7. DETAILED DESIGN OF CABANATUAN BYPASS

- ***Design Policy***

The detailed design policy of the Cabanatuan Bypass includes: (a) providing importance to traffic mobility, (b) segregation of through traffic with the local traffic by providing frontage roads, (c) providing at-grade intersections considering the road network, (d) providing connections on either side of the bypass using underpasses for vehicles and pedestrians/farmers, and (e) providing an all-weather bridge crossing streams, rivers and irrigation canals.

- ***Alignment***

The bypass alignment including the locations of intersections and bridges are shown in the accompanying figure while the scope of civil works are summarized below:

CABANATUAN BYPASS CIVIL WORKS SCOPE		
Total Length of Bypass, km		34.25
Road Length Without Frontage Road, km		32.24
Bridge Length, km		2.01
Frontage Road Length, km		6.91
New Access Roads, km		2.40
At-grade Intersection Positions	Major	10
	Minor	30
	Under Box	20
Drainage	RCPC	223
	RCBC	28

SECTION GEOMETRY				
Section	*Road Width With Frontage Road*		*Road Width W/O Frontage Road*	
	Initial Stage	Ultimate Stage	Initial Stage	Ultimate Stage
Main Carriageway, m	2 @3.5 = 7.0	4 @ 3.5 = 14.0	2 @ 3.5 = 7.0	4 @ 3.5 = 14.0
Frontage Road, m	-	4 @ 3.0 = 12.0	-	-
Shoulder, m	2 @2.5 = 5.0	2 @ 2.0 = 4.0	2 @ 2.5 = 5.0	2 @ 2.5 = 5.0
Center Median, m	-	1 @ 2.0 = 2.0	-	1 @ 2.0 = 2.0
Separator Median, m	-	2 @ 2.0 = 4.0	-	-
Sidewalk, m	-	2 @ 2.0 = 4.0	-	-
Gravel Road, m	2 @ 4.0 = 8.0	-	1 @ 4.0 = 4.0	-
ROW	50.0	50.0	35.0	35.0

- ***Intersections***

The Cabanatuan Bypass has 60 intersections. The intersections are designed based on the forecasted directional traffic volumes, the class of crossing roads, the intervals of intersections and the road networks. The major intersections basically provide through and exclusive left/right turn movements while the minor intersections provide shared lanes for the approach of a crossing road.

- ***Drainage***

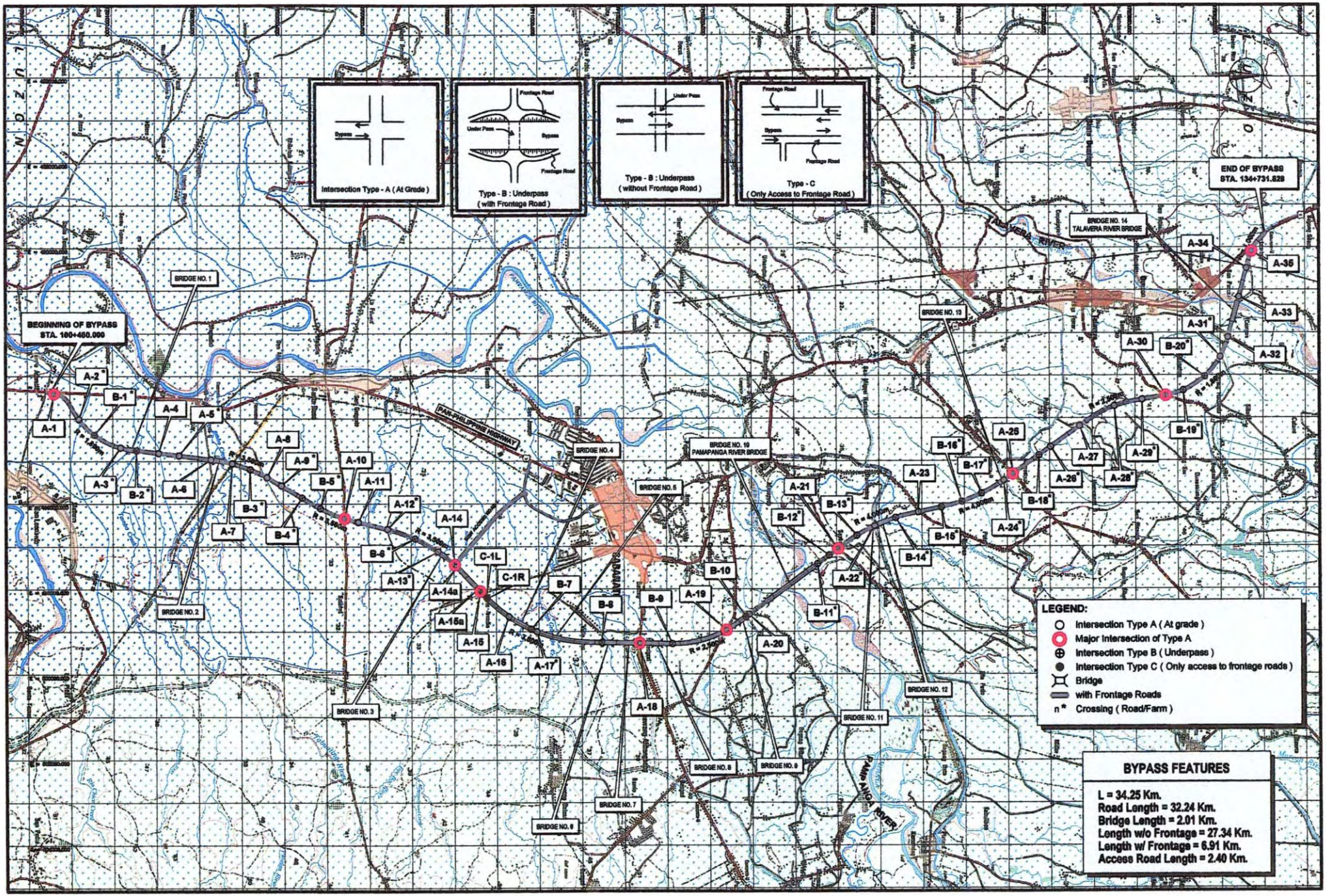
The cross-drainage structures in the form of pipe and box culverts are provided for the bypass considering: (a) the locations defined by the catchment areas, (b) the locations of existing irrigation channels, and (c) the provision of cross-pipes in flat terrains where water flow direction cannot be defined.

- ***Bridges***

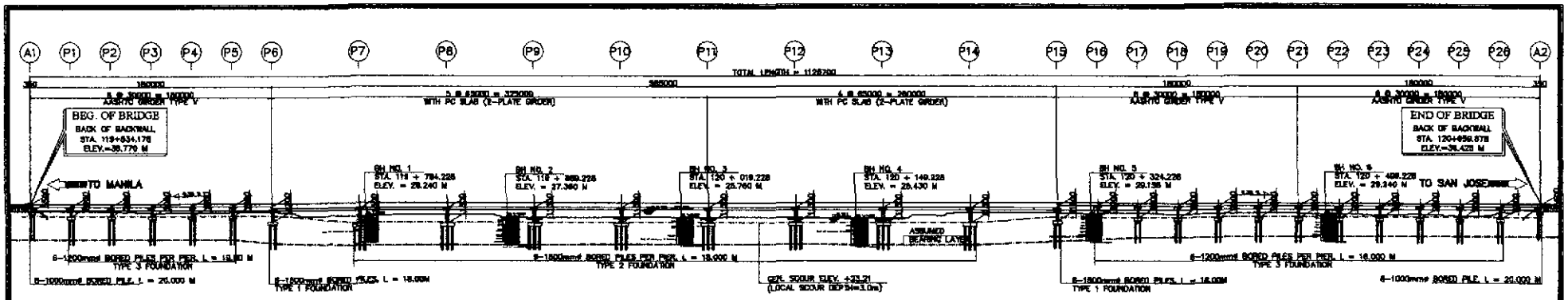
The bridge requirements for the bypass totals 2,002m long with the features described below:

BRIDGES FOR CABANATUAN BYPASS							
BRIDGE NO.	*TYPE OF WATERWAY*	*STATION*	*BRIDGE TYPE*	*NO. SPANS*	*LENGTH (m)*	*FOUNDATION TYPE*	*REMARKS*
1	River	102+925.552	PCDG	2	51.26	RCP 450 x 450	NORMAL
2	River	104+998.326	PCDG	3	63.86	RCP 450 x 450	NORMAL
3	River	110+672.232	PCDG	1	35.86	RCP 450 x 450	NORMAL
4	River	113+177.17	PCDG	1	24.66	RCP 450 x 450	SKEWED 15°
5	River	114+076.990	PCDG	1	24.66	RCP 450 x 450	SKEWED 15°
6	River	115+304.626	PCDG	1	31.66	RCP 450 x 450	SKEWED 10°
7	Irrigation	115+790.758	RCS	3	32.66	RCP 400 x 400	SKEWED 10°
8	River	116+448.026	PCDG	1	31.86	RCP 450 x 450	SKEWED 15°
9	River	118+582.028	PCDG	3	61.86	RCP 450 x 450	NORMAL
10	River	119+534.178	PCDG/2SPG	27	1,125	CCP ϕ 1200 & CCP ϕ 1500	PAMPANGA RIVER
11	Irrigation	122+359.060	PCDG	1	35.86	RCP 450 x 450	NORMAL
12	River	122+581.666	PCDG	4	102.46	RCP 450 x 450	SKEWED 15°
13	Irrigation	125+614.096	PCDG	1	20.66	RCP 450 x 450	SKEWED 10°
14	River	119+534.178	PCDG	9	360	CCP ϕ 1500	TALAVERA RIVER

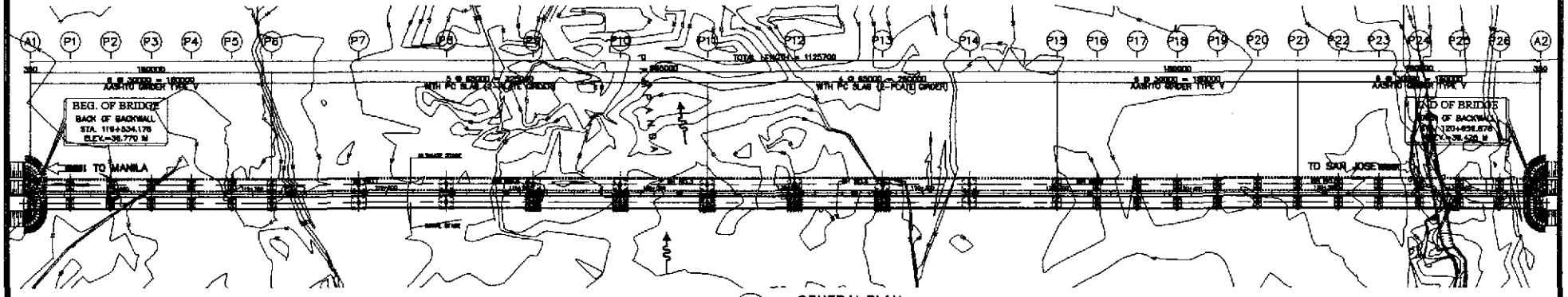
RCDG : Reinforced Concrete Deck Girder
PCDG : Prestressed Concrete Deck Girder
PCBG : Prestressed Concrete Box Girder
2SPG : 2 - Steel Plate Girder
RCP : Precast Reinforced Concrete Pile
CCP : Cast-in-Place Concrete Pile
RCS : Reinforced Concrete Slab
B.P. : Bored Pile



ALIGNMENT OF CABANATUAN BYPASS



A GENERAL ELEVATION
SCALE 1:3000



B GENERAL PLAN
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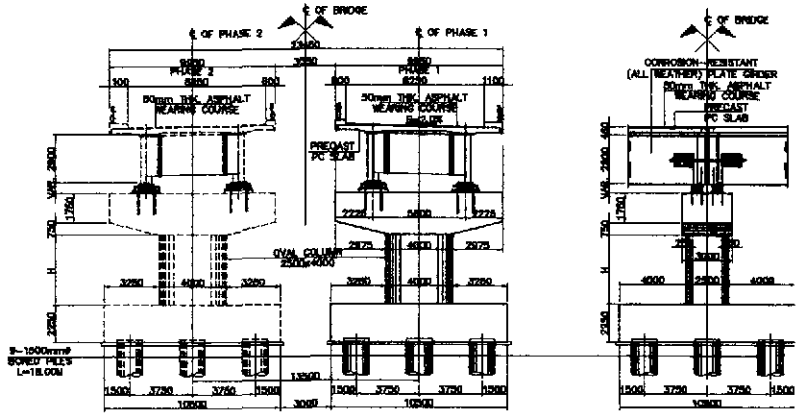
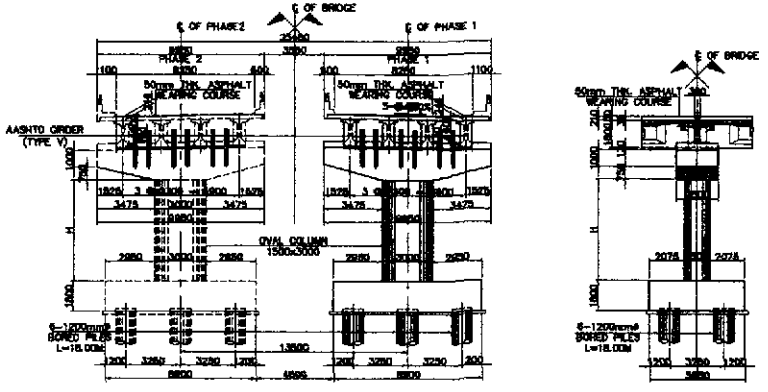
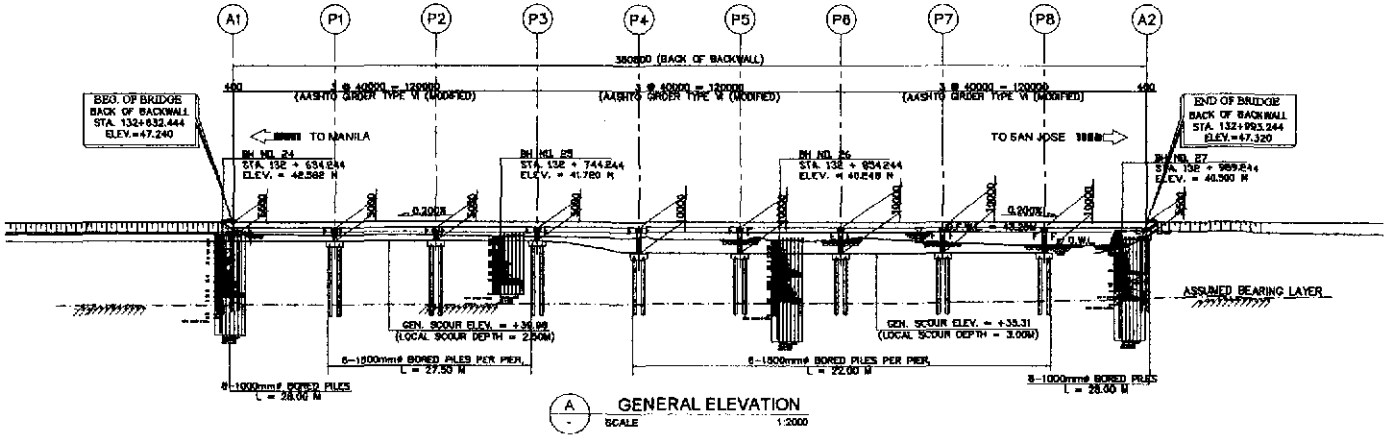


C SECTION @ MAIN BRIDGE
SCALE 1:300

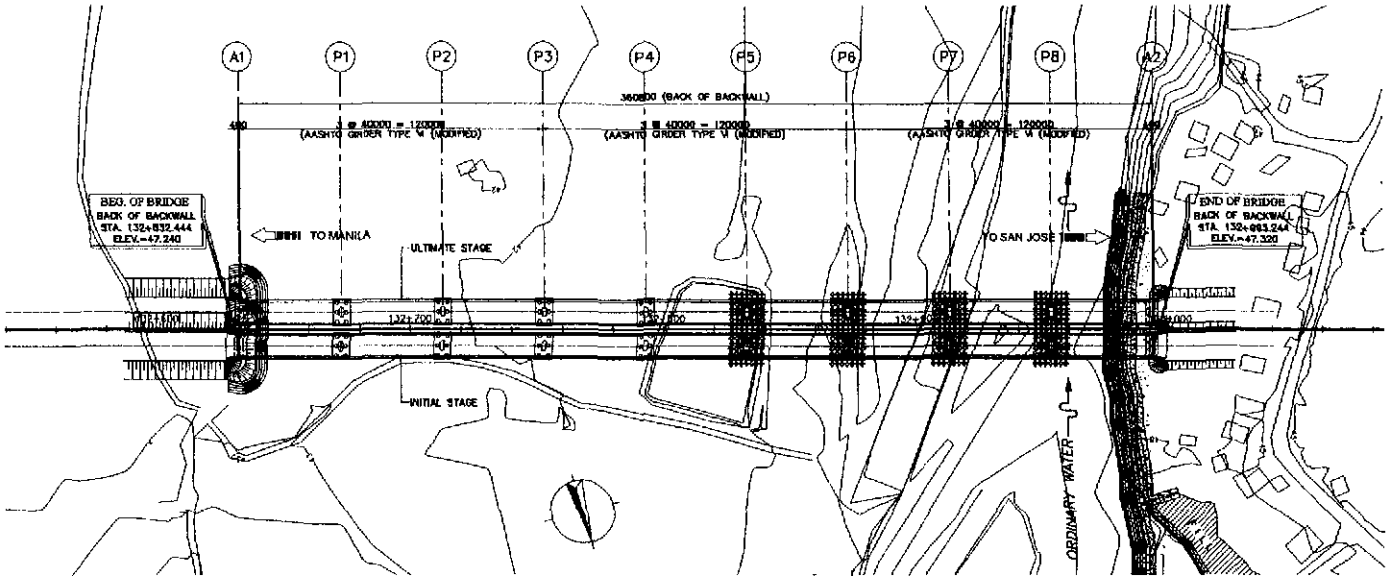


D SECTION @ APPROACH BRIDGE
SCALE 1:300

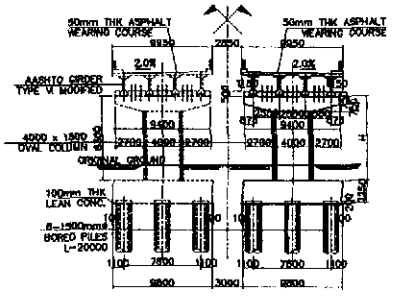
PROPOSED PAMPANGA RIVER BRIDGE CROSSING



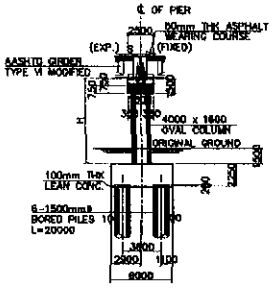
A GENERAL ELEVATION
SCALE 1:2000



B GENERAL PLAN
SCALE 1:2000



C PIER SECTION
SCALE 1:500



D SIDE ELEVATION
SCALE 1:500

PROPOSED TALAVERA RIVER BRIDGE

8. DETAILED DESIGN OF SAN JOSE BYPASS

- ***Design Policy***

The detailed design policy of the San Jose Bypass includes: (a) providing importance to traffic mobility, (b) providing an exclusive tricycle/bike roads divided by 2.5m wide island barriers from the main carriageway, (c) providing at-grade intersections considering the overall road network, and (d) prohibiting the small/slow vehicles such as tricycles and bikes from entering the main carriageway.

- ***Alignment***

The bypass alignment including the locations of intersections and the required bridges are shown in the accompanying figure while the scope of civil works are summarized below:

SAN JOSE BYPASS CIVIL WORKS SCOPE		
Total Length of Bypass, km		7.98
Road Length, km		7.80
Bridge Length, km		0.18
Bike Road Length, km		7.16
New Access Roads, km		-
At-grade Intersection Positions	Major	3
	Minor	8
Drainage	RCPC	57
	RCBC	12

SECTION GEOMETRY		
Section	***Road Width With Bike Road***	
	Initial Stage	**Ultimate Stage**
Main Carriageway, m	2 @ 3.5 = 7.0	2 @ 3.5 = 7.0
Bike Road, m	-	2 @ 3.5 = 7.0
Shoulder, m	2 @ 2.5 = 5.0	2 @ 2.0 = 4.0
Center Median, m	0.5	0.5
Separator Median, m	-	2 @ 2.5 = 5.0
Sidewalk, m	-	2 @ 2.0 = 4.0
Gravel Road, m	2 @ 4.0 = 8.0	-
ROW	35.0	35.0

- ***Intersections***

The San Jose Bypass has 11 intersections. The intersections are designed based on the forecasted directional traffic volumes, the class of crossing roads, the interval of intersections and the road networks. The major intersections basically provide through and exclusive left/right turn movements while the minor intersections provide shared lanes for the approach of a crossing road.

- ***Drainage***

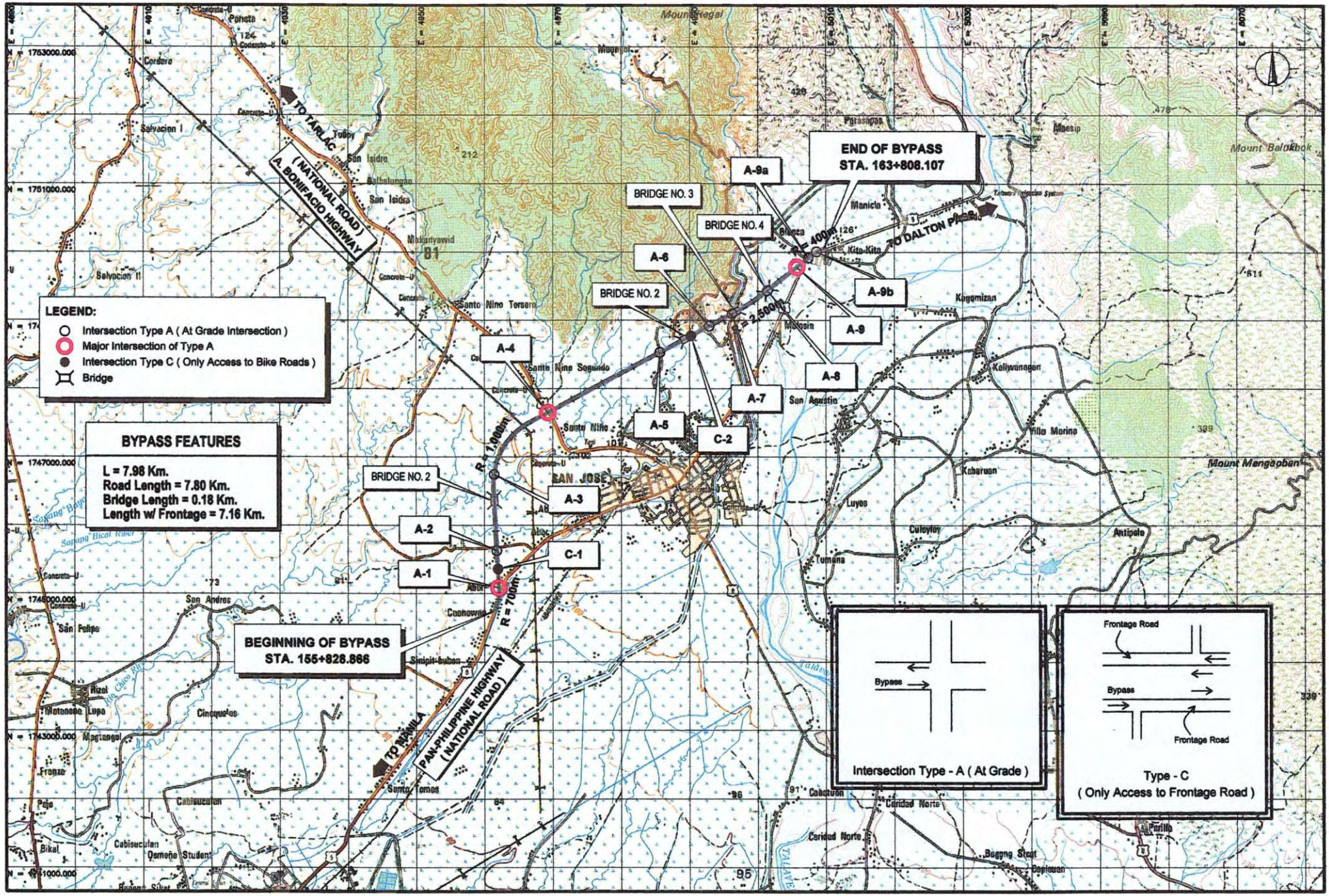
The cross-drainage structures in the form of pipe and box culverts are provided in the bypass considering: (a) the locations defined by the catchment areas, (b) the locations of existing irrigation channels, and (c) the provision of cross-pipes in flat terrains where water flow direction cannot be defined.

- ***Bridges***

The bridge requirements for the bypass totals 176m long with the basic features described below:

BRIDGES FOR SAN JOSE BYPASS							
BRIDGE NO.	*TYPE OF WATERWAY*	*STATION*	*BRIDGE TYPE*	*NO. SPANS*	*LENGTH (m)*	*FOUNDATION TYPE*	*REMARKS*
1	River	157+454.400	PCDG	1	40.86	SPREAD FTG / B.P. 800 ϕ	NORMAL
2	River	161+374.000	PCDG	1	40.86	SPREAD FTG / B.P. 800 ϕ	NORMAL
3	Irrigation	162+222.709	PCDG/RCDG	1	40.86 / 54.66	SPREAD FTG / B.P. 800 ϕ	NORMAL SKEWED 16°
4	River	162+782.020	RCDG	3	53.16	RCP 400 x 400	SKEWED 15°

RCDG : Reinforced Concrete Deck Girder
PCDG : Prestressed Concrete Deck Girder
PCBG : Prestressed Concrete Box Girder
2SPG : 2 - Steel Plate Girder
RCP : Precast Reinforced Concrete Pile
CCP : Cast-in-Place Concrete Pile
RCS : Reinforced Concrete Slab
B.P. : Bored Pile



ALIGNMENT OF SAN JOSE BYPASS

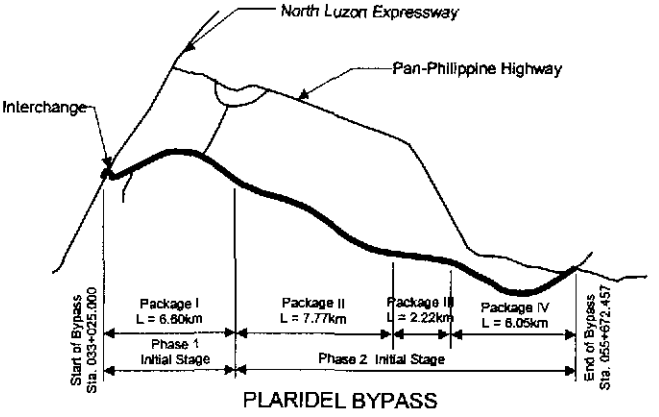
9. CONTRACT PACKAGING AND CONSTRUCTION PLAN

9.1 Contract Packaging

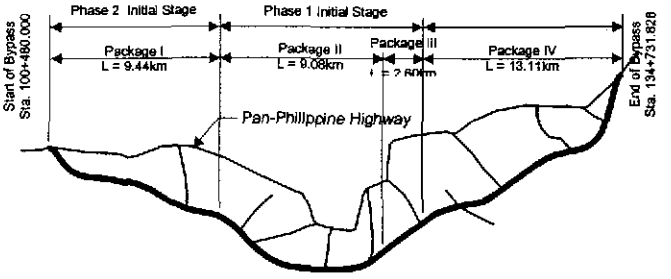
The division of the project into contract packages considered the following:

- construction period
- construction cost
- type of work
- material hauling route

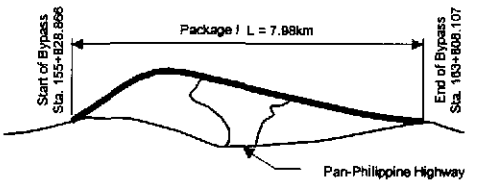
CONTRACT PACKAGE OF CIVIL WORKS FOR THE INITIAL STAGE			
Bypass Name	Contract Package No.	Length (km)	Major Work
PLARIDEL BYPASS	I	6.60	Interchange Without frontage road section
	II	7.50	With short frontage road section
	III	2.50	Angat river bridge
	IV	5.87	With frontage road section
CABANATUAN BYPASS	I	9.44	Without frontage road section
	II	8.70	With frontage road section
	III	2.60	Pampanga river bridge
	IV	13.11	Without frontage road Talavera river bridge
SAN JOSE BYPASS	I	7.98	With bicycle road section



PLARIDEL BYPASS



CABANATUAN BYPASS



SAN JOSE BYPASS

9.2 Construction Plan

- **Basic Principles**
  - The construction work shall be done in accordance with the DPWH Standard Specifications (1995) and the conditions of the Environmental Compliance Certificate.
  - The construction plan shall be based on the scope of contract packages including resource allocation, work breakdown structure and workable days.
  - The relocation of existing utilities, detours for existing roads and diversion of irrigation canals shall be planned to minimize the construction duration, costs and negative impacts.

- **Material Source and Disposal**

  The information on material sources were obtained from the DPWH regional and district offices and the DENR regional offices. The considerations for the borrow material sources includes the condition of access road and the hilly areas with no trees. The disposal of unsuitable materials is taken to be within 5km radius.

- **Construction Schedule and Method**

  The construction schedule and construction method for each of the contract packages is prepared based on the specific site conditions taking into account the following conditions: (a) least impact/no damage to existing nearby structures, (b) the distance of hauling for borrow materials, (c) the connection of bypasses with the Pan-Philippine highway and the North Luzon Expressway, and (d) the access road connections. The construction methodology for the different work items shall basically follow the specifications while the procedures for special structures including bridges are shown on the plans. Construction of the bridge substructures shall be done during the dry season and the periods of low water to minimize temporary works and craneway requirements.

10. PROJECT COST ESTIMATE

10.1 Construction Cost

The construction costs of the different packages for the three bypasses are estimated as follows:

CONSTRUCTION COST

Unit: Million ₱ at August 2002 Prices

Bypass	Contract Package	Phase I of Initial Stage	Phase II of Initial Stage	Ultimate Stage	Total
Plaridel Bypass	I	684.7	-		
	II	-	436.5		
	III	-	700.7		
	IV	-	251.9		
	Sub-total	684.7	1,389.1	1,404.3	3,478.1
Cabanatuan Bypass	I	-	486.5		
	II	723.3	-		
	III	734.9	-		
	IV	-	818.9		
	Sub-total	1,458.2	1,305.4	1,882.1	4,645.7
San Jose Bypass	I	-	431.9	257.0	688.9
Total		2,142.9	3,126.4	3,543.4	8,812.7

Note: Exchange Rate : US$ 1.00 = ₱52.28 = ¥ 120.18 as of 23 August 2002

10.2 Consultancy Services Cost

The Consultancy Services costs for the Pre-construction Stage and the Construction Supervision Stage are summarized in the Table below:

Unit: Million ₱ at August 2002 Prices

Construction Stage		Pre-construction Stage	Construction Supervision Stage	Total
Initial Stage	Phase I	21.4	212.6	234.0
	Phase II	30.8	296.7	327.5
	Total	52.2	509.3	561.5
Ultimate Stage		34.1	319.3	353.4

10.3 ROW Acquisition Cost

The ROW acquisition costs for the different packages of the three bypasses are estimated as follows:

Unit: Million ₱ at August 2002 Prices

Stage	Bypass	Contract Package	Land Area (ha.)	ROW Acquisition Cost (Million ₱)		
				Cost of Land	Compensation Cost	Total
Phase I of Initial Stage	Plaridel	I	26.39	125.10	17.62	142.72
	Cabanatuan	II	45.93	143.76	23.90	167.66
		III	15.58	16.75	5.77	22.52
	Sub-total		77.90	285.61	47.29	332.90
Phase II of Initial Stage	Plaridel	II	25.96	51.97	6.95	58.92
		III	4.58	55.06	18.62	73.68
		IV	30.90	129.71	9.96	139.67
	Cabanatuan	I	32.31	60.83	6.56	67.39
		IV	44.35	47.96	32.26	80.22
	San Jose	I	32.41	31.78	17.85	49.63
	Sub-total		170.51	377.31	92.20	469.51
Total			248.41	662.92	139.49	802.41

Note: The ROW acquisition will be completed at the Initial Stage.

10.4 Total Project Cost

The total project costs of the Initial and Ultimate Stages of the project are estimated as follows:

Unit: Million ₱ at August 2002 Prices

Cost Item	Initial Stage		Ultimate Stage	Total
	Phase I	Phase II		
Construction Cost	2,142.9	3,126.4	3,543.4	8,812.7
Consultancy Services Cost	234.0	327.5	353.4	914.9
ROW Acquisition Cost	332.9	469.5	-	802.4
Total	2,709.8	3,923.4	3,896.8	10,530.0

11. PREQUALIFICATION AND TENDER DOCUMENTS

11.1 Prequalification Documents

The prequalification documents for the project are organized into the following:

- **INVITATION TO PREQUALIFY AND BID** — invitation by GOP to apply for Prequalification and to bid
- **PREQUALIFICATION DOCUMENTS**

PART I: INSTRUCTION AND CONDITIONS FOR PREQUALIFICATION

SECTION	*TITLE*	*CONTENTS*
1	INTRODUCTION	Presents the project background, project description, major work items, and estimated construction duration and implementation schedule.
2	INSTRUCTION TO APPLICANT	Explains the scope of bid, preparation and submission of applications, eligibility of applicants, prequalification criteria, joint ventures, conflict of interest, updating of prequalification information, financial conditions, bid security and guarantee.
3	EVALUATION PROCEDURE	Summarizes the objectives of evaluation, evaluation procedure, evaluation criteria, evaluation of joint ventures, consideration of litigation history, review and concurrence by the funding institution and other particular requirements.
4	GENERAL INFORMATION	Describes the project site location, topography and geography, climate and meteorology, drawings and typical cross sections of the project.
5	PREQUALIFICATIONS	Shows the arrangement and sequence of documents, type of forms and annexes to be used, and the required legal, technical and financial information to be submitted.

PART II: APPLICANT'S CONFIDENTIAL STATEMENT FORMS FOR PREQUALIFICATION — Presents the prescribed forms and annexes to be completed and submitted by the Applicant

PART III: APPENDICES — Shows the relevant Department Orders

11.2 Tender Documents

The tender documents for each package consist of the following five volumes:

VOLUME	*TITLE*	*CONTENTS*
I	PROPOSAL BOOK	Invitation for Bids, Project Background/Description, Instruction to Bidders, Bid Form and Appendices to Bid, Bill of Quantities, Annexes, Daywork Schedule and Draft of Contract Agreement and Sample Forms
II	CONDITIONS OF CONTRACT	Part I – General Conditions of Contracts, FIDIC 1st Edition 1999 Part II – Conditions of Particular Application
III	TECHNICAL SPECIFICATIONS	Part I – DPWH Standard Specifications, 1995 Part II – Supplemental Specifications and Special Provisions
IV	CONTRACT PLANS AND DRAWINGS	Design and Construction Drawings
V	SUPPLEMENTAL NOTICES AND ADDENDA TO THE BIDDING DOCUMENTS	Notices/Addenda to bid documents

12. ENVIRONMENTAL IMPACT ASSESSMENT

12.1 Project Scoping

The **Technical Scoping (Level I)** for the proposed Plaridel, Cabanatuan, and San Jose Bypasses was held on 28 May 2001 at the Environmental Management Bureau (EMB) Conference Room. The **Formal Scoping Sessions (Level II)** were held on the following dates: 15 June, 2001, for the San Jose Bypass; 16 June 2001 for the Cabanatuan Bypass, and 23 June 2001 for the Plaridel Bypass. All these formal scoping sessions were well represented and attended by the stakeholders in the respective impact areas.

12.2 Brief Description of the Project Environment

The **Plaridel Bypass** alignment generally traverses level to very gently sloping areas. The lowland landscape is concentrated along the western, northwestern, and southwestern municipalities of the province including Balagtas, Guiguinto, Plaridel, Bustos, and San Rafael. The proposed **Cabanatuan Bypass** alignment generally traverses a level to very gently sloping topography. It traverses the Municipalities of San Leonardo and Sta.Rosa, the City of Cabanatuan, and the Municipality of Talavera. Level to very gently sloping topography predominates the single City traversed by the San Jose Bypass.

Common among the three bypasses is the high bacteriological content of the water samples collected from selected rivers, creeks, and irrigation canals crossed by alignment, specifically coliform. This can be very well explained by the presence of agricultural lands with patches of human habitation that drain into these water bodies; i.e., from fertilizers and other organic wastes (human and animal excreta).

In terms of ambient air quality, the highest amount of suspended particulate matter was recorded at Sta. 2, of the Plaridel Bypass, which is more than five times the standard TSP limit (300 $\mu g/m^3$) set by the DENR. The sampling results for the rest of the stations at the Plaridel Bypass, as well as for those at the Cabanatuan and San Jose bypasses showed that the observed level of air pollutants such as SOx, NOx, and particulate matters (TSP) are way below the permissible limit.

In terms of biological aspects, there are no endangered, rare, or endemic flora species encountered along the three bypass alignments. The high degree of disturbance in the project sites plus the absence of forest, natural marshes and other good quality wildlife habitats explain the low species diversity, low incidence of endemism, and abundance of generalist species.

In terms of social acceptability; based on a 100% interview of the directly affected communities, a very high 70.8% of the respondents expressed full support to the proposed Plaridel Bypass; 70.8% for the Cabanatuan Bypass, and a very high 90.9% for the proposed San Jose Bypass.

12.3 Environmental Impact Identification, Assessment & Mitigation

Listed in the following table are considered as the most significant among the predicted environmental impacts for the three bypass sections. The corresponding mitigation and enhancement measures are provided on the right side of these impacts.

MOST SIGNIFICANT IMPACTS AND MITIGATION/ENHANCEMENT MEASURES

Impacts	Mitigation/Enhancement Measures
The newly constructed bypass roads will ensure continuous flow of commodity; ease the traffic along the Pan-Philippine Highway particularly in urban areas; and reduce transport costs due to improved traffic flow (long term, positive).	The DPWH will continuously keep its regular maintenance activities to ensure optimal service and benefits to the road users.
There would be a significant reduction in the levels of gaseous emissions and noise in urban areas along the Pan-Philippine Highway as a result of the diversion of thru traffic to the newly constructed bypass roads; (long term, positive).	To further improve the quality of air and reduce noise levels along the existing Pan-Philippine Highway and the LGUs with relatively high local traffic volume, the respective LGUs must implement a sound traffic management plan and strictly enforce existing traffic rules and regulations.
Displacement of Project-Affected-Families (PAFs), (long term, negative).	Just compensation will be accorded to landowners in accordance with the existing DPWH ROW Acquisition Guidelines.
Possible illegal conversion of prime agricultural land into residential / commercial or any other purposes (long term, negative).	The concerned Municipal Councils will pass a resolution or zoning ordinance prohibiting the conversion of prime agricultural areas along the newly constructed bypass roads into any other uses.
Disruption of irrigation water services of farmlands adjacent to the construction areas due to construction of culverts and/or bridges (short term, negative).	Temporary culverts and irrigation channels will be provided to the farmers to ensure continuous supply of irrigation water.
Farmers may experience difficulty in terms of accessibility to the farmland they are cultivating, at areas where the bypass splits cultivated lands into opposite sides of the alignment (long term, negative).	Farmers will be provided with culverts as crossing for carabaos and other farm implements such as hand tractors and threshers.

12.4 Right-of-Way Acquisition Plan

The impact on the stakeholders would mainly be in terms of loss of residential lots, idle open areas, and agricultural land. The number of houses to be relocated for each bypass is shown below:

NUMBER OF HOUSES TO BE RELOCATED FOR EACH BYPASS

Bypass	Number of Houses
Plaridel Bypass	130
Cabanatuan Bypass	160
San Jose Bypass	37
TOTAL	**327**

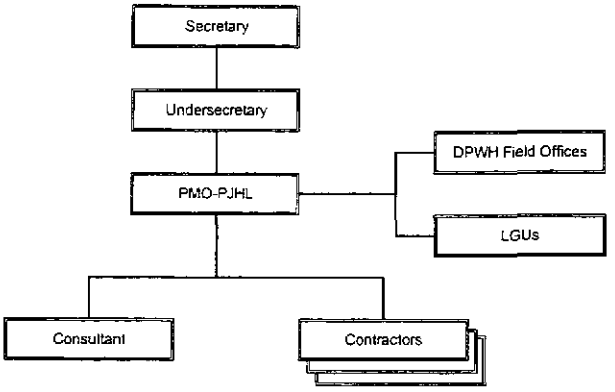
The computation of compensation rates and entitlements are based on the existing guidelines on R-O-W Acquisition. Payment to the PAFs will be in terms of improvements and disturbance compensation only. These include payments for : (i) structures (residential and commercial); (ii) fruit and forest trees; and (iii) disturbance compensation. Payments shall also include compensation to damages to improvements, which are mainly fences and trees, as well as transitional allowance to cover for income loss during the period the businesses were interrupted, without exceeding one (1) month. The amount of transitional allowance will later be determined by the DPWH.

13. IMPLEMENTATION PROGRAM

13.1 Implementing Agency

The Department of Public Works and Highways (DPWH) is the implementing agency for the project. PMO-PJHL will be the executing office.

13.2 Implementation Organization



Project Implementation Organization

13.3 Stage Construction

In view of the funding requirements and the DPWH framework, a two-staged construction plan is recommended for all bypasses. During the Initial Stage, a 2-lane carriageway bypass is proposed to be constructed which will be widened to a 4-lane bypass at the Ultimate Stage. Furthermore, the Initial Stage will be implemented in two phases in consideration of the time required for the road right-of-way acquisition.

13.4 Implementation Schedule and Annual Fund Requirement

Based on the fund availability and stage construction, the Implementation Schedule is prepared as follows:

OVERALL IMPLEMENTATION SCHEDULE

				YEAR											
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Parcellary Survey																
ROW Acquisition		Phase I														
		Phase II														
Phase I of Initial Stage	Selection of Consultant															
	Consultancy Services															
	Selection of Contractor															
	Const-ruction	Plaridel	CP-I													
		Cabana-tuan	CP-II													
			CP-III													
Phase II of Initial Stage	Selection of Consultant															
	Consultancy Services															
	Selection of Contractor															
	Const-ruction	Plaridel	CP-II													
			CP-III													
			CP-IV													
		Cabana-tuan	CP-I													
			CP-IV													
		San Jose														
Ultimate Stage	Selection of Consultant															
	Consultancy Services															
	Selection of Contractor															
	Const-ruction	Plaridel														
		Cabanatuan														
		San Jose														
Annual Fund Requirement (Million ₱)				66.5	140.3	147.3	873.5	1,047.9	1,474.4	1,408.8	1,474.5	10.7	21.4	1,194.7	1,334.9	1,335.1

14. PROJECT EVALUATION

14.1 Effect of the Project on Traffic

The traffic volume on the existing Pan-Philippine Highway and the bypass is as follows:

Note : Average Daily Traffic Volume in PCU per day

Bypass	Condition	Year 2010 (Initial Stage)	Year 2015 (Ultimate Stage)	Year 2020 (Ultimate Stage)
Plaridel Bypass	Without : Pan-Phil.Highway	20,100	24,700	30,700
	With : Pan-Phil.Highway	11,900	13,900	17,200
	: Bypass	26,100	42,000	53,400
Cabanatuan Bypass	Without : Pan-Phil.Highway	26,200	31,000	36,800
	With : Pan-Phil.Highway	12,200	12,200	18,900
	: Bypass	25,100	35,400	41,600
San Jose Bypass	Without : Pan-Phil.Highway	37,400	44,000	52,400
	With : Pan-Phil.Highway	19,700	21,700	26,600
	: Bypass	19,800	24,600	30,100

Note : Without – Without the Bypass Project With – With the Bypass Project

The travel speed and travel time reduction is estimated as shown below:

Unit : Minutes

	Bypass	Condition	Year 2010	Year 2015	Year 2020
Travel Time	Plaridel Bypass	Without : Pan-Phil.Highway	51.5	83.9	133.1
		With : Pan-Phil.Highway	36.6	46.9	57.5
		: Bypass	32.7	25.7	28.9
	Cabanatuan Bypass	Without : Pan-Phil.Highway	82.9	120.3	165.2
		With : Pan-Phil.Highway	48.4	54.4	61.1
		: Bypass	44.9	29.5	34.6
	San Jose Bypass	Without : Pan-Phil.Highway	41.4	38.9	82.3
		With : Pan-Phil.Highway	15.0	17.6	20.6
		: Bypass	7.9	11.8	17.2
Travel Time Reduction	Plaridel Bypass	Pan-Phil.Highway Bypass	- 14.9 - 18.8	- 37.0 - 58.2	- 75.6 - 104.2
	Cabanatuan Bypass	Pan-Phil.Highway Bypass	- 34.5 - 38.0	- 65.9 - 90.8	- 104.1 - 130.6
	San Jose Bypass	Pan-Phil.Highway Bypass	- 26.4 - 33.5	- 21.3 - 27.1	- 61.7 - 65.1

Note : Without – Without the Bypass Project With – With the Bypass Project

14.2 Technical Feasibility

Most of proposed works can be completed by the usual construction methods commonly used in the Philippines. The construction of the two long bridges (namely, the Angat River Bridge and the Pampanga River Bridge) requires special techniques. However, the Contractors of the project will be selected through an international competitive bidding. Therefore, even local contractors will have a good chance to win the contract by associating with experienced foreign contractors and can learn new technology from the associated foreign contractor. No technical problem is thus expected in the project implementation.

14.3 Economic Feasibility

The project is highly feasible as shown below:

Economic Indicator	Plaridel Bypass	Cabanatuan Bypass	San Jose Bypass
EIRR (%)	37.5	38.1	76.4
B/C	2.67	4.54	9.76
NPV (Million ₱)	2,903	7,834	2,507

14.4 Financial Feasibility

Since the implementation schedule is planned in due consideration of the financial capability of the DPWH, there will be no problem expected during implementation.

14.5 Environmental Aspect

In general, the urban environment along the existing sections of the Pan-Philippine Highway will be greatly improved. Thus, the expected adverse impact is minimal, but the expected positive impacts are high.

14.6 Social Aspect

A total of 327 families will be affected by the project. All of these families are legal dwellers. The cost of improvement should be properly assessed and a constant dialogue with the affected families is required to obtain their positive outlook/understanding of the Project.

15. RECOMMENDATIONS

Acceleration of the Project Implementation

The Project is urgently needed. However, due to the GOP's financial situation, the prolonged implementation schedule is proposed. If the financial situation improves, the project implementation should be accelerated, particularly Phase II of the Initial Stage as well as the Ultimate Stage.

Early Completion of the ROW Acquisition

The project requires huge land areas to be acquired. Therefore, the project implementation is greatly influenced by the progress of the ROW acquisition. The parcellary survey which is the basis for the ROW acquisition should start as soon as possible. Proper coordination between the DPWH and the concerned LGUs should be made for the ROW acquisition cost estimate.

Early Preparation of Resettlement Action Plan (RAP)

The initial RAP report was prepared under this Study. However, during the parcellary survey, the detailed RAP should be prepared and implemented at the earliest possible time.

Task Force for the ROW Acquisition and the RAP Implementation

The DPWH should organize a special task force comprising of the PMO-PJHL, the DPWH Regional/District Offices and concerned LGUs for the smooth implementation of the ROW acquisition and the RAP implementation.

Strict Control of New Development and Squattering Within the ROW

Any new development along the proposed alignment must be strictly controlled by the concerned LGUs by promulgating the City / Municipality Ordinance and that no building permit shall be issued along the ROW defined by the project.

The ROW required in the Ultimate Stage will be acquired in the Initial Stage, thus there is a possibility that some squatters will stay within the ROW between the period of the Initial Stage and the Ultimate Stage construction. The DPWH Regional Office and the District Engineering Offices, together with concerned LGUs, should strictly control squattering within the ROW.

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DPWH Steering Committee

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