Pipeline from WLPSZ to CR4 (Plautings) DESCRIPTION UNIT OTV Unit Price Sub-rosal Supply and Installation of pipes, fittings, valves, accessories and equipment Execution of civil works Grand Total	PROJECT:	PROJECT: Vaza Barris Water Supply Project	LOCAT	NO.	LOCATION:			
SCRIPTION UNIT QTY Unit Price Sub-total lot 1 7,704,105 1 7,704,105 11,207 S17,957		Pipeline from WLPS2 to CR4 (Piauitinga)	LIND	SECOND P	HASE			PAGE 1/4
Supply and Installation of pipes, fittings, valves, accessories and equipment Descrition of civil works Grand Total		SCRIPTI	TIND	OTV	Unit Price	Prices (RS) Sub-total	Total	REMARKS
lor 1 517.957		Supply and Installation of pipes, fittings, valves, accessories and equipment	lot			7,704,105		
		Execution of civil works	<u>ro</u>			517,957		
		Grand Total					8.222.062	
						· · · · · · · · · · · · · · · · · · ·		
						-		
			· · · · · · · · · · · · · · · · · · ·					
	·	(€0 ■ 108)		•			:	: :

PROTECT	PROTECT - Vaza Barris Water Sundly Project	LOCATION	ON:				
WORK	Pipeline from WI.PS2 to CR4 (Plautinea)	S: LINS	UNIT: SECOND PHASE	1SE			PAGE 2/4
TTEX	NOTEGIADNEC	I NS	YTO	Unit Price	Prices (RS) Sub-total	Total	REMARKS
11 DIV	Supply and Installation of pipes, fittings, valves and accessories		<u> </u>			7,704,105	·
- :	Ductile Iron Pipes	•				7,588,336	·
.	Push-on Joint Pipes \$\phi 600 - L=6000 - TK7\$ \$\phi 500 - L=6000 - TK7\$	pcs	1,294	3362.63 2752.63	4,351,243	7.588,336	·
1.2	Ductile Iron Fittings					115,769	
1.2.1	Flanged Spigot Pipe \$\phi 600 - L=5800 - PN10 \$\phi 500 - L=5800 - PN10	pcs	0.0	7928.86	15,858	27.636	
1.2.2	Double Socket Sleeve \$\phi 600 \$\phi 500	pcs	7 7	1086.50	1,087	2,913	
1.2.3	Double Socket 90° Bend ϕ 500	bcs	·	1407.17	1,407	1,407	
4.5.	Double Socket 45° Bend φ 600 φ 500	pcs	1.71	1654.11	11,579	13,833	
55	Double Socket 22.5° Bend \$\phi 600 \$\phi 500	pcs	20.4	1282.68	6,413	9,913	
1.2.6	Double Socket 11.25* Bend \$\phi 600 \tag{RD} = 0.3.	Sc	5 0	901.59	4.508	4.508	

	PROJECT: Vaza Barns Water Supply Project	LOCATION		LOCATION:	777.		
2	Pipeline from WLPS2 to CR4 (Piauitinga)	TIND	UNIT: SECOND PHASE	HASE			PAGE 3/4
× 4000	TVITTEL COOK	41.41	ì	0.7.1.4	Prices (RS)	£	70,000
TOTAL	DESCAR 11018		177	Our Frice	Suo-iouai	1001	NCIVIANA
.2.7 Double Flanged 45	nged 45" Bend					14,977	
φ 600 - PΣ	010	bcs	2	3086.58	6,173		
φ 500 - PN10	110	pcs	4	٠.	8,804		
2.8 Double So	kel Toner			,		1 278	
\$600 x \$500	005	Sc		1377.83	1,378	}	
			· · ·			-	
1.2.9 Double So	Double Socket Tee with Flanged Branch	<u> </u>				26,009	
Ф 2009 ф	100	pcs	9		10,560		
\$500 x \$100	100	Soci	11	1404.49	15,449		
						1	
1.2.10 AIT Reicase Valves	Valves		,			10,262	
Ø 100 - PI		bcs	13	789.37	10,262		
1.2.11 Flanged G	te Valves					2 033	
4 100 - PN10	011	2008	. 4	733.20	2.933		
-						*****	
						-	
			,				
-							
						-	
-							
-							
(BDI = 0.3)		÷		-		•	

JAPAN INT	APAN INTERNATIONAL COOPERATION AGENCY : JICA	YACHIY	O ENGINE	YACHIYO ENGINEERING CO	LID. TYEC		DA1E, 50/177
PROJECT	PROJECT: Vaza Barris Water Supply Project	LOCATION	ION:				
WORK	Pineline from WI.PS2 to CR4 (Plauitings)	HIS	SECOND PHASE	IASE			PAGE 4/4
. 222					Prices (RS)	i i	3744474
ITEM	DESCRIPTION	E S	OTY	Unit Price	Sub-total	1001	KEWAKAS
2	Execution of civil works					/66./16	
2.1	Preliminary Works Location of the work	Ε̈́	14,989	0.26	3,897	8,556	
	Demointon and restoration of Asphalt Favernent	!	3			503,331	
7.7	Earthworks					•	
2.2.1	Mechanical excavation of trench in 1st category of soil Depth less than 2.0m Depth less than 2.0m with sheetpile	ËË	56,299 1,597	2.29	117,665	121.322	
2222 2222 2222	Backfill of trench Backfill with compaction control - DC > 95%NP Backfill without compaction control	ÊÊ	24,964 29,323	9.4 4.47	235.660	366,734	· · · · · ·
2.2.3	Disposal of excavated material (Transportation of 1 km)	Ë	3,685	2.86	10,539	10,539	
2.2.4	Gravel	Ê	2	26.48	53	53	
2.2.5	Sheet Piling	H ₂	1,043	4.49	4,683	4,683	
2.3	Concrete works	:				6,070	
2.3.1	Structural concrete, fck=21Mpa	Ê	91	142.38	2,278	2,278	
2.3.2	Plain concrete, fck=15Mpa	Ê		129.1	258	258	
2.3.3	Reinforcing steel	33	1,280	1.69	2,163	2,163	· · ·
2.3.4	Form	H ²	70	19.59	1.371	1,371	

AN INT	APAN INTERNATIONAL COOPERATION AGENCY : JICA	YACHIY) ENGINE	YACHIYO ENGINEERING CO., LTD.	LTD.: YEC		DATE: 30/9/99
PROJECT	: Vaza Barris Water Supply Project	LOCATION	NO	*			
WORK:	One Directional Surge Tank No. 1 (Piaurtinga)	UNIT: F	: FIRST PHASE	SE			PAGE 1/5
ITEM	DESCRIPTION	UNIT	O.TY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
	Supply and Installation of pipes, fittings, valves, accessories and equipment	lot	1		52,255		
	Execution of civil works Grand Total	%			29,871	82,126	
:			:				
		-					
				: :			
	I(BDI = 0.5)						

PROJECT: Vaza Barris Water Sup WORK: WORK: One Directional Surge ITEM Supply and Installation 1.1 Ductile Iron Pipes 450 - L=800 - PN10 450 - L=1300 - PN10 450 - L=1300 - PN10 450 - L=2900 - PN10 450 - L=2900 - PN10 450 - L=2900 - PN10 450 - L=2900 - PN10 450 - L=2900 - PN10 450 - L=200 - PN10 450 - L=2200 - PN10 4500 - L=2200 - PN10 4500 - L=2200 - PN10 4500 - L=2200 - PN10 4500 - L=2200 - PN10	One Directional Surge Tank No.1 (Piauitinga) One Directional Surge Tank No.1 (Piauitinga) Supply and Installation of pipes, fittings, valves and accessories Ductile Iron Pipes Double Flanged pipes \$\phi \text{50} \cdot \text{L} = \text{800} \cdot \text{PN10}\$ \$\phi \text{50} \cdot \text{L} = \text{2000} \cdot \text{PN10}\$ \$\phi \text{50} \cdot \text{L} = \text{200} \cdot \text{PN10}\$	ect DESCRIPTION S, fittings, valves and ac	ON d accessories			LOCATION UNIT: FIRS	LOCATION: UNIT: FIRST PHASE	SE SE			PAGE 2/5
	ctional Surge Tank No ad Installation of pipes on Pipes langed pipes =800 - PN10 =1300 - PN10 =2000 - PN10 =2000 - PN10 =4150 - PN10 =4150 - PN10 =4150 - PN10	.1 (Piauitinga) DESCRIPTI ; fittings, valves and	ON d accessories			E: FIND	RST PHA	CI CI			PAGE 2/5
	ad Installation of pipes on Pipes on Pipes langed pipes = 1300 - PN10 = 1300 - PN10 = 2000 - PN10 = 2000 - PN10 = 1700 - PN10 = 14150 - PN10 = 4150 - PN10	DESCRIPTI	d accessories	·				10			
	ad Installation of pipes on Pipes langed pipes =800 - PN10 =1300 - PN10 =2000 - PN10 =2000 - PN10 =1700 - PN10 =4150 - PN10 =4150 - PN10	, fittings, valves and	1 accessories		-	TIND	O'T'Y	Unit Price	Prices (RS) Sub-total	Total	REMARKS
1.1.1 Double Fi 1.1.1 Double Fi 650 - L= 650 - L= 650 - L= 650 - L= 650 - L= 6300	on Pipes langed pipes =800 - PN10 =1300 - PN10 =2000 - PN10 =2900 - PN10 =1700 - PN10 =4150 - PN10 =4150 - PN10									\$2,255	E.
Double FI # 50 - L= # 500 - L= # 300 - L= # 300 - L= # 300 - L=	langed pipes =800 - PN10 =1300 - PN10 =2000 - PN10 =2900 - PN10 =1700 - PN10 =5800 - PN10 =4150 - PN10		· · · ·							15,205	
6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	*800 - PN10 =1300 - PN10 =2000 - PN10 =2900 - PN10 =1700 - PN10 =\$800 - PN10 =4150 - PN10		· .							12,701	
6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	=1300 - PN10 =2900 - PN10 =1700 - PN10 =5800 - PN10 =5800 - PN10 =4150 - PN10					Sod	-	121.56			
6 50 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	=2900 - PN10 -2900 - PN10 =1700 - PN10 -5800 - PN10 =4150 - PN10 =500 - PN10					bcs		266.08			
6 50 - L =	=2900 - PN10 =1700 - PN10 =5800 - PN10 =4150 - PN10 =500 - PN10					bcs	-	268.28	268		
650-L= 650-L= 650-L= 6100-L 6300-L	=1700 - PN10 =5800 - PN10 =4150 - PN10 =500 - PN10					bcs	-	271.13			
650-L= 650-L= 6100-L 6300-L	=5800 - PN10 =4150 - PN10 =500 - PN10					bcs	2		÷.		
\$50-1≈ \$100-1 \$300-1 \$300-1	=4150 - PN10 =500 - PN10					Sod	2				
6 100 - L 6 300 - L 6 300 - L	=500 - PN10					bcs	74				
4 300-L 4 300-L	-350 DN110					pcs	7				
#300-L	2771 - 2071					bcs	2				
1-002-9	\$300 - L=2200 - PN10					200	2	1225.9	2,452		
	\$300 - L=1300 - PN10					Soc	ผ				
4300-L	300 - L=5800 - PN10				-	bcs	7	2077.02	÷ .		
										2 504	
7.1.7 \$\phi 300 - \text{L}\$	φ 300 - L=6000 - TK7		:			bcs	2	1252.12	2,504		
1.2 Ductile Ir	Ductile Iron Fittings									16,619	
121 Double Fl	Double Flanged 90°Bends - PN10	01.							:	2,705	
						bcs	5		522		
φ 100						20	7				
φ 300						bcs	7	19.096	1,921		
1.2.2 Flanged S	Flanged Spigot Pipe - PN10				2.	· · · · ·			* ·	5.814	
	.=5000			- :	:	bcs	2	2907.11	5.814	•	
1.2.3 Recl							•	1		419	
Ø 50						S	7	403.34	417		

		25.00					100/0/Va - 11. 14. V
DAPAN IN IL	APAN INTERNATIONAL COOPERATION AGENCY : JICA	YACHIY	DENGINE OF S	A ACHIYO ENGINEEKING CO.: LID	בות: גבר		DATE: 50/9/99
PROJECT:	PROJECT : Vaza Barris Water Supply Project	LOCATION	 ON				
WORK:	One Directional Surge Tank No.1 (Piauitinga)	UNIT:	UNIT: FIRST PHASE	SE			PAGE 3/5
ITEM	DESCRIPTION	UNIT	QTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
1.2.4	Gibault Joint \$300	bcs	7	334,54	699	699	
1.2.5	All Flanged Tec - PN10 φ300 x φ100	bcs		1251.11	2,502	2.502	
1.2.6	All Socket Tce - PN10 Φ 400 x Φ 300	SS	. 73	894.75	1,790	1,790	
1.2.7	Double Flanged Rib Pipe - PN10 φ 50	SS		195.22	390	390	
1.2.8	One Flanged Rib Pipe - PN10 \$300 - 500	SS	m	776.69	2,330	2,330	errore de la companya
1.2.9	Double Flanged Taper - PN10 ϕ 100 x 50	bcs	. 71	169.12	338	338	
1.3	Valves and accessories		t			19,580	***************************************
1.3.1	Flanged Gate valves - PN10 \$\phi \text{50}\$ \$\phi \text{300}\$	ys SS	4	290.00 3600.00	580 14,400	14,980	
1.3.2	Flanged Check valves - PN10 \$300	8	7	1800.00	3,600	3,600	
1.3.2	Flanged gate valves with float- PN10 ϕ 50	<u>8</u>	7	200.00	1.000	1,000	
	(BDI = 0.3)						

	APONDOT. View Delice Water States Design	LOCATION	. Z	LOCATION:			
WORK · O	WORK One Directional Surge Tank No. 1 (Planitings)			UNIT: FI	UNIT: FIRST PHASE		PAGE 4/5
	DESCRIPTION	TIND	OTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
		>				851	
<u>. S</u>	Steel Ladder	E	4.5	30.80	139		
<u> </u>	Steel Ladder with Safe Guard	E.	7.0	81.54	571		
Σ_	Manhole Cover	E	1.0	140.90	141	:	
<u> </u>					· · ·		
· ·					:		
		-					
				2		٠.	
				v.			
- :						:	:
						1	
<u> </u>							

EM EEM	WORK: One Directional Surge Tank No.1 (Piauitinga) ITEM DESCRIPTION						
X	DESCRIPTION	正: TZO	: FIRST PHASE	មា			PAGE 5/5
		LING	YTO	Unit Price	Prices (RS) Sub-total	Total	REMARKS
	Execution of civil works					29,871	
27.5	Preliminary works Location of the work Deforest and Stripping	ë ë	6 4 0 0	1.61	32	37	
	Earthworks Mechanical excavation of soil Disposal of excavated material (1km) Compacted backfill	មិន និ	64 13 51	2.09	134 37 228	399	
2.3.1 Concr. 2.3.1 Plain of 2.3.2 Struct. 2.3.3 Reinfo 2.3.4 Form	Concrete works Plain concrete, fck=15Mpa Structural concrete, fck=25Mpa Reinforcing steel Form	មិនិមិ	3 47 5,181 355	129.1 152.01 1.69 19.59	387 7,144 8,756 6,954	23,241	
2.4 Scaffolding Scaffolding Stage	Scaffolding and Stage Scaffolding Stage	a ² a	279	7.94	2,215	3,120	
2.5 Surfac 2.5.1 Filling 2.5.2 Water	Surface finish and treatment Filling by mortar of cement and sand 1:3 Waterproofing with acrylic base crystallized cement	'E'E	175	131.6	132	2,660	
2.6 Paint 2.6.1 Latex paint 2.6.2 Enamel pain	Paint Latex paint Enamel paint for metal	î î î	22	4.36	13	414	
Ę							

PROJECT: Vaza Barris Water Supply Project WORK: One Directional Surge Tank No.2 (Piauitinga) ITEM DESCRIPTION	,					
One Directional Surge Tank No.2 (Frautinga) DESCRIPTION	LOCATION TAIT - FIRS	LOCATION:	SE SE			PAGE 1/5
	TIND	OTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
Supply of pipes, fittings, valves, accessories and equipment	lot			49,033		
Execution of civil works	jo ,			41,117		
Grand Total					90,150	

PROFECT	PROTECT: Vaza Barris Water Sundly Protect	A CITATO I	10 2 10 10 10 10 10 10 10 10 10 10 10 10 10	ENGINEERING CO.	בים בי		DAIE: SOLY/Y
·	One Directional Street Mat No 2 (Districtions)	7.77	Erner nrv	u.o.			9/6 00 7 0
	One Directional Surge Lain 1902 (Figurings)	i	TING LENASE	105	(a)		rwge 2/2
ITEM	DESCRIPTION OF THE PROPERTY OF	LINS	OTY.	Unit Price	Sub-total	Total	REMARKS
	Supply and Installation of pipes, fittings, valves and accessories					49,033	
	Ductile Iron Pipes					12,356	
			- •				
	Double Flanged pipes	- :				9,852	
	φ 50 - L=800 - PN10	pcs		1 121.56			
	φ 50 - L=1300 - PN10	bcs		1 266.08		-	
	φ 50 - L=2000 - PN10	bcs		1 268.28			
	φ 50 - L=2900 - PN10	bcs		1 271.13	271		
	φ50-L=1700-PN10	bcs		2 267.35			
	φ 50 - L=5800 - PN10	pcs					
	\$60 - L=1150 - PN10	bcs					
	\$\phi 100 - L=500 - PN10	<u>8</u>		2 157.73			
	φ300-L=250-PN10	bcs			1,181		
	φ300-L=2200-PN10	pcs					
	\$300 - L=4100 - PN10	DC S					
1.1.2	Push-on Joint Pipes ø 300 - L=6000 - TK7	bcs		2 1252.12	2.504	2,504	
		! 					
	Ductile Iron Fittings					16,619	
	Double Flanged 90°Bends - PN10	· · ·				2.705	
	φ.50 × 20 × 20 × 20 × 20 × 20 × 20 × 20 ×	SQ.			522	K.	
	Ø100	bcs		2 131.14		•	
	6 300	Sc		2 960.61			
22	Flanged Spigot Pipe - PN10				•	5,814	
123	© 3000 ± L=3000	<u>g</u>	· .	2307.11	5,814	0.5	
	0.50	<u>সূ</u>		209.34	419	•	
				_			

ON UNIT PRIST PHASE UNIT PRIST PHASE Prices (RS) Prices (RS)	TADAM INT	ABAN PHEBNATIONAL COOPERATION AGENCY : IICA		YACHIY	YACHIYO ENGINEERING CO	RING CO.	LTD.: YEC		DATE: 30/9/99
EM Controlled	TO TO TO TO	Wass Barris Water Supply Project		LOCAT	NO.				
EMail	WORK .	One Directional Surge Tank No 2 (Pianitings)		LINS	TRST PHAS	ìE			PAGE 3/5
Gibauly Joint \$\phi 300\$ All Flanged Tee - PN10 \$\phi 300 \text{All Socket Tee - PN10} \$\phi 300 \text{All Socket Tee - PN10} \$\phi 300 \text{All Socket Tee - PN10} \$\phi 400 \text{A 300} \$\phi 400 \text{A 400} \$\phi 500 \text{A 300} \$\phi 176.69 \text{A 300} \$\phi 176.60 \text{A 300} \$\phi 176	TEM.	ADSEC	NOIL	TIND	OTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
All Flanged Tee - PN10 All Socker Tee - PN10								699	
All Flanged Tee - PN10 pcs 2 1251.11 2.502 All Socker Tee - PN10 pcs 2 894.75 1,790 A 400 x \$300 Double Flanged Rib Pipe - PN10 pcs 2 195.22 390 \$500 - 500 One Flanged Rib Pipe - PN10 pcs 3 776.69 2.330 \$500 - 500 Double Flanged Taper - PN10 pcs 3 776.69 2.330 \$500 x 50 Valves and accessories Flanged Gate valves - PN10 pcs 2 169.12 338 Yalves and accessories Flanged Cate valves - PN10 pcs 2 250.00 14,400 \$650 #500 Flanged gate valves valves - PN10 pcs 2 550.00 1,000 \$650 \$650 \$650 \$650 1,000 1,000	* 7.	Groanly John 6 300		bcs	73	334.54	699		
All Socket Tee - PM10 \$\phi 400 \times \phi 300\$ Double Flanged Rib Pipe - PM10 \$\phi 50 One	1.2.5	All Flanged Tec - PN10 ϕ 300 x ϕ 100		pcs		1251.11	2,502	2,502	
Double Flanged Rib Pipe - PNIO pcs 2 195.22 390 One Flanged Rib Pipe - PNIO pcs 3 776.69 2.330 One Flanged Rib Pipe - PNIO pcs 3 776.69 2.330 Double Flanged Taper - PNIO pcs 2 169.12 338 Valves and accessories Flanged Gate valves - PNIO pcs 4 3600.00 14.400 PSO PSO pcs 2 290.00 5.600 Planged Gate valves with floar PNIO pcs 2 1800.00 3.600 Planged gate valves with floar PNIO pcs 2 500.00 1.000	1.2.6	All Socket Tee - PN10 \$\phi 400 \times \phi 300		bcs	71	894.75		1,790	
One Flanged Rib Pipe - PN10 3776.69 2,330 \$300 - 500 Double Flanged Taper - PN10 2 169.12 338 Double Flanged Taper - PN10 pcs 2 169.12 338 Valves and accessories Flanged Gate valves - PN10 580 580 Flanged Check valves - PN10 pcs 2 290.00 5.600 Flanged gate valves with float- PN10 pcs 2 1800.00 1.000 \$50 \$50 1.000 1.000	1.2.7	Double Flanged Rib Pipe - PN10 ϕ 50		Sc	74	195.22	390	390	
Double Flanged Taper - PN10 pcs 2 169.12 338 Valves and accessories 19 Flanged Gate valves - PN10 pcs 2 290.00 580 φ 50 φ 50 pcs 4 3600.00 14,400 Flanged Check valves - PN10 pcs 2 1800.00 3.600 Flanged gate valves with floar - PN10 pcs 2 500.00 1.000	1.2.8	One Flanged Rib Pipe - PN10 \$\phi 300 - 500		ន្ត	m	776.69	4.	2,330	
Valves and accessories Valves and accessories Flanged Gate valves - PN10 pcs 2 290.00 580 φ 50 φ 50 14,400 14,400 Flanged Check valves - PN10 pcs 2 1800.00 3,600 Flanged gate valves with float- PN10 pcs 2 500.00 1,000	1.2.9	Double Flanged Taper - PN10 \$\phi\$ 100 x 50		Š	7	169.12		338	,
Flanged Gate valves - PN10 \$\phi \text{50}\$ \$\phi	1,3	Valves and accessonies					· · · · ·	19,580	
φ300 Flanged Check valves - PN10 φ300 Flanged gate valves with floar- PN10 Flanged gate valves with floar- PN10 φ50 φ50 1,000 1,000	1.3.1	Flanged Gate valves - PN10 \$\phi 50		200	77	290.00	:	14,980	
Flanged gate valves with float- PN10 pcs 2 500.00 1.000	1.3.2	# 300 Flanged Check valves - PN10		§ §	4 (1	3600.00		3,600	
	1.3.2	Flanged gate valves with float- PN10 ϕ 50		SS	2	500.00		1,000	
		(DDI = 0.2)							

PROJECT: V	PROJECT: Vaza Barris Water Supply Project	LOCATION:				
WORK: O	One Directional Surge Tank No. 2 (Piautinga)	UNIT: FIRST PHASE	HASE			PAGE 4/5
ITEM	DESCRIPTION	UNIT OTY	Unit Price	Prices (RS)	Total	REMARKS
4.1	Others				478	
1.4.1 St	Steel Ladder	E	3.0	30.80		
1.4.2 St	Steel Ladder with Safe Guard		3.0	81.54 245		
1.4.3 M	Manhole Cover	m _z	1.0	140.90		
<u>u</u>	DDI=02)		:			

TAPAN INT	MANUAL COOPERATION AGENCY: JICA	YACHIYO EI	ENGINE	SRING CO.	YACHIYO ENGINEERING CO., LTD.::YEC		DATE: 30/9/99
PROJECT:	PROJECT: Vaza Barris water Supply Project	TINI :	TINIT - FIRST PHASE	11.			PAGE 5/5
WORN:	One Directional Surge Lank No.2 (Flautininga) DESCRIPTION	Liz 5	OTY.	Unit Price	Prices (RS) Sub-total	Total	REMARKS
2	Execution of civil works					41,117	
2.1. 2.1.1 2.1.2	Preliminary works Location of the work Stripping	e e	30	1.61	3 8	20	
2.2 2.2.1 2.2.2 2.2.3	Earthworks Mechanical excavation of soil Disposal of excavated material (1km) Compacted backfill	ัยโยโย	89 00 70	2.09 2.86 4.47	186 54 313	553	
23.2 23.2 23.2 23.3 24.4	Concrete works Plain concrete, fck=15Mpa Structural concrete, fck=25Mpa Reinforcing steel Form	e e % e	7,678 355	129.1 152.01 1.69 19.59	516 10,641 12,976 6,954	31,087	
2.4	Scaffolding and Stage Scaffolding Stage	B B	346 194	7.94 7.94	2,747	4,287	
2.5 2.5.1 2.5.2	Surface finish and treatment Filling by mortar of cement and sand 1:3 Waterproofing with acrylic base crystallized cement	a"a	128	131.6	132	4,446	
2.6 2.6.1 2.6.2	Paint Latex paint Enamel paint for metal	'e 'e	156	4.36 6.7	680	693	
	1.						

		100.	ことでいる	1 ACHI TO ENGINEERING CO., LID.: 1 EC	17		UM 1 E. 50/3/37
PROJECT: Vaza Barris Water Supply Project		Thirt Elbert buy on	NO TO TO O	ri ci			7/1 30 40
בכוסובאמייסון שות ואכוסובאמיוסון אסואס			No. 1 Co.	775	Prices (RS)		27770
ITEM DESCRIPTION	:		O I Y	Unit Price	Sub-total	Total	KEMAKKS
Reforestation work		lot			546,610	546,610	
Deforestation work Grand Total		ti T			172.800	719,410	

	. Vana Barrio Water Curally Drainet	*		LOCATION					
WORK .	Deforestation and Reforestation works	works		: LIND	UNIT: FIRST PHASE	SE			PAGE 2/6
				T. P. T.	Alic	Thit Drine	Prices (RS)	Total	REMARKS
IIEM		DESCRIPTION		CIVIT	1 7	Ouit v iiio	200-000	1	1
	Reforestation work							546,610	
	Dam Dan and Become Site		* -					546,610	
•	Natural trees			SOU.	17,290	26.61	460.087	-	
	Market trees			202	0,010				
	Check Dam Site Natural trees Market trees			000 000	3,330	26.61	206,760		
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DESCRIPTION OFFICE OF THE PROPERTY OF THE PRO	PROJECT: Vaza Barris Water Supply Project	LOCATIC	z		LOCATION:		
DESCRIPTION	C: Deforestation and Reforestation works	IH: TIND	SST PHAS				PAGE 3/6
Deforestation work Deforestation and transportation 172.800					Prices (RS)		
nos 72,000 2.40 172.800	DESCRIPTION	IINS	T	Juit Price	Sub-totai	Total	REMARK
2.40 nos 72,000	Deforestation work			-		172,800	
	Deforestation and transportation	S S S S S S S S S S S S S S S S S S S	72,000	2.40	172.800		

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20.00	THE PARTY OF THE P	XOLTACO!	20				
-	: Vaza Barris Water Supply Project	TINI.	INIT FIRST PHASE	SE			PAGE 4/6
WOKA:	Delotestation and retorestation works				Prices (RS)		
ITEM	DESCRIPTION	TIND	OTY	Unit Price	Sub-total	Total	REMARKS
S-1	Unit Cost for Reforestation work					26.61	· .
1.1	Earth work Manual Excavation Planting of tree with fertilizer	m ³	0.25	6.37	5.88	7.47	
1.2	Transportation Manual Transportation, Max.500m	82		2.13	2.13	2.13	
1.3	Maintenance Maintenance by watering	pcs	-	17.01	17.01	17.01	
-			.*				
· .							
· 2.		: .					
				:		-	(AB - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
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	A THE STATE OF THE						:

ROJECT	PROJECT: Vaza Barris Water Supply Project	State of the state	 COCATION	LOCATION:	OKING CO	יבוח.		DA1E: 50/3/39
WORK:	Deforestation and Reforestation works		: LINS	UNIT: FIRST PHASE	SE			PAGE 5/6
ITEM	NOLLAINON		HZ5	o.r.	Unit Price	Prices (RS) Sub-total	Total	REMARKS
S-2	Unit Cost for Reforestation work with marketing trees						17.27	
Ţ.	Planting work Manual Excavation Supply and Planting of tree with fertilizer		 E SS	0.13	6.37	0.83	7.83	
7.	Transportation Transportation by truck, 5km Manual Transportation, Max.200m		 E SS	0.09	4.58	0.41	0.94	
m	Maintenance Maintenance by watering		Soc	H	8.50	8.50	8.50	
; ·				-				
								-
	(BDI = 0.3)							

PROJECT	PROJECT: Vaza Barris Water Supply Project		LOCATION	 NO				, , , , , , , , , , , , , , , , , , ,
WORK:	Deforestation and Reforestation works	rks	CNIT	UNIT: FIRST PHASE	SE			PAGE 6/6
ITEM		DESCRIPTION	TIND	OTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
S-3	Unit Cost for Deforestation work						2.40	
	Deforestation Cutting off of trees and branches		S		0.93	0.93	0.93	
1:2	Transportation Manual Transportation, Max.500m Truck Transportation, 5km		SS E	0.09	1.06	1.06	1.47	
								; ;

PROJECT WORK:	PROJECT: Vaza Barris Water Supply Project WORK: Land Acquisition work	AOIC I DNIG		LOCATION INT FIRS	LOCATION:	I ACATION: LOCATION: LOCATION: LOCATION:			PAGE 1/2
TEM		DESCRIPTION		Į.	λLO	I Init Deine	Prices (RS)	Total	PEMARKS
	Land Acquisition work			lot	7		1,004,880	1,004,880	
1	(BDI = 0.3)					:		:	

PEAN IN I	PRAN IN LEKNATIONAL COOFERATION AGENCY SICA	NCX : JICA	the second of the second	TOCATION	NO		LOCATION:		
WORK .	Land Acquisition work			FINE F	UNIT: FIRST PHASE	兴			PAGE 2/2
ITEM		DESCRIPTION		TIND	Q'TY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
	Land Acquisition work							1,004,880	
1.1 1.1.1 1.1.2	Dam Dam and reservoir Check dam and reservoir			ha ha	1,522.1	009	913,260	1,003,020	
122	Piauitinga Water Supply Facility Water Treatment Stations Water Intake and Lift Pump Stations			ha ha	0.0	009	420	006	
1.3. 1.3.2	Agreste Water Supply Facility Water Treatment Stations Water Intake and Lift Pump Stations			ha ha	8.0 8.0	000	480	096	
								· .	
	(AD) = 1-2 April 100 and 100 a								

MORK: Con	WORK: Compensation work			こうごくりつい					
				SNT: F	UNIT: FIRST PHASE	SE			PAGE 1/3
Com		DESCRIPTION		TIND	OTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
	Compensation work			lot			1,531,260		
(BD	(BDI = 0.3)								

RK:			さくと	LOCATION				
ПЕМ	Compensation work		F. TINS	UNIT: FIRST PHASE	SE			PAGE 2/3
		DESCRIPTION	UNIT	ŶŢŶ	Unit Price	Prices (RS) Sub-total	Total	REMARKS
	Compensation work						1,531,260	
	Dam and related facility Resettlement of Residents		lot	F-4		1,519,740	1,519,740	
.2.1 Land	Piauitinga Water Supply Facility Land Compensation for Pipelines		ha	12.1	009	7,260	7,260	
.3 Agre	Agreste Water Supply Facility Land Compensation for Pipelines		Ba	7.1	009	4,260	4,260	

	Market Miller State William Cook English Model Co. 1100		1			-	DAIE: 50/9/99
PROJECT: Vaza Barris Water Supply Project		LOCATION	NOI:				
WORK: Compensation work		CENT	UNIT: FIRST PHASE	Ξ		-	PAGE 3/3
ITEM DESCRIPTI	NOLLAR	UNIT	OTY	nit Price	<u>S</u>	Total	REMARKS
S-1 Resettlement work						1,519,740	
1 Resettlement of Residents					,	1,519,740	
1.1 Mobilization max.5km		Ē	379.9	4.58	1,740	,	
1.2 Construction of new residences		EF	5,060.0	300	1,518,000		
(BD) = 0.3.)							

APPENDIX-3

Cost Estimation of Alternative for Low Flow Bypass

REMARKS PAGE 1/3 32,829,990 Total YACHIYO ENGINEERING CO., LTD. 2,916,208 29,913,782 Prices (RS) Sub-total UNIT: FIRST PHASE LOCATION SNIT tol 5 Appendix-3 Cost Estimation of Alternatives for Low Flow Bypass DESCRIPTION Box Culvert 1,050 x 1,050 Preliminary works Civil works (BDI = 0.3)

LOCATION LOCATION LOCATION LOSTICOS LOCATION LOCATION LOCATION LOCATION LOCATION	JAPAN INTE	APAN INTERNATIONAL COOPERATION AGENCY : JICA	YACHIYC	ENGINEE	YACHIYO ENGINEERING CO., LTD. : YEC	D.: YEC		DATE: 30/9/99
Friend (RS) Physics = Box Culvert 1,050 x 1,050 Physics	PPOTECT	Vara Barris water Supply Project	LOCATIC					
Finish F	1		E LINS	RST PHAS	E			PAGE 2/3
Periminary works			11.4) (H)		Prices (RS)	Total	PEMARKS
Mobilization and demobilization Site office, work spaces and camps Site office, work spaces Site offic	ITEM		CONT		OILL FING	340-1044	2,916,208	Cana Carron
Nobilization and demobilization 10ct 1 300,000	;	rreliminary works						
Site office, work spaces and camps	1.1	Mobilization and demobilization	lot	-		300,000	300,000	•
Access road Access Road (New construction) Total Distance = 1500 m. x 3 routes Road Width	1.2	Site office, work spaces and camps	jo			900,000	900,000	
Access Road (New construction) Total Distance = 1500 m x 3 routes Road Width	 (*	Access road					1,683,870	
Access Road (New construction)								
Regularization Of Sub-Base Regularization of Sub-Base 1,1250	1.3.1	Access Road (New construction) Total Distance = 1500 m x 3 routes Road Width = 5 m					844.931	
Second Control Contr	1.3.1.1	1500 m (1500 m)	E B	22,950		9,639		20301001
Excavation Excavation Excavation Maintent Access Road (Expansion of existing pathway) Total Distance = 3500 m x 3 routes Expansion of Road Width = 2 m Waiting Area Per 500 m Waiting Area Per 500 m Regularization Of Sub-Base (Distance = 3500 m. Thk = 0.5 m) Regularization Of Sub-Base (Distance = 3500 m. Thk = 0.5 m) Regularization Of Sub-Base (Distance = 3500 m. Thk = 0.5 m) Rejudy Area Per 500 m Waiting Area Per 500 m Regularization Of Sub-Base (Distance = 3500 m. Thk = 0.5 m) Regularization Of Sub-Ba	1.3.1.2	, E	∃"∄"	6.885		67.817		20307003
Access Road (Expansion of existing pathway) Total Distance = 3500 m x 3 routes Expansion of Road Width = 2 m Wating Area Per 500 m Regularization Of Sub-Base (Distance = 3500 m, Thk = 0.5 m) Base With Graded Crushed Stone (Thk = 0.3 m) Embankement Deforestation M2 22,050 0,42 9,261 m3 6,615 9,85 65,158 m3 6,615 9,86 65,158 m3 6,615 Deforestation m3 6,0000 9,44 566,400 Deforestation m3 60,000 0,12 32,338	1.3.1.4	Excavation	E E	75,000		566.400		2030/003
Access Road (Expansion of existing pathway) Total Distance = 3500 m x 3 routes Expansion of Road Width = 2 m Waiting Area Per 500 m Waiting Area Per 500 m Regularization Of Sub-Base Reinforcement Of Sub-Base (Distance = 3500 m, Thk = 0.5 m) Base With Graded Crushed Stone (Thk = 0.3 m) Excavation Deforestation Deforestation Deforestation A 269,485.00 0.12 32.338	5.1.5.1	Enternation						
Expansion of Road Width = 2 m Wainforcement Of Sub-Base Reinforcement Of Sub-Base (Distance = 3500 m, Thk = 0.5 m) Base With Graded Crushed Stone (Thk = 0.3 m) Excavation Embankment Deforestation m² 75,000 9,44 560,000 9,44	1.3.2	Access Road (Expansion of existing pathway)					838,939	
Waiting Area Per 500 m Waiting Area Per 500 m Regularization Of Sub-Base 10.500 3.94 Reinforcement Of Sub-Base (Distance = 3500 m. Thk = 0.5 m) m³ 6,615 9.85 Base With Graded Crushed Stone (Thk = 0.3 m) m³ 75,000 2.09 Excavation m³ 60,000 9.44 5 Deforestation m² 269,485.00 0.12		3 100th		٠.			•	
Reinforcement Of Sub-Base (Distance = 3500 m, Thk = 0.5 m) Base With Graded Crushed Stone (Thk = 0.3 m) Excavation Excavation Deforestation m³ 75,000 2.09 8.44 Co.000 Deforestation m² 75,000 0.12	1231	Waiting Area Per 500 m	Ë	22.050		9,261		20301001
Base With Graded Crushed Stone (Thk = 0.3 m) m' 6,615 9.85 Excavation m' 75,000 2.09 Embankment m' 60,000 9.44 Deforestation m² 269,485.00 0.12	1.3.2.2	(Distance = 3500 m, Thk	E'	10,500		41,370		20302001
Excavation Excavation Embankment Deforestation Deforestation m ² 269,485.00 0.12	1.3.2.3	Base With Graded Crushed Stone (Thk = 0.3 m)	e "	6,615		65,158		20307003
Deforestation m ² 269,485.00 0.12	1.3.2.4	Excavation	È	75,000		156,750		2030/003
m² 269,485,00 0,112	1.3.2.5	Embankment	Ė	00.00		200,400		50010507
m² 269,485.00 0.12	14	Deforestation	<u> </u>					:
			37	269,485.00	:	32,338	32,338	
(A) 1				- K 6 45 4 4				
7. CONT. CO. C.								
		(8) 1 (0.3)						

PROJECT	PROJECT: Vaza Barris water Supply Project	LOCATION	ON:	LOCATION:			
WORK:	Low Flow Bypass - Box Culvert 1,050 x 1,050	UNIT: F	UNIT: FIRST PHASE				PAGE 3/3
					Prices (RS)		
ITEM	DESCRIPTION	TINO	QTY	Unit Price	Sub-total	Total	REMARKS
4	Civil works					29,913,782	
2.1	Box Culvert		-			27,237,672	
2.1.1	Box Culvert 1,050 x 1,050	E	27,720.00	982.60	27,237,672		
2.2	Earth work					2,676,110	*-**
2.2.1	Mechanical Soil Excavation Embanisment we excavated soil 95% Process	î î	239,509.00	3.38	809,540		
					:		
	(BDI = 0.3)					:	

PROJECT : Vaza Barris water Supply Project WORK : Low Flow Boyess - Open Channel I.500 x 1.500 LONT : FIRST PHASE Prices (RS)	APAN INTERNATION	PARAN INTERNATIONAL COOLERATION AGENCY COLOR						
WORK: Low Flow Bypass - Open Chainel I,500 x 1,500 TIEM Preliminary works Civil works Civil works DESCRIPTION UNIT OTY Unit Price lot 1	PROJECT: Vaza Barri	is water Supply Project	LOCATIC	. Z.				
TTEM Preliminary works Civil works Civil works This Price I tot I t	WORK: Low Flow	Bypass - Open Channel 1,500 x 1,500	I UNIT : FI	RST PHAS	(n)			PAGE 1/3
Trem Preliminary works DESCRIPTION UNIT QTY Unit Price Civil works						Prices (RS)	- 1	· · ·
Civil works Civil works			LINS	OT.Y	Unit Price	Sub-total	- 1	REMARKS
Civil works			lot	p-et		3,376,338	47,094,678	
		S	lot			43,718,340		
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							-	
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						29		
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(£0 ×1 CG)	(BDI=0.3					-		

PROFFCT	JAPAN INTERNATIONAL COOPERATION AGENCY: JICA PROJECT: Vaza Rattis water Supply Project	YACHIYO EI	SENGINEER ON:	YACHIYO ENGINEERING CO., LTD	YEC .		DATE: 30/9/99
WORK	1 ow Flow Bynass - Onen Channel 1 500 x 1 500	TIMIT.	LOCALION:		:		DAGE 2/2
				1 1	Prices (RS)		
ITEM	DESCRIPTION	TIND	QTY	Unit Price	Sub-total	Total	REMARKS
	Preliminary works				-	3,376,338	
	Mobilization and demobilization	lot			450,000	450,000	
1.2	Site office, work spaces and camps	<u>ಕ</u>	-		1,200,000	1,200,000	
<u></u>	Access road				-	1,683,870	
12.1	A second David (Navi and and and						en case of
1.2.1	Access road (new construction) Total Distance = 1500 m v 3 routes	•		:		844,951	
	Road Width = 5 m					- - -	
	Per 500 n		-			-	6 340 4
1.3.1.1	Regularization Of Sub-Base	ru ₂	22,950		9,639		
1.3.1.2	Reinforcement Of Sub-Base (Distance = 1500 m, Thk = 0.5 m)	m ₃	11,250	3.94	44,325		
1.3.1.3	Base With Graded Crushed Stone (Thk = 0.3 m)	Ē	6,885		67,817		
1.3.1.4	Excavation	Ē	75,000	2.09	156,750		**************************************
1.3.1.5	Embankment	Ê	60,000	9.44	566,400		
(•	er de con
1.5.7	Access Road (Expansion of existing pathway)					838,939	
	ក្ត						
	Expansion of Road Width = 2 m	: '	,				
(Waiting Area Per 500 m	•					
1.5.2.1	Regularization Of Suo-Base	- u	22,050	0.42	9,261		
1.3.2.2	Keinforcement Of Sub-Base (Distance = 3500 m, Thk = 0.5 m)	ੇ ਵਿ	10,500	3.94	41,370		
12.24	Dave Will Claded Classed Stone (1987 - 0.5 m) Expansion	È "	6,615		65,158		
	La caronia	E	000.5/		126,720		<i></i>
1.3.2.5	Embankment	Ë	000,000	44	566,400		
1.4	Deforestation				·		
		m ₃	353,900	0.12	42,468	42,468	
: :	(BDI = 0.3)						

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TEM	PROTECT	Vaza Barris water Sumily Project	LOCATI	: NO				
TIEM	WORK .	Tow Flow Rynass - Open Channel 1.500 x 1.500	I:LINS	TRST PHASE				PAGE 3/3
Transparent Courter Road Support Transparent Road Width = 4 m Transparent Road Width = 4 m Transparent Road Courter Road Courter Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Courter Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Courter Road Width = 4 m Transparent Road Courter Road Court	"Civic					Prices (RS)		
Earth work	ITEM	DESCRIPTION	tiss	QTY	Unit Price	Sub-total	Total	REMARKS
Earth work Soil Excavation Rose Excavation Rose Excavation Embassive and the state of the st	2.	Civil Works					43,718,340	
Soil Excavation Rock Excavatio							5,505,236	
South State	7.7	Earth work	Ë	480.800		1.004.872		
Embadyment	2.1.1	Soli excavation	1 1	21 560	Æ	1.315,376		
Disposal of surplus soil Disposal of surplus	Z.1.2	Kock Excavation	ï	182,100	,			
Single protection	Z.1.3	Embankment	î Î	484 100				
## 4.750 111.6 527.868 25 ## 24.950 150.28 3.749.486 ## 24.950 150.28 3.749.486 ## 24.950 150.28 3.749.486 ## 224.760 150.28 3.749.486 ## 224.760 150.28 3.749.486 ## 224.760 150.28 3.749.486 ## 224.760 150.28 11.516.437 ## 66.0000 3.00 180.000 ## 388.840 28.87 11.225.811 ## 388.840 28.87 11.225.811 ## 12.970 26.48 343.439 ## 75.360 0.42 31.651 ## 31.851 ## 31.851 ## 324.360 ## 324.360 ## 324.390 ## 324.390 ## 324.390 ## 324.390 ## 324.390 ## 324.390 ## 644.280 ## 33.337 ## 33.337 ## 33.337 ## 33.337 ## 343.439 ## 343.439 ## 343.439 ## 343.439 ## 343.439 ## 343.439 ## 343.439 ## 343.439 ## 343.430 ## 344.430 ##	2.1.4 2.1.5	Disposal of surplus son Slope protection	a°a	193,900				
Concrete works							25.589.956	
Concrete Fede-21Mpa	7.7	Concrete works		4 730			-	
Concrete Fok=24Mpa Concrete Fok=24Mpa Form Reinforcement 120kg/m3 Form Reinforcement 1	2.2.1	Leveling Concrete	1	74.950		C.C		
Concrete Foc=44Mpa Form Form Form Form Form Form Form Form	2.2.2	Concrete rex = 41 Mpa	: Î	31.830				
Form Reinforcement 120kg/m3 Form Reinforcement 120kg/m3 Form Reinforcement 120kg/m3 Form Reinforcement 120kg/m3 Form	2.2.3	Concrete rex=24Mpa	-	020.400				
Reinforcement 120kg/m3 Kg 6,814,400 1,09 11,210,423 Water-Stop Scaffolding and Support m² 388,840 28.87 11,225,811 Scaffolding and Support Scaffolding 7,820 7,46 58,337 Support Gravel m³ 12,970 26.48 343,439 Maintenance Road for Bridge Portion Total Distance = 18840 m m³ 12,970 26.48 343,439 Road Width = 4 m m² 75,360 0.42 31,651 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m³ 15,072 9.85 148,459 Embandment 68,250 9.44 644,280 (BDI = 0.3.) (BDI = 0.3.) 9.44 644,280	2.2.4	Form	Ė.	00/ 477	.	•		
Water-Stop m 60,000 3.00 180,000 Scaffolding and Support m³ 388,840 28.87 11,225,811 Scaffolding m³ 7.820 7.46 58,337 Gravel m³ 12,970 26.48 343,439 Maintenance Road for Bridge Portion Total Distance = 18840 m 26.48 343,439 Maintenance Road for Bridge Portion Total Distance = 18840 m 26.48 343,439 Regularization Of Sub-Base m³ 15.070 9.85 148,459 Excavation m³ 15.072 9.85 148,459 Embandment m³ 68,250 9.44 644,280 (BDI = 0.3) m³ 68,250 9.44 644,280	2.2.5	Reinforcement 120kg/m3	<u>59</u>	6,814,460		-		
Scaffolding and Support Scaffolding and Support Scaffolding and Support Scaffolding and Support Support Gravel Compacted gravel Compacted gravel Compacted gravel Compacted gravel Maintenance Road for Bridge Portion Total Distance = 18840 m. Thk = 0.2 m) Regularization Of Sub-Base Base With Graded Crushed Stone (Distance = 18840 m. Thk = 0.2 m) Excaption Excaption Excaption (B1,900 2.09 171.171 Embankment (BDI = 0.3.)	2.2.6	Water-Stop	B	60,000				
Scaffolding and Support Scaffolding and Support m, 388.840 28.87 11.225,811 Support Support 7.820 7.46 58.337 Gravel Maintenance Road for Bridge Portion m, 12.970 26.48 345,439 Maintenance Road for Bridge Portion Total Distance = 18840 m 12.970 26.48 345,439 Road Width = 4 m Road Width = 4 m m, 75,360 0.42 31,651 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m, 81,900 9.85 148,459 Excavation Embankment m, 68,250 9.44 644,280 (BDI = 0.3.) (BDI = 0.3.) 9.44 644,280							07. 700	
Scaffolding Support Support Support Gravel Gravel Compacted gravel Compacted gravel Compacted gravel Maintenance Road for Bridge Portion Total Distance = 18840 m Road Width = 4 m Regularization Of Sub-Base Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) Excavation Embankment Mile 68.250 9.44 644.280	2.3	Scaffolding and Support			- 1		041,407,11	
Support m² 7.820 7.46 58,337 Gravel Gravel m³ 12,970 26.48 343,439 Maintenance Road for Bridge Portion Total Distance = 18840 m m³ 12,970 26.48 343,439 Road Width = 4 m Road Width = 4 m m² 75,360 0.42 31,651 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m³ 15,072 9.85 148,459 Excavation m³ 81,900 2.09 171,171 BDI = 0.3) m³ 68,250 9.44 644,280	2.3.1	Scaffolding	Ē	388,840		17.7		
Gravel Compacted gravel Compacted gravel Maintenance Road for Bridge Portion Total Distance = 18840 m Road Width = 4 m Regularization Of Sub-Base Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) Excavation Embankment m³ 68,250 9.44 644,280 Embankment (BDI = 0.3.)	2.3.2	Support	Ë	7.820	-			
Gravel Gravel Compacted gravel m³ Maintenance Road for Bridge Portion 26.48 Total Distance = 18840 m 31,651 Road Width = 4 m m² Regularization Of Sub-Base 31,651 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m³ Excavation 81,900 2.09 Embankment m³ (BDI = 0.3) 9.44							057 272	,
Maintenance Road for Bridge Portion Total Distance = 18840 m Road Width = 4 m Regularization Of Sub-Base Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) Excavation Embankment (BDI = 0.3) (BDI = 0.3)	2.4	Gravel	Ê	17 970			1	
Maintenance Road for Bridge Portion Total Distance = 18840 m 13.651 Road Width = 4 m 15.072 Regularization Of Sub-Base 0.42 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m³ Excavation 81,900 2.09 Embankment m³ 68,250 (BDI = 0.3.) 9.44 644,280		Comparied graves	1					
Total Distance = 18840 m Road Width = 4 m Regularization Of Sub-Base Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) Excavation Embankment m³ 75.360 0.42 15.072 9.85 Excavation Embankment (BDI = 0.3)	2.5	Maintenance Road for Bridge Portion			-		195,561	
Road Width = 4 m m² 75.360 0.42 Regularization Of Sub-Base m³ 15.072 9.85 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m³ 81,900 2.09 Excavation m³ 68,250 9.44 (BDI = 0.3.) (BDI = 0.3.) 9.44		Total Distance = 18840 m		: .				
Regularization Of Sub-Base 75.360 0.42 Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m³ 15.072 9.85 Excavation m³ 81.900 2.09 Embankment m³ 68,250 9.44 (BDI = 0.3.) 9.44		Road Width = 4 m						
Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m) m ³ 15.072 9.85 Excavation m ³ 81.900 2.09 Embankment m ³ 68,250 9.44 (BDI = 0.3.)	2.5.1	Regularization Of Sub-Base	ë '	75,360		:		
Excavation m' 81,500 2.02 Embankment m^3 68,250 9.44 (BDI = 0.3.)	2.5.2	Base With Graded Crushed Stone (Distance = 18840 m, Thk = 0.2 m)	È	15,072				
Embankment (BDI = 0.3)	2.5.3	Excavation	È	81.900		į	:	
1. (BDI #0.3.) We will be supplied to the control of the control	2.5.4	Embankment	È	067.80		007		
		(8011103)						

ii e	Vaza Barris water Supply Project Low Flow Bypass - φ 1000 Pipeline DESCRIPTION Preliminary works Civil works	LOCATION UNIT: FIRS	ON:	1			
	pass - \$\phi\$1000 Pipeline works	H CNIT: F		•			
ITEM Prel	v orks		UNIT: FIRST PHASE	3			PAGE 1/3
	works				Prices (RS)		
Z S	liminary works	tigs 5	OTY	Unit Price	Sub-total	Total	REMARKS
<u>8</u>	The second of th	6		14	3,116,208	44,506,981	
					11 200 773		
					6//,000		
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				:			
				: .			
(B)	(BD) = 0.3)						

TABANTANTE	A DIT YOUNG TOO BEDATION ACENOY A TION	YACHIYO	ENGINEE	VACHIYO ENGINEERING CO. LTD.: YEC	D.: YEC	II.	DATE: 30/9/99
PROTECT	Vaza Barris water Sumply Project	LOCATION					
WORK:	Low Flow Bypass - \$1000 Pipeline	H: LIND	UNIT: FIRST PHASE	3		I	PAGE 2/3
ITEM	DESCRIPTION	LIND	QTY	Unit Price	Prices (RS) Sub-total	Total	REMARKS
1.	Preliminary works					3,116,208	
1.1	Mobilization and demobilization	ध			400,000	400,000	
1.2	Site office, work spaces and camps	lot			1,000,000	1,000,000	
1.3	Access road					1,683,870	
1.3.1	Access Road (New construction)					844,931	
	lota Distance = 1500 m x 5 routes Road Width = 5 m						
,	Waiting Area Per 500 m	- 7	22.050	6	0 630	~	
1.3.1.1	Regularization Of Sub-Base (Distance = 1500 m , Thk = 0.5 m)	E E	11,250		44,325		
1.3.1.3	Base With Graded Crushed Stone (Thk = 0.3 m)	E.	6.885		67.817		2.8.5≥€
1.3.1.4 1.3.1.5	Excavation Embankment	ÈE	60.000	9.47	566,400		
1.3.2	Access Road (Expansion of existing pathway) Total Distance = 3500 m x 3 routes				**************************************	838,939	
	Expansion of Road Width = 2 m Waiting Area Per 500 m						
1.3.2.1	Regularization Of Sub-Base	e '	22,050		9,261		
1.3.2.2	Reinforcement Of Sub-Base (Distance = 3500 m, Thk = 0.5 m)	ÈÈ	10,500	5.94	41,370		
1324	Base will draded Clushed Stone (1.11k - V.2.111) Excavation	- E	75,000		156,750		
1.3.2.5	Embankment	E	000,09		566,400		
						<u></u> -	
4.	Deforestation	Ē	269.485.00	0.12	32,338	32.338	
	(BDI = 0.3).	•					-

JAPAN INT	APAN INTERNATIONAL COOPERATION AGENCY : JICA	VACHIYC	DENGINEE	YACHIYO ENGINEERING CO. L.TD. YEC	D · VEC		DATE: 30/9/99
PROJECT	PROJECT: Vaza Barris water Supply Project	LOCATION	. NO				
WORK:	Low Flow Bypass - & 1000 Pipeline	UNIT: F	UNIT: FIRST PHASE	6)			PAGE 3/3
ITEM	DESCRIPTION	LINS	O.T.Ý	Unit Price	Prices (RS) Sub-total	Total	REMARKS
2.	Civil works					41,390,773	
2.1 2.1.2 2.1.3 2.1.3	Pipe installation works Steel Pipe φ 1000x11.1mm, Material, Transportation And Installation Steel Pipe φ 1000x9.52mm, Material, Transportation And Installation Steel Pipe φ 1000x7.94mm, Material, Transportation And Installation	666	12,800.00 11,400.00 3,520.00	811.28 686.02 627.18	10,384,384 7,820,628 2,207,674	20,412,686	
22 221 222 223	Earth work Mechanical Soil Excavation Backfill w/ excavated soil, 95% Proctor Bedding, Compaction 95% Proctor, Thk=15cm	ลิลิลิ	435,629.00 369,644.00 55,440.00	3.38 9.07 0.09	1,472,426 3,352,671 4,990	4,830,087	
2.3	Cathodic Protection of Steel Pipe	ጀ	-	16,148,000	16,148,000	16,148,000	
	(BDI = 0.3)						

JAPAN INTERNATIONAL COOPERATION AGENCY

STATE SECRETARIAT OF PLANNING, SCIENCE AND TECHNOLOGY THE STATE OF SERGIPE, THE FEDERATIVE REPUBLIC OF BRAZIL

THE STUDY ON WATER RESOURCES DEVELOPMENT IN THE STATE OF SERGIPE IN THE FEDERATIVE REPUBLIC OF BRAZIL

FINAL REPORT
SUPPORTING
(VOLUME II)
FEASIBILITY STUDY

[J] IMPLEMENTATION PROGRAM

MARCH 2000

YACHIYO ENGINEERING CO., LTD. (YEC)

THE STUDY ON WATER RESOURCES DEVELOPMENT IN THE STATE OF SERGIPE IN THE FEDERATIVE REPUBLIC OF BRAZIL

SUPPORTING REPORT (J) IMPLEMENTATION PROGRAM

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CHAPTER 1 INSTITUTIONAL FORMALITIES FOR PROJECT IMPLEMENTATION

1.1 Jurisdiction

The Vaza Barris River belongs to federal domain, so the Vaza Barris Dam project is also placed under jurisdiction of the federal government. As far as the JICA study team is informed so far, the management of the Sergipe portion of Vaza Barris River will be delegated to the state government under the inspection of the federal organs in the future. For the time being, however, the water resources management for the proposed project is under federal jurisdiction. The project management unit (UGP-PROVABASE) has to implement the project through regulation formalities regarding water resources management under the "National Policy".

In terms of environment assessment, UGP-PROVABASE has to get licenses from the competent agencies at the respective implementation stages. Since the river belongs to the federal domain, the IBAMA is competent to issue licenses from the federal standpoint. On the other hand, the proposed projects are located in state territory, so the ADEMA is also competent to issue licenses from the state standpoint. UGP-PROVABASE would conduct environmental studies under the guidance of both IBAMA and ADEMA.

By the time of commencement of the project, the financial sources must be provided through proper formalities. In order to procure finances from international or local financial organizations, UGP-PROVABASE has to ask the State House to authorize a permission of finance. After that, the state government gets an approval from the competent agency of foreign loans in the federal government, i.e., External Financial Commission (COFIEX or Comissao de Financiamentos Externos) under Ministry of Planning, Budget and Management (MP or Ministerio do Planejamento, Orcamento e Gestao). Besides, the permission from the Upper House is prerequisite for the project entity to procure international loans, under consideration of allowance of debt services.

Just after the approval from COFIEX, the state government applies for construction license of Vaza Barris Dam through Secretariat of Water Resources (SRH or Secretaria de Recusos Hidricos) under Ministry of Environment, Water Resources and Legal Amazon (MMARHAL or Ministerio de Meio Ambiente, dos Recusos Hidricos e da Amazonia Legal), since the Vaza Barris river is under jurisdiction of the federal SRH. In addition to the construction license, the state government intends to take over the authorization of water right granting of Vaza Barris river by means of delegation from the federal government. Once the federal government approves this application, the state government (SEPLANTEC) will be able to have a power on granting of water resources use right on Vaza Barris river and its tributaries as well.

1.2 Coordination with PROAGUA

At present, State Unit of PROAGUA Management (UEGP or Unidade Estadual de Gestao do PROAGUA) applies for the two projects within the Sergipe State to the federal government, i.e., UGP (Unidade Gestora de PROAGUA) under MMARHL. They are (a) Project Expansion of Agreste Pipeline Project and (b) Project Expansion of Piauitinga Pipeline Project. Although these projects are around one year behind the original schedule as of September 1999, the UEGP expects that these projects will be implemented just after the approval of the UGP head office and also the World Bank. The state SRH of SEPLANTEC, the counterpart organization to UEGP, is also coordinating these projects prudently, since these projects have close relationship with the proposed project.

1.3 Prospect of Formalities

Table-1.1 shows the tasks of the state government, i.e., UGP-PROVABASE, till the time of project completion. The major works are classified into three categories as shown in the table. They are (a) administrative or legal formalities, (b) procurement of finances for project implementation and (c) designing and construction of the project. After this JICA study, the first task for the UGP-PROVABASE is to obtain financial sources for the project implementation. The external loans are expected to cover a sizable portion of the capital investment. Thus, the UGP-PROVABASE has to commence negotiating with the agencies concerned as shown in the table below. Just after the prospects for finances look bright, the UGP-PROVABASE starts to get various licenses such as construction license, environmental license and water right license from the agencies concerned. Besides, the UGP-PROVABASE works out the schedule of project designing and construction. The timetable for the designing construction is assembled as shown in the table below.

Work Item 1999 2000 2001 2002 2003 2004 2005 2006 State Government (UGP) Project Office (UGP) Establishment Administrative & Legal Formalities Water Right License Construction License **Environmental License** Land Acquisition in Project Sites Procurement of Finances Approval of State House Approval of Upper House Formulation of I/P Approval of International Financial Organs Study, Design & Construction Study (M/P & F/S) Designing Construction M/P and F/S International Financial Institutes Project Identification Pledge

Table-1.1 Administrative and Financial Formalities

Legend: ▲: Application; ▼: Approval; ——: Execution of Activity

CHAPTER 2 ORGANIZATION OF PROJECT IMPLEMENTATION

2.1 Establishment of UGP-PROVABASE

In parallel with the JICA study, Management Unit of the Project of Water Resources Development and Supply in Vaza Barris River (UGP-PROVABASE) was established by the State Decree No.18297 on 1st of September 1999. It is subordinated directly the Secretary of SEPLANTEC as shown in Appendix 1 of this Supporting Report. Its major competence is as follows:

- 1) To coordinate and to follow up on the Project of Vaza Barris Multi-purpose Dam and related Projects.
- 2) To keep institutional linkage with public and private organs concerned.
- 3) To carry out duties attributed to SEPLANTEC.

2.2 Organizational Strengthening of UGP-PROVABASE

At present, the UGP-PROVABASE is assigned to carry out preparation of the Project. In the future, it is expected to manage financial arrangement, a feasibility study for the irrigation component and to compile environmental impact assessment reports, and subsequently to implement the project employing consultants and contractors.

The UGP-PROVABASE takes and should continue to take a core part in project implementation. At present, the UGP-PROVABASE consists of a coordinator and a secretary only. With the development of the project preparation and implementation, the UGP-PROVABASE should be strengthened to meet with the. Strong administrative supports to the UGP-PROVABASE, such as legal advisory, matters related to public relation, coordination with federal and state organs and general administrative affairs, should be given by the SEPLANTEC.

At present the State Government or SEPLANTEC has a plan to strengthen the UGP-PROVABASE as follows:

Preparation Stage 1 (1999):

Duties: Preparation for the approvals of the federal organs

Staff: A Coordinator and a secretary

Preparation Stage II (2000):

Duties: Preparation for "Environmental Impact Assessment Report (RIMA)"

and for the application to an international financial institute

Staff: Adding a civil engineer

Preparation Stage III (2001):

Duties: Preparation of international bidding for procurement of consultants

Staff: Adding a document specialist with translators (if necessary)

Implementation State (2002-2006):

Duties: total management of project implementation

Staff: Adding a financial staff and technical assistants as required

2.2.1 Major Duties of UGP-PROVABASE

In this section, organization at the implementation stage is discussed. In the implementation stage, major tasks to be managed with 1) land acquisition, 2) designing, 3) construction and its supervision.

Item 1) should be carried out in accordance with relevant laws and regulations such as Decree-Law No. 21st June 1941 and its amendments, with juridical support of the State Government such as legal advisors to SEPLANTEC and Office of the State General Prosecutor. Some involvement of UGP-PROVABASE will be necessary for investigations and negotiations for the land acquisition.

As for 2) and 3), UGP-PROVABASE or SEPLANTEC should hire consultants and conclude contracts with contractors. Bidding procedure should be placed under the inspection of international financial institutes, federal organs in charge and the State Procurement Office. Actual tendering, tender evaluation, negotiations and contract awarding should proceed with the initiative of UGP-PROVABASE. Although the consultants and contractors will undertake most of the engineering works and construction works, some responsibilities will remain to the project office. Check of the results of the works by consultants and contractors is necessary to be done by UGP-PROVABASE. During the construction works, many administrative permissions may be required. Liaison to relevant authorities, such as police, will be necessary.

2.2.2 Organization and Staffing

According to the major duties as described above of UGP-PROVABASE, following organization at implementation stage would be recommendable. The contents and volume of each section will vary according to the development of the project implementation.

For staffing at the implementation stage, employment of engineers in DESO or COHIDRO is very important because of their experiences in similar projects, especially for the domestic water supply components and the irrigation component. Staff of CEHOP, if available, may take major roles in land acquisition, tendering, and construction supervision because of their abundant experiences in these fields.

Preferably, each section should have a core staff responsible for duties assigned to the section, and short-term assistance should be acquired from relevant sections of the Government, state companies and autarchies.

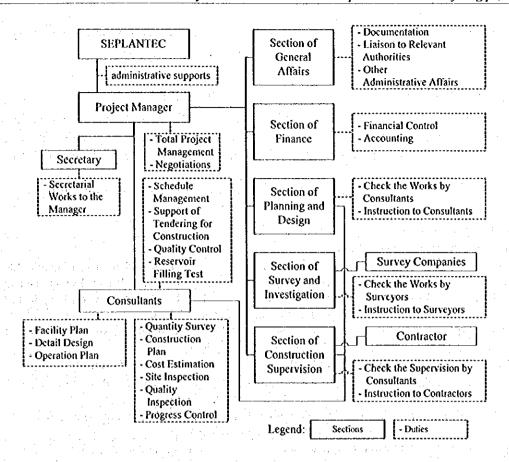


Figure-2.1 Proposed Organization of UGP-PROVABASE at Implementation Stage

CHAPTER 3 SCHEDULE OF PROJECT IMPLEMENTATION AND FINANCIAL DISBURSEMENT

3.1 Project Components and Construction Packaging

The project components are summarized as shown in Table-3.1 below. Considering the type of work and site location of the components, the project is divided into five (5) construction packages, which is the same division of the components shown in Table-3.1.

Table-3.1 Project Components and Construction Packaging

Project Components Construction Package	Specification
(1) Vaza Barris Multipurpose Dan	
Main Dam	Type: Gravity concrete dam, Height: 48.2m, Crest Length::280.0m
Spillway	Type: Free overflow, Design discharge: Width: 15.00m, Height: 5.2m
Check Dam (or Intake Dam)	Type: Gravity concrete dam, Height: 20.0m, Crest Length: 127.0m Width of Overflow Section: 70.0m
Low Flow Bypass	Type: Concrete Box Culvert, Length: 27.7 km, Size: 1.05m x 1.05m Design discharge: 0.75m³/s
(2) Domestic/Industrial Water Sup	pply Facilities: < Itabaiana City Area >
Water Conveyance Pipeline	Raw water pump station: 0.546 m³/s, Ductile cast iron pipe: Diameter ϕ 500-700mm, Total length:25.4km
Treatment and distribution facilities	Municipalities: Itabaiana, Areia Branca, Campo do Brito, Macambira, Sao Domingos
(3) Domestic/Industrial Water Sur	oply Facilities: < Lagarto City Area >
Water Conveyance Pipeline	Raw water pump station: 0.52 m³/s, Ductile cast iron pipe: Diameter ϕ 500-700mm, Total length:24.0km
Treatment and distribution facilities	Municipalities: Lagarto, Poco Verde, Simao Dias, Riachao do Dantes
(4) Forestation for Environmental	Protection
Forestation	Total 300 ha (main dam site: 150 ha, check dam site: 50 ha reservoir: 100 ha)
(5) Irrigation Water Supply Faciliti	es
Water Conveyance Pipeline	Raw water pump station: 2.912 m³/s, Water Conveyance to agricultural land
Irrigation Facilities	Irrigation area: 4,553 ha, Beneficial municipalities: Lagarto, Itaporanga de Ajuda, Salgado

3.2 Procurement Method

3.2.1 Consulting Services

The procurement of consulting services is to be made between January 2001 and December 2001. The recommended method for the selection of a competent consultant is the Short List method in accordance with the Guidelines for the Employment of Consultants by borrowers of a foreign soft loan. However, the direct appointment of a specific consulting company should be considered, as the JICA Study Team has already studied the project in some detail. Similarly, the contract with the consultant should be made in one package for both the design stage and construction stage, in order to assist in the coordination and smooth execution of the project.

3.2.2 Construction Work

The procurement of contractors is to commence from July 2002 and to be completed by December 2003. In accordance with the Guidelines for Procurement under foreign soft loans, International Competitive Bidding (ICB) is proposed. The project involves the construction of a concrete dam, a check dam, a low flow bypass, water supply facilities, forestation works and irrigation facilities. ICB will be the best method for achieving the conomic and efficient implementation of the project. In the interests of the broadest possible competition, contract packages have been made a reasonable size to attract bids on an international basis. Tenders will be limited to contractors who have pre-qualified and been accepted onto the short list.

3.3 Implementation Schedule

The project is composed of the following work items:

- 1) Project Preparation
- 2) Loan procedure for Foreign Soft Loan
- 3) Procurement for consulting services and construction work
- 4) Consulting services including project management, detailed design and construction supervision.
- 5) Construction work
- 6) Land acquisition and compensation

The overall implementation schedule is shown in Table-3.2. Following procurement of the consulting services, the total required period for the main works is five (5) years which comprises four (4) main stages: i) 24 months for the detailed design, ii) 12 months for land acquisition and compensation, iii) 18 months for procurement of contractors (overlapping with the design stage), iv) 36 months (3 years) for construction.

3.4 Financial Disbursement Schedule

Finance for the project is requested from the foreign soft loan with the exception of the costs for land acquisition and compensation, government administration and government tax which will be borne by the federal or state budget. Although loan amount to be borrowed is limited to 60 % of the total project cost, 50 % of that is assumed to be loaned taking into account of the State financial conditions.

The financial disbursement schedule of the project in phase-1 is summarized in Table-3.3.

Table-3.2 Implementation Schedule: Proj	ation Sc	bedule:]	Project	of Water	ect of Water resources Development and Supply in Vaza Barris River- Sergipe	es Deve	lopment	and Sul	yldc	in Vaza	Barris	River-	Sergipe	
	(C	(5)	(3)	(4)	(5)	(9)	(7)	(8)		(10)	(11)	(12)	(12)	(12)
Fiscal Year Month	1999	2000	2001	2002	2003	2004	2005	2006		2012	2013	201	201	
	3 6 9 12	3 6 9 12 3 6 9 12	3 6 9 12	3 6 9 12	3 6 9 12	3 6 9 12	3 6 9 12	1 4 7 10 3 6 9 12		3 6 9 12	3 6 9 12	1 4 7 10 3 6 9 12	1 4 7 10 2 4 6 9 12	3 6 9 12
Project Stages	Pre	Preparation Stage	35c		Implementation Stage (Phase-I)	ition Stag	e (Phase-1)				mplemen	tation Star	Implementation Stage (Phase-2)	
0 Project Preparation														
(1) F/S of the Project								_ _ _						
(2) Basic Design of Water Supply Facilities									. '		-			
(3) F/S on Irrigation Project							; 		<u> </u>					
1														
(6) Formulation of I/P											 			
1 Loan Arrangement							,							
_	*									_	-		 	
(2) Pledge (Exchange of Note)		*				-								
ž			*									_		
2 Procurement] 							·					
				,										
(2) Construction Work														
3 consulting Services								1				-		
									.4"	_				
(2) Detailed Design														
(3) Construction Supervision	-													
4 Construction Works		3 ²				* -/								
(1) Dam, Check Dam and Low Flow Bypass														
(2) Urban Water Supply Facilities to Itabaiana	1					- 22				_				
(3) Urban Water Supply Facilities to Lagarto														
(4) Forestation for Environmental Protection	3 -:			124 24 24 24					- 4					
(5) Irrigation Water Supply Facilities										_			_	-
5 Land Acquisition and Compensation														
(1) Land Acquisition and Compensation										_				
						٠.			•		•			

Table-3.3 Finance and Disbursement Schedule of Phase-1 Project

(Unit: R\$1000)

gramma in managan jahan mengan jahan dalam kelalam dan managan kelalam jahan dan Kanpungan dan pajadan pangan pengangan pengangan		-	- Commission of the Commission		-	(Unit:	R\$1000)
ltem		Total	2002	2003	2004	2005	2006
Consulting Services							
Construction Works							
Land Acquisition & Compensation							
1. Construction Costs	Total	224,232	0	0	39,213	112,512	72,508
	Base Cost	176,253	0	0	32,229	88,920	55,103
	Price Esc.	47,980	0	0	6,982	23,594	17,405
(1) Dam Construction	Total	83,597	0	0	38,337	45,260	0
	Base Cost	67,280	. 0	0	31,510	35,770	0
	Price Esc.	16,317	0	0	6,827	9,490	0
(2) Itabaiana Water Supply	Total	44,667	0	0	0	21,444	23,223
	Base Cost	34,597	0	0	0	16,948	17,649
	Price Esc.	10,070	0	0	. 0	4,496	5,574
(3) Lagarto Water Supply	Total	47,419	0	0	0	22,439	24,980
	Base Cost	36,716	0	0	0	17,733	
	Price Esc.	10,703	0	0	0	4,706	5,997
(4) Reforestation	Total	875	0	0	. 875	0	0
	Base Cost	719	0	0	719	0	0
	Price Esc.	156	0	0	156	0	: 0
(5) Irrigation Water Supply	Total	47,675	0	0	0	23,370	24,305
	Base Cost	36,941	0	0	0	18,470	18,471
	Price Esc.	10,734	0	. 0	0	4,900	5,834
2. Land Acquisition & Compensation	Total	2,929	951	1,978	0	0	0
	Base Cost	2,536	845	1,691	0	0	0
	Price Esc.	393	106	287	0	0	0
3. Consulting Services	Total	21,906	3,644	3,789	3,940	5,163	5,370
	Base Cost	17,877	3,239	3,239	3,239	4,080	4,081
	Price Esc.	4,029	405	550	701	1,083	1,289
4.Administration	Total	2,516	465	483	502	523	543
	Base Cost	2,065	413	413	413	413	413
	Price Esc.	451	52	70	89	110	130
5. Contingency	Total	12,452	235	292	2,163	5,876	3,886
	Base Cost	9,833	208	251	1,777	4,644	2,953
	Price Esc.	2,619	27	41	385	1,233	933
Total Project Costs	Total	264,038	5,294	6,542	45,818	124,075	82,308
	Base Cost	208,564	4,705	5,593	37,658	98,057	62,548
	Price Esc.	55,474	589	949	8,160	26,018	19,759
Foreign Soft Loan		132,019	2,647	3,271	22,909	62,037	41,154
Total Project Costs (US\$1000)		137,520	2,757	3,407	23,864	64,622	42,868
Foreign Soft Loan (US\$1000)		68,760	1,379	1,704	11,932	32,311	21,434
		<u></u>					·

Note: - Exchange rate: US\$ 1 = R\$ 1.92 as of September 1999

^{4 %} of annual price escalation is set since the year of 2000
50 % of the project cost is assumed to be raised with Foreign Soft Loan, taking into account of the state financial condition.

JAPAN INTERNATIONAL COOPERATION AGENCY

STATE SECRETARIAT OF PLANNING, SCIENCE AND TECHNOLOGY THE STATE OF SERGIPE, THE FEDERATIVE REPUBLIC OF BRAZIL

THE STUDY ON WATER RESOURCES DEVELOPMENT IN THE STATE OF SERGIPE IN THE FEDERATIVE REPUBLIC OF BRAZIL

FINAL REPORT SUPPORTING (VOLUME II) FEASIBILITY STUDY

[K] ENVIRONMENT IMPACT ASSESSMENT

MARCH 2000

YACHIYO ENGINEERING CO., LTD. (YEC)

THE STUDY ON WATER RESOURCES DEVELOPMENT IN THE STATE OF SERGIPE IN THE FEDERATIVE REPUBLIC OF BRAZIL

SUPPORTING REPORT (K) ENVIRONMENT IMPACT ASSESSMENT

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CHAPTER 1 INTRODUCTION

This Study was implemented over two phases: the Master Plan Study and the Feasibility Study for Vaza Barris Dam Project. This report mentions results of the Environmental Impact Assessment on Vaza Barris Dam Project.

Several field surveys were conducted to identify present environmental situation at the Vaza Barris and check dam sites, the reservoir area and the pipeline alignments. Basic information on the existing environmental conditions of these areas were provided by ADEMA (Administração do Meio Ambiente) as the local environment management organization. Satellite images and aerial photographs were used to identify the vegetation and land use in the reservoir area.

With regard to Vaza Barris River Estuary where there is expected to be environmental effects from the Vaza Barris dam construction, a specific ecological survey was conducted by the Federal University of Sergipe in the Feasibility Study. Outline of this survey is as follows:

Survey Purpose:

- Collecting baseline data for the Environmental Impact Assessment in JICA's Study
- Providing the information to related environmental organizations such as ADEMA and IBAMA
- Collecting baseline data for the Monitoring Program

Contractor:

FAPESE - Supporting Foundation Research and Extension of Sergipe (The Federal University of Sergipe)

Survey Item:

- Large Fish or Commercial Fish (Fishery Resources)
- Small Fish
- Phytoplankton
- Zooplankton
- Water Quality
- Sediment
- Flora

Total Term:

July 1999 - October 1999 (90 days)

Sampling Period:

July 8th 1999 - July 15th 1999

The general objectives of this supporting report related Environmental Impact Assessment are as follows:

- 1) To provide a baseline information of the existing environmental conditions in the Study Area.
- 2) To indicate the potential environmental impacts and mitigation measures associated with Vaza Barris Dam Project.
- 3) To suggest an Environmental Study to be conducted by Sergipe side at the next stage and Environmental Monitoring Plan to be conducted during the operation stage.

CHAPTER 2 ENVIRONMENTAL CONDITION IN THE STUDY AREA

2.1 Vaza Barris River Basin

Catchment area of Vaza Barris dam in Sergipe State is 1,890 km². The upper area of this basin is plain or hilly area where agriculture is the main economic activity. The steep slopes of the riverside are mainly covered by shrub in the upper valley.

With regard to the downstream area, because the river channel is fixed, there are no flood plains. Due to the small quantity of the flow and the sedimentation, a delta such as Sao Francisco River is not formed. The sediments are composed of coral sand mainly at the river mouth. There are no irrigation areas and intake facilities from Vaza Barris River in the downstream area of Vaza Barris dam.

Areas of each land use category in Vaza Barris River Basin estimated from satellite image are shown in Table-2.1.

Table-2.1 Area of Each Land Use Category in Vaza Barris River Basin

Unit: km

Sub Drainage B	asin No.	401	402	403	404	405	406	407	408	Total	Total %
Area		436.93	274.00	521.00	188.97	173.80	233.81	274.07	456.42	2559.00	100.00%
Town		0.80	· 0.16	1.05	0.27	0.38	0.35	0.23	1.79	5.03	0.20%
	Plain	8.55	0.00	7.52	0.00	0.00	0.00	2.36	37.79	56.22	2.20%
Forest Area	- Hill	7.57	25.19	6.93	3.43	5.82	0.63	26.03	25.95	. 101.55	3.97%
	Mountain	0.00	0.00	6.18	20.24	2 50	0.32	1.57	0.00	30.81	,1.20%
	Plain	99.74	0.00	0.44	0.00	0.00	0.00	4.47	24.48	129.13	5.05%
Wood Land	Hill	38.84	62.13	29.69	0.00	15.79	36.16	132.00	14.80	329.41	12.87%
	Mountain	0.00	26.22	24.81	55.92	30.62	0.00	0.00	0.00	137.57	5.38%
Pasture	Plain	59.74	14.03	165.19	64.39	59.65	121.30	79.40	52.70	616.40	24.09%
(Vegetation	Hill	22.68	57.13	107.05	0.16	13.03	0.00	0.02	58.09	258.16	10.09%
density > 20%)	Mountain	0.00	0.00	0.00	0.00	0.00	0.00	0,00	0.00	0.00	0.00%
Pasture	Plain	0.66	0.00	0.00	9.49	0.00	0.00	4.35	14.90	29.40	1.15%
(Vegetation	Hill	23.95	78.06	7.65	4.12	8.88	0.00	6.21	16.95	145.82	5.70%
density < 20%)	Mountain	0.00	0.00	0.00	0.00	2.76	8.94	0.00	0.00	11.70	0.46%
Mangrove		0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.24	73.24	2.86%
Salt Marsh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.46	2.46	0.10%
Dunes Vegetati	on	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.27	46.27	1.81%
	Dense	0.77	5.79	17.10	13.13	33.60	61.49	16.47	0.00	148.35	5.80%
Cultivation Area	Plane	173.58	5.01	142.18	6.69	0.00	2.85	0.54	36,53	367.38	14.36%
	Hill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Exposed Rock/	Soil	0.00	0.28	5.06	11.13	0.77	0.00	0.42	4.22	21.88	0.86%
Water		0.05	0.00	0.15	0.00	0.00	1.77	0.00	46.25	48.22	1.88%
		Upper Bas	in ←						Lower Ba	sin	14 193 JAH

2.2 Project Area

2.2.1 Social Environment

Vaza Barris dam site, check dam site and two pipeline construction sites are located in the three municipalities of Itabaiana, Sao Domingos and Lagarto. These project sites are located in plain or hilly areas where agriculture is the only economic activity. These agricultural activities are mainly extensive livestock farming. Most of the project area is extensive pasture land or grassland. Small cultivated-pasture lands and riverside forests are dispersed in the area. The steep slopes of the riverside are mainly covered by shrub. Areas of each land use category by each municipality estimated from satellite image are shown in Table-2.2. Main livestock population and density by each municipality are shown in Table-2.3 and Table-2.4 respectively.

Table-2.2 Area of Each Land Use Category by Municipality

Hnit-km²

Municipali	ity	ITABA	IANA	SAO DO	MINGOS	LAG	ARTO	То	Unit: km²
Area	10	338.40	100.0%	102.30	100.0%	962.50	*****		
								1403.20	100.0%
Town	.	2.35	0.7%	0.21	0.2%	1.64	0.2%	4.20	0.3%
The second of the	Plain	,			· · · · · · · · · · · · · · · · · · ·	5.86	0.6%	5.86	0.4%
Forest Area	Hill	0.02	0.0%	1.58	1.5%	131.82	13.7%	133.42	9.5%
10/10/11/11	Mountain	1.08	0.3%	12.29	12.0%	28.68	3.0%	42.05	3.0%
	Sub-Total	1.10	0.3%	13.87	13.6%	166.36	17.3%	181.33	12.9%
	Plain								
Wood Land	Hill	15.34	4.5%	0.03	0.0%	107.77	11.2%	123.14	8.8%
Wood Land	Mountain	N., .		24.32	23.8%	51.62	5.4%	75.94	5.4%
	Sub-Total	15.34	4.5%	24.35	23.8%	159.39	16.6%	199.08	14.2%
	Plain	169.13	50.0%	15.28	14.9%	396.89	41.2%	581.30	41.4%
Pasture (Vegetation	Hill	1.86	0.5%	11.72	11.5%	17.51	1.8%	31.09	2.2%
density > 20%)	Mountain	_	_		_		_	_	
Tach to A lagger to the	Sub-Total	170.99	50.5%	27.00	26.4%	414.40	43.1%	612.39	43.6%
	Plain				. 	8.91	0.9%	8.91	0.6%
Pasture (Vegetation	Hill			3.40	3.3%	25.84	2.7%	29.24	2.1%
density < 20%)	Mountain	0.45	0.1%		·			0.45	0.0%
	Sub-Total	0.45	0.1%	3.40	3.3%	34.75	3.6%	38.60	2.8%
Mangrove				1 1 1 1 1 1	_	<u> </u>			_
Salt Marsh		_							
Dunes Vegetation		_							
	Dense.	135.95	40.2%	20.69	20.2%	140.55	14.6%	297.19	21.2%
Cultivation	Plane	10.41	3.1%	0.06	0.1%	27.48	2.9%	37.95	2.7%
Cultivation Area	Hill			_		14.83	1.5%	14.83	1.1%
	Sub-Total	146.36	43.3%	20.75	20.3%	182.86	19.0%	349.97	24.9%
Exposed Rock/Soil			-	. 12.72	12.4%	1.13	0.1%	13.85	1.0%
Water		1.81	0.5%			1.97	0.2%	3.78	0.3%

Table-2.3 Livestock Population by Municipality

Unit: heads

<u> </u>				Onn. neads
Municipality	ITABAIANA	SAO DOMINGOS	LAGARTO	Total
Cattle	19,200	5,200	68,130	92,530
Sheep	1,360	600	11,800	13,760
Goat	280	260	4,250	4,790
House	1,440	455	19,530	21,425

Source: Production by Municipal Livestock (IBGE)

Table-2.4 Livestock Population Density by Municipality

Unit: heads / km²

				OHILI HEMOST KIN
Municipality	ITABAIANA	SAO DOMINGOS	LAGARTO	Average
Cattle	112	171	152	142
Sheep	8	20	26	21
Goat	2	9	9	7
House	8	15	43	33

State road (SE-110) crosses Vaza Barris River at about 20 km above Vaza Barris dam site. Electric wires exist near check dam site. In and around Vaza Barris dam site, there are only farm roads that are only possible by tractors and jeeps. There are no other infrastructure facilities around the reservoir area. There are no towns and cultural properties in the inundated area. The nearest residence from Vaza Barris dam site is located 4 km upstream.

In Sao Domingos town located near the reservoir, groundwater is the main source of water supply. The outlet of wastewater from Sao Domingos town is located 3 km away from the reservoir.

2.2.2 Natural Environment

Most of the project area is extensive pasture land or grassland, where the vegetation is monotonous biologically. Small forest areas are scattered along the riverside. These riverside forests provide habitats of wildlife such as birds, small mammals and insects. Steep slopes of the riverside where the cattle can not approach are mainly covered by shrub forests. The riverside and shrub forests consist of several species and have no precise dominant species. Main plant species likely to occur in the project area are as follows:

Tapirira guianensia Sclerolobium densiflorum

Byrsonima sericea Bowdichia virgiloides

Thyrsodium sp. Cassia ramiflora Cecropia sp. Cedrella sp.

Vaza Barris dam site is located in hilly pasture land. There is a large forest area 1.5 km downstream from the site. This forest is the largest forest identified by the field surveys around the project area. Extensive areas of undisturbed forest and wildlife habitat do not exist in and around the inundated area. In the upper valley of the reservoir area, most of the riversides are steep slopes and covered with shrub forests.

Rare or endangered wildlife species have not been identified around the reservoir area. Migratory fishes that swim up the river from sea to spawn have not been identified in Vaza Barris River.

The reservoir area is shown in Figure-2.1 (1/4)-(4/4). The typical land use patterns (cross section) are shown in Figure-2.2 (1/3)-(3/3). The land use around Vaza Barris dam site is shown in Figure-2.3.

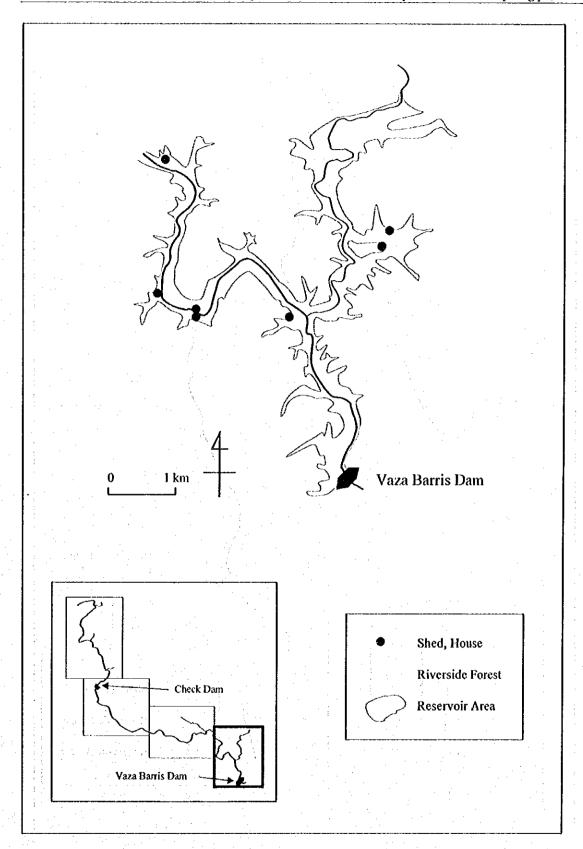


Figure-2.1 (1/4) Reservoir Area

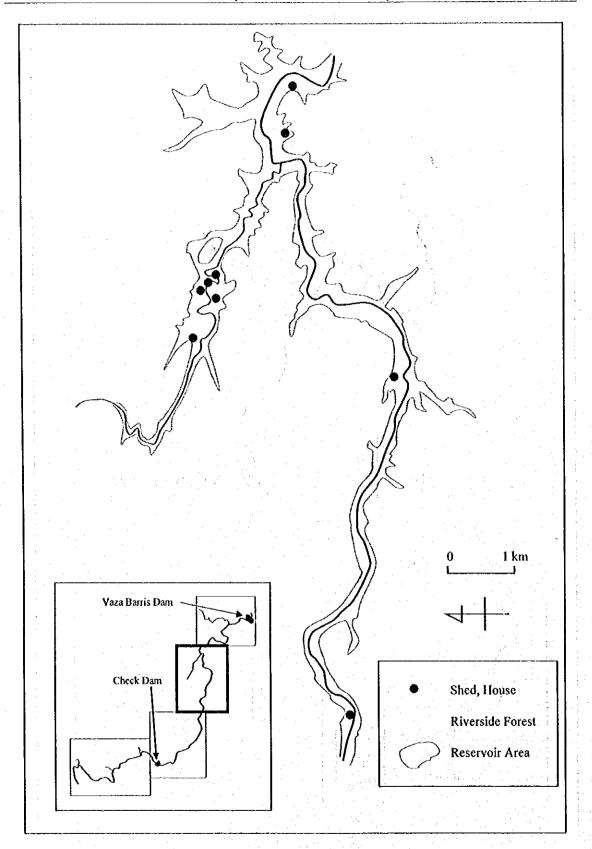


Figure-2.1 (2/4) Reservoir Area

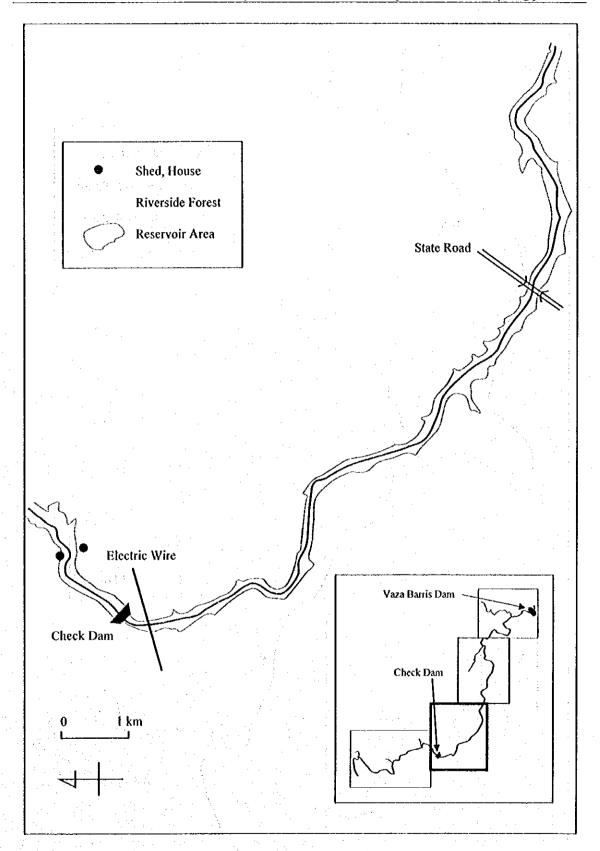


Figure-2.1 (3/4) Reservoir Area

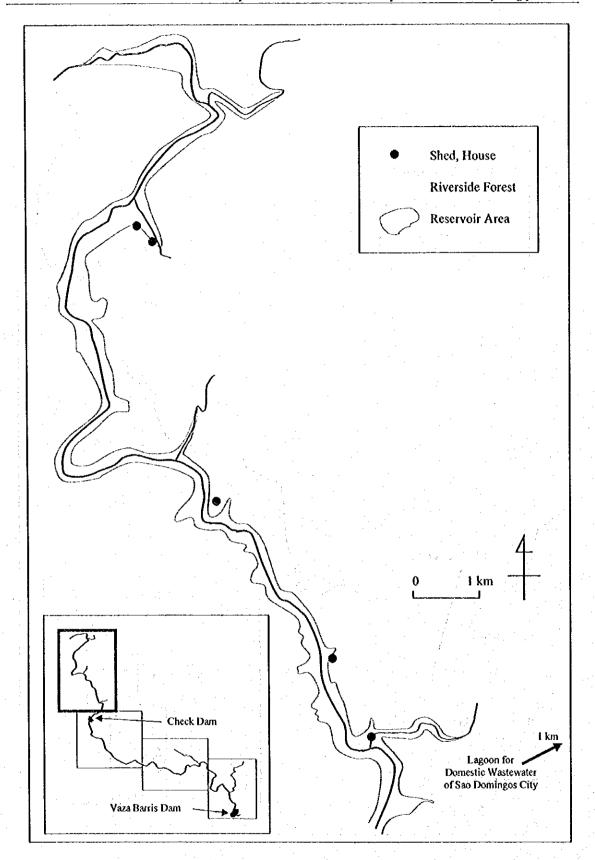


Figure-2.1 (4/4) Reservoir Area

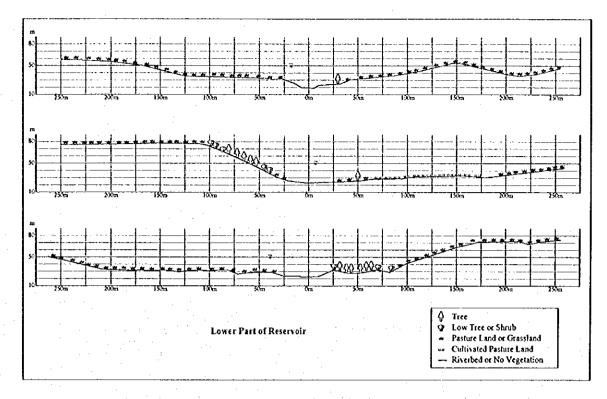


Figure-2.2 (1/3) Typical Land Use Pattern of the Reservoir Area

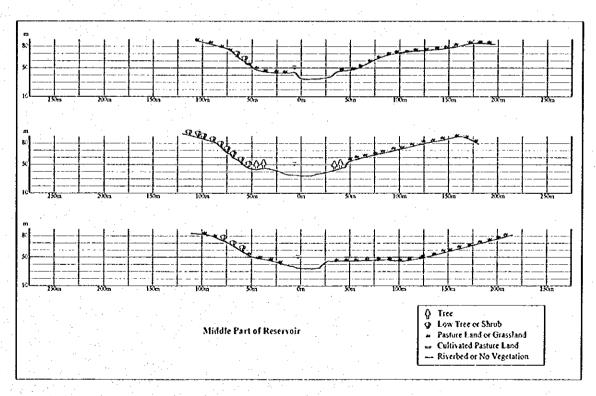


Figure-2.2 (2/3) Typical Land Use Pattern of the Reservoir Area

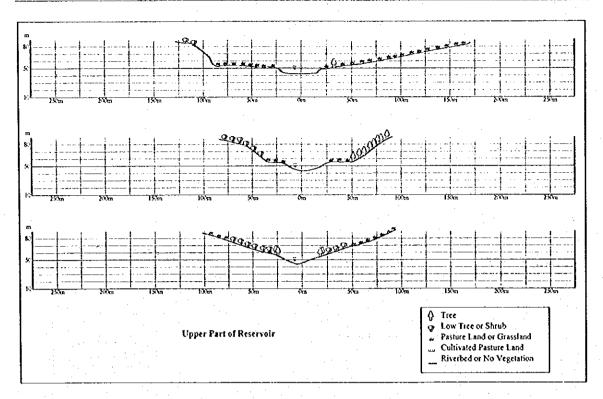


Figure-2.2 (3/3) Typical Land Use Pattern of the Reservoir Area

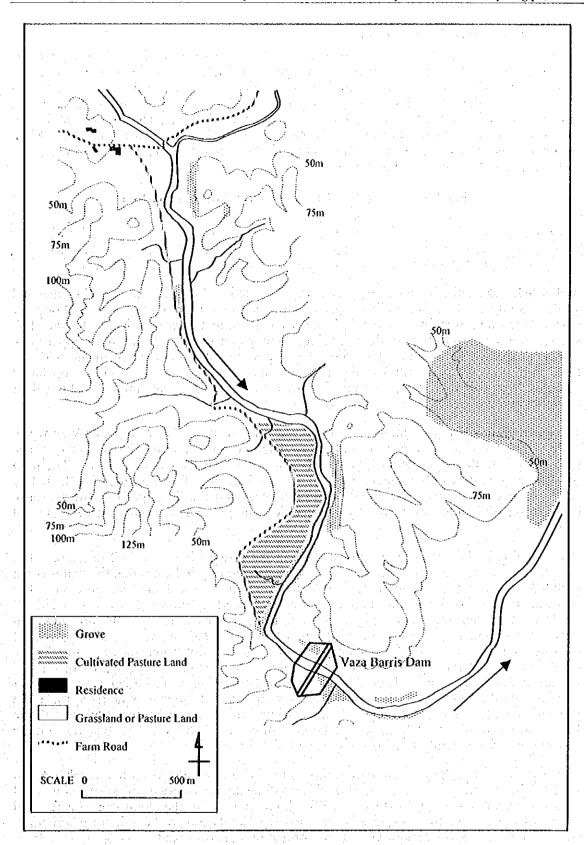


Figure-2.3 Land Use of Vaza Barris Dam Site

2.3 Vaza Barris River Estuary

In the estuary, fishery has been flourishing. In Sao Cristovao, registered fisher persons were 1,401 in 1998. The total including unregistered reaches approximately 6,000 people in a season. Most of the fishery activities use canoes with oar or sail, and a day trip in according with the tide. The shrimp group has a high economical value in the estuary. In recent years, however, the catch has been decreasing. Annual catch for 1987-88 in Sao Cristovao was more than 400 ton, but the catch in 1998 has dropped by 13 ton. Main reason for the decease is over fishing including the catch of juveniles. The catch for 1996-98 in Sao Cristovao is shown in Table-2.5.

Table-2.5 Catch of Fish for 1996-98 in Sao Cristovao

	1996	1997	1998
Sao Cristovao	229.1 t	176.8 t	13.0 t
Total of Sergipe State	3,401.5 t	3,193.8 t	3,692.6 t

Source: Preliminary Ecological Evaluation of Vaza Barris River Estuary by the Federal University of Sergipe

In this fish and shellfish study, 80 species are identified. According to the other fish and shellfish study, the fish and shellfish species sampled in the two rainy seasons and one dry season was composed by at least 133 species belonging to 46 families. Oceanic fish species dominate up to the confluence with Paramopama River. In the more upper area, demersal species dominate. The shrimp group dominates in number of individuals. Pink shrimp (Penaeus subtilis) is the most abundant in the estuary. This group has a complex life cycle and migrates from the estuary to the sea as sub-adult, finishing their growth and reproducing.

The mean grain sizes of sediments in the estuary range from 0.87 to 7.96 phi as Wentworth scale. The river mouth presents sand dominance that has a marine characteristic. The sand extends to the upper area of the estuary where the oceanic energy is low. The ratio of silt rises gradually in the upper area. The mean diameter of the sediment is affected by supply sources of the material, the deposition process and the flow speed. The presence of fine material indicates lower hydrodynamics energy, where make possible the silt deposition.

Water quality in July 1999 (the rainy season) in the estuary is shown in Table-2.6. The sampling points are shown in Figure-2.4. The water quality indicates that the water is not polluted, and has the strong marine influence and the vertical mixture process. The suspended solid (SS) levels are high, more than 160 mg/l, in the whole estuary. The SS levels of the river mouth are higher than the upper area. This result indicates that significant sediments are transported into the estuary by tidal currents. Salinity level of the estuary ranges from 1.78 % to 3.69%. The high salinity water goes up close to the confluence with Paramopama River. The saltwater intrusion reaches approximately 20 km up at the spring tide. The BOD5 levels in the section 3 are higher than the other sections on the ebb tide. This result shows inflows of organic materials form the tributaries in section 3. With regard to the nutrients, the phosphate concentrations suffer a large influence of the lateral channels that drain into the estuary, but the nitrate concentrations are mainly influenced by Vaza Barris River.

The estuary is a developed mangrove forest zone. The total mangrove area reaches 60.56 km². The mangrove areas trap the fine sediments transported in suspension, and progressively colonize the estuary. Rhizophora mangle is the dominant species and grows in the estuary margins, the islands and the shoals, up to the salt intrusion limit. About 70 percent of the mangrove area are formed on the coral sand.

According to the plankton study, the dominant phytoplankton species are Odontella regia, Chaetoceros peruvianus, C. compressus and Rhizosolenia styliformis. Odontella regia is the most frequent. 83 percent of identified 65 species are diatoms that generally exist in clean water. Biomass numbers of the phytoplankton in the section 4 are almost ten times greater than the ones in the section 1. The abundant zooplankton species are zoea of

Brachyuran, Acartia lilljeborgi, nauplius of Cirripede, Paracalanus crassirostris, Temora turbinata, Bouganville ramosa and Liriope tetraphylla. The zoea of Brachyuran is the most abundant in all sections. Biomass numbers of the seston during the ebb tide are much greater than the ones during the flood tide in all sections. The densities of zooplankton are high in the section 3 during the ebb tide, and in the section 1 during the flood tide.

Table-2.6 Water Quality in Vaza Barris River Estuary

Sampling Point	Depth (m)	Temp. (°C)	pН	Cl (mg/l)	Sal. (%)	Turb. (NTU)	SS (mg/l)	DO (mg/l)	BOD5 (mg/l)
Ebb Tide									
1:8	0.0	26.8	8.2	19,600	3.59	4.6	160	7.04	0.88
1:M	6.5	26.5	8.3	19,984	3.66	4.2	301	6.96	1.17
1:B	13.0	26.5	8.3	20,147	3.69	4.6	304	6.93	0.59
2:S	0.0	27.0	8.1	16,325	2.99	5.0	232	6.38	2.19
2:M	5.5	26.8	8.1	17,745	3.25	5.4	259	6.01	1.76
2:B	11.0	26.8	8.2	18,073	3.31	6.2	203	6.16	1.87
3:8	0.0	26.8	8.0	13,595	2.49	5.4	186	5.94	6.60
3:M	5.0	26.8	8.0	13,705	2.51	5.8	250	5.86	4.46
3:B	10.0	27.0	8.0	14,851	2.72	6.9	196	5.79	4.29
4:S	0.0	27.0	8.0	9,719	1.78	8.5	161	6.01	-
4:B	4.5	27.0	8.0	11,794	2.16	9.3	210	5.72	3.96
Flood Tide		÷ (
1:8	0.0	27.2	8.4	16,817	3.08	7.7	211	6.52	-
1:M	6.5	27.0	8.5	17,636	3.23	8.5	347	6.23	1.10
1:B	13.0	26.5	8.5	17,690	3.24	8.5	325	6.74	•
2:8	0.0	27.0	8.4	15,998	2.93	10.0	229	6.3	1.66
2:M	3.5	27.0	8.4	16,435	3.01	10.0	216	6.01	- 1.54
2:B	7.0	27.0	8.4	17,144	3.14	10.4	222	6.16	1.39
3:8	0.0	27.0	8.5	14,087	2.58	9.6	258	7.26	+
3:M	5.5	27.0	8.5	15,179	2.63	10.0	234	6.38	· •
3:B	11.0	26.8	8.5	14,360	2.78	10.8	206	6.45	3.08
4:S	0.0	27.2	8.4	14,360	2.63	12.3	242	7.18	-
4:B	5.5	27.0	8.3	14,414	2.64	12.3	232	6.52	2.86
5:S	0.0	25.5	8.0	328	0.60	18.1	183	6.67	6.60
5:B	3.7	25.5	8.0	328	0.60	18.5	201	7.11	6.22

						(2)
Sampling Point	N-NH4	N-NO2	N-NO3	P-PO4	P-Total	Si-SiO4
Sampling Fount	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Ebb Tide						
1:8	0.003	0.001	0.013	< 0.0009	0.029	3.11
1:M	0.007	0.002	0.007	0.009	0.037	0.59
1:B	0.005	0.004	0.005	< 0.0009	0.070	0.96
2:S	0.006	0.001	0.013	0.003	0.037	2.75
2:M	0.01	0.002	0.008	0.006	0.078	4.06
2:B	0.008	0.003	0.012	0.020	0.122	4.24
3:\$	0.006	< 0.0001	0.011	0.004	0.057	1.45
3:M	0.004	< 0.0001	0.005	0.004	0.022	1.39
3:B	0.004	< 0.0001	0.003	< 0.0009	0.093	1.11
4:\$	0.004	0.001	0.040	0.016	0.099	3.72
4:B	0.004	0.001	0.042	0.009	0.086	2.25
Flood Tide		4.31 45.		r est fact	1, 11, 14, 1	
1:S	0.008	< 0.0001	0.010	< 0.0009	0.045	0.52
1:M	0.006	0.001	0.008	< 0.0009	0.081	0.40
1:B	0.007	0.001	0.008	< 0.0009	0.091	0.39
2:S	0.003	0.002	< 0.001	< 0.0009	0.040	2.67
2:M	0.004	0.002	0.002	< 0.0009	0.011	2.13
2:B	0.007	0.002	0.005	< 0.0009	0.093	1.45
3:\$	0.003	0.0005	0.020	0.003	0.150	1.27
3:M	0.004	< 0.0001	0.015	0.012	0.057	1.02
3:B	0.006	< 0.0001	0.018	0.004	0.050	1.55
4:S	0.005	0.0008	0.042	0.012	0.045	3.21
4:B	0.004	< 0.0001	0.025	< 0.0009	0.052	1.98
rp. ₁. rp.a. 5:S 1	0.011	0.005	0.255	0.015	0.063	4.34
5:B	0.008	0.004	0.221	0.015	0.091	4.77

S: Surface, M: Middle Depth, B: Bottom Original Data: from Federal University of Sergipe

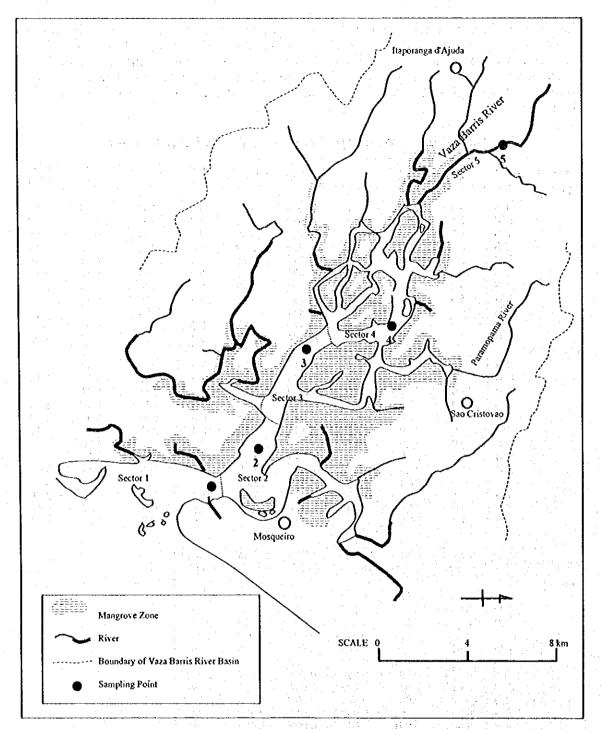


Figure-2.4 Sampling Area of Water, Plankton and Fish

There is a state protected-area in the estuary. This protected-area consists of Paraiso Island located at the river mouth and Paz Island located in front of Mosqueiro Village. However, Paraiso Island is a momentary island and has no biological importance. Paz Island is covered with old growth mangroves. All of mangrove areas in Sergipe State are objects of State Mangrove Protection Law.

The downstream area of Vaza Barris River Basin is shown in Figure-2.5. The more detailed information on the estuary is given in "Preliminary Ecological Evaluation of Vaza Barris River Estuary by the Federal University of Sergipe - September 1999 -".

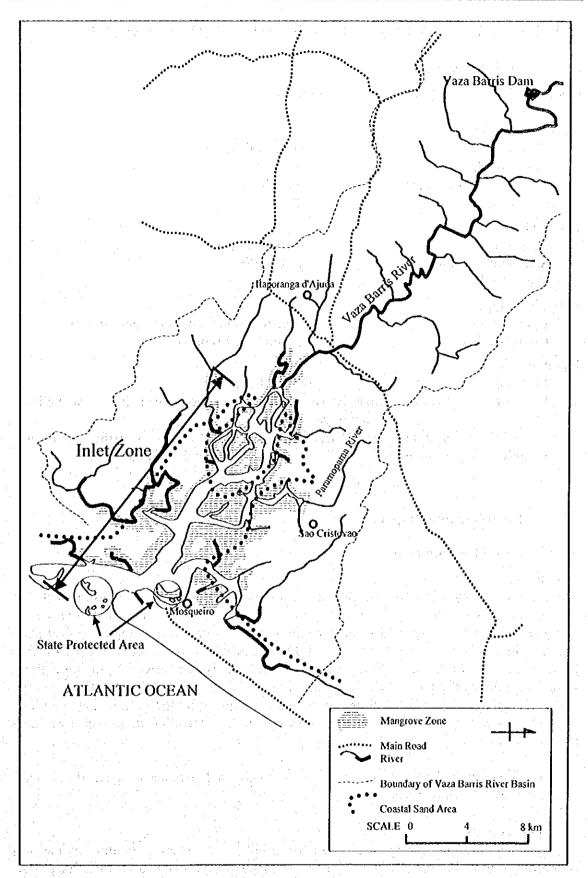


Figure-2.5 Lower Part of Vaza Barris River