging to Phylum Arthropoda and Phylum Nematoda were the most common inhabitants in the four sampling sites studied. Insects of common species (Class Insecta) were most numerous and widely spread over the eight stations. A total of 63 species of insects were identified and recorded to occur in the four sampling sites. In the order of abundance, dragonflies and fruitflies were the most abundant, followed by black and red ants, bowflies, plant hoppers, bees and wasps, beetles, bugs, grasshoppers, crickets, katydids, butterflies and moths, praying mantis, mosquitoes, dragonflies, damselflies and termites, respectively. Five species of spiders (Class Arachnida) and one species representative of Phylum Mollusca and Phylum Annelida were recorded and identified. Eight species of birds were identified from the four sampling sites. Cows, goats, dogs, cats (Class Mammalia), toads and tree frogs (Class Amphibia), and green and monitor lizard (Class Reptilia) were also noted.

**Aquatic Fresh/Marine Environment**

There are no local account of freshwater fish present in the rivers sampled during the water quality measurements, but it has to be established preferably before the start of construction. It is likely that there could be endemic species in these rivers but that had not been noticed during the field survey.

## 3) Socio-Economic Environment

### Demography

Settlement and Population Distribution

The Provincial Physical Framework Plan (PPFP) for Negros Occidental had categorized Bacolod City as a Metropolitan B in the levels of urban hierarchy. It is a highly urbanized city performing multiple roles of commercial, residential, and institutional functions in the province. It is the center of commerce, trade, entertainment, culture, education, and the seat of government offices and tertiary institutions, services, and facilities in the province. Silay City on the other hand is considered a Primary Urban Center A (Level 3) performing a central place function especially in surrounding areas of their influence, though in a smaller scale when compared to Bacolod City. Talisay City and Victorias City are considered as Primary Urban Center B (Level 4) providing for the convergence of trading activities for some medium towns and small towns. These local government units have been observed to have attracted investments in business and modern commercial establishments. The Municipality of E.B. Magalona falls under the Secondary Urban Center B where commerce is mostly through small stores, public markets, and satellite markets. It is generally characterized as an agriculture-based economy but which can be also found basic services and facilities such as intermediate and secondary education, primary health care services, district hospital/infirmary, and water supply system.

Population and Population Growth Rate

Bacolod City had a total population of 429,076 distributed over its 64 barangays in year 2000. Talisay City on the other hand had a total population for the same censal year of 78,909 while Silay had 107,722. The Municipality of E.B. Magalona had 54,490 and Victorias City with 81,743. The combined population of these local government units reached 752,177 persons. The population growth rates of these local government units vary from a low percentage of 1.48% (Talisay City) to a high percentage of 3.72% (Silay City). The growth rates exhibited by the local government units that will be traversed by the road alignment are higher than that of the region, and the province.

**TABLE 12.9-6 POPULATION AND POPULATION GROWTH RATE**

| Region/ Province/ Iloilo City/LGU | Total Population | | HH Population | No. of HH | Average HH Size | Annual Growth Rate* | Population Density (persons/ha) |
|---|---|---|---|---|---|---|---|
| | 2000 | 1995 | 2000 | 2000 | 2000 | 1995-2000 | 2000 |
| Region VI | 6,208,733 | 5,776,938 | | 1,211,647 | 5.1 | 1.30 | 3.07 |
| Negros Occ. | 2,136,647 | 2,031,841 | 2,134,479 | 416,222 | 5.1 | 1.34 | 2.70 |
| Bacolod City | 429,076 | 402,345 | 427,279 | 87,441 | 4.9 | 1.89 | 26.50 |
| Talisay City | 79,146 | 68,401 | 79,046 | 15,774 | 5.0 | 1.48 | 3.90 |
| Silay City | 107,722 | 122,748 | 107,641 | 21,446 | 5.0 | 3.72 | 4.90 |
| E.B. Magalona | 54,490 | 54,421 | 54,409 | 10,498 | 5.2 | 2.04 | 4.80 |
| Victorias City | 81,743 | 78,283 | 81,599 | 15,361 | 5.3 | 2.15 | 6.10 |

*Sources: Socio-Economic Profiles, Census in Housing and Population 1995 and 2000*

Number of Households and Household Size

The comparative number of households and household sizes are shown in **Table 12.9-6** above. Of the local government units traversed by the project, Bacolodd City has the most number of households followed by Silay City and Talisay City.

Population Densities

The comparative population densities are also shown in **Table 12.9-6**. Of the local government units traversed by the project, Bacolod City is the most dense (26.5 persons/hectare), while Talisay is the least dense (3.9 persons per hectare). These local government units are more dense than the province.

Literacy and Highest Educational Attainment

The simple literacy rate in the region for the household population 10-64 years old was 93.62% for both sexes in 1994. It is higher for the female (95.19%) than the male (92.12%). The simple literacy rate increases with increasing educational attainment, where the literacy of female consistently outpace that of the male.

Main Sources of Income

The economy of Metro Bacolod depends heavily on the performance of the sugar industry. It is the main source supporting economically the sugarcane farmers, employees, directly-related industries and various commercial/service industries within the Metro area. But the secondary and tertiary sectors are also contributing substantially to the economy of the Metro area. There are a total of 582 manufacturing establishments in the area where the most number are concentrated in Bacolod City. Outside Bacolod City, most of the establishments are small-scale cottage industries such as bakeries, hollow blocks making, printing press, tailoring, dried fish making, etc.

Employment Status

Employment is concentrated in Bacolod City, especially Zone 2001 (Poblacion) with an employment density of 76.1 persons/hectare. Also in other zones such as 2003, 2005, 2002, 2004, 2008, and 2006, there are considerable volumes of the tertiary and secondary sectors employment. Bacolod City is highly urbanized but about 10,000 persons are engaged in the primary sector.

Other cities/municipalities of Metro Bacolod are basically of agriculture-based economy. Except the built-up area called Poblacion and its vicinity, most zones are rural and employment in the primary sector is dominant. In these zones, however, some secondary and tertiary sector employment is existent providing the residents with daily services at the barangay level such as bakeries, sari-sari stores, and educational and social institutions.

## Health

The required information presented below were culled from the reports of the local government units (LGUs) to the extent these are immediately available or accessible; the Philippine Health Statistics and Field Health Service Information System published annually by the Health Intelligence Service of the Department of Health. The latest data used in this report is circa 1997.

Morbidity and Mortality

The ten leading causes of mortality in 2001 for Bacolod City were the following: hypertensive vascular diseases, pneumonia, tuberculosis, cancer, coronary artery disease, accident (all types), kidney disease, diabetes mellitus, status asthmaticus, and anemia. The ten leading causes of morbidity in the same year were bronchitis/broncholitis, diarrhea, hypertension; pneumonia, dengue fever, TB, respiratory, diseases of the heart, malignant neoplasm, typhoid/paratyphoid fever, and influenza (Bacolod City Health Office, 2001).

Local Health Resources

Bacolod City has one (1) government-owned regional hospital, four (4) private hospitals, three (3) lying-in clinics which serve as mini-hospitals for outlying barangays, 29 Barangay Health Stations, City Health Main Center, one (1) Family Planning Clinic, and several private clinics and laboratories that offer their services to the residents of Bacolod and the residents of Negros Occidental. Government health facilities in Bacolod City include the following:

- Doña Corazon L. Montelibano Memorial Regional Hospital (CLMMRH)
- Lying-In Hospitals located at Barangays Granada and Handumanan
- Health Centers (including Health Plus Centers)
- City Health Main Center (Dispensary, Family Planning Clinic, NTP, and Laboratory)

There are 10 non-government organizations (NGO) and privately-run hospitals, clinics and laboratories based in Bacolod City.

Environmental Health and Sanitation Profile

In 1997, Region VI had a reported total of 1,102,182 households. Of this number, more than 20% have no access to safe water at all. Most of the households (44%) however, had access to Level I water supply and a little more than a fifth (24.3%) had access to Level III services. The percentage of households in Region VI with sanitary toilet was reported at 74.3%. The percentage of households with satisfactory garbage disposal in the region is 56.6%. Only a little more than half (53%) of the total number of households in the region had complete sanitation facilities.

**Other Social Services/Utilities**

Water Supply and Demand

Water supply services of Bacolod City is provided by the BACIWA or the Bacolod City Water District. BACIWA acquired from the Yulo Waterworks System the Boro-Boro and Bocal-Bocal Springs, seven deepwells in the city proper and one deepwell in Sum-ag with a capacity of 3,788 $m^3$ and about 66km pipelines with appurtenances.

At present, the system has 18 operational wells, of which eight are within the Granada well field, three ground reservoirs with total capacity of 15,136 $m^3$ and 144 $m^3$ elevated tank, spring intake boxes and sedimentation basins and chlorination facilities.

Talisay City is a beneficiary of the recently implemented Water and Sanitation project of the Danish International Development Agency (DANIDA). This projected upgraded the service ca pability of the Talisay City Water District.

At present, the water district serves 3,932 households in 18 barangays. Of this number, 390 households have access to Level II water service (clustered) while 3,542 has individual connections. The average daily water consumption of the concessionaires is 420 $m^3$.

Water production in Silay City comes from four pumping stations. These are the Fortuna Pumping Station with a capacity of 60 $m^3$ per hour, the Burgos Pumping Station with capacity of 35 $m^3$ per hour, the Panadgad Pumping Station with a capacity of 80 $m^3$ per hour, and the Buenavista Pumping Station with 160 $m^3$ capacity per hour.

Existing Transportation Characteristics

Bacolod City is home to one of the two trunkline airports in the Province of Negros Occidental. This airport is connected by air services with Manila and Cebu by the Philippine Airlines, Cebu Pacific Air, and Air Philippines, Inc. These airlines service an average of 1,700 passengers per day and 24 tons of cargo per day. A new airport to be located in Silay City is due for implementation starting 2004 through 2007 with a scheduled opening year of 2008.

There are four main port terminals based in Bacolod City. These are the Bredco I and Bredco II, Banago, and Barcelona. The first two terminals are located at the reclamation area and handles the cargo and passenger traffic for various destinations such as Iloilo, Manila, Mindanao, including overseas operated by various shipping companies. The third terminal located at the north side of Bacolod City handles the cargo and passenger for Iloilo and Manila operated by the Negros Navigation. The fourth terminal handles mainly liquid and bulk cargo.

Metro Bacolod has three major inter-city roads: Bacolod Coastal Road – North Section, Bacolod Coastal Road – South Section, and Bacolod City–San Carlos City Road.

Power

In Bacolod City, electricity is provided by the Palinpinon Geothermal Plant through the National Power Corporation and the Central Negros Electric Cooperative, Incorporated or CENECO. It is the franchise holder for power distribution in Central Negros comprising the cities of Bacolod, Silay, Bago and the towns of Murcia and Talisay. The power services of CENECO reaches the 61 barangays of Bacolod City but several puroks of some of these barangays do not have power connection from CENECO. Residents of these unenergized puroks rely on kerosene/gas, oil/LPG, and others for lighting.

Communication

The communication needs of the areas are met by either the PLDT, cellular phones, and handheld transceivers.

### 12.9.5 Perception Survey

The Perception Survey was conducted in the eight (8) barangays traversed by the proposed road. The respondents were disaggregated into two major identification (unless specified otherwise in the rest of the tables): (1) respondents within the barangays traversed by the alignment that are directly affected, and (2) respondents within the barangays that are not directly affected by the alignment.

A total of 237 respondents were identified during the survey. Most of these respondents (97%) were randomly selected within the barangays while the rest (3%) were directly selected within the barangay since they are most likely along the project alignment.

**TABLE 12.9-7 DISTRIBUTION OF RESPONDENTS BY BARANGAY**

| City/Barangay | Directly Affected | | Indirectly affected | | Total | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| **Bacolod City** | | | | | | |
| Bata | 0 | 0 | 20 | 8.7 | 20 | 8.4 |
| Mandalagan | 0 | 0 | 20 | 8.7 | 20 | 8.4 |
| **Sub-total** | **0** | **0** | **40** | **17.4** | **40** | **16.8** |
| **Talisay City** | | | | | | |
| Zone 15 | 1 | 14.3 | 17 | 7.4 | 18 | 7.6 |
| Zone 12A | 0 | 0 | 29 | 12.6 | 29 | 12.2 |
| Zone 16 | 0 | 0 | 11 | 4.8 | 11 | 4.6 |
| Matab-ang | 0 | 0 | 67 | 29.1 | 67 | 28.3 |
| Efigenio Lizares | 1 | 14.3 | 30 | 13.0 | 31 | 13.1 |
| **Sub-total** | **2** | **28.6** | **154** | **66.9** | **156** | **65.8** |
| **Silay City** | | | | | | |
| Bagtic | 5 | 71.4 | 36 | 15.6 | 41 | 17.3 |
| **Sub-total** | **5** | **71.4** | **36** | **15.6** | **41** | **17.3** |
| **Total** | **7** | **100.0** | **230** | **100.0** | **237** | **100.0** |
| % Distribution | | 3.0 | | 97.0 | 100 | |

#### 1) Awareness about the Project

Majority of the respondents (92.4%) of the total number of respondents already heard of the plan for construction of the project. The percentage of directly affected respondents who have already heard of the project is relatively higher (71.4%) and the highest can be found in Barangay Bagtic.

More than two-fifths (41.3%) of the respondents heard of the project 1 or 2 years ago. Nearly the same percentage each (27%) heard of it recently, and more than two years ago.

#### 2) Agreement for the Project

Most (88.2%) of the respondents are in favor of the implementation of the project. The respondents believe that the project will give way to development of the area and the province as a whole (27.4%); project will invite small and big investors in the province; and offer safe and efficient transport of people, goods and services (16.0%). More than a fifth (23.2%) did not provide any response.

#### 3) Effect on Source of Income

About four-fifths (78.9%) of the respondents said that their livelihood will not be affected. More than a tenth (11.8%) said that there will be loss of livelihood, employment and property.

### 4) Good Things Seen about the Project

More than half (54.4%) of the respondents believed that with the project, majority will benefit from it including the opening of new businesses. About a fifth (19.8%) on the other hand said there will be easy and fast access to the region. More than a tenth (15.6%) added that the city or barangay will improve or develop.

### 5) Benefits Expected from the Project

More than half (53.2%) of the total number of respondents believe that there will be opening of new industries along the alignment and consequent offer of employment. About a third (32.9%) on the other hand said that travel time will become shorter (including faster and convenient transport of people and goods). The rest did not provide any response or comment or do not know at all what to expect from the project.

### 6) Bad Things about the Project

More than a fifth (22.8%) of the total number of respondents believe that no bad things can be attributed to the project. On the other hand, nearly a fifth (18.1%) said that there will be loss of livelihood/relocation of affected families while more than a tenth (14.8%) believe that there will be increased noise and air pollution level. The rest are spread to other responses such as fast moving vehicles to cause accidents (5.1%); strangers will be coming into the barangays (1.7%); disruption of regular activities of barangay residents (6.8%); and increased crime rate (3.4%).

### 7) Problems Foreseen for the Community as a Whole

More than a fifth (26.6%) of the total number of respondents believe that the project will not bring any problems to the community as a whole, but nearly a fifth (17.7%) said that there will be accidents/increase in crime rates, drug-related incidents, robbery/hold up cases. More than a tenth (13.1%) also said that there will be loss of properties, and livelihood problems (lack of jobs).

## 12.9.6 Identified Impacts and Mitigation Measures

The predicted environmental impacts, along with the mitigation (for negative impacts) and enhancement (for positive impacts) measures are presented in **Table 12.9-8**, Impacts and Mitigation/Enhancement Matrix.

## 12.9.7 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan is presented in **Table 12.9-9**.

## 12.9.8 Resettlement Plan for Affected People

The survey on Resettlement Plan for affected people is currently being undertaken. Status of survey is discussed in **Section 12.10.**

## TABLE 12.9-8 SUMMARY MATRIX OF IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES (1/3)

| Impacts | Type | | Mitigation/Enhancement Measures |
|---|---|---|---|
| | Negative | Positive | |
| **CONSTRUCTION PHASE** | | | |
| **Physical Environment** | | | |
| **Air Quality and Noise Levels** | | | |
| Increase in levels of Total Suspended Particulates (TSP) such as dust, dirt, and oil soot. | Low | | Use of water trucks equipped with horizontal spray jets located on the aft end and perpendicular to the direction of travel. |
| Increase in exhaust gas emission levels due to the operation of various heavy equipment and vehicles. | Low | | Regular maintenance of heavy equipment and other smoke emitting machinery must be strictly complied with. |
| Increase in noise levels and vibration due to the operation of heavy equipment and vehicles. | Low | | Use of mufflers and appropriate noise suppressors for heavy equipment and machinery. |
| | | | Scheduling of high noise generating activities during the daytime. |
| Temporary stockpiles of excavated and surplus materials as well as fill and embankment materials may also add to the present TSP levels. | Low | | Excavate unsuitable materials and contraction spoils will be regularly hauled and disposed to DENR approved disposal site. |
| | | | Temporary stockpiles of fill and embankment materials will be covered with tarpaulin canvass or sack materials to prevent re-suspension of particulate matters. |
| **Water Quality** | | | |
| Increase in the amount of suspended solids of receiving natural water ways due to the deposition of high volumes of exposed, loose sediments transported by surface run-off. | Low | | Since wetlands have the natural ability to filter and purify water, some areas, particularly those which have low agricultural productivity can be used as natural treatment facilities. |
| Possible contamination of surface and ground water due to borrow pits and quarries and other excavation activities. | Low | | Contamination of surface and ground water due to borrow pits and quarries and other excavation activities may be minimized by carefully studying the substances profiles before any disturbance is started. |
| Increase in the bacteriological content of local surface water bodies due to domestic wastewater generated by construction personnel. This may eventually transmit diseases. | Low | | Sanitation facilities should be provided by the Contractor to ensure that local water bodies are not polluted. |
| Washing of construction vehicles and other mobile equipment such as cement mixers, chutes, and related equipment will pollute the surface waters. | Low | | Washing of construction vehicles and other mobile equipment along the waterways should be prohibited. |
| Improper storage and handling of chemicals such as lubricants, fuel, paint, and other solutions for routine vehicular operation may contaminate local surface and ground water. | Low | | Chemicals such as lubricants, fuel, paint, and other solutions for routine vehicular operation must be handled with care and properly stored. |
| **Biological** | | | |
| As a result of an increase in noise levels and vibration, natural wildlife activates such as mating, nesting, and migratory patterns, particularly of birds will be disrupted/disturbed. | Low | | Disruption/disturbance to natural wildlife activities such as mating, nesting, and migratory patterns is inevitable but reversible. |
| As a result of an increased turbidity of surface waters, the sediments will block light penetration into the rivers and creeks and inhibit both natural and algal photosynthesis and visibility of aquatic fauna required for location of food. | Low | | Increased turbidity of surface waters is a short term and reversible type of adverse impact. |

**TABLE 12.9-8 SUMMARY MATRIX OF IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES (2/3)**

| Impacts | Type | | Mitigation/Enhancement Measures |
|---|---|---|---|
| | Negative | Positive | |
| **Socio-Economic Environment** | | | |
| **Loss of Structure** | | | |
| Number structures affected: 8 | Low | | Government must ensure that the affected structures are properly compensated based on 'Replacement Cost" method as provided by laws and regulations. |
| **Loss of Land** | | | |
| Sugarcane 333,840 $m^2$<br>Residential 60,000<br>Fruit Tree 3,200<br>Chicken Hutch 7,600<br>**Total 404,640 $m^2$** | High | | The affected land shall be compensated with fair market value. |
| **Loss of Other Improvement** | | | |
| - Trees and other perennials<br>- Other structures | Moderate | | Trees and other perennials with commercial values shall be compensated based on schedule of prices available in municipal/city assessor's office. Other structures shall be compensated based on "Replacement Cost" method. |
| **Agricultural Tenants and Informal Settlers** | | | |
| Agricultural tenants residing within the proposed ROW will be displaced but no place to settle. | Moderate | | Government must relocate tenant-farmers at a resettlement site where they can access to their agricultural land. |
| Some of the farmers rely on sugarcane planting as their means of livelihood. Damage to or loss of these agricultural lands would surely hamper their capacity to support their family. | Moderate | | Government must negotiate with the employers of sugarcane plantation workers for their relocation. |
| **Limited Accessibility to Farmlands** | | | |
| During the construction phase, farmers may experience temporal difficulty in terms of accessibility to the land they are cultivating. | Low | | Contractors must provide a safe alternative route to farmers who need to cross the land they are cultivating (during and after construction phase). |
| Generation of temporary employment opportunities. | | Moderate | Contractor must give priority to available local labor. |

**TABLE 12.9-8 SUMMARY MATRIX OF IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES (3/3)**

| Impacts | Type | | Mitigation/Enhancement Measures |
|---|---|---|---|
| | Negative | Positive | |
| **OPERATIONAL PHASE** | | | |
| **Physical Environment** | | | |
| Increase in vehicular gaseous emissions and noise level along the highway as a result of increase in vehicles due to increase in number of lanes. | Moderate | | To improve air quality and noise level along the highway, LTO shall regulate operation of vehicles that emit smokes and make noise beyond limit provided by law. LGUs shall enforce strict traffic regulations to regulate speeding vehicles. |
| **Socio-Economic Environment** | | | |
| Means of livelihood of the dislocated people may not be restored properly as planned in Resettlement Plan. | Low | | External and internal monitoring shall be regularly conducted to verify status of income restoration of dislocated people. |
| Improved accessibility to basic social services such as schools, hospitals, markets, churches, and communication facilities. | | Moderate | DPWH must regularly maintain the bypass sections. |
| | | | DPWH must improve/construct access roads to the road so that more people can have better access to basic social services. |
| Reduction of transport costs due to improved traffic flow. | | Moderate | DPWH must regularly maintain the road. |
| Better flow of industrial, commercial, and agricultural commodities. | | Moderate | DPWH must regularly maintain the road to ensure continuous, undisrupted flow of agricultural products. |
| Urbanization and commercial development of non-agricultural and non-prime agricultural areas. | | Moderate | Concerned LGUs must work hard towards achieving the development plans. |
| Increase in land values of areas traversed by and in the vicinity of the bypass sections. | | Moderate | Landowners will benefit from increase of land values in areas traversed by or near the bypass sections. |
| Increase in employment opportunities as a result of commercial development. | | Moderate | Government must ensure that qualified measures of the host community are given priority in the hiring of local labor force. |

## TABLE 12.9-9 ENVIRONMENTAL MANAGEMENT AND MONITORING MATRIX (BACOLOD, NS-2)

| Parameters to be Monitored | Stations to be Monitored | Frequency of Monitoring | Methods of Analysis/Execution | DENR Standard | Implementor |
|---|---|---|---|---|---|
| ***CONSTRUCTION PHASE*** | | | | | |
| **PHYSICAL** | | | | | |
| Water quality BOD, TSS, and oil and grease of surface water | All major bridges and RCBC sites | Quarterly during construction | Standard EMPASS-EQD water quality analysis | Class "C"<br>BOD - <10 mg/L<br>TSS - <30 mg/L increase<br>Oil & Grease - <3mg/L | DENR-Region 6 |
| Air quality TSP, $NO_2$, and $SO_2$ | Barangay Matab-ang, Talisay City | Quarterly during construction | Standard EMPASS-WQD air quality analysis | TSP: 430, $NO_2$: 470, $SO_2$: 375 | DENR-Region 6 |
| **BIOLOGICAL** | | | | | |
| Tree cutting | Entire alignment where there are trees to be cut | Daily | Monitoring team must ensure that tree cutting is limited within the required ROW only | N. A. | MMT |
| Waste management and disposal | All portions with excavation and fill activities | Weekly during construction | Site inspection | Based on EMP | DENR-Region 6 |
| **SOCIAL** | | | | | |
| Relocation of project affected families | All stretch of the project road and relocation site | Monthly | Monitoring team must ensure that affected families are properly compensated and their means of livelihood is maintained or restored | Based on RAP | MRIC<br>External Monitoring Agent |
| Compliance of Contractor to occupational health and safety rules and regulation | All construction areas | Weekly | Site inspection of work areas including sanitation facilities | Based on EMP | MMT |
| Road safety | Signalized intersections, merging lanes | Quarterly | Site inspection | Based on DPWH Standard Operating Procedures | DPWH |
| ***OPERATIONAL PHASE*** | | | | | |
| **BIOLOGICAL** | | | | | |
| Tree planting and its maintenance on both sides of the highway | Designated environmental belts/zones | Monthly | Site inspection | Based on EMP | DENR-Region 6<br>MMT |
| **SOCIAL** | | | | | |
| Livelihood restoration | Resettlement site | Monthly | Interview with relocated families | Based on RAP | External Monitoring Agent |
| Informal settling/squatting/encroaching | Acquired ROW | Weekly | Site inspection | Based on EMP | LGUs, MMT |
| Illegal conversion of prime agricultural land | Areas adjacent to the bypass | Weekly | Site inspection | Based on EMP | LGUs, MMT |
| Road condition | Pavement and bridge, including drainage system and embankments | Based on standard DPWH maintenance procedures | Standard DPWH road and bridges maintenance works | Based on DPWH Standard Operating Procedures | DPWH |

MMT : Multi-Partite Monitoring Team
MRIC : Municipal RAP Implementation Committee

## 12.10 SOCIAL IMPACT ASSESSMENT AND RESETTLEMENT ACTION PLAN

### 12.10.1 Alternatives Studied

Three (3) alternative alignments were examined to determine the most feasible route, that which has the least impact on land and structures and which is the most technically and economically viable. The detailed process of alternatives selection is discussed in **Section 12.4**. Alternative 1, which avoids built-up areas and other major establishments, was finally selected.

### 12.10.2 Barangays Affected by the Project

The following barangays are identified to be affected.

| Bacolod City | Talisay City | Silay City |
|---|---|---|
| 1. Bata | 1. Zone 15 | 1. Bagtic |
| 2. Mandalangan | 2. Zone 12A | |
| | 3. Zone 16 | |
| | 4. Matab-ang | |
| | 5. Efigenio Lopez | |

### 12.10.3 Community Consultation and Participation

Series of community consultation meetings have been held since the beginning of the study. The topics discussed in these meetings are presented below.

#### 1) Workshops

The JICA Study Team has conducted workshops, whenever major study outputs are made, to present the process of the master plan and feasibility study to all concerned agencies and residents. The location of the final alignment and the extent of land acquisition and social impacts are also presented to the public and their comments and suggestions are incorporated in the study.

The topics discussed in these workshops are summarized in **Table 12.10-1**.

#### 2) Meeting with City/Municipal Officials

Prior to the Social Impact Survey, the Study Team visited the offices of the mayors and the planning and development offices of the affected city and municipalities. These visits are necessary to:

a) Inform them of the purpose of the Team's visit;
b) Validate the list of affected barangays;
c) Coordinate the availability of the Barangay Captains for meetings to discuss the same purpose;

## TABLE 12.10-2 SUMMARY OF WORKSHOPS

| | 1st Workshop | 2nd Workshop | 3rd Workshop | 4th Workshop |
|---|---|---|---|---|
| Date | 24 April 2003 | 30 October 2003 | 30 July 2004 | 30 August 2004 |
| Venue/Location | Bacolod City | Bacolod City | Bacolod City | Bacolod City |
| Attendees | **National Gov't.**<br>DPWH Region 6, DPWH District Office, PPA, ATO<br>**Local Gov't.**<br>Bacolod City, Talisay City, Silay City, Bago City, Municipalities of Murcia, Victorias, Enrique B. Magalona, and Pulupandan | **National Gov't.**<br>DPWH Region 6, DPWH District Office, PPA<br>**Local Gov't.**<br>Bacolod City, Silay City, Bago City, Victorias City, Municipalities of Murcia and Pulupandan, Province of Negros Occidental<br>**Private Sector**<br>Bacolod Chinese Chamber of Commerce | **National Gov't.**<br>DPWH District Office<br>**Local Gov't.**<br>Province of Negros Occidental, Bacolod City, Talisay City, Silay City | **National Gov't.**<br>DPWH Region 6, DPWH District Office<br>**Local Gov't.**<br>Province of Negros Occidental, Bacolod City, Talisay City, Silay City |
| Objectives of the Meeting | 1. Presentation of the scope of work and schedule of the JICA Study<br>2. Presentation of land use plan and infrastructure development plan for Metro Bacolod<br>3. Discussion of road development plans for Metro Bacolod<br>4. Participation of LGUs in the implementation of the project particularly relocation of project affected people | 1. Presentation of the result of the master plan<br>2. Presentation of road sections selected for feasibility study | 1. Presentation of final alignment of the proposed road<br>2. Presentation of identified social impacts | 1. Presentation of Draft Final Report |
| Topics Discussed | 1. The result of the feasibility study will be incorporated in the land use plans of the LGUs to lessen land acquisition burden of DPWH.<br>2. LGUs can support DPWH in the acquisition of the ROW by securing deed of donation from cooperative landowners.<br>3. All LGUs expressed their support to DPWH in the relocation of project affected people by providing relocation site, negotiation with PAPs, and consensus building. | 1. The roads selected for feasibility study, i.e. the Airport Access Road and Sugar Road have been agreed upon between concerned LGUs.<br>2. LGUs are advised to control development activities in the proposed right-of-way established during the feasibility study to lessen land acquisition burden on DPWH. | 1. The selected road alignments were unanimously accepted by concerned LGUs.<br>2. LGUs acknowledged that the proposed road alignments will have to be incorporated in their respective comprehensive land use plans (CLUP) to contain land speculation. | 1. Presentation of master plan outline with emphasis on the participation of DPWH and the LGUs on the realization of the plan.<br>2. Group discussion and group presentation on:<br>- How to realize the master plan<br>- How to minimize social impacts<br>- Other comments on the study |

d) Arrange with the Barangay Captains the schedule of the conduct of barangay level consultations and surveys (Perception Survey for indirectly affected households and Socio-economic Survey of directly affected households); and
e) Explain to them the necessity for the local government unit's endorsement for the project.

### 3) Meetings with Barangay Captains

Meetings with the Barangay Captains of each of the barangays of the affected cities were held to:

a) Present the proposed road alignment, required right-of-way, and the houses and structures that could be possibly affected;
b) Inform them of the schedule of social impact survey;
c) Arrange barangay level consultation meetings; and
d) Secure "**Barangay Endorsement**" for the project.

The "**Barangay Endorsement**" is a Barangay Resolution that expresses affirmative support to the proposed project duly signed by concerned Barangay Officials and endorsed to higher local government units.

The dates of meetings with the Barangay Captains and the date of "**Barangay Endorsement**" are summarized in **Table 12.10-2**.

**TABLE 12.10-2 SUMMARY OF MEETINGS WITH BARANGAY CAPTAINS AND DATE OF ISSUANCE OF BARANGAY ENDORSEMENT**

| City / Municipality | Date of Meeting | Venue / Location | Date of Issuance of Barangay Endorsement | |
|---|---|---|---|---|
| **Bacolod City** | 26 Feb. 2004 | Barangay Offices | Bata<br>Mandalangan | For issuance<br>08 Mar. 2004 |
| **Talisay City** | 27 Feb. 2004 | Barangay Offices | Zone 15<br>Zone 12A<br>Zone 16<br>Matab-ang<br>Efigenio Lopez | 07 Mar. 2004<br>17 Mar. 2004<br>For issuance<br>For issuance<br>05 Mar. 2004 |
| **Silay City** | 26 Feb. 2004 | Barangay Offices | Bagtic | 06 Mar. 2004 |

### 4) Barangay Consultation Meetings

Consultation meetings with residents that could be possibly affected were held in each barangay as summarized in **Table 12.10-3**.

**TABLE 12.10-3 SUMMARY OF BARANGAY CONSULTATION MEETINGS**

| Barangay | Venue / Location | Date of Meeting | |
|---|---|---|---|
| **Bacolod City** | | | |
| Bata | Barangay Hall | 02 Mar. 2004 | 1:00 PM |
| Mandalangan | Abgana Nat'l. High School Gym | 06 Mar. 2004 | 9:00 AM |
| **Pavia** | | | |
| Zone 15 | Barangay Hall | 05 Mar. 2004 | 3:00 PM |
| Zone 12A | Barangay Hall | 07 Mar. 2004 | 8:00 AM |
| Zone 16 | Barangay Covered Court | 04 Mar. 2004 | 10:00 AM |
| Matab-ang | Barangay Hall | 03 Mar. 2004 | 1:00 PM |
| Efigenio Lopez | | 03 Mar. 2004 | 1:00 PM |
| **Oton** | | | |
| Bagtic | Barangay HalL | 03 Mar. 2004 | 8:00 AM |

An aerial photomap that indicates the proposed right-of-way boundary and structures inside the ROW was presented to the residents during the meeting. The residents raised the following issues:

a) Affected residents shall be given higher priority to be employed by the construction firm during project implementation.

DPWH explained that preferential hiring of local labor during the project implementation stage will be one of the conditions of the ECC that will be imposed by the DENR on contractors, hence, this request will be properly addressed.

b) Affected structures and lands are properly compensated.

DPWH explained that structures will be compensated in accordance with the replacement cost method and land will be paid based on fair market value.

### 12.10.4 Identified Impacts

The identified impacts and the corresponding compensation costs are summarized in **Table 13.10-4**.

#### 1) Impact on Land

The required right-of-way width over the entire stretch of the project road is 30m. Affected areas classified by land use are summarized as follows:

| Land Use | Affected Lands ($m^2$) | Share (%) |
|---|---|---|
| Sugarcane field | 333,840 | 82.5 |
| Residential | 60,000 | 14.8 |
| Chicken raising farms | 7,600 | 1.9 |
| Fruit trees | 3,200 | 8.8 |
| **Total** | **404,640** | **100.0** |

## TABLE 12.10-4 SUMMARY OF IMPACTS AND COMPENSATION COST

New Airport Access Road

| Description | No. of HHs | Unit | Rate/Unit | Quantity | Amount (Php) | Remarks |
|---|---|---|---|---|---|---|
| **Compensation for Land and Other Assets** | | | | | | |
| **1. Land** | | | | | | |
| 1) Residential-1 | - | $m^2$ | 2,625.0 | 28,000 | 73,500,000 | Name of land owners to be identified by parcellary survey. |
| 2) Residential-2 | - | $m^2$ | 1,875.0 | 32,000 | 60,000,000 | |
| 3) Agricultural | - | $m^2$ | 187.5 | 344,640 | 64,620,000 | |
| **Subtotal** | | | | 404,640 | 198,120,000 | |
| **2. Structures** | | | | | | |
| 1) Residential (Shanty) | 6 | $m^2$ | 1,140 | 214.59 | 244,633 | |
| 2) Warehouse (Concrete) | 1 | $m^2$ | 6,000 | 10.20 | 61,200 | |
| 3) Warehouse (Shanty) | 1 | $m^2$ | 1,000 | 12.25 | 12,250 | |
| **Subtotal** | | | | 237.04 | 318,083 | |
| **3. Other Fixed Structures** | | | | | | |
| 1) Water pump | 1 | Nos | 10,000 | 1 | 10,000 | |
| **4. Repair Cost** | - | - | - | - | - | None |
| **5. Electric Post Relocation** | - | - | - | - | - | None |
| **6. Perennials** | | | | | | |
| Various types | 5 | Nos. | various | 139 | 32,650 | |
| **Subtotal** | | | | | 198,480,733 | |
| **Other Compensations** | | | | | | |
| **1. Disturbance Allowance** | | | | | | |
| 1) Severely affected land owners | - | - | - | - | - | None |
| 2) Agricultural lessees | - | - | - | - | - | None |
| 3) Temporary land users | - | - | - | - | - | None |
| 4) Severely affected structural owners | 6 | - | 10,000 | 6 | 60,000 | |
| **2. Subsistence Allowance** | | | | | | |
| 1) Income loss for shop owners | - | - | - | - | - | None |
| **2. Financial Assistance** | | | | | | |
| 1) Land users w/o title | 6 | - | 15,000 | 6 | 90,000 | |
| **3. Rehabilitation Assistance** | | | | | | |
| 1) Severely affected land owners | - | - | - | - | - | None |
| 2) Agricultural lessees | - | - | - | - | - | None |
| 3) Severely affected structural owners. | 1 | - | 15,000 | 1 | 15,000 | |
| **4. Transportation Allowance** | | | | | | |
| 1) Relocating PAPs | 8 | - | 3,000 | 8 | 24,000 | |
| 2) Shanty dwellers go back to province. | - | - | - | - | - | None |
| **5. Transitional allowance** | | | | | | |
| 1) Renters of affected structures | 2 | - | 3,000 | 2 | 6,000 | |
| **Subtotal** | | | | | 195,000 | |
| **TOTAL** | | | | | 198,675,733 | |
| **RAP Implementation** | | | | | 2,027,250 | |
| **GRAND TOTAL** | | | | | 280,707,983 | |

More than 80% of the affected lands are sugarcane plantations. Some areas classified as residential are still agricultural lands but the value of which may be the same as residential since these areas have high potential for residential use due to the presence of access road and built-up areas adjacent to the road

Fruit trees observed along the proposed alignment are mostly non-productive and with low commercial value.

### 2) Impact on Structures

A total of **9** structures, mostly residential houses for laborers and employees of sugarcane plantations, are identified along the proposed alignment, as described below.

| Structure Use | Number | Floor Area ($m^2$) |
|---|---|---|
| Residential | 6 | 214.59 |
| Warehouse | 2 | 22.45 |
| Water Pump | 1 | - |
| **Total** | **9** | **237.04** |

### 3) Impact on Residents

Socio-economic survey for project affected families was conducted in February and March 2004. The survey format used is shown in **Table 12.10-5.**

Impacts on affected families are summarized as follows:

| Type of PAF | Number |
|---|---|
| Severely Affected PAFs | 8.0 |
| - Renters | ( 2.0 ) |
| - Agricultural Tenants | ( 6.0 ) |
| Marginally Affected PAFs | 1.0 |
| **Total** | **9.0** |
| Average Household Size | 5.84 |

All severely affected structure owners are agricultural workers in sugarcane plantations who are allowed to occupy the land as plantation workers. They may be allowed by landowners to transfer their residence outside the proposed ROW and rebuild their houses there.

### 4) Impact on Trees and Perennials

Groves of fruit trees such as coconuts, bananas, mangos, guavas, etc., which are mostly non-productive and with minimal commercial values, are observed around residential areas, riverbanks, and feeder roads. A total of **139** of these various types of trees are identified.

## TABLE 12.10-5 SOCIO-ECONOMIC SURVEY OF FORM

Household No. ☐☐☐ Station : _____ + _____

Address : _____ No. _____ Road / Street _____ Barangay _____ Municipality

1. Household Structure

| | Head of Family | Name | Age | Sex | Occupation | Education |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| Co-Residents | | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

2. How many years are you staying at the present address? _____ years

3. Average Family Income per Month

| Name of Family Member | Name of Employer | Average Monthly Income (P) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

4. If you are doing same business at the present address.

- What kind of business : _____
- Monthly income from the business _____ P/month

5. Average Monthly Family Expenditure
_____ P/month

6. Ownership of a land and a house

| Land | | House | |
|---|---|---|---|
| ☐ | Owned | ☐ | Owned |
| ☐ | Rented | ☐ | Rented |
| ☐ | Provided by Government / Company | ☐ | Provided by Government / Company |
| ☐ | Others (specify : _____) | ☐ | Others (specify : _____) |

7. Workplace / Schoolplace and Cost of Transportation

| Name | Address of Workplace 1 / or schoolplace | Mode of Transportation 2 / | Transportation Cost per day | How long does it take to reach workplace / schoolplace |
|---|---|---|---|---|
| | | A, B, C, D, E, F | P/day | hr. min. |
| | | A, B, C, D, E, F | P/day | hr. min. |
| | | A, B, C, D, E, F | P/day | hr. min. |
| | | A, B, C, D, E, F | P/day | hr. min. |
| | | A, B, C, D, E, F | P/day | hr. min. |
| | | A, B, C, D, E, F | P/day | hr. min. |
| | | | P/day | hr. min. |

Note : 1/In case of a former, enter barangay names of nearest and farthest farm land
2/A: Own car B: Walk C: Tricycle D: Jeepney E: Bus
F: Co-riding on company's or friend's car, or school bus

8. House Structure
No. of Storey : 1. Flat 2. 2-story 3. 3-story
Floor Area : _____ sq.m.
Type of House : 1. Wooden 2: Concrete 3: Other (specify: _____)
Lighting : 1. Electricity 2. Kerosene lamp 3. Oil lamp 4. Other (specify : _____)
Water System : 1. Piped 2. Well 3: Spring / River 4. Rain
Toilet Facility : 1. Flush 2. Open pit 3: None
Cooking Fuel : 1. Wood / Charcoal 2: LPG 3. Kerosene 4. Electricity

9. If you are affected by a certain Government Project and asked to be relocated, what conditions do you require?

(1)
(2)
(3)
(4)
(5)
(6)

### 12.10.5 Valuation of Losses

The latest ordinances on market valuation of real properties in cities and municipalities were collected from the respective assessor's offices of these LGUs. The BIR zonal values were likewise obtained from BIR regional offices.

The sources of unit prices used to determine values of each type of loss are summarized in **Table 12.10-6**.

**TABLE 12.10-6 SOURCES OF UNIT PRICES FOR VALUATION**

| Type of Loss | Primary Source | Secondary Source |
|---|---|---|
| Land | Assessment value from assessor's office; BIR zonal value | Prevailing market prices gathered through interviews with developers/residents |
| Structures | Unit price of primary structures from DPWH District Offices; schedule of values from assessor's office | - |
| Trees and Perennials | Schedule of values for agricultural trees from assessor's office | - |
| Income Loss/Disturbances | Socio-economic survey | - |

The value of land for agricultural and residential/commercial/industrial lands obtained from the assessor's offices are summarized and presented in **Appendix 12.10-1**.

It should be noted that the proposed road traverses mostly agricultural lands (i.e. sugarcane plantations), but such lands have high potential of conversion to residential and commercial areas since these lands are located in Metro Bacolod. Hence, the price of agricultural land currently traded in the area is far higher than the zonal and market values available at the assessor's office.

### 12.10.6 Resettlement Site

The location of existing and proposed resettlement sites is shown in **Figure 12.10-1**. The status of these relocation sites is summarized in **Table 12.10-7**.

### 12.10.7 Income Restoration Program

An income restoration training will be given to PAPs who will be obliged to shift from their present occupation or income generating activity due to relocation.

#### 1) Socio-Economic Baseline Survey

The result of the socio-economic baseline survey for project affected persons will be made available to a contracted non-government organization that will need it to design the appropriate income restoration program responsive to the needs of project affected households.

**TABLE 12.10-7 SUMMARY OF RELOCATION SITES**

| City/Municipality | Location | Date of Issuance of Barangay Resolution |
|---|---|---|
| 1. Fortune Town | Barangay Estefaña, Bacolod City | Land Area : 5.9 ha<br>Total Lot Number : 680<br>Area per lot : 54.0 $m^2$<br>Substantial number of lots has been occupied. |
| 2. Celina Home | Barangay Estefaña, Bacolod City | Land Area : 22.9 ha<br>Total Lot Number : 2,781<br>This resettlement site has been developed for government employees. |
| 3. Handumanan | Barangay Handumanan, Bacolod City | Land Area : 95.04 ha<br>Total Lot Number : 5,026<br>This resettlement site will be developed in 6 phases. A substantial number of lots still available. |
| 4. Abada Escay | Barangay Vista Alegre, Bacolod City | Land Area : 30.06 ha.<br>Total Lot Number : yet to be decided<br>The area is reserved for resettlement and low cost housing. Lot areas will vary depending on the financial capability of residents. |
| 5. Hope Village | Barangay Kabataya, Talisay City | Land Area : 9 ha.<br>Total Lot Number : 600<br>Average lot area : 82 $m^2$<br>Low cost housing projects are currently on-going. |
| 6. Banihan Habitat Home | Barangay Concepcion, Talisay City | Land Area : 1.8 ha.<br>Total Lot Number : 145<br>The resettlement site was developed by Gawad Kalinga, a NGO providing low-cost housing. The area can still accommodate additional residents. |
| 7. Mantagan | Barangay Mantagan, Silay City | Land Area : 2.5 ha<br>Total Lot Number : 216 |
| 8. Gahid | Barangay Gahid, Silay City | Land Area : 5.7 ha.<br>Total Lot Number : 444 |
| 9. Barangay III | Barangay III, Silay City | Land Area : 1.2 ha.<br>Total Lot Number : 98 |

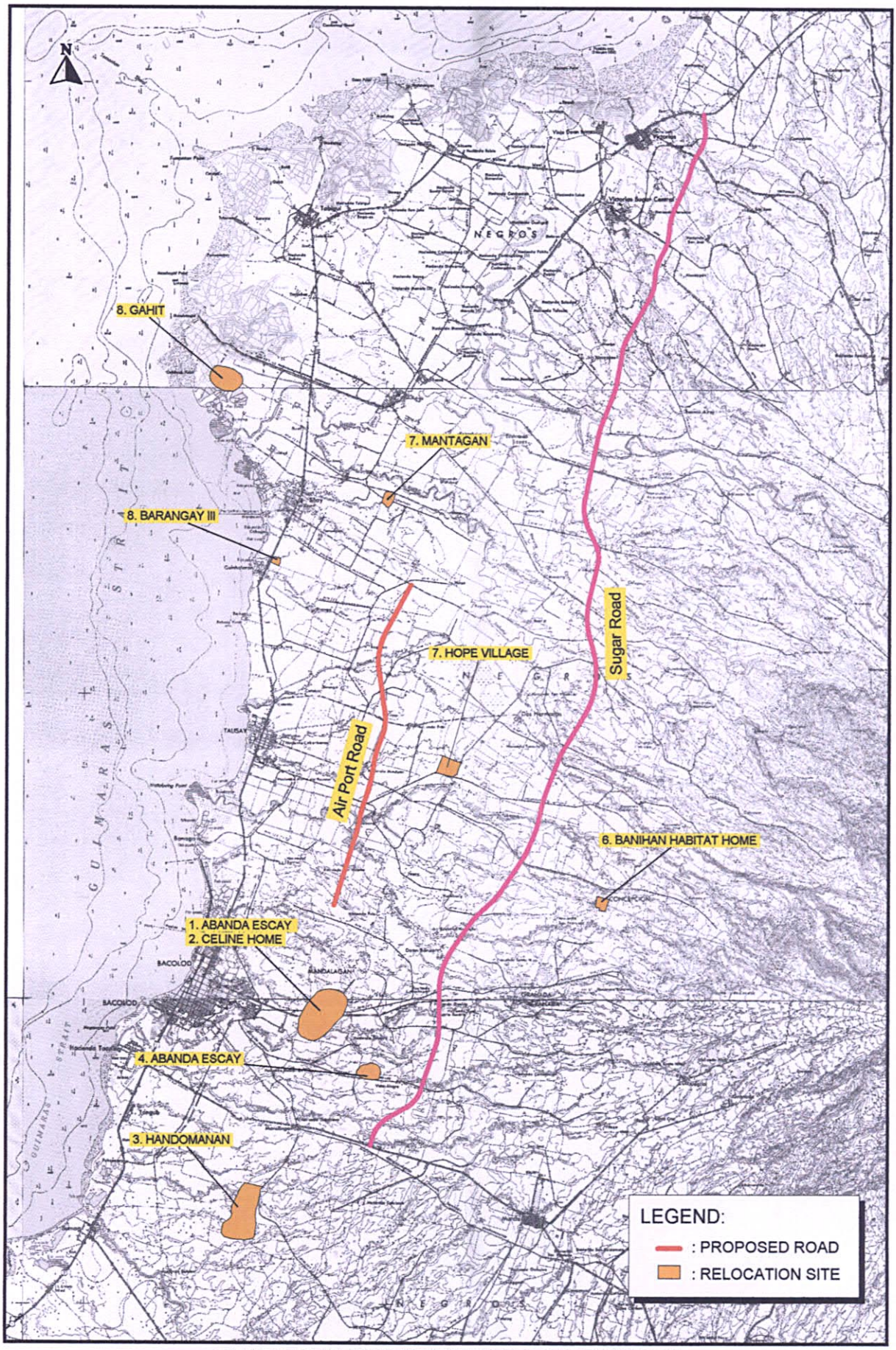



FIGURE 12.10-1 LOCATION OF RELOCATION SITE

### 2) Process and Conceptual Framework for Income Restoration Program

The DPWH shall contract out to a non-government organization with specialization in community-based approaches the income restoration programs, community organizing, livelihood and skills enhancement programs, and the like. This is outsourcing of requirements which DPWH is not capable of doing by itself.

In addition, the DPWH shall continue its linkage with the Social Services Development Divisions of LGUS and tap their own income restoration or poverty alleviation programs, as well as those of other agencies. The income restoration program shall be consistent with the needs of the project-affected persons. It should therefore be demand-driven to the extent that resources can be made available from the DPWH or from its own networking effort.

## 12.10.8 Institutional Arrangements

The DPWH, through an appropriate Project Management Office (PMO), shall be the lead agency responsible for the implementation of the project and the compliance requirement of this RAP.

### 1) Department of Public Works and Highways (DPWH)

A PMO shall be designated by the DPWH as its overall responsible unit in the implementation of the New Airport Access Road Project. It will manage and supervise the Project including its resettlement activities and land acquisition requirement in coordination with concerned agencies. To ensure smooth implementation the PMO shall facilitate the availability of funds, including those required for RAP implementation, in a timely manner.

**Regional and District Engineering Offices of the DPWH**

The City District Engineering Office (DEO) of the DPWH based in Talisay City shall be the lead implementing arm for the Resettlement Action Plan (RAP) for project affected persons within the territorial boundary of the cities of Talisay and Silay. On the other hand, the Bacolod City District Engineering Office of the Department based in Bacolod City shall be responsible for implementation of the RAP for project affected persons within the territorial boundary of Bacolod City.

The District Engineers (DEs), upon receipt of the appropriate Department Order (DO) for the RAP's implementation, shall appoint an adequate number of staff to perform the necessary activities under the plan. Should the number fall short of that required, the DE shall seek assistance from the DPWH Regional Office.

### 2) Local Government Units (LGUs)

The resettlement requirements of the project shall be coordinated by the DPWH and its regional and district engineering offices with the local government units,

namely: Bacolod City, Talisay City, and Silay City. This is especially critical insofar as implementation of the provisions of Republic Act 7279 (the Urban Development and Housing Act of 1992) and its implementing rules and regulations are concerned to ensure the observance of proper and humane relocation and resettlement.

### 3) RAP Implementation Committee (RIC)

The DEO RAP Staff shall be assisted in the implementation by a City or Municipal Resettlement Implementation Committee (C/MRIC) which, consistent with the Resettlement Policy, shall be composed of the following:

**RAP Implementation Committee (RIC) – A** (will attend to PAPs in the cities of Talisay and Silay)

Chairman and Convenor - District Engineer (DPWH), Talisay City
Co-Chairman - City Mayor of Talisay (or his designated representative)
- City Mayor of Silay (or his designated representative)
Members:
Barangay Captain - Barangay Matab-ang, Talisay City
Barangay Captain - Barangay Efigenio Lopez, Talisay City
Barangay Captain - Barangay Zone 16, Talisay City
Barangay Captain - Barangay Zone 15, Talisay City
Barangay Captain - Barangay Zone 12A, Talisay City
Barangay Captain - Barangay Bagtic, Silay City

Representative of PAPs - Barangay Matab-ang, Talisay City
Representative of PAPs - Barangay Efigenio Lopez, Talisay City
Representative of PAPs - Barangay Zone 16, Talisay City
Representative of PAPs - Barangay Zone 15, Talisay City
Representative of PAPs - Barangay Zone 12A, Talisay City
Representative of PAPs - Barangay Bagtic, Silay City
Representative(s) from a Non-Government Organization (NGO) or People's Organization (PO) active in all the traversed barangays

**RAP Implementation Committee (RIC) – B** (will attend to PAPs in Bacolod City)

Chairman and Convenor - District Engineer (DPWH), Bacolod City
Co-Chairman - City Mayor of Bacolod (or his designated representative)

Members:
Barangay Captain - Barangay Bata, Bacolod City
Barangay Captain - Barangay Mandalagan, Bacolod City

Representative of PAPs - Barangay Bata, Bacolod City
Representative of PAPs - Barangay Mandalagan, Bacolod City

Representative(s) from a Non-Government Organization (NGO) or People's Organization (PO) active in all the traversed barangays

The NGO(s) or PO(s) in the RIC should be active in the communities traversed by the alignment and registered organization(s) with the Securities and Exchange Commission (SEC). In addition, it should be duly recognized by the LGU through a process of accreditation and recognition by the Sangguniang Panlungsod (SP) of the cities of Bacolod, Talisay, and Silay.

The functions of the RIC shall be as follows:

a) Assist the DPWH DEO in validating the list of PAPs, the assets of PAPs that will be affected by the project (using a prepared compensation form), and in implementing the RAP;
b) Assist the DPWH DEO in public information campaign, public participation and consultation;
c) Assist the DEO in the payment of compensation to PAPs;
d) Receive complaints and grievances from PAPs and other stakeholders and act on them accordingly;
e) Maintain record of all public meetings, complaints, and actions taken to address complaints and grievances;
f) In coordination with concerned government authorities, assist in the enforcement of laws/ordinances regarding encroachment into the project road corridor.

**4) Internal Monitoring and Evaluation Requirement**

The Environmental Social Service Office (ESSO) of the DPWH shall be responsible for the internal monitoring and evaluation requirement of the RAP. Prior to the RAP implementation, however, the ESSO shall provide the DEO RAP Implementation Staff with the proper orientation in the implementation of the RAP and the DPWH Resettlement Policy.

**5) External Monitoring and Evaluation Requirement**

An external monitoring agency (EMA) or institution shall be engaged by the DPWH upon the donor agency's concurrence of this RAP. The EMA shall perform independent third party monitoring of DPWH's compliance to its own Resettlement Policy and the implementation of the provisions of this Resettlement Action Plan. Selection of this institution shall be in accordance with DPWH's selection process, which shall be concurred by the donor agency before its eventual engagement.

The scope of services of the EMA shall be governed by a Terms of Reference which shall spell out in detail the indicators to be measured among other important aspects of the external monitoring work. The main objectives of conducting an independent external monitoring and evaluation for each of the RAPs implemented are the following:

a) To determine whether or not the implementation of the RAP is carried out according to the Department's Resettlement Policy, and
b) To determine whether or not the main objectives of the RAP (i.e. to improve or at least restore the living standards, income-earning capacity and production levels of affected people) have been achieved.

### 6) Control of Land Speculation and Illegal Encroachment

To deter the proliferation of project affected persons (PAPs) that have not been censused or inventoried during the socio-economic survey as well as the inventory of affected assets, the RAP implementation team shall be guided during the validation work of the "**Cut-off Date**" as **March 10, 2004** (conclusion of the socio-economic survey for affected persons). Any PAPs identified during the validation work, except those which have not been interviewed but who had already been earlier identified, may not be entitled for compensation. The same restriction shall apply for additional assets built and/or improvements made on existing assets of identified PAPs after the cut-off date. Photographs earlier taken of these assets shall be used to validate any variances made after the cut-off date.

## 12.10.9 Grievance Redress Measures

Grievance redressal is one of the main functions of the RIC. The Resettlement Policy provides that grievance related to any aspect of the project will be handled through negotiations aimed at achieving consensus following the procedures outlined below.

### 1) Filing and Action

Grievance will be filed by the PAP with the RIC who will act within 15 days on said complaints upon receipt thereof, except complaints and grievances that specifically pertain to the valuation of affected assets, since such will be decided upon by the proper courts.

### 2) Appeal to the DPWH Regional Director

If no understanding or amicable solution can be reached, or if the PAP does not receive a response from the RIC within 15 days of registry of the complaint, he/she can appeal to the Office of the Regional Director (DPWH), which should act on the complaint/grievance within 15 days from the day of its filing.

### 3) Court of Law

If the PAP is not satisfied with the decision of the Office of the Regional Director, he/she, as a last resort, can submit the complaint to a court of law.

### 4) Miscellaneous Provisions

PAPs will be exempted from all administrative and legal fees incurred in pursuance of the grievance redressal procedures. All documents received in writing (or written when received verbally) from the PAPs will be documented.

### 12.10.10 Monitoring and Evaluation

#### 1) Monitoring and Evaluation Process

The process that will be followed in monitoring and evaluation shall include the following:

a) Data collection, conduct of surveys, interviews and focus group discussions

Data collection could use any or all of the following methods: sample survey using a pre-tested questionnaire prepared by the implementing agency or office; focus group discussions involving specific topics with particular interest groups such as community organizations, cooperatives, women's groups, or project-affected persons; key informant interviews of specific individuals such as local government units officials, community leaders, and implementing agencies; and structured direct observation by monitoring team members.

b) Preparation of preliminary report

The preliminary report shall contain the findings pertaining to the monitoring indicators. It will be written in such a manner that it can be used as a working paper for the feedback sessions (exit conferences, meetings, etc.).

c) Presentation of the preliminary report to the different stakeholders for feedback (including those agencies involved in project implementation and the affected population)

This involves feedback sessions with the different stakeholders: representatives of project affected persons and/or respondents of the surveys and key informants, DPWH-DEOs, DPWH-Region, LGU officials from the host areas, and NGOs and other assisting groups active in the area. The sessions will validate the data and analysis pertaining to the monitoring indicators and solicit observations, feedback, and suggestions from the various stakeholders on the different aspects of the monitoring report.

d) Workshops to identify issues for planning and/or intervention

Workshops may be conducted if it becomes necessary after the feedback sessions to identify problems or issues related to the implementation of the resettlement plan that require resolution, decision, or intervention. But unlike the feedback session which is primarily aimed at completing and validating the data for the monitoring report, the workshops are aimed at identifying practical actions that will have to be undertaken to address specific problems or improve the process of implementation of the resettlement action plan.

e) Preparation of final report incorporating feedback from stakeholders

The final report will contain the validated data, findings, and analysis on the monitoring indicators as well as the recommended courses of action for improving the resettlement action plan.

**2) Monitoring and Evaluation Units**

The monitoring and evaluation units of this project shall be the Project Management Office for Infrastructure Right-of-Way (PMO-IROW) and the Resettlement Project Management Office consistent with the institutionalization of the implementation of Department Order (DO) No. 5, series of 2003. This DO implements a streamlined infrastructure right-of-way process designed to identify, acquire, and manage right-of-way efficiently and in a timely manner for the implementation of infrastructure projects.

**3) Internal Monitoring**

Internal monitoring will be done by the ESSO. The ESSO, acting as the Internal Monitor, shall be responsible for the following:

a) Verification that the baseline information of all PAPs has been carried out and that the valuation of lost or damaged assets and the compensation for resettlement and other rehabilitation entitlements are carried out in accordance with the policy framework;
b) Overseeing the implementation of the RAPs as designed and implemented;
c) Verification of timeliness of the availability and sufficiency of funds and that utilization of these funds are consistent with the LARR Policy and the provisions of this RAP; and
d) Recording of all grievances and their resolution and ensure that complaints are dealt with in a timely manner.

**4) External Monitoring**

External monitoring and evaluation shall cover all the aspects of resettlement activities which include the following:

a) Review of the existing baseline data and gather additional socio-economic baseline data, if necessary, on sample families which are entitled to receive compensation for all their lost assets or for resettlement and rehabilitation;
b) Monitor implementation of the Resettlement Policy and public information campaign;
c) Identify any discrepancy between policy requirements and actual practice, as well as any local level grievances;
d) Gather qualitative indications of the social and economic impact of project implementation on the PAPs; and
e) Provide recommendations for improving implementation of the Department's Resettlement Policy.

### 12.10.11 RAP Implementation

#### 1) Preparation of Final RAP

The social impacts identified in this study shall be verified and validated during the detailed design stage after the exact extent of construction limits and the corresponding ROW limits required have been established. The following RAP updating surveys shall be carried out to update the preliminary RAP prepared under this study after fixing the final ROW limits.

**TABLE 12.10-10 RAP UPDATING SURVEYS TO BE UNDERTAKEN**

| Impact Item | Surveys to be Undertaken |
|---|---|
| Land | - **Parcellary survey** shall be carried out to identify the name of lot owner and area to be acquired from each lot owner. |
| Structure | - **Tagging and picture taking** must be carried to identify PAPs eligible for compensation.<br>- **Cut-off-Date** must be set and informed to the residents prior to tagging. |
| Perennials | - **Validation survey** shall be carried out to identify name of owner of perennials with commercial values. |
| Tenants/Renters, Informal settlers | - **Socio-economic survey** shall be carried out to identify presence of agricultural tenants, renters of structures, and informal settlers who need special consideration by providing relocation site, financial assistance and other assistance |

A final RAP shall be prepared based on the preliminary RAP and the results of the RAP updating surveys.

#### 2) RAP Approval

The final RAP will have to be presented to the DPWH for approval and for concurrence by the donor agency by the scheduled period in 2007. The salient points of the final RAP will have to be reiterated with concerned officials of Bacolod City, Talisay City, and Silay City upon its approval prior to implementation. The RIC that will be organized for the purpose shall provide the necessary assistance to the DPWH DEOs during the implementation process. Any technical assistance, when required by the RIC, will be extended by the DPWH Regional Office upon request.

#### 3) MOU with LGUs and the Establishment of the RIC

Within a reasonable period of time from the approval of this RAP, a Memorandum of Understanding (MOU) will be executed between the DPWH and the LGUs of Bacolod City, Talisay City, and Silay City. The MOU will provide the mandate for the formation of the RIC and will likewise spell out the required cooperation and commitment of the LGUs in ensuring that the right-of-way is sustainably free from encroachments and illegal squatting even after project completion.

**4) Orientation and Training of the RIC**

The members of the RIC will be given orientation on the scope and coverage of their work under the final RAP. In addition, the same RIC members will be trained on the implementation requirements of the RAP, including the scope and coverage of the DPWH policy framework that will be embodied in that RAP.

**5) Stake-out**

During the validation period, the RIC shall conduct a stakeout of the project corridor to determine the extent of the area required by the road project. The results of the alignment survey used during the detailed engineering design and the latest parcellary survey conducted in the area will be used as basis for this activity.

**6) PAP Validation and Establishment of Detailed Compensation Rates**

The RIC members will validate the census of PAPs and inventory of affected assets and review and update, where necessary, the compensation entitlements payable to these PAPs. This will be done at a pre-agreed period prior to the conclusion of the orientation training.

**7) Conduct of Public Information Campaign**

While the PAPs have already been informed about the project during the series of barangay consultations, perception survey, and socio-economic survey conducted during the preparation of the preliminary RAP, the RIC will again call for public meetings to explain further the details of the RAP upon its implementation. The RIC can, upon public information, improve materials prepared during the formulation of the RAP. The PAPs will be informed of the schedule of the RIC's validation work and will be requested to keep documents that would attest ownership of their affected assets as these may be requested by the RIC.

**8) Finalization of Compensation and Other Entitlements of PAPs**

The RIC shall finalize the entitlements and the total amount of compensation payable to each PAP following the updating of the unit prices that will be used, and after confirmation visit to each PAP to validate the inventory of affected assets. This shall be consistent with the entitlement matrix of the RAP. The possibility of additional PAPs who have not bee identified during the preparation of the RAP due to potential minor re-alignment remains high and the validated list is expected to reflect these changes. Those that are within the ROW but who came in after the cut-off period established for the RAP are excluded.

An "Inventory of Affected Fixed Assets Form" will have to be accomplished and signed by each PAP or his duly authorized representative to indicate concurrence with the estimates of the affected assets, entitlements, and total compensation amounts. A copy of the acknowledged form will be given to each of the PAPs for their reference.

**9) Public Meetings**

Public meetings will be held during the disclosure of compensation to the PAPs in the barangays traversed by the road project. These meetings will be conducted in a public place following conclusion of the finalization of the compensation entitlements to inform them of the results of the validation of impacts and

computation of compensation and other entitlements, other resettlement activities, and the schedule of payment to PAPs.

During this activity the PAPs are expected to register any disagreement on the validated results through the grievance redressal mechanism established in the policy framework that will be reiterated in the final RAP. The PAPs will be advised on the options that may be taken following the grievance redressal procedures of the same policy and the Policy Framework on Public Participation and Consultation of the DPWH. The result of the disclosure meetings shall be the basis for the preparation of payment vouchers and subsequent payments to the PAPs.

**10) Payment of Compensation and Other Entitlements**

The place, date, and time of the payment activity will be communicated to the City Mayors of Bacolod, Talisay, and Silay with a request that this be announced in advance to the barangay officials/RIC members. The announcement will likewise be posted by the barangay officials in a place accessible to the public to ensure that all PAPs within their administrative jurisdiction are informed. All payments of compensation will be also done in public.

The activity will be highlighted with the signing of a Pledge of Undertaking (POU) by the PAP, which states among others the demolition, removal or relocation of structures from the ROW within a specified period of time, the failure of which provides corresponding recourse of the DPWH to either carry out the stipulation at the PAPs expense or filing of criminal case in a court of law. In addition, the POU prohibits the rebuilding of such structures by the PAPs or their heirs within the DPWH's road right-of-way (RROW).

**11) Reorganization and Relocation**

The DPWH will not cause any demolition, reorganization or relocation along the ROW until all the PAPs are duly paid their compensation and other entitlements as disclosed during the public meetings.

**12) Hand-over of the Site for Construction**

The site may be handed over for the civil works construction at least a month following the conclusion of the RAP implementation and after the issuance of a "No Objection Letter" from the donor agency.

**13) Monitoring and Supervision of RAP Implementation**

The implementation of the RAP will be supervised by the Project Implementing Office in coordination with the ESSO. The ESSO will also carryout internal monitoring of the RAP implementation and will provide periodic progress reports to the donor agency. Supervision and monitoring of the RAP implementation will be done through the ESSO counterpart staff at the regional level.

An independent agency will be contracted to carry out external monitoring and post-evaluation study.

## 12.11 PROJECT EVALUATION

### 12.11.1 Economic Evaluation

#### 1) Traffic Demand Forecast

Future traffic demand forecasted in a form of OD matrix (years 2010, 2016 and 2022) was assigned on the road network to estimate traffic volume on the new Airport Access Road in Bacolod. The estimated traffic volume on the Road for the case of "with" the project is summarized in Table 12.11-1.

**TABLE 12.11-1 TRAFFIC VOLUME ON NEW AIRPORT ACCESS ROAD**

Unit: PCU / day

| | 2010 | 2016 | 2022 | AAGR (%) | |
|---|---|---|---|---|---|
| | | | | '10 - '16 | '16 – '22 |
| **Section 1** (Bacolod Circumferential Road – Talisay Conception Road) | 7,900 | 23,200 | 28,100 | 19.7 | 3.2 |
| **Section 2** (Talisay Conception Road – Catabla Conception Road) | 6,200 | 22,900 | 26,300 | 24.3 | 2.3 |
| **Section 3** (Catabla Conception Road – Silay Guimbalaon Road) | - | 21,500 | 26,000 | - | 3.2 |

*Notes: 1) In 2010, road section 1 and 2 is only opened to public*
*2) In 2016 and 2022, all sections of new Airport Access road is opened to public.*

The estimated vehicle kilometers and vehicle hours in Metro Bacolod are shown in Tables 12.11-2 and 12.11-3, respectively. These tables are based on the benefit calculation.

**TABLE 12.11-2 TOTAL VEHICLE KILOMETERS IN METRO BACOLOD**

Unit: PCU Km / day

| | W/O Project | W/ Project | W/O – W/ |
|---|---|---|---|
| 2010 | 4,224,100 | 4,166,100 | 57,954 |
| 2016 | 5,198,500 | 5,086,800 | 111,700 |
| 2022 | 7,042,400 | 6,919,900 | 122,500 |

*Notes: Same notes in Table 12.10-1*

**TABLE 12.11-3 TOTAL VEHICLE HOURS IN METRO BACOLOD**

Unit: PCU Hour / day

| | W/O Project | W/ Project | W/O – W/ |
|---|---|---|---|
| 2010 | 123,200 | 117,200 | 6,000 |
| 2016 | 167,000 | 152,600 | 14,400 |
| 2022 | 266,200 | 241,700 | 24,600 |

*Notes: Same notes in Table 12.11-1*

#### 2) Economic Evaluation

**Evaluation Period**

The evaluation period is assumed to be 20 years from 2012 to 2031 taking into account the service life of New Airport Access Road in Bacolod.

## Implementation Schedule

The implementation schedule is assumed as follows:

- 2007 Detailed design
- 2008 – '09 Land acquisition
- 2010 – '11 Construction of New Airport Road
- 2012 - Open of all New Airport Access road to public

## Economic Indicators

The economic evaluation method is principally employed benefit cost analysis. The economic indicators used in this study are as follows:

- Net Present Value (NPV)
- Benefit Cost Ratio, (BCR), and
- Economic Internal Rate of Return (EIRR)

## Estimation of Benefit

### Basic Vehicle Operating Cost

The basic vehicle operating cost (BVOC) is estimated annually by PMO-FS Office in DPWH. The latest BVOC was estimated in April 2002. In this study, this VBOC with some modification by inflation between April 2002 and April 2003 is utilized in this study (See Table 12.11-4)

**TABLE 12.11-4 BASIC VEHICLE OPERATING COST (EXCLUDING TAX)**

| Vehicle Type | Running (P/1000km) | Fixed [P/Min] | Time [P/Min] |
|---|---|---|---|
| Car /Taxi / Jeep | 4,441 | 0.245 | 0.991 |
| Jeepney | 2,991 | 1.181 | 1.468 |
| Bus | 7,453 | 1.794 | 5.561 |
| Truck | 9,622 | 2.107 | 0 |

*Source: PMO-FIS, DPWH*
*Note: BVOC prepared by PMO-FIS is modified with inflation rate.*
*All costs are expressed as 2003 prices.*

The vehicle operating cost by surface type and travel speed was set up since it varies by these factors.

### Estimation of Benefits

The saving in vehicle operating costs and travel time cost were estimated and are shown in **Table 12.11-5**.

**TABLE 12.11- 5 ESTIMATION OF BENEFITS**

Unit: '000 Pesos/Day

| Year | Saving in VRC | Saving in VFC | Saving in VOC | Saving in TCC | Total Saving |
|---|---|---|---|---|---|
| 2010 | 38,400 | 37,488 | 75,888 | 54,872 | 130,760 |
| 2016 | 84,971 | 117,901 | 202,872 | 172,574 | 375,446 |
| 2022 | 93,146 | 200,791 | 293,937 | 293,904 | 587,842 |

*Notes: 1) In 2010, road section 1 and 2 is only opened to public*
*2) In 2016 and 2022, all sections of new Airport Access road is opened to public.*

## Economic Cost

The project cost, which was already calculated in the previous section, is expressed as the financial cost. It is therefore to convert from financial cost to economic cost. In this study the economic cost was estimated to deduct from financial cost to government taxes and shadow prices of unskilled labor is shown in **Table 12.11- 6**.

**TABLE 12.11- 6 ECONOMIC COST ESTIMATE**

Unit: '000 Pesos

| | Description | Economic Cost | Financial Cost |
|---|---|---|---|
| 1 | Construction Cost | 322,300 | 378,000 |
| 2 | ROW Acquisition / Resettlement | 180,600 | 200,700 |
| 3 | Consultancy | 58,100 | 64,500 |
| 3-1 | Detailed Design | 30,900 | 34,300 |
| 3-2 | Construction Supervision | 27,200 | 30,200 |
| | **Total** | 561,000 | 643,200 |

## Maintenance Cost

According to the maintenance study in this study, the present maintenance cost for the road has estimated on the basis of the EMK method. In this study, therefore, the maintenance cost of the New Airport Access Road is estimated on the basis of the same EMK method.

## Benefit Cost Analysis

Based on the above mentioned benefits and cost estimations, the economic analysis of the Project was made. **Table 12.11- 7** shows the benefit – cost analysis of the New Airport Access Road Construction Project during project life period of 20 years and **Table 12.11- 8** shows the benefit cost stream. The results of the economic analysis show that a Net Present Value (NPV) of ₱ 759 million and BCR of 3.92 over 20 years life of the Bridge using a discount date of 15% which is designated by the NEDA. The Economic Internal Rate of Return (EIRR) was compiled at 34.5%.

**TABLE 12.11- 7 ECONOMIC INDICATIONS OF BENEFIT COST ANALYSIS**

| | |
|---|---|
| **Net Present Value** | **P 759 million** |
| **BCR** | **3.92** |
| **EIRR** | **38.3 %** |

*Notes: 1) Project life is assumed to be 20 years*
*2) Discount rate ids 15%*

## TABLE 12.11-8 BENEFIT - COST STREAM OF NEW AIRPORT ROAD CONSTRUCTION PROJECT

**Undiccounted BenefiT Cost Stream**

000 Pesos

| Sq | Year | Construction Cost | O & M Cost | Cost Total | Benefit | Cost-Benefit |
|---|---|---|---|---|---|---|
| 1 | 2004 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2005 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2006 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 2007 | 30,900.0 | 0.0 | 30,900.0 | 0.0 | -30,900.0 |
| 5 | 2008 | 90,300.0 | 0.0 | 90,300.0 | 0.0 | -90,300.0 |
| 6 | 2009 | 90,300.0 | 0.0 | 90,300.0 | 0.0 | -90,300.0 |
| 7 | 2010 | 174,755.0 | 0.0 | 174,755.0 | 0.0 | -174,755.0 |
| 8 | 2011 | 174,755.0 | 0.0 | 174,755.0 | 0.0 | -174,755.0 |
| 9 | 2012 | 0.0 | 906.0 | 906.0 | 311,044.7 | 310,138.7 |
| 10 | 2013 | 0.0 | 911.0 | 911.0 | 323,256.4 | 322,345.4 |
| 11 | 2014 | 0.0 | 916.0 | 916.0 | 339,715.2 | 338,799.2 |
| 12 | 2015 | 0.0 | 922.0 | 922.0 | 357,094.0 | 356,172.0 |
| 13 | 2016 | 0.0 | 927.0 | 927.0 | 375,446.4 | 374,519.4 |
| 14 | 2017 | 0.0 | 932.0 | 932.0 | 400,524.2 | 399,592.2 |
| 15 | 2018 | 0.0 | 938.0 | 938.0 | 427,563.9 | 426,625.9 |
| 16 | 2019 | 0.0 | 943.0 | 943.0 | 456,731.1 | 455,788.1 |
| 17 | 2020 | 0.0 | 949.0 | 949.0 | 540,233.4 | 539,284.4 |
| 18 | 2021 | 0.0 | 954.0 | 954.0 | 583,209.7 | 582,255.7 |
| 19 | 2022 | 0.0 | 960.0 | 960.0 | 587,841.7 | 586,881.7 |
| 20 | 2023 | 0.0 | 965.0 | 965.0 | 603,875.8 | 602,910.8 |
| 21 | 2024 | 0.0 | 971.0 | 971.0 | 620,390.6 | 619,419.6 |
| 22 | 2025 | 0.0 | 976.0 | 976.0 | 637,400.7 | 636,424.7 |
| 23 | 2026 | 0.0 | 981.0 | 981.0 | 654,921.6 | 653,940.6 |
| 24 | 2027 | 0.0 | 987.0 | 987.0 | 672,968.9 | 671,981.9 |
| 25 | 2028 | 0.0 | 992.0 | 992.0 | 691,558.6 | 690,566.6 |
| 26 | 2029 | 0.0 | 998.0 | 998.0 | 710,707.7 | 709,709.7 |
| 27 | 2030 | 0.0 | 1,003.0 | 1,003.0 | 730,433.1 | 729,430.1 |
| 28 | 2031 | 0.0 | 1,009.0 | 1,009.0 | 750,752.8 | 749,743.8 |

**Diccounted BenefiT Cost Stream**

000 Pesos

| Sq | Year | Discounted | Construction Cost | O & M Cost | Cost Total | Benefit | Cost-Benefit |
|---|---|---|---|---|---|---|---|
| 1 | 2004 | 1.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2005 | 1.150 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2006 | 1.323 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 2007 | 1.521 | 20,317.3 | 0.0 | 20,317.3 | 0.0 | -20,317.3 |
| 5 | 2008 | 1.749 | 51,629.3 | 0.0 | 51,629.3 | 0.0 | -51,629.3 |
| 6 | 2009 | 2.011 | 44,895.1 | 0.0 | 44,895.1 | 0.0 | -44,895.1 |
| 7 | 2010 | 2.313 | 75,551.4 | 0.0 | 75,551.4 | 0.0 | -75,551.4 |
| 8 | 2011 | 2.660 | 65,696.9 | 0.0 | 65,696.9 | 0.0 | -65,696.9 |
| 9 | 2012 | 3.059 | 0.0 | 296.2 | 296.2 | 101,681.1 | 101,384.9 |
| 10 | 2013 | 3.518 | 0.0 | 259.0 | 259.0 | 91,889.6 | 91,630.6 |
| 11 | 2014 | 4.046 | 0.0 | 226.4 | 226.4 | 83,972.4 | 83,746.0 |
| 12 | 2015 | 4.652 | 0.0 | 198.2 | 198.2 | 76,754.9 | 76,556.7 |
| 13 | 2016 | 5.350 | 0.0 | 173.3 | 173.3 | 70,173.6 | 70,000.3 |
| 14 | 2017 | 6.153 | 0.0 | 151.5 | 151.5 | 65,096.4 | 64,944.9 |
| 15 | 2018 | 7.076 | 0.0 | 132.6 | 132.6 | 60,427.0 | 60,294.4 |
| 16 | 2019 | 8.137 | 0.0 | 115.9 | 115.9 | 56,129.7 | 56,013.8 |
| 17 | 2020 | 9.358 | 0.0 | 101.4 | 101.4 | 57,731.9 | 57,630.5 |
| 18 | 2021 | 10.761 | 0.0 | 88.7 | 88.7 | 54,195.3 | 54,106.6 |
| 19 | 2022 | 12.375 | 0.0 | 77.6 | 77.6 | 47,500.6 | 47,423.0 |
| 20 | 2023 | 14.232 | 0.0 | 67.8 | 67.8 | 42,431.5 | 42,363.7 |
| 21 | 2024 | 16.367 | 0.0 | 59.3 | 59.3 | 37,906.0 | 37,846.7 |
| 22 | 2025 | 18.822 | 0.0 | 51.9 | 51.9 | 33,865.5 | 33,813.6 |
| 23 | 2026 | 21.645 | 0.0 | 45.3 | 45.3 | 30,257.8 | 30,212.5 |
| 24 | 2027 | 24.891 | 0.0 | 39.7 | 39.7 | 27,036.1 | 26,996.4 |
| 25 | 2028 | 28.625 | 0.0 | 34.7 | 34.7 | 24,159.1 | 24,124.4 |
| 26 | 2029 | 32.919 | 0.0 | 30.3 | 30.3 | 21,589.6 | 21,559.3 |
| 27 | 2030 | 37.857 | 0.0 | 26.5 | 26.5 | 19,294.6 | 19,268.1 |
| 28 | 2031 | 43.535 | 0.0 | 23.2 | 23.2 | 17,244.7 | 17,221.5 |
| | | Total | 258,090.0 | 2,199.5 | 260,289.5 | 1,019,337.4 | 759,047.9 |

| | |
|---|---|
| **Net Present Value** | **759,048** |
| **B/C Ratio** | **3.916** |
| **EIRR** | **38.3** |

### (2) Sensitivity Analysis

The sensitivity analysis is conducted under a worse case scenario incorporating increase and/or decrease of the estimation of costs and benefits. **Table 12.11-9** shows the results of the sensitivity analysis.

**TABLE 12.11- 9 SENSITIVITY ANALYSIS REGARDING COSTS AND BENEFITS OF NEW AIRPORT ACCESS ROAD CONSTRUCTION PROJECT**

| | | Indicator | Benefits | | |
|---|---|---|---|---|---|
| | | | 20% down | Base Case | 20% up |
| Costs | 20% down | NPV (P million) | 607 | 811 | 1,015 |
| | | B/C Ratio | 3.92 | 4.90 | 5.87 |
| | | EIRR (%) | 38.3 | 43.7 | 48.4 |
| | Base Case | NPV (P million) | 555 | 759 | 962 |
| | | B/C Ratio | 3.13 | 3.92 | 4.70 |
| | | EIRR (%) | 33.4 | 38.3 | 42.6 |
| | 20% up | NPV (P million) | 503 | 707 | 911 |
| | | B/C Ratio | 2.61 | 3.26 | 3.98 |
| | | EIRR (%) | 29.8 | 34.3 | 38.3 |

*Note: Project life of the project is assumed to be 20 years*

### (3) Summary of Economic Analysis

The implementation of the New Airport Access Road construction project can be justified from view of national economic point since the economic indicators of all cases more than the over cut-off level which can be considered as 15% of EIRR in the Philippines.

## 12.11.2 Technical Evaluation

Since there is no major problem to construct the New Airport Access Road, the construction of this Access Road is technically feasible.

## 12.11.3 Other Impacts

1) On Traffic

Table 12.11-10 shows the transport efficiency of Metro Bacolod in cases of with and without the New Airport Access road.

**TABLE 12.11-10(1) TRAFFIC VOLUME WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT**

Unit: PCU/day

| | 2010 | | | 2022 | | |
|---|---|---|---|---|---|---|
| | W/O Project | W/ project | | W/O Project | W/. Project | |
| | Existing Coastal Road | NAA Road | Existing Coastal Road | Existing Coastal Road | NAA Road | Existing Coastal Road |
| **Section 1** (Bacolod Circumferential Road – Talisay Concepcion Road) | 52,700 | 18,800 | 34,700 | 80,4000 | 28,100 | 56,900 |
| **Section 2** (Talisay Concepcion Road – Catabla Concepcion Road) | 45,400 | 18,000 | 27,300 | 68,200 | 26,300 | 44,500 |
| **Section 3** (Catabla Conception Road – Silay Guimbalaon Road) | 41,100 | 16,500 | 24,600 | 64,700 | 26,000 | 38,700 |

*Note: It is assumed that all sections of the New Airport Access Road is opened in 2010.*

**TABLE 12.11-10(2) TRAVEL SPEED WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT**

Unit: Km/Hr

| | 2010 | | | 2022 | | |
|---|---|---|---|---|---|---|
| | W/O Project | W/ project | | W/O Project | W/. Project | |
| | Existing Coastal Road | NAA Road | Existing Coastal Road | Existing Coastal Road | NAA Road | Existing Coastal Road |
| **Section 1** (Bacolod Circumferential Road – Talisay Concepcion Road) | 32.7 | 53.4 | 42.8 | 23.2 | 43.3 | 30.6 |
| **Section 2** (Talisay Concepcion Road – Catabla Conception Road) | 36.9 | 54.2 | 46.4 | 26.4 | 45.4 | 37.4 |
| **Section 3** (Catabla Concepcion Road – Silay Guimbalaon Road) | 39.3 | 55.6 | 47.6 | 27.6 | 45.7 | 40.6 |

*Note: Same note as Table 12.11-10(1)*

**TABLE 12.11-10(3) TRAVEL TIME WITH AND WITHOUT R-4 BYPASS ROAD CONSTRUCTION PROJECT**

Unit: Min

| | 2010 | | | 2022 | | |
|---|---|---|---|---|---|---|
| | W/O Project | W/ project | | W/O Project | W/. Project | |
| | Existing Coastal Road | NAA Road | Existing Coastal Road | Existing Coastal Road | NAA Road | Existing Coastal Road |
| Section 1 (Bacolod Circumferential Road – Talisay Concepcion Road) | 6.1 | 4.4 | 4.7 | 8.7 | 5.5 | 6.6 |
| Section 2 (Talisay Concepcion Road – Catabla Concepcion Road) | 1.9 | 2.0 | 1.5 | 22.6 | 2.4 | 1.8 |
| Section 3 (Catabla Concepcion Road – Silay Guimbalaon Road) | 9.0 | 4.7 | 7.4 | 12.8 | 5.7 | 8.7 |
| Total | 17.0 | 11.1 | 13.6 | 24.1 | 13.6 | 17.1 |

*Note: Same note as Table 12.11-10(1)*

**TABLE 12.11-10 (4) TRANSPORT EFFICIENCY IN METRO BACOLOD WITH AND WITHOUT NEW AIRPORT ACCESS ROAD**

| | | 2010 | 2016 | 2022 |
|---|---|---|---|---|
| PCU Kilometers ('000) | W/O Project | 3,158<br>(1.00) | 4,025<br>(1.00) | 5,179<br>(1.00) |
| | W/ Project | 3,138<br>(0.99) | 4,012<br>(0.99) | 5,141<br>(0.99) |
| PCU Hours ('000) | W/O Project | 111.3<br>(1.00) | 159.9<br>(1.00) | 236.3<br>(1.00) |
| | W/ Project | 109.4<br>(0.98) | 149.1<br>(0.93) | 217.8<br>(0.92) |
| Average Travel Speed (km / h) | W/O Project | 28.4<br>(1.00) | 25.2<br>(1.00) | 21.9<br>(1.00) |
| | W/ Project | 28.6<br>(1.01) | 26.9<br>(1.07) | 23.6<br>(1.08) |
| Vehicle Operating Cost (P '000 /day) | W/O Project | 21,754<br>(1.00) | 35,885<br>(1.00) | ]49,686<br>(1.00) |
| | W/ Project | 21,574<br>(0.99) | 34,589<br>(0.96) | 47,391<br>(0.95) |

*Note: Same note as Table 12.11-10 (1)*

**2) On Urban Amenity**

Traffic volume on the existing Bacolod Coastal Road will be greatly reduced because airport traffic and traffic along the this Access Road are mostly diverted to the New Airport Access Road. Therefore, noise level, air quality and vibration in the area of the existing Bacolod Coastal Road will be greatly improved. Thus, urban amenity will be improved.

**3) On Urbanization**

Urbanization will be guided and supported by the New Airport Access road. According to the urbanization index calculated in Section 11.2 of the Master Plan, urbanization index (RUa) along this road corridor will be able to calculate to be almost 80 %. With the existing road network with this road, sound urbanization will be achieved.

**4) On Regional Economy**

With the improved and reliable transport facility, economic activities within the influence area will be stimulated. The project will contribute to economic growth of not only Metro Bacolod but also region VI.

### 12.11.4 Overall Evaluation

As motioned above, the implementation of the New Airport Access Road construction project can be justified from view of economic, technical, and social impact points.