

Tampa Bay Seawater Desalination Plant

PROJECT HISTORY

HOW THE PLANT WORKS

DESAL FUN FACTS



Winter 1997	Request for Qualifications of desal developers advertised
Spring 1997	Statements of Qualifications received from interested developer teams
Spring 1997-Winter 1999	Proposals submitted, reviewed, revised; culminated in Best and Final Offers
November 1998	Master Water Plan Configuration I approved, included seawater desalination
March 1999	Tampa Bay Water Board approved top ranked developer team (S&W Water) to design, build, own and operate a seawater desalination plant for the Tampa Bay region
December 2000	Covanta replaced Stone & Webster as EPC contractor
Spring 2001	Permitting completed
August 2001	Construction began
November 2002	Obtained final operating permits
March 2003	Initial plant start-up
May 2003	Ran first acceptance test
October 2003	Covanta Tampa Bay filed for bankruptcy after failing to successfully complete the plant
February 19, 2004	Plant placed in standby mode to evaluate and fix design and construction deficiencies; plant ran for one week per month
March 2004	Tampa Bay Water sought proposals from qualified teams to revamp the plant and operate it long-term

November 2004	Tampa Bay Water Board of Directors approved agreements with American Water-Pridesa to resolve design and construction deficiencies
January 31, 2005	Large-scale pilot testing began
June 2005	NPDES minor permit modification application submitted
September 2005	Completed design of remedied plant
December 2005	Building Permit and Public Water System Permit issued; pilot testing concluded
February 2006	NPDES permit modification issued
February 10, 2006	First concrete poured for plant remediation
Spring 2007	Completed plant remediation and began plant run-in period
November 2007	Began acceptance testing
December 2007	Passed extensive acceptance test and transitioned to full operating status
	Achieved first funding milestone and received \$21,250,000 from SWFWMD
December 2008	Achieved second funding milestone of 12 months averaging 12.5 mgd and received \$42,500,000 from SWFWMD
February 2010	Achieved third and fourth funding milestones – 12 months averaging 20 mgd and 4 consecutive months at 25 mgd and received \$85,000,000 plus interest from SWFWMD.

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Tampa Bay Seawater Desalination uses a process called reverse osmosis (RO) to produce drinking water from seawater. RO has been successfully used in nearly 200 water and wastewater treatment plants throughout Florida and produces some of the highest quality drinking water in the world.

Tampa Electric's Big Bend Power Station already withdraws and discharges up to 1.4 billion gallons a day of seawater from Tampa Bay, using it as cooling water for the power plant. The Tampa Bay Seawater Desalination plant "catches" 44 million gallons a day (mgd) of that warm seawater, separates it into drinking water and concentrated seawater and dilutes the twice-as-salty seawater before returning it to the bay.

Before the RO process, seawater entering the desalination plant flows through screens that remove debris. The water then goes through a traditional treatment process called coagulation and flocculation. In this process, chemicals are added to the seawater to make algae, organic materials and particles clump together so they can be removed more easily in the sand filtration stage. After sand filtration, the salty water goes through diatomaceous earth filters to remove silt and other fine particles. Cartridge filters just before the RO membranes serve as a backstop, removing any particles that may be remaining after the diatomaceous earth filters. Next is the RO process. High pressure forces the pretreated water through semipermeable membranes to separate the freshwater, leaving twice-as-salty seawater and other minerals behind.

The Tampa Bay Seawater Desalination Plant produces up to 25 mgd of desalinated drinking water that is delivered to Tampa Bay Water's regional facilities site. There, the desalinated seawater is blended with treated drinking water from other supply sources before being delivered to Tampa Bay Water's members.

At full capacity, the RO process leaves about 19 mgd of twice-as-salty seawater behind which is returned to Big Bend's cooling water stream and blended with up to 1.4 billion gallons of cooling water, achieving a blending ratio of up to 70-to-1. At this point before entering and mixing with any bay water, the salinity is already only 1.0 to 1.5 percent higher, on average, than water from Tampa Bay. This slight increase falls within Tampa Bay's normal, seasonal fluctuations in salinity.

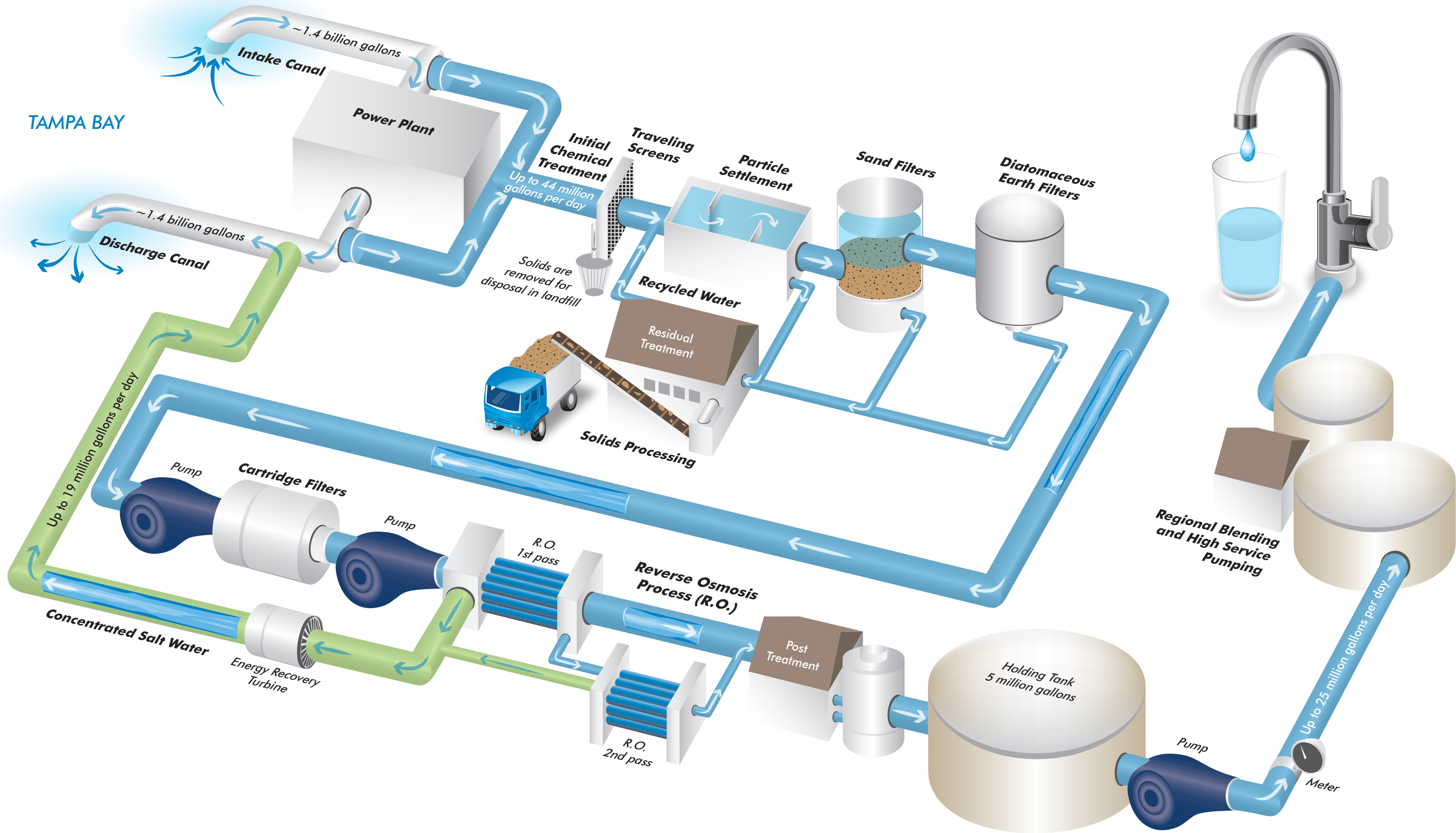
The cooling water mixture moves through a discharge canal, blending with more seawater, diluting the discharge even further. By the time the discharged water reaches Tampa Bay, its salinity is nearly the same as the bay's. And, the large

volume of water that naturally flows in and out of Tampa Bay near Big Bend provides more dilution, preventing any long-term build-up of salinity in the bay.

Tampa Bay Water's comprehensive hydrobiological monitoring program collects thousands of samples including continuous salinity measurements every 15 minutes near the desalination facility. This and other water quality monitoring since 2003 shows no measurable salinity changes in Tampa Bay related to plant production. Salinity outside the discharge canal remained the same whether the desalination plant was operating at full capacity, a fraction of that, or completely off-line.

There are many advantages to locating Tampa Bay Seawater Desalination beside the Big Bend power plant in addition to large volumes of cooling water. Tampa Bay's relatively low salinity and the warm temperature of the power plant's cooling water help optimize the RO process, keeping costs down. Tampa Bay's frequent flushing will also help prevent the build-up of salinity. Also, using seawater that has already passed through the intake system at Tampa Electric's Big Bend power plant eliminates the possibility that fish and other marine life will be hurt in the desalination plant's intake system.

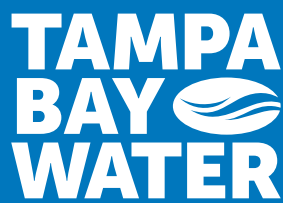
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**Tampa Bay Seawater Desalination Plant
Process Diagram**

- Tampa Bay Seawater Desalination's 25-million-gallon per day (mgd) rated production capacity makes it the largest seawater desalination plant in North America.
- The diatomaceous earth (DE) used in the precoat microfiltration process has other countless uses in today's products and processes, from toothpaste to cigars, plastics to paprika, filter media in swimming pools to home fish tanks.
- There are 18 diatomaceous earth vessels in the plant; each one is approximately 14 feet tall and 6 feet in diameter.
- The total surface area of the 9,408 reverse osmosis (RO) membranes in the plant's 1st pass alone is 82 acres or 62 football fields. The facility sits on land about one-tenth that size.
- If the plant's RO membranes were unrolled and connected, they would stretch the 223 miles from Tampa to Tallahassee.
- The size of each RO membrane pore is about 0.001 microns or 1/100,000th the diameter of a human hair.
- 6,000 cubic yards (12,150 tons) of concrete were poured for the remediation—that's enough concrete to build a 4-foot wide sidewalk more than 23 miles long.
- 610 tons of re-bar were placed and tied for the remediation; if placed end to end, it would extend more than 131 miles (100% of the rebar placed came from recycled materials).
- The electric motors at the plant exceed 27,000 horsepower in total.
- The 1.4 billion gallons of warm water that typically flow through the Big Bend power plant's cooling system daily could provide every New York City resident with three hot showers.
- The plant's high-pressure RO feed pumps push source water through RO membranes at up to 1,000 pounds per square inch (psi). That's the same pressure that high-quality pressure washers use to clean concrete driveways.
- All the plant's high-pressure RO feed pumps have energy recovery units which help cut the plant's energy costs and boost pump horse power by as much as 40 percent.
- The transmission main connecting the desalination facility with Tampa Bay Water's facility site crosses the Alafia River. This crossing spans more than one half mile and is the longest horizontal directional drill involving a 36-inch fiberglass pipe in the country.

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Supplying Water To The Region

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