

Remediation

TAMPA BAY SEAWATER DESALINATION PLANT



AMERICAN WATER

GIBSONTON, FLORIDA

(Serving the Tampa Bay area)

Co-located with the Tampa Electric Company Big Bend Power Plant

Project: Tampa Bay Seawater Desalination Plant

Key Attributes: The 25-million-gallon-per-day facility removes the salt from seawater by reverse osmosis to create drinking water. It is the largest desalination plant in North America.

Project Type: Design, Build, Operate

Owner: Tampa Bay Water, Clearwater, Florida

Remediation Timeline: 2004-Present

Challenge

Historically, Florida's Tampa Bay region relied primarily on groundwater to meet its potable water needs. In the 1990s, population growth in the Tampa Bay area outpaced the development of new drinking water supplies. The demand for water, combined with drought and continued development, strained the environment's long-producing wellfields. New water supplies were needed to offset groundwater pumping, reduce environmental stress and meet the growing needs of the region. In 1998, a plan was developed to implement alternative sources of drinking water. One part of the plan was to build a desalination plant that could remove salt from seawater and send millions of gallons of treated drinking water every day to residents. That plan would eventually lead to what is now the largest seawater desalination plant in North America.



But desalination is no easy task. Although the original plant produced some water, the design was deficient, causing costly filters to clog too quickly. Tampa Bay Water shut down the plant in June 2005 and American Water and Acciona Agua, known through their joint venture subsidiary American Water Acciona Agua, began to develop a solution that would remediate the facility.

Solution

As its contractor, American Water Acciona Agua was appointed by the Tampa Bay Water board of directors in November 2004 as its contractor and long term operator to overhaul and manage the Tampa Bay Seawater Desalination Plant. After three years of work to correct processes and systems to get the plant back on line, American Water Acciona Agua completed the project that is designed to supply up to 25 million gallons per day (mgd) of fresh water to the local governments, communities and residents served by Tampa Bay Water.

The expected lifespan of the plant is 30 to 50 years and the average unit cost of the water produced is far less than a penny per gallon.

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The plant will help ensure that Tampa Bay Water meets its mandate to reduce the amount of groundwater it pumps from aquifers while continuing to deliver drinking water to its customers.

In looking at this facility as a case study, it is clear that with population growth and climate changes threatening the U.S. water supply, desalination is a viable solution to augment groundwater and surface water supplies for drinking water. A report from the Government Accountability Office in 2003 anticipates that by 2013, about 36 states will experience water shortages. Since 97 percent of the earth's water is seawater, tapping into this vast resource using desalination is becoming an industry trend.

Project Details

First, the seawater travels through a multi-step screening and settling process to clear out shells and other debris. Next, after chemical addition, it travels through sand filters to remove smaller particles, and finally through diatomaceous earth filters (similar to extremely fine sand) and cartridge filters to eliminate microscopic materials. The seawater is then ready for the desalination process.

To remove the salt, the facility uses a process known as reverse osmosis – using high pressure to force the pretreated water through semi-permeable membranes that trap salt and other minerals and allow the purified water to move to the final treatment stage. The membrane pores are extremely fine and only measure about 1/100,000 the diameter of a human hair. The final phase of the process puts minerals back into the treated water and pumps it to Tampa Bay Water's facilities site where it is combined with treated water from other sources. The blended drinking water is then delivered to Tampa Bay Water's six member governments, which supply the water to more than 2.5 million residents in the Tampa Bay region.



The reverse osmosis process is successfully used in nearly 200 water and wastewater treatment plants throughout Florida and produces some of the highest quality water in the world. In addition, seawater desalination using reverse osmosis has been extensively used throughout the world in areas where drinking water sources are scarce.

To capitalize on energy efficiency, the desalination plant captures and recycles its own water pressure created during the treatment process to be used as an energy source.

The plant can accommodate a future expansion to 35 million gallons per day.

Environmental Protections

At full capacity, the reverse osmosis process leaves about 19 million gallons per day of twice-as-salty seawater behind. This salty water is diluted with up to 1.4 billion gallons of water that Tampa Electric Company's adjacent Big Bend Power Plant uses as a cooling agent to achieve up to a 70 to 1 dilution ratio. The diluted water then moves through the power plant's discharge canal, blending with more seawater before being safely reintroduced to Tampa Bay. By the time the discharged water reaches Tampa Bay, its salinity is nearly the same as the bay. And, the large volume of water that naturally flows in and out of Tampa Bay near Big Bend provides further dilution, preventing any long-term build-up of salinity.

Monitoring during the plant's first year of operations showed no measurable changes in salinity, even when the plant was operating at maximum capacity.

Population Served:

Tampa Bay Water provides wholesale drinking water to Hillsborough County, Pasco County, Pinellas County, New Port Richey, St. Petersburg and Tampa. These governments supply water to more than 2.5 million people. The desalination plant provides up to 10 percent of Tampa Bay Water's total supply and is a vital component of the Tampa Bay Water system.

Quality Standards:

The facility uses industry-leading, highly advanced treatment technology that meets or surpasses strict United States Environmental Protection Agency (USEPA) Safe Drinking Water standards, State of Florida Department of Environmental Protection and local regulations, as well as the stringent requirements of Tampa Bay Water.

Operations:

American Water Acciona Agua operates the facility 24 hours a day, seven days a week with 23 personnel.

To learn more about American Water, visit www.amwater.com