Commonwealth of the Northern Mariana Islands Integrated 305(b) and 303(d) Water Quality Assessment Report

Alaguan Bay, Rota

Division of Environmental Quality
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TABLE OF CONTENTS

Introduction to this Report and the 305(b) Process

Section 305(b) of the federal Water Pollution Control Act (Clean Water Act) requires that states and territories monitor the quality of their surface and ground waters and produce a report describing the status of their water quality. This report is referred to as the 305(b) which will be used by the United States Environmental Protection Agency (EPA), Congress, and the public, to evaluate (1) whether U.S. waters meet water quality standards, (2) the progress made in maintaining and restoring water quality, and (3) the extent of remaining problems. EPA requires all impaired waterbodies, from unknown pollution sources, to be placed on the 303(d) list for TMDL studies. The EPA consolidated assessment and listing methodology (CALM) categories were used to classify all assessed waterbodies in the CNMI during 2004 and 2005. The Division of Environmental Quality under the Office of the Governor is responsible for preparing the Commonwealth of the Northern Mariana Islands (CNMI) 305(b) report, and subsequent 303(d) listings.

I. Abstract

The health and economic wellbeing of the people of the Commonwealth of the Northern Mariana Islands (CNMI) depend upon good water quality. Tourism is a major driving force behind the CNMI economy. Tourists come to see beautiful sandy beaches, clear blue water, and diverse coral reefs. The CNMI has over 250 species of coral (Randall, 1995) over 850 species of fish (Myers, 2000), and over 1000 marine invertebrates that inhabit our corals reefs. CNMI residents rely upon clean water and healthy reefs for fishing and recreation. Healthy marine environments require clean water that remains within a narrow range of water quality parameters. Under the current development pressure we are challenged to maintain and improve our water resources.

Both point and non-point source pollution are responsible for lowering the quality of the CNMI's surface and ground waters. Sewage outfalls, failing sewer collection systems, sedimentation from unpaved roads and poor erosion control practices during development, urban runoff, and reverse osmosis discharges are the most significant stressors to water quality. The largest groundwater problems in the CNMI are high chlorides resulting from over-pumping of the basal aquifer in an effort to keep up with the increasing population demand, and nutrient and bacteria input from septic systems. Most of CNMI's wetlands were filled for agriculture use and urban development during the Japanese occupation associated with WWII. Presently, wetlands comprise less than 5% of the land, and are patchily distributed around Saipan and Tinian Island.

Eighty beach locations are monitored for traditional surface water quality parameters and *Enterococci* bacteria levels. Unsurprisingly, most microbiological violations were recorded for beaches near stormwater discharge, especially during rain events. These beaches are associated with the Saipan lagoon and represent CNMI's most developed coastline. Other frequent violations occur within CNMI's marinas or small boat launching areas.

Two biocriteria monitoring programs have been established by the Division of Environmental Quality (DEQ) in conjunction with other local resource management agencies. The Saipan lagoon monitoring program collects data regarding the abundances of fast growing macroalgae, seagrass, and corals for each lagoon habitat. This allows for evaluation of the benthic communities, which respond to changes in water quality. Additionally, DEQ is a lead participant in CNMI's nearshore coral reef monitoring program (joint effort with DEQ, Coastal Resources Management (CRM), and Division of Fish and Wildlife (DFW). An important component of understanding reef community responses to nutrient enrichment is the growth and spatial distribution of dominant benthic organisms such as corals, turf algae, coralline algae, macroalgae, and other invertebrates (Littler and Littler, 1985, Lapointe, 1997, Fabricius and De'ath, 2001).

The CNMI Division of Environmental Quality has implemented several programs that address and regulate development, agriculture, fuel storate, pesticide use, and other

potential pollutants. All projects and ongoing issues that have or potentially may affect CNMI's water quality are described within.

II. Background

A. Background of CNMI and its Waters

The Commonwealth of the Northern Mariana Islands (CNMI) consists of two geologically distinct island chains located at 145º E, between 14º – 21º N (Figure 1). The Southern Mariana Islands are between 5 – 20 million years old and consist of raised, limestone reef bedrock resultant from high sea level stands prior to the Holocene. Arc rifting has displaced these islands eastward during the formation of the Mariana Trough (Karig, 1975, Mrozowski and Hayes, 1980, Randall, 1995). The Northern Islands lie to the northwest, residing on the still active Mariana Ridge. This report contains information from the southern islands of Saipan, Tinian, Aguijan, and Rota, where the vast majority of the population live (Table 1). Saipan is the capital of CNMI, and the largest and most inhabited of the islands. Threats to water quality are greatest in Saipan, where DEQ operations are based resulting in more resources being dedicated to understanding impaired waters. Rota and Tinian based DEQ staff monitor surface water quality on 8 week intervals, and ensure that public water systems are tested for contaminants on a quarterly basis.

B. Surface Water Quality Background

The CNMI has two classes (AA and A) for marine water use and two classes (1 and 2) for fresh surface water use. All fresh surface water bodies in the CNMI (wetlands, intermittent streams, and perennial streams) are Class 1 (Figure 2 and 3), meaning that these waters should remain in their natural state with an absolute minimum of pollution from any human-caused source. On Saipan Island there are approximately three perennial streams, one lake, and several isolated wetland regions. On Rota there are several streams, no lakes, and no wetlands. On Tinian there are several wetlands, no lakes, and no streams. Some of these resources are used for drinking water and recreation. The raised limestone bedrock of the Southern Mariana Islands is porous, resulting in percolation of most rainfall that does not directly drain into the ocean. Wetlands and perennial streams comprise less than 5% of the land, and are patchily distributed around Saipan and Tinian Island. The majority of these water bodies are not tested by the DEQ Lab on a regular basis due to their low abundance and use.

Wetlands can be found on the islands of Saipan, Tinian, Rota, and Pagan, however they cover less than 2% of the CNMI at the present time (based on current CNMI GIS layers) (Figure 2). The wetlands provide habitat for unique and endangered plants and animals present in CNMI. Wetlands also serve other functional purposes such as storm runoff water storage and pollutant uptake. For a more detailed look at CNMI's wetlands and their functional roles one can refer to CNMI's "National Wetland Inventory" document (Prepared by US Fish and Wildlife, 1989, CRM Office). This document states there are approximately 600 acres of wetlands in CNMI. The "Commonwealth of the Northern Mariana Islands Wetlands Conservation Plan" states that only 36% of the original wetland acreage still exists (CRM Office). Further, losses are as follows; Garapan - 200 acres, San Roque - 50 acres, Flores Pond - 130 acres, Lake Susupe area - 200 acres, and Kagman and Lower Base - 600 acres. Saipan was heavily farmed during Japanese times (pre-World War II), which resulted in filling of wetland areas to make them suitable for farming. Increasing development continues to threaten wetlands on all of the islands.

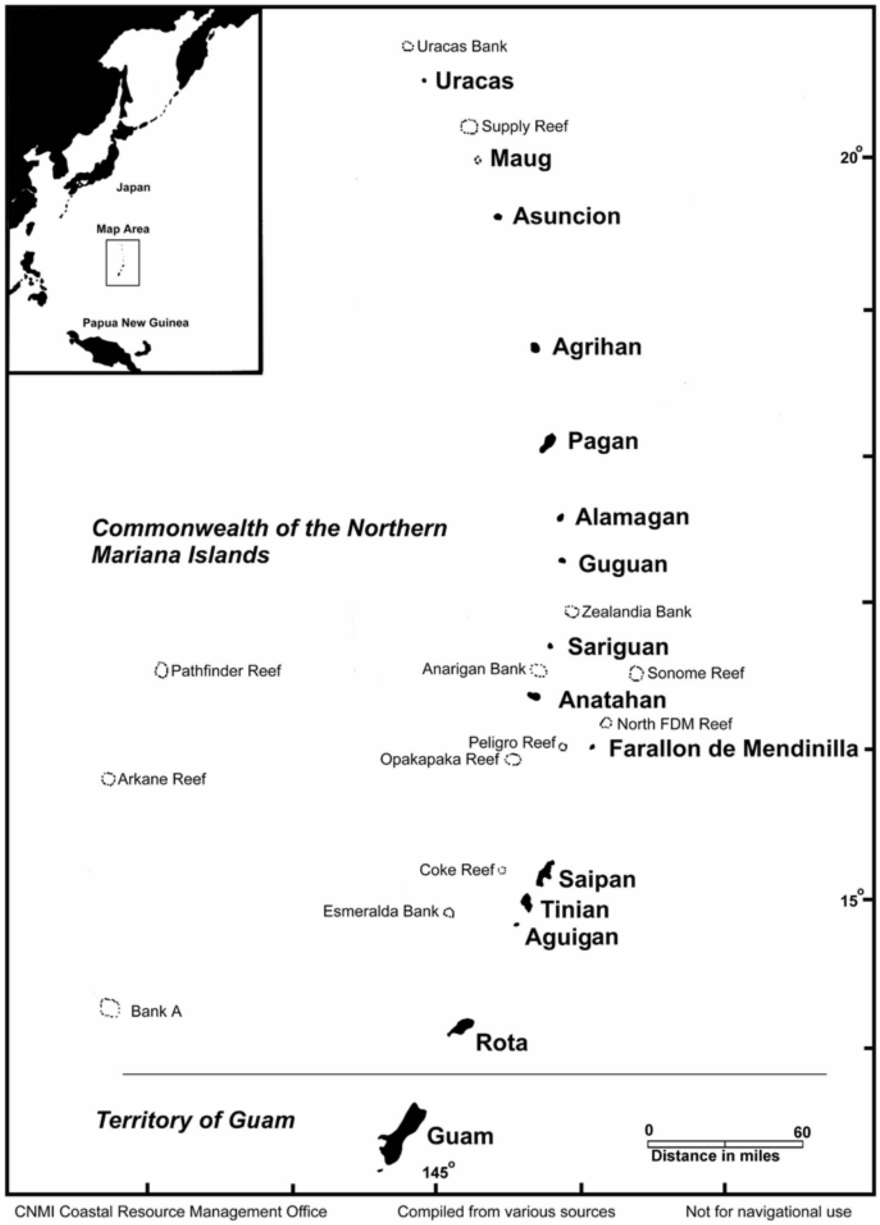
The majority of the coastal marine waters are Class AA (Figure 4), meaning that these waters should remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-related source or actions. The uses protected in these waters are the support and propagation of marine life, conservation of coral reefs and wilderness areas, oceanographic research, and aesthetic enjoyment and compatible recreation inclusive of whole body contact (e.g. swimming and snorkeling) and related activities (Table 2, Figure 4). Class A waters are protected for their recreational use and aesthetic enjoyment; other uses are allowed as long as they are compatible with the protection and propagation of fish, shellfish, and wildlife, and recreation in and on these waters of a limited body contact nature.

Table 1. Statistics for the Southern Mariana Islands.

Resource	Value
Surface area of CNMI	457.1 sq km
Surface area of Saipan	120.4 sq km
Surface area of Tinian	101.5 sq km
Surface area of Rota	85.0 sq km
Population (total)	69,221 (in 2000)
Saipan Population	62,392 (in 2000)
Rota Population	3,282 (in 2000)
Tinian Population	3,540 (in 2000)
CNMI Residents	21,306 (in 1995)
Alien workers	37,540 (in 1995)
Tourists	497,601 (in 2001)
Length of perennial and intermittent streams on Saipan	95.5 km
Area of freshwater and tidal wetlands on Saipan	2,808 sq km
Area of Saipan lagoon	30,750 sq km
Length of Saipan coastline	75.52 km
Length of Rota coastline	55.84 km
Length of Tinian coastline	58.65 km
Area of bays (Lau Lau Bay, Saipan)	10,662 sq km
Area of Saipan marina (Smiling Cove)	0.1 sq km
Area of CNMI EEZ	414,398 sq km (approximate)

CNMI Department of Commerce Statistical Yearbook 1996 (based on 1995 census)
CNMI Geographic Information System
CNMI Department of Commerce

Figure 1. The Mariana Islands.



In the case of the CNMI, as with all island nations, discussions about surface water quality must include information regarding the status of nearshore marine communities. Marine communities can shift in response to nutrient enrichment (e.g. water quality impairment) (Littler and Littler, 1985, Lapointe, 1997, Fabricius and De'ath, 2001). Similarly, changes in temperature, salinity, pH, Dissolve Oxygen, and other water quality criteria will also affect coral reef environments (Valiela, 1995). At any particular time, water quality measurements are affected by rainfall or storm events, tidal fluctuations, and other atmospheric and oceanographic conditions. This dynamic nature makes all water quality data very difficult to properly assess a region, project, or pollutant source, without appropriate sample sizes. It is much more efficient for island nations to use bio-criteria data coupled with water quality measurements to help assess waterbodies.

Both point and non-point source pollution are responsible for lowering the quality of the CNMI's surface waters. Sewage outfalls, failed sewer collection facilities, sedimentation from unpaved roads and development, urban runoff, reverse osmosis discharges, and nutrients from golf courses and agriculture are the most significant stressors to surface and marine water quality.

Table2. Class A Waters, CNMI.

Water Body	Reason for Class A designation
Puerto Rico Industrial, Saipan	Commercial port and municipal waste outfall
Agingan Point, Saipan	Municipal waste outfall
East Harbor, Rota	Commercial port
West Harbor, Rota	Commercial port
San Jose Harbor, Tinian	Commercial port

C. Groundwater Background

The islands of the Northern Marianas formed as the result of arc volcanism west of the Pacific and Philippine plate junction. The geology of the southern islands suggests they were once submerged below sea-level, allowing a layer of coral reef to form over the volcanic rock. As a result of the most recent ice age when sea levels were much lower than the present, exposed surfaces of the southern islands of Saipan, Tinian, Rota, Aguijan, and Farallon de Medinella are predominantly limestone (Randall, 1995). The geological nature of the southern islands influences the groundwater characteristics, where two types of aquifers are dominant. In isolated areas, the geology has created a situation where high-level limestone fresh water aquifers overlie an impermeable volcanic layer, which creates a good and relatively protected supply of drinking water. However, the majority of the fresh water is found in the basal aquifer with a fresh water lens sitting on top of sea water, separated as a result of differences in density of the fluids.

The location and distribution of the fresh water aquifers are of extreme importance in the CNMI because the vast majority of drinking water comes from aquifers. The largest ground water problem in the CNMI is high chlorides resulting from over-pumping of this basal aquifer in an effort to keep up with the increasing population demand. Over-pumping of groundwater can result in saltwater intrusion of the basal aquifer. The thickness of the freshwater lens on top of the saltwater is related to several factors, including extent of recharge areas, geology, and proximity to the coastline. Saltwater intrusion is reversible and does not cause permanent damage to the surrounding aquifer. The chloride problem only exists on the island of Saipan, but new developments initiated on Tinian and Rota may affect the basal aquifers there if future well drilling is not monitored or managed properly.

To protect the basal aquifer from saltwater intrusion the drilling of new water wells needs to be closely monitored. New well explorations should only be considered in areas where the thickness of the freshwater lens is identifiable and adequate. Other means of protecting the basal aquifer from saltwater intrusion are to control and limit the pumping rate of existing wells, and closely monitor the sample results of existing well for chlorides, conductivity and total dissolved solids.

The Safe Drinking Water/Ground Water Management Program has been compiling a database of wells in the CNMI over the past year (2005). There are currently 401 wells in the database. This total includes active and inactive drinking water, irrigation, exploratory, under ground injection, and monitoring wells. Of these 401 wells, 12 are located on Rota, 9 on Tinian, and the rest on Saipan. Of the 380 Saipan wells, 191 are owned by the Commonwealth Utilities Corporation (the local municipal water utility), while the other 189 wells are owned by other government entities, private companies or individuals.

On Saipan, there are several uses of ground water including human consumption (public water supply systems) and irrigation for crops and golf courses. The CNMI is heavily dependent on tourism and garment factories for the local economy. Due to the high level of chlorides in the public water system, major hotels and factories along the coast drill seawater wells and use reverse osmosis treatment for their private water supply.

The high level of chlorides in the public water supply on Saipan is a result of over pumping the municipal wells (which promotes salt water intrusion) to keep up with the demand for water. The 136 wells owned by CUC on Saipan that are currently producing drinking water theoretically produce enough water to meet the demands of the current population on Saipan. However, the real demand for water is significantly greater than the theoretical demand because of leaks in the municipal and homeowner water distribution systems (Army Corps 2003). The production can not keep up with the demand and the leaks, so many neighborhoods on Saipan only receive water via the distribution system for several hours a day.

An emerging concern on Saipan is the presence of coliform bacteria in the untreated (unchlorinated) raw water from the municipal drinking water wells. In March 2006 bacteriological testing of samples from municipal wells revealed that approximately 60% of wells tested positive for total coliform bacteria while 10% tested positive for E. Coli bacteria.

Figure 2. Class 1 Waters
Saipan, CNMI

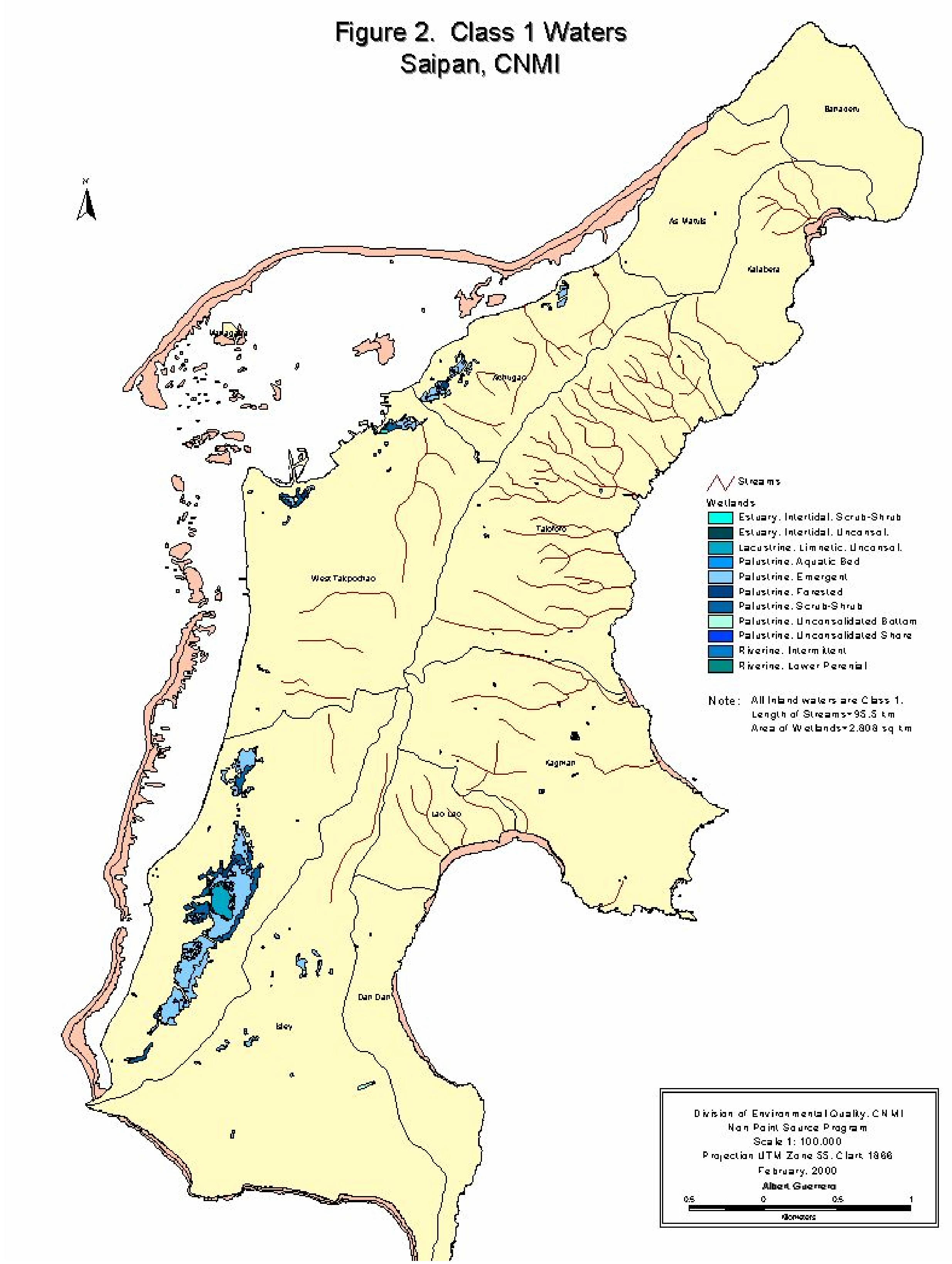
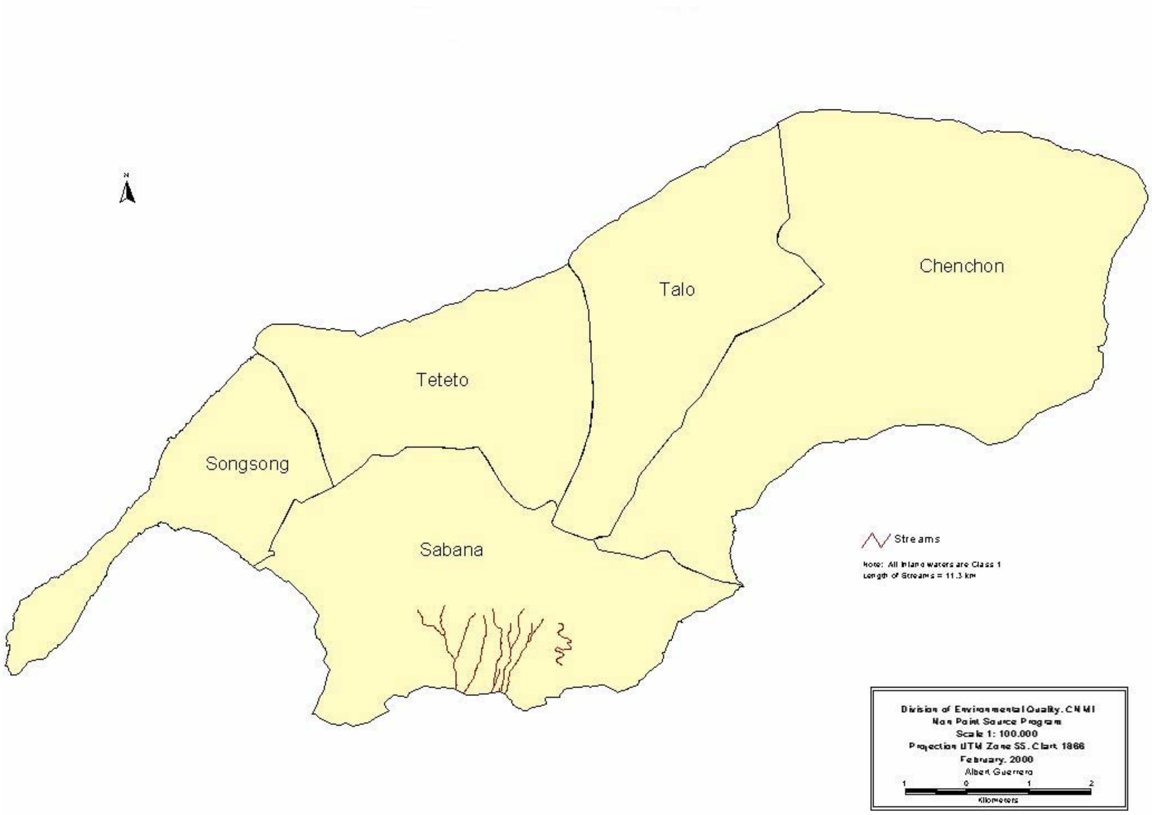


Figure 3. Class 1 Waters of Rota, CNMI



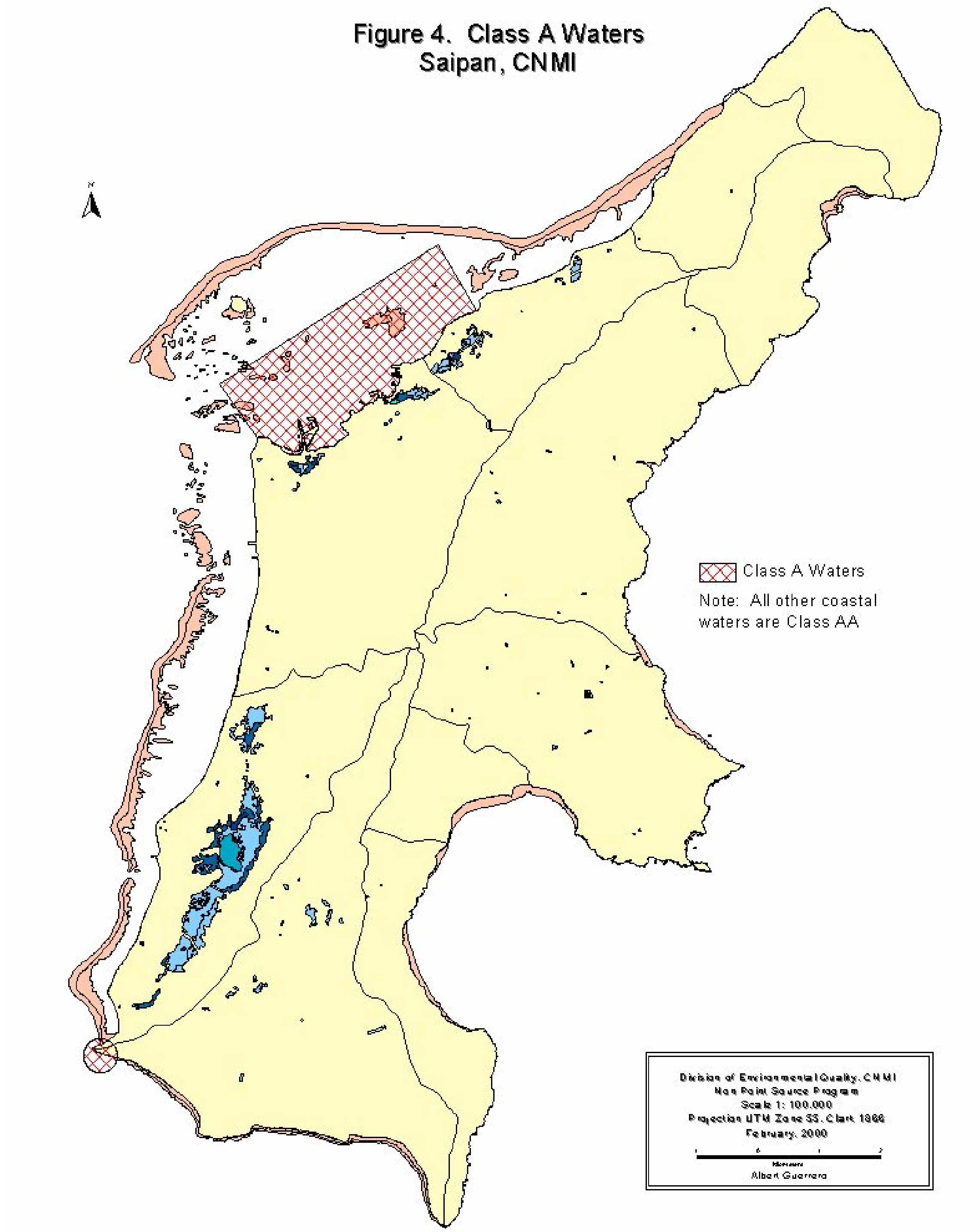


Figure 4. Class A Waters
Saipan, CNMI

The majority of the population of Saipan resides on the western side of the island. The villages of Garapan, Chalan Laulao, Susupe, Chalan Kanoa, and San Antonio are estimated to have concentrated sixty percent of the total island's population within twenty percent of the available landmass on Saipan. The majority of the municipal water supply wells are located in the southern part of the island. These municipal wells are pumping from the basal aquifer. There is a smaller concentration of municipal wells located at higher elevations in the central part of the island, and a few springs, that serve the other forty percent of the population of Saipan.

At the present time the island of Rota, with a population of about 3,000, receives its municipal water from two springs (Water Cave and Onan Cave) and three newly drilled wells. Due to slightly different geologic formation the Rota municipal water is more palatable than that of Saipan's. These wells are drawing water from the high level aquifers and are not susceptible to salt water intrusion. However, the springs on Rota are suspected to be ground water under direct influence of surface water (GUDI). Presently, DEQ is initiating monitoring of turbidity changes in accordance with the seasonal changes in order to determine if further filtration should be required.

Tinian on the other hand, with a population of about 3,200, gets its municipal water from two Maui type wells also suspected of GUDI and three deep wells. Both Tinian and Rota have not had water demands that lead to over-pumping of the aquifers.

D. Background on DEQ Programs to Correct Impairments

The CNMI Division of Environmental Quality has implemented several programs that address and regulate development, agriculture, fuel storate, pesticide use, and other potential pollutants. All programs are mentioned below, however, further information regarding the present status and pertinent findings for each program are located in sections III and IV of this report.

There are several DEQ programs which deal with regulation and enforcement of pollution sources that may potentially affect water quality. The DEQ wastewater and erosion control branch reviews permit applications that deal with the Clean Water Act and section 401 territory water quality certifications. The DEQ non-point source (NPS) pollution branch addresses stormwater runoff concerns at the watershed level through education, outreach, and demonstration projects. The NPS branch administers EPA 319 grants and reviews permits to ensure compliance with the federal 6217 NPS program. The safe drinking water branch regulates public drinking water systems, well drilling, and underground injection wells. The air and toxic management branch deals with hazardous sources of pollution which may affect CNMI's waters. Finally, the above and underground fuel storage and pesticide branch deals with the legal and illegal storage of contaminants that often pose threats to CNMI's waters.

Surface Water Assessment

A. Beach Water Quality Monitoring Program

1. Background and Methodology

The Division of Environmental Quality surveillance laboratory was established by the Commonwealth of the Northern Mariana Islands to provide monitoring data required under the Safe Drinking Water Act (P.L. 93-523) and other environmental programs. The data generated by the laboratory are used to evaluate the quality of drinking water and recreational waters in the Commonwealth. Therefore, a quality assurance plan is essential in the generation of these data and is an important part of the day-to-day activities of the laboratory. The DEQ Environmental Surveillance Laboratory Quality Assurance Manual includes Standard Operating Procedures (SOPs) for sampling, testing, reporting, and providing quality assurance for traditional water quality parameters.

The laboratory has a quality assurance plan with two primary functions: 1) It assures that proper quality control practices are implemented in day-to-day laboratory task, and 2) It assures that the reported data are valid, and are of a known precision and accuracy. The elements of a basic quality control program are well defined by federal statute. Although the success of the program depends upon the training, professional pride and awareness of each individual technician, final responsibility for the reliability of reported analytical results rest with the Environmental Surveillance Laboratory Supervisor.

The laboratory is responsible for measuring the quality of water that is used by the public for drinking, recreational and/or other purposes. It is the objective of DEQ's Environmental Surveillance Laboratory to assure that the data reported are valid, and of known precision and accuracy.

On a weekly basis, DEQ monitors 39 fixed stations along Saipan's most used West coast beaches for microbiological and chemical parameters (Figure 5). Six beaches on the Northeast coast and six beaches on the Southeast coast are monitored on a 8-week rotational basis, and monthly during the non 8-week cycle, because the quality of the water is consistently good and/or a smaller population uses these waters. Eleven sites around Managaha Island, a small (~1.5 km coastline) island located within the Saipan Lagoon, are also monitored on a 8-week rotational basis, and monthly during the non 8-week cycle (Figure 6).

Tinian and Rota monitor eleven and twelve beach areas respectively (Figure 7 and 8, respectively). These sites are frequently used by the community so they are now being monitored at similar intervals described above for Managaha Island.

The microbiological and chemical parameters that the Division of Environmental Surveillance Laboratory currently monitors includes: Salinity (‰), Dissolved Oxygen (% D.O.), Temperature (°C), pH, Turbidity (NTU), and Enterococci bacteria (cfu/100ml). These parameters are monitored on a weekly basis for Saipan West Beaches, and on a monthly and on an 8 week on/off intervals for all other locations. Chemical parameters for Orthophosphate (PO4) and Nitrates (NO3) were not monitored during 2004 - 2005 because quality control samples were not within the acceptable range. A new instrument has been purchased to replace the existing spectrophotometer and will be used to test for nutrients in the future.

The development of the CNMI Water Quality Standards were largely based upon the review of existing water quality standards for other Tropical islands (Table 5).

Table 5. CNMI Water quality standards.

PARAMETER	CLASS AA	CLASS A	CLASS 1	CLASS 2
Fecal Coliform (CFU/100 ml)	GM[1]< 200 < 400	GM[1]< 200 Never > 400	GM[1]< 200 Never > 400	GM[1]< 200 Never > 400
Enterococci (CFU/ 100 ml)	GM < 35 ‹ 104 Single Sample	GM <125 < 276 Single Sample	GM < 33 < 61 Single Sample	GM < 90 < 108 Single Sample
E. coli			GM < 126 < 235 Single Sample	GM < 126 < 406 Single Sample
PH	7.5 – 8.6	7.5 – 8.6	6.50-8.50	6.50 - 8.50
NO_3 - N (mg/L)	< 0.20	< 0.50		
Total Nitrogen (mg/L)	< 0.4	< 0.75	< 0.75	< 1.50
Orthophosphate PO_4 (mg/L)	< 0.025	< 0.05	< 0.10	< 0.10
Total Phos PO_4 (mg/L)	< 0.025	< 0.05	< 0.10	< 0.10
Ammonia (mg/L) (un-iodized)	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved O_2 (%)	> 75	> 75	> 75	> 75
Total Filterable Suspended Solids (mg/L)[2]	5	40	5	40
Salinity (‰)[2]	10	10	20‰ or above 250 mg/L	20‰ or above 250 mg/L
Total Dissolved Solids (mg/L)			500 mg/L	500 mg/L
Temperature (°C)[2]	1.0	1.0	1.0	1.0
Turbidity (NTU)[2]	0.5	1.0	0.5	1.0
Radioactive Materials	Discharge prohibited	Discharge prohibited	Discharge prohibited	Discharge prohibited
Oil & Petroleum	ND[3]	ND[3]	ND[3]	ND[3]

[1] GM - Geometric mean in not less than four samples over a 30 day period.
[2] Shall not exceed ambient by more than the stated value.
[3] ND - Non-detectable.

Figure 5. Saipan Island Beach Water Quality Monitoring Locations.

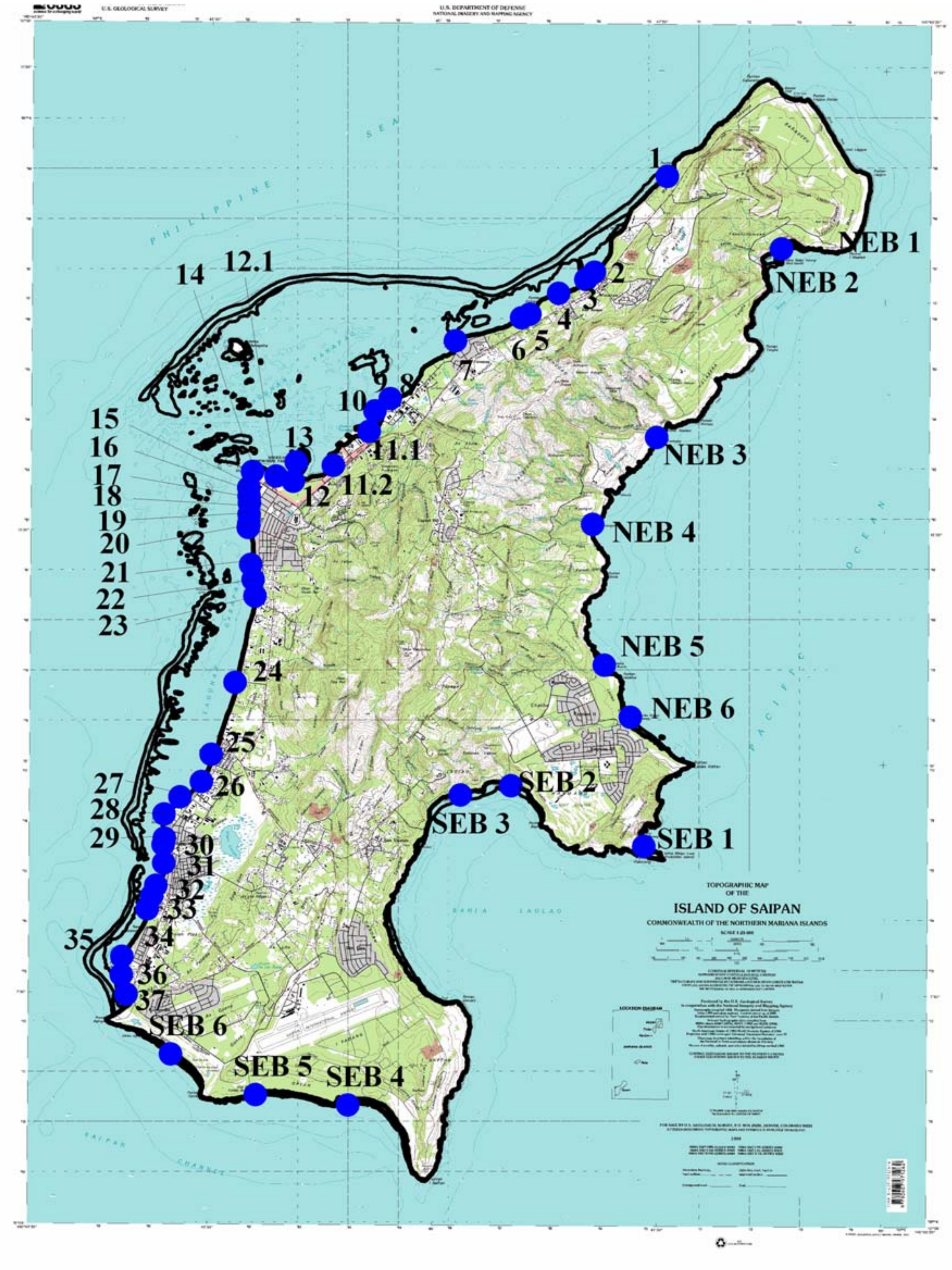


Figure 6. Managaha Island Beach Water Quality Monitoring Locations.

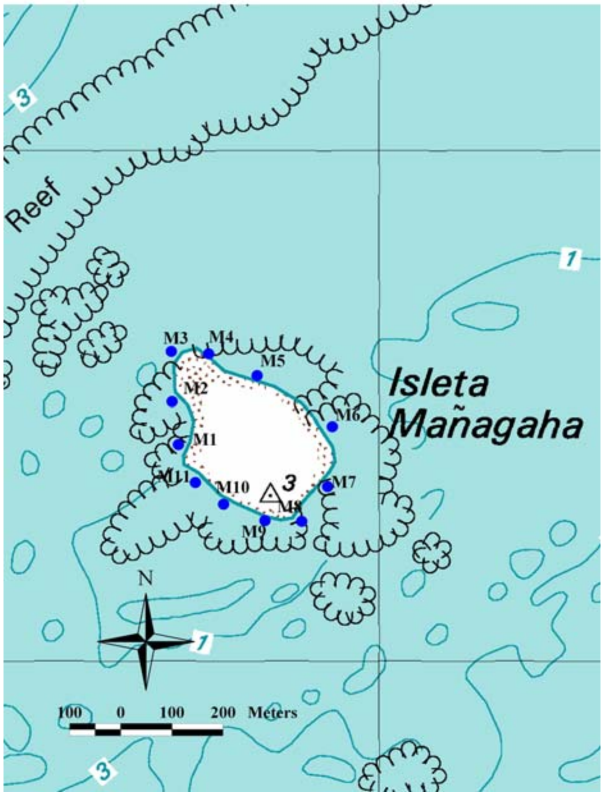
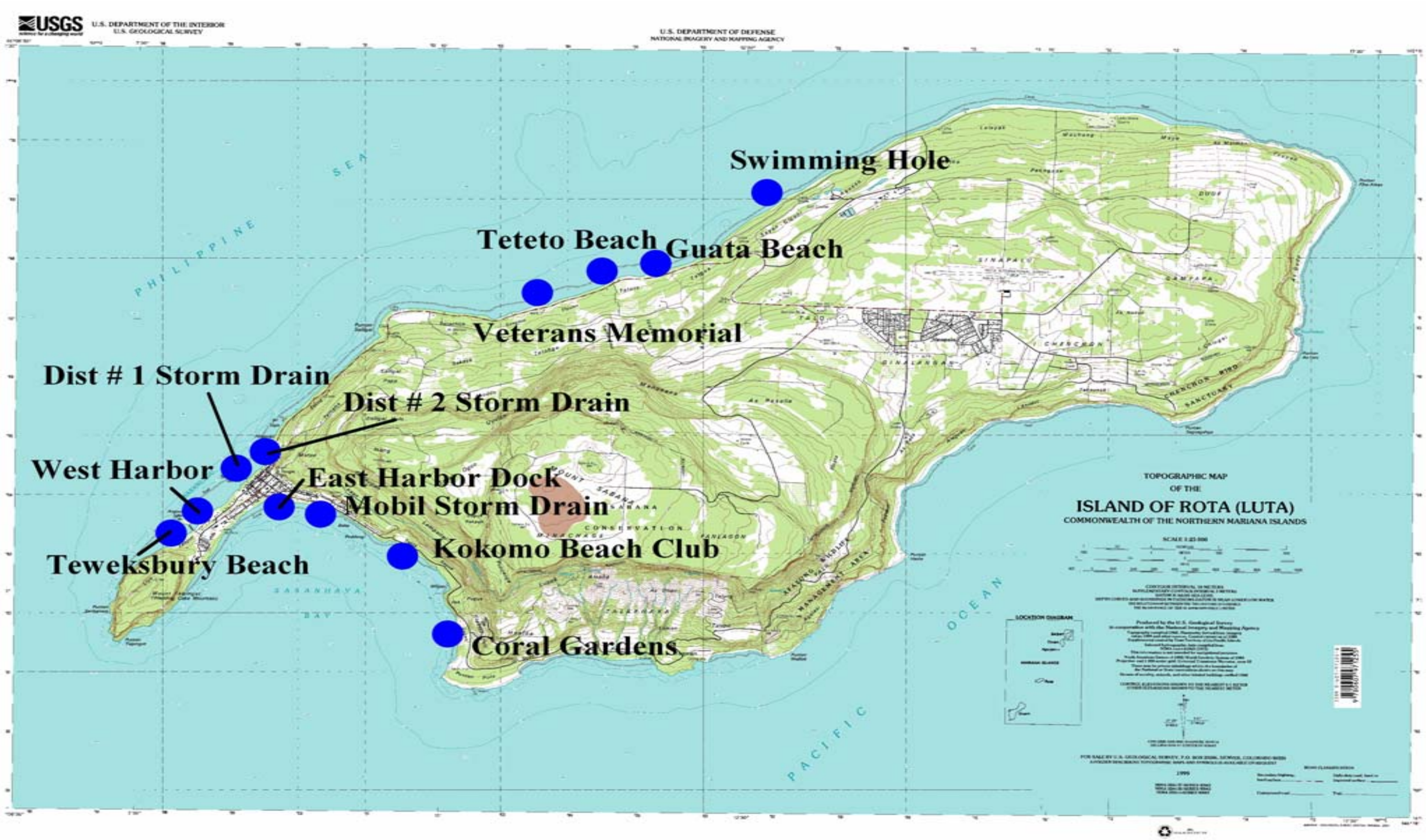


Figure 7. Tinian Island Beach Water Quality Monitoring Locations.

Figure 8. Rota Island Beach Water Quality Monitoring Locations.



The goal of the DEQ Lab Surface Water Quality Monitoring Program is to assess CNMI's waterbodies for compliance with recreational uses and aquatic life uses. EPA guidance material was used assign each water body as 1) non-supportive, 2) partially supportive, and 3) fully supportive for use (Table 6).

2. Results and Discussion

Saipan Island has the largest number of waterbodies that were non-supportive for recreational use compared with Managaha, Tinian, Aguijan, and Rota, which had only

Table 6. Criteria for waterbody classification.

Degree of Aquatic Life Use Support	Criteria
Fully Supporting	For any one pollutant, WQS exceeded in ≤10 percent of measurements.
Partially Supporting	For any one pollutant, WQS exceeded in 11 to 25 percent of measurements.
Not Supporting	For any one pollutant, WQS exceeded in >25 percent of measurements.

eight listed as partially supportive waterbodies (Table 7 - 9). Recreational use classifications were based upon *enterococci* bacteria violations. There was a large enough sample size for Saipan Island to carry out regression analysis between rainfall (independent) and *enterococci* bacteria counts (dependent) (Table 7). Rainfall explained a significant amount ($p<.05$, regression analysis) of the variance in bacteria levels in Saipan waterbodies (Table 7) (Figure 9 and 10). Observations have shown that storm events quickly inundate many of the sewage lift stations around Saipan, and the overflow enters the marine environment through drainages. Additionally, storm events carry untreated urban and rural runoff quickly to the ocean. This leads to predictable, elevated bacteria levels at many beach locations during storm events. In Rota, impaired waterbodies were associated with marinas and boat launching areas, other waters were found to be in excellent quality. It is not clear why an increase in bacteria violations was noted for Tinian waters in 2005 (6 partially supportive waterbodies) as compared with 2004 (all waters were fully supportive). Regressions with rainfall data were all not significant for Tinian monitoring sites, and much stormwater is discharges through the porous limestone rock as groundwater.

Data were also assessed for several other parameters including pH, dissolved oxygen, salinity, and temperature. These data showed little variation over the past two years, and all monitoring locations were ranked as fully supportive based upon them. Despite the fact that they are not presented in tabular format they were used to make final site rankings.

Chemical parameters for Orthophosphate (PO4) and Nitrates (NO3) were not monitored during 2004 - 2005 because quality control samples were not within the acceptable range. A new instrument has been purchased to replace the existing spectrophotometer and will be used to test for nutrients in the future.

B. Lagoon and Coral Reef Biocriteria Monitoring Programs

1. Background and Methodology

Many monitoring programs that assess waterbody health with water quality data only are not sufficient to detect changes over time due to infrequent sampling and low sample sizes. One way to enhance water quality data collection may be through the use of continuous recording instruments (very expensive for multiple waterbodies). A much more cost and time efficient method is to gather data on the distribution and abundances of organisms that live within the waters. For all island nations with tropical marine waters these marine communities will shift in response to nutrients, sediment loads, and turbidity (Rogers, 1990, Telesnicki and Goldberg, 1995). As a result, the CNMI uses several measures of the coral reef and seagrass community as biological criteria for waterbody evaluation.

The CNMI interagency marine monitoring team (MMT) was initially established in 1997 to help understand the current conditions of their coral reefs and coral reef resources. It has developed and expanded over the past 7 years to improve data collection techniques, data accuracy, staff training, and spatial coverage (Houk and Starmer, 2004, Houk and Van Woesik, 2006). It is the goal of the CNMI Marine Monitoring Team to carry out long-term monitoring to continually assess our reefs as CNMI's population and development grow. DEQ plays a major role in the MMT through its Marine Biologist, Non-Point Source Pollution Program, and Laboratory Program. Two biocriteria monitoring programs presently exist; the Saipan lagoon and nearshore coral reef long term monitoring programs. Due to the nature of tropical marine systems both of these are very different from EPA funded bio-criteria monitoring programs in the U.S. mainland.

No EPA criteria exist for the evaluation of coral reefs, however, the existing EPA guidance material can be logically manipulated to allow for evaluation of waterbodies based upon benthic communities. Lagoon benthic communities were evaluated by calculating a ratio of seagrass to turf/macroalgae coverage. Justification comes from studies which show turf and macroalgae abundances to increase in response to nutrient addition (Littler and Littler, 1985, Lapointe, 1997).

Table 7. Summary of beach monitoring locations and *Enterococci* bacteria violations for Saipan: a ranking of 1 = non-supportive, 2 = partially supportive, and 3 = fully supportive. Regression analysis results are presented as P values.

Beach Identifier	Beach Name	Longitude	Latitude	2004 Sample Size (n)	2005 Sample Size (n)	Percent Violations (Enterococci) 2004	Percent Violations (Enterococci) 2005	Rankings 2004	Rankings 2005	P value for Regression Analysis 2004	P value for Regression Analysis 2005
WB 1	Wing Beach	15.2725	145.7927	46	52	10.9	13.5	2	2	0.70 **	-0.08
WB 2	PauPau Beach	15.2552	145.7793	48	52	25.0	5.8	2	3	0.61 **	0.01
WB 3	Nikko Hotel	15.2539	145.7777	48	52	20.8	7.7	2	3	0.63 **	-0.02
WB 4	San Roque School	15.2513	145.7727	49	52	34.7	13.5	1	2	0.12	0.11
WB 5	Plumeria Hotel	15.2476	145.7674	48	52	10.4	11.5	2	2	0.79 **	0.55 **
WB 6	Aqua Resort Hotel	15.2469	145.7659	48	52	8.3	13.5	3	2	0.68 **	0.42 **
WB 7	Tanapag Meeting Hall	15.2427	145.7536	48	52	43.8	34.6	1	1	0.31 **	0.62 **
WB 8	Central Repair Shop	15.2322	145.7416	48	52	33.3	34.6	1	1	-0.06	0.05
WB 9	Sea Plane Ramp	15.2300	145.7388	48	52	0.0	3.8	3	3	0.56 **	0.43 **
WB 10	DPW Channel Bridge	15.2263	145.7377	48	52	33.3	67.3	1	1	0.03	0.55 **
WB 11.2	S. Puerto Rico Dump	15.2201	145.7311	48	50	41.7	76.0	1	1	0.04	0.12
WB 12	Smiling Cove Marina	15.2172	145.7236	48	52	6.3	13.5	3	2	0.62 **	0.02
WB 12.1	American Memorial Park	15.2207	145.7242	48	52	25.0	38.5	2	1	0.27	0.13
WB 13	Outer Cove Marina	15.2181	145.7205	48	52	10.4	21.2	2	2	0.25	0.77 **
WB 14	Micro Beach	15.2189	145.7161	48	52	8.3	17.3	3	2	0.69 **	0.09
WB 15	Hyatt Hotel	15.2160	145.7154	48	52	10.4	21.2	2	2	0.68 **	0.15
WB 16	Dai-Ichi Hotel	15.2145	145.7155	48	52	16.7	25.0	2	1	0.73 **	0.64 **
WB 17	Drainage #1	15.2132	145.7156	48	52	54.2	36.5	1	1	0.27	-0.03
WB 18	Samoan Housing area	15.2112	145.7155	48	52	16.7	17.3	2	2	0.62 **	-0.01
WB 19	Hafa-Adai Hotel	15.2096	145.7154	48	52	31.3	25.0	1	1	0.24	0.88 **
WB 20	Drainage #2	15.2088	145.7154	48	52	33.3	30.8	1	1	0.38 **	0.13
WB 21	Garapan Fishing Dock	15.2022	145.7159	48	52	56.3	34.6	1	1	0.33 **	0.27
WB 22	Garapan Beach	15.1965	145.7167	48	52	20.8	17.3	2	2	0.32 **	0.42 **
WB 23	Drainage #3	15.1995	145.7163	48	52	12.5	9.6	2	3	0.50 **	-0.03
WB 24	Chalan Laulau Beach	15.1809	145.7131	48	52	16.7	3.8	2	3	0.25	0.42 **

Table 7. Cont.

Beach Identifier	Beach Name	Longitude	Latitude	2004 Sample Size (n)	2005 Sample Size (n)	Percent Violations (Enterococci) 2004	Percent Violations (Enterococci) 2005	Rankings 2004	Rankings 2005	P value for Regression Analysis 2004	P value for Regression Analysis 2005
WB 25	San Jose Beach	15.1679	145.7088	48	52	6.3	1.9	3	3	0.25	-0.10
WB 26	Civic Center Beach	15.1630	145.7069	48	52	4.2	0.0	3	3	0.12	-0.13
WB 27	Diamond Hotel	15.1602	145.7030	48	52	6.3	5.8	3	3	0.05	-0.09
WB 28	Grand Hotel	15.1571	145.7000	48	52	4.2	3.8	3	3	0.24	-0.05
WB 29	Community School Beach	15.1527	145.7001	48	52	8.3	7.7	3	3	0.00	-0.04
WB 30	Sugar Dock	15.1516	145.6999	48	52	52.1	13.5	1	2	0.07	0.02
WB 31	CK District #2 Drainage	15.1483	145.7001	48	52	16.7	9.6	2	3	0.67 **	0.29 **
WB 32	CK District #4 Lally Beach	15.1442	145.6986	48	52	10.4	5.8	2	3	0.73 **	0.50 **
WB 33	Chalan Piao Beach	15.1424	145.6979	48	52	10.4	5.8	2	3	0.64 **	0.62 **
WB 34	Hopwood School Beach	15.1400	145.6970	47	52	21.3	5.8	2	3	0.02	0.71 **
WB 35	San Antonio Beach	15.1314	145.6924	48	52	18.8	5.8	2	3	-0.05	0.10
WB 36	Pacific Islands Club (PIC)	15.1281	145.6923	48	52	6.3	3.8	3	3	-0.04	-0.07
WB 37	San Antonio Lift Station	15.1247	145.6932	48	52	33.3	5.8	1	3	0.58 **	0.29 **
NEB 1	Grotto Cave	15.2587	145.8232	26	20	26.9	10.0	1	2	-0.09	0.81 *
NEB 2	Bird Island Beach	15.2596	145.8140	26	20	23.1	30.0	2	1	0.24	-0.15
NEB 3	Jeffrey's Beach	15.2254	145.7910	26	20	15.4	50.0	2	1	0.29	0.45 *
NEB 4	Old Man by the Sea	15.2097	145.7792	20	14	20.0	50.0	2	1	0.08	-0.12
NEB 5	Marine Beach	15.1844	145.7815	26	20	15.4	15.0	2	2	-0.09	-0.08
NEB 6	Tank Beach	15.1750	145.7864	26	20	23.1	5.0	2	3	-0.09	-0.16
NEB 7	Hidden Beach			24	20	37.5	30.0	1	1	0.32	0.64 *
SEB 2	North Laulau Beach	15.1626	145.7644	26	20	19.2	30.0	2	1	-0.01	-0.17
SEB 3	South laulau Beach	15.1608	145.7550	26	20	19.2	25.0	2	1	0.00	-0.13
SEB 4	Obyan	15.1049	145.7345	26	20	26.9	15.0	1	2	0.07	-0.10
SEB 5	Ladder Beach	15.1067	145.7173	26	20	11.5	20.0	2	2	0.17	-0.09
SEB 6	i Dangkulo Beach (site cha	15.1139	145.7015	26	20	46.2	35.0	1	1	-0.09	-0.12

Figure 9. Average *enterococci* bacteria levels at Saipan beach monitoring sites during rain (daily value > .15 inches), and non-rain events for 2004.

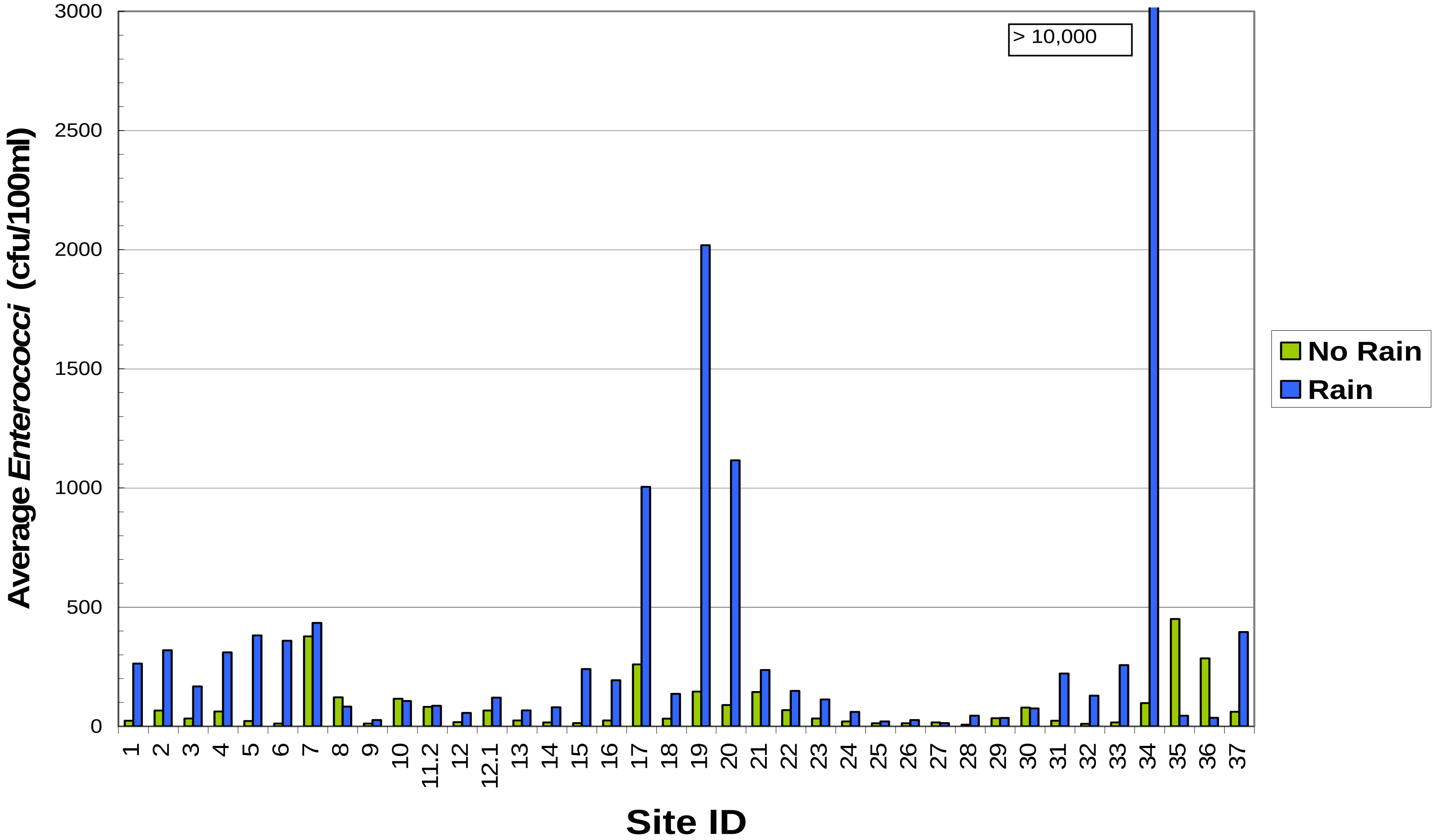


Figure 10. Average *enterococci* bacteria levels at Saipan beach monitoring sites during rain (daily value > .15 inches), and non-rain events for 2005.

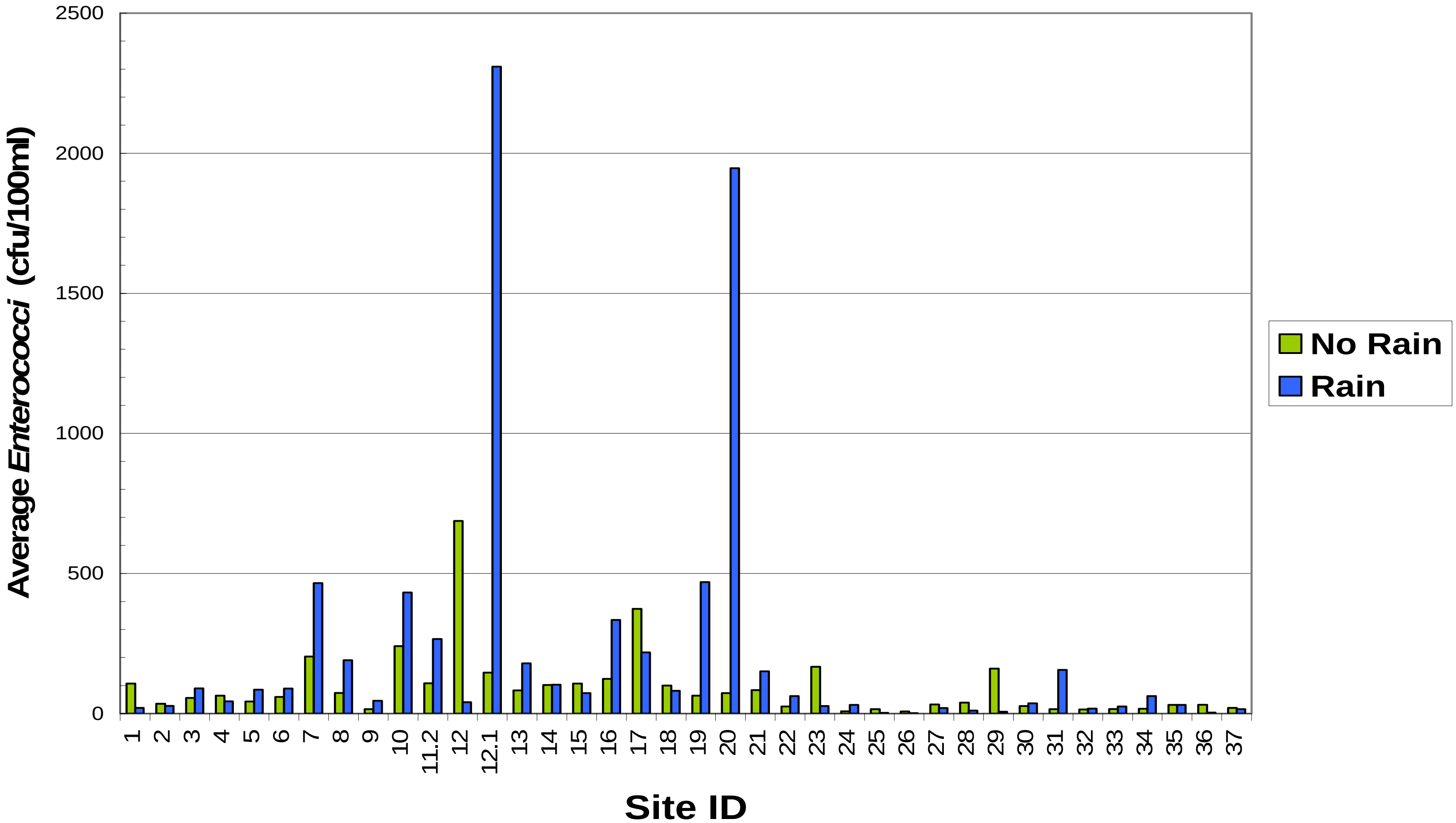


Table 8. Summary of beach monitoring locations and *Enterococci* bacteria violations for Tinian and Rota: a ranking of 1 = non-supportive, 2 = partially supportive, and 3 = fully supportive.

Beach Identifier	Beach Name	Island Name	Longitude	Latitude	2004 Sample Size (n)	2005 Sample Size (n)	Percent Violations (Enterococci) 2004	Percent Violations (Enterococci) 2005	Rankings 2004	Rankings 2005
T1	Unai Masalok Beach	Tinian	15.0211	145.6525	25	26	4.0	0.0	3	3
T2	Unai Dangkolo Beach	Tinian	15.0329	145.6467	25	26	4.0	15.4	3	2
T3	Unai Babui	Tinian	15.0775	145.6197	25	26	4.0	15.4	3	2
T4	Unai Chulu	Tinian	15.0705	145.6126	25	26	4.0	19.2	3	2
T5	Leprosarium Beach I	Tinian	14.9796	145.6099	26	26	3.8	3.8	3	3
T6	Leprosarium Beach II	Tinian	14.9875	145.6056	26	26	0.0	11.5	3	2
T7	Tachogna Beach	Tinian	14.9511	145.6285	26	25	7.7	4.0	3	3
T8	Taga Beach	Tinian	14.9542	145.6270	26	25	7.7	0.0	3	3
T9	Harbor	Tinian	14.9625	145.6171	26	26	3.8	19.2	3	2
T10	Kammer Beach	Tinian	14.9619	145.6228	26	26	3.8	3.8	3	3
R1	Coral Garden Beach	Rota	14.1161	145.1667	26	28	7.7	3.6	3	3
R2	Kokomo Beach Club	Rota	14.1294	145.1598	26	29	0.0	3.4	3	3
R3	Mobile Station Storm Drainage	Rota	14.1369	145.1428	26	29	0.0	10.3	3	2
R4	East Harbor Dock	Rota	14.1371	145.1416	26	25	3.8	4.0	3	3
R5	Tweksberry Beach	Rota	14.1311	145.1282	26	29	11.5	0.0	2	3
R6	West Harbor Marina	Rota	14.1335	145.1309	26	29	11.5	10.3	2	3
R7	District #2 Storm Drainage	Rota	14.1408	145.1379	26	29	42.3	17.2	1	2
R8	District #1 Strom Drainage	Rota	14.1422	145.1394	26	29	3.8	3.4	3	3
R9	Veterans Memorial Beach	Rota	14.1674	145.1787	26	29	0.0	0.0	3	3
R10	Teteto Beach	Rota	14.1702	145.1861	26	29	0.0	0.0	3	3
R11	Guata Beach	Rota	14.1723	145.1945	26	29	19.2	13.8	2	2
R12	Swimming Hole	Rota	14.1823	145.2091	26	29	19.2	6.9	2	3

Table 9. Summary of beach monitoring locations and *Enterococci* bacteria violations for Managaha: a ranking of 1 = non-supportive, 2 = partially supportive, and 3 = fully supportive.

Beach Identifier	Beach Name	Longitude	Latitude	2004 Sample Size (n)	2005 Sample Size (n)	Percent Violations (Enterococci) 2004	Percent Violations (Enterococci) 2005	Rankings 2004	Rankings 2005
M1	Managaha Beaches	15.2409	145.7114	24	26	0.0	3.8	3	3
M2	Managaha Beaches	15.2420	145.7117	26	28	0.0	7.1	3	3
M3	Managaha Beaches	15.2425	145.7116	26	28	7.7	3.6	3	3
M4	Managaha Beaches	15.2428	145.7124	26	28	3.8	3.6	3	3
M5	Managaha Beaches	15.2426	145.7133	26	28	3.8	3.6	3	3
M6	Managaha Beaches	15.2410	145.7147	26	28	7.7	0.0	3	3
M7	Managaha Beaches	15.2403	145.7140	26	28	0.0	3.6	3	3
M8	Managaha Beaches	15.2398	145.7136	26	28	0.0	3.6	3	3
M9	Managaha Beaches	15.2400	145.7129	26	28	0.0	3.6	3	3
M10	Managaha Beaches	15.2401	145.7125	26	28	0.0	0.0	3	3
M11	Managaha Beaches	15.2405	145.7121	26	28	15.4	3.6	2	3

Only *Halodule* seagrass habitats were used in this evaluation due to their high abundance and vast spatial distribution throughout the lagoon. Both attributes allow for relative comparisons to be made. The data collected here represent the highest level of technical components based upon EPA guidance material. All data were collected and analyzed by a professional biologist for interpretation.

Coral reef benthic communities were evaluated by calculating a ratio of coral/crustose coralline algae (CCA) to turf/macroalgae. Justification comes from studies which show CCA as the preferred substrate for coral settlement, and other turf and macroalgae to increase sediment trapping and inhibit coral survival (Rogers, 1990, Richmond, 1997, Fabricius and De'ath, 2001). Several other coral reef metrics are currently being tested for their applicability in the CNMI (Houk, 2006), but not used in this report.

Within each waterbody ecological surveys were completed to evaluate the aquatic life use support according to EPA guidance material as 1) non-supportive, 2) partially supportive, and 3) fully supportive. Coral reef monitoring locations were first separated in habitats based upon their geomorphology and oceanic exposure. This reduces the inherent variation in benthos communities associated with differing environmental settings. All monitoring sites have some level of development within the adjacent watershed, and to some degree, anthropogenic pollutants. As a result, there is no true reference site established if one exists at all. Thus, relative rankings for each site were made based upon the benthos abundance ratio's using the following equation;

$$\sum \frac{\text{Benthos ratio}}{\text{Max benthos ratio } (\textit{for sites with same geomorphology and exposure})}$$

Final ALUS rankings are made based upon the following guidance;

Aquatic Life Use Support Ranking	Criteria
Fully Supportive	Benthos Ratio = 0.8 - 1.0 of Max Value
Partially Supportive	Benthos Ratio = 0.6 - 0.8 of Max Value
Not Supportive	Benthos Ratio = 0.0 - 0.6 of Max Value

The maximum benthos ratio value for coral reef sites in environmental settings 1 and 6 was 1.00. The maximum for coral reef sites in environmental settings 2 – 5 was 1.5. The maximum value for all *Halodule* seagrass habitats was 3.5.

2. Results and Discussion

There were several seagrass beds in the Saipan Lagoon which were non-supportive for aquatic life use (Figure 11). These mostly represent the marine waters adjacent to large, steep sloping, populated watersheds. Runoff that passes through these watersheds drains into the lagoon during storm events, carrying associated pollutants. The remaining non supportive seagrass habitats are attributed to failing sewer collection facilities and large quantities of urban runoff. As a result of nutrient and bacteria input seagrass habitats become dominated by macroalgae (*Calurpa*, *Dictyota*, and *Acanthophora* mainly) compared with seagrass (*Halodule uninervis*). Results from beach water quality monitoring agree with benthic data showing high bacteria levels in regions with high abundances of macroalgae (Figure 11).

Twenty one coral reef surveys were conducted for waterbody evaluation (Figure 12). While the CNMI coral reef monitoring program has a better spatial coverage than shown, only sites with data collection during 2004 were used in this evaluation.

Of the twenty one locations surveyed, 6 were non-supportive, 5 were partially supportive, and 10 were fully supportive for aquatic life use (Table 10). Not supportive rankings were suspected to be a consequence of sedimentation, polluted groundwater discharge, and the proximity to boat marinas. Partially supportive sites are all associated with large volume watersheds with varying levels of suspect pollution. Further studies are currently underway to formulate a predictive knowledge regarding the expected benthos abundances given a set of watershed statistics. In the future we hope to use deviations from the expected abundances as biocriteria measures for the assessment of waterbodies. Further, as DEQ develops trend data sets for these coral reefs we plan to elucidate direction changes to describe trends in reef health on a bi-annual basis. This will help to evaluate the effectiveness of management strategies and action, and allow for a priority ranking of remaining, problematic watersheds.

In general, the results of this rapid assessment based upon relative measures are less desirable than data analysis from long-term studies and monitoring programs, which will better evaluate health and change with greater statistical power. However, the present evaluation serves to fill an important role for regulatory agencies.

Figure 11. A map showing all *Halodule* seagrass habitats throughout the Saipan lagoon color coded as follows: red = non-supportive, yellow = partially supportive, green = fully supportive, and blue = no data available. Color coded circles represent rankings from the beach water quality monitoring data (*Enterococci* bacteria), shown for comparison purposes.

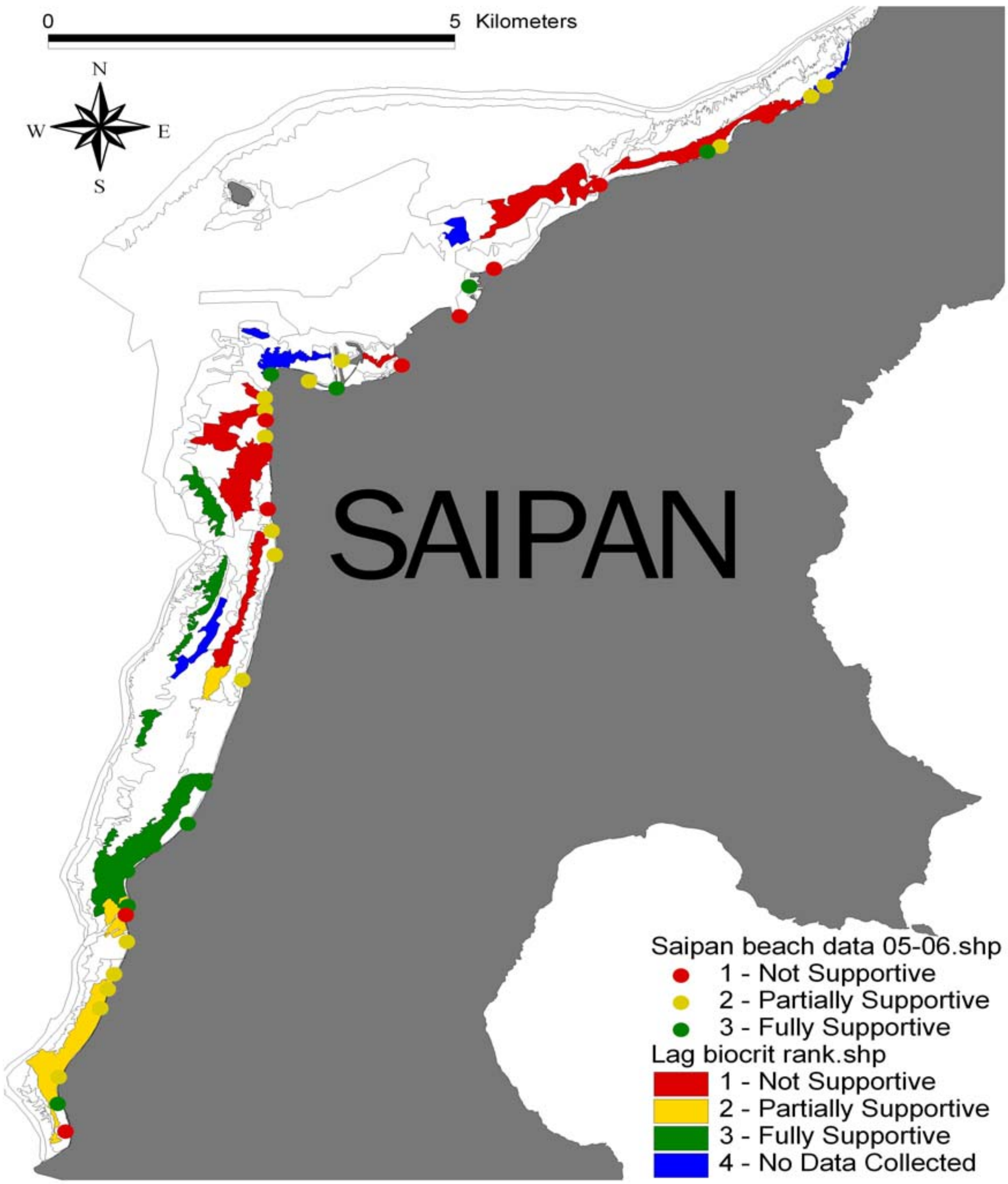


Figure 12. A map of coral reef biocriteria monitoring locations used in the present assessment.

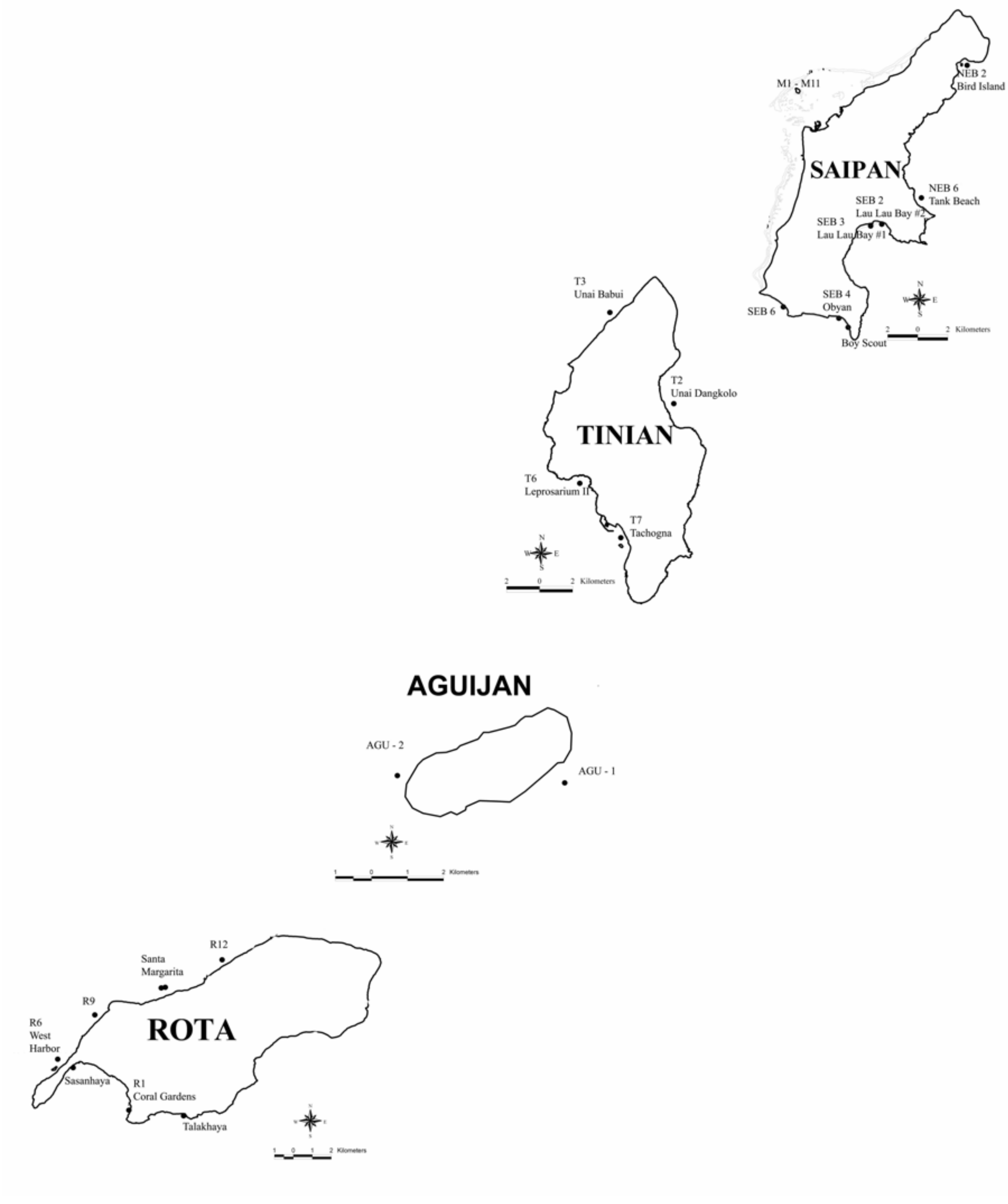


Table 10. Results from the CNMI coral reef biocriteria monitoring program for aquatic life use: a ranking of 1 = non-supportive, 2 = partially supportive, and 3 = fully supportive.

Site Name	Island	Environmental Setting	Benthic Substrate Ratio	Benthic Community Ranking	**ALUS**
AGU - 1	Aguijan	1.0	0.91	3	Fully Supportive
NEB 2 - Bird Island	Saipan	2.0	1.38	3	Fully Supportive
NEB 6 - Tank Beach	Saipan	2.0	0.91	2	Partially Supportive
T2 - Unai Dangkolo	Tinian	2.0	1.00	2	Partially Supportive
AGU - 2	Aguijan	3.0	2.88	3	Fully Supportive
Sasanhaya	Rota	3.0	1.58	3	Fully Supportive
SEB 3 - Lau Lau #1	Saipan	3.0	0.47	1	Not Supportive
SEB 4 - Obyan	Saipan	3.0	1.25	3	Fully Supportive
SEB 6	Saipan	3.0	1.92	3	Fully Supportive
Talakhaya	Rota	3.0	0.17	1	Not Supportive
T3 - Unai Babui	Tinian	3.0	0.82	1	Not Supportive
Boy Scout	Saipan	4.0	1.20	3	Fully Supportive
T6 - Leprosarium II	Tinian	4.0	1.35	3	Fully Supportive
R1 - Coral Gardens	Rota	4.0	1.35	3	Fully Supportive
SEB 2 - Lau Lau #2	Saipan	4.0	0.92	2	Partially Supportive
M1 - M11 Managaha Island	Managaha	5.0	1.61	3	Fully Supportive
T7 - Tachogna	Tinian	5.0	0.35	1	Not Supportive
R12	Rota	6.0	0.14	1	Not Supportive
R6 - West Harbor	Rota	6.0	0.44	1	Not Supportive
Santa Margarita	Rota	6.0	0.77	2	Partially Supportive
R9	Rota	6.0	0.79	2	Partially Supportive

C. Integrated 305b and 303d Waterbody Classification

1. (CALM) Waterbody Classification

EPA Consolidated Assessment and Listing Methodology (CALM) was used to classify each waterbody based upon water quality and biocriteria assessments as follows:

- Category 1 Water body meets all designated uses. No use is impaired.
- Category 2 Water body meets some of the designated uses. There is insufficient data to evaluate any remaining designated uses.
- Category 3 There are insufficient data to evaluate any designated uses.
- Category 4a Water body is impaired for one or more designated uses, but a TMDL has already been prepared and completed.
- Category 4b Water body is impaired for one or more designated uses, but a TMDL is not necessary because other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.

- <u>Category 4c</u> Water body is impaired for one or more designated uses, but a TMDL is not necessary because a pollutant does not cause the impairment.
- <u>Category 5</u> Water body is impaired, and a TMDL is required [303(d) list].

Each water quality or biocriteria monitoring location was considered to be representative of water quality conditions within a 250 m radius. This distance is based upon CNMI water quality standards for sample violations. Assessments from water quality and biocriteria data were used to rank waterbodies following EPA guidance materials: all 'partially supportive' or 'non-supportive' rankings are defined as not meeting the designated use and the waterbody is considered 'impaired'. If available, all historical data were combined with the present to formulate rankings by simply taking the average values over time. If remedial activities have occurred in the past 2 years that were expected to improve water quality then only the recent data were used to formulate rankings. If remedial actions have resulted in a positive change in the water quality data and waterbody ranking, the site was removed from CNMI's 303(d) list. Because biological criteria data are better indicators for aquatic life support (due to relatively small water quality sample sizes), these data were used to formulate final rankings where available. Because of the rarity of fresh, surface waters in the CNMI (<2.5% of CNMI surface area), and the lack of public use, there is no regular monitoring to support this waterbody assessment process at the present time.

The cause for listing all impaired waters is listed in table 11 following:

- <u>1</u> Waters listed as impaired due to *Enterococci* bacteria violations.
- <u>2</u> Waters listed as impaired due to historical (2002 – 2003) nutrient violations.
- <u>3</u> Waters listed as impaired due to biological criteria data.

CNMI wide results indicate that 85% of all monitored waterbodies were impaired and placed in CALM category 4b, if corrective measures are in place, or 5, 303(d) listed. The majority of all impaired waters (64%) were placed in CALM category 5, and are 303(d) listed (Table 11). Saipan has the largest percentage of impaired waters (92%), followed by Tinian (90%), then Rota (80%), and finally Aguijan and Managaha (0%).

The high percentage of impaired waters in CNMI found here is mainly due to stringent orthophosphate and dissolved oxygen water quality standards that do no represent ambient conditions. As discussed at length in our 2004 report, nutrient standards are extremely stringent and their revision remains a top priority. DEQ has requested assistance from EPA and the University of Guam Water and Energy Research Institute to help resolve this matter. Significant corrective measures that have been put in place consist of the construction of a new sewer force main line for the southwest side of Saipan. This has been completed in FY 05 and improved the water quality in the southern lagoon (WB 30 – 37, Table 11). This improvement is expected to allow the recovery of a healthy benthic community, and thus resulted in the removal of these waters from our 303(d) list, and placement in the 4b category. Other waters in the 4b category have current, detailed stormwater (WB 12.1, 14-17, Table 11) or non-point source pollution (SEB 2 – 4, Talakahaya, Table 11) control designs and projects ongoing. Details can be found in section "D" of this report, "Water Quality Permitting and Other Pollution Prevention Programs".

Throughout CNMI's 53.7 km of beach coastline 69% was assessed during 2004 – 2005 (Table 12). The coastline of Managaha is all sandy beach and monitoring efforts cover the entire island. Tinian has only ~12% sandy shores, of which ~71% are monitored. Rota has a ~30% beach coastline, of which ~35% is monitored. The present results show that 34 km of impaired coastline exists around CNMI, 23.5 km on Saipan, 4.5 km on Tinian, and 6 km on Rota (Table 12). Numerical data will serve as a baseline for future assessments of CNMI waterbodies.

2. 303(d) Priority List

A TMDL priority listing was created to accompany all waters placed on the 303(d) list, or category 5 waters (Table 11). All waterbodies were listed as A or B as follows:

A – Bio-criteria or *Enterococci* data analyses resulted in a non-supportive ranking. Waters are heavily used by residents and tourists. Waters have several suspect sources of pollution. These waters are currently the top priority for TMDL listing.

B - Bio-criteria or *Enterococci* data analyses resulted in a partially, or not supportive ranking. Waters are not heavily used by residents and tourists. A single suspect pollution source is known. These waters are currently the medium priority for TMDL listing.

C - Bio-criteria or *Enterococci* data analyses resulted in a fully supportive ranking. Dissolved oxygen and/or orthophosphate data analyses resulted in a non-supportive ranking, and serve as the only reason for placement on the 303(d) list. It is believed that many waterbodies exceed these standards naturally, as discussed above. These waters are currently the low priority for TMDL listing.

Table 11. (CALM) waterbody classification for all islands based upon all designated uses (*enterococci* = recreation use, all other rankings = aquatic life use). See text for explanation.

Beach Identifier	Beach Name	Island Name	2004 Enterococci Rankings (Recreational Use)	2005 Enterococci Rankings (Recreational Use)	2004/5 Bio-Criteria Ranking (ALUS)	(CALM) Waterbody Category	Impairment Cause	Priority Listing
WB 1	Wing Beach	Saipan	Partially Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	B
WB 2	PauPau Beach	Saipan	Partially Supportive	Fully Supportive	no data within 250 m of point	5	2	C
WB 3	Nikko Hotel	Saipan	Partially Supportive	Fully Supportive	no data within 250 m of point	5	2	C
WB 4	San Roque School	Saipan	Non Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	B
WB 5	Plumeria Hotel	Saipan	Partially Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	B
WB 6	Aqua Resort Hotel	Saipan	Fully Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	B
WB 7	Tanapag Meeting Hall	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	A
WB 8	Central Repair Shop	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	A
WB 9	Sea Plane Ramp	Saipan	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
WB 10	DPW Channel Bridge	Saipan	Non Supportive	Not Supportive	no data within 250 m of point	5	1, 2	A
WB 11.2	S. Puerto Rico Dump	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	A
WB 12	Smiling Cove Marina	Saipan	Fully Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	A
WB 12.1	American Memorial Park Drainage	Saipan	Partially Supportive	Not Supportive	no data within 250 m of point	5	1, 2	C
WB 13	Outer Cove Marina	Saipan	Partially Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	A
WB 14	Micro Beach	Saipan	Fully Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	C
WB 15	Hyatt Hotel	Saipan	Partially Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	C
WB 16	Dai-Ichi Hotel	Saipan	Partially Supportive	Not Supportive	Non Supportive	5	1, 2, 3	C
WB 17	Drainage #1	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	C
WB 18	Samoan Housing area	Saipan	Partially Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	A
WB 19	Hafa-Adai Hotel	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	A
WB 20	Drainage #2	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	A
WB 21	Garapan Fishing Dock	Saipan	Non Supportive	Not Supportive	Non Supportive	5	1, 2, 3	A
WB 22	Garapan Beach	Saipan	Partially Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	A
WB 23	Drainage #3	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	A
WB 24	Chalan Laulau Beach	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	A
WB 25	San Jose Beach	Saipan	Fully Supportive	Fully Supportive	Fully Supportive	1		
WB 26	Civic Center Beach	Saipan	Fully Supportive	Fully Supportive	Fully Supportive	1		
WB 27	Diamond Hotel	Saipan	Fully Supportive	Fully Supportive	Fully Supportive	1		
WB 28	Grand Hotel	Saipan	Fully Supportive	Fully Supportive	Fully Supportive	1		
WB 29	Community School Beach	Saipan	Fully Supportive	Fully Supportive	Fully Supportive	1		

Table 11. Cont.

Beach Identifier	Beach Name	Island Name	2004 Enterococci Rankings (Recreational Use)	2005 Enterococci Rankings (Recreational Use)	2004/5 Bio-Criteria Ranking (ALUS)	(CALM) Waterbody Category	Impairment Cause	Priority Listing
WB 30	Sugar Dock	Saipan	Non Supportive	Partially Supportive	Partially Supportive	5	1, 2, 3	C
WB 31	CK District #2 Drainage	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
WB 32	CK District #4 Lally Beach	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
WB 33	Chalan Piao Beach	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
WB 34	Hopwood School Beach	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
WB 35	San Antonio Beach	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
WB 36	Pacific Islands Club (PIC)	Saipan	Fully Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
WB 37	San Antonio Lift Station	Saipan	Non Supportive	Fully Supportive	Partially Supportive	5	2, 3	C
NEB 1	Grotto Cave	Saipan	Non Supportive	Partially Supportive	no data within 250 m of point	5	1	A
NEB 2	Bird Island Beach	Saipan	Partially Supportive	Not Supportive	Fully Supportive	1		
NEB 3	Jeffrey's Beach	Saipan	Partially Supportive	Not Supportive	no data within 250 m of point	5	1, 2	B
NEB 4	Old Man by the Sea	Saipan	Partially Supportive	Not Supportive	no data within 250 m of point	5	1, 2	B
NEB 5	Marine Beach	Saipan	Partially Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	B
NEB 6	Tank Beach	Saipan	Partially Supportive	Fully Supportive	Partially Supportive	5	2, 3	B
NEB 7	Hidden Beach	Saipan	Non Supportive	Not Supportive	no data within 250 m of point	5	1, 2	B
SEB 2	North Laulau Beach	Saipan	Partially Supportive	Not Supportive	Partially Supportive	5	1, 2, 3	C
SEB 3	South laulau Beach	Saipan	Partially Supportive	Not Supportive	Non Supportive	5	1, 2, 3	C
SEB 4	Obyan	Saipan	Non Supportive	Partially Supportive	Fully Supportive	1		
SEB 5	Ladder Beach	Saipan	Partially Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	A
SEB 6	Unai Dangkulo Beach	Saipan	Non Supportive	Not Supportive	Fully Supportive	1		
-	Boy Scout Beach	Saipan	No Data	No Data	Fully Supportive	1		
M1	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M2	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M3	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M4	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M5	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M6	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M7	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M8	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		

Table 11. Cont.

Beach Identifier	Beach Name	Island Name	2004 Enterococci Rankings (Recreational Use)	2005 Enterococci Rankings (Recreational Use)	2004/5 Bio-Criteria Ranking (ALUS)	(CALM) Waterbody Category	Impairment Cause	Priority Listing
M9	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M10	Managaha Beaches	Managaha	Fully Supportive	Fully Supportive	Fully Supportive	1		
M11	Managaha Beaches	Managaha	Partially Supportive	Fully Supportive	Fully Supportive	1		
T1	Unai Masalok Beach	Tinian	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
T2	Unai Dangkolo Beach	Tinian	Fully Supportive	Partially Supportive	Partially Supportive	5	1, 2, 3	A
T3	Unai Babui	Tinian	Fully Supportive	Partially Supportive	Non Supportive	5	1, 2, 3	B
T4	Unai Chulu	Tinian	Fully Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	B
T5	Leprosarium Beach I	Tinian	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
T6	Leprosarium Beach II	Tinian	Fully Supportive	Partially Supportive	Fully Supportive	1		
T7	Tachogna Beach	Tinian	Fully Supportive	Fully Supportive	Not Supportive	5	2, 3	C
T8	Taga Beach	Tinian	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
T9	Harbor	Tinian	Fully Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	A
T10	Kammer Beach	Tinian	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
R1	Coral Garden Beach	Rota	Fully Supportive	Fully Supportive	Fully Supportive	1		
R2	Kokomo Beach Club	Rota	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
R3	Mobile Station Storm Drainage	Rota	Fully Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	A
R4	East Harbor Dock	Rota	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
R5	Tweksberry Beach	Rota	Partially Supportive	Fully Supportive	no data within 250 m of point	5	2	C
R6	West Harbor Marina	Rota	Partially Supportive	Fully Supportive	Non Supportive	5	2, 3	A
R7	District #2 Storm Drainage	Rota	Non Supportive	Partially Supportive	no data within 250 m of point	5	1, 2	A
R8	District #1 Strom Drainage	Rota	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
R9	Veterans Memorial Beach	Rota	Fully Supportive	Fully Supportive	Fully Supportive	1		
R10	Teteto Beach	Rota	Fully Supportive	Fully Supportive	no data within 250 m of point	5	2	C
R11	Guata Beach	Rota	Partially Supportive	Partially Supportive	no data within 250 m of point	5	2	C
R12	Swimming Hole	Rota	Partially Supportive	Fully Supportive	Not Supportive	5	2, 3	A
-	Santa Margarita	Rota	No Data	No Data	Partially Supportive	5	3	B
-	Sasanhaya	Rota	No Data	No Data	Fully Supportive	1		
-	Talakhaya	Rota	No Data	No Data	Not Supportive	5	3	C
AGU - 2	-	Aguijan	No Data	No Data	Fully Supportive	1		
AGU - 1	-	Aguijan	No Data	No Data	Fully Supportive	1		

Table 12. Final statistics for CNMI waters based upon (CALM) classification.

Island	Total Coastline (km)	Total Beach Coastline (km)	Total Beach Coastline Monitored for Recreational Use (Enterococci) (km)	Total Beach Coastline Monitored in (Bio-Criteria Program, ALUS) (km)	(CALM) Category 1 (not impaired, sufficient data) (km)	(CALM) Category 5 (impaired)
Saipan	68.96	28.57	25	18	2	23.5
Managaha	1.04	1.04	1.04	1.04	1.04	0
Tinian	51.36	7.08	5	2	0.5	4.5
Aguijan	11.57	0	0	1	1	0
Rota	50.52	17.05	6	3.5	1.5	6

D. Relevant Issues Associated With Water Quality Permitting and Pollution Prevention Programs

The Division of Environmental Quality (DEQ) and other CNMI government agencies implement several environmental programs to control point and non-point sources of pollution. The two most relevant are the Earthmoving and Erosion Control and Non-Point Source Pollution Programs. The former represents a permitting based program while the latter focuses more on public education and demonstration projects dealing with land based pollution. DEQ's NPS program also coordinates with EPA, NOAA, and the CNMI Coastal Resources Management Office to implement the requirements of the Section 6217 Coastal Non-Point Source Pollution Program into all applicable CNMI regulations and environmental programs.

1. Current program activities and projects relevant to 303(d) listed waters

a. Laolao Bay Stormwater Control (Relevant to Category 4b Waters for 'SEB 2, 3')

On Saipan's east coast, the coral reefs of Laolao Bay are severely threatened by sediment from eroding dirt and gravel roads, streambeds, and upland runoff. Funding and community effort is being devoted to reducing sediment flows through best management practices. Over the past 10 years, partnerships of local and federal agencies and community groups have been working to solve the problems in Laolao Bay. To find permanent solutions, a collaborative effort began with these partnerships to design improvements to the access road, and to fund re-vegetation of badlands in the upper watershed. The partnership drew in funding from various sources to conduct a *Know Your Watershed* awareness campaign, and begin plant propagation necessary for the re-vegetation of the upper watershed.

Additionally, engineering designs for paving and drainage improvements on Laolao Bay Drive are completed, and the project is ready to proceed as construction funding becomes available. Road stabilization and stormwater controls are the major cost for restoring Laolao Bay. Stabilization in some of the major problem areas along the road have recently been funded through the Coral Reef Initiative Program.

b. Obyan Beach Stormwater Control (Relevant to Category 4b Waters for'SEB 4')

Obyan Beach is another dive site frequented by residents and tourists that has been exposed to sedimentation runoff into the ocean from gravel roads. CRMO and DEQ have joined efforts to address the runoff problem by completing engineering designs that would improve the road and water quality of runoff waters. Similar to Laoloa Bay, construction only awaits funding.

c. Talakhaya Restoration Project (Relevant to Category 4b Waters for 'Talakhaya')

The Talakhaya watershed in Rota, CNMI, contains Rota's only perennial streams that support domestic uses. For decades, this watershed has suffered from frequent wildfires intentionally set by hunters to create new vegetation growth to attract Sambar deer. The fires remove vegetation and cause significant soil erosion and slumping, particularly during the rainy season. The greatest threat to this water resource and the health of coral reef communities is runoff containing sediments and nutrients. The natural resource management agencies of the CNMI continue to make important strides in the effort to prevent, control, and reduce the occurrences of wildfires.

Monitoring conducted by the CNMI's Marine Monitoring Team (MMT) over the last five years shows that turf algae, which grow rapidly in response to nutrient addition associated with upland sedimentation, have begun to dominate Talakhaya's nearshore coral reef community. In addition, observations from MMT surveys in 2005 show an increase in heterotrophic organisms (i.e., sponges, bivalves, soft corals, etc.), presumably as a result of increased phytoplankton blooms (food for heterotrophs) and decreased light and oxygen levels. As a result, the Talakhaya watershed has been identified as a Threat/Focus Area in the CNMI's Coral Reef Initiative Local Action Strategies and listed as a Category I Watershed in the CNMI's Unified Watershed Assessment.

Some recent actions taken to address this issue include meetings with the Rota watershed committee to discuss the revegetation and education/outreach efforts for Talakhaya. As a result, a watershed retoration plan has been developed and funding has been granted through the Coral Reef Initiative program to implement the plan which includes revegetation of the barren areas on the watershed, an outreach and education plan, and water quality and marine monitoring.

d. Garapan Drainage Improvement Designs (Relevant to Category 4b Waters for WB 12b, 14-17)

Two sub-drainages within the Garapan district have been identified as significant contributors to tainted water quality in the Garapan Lagoon. Through several outreach campaigns and meetings with CNMI's inter-agency watershed group this information has been disseminated to the public and elected governmental officials. A conceptual, remedial wetland ponding system design was prepared by DEQ and presented to government officials to seek funding for proper planning designs and construction. Currently, two of Saipan's most polluted sub-drainages have completed designs, received permits, and construction funds are earmarked for the establishment of stormwater treatment wetlands. Because of these advances several waterbodies (noted above) were listed as category 4b. The DEQ water quality and marine monitoring programs will serve to examine the effectiveness of stormwater treatment infrastructure.

III. Ground Water Assessment

B. Numeric Ground Water Standards

In December 2004, regulations designating groundwater management zones (GMZs) on Saipan were promulgated. Three zones, Class I, II, and III were created based on groundwater quality, availability of recharge, susceptibility to degradation, and present and future land use (Figure 13). Class I GMZs are critical groundwater protection areas capable of supplying high quality fresh water, and receive the highest level of environmental protection. Class I GMZs include all high level (perched) aquifers, municipal well fields, and watersheds contributing to surface infiltration to springs and fresh water systems. Class II GMZs are important protection areas considered capable of supplying good quality groundwater, but generally of lower quality (e.g. higher chlorides concentration) that Class I GMZs. Class II GMZs include relatively high quality basal groundwater lens resources with chloride concentrations less than 500 mg/l. Class III GMZs are ares providing recharge to primarily brackish aquifers, having some intrinsic value as a resource to supply deslination plants, but primarily of lower value than groundwater found in Class I and II GMZs. Class III GMZs include the groundwater resources with chloride concentrations in excess of 500 gm/l.

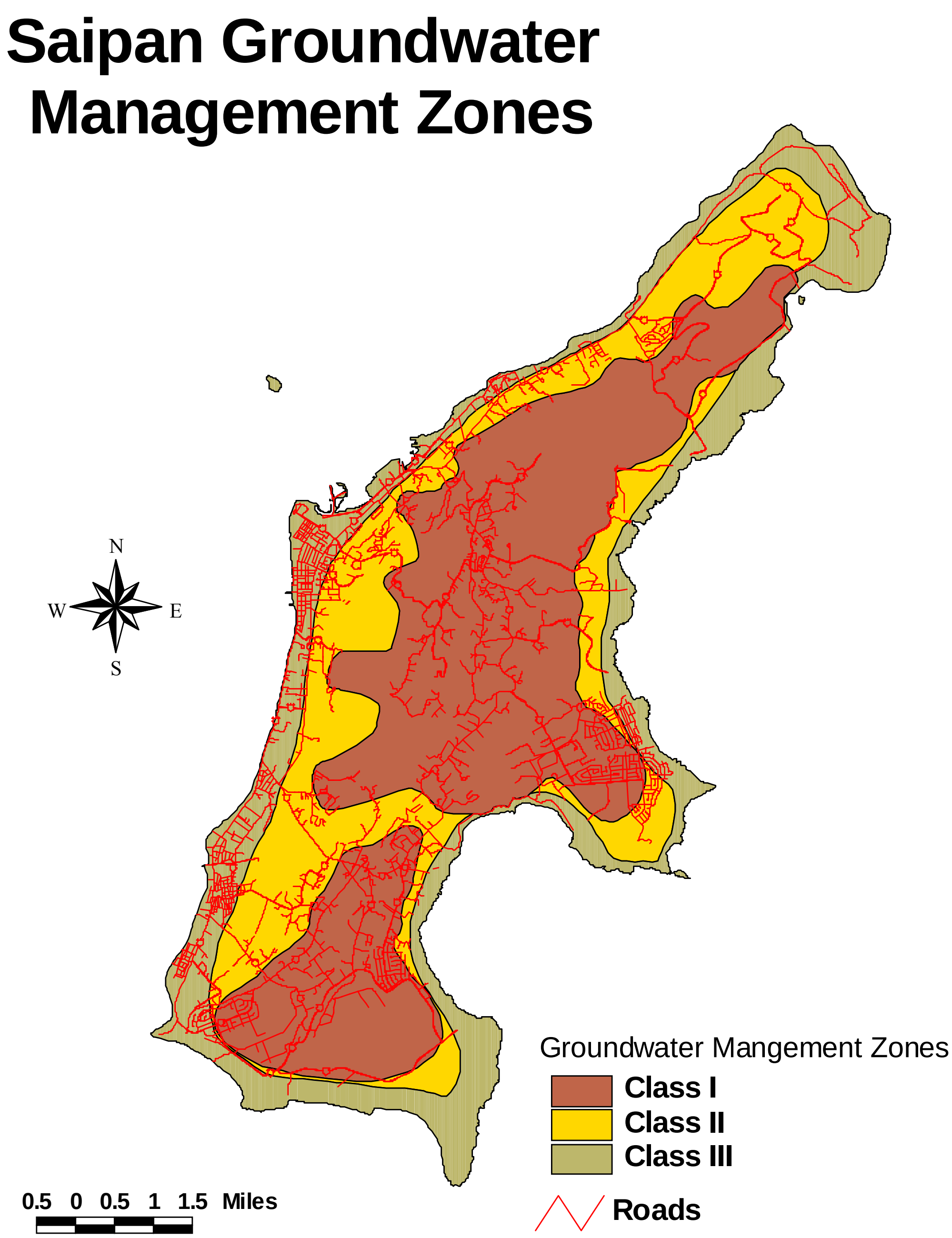
C. Summary Results of Ground Water Monitoring

The CNMI Groundwater Protection and Management Act was enacted into law in 1988. The first set of Well Drilling regulations were adopted in 1992 and later amended in 1994, and most recently in 2004. The well drilling regulations set standard requirements and criteria for licensed well drillers, well construction, setback distances, and requirements for operating of new and renewed wells. As part of operations, annual monitoring of chlorides, conductivity, total dissolve solids, pH, total coliform and monthly withdrawal rate of water are required for all wells.

With the new GIS program and hand held GPS units, DEQ will continue to develop a database of all private wells with information on operation date, location, and monitoring data. The database is its early infantile stages with much need for improvement on quality control of missing or inaccurate data. It is envisioned that the data will be integrated into the CNMI GIS system. DEQ will be able to use the fully developed GIS system to identify existing sources of contamination and potential problems for proposed new and existing wells.

A general review of the sample data for the private wells shows that chlorides and conductivity gradually increase over time in many of the wells. In some wells, a reduction in the operating pressure has resulted in a decrease in conductivity and chlorides. (Note: Conductivity was believed to be a better indicator of increasing saltwater intrusion due to potential laboratory error associated with testing equipment for

Figure 13. Groundwater management zones for Saipan Island.



chlorides). It is the current unofficial policy to limit all new wells to under a pumping rate of 20 gallons per minute unless there are unusual circumstances with high quality aquifer and special needs.

As DEQ laboratory capabilities increase, DEQ will continue requiring the testing of nitrates in private and municipal water wells used for drinking and other human consumptions. To be assured that the quality of ground water being used by the local community is not contaminated from old military or current activities, testing for metals, volatile organic compounds, and synthetic organic compounds, pesticide and herbicide, radionuclides and other inorganic compounds were required as part of a source water assessment. In May 2000, DEQ and EPA region IX conducted an island wide sampling of all private wells for VOC's, metals, pesticides and herbicides on several wells. In 1999, DEQ started enforcing the Phase II/V chemical monitoring and is currently underway. Several private well were found to have exceeded the EPA Maximum Contaminant Level (MCL) for drinking water.

The USGS office in the CNMI was closed in late 2005, and as a result, the Safe Drinking Water/Ground Water Management Program began monthly monitoring of the static water level in the 14 USGS wells on Saipan. The program hopes to be able to use this data in the management of withdrawal rates from the aquifers on Saipan.

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