

US NAVAL AIR STATION GUANTANAMO BAY, CUBA

Why the Navy Chose Distributed Wastewater Infrastructure for Guantanamo Bay

September 27, 2016



DESIGN CHARACTERISTICS

	Flow (gpd)	Electrical (kWhrs/mo)
Caravella Housing & School	100,000	4050
Bargo Barracks	21,500	1300
Granadillo Housing	13,000	1050
Leeward Site Housing	50,000	2550
McCalla Hanger & Office	3,000	700
Radio Point Housing Industrial	22,500	1300
Wharf R Office Industrial	30,000	1800
Total	240,000	12,750

Treatment Level: Secondary (< 30 mg/l BOD & TSS)

Equipment cost per gallon: \$4.86

Military specifications resulted in a \$2.00/gal premium that otherwise would not be expected for a secondary Bioclere system

Estimated O&M Labor: 2 hrs/mo/Bioclere unit

Approx Operating Cost: \$0.01/gal/mo or \$2550.00/mo*

Operating costs assume 2 hrs labor per month at \$40 per hr and an electrical cost of \$0.10 per kWhr *(for all 7 systems)

OVERVIEW

The US Naval Air Station at Guantanamo Bay in Cuba covers over 45 square miles. The base is divided into two distinct areas by the 2.5-mile wide Guantanamo Bay, which is punctuated with many small, steep-cliffed peninsulas that jut out into the Bay.

In the late '90s, the Navy began researching the best way to upgrade its wastewater infrastructure at the base. To determine the level of treatment, the Navy follows a process called the Overseas Environmental Baseline Guidance Document (OEBGD) that takes basic US law and compares it to the host nation's treatment requirements. But Cuba was unique because the US has no diplomatic relations with the host nation.

The base had existing septic tanks scattered far and wide. Because the coral substrate would not allow for proper percolation, the drain fields were not working and the effluent was going directly into the harbor. The situation had steadily grown worse with the influx of "boat people" from Cuba and Haiti in the 90s. With over 125,000 displaced people being housed at the Guantanamo Naval Base, there were 70 systems discharging into the sea which was unacceptable.

Where the treatment could be centralized quickly, the Navy built auxiliary treatment plants, which took care of half the problem. But there were still about 35 isolated and failing treatment points that had to be upgraded to meet OEBGD standards.

The estimated cost for installing, re-piping and building a new centralized wastewater treatment plant in addition to upgrading the 3 smaller plants was cost prohibitive so the Navy was open to exploring alternative treatment options.

In the fall of 1998, Carl Geiling, of Malcolm Pirnie, an engineering company with a branch in Newport News, Virginia, presented AquaPoint's Bioclere™ technology for decentralized application along with a constructed wetland option to the Naval Facilities Engineering Command.

The concept of using decentralized (distributed) treatment made a lot of sense for this application. "Instead of building pumping stations all over the base, a distributed approach could augment many of the existing septic tanks," according to John Chamberlayne, Project Manager, Environmental Division, Environmental Compliance Branch - Waste Water Engineering Section.

"So the Navy conducted a study to consolidate the 70 different treatment points and ended up with half that would be appropriate for a distributed treatment approach if it was more cost efficient in the long run."

"We knew the projected operation and maintenance cost (O&M) with centralized treatment is very low. So before we could proceed, we had to compare it to the O&M cost of distributed. Ordinarily, one would make the assumption that 16 separate treatment plants would cost more because an operator would have to inspect them on a regular basis. But that turned out not to be the case with AquaPoint's technology" said John Chamberlayne. "We chose the distributed approach after looking at both methods' life cycle costs. The fact that the Bioclere system was easy to install and was low maintenance was a big factor."

Finally, after seeing Bioclere's successful use in civilian applications and Navy housing projects in New York and coastal North Carolina, the Navy confirmed distributed treatment was the preferred way to proceed and that the AquaPoint Bioclere trickling filter technology was the most economical and met all the project requirements.

"Beyond low O&M costs, we liked that Bioclere naturally recycled the water. The units could be dropped next to an existing dropped next to an existing septic tank which gave us an immediate solution for this problem," said John Chamberlayne. "Of course, we looked at other technologies but we are confident we made the right choice with AquaPoint's Bioclere based on cost and efficiency."

The Navy Project Managers authorized C. Allen Bamforth Jr. Engineer-Surveyor Ltd., from Norfolk, Virginia, to design a distributed infrastructure treatment system plan to accommodate 240,000 gallons per day (gpd) spread over seven different sites on the Naval Station in Cuba using AquaPoint's Bioclere technology.

KEY CHALLENGES

Providing treatment to reach numerous sites with disparate flow rates and a variety of conditions over a large area was the key challenge. But two other aspects added to the complexity of this project.

Just as in real estate, where “location, location, location” makes all the difference, the Guantanamo Bay location made this project more difficult than most. The southeast corner of the island, where the Guantanamo Bay Naval Station sits, has a harsh marine environment since it has no protection from the Caribbean Sea.

The bases’ remote location on an island, while ideal for military operations, makes it a more difficult location to access from a delivery and installation standpoint. The military specifications and logistics required were significantly more involved than most mainland projects. “All materials must be barged over to Cuba at a significant cost in terms of both time and dollars,” said Ron Tancrede, Project Manager for Islands Mechanical Contractor out of Jacksonville, Florida.

The last concern was about time – literally. Initially, the timetable was very drawn out. As one would expect with this shift in treatment approach, the Navy had a lengthy and careful selection process. Over the course of several years, the AquaPoint team supported the design engineers by providing multiple versions and customizing equipment to meet the exacting requirements of the Navy and this unique project.

The timetable became extremely tight, however, once the project was formally awarded to AquaPoint. The Navy wanted the delivery of this large order on an accelerated timeline. “We thought AquaPoint’s delivery and logistical coordination was excellent. They met all our project deadlines,” added Mr. Tancrede.

THE AQUAPOINT SOLUTION

AquaPoint proposed using the Bioclere technology to treat 7 sites scattered across the base. This involved using 16 separate Bioclere units to treat the individual sites with the flows ranging from 3,000 gallons per day to 100,000 gallons per day. “We only needed 16 Bioclere units to handle the 35 septic tank sites that ended up being distributed,” said Mr. Chamberlayne.

AquaPoint’s Bioclere offered several advantages:

1. Modular Design:
 1. Bioclere uses a modular design concept. This guarantees each Bioclere system can accommodate the specific needs of an individual site with its varying flow rates and treatment levels. Therefore, Bioclere was perfectly suited for this distributed application.
2. Fixed Film Treatment Process: The fixed film treatment process is superior to the suspended growth process because it is:
 1. More stable and robust biological process.
 2. Very small footprint making it easy to ship and easy to install. “We found this to be true for the Bioclere units,” said Ron Tancrede. “And we thought it was important that the units can be buried,” added John Chamberlayne.
 3. Easy to operate and maintain because the fixed film is self-regulating so it requires minimal operator attention.
 4. Low energy demand and has low life cycle costs
3. High Quality Construction: The Aquapoint equipment is extremely durable and is well suited to withstand the marine conditions at the base.

The fiberglass construction is resistant to corrosion and UV radiation. “There is a large UV issue down in Cuba and Bioclere could address that. And because they are made of fiberglass, the units don’t suffer any deterioration from the sea environment,” said Mr. Chamberlayne. “All these features made the Bioclere equipment ideal for the harsh environment at Guantanamo Bay.”

RESULTS

“In the end, the solution was a compromise between centralized and distributed treatment systems which allowed the Navy

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to maximize its 3 existing plants. The Navy used Bioclere where it was cheaper than putting in an extensive piping system. It certainly was easier and less expensive to take the treatment to the location rather than pipe it to the existing treatment plant which did not have the capacity to handle it,” said John Chamberlayne.

“We think AquaPoint provided exceptional customer support throughout the project. We haven’t run into any issues with their Bioclere units to date,” reported Ron Tancrede.

PERFORMANCE DATA

2012	BOD5 (mg/l)	TSS (mg/l)	Nh3 (mg/l)
JAN			
FEB			
MAR			
APR			
MAY			
JUN			
JUL			
AUG			
SEP			
OCT			
NOV			
DEC			

SYSTEM DIAGRAM
