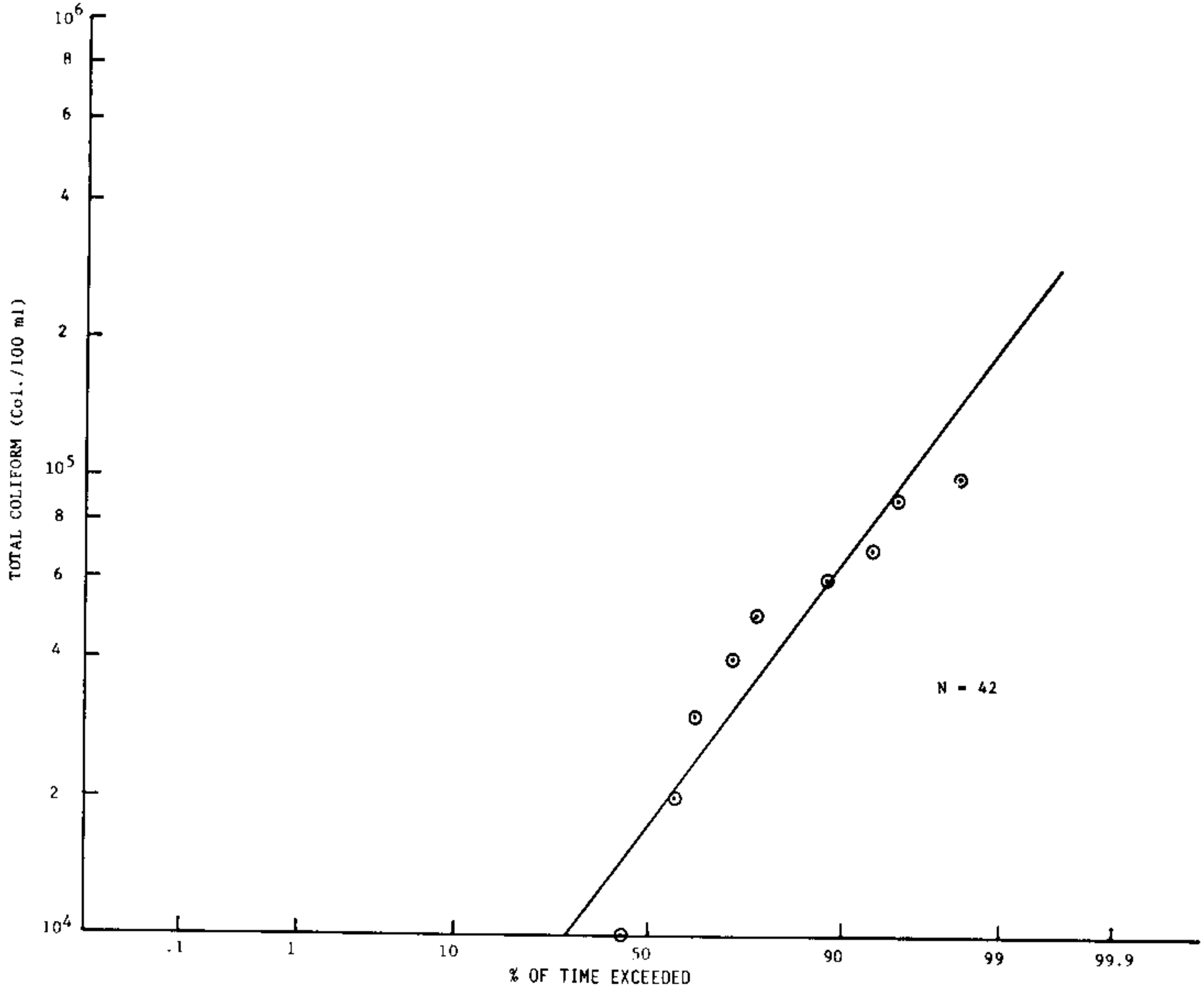

Fig. 94. TOTAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR MARINE DRIVE AND VICINITY STORM DRAINS (excluding NAS Storm Drain).

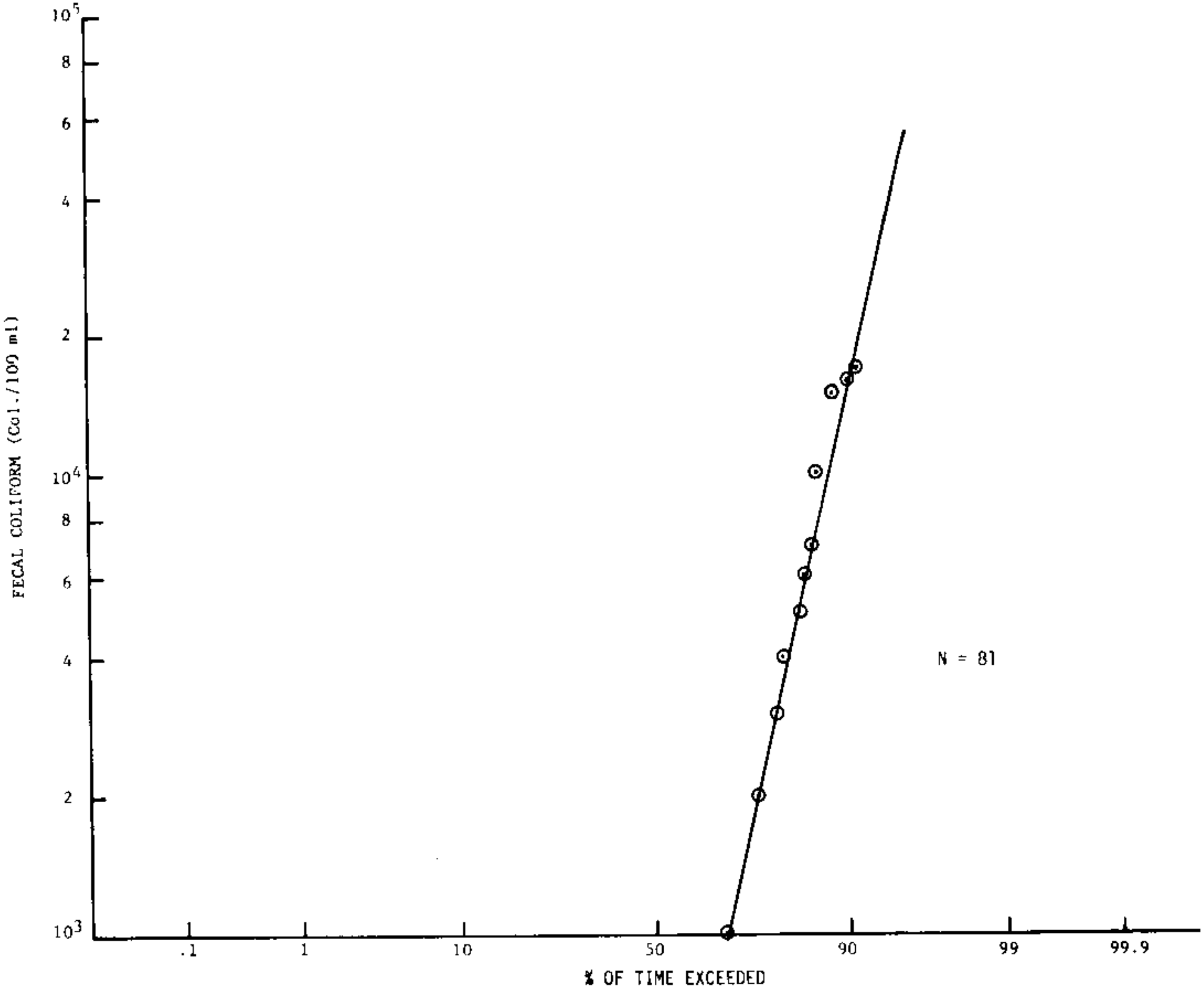

Fig. 95. FECAL COLIFORM vs. FREQUENCY OF OCCURRENCE FOR RESIDENTIAL AREA PONDING BASINS (excluding Mariana Terrace).

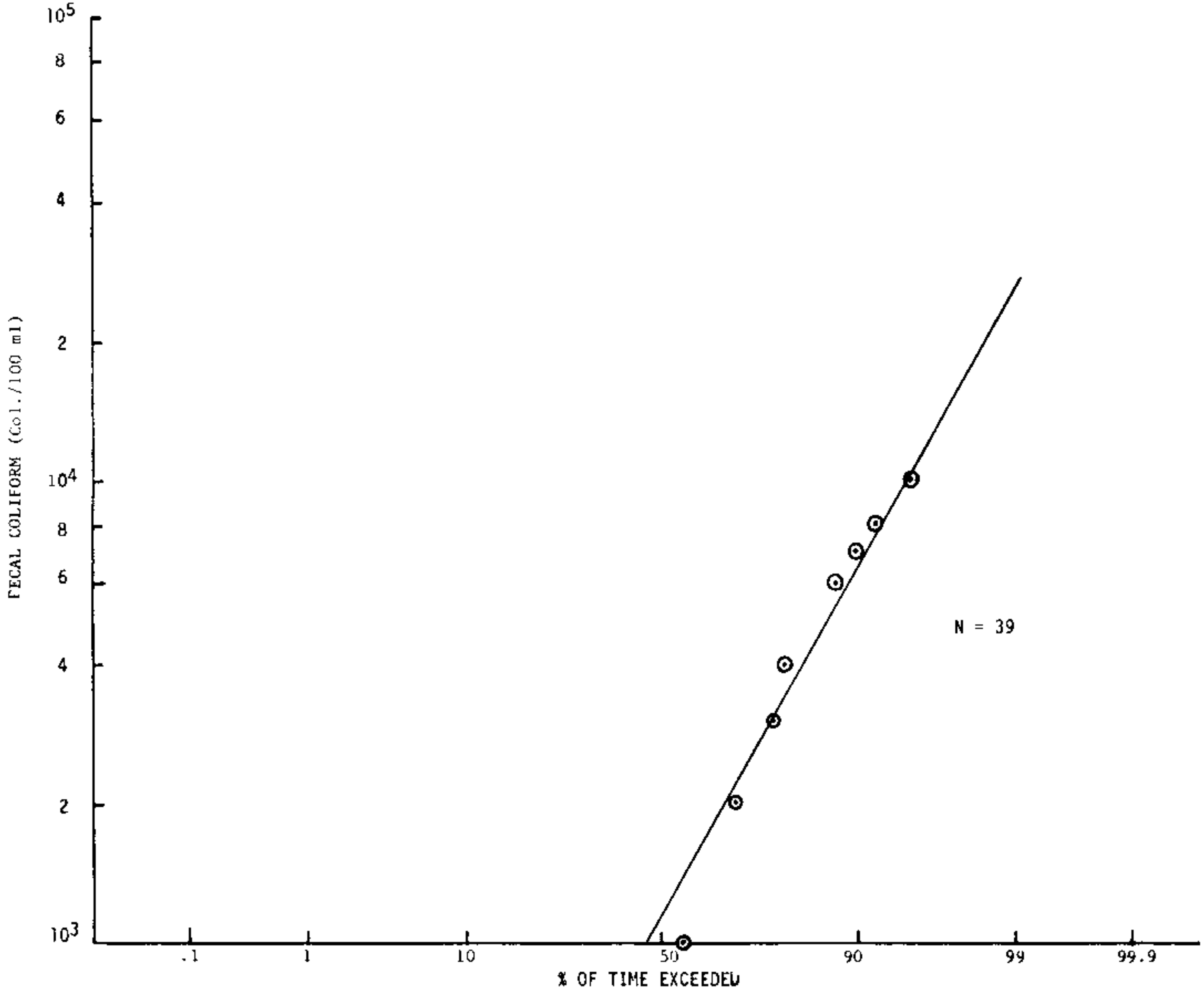

Fig. 96. FECAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR MARINE DRIVE AND VICINITY STORM DRAINS (excluding NAS Storm Drain).

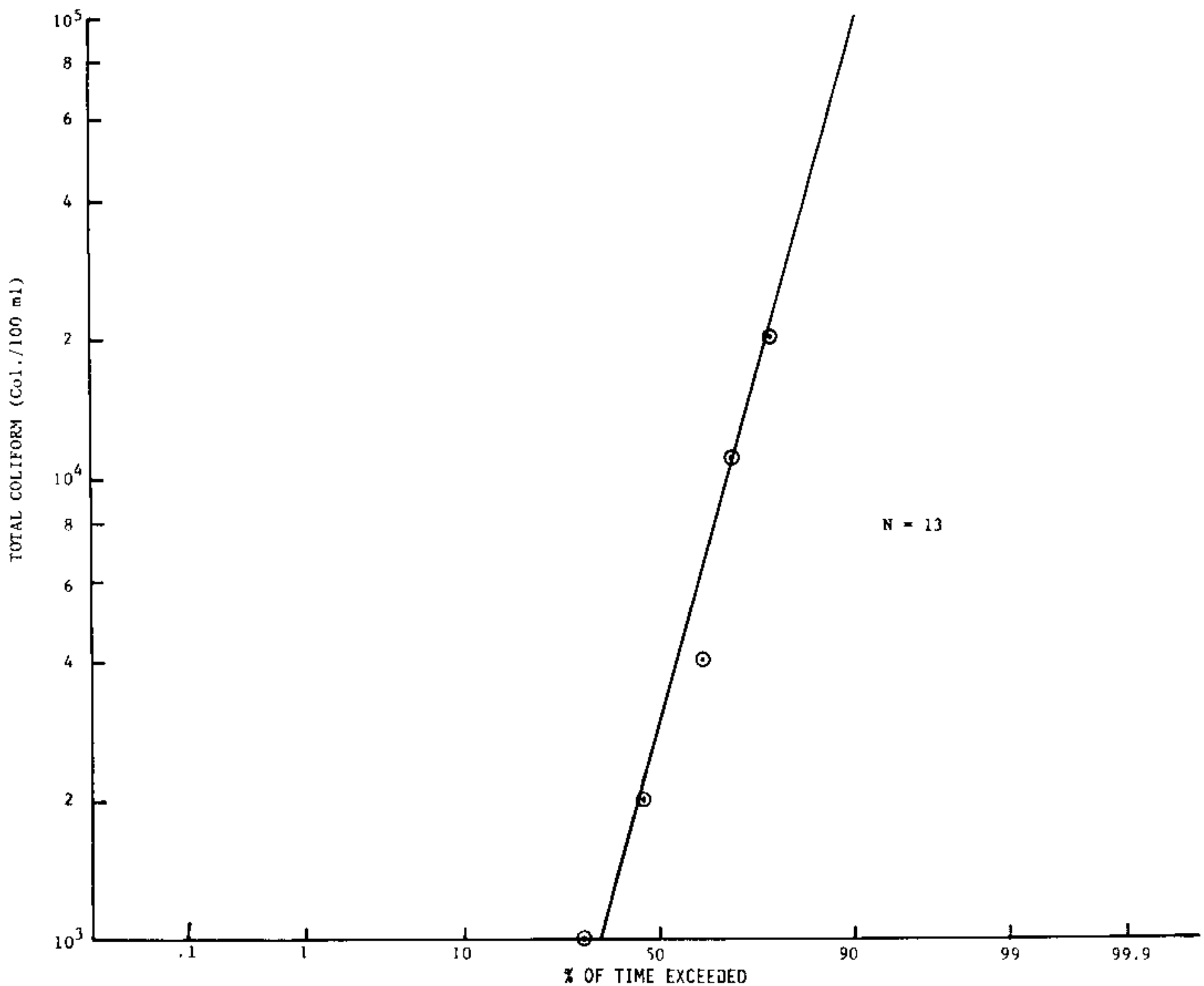

Fig. 97. TOTAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR MARIANA TERRACE PONDING BASIN.

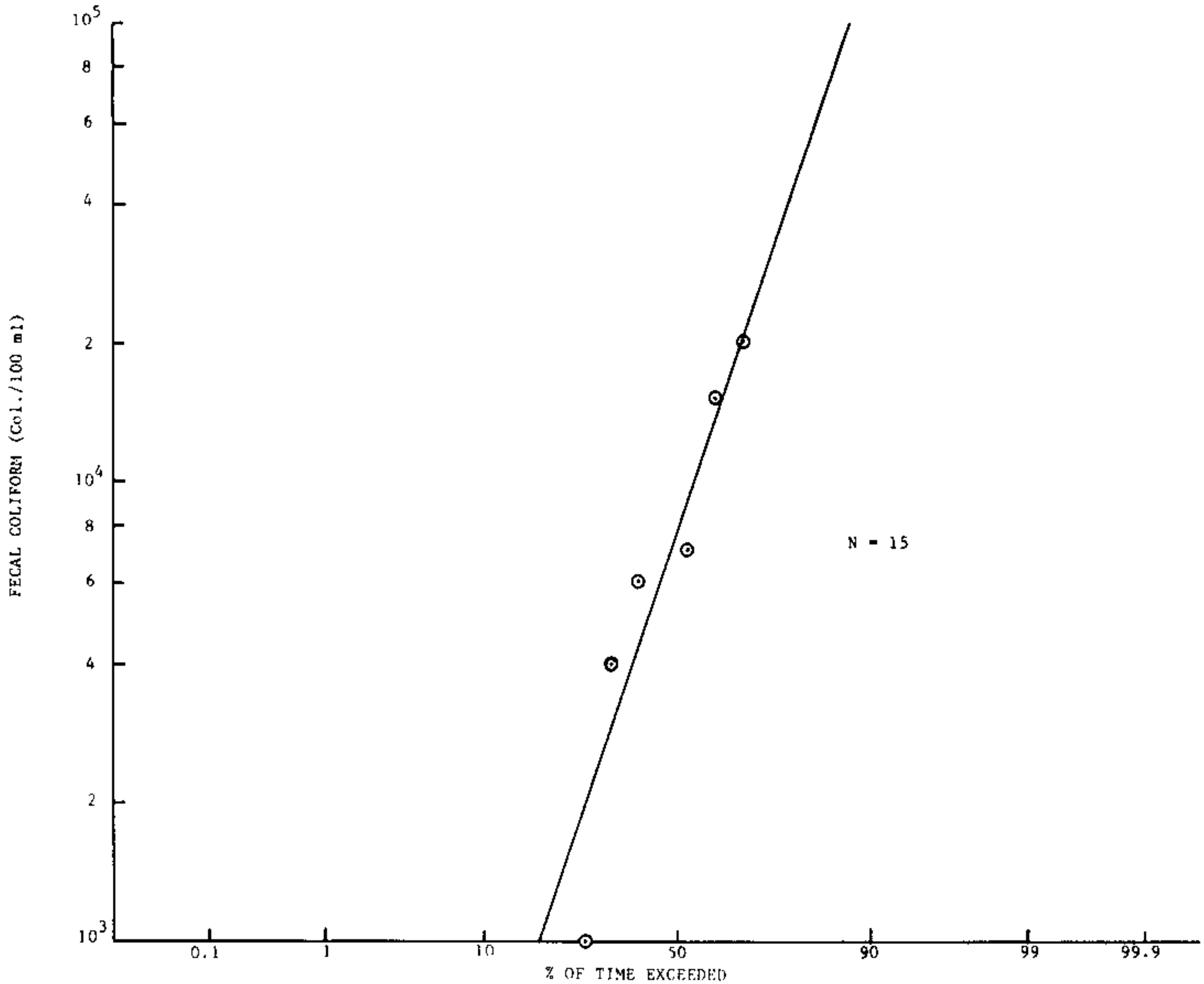

Fig. 98. FECAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR MARIANA TERRACE PONDING BASIN WATER.

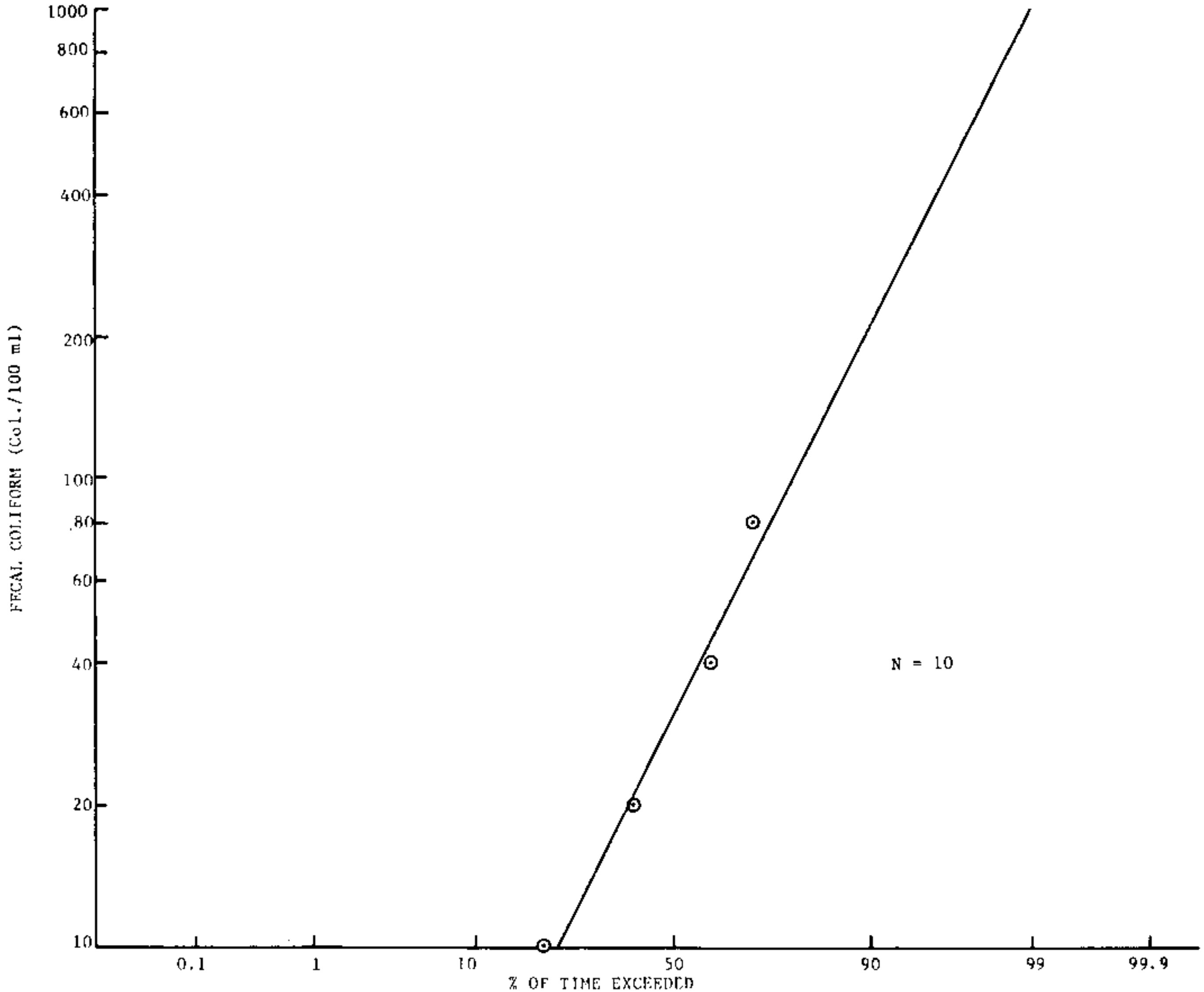

Fig. 99. TOTAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR NAS STORM DRAIN.

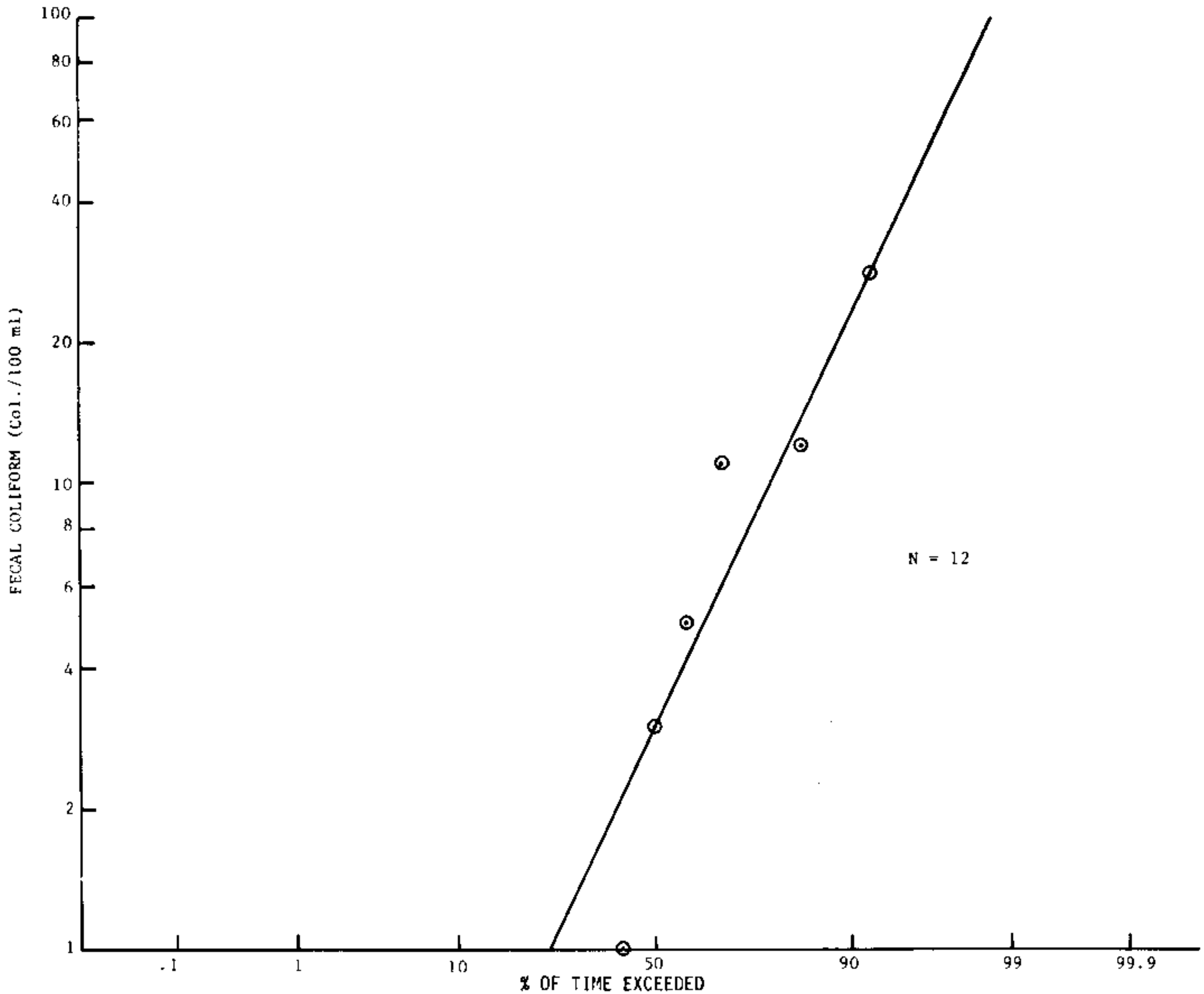

Fig. 100. FECAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR NAVAL AIR STATION STORM DRAIN.

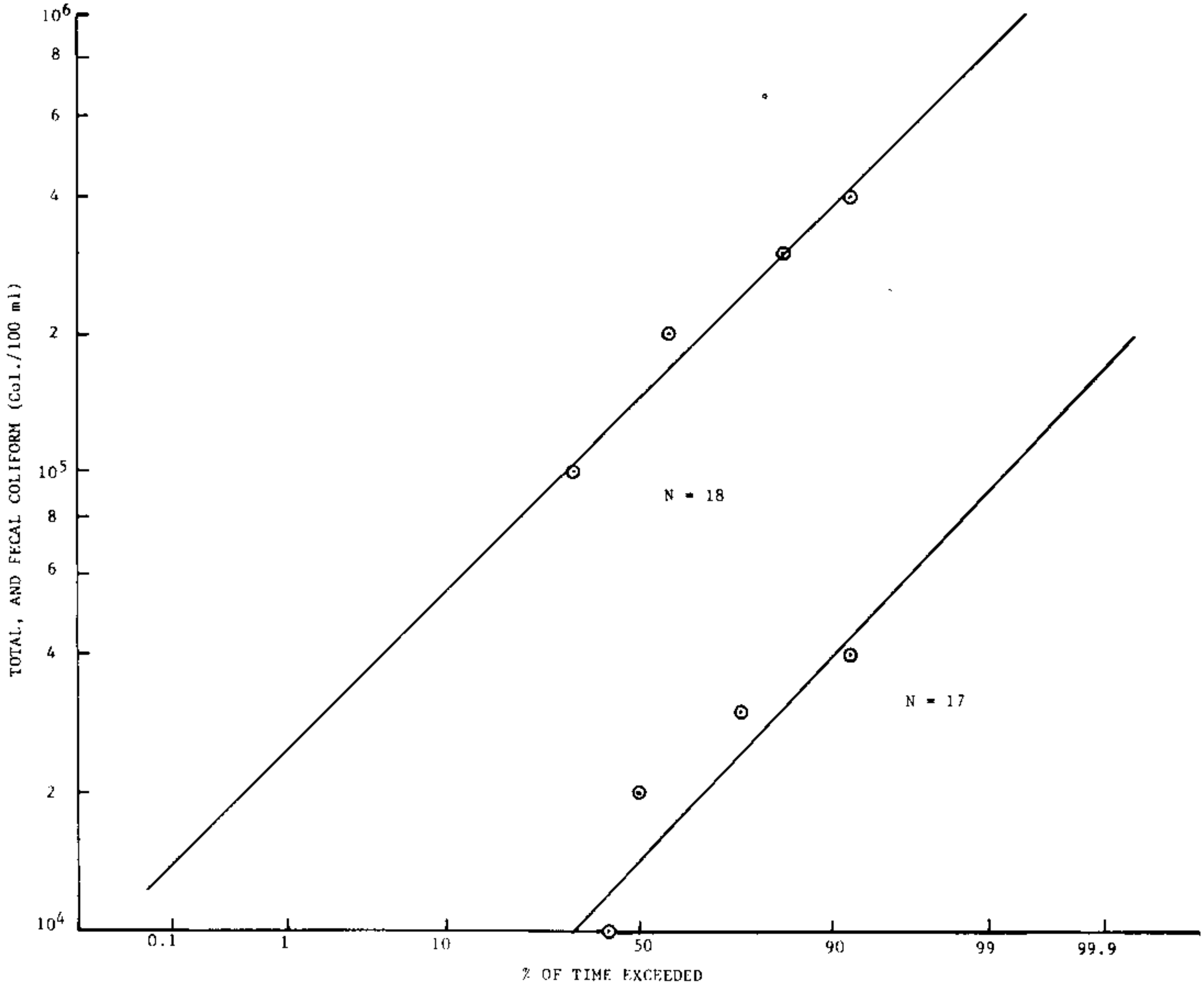

Fig. 101. TOTAL AND FECAL COLIFORM BACTERIA vs. FREQUENCY OF OCCURRENCE FOR BARRIGADA HEIGHTS STORM DRAIN (B2d) EFFLUENT DURING WET WEATHER (May, June and July, 1977).

Table 1. General features of ponding basin and coastal study sites.

KEY:
- AGAR – Agana argillaceous
- MARI – Mariana limestone
- BARR – Barrigada limestone
- CHA-SA – Chacha-Saipan clay
- AAA – Agat-Asan-Atate clay
- SYC – Saipan-Yona-Chacha clay
- QRB – Beach deposits
- ALLU – Alluvial clay deposit
- GUAM – Guam clay

	TYPE OF ZONE	LIMESTONE FORMATION	SOIL TYPE IN AREA	RUNOFF SOURCE	DRAINAGE AREA km^2	BASIN[4] VOLUME m^3	PERCOLATION RATE cm/Hr.
Blc and Ble	Resource	AGAR	CHA-SA	Commercial[2] and Residential	.09	11,300	< 1
B2w and B2d	Conservation	MARI	GUAM	Residential	> 1.0	3,000	< 1
B3	Conservation	MARI	GUAM	Residential	> 1.0	7,200	> 20[5]
L2	Conservation	BARR	GUAM	Residential	.33	33,000	100
L3	Conservation	BARR	GUAM	Residential	.33	7,000	< 5
DEDEDO	Resource	BARR	GUAM	Commercial and Residential	.75	68,000	7.6
PEREZ	Resource	BARR	GUAM	Residential	.08	6,400	102[6]
MT	Resource	BARR/MARI	AAA/SYC/ ALLU	Residential[3]	.50	200,000	< 1
AP	Recharge	MARI[1]	QRB	Commercial and Natural	.30	< 300	-
EAB	Recharge	MARI	QRB	Commerical	-	-	-
WAB	Recharge	MARI/Alifan	QRB	Commercial	-	-	-
NAS	Recharge	MARI	QRB	Residential and Commercial	-	-	-
CWR	Recharge	MARI	QRB	Commerical and Residential	-	-	-

1 – drainage from this site enters the Harmon Sink which is Mariana limestone.
2 – runoff from storm drain is commercially derived, natural runoff is residential.
3 – raw and treated sewage imput.
4 – basin volumes are based on actual available data or rough calculations using maps and field observations of the site.
5 – at 4-5 m head, based on field observations.
6 – at 3 m head during construction, observed rate <5 cm/hr.

Table 2. Sampling frequency for ponding basins and coastal discharge sites. The sampling set includes the total number of phase one and two sets. During the monitoring phase almost all parameter were being analyzed.

SAMPLING SITES	PHASE 1 BEGINNING	MONITORING BEGINNING	MONITORING ENDED	SAMPLING SETS	PERCENT TIME DRY
B1e	12-12-75	7- 6-76	4-13-77	35	0
B1c	12-16-77	7- 6-76	4-13-77	35	0
B2w	2-13-75	7- 6-76	4-13-77	32	14
B2d	1- 1-76	7- 6-76	4-13-77	33	0
B3	12- 2-75	7- 6-76	4-13-77	27	18
L2	12- 2-75	7-19-76	4-13-77	27	25
L3	1- 1-76		7-19-76	12	-
DEDEDO	3- 3-76		7-19-76	8	-
PEREZ		7- 6-76	4-13-77	22	0
MT	12- 2-75	7- 6-76	4-13-77	20	9[1]
AP		8-10-76	4-13-77	20	0
CWR		3-10-76	5-11-77	4	0
EAB		7-12-76	5-11-77	22	0
NAS		7-12-76	5-10-77	19	5[2]
WAB		7-12-76	5-11-77	17	19[3]
HILTON	12-11-75		7-26-76	4	-
CONT 1	12-11-75		7-26-76	3	-
CONT 2	12-11-75		7-26-76	2	-
REEF	12-11-75		12-11-75	2	-
OKURA	12-11-75		7-12-76	4	-

1 - water level at sampling site to low for sampling but basin contained ponded water.
2 - high tide, seawater intursion.
3 - high tide, seawater intrusion, or volume flow to low for sampling.

Table 3. Parameters analyzed during the study.

PARAMETER	METHOD	SOURCE
pH	glass electrode method	Standard Methods
Temperature	mercury thermometer	" "
Turbidity	nephelometric method	" "
Specific Conductance	wheatstone bridge	" "
Total Solids (Residue)	evaporation at 105°C	" "
Suspended Solids	glassfiber filter	" "
Total Dissolved Solids	total solids minus suspended solids	" "
Volatile Solids	ignition at 550°C	" "
Volatile Suspended Solids	ignition at 550°C	" "
Settleable Solids	Imhoff cone	" "
Total Alkalinity	potentiometric titration	" "
Phenolpthalein Alkalinity	potentiometric titration	" "
Chloride	argentometric titration	" "
Sulfate	turbidimetric method	" "
Hardness	EDTA titrametric method	" "
Calcium Hardness	EDTA titrametric method	" "
Dissolved Oxygen	iodometric-azide modification	" "
Biochemical Oxygen Demand	5 day incubation at 20°C	" "
Chemical Oxygen Demand	dicromate-reflux method	J. S. Jeris, Water & Water Engineering
Orthophosphorus	ascorbic acid reduction	A Practical Handbook for Seawater Analysis
Total Phosphorus	persulfate digestion-ascorbic acid reduction	Standard Methods
Nitrite-Nitrogen	sulfanilamide diazotization	A Practical Method for Seawater Analysis
Nitrate-Nitrogen	cadmium reduction	A Practical Method for Seawater Analysis
Oil and Grease	partition-gravimetric method	Standard Methods
MBAS	methylene blue method	L. Wang, Journal of American Water Work Association
Total Coliform	membrane filter	Standard Methods
Fecal Coliform	membrane filter	Standard Methods

Table 4. Mean, standard deviation, range,and number of samples for parameters measured.

	BARRIGADA (1e)					BARRIGADA (1c)				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	8.78	.70	7.15	10.24	30	8.54	.72	6.71	9.52	30
TEMP., °C	29.4	2.0	25.0	33.2	31	29.1	2.2	25.4	34.4	32
TURB., NTU	5.3	4.9	1.0	25	30	20	3.5	1.2	125	30
Sp-COND umho/cm	139	37.5	88.0	229	28	140	58.2	69.5	362	29
TOTAL ALK, mg/1	55.3	16.4	34.0	85.5	29	65.8	23.8	35.0	148	30
PHEN. ALK, mg/1	7.0	4.6	0.0	22	27	4.0	4.4	0.0	14.2	29
CL, mg/1	11.4	8.26	5.70	45.1	21	12.8	9.02	6.10	44.6	19
Settleable, ml/1	5.3	34	0.0	8.0	21	0.1	0.4	0.0	2.0	20
TS, mg/1	117	76	27	343	20	178	16.5	41	656	19
VS, mg/1	61	45	15	173	11	41	3.6	2.0	127	14
SS, mg/1	11	10	1.4	35	21	48	108	1.7	434	20
VSS, mg/1	7.2	5.2	1.5	19	18	14	26	2.1	98	13
TDS, mg/1	106	80	13	341	20	130	81	28	317	19
OIL + GREASE, mg/1					0	13.1	10.4	4.3	26.0	4
DO, mg/1	7.73	2.77	1.00	13.2	27	6.36	2.22	1.00	11.08	26
BOD, mg/1	2.86	3.15	0.42	13.9	17	3.91	4.47	0.46	17.2	16
COD, mg/1	21	14	0.0	51	22	37	41	2.7	192	20
NO_2-N, mg/1	.004	.010	.000	.050	27	.005	.011	.000	.051	26
NO_3-N, mg/1	.068	.109	.000	.602	34	.071	.089	<.001	.341	33
T-P, mg/1	.120	.082	.038	.297	8	.096	.039	.047	.167	8
PO_4-P, mg/1	.038	.020	.000	.082	34	.044	.054	.007	.316	34
MBAS, mg/1	.178	.117	.075	.431	7	.379	.507	.140	1.63	8
SO_4, mg/1			<1.0	2.0	5	2.7	4.8	1.0	12.3	6
HARDNESS, mg/1	75.4	9.63	67.2	86.0	3	73.5	27.3	42.0	91.4	3
Ca HARDNESS, mg/1	76.0	7.07	71.0	81.0	2	63.0	29.7	42.0	84.0	2
TOTAL COLIFORM COL./100 ml	2,120	3,959	0	11,000	9	2,272	2,683	0	<10,000	11
FECAL COLIFORM COL./100 ml	208	407	0	1,470	12	3,445	6.757	0	20,000	12

Table 5. Mean, standard deviation, range, and number of samples for parameters measured.

	BARRIGADA HEIGHTS (B2d)					BARRIGADA HEIGHTS (B2w)				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	7.74	0.54	6.79	8.90	30	8.58	0.64	7.13	9.60	27
TEMP., °C	27.3	1.6	25.4	33.2	30	29.1	2.0	25.6	32.7	30
TURB., NTU	23	39	1.4	200	28	16	24	1.4	113	28
Sp-COND umho/cm	125	53.0	70.8	249	28	97.9	29.1	57.9	163	26
TOTAL ALK, mg/l	53.4	16.2	35.6	103	30	44.5	5.90	33.1	56.8	26
PHEN. ALK, mg/l	0.3	0.8	0.0	3.2	26	4.7	5.5	0.0	22	26
CL, mg/l	11.8	8.52	4.40	29.5	20	7.94	4.90	.10	17.5	20
Settleable, ml/l	<.1		0.0	<.1	17	<.1		0.0	<.1	17
TS, mg/l	129	86	49	388	20	88	64	14	320	20
VS, mg/l	51	25	13	96	11	34	32	1.7	82	12
SS, mg/l	9.9	8.0	1.0	25	19	8.2	5.0	1.9	20	20
VSS, mg/l	5.5	4.9	1.0	19	16	5.4	3.5	1.2	14	14
TDS, mg/l	120	88	32	386	20	69	35	2.9	122	19
OIL + GREASE, mg/l	16.6	11.0	2.2	31.5	5					0
DO, mg/l	4.79	2.40	1.51	7.82	24	8.94	3.21	4.50	16.3	25
BOD, mg/l	2.90	1.94	0.05	8.63	16	2.48	2.35	0.32	8.18	17
COD, mg/l	24	13	0.40	46	20	14	11	0.70	44	20
NO_2-N, mg/l	.008	.009	.000	.030	30	.002	.006	.000	.022	24
NO_3-N, mg/l	.110	.100	<.001	.325	30	.051	.080	.000	.315	31
T-P, mg/l	.127	.059	.063	.245	8	.054	.028	.019	.092	7
PO_4-P, mg/l	.050	.039	.000	.190	32	.015	.026	.000	.143	31
MBAS, mg/l	.386	.230	.057	.665	9	.169	.115	.077	.396	6
SO_4, mg/l	4.3	5.0	0.0	12.6	5	6.8	9.7	<1.0	13.7	2
HARDNESS, mg/l	60.0	24.2	34	82	3	36.0	11.3	28.0	44.0	2
Ca HARDNESS, mg/l	54.0	31.1	32	76	2				44.0	1
TOTAL COLIFORM COL./100 ml	19,454	36,886	80	120,000	13	2,974	6,056	0	20,000	12
FECAL COLIFORM COL./100 ml	9,035	9,468	100	25,000	13	171	141	0	427	11

Table 6. Mean, standard deviation, range, and number of samples for parameters measured.

	BARRIGADA HEIGHTS (B3)					LATTE HEIGHTS (L2)				
	$\bar{X}$	S			N	$\bar{X}$	S			N
pH	8.65	0.65	6.96	9.90	24	9.22	0.82	6.80	10.20	23
TEMP., °C	29.6	2.4	26.0	33.7	25	32.7	3.3	26.9	40.0	20
TURB., NTU	16	22	2.3	88	24	11	15	0.8	78	24
Sp-COND umho/cm	93.1	26.2	57.0	174	23	104	36.9	55.6	246	23
TOTAL ALK, mg/l	46.4	10.0	31.3	75.9	24	44.1	6.3	34.1	57.3	23
PHEN. ALK, mg/l	4.8	5.5	0.0	18.0	22	12.1	8.3	0.0	28.0	21
CL, mg/l	5.64	2.25	2.40	9.90	14	8.12	8.22	1.20	33.7	13
Settleable, ml/l	<.1		0.0	<.1	14	<.1				13
TS, mg/l	102	50	37	187	12	89	46	17	191	12
VS, mg/l	37	42	6.0	118	6	47	25	13	76	5
SS, mg/l	13.8	13.1	2.0	43.3	14	11.8	6.5	2.8	24.7	13
VSS, mg/l	8.0	8.7	2.2	32.3	11	8.2	4.6	2.8	17.3	11
TDS, mg/l	90.4	43.6	31.4	181	12	71.2	45.3	14.2	179	13
OIL + GREASE, mg/l					0	7.9				1
DO, mg/l	8.42	2.30	5.06	14.6	18	10.5	2.80	6.47	14.8	18
BOD, mg/l	2.00	1.24	0.47	76.57	11	3.28	2.11	0.16	7.08	12
COD, mg/l	13	9.1	1.6	38	14	18	15	3.7	60	13
NO_2-N, mg/l	.002	.002	.000	.008	24	.002	.007	.000	.033	26
NO_3-N, mg/l	.079	.115	.000	.548	26	.075	.120	.000	.520	27
T-P, mg/l	.073	.087	.029	.173	3	.144	.065	.081	.211	3
PO_4-P, mg/l	.017	.033	.000	.127	25	.031	.046	.000	.188	26
MBAS, mg/l	.031				1	.400	.370	.057	.85	4
SO_4, mg/l	0.8	0.7	<1.0	1.2	3	1.9	1.1	1.1	2.7	2
HARDNESS, mg/l	37				1	37				1
Ca HARDNESS, mg/l	36				1	34				1
TOTAL COLIFORM COL./100 cm	140	275	0	760	7	1,655	3,493	3	7,900	5
FECAL COLIFORM COL./100 cm	615	963	0	2,320	6	4,104	5,986	0	15,200	7

Table 7. Mean, standard deviation, range, and number of samples for parameters measured.

	PEREZ ACRES					MARIANA TERRACE				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	9.20	.56	8.25	10.35	20	7.47	0.43	6.60	8.40	18
TEMP., °C	29.9	2.1	25.5	34.4	21	28.7	1.9	27.9	33.6	19
TURB., NTU	21	18	5.9	70	19	10	7.9	1.4	30	18
Sp-COND umho/cm	94.2	26.5	52.0	146	20	286	174	73.9	615	17
TOTAL ALK, mg/l	33.1	8.51	27.8	70.2	22	131	82.5	32.1	306	18
PHEN ALK, mg/l	8.2	6.4	0.5	22	22	0.16	0.6	0.0	2.5	19
CL, mg/l	7.77	3.55	0.80	15.5	21	16.2	9.13	4.90	32.2	19
Settleable, ml/l	<.1		0.0	<.1	21	.55	.45	0.0	3.0	16
TS, mg/l	210	188	52	836	21	439	665	123	1,968	18
VS, mg/l	61	19	31	89	10	79	30	37	127	11
SS, mg/l	24.7	19.1	9.6	93.7	21	15.8	14.5	4.10	57.8	19
VSS, mg/l	11.6	4.9	5.5	21.2	17	10.1	7.9	3.5	30.7	16
TDS, mg/	185	183	38.0	782	21	185	183	38.0	783	21
OIL + GREASE, mg/l	1.40	2.0	0.00	2.8	2	1.4	2.0	0.0	2.8	2
DO, mg/l	9.08	1.74	6.93	12.6	20	9.08	1.74	6.93	12.6	20
BOD, mg/l	3.44	2.08	1.13	8.63	17	4.25	2.42	0.93	10.9	16
COD, mg/l	22	11	4.9	40	21	19	8.6	4.2	32	19
NO_2-N, mg/l	.019	.052	.000	.206	17	.048	.074	.000	.239	17
NO_3-N, mg/l	.095	.137	<.001	.504	21	.349	.535	<.001	2.04	19
T-P, mg/l	.056	.018	.034	.087	8	.133	.111	.060	.368	7
PO_4-P mg/l	.015	.020	.000	.073	21	.049	.074	.000	.324	20
MBAS, mg/l	.141	.050	.051	.232	9	.271	.233	.106	.831	8
SO_4, mg/l	1.6	1.2	<1.0	2.6	3	5.4	4.1	<1.0	10	3
HARDNESS, mg/l	31	2.6	29	34	3	243	21.9	228	259	2
Ca HARDNESS, mg/l	27.5	0.7	27	28	2	255				1
TOTAL COLIFORM COL./100 cm	3,112	3,792	0	10,000	14	32,195	69,421	0	246,000	12
FECAL COLIFORM COL./100 cm	393	271	0	710	12	190,541	623,450	800	2,170,000	12

Table 8. Mean, standard deviation, range, and number of samples for parameters measured.

	AIRPORT ROAD					EAST AGANA BAY				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	7.90	.72	6.70	8.98	18	7.74	0.29	7.20	8.30	19
TEMP., °C	31.6	3.1	24.5	35.7	18	29.0	1.3	26.9	31.2	20
TURB. NTU	17	20	3.8	82	16	20	38	1.4	160	19
Sp-COND, umho/cm	175	50.0	88.0	261	17	2,555	3,105	66.0	12,827	19
TOTAL ALK, mg/l	62.4	28.5	38.0	148	19	223	110	19.5	436	19
PHEN. ALK, mg/l	1.4	3.2	0.00	35.3	19	2.5	1.0	1.5	3.5	19
CL, mg/l	14.4	6.10	5.00	25.5	17	745	1,100	2.60	4,656	20
Settleable, ml/l	<.1		0.0	<.1	18	<.1		0.0	0.1	20
TS, mg/l	245	160	47	627	17	1,392	1,280	89	5,664	20
VS, mg/l	97	74	21	286	10	180	166	51	614	10
SS, mg/l	10.4	7.5	3.5	35	18	36.7	42.4	2.4	164	20
VSS, mg/l	9.8	7.4	3.5	35.3	17	8.7	9.1	1.8	37.4	18
TDS, mg/l	220	130	40	486	17	1,303	1,319	40.6	5,645	20
OIL + GREASE, mg/l	33.2	22.4	13.1	64.9	6	10.6	7.8	2.5	18.0	3
DO, mg/l	4.97	3.39	0.00	14.10	17	4.22	1.69	1.10	7.29	20
BOD, mg/l	30.48	39.55	3.73	>160	16	1.93	1.01	0.58	4.98	17
COD, mg/l	116	153	8.0	693	18	19	13	3.2	43	20
NO_2-N, mg/l	.003	.003	.000	.010	18	.047	.041	.002	.202	22
NO_3-N, mg/l	.067	.088	<.001	.346	18	1.06	.630	.231	2.34	21
T-P, mg/l	1.80	2.70	.214	8.28	8	.039	.016	.014	.058	8
PO_4-P, mg/l	.384	.511	.018	3.75	20	.022	.012	.003	.047	21
MBAS, mg/l	3.17	3.27	.677	12.21	11	.360	.297	.061	1.07	9
SO_4, mg/l	2.0	1.3	<1.0	3.7	5	135	152	13.5	370	5
HARDNESS, mg/l	71	22	46	90	3	235	137	77	320	3
Ca HARDNESS, mg/l	62	27	43	81	2	139	115	58	220	2
TOTAL COLIFORM COL./100 cm	21,896	32,507	0	100,000	14	32,206	23,735	2,900	87,000	14
FECAL COLIFORM COL./100 cm	1,417	1,726	0	5,500	15	4,747	10,038	90	39,300	15

Table 9. Mean, standard deviation, range, and number of samples for parameters measured.

	NAS					WEST AGANA BAY				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	7.02	0.27	6.38	7.55	15	7.95	.38	7.20	8.50	15
TEMP., °C	27.4	0.2	27.2	28.0	16	27.5	1.0	25.0	28.2	13
TURB. NTU	1.1	2.3	0.13	8.0	15	19	39	0.4	140	15
Sp-COND, umho/cm	1,928	280	1,229	2,295	16	793	706	87.0	3,070	16
TOTAL ALK, mg/1	246	639	321	279	15	137	79.0	11.8	270	15
PHEN. ALK, mg/1	0.0				15	1.1	2.4	0.0	8.0	15
CL, mg/1	448	70.1	309	627	16	217	532	1.00	2,158	16
Settleable, ml/1	0.0				13	<0.1		0.0	.15	14
TS, mg/1	1,371	420	733	2,468	16	738	612	66	2,324	16
VS, mg/1	206	59	126	268	7	116	90	22	254	7
SS, mg/1	2.4	3.7	0.0	14.8	15	19.4	36.0	<.1	123	15
VSS, mg/1	1.9	3.5	0.0	13.9	13	7.6	12.7	<1.0	45	12
TDS, mg/1	1,370	420	730	2,467	16	675	611	13.0	2,316	15
OIL + GREASE, mg/1	<.7				1					0
DO, mg/1	4.87	0.60	3.96	5.68	15	7.02	1.05	4.26	9.18	15
BOD, mg/1	0.54	0.60	0.00	1.91	14	2.22	326	0.17	11.73	15
COD, mg/1	5.1	6.3	0.0	18.1	16	22	37	0.0	135	16
NO_2-N, mg/1	.002	.003	.000	.009		.020	.025	<.001	.073	16
NO_3-N, mg/1	2.41*	.116	2.14	2.51	13	1.31	1.19	.036	4.56	16
T-P, mg/1	.009	.007	.002	.021	5	.028	.029	.001	.079	6
PO_4-P, mg/1	.010	.008	<.001	.017	19	.019	.019	<.001	.061	17
MBAS, mg/1	.131	.010	.116	.138	4	.172	.305	.010	.860	7
SO_4, mg/1	75	34	47	123	4	158	90	64	245	4
HARDNESS, mg/1	412	10.6	405	420	2	124	20.8	94	138	4
Ca HARDNESS, mg/1	300	14.1	290	310	2	97.0	20.5	77	118	3
TOTAL COLIFORM COL./100 cm	237	540	0	1,460	12	37,800	74,417	0	253,000	10
FECAL COLIFORM COL./100 cm	6	9	0	28	12	4,112	8,445	0	20,000	11

Six readings not included because exact concentration not determined (>.5 mg/1)

Table 10. Mean, standard deviation, range,and number of samples for parameters measured.

	CAMP WATKINS ROAD					TUMON BAY - FRESH WATER SEEPAGE				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	7.05	0.17	6.90	7.23	3	7.01	0.13	6.90	7.30	7
TEMP., °C	29.8	0.9	29.0	30.8	3	27.3	0.6	26.5	28.0	7
TURB. NTU	11	16	1.3	30	3	0.21	0.06	0.12	0.30	7
Sp-COND, umho/cm	737	334	356	976	3	6,130	2,926	2,528	9,665	7
TOTAL ALK, mg/1	190	84.9	96.0	260	3	262	16.9	232	277	7
PHEN. ALK, mg/1	0			0	3	0				7
CL, mg/1	62.3	61.3	13.9	132	3	1,933	1,029	557	3,119	7
Settleable, mg/1	<.1			<.1	3	0				7
TS, mg/1	1,180				1	4,200	2,086	1,611	6,146	7
VS, mg/1					0					0
SS, mg/1	10.6	8.6	5.5	20.5	3	3.0	1.5	0.2	3.8	7
VSS, mg/1	5.9	4.0	3.2	10.5	3	1.6				1
TDS, mg/1	1,174				1	4,197	2,086	1,606	6,142	7
OIL + GREASE, mg/1	15.6	6.3	8.5	20.3	3					0
DO, mg/1	3.07	1.21	1.82	4.23	3	3.88	0.43	3.5	4.8	7
BOD, mg/1	4.49	0.72	3.98	5.00	2	0.78	0.47	0.20	1.2	7
COD, mg/1	15	17	2.4	34	3	14	15	1.0	41	7
NO_2-N, mg/1	.004	.004	<.001	.007	3	.006	.016	.000	.064	15
NO_3-N, mg./1	.102	.063	.031	.150	3	3.39[1]				1
T-P, mg/1	.159	.078	.071	.221	3	.015				1
PO_4-P, mg/1	.087	.043	.056	.136	3	.044	.103	.003	.355	11
MBAS, mg/1	.296	.037	.270	.323	2					0
SO_4, mg/1					0	51.9				1
HARDNESS, mg/1	231	108	115	330	3					0
Ca HARDNESS, mg/1	190	120	105	275	2					0
TOTAL COLIFORM COL./100 cm	34,004	48,078	7,000	68,000	2					0
FECAL COLIFORM COL./100 cm	450	354	200	700	2					0

1. 14 readings not included because exact concentration not determined (>.5 mg/1).

Table 11. Mean, standard deviation, range, and number of samples for parameters measured.

	LATTE HEIGHTS (L3)					DEDEDO				
	$\bar{X}$	S	Low	High	N	$\bar{X}$	S	Low	High	N
pH	9.08	0.69	7.90	9.95	10	9.21	0.70	7.60	9.90	8
TEMP., °C	31.1	2.4	27.0	34.1	10	31.2	2.4	26.4	33.0	8
TURB. NTU	17	23	2.4	78	11	4.9	3.9	2.3	13	8
Sp-COND, umho/cm	90.7	29.5	55.6	16.9	10	75.8	11.7	63.7	99.7·	8
TOTAL ALK, mg/l	39.9	4.2	32.8	46.5	10	39.8	5.73	32.7	47.4	8
PHEN. ALK, mg/l	9.92	6.55	0.00	17.7	9	9.16	4.48	0.00	12.6	8
CL, mg/l	3.9				1	2.9				1
Settleable, mg/l					0					0
TS, mg/l	58				1	66				1
VS, mg/l					0					
SS, mg/l	13.8					8.2				1
VSS, mg/l					0					0
TDS, mg/l	44.2					57.8				1
OIL + GREASE, mg/l					0					0
DO, mg/l	8.43	2.47	5.64	11.51	4	8.04	0.82	6.75	9.33	2
BOD, mg/l	0.40				1	4.92				1
COD, mg/l	23				1	13				1
NO_2-N, mg/l	.007	.015	.000	.046	11	.015	.038	.000	.102	7
NO_3-N, mg/l	.064[1]	.093	.000	>.500	11	.097	.083	.000	.203	7
T-P, mg/l					0					0
PO_4-P, mg/l	.009	.011	.000	.032	11	.008	.009	.000	.025	7
MBAS, mg/l					0					0
SO_4, mg/l					0					0
HARDNESS, mg/l					0					0
Ca HARDNESS, mg/l					0					0
TOTAL COLIFORM COL./100 cm					0					0
FECAL COLIFORM COL./100 cm					0					0

1. One reading not included because exact concentration not determined (>.5 mg/l).

Table 12. Comparison of Guam urban runoff to urban runoff of other communities, other Guam waters and the Guam Water Quality Standards. All parameters are mean values expressed in mg/l unless otherwise noted.

	pH	DO	BOD	COD	TU (NTU)	TS	SS	TDS	PO_4-P	TP	NO_3-N	TN	SPECIFIC COND. (umho/cm)	T C cts/100 ml	F C cts/100 ml	OIL & GREASE
GUAM																
Ponding basins	8.7	7.97	2.98	21	16	130	18	110	.080	.10	.08		115	900[1]	215[1]	1.4-27
Commercial area storm drains	7.7	4.82	9.65	43	17	865	17	846	.118	.510			1,065	17,500	1,140	0.7-65
NAS storm drain	7.0	4.89	.54	5.0	1.1	1371	2.4	1370	.010	.010	2.41		1,928	32	3	
Mariana Terrace ponding basin	7.5	4.53	4.25	19	10	439	16	277	.048	.13	.40		286	3,850	7,800	
Barrigada Heights storm drain (wet weather)			5.30		29	129			.06	.165	.095		218	145,000	14,300	16.6
Geus River (4-12-77)[2]	8.2	9.0				244	7	237		.081	.089				192	
La sa Fua River (4-12-77)[2]	7.6	9.7				242	8	250		.076	.111				1,544	
Sewage-raw Tipalao Plant[2]	7.2	<1.0	2.34	1132		2468	1444	1023	1.15	3.75	1.92	20.1				
Sewage treated-Tipalao Plant[2]	7.2	2.5	26	122		825	40	794	1.12	3.10	0.19	12.6				
Groundwater-well D-12[3]	7.5				.15						2.28		400			
Groundwater-well A-13[3]	7.0				.19						2.14		1,120			
HAWAII																
Street refuse[4]			10.4	25					.10			.05		594,000	14,290	
Manoa stream[4]	7.2	8.0			52	188	124			.60		.34		31,000	1,500	
Kalihi stream[5]	7.2	7.45	1.10		15		21	128		.17		.36	214	185,600	6,260	
OTHER COMMUNITIES[6]																
Ann Arbor							1280			2.9		.84		1,200,000	82,000	
Chicago	6.8		40							0.1		4.6				
Cincinnati	5.3		1.0	20	30		5			0.3				58,000	10,900	
Detroit				96										25,000		
Tulsa	6.8		8.0	42			84	89				.36	36	5,000	10	
Washington, D.C.	6.0		3.0	29			130			0.2		0.5		120,000	40,000	
GUAM WATER QUALITY STANDARDS (1975)																
Drinking water 1a					1						10			1[7]	0	Detectable as visible sheen or by order
Coastal waters "A"	.2 change from ambient		75% of saturation content		5		5% increase over ambient			.05		.75		230		" " "
Drinking water resource-surface waters			Ambient				Ambient			.10		.75		Ambient	Ambient	"

[1]Geometric mean
[2]Source: Guam Environment Protection Agency
[3]Results of 4/77 sampling: Guam Public Utilities Agency
[4]Source: Chun, Young and Anderson (1972)
[5]Source: Matsushita and Young (1973)
[6]Extracted from Matsushita and Young (1973)
[7]Arithmetic mean of 30 day period

Table 13. Results of sequential sampling at Barrigada Heights ponding basin (B2D). December 15, 1975. All concentrations in mg/l unless otherwise noted.

Time	pH	Turb. (NTU)	Specific Conductance (umho/cm)	ALK.	P.ALK.	NO_2-N	NO_3-N	Rainfall Activity
1400						.001	0.43	Terminating
1500	8.25	15.5	128.8	35.5	.45			
1545						.003	.125	
1630	8.30	14.5	138.0	36.0	.40			
1715						.001	.022	
1800	8.18	14.0	147.2	38.2	0.0			
1845						.001	.096	
1930	8.13	12	147.2	41.5	0.0			
2015						<.001	.029	
2100	8.08	11.5	149.4	44.0	0.0			
2145						.001	.023	
2230	8.03	11.0	155.8	45.0	0.0			
2315						.001	.025	
0000	8.03	11.0	154.0	43.5	0.0			
0045						.001	.029	
0130	8.03	10.5	151.7	43.4	0.0			
0215						.002	.140	
0300	7.95	10.5	152.3	43.3	0.0			
0345						.001	.033	
0430	7.95	9.8	165.5	47.3	0.0			
0515						.002	.142	
0600	7.95	8.5	179.3	50.9	0.0			
0645						.003	.141	

Table 14. Results sequential sampling at Latte Heights Estates. January 3, 1977. All concentrations in mg/l unless otherwise noted.

Time	pH	Specific Conductance (umho/cm)	ALK.	P.ALK.	PO_4-P	NO_2-N	NO_3-N	Rainfall Activity
0800								
0815					.109			
0820	7.89	362	47.8	0.0		.002	.027	
0825	7.96	333	42.1	0.0	.093	0.00	.014	
0830	7.94	325	40.0	0.0				Starting
0835					.084	0.00	.106	
0840	8.18	178	30.0	0.0	.058	<.001	.009	Terminating
0845	8.30	154	30.0	0.0	.036	.001	.005	
0855	8.18	154	30.7	0.0	.040	0.00	.005	
0900	8.10	166	33.7	0.0	.050	0.00	0.00	

Table 15. Results of sequential sampling at Perez Acres on January 9, 1976. All concentrations in mg/l unless otherwise noted.

Time	pH	Turb. (NTU)	Specific Conductance (umho/cm)	ALK.	P.ALK.	PO_4-P	NO_2-N	NO_3-N	Rainfall Activity
1100	9.44	2.7	157	30.0	7.0	.048	.001	.009	Raining
1105	9.56	3.6	94.9	25.0	6.0	.030	0	.125	
1125	9.63	6.2	116	29.3	8.0	.028	0	.118	
1140	9.60	5.5	132	27.7	9.5	.067	<.001	<.001	Terminating
1155	8.68	5.7	251	73.7	3.7	.066	.001	.415	Rain
1157	9.00	4.2	116	27.0	4.0	.034	<.001	.053	
1200	9.20	2.8	78.4	15.4	2.7	.026	.004	.011	Terminating
1215	9.20	3.8	95.5	18.1	6.4	.032	.001	.009	
1230	9.55	2.8	113	28.5	8.0	.033	.001	.001	Rain
1235	9.65	3.6	77.6	15.5	4.0	.033	0	.007	Terminating
1245	9.38	2.0	70.2	18.0	5.5	.026	0	.006	

Table 16. Results of sequential sampling at Perez Acres on May 17, 1977. All concentrations in mg/l unless otherwise noted.

Time	pH	Turb. (NTU)	Specific Conductance (umho/cm)	ALK.	P.ALK.	T-P	PO_4-P	NO_2-N	NO_3-N	Rainfall Activity
1110	(Basin water)		135			.115	0		.002	Start of Rain
1113								0	.008	
1116							.058	0	.006	
1117							.074	<.001	.012	
1118			132				.079		.006	
1119						.086	.068	<.001	.004	
1120			123				.062		.003	
1121							.053	.001	.002	
1122			126				.042		.002	
1123							.040	<	.002	
1124						.050	.039		.002	Rain Tapering
1125							.031	.001	.007	to drizzle
1130								<.001	.008	
1135			.64					<.001	.006	
1140						.065		<.001	.007	(.20 inches
1145							.055	<.001	.004	from start
1150							.051			of shower)

Table 17. Mean, standard deviation, range, number of samples and FC:TC ratios for total and fecal coliform bacteria grouped according to type of runoff source.

SAMPLING LOCATIONS	TOTAL SITES	$\bar{X}$	S	LOW	HIGH	N	FC:TC
Ponding Basins	7						.57
TC		4,532	8,163	0	20,000	71	
FC		2,567	3,428	0	25,000	73	
Marine Drive Area	4						.08
TC		32,350	43,448	0	253,000	40	
FC		2,682	4,140	0	39,300	41	
Mariana Terrace	1						5.92
TC		32,195	69,421	0	246,000	12	
FC		190,541	623,450	800	2,170,000	12	
NAS	1						.03
TC		237	540	0	1,460	12	
FC		6	9	0	28	12	
B2d (wet weather)	1						.11
TC		188,300	182,352	1,000	640,000	12	
FC		21,298	15,935	24	44,000	12	

Table 18. Log normal frequency distributions of total and fecal coliform bacteria grouped according to runoff source residential (Ponding Basins) or Commercial (Marine Drive Storm Drains). Mariana Terrace, NAS, B2d (wet weather) presented individually for comparison.

SAMPLE LOCATION		% OF TIME EXCEEDED 10%	50%	90%	FC:TC (of Geometric Means)
Ponding Basins					.24
	TC	8,000	900	100	
	FC	15,000	215	2.6	
Marine Drive Area					.07
	TC	65,000	17,500	4,800	
	FC	6,400	1,140	210	
NAS					.09
	TC	210	32	4.6	
	FC	22.7	3	0.4	
Mariana Terrace					2.03
	TC	8,900	3,850	92	
	FC	135,000	7,800	430	
B2d (wet weather)					.10
	TC	380,000	145,000	50,000	
	FC	40,000	14,300	5,200	

APPENDIX A

Detailed Site Descriptions

Barrigada #1

The Barrigada #1 ponding basin is roughly a circular excavation 65 m in diameter and 7 m deep. The bottom area is 3000 m^2 with a volume, to the highest observed water level, of 12,000 m^3. This equates to roughly three million gallons of ponded water during peak runoff periods. The usual volume is approximately half of this.

Barrigada #1 receives runoff from a .09 km^2 drainage area that is fed into a 0.61 m concrete pipe. This runoff water is discharged into the nothern end of the basin. There is, also, a large quantity of runoff that enters at the southern end as a result of the natural topography of the area. Based on observations and initial parameter measurements, the water characteristics were noted to be distinctly different at these two monitoring sites. Extensive vegetation growth in the central portion of the pond appears to act as a buffer between the northern and southern ends. The principle source of runoff water is from paved areas associated with commercial developments. This includes two service stations which are major contributors of oil and grease to the runoff waters. Additionally a septic tank located 23 m north of the drain outlet may have an impact on the ponded water.

The Mariana Limestone, which forms the majority of the exposed limestone on northern Guam, is an emerged reef and lagoon. As a result, an extremely heterogenous formation, consisting of two principle members and numerous facies, developed. The limestone formation underlying this area 1 is the Agana argillaceous member of the Mariana Limestone. This limestone is distinguished from the remainder of the formation by contamination from clay and volcanic detritus derived from the central volcanic highlands.

The predominant soil type at and around the study site is Chacha-Saipan clay. This is a latosolic intergrading of a yellowish-brown, firm clay (Chacha), and a red, firm clay (Saipan). It has a neutral to acid reaction. This soil type is commonly associated with the Agana argillaceous member. The test bore results showed a 14 m deposit of a light orange clayey silt (Chacha-Saipan clay) overlying a relatively hard limestone.

Construction of this basin at its present site was not advised since the clay deposit can reduce or completely impede infiltration of the ponded runoff. The principle reason used to justify construction was the elimination of an excessive flooding problem occurring in the drainage area.

It has been noted from field observations that infiltration is occurring but at a very slow rate. As a result the basin is more characteristic of a pond than an infiltration field and possesses many of the characteristic flora and fauna of naturally occurring ponds as found on Guam. Hydrilla verticillata, a vascular plant, dominates the flora in the pond as it does in several naturally occurring springs. The pond also contains an abundance of filamentous and "micro" algae. The micro-algae gives the pond a characteristic green tint. Common road-site or disturbed area weeds and grasses abound along the edges of the basin. As the water level decreases this vegetation rapidly occupies all the newly exposed areas. A large assemblage of fauna is associated with the basin and pond. Most noteable in the pond are the mosquito fish (Gambusia affinis affinis and the tapoles of the marine toad, Bufo marinus. Additionally, the pond has abundant copepods, amphipods, ostracods, dragon fly nympths and other larvae. A freshwater fish Tilopia and a catfish are found but have not been able to establish themselves. There are two types of snails around the pond as well as a large population of insects. Dogs, chickens and cats were commonly seen at the site, with an occasional dead animal found in the pond.

Barrigada #2 and #3

The Barrigada #2 and #3 basin system consists of a long shallow, rectangular channel, 50 m long and 10 m wide, with a depth varying from 2 m at the northern end to less than .5 m at the weir, connected to a lower infiltration field, 50 m long and 40 m wide, with constant depth of 2 m. The channel was designed to act as a sediment trap for five sands, silts, and clays, thereby preventing clogging of the lower infiltration basin. This appears to be a fairly successful arrangement since ponding in B3 occurs only in the far east corner, with usually short periods of ponding.

The channel contains ponded water at both the weir and storm drain. The substratum at both these sites is sealed by an accumulation of silts and clays. Therefore the primary reduction of water at these sites is due to evaporation which is considerably higher at the weir site. The drain and weir sites are separated by a slight rise in the central portion of the channel. As a result, there is mixing of the waters only during runoff periods.

The storm drain runoff is characteristic of runoff from only the Barrigada Estates subdivision while the weir reflects additional input from natural runoff derived from adjacent paved and dirt roads. This runoff enters the side of the channel just south of the central rise. Therefore the storm drain and weir ponded waters are characteristically distinct and were treated as such for monitoring purposes.

The runoff water at the storm drain was usually high in organic detritus and man-made debris, with traces of oil and grease observable along the edges of the ponded water. Additionally, the runoff was usually moderately to highly turbid. The waters of the weir and lower basin were generally free of observable pollutants. It was noted on several occasions that foaming occurred in the northern end of the weir pond. High turbidities were characteristic of the weir and B3 runoff waters. This was due to suspension of red clay particles.

The underlying limestone formation is the uncontaminated member of the Mariana Limestone (pliocene-recent) referred to as Mariana limestone. This member underlies most of the northern plateau. Schlanger (1964) divides this member into two major facies: reef-wall and lagoon. The reef-wall facies, which is subdivided into numerous facies based on the depositional environment and matrix components, is characterized by numerous coral heads in growth position, cemented together by a fine-grained white, dense limestone, primarily composed of coralline algae and incrusting foraminifera. The lagoon facies, which forms extensive deposits, is an accumulation of coral debris, shell and reef associated calcium carbonate detritus. This facies underlies this basin system. According to Mink (1975) the lagoonal facies is extremely heterogenous with a complicated history of formation which led to beach sands, marls, and lignitic material (from near shore swamps) as common components. Due to the heterogenous nature of this member, infiltration rates can vary dramatically from one location to another.

The soil type in the drainage area is Guam clay. It is the predominant soil type on northern Guam, comprising approximately 35 percent of the total island soil. It generally forms very shallow deposits on both Barrigada and Mariana Limestone. There are some isolated deeper deposits in the drainage area. Carrol (1963) describes Guam clay as a reddish, granular, friable, permeable latosol. It is frequently interceded with small to large limestone floaters.

As a result of the usually low water levels in B3 the fauna was restricted to Bufo marinus (adults and tapoles), snails, dragon fly nymphs and water striders. This pond is frequently visited by birds, including ducks, during periods of low ponding. The predominant flora in the basin are grasses, roadside weeds, Leuceana spp., cyanophyta (blue-green algae) and occasionally a filamentous chlorophyta (green algae).

The weir, which almost always contained some ponded water, has luxuriant algae growth, including Chara zeylanica, several filamentous chlorophyta and numerous "micro" species. The faunal diversity in the ponded water is high, although large populations were never observed. The predominant organisms are Bufo Marinus (tadpoles & adults), copepods dragon fly nymphs, snails, amphipods, ostracods, and water striders. Birds, mostly ducks, frequently are seen feeding in the shallow end of the pond.

The storm drain is relatively low in diversity and abundance, in terms of both flora and fauna. It is surrounded by a luxuriant growth of sword grass, up to 2 m high, and numerous small grasses. Up until recently the only notable fauna in the pond was an occasional spawn of Bufo tadpoles. Recently a large population of Gambusia was introduced, presumably for mosquito control. The fish have not fared well, mainly due to over-crowding, a lack of food and lowered DO concentrations. Besides the grasses, the only notable flora is a blue-green alga that grows on the concrete wall and substratum.

Latte Estates #2 and #3

Four ponding basins were constructed for the Latte Estates subdivision. Only two of the basins, the central L2 and the western L3, contained a sufficient quality of ponded water to allow for routine sampling. The remaining two basins, located on the eastern end, were almost always dry. They have an extremely small drainage area. Apparently they were constructed to accommodate a possible eastward expansion of the subdivision.

L2 is the largest of the four basins, receiving the bulk of runoff water. Runoff water entering this basin is exclusively residential. The basin measures 85 x 117 m with an average depth of 6.4 m. It receives runoff from four storm drain systems. The bottom area is 4370 m^2 with a capacity, to the expected maximum water surface elevation, of 30,250 m^3. This capacity was exceded by storm runoff from super-typhoon Pamela in May of 1976. At this time infiltration rates were noted to be in excess of 1 m per day. In less than a week over 8 million gallons of water percolated through this basin. This can be partly atributed to the back filling of approximately 1 m of loose gravel during completion of construction. Rapid infiltration occurs at the base of the main storm drain chute as a result of extensive limestone fracturing. Probably the major factor influencing infiltration is the underlying limestone formation, Marrigada Limestone.

Barrigada Limestone (miocene-pliocene) is centeralized on the northern plateau as a ring-shaped outcrop. It is a foraminiferal limestone that is intensely white, medium to coarse grained, and comparatively homegeneous detrital limestone. It is massive, commonly brecciated and ranges from compact and well lithified to extremely friable (Tracey et al, 1964).

Approximately 50 percent of the government owned wells are drilled in this formation, even though it comprises less than 20 percent of the northern limestone. This limestone appears to be highly permeable in comparison with the Mariana Limestone. Additionally, it appears to contain a higher quality of basal water.

The surrounding soil type is Guam clay. Test bore results defined this soil type as a moderately stiff, red brown clay silt grading into a soft to moderately stiff, orange brown clayey silt. The soil contains some limestone floaters to at least gravel size (4.7 to 76.2 mm).

Prior to the typhoon in May of 1976, a substantial body of ponded water, 1/4 to 1/2 of the bottom area, would form in the eastern end of L2. Afterwards only a small shallow pond was maintained in the far southeastern corner. During a period of abnormally low rainfall this pond dried up.

The faunal assemblage in L2 was normally low in diversity and abundance with only Bufo Marinus (tadpoles and adults) and dragon fly nymphs being noticable, although both were noted to be extremely abundant at times. When the water level decreased to approximately 10 cm. massive kills of Bufo tadpoles were noted. At this time the water temperature, at zenith, would be in excess of 35°C.

The principle flora in and around pond is a blue-green algae, Nostoc. Several species of filamentous and "micro" algae periodically produced luxuriant blooms. This would not notably increase the DO concentrations. The sides and dry portions of the basin are moderately covered by numerous road side weeds and small grasses.

L3 is a triangular excavation 40 m long, with a maximum width of 12 m and depth of 3 m. The northern end of the basin has an increased bottom area with an average depth of 4.5 m. Runoff waters enter by way of a single storm drain at the northern end or by a natural drainage cut in the eastern side. The capacity of the basin is at least 1,100 m^3, with a maximum observed volume, after the typhoon in May of 1976, of 800 m^3.

Infiltration rates in L3 are relatively low due to a partial sealing of the limestone substratum by Guam clay. The Guam clay is derived from adjacent land areas and by erosion of a small pocket located at the southern end of the basin. The water level in the pond is normally low as a result of a small drainage area.

The primary source of runoff waters is associated with the subdivision. The basin also receives input from agriculturally developed lands to the east, and disturbed lands to the north and south. This runoff water enters by way of the natural drainage cut.

The flora and fauna associated with L3 is very similar to that found in L2, with one notable exception, no large blooms of either filamentous or "micro" algae were observed.

Routine monitoring of this basin was discontinued in August of 1976. It was felt that L2 would provide sufficient information for this study area.

Dededo

The Dededo basin was excavated in a large shallow natural depression. There are several natural low relief feeders leading into the area from the north and south. The basin design incorporated these natural topographic features in order to minimize the amount of cut. The drainage area is in excess of 75 hectares. Runoff enters this basin by means of a long concrete chute at the northern end and a storm drain at the southern end. The constructed basin has over 31,600 m^2 of bottom area with an average depth of 2.1 m. It has a capacity, to the expected maximum level, of 68,200 m^3. It exceeded this volume during the typhoon in May of 1976. Although no infiltration rates were measured, it was noted that in less than 2 weeks the basin completely dried up. This large influx of water apparently improved the infiltration ability of the basin, since afterwards only minimum ponding for short periods of time would occur.

The runoff waters entering the basin are derived from at least four different land use of sources. It primarily receives runoff from residential and commercial developments, but additionally there is natural drainage from both recently disturbed and undisturbed lands.

The underlying limestone formation is Barrigada Limestone. It is a coralline limestone which is dense to friable, honogenous, and intensively white when unweathered. Soil deposits that range from a few centimeters to several meters veneer this limestone. The predominant soil type is a reddish brown, clayey silt which has been classified as Guam clay. Additionally, the basin and surrounding low lands contain a water borne mixture of a brownish white coralline gravel with varying amounts of sand, silt, clay and organic detritus.

Savanna-line grasslands surround the eastern sides of the basin. This area contains roadside weeds, vines, shrubs, grasses, and Leuceana spp. (tangantangan) as common components. Most of these plants are found growing in or on the sides of the basin. The most abundant flora found in the pond, when it exists, is the blue-green alga Nostoc. A very thin veneer of Nostoc overlies the substratum in the central portion of the basin.

The faunal assemblage associated with this ponded water is low in diversity. The most abundant organisms were dragonfly nymphs. There were also a few large spawns of Bufo marinus tadpoles observed. The only other notable organism that frequented the pond were snails and birds.

Perez Acres

The Perez ponding basin is an elongated trapazoid, being 152 m long and up to 27 m wide at the eastern end, where ponding occurs. The western end is primarily a 50 m maintenance ramp. The capacity of the basin, to the expected maximum water elevation, is 6400 m^3. There is a pair of storm drains with vertically aligned outlets located toward the base of the ramp. The lower drain always had a higher turbidity runoff. The reason for this was not ascertained. Additionally, there are two concrete lined chutes on the eastern end. The southern chute receives runoff from a grassy area adjacent to a swimming pool. The northern chute functions as both a spillway and a drainage system for the eastern boundary of the development.

The development is extensively landscaped; as a result there is very little exposed soil. Most of the soil used for landscaping was transported in. It appears to be a mixture of Agat-Asan-Atate clays and Guam clay with varying amounts of sand. The natural soil type found in the area is Guam clay. It overlies a dense to friable coralline Barrigada Limestone. During construction percolation rates of 102 cm/hr, with a 3 m head, were obtained. Recently observed rates are substantially lower. This reduction is a result of sealing of the substratum by a mixture of silt and clay.

The lands surrounding the development are primarily undisturbed limestone forest, a dense, luxurant growth of tree, shrubs, and vines. Adjacent disturbed lands contain roadside weeds, grasses, and *Leuceana spp.* as common components. These roadside weeds and grasses are well established in the western portion of the basin.

The ponded water is always murky, with a normal turbidity ranging from 10-20 NTU. This is apparently a result of clay particles remaining in a state of suspension. As a result, observations of organisms were limited. Recently there was an introduction of *Hydrilla verticillata*, "micro" algae, *Gambusia*, water striders, and snails. Prior to this introduction, *Nostoc*, occasional spawns of *Bufo* tadpoles, and dragon fly nymphs were the only notable fauna.

There is a bad mosquito problem in the development, but no larvae were ever observed in the pond. Despite this observation, there were occasional massive kills of *Gambusia*, *Bufo* tadpoles, water striders, and dragon fly nymphs. Introduction of pesticides in pond waters for mosquito control will probably worsen the problem by killing the mosquito fish, *Gambusia*.

Naval Air Station

The NAS storm drain, with its continuous flow of brackish water, maintains an extensive sediment delta on the adjourning reef flat. The configuration and formation of the delta follow the classic delta formation . The primary expansion is seaward with a displacement of the inner reef flat moat 75-100 m seaward. At low tide 20-60 m of the delta is exposes. This greatly modifies the current patterns in this area.

Conservative estimates of the primary brackish water flow is 1 million gallons per pay. This value could be as high as 3 million gallons/day. The estimates are based on the observed normal discharge and approximate measurements and calculations.

There are numerous euryhaline fish species associated with the primary discharge water at both the drain outlet and in the vicinity of the delta. Local fishermen have frequently been observed fishing for these species. The abundance of fish were observed to greatly increase when extremely extensive Enteromorpha blooms occurred on the delta. In addition to the fish species, large populations of hermit crabs, marine cocepods, and unidentified crustaceans occurred in the vicinity.

East Agana Bay

The EAB monitoring site consists of a 30 m channel that extends from Marine Drive to the shoreline. At the seaward end of the channel the bottom is elevated 1 m, with the remainder of the landward channel maintaining a depth between 2 and 2.5 m. As a result the channel contains a continuously ponded body of water with an average depth of 1 m. Part of this water is accounted for by sea water intrusion at normal peak high tides. During abnormally high tides the amount of intrusion was considerable.

Two 0.61 m in diameter storm drain pipes are located at the Marine Drive end, which was the sampling location. Additionally, a concrete lined chute located on the northern bank, adjacent to Marine Drive, discharges runoff derived from vacant lots and several small commercial developments. The storm drain waters are derived from streets and parking lots associated with commercial developments.

The EAB storm drain maintains a large lateral delta on the adjoining reef flat. It extends 25-30 m seaward with primary expansion occurring east and west along the shoreline. The delta has a high organic content with large amounts of man-made debris incorporated into its structure. The delta appeared to remain reasonably stable, in terms of size and sediment volume, throughout the study period.

The ponded water in the channel was usually characterized by moderate to heavy accumulations of debris (man-made and organic), low to heavy concentrations of oil and grease, and a scummy film along the drain outlets and at the seaward end.

Mariana Terrace

This ponding basin occupies the southwestern corner of the development. This area, prior to basin construction, was a natural drainage accumulation site, receiving runoff primarily from the northern and western adjacent foothills. The excavated basin originally served both as a storm runoff collector basin and a leaching field for a small sewage treatment plant, located on the southwest corner of the basin. During most of the study raw sewage was leached into the far southern side of the basin, with minor ponding occuring in the southeast corner. This ponded water, when observable, was a black muck with exceedingly high organic and faunal content. Several times there was a detectable odor of raw sewage.

The basin is a large circular excavation with a capacity of at least 200,000 m^3. The depth varies from 12 m on the eastern side to 6-8 m on the western side. Five storm drains discharge into the basins with three outlets on the western side and two outlets in the northern and eastern sides. Ponding occurs in the vicinity of the northern outlets and at the central western outlet. The western pond is a 10 m channel bound by mat-like organic detritus. Input into the western pond occurs only during runoff while the northern pond receives almost continual input.

The drain area is a transition zone between Mariana and Barrigada Limestone. The basin appears to be excavated in Mariana Limestone of lagoonal origin. A deposit of fine-coarse sands occurs in the northeastern corner of the basin. This is due to erosion of the eastern bank and an adjacent construction project.

The soil types in the drainage area are Chacha-Saipan and Saipan-Yona-Chacha clays. The latter soil type is an intergrading of the Chacha-Saipan clays with a shallow brownish lithosal (Yona). This soil type has limited occurrence on the upper northern end of Guam. There are also some alluvial clay deposits in the vicinity of the basin.

There is an extremely luxuriant growth of flora in the basin. Grasses, including sword grass, creeping grasses, and weeds, dominate the basin. Additionally, there is extensive growth of roadside weeds, shrubs, vines, Leuceana, filamentous algae, "micro" algae, and blue-green algae. This resulted in large accumulations of organic detritus, with dense matting, in excess of 1 m, frequently occurring.

The faunal assemblage was extremely diverse with Bufo marinus (tadpoles and adults), mosquito larvae, snails, amphipods, copepods, decapods, ostrapods, Littoria glauerti (tree frog), dragon fly nymphs, snakes, and numerous insects as common components. There was a mosquito problem as a result of the basin. This cleaning operation resulted in improved infiltration ability of the basin.

A diverse assemblage of euryhaline and freshwater organisms were observed in the ponded water. This included fish (at least four species), marine crabs, Bufo tadpoles and adults, copepods, amphipods, ostracods, and snails. There were more marine related organisms at the seaward end.

Both marine and freshwater algae were observed in the pond. The marine algae tended to remain at the seaward end, with the most notable alga being Enteromorpha. The fresh water algae, greens and bluegreens, showed luxuriant growth in the vicinity of the drain outlets. Creeping grasses and common roadside weeds covered the sides of the channel and the adjacent land areas.

West Agana Bay

A comparatively small, 10 m in diameter, sediment is maintained by the WAB storm drain. The delta was unique, in relation to the other storm drain deltas, since there was an almost total lack of algal growth and limited marine organisms on the top surface. Abundant growth of Padina tenius and lesser amounts of Sargassum polycistum occurred along the seaward periphery. This produced a dead zone appearance on the delta. Occasionally small blooms of Enteromorpha and phytoplankton occurred along the periphery with limited expansion onto the delta.

A small filamentous algae was well established in the storm drain pipe. It varied in color from dark brown to tan to gray green. This site was the only recorded location for this algae.

Hermit crabs were common in the vicinity of the outlet. During low tides they tended to migrate toward the outlet, but usually avoided the runoff water. At high tides both blennies and hermit crabs were observed to frequent the storm drain outlet, including movement into the pipe.

During the study period the diameter and sediment accumulation of the delta were observed to increase with a 3-4 m seaward expansion and an 8-10 m lateral expansion. This expansion may be partly accounted for by the construction of an island and causeway north of the outlet.

Table 19. Results of chemical analyses of Barrigada Village (Ble) ponding basin water.

DATE	pH UNITS	TEMP. °C	TURB (NTU'S)	Sp.COND. umho/cm	SET.SOL.	TS	SS	VS	VSS	TDS	CL^-	$SO_4^=$	HARDNESS	CA^{++} HARD
12/ 2/75			5.5											
12/ 6			3.8											
12/19			3.2											
1/14			3.0											
2/ 3	8.63	28.4		120										
2/ 5	9.00	27.2	12.5	128										
2/12	9.11	28.4	8.9	118										
3/23	7.60	31.6	3.3	144										
3/24	8.60	32.0	7.4	140										
3/25	9.20	31.7	7.0	138										
3/26	9.00	30.5	5.0	135										
4/ 2	9.05	30.7	9.2	143										
7/ 6	9.2	32.3	2.4	224	<.1	153	4.0			149	45			
7/19	8.30	28.5	9.4	155	<.1	81	9.0	66		72	14			
7/26	8.92	30.2	6.8	120	<.1	64	9.0		4	55	12			
8/10	8.95	27.4	2.7	111	<.1	105	2.4		2	103	10			
8/24	8.90	28.8	4.4	127	<.1	133	4.0		2.2	129	5.8			
9/ 8	7.25	26.9	2.3	94	<.1	85	1.2			83	5.7			
9/22	9.00	29.2	2.6	88	<.1	56	3.9		3.4	52	6.9	2.0		
10/ 6	9.70	33.2	1.8	100	<.1	27	13		10.6	14	6.0			
10/20	9.22	29.6	1.3	97	<.1	69	32	64	19	37	7.8			
11/ 3/76	8.48	29.0	12	127	<.1		3.4	98	2.9		7.8			
11/17	8.72	27.8	1.8	112	<.1	35	2.4	21	2.1	33	7.7			
12/ 1	9.19	26.3	4.4	117	<.1	165	27	59	13	38	7.2	<1.0		
12/15	9.52	25.6	25	119	<.1	121	35	59	12	86	9.3	<1.0		
12/30	9.18	30.5	1.0	122	<.1	79	2.4	27	1.5	77	7.8	1.7		
1/ 3/77	10.24	29.4	3.6	138	.1	139	23	61	12	116	10			
1/27	9.15	29.7			.1	94	15	15	9.4	79	11			
2/ 9	8.85	30.2	1.9	177	.80	183	7.8		8.5	175	11			
2/23	7.32	25.5		229	28	343	12	173	9	341	14	<1.0		
3/10	8.28	32.2	1.6	180	3	107	12	26	12	85	15		67	
3/23	7.15		2.2	211	<.1	143	2.7		2.7	140	14		86	81
4/13	8.55	29.5	1.8	181	0.0	266	2.9		2.9	263	10		73	71

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
12/ 2/75			12.3			0.0		<.001	.151				
12/ 6			6.6			.004		0.0	.028				
12/19			6.6			.026		0.0	.048				
1/ 1/76						.077		.011	.091				
1/ 5			8.5			.059		.011	.602				
1/14			7.6			.036		0.0	.003				
2/ 3	58	0.0	10.1			.064		.050	.109				
2/ 5	58	0.0				.056		.014	0.0				
2/12	57	9.0	10.2			.042		0.0	.003				
3/23	75	6.2				.040		0.0	.151				
3/24	74	5.0				.055		0.0	.105				
3/25	78	8.0				.051		<.001	.190				
3/26	72	8.4				.035		0.0	.102				
4/ 2	60	3.3				.049		0.0	.013				
7/ 6	35	7.4	9.5		34	.001		<.001	.007				
7/19	34	1.8	5.0	1.3	23	.024		.002	.006				
7/26	44	8.0	8.5	1.1	7.1	.056		0.0	.005				
8/10	46	10.0	7.5	2.6	0.0	.039		.009	0.0				
8/24	51	10.0	6.3		2.7	.067		0.0	.117				
9/ 2	46	3.3	4.5	.9	31	.060		<.001	.063				
9/22	38	11	9.0	2.5	12	.016		.001	.039	< 10			
10/ 6	46	14		2.3	6.8	.031		<.001	.023				
10/20	51	10.7	8.7	2.6	32	.021		0.0	.002				
11/ 3	53	2.3	6.8	1.0	11	.019		.004	.145				
11/ 5										1,100	240		
11/17	49	2.9	5.2	.9	13	.019		0.0	.040				
12/ 1	49	8.8	10.7	1.5	9.4	.026		<.001	.004				
12/ 3										270	1		
12/15	51	9.9	8.4	2.7	20	.045	.108	.001	.122				
12/17										11,000	18		
12/30	50	7.4	8.9	.4	4.7	.014	.038	<.001	<.001			.152	
1/12/76										6,600	40		
1/13	42	21	13.2	2.3	21	.022		<.001	.014			.075	
1/25										10	110		
1/27	53	14	9.5		30	.082	.139	.001	.037			.135	
2/ 8										100	260		
2/ 9	67	7	6.8	4.7	30	.057	.158	.002	.016			.114	
2/22										TnTc	100		
2/23	86	0	1.0	5.5	41	.037	.092	.002	.061			.163	
3/ 9										<10,000	150		
3/10	66	3	6.2	14	51	.028	.297	.004	.012			.431	
3/22										<10,000	100		
3/23	79	0	1.8	2.6	35	.018	.82	0.0	.003			.177	
4/ 5										<1,000	1,470		
4/13	68	4.5	9.1		22	.032	.048	.001	.005			.185	

Table 20. Results of chemical analyses of Barrigada Village (Blc) ponding basin water.

CHEMICAL ANALYSIS OF PONDING BASIN WATER

DATE	pH (UNITS)	TEMP. °C	TURB. (NTU)	Sp.COND µmho/cm	SET.SOL	TS	SS	VS	VSS	TDS	CL-	SO4=	HARDNESS	CA++ HARD
12/16/75			2.8											
12/19			3.7											
1/ 1/76														
1/ 5		30.5												
1/14		29.8	3.0											
2/ 3	8.15	28.0	6.5	91										
2/ 5	8.95	27.2	12	124										
2/12	9.11	28.5	10	126										
3/ 3	7.25	28.3	4.8	136										
3/ 4	8.40	29.7	2.2	118										
3/23	8.90	31.5	5.5	130										
3/24	8.60	31.8	5.3	138										
3/25	9.20	31.9	3.6	138										
3/26	9.40	31.0	4.5	132										
4/ 2	9.00	30.9	10	144										
7/ 6	9.42	32.5	3	225		168	3.5			164	44.6			
7/19	8.35	26.7	80			128	100	80		28	4.4			
8/10	9.25	27.4	2.8	105		106	20	3.2		103	8.9			
8/24	9.20	28.9	4.0	127		140	1.7	2.0		138	6.1			
9/ 8	8.25	27.3	125	119	<.4	656	434	127		222	15			
9/22	9.18	27.4	3.5	86	<.1	44	3.4			41	6.7	1.5		
10/ 6	9.52	30.1	12	120	<.1	138	9.0		5.8	149	9.1			
10/20	8.28	28.3	8.9	148	<.1	125	10	33		115	13			
10/22														
11/ 3	8.92	29.3	3.7	111	<.1		11	50			7.6			
11/ 5														
11/17	7.94	27.4	2.7	137	<.1	92	3.1	60	2.1	89	6.9			
12/ 1	7.68	26.5	2.0	164	<.1	41	5.9	20	5.0	35	7.4	<1.0		
12/13	8.15	25.8	110	362	2.0	574	257	22	98	317		12.3		
12/30	8.55	31.0	3.7	149	<.1	89	5.0	49	2.3	84	8.0	2.6		
1/10/77														
1/13	9.02	34.4	1.2	135	<.1	167	5.2	78	3.9	162	24			
1/27	8.80	32.5			<.1	67	17	13	8.2	50	11			
2/ 9	8.20	30.0	9.8	223	<.1	138	18		15	120	13			
2/23	7.37	26.0		216	0	156	5.0	28	5.0	151	13	<1.0		
3/10	9.00	29.1	3.2	225	<.1	105	9.0	8.0	9.0	96	17		91	
3/22														
3/23	6.71	25.4	90	111	<.1	134		44	15	90	11		42	42
4/13	7.38	27.5		208	<.1	306	3.6			320	10		87	84

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
12/16/75			5.7			.008		0	.005				
12/19			5.8			.025		0	.005				
1/ 1/76						.041		.015	.341				
1/ 5			6.7			.059		.010	.260				
1/14			6.7			.033		0	.284				
	43	0	7.4			.025		.051	.022				
2/ 5						.048		0	.001				
2/12	57	8.8	9.9			.042		.012	.020				
3/ 3	66	0	5.5			.050		0	.121				
3/ 4	68	1.1											
3/23	76	6.2				.039		0	.122				
3/24	74	4.5				.039		0	.024				
3/25	76	7.5				.035		0	.180				
3/26	73	8.7				.037		0	.015				
4/ 2	60	3.2				.050		0	.005				
7/ 6	35	9.2	8.8		47	.015		<.001	.128				
7/19	40	0	7.2	1.3	32	.063		.007	.014				
8/10	47	14	8.8	.7	2.7	.033		<.001	.145				
8/24	54	10	7.1		3.7	.053		0	.140				
9/ 8	123	0	6.3	1.7	143	.029		.022	.108				
9/22	43	6.1	6.4	.9	10	.009		<.001	.083				
10/ 6	50	11		3.8	29	.031		.002	.074				
10/20	64	1.1	4.9	3.7	42	.316		.002	.015				
											57		
11/ 3	45	4.8	6.0	.5	16	.036		.002	.075				
11/ 5										1,500	405		
11/17	58	0	3.4	.9	7.0	.026		0	.004				
11/19											<100		
12/ 1	64	0	2.8	1.3	13	.007		0	.017				
12/ 3										3,700	141		
12/13	148	0	5.9	17	192	.034	.119	<.001	.020			1.6	
12/15										7,600	4,700		
12/29										14,900			
12/30	61	2.0	5.5	2.1	3.6	.027	.068	.001	<.001			.18	
1/10/77										1,100	200		
1/13	62	4	8.5	2.6	16	.024	.063	<.001				.17	
1/25										7,000	20,000		
	48	11	11.1		19	.013	.047	<.001	.004			.18	17
2/ 8										1,200	1,000		
	76	1.7	6.6	5.6	33	.024	.102	.001	.007			.28	26
2/22										1,450	200		
	90	0	1.0	3.5	27	.014	.057	<.001	.046			.21	
3/ 9										<10,000	30		
3/10	88	0	6.2	11	33	.134	.119	.001	.003			.24	
3/22										<10,000	500		
	47	0	8.1	5.3	33	.078	.167	<.001	.046			.14	4.3
4/ 5										3,000	140		
4/13	78	0	3.0		32	.008	.089	.002	.007			4.9	
5/17						.136	.238	.001	.005				

Table 21. Results of chemical analyses of Barrigada Heights (B2d) ponding basin water.

DATE	pH UNITS	TEMP. °C	TURB (NTU'S)	Sp.COND umho/cm	SET.SOL.	TS	SS	VS	VSS	TDS	CL⁻	$SO_4^=$	HARDNESS	CA++ HARD
1/14														
2/ 3	7.29	26.8	80	80										
2/ 5	7.21	25.8	50	88										
2/12	8.54	26.2	50	71										
3/ 3	8.65	25.4	5.7	180										
3/ 4	8.25	26.5	2.4	169										
3/23	7.00	26.8	3.3	80										
3/24	7.80	29.5	12	80										
3/25	8.30	27.4	12	65										
3/26	8.50	27.1	6.5	80										
4/ 2	8.00	29.1	19	197										
7/ 6	7.80	28.6	9.3	108		146	5.2			141	4.8			
7/19	7.70	26.3	22	90		54	12.4	61		42	4.5			
8/10	7.40	26.8	2.4	238		180	2.6			177	29			
8/24	8.90	28.8	28	81	<.1	121	19		7.8	102	4.4			
9/ 8	7.50	27.2	16	91	0.0	71	2.3		2.2	69	6.2			
9/22	7.73	26.8	7.7	104	0.0	90	7.1		3.7	83	5.5	1.4		
10/ 6	5.58	33.2	2.5	120	<.1	139	6.4		5.2	132	6.1			
10/20	7.58	28.4	3.0	107	<.1	49	1.7	36	1.5	47	6.7			
11/ 3	7.89	28.3	9.8	92		302	16	58	4.8	285	5.7			
11/17	27.7	8.2	114		<.1	54	22	13	9.0	32	9.9			
12/ 1	7.72	26.7	15	122	<.1	51	12	41	5.7	38	8.9			
12/13	7.90	25.5	15	168	<.1	140	16	84	4.7	124	15	12.6		
12/30	7.59	27.5	200	113	<.1	97	25	74	14	72	8.4	<1.0		
1/13/77	7.95	27.5	2.4	106	<.1	115	2.7	38	2.1	112	8.0			
1/27	6.85	27.0			0.0	175	1.5	96	1.1	174	29			
2/ 9	6.97	25.8	5.4	128	0.0	65	6.9		4.4	58	8.8			
2/23	7.53	25.5		245	0.0	134	<1.0	28	<1.0	134	17			
3/10	7.55	27.1	2.4	249	0.0	154	4.0	31	1.3	150	29		64	
3/23	6.79	26.0	40	111	<.1	64	22		19	42	8.7	5.1	34	32
4/13	7.36	27.3	1.4	263	<.1	388	2.0		2.0	386	19		82	76

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TD	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
1/1/76						.026		.018	.309				
1/ 5			7.0			.105		.030	.325				
1/14			7.0			.033		.011	>. 5				
2/ 3	43		7.7			.028		.007	.050				
2/ 5	45					.018		.011	.027				
2/12	40		7.7			.028		0.0	.149				
3/ 3	66		5.1			.022		0.0	.231				
3/ 4	71	3.2											
3/23	55	0.0				.057		.020	.041				
3/24	42	.5				.050		.022	.277				
3/25	43	.1				.052		.021	.110				
3/26	40	1.0				.029		.006	.031				
4/ 2	60	0.0				0.0		.027	.277				
7/ 6	42	0.0	4.3		40	.075		.002	.201				
7/19	40	0.0	7.1	< .1	14	.081		.004	.064				
8/10	72	0.0	1.5	3.0	11	.003		.029	.238				
8/24	44	0.0	6.2		9.5	.063		.004	.223				
9/ 8	45	1.0	6.9	1.8	30	.036		.001	.130				
9/22	59	0.0	3.4	1.2	.4	.031		.002	.155				
10/ 6	58	0.0		2.5	34	.003		.004	.030				
10/20	53	0.0	1.8	2.1	23	.042		.002	.013				
10/22										100	21,800		
11/ 3	36	0.0	7.2	1.8	20	.024		.003	.001				
11/ 5										8,100	1,700		
11/17	40	2.8	5.7	3.1	28	.033		.007	.026				
11/19										<100	2,300		
12/ 1	43	0.0	7.8	3.1		.037		.002	.100			.50	
12/ 3										13,700	2,200		
12/13	52	0.0	1.7	2.3	26	.055	.071	<.001	.010			.35	
12/15										7,000	1,160		
12/16	51	0.0						.003	.141				
12/29											TnTc		
12/30	45	0.0	3.5	5.6	18	.014	.063	.001	.047				
1/12/77										1,600	16,500		
1/13	46	0.0	3.3	2.4	18	.030		<.001	.020			.25	2.2
1/25										9,000	21,600		
1/27	103	0.0	3.3		37	.119	.120	.001	.038			.66	15
2/ 8										3,000	5,650		
2/ 9	49	0.0	4.5	2.0	18	.057	.083	.003	.170			.15	
2/22										4,000	3,300		
2/23	82	0.0	1.3	3.6	47	.190	.245	.006	<.001			.57	
3/ 9										12,000	15,500		
3/10	67	0.0	1.7	8.6	45	.060	.153	.004	.030			.62	32
3/22										80,000	25,000		
3/23	37	0.0	7.8	3.2	16	.083	.134	.002	.062			.06	23
4/ 5										6,000	100		
4/13	86	0.0	1.4		46	.106	.148	.001	.006			.46	12
5/10										24,000			

Table 22. Results of chemical analyses of Barrigada Heights (B2w) ponding basin water.

DATE	pH UNITS	TEMP. °C	TURB. NTU	Sp.COND µmho/cm	SET.SOL ml/l	TS	SS	VS	VSS	TDS	CL^-	$SO_4^=$	HARDNESS	CA++ HARD
12/ 2/75			8.2											
12/19		20.6	9.0											
1/ 5		30.8												
1/14		30.5	7.8											
2/ 3	7.7	27.5	7.2	65										
2/ 5	7.5	26.4	112	69										
2/12	8.71	27.2	78	58										
2/24	7.5	30.0	12	60										
3/25	8.5	32.0	12	78										
3/26	8.5	29.5	18	73										
4/ 2	8.4	31.8	19	95										
7/ 6	9.15	31.8	88	111		128	5.8			122	6.1			
7/19	8.35	26.6	40	74		43	20			23	2.4			
7/26	8.35	28.6	15	62		13	10		2.6	2.9	0.1			
8/10	8.65	28.6	10	79	<.1	63	5.1	2.2		58	6.6			
8/24	7.92	29.0	15	76	<.1	84	7.9	4.0		76	13			
9.22	8.78	29.7	3.6	81	<.1	58	2.5	1.7		56	5.2	1.0		
10/ 6	9.10	31.0	3.0	87	<.1	129	11			118	3.2			
10/20	8.85	29.9	2.4	145	<.1	61	2.1	81	2.1	79	12			
11/ 3	8.30	30.4	10	104	<.1	320	31		1.2	317	3.9			
11/17	9.40	28.4	5.0	105	<.1	62	12	10	6	50	5.1			
12/ 1/76	8.34	27.5	10	111	<.1	40	9.1	15	4.5	31	4.6	1.2		
12/13	9.00	25.2	5.0	138	<.1	117	8.0	82	6.2	109	11	<1.0		
12/30	9.25	29.0	3.0	101	<.1	57	1.9	37	1.8	55	4.3	13.7		
1/13/77	9.60	29.0	1.4	111	0.0	121	3.5	38	2.3	118	9.8			
1/27	9.10	32.8			0.0	72	15	66	13	57	17			
2/ 9	9.20	29.5	2.9	140	0.0	50	5.5		4.8	50	11			
2/23	8.30	27.8		163	0.0	106	10	62	10	106	18			
3/10	9.58	32.7	3.7	115	0.0	55	9.4		82	46	12		28	
3/23	7.13	26.8	7.2	132	0.0	66	16		5.3	50	9.6		44	44
4/13	DRY													

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
12/ 2/75			10.6			0.0		.002	.121				
12/19			8.1			.031		0.0	.026				
1/ 1/76						.021		.002	.315				
1/ 5			8.4			.025		.005	.023				
1/14			10.2			.009		0.0	.013				
2/ 3	39		7.5			.011		0.0	.024				
2/ 5	52					.015		.018	0.0				
2/12	42	2.0	7.6			.014		0.0	.010				
3/24	38	1.0				.029		.002	.028				
3/25	42	0.8				0.0		0.0	0.0				
3/26	37	0.3				.018		.001	.167				
4/ 2						0.0		.004	.277				
7/ 6	46	13	11.5		27	<.001		<.001	.130				
7/19	35	.7	5.2	0.3	7.2	.143		.003	.025				
7/26	33	1.1	6.0	0.5	1.2	.029		0.0	.005				
8/10	38	4.8	8.1	1.4	0.7	.007		0.0	.071				
8/24	47	0	4.5		1.4	.004		0.0	.39				
9/ 8	48	0	6.0	1.2	22	.009		<.001	.018				
9/22	43	4.4	5.8	1.2	6.0	.004		<.001	.009				
10/ 6	46	5.3		1.7	8.8	.011		<.001	.003				
10/20	57	4.8	9.0	1.2	19	.001		0.0	.033				
11/ 3	51	1.0	6.6	0.4	5.7	.009		0.0	.008				
11/ 5										150	10		
11/17	44	8.3	7.4	2.7	13	.004		0.0	.001				
11/19										< 10	< 10		
12/ 1	50	1.3	7.4	1.1	4.8	.002		0.0	.094				
12/ 3										28	320		
12/13	52	3.6	10.0	3.8	16	.028	.038	0.0	.004				
12/15										90	69		
12/29											90		
12/30	49	6.6	10.4	0.9	16	.002	.019	<.001	<.001				
1/12/77										1,900	136		
1/13	44	9.0	11.8	3.2	13	0.0		0.0	.009			.11	
1/25										2,000	427		
1/27	41	22.4	15.6		27	.014	.047	.002	.003			.08	
2/ 8										1,400	330		
2/ 9	48	13	14.9	3.0	27	0.0	.035	<.001	.007			.17	
2/22										100	170		
2/23	45	8.0	9.4	8.2	44	.010	.092	<.001	.002			.13	
3/ 9										10,000	250		
3/10	37	11	16.3	7.8	16	.008	.090	<.001	.002	20,000	80	.13	
3/22													
3/23	48	0.0	5.3	3.7	14	.010	.055	0.0	.006			.40	
4/ 5										<10,000	60		
4/13	DRY												
5/10	DRY												

Table 23. Results of chemical analyses of Barrigada Heights (B3) ponding basin water.

DATE	pH (UNITS)	TEMP. °C	TURB. (NTU'S)	Sp.COND µmho/cm	SET.SOL. ml/l	TS	SS	VS	VSS	TDS	CL	SO4=	HARDNESS	CA++ HARD
12/ 2/75			7.0											
1/ 5/76		31.5												
1/14	DRY													
2/ 3	8.10	26.9		69										
2/ 5	8.12	26.5	88	72										
2/12	8.78	28.2	62	86										
3/ 3	8.65	26.9	4.8	87										
3/ 4	9.20	30.8	3.3	75										
3/23	9.20	31.5	2.6	76										
3/24	9.20	33.0	2.8	82										
3/25	9.20	33.7	3.0	85										
3/26	9.90	32.0	4.0	80										
4/ 2	8.80	30.5	14	94										
7/ 6	8.40	33.5	9.8	141	<.1	131	12			119	5.3			
7/19	7.95	27.2	22	68	<.1	67	12			55	3.3			
8/10	8.40	28.8	14	70	<.1	73	11		3.0	62				
8/24	8.50	26.9	51	57	<.1	152	26		11	126	2.4			
9/ 8	8.25	28.1	6.4	84	<.1	95	12		8.0	83	7.4			
9/22	9.12	30.1	2.3	88	<.1	57	4.6		3.2	52	5.2			
10/ 6	8.71	31.2	6.4	90	<.1	117	6.8		3.1	110	3.2			
11/20	8.61	33.3	30	107	<.1	187	40	6.0	11	181	6.6			
11/ 3	8.02	30.0	15	98	0.0		9.1	24	4.8		5.9			
11/17	8.78	28.7	2.6	113	0.0	71	4.0	14	3.0	67	5.9			
12/ 1	8.19	27.8	3.8	120	0.0	37	5.6	17	5.6	31	5.2	1.1		
12/13	8.42	26.0	13	174	0.0	178	43	118	32	135	9.9	<1.0		
12/30	9.38	31.0	2.8	93	.1	65	2.0	45	2.2	63	3.8			
1/12/77	DRY													
2/23	DRY													
3/10	DRY													
3/23	6.96	26.8	6.5	124	0.0		5.7				8.9		37	36

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
12/ 2/75			14.7			0.0		.005	.085				
1/ 1/76						.022		.008	.154				
1/ 5			10.1			.035		.006	.548				
1/14	DRY												
2/ 3	41		8.4			.009		.002	.009				
2/ 5	46					.012		.006	.005				
2/12	45	.8	8.0			.012		0.0	.040				
3/ 3	44	6.9	9.7			0.0		0.0	.119				
3/ 4	43	8.5											
3/23	42	12				.003		0.0	0.0				
3/24	42	13				.007		.002	.051				
3/25	43	18				0.0		.003	.003				
3/26	40	16				0.0		0.0	.180				
4/ 2	43	2.3				0.0		.001	.144				
7/ 6	67	2.5	7.9		8.2	0.0		.001	.004				
7/19	32	0.0	6.1	1.4	15	.27		.004	.008				
8/10	31	0.0	7.1	1.0	9.4	.007		0.0	.004				
8/24	37	1.0	6.8		6.1	.009		0.0	.009				
9/ 8	47	0.0	6.6	1.2	23	.009		.001	.162				
9/22	50	5.9	6.7	1.7	1.6	.008		0.0	.108				
9/24													
10/ 6	52	2.5		1.9	16	.001		<.001	.003	760			
10/13													
10/20	60	2.5	11.5	4.4	18	.017		.001	.133	50	10		
10/22													
11/ 3	40	0.0	7.4	.5	3.8	.009		0.0	.159	20	3,320		
11/ 5													
11/17	49	3.1	7.3	.9	14	.002		0.0	.007	60	100		
11/19													
12/ 1	54	0.0	5.1	3.6	7.1	<.001		0.0	.004	90	30		
12/13													
12/13	76	3.0	10.5	>6.6	38	.119	.173	0.0	.003	0	0		
12/15													
12/30	46	7.1	9.9	2.5	11	.004	.029	0.0	.102	0	1,230		
1/12	DRY												
2/23	DRY												
3/10	DRY												
3/23	43	0.0	7.8	3.0	12	.016	.050	<.001	.010			.03	
4/13	DRY												
5/17	DRY												

Table 24. Results of Chemical analyses of Latte Heights (L2) ponding basin water.

DATE	pH UNITS	TEMP. °C	TURB. (NTU'S)	Sp.COND. μmho/cm	SET.SOL.	TS	SS	VS	VSS	TDS	CL^-	$SO_4^=$	HARD NESS	CA++ HARD
12/ 2/ 75			11											
1/14/76			5.8											
2/ 3	8.10	26.9		69										
2/ 5	8.79	29.1	7.9	76										
2/12	8.58	28.6	78	56										
3/ 3	9.95	33.9	5.8	117										
3/ 4	9.40	34.6	5.2	104										
3/23	9.60	34.7	8.8	93										
3/24			8.6	83										
3/25	10.1	34.6	9.6	104										
3/26	9.80	32.2	9.2	84										
4/ 2	10.2	37.0	10.0	133										
7/16	8.95	40.0												
7/19	10.00	27.0	13	103		78	8.2			70	4.4			
7/26	8.90	31.9	4.9	89		17	2.8		2.8	14	1.2			
8/10	9.75	32.7	4.6	129		117	12		10.5	105	9.3			
8/24	9.10	32.9	14	79		90	16		11	74	3.2			
9/ 8	8.20	30.5	25	99	<.1	111	20		14	91	8.6			
9/22	9.45	31.7	6.6	85	<.1	86	25		17	61	3.5	2.7		
10/ 6	DRY													
10/20	DRY													
11/ 3	9.78	36.2	.8	83	0.0		6.0	13	2.9		4.1			
11/17	9.65	32.4	2.4	111	0.0	66	5.0	30	3.5	61	5.9			
12/ 1	9.51	32.4	4.4	119	<.1	52	8.4		8.4	44	5.7	1.1		
12/30	9.68	34.5	2.8	92	0.0	80	10	62	6.4	70	5.1			
1/13/77	9.62	36.0	1.6	100	<.1	133	18	76	4.0	115	9.6			
1/27	DRY													
2/ 9	8.10	27.9	7.9	246	<.1	191	12		6.5	179	34			
2/23	DRY													
3/23	6.80	29.5	7.3	131	<.1	45	10		5.4	35	11		37	34

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
12/ 2/75			14.0			.034		.002	.006				
1/ 1/76						.036		.033	.350				
1/14			11.5			.070		0.0	.520				
2/ 3	41		8.2			.019		0.0	.108				
2/ 5	40					.011		.011	0.0				
2/12	38	1.0	8.6			.019		0.0	.003				
3/ 3	53	18	12.5			0.0		0.0	.146				
3/ 4	50	24											
3/23	57	28				.012		0.0	.011				
3/24	34	13				0.0		<.001	.103				
3/25	46	22				.007		0.0	.040				
3/26	37	14				0.0		0.0	.025				
4/ 2	45	27				0.0		0.0	.167				
7/19	45	5.5	8.5	.2	16	.134		.001	.011				
7/26	46	9.5	10.8	1.1	13	.004		0.0	.005				
8/10	40	19	11.7	2.6	11	.030		0.0	.149				
8/24	44	6.5	6.5		15	.012		.003	<.001				
9/ 8	48	3.6	6.5	1.7	41	.016		.003	.087				
9/22	51	7.6	9.4	6.3	13			<.001	.013				
9/24										290			
10/ 6	DRY												
10/20	DRY												
10/22						.031		.002	.021	<20	4,360		
11/ 3	34	12	14.6	2.0	8.1	.001		0.0	0.0				
11/ 5										<10	0		
11/17	50	13	12.1	2.1	14	.002		0.0	.001				
11/19										3	6		
12/ 1	53	12	12.9	5.2	7.9	.007		0.0	.006				
12/ 3										50	1		
12/13	DRY												
12/15										30	59		
12/29											9,100		
12/30	40	9.4	12.8	7.1	16	0.0	.081	<.001	<.001				
1/ 3/77						.084		0.0	.106			.84	
1/12										7,900	15,200		
1/13	38	7.2	14.8	2.9	16	.003		0.0	.002			.13	
1/27	DRY												
2/ 9	47	1.5	7.9	4.3	60	.188	.211	.006	.124			.58	
2/23	DRY												
3/23	39	0.0	7.6	4.0	3.7	.090	.139	.001	.030			.06	7.9
4/13	DRY												
5/17	DRY												

Table 25. Results of chemical analyses of Perez Acres ponding basin water.

DATE	pH (UNITS)	TEMP. °C	TURB. (NTU)	Sp. COND. µmho/cm	SET. SOL.	TS	SS	VS	VSS	TDS	CL-	$SO_4^=$	HARDNESS	CA++ HARD
7/ 6/76	8.60	34.3	70	146	< .1	186	94			92	8.5			
7/19		27.9	40	102	< .1	87	24			63	4.9			
7/26	8.25	31.3	19	76	< .1	52	12		6.4	39	.8			
8/10	9.10	30.9	19	87	< .1	342	23		8.5	320	5.1			
8/24	8.95	31.5	22	52	< .1	175	11		5.5	164	3.2			
9/ 8	8.70	29.0	14	63	< .1	392	28		13	364	6.4			
9/22		29.0	14	66	< .1	334	30		6.8	314	5.0			
10/ 6	8.58	28.3	12	68	< .1	372	30		11	353	6.1			
10/20	9.90	32.7	65	94	< .1	836	54	72	21	782	9.1			
11/ 3	8.50	32.3	12	73	< .1	379	14	69	6.8	365	7.5			
11/17	10.35	30.6	15	98	< .1	56	18	56	16	38	6.3			
11/29	9.45													
12/ 1	9.72	29.6	20	78	< .1	85	10	37	9.4	75	5.6	1.9		
12/13	9.07	25.5	18	92	< .1	134	37	89		97	8.3	<1.9		
12/30	9.15	28.0	8.4	72	< .1	54	9.6	31	5.6	44	4.5	<1.0		
1/13/77	9.88	28.6	14	102	< .1	118	24	79	13	94	8.4			
1/27	9.40	31.2			< .1	75	28	42	14	47	11			
2/ 9	9.00	27.1	15	109	< .1	103	36		20	68	12			
2/23	9.80	29.6		122	.0	145	13	63	11	132	12			
3/10	9.70	31.5	15	135	< .1	96	17	78	17	79	15		30	
3/23	9.00	29.3	5.9	113	< .1	74	13		13	61	12	2.6	29	27
4/13	9.00	30.6	8.0	135	< .1	306	15			291	11		34	28

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
7/ 6/76	70	6.4	6.9		40	0.0		.014	.219				
7/19	41	4.5	7.1	2.0	20	.073		.084	.504				
7/26	36	2.4	10.2	1.6	4.9	.005		.206	.150				
8/10	28	2.8	9.3	2.4	12	.008		<.001	.081				
8/24	29	3.8	7.4		8.5	<.001		.002	<.001				
9/ 8	34	1.8	7.2	1.1	17	.015		0.0	.004				
9/22	38	1.2	7.1	1.6	12	.004		<.001	.004	4,610			
10/ 6	29	1.4	3.3		37	.006		.001	.142	200			
10/13										200	17		
10/20	36	14	9.5	4.1	27	.001		0.0	.083				
10/22										4,000	710		
11/ 3	31	.5	8.1	1.8	6.2	.025		.601	.002				
11/ 5										630	430		
11/17	33	19	12.0	3.5	23.4	.004		.003	.002				
11/19										20	<10		
11/29	28	7.8											
12/ 1	30	9.7	10.1	2.2	10	0.0		.002	.108			.05	
12/ 3										500	60		
12/13	36	3.0	7.3	2.5	21	.022	.036	<.001	.093			.17	
12/15										20	670		
12/29											300		
12/30	33	7.6	8.7	2.9	7.9	.006	.068	0.0	.001			.15	
1/ 9/77						.006		.001	.415				
1/12										4,700	500		
1/13	35	10	9.4	3.2	26	.012		<.001	.108			.10	2.8
1/25										0	0		
1/27	36	15	10.5		29	.020	.051	.004	.004			.33	
2/ 8										700	180		
2/ 9	35	9.5	9.1	5.5	33	.008	.046	.004	.024			.16	0
2/22										200	<10		
2/23	36	22	11.4	4.9	27	.005	.034	.004	.029			.15	
3/ 9										<10,000	656		
3/10	32	18	12.6	8.6	33	.009	.087	0.0	.005			.12	
3/22										9,000	680		
3/23	32	13	10.0	7.3	32	.003	.064	0.0	.002			.14	
4/ 5										9,000	TnTc		
4/13	34	7.0	7.7		24	.017	.058	.003	.003				
5/11										10,000	600		
5/17						0.0	.069	.001	.002				

NOTE: In mg/l unless otherwise noted.

Table 26. Results of chemical analyses of Mariana Terrace ponding basin water.

DATE	pH UNITS	TEMP. °C	TURB (NTU'S)	Sp.COND. μmho/cm	SET.SOL	TS	SS	VS	VSS	TDS	CL-	$SO_4^=$	HARDNESS	CA++ HARD
12/ 2/75			12											
7/ 6/76	8.00	22.9	2.8	333	< .1	216	5.0			211	10			
7/19		27.0	30	123	< .1		26	89		97	5.1			
8/10	7.75	30.0	14	159	< .1	1056	8.8		6.8	1048	7.6			
8/24	7.15	30.0	14	116	< .1	467	14		8.9	453	4.9			
9/ 8	7.15	28.9	8.4	152	.45	150	7.0		7.0	143	10			
9/22		28.1	6.4	176		180	13		9.3	167	6.9	2.4		
10/ 6	8.19	29.3	18	74	1.0	198	40		18	158	21			
10/20	7.59	31.0	4.6	251	< .1	297	26	127	26	270	14			
11/ 3	7.23	30.5	15	97	< .1		20	64	11		5.8			
11/17	7.32	29.7	33	252	< .1	171	5.6	85	5.6	165	10			
12/ 1	7.20	29.4	25	525	< .1	176	6.5	37	6.5	170	32	<1.0		
12/13	7.38	26.5	10	250	3.0	262	58	104		204	18	<1.0		
12/30	7.25	28.0	5.4	416	1.0	277	31	96	31	246	30			
1/13/77	7.68	26.5	1.4	271	3.0	238	8.7	53	6.5	249	15			
1/27	6.60	26.9			.1	309	5.3	63	4.6	304	27			
2/ 9	7.22	26.2	3.8	195	.1	136	11		7.6	125	14			
2/23	8.40	27.7		573	.1	364	7.2	112	6.6	357				
3/10	7.78	33.6	4.0	501	< .1	288	4.1	40	3.5	284	23		228	
3/23	7.29	28.0	6.6	616	< .1	338	4.1		3.9	334		3.8	259	255

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	T-P	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
12/ 1/75			18.2			.000		.003	.006				
7/ 6/76	112	0.6	11.1		26	.000		.005	.204				
7/19	52	2.5	7.7	0.9	18	.061		.011	.298				
8/10	72	0.0	3.9	4.5	8.7	.009		0	.007				
8/24	67	0.0	2.4		10	.022		.002	.141				
9/ 8	80	0.0	0.5	2.9	27	.011		0	.004				
	105	0.0	1.2	3.2	14	.024		<.001	.120	3,240			
10/ 6	32	0.0		4.9	23	.003		.006	.153	0	TNTC		
10/13										0	TNTC		
10/20	137	0.0	8.9	8.4	28	.021		<.001	<.001				
10/22										<20	19,800		
11/ 3	46	0.0	5.0	5.0	12	.147		.020	.289				
11/ 5										1,800	1,000		
11/17	118	0.0	6.1	2.8	18	.020		<.001	.053				
11/19										3,300	800		
12/ 1	227	0.0	0.5	4.4	9.6	.035		.011	.045				
12/ 3										246,000	24,800		
12/13	99	0.0	0.5	3.7	23	.024	.064	.011	.040			.21	
12/15										16,000	3,400		
12/29											6,900		
12/30	152	0.0	1.2	4.7	11	.060	.102	.034	.436			.19	
1/12/77										2,000	14,200		
1/13	107	0.0	1.1	3.0	31	.048	.130	.082	.310				
1/25										11,000	5,700		
1/27	236	0.0	1.0		32	.060	.053	.054	.434			.27	
2/ 8										23,000	32,000		
2/ 9	73	0.0	1.0	2.4	28	.090	.111	.018	.113			.24	7.6
2/22										TNTC	170,000		
2/23	306	0.0	0.0	11	22	.324	.368	.095	.402			.83	
3/ 9										60,000	<10,000		
3/10	224	0.0	10.8	4.0	4.2	.014	.065	.239	1.54			.18	24
3/22										70,000	1,000		
3/23	258	0.0	4.9	2.3	10.5	.011	.170	.218	2.04			.11	12
4/ 5										<10,000	<1,000		
4/13	WATER	LEVEL	TOO	LOW	TO SAMPLE								
5/11										930,000	2,000		
5/17						.373	.745	.017	.042				

Table 27. Results of chemical analyses of Airport Road drainage ditch water.

DATE	pH UNITS	TEMP. °C	TURB. (NTU'S)	Sp.COND µmho/cm	SET.SOL. ml/l	TS	SS	VS	VSS	TDS	CL⁻	$SO_4^{=}$	HARDNESS	CA++ HARD
8/10/76	8.49	35.4	82	174	<.1	184	12.2		10.0	175	8.8			
8/24	7.75	32.8	11.0	88	<.1	116	4.0		-4.0	112	7.0			
9/ 8	8.75	32.0	9.0	91		200	8.0		-7.8	192	7.0			
9/22	8.89	33.0	6.0	98		53	6.0		4.0	47	5.0			
10/ 6	8.60	31.0	22.0	197		275	6.0		-6.0	258	16.0			
10/20	7.34	35.0	40	193	<.1	379	18.0	150.0	17.0	362	17			
10/22														
11/ 3	7.59	36.0	8.0	1.0	<.1		11.0	92.0	6.0		11			
11/17	7.69	31.0	8.0	165	<.1	302	9.0	21.0	8.0	293	9.0			
12/ 1	8.40	33.0	4.0	150	<.1	461	5.4	75.0	5.4	456	11	<1.0		
12/13	7.88	26.0	7.0	183	<.1	190	8	81.0		182	22	<1.0		
12/30	7.40	29.0	5.0	189	<.1	135	6.0	93	6.2	129	18	3.7		
1/12/77	7.40	29.0	20	163	.1	161	12	57	10.0	149	12			
1/27	6.70	29.0			.1	627	35.0	286	35.0	341				
2/ 9	6.80	24.0	17	219	.1	171	12.0		14.0	159	22			
2/23	7.60	33.0		235	0.0	189	9.0	51	9	180	21			
3/10	8.20	34.0	7.0	239	<.1	188	12.0	66	12	166	25		76	
3/23	7.36	34.0	8.0	182	<.1	47	7		6.8	40	15	1.2	46	43
4/13	9.25	31.0	8.8	261	<.1	490	3.5		6.8	486	17		90	81

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TD	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
8/10	65.0	0.0	4.9	>9.3	124	.018		0.0	.083				
8/24	43.0	0.0	3.5		46	.056		0.0	.004				
9/ 8	45.0	7.0	5.4	5.6	43	.053		.002	.139				
9/22	56.0	5.0	6.9	3.7	7.9	.027		0.0	.025	0			
10/ 6	78.0	0.0		>13	161	1.30		.005	.153				
10/13										70	0		
10/20	75.0	0.0	0.0	>68	226	.738		.001	.140				
10/22	0.0					.044		.001	.078	1,600	2,880		
11/ 3	53.0	0.0	5.6	5.6	45	.167		.007	.069				
11/ 5						.111		.003	.346	5,600	1,300		
11/17	52.0	0.0	4.9	21	44	.050		.003	<.001				
11/19										< 100	100		
12/ 1	54.0	1.5	7.0	7.0	38	.106		.001	.002			.68	
12/ 3										1,970	< 10		
12/13	56.0	0.0	3.8	7.2	72	.140	.214	.002	.002			1.77	
12/15										3,800	30		
12/29											2,000		
12/30	59.0	0.0	4.8	13	49	.272	.476	.002	0.0			2.11	
1/12/77										400	3,400	3.23	
1/13	65.0	0.0	2.2	27	61	.151		<.001	.011			1.52	26.0
1/25/77										59,000	100		
1/27	148.0	0.0	0.0	>160	693	2.06						12.21	58.0
2/ 8										54,000	5,500		
2/ 9	59.0	0.0	0.7	46	107	.475	1.09					3.60	17.0
2/23	75.0	0.0	7.2	54.0	115	.678	2.29	<.001	<.001			3.75	
2/22										0	2,400		
3/ 9										20,000	200		
3/10	69.0	0.0	7.6	31	78	.463	.984	.002	.005			.76	65.0
3/22										60,000	500		
3/23	38.0	0.0	6.1	15	63	.208	.468	.002	.080			.87	13.0
4/13	91.0	11.0	14.0	106	106	.567	>.567	.010	.063			4.40	19.0
4/15										100,100			
5/10										1240,000			

Table 28. Results of chemical analyses of East Agana Bay storm drain effluent.

DATE	pH UNITS	TEMP. °C	TURB. (NTU'S)	Sp.COND. µmho/cm	SET.SOL.	TS	SS	VS	VSS	TDS	CL⁻	SO4=	HARDNESS	CA++ HARD
7/12/76	7.85	30.0	3.9	3014	<.1	1902	2.4			1900	861			
7/14			6.2											
7/26	8.28	29.4	160	66	.1	234	123		37	111	2.6			
8/10	7.60	31.2	2.6	2070	<.1	642	6.0		2.9	636	577			
8/24	7.60	30.9	19	383	<.1	857	25		10	832	62			
9/ 8	8.00	27.9	55	156	<.1	89	49		20	41	13			
9/22		28.9	1.4	906	<.1	722	4.7		29	717	196	74		
10/ 6	8.00	28.2	2.3	2360	<.1	1435	5.2		38	1429	631			
11/20	7.72	29.9	3.1	1812	<.1	1371	4.1	277	2.9	1367				
11/ 3	7.80	29.4	8.3	1775	<.1	1356	23	66	8.4	1333	485			
11/17	7.32	28.7	6.8	1579	<.1	694	6.8	107	3.7	687	434			
12/ 1	7.75	29.9	20	3050	<.1	3084	17.6	187	10	3066	807	13		
12/13	7.95	26.9	11	1577	<.1	919	14	100		905	314	14		
12/30	7.68	28.5	5.3	8706	<.1	5664	17	614	7.5	5645	2859	370		
1/13/77	8.30	27.1	2.4	1249	<.1	1173	19	51	4.6	1154	308			
1/27	7.70	27.3			0.0	1163	5.7	106	3.2	1157	478			
2/ 9	7.20	27.2	7.3	12830	0.0	806	164		12	640	4656			
2/23	7.80	29.0		2368	0.0	1413	2.5	155	2.3	152	574			
3/10	7.70	29.5	30	1692	0.0	976	4.2	139	3.5	976	373		308	
3/23	7.37	30.7	55	408	<.1	272	40		20	232	37	203	77	58
4/13	7.46	30.0	1.4	2544	<.1	3072	2.8		1.8	3069	619		320	220

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
7/12/76	31		1.6	1.4	32	.026		.069	<.5				
7/14			1.1					.202					
7/26	88	1.5	6.6	2.7	43	.028		.034	.009				
8/10	297	0.0	4.4	2.5	4.7	.018		.047	<.5				
8/24	126	0.0	3.6		30	.008		.016	.238				
9/ 8	97	0.0	5.7	1.2	38	.030		.002	.312				
9/22	270	0.0	3.1	1.3	9.1	.031		.077	7.4	3,000			
10/ 6	296	0.0		1.7	7.8	.032		.059	1.89				
10/13										10,100	520		
10/20	220	0.0	2.7	1.2	15	.014		.035	.607				
10/22						.010		.013	.405	54,000	9,800		
11/ 3	253	0.0	5.0	1.9	14	.020		.020	1.03				
11/ 5										87,000	39,300		
11/17	278	0.0	3.4	.6	17	.014		.084	1.15				
11/19										31,00	1,100		
12/ 1	273	0.0	2.6	1.6	9.2	.003		.065	.378			.34	
										35,00	<100		
12/13	294	0.0	2.9	1.4	16	.014	.036	.059	1.06			.36	
12/15										15,00	370		
12/29											8,000		
12/30	264	0.0	3.4	1.7	18	.029	.058	.026	.602			.41	
1/12/77										40,000	2,800		
1/13	436	3.5	6.5	1.2	8	.047		.039	2.34			.18	11
1/25										2,900	90		
1/27	20	0.0	3.8		3.2	.011	.021	.035	1.33				18
2/ 8										9,600	5,500		
2/ 9	244	0.0	4.8	2.6	41	.028	.047	.030	1.07			1.07	2.5
2/22										40,000	550		
2/23	336	0.0	7.3	2.0	12	.006	.014	.050	2.05			.28	
3/ 9										60,000	1,350		
3/10	252	0.0	5.3	3.0	16	.036	.037	.036	.725			.061	
3/22										50,000	1,600		
3/23	90	0.0	6.0	5.0	39	.042	.044	.005	.231			.29	
4/ 5										21,500	100		
4/13	294	0.0	4.5		13	.010	.058	.036	1.03			.15	
5/10										24,00	30		

Table 29. Results of chemical analyses of Naval Air Station storm drain effluent.

DATE	pH UNITS	TEMP. °C	TURB (NTU'S)	Sp.COND µmho/cm	SET.SOL.	TS	SS	VS	VSS	TDS	CL⁻	SO4=	HARDNESS	CA++ HARD
7/12/76	6.90	28.°	.29	2,079	0.0	1,252				1,252	475			
7/26	6.95	27.°2	5.40	1,961	0.0	733	2.6		2.6	730	309			
8/10	7.00	27.°4	.28	1,884	0.0	1,410	0.5		0.3	1,409	505			
8/24	6.90	27.°5	.16	1,877		907	2.1		1.3	905	495			
9/ 8	6.90	27.°3	32.0	1,861		1,621			0.0	1,621	527			
9/22		27.°3	.20	1,819	0.0	1,479	1.1		1.0	1,478	521	74		
10/ 6	7.24*	27.°2	.45	1,872		1,242	5.0		0.6	1,237	500			
10/20	7.05*	27.°3	.16	1,761	0.0	1,204	0.2	136	0.2	1,204	556			
11/ 3 no sample high tide			--	--	--	--	--	--	--	--	--	--		
11/17	7.20*	27.°2	.16	2,226	0.0	1,556	1.4	126	1.4	1,555	627			
12/ 1	7.18	27.°3	.22	2,271	0.0	2,024	1.2	264	1.2	2,023	459	123.0		
12/30	7.22	27.°2	.13	2,295	0.0	1,352	2.8	258	1.8	1,349	514			
1/13	7.55	27.°4	.20	2,243	0.0	1,287	1.6	201	1.6	1,285	459			
2/23	6.38	27.6		1,545	0.0	1,029	<1.0	195	<1.0	1,029	387			
3/ 9	DRY													
3/23	6.72	27.°5	.21	1,851	0.0	1,050				1,050	463	55.2	405	310
4/13	6.88	27.°2	8.0	1,986	0.0	2,468	1.0		14	2,467	425		420	290

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	TP	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
7/12/76	32	0.0	5.0	0.8	3.0	.012		0.00	<.500				
7/26	179	0.0	5.1	0.1	0.0	.030		.002	<.500				
8/10	244	0.0	4.8	0.5	0.0	.004		0.00	<.500				
8/24	266	0.0	4.0		0.0	.007		.009	<.500				
9/22	272	0.0	4.1	0.5	3.2	.009		0.00	<.500	<100			
10/ 6	270	0.0		0.6	15.2	.030		.001	2.50				
10/13										6	0.0		
10/20			4.9	0.22	1.6	.011		0.00	2.51				
10/22	no sample high tide			--	--	--	--	--	--	--	--		
11/ 5						.008		<.001	2.42	34	0.0		
11/17	276	0.0	5.4	0.1	4.8	.008		0.00	2.45				
11/19								0.00	2.48	19	0.0		
12/ 1	266	0.0	5.4	0.2	0.0	.003		.005	2.44				
12/ 3										88	0.0		
12/13	271	0.0	4.9	0.0	0.5	.008	.012	0.00	2.51				
12/15										18	0.0		
12/29											12		
12/30	270	0.0	5.1	0.2	8.9	.009	.020	.003	2.29				
1/12/77										<100	3		
1/13	279	0.0	4.9	1.8	20.0	.017		0.00	2.14			.14	
2/22										0	28		
2/23	267	0.0	5.0	1.9	9.5	.001	.005	.005	2.43			.14	
3/22										1,460	5		
3/23	266	0.0	5.4	0.2	18.0	.002	.002	<.001	2.24			.12	
4/ 5										535	12		
4/13	265	0.0	5.1		0.6	<.001	.004	.002	2.48			.13	.7
5/10										690	67		

Table 30. Results of chemical analyses of West Agana Bay storm drain effluent.

DATE	pH UNITS	TEMP. °C	TURB (NTU'S)	Sp.COND. umho/cm	SET.COL.	TS	SS	VS	VSS	TDS	CL-	SO4=	HARD-NESS	CA++ HARD
7/12/76	8.05	28.0	15	717	0.0	586	9.3			583	90			
7/26	7.20	27.6	140	87	.05	136	123		45.0	13	1.0			
8/10	DRAIN	NOT	FLOWING											
8/24	DRAIN	NOT	FLOWING											
9/ 8	7.80	28.0	32	262		1168	11		~11.2	1158	527			
9/22		27.3	3.4	654		696	4.4		3.6	695	47	225		
10/ 6	7.61*	28.7	2.8	1652	< .1	1664	20.5		4.0	1644	85			
10/20	8.14*	29.1	4.7	691	< .1	766	7.5	132	3.9	759	74			
11/ 4	7.86		4.2	1460	< .1	1406		169						
11/17	8.40*		8.8	712	< .1	405	7.4	55	4.7	398	36			
12 /	8.20*		2.8	307	< .1	2324	8	254	4.0	2316	2158	245		
12/13	8.12	26.9	80	717	.15	716	90	251		626		99		
12/30	8.20	27.0	1.4	622	0.0	400	3.5	71	1.9	398	37	63.8		
1/12/77	8.50	26.7	1.8	589	0.0	409	2.9	44	2.4	406	18			
2/23	7.78	27.2		506	0.0	330	< 1.0	22	< 1.0	330	40			138
3/10	8.30	25.0	.52	549	0.0	296	1.1	44	2.3	295	101		138	96
3/23	7.26	27.5	.60	249	0.0	66	<.1			66	21	2.6	94	77
4/13	7.95	28.0	.40	296	0.0	448	1.3		447	447	16		126	118

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	T-P	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
7/12/76	12	0.0	6.1	7.65	135	.032		.049	.312				
7/26	72	1.2	6.8	2.8	20	.027		.030	.036				
8/10	DRAIN	NOT	FLOWING										
8/24	DRAIN	NOT	FLOWING										
9/ 8	128	0.0	4.3	2.9	33	.016		.004	.097				
9/22	157	2.8	6.3	1.7	16	.043		.017	.558	~63,000			
10/ 6	51	0.0		0.7	2.2	.054		.073	4.56				
10/13										20,000	600		
10/20		0.0	6.9	1.8	19	.004		.001	1.93				
10/22										12,000	27,200		
11/ 4	74	0.0	9.2	1.5	1.4	.002		.063	3.30				
11/ 5						.061			1.10	253,000	6,000		
11/17	206	5.9	7.8	0.3	11	.008		.013	1.93				
11/19										<1,000	<1,000		
12/ 1	212	0.0	7.4	0.5	14	.002		0.0	1.43				
12/ 3										16,300	< 100		
12/13	127	0.0	7.1	11.7	84	.006	.079	.051	1.38			.86	
12/15										2,200	120		
12/29											300		
12/30	241	0.0	7.8	0.2	2.9	<.001	.032	.008	1.75				
1/12/77										48,000	5,800		
1/13	270	8.0	6.9	0.27	0	.029		.003	1.04			.03	
2/23	233	0.0	7.5	0.4	3.0	.001	.001		.006				
3/10	88	0.0	7.0	0.3	3.3	.020	.042	.002	1.07				
3/22										<10	0		
3/23	70	0.0	7.0	0.5	7.9	.006	.008	<.001	.085			.05	
4/ 5										0	0		
4/13	117	0.0	7.3		0.0	.007	.009	<.001	.363				
5/11										290			

Table 31. Results of chemical analyses of auxillary site urban runoff.

DATE	pH UNITS	TEMP °C	TURB (NTU'S)	Sp.COND µmho/cm	SET.COL	TS	SS	VS	VSS	TDS	CL^-	$SO_4^=$	HARD-NESS	CA++ HARD
				CAMP	WATKINS	ROAD								
3/10/77	7.23	29.0	1.3	879			5.5		3.9		14		248	105
3/23	6.90	30.8	30	356	<.1		20		10		41		115	275
4/13	7.02	29.5	2.0	976	0	1180	4.9		3.2	1174	132		330	
				DEDEDO	PONDING	BASIN								
3/ 3/76	9.25	28.8	3.0	83										
3/ 4	9.20	31.5	2.5	79										
3/23	9.20	32.5	2.7	65										
3/24	9.90	33.0	2.8	69										
3/25	9.30	32.6	4.0	72										
3/26	9.60	31.5	8.8	64										
4/ 2	9.60	33.0	2.5	76										
7/10	7.60	26.4	13	100		66	8.2	117		58	2.9			
				LATTE	HEIGHTS	ESTATES	PONDING		BASIN #3					
1/14/76		32.4	5.8											
2/ 5	7.90	27.8	43	87										
2/12	8.60	28.6	78	56										
3/ 3	9.20	31.1	9.2	89										
3/ 4	8.25	32.3	2.4	169										
3/23	9.30	32.5	2.7	81										
3/24	9.95		5.2	88										
3/25	9.80	33.4	4.8	89										
3/26	9.80	31.6	8.2	87										
4/ 2	9.25	34.1	6.8	89										
7/19	8.20	27.0	18	72		58	14	81		44	3.9			

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	T-P	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
					CAMP	WATKINS	ROAD						
3/10/77	215	0	3.2	4.0	34	.136	.221	<.001	.031			.32	20
3/23	96	0	1.8	5.0	7.8	.070	.006	.150				.27	18
4/ 5										7,000	700		8.5
4/13	260	0	4.2		2.4	.056	.071	.007	.125				
5/10										68,000	200		
					DEDEDO	PONDING	BASIN						
3/ 3/76	44	6.7	9.3			.008		.102	0				
3/ 4	47	7.9											
3/23	39	12				.007		0	.008				
3/24	33	13				.008		0	.203				
3/25	38	12				0		0	.147				
3/26	36	8.3				.006		0	.159				
4/ 2	34	14				0		.002	.028				
7/19/76	47	0	6.8	4.9	13	.025		.003	.135				
					LATTE	HEIGHTS	ESTATES #3						
1/ 1/76						.027		.023	.289				
1/14			11.5			.013		0	>.5				
2/ 5		37				.007		.007	0				
2/12		38	7.6			.014		0	.159				
		42	5.2	9.0		0		.046	0				
3/ 4	46	8.3											
3/23	46	16				0		0	.011				
3/24	40	16				.003		0	.067				
3/25	39	18				0		0	.025				
3/26	38	14				.003		0	.013				
4/ 2	39	10				0		0	.067				
7/19	33	1.7	5.6	.4	23	.032		.003	.004				

Table 32. Results of chemical analyses of Tumon Bay ground-water seepage.

DATE	pH UNITS	TEMP. °C	TURB (NTU'S)	Sp.COND. μmho/cm	SET.COL	TS	SS	VS	VSS	TDS	CL^-	SO_4*	HARD-NESS	CA++ HARD
					TUMON BAY SITE 1									
7/12/76	6.90	28.0	.14	4417	0	2858	2.5			2858	1277			
7/26	7.00	27.0	.20	2554	0	1643	.2			1643	794			
12/31	7.30	26.9	.12	2528		1611	4.9	260	1.6	1606	557	51.9		
					TUMON BAY SITE 2									
7/12/76	6.90	28.0	.27	8522		5748	2.5			5746	2630			
7/26	7.00	26.5	.30	7427		5250	3.2	2.6		5337	2640			
					TUMON BAY SITE 3									
7/12/76	7.00	28.0	.22	7795		6146	3.8			6310	2514			
					TUMON BAY SITE 4									
7/12/76	7.00	27.0	.23	9665		6146	3.8			6142	3119			

DATE	T.ALK	P.ALK	DO	BOD	COD	PO_4-P	T-P	NO_2-N	NO_3-N	TC	FC	MBAS	OIL
					TUMON BAY SITE 1								
12/11/75						.003		0	>.5				
7/12	276	0	4.0	1.1	5.3	.012		0	>.5				
7/26	248	0	3.5	1.2	1.0	.008		0	>.5				
12/31	261	0	3.8	1.1	1.7	.007	.015	0	3.39				
					TUMON BAY SITE 2								
12/11/75								0	>.5				
7/12/76	262	0	3.7	.4	28	.012		0	>.5				
7/26	232		3.6	1.2	7.0	.018		.064	>.5				
					TUMON BAY SITE 3								
12/11/75						.028		.006	>.5				
7/12/76	276		3.8	.3	14	.017		0	>.5				
					TUMON BAY SITE 4								
12/11/75						.025		0	>.5				
7/12/76	277		4.8	.2	41	.022		0	>.5				
					TUMON BAY SITE 5								
12/11/75						.005		.008	>.5				
7/12/76						.355		.004	>.5				