Biological Conditions

II.C. ***Biological Conditions***

II.C.1 Provide a detailed description of representative biological communities in the vicinity of your current and modified discharge(s)

There is evidence that prior to the construction of the Agana treatment plant in 1979, the reef community in Agana Bay may not have been as diverse as other coastal areas of Guam. According to the Dames and Moore Report 1994, an underwater video taken along the Agana Bay reef zone in 1968 showed no significant coral growth within the entire area. WWII battles had denuded much of the Agana area, and heavy rainfalls have caused extensive erosion and mudslides. These have adversely affected and possibly permanently impacted the Coral Communities (Dr. Richard Randall, personal communication as reported in Dames and Moore, 1994). Randall considers that the video findings in Agana Bay as reflecting ambient conditions that do not support coral growth, and not as a result of any point or non-point source pollution or impact activity.

Jones and Randall 1971 reported that the depth at which the reef front terminates along West Agana Bay is generally 6 to 8 meters. The only significant reef coral community occurs in this zone, and is in sharp contrast with the dead corals of the submarine terrace, seaward slope and second submarine terrace. The corals in these areas were reported as been 90% dead, presumably as a result of a Acantaster planci infestation.

Biological monitoring of the Agana WWTP's was contracted to the University of Guam Marine Laboratory. The surveys were conducted quarterly, from Aug 1989 until Sept 1994, with quarterly reports and yearly summaries submitted to GWA. Three 10 m transects were run parallel to shore, one immediately at the diffusers (0 m) and the other two at 20 m and 50 m distances towards shore from the diffusers (Figure 12). The transects were therefore at progressively shallower depths. However, the individual transect depths are unknown. Transect sites were permanently marked for long term monitoring. No control site surveys were conducted for comparison.

Qualitative observations were made to determine the composition of each site. An estimate of substrate cover was done by using a 10 m chain-link transect method, and the percent cover of various species and benthic groups were estimated. The species of fish present were recorded by a diver swimming the 50 meter line connecting each of the three transects. The reports did not state whether the fish observations were restricted to a distance either side of the 50 m line or whether it was a timed observation, and quantities of each species were not recorded. The GWA biologist conducted a Review and Analysis of Past Biological Monitoring Data for the Agana WWTP, Guam. This report is located in ITEM N. The information below is taken from that report.

A summary of the surveys to estimate percent cover by individual species or benthic groups (*i.e.* Bare Substrate, Turf Algae, Macro Algae, Coralline Algae, Corals and other) along the 0m, 20m and 50m transects are given in Table 2, 3 and 4. In general the area surrounding the diffusers (0 - 50m) was predominantly covered by Bare Substrate and Turf Algae. These two groups in general made up greater than 80% of the cover, with Coral, Coralline Algae, Macro Algae or other live sessile organisms (sponges, ascidians, vermetid molluscs, etc) making up the remaining benthic cover. Regression analysis was performed on the data to establish if there had been any significant changes in the benthic community over the period of time that the surveys took place. Results of the analysis are summarized in Table 5. There were significant increases in Bare Substrate and Coral cover along the 0m, 20m and 50m transects.

Macro Algae cover had a significant increase along the 0m and 20m transects, and Coralline Algae cover also significantly increased along the 0m transect. Turf Algae cover significantly decreased along the 0m transect. All other changes in percentage over cover were non significant.

A summary of the fish species observed over the study period is given in Table 6. The species diversity and number of species in each trophic level did not change significantly over the period of biological monitoring, and are believed to be representative of other coral reef fish communities around Guam (personal communication; Dr Steve Amesbury, Prof. of Ichthyology, UOG Marine Laboratory).

Dames and Moore , 1994. Impact Assessment of Non-Chlorinated Effluent from Agana and Northern District Wastewater Treatment Plants. Public Utility Agency of Guam Report

Jones R.S. and R. H. Randall, 1971. An Annual Cycle Study of Biological, Chemical and Oceanographic Phenomena Associated with the Agana Ocean Outfall. University of Guam the Marine Laboratory Technical Report No. 1.

II.C.2. a. Are distinctive habitats of limited distribution (such as kelp beds or coral reef) located in areas potentially affected by the modified discharge?

Yes, coral reefs encircle almost the entire island of Guam.

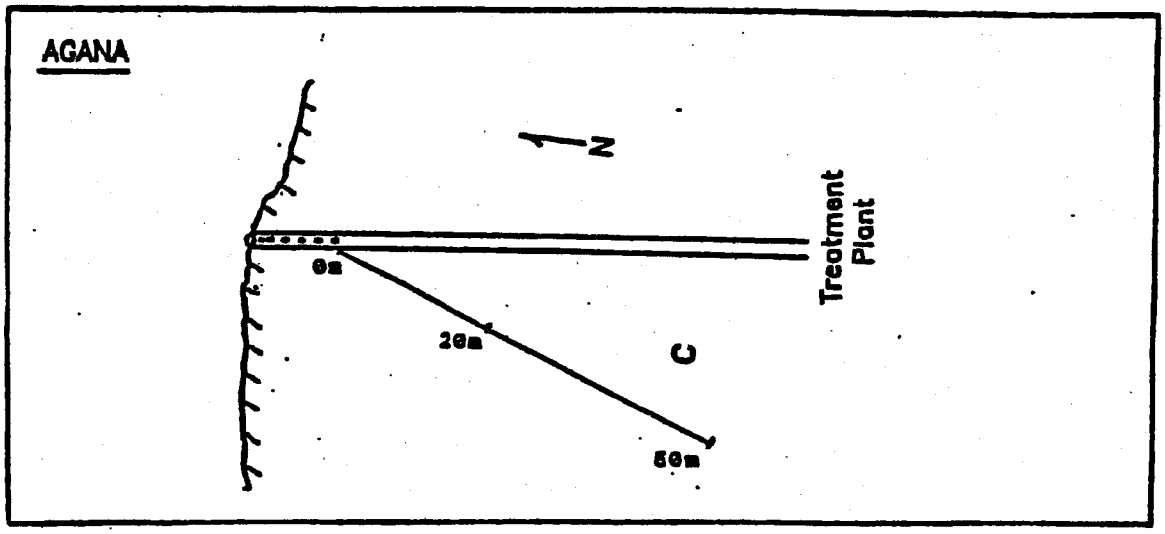
II.C.3. a. Are commercial or recreational fisheries located in areas potentially affected by the discharge?

Yes.

b. If yes, provide information on types, location and value of fisheries

Attached information is from surveys conducted by the Department of Aquatics and Wildlife Resources (DAWR) during 1997.

Figure 12



Location of Biological Monitoring Transects, with sample locations at 0m, 20m and 50m.

Table 2. Species list and percent cover along the 0 meter transect at Agana Outfall

SPECIES OR GROUP	PERCENT COVER															
	8/29/89	11/21/89	4/6/90	6/14/90	10/4/90	12/6/90	8/3/91	12/27/91	4/10/92	8/3/92	12/3/92	3/29/93	8/16/93	1/12/94	5/26/94	9/2/94
Padina sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Tunicate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
Soft coral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
Favites sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porites lutea	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Milliopora	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goniastrea sp.	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Galaxea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pocillopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00
Astreopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00
Halimeda discoidea	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goniopera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fungia	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00
Leptastrea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.78	0.00
Cyptastrea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00
Galaxaura sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00
Thelanota ananas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
Halymenia	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dictiota sp.	0.00	0.00	0.00	0.13	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Neomeris sp.	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.53	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Hydroids	0.00	0.00	0.00	2.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Favia sp.	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.15	0.39	0.00	0.39	0.13	0.00
Montipora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.78	0.39	0.00	1.43	0.00
Sponge	3.03	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porites sp.	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	1.05	1.29	0.69	1.04	0.65	2.99	2.47	1.30
Schizotrix sp.	0.00	0.00	0.00	0.00	5.97	1.43	5.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda sp.	0.00	0.00	0.00	0.00	9.35	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda opuntia	2.76	0.00	0.00	0.26	0.00	0.00	3.95	9.34	6.45	4.03	0.47	1.17	1.82	8.31	6.62	0.26
Coralline Algae	0.00	1.77	0.00	11.95	0.00	3.90	0.00	1.18	0.53	0.00	6.78	4.03	4.94	6.36	10.65	5.19
Bare	17.90	0.00	1.82	1.56	1.69	8.18	9.21	76.72	74.34	53.65	84.44	66.75	76.75	70.39	41.30	4.42
Turf Algae	76.32	97.73	96.62	82.21	81.30	79.22	81.05	11.58	16.84	39.60	7.24	22.47	15.45	11.17	18.57	87.53

Table 3. Species list and percent cover along the 20 meter transect at Agana Outfall

SPECIES OR GROUP	PERCENT COVER															
	8/29/89	11/21/89	4/6/90	6/14/90	10/4/90	12/6/90	8/3/91	12/27/91	4/10/92	8/3/92	12/3/92	3/29/93	8/16/93	1/12/94	5/26/94	9/2/94
Acrhelia horrescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Chrysophycea	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fungia sp.	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porites lutea	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asteopora	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jania sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ceramiales	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goniopera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gracilaria sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00
Sponge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00
Leptoseris	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Enteromorpha sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00
Soft coral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00
Pocillopora	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavona sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
Favia	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.37	0.00
Goniastrea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.78	0.00	0.13
Padina	0.00	0.00	0.26	0.26	0.00	0.00	0.00	0.00	0.26	0.78	0.00	0.00	0.00	0.00	0.00	0.00
Leptastrea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.52	0.00	0.26
Culcita sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.08	0.00	0.00
Porites rus	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	2.08	0.00	1.04	0.26	2.34	0.00	0.00
Neomeris	0.00	0.00	0.00	3.51	0.00	0.00	0.00	0.92	0.13	2.05	0.24	0.00	0.00	0.00	0.74	0.00
Liagora sp.	0.00	1.71	0.00	6.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Galaxaura sp.	2.24	0.79	7.15	0.00	2.21	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00
Montipora sp.	0.00	0.00	0.00	0.00	1.00	2.60	0.00	1.32	0.92	0.00	0.00	0.78	2.73	0.65	4.08	0.00
Porites sp.	0.00	0.00	1.69	0.78	6.10	1.04	0.00	0.00	0.00	0.00	1.89	0.00	0.00	0.00	1.48	1.69
Halimeda discoidea	0.92	0.00	1.82	0.00	0.00	0.00	9.60	6.05	8.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Schizothrix	0.00	0.00	1.95	0.00	31.82	2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda sp.	0.00	0.00	0.00	12.60	12.21	14.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.99	0.00	0.00
Coralline Algae	0.00	13.95	1.30	0.00	10.00	0.00	1.20	0.00	0.26	7.02	4.44	4.03	5.71	0.00	1.11	3.90
Halimeda opuntia	0.53	4.61	4.68	0.00	0.00	0.00	0.00	0.00	0.00	19.37	5.93	1.17	12.08	0.00	11.87	10.52
Turf Algae	65.66	73.81	60.88	65.07	13.25	80.00	28.80	8.02	9.47	36.59	49.04	12.99	24.94	12.08	13.73	71.17
Bare	30.53	4.61	19.75	11.56	12.47	0.00	59.40	83.43	79.48	31.47	37.16	78.18	54.29	68.57	66.05	11.43

Table 4. Species list and percent cover along the 50 meter transect at Agana Outfall

SPECIES OR GROUP	PERCENT COVER															
	8/29/89	11/21/89	4/6/90	6/14/90	10/4/90	12/6/90	8/3/91	12/27/91	4/10/92	8/3/92	12/3/92	3/29/93	8/16/93	1/12/94	5/26/94	9/2/94
Chrysophycea	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Faviidae	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stichopus chloronotus.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
Favites	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00
Pocillopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00
Gracilaria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00
Herpolitha sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00
Echinostrephus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00
Leptastrea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00
Porites lutea	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Astreopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.52	0.00	0.00
Desmea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00
Dictyota	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Echinotrixs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21	0.00
Goniastrea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
Favia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.65	0.00	0.00	0.00	0.78	0.13	0.39
Neomeris sp.	0.00	0.00	0.91	0.39	0.00	0.00	0.00	0.79	0.39	0.52	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda disoidae	2.44	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Padina sp.	0.00	0.00	2.73	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montipora sp.	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	2.24	0.26	0.54	0.00	0.00	0.00	0.00	0.26
Porites sp.	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	1.30	1.95	1.56	0.00	1.95
Porites rus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.24	0.00	0.26	0.39	0.00	0.00	1.56	0.00	0.00
Schizotrix sp.	0.00	0.00	0.26	0.00	2.80	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda sp.	0.00	0.00	0.00	0.00	5.00	8.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Liagora	0.19	3.42	14.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coralline Algae	0.00	1.05	1.43	0.00	0.00	0.78	0.66	0.39	1.58	0.39	1.93	1.30	2.21	2.08	1.43	3.64
Galaxaura sp.	8.83	0.92	5.59	5.32	0.00	1.43	0.00	5.66	0.79	0.00	0.15	4.29	1.30	2.60	0.00	0.00
Halimeda opuntia	0.00	3.29	1.30	3.38	0.00	0.00	6.58	6.18	9.21	13.65	5.77	8.57	9.22	10.39	24.16	9.48
Bare	22.19	11.58	22.46	15.46	5.00	9.48	9.34	2.10	30.41	23.78	80.37	60.13	70.65	60.52	56.49	24.42
Turf Algae	66.17	79.07	50.76	74.15	82.21	68.43	83.42	75.01	54.07	58.93	9.39	24.03	13.51	21.30	14.03	59.48

Table 5. Regression analysis results for Agana Biomonitoring. Regression performed on the change in % cover of the six categorie categories over the 61 months that the area was surveyed. (August 1989 to September 1994).

Transect	Bare	Turf Algae	Macro Algae	Coral	Coralline	Other
0 m	+s	-s	+	+s	+s	-
ts	2.708	-3.36	1.132	3.414	3.414	-1.267
20 m	+s	-	+	+s	-	+
ts	2.51	-0.82	-0.76	4.26	-1.4	1.33
50 m	+s	-	-	+s	+	-
ts	3.159	-0.907	-1.332	3.439	0.509	-0.783

s = significant at 95%
+ = positive regression
- = negative regression

Table 6. Agana outfall Fish Species.

shaded boxes represent that species were present.

Fiscal Year	1990				1991				1992				1993				1994				Tot
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	n/1
Acanthuridae Acanthurinae (Surgeonfishes)																					
Acanthurus blochii						ns					ns				ns				ns		10
Acanthurus nigricans						ns					ns				ns				ns		11
Acanthurus nigrofuscus						ns					ns				ns				ns		15
Acanthurus nigroris						ns					ns				ns				ns		1
Acanthurus olivaceus						ns					ns				ns				ns		2
Ctenochaetus binotatus						ns					ns				ns				ns		3
Ctenochaetus striatus						ns					ns				ns				ns		12
Zebrasoma flavescens						ns					ns				ns				ns		1
Acanthuridae subfamily Nasinae (Unicornfishes)																					
Naso annulatus						ns					ns				ns				ns		5
Naso hexacanthus						ns					ns				ns				ns		2
Naso lituratus						ns					ns				ns				ns		16
Apogonidae (Cardinalfishes)																					
Apogon spp.						ns					ns				ns				ns		1
Apogon angustatus						ns					ns				ns				ns		3
Balistidae (Triggerfishes)																					
Balistapus undulatus						ns					ns				ns				ns		7
Melichthys niger						ns					ns				ns				ns		5
Melichthys vidua						ns					ns				ns				ns		16
Odonus niger						ns					ns				ns				ns		16
Sufflamen bursa						ns					ns				ns				ns		15
Blenniidae (Blennies)																					
Meiacantus atrodorsalis						ns					ns				ns				ns		2
Carangidae (Jacks; Trevallys)																					
Elagatis binnulatus						ns					ns				ns				ns		1
Chaetodontidae (butterflyfishes)																					
Chaetodon citrinellus						ns					ns				ns				ns		15
Chaetodon ephippium						ns					ns				ns				ns		1
Chaetodon kleinii						ns					ns				ns				ns		8
Chaetodon lunula						ns					ns				ns				ns		1
Chaetodon mertensii						ns					ns				ns				ns		13
Chaetodon punctatofasciatus						ns					ns				ns				ns		1
Chaetodon reticulatus						ns					ns				ns				ns		1
Chaetodon ulietensis						ns					ns				ns				ns		10
Forcipiger flavissimus						ns					ns				ns				ns		6
Forcipiger longirostris						ns					ns				ns				ns		12
Heniochus monoceros						ns					ns				ns				ns		3
Cirrhitidae (Hawkfish)																					
Cirrhitichthys falco						ns					ns				ns				ns		1
Diodontidae (Porcupinefishes)																					
Diodon hystrix						ns					ns				ns				ns		1
Gobiidae (Gobies)																					
Valenciennea strigatus						ns					ns				ns				ns		13
Haemulidae (Sweetlips and Grunts)																					
Plectorhinchus obscurus						ns					ns				ns				ns		3
Hemigaleidae (Whitetip shark)																					
Triaenodon obesus						ns					ns				ns				ns		6
Holocentridae (squirrelfishes) Holocentrinae (Squirrelfishes)																					
Sargocentron spiniferum						ns					ns				ns				ns		3
Kyphosidae (Rudderfishes; Sea Chubs)																					
Kyphosus sp.						ns					ns				ns				ns		1
Kyphosus cinerascens						ns					ns				ns				ns		4
Labridae (Wrasses)																					
Anampes spp.						ns					ns				ns				ns		2
Bodianus axillaris						ns					ns				ns				ns		1
Cheilinus oxycephalus						ns					ns				ns				ns		10
Cheilinus unifasciatus						ns					ns				ns				ns		15
Cheilio inermis						ns					ns				ns				ns		10
Cirrhilabrus sp.						ns					ns				ns				ns		1
Coris gaimard						ns					ns				ns				ns		6
Epibulus insidiator						ns					ns				ns				ns		2
Halichoeres biocellatus						ns					ns				ns				ns		10
Halichoeres hortulanus						ns					ns				ns				ns		15
Halichoeres margaritaceus						ns					ns				ns				ns		10
Halichoeres marginatus						ns					ns				ns				ns		11

Table 6. Agana outfall Fish Species.

shaded boxes represent that species were present.

Fiscal Year	1990				1991				1992				1993				1994				Tota
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	n/16
Halichoeres melanurus						ns					ns				ns				ns		1
Halichoeres trimaculatus						ns					ns				ns				ns		3
Hemigymnus fasciatus						ns					ns				ns				ns		4
Hemigymnus melapterus						ns					ns				ns				ns		10
Labroides bicolor						ns					ns				ns				ns		14
Labroides dimidiatus						ns					ns				ns				ns		15
Macropharyngogon meleagris						ns					ns				ns				ns		6
Novaculichthys taeniourus						ns					ns				ns				ns		1
Pseudocheilinus octotaenia						ns					ns				ns				ns		3
Pterogogus cryptus						ns					ns				ns				ns		10
Stethojulis bandanensis						ns					ns				ns				ns		4
Stethojulis strigiventor						ns					ns				ns				ns		11
Thalassoma lutescens						ns					ns				ns				ns		15
Lethrinidae (Emperors)																					
Lethrinus harak						ns					ns				ns				ns		1
Lethrinus ramak						ns					ns				ns				ns		1
Monotaxis grandoculus						ns					ns				ns				ns		1
Lutjanidae (Snappers)																					
Aphareus furca						ns					ns				ns				ns		1
Aprion virescens						ns					ns				ns				ns		3
Microdesmidae (Dartfishes)																					
Nemateleotris magnifica						ns					ns				ns				ns		3
Ptereleotris evides						ns					ns				ns				ns		1
Monacanthidae (Filefishes)																					
Pervagor janthinosoma						ns					ns				ns				ns		1
Mugilidae (Mullets)																					
Parupeneus barberinus						ns					ns				ns				ns		10
Parupeneus cyclostomus						ns					ns				ns				ns		1
Parupeneus multifasciatus						ns					ns				ns				ns		10
Pinguipedidae (Sandperches)																					
Parapercis sp.						ns					ns				ns				ns		10
Parapercis clatherata						ns					ns				ns				ns		6
Pomacanthidae (Angelfishes)																					
Centropyge sp.						ns					ns				ns				ns		1
Centropyge flavissimus						ns					ns				ns				ns		14
Centropyge shepardi						ns					ns				ns				ns		10
Pygoplites diacanthus						ns					ns				ns				ns		8
Pomacentridae (Damselfishes)																					
Abudefduf saxatalis						ns					ns				ns				ns		6
Abudefduf sexfasciatus						ns					ns				ns				ns		9
Amphiprion periderion						ns					ns				ns				ns		3
Chryiptera traceyi						ns					ns				ns				ns		5
Chrysiptera glauca						ns					ns				ns				ns		10
Chrysiptera leucopoma						ns					ns				ns				ns		11
Dascyllus trimaculatus						ns					ns				ns				ns		4
Pomacentrus vaiuli						ns					ns				ns				ns		6
Stegastes sp.						ns					ns				ns				ns		1
Scaridae (Parrotfishes)																					
Calototomus carolinus						ns					ns				ns				ns		2
Scarus gibbus						ns					ns				ns				ns		1
Scarus globiceps						ns					ns				ns				ns		11
Scarus schlegeli						ns					ns				ns				ns		11
Scarus sordidus						ns					ns				ns				ns		16
Scatophagidae (Scats)																					
Platax orbicularis						ns					ns				ns				ns		16
Scombridae (Tunas)																					
Gymnosarda unicolor						ns					ns				ns				ns		1
Scorpaenidae (Scorpionfishes)																					
Pterois antennata						ns					ns				ns				ns		3
Serrandiae (Grouper)																					
Cephalopholis miniata						ns					ns				ns				ns		1
Cephalopholis urodeta						ns					ns				ns				ns		5
Epinephelus sp.						ns					ns				ns				ns		1
Epinephelus fasciatus						ns					ns				ns				ns		1
Plectropomus areolatus						ns					ns				ns				ns		1

Table 6. Agana outfall Fish Species.

shaded boxes represent that species were present.

Fiscal Year	1990				1991				1992				1993				1994				Tota
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	n/1
Siganidae (Rabbitfish)																					
Siganus aregenteus						ns					ns				ns				ns		1
Sphyraenidae (Barracudas)																					
Sphyraena forsteri						ns					ns				ns				ns		10
Syngnathidae (pipefishes) subfamily Syngnathinae (Pipefishes)																					
Corythoichthys sp.						ns					ns				ns				ns		3
Synodontidae (Lizardfishes)																					
Saurida gracilis						ns					ns				ns				ns		1
Tetraodontidae (puffers)																					
Canthigaster solandri						ns					ns				ns				ns		4
Cathigaster valentini						ns					ns				ns				ns		2
Zanclidae (Moorish Idol)																					
Zancluls cornutus						ns					ns				ns				ns		7
total number of species	39	27	48	44	42	ns	56	47	51	46	ns	47	43	38	ns	38	38	37	ns	38	

Numberof fish species that fall under each trophic level.

Fiscal Year	1990				1991				1992				1993				1994			
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Herbivore	14	11	8	8	8	ns	15	15	15	16	ns	16	12	11	ns	11	11	11	ns	10
Carnivore	18	10	24	21	21	ns	29	22	25	23	ns	24	23	20	ns	20	20	19	ns	19
Invertivore	16	8	23	20	20	ns	27	22	24	23	ns	23	22	19	ns	19	19	19	ns	18
Planktivore	5	2	8	7	7	ns	4	5	4	3	ns	3	3	3	ns	3	3	3	ns	3
Omnivore	1	1	1	1	1	ns	0	0	0	0	ns	0	0	0	ns	0	0	0	ns	0
Corallivore	1	3	6	7	4	ns	7	5	7	5	ns	5	4	4	ns	4	4	4	ns	4

FACSIMILE TRANSMITTAL SHEET

DATE: 19 February 1998

NUMBER OF PAGES (INCLUDING THIS PAGE): 3

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TO:

NAME: JoAnne Boyd

ROUTING: Guam Waterworks Authority

TELEPHONE: 637-2592 **(FAX)**

(COMMERCIAL)

SUBJECT: Inshore Catch Estimates for Agana Boat Basin and Tanguisson

****

FROM:

NAME: Todd Pitlik

ROUTING: Division of Aquatic & Wildlife Resources (DAWR)

TELEPHONE: (671) 734-6570 **(FAX)**

(671) 735-3986 **(COMMERCIAL)**

****

MESSAGE:

Hi JoAnne,

I came up with an estimated total of fish harvested from locations 8, 9, 10, and 92 (Fig. 1). The total estimated harvest of finfish and invertebrates for FY97 in these areas was 2.9 mt (not including manahak). The total annual harvest was determined from 51 surveyed locations with an average of 735 kg (2% of islandwide harvest) per location were harvested in FY97. I was not able to generate specific expansions due to results with unacceptable confidence intervals from the use of only 4 locations. However, approximately 99% of our annual Atulai (*Selar crumenophthalmus*) harvest comes from the Boat Basin (loc 9) and it was

approximately 995 kg in FY97. Gerry Davis did not think the offshore results would be of any use to your project due to the catch being derived from the outer banks and FADs. Let me know if this info will suffice and if you have any more questions.

Sincerely,

Todd J. Pitlik

Todd J. Pitlik

Fisheries Biologist

Figure 13

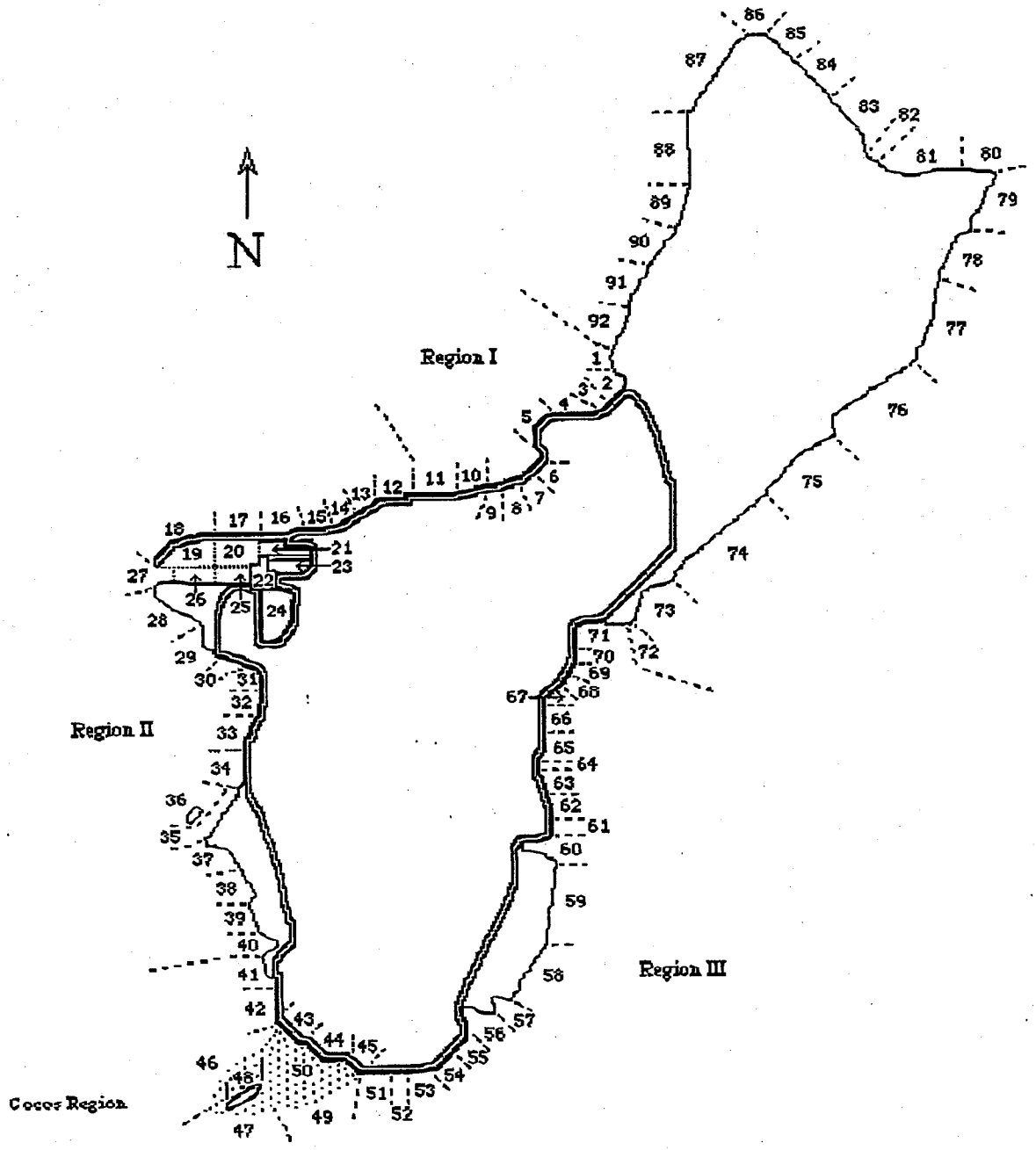

Figure 1. Inshore Fisheries "Participation Survey" Route and Location Codes.

Table 7

Table 1. Combined estimated inshore participation, effort, and total harvest (kg) for all methods during the day and night in FY97.

METHOD	Persons	Gears	Trips	Per-Hrs	Gear-Hrs	Catch	Finfish	Inverts	CPUE**
Hook & Line	44,774	44,158	25,697	155,038	153,318	15,033	14,940	93	0.15 wd
Cast Net	10,055	8,826	7,734	23,063	20,246	7,518	7,500	18	0.78 wen
Gill Net	7,637	3,581	2,410	28,103	13,138	6,111	5,763	347	0.87 wed
Surround Net	0	0	0	0	0	0	0	0	0.0
Spear Snorkel	2,829	2,455	1,370	5,910	5,083	3,410	2,594	815	0.84 wn
Spear Scuba	36	36	32	37	37	39	36	3	1.32 wen
Drag Net	160	29	29	267	49	79	79	0	1.67 wn
Hooks & Gaffs	731	938	469	1,376	1,659	433	0	433	0.28 wd
Other*	2,323	2,323	1,407	3,996	3,996	4,864	647	4,217	2.12 wd
TOTAL	68,545	62,344	39,147	217,789	197,525	37,486	31,560	5,925	0.16

*Other methods typically includes: gleaning, hand nets, traps, and spears.
**CPUE (kg/gh) summary includes either the greatest weekday (wd) or weeknight (wn) or weekend day (wed), weekend night (wen) values listed in Tables 2 and 3. The greatest CPUE value for hook and line was region 3.

Table 2. Estimated inshore participation, effort, and total harvest (kg) for all methods during the day in FY97.

METHOD	Persons	Gears	Trips	Per-Hrs	Gear-Hrs	Catch	Finfish	Inverts	CPUE**
Hook & Line	30,180	30,148	18,361	110,557	110,652	12,098	12,008	90	0.15 wd
Cast Net	9,989	8,759	7,672	22,932	20,115	7,457	7,456	1	0.54 wd
Gill Net	5,628	2,660	1,626	19,567	9,253	4,686	4,447	239	0.87 wed
Surround Net	0	0	0	0	0	0	0	0	0.0
Spear Snorkel	1,348	1,063	785	2,959	2,304	1,473	829	644	0.69 wed
Spear Scuba	0	0	0	0	0	0	0	0	0.0
Drag Net	0	0	0	0	0	0	0	0	0.0
Hooks & Gaffs	731	938	469	1,376	1,659	433	0	433	0.28 wd
Other*	1,668	1,668	928	2,572	2,572	4,664	616	4,048	2.12 wd
TOTAL	49,545	45,235	29,841	159,962	146,555	30,812	25,357	5,454	0.21

*Other methods typically includes: gleaning, hand nets, traps, and spears.
**CPUE (kg/gh) summary includes either the greatest weekday (wd) or weekend day (wed) values. The greatest CPUE value for hook and line was region 3

Table 7

Table 3. Estimated inshore participation, effort, and total harvest (kg) for all methods during the night in FY97.

METHOD	Persons	Gears	Trips	Per-Hrs	Gear-Hrs	Catch	Finfish	Inverts	CPUE**
Hook & Line	14,593	14,010	7,336	44,481	42,666	2,935	2,932	3	0.12 wn
Cast Net	66	66	61	131	131	61	44	17	0.78 wen
Gill Net	2,009	921	784	8,536	3,886	1,424	1,316	108	0.63 wn
Surround Net	0	0	0	0	0	0	0	0	0.0
Spear Snorkel	1,481	1,392	585	2,951	2,778	1,936	1,765	171	0.84 wn
Spear Scuba	36	36	32	37	37	39	36	3	1.32 wen
Drag Net	160	29	29	267	49	79	79	0	1.67 wn
Hooks & Gaffs	0	0	0	0	0	0	0	0	0.0
Other*	655	655	479	1,423	1,423	200	31	169	0.14 wd
TOTAL	19,000	17,109	9,306	57,826	50,970	6,674	6,203	471	0.13

*Other methods typically includes: gleaning, hand nets, traps, and spears.

**CPUE (kg/gh) summary includes either the greatest weeknight (wn) or weekend night (wen) values. The greatest value for hook and line was region 3.

Table 7

Table 4. FY97 combined day and night catch composition for the top ten species and families of finfish harvested. Juvenile *Caranx ignobilis, C. melampygous, C. papuensis,* and *C. sexfasciatus* (i'e' ≤ 200mm), *Mulloides flavolineatus* (ti'ao ≤ 100mm), and *Siganus spinus* (mañåhak), are listed separately from the intermediate to adult size classes. Finfish harvest percentages were derived from the day and night catch (31,560 kg).

SPECIES	Harvest		FAMILY	Harvest	
	kg	%		kg	%
Naso unicornis	3,454.57	10.95	Acanthuridae	6,835.24	21.66
Siganus spinus	3,397.28	10.76	Carangidae	4,662.48	14.77
Acanthurus triostegus	1,973.18	6.25	Siganidae	3,650.93	11.57
Lethrinus harak	1,170.58	3.71	Lethrinidae	2,193.78	6.95
Caranx i'e'	1,047.54	3.32	Mullidae	1,943.47	6.16
Selar crumenophthalmus	994.94	3.15	Mugilidae	1,785.86	5.66
Liza vaigiensis	963.62	3.05	Lutjanidae	1,437.95	4.56
Mulloides ti'ao	798.58	2.53	Gerreidae	1,049.82	3.33
Mulloides flavolineatus	768.74	2.44	Labridae	1,006.37	3.19
Caranx ignobilis	618.85	1.96	Scaridae	854.19	2.71
TOTAL ANNUAL COMBINED CATCH	15,187.88	48.12		25,420.09	80.55

Table 5. FY97 day catch composition for the top ten species and families of finfish harvested. Juvenile *Caranx ignobilis, C. melampygous, C. papuensis,* and *C. sexfasciatus* (i'e' ≤ 200mm), *Mulloides flavolineatus* (ti'ao ≤ 100mm), and *Siganus spinus* (mañåhak), are listed separately from the intermediate to adult size classes. Finfish harvest percentages were derived from the total day catch (25,357 kg).

SPECIES	Harvest		FAMILY	Harvest	
	kg	%		kg	%
Naso unicornis	3,154.85	12.44	Acanthuridae	6,110.36	24.10
Siganus spinus	2,976.54	11.74	Siganidae	3,187.36	12.57
Acanthurus triostegus	1,689.77	6.66	Carangidae	3,005.71	11.85
Lethrinus harak	944.00	3.72	Lethrinidae	1,728.74	6.82
Liza vaigiensis	880.03	3.47	Mullidae	1,726.38	6.81
Mulloides ti'ao	764.30	3.01	Mugilidae	1,615.97	6.37
Caranx i'e'	742.14	2.93	Lutjanidae	963.25	3.80
Mulloides flavolineatus	652.82	2.57	Gerreidae	876.82	3.46
Gerres oblongus	563.68	2.22	Labridae	822.45	3.24
Caranx ignobilis	558.11	2.20	Scaridae	617.89	2.44
TOTAL ANNUAL DAY CATCH	12,926.24	50.98		20,654.93	81.46

Table 7

Table 6. FY97 night catch composition for the top ten species and families of finfish harvested. Juvenile *Caranx ignobilis*, *C. melampygous*, *C. papuensis*, and *C. sexfasciatus* (i'e' ≤ 200mm), *Mulloides flavolineatus* (ti'ao ≤ 100mm), and *Siganus spinus* (mañåhak), are listed separately from the intermediate to adult size classes. Finfish harvest percentages were derived from the total night catch (6,203 kg).

SPECIES	Harvest	
	kg	%
Selar crumenophthalmus	840.55	13.55
Siganus spinus	420.74	6.78
Caranx i'e'	305.40	4.92
Naso unicornis	299.72	4.83
Acanthurus triostegus	283.41	4.57
Lutjanus argentimaculatus	243.27	3.92
Lethrinus harak	226.58	3.65
Caesio caerulaurea	203.32	3.28
Caranx sexfasciatus	200.25	3.23
Lutjanus fulvus	189.89	3.06
TOTAL ANNUAL NIGHT CATCH	3,213.13	51.80

FAMILY	Harvest	
	kg	%
Carangidae	1,656.77	26.71
Acanthuridae	724.88	11.69
Lutjanidae	474.70	7.65
Lethrinidae	465.04	7.50
Siganidae	463.57	7.47
Holocentridae	293.43	4.73
Scaridae	237.19	3.82
Mullidae	217.09	3.50
Caesionidae	207.33	3.34
Labridae	183.92	2.97
	4,923.92	79.38

Table 7

Table 7. Comparison of the combined day and night catch composition for the top species and families of finfish harvested in FY93 and FY97. Juvenile *Caranx ignobilis, C. melampygous, C. papuensis,* and *C. sexfasciatus* (i'e' ≤ 200mm), *Mulloides flavolineatus* (ti'ao ≤ 100mm), and *Siganus spinus* (mañåhak), are listed separately from the intermediate to adult size classes.

SPECIES	Harvest (kg)		% Δ
	FY93	FY97	
Mulloides flavolineatus	4,438.47	768.74	↓83
Acanthurus triostegus	2,305.25	1,973.18	↓14
Lethrinus xanthochilus	2,154.46	436.07	↓80
Siganus spinus	2,143.29	3,397.28	37↑
Myripristis berndti	2,041.87	96.20	↓95
Naso unicornis	1,971.48	3,454.57	43↑
Crenimugil crenilabis	1,675.97	377.73	↓77
Kyphosus cinerascens	1,482.58	226.19	↓85
Lethrinus obsoletus	1,298.21	222.40	↓83
Mulloides ti'ao	1,196.56	798.58	↓14
TOTAL ANNUAL COMBINED CATCH	20,708.14	11,750.94	↓43

FAMILY	Harvest (kg)		% Δ
	FY93	FY97	
Acanthuridae	7,296.15	6,835.24	↓06
Mullidae	6,818.88	1,943.47	↓72
Lethrinidae	4,539.39	2,193.78	↓52
Mugilidae	3,609.74	1,785.86	↓51
Siganidae	3,239.59	3,650.93	37↑
Holocentridae	2,801.69	545.64	↓81
Carangidae	2,189.94	4,662.48	43↑
Scaridae	1,659.54	854.19	↓49
Kyphosidae	1,507.71	472.61	↓69
Lutjanidae	1,480.96	1,437.95	↓03
	35,143.59	24,382.15	↓47

% Δ reduction (↓)or % Δ increase (↑) of species and family totals (kg) from FY93-97.

Table 7

Table 9. FY97 day and night catch composition for the top ten species of finfish harvested by hook and line method. Juvenile *Caranx ignobilis, C. melampygous, C. papuensis,* and *C. sexfasciatus* (i'e' ≤ 200mm), are listed separately from the intermediate to adult size classes. Finfish harvest percentages were derived from the total day (12,008 kg) and night (2,932 kg) hook and line catch.

Day Species	Harvest	
	kg	%
Naso unicornis	2,997.31	24.96
Lethrinus harak	758.63	6.32
Liza vaigiensis	631.76	5.26
Caranx ignobilis	558.11	4.65
Caranx melampygous	530.69	4.42
Caranx i'e'	518.60	4.32
Decapterus macrosoma	430.47	3.58
Abudefduf sexfasciatus	419.54	3.49
Aprion virescens	391.25	3.26
Lethrinus xanthochilus	368.81	3.07
Total Top Ten Hook & Line Catch	7,605.17	63.33
Total Combined Hook & Line Catch	9,719.95	65.06

Night Species	Harvest	
	kg	%
Selar crumenophthalmus	840.55	28.67
Caranx i'e'	277.65	9.47
Lutjanus argentimaculatus	234.05	7.98
Caranx sexfasciatus	189.47	6.46
Lethrinus harak	143.42	4.89
Lutjanus fulvus	142.80	4.87
Decapterus macrosoma	103.68	3.54
Lethrinus obsoletus	62.92	2.15
Caranx ignobilis	60.74	2.07
Sphyraena barracuda	59.50	2.03
	2,114.78	72.13

Table 10. FY97 day and night catch composition for the top ten species of finfish harvested by gill net method. Juvenile *Caranx ignobilis, C. melampygous, C. papuensis,* and *C. sexfasciatus* (i'e' ≤ 200mm), *Mulloides flavolineatus* (ti'ao ≤ 100mm), and *Siganus spinus* (mañåhak), are listed separately from the intermediate to adult size classes. Percentages were derived from the total day (4,447 kg) and night (1,316 kg) gillnet catch.

Day Species	Harvest	
	kg	%
Siganus spinus	597.84	13.44
Gerres oblongus	561.85	12.63
Valamugil seheli	328.24	7.38
Mulloides flavolineatus	323.19	7.27
Liza vaigiensis	242.71	5.46
Leiognathus equulus	219.24	4.93
Crenimugil crenilabis	214.31	4.82
Gerres acinaces	190.18	4.28
Myripristis murdjan	189.20	4.25
Caranx papuensis	178.94	4.02
Total Top Ten Gill Net Catch	3,045.70	68.49
Total Combined Gill Net Catch	4,008.35	61.41

Night Species	Harvest	
	kg	%
Acanthurus triostegus	187.66	14.26
Caesio caerulaurea	167.79	12.75
Gerres acinaces	147.82	11.23
Siganus spinus	100.06	7.60
Mulloides flavolineatus	84.18	6.40
Crenimugil crenilabis	71.86	5.46
Liza vaigiensis	56.55	4.30
Hyporhamphus acutus	56.55	4.30
Lethrinus harak	54.25	4.12
Diodon hystrix	35.93	2.73
	962.65	73.15

Table 7

Table 11. FY97 day and night catch composition for the top ten species of finfish harvested by snorkel spear method. Finfish harvest percentages were derived from the total day (829 kg) and night (1,765 kg) snorkel spear catch.

Day Species	Harvest	
	kg	%
Naso tuberosus	108.10	13.04
Scarus sordidus	92.48	11.16
Scarus microrhinos	83.69	10.10
Kyphosus cinerascens	74.62	9.00
Diodon hystrix	62.77	7.57
Synanceia verrucosa	62.77	7.57
Naso lituratus	57.12	6.89
Acanthurus triostegus	47.42	5.72
Lutjanus fulvus	41.29	4.98
Naso unicornis	35.50	4.28
Total Top Ten Spear Snorkel Catch	665.76	100.00
Total Combined Spear Snorkel Catch	1,843.68	71.07

Night Species	Harvest	
	kg	%
Siganus spinus	312.53	17.71
Naso unicornis	299.56	16.97
Cheilinus trilobatus	127.38	7.22
Acanthurus triostegus	95.75	5.42
Epinelphelus merra	89.56	5.07
Scarus psitticus	73.41	4.16
Naso lituratus	54.57	3.09
Scarus ghobban	49.44	2.80
Parupeneus barberinus	39.53	2.24
Acanthurus lineatus	36.19	2.05
	1,177.92	66.74

State and Federal Laws

II. D. <u>State and Federal Laws [40 CFR 125.61 and 125.62(a)(1)]</u>

II.D.1. Are there water quality standards applicable to the following pollutants for which a modification is requested:

- Biochemical oxygen demand or dissolved oxygen?
- Suspended solids, turbidity, light transmission, light scattering' or maintenance of the euphotic zone?
- pH of the receiving water?

Yes, for all listed.

II.D.2. If yes, what is the water use classification for your discharge area?

Good marine water (M-2)

What are the applicable standards for your discharge area for each of the parameters for which a modification is requested?

See II.B.2.

Provide a copy of all applicable water quality standards or a citation to where they can be found.

Revised Guam Water Quality Standards, 1992 (Appendix E)

II.D.3. Will the modified discharge: [40 CFR 125.59(b)(3)]

- Be consistent with applicable State coastal zone management program(s) approved under the Coastal Zone Management Act as amended, 16 U.S.C. 1451 et seq? [See 16 U.S.C. 1456(c)(3)(A)]

Yes.

- Be located in a marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act (MPRSA) as amended, 16 U.S.C. 1431 et seq., or in an estuarine sanctuary designated under the Coastal Zone Management Act as amended, 16 U.S.C. 1461?

No.

- Be consistent with the Endangered Species Act as amended, 16 U.S.C. 1531 et seq.? Provide the names of any threatened or endangered species that inhabit or obtain nutrients from waters that may be affected by the modified discharge. Identify any critical habitat that may be affected by the modified discharge and evalute whether the modified discharge will affect threatened or endangered species or modify a critical habitat. [See 16 U.S.C. 1536(a)(2)]

None.

II.D.4. Are you aware of any State or Federal laws or regulations (other than the Clean Water Act or the three statutes identified in item 3 above) or an executive order which is applicable to your discharge? If yes, provide sufficient information to demonstrate that your modified discharge will comply with such law(s), regulation(s), or order(s). [40 CFR 125.59 (b)(3)]

No.

GWA has forwarded a copy of its permit application package (relevant sections) to the Bureau of Planning for review. The Bureau is the clearinghouse for all federally funded programs and as such, obtains comments from agencies who's programs may be impacted by planned activities such as wastewater discharges into ocean waters. Letters were delivered to Guam's Bureau of Planning, Department of Agriculture, and the Environmental Protection Agency requesting for consistency determinations with their respective programs. Responses to these letters will be forwarded to U.S.E.P.A. upon receipt. These comments will address consistency with applicable State Coastal Zone Management Program(s) approved under the Coastal Zone Management Act as amended, the modified discharge's consistency with marine sanctuary regulations and with the Endangered Species Act, and consistency with water quality standards. Copies of these letters are attached as Appendix J.

Regulations under Guam's Water Pollution Control Act are applicable. A copy of this Act is attached as Appendix F.

Physical Characteristics of Discharge

III.A. ***Physical Characteristics of the Discharge***

III.A.1. What is the critical initial dilution for your current and modified discharge(s) during 1) the period(s) of maximum stratification? and 2) any other critical periods(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?

There is no significant periods of stratification or any other critical period. There is no stratification of the waters above the diffusers except that caused by the discharge itself. The effluent is low density (non saline) and because of this the effluent rises rapidly to the surface where it flows horizontally in the top 1 m of surface water. The depth of water above the diffusers is 26 m to 29 m (85 ft to 95 ft).

In November 21, 1990 transmittal from Susan Cox regarding Priority Pollutant Scan Results, the initial dilution values for the Agana District Plant was given as 47:1

III.A.2. What are the dimensions of the zone of initial dilution for your modified discharge(s)

According to the Amended Section 301(h) Technical Support Document the dimensions for the zone of initial dilution (ZID) can be considered to include the bottom areas and water column above the area that circumscribed by the distance d from any point of the diffuser.

d = depth of water above deepest point of discharge = 29 m
L = length of diffuser section = 12 m (40 ft)

ZID width = 2d	ZID length = L	ZID area = 2d x L
= 58 m	= 12 m	= 2320 m^2

III.A.3. What are the effects of ambient currents and stratification on dispersion and transport of the discharge plume/wastefield ?

The effluent plume rises rapidly to the surface and dissipates over 1 m depth. Matson (1990) concluded that complete dilution occurs in the top 1 meter of water, and that the effluent dissipates with the surface currents. Currents run predominantly to the west and are generally in an obliquely offshore direction.

NE tradewinds are dominant in all seasons, but are especially pronounced in the winter (Jan.- May). During the summer (July - Oct.) the effect of the trade winds are diminished and winds from every direction are not uncommon. Transportation of the discharge across the reef by wind driven surface currents are in frequent. The near shore current generally runs to the west, currents to the east are weaker and are short in duration. The currents are generally in an obliquely offshore direction. High fecal coliform numbers do occur at the shoreline stations especially during the rainy season, but the source is likely to be from the stormwater culverts situated along the shoreline in Agana Bay. On rare occasions currents may move onshore when there is heavy wave assault from the North.

Matson E.A., 1990. Effects of the Agat, Agana, and Northern District Wastewater Effluents on Receiving Water Quality. Marine Laboratory Technical Report No. 93.

III.A.4. **only small discharges must respond**

III.A.5. Sedimentation of Suspended Solids

a. What fraction of the modified discharge's suspended solids will accumulate within the vicinity of the modified discharge?

b. What are the calculated area(s) and rate(s) of sediment accumulation within the vicinity of the modified discharge(s) ($g/m^2/yr$)?

c. What is the fate of settleable solids transported beyond the calculated sediment accumulation area?

The tabulations for sediment deposition are based on the method for large discharges outlined in Appendix B-I of the Amended Section 301(h) Technical Support Document, EPA 842-b-94-007, Sept 1994. The quantitative prediction of seabed accumulation is based only on the processes of deposition and decay.

Prediction of Deposition

A portion of the settled solids is inert, the organic fraction of the settled solids is a primary concern. For primary or advanced primary discharge 80 percent of the suspended solids are organic and 20 percent are inorganic.

Settling velocities for the effluent were not available, therefor suggested values from appendix B-I were used.

primary or advance primary effluent

5 percent have $V_s \geq 0.1$
20 percent have $V_s \geq 0.01$
30 percent have $V_s \geq 0.006$
50 percent have $V_s \geq 0.001$

remainder of solids settle so slowly that they are assumed to remain suspended in the water column indefinitely.

Current speeds used were:

Upcoast	5 cm/sec
Downcoast	5 cm/sec
Onshore	3 cm/sec
Offshore	3 cm/sec

Bottom Slope:

Onshore	0.09 m/m
Offshore	0.34 m/m

Height of rise of plume is 24.9 m

Mass emission Rate = 2178 kg/day

The settleable organic components by group and maximum settling distances for each group are given in Table 8. The deposition rates and accumulation rates for each contour are given in table 9. The highest steady state accumulation was 27 g/m^2 in a 0.27 km^2 area surrounding the outfall. A detailed bathymeteric map was not available to plot the predicted steady state sediment accumulation around the outfall. Figure 7 is plotted on the Guam , Ritidian Point Quadrangle Map.

Table 8. Tabulations of Settleable Organic Components by Group and Maximum Settling Distance by Group.

Mass emmission Rate = M_T = 2173 kg/day
Organic Component = M_o = 0.8 M_T for primary effluent

Percent by Settling Velocity Group	Organic Component by group	Maximum Settling Distance from Outfall[a] (meters) Upcoast	Downcoast	Onshore	Offshore
Primary Effluent					
5 (V_s = 0.1 cm/sec)	0.04 M_T = 87 kg/day	1245	1245	202	67
20 (V_s = 0.01 cm/sec)	0.16 M_T = 347 kg/day	12450	12450	267	73
30 (V_s = 0.006 cm/sec)	0.24 M_T = 522 kg/day	20750	20750	271	73
50 (V_s = 0.001 cm/sec)	0.40 M_T = 869 kg/day	124500	124500	276	73
	sum = 0.84 M_T or 1825 kg/day				

[a] The distance D is calculated as: D =
where:

V_a = Ambient velocity = 5 cm/sec upcoast and downcoast (default), and 3 cm/sec onshore and offshore (default)
H_T = Average trapping level of plume, measured above the bottom = 17.29 m
V_s = Appropriate settling velocity by group for primary discharges.

If the bottom slope is 5 percent or greater, D should be calculated as follows:

$$D = \frac{H_T}{S + \frac{V_s}{V_a}}$$

where:

S = slope, m/m

Table 9. Tabulations of Deposition Rates and Accummulation Rates by Contour.

Organic Mass Component by Group	Bottom Area	Mass Deposition Rate, by group	Total Organic Deposition Rate Within Area ($g/m^2/day$)	Accumulation (g/m^2) Steady-State	90-day
Primary Effluent					
0.04 M_T = 87 kg/day	87000 m^2	0.16 $g/m^2/day$	0.27 $g/m^2/day$	27	16
0.16 M_T = 347 kg/day	347000 m^2	0.05 $g/m^2/day$	0.11 $g/m^2/day$	11	7
0.24 M_T = 522 kg/day	522000 m^2	0.04 $g/m^2/day$	0.06 $g/m^2/day$	6	3
0.40 M_T = 869 kg/day	869000 m^2	0.01 $g/m^2/day$	0.01 $g/m^2/day$	1	1

Compliance with Water Quality Standards

III.B. Compliance with Applicable Water Quality Standards and CWA 304(a)(1) water quality criteria [40 CFR 125.61(b) and 125.62(a)].

III.B.1. What is the concentration of dissolved oxygen immediately following initial dilution for the period(s) of maximum stratification and any other critical periods(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?

Dissolved oxygen has been measured directly in the effluent boil, at bottom, mid and surface depths, starting in 1989. The results of these measurements are given in Table 1, section II.B. The D.O. readings have varied during this time . From June 1989 until April 1991 readings were above 75% saturation after initial dilution (75% saturation ranges from 5.2 to 7.4 mg/L). However, from May 1991 until October 1993 D.O. readings ranged from 2.5 to 5.6 mg/L, averaging 4.4 mg/L in the surface water and 4.3 mg/L in the mid and bottom waters. The control site also had low D.O. readings, ranging from 2.7 to 5.4 mg/L, averaging 4.1 mg/L in the surface waters and 4.4 mg/L in the mid and 4.5 mg/L in the bottom waters. All 3 stations, including the control station had low D.O. readings, and low D.O. readings were also recorded during this period at both Tanguisson and Agat. It is likely that these readings are due to meter failure, poor calibration or sampling techniques. From June 1994 until present the readings have been well above 75% D.O. saturation. There is no indication that the D.O. in the waters in the zone of initial dilution (station D), or in the near fields (station E) have been adversely impacted by the discharge, when compared to the readings obtained from the control station (E).

III.B.2. What is the farfield dissolved oxygen depression and resulting concentration due to BOD exertion of the wastefield during period(s) of maximum stratification any other critical periods(s) ?

There are no periods of maximum stratification or any other critical periods. The farfields have not been monitored in the past. However, the D.O. readings taken at station E, which is located approximately 100 m West of the boil, do not indicate that there has been any adverse dissolved oxygen depression due to the discharge (Table 1, section II.B.). Readings were similar to those found at the control station.

III.B.3. What are the dissolved oxygen depressions and resulting concentration near the bottom due to steady sediment demand and resuspension of sediments?

The water readings taken at the boil (station D) and in the nearfields (station E) do not indicate that there are adverse depressions in the D.O. of the waters near the bottom, when compared to the D.O. readings of bottom waters at the control site (Table 1, section II.B.). However, a study on D.O. depression due to steady sediment demand has not been conducted.

III.B.4. What is the increase in receiving water suspended solids concentration immediately following initial dilution of the modified discharge(s)?

Suspended solids have not been monitored in the receiving waters. However, turbidity has been measured at three depths, bottom, mid and surface, at the three monitoring stations since 1989. There has been no incidences of adverse increases in turbidity (above 1 NTU of ambient), as outlined in the Guam Water Quality Standards.

III.B.5. What is the change in receiving water pH immediately following initial dilution of the modified discharge(s) ?

Again there has been little or no change in receiving water pH from that of the ambient waters. The receiving waters after initial dilution and the ambient waters average at around pH. 8.3.

III.B.6. Does (will) the modified discharge comply with applicable water quality standards for:

- *Dissolved Oxygen?*
- *Suspended Solids or surrogate standards?*
- *pH?*

Past monitoring of the receiving waters for these parameters has not indicated that the discharge has caused any adverse conditions when compared to the readings obtained from the ambient waters at the control station. There was a period when low D.O. readings that did not comply with the water quality standards (<75% D.O. saturation) recorded from May 1991 until October 1993. However, the ambient waters were also recorded as having similar low D.O. levels. This leads me to believe that these readings were due to incorrect meter operation, calibration or sampling. No D.O. readings below 75 % have been recorded in the last year, and except for fecal colifom, all water quality standards have been meet. Suspended solids have not been part of the parameters measure in the past. However, turbidity readings at all locations and depths have been within the Guam Water Quality Standards as are pH.

III.B.7. Provide data to demonstrate that all applicable State water quality standards, and all applicable water quality criteria established under Section 304(a)(1) of the Clean Water Act for which there are no directly corresponding numerical applicable water quality standards approved by EPA, are met at and beyond the boundary of the ZID under critical environmental and treatment plant conditions in the waters surrounding or adjacent to the point at which your effluent is discharged.

The results of the water quality monitoring conducted since 1989 are given in Table 1. Section II.B. There are occasions when readings indicate that water quality standards are not meet, such as the period of D.O. readings below 75% saturation (May 1991 until October 1993), and pH above pH 9.0 (1991). The same high pH and low D.O readings were recorded at the Northern District receiving water stations on these dates, and are likely to be due to meter failure or incorrect calibration. When receiving water results are compared to the results of ambient waters at the control station, they are very similar.

In the offshore receiving waters fecal coliform densities at the effluent boil (station D) were generally >400 FC/ 100 ml. The numbers of fecal coliform at station E (100 m west of station D and predominantly down current) were also often recorded as being >400 FC/100 ml. On several occasions high numbers of fecal coliform were also recorded at the shoreline stations A, B and C. In June, 1997 extended sampling at the shore line and reef line was started in order to assess if the fecal pollution at the shoreline stations was due to effluent flowing over the reef, or whether its was from non point sources such as stormwater. Stormwater is discharged onto the reef flat at several culverts along the Agana Bay shoreline. The location of these stations are shown in Figure 9. The results of the shoreline samples are given in Table 9. Station A

especially often had elevated levels of fecal coliform. Although the extended surveys have only been conducted for a short period, it is obvious that the shoreline stations have higher levels of fecal coliform. The three stations located near the reef crest (stations: G, H and I) generally had less than 2 FC/ 100 mL. The occurrence of elevated levels of fecal coliform at the shoreline stations also coincided with periods of increased rainfall. It therefore seems that non point source pollution is the cause of fecal contamination along the Agana Bay shoreline.

II.B.8. Provide the determination required by 40 CFR 125.61(b)(2) for compliance with all applicable provisions of State law, including water quality standards or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.

GWA has forwarded a copy of its permit application package (relevant sections) to the Bureau of Planning for review. The Bureau is the clearinghouse for all federally funded programs and as such, obtains comments from agencies who's programs may be impacted by planned activities such as wastewater discharges into ocean waters. Letters were delivered to Guam's Bureau of Planning, Department of Agriculture, and the Environmental Protection Agency requesting for consistency determinations with their respective programs. Responses to these letters will be forwarded to U.S.E.P.A. upon receipt. These comments will address consistency with applicable State Coastal Zone Management Program(s) approved under the Coastal Zone Management Act as amended, the modified discharge's consistency with marine sanctuary regulations and with the Endangered Species Act, and consistency with water quality standards. Copies of these letters are attached as Appendix J.

Regulations under Guam's Water Pollution Control Act are applicable. A copy of this Act is attached as Appendix F.

Figure 14

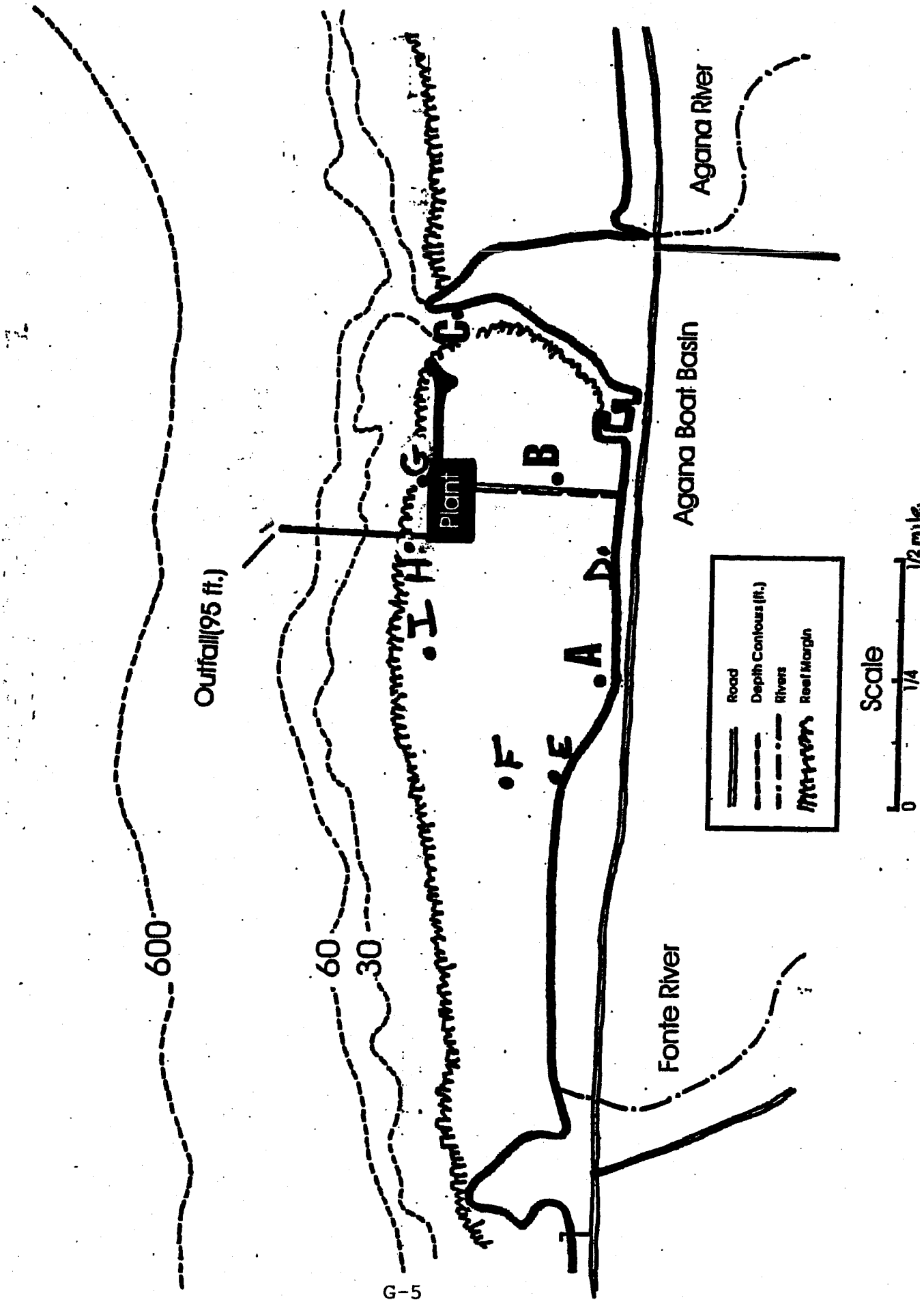
Agana River
Agana Boat Basin
Fonte River
Plant
Outfall(95 ft.)
600
60
30
A
B
C
D
E
F
G
H
I
Road
Depth Contours (ft.)
Rivers
Reef Margin
Scale
0
1/4
1/2 mile

Table 10

Number of Fecal Coliform per 100 mL at Agana Bay Shoreline and Reef Flat sample Stations

SAMPLE	STATION								
DATE	A	B	C	D	E	F	G	H	I
2/26/90	23	60	93						
3/13/90	4	25	5						
8/2/90	0	0	3						
9/3/90	0	0	0						
11/6/90	13	12	8						
12/19/90	0	5	23						
1/16/91	250	0	2						
2/27/91	0	0	0						
3/13/91	3	0	4						
4/30/91	>400	50	10						
5/15/91	>400	60	5						
6/19/91	0	0	1						
7/30/91	0	0	6						
8/14/91	>400	>400	22						
9/5/91	>400	>400	45						
10/14/91	>400	28	>400						
11/11/91	2	26	>400						
12/26/91	97	68	66						
7/6/94	63	15	0						
8/2/94	20	1	1						
10/4/94	81	10	5						
11/1/94	22	10	6						
12/8/94	62	35	10						
1/5/95	12	6	3						
2/15/95	0	0	0						
3/30/95	0	0	0						
4/27/95	>400	>400	>400						
5/18/95	>400	40	6						
6/15/95	0	0	0						
7/10/95	0	0	0						
8/1/95	16	10	13						
9/7/95	6	3	1						
10/5/95	0	0	0						
11/27/95	0	0	0						
12/95	0	0	0						
1/11/96	0	0	0						
2/5/96	3	1	1						
3/21/96	3	7	1						
5/17/96	0	2	8						
6/24/96	9	7	6						
8/22/96	24	18	19						
9/29/96	0	3	3						
10/18/96	5	0	3						
11/28/97	5	1	4						
12/19/96	6	20	59						
1/21/97	113	1	>400						
2/27/97	51	0	10						
3/13/97	15	0	3						
4/10/97	0	0	1						
5/8/97	20	9	39						
6/24/97	111	4	1	36	3	1	0	2	1
7/29/97	6	0	4	1	0	0	0	0	0
8/26/97	>400	10	27	69	>400	45	2	1	0
9/25/97	1	2	0	0	1	0	1	0	0
10/27/97	>400	3	3	2	>400	0	1	0	0
11/20/97	2	5	19		12	0	1	0	1

Station locations
A West Agana Bay Shoreline
B Central Causeway Channel
C Boat Basin channel
D Shoreline between A and causeway
E 200m west of A
F 100 m from shoreline at E
G Reef line 100m east of outfall
H Reef line adjacent to outfall
I Reef line 100m west of outfall

Impact in Public Water Supplies

III. C. ***Impact on Public Water Supplies.***

III.C.1. Is there a planned or existing public water supply (desalinization facility) intake in the vicinity of the current or modified discharge?

No.

Biological Impact of Discharge

III.D. ***Biological Impact of Discharge***

III.D.1. Does (will) a balanced indigenous population of shellfish, fish, and existing wildlife exist:

- ***Immediately beyond the ZID of the current and modified discharge(s)?***

- ***In all other areas beyond the ZID where marine life is actually or potentially affected by the current and modified permit.***

Previous Biological Monitoring Surveys were conducted by UOG Marine Laboratory did not include sites beyond the ZID.

III.D.2. Have distinctive habitats of limited distribution been impacted adversely by the current discharge and will such habitats be impacted adversely by the modified discharge?

Coral reef communities are considered distinctive habitats of limited distribution. Guam'is nearly completely surounded by coastal coral reefs. A report on the Review and Analysis of Past Biological Monitoring Data for the Agana WWTP Outfall, Guam is found in ITEM N.

III.D.3. Have commercial or recreational fisheries been impacted adversely by the current discharge (e.g. warnings, restrictions, closures, or mass mortalities) or will they be impacted adversely by the modified discharge?

Commercial or recreational fisheries have not been adversely impacted by the current discharge.

III.D.4. Does the current or modified discharge cause the following within or beyond the ZID

- ***Mass mortality of fishes or invertebrates due to oxygen depletion, high concentrations of toxics, or other conditions?***
- ***An increase incidence of disease in marine organisms?***
- ***An abnormal body burden of any toxic material in marine organisms?***
- ***Any other extreme, adverse biological impacts?***

There are no reported incidences of fish or invertebrate mortality due to oxygen depletion, high concentration of toxics or other conditions. Monitoring results of dissolved oxygen in the receiving waters indicate >75% oxygen saturation. There is no reported incidences of an increase incidence of disease in marine organisms or any other extreme adverse biological impacts.

As previously stated, GWA has requested Letters of Determination from the Bureau of Planning, Department of Agriculture and Guam Environmental Protection Agency (See *State and Federal Laws*, Section II.D.4 of application questionnaire). Upon receipt of their letters, GWA will immediately forward their responses to your office.

Samples for the required Toxicity and Priority Pollutant Scans were collected on the 8th and 9th of March for the Northern District and Agana WWTPs. The samples were then immediately sent off to the Montgomery & Watson Labs in Pasadena California. GWA has received E-Mail confirmation that the analysis of the samples are presently in progress.

Needs to be done once priority pollutant scan completed
Evaluate potential for bioaccumulation is to compare the concentrations of toxic pollutants after initial dilution with EPA Aquatic life water quality criteria. Two types of information required:
(1) Concentration of the pollutant in the discharge effluent (scans need to be done)
(2) Critical initial dilution (= 100)
the value of (1) divided by (2) should then be compared with available criterion. Also important to study sediment accumulation patterns. Demonstrate adequate initial dilution and sufficient circulation to prevent localized accumulation of solids.
Only necessary to conduct tissue and sediment analysis if effluent and dilution analysis indicate potential for bioaccumulation.

III.D.5.
NA

III.D.6.
NA

III.D.7.
NA

III.D.8.
NA

Impacts of Discharge on Recreational Activites

III.E. ***Impacts of Discharge on Recreational Activities***

III.E.1. Describe the existing or potential recreational activities likely to be affected by the modified discharge(s) beyond the zone of initial dilution.

Fishing (shoreline: scuba, spear, net, rod and reel. Offshore: Boat; trolling and bottom fishing, scuba), swimming, snorkeling and diving.

III. E.2 What are the existing and potential impacts of the modified discharge(s) on recreational activities? Your answer should include, but not be limited to, a discussion of fecal coliform bacteria.

The results obtained from the biological and water quality monitoring the receiving waters indicate that the only potential impact on recreational activities would be from potential pathogens associated with the occurrence of high numbers of the indicator bacterial, fecal coliform. There have been no reports of illness resulting from recreational use of waters in the vicinity of the outfall

As previously stated, GWA has requested Letters of Determinations from the Bureau of Planning, Department of Agriculture and the Guam Environmental Protection Agency (See *State and Federal Laws*, Section II.D.4 of application questionnaire). Upon receipt of their letters, GWA will immediately forward their responses to your office. GWA is confident that the Letters of Determination from these agencies will show that no impact, i.e. no reported incidences of illness attributed to swimming in or consuming fish from the discharge area exist.

III.E.3. Are there any Federal, State, or local restrictions on recreational activities in the vicinity of the modified discharge(s). If yes, describe the restrictions and provide citations to available references.

Not at present.

III.E.4. If such restrictions exist, would such restrictions be lifted or modified if you were discharging a secondary treatment effluent

NA

Establishment of a Monitoring Program

III.F *Establishment of a Monitoring Program*

III.F.1. Describe the biological, water quality and effluent monitoring programs which you propose to meet the criteria of 40 CFR 125.63. Only those scientific investigations that are necessary to study the effects of the proposed discharge should be included in the scope of the 301(h) monitoring program.

This section is divided into several parts. The first addresses the monitoring program of the existing outfall, both biological and water quality monitoring. The second addresses the monitoring of plant effluent. The third part addresses the baseline monitoring for the proposed outfall extensions. Once the location of the proposed extended outfalls is finalized new locations for the water quality and biological monitoring will be established. Water quality monitoring will include stations upcurrent and down current of the outfall, either side of the ZID (zone of initial dilution) and control stations at least 1000m upcurrent of the new outfall. Water quality stations will also include shoreline stations. The biological monitoring will be similar to what is outlined below, but will depend on final placement of the outfall. GWA will then work with EPA to design an appropriate biological monitoring plan. A proposed Quarterly Monitoring Program for the existing outfalls, and the proposed scope of work to obtain information needed to support the extension of the Agana WWTP and Northern District WWTP ocean outfalls, was faxed to USEPA September 9, 1997. They are described below. Also attached is the response letter from USEPA (dated: September 23, 1997).

1) QUARTERLY BIOLOGICAL MONITORING OF THE EXISTING GWA OCEAN OUTFALLS.

BIOLOGICAL MONITORING

Based on Design of 301(h) Monitoring Program for Municipal Wastewater Discharges to Marine Waters, EPA 430/9-82-010, November 1982 and Framework for 301(h) Monitoring Programs, EPA430/09-88-002, September 1987.

General Requirements

1) Conduct periodic surveys of biological communities most likely to be affected by the discharge and communities at reference sites.
2) Provide data to evaluate the impact of the discharge on marine biota.
3) Describe sampling and analytical techniques, sampling locations and schedules.
4) Surveys are to be conducted within the zone of initial dilution (ZID), and at a reference area unaffected by the discharge.

The monitoring objectives are translated into a series of testable hypotheses. These hypotheses focus the monitoring activities so that the studies are conducted efficiently and results are useful for evaluating statistically significant differences between areas. In most cases, multiple testable hypotheses will be required. One example of such a null hypothesis is that the abundance of corals does not differ between a sampling station within the ZID and a reference station.

Biomonitoring Techniques.

There are several technique use to obtain representative data on surface cover and species composition. I recommend using one of the below, or ideally a combination of both. A total of 20 replicates should be sampled at each station

1) Photograph permanently marked quadrats along 50 m transect, that runs parallel to shore, at each station. Photographs of at least $0.5m^2$ of the bottom should be taken at intervals along the transect. An underwater camera mounted on a rigid frame should be used. Each photograph should contain a small slate indicating the station, date, and position of the photograph along the line. To ensure that the same quadrat is photographed each quarter drive or cement stakes to the reef indicating at least two corners of each frame. Photographs should be developed as slides. These slides should be projected onto a grid having the same dimensions of the original quadrate, and the percent cover of living coral species, coralline algae, macro algae, turf algae, bare substrata and other organisms should be estimated.
2) Point quadrat sampling at each station, using a $0.5m^2$ quadrat that is subdivided by 4 evenly spaced lines in both directions, giving 16 intersecting points. Record what lies below each intersecting point for each replicate sample. Replicates should be randomly sampled.

Station Locations.

There should be at least two survey stations, one with in the ZID, and one at a reference site that is located in the opposite direction to the current. The selection of control or reference stations is important as all assessments of impacts will rely on comparisons made with the data from these locations. The stations should be located out side the traceable wastefield and not be affected by the wastewater discharge or other discharges. The monitoring stations for each discharge need to be at the same depth and approximately the same distance from shore.

Describe Community Structure.

Conduct at least quarterly surveys of the benthic flora and fauna each station.

- Percent coverage of the area should be quantified by breaking the cover down into six groups:
  - coral
  - macro algae
  - turf algae
  - coralline algae
  - bare substrate (dead coral, rubble, sand)
  - other (macro invertebrates, any foreign objects or material)

Note predominant species. Photographs of permanently marked quadrates are useful.

- Fish surveys should be conducted using timed visual counts at least by family categories. Several timed counts should be conducted at each site location. Reference depth, location and time period of each survey. From these counts provide a fish list.

Reports.

Compile quarterly reports the that discuss such aspects as station locations, sampling procedures, processing and analytical methods. Each report should include copies of field collection logs and laboratory sample counting forms. Data provided should include the actual numbers of each species or groups counted in each sample, and the calculated areal or volumetric abundance of each taxon. Sufficient detail should be provided to allow for verification of analyses conducted as part of the monitoring program, or for further analysis of the submitted data. Include data from each survey and analysis comparing the potentially impacted site(s) with the reference site(s). Provide an annual report that reviews all previous data, describe any naturally occurring phenomenon and conclusions as to the impact of the discharges on the surrounding community. Presentation of study results should include general characterization of the biological

communities sampled. Emphasis should be placed upon descriptions of spatial and temporal trends in community structure and function. Specific comparisons should be conducted for all biological criteria contained in the 301(h) regulations, (eg. ZID boundary vs reference communities).

WATER QUALITY MONITORING

GWA staff has been conducting water quality monitoring for the Agana WWTP receiving water in accordance with the NPDES permit No. GU0020087. See Table11. indicating parameters to be measured and frequency of monitoring. A map of the site locations can be found in section II.B, figure 11. This monitoring program will continue as is until advised otherwise by EPA.

2) INFLUENT AND EFFLUENT MONITORING

Monitoring is conducted by GWA staff in accordance with NPDES permit requirements (Permit No. GU0020087). Monitoring parameters, limits and frequencies are outlined in Table 12. Monitoring results are submitted to USEPA a via routine quarterly compliance report known as the Discharge Monitoring Report (DMR). The DMR summarizes the quality and/or quantity of the discharge, and compares sampling results to the discharge limitations authorized by the NPDES permit.

Toxic pollutant scans are included in this application and will be conducted annually or as otherwise stipulated in the permit.

3) PROPOSED SCOPE OF WORK FOR SUPPORT FOR OCEAN OUTFALL EXTENSIONS

The following is the *proposed scope of work* to obtain information needed to support extending the sewage outfalls for the Agana and Northern District WWTPs and their corresponding 301(h) applications due April 4, 1998.

1. Bathymetery of seafloor, from the reef crest out to the area surrounding the proposed outfall diffusers.

2. Hydrodynamic studies at the proposed outfall sites, in the nearfields and farfields to determine current and wind regimes, as well as stratification depths at each location.
These studies should include:
- current meter mooring
- dye and drogue releases
- continuous temperature-salinity-dissolved oxygen profiles

3. Baseline monitoring. This should include water quality data, community structure: quantitative information on the benthic flora and fauna, and sediment quality in the area of the proposed discharges.

a. *Water quality*. Collect quarterly data for at least four locations equally spaced around each of the proposed diffuser sites. (surface, mid and bottom depths).

these surveys must include:

- site location, and sample depth
- microbiology (fecal coliform / 100 ml)
- pH
- orthophosphate
- nitrate-nitrogen
- dissolved oxygen
- salinity
- total filterable suspended solids
- turbidity
- temperature
- oil & petroleum products

b. *Community structure.* Conduct quarterly survey of the benthic flora and fauna of the area of the proposed discharges that *quantify* coral, algae, macroinvertebrate and fish communities as follows:

- Provide a species list of flora and fauna, indicating abundance, (*i.e. rare, common, abundant etc.)* identifying predominant species.
- Percent coverage of the area should be quantified by breaking the type of cover down into six groups:
  - coral
  - macro algae
  - turf algae
  - coralline algae
  - bare substrate (dead coral, rubble, sand)
  - other (macro invertebrates, any foreign objects or material)
- Fish surveys done using timed visual counts at least by family categories, for at least four locations equally spaced around each of the proposed diffuser sites. Reference: depth, location and time period of each survey. Compile a report that includes the data from each survey, and a fish species list.

c. *Sediment samples.* Uniform, replicate grabs at four sites equally spaced surrounding each of the proposed diffuser sites should be obtained for analysis of :

- grain size
- total organic carbon
- total Kjeldahl nitrogen
- total phosphorus
- total sulfide
- priority pollutants
- infauna

See *Procedures for Handling and Chemical Analysis of Sediment and Water Samples,* EPA/CE-81-1 and see protocol in EPA's guidance document *Quality Assurance and Quality Control (QA/QC) for 301(h) Monitoring Programs: Guidance on Field and Laboratory Methods.*

Because of the deep depths, diving these sites may not be feasible and surveys may need to be done using remote equipment. All site and sample locations, depths, dates of collection, and methodology needs to be recorded. It is important that the data gathered be quantitative. The monitoring surveys 3a, 3b and 3c will need to be conducted again at a later date, after the outfalls have been constructed and are discharging.

III.F.2. Describe the sampling techniques, schedules, and locations, analytical techniques, quality control and verification procedures to be used.

Influent and effluent sample are obtained on weekly by WWTP operators using composite and discrete sampling methods outlined in the NPDES permit. Characteristics investigated are: flow (mgd), BOD, suspended solids, settleable solids, pH, and oil and grease. Analysis is run in accordance with the Standard Methods for the Examination of Water and Wastewater. The forms used to record the influent and effluent characteristics are attached, along with a description of the sampling points. The GWA laboratory participates in the USEPA annual laboratory performance evaluation, and runs standard and checks along with routine samples. GWA will work with EPA to establish a split sampling and/or oversite plan to ensure the quaility of the sample analysis.

III.F.3. Describe the personnel and financial resources available to implement the monitoring programs upon issuance of a modified permit and to carry it out for the life of the modified permit.

The monitoring program is implemented by GWA's Laboratory Support Services staff. GWA has an annual budget for the activities of these personnel and the laboratory facilities to conduct their work. The agency has its own boat, a 23-foot Sea Ox, which is used for the receiving water quality and biological monitoring. Other essential equipment owned by the laboratory include but is not limited to, various meters (DO, pH, salinity), BOD incubators, Van Dorn samplers, muffle furnace, drying ovens, dessicators, and SCUBA equipment.

Adequate staffing is a dilemma. However, effective time management practices allow laboratory personnel to conduct the required monitoring activities for both water and wastewater systems. The laboratory personnel include a chemist, a biologist, a laboratory technician supervisor, and four laboratory technicians. Three of the laboratory personnel are certified divers and the technicians are certified as water treatment operators and/or water distribution operators. The agency is in the process of acquiring another biologist and an additional technician in order to meet the demanding biological monitoring requirements.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

SEP 23 1997

Richard A. Quintanilla
General Manager
Guam Waterworks Authority
P.O. Box 3010
Agana, Guam 96910

Re: Agana and N. District STP

Dear Mr. Quintanilla:

This is in regards to your letter dated September 9, 1997, transmitting Guam Waterworks Authority's (GWA) draft Scope of Work for the Baseline Surveys to support the proposed extension of the Agana and Northern District Sewage Treatment Plants (STP) ocean outfalls.

We approve of the approach of the proposed Scope of Work for the Baseline Surveys relating to the proposed ocean outfall extensions. The Scope of Work appears comprehensive and should provide the necessary information to support GWA's proposed placement of both the Agana and Northern District's ocean outfalls as we discussed in our letter dated June 18, 1997.

We would also like to mention that we have received a fax copy of the proposed Scope of Work for Quarterly Biomonitoring of the existing Agana, Northern District and Agat STPs from Ms. Joanne Boyd, Biologist, GWA Monitoring Services Laboratory, dated September 10, 1997. Ms. Boyd has also put together a comprehensive proposed Scope of Work for quarterly biomonitoring. Although we have indicated to GWA the need for re-establishing biological monitoring at the existing outfalls in accordance with NPDES permit requirements we hereby request that GWA perform a statistical analysis using the existing biological data collected in place of developing and implementing the proposed biological monitoring plan at this time. GWA's statistical analysis of the existing biological data shall be submitted as part of the reapplications for the Agana and Northern District STPs. The analysis should look into whether the biological data shows a significant change or impact over time.

With respect to monitoring at the existing ocean outfalls receiving water quality monitoring at all three respective outfalls shall be continued, as required, at this time. We will be available to further discuss and comment on monitoring plan specifics once we know actual ocean outfall locations and other area characteristics.

With regard to the Agat STP we need to receive an official response from GWA regarding the type of NPDES permit renewal GWA will be seeking for the facility. GWA needs to clearly indicate if they will be pursuing a NPDES permit renewal for meeting secondary treatment requirements or applying for a waiver from meeting secondary treatment requirements under Section 301(h) of the Clean Water Act. Failure to respond in a timely and appropriate manner will result in us taking further actions and may result in us initiating actions similar to those taken with the Agana and Northern District 301(h) NPDES permit renewals.

If you have any further comments regarding this matter, please contact Mike Lee at (415) 744-1484 or Lily Lee at (415) 744-1592.

Sincerely,

Simon Hardy for

Norman L. Lovelace
Program Manager
Pacific Insular Area Program

cc: T. Quan, GWA
H. Johnston, GWA
J. Boyd, GWA
J. Salas, GEPA
N. Custodio, GEPA

and, if appropriate, revised under the direction of EPA. Revisions may include a reduction or increase in the parameters to be monitored, the frequency of monitoring, or the number and size of samples collected.

1. Receiving Water Quality Monitoring

Parameter	Units	Stations	Monitoring Frequency	Sample Type
Floating materials*, odor, and color		A,B,C	monthly	visual
		D,E,F	quarterly	visual
Total coliform bacteria	MPN/100ml	A,B,C	monthly	discrete**
		D,E,F	quarterly	discrete**
Temperature	°C	D,E,F	quarterly	discrete**
Salinity	ppt	D,E,F	quarterly	discrete**
pH	pH units	D,E,F	quarterly	discrete**
Dissolved oxygen	mg/L	D,E,F	quarterly	discrete**
Turbidity	m or NTU	D,E,F	quarterly	Secchi disc or discrete**

*Floating materials shall include oils, grease, scum, etc.

**Samples shall be taken at the surface for coliform analyses. For other parameters, samples shall be taken at the surface, mid-depth and bottom.

Exact locations of the monitoring stations shall be designated by the permittee. Final station locations, parameters to be monitored, methodology, and frequency shall be approved by EPA Region 9 and the Guam Environmental Protection Agency.

Station Locations

Station	Description
A	shoreline station
B	shoreline station
C	shoreline station
D	outfall station
E	100 m south of outfall station
F	control station 1000 m east of outfall station

Receiving water monitoring data shall be submitted quarterly to EPA Region 9 and the Guam Environmental Protection Agency.

- EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS based upon a treatment capacity of 0.53 m^3/sec (12 MGD)

1. During the period beginning with the effective date of this permit and lasting through June 30, 1991, the permittee is authorized to discharge from outfall serial number 001.

   a. Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
	Average Monthly	Daily Max	Average Monthly	Daily Max	Measurement Frequency	Sample Type
Flow-m^3/day (MGD)	-	-	-	(12 MGD)	Continuous	--
Biochemical Oxygen Demand (5-Day)*	3,634 (8,011)	7,268 (16,022)	80 mg/L	160 mg/L	Once/week	Composite
Suspended Solids*	2,725 (6,008)	5,450 (12,016)	60 mg/L	120 mg/L	Once/week	Composite
Settleable Solids	-	-	1 ml/L	2 ml/L	Once/week	Discrete
Oil and Grease***	-	-	-	-	Once/month	Discrete
pH**	Not less than 7.0 standard units nor greater than 9.0 standard units				Once/week	Discrete

*Both the influent and effluent shall be monitored.

**The discharger shall not cause the pH of the receiving water to deviate more than 0.5 pH units of that which would occur naturally.

***Oil and grease shall be monitored in the effluent on a monthly basis over a six month period since many toxic organic pollutants partition into this fraction. If the level of oil and grease is found to be unacceptable, this permit shall be modified to include an effluent limitation and monitoring requirements

Table 12

Effect of Discharge in Othjer Point and Non-Point Sources

III.G *Effect of Discharge on Other Point and Nonpoint Sources*

III.G.1. Does (will) your modified discharge(s) cause additional treatment or control requirements for any other point or nonpoint pollution source(s)?

There are no other pollution discharges within GWAs current outfall impact area or the proposed outfall extension discharge impact area.

III.G.2. Provide the determination required by 40 CFR 125.64(b) or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.

As previously stated, GWA has requested Letters of Determination from the Bureau of Planning, Department of Agriculture and Guam Environmental Protection Agency (See *State and Federal Laws*, Section II.D.4. of application questionnaire). Upon receipt of their letters, GWA will immediately forward their responses to your office.

Toxics Control Program

and

Urban Area Pretreatment Program

III. H. Toxics Control Program and Urban Area Pretreatment Program [40 CFR 125.65 and 125.66]

III.H.1. a. Do you have any known or susupected industrial sources of toxic pollutants or pesticides?

Guam has very little or no heavy industry and we have no suspected industrial sources of toxic pollutants or pesticides. However, we are waiting on responses from the industrial user surveys that were sent out on March 27, 1998. GWA remains optimistic that the resulting survey summary along with the *Priority Pollutant Scan* results will demonstrate concurrence with the previous statement.

b. If no, provide the certification required by 40 CFR 125.66(c)(2) for large discharges.

Must certify this fact based on the results of an industrial waste survey

c. Provide the results of wet and dry weather effluent analysis for toxic pollutants and pesticides as required by 40 CFR 125.66(a)(1).

Twenty four hour composite effluent samples were taken at the Northern District Wastewater Treatment Plant starting on the 8th day of March, 1998, and Agana Wastewater Treatment Plant starting on the 9th day of March, 1998. Samples have been sent off island for analysis at the Montgomery Watson Laboratories, and results are expected back mid April. These will be forwarded to you once received.

d. Provide analysis of known or suspected industrial sources of toxic pollutants and pesticides identified in 1(c) above in accordance with 40 CFR 125.66(b).

Pending results of effluent analysis for toxic pollutants and pesticides.

III.H.2. a. Are there any known or suspected water quality, sediment accumulation, or biological problems related to toxic pollutants or pesticides from your modified discharge?

b. If no provide the certification required by 40 CFR 125.66(d)(2) together with available supporting data.

c. If yes, provide a schedule for the development and implementation of nonindustrial toxics control programs to meet the requirements of 40 CFR 125.66(d)(3).

d. Provide a schedule for the development and implementation of nonindustrial toxics control programs to meet the requirements of 40 CFR 125.66(d)(3).

Nonindustrial source control program. (1) The applicant shall submit a proposed public education program designed to minimize the entrance of nonindustrial toxic pollutants and

pesticides into its POTW(s) which shall be implemented no later than 18 months after the issuance of a 301(h) modified permit.

(3)The applicants nonindustrial source control programs under paragraph (d)(2) of this section shall include the following schedules which are to be implemented no later than 18 months after the issuance of a 301(h) modified permit:
(i) A schedule of activities for identifying nonindustrial sources of toxic pollutants and pesticides; and
(ii) A schedule for the development and implementation of control programs, to extent practicable, for nonindustrial sources of toxic pollutants and pesticides.

III.H.3. Describe the public education program you propose to minimize the entrance of nonindustrial toxic pollutants and pesticides into your treatment system [40 CFR 125.66(d)(1)]

Applicants for reissued 301(h) modified permits must have a public education program in place. Newspaper articles, poster, or radio and television announcements to increase public awareness of the need for proper disposal of waste oils, solvents, herbicides, pesticides and other substances that contain toxic pollutants.

The following schedule is GWA's plan of action to increase public awareness:

Action	Date
Mail out industrial user survey	Mar, 1998
Compile and analysis survey results	May, 1998
Publish results and their impacts in the local newspaper (PDN)	Jun, 1998
Investigate and identify significant toxic pollutant contributors	Jul, 1998
Establish programs i.e., posters, newspaper articles, radio/TV, etc. to advise public on proper disposal	Sep, 1998
Periodically publish or use electronic media to maintain public awareness previously established	Quarterly commencing December 1998

III.H.4. Do you have an approved industrial pretreatment program (40 CFR 125.66(c)(1)?

No. Have no known or suspected industrial sources of toxic pollutants. This status may change upon receipt of the user survey and toxic pollutant analysis.

a. If yes, provide the date of EPA approval.

b. If no, and if required by 40 CFR Part 403 to have an industrial pretreatment program, provide a proposed schedule for development and implementation of your industrial pretreatment program to meet the requirements of 40 CFR Part 403.

May not be needed

III.H.5. Urban area pretreatment requirement [40 CFR 125.65]
Discharges serving a population of 50,000 or greater must respond.

a. Provide data on all toxic pollutants introduced into the treatment works from industrial sources (categorical and noncategorical).

b. Note whether applicable pretreatment requirements are in effect for each toxic pollutant. Are industrial sources introducing such toxic pollutants in compliance with all of their pretreatment requirements? Are the pretreatment requirements being enforced? [40 CFR 125.65(b)(2)]

c. If applicable pretreatment requirements do not exist for each toxic pollutant in the POTW effluent introduced by industrial sources,

- ***provide a description and a schedule for your development and implementation of applicable pretreatment requirements [40 CFR 125.65(c)], or***

- ***describe how you propose to demonstrate secondary removal equivalency for each of those toxic pollutants, including a schedule for compliance, by using a secondary treatment pilot plant. [40 CFR 125.65(d)].***

Dependant on industrial user survey and toxic pollutant analysis. Used to characterize industrial sources by type, and types and concentrations of toxic pollutants in discharges, and flow into the plant.

Review and Analysis of Past Biological Data for the Agana WWTP Outfall

REVIEW AND ANALYSIS OF PAST BIOLOGICAL MONITORING DATA FOR THE AGANA WASTEWATER TREATMENT PLANT OUTFALL, GUAM.

by

JOANNE BOYD,

BIOLOGIST III,

GUAM WATERWORKS AUTHORITY

FEBRUARY 1998

TABLE OF CONTENTS

PAGE

LIST OF TABLES ii

LIST OF FIGURES iii

INTRODUCTION. 1

METHODS 3

RESULTS. 5

DISCUSSION. 22

REFERENCES 26

APPENDIX 27

LIST OF TABLES

Table 1. Survey of Benthic Community (percent cover) at three transect locations, including fish and invertebrate counts across the transects at the Agana WWTP Outfall. 6

Table 2. Regression analysis results for Agana. 11

Table 3. Agana Outfall fish species 19

Table 4. Typhoons within 100 miles of Guam, from 1980 until 1993 23

LIST OF FIGURES

Figure 1. Location of the Biological Monitoring Transects 4

Figure 2. Benthic cover along the 0 meter transect 7

Figure 3. Benthic cover along the 20 meter transect 8

Figure 4. Benthic cover along the 50 meter transect 10

Figure 5. Bare substrate cover along the 0, 20 and 50 m transects 13

Figure 6. Turf algae cover along the 0, 20 and 50 m transects 14

Figure 7. Macro algae cover along the 0, 20 and 50 m transects 15

Figure 8. Coral cover along the 0, 20 and 50 m transects 16

Figure 9. Coralline algae cover along the 0, 20 and 50 m transects 17

Figure 10. Other cover along the 0, 20 and 50 m transects 18

INTRODUCTION

The Agana Wastewater Treatment Plant (WWTP) discharges primary treated effluent through an ocean outfall into the coastal waters beyond the reef, on the leeward side of Guam at Tanguisson Pt. Agana WWTP outfall located at latitude 13°29' 3.3", longitude 144° 44' 37.1", and runs directly out from the treatment plant . It consists of six diffusers approximately 2875 ft from shore that run perpendicular to the shoreline in 26 - 29 meters (85 - 95 ft) of water. The diffussers sit on a gently sloping submarine terrace of limestone pavement and scattered boulders. They are place 8 ft apart and the end of the outfall sits on the edge of a submarine cliff with the end cap removed.

There is evidence that prior to the construction of the Agana treatment plant in 1979, the reef community in Agana Bay may not have been as diverse as other coastal areas of Guam. According to the Dames and Moore Report (1994), an underwater video taken along the reef zone in 1968, showed no significant coral growth within the entire reef zone of Agana Bay. WWII battles had denuded much of the Agana area, and heavy rainfalls have caused extensive erosion and mudslides. These have adversely affected and possibly permanently impacted the Coral Communities (Randall, personal communication as reported in Dames and Moore, 1994). Randall considers that the video findings in Agana Bay as reflecting ambient conditions that do not support coral growth, and not as a result of any point or non-point source pollution or impact activity.

Jones and Randall, 1971 reported that the depth at which the reef front terminates along West Agana Bay is generally 6 to 8 meters. The only significant reef coral community occurs in this reef front zone, and is in sharp contrast with the dead corals of the submarine terrace, seaward slope and second submarine terrace. The corals in these areas were reported as been 90% dead, presumably as a result of a Acantaster planci infestation.

GWA contracted the University of Guam (UOG), Marine Laboratory, to conduct the Biological Monitoring of the three WWTP ocean outfalls at Agana Bay, Tanguisson Pt and Agat Bay. Surveys were conducted quarterly, with quarterly reports and yearly summaries submitted to GWA (then PUAG). Surveys were conducted from August 1989 until September 1994.

The data provided in the UOG Marine Laboratory quarterly reports were reviewed and analyzed by the GWA biologist. Regression analysis was performed to test if there was any significant change in percent coverage of each of six benthic categories or in fish species diversity, over the 5 year survey period.

METHODS

Qualitative observations were made to determine the benthic composition and fish diversity in the area. Benthic cover was surveyed along three 10 m transects that ran parallel to shore, and were permanently marked for long term monitoring. The first transect was located immediately at the diffusers (0 m) and the other two at 20 m and 50 m distances from the diffusers towards the shore (Figure 1). The transects were therefore at progressively shallower depths. However, the individual transect depths are unknown. The types of benthic cover were recorded along each transect using the chain-link transect method. The types of substrate were later grouped into 6 categories to facilitate data analysis, and percent cover was estimated. These groups are;

1) BARE: bare substrate is non-living surface which can either be attached or loose. This category includes sand, gravel, cobble, dead coral, and limestone pavement.
2) TURF: any substrate type which is covered by an unidentified turf algae. Turf algae are <1 cm in height.
3) MACRO ALGAE: any large fleshy algae (>1 cm). Includes chlorophytes, phaeopytes, fleshy rhodophytes and blue-greens.
4) CORALS: living corals of any taxonomic group
5) CORALLINES: coralline algae.
6) OTHERS: other live sessile organisms: sponges, ascidians, vermetid molluscs, etc.

Fish surveys were done by a diver who swam the 50 meter line connecting each of the three transects and recorded the species types. The number of fish in each species were not recorded, and the reports did not state whether the fish observations were restricted to a certain distance either side of the 50 m line, or whether it was a timed observation.

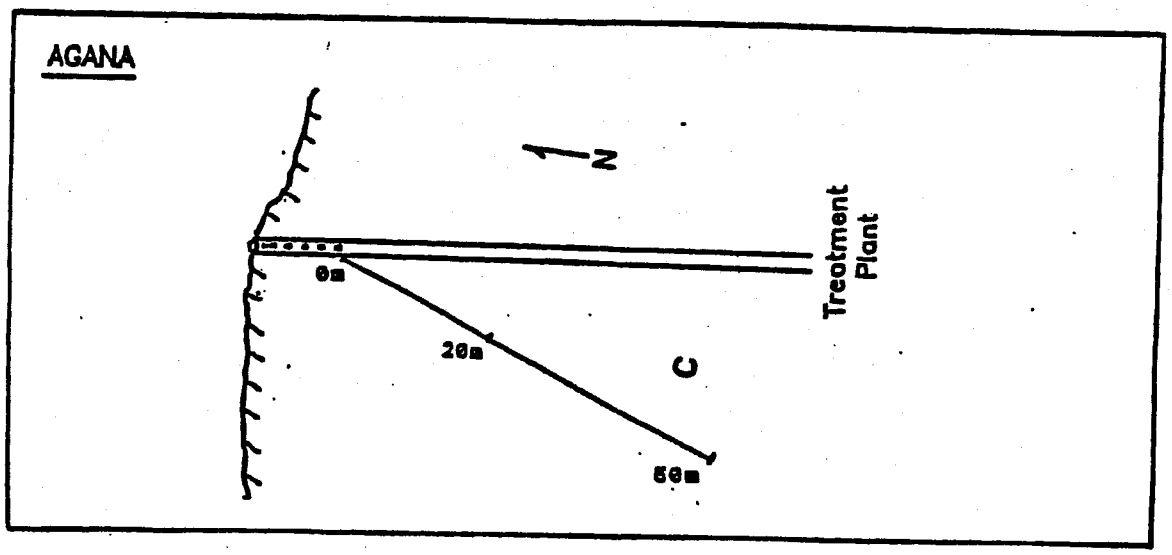

Figure 1. Location of Biological Monitoring Transects. With sample locations at 0m, 20m and 50m.

RESULTS

In the first biological monitoring report, dated March 1990, the benthic cover at the Agana site is described as been dominated by turf algae. The macro invertebrates here were less abundant but more varied than those at the Agat site, but similar to those found at Tanguisson. The larger diversity due to the presence of deep water/low energy habitat species which the Agat site lacked. Macro invertebrates commonly found here are seacucumber Holothuria atra, H. noblis, Stichopus chlorotus, and Bohadschia argus. The Asteroidea included Linka laevigata, L. guildingi, Culcita novaeguinea, and Acanthaster planci. Also found were the sea-urchin Echinopyga calamaris and the large grazing gastropod Trochus niloticus. Species of fish found at Agana were said to be representative of these coral habitats, and large schools of herbivores (Acantruridae) and filter feeding or planktivorous fishes (i.e. Kyposidae) were often seen directly in the plume.

The results of percent cover by each of the six categories, August 1989 to September 1994, are summarized in Table 1, along with the numbers of recorded fish and invertebrate species. The highest percent cover is bolded. The list of recorded benthic species and their percent cover for each survey date are given in the appendix.

Results from the surveys conducted over the 5 year period indicate that the benthic cover along the 0 m transect (Fig. 2) was predominated by turf algae on 12 of 17 sample dates, and bare substrate on 5 of 17 sample dates. In general turf algae predominated up until mid 1992, after which bare substrate became the most predominant cover. The 20 m transect (Fig. 3) had a some what different benthic composition from that of the 0 m transect. Cover was predominated by three categories, turf algae on 8 of 17 survey dates, bare substrate on 4 of 17 dates and macro algae on 5 of 17 dates. As with the 0 m transect bare substrate did not predominate until mid to late 1992, when turf algae was

Table 1. Survey of Benthic Community (percent cover) at three transect locations, including fish and invertebrate counts across the transects at the Agana WWTP Outfall.

	PERCENT COVER					
Date	Bare	Turf Algae	Macro Algae	Corals Live	Coralline Algae	Other
0m						
8/29/89	17.9	76.32	2.76	0	0	3.03
11/21/89	11.01	86.72	0.51	0	1.77	0
4/6/90	12.3	83.8	2.9	0	1	0
6/14/90	7.92	73.25	10.13	0	0	8.7
10/4/90	12.73	66.49	17.14	0	3.62	0
12/6/90	0	97.142	0	0	2.858	0
8/3/91	14.7	77.9	4.7	0	2.6	0
5/17/91	3.6	91.7	4.7	0	0	0
12/27/91	26.9	45.3	26.3	1.2	0.3	0
4/10/92	25.8	41.4	31.7	1.1	0	0
8/3/92	46.1	41.5	11	0	1.2	0
12/3/92	57.8	30.4	10.5	0.2	1.1	0
3/29/93	23.2	33.8	40.5	0	2.5	0
8/16/93	76.8	15.5	1.8	1	4.9	0
1/12/94	70.4	11.2	8.3	3.7	6.4	0
5/26/94	41.3	18.6	24.6	4.9	10.6	0
9/2/94	4.4	87.5	0.3	1.3	5.2	1.3
20m						
8/29/89	30.53	65.66	3.69	0.13	0	0
11/21/89	4.61	11.05	69.87	0.52	13.95	0
4/6/90	8	0	75.2	0	16.8	0
6/14/90	10.39	49.48	39.48	0	0.65	0
10/4/90	15.18	75.09	7.662	0	1.6	0
12/6/90	8.05	68.829	14.155	0	8.962	0
8/3/91	12.4	67.9	19.5	0	0	0
5/17/91	15.9	74.8	9	0.3	0	0
12/27/91	1.8	6.2	91.4	0	0.5	0
4/10/92	10.3	8	78.9	0.8	2	0
8/3/92	31.1	48.4	12.7	0.6	6.6	0.3
12/3/92	51.6	20.3	26.2	0.2	1.7	0
3/29/93	0.8	12.7	85.6	0	0.9	0
8/16/93	54.3	24.9	12.1	3	5.7	0
1/12/94	68.6	12.1	13	4.2	0	2.1
5/26/94	66	13.7	13.2	6	1.1	0
9/2/94	11.4	71.2	10.5	3	3.9	0
50m						
8/29/89	22.19	66.17	11.46	0.19	0	0
11/21/89	11.58	60.39	26.31	0.66	1.05	0
4/6/90	9.5	13.2	73.4	0	3.9	0
6/14/90	3.9	28.31	67.55	0.26	0	0
10/4/90	22.86	39.48	26.88	1.819	7.27	1.68
12/6/90	4.805	46.13	45.433	1.429	1.558	0
8/3/91	5.5	18.1	74.9	0	1.2	0.4
5/17/91	17	40.8	40.7	0	1.5	0
12/27/91	4.2	0	94.3	0	1.1	0.4
4/10/92	10.4	88.9	0.3	0	0	0.4
8/3/92	26.2	59.8	11	0	2.8	0
12/3/92	60.9	24.2	12.6	1.2	1	0
3/29/93	11.8	10.5	71.6	1.7	4.4	0
8/16/93	70.6	13.5	10.5	2.9	2.2	0.2
1/12/94	60.5	21.2	13	3.2	2.1	0
5/26/94	56.5	14	26.4	1.7	1.4	0
9/2/94	24.4	59.5	9.5	3	3.6	0

	SPECIES NUMBER	
Date	Fish	Invertebrates
8/29/89	39	
11/21/89	29	4
4/6/90	41	9
6/14/90	36	8
10/4/90	36	7
12/6/90	40	9
8/3/91	31	7
5/17/91	36	7
12/27/91	34	8
4/10/92	34	5
8/3/92	31	5
12/3/92	34	6
3/29/93	39	7
8/16/93	39	7
1/12/94	33	7
5/26/94	39	7

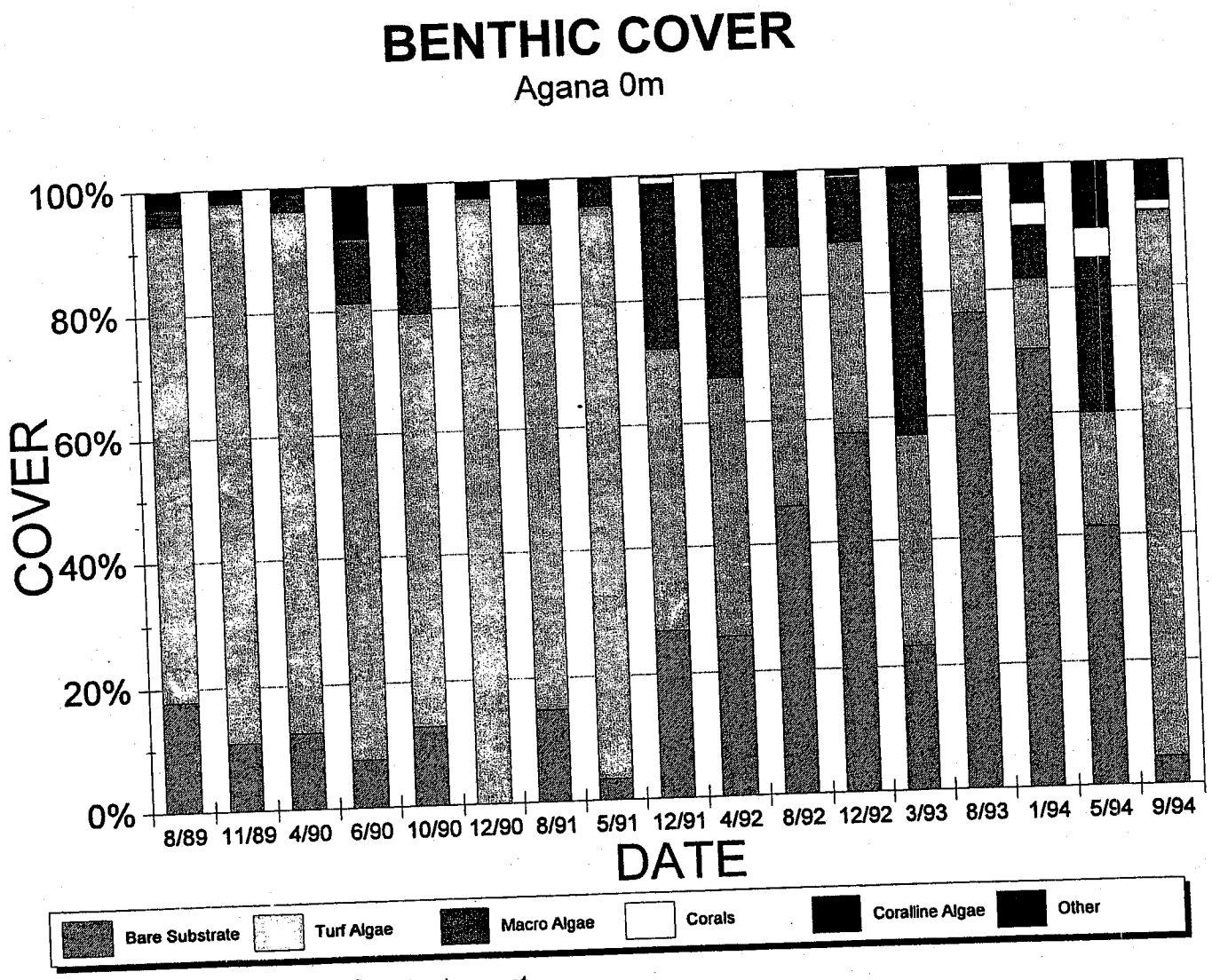

Figure 2. Benthic cover along the 0 meter transect

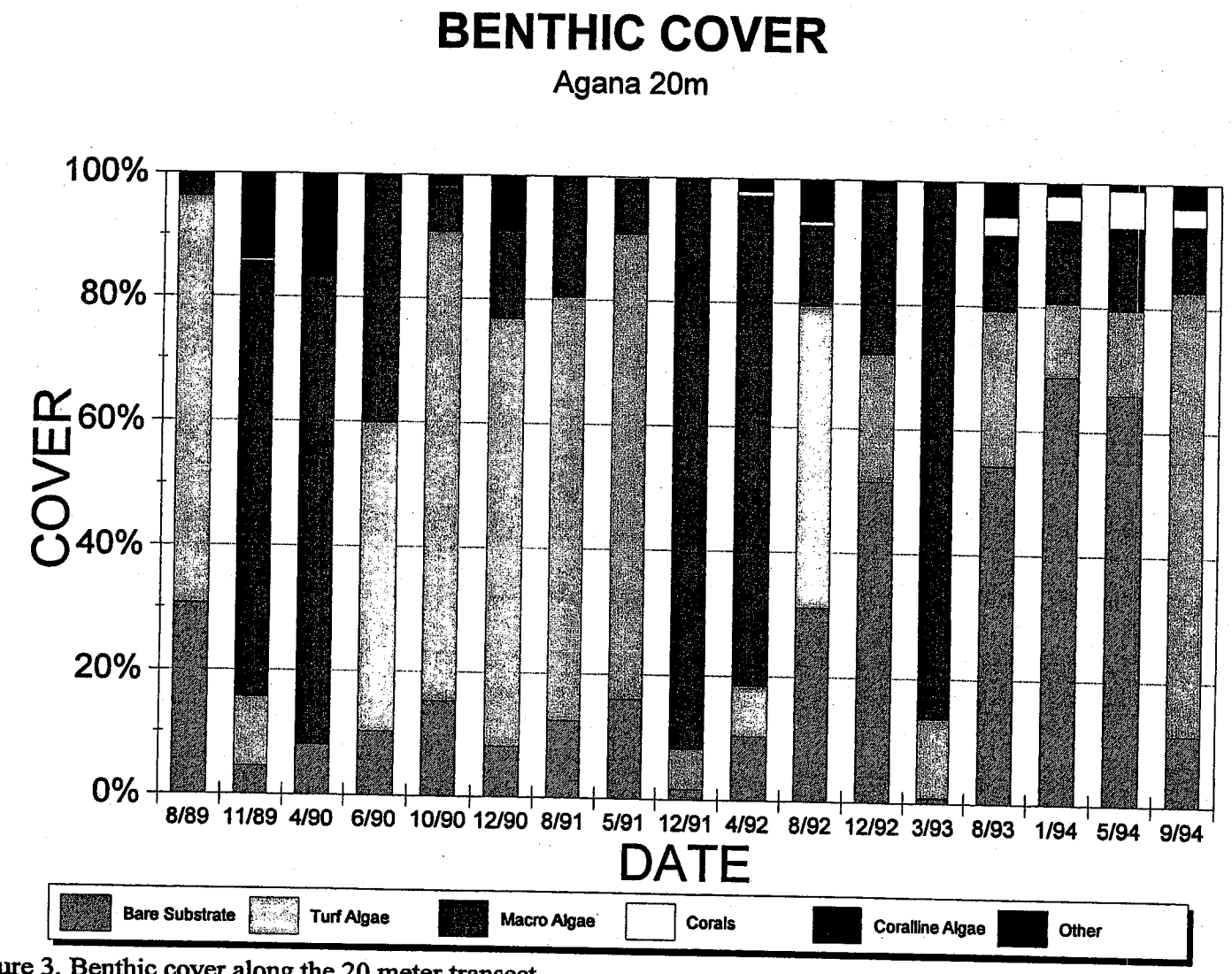

Figure 3. Benthic cover along the 20 meter transect

reduced to less than 20 percent cover. The percentage cover by the other three groups was low. Live coral ranged from 0 to 5 percent cover, with the average cover at approximately 1 percent. Coralline algae cover ranged from 0 to 14 percent and averaged 4 percent. The 50 m transect (Fig. 4) had similar benthic cover to the 20 m transect, in that it was predominated by turf algae (8 out of 17 dates), bare substrate (5 out of 17 dates) and macro algae (6 out of 17 dates). Again bare substrate began to predominate in mid to late 1992. At this time turf algae decreased from an average of 42 percent cover down to an average of 17 percent cover. Coral cover ranged from 0 to 3 percent cover, the average cover was less than 1 percent. Coralline algae cover ranged from 0 to 14.5 percent and averaged around 2 percent.

Turf algae, bare substrate and macro algae were the three most predominant benthic cover along the three transects. Coral, coralline algae and other cover, each made up only a small percentage of the total benthic cover (average <1.5 percent). When macro algae predominated the percent cover by both bare substrate and turf algae was greatly reduced. The predominance of bare substrate that occurred after mid to late 1992 was as a result in the decrease in turf and macro algae, rather than a decrease in coral or coralline algae.

Not all of the changes in percent cover for each of the categories were significant. The results of the regression analysis are summarized in Table 2. Significant changes (**S**) are at the 95% level. There was a statistically significant increase in percent coverage by bare substrate and coral at all three of the transects over the 5 year period . A significant increase was also seen in coralline algae at the 0 m transect, and ther was a significant reduction in the percent cover of turf algae at the 0 m transect. All other changes in percent cover were determined to be non-significant.

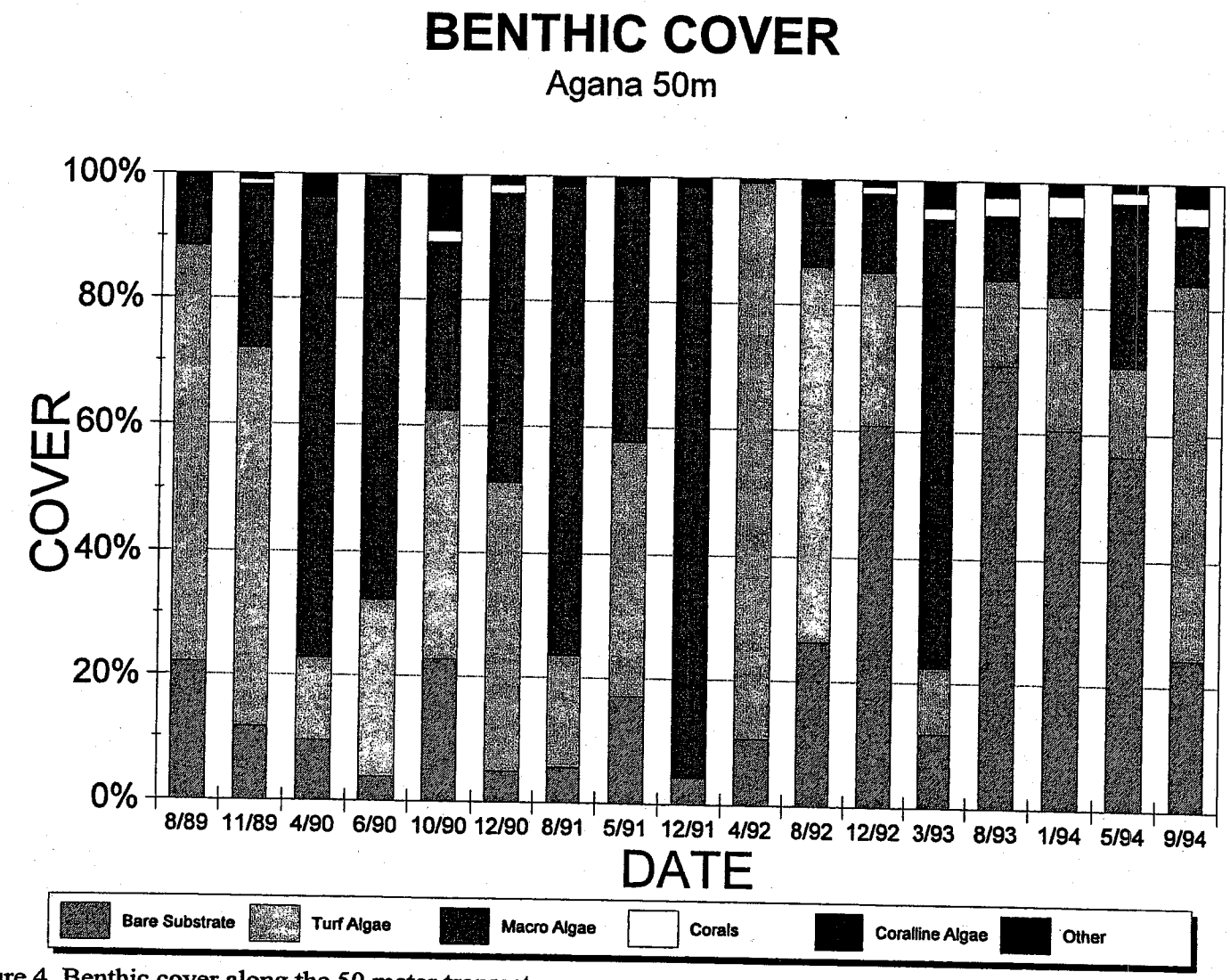

Figure 4. Benthic cover along the 50 meter transect

Table 2. Regression analysis results for Agana. Significance of change in percent cover of the six benthic categories over the 61 months that the area was surveyed.

Transect	Bare	Turf Algae	Macro Algae	Coral	Coralline	Other
0 m *ts*	+s 2.708	-s -3.36	+ 1.132	+s 3.414	+s 3.414	- -1.267
20 m *ts*	+s 2.51	- -0.82	+ -0.76	+s 4.26	- -1.4	+ 1.33
50 m *ts*	+s 3.159	- -0.907	- -1.332	+s 3.439	+ 0.509	- -0.783

s = significant at 95%
+ = positive regression
- = negative regression

The significant increase in the percent cover by bare substrate is shown in Figure 5. Most of this increase took place in mid to late 1992. The percent coverage by turf algae is seen to decrease along all of the transects, but was only significant for the 0 m transect (Fig. 6). The changes in percent cover for macro algae were non-significant (Fig. 7) and any increases in macro algae appeared to be seasonal. Seasonal blooms of macro algae are common in the tropics. Coral cover significantly increased along all three transects (Fig. 8). The percent cover by coralline algae increased significantly along the 0 m transect, and had no significant change along the 20 m and 50 m transects (Fig. 9). There was also no significant changes in other cover (Fig. 10).

A fish species list arranged by Family is given in Table 3. The shaded boxes represent the presence of that species when the survey was conducted. There was no significant change in fish species diversity over the 5 year period that biological monitoring was conducted,. The number of species present in each trophic level remained relatively consistent through out this period and are representative of other coral reef fish communities around Guam (personal communication, Dr. Steven Amesbury, Prof. Ichthyology, UOG Marine Laboratory).

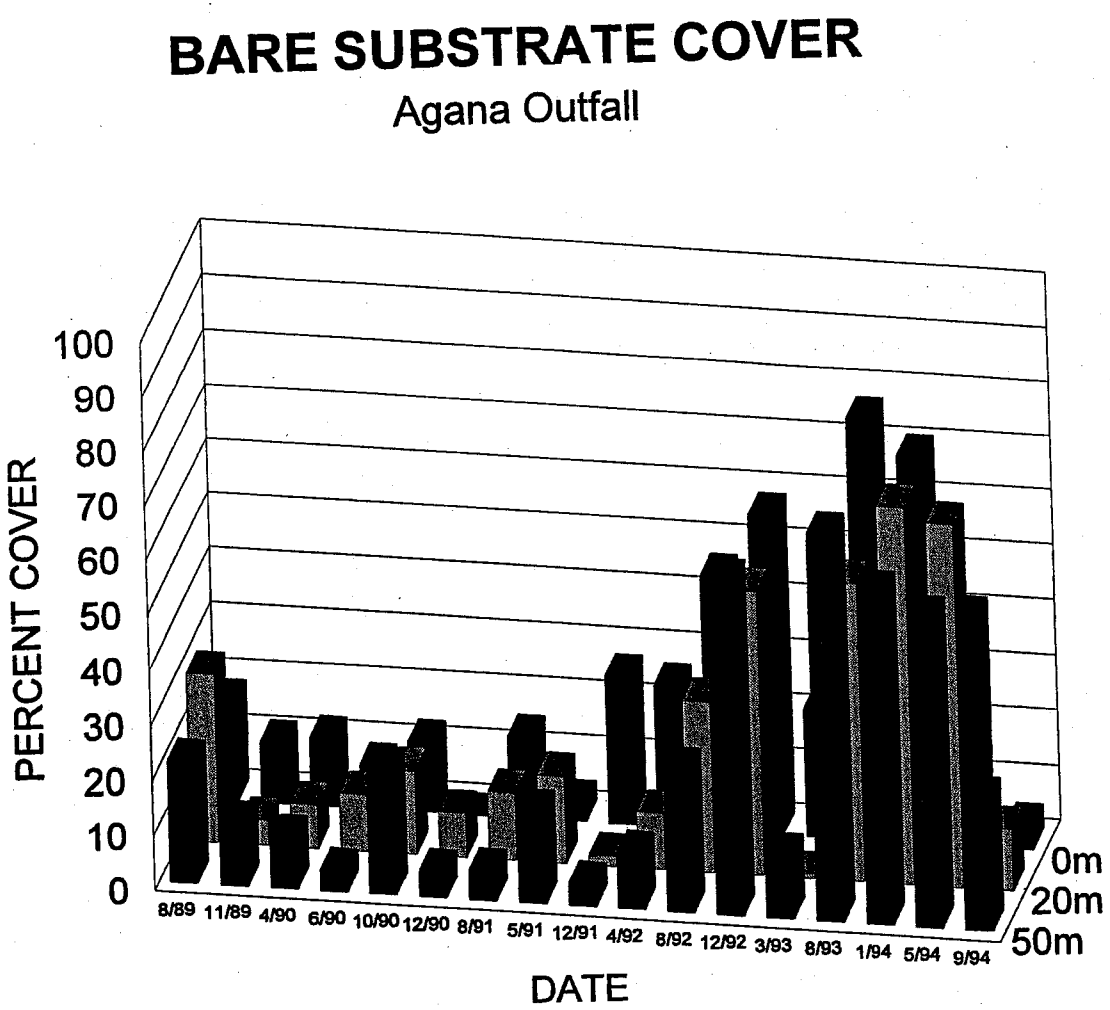

Figure 5. Bare Substrate cover along the 0, 20 and 50 meter transects.

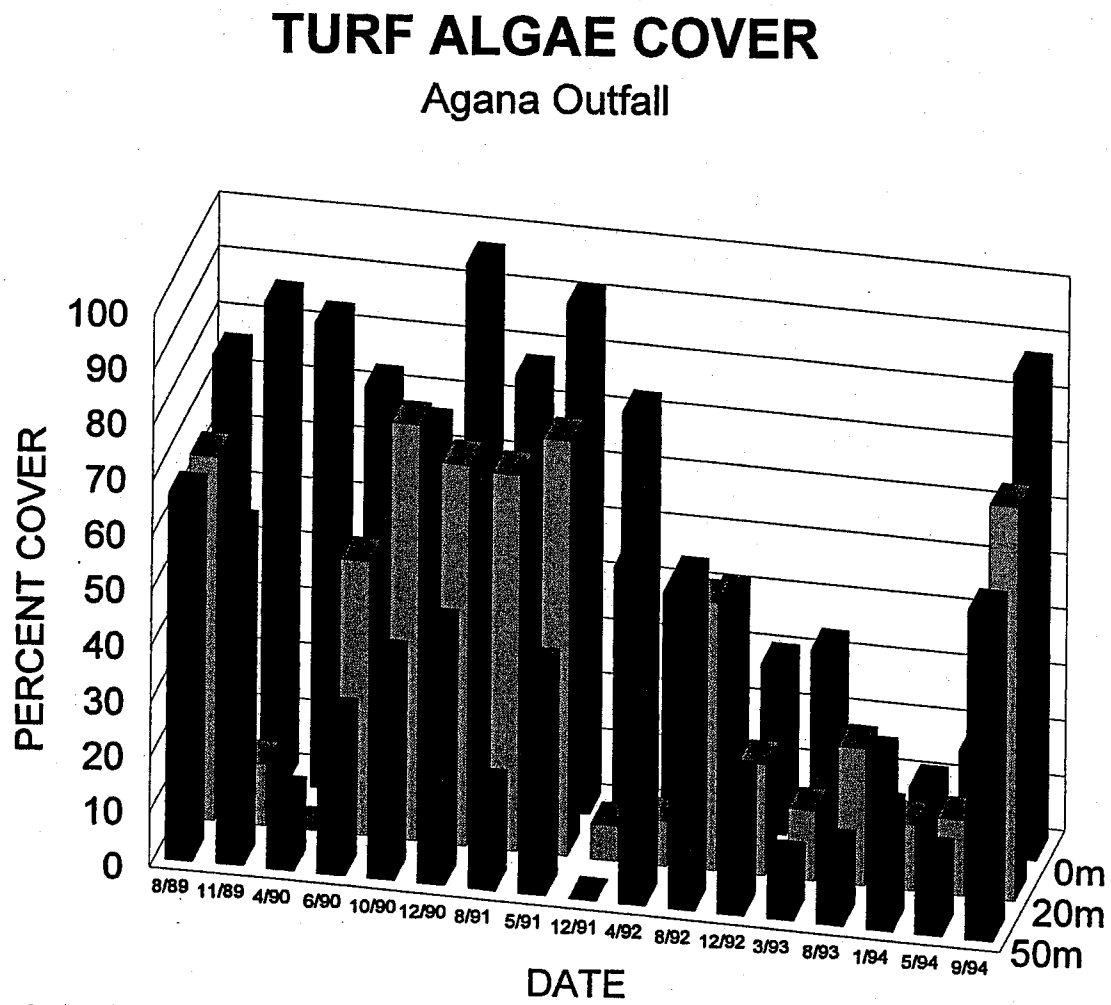

Figure 6. Turf Algae cover along the 0, 20 and 50 meter transects.

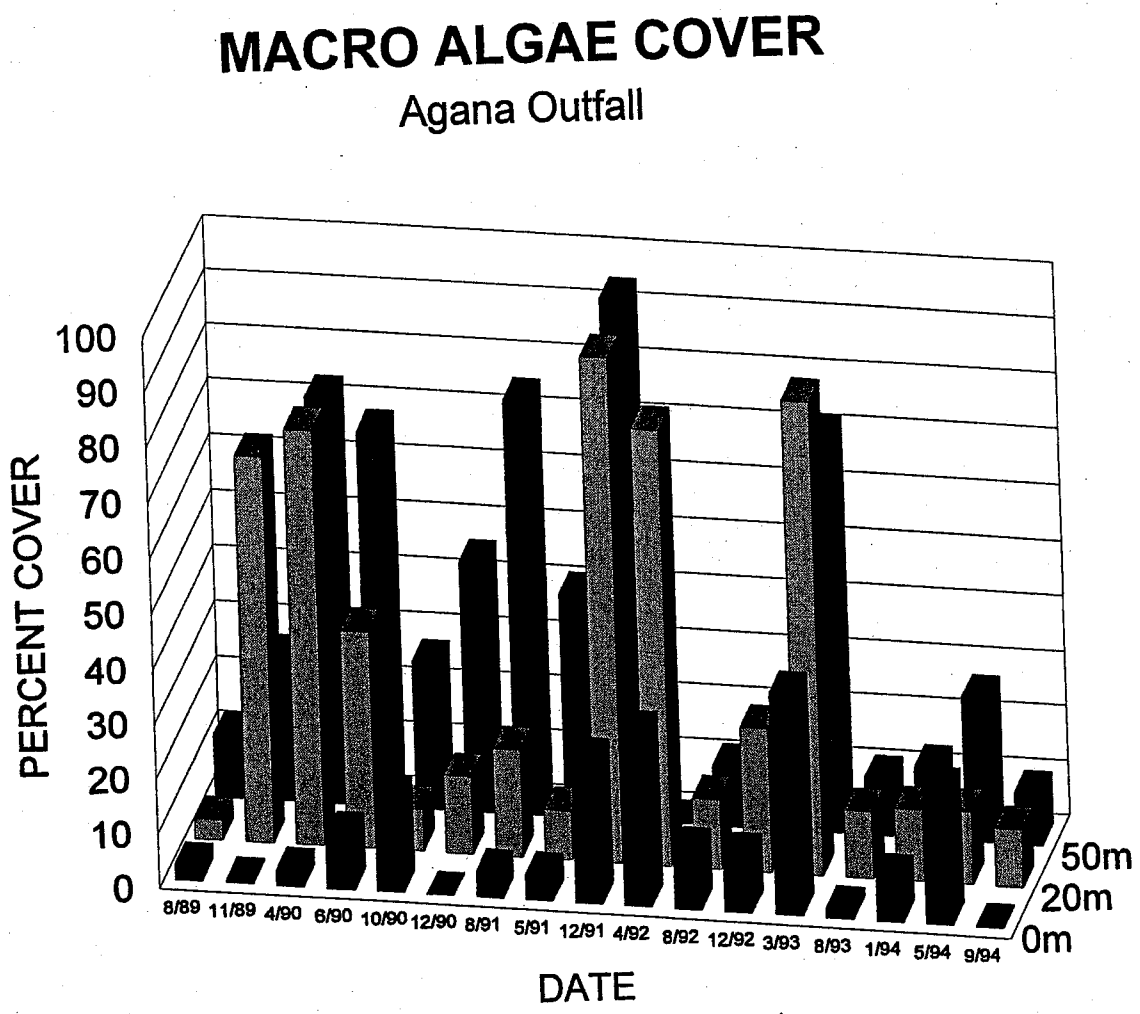

Figure 7. Macro Algae cover along the 0, 20 and 50 meter transects.

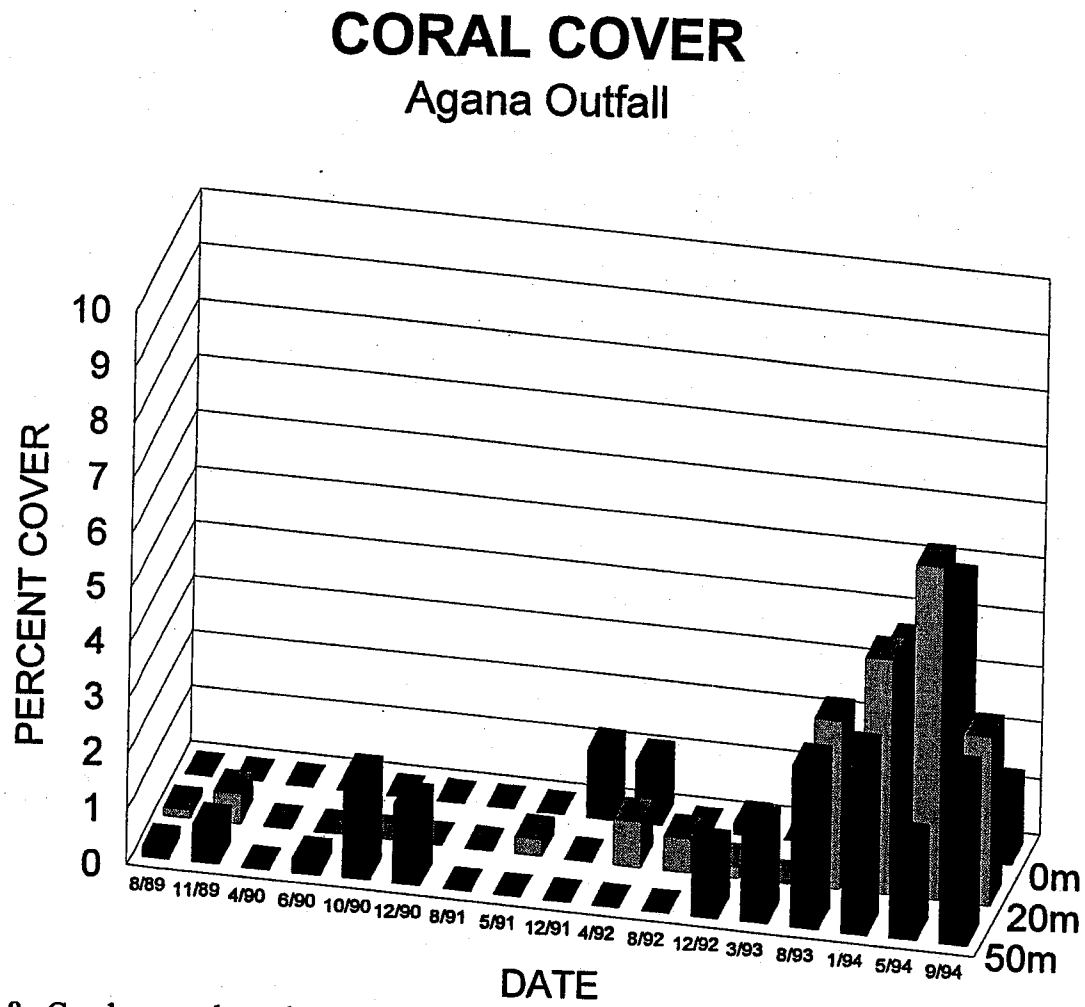

Figure 8. Coral cover along the 0, 20 and 50 meter transects.

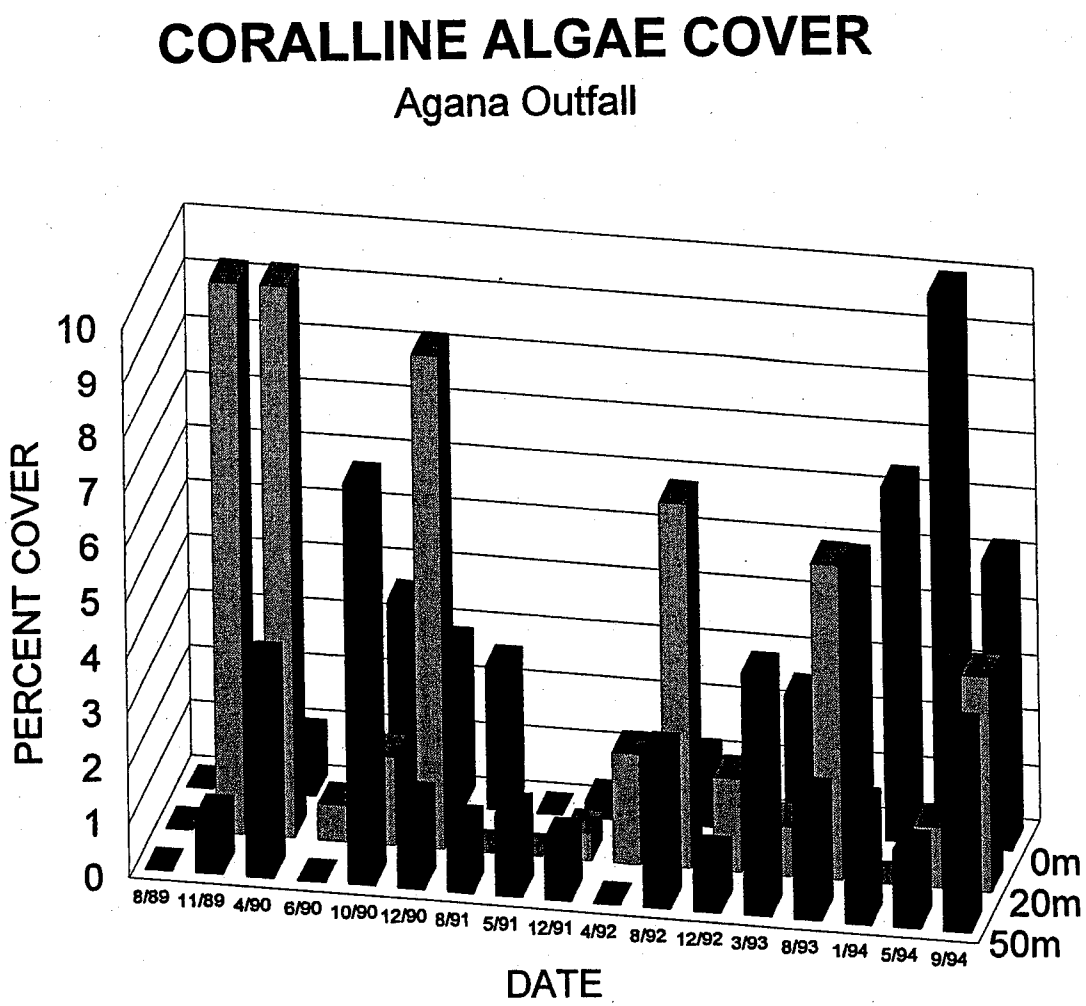

Figure 9. Coralline cover along the 0, 20 and 50 meter transects.

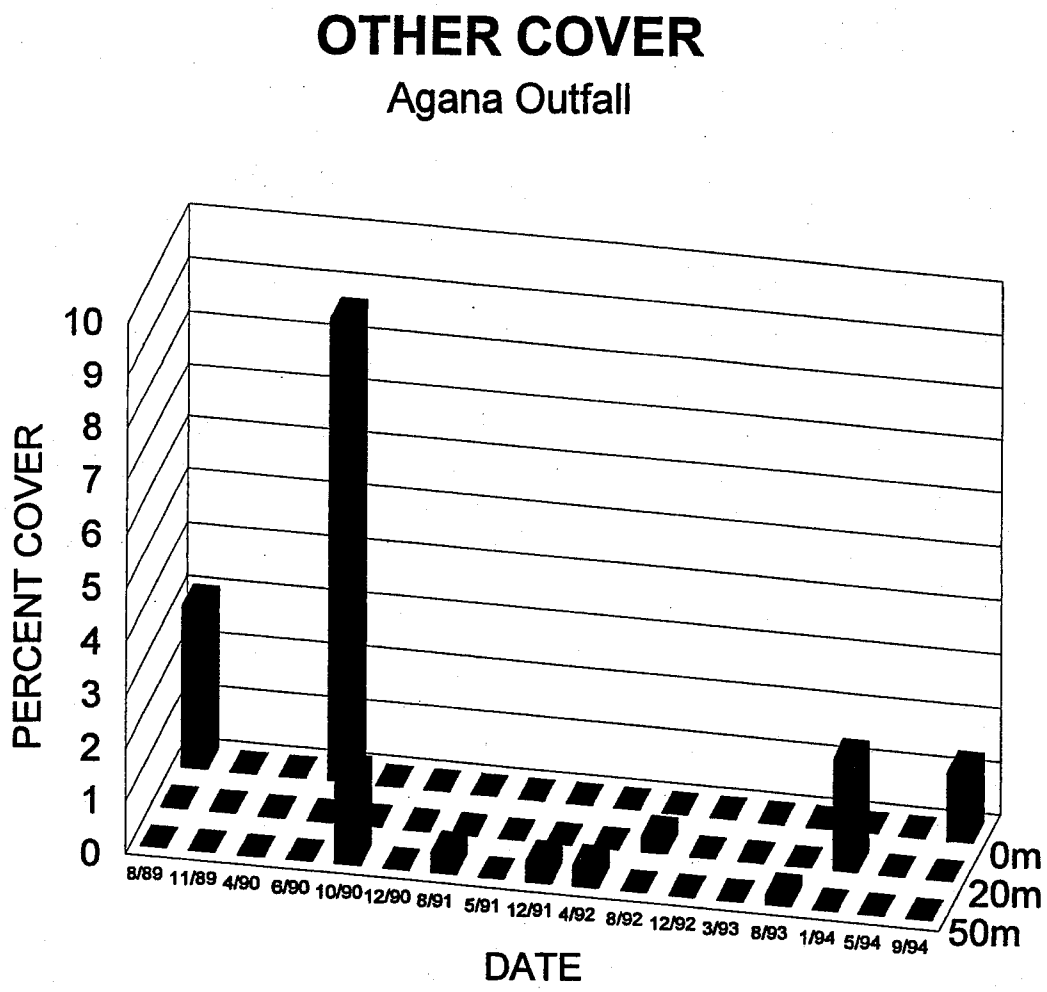

Figure 10. Other cover along the 0, 20, and 50 meter transects.

Table 3. Agana outfall Fish Species.

shaded boxes represent that species were present.

Fiscal Year	1990				1991				1992				1993				1994				Total
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	n/16
Acanthuridae	Acanthurinae (Surgeonfishes)																				
Acanthurus blochii						ns					ns				ns				ns		10
Acanthurus nigricans						ns					ns				ns				ns		11
Acanthurus nigrofuscus						ns					ns				ns				ns		15
Acanthurus nigroris						ns					ns				ns				ns		1
Acanthurus olivaceus						ns					ns				ns				ns		2
Ctenochaetus binotatus						ns					ns				ns				ns		3
Ctenochaetus striatus						ns					ns				ns				ns		12
Zebrasoma flavescens						ns					ns				ns				ns		1
Acanthuridae	subfamily Nasinae (Unicornfishes)																				
Naso annulatus						ns					ns				ns				ns		5
Naso hexacanthus						ns					ns				ns				ns		2
Naso lituratus						ns					ns				ns				ns		16
Apogonidae (Cardinalfishes)																					
Apogon spp.						ns					ns				ns				ns		1
Apogon angustatus						ns					ns				ns				ns		3
Balistidae (Triggerfishes)																					
Balistapus undulatus						ns					ns				ns				ns		7
Melichthys niger						ns					ns				ns				ns		5
Melichthys vidua						ns					ns				ns				ns		16
Odonus niger						ns					ns				ns				ns		16
Sufflamen bursa						ns					ns				ns				ns		15
Blenniidae (Blennies)																					
Meiacantus atrodorsalis						ns					ns				ns				ns		2
Carangidae (Jacks; Trevallys)																					
Elagatis binnulatus						ns					ns				ns				ns		1
Chaetodontidae (butterflyfishes)																					
Chaetodon citrinellus						ns					ns				ns				ns		15
Chaetodon ephippium						ns					ns				ns				ns		1
Chaetodon kleinii						ns					ns				ns				ns		8
Chaetodon lunula						ns					ns				ns				ns		1
Chaetodon mertensii						ns					ns				ns				ns		13
Chaetodon punctatofasciatus						ns					ns				ns				ns		1
Chaetodon reticulatus						ns					ns				ns				ns		1
Chaetodon ulietensis						ns					ns				ns				ns		10
Forcipiger flavissimus						ns					ns				ns				ns		6
Forcipiger longirostris						ns					ns				ns				ns		12
Heniochus monoceros						ns					ns				ns				ns		3
Cirrhitidae (Hawkfish)																					
Cirrhitichthys falco						ns					ns				ns				ns		1
Diodontidae (Porcupinefishes)																					
Diodon hystrix						ns					ns				ns				ns		1
Gobiidae (Gobies)																					
Valenciennea strigatus						ns					ns				ns				ns		13
Haemulidae (Sweetlips and Grunts)																					
Plectorhinchus obscurus						ns					ns				ns				ns		3
Hemigaleidae (Whitetip shark)																					
Triaenodon obesus						ns					ns				ns				ns		6
Holocentridae (squirrelfishes)	Holocentrinae (Squirrelfishes)																				
Sargocentron spiniferum						ns					ns				ns				ns		3
Kyphosidae (Rudderfishes; Sea Chubs)																					
Kyphosus sp.						ns					ns				ns				ns		1
Kyphosus cinerascens						ns					ns				ns				ns		4
Labridae (Wrasses)																					
Anampes spp.						ns					ns				ns				ns		2
Bodianus axillaris						ns					ns				ns				ns		1
Cheilinus oxycephalus						ns					ns				ns				ns		10
Cheilinus unifasciatus						ns					ns				ns				ns		15
Cheilio inermis						ns					ns				ns				ns		10
Cirrhilabrus sp.						ns					ns				ns				ns		1

Table 3. Agana outfall Fish Species.

shaded boxes represent that species were present.

Fiscal Year	1990				1991				1992				1993				1994				Tota
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	n/16
Coris gaimard						ns					ns				ns				ns		6
Epibulus insidiator						ns					ns				ns				ns		2
Halichoeres biocellatus						ns					ns				ns				ns		10
Halichoeres hortulanus						ns					ns				ns				ns		15
Halichoeres margaritaceus						ns					ns				ns				ns		10
Halichoeres marginatus						ns					ns				ns				ns		11
Halichoeres melanurus						ns					ns				ns				ns		1
Halichoeres trimaculatus						ns					ns				ns				ns		3
Hemigymnus fasciatus						ns					ns				ns				ns		4
Hemigymnus melapterus						ns					ns				ns				ns		10
Labroides bicolor						ns					ns				ns				ns		14
Labroides dimidiatus						ns					ns				ns				ns		15
Macropharyngogon meleagris						ns					ns				ns				ns		6
Novaculichthys taeniourus						ns					ns				ns				ns		1
Pseudocheilinus octotaenia						ns					ns				ns				ns		3
Pterogogus cryptus						ns					ns				ns				ns		10
Stethojulis bandanensis						ns					ns				ns				ns		4
Stethojulis strigiventor						ns					ns				ns				ns		11
Thalassoma lutescens						ns					ns				ns				ns		15
Lethrinidae (Emperors)																					
Lethrinus harak						ns					ns				ns				ns		1
Lethrinus ramak						ns					ns				ns				ns		1
Monotaxis grandoculus						ns					ns				ns				ns		1
Lutjanidae (Snappers)																					
Aphareus furca						ns					ns				ns				ns		1
Aprion virescens						ns					ns				ns				ns		3
Microdesmidae (Dartfishes)																					
Nemateleotris magnifica						ns					ns				ns				ns		3
Ptereleotris evides						ns					ns				ns				ns		1
Monacanthidae (Filefishes)																					
Pervagor janthinosoma						ns					ns				ns				ns		1
Mugilidae (Mullets)																					
Parupeneus barberinus						ns					ns				ns				ns		10
Parupeneus cyclostomus						ns					ns				ns				ns		1
Parupeneus multifasciatus						ns					ns				ns				ns		10
Pinguipedidae (Sandperches)																					
Parapercis sp.						ns					ns				ns				ns		10
Parapercis clatherata						ns					ns				ns				ns		6
Pomacanthidae (Angelfishes)																					
Centropyge sp.						ns					ns				ns				ns		1
Centropyge flavissimus						ns					ns				ns				ns		14
Centropyge shepardi						ns					ns				ns				ns		10
Pygoplites diacanthus						ns					ns				ns				ns		8
Pomacentridae (Damselfishes)																					
Abudefduf saxatalis						ns					ns				ns				ns		6
Abudefduf sexfasciatus						ns					ns				ns				ns		9
Amphiprion periderion						ns					ns				ns				ns		3
Chryiptera traceyi						ns					ns				ns				ns		5
Chrysiptera glauca						ns					ns				ns				ns		10
Chrysiptera leucopoma						ns					ns				ns				ns		11
Dascyllus trimaculatus						ns					ns				ns				ns		4
Pomacentrus vaiuli						ns					ns				ns				ns		6
Stegastes sp.						ns					ns				ns				ns		1
Scaridae (Parrotfishes)																					
Calototomus carolinus						ns					ns				ns				ns		2
Scarus gibbus						ns					ns				ns				ns		1
Scarus globiceps						ns					ns				ns				ns		11
Scarus schlegeli						ns					ns				ns				ns		11
Scarus sordidus						ns					ns				ns				ns		16
Scatophagidae (Scats)																					

Table 3. Agana outfall Fish Species.

shaded boxes represent that species were present.

Fiscal Year	1990				1991				1992				1993				1994				Tota
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	n/16
Platax orbicularis	■	■	■	■	■	ns	■	■	■	■	ns	■	■	■	ns	■	■	■	ns	■	16
Scombridae (Tunas)																					
Gymnosarda unicolor						ns	■				ns				ns				ns		1
Scorpaenidae (Scorpionfishes)																					
Pterois antennata			■	■	■	ns					ns				ns				ns		3
Serrandiae (Grouper)																					
Cephalopholis miniata		■				ns					ns				ns				ns		1
Cephalopholis urodeta	■		■	■	■	ns		■			ns				ns				ns		5
Epinephelus sp.						ns	■				ns				ns				ns		1
Epinephelus fasciatus						ns		■			ns				ns				ns		1
Plectropomus areolatus		■				ns					ns				ns				ns		1
Siganidae (Rabbitfish)																					
Siganus aregenteus	■					ns					ns				ns				ns		1
Sphyraenidae (Barracudas)																					
Sphyraena forsteri	■	■	■	■	■	ns			■		ns				ns				ns		10
Syngnathidae (pipefishes) subfamily Syngnathinae (Pipefishes)																					
Corythoichthys sp.			■	■	■	ns					ns				ns				ns		3
Synodontidae (Lizardfishes)																					
Saurida gracilis	■					ns					ns				ns				ns		1
Tetraodontidae (puffers)																					
Canthigaster solandri			■	■	■	ns		■			ns				ns				ns		4
Cathigaster valentini						ns	■		■		ns				ns				ns		2
Zanclidae (Moorish Idol)																					
Zancluis cornutus	■		■	■	■	ns	■	■	■		ns				ns				ns		7
total number of species	39	27	48	44	42	ns	56	47	51	46	ns	47	43	38	ns	38	38	37	ns	38	

Numberof fish species that fall under each trophic level.

Fiscal Year	1990				1991				1992				1993				1994			
quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Herbivore	14	11	8	8	8	ns	15	15	15	16	ns	16	12	11	ns	11	11	11	ns	10
Carnivore	18	10	24	21	21	ns	29	22	25	23	ns	24	23	20	ns	20	20	19	ns	19
Invertivore	16	8	23	20	20	ns	27	22	24	23	ns	23	22	19	ns	19	19	19	ns	18
Planktivore	5	2	8	7	7	ns	4	5	4	3	ns	3	3	3	ns	3	3	3	ns	3
Omnivore	1	1	1	1	1	ns	0	0	0	0	ns	0	0	0	ns	0	0	0	ns	0
Corallivore	1	3	6	7	4	ns	7	5	7	5	ns	5	4	4	ns	4	4	4	ns	4

DISCUSSION

There were significant changes in percentage of cover by four benthic groups (bare substrate, turf algae, coral and coralline algae) at the Agana site, over the survey period (August 1989 until September 1994). The final Biological Monitoring Report of Three Sewage Outfalls on Guam, (Richmond et al., 1994) states that there has been an increase in the amount of bare substratum, and that some of this may be attributed to the typhoons that have hit in the last few years of the surveys. There were several Typhoons during the period that biological monitoring was conducted. Typhoons cause a physical assault on coral reefs from wave action, sediment laden runoff and a disruption in water quality. A list of the typhoons, the month and year in which they occurred are given in Table 4.

The increase in bare substratum was found to be statistically significant for all three transects. We found that the major increase in bare substratum occurred in mid to late 1992, and correlated with a decrease in turf algae cover. That year the island of Guam was hit by five typhoons. The decrease in turf algae is likely to be a result of these typhoons and grazing pressure by herbivorous fishes. The presence of an outfall would tend to increase the presence of turf and macro algae rather than cause a decrease in its cover, because of the possible increases in nutrient laden wastewater.

Table 4. Typhoons within 100 miles of Guam from 1980 until 1993.

Typhoon Name	Month	Year	Maximum Intensity
Andy	April	1989	155 mph
Koryn	January	1990	75 mph
Russ	December	1990	140 mph
Yuri	November	1991	175 mph
Omar	August	1992	120 mph
Brian	October	1992	75 mph
Elsie	November	1992	105 mph
Hunt	November	1992	75 mph
Gay	November	1992	100 mph

source: National Weather Service, Tiyan, Guam.

Statistically we found that there was a significant increase in coral cover along all three transects at the Agana site. Richmond, et al (1994) note that there has been no coral recruitment evident from the present studies. Because of this the increase in coral cover can be attributed to coral growth rather than recruitment. No studies on coral recruitment at Guam's ocean outfalls has been done to date. There was also a significant increase in the percent cover by coralline algae at the 0 m transect. Coralline algae are one of the major substrates that coral larvae will settle and grow on. Although, the whole reef line along Agana Bay is very poorly populated by coral, the fact that we are seeing an increase rather than a decrease in coral cover and coralline algae is a positive sign. Yet it is very difficult to ascertain weather there is still any adverse affects on such things as coral recruitment and growth, because there were no benthic surveys done in areas of the reef that are not impacted by the discharge.

As mentioned previously there were several typhoons during the period that biological monitoring was conducted. When comparing the changes in percent cover of the six benthic categories after the occurrence of a single, or series of typhoons, it is possible to correlate some of these changes with the typhoons. Most obvious are the large increases in the percentage of bare substrate, and a reduction in the percentage of turf algae and coral cover afterwards. However, after the 1992 typhoons coral cover increased. This may be as a result of the decrease in the high cover of turf algae, allowing for growth and recruitment of the more resilient coral species. Similar changes in the percent cover of bare substrate and turf algae occured at the Northern District Outfall site over the same survey period. This tends to support the hypothesis that these changes in benthic cover were as a result of natural disturbances rather than the discharge itself. However, caution must be taken in making any assumptions as to how the typhoons, and grazing pressures have effected the

benthic community in the area of the outfall, as there is no data from control sites outside the discharge area with which to make a comparison.

Water quality monitoring of the receiving waters conducted quarterly basis since 1989 has not indicated that the discharge has had a detrimental impact on the quality of the receiving waters. The water quality parameters monitored include; pH, salinity, temperature, turbidity, dissolved oxygen, and fecal coliform. In general the results are within an acceptable range when compared to the control site, with the exception of the indicator bacteria fecal coliform, which was often elevated in the discharge area. There has been no reported incidences of mass fish or invertebrate mortalities, disease in organisms or any other adverse biological impacts related to the discharge.

In general results from both the water quality and biological monitoring have not indicated that there has been any adverse effects on the coral reef environment from the discharge at Agana Bay. The increase in the percentage of benthic cover by coral and coralline algae, and the results of the fish surveys are positive signs of reef health. The increase in bare substrate and the decrase in turf algae cover occurred at both the Tanguisson and Agana sites, and is likely to be as a result of natural disturbances rather than the discharge itself.

APPENDIX

Appendix
Species list and percent cover along the 0 meter transect at Agana Outfall

SPECIES OR GROUP	PERCENT COVER															
	8/29/89	11/21/89	4/6/90	6/14/90	10/4/90	12/6/90	8/3/91	12/27/91	4/10/92	8/3/92	12/3/92	3/29/93	8/16/93	1/12/94	5/26/94	9/2/94
Padina sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Tunicate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
Soft coral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
Favites sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porites lutea	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Milliopora	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goniastrea sp.	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Galaxea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pocillopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00
Astreopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00
Halimeda discoidea	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goniopera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fungia	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00
Leptastrea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.78	0.00
Cyptastrea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00
Galaxaura sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00
Thelanota ananas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
Halymenia	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dictiota sp.	0.00	0.00	0.00	0.13	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Neomeris sp.	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.53	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Hydroids	0.00	0.00	0.00	2.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Favia sp.	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.15	0.39	0.00	0.39	0.13	0.00
Montipora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.78	0.39	0.00	1.43	0.00
Sponge	3.03	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porites sp.	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	1.05	1.29	0.69	1.04	0.65	2.99	2.47	1.30
Schizotrix sp.	0.00	0.00	0.00	0.00	5.97	1.43	5.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda sp.	0.00	0.00	0.00	0.00	9.35	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda opuntia	2.76	0.00	0.00	0.26	0.00	0.00	3.95	9.34	6.45	4.03	0.47	1.17	1.82	8.31	6.62	0.26
Coralline Algae	0.00	1.77	0.00	11.95	0.00	3.90	0.00	1.18	0.53	0.00	6.78	4.03	4.94	6.36	10.65	5.19
Bare	17.90	0.00	1.82	1.56	1.69	8.18	9.21	76.72	74.34	53.65	84.44	66.75	76.75	70.39	41.30	4.42
Turf Algae	76.32	97.73	96.62	82.21	81.30	79.22	81.05	11.58	16.84	39.60	7.24	22.47	15.45	11.17	18.57	87.53

Appendix
Species list and percent cover along the 20 meter transect at Agana Outfall

SPECIES OR GROUP	PERCENT COVER															
	8/29/89	11/21/89	4/6/90	6/14/90	10/4/90	12/6/90	8/3/91	12/27/91	4/10/92	8/3/92	12/3/92	3/29/93	8/16/93	1/12/94	5/26/94	9/2/94
Acrhelia horrescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Chrysophycea	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fungia sp.	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porites lutea	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asteopora	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jania sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ceramiales	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goniopera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gracilaria sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00
Sponge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00
Leptoseris	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Enteromorpha sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00
Soft coral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00
Pocillopora	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavona sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
Favia	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.37	0.00
Goniastrea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.78	0.00	0.13
Padina	0.00	0.00	0.26	0.26	0.00	0.00	0.00	0.00	0.26	0.78	0.00	0.00	0.00	0.00	0.00	0.00
Leptastrea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.52	0.00	0.26
Culcita sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.08	0.00	0.00
Porites rus	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	2.08	0.00	1.04	0.26	2.34	0.00	0.00
Neomeris	0.00	0.00	0.00	3.51	0.00	0.00	0.00	0.92	0.13	2.05	0.24	0.00	0.00	0.00	0.74	0.00
Liagora sp.	0.00	1.71	0.00	6.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Galaxaura sp.	2.24	0.79	7.15	0.00	2.21	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00
Montipora sp.	0.00	0.00	0.00	0.00	1.00	2.60	0.00	1.32	0.92	0.00	0.00	0.78	2.73	0.65	4.08	0.00
Porites sp.	0.00	0.00	1.69	0.78	6.10	1.04	0.00	0.00	0.00	0.00	1.89	0.00	0.00	0.00	1.48	1.69
Halimeda discoidea	0.92	0.00	1.82	0.00	0.00	0.00	9.60	6.05	8.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Schizothrix	0.00	0.00	1.95	0.00	31.82	2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda sp.	0.00	0.00	0.00	12.60	12.21	14.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.99	0.00	0.00
Coralline Algae	0.00	13.95	1.30	0.00	10.00	0.00	1.20	0.00	0.26	7.02	4.44	4.03	5.71	0.00	1.11	3.90
Halimeda opuntia	0.53	4.61	4.68	0.00	0.00	0.00	0.00	0.00	0.00	19.37	5.93	1.17	12.08	0.00	11.87	10.52
Turf Algae	65.66	73.81	60.88	65.07	13.25	80.00	28.80	8.02	9.47	36.59	49.04	12.99	24.94	12.08	13.73	71.17
Bare	30.53	4.61	19.75	11.56	12.47	0.00	59.40	83.43	79.48	31.47	37.16	78.18	54.29	68.57	66.05	11.43

Appendix.
Species list and percent cover along the 50 meter transect at Agana Outfall

SPECIES OR GROUP	PERCENT COVER															
	8/29/89	11/21/89	4/6/90	6/14/90	10/4/90	12/6/90	8/3/91	12/27/91	4/10/92	8/3/92	12/3/92	3/29/93	8/16/93	1/12/94	5/26/94	9/2/94
Chrysophycea	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Faviidae	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stichopus chloronotus.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
Favites	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00
Pocillopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00
Gracilaria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00
Herpolitha sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00
Echinostrephus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00
Leptastrea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00
Porites lutea	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Astreopora	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.52	0.00	0.00
Desmea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00
Dictyota	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Echinotrixs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21	0.00
Goniastrea sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
Favia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.65	0.00	0.00	0.00	0.78	0.13	0.39
Neomeris sp.	0.00	0.00	0.91	0.39	0.00	0.00	0.00	0.79	0.39	0.52	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda disoidae	2.44	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Padina sp.	0.00	0.00	2.73	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montipora sp.	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	2.24	0.26	0.54	0.00	0.00	0.00	0.00	0.26
Porites sp.	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	1.30	1.95	1.56	0.00	1.95
Porites rus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.24	0.00	0.26	0.39	0.00	0.00	1.56	0.00	0.00
Schizotrix sp.	0.00	0.00	0.26	0.00	2.80	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda sp.	0.00	0.00	0.00	0.00	5.00	8.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Liagora	0.19	3.42	14.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coralline Algae	0.00	1.05	1.43	0.00	0.00	0.78	0.66	0.39	1.58	0.39	1.93	1.30	2.21	2.08	1.43	3.64
Galaxaura sp.	8.83	0.92	5.59	5.32	0.00	1.43	0.00	5.66	0.79	0.00	0.15	4.29	1.30	2.60	0.00	0.00
Halimeda opuntia	0.00	3.29	1.30	3.38	0.00	0.00	6.58	6.18	9.21	13.65	5.77	8.57	9.22	10.39	24.16	9.48
Bare	22.19	11.58	22.46	15.46	5.00	9.48	9.34	2.10	30.41	23.78	80.37	60.13	70.65	60.52	56.49	24.42
Turf Algae	66.17	79.07	50.76	74.15	82.21	68.43	83.42	75.01	54.07	58.93	9.39	24.03	13.51	21.30	14.03	59.48

APPENDIX A

Outfall Repair Information

C. Agana Outfall

The Agana outfall is existing and is the main discharge point (until completion of the Northern District Sewer System) for wastewaters collected in Area V. It is 36 inches in diameter extending some 3,500 feet offshore and discharging at a depth of 85 feet. It s present theoretical peak discharge capacity is 13 MGD assuming Mannings's "n" of 0.015 and onshore hydraulic control at elevation plus 10, the elevation of the existing Agana Pump Station discharge side.

The Agana Sewage Treatment Plant, when completed, will utilize the same ocean outfall. Its capacity will be increased to a peak of 21 MGD by construction of an effluent pumping station.

Recent major storms passing over or near Guam have resulted in damage to existing ocean outfalls. In mid 1976, just after the passage of Super-Typhoon Pamela over Guam, a team of divers inspected the Agana outfall. These divers were primarily personnel of the Guam Environmental Protection Agency and a detailed report of their findings, including underwater photographs, is available at the GEPA offices. Following is a brief description of this survey.

Damage observed on the reef flat was minor. It appeared to have been a result of high water levels and small waves. There was no evidence of the extensive scouring and breakage normally associated with heavy wave activity. This might be expected since the reef margin far offshore was taking the brunt of the surf.

The outfall is buried as it traverses the reef flat on its way to the reef margin. Since this profile offers no restriction to wave and current, there was no observed damage.

At the reef margin the reinforced concrete pipe emerges from the substrata due to a rapid drop to the submarine terrace. The outfall is encased in solid concrete from the reef margin to a depth of 15 feet on the terrace undermine the outfall and its protective cap from the 30 to 40 foot depths. In the center of this zone the excavation reaches dimensions of approximately 5 feet deep and 15 feet wide. The outfall and protective concrete cap remain exposed in some places; however, most of the protective covering has cracked and fallen away from the pipe. The pipe itself is still intact.

The next zone, that stretch of pipe between the 40 and 50 foot contours, shows almost no damage. The outfall in this zone is trenched and capped as before but has almost no erosion along the sides. This is possibly decreased bottom gradient.

Proceeding offshore the concrete cap ends and the outfall pipe is trenched and buried in natural material. No damage was observed in this area; in fact, it was nearly impossible to tell where the pipe had been place. A section of construction boom was observed lying adjacent to and parallel with the outfall. It was interesting to note that a large number of coral colonies had become established on the upper portions of this artificial reef.

The diffuser nozzles and the end of the outfall are located at the very end of a projection of the submarine terrace at a depth of 85 feet. The submarine topography at this point drops precariously to the depths. The diffuser section of the outfall showed no signs of damage. As this survey indicates, the Agana outfall is still in operable condition.

Outfall Repair Information

AGI INTERNATIONAL

AGI & ASSOCIATES
...EAN ENGINEERING · MARINE SCIENCES

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NAVAL STATION GUAM
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PAGER (671) 472-01440
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Dammy
File

January 30, 1989

RECEIVED
JAN 31 198
P. U. A.
Engineeri

Public Utility Agency of Guam
P.O. Box 3010
Agana, GU 96910

RE: Agana Sewer Outfall Repair Project
Final Acceptance

Attn: Mr. Geoff Keeler

Dear Mr. Keeler;

As of January 17, 1989, our office was notified by Healy-Tibbits of the completion of all construction repairs required by their company per the current contract. On January 18, 1989, an underwater inspection of the outfall was performed by our firm for the entire length of the pipe from STA 22+00 to STA 30+00. Thorough inspection of the this area revealed the following:

STA 22+00 TO STA 23+05:

The east side of the pipe shows good consistent coverage. The protective shell of armor stone is securely locked in place with new tremie concrete. All concrete surfaces are hard and tightly bonded to existing portions of firm concrete and reef.

STA 23+50 TO STA 23+75:

The west side of the pipe jacket has been repaired with armor stone and new tremie concrete. The portion of exposed pipe discovered in this area has been completely

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SEATTLE, WA
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covered. The tremie concrete has been brought up to the top of the pipe jacket and is securely bonded to the existing stones and reef in this area. All tremie surfaces are hard and show good quality concrete on the exposed face.

STA 24+30 TO STA 25+60:

The replacement portion of pipe between STA 24+67 and STA 25+15 is very well covered. The protective shell of armor stone consists of stones weighing approximately 2 to 3 tons and being 4 to 5 feet in diameter. All stones are locked tightly into place with tremie concrete to further protect the pipe. Concrete coverage above the pipe is a minimum of eighteen inches and a maximum of approximately twenty-four inches. The small sewage leak that was discovered on December 29, 1988, has been successfully sealed and shows no signs of leakage. All of the areas that showed deterioration due to scour have been completely filled with tremie and tied into the trench wall to form a tightly bonded seal between the new and existing material.

STA 25+72 TO STA 25+90:

Concrete coverage in this area is also good. Armor stone placed on both the east and west sides of the pipe is tightly secured with tremie and a minimum coverage of eighteen inches of concrete is provided over the previously exposed portion of pipe. All concrete surfaces are hard and tightly bonded to the existing tremie and reef surfaces.

STA 28+70 TO STA 28+90:

Previously exposed portions of the pipe have been adequately covered in this area with a cap of new tremie concrete. This cap provides a minimum coverage of eighteen inches. Its surface is hard and establishes a tight bond between the existing tremie and the new tremie cap.

Year gets off to bad start with Roy

By PAT COUNSELL
Daily News Staff

Typhoon Roy made January 1988 a month to remember. Packing winds of up to 150 mph, it ravaged Guam and Rota in the Northern Marianas.

The unusual January typhoon passed within about 30 miles of Guam on Jan. 12, leaving in its wake downed power lines, water outages, debris clogged roads, roofless homes and more than $20 million in damage.

Estimates placed losses at $23.5 million on Guam and more than $4 million on Rota. A total of 45 homes were destroyed on Guam, 94 had major damage and more than 800 had minor damage. Out of 450 homes on Rota, 81 were destroyed and another 250 damaged.

No deaths and only a handful of injuries were attributed to the storm. Authorities on Guam and Saipan credited early storm warnings for the low injury count.

The storm also took its toll on agriculture on the islands. Farmers in southern Guam reported crops damaged and on Rota, even some coconut trees were destroyed.

Before it hit Guam, Tropical Storm Roy rolled through the Marshall Islands, leaving an estimated 3,500 homeless and killing one man. The man died of injuries received when he was blown off his roof.

Guam Power Authority cut electricity to its 27,000 customers to prevent damage during the typhoon and several days passed before GPA was able to restore all power on the island.

The typhoon put a damper on many vacations and forced Tumon hotels to come up with an impromptu slate of indoor activities, including aerobics and hula lessons, to keep stranded guests busy.

Guam Memorial Hospital hosted 47 expectant mothers who were advised to wait out the storm at GMH. The drop in barometric pressure during a typhoon may possibly induce labor.

Triplet boys were born to Elpidia Barcinas the night of Jan. 11.

Another one of eight babies born at GMH during the storm will remember Typhoon Roy as well as he remembers his own hame.

Bao Roy, which means Typhoon Roy in Vietnamese, was born to Triet Kin Nguyen and Phong Quoc Tran on Jan. 12.

The typhoon kicked up the surf in Talofofo Bay, where about 20 die-hard surfers braved the wind-whipped waves before the storm reached its peak.

Daily News file photo

Waves crash against Tumon's shores while coconut trees bowed in the direction of Typhoon Roy's 150 mph winds as Roy made his approach to Guam.

Before the typhoon struck, island businesses reported brisk sales of batteries, canned goods, candles, water and other storm staples.

The aftermath cleanup produced another flurry of business activities especially at hardware stores and lumber yards. Big sellers the day after: water, ice, wet-dry vacuums and fast foods made at outlets with their own generators.

Public schools remained closed for about a week, due in part to the storm and in part to lack of water service.

Roy also damaged a pipe carrying treated sewage from the Agana treatment plant. The ruptured pipe was blamed for higher than usual levels of pollution in East Agana Bay. Health officials ordered the bay closed to recreational activities in September.

Jerry Henkel / Daily News Staff

BIG ROLLERS — Two tourists turn their backs to avoid spray in their faces yesterday as they stand on rocks near the Agana Boat Basin. Winds whipped the surf into huge waves ideal for the surfer in the water. The area is closed to water sports because of pollution. *Related photo on Page 3.*

PACIFIC DAILY NEWS, Wednesday, September 14, 1988

Police confiscate surfboards

By KEN OLA
Daily News Staff

Police yesterday picked up four surfers at the Agana Boat Basin and confiscated their boards.

The police released the four with a warning and returned their surfboards.

"If I have to stop guys out there and you're involved, I'll take it (the board) away. And you'll have to get it out of court. If I have to arrest you, I will," Officer F.C. San Nicolas told the surfers.

Yesterday's incident was the first time police have confiscated the surfboards, San Nicolas said.

He said the surfers were repeatedly warned before police, in a Zodiac boat, went after them.

The four surfers protested how police took them in. Tony Aguon of Tamuning said police grabbed the surfboards.

He asked San Nicolas whether there is a law that

Please see SURF, Page 4

Jerry Henkel / Daily News Staff

Ed Laquato raises his hands in jubilation as he completes a run down a big wave at the Agana Boat Basin. At least 20 surfers yesterday answered the call of the surf, kicked up by Typhoon Hal, and took to the waves in the polluted basin.

Basin surfers to be arrested

By BRIAN PERRY
Daily News Staff

Police may arrest or fine surfers who refuse to heed warnings today to stay out of polluted waters at the mouth of the Agana Boat Basin.

Police announced yesterday that they would "immediately begin enforcing the Agana Boat Basin Regulation prohibiting certain 'in-water' activities within the Agana Boat Basin."

Violators could be arrested and fined as much as $1,000, he said.

The grossly polluted waters in the area have been placed off limits by the Department of Public Health and Social Services and the Guam Environmental Protection Agency.

A sewer outfall pipe, which was damaged by Typhoon Roy on Jan. 12, has been spewing residue of treated sewage from the Agana sewage treatment plant.

Citing Section 15515.9 of the Natural Resources and Recreation Title of the Administrative Rules and Regulations, Police Department spokesman Lt. Phil Dennis said "in-water" activities included bathing, wading, snorkeling, scuba diving and swimming in marina waters.

He said police consider the popular surfing area near the buoys outside the marina to be within the boundaries of the Agana Boat Basin.

Other polluted areas not within the boat basin are not affected by the law, he said.

PACIFIC DAILY NEWS, Wednesday, September 21, 1988

Opinion

Forum topic:

Polluted water

What went wrong with the sewer pipe in Agana Bay and why is it leaking eight months after it was damaged? Anthony Blas from the Public Utility Agency of Guam says the project is complex, expensive and can't be completed overnight. He says repairs are in the works. Surfer John P. Shook believes that the PUAG reacted much too slowly. Joey B. Cepeda writes that tourists expect sand, sun and sea — a clean sea. Joe Murphy says the all of Agana Bay needs to be looked at again. Our view is that the repairs took too long to get started.

Eight-month wait much too long

In January Typhoon Roy damaged the sewage outfall pipe that flows into the Agana Boat Basin area. It still is not fixed and continues to drain into and pollute the reef area.

For eight months the health and welfare of those who swim, fish or surf in the area has been threatened.

After eight months, the repairs should have progressed much further than they have.

Lack of money is not a good enough excuse. During the months the sewer pipe was draining into our ocean, various government agencies did not have too much trouble finding about a million dollars for the mother-daughter pageant. With a little redirected effort, the money to clean up our ocean could have been provided.

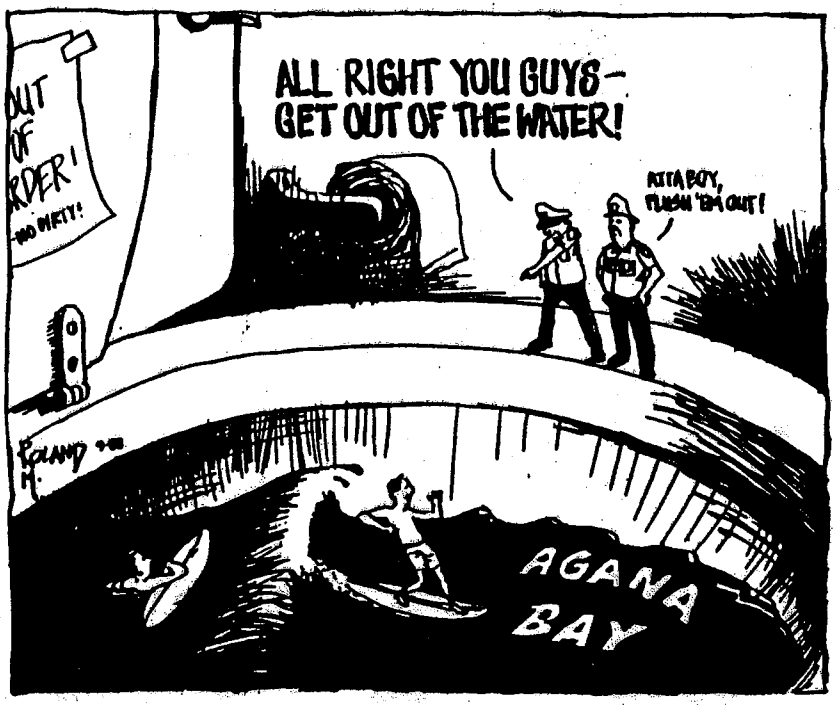
It seems the affair had to come to a crisis before our leaders finally took note of the gravity of the situation. The governor had to declare a state of emergency. We now have popular fishing, boating and surfing areas hopelessly polluted and placed off limits to the public. And we come to find that after eight months, some of the engineering work on the project still has to be completed before repairs can begin.

It is time to recognize the oceans and reefs as resources and take some steps to protect and preserve them. They are part of the Chamorro heritage politicians pay so much lip service to but do little to maintain. They are the draw that supports Guam's biggest economic base — tourism. They are the common assets that one generation hands over to the next.

The Public Utility Agency of Guam, the governor and the Legislature must act on this and other environmental concerns now. We've already seen what slow reaction can bring.

Next: Military bases

Next monthly forum topic will concern the possibility that



We've fouled our front yard

Pipe Dreams

Joe Murphy

I hate people who go around saying: "I told you so!"

So I'm going to do it myself. I told you way back, more than 12 years ago, that putting the sewage treatment plant in the middle of Agana Bay was a mistake. You can look it up. I wrote a number of editorials pleading with the Bordallo administration, the Guam EPA and the federal government to give this more thought.

My problem is that I came from the Midwest part of the country where they don't have oceans to look at and beautiful warm lagoons to swim in. Man, I thought, arriving on Guam, this is really paradise.

Then one day I saw a sign posted on the beach saying "No swimming — this beach area is polluted." I couldn't believe it. Guam has to sell to those half million visitors is the beauty of our island and the cleanliness of our ocean. When that is gone the people will quickly stop coming here.

I've always had a vision about Agana Bay stretching from Adelup Point to Oka Point. This should be Agana and Tamuning's front yard. It should not be commercial buildings, warehouses and car lots. It should be a park, with wide sidewalks, picnic tables, filled with trees and flowers, where people can sit and watch the boats come in and out of an

we have allowed our front yard to become polluted and bordered by massage parlors and beer joints. Some day we might even consider taking down that sewer island piece by ugly piece. We should also think about the Agana River, and clean it out, with park areas at the banks from the mouth of the river to the Agana swamp.

Up to this point our hotels and tourists are concentrated mainly in Tumon. Now we're seeing a different signal. We're beginning to see construction of beautiful hotels like the Palace along the bay, along with condos and apartments. It is time for a master plan of Agana Bay that would address the issues of pollution, construction and

Sewer pipe repair not a simple task

By ANTHONY C. BLAS

Recently with the health hazard declared for the Agana harbor area, there has been much said to question PUAG's lack of progress on the repair of the sewage line I would like to clear the air on what all of a sudden seems to be a less than satisfactory repair effort.

First, it is very important to understand the nature and extent of the necessary work. The problem is not just a broken pipe that a few divers with off-the-shelf materials can easily repair. The pipe is 36 inches inside diameter of 5-inch thick concrete and 48 feet of it is missing in an average depth of 30 feet. In addition, to make sure that normal cross currents don't damage the outfall, much less the tremendous typhoon pressure surges and currents that are all too common here, this new pipe must be anchored with a large number of 2- to 3-ton boulders and hundreds of cubic yards of poured-in-place concrete. This kind of construction will require the use of special equipment mounted on an ocean barge. This work is expensive and cannot be scheduled without significant lead time. In short, no temporary, quick-fix solution to this work appears feasible and the time required to diligently plan and complete this project successfully is indeed time well invested.

Consequently, our ongoing investigations with FEMA have been crucial to establish the most accurate typhoon-damage assessment of the outfall and to negotiate for the most FEMA funding possible, which was finally awarded in

Opposing view

mid-July.

Between mid-July and late August, our staff proceeded to prepare the bidding documents for the work. After months of routine sampling by PUAG and GEPA since Typhoon Roy, which indicated acceptable water quality in the harbor, tests conducted in late August determined that there was unacceptable contamination in the Agana harbor vicinity.

Fully realizing the public health danger this level of contamination poses, we issued a public notice on Sept. 1 warning of the health hazards in the vicinity of the harbor, and GEPA concurrently put up warning signs around the harbor. Since then we have proceeded with our plans to complete this important work as top priority. There has been no unexplainable delay or less than diligent endeavor on PUAG's part to date to provide a fully funded and totally effective repair project which this situation requires.

PUAG sincerely regrets the inconvenience that closing the Agana harbor to recreational use has had, but let us all try to make the best of this unfortunate legacy of Typhoon Roy's visit to Guam. With your patience, we hope to fully remedy the situation and prevent its future occurrence in the shortest amount of time.

Anthony C. Blas is chief officer of the Public Utility Agency of Guam.

Surfer says PUAG

PACIFIC DAILY NEWS, Saturday, September 24, 1988

PUAG gets Agana Basin sewer bids

By KEN OLA
Daily News Staff

The Public Utility Agency of Guam next week will decide which company will repair the sewer line dumping sewage into the Agana Boat Basin.

PUAG Chief Officer Anthony C. Blaz said four companies, two locally based and two others from off island, submitted proposals that were very competitive. The bids were opened Thursday.

"We've got very competitive proposals. They're all around the government estimate of about $1 million," Blaz said.

The four companies are:

- Manson Pacific, an off-island firm based in Long Beach, Calif., with over 80 years of experience in marine work;
- International Bridge, a local firm with about 20 years of experience in general construction within Micronesia;
- Black Construction Corp., an established local general contractor; and,
- Healy Tibbits, a West Coast engineering-construction company specializing in marine work with more than 100 years of experience.

PUAG's technical staff is evaluating the proposals and a decision should be made by the middle of next week, according to Blaz.

By then, Blaz said, the agency should be ready to issue a notice to proceed.

The major factor PUAG officials are considering in their evaluation is the firm's ability to finish the job quickly, Blaz said.

Blaz said PUAG wants the selected contractor to finish the job in 45 days.

The damaged portion of the Agana sewer outfall was discovered by Guam Environmental Protection Agency personnel, when they noticed a sewage discharge while on a routine inspection of the area in February, according to information from PUAG.

Further investigation by GEPA and PUAG revealed a missing 50-foot-long, 36-inch wide pipe.

The break has caused a continuous flow of sewage around the Agana Boat Basin area. However, Blaz said the sewage leaking out is treated, and not raw, which would have a lesser degree of pollution.

PACIFIC DAILY NEWS, Tuesday, September 27, 1988

Real issue is Agana sewage plant is overloaded

I had to wait and see the official government position in the Sunday opinion page about the Agana bay pollution problem before voicing my opinion. It seems that nobody, to date, has come up with the real issue yet; that the Agana sewage treatment plant is woefully overloaded and apparently dumping raw, untreated sewage into our ocean. It doesn't matter where the outfall is located. The treatment plant is supposed to do just what its name implies; treat the sewage so that its effluent is bacteria and contaminant-free, even drinkable if you search back and read some of the comments that were made by the government before and during the time the plant was being built. Please make the public aware of this far greater concern. Once the outfall pipe is fixed, the inner bay may get cleaned up. But it will only deposit the filthy, untreated, polluted gunk a little further out to contaminate our nearby deep water sport fish which, support another facet of our island's recreational facilities.

D.R. Edwards

PACIFIC DAILY NEWS, Wednesday, September 28, 1988

Sewer repair to top $1M

By E.MAX SLAVIT
Daily News Staff

The Public Utility Agency of Guam will spend more than $1 million to stop the flow of sewage from a damaged outflow pipe near the Agana Boat Basin within two months, according to PUAG Chief Officer Anthony C. Blaz.

Blaz said he had wanted the job finished in 45 days, but said the selected firm, Healy Tibbitts Construction Co., will complete all contract work within 100 days of the contract signing. He said the firm plans to replace the pipe, which was damaged by Typhoon Roy on Jan. 12, within about 55 days.

PUAG awarded the contract yesterday.

Once the pipe is replaced, sewage will again discharge at the end of the outfall 600 feet beyond the broken section into 90 feet of water, Blaz said.

The grossly polluted waters in the area have been placed off limits by the Department of Public Health and Social Services and the Guam Environmental Protection Agency. Guam Police Department officers threaten to arrest and fine surfers who continued to use the forbidden waters near the boat basin.

Healy Tibbetts won the bid over Manson Pacific of Long Beach, Calif., and two local companies — International Bridge and Black Construction Corp.

Blaz said the other bids were $150,000 to $340,000 higher.

The company was given a notice of award to do two projects totaling $1,051,800. The firm will replace the missing 48-foot section of outfall pipe for $810,500 and repair other sections damaged by the typhoon for $241,300. He said $515,000 of the cost will be paid by the Federal Emergency Management Administration, with the balance locally funded.

Healy Tibbetts Construction Co., which is more than a hundred years old, has done underwater pipework in the Philippines, Hawaii, the mainland and Athens, Blaz said.

Beach area still closed

The Agana Bay Public Beach from the Panasonic Shop and the areas east of the Agana Boat Basin Channel is still closed to the public until further notice. This area is closed to all swimming, fishing, diving and surfing due to gross pollution. The pollution levels recorded pose a significant risk to the health of persons in contact with the waters in the area.

The public is advised that non-adherence to this order or tampering with these signs is a violation of the law.

Pollution

Samples taken on Oct. 19 by the Guam Environmental Protection Agency showed that the following areas were polluted above the accepted bacteriological standard of 200 Fecal Coliform Colony Forming Units per 100 ml of sample.

They are: Merizo Pier, Santos Memorial Park, USO Beach, and Aqua World Marina.

In addition, GEPA announces that the Agana Bay samples for the week of Oct. 13-19 showed the following results are beyond the bacteriological standard.

West Agana Bay, 230 CFU/100 ml; Agana Boat Channel, 220 CFU/100 ml; Agana Boat Basin, 240 CFU/100 ml; Agana Boat Mouth, 280 CFU/100 ml; Bridge Box Culvert #2, 1,050 CFU/100 ml; and Bridge Box Culvert #3, 1,080 CFU/100 ml.

The public is advised not to swim or fish in polluted waters.

PACIFIC DAILY NEWS, Saturday, October 22, 1988

PACIFIC DAILY NEWS, Thursday, October 27, 1988

Agana sewage outfall fix ready in January

By KEN OLA
Daily News Staff

While the island's treated waste continues to spurt from a broken underwater pipe in Agana Bay, completion of repair work is not expected until January, almost a year since the break occurred.

Public Utility Agency, of Guam Chief Officer Anthony C. Blaz said the firm hired on contract to repair the pipe so far has conducted depth measurements of the boat channel and submitted plans for installation of the new pipe.

A missing 50-foot-long, 36-inch-wide section of pipe along the sewer outfall, damaged by Typhoon Roy in January, is causing sewage at the Agana sewage treatment plant to spill out to shallow water just around the channel.

The break is not expected to be fixed until sometime in January, according to Blaz.

Healy Tibbetts, a San Francisco-based firm, was awarded the repair contract after submitting the lowest bid. The project, which includes upgrading other portions of the sewage line, will cost $1,051,800, Blaz said.

The area has been declared polluted and off-limits to swimmers, boaters, surfers and fishermen by the Guam Environmental Protection Agency and the Department of Public Health.

Blaz said the repair company's barge, equipped with a crane and other sophisticated machinery, is en route to Guam. It left Honolulu on the weekend and is expected to arrive early next month.

"They have to mobilize all this equipment which is not available on Guam," Blaz said. He said work will commence immediately after the barge arrives.

The company was given a notice to proceed on Oct. 14 and it has 100 days to complete the project.

"The entire project will be completed by no later than Jan. 4 ... The repair of the damaged outfall itself will be completed by the first or second week of December," he said.

Blaz said the contract stipulates the critical part be done within 55 days. The second phase of the project includes upgrading other portions of the sewage pipe.

Blaz said he wanted to dispel perceptions that the agency did not consider getting the outfall repaired a top priority.

The problem was discovered in February, he said, but tests then showed there was no contamination of the water. Federal experts were brought in to help study the damage and to draw up engineering designs for repair of the outfall.

"These things don't happen overnight. We had to bring in a lot of experts from off island because we don't have the experts in-house," he said.

PACIFIC DAILY NEWS, Saturday, November 26, 1988

Agana pipe repair

Work is, at last, under way to replace a 48-foot section of the Agana wastewater treatment plant. It is hoped that the broken outfall pipe will be repaired by mid-December.

The firm's diving crew arrived last week, followed by a company tug boat and barge. Work crews will operate off the barge at the end of the outfall. This is a $1 million emergency project of great importance to Guam. The pipe was destroyed almost a year ago, when Typhoon Roy struck the island in January.

The pollution caused by the pipe breakage has been terrible, bringing coliform levels to 300 times the level deemed safe. It has caused the banning of fishermen, surfers, divers and swimmers in that Agana Bay and Agana boat channel area. It is hoped that the second phase of the project will renovate and extend the outfall pipe and eventually end the pollution levels.

This whole episode is sending a message to Guam. Our entire economy is based on tourism. We can't afford pollution of any type, especially that which bans water sports. Our island's future depends on clean waters and beaches. Our planning must take this into consideration. No more pollution. Let's clean up our act. JCM.

PACIFIC DAILY NEWS, Wednesday, December 14, 1988

GEPA keeps Agana Bay clos

By E. MAX SLAVIT
Daily News Staff

Agana Bay will remain closed until the Guam Environmental Protection Agency decides bacteria levels are in the acceptable range, according to Administrator Chuck Crisostomo.

He said GEPA will catch fish this week in the bay and send them to Dr. Robert Haddock, territorial epidemiologist, for analysis. GEPA is looking for fecal coliforms that indicate disease-carrying bacteria, he said.

Haddock said two people have died from cholera after eating fish from Agana Bay. One death was in May; the other was 14 years ago. Both people suffered stomach ailments which negated gastric acids that normally kill the bacteria, he said.

Tony Blaz, Public Utility Agency of Guam chief executive officer, said the damaged pipe was sealed Wednesday and tests by PUAG indicated the water was safe. He said he asked Crisostomo to open the bay, but was refused.

The pipe, ruptured in January 1987 during Typhoon Roy, empties into 90 feet of ocean approximately 800 feet outside the reef, according to Blaz.

GEPA will take weekly samplings of the bay until the middle of next y ing to Crisostomo.

"We're not sure how often this. This is new to us and it wi quickly the waters can re selves," he said.

One remaining problem is t system on the end of the sew pipe, he said. Six diffusers clogged and the end cover of t been missing since the early 197

"We will have to reconstruct the pipe and add more diffu lengthened pipe," he said.

PACIFIC DAILY NEWS, Friday, December 23, 1988

Beach areas polluted

Samples taken on Dec. 21 by the Guam Environmental Protection Agency showed that the following areas were polluted above the accepted bacteriological standard of 200 Fecal Coliform Colony Forming Units per 100 ml of sample.

These areas include San Vitores Beach, Sleepy Lagoon, Padre Palomo Park, Dungca's Beach, Agana Boat Basin, Asan Bay, North Asan Bay, Piti Park, and Santos Memorial Park.

Agana Bay area is still closed to all recreational activities until further notice. The public is advised not to swim or fish in polluted waters.

PACIFIC DAILY NEWS, Thursday, March 23, 1989

GEPA: Agana Bay safe for recreation

By WENDI ELDH
Daily News Staff

The Agana Boat Basin is safe for recreational water activities, according to Guam Environmental Protection Agency officials. Fish and shellfish caught there, however, should not be eaten raw, officials said yesterday.

In an afternoon press conference at GEPA, acting administrator Fred Castro said the bay has been reopened after more than six months of closure prompted by bacteriological contamination.

The contamination was discovered a year ago, about three months after Typhoon Roy on Jan. 12 ripped away a piece of sewage outfall pipe.

The break allowed treated sewage to be released at shallower depths and then, carried by currents, back over the reef and into the bay and surrounding areas.

While GEPA officials warned only against eating fish from Agana Bay, Robert Haddock, territorial epidemiologist for the Department of Public Health, yesterday recommended that no reef or shellfish caught on Guam be eaten raw.

Haddock explained the most common cause of food poisoning is Vibrio parahaemolyticus.

"It is not associated with contamination from sewage," Haddock said. "This germ lives in the ocean normally."

Levels of fecal coliform in the bay have generally been low but GEPA officials said some early morning and evening samples have been slightly higher than the acceptable level of 200 colonies per 100 milliliters of water.

Mel Borja, GEPA's head of surveillance, said the higher levels are probably caused by rainfall runoff. Also, daytime levels of the germ are reduced by the ultraviolet rays in sunlight, Borja said.

Officials yesterday thanked the public for responding to an order that prevented water activities since the Sept. 7, 1988 closure, but joked about the difficulty the agency faced in keeping fishermen out.

"You know, fishing is a very cultural thing," Borja said. "It was hard to stop them."

Gary Stillberger, head of GEPA's environmental review section, said posted signs warning of the dangers of the contaminated bay "mysteriously" disappeared.

"We had trouble keeping those signs up overnight," he said, laughing. "They just kept disappearing."

Population Information

APPENDIX B

Population Information

POPULATION AND VITAL STATISTICS

TABLE PO 1
POPULATION AND HOUSING BY ELECTION DISTRICTS

Election Districts	POPULATION 1990	1980	1970	Percentage change 1980-1990	1970-1980	HOUSING UNITS 1990	1980	1970	Percentage change 1980-1990	1970-1980
GUAM	133,152	105,979	84,996	25.6	24.7	35,223	28,249	16,680	24.7	69.4
Agana	1,139	896	2,119	27.1	-57.7	416	384	515	8.3	-25.4
Agana Heights	3,646	3,284	3,156	11.0	4.1	1,008	971	669	3.8	45.1
Agat	4,960	3,999	4,308	24.0	-7.2	1,300	990	819	31.3	20.9
Asan	2,070	2,034	2,629	1.8	-22.6	620	589	581	5.3	1.4
Barrigada	8,846	7,756	6,356	14.1	22.0	2,140	1,930	1,307	10.9	47.7
Chalan Pago-Ordot	4,451	3,120	2,931	42.7	6.4	1,047	738	526	41.9	40.3
Dededo	31,728	23,644	10,780	34.2	119.3	7,541	5,558	2,285	35.7	142.2
Inarajan	2,469	2,059	1,897	19.9	8.5	553	455	321	21.5	41.7
Mangilao	10,483	6,840	3,228	53.3	111.9	2,699	2,067	740	30.6	179.3
Merizo	1,742	1,663	1,529	4.8	8.8	469	398	271	17.6	46.9
Mongmong-Toto-Maite	5,845	5,245	6,057	11.4	-13.4	1,742	1,490	896	16.9	66.3
Piti	1,627	2,866	1,284	-36.3	123.2	554	503	239	10.1	110.5
Santa Rita	11,857	9,183	8,109	29.1	13.2	2,343	2,253	1,610	4.0	39.9
Sinajana	2,658	2,485	3,506	7.0	-29.1	712	619	680	15.0	-9.0
Talofofo	2,310	2,006	1,935	15.2	3.7	548	445	350	23.1	27.1
Tamuning	16,673	13,580	10,218	22.8	32.9	6,296	4,788	2,208	31.5	116.8
Umatac	897	732	813	22.5	-10.0	188	147	130	27.9	13.1
Yigo	14,213	10,359	11,542	37.2	-10.2	3,686	2,898	2,056	27.2	41.0
Yona	5,338	4,228	2,599	26.3	62.7	1,361	1,026	467	32.7	119.7

Note: Includes non-immigrant aliens and members of the U.S. Armed Forces and their dependents living on post.
Source: U.S. Bureau of the Census; Department of Commerce, Government of Guam.

TABLE PO 2

POPULATION PROJECTIONS BY ELECTION DISTRICT
(Based on percentage distribution and annual rate of increase)

Election Districts	Percent Distribution 1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
GUAM	1.00000	136,226	139,371	142,589	145,881	149,249	152,695	156,220	159,827	163,517	167,292
Agana	0.00855	1,165	1,192	1,220	1,248	1,277	1,306	1,336	1,367	1,399	1,431
Agana Heights	0.02738	3,730	3,816	3,904	3,995	4,087	4,181	4,278	4,376	4,477	4,581
Agat	0.03725	5,075	5,192	5,312	5,434	5,560	5,688	5,819	5,954	6,091	6,232
Asan	0.01555	2,118	2,167	2,217	2,268	2,320	2,374	2,429	2,485	2,542	2,601
Barrigada	0.06644	9,050	9,259	9,473	9,692	9,915	10,144	10,378	10,618	10,863	11,114
Chalan Pago/Ordot	0.03343	4,554	4,659	4,766	4,876	4,989	5,104	5,222	5,343	5,466	5,592
Dededo	0.23828	32,461	33,210	33,977	34,761	35,564	36,385	37,225	38,084	38,964	39,863
Inarajan	0.01854	2,526	2,584	2,644	2,705	2,768	2,831	2,897	2,964	3,032	3,102
Mangilao	0.07873	10,725	10,973	11,226	11,485	11,750	12,022	12,299	12,583	12,874	13,171
Merizo	0.01308	1,782	1,823	1,865	1,908	1,953	1,998	2,044	2,091	2,139	2,188
Mongmong/Toto/Maite	0.04390	5,980	6,118	6,259	6,404	6,552	6,703	6,858	7,016	7,178	7,344
Piti	0.01863	2,537	2,596	2,656	2,717	2,780	2,844	2,910	2,977	3,046	3,116
Santa Rita	0.08414	11,463	11,727	11,998	12,275	12,558	12,848	13,145	13,449	13,759	14,077
Sinajana	0.01996	2,719	2,782	2,846	2,912	2,979	3,048	3,118	3,190	3,264	3,339
Talofofo	0.01735	2,363	2,418	2,474	2,531	2,589	2,649	2,710	2,773	2,837	2,902
Tamuning	0.12522	17,058	17,452	17,855	18,276	18,689	19,120	19,562	20,013	20,475	20,948
Umatac	0.00674	918	939	961	983	1,005	1,029	1,052	1,077	1,102	1,127
Yigo	0.10674	14,541	14,877	15,220	15,572	15,931	16,299	16,675	17,060	17,454	17,857
Yona	0.04009	5,461	5,587	5,716	5,848	5,983	6,122	6,263	6,407	6,555	6,707

Note: These projections assumed no in or out migration, that the rate of growth for the island remained constant, and that the proportion of the total population residing in each election district remained constant.
Source: Census and Population Division, Department of Commerce, Government of Guam.

PHYSICAL INDICATORS

TABLE PH1
METERED WATER CONSUMPTION
(Millions of Gallons)

Fiscal Year	Total	Residential	Commercial & Government	Agriculture & Irrigation
1987	5,275	3,409	1,579	287
1988	7,748	5,089	2,354	305
1989	5,307	3,619	1,490	198
1990	5,804	3,923	1,731	150
1991	6,301	4,372	1,740	189
1992	6,988	4,651	2,099	238
1993	6,924	4,579	2,001	344
1994	7,106	4,725	2,107	274
1995	7,525	4,809	2,292	424
1996	13,954	7,633	5,361	960

Source: Public Utility Agency of Guam, Government of Guam.

TABLE PH2

WATER METERS IN SERVICE

Fiscal Year	Total	Residential	Commercial & Government	Agriculture & Irrigation
1987	23,857	21,581	1,513	763
1988	24,751	22,463	1,575	713
1989	27,704	25,394	1,833	477
1990	29,806	27,318	2,003	485
1991	30,151	27,594	2,005	552
1992	30,791	28,155	2,087	549
1993	32,397	29,588	2,202	607
1994	33,042	30,098	2,303	641
1995	33,271	30,300	2,304	667
1996	34,804	31,725	2,456	623

Source: Public Utility Agency of Guam, Government of Guam.

TABLE PH3

WATER REVENUES
(THOUSANDS OF DOLLARS)

Fiscal Year	Total	Residential	Commercial & Government	Agriculture & Irrigation
1987	6,353	4,286	1,959	108
1988	6,633	4,448	2,097	88
1989	6,302	4,345	1,877	80
1990	7,147	5,064	2,024	59
1991	7,775	5,580	2,121	74
1992	8,517	5,886	2,540	91
1993	8,874	5,827	2,529	118
1994	8,841	5,953	2,788	100
1995	9,610	N/A	N/A	N/A
1996	30,432	16,741	13,274	417

N/A = Not Available. PUAG did not provide breakdown details.
Source: Public Utility Agency of Guam, Government of Guam.

DEPARTMENT OF THE NAVY
U.S. NAVY PUBLIC WORKS CENTER
PSC 458, BOX 193
FPO AP 96540-2937

IN REPLY REFER TO:
7000
Ser 152.22/760
March 4, 1998

Chief Officer
Guam Waterworks Authority
P.O. Box 3010
Agana, Guam 96910

Gentlemen:

We are forwarding the enclosed water tally for February 1998 for sewage billing per Contract No. 62766-72-C-0044.

The following water consumption for the sewage billing is based on meter readings from January 23, 1998 to February 23, 1998.

LINE NOS.	LOCATION	METER NO.	K/GAL USED TO NEAREST K
12	ADELUP RESERVOIR NIMITZ HILL	128067	6,904
19A-2	TIYAN CARETAKER SITE OFFICE	NONE	3
32	NRMC ROUTE #7 (PUAG)	1227131	9,360
32	NRMC Fire Department	8969915	10
36	TIYAN DPI	31950832	2,103
36	PWC HSG FAA NCS	15487926	11
26	N C T A M S	VARIOUS	26,825
		TOTAL	45,216

Sincerely,

R. S. WRIGHT
Acting Comptroller
By direction of the
Commanding Officer

Encl:
(1) Water Tally

Rec'd: 03/09/98

"SAFETY FIRST"

TABLE PU3

ACTIVE DUTY MILITARY, MILITARY DEPENDENTS, AND OTHER CIVILIANS
BY ELECTION DISTRICT: 1990

		Military Dependents					Military Dependents(%)			
Election District	Total	Active Duty Military	Of Active Duty Member*	Other Dependent	Other Civilians	Total	Active Duty Military	Of Active Duty Military	Other Dependent	Other Civilians
GUAM	133,152	11,952	12,149	3,049	106,002	100.00	8.98	9.12	2.29	79.61
Agana	1,139	20	14	31	1,074	100.00	1.76	1.23	2.72	94.29
Agana Heights	3,646	222	176	103	3,145	100.00	6.09	4.83	2.83	86.26
Agat	4,960	93	143	127	4,597	100.00	1.88	2.88	2.56	92.68
Asan	2,070	177	279	87	1,527	100.00	8.55	13.48	4.20	73.77
Barrigada	8,846	1,160	679	170	6,837	100.00	13.11	7.68	1.92	77.29
Chalan Pago/Ordot	4,451	21	64	154	4,212	100.00	0.47	1.44	3.46	94.63
Dededo	31,728	1,704	2,328	658	27,038	100.00	5.37	7.34	2.07	85.22
Inarajan	2,469	7	32	94	2,336	100.00	0.28	1.30	3.81	94.61
Mangilao	10,483	390	688	246	9,159	100.00	3.72	6.56	2.35	87.37
Merizo	1,742	2	31	75	1,634	100.00	0.11	1.78	4.31	93.80
Mongmong/Toto/Maite	5,845	235	297	110	5,203	100.00	4.02	5.08	1.88	89.02
Piti	1,827	214	33	105	1,475	100.00	11.71	1.81	5.75	80.73
Santa Rita	11,857	4,486	3,379	208	3,784	100.00	37.83	28.50	1.75	31.91
Sinajana	2,658	20	50	90	2,498	100.00	0.75	1.88	3.39	93.98
Talofofo	2,310	18	38	83	2,171	100.00	0.78	1.65	3.59	93.98
Tamuning	16,673	425	300	177	15,771	100.00	2.55	1.80	1.06	94.59
Umatac	897	5	28	45	821	100.00	1.56	2.90	5.02	91.53
Yigo	14,213	2,704	3,455	284	7,770	100.00	19.02	24.31	2.00	54.67
Yona	5,338	49	137	202	4,950	100.00	0.92	2.57	3.78	92.73

Note: "Other Dependents" are dependents of retired members of the Armed Forces of the United States, or of active-duty or retired members of the full-time National Guard or Armed Forces Reserve. "Other Civilians" are those who are not active-duty members of the Armed Forces, National Guard or Reserve. "Active-duty" does not include active-duty in the military reserves or National Guard for the 4-6 months of initial training or yearly summer camp.
* "Of active duty member" - either former or retired active duty member.
Source: U.S. Bureau of the Census 1990 CPH-6-G"Social; Economic and Housing Characteristics: Guam".

TABLE PU4

MILITARY EXPENDITURES
(Fiscal Year)

Expenditures	1994	1995	1996
Military Pay	$249,282,602	$350,000,000	$222,535,000
Civilian Pay	189,847,009	20,473,309	147,355,000
Military Construction	188,690,853	124,753,417	109,817,000
Petroleum Products Purchases	0	0	0
Other Purchases	106,459,657	314,520,840	N/A
Total Spending	734,280,121	809,747,566	479,707 P
Total Witholding Taxes	$47,273,204	$44,080,000	N/A

P = Preliminary.
Source: Commander Naval Forces Marianas; U.S. Department of Commerce, Economics and Statistical Administration, Bureau of the Census.

Discharge Monitoring Reports

APPENDIX C

Discharge Monitoring Report

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Public Utility Agency of Guam
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: Agana Sewage Treatment Plant
LOCATION: Agana, Guam

NATIONAL POLLUTANT DI[illegible]E ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITO[illegible]G REPORT (DMR)

Form Apr
OMB No. 20-[illegible]
Expires 3-31-88

(1-16) GU0020087 — PERMIT NUMBER

(17-19) 001 — DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	1	1	TO	97	1	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS

PARAMETER (32-37)		(3 CARD ONLY) QUANTITY OF LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	(4 CARD ONLY) QUALITY OF CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	8.3	9.1	mgd				mgd			cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	10186	15827	lb/d	44.6	149.4	217.0	mg/l		5/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5993	8096		26.9	88.0	111.0	mg/l	1	5/31	Comp
	PERMIT REQUIREMENT	8011	16022			80.0	160.0			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	6950	10853	lb/d	30.0	99.0	150.0	mg/l		16/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3915	5645		10.0	55.8	78.0	mg/l	0	16/31	Comp
	PERMIT REQUIREMENT	6008	12016			60.0	120.0			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0	0.4	1.1	ml/l	0	23/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	396	396	lb/d	5.9	5.9	5.9	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC
pH	SAMPLE MEASUREMENT				7.21	7.43	7.71		0	23/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

RICHARD A. QUINTANILLA
CHIEF OFFICER, PUAG

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)*

(REFERENCE ALL ATTACHMENTS HERE)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 479-7844 (AREA CODE NUMBER)

DATE

COMMENT AND EXPLANATION OF ANY VIOLATIONS
Monthly average BOD (mg/L) was exceeded.

PERMITTEE NAME/ADDRESS (
FACILITY NAME/LOCATION ... ERENT)

NAME: Public Utility Agency of Guam
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: Agana Sewage Treatment Plant
LOCATION: Agana, Guam

NATIONAL POLLUTAN ... ARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form ... ved
OMB No. 2040-000
Expires 3-31-88

(2-16)	(17-19)
GU0020087	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	2	1	TO	97	2	28
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS

PARAMETER (32-37)		QUANTITY OF LOADING (3 CARD ONLY) (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	QUALITY OF CONCENTRATION (4 CARD ONLY) (30-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	8.9	10.5	mgd				mgd	0		cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	9812	13836	lb/d	24	130	178	mg/l		20/28	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	6030	7725		28	81	102	mg/l	1	20/28	Comp
	PERMIT REQUIREMENT	8011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	6743	15235	lb/d	1	92	196	mg/l		20/28	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3757	7212		14	54	94	mg/l	0	20/28	Comp
	PERMIT REQUIREMENT	6008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0.2	0.5	1.0	ml/l	0	20/28	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	487	487	lb/d	6.3	6.3	6.3	mg/l		1/28	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.27	7.47	7.60		0	20/28	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

RICHARD A. QUINTANILLA
CHIEF OFFICER, PUAG

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE
671 479-7844
AREA CODE NUMBER

DATE

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)

EPA Form 3320-1 (rev. 10-79) PREVIOUS EDITION TO BE UNTIL SUPPLY IS EXHAUSTED

(REPLACES EPA FORM T-40 WHICH MAY NOT BE USED)

PERMITEE NAME/ADDRESS
FACILITY NAME/LOCATION (IF DIFFERENT)

NAME: Public Utility Agency of Guam
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: Agana Sewage Treatment Plant
LOCATION: Agana, Guam

NATIONAL POLLUTAI ARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form ...ved
OMB No. 2040-000
Expires 3-31-88

(2-16)	(17-19)
GU0020087	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	3	1	TO	97	3	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS

PARAMETER (32-37)		QUANTITY OF LOADING (3 CARD ONLY) (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	QUALITY OF CONCENTRATION (4 CARD ONLY) (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	8.3	8.8	mgd				mgd	0	21/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	12314	12770	lb/d	164	169	174	mg/l		2/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5251	6040	lb/d	62	72	82	mg/l	0	2/31	Comp
	PERMIT REQUIREMENT	8011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	8648	11228	lb/d	78	125	166	mg/l		21/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	4453	6384	lb/d	38	64	92	mg/l	1	21/31	Comp
	PERMIT REQUIREMENT	6008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0.2	0.5	1.0	ml/l	0	21/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	424	424	lb/d	6.1	6.1	6.1	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC
pH	SAMPLE MEASUREMENT				7.39	7.59	7.90		0	21/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITTLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
CHIEF OFFICER, PUAG
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION. I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)
(REFERENCE ALL ATTACHMENTS HERE)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE
671 479-7844
AREA CODE NUMBER

DATE
year mo day

COMMENT AND EXPLANATION OF ANY VIOLATIONS
We had problems in the analysis of B.O.D for the 11th and 18th , and could not use the results because of high blanks. The monthly average conc.(mg/l) for suspended solids was exceeded. The valves on the clarifiers are defective. Therefore, there is limited control on the amount of solids pumped out of the clarifiers. The valves are on order.

EPA Form 3320-1 (rev. 10-79) PREVIOUS EDITION TO BE UNTIL SUPPLY IS EXHAUSTED

(REPLACES EPA FORM 7-40 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: Agana Sewage Treatment Plant
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-88

PERMIT NUMBER	DISCHARGE NUMBER
GU0020087	001

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	4	1	TO	97	4	30

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS

PARAMETER		QUANTITY OF LOADING AVERAGE	MAXIMUM	UNIT	QUALITY OF CONCENTRATION MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW	SAMPLE MEASUREMENT	8.4	9.3	mgd					0	19/30	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	6264	7202	lb/d	75	92	112	mg/l		4/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	4754	5159	lb/d	56	69	78	mg/l	0	4/30	Comp
	PERMIT REQUIREMENT	8011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	8803	17053	lb/d	80	125	230	mg/l		19/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	4722	8302	lb/d	32	67	110	mg/l	1	19/30	Comp
	PERMIT REQUIREMENT	8008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0.1	0.5	0.9	ml/l	0	19/30	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	201	201	lb/d	2.9	2.9	2.9	mg/l		1/30	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.22	7.48	7.77		0	19/30	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITTLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 479-7844 (AREA CODE, NUMBER)

DATE: year mo. day

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)

Typhoon condition 2 on the 16th and the laboratory was closed until the 18th. Because of this no BOD samples were able to be run that week.
The monthly average concentration (mg/l) for suspended solids was exceeded. However there was no exceedences in the suspended solids loadings.

Explaination of exceedences are attached to the Agana STP DMRs, page 4 of 20

EPA Form 3320 (1) PREVIOUS EDITION TO BE USED. SUPPLY IS EXHAUSTED (REPLACES EPA FORM 7-90 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: Agana Sewage Treatment Plant
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-00

PERMIT NUMBER	DISCHARGE NUMBER
GU0020087	001

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	5	1	TO	97	5	31

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER		QUANTITY OF LOADING AVERAGE	QUANTITY OF LOADING MAXIMUM	UNIT	QUALITY OF CONCENTRATION MINIMUM	QUALITY OF CONCENTRATION AVERAGE	QUALITY OF CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW	SAMPLE MEASUREMENT	8.4	8.8	mgd				mgd	0	20/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	9289	10818	lb/d	109	131	158	mg/l		4/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	6088	6922	lb/d	64	86	99	mg/l	1	4/31	Comp
	PERMIT REQUIREMENT	8011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	7941	10763	lb/d	88	114	152	mg/l		19/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3904	5458	lb/d	34	56	78	mg/l	1	19/31	Comp
	PERMIT REQUIREMENT	5008	12015			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0.2	0.4	0.5	ml/l	0	20/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	376	376	lb/d	5.7	5.7	5.7	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.03	7.39	7.53		0	20/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

TYPED OR PRINTED

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 671, NUMBER 475-7844

DATE: MONTH DAY YEAR

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)

The monthly average for BOD concentration (mg/L) exceeded the permitted level.

Explaination of exceedences are attached to the Agana STP DMRs, page 4 of 20

EPA Form 3320-1 (Rev. 10/79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY IS EXHAUSTED

(REPLACES EPA FORM T-10 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: Agana Sewage Treatment Plant
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-88

(3-10)	(17-19)
GU0020087	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	5	1	TO	97	6	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS F

PARAMETER (32-37)		QUANTITY OF LOADING (3 CARD ONLY) (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	QUALITY OF CONCENTRATION (4 CARD ONLY) (39-40) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	8.3	9.1	mgd				mgd	0	20/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	8175	10275	lb/d	83	117	145	mg/l		4/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5909	7046	lb/d	70	85	96	mg/l	1	4/31	Comp
	PERMIT REQUIREMENT	6011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	9195	13527	lb/d	80	132	186	mg/l		19/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	4830	8660	lb/d	44	70	118	mg/l	1	19/31	Comp
	PERMIT REQUIREMENT	5008	12018			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0	0.6	2.0	ml/l	0	20/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	764	764	lb/d	11.1	11.1	11.1	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.1	7.45	7.61		0	20/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITTLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 479-7844 — AREA CODE | NUMBER

DATE

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)
The monthly average for BOD and Suspendede Solids was exceeded by 9.5 mg/l and 4.5 mg/l respectively.
Treatment Plant on by-pass to replace defective valves, no samples for the 25th, and 26th.

EPA Form 3320-1 PREVIOUS EDITION TO BE IN SUPPLY IS EXHAUSTED (REPLACES EPA FORM T-40 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: AGANA SEWAGE TREATMENT PLANT
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-00

PERMIT NUMBER	DISCHARGE NUMBER
GU0020087	001

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	7	1	TO	97	7	31

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER		QUANTITY OF LOADING AVERAGE	QUANTITY OF LOADING MAXIMUM	UNIT	QUALITY OF CONCENTRATION MINIMUM	QUALITY OF CONCENTRATION AVERAGE	QUALITY OF CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW	SAMPLE MEASUREMENT	8.4	9.4	mgd				mgd	0	22/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	9314	11856	lb/d	85	131	161	mg/l		5/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5556	7070	lb/d	55	78	96	mg/l	0	5/31	Comp
	PERMIT REQUIREMENT	8011	16022			60	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	9237	22373	lb/d	74	132	332	mg/l		22/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	4170	6233	lb/d	26	60	86	mg/l	0	22/31	Comp
	PERMIT REQUIREMENT	8008	17016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0	0.2	1.0	ml/l	0	22/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	332	332	lb/d	4.8	4.8	4.8	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC
pH	SAMPLE MEASUREMENT				7.04	7.40	7.64		0	22/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)
(REFERENCE ALL ATTACHMENTS HERE)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 - 479-7844
AREA CODE, NUMBER

DATE: NOV 28 1997
month day year

COMMENT AND EXPLANATION OF ANY VIOLATIONS
No exceedences this month.

EPA Form 3320-1 (rev. 10-79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY EXHAUSTED

(REPLACES EPA FORM 3-40 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE ZIP)
FACILITY NAME/LOCATION (IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: AGANA SEWAGE TREATMENT PLANT
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISCHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004
Expires 3-31-88

PERMIT NUMBER	DISCHARGE NUMBER
GU0020087	001

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	8	1	TO	97	8	31

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER		QUANTITY OF LOADING AVERAGE	QUANTITY OF LOADING MAXIMUM	UNIT	QUALITY OF CONCENTRATION MINIMUM	QUALITY OF CONCENTRATION AVERAGE	QUALITY OF CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW	SAMPLE MEASUREMENT	9.1	10.8	mgd				mgd	0	20/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	6759	9731	lb/d	65	88	124	mg/l		4/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5061	6200	lb/d	56	65	79	mg/l	0	4/31	Comp
	PERMIT REQUIREMENT	6011	16022			60	150			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	9096	12106	lb/d	50	120	152	mg/l		20/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	5200	9548	lb/d	22	68	106	mg/l	1	20/31	Comp
	PERMIT REQUIREMENT	6008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0	0.4	1.0	ml/l	0	20/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	645	645	lb/d	8.4	8.4	8.4	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.21	7.39	7.55		0	20/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

TYPED OR PRINTED

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 475-7844

DATE: NOV 28 1997

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)
Exceeded the suspended solids monthly average concentration by 8 mg/l.

Explaination of exceedences are attached to the Agana DMRs, page 4 of 20

EPA Form 3320-1 (--- 10-79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY IS EXHAUSTED (REPLACES EPA FORM T-40 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: AGANA SEWAGE TREATMENT PLANT
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-88

(3-14)	(17-19)
GU0020087	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	9	1	TO	97	9	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER (33-37)		QUANTITY OF LOADING (2 CARD ONLY) (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	QUALITY OF CONCENTRATION (4 CARD ONLY) (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-69)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	7.9	10.3	mgd				mgd	0	21/30	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	7687	10466	lb/d	76	108	127	mg/l		5/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5609	7777	lb/d	64	79	94	mg/l	0	5/30	Comp
	PERMIT REQUIREMENT	8011	15022			60	150			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	5720	13824	lb/d	60	87	170	mg/l		18/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3502	7202	lb/d	32	53	84	mg/l	0	18/30	Comp
	PERMIT REQUIREMENT	8008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0	0.6	6.0	ml/l	1	20/30	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	695	695	lb/d	8.4	8.4	8.4	mg/l		1/30	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.25	7.39	7.59			20/30	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 479-7844 AREA CODE NUMBER

DATE: NOV 28 1997

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)
Daily maximum settleable solids exceeded on the 15th.

Explaination of exceedences are attached to the Agana DMRs, page 4 of 20

EPA Form 3320-1 (10-79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY IS EXHAUSTED (REPLACES EPA FORM T-40 WHICH MAY NOT BE USED)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: AGANA SEWAGE TREATMENT PLANT
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISCHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004
Expires 3-31-88

PERMIT NUMBER	DISCHARGE NUMBER
GU0020087	001

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	10	1	TO	97	10	31

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER		QUANTITY OF LOADING AVERAGE	QUANTITY OF LOADING MAXIMUM	UNIT	QUALITY OF CONCENTRATION MINIMUM	QUALITY OF CONCENTRATION AVERAGE	QUALITY OF CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
FLOW	SAMPLE MEASUREMENT	8.2	9.2	mgd				mgd	0	31/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	8153	9166	lb/d	86	113	129	mg/l		3/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	6284	6633	lb/d	83	87	91	mg/l	1	3/31	Comp
	PERMIT REQUIREMENT	8011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	5905	9376	lb/d	52	85	134	mg/l		21/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3220	6695	lb/d	22	46	94	mg/l	0	21/31	Comp
	PERMIT REQUIREMENT	6008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0.1	0.3	0.5	ml/l	0	21/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	411	411	lb/d	5.6	5.6	5.6	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.14	7.30	7.56		0	21/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

TYPED OR PRINTED

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 479 7844

DATE

AREA CODE NUMBER

COMMENT AND EXPLANATION OF ANY VIOLATIONS
(REFERENCE ALL ATTACHMENTS HERE)
Violation : BOD average monthly concentration exceeded by 7.0 mg/L

Explaination of exceedences are attached to the Agana DMRs, page 4 of 20

EPA Form 3320-1 (10-79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY EXHAUSTED
(REPLACES EPA FORM 7 40 WHICH MAY NOT BE USED)

PERMITEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: AGANA SEWAGE TREATMENT PLANT
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-88

(2-16)	(17-19)
GU0020087	001
PERMIT NUMBER	DISCHARGE NUMBER

	MONITORING PERIOD						
	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	11	1	TO	97	11	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER (32-37)		QUANTITY OF LOADING (3 CARD ONLY) (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	QUALITY OF CONCENTRATION (4 CARD ONLY) (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-69)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	8.6	9.3	mgd				mgd	0	30/30	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	7017	10913	lb/d	69	95	141	mg/l		4/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	4215	4799	lb/d	52	58	62	mg/l	0	4/30	Comp
	PERMIT REQUIREMENT	8011	16022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	6545	8025	lb/d	66	91	108	mg/l		18/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3166	4644	lb/d	28	44	60	mg/l	0	18/30	Comp
	PERMIT REQUIREMENT	6008	12016			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0	0.2	1.9	ml/l	0	19/30	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	383	383	lb/d	5.6	5.6	5.6	mg/l		1/30	Disc
	PERMIT REQUIREMENT									1/31	DISC.
pH	SAMPLE MEASUREMENT				7.13	7.39	7.76		0	19/30	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION. I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (PENALTIES UNDER THESE STATUTES MAY INCLUDE FINES UP TO 10,000 AND/OR MAXIMUM IMPRISONMENT BETWEEN 6 MONTHS AND 5 YEARS.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: 671 479-7844 (AREA CODE / NUMBER)

DATE: year mo. day

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)
No violations

Explaination of exceedences are attached to the Agana DMRs, page 4 of 20

EPA Form 3330-1 (rev. 10-79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY IS EXHAUSTED (REPLACES EPA FORM T-40 WHICH MAY NOT BE USED)

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME: Guam Waterworks Authority
ADDRESS: P.O. BOX. 3010
AGANA, GUAM 96932
FACILITY: AGANA SEWAGE TREATMENT PLANT
LOCATION: Agana, Guam

NATIONAL POLLUTANT DISHARGE ELLIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-000
Expires 3-31-88

(3-16)	(17-19)
GU0020087	001
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO.	DAY		YEAR	MO.	DAY
FROM	97	12	1	TO	97	12	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: READ INSTUCTIONS BEFORE COMPLETING THIS FORM

PARAMETER (32-37)		QUANTITY OF LOADING (3 CARD ONLY) (46-53) AVERAGE	(54-61) MAXIMUM	UNIT	QUALITY OF CONCENTRATION (4 CARD ONLY) (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT	7.6	8.8	mgd				mgd	0	28/31	cont.
	PERMIT REQUIREMENT		12.0								CONT.
INFLUENT BOD	SAMPLE MEASUREMENT	8412	10424	lb/d	107	130	145	mg/l		3/31	Comp
	PERMIT REQUIREMENT										
EFFLUENT BOD	SAMPLE MEASUREMENT	5578	7214	lb/d	70	86	106	mg/l	1	3/31	Comp
	PERMIT REQUIREMENT	8011	15022			80	160			1/7	COMP.
INFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	6290	11583	lb/d	66	100	158	mg/l		18/30	Comp
	PERMIT REQUIREMENT										
EFFLUENT SUSPENDED SOLIDS	SAMPLE MEASUREMENT	3546	11290	lb/d	24	55	154	mg/l	0	17/31	Comp
	PERMIT REQUIREMENT	6008	12018			60	120			1/7	COMP.
SETTLEABLE SOLIDS	SAMPLE MEASUREMENT				0.1	0.2	0.5	ml/l	0	17/31	Disc
	PERMIT REQUIREMENT					1.0	2.0			1/7	DISC.
OIL & GREASE	SAMPLE MEASUREMENT	6873	6873	lb/d	101	101	101.0	mg/l		1/31	Disc
	PERMIT REQUIREMENT									1/31	DISC
pH	SAMPLE MEASUREMENT				7.11	7.37	7.56		0	17/31	Disc
	PERMIT REQUIREMENT				7.0		9.0			1/7	DISC.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
RICHARD A. QUINTANILLA
GENERAL MANAGER, GWA
TYPED OR PRINTED

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE 671 479 7844
AREA CODE NUMBER

DATE

COMMENT AND EXPLANATION OF ANY VIOLATIONS (REFERENCE ALL ATTACHMENTS HERE)

Violations: BOD monthly average concentration exceeded by 6 mg/L

Explaination of exceedences are attached to the Agana DMRs, page 4 of 20

EPA Form 3320 (9-79) PREVIOUS EDITION TO BE USED UNTIL SUPPLY IS EXHAUSTED (REPLACES EPA FORM 1 40 WHICH MAY NOT BE USED)

Daily and Monthly Flow Reports

APPENDIX D

Daily and Monthly Flow Reports

DAILY d MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: JANUARY 1997

TE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01				8.17			
02					8.11		
03						8.02	
04							7.25
05	8.41						
06		8.0					
07			8.19				
08				7.86			
09					8.13		
10						8.43	
11							7.88
12	8.29						
13		8.67					
14			8.05				
15				7.82			
					8.93		
17						9.11	
18							8.85
19	7.92						
20		7.78					
21			7.60				
22				8.90			
23					9.08		
24						8.38	
25							8.52
26	7.69						
27		8.83					
28			8.74				
29				8.80			
30					8.67		
31						8.88	
TOTAL OF EL	32.31	33.28	32.58	41.55	42.92	42.82	32.50
AVG DAILY FLOWS	8.08	8.32	8.15	8.31	8.58	8.56	8.13

AVERAGE MONTHLY FLOW (8.32) TOTAL MONTHLY FLOW (257.96)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY AND MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: FEBRUARY 1997

DATE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01							8.17
02	8.42						
03		8.07					
04			8.50				
05				9.14			
06					9.02		
07						9.26	
08							8.26
09	8.10						
10		8.83					
11			9.52				
12				10.46			
13					9.19		
14						9.27	
15							9.39
16	8.60						
17		8.30					
18			8.21				
19				9.20			
20					8.25		
21						8.70	
22							8.30
23	8.90						
24		10.24					
25			9.32				
26				8.17			
27					8.41		
28						7.80	
29							
30							
31							
TOTAL DAILY FLOWS	34.62	35.44	35.55	36.97	34.87	35.63	34.72
AVG DAILY FLOWS	8.51	8.86	8.89	9.24	8.72	8.91	8.68

AVERAGE MONTHLY FLOW (8.83) TOTAL MONTHLY FLOW (247.80)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY AND MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: MARCH 1997

DATE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01							7.67
02	7.30						
03		7.75					
04			8.67				
05				8.32			
06					8.34		
07						8.61	
08							8.81
09	8.32						
10		8.74					
11			8.33				
12				8.22			
13					8.41		
14						8.99	
15							8.16
[illegible]	8.32						
17		8.43					
18			8.55				
19				8.13			
20					8.39		
21						8.04	
22							8.30
23	7.62						
24		8.39					
25			8.80				
26				8.11			
27					8.49		
28						8.69	
29							8.36
30	7.61						
31		8.18					
TOTAL DAILY FLOWS	39.58	41.48	34.35	32.78	33.62	34.33	41.30
AVG DAILY FLOWS	7.92	8.30	8.59	8.20	8.41	8.58	8.26

AVERAGE MONTHLY FLOW (8.32) TOTAL MONTHLY FLOW (257.44)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY AND MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: APRIL 1997

DATE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01			7.93				
02				7.24			
03					8.38		
04						9.32	
05							9.05
06	8.75						
07		9.0					
08			8.29				
09				8.0			
10					8.32		
11						8.63	
12							9.36
13	7.27						
14		7.79					
15			8.34				
16				9.31			
17					9.88		
18						9.54	
19							8.93
20	7.24						
21		8.74					
22			9.05				
23				9.16			
24					7.80		
25						8.66	
26							9.16
27	7.76						
28		8.61					
29			7.71				
30				7.78			
31							
TOTAL DAILY FLOWS	33.12	35.24	41.32	41.49	35.38	36.15	36.50
AVG DAILY FLOWS	8.28	8.81	8.26	8.30	8.85	9.04	9.13

AVERAGE MONTHLY FLOW (8.64) TOTAL MONTHLY FLOW (259.20)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY AND MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: MAY 1997

DATE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01					8.22		
02						8.78	
03							8.36
04	7.96						
05		8.80					
06			8.83				
07				8.38			
08					8.22		
09						8.90	
10							8.32
11	8.1						
12		7.91					
13			8.21				
14				8.50			
15					8.58		
[illegible]						8.85	
17							8.07
18	8.75						
19		8.27					
20			8.61				
21				8.50			
22					8.56		
23						9.12	
24							9.13
25	9.02						
26		7.71					
27			8.49				
28				8.13			
29					8.29		
30						8.74	
31							8.64
TOTAL DAILY FLOWS	33.73	32.69	34.14	33.51	41.97	44.30	42.52
AVG DAILY FLOWS	8.43	8.17	8.54	8.38	8.39	8.86	8.50

AVERAGE MONTHLY FLOW (8.48) TOTAL MONTHLY FLOW (262.86)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY 1 MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: JUNE 1997

DATE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01	8.72						
02		8.55					
03			8.91				
04				8.43			
05					8.33		
06						8.91	
07							9.04
08	9.10						
09		8.16					
10			8.11				
11				7.97			
12					8.25		
13						8.97	
14							8.33
15	8.11						
		8.77					
17			8.25				
18				7.78			
19					8.36		
20						9.05	
21							8.69
22	8.13						
23		7.95					
24			8.28				
25				BY-PASS			
26					9.25		
27						8.50	
28							8.82
29	8.66						
30		7.99					
31							
TOTAL DAILY FLOW	42.11	41.42	33.44	24.18	34.19	35.43	34.88
AVG DAILY FLOWS	8.42	8.28	8.36	8.06	8.55	8.86	8.72

AVERAGE MONTHLY FLOW (8.47) TOTAL MONTHLY FLOW (245.65)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY 1 MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: JULY 1997

TE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01			8.82				
02				7.96			
03					8.53		
04						8.68	
05							8.5
06	8.1						
07		8.30					
08			8.44				
09				7.98			
10					8.54		
11						8.47	
12							9.07
13	8.43						
14		8.11					
15			8.85				
				8.61			
17					8.21		
18						8.83	
19							8.30
20	7.82						
21		8.44					
22			8.07				
23				8.69			
24					8.36		
25						8.25	
26							8.36
27	8.50						
28		8.09					
29			8.55				
30				9.41			
31					8.24		
TOTAL DAILY FLOW	32.75	32.93	42.73	42.65	41.89	34.23	34.23
AVG DAILY FLOWS	8.19	8.23	8.55	8.53	8.38	8.56	8.56

AVERAGE MONTHLY FLOW (8.43) TOTAL MONTHLY FLOW (261.42)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY AND MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: AUGUST 1997

DATE	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
01						8.89	
02							8.35
03	8.50						
04		9.36					
05			8.61				
06				8.15			
07					8.91		
08						8.93	
09							8.40
10	8.47						
11		9.55					
12			10.80				
13				9.20			
14					8.85		
15						8.38	
							9.56
17	8.22						
18		8.89					
19			8.47				
20				9.63			
21					9.55		
22						8.69	
23							7.95
24	8.61						
25		8.18					
26			9.41				
27				9.96			
28							
29							
30							
31							
TOTAL DAILY FLOWS	33.80	36.00	37.30	36.94	27.31	34.90	34.30
AVG DAILY FLOWS	8.45	9.0	9.33	9.24	9.10	8.73	8.58

AVERAGE MONTHLY FLOW (8.99) TOTAL MONTHLY FLOW (240.60)

* Holiday(s)

DAILY and MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: SEPTEMBER 1997

E	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01		8.52					
02			9.75				
03				9.83			
04					10.28		
05						10.05	
06							7.47
07	6.57						
08		9.08					
09			9.92				
10				8.49			
11					8.42		
12						8.08	
13							6.52
14	7.80						
15		8.60					
			7.46				
17				7.57			
18					6.86		
19						7.13	
20							6.94
21	6.13						
22		6.08					
23			6.72				
24				6.47			
25					6.30		
26						6.79	
27							6.97
28	5.49						
29		7.52					
30			8.36				
31							
TOTAL DAILY F S	25.99	39.81	42.21	32.36	31.86	32.05	27.90
AVG DAILY FLOWS	6.50	7.96	8.44	8.09	7.97	8.01	6.98

AVERAGE MONTHLY FLOW (7.74) TOTAL MONTHLY FLOW (232.17)

* Holiday(s)

DAILY and MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: OCTOBER 1997

TE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01				7.50			
02					8.46		
03						7.80	
04							7.63
05	8.97						
06		7.92					
07			8.72				
08				7.96			
09					8.05		
10						8.36	
11							8.77
12	7.78						
13		8.38					
14			7.67				
15				8.81			
					7.82		
17						8.17	
18							7.83
19	9.11						
20		9.19					
21			8.74				
22				7.88			
23					8.30		
24						8.32	
25							7.91
26	8.39						
27		7.69					
28			8.52				
29				8.54			
30					8.51		
31						7.13	
TOTAL DA' FL	34.25	33.18	33.65	40.69	41.13	39.78	32.14
AVG DAILY FLOWS	8.56	8.30	8.41	8.14	8.23	7.96	8.04

AVERAGE MONTHLY FLOW (8.24) TOTAL MONTHLY FLOW (254.82)

* Holiday(s)

DAILY AND MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: NOVEMBER 1997

DATE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01							8.10
02	9.19						
03		8.92					
04			9.28				
05				8.41			
06					8.39		
07						9.04	
08							8.10
09	8.92						
10		9.02					
11			8.92				
12				8.27			
13					8.97		
14						7.85	
15							9.0
16	8.74						
17		8.49					
18			8.19				
19				8.30			
20					8.58		
21						8.67	
22							7.75
23	9.16						
24		8.68					
25			8.54				
26				8.11			
27					7.36		
28						8.42	
29							7.94
30	8.91						
31							
TOTAL FLOW	44.92	35.11	34.93	33.09	33.30	33.98	40.89
AVG DAILY FLOWS	8.98	8.78	8.73	8.27	8.33	8.50	8.18

AVERAGE MONTHLY FLOW (8.54) TOTAL MONTHLY FLOW (256.22)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

DAILY d MONTHLY FLOW REPORT
AGANA SEWAGE TREATMENT PLANT
MONTH OF: DECEMBER '97

TE	DAILY AGANA FLOW (RECORDED – MILLIONS OF GALLONS)						
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
01		8.40					
02			8.62				
03				7.83			
04					7.99		
05						8.65	
06							8.16
07	8.02						
08		8.79					
09			8.16				
10				8.03			
11					8.21		
12						8.47	
13							8.27
14	8.19						
15		8.66					
1			8.35				
17				—			
18					—		
19						6.96	
20							7.19
21	6.62						
22		6.17					
23			5.19				
24				5.69			
25					—		
26						8.29	
27							6.99
28	7.91						
29		6.62					
30			6.15				
31				6.65			
OTA DAI LL	30.74	38.64	36.47	28.20	16.20	32.37	30.41
AVG AILY LOWS	7.69	7.73	7.29	7.05	5.40	8.09	7.65

AVERAGE MONTHLY FLOW (7.27) TOTAL MONTHLY FLOW (213.23)

(REPRODUCED AT GOVERNMENT OF GUAM EXPENSE)

Revised Guam Water Quality Standards

APPENDIX E

Revised Guam Water Quality Standards

Vermen S Cing

GUAM ENVIRONMENTAL PROTECTION AGENCY

REVISED GUAM WATER QUALITY STANDARDS

"ALL LIVING THINGS OF THE EARTH ARE ONE "

HARMON PLAZA COMPLEX UNIT D-107
130 ROJAS ST.
HARMON, GUAM 96911

72-0135

REVISED GUAM WATER QUALITY STANDARDS

ADOPTED: JULY 18, 1987
ADOPTED: JANUARY 2, 1992

ANTONIO T. LIZAMA
Board Chairman

ATTESTED TO:
SANDRA L. CRISOSTOMO
Board Secretary

APPROVED:

ELIZABETH BARRETT-ANDERSON
Attorney General

DATE: 1-22-92

TABLE OF CONTENT

	TITLE	PAGE
	STATEMENT OF POLICY	1 to 3
SECTION I	CATEGORIES OF WATERS	4
A)	Marine waters	4 to 5
B)	Groundwater	5 to 7
C)	Surface waters	7 to 8
SECTION II	WATER QUALITY CRITERIA	9
A)	General criteria applicable to all Territorial waters	9 to 10
B)	Specific Numerical Water criteria	10
1)	Microbiological requirements	10
2)	pH	10 to 11
3)	Nutrients	11 to 12
4)	Dissolved oxygen	12
5)	Salinity	12 to 13
6)	Total filterable suspended solids	13
7)	Turbidity	13 to 14
8)	Radioactive materials	14
9)	Temperature	14
10)	Concentration of oil or petroleum products	14
11)	Pesticides	15
12)	Toxic substances	15 to 18

SECTION III EFFLUENT LIMITATIONS 19

A) General criteria 19 to 21

B) Mixing zones in receiving waters 21 to 22

C) Mixing zones for non-thermal discharges 22

1) Mixing zones for non-thermal discharges 22

2) Mixing zones for non-thermal discharges into coastal waters 22 to 23

D) Mixing zones for thermal discharges 23

1) All above ambient discharges 23 to 24

2) Above-ambient discharges in existence prior to approval of these standards 24 to 25

3) Below-ambient discharges 25

E) Prohibited discharges 26 to 27

F) Land disposal of treated wastewaters 27 to 29

G) Effluent discharge limitations for groundwater categories G-2a, G-2b, and G-3 29

H) Petroleum Storage Facilities 30

SECTION IV DEFINITIONS 31 to 42

APPENDICES

A List of the 126 priority toxic pollutants designated under section 307(A)(1) of the Clean Water Act 43 TO 44

B WETLAND 45

1) The hierarchy of the wetland classification is shown in

Figures I & IA 45

2) Definitions of wetland classifications 45

a) Lacustrine wetlands 45

b) Palustrine wetlands 45 to 46

c) Riverine wetlands 46 to 49

3) Criteria for wetland Identification 50

4) Anti-degradration policy 50 to 51

Figure I - Wetlands and deepwater habitats 52

Figure IA -Wetland and deepwater habitats 53

C Created wetland guidelines 54

D Executive Order no. 90-13 - Protection of wetlands 55

E Executive Order no. 90-09 - Establishing the Development Review Committee 56

F Guidelines for the review and issuance of 401 Water Quality Certification 57

I) Primary Goal of the Water Quality Certification 57

II) 401 Water Quality Certification 57

A) The goals are to restore and maintain a biological integrity of the territory's waters and to eliminate all discharges of pollutants (including dredged and fill materials). 57

1) The following is required to accompany an application of 401 WQC 57

a) A historical overview & ecological evaluation of site 58

b) A sediment physical characterization 58 to 59

c) A sediment analysis 59 to 60

2) No certification may be by the Agency unless the applicant has demonstration of that activities permitted by section 404 of the FCWA of 1987 will not 60

3) Restrictions on Discharges to Territory's waters 60 to 62

4) Dam construction review for 401 WQC 62 to 63

5) Mitigation policy statements 64 to 66

B) Applicable laws, statutes and regulations 66 to 67

C) 401 WQC authority 67

D) Applicability 67 to 68

E) Application requirements 68 to 69

F) Content of certification 69 to 70

G) Procedures 70 to 72

H) Public notices 72

I) Public hearings 72

J) Contested case and adjudicatory hearings 72

	K) Signatory requirement for 401 WQC	73
	L) Section 401 WQC application format	74 to 78
	Wetland areas procedural flow chart	79
G	Water Classification Master Map	80
H	Executive Order no. 90-10 - Requirements for EIA for all Territorial Land Use Commission actions	81
I	Tributyltin (TBT)	82
J	TABLE III - Limitations for Discharges to categories G-2a, G-2b, and G-3	83

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STATEMENT OF POLICY

It shall be the public policy of the Territory of Guam to:

1. conserve, protect, maintain, and improve the quality of the Guam's waters for (drinking and food processing) human consumption, for the growth and propagation of aquatic life, for marine research and for the preservation of coral reefs and wilderness areas, and for domestic, agricultural, commercial, industrial, recreational and other legitimate uses;

2. provide that no pollutant discharged into any water, unless (a) the discharge first receives processing which will remove all harmful products or provide the control technology necessary to protect the designated beneficial uses of waters; (b) the discharge meets the effluent limitations established for that discharge; and (c) best management practices are applied to all non-point sources; and

3. provide for the prevention, abatement and control of new and existing water pollution sources including non-point sources.

4. maintain and improve the chemical, physical, and biological integrity of wetlands water quality as necessary to meet the Clean Water Act Section 101 (a), and to protect wetlands.

5. provide protection from point or non-point source discharges to wetlands in the same way as other surface waters.

6. provide protection from point and non-point discharges, including discharges from ponding basins and via sinkholes to groundwater.

Further, under the terms of the U.S. Water Pollution Control Act 92-500 as amended by all Public Laws through 1986:

1. it is the territorial goal that the discharge of pollutants into all territorial waters be eliminated;

2. it is the territorial goal that a water quality guideline be established and enforced, which

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provide for the protection and propagation of fish, shellfish and other aquatic and marine life, and provide for safe public recreation in and on the water;

3. it is the territorial policy that the discharge of pollutants in harmful or hazardous amounts be prohibited; and

4. it is the territorial goal to eliminate all point source discharges to certain near-shore waters.

To assist in obtaining these goals, all discharges including non-point sources will be controlled (permitted) either through the National Pollutant Discharge Elimination System (NPDES) or through the Guam Environmental Protection Agency's local permit program.

Therefore, pursuant to the authority contained in the Guam Water Pollution Control Act (Section 47104 and 47108 of Chapter 47, Title 10 of the Guam Code Annotated), which authorized the formulation of standards of water purity and classification of waters according to their most beneficial uses, the Guam Environmental Protection Agency hereby adopts the following standards of water quality for Guam.

Waters whose existing quality is better than the established standards will be maintained at the same high quality.

Waters whose existing quality is less than the established standards for their use due to the presence of substances, conditions, or combinations thereof attributable to domestic, commercial and industrial discharges or agricultural, construction and other land-use practices, shall be improved to comply with the established standards. However, in such cases where the natural conditions are of lower quality than criteria assigned, the natural conditions shall constitute the water quality criteria. Water quality criteria in boundary areas shall be established so that the most stringent standard applies. When more than one set of Water Quality criteria apply, including overlap of category designations or at a boundary water between two categories, then the more stringent standard shall prevail.

The Administrator of the Guam Environmental Protection Agency may allow a lowering of water quality, only if it has been demonstrated to the Administrator with an Environmental Impact Statement (EIS) pursuant to the requirement of

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Executive Order 90-10 (Appendix H) that a lowering of the water quality is the only alternative and is necessary as a result of essential social needs. It must also be demonstrated with the EIS that the lowered water quality will not interfere with or become injurious to any aquatic life or uses made of or potentially possible in the affected waters. A public hearing shall be conducted to give residents of the territory, primarily those residing in the affected area, opportunity to review and comment on the EIS.

All industrial, public or private projects or developments will be required, as part of the initial project design, to make provisions for the pollutant removal or control technology necessary to protect the designated use of receiving waters or maintain the existing high quality of the receiving waters.

Point Source discharges through storm drainage except for storm water is prohibited by these standards.

The purpose of these Water Quality Standards is to prevent degradation of water resources resulting from pollution sources. An Environmental Protection Plan (EPP) will be prepared by all developers, contractors, and others prior to construction initiation to ensure that water resources will not be degraded. This EPP will be submitted to the Guam Environmental Protection Agency for approval. Failure to comply with the EPP will result in a Stop Work Order and other actions, as deemed necessary, until compliance is achieved.

SECTION I

CATEGORIES OF WATERS

The following categories of water established under these standards relate to the different liquid components of the hydrologic cycle. All categories of water (Marine, Surface and Groundwater) are referenced on the Water Classification Map. Scaled down copies of these maps are included in these standards enabling readers to understand their relative position, application and use.

A. MARINE WATERS

This category includes all coastal waters off-shore from the mean high water mark, including estuarine waters, lagoons and bays, brackish areas, wetlands and other special aquatic sites, and other inland waters that are subject to ebb and flow of the tides. Refer to Water Classification Map.

CATEGORY M-1 EXCELLENT

Waters in this category must be of high enough quality to ensure preservation and protection of marine life, including corals and reef dwelling organisms, fish and related fisheries resources, and enable the pursuit of marine scientific research as well as aesthetic enjoyment. This category of water shall remain substantially free from pollution attributed to domestic, commercial and industrial discharges, shipping and boating, or agriculture, construction and other activities which can reduce the waters' quality. Furthermore, there shall be no zones of mixing within this category water.

CATEGORY M-2 GOOD

Water in this category must be of sufficient quality to allow for the propagation and survival of marine organisms, particularly shellfish, corals and other reef related resources. Other important and intended uses include mariculture activities, aesthetic enjoyment and compatible recreation inclusive of whole body contact and related activities.

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CATEGORY M-3 FAIR

Water in this category is intended for general, commercial and industrial use. Specific intended uses include the following: shipping, boating and berthing, industrial cooling water, marinas, while allowing for protection of aquatic life, aesthetic enjoyment and compatible recreation with limited body contact.

B. GROUNDWATER

This major type of water encompasses all subsurface water and includes basal and parabasal water, perched water, all water below the groundwater table, water percolating through the unsaturated zone (Vadose Water), all saline waters below and along the perimeter of the basal fresh water body (freshwater lens), and water on the surface that has been collected with the specific intent of recharging or disposing of that water to the subsurface by means of injection, infiltration, percolation or other means. The Northern Guam Water lens which is the Principal Source Aquifer and any other groundwater resource as they are identified shall continue to receive protection under Guam's groundwater regulations.

CATEGORY G-1 RESOURCE ZONE

The primary use of groundwater within this zone is for drinking (human consumption) and this use must be protected. Virtually all water of the saturated zone of Guam is included. Specifically it includes all water occurring in the saturated zone below the groundwater table, all vadose water occurring in an unsaturated zone extending 100 feet (30.5 m) above any water table, or within 20 feet of the ground surface above all fresh groundwater bodies, all water of the basal and parabasal freshwater bodies, and all water of and below the freshwater/salt-water transition zone beneath the basal water body (Examples, Wells A-1, A-2, A-3, MJ1, & MJ5).

Because any water discharges within this zone will (by definition) be tributary to groundwater bodies which are actual or potential sources of fresh, potable water, no pollutant discharges to the ground-water within this zone will be allowed.

CATEGORY G-2 RECHARGE ZONE

Water within this zone is tributary to, replenishes, and recharges the Category G-1 groundwater and must be of drinking water quality before it enters the Resource Zone. All water discharges within the Recharge Zone must receive treatment to the degree necessary to protect the underlying Category G-1 groundwater from any contamination.

Category G-2 is divided into two distinct sub-categories based upon the boundaries of the Groundwater Management Protection Zone (GWMPZ).

Category G-2a exists within the GWMPZ and extends from the ground surface to the top of the G-1 zone.

Category G-2b exists only outside the GWMPZ and includes all waters which are collected and recharged or disposed of within a zone which is bounded above by G-3 and below by G-1. Vertically, this zone extends 20 feet below the ground surface to the upper surface of the Category G-1 waters. Input to ground water within this zone occurs primarily through storm water injection wells.

It is recognized that water within this zone will percolate through soil/rock media before reaching the Resource Zone. In this way it may undergo some degree of natural treatment consisting of filtration and subsequent purification. However, the degree of treatment is not easily demonstrated. Thus, due to the need to protect G-1 waters and considering the difficulty in tracing pollutants reaching the G-1 zone to a particular source, discharge limitations have been established to regulate discharges to the G-2a and G-2b zone. All discharges must meet the discharge limitations established in Table III (Appendix "J).

All discharges within this zone may be required by the Agency to obtain discharge permits under these standards.

CATEGORY G-3 BUFFER ZONE

Category G-3 exists only outside the GWMPZ and includes all waters which are collected and disposed of or recharged at or near the existing groundwater supply. Vertically, the zone for this category extends from the surface to 20 feet (6 m) below the surface. Disposal methods which may result in discharges to groundwater within this zone include, but are not limited to, ponding basins, rapid infiltration, slow rate land treatment, surface or spray irrigation and all subsurface discharges (seepage, leaching).

For reasons similar to those discussed for Category G-2a and Category G-2b, discharge limitations for G-3 are also established in Table III (Appendix J). Discharges equal to or less than 3,000 gallons per day (gpd) within the G-3 zone are designated by G-3a. Water quality criteria for all discharges within zone G-3 which are greater than 3,000 gpd are designated G-3b. This differentiation in criteria addresses the fact that minor discharges typified by small scattered individual dwelling units probably have less adverse impact on underlying groundwater than major point source discharges and thus are allowed less restrictive water quality limits (i.e. equivalent to primary treatment).

All discharges within this zone may be required by the Agency to obtain discharge permits under these standards.

C. SURFACE WATERS

This Category includes all of surface fresh-water and includes, (1) waters that flow continuously over land surfaces in a defined channel or bed, such as streams and rivers, (2) standing water in basins such as lakes, wetlands, marshes, swamps, ponds, sinkholes, impoundments, and reservoirs either natural or man-made and (3) all waters flowing over the land as runoff, or as runoff confined to channels with intermittent flow. Refer to the Water Classification Map. Waters under these category are those waters which are collected with specific intent of disposal by recharging them into the ground (i.e.,ponding basin).

Category S-1 HIGH

Surface waters in this category is used for drinking water resources, conservation of wilderness areas, propagation and preservation of aquatic life and aesthetic enjoyment. It is the objective of these standards that these waters shall be kept free of substances or pollutants from domestic, commercial and industrial discharges, or agricultural activities, construction or other land-use practices that may impact water quality. No pollutant discharges will be permitted into S-1 waters via discharge or as a result of land uses adjacent to S-1 waters. Mixing zones will not be allowed within the boundaries of Category S-1.

Category S-2 MEDIUM

Surface water in this category is used for recreational purposes including water contact recreation, for use as potable water supply after adequate treatment is provided, and propagation and preservation of aquatic wildlife and aesthetic enjoyment.

Category S-3 LOW

Surface water in this category is primarily used for commercial, agricultural and industrial activities. Aesthetic enjoyment and compatible recreation are acceptable in this zone, as well as maintenance of aquatic life. Compatible recreation may include limited body contact activities. All discharges within this zone which are not required to have construction and/or discharge permits under existing regulations may be required by this Agency to obtain such permits under these regulations.

SECTION II

WATER QUALITY CRITERIA

A. GENERAL CRITERIA APPLICABLE TO ALL TERRITORIAL WATERS

All waters shall meet generally accepted aesthetic qualifications, shall be capable of supporting desirable aquatic life, and shall be free from substances, conditions or combinations thereof attributable to domestic, commercial and industrial discharges or agricultural, construction and land-use practices or other human activities that:

1. cause visible floating materials, debris, oils, grease, scum, foam, or other floating matter which degrades water quality or use;

2. produce visible turbidity, settle to form deposits or otherwise adversely affect aquatic life;

3. produce objectionable color, odor, or taste, directly or by chemical or biological action;

4. injure or are toxic or harmful to humans, animals, plants or aquatic life; and

5. induce the growth of undesirable aquatic life.

Analytical testing methods for these criteria shall be in accordance with the most recent editions of Standard Methods for the Examination of Water and Wastewater (APHA, AWWA, WPCF), Methods for Chemical Analysis of Water and Wastes (U.S. Environmental Protection Agency), and other methods acceptable to GEPA and possessing adequate procedural precision and accuracy.

Effects of high temperature, biocide, pathogenic organisms, toxic, corrosive, or other deleterious substances at levels or combinations sufficient to be toxic or harmful to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water, shall be evaluated as a minimum, by use of a 96-hour bioassay as described in the most recent edition of the EPA Manual or ASTM. Survival of test organisms shall not be less than that of controls which utilize appropriate water. Failure to determine presence

of toxic substances by this method shall not preclude determination of excessive levels of toxic substances on the basis of other criteria or methods.

B. SPECIFIC NUMERICAL WATER QUALITY CRITERIA

1. Microbiological Requirements

	Applicable to	
Concentrations of total coliform bacteria at any point shall not be increased from natural conditions at any time.	M-1	S-1
The fecal coliform bacteria count shall not exceed an arithmetic mean of 70 per 100 ml during any 30-day period nor shall any sample exceed 400 per 100 ml at any time.	M-2	S-2
The fecal coliform bacteria count shall not exceed an arithmetic mean of 200 per 100 ml during any 30-day period nor shall any sample exceed 400 per 100 ml at any time.	M-3	S-3

To determine compliance with the above microbiological requirements where a "30-day period" is specified, a minimum of four samples shall be collected at approximately equal intervals.

NOTE: Where shellfish are collected for human consumption, the microbiological standard for M-1 waters shall apply.

2. pH

The ambient pH of fresh and estuarine waters and wetlands ranges from 6.5-8.5 and 7.0-9.0 for marine waters. Variations of more than 0.5 pH units from ambient shall not be allowed	M-1 M-2 M-3	S-1 S-2 S-3

except due to natural causes.

3. Nutrients

Phosphorus:	Applicable to	
Orthophosphate (PO_4-P) shall not exceed 0.025 mg/l	M-1	S-1
Orthophosphate (PO_4-P) shall not exceed 0.05 mg/l	M-2	S-2
Orthophosphate (PO_4-P) shall not exceed 0.10 mg/l	M-3	S-3
Nitrogen:		
Nitrate-nitrogen (NO_3-N) shall not exceed 0.10 mg/l	M-1	S-1
Nitrate-nitrogen (NO_3-N) shall not exceed 0.20 mg/l	M-2	S-2
Nitrate-nitrogen (NO_3-N) shall not exceed 0.50 mg/l	M-3	S-3

Guam's groundwater has nitrate-nitrogen concentrations up to 5 mg/l. It is the intent of these standards to require secondary wastewater treatment. Treatment in excess of secondary treatment may be required and reviewed on a case by case basis. Levels of nutrients in receiving waters will be used as a guide in determining if treatment in excess of secondary treatment is required. Point source discharges will be regulated by permits specifying effluent standards and operational requirements.

Activities which may result in non-point discharges of nutrients shall be conducted in accordance with the best management practices reasonably determined by the Agency to be necessary to preclude or minimize such discharges of nutrients,

not to allow levels beyond those explicitly stated above.

In all cases, discharges containing nutrients, primarily nitrogen and/or phosphorous shall be treated to the extent necessary to prevent damage to coral reefs or growth of aquatic species which create a public nuisance or interfere with beneficial uses as defined in Section I.

4. Dissolved Oxygen

Applicable to

Concentrations of dissolved oxygen shall not be decreased below 75 percent saturation at any time, as influenced by salinity or naturally occurring temperature variations. Where natural conditions cause lower dissolved oxygen levels, controllable water quality factors shall not cause further reductions.

All waters of the Territory

Table I. Saturation D.O.

Freshwater		Marine Water and Wetlands			
Sat.	75% Sat.	Temp.	Salinity	Sat.	75% Sat.
mg/l	mg/l	C	ppt	mg/l	mg/l
7.6	5.6	30	32	6.2	4.6
8.2	6.2	26	32	6.7	5.0

5. Salinity

Marine-Waters: No alterations of the marine environment shall occur that would alter the salinity of marine or estuarine waters more than +10% of the ambient conditions, except when due to natural conditions.

All Marine (M-1, M-2, M-3), Estuarine Waters and Wetlands of the Territory.

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Fresh-Water: The maximum allowable amount of chlorides and sulfates shall be 250 mg/l, and the total dissolved solids shall not exceed 500 mg/l or 133% of the ambient condition. The salinity of fresh-water sources and wetlands shall not be increased more than 20% above ambient by discharges of saline water.		S-1 S-2 S-3
6. Total Filterable Suspended Solids	Applicable to	
Concentrations of suspended matter at any point shall not be increased from ambient conditions at any time, and should not exceed 5 mg/l except when due to natural conditions.	M-1	S-1
Concentrations of suspended matter at any point shall not be increased more than 10% from ambient at any time, and should not exceed 20 mg/l except when due to natural conditions.	M-2	S-2
Concentrations of suspended matter at any point shall not be increased more than 25% from ambient at any time, and should not exceed 40 mg/l except when due to natural conditions.	M-3	S-3
7. Turbidity		
Turbidity at any point, as measured by nephelometric turbidity units (NTU), shall not exceed 0.5 NTU over ambient conditions except when due to natural conditions.	M-1	S-1
Turbidity values (NTU) at any	M-2	S-2

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point shall not exceed 1.0 NTU over ambient conditions except when due to natural conditions.	M-3	S-3
Since debris, rapidly settling particles and true color give low readings when using Nephelometric methods in making turbidity determinations and one or more of these conditions may exist in marine and surface water, secchi disc determinations will be used when these conditions exist. Secchi disc visibility shall not decrease by more than 5 meters from ambient conditions except when due to natural conditions.		

8. Radioactive Materials

Discharges of radioactive materials at any level into any waters of the territory is strictly prohibited.	All Waters of the Territory

9. Temperature

Water temperature shall not be changed more than 1.0 degree centigrade (1.8 degree fahrenheit) from ambient conditions.	All Waters of the Territory

10. Concentrations of Oil or Petroleum Products. Those that exceed the limits described below are unacceptable.	M-1 M-2 M-3	S-1 S-2 S-3

a) Detectable as a visible film, or sheen, or results in visible discoloration of the surface with a corresponding oil or petroleum product odor; or

b) causes damage to fish, invertebrates or objectionable degradation of drinking water quality; or

c) forms an oil deposit on the shores or bottom of the receiving body of water.

11. Pesticides

Concentrations of pesticides shall not exceed one percent of the 24-hour LC50 value determined using the receiving water in question and the most sensitive species of aquatic organisms affected.

Where the concentration based on the LC50 data exceeds the recommended maximum concentrations, the maximum concentrations shall constitute the criteria.

For the listing of all pesticides (Organochlorides, Organophosphates, Carbamates, Herbicides, Fungicides, Defolliants, and Botanicals) please refer to the U.S. Water Quality Criteria "Blue Book."

Note:

The setting or publishing of maximum concentrations (limits) for specific pesticides and other toxics should in no way be construed as official approval or authorization for their use where such use is contrary to U.S. Environmental Protection Agency or other Federal or local regulations.

12. Toxic Substances

In order to provide maximum protection for the propagation of fish and wildlife, concentrations of toxic substances (persistent or non-persistent, cumulative or non-comulative); (a) shall not exceed 5 percent (0.05) of the 96-hour LC50 at any time or place, nor should the 24-hour average concentration exceed one percent (0.01) of the 96-hour LC50 or, (b) shall not exceed levels calculated by multiplying the appropriate application factor by the 96-hour LC50 values determined by using the most sensitive species of aquatic organism affected. Whichever value (a or b) is less shall be the maximum allowable concentration, unless this value exceeds the Maximum Numerical Limit, then the numerical limit shall constitute the maximum allowable concentration.

Criteria for the 126 Section 307 (A) Toxic Pollutants, listed by the U.S. Environmental Protection Agency, to which this standard applies, are incorporated by reference into the Guam Water Quality Standards. A list of some of the Toxic Pollutants is given in Appendix A. Absence from this list does not mean a substance is non-toxic, as it may be added later. All effluents containing materials attributable to the activities of man shall be considered harmful and not permissible until acceptable bioassay tests have shown otherwise. At the request of the Administrator, it is the obligation of the person producing the effluent to demonstrate that it is harmless.

In addition, effluent limits based upon acute and/or chronic toxicity tests of effluents may be prescribed by the Administrator. As a minimum, compliance with the standard as stated in the previous sentence shall be evaluated with a 96-hour bioassay or short-term method for estimating chronic toxicity. References for these methods are: EPA/600/4-89/011 Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, March, 1989; or EPA/600/4-85/013 Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, Cincinnati, Ohio, EMSL, March, 1985; or EPA/600/4-87/028 Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Cincinnati, Ohio, EMSL, May 1988. Numerical receiving water limits including EPA's Section 304(a) criteria for Section 307(a) toxic pollutants (Appendix A) as cited at 53 FR 177 and summarized in EPA 440/5-86-001 Quality Criteria for Water 1986, Washington D.C., OWRS, May 1, 1986, as amended by Update #1, September 16, 1986, and Update #2, May 1, 1987 ("Quality Criteria for Water") will apply. The numeric water quality standards from this reference are those for the parameters that are the Section 307 (a) priority pollutants (Appendix A). These standards are intended to protect both aquatic life and human health. For protection of aquatic life, they are maximum levels not to be exceeded and GEPA will utilize the national criteria guidance four-day average concentration limits or 24-hour average

limits, whichever is most current, as standards. For protection of human health in fresh surface waters, the GEPA will apply the national criteria guidance for ingestion through water and contaminated aquatic organisms as 30-day average limits. For other territorial waters, the GEPA will apply the national criteria guidance for ingestion through contaminated aquatic organisms alone as 30-day average limits. For those priority pollutants that are carcinogens, the 10 to the minus sixth power risk level will be used (10^{-6}).

In addition to the 126 listed toxics, Table II shows the maximum allowable concentrations and application factors for additional toxic substances.

TABLE II. ADDITIONAL TOXIC POLLUTANTS NOT INCLUDED IN APPENDIX A.

* Substance	Maximum Numerical Limit		Application Factors
	Marine Water	Fresh Water	
Aluminum	0.20 mg/l	1.0 mg/l	0.01
Ammonia	0.02 mg/l		0.05
Barium	0.50 mg/l		0.05
Boron	5.00 mg/l		0.10
Bromine (free	0.10 mg/l		-
as Bromate)	100.00 mg/l		-
Chlorine (Total Residual)	0.00 mg/l	0.01 mg/l	0.1
Fluoride	1.50 mg/l	0.80 mg/l	0.1
Iron	0.05 mg/l	3.00 mg/l	-
Manganese	0.02 mg/l		0.2
Molybdenum	-		0.0
Sulfide	0.005 mg/l		0.1 (Applicable to 20-day LC data)
TBT	(See Appendix I)		
Uranium	0.00 mg/l		0.01
Vanadium	-		0.05

* Total amounts in indicated chemical state of form.

1 Greater concentrations of Chlorine may be used to treat a source of drinking water in order to meet the requirements of Subsection II.B.1 of these standards.

2 Naturally occurring Uranium has been reported in concentrations of 0.003 mg/l (seawater) and 0.00004 mg/l (river water)

Note: Whenever natural concentrations of any toxic substance or element occur and exceed the limits established in these standards, this greater concentration shall constitute the limit, provide that this natural concentration was not directly affected by man-induced causes.

SECTION III

EFFLUENT LIMITATIONS

A. GENERAL CRITERIA

The Agency reserves the right to amend or extend the following criteria as improved standard methods are developed or revisions consistent with the enhancement of water quality are justified:

1. All sewage shall be treated to the degree required by the Agency to achieve standards of water quality prior to being discharged to the waters of the Territory. Industrial waters and other wastes shall also be treated to the degree required by the Agency.

2. Dilution of the effluent from any source as a sole means of treatment is not acceptable as a method of treatment of wastes in order to meet the standards set forth in this Section. Rather, it shall be the obligation of any person discharging pollutants of any kind to the waters of the Territory to provide the best pollutant removal or control consistent with technological feasibility, economic reasonableness, and sound engineering judgement. In making a determination as to what degree of treatment is the best pollutant removal or control within the meaning of this paragraph, any person shall consider the following:

   a) the degree of waste reduction that can be achieved by process change, improved house-keeping and recovery of individual waste components for reuse; and

   b) whether individual process wastewater streams should be segregated or combined.

3. Measurement of pollutant concentrations to determine compliance with the effluent limitations shall be made by the discharger at the point immediately following the final treatment process and before mixing with other waters. Points of measurement shall be designated by the Agency in an individual permit, after consideration of the elements contained in this section. If necessary, the concentrations so

measured shall be recomputed to exclude the effect of any dilution that is improper under this standard.

4. Every person discharging effluent to the waters of the Territory shall submit operating reports to the Agency at a frequency to be determined by the Agency. Such reports shall contain information of those physical, chemical and bacteriological parameters which shall be specified by the Agency; and any additional information the Agency may reasonably require.

5. In addition to other requirements no effluent shall, alone, or in combination with other sources, cause a violation of any applicable Water Quality Standard. If the Agency finds that a discharge which complies with treatment requirements under the Authority of Section III-A of these standards would cause or is causing a violation of Water Quality Standards, the Administrator shall take appropriate action under Section 47109 of the Water Pollution Control Act to require the discharge to meet whatever effluent limits are necessary to ensure compliance with the Water Quality Standards. When such a violation is caused by the cumulative effect of more than one source, several sources may be joined in a schedule of compliance. Measures necessary for effluent reductions will be determined on the basis of technical feasibility, economic reasonableness, and fairness to all dischargers.

6. Any existing point source discharges to near shore waters of M-1 and M-2 classifications as of the effective date of these standards shall submit to the Administrator for approval a plan and schedule for elimination of the discharge to near shore waters by December 31, 1998. Any such plan shall consider all alternate disposal options and give preferential consideration to eliminating all point source discharges to the waters of the Territory. After approval of the plan by the Administrator, the Administrator shall not certify compliance with these standards to the USEPA in connection with issuance or reissuance of a NPDES permit for the discharge unless the permit includes the aforementioned plan and schedule.

7. The Administrator shall not certify compliance with these standards to the USEPA in connection with issuance of a NPDES permit for a new discharge to near shore waters.

B. MIXING ZONES IN RECEIVING WATERS

Whenever a mixing zone is allowed by the Agency for the mixture of an effluent with its receiving waters, the zone in which mixing occurs will not adversely affect the designated uses of the receiving waters. If mixing zones are used, Water Quality Standards for a receiving water must be met at every point at the boundaries of the designated mixing zone. The following criteria apply to all mixing zones:

1. Whenever mixing zones are allowed, zones of passage, i.e., continuous water routes of the volume, area, and quality necessary to allow passage of free-swimming and drifting organisms with no significant effects produced on their populations, shall be provided.

2. Where two or more mixing zones are in close proximity, they shall be so defined that a continuous zone of passage for aquatic life is available.

3. Biologically important areas, including spawning and nursery areas, shall be protected.

4. No criteria shall be set aside in the mixing zone which shall cause conditions in the mixing zone to become lethal to aquatic life and wildlife which may enter the zone or become injurious to human health in the event of a temporary exposure.

5. The area or volume of an individual mixing zone shall be limited to an area or volume that will minimize impacts on uses.

6, The discharge shall not violate the basic standards applicable to all waters (Section II A and Section III E) nor shall it unreasonably interfere with any actual or probable use of the water within the mixing zone.

7. For those water quality criteria eligible for a mixing zone, alternate limits will be established if

the limits in II-B are to be revised in the zone of mixing.

8. Mixing Zones may be allowed on a case by case basis upon approval of an Environmental Impact Statement.

C. MIXING ZONES FOR NON-THERMAL DISCHARGES

Non-thermal discharges shall be permitted by the National Pollutant Discharge Elimination System (NPDES) permit process. Mixing zone for non-thermal discharge may be granted only after careful analysis of the nature of the effluent and a thorough study to assess the consequences of the effluent upon the environment. Mixing zones for non-thermal discharges shall be based on the following models, taking into consideration the criteria in Section III(B) above.

1. Mixing Zones for Non-thermal Discharges

For non-thermal discharges into streams and rivers, the mixing zone, at the point of discharge, is limited to 25% of the cross sectional area of the stream at the minimum flow at which the appropriate Water Quality Standard can be met by thorough mixing of the effluent with the receiving waters.

The length of the mixing zone shall extend downstream no more that 5 times the natural width of the stream at the point of discharge at the minimum flow condition.

The applicable water quality standard must be achieved at all points outside the mixing zone.

Mixing zones will not be permitted in standing bodies of water.

2. Mixing Zones for Non-thermal Discharges into Coastal Waters.

For non-thermal discharges to coastal waters, the mixing zone shall be equal in depth to the depth of the water over the diffuser, in width to twice the depth of the water plus the width of the diffuser, and in length to twice the depth of the water plus the length of the diffuser, with the diffuser geographically centered within the mixing zone.

All discharges to marine waters will comply with the ocean discharge Criteria promulgated under Section 403 (6) (c) of the Federal Clean Water Act.

D. MIXING ZONES FOR THERMAL DISCHARGES

Thermal discharges pertain to effluent water with a temperature component either above or below ambient conditions of the receiving body of water. All thermal discharges, existing or proposed, into receiving bodies of water located on M-2 and M-3 shall be subject to criteria established in Section 316 (a) of the Federal Water Pollution Control Act (FWPCA), Public Law 95-217. Thermal discharges shall be subject to the National Pollutant Discharge Elimination System (NPDES) permit process. Mixing zone for thermal discharge may be granted only after careful analysis of the nature of the effluent and a thorough study to assess the consequences of the effluent upon the environment.

1. All above-Ambient Discharges:

a) Shall conform to a zone of mixing defined for that particular discharge on a case-by-case basis. This zone of mixing shall be defined by the following references or other references depicting appropriate thermal mixing zone models.

- EPA/505/2-90-001, PB91-127415, March 1991 Technical Support Document For Water Quality-based Toxic Control.

And take into consideration the following criteria:

- Time of exposure
- Temperature of effluent
- Depth of discharge
- Type of environment
- Volume of discharge
- Mass of pollutant rate of critical materials
- Aesthetics and the assessment of damage to

biota on the population basis.

Final authority in defining a zone of mixing rests with the GEPA.

b) Shall not increase the temperature of the receiving body of water to cause substantial damage or harm to the flora and fauna or interfere with the beneficial uses assigned therein.

c) Shall comply with all other water quality criteria as defined in these standards, and specific criteria established in the discharge permit.

d) These zones of mixing shall be monitored by the discharger on a regular schedule established by the NPDES Permit, to ensure compliance with established criteria.

e) If the Agency, pursuant to notice and opportunity for public hearings, finds evidence that a discharge has caused substantial damage, it may require conversion of such discharge to an approved alternative method. In making such a determination, the Agency may consider:

(1) The nature and extent of damage to the environment.

(2) Projected lifetime of discharge.

(3) Adverse economic and environmental impacts, marine and terrestrial, resulting from such conversion.

(4) All available data, reports, surveys and projects related to the discharge.

(5) Such other factors which may prove to be appropriate.

2. Above-Ambient Discharges in Existence Prior to Approval of These Standards.

a) Shall be given special attention when defining a zone of mixing. All criteria established for part D-1 above, shall apply with special emphasis on specific criteria listed in part D-1a.

b) Description of mixing zones for Tanguisson and Piti/Cabras Power Plants.

(1) Tanguisson Power Plant Zone of Mixing

The zone of mixing for the Tanguisson Power Plant is defined as a rectangle of approximately 10,000 sq. m. with the following reference points.

Northern boundary - North side of intake channel

South boundary - 1969 ft (600 m) south of intake channel

Eastern boundary - Shoreline at mean high tide

Western boundary - 591 ft (180 m) off-shore to a depth beyond the reef margin of about one meter which is the top of the zone of passage.

(2) Piti/Cabras Zone of Mixing

The zone of mixing for the Piti/Cabras Power Plants combined is the Piti Channel, from the power plants to a distance 300 feet back from where the channel joins the harbor proper and from there to a depth of about one meter or 3.28 feet to a line from the GORCO Pier and the Navy Fuel Pier on Dry Dock Island.

(3) Below-Ambient Discharges.

All below-ambient discharges shall follow the same guidelines set down for thermal discharges and be evaluated on a case-by-case basis.

E. PROHIBITED DISCHARGES

1. No person shall cause or permit:

   a) the discharge of any wastes or wastewaters regardless of volume, unless authorized by the Administrator under Section 47106 of the Water Pollution Control Act or unless subject to control or modification required by a schedule of compliance established by the GEPA Board of Directors;

   b) the discharge of any pollutant in toxic amounts, including the substances which may accumulate to toxic amounts, during the expected life of organisms in the receiving water, which are lethal to, or which produce deleterious genetic, physiological, or behavioral effects in the organisms;

   c) the discharge of any radiological, chemical, biological warfare agents, or radioactive wastes and contaminated radioactive materials from research and medical facilities.

   d) any discharge which would substantially impair anchorage and navigation, including any discharge which the Secretary of the Army, acting through the Corps of Engineers, finds would result in this damage;

   e) any discharge which the Administrator of the United States Environmental Protection Agency has objected to in writing pursuant to any right to object provided by the Federal Water Pollution Control Act, as amended;

   f) any discharge which is in conflict with an approved Territorial plan;

   g) the discharge of sewage from vessels while moored, berthed or docked, or underway in waters of the Territory except through a properly functioning Coast Guard approved type II Marine Sanitation Device; and

   h) any pollutant discharge into M-1, S-1, or G-1 waters as defined in Section I of these Standards.

i) any discharge of visible floating materials including scum and foam.

2. All vessels exceeding 400 gross tons which are berthed or docked in the waters of the Territory, without fully functional U.S. Coast Guard approved oil pollution prevention devices (for longer than 72 hours detention) must be completely encircled with flotation booms to contain any discharged oil. The Administrator may require any vessel, regardless of gross tonnage, operating ability, oil pollution prevention devices, duration of moorage or dockage time, to be completely encircled with floating booms if in this opinion such measures are necessary to control potential oil discharges into Territorial waters including, but not limited to, instances where excessive oil is present on the vessel's deck or in the vessel's bilges; when major machinery repairs are undertaken; or when a vessel cannot close its scuppers effectively during bunkering operations.

F. LAND DISPOSAL OF TREATED WASTEWATERS

1. Approval of land disposal of treated liquid wastewater requires that:

a) wastewaters shall be restricted to the premises of the disposal site;

b) provision shall be made by the discharger for monitoring the quality of the effluent with the exception of single family dwelling units unless there are more than five (5) units connected to a single system, or the Agency requires it after identifying a potential hazard;

c) all monitoring data and reports required under a discharge permit shall be submitted to the Agency;

d) land disposal shall not create a public health hazard, a nuisance condition or an air pollution problem;

e) these standards do not solely govern water/ wastewater to be reused to produce products which may end up in the human food chain, such as crops, animal feed or animal products. The

Agency will consider such reuse on a case-by-case basis using available guidelines on best available technology.

2. The evaluation for a permit for land treatment and/or disposal of wastewater(s) should include, but not necessarily be limited to consideration of the following items:

   a) the type of wastewater(s) proposed for disposal. (The wastewater(s) should be biologically degradable but other wastewater(s) will be considered provided it can be shown that disposal of the wastewater(s) will not adversely affect the designated use of the waters underlying or adjacent to the disposal site).

   b) the nature of the earth material(s) underlying the disposal site. (The applicant must provide positive assurance that the earth material(s) underlying the proposed disposal site will not allow movement of pollutants into underlying groundwaters so as to exceed ground water standards.)

   c) the vegetative cover of the disposal site. The selection of a vegetative cover should reflect the disposal season(s), the duration and frequency of disposal and the response of the vegetative cover to the wastewater. If the wastewater proves to be deleterious to vegetative cover, a higher degree to treatment or another means of disposal will be required.

3. Improperly and/or inadequately treated sewage shall not be allowed to accumulate on the ground surface in such a manner that it may create a health hazard and/or a nuisance condition.

4. It shall be a violation of these standards to store, dispose of, or allow to accumulate any solid waste or other deleterious material adjacent to or in the immediate vicinity of any streams, rivers, wetlands, or marine waters in a manner that such material will directly or indirectly enter such waters or wetlands. Such

material shall include, but not be limited to sewage sludge, trash, rubbish, garbage, oil, gasoline, chemicals, sawdust, accumulations of manure, and stockpiles of soil.

5. In case of accidental spills of deleterious materials, responsible persons in charge shall immediately notify the Administrator of any such spills and make every reasonable effort to contain spilled material in such a manner that it will not pollute waters of the Territory.

6. Wastewater discharged to disposal wells for underground disposal shall receive, prior to discharge, treatment necessary to protect potable water resources and any adjacent marine waters or fresh surface waters. See Table III (Appendix J).

G. EFFLUENT DISCHARGE LIMITATIONS FOR GROUNDWATER CATEGORIES G-2a, G-2b, AND G-3

Any water percolating to the groundwater table is in the state of transition from being a discharge to becoming part of a useable body of water. Because of the difficulty involved in tracing the source and eliminating pollutants after they have reached the groundwater table, limitations for discharges to G-2a, G-2b, and G-3 waters are established in Table III (Appendix J). This Table provides criteria for some common water quality parameters. The Agency will set limits for other parameters as necessary on a case-by-case basis.

The Agency may allow the application of G-3a discharge limitations to flows greater than 10,000 gallons per day if it can be shown by an engineering feasibility study that there will be no significant adverse effect on the waters of the Territory.

The Agency also reserves the right to set more stringent standards than those shown in Table III (Appendix J) if there is reason to believe that significant environmental damage will result from any discharge. Effluent limitations have not been set for G-1 waters because the Agency prohibit such discharges.

H. PETROLEUM STORAGE FACILITIES

Any storage facility containing petroleum products or hazardous substances not directly adjacent to navigable waters and below the SPCC capacity requirements of 600 gallons shall be provided with secondary containment to protect Guam's groundwater resources from potential threat to oil or hazardous substances discharges. In case of spills, the Federal Spill Prevention Control counter measure requirements shall be adhered to.

CHAPTER IV

DEFINITIONS

The following definitions are used for the purpose of clarification where such terms, phrases and words are used or implied in the text of these Water Quality Standards.

ADMINISTRATOR: Primary responsible person of the Guam Environmental Protection Agency.

ADVERSELY AFFECT: Damage to the waters of the Territory of Guam that result in, but are not limited to any of the following:

1. Substantial increase or decrease in abundance or distribution of any species or representative of the highest community development achievable in receiving waters of comparable quality.

2. A substantial decrease in abundance or diversity of indigenous species.

3. Change(s) in community structure to resemble a simpler successional stage than is natural for the locality and season in question.

4. Degradation in appearance, odor or taste of the waters.

5. Elimination of an established or potential economic or recreational use of the waters.

6. Reduction of the successful completion of life cycles of indigenous species, including those of migratory species.

7. Substantial reduction of community heterogeneity or trophic structure.

AGENCY: Guam Environmental Protection Agency (GEPA).

AMBIENT: Existing conditions in surrounding waters taking into account established human activity at that time and place (should approach natural conditions that would be present without the presence of human activities).

AMBIENT MONITORING: Monitoring within lakes, rivers, estuaries, wetlands, springs, swamps, mangroves, etc., to determine existing conditions of the natural system.

AQUIFER: A water-bearing stratum of permeable rock, sand or gravel.

BASAL GROUNDWATER: Fresh groundwater floating directly on sea water.

BEST AVAILABLE TECHNOLOGY: Subject to economic and engineering feasibility limitation, BAT should incorporate the best available current technology with a capacity up to and including no discharge of pollutants. Considerations include the age of the equipment and facilities involved; the process used; the engineering aspects of applying various types of control techniques; process changes; the cost of achieving the effluent reduction resulting from applying the technology; and non-water quality environmental impacts.

BEST MANAGEMENT PRACTICE: Application of the most current and effective techniques, methods and procedures, practices or design and performance standards for a specific purpose.

BEST POLLUTANT REMOVAL OR CONTROL: A feasible process which, as demonstrated by general use, demonstration process or pilot plants represents good engineering practice at a reasonable cost at the time a discharge permit is issued by the Agency.

BIOTA: The animal, plant and microbial life of a region.

BOUNDARY: The physical interface between adjoining discreet areas. A fine line as applied to groundwaters, but as applied to surface and marine waters the line may shift due to storm conditions, tides, water current changes and surface winds.

COASTAL WATERS: Includes near-shore, off-shore and estuary waters within the jurisdiction of the Territory of Guam.

COLIFORM BACTERIA:

a. TOTAL COLIFORM BACTERIA: All of the aerobic and facultative anaerobic gram-negative, non spore-forming, rod-shaped bacteria that ferment lactose broth with gas formation within 48 hours at 35 degrees Centigrade +/- 0.5 degrees Centigrade.

b. FECAL COLIFORM: That portion of the coliform group which is present in the gut or the feces of warm-blooded animals. It generally includes organisms capable of producing gas from lactose broth in a suitable culture medium within 24 hours at 44 degrees Centigrade +/- 0.2 degrees Centigrade. This elevated temperature will eliminate non-fecal and non-coliform organisms and selectively culture fecal coliform bacteria.

COMMUNITY: An association of living organisms in a given area or region in which the various species are more or less interdependent upon each other.

CONTROLLABLE WATER QUALITY: The aspects of water quality that can be protected or modified by human activity.

CONSERVATION: Planned management of a natural resource to prevent exploration, destruction or neglect.

CREATED WETLAND: A wetland at a site where it did not formerly occur. Created wetlands are designed to meet a variety of human benefits including, but not limited to, the treatment of water pollution discharges (e.g., municipal wastewater, storm water, etc.) and the mitigation of wetland losses permitted under Section 404 of the Clean Water Act. This term encompasses the term "constructed wetland" as used in other EPA guidance and documents. Created wetlands designed and specifically created and used solely for the purpose of wastewater treatment do not qualify as waters of the territory of Guam. The discharges from the created wetlands which do not qualify as waters of the territory must meet applicable water quality standards for the receiving waters and will be treated on a case-by-case basis.

DEVELOPMENT: Means the placement or erection of any solid material or structure, including structures on pilings; discharge or disposal of any dredged

material or of any gaseous, liquid, solid or thermal waste; grading, removing, dredging, mining or extraction of any materials; change in the density or intensity of use of land, including, but not limited to, subdivision of land and any other division of land including, lot parceling; change in the intensity of use of water, ecology related thereto or of access thereto; construction or reconstruction, demolition or alteration of the size of any structure, including any facility of any private, public or municipal utility, and the removal of significant vegetation.

DIRECT MOVEMENT: The movement of effluent through the soil and underlying rock strata in such a manner that pollutants which would adversely impact on the designated uses of the receiving water are not removed.

DISCHARGE: The direct or indirect outflow of wastewater, substance or material from any domestic, commercial, industrial, agricultural or any other source into air, land and waters of the Territory of Guam. The term "discharge" includes either the discharge of a single pollutant or the discharge of multiple pollutants.

DISCHARGER: Any person or entity that discharges any wastewater, substance or material into the waters of the Territory of Guam whether or not such substance causes pollution.

EFFLUENT: Solid, liquid or gaseous material discharged into the environment.

EFFLUENT LIMITATION: Any restriction or prohibition established under Territorial or Federal Law including, but not limited to parameters for toxic and non-toxic discharges, standards of performance for new sources, or ocean discharge criteria. The restrictions or prohibitions shall specify quantities, rates and concentrations of chemical, physical, biological and other constituents which are discharged to waters of the Territory of Guam.

EMERGENCY PLAN: The corrective procedure (SPCC) is to be followed in the case of oil or toxic substance spills, or in the case of damage caused by natural phenomena

whether on-land or off-land. This definition covers spills whether they are caused by small quantity generators, i.e., underground/above ground storage tanks, or underground/above ground fuel lines.

ENVIRONMENTAL IMPACT ASSESSMENT: A documentary evaluation of the impact upon the environment of any human activity.

ENVIRONMENTAL IMPACT STATEMENT: A documentary presentation justifying an adverse environmental impact.

ENVIRONMENTAL PROTECTION PLAN: A written document required by the Agency prior to the start of construction in which the developer/contractor describes the methods/equipment selected for use in the development, the environmental problems expected during and after development and the methods or equipment chosen to avoid, mitigate or control adverse effect on the environment.

ESTUARY: A region of interaction between near-shore waters and rivers within which tidal action and river flow bring about mixing of fresh and salt water.

FECAL COLIFORM: See "Coliform".

FWPCAA: Federal Water Pollution Control Act Amendments of 1972, as amended through 1987 (Clean Water Act).

HABITAT: The environment occupied by individuals of a particular species, population or community.

HIGHER DEGREE OF TREATMENT: Any physical, biological and/or chemical method directed at removing a specified portion of the remaining pollutants after secondary treatment.

HYDROLOGIC CYCLE: That natural system dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

INDUSTRIAL WASTE: Any discharge containing gaseous, dissolved or suspended material resulting from any process of industry, manufacturing, trade or business or from the processing of any natural resource, together with such sewage as may be present, which may pollute the waters of the territory.

LAND TREATMENT: Any treatment of wastewater which involves the use of plants, soil surface and the soil matrix for wastewater treatment, including irrigation systems, infiltration systems, overland flow systems and other systems of wastewater treatment via land application.

LETHAL CONCENTRATION - 50 PERCENT (LC50): That concentration of a toxic substance in water which for a given time period causes 50 percent of the exposed individuals of an aquatic test organism to die.

LIMITED BODY CONTACT: Any recreational or other use in which contact with the water is either incidental or accidental and in which the probability of ingesting appreciable quantities of water is minimal.

LINE OF MEAN HIGH WATER: The shoreline as indicated on the 1:24,000 Series (Topographic) Maps of the Island of Guam prepared by the U.S. Geological Survey.

MARINE SANITATION DEVICE: Equipment or process for installation on vessel or water craft which is designed to receive, retain, treat, or discharge sewage or other pollutants or any process to treat such sewage, or other pollutants which has received U.S. Coast Guard approval.

MIXING ZONE: The area or volume of a water body within which effluent(s) shall become physically mixed with the receiving waters through initial dilution. Initial dilution is the process through which the wastewater immediately mixes with the receiving water due to the momentum of the waste discharge and the difference in density between the discharge and the receiving water. The total area or volume of water designated as a mixing zone shall be limited to that area or volume which will not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem and which will not cause substantial damage to or impairment of designated water uses within the mixing zone or in surrounding waters. A mixing zone shall be considered designated only when approved by the Guam Environmental Agency and when concurrence of the U.S. EPA has been received.

MUNICIPAL WASTES: Water carrying human and animal wastes from homes, buildings, industrial establishments and other places either alone or in combination with industrial wastes.

NATURAL CONDITIONS: The resulting water quality in the absence of any measurable pollution effect due to human activities.

NEAR-SHORE WATERS: All coastal waters lying within a defined reef area; all coastal waters of a depth of less than ten fathoms (60 feet, 18.3 m.); and all coastal waters greater than 10 fathoms up to 1,000 feet (305 m.) off-shore where there is no defined reef area.

NEW SOURCE: Any wastewater sources, the construction of which is commenced on or after the 1968 effective date of these standards.

NPDES PERMIT: National Pollution Discharge Elimination System (permit). A federal permit used as the principal regulatory tool for reducing the quantity of pollutant discharges to the waters of the territory and for obtaining data on point source discharges.

OFF-SHORE WATERS: All coastal waters beyond the limits defined for "near-shore waters" to the Territorial Limit as recognized by International Law.

OUTFALL: The conduit from its connection to a wastewater treatment facility to its outlet through diffusers into off shore waters.

OIL SPILL PREVENTION DEVICES: Shall mean any U.S. Coast Guard approved device, such as an oil/water separator, a sludge tank (for oily deposits), a standard discharge connection or other equipment or apparatus required by the MAROL Convention of 1973/1978 for the prevention of oil pollution of vessels.

OTHER WASTE: Garbage, municipal refuse, sand, offal, oil, tar, chemicals and all other substances which may pollute the waters of the territory.

PARABASAL GROUNDWATER: Fresh groundwater hydraulically connected with basal water but lying directly on impermeable basement rock.

PASSAGEWAY: A continuous stretch where water characteristics are affected only by the environment in such a manner that the free flow or continuous drifting of biota is always possible.

PERMIT: A permit issued pursuant to Section 47106 of the Guam Water Pollution Control Act.

PERSON(S): Means any individual, firm, partnership, association or corporation, both public and private, including the agencies of the Government of Guam and of the United States of America.

POINT SOURCE: Any discernible, confined and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged. This term does not include flows from irrigated agriculture.

POLLUTANT: Any substance, refuse or waste, dredged spoils, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal and agricultural waste discharge into the water and capable of polluting the waters. See Pollution.

POLLUTION: Alteration of the physical, chemical or biological and radiological properties of any waters of the Territory which adversely and unreasonably impairs the water quality of the territory or which renders said waters hazardous to human health or harmful or detrimental to the aquatic and wildlife in or about the waters or to the most beneficial uses of the waters.

POTABLE WATER RESOURCES: Waters of the Territory actually used or intended to be used for drinking water or general domestic use.

PRIMARY TREATMENT: Removal of floating or settleable solids through screening and sedimentation processes.

RESTORATION: An activity returning a wetland from a disturbed or altered condition with lesser acreage or functions to a previous condition with greater wetland acreage or functions. For example, restoration might involve the plugging of a drainage ditch to restore the hydrology to an area that was a wetland before the installation of the drainage ditch.

RECEIVING WATER(S): Water(s) of the Territory into which wastes or wastewaters are, or may be discharged.

SECONDARY TREATMENT: The following degree of pollution removal:

1. Biochemical oxygen demand (five-day)

   a) The arithmetical mean of the values for effluent samples collected in a period 30 consecutive days shall not exceed 30 mg/l.

   b) The arithmetic mean of the values for effluent samples collected in a period of seven consecutive days shall not exceed 45 mg/l.

   c) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85 percent removal).

2. Suspended solids

   a) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 30 mg/l.

   b) The arithmetic mean of the values for effluent samples collected in a period of seven consecutive days shall not exceed 45 mg/l.

   c) The arithmetic mean of the values for effluent samples collected in a period of 30

consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected approximately the same times during the same period (85 percent removal).

3. Fecal coliform bacteria

a) The arithmetic mean of the value for effluent samples collected in a period of 30 consecutive days shall not exceed 200 per 100 ml.

b) The arithmetic mean of the values for effluent samples collected in a period of seven consecutive days shall not exceed 400 per 100 ml.

4. pH

a) The effluent values for pH shall remain within the limits of 6.0 to 9.0.

SCHEDULE OF COMPLIANCE: A schedule of corrective measures and times including an enforceable sequence of actions or operations leading to compliance with any control regulation or effluent limitation in a specified time period.

SEWAGE: The water-carried waste products from the residences, public buildings, institutions or other buildings, including the excrementitious or other discharge from the bodies of human beings or animals, together with such ground water infiltration and surface water as may be present.

SPECIAL AQUATIC SITES: Sites possessing special ecological characteristics and values including wetlands, wildlife sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, riffle and pool complexes.

SURFACE WATERS: Any natural or artificial water source including all streams, sinkholes, lakes, ponds, wetlands, impounding reservoirs, inland watercourses and waterways, springs, irrigation systems and all other inland water bodies or accumulated waters. For

the purpose of this regulation, the term does not include coastal waters or those subject to the ebb and flow of tides.

THERMAL DISCHARGE: Discharge of water into the environment which has temperature component either above or below the temperature of the receiving body of water.

TOXIC: Lethal, teratogenic or mutagenic, or otherwise damaging to man or other living organisms.

TRANSITION ZONE: In basal water the interface between the bottom of the freshwater lens and the underlying saltwater. Salinity is low at the top of the transition zone and increases to that of seawater at the bottom of the zone.

UPLAND: Any area that does not qualify as wetland because the associated hydrologic regime is not sufficiently wet to elicit development of vegetation, soils and/or hydrologic characteristics associated with wetlands, or is defined as open waters.

WASTEWATER: Sewage, industrial waste, or other waste, excluding thermal discharge, or any combination of these, whether treated or untreated, plus any admixed land runoff.

WATER QUALITY STANDARDS: The designated water body uses or classifications and the criteria including anti-degradation provisions and provisions for implementation to protect those uses and classifications.

WATERS OF THE TERRITORY: All waters within three miles from the high waterline surrounding Guam, streams (including intermittent streams), lakes, wells, springs, wetlands, irrigation systems, marshes, watercourses, waterways, sink holes, drainage systems and other bodies of water, surface and underground, natural or artificial, publicly or privately owned.

WETLANDS: Means areas of land where the water table is at, near or above the land surface long enough each year to result in the formation of characteristically wet (hydric) soil types, and support the growth of water dependent (hydrophytic) vegetation. Wetlands include, but are not limited to, marshes, swamps, mangroves,

natural ponds, surface springs, estuaries, bogs, and other such low-lying or similar areas. Inland wetlands will include all wetlands meeting the following conditions.

1) Wetlands greater than one hectare in size with less than 0.5% (ocean derived) salinity; and

2) Palustrine, Riverine and Lacustrine wetlands with greater than 30% wetland vegetation cover.

Wetlands must meet applicable water quality standards requirements based on where it is situated in accordance with Category Classification of the Water Quality Standards.

WETLAND FUNCTIONS: The beneficial uses of wetlands which are protected by these Water Quality Standards including but not limited to groundwater recharge/discharge, floodwater retention, sediment stabilization, nutrient removal/transformation, wildlife diversity/ abundance, aquatic diversity/abundance, and recreation.

WHOLE BODY CONTACT: Any recreation or other use in which there is whole body contact with the water involving a risk sufficient to pose a significant health hazard either by contact with or ingestion of the water.

ZONE OF PASSAGE: Shall mean a continuous water route which joins segments of river, stream, reservoir, estuary, or channel above, below, or around a mixing zone without going through the mixing zone. As a minimum, no less than one-third of the cross-section of the water body shall be retained in compliance with the water quality criteria in Section II.

APPENDIX A

LIST OF THE 126* PRIORITY TOXIC POLLUTANT DESIGNATED UNDER SECTION 307(A) (1) OF THE CLEAN WATER ACT.

Acenaphthene
Acenapthylene (PAH)
Acrolein
Acrylonitrile
Aldrin
Antimony
Anthracene
Arsenic
Asbestos

1,2-Benzanthracene (PAH)
Benzene
Benzidine
Benzo (a) Pyrene (3,4-Benzo-pyrene) (PAH)
3,4-Benzofluoranthene (PAH)
Benzo (A) Fluoranthene (PAH)
1,12-Benzoperylene (PAH)
Beryllium
Bromoform (Tribromomethane)
Bromomethane (Methyl Bromide)
4-Bromophenyl Phenyl Ether
Cadmium
Carbon Tetrachloride (Tetrachloromethane)
Chlordane
Chlorobenzene (Monochloro-Benzene)
Chlorodibromomethane (Halomethane)
Chloroethane (Monochloroethane)
Chloroethyl Ether (Bis-2)
1 Chloroethoxy Methane (Bis-2)
2 ChloroethylVinyl Ether
4-Chloro-3-Methylphenol
Chloromethane (Methyl Chloride)
Chloroform (Trichloromethane)
2-Chlorophenol
Chloroisopropyl Ether (Bis-2)
2-Chloronaphthalene
4-Chlorophenylphenyl Ether
Chromium (HEX)

1,2 Dichlorobenzene
1,3 Dichlorobenzene
1,4 Dichlorobenzene
3,3 Dichlorobenzidine
Dichloroethane 1,1
Dichloroethane 1,2
1,1 Dichloroethylene
1,2-Trans-Dichloroethylene
Dichlorobromomethane (Halomethanes)
Dichloromethane (Halomethanes)
2,4-Dichlorophenol
Dichloropropane 1,2

Dichloropropene 1,3
Dieldrin
Dimethylphenol 2,4
Diethyl phthalate
Dimethyl phthalate
Dinitrotoluene 2,4
Dinitrotoluene 2,6
2,4-Dinitrophenol
Dioxin (2,3,7,8-TCDD)
Diphenylhydrazine 1,2
Alpha Endosulfan
Beta Endosulfan
Endosulfan Sulfate
Endrin
Endrin Aldehyde
Ethylbenzene
Fluorene (PAH)
Fluoranthene
Heptachlor
Heptachlor Epoxide
Hexachloroethane
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclohexane (lindane)
Hexachlorocyclohexane (Alpha)
Hexachlorocyclohexane (Beta)
Hexachlorocyclohexane (Delta)
Hexachlorocyclopentadiene

Chromium (TRI)
Chrysene (PAH)
Copper
Cyanide
4,4,-DDT
4,4,-DDE
4,4,-DDD
Dibenzo (a,h) Anthracene (PAH)
2-Nitrophenol
4-Nitrophenol
4,6-Dinitro-2-Methylphenol
Nitrosodimethylamine N
Nitrosodiphenylamine-N
Nitrosodi-n-Propylamine-N
PCB 1242
PCB 1254
PCB 1221
PCB 1232
PCB 1248
PCB 1260
PCB 1016
Phenol
Pentachlorophenol
Phenanthrene (PAH**)
Bis (2-Ethyl Hexyl) Phthalate
Butyl Benzyl Phthalate
Ideno (1,2,3-cd) Pyrene (PAH)
Isophorone
Lead
Mercury
Naphthalene
Nickel
Nitrobenzene
Di-n-Butyl Phthalate
Di-n-Octyl-Phthalate
Pyrene (PAH)
Selenium
Silver
Tetrachloroethane 1,1,2,2
Tetrachloroethylene
Thallium
Toluene
Toxaphene
1,2,4 Trichlorobenzene
Trichloroethane 1,1,1
Trichloroethane 1,1,2
Trichloroethylene
Trichlorophenol 2,4,6
Vinyl Chloride (Chloroethylene)
Zinc

Note: * Three volatile chemicals were removed from the original of 129 (44 CFR 44502, July 30,1979, as amended at 46 FR 2266, January 8, 1981, 46 FR 10724, February 4, 1981)

** (PAH) means Poly Aeromatic Hydrocarbon

Reproduced at Government Expense

TABLE III

Limitations for Discharges to Categories G-2 and G-3

Groundwater Category	Fecal Coliform	COD (mg/1)	pH	Chlorides (mg/1)	Ortho-phosphate (PO_4-P) (mg/1)	Nitrate-Nitrogen (NO_3-N) (mg/1)	Oil and Grease (mg/1)
G-2a	20/100 m/1	20	6-10	250	10	5	0.005
G-2b	200/100 m/1	20	6-10	250	10	5	5
G-3a (<3,000 gpd)	-(2)	300	6-10	500(1)	25	30(3)	5
G-3b (>3,000 gpd)	400(4)/100 ml	50	6-10	500(1)	10	5(3)	5

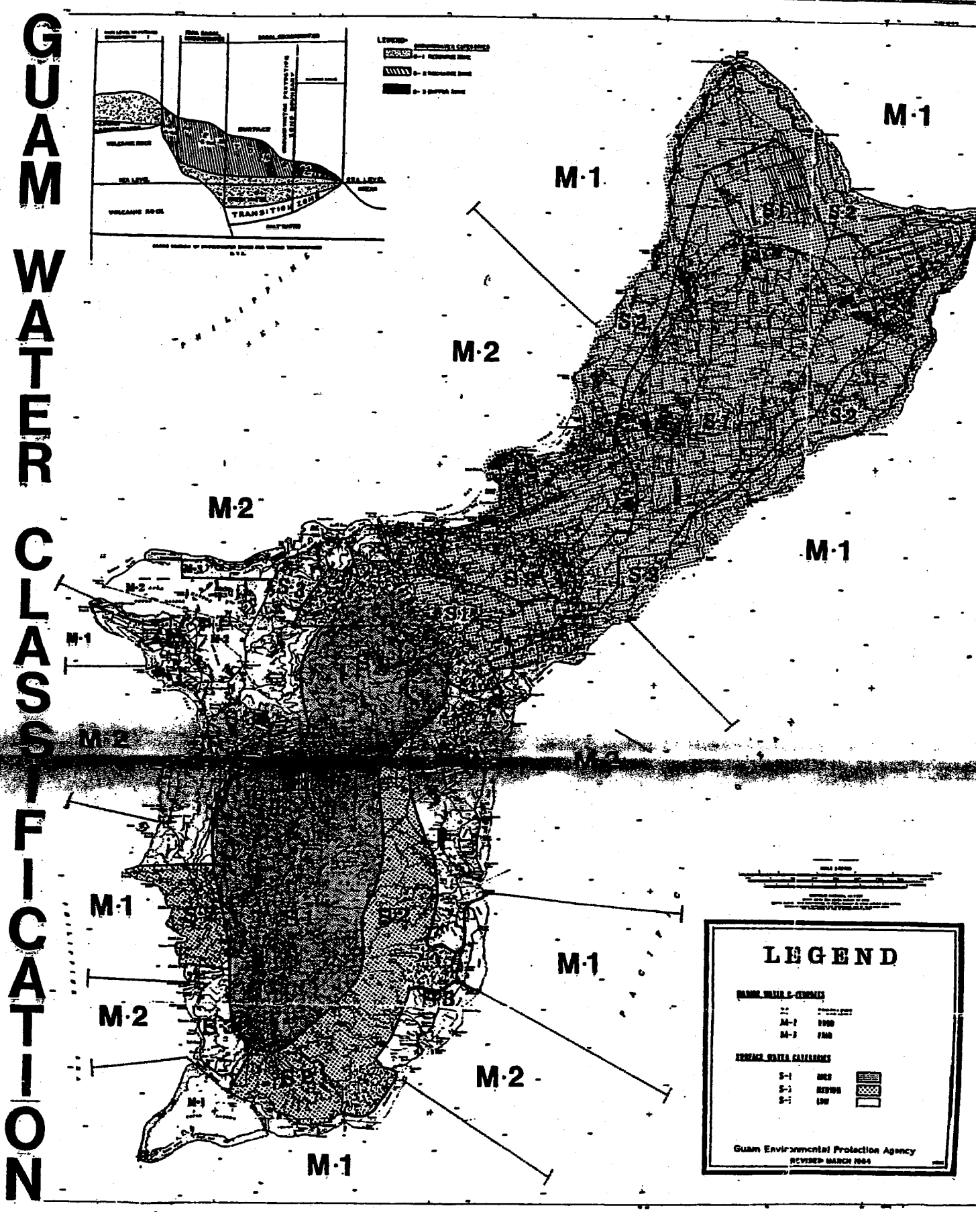
(1) outside of the Groundwater Protection Zone this limit is increased to 2000 mg/1

(2) concentrations to be established on a case-by-case basis by the Agency

(3) for animal feedlot operations higher discharge limitations may be permitted on a case-by-case basis

(4) daily average is based on a minimum of 15 samples per month

GUAM WATER CLASSIFICATION



MASTER MAP

Water Pollution Control Act

Outfall Extension

A/E and Construction Schedule

AGANA SEWAGE TREATMENT PLANT

OUTFALL EXTENSION

ACTION PLAN

ACTIVITY	COMPLIANCE DATE
Advertise for A/E Selection	November 3, 1997
Commence Design	February 2, 1998
Complete Design	October 1, 1998
Construction Funding Secured	June 30, 1999
Advertise for Construction Bids	December 14, 1999
Award Construction Contract	February 11, 2000
Commence Construction	April 8, 2000
Complete Construction	December 30, 2000

APPENDIZ G

Outfall Extension - A/E Construction Schedule

of its functions to the extent allowed by law.

Section 2. Section 21414, Government Code of Guam, is hereby repeale

Section 3. This Act is an urgency measure.

Approved July 29, 1967

(e) In connection with any hearing held pursuant to this Section, the Agency, or its designate, shall have power to administer oaths, examine witnesses and the production of evidence relevant to matter involved in the hearing.

Section 57049. Emergency Procedure.

(a) Any other provisions of law to the contrary notwithstanding, if the Administrator finds that a generalized condition of pollution exist and that it creates an emergency requiring immediate action to protect the intended uses of the water as designated in the Standards of Water Quality for Waters of the Territory of Guam, or to protect human health or safety, the Administrator, with the concurrence of the Governor, shall persons causing or contributing to the pollution to reduce or discontinue immediately the pollutants, and such order shall fix a place and time, not later than twenty-four (24) hours thereafter, for a hearing to be held before the Agency. Not more than twenty-four (24) hours after the commencement of such hearing, and without adjournment thereof, the Agency shall affirm, modify or set aside the order of the Administrator.

(b) In the absence of a generalized condition of pollution of the type referred to in subsection (a), but if the Administrator finds that pollutants from the operation of one or more polluting sources in causing imminent danger to the intended uses of the water as designated in the Standards of Water Quality for Waters of the Territory of Guam or is causing imminent danger to human health or safety, he may order the person or persons responsible for the operation or operations in question to reduce or discontinue pollutants immediately, without regard to the provision of subsection (a) of Section 57048 of this Act. In such event, the requirements for hearing and affirmance, modification or setting aside of orders set forth in subsection (a) of Section 57049 shall apply.

Section 57050. Penalties.

(a) Any person who violates any provision of this Act, or any rule or regulation in force pursuant thereto, shall be guilty of misdemeanor and subject on account thereof to a fine of not to exceed $1,000. Each day of violation shall constitute a separate offense.

(b) Action pursuant to subsection (a) of this Section shall not be a bar to enforcement of this Act, rules and regulations in force pursuant thereto, and orders made pursuant to this Act, by injunction or other appropriate remedy, and the Agency shall have power to institute and maintain in the name of this territory any and all such enforcement proceedings. Such proceedings shall be conducted in and by the Island Court of Guam.

(c) Nothing in this Act shall be construed to abridge, limit, impair, create, enlarge or otherwise affect substantively or procedurally the right of any person to damages or other relief on account of injury to persons or property and to maintain any action or other appropriate proceeding therefor.

Section 57051. Assistance by Governmental Agencies. The services and facilities of departments, agencies and instrumentalities of the Government of Guam may be made available to the Agency in the exercise

for each such classification shall be adopted in relation to the most beneficial use and benefit to which the waters are or may in the future be put; such standards may from time to time altered or modified.

Before streams are classified or standards established or before such standards are modified or repealed, public hearings by the Agency shall be held in connection therewith. Notice of public hearing for the consideration, adoption or amendment of the classification of waters and the standards of purity and quality thereof shall specify the water concerning which a classification is sought to be made or for which standards are sought to be adopted and the time, date and place of such hearing. Such notice is to be published at least once a week for two (2) consecutive weeks in a newspaper of general circulation and in addition shall be mailed to such other persons as the Agency has reason to believe may be directly affected by such classifications and the setting of such standards.

Section 57048. Enforcement.

(a) Whenever the Agency has reason to believe that a violation of any provision of this Act or rule or regulation pursuant thereto has occurred, it may cause written notice to be served upon the alleged violator or violators. The notice shall specify the provision of this Act or rule or regulation alleged to be violated, and the facts alleged to constitute a violation thereof, and may include an order that necessary corrective action be taken within a specified time. Any such order shall become final unless, no later than ten (10) days after the date the notice and order are served, the person or persons named therein request in writing a hearing before the Agency. Upon such request, the Agency shall hold a hearing. In lieu of an order, the Agency may require that the alleged violator or violators appear before the Agency for a hearing at a time and place specified in the notice and answer the charges complained of, or the Agency may initiate action pursuant to Section 57050 of this Act.

(b) If, after a hearing held pursuant to subsection (a) of this Section, the Agency finds that a violation or violations have occurred, it shall affirm or modify the order previously issued or issue an appropriate order or orders for the prevention, abatement or control of the pollutions involved or for the taking of such other corrective action as may be appropriate. If, after hearing on an order contained in a notice, the Agency finds that no violation has occurred or is occurring, it shall rescind the order. Any order issued as part of a notice or after hearing may prescribe the date or dates by which the violation or violations shall cease and may prescribe timetables for necessary action in preventing, abating or controlling the pollution.

(c) No later than ten (10) days after the issuance of the final order of the Agency, an appeal to the Island Court of Guam may be made against any decision of the Agency by any person who is or may be adversely affected thereby.

(d) Nothing in this Act shall prevent the Agency from making efforts to obtain voluntary compliance through warning, conference or any other appropriate means.

properties of the waters of the territory and (4) new outlets for the discharge of sewage, industrial wastes or other wastes into any sewerage system or otherwise into the water of the territory subject to the rules and regulations of the Agency;

(e) To issue, continue in effect, revoke, modify or deny permits to any person for the collection and discharge of sewage and industrial and other wastes under such conditions as the Agency may prescribe;

(f) To advise, consult and cooperate with other agencies of the territory of Guam; with the Federal Government and with affected groups, political subdivisions and industries, in the formulation of such comprehensive program;

(g) To collect and disseminate information relating to water pollution and the prevention, control and abatement thereof;

(h) To conduct as the Administrator deems necessary, studies, investigations, research and demonstrations relating to water pollution and the causes, prevention, control and abatement thereof.

Section 57045. Pollution Unlawful: Permits.

(a) It shall be unlawful for any person to cause the pollution, as defined herein, of any waters of the territory.

(b) It shall be unlawful for any person to construct, install or operate a new sewerage system, disposal system or treatment works, extensions, modifications, or additions to new and existing sewerage systems, disposal systems, or treatment works, extensions, modifications or additions to factories, manufacturing establishments or business enterprises, the operation of which would cause a substantial increase in waste discharges to the waters of the territory or otherwise substantially alter the physical, chemical or biological properties of the waters of the territory to make or cause to be made any new outlet for the discharge of sewage, industrial waste or other wastes into any sewerage system or into the waters of this territory without first securing such permit as the Administrator may require, including the submission of plans and specifications and such other information as he deems relevant in connection with the issuance of such permits.

(c) No permit shall be issued under this Section for any use in violation of water quality standards adopted under this Act.

Section 57046. Inspection and Entry. The Administrator or his duly authorized representative shall have the power to enter at reasonable times upon any private or public property for the purpose of inspecting and investigating conditions relating to pollution of any waters of the territory.

Section 57047. Classification and Standards. In order to effectuate a comprehensive program for the prevention, abatement and control of pollution in the waters of the territory, the Agency is authorized to group such waters into classes in accordance with their present and future most beneficial uses; such classification or standards may from time to time be altered or modified. Standards of quality and purity

methods, as far as practical, of preventing pollution that is detrimental to the public health or the health of animals, fish, or aquatic life, or the industrial development of the territory or detrimental to the practical use of waters for recreational purposes, agricultural or industrial purpose, or obnoxious, nauseous or toxic for domestic purposes;

(b) To develop and adopt a comprehensive program for the prevention, control, and abatement of pollution of the waters of the territory and from time to time review and modify such program for the guidance of the Administrator;

(c) To recommend and encourage studies, investigations, research, demonstrations relating to water pollution and causes, prevention, control and abatement thereof as are deemed advisable and necessary and to direct the Administrator regarding any actions deemed necessary from the results of such studies, investigations, research and demonstrations in order that the Administrator may discharge his responsibilities under this Act;

(d) To formulate standards of water purity and classification of water according to the most beneficial uses of such water; in formulating such standards and classifications consideration shall be given to the economics of waste treatment and prevention;

(e) To hold hearings necessary for the proper administration of this Act; and to receive complaints and make investigations in relation thereto;

(f) To exercise all incidental powers necessary to carry out the purposes of this Act;

Section 57044. Powers and Duties of the Administrator. The Administrator shall have and may exercise the following powers and duties:

(a) To consider actions of this Agency as set forth in Section 57043 providing that the Administrator may modify such actions of the Agency only insofar as is necessary to protect human health;

(b) To accept and administer loans and grants from the Federal Government and from any other source for carrying out any of its functions;

(c) To issue, modify or revoke orders for the abatement of pollution or to require the adoption of such remedial measure, including the construction of new disposal system or treatment works or the modifications, extension or alteration of existing systems and works, as directed by the Agency;

(d) To examine and approve or disapprove all plans and specifications for the construction and operation of (1) new sewerage systems, disposal systems and treatment works, (2) extensions, modifications of or additions to new or existing sewerage systems, disposal systems or treatment works, (3) extension and modifications of or additions to factories, manufacturing establishments or business enterprises, the operation of which would cause a substantial increase in waste discharges or otherwise substantially alter the physical, chemical or biological

(b) "Industrial waste" means any liquid, gaseous or solid waste substances resulting from any process of industry, manufacturing, trade or business or from the development of any natural resource, together with such sewage as may be present, which may pollute the waters of the territory.

(c) "Other wastes" means garbage, municipal refuse, sand, offal, oil, tar, chemicals and all other substances which may pollute the waters of the territory.

(d) "Contamination" means an impairment of the qualities of the waters of the territory by sewage or, industrial wastes, or other wastes to a degree which creates a hazard to human health or is detrimental to the most beneficial uses of the waters.

(e) "Pollution" as used in this Act shall mean the alteration of the physical, chemical or biological properties of any waters of the territory which renders said waters harmful or detrimental for their most beneficial uses adversely and unreasonably impair the water quality of the territory, or which renders said waters hazardous to human health or harmful or detrimental for their most beneficial uses.

Where waters have been classified or standards established pursuant to this Act, any discharge which is not in accord with such classification or standards shall be deemed to be "pollution."

(f) "Sewerage system" means pipelines or conduits, pumping stations, and force mains, and all other construction, devices, and appliances appurtenant thereto, used for collecting or conducting sewage or industrial waste or other wastes to a point of ultimate disposal.

(g) "Treatment works" means any plant, disposal field, lagoon, dam, pumping station, incinerator, or other works not specifically mentioned herein, installed for the purpose of treating, stabilizing or holding sewage, industrial waste, or other wastes.

(h) "Disposal system" means a system for disposing of sewage, industrial waste or other wastes, and includes sewerage systems and treatment works.

(i) "Waters of the territory" means all shore waters surrounding Guam, streams, lakes, wells, springs, irrigation systems, marshes, watercourses, waterways, drainage systems and other bodies of water, surface and underground, natural or artificial, publicly or privately owned.

(j) "Person" means the territory of Guam or any instrumentality thereof, any municipality, political subdivision, institution, public or private corporation, partnership, individual, or other entity.

Section 57043. Powers and Duties of the Agency. The Agency is herewith authorized and directed:

(a) To study, investigate, or cause to be studied and investigated and, from time to time, determine ways and means of eliminating from all ground and surface waters of the territory, so far as practical, all substances and materials which pollute the same, and to determine

As amended by P.L. 10-31 on March 10, 1969
As amended by P.L. 12-191 on December 30, 1974

Public Law 9-76
Ninth Guam Legislature

(Bill 303)
July 29, 1967

AN ACT

An Act to add a new Chapter III to Title LXI, Government Code of Guam, relative to Water Pollution Control, and for other purposes.

Be it enacted by the People of the Territory of Guam:

Section 1. A new Chapter III is hereby added to Title LXI, Government Code of Guam, to read as follows:

"CHAPTER III"
Water Pollution Control

Section 57040. This Act shall be known as the Water Pollution Control Act.

Section 57041. Statement of Policy. Whereas, a comprehensive program of water resource development for municipal and industrial water supply, irrigation, fish and wildlife conservation, and recreation is now in progress, and whereas, pollution of the waters of this territory may constitute a menace to public health and welfare, and may adversely affect livestock, wildlife, fish and aquatic life, and may progressively obstruct agricultural, industrial, recreational and other legitimate uses of water, it is hereby declared to be the public policy of this territory to conserve its water resources and to protect, maintain, and improve the quality and potability thereof for public water supplies, for the propagation of wildlife, fish and aquatic life, and for agricultural, industrial, recreational and other legitimate beneficial uses, to provide a comprehensive program in the public interest for the prevention, abatement and control of new or existing water pollution, to provide effective means for the carrying out and enforcement of such program, and to provide for cooperation with agencies of the Federal Government in carrying out these objectives.

Section 57042. Definitions. For the purpose of this Act, the following words and phrases shall have the meanings ascribed to them in this Section:

(a) "Sewage" means the water-carried waste products from the residences, public buildings, institutions or other buildings, including the excrementitious or other discharge from the bodies of human beings or animals, together with such ground water infiltration and surface water as may be present.

APPENDIX F

Water Pollution Control Act

Outfall Extension

Memo to DPW

APPENDIX H

Outfall Extension - Memo to DPW
(refurbishment money)

GUAM WATERWORKS AUTHORITY

Government of Guam

Post Office Box 3010, Agana, Guam 96932

Phone: (671)479-7823 Fax: (671)479-7879

MEMORANDUM

TO: Director, Department of Public Works MAR 13 1998

FROM: General Manager

SUBJECT: Refurbishment of Northern District and Agana Sewage Treatment Plants

As you are aware, the Guam Waterworks Authority is in a difficult situation concerning environmental issues on both Northern District and Agana Sewage Treatment Plants. During a meeting with the USEPA and local EPA representatives, we were given a deadline of April 3, 1998 to work on baseline studies as part of our 301H application to enable us to discharge to the ocean using primary treatment for both plants.

Hence, as these projects are part of the Tumon Redevelopment Projects which falls under your department's management, we are requesting for a priority study of the existing sewage outfall to include baseline study and possible extension or replacement of the existing outfalls as part of the refurbishment as soon as possible.

Thank you very much for your cooperation. Should you have any questions or require additional information, please call Mr. Rene Alcazaren, CIP Sewer Supervisor at 479-7830.

We are looking forward to your early and favorable reply.

RICHARD A. QUINTANILLA

Tumon Bay Beautification Project
March 17, 1998
Guam Visitor's Bureau Conference Room

Agenda

I. Project Schedule Update
- 60% Submittal
- Bid Advertisement
- Bid Documents (Completion)
- Pre-Bid Conference
- Bid Opening

II Cost Esitmates
- Roadway
- Water
- Sewer
- Power
- Telephone
- Landscaping

II Construction Plan
- Beach Side⇒Cliff Side
- Traffic Flow
- Staging Area

IV Miscellaneous
- A. Meeting with Department of Agriculture
- B. Tumon Pump Station/Pump Station Site
- C. Meeting with GWA (Burt Johnson & Rene Alcazaren)
  - Northern/Agana Treatment Plant
  - Oka Point Sewer Collector Line
- D. Soils Report (Pacific Soils Engineering & Testing)
- E. Beach Access (Which sites, Design Stage)
- F. Tumon Bay Shuttle System
- G. Meeting with Land Owners
- H. Legislative Amendment

ASSOCIATES, INC.

Facsimile Transmittal

TO:	Mike Miller	NAME:	FAX: 649-0158
FROM:	GMP Associates, Inc. GITC Building, Suite 302 590 South Marine Dr. Tamuning, Guam 96911	FROM: Dr. Peter Melnyk	Phone: (671) 647-4467 Fax: (671) 647-6471
DATE:	March 25, 1998	Project No.	No. of Pages: 9 (Including this page)
RE:	Scope of Work Design of Agana		

Please let us know if you have any questions.

SCOPE OF WORK
TASK XVI

PROJECT TITLE: **DESIGN OF AGANA AND NORTHERN DISTRICT SEWAGE TREATMENT PLANT OUTFALL EXTENSION**

I. INTENT

It is the intent of this project to provide professional survey, engineering and design services for the construction of Agana and Northern District Sewage Treatment Plant Outfall Extension. Design shall be guided by Dames & Moore report of impact assessment of non-chlorinated effluent from Agana and Northern District Wastewater Treatment plants dated December 1994 and applicable GovGuam and Federal criteria and standards. Preliminary engineering and planning to design the outfall extension shall be the basic scope of work.

II. ITEMS OF WORK

A. Oceanographic Surveys, Studies and Investigations Ocean Outfall Improvements.

1. General Requirement: The Consultant shall conduct oceanographic studies, field investigations and analyses required to support and produce the most cost-effective design of ocean outfall improvements. To this extent, the Consultant shall consider the following tasks as a basic part of his scope of work:

   a. Develop oceanographic design criteria for ocean outfall structures including, but not necessarily limited to the following:
      - Design Water Level
      - Design Wave Forces
      - Design Current Forces
      - Wave Scouring Potential
      - Typhoon Wave Verification Program

   b. Conduct ocean current and water density measurements as necessary to support the design of wastewater discharge facilities.

   c. Conduct an inspection as well as an underwater visual and photographic reconnaissance survey of the existing and proposed outfall site.

   d. Perform required hydraulic analyses and computations. Required to support the design of ocean outfall improvements.

2. Hydrographic Surveys: The Consultant shall conduct all hydrographic Surveys and mapping required for the design of ocean outfall

improvements from the reef crest out to the area surrounding the proposed outfall diffusers. All such surveys and mapping shall be accomplished under the direction and supervision of a Guam-registered Land Surveyor.

3. Subsurface Investigations and Reports - Ocean Outfall Improvements:

The Consultant shall conduct subsurface investigations such as seismic refraction surveys and soil borings and perform related analyses of results to support the design of ocean outfall improvements. The Consultant shall prepare and submit reports documenting the results and recommendations of such investigations and analyses.

4. Hydrodynamic studies at the proposed outfall sites, in the nearfields and farfields to determine current and wind regimes, as well as stratification depth at each location. These studies should include:

   a. current meter mooring
   b. dye and drogue releases
   c. continuous temperature-salinity-dissolved oxygen profiles

5. Baseline monitoring. This should include water quality data, community structure: quantitative information on the benthic flora and fauna, and sediment quality in the area of the proposed discharges.

   a. Water quality. Collect quarterly data for at least four locations equally spaced around each of the proposed diffuser sites (surface, mid and bottom depth). These surveys must include:

      - site location, and sample depth
      - microbiology (fecal coliform / 100 ml)
      - pH
      - orthophosphate
      - nitrate-nitrogen
      - dissolved oxygen
      - salinity
      - total filterable suspended solids
      - turbidity
      - temperature
      - oil & petroleum products

   b. Community structure. Conduct quarterly survey of the benthic flora and fauna at the proposed discharges that quantify coral, algae, macroinvertebrate and fish communities as follows:

      - Provide a species list of flora and fauna, indicating abundance, (i.e. rare, common, abundant etc.) identifying predominant species.

- Percent coverage of the area should be quantified by breaking the type of cover down into six groups:

  (a) coral
  (b) macro algae
  (c) turf algae
  (d) coralline algae
  (e) bare substrate (dead coral, rubble, sand)
  (f) other (macro invertebrates, any foreign objects or material)

- Fish surveys done using timed visual counts at least by family categories, for at least four locations equally spaced around each of the proposed diffuser sites. Reference: depth, location and time period of each survey. Compile a report that includes the data from each survey, and a fish species list.

c. Sediment samples. Uniform, replicate grabs at four sites equally spaced surrounding each of the proposed diffuser sites should be obtained for analysis of:

- grain size
- total organic carbon
- total Kjeldahl nitrogen
- total phosphorus
- total sulfide
- priority pollutants
- infauna
- steady sediment oxygen demand
- resuspended sediment oxygen demand

6. Because of the deep depths, diving these sites may not be feasible and surveys may need to be done using remote equipment. All site and sample locations, depths, dates of collection, and methodology needs to be recorded. It is important that the data gathered be quantitative. The monitoring surveys 5a, 5b and 5c will need to be conducted again at a later date, after the outfalls have been constructed and are discharging.

B. Outfall Design

1. Outfall Design Strategy: The outfall design strategy shall establish "whipstock-drilled outfall as the primary design objective and the design of a conventional buried, concrete-encased outfall as a secondary objective which shall be pursued should a whipstock-drilled outfall prove infeasible. Accordingly, a Whipstock-drilled outfall feasibility study along with concomitant field and geotechnical investigations shall be conducted <u>in advance of any investigation or design work which are exclusively required for a conventional outfall</u>.

2. Should whipstock drilling prove to be feasible to the satisfaction of Guam Waterworks Authority (GWA), the design of a Whipstock-drilled outfall shall be pursued as the single choice for construction.

3. Whipstock-drilled Feasibility Study: The Consultant shall evaluate the feasibility and cost-effectiveness of a "Whipstock-drilled" alternative to construction of conventional outfall improvements. The scope of this study shall involve the evaluation of the use of whipstock drilling to excavate a tunnel through the limestone formations and beneath the ocean floor through which an outfall line can be installed. The study shall include all research, site investigations and subsurface explorations as well as engineering, construct ability and construction cost analyses required to determine feasibility and cost-effectiveness.

4. The Consultant shall prepare and Submit a detailed study report acceptable to GWA which documents the procedures used and analyses performed in the investigation and evaluation of the whipstock-drilled alternative and which sets forth results, conclusions and recommendations. GWA shall decide whether the design of this alternative is to be pursued and will issue appropriate approval and direction.

5. Conventional Outfall Design: If a whipstock drilled outfall is determined to be infeasible, the Consultant shall, at the option and direction of GWA, proceed with the design of a conventional outfall.

C. Basis of Design/Report

The Consultant shall prepare an submit for approval a comprehensive report which consolidated the results of investigations and analyses, including evaluation of the feasibility of alternative improvements, and which establishes the basis for design.

D. Items of Design

The Consultant shall provide design services and prepare a construction contact package consisting of a drawings, specifications, bid documents, alternative bids, cost estimate and supporting design calculations for the following improvements:

1. Interim connection of existing Agana & Northern District to the new ocean outfall.
2. Ocean Outfall Improvements shall provide for and accommodate the continued operation of the Agana and Northern District Wastewater Treatment Plant as well as transmission of peak wastewater and storm-related flows to ultimate disposal.

E. Construction Cost Apportionment

The Consultant shall provide a breakdown of the estimated engineering and construction cost of the project. This breakdown shall be revised a necessary during the course of the planning and design effort for this project.

F. Environmental Impact Assessment (EIA)

The Consultant shall conduct all necessary environmental impact assessments and prepare suitable reports in support of the proposed ocean outfall.

G. Preparation of Construction Permit Application

The Consultant shall prepare applications for use by GWA in obtaining required permits for construction such as:

1. Army Corps of Engineers Permit
2. Territorial Seashore Protection Commission Permit

III. DESIGN CRITERIA

The design of improvements shall be accomplished in accordance with applicable criteria and standards of the following agencies:

A. Guam Waterworks Authority
B. U.S. Environmental Protection Agency
C. Army Corps of Engineers
D. Department of Public Works
E. Guam Environmental Protection Agency
F. The decision of the Contracting Officer shall prevail in the event of any conflicts or disputes regarding design criteria.

IV. REFERENCES

The Consultant shall refer primarily to the following publications for guidance on the design of the project:

A. Guam Island wide Wastewater Facilities Plan

B. GWA Standards for Sewerage System Planning, Design and Construction Materials (latest edition).

C. Dames & Moore report dated December 1994.

V. SUBMITTAL REQUIREMENTS

The Consultant shall provide project submittals of specific items according to the following schedule:

	Submittal/Item	# of Copies	Schedule (in calendar days)
A.	**30% Design**	**10 copies**	**120 days after NTP**

1. Basis for Design Report complete with results of field investigations and engineering analyses, analysis of the feasibility of alternative outfall improvements and design calculations;
2. Topographic/Hydrographic Survey Maps;
3. Subsurface/Soils Investigation Report(s);
4. 30% complete drawings showing location, size and alignment (on plan)/configuration of proposed improvements.
5. 30% complete specification;
6. Preliminary Construction Cost Estimates;
7. Preliminary Permit Applications.

B.	**60% Design**	**10 copies**	**60 days after review and approval of 30% submittal**

1. 60% complete construction drawings;
2. 60% complete construction specifications;
3. Preliminary Construction Cost Estimate;
4. Final Basis for Design Report;
5. Design Calculations;
6. Final Permit Applications.

C.	**90% Design**	**10 copies**	**30 days after review and approval of 60% submittal**

1. 90% complete construction drawings;
2. 90% complete construction specifications;
3. Preliminary Construction Contract/Bid Documents;
4. Pre-final Construction Cost Estimate

5. Preliminary Anticipated Construction Schedule;

6. Final Design Calculations.

D. **Final Submittal** **Original + 10 copies** **30 days after review and approval of 90% submittal**

1. Final construction Drawings;

2. Final Construction Specifications;

3. Final Construction contract/Bid Documents

4. Final construction Cost Estimate;

5. Anticipated Construction Schedule;

6. List of shop drawings, brochures, samples, specifications, tests, etc. which are listed in the specifications as being required to be submitted by the construction contractor.

E. **APPOINTMENT OF PROJECT MANAGER**

The Consultant shall appoint a Project Manager, subject to the approval of Guam Waterworks Authority, who shall, at all times, be knowledgeable and have the authority to make decisions, provide and receive direction and make commitments regarding matters relating to the project.

VI. DESIGN REVIEW CONFERENCES

The Consultant shall participate in a "Pre-Design" conference at GWA within 14 days of Notice to Proceed with work to discuss and confirm contractual obligations and requirements with appropriate authorities.

Informal review conferences shall be conducted once per month, or more frequently at the discretion of the Contracting officer, for the purpose of reviewing the progress of the design of the project. The Consultant shall at each conference report project design status, demonstrate accomplishments and prepare conference minutes.

A formal Design Review Conference shall be conducted no later than 21 calendar days following each submittal for appropriate authorities to provide review conferences shall be held on-island and shall be attended by the designated Project Manager and principals or key project personnel of the Prime Consultant as well as Sub-consultants. The Consultant shall prepare minutes of each review conference.

Outfall Extension

Baseline A/E Requirements

GUAM WATERWORKS AUTHORITY

P.O. BOX 3010, Agana, Guam 96932

MONITORING SERVICES LABORATORY

Main Office Dededo Lab. Phone (671) 632-9697 Fax (671-2592
Joanne Boyd, Agana Wastewater Lab. Phone / Fax (671) 472-1338

INTRAOFFICE MEMORANDUM

Date: 3/16/98
To: Mark Miller
From: Joanne Boyd, Biologist III
RE: Outfall extension A&E and 301(h) application.

I have attached a copy of the questions that I addressed in the 301(h) application. Several of these questions will need to be addressed for the outfall extensions. I think it would be a good idea if we could provide copies of these questions from the "Amended 301(h) technical support document" provided to us by USEPA. It outlines the specifics needed to answer the questions fully and to their satisfaction. By providing the A&E with copies we should be assured that all nessecary baseline information is gathered. It would be great if we could get them to answer these questions in some sort of report. Either way at least we would have all the data required to answer these questions when the time comes.

circled questions need to be addressed as part of A & B baseline report. See technical support document & 301(h) application, for specifics each question

II. B. Receiving Water Description

II.B.1. Are you applying for a modification based on a discharge into the ocean or to saline estuary?

II.B.2. Is your current discharge or modified discharge to stressed waters as defined by 40 CFR 125.58(z)?

II.B.3. Provide a description and data on the seasonal circulation patterns in the vicinity of your current or modified discharge(s).

II.B.4. Oceanographic conditions in the vicinity of the current and proposed modified discharge(s). Provide the following:

- Lowest percentile current speed
- Predominant current speed and direction during four seasons
- Periods of maximum stratification (months)
- Density profiles during periods of maximum stratification

II.B.5. Do the receiving waters for your discharge contain significant amounts of effluent previously discharged from treatment works for which you are applying for a section 301(h) modified permit?

II.B.6. Ambient water quality conditions during the period(s) of maximum stratification: at the zone of initial dilution (ZID) boundary, at other areas of potential impact and at control stations.

a. Provide profiles with depth on the following for the current discharge location and for the modified discharge location, if different from the current discharge:
   - BOD_5 (mg/L) (not measured)
   - Dissolved oxygen
   - Suspended solids (mg/L) (not measured)
   - pH
   - Temperature (°C)
   - Salinity
   - Turbidity
   - Other significant variables

c. Are there other periods when receiving water quality conditions may be more critical than period(s) of maximum stratification?

II.B.7. provide data on steady state sediment dissolved oxygen demand and oxygen demand due to resuspension of sediments in the vicinity of the discharge. (mg/L/day).

II. C. Biological Conditions

II.C.1 Provide a detailed description of representative biological communities in the vicinity of your current and modified discharge(s)

II.C.2. a. Are distinctive habitats of limited distribution (such as kelp beds or coral reef) located in areas potentially affected by the modified discharge?

II.C.3. a. Are commercial or recreational fisheries located in areas potentially affected by the discharge?

b. If yes, provide information on types, location and value of fisheries

III.A. Physical Characteristics of the Discharge

III.A.1 What is the critical initial dilution for your current and modified discharge(s) during 1) the period(s) of maximum stratification? and 2) any other critical periods(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?

may be able to give info on expected initial dilution based on design

III.A.2 What are the dimensions of the zone of initial dilution for your modified discharge(s)

III.A.3. What are the effects of ambient currents and stratification on dispersion and transport of the discharge plume/wastefield ?

III.A.4. only small discharges must respond

III.A.5. Sedimentation of Suspended Solids

a. What fraction of the modified discharge's suspended solids will accumulate within the vicinity of the modified discharge?

b. What are the calculated area(s) and rate(s) of sediment accumulation within the vicinity of the modified discharge(s) ($g/m^2/yr$)?

c. What is the fate of settleable solids transported beyond the calculated sediment accumulation area?

III.B. Compliance with Applicable Water Quality Standards and CWA 304(a)(1) water quality criteria [40 CFR 125.61(b) and 125.62(a)].

III.B.1. What is the concentration of dissolved oxygen immediately following initial dilution for the period(s) of maximum stratification and any other critical periods(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?

III.B.2. What is the farfield dissolved oxygen depression and resulting concentration due to BOD exertion of the wastefield during period(s) of maximum stratification any other critical periods(s)?

III.B.3. What are the dissolved oxygen depressions and resulting concentration near the bottom due to steady sediment demand and resuspension of sediments?

may be able to make predictions on these questions

III.B.4. What is the increase in receiving water suspended solids concentration immediately following initial dilution of the modified discharge(s)?

III.B.5. What is the change in receiving water pH immediately following initial dilution of the modified discharge(s) ?

III.B.6. Does (will) the modified discharge comply with applicable water quality standards for:
- Dissolved Oxygen?
- Suspended Solids or surrogate standards?
- pH?

III.B.7. Provide data to demonstrate that all applicable State water quality standards, and all applicable water quality criteria established under Section 304(a)(1) of the Clean Water Act for which there are no directly corresponding numerical applicable water quality standards approved by EPA, are met at and beyond the boundary of the ZID under critical environmental and treatment plant conditions in the waters surrounding or adjacent to the point at which your effluent is discharged.

III.B.8. Provide the determination required by 40 CFR 125.61(b)(2) for compliance with all applicable provisions of State law, including water quality standards or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.

III. C. Impact on Public Water Supplies.

III.C.1. Is there a planned or existing public water supply (desalinization facility) intake in the vicinity of the current or modified discharge?

III.D. Biological Impact of Discharge

III.D.1. Does (will) a balanced indigenous population of shellfish, fish, and existing wildlife exist:

- Immediately beyond the ZID of the current and modified discharge(s)?

- In all other areas beyond the ZID where marine life is actually or potentially affected by the current and modified permit.

III.D.2. Have distinctive habitats of limited distribution been impacted adversely by the current discharge and will such habitats be impacted adversely by the modified discharge?

III.D.3. Have commercial or recreational fisheries been impacted adversely by the current discharge (e.g. warnings, restrictions, closures, or mass mortalities) or will they be impacted adversely by the modified discharge?

III.D.4. Does the current or modified discharge cause the following within or beyond the ZID

- Mass mortality of fishes or invertebrates due to oxygen depletion, high concentrations of toxics, or other conditions?
- An increase incidence of disease in marine organisms?
- An abnormal body burden of any toxic material in marine organisms?
- Any other extreme, adverse biological impacts?

III.E. Impacts of Discharge on Recreational Activities

III.E.1. Describe the existing or potential recreational activities likely to be affected by the modified discharge(s) beyond the zone of initial dilution.

III. E.2. What are the existing and potential impacts of the modified discharge(s) on recreational activities? Your answer should include, but not be limited to, a discussion of fecal coliform bacteria.

III.E.3. Are there any Federal, State, or local restrictions on recreational activities in the vicinity of the modified discharge(s). If yes, describe the restrictions and provide citations to available references.

III.E.4. If such restrictions exist, would such restrictions be lifted or modified if you were discharging a secondary treatment effluent

III.F Establishment of a Monitoring Program

III.F.1. Describe the biological, water quality and effluent monitoring programs which you propose to meet the criteria of 40 CFR 125.63. Only those scientific investigations that are necessary to study the effects of the proposed discharge should be included in the scope of the 301(h) monitoring program.

III.F.2. Describe the sampling techniques, schedules, and locations, analytical techniques, quality control and verification procedures to be used.

III.F.3. Describe the personnel and financial resources available to implement the monitoring programs upon issuance of a modified permit and to carry it out for the life of the modified permit.

III.G Effect of Discharge on Other Point and Nonpoint Sources

III.G.1. Does (will) your modified discharge(s) cause additional treatment or control requirements for any other point or nonpoint pollution source(s)?

III.G.2. Provide the determination required by 40 CFR 125.64(b) or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.

III. H. Toxics Control Program and Urban Area Pretreatment Program [40 CFR 125.65 and 125.66]

III.H.1. a. Do you have any known or susupected industrial sources of toxic pollutants or pesticides?

b. If no, provide the certification required by 40 CFR 125.66(c)(2) for large discharges.

c. Provide the results of wet and dry weather effluent analysis for toxic pollutants and pesticides as required by 40 CFR 125.66(a)(1).

d. Provide analysis of known or suspected industrial sources of toxic pollutants and pesticides identified in 1(c) above in accordance with 40 CFR 125.66(b).

III.H.2. a. Are there any known or suspected water quality, sediment accumulation, or biological problems related to toxic pollutants or pesticides from your modified discharge?

b. If no provide the certification required by 40 CFR 125.66(d)(2) together with available supporting data.

c. If yes, provide a schedule for the development and implementation of nonindustrial toxics control programs to meet the requirements of 40 CFR 125.66(d)(3).

d. Provide a schedule for the development and implementation of nonindustrial toxics control programs to meet the requirements of 40 CFR 125.66(d)(3).

III.H.3. Describe the public education program you propose to minimize the entrance of nonindustrial toxic pollutants and pesticides into your treatment system [40 CFR 125.66(d)(1)]

III.H.4. Do you have an approved industrial pretreatment program (40 CFR 125.66(c)(1)?

a. If yes, provide the date of EPA approval.

b. If no, and if required by 40 CFR Part 403 to have an industrial pretreatment program, provide a proposed schedule for development and implementation of your industrial pretreatment program to meet the requirements of 40 CFR Part 403.

III.H.5. Urban area pretreatment requirement [40 CFR 125.65]
Discharges serving a population of 50,000 or greater must respond.

a. Provide data on all toxic pollutants introduced into the treatment works from industrial sources (categorical and noncategorical).

b. Note whether applicable pretreatment requirements are in effect for each toxic pollutant. Are industrial sources introducing such toxic pollutants in compliance with all of their pretreatment requirements? Are the pretreatment requirements being enforced? [40 CFR 125.65(b)(2)]

c. If applicable pretreatment requirements do not exist for each toxic pollutant in the POTW effluent introduced by industrial sources,
   - provide a description and a schedule for your development and implementation of applicable pretreatment requirements [40 CFR 125.65(c)], or
   - describe how you propose to demonstrate secondary removal equivalency for each of those toxic pollutants, including a schedule for compliance, by using a secondary treatment pilot plant. [40 CFR 125.65(d)].

Letter of Determination Requests

GUAM WATERWORKS AUTHORITY

Government of Guam

Post Office Box 3010, Agana, Guam 96932

Phone: (671)479-7823 Fax: (671)479-7879

MAR 06 1998

MEMORANDUM

TO: Administrator, Guam Environmental Protection Agency

FROM: General Manager

SUBJECT: Applications for Modified Permits, Pursuant to Section 301(h) of the Clean Water Act for Agana and Northern District Sewage Treatment Plants

GWA is currently compiling all the necessary documents and applicable data in which to complete it's re-application for 301(h) Modified Permits. As requested by the Application Questionnaire, the application must include *determinations* by appropriate state agencies. These letters of determination must address the sections of 40 CFR that are relevant to your Agency.

To expedite this requirement, attached are copies of: (1) your Agency's previously submitted Letter of Determination; (2) the actual Application Questionnaire sections applicable to your agency; and (3) completed portions of the 301(h) application package that will assist you in preparing your responses.

Futhermore, U.S. EPA has given GWA an absolute, non-extendable application submission date of April 03, 1998. In order to meet this deadline, we need your Letter of Determination by March 15, 1998. In this respect, GWA kindly requests that if there are any questions or concerns that you may have regarding the application, immediately contact Mr. Mark Miller, Planning Division at 479-7810.

Richard A. Quintanilla
General Manager

GUAM WATERWORKS AUTHORITY

Government of Guam

Post Office Box 3010, Agana, Guam 96932

Phone: (671)479-7823 Fax: (671)479-7879

MAR 06 1998

MEMORANDUM

TO: Administrator, Department of Agriculture

FROM: General Manager

SUBJECT: Applications for Modified Permits, Pursuant to Section 301(h) of the Clean Water Act for Agana and Northern District Sewage Treatment Plants

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Sincerely,

Richard A. Quintanilla
General Manager

GUAM WATERWORKS AUTHORITY

Government of Guam

Post Office Box 3010, Agana, Guam 96932

Phone: (671)479-7823 Fax: (671)479-7879

MAR 06 1998

MEMORANDUM

TO: Administrator, Bureau of Planning

FROM: General Manager

SUBJECT: Applications for Modified Permits, Pursuant to Section 301(h) of the Clean Water Act for Agana and Northern District Sewage Treatment Plants

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Richard A. Quintanilla
General Manager

APPENDIX J

Letters of Determination
(requests)

Industrial Users' Survey

APPENDIX K

Industrial User Survey

COMMERCIAL WASTEWATER DISCHARGE SURVEY

Completion of this questionnaire is required for all commercial wastewater dischargers. Please return the completed form to tl above mailing address no later than _____ ____

PLEASE TYPE OR PRINT LEGIBLY. (NOTE: Incomplete and illegible questionnaires will be returned to you)

Should you have any questions or need assistance in competing this questionnaire, please call GWA's Wastewater Division a 647-7873 or 647-7802 between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday. Thank you for your cooperation a timely response.

1. NAME OF YOUR BUSINESS OR INDUSTRY: _____

MAILING ADDRESS: _____

CITY: _____

2. LOCATION OF YOUR BUSINESS (if different from mailing address):

_____

3. YOUR PRINCIPAL SERVICE OR PRODUCT OF BUSINESS: _____

_____

_____

STATEMENT OF RESPONSIBLE OFFICIAL: The information contained in this questionnaire is familiar to me and, to the est of my knowledge and belief, such information is true, complete, and accurate.

SIGNATURE: _____

NAME: _____

TITLE: _____

DATE: _____

5. PERSON AND TITLE (WITHIN YOUR BUSINESS) WHO MAY BE CONTACTED CONCERNING YOUR WASTEWATER DISCHARGE INTO THE PUBLIC SEWER:

NAME: _____

TITLE: _____

TELEPHONE NUMBER: _____

6. DO YOU DISCHARGE ANY NON-DOMESTIC WASTEWATER (FROM OTHER THAN WASHROOM, TOILET, OR SHOWER) INTO THE SEWER SYSTEM?

[ ] YES [ ] NO (GO TO QUESTION #16)

7. DESCRIBE THE OPERATION(S) AT YOUR BUSINESS THAT RESULT(S) IN THE DISCHARGE TO TH SEWER OF NON-DOMESTIC WASTES. INCLUDE A DESCRIPTION OF RAW MATERIALS, CATALYSTS, O INTERMEDIARIES, IF APPLICA BLE. DESCRIBE ANY MANUFACTURING OPERATION AT THIS LOCATION (ATTACH ADDITIONAL SHEETS AS NECESSARY):

_____

_____

_____

_____

8. DESCRIBE ANY WATER CONDITIONING PROCESSES USED AT THIS FACILITY (SUCH AS WATEI SOFTENING, RE VERSE OSMOSIS, FILTRATION):

_____

_____

_____

9. INDICATE BY CHECKMARK OPERATION SHIFTS NORMALLY WORKED EACH DAY:

SHIFT	START TIME	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1ST								
2ND								
3RD								

10. IS YOUR PRODUCTION SEASONAL? [ ] YES [ ] NO

11. CHECK THE TYPE WHICH BEST DESCRIBES YOUR WASTEWATER DISCHARGE FLOW:

[ ] CONTINUOUS

AVERAGE DAILY FLOW: _____ GALLONS PER DAY

[ ] INTERMITTENT

AVERAGE QUANTITY PER DISCHARGE: _____ GALLONS

AVERAGE NUMBER OF DISCHARGES PER DAY: _____

[ ] BATCH

AVERAGE QUANTITY PER DISCHARGE: _____ GALLONS

AVERAGE NUMBER OF DISCHARGES PER DAY: _____

12. INDICATE THE APPROXIMATE TIMES THAT DISCHARGES OCCUR:

Sun	Mon	Tue	Wed	Thu	Fri	Sat

13. DESCRIBE THE CHARACTERISTICS AND CONSTITUENTS OF YOUR WASTEWATER DISCHARGE(S). LIST THE CONCENTRATION (IN PERCENT OR MG/L) IF KNOWN:

_____

_____

_____

_____

_____

_____

_____

14. DESCRIBE ANY TREATMENT FACILITIES AT YOUR BUSINESS THAT TREATS WASTEWATER PRIOR TO DISCHARGE TO THE SEWER:

_____

_____

_____

_____

_____

_____

_____

15. INDICATE IF ANY OF THE FOLLOWING CONSTITUENTS OR SUBSTANCES IS (OR CAN BE) PRESENT IN YOUR WASTEWATER DISCHARGE AS A RESULT OF YOUR OPERATIONS BY PLACING IN FRONT OF EACH LISTED CHEMI CAL COMPOUND:

1 = YOU SUSPECT THE COMPOUND IS ABSENT
2 = YOU KNOW THE COMPOUND IS ABSENT
3 = YOU SUSPECT THE COMPOUND IS PRESENT
4 = YOU KNOW THE COMPOUND IS PRESENT:

[ ] Acenapthene
[ ] Acenapthylene (PAH)
[ ] Acrolein
[ ] Acrylonitrile
[ ] Aldrin
[ ] Antimony
[ ] Anthracene
[ ] Arsenic
[ ] Asbestos (Halomethanes)
[ ] 1,2 Benzanthracene (PAH)
[ ] Benzene
[ ] Benzidine
[ ] Benzo (A) Pyrene (3,4-Benzo-Pyrene) (PAH)
[ ] 3,4 Benzofluoranthene (PAH)
[ ] Benzo (K) Fluoranthene (PAH)
[ ] 1,12 Benzoperylene (PAH)
[ ] Beryllium
[ ] Bromoform (Tribromomethane)
[ ] Bromomethane (Methyl Bromide)
[ ] 4-Bromophenyl Phenyl Ether
[ ] Cadmium
[ ] Carbon Tetrachloride (Tetrachloromethane)
[ ] Chlordane
[ ] Chlorobenzene (Monochloro-Benzene)
[ ] Chlorodibromomethane (Halomethane)
[ ] 1,2 Dichlorobenzene
[ ] 1,3 Dichlorobenzene
[ ] 1,4 Dichlorobenzene
[ ] 3,3 Dichlorobenzidine
[ ] Dichloroethane 1,1
[ ] Dichloroethane 1,2
[ ] 1,1 Dichloroethylene
[ ] 1,2-Trans-Dichloroethylene
[ ] Dichlorobromomethane
[ ] Dichloromethane (Halomethanes)
[ ] 2,4-Dichlorophenol
[ ] Dichloropropane 1,2
[ ] Dichloropropene 1,3
[ ] Dieldrin
[ ] Dimethylphenol 2,4
[ ] Diethylphthalate
[ ] Dimethylphthalate
[ ] Dinitrotoluene 2,4
[ ] Dinitrotoluene 2,6
[ ] 2,4 Dinitrophenol
[ ] Dioxine (2,3,7,8-TCDD)
[ ] Diphenylhydrazine 1,2
[ ] Alpha Endosulfan
[ ] Beta Endosulfan
[ ] Endosulfan Sulfate
[ ] Endrin
[ ] Endrin Aldehyde
[ ] Ethylbenzene
[ ] Chlorethane (Monochloroethane)
[ ] Chlorothyl Ether (Bis-2)
[ ] 1 Chloroethoxy Methane (Bis-2)
[ ] 2 Chloroethyl Vinyl Ether
[ ] 4-Chloro-3-Methylphenol
[ ] Chloromethane (Methyl Chloride)
[ ] Chloroform Trichloromethane
[ ] 2 Chlorophenol
[ ] Chloroisopropyl Ether (Bis-2)
[ ] 2 Chloronaphthalene
[ ] 4-Chlorophenyl Ether
[ ] Chromium (HEX)
[ ] Chromium (TRI)
[ ] Oil / Grease (animal or vegetable origin)
[ ] Oil / Grease (mineral origin)
[ ] Petroleum or petroleum products
[ ] Chrysene (PAH)
[ ] Copper
[ ] pH decrease
[ ] pH increase
[ ] 4,4 DDT
[ ] 4,4 DDE
[ ] 4,4 DDD
[ ] Dibenzo (a,h) Anthracene (PAH)
[ ] 2 Nitrophenol
[ ] 4 Nitrophenol
[ ] 4, 6-Dinitro-2-Methylphenol
[ ] Nitrosodimenthylamine N
[ ] Nitrosodimenthylamine-N
[ ] Nitrosodi-N-Propylamine-N
[ ] PCB 1242
[ ] PCB 1254
[ ] PCB 1221
[ ] PCB 1232
Temperature decrease
- _____ F
Temperature increase
+ _____ F
[ ] PCB 1248
[ ] PCB 1260
[ ] PCB 1016
[ ] Fluorene (PAH)
[ ] Fluoranthene
[ ] Heptachlor
[ ] Heptachlor Epoxide
[ ] Hexachloroethane
[ ] Hexachlorobenzene
[ ] Hexachlorobutadiene
[ ] Hexachlorocyclohexane (lindane)
[ ] Hexachlorocyclohexane (Alpha)
[ ] Hexachlorocyclohexane (Beta)
[ ] Hexachlorocyclohexane (Delta)
[ ] Hexachlorocyclopentadiene
[ ] Indeno (1,2,3-cd) Pyrene (PAH)
[ ] Isophorone
[ ] Lead
[ ] Mercury
[ ] Naphthalene
[ ] Nickel
[ ] Nitrobenzene
[ ] Di-N-Butyl Phthalate
[ ] Di-N-Octyl-Phthalate
[ ] Pyrene (PAH)
[ ] Selenium
[ ] Silver
[ ] Tetracholoethane 1,1,2,2
[ ] Tetrachloroethylene
[ ] Thallium
[ ] Toluene
[ ] Toxaphene
[ ] 1,2,4 Trichlorobenzene
[ ] Trichloroethane 1,1,1
[ ] Trichloroethane 1,1,2
[ ] Trichloroethylene
[ ] Phenol
[ ] Pentachlorophenol
[ ] Phenanthrene (PAH)
[ ] Bis (2 Ethyl Hexyl)
[ ] Phthalate
[ ] Butyl Benzyl Phthalate
[ ] Trichlorophenol 2,4,6
[ ] Vinyl Chloride (Chloroethylene)
[ ] Zinc

OTHER COMPOUNDS NOT LISTED:

[ ] _____

[ ] _____

[ ] _____

[ ] _____

[ ] _____

16. ADDITIONAL INFORMATION ON YOUR OPERATION:

_____

_____

_____

_____

_____

_____

_____

_____

As Built Record of System

APPENDIX L

As Built Record of System

DRAWING

Engineering Details of AWWTP Outfall

APPENDIX M

Engineering Details
Agana WWTP Outfall
(existing)

MAP