

Table B.2.1 (4) Monthly River Discharge and Intake Volume

River : Badung
Intake Site : Merta Gangga (No.4)

River Discharge (Before Intake)

Unit : m³/s

	1986	1987	1988	1989	1990	Average
Jan.	2.453	2.455	-	2.167	2.579	2.414
Feb.	0.015	2.208	-	2.044	1.653	1.480
Mar.	1.509	1.099	-	2.307	2.397	1.828
Apr.	1.687	0.870	-	1.394	1.530	1.370
May	1.077	1.249	-	0.961	1.204	1.123
Jun.	1.221	1.232	-	1.731	0.740	1.231
Jul.	0.768	0.988	-	1.240	0.987	0.996
Aug.	0.696	1.095	-	1.847	0.965	1.151
Sep.	0.904	0.885	-	1.097	1.314	1.050
Oct.	1.170	1.124	-	1.485	1.046	1.206
Nov.	1.770	1.490	-	1.208	1.025	1.373
Dec.	1.628	2.090	-	1.448	1.366	1.633
Average	1.242	1.399	-	1.577	1.401	1.405

Intake Volume

Unit : m³/s

	1986	1987	1988	1989	1990	Average
Jan.	0.634	0.648	-	0.758	0.791	0.708
Feb.	0.628	0.643	-	0.716	0.741	0.682
Mar.	0.610	0.584	-	0.738	0.780	0.678
Apr.	0.620	0.567	-	0.715	0.733	0.659
May	0.583	0.591	-	0.677	0.702	0.638
Jun.	0.591	0.591	-	1.213	0.651	0.762
Jul.	0.556	0.575	-	0.741	0.683	0.639
Aug.	0.548	0.779	-	0.666	0.662	0.664
Sep.	0.564	0.672	-	0.694	0.709	0.660
Oct.	0.586	0.691	-	0.573	0.688	0.635
Nov.	0.617	0.726	-	0.703	0.688	0.684
Dec.	0.611	0.759	-	0.721	0.716	0.702
Average	0.596	0.652	-	0.743	0.712	0.676

Table B.2.1 (5-1) Monthly River Discharge and Intake Volume

River : Badung
 Intake Site : Tukad Badung (No.5)

River Discharge (Before Intake)

Unit : m³/s

	1986	1987	1988	1989	1990	Average
Jan.	-	1.087	1.081	-	-	1.084
Feb.	1.272	2.042	1.839	-	-	1.718
Mar.	1.545	1.010	2.109	-	-	1.555
Apr.	2.158	0.696	1.325	-	-	1.393
May	0.525	0.878	1.245	-	2.614	1.316
Jun.	0.348	0.754	1.339	-	1.746	1.047
Jul.	0.830	0.714	1.136	-	1.779	1.115
Aug.	0.685	0.629	0.937	-	0.899	0.788
Sep.	0.888	0.492	1.113	-	-	0.831
Oct.	1.037	0.391	-	-	-	0.714
Nov.	1.744	0.649	3.110	-	-	1.834
Dec.	0.976	2.018	4.474	-	2.166	2.409
Average	1.092	0.947	1.642	-	1.841	1.317

Intake Volume from Right Bank

Unit : m³/s

	1986	1987	1988	1989	1990	Average
Jan.	-	0.467	0.445	-	-	0.456
Feb.	0.569	0.744	0.820	-	-	0.711
Mar.	0.549	0.383	0.818	-	-	0.583
Apr.	0.727	0.194	0.582	-	-	0.501
May	0.234	0.264	0.608	-	1.475	0.645
Jun.	0.157	0.283	0.666	-	1.127	0.558
Jul.	0.404	0.261	0.571	-	0.713	0.487
Aug.	0.288	0.232	0.390	-	0.424	0.334
Sep.	0.311	0.178	0.464	-	-	0.318
Oct.	0.409	0.227	-	-	-	0.318
Nov.	0.619	0.096	0.975	-	-	0.563
Dec.	0.339	0.810	2.683	-	0.636	1.117
Average	0.419	0.345	0.820	-	0.875	0.615

Table B.2.1 (5-2) Monthly River Discharge and Intake Volume

River : Badung
Intake Site : Tukad Badung (No.5)

Intake Volume from Left Bank

Unit : m³/s

	1986	1987	1988	1989	1990	Average
Jan.	-	0.474	0.585	-	-	0.530
Feb.	0.530	0.903	0.857	-	-	0.763
Mar.	0.946	0.626	0.885	-	-	0.819
Apr.	0.778	0.501	0.603	-	-	0.627
May	0.891	0.614	0.618	-	0.853	0.744
Jun.	0.227	0.741	0.674	-	0.618	0.565
Jul.	0.334	0.453	0.556	-	0.748	0.523
Aug.	0.332	0.397	0.546	-	0.454	0.432
Sep.	0.378	0.313	0.501	-	-	0.397
Oct.	0.617	0.164	-	-	-	0.391
Nov.	0.792	0.294	0.276	-	-	0.454
Dec.	0.617	0.804	1.220	-	0.639	0.820
Average	0.586	0.524	0.610	-	0.662	0.589

Total Intake Volume

Unit : m³/s

	1986	1987	1988	1989	1990	Average
Jan.	-	0.941	1.030	-	-	0.986
Feb.	1.099	1.647	1.677	-	-	1.474
Mar.	1.495	1.009	1.703	-	-	1.402
Apr.	1.505	0.695	1.185	-	-	1.128
May	1.125	0.878	1.226	-	2.328	1.389
Jun.	0.384	1.024	1.340	-	1.745	1.123
Jul.	0.738	0.714	1.127	-	1.461	1.010
Aug.	0.620	0.629	0.936	-	0.878	0.766
Sep.	0.689	0.491	0.965	-	-	0.715
Oct.	1.026	0.391	-	-	-	0.709
Nov.	1.411	0.390	1.251	-	-	1.017
Dec.	0.956	1.614	3.903	-	1.275	1.937
Average	1.004	0.869	1.486	-	1.537	1.138

Table B.2.2 Average Monthly River Discharge

Site	Mambal		Peraupan		Oongan		Merta Gangga		Tukad Badung	
	Before	After	Before	After	Before	After	Before	After	Before	After
Jan.	7.177	2.759	4.920	4.479	5.125	1.814	2.414	1.706	1.084	0.098
Feb.	7.050	2.824	4.911	4.366	5.475	1.870	1.480	0.798	1.718	0.244
Mar.	7.020	2.708	5.707	5.143	5.859	2.237	1.828	1.150	1.555	0.153
Apr.	6.277	2.016	3.596	3.004	3.956	1.017	1.370	0.711	1.393	0.265
May	5.434	1.639	2.782	2.195	3.299	0.698	1.123	0.485	1.316	0.000
Jun.	5.598	1.911	2.614	2.036	2.866	0.441	1.231	0.469	1.047	0.000
Jul.	5.550	1.950	2.630	2.093	2.771	0.585	0.996	0.357	1.115	0.105
Aug.	5.014	1.445	2.294	1.740	2.225	0.654	1.151	0.487	0.788	0.022
Sep.	4.443	1.293	1.595	1.029	1.656	0.000	1.050	0.390	0.831	0.116
Oct.	4.753	1.485	1.866	1.314	1.676	0.080	1.206	0.571	0.714	0.005
Nov.	5.006	1.868	2.715	2.183	2.817	1.076	1.373	0.689	1.834	0.817
Dec.	6.267	2.282	3.922	3.374	3.980	1.361	1.633	0.931	2.409	0.472
Ave.	5.799	2.015	3.296	2.746	3.475	0.986	1.405	0.729	1.317	0.191

Note: Before :river discharge before irrigation water intake

After :river discharge after irrigation water intake

Table B.2.3 Observed River Discharge by JICA

No.	River Name	Dry Season		Rainy Season	
		Date	Q (m ³ /s)	Date	Q (m ³ /s)
1	Pengegeh	8-Nov-91	1.37	15-Jan-92	0.90
2	Ayung	6-Nov-91	4.01	15-Jan-92	4.39
3	Ayung	8-Nov-91	0.44	15-Jan-92	3.16
4	Ayung	7-Nov-91	0.76	15-Jan-92	2.46
5	Abianbase	8-Nov-91	1.56	13-Jan-92	4.74
6	Abianbase	8-Nov-91	1.02	13-Jan-92	1.50
7	Abianbase	6-Nov-91	0.05	13-Jan-92	0.07
8	Loloan	8-Nov-91	0.06	13-Jan-92	0.02
9	Loloan	7-Nov-91	0.05	13-Jan-92	1.05
10	Oongan	8-Nov-91	0.78	13-Jan-92	1.00
11	Punggawa	8-Nov-91	0.05	13-Jan-92	0.37
12	Punggawa	7-Nov-91	0.06	13-Jan-92	0.74
13	Oongan	8-Nov-91	0.06	13-Jan-92	0.31
14	Rangda	8-Nov-91	0.20	13-Jan-92	0.07
15	Rangda	6-Nov-91	0.37	13-Jan-92	0.98
16	Badung	6-Nov-91	0.89	15-Jan-92	1.07
17	Badung	8-Nov-91	1.76	15-Jan-92	2.96
18	Badung	8-Nov-91	1.72	15-Jan-92	2.61
19	Badung	6-Nov-91	2.34	13-Jan-92	2.55
20	Teba	6-Nov-91	0.38	15-Jan-92	0.18
21	Teba	6-Nov-91	0.36	15-Jan-92	0.35
22	Mati	6-Nov-91	0.74	15-Jan-92	1.61
23	Mati	6-Nov-91	2.61	15-Jan-92	0.90
24	Mati	6-Nov-91	1.11	16-Jan-92	1.29
25	Sama	6-Nov-91	2.04	16-Jan-92	0.63

Table B.2.4 River Water Quality in August, 1987

Parameter	Unit	Location		
		Mati River No.1	Mati River No. 2	Badung River No.3
Turbidity	NTU	93.75	62.5	18.75
Hardness - Total	deg F	36.06	14.6	14.4
Hardness - Ca	mg/l	53.494	34.494	35.142
Alkalinity	deg F	17.5	17.5	17
Total Susp. Solid	mg/l	1,946	92	432
NO ₂	mg/l	0.076	0.079	0.043
Phosphate	mg/l	0.055	0.061	0.032
BOD ₅	mg/l	8.375	9.125	2.625
Cl ⁻	mg/l	651	21	26.25
Fe ⁺⁺⁺	mg/l	1.29	2.045	0.595
Nun ⁺⁺ (Mn)	mg/l	0.0	0.0	0.0
KMnO ₄ ⁺ value	mg/l	32.535	30.728	19.389
NH ₄	mg/l	0.761	1.101	0.229
NO ₃ ⁻	mg/l	16.94	3.176	5.294
CO _D	mg/l	0.15	0.15	0.2

Source : Technical Assistance for the Development of Water Supply Systems Based on Estuary Reservoirs, May 1988

Table B.2.5(1) River Quality in December, 1987

Ayung River

Location No.	A-1			
	7:46	13:44	14:48	1:45
Time/Hour	7:46	13:44	14:48	1:45
Temperature °C	27	27	27	27
pH	7.5	7.8	7.8	7.8
Conductivity Umhos/cm ³	300	300	275	300
Suspended Solid mg/l	490	310	188	26
Ammonia mg/l	0.532	0.266	0.745	0.638
Nitrat mg/l	3.529	1.412	7.058	0.0
Nitrit mg/l	0.05	0.044	0.075	0.063
Phosphat mg/l	0.025	0.013	0.025	0.021
Chlorida mg/l	10.554	10.544	10.554	7.656
DO mg/l	6.25	6.45	6.7	6.1
SOD mg/l	28.824	11.701	21.973	11.701
COD mg/l	3.094	0.0	12.378	0.0
Coliform MPN 100 ml	2,400	2,400	2,400	960
E. Coli MPN	500	500	500	500

Source : Preparation and Development of Human Waste and Wastewater Disposal for the City of Denpasar.
by PT. ASTRON POLARIS, April 1988.

Badung River

Location No.	B-1				B-2				B-2a				B-3				B-4			
	0:358	14:23	20:35	2:27	8:21	14:46	20:20	2:45	8:16	14:12	20:15	2:12	8:06	14:01	20:06	2:00	8:23	14:25	20:27	2:24
Time/Hour	0:358	14:23	20:35	2:27	8:21	14:46	20:20	2:45	8:16	14:12	20:15	2:12	8:06	14:01	20:06	2:00	8:23	14:25	20:27	2:24
Temperature °C	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
pH	7.7	7.3	7.7	7.3	7.3	7.5	7.5	7.7	7.3	7.3	7.5	7.5	7.3	7.5	7.3	7.3	7.3	7.5	7.5	7.5
Conductivity Umhos/cm ³	350	350	390	375	400	400	400	400	550	550	550	575	425	400	400	425	550	550	550	550
Suspended Solid mg/l	574	404	172	136	142	704	80	72	576	508	272	174	532	610	106	120	722	534	72	274
Ammonia mg/l	0.372	0.319	0.479	0.585	0.319	0.266	0.745	0.585	2.208	3.710	2.373	3.191	0.745	1.276	1.363	1.223	0.426	0.426	0.501	0.745
Nitrat mg/l	3.529	3.259	3.259	3.529	3.529	4.412	10.587	1.412	3.529	3.529	10.537	0.0	0.0	1.412	7.053	1.412	8.529	7.053	7.053	10.537
Nitrit mg/l	0.05	0.044	0.063	0.038	0.059	0.375	0.131	0.1	0.114	0.121	0.223	0.131	0.338	0.21	0.275	0.125	0.181	0.223	0.275	0.233
Phosphat mg/l	0.521	0.021	0.013	0.017	0.015	0.015	0.013	0.013	0.008	0.013	0.008	0.008	0.017	0.017	0.013	0.003	0.015	0.008	0.003	0.008
Chlorida mg/l	10.554	10.554	10.554	14.072	14.072	14.072	14.072	14.072	24.626	24.626	24.626	24.626	17.59	21.108	14.072	14.072	21.108	33.144	24.626	21.103
DO mg/l	5.00	5.7	9.95	6.25	4.2	2.6	5.1	5.05	2.45	2.6	2.3	2.3	1.25	2.15	0.25	1.7	3.7	4.05	4.15	4.6
SOD mg/l	55.08	55.08	41.381	32.25	36.221	101.333	35.672	34.532	108.733	122.573	115.632	108.733	137.272	123.573	100.743	13.042	87.643	77.642	66.495	12.12
COD mg/l	3.094	6.189	9.233	7.736	4.462	0.0	7.736	9.233	12.378	15.472	9.293	6.139	6.189	3.098	6.189	3.094	3.094	3.094	6.18	0.233
Coliform MPN 100 ml	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
E. Coli MPN	0	0	0	0	2,100	2,100	2,100	2,100	880	880	880	880	880	880	880	880	880	880	880	880

Table B.2.5(2) River Water Quality in December, 1987

Oongan River

Location No.	O-1				O-2			
	7:47	10:54	13:54	19:58	8:12	14:10	20:13	9:09
Time/Hour	7:47	10:54	13:54	19:58	8:12	14:10	20:13	9:09
Temperatur °C	27	27	27	27	27	27	27	27
pH	7.7	7.8	7.7	7.5	7.1	7.5	7.3	7.3
Conductivity Umhos/cm3	300	275	300	260	550	600	450	500
Suspended Solid mg/l	316	172	584	112	230	694	248	163
Amonia mg/l	0.606	0.638	0.319	0.691	5.404	5.745	4.628	4.468
Nitrat mg/l	7.058	0	3529	0	3.529	7.058	3.529	0
Nitrit mg/l	0.038	0.069	0.038	0.088	0.040	0.038	0.188	0.031
Phosphat mg/l	0.035	0.021	0.017	0.025	0.025	0.021	0.008	0.013
Chlorida mg/l	7.736	10.554	7.036	10.554	24.626	31.662	24.626	34.636
TD mg/l	6.30	6.65	6.45	6.30	0.0	0.0	1.70	0.30
BOD mg/l	20.833	26.541	32.249	32.248	150.970	168.094	138.413	148.689
COD mg/l	10.83	6.189	6.189	10.83	9.283	13.925	4.642	3.094
Coliform MPN 100 ml	960	380	380	960	2,400	380	2,400	88
E. Coli MPN	960	960	960	960	500	500	500	500

Mati River

Location No.	M-1				M-2				M-3			
	7:46	13:10	19:45	1:45	8:35	14:20	20:35	2:13	10:10	16:05	22:05	4:05
Time/Hour	7:46 <td>13:10 <td>19:45 <td>1:45 <td>8:35 <td>14:20 <td>20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td></td></td></td></td></td></td>	13:10 <td>19:45 <td>1:45 <td>8:35 <td>14:20 <td>20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td></td></td></td></td></td>	19:45 <td>1:45 <td>8:35 <td>14:20 <td>20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td></td></td></td></td>	1:45 <td>8:35 <td>14:20 <td>20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td></td></td></td>	8:35 <td>14:20 <td>20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td></td></td>	14:20 <td>20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td></td>	20:35 <td>2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td></td>	2:13 <td>10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td></td>	10:10 <td>16:05 <td>22:05 <td>4:05</td> </td></td>	16:05 <td>22:05 <td>4:05</td> </td>	22:05 <td>4:05</td>	4:05
Temperatur °C	27	27	27	27	27	27	27	27	27	27	27	27
pH	7.5	7.5	7.7	7.7	7.3	7.5	7.6	7.4	7.7	7.6	7.7	7.6
Conductivity Umhos/cm3	400	350	400	400	550	450	400	400	400	425	450	425
Suspended Solid mg/l	448	404	182	252	722	572	194	340	346	624	1	538
Amonia mg/l	0.60	0.383	0.691	0.585	0.426	1.499	2.128	2.553	1.223	0.287	0.287	2
Nitrat mg/l	1.412	0.0	14.116	3.599	3.2	8.47	10.587	22.586	10.537	22.582	15.527	10.587
Nitrit mg/l	0.033	0.056	0.063	0.050	0.481	0.125	0.215	0.200	0.135	0.137	0.055	0.036
Phosphat mg/l	0.025	0.017	0.013	0.017	0.013	0.029	0.050	0.067	0.0	0.018	0.018	0.003
Chlorida mg/l	10.554	14.072	14.072	10.554	21.108	21.108	17.59	14.072	351.305	17.168.084	24.626	45.735
TD mg/l	5.40	4.40	5.10	5.40	3.70	2.30	3.40	2.90	6.30	6.65	6.45	6.30
BOD mg/l	43.664	69.62	47.088	43.665	8.043	104.167	88.185	114.441	33.39	0.285	42.521	33.39
COD mg/l	6.189	0.0	21.661	10.33	3.094	12.378	15.472	9.283	0.0	7.736	7.6	4.642
Coliform MPN 100 ml	2,400	2,400	2,400	2,400	2,400	880	2,400	960	2,400	2,400	2,400	2,400
E. Coli MPN	0	0	0	0	880	880	880	880	-	-	-	-

Table B.2.6 Observed River Water Quality by JICA in Dry Season

Date of Sampling : October 29, 1991

Weather : Fine

SAMPLING POINT NO.	LOCATION/RIVER	TIME (local)	AIR TEMPERATURE (C)	WATER TEMPERATURE (C)	pH	TURBIDITY (NTU)	SS (PPM)	DO (PPM)	BOD5 (PPM)	CODcr (PPM)	NH4-N (PPM)	NO2-N (PPM)	NO3-N (PPM)	T-N (PPM)	T-P (PPM)	n-HEXAN EXTRACTS (PPM)	FECAL COLIFORM (N/100 ml)
1	Ayung River	12:00	35	28	7.9	65.6	0.0	6.5	6.0	14.8	0.0	ND	4.50	5.34	0.060	ND	3,900
2	Ayung River	14:00	37	29	8.3	15.6	2.8	6.9	4.1	5.0	0.0	ND	5.10	6.11	0.530	2.2	10,000
3	Ayung River	12:25	34	31	8.1	68.8	11.0	6.6	3.1	14.8	0.0	ND	4.80	5.72	0.060	4.0	19,000
4	Ayung River	11:45	39	30	7.7	12.5	0.8	6.6	5.0	24.8	0.0	0.6	33.70	40.45	0.090	ND	50,000
5	Abian Base River	12:35	35	29	7.9	100.0	31.0	6.6	5.0	14.8	0.0	ND	7.20	8.59	0.060	ND	19,000
6	Abian Base River	13:05	35	29	7.7	343.8	0.0	6.3	7.2	12.2	0.0	ND	8.00	9.54	0.060	ND	20,000
7	Abian Base River	11:25	35	28	7.4	15.6	1.6	5.4	6.7	15.2	0.0	ND	4.00	4.77	0.080	ND	20,000
8	Loloan River	17:23	31	29	7.3	56.3	0.3	4.2	21.3	33.9	0.0	0.001	4.10	4.96	0.050	ND	25,000
9	Loloan River	17:40	31	32	7.7	6.3	14.4	0.0	22.0	52.2	6.8	ND	ND	8.17	0.330	ND	28,000
10	Punggawa River	12:55	35	28	8.0	15.6	1.0	5.2	22.3	38.2	0.0	0.165	10.70	12.98	0.050	ND	25,000
11	Punggawa River	17:15	32	30	7.5	9.4	5.4	3.7	29.2	70.1	0.3	0.074	4.10	5.41	0.030	ND	28,000
12	Punggawa River	17:48	30	32	7.5	37.5	11.0	4.2	24.0	39.2	0.1	0.095	1.60	2.14	0.050	1.3	22,000
13	Oongan River	16:40	34	31	7.5	25.0	2.4	0.0	50.4	80.2	3.9	0.008	ND	4.71	0.100	5.7	2,800,000
14	Pekasih River	15:35	35	30	7.4	37.5	90.4	0.0	35.2	70.4	4.8	ND	ND	5.71	0.150	1.3	300,000
15	Pekasih River	18:00	30	32	7.4	15.6	10.6	2.2	24.0	29.7	3.8	0.044	ND	4.65	0.070	ND	22,000
16	Badung River	14:50	36	28	8.1	328.1	17.0	6.7	4.1	24.8	0.0	ND	11.40	13.74	0.040	ND	8,000
17	Badung River	15:20	38	30	7.7	18.8	20.2	4.3	13.2	22.4	2.4	0.047	10.80	15.89	0.050	ND	110,000
18	Badung River	15:55	33	30	7.7	6.3	15.0	0.0	29.8	50.7	1.5	0.019	ND	1.86	0.070	ND	130,000
19	Badung River	10:55	40	30	7.8	59.4	29.6	5.8	33.6	49.5	1.7	0.003	ND	2.85	0.040	ND	29,000
20	Teba River	14:20	34	28	7.9	3.1	17.8	6.1	3.1	9.9	0.0	0.013	8.00	9.56	0.050	ND	19,000
21	Teba River	16:08	33	30	7.5	18.8	21.2	0.0	13.5	43.1	3.1	0.021	ND	3.70	0.060	ND	710,000
22	Mati River	14:35	35	27	7.9	28.1	26.4	6.8	5.0	10.6	0.0	ND	7.60	9.16	0.050	ND	13,000
23	Mati River	16:20	31	29	7.8	406.3	34.2	5.9	7.8	13.3	0.0	0.038	14.60	17.68	0.060	ND	20,000
24	Mati River	10:45	32	29	7.6	37.5	64.0	4.5	11.6	34.6	0.5	ND	ND	8.65	0.050	ND	21,000
25	Sama River	10:20	34	29	7.6	31.3	17.1	6.2	4.1	5.0	0.0	ND	ND	8.80	0.010	9.4	40,000

Table B.2.7 Observed River Water Quality by JICA in Rainy Season

Date of Sampling : January 14, 1992

Weather : Cloudy/Fine

SAMPLING POINT NO.	LOCATION/RIVER	TIME (local)	AIR TEMPERATURE (C)	WATER TEMPERATURE (C)	pH	TURBIDITY (NTU)	SS (PPM)	DO (PPM)	BOD5 (PPM)	CODcr (PPM)	NH4-N (PPM)	NO2-N (PPM)	NO3-N (PPM)	T-N (PPM)	T-P (PPM)	n-HEXAN EXTRACTS (PPM)	FECAL COLIFORM (N/100 ml)
1	Ayung River	11:55	33	30	7.9	22.3	70.0	7.7	5.2	22.6	2.80	0.025	1.20	5.12	0.106	1.2	5,700
2	Ayung River	14:05	34	29	8.0	6.0	35.0	7.9	5.5	20.9	1.85	0.010	1.00	3.51	0.050	ND	27,000
3	Ayung River	12:20	37	30	7.5	39.0	91.0	6.8	5.0	19.8	3.35	0.012	0.85	4.48	0.043	ND	9,800
4	Ayung River	11:40	35	29	7.9	13.0	55.0	7.5	4.6	27.0	3.30	0.007	0.85	5.51	0.119	ND	28,000
5	Abian Base River	12:30	34	29	7.4	23.1	69.0	8.0	4.5	32.0	1.55	0.010	0.85	3.47	0.043	ND	12,000
6	Abian Base River	13:00	36	30	7.5	39.0	205.0	7.6	6.2	38.5	0.75	0.012	1.50	2.12	0.177	2.0	28,000
7	Abian Base River	11:15	35	29	7.1	27.9	1.2	6.4	15.6	42.9	1.75	0.028	1.20	3.12	0.115	3.2	23,000
8	Loloan River	17:30	32	30	7.0	4.8	67.0	6.1	14.4	35.0	0.75	0.028	1.00	2.43	0.044	3.2	21,000
9	Loloan River	17:45	32	31	7.0	3.5	29.0	4.2	26.5	48.0	1.80	0.025	0.50	2.91	0.115	2.4	12,000
10	Punggawa River	12:50	37	30	7.6	33.3	52.0	7.2	16.0	25.0	0.75	0.012	1.20	2.67	0.042	ND	27,000
11	Punggawa River	17:20	30	29	7.2	8.3	34.0	5.1	23.1	62.9	0.75	0.012	1.75	3.54	0.190	ND	22,000
12	Punggawa River	17:55	31	31	7.3	9.5	55.0	5.4	22.8	57.3	1.20	0.010	0.85	2.32	0.115	ND	27,000
13	Oongan River	16:45	33	31	7.2	25.0	38.0	1.6	50.5	94.5	7.80	0.012	0.25	10.92	0.389	ND	190,000
14	Pekasih River	15:45	32	30	7.1	36.1	49.0	1.1	39.0	61.5	9.00	0.012	0.25	12.13	0.431	ND	490,000
15	Pekasih River	18:10	28	31	7.1	3.5	7.4	3.8	33.8	45.8	3.30	0.010	0.35	4.27	0.472	ND	23,000
16	Badung River	15:00	35	28	7.7	10.7	49.0	7.7	4.2	11.8	1.55	0.010	0.85	3.16	0.032	ND	27,000
17	Badung River	15:30	33	31	7.4	6.0	28.0	2.8	19.8	33.7	1.90	0.012	1.20	3.80	0.240	0.4	23,000
18	Badung River	16:00	33	31	7.3	3.0	26.0	1.3	32.1	67.5	3.30	0.010	0.35	4.74	0.271	ND	21,000
19	Badung River	10:50	35	30	7.2	4.0	35.0	5.2	21.3	30.8	1.55	0.012	0.85	3.28	0.200	ND	19,000
20	Teba River	14:30	35	29	7.8	12.5	50.0	7.1	6.2	20.9	1.55	0.012	1.00	3.16	0.051	ND	88,000
21	Teba River	16:15	32	30	7.3	7.3	35.0	1.5	14.2	26.3	9.00	0.012	0.85	11.84	0.938	7.2	120,000
22	Mati River	14:45	35	27	7.8	10.5	22.0	8.2	3.2	20.3	1.85	0.007	0.85	3.15	0.032	2.0	20,000
23	Mati River	16:25	35	28	7.5	20.0	30.0	5.0	11.9	28.3	1.40	0.012	0.85	2.60	0.043	ND	14,000
24	Mati River	10:30	34	29	7.6	14.0	19.0	3.9	17.2	24.5	0.75	0.025	1.20	2.50	0.204	ND	110,000
25	Sarna River	10:15	32	28	8.1	8.1	107.0	8.2	2.7	16.6	1.40	0.012	1.20	3.36	0.009	ND	260,000

Table B.2.8 (1) Color and Smell of River Water by Kelurahan/Desa

Code No. of Kelurahan/Desa	Color					Smell		
	Green & Clear	Light Brown	Dark Brown	Gray	Black	No Smell	Slight Smell	Strong Smell
101					**		**	
102		*					*	
103					*		*	
104		*					*	
105	—	—	—	—	—	—	—	—
106				*	*			**
107		**	*			**	*	
108		*		*			*	*
109		*					*	
110	*					*		
111	*					*		
112	*						*	
113		*	*				*	*
114			*				*	
115		*	*			*	*	
116	*	*				**		
117			*				*	
118			**					**
100	15 %	35 %	27 %	8 %	15 %	27 %	50 %	23 %
210	*						*	
202	—	—	—	—	—	—	—	—
203	—	—	—	—	—	—	—	—
204		*					*	
205		*					*	
206		*				*		
207	*						*	
208		*					*	
209	**						**	
210				*			*	
211	*					*		
212		*					*	
213		*				*		
214	**					**		
215	*					*		
200	53 %	40 %	0 %	7 %	0 %	40 %	60 %	0 %

Table B.2.8 (2) Color and Smell of River Water by Kelurahan/Desa

Code No. of Kelurahan/Desa	Color					Smell		
	Green & Clear	Light Brown	Dark Brown	Gray	Black	No Smell	Slight Smell	Strong Smell
301	-	-	-	-	-	-	-	-
302	-	-	-	-	-	-	-	-
303				*			*	
304				*	*		**	
305				**			**	
306				*			*	
307	*			*		*	*	
308					*			*
309					*		*	
310	-	-	-	-	-	-	-	-
300	10 %	0 %	0 %	60 %	40 %	10 %	80 %	10 %
401	**					**		
402	*					*		
403		*					*	
404		*					*	
405	-	-	-	-	-	-	-	-
406	-	-	-	-	-	-	-	-
407	-	-	-	-	-	-	-	-
400	60 %	40 %	0 %	0 %	0 %	60 %	40 %	0 %
Total	27 %	30 %	13 %	16 %	14 %	20 %	57 %	13 %

- Note :
- 1 Results of the interview survey conducted toward the chairmen of Kelurahan/Desa on Jan. 16 to 24, 1992.
 - 2 The asterisk signifies the affirmative reply from the chairman of a Kelurahan/Desa regarding a particular water color or smell of a river flowing across the Kelurahan/Desa.
If there are more than one asterisk regarding a particular water color or smell in a Kelurahan/Desa, it means that there flow more than one major river across the Kelurahan/Desa and the particular water color or smell applies to more than one river.
 - 3 A percentage expresses the ratio of affirmative replies regarding a particular water color or smell of rivers flowing in a Kecamatan or the Study Area.

Source : JICA

Table B.2.9(1) Color and Smell of River Water by River

River	Code No. of Kelurahan/Desa	Color					Smell		
		Green & Clear	Light Brown	Dark Brown	Gray	Black	No Smell	Slight Smell	Strong Smell
1. Abian Base	211	*					*		
	Total	100%	0%	0%	0%	0%	100%	0%	0%
2. Badung	116		*				*		
	109		*					*	
	115		*				*		
	102		*					*	
	107		*				*		
	106					*			*
	104		*					*	
	101					*		*	
	108				*				*
	103					*		*	
	308					*			*
	309					*		*	
	Total	0%	50%	0%	8%	42%	25%	50%	25%
3. Loloan	210				*			*	
	209	*						*	
	304					*		*	
	303				*			*	
	Total	25%	0%	0%	50%	25%	0%	100%	0%
4. Mati	401	*					*		
	113		*					*	
	107		*				*		
	112	*						*	
	117			*				*	
	118			*					*
	114			*				*	
	404		*					*	
Total	24%	38%	38%	0%	0%	25%	63%	12%	
5. Oongan	206		*				*		
	208		*					*	
	207	*						*	
	204		*					*	
	201	*						*	
	101					*		*	
	Total	33%	50%	0%	0%	17%	17%	83%	0%
6. Pengegeh	214	*					*		
	215	*					*		
	Total	100%	0%	0%	0%	0%	100%	0%	0%

Table B.2.9(2) Color and Smell of River Water by River

River	Code No. of Kelurahan/Desa	Color					Smell		
		Green & Clear	Light Brown	Dark Brown	Gray	Black	No Smell	Slight Smell	Strong Smell
7. Punggawa	209	*						*	
	304				*			*	
	305				*			*	
	307	*					*		
	Total	50%	0%	0%	50%	0%	25%	75%	0%
8. Rangda	205		*					*	
	305				*			*	
	306				*			*	
	307				*			*	
	Total	0%	25%	0%	75%	0%	0%	100%	0%
9. Teba	113			*					*
	116	*					*		
	115		*					*	
	107			*				*	
	106				*				*
	118			*					*
	108		*					*	
	Total	14%	29%	43%	14%	0%	14%	43%	43%
## Yeh Ayung	110	*					*		
	111	*					*		
	214	*					*		
	213		*				*		
	212		*					*	
	Total	60%	40%	0%	0%	0%	80%	20%	0%
## Yeh Poh	401	*					*		
	402	*					*		
	403		*					*	
	Total	67%	33%	0%	0%	0%	67%	33%	0%

Notes : 1) Results of the interview survey conducted toward the chairmen of Kelurahan/Desa. The asterisk signifies the affirmative reply from the chairman of a Kelurahan/Desa regarding a particular water color or smell of a river.

2) A percentage expresses the ratio of affirmative replies regarding a particular water color or smell of a river.

Source : JICA

Table B.2.10 (1) Uses of Rivers by Kelurahan/Desa

Code No. of Kelurahan/Desa	Uses of River										No Uses	
	Transport	Washing	Bathing	Drinking/ Cooking	Agriculture	Industrial Water	Recreation	Fisheries	Wastewater/ Refuse Disposal	Garbage Dumping		
101					**				**			
102		*	*				*		*			
103		*			*				*			
104		*	*						*			
105	-	-	-	-	-	-	-	-	-	-	-	-
106									**			
107		***	***		*				**			
108					*		**		*			
109		*	*		*		*					
110		*	*		*		*					
111		*	*		*							
112					*		*		*			
113		**	**		*		*					
114		*	*		*		*		*			
115		*	*		*				**			
116		**	**		**				**			
117												*
118		**			**		**		**			
100	0 %	65 %	54 %	0 %	62 %	4 %	38 %	12 %	69 %	0 %	4 %	

Table B.2.10 (2) Uses of Rivers by Kelurahan/Desa

Code No. of Kelurahan/ Desa	Uses of River										No Uses	
	Transport	Washing	Bathing	Drinking/ Cooking	Agriculture	Industrial Water	Recreation	Fisheries	Wastewater/ Refuse Disposal	Garbage Dumping		
201									*			
202	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-
204		*	*		*				*	*		
205												*
206		*	*		*							
207					*							
208		*	*		*							
209		**	**		**							
210		*	*		*				*	*		
211		*	*		*							
212			*				*		*			
213					*		*					
214		**	**		**							
215		*	*		*		*		*			
200	0 %	67 %	60 %	0 %	73 %	0 %	20 %	7 %	33 %	13 %	7 %	
301	-	-	-	-	-	-	-	-	-	-	-	-
302	-	-	-	-	-	-	-	-	-	-	-	-
303					*		*					
304		**	**		**			**	**			

Table B.2.10 (3) Uses of Rivers by Kelurahan/Desa

Code No. of Kelurahan/Desa	Uses of River										No Uses	
	Transport	Washing	Bathing	Drinking/Cooking	Agriculture	Industrial Water	Recreation	Fisheries	Wastewater/Refuse Disposal	Garbage Dumping		
305					**				**			
306					*		*		*			
307					*		*					*
308		*			*		*		*		*	
309		*	*		*		*		*			
310	-	-	-	-	-	-	-	-	-	-	-	-
300	0 %	40 %	30 %	0 %	90 %	0 %	50 %	30 %	70 %	0 %	10 %	
401		*	**		**		**					
402		*	*		*		*		*			
403		*	*		*		*		*			
404		*	*		*		*		*			
405	-	-	-	-	-	-	-	-	-	-	-	-
406	-	-	-	-	-	-	-	-	-	-	-	-
407	-	-	-	-	-	-	-	-	-	-	-	-
400	0 %	80 %	100 %	0 %	100 %	0 %	100 %	10 %	60 %	0 %	0 %	
Total	0 %	62 %	55 %	0 %	73 %	2 %	41 %	14 %	59 %	3 %	5 %	

Notes : 1) Results of the interview survey conducted toward the chairmen of Kelurahan/Desa on Jan. 16 to 24, 1992.
 2) The asterisk signifies the affirmative reply from the chairman of a Kelurahan/Desa regarding a particular use of a river flowing across the Kelurahan/Desa. If there are more than one asterisk for a particular river use in a Kelurahan/Desa, it means that there flow more than one major river across the Kelurahan/Desa and the particular river use applies to more than one river.
 3) A percentage expresses the ratio of affirmative replies regarding a particular use of rivers flowing in a Kecamatan or the Study Area.

Source : JICA

Table B.2.11 (1) Uses of Rivers by River

River	Code No. of Kelurahan/Desa	Uses of River													
		Transport	Washing	Bathing	Drinking/ Cooking	Agriculture	Industrial Water	Recreation	Fisheries	Wastewater/ Refuse Disposal	Garbage Dumping	No Uses			
1. Abianbase	211		*	*											
	Total	0 %	100 %	100 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
2. Badung	116		*	*		*				*		*			
	109		*	*		*				*					
	115		*	*							*				
	102		*	*				*							
	107		*	*							*				
	106										*				
	104		*	*						*					
3. Loloan	101							*							
	108								*						
	103							*							
	308		*					*		*					
	309		*	*				*		*					
	Total	0 %	67 %	58 %	0 %	50 %	0 %	42 %	17 %	83 %	0 %	0 %	0 %	0 %	0 %
	210		*	*		*			*		*		*		
4. Mati	209		*			*									
	304		*	*		*		*		*		*			
	303					*		*		*					
Total	0 %	75 %	50 %	0 %	100 %	0 %	25 %	25 %	50 %	25 %	25 %	0 %	0 %	0 %	
401			*		*		*		*						
113			*				*								
107		*	*			*									
112							*		*		*				

Table B.2.11 (2) Uses of Rivers by River

River	Code No. of Kelurahan/Desa	Uses of River										No Uses		
		Transport	Washing	Bathing	Drinking/ Cooking	Agriculture	Industrial Water	Recreation	Fisheries	Wastewater/ Refuse Disposal	Garbage Dumping			
(4. Mati)	117												*	
	118		*			*			*				*	
	114		*	*		*			*				*	
	404		*	*		*			*				*	
	Total	0 %	63 %	63 %	0 %	75 %	0 %	0 %	75 %	25 %	50 %	13 %	0 %	
5. Oongan	206		*	*		*			*					
	208		*	*		*			*					
	207					*			*					
	204		*	*		*			*				*	
	201					*			*				*	
6. Pengegeh	101		*			*			*				*	
	Total	0 %	67 %	50 %	0 %	83 %	0 %	0 %	0 %	50 %	17 %	0 %	17 %	
	214		*	*		*			*					
	215		*	*		*			*					
	Total	0 %	100 %	100 %	0 %	100 %	0 %	0 %	50 %	0 %	50 %	0 %	0 %	
7. Punggawa	209		*			*			*					
	304		*	*		*			*				*	
	305					*			*				*	
	307					*			*				*	
	Total	0 %	50 %	25 %	0 %	100 %	0 %	25 %	25 %	50 %	0 %	0 %	0 %	
8. Rangda	205					*			*				*	
	305					*			*				*	
	306					*			*				*	
	307					*			*				*	
	Total	0 %	0 %	0 %	0 %	50 %	0 %	25 %	0 %	50 %	50 %	50 %	0 %	

Table B.2.11 (3) Uses of Rivers by River

River	Code No. of Kelurahan/Desa	Uses of River														
		Transport	Washing	Bathing	Drinking/ Cooking	Agriculture	Industrial Water	Recreation	Fisheries	Wastewater/ Refuse Disposal	Garbage Dumping	No Uses				
9. Tega	113		*	*		*										
	116		*	*		*						*				
	115					*						*				
	107		*	*								*				
	106											*				
10. Yeh Ayung	118		*			*		*				*				
	108					*		*								
	Total	0 %	57 %	43 %	0 %	71 %	0 %	29 %	14 %	71 %	0 %	0 %	0 %			
	110		*	*		*	*	*								
	111		*	*		*										
11. Yeh Poh	214		*	*		*		*								
	213					*		*				*				
	212			*				*	*			*				
	Total	0 %	60 %	80 %	0 %	80 %	20 %	60 %	20 %	20 %	0 %	0 %	0 %			
	401		*	*		*	*	*								
402		*	*		*	*	*				*					
403		*	*		*	*	*				*					
Total	0 %	100 %	100 %	0 %	100 %	0 %	100 %	0 %	0 %	67 %	0 %	0 %				

Notes : 1) Results of the interview survey conducted toward the chairman of Kelurahan/Desa. The asterisk signifies the affirmative reply from the chairman of a Kelurahan/Desa regarding a particular use of a river.

2) A percentage expresses the ratio of affirmative replies regarding a particular use of a river.

Source : JICA

Table B.2.12 Average Monthly Intake Volume by Season by Intake Site

River : Ayung

Intake Site : Mambal

Unit : m³/s

	Dry Season						Rainy Season						Average
Month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	-
Q	3.795	3.687	3.600	3.569	3.150	3.268	3.138	3.983	4.418	4.226	4.312	4.261	-
Average	3.512						4.056						3.784

River : Ayung

Intake Site : Peraupan

Unit : m³/s

	Dry Season						Rainy Season						Average
Month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	-
Q	0.587	0.578	0.537	0.554	0.566	0.552	0.532	0.548	0.441	0.545	0.564	0.592	-
Average	0.562						0.537						0.550

River : Ayung

Intake Site : Oongan

Unit : m³/s

	Dry Season						Rainy Season						Average
Month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	-
Q	2.601	2.425	2.186	1.571	1.856	1.596	1.741	2.619	3.311	3.605	3.622	2.939	-
Average	2.039						2.973						2.506

River : Badung

Intake Site : Merta Gangga

Unit : m³/s

	Dry Season						Rainy Season						Average
Month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	-
Q	0.638	0.762	0.639	0.664	0.660	0.635	0.684	0.702	0.708	0.682	0.678	0.659	-
Average	0.666						0.686						0.676

River : Badung

Intake Site : Tukad Badung

Unit : m³/s

	Dry Season						Rainy Season						Average
Month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	-
Q	1.389	1.123	1.010	0.766	0.715	0.709	1.017	1.937	0.986	1.474	1.402	1.128	-
Average	0.952						1.324						1.138

Table B.3.3(1) Observed Sea Water Quality by JICA in 1991
Date of Sampling : November 5, 6, 7, 12, 1991

LOCATION NO.	LOCATION/SEA		DATE	TIME	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	PH	TURBIDITY (NTU)	SS (PPM)	DO (PPM)	COD _{Mn} (PPM)	NO ₂ -N (PPM)	NO ₃ -N (PPM)	T-N (PPM)	T-P (PPM)	p-HEXAN EXTRACTS (PPM)	FECAL COLIFORM (N/100 ml)
	EAST LATITUDE	SOUTH LATITUDE															
I. Sanur - Nusa Dua (36 points)																	
A0(D)	115°16'20"	8°40'48"	5-Nov	14:50	30.0	27.0	7.9	0.52	6.6	7.2	6.5	0.0	0.0	0.50	0.030	ND	2.2
A1	115°15'50"	8°40'00"	5-Nov	10:18	27.0	25.5	8.0	0.60	3.2	7.2	8.5	0.0	0.0	0.64	0.055	3.98	0.0
A2	115°17'00"	8°40'00"	5-Nov	10:34	27.0	26.0	8.0	0.38	0.6	7.4	3.2	0.0	0.0	0.31	0.025	1.68	0.0
A3	115°18'00"	8°40'00"	5-Nov	14:35	28.0	27.0	8.0	0.50	1.0	7.0	1.6	0.0	0.0	0.35	0.020	ND	0.0
D1	115°15'54"	8°41'00"	5-Nov	11:25	28.0	27.1	8.0	0.82	6.8	7.4	8.1	0.4	0.0	0.79	0.110	ND	21.0
D2	115°16'35"	8°41'00"	5-Nov	13:15	28.3	27.1	8.0	0.44	6.2	7.2	4.8	0.0	0.0	0.61	0.075	1.00	0.0
D3	115°17'05"	8°41'00"	5-Nov	15:00	28.1	28.0	8.0	0.42	6.0	7.3	4.8	0.0	0.0	0.50	0.060	ND	0.0
G1	115°16'01"	8°42'00"	5-Nov	11:54	28.0	27.2	8.0	1.20	7.8	7.8	8.5	0.8	0.0	0.80	0.150	1.50	2.2
G2	115°16'05"	8°42'00"	5-Nov	12:03	28.4	27.2	8.1	0.90	7.0	7.6	5.3	0.8	0.0	0.84	0.075	ND	0.0
G3	115°16'37"	8°42'00"	5-Nov	13:35	27.6	27.0	8.0	0.32	3.0	7.5	4.0	0.0	0.0	0.58	0.060	ND	0.0
J0(C)	115°14'29"	8°43'18"	5-Nov	16:46	28.0	31.0	8.0	1.33	9.8	7.5	9.7	1.0	0.1	1.53	0.085	3.06	21.0
J1	115°14'50"	8°43'00"	6-Nov	9:15	24.0	25.1	8.0	0.80	1.8	7.2	4.2	12.0	0.0	0.46	0.060	2.28	0.0
J2	115°15'30"	8°43'00"	6-Nov	9:06	23.9	24.0	8.1	0.63	3.6	7.4	3.9	0.8	0.0	71.00	0.035	1.00	0.0
J3	115°15'45"	8°43'00"	6-Nov	9:00	23.9	24.0	8.1	0.62	1.2	7.3	2.4	0.8	0.0	0.75	0.035	1.42	245.0
J4	115°16'20"	8°43'00"	5-Nov	16:20	27.0	25.0	8.1	0.10	7.4	7.6	1.6	0.8	0.0	0.80	0.035	ND	0.0
J5	115°16'40"	8°43'00"	5-Nov	15:25	27.5	26.2	8.1	0.31	5.0	7.7	1.6	0.0	0.0	0.55	0.090	ND	0.0
M1	115°13'00"	8°44'00"	6-Nov	10:24	26.1	25.0	8.1	0.89	4.2	7.0	4.2	2.0	0.0	0.51	0.060	ND	0.0
M2	115°14'40"	8°44'00"	6-Nov	9:30	25.0	24.0	8.1	1.01	7.6	7.2	7.9	2.0	0.0	0.34	0.055	ND	21.0
M3	115°14'50"	8°44'00"	6-Nov	9:35	25.0	24.0	8.0	1.13	3.2	7.5	6.3	0.0	0.0	0.75	0.050	ND	2.2
M4	115°15'45"	8°44'00"	5-Nov	15:45	29.0	26.0	8.0	0.20	1.8	7.4	1.2	0.8	0.0	0.71	0.030	ND	0.0
PO(E)	115°16'54"	8°43'48"	7-Nov	11:06	23.7	24.0	8.0	0.33	0.6	7.8	3.9	0.0	0.0	0.47	0.030	ND	0.0
P1	115°13'30"	8°45'00"	5-Nov	17:30	27.2	26.0	8.1	1.90	9.6	7.7	25.3	2.0	0.0	0.89	0.100	ND	240.0
P2	115°14'00"	8°45'00"	6-Nov	9:56	27.0	26.0	8.1	1.75	7.8	7.2	13.4	0.0	0.0	0.45	0.070	3.06	120.0
P3	115°14'30"	8°45'00"	5-Nov	17:10	25.6	25.0	8.1	0.22	0.6	7.2	1.6	0.0	0.0	0.50	0.050	2.20	0.0
S1	115°13'31"	8°45'46"	6-Nov	13:41	24.5	25.0	8.2	0.80	4.0	7.8	5.5	0.4	0.0	0.47	0.090	1.18	2.0
S2	115°13'25"	8°46'00"	7-Nov	8:50	23.7	24.3	8.0	0.28	0.8	7.6	2.8	0.4	0.0	0.30	0.085	ND	0.0
S3	115°14'30"	8°46'00"	6-Nov	12:20	24.0	24.8	8.1	0.35	4.0	7.1	3.1	0.0	0.0	0.54	0.070	ND	0.0

Table B.3.3(2) Observed Sea Water Quality by JICA in 1991
Date of Sampling : November 5, 6, 7, 12, 1991

LOCATION NO.	LOCATION/SEA		DATE	TIME	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	pH	TURBIDITY (NTU)	SS (PPM)	DO (PPM)	COD _{Mn} (PPM)	NO ₂ -N (PPM)	NO ₃ -N (PPM)	T-N (PPM)	T-P (PPM)	p-HEXAN EXTRACTS (PPM)	FECAL COLIFORM (N/100 ml)
	EAST LATITUDE	SOUTH LATITUDE															
V1	115°13'34"	8°47'00"	7-Nov	9:14	24.0	24.3	8.0	0.39	0.4	7.5	3.9	2.0	0.0	0.74	0.070	ND	0.0
V2	115°13'42"	8°47'00"	7-Nov	9:16	24.0	24.0	8.1	0.50	2.2	7.4	3.9	0.8	0.0	0.69	0.040	ND	2.2
V3	115°14'30"	8°47'00"	6-Nov	12:32	24.0	24.0	8.1	0.19	1.6	7.4	3.1	2.0	0.0	0.90	0.020	ND	21.0
Y1	115°14'00"	8°47'46"	7-Nov	9:30	24.0	24.0	8.0	1.00	4.4	7.0	8.7	16.0	0.0	0.50	0.075	ND	0.0
Y2	115°14'20"	8°48'00"	7-Nov	9:42	24.0	23.5	8.1	0.92	3.6	7.5	6.3	0.8	0.0	0.89	0.060	ND	0.0
Y3	115°14'40"	8°48'00"	7-Nov	9:45	23.8	23.5	8.1	0.57	5.2	7.5	5.1	0.0	0.0	0.87	0.035	ND	2.2
B1	115°14'10"	8°49'00"	7-Nov	10:15	23.2	22.3	8.1	0.40	2.8	7.6	3.1	16.0	0.0	0.99	0.085	ND	0.0
B2	115°14'40"	8°49'00"	7-Nov	10:20	23.6	23.8	8.1	0.13	0.4	7.4	1.6	16.0	0.0	0.88	0.060	ND	0.0
B3	115°12'20"	8°49'00"	7-Nov	10:25	23.6	23.9	8.1	0.06	1.2	7.1	0.4	24.0	0.0	0.59	0.055	ND	0.0
2. Benoa Bay (6 points)																	
Nb	115°11'50"	8°44'35"	6-Nov	11:09	28.0	26.0	8.1	0.52	4.6	7.3	4.2	2.0	0.1	0.78	0.070	1.14	0.0
Pb1	115°11'30"	8°44'52"	6-Nov	11:20	28.0	28.0	8.0	0.42	4.2	6.8	4.5	0.0	0.0	0.42	0.045	1.58	0.0
Pb2(B)	115°13'04"	8°45'03"	5-Nov	17:47	27.5	25.5	8.1	1.36	2.0	7.2	12.6	0.8	0.0	0.67	0.080	3.28	21.0
Qb(A)	115°11'57"	8°45'01"	5-Nov	17:40	27.5	29.0	8.0	0.80	6.0	7.1	5.1	0.0	0.0	0.38	0.075	3.08	0.0
Rb	115°11'40"	8°45'25"	6-Nov	11:27	27.2	26.1	8.1	0.63	5.2	7.0	5.9	0.0	0.0	0.67	0.045	7.54	0.0
Tb	115°12'00"	8°45'50"	6-Nov	11:35	27.0	25.8	8.0	0.50	2.8	7.4	4.7	0.8	0.0	0.75	0.055	ND	0.0
3. Kuta (10 points)																	
EK1	115°08'10"	8°41'20"	12-Nov	10:54	28.0	28.0	8.2	0.37	0.0	7.0	3.0	0.8	0.0	0.75	0.065	ND	21.0
EK2	115°08'40"	8°41'20"	12-Nov	10:50	28.0	28.0	8.2	0.40	0.0	7.2	4.1	16.0	0.0	0.84	0.070	1.22	2.2
Ik1	115°09'00"	8°42'20"	12-Nov	11:08	28.0	27.5	8.2	0.57	1.0	7.3	5.1	0.4	0.0	0.79	0.060	ND	2.2
Ik2	115°09'30"	8°42'40"	12-Nov	11:04	27.6	27.5	8.2	0.63	1.2	6.9	6.9	12.0	0.0	0.84	0.075	ND	2.2
Nk1	115°09'00"	8°43'40"	12-Nov	11:24	28.3	28.2	8.2	0.42	0.0	7.0	4.3	0.8	0.0	0.75	0.060	ND	0.0
Nk2	115°09'30"	8°43'40"	12-Nov	11:20	28.5	27.9	8.2	0.28	8.0	7.4	4.7	16.0	0.0	0.72	0.070	1.60	0.0
Ok1	115°08'30"	8°45'20"	12-Nov	11:46	28.0	28.1	8.2	0.19	0.0	6.9	1.8	0.4	0.0	0.56	0.055	ND	0.0
Qk2	115°08'58"	8°45'20"	12-Nov	11:43	28.1	28.0	8.2	0.40	5.4	6.8	3.6	12.0	0.0	0.42	0.060	1.28	21.0
Sk1	115°09'50"	8°45'40"	12-Nov	11:59	27.9	27.9	8.1	0.15	0.4	7.2	1.6	0.0	0.0	0.67	0.085	ND	0.0
Rk1	115°09'20"	8°46'00"	12-Nov	12:04	27.9	28.0	8.0	0.47	1.6	7.3	4.3	0.0	0.0	0.67	0.060	ND	0.0

Table B.3.4 (1) Observed Sea Water Quality by JICA in 1992
Date of Sampling : January 23,24,29 & February 6, 1992

LOCATION NO.	LOCATION/SEA		DATE	TIME	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	pH	TURBIDITY (NTU)	SS (PPM)	DO (PPM)	COD _{Mn} (PPM)	NO ₂ -N (PPM)	NO ₃ -N (PPM)	T-N (PPM)	T-P (PPM)	n-HEXAN EXTRACTS (PPM)	FECAL COLIFORM (NTU/100 ml)
	EAST LATITUDE	SOUTH LATITUDE															
1. Sanur - Nusa Dua (36 points)																	
A0(D)	115°16'20"	8°40'48"	24-Jan	10:35	28.5	28.9	8.3	0.45	4.3	7.1	4.1	0.0	0.1	0.00	0.020	ND	21.0
A1	115°15'50"	8°40'00"	24-Jan	10:45	28.3	29.4	8.3	0.38	5.5	7.1	4.7	0.0	0.3	0.48	0.020	1.6	0.0
A2	115°17'00"	8°40'00"	24-Jan	10:55	28.0	29.0	8.3	0.42	4.4	7.1	3.9	0.2	0.2	0.72	0.010	1.0	2.2
A3	115°18'00"	8°40'00"	24-Jan	11:06	28.1	27.5	8.3	0.40	3.0	7.1	3.1	0.0	0.0	0.00	0.020	ND	0.0
D1	115°15'54"	8°41'00"	29-Jan	13:20	31.0	30.4	8.2	0.50	1.5	7.7	4.2	0.0	0.1	0.02	0.060	2.4	2.2
D2	115°16'35"	8°41'00"	24-Jan	10:26	28.4	29.0	8.3	0.44	5.5	7.2	7.8	0.0	0.1	0.14	0.010	ND	0.0
D3	115°17'05"	8°41'00"	24-Jan	10:17	28.5	29.5	8.3	0.48	5.2	7.3	5.2	0.0	0.1	0.14	0.020	ND	0.0
G1	115°16'01"	8°42'00"	29-Jan	13:35	31.1	32.1	8.4	0.50	3.7	7.6	6.8	0.0	0.0	0.08	0.050	0.8	0.0
G2	115°16'05"	8°42'00"	29-Jan	13:40	30.2	29.5	7.9	0.72	3.5	7.5	6.2	0.0	0.0	0.02	0.070	0.8	5.1
G3	115°16'37"	8°42'00"	23-Jan	15:13	28.5	29.2	8.3	0.45	4.1	7.6	4.7	0.0	0.3	0.28	0.010	ND	0.0
J0(C)	115°14'29"	8°43'18"	29-Jan	14:45	31.2	30.8	8.1	0.98	1.0	7.6	5.2	0.0	0.4	0.88	0.010	5.6	0.0
J1	115°14'50"	8°43'00"	29-Jan	14:35	30.9	32.0	8.3	0.51	0.8	7.6	5.7	0.0	0.0	0.00	0.070	2.7	2.2
J2	115°15'30"	8°43'00"	29-Jan	14:25	30.4	31.5	8.4	1.15	0.7	7.7	2.6	0.0	0.1	0.41	0.050	3.2	5.1
J3	115°15'45"	8°43'00"	24-Jan	11:30	28.5	28.0	8.2	0.54	4.5	7.1	3.6	0.0	0.1	0.14	0.030	ND	0.0
J4	115°16'20"	8°43'00"	23-Jan	14:33	29.0	29.0	8.5	0.21	5.5	7.8	3.1	0.0	0.1	0.28	0.040	3.2	240.0
J5	115°16'40"	8°43'00"	23-Jan	14:49	29.5	29.1	8.5	0.34	5.4	7.8	3.9	0.0	0.0	0.00	0.050	ND	0.0
M1	115°13'00"	8°44'00"	29-Jan	15:17	31.0	30.6	8.2	1.00	2.6	7.6	5.5	0.0	0.4	0.41	0.050	ND	15.0
M2	115°14'40"	8°44'00"	29-Jan	17:21	30.1	29.5	8.2	0.48	2.3	7.8	5.7	0.0	0.0	0.00	0.010	ND	2.2
M3	115°14'50"	8°44'00"	23-Jan	12:24	28.0	30.5	8.3	0.27	4.3	7.8	2.3	0.0	0.0	0.00	0.020	ND	0.0
M4	115°15'45"	8°44'00"	24-Jan	9:45	28.3	28.0	8.3	0.61	4.6	6.9	3.1	0.0	0.2	0.24	0.010	0.4	0.0
PO(E)	115°16'54"	8°43'48"	29-Jan	14:04	30.3	29.1	8.2	0.28	0.8	7.5	2.3	0.0	0.0	0.00	0.070	ND	5.1
P1	115°13'30"	8°45'00"	23-Jan	9:51	28.0	30.5	8.2	0.64	3.5	7.6	11.7	0.0	0.3	0.34	0.040	ND	5.0
P2	115°14'00"	8°45'00"	24-Jan	12:05	29.0	28.6	8.2	0.48	3.4	7.2	7.0	0.0	0.1	0.42	0.010	ND	0.0
P3	115°14'30"	8°45'00"	23-Jan	10:24	28.2	30.0	8.2	0.45	4.3	7.5	4.9	0.0	0.2	0.51	0.020	ND	5.0
S1	115°13'31"	8°45'46"	29-Jan	15:52	31.9	29.2	8.1	0.38	1.0	7.6	4.4	0.0	0.3	0.41	0.050	ND	2.2
S2	115°13'25"	8°46'00"	29-Jan	15:56	31.8	30.3	8.3	0.58	0.1	7.0	4.7	0.0	0.0	0.02	0.070	ND	2.2
S3	115°14'30"	8°46'00"	23-Jan	10:34	28.1	29.8	8.2	0.81	5.1	7.6	4.9	0.1	0.1	0.20	0.030	ND	240.0

Table B.3.4 (2) Observed Sea Water Quality by JICA in 1992
Date of Sampling : January 23,24,29 & February 6, 1992

LOCATION NO.	LOCATION/SEA		DATE	TIME	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	pH	TURBIDITY (NTU)	SS (PPM)	DO (PPM)	COD _{Mn} (PPM)	NO ₂ -N (PPM)	NO ₃ -N (PPM)	T-N (PPM)	T-P (PPM)	α-HEXAN EXTRACTS (PPM)	FECAL COLIFORM (NS/100 ml)
	EAST LATITUDE	SOUTH LATITUDE															
V1	115°13'34"	8°47'00"	29-Jan	16:40	31.1	31.1	8.3	0.37	3.7	7.7	5.2	0.0	0.0	0.00	0.070	ND	0.0
V2	115°13'42"	8°47'00"	29-Jan	16:44	31.0	29.4	8.1	0.39	5.4	7.5	2.6	0.0	0.0	0.00	0.040	ND	5.1
V3	115°14'30"	8°47'00"	23-Jan	10:43	27.9	30.0	8.2	0.23	4.5	7.4	2.3	0.2	0.1	0.27	0.030	ND	38.0
Y1	115°14'00"	8°47'46"	23-Jan	11:31	27.8	29.8	8.2	0.24	5.1	7.6	6.5	0.0	0.2	0.17	0.060	ND	0.0
Y2	115°14'20"	8°48'00"	23-Jan	10:58	27.7	28.0	8.2	0.38	3.0	7.7	6.5	0.0	0.0	0.00	0.020	ND	0.0
Y3	115°14'40"	8°48'00"	23-Jan	10:52	28.0	29.0	8.2	0.20	4.2	7.8	2.6	0.0	0.1	0.17	0.070	ND	4.4
B1	115°14'10"	8°49'00"	23-Jan	11:07	27.5	30.1	8.3	0.38	3.7	7.8	3.4	0.0	0.2	0.17	0.040	ND	0.0
B2	115°14'40"	8°49'00"	23-Jan	11:13	28.0	30.5	8.3	0.23	3.8	7.8	2.9	0.2	0.2	0.51	0.020	ND	0.0
B3	115°15'20"	8°49'00"	23-Jan	11:19	27.4	30.2	8.3	0.34	3.2	7.8	1.6	0.1	0.2	0.34	0.030	ND	0.0
2. Benoa Bay (6 points)																	
Nb	115°11'50"	8°44'35"	24-Jan	13:23	29.0	29.0	8.2	1.24	7.2	7.3	5.5	0.0	0.3	0.28	0.020	1.2	0.0
Pb1	115°11'30"	8°44'52"	24-Jan	13:17	28.9	29.5	8.2	1.00	3.3	7.3	5.0	0.0	0.1	0.56	0.030	ND	0.0
Pb2(B)	115°13'04"	8°45'03"	23-Jan	9:51	28.0	29.5	8.2	0.34	5.1	7.7	9.1	0.0	0.1	0.34	0.020	ND	2.2
Qb(A)	115°11'57"	8°45'01"	24-Jan	12:27	29.0	28.5	8.2	0.88	3.5	7.2	4.9	0.0	0.2	0.20	0.020	ND	0.0
Rb	115°11'40"	8°45'25"	24-Jan	13:10	29.0	28.9	8.3	1.08	1.5	7.2	4.1	0.0	0.1	0.42	0.030	ND	5.0
Tb	115°12'00"	8°45'50"	24-Jan	13:52	30.0	29.2	8.2	0.78	5.6	7.3	5.5	0.2	0.3	0.56	0.020	ND	2.2
3. Kuta (10 points)																	
Ek1	115°08'10"	8°41'20"	6-Feb	10:18	30.8	32.0	8.2	1.28	3.7	7.4	2.6	0.1	0.1	0.18	0.100	4.4	5.0
Ek2	115°08'40"	8°41'20"	6-Feb	10:10	30.6	32.0	8.1	1.00	3.8	7.6	5.7	0.0	0.1	0.18	0.110	ND	7.9
Ik1	115°09'00"	8°42'20"	6-Feb	9:55	30.6	31.5	8.2	0.81	3.2	7.4	5.2	0.1	0.1	0.18	0.100	ND	8.8
Ik2	115°09'30"	8°42'40"	6-Feb	9:43	30.3	31.0	8.2	0.60	3.3	7.5	6.5	0.0	0.0	0.02	0.310	4.8	2.2
Nk1	115°09'00"	8°43'40"	6-Feb	9:19	29.1	31.0	8.2	0.48	2.8	7.4	4.9	0.0	0.1	0.18	0.070	ND	0.0
Nk2	115°09'30"	8°43'40"	6-Feb	9:28	29.8	31.0	8.1	0.56	2.8	7.3	6.2	0.0	0.1	0.18	0.350	ND	0.0
Ok1	115°08'30"	8°45'20"	6-Feb	8:57	28.9	31.0	8.2	0.35	3.0	7.4	3.2	0.1	0.1	0.18	0.080	8.4	2.2
Ok2	115°08'58"	8°45'20"	6-Feb	8:48	29.0	31.0	8.0	0.26	3.2	7.7	5.5	0.0	0.0	0.02	0.100	5.6	0.0
Sk1	115°09'50"	8°45'40"	6-Feb	8:23	28.5	31.0	8.1	0.63	6.0	7.3	3.9	0.0	0.3	0.36	0.070	ND	0.0
Rk1	115°09'20"	8°46'00"	6-Feb	8:34	29.0	31.0	8.1	0.41	3.9	7.2	5.7	0.1	0.1	0.36	0.020	ND	2.2

Table B.3.5 Observed Sea Water Quality by JICA in 1991

Location No.	Faecal -coliform (N/100ml)	Phenols (mg/l)	pH	COD (mg/l)	DO (mg/l)	SS (mg/l)
(1) Sanur - Nusa Dua (49 points)						
B1	--	<0.2	7	2	5	1.9
B2	--	<0.2	7	2	6	2.5
C1	--	<0.2	7	2	5	2.3
C2	--	<0.2	7	2	5	1.5
E1	--	<0.2	7	2	5	1.9
E2	--	<0.2	7	2	5	4.5
F1	--	<0.2	7	2	5	3.2
F2	--	<0.2	7	2	5	2.4
H1	--	<0.2	7	2	5	3.5
H2	--	<0.2	7	2	5	2.4
H3	--	<0.2	7	2	5	4.3
I1	--	<0.2	7	2	5	2.2
I2	--	<0.2	7	2	5	3.0
I3	--	<0.2	7	2	5	0.6
K1	--	<0.2	7	2	5	1.2
K2	--	<0.2	7	2	5	5.0
K3	--	<0.2	7	2	5	2.1
K4	--	<0.2	7	2	5	2.8
L1	--	<0.2	7	2	5	9.5
L2	--	<0.2	7	2	5	1.4
L3	--	<0.2	7	2	7	0.8
L4	--	<0.2	7	2	5	3.6
N1	--	<0.2	7	2	5	4.5
N2	--	<0.2	7	2	5	1.5
N3	--	<0.2	7	2	5	4.9
N4	--	<0.2	7	2	5	4.2
O1	--	<0.2	7	2	5	3.1
O2	--	<0.2	7	2	5	3.4
O3	--	<0.2	7	2	5	0.3
Q1	--	<0.2	7	2	5	5.5
Q2	--	<0.2	7	2	5	2.0
Q3	--	<0.2	7	2	5	2.0
R1	--	<0.2	7	2	5	2.4
R2	--	<0.2	7	2	5	2.7
R3	--	<0.2	7	2	5	3.7
T1	1,000	<0.2	7	2	5	1.8
T2	--	<0.2	7	2	5	0.7
T3	--	<0.2	7	2	5	0.2
U1	1,400	<0.2	7	2	5	3.4
U2	--	<0.2	7	2	5	1.7
U3	--	<0.2	7	2	5	2.5
W1	300	<0.2	7	2	5	2.1
W2	--	<0.2	7	2	6	4.5
X1	--	<0.2	7	2	5	7.8
X2	--	<0.2	7	2	5	0.2
Z1	--	<0.2	7	2	5	7.1
Z2	--	<0.2	7	2	5	6.8
ã1	--	<0.2	7	2	5	7.8
ã2	--	<0.2	7	2	5	3.8
(3) Kuta (2 points)						
Tk1	300	<0.2	7	2	5	0.05
Uk1	--	<0.2	7	2	5	4.1

Table B.3.6 Production of Fish in Badung 1985 to 1989

(Unit : ton)

Year	Sea Fisheries		Inland Fisheries						Total I	Total II
	Catching in Outer Seas	Seaweed Breeding	Catching in Public Waters	Brackish Water	Breeding			Rice Fields		
					Static Water Ponds	Fresh Water				
						Moving Water Ponds	Irrigation Channels			
	A	B	C	D	E	F	G	H	A to H	B to H
1985	5,733.5	2,754.5	20.0	50.0	24.5	1.4	2.9	90.8	8,677.6	2,944.1
1986	4,471.9	3,281.0	35.6	55.4	53.9	1.2	3.6	93.2	7,995.8	3,523.9
1987	12,054.2	5,070.0	48.1	119.7	35.6	0.9	2.7	98.1	17,429.3	5,375.1
1988	8,989.5	4,753.3	64.1	1,213.5	82.5	0.6	2.4	137.2	15,243.1	6,253.6
1989	12,027.9	3,666.3	55.3	1,749.5	56.4	0.5	1.7	113.2	17,670.8	5,642.9

Source : Buku Tahunan Statistik Perikanan Propinsi Daerah Tingkat I Bali 1985 - 1989

Table B.3.7 Values of Fish Produced in Badung 1985 to 1989

(Unit : Rp. 1,000)

Year	Sea Fisheries		Inland Fisheries						Total I	Total II		
	Catching in Outer Seas A	Seaweed Breeding B	Catching in Public Waters C	Brackish Water D	Breeding						Total A to H	
					Static Water Ponds E	Moving Water Ponds F	Fresh Water					Rice Fields H
							Irrigation Channels G					
1985	3,671,750	104,671	9,275	163,785	28,908	2,100	3,480	105,210	4,089,179	417,429		
1986	1,933,634	188,670	17,270	193,333	67,830	1,270	4,320	123,520	2,529,847	596,213		
1987	6,968,665	218,574	47,550	969,705	54,968	1,350	4,200	140,850	8,405,862	1,437,197		
1988	5,538,498	169,321	49,676	15,293,890	141,330	964	4,215	240,660	21,438,554	15,900,056		
1989	12,250,891	222,859.6	46,660	14,978,200	102,830	1,000	3,400	215,400	27,821,240.6	15,570,349.6		

Source : Buku Tahunan Statistik Perikanan Propinsi
Daerah Tingkat I Bali 1985 - 1989

Table B.3.8 Number of Households Engaged in Fisheries in Badung 1985 to 1989

(Unit : No. of Households)

Year	Sea Fisheries		Inland Fisheries				Total I	Total II	
	Catching in Outer Seas	Seaweed Breeding	Catching in Public Waters	Brackish Water	Breeding				
					Ponds	Fresh Water			
						Irrigation Channels			Rice Fields
A	B	C	D	E	F	G	A to G	B to G	
1985	1,405	-	95	188	505	3	1,114	3,310	1,905
1986	1,726	284	95	86	751	6	1,347	4,295	2,569
1987	1,876	294	305	94	885	6	1,954	5,414	3,538
1988	1,430	431	305	110	883	3	1,954	5,116	3,686
1989	840	377	294	109	883	10	1,299	3,812	2,972

Source : Buku Tahunan Statistik Perikanan Propinsi Daerah Tingkat I Bali 1985 - 1989

Table B.3.9 Production and Values of Salt Produced by Salt Farming in Badung 1985 - 1991

Year	Kelurahan/Desa & Kecamatan	No. of Farmers Engaged	Production (ton)	Values (Rp. thousand)
1985	Pedungan Denpasar Selatan	31	321.05	64,210
	Sesetan Denpasar Selatan	36	223.38	44,676
	Tuban Kuta	8	1.10	220
	Jimbaran Kuta	26	87.31	17,462
	Total	101	632.84	126,568
1988	Pedungan Denpasar Selatan	4	550.00	111,000
1991	Pedungan Denpasar Selatan	5	575.00	116,000

Source : Kantor Departemen Perindustrian Kabupaten Badung

Table B.4.1 Principal Tidal Constituents

Symbol	Name of partial tides	Period in solar hours (hr:min)	Amplitude (cm)
M ₂	Principal lunar	12:25	71
S ₂	Principal solar	12:00	33
K ₁	Luni-solar diurnal	23:56	25
O ₁	Principal lunar diurnal	25:49	12

Source : Hydrographer of the Navy; Admiralty Tide Tables and Tidal Stream Tables, Vol. 3, 1988

Table B.5.1(1) Observed Groundwater Table and Quality by JICA in November, 1991
Date of Sampling : November 16, 18, 19, 20, 1991

WELL NO. CODE NO.	NAME OF KELURAHAN/DESA	SAMPLING DATE	GROUNDWATER DEPTH (m)	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	pH	SS (PPM)	DO (PPM)	COD _{Mn} (PPM)	NH ₄ -N (PPM)	NO ₂ -N (µg/l)	NO ₃ -N (PPM)	T-N (PPM)	T-P (µg/l)	FECAL COLIFORM (N/100ml)
1	206 Sumerta	18-Nov-91	2.83	31.5	28.0	8.6	25.3	7.5	29.7	0.0	8	3.0	3.3	3.2	980.0
2	206 Sumerta	18-Nov-91	4.36	32.0	28.0	8.4	14.0	7.4	24.8	0.0	11	2.2	2.5	2.9	960.0
3	206 Sumerta	18-Nov-91	3.58	32.0	29.0	8.3	22.2	7.2	14.9	0.0	11	2.0	2.2	2.6	0.0
4	211 Kesiman Petilan	18-Nov-91	4.55	29.5	28.0	8.3	29.8	7.5	9.9	0.0	10	2.3	2.4	3.0	0.0
5	211 Kesiman Petilan	18-Nov-91	9.98	32.0	27.5	8.3	23.9	7.6	5.0	0.0	12	2.1	2.3	1.7	2.0
6	210 Kesiman	18-Nov-91	4.19	33.0	28.5	8.3	13.8	7.4	19.8	0.0	15	1.9	2.2	2.7	380.0
7	210 Kesiman	18-Nov-91	1.77	32.0	28.5	8.4	12.2	7.1	9.9	0.0	10	1.2	1.4	2.3	0.0
8	209 Sumerta Kelod	18-Nov-91	2.69	30.0	27.5	8.3	18.6	7.6	9.9	0.4	0	0.1	0.7	2.6	0.0
9	305 Panjer	16-Nov-91	0.65	33.2	28.7	8.3	44.0	5.6	14.1	5.9	41	2.3	9.5	3.2	38.0
10	306 Sesetan	16-Nov-91	1.11	33.0	28.3	8.3	20.0	6.5	24.8	0.1	5	1.6	2.9	2.8	0.0
11	306 Sesetan	16-Nov-91	0.80	38.5	28.5	8.5	28.0	6.5	14.9	4.4	2	0.2	6.1	2.9	0.0
12	306 Sesetan	16-Nov-91	0.62	36.0	28.0	7.9	14.0	6.5	19.8	0.7	3	1.6	2.8	2.7	88.0
13	306 Sesetan	16-Nov-91	1.98	38.1	28.9	8.4	0.0	6.3	19.8	0.4	1	0.1	0.8	3.7	0.0
14	306 Sesetan	16-Nov-91	1.94	34.0	29.0	8.1	18.0	6.5	14.8	0.0	3	1.1	1.7	3.0	150.0
15	305 Panjer	16-Nov-91	1.92	32.0	28.0	8.1	8.0	6.4	19.8	0.0	3	1.6	2.0	3.7	5.0
16	305 Panjer	16-Nov-91	1.47	31.8	26.3	8.6	34.4	7.2	24.8	1.4	4	0.6	2.7	3.0	980.0
17	306 Sesetan	16-Nov-91	2.66	34.0	28.8	8.5	0.0	7.4	14.9	0.0	3	1.7	1.9	3.4	980.0
18	307 Sidakarya	16-Nov-91	2.22	34.0	28.7	8.4	16.0	7.2	24.8	4.6	5	1.3	9.3	2.9	2400.0
19	307 Sidakarya	16-Nov-91	1.03	34.0	28.0	8.5	9.6	6.5	43.7	0.0	4	2.2	2.4	2.7	380.0
20	205 Dangin Puri Kelod	16-Nov-91	1.24	33.5	29.0	8.4	24.0	6.7	29.7	0.8	7	2.1	3.3	3.0	210.0
21	305 Panjer	16-Nov-91	4.01	32.5	28.0	8.3	48.0	6.6	14.9	0.0	6	0.0	1.3	4.7	38.0
22	101 Dauh Puri	16-Nov-91	1.25	33.0	28.0	8.3	46.0	6.2	43.7	7.3	4	1.7	12.8	3.9	0.0
23	101 Dauh Puri	18-Nov-91	1.93	33.5	28.5	8.3	10.4	7.6	5.0	0.0	11	1.8	2.2	2.5	2400.0
24	101 Dauh Puri	16-Nov-91	1.83	33.0	28.5	8.4	24.2	7.5	39.6	0.0	9	2.3	2.7	6.8	0.0
25	308 Pedungan	16-Nov-91	1.44	34.0	28.0	8.4	30.0	7.4	39.6	0.0	2	1.8	2.2	3.3	2.0

Source : JICA

Table B.5.1(2) Observed Groundwater Table and Quality by JICA in November, 1991
Date of Sampling : November 16, 18, 19, 20, 1991

WELL NO.	CODE NO.	NAME OF KELURAHAN/DESA	SAMPLING DATE	GROUNDWATER DEPTH (m)	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	pH	SS (PPM)	DO (PPM)	COD _M (PPM)	NH ₄ -N (PPM)	NO ₂ -N (µg/l)	NO ₃ -N (PPM)	T-N (PPM)	T-P (µg/l)	FECAL COLIFORM (N/100ml)
26	101	Dauh Puri	18-Nov-91	6.45	32.0	29.0	8.3	30.0	7.6	14.9	0.0	18	2.4	2.7	2.5	0.0
27	101	Dauh Puri	18-Nov-91	2.87	31.0	28.5	8.2	60.0	7.2	9.9	0.2	4	2.8	3.3	2.8	0.0
28	105	Dauh Puri Kelod	18-Nov-91	0.68	33.0	29.0	8.3	4.0	7.5	9.9	0.6	0	0.2	1.2	2.8	0.0
29	105	Dauh Puri Kelod	18-Nov-91	2.44	31.5	27.0	8.2	22.0	7.5	24.8	1.9	15	2.4	5.0	2.6	5.0
30	108	Peneucuan Kelod	18-Nov-91	1.65	33.5	28.5	8.2	22.0	7.5	14.9	0.0	4	2.2	2.5	2.8	0.0
31	211	Kesiman Petilan	20-Nov-91	6.52	31.0	28.0	7.9	26.0	7.4	14.9	0.0	34	2.0	2.4	2.5	150.0
32	301	Sanur Kaja	20-Nov-91	2.43	31.5	28.0	7.9	22.0	7.5	14.9	0.0	2	0.3	0.5	2.6	38.0
33	305	Panjer	20-Nov-91	1.25	33.0	28.0	8.0	28.0	7.2	19.8	1.8	8	0.1	2.7	2.5	15.0
34	304	Renon	20-Nov-91	1.33	33.0	28.5	7.8	10.0	7.3	29.7	1.0	3	0.0	1.3	2.4	0.0
35	304	Renon	20-Nov-91	1.49	32.0	28.5	7.9	14.0	7.2	14.9	0.1	12	2.1	2.3	2.3	980.0
36	304	Renon	20-Nov-91	1.98	33.0	28.0	7.9	34.0	7.5	19.8	0.3	24	2.4	2.9	2.4	0.0
37	205	Dangin Puri Kelod	18-Nov-91	1.95	32.0	28.0	8.2	32.0	7.5	9.9	6.4	28	2.3	13.1	2.8	150.0
38	205	Dangin Puri Kelod	18-Nov-91	2.54	30.0	28.5	8.2	42.0	6.6	14.9	2.0	25	2.4	5.1	2.7	5.0
39	213	Tonia	18-Nov-91	9.00	31.0	28.0	8.2	12.0	7.7	14.9	0.0	5	2.2	2.4	2.2	2.0
40	209	Sumerta Kelod	20-Nov-91	1.46	32.0	28.0	7.9	18.0	7.4	9.9	0.2	4	1.2	1.6	2.0	5.0
41	211	Kesiman Petilan	20-Nov-91	11.50	30.0	29.5	7.9	12.0	7.6	19.9	0.0	4	2.3	2.4	3.1	0.0
42	213	Tonia	20-Nov-91	15.41	31.5	28.5	8.0	38.0	7.5	19.8	0.0	2	2.3	2.5	1.6	0.0
43	308	Pedungan	16-Nov-91	1.97	35.0	28.0	8.4	20.0	6.7	24.8	0.0	1	0.5	0.7	3.1	0.0
44	204	Dangin Puri Kangin	18-Nov-91	9.66	35.0	29.0	8.2	16.0	7.6	9.9	0.0	7	1.7	1.9	2.4	8.8
45	214	Penatih	19-Nov-91	6.64	33.0	30.0	8.2	28.0	7.8	24.8	0.0	1	2.3	2.6	2.1	0.0
46	115	Ubung	19-Nov-91	4.66	32.0	28.5	8.1	12.0	7.6	5.0	1.0	6	2.4	4.3	1.8	2.0
47	213	Tonia	19-Nov-91	8.58	31.5	28.5	8.2	8.0	7.6	24.8	0.0	1	2.0	2.3	2.5	38.0
48	309	Pemogan	16-Nov-91	0.92	34.1	28.0	8.4	6.0	7.2	44.6	0.0	2	1.5	1.7	3.1	8.8
49	309	Pemogan	16-Nov-91	0.72	35.0	31.0	8.4	0.0	6.6	29.7	0.6	6	0.6	1.6	3.2	210.0
50	306	Sesetan	16-Nov-91	1.58	35.0	28.0	8.3	8.0	6.9	19.8	0.7	7	1.9	2.8	3.2	98.0

Source : JICA

Table B.5.1(3) Observed Groundwater Table and Quality by JICA in December, 1991
Date of Sampling : December 20, 21, 22, 1991

WELL NO.	CODE NO.	NAME OF KELURAHAN/DESA	SAMPLING DATE	GROUNDSWATER DEPTH (*) (m)	AIR TEMPERATURE (°C)	WATER TEMPERATURE (°C)	pH	SS (PPM)	DO (PPM)	CODcr (PPM)	NH4-N (PPM)	NO2-N (µg/l)	NO3-N (PPM)	T-N (PPM)	T-P (µg/l)	FECAL COLIFORM (N/100ml)
51	407	Benoa	20-Dec-91	3.30	34.0	28.0	7.3	42.0	7.6	4.0	0.0	10	2.7	3.1	3.6	240.0
52	407	Benoa	20-Dec-91	4.40	32.0	29.0	7.5	32.0	7.6	4.5	0.0	20	2.7	3.1	3.7	96.0
53	407	Benoa	20-Dec-91	6.40	33.0	28.5	7.8	34.0	7.2	2.5	0.0	0	2.5	3.7	5.0	8.8
54	406	Jimbaran	20-Dec-91	2.40	33.5	28.5	7.8	44.0	7.4	2.0	0.0	20	2.6	2.6	3.2	240.0
55	405	Tuban	20-Dec-91	3.84	32.0	29.0	7.6	42.0	7.5	4.0	0.0	0	2.7	2.9	4.6	2.2
56	405	Tuban	20-Dec-91	5.30	34.0	29.0	7.6	36.0	7.4	5.0	0.0	20	4.4	4.7	3.7	38.0
57	404	Kuta	20-Dec-91	4.50	32.0	29.0	7.6	48.0	7.4	4.5	0.0	20	2.7	3.2	7.0	96.0
58	404	Kuta	20-Dec-91	4.14	33.5	29.0	7.6	34.0	7.6	4.5	0.0	50	2.6	3.2	4.0	15.0
59	404	Kuta	20-Dec-91	3.50	32.0	29.0	7.6	12.0	7.6	1.5	1.1	10	2.6	3.9	4.4	8.8
60	309	Pemogan	21-Dec-91	1.17	33.5	29.0	7.9	8.0	7.4	50.0	0.0	10	1.7	2.0	5.0	5.0
61	309	Pemogan	21-Dec-91	1.60	31.5	28.5	7.8	26.0	7.1	15.0	0.0	0	1.8	2.0	6.5	21.0
62	404	Kuta	20-Dec-91	3.30	36.0	31.5	7.7	34.0	7.4	4.0	0.0	60	2.6	3.0	5.3	5.0
63	404	Kuta	21-Dec-91	10.10	31.5	28.0	7.9	10.0	7.5	5.5	0.0	10	1.4	1.8	7.6	0.0
64	309	Pemogan	21-Dec-91	0.75	32.0	29.0	7.8	34.0	7.4	65.0	0.0	0	2.1	2.5	6.8	38.0
65	114	Padang Sambian Kelod	21-Dec-91	2.40	33.5	30.0	7.7	28.0	5.6	60.0	0.0	0	1.7	2.0	4.5	240.0
66	403	Kerobokan	21-Dec-91	3.30	36.0	28.0	7.5	18.0	5.2	7.5	0.1	10	2.5	2.7	5.5	98.0
67	403	Kerobokan	21-Dec-91	11.20	33.0	29.0	7.9	10.0	5.7	4.5	0.0	20	1.7	2.2	4.5	8.8
68	402	Canggu	22-Dec-91	15.00	32.0	28.0	7.9	8.0	7.7	1.5	0.0	0	0.6	1.3	5.5	7.6
69	402	Canggu	22-Dec-91	13.30	31.0	29.0	7.8	18.0	7.8	4.5	0.0	0	0.3	0.6	5.7	5.0
70	403	Kerobokan	22-Dec-91	8.25	31.0	28.0	7.8	22.0	7.2	3.0	0.0	1	2.6	2.7	5.3	240.0
71	107	Pemecutan Kaja	21-Dec-91	4.50	33.0	30.0	7.6	28.0	7.3	2.0	0.0	0	2.4	3.2	6.5	0.0
72	401	Dalung	22-Dec-91	5.20	32.0	30.0	7.7	28.0	7.3	5.0	0.0	0	2.2	2.4	6.2	5.0
73	401	Dalung	22-Dec-91	0.80	33.0	28.0	7.8	24.0	7.2	3.5	0.0	0	0.8	1.8	5.1	2.0
74	109	Peguyangan	22-Dec-91	18.00	28.5	28.0	7.7	12.0	7.3	3.0	0.0	0	2.7	3.5	5.0	8.8
75	214	Penatih	22-Dec-91	3.30	29.5	28.0	7.5	12.0	7.3	3.5	0.0	0	2.6	3.3	7.9	21.0

Source : JICA

Note : *) : Groundwater table depth measured from ground surface.

Table B.5.2 Groundwater Quality in December, 1987

Location No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Time/Hour	13:40	9:00	10:30	14:00	9:38	15:00	12:40	10:30	11:15
Temperature °C	27	27	27	27	27	27	27	27	27
pH	7.5	7.1	7.1	7.3	7.8	7.1	7.1	7.7	7.1
Conductivity Umnos/cm ²	1,200	5,000	950	600	1,050	2,000	1,200	1,150	1,300
Suspended Solid mg/l	914	982	2,340	540	1,424	2,164	1,242	1,030	972
Amonia (NH ₄) mg/l	0.287	0.34	0.266	0.319	0.464	1,755	2.34	0.298	0.266
Nitrat (NO ₃) mg/l	52.935	17.645	17.645	17.645	19.762	60.168	8.47	28.232	26.82
Nitrit (NO ₂) mg/l	0.034	0.016	0.006	0.019	0.135	0.196	0.022	0.009	0.04
Phosphat T-P mg/l	0.025	0.023	0.018	0.025	0.022	0.017	0.022	0.022	0.021
Chlorida mg/l	123.132	211.83	1,055.415	16.450	123.132	965.600	66.843	1,336.859	84.33
DO mg/l	6.65	3.9	5.85	6.65	4.15	5.75	4.95	5.15	4.4
BOD mg/l	27.681	79.051	50.513	10.559	57.361	39.096	75.626	51.655	56.22
COD mg/l	0.0	0.0	0.0	0.0	0.0	12.378	0.0	0.0	0.0
Coliform MPM 100 ml	380	88	160	50	88	88	22	160	8

Source : Pengembangan Sistem Perencanaan Pembuangan Air Limbah and Kotoran Manusia Di Kota Denpasar by Cipta Karya, 1988

Table B.5.3(1) Integrated Pollution Index of Groundwater

WELL NO.	GROUNDWATER DEPTH (m)	COD _{Cr}		NH ₄ -N		FECAL COLIFORM		Integrated Pollution Index
		(PPM)	Pollution Index	(PPM)	Pollution Index	(N/100ml)	Pollution Index	
1	2.83	29.7	3	0.0	0	980.0	3	6
2	4.36	24.8	3	0.0	0	960.0	3	6
3	3.58	14.9	2	0.0	0	0.0	0	2
4	4.55	9.9	1	0.0	0	0.0	0	1
5	9.98	5.0	1	0.0	0	2.0	1	2
6	4.19	19.8	2	0.0	0	380.0	3	5
7	1.77	9.9	1	0.0	0	0.0	0	1
8	2.69	9.9	1	0.4	1	0.0	0	2
9	0.65	14.1	2	5.9	4	38.0	2	8
10	1.11	24.8	3	0.1	1	0.0	0	4
11	0.80	14.9	2	4.4	4	0.0	0	6
12	0.62	19.8	2	0.7	2	88.0	2	6
13	1.98	19.8	2	0.4	1	0.0	0	3
14	1.94	14.8	2	0.0	0	150.0	3	5
15	1.92	19.8	2	0.0	0	5.0	1	3
16	1.47	24.8	3	1.4	3	980.0	3	9
17	2.66	14.9	2	0.0	0	980.0	3	5
18	2.22	24.8	3	4.6	4	2400.0	4	11
19	1.03	43.7	4	0.0	0	380.0	3	7
20	1.24	29.7	3	0.8	2	210.0	3	8
21	4.01	14.9	2	0.0	0	38.0	2	4
22	1.25	43.7	4	7.3	4	0.0	0	8
23	1.93	5.0	1	0.0	0	2400.0	4	5
24	1.83	39.6	4	0.0	0	0.0	0	4
25	1.44	39.6	4	0.0	0	2.0	1	5
26	6.45	14.9	2	0.0	0	0.0	0	2
27	2.87	9.9	1	0.2	1	0.0	0	2
28	0.68	9.9	1	0.6	2	0.0	0	3
29	2.44	24.8	3	1.9	4	5.0	1	8
30	1.65	14.9	2	0.0	0	0.0	0	2
31	6.52	14.9	2	0.0	0	150.0	3	5
32	2.43	14.9	2	0.0	0	38.0	2	4
33	1.25	19.8	2	1.8	4	15.0	2	8
34	1.33	29.7	3	1.0	2	0.0	0	5
35	1.49	14.9	2	0.1	1	980.0	3	6
36	1.98	19.8	2	0.3	1	0.0	0	3
37	1.95	9.9	1	6.4	4	150.0	3	8
38	2.54	14.9	2	2.0	4	5.0	1	7
39	9.00	14.9	2	0.0	0	2.0	1	3
40	1.46	9.9	1	0.2	1	5.0	1	3

Table B.5.3(2) Integrated Pollution Index of Groundwater

WELL NO.	GROUNDWATER DEPTH (m)	CODcr		NH4-N		FECAL COLIFORM		Integrated Pollution Index
		(PPM)	Pollution Index	(PPM)	Pollution Index	(N/100ml)	Pollution Index	
41	11.5	19.9	2	0.0	0	0.0	0	2
42	15.4	19.8	2	0.0	0	0.0	0	2
43	2.0	24.8	3	0.0	0	0.0	0	3
44	9.7	9.9	1	0.0	0	8.8	1	2
45	6.6	24.8	3	0.0	0	0.0	0	3
46	4.7	5.0	1	1.0	2	2.0	1	4
47	8.6	24.8	3	0.0	0	38.0	2	5
48	0.9	44.6	4	0.0	0	8.8	1	5
49	0.7	29.7	3	0.6	2	210.0	3	8
50	1.6	19.8	2	0.7	2	98.0	2	6
51	3.3	4.0	1	0.0	0	240.0	3	4
52	4.4	4.5	1	0.0	0	96.0	2	3
53	6.4	2.5	1	0.0	0	8.8	1	2
54	2.4	2.0	1	0.0	0	240.0	3	4
55	3.8	4.0	1	0.0	0	2.2	1	2
56	5.3	5.0	1	0.0	0	38.0	2	3
57	4.5	4.5	1	0.0	0	96.0	2	3
58	4.1	4.5	1	0.0	0	15.0	2	3
59	3.5	1.5	1	1.1	3	8.8	1	5
60	1.2	50.0	4	0.0	0	5.0	1	5
61	1.6	15.0	2	0.0	0	21.0	2	4
62	3.3	4.0	1	0.0	0	5.0	1	2
63	10.1	5.5	1	0.0	0	0.0	0	1
64	0.8	65.0	4	0.0	0	38.0	2	6
65	2.4	60.0	4	0.0	0	240.0	3	7
66	3.3	7.5	1	0.1	1	98.0	2	4
67	11.2	4.5	1	0.0	0	8.8	1	2
68	15.0	1.5	1	0.0	0	7.6	1	2
69	13.3	4.5	1	0.0	0	5.0	1	2
70	8.3	3.0	1	0.0	0	240.0	3	4
71	4.5	2.0	1	0.0	0	0.0	0	1
72	5.2	5.0	1	0.0	0	5.0	1	2
73	0.8	3.5	1	0.0	0	2.0	1	2
74	18.0	3.0	1	0.0	0	8.8	1	2
75	3.3	3.5	1	0.0	0	21.0	2	3

Source : JICA

Note :

CODcr (mg/l)		NH4-N (mg/l)		Fecal Coliform (N/100ml)	
Range	Pollution Index	Range	Pollution Index	Range	Pollution Index
0	0	0	0	0	0
0 < COD ≤ 10	1	0 < NH4-N ≤ 0.5	1	0 < F.C. ≤ 10 ²	1
10 < COD ≤ 20	2	0.5 < NH4-N ≤ 1.0	2	10 < F.C. ≤ 10 ³	2
20 < COD ≤ 30	3	1.0 < NH4-N ≤ 1.5	3	10 < F.C. ≤ 10 ⁴	3
30 < COD	4	1.5 < NH4-N	4	10 < F.C.	4

Table B.5.4(1) Existing Condition of Groundwater Use

Well No.	Income Level of User	Well			Use		
		Diameter (m)	Groundwater Table Depth(m)	Drawing Method	No. of Person	Well Water Use Ratio	Water Use *1)
1.	Low	0.80	2.83	Hand	4	100	D,W,C,B
2.	Middle	0.92	4.36	Motor	20	100	D,W,C,B
3.	Middle	0.68	3.58	Hand	10	50	DC
4.	Low	0.70	4.55	Hand	6	25	D
5.	Low	1.00	9.98	Hand	4	100	D,W,C,B
6.	Low	1.00	4.19	Hand	8	100	D,W,C,B
7.	Low	0.80	1.77	Hand	5	100	D,W,C,B
8.	Low	0.70	2.69	Hand	8	100	D,W,C,B
9.	Low	0.52	0.65	Hand	15	100	W,B
10.	Low	0.61	1.11	Hand	39	100	D,W,C,B
11.	Middle	0.80	0.80	Motor	5	100	D,W,C,B
12.	Low	0.60	0.62	Hand	6	100	D,W,C,B
13.	Low	0.70	1.98	Hand	18	100	D
14.	Low	0.71	1.94	Hand	3	100	D,W,C,B
15.	Middle	0.97	1.92	Motor	15	100	D,W,C,B
16.	Low	0.71	1.47	Hand	9	100	D,W,C,B
17.	Low	0.58	2.66	Hand	7	100	D,W,C,B
18.	Low	0.60	2.22	Motor	3	100	W,B
19.	Low	0.72	1.03	Hand	6	100	D,W,C,B
20.	Low	0.71	1.24	Hand	20	100	D,W,C,B
21.	Middle	0.70	4.01	Motor	30	50	W,B
22.	Low	0.70	1.25	Motor	8	100	D,W,C,B
23.	Middle	0.79	1.93	Motor	6	100	D,W,C,B
24.	Middle	0.60	1.83	Motor	4	100	D,W,C,B
25.	Low	0.75	1.44	Motor	11	100	D,W,C,B
26.	Low	0.82	6.45	Motor	10	100	D,W,C,B
27.	Low	1.04	2.87	Motor	6	20	W
28.	Low	0.80	0.68	Hand	12	100	D,W,C,B
29.	Low	0.60	2.44	Hand	7	100	D,W,C,B
30.	Middle	0.70	1.65	Hand	10	100	D,W,C,B
31.	Low	1.00	6.52	Hand	5	-	D,W,C,B
32.	Low	0.93	2.43	Hand	5	100	D,W,C,B
33.	High	0.80	1.25	Motor	6	100	D,W,C,B
34.	Low	0.77	1.33	Hand	9	100	D,W,C,B
35.	Low	0.80	1.49	Hand	8	100	D,W,C,B
36.	Low	0.79	1.98	Hand	6	100	D,W,C,B
37.	Middle	1.02	1.95	Hand	8	100	D,W,C,B
38.	Middle	0.58	2.54	Hand	11	10	W
39.	Low	1.05	9.00	Hand	15	100	D,W,C,B
40.	Low	0.97	1.46	Hand	7	100	D,W,C,B
41.	Low	0.71	11.50	Motor	7	100	D,W,C,B
42.	Low	1.10	15.41	Hand	10	100	D,W,C,B
43.	Low	0.79	1.97	Motor/Hand	5	-	D,W,C,B
44.	Low	0.86	9.66	Hand	12	100	D,W,C,B
45.	Middle	0.97	6.64	Motor	12	100	D,W,C,B
46.	Low	0.60	4.66	Motor	9	100	D,W,C,B
47.	Low	0.85	8.58	Hand	14	100	D,W,C,B
48.	Low	0.60	0.92	Motor	8	-	D,W,C,B

Note : *1) D = Drinking, W = Washing, C = Cooking, B = Bathing (include Toilet)

Table B.5.4(2) Existing Condition of Groundwater Use

Well No.	Income Level of User	Well Size			Use		
		Diameter (m)	Groundwater Table Depth(m)	Drawing Method	No. of Person	Well Water Use Ratio	Water Use *1)
49.	Low	0.60	0.72	Motor	15	-	D,W,C,B
50.	Middle	0.75	1.58	Hand	30	100	D,W,C,B
51.	Middle	0.80	3.30	Motor	7	100	D,W,C,B
52.	Middle	0.55	4.40	Motor	8	100	D,W,C,B
53.	Low	1.02	6.44	Hand	30	-	D,C,B
54.	Low	0.80	2.35	Hand	13	-	D,W,C,B
55.	Middle	0.80	3.84	Motor	10	-	D,C,B
56.	Low	0.80	5.26	Motor	5	-	D,W,C,B
57.	Middle	0.65	4.47	Motor	7	100	D,W,C,B
58.	Low	0.70	4.14	Hand	10	100	D,W,C,B
59.	Middle	0.70	3.50	Motor	7	100	D,W,C,B
60.	Low	0.80	1.17	Hand	7	100	D,W,C,B
61.	Low	0.83	1.61	Hand	5	-	D,W,C,B
62.	High	0.80	3.26	Motor	10	100	D,W,C,B
63.	Middle	0.70	10.55	Motor	7	-	D,W,C,B
64.	Low	0.80	0.75	Hand	4	100	D,W,C,B
65.	Low	0.80	2.40	Hand	10	-	D,W,C,B
66.	Low	0.80	3.25	Hand	10	-	D,W,C,B
67.	Middle	0.80	11.18	Motor	5	-	D,W,C,B
68.	Low	0.80	15.00	Motor	4	-	D,W,C,B
69.	Middle	0.80	13.30	Motor	5	-	D,W,C,B
70.	Middle	0.72	8.25	Motor	7	-	D,W,C,B
71.	Middle	0.70	4.50	Motor	7	100	D,W,C,B
72.	Middle	0.80	5.50	Motor	4	-	D,W,C,B
73.	Middle	0.60	0.80	Motor	7	-	D,W,C,B
74.	Low	0.80	18.00	Hand	10	-	D,W,C,B
75.	Low	0.90	3.30	Motor	20	-	D,W,C,B

Note : *1) D = Drinking, W = Washing, C = Cooking, B = Bathing (include Toilet)

Table B.6.1 Observed Permeability by JICA in January, 1992

No.	Location	Kelurahan/Desa	Groundwater Table Depth (m)	Sampling Depth (m)	Permeability (cm/sec.) *1)	Soil Identification
1.	Sempidi	Dalung	1.1	2	5.7E-06	Sandy clay
				5	None	Rocky ground
2.	Kerobokan	Kerobokan	5.8	2	3.4E-07	Silty clay
				5	None	Rocky ground
3.	Jl. Supratman	Dangin Puri Kaja	8.4	2	7.7E-06	Sandy silt
				5	1.6E-04	Coarse sand
4.	Jl. T. Perahu	Kerobokan	7.2	2	None	Rocky ground
				5	8.2E-08	Medium clay
5.	Jl. L. Tantular	Dangin Puri Kelod	2.1	2	8.8E-06	Sandy silt
				5	2.4E-04	Silty sand
6.	Werdhapura, Sanur	Sanur	2.9	2	8.1E-03	Beach sand
				5	7.4E-03	Beach sand
7.	Jl. Bypass Sanggaran	Pemogan	0.3	2	5.8E-06	Sandy clay
				5	2.3E-06	Sandy clay
8.	Pantai Kuta	Kuta	2.8	2	2.7E-02	Beach sand
				5	8.8E-03	Beach sand
9.	Udayana Univ.	Jimbaran	5.2	2	8.6E-05	Stiff silt
				5	None	Lime stone
10.	Nusa Dua (BTDC)	Benoa	2.6	2	7.3E-03	Beach sand
				5	6.2E-03	Beach sand

Source : JICA

Note : *1) : $5.7E-06 = 5.7 \times 10^{-6}$

Table B.7.1(1) Contraction Rate of Water-Borne Diseases per Year

(Unit : No. of cases per 1,000 population)

Code No. of Kel./Desa	Water-Borne Diseases											Total
	Malaria	Diarrhea	Cholera	Tuber- culosis	D.H.F	Typhoid	Dysentery	Diphtheria	Measles	Hepatitis A	Hepatitis B	
101	20	285	0	0	0	0	12	0	0	0	0	317
102	0	16	0	0	0	0	0	0	0	0	0	16
103	0	8	0	0	0	0	0	0	0	0	0	8
104	0	84	0	0	0	4	0	0	0	0	0	88
105	0	8	0	0	0	0	4	0	0	0	0	16
106	0	251	0	0	0	0	12	0	0	0	0	267
107	0	5	0	0	0	0	4	0	0	0	0	9
108	0	0	0	0	0	0	0	0	0	0	0	0
109	4	12	0	4	0	0	0	0	0	0	0	20
110	0	167	0	12	0	0	0	8	0	0	0	187
111	0	0	0	12	0	0	0	0	0	0	0	12
112	0	31	0	0	0	0	0	8	0	0	0	39
113	32	34	0	8	16	0	20	0	0	0	0	110
114	4	0	0	8	0	0	12	0	0	0	0	24
115	0	58	8	0	0	0	24	0	0	0	0	90
116	24	0	0	0	0	0	0	0	0	0	0	24
117	0	125	0	0	0	0	6	4	0	0	0	137
118	0	0	0	0	0	0	0	4	0	0	0	4
100	4.7	60.2	0.4	2.5	0.9	0.2	5.2	1.3	0.6	0.0	0.0	76.0

Source : JICA

Table B.7.1(2) Contraction Rate of Water-Borne Diseases per Year

(Unit : No. of cases per 1,000 population)

Code No. of Kel./Desa	Water-Borne Diseases											Total
	Malaria	Diarrhea	Cholera	Tuber- culosis	D.H.F	Typhoid	Dysentery	Diphtheria	Measles	Hepatitis A	Hepatitis B	
201	0	0	0	0	0	0	0	0	4	0	0	4
202	0	9	0	0	0	4	8	0	0	0	0	21
203	0	0	0	0	0	4	4	0	0	0	0	8
204	0	167	0	0	0	0	0	8	8	0	0	183
205	4	0	4	0	8	4	0	0	8	0	0	28
206	0	19	0	4	8	4	8	8	0	0	0	51
207	0	0	0	0	0	0	4	0	0	0	0	4
208	20	0	0	0	0	0	0	0	0	0	0	20
209	0	0	0	0	0	4	4	0	0	0	0	8
210	4	5	0	0	0	0	8	0	0	0	0	17
211	0	0	0	0	0	0	0	0	0	0	0	0
212	0	16	0	0	0	0	0	0	0	0	0	16
213	20	30	0	0	0	0	0	0	0	0	0	50
214	12	16	0	0	0	8	16	4	8	0	0	64
215	0	19	0	0	8	0	0	0	8	0	0	35
200	4.0	18.7	0.3	0.3	1.6	1.9	3.5	1.3	2.4	0.0	0.0	34.0
301	12	0	8	0	4	0	20	0	8	0	0	52
302	4	0	0	0	0	0	0	0	0	0	0	4
303	4	167	0	4	0	0	8	0	0	0	0	183
304	0	0	0	0	0	0	4	0	12	4	0	20
305	4	167	0	0	0	0	4	0	0	0	0	175
306	0	37	0	0	0	0	4	0	0	0	0	41
307	0	18	0	0	0	0	4	0	0	0	0	22

Source : JICA

Table B.7.1(3) Contraction Rate of Water-Borne Diseases per Year

(Unit : No. of cases per 1,000 population)

Code No. of Kel./Desa	Water-Borne Diseases											Total
	Malaria	Diarrhea	Cholera	Tuber- culosis	D.H.F	Typhoid	Dysentery	Diphtheria	Measles	Hepatitis A	Hepatitis B	
308	0	68	0	0	0	0	8	8	0	0	8	92
309	4	57	0	0	0	0	4	12	0	0	8	85
310	8	84	12	0	0	0	4	0	8	0	0	116
300	3.6	60.0	2.0	0.4	0.4	0.0	6.0	2.0	2.8	0.4	1.6	79.2
401	0	0	0	4	0	4	0	0	0	0	0	8
402	20	17	0	0	0	4	0	0	0	0	0	41
403	0	10	0	0	0	0	0	0	0	0	0	10
404	0	5	0	0	0	0	0	0	0	0	0	5
405	0	0	0	0	0	16	8	0	0	0	0	24
406	0	17	0	0	0	8	4	0	0	0	0	29
407	0	61	0	12	0	0	0	0	0	0	0	73
400	2.9	15.7	0.0	2.3	0.0	4.6	1.7	0.0	0.0	0.0	0.0	27.2
Total	4.0	41.5	0.6	1.4	0.9	1.3	4.4	1.3	1.3	0.1	0.3	57.1

Source : JICA

Table B.7.2 Cases of Water-Borne Diseases Recorded
in Public Health Centers in Badung 1988 to 1990

(Unit : No. of Cases)

No.	Name of Disease	1988	1989	1990
1	Tuberculosis	-	9,425	6,939
2	Diarrhea Inclusive of Cholera	18,074	19,842	22,642
3	Chicken Fox	-	687	759
4	Dysentery	-	1,702	1,385
5	Parasitic Disease	-	1,719	1,337
	Total	-	33,375	33,062

Source : Badung dalam Angka 1988 to 1990.

Table B.8.1 Laws, Regulations and Others Concerning Environmental Management

Nr.	Authority	Name	Nr of Low /Regul.	Effective Year
1	MNPPLH	Law for Main Decision on Environmental Management	No. 4	1982
2	President	Law for Conservation of Natural Resources and Ecosystem	No. 5	1990
3	MNKLH	Law for Environmental Impact Analysis (AMDAL)	No. 29	1986
4	President	Law of Water Pollution Control (No. 20/1990)	No. 20	1990
5	Forest Minister	Regulation for Environmental Analysis and Evaluation Study on Forest Environmental Impact (No. 500/Kpts-II/89)	No. 500	1989
6	MPE	Regulation for Environmental Impact Analysis in Mining and Energy Sector (1158 K/008/M.PE/1989)	No. 1158	1989
7	Agricultural Minister	Law for Activity Criteria on Compulsory Environmental Information Presentation (PIL) and Environmental Evaluation Presentation (PEL) in Agriculture (362/Kpts/RC.410/6/1989)	No. 362	1989
8	Industrial Minister	Law for Prevention and Protection of the Environment from Pollution Caused by Industrial Activities (134/M/SK/4/1988)	No. 134	1988
9	Health Minister	Law for Activities in Health Sector Requiring AMDAL (286/MEN KES/SK/VI/1990)	No. 286	1990
10	Minister of Public Works	Law for Projects in the Sector of Public Works Requiring Environmental Impact Analysis (AMDAL) (126/KPTS/1990)	No. 126	1990
11	MPPT	Law of Tourism Activities Requiring Environmental Impact Analysis (AMDAL) (KM. 9/OT 001/Ro. I/MPPT-90)	No. 9	1990
12	MNRT	Law for Activities in the Field of Technological Research and Application Requiring AMDAL or SEMDAL (SK/620/M/BPPT/IX/1990)	No. 620	1990
13	BAPPENAS	Law for Environmental Information Presentation in Industry	No. 6	1990
14	MENKLH	Guidelines for Decision of Important Environmental Impacts (KEP-49/MENKLH/6/1987)	No. 49	1987

15	MENKLH	Law for Prevention Procedures of Pollution and Damages of Environment (03/SE/MENKLH)	No. 3	1987
16	Governor of Bali Province	Law for Control and Protection of Environmental Pollution	No. 16	1988
17	Governor of Bali Province	Law for Environmental Protection in Mining Industry of Raw Materials of Group C	No. 10	1983
18	Governor of Bali Province	Firts Revision of No. 10 Law of 1983 for Environmental Protection in Mining Industry of Raw Materials of Group C	No. 4	1987
19	Bali Govern-ment	Law for Regional Planning of Bali Province	No. 6	1989
20	Governor of Bali	Law for Control of Taking Groundwater and Surface Water	No. 445	1989
21	Governor of Bali	Regulation for Control of Taking Groundwater and Surface Water	No. 15	1988
22	Governor of Bali	Regulation to Implement the No. 16/1988 Law for Control and Protection of Environ-mental Pollution	No. 174	1990
23	Governor of Bali	Regulation for Hunting and Protection of Wild Animals as well as Utilization of Turtles	No. 22	1990
24	Governor of Bali	Regulation and Members of the Commision of AMDAL of Bali Province	No. 89	1990
25	Governor of Bali	Regulation for Execution of AMDAL of Bali Province (660.1/13212/BKLH)	No. 660.1	1990
26	Governor of Bali	Letter for Clean Bali Action (GERBASIH) (660.1/17393/BKLH)	No. 660.1	1990
27	MENKLH	Law of Standard Wastewater Quality for Opera-tiong Activities (KEP-03/MENKLH/II/1991)	No. 03	1991

Note : MNPLH = Menteri Negara Pengawasan Pembangunan dan Lingkungan Hidup
(National Minister of Control of Development and Environment)

MENKLH = Menteri Negara Kependudukan Dan Lingkungan Hidup
(National Minister of Population and Environment)

MPE = Menteri Pertambangan Dan Energi
(National Minister of Mining and Energy)

MPPT = Menteri Pariwisata, Pos Dan Telekomunikasi
(National Minister of Tourism, Post and Telecommunication)

MNRT = Menteri Negara Riset Dan Teknologi
(National Minister of Research and Technology)

BAPPENAS = Badan Pertahanan Nasional
(National Development Planning Agency)

Table B.8.2(1) River Water Quality Standards in DKI Jakarta (Governor's Decree No.1608, 1988)

Parameter	Unit	A Drinking Water Source		B Fishery		C Agriculture		D Aquatic Biota	
		Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit
I. PHYSICAL									
- Conductivity	micro-mhos/cm	500	500	500	750	750	750	1000	1500
- Turbidity	NTU	100	150	50	100	100	150	100	150
- Temperature	C	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
- Color	color unit	50	100	50	100	50	100	-	-
- Dissolved solids	mg/l	500	500	-	-	-	-	-	-
II. CHEMICAL									
- NH ₃ - N	mg/l	0.01	2	1	2	-	-	1	1
- Hg	mg/l	0.0005	0.001	0.002	0.002	0.002	0.005	0.002	0.002
- As	mg/l	none	0.05	0.05	0.05	0.05	0.05	0.05	0.05
- Ba	mg/l	none	1	1	1	1	1	1	1
- Fe	mg/l	1	2	1	2	-	-	1	3
- B	mg/l	1	1	-	-	0.7	0.7	-	-
- F	mg/l	0.5-1.5	0.5-1.5	1	1	1	1	1.5	1.5
- H ₂ S	mg/l	none	none	none	0.002	-	-	none	none
- Cd	mg/l	none	0.01	0.01	0.01	0.01	0.01	0.01	0.01
- Cl	mg/l	25	100	12	20	20	50	-	-
- Cr	mg/l	none	0.02	0.05	0.05	0.05	0.05	0.05	0.05
- Hardness	mg/l	100	100	60	100	-	-	60-100	60-100
- Co	mg/l	-	-	0.5	0.5	-	-	-	-
- Mn	mg/l	0.05	1	0.5	0.5	-	-	-	-
- Ni	mg/l	0.1	0.1	0.01	0.01	-	-	-	-
- NO ₃ -N	mg/l	5	10	10	10	10	10	10	10

Table B.8.2(2) River Water Quality Standards in DKI Jakarta (Governor's Decree No.1608, 1988)

Parameter	Unit	A		B		C		D	
		Drinking Water Source		Fishery		Agriculture		Aquatic Biota	
		Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit
II. CHEMICAL									
(Continued)									
- NO ₂ -N	mg/l	none	2	1	2	-	-	1	1
- Ag	mg/l	none	none	-	-	-	-	-	-
- pH	mg/l	6 - 8.5	6 - 8.5	6 - 8.5	6 - 8.5	6 - 8.5	6 - 8.5	6 - 8.5	6 - 8.5
- PO ₄ -P	mg/l	0.5	0.5	0.2 - 0.5	0.2 - 0.5	0.2	0.2	0.5	0.5
- Se	mg/l	none	none	0.02	0.02	0.01	0.01	0.04	0.04
- Zn	mg/l	1	1	0.2	0.2	1	1	1	1
- SO ₄	mg/l	50	100	12	50	12	25	12	15
- Cu	mg/l	none	0.1	0.02	0.02	0.05	0.05	0.05	0.05
- Pb	mg/l	0.05	0.1	0.03	0.03	0.05	0.05	0.05	0.05
- Ca	mg/l	-	-	-	-	-	-	25-40	25-40
III. ORGANIC									
- Carbon chloroform extract	mg/l	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
- M.Blue active substance	mg/l	none	1	-	-	-	-	-	-
- Oil&grease	mg/l	none	none	none	none	none	none	none	none
- CN	mg/l	none	0.05	0.01	0.01	0.02	0.02	0.2	0.2
- Phenol	mg/l	0.001	0.05	0.01	0.02	0.02	0.2	0.2	0.2
- Detergent	mg/l	-	-	0.1	0.5	0.02	0.25	0.2	0.2
- Pesticide	mg/l	none	none	none	none	none	none	none	none
- Organo-chlorine	mg/l	none	none	none	none	none	none	none	none
- Organo-phosphorous	mg/l	none	none	none	none	none	none	none	none

Table B.8.2(3) River Water Quality Standards in DKI Jakarta (Governor's Decree No.1608, 1988)

Parameter	Unit	A		B		C		D	
		Drinking Water Source		Fishery		Agriculture		Aquatic Biota	
		Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit
IV. SPECIAL									
- BOD5 (20 C)	mg/l	5	10	20	20	20	20	30	30
- COD (CR207)	mg/l	10	20	30	30	30	30	50	50
- DO	mg/l	>3	>3	>5	>3	>4	>3	>3	>3
- SS	mg/l	100	150	100	100	200	200	200	200
- SAR	meq/l	-	-	-	-	10-18	10-18	-	-
- %Na	%	-	-	-	-	40	50	-	-
V. BACTERIOLOGY									
- Total bacteria	MPN/100 ml	10 x 10	10 x 10	20 x 10	20 x 10	-	-	10 x 10	10 x 10
- Fecal coliform	MPN/100 ml	20 x 10	20 x 10	40 x 10	40 x 10	-	-	20 x 10	20 x 10

Table B.8.3(1) Water Quality Standards for Sea

No.	Parameter	Unit	Swimming		Mining and Industry		Fishery		Sea Park		Public and Aesthetic		Cooling	
			Permissible Limit (4)	Desirable Limit (5)	Permissible Limit (6)	Desirable Limit (7)	Permissible Limit (8)	Desirable Limit (9)	Permissible Limit (10)	Desirable Limit (11)	Permissible Limit (12)	Desirable Limit (13)	Permissible Limit (14)	Desirable Limit (15)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Physical														
1	Color	CU	50	30	50	30	50	30	50	30	50	30	-	-
2	Smell	-	Natural	None	Natural	Natural	Natural*	None*	Natural*	None*	Natural*	None*	-	-
3	Transparency	m	10	30	-	-	3*	5*	10*	30*	Natural	Natural	-	-
4	Turbidity	TU	30	10	-	-	30*	5*	30*	5*	-	-	-	-
5	Suspended Solids	mg/l	20	20	200*	25*	80*	25*	80*	25*	-	-	2500*	1000*
6	Floating Matters	-	None	None	Natural	Natural	None*	None*	None	None	None*	None*	Natural	Natural
7	Oil Appearance	-	None	None	None	None	None*	None*	None*	None*	None*	None*	None	None
8	Temperature	°C	Natural	26 - 30	Natural*	Natural*	Natural* ± 20	Natural*	-	-	Natural	Natural	-	-
Chemical														
1	pH	-	6 - 9	6.5 - 8.5	6 - 9*	6.5 - 8.5*	6 - 9*	6.5 - 8.5*	6 - 9*	6.5 - 8.5*	-	-	6 - 9*	6.5 - 8.5*
2	Salinity	%	Natural ± 10%	Natural	Natural ± 10%	Natural	Natural ± 10%	Natural	Natural ± 10%	Natural	-	-	Natural ± 10%	Natural
3	Dissolved Oxygen (DO)	mg/l	5	5	-	-	4*	6*	4*	6*	-	-	-	-

Source : KEP-02/MENKLH/1988

Remark : * = Key parameter

Table B.8.3(2) Water Quality Standards for Sea

No.	Parameter	Unit	Swimming		Mining and Industry		Fishery		Sea Park		Public and Aesthetic		Cooling	
			Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit	Permissible Limit	Desirable Limit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
4	BOD5	mg/l	20	10	20*	10*	45*	25*	45*	25*	-	-	-	-
5	COD Dichromate	mg/l	40	20	40	20	80	40	80	40	-	-	-	-
6	Ammonium (NH3-N)	mg/l	4	None	-	-	1*	0.3*	0.3*	0.1*	-	-	-	-
7	Nitrite (NO2)	mg/l	None	None	-	-	None*	None*	None*	None*	-	-	-	-
8	Cyanide (CN)	mg/l	0.20	0.05	0.20	0.05	0.20*	0.05*	0.20*	0.05*	-	-	-	-
9	Hydrogen Sulfur (H2S)	mg/l	-	-	-	-	0.03*	0.01*	0.03*	0.01*	-	-	-	-
10	Oil	mg/l	3	None	2*	None*	5*	None*	5*	None*	5	None	-	-
11	Phenol	mg/l	0.002	None	-	-	0.002*	None*	0.002*	None*	-	-	-	-
12	Pesticides Organic Chlorides	mg/l	0.042	None	0.02	None	0.02*	None*	0.02*	None*	-	-	-	-
13	PCB	mg/l	0.001	None	0.001	None	0.001*	None*	0.001*	None*	-	-	-	-
14	Detergents	mg/l MBAS	0.5	None	1.5	None	1.0*	None*	1.0*	None*	-	-	-	-
15	Mercury (Hg)	mg/l	0.005	0.0001	0.005	0.0001	0.003*	0.0001*	0.006*	0.0001*	-	-	-	-
16	Chromium six valved (Cr6+)	mg/l	0.01	0.00004	0.01	0.00004	0.01*	0.00004*	0.05*	0.00001*	-	-	-	-
17	Arsenic (As)	mg/l	0.05	0.0026	0.05	0.0026	0.01*	0.0026*	0.01*	0.0026*	-	-	-	-

Source : Ibid

Table B.8.3(3) Water Quality Standards for Sea

No.	Parameter	Unit	Swimming		Mining and Industry		Fishery		Sea Park		Public and Aesthetic		Cooling	
			Permissible Limit (4)	Desirable Limit (5)	Permissible Limit (6)	Desirable Limit (7)	Permissible Limit (8)	Desirable Limit (9)	Permissible Limit (10)	Desirable Limit (11)	Permissible Limit (12)	Desirable Limit (13)	Permissible Limit (14)	Desirable Limit (15)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
18	Selenium (Se)	mg/l	0.06	0.00045	0.06	0.00045	0.005*	0.00045*	0.005	0.00045	-	-	-	-
19	Cadmium (Cd)	mg/l	0.01	0.00002	0.01	0.00002	0.01*	0.00002*	0.01*	0.00002*	-	-	-	-
20	Copper (Cu)	mg/l	1	0.001	1	0.001	0.06*	0.001*	0.06	0.001	-	-	-	-
21	Lead (Pb)	mg/l	0.05	0.00002	0.05	0.00002	0.01	0.00002	0.075	0.00002	-	-	-	-
22	Zinc (Zn)	mg/l	0.15	0.002	0.15	0.002	0.1	0.002	0.1	0.002	-	-	-	-
23	Nickel (Ni)	mg/l	0.1	0.007	0.1	0.007	0.002	0.007	0.1	0.007	-	-	-	-
24	Silver (Ag)	mg/l	0.05	0.0004	0.05	0.0004	0.05	0.0003	0.05	0.0003	-	-	-	-
Biology														
1	E.Coliform	per 100 ml	1000	None	1000	None	1000	None	1000	None	-	-	-	-
2	Phatogens	per 100 ml	None	None	None	None	None	None	None	None	-	-	-	-
3	Planktons	Member	None	None	None	None	None	None	-	-	-	-	-	-
Radio Activity														
1	a (Alpha)	pCi/l	1	None	1	None	1	None	1	None	-	-	-	-
2	β (Betha)	pCi/l	100	None	100	None	100	None	100	None	-	-	-	-
3	Sr-90	pCi/l	1	None	1	None	1	None	1	None	-	-	-	-
4	Ra-226	pCi/l	3	None	3	None	3	None	3	None	-	-	-	-

Table B.8.4 Coastal Sea Water Quality Standards of International Beach Resorts

Parameter	Thailand (Phuket)		Philippine		USA (Hawaii)		Japan Swimming & Conservation of Natural Life
	Swimming	Conservation of Coral	Swimming	Conservation of Coral	Swimming	Conservation of Coral	
pH	6.5 ~ 8.3	8.9	6.5 ~ 8.3	-	6.5 ~ 8.3	-	7.8 ~ 8.3
Water Temperature (°C)	23 ~ 33	23 ~ 33	-	-	-	-	-
DO (mg/l)	More than 4	More than 5	More than 5	More than 5	Aerobic	More than 5	More than 7.5
COD KMnO4 (mg/l)	-	-	-	-	-	-	Less than 2
SS (mg/l)	Less than 20	Less than 10	-	-	-	-	-
Cl ⁻ (mg/l)	-	29 ~ 35	-	-	-	-	-
Fecal Coliform (MPN/100 ml)	Less than 1,000	-	-	-	Less than 1,000	-	Less than 1,000
n-Hexan Extracts (mg/l)	N.D	N.D	Less than 2	-	-	-	N.D
Transparency (m)	More than 10	More than 15	-	-	-	-	-

None : N.D means not detectable

Tabel B.8.5 (1) Effluent Standard for Wastewater *)

No	Parameter	Unit	Standard of Wastewater Quality			
			I	II	III	IV
Physical						
1	Temperature	°C	35	38	40	45
2	Disolved Solid	mg/l	1500	2000	4000	5000
3	Suspended Solid	mg/l	100	200	400	500
Chemical						
1	pH		6-9	6-9	6-9	5-9
2	Disolved Ferum (Fe)	mg/l	1	5	10	20
3	Disolved Mangan (Mn)	mg/l	0,5	2	5	10
4	Barium (Ba)	mg/l	1	2	3	5
5	Copper (Cu)	mg/l	1	2	3	5
6	Zinc (Zn)	mg/l	2	5	10	15
7	Chromium six valued (Cr 6+)	mg/l	0,05	0,1	0,5	1
8	Total Cromium (Cr)	mg/l	0,1	0,5	1	2
9	Cadmium (Cd)	mg/l	0,01	0,05	0,1	0,5
10	Mercury (Hg)	mg/l	0,001	0,002	0,005	0,01
11	Lead (Pb)	mg/l	0,03	0,1	1	2
12	Tin (Sn)	mg/l	1	2	3	5
13	Arsenic (As)	mg/l	0,05	0,1	0,5	1
14	Selenium (Se)	mg/l	0,01	0,05	0,5	1
15	Nikel (Ni)	mg/l	0,1	0,2	0,5	1
16	Cobalt (Co)	mg/l	0,2	0,4	0,6	1
17	Cyanide (CN)	mg/l	0,02	0,05	0,5	1
18	Hydrogen sulfide (H ₂ S)	mg/l	0,01	0,05	0,1	1
19	Fluorine (F)	mg/l	1,5	2	3	5

Source : Law for Control and Protection of Environmental Pollution
(No. 16/1988 Governor of Bali Province)

Tabel B.8.5 (2) Effluent Standard for Wastewater *)

No	Parameter	Unit	Standard of Wastewater Quality			
			I	II	III	IV
20	Free Chlorine (Cl ₂)	mg/l	0,5	1	2	5
21	Free Ammonium (NH ₃ -N)	mg/l	0,02	1	5	20
22	Nitrate (NO ₃ -N)	mg/l	10	20	30	50
23	Nitrite (NO ₂ -N)	mg/l	0,06	1	3	5
24	Biochemical Oxygen Demand (BOD)	mg/l	20	50	150	300
25	Chemical Oxygen Demand (COD)	mg/l	40	100	300	600
26	Methylene Blue	mg/l	0,5	5	10	15
27	Phenol	mg/l	0,01	0,5	1	2
28	Plant Oil	mg/l	1	5	10	20
29	Mineral Oil	mg/l	1	10	50	100
30	Radioactivity **)					
31	Pesticida in PCB ***)					

*) Wastewater quality fills the qualifications of standard of wastewater quality. Water is not allowed to be taken directly from the water resources.

The waste water quality is the maximum permissible quality except pH.

**) Radioactivity quality is based on the regulation.

***) Waste of pesticides from the industry is not allowed to pollute water.

Table B.8.6(1) Effluent Quality Standards for Leather Industry

Maximum Discharge : 70 m ³ /ton Product		
Parameter	Maximum Unit	Maximum Pollution Load
BOD ₅	150 mg/l	10.5 kg/ton
COD	300 mg/l	21.0 kg/ton
TSS	150 mg/l	10.5 kg/ton
H ₂ S	1.0 mg/l	0.07 kg/ton
Total Cr	2.0 mg/l	0.14 kg/ton
Oil and Grease	5.0 mg/l	0.35 kg/ton
NH ₃ -N	10.0 mg/l	0.70 kg/ton
pH	6 - 9	

Source : KEP-03/MENKLH/II/1991

Table B.8.6(2) Effluent Quality Standards for Pulp and Paper

Maximum Discharge : 170 m ³ /ton Dry Product		
Parameter	Maximum Unit	Maximum Pollution Load
BOD ₅	150 mg/l	25.5 kg/ton
COD	350 mg/l	59.5 kg/ton
TSS	150 mg/l	25.5 kg/ton
pH	6 - 9	

Source : Ibid

Table B.8.6(3) Effluent Quality Standards for Sugar Industry

Maximum Discharge : 40 m ³ /ton Product		
Parameter	Maximum Unit	Maximum Pollution Load
BOD ₅	100 mg/l	40.0 kg/ton
COD	250 mg/l	10.0 kg/ton
TSS	175 mg/l	7.0 kg/ton
H ₂ S	1.0 mg/l	0.04 kg/ton
pH	6 - 9	

Source : Ibid

Table B.8.6(4) Effluent Quality Standards for Textile Industry

Maximum Discharge : 150 m ³ /ton Product		
Parameter	Maximum Unit	Maximum Pollution Load
BOD ₅	85 mg/l	12.75 kg/ton
COD	250 mg/l	39.5 kg/ton
TSS	60 mg/l	9.0 kg/ton
Phenol	1.0 mg/l	0.15 kg/ton
Total Cr	2.0 mg/l	0.30 kg/ton
Oil and Grease	5.0 mg/l	0.75 kg/ton
pH	6 - 9	

Source : Ibid

Table B.8.6(5) Effluent Quality Standards for Wood Industry

Maximum Discharge : 2.8 m ³ /m ³ Product		
Parameter	Maximum Unit	Maximum Pollution Load
BOD ₅	100 mg/l	0.28 kg/ton
COD	250 mg/l	0.90 kg/ton
TSS	100 mg/l	0.28 kg/ton
Phenol	1.0 mg/l	2.8 kg/ton
pH	6 - 9	

Source : Ibid

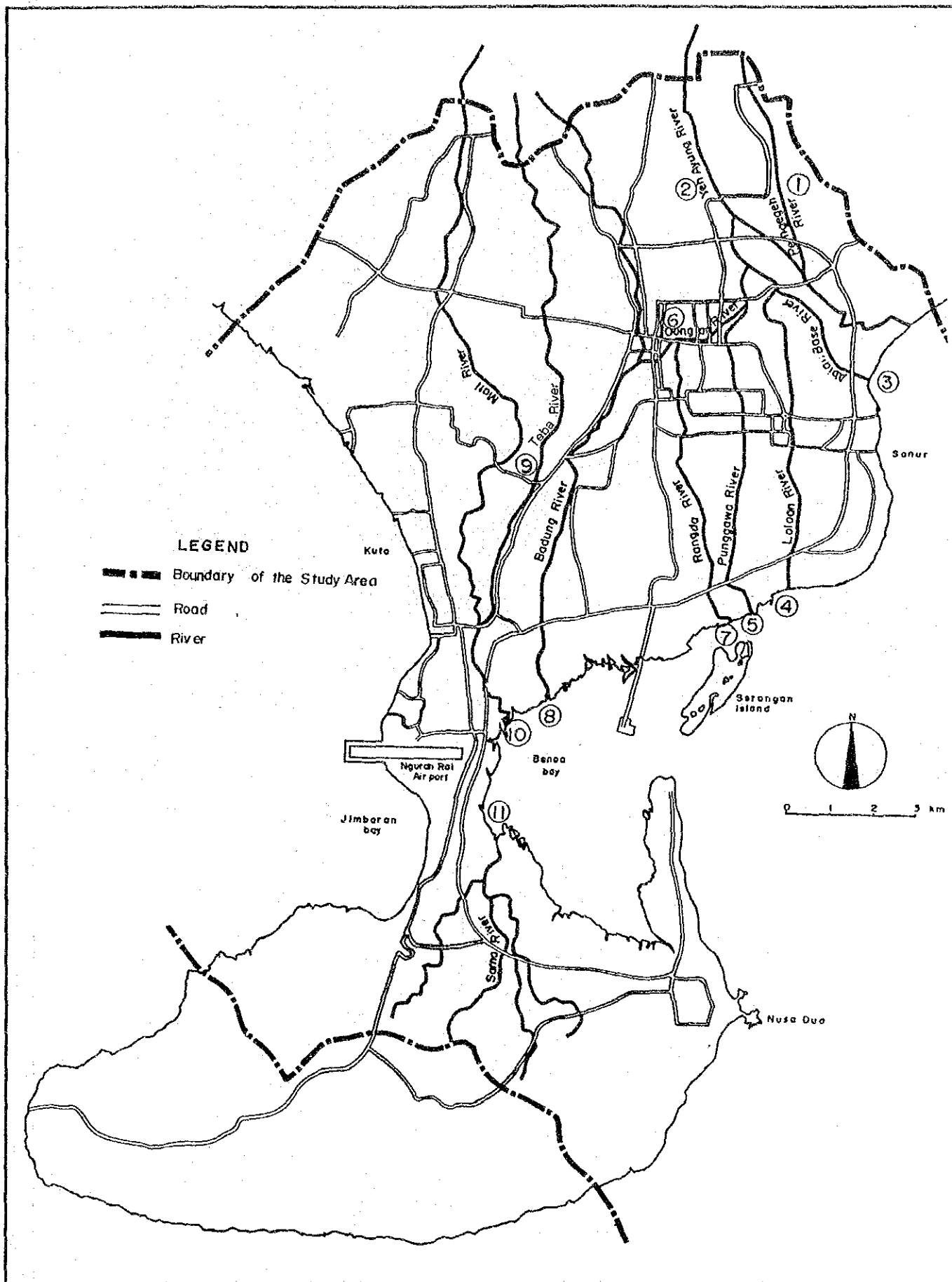


FIG. B.1.1

RIVER NETWORKS IN THE STUDY AREA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

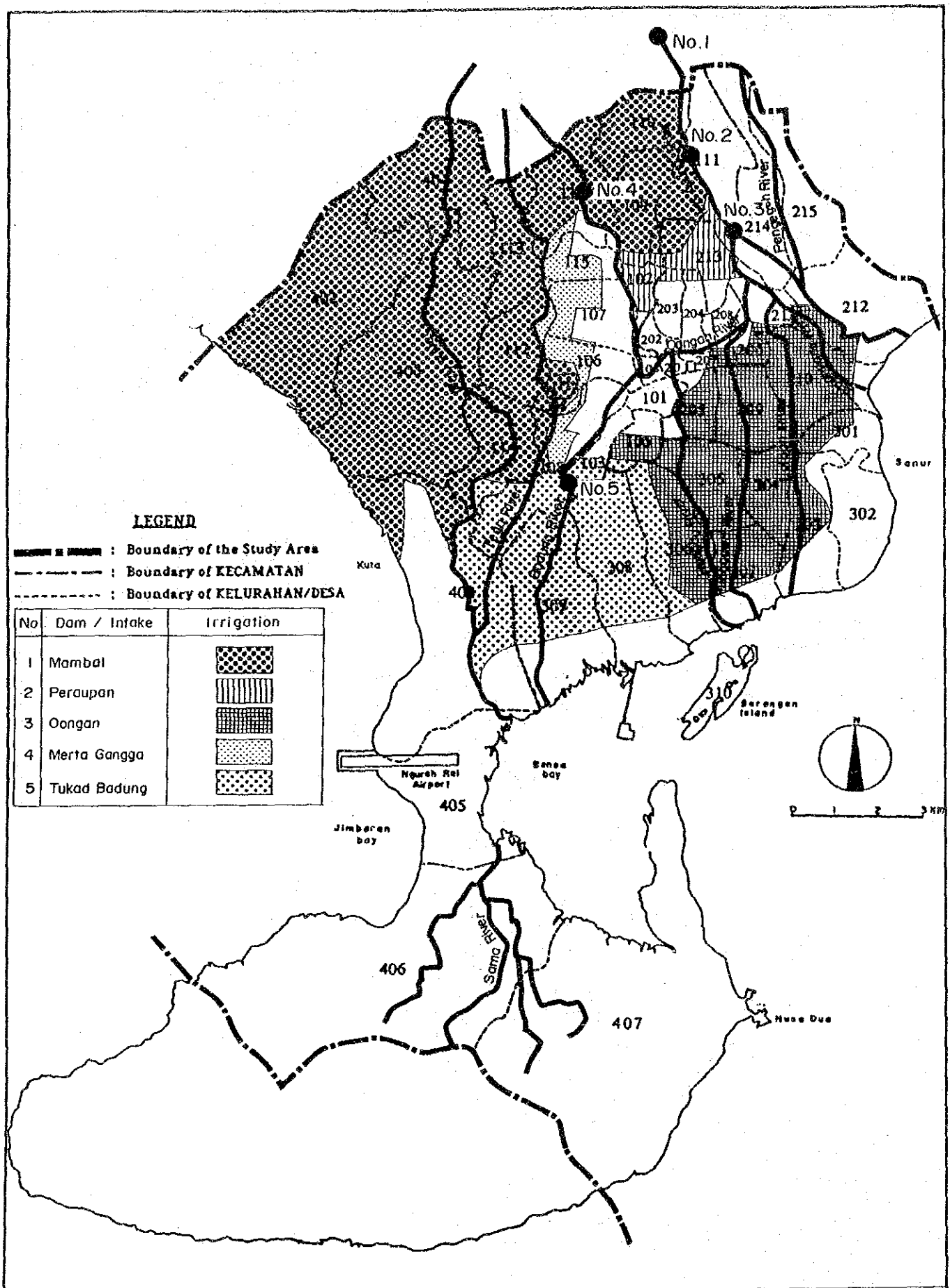


FIG. B.2.1

IRRIGATION INTAKE SITE AND COMMANDING AREA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

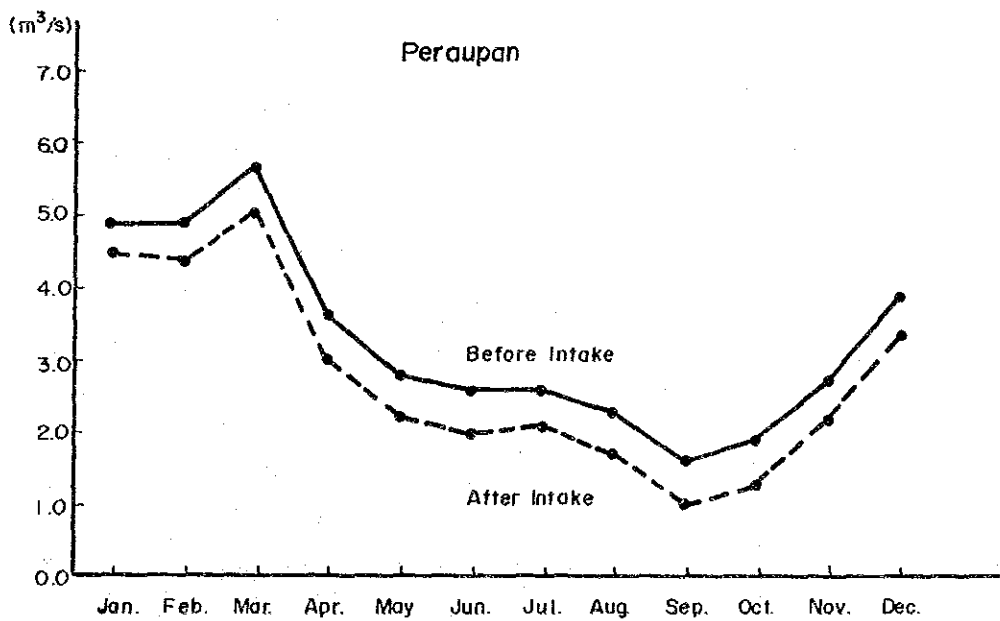
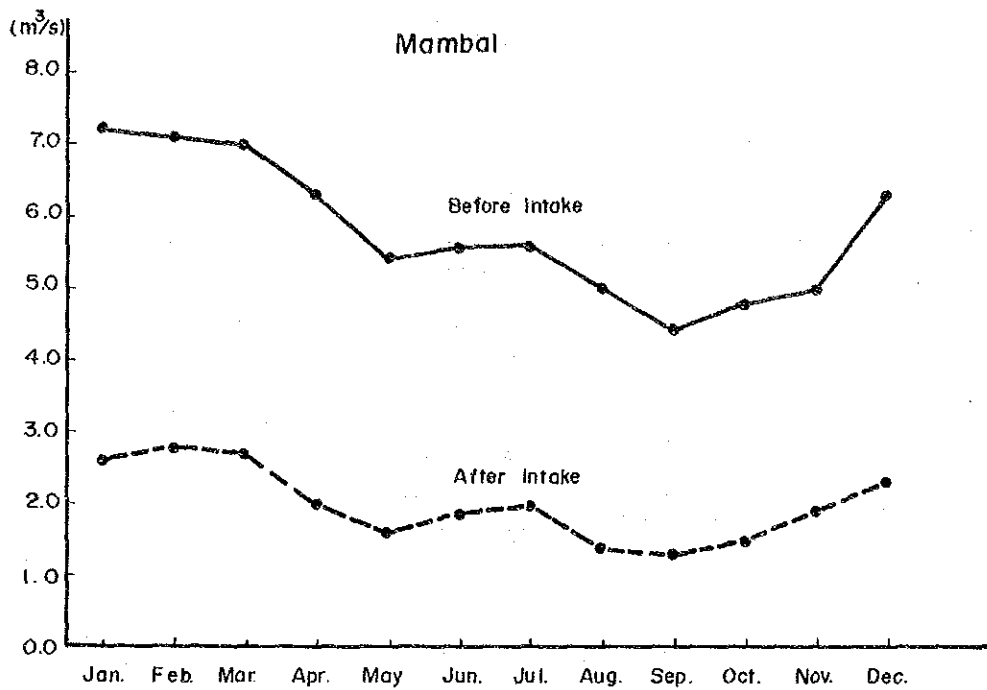


FIG.B.2.2(1)

AVERAGE MONTHLY RIVER DISCHARGE

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

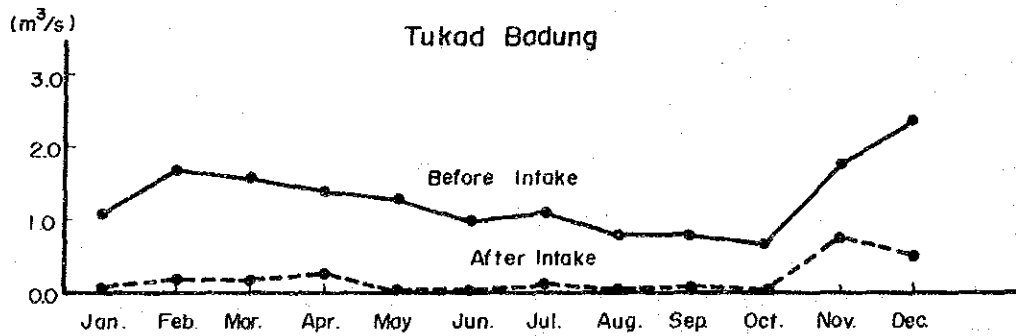
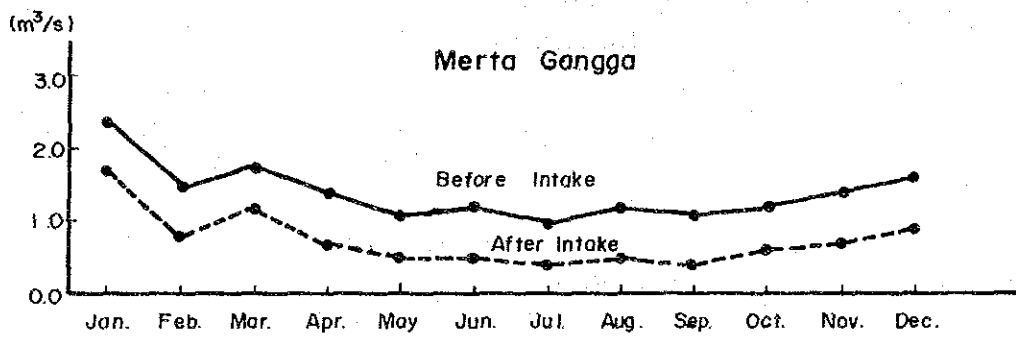
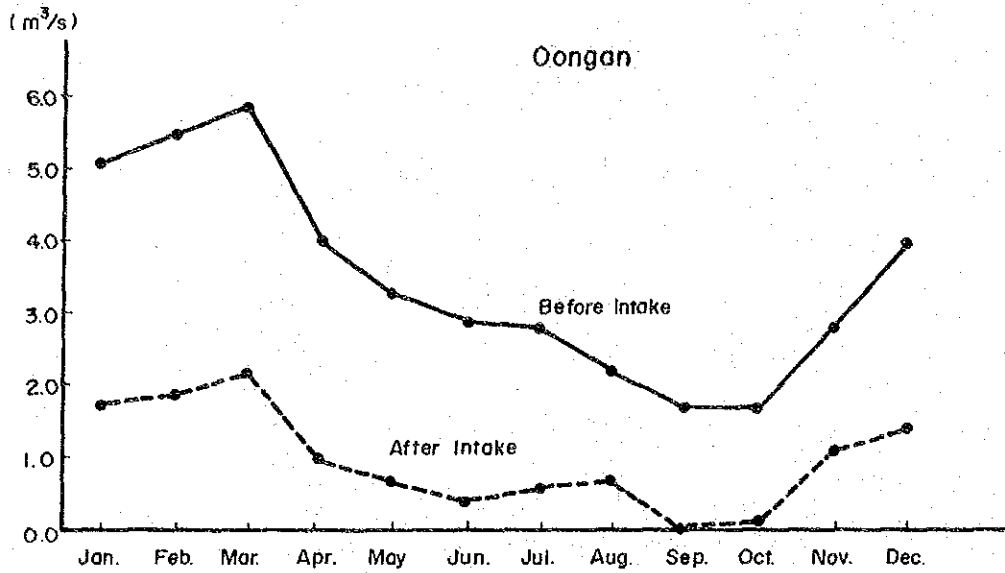


FIG. B.2.2(2)

AVERAGE MONTHLY RIVER DISCHARGE

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

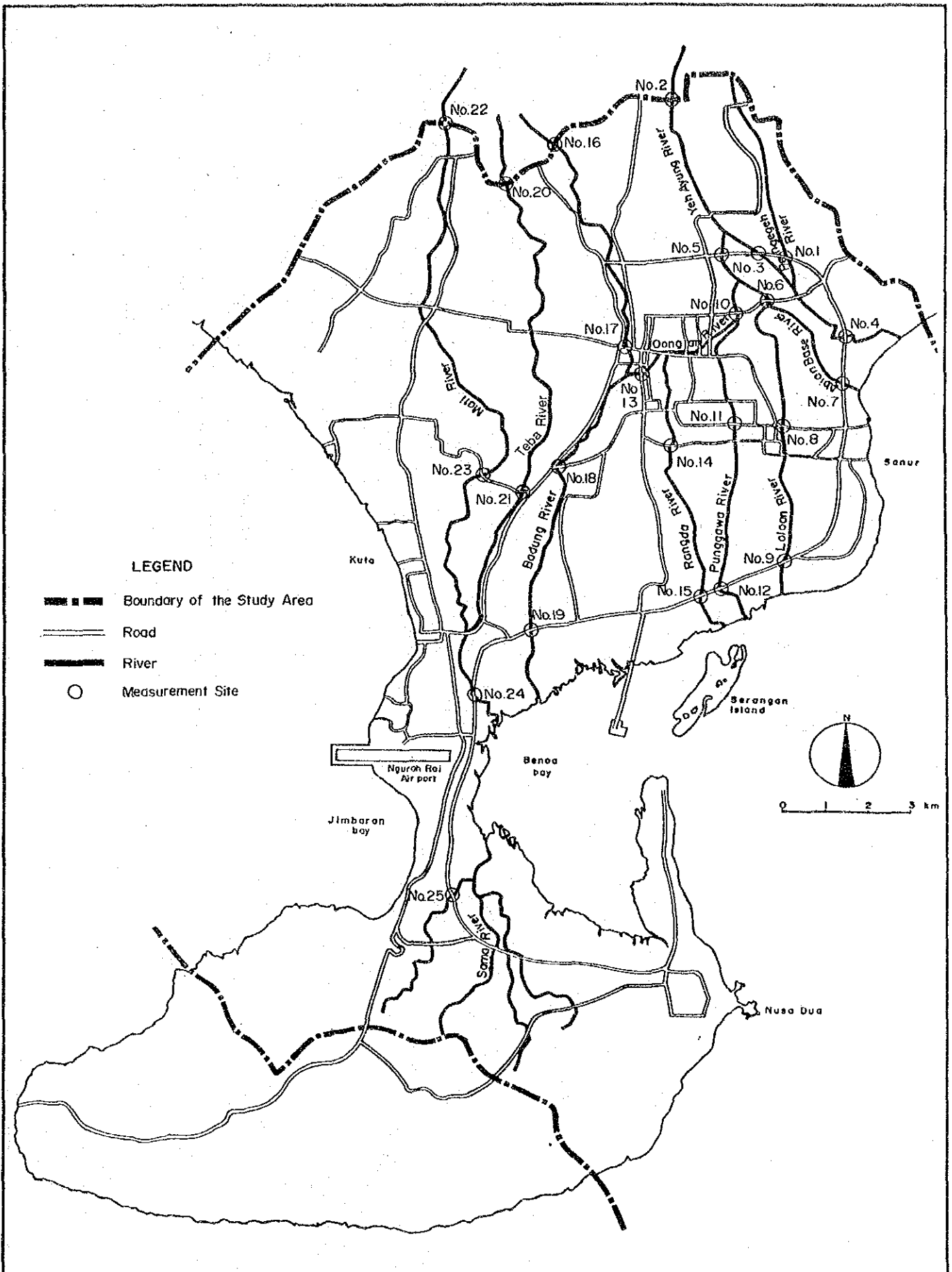


FIG. B.2.3

DISCHARGE MEASUREMENT SITES BY JICA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

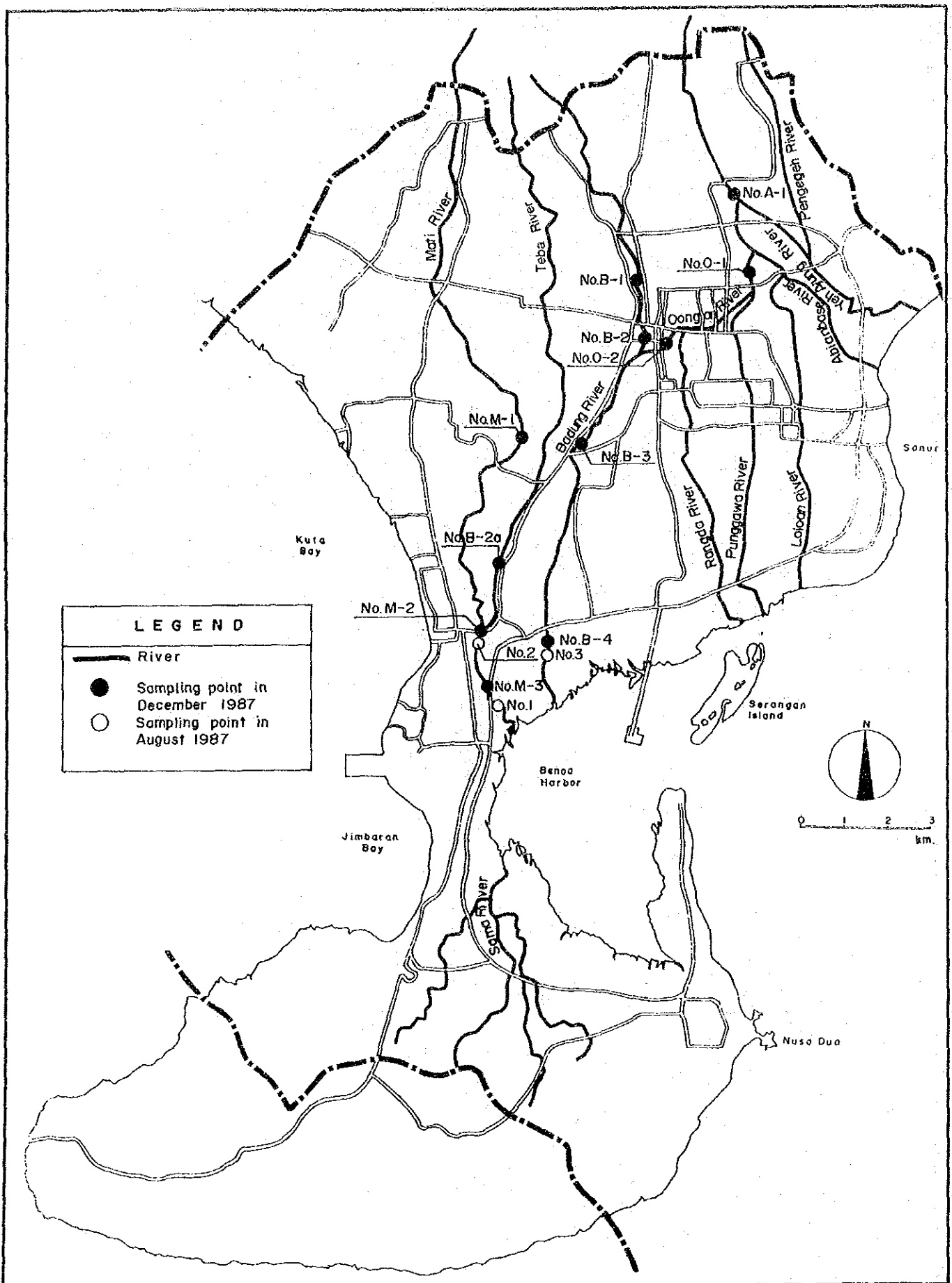


FIG. B.2.4

RIVER WATER QUALITY OBSERVATION POINT

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

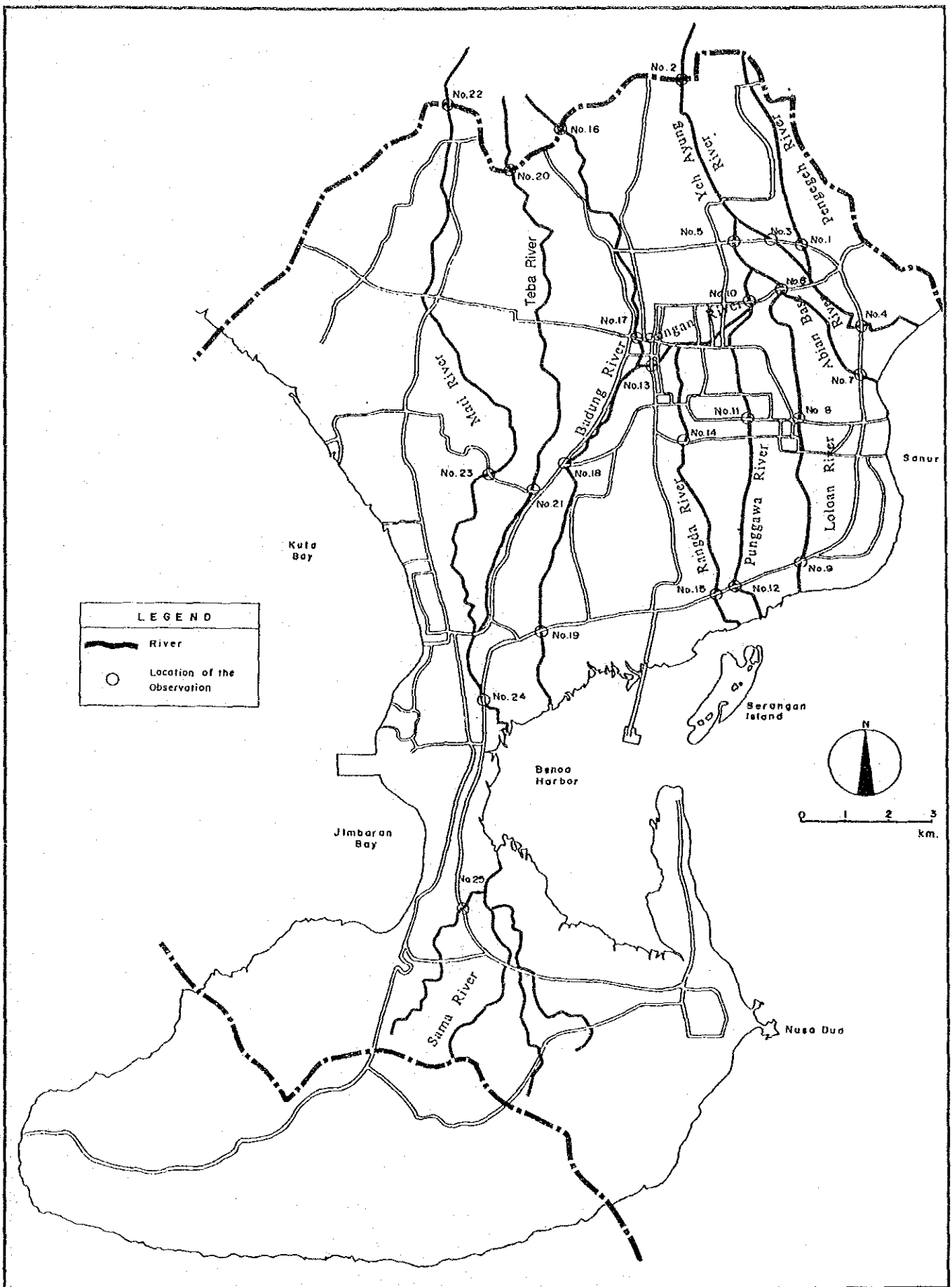


FIG. B.2.5

**RIVER WATER QUALITY OBSERVATION POINT BY JICA
(1991~1992)**

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

(1) DO

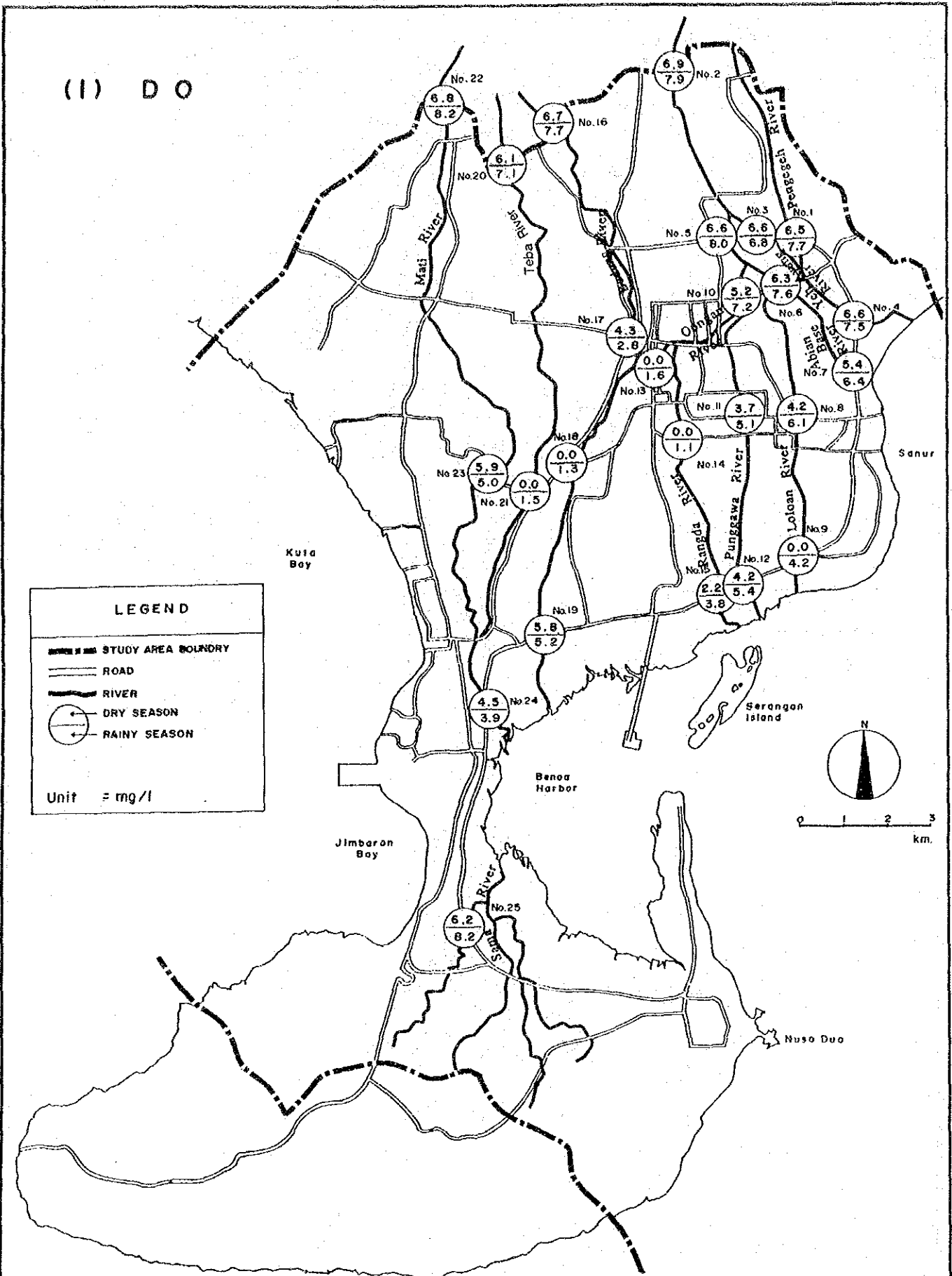


FIG. B.2.6(1)

OBSERVED RIVER WATER QUALITY BY JICA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

(2) BOD₅

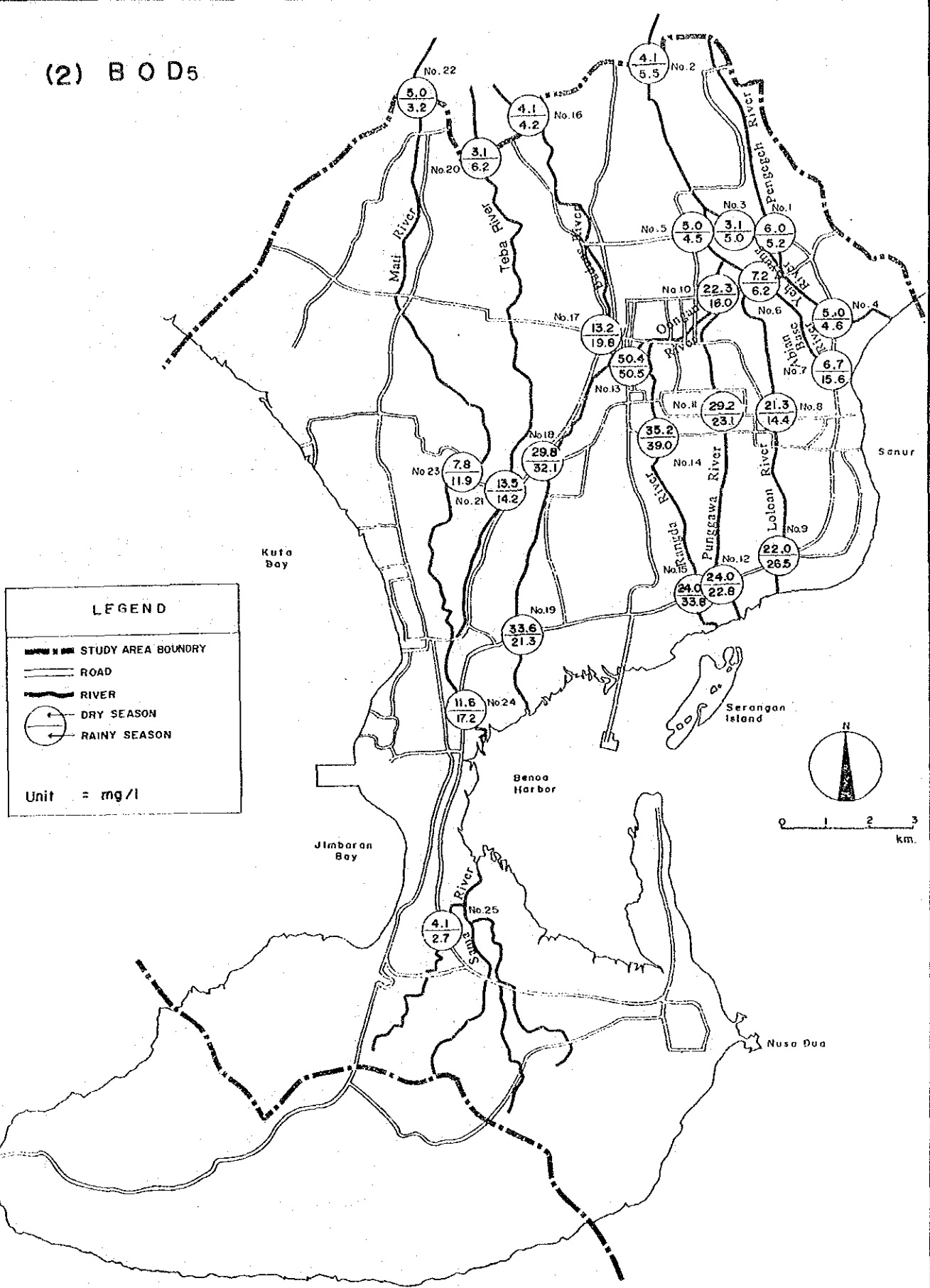


FIG. B.2.6(2)

OBSERVED RIVER WATER QUALITY BY JICA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

(3) COD cr

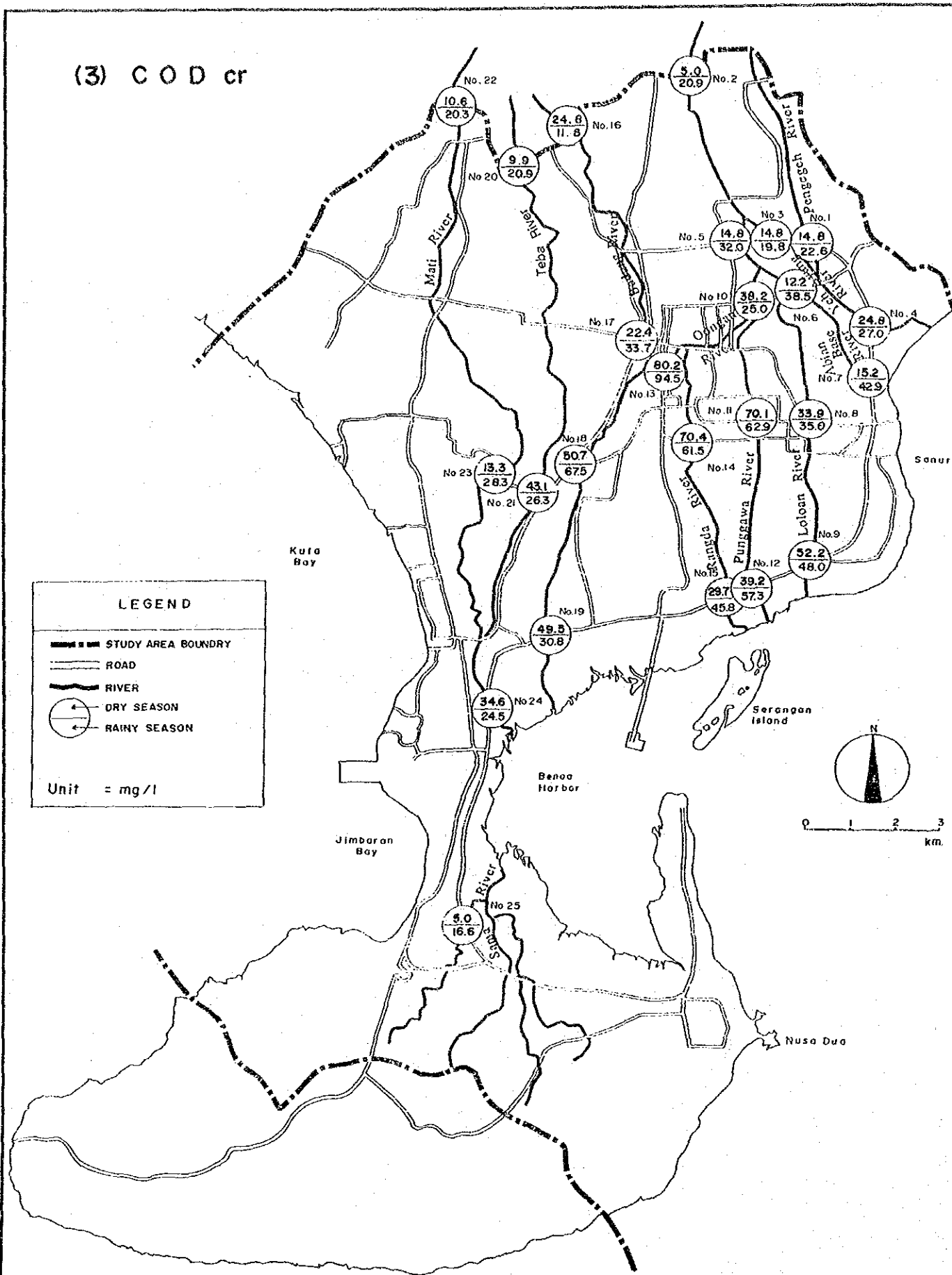


FIG. B.2.6(3)

OBSERVED RIVER WATER QUALITY BY JICA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR

(4) NH4 - N

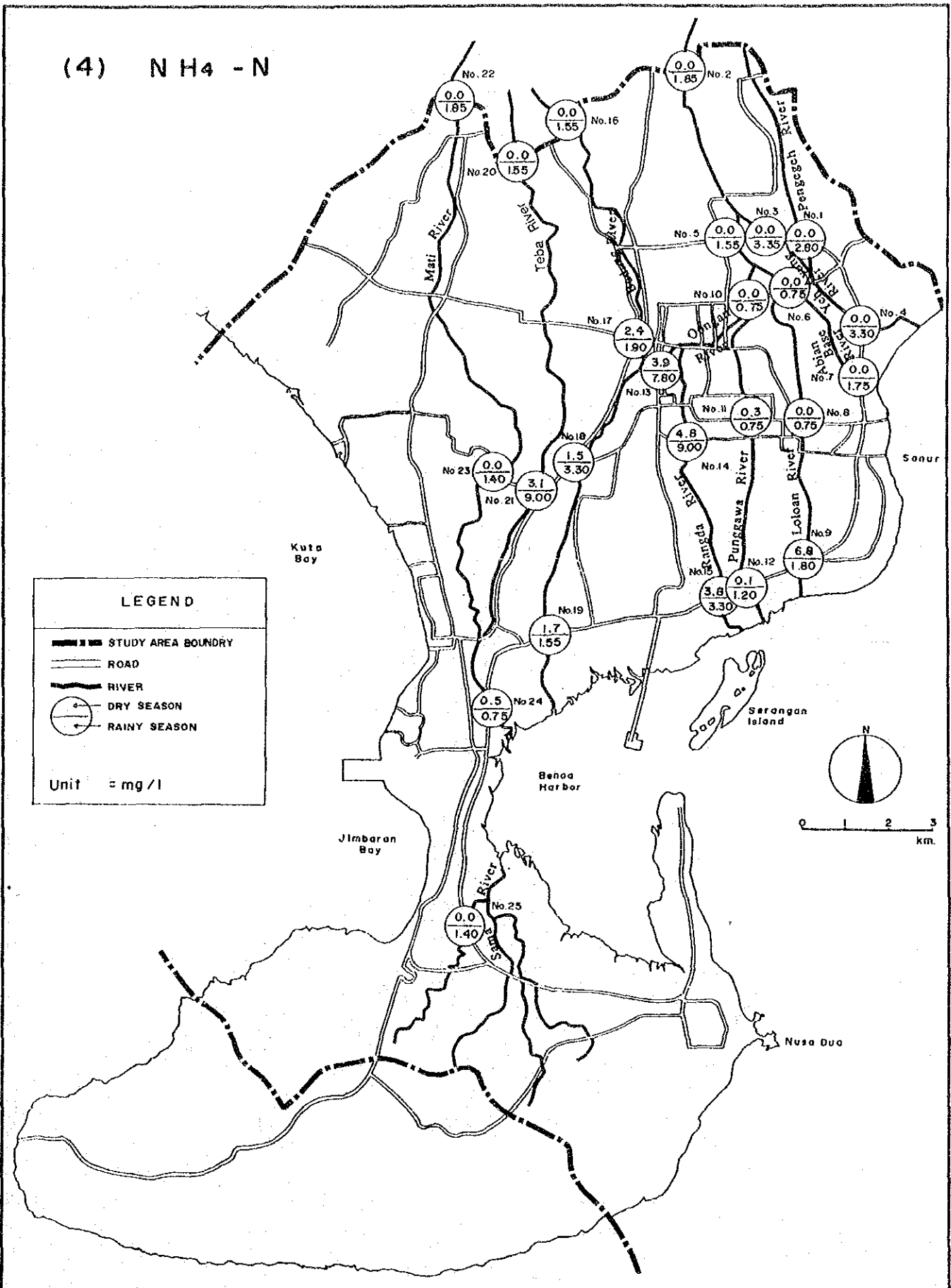


FIG. B.2.6(4).

OBSERVED RIVER WATER QUALITY BY JICA

THE DEVELOPMENT STUDY ON WASTEWATER DISPOSAL FOR DENPASAR