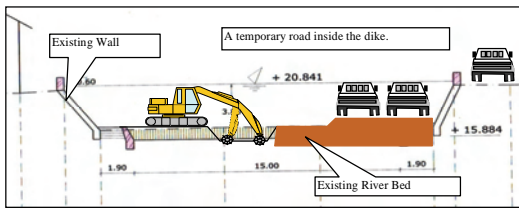
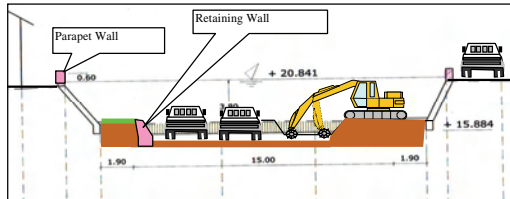


### Badung River

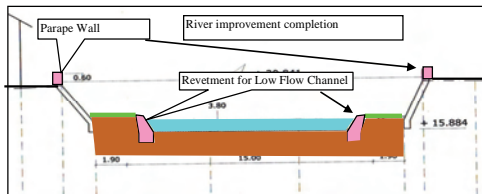
1) Setting up of temporary road in the river.



2) Retevment work by stage diversion method

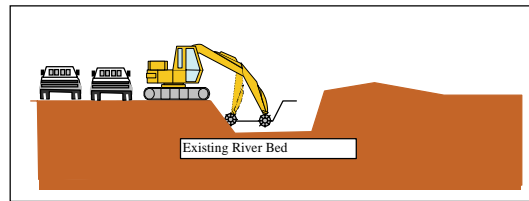


3) River improvement work

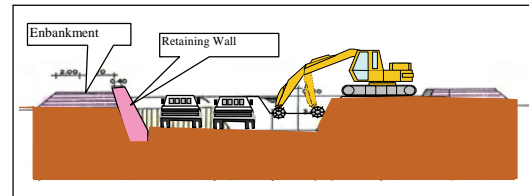


### Mati River

1) Diversion work shall be done in the river before excavation



2) Conveyance of excavation materials on the temporary road



3) Backfilling behaind wall by bollow sand.

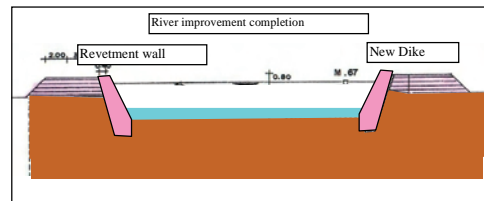


Figure-K.8 Work Procedure for River Improvement Project

Construction Schedule for River Improvement Project is shown in Table-K.44.

Table-K.44 Construction Schedule for River Improvement Project

Item	First Year		Second year		Third Year		Fourth Year	
	Dry Season (May - Oct.)	Rainy Season (Nov. - April)	Dry Season (May - Oct.)	Rainy Season (Nov. - April)	Dry Season (May - Oct.)	Rainy Season (Nov. - April)	Dry Season (May - Oct.)	Rainy Season (Nov. - April)
<b>Badung River</b>	3mths							
Preparatory Works	█							
Ground Sill			█	█	█		█	
Earthwork (Using 2 Backhoes)								
River Bed Excavation	█		█	█	█			
Retaining wall								
construction wall (small)			█	█	█		█	
Parapet Wall	█		█		█			
Bridge								
Dismantle & construction					█	█		
Buagan Weir								
modify basemnt			█					
<b>Mati River</b>	3mths							
Preparation Work	█	█						
Dismantle Urun Tanjung Weir	█							
Earthwork (Using 3 Backhoes)								
river bed (incl. wall exc.)	█		█	█	█		█	
backfill behind big wall			█	█	█			
Retaining wall								
construction wall (big)			█	█	█		█	

## K-4 OPERATION AND MAINTENANCE COST

### K-4.1 Annual O&M Cost for Dam Project and Water Supply Project

Operation and maintenance (O&M) cost of the projects is estimated based on the actual cost of PDAMs of Bali province and data of Japan. O&M cost of treatment plant of Western and Eastern Water Supply System comes out higher than that of Central system caused by transmission pumping system necessary to be installed. Chemical cost for water purification is estimated at 176Rp/m which is drawn from averaged purification cost between upstream river water and downstream river water.

**Table-K.45 Annual O&M Cost for Dam Project and Water Supply Project**

Items		Multi-purpose Ayung Dam	Water Supply System for Southern Bali Area		
			Western	Eastern	Central
Bases	General O&M for Dam	0.2% of construction cost	-	-	-
	Operation cost for Intake/Treatment	-	30kWh/(lit/sec)/day		20kWh/(lit/sec)/day
	Electricity Price	-	750 Rp/kWh		
	Chemical cost for Water Treatment	-	176 Rp/m <sup>3</sup> : average cost between upstream river and downstream river (respectively 88 Rp/m <sup>3</sup> , 264 Rp/m <sup>3</sup> )		
	Repair/Maintenance	3% of Electric Equipment/Machinery Cost			
O&M Cost (Rp. million)		3,874	5,459	5,459	9,880

### K-4.2 Annual O&M Cost for Flood Control Project

The annual O&M cost for flood control project was made 0.5% of project cost. The annual O&M cost is shown in Table-K.46.

**Table-K.46 Annual O&M Cost for Flood Control Project**

Item	Improvement for Badung River	Improvement for Mati River	Total(Rp)
Base	0.5% of Project Cost		-
O&M Cost (Rp.million)	362	346	708

# *Appendices*

# **Appendix-1**

## **IPA Penet Cost Estimate**

**Appendix-1-1 BUDGET PLAN (INCLUDE TAX 10%)  
WATER TREATMENT PLAN (IPA) PENET SUPPROTING BUILDING AND PIPING PDAM  
BADUNG**

No.	Item	Volume	Unit	Price(Rp.)
1	Site arrangement and road construction	1	Unit	2,572,177,000
2	Weir, Intake and Pumping House	1	Unit	2,750,451,000
3	Water Treatment Plant (IPA)	1	Unit	4,873,363,000
4	Reservoir 2,000 m <sup>3</sup>	1	Unit	2,157,561,000
5	Waste water Treatment Plant (IPAL)	1	Unit	594,549,000
6	Chemistry Building, Storage and Chlor Gas	1	Unit	509,472,000
7	Laboratory and Office	1	Unit	290,625,000
8	Workshop Building	1	Unit	236,639,000
9	Machine and Relay Station House	1	Unit	122,845,000
10	Guard House	1	Unit	61,632,000
11	Distribution Pipe of IPA Penet – Krobokan	1	Unit	19,953,702,000
12	Raw Water Transmission Pipe	1	Unit	817,900,000
13	Electrical Mechanical	1	Unit	7,408,888,000
<b>Grand Total</b>				<b>42,349,804,000</b>

8.04 Rp/¥ ¥481,029,123  
4.81 billion ¥

**Appendix-1-2 ENGINEERING ESTIMATE  
SITE ARRANGEMENT AND ROAD CONSTRUCTION**

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I. PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	1,500,000.00	1,500,000.00
2	Mobilisasi / Demobilisasi Alat-alat Berat	Ls	1.00	5,000,000.00	5,000,000.00
3	Penerangan	Ls	1.00	500,000.00	500,000.00
4	Papan Nama Proyek	Ls	1.00	300,000.00	300,000.00
5	Pembuatan Rambu-Rambu Jalan	Ls	1.00	500,000.00	500,000.00
6	Pelaporan, Perijinan dan Dokumentasi	Ls	1.00	2,000,000.00	2,000,000.00
<b>Sub. Total I</b>					<b>9,800,000.00</b>
<b>II. SOIL ARRANGEMENT ON THE SITE</b>					
1	Galian tanah biasa	m <sup>3</sup>	7,982.00	19,525.00	155,848,550.00
2	Urugan tanah dari dalam site	m <sup>3</sup>	2,394.60	30,125.00	72,137,325.00
3	Dinding Penahan Tanah Batu Kali 1:4	m <sup>3</sup>	162.00	351,328.45	56,915,208.90
4	Plesteran PC 1:4 tebal 1,5 cm	m <sup>2</sup>	541.20	18,666.45	10,102,282.74
5	Gebalan Rumput	m <sup>2</sup>	925.50	12,500.00	11,568,750.00
<b>Sub Total II</b>					<b>306,572,116.64</b>
<b>III. CHANNEL AND BOX CONTROL CONSTRUCTION</b>					
1	Galian tanah biasa	m <sup>3</sup>	320.00	19,525.00	6,248,000.00
2	Urugan tanah kembali	m <sup>3</sup>	64.00	30,125.00	1,928,000.00
3	Urugan pasir	m <sup>3</sup>	19.55	82,612.75	1,615,079.26
4	Lantai kerja K125	m <sup>3</sup>	1.50	353,034.00	529,551.00
5	Beton K175	m <sup>3</sup>	96.75	410,338.50	39,700,249.88
6	Besi - ø 12 mm U24	kg	8,332.00	7,896.60	65,794,471.20
7	Bekisting biasa	m <sup>2</sup>	862.00	50,721.61	43,722,028.78
8	Pemasangan Buis Beton	m <sup>1</sup>	95.00	132,500.00	12,587,500.00
<b>Sub Total III</b>					<b>172,124,880.12</b>
<b>IV. FENCE CONSTRUCTION</b>					
1	Galian tanah biasa	m <sup>3</sup>	429.00	19,525.00	8,376,225.00
2	Urugan tanah kembali	m <sup>3</sup>	214.00	30,125.00	6,446,750.00
3	Urugan pasir	m <sup>3</sup>	23.00	82,612.75	1,900,093.25
4	Pasangan Batu Kosong	m <sup>3</sup>	46.00	146,162.50	6,723,475.00
5	Pasangan Batu Kali 1 : 4	m <sup>3</sup>	146.00	351,328.45	51,293,953.70
6	Sloof, Kolom & Ring Balok				
	Beton K175	m <sup>3</sup>	34.00	438,086.00	14,894,924.00
	Besi - ø 10 mm U24	kg	3,988.00	7,896.60	31,491,640.80
	Besi - ø 8 mm U24	kg	2,081.00	7,896.60	16,432,824.60
	Bekisting biasa	m <sup>2</sup>	340.00	50,721.61	17,245,347.78
7	Pasangan Dinding Bata 1 : 4	m <sup>2</sup>	920.00	83,872.25	77,162,470.00
8	Plesteran PC 1:4 tebal 1:5 cm + Acian	m <sup>2</sup>	2,163.00	18,666.45	40,375,531.35
9	Pasangan bata perpipaan	m <sup>2</sup>	192.40	200,000.00	38,480,000.00
10	Pasangan paras Bali	m <sup>2</sup>	37.00	175,000.00	6,475,000.00
11	Pembuatan Padma	bh	1.00	25,000,000.00	25,000,000.00
12	Pembuatan Candi Bentar	bh	1.00	25,000,000.00	25,000,000.00
13	Pengecatan Dinding	m <sup>2</sup>	2,163.00	19,140.00	41,399,820.00
<b>Sub Total IV</b>					<b>408,698,055.48</b>
<b>V. ROAD CONSTRUCTION ON THE IPA AREA</b>					
1	Galian tanah biasa	m <sup>3</sup>	1,053.00	19,525.00	20,559,825.00
2	Buangan Tanah	m <sup>3</sup>	1,053.00	8,552.50	9,005,782.50
3	Pemadatan tanah	m <sup>2</sup>	1,755.00	4,770.00	8,371,350.00
4	Lapisan Limestone, tebal 40 cm	m <sup>2</sup>	1,755.00	45,327.50	79,549,762.50
5	Lapisan Beton dengan Tulangan Praktis, tebal 15 cm	m <sup>2</sup>	1,755.00	112,878.68	198,102,074.63
6	Pasangan Paving Stone	m <sup>2</sup>	1,755.00	55,385.00	97,200,675.00
7	Pasangan Kanstin	m <sup>1</sup>	260.00	20,000.00	5,200,000.00
<b>Sub Total V</b>					<b>417,989,469.63</b>
<b>VI. ROAD CONSTRUCTION OUTSIDE IPA AREA</b>					
1	Pengukuran Jalur	Ls	1.00	500,000.00	500,000.00
2	Penyediaan Rambu Jalan dan Ijin Pembuatan Jalan	Ls	1.00	1,500,000.00	1,500,000.00
3	Galian tanah biasa	m <sup>3</sup>	5,271.00	19,525.00	102,916,275.00
4	Buangan Tanah	m <sup>3</sup>	5,271.00	8,552.50	45,080,227.50
5	Pemadatan tanah	m <sup>3</sup>	7,530.00	4,770.00	35,918,100.00
6	Pembuatan Jalan Aspal dengan ATB/HRS	m <sup>2</sup>	7,530.00	92,567.28	697,031,608.52
7	Pasangan Kanstin	m <sup>1</sup>	2,510.00	50,000.00	125,500,000.00
<b>Sub Total VI</b>					<b>1,006,446,211.02</b>
<b>SUB TOTAL I+II+III+IV+V+VI</b>					<b>2,321,630,732.88</b>
<b>TAX 10%</b>					<b>232,163,073.29</b>
<b>TOTAL</b>					<b>2,553,793,806.17</b>
<b>ROUNDED</b>					<b>2,553,793,000.00</b>

**Appendix-1-3 ENGINEERING ESTIMATE  
DIKE, INTAKE BUILDING AND PUMPING HOUSE**

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I. PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	1,500,000.00	1,500,000.00
2	Gudang Material dan Barak Kerja	Ls	1.00	3,000,000.00	3,000,000.00
3	Mobilisasi / Demobilisasi Alat-alat Berat	Ls	1.00	1,000,000.00	1,000,000.00
4	Penerangan	Ls	1.00	500,000.00	500,000.00
5	Pelaporan dan Dokumentasi	Ls	1.00	1,000,000.00	1,000,000.00
<b>Sub Total I</b>					<b>7,000,000.00</b>
<b>II. DIKE CONSTRUCTION</b>					
<b>2.1. EARTH WORK</b>					
1	Galian tanah biasa	m <sup>3</sup>	1,268.00	19,525.00	24,757,700.00
2	Galian tanah cadas	m <sup>3</sup>	140.90	38,395.50	5,409,925.95
3	Galian tanah cadas terowongan	m <sup>3</sup>	140.90	115,186.50	16,229,777.85
4	Urugan tanah kembali	m <sup>3</sup>	1,268.00	30,125.00	38,198,500.00
5	Urugan tanah dari luar site	m <sup>3</sup>	3,339.00	86,885.00	290,109,015.00
6	Perataan dan Pemadatan tanah	m <sup>3</sup>	3,339.00	21,572.50	72,030,577.50
7	Urugan pasir t = 10 cm	m <sup>3</sup>	14.00	82,612.75	1,156,578.50
8	Gebalan rumput	m <sup>2</sup>	215.00	15,000.00	3,225,000.00
9	Pengeringan dengan pemompaan	Ls	1.00	20,000,000.00	20,000,000.00
<b>Sub Total 2.1</b>					<b>471,117,074.80</b>
<b>2.2. MASONRY</b>					
1	Pasangan Batu Kali 1 : 4	m <sup>3</sup>	1,778.00	351,328.45	624,661,984.10
2	Pasangan Batu Kali 1 : 2	m <sup>3</sup>	25.00	431,271.50	10,781,787.50
3	Plesteran 1 : 3	m <sup>2</sup>	71.00	18,666.45	1,325,317.95
4	Siaran 1 : 2	m <sup>2</sup>	740.00	10,103.78	7,476,793.50
<b>Sub Total 2.2</b>					<b>644,245,883.05</b>
<b>2.3. CONCRETING</b>					
1	Beton rabat K125	m <sup>3</sup>	11.00	353,034.00	3,883,374.00
2	Beton Massa (Pembalut Mercu), K225	m <sup>3</sup>	148.00	438,086.00	64,836,728.00
3	Beton Struktur				
	Beton K225	m <sup>3</sup>	61.50	438,086.00	26,942,289.00
	Besi U24	kg	4,948.00	7,896.60	39,072,376.80
	Bekesting	m <sup>2</sup>	369.00	50,721.61	18,716,274.50
<b>Sub Total 2.3</b>					<b>153,451,042.30</b>
<b>2.4. OTHERS</b>					
1	Papan Duga Air	M	7.60	175,000.00	1,330,000.00
2	Tangga Besi Profil	Ls	1.00	500,000.00	500,000.00
3	Pintu Air, lebar 1,20 dan tinggi 3,00 m	Bh	1.00	19,500,000.00	19,500,000.00
4	Pintu Air, lebar 0.6 dan tinggi 1,30 m	Bh	1.00	6,700,000.00	6,700,000.00
5	Saringan (kisi-kisi besi)	kg	393.00	13,850.00	5,443,050.00
6	Papan Nama Bendung	Bh	1.00	1,250,000.00	1,250,000.00
7	Tangga Monyet	Kg	65.00	14,358.00	933,270.00
8	Pipa Sulingan PVC dia 2"	m'	227.00	14,394.67	3,267,589.33
<b>Sub Total 2.4</b>					<b>38,923,909.33</b>
<b>SUB TOTAL II</b>					<b>1,307,737,909.48</b>



BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>III.</b>	<b>INTAKE BUILDING I Pump room</b>				
<b>3.1.</b>	<b>EARTH WORK</b>				
1	Galian tanah	m <sup>3</sup>	798.00	19,525.00	15,580,950.00
2	Urugan tanah kembali	m <sup>3</sup>	193.00	86,885.00	16,768,805.00
3	Perataan dan Pematatan tanah	m <sup>3</sup>	193.00	21,572.50	4,163,492.50
4	Urugan pasir t = 10 cm	m <sup>3</sup>	14.00	82,612.75	1,156,578.50
	<b>Sub Total 3.1</b>				<b>37,669,826.00</b>
<b>3.2.</b>	<b>CONCRETING</b>				
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	7.00	353,034.00	2,471,238.00
2	Plat dasar				
	Beton K225	m <sup>3</sup>	24.60	438,086.00	10,776,915.60
	Besi - ø 16 mm U24	Kg	1,947.00	7,896.60	15,374,680.20
	Besi - ø 12 mm U24	kg	1,111.00	7,896.60	8,773,122.60
	Bekisting biasa	m <sup>2</sup>	18.00	50,721.61	912,989.00
3	Balok Dasar				
	Beton K225	m <sup>3</sup>	9.31	438,086.00	4,078,580.66
	Besi - ø 22 mm U24	kg	4,664.00	7,896.60	36,829,742.40
	Besi - ø 12 mm U24	kg	174.00	7,896.60	1,374,008.40
	Besi - ø 10 mm U24	kg	752.00	7,896.60	5,938,243.20
	Bekisting batako	m <sup>2</sup>	100.80	44,256.74	4,461,079.39
4	Dinding				
	Beton K225	m <sup>3</sup>	153.70	438,086.00	67,333,818.20
	Besi - ø 19 mm U24	kg	31,847.00	7,896.60	251,483,020.20
	Besi - ø 16 mm U24	kg	12,462.00	7,896.60	98,407,429.20
	Bekisting + 1/2 stoot	m <sup>2</sup>	1,029.00	75,763.11	77,960,241.33
5	Balok Lantai R. Operasional				
	Beton K225	m <sup>3</sup>	2.50	438,086.00	1,095,215.00
	Besi - ø 19 mm U24	kg	676.00	7,896.60	5,338,101.60
	Besi - ø 10 mm U24	kg	168.00	7,896.60	1,326,628.80
	Bekisting + 1 stoot	m <sup>2</sup>	40.00	97,383.61	3,895,344.44
6	Pelat Lantai R. Operasional				
	Beton K225	m <sup>3</sup>	14.90	438,086.00	6,527,481.40
	Besi - ø 10 mm U24	kg	1,341.00	7,896.60	10,589,340.60
	Bekisting + 1 stoot	m <sup>2</sup>	124.00	97,383.61	12,075,567.78
7	Kolom				
	Beton K225	m <sup>3</sup>	5.04	438,086.00	2,207,953.44
	Besi - ø 19 mm U24	kg	589.00	7,896.60	4,651,097.40
	Besi - ø 10 mm U24	kg	439.00	7,896.60	3,466,607.40
	Bekisting + 1/2 stoot	m <sup>2</sup>	6.72	75,763.11	509,128.11
8	Balok Atap R. Pompa & Lisplank				
	Beton K225	m <sup>3</sup>	6.33	438,086.00	2,773,084.38
	Besi - ø 19 mm U24	kg	789.00	7,896.60	6,230,417.40
	Besi - ø 10 mm U24	kg	530.00	7,896.60	4,185,198.00
	Bekisting + 1 stoot	m <sup>2</sup>	110.00	97,383.61	10,712,197.22
9	Pelat Atap R. Pompa				
	Beton K225	m <sup>3</sup>	14.88	438,086.00	6,518,719.68
	Besi - ø 10 mm U24	kg	1,341.00	7,896.60	10,589,340.60
	Bekisting + 1 stoot	m <sup>2</sup>	124.00	97,383.61	12,075,567.78
10	Pondasi Pompa				
	Beton K225	m <sup>3</sup>	8.35	438,086.00	3,658,018.10
	Besi - ø 16 mm U24	kg	904.00	7,896.60	7,138,526.40
	Bekisting	m <sup>2</sup>	9.60	97,383.61	934,882.67
11	Tangga				
	Beton K225	m <sup>3</sup>	1.10	438,086.00	481,894.60
	Besi - ø 12 mm U24	kg	271.00	7,896.60	2,139,978.60
	Bekisting	m <sup>2</sup>	13.50	97,383.61	1,314,678.75
	<b>Sub Total 2.3</b>				<b>706,610,078.53</b>

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>3.3.</b>	<b>MASONRY AND PLASTERING</b>				
1	Pasangan Dinding Bata 1 : 4	m <sup>3</sup>	113.00	83,872.25	9,477,564.25
2	Plesteran PC 1:3 tebal 1:5 cm	m <sup>3</sup>	455.00	17,712.20	8,059,051.00
3	Pasangan Keramik 30x30 cm berwarna	m <sup>2</sup>	38.00	63,672.40	2,419,551.20
4	Saluran Pembuang				
	- Galian tanah	m <sup>3</sup>	11.00	19,525.00	214,775.00
	- Pasangan batu bata 1:3	m <sup>3</sup>	60.50	83,872.25	5,074,271.13
	- Rabat beton	m <sup>3</sup>	8.25	353,034.00	2,912,530.50
	- Plesteran 1 : 3	m <sup>2</sup>	82.50	18,666.45	1,539,982.13
4	Pasangan Bata Perpihan	m <sup>2</sup>	16.80	200,000.00	3,360,000.00
5	Pasangan Paras Bali	m <sup>2</sup>	14.00	175,000.00	2,450,000.00
	<b>Sub Total 3.3</b>				<b>35,507,725.20</b>
<b>3.4.</b>	<b>GATE/WINDOW, ETC</b>				
1	Kusen pintu/jendela aluminium	m <sup>3</sup>	110.00	85,800.00	9,438,000.00
2	Pintu Panil	m <sup>2</sup>	4.20	250,310.50	1,051,304.10
3	Jendela Kaca bingkai aluminium	m <sup>2</sup>	9.45	523,809.52	4,950,000.00
4	Kunci untuk pintu 2 daun	psg	3.00	175,000.00	525,000.00
5	Rel pintu dorong	m	5.00	300,000.00	1,500,000.00
6	Hand Railing	m	14.00	165,721.15	2,320,096.08
7	Tangga Monyet	bh	18.00	410,592.41	7,390,663.45
8	Talang Air Hujan	m	28.00	58,401.11	1,635,231.02
	<b>Sub Total 3.4</b>				<b>28,810,294.65</b>
<b>3.5.</b>	<b>PAINTING</b>				
1	Meni dan Cat besi	m <sup>2</sup>	12.00	31,845.00	382,140.00
2	Plamur dan Cat tembok	m <sup>2</sup>	523.60	19,140.00	10,021,704.00
	<b>Sub Total 3.5</b>				<b>10,403,844.00</b>
	<b>SUB TOTAL III</b>				<b>819,001,768.38</b>
<b>IV.</b>	<b>PIPE EXISTING AND ITS COMPLEMENTS</b>				
<b>4.1.</b>	<b>Absorb Pipe</b>				
1	Pipa spiral welded Steel 400	m	9.00	946,512	8,518,610
2	Butterfly Valve 400	bh	2.00	25,308,000	50,616,000
3	Exentric Reducer 400 x 300	bh	2.00	670,848	1,341,696
4	AF Flexible Joint 400	bh	2.00	5,070,240	10,140,480
5	Flange Las 400	bh	10.00	1,179,360	11,793,600
6	Foot Valve With Strainer 400	bh	2.00	3,840,000	7,680,000
7	Dismantling joint 400	bh	2.00	8,618,040	17,236,080
8	Flange las 300	bh	2.00	675,360	1,350,720
<b>4.2.</b>	<b>Welded Pipe</b>				
1	Pipa Galvanized Steel 250	bh	4.00	579,600	2,318,400
2	Butterfly Valve PN16 250	bh	2.00	22,377,600	44,755,200
3	Wafer Check Valve PN16 250	bh	2.00	11,833,920	23,667,840
4	Flexible Joint PN 16 250	bh	2.00	1,149,120	2,298,240
5	Spigot Reducer 250 x 200	bh	2.00	419,280	838,560
6	Flange Las 200	bh	2.00	312,480	624,960
7	Flange Las 250	bh	9.00	433,440	3,900,960
8	Blank Flange PN 16 250	bh	1.00	342,720	342,720
<b>4.3</b>	<b>Air Valve Header Pipe</b>				
1	Pipa Galvanized 100	m	0.50	155,880	77,940
2	AF Gate Valve PN16 100	bh	1.00	2,557,440	2,557,440
3	Double Air Valve 100	bh	1.00	4,339,200	4,339,200
4	Flange Las 100	bh	1.00	78,000	78,000
<b>4.4</b>	<b>Header Pipe</b>				
1	Pipa Spiral welded / steel 600	m	12.00	1,262,016	15,144,195
2	All spigot Bend 22½° 600	bh	4.00	3,169,080	12,676,320
3	Flange Las PN 16 600	bh	1.00	3,062,304	3,062,304
4	Blank Flange PN16 600	bh	1.00	3,528,000	3,528,000
<b>4.5</b>	<b>Flushing Pipe for Raw Water</b>				
	Fhlusconi Bak Pengumpul				
1	Pipa Galvanized 50	m'	0.50	88,052	44,026
2	Pipa PVC 50	m'	12.00	16,836	202,032
3	Valve Socket PVC/SCJ 50	bh	2.00	14,520	29,040
4	All Flange Gate Valve * 50	bh	1.00	173,960	173,960
5	Elbow 90° 50	bh	4.00	70,185	280,739
6	Tee All Socket 50x50	bh	1.00	277,761	277,761
7	Giboult Joint PVC/Steel 50	bh	1.00	98,826	98,826
	<b>SUB TOTAL IV</b>				<b>229,993,850</b>

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>V.</b>	<b>PIPE INSTALLATION AND ITS COMPLEMENTS</b>				
<b>5.1</b>	<b>Absorb Pipe</b>				
1	Pipa spiral	m	400	26,965	242,685
2	Butterfly Valve	bh	400	108,280	216,560
3	Exentric Reducer	bh	400 x 300	57,662	115,324
4	AF Flexible Joint	bh	400	58,197	116,393
5	Flange Las	bh	400	133,993	1,339,925
6	Foot Valve With Strainer	bh	400	108,280	216,560
7	Dismantling joint	bh	400	54,182	108,365
8	Flange las	bh	300	99,195	198,390
<b>5.2</b>	<b>Welded Pipe</b>				
1	Pipa Galvanized Steel	m'	250	18,549	74,196
2	Butterfly Valve PN16	bh	250	98,073	196,146
3	Wafer Check Valve PN16	bh	250	98,073	196,146
4	Flexible Joint PN 16	bh	250	38,332	76,664
5	Spigot Reducer	bh	250 x 200	45,449	90,898
6	Flange Las	bh	200	66,788	133,577
7	Flange Las	bh	250	84,096	756,860
8	Blank Flange PN 16	bh	250	35,499	35,499
<b>5.3</b>	<b>Air Valve Header Pipe</b>				
1	Pipa Galvanized	m	100	8,248	4,124
2	AF Gate Valve PN16	bh	100	19,960	19,960
3	Double Air Valve	bh	100	19,960	19,960
4	Flange Las	bh	100	35,411	35,411
<b>5.4</b>	<b>Header Pipe</b>				
1	Pipa Spiral welded / steel	m	600	40,530	486,363
2	All spigot Bend 22½°	bh	600	73,993	295,973
3	Thrust Blok Bend 22½°	bh	600	1,364,648	5,458,593
4	All spigot Bend 90°	bh	600	73,993	73,993
5	Thrust Blok Bend 90°	bh	600	2,128,844	2,128,844
6	Flange Las PN16	bh	600	207,587	207,587
7	Blank Flange PN16	bh	600	64,795	64,795
<b>5.5.</b>	<b>Flushing Pipe for Raw Water</b>				
	Fhusing Bak Pengumpul				
1	Pipa Galvanized	m'	50	4,885	2,442
2	Pipa PVC	m'	50	1,273	15,280
3	Valve Socket PVC/SCJ	bh	50	12,014	24,029
4	Ball Valve PVC	bh	50	17,960	17,960
5	Elbow 90°	bh	50	16,144	64,577
6	Tee All Socket	bh	50x50	16,144	16,144
7	Giboult Joint PVC/Steel	bh	50	11,471	11,471
<b>SUB TOTAL V</b>					<b>13,061,695.42</b>
<b>SUB TOTAL I + II + III + IV + V + V</b>					<b>2,376,795,222.92</b>
<b>TAX 10%</b>					<b>237,679,522.29</b>
<b>TOTAL</b>					<b>2,614,474,745.21</b>
<b>ROUNDED</b>					<b>2,614,474,000.00</b>

**Appendix-1-4 ENGINEERING ESTIMATE  
WATER TREATMENT PLANT CONSTRUCTION CAPACITY 300 Lit/Sec**

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I. PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	2,000,000.00	2,000,000.00
2	Pemasangan Bouwplank	m'	146.00	12,114.30	1,768,687.80
3	Sewa Kantor Direksi, Gudang Material dan Barak Kerja	Ls	1.00	7,500,000.00	7,500,000.00
4	Mobilisasi / Demobilisasi Alat-alat Berat	Ls	1.00	15,000,000.00	15,000,000.00
5	Penerangan	Ls	1.00	1,000,000.00	1,000,000.00
6	Papan Nama Proyek	Ls	1.00	300,000.00	300,000.00
6	Pagar Pengaman (Seng Gelombang)	Ls	530.00	50,000.00	26,500,000.00
7	Pelaporan dan Dokumentasi	Ls	1.00	2,500,000.00	2,500,000.00
<b>Sub. Total I</b>					<b>56,568,687.80</b>
<b>II. SPLITER BOX BUILDING</b>					
<b>2.1. EARTH WORK</b>					
1	Galian Tanah	m3	10.50	19,525.00	205,012.50
2	Urugan tanah dari luar site (dibawah Bak Splitter)	m3	6.30	86,885.00	547,375.50
3	Perataan dan Pematatan tanah	m3	6.30	21,572.50	135,906.75
4	Urugan pasir t = 10 cm	m3	3.00	82,612.75	247,838.25
<b>Sub Total 2.1</b>					<b>1,136,133.00</b>
<b>2.2. CONCRETING</b>					
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	1.70	353,034.00	600,157.80
2	Tiang Beton Pratekan 350 x 350 mm, panjang 6 m, 8 batang	m	48.00	350,000.00	16,800,000.00
3	Pemancangan Tiang	m	48.00	80,162.22	3,847,786.67
4	Pemotongan Kepala Tiang	bh	8.00	25,000.00	200,000.00
5	Pile cap				
	Beton K225	m2	4.10	438,086.00	1,796,152.60
	Besi - ø 16 mm U24	kg	520.00	7,896.60	4,106,232.00
	Bekisting batako	m2	24.00	44,256.74	1,062,161.76
6	Tie beam				
	Beton K225	m3	3.20	438,086.00	1,401,875.20
	Besi - ø 19 mm U24	kg	519.00	7,896.60	4,098,335.40
	Besi - ø 12 mm U24	kg	46.30	7,896.60	365,612.58
	Besi - ø 10 mm U24	kg	177.40	7,896.60	1,400,856.84
	Bekisting batako	m2	26.00	44,256.74	1,150,675.24
7	Kolom				
	Beton K225	m3	3.80	438,086.00	1,664,726.80
	Besi - ø 16 mm U24	kg	853.00	7,896.60	6,735,799.80
	Besi - ø 10 mm U24	kg	217.00	7,896.60	1,713,562.20
	Bekisting + 1/2 stoot	m2	51.50	75,763.11	3,901,800.22
8	Balok Bak Splitter				
	Beton K225	m3	2.20	438,086.00	963,789.20
	Besi - ø 16 mm U24	kg	242.00	7,896.60	1,910,977.20
	Besi - ø 12 mm U24	kg	40.00	7,896.60	315,864.00
	Besi - ø 8 mm U24	kg	70.00	7,896.60	552,762.00
	Bekisting + 1/2 stoot	m2	18.00	75,763.11	1,363,736.00
9	Plat dasar				
	Beton K225	m3	4.60	438,086.00	2,015,195.60
	Besi - ø 10 mm U24	kg	771.00	7,896.60	6,088,278.60
	Bekisting biasa	m2	33.30	50,721.61	1,689,029.65
10	Dinding t = 15 cm				
	Beton K225	m3	7.50	438,086.00	3,285,645.00
	Besi - ø 10 mm U24	kg	1,336.00	7,896.60	10,549,857.60
	Bekisting + 1/2 stoot	m2	99.00	75,763.11	7,500,548.00
<b>Sub Total 2.2.</b>					<b>87,081,417.96</b>
<b>2.3. MASONRY AND PLASTERING</b>					
1	Plesteran PC 1:3 tebal 1 cm	m2	220.00	12,444.30	2,737,746.00
2	Pasangan Bata Perpihan	m2	16.30	200,000.00	3,260,000.00
3	Pasangan Paras Bali	m2	24.72	175,000.00	4,326,000.00
<b>Sub Total 2.3</b>					<b>10,323,746.00</b>
<b>2.4. OTHERS</b>					
1	Bak Penampung air (Aerator) dibawah Bellmouth dari fibre glass 5 mm, termasuk pipa dudukannya	Unit	1.00	10,000,000.00	10,000,000.00
2	Penyangga pipa pembubuh dari GIP dia 2 1/2 "	Unit	1.00	750,000.00	750,000.00
<b>Sub Total 2.4</b>					<b>10,750,000.00</b>
<b>2.5. PAINTING</b>					
1	Meni dan Cat besi	m2	40.00	31,845.00	1,273,800.00
2	Plamur dan Cat tembok	m2	127.20	19,140.00	2,434,608.00
<b>Sub Total 2.5</b>					<b>3,708,408.00</b>
<b>SUB TOTAL II</b>					<b>112,999,704.96</b>

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>III. FLOCCULATOR BUILDING</b>					
<b>3.1. EARTH WORK</b>					
1	Galian Tanah	m3	72.00	19,525.00	1,405,800.00
2	Urugan tanah dari dalam site	m3	28.80	86,885.00	2,502,288.00
4	Urugan pasir t = 10 cm	m3	3.80	82,612.75	313,928.45
<b>Sub Total 3.1.</b>					<b>4,222,016.45</b>
<b>3.2. CONCRETING</b>					
1	Lantai kerja beton tumbuk (1:3:5 t= 5 cm)	m3	0.90	353,034.00	317,730.60
2	Tiang Beton Pratekan 350 x 350 mm, panjang 6 m, 7 batang	m	42.00	350,000.00	14,700,000.00
3	Pemancangan Tiang	m	42.00	80,162.22	3,366,813.33
4	Pemotongan Kepala Tiang	bh	7.00	25,000.00	175,000.00
5	Pile Cap ukuran (80x80x80) cm				
	Beton K225	m3	3.58	438,086.00	1,570,100.22
	Besi - ø 10 mm U24	kg	697.00	7,896.60	5,503,930.20
	Bekisting batako	m2	17.90	44,256.74	792,195.65
8	Balok Dasar				
	Beton K225	m3	7.69	438,086.00	3,368,881.34
	Besi - ø 25 mm U24	kg	1,448.00	7,896.60	11,434,276.80
	Besi - ø 12 mm U24	kg	142.00	7,896.60	1,121,317.20
	Besi - ø 8 mm U24	kg	274.00	7,896.60	2,163,668.40
	Bekisting batako	m2	30.75	44,256.74	1,360,894.76
9	Plat dasar t = 30 cm				
	Beton K225	m3	11.29	438,086.00	4,945,990.94
	Besi - ø 12 mm U24	kg	941.00	7,896.60	7,430,700.60
	Bekisting batako	m2	9.90	44,256.74	438,141.73
10	Dinding t = 30 cm				
	Beton K225	m3	61.69	438,086.00	27,025,525.34
	Besi - ø 12 mm U24	kg	5,141.00	7,896.60	40,596,420.60
	Bekisting + 1/2 stoot	m2	411.00	75,763.11	31,138,638.67
11	Plat bordes t=15 cm				
	Beton K225	m3	3.69	438,086.00	1,616,537.34
	Besi - ø 10 mm U24	kg	768.00	7,896.60	6,064,588.80
	Bekisting + 1 stoot	m2	28.40	97,383.61	2,765,694.56
<b>Sub Total 3.2.</b>					<b>167,897,047.07</b>
<b>3.3. MASONRY AND PLASTERING</b>					
1	Plesteran PC 1:3 tebal 1 cm	m2	508.00	12,444.30	6,321,704.40
2	Pasangan Bata Perpihan	m2	72.00	200,000.00	14,400,000.00
3	Pasangan Paras Bali	m2	11.53	175,000.00	2,018,100.00
<b>Sub Total 3.3.</b>					<b>22,739,804.40</b>
<b>3.4. OTHERS</b>					
1	Pengadaan dan pemasangan Penstock termasuk indikator bukaan	Unit	14.00	1,500,000.00	21,000,000.00
2	Box pengarah aliran dari pelat baja 5 mm dilapisi fibre glass tebal 0,6 mm	Unit	5.00	1,853,905.00	9,269,525.00
3	Railling dari pipa GIP termasuk pengecatan	m'	67.00	165,721.15	11,103,316.96
<b>Sub Total 3.4.</b>					<b>41,372,841.96</b>
<b>3.5. PAINTING</b>					
2	Plamur dan Cat tembok	m2	373.86	19,140.00	7,155,680.40
<b>Sub Total 3.5.</b>					<b>7,155,680.40</b>
<b>SUB TOTAL III</b>					<b>243,387,390.28</b>

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>IV.</b>	<b>SEDIMENTATION BUILDING</b>				
<b>4.1.</b>	<b>EARTH WORK</b>				
1	Galian tanah	m3	315.00	19,525.00	6,150,375.00
2	Buangan tanah	m3	187.68	21,572.50	4,048,726.80
3	Urugan pasir (t = 10 cm)	m3	9.80	82,612.75	809,604.95
	<b>Sub Total 4.1.</b>				<b>11,008,706.75</b>
<b>4.2.</b>	<b>CONCRETING</b>				
1	Lantai kerja beton tumbuk 1:3:5	m3	6.86	353,034.00	2,421,813.24
2	Tiang Beton Pratekan 350 x 350 mm, panjang 6 m, 18 batang	m	108.00	350,000.00	37,800,000.00
3	Pemancangan Tiang	m	108.00	80,162.22	8,657,520.00
4	Pemotongan Kepala Tiang	bh	18.00	25,000.00	450,000.00
5	Pile Cap ukuran (80x80x80) cm				
	Beton K225	m3	9.22	438,086.00	4,037,400.58
	Besi - ø 16 mm U24	kg	1,170.00	7,896.60	9,239,022.00
	Bekisting batako	m2	54.00	44,256.74	2,389,863.96
6	Plat dasar				
	Beton K225	m3	37.60	438,086.00	16,472,033.60
	Besi - ø 16 mm U24	kg	3,498.00	7,896.60	27,622,306.80
	Bekisting batako	m2	16.50	44,256.74	730,236.21
7	Balok Dasar (tie beam)				
	Beton K225	m3	7.85	438,086.00	3,438,975.10
	Besi - ø 25 mm U24	kg	1,434.51	7,896.60	11,327,751.67
	Besi - ø 19 mm U24	kg	1,910.00	7,896.60	15,082,506.00
	Besi - ø 12 mm U24	kg	149.00	7,896.60	1,176,593.40
	Besi - ø 10 mm U24	kg	795.00	7,896.60	6,277,797.00
	Bekisting batako	m2	39.00	44,256.74	1,726,012.86
8	Dinding sedimentasi termasuk kantilever				
	Beton K225	m3	109.44	438,086.00	47,944,131.84
	Besi - ø 25 mm U24	kg	21,713.00	7,896.60	171,458,875.80
	Besi - ø 16 mm U24	kg	-	7,896.60	0.00
	Bekisting + 1/2 stoot	m2	593.30	75,763.11	44,950,253.82
9	Beton dudukan pipa				
	Beton K225	m3	0.53	438,086.00	233,061.75
	Besi - ø 12 mm U24	kg	75.00	7,896.60	592,245.00
	Besi - ø 10 mm U24	kg	15.00	7,896.60	118,449.00
	Bekisting + 1/2 stoot	m2	7.70	75,763.11	583,375.96
10	Balok Dudukan Tube Settler				
	Beton K225	m3	2.93	438,086.00	1,281,401.55
	Besi - ø 16 mm U24	kg	1,071.00	7,896.60	8,457,258.60
	Besi - ø 12 mm U24	kg	99.00	7,896.60	781,763.40
	Bekisting + 1/2 stoot	m2	28.50	75,763.11	2,159,248.67
9	Saluran (Gutter) ukuran 40/81 cm dan 60/96 cm				
	Beton K225	m3	5.13	438,086.00	2,247,381.18
	Besi - ø 10 mm U24	kg	745.00	7,896.60	5,882,967.00
	Bekisting + 1/2 stoot	m2	101.00	75,763.11	7,652,074.22
10	Pelat Bordes				
	Beton K225	m3	7.43	438,086.00	3,256,731.32
	Besi - ø 12 mm U24	kg	260.00	7,896.60	2,053,116.00
	Besi - ø 10 mm U24	kg	843.00	7,896.60	6,656,833.80
	Bekisting + 1/2 stoot	m2	44.00	75,763.11	3,333,576.89
11	Pemasangan beton isian pada dasar sedimentasi K125	m3	52.00	353,034.00	18,357,768.00
	<b>Sub Total 4.2.</b>				<b>476,850,346.21</b>
<b>4.3.</b>	<b>MASONRY AND PLASTERING</b>				
1	Plesteran beton 1:3 tebal 1 cm	m2	688.00	12,444.30	8,561,678.40
2	Penambahan pas. Bata untuk kolom	m2	18.00	81,220.15	1,461,962.70
3	Pasangan bata perpipaan	m2	36.00	200,000.00	7,200,000.00
4	Pasangan paras Bali	m2	9.60	175,000.00	1,680,000.00
	<b>Sub Total 4.3.</b>				<b>18,903,641.10</b>
<b>4.4.</b>	<b>OTHERS</b>				
1	Saluran Pelimpah Outlet (gutter) 30 cm x 25 cm				
	- Gutter dari pelat baja 5 mm dilapis fibre glass 0.6 mm	m'	36.00	432,320.00	15,563,520.00
	- Pelat pengatur dari aluminium 3 mm	m2	11.00	200,000.00	2,200,000.00
	- Mur baut kupu-kupu dia 12 mm, galvanis	bh	60.00	15,000.00	900,000.00
2	Klem plat untuk pipa dia 1000 mm tebal 5 mm, termasuk angker baut	bh	6.00	75,000.00	450,000.00
3	Grill Penutup bak pelimpahan dari baja L 50.50.5 dan plat strip 50.5 mm lebar 60 cm	m'	7.60	484,473.00	3,681,994.80
4	Pengadaan dan pemasangan Tube Settler dari PVC ukuran 1.0 m x 1.2 m x 1.05 m. tebal 1 mm	bh	65.00	4,500,000.00	292,500,000.00
6	Pengadaan/emasangan railling termasuk pengecatan	m	79.20	165,721.15	13,125,114.98
7	Konstruksi atap :				
	- Rangka utama pipa dia.15 cm, termasuk pelat, angkur & bout	unit	6.00	3,430,872.00	20,585,232.00
	- Atap Polycarbonate termasuk rangka	m2	225.00	175,000.00	39,375,000.00
	<b>Sub Total 4.4.</b>				<b>388,380,861.78</b>
<b>4.5.</b>	<b>PAINTING</b>				
1	Cat besi + meni	m²	22.00	31,845.00	700,590.00
2	Plamur dan Cat tembok	m²	198.00	19,140.00	3,789,720.00
	<b>Sub Total 4.5.</b>				<b>4,490,310.00</b>
	<b>SUB TOTAL IV.</b>				<b>899,633,865.84</b>

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
V.	<b>FILTER BUILDING</b>				
5.1.	<b>EARTH WORK</b>				
1	Galian tanah	m3	405.00	19,525.00	7,907,625.00
2	Buangan tanah	m3	70.40	26,215.40	1,845,564.16
3	Urugan pasir (t = 10 cm)	m3	13.38	59,554.22	796,597.25
	<b>Sub Total 5.1.</b>				<b>10,549,786.41</b>
5.2.	<b>CONCRETING</b>				
1	Lantai kerja beton tumbuk 1:3:5	m3	6.69	353,034.00	2,361,091.39
2	Tiang Beton Pratekan 350 x 350 mm, panjang 6 m, 35 batang	m	210.00	350,000.00	73,500,000.00
3	Pemancangan Tiang	m	210.00	80,162.22	16,834,066.67
4	Pemotongan Kepala Tiang	bh	35.00	25,000.00	875,000.00
3	Pile Cap ukuran (80x80x80) cm				
	Beton K225	m3	17.92	438,086.00	7,850,501.12
	Besi - ø 16 mm U24	kg	3,484.95	7,896.60	27,519,256.17
	Bekisting batako	m2	89.60	44,256.74	3,965,403.90
4	Tie beam				
	Beton K225	m3	23.74	438,086.00	10,400,161.64
	Besi - ø 25 mm U24	kg	5,114.20	7,896.60	40,384,791.72
	Besi - ø 19 mm U24	kg	1,659.00	7,896.60	13,100,459.40
	Besi - ø 12 mm U24	kg	425.00	7,896.60	3,356,055.00
	Besi - ø 10 mm U24	kg	1,429.00	7,896.60	11,284,241.40
	Bekisting batako	m2	127.30	44,256.74	5,633,883.00
5	Pelat Dasar t = 30 cm				
	Beton K225	m3	69.70	438,086.00	30,534,594.20
	Besi - ø 12 mm U24	kg	8,328.56	7,896.60	65,767,306.90
	Bekisting batako	m2	21.12	44,256.74	934,702.35
6	Kolom				
	Beton K225	m3	13.63	438,086.00	5,971,112.18
	Besi - ø 19 mm U24	kg	4,402.00	7,896.60	34,760,833.20
	Besi - ø 10 mm U24	kg	645.00	7,896.60	5,093,307.00
	Bekisting + 1/2 stoot	m2	190.00	75,763.11	14,394,991.11
7	Dinding				
	Beton K225	m3	197.99	438,086.00	86,736,647.14
	Besi - ø 16 mm U24	kg	38,718.00	7,896.60	305,740,558.80
	Besi - ø 12 mm U24	kg	7,794.00	7,896.60	61,546,100.40
	Besi - ø 10 & 8 mm U24	kg	2,103.00	7,896.60	16,606,549.80
	Bekisting + 1/2 stoot	m2	1,319.93	75,763.11	100,002,255.79
8	Balok Plat & Kolom underdrain dan gutter				
	Beton K225	m3	19.90	438,086.00	8,717,911.40
	Besi - ø 19 mm U24	kg	3,028.00	7,896.60	23,910,904.80
	Besi - ø 12 mm U24	kg	2,376.00	7,896.60	18,762,321.60
	Besi - ø 10 mm U24	kg	405.00	7,896.60	3,198,123.00
	Bekisting + 1/2 stoot	m2	106.00	75,763.11	8,030,889.78
9	Beton isian pada saluran filter K225	m3	44.00	353,034.00	15,533,496.00
10	Balok Lantai Atas				
	Beton K225	m3	6.58	438,086.00	2,882,605.88
	Besi - ø 19 mm U24	kg	895.00	7,896.60	7,067,457.00
	Besi - ø 16 mm U24	kg	524.00	7,896.60	4,137,818.40
	Besi - ø 12 mm U24	kg	58.00	7,896.60	458,002.80
	Besi - ø 10 mm U24	kg	554.00	7,896.60	4,374,716.40
	Bekisting + 1/2 stoot	m2	52.56	75,763.11	3,982,109.12
11	Pelat Beton Berlubang				
	Beton K225	m3	1.00	438,086.00	438,086.00
	Bekisting + 1/2 stoot	m2	39.20	75,763.11	2,969,913.96
12	Pelat atas t = 15 cm				
	Beton K225	m3	14.36	438,086.00	6,290,914.96
	Besi - ø 10 mm U24	kg	1,309.00	7,896.60	10,336,649.40
	Bekisting + 1 stoot	m2	117.00	97,383.61	11,393,882.50
13	Pelat bordes t = 15 cm				
	Beton K225	m3	5.81	438,086.00	2,545,279.66
	Besi - ø 10 mm U24	kg	858.00	7,896.60	6,775,282.80
	Bekisting + 1 stoot	m2	13.70	97,383.61	1,334,155.47
14	Balok Pelat Atap				
	Beton K225	m3	6.30	438,086.00	2,759,941.80
	Besi - ø 19 mm U24	kg	895.00	7,896.60	7,067,457.00
	Besi - ø 16 mm U24	kg	776.00	7,896.60	6,127,761.60
	Besi - ø 12 mm U24	kg	634.00	7,896.60	5,006,444.40
	Besi - ø 10 mm U24	kg	109.00	7,896.60	860,729.40
	Bekisting + 1/2 stoot	m2	73.70	75,763.11	5,583,741.29
15	Pelat atap tebal 12 cm				
	Beton K225	m3	21.84	438,086.00	9,567,798.24
	Besi - ø 10 mm U24	kg	1,579.00	7,896.60	12,468,731.40
	Bekisting + 1 stoot	m2	175.00	97,383.61	17,042,131.94
16	Tangga masuk ruang operasional filter				
	Beton K225	m3	1.96	417,461.00	818,223.56
	Besi - ø 12 mm U24	kg	425.00	7,896.60	3,356,055.00
	Bekisting + 1/2 stoot	m2	15.33	75,763.11	1,161,448.49
17	Lisplank				
	Beton K225	m3	7.00	438,086.00	3,066,602.00
	Besi - ø 8 mm U24	kg	896.00	7,896.60	7,075,353.60
	Bekisting + 1 stoot	m2	125.60	75,763.11	9,515,846.76
18	Saluran Pelimpah (gutter)				
	Beton K225	m3	8.82	438,086.00	3,863,918.52
	Besi - ø 16 mm U24	kg	1,543.00	7,896.60	12,184,453.80
	Besi - ø 12 mm U24	kg	732.00	7,896.60	5,780,311.20
	Bekisting + 1/2 stoot	m2	87.00	75,763.11	6,591,390.67
	<b>Sub Total 5.2</b>				<b>1,208,192,731.88</b>

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No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
<b>5.3. MASONRY AND PLASTERING</b>						
1	Pasangan dinding bata 1/2 batu 1:4	m2	130.00	87,943.79	11,432,692.70	
2	Plesteran Beton 1:3 tebal 1cm	m2	1,499.60	12,444.30	18,661,472.28	
3	Plesteran PC 1:4 tebal 1.5 cm	m2	258.00	20,207.55	5,213,547.90	
4	Pasangan Keramik 30x30 cm berwarna	m2	106.24	63,672.40	6,764,555.78	
5	Pas. Porselin pada saluran filtrat 11x11 cm	m2	439.40	50,304.10	22,103,621.54	
3	Pasangan bata perpipaan	m2	67.20	200,000.00	13,440,000.00	
4	Pasangan paras Bali	m2	13.44	175,000.00	2,352,000.00	
<b>Sub Total 5.3</b>					<b>79,967,890.20</b>	
<b>5.4. GATE/WINDOW</b>						
1	Kusen pintu/jendela aluminium	m3	168.00	90,800.00	15,254,400.00	
2	Pintu Kaca Bingkai Aluminium	m2	5.60	641,666.67	3,593,333.33	
3	Jendela Kaca bingkai Aluminium	m2	28.00	523,809.52	14,666,666.67	
4	Jendela Jalusi Aluminium	m2	19.04	440,000.00	8,377,600.00	
5	Kunci untuk pintu 2 daun	psg	2.00	120,000.00	240,000.00	
6	Engsel pintu	psg	4.00	33,000.00	132,000.00	
7	Engsel jendela jungkit	psg	12.00	12,000.00	144,000.00	
8	Grendel jendela jungkit	bh	12.00	12,000.00	144,000.00	
<b>Sub Total 5.4</b>					<b>42,552,000.00</b>	
<b>5.5. STEEL</b>						
1	Pekerjaan bordes dalam ruang pipa					
	- Baja profil	kg	868.00	13,850.00	12,021,800.00	
	- Chequered Pelat 4 mm	m2	26.00	371,584.00	9,661,184.00	
	- Angkur Baut/Baut dia 12-200 mm, dll	Ls	1.00	300,000.00	300,000.00	
2	Pekerjaan Tangga putar					
	- Baja profil	kg	121.00	13,850.00	1,675,850.00	
	- Chequered Pelat 4 mm	m2	4.90	371,584.00	1,820,761.60	
	- Pipa baja dia 150 mm	m'	5.00	299,720.00	1,498,600.00	
<b>Sub Total 5.5</b>					<b>26,978,195.60</b>	
<b>5.6. OTHERS</b>						
1	Pengadaan dan pemasangan Alat Pembaca Muka Air pada Cipoletty	Unit	6.00	1,500,000.00	9,000,000.00	
2	Pengadaan dan pemasangan papan pembacaan H&O dari aluminium 60x45x0.2 cm digravier	Unit	1.00	1,000,000.00	1,000,000.00	
3	Pengadaan/pemasangan Nozzle untuk Filter dia 3/4 L = 35 cm	bh	1,152.00	55,000.00	63,360,000.00	
4	Pengadaan dan pemasangan saringan pasir cepat					
	- Silica Sand uk. Efektif 0,65 mm.BJ= 2.65 kg/m3	m3	18.00	600,000.00	10,800,000.00	
	- Antrasit uk. Efektif 0.83 mm.BJ = 1.50 kg/m3	m3	32.40	3,500,000.00	113,400,000.00	
	- Filter Gravel uk. Efektif 3.5-17.6 mm.BJ=2.50 kg/m3	m3	36.00	400,000.00	14,400,000.00	
5	Pengadaan dan pemasangan pelat pengatur aliran pada saluran pelimpah filter					
	- Pelat aluminium 3 mm	m2	10.80	200,000.00	2,160,000.00	
	- Mur baut kupu-kupu dia 12 mm	bh	144.00	7,500.00	1,080,000.00	
6	Pengadaan dan Pemasangan Pipa talang Air					
	- Saringan Cast Iron dia 100 mm	bh	2.00	20,000.00	40,000.00	
	- Pipa PVC dia 100 mm	m'	44.00	58,401.11	2,569,648.75	
7	Tangga Monyet pada saluran filtrat	bh	2.00	410,592.41	821,184.83	
8	Pengadaan/pemasangan railing dari GIP	m	117.00	165,721.15	19,389,374.40	
9	Pengadaan/pemasangan pelat penahan pada pipa dia 300 mm					
	- Pelat Baja Strip (3 mm x 30 mm)	kg	4.32	13,850.00	59,832.00	
	- Mur Baut dia 12 mm	bh	48.00	5,000.00	240,000.00	
<b>Sub Total 5.6</b>					<b>238,320,039.97</b>	
<b>5.7. PAINTING</b>						
1	Cat tembok (emulsion)					
	- dinding dan tangga	m2	1,175.97	19,140.00	22,508,002.00	
	- langit - langit beton	m2	418.26	19,140.00	8,005,496.40	
	- lisplank	m2	125.60	19,140.00	2,403,984.00	
2	Cat besi ex Vinilex atau setara					
	- Profil dan pelat untuk bordes dan tangga putar	m'	96.00	31,845.00	3,057,120.00	
<b>Sub Total 5.7</b>					<b>35,974,602.40</b>	
<b>SUB TOTAL V.</b>					<b>1,642,535,246.45</b>	
<b>VI. PIPE AND ITS COMPLEMENTS</b>						
<b>6.1. PIPE AND ITS COMPLEMENTS ON SPLITTER BOX</b>						
1	Pipa					
	Pipa (tebal=6,35 mm) Ø 600 mm	Steel	m	3.00	1,262,016.29	3,786,048.86
	Pipa (tebal=6,35 mm) Ø 400 mm	Steel	m	6.00	946,512.22	5,679,073.30
2	Perlengkapan Inlet					
	Bell Mouth Ø 600 mm	Cl/FJ	buah	1.00	1,944,000.00	1,944,000.00
	Flange PN 10 Ø 600 mm	Steel	buah	2.00	2,187,360.00	4,374,720.00
	Puddle Flange Ø 600 mm (termasuk pipa)	Steel	buah	1.00	1,732,546.33	1,732,546.33
3	Perlengkapan Outlet					
	Adjuster pipa outlet Ø 400 mm	Steel	buah	1.00	90,018.15	90,018.15
	Butterfly Valve Ø 400 mm	Steel	buah	1.00	22,777,200.00	22,777,200.00
	Spigot Bend 90 Ø 400 mm	Steel	buah	1.00	1,875,744.00	1,875,744.00
	Flange PN 10 Ø 400 mm	Steel	buah	5.00	1,179,360.00	5,896,800.00
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	2.00	1,182,810.08	2,365,620.17
	Blank Flange Ø 400 mm	Steel	buah	1.00	1,360,800.00	1,360,800.00
4	Perlengkapan Drain Dan Over Flow					
	Adjuster pipa over flow Ø 200 mm	Steel	buah	2.00	45,551.35	91,102.70
	Butterfly Valve dia 200 mm (termasukFlange joint)	Steel	buah	1.00	15,486,000.00	15,486,000.00
	Ext Spindel + Protecting tube + Valve Box (as horizontal - tinggi 1.5 m)					
	All Flange bend 90 Ø 200 mm	Steel	buah	5.00	1,411,615.60	7,058,078.00
	Spigot Tee Y Ø 200 mm x 200 mm	Steel	buah	1.00	730,860.00	730,860.00
	Flange PN 10 Ø 200 mm	Steel	buah	11.00	312,480.00	3,437,280.00
	Puddle Flange Ø 200 mm (termasuk pipa)	Steel	buah	2.00	423,323.82	846,647.64
<b>Sub Total 6.1.</b>					<b>79,532,539.14</b>	



TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>6.2. PIPE AND ITS COMPLEMENT ON FLOCKULATOR</b>					
1	Perlengkapan Inlet				
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	1.00	1,182,810.08
	Flexible joint Ø 400 mm	Steel	buah	1.00	5,070,240.00
	Flange PN 10 Ø 400 mm	Steel	buah	2.00	1,179,360.00
2	Perlengkapan Outlet				
	Pipa tebal=12 mm Ø 1000 mm	Steel	m	4.00	3,440,301.43
	Flange PN 10 Ø 1000 mm	Steel	buah	2.00	10,886,400.00
	Puddle Flange Ø 1000 mm (termasuk pipa)	Steel	buah	1.00	5,670,114.16
	Flexible joint Ø 1000 mm	Steel	buah	1.00	21,206,707.20
3	Perlengkapan Drain Dan Over Flow				
	Butterfly Valve with hand wheel Ø 200 mm	Steel	buah	6.00	12,587,400.00
	Flange PN 10 Ø 200 mm	Steel	buah	12.00	312,480.00
	Puddle Flange Ø 200 mm (termasuk pipa)	Steel	buah	6.00	423,323.82
	Spigot Bend 90 Ø 200 mm	Steel	buah	2.00	545,064.00
	Pipa Steel Ø 200 mm		m	20.00	545,746.50
<b>Sub Total 6.2.</b>					<b>164,841,758.06</b>
<b>6.3. PIPE AND ITS COMPLEMENT ON SEDIMENTATION UNIT</b>					
1	Pipa				
	Pipa berlubang (Ø lubang = 200 mm) Ø 1000 mm	Steel	m	13.00	3,540,301.43
	Pipa (tebal=4,47 mm) Ø 100 mm	Steel	m	48.00	155,880.00
2	Perlengkapan Inlet				
	All spigot bend 45 Ø 1000 mm	Steel	buah	1.00	1,622,915.28
	Flange PN 10 Ø 1000 mm	Steel	buah	3.00	10,886,400.00
	Puddle Flange Ø 1000 mm (termasuk pipa)	Steel	buah	1.00	3,566,753.68
3	Perlengkapan Outlet				
	Bell Mouth Ø 400 mm	CI/FJ	buah	1.00	972,000.00
	Spigot Bend 90 Ø 400 mm	Steel	buah	1.00	1,875,744.00
	Flange PN 10 Ø 400 mm	Steel	buah	2.00	1,179,360.00
	Butterfly Valve Ø 400 mm	Steel	buah	1.00	22,777,200.00
4	Perlengkapan Drain				
	All spigot bend 90 Ø 100 mm	CI/FJ	buah	11.00	191,400.00
	Butterfly Valve Ø 100 mm	CI/FJ	buah	5.00	8,154,000.00
	Flange PN 10 Ø 100 mm	Steel	buah	10.00	78,000.00
	Puddle Flange Ø 100 mm (termasuk pipa)	Steel	buah	5.00	175,250.70
<b>Sub Total 6.3.</b>					<b>163,870,345.03</b>

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>6.4.</b>	<b>PIPE &amp; ITS COMPLEMENT ON FILTER UNIT</b>				
1	Pipa				
	Pipa (tebal=4,78 mm) Ø 400 mm	Steel	m	30.00	946,512.22
	Pipa (tebal=4,37 mm) Ø 300 mm	Steel	m	30.00	652,041.75
	Pipa (Medium class- galvanized) Ø 250 mm	Steel	m	73.00	579,600.00
	Pipa (Medium class- galvanized), Main Air Wa Ø 100 mm	Steel	m	46.00	155,880.00
	Pipa (Medium class- galvanized) Ø 100 mm	Steel	m	102.00	155,880.00
	berlubang dengan Ø lubang = 20 mm lateral air wash				
2	Perlengkapan Inlet				
	Flexible joint Ø 400 mm	Steel	buah	1.00	5,070,240.00
	Spigot bend 90 Ø 400 mm	Steel	buah	8.00	1,875,744.00
	Spigot Tee Ø 400 mm x 400 mm	Steel	buah	6.00	1,343,487.60
	Butterfly Valve With Hand Wheel Ø 400 mm	CI/FJ	buah	6.00	25,308,000.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)				
	Flange PN 10 Ø 400 mm	Steel	buah	15.00	1,179,360.00
	Blank Flange PN 10 Ø 400 mm	Steel	buah	1.00	1,360,800.00
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	6.00	1,182,810.08
3	Perlengkapan Outlet				
	All Flange Butterfly Valve Ø 300 mm	CI/FJ	buah	6.00	17,316,000.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)				
	All spigot Level Invert Tee Ø 300 mm x 100 mm	Steel	buah	6.00	1,343,487.60
	Spigot Bend 90 Ø 100 mm	Steel	buah	6.00	191,400.00
	All Flange Butterfly Valve Ø 100 mm	CI/FJ	buah	6.00	8,154,000.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)				
	Flange PN 10 Ø 300 mm	Steel	buah	12.00	675,360.00
	Flange PN 10 Ø 100 mm	Steel	buah	12.00	78,000.00
	Dresser Joint for Steel Ø 300 mm	Steel	buah	6.00	675,360.00
	Puddle Flange Ø 300 mm (termasuk pipa)	Steel	buah	12.00	708,446.69
4	Perlengkapan Back Wash				
	Spigot Bend 90 Ø 250 mm	Steel	buah	11.00	742,404.00
	All spigot Tee Ø 250x 250 mm	Steel	buah	6.00	1,078,272.00
	All Flange Butterfly Valve Ø 250 mm	CI/FJ	buah	6.00	15,984,000.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)				
	Flange PN 10 Ø 250 mm	Steel	buah	13.00	433,440.00
	Blank Flange PN 10 Ø 250 mm	Steel	buah	1.00	342,720.00
	Dresser Joint for Steel Ø 250 mm	Ductile CI	buah	6.00	2,235,600.00
	Puddle Flange Ø 250 mm (termasuk pipa)	Steel	buah	6.00	532,202.38
5	Perlengkapan Air Wash				
	Spigot Bend 90 Ø 100 mm	Steel	buah	27.00	191,400.00
	All Flange Butterfly Valve Ø 100 mm	CI/FJ	buah	6.00	9,560,000.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)				
	All spigot Tee Ø 100 mm x 100 mm	Steel	buah	23.00	256,932.00
	Dresser Joint for Steel Ø 100 mm	Ductile CI	buah	6.00	976,800.00
	Flange PN 10 Ø 100 mm	Steel	buah	13.00	78,000.00
	Puddle Flange Ø 100 mm (termasuk pipa)	Steel	buah	6.00	175,250.70
	Blank Flange PN 10 Ø 100 mm	Steel	buah	1.00	218,736.00
6	Perlengkapan Drain				
	All Flange Butterfly Valve Ø 300 mm	CI/FJ	buah	6.00	17,316,000.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)				
	Spigot Bend 90 Ø 300 mm	Steel	buah	6.00	987,324.00
	Flange PN 10 Ø 300 mm	Steel	buah	12.00	675,360.00
	Puddle Flange Ø 300 mm (termasuk pipa)	Steel	buah	6.00	708,446.69
7	Perlengkapan Pintu Pemeriksaan				
	Flange PN 10 Ø 700 mm	Steel	buah	6.00	4,718,700.00
	Blank Flange PN 10 Ø 700 mm	Steel	buah	6.00	5,424,300.00
	Puddle Flange Ø 700 mm (termasuk pipa)	Steel	buah	6.00	5,339,138.42
8	Perlengkapan Transmisi Air Bersih				
	Flange PN 10 Ø 400 mm	Steel	buah	2.00	1,179,360.00
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	1.00	1,182,810.08
<b>Sub Total 6.4.</b>					<b>931,409,914.14</b>
<b>TOTAL VI</b>					<b>1,339,654,556.38</b>

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
<b>VII. PIPE INSTALLATION AND ITS COMPLEMENT</b>						
<b>7.1. PIPE AND ITS COMPLEMENT ON SPLITTER BOX</b>						
1	Pipa					
	Pipa (tebal=6,35 mm) Ø 600 mm	Steel	m	3.00	40,530.28	121,590.85
	Pipa (tebal=6,35 mm) Ø 400 mm	Steel	m	6.00	26,964.97	161,789.80
2	Perlengkapan Inlet					
	Bell Mouth Ø 600 mm	Cl/FJ	buah	1.00	73,993.30	73,993.30
	Flange PN 10 Ø 600 mm	Steel	buah	2.00	207,587.10	415,174.20
	Puddle Flange Ø 600 mm (termasuk pipa)	Steel	buah	1.00	105,325.33	105,325.33
	Pengelasan Pipa		m	2.51	96,175.00	241,591.60
	Pemotongan Pipa		m	2.51	47,395.00	119,056.24
3	Perlengkapan Outlet					
	Adjuster pipa outlet Ø 400 mm	Steel	buah	1.00	300,000.00	300,000.00
	Butterfly Valve Ø 400 mm	Steel	buah	1.00	108,279.85	108,279.85
	Spigot Bend 90 Ø 400 mm	Steel	buah	1.00	57,662.20	57,662.20
	Flange PN 10 Ø 400 mm	Steel	buah	5.00	133,992.50	669,962.50
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	2.00	57,662.20	115,324.40
	Blank Flange Ø 400 mm	Steel	buah	1.00	58,196.70	58,196.70
	Pengelasan Pipa		m	2.51	96,175.00	241,591.60
	Pemotongan Pipa		m	2.51	47,395.00	119,056.24
4	Perlengkapan Drain Dan Over Flow					
	Adjuster pipa over flow Ø 200 mm	Steel	buah	2.00	200,000.00	400,000.00
	Butterfly Valve dia 200 mm (termasuk Flange joint) Ext Spindel + Protecting tube + Valve Box (as horizontal - tinggi 1.5 m)	Steel	buah	1.00	93,073.05	93,073.05
	All Flange bend 90 Ø 200 mm	Steel	buah	5.00	35,918.10	179,590.50
	Spigot Tee Y Ø 200 mm x 200 mm	Steel	buah	1.00	35,480.85	35,480.85
	Flange PN 10 Ø 200 mm	Steel	buah	11.00	66,788.35	734,671.85
	Puddle Flange Ø 200 mm (termasuk pipa)	Steel	buah	2.00	35,918.10	71,836.20
	Pengelasan Pipa		m	3.77	96,175.00	362,387.40
	Pemotongan Pipa		m	4.40	47,395.00	208,348.42
5	Pengecatan Pipa & Perlengkapannya		m <sup>2</sup>	13.90	31,845.00	442,645.50
<b>Sub Total 7.1.</b>					<b>5,436,628.58</b>	
<b>7.2. PIPE AND ITS COMPLEMENT ON FLOCKULATOR</b>						
1	Perlengkapan Inlet					
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	1.00	57,662.20	57,662.20
	Flexible joint Ø 400 mm	Steel	buah	1.00	58,196.70	58,196.70
	Flange PN 10 Ø 400 mm	Steel	buah	2.00	133,992.50	267,985.00
2	Perlengkapan Outlet					
	Pipa tebal=12 mm Ø 1000 mm	Steel	m	4.00	64,208.58	256,834.33
	Flange PN 10 Ø 1000 mm	Steel	buah	2.00	346,054.40	692,108.80
	Puddle Flange Ø 1000 mm (termasuk pipa)	Steel	buah	1.00	106,655.50	106,655.50
	Flexible joint Ø 1000 mm	Steel	buah	1.00	106,655.50	106,655.50
	Pengelasan Pipa termasuk pembuatan bend		m	15.70	96,175.00	1,509,947.50
	Pemotongan Pipa, termasuk pembuatan bend		m	12.56	47,395.00	595,281.20
3	Perlengkapan Drain Dan Over Flow					
	Butterfly Valve with hand wheel Ø 200 mm	Steel	buah	6.00	93,073.05	558,438.30
	Flange PN 10 Ø 200 mm	Steel	buah	12.00	66,788.35	801,460.20
	Puddle Flange Ø 200 mm (termasuk pipa)	Steel	buah	6.00	35,918.10	215,508.60
	Spigot Bend 90 Ø 200 mm	Steel	buah	2.00	35,918.10	71,836.20
	Pipa Steel Ø 200 mm		m	20.00	15,269.60	305,392.00
	Pengelasan Pipa		m	6.28	96,175.00	603,979.00
	Pemotongan Pipa		m	3.77	47,395.00	178,584.36
5	Pengecatan Pipa & Perlengkapannya		m <sup>2</sup>	8.00	31,845.00	254,760.00
6	Blok Penahan/Dudukan Pipa Outlet (Beton K175, bertulang)		m <sup>3</sup>	0.80	1,010,938.53	808,750.82
<b>Sub Total 7.2.</b>					<b>7,450,036.22</b>	
<b>7.3. PIPE AND ITS COMPLEMENT ON SEDIMENTATION UNIT</b>						
1	Pipa					
	Pipa berlubang (Ø lubang = 200 mm) Ø 1000 mm	Steel	m	13.00	164,208.58	2,134,711.58
	Pipa (tebal=4,47 mm) Ø 100 mm	Steel	m	48.00	8,247.70	395,889.60
2	Perlengkapan Inlet					
	All spigot bend 45 Ø 1000 mm	Steel	buah	1.00	106,655.50	106,655.50
	Flange PN 10 Ø 1000 mm	Steel	buah	3.00	346,054.40	1,038,163.20
	Puddle Flange Ø 1000 mm (termasuk pipa)	Steel	buah	1.00	106,655.50	106,655.50
	Plat Baja tebal 12 mm	Steel	kg	113.98	13,850.00	1,578,650.70
	Pengelasan Pipa		m	12.56	96,175.00	1,207,958.00
	Pemotongan Pipa		m	3.14	47,395.00	148,820.30
3	Perlengkapan Outlet					
	Bell Mouth Ø 400 mm	Cl/FJ	buah	1.00	58,196.70	58,196.70
	Spigot Bend 90 Ø 400 mm	Steel	buah	1.00	58,196.70	58,196.70
	Flange PN 10 Ø 400 mm	Steel	buah	2.00	133,992.50	267,985.00
	Butterfly Valve Ø 400 mm	Steel	buah	1.00	108,279.85	108,279.85
4	Perlengkapan Drain					
	All spigot bend 90 Ø 100 mm	Cl/FJ	buah	11.00	20,888.35	229,771.85
	Butterfly Valve Ø 100 mm	Cl/FJ	buah	5.00	19,960.00	99,800.00
	Flange PN 10 Ø 100 mm	Steel	buah	10.00	35,411.30	354,113.00
	Puddle Flange Ø 100 mm (termasuk pipa)	Steel	buah	5.00	20,888.35	104,441.75
	Pengelasan Pipa		m	6.59	96,175.00	634,177.95
	Pemotongan Pipa		m	3.45	47,395.00	163,702.33
	Penyangga Pipa drain (Beton K175)		m <sup>3</sup>	0.50	1,524,217.53	762,108.76
5	Pengecatan Pipa & Perlengkapannya		m <sup>2</sup>	4.00	31,845.00	127,380.00
<b>Sub Total 7.3.</b>					<b>9,685,658.28</b>	

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
7.4.	<b>PIPE AND ITS COMPLEMENT ON FILTER UNIT</b>					
1	Pipa					
	Pipa (tebal=4,78 mm) Ø 400 mm	Steel	m	30.00	26,964.97	808,949.00
	Pipa (tebal=4,37 mm) Ø 300 mm	Steel	m	30.00	21,915.81	657,474.25
	Pipa (Medium class- galvanized) Ø 250 mm	Steel	m	73.00	18,548.98	1,354,075.48
	Pipa (Medium class- galvanized), Main Air Wa Ø 100 mm	Steel	m	46.00	8,247.70	379,394.20
	Pipa (Medium class- galvanized) Ø 100 mm	Steel	m	102.00	58,247.70	5,941,265.40
	berlubang dengan Ø lubang = 20 mm lateral air wash					
2	Perlengkapan Inlet					
	Flexible joint Ø 400 mm	Steel	buah	1.00	58,196.70	58,196.70
	Spigot bend 90 Ø 400 mm	Steel	buah	8.00	58,196.70	465,573.60
	Spigot Tee Ø 400 mm x 400 mm	Steel	buah	6.00	81,038.85	486,233.10
	Butterfly Valve With Hand Wheel Ø 400 mm	CI/FJ	buah	6.00	108,279.85	649,679.10
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)					
	Flange PN 10 Ø 400 mm	Steel	buah	15.00	133,992.50	2,009,887.50
	Blank Flange PN 10 Ø 400 mm	Steel	buah	1.00	58,196.70	58,196.70
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	6.00	58,196.70	349,180.20
	Pengelasan Pipa	m	18.84	96,175.00	1,811,937.00	
	Pemotongan Pipa	m	7.54	47,395.00	357,168.72	
3	Perlengkapan Outlet					
	All Flange Butterfly Valve Ø 300 mm	CI/FJ	buah	6.00	103,150.05	618,900.30
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)					
	All spigot Level Invert Tee Ø 300 mm x 100 mm	Steel	buah	6.00	66,385.80	398,314.80
	Spigot Bend 90 Ø 100 mm	Steel	buah	6.00	20,888.35	125,330.10
	All Flange Butterfly Valve Ø 100 mm	CI/FJ	buah	6.00	19,960.00	119,760.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)					
	Flange PN 10 Ø 300 mm	Steel	buah	12.00	99,195.00	1,190,340.00
	Flange PN 10 Ø 100 mm	Steel	buah	12.00	35,411.30	424,935.60
	Dresser Joint for Steel Ø 300 mm	Steel	buah	6.00	99,195.00	595,170.00
	Puddle Flange Ø 300 mm (termasuk pipa)	Steel	buah	12.00	50,364.30	604,371.60
	Pengelasan Pipa	m	16.96	96,175.00	1,630,743.30	
	Pemotongan Pipa	m	16.96	47,395.00	803,629.62	
4	Perlengkapan Back Wash					
	Spigot Bend 90 Ø 250 mm	Steel	buah	11.00	45,449.00	499,939.00
	All spigot Tee Ø 250x 250 mm	Steel	buah	6.00	47,112.20	282,673.20
	All Flange Butterfly Valve Ø 250 mm	CI/FJ	buah	6.00	98,073.05	588,438.30
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)					
	Flange PN 10 Ø 250 mm	Steel	buah	13.00	84,095.53	1,093,241.83
	Blank Flange PN 10 Ø 250 mm	Steel	buah	1.00	35,498.95	35,498.95
	Dresser Joint for Steel Ø 250 mm	Ductile CI	buah	6.00	38,332.00	229,992.00
	Puddle Flange Ø 250 mm (termasuk pipa)	Steel	buah	6.00	45,449.00	272,694.00
	Pengelasan Pipa	m	14.13	96,175.00	1,358,952.75	
	Pemotongan Pipa	m	14.13	47,395.00	669,691.35	
5	Perlengkapan Air Wash					
	Spigot Bend 90 Ø 100 mm	Steel	buah	27.00	20,888.35	563,985.45
	All Flange Butterfly Valve Ø 100 mm	CI/FJ	buah	6.00	19,960.00	119,760.00
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)					
	All spigot Tee Ø 100 mm x 100 mm	Steel	buah	23.00	21,696.85	499,027.55
	Dresser Joint for Steel Ø 100 mm	Ductile CI	buah	6.00	15,354.80	92,128.80
	Flange PN 10 Ø 100 mm	Steel	buah	13.00	35,411.30	460,346.90
	Puddle Flange Ø 100 mm (termasuk pipa)	Steel	buah	6.00	20,888.35	125,330.10
	Blank Flange PN 10 Ø 100 mm	Steel	buah	1.00	14,752.00	14,752.00
	Pengelasan Pipa	m	39.56	96,175.00	3,805,067.70	
	Pemotongan Pipa	m	39.56	47,395.00	1,875,135.78	
6	Perlengkapan Drain					
	All Flange Butterfly Valve Ø 300 mm	CI/FJ	buah	6.00	103,150.05	618,900.30
	Extension Spindle + hand wheel + Floorstand (as Vertikal - tinggi 5 m)					
	Spigot Bend 90 Ø 300 mm	Steel	buah	6.00	50,364.30	302,185.80
	Flange PN 10 Ø 300 mm	Steel	buah	12.00	99,195.00	1,190,340.00
	Puddle Flange Ø 300 mm (termasuk pipa)	Steel	buah	6.00	50,364.30	302,185.80
	Pengelasan Pipa	m	5.65	96,175.00	543,581.10	
	Pemotongan Pipa	m	5.65	47,395.00	267,876.54	
7	Perlengkapan Pintu Pemeriksaan					
	Flange PN 10 Ø 700 mm	Steel	buah	6.00	242,176.70	1,453,060.20
	Blank Flange PN 10 Ø 700 mm	Steel	buah	6.00	68,141.25	408,847.50
	Puddle Flange Ø 700 mm (termasuk pipa)	Steel	buah	6.00	79,658.85	477,953.10
8	Perlengkapan Transmisi Air Bersih					
	Flange PN 10 Ø 400 mm	Steel	buah	2.00	133,992.50	267,985.00
	Puddle Flange Ø 400 mm (termasuk pipa)	Steel	buah	1.00	58,196.70	58,196.70
9	Pengecatan Pipa & Perlengkapannya	m <sup>2</sup>	116.00	31,845.00	3,694,020.00	
	# Blok Penahan/Dudukan Pipa Outlet (Beton K175, bertulang)	m <sup>3</sup>	6.50	1,453,606.56	9,448,442.61	
	<b>Sub Total 7.4.</b>				<b>53,518,936.58</b>	
	<b>TOTAL VII</b>				<b>76,091,259.65</b>	

**Appendix-1-5 COST RECAPITULATION  
WATER TREATMENT PLANT CONSTRUCTION CAPACITY 300 Lit/Sec**

**BUDGET YEAR : 2004/2005**

<b>NO.</b>	<b>ITEM</b>	<b>PRICE (Rp)</b>
<b>I.</b>	<b>PREPARATION</b>	<b>56,568,687.80</b>
<b>II.</b>	<b>SPLITTER BOX BUILDING</b>	<b>112,999,704.96</b>
<b>III.</b>	<b>FLOCKULATOR BUILDING</b>	<b>243,387,390.28</b>
<b>IV.</b>	<b>SEDIMENTATION BUILDING</b>	<b>899,633,865.84</b>
<b>V.</b>	<b>FILTER BUILDING</b>	<b>1,642,535,246.45</b>
<b>VI.</b>	<b>PIPE AND ITS COMPLEMENT</b>	<b>1,339,654,556.38</b>
<b>VII.</b>	<b>PIPE INSTALLATION AND ITS COMPLEMENT</b>	<b>76,091,259.65</b>
<b>SUB TOTAL I+II+III+IV+V+VI+ VII</b>		<b>4,370,870,711.36</b>
<b>TAX 10%</b>		<b>437,087,071.14</b>
<b>TOTAL</b>		<b>4,807,957,782.50</b>
<b>ROUNDED</b>		<b>4,807,957,000.00</b>

**Appedix-1-6 ENGINEERING ESTIMATE  
RESERVOIR CONSTRUCTION 2000 M3**

BUDET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
<b>I. PREPARATION</b>						
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	1,000,000.00	1,000,000.00	
2	Pemasangan Bouwplank	m'	100.00	12,114.30	1,211,430.00	
3	Sewa Kantor Direksi, Gudang Material dan Barak Kerja	Ls	1.00	6,000,000.00	6,000,000.00	
4	Mobilisasi / Demobilisasi Alat-alat Berat	Ls	1.00	5,000,000.00	5,000,000.00	
4	Penerangan	Ls	1.00	500,000.00	500,000.00	
5	Papan Nama Proyek	Ls	1.00	300,000.00	300,000.00	
6	Pagar Pengaman (Seng Gelombang)	m'	130.00	50,000.00	6,500,000.00	
7	Pelaporan dan Dokumentasi	Ls	1.00	2,500,000.00	2,500,000.00	
<b>Sub Total I</b>					<b>23,011,430.00</b>	
<b>II. EARTH WORK</b>						
1	Galian tanah	m3	2,686.00	19,525.00	52,444,150.00	
1	Urugan tanah kembali	m3	682.00	86,885.00	59,255,570.00	
2	Perataan dan Pemasatan tanah	m3	682.00	21,572.50	14,712,445.00	
3	Urugan pasir t = 10 cm	m3	61.20	82,612.75	5,055,900.30	
<b>Sub Total II</b>					<b>131,468,065.30</b>	
<b>III. CONCRETING</b>						
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	30.60	353,034.00	10,802,840.40	
2	Plat dasar					
	Beton	K225	m3	238.40	438,086.00	104,439,702.40
	Besi - ø 16 mm	U24	Kg	26,852.00	7,896.60	212,039,503.20
	Bekisting biasa		m2	60.00	44,256.74	2,655,404.40
3	Balok Pelat Dasar					
	Beton	K225	m3	38.00	438,086.00	16,647,268.00
	Besi - ø 22 mm	U24	kg	11,936.00	7,896.60	94,253,817.60
	Besi - ø 12 mm	U24	kg	625.00	7,896.60	4,935,375.00
	Besi - ø 10 mm	U24	kg	4,614.00	7,896.60	36,434,912.40
	Bekisting batako		m2	268.00	44,256.74	11,860,806.32
4	Dinding Luar & Penyekat					
	Beton	K225	m3	246.30	438,086.00	107,900,581.80
	Besi - ø 19 mm	U24	kg	11,379.00	7,896.60	89,855,411.40
	Besi - ø 16 mm	U24	kg	9,973.00	7,896.60	78,752,791.80
	Besi - ø 12 mm	U24	kg	13,017.00	7,896.60	102,790,042.20
	Bekisting + 1/2 stoot		m2	1,964.40	75,763.11	148,829,055.47
5	Balok Atas Reservoir					
	Beton	K225	m3	12.26	438,086.00	5,370,934.36
	Besi - ø 16 mm	U24	kg	3,609.00	7,896.60	28,498,829.40
	Besi - ø 10 mm	U24	kg	1,313.00	7,896.60	10,368,235.80
	Bekisting + 1 stoot		m2	175.00	97,383.61	17,042,131.94
6	Pelat Atas Reservoir					
	Beton	K225	m3	61.20	438,086.00	26,810,863.20
	Besi - ø 10 mm	U24	kg	5,119.00	7,896.60	40,422,695.40
	Bekisting + 1 stoot		m2	475.00	97,383.61	46,257,215.28
7	Kolom					
	Beton	K225	m3	3.60	438,086.00	1,577,109.60
	Besi - ø 19 mm	U24	kg	424.00	7,896.60	3,348,158.40
	Besi - ø 10 mm	U24	kg	198.00	7,896.60	1,563,526.80
	Bekisting + 1/2 stoot		m2	48.00	75,763.11	3,636,629.33
8	Balok Atap R. Pompa					
	Beton	K225	m3	7.21	438,086.00	3,158,600.06
	Besi - ø 16 mm	U24	kg	989.00	7,896.60	7,809,737.40
	Besi - ø 10 mm	U24	kg	379.00	7,896.60	2,992,811.40
	Bekisting + 1 stoot		m2	76.00	97,383.61	7,401,154.44
9	Pelat Atap R. Pompa & Listplank					
	Beton	K225	m3	19.42	438,086.00	8,507,630.12
	Besi - ø 10 mm	U24	kg	1,434.00	7,896.60	11,323,724.40
	Bekisting + 1 stoot		m2	193.00	97,383.61	18,795,036.94
10	Bak Cipoletti					
	Beton	K225	m3	2.82	438,086.00	1,235,402.52
	Besi - ø 10 mm	U24	kg	320.00	7,896.60	2,526,912.00
	Bekisting biasa		m2	37.00	50,721.61	1,876,699.61
<b>Sub Total III</b>					<b>1,272,721,550.80</b>	

BUDET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
<b>IV. MASONRY AND PLASTERING</b>						
1	Pasangan Dinding Bata 1 : 4	m2	184.10	83,872.25	15,440,881.23	
2	Plesteran PC 1:3 tebal 1 cm	m2	2,968.40	12,444.30	36,939,660.12	
3	Plesteran PC 1:4 tebal 1,5 cm	m2	523.00	17,712.20	9,263,480.60	
5	Pasangan Bata Perpihan	m2	79.20	200,000.00	15,840,000.00	
6	Pasangan Paras Bali	m2	12.48	175,000.00	2,184,000.00	
<b>Sub Total IV</b>					<b>79,668,021.95</b>	
<b>V. GATE/WINDOW, ETC</b>						
1	Kusen pintu/jendela kayu	m3	0.67	90,800.00	60,836.00	
2	Pintu Panil	m2	3.36	250,310.50	841,043.28	
3	Jendela Kayu	m2	11.60	523,809.52	6,076,190.48	
4	Kunci untuk pintu 2 daun	bh	1.00	110,000.00	110,000.00	
5	Engsel pintu	psg	2.00	33,000.00	66,000.00	
6	Pemasangan Pelat Cipoletti	bh	2.00	200,000.00	400,000.00	
7	Tutup Manhole Pelat Baja 6 mm	bh	8.00	796,851.20	6,374,809.60	
8	Tangga Monyet	bh	8.00	410,592.41	3,284,739.31	
<b>Sub Total V</b>					<b>17,213,618.67</b>	
<b>VI. PAINTING</b>						
1	Meni dan Cat besi	m2	16.52	31,845.00	526,079.40	
2	Plamur dan Cat tembok	m2	523.60	19,140.00	10,021,704.00	
<b>Sub Total VI</b>					<b>10,547,783.40</b>	
<b>VII. PIPE AND ITS COMPLEMENT</b>						
<b>7.1. Connection Pipe</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600 Steel	m'	3.00	1,262,016	3,786,048.86
2	All Spigot Bend 90 <sup>0</sup>	600 Steel	bh	2.00	6,568,224	13,136,448.00
3	All Flange Butterfly Valve *	600 CI	bh	1.00	38,628,000	38,628,000.00
4	Flange Las	600 CI	bh	2.00	2,187,360	4,374,720.00
5	Gibout Joint	600 CI	bh	1.00	1,518,720	1,518,720.00
<b>7.2 Drain &amp; Overflow</b>						
1	Pipa Baja Spiral Welded	300 Steel	m'	48.00	652,041.75	31,298,003.94
2	All Spigot Bend 90 <sup>0</sup>	300 Steel	bh	4.00	987,324.00	3,949,296.00
3	All Spigot Tee	300x300 Steel	bh	3.00	1,492,764.00	4,478,292.00
4	All Flange Butterfly Valve *	300 CI	bh	2.00	17,316,000.00	34,632,000.00
5	Flange Las	300 Steel	bh	4.00	675,360.00	2,701,440.00
<b>7.3 Double Air Valve Header</b>						
1	Pipa Galvanized	100 Steel	m'	0.50	155,880.00	77,940.00
2	All Flange Gate Valve	100 CI	bh	1.00	1,598,400.00	1,598,400.00
3	Flange Las	100 CI	bh	1.00	78,000.00	78,000.00
4	Double Air Valve	100 CI	bh	1.00	4,339,200.00	4,339,200.00
<b>7.4 Others</b>						
1	Vent	Steel	unit	8.00	333,700.42	2,669,603.36
2	Tutup Manhole + Tangga Monyet	Steel	m'	32.00	410,592.41	13,138,957.25
<b>7.5 Inlet Reservoir Pipe (Cipoletti)</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600 Steel	m'	6.00	1,262,016.29	7,572,097.73
2	All Spigot Bend 90 <sup>0</sup>	600 Steel	bh	5.00	6,568,224.00	32,841,120.00
3	All Spigot Tee	600x600 Steel	bh	1.00	5,844,228.00	5,844,228.00
4	All Flange Butterfly Valve	600 CI	bh	2.00	38,628,000.00	77,256,000.00
5	Flange Las	600 Steel	bh	4.00	2,187,360.00	8,749,440.00
6	Mistar Ukur mika L = 0.6 m	mika	bh	2.00	100,000.00	200,000.00
7	Blank Flange	600 Steel	bh	1.00	2,520,000.00	2,520,000.00
<b>7.6 Drain Cipolety</b>						
1	Pipa Galvanized	100 Steel	m'	12.00	155,880.00	1,870,560.00
2	All Spigot Bend 90 <sup>0</sup>	100 Steel	bh	7.00	191,400.00	1,339,800.00
3	All Spigot Tee "Y"	100x100 Steel	bh	3.00	256,932.00	770,796.00
4	All Flange Gate Valve	100 CI	bh	4.00	1,598,400.00	6,393,600.00
5	Flange Las	100 Steel	bh	4.00	78,000.00	312,000.00
<b>7.6 Outlet Filer Pipe to Reservoir</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600 Steel	m	4.00	1,262,016.29	5,048,065.15
2	Pipa Spiral Welded	400 Steel	m	2.00	1,051,680.24	2,103,360.48
3	All Spigot Bend 45 <sup>0</sup>	400 Steel	bh	1.00	191,400.00	191,400.00
4	Spigot Reducer	600X400 Steel	bh	2.00	3,664,440.00	7,328,880.00
5	Spigot Tee Y	600X600 Steel	bh	1.00	5,844,228.00	5,844,228.00
6	Flange Las	400 Steel	bh	4.00	1,179,360.00	4,717,440.00
7	All Flange Butterfly valve	400 CI	bh	2.00	25,308,000.00	50,616,000.00
8	Blank Flange	600 Steel	bh	1.00	2,520,000.00	2,520,000.00
<b>Sub Total VII</b>					<b>384,444,084.77</b>	

BUDET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
<b>VIII. PIPE INSTALLATION AND ITS COMPLEMENT</b>						
<b>8.1</b> Pipa Penghubung						
1	Pipa Baja Spiral Welded t = 6,35 mm	600 Steel	m'	3.00	40,530.28	121,590.85
2	All Spigot Bend 90 <sup>0</sup>	600 Steel	bh	2.00	73,993.30	147,986.60
	Thrust Blok Bend 90 <sup>0</sup>	600 Beton	bh	2.00	2,128,844.05	4,257,688.09
3	All Flange Butterfly Valve *	600 CI	bh	1.00	151,293.42	151,293.42
4	Flange Las	600 CI	bh	2.00	207,587.10	415,174.20
5	Giboult Joint	600 CI	bh	1.00	68,820.55	68,820.55
<b>8.2 Drain &amp; Overflow</b>						
1	Pipa Spiral Welded	300 Steel	m'	48.00	21,915.81	1,051,958.80
2	All Spigot Bend 90 <sup>0</sup>	300 Steel	bh	4.00	50,364.30	201,457.20
	Thrust Blok Bend 90 <sup>0</sup>	300 Beton	bh	4.00	1,129,194.80	4,516,779.18
3	All Spigot Tee	300x300 Steel	bh	3.00	66,385.80	199,157.40
	Blok Penahan pada Tee	300 Beton	bh	3.00	1,129,194.80	3,387,584.39
4	All Flange Butterfly Valve *	300 CI	bh	2.00	103,150.05	206,300.10
5	Flange Las	300 Steel	bh	4.00	99,195.00	396,780.00
<b>8.3 Double Air Valve Header</b>						
1	Pipa Galvanized	100 Galv.	m'	0.50	8,247.70	4,123.85
2	All Flange Gate Valve	100 CI	bh	1.00	19,960.00	19,960.00
3	Flange Las	100 CI	bh	1.00	35,411.30	35,411.30
4	Double Air Valve	100 CI	bh	1.00	19,960.00	19,960.00
<b>8.4 Others</b>						
1	Vent	Steel	unit	8.00	50,000.00	400,000.00
2	Tutup Manhole + Tangga Monyet	Baja	unit	8.00	250,000.00	2,000,000.00
<b>8.5 Inlet Reservoir Pipe</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600 Steel	m'	6.00	40,530.28	243,181.70
2	All Spigot Bend 90 <sup>0</sup>	600 Steel	bh	5.00	73,993.30	369,966.50
	Thrust Blok Bend 90 <sup>0</sup>	600 Beton	bh	5.00	2,128,844.05	10,644,220.23
3	All Spigot Tee	600x600 Steel	bh	1.00	109,322.00	109,322.00
	Blok Penahan pada Tee	600 Beton	bh	1.00	2,482,032.77	2,482,032.77
4	All Flange Butterfly Valve	600 CI	bh	2.00	151,293.42	302,586.85
5	Flange Las	600 Steel	bh	4.00	207,587.10	830,348.40
6	Mistar Ukur muka L = 0.6 m	mika	ls	2.00	25,000.00	50,000.00
7	Blank Flange	600 Steel	bh	1.00	64,795.05	64,795.05
<b>8.6 Drain Cipolety</b>						
1	Pipa Galvanized	100 Galv.	m'	12.00	8,247.70	98,972.40
2	All Spigot Bend 90 <sup>0</sup>	100 Steel	bh	7.00	20,888.35	146,218.45
3	All Spigot Tee "Y"	100x100 Steel	bh	3.00	21,696.85	65,090.55
	Thrust Blok Tee	100 Beton	bh	3.00	82,027.61	246,082.82
4	All Flange Gate Valve	100 CI	bh	4.00	19,960.00	79,840.00
5	Flange Las	100 Steel	bh	4.00	35,411.30	141,645.20
<b>8.7 Outlet Filer Pipe to Reservoir</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600 Steel	m	4.00	40,530.28	162,121.13
2	Pipa Spiral Welded	400 Steel	m	2.00	26,964.97	53,929.93
3	All Spigot Bend 45 <sup>0</sup>	400 Steel	bh	1.00	57,662.20	57,662.20
	Thrust Blok Bend 45 <sup>0</sup>	400 Beton	bh	1.00	1,101,564.71	1,101,564.71
4	Spigot Reducer	600X400 Steel	bh	2.00	73,993.30	147,986.60
	Thrust Blok Reducer	600X400 Beton	bh	2.00	1,594,444.98	3,188,889.97
5	Spigot Tee Y	600X600 Steel	bh	1.00	109,322.00	109,322.00
	Thrust Blok TeeY	600X600 Beton	bh	1.00	2,482,032.77	2,482,032.77
6	Flange Las	400 Steel	bh	4.00	133,992.50	535,970.00
7	All Flange Butterfly valve	400 CI	bh	2.00	108,279.85	216,559.70
8	Blank Flange	600 Steel	bh	1.00	64,795.05	64,795.05
<b>Sub Total VIII</b>					<b>41,597,162.90</b>	
<b>SUB TOTAL I s/d VIII</b>					<b>1,960,671,717.79</b>	
<b>TAX 10%</b>					<b>196,067,171.78</b>	
<b>TOTAL</b>					<b>2,156,738,889.57</b>	
<b>ROUNDED</b>					<b>2,156,738,000.00</b>	



**Appendix-1-7 ENGINEERING ESTIMATE  
WASTE WATER TREATMENT PLANT CONSTRUCTION**

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I</b>	<b>PREPARATION</b>				
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	1,500,000.00	1,500,000.00
2	Pemasangan Bouwplank	m'	100.00	12,114.30	1,211,430.00
3	Sewa Kantor Direksi, Gudang Material dan Barak Kerja	Ls	1.00	3,000,000.00	3,000,000.00
4	Mobilisasi / Demobilisasi Alat-alat Berat	Ls	1.00	5,000,000.00	5,000,000.00
5	Penerangan	Ls	1.00	500,000.00	500,000.00
6	Papan Nama Proyek	Ls	1.00	300,000.00	300,000.00
7	Pelaporan dan Dokumentasi	Ls	1.00	2,500,000.00	2,500,000.00
<b>Sub. Total I</b>					<b>14,011,430.00</b>
<b>II</b>	<b>EARTH WORK</b>				
1	Galian tanah biasa	m <sup>3</sup>	809.00	19,525.00	15,795,725.00
2	Urugan tanah kembali	m <sup>3</sup>	323.60	30,125.00	9,748,450.00
3	Perataan dan Pematatan tanah	m <sup>3</sup>	323.60	21,572.50	6,980,861.00
4	Urugan pasir	m <sup>3</sup>	211.00	82,612.75	17,431,290.25
5	Hampanan kerikil	m <sup>3</sup>	124.00	82,000.00	10,168,000.00
<b>Sub Total II</b>					<b>60,124,326.25</b>
<b>III</b>	<b>CONCRETING</b>				
1	Beton rabat K125	m <sup>3</sup>	31.00	353,034.00	10,944,054.00
2	Beton dinding & pelat				
	Beton K225	m <sup>3</sup>	267.00	438,086.00	116,968,962.00
	Besi - ø 12 mm U24	kg	16,516.00	7,896.60	130,420,245.60
	Besi - ø 10 mm U24	kg	952.00	7,896.60	7,517,563.20
	Bekisting biasa	m <sup>2</sup>	104.00	50,721.61	5,275,047.56
	Bekisting + 1/2 stoot	m <sup>2</sup>	494.00	75,763.11	37,426,976.89
	Bekisting + 1 stoot	m <sup>2</sup>	52.00	97,383.61	5,063,947.78
3	Plesteran PC 1:3 tebal 1 cm	m <sup>2</sup>	1,205.00	12,444.30	14,995,381.50
<b>Sub. Total III</b>					<b>328,612,178.52</b>
<b>IV</b>	<b>PIPING AND OTHERS</b>				
1	Pipa PVC, dia 200 mm	m	132.00	171,351.95	22,618,457.40
2	Pipa PVC, dia 150 mm	m	9.00	110,458.49	994,126.43
3	All Flange Gate Valve, dia 150 mm	bh	6.00	2,552,015.65	15,312,093.90
4	All Socket Tee (RR), 200 x 150 mm	bh	6.00	1,172,312.93	7,033,877.55
5	Dop PVC, dia 200 mm	bh	1.00	340,954.40	340,954.40
6	Flange Socket, Steel/PVC, dia 150 mm	bh	12.00	260,870.10	3,130,441.20
7	All Socket Bend 90, dia 150 mm	bh	18.00	636,982.65	11,465,687.70
8	Penutup Saluran, Grill Besi 30.3.				
	- Grill Besi 30.3., lebar 50 cm	m'	90.00	221,600.00	19,944,000.00
	- Grill Besi 30.3., lebar 30 cm	m'	35.00	193,900.00	6,786,500.00
9	Pintu Kayu, ukuran 1,0 m x 1,1 m	bh	12.00	263,075.00	3,156,900.00
<b>Sub. Total IV</b>					<b>90,783,038.58</b>
<b>SUB TOTAL I-II+III+IV</b>					<b>493,530,973.35</b>
<b>TAX 10%</b>					<b>49,353,097.33</b>
<b>TOTAL</b>					<b>542,884,070.68</b>
<b>ROUNDED</b>					<b>542,884,000.00</b>

**Appendix-1-8 ENGINEERING ESTIMATE  
CHEMISTRY TREATMENT BUILDING CONSTRUCTION, CHEMISTRY STORAGE AND  
CHLOR GAS ROOM**

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I. PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	500,000.00	500,000.00
2	Pemasangan Bouwplank	Ls	105.00	12,114.30	1,272,001.50
<b>Sub. Total I</b>					<b>1,772,001.50</b>
<b>II. EARTH WORK AND FOUNDATION</b>					
1	Galian tanah	m3	279.50	19,525.00	5,457,237.50
2	Urugan tanah kembali	m3	202.82	30,125.00	6,109,952.50
4	Urugan pasir	m3	32.60	82,612.75	2,693,175.65
5	Pasangan Batu Kosong	m3	10.10	146,162.50	1,476,241.25
6	Pasangan Batu Kali 1 : 4	m3	55.60	351,328.45	19,533,861.82
<b>Sub. Total II</b>					<b>35,270,468.72</b>
<b>III. CONCRETING</b>					
1	Lantai kerja beton tumbuk (1:3:5)	m³	26.00	353,034.00	9,178,884.00
2	Pondasi Telapak				
	Beton K175	m3	10.98	410,338.50	4,505,516.73
	Besi - ø 12 mm U24	kg	1,504.00	7,896.60	11,876,486.40
	Bekisting biasa	m2	52.38	50,721.61	2,656,797.99
3	Kolom				
	Beton K175	m3	23.27	410,338.50	9,546,525.20
	Besi - ø 22 mm U24	kg	5,074.00	7,896.60	40,067,348.40
	Besi - ø 10 mm U24	kg	877.00	7,896.60	6,925,318.20
	Bekisting + 1/2 stoot	m2	181.50	75,763.11	13,751,004.67
4	Sloof				
	Beton K175	m3	12.12	438,086.00	5,309,602.32
	Besi - ø 16 mm U24	kg	1,043.00	7,896.60	8,236,153.80
	Besi - ø 8 mm U24	kg	354.00	7,896.60	2,795,396.40
	Bekisting biasa	m2	60.75	50,721.61	3,081,337.88
5	Bak pengolahan kimia				
	Beton K175	m3	16.81	438,086.00	7,364,225.66
	Besi - ø 10 mm U24	kg	1,232.00	7,896.60	9,728,611.20
	Bekisting biasa	m2	129.00	50,721.61	6,543,087.83
6	Balok Atap				
	Beton K175	m3	12.40	438,086.00	5,432,266.40
	Besi - ø 19 mm U24	kg	1,509.00	7,896.60	11,915,969.40
	- ø 16 mm U24	kg	1,475.00	7,896.60	11,647,485.00
	- ø 12 mm U24	kg	142.00	7,896.60	1,121,317.20
	- ø 10 mm U24	kg	739.00	7,896.60	5,835,587.40
	Bekisting + 1 stoot	m2	93.35	97,383.61	9,090,760.10
7	Pelat Atap				
	Beton K175	m3	39.48	438,086.00	17,295,635.28
	Besi - ø 10 mm U24	kg	2,632.00	7,896.60	20,783,851.20
	Bekisting + 1 stoot	m2	329.00	97,383.61	32,039,208.06
8	Lisplank				
	Beton K175	m3	7.78	438,086.00	3,408,309.08
	Besi - ø 10 mm U24	kg	389.00	7,896.60	3,071,777.40
	Bekisting + 1 stoot	m2	104.25	50,721.61	5,287,727.96
9	Lantai beton rabat K125	m3	30.86	410,338.50	12,663,046.11
<b>Sub Total III</b>					<b>281,159,237.26</b>
<b>IV. MASONRY AND PLASTERING</b>					
1	Pasangan Dinding Bata 1 : 4	m2	270.00	83,872.25	22,645,507.50
2	Pasangan Batu Kali 1 : 4 (untuk tangga)	m2	2.12	351,328.45	744,816.31
3	Plesteran PC 1:4 tebal 1.5 cm	m2	566.00	18,666.45	10,565,210.70
4	Lantai Keramik 30 x 30 cm	m2	53.00	63,672.40	3,374,637.20
5	Dinding Keramik 15 cm x 15 cm	m2	63.00	63,672.40	4,011,361.20
6	Saluran Air Hujan				
	- Galian tanah	m3	26.25	19,525.00	512,531.25
	- Pasangan batu bata 1:3	m3	115.50	81,220.15	9,380,927.33
	- Rabat beton	m3	2.63	353,034.00	926,714.25
	- Plesteran 1 : 3	m2	115.50	18,666.45	2,155,974.98
7	Pasangan Bata Perpiphan	m2	24.00	200,000.00	4,800,000.00
8	Pasangan Paras Bali	m2	20.00	175,000.00	3,500,000.00
<b>Sub Total IV</b>					<b>62,617,680.71</b>
<b>V. GATE/WINDOW, Etc</b>					
1	Kusen pintu/jendela aluminium	m'	86.00	85,800.00	7,378,800.00
2	Pintu Kaca Bingkai Aluminium	m2	11.74	641,666.67	7,533,166.67
3	Pintu Aluminium untuk KM/WC	bh	1.00	400,000.00	400,000.00
3	Jalusi Aluminium	m2	8.80	523,809.52	4,609,523.81
5	Kunci Pintu	psg	3.00	120,000.00	360,000.00
5	Talang air hujan	m'	28.00	58,401.11	1,635,231.02
5	Grendel Pintu	bh	1.00	10,000.00	10,000.00
7	Engsel Pintu	psg	1.00	33,000.00	33,000.00
8	Engsel Jendela	psg	12.00	15,000.00	180,000.00
9	Rel Pintu Dorong	m	6.20	300,000.00	1,860,000.00
<b>Sub Total V</b>					<b>23,999,721.50</b>

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)	
<b>VI. PAINTING</b>						
1	Meni dan Cat Kayu	m2	23.48	31,845.00	747,720.60	
2	Plamur dan Cat tembok	m2	1,127.00	19,140.00	21,570,780.00	
<b>Sub Total VI</b>					<b>22,318,500.60</b>	
<b>VII. PIPE INSTALLATION AND ITS COMPLEMENTS</b>						
<b>7.1. Pump Absorb Pipe Dosing Alum &amp; Soda</b>						
1	Pipa PVC 10 bar	PVC	m'	8.00	21,720.95	173,767.63
2	Ball Valve	PVC	bh	8.00	96,014.40	768,115.20
3	Valve Socket	PVC/Sc	bh	8.00	26,534.40	212,275.20
4	All Socket Reducer	PVC	bh	8.00	23,552.85	188,422.80
5	Knie 90°	PVC	bh	8.00	24,289.41	194,315.28
<b>7.2. Pump Welded Pipe Dosing Alum &amp; Soda</b>						
1	Pipa	PE	m'	172.00	8,148.95	1,401,620.12
2	Faucet Elbow 90°	PE	bh	8.00	23,938.80	191,510.40
3	Elbow 90°	PE	bh	15.00	23,938.80	359,082.00
4	Tee Equal 90°	PE	bh	8.00	192,102.20	1,536,817.60
5	Ball Valve	PE	bh	10.00	45,538.80	455,388.00
6	Valve Socket	PVC	bh	20.00	15,154.80	303,096.00
7	Female Thread Adaptor	PE	bh	10.00	14,338.80	143,388.00
<b>7.3. Drain Pipe</b>						
1	Pipa (RR)	PVC	m'	24.00	52,195.88	1,252,701.00
2	Elbow 90°	PVC	bh	3.00	72,800.35	218,401.05
3	Ball Valve	PVC	bh	4.00	199,960.00	799,840.00
4	Valve Socket	PVC	bh	8.00	106,312.00	850,496.00
5	Tee All Socket	PVC	bh	3.00	632,771.05	1,898,313.15
6	Elbow 45 °	PVC	bh	2.00	72,800.35	145,600.70
7	All Socket Tee (RR)	PVC	bh	1.00	632,771.05	632,771.05
<b>7.4. Solvent Pipe/Clean Water Inlet</b>						
1	Pipa	PVC	m'	30.00	18,109.33	543,280.00
2	All Socket Tee	PVC	bh	3.00	293,905.35	881,716.05
3	Knie 90°	RR	bh	3.00	24,289.41	72,868.23
4	Valve Socket	PVC	bh	8.00	26,534.40	212,275.20
5	Spigot Socket Knie 90°	PVC	bh	4.00	42,064.35	168,257.40
6	Ball Valve	PVC	bh	4.00	101,960.00	407,840.00
<b>7.5. Interconnection Pipe Ø 600 mm</b>						
1	Pipa Galvanized	Baja	m'	1.00	92,936.61	92,936.61
2	All Flange Gate Valve	CI	bh	1.00	173,960.00	173,960.00
3	Flange Las	Baja	bh	2.00	80,798.44	161,596.88
4	Valve Socket	PVC	bh	1.00	26,534.40	26,534.40
5	A. F Pressure Red & Check Valve	CI	bh	1.00	898,760.00	898,760.00
<b>7.6 Flushing of Chemistry Container</b>						
1	Pipa Galvanized	Galv.	m'	0.50	92,936.61	46,468.31
2	Pipa PVC	PVC	m'	36.00	18,109.33	651,936.00
3	Elbow 90°	PVC	bh	6.00	70,184.85	421,109.10
4	All Flange Gate Valve *	CI	bh	1.00	173,960.00	173,960.00
5	Valve Socket PVC/SCJ	PVC/SCJ	bh	4.00	26,534.40	106,137.60
6	Ball Valve PVC	PVC	bh	2.00	101,960.00	203,920.00
<b>SUB TOTAL VII</b>					<b>16,969,476.96</b>	
<b>SUB TOTAL I+II+III+IV+V+VI+VII</b>					<b>444,107,087.25</b>	
<b>TAX 10%</b>					<b>44,410,708.72</b>	
<b>TOTAL</b>					<b>488,517,795.97</b>	
<b>ROUNDED</b>					<b>488,517,000.00</b>	

**Appendix-1-9 ENGINEERING ESTIMATE  
LABORATORY AND OFFICE BUILDING**

**BUDGET YEAR : 2004/2005**

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I. PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	500,000.00	500,000.00
2	Pemasangan Bouwplank	m'	56.00	12,114.30	678,400.80
<b>Sub. Total I</b>					<b>1,178,400.80</b>
<b>II. EARTH WORK AND FOUNDATION</b>					
1	Galian tanah	m <sup>3</sup>	187.00	19,525.00	3,651,175.00
2	Urugan tanah kembali	m <sup>3</sup>	25.30	30,125.00	762,162.50
4	Urugan pasir	m <sup>3</sup>	30.53	82,612.75	2,522,332.48
5	Pasangan Batu Kosong	m <sup>3</sup>	8.80	146,162.50	1,286,230.00
6	Pasangan Batu Kali 1 : 4	m <sup>3</sup>	43.56	351,328.45	15,303,867.28
<b>Sub Total II</b>					<b>23,525,767.27</b>
<b>III. CONCRETING</b>					
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	26.20	353,034.00	9,249,490.80
2	Pondasi beton				
	Beton K175	m <sup>3</sup>	7.14	410,338.50	2,929,816.89
	Besi - ø 12 mm U24	kg	907.00	7,896.60	7,162,216.20
	Bekisting biasa	m <sup>2</sup>	5.30	50,721.61	268,824.54
3	Kolom				
	Beton K175	m <sup>3</sup>	2.05	410,338.50	841,193.93
	Besi - ø 16 mm U24	kg	814.00	7,896.60	6,427,832.40
	Besi - ø 12 mm U24	kg	80.00	7,896.60	631,728.00
	Besi - ø 10 mm U24	kg	239.00	7,896.60	1,887,287.40
	Besi - ø 8 mm U24	kg	30.00	7,896.60	236,898.00
	Bekisting + 1 stoot	m <sup>2</sup>	104.00	50,721.61	5,275,047.56
4	Sloof & Ring Balok				
	Beton K175	m <sup>3</sup>	10.56	438,086.00	4,626,188.16
	Besi - ø 16 mm U24	kg	1,617.00	7,896.60	12,768,802.20
	Besi - ø 8 mm U24	kg	406.00	7,896.60	3,206,019.60
	Bekisting biasa	m <sup>2</sup>	53.00	50,721.61	2,688,245.39
5	Meja Laboratorium				
	Beton K175	m <sup>3</sup>	1.37	438,086.00	600,615.91
	Besi - ø 10 mm U24	kg	137.00	7,896.60	1,081,834.20
	Bekisting biasa	m <sup>2</sup>	15.00	50,721.61	760,824.17
<b>Sub Total III</b>					<b>58,199,591.06</b>
<b>IV. MASONRY AND PLASTERING</b>					
1	Pasangan Dinding Bata 1 : 4	m <sup>2</sup>	263.00	83,872.25	22,058,401.75
2	Plesteran PC 1:4 tebal 1:5 cm	m <sup>2</sup>	512.34	18,666.45	9,563,568.99
3	Lantai Keramik 30 X 30 cm	m <sup>2</sup>	157.00	63,672.40	9,996,566.80
4	Pasangan Keramik 10 x 20 cm	m <sup>2</sup>	73.26	70,029.85	5,130,386.81
5	Pasangan Kloset Duduk	bh	1.00	710,000.00	710,000.00
6	Pasangan Bak Mandi	bh	1.00	400,000.00	400,000.00
7	Pasangan Kitchen Zink	bh	1.00	300,000.00	300,000.00
8	Saluran Air Hujan				
	- Galian Tanah	m <sup>3</sup>	17.25	19,525.00	336,806.25
	- Pasangan Batu Bata 1:3	m <sup>3</sup>	75.90	81,220.15	6,164,609.39
	- Rabat beton	m <sup>3</sup>	1.73	353,034.00	608,983.65
	- Plesteran 1 : 3	m <sup>2</sup>	75.90	18,666.45	1,416,783.56
9	Pasangan Bata Perpihan	m <sup>2</sup>	18.00	200,000.00	3,600,000.00
10	Pasangan Paras Bali	m <sup>2</sup>	15.00	175,000.00	2,625,000.00
<b>Sub Total IV</b>					<b>62,911,107.19</b>

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>V.</b>	<b>GATE/WINDOW, ROOF, ETC</b>				
1	Kusen Pintu/Jendela Aluminium	m	165.00	90,800.00	14,982,000.00
2	Pintu Kaca Bingkai Aluminium	m <sup>2</sup>	11.80	641,666.67	7,571,666.67
3	Pintu Aluminium untuk KM/WC	bh	1.00	400,000.00	400,000.00
4	Jendela kaca Bingkai Aluminium	m <sup>2</sup>	16.80	523,809.52	8,800,000.00
5	Jalusi Aluminium	m <sup>2</sup>	14.66	440,000.00	6,450,400.00
6	Pasangan Kaca 5 mm	m <sup>2</sup>	1.40	93,650.00	131,110.00
7	Pasangan Kuda-Kuda & Gording	m <sup>3</sup>	7.80	2,721,675.00	21,229,065.00
8	Pasangan Rangka Atap	m <sup>2</sup>	284.00	35,423.20	10,060,188.80
9	Pasangan Atap Genteng	m <sup>2</sup>	284.00	40,040.00	11,371,360.00
10	Pasangan Bubungan Atap	m'	44.00	54,780.00	2,410,320.00
11	Pasangan Lisplank	m'	60.00	50,454.25	3,027,255.00
12	Pasangan Plafon Triplek	m <sup>2</sup>	216.00	47,777.40	10,319,918.40
13	Pasangan Talang air hujan	m'	28.00	58,401.11	1,635,231.02
14	Kunci pintu	psg	5.00	120,000.00	600,000.00
15	Engsel pintu	psg	8.00	33,000.00	264,000.00
16	Engsel jendela	psg	8.00	12,000.00	96,000.00
17	Grendel pintu/jendela	bh	8.00	15,000.00	120,000.00
	<b>Sub Total V</b>				<b>99,348,514.89</b>
<b>VI</b>	<b>PAINTING</b>				
1	Meni dan Cat Kayu	m <sup>2</sup>	120.00	24,090.00	2,890,800.00
2	Plamur dan Cat tembok	m <sup>2</sup>	512.34	19,140.00	9,806,187.60
	<b>Sub Total VI</b>				<b>12,696,987.60</b>
<b>VII.</b>	<b>PLUMBING</b>				
<b>7.1</b>	<b>Sample Pipe to Laboratory (including accessories)</b>				
1	Pipa Air Baku Ø ¾ PVC	m'	65.00	6,706	435,922.50
2	Pipa Sedimentasi Ø ¾ PVC	m'	90.00	4,473	402,525.00
3	Kran ½"	bh	3.00	107,500	322,500.00
4	Pipa Drain 1 1/2 " PVC	m'	6.00	11,835	71,010.00
5	Pipa Filter Ø ¾ PVC	m'	130.00	6,709	872,137.50
<b>7.2</b>	<b>Plumbing</b>				
1	Pipa PVC Ø 25	m'	260.00	7,890	2,051,400.00
2	Pipa PVC Ø 20	m'	40.00	10,063	402,525.00
3	All Socket Tee 50 x 25 mm	bh	2.00	11,963	23,926.32
4	Kran ½"	bh	13.00	117,500	1,527,500.00
	<b>Sub Total VII</b>				<b>6,109,446.32</b>
	<b>SUB TOTAL I+II+III+IV+V+VI+VII</b>				<b>263,969,815.12</b>
	<b>TAX 10%</b>				<b>26,396,981.51</b>
	<b>TOTAL</b>				<b>290,366,796.64</b>
	<b>ROUNDED</b>				<b>290,366,000.00</b>

**Appendix-1-10 ENGINEERING ESTIMATE  
WORKSHOP BUILDING**

**BUDGET YEAR : 2004/2005**

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I. PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	250,000.00	250,000.00
2	Pemasangan Bouwplank	m'	32.00	12,114.30	387,657.60
<b>Sub Total I</b>					<b>637,657.60</b>
<b>II. EARTH WORK AND FOUNDATION</b>					
1	Galian tanah	m <sup>3</sup>	67.50	19,525.00	1,317,937.50
2	Urugan tanah kembali	m <sup>3</sup>	35.70	30,125.00	1,075,462.50
4	Urugan pasir	m <sup>3</sup>	8.40	82,612.75	693,947.10
5	Pasangan Batu Kosong	m <sup>3</sup>	7.20	146,162.50	1,052,370.00
6	Pasangan Batu Kali 1 : 4	m <sup>3</sup>	16.20	351,328.45	5,691,520.89
<b>Sub Total II</b>					<b>9,831,237.99</b>
<b>III. CONCRETING</b>					
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	4.80	353,034.00	1,694,563.20
2	Sloof, Kolom & Ring Balok				
	Beton K175	m <sup>3</sup>	3.40	438,086.00	1,489,492.40
	Besi - ø 12 mm U24	kg	479.00	7,896.60	3,782,471.40
	Besi - ø 8 mm U24	kg	250.00	7,896.60	1,974,150.00
	Bekisting biasa	m <sup>2</sup>	35.00	50,721.61	1,775,256.39
<b>Sub Total III</b>					<b>10,715,933.39</b>
<b>IV. MASONRY AND PLASTERING</b>					
1	Pasangan Dinding Bata 1 : 4	m <sup>2</sup>	80.24	83,872.25	6,729,909.34
2	Plesteran PC 1:4 tebal 1:5 cm	m <sup>2</sup>	160.50	18,666.45	2,995,965.23
3	Lantai Keramik 30 X 30 cm	m <sup>2</sup>	48.00	63,672.40	3,056,275.20
4	Saluran Air Hujan				
	- Galian tanah	m <sup>3</sup>	9.00	19,525.00	175,725.00
	- Pasangan batu bata 1:3	m <sup>3</sup>	49.50	83,872.25	4,151,676.38
	- Rabat beton	m <sup>3</sup>	6.75	353,034.00	2,382,979.50
	- Plesteran 1 : 3	m <sup>2</sup>	67.50	18,666.45	1,259,985.38
8	Pasangan Bata Perpihan	m <sup>2</sup>	12.00	200,000.00	2,400,000.00
9	Pasangan Paras Bali	m <sup>2</sup>	10.00	175,000.00	1,750,000.00
<b>Sub Total IV</b>					<b>24,902,516.02</b>
<b>V. GATE/WINDOW, ROOF, ETC</b>					
1	Kusen Pintu/Jendela Aluminium	m'	74.00	85,800.00	6,349,200.00
2	Pintu Kaca Bingkai Aluminium	m <sup>2</sup>	4.80	641,666.67	3,080,000.00
3	Jalusi Aluminium	m <sup>2</sup>	10.00	440,000.00	4,400,000.00
4	Kunci Pintu	psg	1.00	110,000.00	110,000.00
5	Engsel Pintu	psg	2.00	33,000.00	66,000.00
6	Engsel Jendela	psg	10.00	15,000.00	150,000.00
7	Pasangan Kuda-Kuda & Gording	m <sup>3</sup>	1.17	2,721,675.00	3,184,359.75
8	Pasangan Rangka Atap	m <sup>2</sup>	74.00	35,423.20	2,621,316.80
9	Pasangan Atap Genteng	m <sup>2</sup>	74.00	40,040.00	2,962,960.00
10	Pasangan Bubungan Atap	m'	10.00	54,780.00	547,800.00
11	Pasangan Lisplank	m <sup>2</sup>	10.20	50,454.25	514,633.35
12	Pasangan Plafon Triplek	m <sup>2</sup>	72.00	47,777.40	3,439,972.80
13	Pasangan Talang air hujan	m'	28.00	58,401.11	1,635,231.02
14	Kunci pintu	psg	1.00	120,000.00	120,000.00
15	Engsel pintu	psg	2.00	33,000.00	66,000.00
<b>Sub Total V</b>					<b>27,426,242.70</b>
<b>VI. PAINTING</b>					
1	Meni dan Cat Kayu	m <sup>2</sup>	74.55	85.00	6,336.75
2	Plamur dan Cat tembok	m <sup>2</sup>	160.50	425.00	68,212.50
<b>Sub Total VI</b>					<b>74,549.25</b>
<b>SUB TOTAL I+II+III+IV</b>					<b>73,588,136.94</b>
<b>TAX 10%</b>					<b>7,358,813.69</b>
<b>TOTAL</b>					<b>80,946,950.64</b>
<b>ROUNDED</b>					<b>80,946,000.00</b>

**Appendix-1-11 ENGINEERING ESTIMATE  
GENERATOR SET DAN PLN RELAY STATION**

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I PREPARATION</b>					
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	200,000.00	200,000.00
2	Pemasangan Bouwplank	m'	37.00	12,114.30	448,229.10
<b>Sub. Total I</b>					<b>648,229.10</b>
<b>II. EARTH WORK AND FOUNDATION</b>					
1	Galian tanah	m <sup>3</sup>	89.00	19,525.00	1,737,725.00
2	Urugan tanah kembali	m <sup>3</sup>	55.07	30,125.00	1,658,983.75
3	Urugan pasir	m <sup>3</sup>	7.38	82,612.75	609,682.10
4	Pasangan Batu Kosong	m <sup>3</sup>	3.85	146,162.50	562,725.63
5	Pasangan Batu Kali 1 : 4	m <sup>3</sup>	19.00	351,328.45	6,675,240.55
<b>Sub. Total II</b>					<b>4,006,390.85</b>
<b>III CONCRETING</b>					
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	12.00	353,034.00	4,236,408.00
2	Pondasi beton				
	Beton K175	m <sup>3</sup>	3.70	410,338.50	1,518,252.45
	Besi - ø 12 mm U24	kg	422.00	7,896.60	3,332,365.20
	Bekisting biasa	m <sup>2</sup>	10.56	50,721.61	535,620.21
3	Pelat Lantai				
	Beton K175	m <sup>3</sup>	2.97	410,338.50	1,218,705.35
	Besi - ø 10 mm U24	kg	301.00	7,896.60	2,376,876.60
4	Kolom				
	Beton K175	m <sup>3</sup>	2.64	410,338.50	1,083,293.64
	Besi - ø 16 mm U24	kg	751.00	7,896.60	5,930,346.60
	Besi - ø 10 mm U24	kg	148.00	7,896.60	1,168,696.80
	Bekisting + 1 stoot	m <sup>2</sup>	52.80	50,721.61	2,678,101.07
5	Sloof				
	Beton K175	m <sup>3</sup>	1.40	410,338.50	574,473.90
	Besi - ø 16 mm U24	kg	344.40	7,896.60	2,719,589.04
	Besi - ø 10 mm U24	kg	192.00	7,896.60	1,516,147.20
	Bekisting biasa	m <sup>2</sup>	17.60	50,721.61	892,700.36
6	Balok Atap				
	Beton K175	m <sup>3</sup>	2.62	410,338.50	1,075,086.87
	Besi - ø 19 mm U24	kg	731.00	7,896.60	5,772,414.60
	Besi - ø 10 mm U24	kg	262.00	7,896.60	2,068,909.20
	Bekisting + 1 stoot	m <sup>2</sup>	40.50	50,721.61	2,054,225.25
7	Pelat Atap				
	Beton K175	m <sup>3</sup>	6.87	410,338.50	2,819,025.50
	Besi - ø 10 mm U24	kg	995.00	7,896.60	7,857,117.00
	Bekisting biasa	m <sup>2</sup>	57.00	50,721.61	2,891,131.83
8	Lisplank				
	Beton K175	m <sup>3</sup>	3.40	410,338.50	1,395,150.90
	Besi - ø 10 mm U24	kg	250.00	7,896.60	1,974,150.00
	Bekisting biasa	m <sup>2</sup>	44.00	50,721.61	2,231,750.89
9	Pondasi Genset				
	Beton K175	m <sup>3</sup>	3.94	410,338.50	1,616,733.69
	Besi - ø 16 mm U24	kg	542.00	7,896.60	4,279,957.20
	Bekisting biasa	m <sup>2</sup>	7.50	50,721.61	380,412.08
<b>Sub. Total III</b>					<b>66,197,641.42</b>

BUDGET YEAR : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>IV.</b>	<b>MASONRY AND PLASTERING</b>				
1	Pasangan Dinding Bata 1 : 4	m <sup>2</sup>	97.00	83,872.25	8,135,608.25
2	Plesteran PC 1:4 tebal 1,5 cm	m <sup>2</sup>	194.00	18,666.45	3,621,291.30
3	Plesteran PC 1:3 tebal 1 cm	m <sup>2</sup>	141.50	12,444.30	1,760,868.45
4	Lantai Keramik 30 X 30 cm	m <sup>2</sup>	25.00	63,672.40	1,591,810.00
5	Saluran Pembuang				
	- Galian tanah	m <sup>3</sup>	7.80	19,525.00	152,295.00
	- Pasangan batu bata 1:3	m <sup>3</sup>	42.90	83,872.25	3,598,119.53
	- Rabat beton	m <sup>3</sup>	5.85	353,034.00	2,065,248.90
	- Plesteran 1 : 3	m <sup>2</sup>	58.50	18,666.45	1,091,987.33
5	Talang air hujan	m'	35.00	58,401.11	2,044,038.78
6	Pasangan Bata Perpihan	m <sup>2</sup>	10.80	200,000.00	2,160,000.00
7	Pasangan Paras Bali	m <sup>2</sup>	9.00	175,000.00	1,575,000.00
	<b>Sub. Total IV</b>				<b>27,796,267.53</b>
<b>V</b>	<b>GATE/WINDOW, ROOF, ETC</b>				
1	Kusen Pintu/Jendela Kayu	m <sup>3</sup>	0.30	4,172,564.00	1,251,769.20
2	Pintu Panil	m <sup>2</sup>	9.60	250,310.50	2,402,980.80
3	Jendela Jalusi Kayu	m <sup>2</sup>	4.00	377,421.00	1,509,684.00
4	Kisi-Kisi Plat Baja	m <sup>2</sup>	4.80	400,000.00	1,920,000.00
5	Kunci pintu	psg	2.00	175,000.00	350,000.00
6	Engsel Pintu	psg	2.00	33,000.00	66,000.00
	<b>Sub. Total V</b>				<b>7,500,434.00</b>
<b>VI</b>	<b>PAINTING</b>				
1	Meni dan Cat Kayu	m <sup>2</sup>	36.20	24,090.00	872,058.00
2	Plamur dan Cat tembok	m <sup>2</sup>	194.00	19,140.00	3,713,160.00
	<b>Sub. Total IV</b>				<b>4,585,218.00</b>
	<b>SUB TOTAL I+II+III+IV</b>				<b>110,734,180.89</b>
	<b>TAX 10%</b>				<b>11,073,418.09</b>
	<b>TOTAL</b>				<b>121,807,598.98</b>
	<b>ROUNDED</b>				<b>121,807,000.00</b>



**Appendix-1-12 ENGINEERING ESTIMATE  
WORKSHOP BUILDING**

TAHUN ANGGARAN : 2004/2005

No.	Item	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>I</b>	<b>PREPARATION</b>				
1	Pekerjaan Pembersihan dan Pengukuran	Ls	1.00	200,000.00	200,000.00
2	Pemasangan Bouwplank	Ls	23.00	12,114.30	278,628.90
<b>Sub. Total I</b>					<b>478,628.90</b>
<b>II.</b>	<b>EARTH WORK AND FOUNDATION</b>				
1	Galian tanah	m <sup>3</sup>	30.80	19,525.00	601,370.00
2	Urugan tanah kembali	m <sup>3</sup>	6.00	30,125.00	180,750.00
4	Urugan pasir	m <sup>3</sup>	2.80	82,612.75	231,315.70
5	Pasangan Batu Kosong	m <sup>3</sup>	5.60	146,162.50	818,510.00
6	Pasangan Batu Kali 1 : 4	m <sup>3</sup>	11.00	351,328.45	3,864,612.95
<b>Sub Total II</b>					<b>5,696,558.65</b>
<b>III</b>	<b>CONCRETING</b>				
1	Lantai kerja beton tumbuk (1:3:5)	m <sup>3</sup>	4.50	353,034.00	1,588,653.00
2	Sloof, Kolom & Ring Balok				
	Beton K175	m <sup>3</sup>	2.83	438,086.00	1,239,783.38
	Besi - ø 12 mm U24	kg	424.00	7,896.60	3,348,158.40
	Besi - ø 10 mm U24	kg	136.00	7,896.60	1,073,937.60
	Bekisting biasa	m <sup>2</sup>	38.00	50,721.61	1,927,421.22
<b>Sub Total III</b>					<b>9,177,953.60</b>
<b>IV.</b>	<b>MASONRY AND PLASTERING</b>				
1	Pasangan Dinding Bata 1 : 4	m <sup>2</sup>	59.00	81,220.15	4,791,988.85
2	Plesteran PC 1:4 tebal 1:5 cm + Acian	m <sup>2</sup>	128.00	33,793.65	4,325,587.20
3	Lantai Keramik 30 X 30 cm	m <sup>2</sup>	22.50	63,672.40	1,432,629.00
4	Pasangan Keramik 10 x 20 cm	m <sup>2</sup>	9.00	70,029.85	630,268.65
5	Pasangan Kloset Jongkok	bh	1.00	150,000.00	150,000.00
6	Pasangan Bak Mandi	bh	1.00	150,000.00	150,000.00
7	Saluran Pembuang				
	- Galian tanah	m <sup>3</sup>	4.00	19,525.00	78,100.00
	- Pasangan batu bata 1:3	m <sup>3</sup>	2.00	81,220.15	162,440.30
	- Plesteran 1 : 3	m <sup>2</sup>	20.00	18,666.45	373,329.00
8	Pasangan Bata Perpihan	m <sup>2</sup>	5.60	200,000.00	1,120,000.00
9	Pasangan Paras Bali	m <sup>2</sup>	0.96	175,000.00	168,000.00
<b>Sub Total IV</b>					<b>13,382,343.00</b>
<b>V</b>	<b>GATE/WINDOW, ROOF, ETC</b>				
1	Kusen pintu/jendela aluminium	m	30.20	85,800.00	2,591,160.00
2	Pintu Kaca bingkai aluminium	m <sup>2</sup>	3.36	641,666.67	2,156,000.00
3	Pintu Aluminium untuk KM/WC	bh	1.00	400,000.00	400,000.00
4	Jendela kaca bingkai aluminium	m <sup>2</sup>	4.20	523,809.52	2,200,000.00
5	Jalusi Aluminium	m <sup>2</sup>	4.65	440,000.00	2,046,000.00
6	Kunci pintu	psg	2.00	110,000.00	220,000.00
7	Engsel pintu	psg	3.00	33,000.00	99,000.00
8	Engsel jendela	psg	6.00	12,000.00	72,000.00
9	Grendel pintu dan jendela	bh	7.00	10,000.00	70,000.00
10	Pasangan kuda-kuda & gording	m <sup>3</sup>	0.90	2,721,675.00	2,449,507.50
11	Pasangan rangka atap	m <sup>2</sup>	77.76	35,423.20	2,754,508.03
12	Pasangan atap genteng	m <sup>2</sup>	77.76	40,040.00	3,113,510.40
13	Pasangan bubungan atap	m'	26.40	54,780.00	1,446,192.00
14	Lisplank	m'	8.70	50,454.25	438,951.98
14	Plafon Triplek	m <sup>2</sup>	57.00	47,777.40	2,723,311.80
<b>Sub Total V</b>					<b>22,780,141.71</b>
<b>VI</b>	<b>PAINTING</b>				
1	Meni dan Cat Kayu	m <sup>2</sup>	8.70	31,845.00	277,051.50
2	Plamur dan Cat tembok	m <sup>2</sup>	185.00	19,140.00	3,540,900.00
<b>Sub Total VI</b>					<b>3,817,951.50</b>
<b>SUB TOTAL I+II+III+IV+V+VI</b>					<b>55,333,577.36</b>
<b>TAX 10%</b>					<b>5,533,357.74</b>
<b>TOTAL</b>					<b>60,866,935.10</b>
<b>ROUNDED</b>					<b>60,866,000.00</b>

**Appendix-1-13 BUDGET PLAN  
PIPE INSTALLATION/EXISTING AND ITS COMPLEMENT DISTRIBUTION NETWORK  
FROM IPA PENET TO KEROBOKAN**

BUDGET YEAR : 2004/2005

No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
<b>A.</b>	<b>PIPE AND ITS COMPLEMENTS</b>						
<b>I.</b>	<b>LINE OF IPA PENET - KEROBOKAN</b>						
<b>1.1</b>	<b>IPA Location - Junction 1</b>						
1	Pipa Steel, tebal 6,35 mm	600	Baja	2,317.50	m	1,544,119	3,578,496,246
2	All Spigot Bend 45 <sup>0</sup>	600	Baja	3.00	bh	1,460,624	4,381,871
3	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	1.00	bh	379,920	379,920
4	All Spigot Bend 11 1/4 <sup>0</sup>	600	Baja	1.00	bh	379,920	379,920
5	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	m	155,880	77,940
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
	- Double Air Valve	100	CI	1.00	bh	4,339,200	4,339,200
	- Flange Las PN 16	100	Baja	1.00	bh	124,800	124,800
6	Junction 1						
	- All Spigot Tee	600x300	Baja	1.00	bh	5,396,976	5,396,976
	- All Spigot Reducer	300x200	Baja	1.00	bh	828,360	828,360
	- All Spigot Reducer	200x100	Baja	1.00	bh	252,000	252,000
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
	- All Flange Pressure Reduc & Ceck Valve	100	CI	1.00	bh	2,597,400	2,597,400
	- Giboult Joint	600	CI	1.00	bh	1,518,720	1,518,720
	- Giboult Joint	100	CI	1.00	bh	152,040	152,040
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	100	Baja	3.00	bh	124,800	374,400
	- Blank Flange	100	Baja	1.00	bh	218,736	218,736
<b>1.2</b>	<b>Junction 1 - Junction 2</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600	Baja	1,484.23	m	1,544,119	2,291,828,040
2	All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	4,232,280	8,464,560
3	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	3.00	bh	3,169,080	9,507,240
4	All Spigot Bend 11 1/4 <sup>0</sup>	600	Baja	2.00	bh	3,169,080	6,338,160
5	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	bh	155,880	77,940
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
	- Double Air Valve	100	CI	1.00	bh	4,339,200	4,339,200
	- Flange Las PN 16	100	Baja	1.00	bh	124,800	124,800
6	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded t = 6,35 mm	300	Baja	2.00	m	652,042	1,304,083
	- All Spigot Tee	600x300	Baja	1.00	bh	5,396,976	5,396,976
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	6,568,224	6,568,224
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	4,232,280	8,464,560
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	13,240,080	13,240,080
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	300	Baja	2.00	bh	1,080,576	2,161,152
	- Giboult Joint	600	Baja	1.00	bh	1,518,720	1,518,720
7	Junction 2						
	- All Spigot Tee	600x600	Baja	2.00	bh	5,844,228	11,688,456
	- All Spigot Tee	600x300	Baja	1.00	bh	5,396,976	5,396,976
	- All Spigot Reducer	300x100	Baja	1.00	bh	736,320	736,320
	- All Flange Gate Valve PN 16	600	CI	2.00	bh	70,862,400	141,724,800
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
	- All Flange Pressure Reduc & Ceck Valve	100	CI	1.00	bh	17,400,000	17,400,000
	- Giboult Joint	600	CI	1.00	bh	1,518,720	1,518,720
	- Giboult Joint	100	CI	1.00	bh	152,040	152,040
	- Flange Las PN 16	600	Baja	4.00	bh	3,062,304	12,249,216
	- Flange Las PN 16	100	Baja	3.00	bh	124,800	374,400
	- Blank Flange	600	Baja	2.00	bh	2,520,000	5,040,000
	- Blank Flange	100	Baja	1.00	bh	218,736	218,736

BUDGET YEAR : 2004/2005

No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
<b>1.3</b>	<b>Junction 2 - Junction 3</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600	Baja	1,563.54	m	1,544,119	2,414,292,134
2	All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	4,232,280	8,464,560
3	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	1.00	bh	3,169,080	3,169,080
4	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	bh	155,880	77,940
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
	- Double Air Valve	100	CI	1.00	bh	4,339,200	4,339,200
	- Flange Las PN 16	100	Baja	1.00	bh	124,800	124,800
5	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded t = 6,35 mm	300	Baja	2.00	m	652,042	1,304,083
	- All Spigot Tee	600x300	Baja	1.00	bh	5,396,976	5,396,976
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	6,568,224	6,568,224
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	1,544,119	3,088,238
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	13,240,080	13,240,080
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	300	Baja	2.00	bh	1,080,576	2,161,152
	- Giboult Joint	600	Baja	1.00	bh	1,518,720	1,518,720
6	Junction 3						
	- All Spigot Tee	600x300	Baja	2.00	bh	5,396,976	10,793,952
	- All Spigot Reducer	300x200	Baja	1.00	bh	828,360	828,360
	- All Spigot Reducer	300x150	Baja	1.00	bh	745,524	745,524
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	200	CI	1.00	bh	6,340,320	6,340,320
	- All Flange Gate Valve PN 16	150	CI	1.00	bh	3,449,880	3,449,880
	- All Flange Pressure Reduc & Ceck Valve	100	CI	1.00	bh	2,597,400	2,597,400
	- Giboult Joint	600	CI	1.00	bh	1,518,720	1,518,720
	- Giboult Joint	150	CI	1.00	bh	227,880	227,880
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	200	Baja	1.00	bh	437,472	437,472
	- Flange Las PN 16	150	Baja	3.00	bh	331,800	995,400
	- Blank Flange	200	Baja	1.00	bh	312,480	312,480
	- Blank Flange	150	Baja	1.00	bh	281,232	281,232
<b>1.4</b>	<b>Junction 3 - Junction 4</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600	Baja	1,217.46	m	1,544,119	1,879,903,361
2	All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	4,232,280	8,464,560
3	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	bh	155,880	77,940
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
	- Double Air Valve	100	CI	1.00	bh	4,339,200	4,339,200
	- Flange Las PN 16	100	Baja	1.00	bh	124,800	124,800
4	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded t = 6,35 mm	300	Baja	2.00	m	652,042	1,304,083
	- All Spigot Tee	600x300	Baja	1.00	bh	5,396,976	5,396,976
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	6,568,224	6,568,224
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	4,232,280	8,464,560
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	13,240,080	13,240,080
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	300	Baja	2.00	bh	1,080,576	2,161,152
	- Giboult Joint	600	Baja	1.00	bh	1,518,720	1,518,720
5	Junction 4						
	- All Spigot Tee	600x300	Baja	2.00	bh	5,396,976	10,793,952
	- All Spigot Reducer	300x150	Baja	1.00	bh	745,524	745,524
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	13,945,554	13,945,554
	- All Flange Pressure Reduc & Ceck Valve	150	CI	1.00	bh	3,862,800	3,862,800
	- Giboult Joint	600	CI	1.00	bh	1,518,720	1,518,720
	- Giboult Joint	300	CI	1.00	bh	645,000	645,000
	- Giboult Joint	150	CI	1.00	bh	227,880	227,880
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	300	Baja	2.00	bh	1,080,576	2,161,152
	- Flange Las PN 16	150	Baja	3.00	bh	331,800	995,400
	- Blank Flange	150	Baja	1.00	bh	281,232	281,232

BUDGET YEAR : 2004/2005

No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
<b>1.5</b>	<b>Junction 4 - Junction 5</b>						
1	Pipa Baja Spiral Welded t = 6,35 mm	600	Baja	2,154.76	m	1,544,119	3,327,206,287
2	All Spigot Bend 45 <sup>0</sup>	600	Baja	4.00	bh	4,232,280	16,929,120
3	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	3.00	bh	3,169,080	9,507,240
4	Air Valve, 2 unit						
	- Pipa galvanized	100	Baja	1.00	bh	155,880	155,880
	- All Flange Gate Valve	100	CI	2.00	bh	2,557,440	5,114,880
	- Double Air Valve	100	CI	2.00	bh	4,339,200	8,678,400
	- Flange Las PN 16	100	Baja	2.00	bh	124,800	249,600
5	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded	300	Baja	2.00	m	652,042	1,304,083
	- All Spigot Tee	600x300	Baja	1.00	bh	5,396,976	5,396,976
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	6,568,224	6,568,224
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	1,544,119	3,088,238
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	70,862,400	70,862,400
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	13,240,080	13,240,080
	- Flange Las PN 16	600	Baja	2.00	bh	3,062,304	6,124,608
	- Flange Las PN 16	300	Baja	2.00	bh	1,080,576	2,161,152
	- Giboult Joint	600	Baja	1.00	bh	1,518,720	1,518,720
6	Junction 5						
	- Pipa Baja Spiral Welded	350	Baja	1.00	m	895,869	895,869
	- Pipa Baja Spiral Welded	300	Baja	1.00	m	814,554	814,554
	- All Spigot Tee	600x600	Baja	1.00	bh	5,844,228	5,844,228
	- All Spigot Tee	600x500	Baja	1.00	bh	4,198,880	4,198,880
	- All Spigot Reducer	600x300	Baja	1.00	bh	2,820,000	2,820,000
	- All Spigot Reducer	600x350	Baja	1.00	bh	2,961,000	2,961,000
	- All Flange Gate Valve	500	CI	1.00	bh	39,960,000	39,960,000
	- All Flange Gate Valve	350	CI	1.00	bh	11,348,640	11,348,640
	- All Flange Gate Valve	300	CI	1.00	bh	9,457,200	9,457,200
	- Giboult Joint	350	CI	1.00	bh	774,000	774,000
	- Giboult Joint	300	CI	1.00	bh	645,000	645,000
	- Flange Las	500	Baja	1.00	bh	1,632,960	1,632,960
	- Flange Las	350	Baja	2.00	bh	810,432	1,620,864
	- Flange Las	300	Baja	2.00	bh	675,360	1,350,720
	- Blank Flange	500	Baja	1.00	bh	1,874,880	1,874,880
<b>1.6</b>	<b>FLOW METER OF CLEAN WATER DISTRIBUTION PIPE</b>						
	Elektromagnetik flow meter	500	Steel	bh	1.00	57,727,283	57,727,283
	Pipa Spiral Welded	500	Steel	m'	3.00	1,286,766	3,860,298
	All Flange Butterfly Valve	600	CI	bh	1.00	38,628,000	38,628,000
	All Flange Butterfly Valve	500	CI	bh	2.00	34,632,000	69,264,000
	All Flange Check Valve	500	CI	bh	1.00	66,600,000	66,600,000
	Spigot Tee	600x600	Steel	bh	2.00	5,844,228	11,688,456
	Spigot Bend 90 <sup>0</sup>	600	Steel	bh	2.00	6,568,224	13,136,448
	All Flange Gate Valve *	600	CI	bh	1.00	50,616,000	50,616,000
	All Flange Gate Valve *	500	CI	bh	2.00	39,960,000	79,920,000
	Spigot Reducer	600x500	Steel	bh	2.00	3,748,680	7,497,360
	Giboult Joint	600	CI	bh	1.00	1,518,720	1,518,720
	Giboult Joint	500	CI	bh	1.00	1,141,200	1,141,200
	Flange Las	600	Steel	bh	2.00	2,187,360	4,374,720
	Flange Las	500	Steel	bh	6.00	1,632,960	9,797,760
<b>Sub Total I</b>							<b>15,071,708,225</b>
<b>II.</b>	<b>WELDED PIPE SUBMERSIBLE PUMP</b>						
1	Pipa Galvanized	100	Steel	0.50	m'	155,880	77,940
2	Pipa Baja Spiral Welded t = 6,35 mm	600	Steel	21.00	m'	1,544,119	32,426,503
3	Pipa Spiral Welded	300	Steel	9.00	m'	652,042	5,868,376
4	AF Flexible Joint PN 16	300	CI	3.00	bh	3,802,680	11,408,040
5	Wafer Check Valve PN 16	300	CI	3.00	bh	39,939,480	119,818,440
6	Butterfly Valve PN 16	300	CI	3.00	bh	24,242,400	72,727,200
7	Flange Las PN 16	300	Steel	20.00	bh	1,080,576	21,611,520
8	Spigot Bend 90 <sup>0</sup>	300	Steel	3.00	bh	987,324	2,961,972
9	Blank Flange PN 16	300	Steel	2.00	bh	945,504	1,891,008
10	AF Gate Valve PN 16	100	CI	1.00	bh	2,557,440	2,557,440
11	Double Air Valve PN 16	100	CI	1.00	bh	4,339,200	4,339,200
12	Flange Las PN 16	100	Steel	1.00	bh	124,800	124,800
<b>Sub Total II</b>							<b>275,812,439</b>
<b>SUB TOTAL A</b>							<b>15,347,520,664</b>

BUDGET YEAR : 2004/2005

No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
<b>B. PIPE INSTALLATION</b>							
<b>I. LINE OF IPA PENET - KEROBOKAN</b>							
<b>1.1 Preparation</b>							
1	Pekerjaan Pengukuran / Bouwplank			6,657.49	m	12,114	80,650,831
2	Papan Nama Proyek 2 buah				ls		600,000
3	Direksi Keet (4 x 6 m) + Gudang				ls		12,000,000
4	Administrasi Proyek				ls		8,000,000
5	SOP/Asbuilt Drawing, Foto <sup>2</sup> & Pelaporan						
<b>1.2 IPA Location- Junction 1</b>							
1	Pemasangan Pipa di bawah Jalan Aspal	600	Baja	996.53	m'	318,936	317,827,604
2	Pemasangan Pipa di bawah Berm	600	Baja	1,320.98	m'	245,180	323,876,713
3	All Spigot Bend 45 <sup>0</sup>	600	Baja	3.00	bh	73,993	221,980
	Thrust Blok Bend 45 <sup>0</sup>			3.00	bh	1,213,300	3,639,901
4	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	Thrust Blok Bend 22 1/2 <sup>0</sup>			1.00	bh	1,364,648	1,364,648
5	All Spigot Bend 11 1/4 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	Thrust Blok Bend 11 1/4 <sup>0</sup>			1.00	bh	1,364,648	1,364,648
6	Air Valve, 1 unit						
	- Pipa Galvanized	100	Baja	0.50	m	8,248	4,124
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	19,960	19,960
	- Double Air Valve	100	CI	1.00	bh	19,960	19,960
	- Flange Las PN 16	100	Baja	1.00	bh	35,411	35,411
	- Box Air Valve		Beton	1.00	bh	1,091,403	1,091,403
7	Junction 1						
	- All Spigot Tee	600x300	Baja	1.00	bh	109,322	109,322
	Blok Penahan Pada Tee			1.00	bh	1,909,256	1,909,256
	- All Spigot Reducer	300x200	Baja	1.00	bh	50,364	50,364
	Blok Penahan Pada Reducer			1.00	bh	349,750	349,750
	- All Spigot Reducer	200x100	Baja	1.00	bh	35,918	35,918
	Blok Penahan Pada Reducer			1.00	bh	144,709	144,709
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	19,960	19,960
	- All Flange Pressure Reduc & Ceck Valve	100	CI	1.00	bh	19,960	19,960
	- Giboult Joint	600	CI	1.00	bh	68,821	68,821
	- Giboult Joint	100	CI	1.00	bh	15,355	15,355
	- Flange Las PN 16	600	Baja	2.00	bh	207,587	415,174
	- Flange Las PN 16	100	Baja	3.00	bh	35,411	106,234
	- Blank Flange	100	Baja	1.00	bh	14,752	14,752
<b>1.3. Junction 1 - Junction 2</b>							
1	Pemasangan Pipa di bawah Jalan Aspal	600	Baja	697.59	m'	318,936	222,485,893
2	Pemasangan Pipa di bawah Berm	600	Baja	786.64	m'	245,180	192,868,898
3	All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	Thrust Blok Bend 45 <sup>0</sup>			2.00	bh	1,213,300	2,426,601
4	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	3.00	bh	73,993	221,980
	Thrust Blok Bend 22 1/2 <sup>0</sup>			3.00	bh	1,364,648	4,093,945
5	All Spigot Bend 11 1/4 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	Thrust Blok Bend 11 1/4 <sup>0</sup>			2.00	bh	1,364,648	2,729,297
6	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	m	8,248	4,124
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	19,960	19,960
	- Double Air Valve	100	CI	1.00	bh	19,960	19,960
	- Flange Las PN 16	100	Baja	1.00	bh	35,411	35,411
	- Box Air Valve			1.00	bh	1,091,403	1,091,403
7	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded	300	Baja	2.00	m	120,921	241,843
	- All Spigot Tee	600x300		1.00	bh	109,322	109,322
	Blok Penahan Pada Tee			1.00	bh	1,909,256	1,909,256
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	Thrust Blok Bend 90 <sup>0</sup>			1.00	bh	2,128,844	2,128,844
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	Thrust Blok Bend 45 <sup>0</sup>			2.00	bh	1,213,300	2,426,601
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	103,150	103,150
	- Flange Las PN 16	600	Baja	2.00	bh	151,293	302,587
	- Flange Las PN 16	300	Baja	2.00	bh	99,195	198,390
	- Giboult Joint	600	Baja	1.00	bh	68,821	68,821
	- Box Wash Out			1.00	bh	6,073,871	6,073,871

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No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
8	Junction 2						
	- All Spigot Tee	600x300	Baja	1.00	bh	109,322	109,322
	- Blok Penahan Pada Tee			1.00	bh	1,909,256	1,909,256
	- All Spigot Reducer	300x200	Baja	1.00	bh	50,364	50,364
	- Blok Penahan Pada Reducer			1.00	bh	349,750	349,750
	- All Spigot Reducer	200x100	Baja	1.00	bh	10,930	10,930
	- Blok Penahan Pada Reducer			1.00	bh	144,709	144,709
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	19,960	19,960
	- All Flange Pressure Reduc & Ceck Valve	100	CI	1.00	bh	19,960	19,960
	- Giboult Joint	600	CI	1.00	bh	68,821	68,821
	- Giboult Joint	100	CI	1.00	bh	15,355	15,355
	- Flange Las PN 16	600	Baja	2.00	bh	207,587	415,174
	- Flange Las PN 16	100	Baja	3.00	bh	35,411	106,234
	- Blank Flange	100	Baja	1.00	bh	14,752	14,752
<b>1.4.</b>	<b>Junction 2 - Junction 3</b>						
1	Pemasangan Pipa di bawah Jalan Aspal	600	Baja	985.03	m'	318,936	314,161,500
2	Pemasangan Pipa di bawah Berm	600	Baja	578.51	m'	245,180	141,839,060
3	All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	- Thrust Blok Bend 45 <sup>0</sup>			2.00	bh	1,213,300	2,426,601
4	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	- Thrust Blok Bend 22 1/2 <sup>0</sup>			1.00	bh	1,364,648	1,364,648
5	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	bh	8,248	4,124
	- All Flange Gate Valve PN 16	100	CI	1.00	bh	19,960	19,960
	- Double Air Valve	100	CI	1.00	bh	19,960	19,960
	- Flange Las PN 16	100	Baja	1.00	bh	35,411	35,411
	- Box Air Valve			1.00	bh	1,091,403	1,091,403
6	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded	300	Baja	2.00	m	120,921	241,843
	- All Spigot Tee	600x300		1.00	bh	109,322	109,322
	- Blok Penahan Pada Tee			1.00	bh	1,909,256	1,909,256
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	- Thrust Blok Bend 90 <sup>0</sup>			1.00	bh	2,128,844	2,128,844
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	- Thrust Blok Bend 45 <sup>0</sup>			2.00	bh	1,213,300	2,426,601
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	103,150	103,150
	- Flange Las PN 16	600	Baja	2.00	bh	151,293	302,587
	- Flange Las PN 16	300	Baja	2.00	bh	99,195	198,390
	- Giboult Joint	600	Baja	1.00	bh	68,821	68,821
	- Box Wash Out			1.00	bh	6,073,871	6,073,871
7	Junction 3						
	- All Spigot Tee	600x300	Baja	2.00	bh	109,322	218,644
	- Blok Penahan Pada Tee			2.00	bh	1,909,256	3,818,512
	- All Spigot Reducer	300x200	Baja	1.00	bh	50,364	50,364
	- Blok Penahan Pada Reducer			1.00	bh	349,750	349,750
	- All Spigot Reducer	300x150	Baja	1.00	bh	50,364	50,364
	- Blok Penahan Pada Reducer			1.00	bh	181,777	181,777
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	200	CI	1.00	bh	93,073	93,073
	- All Flange Gate Valve PN 16	150	CI	1.00	bh	87,816	87,816
	- All Flange Pressure Reduc & Ceck Valve	100	CI	1.00	bh	19,960	19,960
	- Giboult Joint	600	CI	1.00	bh	68,821	68,821
	- Giboult Joint	150	CI	1.00	bh	23,995	23,995
	- Flange Las PN 16	600	Baja	2.00	bh	207,587	415,174
	- Flange Las PN 16	200	Baja	1.00	bh	66,788	66,788
	- Flange Las PN 16	150	Baja	3.00	bh	51,689	155,067
	- Blank Flange	200	Baja	1.00	bh	28,474	28,474
	- Blank Flange	150	Baja	1.00	bh	22,910	22,910
<b>1.5</b>	<b>Junction 3 - Junction 4</b>						
1	Pemasangan Pipa di bawah Jalan Aspal	600	Baja	827.87	m'	318,936	264,038,362
2	Pemasangan Pipa di bawah Berm	600	Baja	389.59	m'	245,180	95,519,008
3	All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	- Thrust Blok Bend 45 <sup>0</sup>			2.00	bh	1,213,300	2,426,601
4	Air Valve, 1 unit						
	- Pipa galvanized	100	Baja	0.50	bh	8,248	4,124
	- All Flange Gate Valve	100	CI	1.00	bh	19,960	19,960
	- Double Air Valve	100	CI	1.00	bh	19,960	19,960
	- Flange Las	100	Baja	1.00	bh	35,411	35,411
	- Box Air Valve			1.00	bh	1,091,403	1,091,403

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No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
5	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded	300	Baja	2.00	m	120,921	241,843
	- All Spigot Tee	600x300		1.00	bh	109,322	109,322
	Blok Penahan Pada Tee			1.00	bh	1,909,256	1,909,256
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	Thrust Blok Bend 90 <sup>0</sup>			1.00	bh	2,128,844	2,128,844
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	Thrust Blok Bend 45 <sup>0</sup>			1.00	bh	1,213,300	1,213,300
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	103,150	103,150
	- Flange Las PN 16	600	Baja	2.00	bh	151,293	302,587
	- Flange Las PN 16	300	Baja	2.00	bh	99,195	198,390
	- Giboult Joint	600	Baja	1.00	bh	68,821	68,821
	- Box Wash Out			1.00	bh	6,073,871	6,073,871
6	Junction 4						
	- All Spigot Tee	600x300	Baja	2.00	bh	109,322	218,644
	Blok Penahan Pada Tee			2.00	bh	1,909,256	3,818,512
	- All Spigot Reducer	300x150	Baja	1.00	bh	50,364	50,364
	Blok Penahan Pada Reducer			1.00	bh	181,777	181,777
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	103,150	103,150
	- All Flange Pressure Reduc & Ceck Valve	150	CI	1.00	bh	87,816	87,816
	- Giboult Joint	600	CI	1.00	bh	68,821	68,821
	- Giboult Joint	300	CI	1.00	bh	46,513	46,513
	- Giboult Joint	150	CI	1.00	bh	23,995	23,995
	- Flange Las PN 16	600	Baja	2.00	bh	207,587	415,174
	- Flange Las PN 16	300	Baja	2.00	bh	99,195	198,390
	- Flange Las PN 16	150	Baja	3.00	bh	51,689	155,067
	- Blank Flange	150	Baja	1.00	bh	22,910	22,910
1.6	Junction 4 - Junction 5						
1	Pemasangan Pipa di bawah Jalan Aspal	600	Baja	1,810.00	m'	318,936	577,273,481
2	Pemasangan Pipa di bawah Berm	600	Baja	344.76	m'	245,180	84,528,665
3	All Spigot Bend 45 <sup>0</sup>	600	Baja	4.00	bh	73,993	295,973
	Thrust Blok Bend 45 <sup>0</sup>			4.00	bh	1,213,300	4,853,202
4	All Spigot Bend 22 1/2 <sup>0</sup>	600	Baja	3.00	bh	73,993	221,980
	Thrust Blok Bend 22 1/2 <sup>0</sup>			3.00	bh	1,364,648	4,093,945
5	Air Valve, 2 unit						
	- Pipa galvanized	100	Baja	1.00	m	8,248	8,248
	- All Flange Gate Valve	100	CI	2.00	bh	19,960	39,920
	- Double Air Valve	100	CI	2.00	bh	19,960	39,920
	- Flange Las PN 16	100	Baja	2.00	bh	35,411	70,823
	- Box Air Valve			2.00	bh	1,091,403	2,182,806
6	Wash Out, 1 unit						
	- Pipa Baja Spiral Welded	300	Baja	2.00	m	120,921	241,843
	- All Spigot Tee	600x300		1.00	bh	109,322	109,322
	Blok Penahan Pada Tee			1.00	bh	1,909,256	1,909,256
	- All Spigot Bend 90 <sup>0</sup>	600	Baja	1.00	bh	73,993	73,993
	Thrust Blok Bend 90 <sup>0</sup>			1.00	bh	2,128,844	2,128,844
	- All Spigot Bend 45 <sup>0</sup>	600	Baja	2.00	bh	73,993	147,987
	Thrust Blok Bend 45 <sup>0</sup>			2.00	bh	1,213,300	2,426,601
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	103,150	103,150
	- Flange Las PN 16	600	Baja	2.00	bh	151,293	302,587
	- Flange Las PN 16	300	Baja	2.00	bh	99,195	198,390
	- Giboult Joint	600	Baja	1.00	bh	68,821	68,821
	- Box Wash Out			1.00	bh	6,073,871	6,073,871
7	Junction 5						
	- Pipa Baja Spiral Welded	350	Baja	1.00	m	158,131	158,131
	- Pipa Baja Spiral Welded	300	Baja	1.00	m	120,921	120,921
	- All Spigot Tee	600x600	Baja	1.00	bh	109,322	109,322
	Blok Penahan Pada Tee			1.00	bh	2,482,033	2,482,033
	- All Spigot Reducer	600x300	Baja	1.00	bh	109,322	109,322
	Blok Penahan Pada Reducer			1.00	bh	1,909,256	1,909,256
	- All Spigot Reducer	600x350	Baja	1.00	bh	73,993	73,993
	Blok Penahan Pada Reducer			1.00	bh	1,275,824	1,275,824
	- All Flange Gate Valve PN 16	600	CI	1.00	bh	151,293	151,293
	- All Flange Gate Valve PN 16	350	CI	1.00	bh	108,280	108,280
	- All Flange Gate Valve PN 16	300	CI	1.00	bh	103,150	103,150
	- Giboult Joint	600	CI	1.00	bh	68,821	68,821
	- Giboult Joint	350	CI	1.00	bh	54,182	54,182
	- Giboult Joint	300	CI	1.00	bh	46,513	46,513
	- Flange Las PN 16	600	Baja	2.00	bh	207,587	415,174
	- Flange Las PN 16	350	Baja	2.00	bh	133,993	267,985
	- Flange Las PN 16	300	Baja	2.00	bh	99,195	198,390

BUDGET YEAR : 2004/2005

No.	Description	Size (mm)	Material	Volume	Unit	Unit Price (Rp.)	Total Price (Rp.)
<b>1.7 FLOW METER OF CLEAN WATER DISTRIBUTION PIPE</b>							
1	Elektromagnetik flow meter	500	Steel	bh	1.00	128,570	128,570
2	Pipa Spiral Welded	500	Steel	m'	3.00	109,322	327,966
3	All Flange Butterfly Valve	600	CI	bh	1.00	151,293	151,293
4	All Flange Butterfly Valve	500	CI	bh	2.00	128,570	257,139
5	All Flange Check Valve	500	CI	bh	1.00	128,570	128,570
6	Spigot Tee	600x600	Steel	bh	2.00	109,322	218,644
7	Blok Penahan pada Tee	600x600	Beton	bh	1.00	2,482,033	2,482,033
8	Spigot Bend 90°	600	Steel	bh	2.00	73,993	147,987
9	Thrust Blok Bend 90°	600	Beton	bh	1.00	2,128,844	2,128,844
10	Spigot Reducer	600x500	Steel	bh	2.00	73,993	147,987
11	Blok Penahan pada Reducer	600x500	Beton	bh	2.00	1,733,153	3,466,306
12	Giboult Joint	600	CI	bh	1.00	68,821	68,821
13	Giboult Joint	500	CI	bh	1.00	63,967	63,967
14	Flange Las	600	Steel	bh	2.00	207,587	415,174
15	Flange Las	500	Steel	bh	6.00	168,115	1,008,693
16	Box flow meter		Beton	bh	1.00	6,073,871	6,073,871
<b>Sub Total I</b>							<b>2,772,795,984</b>
<b>II. WELDED PIPE SUBMERSIBLE PUMP INSTALLATION</b>							
1	Pipa Galvanized	100	Steel	0.50	m'	25,712	12,856
2	Pipa Spiral Welded	600	Steel	21.00	m'	191,799	4,027,773
3	Pipa Spiral Welded	300	Steel	9.00	m'	68,464	616,173
4	AF Flexible Joint PN 16	300	CI	3.00	bh	46,513	139,538
5	Wafer Check Valve PN 16	300	CI	3.00	bh	103,150	309,450
6	Butterfly Valve PN 16	300	CI	3.00	bh	103,150	309,450
7	Flange Las	300	Steel	20.00	bh	99,195	1,983,900
8	Spigot Bend 90°	300	Steel	3.00	bh	50,364	151,093
9	Thrust Blok Bend 90°	300	Beton	3.00	bh	1,129,195	3,387,584
10	Blank Flange	300	Steel	2.00	bh	41,192	82,384
11	AF Gate Valve PN 16	100	CI	1.00	bh	19,960	19,960
12	Double Air Valve PN 16	100	CI	1.00	bh	19,960	19,960
13	Flange Las PN 16	100	Steel	1.00	bh	35,411	35,411
<b>Sub Total II</b>							<b>11,095,533</b>
<b>SUB TOTAL B</b>							<b>2,783,891,517</b>
<b>SUB TOTAL A+B</b>							<b>18,131,412,181</b>
<b>TAX 10%</b>							<b>1,813,141,218</b>
<b>TOTAL</b>							<b>19,944,553,399</b>
<b>ROUNDED</b>							<b>19,944,553,000</b>

Catatan :

1. Gate Valve lengkap dengan T.Key - Street Cover & Protecting Tube
2. Perlengkapan Pipa termasuk about, mur, packing



**Appendix-1-14 BUDGET PLAN**  
**PIPE INSTALLATION/EXISTING AND ITS COMPLEMENT TRANSMISSION NETWORK**

BUDGET YEAR : 2004/2005

No.	Description	Size (mm)	Material	Unit	Volume	Unit Price (Rp.)	Total Price (Rp.)
<b>A. SUPPLYING</b>							
<b>I. RAW WATER TRANSMISSION PIPE</b>							
1	Pipa Baja Spiral Welded t = 6,35 mm	600	Steel	m'	174.00	1,544,119	268,676,741
2	All Spigot Bend 90 <sup>0</sup>	600	Steel	bh	4.00	6,568,224	26,272,896
<b>II. FLOW METER OF RAW WATER PIPE</b>							
1	Elektromagnetik flow meter	500	Steel	bh	1.00	57,727,283	57,727,283
2	Pipa Spiral Welded	500	Steel	m'	3.00	1,286,766	3,860,298
3	All Flange Butterfly Valve	600	CI	bh	1.00	38,628,000	38,628,000
4	All Flange Butterfly Valve	500	CI	bh	2.00	34,632,000	69,264,000
5	All Flange Check Valve	500	CI	bh	1.00	66,600,000	66,600,000
6	Spigot Tee	600x600	Steel	bh	2.00	5,844,228	11,688,456
7	Spigot Bend 90 <sup>0</sup>	600	Steel	bh	2.00	6,568,224	13,136,448
8	All Flange Gate Valve *	600	CI	bh	1.00	50,616,000	50,616,000
9	All Flange Gate Valve *	500	CI	bh	2.00	39,960,000	79,920,000
10	Spigot Reducer	600x500	Steel	bh	2.00	3,748,680	7,497,360
11	Giboult Joint	600	CI	bh	1.00	1,518,720	1,518,720
12	Giboult Joint	500	CI	bh	1.00	1,141,200	1,141,200
13	Flange Las	600	Steel	bh	2.00	2,187,360	4,374,720
14	Flange Las	500	Steel	bh	6.00	1,632,960	9,797,760
<b>Sub Total A</b>							<b>710,719,881</b>
<b>B. INSTALLATION</b>							
<b>I. RAW WATER TRANSMISSION PIPE</b>							
1	Pipa Baja Spiral Welded t = 6,35 mm	600	Steel	m'	174.00	40,530	7,052,269
2	All Spigot Bend 90 <sup>0</sup>	600	Steel	bh	4.00	73,993	295,973
	Thrust Blok Bend 90 <sup>0</sup>	600	Beton	bh	4.00	2,128,844	8,515,376
<b>II. FLOW METER OF RAW WATER PIPE</b>							
1	Elektromagnetik flow meter	500	Steel	bh	1.00	128,570	128,570
2	Pipa Spiral Welded	500	Steel	m'	3.00	33,331	99,993
3	All Flange Butterfly Valve	600	CI	bh	1.00	151,293	151,293
4	All Flange Butterfly Valve	500	CI	bh	2.00	128,570	257,139
5	All Flange Check Valve	500	CI	bh	1.00	128,570	128,570
6	Spigot Tee	600x600	Steel	bh	2.00	109,322	218,644
	Blok Penahan pada Tee	600x600	Beton	bh	1.00	2,482,033	2,482,033
7	Spigot Bend 90 <sup>0</sup>	600	Steel	bh	2.00	73,993	147,987
	Thrust Blok Bend 90 <sup>0</sup>	600	Beton	bh	1.00	2,128,844	2,128,844
8	Spigot Reducer	600x500	Steel	bh	2.00	73,993	147,987
	Blok Penahan pada Reducer	600x500	Beton	bh	2.00	1,733,153	3,466,306
9	Giboult Joint	600	CI	bh	1.00	68,821	68,821
10	Giboult Joint	500	CI	bh	1.00	63,967	63,967
11	Flange Las	600	Steel	bh	2.00	207,587	415,174
12	Flange Las	500	Steel	bh	6.00	168,115	1,008,693
13	Box flow meter		Beton	bh	1.00	6,073,871	6,073,871
<b>Sub Total B</b>							<b>32,851,508</b>
<b>SUB TOTAL A+B</b>							<b>743,571,390</b>
<b>TAX 10%</b>							<b>74,357,139</b>
<b>TOTAL</b>							<b>817,928,529</b>
<b>ROUNDED</b>							<b>817,900,000</b>

Catatan :

1. Gate Valve lengkap dengan T.Key - Street Cover & Protecting Tube
2. Perlengkapan Pipa termasuk about, mur, packing

# **Appendix-2**

## **Dam cost Detail**

**Appendix-2-1 AYUN MULTI PURPOSE DAM PROJECT BILL OF QUANTITIES: SUMMARY OF COSTS**

No.	Works	Foreign Currency Portion (Y)	Local Currency Portion (Rp.)	Total Amount (Rp.)	Remarks			
					Equivalent (¥)	Dam	Civil	Bill No.
0	Mobilization and Demobilization	720,552,500	24,250,200,000.00	87,687,642,100.00	995,997,752	497,998,876	497,998,876	0
1	General Items		45,343,977,772.00	45,343,977,772.00	515,038,366		515,038,366	1
2	Diversions Works	37,301,160	84,823,790,040.00	88,107,784,166.40	1,000,769,925		1,000,769,925	2
3	Concrete Gravity Dam	22,750,800	258,432,662,600.00	260,435,643,032.00	2,958,151,329	1,479,075,665	1,479,075,665	3
4	Artificial Concrete Abutment		913,094,400.00	913,094,400.00	10,371,358	5,185,679	5,185,679	4
5	Sabo Dam	15,600	2,079,321,000.00	2,080,694,424.00	23,633,512		23,633,512	5
6	Instrumentation	42,640,000	895,440,000.00	4,649,465,600.00	52,810,831	26,405,416	26,405,416	6
8	Roadworks	7,495,100	58,949,368,370.00	59,609,236,974.00	677,069,934		677,069,934	8
9	Power Station	3,885,400	26,950,075,120.00	27,292,145,736.00	309,997,112		309,997,112	9
10	Electrical Works		911,689,800.00	911,689,800.00	10,355,404		10,355,404	10
12	Operation and Maintenance Equipment		659,590,000.00	659,590,000.00	7,491,935		7,491,935	12
	Total Civil Works	834,640,560	504,209,209,102.00	577,690,964,004.40	6,561,687,460	2,008,665,636	4,553,021,825	
7	Hydromechanical Works	2,000,000,000		176,080,000,000.00	2,000,000,000	2,000,000,000		7
11	M&E	946,800,000		83,356,272,000.00	946,800,000	946,800,000		11
13	<b>Total Direct Cost</b>	<b>3,781,440,560</b>	<b>504,209,209,102</b>	<b>837,127,236,004.40</b>	<b>9,508,487,460</b>	<b>4,955,465,636</b>	<b>4,553,021,825</b>	<b>13</b>

**(Rp:Million) (¥ : Million)**

Direct Cost (× 1,000,000 )	3,781	504,209	<b>837,127</b>	<b>9,508</b>	4,955	4,553	
Land Acquisition (3%)	113	15,126	25,114	190	99	91	
Administration (5%)	189	25,210	41,856	475	248	228	
Engineering Fee (10%)	378	50,421	83,713	951	496	455	
Subtotal	4,462	594,967	987,810	11,125	5,798	5,327	
Contingency (10%)	446	59,497	98,781	1,112	580	533	
Total	4,908	654,464	<b>1,086,591</b>	<b>12,237</b>	6,378	5,860	

**Appendix-2-2 AYUN MULTI PURPOSE DAM PROJECT BILL OF QUANTITIES: DAM OF COSTS**

Works Description	Unit	Quantity	Foreign Currency (¥)		Local Currency (Rp)		Total (Rp)	Foreign (¥)	Remark Total of Bill No
			Unit Price	Amount	Unit Price	Amount			
<b>Mobilization and Demobilization</b>	LS	1		720,552,500.0		24,250,200,000.00	<b>87,687,642,100.00</b>	<b>995,997,752</b>	<b>NO.0</b>
<b>1.General Item</b>	LS	1				45,343,977,772.00	<b>45,343,977,772.00</b>	<b>515,038,366</b>	<b>NO.1</b>
<b>2.Diversion Work</b>	m	343							<b>NO.2</b>
2.1 Care of Water	LS	1			941,940,060.00	941,940,060.00	941,940,060.00		
2.2 Earths Works						0.00			
1) Excavation (Soil)	m <sup>3</sup>	139,110	270.0	37,301,160.0		0.00	3,283,994,126.40		
2) Excavation(Rock)	m <sup>3</sup>	188,110			289,400.00	54,439,034,000.00	54,439,034,000.00		
3) Backfill	m <sup>3</sup>	1,495,000			9,450.00	14,127,750,000.00	14,127,750,000.00		
2.3 Excavation Support and Protection Works	m <sup>2</sup>	7,830			1,036,120.00	8,112,819,600.00	8,112,819,600.00		
2.4 Concrete Works	m <sup>3</sup>	9,905			671,300.00	6,649,226,500.00	6,649,226,500.00		
2.5 Drilling and Grouting Works	m	1,731			319,480.00	553,019,880.00	553,019,880.00		
		Sub Total		37,301,160.0		84,823,790,040.00	<b>88,107,784,166.40</b>	<b>1,000,769,925</b>	
<b>3.Concrete Gravity Dam</b>									<b>NO.3</b>
3.1 Care of Water	LS	1			2,018,376,000.00	2,018,376,000.00	2,018,376,000.00		
3.2 Excavation and Support Works	m <sup>3</sup>	609,100	37.0	22,750,800.0	119,640.00	72,872,724,000.00	74,875,704,432.00		
3.3 Protection and Support of Excavation	m <sup>2</sup>	1,000			2,851,220.00	2,851,220,000.00	2,851,220,000.00		
3.4 Dam Concrete	m <sup>3</sup>	277,400			554,080.00	153,701,792,000.00	153,701,792,000.00		
1) Reinforce Concrete	m <sup>3</sup>	16,300			970,730.00	15,822,899,000.00	15,822,899,000.00		
2) Coffer Dam	m <sup>3</sup>	920			2,100,380.00	1,932,349,600.00	1,932,349,600.00		
3.5 Drilling and Grouting Works							0.00		
1) Consolidation grou	m	2,600			165,370.00	429,962,000.00	429,962,000.00		
2) Curtain Grouting	m	29,500			295,670.00	8,722,265,000.00	8,722,265,000.00		
3) Rim Grout	m	500			162,150.00	81,075,000.00	81,075,000.00		
		Sub Total		22,750,800.0		258,432,662,600.00	<b>260,435,643,032.00</b>	<b>2,958,151,329</b>	
<b>4.Artificial Concrete Abutment</b>									<b>NO.4</b>
4.1 Care of Water	L.S	1			80,280,000.00	80,280,000.00	80,280,000.00		
4.2 Earth Works	m <sup>3</sup>	600			38,480.00	23,088,000.00	23,088,000.00		
4.3 Protection and Support Works	m <sup>3</sup>	300			211,163.00	63,348,900.00	63,348,900.00		
4.5 Concrete Works	m <sup>3</sup>	750			995,170.00	746,377,500.00	746,377,500.00		
		Sub Total				913,094,400.00	<b>913,094,400.00</b>	<b>10,371,358</b>	
<b>5.Sabo Dam</b>									<b>NO.5</b>
5.1.1 Care of Water	L.S.	1			1,126,560,000.00	1,126,560,000.00	1,126,560,000.00		
5.1.2 Earth Works							0.00		
1) Excavation (Soil)	m <sup>3</sup>	900			92,370.00	83,133,000.00	83,133,000.00		
2) Excavation(Rock)	m <sup>3</sup>	100	156.0	15,600.0	585,180.00	58,518,000.00	59,891,424.00		
3) Backfill	m <sup>3</sup>	600			9,450.00	5,670,000.00	5,670,000.00		
5.1.3 Concrete Works	m <sup>3</sup>	12,000			67,120.00	805,440,000.00	805,440,000.00		
		Sub Total		15,600.0		2,079,321,000.00	<b>2,080,694,424.00</b>	<b>23,633,512</b>	
<b>6.Instrumentation DAM</b>									<b>NO.6</b>
1) Ground water level	LS	1	6,400,000.0	6,400,000.0	134,400,000.00	134,400,000.00	697,856,000.00		
2) Seepage measuring	LS	1	6,560,000.0	6,560,000.0	137,760,000.00	137,760,000.00	715,302,400.00		
3) Plamline	LS	1	9,600,000.0	9,600,000.0	201,600,000.00	201,600,000.00	1,046,784,000.00		
4) Strain gauge	LS	1	3,520,000.0	3,520,000.0	73,920,000.00	73,920,000.00	383,820,800.00		
5) Embedded Instrument	LS	1	10,400,000.0	10,400,000.0	218,400,000.00	218,400,000.00	1,134,016,000.00		
6) Cabling	LS	1	6,160,000.0	6,160,000.0	129,360,000.00	129,360,000.00	671,686,400.00		
		Sub Total		42,640,000.0		895,440,000.00	<b>4,649,465,600.00</b>	<b>52,810,831</b>	
<b>8.Road Works</b>									<b>NO.8</b>
1) Earth and Pavement Works	m <sup>2</sup>	18,550			2,170,820.00	40,268,711,000.00	40,268,711,000.00		
2) Excavation(Rock)	m <sup>3</sup>	5,000	156.0	780,000.0	245,010.00	1,225,065,000.00	1,293,736,200.00		
3) Concrete Surfacing, Wearing Course(25cm)	m <sup>2</sup>	18,550	362.0	6,715,100.0	679,830.00	12,610,772,300.00	13,201,969,704.00		
4) Concrete and Masonry Works	m <sup>2</sup>	300			3,422,960.00	1,026,889,000.00	1,026,889,000.00		
5) Guarding Road Markings and Signs	m	1,667			380,410.00	634,138,670.00	634,138,670.00		
6) Steel Bridge	t	390			27,685,200.00	3,183,792,400.00	3,183,792,400.00		
		Sub Total		7,495,100.0		58,949,368,370.00	<b>59,609,236,974.00</b>	<b>677,069,934</b>	
<b>9.Power Station</b>									<b>NO.9</b>
9.1 Building Works	LS	1				5,801,354,500.00	5,801,354,500.00		
9.2 Water Supply and Sewage Water System	LS	1				343,740,000.00	343,740,000.00		
9.3 Civil Works							0.00		
(1) Asphalt Paving	m <sup>2</sup>	4,700	362.0	1,701,400.0	4,426,590.00	20,804,980,620.00	20,954,771,876.00		
(2) Excavation	m <sup>3</sup>	14,000	156.0	2,184,000.0			192,279,360.00		
		Sub Total		3,885,400.0		26,950,075,120.00	<b>27,292,145,736.00</b>	<b>309,997,112</b>	
<b>10.Electrical Works</b>	LS	1				911,689,800.00	911,689,800.00	10,355,404	<b>NO.10</b>
		Sub Total				911,689,800.00	<b>911,689,800.00</b>	<b>10,355,404</b>	
<b>12.Operation and Maintenance Equipmen</b>									<b>NO.12</b>
						659,590,000.00	<b>659,590,000.00</b>	<b>7,491,935</b>	
							0.00	0	
<b>Total Civil Works</b>				834,640,560.0		504,209,209,102.00	<b>577,690,964,004.40</b>	<b>6,561,687,460</b>	
<b>7.Hydrmechanical</b>									<b>NO.7</b>
1) Diversion Gate	Set	1	1,750,000,000.0	1,750,000,000.0					
2) Penstock	Set	1	250,000,000.0	250,000,000.0					
		Sub Total		2,000,000,000.0			<b>176,080,000,000.00</b>	<b>2,000,000,000</b>	
<b>11. Electric &amp; Mechanical equipment(E &amp; M)</b>	LS	1	946,800,000.0	946,800,000.0					<b>NO.11</b>
		Sub Total		946,800,000.0			<b>83,356,272,000.00</b>	<b>946,800,000</b>	
<b>13.Total Direct Cost</b>				<b>3,781,440,560.0</b>		504,209,209,102.00	<b>837,127,236,004.40</b>	<b>9,508,487,460</b>	<b>13</b>
<b>Total</b>				<b>3,781,440,560.0</b>		504,209,209,102.00	( Rp : Billion ) <b>8,371.3</b>	( ¥ : Billion ) <b>95.1</b>	

**Appendix-2-3 BILL No.0; MOBILIZATION AND DEMOBILIZATION: AYUN MULTIPURPOSE DAM**

Equipment	Jumlah Alat	Import Item			Total	Biaya Mobilisasi Demobilisasi	Posisi Alat Terakhir
		Purchase Price	Depreciation	Transportation Cost			
<b>Batching Plant for concrete</b>							
Batching Plant	1					60,000,000.00	Makasar
Wheel Loader	1					60,000,000.00	Makasar
Truck Mixer	3					30,000,000.00	Makasar
Concrete Pump Mobile	2					20,000,000.00	Makasar
Mobile Crane	2					10,000,000.00	Makasar
<b>Platform for Concrete</b>							
Steel Plat Form (t)	750				18,000,000	13,500,000,000.00	JKT
<b>Blasting Works for earth works and concrete material</b>							
Drilling Machine	0					0.00	
Compressor	0					0.00	Makasar
						0.00	Makasar
<b>Tunnel</b>							
Generator Set	2					80,000,000.00	Makasar
Compressor Atlas Copco XAHS 285	2					80,000,000.00	Makasar
Water Pump Pressured	2					10,000,000.00	Makasar
Submersible Pump	3					15,000,000.00	Makasar
Blower/Multi Stage Fan	2					10,000,000.00	Makasar
Pusher Leg Drill	8					40,000,000.00	Makasar
Leg Drill	4					0.00	Makasar
Rock Breaker B 40	4					0.00	Makasar
Pick Hammer CA 7	4					0.00	Makasar
Shotcrete Machine (Aliva)	2					80,000,000.00	Makasar
Concrete Mixer	0					0.00	Makasar
Welding Machine	2					0.00	Makasar
Mud Pump/GROUTING Machine	2					0.00	Makasar
Cavo Atlas Copco Overhead Loader	2					10,000,000.00	Makasar
Wheel Loader	1					40,000,000.00	Makasar
Dump Truck 4 x 4	4					40,000,000.00	Makasar
Dump Truck 4 x 4	2					10,000,000.00	Makasar
Bulldozer	1					60,000,000.00	Makasar
Total Station	1					0.00	Makasar
Auto Level	1					0.00	Makasar
Laser Beam Theodolite	1					0.00	Makasar
Gyro Station (GPS System)	1					0.00	Makasar
						0.00	
<b>Drilling grouting</b>	1					2,015,200,000.00	Malang
						0.00	
						0.00	
<b>Earth Works</b>							
Excavator PC 200	4					240,000,000.00	Makasar
Giant Breaker PC 200	2					120,000,000.00	Makasar
Excavator PC 400	5					1,500,000,000.00	Surabaya
Giant Breaker PC 300	1					60,000,000.00	Makasar
Bulldozer D 31	1					40,000,000.00	Makasar
Bulldozer D 65	1					60,000,000.00	Makasar
Bulldozer D 85	5					300,000,000.00	Makasar
Bulldozer, with rake D 155	3					180,000,000.00	Makasar
Dump Truck 10 T	2					20,000,000.00	Makasar
Dump Truck 20 T	16					160,000,000.00	Makasar
Compactor 10 ton	4					160,000,000.00	Makasar
Water Tanker 5,000 ltr	2					10,000,000.00	Makasar
Wheel Loader	0					0.00	Makasar
Drilling ECM-350	3					150,000,000.00	Makasar
Compressor	3					120,000,000.00	Makasar
Screen Plant	1					60,000,000.00	Makasar
Crusher Stone	1					60,000,000.00	Makasar
Motor Grader GD 650	1					60,000,000.00	Makasar
						0.00	
<b>General item</b>							
Submersible pump 8 inch	6					30,000,000.00	Makasar
Submersible pump 6 inch	4					20,000,000.00	Makasar
Submersible pump 4 inch	2					0.00	Makasar
Generator set 30 kVA	1					5,000,000.00	Makasar
Generator set 75 kVA	1					5,000,000.00	Makasar
Generator set 100 kVA	1					10,000,000.00	Makasar
Generator set 150 kVA	1					10,000,000.00	Makasar
<b>Imported Item</b>					<b>1,441,105,000</b>		
Tower Crane: 13.5t*75m	2	395,000,000	276,500,000	42,900,000	724,600,000	3,000,000,000.00	Japan
Concrete Bucket: 4.5m3	2	12,500,000	8,750,000	1,040,000	21,660,000		Japan
Ground Hopper: 4.5m3	1	7,500,000	5,250,000	1,930,000	9,110,000		Japan
Vessel Dump: 4.5m3	2	20,000,000	14,000,000	1,160,000	32,640,000		Japan
Flat Bucket: 4.5m3	1	10,000,000	7,000,000	330,000	7,660,000		Japan
Mobile Concrete Conveyor	1	109,000,000	76,300,000	5,790,000	87,880,000		Japan
Vibratory Backhoe	1	15,000,000	10,500,000	370,000	11,240,000		Japan
Higher Vessel Dump	0	15,000,000	10,500,000	300,000	0		Japan
Vibratory Joint Cutter	1	27,400,000	19,180,000	1,070,000	21,320,000		Japan
Batcher Plant: 2 axial 2.25m3*2	1	215,000,000	150,500,000	57,600,000	265,700,000	600,000,000.00	Japan
Silo: 600t	1	17,500,000	12,250,000	3,000,000	18,250,000		Japan
Water Treatment Plant: 100t	1	53,500,000	37,450,000	3,000,000	43,450,000	100,000,000.00	Japan
Generators LS	1	110,350,000	77,245,000	1,700,000	80,645,000		Japan
Aggregate Bins & Transportation	1	158,500,000	110,950,000	3,000,000	116,950,000	1,000,000,000.00	Japan
Two Tower Crane ⇒ One Tower Crane							
<b>Total of Bill No.0</b>					<b>720,552,500</b>	<b>24,250,200,000.00</b>	

**Appendix-2-4 BILL OF QUANTITIES: BILL NO. 1 GENERAL ITEM**

Item No.	Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
				Unit Price	Amount	Unit Price	Amount
1/01	Construction, maintenance, and subsequent removal of temporary access road including temporary bridges and river crossings	LS	1			5,842,577,400.00	5,842,577,400.00
1/02	Construction, maintenance, and subsequent removal of Contractor's temporary offices, stores, and workshops	LS	1			4,159,163,600.00	4,159,163,600.00
1/03	Construction, maintenance, and subsequent removal of Contractor's staff quarters and labor camp	LS	1			5,096,360,000.00	5,096,360,000.00
1/04	Construction, maintenance, and subsequent removal of Engineer's site offices and staff housing: - Engineer's site office, 360 sq.m, one ( 1	LS	1			5,880,746,000.00	5,880,746,000.00
1/05	Construction, maintenance, and subsequent removal of site laboratory. 180 sq.m	LS	1			741,139,632.00	741,139,632.00
1/06	Provision, installation, and operation of field laboratory equipment and consumables	LS	1			2,001,144,000.00	2,001,144,000.00
1/07	Construction, fitting out, operation, maintenance, and subsequent removal of medical and first aid facilities	LS	1			1,006,000,000.00	1,006,000,000.00
1/08	Supply, installation, operation, maintenance and subsequent removal of portable water purification plant for drinking and domestic water supply system for construction purposes including for Employer's and Engineer's offices and housing	LS	1			875,552,000.00	875,552,000.00
1/09	Installation, operation, maintenance and subsequent removal of electric supply system for construction purposes including for Employer's and Engineer's offices and housing	LS	1			7,279,303,120.00	7,279,303,120.00
1/10	Installation, operation, maintenance and subsequent removal of telephone communication system	LS	1			520,000,000.00	520,000,000.00
1/11	Furnishing Employer and Engineer's vehicles including maintenance and services for the full period of the contract: - 4-wheel drive station wagon, 2500 cc, ten (10) nos - Motorcycle, 125 cc, eight (8) nos	LS	1			7,202,080,000.00	7,202,080,000.00
1/12	Construction, fitting out, operation, maintenance and subsequent removal of safety and fire protection facilities	LS	1			581,680,000.00	581,680,000.00
1/13	Assistance to Engineer's staff for checking the Contractor's setting out survey and measurement of the works	LS	1			2,329,817,520.00	2,329,817,520.00
1/14	Additional site investigation	LS	1			808,080,000.00	808,080,000.00
1/15	Provision of weather recording station	LS	1			679,284,500.00	679,284,500.00
1/16	Provision of video film		1			341,050,000.00	341,050,000.00
	<b>Total of Bill No.1</b>						45,343,977,772.00

**BILL OF QUANTITIES: BILL NO. 2 DIVERSION WORKS**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>2.1 CARE OF WATER</b>						
Care of water during construction in open air construction site and in diversion tunnel	LS	1			786,470,400.00	786,470,400.00
Pre-cofferdam, coffering for cofferdam construction	LS	1			155,469,660.00	155,469,660.00
<b>2.2 EARTHS WORKS</b>						
Clearing and grubbing	M2	6,500			10,270.00	66,755,000.00
Excavation, common, in open cut	M3	16,300			71,501.00	1,165,466,300.00
Excavation, weathered rock in open cut	M3	32,600			96,296.00	3,139,249,600.00
Excavation, rock, in open cut	M3	114,100	156.00	17,799,600.00	236,819.00	27,021,047,900.00
Excavation, rock in trenches, for pits and footings	M3	10	156.00	1,560.00	576,340.00	5,763,400.00
Excavation, all classes, in underground for diversion tunnel	M3	25,000	780.00	19,500,000.00	918,910.00	22,972,750,000.00
Excavation, rock, in local surface for seams and defects	M3	100			115,500.00	11,550,000.00
Cleaning-off of foundations for inspection	M2	1,960			29,030.00	56,898,800.00
Backfill, Spoil Bank	M3	1,465,000			9,450.00	13,844,250,000.00
Embankment, Random	M3	30,000			9,450.00	283,500,000.00
Embankment Zone 2A, fine filter	M3	0				-
Embankment Zone 2B, coarse filter	M3	0				-
Embankment Zone 3A, transition	M3	0				-
Embankment Zone 3B, rockfill	M3	0				-
Embankment Zone 3D, downstream slope protection	M3	0				-
<b>2.3 EXCAVATION SUPPORT AND PROTECTION WORKS</b>						
Steel rib support and accessories, in tunnel	Ton	10.0			9,199,270.00	91,992,700.00
Grouted rock bolts, D25 bar, in tunnel	M	6,138			221,964.00	1,362,415,032.00
Grouted rock bolts, D25 bar, in inlet & outlet channel	M	100			221,964.00	22,196,400.00
Rock anchor bar, D25 bar, in inlet & outlet channel	M	5,873			152,139.00	893,512,347.00
Shotcrete, 50 mm min. thickness, in tunnel	M3	0			2,680,050.00	-
Shotcrete, 100 mm min. thickness, in tunnel	M3	1,050			2,811,411.00	2,951,981,550.00
Shotcrete, 50 mm thickness, in inlet & outlet channel	M3	0			2,534,928.00	-
Shotcrete, 100 mm thickness, in inlet & outlet channel	M3	783			2,668,050.00	2,089,083,150.00
Steel wire mesh, 100 mm x 100 mm aperture size, 4 mm wire dia. incl. all necessary fixing, in tunnel	M2	0			68,220.00	-
Steel wire mesh, 100 mm x 100 mm aperture size, 5 mm wire dia incl. all necessary fixing, in inlet & outlet channel	M2	7,830			85,095.00	666,293,850.00
Perforated HVC pipe 50 mm dia. for drain holes, including necessary drilling holes 65 mm dia.	M	200			176,637.00	35,327,400.00
<b>2.4 CONCRETE WORKS</b>						
Concrete Class A, in blockouts	M3	15			673,150.00	10,097,250.00
Concrete Class A, in miscellaneous concrete	M3	20			673,150.00	13,463,000.00
Concrete Class B, in inlet & outlet structure	M3	500			673,150.00	336,575,000.00
Concrete Class C, in tunnel lining	M3	320			653,530.00	209,129,600.00
Concrete Class C, U/S Cofferdam	M3	9,000			642,100.00	5,778,900,000.00
Concrete Class E, in levelling concrete and backfill concrete	M3	50			565,350.00	28,267,500.00
Form F1, in inlet & outlet structure	M2	200			67,130.00	13,426,000.00
Form F2, in inlet & outlet structure and tunnel	M2	300			67,130.00	20,139,000.00
Form F4, in tunnel	M2	100			78,380.00	7,838,000.00
Reinforcement bars, deformed, for inlet and outlet structure	Ton	25			6,438,000.00	160,950,000.00
Reinforcement bars, deformed, for tunnel lining	Ton	0			6,588,000.00	-
Reinforcement bars, plain	Ton	0			6,438,000.00	-
Anchors bar, D22 bar, in blockouts	Kg	170			152,139.00	25,863,630.00
PVC waterstop, 240 mm wide	M	257			114,570.00	29,444,490.00
Weep hole, PVC pipe 50 mm dia.	M	75			21,870.00	1,640,250.00
Chipping surface of tunnel lining for tunnel plug	M2	160			56,900.00	9,104,000.00
Stone Masonry for Broad crest weir for temporary discharge monitoring at Diversion tunnel (1:4)	M3	13			334,980.00	4,354,740.00
<b>2.5 DRILLING AND GROUTING WORKS</b>						
Drilling, for consolidation grouting hole, depth up to 5 m	M	1,326			144,241.00	191,263,566.00
Drilling, for curtain grouting hole:						
Depth from 0 m up to 1 0 m	M	240			144,408.00	34,657,920.00
Depth from 10 m to 20 m	M	120			152,223.00	18,266,760.00
Drilling, for check hole with core:						
Depth from 0 m up to 10m	M	30			249,291.00	7,478,730.00
Depth from 1 0 m to 20 m	M	15			260,280.00	3,904,200.00
Grouting, grout operation only:						
Consolidation grout	Ton	45			375,025.00	16,876,125.00
Curtain grout	Ton	10			417,274.00	4,172,740.00
Grouting materials:						
Cement	Ton	55			1,023,000.00	56,265,000.00
Bentonite	Ton	3			3,948,000.00	11,844,000.00
Sand	Ton	2			198,000.00	396,000.00
Packer setting up	Times	192			50,932.00	9,778,944.00
Water pressure test	Nos	192			75,102.00	14,419,584.00
Permeability test (lugeon test)	Nos	9			133,513.00	1,201,617.00
Backfill grouting	M3	30			1,355,458.00	40,663,740.00
Grout steel pipe, 50 mm dia., for backfill grouting	Kg	74			11,298.00	836,052.00
Contact grouting, for tunnel concrete plug including furnishing and installing grout & reiser pipe, vent pipes, valves and grout stops for contact grouting in tunnel plug	LS	1			140,991,550.00	140,991,550.00
<b>2.6 METAL WORKS</b>						
Drainage pipe, GSP 200 mm dia., incl. wire rope and all accessories, through tunnel plug	Kg	0			42,500.00	-
<b>Total of Bill No. 2</b>					37,301,160.00	84,824,182,477.00

**BILL OF QUANTITIES: BILL NO. 3 CONCRETE GRAVITY DAM(1/2)**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>3.1 CARE OF WATER</b>						
Care of water during construction in open air construction site	LS	1			2,018,376,000.00	2,018,376,000.00
<b>3.2 EXCAVATION AND SUPPORT WORKS</b>						
Clearing and grubbing, main dam site and stockpile area	M2	60,000			9,450.00	567,000,000.00
Clearing, reservoir area	M2	3,000,000			660.00	1,980,000,000.00
Clearing and grubbing, quarry site	M2	0			9,450.00	-
Excavation, common	M3	243,600			71,501.00	17,417,643,600.00
Excavation, weathered rock	M3	243,600			96,296.00	23,457,705,600.00
Excavation, rock	M3	121,800	156.00	19,000,800.00	236,819.00	28,844,554,200.00
Local surface excavation for seams and defects	M3	100			115,500.00	11,550,000.00
Cleaning-off of foundations for inspection	M2	9,200			29,030.00	267,076,000.00
Line Drilling	M3	10,000	375.00	3,750,000.00	32,764.00	327,640,000.00
<b>3.3 Protection and Support of Excavation</b>						
Rock anchor bar, D32 dia. bar, in dam plinth	M	6,900			193,108.00	1,332,445,200.00
Sod facing by turfing	M2	1,000			44,760.00	44,760,000.00
Shotcrete protection, 10cm	M3	500			2,668,050.00	1,334,025,000.00
Masonry catch drain, 500 mm width x 500 mm deep, 300 mm thickness, 1 :3 cement-sand ratio, incl. pointing and plastering	M3	400			349,980.00	139,992,000.00
<b>3.4 Dam Concrete</b>						
Testing and measurement for trial batching	LS	1			336,031,920.00	336,031,920.00
Concrete Class A: Lean Concrete	M3	31,400			520,870.00	16,355,318,000.00
Concrete Class B: Inner Concrete	M3	206,000			538,990.00	111,031,940,000.00
Concrete Class C: Outer Concrete	M3	40,000			609,350.00	24,374,000,000.00
Concrete Class D: Structural Concrete	M3	10,000			689,100.00	6,891,000,000.00
Retaining Wall at Spoil Banks	M3	6,000			689,100.00	4,134,600,000.00
Concrete Class E: Mortar	M3	300			797,850.00	239,355,000.00
Shotcrete protection, 7cm for temp. protection of integral cofferdam, up to F.L. 1 86.00	M3	920			1,909,881.00	1,757,090,520.00
Demolishing temporary shotcrete protection	M3	920			100,828.00	92,761,760.00
Wire mesh for shotcrete, 100 x 100 x 4 mm	M2				29,480.00	-
Form F1, Dam Form	M2	20,000			80,180.00	1,603,600,000.00
Form F2, Structural Form	M2	7,000			88,010.00	616,070,000.00
Reinforcement bars	Ton	500			6,438,000.00	3,219,000,000.00
Waterstop in vertical expansion joint of Retaining Wall		600			869,760.00	521,856,000.00
Stone masonry, 1 :4 cement-sand ratio incl. pointing and plastering	M3	600			334,980.00	200,988,000.00
<b>3.5 DRILLING AND GROUTING WORKS</b>						
<b>-MAIN DAM</b>						
Drilling for consolidation grouting hole, depth from 0 to 10 m	M	2,600			144,408.00	375,460,800.00
Drilling, for curtain grouting hole:						
Depth from 0 m up to 25 m	M	3,900			144,741.00	564,489,900.00
Depth from 25 m up to 50 m	M	3,900			152,758.00	595,756,200.00
Depth from 50 m up to 75 m	M	3,900			162,009.00	631,835,100.00
Depth from 75 m up to 100 m	M	3,900			172,801.00	673,923,900.00
Re-drilling, for curtain grouting hole:						
Depth from 0 m up to 15 m	M	0			-	-
Depth from 25 m up to 50 m	M	3,900			26,959.00	105,140,100.00
Depth from 50 m up to 75 m	M	3,900			28,501.00	111,153,900.00
Depth from 75 m up to 100 m	M	3,900			30,300.00	118,170,000.00
Drilling, for check hole and pilot hole, with core:						
Depth from 0 m up to 25 m	M	550			249,847.00	137,415,850.00
Depth from 25 m up to 50 m	M	550			261,162.00	143,639,100.00
Depth from 50 m up to 75 m	M	550			273,891.00	150,640,050.00
Depth from 75 m up to 100 m	M	550			288,316.00	158,573,800.00
Grouting, grout operation only:						
Consolidation grout	Ton	130			375,775.00	48,850,750.00
Curtain grout	Ton	780			388,525.00	303,049,500.00
Grouting materials:						
Cement	Ton	910			1,023,000.00	930,930,000.00
Bentonite	Ton	27			3,948,000.00	106,596,000.00
Sand	Ton	32			198,000.00	6,336,000.00
Packer setting up:						
Ascending	Nos	3,640			49,440.00	179,961,600.00
Descending	Nos	910			50,932.00	46,348,120.00
Water pressure test	Nos	3,640			75,102.00	273,371,280.00
Permeability test (lugeon test)	Nos	440			133,513.00	58,745,720.00
Drilling through concrete	M	1,560			484,032.00	755,089,920.00
Grout steel pipe, 65 mm dia., for grouting	Kg	3,000			11,298.00	33,894,000.00
Grout steel pipe, 42 mm dia., for consolidation grouting		500			11,298.00	5,649,000.00



**BILL OF QUANTITIES: BILL NO. 3 CONCRETE GRAVITY DAM(2/2)**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>RIM GROUT</b>						
Drilling with casing, in soil or decomposed rock, depth up to 10m Depth from 0m to up to 10m	M	500			162,145.00	81,072,500.00
Drilling, for curtain grouting hole:						
Depth from 0 m up to 25 m	M	3,900			144,741.00	564,489,900.00
Depth from 25 m up to 50 m	M	3,900			152,758.00	595,756,200.00
Re-drilling, for curtain grouting hole:						
Depth from 0 m up to 25 m	M	3,900			25,623.00	99,929,700.00
Depth from 25 m up to 50 m	M	3,900			26,959.00	105,140,100.00
Drilling, for check hole and pilot hole with core:						
Depth from 0 m up to 25 m	M	550			249,847.00	137,415,850.00
Depth from 25 m up to 50 m	M	550			261,162.00	143,639,100.00
Depth from 50 m up to 75 m	M	550			273,891.00	150,640,050.00
Grouting, grout operation only, for curtain grout	Ton	390			384,775.00	150,062,250.00
Grouting materials:						
Cement	Ion	390			1,023,000.00	398,970,000.00
Bentonite	Ton	12			3,948,000.00	47,376,000.00
Sand	Ton	2			198,000.00	396,000.00
Packer setting up:						
Ascending	Nos	1,560			49,440.00	77,126,400.00
Descending	Nos	390			50,932.00	19,863,480.00
Water pressure test	Nos	1,560			75,102.00	117,159,120.00
Permeability test (lugeon test)	Nos	220			133,513.00	29,372,860.00
<b>3.6 METAL WORKS</b>						
Electrical conduit pipe, GS pipe 100 mm dia.	Kg	5,000			14,400.00	72,000,000.00
Handrail for access stair, GSP 64 mm dia & GSP 50 mm dia	Kp	500			21,000.00	10,500,000.00
<b>Total of Bill No. 3</b>				22,750,800.00		258,432,308,900.00

**BILL OF QUANTITIES: BILL NO. 4 ARTIFICIAL CONCRETE ABUTMENT**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>4.1 CARE OF WATER</b>						
Care of water during construction in open construction site	L.S.	1			80,280,000.00	80,280,000.00
<b>4.2 EARTH WORKS</b>						
Cleaning-off of foundations for inspection	M2	600			29,030.00	17,418,000.00
Backfill, random	M3	600			9,450.00	5,670,000.00
<b>4.3 PROTECTION AND SUPPORT WORKS</b>						
Rock anchor bar, D25 bar	M	300			152,289.00	45,686,700.00
Perforated PVC drain pipe 50 mm dia., including necessary drilling holes 65 mm dia.	M	100			176,637.00	17,663,700.00
<b>4.5 CONCRETE</b>						
Concrete Class D	M3	750			689,100.00	516,825,000.00
Form F2, for walls	M2	1,200			67,130.00	80,556,000.00
Reinforcement bar, deformed	Ton	15			6,438,000.00	96,570,000.00
PVC waterstop, 300mm wide	M	90			133,790.00	12,041,100.00
Weep hole, PVC pipe 50 mm dia.	M	250			21,870.00	5,467,500.00
Dowel bar, D19 bar with PVC pipe capping	Kg	530			65,880.00	34,916,400.00
<b>Total of Bill No. 4</b>						913,094,400.00

**BILL OF QUANTITIES: BILL NO. 5 SABO DAM**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>5.1 OUTLET WORKS</b>						
<b>5.1.1 CARE OF WATER</b>						
Care of water during construction	L.S.	1			1,126,560,000.00	1,126,560,000.00
<b>5.1.2 EARTH WORKS</b>						
Gearing and grubbing	M2	1,200			9,450.00	11,340,000.00
Excavation, common in open cut	M3	600			71,501.00	42,900,600.00
Excavation, weathered rock in open cut	M3	300			96,296.00	28,888,800.00
Excavation, rock in open cut	M3	100	156.00	15,600.00	236,819.00	23,681,900.00
Cleaning-off of foundations for inspection	M2	1,200			29,030.00	34,836,000.00
Backfill, random material	M3	600			9,450.00	5,670,000.00
<b>S.I. 4 CONCRETE WORKS</b>						
Concrete Class B, Internal	M3	5,600			631,600.00	3,536,960,000.00
Concrete Class C, Outer	M3	14,700			643,030.00	9,452,541,000.00
Form F2, for structures	M2	2,760			88,010.00	242,907,600.00
Reinforcement bars, deformed, for structures	Ton	2			6,438,000.00	12,876,000.00
Anchor bar, D22 bar	Kg	2,500			152,139.00	380,347,500.00
<b>Total of Bill No. 5</b>				15,600.00		14,899,509,400.00

**BILL OF QUANTITIES: BILL NO.6 INSTRUMENTATION**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>6.1 DAM</b>						
Ground water level	LS	1	6,400,000.00	6,400,000.00	134,400,000.00	134,400,000.00
Seepage measuring (W - 1 Measuring Weir)	LS	1	6,560,000.00	6,560,000.00	137,760,000.00	137,760,000.00
Plamline	LS	1	9,600,000.00	9,600,000.00	201,600,000.00	201,600,000.00
Strain gauge	LS	1	3,520,000.00	3,520,000.00	73,920,000.00	73,920,000.00
Embedded Instrument	LS	1	10,400,000.00	10,400,000.00	218,400,000.00	218,400,000.00
Cabling	LS	1	6,160,000.00	6,160,000.00	129,360,000.00	129,360,000.00
<b>Total of Bill No. 6</b>				42,640,000.00	42,640,000.00	895,440,000.00

**BILL OF QUANTITIES: BILL NO.7. HYDROMECHANICAL**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
Diversion Gate(Intake Gate)	Set	1	1,750,000,000.00	1,750,000,000.00		0.00
Penstock	Set	1	250,000,000.00	250,000,000.00		0.00
						0.00
						0.00
						0.00
						0.00
						0.00
<b>Total of Bill No.7</b>				2,000,000,000.00		0.00

**BILL OF QUANTITIES: BILL NO.8 ROAD WORKS**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>- EARTH AND PAVEMENT WORKS</b>						
Clearing and grubbing	M2	386,220			9,450.00	3,649,779,000.00
Excavation, common, hauling to embankment or disposal area	M3	193,110			71,501.00	13,807,558,110.00
Excavation, weathered rock, hauling to embankment or disposal area	M3	64,370			95,216.00	6,129,053,920.00
Excavation, rock, hauling to embankment or disposal area	M3	5,000	156.00	780,000.00	245,013.00	1,225,065,000.00
Embankment, random, direct hauling from the excavation	M3	21,200			162,173.00	3,438,067,600.00
Backfill, freedrainage material	M3	100			193,550.00	19,355,000.00
Sub-base course, 150 mm thick	M3	3,875			385,979.00	1,495,668,625.00
Base course, 150 mm thick	M3	3,875			385,979.00	1,495,668,625.00
Asphalic concrete surfacing, binder course, 50 mm thick	M2	18,550			527,548.00	9,786,015,400.00
Asphaltic concrete surfacing, wearing course, 25 mm thick	M2	18,550	362.00	6,715,100.00	679,826.00	12,610,772,300.00
Sod facing by turfing	M2	10,000			44,760.00	447,600,000.00
<b>- CONCRETE AND MASONRY WORKS</b>						
Concrete Class D, for box culverts	M3	100			689,100.00	68,910,000.00
Concrete Class D, for slope protection foundation	M3	100			689,100.00	68,910,000.00
Concrete Class D, for lining of drain canal	M3	100			689,100.00	68,910,000.00
Fomi F2, for road structures	M2	100			88,010.00	8,801,000.00
Form F2, for drain canal	M2	5,000			88,010.00	440,050,000.00
Reinforcement bar, deformed	lon	15			6,438,000.00	96,570,000.00
Reinforced precast concrete drain pipe, 1200 mm dia.	M	100			2,179,180.00	217,918,000.00
Under drain, 300mm x 300mm gravel pack covered by geotextile filter	M	100			135,600.00	13,560,000.00
Gabion mattress, 2 m x 1 m x 0.5 m box size	M3	100			432,600.00	43,260,000.00
<b>- GUARDING, ROAD MARKINGS AND SIGNS</b>						
Guardrail fencing, galvanised corrugated steel sheet	M	1,667			336,010.00	560,128,670.00
Road marking	M	1,667			30,000.00	50,010,000.00
Road signs	Nos	10			150,000.00	1,500,000.00
Reinforced precast concrete guide post, 15 cm dia. x 1.20 m long	Nos	100			225,000.00	22,500,000.00
<b>- STEEL BRIDGE STRUCTURE</b>						
Furnishing and installation of steel truss bridge including assembling at site and launching facilities	Ton	115			27,685,151.30	3,183,792,400.00
<b>Total of Bill No.8</b>				7,495,100.00		58,949,423,650.00

**BILL OF QUANTITIES: BILL NO.9. POWER STATION**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
<b>9.1 BUILDING WORKS</b>						
Gate House, 50.4 sq.m floor area and security fence (BRC type, 40 m)	LS	1			230,472,179.40	230,472,179.40
Office Building, 106.3 sq.m floor area and garage for 2 cars and a boat (70 sqm)	LS	1			299,214,557.97	299,214,557.97
Official House, 51.0 sq.m floor area	LS	1			121,571,952.86	121,571,952.86
Generator House, 39.0 sq m floor area	LS	1			189,630,498.35	189,630,498.35
Guard House, 9.0 sq.m floor area and security fence (BRC type, 150m)	LS	1			50,145,318.25	50,145,318.25
Entrance gate and fence	LS	1			24,000,000.00	24,000,000.00
Project monument including dam plate name	LS	1			24,000,000.00	24,000,000.00
Power Station, 1,000 sq.m	LS	1			4,862,320,000.00	4,862,320,000.00
<b>9.2 WATER SUPPLY AND SEWERAGE SYSTEM</b>						
Water supply system for Office Building	LS	1			25,512,000.00	25,512,000.00
Water supply system for Official House	LS	1			12,240,000.00	12,240,000.00
Water supply system for Generator House	LS	1			9,360,000.00	9,360,000.00
Sewerage system and septic tank for Office Building	LS	1			38,268,000.00	38,268,000.00
Sewerage system and septic tank for Official House	LS	1			18,360,000.00	18,360,000.00
Sewerage system and septic tank for Power Station	LS	1			240,000,000.00	240,000,000.00
<b>9.3 CIVIL WORKS FOR BUILDING AREA (BUILDING PLATFORM AREA AND PARKING AREA)</b>						
Clearing and grubbing	M2	3,000			9,450.00	28,350,000.00
Excavation, common, for building platform	M3	22,000			71,501.00	1,573,022,000.00
Excavation, weathered rock, for building platform	M3	11,900			96,296.00	1,145,922,400.00
Excavation, rock, for building platform	M3	14,000	156.00	2,184,000.00	236,819.00	3,315,466,000.00
Trench excavation, all classes in open cut	M3	200			576,340.00	115,268,000.00
Embankment and backfill, random	M3	48,900			9,450.00	462,105,000.00
Sub-base course, 150 mm thick	M3	940			385,979.00	362,820,260.00
Base course, 150 mm thick	M3	940			385,979.00	362,820,260.00
Asphaltic concrete surfacing, binder course, 50 mm thick	M2	4,700			527,548.00	2,479,475,600.00
Asphaltic concrete surfacing, wearing course, 25 mm thick	M2	4,700	362.00	1,701,400.00	679,826.00	3,195,182,200.00
Rip Rap around tailrace channel	M3	5,870			193,550.00	1,136,138,500.00
Crushed rock bedding	M3	100			385,979.00	38,597,900.00
Sod facing by turfing	M2	1,000			44,760.00	44,760,000.00
Concrete Class A	M3	6,190			520,870.00	3,224,185,300.00
Form F2	M2	8,180			88,010.00	719,921,800.00
Reinforcement bar, deformed	Ton	340			6,438,000.00	2,188,920,000.00
Stone masonry, 1:4 cement-sand ratio incl. pointing and plastering	M3	1,230			334,980.00	412,025,400.00
<b>Total of Bill No.9</b>				3,885,400.00		26,950,075,126.83

**BILL OF QUANTITIES: BILL NO.10. ERECTRICAL WORKS**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
Furnishing and installing two (2) nos of diesel engine generator of 30 kVA or 24 kW continuous output, 1500 RPM, 3 phase, 380 Volt, 50 Hz, lagging power 0.8 and accessories as which the technical specification requirement at Generator House, incl. fuel oil	Set	1			341,085,000.00	341,085,000.00
Furnishing and installing of control panels : Main panel, distribution panel and local control panel for gates operation, comprise of all switches, indicator, relays, transformer, galvanised steel pipe, box, c	LS	1			20,034,000.00	20,034,000.00
Furnishing and installing outdoor lighting system complete with fitting for AC, 50 Hz, 220 Volt, galvanised steel poles fifteen (15) nos, including cabling and accessories for :	LS	1			377,493,000.00	377,493,000.00
Indoor lighting complete with fitting for AC, 50 Hz, 220 Volt, tubes include cablings, lamps and other accessories: - Gate House, 50.4 sq.m floor area, including electrical wiring an	LS	1			103,462,800.00	103,462,800.00
Grounding system of all equipment and lighting rod for : - Gate House - Office Building	LS	1			3,815,000.00	3,815,000.00
Spare parts of generator including panel controls and tools	LS	1			65,800,000.00	65,800,000.00
<b>Total of Bill No.10</b>						911,689,800.00

**BILL OF QUANTITIES: BILL NO.11. E&M**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
1. Generating Equipment						
Generation Equipment	LS	1	946,800,000.00	946,800,000.00	-	-
<b>Total of Bill No.11</b>				946,800,000.00		-

**BILL OF QUANTITIES: BILL NO.12. O&M EQUIPMENT**

Works Description	Unit	Quantity	Foreign Currency (Y)		Local Currency (Rp.)	
			Unit Price	Amount	Unit Price	Amount
Survey equipment (total station, auto level, and staff)	Set	1			339,150,000.00	339,150,000.00
4-wheel drive station wagon, 2,500 cc	Nos	1			57,080,000.00	57,080,000.00
Motor cycle, 125 cc	No	3			6,020,000.00	18,060,000.00
Computer set (Pentium 4, HDD: 100GB, Memory: 512MB, 19 in. Monitor) including UPS, A3 size Printer, Stabilizer, MS Office, AutoCAD	Nos	2			39,000,000.00	78,000,000.00
Engine boat for reservoir maintenance. (4 passenger, L = 5 m, fibre glass, single detachable out boatmoto 20HP out boat motor) including spare part, tool kit, 5 life jacket, and a trailer	Nos	1			167,300,000.00	167,300,000.00
<b>Total of Bill No.12</b>						659,590,000.00

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**DIRECTORATE GENERAL OF WATER RESOURCES,  
MINISTRY OF PUBLIC WORKS  
PUBLIC WORKS SERVICE, BALI PROVINCE**

**THE COMPREHENSIVE STUDY  
ON  
WATER RESOURCES DEVELOPMENT  
AND MANAGEMENT IN BALI PROVINCE  
IN  
THE REPUBLIC OF INDONESIA**

**FINAL REPORT  
SUPPORTING REPORT**

**[L] ENVIRONMENTAL STUDY**

**AUGUST 2006**

**YACHIYO ENGINEERING CO., LTD.  
NIPPON KOEI CO., LTD.**

THE COMPREHENSIVE STUDY ON WATER RESOURCES DEVELOPMENT  
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IN THE REPUBLIC OF INDONESIA

SUPPORTING REPORT (L)  
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## **L-1 ENVIRONMENTAL STUDY**

Environmental Impact Assessment (EIA) Study basically conforming the relevant laws, regulations and guidelines of Indonesia has been conducted on a provisional basis for the 4 significant priority projects of feasibility study since formal EIA Study is not required during the planning stage of a project (master plan and feasibility study stage as in this study). Certified Indonesian multidisciplinary expert team, as required by the Indonesian EIA guidelines, conducted the EIA Study with technical assistance and guidance from the JICA Study Team. The EIA study was conducted during November 2005 and February 2006.

The EIA report is compiled as 2 sets of documents, one for the Multipurpose Ayung Dam Project and the other for the 3 regional potable water supply development projects for the Southern Bali Area (Metropolitan Denpasar area and its surroundings). The 3 regional water supply projects are West Region Project with Penet River as the water source (Western Water Supply System/West System), Central Region Project with stored water from Ayung Dam (Ayung River) as the water source (Central Water Supply System/Central System) and East Region Project with Petanu River as the water source (Eastern Water Supply System/East System).

The EIA Study for Ayung Dam Project involved review and update of the existing EIA Study report of 2003 with additional data collection works so as to suit the proposed dam design by this project.

Based on the findings of the EIA study environmental evaluation of priority projects is made as summarized below. For details on analysis and evaluation of environmental impacts the EIA reports compiled as 2 sets of documents both in English and Indonesia could be referred to. For the purpose of environmental evaluation the priority projects are categorized into 3 groups of Ayung Dam Project, Water supply Projects (3 regional projects) and Flood Control Projects (Badung and Mati River flood control projects, which are of very small-scale and hence not subjected to EIA study by the Indonesian multidisciplinary expert team).

The locations of project facilities, in fact the entire master plan project facilities, are shown in Figure-L. 1.

Potential environmental impacts and mitigation measures with due consideration to the 3 significant phases of the project implementation, pre-construction, construction and post-construction (operation) as appropriate are illustrated below for the 3 project groups thereby justifying the environmental viability of the projects.

## **L-2 AYUNG (BUANGGA) DAM PROJECT**

The multipurpose Ayung Dam that would provide stored water in the dam for the central region water supply project (Central Water Supply System) of Southern Bali Area (potable water source) and also water for hydroelectric power generation, irrigation and dilution water as environmental flow to Badung River so as to improve the Badung River water quality to the extent possible is planned to be constructed at the upstream river reach of Ayung River in Buangga area (also known as Buangga Dam).

### **L-2.1 Pre-construction phase**

Social aspects are the most significant concern of pre-construction phase. In this respect the most significant social issue is the requirement for any resettlement of population involving housing compensation consequent to inundation with dam water. The planned location of dam is uninhabitable since it is a steep sloping terrain and hence no resettlement of population is involved.

It is noted that some works on procurement and transportation of equipment and material for construction works need to be carried out prior to the commencement of actual construction works and hence strictly falls under pre-construction phase. Nevertheless, they are regarded as construction phase related activity in overall sense and dealt with under construction phase of below.

## **L-2.2 Construction phase**

### **(1) Construction equipment and materials and transportation aspects**

The most significant activity of construction phase requiring proper management measures involves procurement and transportation of equipment and material for constructions works and their proper storage and use at the dam site.

The construction of the dam though of concrete type and would require much smaller quantity of material comparison to that of rock-fill type, dams that already exist and also under construction (Tegal Tunjung Dam) in Bali, still since the dam is of significant scale and hence the requirement of material and equipment is quite significant.

The source of basic construction material such as sand, gravel and aggregate has long been procured in Karangasem for similar civil engineering projects and identified as the most suited environmentally acceptable location for securing such materials for this project as well.

These construction materials could be transported using existing road networks as has been accomplished in the past for similar projects. Still, the detailed transportation plan should be formulated during the detailed construction planning in detailed engineering to mitigate undue interference with regular traffic by organizing such transportation during off-peak hours including nighttime as appropriate. Moreover, materials having potential for dust pollution such as sand shall be transported in covered trucks with secured vinyl covering being the minimum requirement.

Accordingly, with due construction planning and scheduling potential adverse effects of this short-term impacts during transportation of materials and equipment for the construction works could be minimized and managed if not entirely eliminated with conventional “*good engineering practice*”.

### **(2) Construction work effects and safety aspects**

Construction works would involve noise, vibration and potential dust generation including increased sediment run-off in the river due to dredging works. Since, the site is in deep valley of more than 100 m deep and there are no residents in the immediate vicinity of site potential adverse effects on residents due to noise and vibration is regarded as insignificant. Still, as a measure of safety in construction works and also to avoid any adverse effects on surrounding communities, heavy machinery work activities generating high noise and vibration could be limited to day-time work only as *good engineering practice*.

Dust generation need to be controlled with due diligence principally as health protection measure of construction personnel at site. Water spraying on materials prone to dust generation could be carried out as control measure. Moreover, such dust prone materials of long storage could be covered with vinyl sheets both as means of dust control and to mitigate loss of material and subsequent increased sediment runoff to the river in case of heavy downpour. Moreover, provision of boots, earplugs, goggles, masks, helmets and other safety gears shall be ensured for construction personnel at site as required.

Dredging works in river might inevitably result in some increase in turbidity and sediment runoff in river, which shall be mitigated to the extent possible with cofferdam. Considering the fact that natural sediment runoff is high in most rivers in Bali during flood discharge in rainy season, including Ayung River, any potential long-term adverse effects on river ecology due to temporary increase in turbidity in river during construction works is considered as insignificant. Still, provision of stilling ponds shall be mandatory aimed at limiting potential soil erosion from surrounding construction lands along with cofferdam to control sediment runoff from in-river dredging works.

Accordingly, with due planning of construction works in detailed engineering by sticking to well established (in fact conventional) *good engineering practice* potential (still temporary) adverse effects due to construction works could be managed so as not to significantly affect the surrounding environment.



### (3) Effects on fauna and flora at dam construction site

From the findings of the EIA study no significant long-term adverse effects on fauna and flora of the dam site (that would significantly affect their survival) due to the construction as well as the existence of the dam is anticipated. Some adverse effects on aquatic biota (fauna and flora) due to increased turbidity of dredging works and also surrounding terrestrial biota due to land clearing and other construction activities including permanent inundation by dam of limited terrestrial area of about 75 ha is inevitable. However, the surrounding terrestrial environment shall be restored with re-plantation (in fact reforestation) once the construction works are over (again as conventional *good engineering practice*), while the water environment of the dam shall be duly managed as dealt with under item (3) on Post-construction phase of below to ensure good aquatic ecology in dam.

The EIA study has identified suitable species of flora for re-plantation (reforestation) of the dam site once construction works are over. In fact the flora species identified are suited for reforestation of any area in the dam drainage basin and beyond (in particular for areas of critically sloping terrains similar to the dam site). The identified flora species of trees, bushes and herbs of reforestation are shown in Table-L. 1.

Most biota identified in the dam site area, both aquatic and terrestrial, are common and none of them belong to the category of endangered species. Still, there exist some terrestrial fauna species, seven birds and two mammals, protected by Indonesian Law. It is noted that all seven protected bird species are scientifically common while the two mammals are threatened. Still, the range of distribution (habitat) of all nine protected fauna species covers several surrounding islands and countries.

The seven species of protected birds are Cattle egret (*Bubulcus ibis* or Kuntul Kerbau in Indonesian), Little egret (*Egretta garzetta* or Kuntul Kecil in Indonesian), Java kingfisher (*Halcyon cyanoventris* or Cekakak Jawa in Indonesian), White-collared kingfisher (*Halcyon chloris* or Cekakak Sungai in Indonesian), Spotted kestrel (*Falco moluccensis* or Alap-Alap Sapi in Indonesian), Black eagle (*Ictinaetus malayensis* or Elang Hitam in Indonesian) and Changeable hawk-eagle (*Spizaetus cirrhatius* or Elang Brontok in Indonesian). These birds have very wide range and distribution of habitat and are very mobile and very responsive. Accordingly, the dam project area is extremely small in comparison to the range of distribution and habitat of these birds. Therefore potential adverse effects by dam is evaluated as not significant.

The two threatened (and protected) mammal species are Southeast-Asian porcupine (*Hystrix brachyura* or Landak in Indonesian) and Pangolin (*Manis javanica* or Trenggiling in Indonesian). These two mammals are classified as threatened since their population is low. Though it might seem that the survival of these two mammal species would be quite significantly affected by the Ayung River Dam development, still their range of distribution of habitat is wide, eventhough not to that level of the seven bird species of above. Distribution of these mammal species covers most of Southeast-Asian region (in particular, Java Island and Malaysia).

It is noted that some habitat of these two mammals will be lost consequent to dam inundation since they live in cave/hole/crack of the steeply sloping Ayung and Siap riversides. Still there remains a large extent of area with similar characteristics along Ayung and Siap rivers. Both of these mammals are highly responsive and able to swim well and are expected to escape inundation by dam naturally by moving to alternative terrestrial habitats located elsewhere in the surrounding sloping terrains (eg. uninundated terrains of higher elevation). Moreover, inundation area by dam of only about 75 ha is extremely small in comparison to the available sloping terrains to serve as alternative habitat for these mammals. Therefore potential adverse effects on both of these threatened mammal species by dam is evaluated as not significant.

In fact the protection of Ayung Dam drainage basin, which is its terrestrial ecosystem, against further development (in reality its improved protection with reforestation as appropriate), as delineated under item (3) of post-construction phase of below, also in turn would ensure the long-term protection of the terrestrial habitats for these protected fauna species (threatened in case of the 2 mammals) and hence their long-term survival.

Accordingly, in overall, potential adverse effects on fauna and flora due to construction as well as the long-term existence of the dam are evaluated as not significant. In fact the protection of Ayung Dam

drainage basin with an area of about 218 km<sup>2</sup> against further development is regarded as beneficial for the long-term survival of protected terrestrial fauna species.

### **L-2.3 Post-Construction (Operation) phase**

Potential adverse effects during operation of dam would be of long-term and hence the relevant mitigation and management measures to ensure the ecological sustainability of the dam, which is also necessary to ensure intended multipurpose beneficial use (source of potable water supply being the prime use) of the dam, are also of long-term (permanent).

The most significant long-term adverse effect the dam might encounter is the deterioration of its aquatic ecology represented by potential eutrophication and hence deterioration of dam water quality (in addition to potential rapid siltation of dam). It is extremely important to employ proactive (and long-term) management and monitoring measures based on *precautionary principle* to mitigate such occurrence as dealt with below. The mitigation measures will focus integrally both on the drainage basin of dam (218 km<sup>2</sup>) and the aquatic environment of dam (both the terrestrial and aquatic ecosystems of the dam).

#### **(1) Potential eutrophication of dam**

Potential eutrophication of dam water that would affect the intended prime beneficial use of dam water as potable water source and potential rapid siltation affecting the life of dam are the most significant environmental issues that need to be strictly mitigated. It is noted that eutrophic water (with floatable solids of phytoplankton) is not amenable to conventional surface water treatment that is based on gravity settling principle to realize solid-liquid separation.

First of all, the measured phosphorus level in the river water just upstream of dam was around 0.01 mg/l, a level marginally sufficient to result in potential eutrophication of stored dam water (at least theoretically). Still, shallow stationary (lentic) water bodies (lakes and dams), due to their effective sunlight penetration into water, are more prone to eutrophication in comparison to deep ones. Considering the deep-water depth of the dam of more than 50m and only the marginal availability of the primary nutrient (phosphorus) no eutrophication in dam water is anticipated under the current land-use status of the drainage basin of dam.

Still, as precautionary measure both against eutrophication and rapid siltation of dam it is proposed as a must to protect the drainage basin of the dam against any further significant future development including intensive agricultural development in order to mitigate any further increase in nutrient (phosphorus) input to the dam.

It is also noted that as structural measure of controlling sediment inflow to the dam 2 check-dams at the upstream river reaches to the dam inlet is provided in the two rivers of Ayung (main river) and Siap (tributary of Ayung). It is important to regularly remove (dredge) the accumulated silt material in both check-dams, in principle at the end of each rainy season, so that their functioning would be effective in settling the suspended solids in river water that would occur mostly occur during rainy season of flood discharge. Such silt material removed from the check-dams could be beneficially used as construction material. Accordingly, regular removal of the accumulated silt material could be contracted out to some construction material sourcing company.

The total area of drainage basin (terrestrial ecosystem) of the dam is about 218 km<sup>2</sup>, which in its most upstream reaches incorporates some areas that are already protected. Accordingly, net area of drainage basin to be protected consequent to the dam is about 200 km<sup>2</sup> (refer to Figure-L. 1). It is noted that projects shown in this figure incorporate all significant projects of the entire Master Plan and not just only the priority projects of targeted for environmental evaluation/EIA. Still, priority projects of environmental evaluation are specifically marked in the Figure. This Figure, as far as the Ayung Dam project is concerned, primarily intended at showing the location of dam and its drainage basin/terrestrial ecosystem along with the entire existing protected areas in Bali). As the first step to achieve the protection of dam drainage basin, the Provincial Government of Bali shall enact the necessary legislation to declare it as protected area with strict control on development oriented change in land-use (in future).

In this respect, it is necessary to maintain all publicly owned lands in the dam drainage basin as conserved forestation, with reforestation if warranted, in particular affected critically sloping terrains, to control both nutrient runoff and soil erosion in addition to the obvious reforestation of lands surrounding the Ayung Dam as pointed out above under item (2) on construction phase. Critically sloping terrains even when they are privately owned shall be targeted for maintenance as conserved forestation. The flora species shown in Table-L. 1 are primarily intended for reforestation of the surroundings of Ayung Dam. Still, they could also be used for reforestation of critically sloping terrains and publicly owned lands as appropriate.

Moreover, concerned to existing agricultural developments in the dam drainage basin (terrestrial ecosystem), conversion to organic farming shall be promoted. It is noted that organic agricultural produce has market potential for sale to upscale hotels and restaurants of tourism industry. Concerned to tourism development in the dam drainage basin it shall be focused on eco-tourism and development of large-scale hotels and villas will be prohibited.

With these measures any potential increase in both nutrient inflow and rapid sediment inflow into the dam could be mitigated (in fact could be reduced). In fact the target is to achieve pristine aquatic environment in dam that might require further future reduction in nutrient input to the dam.

The increase in protected terrestrial area of the dam drainage basin (about 200 km<sup>2</sup>) is regarded as a beneficial effect inspired by the dam, which would more than compensate the loss of small terrestrial area, with a maximum area of 1km<sup>2</sup>, due to inundation to make way for the dam. This protected terrestrial area (belonging to the terrestrial ecosystem of dam) is expected to assist in long-term survival of the nine protected terrestrial fauna species (7 birds and 2 mammals) identified at the dam site area (refer to item (2) of construction phase of above).

Moreover, as the natural means to control the proliferation of phytoplankton in dam water, the cause of any eventual eutrophication, introduction of plankton grazing fresh water fish species (planktivores) that are also economically valuable is recommended. Such freshwater fish species identified by the EIA Study, which are being well reared in the natural lakes of Batur, Beratan and Buyan as well, include Hard-lipped barb (*Osteochilus hasselti*), Common carp (*Cyprinus carpio*) and Nile tilapia (*Oreochromis nilotica*). This would also enhance the species diversity and hence the ecological balance of the dam aquatic environment.

Such introduced fish species will solely depend on naturally available plankton and other biomass in water as their feed and in principle no artificial feeding would be permitted in order to mitigate human induced (anthropogenic) deterioration in dam water quality. With regular harvesting of such matured fish (that may be sold in the market), including recreational fishing, pristine fresh water aquatic ecosystem of the dam, similar to the central mountain natural lakes of Beratan, Buyan and Tamblingan, could be attained, which is in fact the long-term management objective of the dam.

Moreover, water discharged from dam containing such reared fish species may naturally contribute to at least some restoration of fish ecology even at its downstream river reaches. If further restoration of fish ecology at Ayung River downstream reaches of dam is preferred a fishpond with artificial feeding to facilitate fish culture development could be provided at downstream of dam (independent of dam aquatic ecosystem). In this respect such a fishpond to serve as fish nursery could be provided using the water discharged from the hydroelectric power generation plant. Accordingly, the overall dam system has potential for development of fishery within the dam and also rehabilitation of fish ecology at the downstream Ayung River reaches of the dam.

It is noted that there are many existing irrigation and other water intake weirs at downstream of planned Ayung (Buangga) dam in Ayung River that have no fish ladders (in fact in almost all rivers in Bali with significant flow) and hence they potentially affect the fish ecology of the river by inhibiting fish migration. The proposed fish nursery (using water discharged from the electric power generation plant) could even rectify the overall aquatic ecology in the entire downstream river reaches of the Ayung Dam, which could also be regarded as a probable potential long-term aquatic ecological beneficial effect of the dam.

## (2) Dam water quality monitoring program

Regular water quality monitoring program in dam is necessary to effectively undertake the necessary protection measures in timely manner against any potential dam water quality deterioration (including eutrophication) and hence to ensure pristine aquatic ecology. The water quality-monitoring program shall be established concretely during the detailed engineering of the dam. Still, a tentative monitoring program is proposed as given below so as to determine the overall water environmental condition of dam with respect to physical, biological, bacteriological and eutrophication potential aspects.

### 1) Locations of monitoring

Minimum of 4 locations, 2 locations near the water inlet river reaches of Ayung and Siap Rivers within dam, 1 location at center of dam and 1 location near the water outlet of the dam.

### 2) Frequency and parameters of monitoring

Frequency of monitoring recommended, at least initially following the commissioning of the dam, is on a monthly basis with the minimum of following parameters of monitoring (a lesser but still regular monitoring frequency such as once in two months may be adopted in the long-term based on analysis of accumulated data on monitoring results and their degree of variation).

*Temperature, pH, TDS (EC), turbidity, SS, DO, BOD, COD, T-N, T-P, Coliform (total and fecal) level and Phytoplankton density.*

### 3) Target dam water quality

The recommended long-term target of water quality of dam is to attain pristine aquatic environment. The target with respect to the basic parameters of BOD (prime indicator of biological pollution) and T-P (prime indicator of potential eutrophication) is set as given below referring to the NWQS of Indonesia and also relevant lake (dam) water quality standards of Japan including the current water quality status of central mountain natural lakes.

- For BOD the annual average value will not exceed 3 mg/L.
- For T-P the annual average value will not exceed 0.005 mg/L.

With the undertaking of these environmental management and monitoring measures targeting integrally the dam drainage basin and its aquatic environment (both the terrestrial and aquatic ecosystems of the dam), long-term ecological sustainability of the dam so as to meet effectively its intended beneficial uses (in particular as source of potable water) could be ensured. Moreover, pristine water quality in dam could be attained, which is the long-term objective. The cost of these protection measures of the dam drainage basin is incorporated in the overall operation and maintenance cost of the dam.

**Table-L. 1(1/2) Flora Species for Reforestation around Ayung Dam**

No	Native/Local Name	Scientific Name	Remarks
<b>A</b>	<b>Trees</b>		
1	Angsana	<i>Pterocarpus indicus</i>	Strong large straight root, dry resistant
2	Tanjung	<i>Mimusops elengi</i>	Strong root and evergreen
3	Pule	<i>Alstonia scholaris</i>	Strong root
4	Kutat	<i>Planchonia valida</i>	Strong and buttress root, and evergreen
5	Gintungan	<i>Bischofia javanica</i>	Deep and strong root
6	Bayur	<i>Pterospermum indicum</i>	Strong large straight root
7	Majagau	<i>Dysoxylum caulostachyum</i>	Strong stem and root
8	Bentawas	<i>Wrightia pubescens</i>	Buttress root and strong stem
9	Buni	<i>Antidesma bunius</i>	Branching root, soil erosion resistant
10	Bambu betung	<i>Dendrocalamus aster</i>	Strong adventitious root as land cover
11	Udu	<i>Lindera sp</i>	Strong large straight root, evergreen
12	Sone keling	<i>Dalbergia latifolia</i>	Dry resistant
13	Sengon	<i>Albizia falcataria</i>	Deep and spreading root

**Table-L.1(2/2) Flora Species for Reforestation around Ayung Dam**

No	Native/Local Name	Scientific Name	Remarks
<b>B</b>	<b>Bushes</b>		
1	Kaliandra	<i>Caliandra sp</i>	Branching root that strongly covers the land
2	Lamtoro	<i>Leucaena glauca</i>	Branching root and dry resistant
3	Kerinyu	<i>Eupatorium inulifolium</i>	Dense and branching root
4	Kerasi	<i>Lantana camara</i>	Wider branching root, dry resistant
5	Kem	<i>Fleucortia rucam</i>	Strong root and stem
<b>C</b>	<b>Herbs</b>		
1	Rerumputan	<i>Gramineae</i>	Plant for land cover
2	Semanggi gunung	<i>Oxalis corniculata</i>	Covering herbs with strong adventitious root

Source: Ayung Dam EIA Study by Study Team (2006)

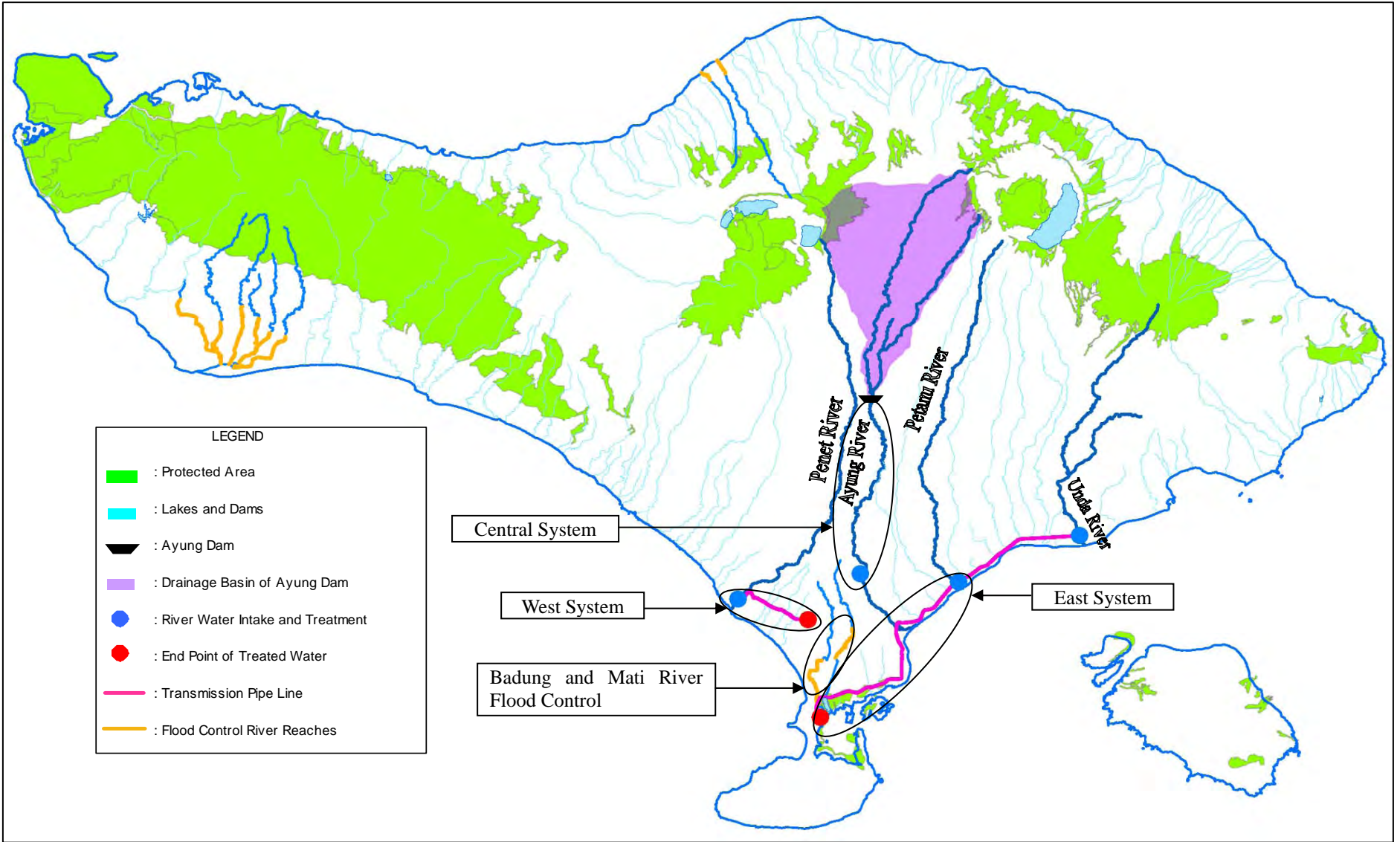


Figure-L. 1 Protected Areas and Projects of Master Plan

## **L-3 WATER SUPPLY PROJECTS**

There are 3 regional water supply projects that are independent of each other since they draw raw water from 3 separate rivers having their own independent drainage basins, namely, West Region Project or Western Water Supply System (raw water intake from Penet River and hereafter referred to as West Project/System), Central Region Project or Central Water Supply System (raw water intake from Ayung River at downstream of Ayung Dam as water released from the dam and hereafter referred to as Central Project/System) and East Region Project or Eastern Water Supply System (raw water intake from Petanu River and hereafter referred to as East Project/System). Still, all three projects are aimed at supplying potable water to the Southern Bali Area (Metropolitan area of Denpasar and its surroundings including the tourism-developed areas of Badung Regency adjacent to Denpasar such as Kuta, Nusa Dua and others).

In fact the 3 projects/systems also shown in Figure-L. 1, despite their independence, are quite similar in nature with respect to many aspects such as water intakes with weirs and their respective water treatment plants. The most significant difference is the treated bulk water transmission mains that are common to both East and West Projects but not for the Central Project. Also the Central Project is viable only with the existence of Ayung Dam to provide the required raw water principally as water released from the dam, while West and East projects are viable on their own since they are based on direct river water intake. Accordingly, the relevant environmental impacts have much in common and dealt with cumulatively with due consideration to their distinct environment whenever necessary.

### **L-3.1 Pre-construction phase**

Social aspects are the most significant concern of pre-construction phase. In this respect the most significant social issue is the requirement for any resettlement of population involving housing compensation consequent to the provision of project facilities of water supply systems, basically for the provision of water treatment plants. It is noted that the locations of treatment plants for both the West and East projects are open rice fields that are uninhabited. In case of the Central Project the planned location is already lies within the property line of existing IPA Ayung. Accordingly, no resettlement is involved.

Also any social conflict with existing irrigation water user (farmer) rights is avoided for both the West and East projects with direct river water intakes by selecting the intake locations at the most downstream river reaches. Water user rights conflict does not exist for the Central Project since stored water released from the Ayung Dam will be the raw water intake (no direct river water intake). Accordingly, potential water user rights conflict is avoided in the form of in-built mitigation in the project plans.

### **L-3.2 Construction phase**

#### **(1) Construction equipment and materials and transportation related aspects**

The most significant activity of construction phase requiring proper management measures involves procurement and transportation of equipment and material for constructions works and their proper storage and use at the 3 independent project sites.

The construction material and equipment requirement for the projects are not that large scale since the 3 three project sites are located at different locations and hence amenable for totally independent material and equipment procurement and construction work scheduling and execution. The works involved are conventional and already widely implemented for many existing water supply schemes in Bali.

Still, the transmission pipe laying works along the existing roads, in particular along the Bypass Sanur Highway in the case of East Project with heavy regular traffic, has potential to cause interference with regular traffic and hence shall be executed in a sector-wise manner and also as far as possible focused on off-peak hours including nighttime as appropriate so as to minimize interference with regular traffic, including rerouting of regular traffic if absolutely necessary. Also due diligence is utmost important

to avoid potential accident with regular traffic that again points to the significance of using off-peak traffic hours for construction works along roads. Even regarding this aspect the ongoing DSDP project that also involves sewer pipe laying works in Denpasar including the Bypass Sanur highway has already contributed in gaining similar experience. After all these mitigation measures are simply conventional *good engineering practice* for construction works along public roads.

## **(2) Construction work effects and safety aspects**

Construction works would involve some noise, vibration and potential dust generation including increased sediment run-off in the river due to dredging works related to intake weir construction. All three water intake and water treatment plant sites are located in low density rural areas surrounded with agricultural land use, in particular rice fields in case of both the West and East projects. In case of the Central Project the project site is adjacent to the existing potable water intake and treatment plant location of IPA Ayung (Ayung WTP). Accordingly, potential adverse effect on residents due to noise and vibration is regarded as insignificant. Still, as a measure of safety in construction works and also to avoid any adverse effects on surrounding communities, heavy machinery work activities generating high noise and vibration could be limited to day-time work only.

Dust generation could be controlled with due diligence principally as health protection measure of construction personnel. Water spraying on materials prone to dust generation could be used as control measure. Moreover, such dust prone materials of long storage could be covered with vinyl sheets both as means of dust control and to mitigate loss of material and subsequent increased sediment runoff in case of heavy downpour. Moreover, provision of boots, earplugs, goggles, masks, helmets and other safety gears shall be ensured for construction personnel at site as required. Again these environmental mitigation measures of construction works including safety aspects are conventional *good engineering practice*.

### **L-3.3 Post-Construction (Operation) phase**

Potential adverse effects during operation of water supply systems would be of long-term and hence the relevant mitigation and management measures are also of long-term. In this respect design in-built mitigation measures are also used to avoid long-term adverse effects as noted below. Water supply systems basically produce clean water for human consumption and accordingly there exist virtually no potential long-term adverse effects directly due to the water production and consumption. Still, there are three significant aspects having potential long-term adverse effects due to the operation of water supply systems as dealt with below.

#### **(1) Potential adverse effects of river water intake with weirs**

Reduced discharge at downstream of intake and its potential adverse effects on river ecology may be significant and shall be mitigated. This case is not applicable at least for the Central Project/System since the intake water taken from the weir is the one that was planned, stored and released from the Ayung Dam and hence there is no net reduction in discharge at downstream of weir. However, this might be an issue for the other two direct river intakes with weirs (West and East projects/systems). Still, the amount of intake is planned with due amount of remaining water for release as environmental flow to downstream to sea, since both intakes are located at their most downstream river reaches. Accordingly, in-built design mitigation measure is used in determining the quantity of water intakes. Moreover, both intake weirs, though located at their most downstream, are located at ground elevations well above the high tide level of sea. Accordingly, any potential salinity intrusion, due to tidal backwater effect, at the intakes is mitigated. This is in fact a very important basic requirement in locating intakes for potable water supply.

Another, potential adverse ecological effect due to weir intake, which should be the case with all existing weirs in Bali rivers, is the potential inhibition of fish migration upstream due to discontinuity in flow (waterfall effect) caused by weir. However, for the two systems of West and East, since the existing weirs in the rivers (Penet and Petanu rivers) are located at far upstream of the intake weirs of



this project and also nekton (fish) sampling results indicated that fish migration occurs upstream of the intakes, it has been decided to provide fish ladders for both weirs as in-built design mitigation measure of river ecological conservation.

Fish ladder for the weir of Central Project in Ayung River was not incorporated since there exist many weirs, all without fish ladders, right from the very upstream of the weir of this project (existing Peraupan Weir, Mambal Weir and others)) and also at downstream (existing Oongan Weir and Waribang PDAM Intake with Rubber Dam) and hence provision of fish ladder only for this weir is not expected to facilitate any significant fish migration in river.

Still, fish ecology along the entire downstream of Ayung Dam that includes this weir river reach as well may better be planned as component of Ayung Dam System (including the hydroelectric power plant that would provide water for fish culturing pond) serving as fish nursery as pointed out under the operational phase of Ayung Dam Project of above (Item (3) of Section O.1).

## **(2) Generation of waste sludge at water treatment plants**

The production of clean water from raw river water also results in waste sludge (residuals) generation principally as settled matter in the sedimentation tank of the water treatment plant. Still, the sludge is very watery and amenable for discharge back into the river of raw water intake, a practice still rather widely used. It is understood that most existing water treatment plants in Bali actually use this practice even when they have drying bed for waste sludge management. Nevertheless, such sludge could be easily dewatered and dried in earthen ponds or other simple drying beds and beneficially used as general soil conditioner or material for land reclamation.

Still, water treatment plant sludge have no particular beneficial use as agricultural soil, principally due to their non-fertility (non-nutrient) to provide any supplemental nutrient to facilitate plant growth. Still, combing them with normal agricultural soil does not significantly affect plant growth (ref. An assessment of Cropland Application of Water Treatment Residuals, American Water Works Association, 1995). So the sludge could be used as soil conditioner for agricultural lands as well. Still, in overall beneficial use based on nonagricultural use is recommended.

The design of the three water treatment plants by this project (West, Central and East Systems) incorporates sludge-drying facilities as a precautionary measure against river water environmental degradation and also as *good engineering practice* of waste sludge management. In fact such practice is recommended to be duly followed in all existing water treatment plants having sludge drying facilities.

## **(3) Wastewater generation consequent to consumption of supplied water**

In general, about 80% of water consumed is discharged as wastewater. In the absence of sewerage system such discharged wastewater finally ends up in surface river waters resulting in water environmental degradation as evident from the current status of Badung and Mati rivers.

Actually this water supply project is aimed at providing bulk treated water for supply by PDAM and other water supply companies, and hence the issue of potential surface water quality degradation due to supplied water is an indirect, but still significant, long-term impact consequent to these water supply development projects.

In reality, this surface water environmental degradation issue is being addressed by the ongoing DSDP as the initial phase of sewerage system development for Denpasar and Kuta areas. Accordingly, as the long-term mitigation measure against potential surface water environmental degradation consequent to the discharge of untreated wastewater to the surface water environment it is imperative to make the necessary plans in future to expand the sewerage system to cover the new water service areas as per these projects as well. In effect expansion of sewerage system should proceed at least after the provision of water supply service as soon as possible (financially practical).

## L-4 FLOOD CONTROL PROJECTS

The planned river improvement works in the urban river reaches of Badung and Mati rivers are basically routine maintenance works to ensure the flood carrying capacity of the rivers (refer to Figure-L. 1). Portions of river improvement works in these rivers have already been accomplished recently. Accordingly, the planned river improvement works in these two rivers target that portion of river reaches yet to be improved. These two river reaches have undergone similar drainage improvement works many times in the past and hence any potential adverse environmental effects in overall regarded as easily manageable and insignificant. Still, there exists two significant issues of social aspects and dredged material management aspects that would require due justification and hence illustrated below.

### (1) Social aspects

The entire river improvement reach of Badung river is surrounded with residential developments located right adjacent to their both river bank areas and hence no river widening work is possible without resettlement of population and demolition of houses located along banks. This is regarded as socially impractical and the entire river improvement works planned is basically composed only of deepening of riverbed and provision of floodwall (parapet walls) but without any river widening works so as to increase flood carrying capacity of river. Planned river improvement reaches of Mati River is still located in relatively low population density area surrounded with open fields including agricultural lands (rice fields). Some of such agricultural lands are planned to be reserved as retarding areas of flood control, nonstructural measure. Also the planned river improvement works would involve river-widening works as well since no residential resettlement is involved and required land could be easily acquired. Accordingly, potential adverse social effects are mitigated in the form of in-built design mitigation measures of river improvement works.

### (2) Dredged material management aspects

The most significant environmental issue concerned to these river improvement works is the management of dredged riverbed material since both of these urban riverbeds are potentially contaminated since they carry polluted waters with very significant water quality deterioration as evident from the results of water quality sampling as well as available data (in fact visually discernable).

Still during annual flood discharge of rainy season the surface layers of these riverbeds where settled contaminants accumulate should be naturally flushed off to sea thereby resulting in clean riverbeds (annual natural flushing of pollutants during rainy season from November to February). Accordingly, by planning the dredging works just after the end of rainy season in overall relatively uncontaminated riverbed material could be dredged that can be disposed in landfill or even used for beneficial uses such as land reclamation. Similarly, it is also important to avoid dredging works just before the start of rainy season in order to avoid dredging of mostly contaminated material. It is also reported that in similar past cases of dredging the dredged material was basically used for land reclamation. In fact this environmentally preferred timing of dredging is in agreement with the timing of *good engineering practice* for conducting flood control related construction works. It is natural to carryout the river improvement works just after the end of rainy season and terminate it well before the start of rainy season so as to avoid any interference with flood discharge due to the construction (river improvement) works itself. Accordingly, it is concluded that contaminated dredged material should not be a concern when *good engineering practice* is adhered to in timing the conduct of river improvement works.

## L-5 CONCLUSION

It is concluded that there are potential adverse environmental effects consequent to the implementation of the priority projects, in particular, the Multipurpose Ayung Dam Project and the Water Supply Projects (West, Central and East Projects/Syatem). Still, all significant adverse effects, including

potential eutrophication and rapid siltation of Ayung Dam, are manageable and hence could be mitigated with well-known management and monitoring measures integrally focused both on the drainage basin of the dam and its aquatic environment (both the terrestrial and aquatic ecosystems of the dam). Accordingly, the priority projects are evaluated as environmentally viable and sustainable.

# *Appendices*

**Appendix-1**  
**Ayung Dam Environment**  
**Impact Analysis**

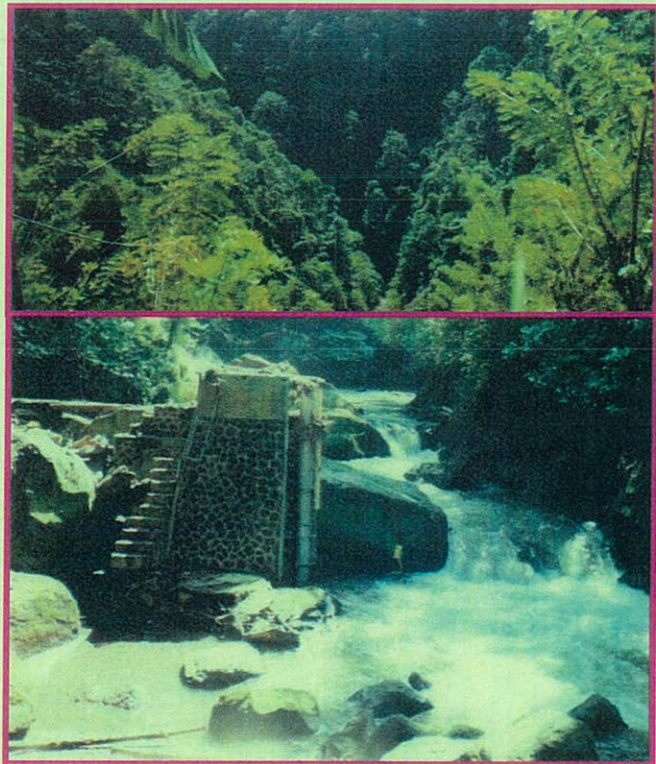


## JICA Study Team

for the Comprehensive Study on Water Resources Development  
and Management in Bali Province in the Republic of Indonesia

# MAIN REPORT

## REVIEW OF AYUNG DAM ENVIRONMENT IMPACT ANALYSIS



DENPASAR, 2006



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# PREFACE

The policy of environment management in Indonesia is implemented to reserve and develop the balanced and harmonious environment ability to support the sustainable development with environmental perspective.

Ayung Dam Development Plan at Badung Regency is purposed to developed irrigation infrastructure, water supply and hidro-electropower, which will serve community in Badung, Denpasar, Gianyar and its surrounding. According to Indonesian Law No.23/1997 and Minister of Environment Decree No. 17/2001 that an activity with certain conditions should be completed with Environment Impact Analysis.

JICA Study Team for *The Comprehensive Study on Water Resources Development and Management in Bali Province in The Republic of Indonesia* for the purpose of supporting water resources development in Bali then conduct Environment Assessment for the activity plan.

The study is executed by PT. ASA CITRA Team as sub-contractor. Under supervision of JICA Study Team, Team of PT. ASA CITRA is implement Head of Bapedal Decree No.9/2000 Annex II about Environment Impact Analysis Arrangement Guidelines for guidance of this study.

Denpasar, March 15<sup>th</sup>, 2006

**PT. ASA CITRA Denpasar**

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## ABSTRACT

### REVIEW OF AYUNG DAM ENVIRONMENT IMPACT ANALYSIS

Ayung Dam development at Badung regency, Bali Province is addressed to meet the need of developing Ayung River multifunctioned dam for raw water resources supply, irrigation water, and hydro-electropower. The benefits of this project are: Fulfill the need of raw water of 1.6 to 3.6 m<sup>3</sup>/sec (drinking water, sanitation, and city flushing). To stabilize the irrigation water for 9.542 Ha ricefields at Subak Kedewatan, Mambal, Singempel, Praupan, and Oongan in order to keep it preserved. PLTA with the capacity of 7 to 12.3 MW. Prevent the erosion at upstream area, flood controlling, and Bali Province water resources development.

Ayung Dam development activity will cover the riverbasin of approximately 218, 41 km<sup>2</sup> with dam water inundation of 73,17 ha that will store 10.562.600 m<sup>3</sup> of water, and the normal elevation altitude of the water level surface of +377,00 m and maximal elevation of flood water surface is +377,70 m.

Dam body is made of Concrete Gravity Dam with maximum height of 104,00 from the base foundation. Riverbed elevation is +280,00 m with free board height of 2,40 m. Length of crest is 221,25 m with peak dam elevation of +380,10 m. Width of dam crest is 6,00 m with the up-stream slope vertical and downstream slope 1 : 0,8. The spillway type belongs to ogee type complemented with gate with crest width of 3 x 8 m. Spilway crest elevation +367,00. Up-stream slope vertical 1 : 1 dan downstream slope 1 : 0,8. The intake type is Vertical Sliding Gate, with door dimension of 2,5 x 2,5 m and inlet ground elevation +355,90 m. Penstock length of 120 m with steel construction and tunnel dimension of 2,00 m.

The borders of this project cover Banjar Buangga's right border and Payangan Village in the left side. Geographically, the dam location is on coordinate of 8 23'30" South Latitude – 8 26'00 South Latitude and 115 13'30" West Longitude – 115 14'30" West Longitude.

Based on the impact prediction analysis after implementing the significant and important impact evaluation that refers to Head of Bapedal Decree No 056/1994, it can be explained that impact must be managed and monitored as followed:

#### Important Negative Impact :

- 1) Change of topography and land scape.
- 2) Degradation of geologic stability.
- 3) Degradation of land physical and chemical characteristic.
- 4) Degradation of Ayung River water quality.
- 5) Increase of erosion and sedimentation.
- 6) Increase of the change of land use and decrease of environmental aesthetics value.
- 7) Disturbance on aquatic flora and fauna.
- 8) Negative attitude and perception toward the project.
- 9) Disturbance on holy area/place and local values.
- 10) Disturbance on community's security and orderliness.
- 11) Deterioration of community's health.
- 12) Transportation disturbance.

### **Important Positive Impact due to this Activity:**

- 1) Improvement of micro climate components
- 2) Increase of environmental aesthetics values
- 3) Increase of water resources potential and reserve in Bali
- 4) More habitats for biological diversity in Bali
- 5) Decrease of sedimentation risk in Ayung river body
- 6) new economic sources and job opportunities on Payangan and petang, particularly local economy
- 7) Increase of community's health, especially Southern Bali
- 8) Increase of government, community and region's income

Environmental feasibility analysis of Ayung Dam development follows main pillar of environmental aspect those are:

#### 1. Spatial plan appropriateness

For Badung Regency, site plan of Ayung Dam that is situated in Petang sub-District should convey conservation character for its low land in the downstream. So with in Gianyar Regency. On Local Government Regulation No. 3 / 2005 about Bali Spatial Plan, the plan to develop dam in the same location is already stated. The conclusion then is that the dam development has been appropriate to the all spatial plan both in regencies level and provincial level

#### 2. Technology of Environmental Impact Management

Technical arrangement for managing impact of the dam development should covering:

- 1) Management toward the change of land scape topography,
- 2) Management towards degradation of soil's physical and chemical characteristic, soil stability and also increase of erosion and sedimentation,
- 3) Management towards the deterioration to the Ayung River water quality,
- 4) Management towards the change of land use,
- 5) Management towards the degradation of species abundance and diversity of aquatic flora and fauna,
- 6) Management towards the transportation disturbance.

#### 3. Economic beneficial

Economic beneficial of the dam is mainly lead the positive perception to the plan. Eventhough, that beneficial should be well carry out. Several identified benefit will always remind by the stakeholder and there for should be maximally realized

#### 4. Community's agreement

The community's attitudes and perceptions toward Ayung River Dam development plan are very various. Community who agree with Ayung Dam development are 90,77 % and those who disagree are 9,23 %.. The agree respondents conveye some requirements, such as: (1) There must be such guarantee toward Ayung River's flow to downstream; (2) the released land must be compensate with resemble land or appropriate compensation and will not adverse the community (3) The project should create new job opportunities to the local community; (4) There should be electricity and water supply contribution for the village.