

APPENDIX 13.4-1

1. ANNUAL MAINTENANCE COST PER KM

1.1 Annual Maintenance Cost of Existing Pan-Philippine Highway (per km)

Pavement: AC overlay on PCC      W = 6.7m  
 Gravel shoulder                      W = 1.5~2.0m

Initial Rehabilitation completed in 1996

	Unit Price (P)	Pavement Condition					
		Good		Fair		Bad	
		Quantity	Cost	Quantity	Cost	Quantity	Cost
Pavement							
• Patching (m <sup>2</sup> )	478	13 (0.2%)	6,200	134 (2%)	64,000	335 (5%)	160,000
Gravel Shoulder							
• Gravel Patching (cu.m.)	270	16 (2%)	4,300	16 (2%)	4,300	16 (2%)	4,300
• Regravelling (cu.m.) (once in 10 years t=10cm)	270	40 (10%)	10,800	40 (10%)	10,800	40 (10%)	10,800
Drainage Cleaning (per m) (80m/km x 3 times = 200m)	30	200	6,000	200	6,000	200	6,000
Road Marking / Others (km)	15,000	1	15,000	1	15,000	1	15,000
			42,300 Say 43,000		100,100 Say 101,000		196,100 Say 196,000

Pavement Condition After Rehabilitation

Case 1: Without Bypass

Good 1 year

Fair 1 year

Bad 2 years

Rehabilitation Every 5<sup>th</sup> year

Case 2: With Bypass

Good 3 years

Fair 2 years

Bad 2 years

Rehabilitation Every 8<sup>th</sup> year

Rehabilitation Cost (AC Overlay)

Overlay       $6.7m \times 0.06 \times 1,000m \times 2.35 \times 2,540P = 2.40$  Million P/km

Shoulder      $4.0m \times 0.10 \times 1,000m \times 270P = 0.11$

2.51 Million P/km

## 1.2 Annual Maintenance Cost of Bypass with Frontage Road (per km)

- Plaridel -- Baliuag Bypass (Populated Area)
- Cabanatuan Bypass (Planned Urban Area)

Carriageway Pavement PCC W = 14.0m  
 Shoulder Pavement PCC W = 5.0m  
 Frontage Road PCC W = 11.0m

	Unit Price (P)	Pavement Condition					
		Good		Fair		Bad	
		Quantity	Cost	Quantity	Cost	Quantity	Cost
PCC							
Crack / Joint Sealing	45 (P/m)	300 (30mx10 cracks)	13,500	600 (30mx20 cracks)	27,000	900m (30mx30 cracks)	40,500
Patching	250 (P/m <sup>2</sup> )	0	0	150 (0.5%)	37,500	300 (1%)	75,000
Replacement of Slab	800 (P/m <sup>2</sup> )	0	0	30 (0.1%)	24,000	150 (0.5%)	120,000
Drainage Cleaning							
Side Ditch 4,000mx3times = 12,000m	5 (P/m)	12,000	60,000	12,000	60,000	12,000	60,000
Cross Drainage 160m/kmx 3 times = 540m	30 (P/m)	540	16,200	540	16,200	540	16,200
Tree / Plant Maintenance	10 (P/m)	3,000	30,000	3,000	30,000	3,000	30,000
Road Markings / etc.	40,000 (P/km)	1	40,000	1	40,000	1	40,000
			159,700		234,700		381,700
			Say		Say		Say
			160,000		235,000		382,000

### Pavement Condition After Rehabilitation

Good 7 years  
 Fair 6 years  
 Bad 4 years  
 Rehabilitation at 18<sup>th</sup> year

### Rehabilitation Cost (4-lane)

AC Overlay including shoulder  
 $19\text{m} \times 0.06 \times 1,000\text{m} \times 2.35 \times 2,540 = 6.8 \text{ Million P/km.}$

### 1.3 Annual Maintenance Cost of Bypass Without Frontage Road (per km)

- Plaridel – Baliuag Bypass (Non-populated Area)
- Cabanatuan Bypass (Outskirts of Planned Urban Area)

Carriageway Pavement PCC W = 14.0m

Shoulder Pavement PCC W = 5.0m

	Unit Price (P)	Pavement Condition					
		Good		Fair		Bad	
		Quantity	Cost	Quantity	Cost	Quantity	Cost
PCC							
Crack / Joint Sealing	45	190 (19mx10 cracks)	8,550	380 (19mx20 cracks)	17,100	570 (19mx30 cracks)	25,650
Patching	250	0	0	95 (0.5%)	23,750	190 (1%)	47,500
Replacement of Slab	800	0	0	19 (0.1%)	15,200	95 (0.5%)	76,000
Drainage Cleaning							
Cross Drainage 80m/km X 3 times	30	240	7,200	240	7,200	240	7,200
Trees / Plants Maintenance	10	1,000	10,000	1,000	10,000	1,000	10,000
Road Markings / etc.	30,000	1	30,000	1	30,000	1	30,000
			55,750 Say 56,000		103,250 Say 104,000		196,350 Say 197,000

#### Pavement Condition After Rehabilitation

Good 7 years

Fair 6 years

Bad 4 years

Rehabilitation at 18<sup>th</sup> year

#### Rehabilitation Cost (4-lane)

AC Overlay

6.8 Million P/km.

#### 1.4 Annual Maintenance Cost of Bypass: San Jose Bypass (per km)

Carriageway Pavement PCC W = 8.5m  
 Shoulder Pavement PCC W = 5.0m

	Unit Price (P)	Pavement Condition					
		Good		Fair		Bad	
		Quantity	Cost	Quantity	Cost	Quantity	Cost
<b>PCC</b>							
Crack / Joint Sealing	45	135 (13.5mx10 cracks)	6,075	270 (13.5mx20 cracks)	12,150	405 (13.5mx30 cracks)	18,225
Patching	250	0	0	67.5 (0.5%)	16,875	135 (1.0%)	33,750
Replacement of Slab	800	0	0	13.5 (0.1%)	10,800	67.5 (0.5%)	54,000
<b>Drainage Cleaning</b>							
Side Ditches 2,000m x 3 times = 6,000m	5	6,000	30,000	6,000	30,000	6,000	30,000
Cross Drainage 120mx3 = 360m	30	360	10,800	360	10,800	360	10,800
Tree/Plant Maintenance	10	2,000	20,000	2,000	20,000	2,000	20,000
Road Markings / Others	30,000	1	30,000	1	30,000	1	30,000
			96,875 Say 97,000		130,625 Say 131,000		196,775 Say 197,000

#### Pavement Condition After Rehabilitation

Good 7 years  
 Fair 6 years  
 Bad 4 years  
 Rehabilitation at 18<sup>th</sup> year

#### Rehabilitation Cost (4-lane)

$13.5 \times 0.06 \times 1,000 \times 2.35 \times 2.540 \text{ P} = 4.9 \text{ Million P/km}$

## 2. ANNUAL MAINTENANCE COST OF EACH ROAD

### 2.1 Bypass Annual Maintenance Cost

(Million P)

	Good	Fair	Bad
Plaridel-Baliuag	$0.160 \times 7.5 \text{ km}$ $0.056 \times 13.1 \text{ km}$ = 1.94	$0.235 \times 7.5 \text{ km}$ $0.104 \times 13.1 \text{ km}$ = 3.13	$0.382 \times 7.5 + 0.19$ $\times 13.1 \text{ km}$ = 5.45
Cabanatuan	$0.160 \times 15.8 \text{ km}$ $0.056 \times 12.4 \text{ km}$ = 3.23	$0.235 \times 15.8 \text{ km}$ $0.104 \times 12.4$ = 5.01	$0.382 \times 15.8 \text{ km}$ $0.197 \times 12.4$ = 8.48
San Jose	$0.097 \times 7.2$ = 0.70	$0.131 \times 7.2$ = 0.95	$0.197 \times 7.2$ = 1.42

### 2.2 Existing Pan-Philippine Highway Annual Maintenance Cost

(Million P)

	Good	Fair	Bad
Plaridel-Baliuag (20.7 km)	$0.043 \times 20.7 \text{ km}$ = 0.89	$0.101 \times 20.7 \text{ km}$ = 2.09	$0.196 \times 20.7 \text{ km}$ = 4.06
Cabanatuan (29.6 km)	$0.043 \times 29.6 \text{ km}$ = 1.27	$0.101 \times 29.6 \text{ km}$ = 2.99	$0.196 \times 29.6 \text{ km}$ = 5.80
San Jose (6.6 km)	$0.043 \times 6.6 \text{ km}$ = 0.28	$0.101 \times 6.6 \text{ km}$ = 0.67	$0.196 \times 6.6 \text{ km}$ = 1.29

<u>Cost Component</u>	
Maintenance	
Foreign	50%
Local	40%
Tax	10%

### 3. REHABILITATION COST

#### 3.1 Rehabilitation Cost of Bypass

	Rehabilitation Cost (Million P)	
Plaridel-Baliuag	6.8 x 20.6	= 140.08
Cabanatuan	6.8 x 28.2	= 191.76
San Jose	4.9 x 7.2	= 35.28

#### 3.2 Rehabilitation Cost of Existing Pan-Philippine Highway

	Rehabilitation Cost (Million P)	
Plaridel-Baliuag	2.51 x 20.7	= 51.96
Cabanatuan	2.51 x 29.6	= 74.30
San Jose	2.51 x 6.6	= 16.57

Rehabilitation	
Foreign	60%
Local	28%
Tax	12%

4. MAINTENANCE COST FOR 20 YEARS

4.1 (1) Maintenance Cost: PLARIDEL-BALIUG BYPASS (Without)

July 1999 Prices at Million Pesos

Year	Without (Existing Pan-Philippine Highway)				With (Bypass)			
	F	L	T	Total	F	L	T	Total
2005	-	-	-	-	-	-	-	-
2006	31.18	14.54	6.24	51.96				
2007	0.45	0.35	0.09	0.89				
2008	1.05	0.83	0.21	2.09				
2009	2.03	1.62	0.41	4.06				
2010	2.03	1.62	0.41	4.06				
2011	31.18	14.54	6.24	51.96				
2012	0.45	0.35	0.09	0.89				
2013	1.05	0.83	0.21	2.09				
2014	2.03	1.62	0.41	4.06				
2015	2.03	1.62	0.41	4.06				
2016	31.18	14.54	6.24	51.96				
2017	0.45	0.35	0.09	0.89				
2018	1.05	0.83	0.21	2.09				
2019	2.03	1.62	0.41	4.06				
2020	2.03	1.62	0.41	4.06				
2021	31.18	14.54	6.24	51.96				
2022	0.45	0.35	0.09	0.89				
2023	1.05	0.83	0.21	2.09				
2024	2.03	1.62	0.41	4.06				
2025	2.03	1.62	0.41	4.06				
<b>TOTAL</b>	<b>146.96</b>	<b>75.84</b>	<b>29.44</b>	<b>252.24</b>				

4.1 (2) Maintenance Cost: PLARIDEL-BALUAG BYPASS (With)

July 1999 Prices at Million Pesos

Year	With (Existing Pan-Philippine Highway)				With (Bypass)			
	F	L	T	Total	F	L	T	Total
2005	-	-	-	-	-	-	-	-
2006	2.03	1.62	0.41	4.06	0.97	0.78	0.19	1.94
2007	31.18	14.54	6.24	51.96	0.97	0.78	0.19	1.94
2008	0.45	0.35	0.09	0.89	0.97	0.78	0.19	1.94
2009	0.45	0.35	0.09	0.89	0.97	0.78	0.19	1.94
2010	0.45	0.35	0.09	0.89	0.97	0.78	0.19	1.94
2011	1.05	0.83	0.21	2.09	0.97	0.78	0.19	1.94
2012	1.05	0.83	0.21	2.09	0.97	0.78	0.19	1.94
2013	2.03	1.62	0.41	4.06	1.57	1.25	0.31	3.13
2014	2.03	1.62	0.41	4.06	1.57	1.25	0.31	3.13
2015	31.18	14.54	6.24	51.96	1.57	1.25	0.31	3.13
2016	0.45	0.35	0.09	0.89	1.57	1.25	0.31	3.13
2017	0.45	0.35	0.09	0.89	1.57	1.25	0.31	3.13
2018	0.45	0.35	0.09	0.89	1.57	1.25	0.31	3.13
2019	1.05	0.83	0.21	2.09	2.73	2.17	0.55	5.45
2020	1.05	0.83	0.21	2.09	2.73	2.17	0.55	5.45
2021	2.03	1.62	0.41	4.06	2.73	2.17	0.55	5.45
2022	2.03	1.62	0.41	4.06	2.73	2.17	0.55	5.45
2023	31.18	14.54	6.24	51.96	84.05	39.22	16.81	140.08
2024	0.45	0.35	0.09	0.89	0.97	0.78	0.19	1.94
2025	0.45	0.35	0.09	0.89	0.97	0.78	0.19	1.94
<b>TOTAL</b>	<b>111.49</b>	<b>57.84</b>	<b>22.33</b>	<b>191.66</b>	<b>113.12</b>	<b>62.42</b>	<b>22.58</b>	<b>198.12</b>



4.2(1) Maintenance Cost: CABANATUAN BYPASS (Without)

July 1999 Prices at Million Pesos

Year	Without (Existing Pan-Philippine Highway)				With (Bypass)			
	F	L	T	Total	F	L	T	Total
2005	-	-	-	-	-	-	-	-
2006	44.58	20.80	8.92	74.30				
2007	0.64	0.50	0.13	1.27				
2008	1.50	1.19	0.30	2.99				
2009	2.90	2.32	0.58	5.80				
2010	2.90	2.32	0.58	5.80				
2011	44.58	20.80	8.92	74.30				
2012	0.64	0.50	0.13	1.27				
2013	1.50	1.19	0.30	2.99				
2014	2.90	2.32	0.58	5.80				
2015	2.90	2.32	0.58	5.80				
2016	44.58	20.80	8.92	74.30				
2017	0.64	0.50	0.13	1.27				
2018	1.50	1.19	0.30	2.99				
2019	2.90	2.32	0.58	5.80				
2020	2.90	2.32	0.58	5.80				
2021	44.58	20.80	8.92	74.30				
2022	0.64	0.50	0.13	1.27				
2023	1.50	1.19	0.30	2.99				
2024	2.90	2.32	0.58	5.80				
2025	2.90	2.32	0.58	5.80				
<b>TOTAL</b>	<b>210.08</b>	<b>108.52</b>	<b>42.04</b>	<b>360.64</b>				

4.2(2) Maintenance Cost: CABANATUAN BYPASS (With)

July 1999 Prices at Million Pesos

Year	With (Existing Pan-Philippine Highway)				With (Bypass)			
	F	L	T	Total	F	L	T	Total
2005	-	-	-	-	-	-	-	-
2006	2.90	2.32	0.58	5.80	1.62	1.29	0.32	3.23
2007	44.58	20.80	8.92	74.30	1.62	1.29	0.32	3.23
2008	0.64	0.50	0.13	1.27	1.62	1.29	0.32	3.23
2009	0.64	0.50	0.13	1.27	1.62	1.29	0.32	3.23
2010	0.64	0.50	0.13	1.27	1.62	1.29	0.32	3.23
2011	1.50	1.19	0.30	2.99	1.62	1.29	0.32	3.23
2012	1.50	1.19	0.30	2.99	1.62	1.29	0.32	3.23
2013	2.90	2.32	0.58	5.80	2.51	2.00	0.50	5.01
2014	2.90	2.32	0.58	5.80	2.51	2.00	0.50	5.01
2015	44.58	20.80	8.92	74.30	2.51	2.00	0.50	5.01
2016	0.64	0.50	0.13	1.27	2.51	2.00	0.50	5.01
2017	0.64	0.50	0.13	1.27	2.51	2.00	0.50	5.01
2018	0.64	0.50	0.13	1.27	2.51	2.00	0.50	5.01
2019	1.50	1.19	0.50	2.99	4.24	3.39	0.85	8.48
2020	1.50	1.19	0.30	2.99	4.24	3.39	0.85	8.48
2021	2.90	2.32	0.58	5.80	4.24	3.39	0.85	8.48
2022	2.90	2.32	0.58	5.80	4.24	3.39	0.85	8.48
2023	44.58	20.80	8.92	74.30	115.06	53.69	23.01	191.76
2024	0.64	0.50	0.13	1.27	1.62	1.29	0.32	3.23
2025	0.64	0.50	0.13	1.27	1.62	1.29	0.32	3.23
<b>TOTAL</b>	<b>159.36</b>	<b>82.76</b>	<b>32.10</b>	<b>274.02</b>	<b>161.66</b>	<b>90.86</b>	<b>32.29</b>	<b>284.81</b>

4.3(1) Maintenance Cost: SAN JOSE BYPASS (Without)

July 1999 Prices at Million Pesos

Year	Without (Existing Pan-Philippine Highway)				With (Bypass)			
	F	L	T	Total	F	L	T	Total
2005	0.65	0.51	0.13	1.29				
2006	9.94	4.64	1.99	16.57				
2007	0.14	0.11	0.03	0.28				
2008	0.34	0.26	0.07	0.67				
2009	0.65	0.51	0.13	1.29				
2010	0.65	0.51	0.13	1.29				
2011	9.94	4.64	1.99	16.57				
2012	0.14	0.11	0.03	0.28				
2013	0.34	0.26	0.07	0.67				
2014	0.65	0.51	0.13	1.29				
2015	0.65	0.51	0.13	1.29				
2016	9.94	4.64	1.99	16.57				
2017	0.14	0.11	0.03	0.28				
2018	0.34	0.26	0.07	0.67				
2019	0.65	0.51	0.13	1.29				
2020	0.65	0.51	0.13	1.29				
2021	9.94	4.64	1.99	16.57				
2022	0.14	0.11	0.03	0.28				
2023	0.34	0.26	0.07	0.67				
2024	0.65	0.51	0.13	1.29				
2025								
<b>TOTAL</b>	<b>46.89</b>	<b>24.12</b>	<b>9.40</b>	<b>80.40</b>				

4.3(2) Maintenance Cost: SAN JOSE BYPASS (With)

July 1999 Prices at Million Pesos

Year	With (Existing Pan-Philippine Highway)			With (Bypass)			Total
	F	L	T	F	L	T	
2005	0.65	0.51	0.13	0.35	0.28	0.07	0.70
2006	0.65	0.51	0.13	0.35	0.28	0.07	0.70
2007	9.94	4.64	1.99	0.35	0.28	0.07	0.70
2008	0.14	0.11	0.03	0.35	0.28	0.07	0.70
2009	0.14	0.11	0.03	0.35	0.28	0.07	0.70
2010	0.14	0.11	0.03	0.35	0.28	0.07	0.70
2011	0.34	0.26	0.07	0.35	0.28	0.07	0.70
2012	0.34	0.26	0.07	0.48	0.37	0.10	0.95
2013	0.65	0.51	0.13	0.48	0.37	0.10	0.95
2014	0.65	0.51	0.13	0.48	0.37	0.10	0.95
2015	9.94	4.64	1.99	0.48	0.37	0.10	0.95
2016	0.14	0.11	0.03	0.48	0.37	0.10	0.95
2017	0.14	0.11	0.03	0.48	0.37	0.10	0.95
2018	0.14	0.11	0.03	0.71	0.57	0.14	1.42
2019	0.34	0.26	0.07	0.71	0.57	0.14	1.42
2020	0.34	0.26	0.07	0.71	0.57	0.14	1.42
2021	0.65	0.51	0.13	0.71	0.57	0.14	1.42
2022	0.65	0.51	0.13	21.17	9.88	4.23	35.28
2023	9.94	4.64	1.99	0.35	0.28	0.07	0.70
2024	0.14	0.11	0.03	0.35	0.28	0.07	0.70
2025	-	-	-	-	-	-	-
<b>TOTAL</b>	<b>36.06</b>	<b>18.79</b>	<b>7.24</b>	<b>30.04</b>	<b>16.90</b>	<b>6.02</b>	<b>52.96</b>

## APPENDIX 13.4-2

### Maintenance Budget Based on EMK Systems

Annual Budget = Basic Cost x Traffic Factor x Width Factor

Basic cost = 70,511 P/EMK (Year 1999)

- 1) Existing Pan-Philippine Highway

Budget per Km =  $70,511 \times 1.25 \times 1.0 = \text{P}88,140$

- 2) Plaridel – Baliuag Bypass, Cabanatuan Bypass

#### With Frontage Road

Budget per Km =  $70,511 \times 1.15 \times 2.05 = \text{P}166,230$

#### Without Frontage Road

Budget per Km =  $70,511 \times 1.15 \times 1.6 = \text{P}129,740$

- 3) San Jose Bypass

Budget per Km =  $70,511 \times 1.15 \times 1.15 = \text{P}93,250$

AADT assumed to be 15,000 – 20,000.

## **APPENDIX 14**

- **14.3-1 Vehicle Operating Cost and Travel Time Cost by Speed**
- **14.4-1 Cash Flow of Cost and Benefit of Bypass**



**Appendix 14.3-1 VEHICLE OPERATING COST AND TRAVEL TIME COST BY SPEED**

**(1) Car, Jeep, Van, Pick-up**

Speed(Km/hr)	VOCD	VOCT	TTC	Total
10	2,858	2,624	2,812	8,295
20	2,665	1,482	1,406	5,554
30	2,525	971	937	4,434
40	2,436	692	703	3,832
50	2,408	522	562	3,493
60	2,427	409	469	3,304
70	2,508	330	402	3,240
80	2,644	273	352	3,268
90	2,855	229	312	3,397

**(2) Jeepney**

Speed(Km/hr)	VOCD	VOCT	TTC	Total
10	2,727	2,698	10,276	15,701
20	2,547	1,524	5,138	9,208
30	2,411	1,053	3,425	6,890
40	2,320	794	2,569	5,683
50	2,292	632	2,055	4,979
60	2,302	521	1,713	4,535
70	2,360	441	1,468	4,269
80	2,487	382	1,284	4,154
90	2,708	338	1,142	4,188

**(3) Bus**

Speed(Km/hr)	VOCD	VOCT	TTC	Total
10	7,886	7,333	41,017	56,236
20	7,364	4,474	20,508	32,346
30	7,034	3,226	13,672	23,932
40	6,889	2,505	10,254	19,648
50	7,110	2,047	8,203	17,360
60	7,500	1,731	6,836	16,068
70	8,148	1,510	5,860	15,517
80	9,241	1,358	5,127	15,726
90	11,113	1,267	4,557	16,937

**(4) Truck**

Speed(Km/hr)	VOCD	VOCT	TTC	Total
10	10,600	8,672	0	19,272
20	9,045	5,068	0	14,113
30	7,911	3,497	0	11,408
40	7,194	2,615	0	9,810
50	7,154	2,072	0	9,226
60	7,505	1,711	0	9,216
70	8,379	1,463	0	9,842
80	10,043	1,298	0	11,340
90	12,987	1,199	0	14,186

**(5) Tricycle**

Speed(Km/hr)	VOCD	VOCT	TTC	Total
10	978	1,573	987	3,538
20	889	804	494	2,187
30	830	533	329	1,693
40	799	396	247	1,441
50	801	313	197	1,312
60	828	258	165	1,250
70	881	219	141	1,241
80	966	190	123	1,279
90	1,093	167	110	1,370



Appendix 14.4-1 Cash Flow of Cost and Benefit of Bypass Project (1/3)

(1) Base Case

Year	Cash Flow			Discounted CF at 15%			Net CF
	Cost	Benefit	Net CF	Cost	Benefit	Net CF	
2000	97.3	0.0	-97.3	97.3	0.0	-97.3	-97.3
2001	229.5	0.0	-229.5	199.5	0.0	-199.5	-199.5
2002	445.7	0.0	-445.7	337.0	0.0	-337.0	-337.0
2003	1217.2	0.0	-1217.2	800.3	0.0	-800.3	-800.3
2004	1426.5	0.0	-1426.5	815.6	0.0	-815.6	-815.6
2005	856.3	122.3	-734.0	425.7	60.8	-384.9	-384.9
2006	58.0	523.4	465.4	25.1	226.3	201.2	201.2
2007	7.5	802.3	794.8	2.8	301.6	298.8	298.8
2008	747.3	1081.1	333.8	244.3	353.4	109.1	109.1
2009	1487.2	1359.9	-127.3	422.8	386.6	-36.2	-36.2
2010	1487.2	1683.8	196.6	367.6	416.2	48.6	48.6
2011	14.9	2086.8	2071.9	3.2	448.5	445.3	445.3
2012	14.9	2444.6	2429.7	2.8	456.9	454.1	454.1
2013	14.9	2802.5	2787.6	2.4	455.5	453.1	453.1
2014	14.9	3160.4	3145.5	2.1	446.7	444.5	444.5
2015	14.9	3518.3	3503.4	1.8	432.4	430.5	430.5
2016	14.9	3876.2	3861.3	1.6	414.2	412.6	412.6
2017	14.9	4234.0	4219.1	1.4	393.4	392.1	392.1
2018	14.9	4591.9	4577.0	1.2	371.0	369.8	369.8
2019	14.9	4949.8	4934.9	1.0	347.8	346.8	346.8
2020	14.9	5307.7	5292.8	0.9	324.3	323.4	323.4
Residual	-4793.6	0.0	4793.6	-292.9	-	292.9	292.9
Total	3415.0	42545.0	39130.0	3463.6	5835.7	2372.1	2372.1

IRR	22.0%
NPV	2372.1
B/C	1.68

(2) If Expressway is not developed ...

Year	Cash Flow			Discounted CF at 15%			Net CF
	Cost	Benefit	Net CF	Cost	Benefit	Net CF	
2000	97.3	0	-97.3	97.3	0.0	-97.3	-97.3
2001	229.5	0	-229.5	199.5	0.0	-199.5	-199.5
2002	445.7	0	-445.7	337.0	0.0	-337.0	-337.0
2003	1217.2	0	-1217.2	800.3	0.0	-800.3	-800.3
2004	1426.5	0	-1426.5	815.6	0.0	-815.6	-815.6
2005	856.3	122.3	-734.0	425.7	60.8	-364.9	-364.9
2006	58.0	523.4	465.4	25.1	226.3	201.2	201.2
2007	7.5	802.3	794.8	2.8	301.6	298.8	298.8
2008	747.3	1081.1	333.8	244.3	353.4	109.1	109.1
2009	1487.2	1359.9	-127.3	422.8	386.6	-36.2	-36.2
2010	1487.2	1871.5	384.3	367.6	462.6	95.0	95.0
2011	14.9	5253.9	5239.0	3.2	1129.3	1126.1	1126.1
2012	14.9	8564.4	8549.5	2.8	1600.7	1598.0	1598.0
2013	14.9	11874.9	11860.0	2.4	1930.0	1927.6	1927.6
2014	14.9	15185.4	15170.5	2.1	2146.1	2144.0	2144.0
2015	14.9	18495.8	18480.9	1.8	2273.0	2271.2	2271.2
2016	14.9	21806.3	21791.4	1.6	2330.3	2328.7	2328.7
2017	14.9	25116.8	25101.9	1.4	2334.0	2332.6	2332.6
2018	14.9	28427.3	28412.4	1.2	2297.1	2295.9	2295.9
2019	14.9	31737.8	31722.9	1.0	2230.1	2229.0	2229.0
2020	14.9	35048.3	35033.4	0.9	2141.5	2140.5	2140.5
Residual	-4793.6	0.0	4793.6	-292.9	-	292.9	292.9
Total	3415.0	207271.4	203856.4	3463.6	22203.4	18739.8	18739.8

IRR	37.6%
NPV	18739.8
B/C	6.41

Appendix 14.4-1 Cash Flow of Cost and Benefit of Bypass Project (2/3)

(3) Plaridel – Baliuag

Year	Cash Flow		Discounted CF at 15%		Net CF
	Cost	Benefit	Cost	Benefit	
2000	42.8	0.0	42.8	0.0	-42.8
2001	118.9	0.0	103.4	0.0	-103.4
2002	228.4	0.0	172.7	0.0	-172.7
2003	535.5	0.0	352.1	0.0	-352.1
2004	612.5	0.0	350.2	0.0	-350.2
2005	459.4	51.9	228.4	25.8	-202.6
2006	23.8	288.5	10.3	124.7	114.4
2007	3.1	473.2	1.1	177.9	176.7
2008	307.4	657.9	100.5	215.1	114.6
2009	611.7	842.5	173.9	239.5	65.6
2010	611.7	1147.4	151.2	283.6	132.4
2011	6.1	1347.2	1.3	289.6	288.3
2012	6.1	1427.0	1.1	266.7	265.6
2013	6.1	1506.8	1.0	244.9	243.9
2014	6.1	1586.6	0.9	224.2	223.4
2015	6.1	1666.3	0.7	204.8	204.0
2016	6.1	1746.1	0.7	186.6	185.9
2017	6.1	1825.8	0.6	169.7	169.1
2018	6.1	1905.6	0.5	154.0	153.5
2019	6.1	1985.4	0.4	139.5	139.1
2020	6.1	2065.1	0.4	126.2	125.8
Residual	-1650.5	0.0	-100.8	-	100.8
Total	1965.6	20523.3	1593.3	3072.7	1479.4

IRR	24.6%
NPV	1479.4
B/C	1.93

(4) Cabanatuan

Year	Cash Flow		Discounted CF at 15%		Net CF
	Cost	Benefit	Cost	Benefit	
2000	51.9	0.0	51.9	0.0	-51.9
2001	99.0	0.0	86.0	0.0	-86.0
2002	189.2	0.0	143.1	0.0	-143.1
2003	555.7	0.0	365.4	0.0	-365.4
2004	555.7	0.0	317.7	0.0	-317.7
2005	396.9	29.9	197.3	14.9	-182.5
2006	32.6	164.5	14.1	71.1	57.0
2007	4.4	263.1	1.7	98.9	97.3
2008	439.9	361.9	143.8	118.3	-25.5
2009	875.5	460.6	248.9	130.9	-117.9
2010	875.5	595.2	216.4	147.1	-69.3
2011	8.8	518.5	1.9	111.4	109.5
2012	8.8	863.4	1.6	161.4	159.7
2013	8.8	1208.4	1.4	196.4	195.0
2014	8.8	1553.3	1.2	219.5	218.3
2015	8.8	1898.3	1.1	233.3	232.2
2016	8.8	2243.1	0.9	239.7	238.8
2017	8.8	2588.1	0.8	240.5	239.7
2018	8.8	2933.0	0.7	237.0	236.3
2019	8.8	3278.1	0.6	230.3	229.7
2020	8.8	3623.0	0.5	221.4	220.8
Residual	-1436.0	0.0	-87.7	-	87.7
Total	2728.3	22582.4	1709.4	2672.2	962.8

IRR	20.3%
NPV	962.8
B/C	1.56

Appendix 14.4-1 Cash Flow of Cost and Benefit of Bypass Project (3/3)

(5) San Jose

(Mill.Peso)

Year	Cash Flow		Discounted CF at 15%	
	Cost	Benefit	Cost	Benefit
2000	2.7	0.0	2.7	0.0
2001	11.6	0.0	10.1	0.0
2002	28.0	0.0	21.2	0.0
2003	126.0	0.0	82.9	0.0
2004	258.3	0.0	147.7	0.0
2005	1.5	13.7	0.7	6.8
2006	1.5	74.0	0.7	32.0
2007	1.5	120.7	0.6	45.4
2008	1.5	167.4	0.5	54.7
2009	1.5	214.0	0.4	60.8
2010	1.5	251.1	0.4	62.1
2011	1.5	258.2	0.3	55.5
2012	1.5	274.8	0.3	51.4
2013	1.5	291.4	0.3	47.4
2014	1.5	308.1	0.2	43.5
2015	1.5	324.7	0.2	39.9
2016	1.5	341.3	0.2	36.5
2017	1.5	358.0	0.1	33.3
2018	1.5	374.6	0.1	30.3
2019	1.5	391.2	0.1	27.5
2020	1.5	407.9	0.1	24.9
Residual	-165.4	0.0	-10.1	-
Total	285.9	4170.7	259.6	651.8
				392.2

IRR	28.6%
NPV	392.2
B/C	2.51

## **APPENDIX 15**

- **15.2-1 ROW Acquisition Procedures for Legal Occupants**
- **15.2-2 Resettlement Plan for Informal Settlers on Public Land (Squatters)**
- **15.2-3 Constraints on the Implementation of Resettlement Plan**



## APPENDIX 15.2-1

### R-O-W ACQUISITION PROCEDURES FOR LEGAL OCCUPANTS

The following summary of R-O-W Acquisition Procedures (Purchase Option) is based on the DPWH Ministry Order No. 65, Series of 1983, entitled, "Revised guidelines on the acquisition and payment of right-of-way for public works and highways projects".

**Step 1:** A **Contract of Sale** is executed between the Government (vendee) and the property Owner (vendor).

The basis of price would be:

- (i) For lots and improvements acquired before promulgation of P. D. 76, just compensation shall be determined by the Appraisal Committee, using all available information and records of sale at the time of taking, but in no case shall such price exceed the market value as determined by the Assessor pursuant to P. D. 76;
- (ii) For lots and improvement acquired between 1974 and 1978, the basis shall be the price determined by the Assessor, as appearing in the tax declaration issued pursuant to P. D. 76, or the current market price as stated in the sworn statement filed by the owner on or before October 31, 1973 pursuant to P. D. 76, whichever is lower;
- (iii) For properties acquired between 1979 and 1981, the basis shall be the current market value as appearing in the tax declaration issued by the Assessor for the year 1979 or the current market value as declared by the owner in a sworn statement filed on or before August 15, 1977 pursuant to P. D. 464, whichever is lower;
- (iv) For properties acquired between 1982 and 1984, the basis shall be the current market value as appearing in the tax declaration issued by the Assessor in 1982 or the current market value declared by the owner in a sworn statement filed on or before June 30, 1980 pursuant to the provisions of P. D. 1621, whichever is lower;
- (v) In cases where the owners failed to file a sworn statement, a certification of non-filing should be secured from the Assessor concerned in addition to the Affidavit executed by the owner to attest his failure to file such sworn statement.

**Step 2** When a Project is already approved for implementation during a specified calendar year, the officials in charge with the R-O-W acquisition shall immediately gather all tax declarations and the corresponding sworn statements of owners relative to all lots and improvements affected by such construction.

**Step 3** The *owners of the property* shall be notified in writing, and the just compensation to be paid for the affected properties shall be based on the tax declaration or the sworn statement filed and existing at the time the notice was given, and not at the time the actual construction shall commence.

**Step 4** The **Deed of Sale** is prepared.

Requirements and Conditions to be Complied With in the Preparation of the Deed of Sale:

- (i) If the subject property is registered or titled, the vendor must be the registered owner of the said property and must possess a clear and clean title under the *Torrens System*, free of any lien and encumbrances whatsoever. A photocopy of the title forms part of the Deed;
- (ii) If the subject property is unregistered or untitled, the vendor must submit a certified true copy of the tax declaration and an indemnity bond, which must either be a surety bond or property bond. Either of these bonds shall remain in force until the government obtained the corresponding title to the subject property;
- (iii) If the owner of a property is a corporation, a certified copy of the resolution of the governing board of such corporation or partnership, authorizing any of its officers to execute the deed shall be attached to the said deed. In the case of a partnership, the managing partner should execute the deed;
- (iv) If the owner is already deceased, the heirs must first consolidate their ownership of the property either thru court proceedings or thru an extra-judicial settlement, subject to the provisions of Rule 74 of the New Rules of Court;
- (v) If the property is under guardianship or administratorship, approval by the proper court of the deed of sale executed by the guardian or administrator/executor must first be secured. The corresponding Letters of Administratorship and/or Guardianship should be submitted as an integral part of the Deed;
- (vi) If the property being sold was acquired under the Public Land Act, the government shall be entitled to a twenty (20) meters strip free under Section 112 of CA 141, or sixty (60) meters strip under P. D. 635 (January 7, 1975);
- (vii) If it appears that the property is subject to the provisions of Section 4 Rule 74 of the New Rules of Court and the period of two (2) years from the registration of the consolidation or settlement has not yet expired, an indemnity bond (either surety or property bond), conditioned for the payment of any adverse claim against the

property filed within the said period of two (2) years, should be posted;

- (viii) If the vendor is represented by an Attorney-In-Fact, the corresponding special power of Attorney should be attached to, and made an integral part of the deed of sale. If the vendor is residing abroad at the time of the sale, such special power of attorney should be duly attested by the Philippine Consulate of the country where the vendor resides;
- (ix) Where the subject property is mortgaged, the consent of the mortgagee to sale of the said property, or release of the mortgage must first be secured;
- (x) If the property is a conjugal property, a deed of conveyance or sale must be executed in the proper form by the parties concerned, specifically describing the property to be sold. The marital consent of the spouse of the owner-vendor should generally be indicated in the deed; the deed of conveyance must be witnessed by at least two persons and if the vendor affixed his signature by thumb mark, same should be witnessed by two additional persons;
- (xi) All Realty Estate taxes due on the property must have been paid as evidenced by a tax clearance certificate issued by the proper authority;
- (xii) The accountant concerned should also witness the contract, and his signature shall be considered as constituting a certification that funds for the purpose is available (LOI 968);
- (xiii) The papers and documents submitted in support of the claim in every case should be carefully verified as to their authenticity and genuineness in order to forestall fraud.

**Step 5** A **certificate as to the availability of funds** in the proper form, duly verified by the Auditor concerned, indicating the particular source and nature of the funds to be used in payment of the **consideration** of the sale, must be secured and attached to the Deed (Section 607, Revised Administrative Code and Section 86 of P. D. 1445);

**Step 6** The Right-of-Way Engineer, in addition to verifying the ownership of the lot to be purchased, as well as any encumbrance to which such lot may have been subjected to, should likewise **verify and inspect the actual lot to be purchased to determine** whether the classification made by the Assessor is in accordance with the actual use of the property (Section 19, P. D. 464). A certification to this effect should be issued by the Right-of-Way Engineer;



- Step 7** The Deed of Sale is signed by the Owner of the property, the District Engineer/Project Manager/ and or Regional Director
- Step 8** The signed Deed of Sale is brought to the DPWH for approval of the Secretary
- Step 9** Approved Deed of Sale is then registered with the Register of Deeds of the Bulacan and Nueva Ecija or at the concerned municipalities where the property is located. The title of the property shall be annotated at the back if only a portion of the property is purchased by the government. If the whole property was purchased by the government, the old title will be cancelled and a new one shall be issued to the government.
- Step 10** Payment of Claims

Conditions/Requirements Prior to Release of Payment

- (i) Payment of lots should be effected only after the corresponding Deed of Sale had already been registered with the Register of Deeds concerned and *Torrens Title* to the subject lot is already vested in the name of the government. For parcel of lands partially affected, payments should be effected only after the corresponding Deed of Sale had already been annotated at the back of the title of the subject lot;
- (ii) If the Deed of Conveyance was not signed by the owner but was signed by his duly and legally constituted agent, the owner should also be notified in writing of the amount due him as payment of his property. Accordingly, the treasury warrant or check for the payment of said property should be drawn in favor of the registered owner;
- (iii) Officials or employees responsible for releasing checks or warrants should require positive identification of the payee before releasing these checks or warrants;

*Note: District/City and Regional Offices as well as Project Management Offices of the DPWH shall act on the claim within forty eight (48) hours from the time of receipt. Should there be no sufficient funds to pay all claims presented with complete documents and ready for payment, the smaller claims should be given priority in payment; and in case the amount of claim are equal, priority of payment shall be based on the period/date the property/lot was taken by the government.*

## APPENDIX 15.2-2

### RESETTLEMENT PLAN FOR INFORMAL SETTLERS ON PUBLIC LAND (SQUATTERS)

There are two legal frameworks that can be used in describing the resettlement plan for informal settlers on public land. These are the:

- (i) Republic Act 7279 (Urban Development and Housing Act of 1992)
- (ii) DPWH's Policy Framework for Land Acquisition, Resettlement, and Rehabilitation

#### Urban Development and Housing Act of 1992 (RA 7279)

One of the main objectives of this act is to "*Provide decent shelter to the underprivileged and homeless citizens in urban areas and resettlement areas whose lives are generally marked by economic insecurities and whose occupancy of land is uncertain*". As such, several guidelines were enacted by various government agencies such as the Housing and Land Use Regulatory Board (HLRB), Housing and Urban Development Coordinating Council (HUDCC), National Housing Authority (NHA), Land Management Bureau (LMB) and the National Mapping and Resource Information Authority (NAMRIA).

One of such is the guideline which directed all city and municipal governments to conduct an inventory of lands and identify sites for socialized housing. Under the same Act, potential socialized housing program beneficiaries must first register with the Barangay Registration Committee (BRC) in their respective areas. It should be noted however, that not all informal settlers are entitled to be resettled in these areas. The following qualifications make applicants eligible to be included in the Master List of Underprivileged and Homeless Citizens:

- (i) Must be a Filipino citizen of legal age;
- (ii) The combined family income must fall within the NEDA-defined poverty threshold;
- (iii) Must not own any real property whether in the urban or rural areas and must not have been a beneficiary of any government housing program except those in leasehold or rental arrangements;
- (iv) Must not be a professional squatter nor a member of a squatting syndicate; and
- (v) Must be the head of the family

## DPWH's Policy Framework for Land Acquisition, Resettlement, and Rehabilitation

This policy framework is not yet finalized at this point in time. In fact, the study is still on-going. Nevertheless, some of the salient points are included here for reference. These are:

- (i) All Project Affected Persons (PAPs) residing in, working, doing business, or cultivating land, or having rights over resources within the project area as of the date of the census surveys (Cut-off Date) are entitled to compensation for their lost assets, incomes, jobs and businesses at replacement cost;
- (ii) In cases when the remaining assets of a PAP are not viable for continued use, he will be entitled to full compensation for the entire affected assets;
- (iii) When payment is made for an **agricultural land** acquired by the DPWH, the landowner will be exempted from capital gains tax on the compensation paid to him; In addition, other expenses such as registration fee, transfer taxes, documentary stamp tax, and notional fees will be paid by DPWH for property transfers made through land acquisition;
- (iv) Replacement agricultural land, premise/business plot will be as close as possible to the land that was lost and/or acceptable to the PAPs;
- (v) All replacement land for agriculture, residential, and business will be provided with secured tenure status and without any additional cost, taxes, surcharge to the PAPs at the time of transfer;
- (vi) The previous level of community services and access to resources will be maintained or improved after the resettlement;
- (vii) The general mechanism for compensation of lost **residential and commercial** land will be through land-for-land or cash compensation at replacement cost.
- (viii) Tenants are entitled to assistance to transfer to a new location

## APPENDIX 15.2-3

### CONSTRAINTS ON THE IMPLEMENTATION OF RESETTLEMENT PLAN

If the "*Policy Framework for Land Acquisition, Resettlement, and Rehabilitation*" is **NOT approved** for implementation by the time the R-O-W acquisition procedures for the bypass projects begin, the following constraints are imminent:

- (i) Based on Administrative Order 50 dated 17 February 1999, states that the compensation levels shall be at **10%** higher than the zonal values of the properties;

Based on information gathered from the concerned Municipal Assessor's Offices, there are huge discrepancies (between the Assessor's Schedule of Market Values and the Fair Market Value (Actual price in the open market));

Therefore, R-O-W acquisition procedures may take a long time because negotiations will fail, and the Appraisal Committee will have to exhaust all efforts to ascertain the purchase price of the property to be acquired;

It may even take years before this is settled, specially if expropriation procedures are exercised by the DPWH;

- (ii) Based on Ministry Order 65, tenant lessees are **NOT** entitled to "disturbance compensation" if the land acquired by the government is private land";  
Implementation of this policy will encounter strong objections from the stakeholders;

If the "*Policy Framework for Land Acquisition, Resettlement, and Rehabilitation*" is **approved** for implementation by the time the R-O-W acquisition procedures for the bypass projects begin, the following constraints are expected:

- (iii) Landowners who have past experience with DPWH R-O-W acquisition procedures complain that they were either not fairly compensated, or much worse, not even paid a single centavo;

If the Government cannot pay compensations based on tax declarations, how can it settle negotiated sales that are priced at replacement cost;

- (iv) Almost all of the concerned municipalities cited that they have not finalized the delineation of sites for socialized housing; if this is so, then the Government has to purchase land for relocation purposes;

If the Government cannot settle compensations based on tax declarations, how can it purchase additional properties for relocation sites of displaced communities

## **APPENDIX 17**

- **17.3-1 Annual Fund Requirement in Case of 4-Lane Construction at Initial Stage**



APPENDIX 17.3-1 ANNUAL FUND REQUIREMENT

Implementation Schedule	2000	2001	2002	2003	2004	2005	TOTAL		
Plaridel - Baliuag Bypass	Detailed Design								
	ROW Acquisition								
	Tender								
	Construction								
	Detailed Design								
	ROW Acquisition								
	Tender								
	Construction								
	Detailed Design								
	ROW Acquisition								
	Tender								
	Construction								
Cabanatuan Bypass	Detailed Design								
	ROW Acquisition								
	Tender								
	Construction								
San Jose Bypass	Detailed Design								
	ROW Acquisition								
	Tender								
	Construction								
Plaridel - Baliuag Bypass	Detailed Design	44.38	68.94	-	-	-	113.32		
	ROW Acquisition	-	107.73	272.89	-	-	380.62		
	Construction	-	-	-	693.33	1,109.34	1,030.07	2,832.74	
	Const. Supervision	-	-	-	55.47	88.74	82.40	226.61	
	Total	44.38	176.67	272.89	748.80	1,198.08	1,112.47	3,553.29	
	Cabanatuan Bypass	Detailed Design	53.26	85.90	-	-	-	139.16	
		ROW Acquisition	-	40.70	116.25	-	-	156.95	
		Construction	-	-	166.43	832.12	1,264.83	1,215.73	3,479.11
		Const. Supervision	-	-	13.31	66.57	101.19	97.26	278.33
	Total	53.26	126.60	295.99	898.69	1,366.02	1,312.99	4,053.55	
	San Jose Bypass	Detailed Design	3.15	13.69	-	-	-	16.84	
		ROW Acquisition	-	-	28.04	-	-	28.04	
Construction		-	-	-	137.97	282.89	-	420.86	
Const. Supervision		-	-	-	11.04	22.53	-	33.67	
Total	3.15	13.69	28.04	149.01	305.52	-	499.41		
Grand Total	Detailed Design	100.79	168.53	-	-	-	269.32		
	ROW Acquisition	-	148.43	417.18	-	-	565.61		
	Construction	-	-	166.43	1,663.42	2,657.06	2,245.80	6,732.71	
	Const. Supervision	-	-	13.31	133.08	212.56	179.66	538.61	
Total	100.79	316.96	596.92	1,796.50	2,869.62	2,425.46	8,106.25		











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