The Florida Senate

COMMITTEE MEETING EXPANDED AGENDA

COMMUNICATIONS, ENERGY, AND PUBLIC UTILITIES
Senator Grimsley, Chair
Senator Hukill, Vice Chair

MEETING DATE: Friday, April 29, 2016
TIME: 4:00—8:00 p.m.
PLACE: *F-222,* Miami Dade College, Homestead Campus

MEMBERS: Senator Grimsley, Chair; Senator Hukill, Vice Chair; Senators Abruzzo, Bradley, Dean, Evers, Garcia, Gibson, Hutson, and Sachs

TAB	BILL NO. and INTRODUCER	BILL DESCRIPTION and SENATE COMMITTEE ACTIONS	COMMITTEE ACTION
	Meeting jointly with the Environmental Preservation and Conservation Commmittee: Miami Dade College, Homestead Campus Room F-222 500 College Terrace Homestead, FL 33030 http://www.mdc.edu/homestead/campus-information/idrections.aspx		
	Workshop - Discussion and testimony only on issues related to the cooling canal system at the Turkey Point Power Plant (no vote to be taken):		
	Senator Flores: Opening remarks and discussion of the concerns		Presented
	Presentation by Florida Power and Light		Presented
	Presentation by the Florida Department of Environmental Protection		Presented
	Presentation by the Department of Regulatory and Economic Resources, Miami-Dade County (DERM)		Presented
	Presentation by the Federal Nuclear Regulatory Commission		Presented
	Public Comment		
	Other Related Meeting Documents		

Turkey Point Cooling Canal System Update

April 29, 2016

CHANGING THE CURRENT. FPL.

FPL's Turkey Point Power Plant complex has operated safely since the 1960s

- Located on 9,400-acre site in southern Miami-Dade
- Staffed 24 hours a day
- 800 full-time employees
- Four separate generating units currently in service

CHANGING THE CURRENT. FPL.

About the Turkey Point area

- **Like much of Miami-Dade – and much of Florida – Turkey Point is located in close proximity to a host of environmental treasures**
  - Nearby protected areas include Biscayne National Park, Biscayne Bay Aquatic Preserve, Homestead Bayfront Park and Everglades National Park
  - Site is home to diverse species such as wood storks, American crocodiles, little blue herons, snowy egrets, Florida manatees, snail kites, bald eagles and more

FPL believes in operating in harmony with the environment

At Turkey Point, FPL has worked for years to help the American crocodile rebound from the brink of extinction. In 2007, the U.S. Fish and Wildlife Service reclassified the species from “endangered” to “threatened” and recognized FPL for its integral role

How Turkey Point generates energy

- Turkey Point generates enough energy to supply the annual needs of more than 900,000 homes

Generating Units	Unit 1*	Units 3 & 4	Unit 5
In-Service	1967 *(retiring 2016)*	1972-73	2007
Fuel	Oil**	Nuclear	Natural Gas
Capacity	396 megawatts	1,632 megawatts	1,187 megawatts
Cooling	Canals	Canals	Towers

***** Unit 2, an oil-fired generator similar to Unit 1, entered service in 1968. It was retired (converted to synchronous condenser mode) in 2011 as part of FPL's ongoing power plant modernization strategy. Unit 1 is being retired this year.

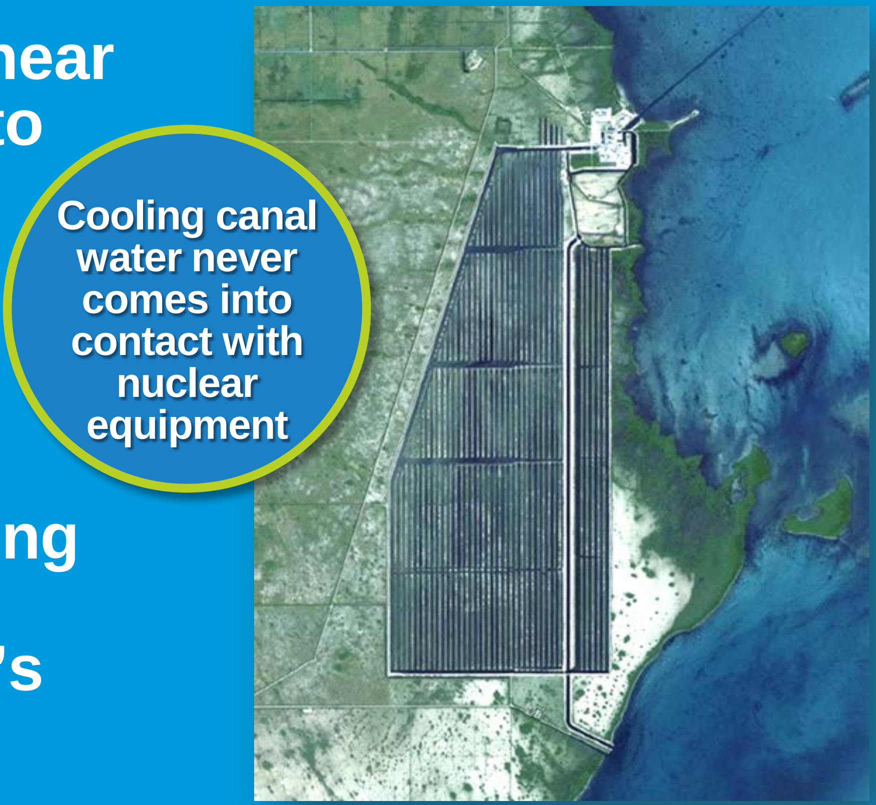
****** Since 2001, by phasing out older, less-efficient generating units and investing in advanced, fuel-efficient technology, FPL has reduced its annual oil usage by 99 percent and saved customers more than $8 billion on fuel costs.

What makes Turkey Point unique

- Many coastal power plants use ocean water for cooling, but Turkey Point uses a unique, manmade system of canals
- System is a loop that is closed off from other surface waters (i.e., Biscayne Bay) but is designed and permitted to be connected with groundwater

Turkey Point's cooling canal system

- **Water travels approximately 168 linear miles of canals in a 48-hour cycle to keep the plant cool**
  - Similar to the way a car's radiator works
  - System salinity balance depends on water inputs from rain and groundwater
- **An "interceptor ditch" was built along the western perimeter to restrict westward movement of the system's water in the adjacent wetlands**



Cooling canal system history

- **In the early 1970s, the cooling canals were created to avoid the thermal effect on Biscayne Bay of a traditional "once-through" cooling design**

Initial Design and Installation

- Final Judgment in federal government case in 1971 required FPL to construct a cooling reservoir closed to other surface-water bodies (Civil Action No. 70-328-CA)
- Note that closing system left remnant deep excavations

Regulatory Oversight

- Permitted as Industrial Waste Water Facility under National Pollutant Discharge Elimination System (NPDES), issued by DEP (FL 0001562)
- Florida Power Plant Siting Act provides Conditions of Certification
- SFWMD provides oversight under 5th Supplemental Agreement

Continuous oversight and regulation has governed the operation of the system since 1971

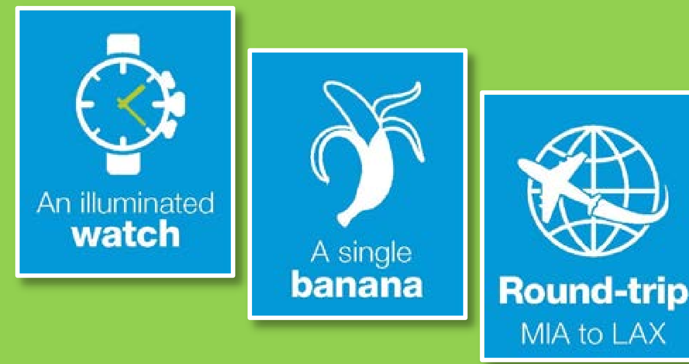
Monitoring water quality

- **FPL has monitored the Turkey Point site since 1970s**
- **Expanded comprehensive program beginning in 2010 to evaluate impacts on saltwater intrusion**
- **4.5 million data points per year, covering:**
  - Groundwater and surface water quality from canals, model lands and Bay
  - Marsh and Bay ecological surveys incl. plant diversity, growth and density
  - Porewater quality in sediments in wetlands and beneath the bay bottom
- **Bi-annual reporting since 2010, publically available**
- **Data immediately available to agencies through online electronic database**

FPL takes water-quality monitoring seriously and uses the data to make scientifically driven decisions

Expanded monitoring uses tritium tracer

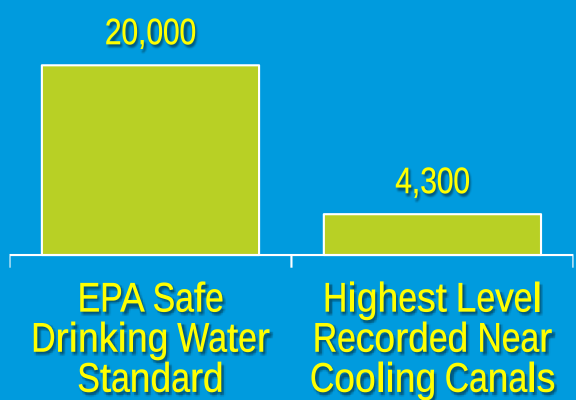
- Tritium is a radioactive isotope used as a tracer to help monitor cooling canal water
- Tritium exists in nature and is found in products like exit signs and watches
- Contrary to rumor, the tritium levels recorded are not dangerous – they are far below the EPA's standard for acceptable levels in drinking water



Each of these everyday things presents greater radiation exposure than the highest levels of tritium recorded at Turkey Point

Tritium levels are safe

- **In five years of monitoring, the highest level of tritium recorded in waters outside the canals is almost 80% lower than the U.S. EPA's standard for safe drinking water**



SUNDAY MARCH 20 2016 | $2 | VOLUME 113, No. 188 STAY CONNECTED MIAMIHERALD.COM | FACEBOOK.COM/MIAMIHERALD TWITTER.COM/MIAMIHERALD | WINNER OF 20 PULITZER PRIZES | Breezy; rain likely 86°/60°

Miami Herald

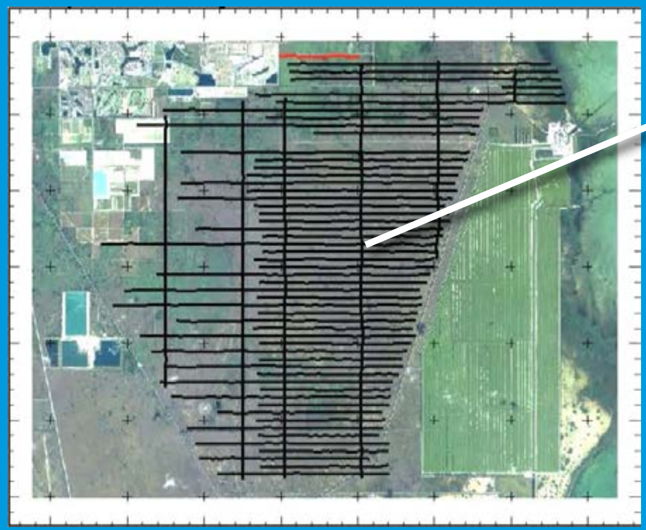
There is nothing to panic about. What's happening in Biscayne Bay is nothing like the disaster in Fukushima, Japan, where highly radioactive water from damaged reactors and storage pools for fuel rods spilled into ocean waters. **At Turkey Point, the tritium is simply a 'tracer' element that marks water flowing out from under the nuclear power plant's vast cooling canals.**

Monitoring hypersaline groundwater

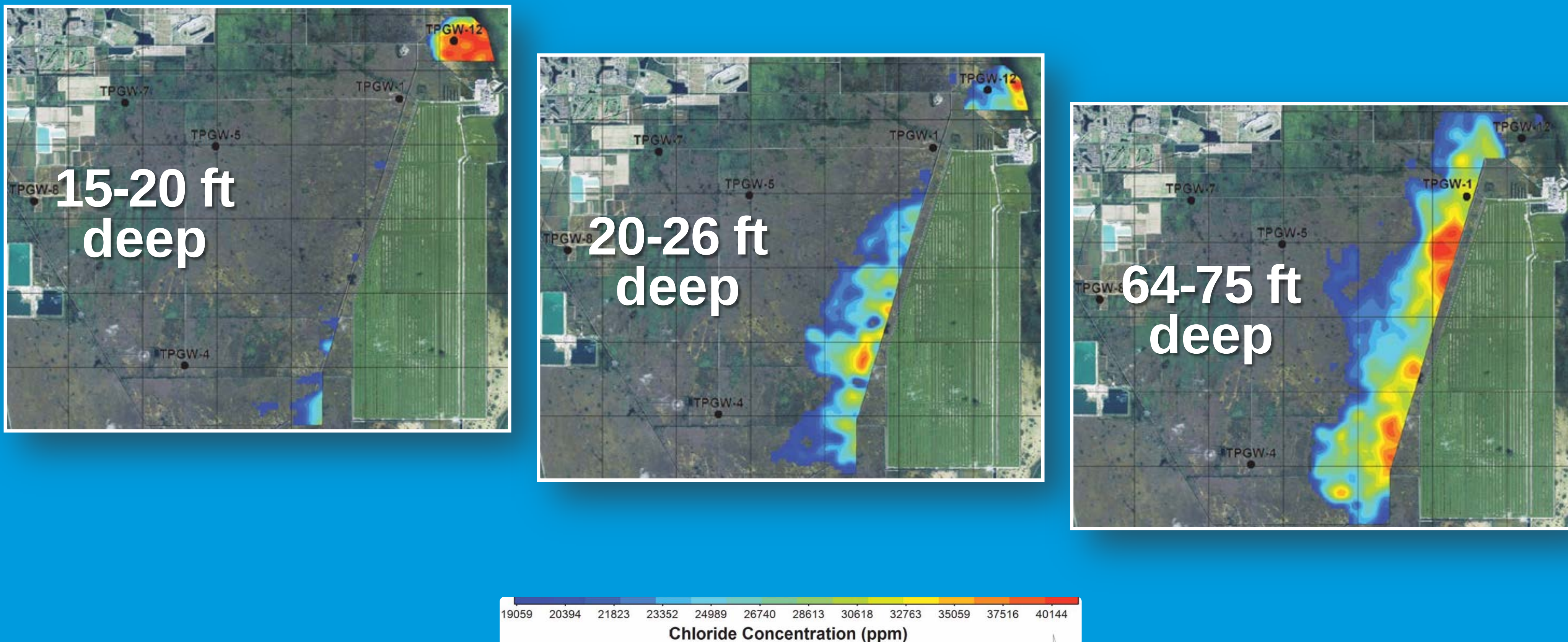
- **In 2013, four years of monitoring results confirmed and defined hypersaline plume underneath the cooling canals and beyond the property boundary**
  - DEP and SFWMD required FPL to identify corrective action (December 2014 Administrative Order)
  - In 2015, Miami-Dade County initiated separate enforcement (October 2015 Consent Agreement)
  - In April 2016, DEP issued the Final Administrative Order and a Notice of Violation

Monitoring continues to advance

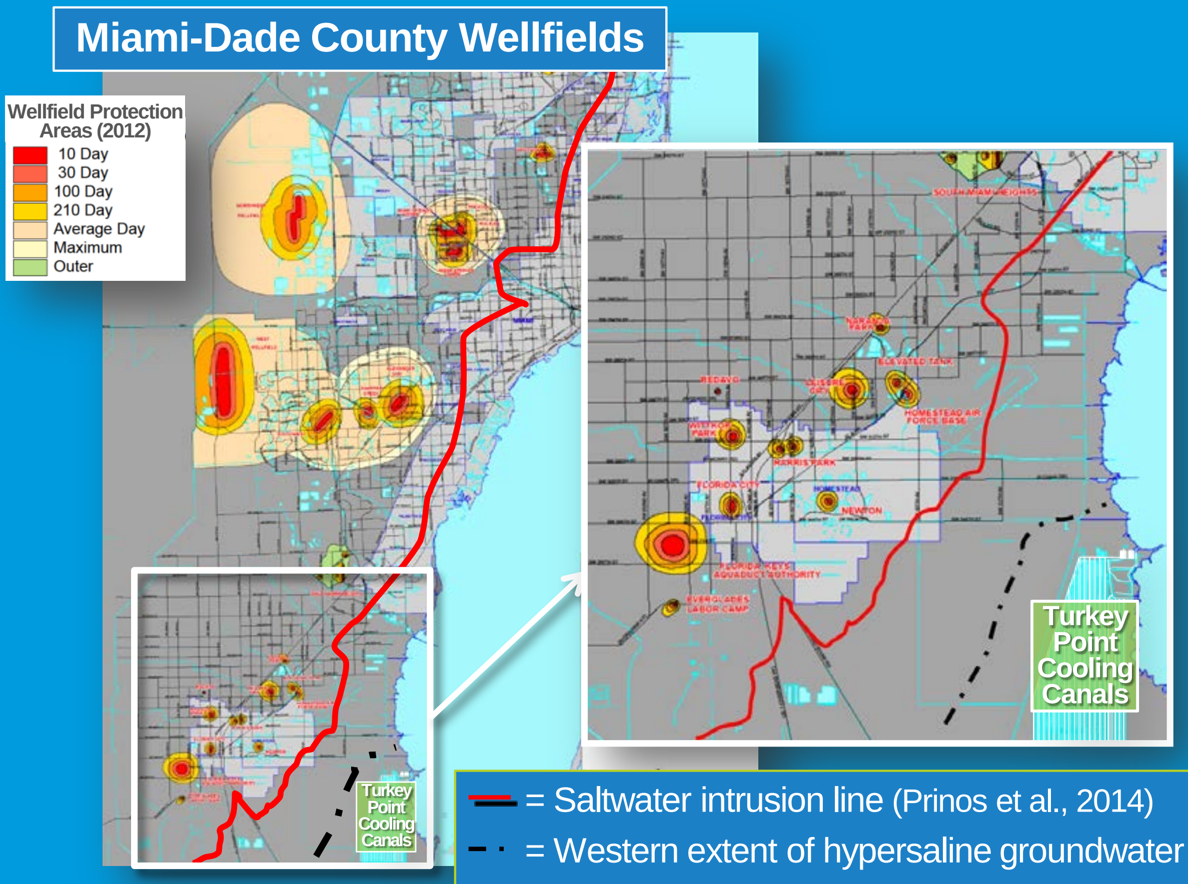
- Enhanced technology enables us to monitor salinity at varying depths
- Helicopters fly a grid pattern to conduct advanced airborne electromagnetic 3-D mapping



3-D mapping of groundwater hypersalinity



Where South Florida Gets Its Water

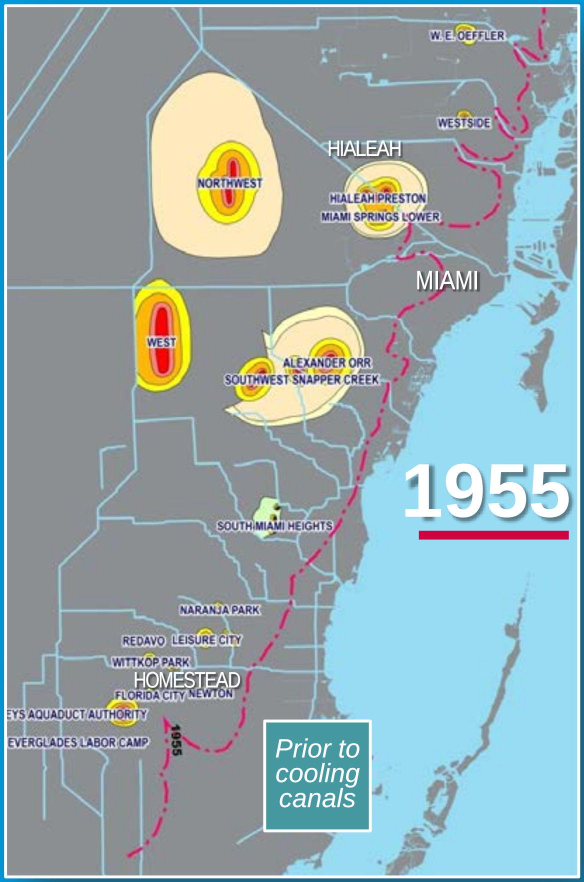


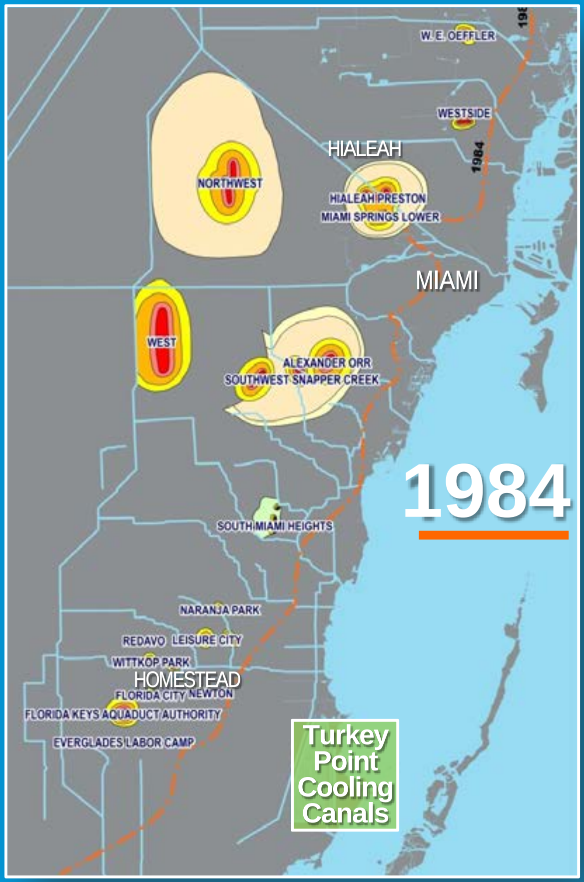
- Miami-Dade's wellfields are primarily north of the Homestead area
- Saltwater intrusion is a challenge for many wellfields in Florida, and it existed in this region prior to Turkey Point's existence

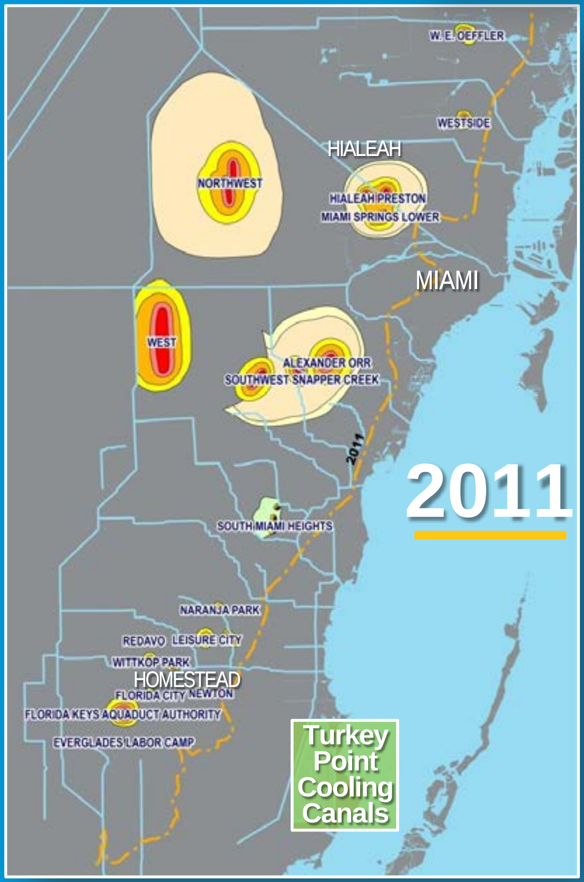
Saltwater intrusion in Miami-Dade

Historical saltwater intrusion in relation to County wellfields

Wellfield Protection Areas (2012)
- 10 Day
- 30 Day
- 100 Day
- 210 Day
- Average Day
- Maximum
- Outer

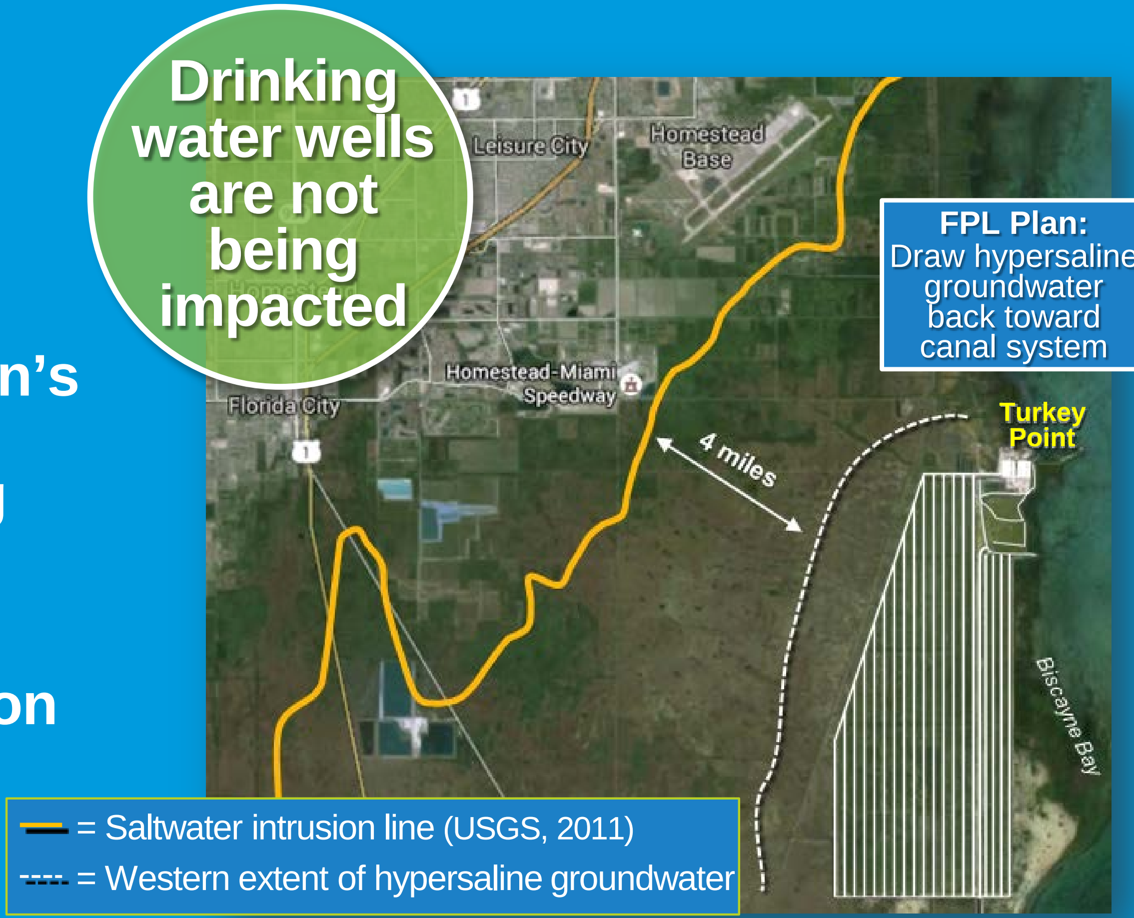






Keeping hypersalinity far from wellfields

- Monitoring shows westward migration of cooling canal system's hypersaline water
- If left unabated, this plume would contribute to the region's greater saltwater intrusion issue, however, FPL is taking action
- We are fully committed to reversing the plume's direction to prevent it from increasing saltwater intrusion

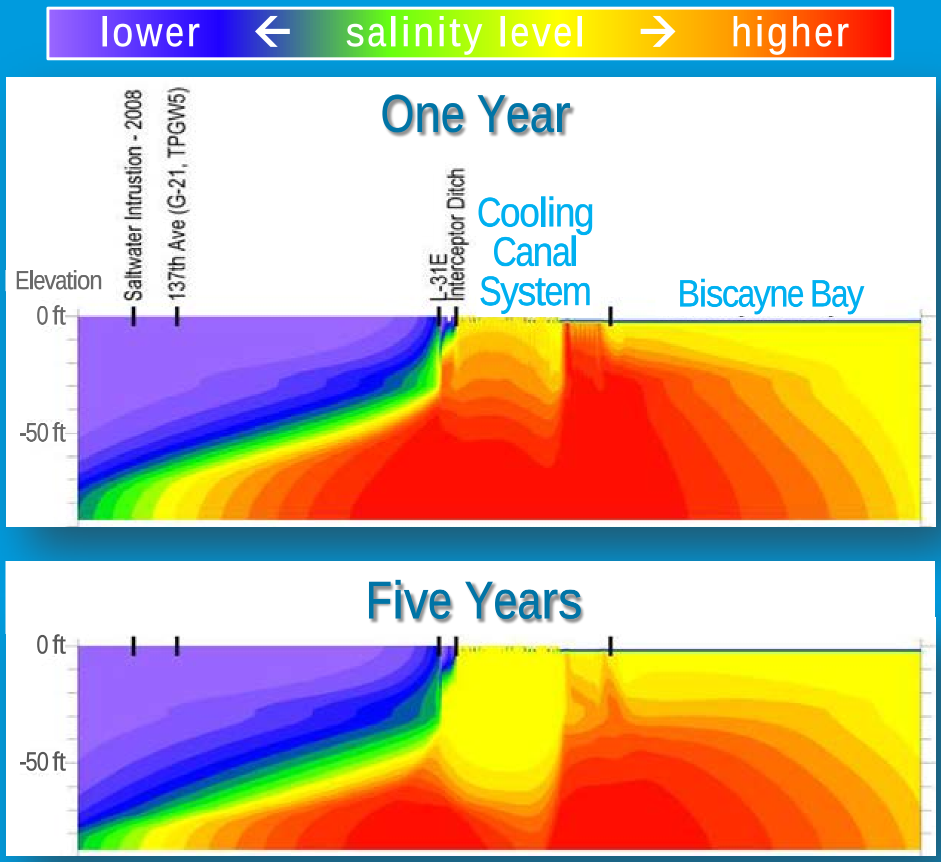


Solutions

- Long-term freshening inputs to the cooling canals from the Floridan Aquifer will have a positive impact on the groundwater

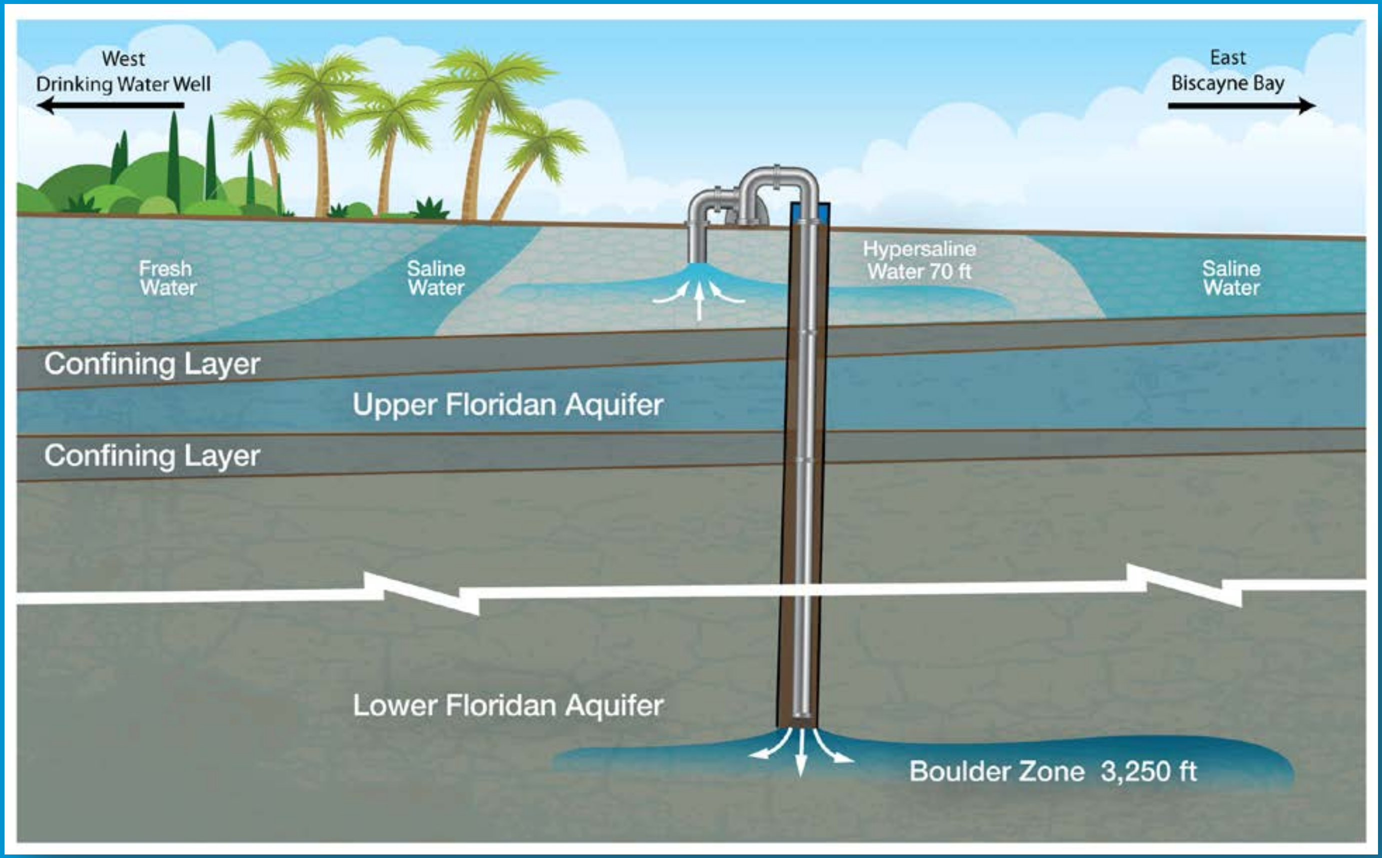
2-D modeling shows that freshening the canals will reduce the hypersaline plume over time

Groundwater Salinity Improvement Model



Solutions

Hypersalinity Recovery Well System

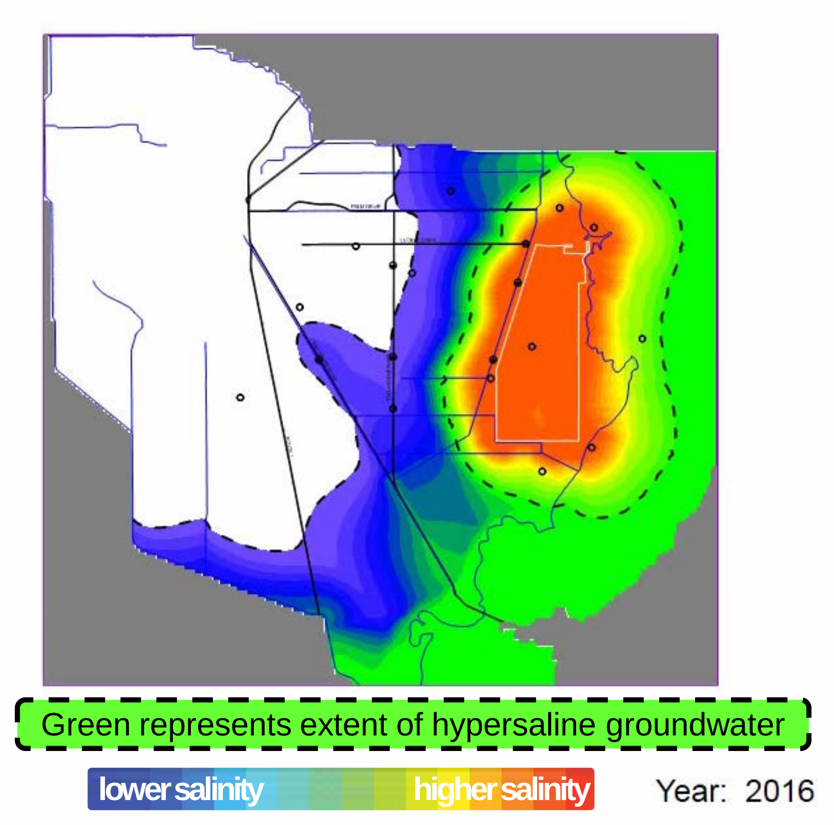


Solutions

- Initial 3-D modeling demonstrates that the recovery well system is the right approach

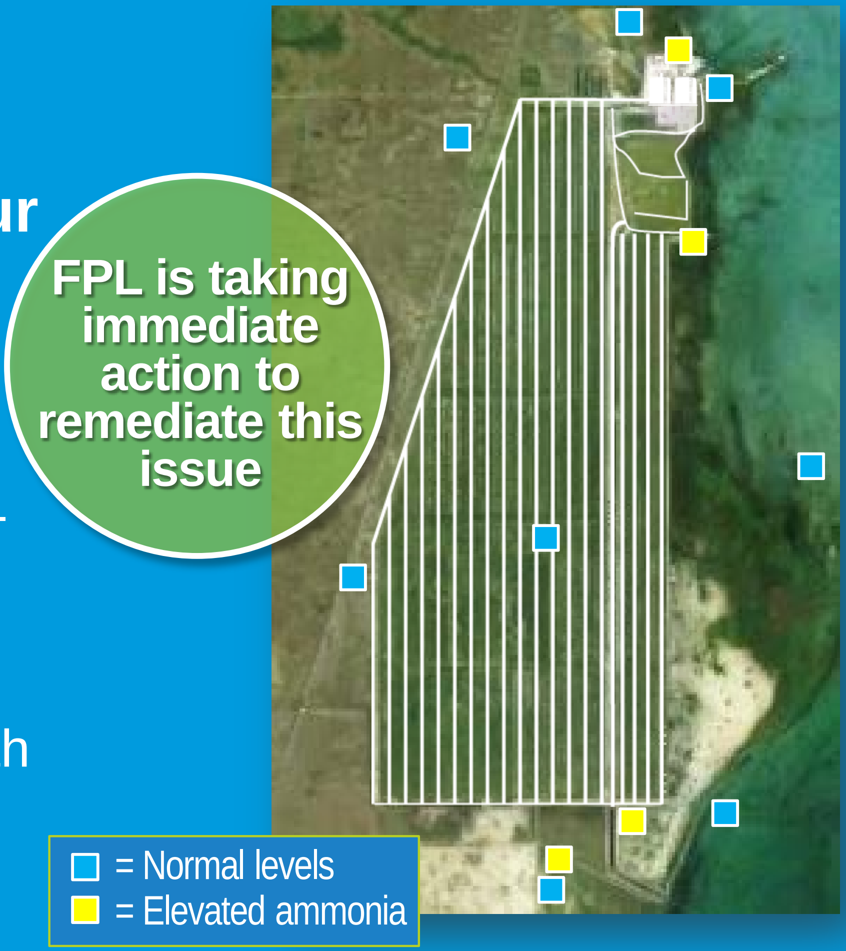
Model shows we will be able to pull back the saltwater intrusion line over the next decade

Groundwater Salinity Improvement Model



Fixing isolated artificial channels

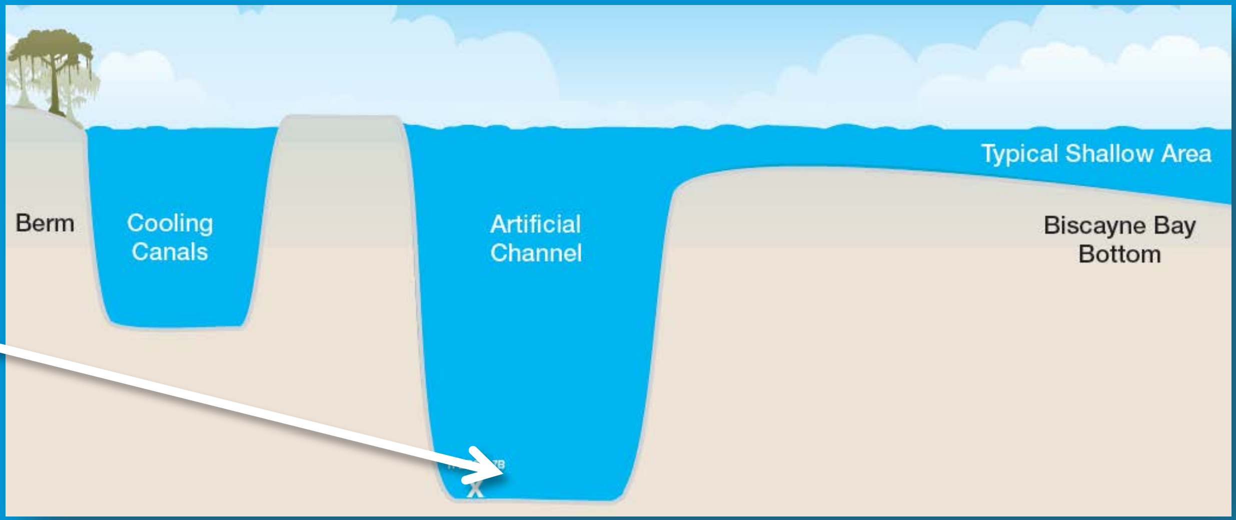
- **Recently, elevated levels of nutrients and the canal system's tritium tracer were identified in deep pockets of four isolated artificial channels between the canals and Biscayne Bay**
- **Central issue is ammonia**
  - Data indicate multiple sources of ammonia – e.g. vegetation decay (power plant does not produce or use significant amounts of ammonia)
  - Tritium tracer simply indicates interaction with cooling canals via groundwater in these specific locations



Solutions

- We are implementing a combination of actions, including removing the stagnant deep water and returning some of the areas to their natural bay state
- Ammonia levels have already begun to come down, with one of the four areas now back to normal concentrations

Deep areas affected by stagnation due to minimal water movement



Three essential facts to keep in mind

1. Drinking water is safe – there is no impact to safety or public health

2. There will not be any lasting adverse impact on the ecology of Biscayne Bay

3. FPL is absolutely committed to the Miami-Dade community, just as we have been for the past 90 years

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Thank You
Photo credit: NASA.gov

Turkey Point's
Cooling Canal System
Overview

Turkey Point's Cooling Canal System

Introduction

Turkey Point consists of five electrical generating units. Units 1 and 2 are oil/natural gas-fired generation units.[1] Units 3 and 4 are nuclear generating units and Unit 5 is a natural gas combined cycle generating unit. In 1973 the Cooling Canal System (CCS) was constructed to eliminate direct warm water discharges to the Biscayne Bay and Card Sound. The CCS is a closed-loop system consisting of a 5,900-acre network of unlined canals which serves as the tertiary cooling system for units 1, 3, and 4 of the power plant. The water passes through the condenser systems and is then discharged to the northern end of the canals and travels through the system and is recycled back to the plant for intake. The CCS water is considered hypersaline, which means that it has higher levels of salinity than seawater. The canals are unlined, therefore, there is a sub-surface interchange between the CCS and the surrounding waters.

Concerns

Temperature and Salinity Variations

Spiking in the summer of 2014, the temperature of the CCS water has approached and exceeded 100 degrees. The higher the temperature of the CCS water, the faster the evaporation rate, and, therefore, the higher the salinity levels of the water. The higher salinity makes the CCS water more dense, which leads the water to sink beneath the canals and to the bottom of the Biscayne Aquifer. The confining layer between the Biscayne Aquifer and the Upper Floridan Aquifer prevents the further downward movement of the hypersaline CCS water and causes a plume of high salinity water to spread east and west.

Saltwater Intrusion

The point where saltwater and freshwater meet is called the saline water interface. When the canals were built an interceptor ditch was constructed on the west side of the cooling canal system to prevent the hypersaline CCS water from migrating westward. In 2013 both the Department of Environmental Protection and the South Florida Water Management District found that there is evidence that the saline water interface has moved 4-5 miles westward of the L-31E canal. The westward movement of the hypersaline CCS water has the potential to impact the drinking water supply for the Miami-Dade area, which relies on the Biscayne Aquifer.

Tritium Levels

Tritium is a mildly radioactive type of hydrogen that occurs both naturally and as waste from nuclear power plants. The CCS tritium level averages about 4,000 pCi/L.[2] Tritium is used as an additional tracer to monitor the rate and direction of the movement of the CCS waters. There are multiple samples collected from various locations beyond the boundaries of the facility to monitor the tritium levels.[3] Miami-Dade County has found that based on the tritium data, there are low doses of tritium outside of the property boundaries of the CCS. At such low doses, the levels of tritium reported do not pose a health concern, rather they serve as evidence that the hypersaline water that exists in the groundwater outside of the facility's property boundaries can be attributed to the CCS.

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[1] Unit 2 ceased operating in 2010.

[2] The maximum contaminant level for drinking water is 20,000 pCi/L.

[3] Tritium samples exceeding 20 pCi/L are used to identify saline groundwater as having originated from the CCS.

South Florida Water Management District

Timeline/Background

Background Information Provided by the South Florida Water Management District

- In January 2008, FPL applied to DEP to increase electrical generation from Unit Nos. 3 and 4 at its Turkey Point Power Plant. FPL submitted this application to "uprate" and certify its units pursuant to the Florida Electrical Power Plant Siting Act. The District participated in the uprate proceeding as a statutorily-mandated party, and ultimately recommended approval of the application conditioned upon FPL's future ground and surface water monitoring of the area surrounding the power plant's cooling canal system for potential impacts to the Biscayne Aquifer and Biscayne Bay. Review of FPL's proposal also included discussion of salinity trends in groundwater wells west of the power plant's cooling canal system.

- In October 2008, DEP issued a Final Order authorizing the uncontested uprate and certification of Unit Nos. 3 and 4. Conditions of that approval included that FPL delineate the vertical and horizontal extent of a hyper-saline plume originating from the cooling canal system, and that FPL monitor changes in the quantity and quality of surface and ground water over time due to the uprate project. Subsequently, technical staff from the District, DEP, and Miami-Dade County cooperated in development of FPL's monitoring plan and technical evaluation of collected data.

- In April 2013, the District notified FPL that its technical evaluation of collected data indicated that saline water from the cooling canal system had moved westward of the L-31E canal system, and into water resources outside of the power plant's property boundary. The District understands that, around this same time, DEP began discussing regulatory action to require FPL to abate movement of saline water outside the cooling canal system. District technical staff worked with DEP to evaluate monitoring data, review three-dimensional groundwater models, and model potential abatement measures.

- In August 2014, FPL requested that the District issue an Emergency Order for temporary authorization to divert and use surface water from the District's L-31E canal system to help moderate unusually high temperatures and salinity occurring in the cooling canal system. Those conditions within the cooling canal system had the potential to affect the continued operation of the power plant. Pursuant to Chapter 373, *Florida Statutes*, the District has jurisdiction over the use of and connection to the District's rights of way and facilities (e.g., L-31E canal system), as well as the consumptive use of water within its geographic boundaries. The District also reserves from allocation to consumptive uses a quantity of water to protect fish and wildlife in Biscayne Bay. The District issued the Emergency Order authorizing FPL to temporarily withdraw surface water from the L-31E canal to distribute to the cooling canal system only after Biscayne Bay's water reservation was met.

- In September 2014, FPL submitted to DEP an application to modify its site certification for Unit Nos. 3 and 4 under the Florida Electrical Power Plant Siting Act. FPL's proposal included the installation of six wells to withdraw 14 million gallons per day of water from the Upper Floridan aquifer system to manage salinity and temperature within the cooling canal system. The District participated in that proceeding as a statutorily-mandated party, and recommended approval of the modification. During litigation over the proposed modification, District technical staff testified that this groundwater withdrawal would not interfere with existing legal uses or otherwise cause harmful saltwater intrusion, and would likely slow the inland movement of the saltwater interface. The Governor and Cabinet sitting as the Siting Board approved FPL's proposal in March 2016.

- In December 2014, DEP issued a regulatory order ("Administrative Order") to compel FPL to produce for review and approval a detailed Salinity Management Plan to reduce the hyper-salinity of the cooling canal system to abate westward movement of saline water associated with the system. Litigation over DEP's order ensued, and DEP has not yet taken final agency action. The District was not a party to that litigation, but District technical staff testified that reducing the salinity in the cooling canal system would likely slow the inland movement of the saltwater interface.

- In May 2015, upon FPL's demonstration of emergency conditions, the District issued a second Emergency Order allowing the temporary diversion and use of non-reserved surface water from the L-31E canal system. By the end of November 2015, salinity in the cooling canal system had dropped significantly. The District expects that introduction of Upper Floridan aquifer water pursuant to FPL's approved site certification modification will eliminate the need for future emergency surface water withdrawals from the L-31E canal system.

- In October 2015, FPL and Miami-Dade County entered into a Consent Agreement requiring FPL to take action to address the County's alleged violations of County water quality standards and criteria in groundwater outside the cooling canal system. The District has provided technical support to Miami-Dade County in the evaluation of FPL's saltwater extraction plan and groundwater model development.

Historical Information

Historical actions that pre-date the establishment of modern environmental regulatory programs and Florida's centralized power plant licensing program:

- In 1971, FPL signed a Consent Decree with the U.S. Department of Justice that required the construction of a "closed-loop" cooling canal system, and the Florida Department of Pollution Control (later to become the Florida Department of Environmental Protection) issued a construction permit for the project. FPL had been discharging heated water directly into Biscayne Bay. FPL completed construction of the cooling canal system in 1973.

- Although it did not have regulatory authority over the cooling canal system, the Central and Southern Florida Flood Control District (later to become the South Florida Water Management District) sought assurances that the construction and operation of the facility would not impede the function of the District. In 1972, the Flood Control District and FPL entered into an agreement requiring FPL to implement and operate a seepage control system to restrict the movement of saline water from the cooling canal system westward of the L-31E canal to those amounts that would occur without the existence of the cooling canals. The seepage control system is commonly known as the "interceptor ditch," and is located along the western edge of the cooling canal system. Since then, the agreement has been updated several times; the most recent version is the "Fifth Supplemental Agreement" entered into in October 2009. The Fifth Supplemental Agreement brings forward much of the language and commitments from the prior versions, including operation of the interceptor ditch.

District Contacts

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561-682-6952	561-682-6849

Miami-Dade County
Preliminary Report

Memorandum

MIAMI-DADE COUNTY

Date: February 17, 2016

Agenda Item No. 2(B)1
March 8, 2016

To: Honorable Chairman Jean Monestime
and Members, Board of County Commissioners

From: Carlos A. Gimenez
Mayor

Subject: Cooling Canal Study at the Florida Power and Light Turkey Point Power Plant – Directive 151025

Pursuant to Resolution No. R-517-15, which was adopted by the Board of County Commissioners (Board) on June 2, 2015, the County Mayor or the County Mayor's designee was to have a study and report on the cooling canal system at Turkey Point Power Plan conducted by a third party to examine available data, including the long-term monitoring data from Florida Power and Light, and analyze what has happened with the cooling canal system. Furthermore, the study is to address issues including, but not limited to, salinity levels, temperature levels, and the migration of the plume of cooling canal water into the groundwater beyond the cooling canal system.

For the Board's reference, attached is a preliminary report on the study completed by Dr. David Chin of the University of Miami.

Resolution No. R-517-15 also directed that the preliminary report be made available to the public through the County's website. Interested parties and members of the public will have 30 days to submit written comments and questions about the study, which will be relayed to Dr. David Chin to be addressed in the final study report that shall be completed within 60 days after the closing of the public comment period. For your reference, the link for public comment is http://www.miamidade.gov/environment/cooling-canal-study-and-feedback.asp

Pursuant to Ordinance No. 14-65, this memorandum will be placed on the next available Board meeting agenda. The final study report will be also be placed on a Board meeting agenda upon its completion.

Should you have any questions or concerns, please contact Lee Hefty, Assistant Director, Department of Regulatory and Economic Resources, at 305-372-6754 or heftyl@miamidade.gov.

Attachment

c: Honorable Harvey Ruvin, Clerk of the Board
Abigail Price-Williams, County Attorney
Office of the Mayor Senior Staff
Lourdes Gomez, Deputy Director, Department of Regulatory and Economic Resources
Lee Hefty, Assistant Director, Department of Regulatory and Economic Resources
Charles Anderson, Commission Auditor
Eugene Love, Agenda Coordinator

The Cooling-Canal System at the FPL Turkey Point Power Station

By David A. Chin, Ph.D., P.E., D.WRE, BCEE
Professor of Civil and Environmental Engineering
University of Miami

Executive Summary

This report was prepared under an agreement between Miami-Dade County and the University of Miami. The following issues related to the operation of the cooling-canal system (CCS) at the Turkey Point Power Station were investigated: (1) temperature variations in the CCS and associated impacts on the surrounding groundwater, (2) salinity variations in the CCS and associated impacts on the surrounding groundwater, and (3) the effects of pumping up to 100 million gallons per day from the L-31E Canal into the CCS. The principal findings of this investigation are summarized below, with analytical details supporting the findings contained in the body of the report. Data for this study was provided by the Miami-Dade County Department of Regulatory and Economic Resources. CCS temperature and salinity data for the four-year interval of 9/1/10 – 12/7/14 were made available for this investigation.

Temperature in the CCS. A heat-balance model was developed to simulate the temperature dynamics in the CCS. The results derived from the heat-balance model showed that there were two distinct periods during which the heat-rejection rate from the power plant remained approximately constant. The first period corresponded to pre-uprate conditions, and the second period corresponded to post-uprate conditions. The heat-rejection rate during the second period was found to be significantly greater than the heat-rejection rate during the first period. As a result of the increased heat addition to the CCS, the average temperature of water in the CCS has increased, and in the vicinity of the power-plant intake the average temperature has increased by approximately 2.6°C (4.7°F). This measured increase in average temperature within the intake zone is slightly greater than the increase in the maximum allowable operating temperature at the intake location of 2.2°C (4.0°F) that was approved by the Nuclear Regulatory Commission in 2014. Therefore, the increased maximum operating temperature has not reduced the probability of the intake temperatures exceeding the threshold value, which currently stands at 104°F. Since supplementary cooling of the CCS was needed in 2014, this serves as a cautionary note regarding further increases in power generation beyond 2014 levels without providing a reliable supplementary cooling system. Measured temperature data during the period of record indicate that the thermal efficiency of the CCS has decreased between the pre-uprate and post-uprate periods. Further investigation is recommended to confirm the decrease in thermal efficiency of the CCS and identify the causative factor(s). The assertion that higher algae concentrations in the CCS were responsible for the elevated temperatures in the CCS was investigated. A sensitivity analysis indicates that increased algae concentrations were not likely to have been responsible for the significantly elevated temperatures in the CCS recorded in the mid-summer months of 2014. The additional heating rate in the CCS caused by the presence of high concentrations of algae is estimated to be less than 7% of the heat-rejection rate of the power plant, hence the minimal impact. Further development of the heat-balance model is needed, since the design of any engineered system to control temperatures in the CCS must be done in tandem with heat-balance-model simulations.

Temperature impact on groundwater. Measured groundwater temperatures in some monitoring wells between the CCS and the L-31E Canal have shown higher temperatures than groundwater west of the L-31E

Canal, and this occurrence can be partially attributed to limited cooling-canal water intrusion into the Biscayne Aquifer. Monitoring-well measurements further show that nearly all of the seasonal temperature fluctuations in the groundwater occur above an elevation of −25 ft NGVD* (about 30 ft below the ground surface). At lower elevations in the aquifer, the groundwater temperature generally remains relatively steady and in the range of 75°F–77°F (24°C–25°C). Seasonal temperature fluctuations above −25 ft NGVD can be partially attributed to the heating and cooling of water in the L-31E Canal in response to seasonal changes in atmospheric conditions. Overall, the impact of CCS water on the temperature of groundwater in the Biscayne Aquifer can be considered as localized of not having any significant environmental consequence.

Salinity in the CCS. There has been a steady increase in CCS salinity of around 5‰ per decade since the CCS began operation in 1973. Recent measurements indicate that the rate of change of salinity might be increasing. Analyses of the salinity dynamics in the CCS were performed using a salinity model previously developed by a FPL contractor. Results from this salinity model show that evaporation and rainfall are the primary drivers affecting the salinity in the CCS, with pumpage from the interceptor ditch and blowdown from the Unit 5 generating facility also having an effect. Over prolonged periods with no rainfall, the salinity in the CCS will generally increase as fresh water is evaporated and the evaporated fresh water is replaced by saline water from the surrounding aquifer. A prolonged period with no rainfall was the primary cause for the unusually high salinities (greater than 90‰) that were observed in early summer of 2014. Seepage inflow to the CCS is mostly from the east (i.e., the area adjacent to Biscayne Bay) and seepage outflow of more saline water occurs primarily through the bottom of the CCS, thereby contributing to an increased salinity of the underlying groundwater. The short-term (seasonal) salinity fluctuations in the CCS are controlled by seasonal variations in the amount and timing of rainfall, and aperiodic spikes in salinity should be considered as being normal and expected. In the long term, barring any significant intervention, salinities will continue to follow an upward trend, since over the long term annual evaporation exceeds annual rainfall. Increased temperatures in the CCS lead to increased evaporation which increases the rate of change of salinity in the CCS above historical rates of change. The steady increase in salinity could be mitigated by an engineered system to add supplemental water with lesser salinity. However, pumping lower salinity water into the CCS in large quantities will elevate the water level in the CCS, decrease the seaward piezometric-head gradient, and likely exacerbate the inland intrusion of saltwater originating from the CCS. The effectiveness of an engineered system that pumps saline water from the CCS to deep-well(s) for disposal will depend on the groundwater-flow response in the aquifer surrounding the CCS, the induced salinity-transport dynamics within the aquifer, and the operational protocol of the deep-well injection system. Data in support of such a proposed system was not made available to the investigator during this study.

Salinity impact on groundwater. Based on available documentation and data summaries contained in numerous reports prepared by FPL, SFWMD, and DERM, there is little doubt that seepage from the CCS into the Biscayne Aquifer has caused salinity increases within the aquifer, and this impact extends several miles inland from the CCS. The strongest evidence for this assertion comes from the analysis of tritium data. The CCS contains water with a high tritium concentration, and utilization of tritium as a tracer to identify groundwater originating from the CCS is justified. Elevated concentrations of tritium above a 20 pCi/L threshold in the deep groundwater can reasonably be attributed to the presence of water originating from the CCS. The approximate limit of the 20 pCi/L concentration contour has been reported to be 3.8–4.7 miles west of the CCS and 2.1 miles east of the CCS.

*"NGVD" refers to the NGVD 29 datum.

Withdrawal of 100 mgd from the L-31E Canal. Adverse impacts of pumping 100 mgd from the L-31E Canal into the CCS during June 1 – November 30 are likely to occur under the current permitted pumping protocol. Under the current pumping protocol stipulated in the SFWMD-issued permit, the stage in the L-31E Canal will be held constant during pumping, while the stage in the CCS will generally rise as a result of pumping. This combined effect will decrease, or possibly reverse, the seaward piezometric-head gradient between the L-31E Canal and the CCS that would normally exist in the absence of pumping. A possible consequence of a reversed head gradient between the L-31E Canal and the CCS is advection of a saline plume from the CCS towards the L-31E Canal, and creation of a circulation cell in which the salinity of the water in the L-31E Canal is increased as the saline plume enters the L-31E Canal. Furthermore, according to model results provided by FPL in support of the pumping-permit application, pumping of 100 mgd into the CCS is likely to reduce the water-level differential between the L-31E Canal and the CCS to below the 0.30 ft threshold that would normally trigger the operation of the interceptor ditch salinity-control system, which, if operational, would further reduce the head gradient between the L-31E Canal and the CCS. Based on these findings, it is recommended that the permitted pumping protocol be revised prior to the 2016 pumping period. The revised protocol should include, as a minimum, real-time monitoring of the stages in the CCS and the L-31E Canal during pumping operations, specification of a threshold water-level difference between the L-31E Canal and the CCS that would limit further pumping, and real-time monitoring of the salinity in the L-31E Canal during pumping operations.

Recommended actions. The following specific action items would lead to better and more efficient management of the cooling-canal system:

- Develop a calibrated heat-balance model to simulate the thermal dynamics in the CCS, and collect the data necessary to calibrate and validate this model.
- Confirm and identify the causative factors for the decline in the thermal efficiency of the CCS between the pre-uprate and post-uprate periods.
- Develop a quantitative relationship for estimating algae concentrations in the CCS as a function of temperature, salinity, and nutrient levels.
- Develop a locally validated relationship between the evaporation rate, water temperature, air temperature, wind speed, salinity, and algae concentrations in the CCS.
- Modify the operational protocol associated with the 2015 – 2016 permit for transferring up to 100 mgd from the L-31E Canal to the CCS.

The analyses and recommendations contained in this report are offered in support of the goal of achieving an environmental balance for the sustainable generation of electrical power at the Turkey Point power station.

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Contents

1 Background

This investigation is primarily focused on the operation of the cooling-canal system (CCS) located at the Turkey Point power-generating station in south Miami-Dade County, Florida. The issues of concern relate primarily to the increased temperatures and salinities that have recently been measured in the CCS, the environmental impacts of these increased levels on the quality of groundwater in the Biscayne Aquifer, the need for additional engineered systems to supply supplemental cooling water to the CCS, and the environmental impacts of permitted pumping of up to 100 mgd of water from the L-31E Canal to the CCS between June 1 and November 30.

Environmental concerns. Most of the environmental concerns regarding the operation of the cooling-canal system (CCS) at Turkey Point relate to: (1) the sustainability of the system in maintaining adequate temperatures to cool the power-generating units, (2) the impact that current and projected future salinities in the CCS have on the quality of groundwater in the surrounding Biscayne Aquifer, and (3) the need for new supplementary sources of water and/or revised operational protocols to control the temperatures and salinities in the CCS. Specific issues of concern are as follows:

- Increased temperatures in the CCS limit the effectiveness of the CCS as a cooling-water source servicing four power-generating units. When the intake temperature in the CCS exceeds a regulatory limiting value of 104°F, either power generation must be curtailed or supplementary cooling water must be provided to the CCS to reduce the temperature and hence keep the generating units in operation; the sustainability of a supplementary system to cool the water in the CCS has not yet been established.

- Increased salinity in the CCS likely contributes to increased saltwater intrusion within the Biscayne Aquifer, thereby deteriorating the groundwater quality underlying inland areas. The current salinity-control system, sometimes called the interceptor-ditch system, has not been effective in controlling the inland migration of saline water from the CCS, thereby signaling the need for revised operating strategies to manage salinity intrusion resulting from CCS operation.

- The effectiveness of the permitted protocol for pumping 100 mgd from the L-31E Canal into the CCS to reduce temperatures in the CCS, and the effect of this pumping operation on saltwater intrusion in the Biscayne Aquifer and water quality within the L-31E Canal are issues that are yet to be resolved.

This report summarizes what is currently known about the CCS, summarizes key findings from previous related investigations, regulatory reports and reviews, provides new analyses, and gives suggested answers and pathways forward to resolve several issues related to the above-listed concerns.

1.1 Turkey Point Power Station

The Turkey Point Power Station currently consists of five power-generating units: two 404-MW oil/natural gas-fired generating units (Units 1 and 2), two 728-MW nuclear-powered units (Units 3 and 4), and a nominal 1150-MW natural gas-fired combined-cycle unit (Unit 5). In 2002, the Nuclear Regulatory Commission (NRC) extended the operating licenses for both nuclear reactors from forty years to sixty years, extending licensed operation to the year 2033. In June of 2009 the Florida Department of Environmental Protection (FDEP) issued certification for the increase in power-generating capacity (commonly called an "uprate") of

Units 3 and 4 to provide an additional 250 MW of power. Unit 3 has been operating at its uprated power-generation capacity since Nov 2012, and Unit 4 has been operated at its uprated power-generation capacity since May 2013. In planning for the Unit 3 and Unit 4 uprates, it was anticipated that the uprate would increase the temperature of the cooling water discharged to the CCS by 2.5°F (1.4°C), from 106.1°F to 108.6°F (41.2°C to 42.6°C) (FPL 2011), and that the increased temperature in the CCS might result in increased evaporation and increased salinity. The CCS provides cooling water for Units 1 to 4, with cooling of Unit 5 accomplished by mechanical-draft cooling towers that use make-up water drawn from the Upper Floridan Aquifer. Blowdown water from Unit 5 is discharged into the CCS. Since the uprate of Units 3 and 4 went into effect, Unit 2 has not been operational. In 2014, the Florida legislature approved construction of two additional nuclear reactors at Turkey Point (Units 6 and 7), with each additional unit having an approximate electrical output of 1100 MW; approval of the additional units by the NRC is currently pending. The two additional nuclear reactors will not use the CCS for cooling. Presently, with an estimated total power-station capacity of approximately 3550 MW, the Turkey Point power station is the second largest power station in Florida, in terms of generating capacity, and is the sixth largest power station in the United States (NRC, 2012).

1.2 Geohydrology

The Turkey Point power station and associated cooling-canal system (CCS) are underlain by the Biscayne Aquifer. In the vicinity of Turkey Point, the Biscayne Aquifer extends from land surface to a depth of approximately 106 ft below sea level (BSL), with the thickness of the aquifer decreasing towards the west. Geologic formations within the Biscayne Aquifer include, from the ground surface downward, the Miami Limestone Formation, Key Largo/Fort Thompson Formations, and upper portions of the Tamiami Formation. The less-permeable units of the Tamiami Formation, and the deeper Hawthorn Group, form the confining unit between the Biscayne Aquifer and the Upper Floridan aquifer. The top of the confining unit is characterized by the transition between highly permeable beds of the Fort Thompson Formation and the lower-permeability silty sands of the Tamiami Formation. The thickness of the Miami Limestone Formation is in the range of 8 – 23 ft, and the thickness of the Fort Thompson Formation is in the range of 46 – 95 ft. The regional groundwater flow direction is, on average, from the northwest to southeast (Fish and Stewart 1991), although the predominant flow direction at the coast can vary significantly between the wet and dry seasons. The water-table gradient is typically towards the coast during the wet season (May – October), but can be directed inland during the dry season (October – April). The possibility of the occurrence of an inland water-table gradient is the primary reason for the so-called "interceptor-ditch system" that is used ostensibly to control the inland migration of saline water originating from the CCS. Water-table elevations at Turkey Point are typically around 1 ft NGVD, and the magnitude of the average regional water-table gradient is typically in the range of 0.004% – 0.005%. Notably, with such small water-table gradients, small errors in measured water-table elevations can significantly impact the accuracy of the estimated gradients. Vertical piezometric-head gradients at the Turkey Point site (away from the CCS) are typically negligible, with piezometric-head differentials between shallow, intermediate, and deep zones reportedly being within hundredths of a foot.

Groundwater classification. Groundwater at the Turkey Point site was originally classified by FDEP as as G-II, which is the classification for groundwater that is of possible potable use and has a total dissolved solids content of less than 10,000 mg/L. In September 1983, at the request of FPL, the groundwater at the Turkey Point site was reclassified by FDEP as G-III, which is the classification for groundwater that has a total dissolved solids content of 10,000 mg/L or greater, or has a total dissolved solids of 3,000–10,000 mg/L and has no reasonable potential as a future source of drinking water. The G-III classification currently remains in effect.

1.3 The Cooling-Canal System

History and regulation. Construction of the cooling-canal system (CCS) was approved by the Dade County Board of County Commissioners in November 1971, and became operational in February 1973. At the time of its initial operation, the CCS was approximately half-way completed compared with the present system. The CCS is sometimes referred to as an Industrial Wastewater Facility (IWW) since the circulating water system, which discharges saline water to the surrounding aquifer, is regulated under the federal National Pollutant Discharge Elimination System (NPDES) and an Industrial Wastewater (IW) permit issued to FPL by the Florida Department of Environmental Protection.

Current canal system. In its present state, the CCS is approximately two miles wide (east–west) and five miles long (north–south), covers an area of approximately 5900 acres, and has approximately 4370 acres of water surface. The CCS consists of 32 canals flowing south from the discharge location in the north, and 7 return canals flowing north to the intake location. Because the south-flowing canals are located in the western section of the CCS and the north-flowing canals are located in the eastern section of the CCS, the system is sometimes referred to as having 32 western canals and 7 eastern canals. The south-flowing (western) canals are each approximately 4 ft deep, 200 ft wide, and spaced approximately 90 ft apart; these canals range in length from 2 – 5 miles. The 4 ft depth of the canals (from ground surface) was originally chosen so as to not penetrate the less-permeable surficial Miami Oolite Formation that extends to about 4 ft below grade, thereby minimizing groundwater exchange between the CCS and the underlying Biscayne Aquifer. The bottom of the canals are below the lowest water-table elevation expected in the Biscayne Aquifer at Turkey Point, and therefore the canals always contain water that is directly connected to the adjacent groundwater. Cooling water leaves the four generating units (Units 1 – 4), flows into Lake Warren, and then into the 20-ft deep 100-ft wide feeder canal that connects to the 32 south-flowing cooling canals. Four shallow cross canals spaced 1-mile apart run east – west across the 32 south-flowing cooling canals. These cross canals contain flow-control structures that distribute water flow evenly to the canals so that each cooling canal carries a flow that is proportional to its surface area in order to optimize heat exchange with the atmosphere. At the southern end of the CCS is a collector canal that is approximately 20 ft deep and 200 ft wide. Water returns to the power-generating units from the southern collector canal via 6 north-flowing canals, the largest of which is the Card Sound Canal which is 200 ft wide and 20 ft deep. The average length of the circulation path between the discharge and intake locations is 13.4 miles. The 32 south-flowing cooling canals are numbered from 1 to 32, from east to west, hence, cooling-canal number 32 is the westernmost canal in the CCS. Endangered American crocodiles (*Crocodylus acutus*) inhabit the cooling canals. During nesting season, more than 40 adult crocodiles have been observed in the canals, although there have been some reports that the crocodile population in the CCS is declining possibly due directly or indirectly to the increased salinities in the CCS.

Operational characteristics. The canals in the CCS were designed to operate at a total flow rate of 4250 ft^3/s (2750 mgd) when all four generating units (Units 1 – 4) supported by the CCS are in full operation. Small wastewater (blowdown) flows from Unit 5 are also discharged into the CCS. Typically, the flow rate through the CCS varies significantly with the electric load demand on the generating units, and is usually in the range of 2700 – 4250 ft^3/s (1750 – 2750 mgd) on any given day, with a typical flow depth of around 2.8 ft. Thermal energy is dissipated in CCS as water moves from north to south, with the primary heat-exchange processes being evaporation, solar radiation, and both emitted and absorbed longwave radiation. Maximum temperatures near the discharge location of the power-generating units are typically around 108°F (42°C), and maximum temperatures near intake to the power-generating units are typically around 93°F (34°C); the difference between these typical maxima is 15°F (8°C), which gives a measure of the cooling effect of the CCS. The (regulated) maximum allowable temperature at the intake location in the CCS is 104°F (40°C). The flow in the CCS is driven by 12 condenser-circulating pumps and auxiliary cooling pumps. The CCS typically contains approximately 7×10^8 ft^3 of water, and the average velocity is around 0.25 ft/s in each canal. Approximately two days (44 – 48 h) are required for water in the CCS to travel from the discharge location to the intake location. Within the CCS, the flow is maintained by a head differential between the discharge and intake locations, with the water-surface elevation being highest at the discharge location and lowest at the intake location. The water level at the discharge location is typically about 3 ft higher than the water level at the intake location. Typical water surface elevations in the CCS are 2.04 ft NGVD at the discharge location, 0.76 ft NGVD at the south end, and −0.77 ft NGVD at the intake location. The water-surface elevation at south end of the CCS is usually closest to the water-surface elevation in Biscayne Bay. The water-surface elevation in the CCS is typically higher than the site-average water-table elevation in the Biscayne Aquifer at the discharge (north) end of the system, approximately equal to the water-table elevation at the south end of the system, and below the water table at the intake (north) end of the system. Consequently, water generally flows out of the CCS into the aquifer near the discharge location of the CCS and water generally flows into the CCS from the aquifer near the intake location of the CCS, there is less flow interaction between the CCS and the aquifer at the southern end of the system. During very heavy rains, there can be a net inflow to the CCS from the surrounding aquifer. The CCS is approximately nontidal, and water in the CCS is typically warmer than the air temperature. The effectiveness of the CCS as a cooling system decreases as the temperature in the CCS increases.

1.4 Algae in the CCS

A significant algae bloom occurred in the CCS during 2014 and algae in now perceived to be a problem in the CCS. Prior to 2013, only limited and short-term algae blooms had occurred in the CCS, typically during the early summer months. In fact, algae blooms were of such limited concern that routine monitoring for algae was not commonly done prior to 2014. In the summer of 2014, large-scale application of a $CuSO_4$-based algaecide was used to reduce the algae concentrations in the CCS. The applied algaecide was reported as being ineffective in reducing the algae concentrations, serving only to stabilize the existing concentrations (SFWMD, 2015).

Factors affecting algae concentrations. High concentrations of algae have been observed in the CCS with correspondingly high concentrations of nutrients being measured. The historical average algae concentration in the CCS is reported to be 50 cell/L[†], however, in the summer of 2014 algae concentrations as high as 1600 cell/L were reported (SFWMD, 2015). The addition of nutrients from the power-generating units into the CCS is assumed to be negligible, with nutrients likely originating from allochthonous sources. Total nitrogen (TN) concentrations in the CCS have been reported in the range of 1.7 – 5.3 mg/L (Ecology and Environment, Inc., 2012). The highest reported TN concentrations in the CCS were measured at all stations in March 2012, which coincided with higher turbidities and pH in the CCS. The majority of the nitrogen

[†]Algae concentrations are normally given in Chl*a*/L, so these units are unusual.

in the CCS appears to be in organic form (typically 80%–90%). Total phosphorus (TP) concentrations in the CCS have been reported in the range of 4–73 μg/L, with an overall average concentration of 36 μg/L. Numerous measurements of TN and TP have been reported between 7/2010 and 3/2015 (Ecology and Environment, Inc., 2010; 2011a; 2011b; 2012a; 2012b; 2012c; 2013a; 2013b; 2014a; 2014b; 2015), and synoptic measurements within this time period yield TN/TP values in the range of 48–2015 with a median value of 142. Since the measured TN/TP values generally exceed the Redfield ratio of 16, it can be inferred that TP is the controlling nutrient for algae growth in the CCS. The existence of TP control of algae growth in saline systems is commonly attributed to the presence of nitrogen-fixing planktonic cyanobacteria which make up any short-term nitrogen deficits (Howarth and Marino, 2006). It has been reported that the cyanobacteria *Aphanothece* sp. are the predominant algae species in the CCS; these species are nitrogen-fixing and thrive under hypersaline conditions. In addition to nutrients, both temperature and salinity are known to affect the growth of algae in water bodies. For given nutrient levels, increasing temperatures usually contribute to increased algae concentrations, and increasing salinities usually contribute to decreased algae concentrations (Håkanson and Eklund, 2010). However, for the algae species commonly found within the CCS, algae concentrations have been reported to increase with increasing salinity (SFWMD, 2015). Algae concentrations are usually expressed in terms of the mass of chlorophyll-a per liter. Synoptic measurements of chlorophyll-a (Chl$a$) concentration, salinity (S), temperature (T), and total phosphorus (TP) concentration at locations near the discharge and intake locations in the CCS between May 31, 2015 and November 13, 2015 are plotted in Figure 1. These synoptic measurements collectively show the algae concentration

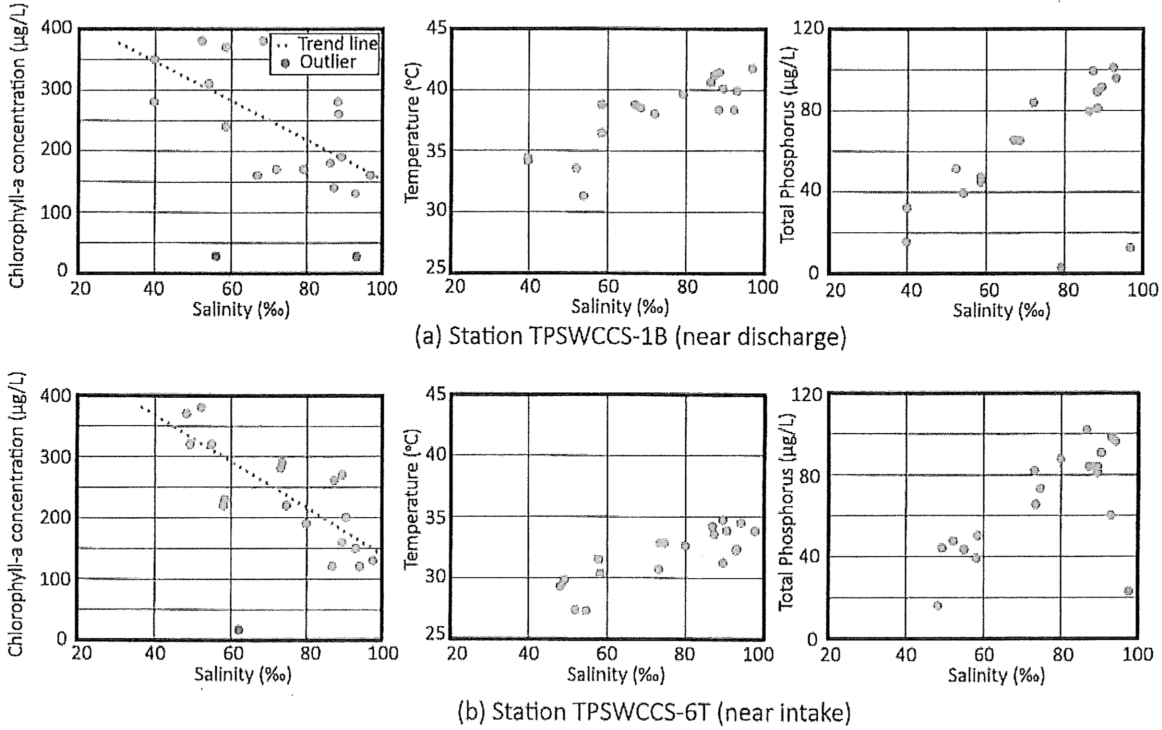


Figure 1: Chlorophyll-a levels in the CCS as a function of temperature, salinity, and total phosphorus

(Chl$a$) decreasing with increasing salinity (S), decreasing with increasing temperature (T), and decreasing with increasing nutrient concentration (TP). All of these trends are contrary to the natural relationships between Chl*a*, S, T, and TP and are either anomalous or indicate the effect of an algaecide. Assuming that a $CuSO_4$-based algaecide was applied during the period of measurements, the effectiveness of the algaecide can be seen by plotting the relationship between Chl*a* and sulfate (SO_4) concentrations, and this relationship is shown in Figure 2. It is apparent from Figure 2 that algae concentrations decrease significantly with

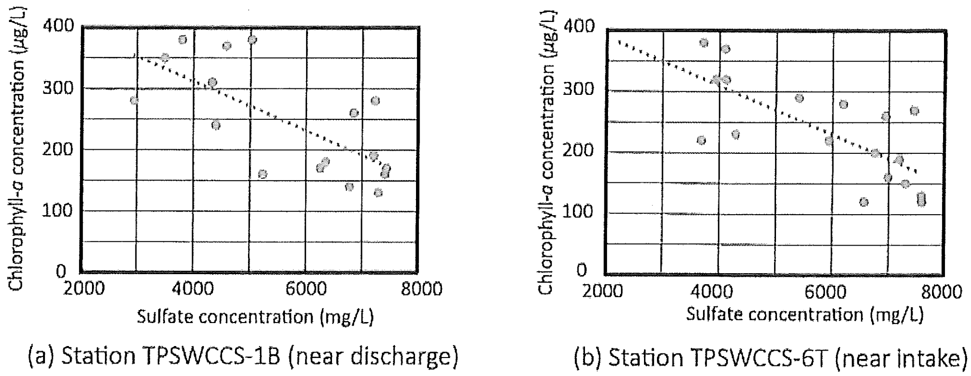


Figure 2: Chlorophyll-*a* levels in the CCS sulfate concentrations

increasing concentrations of algaecide (as measured by sulfate concentration), indicating that addition of an algaecide is an effective means of reducing algae concentrations in the CCS. However, it should also be kept in mind that Chl*a* reductions caused by an algaecide are necessarily only temporary, since the natural factors causing high levels of Chl*a* (i.e., S, T, and TP) remain at elevated levels within the CCS. Since the system is autotrophic, reduction of autochthonous TP levels should be targeted to ultimately reduce both algae levels and the need for repeated application of algaecide(s) in the CCS.

Impact of increased algae concentrations. It has been asserted (SFWMD, 2015) that increased algae concentrations and turbidities associated with algae blooms cause more solar energy to be absorbed in the CCS, and reduces the ability of the CCS to dissipate thermal energy. The primary mechanisms by which the CCS dissipates thermal energy are by evaporation and the emission of longwave radiation. A conventional assumption made by engineers and scientists is that the evaporation rate from a water body is unaffected by the concentration of algae in the water body. There is no scientific evidence documented in any published studies showing that the rate of evaporation from a water body is reduced by high algae concentrations. Further, there are no published studies showing that the emission of longwave radiation from a water body is particularly sensitive to the concentration of algae in the water. As a consequence, the primary effect of increased algae concentrations in the CCS can be assumed to be increased absorption of solar radiation, which would increase the heating of the water and elevate the temperature of the water in the CCS. The quantitative effect of increased solar heating of the CCS due to increased algae concentrations is parameterized by a reduced albedo of the water surface, and the relationship between the reduced albedo and the corresponding increased temperature was investigated in this study using a heat-balance model described subsequently in Section 2.2 of this report. It should be noted that the "trapping" of solar energy due to increased algae concentrations would be moderated by the resulting increased evaporation which would cause increased cooling due to the extraction of the latent heat of vaporization.

1.5 Saltwater Intrusion

The inland extent of saltwater intrusion in the Biscayne Aquifer is defined by the location of the 1000 mg/L isochlor. As a reference concentration, the South Florida Water Management District (SFWMD) defines seawater as having a chlorinity (i.e., chloride concentration) greater than 19,000 mg/L, and saline water as having a chlorinity greater than 250 mg/L. Surface waters with chlorinities greater than 1500 mg/L are classified as marine waters, and surface waters with chlorinities less than 1500 mg/L are classified as fresh waters (F.A.C. 62-302.200). The landward extent of the saltwater interface (i.e., the 1000 mg/L isochlor) varies naturally in response to a variety of factors, such as seasonal variations groundwater recharge and variations in rates at which groundwater is pumped from the aquifer. For example, prolonged droughts or excessive water usage inland that reduce water-table elevations can cause increased salinity intrusion. Prior to the construction of the CCS, the groundwater underlying the Turkey Point site was naturally saline due to the proximity of the site to the coast. In fact, had the groundwater not been saline, construction of the cooling-canal system at Turkey Point would not have been permitted. Since the water-table gradient towards the coast at Turkey Point is typically very low, and with the location of the saltwater interface being partially controlled by those gradients, even slight reductions of the fresh water piezometric-head gradient can cause substantial landward movement of the saltwater interface. The occurrence of landward gradients during the dry season promotes inland movement of saline groundwater.

CCS impact on saltwater intrusion. It has always been recognized that construction of the CCS without any mitigating salinity-control systems would cause the saltwater interface to move further inland. This expectation was based on the assertion that construction of a CCS containing saline water one mile inland from the coast is tantamount to moving the coast one mile inland, and also moving the associated saltwater wedge around one mile inland. Since water in the CCS has a higher salinity than seawater, and is therefore denser that the water in Biscayne Bay, the effect of the CCS is actually greater than moving the coast one mile inland. To compound this effect, the engineering consultants that originally analyzed the performance of the CCS also asserted that if the water level in the CCS were to be increased by 0.50 ft above the preconstruction water-table elevation, then the toe of saltwater water wedge at the base of the Biscayne Aquifer might move approximately 7.5 miles further inland during the dry season as compared to its original location during the dry season. The engineering consultants also asserted that in the wet season, an elevated water level of 0.50 ft in the CCS might move the toe of the saltwater wedge approximately 1 mile further inland compared to its original location during the wet season. Based partially on these expectations, the salinity-control system that is currently in place was designed to control the westward migration of saltwater originating in the CCS. This control system involves pumping water from a so-called "interceptor ditch" into the CCS in order to create a seaward hydraulic gradient between the L-31E Canal and the interceptor ditch, where the L-31E Canal is located to the west of the interceptor ditch. The protocol for operating this salinity-control system and the effectiveness of the system are discussed in Section 1.6 of this report.

Tracing the movement of CCS water in the Biscayne Aquifer. Tritium has been selected by the cognizant regulatory agencies (SFWMD and DERM) to trace the movement of CCS water in the Biscayne Aquifer. Historical data from 1974 to 1975 showed CCS tritium concentrations in the CCS to be in the range of 1556 – 4846 pCi/L, and reports submitted by FPL for the monitoring period from June 2010 through December 2011 showed CCS tritium concentrations in the range of 1260 – 14,280 pCi/L. Natural groundwater at the base of the Biscayne Aquifer would be expected to have relatively low concentrations of tritium. A threshold concentration of 20 pCi/L has been used as a baseline to infer the presence of groundwater originating from the CCS. Groundwater with concentrations below 20 pCi/L are presumed not to be affected by the CCS. FPL does not concur with the selection of 20 pCi/L as a threshold or background tritium concentration for surface water, pore water, or shallow groundwater. The basis of FPL's contention regarding the 20 pCi/L threshold is that multiple factors such as atmospheric deposition, vapor exchange, and errors in laboratory analysis can influence reported tritium levels. The FPL assertion is reasonable and is supported by measured data that indicate atmospheric and vapor exchange effects on tritium concentrations can be particularly significant in surface water and shallow groundwater, with significance decreasing with distance from the CCS. However, at depth, the CCS appears to be the primary source of tritium, and using tritium as a tracer in the lower elevations of the Biscayne Aquifer is reasonable. Reported measurements show groundwater tritium concentrations in excess of 3000 pCi/L near the CCS, with concentrations decreasing with distance from the CCS, and found at concentrations of hundreds of pCi/L three miles west of the CCS at depth. The approximate limit of the 20 pCi/L concentration contour is 3.8 – 4.7 mi west of the CCS and 2.1 mi east of the CCS. Based on the strength of these data and supporting analyses, it is reasonable to conclude that operation of the CCS has impacted the salinity of the Biscayne Aquifer within the limits of the 20 pCi/L contour.

1.6 L-31E Canal and Interceptor Ditch

L-31E Canal Levee L-31E and its adjacent 20-ft deep borrow canal to the west of the levee were primarily constructed as a barrier to prevent salinity intrusion to locations west of the canal. The L-31E Canal collects water from other drainage canals in the area that include Military Canal, North Canal, Florida City Canal, North Model Land Canal (C-106), and South Model Land Canal (C-107). The L-31E Canal discharges into Biscayne Bay through structures S-20 and S-20F in the vicinity of Turkey Point. The L-31E Canal was constructed in the late 1960's by the U.S. Army Corps of Engineers and the Central and Southern Florida Flood Control District (CSFFCD), where the CSFFCD was later renamed the South Florida Water Management District (SFWMD).

Interceptor ditch control system. The interceptor-ditch (ID) salinity-control system was designed to prevent the seepage of water from the CCS westward within the Biscayne Aquifer. The ID, which is located immediately to the west of the CCS, is occasionally pumped to create a seaward water-table gradient between the L-31E Canal to the west and the ID to the east, with the basis for the effectiveness of the ID control system being that groundwater originating in the CCS will be prevented from migrating towards the west in the presence of an eastward water-table gradient between the L-31E Canal and the ID. The ID is pumped when a natural seaward water-table gradient between the L-31E Canal and the ID does not exist, and usually this is needed only during the dry season (November – April). The ID is adjacent and parallel to cooling-canal number 32 (CC-32) at the western end of the CCS, and was constructed at the same time as the CCS. The ID is approximately 18 – 20 ft deep, 30 ft wide, and 29,000 ft (5.5 mi) long. Within the ID are two pump stations, with each station containing two pumps, each capable of pumping up to 15,000 gpm (21.6 mgd). There is no mechanism to transfer water between the ID and CCS, except for the 4 pumps at the two pump stations. The L-31E Canal, ID, and CC-32 are all approximately parallel to each other and run at an angle of approximately 17°38′ west of south. The perpendicular horizontal distance between the L-31E Canal and the ID is about 1000 ft. When the ID is pumped, there is a quick and measurable response in water levels in the L-31E Canal and the monitoring wells closest to the ID, indicating that there is good connectivity between the ID, L-31E Canal, and nearby monitoring wells.

Interceptor ditch operating rule (1973 – 2011). The ID operating rule that was followed from the initial date of operation of the CCS in February 1973 up until December 2011 (i.e., for 38 years) was as follows:

- Whenever the water-surface elevation in the L-31E Canal is more than 0.2 ft higher than the water-surface elevation in CC-32, there is a seaward water-level gradient and no pumping is necessary.
- If the above criterion is not met, a seaward gradient is still taken to exist if the water-surface elevation in the L-31E Canal is more than 0.3 ft higher than the water-surface elevation in the ID. Under this condition no pumping is necessary.
- If neither of the above two criteria are met, pumping of the ID is initiated and the pumping rates are adjusted to meet the 0.3-ft water-level difference criterion between the L-31E Canal and the ID.
- Pumping is terminated when the criteria for a natural water-table gradient is met (without pumping).

Although this operating rule is no longer in effect, it is still relevant to this analysis since possible westward migration of saline water from the CCS into the Biscayne Aquifer could have occurred while following this operating rule. This concern is discussed subsequently.

Interceptor ditch operating rule (2011 – present). A more conservative revised operating rule for the ID was initiated in December 2011 that considered freshwater piezometric-head equivalents rather than measured water-table elevations. This resulted in changes to the ID operating rule, and since December 2011 the ID operating rule in effect is as follows:

- If the L-31E Canal water-surface elevation minus the CC-32 water-surface elevation is equal to or greater than 0.30 ft then no pumping of ID is necessary, and a seaward gradient exists.
- If the L-31E Canal water-surface elevation minus the CC-32 water-surface elevation is less than 0.30 ft, a natural seaward gradient might still exist if the L-31E Canal water-surface elevation minus the ID water-surface elevation is equal to or greater than 0.30 ft and the density of the water in the ID is less than or equal to 1012 kg/m^3. If a density in the ID is greater than 1012 kg/m^3, a higher elevation difference between L-31E and the ID is necessary and can be calculated by converting the surface-water levels to freshwater piezometric-head equivalents.
- If a natural seaward gradient does not exist, create an artificial seaward gradient by pumping the ID until the ID is maintained at an elevation difference of at least 0.30 – 0.70 ft between the L-31E Canal and the ID, depending on the density of the ID water.

The primary change between this revised operating rule and the previous operating rule is the increase in the L-31E/ID/CC-32 water-level difference criteria and the consideration of variable-density effects. The use of freshwater piezometric-head equivalents provides a more rigorous approach to the operation of the ID.

Effectiveness of the ID salinity-control system. Both the current and previous operating rules of the ID salinity-control system have limited salinity-control effects and do not prevent the landward migration of saline water originating from the CCS under all conditions. Following either of these operating rules, pumping of the ID reduces the water level in the ID below that in the L-31E Canal thereby creating a seaward water-table gradient and presumably precluding westward migration of groundwater originating in the CCS. However, pumping water from the ID into the CCS generally elevates the water-surface in the CCS and it is possible for the water level in the CCS to be above the water level in the L-31E Canal, which then creates the possibility that water originating in the CCS could pass under the ID even when the pumps in the ID are running to prevent this occurrence. Interestingly, this scenario was recognized in an early report prepared by the design engineers (Dames and Moore, 1971) based on results derived from an analog model of the system. The analog model showed that westward migration of the saltwater interface is possible even if the ID operating rule is followed. Further, Golder (2008) stated that operation of the ID salinity-control system would prevent westward migration of CCS water "at least in the top 18 ft of groundwater." Measurements taken during ID pumping have in fact shown several occurrences where the water level in the CCS exceeds that in the L-31E Canal during ID pump operation, thereby indicating the possible ineffectiveness of the ID salinity-control system. In actuality, the functioning of the ID salinity-control system is more accurately characterized as intercepting shallow saline groundwater adjacent to the ID that is then pumped back to the CCS when the natural gradients are low and the potential for saltwater intrusion exists. It is possible that pumping of the ID under some circumstances simply creates a shallow subsurface (groundwater) circulation in which water from the CCS flows into the ID as groundwater that is subsequently returned to the CCS as pumped water. In support of this assertion, time series plots show that there are periods during pumping of the ID when the bottom-water temperatures in the ID rose along with an increase in specific conductance in the ID (Ecology and Environment, Inc., 2014). Aside from concerns regarding the effectiveness of the ID control system in mitigating saltwater intrusion, secondary concerns have also been raised that the ID control system contributes to the deterioration of groundwater quality in that it generally pumps less-saline water from the ID into the hypersaline CCS which further contributes to increased salinity in the aquifer.

2 Temperature Variations in the Cooling Canals

The temperature in the CCS at the intakes to the power-generating units affect the efficiency and power output of the generating units that use water from the CCS. Both the efficiency and the power output of the generating units decrease with higher cooling-water temperatures. The practical upper limit of the intake cooling-water temperature is determined by the characteristics of the condensers and auxiliary heat exchangers in the generating units. In 2014 the Nuclear Regulatory Commission granted FPL's request to increase the maximum intake cooling-water temperature from 100°F to 104°F (37.8°C to 40°C). If the intake cooling-water temperatures in the CCS were to exceed 104°F, then FPL would be required to reduce power output and possibly shut down one or more of the power-generating units. Since this occurrence would adversely affect a large number of customers in the South Florida service region, Miami-Dade County is obliged to work with FPL to find ways to avoid cutbacks in power generation resulting from elevated temperatures in the CCS.

2.1 Results from Previous Studies

2.1.1 Temperatures in the CCS

Water temperatures in the CCS are almost always higher than synoptic temperatures of the overlying air, and temperatures in the CCS are almost always higher than temperatures in nearby Biscayne Bay. Analyses done by FPL's engineering consultants in around 2008 anticipated that the uprate of Units 3 and 4 would cause a maximum temperature increase of 2.5°F (1.4°C) in the cooling water discharged to the CCS and an increase of 0.9°F (0.5°C) in the temperature of the intake water (reported in SFWMD, 2008). These temperature changes were predicted to result in an increase in evaporation from the CCS of around 2–

3 mgd, and the increased evaporation was expected to increase the salinity in the CCS by 2‰–3‰. In contrast to the aforementioned predictions, it has been generally reported that temperatures in the CCS have actually increased by 5–9°F (3–5°C) in the post-uprate period compared with the pre-uprate period. In the summer of 2014 (during the post-uprate period), temperatures in the CCS were sufficiently elevated as to prompt concern regarding the sustainability of the CCS as an adequate source of cooling water to the power-generating units. According to FPL's consultant (Ecology and Environment, Inc., 2014), the increase in CCS water temperatures in the post-uprate period cannot be attributed to the uprate since the total heat rejection rate to the CCS from Units 1, 2, 3, and 4, operating at full capacity prior to the uprate would have been higher than the post-uprate heat rejection rate to the CCS for Units 1, 3, and 4, operating at full capacity. Unit 2 in the post-uprate period has been dedicated to operate in a synchronous generator mode and hence not producing steam heat.

2.1.2 Thermal Efficiency of the CCS

The thermal efficiency of the CCS is a measure of the ability of the CCS to cool the discharged water down to the background air temperature. An investigation of the thermal efficiency of the CCS was performed by Lyerly (1998), and these analyses indicated that the thermal efficiency of the CCS at the time of the study was equal to 86.4%. This efficiency was based on a 24-h average discharge temperature of 107.3°F (41.8°C), average intake temperature of 91.1°F (32.8°C), and an average air temperature of 88.6°F (31.4°C). In analyzing the temperature measurements, Lyerly (1998) noted that most of the cooling (i.e., most of the temperature decrease) occurs as the water in the CCS flows from the (north) discharge location to (south) collector canal, with much less temperature decrease as the water flows back from the collector canal to the (north) intake location. It is expected that the thermal performance varies with flow rate and the state of the CCS, so the reported thermal efficiency should be regarded more as a snapshot of conditions at the time of the measurements than as a constant value. More recent measurements between June 2010 and June 2012 (Ecology and the Environment, 2012) show water temperatures in the CCS on the discharge side of the power-generating units being around 13.5°F (7.5°C) warmer on average than at the intake side of the power-generating units. The average temperature at the south end of the CCS was only 2°F (1.1°C) warmer than at the intake side of the power-generating units, which supports the assertion that most of the cooling in the CCS occurs as the water flows from north to south.

2.1.3 Thermal Effects on Groundwater

Measured groundwater temperatures in some wells between the ID and the L-31E Canal show higher temperatures than the groundwater west of the L-31E Canal, and this occurrence has been partially attributed to limited cooling-canal water intrusion (Dames and Moore, 1977). A "groundwater thermocline" has been reported to exist in the area west of the CCS, which shows a sudden decrease in groundwater temperature at a particular depth in the aquifer. Measurements show that nearly all of the seasonal temperature fluctuations occur above an elevation of −25 ft NGVD. Below −25 ft NGVD, the groundwater temperature generally remains in the range of 75°F–77°F (24°C–25°C). The seasonal temperature fluctuations above −25 ft NGVD have been attributed to the heating and cooling of water in the L-31E Canal in response to seasonal changes in atmospheric conditions. Notably there is some temperature stratification in the L-31E Canal, in part due to the canal depth and limited flow. The near-surface water temperatures in the L-31E Canal are almost always warmer than the bottom temperatures, and the surface temperatures exhibit more daily variability in response to air temperature changes. Aside from the groundwater adjacent to the L-31E

Canal, it has also been reported (Ecology and Environment, Inc., 2014) that since groundwater in monitoring wells TPGW-2M and TPGW-2D is warmer than other nearby surface waters such as Biscayne Bay or fresh groundwater, the CCS might be influencing the groundwater temperatures in those wells. Based on the aforementioned evidence, it can be concluded that the environmental effects of elevated groundwater temperatures due to the operation of the CCS are inconsequential.

2.2 Heat-Balance Model of CCS

To fully understand the temperature dynamics in the CCS, it is necessary to have a validated heat-balance model of the CCS. In reviewing the documentation made available for this investigation, all indications were that such a model does not currently exist, at least not in the public domain. Historical documentation shows that a heat-balance model was developed in the early stages of operating the CCS, as reported by Ray L. Lyerly Associates (1973), however, utilization of this model has not been subsequently reported. As described by Lyerly (1973), the heat-balance model that was developed previously took into account such key components as the heat entering the water from the power-generating units, the net heat entering the water from shortwave solar radiation and longwave atmospheric radiation, and the latent heat transfer associated with evaporation. The input variables in the thermal model were the air temperature, relative humidity, wind velocity, and the net amount of radiation; the output variable was the water temperature in the CCS.

2.2.1 Heat-Balance Model Formulation

To investigate and understand the thermal dynamics within the CCS, a preliminary heat-balance model of the CCS was developed for this study. The CCS was divided into four zones as shown in Figure 3, where water in the CCS flows sequentially through zones 1, 2, 3, and 4. The four delineated zones are the same

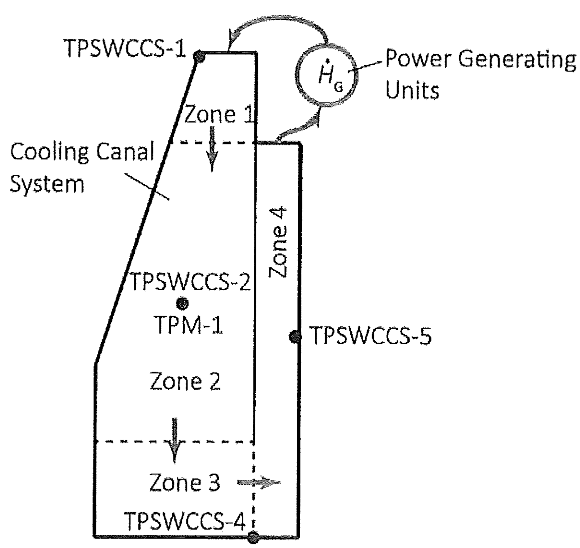


Figure 3: Cooling-canal system

zones that are used in salinity-balance model of the CCS developed by the engineering consultant for FPL.

The measurement stations that characterize conditions within each of the four CCS zones were taken as TPSWCCS-1, TPSWCCS-2, TPSWCCS-4, and TPSWCCS-5, respectively, and the approximate locations of these measurement stations are shown in Figure 3. The average-daily temperature measurements within each of the CCS zones in the period 9/1/10 – 12/7/14 are shown in Figure 4. It is apparent from these

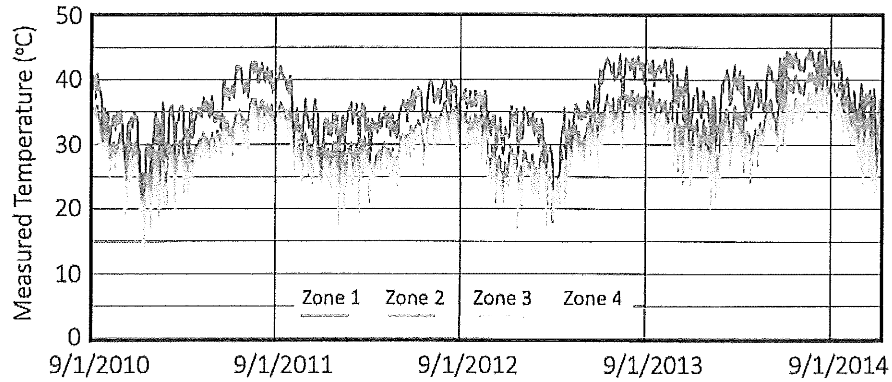


Figure 4: Temperature measurements in CCS

measurements that the temperatures in the CCS decrease noticeably from zones 1 to 3 (i.e., moving from north to south in the CCS), with much less temperature change as the water moves back to the northern (cooling-water intake) end of the CCS through zone 4. Therefore, almost all of the cooling in the CCS occurs in the south-flowing canals in the western portion of the CCS. It is further apparent from the temperature measurements shown in Figure 4 that the midsummer temperatures in 2014 (between July and August) were higher than the midsummer temperatures in previous years. For the period of record (9/1/10 – 12/7/14), the maximum measured daily-average temperature in Zone 1 was 113°F (44.9°C) recorded on 8/21/14, and the maximum measured daily-average temperature in Zone 4 was 101°F (38.3°C) recorded on 8/22/14. Since the maximum allowable temperature at the cooling-water intake is 104°F and measured temperatures in Zone 4 have been close to this limiting value (e.g., 101°F recorded on 8/22/14), there is cause for concern. Temperatures in Zone 4 near the 104°F limit could force curtailment of power generation by one or more of the power-generating units, and cause power outages in South Florida. Given the elevated temperatures that have been recorded in the CCS, is necessary to identify the fundamental reasons for these occurrences, and to determine whether such occurrences are expected to continue in the future without any changes in the CCS and/or power-plant operations. To fully understand the temperature dynamics in the CCS it was necessary to develop a heat‡-balance model of the CCS, which is described in the following section.

2.2.2 Heat-Flux Components

The heat fluxes within each of the CCS zones are illustrated in Figure 5, where the volumetric inflow rate and temperature are Q_1 and T_1, respectively, and the corresponding quantities on the outflow side are Q_2 and T_2. Within each zone, there are several sources of energy that are represented in Figure 5. These energy sources

‡In this report "heat" and "thermal energy" are used interchangeably.

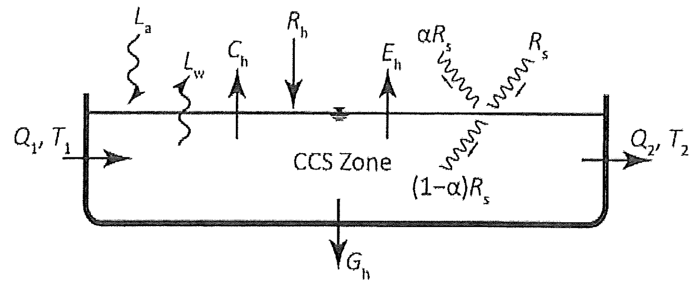


Figure 5: Energy fluxes in CCS zone

and their quantification are described below, where, for consistency with thermodynamic convention, energy added to CCS is taken as positive and energy losses are taken as negative.

Absorbed solar radiation, $(1-\alpha)R_s$. The incident solar (short-wave) radiation is represented by R_s [$EL^{-2}T^{-1}$][§], and the albedo (i.e., reflectivity) of the water surface is represented by α [dimensionless]; therefore the amount of solar radiation that is absorbed within the zone is $(1-\alpha)R_s$. The average solar radiation, R_s, for each day in the four-year study (9/1/10–12/7/14) was obtained from the Florida Automated Water Network (FAWN) station located on the premises of the University of Florida Tropical Research and Education Center (TREC) in Homestead, Florida. The albedo, α, of a water surface is typically on the order of 0.1 for latitudes in the range of 20°–30° (Cogley, 1979), and a value of 0.1 was used as a reference value for this investigation. Factors such as the concentration of algae in the CCS can affect the value of α, and therefore the sensitivity of the temperature dynamics within the zone to elevated algae concentrations was investigated by varying α. The minimum value of α is equal to zero, in which case all of the incident solar radiation is absorbed by the CCS and none is reflected. Hence, α was varied within the range of 0–0.1.

Evaporation heat flux, E_h. Evaporation extracts heat from the CCS due to the latent heat of evaporation required to transform water from the liquid phase to the vapor phase. The evaporation heat flux, E_h [$EL^{-2}T^{-1}$], is given by

$$E_h = -E\rho_f L_v \tag{1}$$

where E [LT^{-1}] is the evaporation rate, ρ_f [ML^{-3}] is the density of fresh water, and L_v [EM^{-1}] is the latent heat of vaporization of water. The evaporation rate of water has long been known to decrease with increasing salinity (e.g., Harbeck, 1955; Salhorta et al., 1985). In the present study, daily evaporation rates, E, were calculated based on typical salinities in the CCS, measurements of water temperature, T_s [Θ], at the monitoring station within the zone, onsite measurements of air temperature, T_a [Θ] and relative humidity, RH [dimensionless] at station TPM-1, and measurements of wind speed, V_w, at station TD. The freshwater density, ρ_f, in Equation 1, was taken as 994 kg/m^3, which is the approximate density of fresh water at 35°C (95°F). The latent heat of vaporization, L_v, in Equation 1, is known to depend on both the temperature and salinity of the source (liquid) water. At a temperature of 35°C, values of L_v at salinities of 60‰ and 80‰ are 2.279 MJ/kg and 2.229 MJ/kg, respectively (Sharqawy et al., 2010), and an average of 2.254 MJ/kg was used for L_v in the energy analysis. The empirical formula used for estimating E [cm/d], from onsite meteorological

[§]Terms in square brackets indicate dimensions: E = energy, L = length, M = mass, T = time, and Θ = temperature.

measurements is

$$E = -\underbrace{C_{\mathrm{w}}(0.299 + 0.11V_{\mathrm{w}})}_{=f(V_{\mathrm{w}})}\,[\beta e_{\mathrm{s}}(T_{\mathrm{s}}) - \mathrm{RH}\, e_{\mathrm{s}}(T_{\mathrm{a}})] \tag{2}$$

where C_{w} [dimensionless] is a calibration constant, $f(V_{\mathrm{w}}) = C_{\mathrm{w}}(0.299 + 0.11V_{\mathrm{w}})$ is a wind function that accounts for the effect of wind on evaporation, V_{w} is the wind speed in m/s, β [dimensionless] is a factor that accounts for the effect of salinity on the saturation vapor pressure of water, and $e_{\mathrm{s}}(T)$ [kPa] is the saturation vapor pressure of water at temperature T. Equation 2 was used to calculate the evaporation for the sake of consistency with the previously developed salinity model of the CCS, where the constants C_{w} and β were taken as 0.69 and 0.885, respectively. In the salinity model, the value of C_{w} was determined by calibration, and the value of β was obtained from previous research on evaporation from saline water bodies reported by Salhorta et al. (1985). The evaporation formula given by Equation 2 has an uncertain functional form, particularly for the wind function $f(V_{\mathrm{w}})$.

Uncertainty in the wind function. Wind functions used to estimate evaporation typically have the form $f(V_{\mathrm{w}}) = a + bV_{\mathrm{w}}$, where a and b are constants. Such a wind function is used in Equation 2. In artificially heated waters, vertical convection is particulary important under low-wind conditions making specification of the value of a a key parameter. The wind function used in Equation 2 was originally proposed by Williams and Tomasko (2009) for heated waters, however, alternate formulations have been proposed by others (e.g., Brady et al., 1969; Ryan and Harleman, 1973). Notably, the formulation proposed by Ryan and Harleman (1973), and subsequently supported by Adams et al. (1975), accounts for the effect of the temperature difference between the heated water and the overlying air in specifying the convection parameter a in the wind function, which is a logical relationship that is not accounted for in the other models (including the model used in this study) and could be an important consideration in accounting for convective heat transfer at low wind velocities.

Rainfall heat flux, R_{h}. Rainfall that is cooler than the water in the CCS extracts thermal energy from the CCS because thermal energy in the CCS water is used to warm the rainwater. The heat flux, R_{h} [EL^{2}T^{-1}] due to rainfall directly on the CCS can be estimated using the relation

$$R_{\mathrm{h}} = -\rho_{\mathrm{f}} c_{p\mathrm{f}}\, d_{\mathrm{r}}(T_{\mathrm{s}} - T_{\mathrm{r}})$$

where ρ_{f} [ML^{-3}] and $c_{p\mathrm{f}}$ [EM$^{-1}\Theta^{-1}$] are the density and specific heat of the (fresh) rainwater, respectively, d_{r} is the depth of rainfall, T_{s} [Θ] is the temperature of the water in the CCS, and T_{r} [Θ] is the temperature of the rainfall. There are no direct measurements of rainfall temperature at the Turkey Point site, however, it can be estimated that during a rainfall event the ambient air can be cooled by several degrees, and the temperature of raindrops approaches that of the cooled ambient air. Cooling effects of rainfall on the ambient air have been reported to be as high as 10°C (Byers, 1949). On a global average, raindrops can have temperatures in the range of 32°F–80°F (0°C–27°C). For purposes of the present analysis, the temperature of the rainfall, T_{r}, was assumed to be 68°F (20°C), and the corresponding values of ρ_{f} and $c_{p\mathrm{f}}$ were taken as 998 kg/m^3 and 4.180 kJ/kg·°C, respectively. The temperature dynamics in the CCS zones are relatively insensitive to the assumed temperature of the rainfall.

Atmospheric longwave radiation, L_{a}. Any body of matter whose temperature is above absolute zero emits longwave radiation. Longwave radiation, L_{a} [W/m^2] emitted by the atmosphere can be estimated using the relation (Chin, 2013)

$$L_\mathrm{a} = \sigma(T_\mathrm{a} + 273)^4(0.6 + 0.031\sqrt{\mathrm{RH}\, e_\mathrm{s}(T_\mathrm{a})}(1 - R_\mathrm{L})$$

where σ is the Stefan-Boltzmann constant ($= 4.903 \times 10^{-9}\,\mathrm{MJ{\cdot}m^2K^{-4}d^{-1}}$), T_a [°C] is the air temperature, RH [dimensionless] is the relative humidity, $e_\mathrm{s}(T_\mathrm{a})$ [mm Hg] is the saturation vapor pressure of water at temperature T_a, and R_L is the longwave reflection coefficient that can be taken as 0.03. On cloudy days, atmospheric longwave radiation can be the greatest source of thermal energy at the water surface.

Water longwave radiation, L_w. Water in the CCS also emits longwave radiation by virtue of its temperature being greater than absolute zero. Longwave radiation, L_w [W/m^2] emitted by the water in the CCS can be estimated using the relation (Chin, 2013)

$$L_\mathrm{w} = -\epsilon\sigma(T_\mathrm{s} + 273)^4$$

where ϵ is the emissivity of water that can be estimated as 0.97 [dimensionless], σ is the Stefan-Boltzmann constant as given previously, and T_s [°C] is the temperature of the water in the CCS.

Heat interchange with surrounding aquifer, G_h. The CCS exchanges heat with the surrounding aquifer via seepage of groundwater into and out of the CCS, and conduction of heat between water in the CCS and groundwater in the surrounding aquifer. It is to be expected that the region immediately surrounding the CCS is normally cooler than the water in the CCS, in which case there will be cooling of the CCS water due to heat conduction between the CCS and the surrounding aquifer, cooling due to seepage inflow from the surrounding aquifer into the CCS, and no cooling or heating due to seepage outflow from the CCS into the surrounding aquifer. The cooling heat flux due to conduction can be assumed to negligible compared to the heat flux due to seepage inflow. The heat flux G_h [EL^{-2}T^{-1}] due to seepage inflow is proportional to the temperature difference between the water in the CCS and the groundwater in the surrounding aquifer and can be estimated by the relation

$$G_\mathrm{h} = -\rho_\mathrm{g} c_{p\mathrm{g}} \frac{Q_\mathrm{sg}}{A_\mathrm{s}} \Delta T_\mathrm{sg}$$

where ρ_g [ML^{-3}] and $c_{p\mathrm{g}}$ [EM$^{-1}\Theta^{-1}$] are the density and specific heat, respectively, of the groundwater surrounding the CCS, Q_sg [L^{3}T^{-1}] is the seepage inflow to the CCS from the surrounding aquifer, A_s [L^2] is the area of the CCS zone, and ΔT_sg [Θ] is the difference between the temperature in the CCS, T_s [Θ], and the temperature on the surrounding groundwater, T_g [Θ] (i.e., $\Delta T_\mathrm{sg} = T_\mathrm{s} - T_\mathrm{g}$)

Conduction heat flux, C_h. The conduction heat flux is associated with the sensible transfer of heat between the CCS water and the air above the CCS. The conduction heat flux, C_h [W/m^2] can be estimated using the empirical relation (Chin, 2013; Chapra, 1997)

$$C_\mathrm{h} = -c_\mathrm{B} f(V_\mathrm{w})\,(T_\mathrm{s} - T_\mathrm{a})$$

where c_B is Bowen's coefficient, and $f(V_\mathrm{w})$ is the wind function as defined in Equation 2. Following the guidance given in Chin (2013) and Chapra (1997), the value of c_B can be estimated as 0.063. According to Martin and McCutcheon (1998), sensible heat transfer from lakes and reservoirs to the overlying air due to conduction and convection is a relatively small component of the heat balance equation that is poorly understood, and Brown and Barnwell (1987) have noted that the conduction heat flux from lakes and reservoirs to the overlying air calculated by heat-transfer theory is normally small enough to neglect. Given the aforementioned considerations, conduction of heat between the CCS and the overlying air was neglected in this analysis.

Based on the component heat fluxes described above, the net heat flux, $\dot{H}_{\mathrm{C}}$ [$\mathrm{EL^{-2}T^{-1}}$], into the CCS is given by

$$\dot{H}_{\mathrm{C}} = \sum_{i=1}^{4} \left\{ [(1-\alpha)R_{\mathrm{s}} + E_{\mathrm{h}} + R_{\mathrm{h}} + L_{\mathrm{a}} + L_{\mathrm{w}} + G_{\mathrm{h}}]_i \, A_i \right\} \tag{3}$$

where i is an index that refers to each zone within the CCS, A_i [$\mathrm{L^2}$] is the area of Zone i, and the summation is over the four zones within the CCS. The areas of each of the zones in the CCS are given in Table 1, and the total area of the CCS is approximately 1907 ha (= 4712 ac). The heat extracted from the CCS by pumping cooler water from the ID into the CCS was calculated in a similar manner to the method used to calculate the cooling effect of rainfall, where the "effective" rainfall rate is equal to the volume of water pumped from the ID divided by the area of the CCS. Assuming (conservatively) that the temperature difference between the ID water and the CCS water is 10°C (50°F), the cooling effect of pumped ID water was found to be negligible compared with other component fluxes in the heat-balance equation.

Table 1: CCS Zonal Areas in Energy and Salinity Models

Zone	**Area (ha)**
1	368.0
2	795.1
3	396.6
4	347.0
Total	1906.7

2.2.3 Heat-Balance Equations

Under steady-state conditions, conservation of thermal energy requires that the net rate at which heat is added to the CCS is equal to the difference in thermal energy between the water leaving the CCS and the water entering the CCS. This relationship is expressed by the following equation,

$$\dot{H}_{\mathrm{C}} = \rho_s c_{ps} Q (T_4 - T_1) \tag{4}$$

where ρ_s and c_{ps} are the density and specific heat of the CCS water, Q is the flow rate of water through the CCS, T_4 the temperature of the cooling water at the intake of the power plant (in Zone 4), and T_1 is the temperature of the cooling water at the discharge from the power plant (in Zone 1). If the power-generating units add heat to the water at a rate $\dot{H}_{\mathrm{G}}$, then between the intake and discharge end of the power-generating units the heat-balance equation is given by

$$\dot{H}_{\mathrm{G}} = \rho_s c_{ps} Q (T_1 - T_4) \tag{5}$$

Combining Equations 3, 4, and 5 requires that the heat rejection rate in the power-generating units, $\dot{H}_{\rm G}$, is related to the net rate at which heat is added to the CCS, $\dot{H}_{\rm C}$, by the relation

$$\dot{H}_{\rm G} = -\sum_{i=1}^{4}\left\{ [(1-\alpha)R_{\rm s} + E_{\rm h} + R_{\rm h} + L_{\rm a} + L_{\rm w} + G_{\rm h}]_i\, A_i \right\} \tag{6}$$

This equation can be used to estimate the heat-rejection rate, $\dot{H}_{\rm G}$, of the power-generating units based on field measurements that are used to calculate the terms on the righthand side of Equation 6. In cases where daily time steps are used, estimated values of $\dot{H}_{\rm G}$ might fluctuate about a mean value and be difficult to discern. In such cases, the average heat-rejection rate, $\langle \dot{H}_{\rm G}\rangle_J$, over a period of J time steps can be estimated using the relation

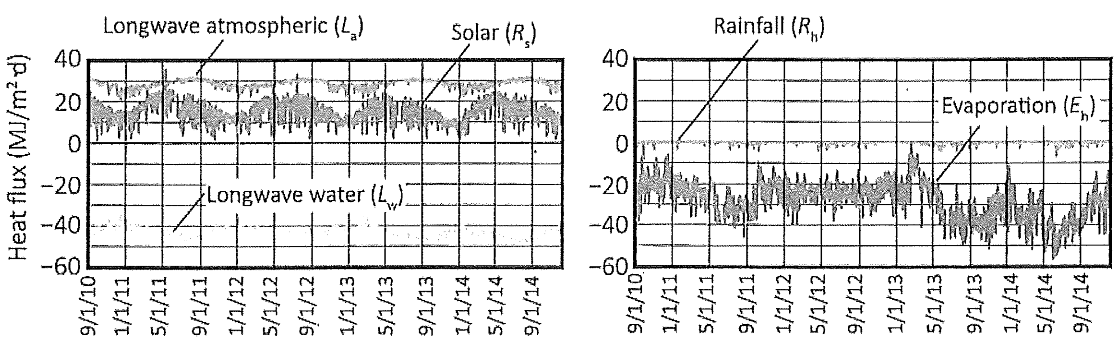
$$\langle \dot{H}_{\rm G}\rangle_J = \frac{1}{J\Delta t}\sum_{j=1}^{J} \dot{H}_{\rm G}\Delta t \tag{7}$$

where Δt is the duration of each time step. In accordance with Equation 7, a constant heat rejection rate can be recognized by plotting the cumulative estimated heat rejection rate, $\sum_{j=1}^{J} \dot{H}_{\rm G}\Delta t$, versus time, $J\Delta t$, which would would result in a straight line of constant slope equal to $\langle \dot{H}_{\rm G}\rangle_J$. This relationship was used in this study to identify periods of constant heat rejection rate of the power-generating units that utilize the CCS.

2.2.4 Model Results

The heat-balance model was applied to each of the four zones within the CCS to determine the net heat flux into each zone, and the results from all zones were combined to determine the net heat flux into the entire CCS. The energy model was applied at daily time steps for the period of record 9/1/10 – 12/7/14. The thermal-energy dynamics within each of the CCS zones are similar, and the fluctuations of the heat-flux components in Zone 1 will be used to demonstrate the thermal-energy dynamics within each zone.

Zone 1 heat-flux components. The longwave radiation and shortwave solar energy fluxes as a function of time are shown in Figure 6(a), and the evaporation and rainfall heat fluxes as a function of time are shown in Figure 6(b). It is apparent that the shortwave and longwave energy fluxes vary seasonally, and that there



(a) Longwave and solar energy

(b) Rainfall and evaporation energy

Figure 6: Energy fluxes in Zone 1

is much more seasonal variation in the shortwave solar radiation than in the longwave radiation. The net longwave radiation has a cooling effect (i.e. net negative heat flux) which contributes to a net-radiation cooling of the CCS water at night when the solar radiation is effectively zero. It is apparent from Figure 6(b) that evaporation and rainfall generally have a cooling effect, with evaporation usually having the greater cooling effect and rainfall having a lesser cooling effect. The convective heat flux between the CCS and the adjacent groundwater, G_h, is not shown in Figure 6 because the magnitude of G_h is generally much smaller that the heat flux due to rainfall and therefore has a minimal impact on the heat balance within the CCS.

Heat rejection rate of the power-generating units. To determine the thermal dynamics in the entire CCS, the component heat fluxes were determined for each zone within the CCS, and these heat fluxes were combined in accordance with Equation 6 to determine the thermal energy that is added to the CCS by the power plant (i.e., the heat-rejection rate). The cumulative heat-rejection from the power plant as a function of time for the entire CCS is shown in Figure 7. It is apparent from Figure 7 that there are two

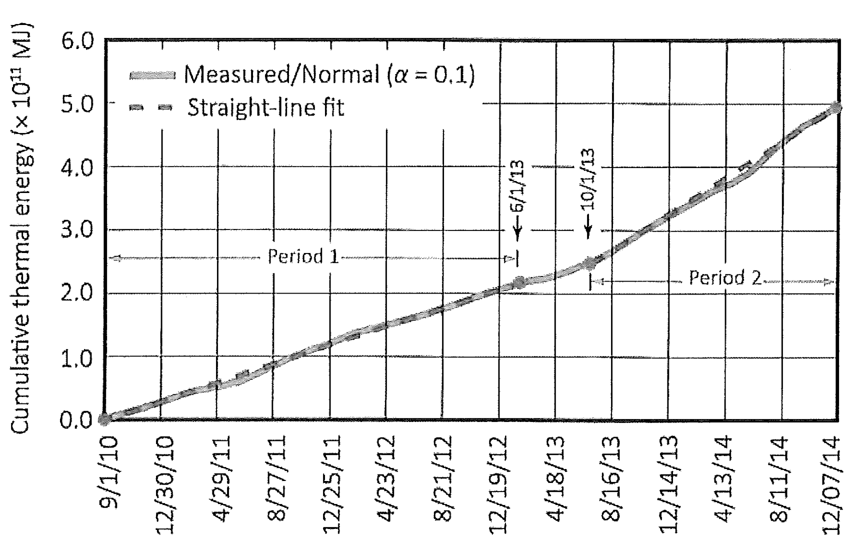


Figure 7: Cumulative heat rejection rate from the power plant

periods during which the heat rejection rate is approximately constant. The first period, shown as Period 1 in Figure 7, covers the time interval 9/1/10 – 2/1/13, and the second period (Period 2) covers the time interval 7/1/13 – 12/1/14. Notably, Period 1 includes the pre-uprate period before May 2013 and Period 2 includes the post-uprate period after May 2013. During Period 1, the average heat-rejection rate is estimated to be around 2800 MW, and during Period 2 the average heat-rejection rate is estimated to be around 5500 MW. Although these estimated heat rejection rates are preliminary estimates and derived from an uncalibrated heat-balance model, the distinct difference in heat-rejection rates between the two periods is clear, and the numerical estimates of the heat-rejection rates during these two periods are reasonable given the capacities of the power-generating units serviced by the CCS and the energy efficiencies normally associated with both fossil-fuel and nuclear power plants. A logical inference from the results shown in Figure 7 is that the uprate in power-generating capacity of the two nuclear units (Units 3 and 4) has caused the total heat-rejection rate from the power plant to increase significantly. This finding is not inconsistent with the condition that the post-uprate generating capacity of the power plant served by the CCS is less than the pre-uprate generating capacity (due to Unit 2 operating in synchronous generator mode). This is so because in the post-uprate generating capacity there is a significant shift from fossil-fuel generation to nuclear-power generation, and nuclear-power units are known to have a much higher heat-rejection rates to cooling water than fossil-fuel generating units, which release a significant portion of their waste heat in flue-gas emissions.

Effect of algae. It is assumed that the algae content of the CCS affects the heat balance in the CCS by increasing the amount of solar energy that is absorbed by the CCS. Consequently, the effect of algae in the CCS was investigated by reducing the albedo (i.e., reflectivity), α, of the water surface from 0.1 to 0.0 starting on January 1, 2014. An albedo of 0.1 was used in the "normal" simulations presented in Figure 7 since this is the typical value of α that is associated with water surfaces at subtropical latitudes; this corresponds to 90% of the incident solar radiation being absorbed by the water in the CCS. Assuming that the effect of algae is to retain more solar heat, then taking $\alpha = 0$ reflects the extreme case where the CCS with high concentrations of algae absorbs 100% of the incoming solar radiation. The effect of reducing α from 0.1 to 0.0 on the estimated cumulative heat-rejection rate is shown in Figure 8. It is apparent that the

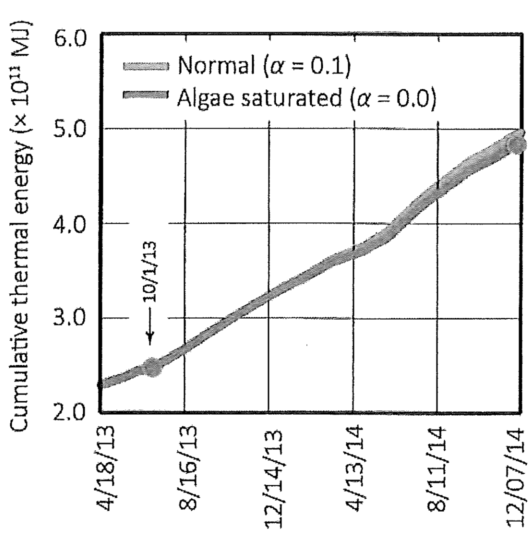


Figure 8: Estimated algae effect on estimated cumulative heat rejection rate from the power plant

impact of the higher absorption rate of solar energy attributed to high algae concentrations is relatively small compared with the heat rejection rate of the power-generating units. In quantitative terms, the increased rate of heating of the CCS due to reduced reflection of solar energy is around 400 MW, compared with a normal heat rejection rate of around 5700 MW (in 2014). This indicates that the (maximum) rate of increased heating caused by algae is only around 7% of the normal heat-rejection rate, and hence there is a relatively small heating effect caused by algae in the CCS.

Relationship between increased net heat flux and temperature. An increased heat-rejection rate would be expected to increase the temperature in the CCS relative to the temperature of the overlying air. Representing the temperature in the CCS as T_s, and the temperature of the overlying air as T_a, this temperature difference is $T_s - T_a$. The variation of $T_s - T_a$ as function of time for each of the four CCS zones is shown in Figure 9, where the average temperature difference during Period 1 and Period 2 are shown as horizontal lines. It is apparent from Figure 9 that the increase in the average heat-rejection rate from Period 1 to

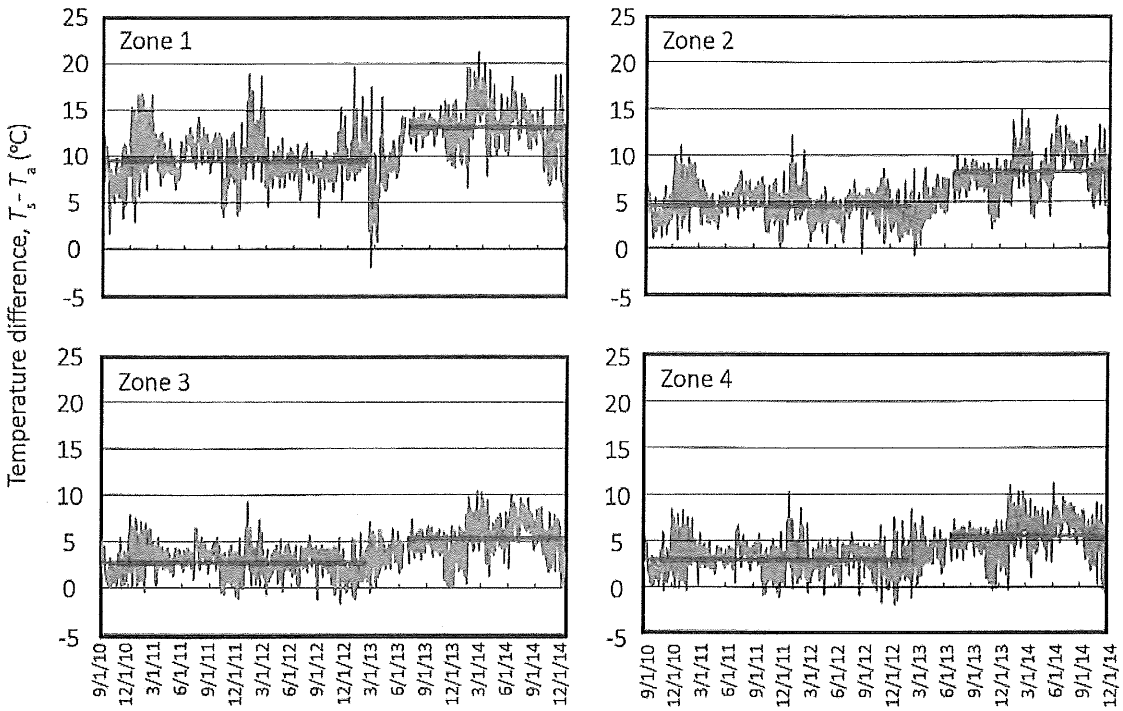


Figure 9: Temperature differences between CCS and overlying air. Horizontal lines show intervals of constant heat-addition rates.

Period 2 corresponds to an increase in the average value of $T_s - T_a$. Representing the average value of $T_s - T_a$ during Period 1 as $\overline{\Delta T}_1$ and the average value of $T_s - T_a$ during Period 2 as $\overline{\Delta T}_2$, these averaged values for each CCS zone are shown in Table 2, along with the corresponding standard deviations, S_1 and S_2, respectively. These results show that in Zone 1, which accepts the cooling-water discharge, the average temperature difference between the CCS and the overlying air has increased from 9.6°C (18°F) to 13.1°C (23.6°F), which corresponds to an average temperature increase of 3.5°C (6.3°F). In Zone 4, which contains the cooling-water intake, the average temperature difference between the CCS and the overlying air has increased from 2.8°C (5.0°F) to 5.4°C (9.7°F), which corresponds to an average temperature increase of 2.6°C (4.7°F). These changes in average temperature can be contrasted with previous (pre-uprate) predictions made by FPL's engineering consultants in 2008 where it was anticipated that the uprate of Units 3 and 4 would cause a maximum temperature increase of 1.4°C (2.5°F) in the discharged cooling water (to Zone 1) and an increase of 0.5°C (0.9°F) in the temperature of the intake water (from Zone 4). The standard deviations of the temperature fluctuations are similar across all zones, and have shown relatively modest decreases between the pre-uprate and post-uprate periods. Of particular interest, in Zone 1 the standard deviation decreased from 3.8°C (6.8°F) to 3.3°C (5.9°F), and in Zone 4 the standard deviation decreased from 3.9°C (7.0°F) to 3.5°C (6.3°F).

Table 2: Temperature Statistics in CCS

	Period 1		**Period 2**			
	$\overline{\Delta T}_1$	S_1	$\overline{\Delta T}_2$	S_2	$\overline{\Delta T}_2 - \overline{\Delta T}_1$	
Zone	(°C)	(°C)	(°C)	(°C)	(°C)	(°F)
1	9.6	3.8	13.1	3.3	3.5	6.3
2	4.6	3.7	8.4	3.7	3.8	6.8
3	2.9	3.9	5.5	3.6	2.6	4.7
4	2.8	3.9	5.4	3.5	2.6	4.7

Thermal efficiency. The thermal efficiency, η_t, of the CCS is a measure of the ability of the CCS to cool the water down to the background air temperature. The thermal efficiency of the CCS was previously measured by Lyerly (1998) using the relation

$$\eta_t = 1 - \frac{T_i - T_a}{T_d - T_a} \tag{8}$$

where T_d and T_i are the temperatures of the cooling water at the discharge and intake ends of the power plant, respectively, and T_a is the temperature of the ambient air above the CCS. The thermal efficiency of the CCS can be estimated using Equation 8 by replacing $T_d - T_a$ by the average value of $T_s - T_a$ in Zone 1, and replacing $T_i - T_a$ by the average value of $T_s - T_a$ in Zone 4. Using the averaged temperature differences given in Table 2 in Equation 8 gives:

$$\text{Period 1: } \eta_t = 1 - \frac{2.8}{9.6} = 0.71, \qquad \text{Period 2: } \eta_t = 1 - \frac{5.4}{13.1} = 0.59$$

These results indicate that the thermal efficiency of the CCS in Period 1 is around 70% and the thermal efficiency of the CCS in Period 2 is around 60%. Hence, the thermal efficiency of the CCS has apparently decreased between Period 1 and Period 2. The reason for this decrease in thermal efficiency is not readily apparent and could be due to a variety of factors, including increased thermal loading and increase algae concentrations in the CCS. It should be noted that the thermal efficiency of 86% reported by Lyerly (1998) is not directly comparable to the values calculated here, since the additional cooling between the discharge location and the Zone 1 temperature measurement station, as well as the additional cooling between the intake location and the Zone 4 temperature measurement location are not taken into account in the present analysis.

2.2.5 Conclusions

The results derived from the heat-balance model indicate that the rate of heat addition to the CCS has increased significantly during the period of record, and that the increased heat-addition rate is manifested in an increase in the average temperature in the CCS relative to the temperature of the overlying air. It appears that the most likely cause for the increased heat-addition rate is an increased heat-rejection rate from the power-generating units. Notably, the increased heat-addition rate began shortly after the beginning of the post-uprate period. As a result of the increased heat addition to the CCS, the average temperature in the intake zone (Zone 4) has increased by approximately 2.6°C (4.7°F). Interestingly, this measured increase in average temperature is slightly greater than the increase in the maximum allowable operating temperature at the intake location of 2.2°C (4.0°F)[¶] approved by the Nuclear Regulatory Commission in 2014. Therefore, the increased maximum allowable operating temperature has not reduced the probability of the intake temperatures exceeding the threshold value, and might have slightly increased the probability of exceeding the threshold temperature. This serves as a cautionary note regarding further increases in power generation beyond 2014 levels without providing a supplementary system to cool the water in the CCS. Others have cited increased algae concentrations in the CCS as being as a possible reason for elevated temperatures of the water in the CCS. However, a sensitivity analysis indicates that changes in the algae-influenced solar reflectivity of the CCS within a realistic range are unlikely to have been of sufficient magnitude to cause the observed changes in temperature, nor stimulate the sudden change in heat-addition rate that was observed almost immediately after the beginning of the post-uprate period. There are indications that the thermal efficiency of the CCS has decreased significantly between the pre-uprate and post-uprate periods. Further investigation is recommended to confirm this finding and to identify the factor(s) causing the reduced thermal efficiency.

Limitations of the heat-balance model. The heat-balance model developed for this study is based on the best estimates of all of the heat-balance components that influence the temperature in the CCS. However, the heat-balance model has not been calibrated due to lack of available data for calibration. Data required to calibrate the heat-balance model would include synoptic measurements of the flow rate and temperature differences between the intake and discharge structures of the power-generating units, and synoptic temperatures and flow rates at the inflow and outflow faces of each CCS zone. Calibration of the heat-balance model would not necessarily change the key inferences that have been drawn from the uncalibrated model, namely that there has been a significant increase in the heat-rejection rate from the power-generating units during the post-uprate period, and that increased algae concentrations and increased ambient temperatures are not the most likely causes of elevated temperatures in the CCS. Further development of a calibrated heat-balance model is warranted to confirm the conclusions that have been drawn.

3 Salinity Variations in the Cooling Canals

Salinity is defined as the mass of dissolved salts per unit mass of solution, and is usually reported directly in units of either parts per thousand (‰) or as a dimensionless number on the practical salinity scale 1978 (PSS-78). Salinities are sometimes expressed indirectly in terms of chlorinity (mg/L chloride) or conductance (mS/cm). In this report, salinities are expressed in units of parts per thousand (‰), which gives salinities approximately equal in magnitude to salinities expressed in PSS-78. As reference points, average seawater at 25°C has a salinity of 35‰, a chlorinity of 19.84 g/L, and a specific conductance of 54.7 mS/cm. Hypersaline water is typically defined as water with a salinity greater than 40‰ or a specific conductance greater than 61.5 mS/cm, and brine is typically defined as water with a salinity greater than 50‰. These hypersalinity and brine thresholds are routinely exceeded in the CCS, and therefore water within the CCS can be properly classified either as being hypersaline or as brine.

[¶]From 37.8°C to 40°C (100°F to 104°F)

3.1 Results from Previous Studies

There has been a continuous upward trend in salinity since the CCS began operation in August 1973, and this trend is clearly apparent in Figure 10, which shows the maximum reported salinities in the CCS since the initial NPDES report was submitted in 1973. The long-term trend of increasing salinity shown in Figure 10

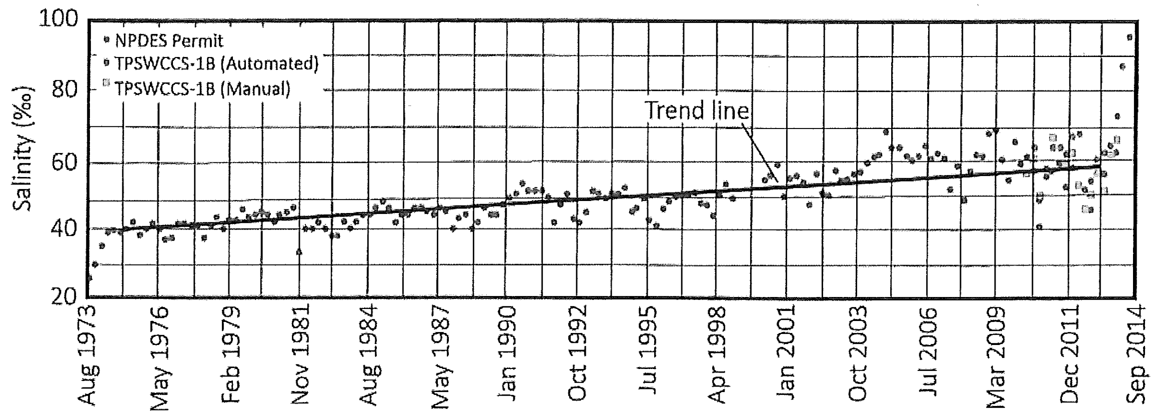


Figure 10: Maximum observed salinities in the CCS since initial operation

can be approximated as being linear (as shown by the linear trend line) with a salinity increase of around 5‰ per 10 years. It is also apparent from Figure 10 that the rate of increase in salinity might have accelerated since 2013. The salinity in the CCS when it was first put into operation was around 26.5‰, with the contemporaneous salinity in Biscayne Bay being around 33‰ (Lyerly, 1973). The average CCS salinity in 1998 was reported to be in the range of 38 – 50‰ (Lyerly, 1998), and in May 2014, the salinity in the CCS was reported to be as high as 95‰.

Salinity-control processes. The key processes affecting the salinity in the CCS are: rainfall, evaporation, and groundwater exchange between the CCS and the surrounding aquifer. Average annual rainfall at Turkey Point is approximately 60 inches, and the natural annual evaporation at Turkey Point is approximately equal to the average annual rainfall. Actual evaporation of water from the CCS exceeds natural evaporation due to the elevated temperatures in the CCS. The steady increase in salinity since operation of cooling canals began in the early 1970s (as shown in Figure 10) has been most commonly attributed to evaporation excess over rainfall.

3.1.1 Historical Chloride Levels

Chloride concentrations (i.e., chlorinities) in the CCS between June 2010 and June 2012 were in the range of 26 – 46 g/L with an average chlorinity of 33.9 g/L. The average chlorinity in Biscayne Bay during the same period was 18.9 g/L (Ecology and Environment, Inc., 2012). There is little difference (less than 10%) in chloride concentration between samples collected near the surface or near the bottom at any given sampling location within the CCS canals. Chloride concentrations in the CCS during the post-uprate period were observed in range of 27.0 – 49.8 g/L, with the highest values observed in March 2014 and the lowest values in June 2013 (Ecology and Environment, Inc., 2014).

3.1.2 Historical Specific Conductance Levels

Specific conductances in the CCS between June 2010 and June 2012 were in the range of 70 – 90 mS/cm. Specific conductance in the CCS has been rising since the beginning of the dry season in 2014 and reached over 120 mS/cm in May 2014. The average post-uprate specific conductance for all CCS stations was reported as 92.6 mS/cm, and this average value was over 15 mS/cm higher than the average value reported in the pre-uprate period.

3.2 Salinity-Balance Model of CCS

The salinity-balance model of the CCS that is currently being used to simulate salinity variations in the CCS was developed by engineering consultants for FPL. The salinity-balance model uses a finite-control-volume approach in which the control volume is defined to include the canals of the CCS and the adjacent interceptor ditch (ID). The salinity-balance model is closely related to a companion water-balance model, with both models having been developed by the same contractor and described by Ecology and Environment, Inc. (2012). For purposes of the current analyses, this previously developed model will be accepted as valid and the relevant components of the model formulation are described in the following section.

3.2.1 Salinity-Balance Model Formulation

Component salinity fluxes into and out of the defined control volume are determined by multiplying the water (volume) flux by the corresponding salinity. The components of the water balance model are the lateral and vertical seepage into the CCS, blowdown water (i.e., additional water pumped from other units to the CCS), rainfall (including runoff from earth berms between canals), and evaporation. The key features of the salinity model are as follows:

- The base of the control volume is assumed to be the bottom of the ID and the cooling canals, whose elevation ranges from approximately −3 ft feet NAVD[1] to approximately −30 ft NAVD. The elevation of bottom of the ID is approximately −20 ft NAVD. Sloping sidewalls of the canals in the CCS are taken into account by expressing the water-surface area as a function of the water-surface elevation(s) in the CCS.

- Lateral seepage of water and salt between the L-31E Canal and the control volume is calculated directly from the product of the calibrated hydraulic conductivity and the difference in water-surface elevations between the L-31E Canal and the ID.

- Lateral seepage of water and salt between Biscayne Bay and the control volume is calculated directly from the product of the calibrated hydraulic conductivity and the difference in water-surface elevations between the CCS and Biscayne Bay.

- Vertical seepage of water and salt through the bottom of the control volume is calculated directly from the product of the calibrated hydraulic conductivity and the difference in the water-surface elevations in the CCS and the measured and estimated piezometric heads beneath the CCS.

- Evaporation is estimated using Equation 2, which uses meteorological data collected from meteorological stations in and immediately to the north and south of the CCS.

[1] "NAVD" refers to the NAVD 88 datum.

- Rainfall is estimated using Next Generation Weather Radar (NEXRAD) precipitation data provided by the SFWMD. Runoff into the control volume from earth berms between canals is used as a calibration parameter and is initially assumed to be 50% of the rainfall that falls on the berms.
- Added water from Units 3 and 4 are assumed to be freshwater (non-saline); Unit 5 blowdown salinities are adjusted to between 20% and 80% of seawater (35‰), with the exact percentage used as a calibration parameter.
- The ID control system is simulated to operate primarily between the months of January and June; with pumping rates as high as 50 mgd and averaging 4.5 mgd over the calibration period.
- The water-budget model is calibrated first by minimizing the errors between the simulated and observed storage in the control volume. Parameters adjusted during calibration of the water-budget model included the hydraulic conductivities in the aquifer adjacent to and beneath the CCS, an evaporation factor that adjusts the coefficients in the wind function, the amount of runoff that enters the control volume as percentage of precipitation, and the amount of Unit 5 cooling-tower water that is lost to evaporation before entering the CCS. The salinity model uses measured salinities in and around the CCS.

Calibrated values of the horizontal hydraulic conductivities in the aquifer surrounding the control volume have been found to be in the range of 500−950 ft/d, and calibrated values of the vertical hydraulic conductivities beneath the control volume have been found to be in the range of 0.1−4 ft/d. Vertical hydraulic conductivities beneath the northern discharge canals and beneath the return canals, where it is assumed deeper canals intersect highly permeable material underlying the muck and Miami Limestone Formation, were calibrated to have (higher) vertical hydraulic conductivities of 3.8 ft/d and 4 ft/d, respectively. Lower vertical hydraulic conductivities of 0.1 ft/d were calibrated for the mid- and southern portions of the discharge canals, as well as the southern portion of the return canals. Calibration of the salinity model was done entirely by the FPL contractor.

3.2.2 Previous Model Results

The model was run to simulate salinity variations both before the uprate (i.e., before November 2012) and after the uprate (i.e., after May 2013). The results of these model simulations are useful in understanding the salinity dynamics in the CCS and are described below.

Pre-uprate model results. The salinity model was calibrated for a 22-month pre-uprate period and the results showed an average volume outflow rate from the CCS of 0.62 mgd, with monthly-averaged outflow rates ranging from −46.6 mgd (October 2010) to +52.1 mgd (September 2010) (Ecology and Environment, Inc., 2012). Net flow through the bottom of the CCS was generally outward between the dry-season months of September through February, and inward during the wet-season months. Average inflow from precipitation during the wet season was more than twice that for the dry season. It was reported that vertical flows into and out of the control volume were substantially larger than lateral flows.

Post-uprate model results. A second round of salinity-model results was reported for the post-uprate period of June 2013−May 2014 (Ecology and Environment, Inc., 2014). The results showed an average outflow rate of 3.26 mgd, with monthly-averaged outflow rates ranging from −31.1 mgd (June 2013) to

$+19.6$ mgd (July 2013). During the pre-uprate and interim operating period, (September 2010 to May 2013), precipitation accounted for 39.4% of inflowing water to the CCS and evaporation accounted for 63.7% of the outflowing water from the CCS. There was an average rate of increase of salt in the CCS during the post-uprate period of 2.2×10^6 lb/d, which was attributed primarily to the combined effects of low rainfall and high evaporation. These model simulations were able to match the summer 2014 rise in salinity from approximately 60‰ to approximately 90‰.

3.2.3 Analysis of Salinity Dynamics

The primary drivers of salinity variations in the CCS are rainfall, evaporation, and seepage exchanges between the CCS and the surrounding aquifer. Pumpage from the ID can also influence salinity variations in the CCS, but its role is secondary to that of the aforementioned processes. Evaporation increases the salinity, rainfall and ID pumpage decrease the salinity, and seepage interchange with the surrounding aquifer can either increase or decrease the salinity depending on other factors.

Salinity variations under dry conditions. Under conditions of no rainfall (i.e., dry conditions), salinity in the CCS is primarily controlled by evaporation, and the salinity in the CCS steadily increases with time. Evaporation removes pure water from the CCS, and the volume of pure water that is evaporated is replenished by the seepage of saline water into the CCS from the surrounding aquifer. Since the CCS is directly connected to the surrounding aquifer, the water surface elevation within the CCS remains close to the water-table elevation in the surrounding aquifer which changes over relatively long time scales (viz. months) compared to the shorter time scales (viz. days, weeks) over which significant salinity variations are observed. Small differences between the water-surface elevations in the CCS and the water-table elevations in the adjacent aquifer are proportional to the seepage interchange between these two bodies of water. Over shorter time scales (viz. days) the evaporated volume of pure water is approximately equal to the seepage inflow volume of saline water, and the volume of water within the CCS remains approximately constant. This mechanism results in an increased mass of salt in an unchanged CCS volume, and hence an increase in salinity.

Salinity variations under wet conditions. When rainfall occurs (i.e., wet conditions), salinity is primarily controlled by the difference between evaporation and rainfall. Conditions under which evaporation exceeds rainfall result in the net removal of pure water from the CCS and the dynamics of salinity variations under this condition are similar to those described previously for evaporation without rainfall. Hence, for time intervals where evaporation exceeds rainfall, the salinity in the CCS can be expected to increase. For time intervals where rainfall exceeds evaporation, there is a net inflow of (approximately) pure water into CCS that is equal to the difference between the rainfall and evaporation volumes, and this inflow is approximately balanced by the volume of saline water that seeps out of the CCS into the surrounding aquifer. The salinity of the seepage outflow is approximately equal to the salinity of the water within the CCS. This mechanism results in a decreased mass of salt in the CCS in an unchanged volume, and hence a decrease in salinity.

Salinity variations under ID pumping. Pumping water from the ID into the CCS has a relatively minor effect on the salinity in the CCS relative to rainfall and evaporation, since the volume of pumped water is relatively smaller and the difference in salinity between the pumped water and the water in the CCS is also less than for evaporation and rainfall.

3.2.4 Demonstration of Salinity Dynamics

The mechanism driving salinity changes in the CCS can be demonstrated using the previously calibrated salinity model. The cumulative rainfall, evaporation, seepage inflow, ID pumpage, and water storage (= net inflow) within the CCS between September 2010 and April 2014 are shown in Figure 11. It is apparent

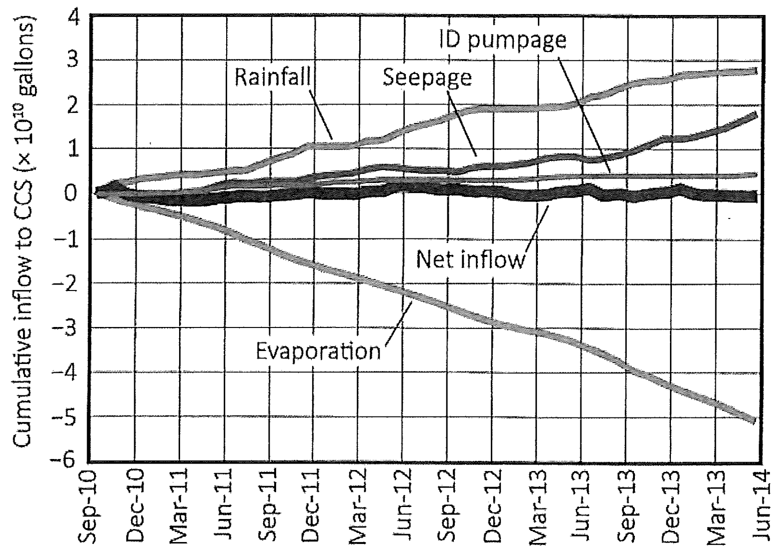


Figure 11: Water inflow into CCS

from Figure 11 that the storage in the CCS remains relatively constant compared with cumulative rainfall, evaporation, ID pumpage, and seepage inflow. Further, it can be asserted from Figure 11 that the seepage inflow adjusts to the difference between evaporation and rainfall-plus-ID-pumpage so as to keep the volume of water within the CCS approximately constant. The cumulative evaporation and rainfall in Figure 11 show approximately linear trends, with the evaporation trend line showing an average evaporation rate of approximately 39 mgd, and the rainfall trend line showing an average rainfall rate of approximately 21 mgd.

Distribution of seepage inflows and outflows. Seepage flow to the CCS does not occur uniformly over the interfaces of the CCS with the surrounding aquifer, and the relative volumes of seepage inflow over the CCS interfaces are shown in Figure 12. It is apparent from Figure 12 that most of the inflow is across the East interface (i.e., the interface facing Biscayne Bay), most of the outflow is across the Bottom interface, relatively lesser volume fluxes occur across of the North, South, and West interfaces, and inflows and outflows occur across all interfaces to varying degrees. The relative seepage contributions from the different faces are important inasmuch as the salinity in the aquifer adjacent to the East interface tends to be at least as high as the salinity in Biscayne Bay, the salinity in the aquifer adjacent to the Bottom interface tends to be on the same order of magnitude as the salinity in the CCS, and lesser salinities occur at the North, South, and West interfaces. The salt contributions from the CCS seepage interfaces are shown in Figure 13. It is apparent that the salt fluxes across the East and Bottom interfaces constitute the predominant components of the salt budget, with influx of salt primarily associated with the East interface and efflux of salt primarily associated with the Bottom interface; keeping in mind that both influx and efflux of salt can occur at these

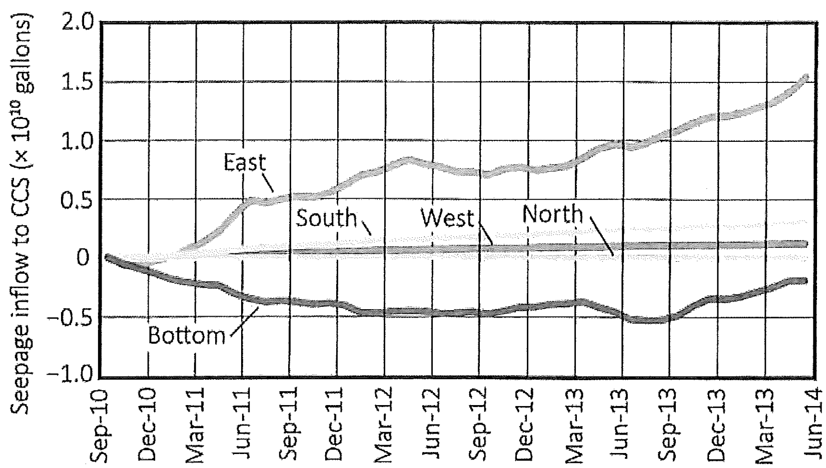


Figure 12: Seepage into CCS from aquifer

interfaces. Lesser but still significant salt influx occurs across the South interface and via ID pumping, with much smaller to negligible salt fluxes across the North and West interfaces. It is apparent from Figure 13 that in the interval September 2013–May 2014 the flux of salt was primarily and (almost) consistently into the CCS from both the East and Bottom interfaces and, with relatively stable water level and volume in the CCS, this yielded an (almost) consistent increase in the CCS salinity as demonstrated by the measurements shown in Figure 14. Since the seepage influx was driven by the deficit between evaporation and rainfall volumes, it can be concluded that the increase in salinity in the CCS was due directly to the evaporation-rainfall deficit causing contemporaneous influxes of salinity from both the Bottom and East interfaces. Subsequent to the time period covered by Figure 14, salinity in the CCS during 2014 increased to a maximum daily-average value of approximately 99‰. On January 1, 2015, the average salinity in the CCS was 75‰, and by April 26, 2015, salinity levels were over 95‰. From April 27–28, 2015, significant rainfall over the CCS reduced the average salinity to 78‰, however, salinities subsequently began rising again in the absence of more rainfall (SFWMD, 2015).

Lessons learned. The results presented in this section clearly demonstrate that the salinity in the CCS can be expected to rise significantly during prolonged periods without rainfall, and that further controls are necessary to ensure that CCS salinity concentrations do not exceed acceptable levels in the future. In October 2015, in response to chloride levels in the Biscayne Aquifer exceeding water-quality standards as a result of the high salinities in the CCS, FPL reached an agreement with Miami-Dade County which includes construction and operation of six wells that would pump water from the CCS into the Boulder Zone of the Floridan Aquifer so as to reduce the salinity in the CCS.

4 Pumping Water from the L-31E Canal into the Cooling Canals

4.1 Pumping Permit and Protocols

In August 2014, SFWMD issued an Emergency Order authorizing the pumping of up to 100 mgd of freshwater from the L-31E Canal to the CCS between August and October 2014, with the primary goal of reducing

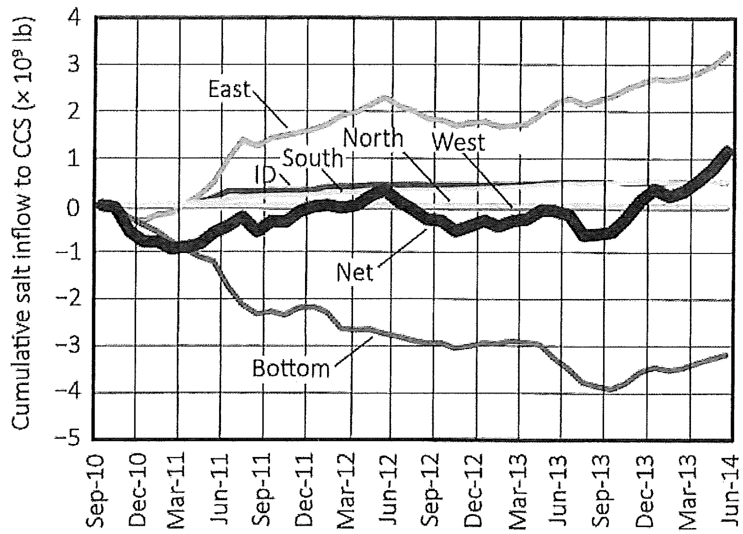


Figure 13: Salt inflow to CCS

the temperature in the CCS. Pursuant to this order, FPL conducted emergency pumping between September 25 and October 15, 2014, and as a result the temperature in the CCS dropped by 6.5°F, the salinity dropped from 87‰ to 75‰, and the algae concentrations reportedly dropped from 1315 cell/L on September 26, 2014 to 68 cell/L on October 27, 2014. After pumping had terminated, algae concentrations again began increasing. Also subsequent to pumping, the temperature in the CCS began to rise again and on April 27, 2015, the intake temperature in the CCS was 98.2°F. A large rainfall event between April 27 and 28, 2015 reduced the temperature in the CCS to 81.3°F, however, by May 17, 2015, the intake temperature had risen to 94.6°F, which was within 10°F of the maximum allowable intake temperature of 104°F. It was primarily on the basis of these conditions that FPL requested a permit to pump additional water from the L-31E Canal into the CCS.

2015 – 2016 Pumping Permit In May 2015, FPL received a permit from the SFWMD to pump up to 100 mgd from the L-31E Canal to the CCS, for the purpose of controlling the temperature in the CCS. Pumping is permitted between June 1 and November 30 in both 2015 and 2016. A limitation stipulated within this permit is that water cannot be withdrawn from the L-31E Canal on any given day until at least 504 acre-ft (2.2×10^7 ft^3) of water has been diverted from the L-31E Canal to Biscayne Bay for purposes of fish and wildlife preservation. Diversion of water from the L-31E Canal to Biscayne Bay occurs through structures S-20F, S-20G, and S-21A, which are located upstream of the CCS withdrawal location (at the "South Pumps") as shown in Figure 15. These three upstream structures open and close based on prescribed water-surface elevations in L-31E Canal at the structure locations, and the open/close stages of these structures are given in Table 3. For example, in the wet-season period of April 30 – October 15 the S-20F, S-20G, and S-21A structures open when the L-31E Canal stage is at or above 0.67 ft NAVD and close when the stage is at or below 0.27 ft NAVD. The cumulative discharges from these structures are monitored daily, to ensure that no pumping from the L-31E Canal into the CCS is allowed until the cumulative discharges from these structures exceed the threshold of 504 acre-ft. The delivery system consists of a northern and southern pump station, where the northern pump station pumps water from the C-103 Basin into the L-31E

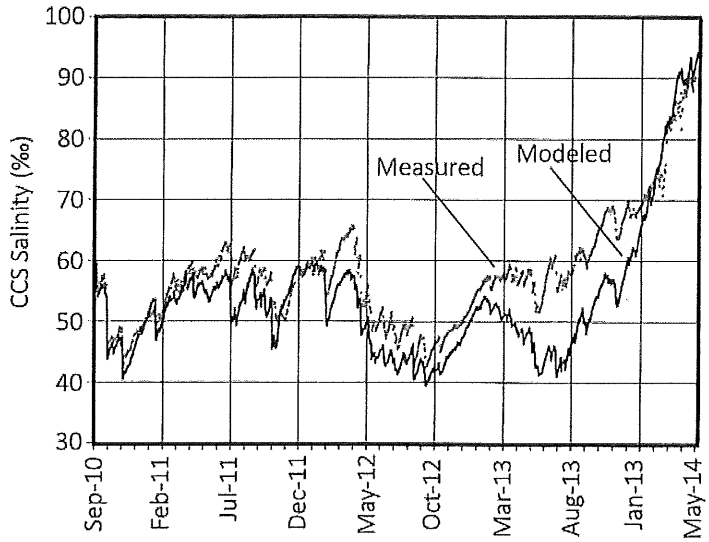


Figure 14: Measured and modeled salinity variations in CCS

Table 3: Gate Operation Rules that Affect L-31E Withdrawals

Gate(s)	Season	Period	L-31E Stage Open (ft NAVD)	L-31E Stage Close (ft NAVD)
S-20F, S-20G, S-21A	Wet	April 30 – October 15	0.67	0.27
S-20F	Dry	October 15 – April 30	−0.13	−0.53
S-20G			0.67	0.27
S-21A			−0.13	−0.53

Canal, and the southern pump station pumps water from the L-31E Canal into the CCS. The operational plan synchronizes northern and southern pumping operations so as to avert dewatering of wetlands between the two pump stations and adjacent to the L-31E Canal. The operational protocol requires that the northern pumps always be started at least five minutes prior to starting the southern pumps, and at the end of each day the southern pumps must be shut down at least five minutes before the northern pumps are shut down. This operational protocol for the pumps ensures that the volume of water pumped daily from the C-103 Basin into the L-31E Canal by the northern pumps exceeds the volume pumped from the L-31E Canal into the CCS by the southern pumps. A particularly important condition of the pumping permit is that FPL is required to monitor the stage in the L-31E Canal between the pumps to ensure that there is no drawdown in the L-31E Canal as a result of the pumping operations. Besides ensuring that there is no L-31N drawdown as a result of pumping, this protocol also ensures that the wetlands adjacent to the L-31N Canal are not dewatered as a result of pumping. Subsequent to beginning of pumping on June 1 2015, the salinity level in the CCS dropped to 70‰, and subsequent large rainfall events have further reduced the CCS salinity to 60‰, according to reports submitted by FPL to the SFWMD.

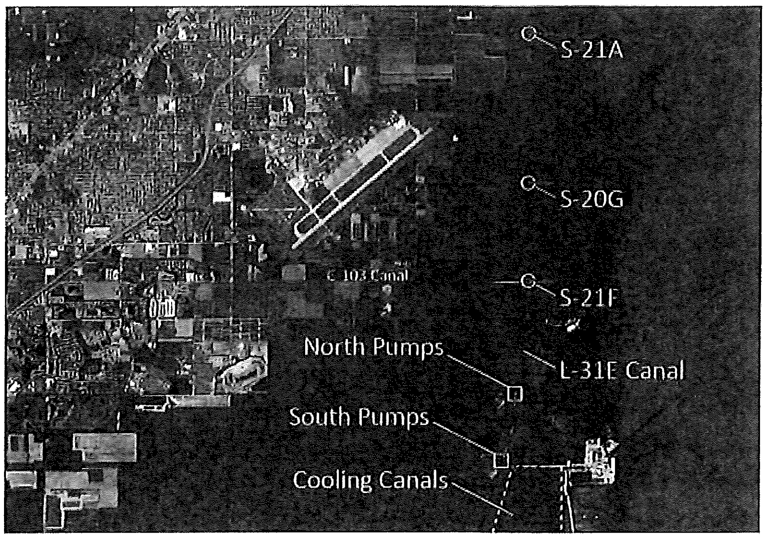


Figure 15: Pumping from L-31E Canal into Cooling-Canal System

4.2 Quantitative Effects

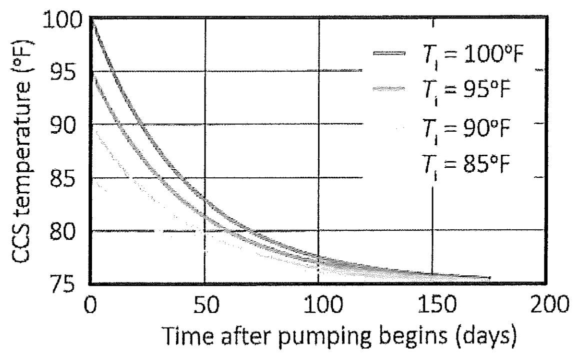
The change in temperature, ΔT, of the water in the CCS resulting from the addition of a volume V_a water at temperature T_a can be approximated using the relation

$$\Delta T = \frac{V_a}{V_0 + V_a} (T_a - T_0) \tag{9}$$

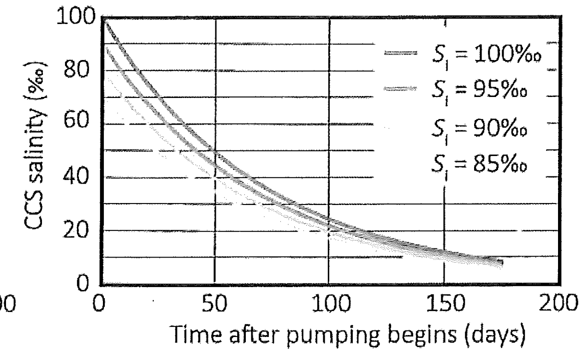
where V_0 is the initial volume of water in the CCS, and T_0 is the initial temperature of water in the CCS. Equation 9 is a very approximate relationship which assumes that the added water is well mixed over the CCS, and it neglects the differences in density and specific heat between the saline water in the CCS and the fresh water being added. In spite of these shortcomings and in the absence of a detailed heat-balance model of the CCS, Equation 9 can be used to provide a rough estimate of how the temperature in the CCS might react to the addition water from the L-31E Canal. If 100 mgd ($= 1.337 \times 10^7$ ft^3/d) is added to the CCS which has a volume of 5.746×10^8 ft^3 (assuming an average depth of 2.8 ft) and the added water has a temperature of 75°F, then Equation 9 can be applied using a daily time step to calculate the temperature in the CCS in as a function of number of days of continuous pumping for initial temperatures in the range of 85°F – 100°F. The results of these calculations are shown in Figure 16(a). In a similar manner, the change in salinity, ΔS, in the CCS resulting from the addition water at salinity S_a can be estimated using the approximate relationship

$$\Delta S = \frac{(V_a - V_e)}{V_0 + (V_a - V_e)} (S_a - S_0) \tag{10}$$

where S_0 is the initial salinity in the CCS, and V_e is the evaporated volume. Equation 10 is an approximate relationship which assumes that the added water is well mixed over the CCS, and it neglects decreases in salinity that would be caused by rainfall. If 100 mgd is added to the CCS and the rate of evaporation is 39 mgd, then the net rate of freshwater addition to the CCS (i.e., $V_a - V_e$) is equal to 61 mgd ($= 8.156 \times 10^6$ ft^3/d). Using the same CCS volume V_0 that is used for calculating the daily temperature changes, ΔT,



(a) Temperature versus pumping time



(b) Salinity versus pumping time

Figure 16: Approximate effect of pumping 100 mgd on temperature and salinity in CCS

and taking the salinity, S_a of the water pumped from the L-31E Canal equal to zero, Equation 10 can be used to calculate the salinity in the CCS in as a function of number of days of continuous pumping for initial salinities in the range of 70‰ – 100‰ as shown in Figure 16(b). The results in Figure 16 collectively indicate that the sustained addition of 100 mgd from the L-31E Canal to the CCS over continuous times on the order of a week to a month (30 days) would be an effective means of reducing the temperature and salinity in the CCS. The environmental effects on the surrounding environment of pumping water from the L-31E Canal to the CCS are discussed subsequently.

Context. To put a volume flow rate of 100 mgd of fresh water in a societal context, it is noted that 100 mgd is approximately the average daily drinking-water demand of one million people. In the context of the CCS, 100 mgd can be contrasted with the average CCS evaporation rate of around 39 mgd and a long-term average rainfall rate on the CCS of around 21 mgd, where both of these averages are computed over the 9/1/2010–5/1/2014 time period. If the CCS were empty and were to be filled by supplying water at 100 mgd, it would take approximately 43 days to fill the CCS. Although 100 mgd is more than twice the evaporation rate, the cooling effect of a unit volume of evaporated water is much greater than the cooling effect of a unit volume of added liquid water. For example, a unit volume of evaporated water would cause a temperature decrease of around 50 times the temperature decrease caused by adding a unit volume of liquid water that is 20°F cooler than the CCS. Therefore, in thermodynamic terms, the addition of 100 mgd of pumped water has approximately the same cooling effect as 2 mgd of evaporated water. With regard to salinity, the salinity reduction resulting from the addition of a unit volume of fresh water exactly compensates for the salinity increase caused by a unit volume of evaporated water. Hence, 39 mgd of added water would neutralize the salinity-increase caused by 39 mgd of evaporated water, with the excess added water causing a reduction in salinity.

4.3 Model Results

The water-balance and salt-balance models used previously by FPL to simulate the pre-uprate salinity dynamics in the CCS were used by FPL to simulate the potential future scenarios with and without the L-31E water inputs in the summer of 2015 and 2016. FPL made minor revisions in the model to incorporate data up through October 2014. The model simulation to predict the response of the CCS to pumping water from the

L-31E Canal started November 1, 2014, and ended November 30, 2016. Two scenarios were simulated at multiple maximum-allowable withdrawal rates, where actual withdrawal rates were predicated on the availability of water in the L-31E Canal after providing 504 acre-ft to Biscayne Bay. Scenario A assumes future conditions that are the same as those observed between November 1, 2010 and October 31, 2012; conditions during this time frame reflected normal weather patterns. Scenario B assumes future conditions that are the same as those observed between November 1, 2013 and October 31, 2014; conditions during this time reflected dry weather patterns, and this one-year period was repeated sequentially to produce a two-year predictive simulation. In both scenarios, the conditions observed during the first November (2010, 2013) were repeated to simulate conditions for the last month (November 2016) of the 25-month predictive simulation. Scenario A and Scenario B were each run four times under different pumping scenarios: no pumping, 30 mgd-maximum, 60 mgd-maximum, and 100 mgd-maximum and for a two-year time period. Under all pumping scenarios the simulated CCS water levels increased and simulated CCS salinities decreased relative to the base case of no pumping. Greater changes were observed in response to greater pumping rates. Under all pumping scenarios, the greatest increases in CCS stage occur between June 1 and November 30.

Application of model results. The water-balance and salinity-balance modeling done by FPL in support of the application for the 2015 – 2016 pumping permit focused on the effectiveness of the L-31E pumping on reducing salinity, whereas the primary motivation for pumping from the L-31E Canal is actually to reduce temperature. Elevated temperatures in the CCS will affect power-generation while elevated salinities will not, and there is not a proportional correspondence between reduced salinity and reduced temperature, since temperatures in the CCS depend on a variety of other factors besides the volume of water pumped from the L-31E Canal..

4.4 Environmental Effects

Environmental concerns that have been raised previously by others relate to both the diversion of fresh water from other environmental restoration projects that are currently being serviced by the L-31E Canal, and the utilization of fresh water to dilute hypersaline water, which degrades the quality and utility of the fresh water. Based on available information, it appears that the only environmental projects currently being served directly by the L-31E Canal is the Biscayne Bay fish and wildlife preservation allocation of 504 acre-ft, and the maintenance seasonal water levels in support of adjacent wetlands. The permitted pumping operation will not divert the water volume previously allocated to fish and wildlife preservation, and a pumping protocol will be followed to maintain water levels at their no-pumping levels. With respect to the degradation of fresh water, this degradation will in fact occur, however, the extent of water-quality deterioration and specific deleterious impacts on existing water uses have not to date been identified. Aside from these previously raised concerns, some major additional concerns resulting from pumping up to 100 mgd from the L-31E Canal to the CCS are described below.

4.4.1 Effect of Increased Water-Surface Elevations in the CCS

Pumping water from the L-31E Canal into the CCS will elevate the average water level in the CCS relative to the water level that would exist without pumping. The magnitudes of water-level increases in the CCS were estimated by FPL using the previously developed and calibrated mass balance model of the CCS, and the results of these simulations were submitted to the SFWMD as part of the application for the 2015 – 2016 pumping permit (SFWMD, 2015). Since the water level in the L-31E Canal will be held constant during pumping operations, the increased water-surface elevations in the CCS are of concern because they will decrease the seaward piezometric-head gradient between the L-31E Canal and the CCS. Furthermore, it is likely that the piezometric-head gradient between the L-31E Canal and the CCS could be reversed from a seaward gradient to a landward gradient. This could produce landward groundwater flow between the CCS and the L-31E Canal, which would likely advect a saline plume from the CCS towards the L-31E Canal. In addition to the aforementioned outcome, elevated water levels in the CCS resulting from pumping 100 mgd from the L-31E Canal will increase the (seaward) piezometric-head gradient between the CCS and Biscayne Bay, resulting in the increased discharge of higher-salinity water from the CCS into the Bay via the Biscayne Aquifer.

Relevant data. To quantify the effect of increased water-surface elevations in the CCS that would occur as a result of pumping, the increased water-surface elevations simulated by FPL were subtracted from historical water-level differences between the L-31E Canal and the CCS to yield possible water-level differences under the 100-mgd pumping scenario. As described previously, two scenarios were modeled, with Scenario A corresponding to "normal" conditions and Scenario B corresponding to "dry" conditions. Each simulation covered two years (2015 and 2016), with pumping in each year from June 1 to November 30. The increases in CCS water-surface elevations over the water-surface elevations that would exist in the CCS without pumping are given in Table 4 for selected dates (about a month apart) during each of these scenarios. The values

Table 4: Estimated Water Level Increases in CCS

Day-Month	Scenario	2015 (ft)	2016 (ft)
15-Jun	A	0.00	0.23
15-Jul	A	0.00	0.55
15-Aug	A	0.55	0.40
15-Sep	A	0.57	0.40
15-Oct	A	0.50	0.60
15-Nov	A	0.65	0.60
30-Nov	A	0.50	0.45
15-Jun	B	0.00	0.00
15-Jul	B	0.62	0.50
15-Aug	B	0.65	0.70
15-Sep	B	0.15	0.10
15-Oct	B	0.35	0.30
15-Nov	B	0.37	0.55
30-Nov	B	0.50	0.65

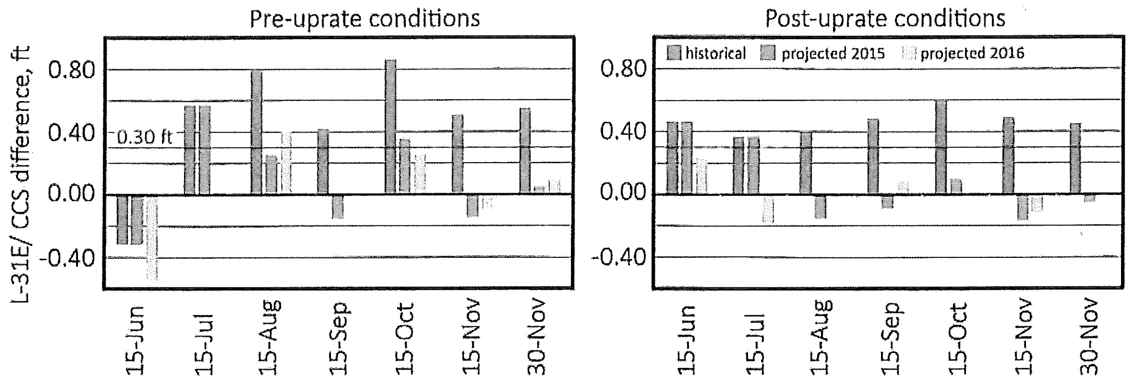
given in Table 4 were estimated from graphical plots developed by FPL as part of the permit application. It is apparent from Table 4 that water-level increases in the CCS on the order of 0.5 ft are predicted to occur as a result of pumping water at a rate of 100 mgd from the L-31E Canal into the CCS. These water-level increases can be contrasted with historical differences in the water levels between the L-31E Canal and the CCS for the pre-uprate (June 2011 – May 2012) and post-uprate (June 2013 – May 2014) periods as shown in Table 5, where a positive difference indicates that the water level in the L-31E Canal is higher than the water level in the CCS. It is apparent from Table 5 that the historical differences between the water levels

Table 5: Historical Water-Level Differences Between L-31E Canal and CCS

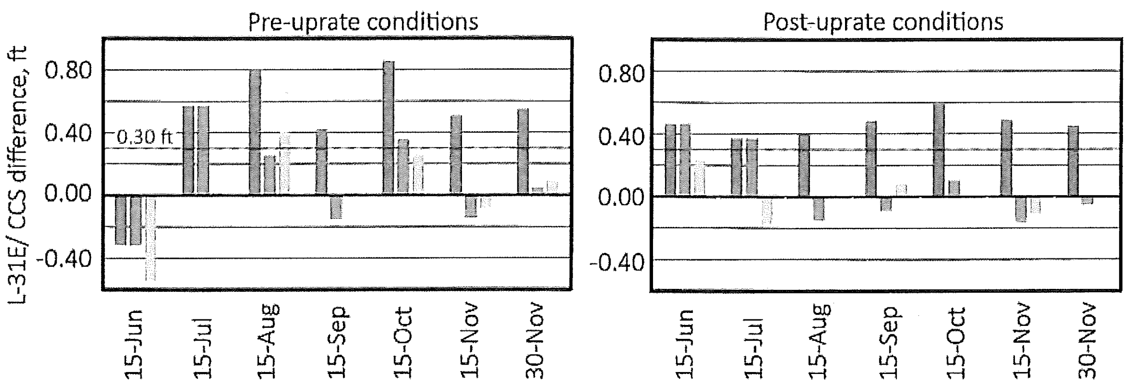
Day-Month	Pre-Uprate (ft)	Post-Uprate (ft)
15-Jun	−0.32	0.46
15-Jul	0.57	0.37
15-Aug	0.80	0.40
15-Sep	0.42	0.48
15-Oct	0.85	0.60
15-Nov	0.51	0.49
30-Nov	0.55	0.45

in the L-31E Canal and the CCS are typically on the same order of magnitude as the expected increases in the CCS water level, and therefore a significant impact on the historical seaward water-level gradient is to be expected. This concern is further amplified when it is considered that a minimum water-level difference of 0.30 ft is required to keep an acceptable seaward water-level gradient and to keep from triggering the interceptor ditch (ID) pumps. If the ID pumps are turned on, this would further elevate the water level in the CCS and further decrease the water-level difference between the L-31E Canal and the CCS.

Demonstration of effects. The increases in the water-surface elevations in the CCS predicted by the FPL mass-balance model can be subtracted from the historical water-level differences between the L-31E Canal and the CCS to estimate the water-level differences between the L-31E Canal and the CCS that are likely to exist as a consequence of pumping a maximum of 100 mgd from the L-31E Canal into the CCS. These expected water-level differences are summarized for the Scenario A (the "normal" condition) in Figure 17(a), and for Scenario B (the "dry" condition) in Figure 17(b). For each historical period (pre-uprate and post-uprate), and for each selected day, three water-level differences are shown: the historical difference (blue), the projected 2015 difference (orange), and the projected 2016 difference (gray). In general, the 2015 and 2016 projected water-level differences are less than the historical differences by the amounts listed in Table 4. Also shown in Figure 17 is the 0.30-ft reference line, which is the threshold water-level difference below which the ID pump system is triggered. It is apparent from Figure 17(a) that under pre-uprate water-level-difference conditions a landward water-level gradient would be created around 15-Sep and 15-Nov on which dates there were previously seaward water-level gradients; the 15-Jun data point is anomalous in that a landward gradient already existed in the historical record. It is further apparent from Figure 17(a) that under post-uprate water-level-difference conditions a landward water-level gradient would be created around 15-Jul, 15-Aug, 15-Sep, 15-Nov, and 30-Nov on which dates there were previously seaward gradients. Under both historical conditions (pre-uprate, post-uprate) shown in Figure 17(a), the difference between the water level in the L-31E Canal and the CCS would fall below the 0.30-ft threshold on all of the dates cited in Figure 17(a). Considering Scenario B (the "dry" condition) shown in Figure 17(b), the results are similar to those shown in Figure 17(a). Under pre-uprate conditions, a landward water-level gradient would be created around 15-Sep and 15-Nov, and under post-uprate water-level-difference conditions a landward water-level gradient would be created around 15-Jul, 15-Aug, 15-Sep, 15-Nov, and 30-Nov. Under both historical conditions, the difference between the water levels in the L-31E Canal and the CCS would fall below the 0.30-ft threshold on all dates cited in Figure 17(b). The results shown in Figure 17 collectively show that



(a) Scenario A (Normal Conditions)



(a) Scenario B (Dry Conditions)

Figure 17: Differences Between L-31E Canal and CCS Water Levels. The historical difference is in blue, the projected 2015 difference is in orange, and the projected 2016 difference is in gray.

there is cause for concern that pumping 100 mgd from the L-31E Canal into the CCS could cause a landward water-level gradient where none previously existed. This concern is further exacerbated when considering that water levels at the northern end of the CCS near the discharge from the power-generating units will be higher that the average water level in the CCS that is used in this analysis, which further decreases the seaward water-level gradient between the L-31E Canal and the CCS. Concern is further heightened when the increased density of water in (and under) the CCS is taken into account, since the difference in equivalent freshwater (piezometric) heads between the L-31E Canal and the CCS is less that the difference in water levels between the L-31E Canal and the CCS. It is actually the difference in equivalent freshwater heads that govern the flow between these bodies of water (e.g., Post et al., 2007). This latter point is particularly important since the difference in freshwater heads between the L-31E Canal and the CCS will increase with depth.

Effect of generating a landward gradient. A landward gradient in the freshwater-equivalent piezometric head between the L-31E Canal and the CCS would advect saline water from the CCS towards the L-31E Canal. Such gradients are likely to be generated under 100-mgd pumping operations. Also, since pumping would be occurring mostly during the wet season, it is likely that a seaward head gradient would exist (and be maintained) west of the L-31E Canal. As a consequence of a landward gradient in the freshwater-equivalent piezometric head east of the L-31E Canal and a seaward (freshwater) head gradient west of the L-31E Canal, it is possible that a "saline circulation cell" is developed in which water is pumped from the L-31E Canal into the CCS, water seeps out of the CCS and flows through the Biscayne Aquifer back into the L-31E Canal, and then this water is pumped back into the CCS. This circulation cell would increase the salinity in the L-31E Canal, which would degrade the quality of the water in the L-31E Canal and decrease the effectiveness of the pumped water in decreasing the salinity in the CCS.

Historical anecdote. Interestingly, in 1978, engineers from the consulting firm Dames and Moore wrote a report to FPL with a specific section in their report titled "Effects of an Overall Increase in Water Level in the Cooling-Canal System Relative to the Ground Water" (Dames and Moore, 1978). In their report, the engineers at Dames and Moore specifically considered the impact of raising the water level in the CCS by 0.50 ft above the water table in the surrounding aquifer. They concluded that such an occurrence would cause the saltwater interface to move approximately one mile further inland relative to its location prior to the rise in the water level of the CCS.

4.4.2 Suggested Permit Modifications

Based on the concerns described here, along with the supporting analyses provided, it is recommended that the pump-operation protocol associated with the 2015–2016 pumping permit be modified to include measurement of water levels in the CCS, and that a threshold water-level difference between the L-31E Canal and the CCS be determined by the SFWMD and added as a controlling factor in pump operations. To ensure that a subsurface circulation cell of saline water does not develop, the salinity of the water in the L-31E Canal should be monitored during pump operations.

5 Conclusions and Recommendations

This brief study consisted of reviewing and summarizing the relevant data and reports relating to the operation of the cooling-canal system (CCS) at the Turkey Point power station, and focusing on three primary issues: (1) the temperature dynamics in the CCS, (2) the salinity dynamics in the CCS, and (3) the impacts and consequences of pumping a maximum of 100 mgd from the L-31E Canal into the CCS.

Temperature dynamics: Temperature dynamics in the CCS are a concern primarily because operation of the power-generating units will be impacted if the temperature of the cooling water at the intake exceeds 104°F. Recent elevated temperatures have come close to exceeding this threshold value. Understanding the temperature dynamics in the CCS is not possible without the development of a heat-balance model of the CCS, and no such model currently exists in the public domain. As part of this study, a preliminary heat-balance model was developed and is described in this report. Using this model to simulate the heat balance in the CCS during the interval 9/1/10 – 12/7/14 showed that there were two distinct periods during which the heat-rejection rate from the power plant remained approximately constant. The first period corresponded to pre-uprate conditions and the second period corresponded to post-uprate conditions. The heat-rejection rate during the second period was found to be significantly greater than the heat-rejection rate during the first period. This finding is not inconsistent with the condition that the post-uprate generating capacity of the power-generating units served by the CCS is less than the pre-uprate generating capacity, since in the post-uprate generating capacity there is a significant shift from fossil-fuel generation to nuclear-power generation, and nuclear-power units are known to have a much higher heat-rejection rate to cooling water than fossil-fuel generating units. The increased heat-rejection rate in the post-uprate period was manifested in the CCS by increased temperatures. Notably, the average temperature in the discharge zone increased by about 6.3°F (3.5°C) and the average temperature in the intake zone increased by about 4.7°F (2.6°C). Considering that the increased average temperature in the intake zone of the CCS is slightly greater that the increased threshold temperature of 4.0°F (2.2°C) approved by the NRC in 2014, and also considering that supplementary cooling of the CCS was needed in 2014, then caution should be exercised in further increasing power generation beyond 2014 levels without a reliable system to provide additional cooling beyond that currently being provided by the CCS. A power-generation increase would likely lead to a repeat of the need for supplementary cooling that was experienced in 2014. There are also indications that the thermal efficiency of the CCS has decreased in the post-uprate period relative to the thermal efficiency in the pre-uprate period. A sensitivity analysis indicated that increased algae concentrations in the CCS and increased air temperatures are unlikely to have been of sufficient magnitude to cause the elevated temperatures that have been measured in the CCS. In quantitative terms, the additional heating rate in the CCS caused by the presence of high concentrations of algae is estimated to be less than 7% of the heat-rejection rate of the power plant, hence the relatively small effect of algae-induced additional heating. The preliminary findings of this study will need to be followed up by further development of the thermal model supplemented by indirect measurements of heat-rejection rates, and (ideally) flows and temperatures within the CCS, that can be used to calibrate the model within each of the four zones of the CCS. The development of any engineered system to control temperatures in the CCS will need to be done in tandem with thermal-model simulations.

Salinity dynamics: Salinity in the CCS is a concern because increased salinity levels contribute to the increased salinity intrusion into the Biscayne Aquifer. Although an interceptor-ditch salinity-control system is in place, this system is ineffective in controlling salinity intrusion at depth, and so elevated salinities in the CCS remain a problem. This study confirms that long-term salinity increases in the CCS are caused by evaporation rates exceeding rainfall rates. Without any intervention, the trend of increasing salinity would continue into the future. Recent spikes in salinity in the CCS are a normal consequence of a prolonged rainfall deficit and can be expected to recur. Engineered systems that add less-saline water to the CCS to decrease salinity could have an adverse environmental impact caused by the increased water-level elevations in the CCS that these systems create. The effectiveness of an engineered system that pumps saline water from the CCS to deep-well(s) for disposal will depend on the groundwater-flow response in the aquifer surrounding the CCS, the induced salinity-transport dynamics within the aquifer, and the operational protocol of the deep-well injection system. The investigator was made aware through press reports that such a deep-well injection system has been approved for implementation, however, no supporting details were provided by Miami-Dade County to the investigator for further consideration during this study.

Pumping from the L-31E Canal: Pumping of up to 100 mgd from the L-31E Canal into the CCS is permitted between June 1 and November 30 during 2015 and 2016. Mass-balance modeling has shown that this level of pumping will likely raise the average water level in the CCS by around 0.5 ft, and since the historical water-level differences between the L-31E Canal and the CCS are also on the order of 0.5 ft, it is likely that there will be a significant reduction, or even reversal, of the historical seaward water-level gradient that would exist in the absence of pumping. It is even more likely that the water-level difference between the L-31E Canal and the CCS will be reduced below the 0.30-ft threshold that normally triggers the

ID salinity-control system. Model results show a likely reversal of gradient under some circumstances, and a consequence of this reversal could be the advection of a saline plume from the CCS to the L-31E Canal which would cause in increase in the salinity in the L-31E Canal, which is undesirable since the L-31E Canal is regarded as a source of freshwater in its various environmental functions.

Recommended action items. Based on the aforementioned findings, the following action items should be considered:

- Develop a calibrated heat-balance model to simulate the thermal dynamics in the CCS. Essential additional measurements that are required to supplement the calibration of this model are synoptic measurements of volumetric flow rate through the power-generating units, intake temperature, and discharge temperature. Desirable additional measurements include synoptic measurements of the volumetric flow rate and temperature into and out of each CCS zone. The thermal model could be developed to simulate the effects of various supplementary cooling systems to support operation of the CCS.

- Confirm and identify causative factors for the decline in the thermal efficiency of the CCS between the pre-uprate and post-uprate periods.

- Develop a quantitative relationship for estimating algae concentrations as a function of temperature, salinity, and nutrient levels in the CCS. Such a relationship could be derived using data that is already being collected. The developed model could be useful in managing the CCS, since algae concentrations affect the heat balance and possibly the thermal efficiency of the CCS.

- Develop a locally validated relationship between the evaporation rate, water temperature, air temperature, wind speed, salinity, and algae concentrations in the CCS. This is justified since evaporation is the major cooling process in the CCS, and the evaporation model that is currently being used has a high uncertainty level. At present, a constant in the evaporation function is used as a calibration parameter in the salinity-balance model which is not a desirable circumstance given the importance of the evaporation process.

- The operational protocol associated with the 2015 – 2016 permit for transferring up to 100 mgd from the L-31E Canal to the CCS should be modified to include: (1) measurement of water levels in the CCS to preclude a landward equivalent freshwater head gradient being developed, (2) specification of threshold water-level difference between the L-31E Canal and the CCS as a controlling factor in pump operations, and (3) monitoring of the salinity of the water in the L-31E Canal during pump operations to ensure that CCS water is not seeping into the L-31E Canal.

The scope of this study was necessarily limited by the short (120-day) time frame that was available to investigate all of the relevant issues. Follow-on and more detailed investigations will likely lead to a resolution of outstanding issues and the design of robust engineered systems to control the temperature and salinity in the CCS, as well as the extent of salinity intrusion associated with the operation of the CCS. All of these objectives can likely be accomplished with the goal of having sustainable power generation at the Turkey Point station.

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Miami-Dade County
Florida Power & Light

Consent Agreement

MIAMI-DADE COUNTY, through its
DEPARTMENT OF REGULATORY AND
ECONOMIC RESOURCES, DIVISION OF
ENVIRONMENTAL RESOURCES
MANAGEMENT,

CONSENT AGREEMENT

Complainant,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.
_______________________________/

This Consent Agreement, entered into by and between the Complainant, MIAMI-DADE COUNTY, through its DEPARTMENT OF REGULATORY AND ECONOMIC RESOURCES, DIVISION OF ENVIRONMENTAL RESOURCES MANAGEMENT ("DERM"), and the Respondent FLORIDA POWER & LIGHT COMPANY ("FPL"), pursuant to Section 24-7(15)(c) of the Code of Miami-Dade County, shall serve to redress alleged violations of Chapter 24 of the Code of Miami-Dade County located near, surrounding, or in the vicinity of the Cooling Canal System located at Turkey Point on FPL's property, as further described herein, in Miami-Dade County, Florida.

DERM and FPL enter into the following Consent Agreement:

FINDINGS OF FACT

1. DERM is a division of Miami-Dade County, a political subdivision of the State of Florida, which is empowered to control and prohibit pollution and protect the environment within Miami-Dade County pursuant to Article VIII, Section 6 of the Florida Constitution, the Miami-Dade County Home Rule Charter and Section 403.182 of the Florida Statutes.

2. Florida Power & Light Company ("FPL") is the owner and operator of the Turkey Point Power Plant, and FPL is the owner and operator of approximately a 5,900-acre network of unlined canals (the "Cooling Canal System" or "CCS") on the FPL property described in the map in Exhibit A (the "Property").

3. In 1971, FPL signed a Consent Decree with the U.S. Department of Justice that required the construction, after permitting, of a closed-loop cooling configuration, with no discharge to surface waters.

4. The Florida Department of Pollution Control (later to become the Florida Department of Environmental Protection), in 1971, issued Construction Permit No. IC-1286 for the CCS. In 1972, Dade County issued Zoning Use Permit No. W-49833 for the excavation of the proposed Alternate Cooling Water Return Canal. FPL represents that in 1973, the construction of the CCS was completed; and the CCS was closed from the surface waters of both Biscayne Bay and Card Sound, becoming a closed-loop system.

5. An approximate 18 foot deep interceptor ditch located along the west side of the CCS was designed and constructed to create a hydraulic barrier to keep water in the CCS from migrating inland or westward.

6. In 1972, FPL entered into an agreement with the Central and Southern Florida Flood Control District (later to become the South Florida Water Management District or "District") addressing the operations and impacts of the CCS. The agreement has been updated several times, with the most recent version being the Fifth Supplemental Agreement between the District and FPL entered into on October 16, 2009 ("Fifth Supplemental Agreement") which included an extensive monitoring program for the CCS, entitled the Turkey Point Plant Groundwater, Surface Water and Ecological Monitoring Plan ("2009 Monitoring Plan"), incorporated as Exhibit A of the Fifth Supplemental Agreement.

7. In a letter dated April 16, 2013, the District notified FPL of their determination that saline water from the CCS has moved westward of the L-31E Canal in excess of those amounts that would have occurred without the existence of the CCS, and pursuant to the provisions of the Fifth Supplemental Agreement, initiated consultation with FPL for the mitigation, abatement or remediation of the saline water movement.

8. DERM issued a Notice of Violation dated October 2, 2015 (the "NOV") to FPL, alleging violations of Chapter 24 of the Code of Miami-Dade County, for alleged violations of County water quality standards and criteria in groundwater attributable to FPL's actions, and specifically for groundwaters outside the boundaries of FPL's Cooling Canal System and beyond the boundaries of the Property.

9. The phrase "hypersaline water" as used herein is defined as water that exceeds 19,000 mg/L chlorides.

10. DERM maintains there is hypersaline water attributable to FPL's actions in the groundwaters outside the boundaries of the Property, which exceeds County water quality standards and criteria. FPL acknowledges the presence of hypersaline water in certain areas outside the boundaries of the Property. For waters that do not reach the level of hypersalinity, DERM and FPL do not agree on the applicable "background" standards for chlorides.

11. In 2013 and 2014, FPL experienced water quality issues within the CCS, including increases in temperature and salinity, and FPL sought approvals from various regulatory agencies for actions to improve the water quality within the CCS.

12. DEP issued an Administrative Order, No. 14-0741, on December 23, 2014, requiring FPL to, among other things, reduce and maintain the annual average salinity of the CCS at a practical salinity of 34, and that Administrative Order is currently the subject of an Administrative Hearing.

13. Both DERM and FPL agree and acknowledge that it would be beneficial to improve the water quality within the Cooling Canal System itself, and FPL has already undertaken some efforts to improve the CCS water quality.

14. This Consent Agreement requires FPL to take action to address the County's alleged violations of County water quality standards and criteria in groundwaters outside the CCS as described in the NOV. As part of these actions, this Consent Agreement also requires FPL to take into account its efforts to improve CCS water quality and the potential and actual impacts of such actions on water resources outside the CCS, to not cause or contribute to (i) the exacerbation of alleged violations of County water quality standards or criteria or (ii) future violations of County water quality standards or criteria in the groundwaters or surface waters outside the CCS.

15. FPL hereby agrees to the terms of this Consent Agreement without admitting the allegations made by the above-mentioned NOV.

16. In an effort to expeditiously resolve this matter and to ensure compliance with Chapter 24 of the Code of Miami-Dade County, and to avoid time consuming and costly litigation, the parties hereto agree to the following, and it is ORDERED:

REQUIREMENTS

17. FPL shall undertake the following activities to specifically address water quality impacts associated with the CCS, as alleged in the NOV. The objective of this Consent Agreement will be for FPL to demonstrate a statistically valid reduction in the salt mass and volumetric extent of hypersaline water (as represented by chloride concentrations above 19,000 mg/L) in groundwater west and north of FPL's property without creating adverse environmental impacts. A further objective of this Consent Agreement is to reduce the rate of, and, as an ultimate goal, arrest migration of hypersaline groundwater. Recognizing other factors beyond FPL's control may influence movement of groundwater in the surficial aquifer, FPL shall reasonably take into account such factors when developing and implementing remedial actions to minimize the timeframe for achieving compliance with this Consent Agreement.

a. Abatement.

i. DERM acknowledges that FPL is planning to undertake the following:

1. pursue permitting, construction and operation of up to six Upper Floridan Aquifer System wells in accordance with the Site Certification Modification that is the subject of DOAH Case No. 15-1559EPP.

2. continue the use of the existing marine wells (SW-1, SW-2, and PW-1) as a short term resource to lower and maintain salinities. FPL shall work to avoid the use of the marine wells, except under extraordinary circumstances.

3. continue operation of the authorized L-31E canal pumps as a short term resource only, in accordance with the terms and conditions of the applicable approvals. FPL acknowledges that the use of water from the L-31E canal is intended only as a short term resource to lower CCS salinity. FPL anticipates the need for this resource for the next two years to reduce salinity as it transitions into the long term resources that are intended to maintain the lower salinity in the CCS. FPL acknowledges that additional regulatory

approvals will be required for continuation of this activity beyond the expiration of the existing approvals.

ii. FPL shall evaluate alternative water sources to offset the CCS water deficit and reduce chloride concentration in the CCS, and as a means of abating the westward movement of CCS groundwater. FPL will consider the practicality and appropriateness of using reclaimed wastewater from the Miami-Dade County South District Waste Water Treatment Plant as an alternative water source. FPL will provide DERM a summary of its Alternative Water Supply plan within 180 days of executing the Consent Agreement. FPL recognizes the importance and potential for reuse water, and FPL will make good faith efforts to implement the use of reuse water where practicable.

iii. FPL shall also conduct a review of the Interceptor Ditch operations to determine if current design and/or operations can be practicably modified to improve its function recognizing the current status of the CCS and surrounding wetlands. FPL will provide a summary of its Interceptor Ditch Review within 180 days of executing the Consent Agreement.

iv. The alternative water sources and any modifications to Interceptor Ditch design or operation shall be authorized through the appropriate regulatory processes and shall be demonstrated to not create adverse impacts to surface waters, groundwater, wetland or other environmental resources consistent with the Fifth Supplemental Agreement.

b. <u>Remediation</u>. FPL shall develop and implement the following actions to intercept, capture, contain, and retract hypersaline groundwater (groundwater with a chloride concentration of greater than 19,000 mg/L) to the Property boundary to achieve the objectives of this Consent Agreement.

i. Phase I. FPL shall design, permit, and construct a Biscayne Aquifer Recovery Well System (RWS) based on the results of a variable density dependent groundwater model which shall be sufficient to support the design of the RWS to intercept, capture, and contain the hypersaline plume; support authorization through the appropriate regulatory processes; and demonstrate that it will not create adverse impacts to groundwater, wetland (hydroperiod or water-stage), or other environmental resources. Final operation and design will be informed by an Aquifer Performance Test (APT). FPL shall provide its design and supporting information for the Recovery Well System and associated monitoring wells for DERM review and approval within 180 days of executing the Consent Agreement. FPL shall proceed with implementation within one year of executing the Consent Agreement, subject to regulatory timelines not in FPL's control. The initial design will be based on up to 12 MGD disposal capacity recognizing existing on-site capability. Efficacy of this design constraint will be reviewed in Phases 2, 3, and 4.

ii. Phase 2. FPL shall operate the RWS in accordance with all local, state, and federal regulatory requirements, collect data as required by the monitoring program, and employ the data to inform and reduce the uncertainty of the groundwater model. Status and efficacy of the system operation in meeting the objectives of this Consent Agreement and results of continued groundwater model refinement will be provided in the annual reports required in Paragraph 17d.

iii. Phase 3. After five years, FPL shall evaluate the effectiveness of the RWS in achieving the goal to intercept, capture, contain, and ultimately retract the hypersaline groundwater plume. This evaluation shall include estimated milestones and be based on the results of the monitoring data and refined groundwater/surfacewater model, which will be submitted to DERM. If the analysis indicates that the RWS is not anticipated to achieve the goal to intercept, capture, contain, and ultimately retract the hypersaline groundwater plume, FPL shall make recommendations for modifications to the project components and/or designs to ensure the ability of the system to achieve the objectives of the Consent Agreement. The evaluation and any proposed revisions shall be submitted to DERM for review and approval.

iv. Phase 4. After ten years, FPL shall review the results of the activities and progress to achieve the objectives of this Consent Agreement, and this evaluation shall be submitted to DERM. If monitoring demonstrates that the activities are not achieving the objectives of this Consent Agreement, FPL shall revise the project components and/or designs to ensure the ability of the system to achieve the objectives of this

Consent Agreement. The proposed revisions shall be submitted to DERM for review and approval.

c. Regional Hydrologic Improvement Projects. In addition, FPL agrees to undertake the following:

i. Raise control elevations in the Everglades Mitigation Bank. Within 30 days of the effective date of this Consent Agreement, FPL shall raise the control elevations of the FPL Everglades Mitigation Bank ("EMB") culvert weirs to no lower than 0.2 feet lower than the 2.4 foot trigger of the S-20 structure and shall maintain this elevation. After the first year of operation, FPL shall evaluate the change in control elevation, in regards to improvements in salinity, water quality, and lift in the area, and if FPL determines that the change in control elevations is not effective, or that FPL is negatively impacted in receiving mitigation credits as a result of this action, FPL will consult with DERM and propose potential alternatives.

ii. Fill portions of the Model Lands North Canal within the Everglades Mitigation Bank. Within 30 days of the effective date of the Consent Agreement, FPL shall seek all necessary regulatory approvals to place excavated fill from the adjoining roadway into the Model Lands North Canal within FPL's Everglades Mitigation Bank. Upon issuance of such regulatory approvals, FPL shall, starting on the east end, fill the Model Lands North Canal. This Consent Agreement only requires FPL to fill to the extent the fill is available from the adjoining roadway permitted to be degraded.

iii. If the District determines that flowage easements are needed from FPL in order to increase the operational stages of the S-20 water control structure as planned and approved by CERP, FPL agrees to provide such flowage easements for FPL owned land within the Everglades Mitigation Bank, in favor of the District within six months of the determination.

iv. FPL acknowledges the benefit of hydrologic restoration projects contemplated by the Comprehensive Everglades Restoration Project ("CERP"), as well as other government entities, adjacent and to the west of the CCS in controlling movement of hypersaline and saline waters in the Biscayne Aquifer. FPL commits to working with local, state and federal agencies to facilitate implementation of these projects to promote improved hydrologic conditions.

d. Monitoring and Reporting. FPL shall conduct monitoring to evaluate the progress made in achieving the objectives of this Consent Agreement. This includes actions that result from satisfying the abatement, remediation and hydrologic improvement components of this Consent Agreement. FPL shall initiate the monitoring and reporting requirements identified below within 30 days of executing the Consent Agreement. The monitoring shall include the following:

   i. FPL shall facilitate DERM access to all data from continuous electronically monitored stations.

   ii. FPL shall continue to provide monthly and quarterly reports substantially consistent with those required in M-D Class I permit CLI-2014-0312, beyond the expiration of the permit.

   iii. FPL shall employ Continuous Surface Electromagnetic Mapping (CSEM) methods to assess the location and orientation of the hypersaline plume west and north of the CCS.

   iv. FPL shall add three groundwater monitoring clusters (shallow, mid and deep) to monitor groundwater conditions in the model lands basin. The well clusters shall be similar in design and function to existing groundwater monitoring wells in the region as part of the CCS monitoring program, and shall be geographically located in consultation with DERM.

   v. FPL shall submit annual reports providing an evaluation of progress in achieving the objectives of this Consent Agreement, status of implementing projects identified above, and the results of monitoring to determine the impacts of these activities. Recommendations for refinements to the activities will be included in the annual report. This may include deletions of monitoring that is demonstrated to no longer be needed, or additional monitoring that is warranted based on observations.

SAFETY PRECAUTIONS

18. FPL shall maintain the subject property during the pendency of this Consent Agreement in a manner which shall not pose a hazard or threat to the public at large or the environment and shall not cause a nuisance or sanitary nuisance as set forth in Chapter 24 of the Code of Miami-Dade County, Florida.

VIOLATION OF REQUIREMENTS

19. This Consent Agreement constitutes a lawful order of the DERM Director and is enforceable in a civil court of competent jurisdiction. Violation of any requirement of this Consent Agreement may result in enforcement action by DERM. Each violation of any of the terms and conditions of this Consent Agreement by FPL shall constitute a separate offense.

SETTLEMENT COSTS

20. FPL hereby certifies that it has the financial ability to comply with the terms and conditions herein and to comply with the payment of settlement costs specified in this Agreement.

21. DERM has determined that due to the administrative costs incurred by DERM for this matter, a settlement of $30,000.00 is appropriate. FPL shall, within sixty (60) days of the effective date of this Consent Agreement, submit to DERM a check in the amount of $30,000.00 for full settlement payment. The payment shall be made payable to Miami-Dade County and sent to the Division of Environmental Resources Management, c/o Barbara Brown, 701 NW 1st Court, 6th Floor, Miami, FL 33136-3912.

22. In the event that FPL fails to submit, modify, implement, obtain, provide, operate and/or complete those items listed in paragraph 17 herein, FPL shall pay DERM a civil penalty of one hundred dollars ($100.00) per day for each day of non-compliance and FPL may be subject to enforcement action in a court of competent jurisdiction for such failure pursuant to those provisions set forth in Chapter 24 of the Code of Miami-Dade County. Any such payments shall be made by FPL to DERM within ten days of receipt of written notification and shall be sent to the Division of Environmental Resources Management, 701 NW 1st Court, 6th Floor, Miami, FL 33136-3912.

GENERAL PROVISIONS

23. FPL shall allow any duly authorized representative of DERM, with reasonable notification, to enter and inspect the CCS, Floridan wells, extraction wells, or any other relevant facilities, at any reasonable time for the purpose of ascertaining the state of compliance with the terms and conditions of this Consent Agreement. DERM shall comply with the plant safety and security precautions. FPL shall provide and maintain a point of contact at the Turkey Point Power Plant to assist DERM in accessing the facilities to be inspected.

24. On a quarterly basis (January, April, July, and October), DERM may collect surface and/or groundwater samples at the discretion of DERM at various monitoring locations in accordance with monitoring referenced in Paragraph 17 above.

25. FPL and DERM agree to cooperate and use best efforts moving forward related to this Consent Agreement.

26. Disputes related to or arising out of this Consent Agreement shall be construed consistent with the laws of the State of Florida and the United States, as applicable, and shall be filed in the state or federal courts of the State of Florida, as appropriate. Proceedings shall take place exclusively in the Circuit Court for Miami-Dade County, Florida or the United States District Court for the Southern District of Florida.

27. In consideration of the complete and timely performance by FPL of the obligations contained in this Consent Agreement, DERM waives its rights to seek judicial imposition of damages or civil penalties for the matters alleged in Notice of Violation and Consent Agreement.

28. Where FPL cannot meet timetables or conditions due to circumstances beyond FPL's control, FPL shall provide written documentation to DERM which shall substantiate that the cause(s) for delay or non-compliance was not reasonably in FPL's control. DERM shall make a determination of the reasonableness of the delay for the purpose of continued enforcement pursuant to paragraph 22 of this Consent Agreement.

29. DERM expressly reserves the right to initiate appropriate legal action to prevent or prohibit future violations of applicable laws, regulations, and ordinances or the rules promulgated thereunder.

30. Entry of this Consent Agreement does not relieve FPL of the responsibility to comply with applicable federal, state or local laws, regulations, and ordinances.

31. FPL acknowledges that this Consent Agreement is within the jurisdiction of Miami-Dade County. Nothing in this Consent Agreement is intended to expand, nor shall this Consent Agreement be construed to expand, the regulatory authority or jurisdiction of Miami-Dade County.

32. This Consent Agreement shall neither be evidence of a prior violation of this Chapter nor shall it be deemed to impose any limitation upon any investigation or action by DERM in the enforcement of Chapter 24 of the Code of Miami-Dade County.

33. This Consent Agreement shall become effective upon the date of execution by the DERM Director, or the Director's designee.

October 6, 2015

Date

Eric E. Silagy
President & CEO
Florida Power & Light Company
700 Universe Boulevard
Juno Beach, FL 33408
Respondent

Before me, the undersigned authority, personally appeared Eric Silagy, who after being duly sworn, deposes and says that they have read and agreed to the foregoing.

Subscribe and sworn to before me this 6th day of October, 2015 by

Eric Silagy (name of affiant).

Personally known ✓ or Produced Identification ______.
(Check one)

Type of Identification Produced: ______________________.

LISA GROVE
MY COMMISSION # FF 154741
EXPIRES: December 14, 2016
Bonded Thru Budget Notary Services

Lisa Grove
Notary Public Signature

Lisa Grove
Notary Public Printed Name

DO NOT WRITE BELOW THIS LINE – GOVERNMENT USE ONLY

OCT 7, 2015
Date

Lee N. Hefty, DERM Director
Miami-Dade County

Witness

Barbara Brown
Witness

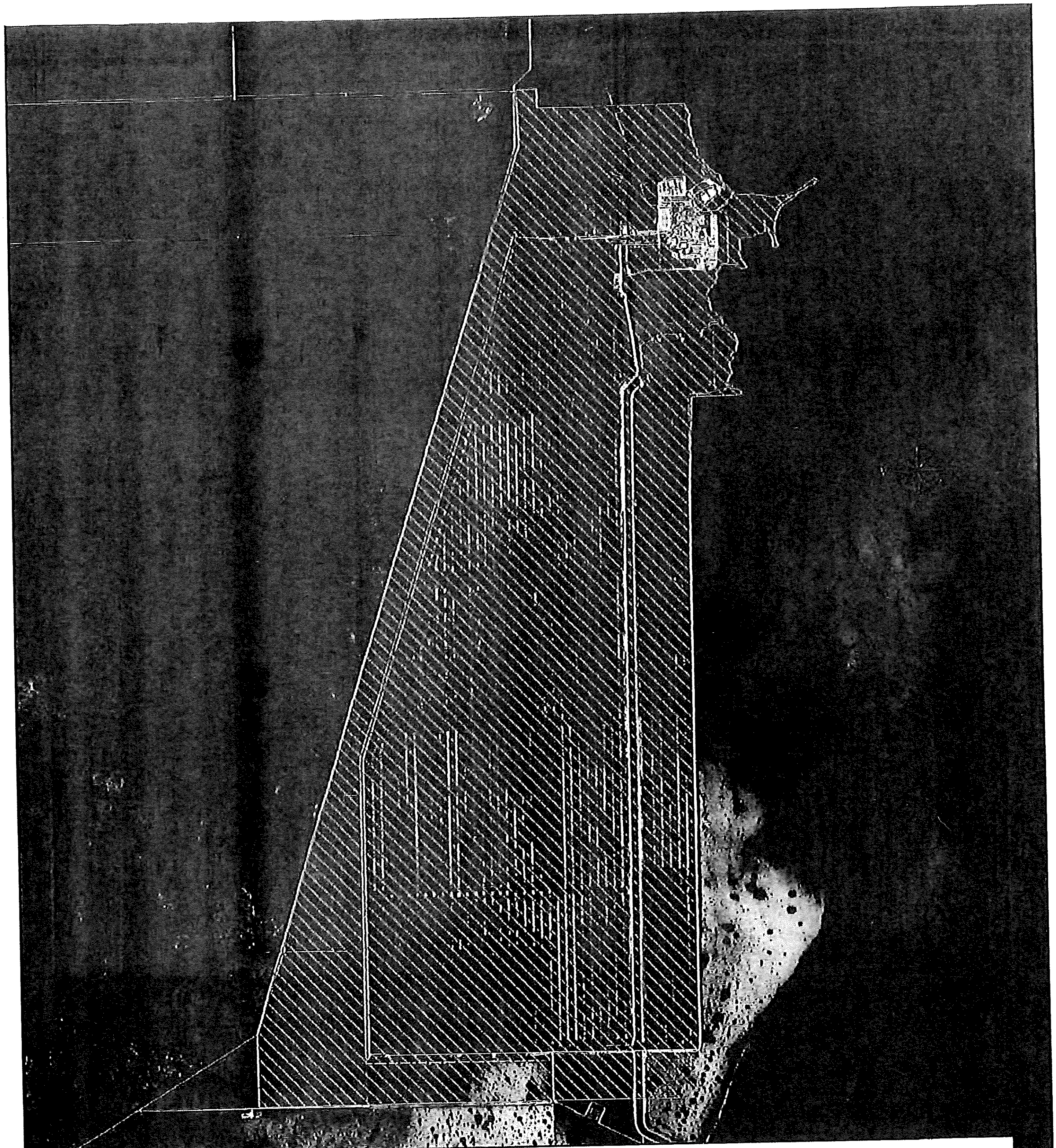

Exhibit A
FPL Turkey Point Property Boundary for Purposes of Consent Agreement (~9000 acres)

0 0.5 1 2 Miles

2015_FPL_TP_facility_bnd90K.mxd - October 6, 2015

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY, INC.,

Respondent.
______________________________/

IN THE OFFICE OF THE SOUTHEAST DISTRICT

OGC File No.: 16-0241

NOTICE OF VIOLATION AND
ORDERS FOR CORRECTIVE ACTION

To: Florida Power & Light Company, Inc.
c/o J. E. Leon, Registered Agent
4200 West Flagler Street
Suite 2113
Miami, Florida 33134

Certified Return Receipt No. 7013 2630 0001 2651 6074

Pursuant to the authority of section 403.121(2), Florida Statutes, the State of Florida Department of Environmental Protection (Department) gives notice to Florida Power & Light Company, Inc. (Respondent) of the following findings of fact and conclusions of law with respect to violations of chapter 403, Florida Statutes.

FINDINGS OF FACT

1. The Department is the administrative agency of the State of Florida having the power and duty to protect Florida's air and water resources and to

administer and enforce the provisions of chapter 403, Florida Statutes, and the rules promulgated thereunder in title 62, Florida Administrative Code.

2. Respondent is an active Florida corporation, registered to conduct business in the State of Florida. Respondent is a regulated Florida Utility providing electric service to 4.7 million customers in 35 counties.

3. Respondent owns and operates the Turkey Point Power Plant located on approximately 9,400 acres in unincorporated Miami-Dade County, Florida along the coastline adjacent to Biscayne Bay (Turkey Point), with a permitted address of 9670 S.W. 344 Street, Florida City, Miami-Dade County, Florida.

4. Turkey Point consists of five electrical generating units and also includes a cooling canal system (CCS). The CCS is made up of a 5,900-acre network of canals providing a heat removal function for the five electrical generating units.

5. Respondent is the permittee of National Pollutant Discharge Elimination System Industrial Wastewater Permit Number FL0001562 (Permit). Respondent operates the CCS under the Permit.

6. The CCS canals are unlined and have a direct connection to the groundwater.

7. On or about December 23, 2014, the Department issued an Administrative Order related to the CCS at Turkey Point.

8. On or about February 9, 2015, the Administrative Order was petitioned and subsequently referred to the Division of Administrative Hearings (DOAH) (Consolidated Case Numbers 15-1746 and 15-1747).

9. On February 15, 2016, the Administrative Law Judge issued a Recommended Order in DOAH Case Numbers 15-1746 and 15-1747 (Recommended Order).

10. On April 21, 2016, the Recommended Order, as modified in part, was adopted by the Department in Final Order Number 16-0111.

11. The following findings in the Final Order are hereby incorporated in this Notice of Violation:

a. The CCS is the major contributing cause to the continuing westward movement of the saline water interface;

b. The CCS groundwater discharge of hypersaline water contributes to saltwater intrusion;

c. Rule 62-520.400, Florida Administrative Code, prohibits a discharge in concentrations that impair the reasonable and beneficial use of adjacent waters;

d. Saltwater intrusion into the area west of the CCS is impairing the reasonable and beneficial use of adjacent G-II groundwater and therefore, is a violation of the minimum criteria for groundwater in rule 62-520.400, Florida Administrative Code.

12. Condition IV. 1. of the Permit requires that Respondent's discharge to groundwater shall not cause a violation of the minimum criteria for groundwater as specified in rules 62-520.400 and 62-520.430, Florida Administrative Code.

13. Section 403.161(1)(b), Florida Statutes, states, in part, it is a violation to fail

to comply with a permit issued by the Department.

CONCLUSIONS OF LAW

14. The Department has evaluated the Findings of Fact with regard to the requirements of chapter 403, Florida Statutes, and title 62, Florida Administrative Code. Based on the foregoing facts, the Department has made the following conclusions of law.

15. Respondent is a "person" as defined in section 403.031(5), Florida Statutes.

16. Respondent is the permittee of the Permit.

17. Respondent operates the CCS under the Permit.

18. The facts set forth above constitute a violation of section 403.161(1)(b), Florida Statutes, for failing to comply with Condition IV. 1. of the Permit.

ORDERS FOR CORRECTIVE ACTION

19. The Department has alleged that the activities related in the Findings of Fact constitute violations of Florida law. The Orders for Corrective Action state what you, Respondent, must do in order to correct and redress the violations alleged in this Notice. The Department will adopt the Orders for Corrective Action as part of its Final Order in this case unless Respondent either files a timely petition for a formal hearing or informal proceeding, pursuant to section 403.121(2)(c), Florida Statutes, or files written notice with the Department opting out of this administrative process, pursuant to section 403.121(2)(c), Florida Statutes. (See Notice of Rights.) If Respondent fails to comply with the corrective actions ordered by the Final Order, the Department is authorized to file suit seeking judicial enforcement of the Department's Order pursuant

to sections 120.69, 403.121, and 403.131, Florida Statutes.

20. Pursuant to the authority of sections 403.061(8) and 403.121, Florida Statutes, the Department proposes to adopt in its Final Order in this case the following specific corrective actions that will redress the alleged violations.

21. Within 21 days of the effective date of this Order, Respondent shall enter into consultations with the Department to address abatement and remediation measures necessary to address the violation set forth above. At the start of this consultation, Respondent shall provide the following information/data to the Department:

a. All final studies and analyses of the effects of the CCS on ground waters.
b. All final studies and analyses regarding abatement, remediation, modeling and/or prevention of the hypersaline plume, to which the CCS contributes.

22. Respondent and Department shall attempt to enter into an agreeable consent order or equivalent that incorporates corrective actions to abate and remediate the effects of the violation listed above. The consent order or equivalent shall, at a minimum, delineate actions to abate the CCS contribution to the hypersaline plume, reduce the size of the hypersaline plume, and prevent future harm to waters of the State.

23. If parties are unable to enter into a consent order or equivalent incorporating the terms described above, within 60 days of the effective date of this

Order, the Department may issue a comprehensive management plan to, at a minimum, abate the CCS contribution to the hypersaline plume, reduce the size of the hypersaline plume, and prevent future harm to waters of the State. Respondent shall implement the comprehensive management plan as issued by the Department.

24. Except as otherwise provided, all submittals required by this Order shall be sent to Elsa Potts, Program Administrator Water Resource Management, Department of Environmental Protection, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.

NOTICE OF RIGHTS

25. Respondent's rights to negotiate, litigate or transfer this action are set forth below.

Right to Negotiate

26. This matter may be resolved if the Department and Respondent enter into a consent order, in accordance with section 120.57(4), Florida Statutes, upon such terms and conditions as may be mutually agreeable.

Right to Request a Hearing

27. Respondent has the right to a formal administrative hearing pursuant to sections 120.569, 120.57(1), and 403.121(2), Florida Statutes, if Respondent disputes issues of material fact raised by this Notice of Violation and Orders for Corrective Action (Notice). At a formal hearing, Respondent will have the opportunity to be represented by counsel or other qualified representative, to present evidence and argument on all issues involved, to conduct cross-examination and submit rebuttal evidence, to submit proposed findings of fact and orders, and to file exceptions to any

order or administrative law judge's recommended order.

28. Respondent has the right to an informal administrative proceeding pursuant to sections 120.569 and 120.57(2), Florida Statutes, if Respondent does not dispute issues of material fact raised by this Notice. If an informal proceeding is held, Respondent will have the opportunity to be represented by counsel or other qualified representative, to present to the agency written or oral evidence in opposition to the Department's proposed action, or to present a written statement challenging the grounds upon which the Department is justifying its proposed action.

29. If Respondent desires a formal hearing or an informal proceeding, Respondent must file a written responsive pleading entitled "Petition for Administrative Proceeding" within 20 days of receipt of this Notice. The petition must be in the form required by rule 28-106.2015, Florida Administrative Code.

(a) The Department's Notice identification number and the county in which the subject matter or activity is located;

(b) The name, address, and telephone number, and facsimile number (if any) of each respondent;

(c) The name, address, telephone number, and facsimile number of the attorney or qualified representative of respondent, if any, upon whom service of pleadings and other papers shall be made;

(d) A statement of when respondent received the Notice; and

(e) A statement requesting an administrative hearing identifying those material facts that are in dispute. If there are none, the petition must so indicate.

A petition is filed when it is received by the Department's Office of General Counsel, 3900 Commonwealth Boulevard, MS-35, Tallahassee, Florida, 32399-3000.

Right to Request Mediation

30. Respondent may request mediation after filing a petition for hearing. Requesting mediation will not adversely affect the right to a hearing if mediation does not result in a settlement. The mediation will be held if the parties enter a written agreement, which is described below, within 30 days after receipt of the Notice. The mediation must be completed within 60 days of the agreement unless the parties otherwise agree.

The agreement to mediate must include the following:

(a) The names, addresses, and telephone numbers of any persons who may attend the mediation;

(b) The name, address, and telephone number of the mediator selected by the parties, or a provision for selecting a mediator within a specified time;

(c) The agreed allocation of the costs and fees associated with the mediation;

(d) The agreement of the parties on the confidentiality of discussions and documents introduced during mediation;

(e) The date, time, and place of the first mediation session, or a deadline for holding the first session, if no mediator has yet been chosen;

(f) The name of each party's representative who shall have authority to settle or recommend settlement; and

(g) The signatures of all parties or their authorized representatives.

As provided in section 120.573 of the Florida Statutes, the timely agreement of all parties to mediate will toll the time limitations imposed by sections 120.569 and 120.57 for requesting and holding an administrative hearing. Unless otherwise agreed by the parties, the mediation must be concluded within sixty days of the execution of the agreement. If mediation results in settlement of the administrative dispute, the Department must enter a final order incorporating the agreement of the parties. Persons whose substantial interests will be affected by such a modified final decision of the Department have a right to petition for a hearing only in accordance with the requirements for such petitions set forth above, and must therefore file their petitions within 21 days of receipt of this notice. If mediation terminates without settlement of the dispute, the Department shall notify the Respondent in writing that the administrative hearing processes under sections 120.569 and 120.57 remain available for disposition of the dispute, and the notice will specify the deadlines that then will apply for challenging the agency action and electing remedies under those two statutes.

Waivers

31. Respondent will waive the right to a formal hearing or an informal proceeding if a petition is not filed with the Department within 20 days of receipt of this Notice. These time limits may be varied only by written consent of the Department.

General Provisions

32. The allegations of this Notice together with the Orders for Corrective Action will be adopted by the Department in a Final Order if Respondent fails to timely file a petition for a formal hearing or informal proceeding, pursuant to section 403.121, Florida Statutes. A Final Order will constitute a full and final adjudication of the matters alleged in this Notice.

33. If Respondent fails to comply with the Final Order, the Department is authorized to file suit in circuit court seeking a mandatory injunction to compel compliance with the Order, pursuant to sections 120.69, 403.121 and 403.131, Florida Statutes. The Department may also seek to recover damages, all costs of litigation including reasonable attorney's fees and expert witness fees, and civil penalties of not more than $10,000 day for each day that Respondent has failed to comply with the Final Order.

34. The Department is not barred by the issuance of this Notice from maintaining an independent action in circuit court with respect to the alleged violations. If such action is warranted, the Department may seek injunctive relief, damages, civil penalties of not more than $10,000 per day, and all costs of litigation.

35. Copies of Department rules referenced in this Notice may be examined at any Department Office or may be obtained by written request to the person listed on the last page of this Notice.

DATED this 25th day of April, 2016.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Frederick L. Aschauer, Jr., Director
Division of Water Resource Management

Copies furnished to:
Larry Morgan, OGC Enforcement Section
Mail Station 35

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Florida Power & Light Company, Inc.
c/o J.E. Leon, Registered Agent
4200 West Flagler Street, Suite 2113
Miami, FL 33134

PS Form 3800, August 2006 — See Reverse for Instructions

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- Attach this card to the back of the mailpiece, or on the front if space permits.

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Florida Power & Light Company, Inc.
c/o J.E. Leon, Registered Agent
4200 West Flagler Street, Suite 2113
Miami, FL 33134

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X
☐ Agent
☐ Addressee

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PS Form 3811, February 2004 — Domestic Return Receipt 4/25/16 Ltr.-FPL NOV — 102595-02-M-1540

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

April 25, 2016

Florida Power & Light Company, Inc.
c/o J.E. Leon, Registered Agent
4200 West Flagler Street
Suite 2113
Miami, Florida 33134

Certified US Mail Return Receipt
#7013 2630 0001 2651 6081

Re: Warning Letter #WL16-00015IW13SED
Turkey Point Power Plant
Facility ID No.: FL0001562
Miami-Dade County

Dear Sir:

The Department is in receipt of a March 2016 "Report on Recent Biscayne Bay Water Quality Observations associated with Florida Power and Light Turkey Point Cooling Canal System Operations" (Report). The Report indicates recent sampling events "provide compelling evidence that water originating from the Cooling Canal System is reaching these tidal surface waters connected to Biscayne Bay." Information in the Report indicates possible violations of chapter 403, Florida Statutes, and chapters 62-302 and 62-520, Florida Administrative Code.

Violations of Florida Statutes or administrative rules may result in liability for damages and restoration, and the judicial imposition of civil penalties, pursuant to section 403.161, Florida Statutes.

Please contact Elsa Potts, at (850) 245-8665, within **15 days** of receipt of this Warning Letter to arrange a meeting to discuss this matter. The Department is interested in receiving any facts you may have that will assist in determining whether any violations have occurred. You may bring anyone with you to the meeting that you feel could help resolve this matter.

Please be advised that this Warning Letter is part of an agency investigation, preliminary to agency action in accordance with section 120.57(5), Florida Statutes. We look forward to your cooperation in completing the investigation and resolving this matter.

Sincerely,

Frederick L. Aschauer, Jr., Director
Water Resource Management
Florida Department of Environmental Protection

cc: Elsa Potts, DEP

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Street, Apt. No.; or PO Box No.

c/o J.E. Leon, Registered Agent
4200 West Flagler Street, Suite 2113

City, State, ZIP+4

Miami, FL 33134

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Miami, FL 33134

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A. Signature
X ☐ Agent ☐ Addressee

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LLW | LEWIS LONGMAN WALKER

Attorneys at Law
llw-law.com

Andrew J. Baumann
abaumann@llw-law.com

Reply To:
West Palm Beach Office

April 29, 2016

VIA HAND DELIVERY

Senator Anitere Flores
10691 N. Kendall Drive
Suite 309
Miami, FL 33176

Re: Florida Power & Light Company Turkey Point Cooling Canal System Groundwater Contamination

Dear Senator Flores:

Our firm represents Atlantic Civil, Inc., a family owned and operated business in Southeastern Miami-Dade County located due west of Florida Power & Light Company's (FPL) Cooling Canal System (CCS). Thank you very much for the opportunity to provide you with information regarding the severe impacts that CCS is causing to the groundwater around FPL's Turkey Point Power Plant.

Atlantic Civil has been closely following this issue since 2004, when extensive groundwater models Atlantic Civil was ordered to provide as part of its mining permits revealed the serious impacts the CCS was causing. Since then, Atlantic Civil has repeatedly tried to work with FPL, South Florida Water Management (SFWMD), Miami-Dade County, and the Florida Department of Environmental Protection (DEP) to resolve Atlantic Civil's concern. Now, twelve years later, Atlantic Civil's validly issued mining and agricultural permits and its longstanding business operations are in imminent peril, yet FPL has still made no binding commitment to protect Atlantic Civil from the advancing saltwater intrusion caused by the CCS.

As recently as December, 2014, FPL continued to deny that the CCS was even the cause of the problem. It took two different rulings by a Judge to at least force FPL to accept responsibility for the saltwater intrusion.

After nearly two weeks of testimony, where FPL and DEP both testified that the saltwater intrusion was likely the result of other forces, a Judge ruled in two different cases that that the CCS is the primary cause of saltwater intrusion in Southeastern Miami-Dade County. In fact, modeling presented by Atlantic Civil showed that these other forces, such as drinking well fields and canals, were insignificant in comparison to the CCS's impact.

Despite their continued denials, FPL was already studying the feasibility of 36 different measures to stop the CCS's continued contamination of the water supply as far back as 2009 and 2010. DEP staff had already internally communicated that the CCS was causing exceedances of State groundwater standards, and the SFWMD had already concluded that the CCS plume had spread beyond its permitted area and had advanced miles to the west, contrary to the Supplemental Agreements between SFWMD and FPL.

Relying primarily on FPL's own monitoring data, the Judge had no difficulty finding that FPL was causing the saltwater intrusion and that the CCS was violating state groundwater standards. These findings were made in two different rulings earlier this year.

Throughout all of this, FPL has still made no binding commitment to prevent the known and impending harm to Atlantic Civil. FPL's Band-Aid solutions (adding water to the CCS) were debunked in FPL's 2010 feasibility study because it was likely to negatively affect the huge plume of CCS water that had already seeped from the unlined CCS into the Aquifer. At the end of December, SFWMD staff testified that even under FPL's chosen action ***the Biscayne Aquifer will continue to be loaded with between 600,000 and 3 million pounds of salt per day. The saltfront will convert over 850,000 gallons a day of water from potable to non-potable each day after the CCS is freshened with additional water. That is enough drinking water to supply 6,000 south Florida residents that is lost each and every day.***

Atlantic Civil, Inc.'s Harm in Imminent

The Torcise family came to Florida from Italy and started a family farm in southeastern Miami-Dade County in the 1920's, long before there was a nuclear power plant or CCS. As south Florida grew and diversified, so did the Torcise family business operations; expanding from agriculture to include the rock-mining and beach-compatible sand industries. Today, Atlantic Civil is in the castor bean business and produces FDOT grade limerock utilized across the state for public road projects, concrete and building materials and provides high quality beach-compatible sand for beach renourishment projects.

Atlantic Civil owns 2,600 acres of property four miles due west of Turkey Point. The Biscayne Aquifer is the sole source of fresh water for the Atlantic Civil Property. Atlantic Civil uses fresh water from the Biscayne Aquifer pursuant to SFWMD Water Use Permit Nos. 13-03608-W and 13-03796-W. DEP has also issued Atlantic Civil a Life-of-the-Mine Environmental Resource Permit for mining activities.

In order to obtain this permit, Atlantic Civil was required to demonstrate that the mining operations would not cause or worsen saltwater intrusion, something that was already a serious concern to DEP, SFWMD and the Corps of Engineers back in 2004. Atlantic Civil was required to develop a sophisticated 3-D density dependent, solute transfer groundwater model to determine impact of various factors on saltwater intrusion in the area. The model is able to look both cumulatively and to isolate individual potential causes such as mining operations, SFWMD canals, agricultural withdrawals and the CCS. In the course of this analysis, the model revealed the CCS was causing the saltwater intrusion and that that other activities in the area were having only a negligible impact.

Atlantic Civil was required to install dozens of monitoring wells on its property. If any groundwater monitoring well profile, mine pit profile, or monitoring well sample shows an exceedance of salinity (measured as a specific conductivity threshold of 1.07 mS/cm (150 mg/L chloride)), Atlantic Civil must immediately notify DEP. If the groundwater monitoring data shows that chloride concentrations rise above 250 mg/L within the mine pit, DEP's permit prohibits Atlantic Civil from continuing to mine on its property.

Regardless of Atlantic Civil's permit, ***if the saltfront reaches Atlantic Civil's property, even with a valid permit, the limerock mine would be rendered essentially inoperable.*** If salt mixes with limerock, the limerock loses its commercial viability for road infrastructure and building materials because the limerock can no longer maintain its structural integrity.

Atlantic Civil's concerns mounted when FPL Monitoring Well TPGW-7D,[1] which historically has always contained fresh, potable water and which is located approximately 1,200 feet from Atlantic Civil, began to show signs of saltwater intrusion in the fall of 2013. Since that time, salinity and total dissolved solids (TDS) at the deep monitoring horizon have rapidly increased converting Class G-II potable groundwater to non-potable Class G-III groundwater.[2] The sodium levels at TPGW-7D also now exceed 160 mg/L, which violates DEP's primary groundwater standard for sodium. There are no more monitoring wells between Turkey Point and Atlantic Civil's property. The saltfront now sits somewhere between TPGW-7D and Atlantic Civil's property. The next well to the west is located on Atlantic Civil's property.

<u>Atlantic Civil's Administrative Challenges Brought These Issues to Light</u>

When it became clear to Atlantic Civil during its permitting process that the CCS was causing saltwater intrusion and that Atlantic Civil's business was in jeopardy, Mr. Torcise approached FPL and all the regulatory agencies asking an open dialogue about how to stop the saltfront. FPL denied that the CCS was the cause of saltwater intrusion, pointed fingers towards

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[1] As part of the Uprate Certification for Units 3 & 4 and as part of the 5th Supplemental Agreement between FPL and SFWMD, an extensive groundwater and surface water monitoring system was installed.

[2] Classes of groundwater are defined by DEP Rule 62-520, F.A.C. Class G-II groundwater is measured as less than 10,000 mg/L TDS and indicates potable, fresh water. Once the TDS level increases above 10,000 mg/L TDS, that portion of the aquifer is considered to be G-III classification, or non-potable.

other activities in the region, and denied any responsibility for remediation. When Atlantic Civil learned that that DEP and SFWMD were negotiating an Administrative Order (AO) over the CCS, Atlantic Civil provided substantive input and met with DEP to discuss its serious concerns over the sufficiency of the AO.

On December 23, 2014, DEP issued the AO without addressing Atlantic Civil's concerns and simultaneously approved FPL's request to modify the Conditions of Certification to their Power Plant Site License to add 14 million gallons a day (mgd) of Upper Floridan Aquifer to the CCS. In combination, these efforts were designed to solve FPL's temperature and salinity concerns inside of the CCS itself, but did not address or clean-up 40 years of legacy pollution already in the Biscayne Aquifer. Atlantic Civil was forced to administratively challenge these two authorizations in order to prevent the grandfathering in of this pollution plume and in the hopes of forcing a solution that remediated the known and continuing harm.[3]

Administrative Law Judge Bram Canter presided over both hearings and after nearly 8 days of collective testimony and evidence, made several vital findings:

- Tritium above natural background levels (of ~ 20 picocuries per liter) has is universally accepted by the agencies as "fingerprinting" water that originated from the CCS.[4] Tritium above background in combination with levels of salt above the salinity of bay water have been found in monitoring wells 4-5 miles west of the CCS and within close proximity to Miami-Dade County's public water supply wellfields.

- The hypersaline plume from the CCS continues to push naturally occurring freshwater/saltwater line in front of it – pushing this saltfront miles further west than normal.

- The preponderance of the evidence presented at hearing indicated that the CCS is the major contributing cause of the continued westward movement of the saltwater interface.

The Judge further found:

- The DEP administrator who testified in both hearings regarding DEP's inability to determine a specific groundwater quality violation lacked credibility.

- The undisputed evidence at the hearings was that the CCS has contributed to saltwater intrusion, making less fresh/potable water available for the environment and legal existing users. FPL is in violation of the minimum criteria for groundwater in Rule 62-520.400,

[3] In addition to this letter, Atlantic Civil has submitted an extensive back-up materials which include both materials from the two hearings and other key information to consider.
[4] Atlantic Civil does not claim that the levels of tritium in the Biscayne Aquifer are at levels dangerous to human health. However, the levels of tritium in Biscayne Bay need further study before claims can be made by FPL or others that there is no harm to the Bay.

F.A.C. which prohibits a discharge to groundwater in concentrations that "impair the reasonable and beneficial use of adjacent waters."[5]

- Wells west of the CCS and beyond FPL's zone of discharge are many times greater than the applicable G-II groundwater standard for sodium.

While skeptically authorizing the 14 mgd proposal as something of an improvement over the current situation by somewhat slowing the rate of saltwater intrusion, the Judge found that nothing about the addition of the 14 mgd will stop the known and continuing harm to the Biscayne Aquifer and Atlantic Civil. All the modeling evidence at hearing demonstrated that under the 14 mgd solution, the saltwater front continued to move west through the modeling horizon of 2044 and all the modeling demonstrated Atlantic Civil's property becoming overrun with saltwater in the next few years.

In light of this the Judge felt that is was ***"appropriate to inform the Siting Board that the operation of the Turkey Point Power Plant, as authorized by the Siting Board under the Conditions of Certification, has caused harm to water resources because of the effects of the CCS, and the modification requested by FPL will not prevent further harm from occurring."***

In March 2016, Atlantic Civil went before the Governor and Cabinet, sitting as the Siting Board, and asked that additional conditions be placed into the Site License to require FPL to stop the harm and remediate the known and continuing pollution caused by the CCS. Unfortunately, the Siting Board believed it lacked legal authority to add conditions. Recent case law from the Third District Court of Appeal indicates otherwise.

In the AO case, ***The Judge agreed with Atlantic Civil and found that the success criteria in the AO were fatally flawed because they allowed FPL to continue to violate groundwater quality standards for decades. The Judge concluded that the AO was not a reasonable exercise of DEP's enforcement discretion because the AO did not require FPL to come into compliance with the applicable rules and regulations, or specify a reasonable time for the CCS to come into compliance with those rules and regulations.*** The Judge evaluated DEP's definition of "abate" with regard to the groundwater contamination, and found it was inconsistent with the intended meaning of the Conditions of Certification and incongruous with environmental statutes use and meaning of the word abate. Just last week, DEP rejected the ALJ's finding and determined in its Final Order that the AO was reasonable because DEP has exclusive right to determine enforcement and issued the AO as written.

<u>The Miami-Dade Consent Order Is Not Intended to Address the Groundwater Plume</u>

[5] This requirement is also found in FPL's "administratively extended" NPDES permit. The NPDES permit has been expired since 2010 and DEP provided testimony at hearing that they cannot renew the NPDES permit while the groundwater issues with the CCS remain and that the AO was intended to assist in the reissuance.

Miami-Dade County was originally a party to both of Atlantic Civil's administrative challenges. However, Miami-Dade and FPL entered into settlement discussions which resulted in Miami-Dade withdrawing from the litigation and the issuance of a Notice of Violation for FPL for chlorides. FPL and Miami-Dade entered into a Consent Order to help resolve the CCS as the source of the pollution. However, Miami-Dade officials have informed Atlantic Civil that the Consent Order was never intended to address the existing groundwater pollution or stop the western edge of the saltfront from continuing to move inland.

Under the Consent Order, FPL was required within 180 days from execution to provide Miami-Dade County comprehensive 3-D modeling of proposed extraction wells in the immediate area of the CCS. That deadline came and went. FPL asked for an extension on the modeling to mid-May. To date, FPL has provided no modeling showing that the proposed extraction wells will stop the continued westward movement of the saltfront.

Atlantic Civil modeled the Miami-Dade Consent Order's actions and informed FPL that the proposed extraction wells would be insufficient to prevent the harm to Atlantic Civil in their proposed location. FPL, in their own feasibility study from 2010, evaluated the idea of locating extraction wells further to the west at 137th / Tallahassee Road. Atlantic Civil's modeling indicates that this location will have a greater impact on both removing the hypersaline plume and stopping the leading edge of the saltfront from moving further west.

<u>DEP's NOV Does Not Appear to Address the Saltwater Intrusion</u>

Just this week DEP has issued a Notice of Violation against FPL for a violation of their National Pollutant Discharge Elimination System/Industrial Wastewater Permit. This Permit is incorporated into the Turkey Point Site License as Condition of Certification XI, which states that a violation of this permit is considered a violation of the Site License.

While the recent NOV is a positive step forward, several concerns remain. The NOV does not address the actual movement of the saltfront caused by discharges from the CCS, but only mentions the "hypersaline plume" which is only a portion of the CCS plume in the groundwater. A much larger portion of the Aquifer is contaminated by CCS water fingerprinted by elevated levels of tritium, which are not strictly speaking, hypersaline. The NOV does not specify a date for implementation or date for which compliance must be reached, it only calls for a plan. So, until a Consent Order is executed, it is unclear how effective any yet-to-be identified measures will be. Finally, FPL modeling has not been provided to Atlantic Civil and Atlantic Civil has serious concerns that modeling is based on outdated information that does not account for FPL's practice of 45 mgd of marine water into the CCS or FPL's recent dredging of the CCS which has actually increased the connection between the CCS and the Aquifer below and has increased seepage from the CCS. Nevertheless, Atlantic Civil remains hopeful that it can be included in discussions with DEP and, with continued oversight by the Legislature, a Consent Order can be reached that protects the Aquifer, including Atlantic Civil's property.

Conclusions

Atlantic Civil has been working tirelessly for 12 years to get FPL and the regulatory agencies to take action to stop the saltfront from continuing to convert south Florida's drinking water from potable to non-potable and to protect the imminent harm to Atlantic Civil's family owned and operated businesses. Until Atlantic Civil's administrative litigation and ultimately the findings by the Judge, FPL and the agencies denied that the CCS was even the cause of saltwater intrusion. Atlantic Civil has given many dozen presentations and written extensive letters over the years on this serious issue, to no avail. No regulatory agency has held FPL accountable for what has now been judicially determined to be FPL's historical a continuing violation of groundwater standards. Atlantic Civil is hopeful the Legislature can help reinstate public confidence by forcing the regulators to restore the Biscayne Aquifer to its former pre-CCS condition.

Sincerely,

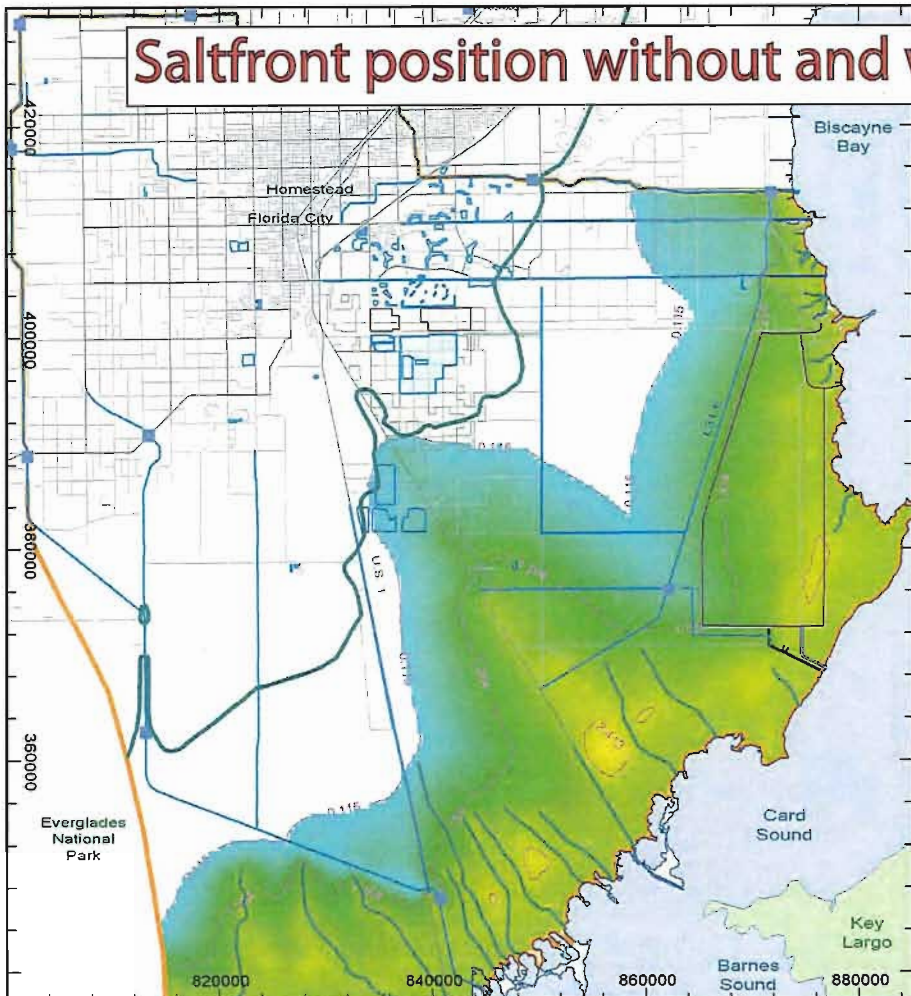
Andrew J. Baumann

AJB/mal

Atlantic Civil's "Cheat Sheet" to the Parallel Ch. 120 Cases

<table>
<tr><th>Power Plant Siting Act Case- *
DOAH 15-1559EPP</th><th>Administrative Order Case-
DOAH 15-1746</th></tr>
<tr><td>Modification Approved by DEP as Siting Board 12/23/2014</td><td>Administrative Order Approved by DEP 12/23/2014</td></tr>
<tr><td>FPL requested to withdraw 14 mgd from Upper Floridan Aquifer and place into CCS in order to reduce salinity within CCS- application does not discuss Condition X.D of Site License</td><td>DEP approved a hybrid "order" under general authority "implementing and enforcing" Condition of Certification X.D of Site License</td></tr>
<tr><td>Water will free flow from artesian wells (indefinitely) into NW corner of CCS- This is also the area of the CCS where seepage (leaking) into Biscayne Aquifer is greatest.
There is no corresponding mitigation or remediation to offset the known harm from doing so.</td><td>Administrative Order directed FPL to create a "salinity management plan" which would declare FPL successful in "abating" harm to the water resources of the state if:
• CCS could be brought down to at least 34 PSU (Practical salinity units)
• Monitoring wells at edge of CCS showed a "decreasing trend"</td></tr>
<tr><td>Atlantic Civil, Miami-Dade County and Tropical Audubon filed written objections</td><td>Atlantic Civil, Miami-Dade County, City of Miami and Tropical Audubon filed petitions</td></tr>
<tr><td>Miami-Dade Settled; Tropical withdrew</td><td>Miami-Dade Settled; Tropical withdrew</td></tr>
<tr><td>Hearing held: December 2015</td><td>Hearing held: November 2015</td></tr>
<tr><td>ALJ: Bram Canter</td><td>ALJ: Bram Canter</td></tr>
<tr><td>Recommended Order issued: January 25, 2016 recommending approval of 14 mgd but also informing Siting Board that the operation of the CCS is causing harm to the water resources of the state and the 14mgd will not prevent the harm.</td><td>Recommended Order issued: February 25, 2016 recommending rescinding Administrative Order as document was an abuse of DEP's enforcement discretion or altering it to conform to the order.</td></tr>
<tr><td>Atlantic Civil's concerns:
• Adding additional water into the CCS raises the stage/head/gradient of the CCS compared to the rest of the Model Lands Basin (area to the west of the CCS).
• This in turn forces CCS water out of the bottom of the CCS down into the Biscayne Aquifer and out into the environment in all directions in quantities greater than the amount of water added (~15.7 MGD of seepage out after 14 MGD in)
• No evaluation by SFWMD permit review staff was done on the impact of adding the water to the CCS- only the withdrawals.
• Not one party believes this "solution" will halt/stop or remediate the existing pollution in the Aquifer- merely slow it down- but the front moves for at least another 25 years
• Atlantic Civil's existing legal use of Biscayne Aquifer will be compromised/ Atlantic Civil's validly issued mining operations will be forced to shut down</td><td>Key Points from the Administrative Order Recommended Order:
• FPL's CCS is the primary cause of the continuing saltwater intrusion issue in Southeast Miami-Dade County
• The CCS is causing conversion of groundwater from potable/fresh (G-II GW) to non-potable (G-III GW)
• This causing violations of the "free-from" rule for groundwater and also violations of the primary drinking water standard for sodium. (Unaddressed by NOV)
• The Administrative Order defines abate as to lessen or diminish. The ALJ found that inconsistent with environmental rules and statutes and contrary to the meaning in Condition X.D of the Site License it was intended to "enforce."
• The Administrative Order did nothing to clean up the groundwater- merely the CCS itself- same as 14 mgd case.
• DEP's NOV addresses only the CCS contribution to the "hypersaline" plume- does not address leading edge of saltfront</td></tr>
</table>

Saltfront position without and with FPL Cooling Canal System 2010



Data Legend:

Dissolved Solids Conc. in Layer 7 - end of 2010 wet season

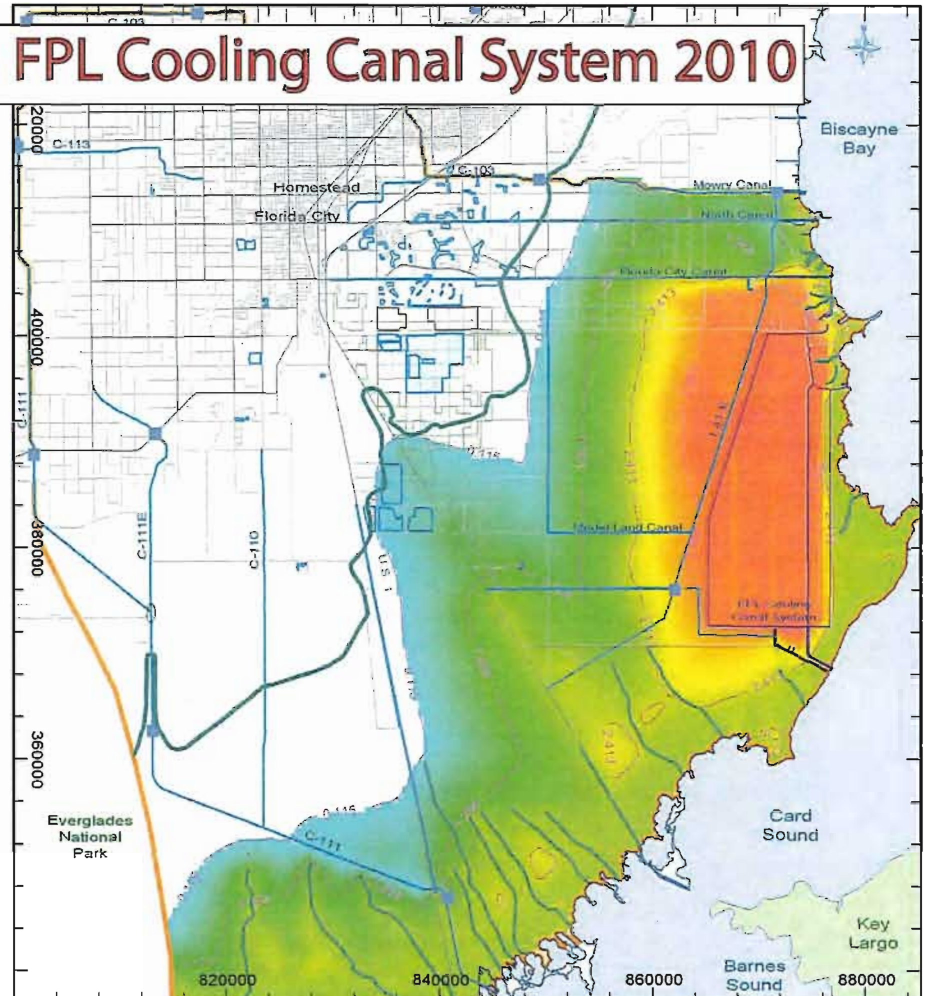
0.115 | 1.000 | 2.000 | 3.000 | 4.000 | 5.000

Map Scale: 0 | 10000 | 20000

Note: Multiply by 8700 to get equivalent chloride concentration in mg/L

Data Sources: Topography and Digital Line Data from USGS
Projection: Florida East State Plane NAD83

Atlantic Civil Inc. - SDI Property - Miami-Dade County	8/14/2011
Simulated Dissolved Solids Concentration in Layer 7 at the end of the 2010 wet season (No FPL)	
Earthfx	EAS Engineering, Inc.



Data Legend:

Dissolved Solids Conc. in Layer 7 - end of 2010 wet season

0.115 | 1.000 | 2.000 | 3.000 | 4.000 | 5.000

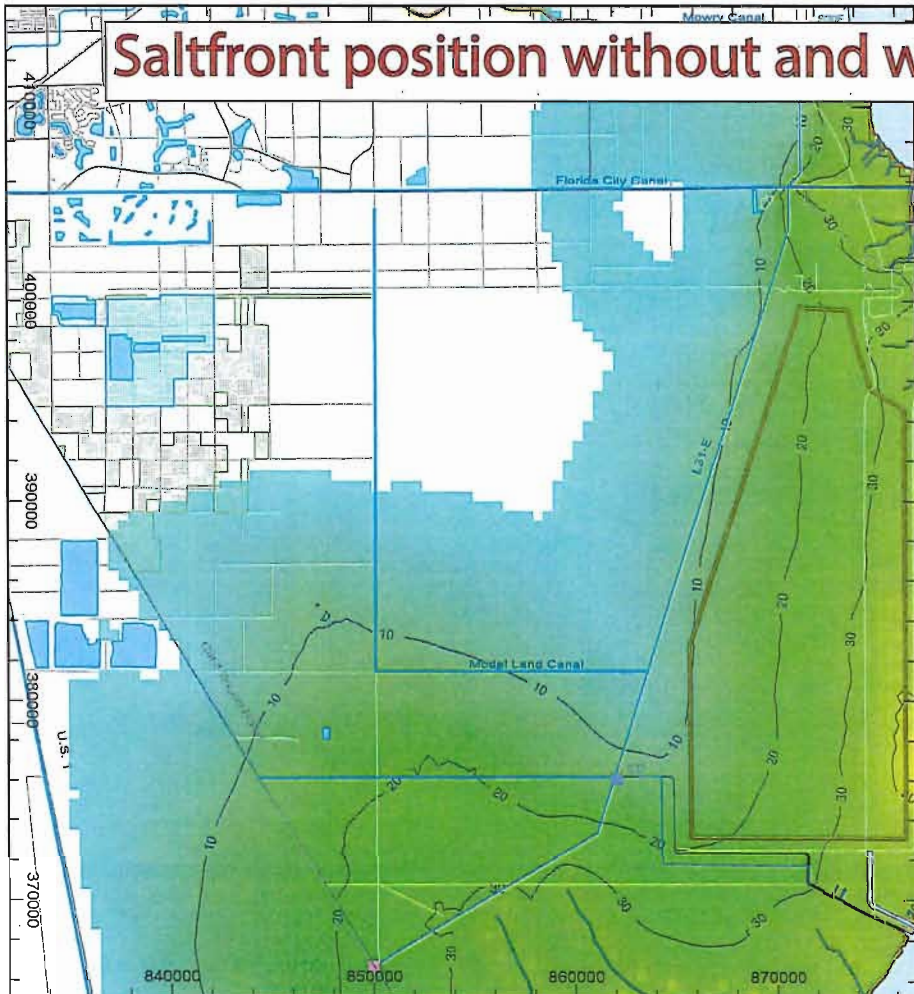
■ SFWMD Canal Structures - no names

Map Scale: 0 | 10000 | 20000

Data Sources: Topography and Digital Line Data from USGS
Projection: Florida East State Plane NAD83

Atlantic Civil Inc. - SDI Property - Miami-Dade County	7/3/2011
Simulated Dissolved Solids Concentration in Layer 7 at the end of the 2010 wet season	
Earthfx	EAS Engineering, Inc.

Saltfront position without and with FPL Cooling Canal System 2015



Data Legend:

PSU Layer 8 - 2010-2015 - No FPL

Contour Line Start: 0 Step: 10 Stop: 90

Map Scale

0 4000 8000

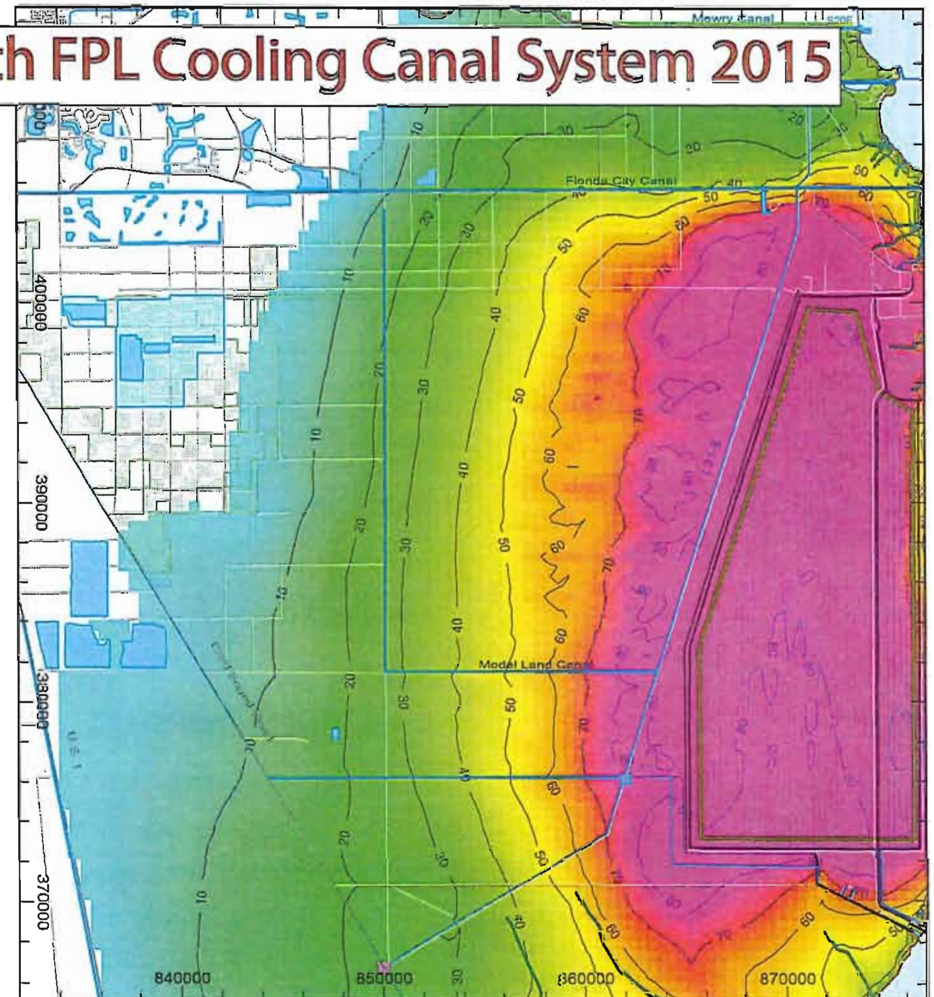
Note: Multiply by 8700 to get equivalent chloride concentration in mg/L

For example, a dissolved solids concentration of 0.0287 is equal to 250 mg/L chloride

Data Sources: Topography and Digital Line Data from USGS

Projection: Florida East State Plane NAD83

Atlantic Civil Inc. - SDI Property - Miami-Dade County	April 2015
Simulated Salinity (PSU) in Layer 8 at the end of the 2015 wet season - with no CCS	
Earthfx	



Data Legend:

PSU Layer 8 - 2010-2015 - With FPL

Contour Line Start: 0 Step: 10 Stop: 90

Map Scale

0 4000 8000

Note: Multiply by 8700 to get equivalent chloride concentration in mg/L

For example, a dissolved solids concentration of 0.0287 is equal to 250 mg/L chloride

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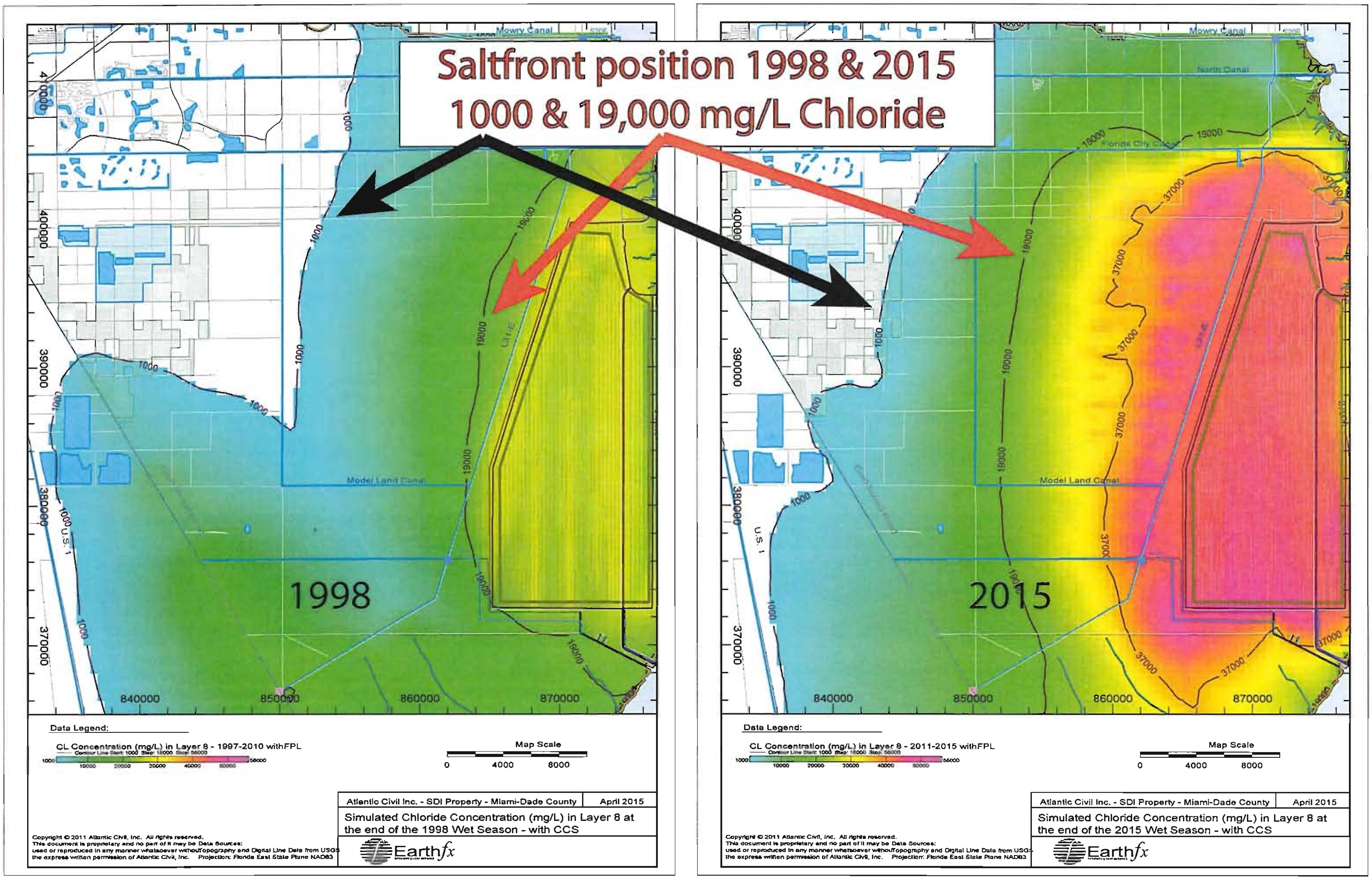
Data Sources: Topography and Digital Line Data from USGS

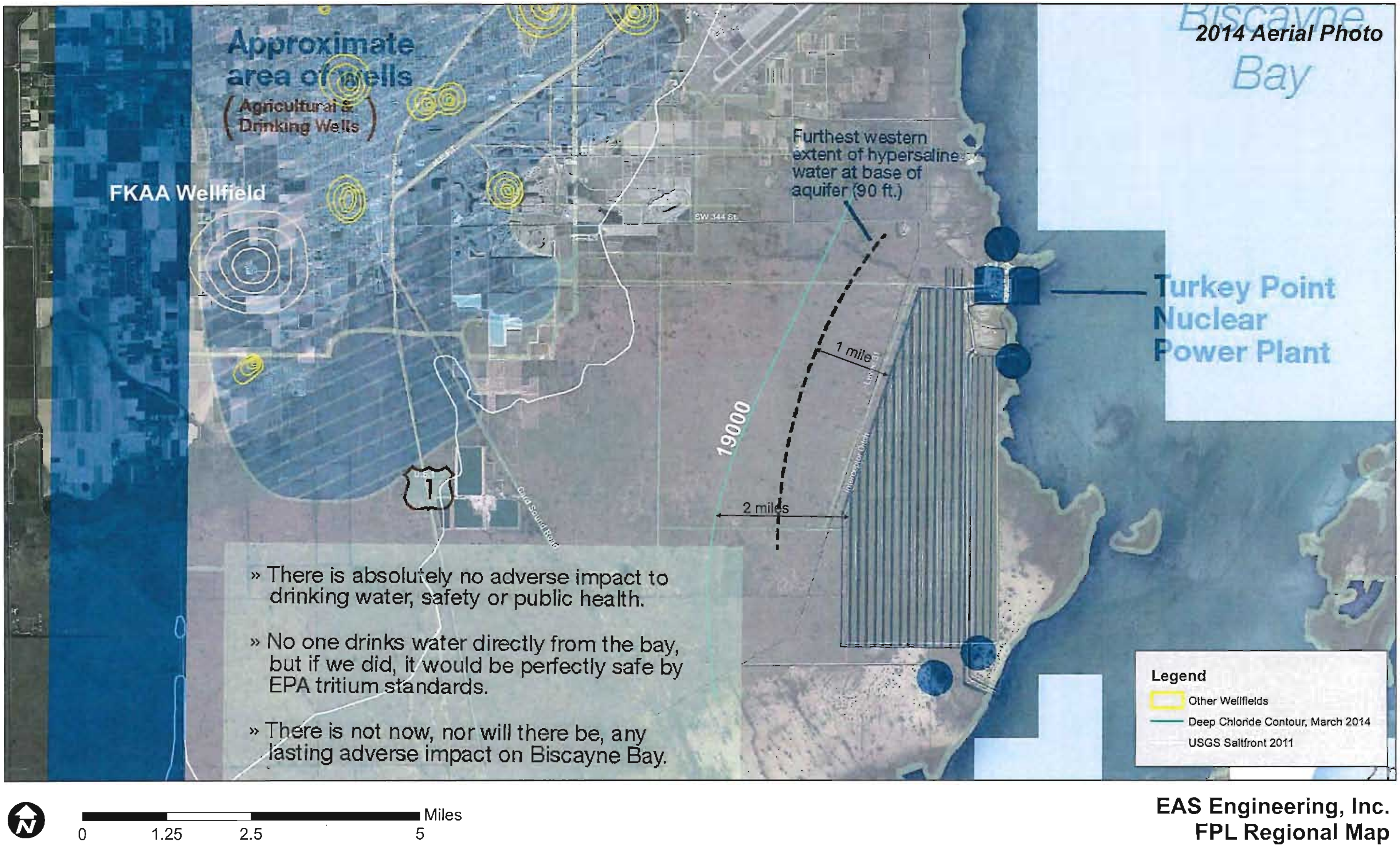
Projection: Florida East State Plane NAD83

Atlantic Civil Inc. - SDI Property - Miami-Dade County	April 2015
Simulated Salinity (PSU) in Layer 8 at the end of the 2015 wet season - with CCS	
Earthfx	



Saltfront position 1998 & 2015
1000 & 19,000 mg/L Chloride
Mowry Canal
North Canal
Florida City Canal
Model Land Canal
U.S. 1
1998
2015
1000
19000
37000
410000
400000
390000
380000
370000
840000
850000
860000
870000
Data Legend:
CL Concentration (mg/L) in Layer 8 - 1997-2010 withFPL
CL Concentration (mg/L) in Layer 8 - 2011-2015 withFPL
Contour Line Start: 1000 Step: 18000 Stop: 56000
1000
10000
20000
30000
40000
50000
56000
Map Scale
0
4000
8000
Atlantic Civil Inc. - SDI Property - Miami-Dade County
April 2015
Simulated Chloride Concentration (mg/L) in Layer 8 at the end of the 1998 Wet Season - with CCS
Simulated Chloride Concentration (mg/L) in Layer 8 at the end of the 2015 Wet Season - with CCS
Copyright © 2011 Atlantic Civil, Inc. All rights reserved. This document is proprietary and no part of it may be used or reproduced in any manner whatsoever without the express written permission of Atlantic Civil, Inc.
Data Sources: Topography and Digital Line Data from USGS Projection: Florida East State Plane NAD83
Earthfx

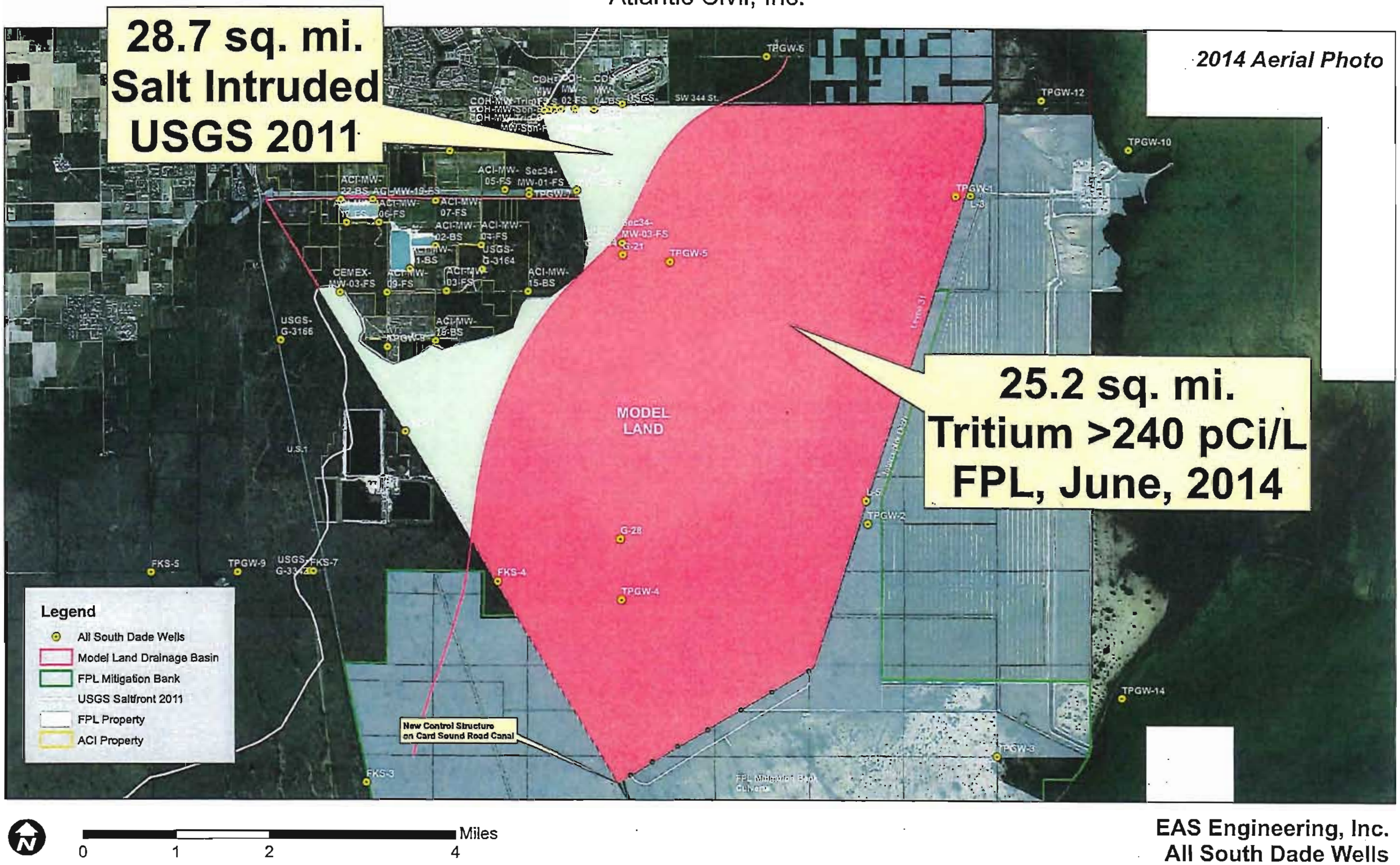
Atlantic Civil, Inc.



Wells 19a.pdf

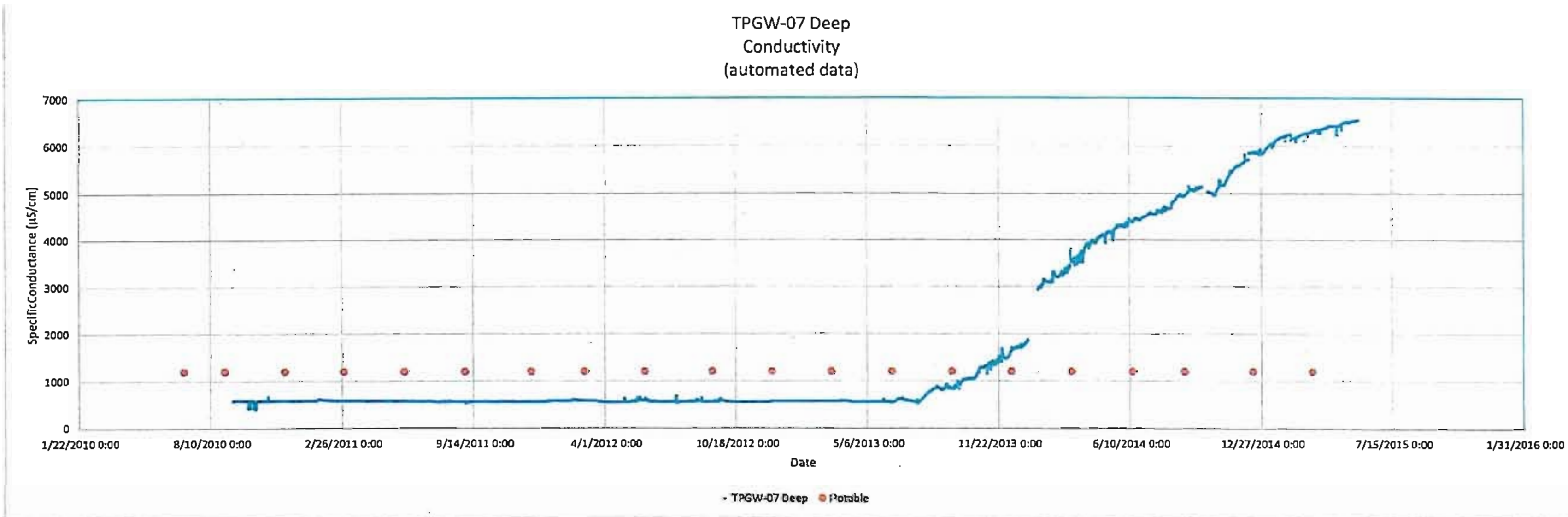
EAS Engineering, Inc.
FPL Regional Map

Atlantic Civil, Inc.

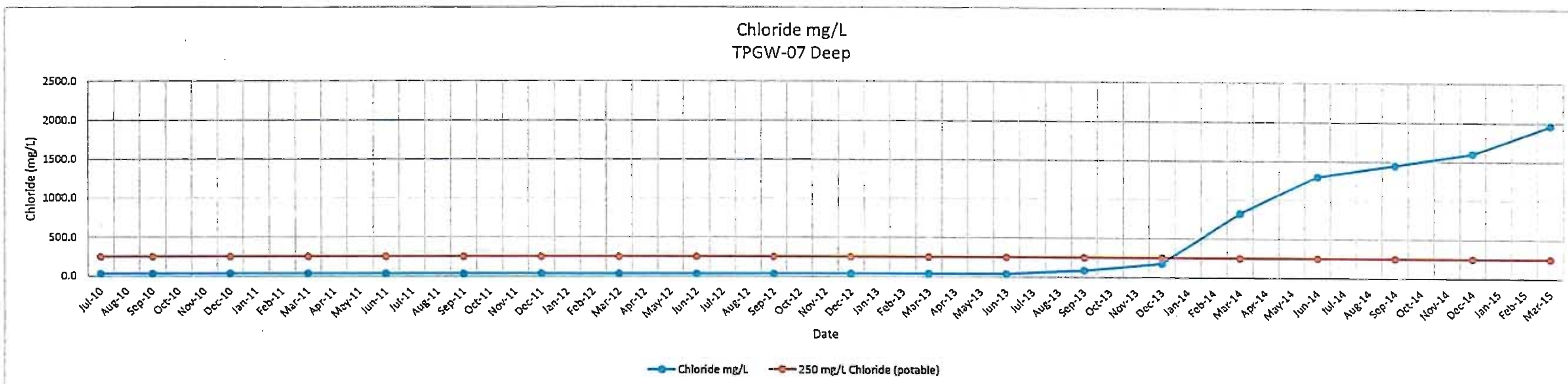


Wells 16_3.pdf

EAS Engineering, Inc.
All South Dade Wells



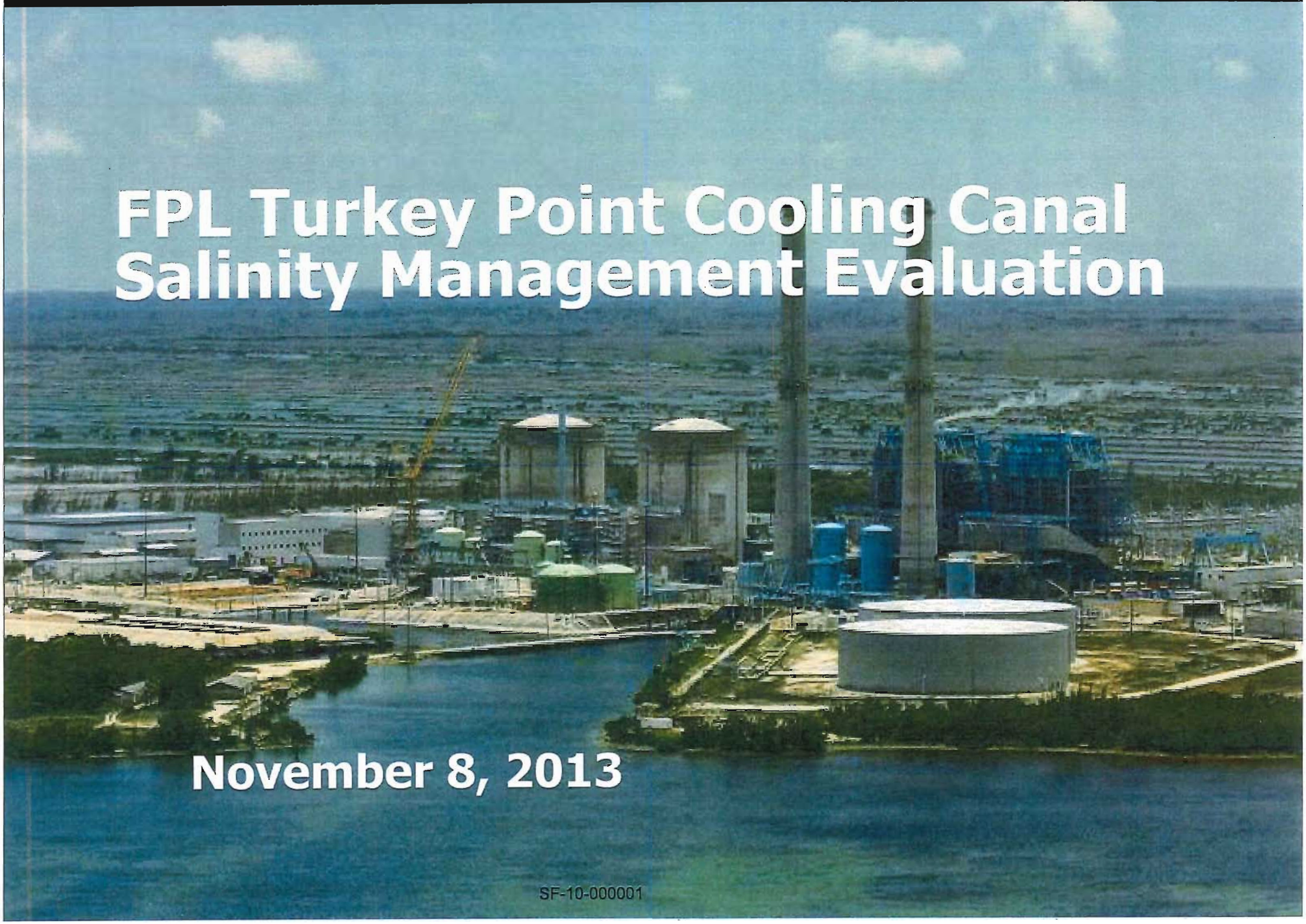
ACI-49-000001



ACI-49-000002

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

FPL Turkey Point Cooling Canal Salinity Management Evaluation



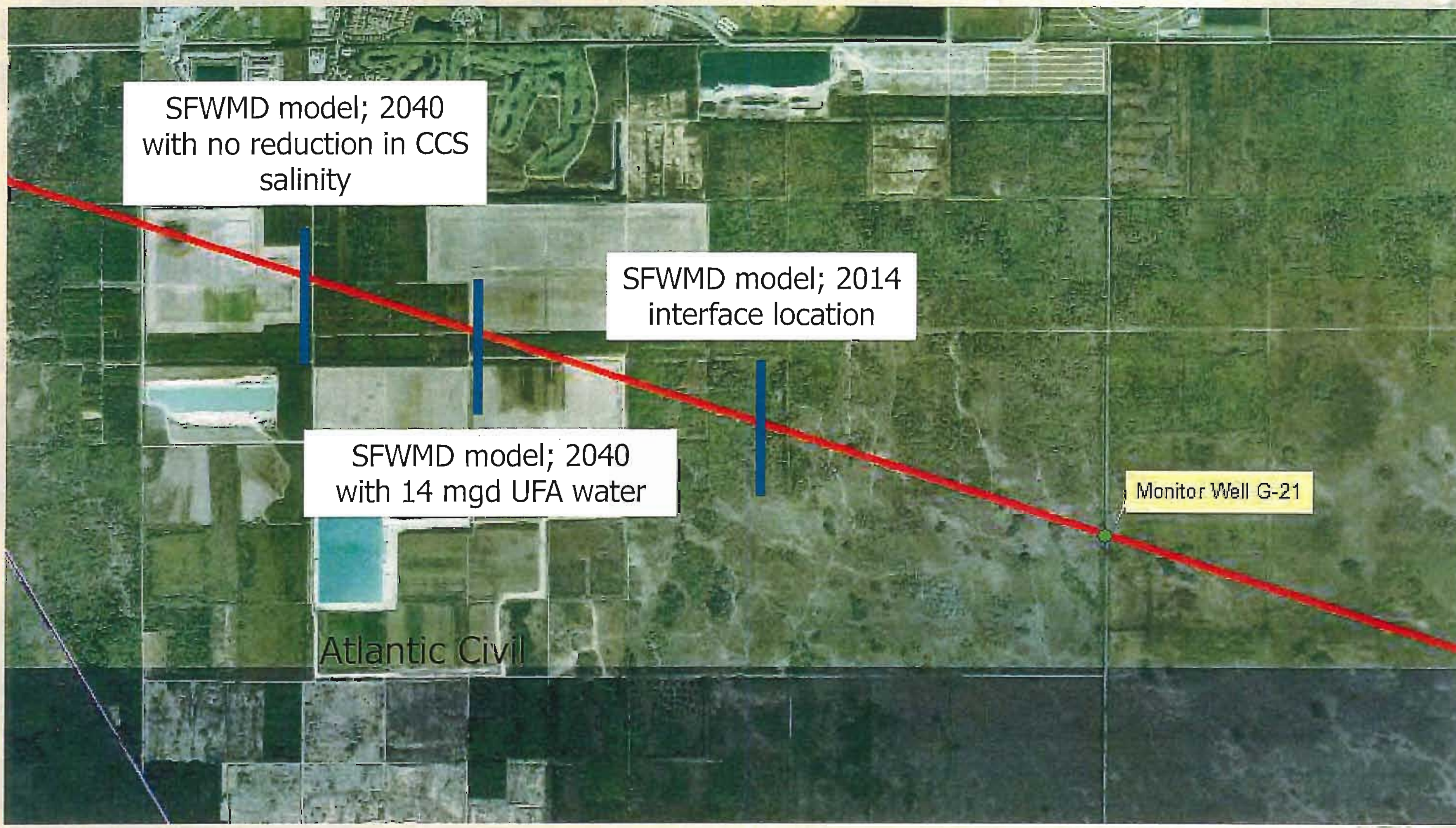
November 8, 2013

SF-10-000001

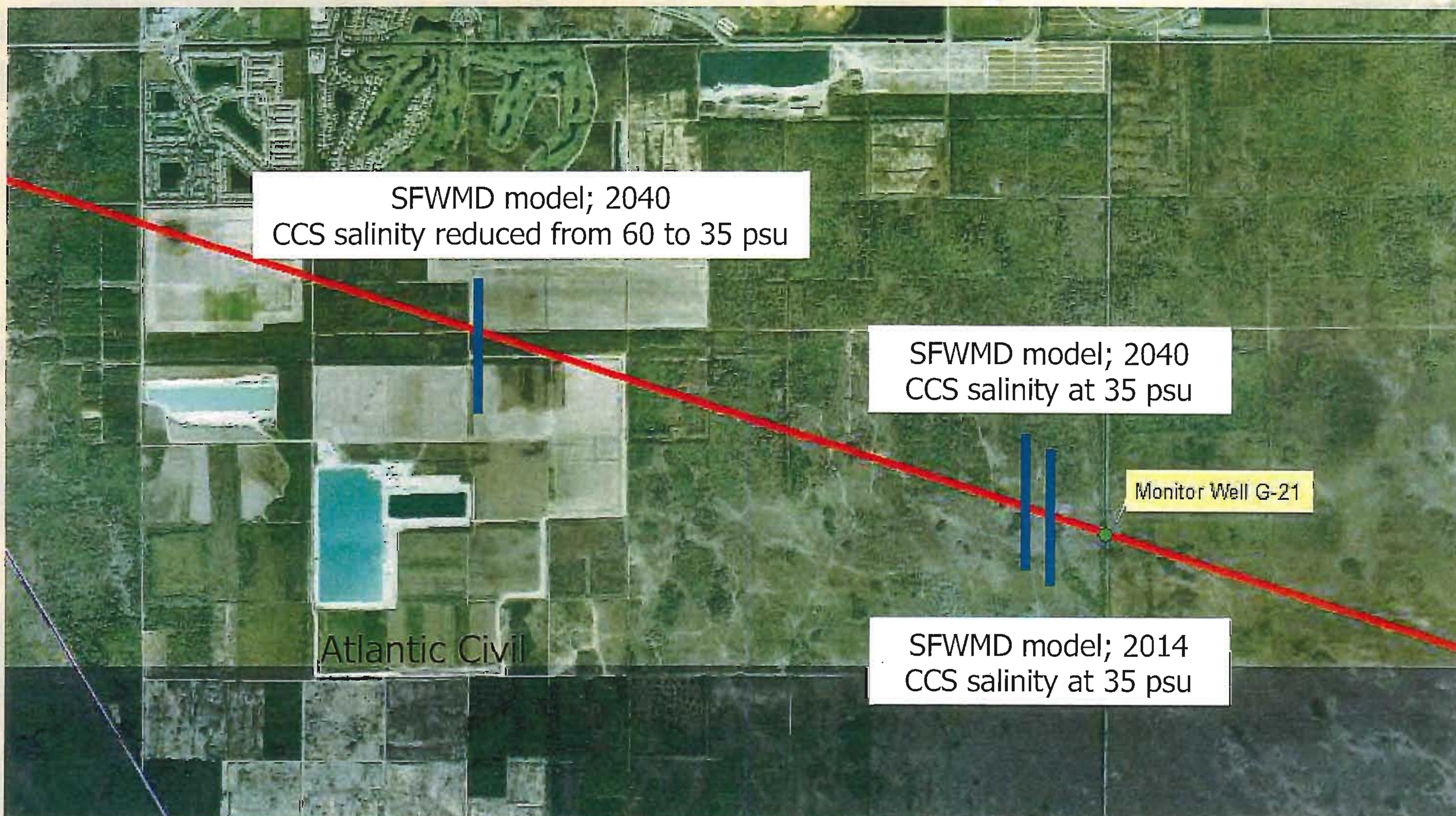
SF-10-000002

- **FPL constructs a Cooling Canal System (CCS) in early 1970s**
  - Closed loop cooling system
  - Salinity to match seawater
  - Salinity management system
- **District permit authority under agreement with FPL**
  - Monitoring and management provisions included in the Agreement
- **CCS water becomes hyper saline over time**
- **Groundwater monitoring wells show increasing salinity levels**
- **FPL seeks power uprate to nuclear units 3 and 4**
  - Condition of certification requires additional pre and post uprate monitoring
  - District/FPL agreement updated October 2009

District Model: Historic and Future Interface Location; No Change to CCS Salinity



District Model: Historic and Future Interface Location; CCS Salinity Equal Bay Concentrations



Florida Department of

Memorandum **Environmental Protection**

TO: Marc Harris
NPDES Power Plant Permitting Supervisor/Tallahassee

THROUGH: Linda Brien
Water Facilities Administrator/DEP Southeast District

FROM: Tim Powell
Wastewater Permitting Supervisor/DEP Southeast District

DATE: November 16, 2009

SUBJECT: FPL Turkey Point NPDES Permit Renewal (FL0001562)

Marc,

We have reviewed the subject permit renewal package, received October 22, 2009, and offer the following comments.

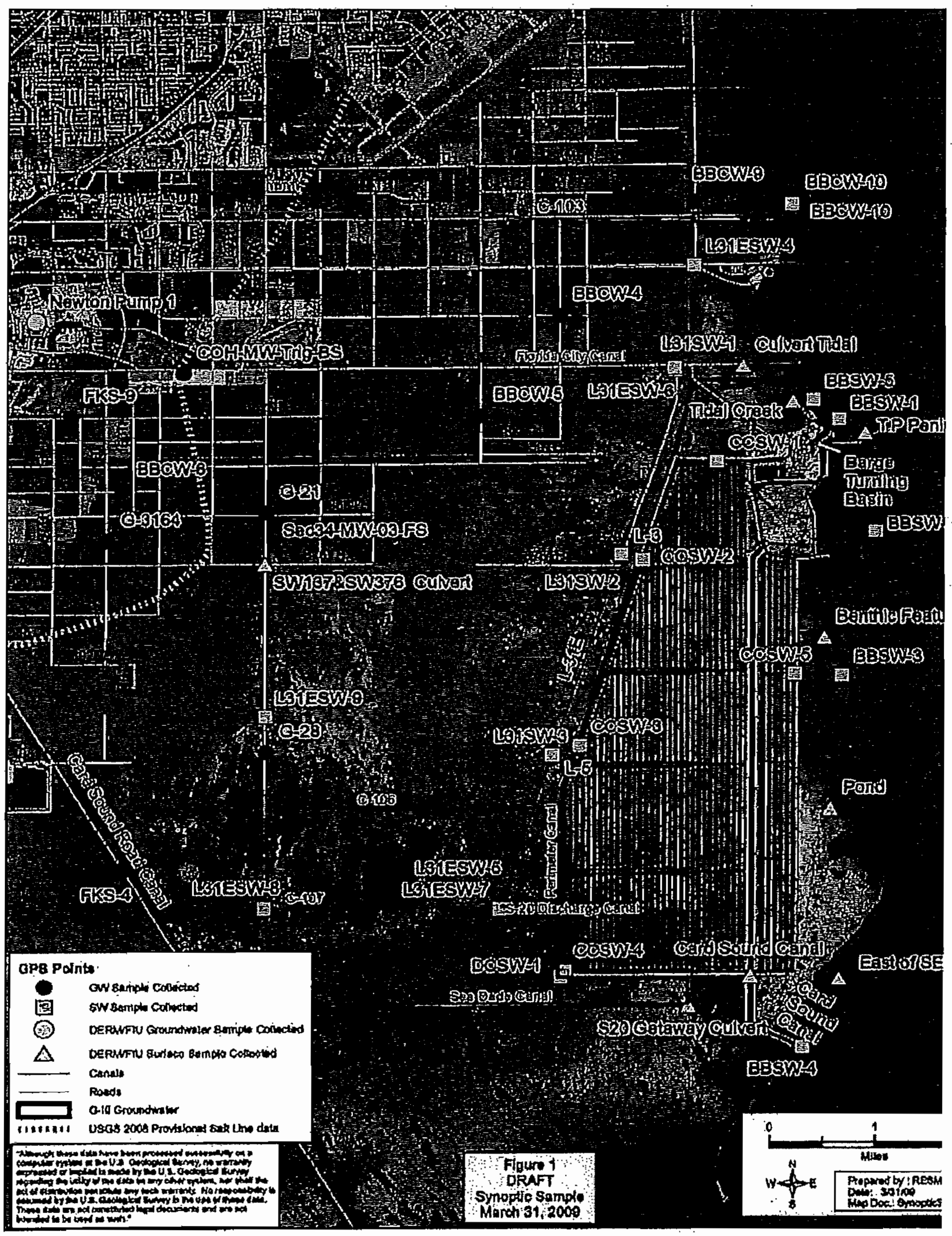
1. The applicant should submit a proposal for a ground water monitoring plan. The plan could include wells that are part of the updated SFWMD Monitoring Plan in the agreement that was approved last month by the SFWMD Board. The plan should include monitoring of ground waters both east and west of the Cooling Canal System (CCS). Any wells that are used to monitor ground water movement to Biscayne Bay should be monitored for appropriate surface water standards (Class III Marine). The proposal should identify the G-II/G-III ground water boundary, and include compliance wells at the boundary.

2. Per FAC Rule 62-520.520(8), existing cooling ponds are exempt from secondary standards for G-II ground water so long as the cooling pond waters are monitored pursuant to Department permit to ensure that the pond does not impair the designated use of contiguous ground waters and surface waters. Review of water quality data collected by the SFWMD in Feb-Mar 2009 indicates not only exceedences of the secondary standards, but also for at least one primary standard - sodium. The following wells listed below indicate sodium levels above the standard (160 mg/L). Please see the attached map for well locations. It's important to note that the L-3 and L-5 wells exhibit higher salinities than sea water, in line with the CCS salinities.

Well ID	Sodium (mg/L)
BBCW-4	2,730
BBCW-5	3,560
FKS-4	2,850
G-21	1,640
G-28	6,750
L-3	17,200
L-5	15,600

Compliance with our Ground Water rules depends on where the boundary between G-II and G-III waters lies. Review of documents from the early 1980's indicate the boundary at the time lay just west of the CCS interceptor ditch. The applicant should discuss this data and how they can demonstrate compliance with appropriate ground water criteria.

3. It is inaccurate to describe the CCS as a "closed-loop" system, since we now know there is a plume of hypersaline water moving west from the CCS. It is also likely that the CCS is impacting surface waters to the west, or possibly Biscayne Bay to the east. Therefore, a complete analysis of CCS waters should be completed as provided in Section V of the ground water discharge application (Form 2CG), and Section VII of the surface water discharge application (Form 2CS). We recommend at least three sampling events from various representative locations within the CCs. We suggest at least three locations: one of effluent (cooling water) exiting the plant condensers; one at cooling water intake; and one point approximately midway between the intake and effluent points. Some of the data collected in the SFWMD study in Feb-Mar 2009 could be used.



BBCW-9
BBCW-10
BBCW-10
C-103
L31ESW-4
BBCW-4
Newton Pump 1
COH-MW-Trig-BS
Florida City Canal
L31SW-1
Culvert Tidal
FKS-9
BBCW-5
L31ESW-6
BBSW-5
BBSW-1
Tidal Creek
T.P Pen
COSW-1
Barge
Turning
Basin
BBCW-8
G-21
G-3164
Sec34-MW-03-FS
L-3
COSW-2
SW187 2SW378 Culvert
L31SW-2
COSW-5
BBSW-3
L31ESW-9
G-28
L31SW-3
COSW-3
L-5
Card Sound Road Canal
Pond
Perimeter Canal
L31ESW-6
L31ESW-7
FKS-4
L31ESW-8
COSW-4
Card Sound Canal
East of SE
DCSW-1
Sea Dade Canal
S20 Getaway Culvert
Card Sound Canal
BBSW-4
GPS Points
GW Sample Collected
SW Sample Collected
DERM/FIU Groundwater Sample Collected
DERM/FIU Surface Sample Collected
Canals
Roads
G-10 Groundwater
USGS 2008 Provisional Salt Line data
0
1
Miles
N
W
E
S
Prepared by : RESM
Date: 3/31/09
Figure 1
DRAFT
Synoptic Sample
March 31, 2009

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

ATLANTIC CIVIL, INC.,

Petitioner,

vs. Case No. 15-1746

FLORIDA POWER AND LIGHT COMPANY
AND DEPARTMENT OF ENVIRONMENTAL
PROTECTION,

Respondents.
_______________________________/

CITY OF MIAMI,

Petitioner,

vs. Case No. 15-1747

FLORIDA POWER AND LIGHT COMPANY
AND DEPARTMENT OF ENVIRONMENTAL
PROTECTION,

Respondents.
_______________________________/

RECOMMENDED ORDER

The final hearing in this case was held on November 2 through 4, 2015, in Miami, Florida, before Bram D. E. Canter, Administrative Law Judge of the Division of Administrative Hearings ("DOAH").

APPEARANCES

For Petitioner Atlantic Civil, Inc. ("ACI"):

Andrew J. Baumann, Esquire
Rachael B. Santana, Esquire
Lewis, Longman and Walker, P.A.
515 North Flagler Drive, Suite 1500
West Palm Beach, Florida 33401

Edwin A. Steinmeyer, Esquire
Lewis, Longman and Walker, P.A.
315 South Calhoun Street, Suite 830
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For Petitioner City of Miami:

Kerri L. McNulty, Esquire
Matthew S. Haber, Esquire
Ruth A. Holmes, Esquire
Nicholas Basco, Esquire
City of Miami
444 Southwest 2nd Avenue, Suite 945
Miami, Florida 33130

For Respondent Florida Power and Light Company ("FPL"):

Gary V. Perko, Esquire
Brooke E. Lewis, Esquire
Hopping Green and Sams, P.A.
119 South Monroe Street, Suite 300
Tallahassee, Florida 32301

Peter Cocotos, Esquire
Florida Power and Light Company
215 South Monroe Street, Suite 810
Tallahassee, Florida 32301

For Respondent Department of Environmental Protection ("DEP"):

Sarah M. Doar, Esquire
Benjamin Melnick, Esquire
Department of Environmental Protection
Mail Stop 35
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

STATEMENT OF THE ISSUE

The issue to be determined in this case is whether the Administrative Order issued by DEP on December 23, 2014, is a reasonable exercise of its enforcement authority.

PRELIMINARY STATEMENT

On December 23, 2014, DEP issued Administrative Order OGC No. 14-0741 ("the AO") related to the cooling canal system at FPL's Turkey Point Power Plant in southeast Miami-Dade County. On February 9, 2015, petitions for administrative hearing challenging the AO were filed by Tropical Audubon Society, Inc., Blair Butterfield, Charles Munroe, and Jeffrey Mullins; Miami-Dade County; ACI; and the City of Miami. After referral to DOAH, the four cases were consolidated for hearing.

On April 16, 2015, Respondent FPL filed a motion to dismiss portions of the petitions on grounds that the petitions failed to allege sufficient grounds for standing. The motion was denied.

On October 2, 2015, ACI filed a motion for leave to file an amended petition for administrative hearing. The motion was granted except with respect to the request in ACI's Amended Petition that the Administrative Law Judge recommend "additional appropriate terms and criteria to halt and remediate the ongoing westward migration of saltwater intrusion in the Aquifer."

On October 9, 2015, Miami-Dade County filed a Notice of Voluntary Dismissal and Case No. 15-1745 was closed.

FPL filed a Motion for Partial Summary Recommended Order or Alternatively for Dismissal of Petitioner City of Miami, claiming the City lacked standing. The motion was denied.

On August 24, 2015, Petitioner Mullins filed a Notice of Voluntary Dismissal. On October 30, 2015, Petitioners Tropical Audubon Society, Butterfield, and Munroe filed an Agreed Notice of Voluntary Dismissal without Prejudice. Accordingly, Case No. 15-1744 was closed.

At the final hearing, Joint Exhibits J-1, J-2, J-3, J-5, J-6, and J-7 were admitted into evidence. DEP presented the testimony of Phillip Coram, a DEP Program Administrator who was accepted as an expert in environmental engineering; Terri Bates, Division Director of Water Resources at the South Florida Water Management District ("SFWMD"), and Jefferson Giddings, a Principal Scientist at SFWMD who was accepted as an expert in groundwater modeling. DEP Exhibits D-2, D-6, D-7, D-10, D-11, D-13, D-15, and D-16 were admitted into evidence.

FPL presented the testimony of Michael Sole, who is FPL's Vice President of Governmental Affairs; Steven Scroggs, a Senior Director of Project Development for FPL who was accepted as an expert in power plant engineering, design and siting; and

Peter Andersen, who was accepted as an expert in groundwater hydrology and groundwater flow and transport modeling. FPL Exhibits FPL-1 through FPL-6, FPL-9, FPL-11, FPL-14, FPL-15, FPL-25, and FPL-26 were admitted into evidence.

ACI presented the testimony of Steve Torcise, Jr., who is ACI's President; Marc Harris, who is a DEP employee responsible for issuing NPDES permits for power plants; William Nuttle, Ph.D., who was accepted as an expert in water salt budgets; and Edward Swakon, who was accepted as an expert in groundwater resources and groundwater monitoring. ACI Exhibits ACI-7, ACI-8, ACI-9, ACI-11, ACI-31, ACI-33, ACI-34, ACI-63, and ACI-66 were admitted into evidence.

The City presented the testimony of Miguel Augustin, who is the City's Controller; and Mark Crisp, who was accepted as an expert in design and function of electrical generating facilities and cooling systems. City Exhibits 40 and 43 were admitted into evidence. The City's motion for official recognition of its City Charter was denied, but a copy of the City Charter was accepted as a proffer.

The five-volume transcript of the final hearing was filed with DOAH. The parties filed proposed recommended orders that were considered in the preparation of this Recommended Order.

FINDINGS OF FACT

Parties

1. FPL is a subsidiary of NextEra Energy. It is a regulated Florida Utility providing electric service to 4.7 million customers in 35 counties.

2. FPL owns and operates the Turkey Point Power Plant, which includes a cooling canal system ("CCS") that is the subject of the AO at issue in this proceeding.

3. DEP is the state agency charged with administering the Florida Electric Power Plant Siting Act ("PPSA"), chapter 403, Part II, Florida Statutes. DEP has the power and the duty to control and prohibit pollution of air and water in accordance with the law and rules adopted and promulgated by it. § 403.061, Fla. Stat. (2015).

4. ACI is a Florida corporation and the owner of 2,598 acres of land in southeast Miami-Dade County approximately four miles west of the Turkey Point CCS. ACI is engaged in agriculture and limerock mining on the land.

5. ACI withdraws and uses water from the Biscayne Aquifer pursuant to two SFWMD water use permits. ACI also has a Life-of-the-Mine Environmental Resource Permit issued by DEP for its mining activities. The Life-of-the-Mine permit requires that mining be terminated if monitoring data indicate the occurrence

of chloride concentrations greater than 250 milligrams per liter ("mg/L") in the mine pit.

6. The City of Miami is a municipal corporation located about 25-miles north of Turkey Point.

7. The City purchases water from Miami-Dade County, which withdraws the water from the Biscayne Aquifer.

Turkey Point

8. FPL's Turkey Point property covers approximately 9,400 acres in unincorporated Miami-Dade County, along the coastline adjacent to Biscayne Bay.

9. Five electrical generating units were built at Turkey Point. Units 1 and 2 were built in the 1960s. Unit 2 ceased operating in 2010. Units 3 and 4 are Florida's first nuclear generating units, which FPL constructed in the 1970s. Unit 5 is a natural gas combined cycle generating unit brought into service in 2007.

10. Units 1 through 4 pre-date the PPSA and were not certified when they were built. However, Units 3 and 4 were certified pursuant to the PPSA in 2008 when FPL applied to increase their power output, referred to as an "uprate." Unit 5 was built after the PPSA and was certified under the Act.

The CCS

11. The Turkey Point CCS is a 5,900-acre network of canals, which provides a heat removal function for Units 1, 3, and 4, and receives cooling tower blowdown from Unit 5.

12. FPL constructed the CCS pursuant to satisfy a 1971 consent judgment with the U.S. Department of Justice which required FPL to terminate its direct discharges of heated water into Biscayne Bay.

13. The CCS is not a certified facility under the PPSA, but it is an "associated facility," which means it directly supports the operation of the power plant.

14. The CCS functions like a radiator, using evaporation, convective heat transfer, and radiated heat loss to lower the water temperature. When cooling water enters the plant, heat is transferred to the water by flow-through heat exchangers and then discharged to the "top" or northeast corner of the CCS. Circulating water pumps provide counter-clockwise flow of water from the discharge point, down (south) through the 32 westernmost canals, across the southern end of the CCS, and then back up the seven easternmost canals to the power plant intake.

15. The full circuit through the CCS from discharge to intake takes about 48 hours and results in a reduction in water temperature of about 10 to 15 degrees Fahrenheit.

16. The CCS canals are unlined, so they have a direct connection to the groundwater. Makeup water for the CCS to replace water lost by evaporation and seepage comes from process water, rainfall, stormwater runoff, and groundwater infiltration.

17. When the CCS was first constructed, FPL and SFWMD's predecessor, the Central and Southern Florida Flood Control District, entered into an agreement to address the operation and management of the CCS. The agreement has been updated from time to time. The original agreement and updates called for monitoring the potential impacts of the CCS.

18. Operation of the CCS is also subject to a combined state industrial wastewater permit and National Pollution Discharge Elimination System ("NPDES") permit administered by DEP. The industrial wastewater/NPDES permit is incorporated into the Conditions of Certification.

Hypersaline Conditions

19. The original salinity levels in the CCS were probably the same as Biscayne Bay. However, because the salt in saltwater is left behind when the water evaporates, and higher water temperature causes more evaporation, the water in the CCS becomes saltier. Salinity levels in the CCS are also affected by rainfall, air temperature, the volume of flow from the power plant, and the rate of water circulation.

20. In 2008, when FPL applied for certification of the uprate of Units 3 and 4, it reported average salinity to be 50 to 60 Practical Salinity Units ("PSU"). This is a "hypersaline" condition, which means the salinity level is higher than is typical for seawater, which is about 35 PSU.

21. Higher salinity makes water denser, so the hypersaline water in the CCS sinks beneath the canals and to the bottom of the Biscayne Aquifer, which is about 90 feet beneath the CCS. At this depth, there is a confining layer that separates the Biscayne Aquifer from the deeper Upper Floridan Aquifer. The confining layer stops the downward movement of the hypersaline "plume" and it spreads out in all directions.

22. FPL estimated that the average daily loading of salt moving from the CCS into the Biscayne Aquifer is 600,000 pounds per day.

23. In late 2013, salinity levels in the CCS began to spike, reaching a high of 92 PSU in the summer of 2014. FPL believes the salinity spikes in recent years are attributable in part to lower than normal rainfall and to higher turbidity in the CCS caused by algal blooms. Reductions in flow and circulation during this period associated with the retirement of Unit 2 and the uprate of Units 3 and 4 could also have contributed to increased temperatures in the CCS, more evaporation, and higher salinity.

24. ACI presented evidence suggesting that the uprate of Units 3 and 4 could be the primary cause of recent, higher water temperatures and higher salinity.

25. The analyses that have been conducted to date are not comprehensive or meticulous enough to eliminate reasonable disagreement about the relative influence of the factors that affect salinity in the CCS.

26. FPL has taken action to reduce salinity within the CCS by adding stormwater from the L-31E Canal (pursuant to emergency orders), adding water from shallow saline water wells, and removing sediment build-up in the canals to improve flow. These actions, combined with more normal rainfall, have decreased salinity levels in the CCS to about 45 PSU at the time of the final hearing.

Saltwater Intrusion

27. Historical data show that when the CCS was constructed in the 1970s, saltwater had already intruded inland along the coast due to water withdrawals, drainage and flood control structures, and other human activities.

28. The "front" or westernmost line of saltwater intrusion is referred to as the saline water interface. More specifically, the saline water interface is where groundwater with total dissolved solids ("TDS") of 10,000 mg/L or greater meets groundwater with a lower chloride concentration. DEP

classifies groundwater with a TDS concentration less than 10,000 mg/L as G-II groundwater, and groundwater with a TDS concentration equal to or greater than 10,000 mg/L as G-III groundwater, so the saline water interface can be described as the interface between Class G-II groundwater and Class G-III groundwater.

29. In the 1980s, the saline water interface was just west of the interceptor ditch, which runs generally along the western boundary of the CCS. The interceptor ditch was installed when the CCS was first constructed as a means to prevent saline waters from the CCS from moving west of the ditch. Now, the saline water interface is four or five miles west of the CCS, and it is still moving west.

30. The groundwater that comes from the CCS can be identified by its tritium content because tritium occurs in greater concentrations in CCS process water than occurs naturally in groundwater. CCS water has been detected four miles west of the CCS.

31. Saline waters from the CCS have been detected northwest of the CCS, moving in the direction of Miami-Dade County's public water supply wellfields.

32. The hypersaline plume from the CCS is pushing the saline water interface further west.

33. Respondents identified factors that contributed to the saltwater intrusion that occurred before the CCS was constructed. However, while saltwater intrusion has stabilized in other parts of Miami-Dade County, it continues to worsen in the area west of the CCS.

34. Respondents made no effort to show how any factor other than the CCS is currently contributing to the continuing westward movement of the saline water interface in this area of the County.

35. The preponderance of the record evidence indicates the CCS is the major contributing cause of the continuing westward movement of the saline water interface.

36. Fresh groundwater in the Biscayne Aquifer in southeast Miami-Dade County is an important natural resource that supports marsh wetland communities and is utilized by numerous existing legal water uses including irrigation, domestic self-supply, and public water supply. The Biscayne Aquifer is the main source of potable water in Miami-Dade County and is designated by the federal government as a sole source aquifer under the Safe Drinking Water Act.

37. Saltwater intrusion into the area west of the CCS is reducing the amount of fresh groundwater in the Biscayne Aquifer available for natural resources and water uses.

Water Quality Violations

38. At the final hearing, a DEP administrator testified that DEP was unable to identify a specific violation of state groundwater or surface water quality standards attributable to the CCS, but DEP's position cannot be reconciled with the undisputed evidence that the CCS has a groundwater discharge of hypersaline water that is contributing to saltwater intrusion. Florida Administrative Code Rule 62-520.400, entitled "Minimum Criteria for Ground Water," prohibits a discharge in concentrations that "impair the reasonable and beneficial use of adjacent waters."

39. Saltwater intrusion into the area west of the CCS is impairing the reasonable and beneficial use of adjacent G-II groundwater and, therefore, is a violation of the minimum criteria for groundwater in rule 62-520.400.

40. In addition, sodium levels detected in monitoring wells west of the CCS and beyond FPL's zone of discharge are many times greater than the applicable G-II groundwater standard for sodium. The preponderance of the evidence shows that the CCS is contributing to a violation of the sodium standard.

Agency Response

41. The 2008 Conditions of Certification included a Section X, entitled "Surface Water, Ground Water, Ecological Monitoring," which, among other things, required FPL and SFWMD

to execute a Fifth Supplemental Agreement regarding the operation and management of the CCS. New monitoring was required and FPL was to "detect changes in the quantity and quality of surface and ground water over time due to the cooling canal system."

42. Section X.D. of the Conditions of Certification provides in pertinent part:

> If the DEP in consultation with SFWMD and [Miami-Dade County Department of Environmental Resources Management] determines that the pre- and post-Uprate monitoring data: is insufficient to evaluate changes as a result of this project; indicates harm or potential harm to the waters of the State including ecological resources; exceeds State or County water quality standards; or is inconsistent with the goals and objectives of the CERP Biscayne Bay Coastal Wetlands Project, then additional measures, including enhanced monitoring and/or modeling, shall be required to evaluate or to abate such impacts. Additional measures include but are not limited to:
>
> * * *
>
> 3. operational changes in the cooling canal system to reduce any such impacts;

43. DEP determined that the monitoring data indicates harm to waters of the State because of the contribution of CCS waters to westward movement of the saline water interface. Under the procedures established in the Conditions of Certification, this

determination triggered the requirement for "additional measures" to require FPL to "evaluate or abate" the impacts.

44. Pursuant to the Conditions of Certification, a Fifth Supplemental Agreement was executed by FPL and SFWMD, which, among other things, requires FPL to operate the interceptor ditch to restrict movement of saline water from the CCS westward of Levee 31E "to those amounts which would occur without the existence of the cooling canal system." The agreement provides that if the District determines that the interceptor ditch is ineffective, FPL and the District shall consult to identify measures to "mitigate, abate or remediate" impacts from the CCS and to promptly implement those approved measures.

45. SFWMD determined that the interceptor ditch is ineffective in preventing saline waters from the CCS in deeper zones of the Biscayne Aquifer from moving west of the ditch, which triggered the requirement of the Fifth Supplemental Agreement for FPL to mitigate, abate, or remediate the impacts.

46. Following consultation between DEP and SFWMD, the agencies decided that, rather than both agencies responding to address the harm caused by the CCS, DEP would take action. DEP then issued the AO for that purpose.

The AO

47. The AO begins with 36 Findings of Fact, many of which are undisputed background facts about the history of Turkey Point and the CCS.

48. Also undisputed is the statement in Finding of Fact 25 that "the CCS is one of the contributing factors in the western migration of CCS saline Water" and "the western migration of the saline water must be abated to prevent further harm to the waters of the state."

49. Findings of Fact 16-19 and 25 indicate there is insufficient information to identify the causes and relative contributions of factors affecting saltwater intrusion in the area west of the CCS. However, as found above, the preponderance of the record evidence indicates the CCS is the major contributing cause of the continuing westward movement of the saltwater interface.

50. In the "Ordered" section of the AO, FPL is required to submit to DEP for approval a detailed CCS Salinity Management Plan. The AO explains that "[t]he primary goal of the Management Plan shall be to reduce the hypersalinity of the CCS to abate westward movement of CCS groundwater into class G-II (<10,000 mg/L TDS) groundwaters of the State."

51. The goal of reducing hypersalinity of the CCS to abate westward movement of CCS groundwater into class G-II

groundwaters is to be demonstrated by two success criteria: (1) reducing and maintaining the average annual salinity of the CCS at a practical salinity of 34 within 4 years of the effective date of the Salinity Management Plan; and (2) decreasing salinity trends in four monitoring wells located near the CCS.

52. Although the AO states that FPL's proposal to withdraw 14 mgd from the Upper Florida Aquifer and discharge it into the CCS might accomplish the goal of the AO, the AO does not require implementation of this particular proposal. It is just one of the options that could be proposed by FPL in its Salinity Management Plan.[1/]

53. If the success criteria in the AO are achieved, hypersaline water will no longer sink beneath the CCS, the rate of saltwater intrusion will be slowed, and the existing hypersaline plume would begin to "freshen."

Petitioners' Objections

54. ACI and the City object to the AO because the success criteria do not prevent further harm to water resources. Maintaining salinity in the CCS to 34 PSU will not halt the western movement of the saline water interface.

55. They also contend the AO is vague, forecloses salinity management options that could be effective, and authorizes FPL's continued violation of water quality standards.

56. For ACI, it doesn't matter when the saline water interface will reach its property because, advancing in front of the saltwater interface (10,000 mg/L TDS) is a line of less salty water that is still "too salty" for ACI's mining operations. Years before the saline water interface reaches ACI's property, ACI's mining operations will be disrupted by the arrival of groundwater with a chloride concentration at or above 250 mg/L.[2/]

CONCLUSIONS OF LAW

Standing

57. To establish standing, a party must present evidence to show that its substantial interests could be affected. St. Johns Riverkeeper, Inc. v. St. Johns River Water Mgmt. Dist., 54 So. 3d 1051, 1054 (Fla 5th DCA 2011).

58. The City claims standing based on the doctrine of *parens patriae*, which generally recognizes an inherent authority of the state to protect persons who are unable to act on their own behalf and there is a sovereign interest involved. See Engle v. Liggett Group, Inc., 945 So. 2d 1246 (Fla. 2006). In Engle, the Court stated "it is clear that a state may sue to protect its citizens against the pollution of the air over its territory; or interstate waters in which the state has rights." Id. at 1260.

59. The City cites no case in which the City or any other local government was held to have standing under the doctrine *parens patriae* to participate in a proceeding like the present case. The Administrative Law Judge declines the City's invitation to be the first forum in Florida to extend the doctrine of *parens patriae* to allow a municipality to intervene in a DEP enforcement action.

60. The City holds no water use permit and, generally, an entity has no water rights unless it has obtained a permit for the water or is using water pursuant to a statutory exemption from permitting. See Tequesta v. Jupiter Inlet Corp., 371 So. 2d 663 (Fla. 1979). However, in Osceola County v. St. Johns River Water Management District, 486 So. 2d 616 (Fla. 5th DCA 1986), it was held that Osceola County had standing based of the potential effect of the decision on the County's "various statutory duties and responsibilities with respect to planning for water management and conservation." See also South Fla. Water Mgmt. Dist. v. City of St. Cloud, 550 So. 2d 551 (Fla. 5th DCA 1989).

61. All local governments have statutory duties and responsibilities with respect to planning for water management and conservation under section 163.3177(6)(c), Florida Statutes. Therefore, based on the precedent established in Osceola County

and City of St. Cloud, supra, it is concluded the City of Miami has standing in this proceeding.

62. ACI and the City presented competent evidence that their substantial interests could be affected.

The Nature of the Proceeding

63. The parties debated the nature of the proceeding that was initiated by the AO. The AO begins with a statement that it is being issued under the authority of sections 403.061(8). Section 403.061(8) is the authority to issue "such orders as are necessary to effectuate the control of air and water pollution and enforce the same by all appropriate administrative and judicial proceedings."

64. Respondents contend the AO resolves a "violation" of Section X.D. of the Conditions of Certification, but Section X.D. has not been violated. A "violation" involves doing something that is prohibited or failing to do something that is required. FPL has done nothing prohibited by Section X.D. and has not failed to do something required by Section X.D. The section is directed to DEP, which is required to determine whether harm has been caused, consult with other agencies, and then require additional measures to address the harm.

65. The Conditions of Certification do not say what procedure DEP should use. DEP admitted the AO is not a typical administrative order and referred to it as a "hybrid" between an

administrative order and a consent order. Still, Respondents also describe the AO as a "pure" enforcement action.

66. The AO lacks the most fundamental element of an enforcement action: charges. An agency enforcement action charges a party with one or more violations of law, which the party has the right to challenge and attempt to refute. DEP did not charge FPL with violating the minimum criteria for groundwater, with violating the conditions of its industrial wastewater permit, or with violating the primary groundwater standard for sodium. FPL did not come to the final hearing to defend against these charges.

67. DEP cites some of its final orders that involved consent orders, but the AO is not a consent order.

68. ACI and the City are wrong in characterizing the AO as a permit. The Salinity Management Plan required by the AO could possibly lead to a permit or a modification to the Conditions of Certification, but the AO's requirement for a plan is not an authorization for FPL to change any facilities or operations at Turkey Point. For comparison, SFWMD issued a water use permit to FPL (the subject of DOAH Case No. 15-3845) to withdraw water from the L-31E Canal and discharge it into the CCS to lower water temperature and salinity. A permit was necessary because a water withdraw was authorized. The AO does not authorize any action.

69. Section 403.088(2)(e) gives DEP enforcement authority suited for the circumstances associated with the CCS discharge. This statute provides that, if a discharge will not meet permit conditions or applicable statutes and rules, DEP "may issue, renew, revise, or reissue the operation permit" when one of six specified criteria is satisfied. The criteria pertain to actions to come into compliance or to demonstrate why non-compliance is justified. However, DEP did not choose this approach.

The Meaning of the Term "Abate"

70. DEP defines the term "abate" in Paragraph 37 of the AO as "to reduce in amount, degree or intensity; lessen; diminish" and believes it is consistent with the meaning of the term in Section X.D. of the Conditions of Certification. ACI and the City dispute this interpretation and contend the term "abate" means to stop or terminate. However, this dispute is largely moot because the AO states that "[f]or the purposes of this Order" the term "abate" means to reduce. With this caveat, the term "abate" in the AO can have a different meaning than it has in the Conditions of Certification. However, the following analysis of the law was undertaken to show that the term "abate," as used in the Conditions of Certification, does not mean to reduce.

71. The term "abate" is not defined in Section X.D. or elsewhere in the Conditions of Certification. Under Section III, the following statement appears:

> The meaning of terms used herein shall be governed by the definitions contained in chapter 373 and 403, Florida Statutes, and any regulation adopted pursuant thereto. In the event of any dispute over the meaning of a term used in these conditions which is not defined in such statutes or regulations, such dispute shall be resolved by reference to the most relevant definitions contained in any other relevant state or federal statute or regulation or, in the alternative by the use of the commonly accepted meaning as determined by the Department.

72. There is no definition of "abate" in chapter 373 or chapter 403, or in any regulation adopted pursuant thereto. DEP made no showing about the use of the term in a relevant statute or regulation of the Federal Government or another state. DEP chose to use a dictionary definition of the term "abate."

73. Respondents made no effort to show the definition in the AO is the "most commonly accepted meaning" of the term. The most commonly accepted meaning is a matter subject to objective determination. DEP cannot simply deem a definition to be the most commonly accepted meaning if it is not.

74. In Webster's New Collegiate Dictionary, the first definition entry for the word "abate" is "to put an end to." The second entry is similar to the definition in the AO; that

is, to reduce or lessen. Most suggested synonyms are associated with the meaning to reduce or lessen. See e.g., Thesaurus.com

75. However, the terms "abate" and "abatement" are regularly used in environmental law. Therefore, choosing one of the meanings of "abate" outside the environmental context is unnecessary and inappropriate.

76. Several environmental statutes use the phrase "prevent or abate." This usage is not free of ambiguity, but it is more likely to mean "prevent or, if it is already occurring, then stop." See e.g., §§ 376.308, 403.061(9) 403.081(4), and 403.191(1), Fla Stat.

77. Section 373.433, entitled "Abatement," refers to injunctions if certain water control structures are violating DEP or water management district standards. The meaning of "abatement" in this section is clearly to stop the violation, not merely to diminish it.

78. Section 376.12(1) refers to "abatement of a prohibited discharge," which means to stop the discharge.

79. Sections 376.09 and 376.305, pertaining to the removal of prohibited discharges, states that polluters shall immediately "contain, remove, and abate the discharge," which is not free of ambiguity regarding the intended meaning of the word "abate." There are a few other statutes with this kind of ambiguous wording.

80. Section 403.4154(3) authorizes DEP to "abate or substantially reduce" hazards caused by phosphogypsum stacks. In this section, the term abate is clearly intended to mean to stop and to be distinguished from "reduce."

81. Section 403.709 refers to an "abatement action" brought by DEP to bring an illegal waste tire site into compliance. In this context, the word "abatement" means to stop the violation of waste tire regulations.

82. Section 403.726 is entitled "Abatement of imminent hazard caused by hazardous substance" and includes a similar statement that DEP "shall take and any action necessary to abate or substantially reduce any imminent hazard." In this section, the term "abate" means to stop.

83. Section 403.727(1)(g) refers to statutory remedies "available to the department to abate violations of this act." In this context, the term "abate" means to stop.

84. Section 376.11(6) provides for payment of moneys from the Florida Coastal Protection Trust Fund for "the abatement of any other potential pollution hazards," which means to end the hazard, not to diminish it.

85. Finally, article II, section 7(a) of the Florida Constitution provides:

> It shall be the policy of the state to conserve and protect its natural resources and scenic beauty. Adequate provision shall

> be made by law for the abatement of air and water pollution and of excessive and unnecessary noise and for the conservation and protection of natural resources.

It is likely that the word "abate" in section 7(a) was intended to mean to stop pollution. A state policy to only reduce pollution does not sound very ambitious.

86. When these uses of the term "abate" or "abatement" are objectively considered, it is clear that the most commonly accepted meaning for the term in Florida environmental laws is to stop, terminate, or end.

87. It is logical that a statute granting enforcement power to DEP would grant full power to stop a violation or harmful activity, rather than only the power to reduce the violation or activity. Therefore, even in the statutes cited above, where the use of the term "abate" did not make its meaning clear, it is likely that the intended meaning was to stop.

88. The use of the term "abate" or similar terms in Florida statutes has not been interpreted by DEP or any court to mean DEP must always require complete restoration of the harm caused or full compliance with a standard. DEP retains enforcement discretion. It is a separate question whether the circumstances in any case provide a reasonable basis for DEP to require less than complete restoration or full compliance.

89. If the term "abate" in Section X.D. was intended by the Siting Board to mean to lessen or diminish, that would mean the Siting Board, without explanation, meant to prevent DEP from exercising its full range of enforcement authority with respect to harm caused by the CCS. That is an unreasonable interpretation.

<u>Reasonable Enforcement Discretion</u>

90. Because the AO purports to be an enforcement action, the applicable standard of review in this case is whether the action taken by the Department is a reasonable exercise of its enforcement discretion.

91. ACI and the City have the burden to prove by a preponderance of the evidence that the AO is not a reasonable exercise of enforcement discretion. They met their burden.

92. The AO is not a reasonable exercise of DEP's enforcement discretion because FPL has not been charged with violations of law and afforded due process to address the charges through litigation, consent order, or settlement.

93. The AO is not a reasonable exercise of DEP's enforcement discretion because, without demonstrating a reasonable basis for doing so, DEP does not require FPL to come into compliance with standards or specify a reasonable time for FPL to come into compliance.

94. The AO is an unreasonable exercise of DEP's enforcement discretion because the success criteria are inadequate to accomplish DEP's stated purposes as explained below.

a. Maintaining Salinity at 34 PSU in the CCS

i. Requiring FPL to maintain salinity in the CCS at 34 PSU is based on 34 PSU being the average salinity of Biscayne Bay. However, in the context of addressing existing harm to the Biscayne Aquifer, it could be an unnecessary impediment. It was not shown why it is important not to allow the water in the CCS to become fresher than Biscayne Bay.

ii. The evidence presented shows that, the fresher the water in the CCS, the greater would be the freshening of the Biscayne Aquifer beneath and west of the CCS. Perhaps FPL would be able to explain in the Salinity Management Plan why economic, technological, ecological, or other considerations support the reasonableness of going no fresher than 34 PSU. However this record does not show the reasonableness of restricting FPL's options in this manner. FPL should be free to consider and propose options to lower the salinity in the CCS even further if it is practicable and could achieve greater benefits.

iii. Requiring salinity to be maintained at 34 PSU is also unreasonable because it forecloses all options that could achieve the goal of the AO to abate westward movement of CCS groundwater into Class G-II groundwater without lowering the salinity of CCS water or not lowering it as much. Respondents did not explain in the record why FPL should be foreclosed from considering any option that achieves the goal of reducing the westward movement of CCS groundwater.

b. Decreasing Salinity Trends in Nearby Wells

i. Another success criterion in the AO is for FPL to demonstrate "decreasing salinity trends" in four monitoring wells near the CCS, but the decreasing trend is not quantified.

ii. The wording in the AO allows for achievement of this success criterion even with decreasing trends that are smaller than was predicted by the computer modeling upon which DEP relied. If decreasing salinity trends in wells near the CCS are smaller, then there would likely be less slowing of the westward movement of the saline water interface than was predicted by the modeling, and one of DEP's stated purposes would be thwarted.

iii. In addition, by only using wells near the CCS, the AO allows for the possibility that salinity trends near the CCS decrease as predicted by the computer modeling, but the predicted benefits at distance do not occur.

c. FPL's Contribution to the Harm

In this proceeding, DEP never stated that it had made a determination that FPL should not be required to terminate its contribution to the westward movement of the saline water interface. Instead, DEP stated that FPL's contribution had not been determined. That was the reason given for the enforcement approach taken by DEP. However, the AO does not require FPL to determine its contribution.

95. All of the infirmities in the AO described above can be cured by amending the AO to delete the proposed success criteria and require FPL to submit a Salinity Management Plan that includes an analysis of the factors contributing to the western movement of saltier groundwater and options that could eliminate the CCS's contribution. In this amended form, the AO would not be an enforcement instrument, but would achieve DEP's apparent intent to require further analysis of the problem and its solution.

96. Petitioners' claim that DEP should take immediate enforcement action to stop FPL's current violations and prevent further harm is a claim that must be brought in a proceeding under section 403.412, section 120.69, or other law which allows for redress of injuries when DEP has chosen not to exercise its enforcement authority.

RECOMMENDATION

Based on the foregoing Findings of Fact and Conclusions of Law it is

RECOMMENDED that the Department of Environmental Protection rescind the AO or amend it as described above.

DONE AND ENTERED this 15th day of February, 2016, in Tallahassee, Leon County, Florida.

BRAM D. E. CANTER
Administrative Law Judge
Division of Administrative Hearings
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Filed with the Clerk of the
Division of Administrative Hearings
this 15th day of February, 2016.

ENDNOTES

1/ FPL applied to modify the Conditions of Certification to authorize FPL to withdraw 14 mgd from the Upper Floridan Aquifer for use in the CCS. ACI challenged the proposed modification in a separate DOAH proceeding, a hearing was held, a Recommended Order was issued, and the matter is now pending before the Governor and Cabinet in their capacity as the State Siting Board.

2/ TDS and chloride concentration are not equivalent, but can be considered roughly equivalent for the purpose of this finding.

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NOTICE OF RIGHT TO SUBMIT EXCEPTIONS

All parties have the right to submit written exceptions within 15 days from the date of this Recommended Order. Any exceptions to this Recommended Order should be filed with the agency that will issue the Final Order in this case.

ENVIRONMENT APRIL 21, 2016 3:00 AM

Evidence of salt plume under Turkey Point nuclear plant goes back years

HIGHLIGHTS

Engineers warned decades ago of flaws in cooling canal design

Internal review by FPL engineers in 2010 said fixes could worsen plume

On Thursday, Florida environmental regulators approved controversial management plan

Matt Raffenberg, FPL's environmental services director, talks about how FPL is working on ways to better control water temperature and salinity in the 39 cooling canals at the Turkey Point power plant. **Emily Michot** - emichot@miamiherald.com

BY JENNY STALETOVICH
jstaletovich@miamiherald.com

In the wake of revelations last month that its aging cooling canals at Turkey Point were leaking into Biscayne Bay, Florida Power & Light rushed to do damage control: company leadership went on the defensive, insisting they were acting responsibly and, in a full page ad, blaming "misinformation" for fanning unfounded fears.

"We're not punting on this at all," president and CEO Eric Silagy told the Miami Herald editorial board earlier this month as he laid out a list of on-going fixes.

"If this company has given that impression, that's my fault," he said. "What is frustrating a little bit is we've worked really hard over the decades to do the right thing."

But critics contend the powerful utility worked even harder at delay tactics in the face of mounting evidence that its compromised canal system had produced an underground plume of saltwater threatening nearby drinking

supplies and contaminating Biscayne Bay.

Records show FPL had been warned for years about problems and even conducted its own research in 2010 that concluded its key fix — adding millions of gallons of brackish water to freshen the super salty canals — would likely make the plume worse. After overheated canals forced the plant's two reactors to partially power down in 2014, the utility pushed state regulators and water managers repeatedly to add more water, solutions that would allow it to continue operating under Nuclear Regulatory Commission limits but potentially increase the extent and speed of saltwater seepage from the unlined canals.

At the time, the company was still publicly insisting its canals were "definitely a closed system" not impacting any other source of water.

The end result, say environmentalists and others who pushed FPL to move faster over the years, are patchwork fixes and shortsighted solutions they say have failed to deal with broader problems caused by the 44-year-old canals.

"They're band-aids," said Steve Torcise, whose family has operated a rock mine just west of the canals for 90 years and earlier this year won a legal fight demanding the state overhaul a management plan that allowed FPL to add more water without fully addressing the impact on the plume. An administrative

judge in February faulted the Florida Department of Environmental Protection for being too weak and not citing FPL.

Despite the criticism, the DEP on Thursday approved the plan, dismissing many of the judge's findings. In a 28-page decision, DEP Secretary Jon Steverson wrote the judge "inappropriately invaded the exclusive province" of the state's ability to regulate the utility. The city of Miami, which had joined the lawsuit with Torcise, plans to appeal.

"We will be pursuing all available appellate remedies to challenge this ruling," said deputy city attorney Barnaby Min.

In the meantime, the salt plume continues to grow. According to the DEP's own 2014 management plan, it has advanced at a rate of 525 to 660 feet per year with up to 600,000 pounds of salt escaping daily from the canals. That's pure salt, not salty water.

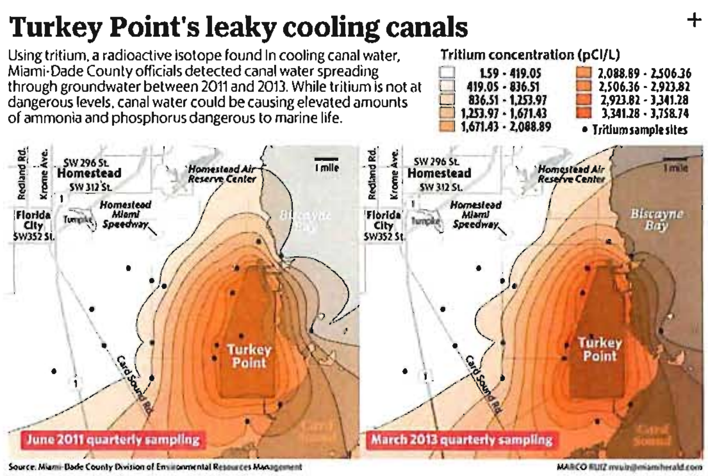
"THEIR FIRST ORDER OF BUSINESS HAS TO BE TO DO NO HARM TO OUR COMMUNITY AND TO OUR ENVIRONMENT."

Miami-Dade County Commissioner Daniella Levine Cava

"FPL definitely should have shared that they were working on a solution, instead of fighting us in court," said Miami-Dade County Commissioner Daniella Levine Cava, who

pressed for information from additional monitoring wells that this year confirmed the presence of tritium, a radioactive isotope used to trace cooling canal water, in Biscayne Bay.

"Their first order of business has to be to do no harm to our community and to our environment," she said. "They want to be known as being good stewards, so it's especially incumbent upon them to set the example."



This month, County Commissioner Dennis Moss, whose district covers the canals, asked the Environmental Protection Agency to weigh in, joining Rep. Jose Javier Rodriguez, D-Miami, who in March requested an investigation. In a letter to Rodriguez this week, EPA regional administrator Heather McTeer Toney said the agency has been meeting with county, state and FPL officials to collect information. The agency has already

made one visit to the canals and plans to before the end of the month, a spokeswoman said.

Worsening conditions have also caught the attention of Monroe County, which operates its only wellfield west of the canals. The county, which this week passed a resolution raising concerns, is considering buying land further west to relocate its well field as well as build an additional reverse osmosis plant in Key West, an expensive option that can make salt water fit for human consumption.

"The cooling canals have been on our radar screen as long as I've been here," said Florida Keys Aqueduct Authority deputy director Tom Walker. "We literally have a line we watch."

How FPL got to this point is a complex path of regulatory decisions and company expansion, complicated by the singular design of the cooling canals. Turkey Point is the only nuclear power plant in the country that uses the radiator-like cooling system spanning 5,900 acres. It also sits atop the Biscayne aquifer, a pitted layer of coral rock that looks more like a hardened sponge than solid ground.

In 1972, when the canals were created — a compromise FPL says it was forced to accept after federal environmental regulators sued in court to stop the plant from dumping cooling water directly into the bay — it was understood canals in such porous geology

would leak. So the design included a critical feature: a straight, deep canal, called an interceptor ditch, to stop saltwater piling up under the canals from migrating west.

Turkey Point's salt problem explained

Engineer Ed Swakon created this video model of an expanding saltwater plume near Turkey Point using data collected from groundwater sampling. Swakon, who was hired by Atlantic Civil, a rock mining company that has sued FPL, depicted what the underground salt front looked like over time and expanded as conditions in the canals grew saltier.

The interceptor ditch was important because South Florida's drinking water supply also sits just below the surface in the Biscayne aquifer. Canals dredged in the 1940s to drain the Everglades had caused the salt front to

migrate inland. But over the years water managers installed hundreds of gates and other controls to stop the migration — and in some cases, even reverse it.

But by the 1980s, there already was an indication that Turkey Point's ditch wasn't effective, with the underground salt front moving just west of what was suppose to act as a barrier.

Under all five management plans for Turkey Point drawn up by the Florida environmental regulators and water managers over the decades, FPL has been under orders to maintain the quality of surrounding groundwater. A network of monitoring wells was dug to keep watch.

Over the years, the number of wells dwindled, falling to just four by 1983. If state regulators were watching them, they weren't doing it very closely, said consulting engineer Ed SwakonTorcise hired him to investigate the plume after plans to expand a rock mine near Homestead were nearly derailed when environmental regulators wondered whether mining would pull the saltwater front inland.

In 2007, Swakon went to the South Florida Water Management District, the regulatory agency keeping tabs on salt water intrusion, and asked for old records. To his surprise, Swakon found salinity in groundwater spreading and spiking. By 2001 and 2002, readings showed the front — water with

higher salt concentrations than in Biscayne Bay — had reached Southwest 137th Avenue about three miles to the west.

> **"THEY NEVER REALLY DID A LONG TERM HISTORY OF THE DATA. THEY ONLY [COMPARED] QUARTER TO QUARTER AND THERE WAS VERY LITTLE DIFFERENCE."**
>
> Ed Swakon, president EAS Engineering

"The way the reports were written, they never really did a long term history of the data. They only [compared] quarter to quarter and there was very little difference," he said. "But if you really plotted it, and somebody had taken the time, they would have seen each successive quarter got a little worse and a little worse."

Swakon said he and Torcise met with FPL officials to report their findings, but got no response. An FPL spokesman later called them "unfounded allegations." At the time, the utility was in the midst of hammering out a new administrative order required by a $3 billion uprating project of Turkey Point's two nuclear reactors that FPL said it needed to keep up with increasing demand: as much as 40 percent of the power the county needed was being imported, FPL officials said in a 2007 zoning meeting.

The uprate would increase power output by 15 percent but also raise temperatures in the cooling canals, with the effect of increasing evaporation and salt concentrations. FPL officials planned to offset additional heat going into the canals by shutting down the plant's two oldest fossil fuel burning units. The move was expected to cap the heat increase to only by 2.5 degrees — an impact FPL insisted would not effect the operation of the canals.

But modeling done by the U.S. Geological Survey in 2009 found that as the canals grew hotter and saltier, they could potentially shoot "saline fingers" to the bottom of the 98-foot thick aquifer —sometimes as fast as a few days. The extra salty water could then spread laterally, expanding the plume.

Water managers, whose approval was key to the uprating moving forward, wanted to know if the interceptor ditch was still an effective barrier. At the time, FPL officials assured them it was.

Engineers who designed the ditch weren't so confident. According to a report compiled this year by University of Miami hydrologist David Chin for Miami-Dade County, the engineers worried as early as 1971 that saltwater could migrate inland even if the ditch was properly operated. Chin also found the ditch only blocks shallow saltwater from spreading — and the canal system was pushing it deeper into the Biscayne aquifer.

Faced with increased scrutiny, FPL hired its own engineers to look for remedies, according to an in-house study Torcise obtained in his recent lawsuit. Completed in August 2011, the study found that canal water had moved 3.5 miles west of the plant and was spreading at a relatively brisk pace of 500 feet a year. In response to a question, an FPL spokesman this week revised that figure, saying the rate has since slowed to just over 120 feet a year.

FPL's engineers offered five alternatives, including building massive slurry walls underground to stop water from moving at a cost of $134.4 million. But the cheapest and preferable alternative, the engineers said, was adding fresher water from the Floridan aquifer.

"The alternative is attractive because it effectively removes the source of the hypersaline water," engineers wrote. But a "potentially negative aspect" of the remedy, they said, was it did nothing to stop the westward movement of saltwater. Nor did the other four.

Despite the findings, FPL officials in 2010 and 2011 continued to work with water managers on an elaborate monitoring plan that also for the first time included checking for tritium, a radioactive isotope found in canal water that could be used as a tracer. In 2011, as part of their effort to confirm tritium as the best tracer, district hydrologists John Janzen and Steven Krupa found that canal

water was in wells at Southwest 137th Avenue. Tritium was also found in surface water just east of the canals and at the mouth of the Card Sound Canal. To get a better read, the hydrologists recommended installing a better network of wells.

But in its annual post-uprate report in October 2012, FPL continued to debate the 2009 USGS findings of the expanding plume, arguing that the wells used by the agency might not be connected or in the same zone because of the "complex geology of the area." Still, the utility agreed a plume existed and offered solutions.

FPL managers now say the location of the saltwater plume wasn't in dispute — just the exact cause of it.

"WE ALWAYS SAID WE WERE PART OF IT, BUT THERE'S OTHER FACTORS."

FPL senior director Steve Scroggs

"We always said we were part of it, but there's other factors," including lowering the water table seasonally for nearby farmers, senior project director Steve Scroggs said this week. "It's easy to say it's all FPL. It's not."

Meanwhile, the boundaries of the tritium were growing clearer. A Miami-Dade County contour map of samples in 2011 and 2013

show tritium detected well beyond cooling canal borders. County officials had been keeping an eye on the wells, but had no authority without a water quality violation, said Lee Hefty, director of the Division of Environmental Resources Management. Instead, he said, they pushed for the district to act.

In April 2013, the Water Management District finally officially notified FPL that the canals were in violation. The utility responded by asking to add 14 million gallons of water a day from the Floridan aquifer, which it said would reverse the plume, a prediction that contradicts the earlier 2010 report. But district hydro-geologist Jeff Giddings found FPL used faulty modeling. While adding Floridan water reduced salinity in the canals, it did nothing to reduce the underground plume.

District consultant William Nuttle also concluded more water would just increase seepage and warned that FPL failed to account for local conditions including a major change on the horizon: sea rise. A foot rise, now predicted by the National Oceanic and Atmospheric Administration by 2030, would put the shoreline west of the canals.

As the agencies tried to hammer out a deal, temperatures in the canal spiked in the summer of 2014, prompting the utility to scramble for solutions, including getting operating limits raised to 104 degrees, the

highest in the country, and an emergency permit to pump up to 100 million gallons of water a day from a nearby drainage canal. The utility also began pumping water from unregulated marine wells.

Over the next year, Miami-Dade County officials estimate that FPL pumped more than 12 billion gallons of water into the canals. Half that came from the marine wells with a quarter coming from the nearby L-31e canal. Rain supplied just 37 percent, even though company officials say rain remains the primary source of water to address increasing evaporation with higher temperatures.

What caused the spike remains in dispute. Chin, whose final report is due next month, concluded that the uprating project caused it. FPL blames a local drought. In July 2014, FPL environmental services director Matt Raffenberg said rainfall over the canals amounted to just 5.29 inches and only 20 inches in all of 2013.

"IF IT'S SUCH AN IMPORTANT FACILITY, YOU WOULD EXPECT ITS DESIGN WOULD NOT BE BASED UPON THE WEATHER."

Lee Hefty, director of Miami-Dade County's Division of Environmental Resources Management

"If it's such an important facility, you would expect its design would not be based on the

weather," Hefty said. "It sounds like a funny thing to say, but really it's a fairly significant facility. I would have expected their design engineers would have contemplated how that facility would operate without rain."

FPL's Scroggs also said that when the canals were briefly shut down, sediment built up in the northwest corner, which slowed flowed, turned the water browner and hotter, and caused an algae bloom to spread. Sediment had not been removed from the canals since 1990s, Scroggs said, because it is expensive.

When the state finally issued a new administrative order late in 2015, allowing FPL to pump more water into the canals to lower salinity and "abate" the plume without fully spelling out how, Torcise, environmentalists, neighboring cities and the county sued. Last month, a Tallahassee administrative judge ordered the state to redo the plan after it failed to cite FPL for a specific violation.

On Thursday, DEP chief Steverson wrote that the order in fact contained remedies which were not suitable for judicial review and that choosing to fix the problem, rather than penalize FPL, was up to the department.

The state's decision, South Miami Mayor Phil Stoddard said, comes as no surprise given the utility's political connections.

"I suspect there's incentive enough for DEP to disrespect the administrative law judge and

the public welfare to avoid holding FPL responsible for the environmental damage they've done."

On May 15, FPL is also due to submit a clean-up plan to the county, which pulled out of the suit and hammered out its own deal. The plan calls for FPL to install extraction wells to pump the extra salty water deep into the boulder zone, which environmentalists worry won't do enough to address the plume. To address high levels of ammonia and phosphorus leaking into the bay, FPL also dug a 30-foot deep well east of the canals, which it did without consulting the county environmental staff, prompting another letter from Hefty to better spell out plans.

FPL now says the cooling canals are back under control, that salinity is a third lower than last summer and, now that they've cleared sediment and have permission to add water from the deeper brackish Floridan aquifer, they expect the canals to work properly. Efforts to address the plume was delayed not by them, Scroggs said, but by a complicated bureaucratic system.

"For years people knew about this and everybody talked about what we would do. Well, we finally broke through that," he said. "I'm living everyday with the delays and the questions and the go back and do this and the back and forth. It's an incredibly complex process with multiple people and multiple interests. But at the end of the day, we've

moved to a place where we're taking action."

Follow Jenny Staletovich on Twitter @jenstaletovich

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SCIENTIFIC STUDY ON THE CCS

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The Cooling-Canal System at the FPL Turkey Point Power Station

By David A. Chin, Ph.D., P.E., BCEE
Professor of Civil and Environmental Engineering
University of Miami

Final Report
May 2016

Executive Summary

This report was prepared under an agreement between Miami-Dade County and the University of Miami. The following issues related to the operation of the cooling-canal system (CCS) at the Turkey Point Power Station were investigated: (1) temperature variations in the CCS and associated impacts on the surrounding groundwater, (2) salinity variations in the CCS and associated impacts on the surrounding groundwater, (3) salinity control within the CCS, and (4) the effects of pumping up to 100 million gallons per day from the L-31E Canal into the CCS. The principal findings of this investigation are summarized below, with analytical details supporting the findings contained in the body of the report. Data for this study was provided by the Miami-Dade County Department of Regulatory and Economic Resources, Division of Environmental Resources Management (DERM). CCS temperature and salinity data for the four-year interval of 9/1/10 – 12/7/14 were made available for this investigation.

Temperature in the CCS. A heat-balance model was developed to simulate the temperature dynamics in the CCS. The results derived from the heat-balance model identified two distinct periods during which the heat-rejection rate from the power plant remained approximately constant. The first period corresponded to pre-uprate conditions (i.e., before February 2012), and the second period corresponded to post-uprate conditions (i.e., after May 2013). The heat-rejection rate under post-uprate conditions was found to be significantly greater than the heat-rejection rate under pre-uprate conditions. As a result of the increased heat addition to the CCS, the average temperature of water in the CCS has increased, and in the vicinity of the power-plant intake the average temperature has increased by approximately 4.7°F. This measured increase in average temperature within the intake zone is slightly greater than the increase in the maximum allowable operating temperature at the intake location of 4.0°F that was approved for the nuclear-power generating units by the Nuclear Regulatory Commission in 2014. Therefore, the increased maximum operating temperature has not reduced the probability of the intake temperatures exceeding the threshold value, which currently stands at 104°F. Since supplementary cooling of the CCS was needed in 2014, this serves as a cautionary note regarding further increases in power generation beyond 2014 levels without providing a reliable supplementary cooling system. Measured temperature data under pre-uprate conditions indicate that the thermal efficiency of the CCS has decreased between the pre-uprate and post-uprate periods. Recent efforts have been made by FPL to increase the thermal efficiency of the CCS with some tangible results. However, measured (current) post-uprate thermal efficiencies of the CCS remain below the pre-uprate levels (67% versus 77%), and the extent to which further improvements in the thermal efficiency of the CCS will be able to mitigate increased temperatures resulting from increased thermal loading is yet to be established. The assertion that higher algae concentrations in the CCS were responsible for the elevated temperatures in the CCS was investigated. A sensitivity analysis indicates that increased algae concentrations were not likely to have been responsible for the significantly elevated temperatures in the CCS recorded in the mid-summer

months of 2014. The additional heating rate in the CCS caused by the presence of high concentrations of algae is estimated to be less than 7% of the heat-rejection rate of the power plant, hence the minimal impact. Further development of a heat-balance model of the CCS is needed, since the design of any engineered system to control temperatures in the CCS must be done in tandem with heat-balance-model simulations.

Temperature impact on groundwater. Measured groundwater temperatures in some monitoring wells between the CCS and the L-31E Canal have shown higher temperatures than groundwater west of the L-31E Canal, and this occurrence can be partially attributed to limited cooling-canal water intrusion into the Biscayne aquifer. Monitoring-well measurements show that nearly all of the seasonal temperature fluctuations in the groundwater occur above an elevation of −25 ft NGVD* (about 30 ft below the ground surface). At lower elevations in the aquifer, the groundwater temperature generally remains relatively steady and in the range of 75°F – 77°F. Seasonal temperature fluctuations above −25 ft NGVD can be partially attributed to the heating and cooling of water in the L-31E Canal in response to seasonal changes in atmospheric conditions. Overall, the impact of the CCS on the temperature of the groundwater in the Biscayne aquifer can be considered as localized of not having any direct environmental consequence. However, since the density of water is inversely proportional to temperature and directly proportional to salinity, the cooling of CCS water as it penetrates the Biscayne aquifer causes an increase in density that affects the groundwater flow in the vicinity of the CCS. Hence, accounting for subsurface temperature variations in the vicinity of the CCS is essential in modeling the extent of salinity intrusion resulting from operation of the CCS.

Salinity in the CCS. There has been a steady increase in the CCS salinity of around 5‰ per decade since the CCS began operation in 1973. Recent measurements indicate that the rate of change of salinity in the CCS might be increasing. Analyses of the salinity dynamics in the CCS were performed using a salinity model previously developed by a FPL contractor. Results from this salinity model show that evaporation and rainfall are the primary drivers affecting the salinity in the CCS, with pumpage from the interceptor ditch and blowdown from the Unit 5 generating facility also having an effect. Over prolonged periods with no rainfall, the salinity in the CCS will typically increase as fresh water is evaporated and the evaporated fresh water is replaced by saline water from the surrounding aquifer. A prolonged period with no rainfall coupled with the significant inflow of saline water from the surrounding aquifer were the primary causes of the unusually high salinities (greater than 90‰) that were observed in early summer of 2014. Seepage inflow to the CCS is mostly from the east (i.e., the area adjacent to Biscayne Bay) and seepage outflow is mostly through the bottom of the CCS, thereby contributing to an increased salinity of the underlying groundwater. The short-term (seasonal) salinity fluctuations in the CCS are controlled by seasonal variations in the amount and timing of rainfall, and aperiodic spikes in salinity should be considered as being normal and expected. In the long term, barring any significant intervention, salinities in the CCS will continue to follow an upward trend, since over the long term annual evaporation exceeds annual rainfall. Recent increases in the temperatures in the CCS will certainly lead to increased evaporation, which will likely increase the rate of change of salinity in the CCS to above-historical rates of change.

Salinity impact on groundwater. Based on available documentation and data summaries contained in numerous reports prepared by FPL, SFWMD, and DERM, there is little doubt that seepage from the CCS into the Biscayne aquifer has caused salinity increases within the aquifer, and this impact extends several miles inland from the CCS. The strongest evidence for this assertion comes from measured tritium concentrations

*"NGVD" refers to the NGVD 29 datum.

in groundwater samples collected at monitoring wells in the vicinity of the CCS. Water in the CCS generally contains tritium concentrations that are significantly higher than natural background concentrations in the surrounding aquifer, and hence utilization of tritium as a tracer to identify groundwater originating from the CCS is justified. Elevated concentrations of tritium above a 20 pCi/L threshold in the deep groundwater can reasonably be attributed to the presence of water originating from the CCS. The approximate limit of the 20 pCi/L concentration contour has been reported to be 3.8 – 4.7 miles west of the CCS and 2.1 miles east of the CCS. This finding is further reinforced by USGS measurements showing that groundwater samples collected within 5.3 miles west of the CCS had elevated levels of tritium relative to normal background levels of tritium in the Biscayne aquifer. It is important to note that presence of elevated levels of tritium above natural background levels in the Biscayne aquifer is not considered to be a threat to public health and safety, since the measured concentrations are far below the federal drinking water standard of 20,000 pCi/L. Elevated levels of tritium are simply being attributed to the presence of water originating in the CCS.

Salinity control in the CCS. FPL has reached an agreement with Miami-Dade County to install a system of up to six wells to pump low-salinity water at a rate of 14 mgd from the Upper Floridan aquifer into the CCS in order to reduce salinity in the CCS. The operational goal of this system is to reduce the average-annual salinity in the CCS to approximately 34‰ within four years after the system begins operation. Based on available information, there are still some outstanding technical issues that should be addressed in developing the final design of the salinity-control system. The first issue is that the long-term addition of 14 mgd of brackish water from the Upper Floridan aquifer could be insufficient to compensate for the post-uprate evaporation-rainfall deficit that is currently around 29 mgd. This shortfall in pumping rate, if not adequately addressed in the design of the salinity-control system, would likely result in a continued steady increase in salinity within the CCS. A second issue of concern is that adding 14 mgd or more of water to the CCS is likely to significantly increase the salinity flux out of the bottom of the CCS, at least in the short term, and the extent to which this increased salinity flux will exacerbate salinity intrusion in the Biscayne aquifer still needs to be addressed. A third issue of concern is that the time-frame required for the proposed system to significantly reduce salinity levels in the Biscayne aquifer remains highly uncertain pending more definitive characterization of the subsurface hydrostratigraphy and the development of a groundwater-flow model that accounts for the effects of temperature and salinity on the flow distribution in the aquifer. The variable-density groundwater model that is being developed in support of the Biscayne Aquifer Recovery Well System (RWS) could possibly be adapted to investigate the technical issues relating to CCS salinity-control system that are identified here.

Withdrawal of 100 mgd from the L-31E Canal. Adverse impacts of pumping 100 mgd from the L-31E Canal into the CCS during June 1 – November 30 are possible under the current permitted pumping protocol. Under the current pumping protocol stipulated in the SFWMD-issued permit, the stage in the L-31E Canal will be held constant during pumping, while the stage in the CCS will generally rise as a result of pumping. This combined effect will decrease, or possibly reverse, the seaward piezometric-head gradient between the L-31E Canal and the CCS that would normally exist in the absence of pumping. A possible consequence of a reversed head gradient between the L-31E Canal and the CCS is advection of a saline plume from the CCS towards the L-31E Canal, and creation of a circulation cell in which the salinity of the water in the L-31E Canal is increased as the saline plume enters the L-31E Canal. Furthermore, according to model results provided by FPL in support of the pumping-permit application, pumping of 100 mgd into the CCS is likely to reduce the water-level differential between the L-31E Canal and the CCS to below the 0.30 ft threshold that would normally trigger the operation of the interceptor ditch salinity-control system, which, if operational, would further reduce the head gradient between the L-31E Canal and the CCS. Based on these findings, it is recommended that the permitted pumping protocol be revised prior to the 2016 pumping period. The revised protocol should include, as a minimum, real-time monitoring of the stages in the CCS and the L-31E Canal during pumping operations, specification of a threshold water-level difference between the L-31E Canal and the CCS that would limit further pumping, and real-time monitoring of the salinity in the L-31E Canal during pumping operations.

Recommended actions. The following action items would lead to better and more efficient management of temperatures and salinities within the cooling-canal system, and support the robust design of remediation systems to control CCS-induced salinity intrusion:

- Develop a calibrated heat-balance model to simulate the thermal dynamics in the CCS, and collect the data necessary to calibrate and validate the model.
- Continue present efforts to increase the thermal efficiency of the CCS, and use measured data to establish the extent to which temperature increases due to increased thermal loading are being mitigated by increased thermal efficiency.
- Develop a quantitative relationship for estimating algae concentrations in the CCS as a function of temperature, salinity, and nutrient levels.
- Develop a locally validated relationship between the evaporation rate, water temperature, air temperature, wind speed, salinity, and algae concentrations in the CCS.
- Re-assess the effectiveness of pumping 14 mgd of brackish water from the Upper Floridan aquifer into the CCS with the objective of reducing the salinity in the CCS. Under present operating conditions, a higher pumping rate will likely be necessary, since post-uprate increases in CCS operating temperatures have increased the evaporation-rainfall deficit from around 19 mgd to around 29 mgd.
- Utilize a variable-density groundwater model to better estimate the effectiveness and aquifer-response time scale of the proposed CCS salinity-control actions related to pumping 14 mgd or more from the Upper Floridan aquifer into the CCS. Based on available data, there is much uncertainty in the effectiveness and aquifer-response time scale.
- Modify the operational protocol associated with the 2015 – 2016 permit for transferring up to 100 mgd from the L-31E Canal to the CCS.

The analyses and recommendations contained in this report are offered constructively in support of the goal of achieving an environmental balance for the sustainable generation of electrical power at the Turkey Point power station.

Contents

1 Background

This investigation is primarily focused on the operation of the cooling-canal system (CCS) located at the Turkey Point power-generating station in south Miami-Dade County, Florida. The issues of concern relate to the increased temperatures and salinities that have recently been measured in the CCS, the environmental impacts of these increased levels on the quality of groundwater in the Biscayne aquifer, the need for additional engineered systems to supply supplemental cooling water to the CCS, the proposed plan to reduce salinities in the CCS, and the environmental impacts of permitted pumping of up to 100 mgd of water from the L-31E Canal to the CCS between June 1 and November 30.

Environmental concerns. Most of the environmental concerns regarding the operation of the cooling-canal system (CCS) at Turkey Point relate to: (1) the sustainability of the system in maintaining adequate temperatures to cool the power-generating units, (2) the impact that current and projected future salinities in the CCS have on the quality of groundwater in the surrounding Biscayne aquifer, and (3) the need for new supplementary sources of water and/or revised operational protocols to control the temperatures and salinities in the CCS. Specific issues of concern are as follows:

- Increased temperatures in the CCS limit the effectiveness of the CCS as a cooling-water source servicing three power-generating units. When the intake temperature in the CCS exceeds a regulatory limiting value of 104°F, either nuclear-power generation must be curtailed or supplementary cooling water must be provided to the CCS to reduce the temperature and hence keep the nuclear-power generating units in operation; the sustainability of a supplementary system to cool the water in the CCS has not yet been established.

- Increased salinity in the CCS likely contributes to increased saltwater intrusion within the Biscayne aquifer, thereby deteriorating the groundwater quality underlying nearby inland areas. This is of concern because of the proximity of the CCS to public water-supply wellfields, a commercial rockmining operation, and ecologically sensitive areas. The current salinity-control system, sometimes called the interceptor-ditch system, has not been effective in controlling the inland migration of saline water from the CCS, thereby signaling the need for revised operating strategies to manage salinity intrusion resulting from CCS operation.

- The effectiveness and environmental impact of a planned system to reduce the salinity in the CCS by pumping water from the Upper Floridan aquifer into the CCS, and the effectiveness and environmental impact of a planned system to reduce CCS-induced salinity intrusion by pumping CCS-derived hypersaline water from the Biscayne aquifer into the Boulder Zone are unresolved issues.

- The effectiveness of the permitted protocol for pumping 100 mgd from the L-31E Canal into the CCS to reduce temperatures and salinities in the CCS, and the effect of this pumping operation on saltwater intrusion in the Biscayne aquifer and water quality within the L-31E Canal are issues that are yet to be resolved.

This report summarizes what is currently known about the CCS, summarizes the key findings from previous related investigations, regulatory reports and reviews, provides new analyses, and gives suggested answers and pathways forward to resolve several issues related to the above-listed concerns.

1.1 Turkey Point Power Station

The Turkey Point Power Station consists of five power-generating units: two 404-MW oil/natural gas-fired generating units (Units 1 and 2), two 728-MW nuclear-powered units (Units 3 and 4), and a nominal 1150-MW natural gas-fired combined-cycle unit (Unit 5). The five power-generating units and support facilities occupy approximately 130 acres of the 11,000-acre Turkey Point plant. Units 3 and 4 were the first nuclear power plants constructed in Florida, and they were licensed to begin operation in 1972 and 1973, respectively. In 2002, the Nuclear Regulatory Commission (NRC) extended the operating licenses for both nuclear reactors from forty years to sixty years, extending licensed operation of Units 3 and 4 to the years 2032 and 2033, respectively. The CCS provides cooling water for Units 1 to 4, with cooling of Unit 5 accomplished by mechanical-draft cooling towers that use make-up water drawn from the Upper Floridan aquifer. Blowdown water from Unit 5 is discharged into the CCS. Since the uprate of Units 3 and 4 went into effect, Unit 2 has not been operational, with some documentation indicating that Unit 2 actually ceased operating in 2010 (Florida, 2015). With an estimated total power-station capacity of approximately 3550 MW, the Turkey Point power station has been cited as the second largest power station in Florida, in terms of generating capacity, and is the sixth largest power station in the United States (NRC, 2012).

Uprate of Units 3 and 4. In June of 2009, the Florida Department of Environmental Protection (FDEP) certified the increase in power-generating capacity (commonly called an "uprate") of Units 3 and 4 to provide an additional 250 MW of electrical power (i.e., 250 MWe). Pursuant to this uprate certification, Unit 3 has been operating at its uprated power-generation capacity since November 2012, and Unit 4 has been operated at its uprated power-generation capacity since May 2013. By increasing electrical-power generation by 250 MW, the NRC estimated that the increase in thermal loading on the CCS would be approximately 688 MW (i.e., 688 MWt). Further, in planning for the Unit 3 and Unit 4 uprates, it was anticipated that the uprate would increase the temperature of the cooling water discharged to the CCS by approximately 2.5°F, and would increase the temperature in the CCS at the power-plant intake by around 0.9°F (FPL 2011; FDEP, 2008) . It was also anticipated that the increased temperature in the CCS would result in increased evaporation, which would cause an increased CCS salinity of around 3.6‰.

Future plans. In 2014, the Florida legislature approved construction of two additional nuclear reactors at Turkey Point (Units 6 and 7), with each additional unit having an approximate electrical output of 1100 MW; approval of the additional units by the NRC is currently pending. The two additional nuclear reactors will not use the CCS for cooling.

1.2 Geohydrology

The Turkey Point power station and associated cooling-canal system (CCS) are underlain by the Biscayne aquifer. In the vicinity of Turkey Point, the Biscayne aquifer extends from land surface to a depth of approximately 106 ft below sea level (BSL), with the thickness of the aquifer decreasing towards the west. Geologic formations within the Biscayne aquifer include, from the ground surface downward, the Miami Limestone Formation, Key Largo/Fort Thompson Formations, and upper portions of the Tamiami Formation. The less-permeable units of the Tamiami Formation, and the deeper Hawthorn Group, form the confining unit between the Biscayne aquifer and the Upper Floridan aquifer. The top of the confining unit is characterized by the transition between highly permeable beds of the Fort Thompson Formation and the lower-permeability silty sands of the Tamiami Formation. The thickness of the Miami Limestone Formation is in the range of

8 – 23 ft, and the thickness of the Fort Thompson Formation is in the range of 46 – 95 ft. The bulk hydraulic conductivity of the Biscayne aquifer in the vicinity of Turkey Point is in the range of 2700 – 7300 m/day (Fish and Stewart, 1991). The regional groundwater flow direction is, on average, from the northwest to southeast, although the predominant flow direction at the coast can vary significantly between the wet and dry seasons. The water-table gradient is typically towards the coast during the wet season (May – October), but can be directed inland during the dry season (October – April). The possibility of the occurrence of an inland water-table gradient is the primary reason for utilization of the so-called "interceptor-ditch system" that is used ostensibly to control the inland migration of saline water originating from the CCS. Water-table elevations at Turkey Point are typically around 1 ft NGVD, and the magnitude of the average regional water-table gradient is typically in the range of 0.004% – 0.005%. Notably, with such small water-table gradients, small errors in measured water-table elevations can significantly impact the accuracy of the estimated gradients. Vertical piezometric-head gradients at the Turkey Point site (away from the CCS) are typically negligible, with piezometric-head differentials between shallow, intermediate, and deep zones reportedly being within hundredths of a foot. Negligible vertical piezometric-head gradients indicate that groundwater flows are predominantly in the horizontal direction (Chin, 2013).

Groundwater classification. Groundwater at the Turkey Point site was originally classified by FDEP as as G-II, which is the classification for groundwater that is of possible potable use and has a total dissolved solids content of less than 10,000 mg/L. In September 1983, at the request of FPL, the groundwater at the Turkey Point site was reclassified by FDEP as G-III, which is the classification for groundwater that has a total dissolved solids content of 10,000 mg/L or greater, or has a total dissolved solids of 3,000 – 10,000 mg/L and has no reasonable potential as a future source of drinking water. The G-III classification currently remains in effect.

1.3 The Cooling-Canal System

Background. The utilization of recirculating cooling ponds and cooling canals at thermoelectric power plants in the United States is not unique to South Florida, with approximately 85 thermoelectric power plants using such closed-loop cooling systems as of 2005 (Hughes et al., 2010). Approximately 40% of U.S. nuclear power plants use closed-cycle cooling, with the others using once-through cooling systems (EPRI, 2012). In the United States, closed-loop cooling-pond systems are more commonly utilized in arid areas where evaporation rates are high, and such systems are less commonly used in humid areas where evaporation rates are relatively low. Elevated temperatures and salinities are common features of cooling ponds and canals. Notably, elevated temperatures and salinities have opposite effects on the density of water, with elevated temperatures causing reduced densities, and elevated salinities causing increased densities. Typically, the increased density due to elevated salinities is greater than the reduced density due to elevated temperatures†. Therefore, the combined effect is to increase the density of the water in the cooling system relative to that of surrounding groundwater. The increased density of water within the cooling system causes the water to move downward through the surrounding aquifer. Such density-driven flows are commonly referred to as thermohaline flows, and such flows contribute to the process of salinity intrusion.

History and regulation of the Turkey Point cooling canal system. The Turkey Point cooling-canal system (CCS) is located approximately 4.5 miles southeast of Homestead, approximately 8 miles east of Florida

†For temperature: $\partial\rho/\partial T = -0.375$ (kg/m^3)/°C; and for salinity: $\partial\rho/\partial S = 0.75$ (kg/m^3)/‰.

City, and approximately 10 miles north of Key Largo. Construction of the CCS was approved by the Dade County Board of County Commissioners in November 1971, and became operational in February 1973. At the time of its initial operation, the CCS was approximately half-completed compared with the present system. The CCS is sometimes referred to as the Industrial Wastewater Facility (IWW), since the circulating-water system discharges saline water to the surrounding Biscayne aquifer and is regulated under the federal National Pollutant Discharge Elimination System (NPDES) and an Industrial Wastewater (IW) permit issued to FPL by the Florida Department of Environmental Protection. The CCS is also commonly referred to as the Ultimate Heat Sink (UHS) of the nuclear-reactor power-generating units (Units 3 and 4).

Current canal system. In its present state, the CCS is approximately two miles wide (east–west) and five miles long (north–south), covers an area of approximately 6100 acres, and has approximately 4370 acres of water surface. The CCS occupies more than half of the 11,000-acre Turkey Point power-station property. The CCS consists of 32 canals flowing south from the discharge location in the north, and 6 return canals flowing north to the intake location. Because the south-flowing canals are located in the western section of the CCS and the north-flowing canals are located in the eastern section of the CCS, the system is sometimes referred to as having 32 western canals and 6 eastern canals. The south-flowing (western) canals are each approximately 4 ft deep, 200 ft wide, and spaced approximately 90 ft apart; these canals range in length from 2 – 5 miles. The 4 ft depth of the canals (from ground surface) was originally chosen so as to not penetrate the less-permeable surficial Miami Oolite Formation that extends to about 4 ft below grade, thereby minimizing groundwater exchange between the CCS and the underlying Biscayne aquifer. The bottom of the canals are below the lowest water-table elevation expected in the Biscayne aquifer at Turkey Point, and therefore the canals always contain water that is directly connected to the adjacent groundwater. Cooling water leaves the three operational power-generating units (Units 1,3, and 4), flows into Lake Warren, and then into the 20-ft deep 100-ft wide feeder canal that connects to the 32 south-flowing cooling canals. Four shallow cross canals spaced 1-mile apart run east – west across the 32 south-flowing cooling canals. These cross canals contain flow-control structures that distribute water flow evenly to the canals so that each cooling canal carries a flow that is proportional to its surface area in order to optimize heat exchange with the atmosphere. At the southern end of the CCS is a collector canal that is approximately 20 ft deep and 200 ft wide. Water returns to the power-generating units from the southern collector canal via 6 north-flowing canals, the largest of which is the Grand Canal which is 200 ft wide and 20 ft deep. The average length of the circulation path between the discharge and intake locations is 13.4 miles. The 32 south-flowing cooling canals are numbered from 1 to 32, from east to west, hence, cooling-canal number 32 is the westernmost canal in the CCS.

Federally protected species inhabiting the CCS. Since 1977 an area that includes the majority of the Turkey Point site (including the CCS) has been designated as critical habitat for American crocodiles under the Endangered Species Act. Endangered American crocodiles (*Crocodylus acutus*) have inhabited the cooling canals since around 1976 (FDEP, 2008). During nesting season, more than 40 adult crocodiles have been observed in the canals, although there have been some reports that the crocodile population in the CCS is declining possibly due directly or indirectly to the increased salinities in the CCS. According to the NRC (NRC, 2014), the Turkey Point site now hosts approximately one-third to one-half of the breeding population of crocodiles in the United States.

Operational characteristics of the CCS. The canals in the CCS were designed to operate at a total flow rate of 4250 ft^3/s (2750 mgd) when all four generating units (Units 1 – 4) supported by the CCS are in full operation. Small wastewater (blowdown) flows from Unit 5 are also discharged into the CCS. Typically, the flow rate through the CCS varies with the electric load demand on the generating units, and is usually in the range of 2700 – 4250 ft^3/s (1750 – 2750 mgd) on any given day, with a typical flow depth of around 2.8 ft. Thermal energy input from the power-generating units is dissipated in CCS as water moves from north to south, with the primary heat-exchange processes being evaporation, solar radiation, and both emitted and absorbed longwave radiation. Maximum temperatures near the discharge location of the power-generating units are typically around 108°F, and maximum temperatures near intake to the power-generating units are typically around 93°F; the difference between these typical maxima is 15°F, which gives a measure of the cooling effect of the CCS. The (regulated) maximum allowable temperature at the intake location in the CCS is 104°F. The flow in the CCS is driven by 12 condenser-circulating pumps and auxiliary cooling pumps. The CCS typically contains approximately $7 \times 10^8\,ft^3$ of water, and the average velocity of flow is around 0.25 ft/s in each canal. Approximately two days (44 – 48 h) are required for water in the CCS to travel from the discharge location to the intake location. Flow within the CCS is maintained by a head differential between the discharge and intake locations, with the water-surface elevation being highest at the discharge location and lowest at the intake location. Under current operating conditions, typical water surface elevations in the CCS are 1.48 ft NGVD at the discharge location, 0.95 ft NGVD at the south end, and 0.70 ft NGVD at the intake location. The water-surface elevation at south end of the CCS is usually closest to the water-surface elevation in Biscayne Bay. The water-surface elevation in the CCS is typically higher than the site-average water-table elevation in the Biscayne aquifer at the discharge (north) end of the system, approximately equal to the water-table elevation at the south end of the system, and below the water table at the intake (north) end of the system. Consequently, water generally flows out of the CCS into the aquifer near the discharge location of the CCS and water generally flows into the CCS from the aquifer near the intake location of the CCS, there is less flow interaction between the CCS and the aquifer at the southern end of the system. During very heavy rains, there can be a net inflow to the CCS from the surrounding aquifer. The CCS is approximately nontidal, and water in the CCS is typically warmer than the air temperature.

1.4 Algae in the CCS

A significant algae bloom occurred in the CCS during 2014 and algae is now perceived to be a problem in the CCS. Prior to 2013, only limited and short-term algae blooms had occurred in the CCS, typically during the early summer months. In fact, algae blooms were previously of such limited concern that routine monitoring for algae was not commonly done prior to 2014. In the summer of 2014, large-scale application of a $CuSO_4$-based algaecide was used to reduce the algae concentrations in the CCS. The applied algaecide was reported as being ineffective in reducing the algae concentrations, serving only to stabilize the existing concentrations (SFWMD, 2015).

Factors affecting algae concentrations. High concentrations of algae have been observed in the CCS with correspondingly high concentrations of nutrients being measured. The historical average algae concentration in the CCS is reported to be 50 cell/L[‡], however, in the summer of 2014 algae concentrations as high as 1600 cell/L were reported (SFWMD, 2015). The addition of nutrients from the power-generating units into the CCS is assumed to be negligible, with nutrients likely originating from allochthonous sources. Total nitrogen (TN) concentrations in the CCS have been reported in the range of 1.7 – 5.3 mg/L (Ecology and Environment, Inc., 2012). The highest reported TN concentrations in the CCS were measured at all stations

[‡]Algae concentrations are normally given in Chl*a*/L, so these units are unusual.

in March 2012, which coincided with higher turbidities and pH in the CCS. The majority of the nitrogen in the CCS appears to be in organic form (typically 80% – 90%). Total phosphorus (TP) concentrations in the CCS have been reported in the range of 4 – 73 μg/L, with an overall average concentration of 36 μg/L. Numerous measurements of TN and TP were reported between 7/2010 and 3/2015 (Ecology and Environment, Inc., 2010; 2011a; 2011b; 2012a; 2012b; 2012c; 2013a; 2013b; 2014a; 2014b; 2015), and synoptic measurements within this time period yield TN/TP values in the range of 48 – 2015 with a median value of 142. Since the measured TN/TP values generally exceed the Redfield ratio of 16, it can be inferred that TP is the controlling nutrient for algae growth in the CCS. The existence of TP-control of algae growth in saline systems is commonly attributed to the presence of nitrogen-fixing planktonic cyanobacteria which make up any short-term nitrogen deficits (Howarth and Marino, 2006). It has been reported that the cyanobacteria *Aphanothece* sp. are the predominant algae species in the CCS; these species are nitrogen-fixing and thrive under hypersaline conditions. In addition to nutrients, both temperature and salinity are known to affect the growth of algae in water bodies. For given nutrient levels, increasing temperatures usually contribute to increased algae concentrations, and increasing salinities usually contribute to decreased algae concentrations (Håkanson and Eklund, 2010). However, for the algae species commonly found within the CCS, algae concentrations have been reported to increase with increasing salinity (SFWMD, 2015). Algae concentrations are usually expressed in terms of the mass of chlorophyll-a per liter of sample volume. Synoptic measurements of chlorophyll-a (Chl$a$) concentration, salinity (S), temperature (T), and total phosphorus (TP) concentration at locations near the discharge and intake locations in the CCS between May 31, 2015 and November 13, 2015 are plotted in Figure 1. These synoptic measurements collectively show the algae

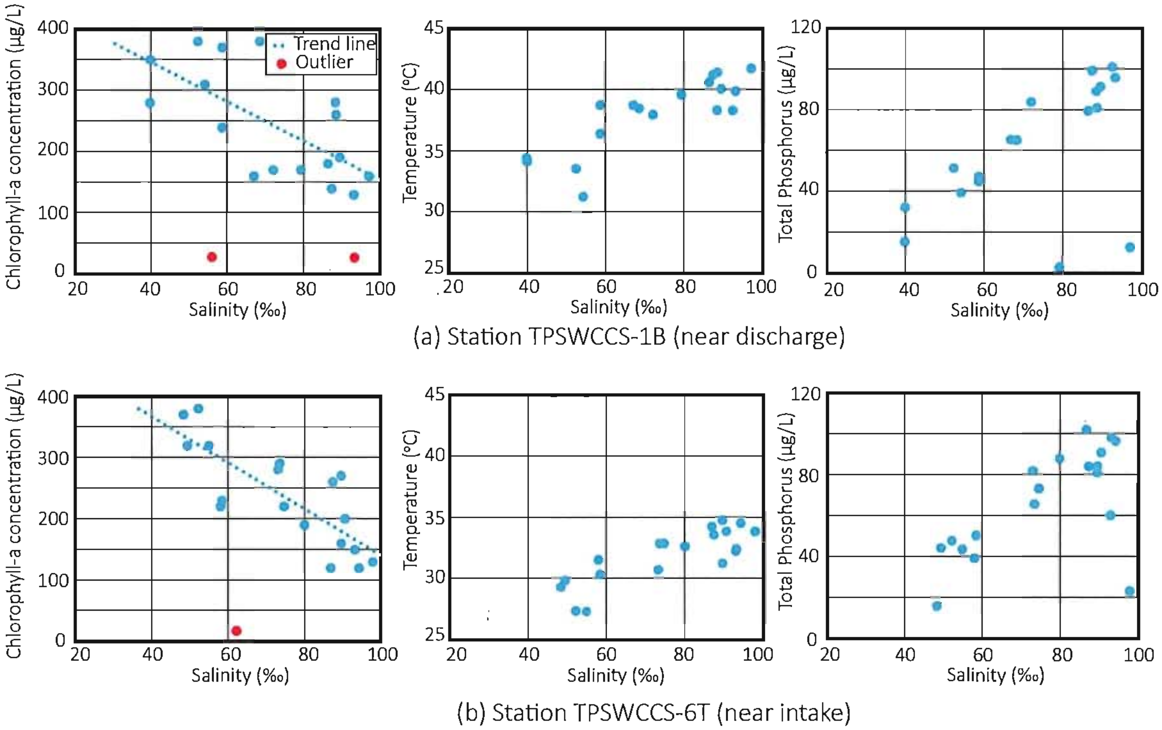


Figure 1: Chlorophyll-a levels in the CCS as a function of temperature, salinity, and total phosphorus

concentration (Chl$a$) decreasing with increasing salinity (S), decreasing with increasing temperature (T), and decreasing with increasing nutrient concentration (TP). All of these trends are contrary to the natural relationships between Chl$a$, S, T, and TP and are either anomalous or indicate the effect of an algaecide. The active ingredient of the algaecide commonly used in the CCS is $CuSO_4$, and the possible effectiveness of this algaecide can be seen by plotting the relationship between Chl$a$ and sulfate (SO_4^{2-}) concentrations; this relationship is shown in Figure 2. It is apparent from Figure 2 that algae concentrations decrease signifi-

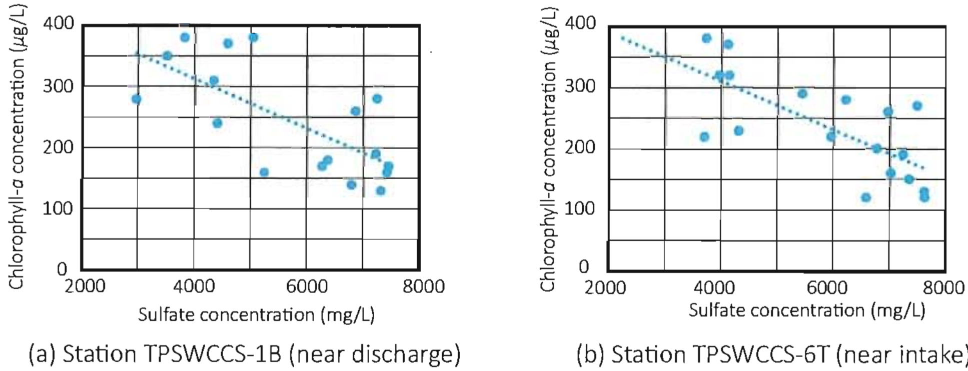


Figure 2: Chlorophyll-a levels in the CCS sulfate concentrations

cantly with increasing concentrations SO_4^{2-}, indicating that the addition of an algaecide is an effective means of reducing algae concentrations in the CCS. However, according to FPL (see Appendix A), no algaecide was applied during the period covered by Figures 1 and 2, and so the SO_4^{2-} apparently acting as an algaecide could be the residual from previous $CuSO_4$ applications. FPL has suggested an alternative hypothesis that the decreasing trend in algae concentrations during this time is attributable to salinity concentrations exceeding 70‰, since the particular algae species observed in the CCS during this time frame was not ideally suited to growing and surviving in water with salinity exceeding 70‰. Collectively, the anomalous results described here should provide a strong motivation for FPL to use measured data to develop a functional relationship between algae concentrations and the influencing independent variables of temperature, salinity, total phosphorus, and algaecide concentrations. Such a functional relationship could provide useful guidance for the control of algae within the CCS. However, it should generally be kept in mind that Chl$a$ reductions caused by any algaecide are necessarily only temporary, since the natural factors causing high levels of Chl$a$ (i.e., S, T, and TP) remain at elevated levels within the CCS. Since the system is autotrophic, reduction of autochthonous TP levels should be targeted to ultimately reduce both algae levels and the need for repeated application of algaecide(s) in the CCS.

Impact of increased algae concentrations. It has been asserted (SFWMD, 2015) that increased algae concentrations and turbidities associated with algae blooms cause more solar energy to be absorbed in the CCS, and reduces the ability of the CCS to dissipate thermal energy. The primary mechanisms by which the CCS dissipates thermal energy input by the power-generating units are by evaporation and the emission of longwave radiation. A conventional assumption made by engineers and scientists is that the evaporation rate from a water body is unaffected by the concentration of algae in the water body. There is no scientific evidence documented in any published studies showing that the rate of evaporation from a water body is reduced by high algae concentrations. Further, there are no published studies showing that the emission of longwave radiation from a water body is particularly sensitive to the concentration of algae in the water. As a consequence, the primary effect of increased algae concentrations in the CCS can be assumed to be increased absorption of solar radiation, which would increase the heating of the water and elevate the temperature of the water in the CCS. The quantitative effect of increased solar heating of the CCS due to increased algae concentrations is parameterized by a reduced albedo of the water surface, and the relationship between the reduced albedo and the corresponding increased temperature was investigated in this study using a heat-balance model described subsequently in Section 2.2 of this report. It should be noted that the "trapping" of solar energy due to increased algae concentrations would be moderated by the resulting increased evaporation which would cause increased cooling due to the extraction of the latent heat of vaporization.

1.5 Saltwater Intrusion

Definitions. The extent of saltwater intrusion in an aquifer is typically based on the chloride concentration in the groundwater. The chloride concentration in water is commonly called the chlorinity, and typical seawater has a chlorinity of around 19,000 mg/L. Contours of equal chlorinity are called isochlors. In South Florida, water with clorinity exceeding 19,000 mg/L is commonly classified as hypersaline, and the inland extent of saltwater intrusion is defined by the location of the 1000 mg/L isochlor. As a reference concentration, the (secondary) drinking-water standard for chloride concentration is 250 mg/L. Saltwater is commonly defined as water having a chlorinity greater than or equal to 1000 mg/L, and brackish water as having a chlorinity between 250 mg/L and 1000 mg/L. The South Florida Water Management District (SFWMD) defines seawater as having a chlorinity greater than 19,000 mg/L, and saline water as having a chlorinity greater than 250 mg/L. Surface-water bodies with chlorinities greater than 1500 mg/L are classified as marine waters, and surface-water bodies with chlorinities less than 1500 mg/L are classified as fresh waters (F.A.C. 62-302.200). The terms "saltwater intrusion", "saltwater encroachment", and "salinity intrusion" are used synonymously. Chlorinity is closely related to salinity, where salinity measures the concentration of total dissolved solids and chlorinity measures the concentration of dissolved chloride ions. Typical seawater has a salinity of around 35 g/kg or 35‰. Salinities are also commonly expressed in terms of the practical salinity unit (PSU), with salinities in PSU being numerically close, but not exactly equal, to salinities in ‰ (i.e., $35\,\text{PSU} \approx 35‰$).

Saltwater intrusion in the vicinity of Turkey Point. The landward extent of the saltwater interface (i.e., the 1000 mg/L isochlor) in South Florida varies naturally in response to a variety of factors, such as seasonal variations groundwater recharge, variations in rates at which groundwater is pumped from the aquifer, and controlled water-surface elevations in coastal canals. For example, prolonged droughts or excessive water usage inland that reduce water-table elevations can cause increased salinity intrusion. The beginning of saltwater intrusion in South Florida can be traced back to the draining of the Everglades starting in the early 1900s; the motivation for draining the Everglades was to support urban development and human habitation. At the time of construction of the CCS in the early 1970s, the groundwater underlying the Turkey Point site was saline due to the proximity of the site to the coast. In fact, had the groundwater not been saline, construction of the cooling-canal system at Turkey Point would not have been permitted. The current state of salinity intrusion in the vicinity of Turkey Point can be found in Prinos et al. (2014). Since the water-table gradient (and topographic gradient) towards the coast at Turkey Point is very low, and with the location of the saltwater interface being partially controlled by the water-table gradient, even slight reductions of the water-table gradient can cause substantial landward movement of the saltwater interface. The occurrence of landward gradients during the dry season promotes inland movement of saline groundwater.

CCS impact on saltwater intrusion. It has always been recognized that construction of the CCS without any mitigating salinity-control systems would cause the saltwater interface to move further inland. This expectation was based on the assertion that construction of a CCS containing saline water one mile inland from the coast is tantamount to moving the coast one mile inland, and also moving the associated saltwater wedge around one mile inland. Since water in the CCS has a higher salinity than seawater, and is therefore denser that the water in Biscayne Bay, the effect of the CCS is actually greater than moving the coast one mile inland. The engineering consultants that originally analyzed the performance of the CCS further asserted that if the water level in the CCS were to be increased by 0.50 ft above the preconstruction water-table elevation, then the toe of saltwater wedge at the base of the Biscayne aquifer might move approximately 7.5 miles further inland during the dry season as compared to its original location during the dry season. The engineering consultants also asserted that in the wet season, an elevated water level of 0.50 ft in the CCS might move the toe of the saltwater wedge approximately 1 mile further inland compared to its original location during the wet season. Based partially on these expectations, the salinity-control system that is currently in place was designed to control the westward migration of saltwater originating in the CCS. This control system involves pumping water from a so-called "interceptor ditch" into the CCS in order to create a seaward hydraulic gradient between the L-31E Canal and the interceptor ditch, where the L-31E Canal is located to the west of the interceptor ditch. The protocol for operating this salinity-control system and the effectiveness of the system are discussed in Section 4.2 of this report.

Trituim as a tracer. Tritium is a naturally occurring radioactive isotope of hydrogen (^3H) that is produced in the atmosphere, is naturally found in very small or trace amounts in groundwater throughout the world, and has a half life of approximately 12.32 years. Tritium is also a byproduct of the production of electricity by nuclear power plants, and elevated levels of tritium are commonly found in the cooling water of nuclear power plants. Tritium has been selected by the cognizant regulatory agencies (SFWMD and DERM) as a tracer to track the movement of CCS water in the Biscayne aquifer. The drinking-water standard for tritium is 20,000 picocuries per liter (pCi/L).

Tritium concentrations in the vicinity of CCS. Data collected and analyzed by Prinos et al. (2014) showed that natural tritium concentrations in southern Miami-Dade county average around 4.2 pCi/L with a standard deviation of 2.6 pCi/L. Prinos et al. (2014) also noted that groundwater samples collected within 5.3 miles of the CCS had elevated levels of tritium, with measured tritium concentrations in this proximal area being in the range of 13 – 173 pCi/L, with an average concentration of 40 pCi/L.

Using tritium to trace the movement of CCS water in the Biscayne aquifer. Historical data from 1974 to 1975 showed tritium concentrations in the CCS to be in the range of 1556 – 4846 pCi/L, and reports submitted by FPL for the monitoring period from June 2010 through December 2011 showed CCS tritium concentrations in the range of 1260 – 14,280 pCi/L. Natural groundwater at the base of the Biscayne aquifer would be expected to have relatively low concentrations of tritium. A threshold concentration of 20 pCi/L has been used as a baseline to infer the presence of groundwater originating from the CCS. Groundwater with concentrations below 20 pCi/L are presumed not to be significantly affected by the CCS. FPL does not concur with the selection of 20 pCi/L as a threshold for background tritium concentration for surface water, pore water, or shallow groundwater. The basis of FPL's contention regarding the 20 pCi/L threshold is that multiple factors such as atmospheric deposition, vapor exchange, and errors in laboratory analysis can influence reported tritium levels. The FPL assertion is reasonable and is supported by measured data that indicate atmospheric and vapor exchange effects on tritium concentrations can be particularly significant in surface water and shallow groundwater, with significance decreasing with distance from the CCS. However, at depth, the CCS appears to be the primary source of tritium, and using tritium as a tracer in the lower elevations of the Biscayne aquifer is reasonable. Reported measurements show groundwater tritium concentrations in excess of 3000 pCi/L near the CCS, with concentrations decreasing with distance from the CCS, and found at concentrations of hundreds of pCi/L three miles west of the CCS at depth. The tritium-concentration contours derived from measurements in deep wells (within the Biscayne aquifer) surrounding the CCS were documented by Ecology and Environment, Inc. (2012c) and these contours are shown in Figure 3. The contours shown in Figure 3 support the assertion that the CCS is the source of tritium in the

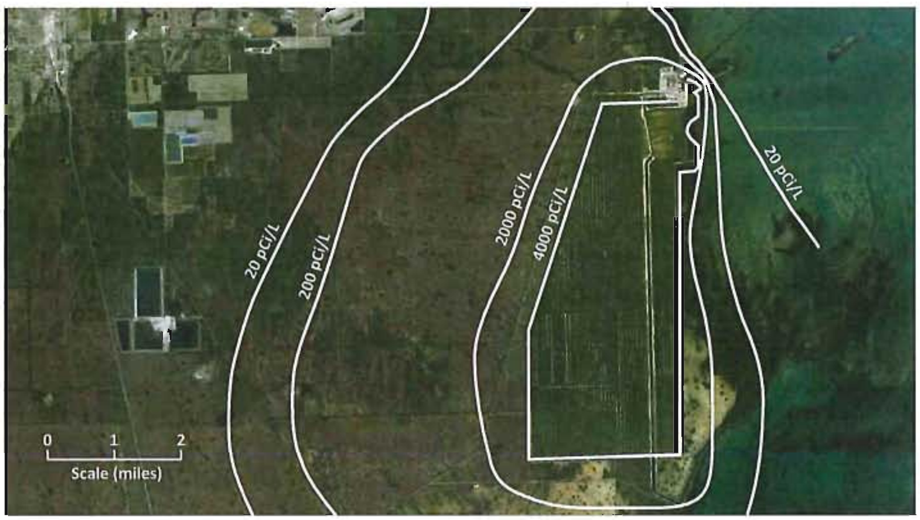


Figure 3: Tritium-concentrations derived from deep wells surrounding the CCS

groundwater at the bottom of the Biscayne aquifer, indicating that some of this groundwater originated from the CCS. The approximate limit of the 20 pCi/L concentration contour is 3.8 – 4.7 mi west of the CCS and 2.1 mi east of the CCS. Based on these data and supporting analyses, it is reasonable to conclude that operation of the CCS has impacted the salinity of the Biscayne aquifer at least within the limits of the 20 pCi/L contour. The presence of elevated levels of tritium above natural background levels in the Biscayne aquifer is not considered to be a threat to public health and safety, since the measured concentrations are far below the federal drinking water standard of 20,000 pCi/L. Elevated levels of tritium are simply being attributed to the presence of water originating in the CCS.

Groundwater flows around the CCS. Any representative model of groundwater flow in the aquifer surrounding the CCS must necessarily account for temperature and salinity effects. This approach is necessary since flows in the vicinity of the CCS are influenced by spatial variations in density, and the density distribution in the groundwater depends on both the temperature and salinity distribution. A simplified two-dimensional cross-section model of the portion of the Biscayne aquifer surrounding the CCS was developed by Hughes et al. (2010) using the SEAWAT code (Langevin et al., 2007). The focus of the Hughes et al.

(2010) model was to study the dynamics of density-driven groundwater flow and salinity transport for a variety of assumed realistic aquifer hydrogeologic properties. Results generated by Hughes et al. (2010) showed that the base of the Biscayne aquifer immediately under the CCS can be expected to have a salinity roughly equal to that of the water in the CCS, indicating a uniform salinity distribution over the 100-ft aquifer depth under the CCS. The temperature at the base of the aquifer under the CCS can be expected to have an equilibrium temperature of around 80% of the temperature of the CCS water. This combination of salinity and temperature indicates that the density of the groundwater at the base of the aquifer under the CCS is greater than the density of water in the CCS, since the density of water is inversely proportional to temperature. The Hughes et al. (2010) model showed that the extent of salinity intrusion attributable to operation of the CCS is very sensitive to the salinity of the water in the CCS. For example, increasing the salinity in the CCS from 35‰ to 70‰ (i.e., by a factor of 2) increased the extent of of salinity intrusion by a factor of 6. This result lends support to the effectiveness of a strategy of reducing CCS salinities as a means of reducing salinity intrusion caused by operation of the CCS. The Hughes et al. (2010) model also showed that the time taken for a salinity plume originating at the CCS-aquifer interface to penetrate the 100-ft depth of the aquifer could be anywhere from a few days to 5 years, depending on the hydraulic conductivity distribution over the depth of the aquifer. Since Hughes et al. (2010) investigated a range of plausible aquifer hydraulic conductivity distributions, the aforementioned result indicates that greater certainty in the subsurface hydrogeology is required in order to provide reasonably accurate estimates of the time required to arrest salinity intrusion by reducing the salinity of the water in the CCS.

1.6 L-31E Canal and Interceptor Ditch

L-31E Canal Levee L-31E and its adjacent 20-ft deep borrow canal to the west of the levee were primarily constructed as a barriers to prevent salinity intrusion to locations west of the canal. The L-31E Canal collects water from other drainage canals in the area, including Military Canal, North Canal, Florida City Canal, North Model Land Canal (C-106), and South Model Land Canal (C-107). The L-31E Canal discharges into Biscayne Bay through structures S-20 and S-20F in the vicinity of Turkey Point. The L-31E Canal was constructed in the late 1960's by the U.S. Army Corps of Engineers and the Central and Southern Florida Flood Control District (FCD); in 1972 the FCD was renamed the South Florida Water Management District (SFWMD).

Interceptor-ditch control system. The interceptor-ditch (ID) salinity-control system was designed to prevent the seepage of water from the CCS westward within the Biscayne aquifer. The ID, which is located immediately to the west of the CCS, is occasionally pumped to create a seaward water-table gradient between the L-31E Canal to the west and the ID to the east, with the basis for the effectiveness of the ID control system being that groundwater originating in the CCS will be prevented from migrating towards the west in the presence of an eastward water-table gradient between the L-31E Canal and the ID. The ID is pumped when a natural seaward water-table gradient between the L-31E Canal and the ID does not exist, and usually this is needed only during the dry season (November – April). The ID is adjacent and parallel to cooling-canal number 32 (CC-32) at the western end of the CCS, and was constructed at the same time as the CCS. The ID is approximately 18 – 20 ft deep, 30 ft wide, and 29,000 ft (5.5 mi) long. Within the ID are two pump stations, with each station containing two pumps, each capable of pumping up to 15,000 gpm (21.6 mgd). There is no mechanism to transfer water between the ID and the CCS, except for the 4 pumps at the two pump stations. The L-31E Canal, ID, and CC-32 are all approximately parallel to each other and run at an angle of approximately $17°38'$ west of south. The perpendicular horizontal distance between the

L-31E Canal and the ID is about 1000 ft. When the ID is pumped, there is a quick and measurable response in water levels in the L-31E Canal and the monitoring wells closest to the ID, indicating that there is good connectivity between the ID, L-31E Canal, and nearby monitoring wells.

Interceptor ditch operating rule (1973 – 2011). The ID operating rule that was followed from the initial date of operation of the CCS in February 1973 up until December 2011 (i.e., for 38 years) was as follows:

- Whenever the water-surface elevation in the L-31E Canal is more than 0.2 ft higher than the water-surface elevation in CC-32, there is a seaward water-level gradient and no pumping is necessary.
- If the above criterion is not met, a seaward gradient is still taken to exist if the water-surface elevation in the L-31E Canal is more than 0.3 ft higher than the water-surface elevation in the ID. Under this condition no pumping is necessary.
- If neither of the above two criteria are met, pumping of the ID is initiated and the pumping rates are adjusted to meet the 0.3-ft water-level difference criterion between the L-31E Canal and the ID.
- Pumping is terminated when the criteria for a natural water-table gradient is met (without pumping).

Although this operating rule is no longer in effect, it is still relevant to this analysis since possible westward migration of saline water from the CCS into the Biscayne aquifer could have occurred while following this operating rule. This concern is discussed subsequently.

Interceptor ditch operating rule (2011 – present). A more conservative operating rule for the ID was initiated in December 2011 that considered freshwater piezometric-head equivalents rather than measured water-table elevations. This resulted in changes to the ID operating rule, and since December 2011 the ID operating rule in effect is as follows:

- If the L-31E Canal water-surface elevation minus the CC-32 water-surface elevation is equal to or greater than 0.30 ft then no pumping of ID is necessary, and a seaward gradient exists.
- If the L-31E Canal water-surface elevation minus the CC-32 water-surface elevation is less than 0.30 ft, a natural seaward gradient might still exist if the L-31E Canal water-surface elevation minus the ID water-surface elevation is equal to or greater than 0.30 ft and the density of the water in the ID is less than or equal to 1012 kg/m^3. If a density in the ID is greater than 1012 kg/m^3, a higher elevation difference between L-31E and the ID is necessary and can be calculated by converting the surface-water levels to freshwater piezometric-head equivalents.
- If a natural seaward gradient does not exist, create an artificial seaward gradient by pumping the ID until the ID is maintained at an elevation difference of at least 0.30 – 0.70 ft between the L-31E Canal and the ID, depending on the density of the ID water.

The primary change between this revised operating rule and the previous operating rule is the increase in the L-31E/ID/CC-32 water-level difference criteria and the consideration of variable-density effects. The use of freshwater piezometric-head equivalents provides a more rigorous approach to the operation of the ID.

Effectiveness of the ID salinity-control system. Both the current and previous operating rules of the ID salinity-control system have limited salinity-control effects and do not prevent the landward migration of saline water originating from the CCS under all conditions. Following either of these operating rules, pumping of the ID reduces the water level in the ID below that in the L-31E Canal thereby creating a seaward water-table gradient and presumably precluding westward migration of groundwater originating in the CCS. However, pumping water from the ID into the CCS generally elevates the water-surface in the CCS and it is possible for the water level in the CCS to be above the water level in the L-31E Canal, which then creates the possibility that water originating in the CCS could pass under the ID even when the pumps in the ID are running to prevent this occurrence. Interestingly, this scenario was recognized in an early report prepared by the design engineers (Dames and Moore, 1971) based on results derived from an analog model of the system. The analog model showed that westward migration of the saltwater interface is possible even if the ID operating rule is followed. Further, Golder (2008) stated that operation of the ID salinity-control system would prevent westward migration of CCS water "at least in the top 18 ft of groundwater." Measurements taken during ID pumping have in fact shown several occurrences where the water level in the CCS exceeds that in the L-31E Canal during ID pump operation, thereby indicating the possible ineffectiveness of the ID salinity-control system. In actuality, the functioning of the ID salinity-control system is more accurately characterized as intercepting shallow saline groundwater adjacent to the ID that is then pumped back to the CCS when the natural gradients are low and the potential for saltwater intrusion exists. It is possible that pumping of the ID under some circumstances simply creates a shallow subsurface (groundwater) circulation in which water from the CCS flows into the ID as groundwater that is subsequently returned to the CCS as pumped water. In support of this assertion, time series plots show that there are periods during pumping of the ID when the bottom-water temperatures in the ID rose along with an increase in specific conductance in the ID (Ecology and Environment, Inc., 2014). Aside from concerns regarding the effectiveness of the ID control system in mitigating saltwater intrusion, secondary concerns have also been raised that the ID control system contributes to the deterioration of groundwater quality in that it generally pumps less-saline water from the ID into the hypersaline CCS which further contributes to increased salinity in the aquifer.

2 Temperature Variations in the Cooling Canals

The temperature in the CCS at the intake to the power-generating units affect the efficiency and power output of the generating units that use water from the CCS. Both the efficiency and the power output of the generating units decrease with higher cooling-water temperatures. The practical upper limit of the intake cooling-water temperature is determined by the characteristics of the condensers and auxiliary heat exchangers in the generating units.

Maximum-allowable intake temperature. In 2014 the Nuclear Regulatory Commission granted FPL's request to increase the maximum intake cooling-water temperature for the nuclear-power generating units from 100°F to 104°F. Under the new rule, if the intake cooling-water temperatures in the CCS were to exceed 100°F, then FPL would be required to monitor the temperature at the cooling-water intake at least once every six hours[§] as long as the intake-water temperature exceeds 100°F. If the intake cooling-water temperatures in the CCS were to exceed 104°F, then FPL would be required to transition Units 3 and 4 into at least "hot stand by" mode within 12 hours, and to "cold shutdown" mode within 30 hours. Since curtailment of power generation would adversely affect a large number of customers in the South Florida

[§]The normal monitoring interval for the intake-water temperature is 24 hours.

service region, Miami-Dade County is obliged to work with FPL to find ways to avoid cutbacks in power generation resulting from elevated temperatures in the CCS.

2.1 Results from Previous Studies

2.1.1 Temperatures in the CCS

Water temperatures in the CCS are almost always higher than synoptic temperatures of the overlying air, and temperatures in the CCS are almost always higher than temperatures in nearby Biscayne Bay. Analyses done by FPL's engineering consultants in around 2008 anticipated that the uprate of Units 3 and 4 would cause a maximum temperature increase of 2.5°F (1.4°C) in the cooling water discharged to the CCS and an increase of 0.9°F (0.5°C) in the temperature of the intake water (SFWMD, 2008). These temperature changes were predicted to result in an increase in evaporation from the CCS of around 2 – 3 mgd, and the increased evaporation was expected to increase the salinity in the CCS by 2‰ – 3‰. In contrast to the aforementioned predictions, it has been generally reported that temperatures in the CCS have actually increased by 5 – 9°F (3 – 5°C) in the post-uprate period compared with the pre-uprate period. In the summer of 2014 (during the post-uprate period), temperatures in the CCS were sufficiently elevated as to prompt concern regarding the sustainability of the CCS as an adequate source of cooling water to the power-generating units. According to FPL's consultant (Ecology and Environment, Inc., 2014), the increase in CCS water temperatures in the post-uprate period cannot be attributed to the uprate since the total heat rejection rate to the CCS from Units 1, 2, 3, and 4, operating at full capacity prior to the uprate would have been higher than the post-uprate heat rejection rate to the CCS for Units 1, 3, and 4, operating at full capacity. Unit 2 in the post-uprate period has been dedicated to operate in a synchronous generator mode and hence not producing steam heat. It is important to note that the preceding argument presented by FPL's consultant is flawed, since power-generating units do not operate at full capacity over extended periods of time, and so the actual power generation (which affects the temperatures in the CCS) should not be inferred from power-generation capacity. Furthermore, with the post-uprate switch to a higher percentage of power being generated by the nuclear units, the capacity factor of the combined generating units serviced by the CCS would almost certainly be higher in the post-uprate period compared with the pre-uprate period.

2.1.2 Thermal Efficiency of the CCS

The thermal efficiency of the CCS is a measure of the ability of the CCS to cool the discharged water down to the background air temperature. An investigation of the thermal efficiency of the CCS was performed by Lyerly (1998), and these analyses indicated that the thermal efficiency of the CCS at the time of the Lyerly (1998) study was equal to 86.4%. This efficiency was based on a 24-h average discharge temperature of 107.3°F (41.8°C), average intake temperature of 91.1°F (32.8°C), and an average air temperature of 88.6°F (31.4°C). In analyzing the temperature measurements, Lyerly (1998) noted that most of the cooling (i.e., most of the temperature decrease) occurs as the water in the CCS flows from the (north) discharge location to the (south) collector canal, with much less temperature decrease as the water flows back from the collector canal to the (north) intake location. It is expected that the thermal performance varies with flow rate and the state of the CCS, so the reported thermal efficiency should be regarded more as a snapshot of conditions at the time of the measurements than as a constant value. More recent measurements between June 2010 and June 2012 (Ecology and the Environment, 2012) show water temperatures in the CCS on the discharge side of the power-generating units being around 13.5°F (7.5°C) warmer on average than at the intake side of the power-generating units. The average temperature at the south end of the CCS was only 2°F (1.1°C) warmer than at the intake side of the power-generating units, which supports the assertion that most of the cooling in the CCS occurs as the water flows from north to south.

2.1.3 Thermal Effects on Groundwater

Measured groundwater temperatures in some wells between the ID and the L-31E Canal show higher temperatures than the groundwater west of the L-31E Canal, and this occurrence has been partially attributed to limited cooling-canal water intrusion (Dames and Moore, 1977). A "groundwater thermocline" has been reported to exist in the area west of the CCS, which shows a sudden decrease in groundwater temperature at a particular depth in the aquifer. Measurements show that nearly all of the seasonal temperature fluctuations occur above an elevation of −25 ft NGVD. Below −25 ft NGVD, the groundwater temperature generally remains in the range of 75°F–77°F (24°C–25°C). The seasonal temperature fluctuations above −25 ft NGVD have been attributed to the heating and cooling of water in the L-31E Canal in response to seasonal changes in atmospheric conditions. Notably there is some temperature stratification in the L-31E Canal, in part due to the canal depth and limited flow. The near-surface water temperatures in the L-31E Canal are almost always warmer than the bottom temperatures, and the surface temperatures exhibit more daily variability in response to air-temperature changes. Aside from the groundwater adjacent to the L-31E Canal, it has also been reported (Ecology and Environment, Inc., 2014) that since groundwater in monitoring wells TPGW-2M and TPGW-2D is warmer than other nearby surface waters such as Biscayne Bay or fresh groundwater, the CCS might be influencing the groundwater temperatures in those wells. Based on modeling results reported by Hughes et al. (2010), subsurface temperature variations in the immediate vicinity of the CCS are of sufficient magnitude to significantly influence the density-driven groundwater flow in the aquifer, particulary in the immediate vicinity of the CCS. As a consequence, temperature variations in the aquifer must be regarded as significant, and therefore taken into account in modeling the extent of intrusion of CCS water into the Biscayne aquifer.

2.2 Heat-Balance Model of CCS

To fully understand the temperature dynamics in the CCS, it is necessary to have a validated heat-balance model of the CCS. In reviewing the documentation made available for this investigation, all indications were that such a model does not currently exist, at least not in the public domain. Historical documentation shows that a heat-balance model was developed in the early stages of operating the CCS, as reported by Ray L. Lyerly Associates (1973), however, utilization of this model has not been subsequently reported. As described by Lyerly (1973), the heat-balance model that was developed previously took into account such key components as the heat input from the power-generating units, the net heat entering the water from shortwave solar radiation and longwave atmospheric radiation, and the latent heat transfer associated with evaporation. The input variables in the thermal model were the air temperature, relative humidity, wind speed, and the net amount of radiation; the output variable was the water temperature in the CCS.

2.2.1 Heat-Balance Model Formulation

To investigate and understand the thermal dynamics within the CCS, a preliminary heat-balance model of the CCS was developed for this study. The CCS was divided into four zones as shown in Figure 4, where water in the CCS flows sequentially through zones 1, 2, 3, and 4. The four delineated zones are the same zones that are used in salinity-balance model of the CCS developed by an engineering consultant for FPL. The measurement stations that characterize conditions within each of the four CCS zones were taken as

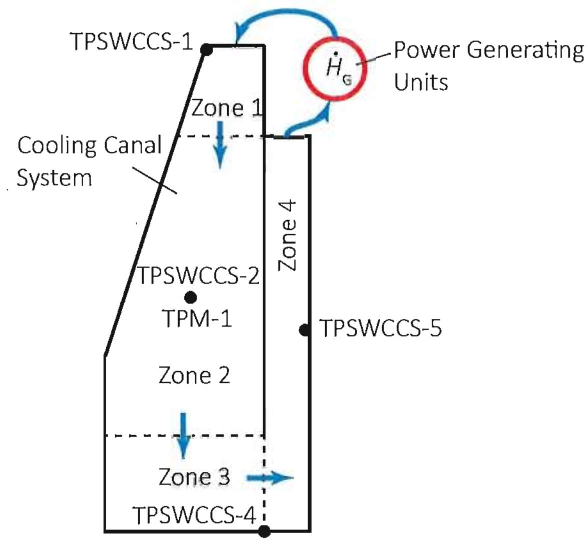


Figure 4: Cooling-canal system

TPSWCCS-1, TPSWCCS-2, TPSWCCS-4, and TPSWCCS-5, respectively, and the approximate locations of these measurement stations are shown in Figure 4. The average-daily temperature measurements within each of the CCS zones in the period 9/1/10 – 12/7/14 are shown in Figure 5. It is apparent from these

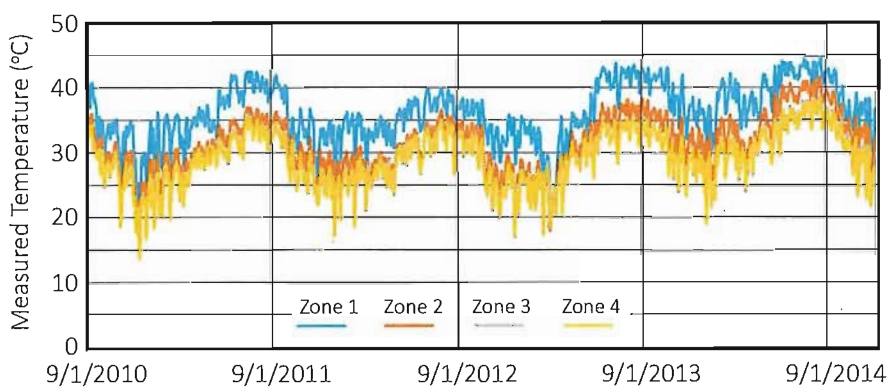


Figure 5: Temperature measurements in CCS

measurements that the temperatures in the CCS decrease noticeably from zones 1 to 3 (i.e., moving from north to south in the CCS), with much less temperature change as the water moves back to the northern (cooling-water intake) end of the CCS through zone 4. Therefore, almost all of the cooling in the CCS occurs in the south-flowing canals in the western portion of the CCS. It is further apparent from the temperature measurements shown in Figure 5 that the midsummer temperatures in the CCS in 2014 (between July and August) were higher than the midsummer temperatures in the CCS in previous years. For the period of record (9/1/10 – 12/7/14), the maximum measured daily-average temperature in Zone 1 was 113°F (44.9°C) recorded on 8/21/14, and the maximum measured daily-average temperature in Zone 4 was 101°F (38.3°C) recorded on 8/22/14. Since the maximum allowable temperature at the cooling-water intake is 104°F and measured temperatures in Zone 4 have been close to this limiting value (e.g., 101°F recorded on 8/22/14), there is cause for concern. Temperatures in Zone 4 near the 104°F limit could force curtailment of power generation by one or more of the nuclear-power generating units, and cause power outages in South Florida. Given the elevated temperatures that have been recorded in the CCS, is necessary to identify the fundamental reasons for these occurrences, and to determine whether such occurrences are expected to continue in the future without any changes in the CCS and/or power-plant operations. To fully understand the temperature dynamics in the CCS it was necessary to develop a heat[¶]-balance model of the CCS, which is described in the following section.

2.2.2 Heat-Flux Components

The heat fluxes within each of the CCS zones are illustrated in Figure 6, where the volumetric inflow rate and temperature are Q_1 and T_1, respectively, and the corresponding quantities on the outflow side are Q_2 and T_2. Within each zone, there are several sources of energy that are represented in Figure 6. These energy sources

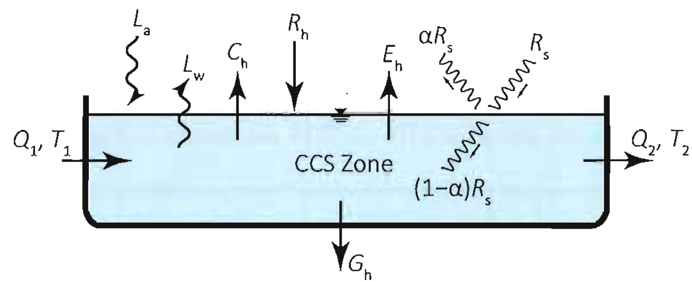


Figure 6: Energy fluxes in CCS zone

and their quantification are described below, where, for consistency with thermodynamic convention, energy added to CCS is taken as positive and energy losses are taken as negative.

Absorbed solar radiation, $(1-\alpha)R_s$. The incident solar (short-wave) radiation, which is normally available from direct measurements, is represented by R_s [$EL^{-2}T^{-1}$][‖], and the albedo (i.e., reflectivity) of the water surface is represented by α [dimensionless]. Therefore, the amount of solar radiation that is absorbed within the zone is $(1-\alpha)R_s$. The average solar radiation, R_s, for each day in the four-year study (9/1/10 – 12/7/14) was obtained from the Florida Automated Water Network (FAWN) station located on the premises of the University of Florida Tropical Research and Education Center (TREC) in Homestead, Florida. The albedo, α, of a water surface is typically on the order of 0.1 for latitudes in the range of 20° – 30° (Cogley, 1979), and a value of 0.1 was used as a reference value for this investigation. Factors such as the concentration of algae in the CCS can affect the value of α, and therefore the sensitivity of the temperature dynamics within the zone to elevated algae concentrations was investigated by varying α. The minimum value of α is equal to zero, in which case all of the

[¶] In this report "heat" and "thermal energy" are used interchangeably.

[‖] Terms in square brackets indicate dimensions: E = energy, L = length, M = mass, T = time, and Θ = temperature.

incident solar radiation is absorbed by the CCS and none is reflected. Hence, α was varied within the range of $0-0.1$.

Evaporation heat flux, E_h. Evaporation extracts heat from the CCS due to the latent heat of evaporation required to transform water from the liquid phase to the vapor phase. The evaporation heat flux, E_h [$\mathrm{EL^{-2}T^{-1}}$], is given by

$$E_\mathrm{h} = -E\rho_\mathrm{f}L_\mathrm{v} \tag{1}$$

where E [$\mathrm{LT^{-1}}$] is the evaporation rate, ρ_f [$\mathrm{ML^{-3}}$] is the density of fresh water, and L_v [$\mathrm{EM^{-1}}$] is the latent heat of vaporization of water. The evaporation rate of water has long been known to decrease with increasing salinity (e.g., Harbeck, 1955; Salhorta et al., 1985). In the present study, daily evaporation rates, E, were calculated based on typical salinities in the CCS, measurements of water temperature, T_s [Θ], at the monitoring station within the zone, onsite measurements of air temperature, T_a [Θ] and relative humidity, RH [dimensionless] at station TPM-1, and measurements of wind speed, V_w, at station TD. The freshwater density, ρ_f, in Equation 1, was taken as 994 kg/m^3, which is the approximate density of fresh water at 35°C (95°F). The latent heat of vaporization, L_v, in Equation 1, is known to depend on both the temperature and salinity of the source (liquid) water. At a temperature of 35°C, values of L_v at salinities of 60‰ and 80‰ are 2.279 MJ/kg and 2.229 MJ/kg, respectively (Sharqawy et al., 2010), and an average of 2.254 MJ/kg was used for L_v in the energy analysis. The empirical formula used for estimating E [cm/d], from onsite meteorological measurements is

$$E = -\underbrace{C_\mathrm{w}(0.299 + 0.11V_\mathrm{w})}_{=f(V_\mathrm{w})}\left[\beta e_\mathrm{s}(T_\mathrm{s}) - \mathrm{RH}\, e_\mathrm{s}(T_\mathrm{a})\right] \tag{2}$$

where C_w [dimensionless] is a calibration constant, $f(V_\mathrm{w}) = C_\mathrm{w}(0.299 + 0.11V_\mathrm{w})$ is a wind function that accounts for the effect of wind on evaporation, V_w is the wind speed in m/s, β [dimensionless] is a factor that accounts for the effect of salinity on the saturation vapor pressure of water, and $e_\mathrm{s}(T)$ [kPa] is the saturation vapor pressure of water at temperature T. Equation 2 was used to calculate the evaporation for the sake of consistency with the previously developed salinity model of the CCS, where the constants C_w and β were taken as 0.69 and 0.885, respectively. In the salinity model, the value of C_w was determined by calibration, and the value of β was obtained from previous research on evaporation from saline water bodies reported by Salhorta et al. (1985). The evaporation formula given by Equation 2 has an uncertain functional form, particularly for the wind function $f(V_\mathrm{w})$.

Uncertainty in the wind function. Wind functions used to estimate evaporation typically have the form $f(V_\mathrm{w}) = a + bV_\mathrm{w}$, where a and b are constants. Such a wind function is used in Equation 2. In artificially heated waters, vertical convection is particulary important under low-wind conditions making specification of the value of a a key parameter. The wind function used in Equation 2 was originally proposed by Williams and Tomasko (2009) for heated waters, however, alternate formulations have been proposed by others (e.g., Brady et al., 1969; Ryan and Harleman, 1973). Notably, the formulation proposed by Ryan and Harleman (1973), and subsequently supported by Adams et al. (1975), accounts for the effect of the temperature difference between the heated water and the overlying air in specifying the convection parameter a in the wind function, which is a logical relationship that is not accounted for in the other models (including the model used in this study) and could be an important consideration in accounting for convective heat transfer at low wind velocities.

Rainfall heat flux, R_h. Rainfall that is cooler than the water in the CCS extracts thermal energy from the CCS because thermal energy in the CCS water is used to warm the rainwater. The heat flux, R_h [$\mathrm{EL^2T^{-1}}$] due to rainfall directly on the CCS can be estimated using the relation

$$R_\mathrm{h} = -\rho_\mathrm{f} c_{p\mathrm{f}}\, d_\mathrm{r}(T_\mathrm{s} - T_\mathrm{r})$$

where ρ_f [$\mathrm{ML^{-3}}$] and $c_{p\mathrm{f}}$ [$\mathrm{EM^{-1}\Theta^{-1}}$] are the density and specific heat of the (fresh) rainwater, respectively, d_r is the depth of rainfall, T_s [Θ] is the temperature of the water in the CCS, and T_r [Θ] is the temperature of the rainfall. There are no direct measurements of rainfall temperature at the Turkey Point site, however, it can be estimated that during a rainfall event the ambient air can be cooled by several degrees, and the temperature of raindrops approaches that of the cooled ambient air. Cooling effects of rainfall on the ambient air have been reported to be as high as 10°C (Byers, 1949). On a global average, raindrops can have temperatures in the range of 32°F – 80°F (0°C – 27°C). For purposes of the present analysis, the temperature of the rainfall, T_r, was assumed to be 68°F (20°C), and the corresponding values of ρ_f and $c_{p\mathrm{f}}$ were taken as 998 kg/m^3 and 4.180 kJ/kg·°C, respectively. The temperature dynamics in the CCS zones are relatively insensitive to the assumed temperature of the rainfall.

Atmospheric longwave radiation, L_a. Any body of matter whose temperature is above absolute zero emits longwave radiation. Longwave radiation, L_a [W/m^2] emitted by the atmosphere can be estimated using the relation (Chin, 2013)

$$L_\mathrm{a} = \sigma(T_\mathrm{a} + 273)^4(0.6 + 0.031\sqrt{\mathrm{RH}\, e_\mathrm{s}(T_\mathrm{a})}(1 - R_\mathrm{L})$$

where σ is the Stefan-Boltzmann constant ($= 4.903 \times 10^{-9}\,\mathrm{MJ{\cdot}m^2K^{-4}d^{-1}}$), T_a [°C] is the air temperature, RH [dimensionless] is the relative humidity, $e_\mathrm{s}(T_\mathrm{a})$ [mm Hg] is the saturation vapor pressure of water at temperature T_a, and R_L is the longwave reflection coefficient that can be taken as 0.03. On cloudy days, atmospheric longwave radiation can be the greatest source of thermal energy at the water surface.

Water longwave radiation, L_w. Water in the CCS also emits longwave radiation by virtue of its temperature being greater than absolute zero. Longwave radiation, L_w [W/m^2] emitted by the water in the CCS can be estimated using the relation (Chin, 2013)

$$L_\mathrm{w} = -\epsilon\sigma(T_\mathrm{s} + 273)^4$$

where ϵ is the emissivity of water that can be estimated as 0.97 [dimensionless], σ is the Stefan-Boltzmann constant as given previously, and T_s [°C] is the temperature of the water in the CCS.

Heat interchange with surrounding aquifer, G_h. The CCS exchanges heat with the surrounding aquifer via seepage of groundwater into and out of the CCS, and conduction of heat between water in the CCS and both the groundwater and solid (limestone) matrix in the surrounding aquifer. It is to be expected that the region immediately surrounding the CCS is normally cooler than the water in the CCS, in which case there will be cooling of the CCS water due to heat conduction between the CCS and the surrounding aquifer, cooling due to seepage inflow from the surrounding aquifer into the CCS, and no cooling or heating due to seepage outflow from the CCS into the surrounding aquifer. The cooling heat flux due to conduction can be assumed to negligible compared to the heat flux due to seepage inflow. The heat flux G_h [$\mathrm{EL^{-2}T^{-1}}$] due to seepage inflow is proportional to the temperature difference between the water in the CCS and the groundwater in the surrounding aquifer and can be estimated by the relation

$$G_\mathrm{h} = -\rho_\mathrm{g} c_{p\mathrm{g}} \frac{Q_\mathrm{sg}}{A_\mathrm{s}} \Delta T_\mathrm{sg}$$

where ρ_g [ML^{-3}] and $c_{p\mathrm{g}}$ [EM$^{-1}\Theta^{-1}$] are the density and specific heat, respectively, of the groundwater surrounding the CCS, Q_sg [L^{3}T^{-1}] is the seepage inflow to the CCS from the surrounding aquifer, A_s [L^2] is the area of the CCS zone, and ΔT_sg [Θ] is the difference between the temperature in the CCS, T_s [Θ], and the temperature on the surrounding groundwater, T_g [Θ] (i.e., $\Delta T_\mathrm{sg} = T_\mathrm{s} - T_\mathrm{g}$)

Conduction heat flux, C_h. The conduction heat flux is associated with the sensible transfer of heat between the CCS water and the air above the CCS. The conduction heat flux, C_h [W/m^2] can be estimated using the empirical relation (Chin, 2013; Chapra, 1997)

$$C_\mathrm{h} = -c_\mathrm{B} f(V_\mathrm{w})\,(T_\mathrm{s} - T_\mathrm{a})$$

where c_B is Bowen's coefficient, and $f(V_\mathrm{w})$ is the wind function as defined in Equation 2. Following the guidance given in Chin (2013) and Chapra (1997), the value of c_B can be estimated as 0.063. According to Martin and McCutcheon (1998), sensible heat transfer from lakes and reservoirs to the overlying air due to conduction and convection is a relatively small component of the heat balance equation that is poorly understood, and Brown and Barnwell (1987) have noted that the conduction heat flux from lakes and reservoirs to the overlying air calculated by heat-transfer theory is normally small enough to neglect. Given the aforementioned considerations, conduction of heat between the CCS and the overlying air was neglected in this analysis.

The sum of the above-described heat-flux components gives the net heat flux into to the CCS due to the combined effects of solar radiation, evaporation, longwave radiation, seepage, and conduction. The heat dissipated by the CCS is equal to the negative of this summation.

2.2.3 Steady-State Energy Model

In terms of the component heat fluxes described in the previous section, the steady-state heat-balance equation for the CCS is given by

$$\dot{H}_\mathrm{G} = -\sum_{i=1}^{4} \Big\{ [(1-\alpha)R_\mathrm{s} + E_\mathrm{h} + R_\mathrm{h} + L_\mathrm{a} + L_\mathrm{w} + G_\mathrm{h}]_i \, A_i \Big\} \tag{3}$$

where $\dot{H}_\mathrm{G}$ [EL^{-2}T^{-1}], is the heat-rejection rate of the power-generating units that are serviced by the CCS, i is an index that refers to each zone within the CCS, A_i [L^2] is the area of Zone i, and the summation is over the four zones within the CCS. The average water-surface area in each CCS zone during the period 9/1/10 – 5/31/14 is given in Table 1, and the average total area of the CCS water surface during this period was approximately 1886 ha (= 4685 ac = 7.32 mi^2).

Table 1: CCS Zonal Areas in Energy and Salinity Models

Zone	Area (ha)
1	187.7
2	988.1
3	349.1
4	371.1
Total	1896.0

2.2.4 Model Application

Application of the heat-balance model given by Equation 3 consists of first calculating the the component heat fluxes in each zone of the CCS, and then summing the component heat fluxes to estimate the rate at which heat is being added to the CCS by the power-generating units. A daily time step is used in the calculations, and so daily-averaged heat-rejection rates are estimated. Two key aspects of these calculations are given below.

Cooling from ID pumpage. The heat extracted from the CCS by pumping cooler water from the ID into the CCS was calculated in a similar manner to the method used to calculate the cooling effect of rainfall, where the "effective" rainfall rate is equal to the volume of water pumped from the ID divided by the area of the CCS. Assuming (conservatively) that the temperature difference between the ID water and the CCS water is 10°C (50°F), the cooling effect of pumped ID water was found to be negligible compared with other component fluxes in the heat-balance equation.

Estimation of heat-rejection rate. The heat-balance model used in this study, given by Equation 3, assumes that on any given day the heat added to the CCS (by the power-generating units, solar radiation, and atmospheric longwave radiation) is equal to heat loss from the CCS (by evaporation and longwave radiation). It is assumed that heat storage due to stage changes on any given day is small relative to the other heat-flux terms. Since daily stage changes are typically less than 2% of the local CCS depth, the assumption of a relatively small change in heat storage over daily time scales within the CCS is justified. In cases where daily time steps are used, estimated values of $\dot{H}_\mathrm{G}$ given by Equation 3 might fluctuate about a mean value and be difficult to discern. In such cases, the average heat-rejection rate, $\langle\dot{H}_\mathrm{G}\rangle_J$, over a period of J time steps can be estimated using the relation

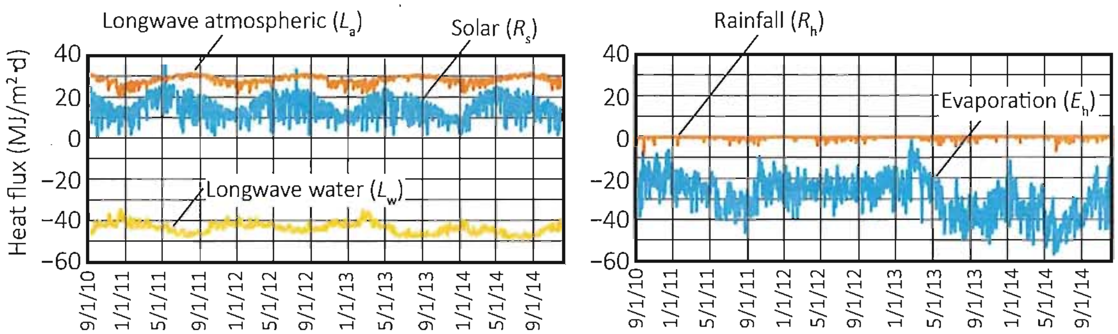
$$\langle\dot{H}_\mathrm{G}\rangle_J = \frac{1}{J\Delta t}\sum_{j=1}^{J}\dot{H}_\mathrm{G}\Delta t \tag{4}$$

where Δt is the duration of each time step. In accordance with Equation 4, a constant heat-rejection rate can be recognized by plotting the cumulative estimated heat rejection rate, $\sum_{j=1}^{J}\dot{H}_\mathrm{G}\Delta t$, versus time, $J\Delta t$, which would would result in a straight line of constant slope equal to $\langle\dot{H}_\mathrm{G}\rangle_J$. This relationship was used in this study to identify periods of constant heat rejection rate of the power-generating units that utilize the CCS.

2.2.5 Model Results

The heat-balance model was applied to each of the four zones within the CCS to determine the net heat flux into each zone, and the results from all zones were combined to determine the net heat flux into the entire CCS. The heat-balance model was applied at daily time steps for the period of record, 9/1/10 – 12/7/14. The thermal-energy dynamics within each of the CCS zones are similar, and the temporal variations of the heat-flux components in Zone 1 will be used to demonstrate the thermal-energy dynamics within each zone.

Zone 1 heat-flux components. The longwave radiation and shortwave solar energy fluxes as a function of time are shown in Figure 7(a), and the evaporation and rainfall heat fluxes as a function of time are shown in Figure 7(b). It is apparent that the shortwave and longwave energy fluxes vary seasonally, and there is much



(a) Longwave and solar energy

(b) Rainfall and evaporation energy

Figure 7: Energy fluxes in Zone 1

more seasonal variation in the shortwave solar radiation than in the longwave radiation. The net longwave radiation has a cooling effect (i.e. net negative heat flux) which contributes to a net-radiation cooling of the CCS water at night when the solar radiation is effectively zero. It is apparent from Figure 7(b) that evaporation and rainfall generally have a cooling effect, with evaporation usually having the greater cooling effect and rainfall having a lesser cooling effect. The convective heat flux between the CCS and the adjacent groundwater, G_h, is not shown in Figure 7 because the magnitude of G_h is generally much smaller that the heat flux due to rainfall, and therefore has a minimal impact on the heat balance within the CCS.

Heat rejection rate of the power-generating units. To determine the thermal dynamics in the entire CCS, the component heat fluxes were determined for each zone within the CCS, and these heat fluxes were combined in accordance with Equation 3 to determine the thermal energy that is added to the CCS by the power plant (i.e., the heat-rejection rate). The cumulative heat-rejection from the power plant as a function of time for the entire CCS is shown in Figure 8. It is apparent from Figure 8 that there are two periods during which the heat rejection rate is approximately constant. The first period, shown as Period 1 in Figure 8, covers the time interval 9/1/10 – 2/1/13, and the second period, shown as Period 2 in Figure 8 covers the time interval 7/1/13 – 12/1/14. Notably, Period 1 includes the pre-uprate period before February 2012 and Period 2 includes the post-uprate period after May 2013. During Period 1, the average heat-rejection rate is estimated to be around 2600 MW, and during Period 2 the average heat-rejection rate is estimated to be around 5300 MW. Although these estimated heat rejection rates are preliminary estimates and derived from

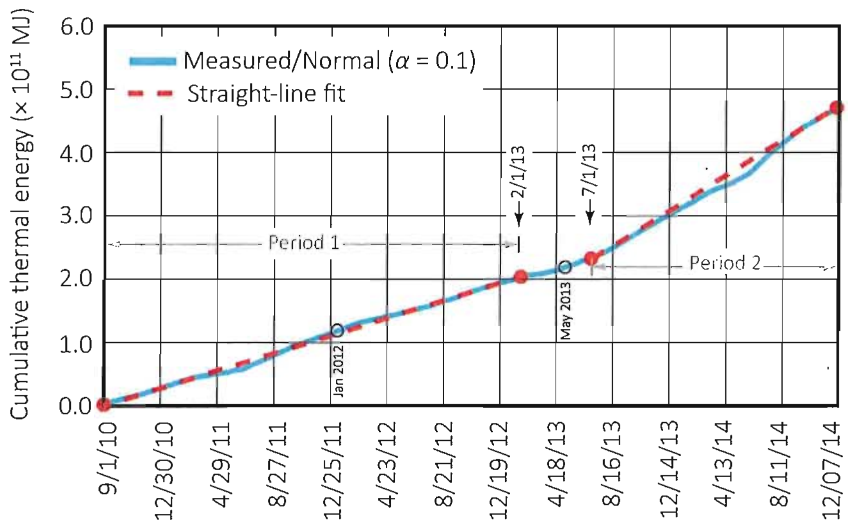


Figure 8: Cumulative heat rejection rate from the power plant

an uncalibrated heat-balance model, the distinct difference in heat-rejection rates between the two periods is clear, and the estimated magnitudes of the heat-rejection rates during these two periods are reasonable given the capacities of the power-generating units serviced by the CCS and the energy efficiencies normally associated with fossil-fuel and nuclear power plants. A logical inference from the results shown in Figure 8 is that the uprate in power-generating capacity of the two nuclear units (Units 3 and 4) has caused the total heat-rejection rate from the power plant to increase significantly. This finding is not inconsistent with the condition that the post-uprate generating capacity of the power plant served by the CCS is less than the pre-uprate generating capacity (due to Unit 2 operating in synchronous generator mode). This is so because in the post-uprate generating capacity there is a significant shift from fossil-fuel generation to nuclear-power generation, and nuclear-power units are known to have much higher heat-rejection rates to cooling water than fossil-fuel generating units, which release a significant portion of their waste heat in flue-gas emissions. In addition, nuclear units typically have much higher capacity factors than fossil-fuel generating units, which means that the actual power generation is likely to be closer to the generating capacity under post-uprate conditions than under pre-uprate conditions.

Effect of reduced flows in the CCS. According to FPL, the uprate of Units 3 and 4 between January 2012 and May 2013 resulted in reduced CCS flow rates of up to 50% for a period of approximately 16 months. If the anomalous period with reduced CCS circulation (January 2012 – May 2013) were excluded from the heat-budget analysis, this would not affect the conclusion that the post-uprate heat rejection rate to the CCS is significantly higher than the pre-uprate heat-rejection rate. This assertion is apparent from Figure 8, which shows that the heat-rejection rate prior to January 2012 is approximately the same as that asserted for the entire Period 1, and the anomalous flow period (January 2012 – May 2013) does not overlap with Period 2. Consequently, the asserted pre- and post-uprate heat-rejection rates would be approximately the same if the anomalous flow period were excluded from the analysis, and hence inclusion of the anomalous flow period does not significantly affect the heat-budget analysis and the derived conclusions.

Data supporting increased heat rejection rate. Using the uncalibrated heat-balance model, the average heat-rejection rate prior to 2/1/13 (Period 1) is estimated as 2600 MW, and after 7/1/13 (Period 2) is estimated as 5300 MW. Power-generation data for the units serviced by the CCS for the months included in Periods 1 and 2 were documented by Ecology and Environment, Inc. (2012; 2014) and Nuttle (2015a; 2015b) and these data are plotted in Figure 9. For the months within Period 1, the average power generation (shown in red in

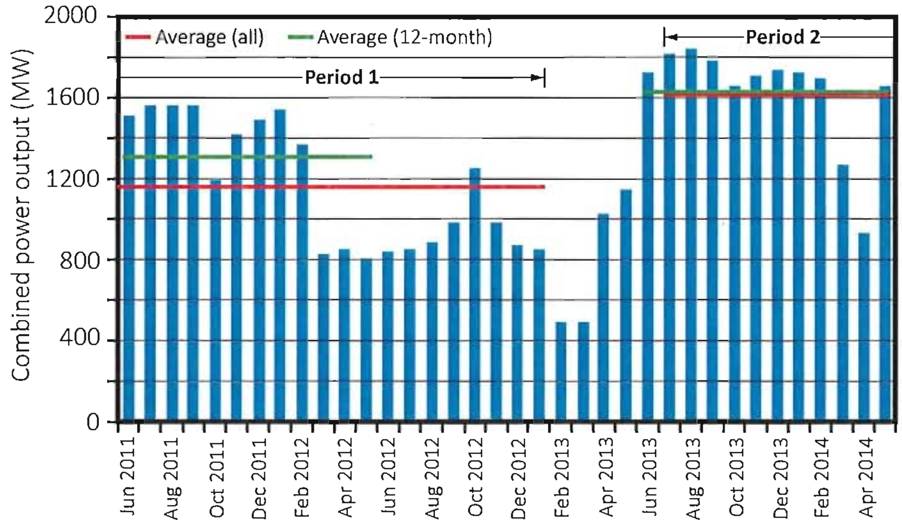


Figure 9: Power-generation in Periods 1 and 2

Figure 9) was 1160 MW, and for the months within Period 2 the average power generation (also shown in red) was 1620 MW. Using these data, the plant efficiencies during Periods 1 and 2 are approximately 31% and 23%, respectively, which are on the order of magnitude that one would expect from the mix of fossil-fuel and nuclear-power generating units being serviced by the CCS. To account for possible seasonalities in power generation, 12-month average power generation (shown in green in Figure 9) were 1307 MW and 1629 MW for Periods 1 and 2, respectively, which correspond to plant efficiencies of 33% and 24%, respectively. For both of the scenarios considered here, the estimated heat-rejection rates appear to be quite reasonable for the given power-generation rates. The results presented here are further supported by data contained in a recent report by the Electric Power Research Institute (EPRI, 2012). These data show the summer capacity of each nuclear unit as 693 MWe, with a corresponding thermal output of 2300 MWth, indicating a unit efficiency of 23% which is remarkably close to the plant efficiencies derived from the heat-balance model developed in this study.

Effect of algae. It is assumed that increased algae concentrations in the CCS affect the heat balance in the CCS by increasing the amount of solar energy that is absorbed by the CCS. Consequently, the effect of elevated algae concentrations in the CCS was investigated by reducing the albedo (i.e., reflectivity), α, of the water surface from 0.1 to 0.0 starting on January 1, 2014. An albedo of 0.1 was used in the "normal" simulations presented in Figure 8 since this is the typical value of α that is associated with water surfaces at subtropical latitudes; this corresponds to 90% of the incident solar radiation being absorbed by the water in the CCS. Assuming that the effect of algae is to retain more solar heat, then taking $\alpha = 0$ represents the extreme case where the CCS with high concentrations of algae absorbs 100% of the incoming solar radiation. The effect of reducing α from 0.1 to 0.0 on the estimated cumulative heat-rejection rate is shown in Figure 10. It is apparent from Figure 10 that the impact of the higher absorption rate of solar energy

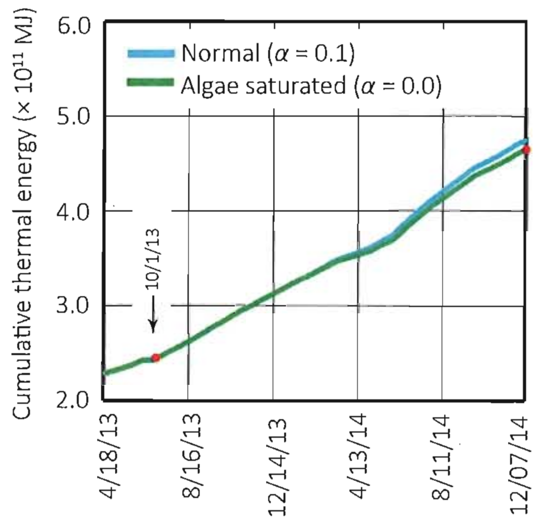


Figure 10: Estimated algae effect on estimated cumulative heat rejection rate from the power plant

attributed to high algae concentrations is relatively small compared with the heat rejection rate of the power-generating units. In quantitative terms, the increased rate of heating of the CCS due to reduced reflection of solar energy is around 400 MW, compared with a normal heat rejection rate of around 5500 MW (in 2014). This indicates that the (maximum) rate of increased heating caused by algae is only around 7% of the normal heat-rejection rate, and hence there is a relatively small heating effect caused by algae in the CCS.

Relationship between increased net heat flux and temperature. An increased heat-rejection rate would normally be expected to increase the temperature in the CCS relative to the temperature of the overlying air. Representing the temperature in the CCS as T_s, and the temperature of the overlying air as T_a, this temperature difference is $T_s - T_a$. The variation of $T_s - T_a$ as function of time for each of the four CCS zones is shown in Figure 11, where the average temperature difference during Period 1 and Period 2 are shown as horizontal lines. It is apparent from Figure 11 that the increase in the average heat-rejection rate from Period 1 to Period 2 corresponds to an increase in the average value of $T_s - T_a$. Representing the average value of $T_s - T_a$ during Period 1 as $\overline{\Delta T}_1$ and the average value of $T_s - T_a$ during Period 2 as $\overline{\Delta T}_2$, these averaged values for each CCS zone are shown in Table 2, along with the corresponding standard deviations, S_1 and S_2, respectively. These results show that in Zone 1, which accepts the cooling-water discharge, the average temperature difference between the CCS and the overlying air has increased from 9.6°C (17.3°F) to 13.1°C (23.6°F), which corresponds to an average temperature increase of 3.5°C (6.3°F). In Zone 4, which contains the cooling-water intake, the average temperature difference between the CCS and the overlying air has increased from 2.8°C (5.0°F) to 5.4°C (9.7°F), which corresponds to an average temperature increase of 2.6°C (4.7°F). These changes in average temperature can be contrasted with previous (pre-uprate) predictions made by FPL's engineering consultants in 2008 where it was anticipated that the uprate of Units 3 and 4 would cause a maximum temperature increase of 1.4°C (2.5°F) in the discharged cooling water (to Zone 1) and an increase of 0.5°C (0.9°F) in the temperature of the intake water

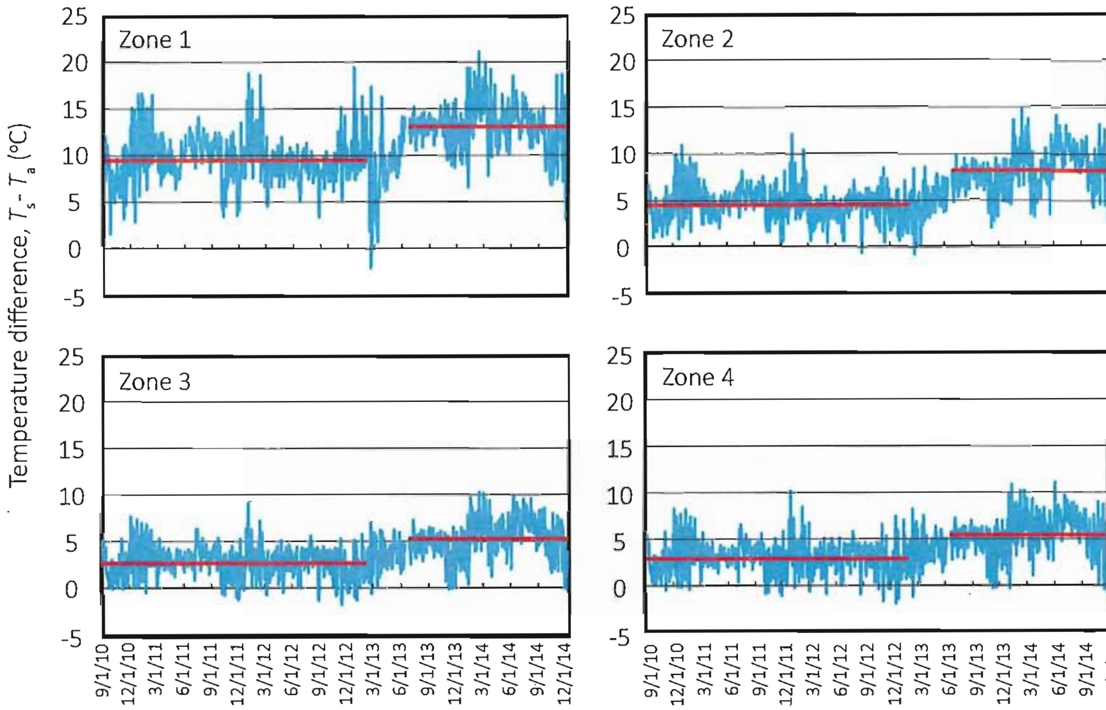


Figure 11: Temperature differences between CCS and overlying air. Horizontal lines show intervals of constant heat-addition rates.

(from Zone 4). The standard deviations of the temperature fluctuations are similar across all zones, and have shown relatively modest decreases between the pre-uprate and post-uprate periods. Of particular interest, in Zone 1 the standard deviation decreased from 3.8°C (6.8°F) to 3.3°C (5.9°F), and in Zone 4 the standard deviation decreased from 3.9°C (7.0°F) to 3.5°C (6.3°F).

Thermal efficiency. The thermal efficiency, η_t, of the CCS is a measure of the ability of the CCS to cool the water down to the background air temperature. The thermal efficiency of the CCS was previously measured by Lyerly (1998) using the relation

$$\eta_t = 1 - \frac{T_i - T_a}{T_d - T_a} \tag{5}$$

where T_d and T_i are the temperatures of the cooling water at the discharge and intake ends of the power plant, respectively, and T_a is the temperature of the ambient air above the CCS. The thermal efficiency of the CCS can be estimated using Equation 5 by replacing $T_d - T_a$ by the average value of $T_s - T_a$ in Zone 1, and replacing $T_i - T_a$ by the average value of $T_s - T_a$ in Zone 4. Using the averaged temperature differences given in Table 2 in Equation 5 gives:

$$\text{Period 1: } \eta_t = 1 - \frac{2.8}{9.6} = 0.71, \qquad \text{Period 2: } \eta_t = 1 - \frac{5.4}{13.1} = 0.59$$

These results indicate that the thermal efficiency of the CCS in Period 1 is around 70% and the thermal efficiency of the CCS in Period 2 is around 60%. Hence, the thermal efficiency of the CCS has apparently

Table 2: Temperature Statistics in CCS

	Period 1		Period 2			
	$\overline{\Delta T_1}$	S_1	$\overline{\Delta T_2}$	S_2	$\overline{\Delta T_2} - \overline{\Delta T_1}$	
Zone	(°C)	(°C)	(°C)	(°C)	(°C)	(°F)
1	9.6	3.8	13.1	3.3	3.5	6.3
2	4.6	3.7	8.4	3.7	3.8	6.8
3	2.9	3.9	5.5	3.6	2.6	4.7
4	2.8	3.9	5.4	3.5	2.6	4.7

decreased between Period 1 and Period 2. The reason for this decrease in thermal efficiency is not readily apparent and could be due to a variety of factors, including increased thermal loading, inefficient flow distribution, and increased algae concentrations and turbidity in the CCS. It should be noted that the thermal efficiency of 86% reported by Lyerly (1998) is not directly comparable to the values calculated here, since the additional cooling between the discharge location and the Zone 1 temperature measurement station, as well as the additional cooling between the intake location and the Zone 4 temperature measurement location are not taken into account in the present analysis.

Efforts to improve thermal efficiency. FPL has undertaken significant efforts to improve the thermal efficiency of the CCS by reducing flow restrictions (blockages) caused by elevated sediment levels and other impediments in the CCS. Sediment removal from the CCS was conducted between March and October 2015, with the intention of redistributing the flow and recovering the design flow depths in portions of CCS. FPL has reported that the thermal efficiency of the CCS was approximately 65% in August 2015 (see Appendix A). However, the extent to which the removal of blockages will contribute to increased thermal efficiency in the CCS is unknown at this time. The temporal trend in the thermal efficiency of the CCS is shown in Figure 12**, where it is apparent that the pre-uprate thermal efficiency averaged around 77% and the post-uprate thermal efficiency is currently averaging around 67%. Under the best-case scenario, the thermal efficiency of the CCS would be improved to levels that are sufficiently greater than the pre-uprate thermal efficiency so as to compensate for the increased heat loading that is occurring under post-uprate (current) conditions. If this best-case scenario is not achieved, then post-uprate temperatures in the CCS can be expected to continue being greater than pre-uprate temperatures in the CCS. Based on the data shown in Figure 12, it is not apparent at this time that the post-uprate thermal efficiency is trending towards recovering the pre-uprate thermal efficiency. As a consequence, temperatures in the CCS are expected to continue being elevated relative to pre-uprate temperatures.

2.2.6 Conclusions

The results derived from the heat-balance model indicate that the rate of heat addition to the CCS has increased significantly during the period of record, and that the increased heat-addition rate is manifested in an increase in the average temperature in the CCS relative to the temperature of the overlying air. It appears that the most likely cause for the increased heat-addition rate is an increased heat-rejection rate from the

**From data contained in the FPL response to the preliminary report.

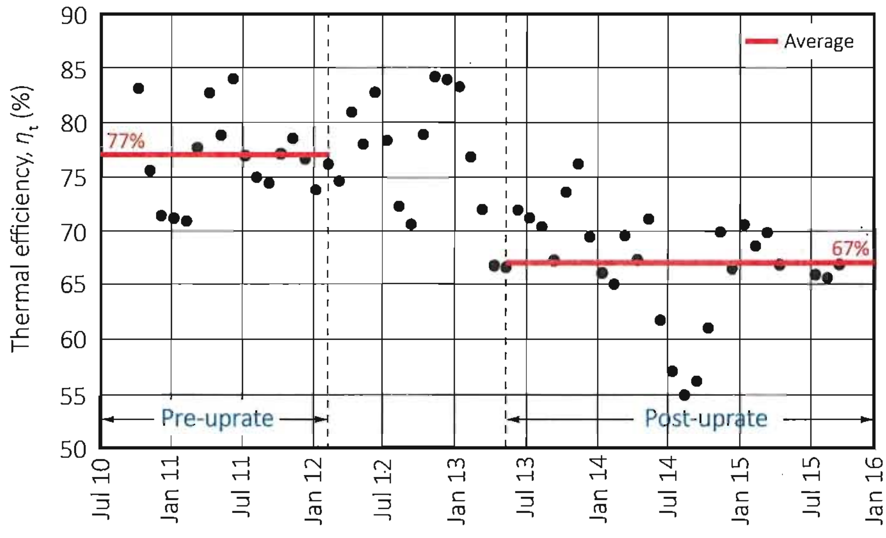


Figure 12: Thermal efficiency of the cooling canal system

power-generating units. Notably, the increased heat-addition rate began shortly after the beginning of the post-uprate period. As a result of the increased heat addition to the CCS, the average temperature in the intake zone (Zone 4) has increased by approximately 2.6°C (4.7°F). Interestingly, this measured increase in average temperature is slightly greater than the increase in the maximum allowable operating temperature at the intake location of 2.2°C (4.0°F)†† approved for the nuclear-power generating units by the Nuclear Regulatory Commission in 2014. Therefore, the increased maximum allowable operating temperature has not reduced the probability of the intake temperatures exceeding the threshold value, and might have slightly increased the probability of exceeding the threshold temperature. This serves as a cautionary note regarding further increases in power generation beyond 2014 levels without providing a supplementary system to cool the water in the CCS. Others have cited increased algae concentrations in the CCS as being a possible reason for elevated temperatures in the CCS. However, a sensitivity analysis indicates that changes in the algae-influenced solar reflectivity of the CCS within a realistic range are unlikely to have been of sufficient magnitude to cause the observed changes in temperature, nor stimulate the sudden change in heat-addition rate that was observed almost immediately after the beginning of the post-uprate period. There are indications that the thermal efficiency of the CCS has decreased significantly between the pre-uprate and post-uprate periods. Further investigation is recommended to identify the factor(s) causing the reduced thermal efficiency.

Limitations of the heat-balance model. The heat-balance model developed for this study is based on the best estimates of all of the heat-balance components that influence the temperature in the CCS. However, the heat-balance model has not been calibrated due to lack of available data for calibration. Data required to calibrate the heat-balance model would include synoptic measurements of the flow rate and temperature differences between the intake and discharge structures of the power-generating units, and synoptic temperatures and flow rates at the inflow and outflow faces of each CCS zone. Calibration of the heat-balance

††From 37.8°C to 40°C (100°F to 104°F)

model would not necessarily change the key inferences that have been drawn from the uncalibrated model, namely that there has been a significant increase in the heat-rejection rate from the power-generating units during the post-uprate period, and that increased algae concentrations and increased ambient temperatures are not the most likely causes of elevated temperatures in the CCS. Further development of a calibrated heat-balance model is warranted to confirm the conclusions that have been drawn.

3 Salinity Variations in the Cooling Canals

Salinity is defined as the mass of dissolved salts per unit mass of solution, and is usually reported in units of either parts per thousand (‰) or as a dimensionless number on the practical salinity scale 1978 (PSS-78). Salinities are sometimes expressed indirectly in terms of chlorinity (mg/L chloride) or conductance (mS/cm). In this report, salinities are expressed in units of parts per thousand (‰), which gives salinities approximately equal in magnitude to salinities expressed in PSS-78. As reference points, average seawater at 25°C has a salinity of 35‰, a chlorinity of 19.84 g/L, and a specific conductance of 54.7 mS/cm. Hypersaline water is typically defined as water with a salinity greater than 40‰ or a specific conductance greater than 61.5 mS/cm, and brine is typically defined as water with a salinity greater than 50‰. These hypersalinity and brine thresholds are routinely exceeded in the CCS, and therefore water within the CCS can be properly classified either as being hypersaline or as brine.

3.1 Results from Previous Studies

There has been a continuous upward trend in salinity since the CCS began operation in August 1973, and this trend is clearly apparent in Figure 13, which shows the maximum reported salinities in the CCS since the initial NPDES report was submitted by FPL in 1973. The long-term trend of increasing salinity shown

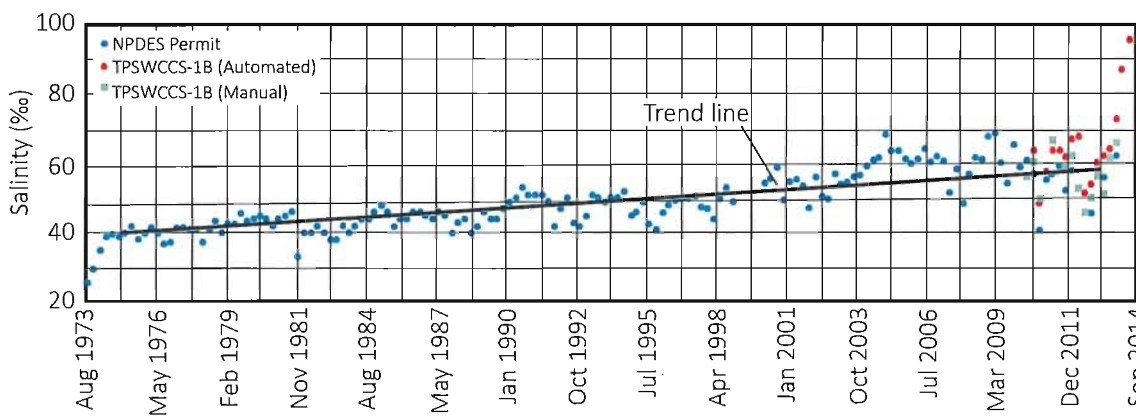


Figure 13: Maximum observed salinities in the CCS since initial operation

in Figure 13 can be approximated as being linear (as shown by the linear trend line) with a salinity increase of around 5‰ per 10 years. It is also apparent from Figure 13 that the rate of increase in salinity might have accelerated since 2013. The salinity in the CCS when it was first put into operation was around 26.5‰, with the contemporaneous salinity in Biscayne Bay being around 33‰ (Lyerly, 1973). The average CCS salinity in 1998 was reported to be in the range of 38 – 50‰ (Lyerly, 1998), and in May 2014, the salinity in the CCS was reported to be as high as 95‰.

Salinity-control processes. The key processes affecting the salinity in the CCS are: rainfall, evaporation, and groundwater exchange between the CCS and the surrounding Biscayne aquifer. Average annual rainfall at Turkey Point is approximately 60 inches, and the natural annual evaporation at Turkey Point is approximately equal to the average annual rainfall. Actual evaporation of water from the CCS exceeds natural evaporation due to the elevated temperatures in the CCS. The steady increase in salinity since operation of cooling canals began in the early 1970s (as shown in Figure 13) has been most commonly attributed to evaporation excess over rainfall.

3.1.1 Historical Chloride Levels

Chloride concentrations (i.e., chlorinities) in the CCS between June 2010 and June 2012 were in the range of 26 – 46 g/L with an average chlorinity of 33.9 g/L. The average chlorinity in Biscayne Bay during the same period was 18.9 g/L (Ecology and Environment, Inc., 2012). There is little difference (less than 10%) in chloride concentration between water samples collected near the surface or near the bottom at any given sampling location within the CCS. Chloride concentrations in the CCS during the post-uprate period were observed in range of 27 – 50 g/L, with the highest values observed in March 2014 and the lowest values in June 2013 (Ecology and Environment, Inc., 2014).

3.1.2 Historical Specific Conductance Levels

Specific conductances in the CCS between June 2010 and June 2012 were in the range of 70 – 90 mS/cm. Specific conductance in the CCS has been rising since the beginning of the dry season in 2014 and exceeded 120 mS/cm in May 2014. The average post-uprate specific conductance for all CCS stations was reported as 92.6 mS/cm, and this average value was over 15 mS/cm higher than the average value reported in the pre-uprate period.

3.2 Salinity-Balance Model of CCS

The salinity-balance model of the CCS that is currently being used to simulate salinity variations in the CCS was developed by FPL consultants. The salinity-balance model uses a finite-control-volume approach in which the control volume is defined to include the canals of the CCS and the adjacent interceptor ditch (ID). The salinity-balance model is closely related to a companion water-balance model, with both models having been developed by the same consultant and described by Ecology and Environment, Inc. (2012). For purposes of the current analyses, this previously developed model will be accepted as valid, and the relevant components of the model formulation are described in the following section.

3.2.1 Salinity-Balance Model Formulation

Component salinity fluxes into and out of the defined control volume are determined by multiplying the water (volume) flux by the corresponding salinity. The components of the water balance model are the lateral and vertical seepage into the CCS, blowdown water (i.e., additional water pumped from other units to the CCS), rainfall (including runoff from earth berms between canals), and evaporation. The key features of the salinity model are as follows:

- The base of the control volume is assumed to be the bottom of the ID and the cooling canals, whose elevations range from approximately −3 ft feet NAVD[‡‡] to approximately −30 ft NAVD. The elevation of bottom of the ID is approximately −20 ft NAVD. Sloping sidewalls of the canals in the CCS are taken into account by expressing the water-surface area as a function of the water-surface elevation in the CCS.
- Lateral seepage of water and salt between the L-31E Canal and the control volume is calculated directly from the product of the calibrated hydraulic conductivity and the difference in water-surface elevations between the L-31E Canal and the ID.
- Lateral seepage of water and salt between Biscayne Bay and the control volume is calculated directly from the product of the calibrated hydraulic conductivity and the difference in water-surface elevations between the CCS and Biscayne Bay.
- Vertical seepage of water and salt through the bottom of the control volume is calculated directly from the product of the calibrated hydraulic conductivity and the difference in the water-surface elevations in the CCS and the measured and estimated piezometric heads beneath the CCS.
- Evaporation is estimated using Equation 2, which uses meteorological data collected from meteorological stations in and immediately to the north and south of the CCS.
- Rainfall is estimated using Next Generation Weather Radar (NEXRAD) precipitation data provided by the SFWMD. Runoff into the control volume from earth berms between canals is used as a calibration parameter and is initially assumed to be 50% of the rainfall that falls on the berms.
- Added water from Units 3 and 4 are assumed to be freshwater (non-saline); Unit 5 blowdown salinities are adjusted to between 20% and 80% of seawater (35‰), with the exact percentage used as a calibration parameter.
- The ID control system is simulated to operate primarily between the months of January and June; with pumping rates as high as 50 mgd and averaging 4.5 mgd over the calibration period.
- The water-budget model is calibrated first by minimizing the errors between the simulated and observed storage in the control volume. Parameters adjusted during calibration of the water-budget model included the hydraulic conductivities in the aquifer adjacent to and beneath the CCS, an evaporation factor that adjusts the coefficients in the wind function, the amount of runoff that enters the control volume as percentage of precipitation, and the amount of Unit 5 cooling-tower water that is lost to evaporation before entering the CCS. The salinity model uses measured salinities in and around the CCS.

Calibrated values of the horizontal hydraulic conductivities in the aquifer surrounding the control volume have been found to be in the range of 500 – 950 ft/d, and calibrated values of the vertical hydraulic conductivities beneath the control volume have been found to be in the range of 0.1 – 4 ft/d. Vertical hydraulic conductivities beneath the northern discharge canals and beneath the return canals, where it is assumed deeper canals intersect highly permeable material underlying the muck and Miami Limestone Formation, were calibrated to have (higher) vertical hydraulic conductivities of 3.8 ft/d and 4 ft/d, respectively. Lower

[‡‡]"NAVD" refers to the NAVD 88 datum.

vertical hydraulic conductivities of 0.1 ft/d were calibrated for the mid- and southern portions of the discharge canals, as well as the southern portion of the return canals. Calibration of the salinity model was done entirely by the FPL consultant.

3.2.2 Previous Model Results

The model was run to simulate salinity variations both before the uprate (i.e., before February 2012) and after the uprate (i.e., after May 2013). The results of these model simulations are useful in understanding the salinity dynamics in the CCS and are described below.

Pre-uprate model results. The salinity model was calibrated for a 22-month pre-uprate period and the results showed an average volume outflow rate from the CCS of 0.62 mgd, with monthly-averaged outflow rates ranging from −46.6 mgd (October 2010) to +52.1 mgd (September 2010) (Ecology and Environment, Inc., 2012). Net flow through the bottom of the CCS was generally outward between the dry-season months of September through February, and inward during the wet-season months. Average inflow from precipitation during the wet season was more than twice that for the dry season. It was reported that vertical flows into and out of the control volume were substantially larger than lateral flows.

Post-uprate model results. A second round of salinity-model results was reported for the post-uprate period of June 2013 – May 2014 (Ecology and Environment, Inc., 2014). The results showed an average outflow rate of 3.26 mgd, with monthly-averaged outflow rates ranging from −31.1 mgd (June 2013) to +19.6 mgd (July 2013). During the pre-uprate and interim operating period, (September 2010 to May 2013), precipitation accounted for 39.4% of inflowing water to the CCS and evaporation accounted for 63.7% of the outflowing water from the CCS. There was an average rate of increase of salt in the CCS during the post-uprate period of 2.2×10^6 lb/d, which was attributed primarily to the combined effects of low rainfall and high evaporation. These model simulations were able to match the summer 2014 rise in salinity from approximately 60‰ to approximately 90‰.

3.2.3 Analysis of Salinity Dynamics

The primary drivers of salinity variations in the CCS are rainfall, evaporation, and seepage exchanges between the CCS and the surrounding aquifer. Pumpage from the ID can also influence salinity variations in the CCS, but its role is secondary to that of the aforementioned processes. Evaporation increases the salinity, rainfall and ID pumpage decrease the salinity, and seepage interchange with the surrounding aquifer can either increase or decrease the salinity depending on other factors.

Salinity variations under dry conditions. Under conditions of no rainfall (i.e., dry conditions), salinity in the CCS is primarily controlled by evaporation, and the salinity in the CCS steadily increases with time. Evaporation removes pure water from the CCS, and the volume of pure water that is evaporated is replenished by the seepage of saline water into the CCS from the surrounding aquifer. Since the CCS is directly connected to the surrounding aquifer, the water surface elevation within the CCS remains close to the water-table elevation in the surrounding aquifer which changes over relatively long time scales (viz. months) compared to the shorter time scales (viz. days, weeks) over which significant salinity variations are observed. The seepage flows between the CCS and the surrounding aquifer are proportional to the small differences between the water-surface elevations in the CCS and the piezometric heads in the surrounding aquifer. Over shorter time scales (viz. days) the evaporated volume of pure water is approximately equal to the seepage inflow volume of saline water, and the volume of water within the CCS remains approximately constant. This mechanism results in an increased mass of salt in an approximately unchanged CCS volume, and hence an increase in salinity.

Salinity variations under wet conditions. When rainfall occurs (i.e., wet conditions), salinity is primarily controlled by the difference between evaporation and rainfall. Conditions under which evaporation exceeds rainfall result in the net removal of pure water from the CCS and the dynamics of salinity variations under this condition are similar to those described previously for evaporation without rainfall. Hence, for time intervals where evaporation exceeds rainfall, the salinity in the CCS can be expected to increase. For time intervals where rainfall exceeds evaporation, there is a net inflow of (approximately) pure water into CCS that is equal to the difference between the rainfall and evaporation volumes, and this inflow is approximately balanced by the volume of saline water that seeps out of the CCS into the surrounding aquifer. The salinity of the seepage outflow is approximately equal to the salinity of the water within the CCS. This mechanism results in a decreased mass of salt in the CCS in an unchanged volume, and hence a decrease in salinity.

Salinity variations under ID pumping. Pumping water from the ID into the CCS has a relatively minor effect on the salinity in the CCS relative to rainfall and evaporation, since the volume of pumped water is relatively smaller and the difference in salinity between the pumped water and the water in the CCS is also less than for evaporation and rainfall.

3.2.4 Modeled Salinity Dynamics

The mechanism driving salinity changes in the CCS can be demonstrated using the previously calibrated salinity model. The cumulative rainfall, evaporation, seepage inflow, ID pumpage, and water storage (= net inflow) within the CCS between September 2010 and April 2014 are shown in Figure 14. It is apparent from

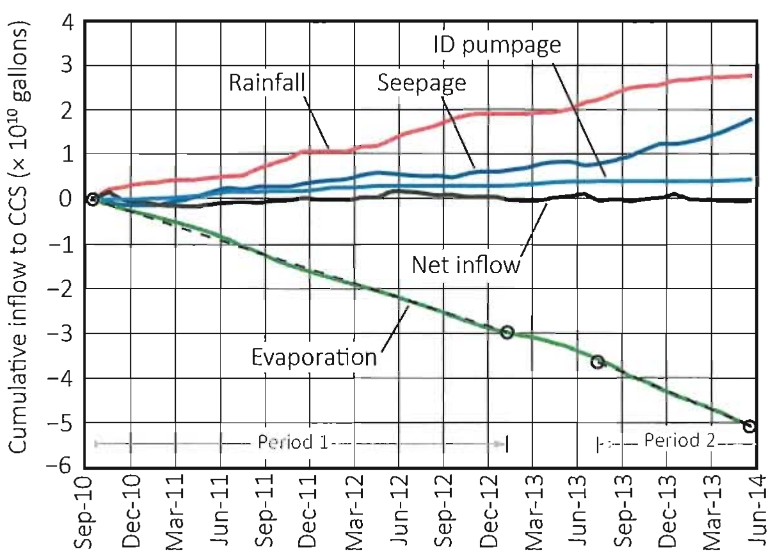


Figure 14: Water inflow into CCS

Figure 14 that evaporation and rainfall are dominant components of the water budget, and the storage in the CCS remains relatively constant compared with cumulative rainfall, evaporation, ID pumpage, and seepage inflow. Further, it can be asserted from Figure 14 that the seepage inflow adjusts to the difference between evaporation and rainfall-plus-ID-pumpage so as to keep the volume of water within the CCS approximately constant.

Post-uprate increase in evaporation. A notable feature of Figure 14 is that the evaporation rate increases during the post-uprate period (Period 2) relative to the evaporation rate during the pre-uprate period (Period 1), which is consistent with the post-uprate temperature increases shown in Figure 11. Using the evaporation and rainfall data from the heat-balance model, the average evaporation rate, average rainfall rate, and the difference between these quantities during Period 1 (9/1/10 – 2/1/13) and Period 2 (7/1/13 – 12/1/14) are shown in Table 3. It is apparent from Table 3 that the average evaporation rate in the post-uprate period

Table 3: Average Evaporation and Rainfall Rates in the CCS

Period	Evaporation (mgd)	Rainfall (mgd)	Difference (mgd)
1	34.46	15.44	19.02
2	44.20	15.52	28.68

is approximately 9.7 mgd greater than the average evaporation rate during the pre-uprate period, with the evaporation-rainfall deficit increasing by approximately the same amount. Since the long-term rate of increase in salinity in the CCS is proportional to the evaporation-rainfall deficit, these results indicate that the long-term rate of increase in CCS salinity is likely to increase if there is no intervention. It is interesting to note that pre-uprate analyses by FPL consultants predicted that the CCS evaporation rate would increase by 2 – 3 mgd and the intake temperature would increase by 0.9°F. In contrast, the actual increase in evaporation rate is around 9.7 mgd and the measured increase in the average intake temperature is 4.7°F. The post-uprate evaporation-rainfall deficit of 28.7 mgd is a key design variable for any planned system to control salinity within the CCS by pumping fresh or brackish water into the CCS from external sources.

Seepage inflow and outflow. Seepage flow to the CCS does not occur uniformly over the interfaces of the CCS with the surrounding Biscayne aquifer, and the relative volumes of seepage inflows and outflows over the CCS interfaces are shown in Figure 15. It is apparent from Figure 15 that most of the inflow is across the East interface (i.e., the interface facing Biscayne Bay), most of the outflow is across the Bottom interface, relatively lesser volume fluxes occur across of the North, South, and West interfaces, and inflows and outflows occur across all interfaces to varying degrees. The relative seepage contributions from the different faces are important inasmuch as the salinity in the aquifer adjacent to the East interface tends to be at least as high as the salinity in Biscayne Bay, the salinity in the aquifer adjacent to the Bottom interface tends to be on the same order of magnitude as the salinity in the CCS, and lesser salinities occur at the North, South, and West interfaces. Analyses have shown that, although the net seepage across of the Bottom interface is predominantly outward, seepage across the Bottom interface is not uniform within the four zones of the CCS. In particular, seepage across the Bottom interface is predominantly outward in Zone 1, predominantly inward in Zone 4, and much weaker inflows and outflows occur in Zones 2 and 3 (Nuttle, 2015a).

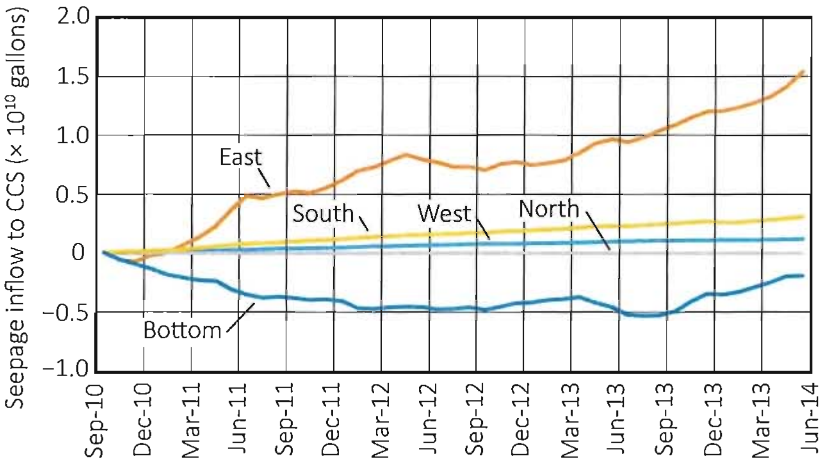


Figure 15: Seepage into CCS from aquifer

Salinity inflow and outflow. The estimated salt contributions from the CCS seepage interfaces are shown in Figure 16. It is apparent that the salt fluxes across the East and Bottom interfaces constitute the predomi-

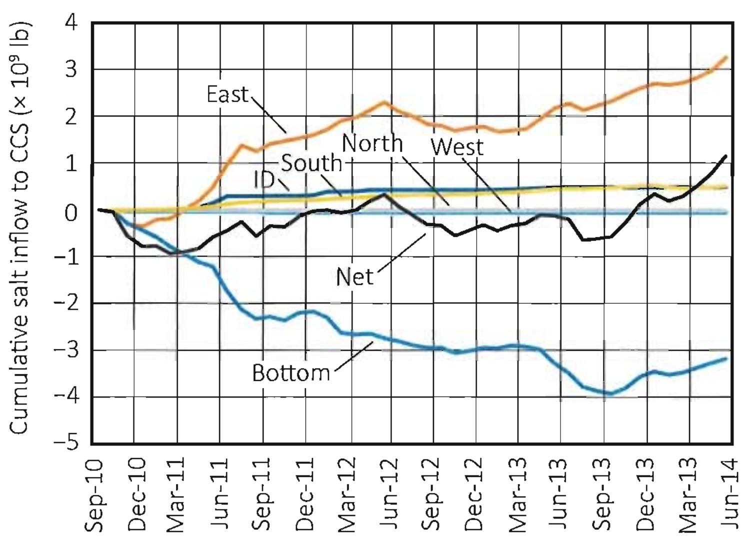


Figure 16: Salt inflow to CCS

nant components of the salt budget, with influx of salt primarily associated with the East interface and efflux of salt primarily associated with the Bottom interface; keeping in mind that both influx and efflux of salt can occur at these interfaces. Lesser but still significant salt influx occurs across the South interface and via ID pumping, with much smaller to negligible salt fluxes across the North and West interfaces. Following the same pattern as seepage fluxes, salt fluxes across the Bottom interface are predominantly outward in Zone 1 and predominantly inward in Zone 4 (Nuttle, 2015a), with the net salt flux across the Bottom interface typically being outward. It is apparent from Figure 16 that in the interval September 2013 – May 2014 the flux of salt was primarily and (almost) consistently into the CCS from both the East and Bottom interfaces and, with relatively stable water level and volume in the CCS, this yielded an (almost) consistent increase in the CCS salinity as demonstrated by the measurements shown in Figure 17. Since the seepage influx was

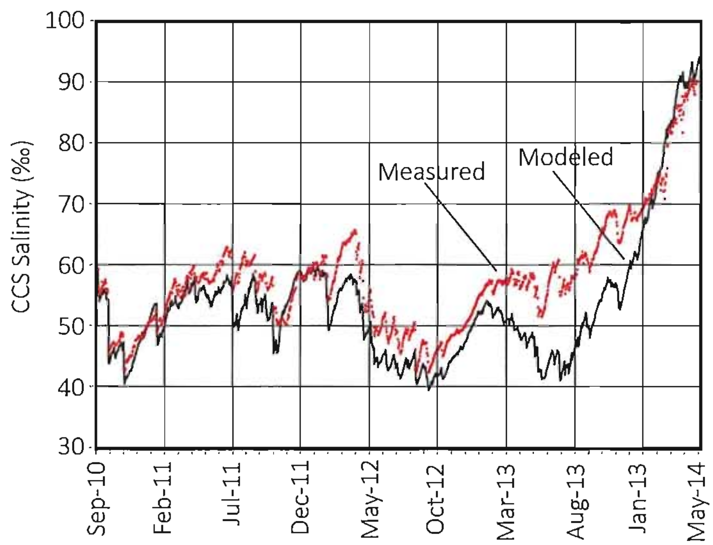


Figure 17: Measured and modeled salinity variations in CCS

driven by the deficit between evaporation and rainfall, it can be concluded that the increase in salinity in the CCS was due to the evaporation-rainfall deficit causing contemporaneous influxes of salinity from both the Bottom and East interfaces. Subsequent to the time period covered by Figure 17, salinity in the CCS during 2014 increased to a maximum daily-average value of approximately 99‰. On January 1, 2015, the average salinity in the CCS was 75‰, and by April 26, 2015, salinity levels were over 95‰. During April 27 – 28, 2015, significant rainfall over the CCS reduced the average salinity to 78‰, however, salinities subsequently began rising again in the absence of more rainfall (SFWMD, 2015).

Lessons learned. The results presented in this section clearly demonstrate that the salinity of water in the CCS can be expected to rise significantly during prolonged periods without rainfall. Furthermore, over multi-seasonal time scales, a steady increase in salinity within the CCS occurs since average evaporation rates exceed average rainfall rates. Post-uprate increases in CCS operating temperatures have increased evaporation rates compared with pre-uprate evaporation rates. In the absence on any engineered intervention, this increased evaporation rate will cause salinities in the CCS to increase at a higher rates in the future compared with the rates of salinity increase observed during the pre-uprate period. It is apparent from the results presented here that additional salinity controls are necessary in order to reduce the likelihood that the excessive salinity levels of the past will be repeated in the future.

Salinity-control and groundwater remediation plan. In October 2015, in response to chloride levels in the Biscayne aquifer exceeding water-quality standards as a consequence of the high salinities in the CCS, FPL reached an agreement with Miami-Dade County which includes the design of a system of up to six wells to pump low-salinity water from the Upper Floridan aquifer into the CCS to reduce salinity levels in the CCS. Reports indicate that the plan is to pump up to 14 mgd of water from the Upper Floridan aquifer into the CCS, with the goal of reducing the average annual salinity in the CCS to approximately 34‰ within four years of the implementation of the plan. In addition to the aforementioned plan to reduce the salinity in the CCS, FPL has agreed to remediate the hypersaline part of the saltwater plume to the west of the CCS, potentially by pumping hypersaline water from the Biscayne aquifer into the Boulder Zone. This planned remediation system is called the Biscayne Aquifer Recovery Well System (RWS) and will be designed based on simulations using a variable-density groundwater flow model that is currently under development by FPL. Initial design of the RWS will be based on a 12 mgd capacity.

Issues of concern. The analyses and modeling that were used as bases for formulating the salinity-control plan for the CCS were not made available to the author of this report, and so unanswered questions remain concerning the likelihood that the proposed plan will be successful. Three technical issues of concern are identified here. The first issue of concern is that the current (post-uprate) evaporation and rainfall rates at the CCS are 44.2 mgd and 15.5 mgd, respectively, which means that a long-term average inflow of around 44.2 mgd − 15.5 mgd = 28.7 mgd of fresh water would be required to keep the salinity in the CCS at approximately its current average-annual value. Hence, a long-term addition of only 14 mgd of brackish water from the Upper Floridan aquifer might be of insufficient volume and quality to abate the persistent increase in salinity within the CCS. A second issue of concern is that adding 14 mgd or more of water to the CCS is likely to significantly increase the salinity flux out of the bottom of the CCS (at least in the short term), and the extent to which this increased salinity flux will exacerbate salinity intrusion would need to be addressed. To properly model the effect of adding 14 mgd or more of brackish water to the CCS on salinity intrusion in the surrounding aquifer it would be necessary to use a groundwater model that accounts for density-driven flow, heat transport, and dissolved-solids transport in the portion of the Biscayne aquifer surrounding the CCS. This model could also be used to accurately describe the seepage flux of salinity into and out of the CCS at a much more sophisticated level that is currently being done with the FPL salinity-balance model. A third issue of concern is that the time-frame required for the proposed system to significantly reduce salinity levels in the aquifer remains highly uncertain pending more definitive characterization of the subsurface hydrogeology and the development of a groundwater-flow model that accounts for the effects of temperature and salinity on the flow distribution in the surrounding aquifer. Utilization of a variable-density groundwater model is essential to estimate the time scale required for the proposed actions to take effect, The need for model development in support of designing the salinity-reduction protocol is further buttressed by the modeling results reported by Hughes et al. (2010), who showed that estimation of the time scale for salinity changes in the CCS to propagate through the aquifer are significantly influenced by the certainty with which the hydrogeology in the aquifer surrounding the CCS can be specified. The model being developed in support of the RWS could possibly be adapted for this purpose.

4 Pumping Water from the L-31E Canal into the Cooling Canals

4.1 Pumping Permit and Protocols

In August 2014, SFWMD issued an Emergency Order authorizing the pumping of up to 100 mgd of freshwater from the L-31E Canal to the CCS between August and October 2014, with the primary goal of reducing the temperature in the CCS. Pursuant to this order, FPL conducted emergency pumping between September 25 and October 15, 2014, and as a result the temperature in the CCS dropped by 6.5°F, the salinity dropped from 87‰ to 75‰, and the algae concentrations reportedly dropped from 1315 cell/L on September 26, 2014 to 68 cell/L on October 27, 2014. After pumping had terminated, algae concentrations again began increasing. Also subsequent to pumping, the temperature in the CCS began to rise again. On April 27, 2015, the temperature of the CCS reached 98.2°F. A large rainfall event occurred over the CCS between April 27 and 28, 2015. The addition of freshwater inflow from rainfall reduced the temperature of the water in the CCS to 81.3°F. However, by May 17, 2015, the intake temperature had risen to 94.6°F, which was within 10°F of the maximum allowable intake temperature of 104°F. It was primarily on the basis of these conditions that FPL requested a permit to pump additional water from the L-31E Canal into the CCS.

2015 – 2016 Pumping Permit In May 2015, FPL received a permit from the SFWMD to pump up to 100 mgd from the L-31E Canal to the CCS, for the purpose of controlling the temperature in the CCS. Pumping is permitted between June 1 and November 30 in both 2015 and 2016. A limitation stipulated within this permit is that water cannot be withdrawn from the L-31E Canal on any given day until at least 504 acre-ft (2.2×10^7 ft^3) of water has been diverted from the L-31E Canal to Biscayne Bay for purposes of fish and wildlife preservation. Diversion of water from the L-31E Canal to Biscayne Bay occurs through structures S-20F, S-20G, and S-21A, which are located upstream of the CCS withdrawal location (at the "South Pumps") as shown in Figure 18. These three upstream structures open and close based on prescribed

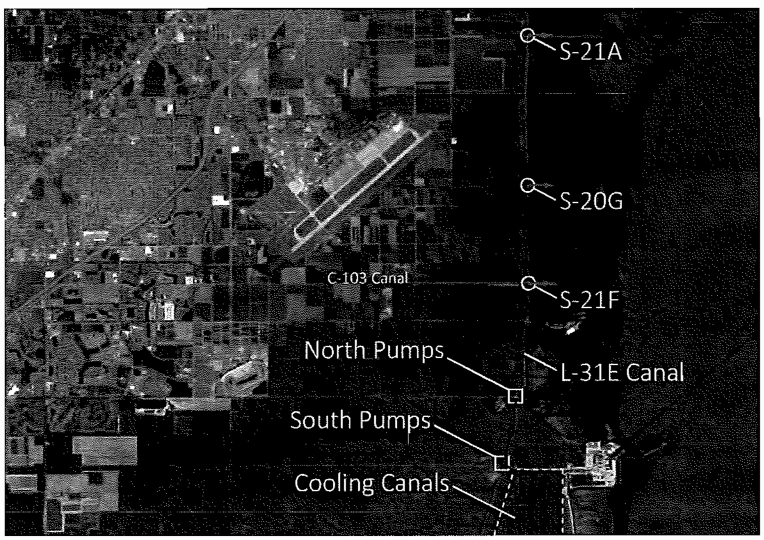


Figure 18: Pumping from L-31E Canal into Cooling-Canal System

water-surface elevations in L-31E Canal at the structure locations, and the open/close stages of these structures are given in Table 4. For example, in the wet-season period of April 30 – October 15 the S-20F, S-20G, and S-21A structures open when the L-31E Canal stage is at or above 0.67 ft NAVD and close when the stage is at or below 0.27 ft NAVD. The cumulative discharges from these structures are monitored daily, to ensure that no pumping from the L-31E Canal into the CCS is allowed until the cumulative discharges from these structures exceed the threshold of 504 acre-ft. The delivery system consists of a northern and southern pump station, where the northern pump station pumps water from the C-103 Basin into the L-31E Canal, and the southern pump station pumps water from the L-31E Canal into the CCS. The operational

Table 4: Gate Operation Rules that Affect L-31E Withdrawals

Gate(s)	Season	Period	L-31E Stage Open (ft NAVD)	L-31E Stage Close (ft NAVD)
S-20F, S-20G, S-21A	Wet	April 30 – October 15	0.67	0.27
S-20F	Dry	October 15 – April 30	−0.13	−0.53
S-20G			0.67	0.27
S-21A			−0.13	−0.53

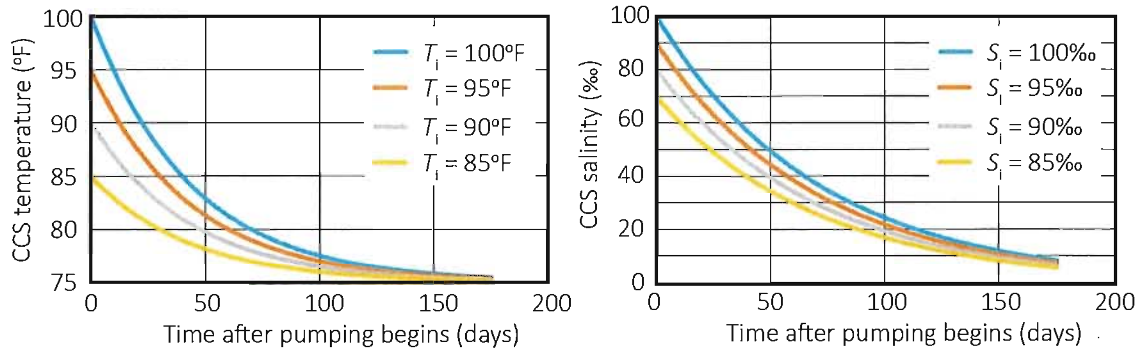
plan synchronizes northern and southern pumping operations so as to avert dewatering of wetlands between the two pump stations and adjacent to the L-31E Canal. The operational protocol requires that the northern pumps always be started at least five minutes prior to starting the southern pumps, and at the end of each day the southern pumps must be shut down at least five minutes before the northern pumps are shut down. This operational protocol for the pumps ensures that the volume of water pumped daily from the C-103 Basin into the L-31E Canal by the northern pumps exceeds the volume pumped from the L-31E Canal into the CCS by the southern pumps. A particularly important condition of the pumping permit is that FPL is required to monitor the stage in the L-31E Canal between the northern and southern pump stations to ensure that there is no drawdown in the L-31E Canal between the pump stations as a result of the pumping operations. Besides ensuring that there is no L-31N drawdown as a result of pumping, this protocol also ensures that the wetlands adjacent to the L-31N Canal are not dewatered as a result of pumping. Subsequent to beginning of pumping on June 1 2015, the salinity level in the CCS dropped to 70‰, and subsequent large rainfall events have further reduced the CCS salinity to 60‰, according to reports submitted by FPL to the SFWMD.

4.2 Quantitative Effects

This section presents a simplified analysis that is intended only to illustrate the relative impacts on temperature and salinity of pumping water from the L-31E Canal into the CCS. The change in temperature, ΔT, of the water in the CCS resulting from the addition of a volume V_a water at temperature T_a can be approximated using the relation

$$\Delta T \approx \frac{V_\mathrm{a}}{V_0 + V_\mathrm{a}} (T_\mathrm{a} - T_0) \tag{6}$$

where V_0 is the initial volume of water in the CCS, and T_0 is the initial temperature of water in the CCS. Equation 6 is a very approximate relationship which assumes that the added water is well mixed over the CCS, and it neglects the differences in density and specific heat between the saline water in the CCS and the fresh water being added. In spite of these shortcomings and in the absence of a detailed heat-balance model of the CCS, Equation 6 can be used to provide a rough estimate of how the temperature in the CCS might react to the addition water from the L-31E Canal. If 100 mgd (= 1.337×10^7 ft^3/d) is added to the CCS which has a volume of 5.746×10^8 ft^3 (assuming an average depth of 2.8 ft) and the added water has a temperature of 75°F, then Equation 6 can be applied using a daily time step to calculate the temperature in the CCS in as a function of number of days of continuous pumping for initial temperatures in the range of 85°F – 100°F. The results of these calculations are shown in Figure 19(a). In a similar manner, the change in salinity, ΔS, in the CCS resulting from the addition water at salinity S_a can be estimated using the approximate



(a) Temperature versus pumping time

(b) Salinity versus pumping time

Figure 19: Approximate effect of pumping 100 mgd on temperature and salinity in CCS

relationship

$$\Delta S \approx \frac{(V_a - V_e)}{V_0 + (V_a - V_e)} (S_a - S_0) \tag{7}$$

where S_0 is the initial salinity in the CCS, and V_e is the evaporated volume. Equation 7 is an approximate relationship which assumes that the added water is well mixed over the CCS, and it neglects decreases in salinity that would be caused by rainfall. If 100 mgd is added to the CCS and the rate of evaporation is 39 mgd, then the net rate of freshwater addition to the CCS (i.e., $V_a - V_e$) is equal to 61 mgd (= 8.156×10^6 ft^3/d). Using the same CCS volume V_0 that is used for calculating the daily temperature changes, ΔT, and taking the salinity, S_a of the water pumped from the L-31E Canal equal to zero, Equation 7 can be used to calculate the salinity in the CCS in as a function of number of days of continuous pumping for initial salinities in the range of 70‰ – 100‰ as shown in Figure 19(b). The results in Figure 19 collectively indicate that the sustained addition of 100 mgd from the L-31E Canal to the CCS over continuous times on the order of a week to a month (30 days) would be an effective means of reducing the temperature and salinity in the CCS. The environmental effects on the surrounding environment of pumping water from the L-31E Canal to the CCS are discussed subsequently.

Context. To put a volume flow rate of 100 mgd of fresh water in a societal context, it is noted that 100 mgd is approximately the average daily drinking-water demand of one million people. In the context of the CCS, 100 mgd can be contrasted with the assumed average CCS evaporation rate of around 39 mgd and a long-term average rainfall rate on the CCS of around 21 mgd, where both of these averages are computed over the 9/1/2010 – 5/1/2014 time period using data from the FPL water-balance model. If the CCS were empty and were to be filled by supplying water at 100 mgd, it would take approximately 43 days to fill the CCS. Although 100 mgd is more than twice the evaporation rate, the cooling effect of a unit volume of evaporated water is much greater than the cooling effect of a unit volume of added liquid water. For example, a unit volume of evaporated water would cause a temperature decrease of around 50 times the temperature decrease caused by adding a unit volume of liquid water that is 20°F cooler than the CCS. Therefore, in thermodynamic terms, the addition of 100 mgd of pumped water has approximately the same cooling effect as 2 mgd of evaporated water. With regard to salinity, the salinity reduction resulting from the addition of a unit volume of fresh water exactly compensates for the salinity increase caused by a unit volume of evaporated water. Hence, 39 mgd of added water would neutralize the salinity-increase caused by 39 mgd of evaporated water, with the excess added water causing a reduction in salinity.

4.3 Model Results

The water-balance and salt-balance models used previously by FPL to simulate the pre-uprate salinity dynamics in the CCS were used by FPL to simulate the potential future scenarios with and without the L-31E water inputs in the summer of 2015 and 2016. FPL made minor revisions in the models to incorporate data up through October 2014. The model-simulation period to predict the response of the CCS to pumping water from the L-31E Canal starts on November 1, 2014, and ends on November 30, 2016. Two scenarios were simulated at multiple maximum-allowable withdrawal rates, where actual withdrawal rates were predicated on the availability of water in the L-31E Canal after providing 504 acre-ft to Biscayne Bay. Scenario A assumes that future conditions are the same as those observed between November l, 2010 and October 31, 2012; conditions during this time frame reflected normal weather patterns. Scenario B assumes that future conditions are the same as those observed between November 1, 2013 and October 31, 2014; conditions during this time reflected dry weather patterns, and this one-year period was repeated sequentially to produce a two-year predictive simulation. In both scenarios, the conditions observed during the first November (2010, 2013) were repeated to simulate conditions for the last month (November 2016) of the 25-month predictive simulation. Scenario A and Scenario B were each run four times under different pumping scenarios: no pumping, 30 mgd-maximum, 60 mgd-maximum, and 100 mgd-maximum and for a two-year time period. Under all pumping scenarios the simulated CCS water levels increased and simulated CCS salinities decreased relative to the base case of no pumping. Greater changes were observed in response to greater pumping rates. Under all pumping scenarios, the greatest increases in CCS stage occur between June 1 and November 30.

Application of model results. The water-balance and salinity-balance modeling done by FPL in support of the application for the 2015 – 2016 pumping permit focused on the effectiveness of the L-31E pumping on reducing salinity, whereas the primary motivation for pumping from the L-31E Canal is actually to reduce temperature. Elevated temperatures in the CCS will affect power-generation while elevated salinities will not, and there is not a proportional correspondence between reduced salinity and reduced temperature, since temperatures in the CCS depend on a variety of other factors besides the volume of water pumped from the L-31E Canal.

4.4 Environmental Effects

Environmental concerns that have been raised previously by others relate to both the diversion of fresh water from other environmental restoration projects that are currently being serviced by the L-31E Canal, and the utilization of fresh water to dilute hypersaline water, which degrades the quality and utility of the fresh water. Based on available information, it appears that the only environmental projects currently being served directly by the L-31E Canal is the Biscayne Bay fish and wildlife preservation allocation of 504 acre-ft, and the maintenance seasonal water levels in support of adjacent wetlands. The permitted pumping operation will not divert the water volume previously allocated to fish and wildlife preservation, and a pumping protocol will be followed to maintain water levels at their no-pumping levels. With respect to the degradation of fresh water, this degradation will in fact occur, however, the extent of water-quality deterioration and specific deleterious impacts on existing water uses have not to date been identified. Aside from these previously raised concerns, some major additional concerns resulting from pumping up to 100 mgd from the L-31E Canal to the CCS are described below.

4.4.1 Effect of Increased Water-Surface Elevations in the CCS

Pumping water from the L-31E Canal into the CCS will elevate the average water level in the CCS relative to the water level that would exist without pumping. The magnitudes of water-level increases in the CCS were estimated by FPL using the previously developed and calibrated mass balance model of the CCS, and the results of these simulations were submitted to the SFWMD as part of the application for the 2015 – 2016 pumping permit (SFWMD, 2015). Since the water level in the L-31E Canal will be held constant during pumping operations, the increased water-surface elevations in the CCS are of concern because they will decrease the seaward piezometric-head gradient between the L-31E Canal and the CCS. Furthermore, it is likely that the piezometric-head gradient between the L-31E Canal and the CCS could be reversed from a seaward gradient to a landward gradient. This could produce landward groundwater flow between the CCS and the L-31E Canal, which would likely advect a saline plume from the CCS towards the L-31E Canal. In addition to the aforementioned outcome, elevated water levels in the CCS resulting from pumping up to 100 mgd from the L-31E Canal will increase the (seaward) piezometric-head gradient between the CCS and Biscayne Bay, resulting in the increased discharge of higher-salinity water from the CCS into the Bay via the Biscayne aquifer.

Relevant data. To quantify the effect of increased water-surface elevations in the CCS that would occur as a result of pumping, the increased water-surface elevations simulated by FPL were subtracted from historical water-level differences between the L-31E Canal and the CCS to yield possible water-level differences under the 100-mgd pumping scenario. As described previously, two scenarios were modeled, with Scenario A corresponding to "normal" conditions, and Scenario B corresponding to "dry" conditions. Each simulation covered two years (2015 and 2016), with pumping in each year from June 1 to November 30. The increases in CCS water-surface elevations over the water-surface elevations that would exist in the CCS without pumping are given in Table 5 for selected dates (about a month apart) during each of these scenarios. The values given in Table 5 were estimated from graphical plots developed by FPL as part of the permit application. It is apparent from Table 5 that water-level increases in the CCS on the order of 0.5 ft are predicted to occur as a result of pumping water at a rate of 100 mgd from the L-31E Canal into the CCS. These water-level increases can be contrasted with historical differences in the water levels between the L-31E Canal and the CCS for the pre-uprate (June 2011 – May 2012) and post-uprate (June 2013 – May 2014) periods as shown in Table 6, where a positive difference indicates that the water level in the L-31E Canal is higher than the water level in the CCS. It is apparent from Table 6 that the historical differences between the water levels in the L-31E Canal and the CCS are typically on the same order of magnitude as the expected increases in the CCS water level, and therefore a significant impact on the historical seaward water-level gradient is to be expected. This concern is further amplified when it is considered that a minimum water-level difference of 0.30 ft is required to keep an acceptable seaward water-level gradient and to keep from triggering the interceptor ditch (ID) pumps. If the ID pumps are turned on, this would further elevate the water level in the CCS and further decrease the water-level difference between the L-31E Canal and the CCS.

Demonstration of effects. The increases in the water-surface elevations in the CCS predicted by the FPL mass-balance model can be subtracted from the historical water-level differences between the L-31E Canal and the CCS to estimate the water-level differences between the L-31E Canal and the CCS that are likely

Table 5: Estimated Water Level Increases in CCS

Day-Month	Scenario	2015 (ft)	2016 (ft)
15-Jun	A	0.00	0.23
15-Jul	A	0.00	0.55
15-Aug	A	0.55	0.40
15-Sep	A	0.57	0.40
15-Oct	A	0.50	0.60
15-Nov	A	0.65	0.60
30-Nov	A	0.50	0.45
15-Jun	B	0.00	0.00
15-Jul	B	0.62	0.50
15-Aug	B	0.65	0.70
15-Sep	B	0.15	0.10
15-Oct	B	0.35	0.30
15-Nov	B	0.37	0.55
30-Nov	B	0.50	0.65

to exist as a consequence of pumping a maximum of 100 mgd from the L-31E Canal into the CCS. These expected water-level differences are summarized for the Scenario A (the "normal" condition) in Figure 20(a), and for Scenario B (the "dry" condition) in Figure 20(b). For each historical period (pre-uprate and post-uprate), and for each selected day, three water-level differences are shown: the historical difference (blue), the projected 2015 difference (orange), and the projected 2016 difference (gray). In general, the 2015 and 2016 projected water-level differences are less than the historical differences by the amounts listed in Table 5. Also shown in Figure 20 is the 0.30-ft reference line, which is the threshold water-level difference below which the ID pump system is triggered. It is apparent from Figure 20(a) that under pre-uprate water-level-difference conditions a landward water-level gradient would be created around 15-Sep and 15-Nov on which dates there were previously seaward water-level gradients; the 15-Jun data point is anomalous in that a landward gradient already existed in the historical record. It is further apparent from Figure 20(a) that under post-uprate water-level-difference conditions a landward water-level gradient would be created around 15-Jul, 15-Aug, 15-Sep, 15-Nov, and 30-Nov on which dates there were previously seaward gradients. Under both pre-uprate and post-uprate conditions shown in Figure 20(a), the difference between the water level in the L-31E Canal and the CCS would fall below the 0.30-ft threshold on all of the dates cited in Figure 20(a). Considering Scenario B (the "dry" condition) shown in Figure 20(b), the results are similar to those shown in Figure 20(a). Under pre-uprate conditions, a landward water-level gradient would be created around 15-Sep and 15-Nov, and under post-uprate water-level-difference conditions a landward water-level gradient would be created around 15-Jul, 15-Aug, 15-Sep, 15-Nov, and 30-Nov. Under both pre-uprate and post-uprate conditions, the difference between the water levels in the L-31E Canal and the CCS would fall below the 0.30-ft threshold on all dates cited in Figure 20(b). The results shown in Figure 20 collectively show that there is cause for concern that pumping 100 mgd from the L-31E Canal into the CCS could cause a landward water-level gradient where none previously existed. This concern is further exacerbated when considering that water levels at the northern end of the CCS near the discharge from the power-generating units will

Table 6: Historical Water-Level Differences Between L-31E Canal and CCS

Day-Month	Pre-Uprate (ft)	Post-Uprate (ft)
15-Jun	−0.32	0.46
15-Jul	0.57	0.37
15-Aug	0.80	0.40
15-Sep	0.42	0.48
15-Oct	0.85	0.60
15-Nov	0.51	0.49
30-Nov	0.55	0.45

be higher than the average water level in the CCS that is used in this analysis, which further decreases the seaward water-level gradient between the L-31E Canal and the CCS. Concern is further heightened when the increased density of water in (and under) the CCS is taken into account, since the difference in equivalent freshwater (piezometric) heads between the L-31E Canal and the CCS is less that the difference in water levels between the L-31E Canal and the CCS. It is actually the difference in equivalent freshwater heads that govern the flow between these bodies of water (e.g., Post et al., 2007). This latter point is particularly important since the difference in freshwater heads between the L-31E Canal and the CCS will increase with depth.

Effect of generating a landward gradient. A landward gradient in the freshwater-equivalent piezometric head between the L-31E Canal and the CCS would advect saline water from the CCS towards the L-31E Canal. Such gradients are likely to be generated under 100-mgd pumping operations. Also, since pumping would be occurring mostly during the wet season, it is likely that a seaward head gradient would exist (and be maintained) west of the L-31E Canal. As a consequence of a landward gradient in the freshwater-equivalent piezometric head east of the L-31E Canal and a seaward (freshwater) head gradient west of the L-31E Canal, it is possible that a "saline circulation cell" is developed in which water is pumped from the L-31E Canal into the CCS, water seeps out of the CCS and flows through the Biscayne aquifer back into the L-31E Canal, and then this water is pumped back into the CCS. This circulation cell would increase the salinity in the L-31E Canal, which would degrade the quality of the water in the L-31E Canal and decrease the effectiveness of the pumped water in decreasing the salinity in the CCS.

Historical anecdote. Interestingly, in 1978, engineers from the consulting firm Dames and Moore wrote a report to FPL with a specific section in their report titled "Effects of an Overall Increase in Water Level in the Cooling-Canal System Relative to the Ground Water" (Dames and Moore, 1978). In their report, the engineers at Dames and Moore specifically considered the impact of raising the water level in the CCS by 0.50 ft above the water table in the surrounding aquifer. They concluded that such an occurrence would cause the saltwater interface to move approximately one mile further inland relative to its location prior to the rise in the water level of the CCS.

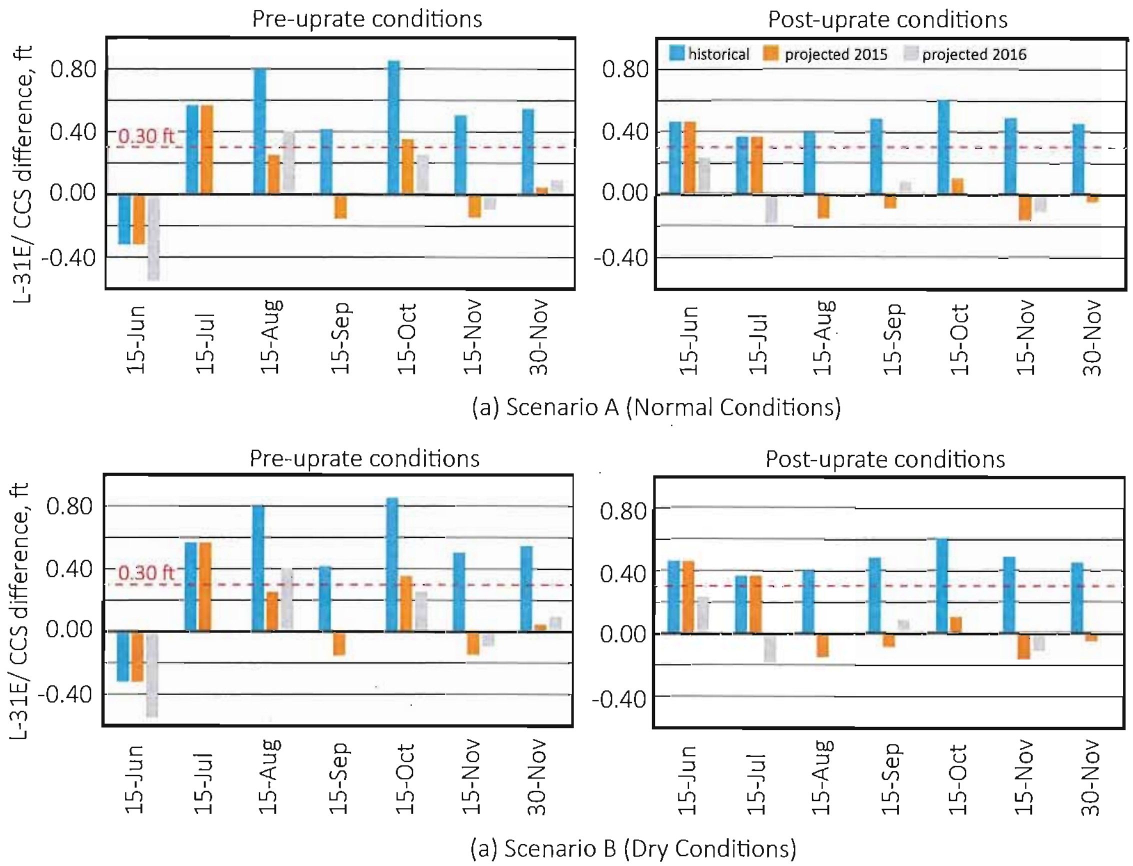


Figure 20: Differences Between L-31E Canal and CCS Water Levels. The historical difference is in blue, the projected 2015 difference is in orange, and the projected 2016 difference is in gray.

4.4.2 Suggested Permit Modifications

Based on the concerns described here, along with the supporting analyses provided, it is recommended that the pump-operation protocol associated with the 2015 – 2016 pumping permit be modified to include measurement of water levels in the CCS, and that a threshold water-level difference between the L-31E Canal and the CCS be determined by the SFWMD and added as a controlling factor in pump operations. To ensure that a subsurface circulation cell of saline water does not develop, the salinity of the water in the L-31E Canal should be monitored during pump operations.

5 Conclusions and Recommendations

This study consisted of reviewing, summarizing, and analyzing the relevant reports and data relating to the operation of the cooling-canal system (CCS) at the Turkey Point power station. The study focused on the following four primary issues: (1) the temperature dynamics in the CCS, (2) the salinity dynamics in the CCS, (3) salinity control in the CCS, and (4) the impacts and consequences of pumping a maximum of

100 mgd from the L-31E Canal into the CCS.

5.1 Temperature Dynamics

Temperature dynamics in the CCS are a concern primarily because operation of the nuclear-power generating units will be impacted if the temperature of the cooling water at the intake exceeds 104°F. Recent elevated temperatures have come close to exceeding this threshold value.

Heat balance in the CCS. Understanding the temperature dynamics in the CCS is not possible without the development of a heat-balance model of the CCS, and no such model currently exists in the public domain. As part of this study, a preliminary heat-balance model was developed and is described in this report. Using this model to simulate the heat balance in the CCS during the interval 9/1/10 – 12/7/14 showed that there were two distinct periods during which the heat-rejection rate from the power plant remained approximately constant. The first period corresponded to pre-uprate conditions (prior to February 2012) and the second period corresponded to post-uprate conditions (after May 2013). The heat-rejection rate during the post-uprate period was found to be significantly greater than the heat-rejection rate during the pre-uprate period. In the 250 MW uprate in nuclear-power generating capacity (Units 3 and 4) that was completed in 2013 and the retirement of a 400 MW standby fossil-fuel plant (Unit 2) that was done in 2010 there was a significant shift from fossil-fuel generation to nuclear-power generation that occurred between the pre-uprate and post-uprate periods. This shift towards the greater utilization of nuclear power in the units served by the CCS is significant because nuclear-power units are known to have a much higher heat-rejection rates to cooling water than fossil-fuel generating units. Hence, on a per-megawatt basis, nuclear-power units generate more heat to the CCS than fossil-fuel units. Furthermore, capacity factors of nuclear-power units are typically much higher than capacity factors of fossil-fuel units, hence the ratio of actual power generation to installed capacity can be expected to be higher during the post-uprate period compared with the corresponding ratio during the pre-uprate period.

Increased temperatures. The increased heat-rejection rate in the post-uprate period was manifested in the CCS by increased temperatures. Notably, the average temperature in the CCS discharge zone increased by about 6.3°F (3.5°C), and the average temperature in the CCS intake zone increased by about 4.7°F (2.6°C). Considering that the increased average temperature in the intake zone of the CCS is slightly greater that the increased threshold temperature of 4.0°F (2.2°C) approved by the NRC in 2014, and also considering that supplementary cooling of the CCS was needed in 2014, then caution should be exercised in further increasing power generation beyond 2014 levels without a reliable system to provide additional cooling beyond that currently being provided by the CCS. A power-generation increase would likely lead to a repeat of the need for supplementary cooling that was experienced in 2014.

Decreased thermal efficiency. The thermal efficiency of the CCS has decreased in the post-uprate period relative to the thermal efficiency in the pre-uprate period. FPL has undertaken efforts to improve the thermal efficiency of the CCS and thereby compensate for the increased thermal loading on the CCS. However, available data indicate that the average post-uprate thermal efficiency remains significantly less than the average pre-uprate efficiency (67% versus 77%). Increasing the thermal efficiency of the CCS is a possible means of mitigating the effects of increase heat loading on the CCS, but the extent of this mitigation is yet to be established and current levels of mitigation are insufficient to compensate for the increased heat loading.

Thermal effect of algae. A sensitivity analysis indicates that increased algae concentrations in the CCS and increased air temperatures are unlikely to have been of sufficient magnitude to have caused the elevated temperatures that have been measured in the CCS. In quantitative terms, the additional solar heating rate in the CCS caused by the presence of high concentrations of algae is estimated to be less than 7% of the heat-rejection rate of the power plant, hence the relatively small effect of algae-induced additional heating.

Follow-up. The preliminary findings of this study will need to be followed up by further development of the thermal model. This model will need to be calibrated within each zone of the CCS. Data required for calibration include indirect measurements of heat-rejection rates, and (ideally) flows and temperatures within the designated zones of the CCS. The development of any engineered system to control temperatures in the CCS will need to be done in tandem with thermal-model simulations.

5.2 Salinity Dynamics

Salinity in the CCS is of concern because increased salinity levels contribute to increased salinity intrusion into the Biscayne aquifer. Although an interceptor-ditch salinity-control system has been in place since initial operation of the CCS, this salinity-control system is ineffective in controlling salinity intrusion at depth, and so elevated salinities in the CCS remain a problem. This study confirms that long-term salinity increases in the CCS are primarily caused by long-term evaporation rates exceeding long-term rainfall rates. Without any intervention, the trend of increasing salinity would continue into the future, likely at an increased rate due to increased post-uprate temperatures in the CCS. Recent spikes in salinity in the CCS are a normal consequence of a prolonged rainfall deficit and can be expected to recur.

5.3 Salinity-Control Plan

FPL has reached an agreement with Miami-Dade County which includes the installation of a system of up to six wells to pump brackish water at a rate of up to 14 mgd from the Upper Floridan aquifer into the CCS. The design objective of this system is to reduce the average annual salinity in the CCS to approximately 34‰ within four years after installation of the system. The agreement with Miami-Dade County also includes remediation of the hypersaline part of the saltwater plume to the west of the CCS, potentially by pumping hypersaline water from the Biscayne aquifer into the Boulder Zone. Three issues of concern related to salinity control in the CCS are identified in this report.

Concern # 1: Pumping rate. The long-term addition of 14 mgd of brackish water from the Upper Floridan aquifer could be of insufficient volume and quality to compensate for the post-uprate evaporation-rainfall deficit that is currently around 29 mgd. This shortfall in pumping rate, if not adequately addressed in the design of the salinity-control system, would likely result in a continued steady increase in salinity within the CCS.

Concern # 2: Increased salinity flux. Adding 14 mgd or more of water to the CCS is likely to significantly increase the salinity flux out of the bottom of the CCS, at least in the short term. The extent to which this increased salinity flux will exacerbate salinity intrusion needs to be addressed.

Concern # 3: Time-frame. The time-frame required for the proposed system to significantly reduce salinity levels in the aquifer remains highly uncertain. Increased certainty is pending more definitive characterization of the subsurface hydrostratigraphy, and the development of a groundwater-flow model that accounts for density-driven flow, heat transport, and dissolved-solids transport in the portion of the Biscayne aquifer surrounding the CCS.

Model leveraging. Utilization of a variable-density groundwater-flow model is essential to accurately describe the flux of salinity into and out of the CCS, to estimate the time scale required for the proposed actions to take effect, and to account for the effects of pumping hypersaline water from the Biscayne aquifer into the Boulder Zone. The variable-density groundwater model that is being developed in support of the Biscayne Aquifer Recovery Well System (RWS) could possibly be adapted to further investigate the technical issues relating to the CCS salinity-control system that are identified here.

5.4 Pumping from the L-31E Canal

Pumping of up to 100 mgd from the L-31E Canal into the CCS is permitted between June 1 and November 30 during 2015 and 2016. Mass-balance modeling has shown that this level of pumping will likely raise the average water level in the CCS by around 0.5 ft, and since the historical water-level differences between the L-31E Canal and the CCS are also on the order of 0.5 ft, it is likely that there will be a significant reduction, or even reversal, of the historical seaward water-level gradient that would exist in the absence of pumping. It is even more likely that the water-level difference between the L-31E Canal and the CCS will be reduced below the 0.30-ft threshold that normally triggers the ID salinity-control system. Model results show a likely reversal of gradient under some circumstances, and a consequence of this reversal could be the advection of a saline plume from the CCS to the L-31E Canal which would cause in increase in the salinity in the L-31E Canal, which is undesirable since the L-31E Canal is regarded as a source of freshwater in its various environmental functions.

5.5 Recommended Action Items

Based on the aforementioned findings, the following action items should be considered:

- Develop a calibrated heat-balance model to simulate the thermal dynamics in the CCS. Essential additional measurements that are required to supplement the calibration of this model are synoptic measurements of volumetric flow rate through the power-generating units, intake temperature, and discharge temperature. Desirable additional measurements include synoptic measurements of the volumetric flow rate and temperature into and out of each CCS zone. The thermal model could be developed to simulate the effects of various supplementary cooling systems to support operation of the CCS.

- Continue efforts to increase the thermal efficiency of the CCS. Increasing the thermal efficiency of the CCS is a possible means to mitigate elevated temperatures caused by increased heat loading on the CCS. However the extent of mitigation that is possible is yet to be established.

- Develop a quantitative relationship for estimating algae concentrations as a function of temperature, salinity, and nutrient levels in the CCS. Such a relationship could be derived using data that is already being collected. The developed model could be useful in managing the CCS, since algae concentrations affect the heat balance and possibly the thermal efficiency of the CCS.

- Develop a locally validated relationship between the evaporation rate, water temperature, air temperature, wind speed, salinity, and algae concentrations in the CCS. This is justified since evaporation is the major cooling process in the CCS, and the evaporation model that is currently being used has a high uncertainty level. At present, a constant in the evaporation function is used as a calibration parameter in the salinity-balance model which is not a desirable circumstance given the importance of the evaporation process.

- Re-assess the effectiveness of pumping up to 14 mgd of brackish water from the Upper Floridan aquifer into the CCS with the objective of reducing the salinity in the CCS. Under present post-uprate operating conditions, a much higher pumping rate will likely be necessary, since post-uprate increases in CCS operating temperatures have increased the evaporation-rainfall deficit from around 19 mgd to around 29 mgd.

- Utilize a variable-density groundwater model to estimate the effectiveness and aquifer-response time scale of the proposed CCS salinity-control actions related to pumping 14 mgd or more from the Upper Floridan aquifer into the CCS.

- The operational protocol associated with the 2015 – 2016 permit for transferring up to 100 mgd from the L-31E Canal to the CCS should be modified to include: (1) measurement of water levels in the CCS to preclude a landward equivalent freshwater head gradient being developed, (2) specification of threshold water-level difference between the L-31E Canal and the CCS as a controlling factor in pump operations, and (3) monitoring of the salinity of the water in the L-31E Canal during pump operations to ensure that CCS water is not seeping into the L-31E Canal.

The recommendations made in this report are intended to facilitate the resolution of the outstanding operational issues related to the CCS. In particular, these recommendations will facilitate the design of robust engineered systems to control the temperature and salinity in the CCS, and control to some degree the extent of salinity intrusion associated with the operation of the CCS. All of the issues raised in this report can likely be resolved, with the goal of having sustainable power generation at the Turkey Point station.

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Appendices

A Response to FPL Comments

Author Comment: The author thanks FPL for providing feedback on the preliminary report. The comments and data provided by FPL were taken into consideration in the preparation of this final report. As explained subsequently in this response, most of the data and commentary provided by FPL reinforces the findings and recommendations contained in the preliminary report. The author encourages FPL to give serious consideration to several recommended actions contained in this final report.

General Comments

FPL Comment: We note that Dr. Chin's review was limited by the lack of any direct interaction with FPL engineers and scientists, or the body of data that has been developed to characterize and understand the various forces in action within the system.

Author Response: The author respectfully disagrees with the above statement. A preliminary form of this report was publicly disseminated, and FPL was formally invited to provide comments and any additional data of their choice. All comments and additional data submitted by FPL were considered in the preparation of this final report. Following this protocol, this final report does not lack direct interaction with FPL and is not limited by lack of FPL input. In conducting scientific and engineering studies that affect a variety of public interests, it is common professional practice to develop a preliminary report based on available data before disseminating the preliminary report and inviting comments and input from stakeholders; this practice was followed here. For preparation of the preliminary report, the Miami-Dade County Division of Environmental Resources Management (DERM) provided the author with an extensive amount of documentation and data that had been compiled by FPL and submitted to regulatory agencies including DERM and the South Florida Water Management District (SFWMD). These data and documentation were used in the preparation of the preliminary report, and additional data provided by stakeholders (including FPL) were also taken into consideration in the preparation of the final report. In their response to the preliminary report, FPL does not contest the accuracy of any of the data used in this study. Although more data has been collected by FPL, beyond that used in this study, the data used in this study was of sufficient length to provide a good understanding of the "various forces in action (sic) within the system." FPL has not provided any additional data that changes the fundamental understanding of the driving forces in the CCS. This latter assertion is discussed in more detail in subsequent sections of this response.

FPL Comment: "Not unexpectedly some of the assumptions employed by Dr. Chin are not consistent with our observations or practical limitations. Moreover, we regret that Dr. Chin's work does not reflect the significant results of FPLs concerted efforts undertaken in 2014 and 2015 to address degraded water quality."

Author Response: The author respectfully disagrees with the above statement. FPL states that "some of the assumptions employed by Dr. Chin are not consistent with our observations or practical limitations," and yet does not state what assumptions they are referring to and what are the observations and practical limitations that are not consistent with the assumptions made in the preliminary report. Therefore, the FPL statement is simply unsubstantiated. A review of FPL's Technical Addendum included with their response to the preliminary report indicates that FPL's statement might have resulted from their misunderstanding of some of the material in the preliminary report, and the author has endeavored to provide increased clarity in this final report. The author recognizes that FPL has done additional work and has acquired additional data beyond the data used in the present study. However, FPL has not presented any additional data that contradicts or changes any of the key findings that were contained in the preliminary report.

FPL Comment on Recommendation 1: Heat balance models are a useful tool that have been used to inform the original design and subsequent changes to system operation and remain an important part of CCS management. It is important that these models be informed with actual system data and observations of the full range of system operations, and with an appreciation for the wide range of water quality, flow distribution, and ambient conditions that affect the heat balance. Importantly, these models have been the basis of regulatory review and direction provided for system operation. Review of the system operational experience through the summer of 2015 confirms that actions taken to restore water quality and system flow have stabilized the thermal operation of the system.

Author Response: FPL states that "Heat balance models are a useful tool that have been used to inform the original design and subsequent changes to system operation and remain an important part of CCS management," yet, there is no documentation cited by FPL, no documentation submitted to regulatory agencies and made available to the author, and no documentation in the public domain that could be found by the author of any heat-balance model currently being used in the management of the CCS, particularly to guide temperature-control measures in the CCS. Any heat-balance model that is currently being used by FPL to assist in the management of the CCS should be made available to the public and outside professionals for peer review and comment. Utilization of such a model would likely have shown that algae blooms in the CCS were not of sufficient magnitude to have been the prime cause of elevated temperatures in the CCS. With this knowledge, FPL might not have made statements to regulatory agencies and the public that elevated algae concentrations were primarily responsible for elevated temperature levels in the CCS, and FPL might have been able to focus on the actual cause of elevated temperatures in the CCS. Therefore, in the absence of any documentation of a FPL heat-balance model that is being used to manage the CCS, the author stands by the recommendation that FPL should develop a calibrated heat balance model to simulate the thermal dynamics in the CCS, and collect the data necessary to calibrate and validate this model. Such a model would likely improve management of the CCS.

FPL Comment on Recommendation 2: There have been multiple reviews over the past 18 months that have identified the causative factors for the decline in thermal efficiency of the CCS. Additionally, the factors have been reviewed in three related DOAH administrative hearings, and testimony before the NRC. These factors have been confirmed, as identified by the recovery of system thermal efficiency and water quality through actions taken in late 2014 and 2015. Future actions are directed by continuing to validate and address these causative factors.

Author Response: FPL's future actions to validate and address the causative factors for the decline in thermal efficiency of the CCS are in support of Recommendation 2 in the report. Data provided by FPL that were derived from their latest efforts to improve the thermal efficiency of the CCS are plotted in Figure 12 of this final report. These data show that the thermal efficiency of the CCS under current conditions remains significantly below the thermal efficiency of the CCS under per-uprate (before Februrary 2012) conditions. Therefore, based on these data, although FPL has made some progress in improving the thermal efficiency of the CCS, the thermal efficiency has not "recovered" to pre-uprate levels and in fact remains significantly below pre-uprate levels.

FPL Comment on Recommendation 3: FPL continues a detailed data monitoring program to characterize the status and behavior of the ecology of the CCS system. This information will enable development of a longer term solution, which may include re-establishing natural filtration through managed vegetation in the system.

Author Response: FPL's data monitoring program to characterize the status and behavior of the ecology of the CCS is partially consistent with the report recommendation. However, to date FPL has not documented any quantitative relationships for estimating algae concentrations in the CCS as a function of temperature, salinity and nutrient levels. Development of such quantitative relationships, as recommended in the final report, could further assist FPL in the effective management of algae concentrations in the CCS. Furthermore, comparative evaluation of the developed relationships with published data from other sites would provide valuable technical validation and guidance to the efforts of FPL.

FPL Comment on Recommendation 4: The salt/water balance model provides a serviceable and validated tool to address the salinity objective identified in this recommendation. The model has been reviewed through regulatory processes and accepted for use in developing predictions of CCS behavior under various future scenarios. Algae and nutrient concentrations are being monitored through the efforts described above, and are the focus of longer term efforts.

Author Response: Recommendation 4 suggests that FPL develop a validated relationship between evaporation rate, water temperature, air temperature, wind speed, salinity, and algae concentrations in the CCS. The basis for this recommendation is that the evaporation process is separately measurable and is central to the management of the CCS for both temperature and salinity control. The evaporation model that is currently embedded in the salt/water balance model is unvalidated, and there is no evidence that this model yields accurate estimates of evaporation from the CCS. The fact that evaporation is adjusted during calibration of a salt/water balance model that also includes several other key unvalidated seepage process equations and associated calibration parameters (viz. hydraulic conductivities) does not validate the evaporation process equation. For example, other functional forms of the evaporation model and other functional forms of the seepage process equations with other calibration constants could provide comparable performance of the salt/water balance model. The primary importance of the evaporation process in the thermal management of the CCS and the practicality of validating the evaporation model separately are the key bases for the recommendation provided in the final report. Furthermore, having a separately validated evaporation model embedded in the salt/water balance model would provide an opportunity to improve the certainty with which the seepage processes are quantified in the salt/water balance model, and provide a more useful tool for managing and quantifying the water fluxes into and out of the CCS.

FPL Comment on Recommendation 5: The 2015 activities associated with the L-31E canal will be the subject of an After Action report by the SFWMD. This report will document the actual pumping history experienced through 2015 and make recommendations for modifications, as deemed necessary. FPL and Miami-Dade County Department of Environmental Resource Management will continue to review system operations to determine consistency with the objectives and requirements of the Consent Agreement. Any revisions to protocols warranted can be accommodated through this vehicle.

Author Response: Recommendation 5 is consistent with the preparation of the After Action report by the SFWMD. The intent of Recommendation 5 is to ensure that future actions (which might deviate from past actions) have sufficient safeguards to protect against negative and unintended environmental impacts that might not have occurred in the past.

Technical Addendum

FPL Comment, #1 Temperature in the CCS: The review apparently relies on a limited data set (2010–2014), and considers no other causative factors for an increase in average CCS temperature.

Author Response: The above statement is simply false. The report extensively documents the development of a heat balance model of the CCS and the report quantifies all of the heat sources and sinks of thermal energy in the CCS. Causative factors explicitly considered in the study include: algae in the CCS, variations in atmospheric temperature, variations in evaporation, and variations in rainfall.

FPL's observations have concluded that the temporal increase in average CCS temperature in 2014 was the result of a series of events that degraded CCS water quality and negatively affected the heat exchange capacity of the CCS.

Author Response: FPL has not produced any data or analyses showing that degraded water quality in the CCS has been responsible for increased temperatures in the CCS.

Key factors contributing to the CCS degradation were:

- Lower than average precipitation into the CCS during 2011 through early 2014 established a deficit of rainfall and reduced stage levels in the system. See Figure 1.

  Author Response: Figure 1 that is cited by FPL is simply a plot of evaporation minus rainfall which correlates to increased salinity in the CCS. However, Figure 1 does not show a reduction in CCS stage nor does it imply that the stage in the CCS is reduced since the evaporation-rainfall deficit is made up by inflowing groundwater mostly originating from Biscayne Bay (i.e., the East side of the CCS). Therefore, Figure 1 does not relate to temperature changes in the CCS. The heat-balance model used in this study uses a daily time step, and the model assumes that on any given day the heat added to the CCS (by the power-generating units, solar radiation, and atmospheric longwave radiation) is equal to heat loss from the CCS (by evaporation and longwave radiation). It is assumed that heat storage due to stage changes on any given day is small relative to the other heat-flux terms. Since daily stage changes are typically less than 2% of the local CCS depth, the assumption of a relatively small change in heat storage over sub-daily time scales within the CCS is justified.

- Beginning in 2010 Unit 2 was secured, along with its circulation water pumps, which provided approximately 17% of design CCS flow. Uprate outages required securing circulating water pumps for Units 3 and 4, sequentially, over a 17-month period beginning in January 2012 and ending in May 2013. This reduced the circulation to approximately 50% of the design flow for a period of approximately 16 months. Reduction of flow had two affects: (1) reduced flow velocities allowed increased deposition of sediments from the water column (preferentially, at the northern end of the system), and (2) higher head levels in the eastern return canals inhibiting the historic inflow of saline groundwater into the CCS based on relative tidal fluctuations.

Author Response: FPL has not provided any data or scientific analyses to show that either increased sediment deposition or higher stages in the eastern return canals have any significant effect on the temperature in the CCS. The effect of reduced seepage inflows on the heat budget is likely to be minimal. If the anomalous period with reduced CCS circulation (January 2012 – May 2013) were excluded from the heat-budget analysis, this would not affect the conclusion that the post-uprate heat rejection rate to the CCS is significantly higher than the pre-uprate heat-rejection rate. This assertion is apparent from Figure 8 of this report, which shows that the heat-rejection rate prior to January 2012 is approximately the same as that asserted for the entire Period 1, and the anomalous flow period (January 2012 – May 2013) does not overlap with Period 2. Consequently, the asserted pre- and post-uprate heat-rejection rates would be approximately the same if the anomalous flow period were excluded from the analysis, and hence inclusion of the anomalous flow period does not significantly affect the heat-budget analysis and the derived conclusions.

- Observations of CCS water quality during June 2012 noted a significant increase in turbidity and algae concentration, which was reduced upon receiving seasonal rainfall and cooler ambient temperatures in the fall of 2012. Following the dry season of 2013, CCS water quality was once again degraded, with observations of high turbidity. Below average rainfall throughout the remainder of the year contributed to increasing salinity in the CCS.

Author Response: The effects of increased turbidity and algae concentrations were taken into account in the heat-balance model by reducing the albedo to zero, which is the most extreme case in which the turbidity is so high that all of the solar radiation is absorbed. The assumption of extreme turbidity has a minimal impact on the heat balance, so it is reasonable to conclude that increased turbidity and algae concentrations were not responsible for the significant temperature increases in the CCS. Increased salinity is linked to increased temperature, since the specific heat of water decreases with increasing salinity. However, the decrease in specific heat between a salinity of 75‰ and 100‰ is only around 3%, which means that the error in assuming a constant specific heat (corresponding to a salinity of 75‰) produces a maximum error of around 3% in the predicted temperature change, which is small compared with the observed temperature changes.

- In late 2013 and early 2014, salinity increased above historically observed peak levels. High turbidity and algae concentrations were observed out of the normal seasonal occurrences. Significant rainfall did not begin until mid-July 2014. Significant canal blockages in the upper segments of the CCS were observed, particularly during periods of low stage levels prior to rainfall. See Figure 2.

> Author Response: Figure 2 provided by FPL is a plot that simply shows the salinity, turbidity, and algae concentrations increasing primarily between June 2013 and September 2014. These changes were taken into account in the heat balance model as described in the previous response.

- A review of CCS heat exchange efficiency shows a decrease from a historic level of 75% efficiency to 65% in early 2013 followed by a decrease to 55% in early 2014. Significant blockages and sediment levels were noted, principally in the northern segments of the CCS. See Figure 3.

> Author Response: Figure 3 provided by FPL shows a decrease in thermal efficiency between the pre-uprate and post-uprate time periods. The data shown in Figure 3 confirm the reported decrease in thermal efficiency contained in both the preliminary report and this final report. FPL indicates that significant blockages and sediment levels might be responsible for the decreased thermal efficiency, however, no data or analyses were provided to support this assertion. Whereas it seems reasonable to assert that blockages in the CCS are at least partially responsible for the reduced thermal efficiency in the CCS, it is equally reasonable to assert that increased temperatures in the CCS (due to increase power input from the power plant) is partially responsible for reduced thermal efficiency. The relative impacts of blockages and increased CCS temperature on thermal efficiency have not been analyzed by FPL, and therefore the extent to which removal of blockages will contribute to reduced temperatures in the CCS has not been addressed by FPL.

- Elevated temperatures in the CCS approached the Ultimate Heat Sink (UHS) Technical Specification limit of 100°F, requiring multiple power reductions to maintain compliance in the summer of 2014. The UHS Technical Specification limit was subsequently amended to 104°F.

> Author Response: The above statement is reflected in both the preliminary and final report. This statement does not relate to the cause of increased temperatures in the CCS.

- Sediment removal was conducted March through October 2015 to redistribute flow and recover design depths in portions of Section 3 and Section 1. Aerial thermography comparing August 2014 vs August 2015 conditions confirm improved cooling and flow distribution in the system. CCS heat exchange efficiency improved to approximately 65% in August 2015. This is in spite of the fact that five of the canal segments were blocked for sediment maintenance activities during this period. See Figure 4.

> Author Response: Even with an improvement of the thermal efficiency to 65%, the thermal efficiency of the CCS in the post-uprate period is still significantly below the average thermal efficiency of 77% based on measurements during the pre-uprate period. Figure 4 provided by FPL shows thermographs of temperatures on two particular days in 2014 (6/29/14) and 2015 (9/10/15), where there is obviously more cooling on 9/10/15 compared to 6/29/14. These two snapshot thermographs lend support to the hypothesis that removal of blockages improves cooling in the CCS. However, the extent to which these two snapshots represent longer-term improved

thermal efficiency cannot be determined. Multiple snapshots taken at regular time intervals (e.g., monthly) would be more useful in this regard, particularly since the latest thermal-efficiency analyses provided by FPL show that thermal efficiencies are still significantly below pre-uprate levels. It should also be noted that assessment of thermal efficiency from the thermographs provided by FPL is not possible, since the ambient temperatures of the given dates were not provided.

FPL Conclusion: The combined effect of multiple factors impacted water quality and heat exchange effectiveness to result in elevated CCS temperatures during the summer of 2014. Sediment removal activities in 2015 established improved heat exchange efficiency that reduced CCS temperatures during the summer of 2015, despite continued high salinity (average of 95 PSU) and degraded water quality. Units 3 and 4 operated continuously through the summer of 2015 with a maximum intake temperature of 98.5°F.

Author Response: For FPL to simply state that elevated CCS temperatures were the result of degraded water quality and reduced heat-exchange effectiveness without providing any supporting data and quantitative analyses is rather unscientific. Such an approach points to the urgent need for FPL to develop a validated heat-balance model to support effective management of the CCS. FPL states that sediment removal activities in 2015 established improved heat exchange efficiency that reduced CCS temperatures. However, reduced temperatures in the CCS could have been mostly due to reduced power generation and minimally influenced by sediment removal activities. The author urges FPL to perform a more complete scientific investigation of the performance of the CCS and the impact of increase thermal efficiency on the temperatures in the CCS. It is entirely plausible that FPL could be successful in significantly improving the thermal efficiency of the CCS, while at the same time post-uprate temperatures continue to exceed pre-uprate temperatures. The reason for such an occurrence is that the achievement of increased thermal efficiency in the CCS is insufficient to compensate for the increased thermal loading resulting from increased heat rejection from the power plant during the post-uprate period. For improved thermal efficiency to maintain temperatures at pre-uprate levels, the post-uprate thermal efficiency would have to significantly exceed the pre-uprate thermal efficiency. To date, there has been no data or analyses provided to indicate that this is possible, and the post-uprate thermal efficiency remains below pre-uprate levels.

FPL Comment, #2 - Quantitative Effects of Water Input (Section 4.2): The discussion of the impacts of L-31E water temperature and salinity are based on unrealistic and incorrect assumptions that are inconsistent with the observations at site. For example:

- For the calculations, the focus is on the impacts of added L-31E canal water and disregards the variations that come from groundwater exchange and ambient weather conditions (rainfall, evaporation rates, etc.). These factors tend to be significant and more influential than the impacts being hypothetically calculated.

  Author Response: The author respectfully disagrees with FPL's statement that the analysis of impacts of L-31E water on temperature and salinity as described in Section 4.2 are based on unrealistic and incorrect assumptions. It appears that FPL has misinterpreted the intent of this section of the report. The intent of this section is simply to isolate the temperature and salinity effects of pumping water from the L-31E Canal into the CCS. Therefore temperature and salinity changes caused by other processes are purposely not taken into account in this section. This

> section of the report is not intended to be nor presented as a model of how the CCS will respond to water pumped from CCS over the long term (viz. months), it is just intended to illustrate the isolated impact of pumped water on temperature and salinity. Over the short term (viz. days) other effects on CCS temperature and salinity might be small and the effects of pumped water on temperature and salinity provided in this section could give a fair indication of the response of the CCS.

- The calculation assumes a 100 MGD rate of addition for over 170 days. The average daily volume during pumping operations was approximately 30 MGD. The period of active pumping began August 27, 2015 and ceased November 30, 2015–a period of 94 days. These events occurred during periods of significant rainfall, whose volumetric contributions were the predominant influence on CCS temperature and salinity during this period.

> Author Response: The objective of the present study, as requested by DERM, was to "examine the effects of extracting up to 100 mgd of water from the L-31E Canal." Therefore, the calculations in this section are provided only as an example and are intended to present the maximum impact of pumping water from the L-31E Canal into the CCS. The duration of the pumping is also given as an example and is not intended to show the actual duration of pumping, but rather the duration of pumping that would be required for the temperature or salinity to reach an asymptotic value. The simple hypothetical example presented here is not an attempt to replicate the pumping that occurred in 2015 and assumes a period of no rainfall during pumping operations.

- In FPLs experience, L-31E water provided an input of approximately 28 MGD (or 0.6% of system volume per day) at an average temperature of 80°F. The temperature impact of this water would be less than 0.2°F degrees each day, calculable but likely not measurable.

> Author Response: The author does not contest this statement, and this statement does not contradict any statement in the report.

- While FPL believes that a potential benefit of adding water is a reduction in CCS water temperature, as the report states, added water is significantly more effective at reducing CCS salinity. As the report later states, evaporation is a notably more effective means of cooling than added water. Whereas the report identifies occasions where water added to the CCS (i.e. L-31E, precipitation) has appeared to produce significant reductions in CCS water temperature, FPL wishes to identify potential inaccuracies in the cited events:

  - The report suggests that the water temperature of the CCS dropped by 6.5°F during the fall 2014 pumping of L-31E water into the CCS. However, based on uprate monitoring data, the average CCS temperature decreased from 92.8°F (September 25) to 91.4°F (October 15), a total reduction of 1.4°F.

    > Author Response: The author respectfully disagrees with the statement made by FPL. The text of the Emergency Final Order (SFWMD, 2015) explicitly states that "During the term of the fall 2014 Emergency Order, the temperature of the water in the CCS dropped 6.5°F." Therefore, the statement made in the report is consistent with the understanding of the South Florida Water Management District. FPL states here that the average CCS temperature decreased from 92.8°F (September 25) to 91.4°F (October 15), a total reduction of

> 1.4°F. This statement is not contradicted in the report and does not affect the statements and conclusions in the report.

- The report concludes that the average temperature of the CCS dropped from 98.2°F on April 27, 2015 to 81.3°F on April 28, 2015 (a reduction by 16.9°F in one day) due to a rainfall event that occurred in that 2-day timeframe. Based on uprate monitoring data, the average temperatures for April 27 and 28, 2015 were 97.9°F and 96.8°F, respectively. The average water temperature on April 29 did drop to 90.0°F, a reduction of 6.8 degrees in one day. This reduction is likely due to a number of factors, including an approximately 5-inch rainfall on April 29 and a drop in air temperature of a similar magnitude.

> Author Response: The author respectfully disagrees with the inference made by FPL. The text of the Emergency Final Order (SFWMD, 2015) explicitly states that "On April 27, 2015, the temperature of the CCS reached 98.2°F. A large rainfall event occurred over the CCS between April 27 and 28, 2014. The addition of freshwater inflow from rainfall reduced the temperature of the water in the CCS to 81.3°F." Therefore, the statement made in the report is consistent with the understanding of the South Florida Water Management District. To avoid any ambiguity, the statement in the report has been changed to be exactly the same as stated in SFWMD (2015).

Conclusion: The discussion of quantitative effects of L-31E water fail to recognize the actual experience and environment, and therefore overstate the impacts of this activity.

- The report notes that pumping from the Interceptor Ditch (ID) has produced increases in the stage of the CCS. FPL is not cognizant of data that demonstrate a relationship between ID pumping and CCS stage in an absolute or relative sense. Due to the complex nature of inflows and outflows of water from the CCS, it is impossible to isolate the effect of water additions from water additions from the ID on CCS stage.

> Author Response: The author finds this statement by FPL to be very surprising, given that such data is routinely collected, analyzed, and reported subsequent to ID operation. There are multiple data collected by FPL contractors showing that when the ID system is operational and there is no rainfall the stage in the CCS increases, sometimes increasing above the state in the L-31E Canal. Such data and associated analyses relating ID pumpage, L-31E Canal stage, and CCS stage can be found, for example, in the following documents produced by FPL contractors: Golder (2008) and Ecology and Environment, Inc. (2012c). This responsive increase in the CCS stage when the ID pumps are operating would most likely be due to ID-pump operation, since they could not reasonably be caused by net seepage inflows as would be shown by FPL's own water-balance model.

- The report notes that "In October 2015...FPL reached an agreement with Miami-Dade County which includes construction and operation of six wells that would pump water from the CCS into the Boulder Zone of the Floridan aquifer so as to reduce the salinity in the CCS". The agreement between FPL and Miami-Dade County includes the design a system to pump low salinity Floridan aquifer water into the CCS via six wells for the purpose of salinity reduction. In addition, FPL has agreed to remediate the hypersaline part of the plume to the west of the CCS, potentially by pumping water from the Biscayne aquifer and injecting into the Boulder Zone.

Author Response: The author thanks FPL for this correction. During preparation of the preliminary report, the author was not provided any information on the agreement between Miami-Dade County and FPL, so the author relied on media accounts that were repeated in the preliminary report. The media accounts were apparently incorrect. The text in the report has been changed, and the replacement text in the final report is as follows: "In October 2015, in response to chloride levels in the Biscayne aquifer exceeding water-quality standards as a result of the high salinities in the CCS, FPL reached an agreement with Miami-Dade County which includes the design of a system of up to six wells to pump low-salinity water from the Floridan aquifer into the CCS to reduce salinity levels in the CCS. In addition, FPL agreed to remediate the hypersaline part of the saltwater plume to the west of the CCS, potentially by pumping hypersaline water from the Biscayne aquifer into the Boulder Zone." Subsequent to the dissemination of the preliminary report and during preparation of this final report, DERM provided the author with a copy of the Consent Agreement between FPL and Miami-Dade County relating to salinity control in the CCS and remediation of the hypersaline plume in the Biscayne aquifer. The content of this Consent Agreement is reflected in the analyses presented in this final report.

- The report states that a unit volume of evaporated water would cause a 50 times greater temperature decrease than a unit volume of added water. This means that the average 39 MGD of evaporation reduces temperature approximately 50 times the 6.8°F that is attributed (earlier in the report) to the average 43.5 MGD of L-31E water added during fall 2014. In theory, FPL agrees with the relative effectiveness of evaporation at cooling water. As such, FPL believes that comments elsewhere in the report pertaining to the cooling effects of added water to the CCS are overstated.

Author Response: FPL's interpretation of the statements in the report is grossly incorrect and taken out of context. The heat extracted from the CCS at an evaporation rate of 39 mgd is supplied by multiple sources that include solar energy and heat from the power-generating units. Hence, the latent heat of evaporation does not directly translate into a proportional decrease in temperature, but rather the heat demand of evaporation is buffered by the aforementioned heat sources.

FPL Comment, #3 - Application of Model Results (pg. 39): The review improperly characterizes that "...the primary motivation for pumping from the L-31E is actually to reduce temperature." At best this statement is an oversimplification. The input of L-31E water was conducted primarily to reduce CCS salinity by making up for evaporative losses and diluting the existing CCS salinity. This allowed for improved water quality and therefore more efficient heat exchange operation. Input of L-31E water can only occur during periods of coincident rainfall.

Author Response: The author respectfully disagrees with the above statement. The primary motivation for short-term pumping, as it relates to the public interest and the involvement of DERM and SFWMD, is that the FPL plant is not forced to shut down the nuclear-power generating units, which would deprive a significant number of FPL customers of electricity. Curtailment of nuclear-power generation is required as a result of high temperatures in the CCS, and is not required as a result of high salinities in the CCS. FPL appears to be asserting that high salinities are responsible for high temperatures, and therefore salinity reduction is the primary motivation for pumping water from the L-31E Canal. In fact, the reduction of CCS temperature by mixing colder water from the L-31E Canal with warmer water from the CCS is the "primary motivation" for pumping water from the L-31E Canal into the CCS. There is no scientific data or analyses to support the assertion that focusing on salinity reduction to improve heat exchange would be a reasonable tactic in this circumstance.

With regard to the heat balance and unit operations, the following is noted.

- Following the approval of the uprate, but prior to its execution, FPL made the decision to decommission Unit 2. Calculations have been conducted to illustrate the pre- and post-uprate maximum thermal capacity provided by operating units at the Turkey Point site. While Unit 3 and 4 electric capacity was increased by 225 MW as a result of the uprates, Unit 2 was decommissioned removing 400 MW of electric capacity. The resultant net change in thermal heat rejection capacity to the CCS was a decrease of approximately 4%. (See FPLs NRC ASLB testimony, Exhibit FPL 008, November 11, 2015).

Author Response: The author respectfully asserts that the above statement is grossly misleading. This statement, which has been made in key testimony and in the public square, implies that since the capacity of the generating units has decreased in the post-uprate period then increased power generation could not be responsible for increased temperatures in the CCS. This is simply not true. In fact, actual power generation has increased during the post-uprate period (at least in 2014 for which data is available to the author). In addition, FPL should acknowledge that switching 1 MW of power-generation capacity from a backup fossil-fuel plant (Unit 2) to 1 MW of capacity in a base-load nuclear power plant (Units 3 and 4) increases the heat rejection rate significantly for several reasons: (1) heat that used to be rejected with flue gas through stacks is now rejected into the CCS, (2) base-load units generate waste-heat most of the time, while backup units generate waste heat sporadically, and (3) Unit 2 has apparently been out of service since 2010, so the power-generating capacity serviced by the CCS in the post-uprate period is in fact greater than the immediate pre-uprate capacity serviced by the CCS. In addition to all of these facts, actual power-generation data plotted in Figure 9 of this report show unequivocally that power generation in post-uprate period was greater than power generation in the pre-uprate period.

FPL Comment, #4 - Impacts to Adjacent Water Bodies:

- Between August 27 and November 30, 2015, FPL conducted near-sustained pumping from L-31E into the CCS (approximately 30 MGD). During this time, there was no evidence of increasing salinity within even the deepest portions of L-31E adjacent to the CCS. A figure is provided that illustrates the daily averaged salinities in L-31E in the bottom sensors at stations TPSWC-1 and TPSWC-2. Inspection of this figure reveals that there is no notable increase in L-31E salinity (orange and blue lines) beyond the natural fluctuations over the prior year, between late-August and the end of November. See Figure 5.

Author Response: FPL has misinterpreted the statement in the report, which identifies the possibility of salinity increases in the L-31E Canal due to sustained pumping 100 mgd from the

L-31E Canal into the CCS. The fact that salinity increases were not observed during the previous pumping of 30 mgd does not preclude the possibility of the cited occurrence in the future.

- The seasonal inland movement of saltwater noted in the report (7.5 miles during the dry season, 1 mile during the wet season for 0.5 ft increase in CCS water levels) suggests a maximum rate of migration of 7.5 miles per 180 days (220 ft per day). This rate is significantly higher than and inconsistent with tritium-based estimates of saltwater wedge movement (400 to 500 ft per year).

Author Response: FPL has misinterpreted the statement in the report, which simply re-states previous predictions of salinity intrusion under a particular circumstance (0.5 ft increase in CCS water level). These predictions were made by engineers several years ago. FPL has also misinterpreted the meaning of the salinity intrusion predictions cited. The predictions refer to the equilibrium position of the saltwater front; there is no implication as to the rate of movement of the saltwater front as interpreted by FPL.

- While increased salinity in the CCS can contribute to increased saltwater intrusion within the Biscayne aquifer, as the report concludes, it is also true that periods of increased CCS salinity are generally coupled with depressed water levels within the CCS. These periods of time are generally characterized by predominant groundwater inflow to (and reduced seepage to Biscayne aquifer from) the CCS.

Author Response: This above analysis provided by FPL is incomplete and misleading. FPL has not produced any data or analyses to show that elevated salinities in the CCS are generally coupled with depressed stages in the CCS. This assertion is in fact not supported by available data. The report shows that salinities in the CCS have been steadily increasing over time, whereas it is clear that CCS stages have not been steadily decreasing over time. Over the shorter term, stages in the CCS roughly follow the stages in the surrounding aquifer, with stages in the CCS and surrounding aquifer both being lower in the dry season, and both being higher in the wet season. Since seepage inflow is related to the difference between the water level in the CCS and the water-table elevation in the surrounding aquifer, one cannot generally conclude that this difference is lesser under particular seasonal conditions within the CCS. Groundwater inflow and outflow from the CCS is governed by the relative elevation of water-table in the surrounding aquifer compared with the elevation of the water surface in the CCS. Since both the water-table in the surrounding aquifer and the elevation of the water surface in the CCS are likely to be simultaneously depressed (e.g., in the dry season) then one cannot generally associate depressed water levels in the CCS with increased groundwater inflow to the CCS as implied by FPL.

FPL Comment, #5 - Algae in the CCS:

- The statement by SFWMD that algaecide is ineffective at reducing algae concentrations in the CCS is contradicted by observed relationships between algaecide concentrations and algae concentrations. Dr. Chin illustrates this conclusion reasonably well in his report.

- The report speculates on the application of a $CuSO_4$-based algaecide between May 31, 2015 and November 13, 2015. FPL would like to clarify that no such algaecide was applied during this time. The decreasing trend in algae concentrations during this time are likely attributable to salinity concentrations exceeding 70 ppt. The particular algae observed in the CCS during this timeframe are not ideally suited to growing and surviving in water with salinity exceeding 70 ppt.

Author Response: The speculation on the application of a $CuSO_4$-based algaecide between May 31, 2015 and November 13, 2015 was inferred from monitoring data that showed elevated SO_4^{2-} levels during the period cited. However, in the light of the additional information provided by FPL, the text in the preliminary report has been modified in the final report, and the revised text is as follows: "The algaecide commonly used in the CCS is $CuSO_4$, and the possible effectiveness of this algaecide can be seen by plotting the relationship between Chl$a$ and sulfate (SO_4^{2-}) concentrations; this relationship is shown in Figure 2. It is apparent from Figure 2 that algae concentrations decrease significantly with increasing concentrations SO_4^{2-}, indicating that the addition of an algaecide is an effective means of reducing algae concentrations in the CCS. However, according to FPL (see Appendix A), no algaecide was applied during the period covered by Figures 1 and 2, and so the SO_4^{2-} apparently acting as an algaecide could be the residual from previous $CuSO_4$ applications. FPL has suggested an alternative hypothesis that the decreasing trend in algae concentrations during this time is attributable to salinity concentrations exceeding 70‰, since the particular algae species observed in the CCS during this time frame was not ideally suited to growing and surviving in water with salinity exceeding 70‰. Collectively, the anomalous results described here should provide a strong motivation for FPL to use measured data to develop a functional relationship between algae concentrations and the influencing independent variables of temperature, salinity, total phosphorus, and algaecide concentrations. Such a functional relationship could provide useful guidance for the control of algae within the CCS. However, it should generally be kept in mind that Chl$a$ reductions caused by any algaecide are necessarily only temporary, since the natural factors causing high levels of Chl$a$ (i.e., S, T, and TP) remain at elevated levels within the CCS."

FPL Comment, #6 - CCS Salinity:

- While the differential between evaporation and precipitation is a cause for continuing increases in salinity, as the report states, data show that evaporation is greater than precipitation during periods of relatively steady and decreasing trends in salinity (See the 2004 to 2013 timeframe in report Figure 10). For example, between June 1 and August 31, 2012 (pre-uprate period), cumulative evaporation exceeded cumulative precipitation by more than 200 MG; yet, average CCS salinity decreased by more than 6 ppt during this timeframe.

Author Response: The main point in the report is that over the long term the fact that evaporation exceeds rainfall is the primary cause for the upward trend in CCS salinity. The report also makes clear that over the short term seepage flows and ID pumpage can influence salinity levels in the CCS. In this regard, the report does not contradict the above statement made by FPL.

- In addition to evaporation and precipitation, there are other factors that affect the balance of salt in the CCS, as illustrated in the water and salt balance model. Salinity moderating factors include CCS water seepage to groundwater, inflow of lower salinity groundwater into the CCS, and additional water sources.

Author Response: See previous response.

- According to the most recent calibrated water and salt balance model (which simulates from September 2010 through November 2015), evaporation is, on average, approximately twice precipitation. During this this timeframe, the CCS has experienced periods of increasing, decreasing and relatively steady salinity.

> Author Response: See previous response.

FPL Comment, #7 - Inaccuracies Regarding the CCS:

- Card Sound Canal is not a part of the Cooling Canal System. Perhaps the author is referring to the Grand Canal.

> Author Response: Yes, this is a typographical error. "Card Sound" has been changed to "Grand."

- The report notes that typical CCS stage elevations (NGVD 29) near the discharge, CCS southern canal, and intake locations are 2.04 ft, 0.76 ft, and −0.77 ft, respectively. Based on uprate monitoring data, the average stage elevations (NGVD 29) near the discharge, CCS southern canal, and intake locations during pre-Uprate, Interim, and post-Uprate periods are summarized in the table below. These values appear to be inconsistent with the stages stated in the report, and are indicative of a CCS with a lower stage at the discharge location (lower seepage rate to groundwater) and a more moderate hydraulic gradient across the CCS (lower canal flow rate, increased water travel time through the CCS, and increased opportunity for water cooling). See Table 1.

> Author Response: The cited stages in the preliminary report were the same as those stated by Lyerly (1998), a FPL contractor, in a report on the thermal performance of the CCS. Therefore, any inaccuracies in these data can be attributed to Lyerly (1998). Nevertheless, the author assumes that the stages reported in the above comment by FPL are more authoritative, and so the stages in question have been changed in the final report. The revised text in the report now reads as follows: "Under current operating conditions, typical water surface elevations in the CCS are 1.48 ft NGVD at the discharge location, 0.95 ft NGVD at the south end, and 0.70 ft NGVD at the intake location (see Appendix A)."

B Response to SACE Comments

> Author Comment: The author thanks the Southern Alliance for Clean Energy (SACE) for providing feedback on the preliminary report. The comments provided by SACE were taken into consideration in the preparation of the final report.

Cover-Letter Comments

SACE Comment: To complement and strengthen the basis of the report with additional data, SACE believes that it is important to expand the scope to include all new available information such as work from William Nuttle and baseline studies of the underlying geology of the area. As well as ensuring that Mr. Chin consult some older reliable reports to help him inform and support his analysis. There are some key reports missing from the references that were cited as well.

Author Response: The study was initiated in fall 2015 and lasted 120 days. The scope of the study was specified by the Miami-Dade County Commission, and the database for the study was that made available by DERM. Publications by Nuttle were not available to the author during the preparation of the preliminary report, and were not in the open technical literature. However, Nuttle's publications were subsequently made available to the author via DERM and were considered and referenced in the final report. The documents and data provided to the author by DERM was extensive and covered mostly up to the end of 2014. Many reports and data files were referred to during the study to gain an understanding of the CCS and the surrounding environment. The reports reviewed included many relating to the subsurface geology, and the author believes that this geology is adequately summarized in the final report at a level that is commensurate with the scope of this study. Additional data considered in the preparation of the final report was provided by FPL subsequent to their review of the preliminary report. All references cited in the final report are listed in the Bibliography, however, these references are limited to those from which either data or factual information was derived in the preparation of the final report.

SACE Comment: In addition, to the extent the report relied upon data provided by Florida Power and Light, Inc. (FPL) the owner and operator of the CSS, that data should be independently verified. We would not want anyone to assume that information now becomes factual just because it is now cited here. We know for example the water budget has at least a 30% error associated with it and that normal background levels of tritium in surface water are typically 1 – 3 pCi/L and 4 – 6 pCi/L in groundwater and it is important to realize that the 20 pCi/L threshold is only a screening tool, not a regulatory measure of any kind.

Author Response: None of the key findings or recommendations contained in the final report were based on data obtained directly from FPL. Although most of the data used in the analyses were indeed collected by FPL consultants, these data were reviewed by DERM and SFWMD prior to being used in this study. The author found no reason to question the collected and reviewed data. The author did not rely on any interpretations of these data by FPL. The study did not rely on the accuracy of the water-budget model in any of its findings. However, the report does recommend that FPL improve the water-budget model by developing a more precise evaporation process equation, noting that evaporation is a dominant yet uncertain component of the water budget. Regarding the 20 pCi/L threshold, the final report states that "A threshold concentration of 20 pCi/L has been used as a baseline to infer the presence of groundwater originating from the CCS." This wording should make it clear that the 20 pCi/L tritium concentration is used for screening only. The final report further states that "The presence of elevated levels of tritium above natural background levels in the Biscayne aquifer is not considered to be a threat to public health and safety, since the measured concentrations are far below the federal drinking water standard of 20,000 pCi/L. Elevated levels of tritium are simply being attributed to the presence of water originating in the CCS."

General Comments

1. The report appeared to give primary focus on the operations and outcomes within the CCS with much less attention given to impacts of CCS operations on the surrounding groundwater or surface water systems.

> Author Response: The objective of this study as stated by the Miami-Dade County Commission was to "...look at the temporal trends in the physical and chemical characteristics of the CCS water, and to provide possible explanations for these changes." Pursuant to this objective, the focus of the investigation was on the CCS and not on the surrounding groundwater or surface water systems.

2. Temperature and Salinity data were only evaluated through 12/7/14. The report would likely benefit from focused data collection efforts instigated over the past year.

> Author Response: Temperature and salinity data subsequent to 12/7/14 were not made available to the author during the period of the study. It should also be noted that to fully analyze the temperature and salinity data for the past year supporting climatic and operational data would also have been needed.

3. Review with consult (sic) William Nuttle, wnuttle eco-hydrology.com, and all of his published works and presentations. One such report dated June 8th, 2015 entitled "Review of CCS water and salt budgets reported in the 2014 FPL Turkey Point Pre-Uprate Report and Supporting Data" would be particularly helpful.

> Author Response: It would not have been appropriate to consult with Dr. Nuttle during this study since he appears to be affiliated with at least one of the stakeholder groups; such a consultation could have compromised the impartiality of this investigation. Subsequent to preparation of the preliminary report, the author was provided (via DERM) with a copy of the above-referenced report. This report has been reviewed and referenced in the final report.

4. Impacts on the aquifer should be discussed, salt loading and the water budget.

> Author Response: See response to Comment #1. The water and salt interchanges between the CCS and the surrounding aquifer are discussed fairly extensively in Section 3.2.4 of the report.

5. What additional data need to be collected to help correct the % error we see in the modeling of the operations? The water budget for example seems to have a percent error of +/- 30% for example how could this be corrected by informing the models with better data: additional rain gauges, flow meters, a rhodium dye study–what sampling would be most helpful?

> Author Response: Improvement in the water-budget model would likely require the development of a more sophisticated water-balance model. A first step in this direction is a recommendation in the final report that FPL develop a more accurate evaporation model, since this is a dominant component of the water budget, and the current evaporation model has not been appropriately validated. In order to properly quantify the seepage fluxes to the CCS, a variable-density groundwater-flow model of the surrounding aquifer would need to be interfaced with the CCS. This would produce a quantum improvement in the water-budget model, and a much better understanding of the interaction between the CCS and the surrounding aquifer. Improved flow measurements within the CCS would be particularly helpful in validating seepage estimates.

6. Additional minor comments: We did not see a date on the report, this report does not indicate it is a draft, there was a mix of metric and English units used in the report and there was a mix of NGVD and NAVD vertical datum used in the report.

Author Response: There was no date on the report and it was not tagged as a draft. This final report is tagged as the "Final Report" and is dated. The mix of SI and American units, as well as the mix of NGVD and NAVD, reflected the variations of units that were used in other key studies cited in the report. To facilitate references to those other studies, it was decided to retain (for the most part) the units and benchmarks used in those studies.

Specific Comments

1. Page 2: Temperature in the CCS. The report makes important commentary on increasing temperature with increased power generation and the critical need for a reliable supplementary cooling system.

2. Page 3: Salinity in the CCS. Statement that period of no rainfall was primary cause of high salinities in 2014 is not supported by the data collected subsequent to 2014. In addition there were 0-1 working rain gauges to calibrate the NEXRAD data used.

Author Response: In 2014, the extended period of no rainfall was the primary cause for high salinities measured in the CCS. As shown in Figure 16 and discussed in this report, the extended period of no rainfall was associated with a net seepage inflow of saline water from both the east-side and the bottom of the CCS, and these combined (yet interdependent) occurrences resulted in a steep trend of increasing salinity in 2014. Data collected subsequent to 2014 does not change the assertion regarding salinity dynamics that led to the increasing salinity in 2014. The cause of the salinity increase in 2014 is supported by the FPL mass balance model and is a data-driven conclusion. Subsequent to 2014, other factors contributing to salinity variations might have had a more dominant influence than the absence of rainfall. This occurrence is not contrary to the mass-balance analyses in the report. The lack of working rain gages to calibrate the NEXRAD data is certainly a concern, but there is insufficient data or analyses to assess the impact of this issue on the water-budget analyses presented in the report.

3. Page 3: Salinity in the CCS. The report makes important commentary that while supplemental fresh water can mitigate CCS salinity, it will elevate water levels and likely exacerbate inland intrusion of saltwater from the CCS. But where else will it go? Preferential flow paths? How will it interact with the surrounding environment? How about a look at the geology and how the pH of the plume may be interacting with the basic limestone. Could it be making those flow paths larger? Are there other locations in the bay where the pollution is reaching the surface that are not being monitored currently? Just as historical upwelling of freshwater into Biscayne Bay from the Everglades once did. These locations are recorded in old historical sailing accounts and the National Park may actually know where some of these upwelling features are.

Author Response: Accurate estimation of the contribution of elevated stages in the CCS to salt-water intrusion and outflows to Biscayne Bay will require the utilization of a variable-density groundwater-flow model that takes into account the spatial variations in the subsurface geology, and spatial variations in groundwater densities and salinities in the aquifer surrounding the CCS. Such analyses and modeling of flow in the surrounding aquifer were beyond the scope of this study.

4. Page 3: Salinity in the CCS. The report makes important commentary that the effectiveness of the proposed hyper saline extraction system will depend upon salinity-transport dynamics within the aquifer.

5. Page 4: Withdrawal of 100 mgd from L-31E Canal. The report makes important commentary on adverse effects on groundwater gradients and groundwater salinity from pumping water from the L-31E Canal to the CCS. However, it only notes water level impacts and does not mention the complex hydrodynamics of water level and salinity within the CCS and surrounding groundwater system.

> Author Response: The impact of pumped water on the flow dynamics and the salinity distribution in the CCS was beyond the scope of this study. Such analyses would require the development of detailed hydrodynamic and mass-balance (salt) models of the CCS. An analysis of the impact of the pumpage on the flow field in the surrounding aquifer would require the use of a variable-density groundwater-flow model. Development of such models were beyond the scope of the present study.

6. Page 4: Recommended Actions. All of the recommendations appear to focus on the CCS itself with no specific recommendations on monitoring or mitigation of impacts to the surrounding groundwater or surface water systems.

> Author Response: As described previously, the scope of work for this 120-day study was only concerned with the CCS. Specifically the scope of work was "...to look at the temporal trends in the physical and chemical characteristics of the CCS water, and to provide possible explanations for these changes." Consequently, no specific recommendations on monitoring or mitigation of impacts to the surrounding groundwater or surface water systems were generated.

7. Page 8: 1.2 Geohydrology. The report correctly points out the generally low hydraulic gradients in the Biscayne aquifer and the importance of very accurate measurements of water levels. However, he does not mention the importance of density differentials and density gradients to the acquisition of accurate water level measurements or the fact that in the highly permeable Biscayne aquifer, a very small gradient change can mean very large movements of water in the aquifer.

> Author Response: The report mentions the importance of density variations in the groundwater surrounding the CCS, particularly in the context of converting water-table gradients to piezometric-head gradients when considering the elevated stages in the CCS that will result from pumping water into the CCS. The fact that the use of freshwater piezometric-head equivalents provides a more rigorous approach to the operation of the ID is mentioned on Page 17, and the fact that it is actually the difference in equivalent freshwater heads that govern the flow between the CCS and the L-31E Canal is stated on Page 49. There are a variety of factors that affect the inland movement of a saltwater front and the fact that small gradient changes can cause large changes in seepage velocity, while true, is not the only reason for the inland migration of the saltwater front.

8. Page 13: 1.5 Saltwater Intrusion. The report states that the inland extent of the saltwater interface varies naturally in response to a variety of factors but then goes on to only mention two of those factors; rainfall and groundwater pumping. Numerous studies have shown that construction and operation of the extensive canal network in SE Florida is the most critical influence and control on saltwater movement in the aquifer.

Author Response: The factors cited in the report that influence saltwater intrusion are factors that vary seasonally (e.g., rainfall) or can have inadvertent effects on salinity intrusion (e.g., groundwater pumping). The author acknowledges the role of coastal canals and salinity-control structures on salinity intrusion, however, in recent history these are highly controlled systems and are usually used to mitigate saltwater intrusion.

9. Page 13: CCS Impact on Saltwater Intrusion. The report provides a number of references to the original engineering studies completed by Dames and Moore in the 1970's as predicting the very outcomes we are observing today.

10. Page 14: Upper Paragraph. The report correctly concludes that the tritium data strongly support the conclusion that operation of the CCS has impacted salinity of the Biscayne aquifer some 4 miles west of the CCS.

11. Page 15/16: Effectiveness of the ID Salinity Control System. The report correctly points out that operating rules of the ID salinity control system have limited effects and do not prevent landward migration of saline water originating from the CCS. It further points out that pumping water into the CCS will elevate water levels in the CCS above the L-31E Canal and notes that this condition was recognized in a study by Dames and Moore in 1971 which predicted westward migration of the saltwater interface even with operation of the ID salinity control system.

12. Page 17/18: 2.1.3 Thermal Effects on Groundwater. The report discusses thermal impacts to groundwater above −25 feet NGVD with little or no observed thermal impacts below that depth. It should be noted here that a depth of 20 − 30 feet is typically the occurrence of the contact between the less permeable overlying Miami Oolite and the highly permeable underlying Key Largo/Fort Thompson formation. High porosity and strong groundwater movement within the underlying formation may be a primary control on the vertical extent of thermal impacts to the groundwater system.

Author Response: This is a possible scenario, but there is no data or analyses presented to support this assertion. The thermocline occurrence as described in the report is a measured effect that is explainable simply based on the lesser density of shallow warm water compared to deeper cool water. The influence of seepage velocities on thermocline formation is more speculative.

13. Page 31: Salinity Balance Model Formulation. It is not clear from the model descriptions that water levels are corrected for density differentials associated with varying salinity.

Author Response: Water levels in the (FPL-developed) salinity-balance model are not corrected for density differentials associated with varying salinity.

14. Page 40: Upper Paragraph. The report refers to model Scenario A from 11/2010 to 10/2012 as reflecting normal weather conditions and Model Scenario B from 11/2013 to 10/2014 as reflecting dry weather patterns. However, these periods also reflect pre and post uprate periods for power generating units 3 and 4 and therefore do not provide valid wet and dry scenarios absent of the bias created by the different operating conditions.

Author Response: Yes, there is a bias that comes from assuming that the temperature of the water in the CCS corresponds to the given external conditions during each of the scenarios. However, in order to use the FPL analysis as a basis for the analyses presented in this report, the bias was carried forward. This temperature bias likely has minimal impact on the analyses in the report, since the analyses in the report are concerned with elevated stages in the CCS due to the addition of pumped water, where the elevated stages would be minimally affected by any inherent temperature bias; the more important variables in this case being rainfall, water-table elevations, and pumpage rate. Consequently, the key findings in this report are unlikely to be sensitive to temperature biases in the assumed scenarios.

15. Page 40/41: Effect of Increased Water Elevations in the CCS. The report correctly points out that the addition of up to 100 mgd of freshwater to the CCS will raise water level elevations and increase the discharge of highly saline water from the CCS into Biscayne Bay and into the Biscayne aquifer.

16. Page 43: Demonstration of Effects. The report discusses the density differentials between the freshwater from the L-31E Canal and the hypersaline groundwater underlying the CCS as further increasing the potential for reversed gradients and increased movement of hypersaline water from the CCS to the Bay and Aquifer. However, he does not discuss that the density differential will also likely result in little to no mixing in the groundwater system.

Author Response: The report discusses differences in piezometric head in the context of flow direction, since groundwater will flow from a location of higher piezometric head to a location of lower piezometric head. The report states that groundwater density must be factored into the calculation of piezometric head and that, as a consequence of pumping water from the L-31E Canal into the CCS, water will flow from the CCS towards the L-31E Canal whenever the piezometric head at the CCS is greater than the piezometric head at the L-31E Canal. This is the undesirable consequence of pumping water from the L-31E Canal that is addressed in the report. Whereas density variations have an impact on mixing of saltwater and freshwater in the aquifer, this phenomenon is not discussed in the report since it is regarded as a separate issue. Furthermore, subsurface mixing of salt and fresh water depends on several other factors in addition to the difference in piezometric head between the CCS and the L-31E Canal. The mixing issue will certainly be a primary focus of any follow-up investigation dealing with the movement of saline groundwater originating in the CCS.

17. Page 44: Historical Anecdote. The report again provides results of early studies by Dames and Moore (1978) showing the an increase in water level of 0.5 feet in the CCS (as predicted with the addition of 100 mgd of L-31E Canal water) will result in a one-mile inland movement of the saltwater interface.

18. Page 45/46: Salinity Dynamics and Pumping From the L-31E Canal. The report's Conclusions Section provides a good summary of many of the points above.

Memorandum

11 November 2015

To: Lewis, Longman & Walker, P.A.

From: Dr. William Nuttle, PhD, PEng

RE: Calculations show increased power output is the cause of higher evaporation rates

My analysis of the water and salt budget data assembled by FPL indicates that increased power output by the two nuclear power plants causes evaporation from the CCS to increase, and this is the primary cause for the recent rise in salinity values. I used regression analysis to investigate claims by FPL that unusually low rainfall is the cause of the rise in salinity values. This analysis reveals a strong relationship between power output by the plants and evaporation from the CCS. By comparison, empirical relationships with rainfall were less robust statistically. Thermodynamic calculations confirm that the correlation between power output and evaporation reflects the balance between increased thermal loading to the CCS and increased dissipation of heat from the CCS primarily through evaporation. This establishes that changes in plant operations are the cause of increased evaporation and related increases in temperature and salinity in the CCS.

Overview of Water and Salt Budgets

The following summary of the water and salt budgets is based on daily fluxes reported in the spreadsheet used to perform the budget calculations for the 2014 Post-Uprate Report. I summarized these data by computing monthly averages for the water and salt fluxes, Table 1 and Figure 1.

The principal fluxes involved in the balance between inflows and outflows of water to the CCS are evaporation, rainfall, inflow from interceptor ditch pumping, seepage across the east and south boundaries, and bottom seepage in zones A and D, Figure 2. The long-term pattern in the bottom seepage is net downward flux in zone A, which is immediately downstream of the discharge from the plant circulating pumps, and net inward flux through the bottom in zone D and through the east side of the CCS from Biscayne Bay. Other water fluxes are small by comparison to these principal fluxes.

Larger water fluxes occur on shorter time and space scales. The largest water fluxes in the CCS (Table 1) are associated with days with high rainfall, seepage associated with the "underflow" phenomenon (estimated from the difference in measured canal discharge within the CCS), and daily fluctuations in the volume of surface water contained in the CCS. These fluxes can dominate the water balance over periods of days to weeks, but their effect is ephemeral.

The principal fluxes required to balance inflow and outflow of salt to the CCS are bottom seepage out through zone A and the inflows from bottom seepage in zone D, seepage induced

from Biscayne Bay through the east boundary of the CCS, Figure 2, and interceptor ditch pumping, seepage across the east and south boundaries, and the accumulation of salt within the CCS

Effect of Power Plant Operations

FPL has made available detailed information about the day-to-day operation of the units of the power plant that use the CCS for cooling for the period June 2011 through May 2014.[1] This makes it possible to examine how changes in power plant operations affect elements of the water and salt budget. To do this I compiled combined daily power output from units 1, 3 and 4, and I calculated the average combined power output for each month for the period that plant operations data are available, lower panel of Figures 1 and 3.

Effect of Power Plant Operations on the Water and Salt Balances

By its effect on evaporation, power plant operations also affect other elements of the water and salt budgets. I investigated this by dividing the months in the period June 2011 through May 2014 into contiguous periods of "high" and "low" power output, using 1200 MW as the threshold power level, lower panel in Figures 1 and 3, and summarized water and salt fluxes for each set month. Average power output during the high output months was about twice that during the low output months (1581 MW compared to 881 MW), Table 2. The corresponding increase in evaporation, which amounts to an increase from an average of 3040 to 4110 acre-feet per month, agrees with at least one estimate of increase in evaporation anticipated from the planned uprate modifications.

Average evaporation increased by about 35 percent during months of high power output compared with months with low power output, Table 2. However, it is the net difference of rainfall minus evaporation that lowers water levels and drives groundwater seepage into the CCS; this difference is twice as large during months of high power output. Similarly, the seepage of Biscayne Bay water into the CCS along the east side also is doubled.

The difference in net salt flux is even greater, Table 3. Virtually all of the accumulation of salt in the CCS that accounts for the rise in salinity occurred during months with high power output. During months with low power output the net salt flux was small and directed out of the CCS, i.e. essentially zero.

Effect of Power Plant Operations on Evaporation

Regression analysis shows that monthly average evaporation from the CCS increases linearly with the monthly average of the combined power output from the power plants, Figure 5. This is expected based on principles underlying the design of the CCS: power output from a thermo-electric generation plant is directly related to the amount of heat that must be dissipated into the environment. Evaporation is one of the principal mechanisms by which the CCS dissipates heat. Other factors also affect the rate of evaporation from the CCS. Evaporation varies seasonally, in response to heating by the sun, and with changing weather conditions. In particular, evaporation is suppressed during periods of rainfall. Both effects are evident in the times series of monthly

[1] c.f. Appendix D: Plant Outages, in FPL Turkey Point Data Delivery for Units 3 & 4 Uprate Project – February 2014; and Appendix A: Plant Outages, in FPL Turkey Point Post-Uprate Monitoring Report for Units 3 & 4 Uprate Project – August 2014

evaporation and rainfall shown in the upper panel of Figures 1 and 3. These additional sources of variation contribute to the scatter around the linear relationship between evaporation and power output.

By comparison, regression analysis reveals the absence of a strong relationship between rainfall and CCS evaporation, Figure 5. Similarly, investigation of possible relationships between power output and rainfall and other elements of the water and salt budgets fails to find another relationship as strong as the one between power output and CCS evaporation, Figures 6 through 13.

Thermodynamic Calculations Confirm a Causal Relationship

The trendline in the plot shown in Figure 4 is fitted to these data, and therefore it represents the general trend in the data rather than the underlying physical processes that might be responsible for this trend. The slope of the trendline is ~2200 cubic feet per day per MW of electric power output.

To investigate the degree to which the trend of increasing evaporation might be explained by the increased heat loading to the CCS at higher power output, I calculated the additional power dissipated from the CCS by an additional 1 million cubic feet per day increase in the evaporation rate. This calculation is based simply on the latent heat of vaporization for water, which is a physical property of water. I used the value for freshwater, ignoring for purposes of simplicity the effect of salinity on the evaporation process. The result of this calculation is 740 MW heat dissipated per 1 million cubic feet per day of additional evaporation or, in terms comparable to the slope of the plot, 1300 cubic feet per day per additional MW heat dissipated by the CCS.

The MW of electric power output and the MW of heat dissipated from a thermal power plant are related to each other by principles of thermodynamics and the operating characteristics of the power plant. The nuclear power units at Turkey Point are thermal power plants. A value of 33% is reasonable for the overall thermal efficiency of the power plants; values typically range between 30% and 40%. At a thermal efficiency of 33% the MW of heat dissipated by the CCS is exactly twice the MW of electric power produced. Applying this equivalence to the latent heat calculations results in a value of ~2600 cubic feet *per day additional evaporation per additional MW of electric power output.*

This trend is the theoretical maximum additional evaporation that could occur from the CCS, based on the assumption that all of the increase in the thermal loading is dissipated through evaporation. Comparison with the slope of the trendline from the data suggests that in actuality about 85% of the additional heat loading is dissipated by evaporation. This result is consistent with increased heat loading being the main cause for the observed increased evaporation because heat dissipation from the CCS occurs through two additional mechanisms, black-body radiation and conduction. All three mechanisms act in parallel; each accounts for a portion of the total heat dissipation. In all three increased heat dissipation occurs as the result of increased water temperature, which is the result of increased thermal loading from the power plants.

Overall, the results of this analysis point to increased power output by the nuclear units and the associated increase in heat loading as the principle, direct cause for increased temperatures,

increased evaporation, and increased salinity values that have occurred in the CCS in the post-uprate period. Although low rainfall may contribute to increasing salinity values, as FPL claims, low monthly rainfall is not associated with higher rates of evaporation; the R^2 is very low, Figure 1. The addition of freshwater by rainfall affects the rate of evaporation indirectly, by changing salinity, and this is a relatively small effect on evaporation. Rainfall may be associated with lower heat loading to the CCS, and thus lower water temperatures. But, this is only because the sky is cloudy when it rains, and clouds reduce heat loading by solar radiation.

Finally, the thermodynamics analysis outlined above uses basic principles taught to undergraduate students of engineering. Indeed, this analysis could easily be given as a homework or exam problem in an introductory thermodynamics course. It can be reasonably expected that any licensed professional engineer practicing in the fields of civil or mechanical engineering would be able to perform this same analysis. In particular, any engineer with responsibility for operating a thermal power plant should be able to carry out this analysis.

Table 1: Magnitudes of different water fluxes involved in the CCS water budget. Water balance fluxes that differ by a factor of 2 or more between the 2012 and 2014 reports are highlighted.

Water Flux	2014 Report ft3/day	2012 Report ft3/day	Other ft3/day	mgd	Comment
CCS surface discharge			2.4E+08	1810	Average for Sep 2010 through June 2011
Max 1-day rainfall	1.6E+08	1.7E+08		1289	
N-S difference in measured CCS discharge (underflow)			2.9E+07	218	Average for Sep 2010 through June 2011
Daily change in CCS Vol	5.4E+06	6.3E+06		47	Average absolute day-to-day change
Evaporation (average)	-5.1E+06	-4.2E+06		-31	(~3500 acre-ft per month)
Rainfall + runoff (average)	2.8E+06	3.2E+06		24	
Bottom seepage (Zone A)	-6.1E+05	-1.1E+06		-8	
Long-term seepage loading to aquifer			-1.0E+06	-7	W.K. Nuttle report to SFWMD, 5 April 2013
Side seepage (East)	1.5E+06	6.3E+05		5	
ID pumping	4.4E+05	6.1E+05		5	
Bottom seepage (Zone D)	4.0E+05	5.6E+05		4	
Blowdown (inflow to CCS)	1.9E+05	1.7E+05		1	
Side seepage (South)	3.0E+05	9.9E+04		1	
Side seepage (West)	1.2E+05	6.8E+04		1	
Bottom seepage (Zone C)	3.6E+04	4.5E+04		0	
Bottom seepage (Zone B)	1.7E+04	2.4E+04		0	
Side seepage (North)	5.0E+02	-3.6E+02		0	

CCS Volume	6.303E+08 ft3	Average for Sep 2010 through June 2011

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Table 2: Summary of water budget components reported as averages of All Data (September 2010 through May 2014) and average for periods of Low Power and High Power plant operations (see lower panel in Figures 1 and 3). Units are cubic feet per day. Positive fluxes are oriented into the control volume. Note that the data summarized in the "Low Power" and "High Power" columns together do NOT constitute all of the data.

Average Water flux cfd	All Data	Low Power	High Power
Zone A	-6.08E+05	3.81E+04	-5.96E+05
Zone B	1.73E+04	2.46E+04	2.30E+04
Zone C	3.55E+04	2.48E+04	4.90E+04
Zone D	3.99E+05	4.97E+03	7.89E+05
net Bottom Flux	-1.51E+05	1.16E+05	2.74E+05
East	1.48E+06	7.05E+05	1.97E+06
West	1.23E+05	1.22E+05	1.18E+05
North	4.97E+02	1.60E+03	3.89E+02
South	3.01E+05	2.78E+05	3.04E+05
ID pump	4.39E+05	4.23E+05	4.17E+05
Blowdown	1.86E+05	1.97E+05	1.95E+05
Rain	2.76E+06	2.92E+06	2.80E+06
Evap	-5.10E+06	-4.42E+06	-5.97E+06
Net Flux	2.77E+04	3.22E+05	9.41E+04

Table 3: Summary of salt budget components reported as averages of the available data calculated for All Data (September 2010 through May 2014) and average for periods of Low Power and High Power plant operations (see bottom panel of Figures 1 and 3); units are pounds per day. Positive fluxes are directed into the control volume. Note that the data summarized in the "Low Power" and "High Power" columns together do NOT constitute all of the data.

Average Salt flux lb/day

	All Data	Low Power	High Power
Bottom Seepage			
Zone A	-3.04E+06	-1.18E+06	-3.18E+06
Zone B	6.08E+04	9.31E+04	7.95E+04
Zone C	6.23E+04	3.77E+04	9.80E+04
Zone D	4.68E+05	-5.81E+05	1.84E+06
Side Seepage			
East	2.67E+06	6.62E+05	4.01E+06
West	6.39E+03	6.28E+03	6.90E+03
North	-8.82E+02	1.81E+03	-1.17E+03
South	3.93E+05	4.19E+05	3.76E+05
ID pump	3.63E+05	1.81E+05	4.22E+05
Blow down	1.07E+05	1.10E+05	1.11E+05
Net Flux	1.09E+06	-2.54E+05	3.76E+06

Figure 1: Monthly average values for the volume of water in the CCS and the major seepage fluxes are compared with rainfall and evaporation and combined power output for power plants that use the CCS for cooling for the period of record. Months designated as High and Low power output for the analysis of the water and salt budgets are shown.

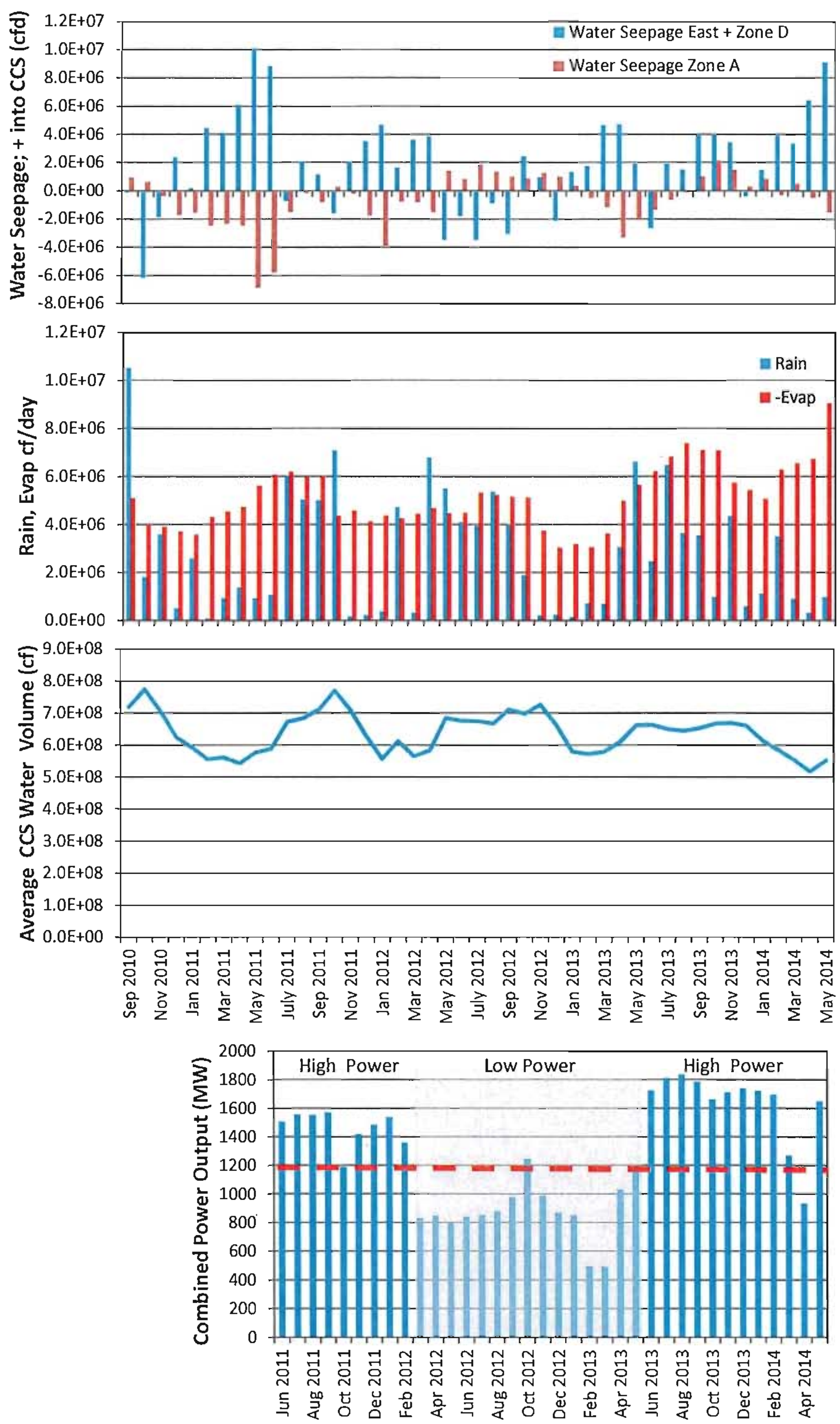


Figure 2: Location of zones used in the calculation of the bottom seepage fluxes

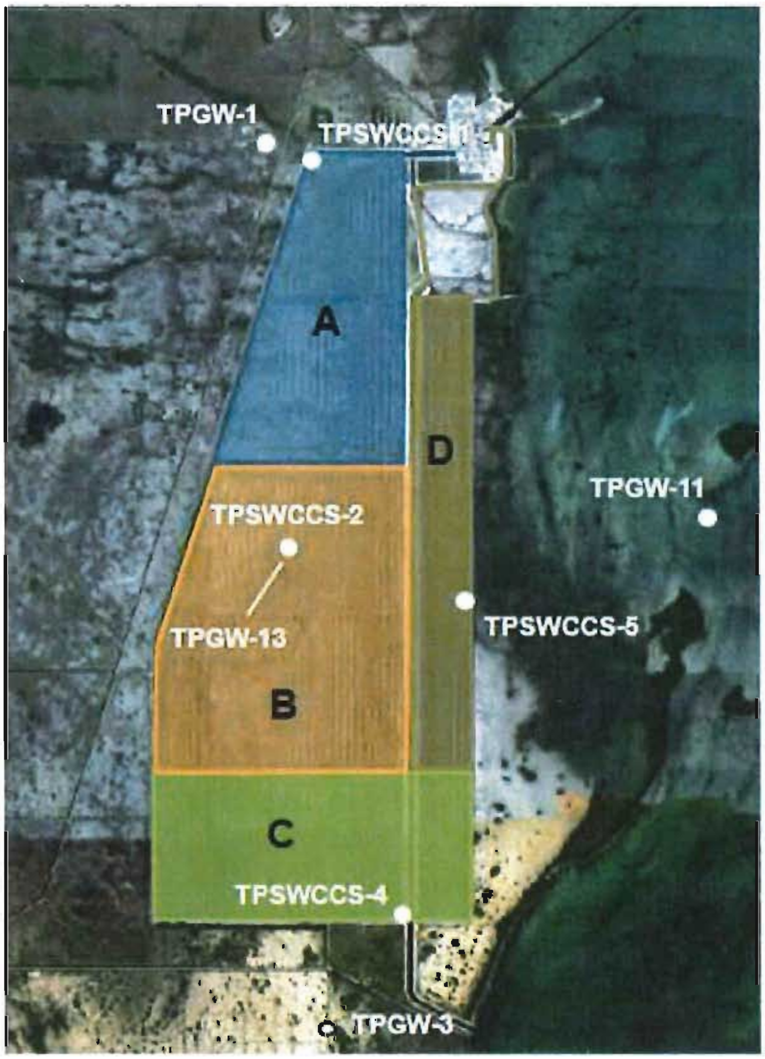


Figure 3: Monthly average values of salinity and the major seepage fluxes of salt in the CCS compared with rainfall and evaporation and combined power output for power plants that use the CCS for cooling for the period of record. Months designated as High and Low power output for the analysis of the water and salt budgets are shown.

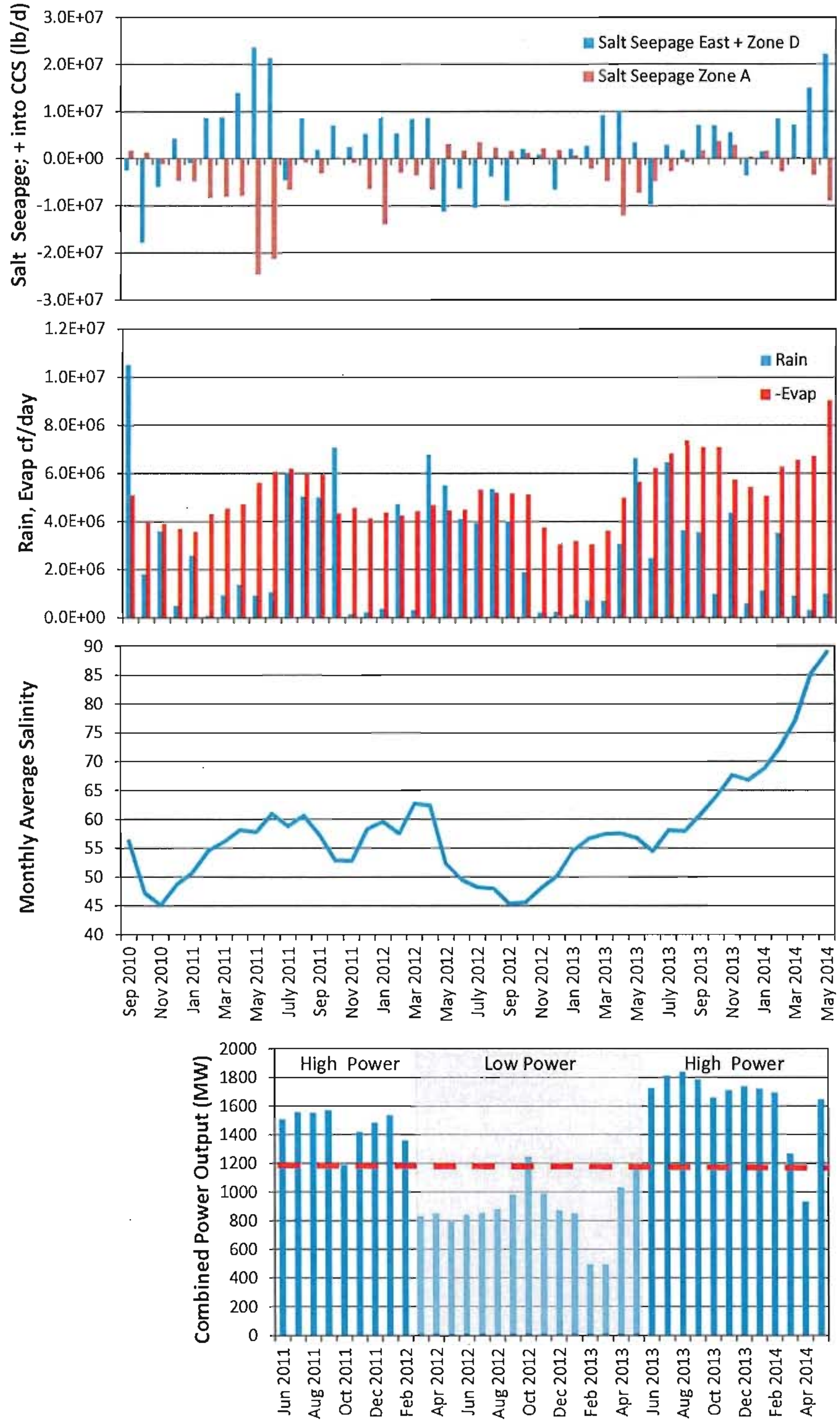


Figure 4: Monthly evaporation is related to the average combined power output from the units that rely on the CCS for cooling. The slope is statistically significant at the level of $p = 8x10^{-6}$.

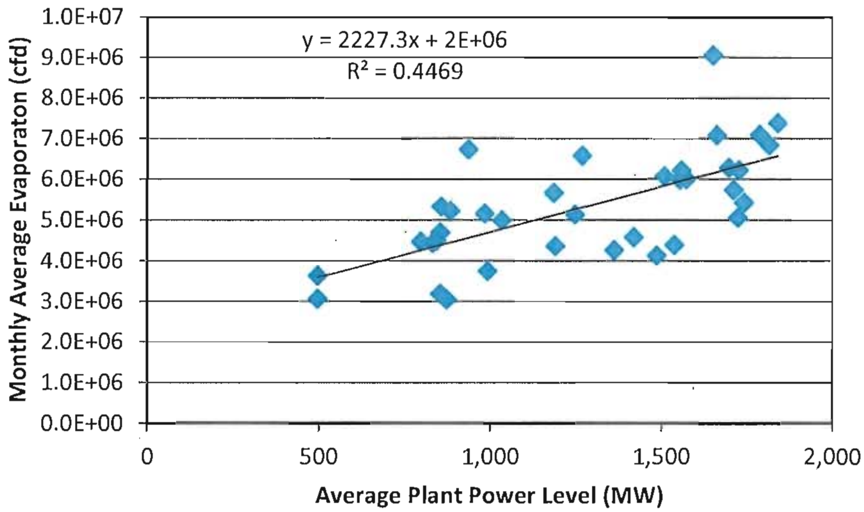


Figure 5: Monthly average rainfall is not strongly related to CCS evaporation. The value of p for this relationship is 0.269, which indicates no significant relationship.

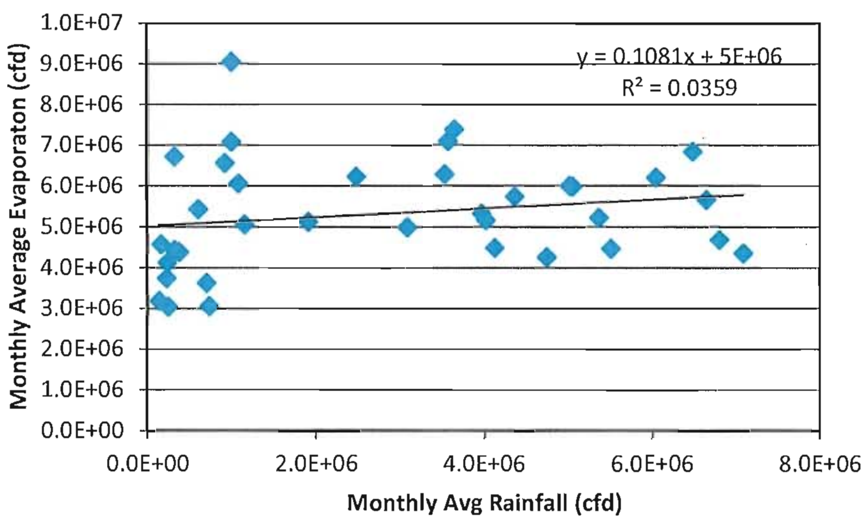


Figure 6: Monthly combined water seepage flux up through Zone D and along the East side of the CSS is not related to the average combined power output from the units that rely on the CCS for cooling. The value of p for this relationship is 0.185, which indicates no significant relationship.

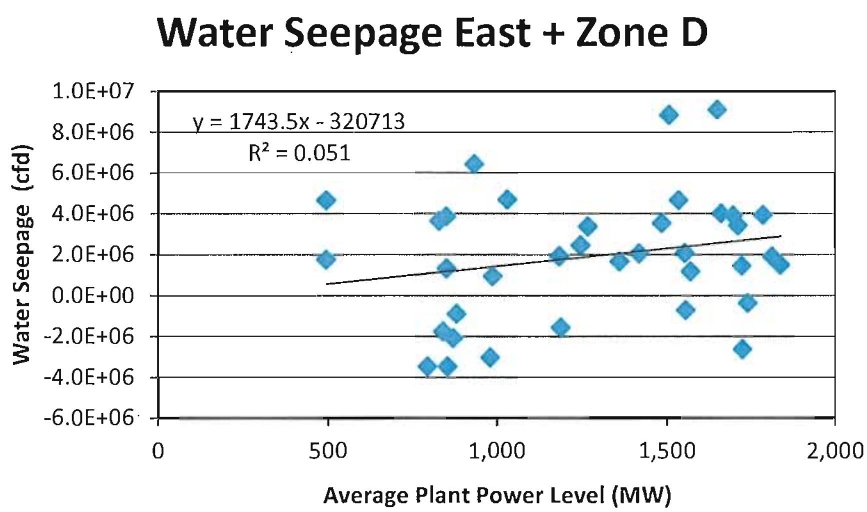


Figure 7: Monthly combined water seepage flux up through Zone D and along the East side of the CSS is moderately related to monthly rainfall. The value of p for this relationship is 0.028.

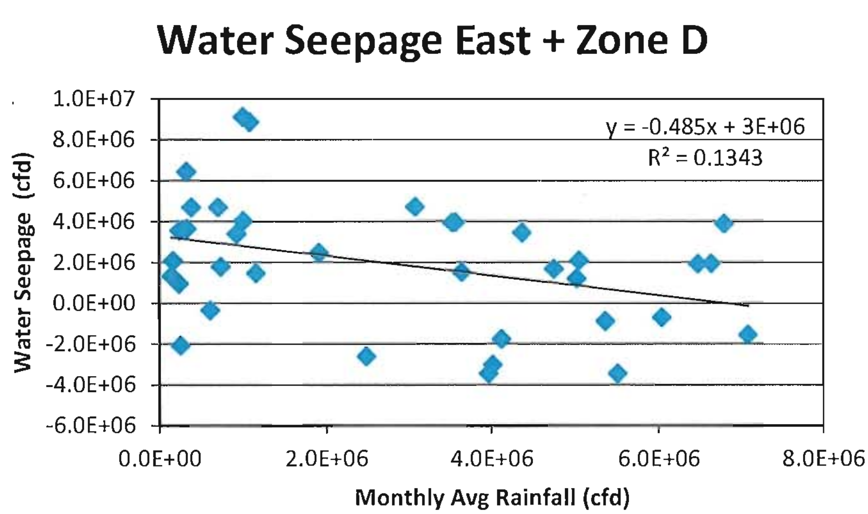


Figure 8: Monthly water seepage through the bottom of the CCS in Zone A is not related to the average combined power output from the units that rely on the CCS for cooling. The value of p for this relationship is 0.479, which indicates no significant relationship.

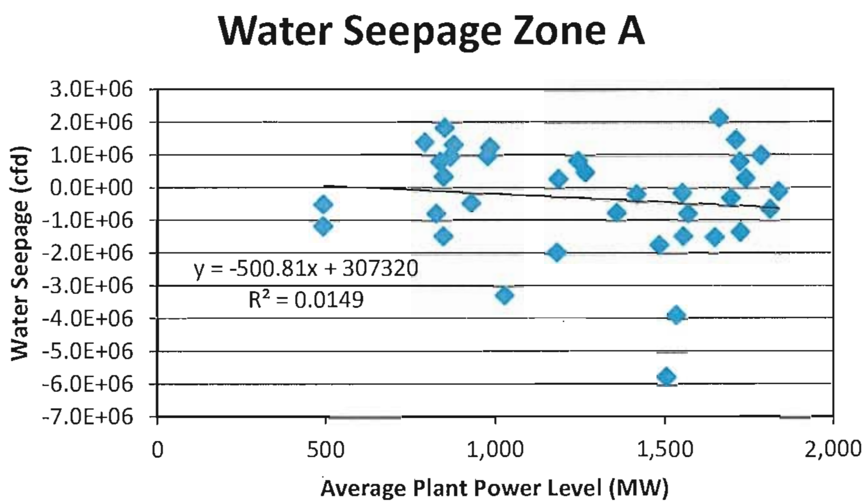


Figure 9: Monthly water seepage through the bottom of the CCS in Zone A is not related to monthly rainfall. The value of p for this relationship is 0.636, which indicates no significant relationship.

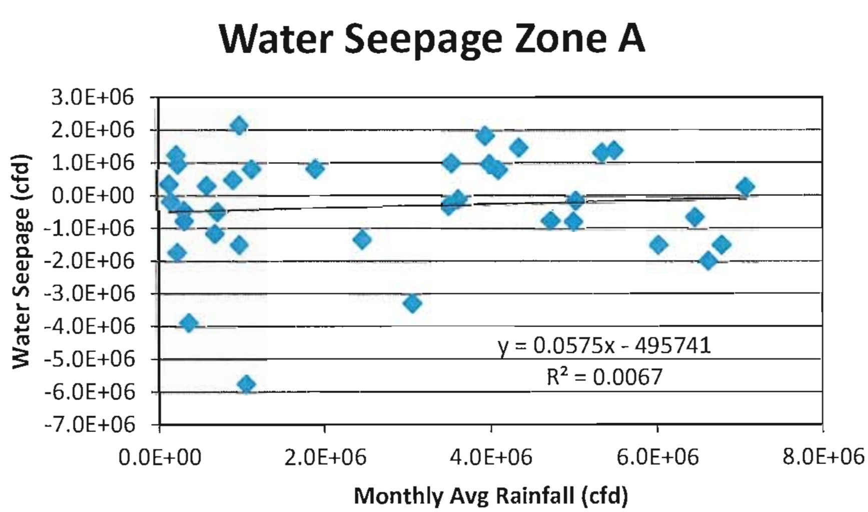


Figure 10: Monthly combined salt seepage flux up through Zone D and along the East side of the CSS is not related to the average combined power output from the units that rely on the CCS for cooling. The value of p for this relationship is 0.260, which indicates no significant relationship.

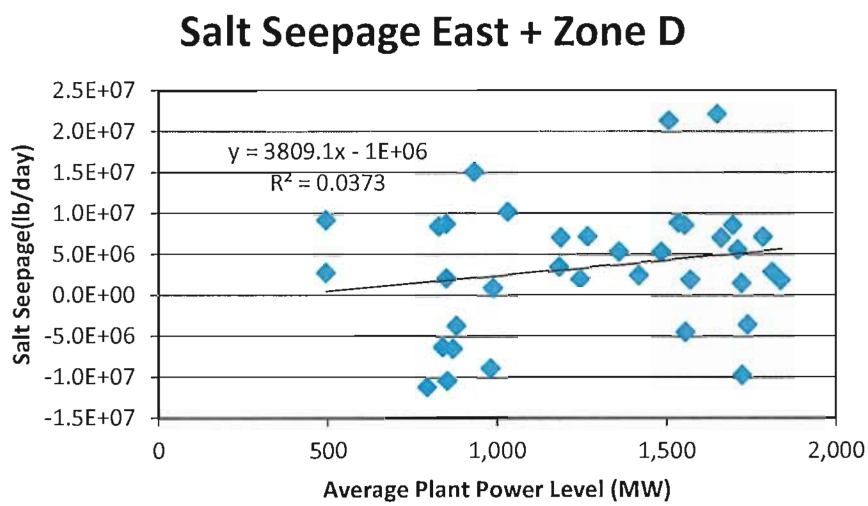


Figure 11: Monthly combined salt seepage flux up through Zone D and along the East side of the CSS is not related to monthly rainfall. The value of p for this relationship is 0.157, which indicates no significant relationship.

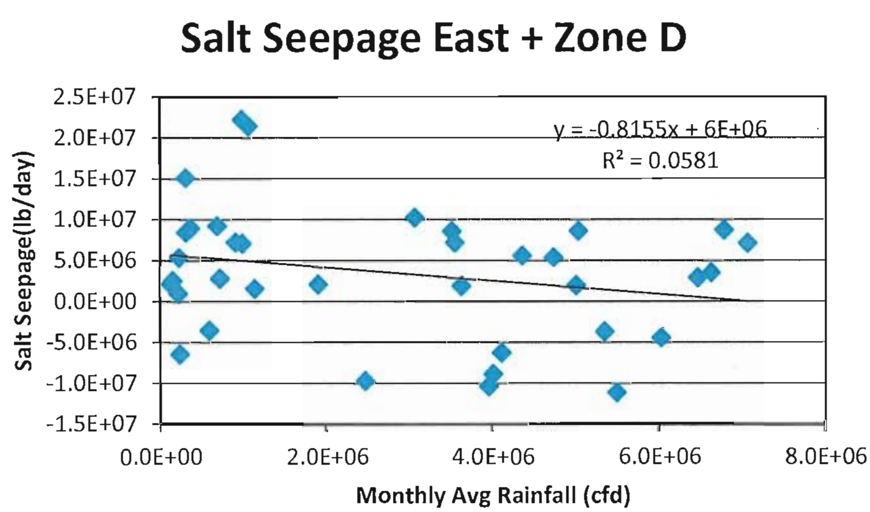


Figure 12: Monthly salt seepage through the bottom of the CCS in Zone A is not related to the average combined power output from the units that rely on the CCS for cooling. The value of p for this relationship is 0.470, which indicates no significant relationship.

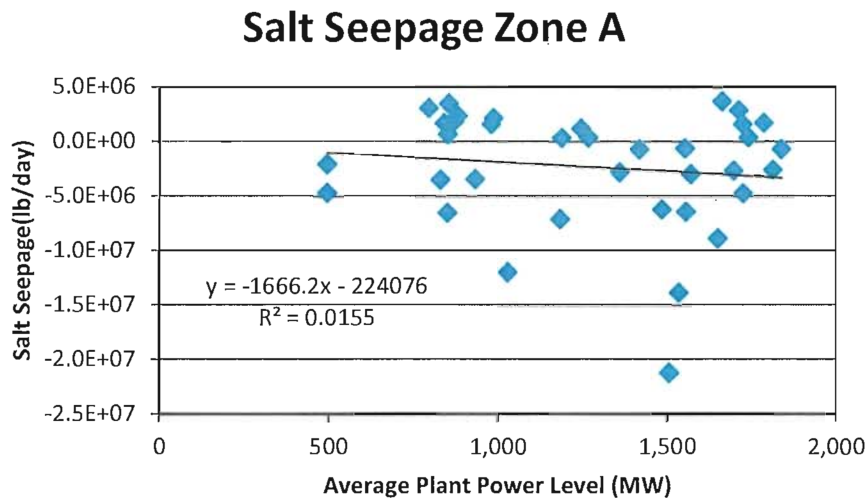
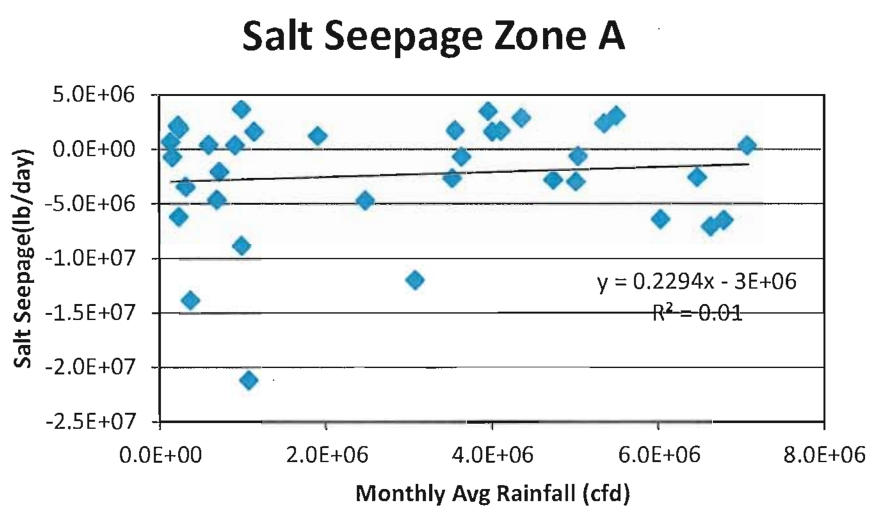


Figure 13: Monthly salt seepage through the bottom of the CCS in Zone A is not related to monthly rainfall. The value of p for this relationship is 0.562, which indicates no significant relationship.



FPL Turkey Point Cooling Canal System
Salinity Reduction Proposal Review

October 2013

Jeff Giddings

Resource Evaluation Section

Water Supply Bureau

South Florida Water Management District
West Palm Beach, Florida

1.0 Executive Summary

Hypersaline conditions exist within and beneath the Cooling Canal System (CCS) located at Florida Power and Light's (FPL) Turkey Point Power Plant in southern Miami-Dade County. To address these hypersaline conditions, FPL is proposing to dilute the existing CCS waters with 14 million gallons per day (mgd) of additional fresh and/or brackish water from the SFWMD L-31E canal or from the Floridan aquifer in order to reduce and maintain a salinity of 35 practical salinity units (psu) in the CCS canals. It is FPL's position that as a result of reducing the CCS water salinity to match that of Biscayne Bay combined with the CCS water levels associated with routine operations of the cooling system, the hypersaline groundwater and the associated effects on the inland position of CCS saline groundwater will stabilize and the inland extent of the saline groundwater wedge will retreat eastward from its current position over the next 30 years. FPL has developed a two-dimensional, cross-sectional, density-dependent groundwater model through the study area within the Biscayne aquifer -- with associated documentation along with a water budget spreadsheet model used to estimate the volume of Floridan Aquifer System water needed to reduce CCS salinity levels to 35 psu -- to support its proposal.

The purpose of this technical memorandum is to (1) evaluate FPL's groundwater model and associated documentation, (2) correct assumptions and data and conduct revised simulations, (3) reevaluate FPL's proposal and associated conclusions based on the revised simulations and (4) conduct additional simulations – including use of another model to evaluate effects of groundwater withdrawals from the Floridan aquifer system -- to address other concerns and scenarios not included in FPL's submittal.

District staff review of FPL's 2-D groundwater model identified three areas where additional evaluation was warranted: (1) model data and values with inconsistent datums, (2) specified heads which deviate from average elevations calculated from District databases and (3) more appropriate choice of canal for the western boundary condition (C-111). Regarding Item 1, it is apparent that data used in FPL's model inadvertently switched between two datums; that is the National Geodetic Vertical Datum (NGVD) of 1929 and the National American Vertical Datum (NAVD) of 1988. Because NAVD is approximately 1.5 feet higher than NGVD and the hydraulic gradient is rather flat in south Florida, these datum discrepancies can have a large effect on simulated hydraulic gradients and model interpretations and conclusions. Regarding Item 2, SFWMD downloaded data from SFWMD's DBHYDRO database and FPL's submitted monitoring data regarding water level elevations and used this data to evaluate model sensitivity to small changes in specified head elevations. Regarding Item 3, SFWMD tested the model responses to stage elevations from the C-111 Canal as a more appropriate western boundary condition -- rather than the L-31W canal used in the FPL model -- because the C-111 is the controlling canal for water levels in the area. Two additional sensitivity runs were conducted by the District; one was to evaluate the potential impact of increasing the stages in the CCS by 0.25 feet on the inland position of saline groundwater (possible increase due to adding 14 mgd to the system); the second was to assess the possible impacts associated with a hypothetical increase in sea level of 0.25 feet.

Results from FPL's original model runs were compared with the adjusted water level data set and the additional sensitivity runs developed by the District to evaluate the proposed 14 mgd addition of fresh/brackish groundwater to the CCS. Results of these simulations were generally consistent with FPL's model; that is, that the freshening of the CCS with 14 mgd of fresh/brackish water will serve to return the CCS to a saltwater concentration similar to Biscayne Bay. However, FPL's model indicates that the proposed action will not only reduce the salinity of the CCS water, but will also reverse the western movement of the hypersaline plume. In contrast, SFWMD's model does not indicate such a reversal in the inland groundwater movement. In fact, SFWMD's model indicates a continued increase in the western movement of the hypersaline plume. Slight differences of several hundred feet were noted in the position and orientation of saline groundwater west of the CCS when comparing whether or not the stage in the CCS was raised an additional 0.25 feet. There was also no significant change in the inland position and orientation of saline groundwater associated with an increase in sea level of 0.25 feet, which may be due to the higher water level elevations that occur in the discharge side of the CCS.

In an attempt to gain insights into the significance of the continued potential westward movement of saline groundwater, two additional model simulations were run by the District. In the first, a 'no action' simulation was run in which the hypersaline conditions within the CCS remain unchanged for 30 years. The second scenario capped the salinity of the CCS at 35 psu from 1972 through 2043, representing a hypothetical condition where the CCS never became hypersaline. The model calculated groundwater salinity distributions were then compared with the model runs representing the CCS becoming hypersaline and then being managed at a salinity of 35 psu for 30 years. Results suggest that the inland position and orientation of saline groundwater for the proposed 14 mgd scenario rests between the no action and constant sea water salinity scenarios.

FPL's analysis did not include an assessment of the potential impacts of withdrawing 14 mgd on existing legal uses of the Floridan aquifer. To provide insight into this question, the District utilized the regional East Coast Model to estimate drawdowns resulting from the proposed withdrawals. The results of the effects of the 14 mgd withdrawals on the Floridan aquifer indicated a 40-foot drawdown at the site, but only a few feet of drawdown at existing, adjacent legal users of the Floridan aquifer such as Florida Keys Aqueduct Authority in Florida City, Miami-Dade Water and Sewer Department and the Ocean Reef Club in Key Largo.

2.0 Introduction

In 1972, following a law suit brought against Florida Power and Light (FPL) by the United States of America, the predecessor of the South Florida Water Management District (SFWMD or the District) entered into an agreement with FPL for the construction and operation of a cooling canal system (CCS) at the Turkey Point Power Plant in southern Miami-Dade County. The purpose of this agreement was to restrict the direct discharge of heated water from the plant into Biscayne Bay and instead use a closed-

loop system, which would allow the water to cool and be reused by FPL on their property. At that time, it was identified that the construction of a series of saline cooling canals within the Model Lands area of Miami-Dade County could potentially impact the Biscayne aquifer. As a result, the agreement required the construction of a seepage control system (i.e., Interceptor Ditch) designed to limit the loss of freshwater and to restrict the westward migration of saline water west of the L-31E canal beyond which would occur naturally. Monitoring of surface water and groundwater was also required. Amendments to the original agreement were made four separate time's mainly addressing monitoring requirements and the seepage control operation. A fifth agreement between FPL and SFWMD was reached in 2009 following the uprate approval of the nuclear Units 3 and 4 in 2008. This agreement required FPL, in part, to revise the Interceptor Ditch seepage control system operations, to enhance the existing monitoring program, and to mitigate, abate or enact other remedial measures to control the migration of the saline interface caused by the operation of the CCS.

In 2012, FPL provided the SFWMD with a Turkey Point Pre-uprate report, which identified that the hypersaline water originating from the CCS had migrated into the Biscayne Aquifer to varying degrees and distances surrounding the CCS. To address this, FPL is considering an option of reducing the salinity levels within the CCS to those of seawater (35 psu) and conducted some preliminary evaluations of the concept. The studies, which consisted of a technical document discussing their findings, a spreadsheet model addressing the salt balance within the CCS, and a 2-D cross-sectional density-dependent solute-transport groundwater model, were sent to the District for review and approval.

District technical staff reviewed the reports and models sent by FPL to the required Agencies and District leadership. This report is compiled to document the procedures and findings of the District's technical review of FPL's proposal. District staff was tasked with documenting the finding of the review and the submittal of the findings along with FPL's and the District's work to FPL, District leadership, the Florida Department of Environmental Protection (FDEP) and Miami-Dade County to aid of their joint exploration of CCS salinity management options.

3.0 Approach

In August 2013, FPL provided the District with a proposal for reducing the salinity within the CCS to levels consistent with Biscayne Bay and the Atlantic Ocean. The District, working in conjunction with FDEP and Miami-Dade County (Agencies), elected to provide the initial technical evaluation of the FPL proposal and then share its findings with the Agencies and FPL. Upon receipt of the proposal, District staff used the following procedure for review:

3.1 Water Budget Analysis:

FPL's spreadsheet analysis was sent to the District's contract water budget expert for review and analysis. A copy of the assessment and findings are included as **Appendix E** of this report.

3.2 Two Dimensional Density-Dependent Solute-Transport Groundwater Model

FPL provided the District with a technical memorandum prepared by their contractor Tetra Tech that documents the model structure data and assumptions. In addition, FPL made available all model datasets, which enabled the District to better understand the model setup, data and to conduct sensitivity runs. District staff reviewed the FPL technical memo and model data sets initially to determine data consistency. In that review, two issues were identified. The first involved data values which were based on a different datum (NGVD and NAVD). The second observation was that some of the specified head values were slightly different than calculated values produced from District databases (example, Biscayne Bay stage and Stage data for District canals L-31E, L-31N and C-111). The values used by FPL may have been based on data from different monitor stations (as was the case in Biscayne Bay) or from different data-bases or periods of record. In any case, the differences were on the order of a few tenths of a foot but could be sufficient to produce different results. Accordingly, it was decided to evaluate the sensitivity of the model to see how robust the calculated location and orientation of saline groundwater was to small changes in water levels.

A series of model sensitivity runs were identified as listed in the table below. Results from these sensitivity runs are described below.

3.3 Floridan Aquifer Withdrawal Assessment:

FPL's scope of study did not include an assessment of the impact of withdrawing 14 mgd from the Floridan aquifer on existing legal uses. This was an important consideration of the proposed project so the District elected to use the LECFAS model to assess potential impacts

Figure 1 – Site Map with Monitor Well Locations

4.0 Review and Findings of the FPL Submittals

4.1 Cooling Canal System Water Budget

FPL used a CCS water and salt budget model developed for and under review by the District and documented in the pre-uprate report (FPL 2012) to estimate the volume of water needed for dilution. Using this water budget model, FPL concludes that the addition of 14 mgd of low salinity water from the either the Floridan aquifer or L-31E canal north of the plant site and discharged into the CCS would reduce the salinity concentration in the CCS to approximately seawater within 1 year of continuous operation. The analysis also suggests that the added 14 MGD of water would increase levels in the CCS by approximately 0.25 ft.

The water and salt budgets used are described in the Pre-uprate report (2012), and the calculations and results of the volume necessary were included in the FPL Cross-Sectional Model of Turkey Point Cooling Canal System report (2013). The general methodology used was:

a. Review and analyze FPL submitted documentation and model data sets.
b. District staff to review the FPL submittals in order to provide an independently evaluation of the data, assumptions, methods and findings for accuracy and correctness.
c. Correct errors within the model or conduct independent assessments if needed to address omissions.
d. Conduct sensitivity evaluations in order to gain an understanding of how changes to the area hydrology could affect results.

District staff contracted with an outside water budget expert to evaluate and conduct an independent, spreadsheet budget calculation and review of the work submitted by FPL and to validate the assumption that 14 MGD was sufficient to reduce the CCS to saline conditions. The result of this work is documented in a tech memo provided to the District and included in this report as **Appendix E**. The analysis require some changes to the water and salt budget model submitted by FPL but the results of the calculations show that the addition of an inflow of 14 mgd of brackish water from the Floridan aquifer is sufficient to reduce the long-term average salinity in the CCS to near or below the target value of 35,000 mg/l TDS and is consistent with the FPL conclusion. Temporal variability will remain and seasonal and year-to-year variation in rainfall and, to a lesser extent, evaporation will drive fluctuations in salinity on similar time scales. More detailed model calculations are required to fully describe the effect that the additional input of Floridan aquifer water would have on salinity in the CCS.

While 14 mgd of FAS water appears to be a reasonable estimate of the volume of water needed to reduce the CCS salinity, no evaluation of the potential impacts that could be associated with the withdrawal of 14 mgd from the FAS was included in the report for District evaluation. This issue will be discussed in **Section 5**.

4.2 2-Deminsional, Cross-Sectional Density-Dependent Solute-Transport Groundwater Model

FPL provided the District with a proposal for reducing the hypersaline conditions within the CCS at the FPL Turkey Point facility. The submittal included a report and data sets that were reviewed by District staff. Documentation of FPL's methods, assumptions, and findings can be found in their report (2013).

Hypersaline conditions exist within the CCS because water quality at the surface becomes hypersaline as a result of evaporation and plant operations and its lack of direct surface water interaction with adjacent water bodies. The result is that hypersaline water sinks beneath the CCS to the base of the aquifer because it is denser, potentially contributing to the inland migration of the saline interface in southern Miami-Dade County. To address the hypersaline conditions at the site, FPL is proposing to dilute the existing CCS with 14 mgd of additional fresh and/or brackish water from the SFWMD L-31E canal or from the Floridan aquifer.

To support their proposal, FPL provided a two-dimensional groundwater flow and density-dependent transport model of the Biscayne aquifer to the SFWMD using the USGS computer code known as SEAWAT (2003). This USGS 2-D model was originally developed by Hughes (2009) and subsequently modified by FPL (2013) to address specific issues relating to the CCS at the FPL Turkey Point Power Plant. The model is a two-dimensional cross-sectional model through the Biscayne aquifer across southern Miami-Dade County in a general east/west direction beginning on the west in the C-111 basin and terminated on the east off-shore of old Rhodes Key. The primary modifications made by FPL (2013) to the original USGS model are adjustments to the FPL cooling canal systems, internal boundary conditions, and changes to aquifer properties based upon recent aquifer performance tests conducted at the facility. **Figure 1** provides the project location.

This two-dimensional model modified from Hughes (2009) allows for a simple and quick method for evaluating proposed changes and provides reasonable results for a rudimentary assessment of possible alternatives. This model can be run and processed in a short period of time and has significant cost and time advantages compared to the development of a full 3-D solute transport model of the aquifer system. However, the geometry of the CCS and its plume are poorly represented at the regional scale by the 2-D model. The 2-D model also lacks essential features of regional hydrology that can affect the behavior of the plume. Recharge from rainfall and water loss from the aquifer due to evaporation and well withdrawals are not accounted for. Neither are the interaction between the aquifer and canals outside of the immediate area of the CCS, which can function both as sources of recharge and discharge from the aquifer. Limitations of using a 2-D versus a 3-D model are numerous because of the overly simplified hydrology, inherent constraints in 2-D flow and transport fate when applied to a 3-D problem and accordingly, results provided on saline movement in the region derived from the 2-D model should be considered as a very generalized representation of what could be expected.

The model provided by FPL is a cross-sectional model through the Biscayne aquifer with the vertical discretization divided into 31 layers each 3 feet thick. **Figure 2** shows the horizontal hydraulic

conductivity with depth. The hydraulic conductivity does not vary laterally within an individual layer. The high hydraulic conductivity occurring at a depth of approximately -27 feet NGVD is a very productive unit of the Key Largo Limestone. Note that this is the same zone that the proposed radial collector wells are targeting as described in FPL's Site Certification Application proposed for Units 6 and 7.

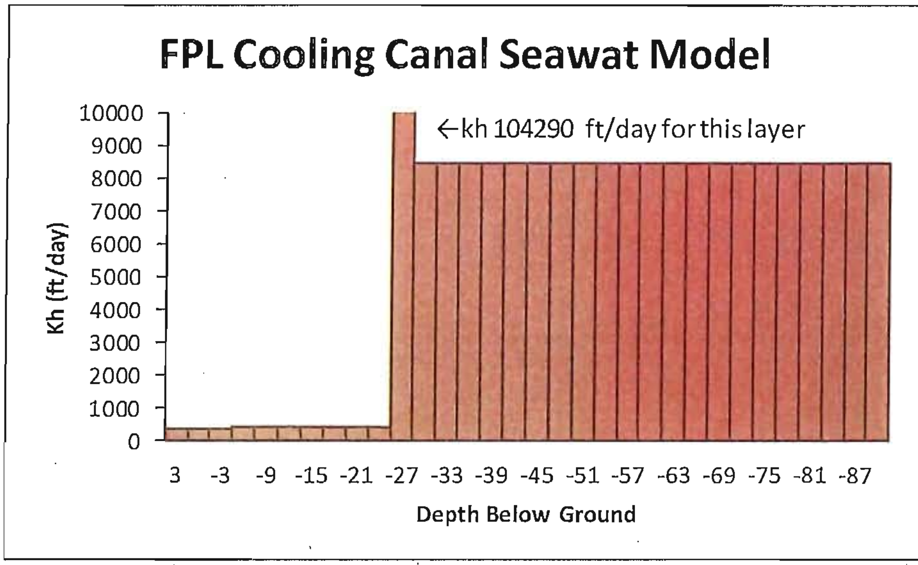


Figure 2. Hydraulic Conductivity of the FPL Biscayne aquifer model.

The use of a constant thickness and constant hydraulic conductivity for each layer of a model that stretches 136,000 feet across the Biscayne aquifer is a highly simplified representation of the groundwater system. FPL states that "No attempt was made to approximate the thinning of the aquifer to the west as it was believed that thickness changes would have an insignificant effect on model transmissivity given variability in hydraulic conductivity". This simplifying assumption of constant aquifer thickness over the model domain is incorrect and may influence the advective flow component of the model and the associated movement of saline water within the aquifer. The assumption that the hydraulic conductivity does not change across the model and that the highly transmissive zone of the Key Largo Limestone is laterally contiguous at -27 feet NGVD is also questionable. Modification of the model to more accurately reflect the area hydrogeology would require the model to be recalibrated.

4.2.1 Datum Inconsistencies

Besides the inherent problems identified above by using a simplified 2-diminsional model, another key inconsistency was identified in the FPL report. It appears that the data used to simulate the canal stages had mixed datum reference points. FPL provided two model simulations, a historical model simulation which has the CCS operating at it's historically did from 1975 through the present. A second simulation,

called the salinity reduction simulation, assumes the 14 mgd inflow of brackish water into the CCS and simulates a period of 30 years beginning in 2015. In the historical simulation, FPL assumed all canals and ocean levels were referenced to NGVD. However, for the salinity reduction simulation, they assumed that the canals and ocean on the east use a NAVD datum while the west remains at a NGVD datum. This creates a series of problems because the difference between NAVD and NGVD is 1.53 feet, with NGVD being the higher datum. Basically, by keeping the western boundary at NGVD levels for the salinity reduction run and changing the eastern canals and ocean to reflect NAVD levels, an additional 1.5 foot west-to-east head gradient is artificially introduced into the simulation. Furthermore, the salinity reduction run uses the heads and concentrations from the historical operations run which means the heads are starting out 1.5 feet higher than they should be.

The topography of southern Miami-Dade County is only several feet above sea level in most of the area except along the Atlantic Coastal ridge. Due to the low topographic and hydrologic gradients of the area, deviations on the order of approximately 1.5 feet could significantly alter local groundwater flow and salinity migration rates and directions. **Figures 3 and 4** show the heads at various points that FPL used in their simulations. The mixing of NAVD and NGVD vertical datums is apparent. Correction of the FPL data to a single datum was needed to assess the effects of FPL's proposed CCS salinity reduction proposal and for the basis of comparison to the historical run and against the sensitivity model runs proposed by District staff.

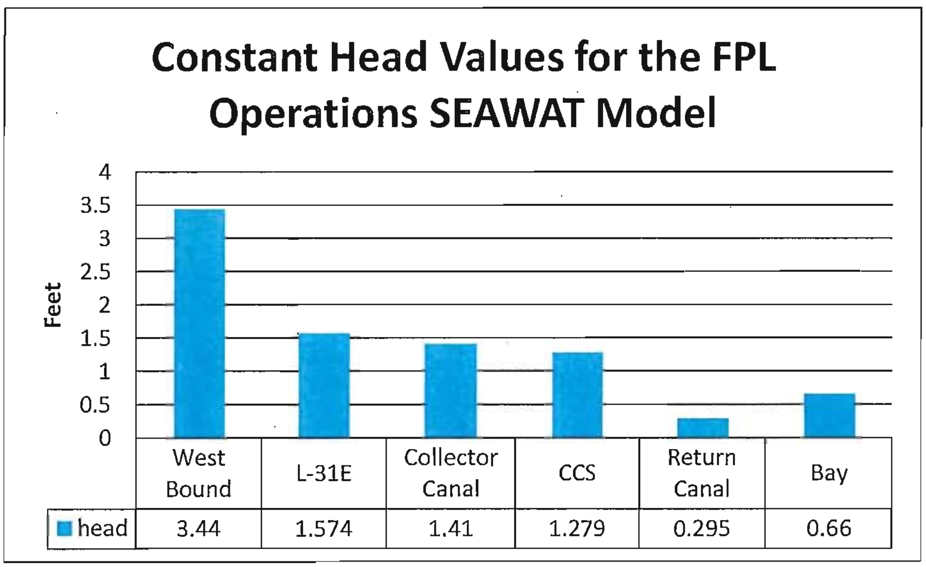


Figure 3. FPL Canal Stages for the Operations Model submitted to SFWMD.

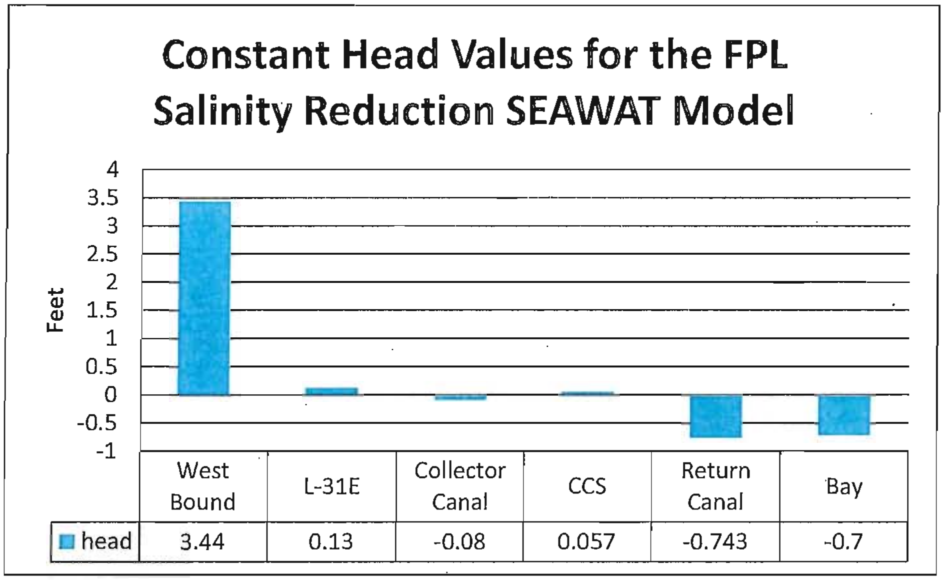


Figure 4. FPL Canal Stages for the Salinity Reduction Model submitted to SFWMD.

4.2.2 Canal, Biscayne Bay and Atlantic Ocean Specified Head Values

Water levels in the model at maintained surface water features are simulated using constant heads. These boundary conditions are the Atlantic Ocean and Biscayne Bay on the east, the C-111 basin on the west, and the SFWMD L-31E canal and the CCS in the center. Water levels within the CCS are maintained at different elevations and can be divided into the interceptor canal, the discharge canals and the return canals. The L-31E and CCS canals have varying depths ranging from several feet upwards of 30 feet deep. For each individual simulation, water levels are maintained at a fixed level throughout the simulation at each individual canal, but may have different levels between canals.

The values used by FPL for certain specified-head conditions are not non-unique and do not match long term averages calculated from District data-base time series. There is a potential that these differences, albeit small, may be significant to affect the model's representation of saline groundwater occurrence and movement. Corrections to these boundary conditions, and standardized to NGVD, were conducted for District simulations and are required to properly assess the proposed salinity reduction scenario.

5.0 SFWMD Model Scenarios Conducted Under this Review

5.1 Model Simulations and Revisions

In order to provide an independent review of the FPL proposal, SFWMD conducted a series of model simulations to evaluate groundwater conditions. These included 9 simulations using the revised 2-D Biscayne aquifer model and 3 simulations with the SFWMD East Coast Floridan Model. Several additional recalibration model runs and target-specific sensitivity runs were also conducted but not included in **Table 1**. The nine simulations using the 2-D Biscayne aquifer model are listed in **Table 1**. A detailed discussion of each run is provided in **Section 5.4**.

Table 1. SFWMD CCS simulations.

2-D Flow /Transport Steady State Biscayne Aquifer Model	
Model Run	**Description**
HIS_FPL	Original FPL Historical Operations Simulation.
HIS_SFWMD	Historical Operations Simulation with SFWMD modifications
SR_FPL_V1	Original FPL Salinity Reduction simulation with mixed NAVD and NGVD canal stages.
SR_FPL_V2	Original FPL Salinity Reduction simulation with FPL canal stages all referenced to NGVD.
SR_SFWMD	Salinity Reduction Simulation with SFWMD modifications.
SENS_SFWMD_SLR	Sensitivity simulation with combined HIS_SFWMD and SR_SFWMD run with Sea Level Rise of 0.25 feet.
SENS_SFWMD_SEA	Sensitivity simulation with combined HIS_SFWMD and SR_SFWMD run with CCS salinity held at ocean water levels.
SENS_SFWMD_NC	Sensitivity simulation with combined HIS_SFWMD and SR_SFWMD run without the 14 mgd Floridan water added. A no change simulation.
SENS_SFWMD_NI	Sensitivity simulation with combined HIS_SFWMD and SR_SFWMD run. Assumes 14 mgd added to the CCS but it does not increase stages an additional 0.25 feet.

5.2 Floridan Aquifer Model Simulations

FPL did not provide an evaluation of the potential impacts of withdrawing 14 mgd either from the L-31 Canal/Biscayne aquifer or from the Floridan aquifer. For this analysis, it was assumed that the 14 mgd would be withdrawn from the upper Floridan aquifer. The Floridan aquifer at Turkey Point is approximately 1,000 feet below land surface and is not hydraulically connected to the Biscayne aquifer. As a result, a withdrawal of this magnitude does not require an evaluation of potential impacts to Everglades National Park and other wetland features, nor does it need to address the SFWMD regional water availability rule.

To evaluate potential impacts to the Floridan aquifer system, the SFWMD's East Coast Floridan Model (Giddings et. al., 2013) was used. This model is a three-dimensional flow and transport model that encompasses the entire southeast coast of Florida from Sebastian Inlet to the north extending midway between Florida and the Cay Sal Banks in the Florida Straits to the south. The model simulates the three primary production intervals with usable water in the Floridan aquifer system. Three scenarios were simulated with this tool and are provided in **Table 2.**

Table 2. SFWMD Floridan aquifer model scenarios.

ECFM 3-D Flow /Transport 1989 - 2010 Transient Floridan Model	
Model Run	**Description**
ECFMNP	ECFM – No groundwater withdrawals.
ECFMPER	ECFM – Permitted demands. Groundwater withdrawals north of Miami Dade County set at calibration rates. Miami-Dade and Monroe County Floridan users at permitted allocations. FPL Unit 5 withdrawals at 12.6 mgd.
ECFMFPL	Permitted users simulation plus the proposed 14 mgd Upper Floridan FPL wellfield for CCS dilution.

5.3 Floridan Aquifer Simulation Results

Figure 5 provides the estimated location for the proposed FPL 14 mgd Upper Floridan aquifer wellfield. The wellfield was simulated along the northern boundary of the CCS and adjacent to the existing Unit 5 wellfield. The projected drawdown for the proposed 14 mgd wellfield is provided in **Figure 6,** which shows the cumulative impact of all permitted Floridan users in southern Miami-Dade County including the Florida Keys Aqueduct Authority (FKAA) near Florida City, the Ocean Reef Country Club on Key Largo,

Miami Dade Water and Sewer Departments proposed South Miami Heights wellfield and the existing FPL Unit 5 wellfield at the Turkey Point facility plus the proposed 14 mgd for the CCS.

As shown in **Figure 6**, the cumulative cone of influence from the users in the area is confined to the southern Miami-Dade and eastern Monroe county area. **Table 3** provides the estimated additional drawdowns at the wells of existing legal users. Drawdowns between 1 and 3 feet are predicted to occur at the FKAA wellfield and the Ocean Reef wellfield. Water levels in the Upper Floridan aquifer in southern Miami-Dade and eastern Monroe County general range around 40 feet above sea level were not locally influenced by wellfield withdrawals. The projected drawdown of several feet on the existing legal users should not have an adverse impact.

Table 3. Projected drawdowns at existing legal users.

ECFM 3-D Flow /Transport 24 year Simulation		
Existing Legal User	**Permitted UFA Allocation**	**Projected Drawdown**
FPL Unit 5 (2009 Power Plant Certification)	12.6 mgd	40.4 feet
Florida Keys Aqueduct Authority SFWMD permit 13-00005-W	6.97 mgd	1.1 feet
Ocean Reef Country Club SFWMD permit 44-00001-W	0.58 mgd	2.3 feet
Ocean Reef Country Club SFWMD Permit 44-00002-W	1.42 mgd	2.6 feet
Miami Dade Water and Sewer Department SFWMD Permit 13-00017-W (South Miami Heights Wellfield)	23.3 mgd	0.3 feet

FPL Turkey Point - Estimated Floridan Well Locations

Figure 5. Estimated Location of the proposed FPL 14-mgd CCS wellfield.

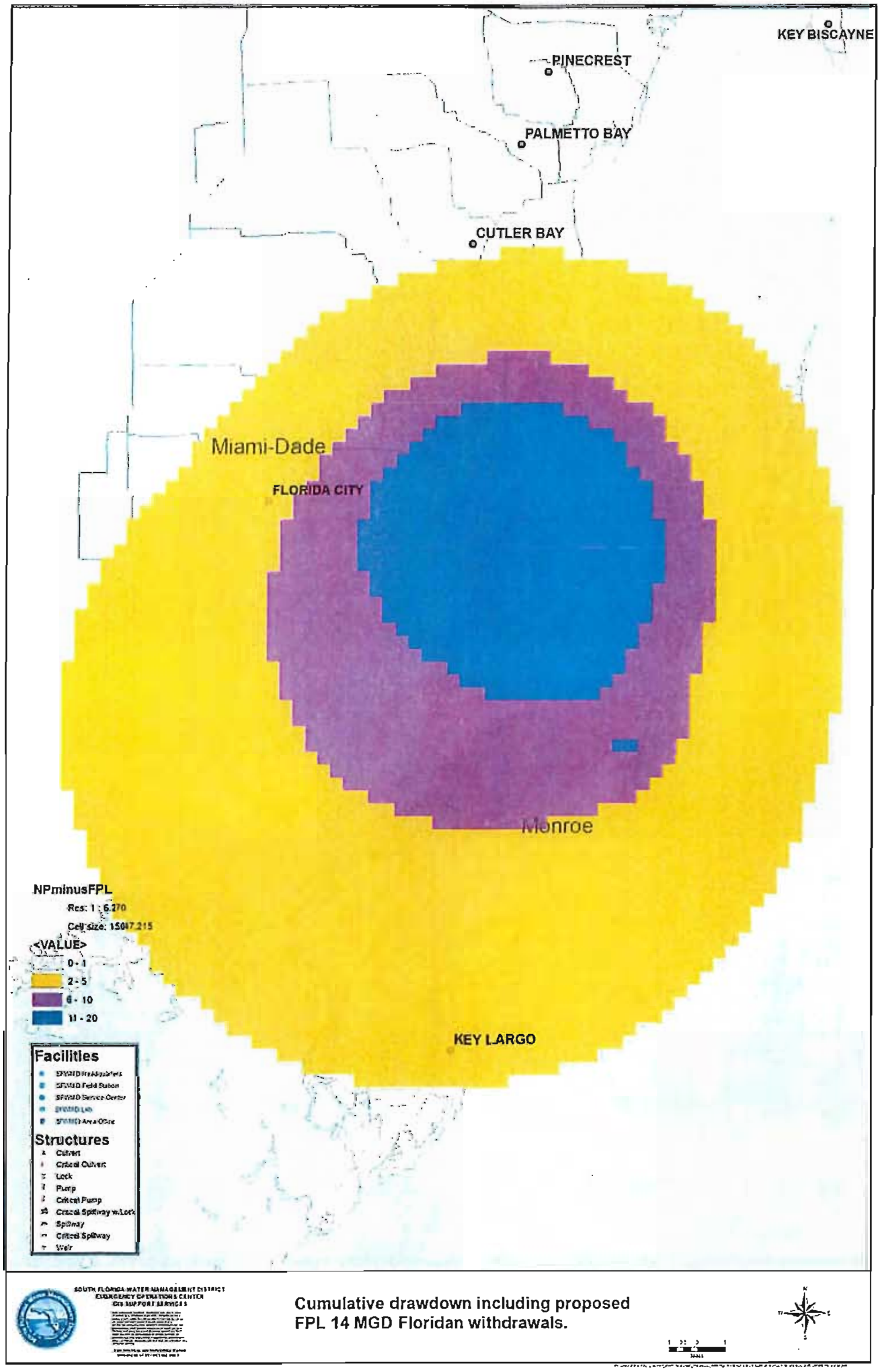


Figure 6. Upper Floridan aquifer cumulative drawdown for permitted users in south Miami-Dade County plus the proposed FPL 14 MGD demand.

5.4 CCS Historical Simulation Results

The historical simulation obtained from FPL was run in its existing condition. The situation concerning the datum is not an issue for this simulation because FPL referenced all data to NGVD in their original model submittal. This simulation is termed **HIS_FPL**.

Because of issues identified during the review of the FPL submittal and discussed in Section 4, SFWMD staff modified the model submitted by FPL to reflect these concerns. The thickness of the aquifer, which was constant in the original model, was modified to reflect the thickening of the Biscayne aquifer eastward from the edge of Everglades National Park on the west to Biscayne National Park on the east. Several other lessor modifications were also incorporated and were primarily associated with model stability. However, modifications of the model to more accurately reflect the area hydrogeology, other than the thinning of the aquifer to the west, would require the model to be significantly recalibrated. Such modifications were not consistent with the scope of review conducted here but can be introduced if needed.

In addition to changes to the model structure, stages used in the model to simulate existing and future canal and ocean/bay stages had to be adjusted to represent observed field values. Stages used for the simulations were obtained from the SFWMD DBHYDRO data base and the FPL monitoring network and all referenced to a consistent NGVD datum. Although the western boundary of the model extends to the L-31W canal, stages in the C-111 canal were used for the western boundary because it is the controlling canal for water levels in that area of the model. **Table 4** provides the levels and source for each of the canal and ocean boundary conditions simulated in all SFWMD simulations unless specifically stated. The revised SFWMD version of the historical simulation is termed **HIS_SFWMD**.

Table 4. Canal/boundary stages used for the SFWMD Biscayne aquifer model simulations.

2-D Flow /Transport Steady State Biscayne Aquifer Model		
Canal/Boundary	**Stage**	**Source**
Atlantic Ocean	0.78 ft. NGVD	DBHYDRO S-20F downstream gage
Biscayne Bay	0.78 ft. NGVD	DBHYDRO S-20F downstream gage
C-111/L-31W	3.44 ft. NGVD	DBHYDRO S-176 downstream gage
L-31E	1.75 ft. NGVD	DBHYDRO S-20 upstream gage
FPL Interceptor Ditch	1.41 ft. NGVD	FPL ID monitoring network I.D. gage
FPL discharge canals	1.63 ft. NGVD	FPL ID monitoring network C-32 gage
FPL return canals	0.71 ft. NGVD	FPL Power UprateTPSWCCS-5 gage

The calibration results are provided in the following figures. Each graph shows the observed data, the simulated FPL run, and the simulated SFWMD run for water levels or concentrations. Salinity is expressed in practical salinity units (psu), parts per thousand (ppt), or mg/L. Seawater is approximately 35 psu, 35 ppt, 35 g/L, or 35,000 mg/L. For this discussion Total Dissolved Solids (mg/l) and psu of sea water (expressed in mg/l) are considered approximately equal. **Figure 7** shows the water quality concentrations at well G-21 Deep. Both the **HIS_FPL** and **HIS_SFWMD** runs provide a good fit to the observed values, but this is misleading. The **HIS_FPL** run assumes that the levels in the CCS are at 1.27 feet NGVD while the **HIS_SFWMD** run assumes levels in the CCS are at 1.55 feet NGVD, which is consistent with observed data. This 0.27 foot head difference is significant and results in a noticeable inland migration of the saline interface if that level was used in the original **HIS_FPL** run as shown in **Figure 8** for the same G-21 Deep well. This is one of the primary reasons why District staff modified and partially recalibrated the 2-D model including the need to vary the aquifer thickness across the model domain.

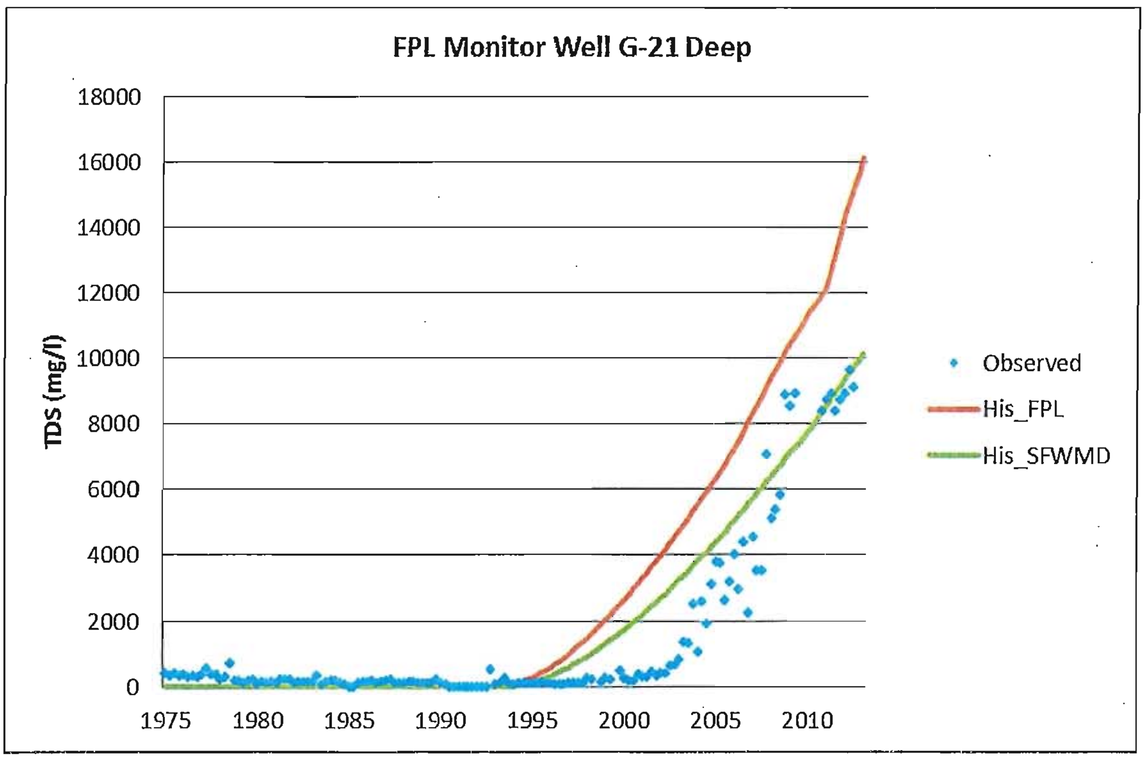


Figure 7. Simulated and observed water quality concentrations for well G-21 Deep.

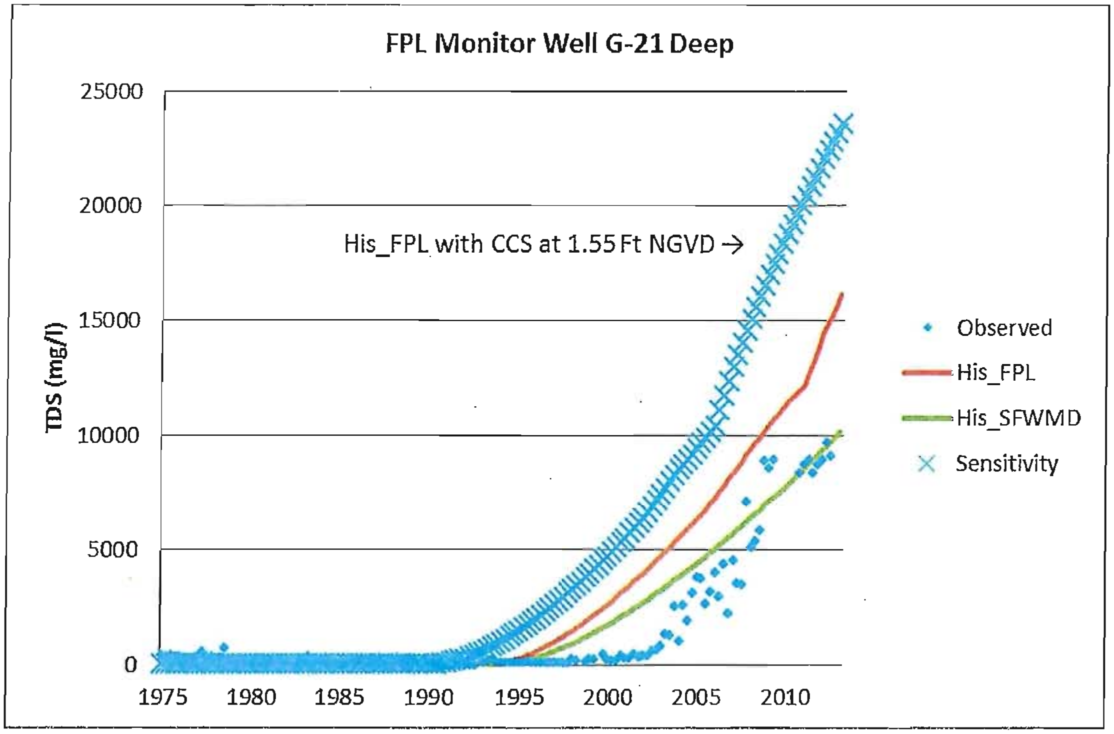


Figure 8. Water quality concentrations for well G-21 Deep including CCS stage revisions.

While the FPL report does compare historic salinity monitoring data to the model-calculated response, there is no information to describe whether the model reasonably represents groundwater stage and gradients. Comparison of groundwater stage data using monitoring data from wells located along the model transect to model-calculated stage data would provide valuable insights into the reasonableness of the models result in representing area hydrology. District staff included this analysis and water levels at well G-21 are shown in **Figure 9**. The observed and simulated water levels are significantly different, with both simulations having water levels approximately 1.0 feet higher than the observed values. This demonstrates the limitations of both models because they do not reflect changes in local hydrology included drainage canals, groundwater withdrawals, rainfall and other factors.

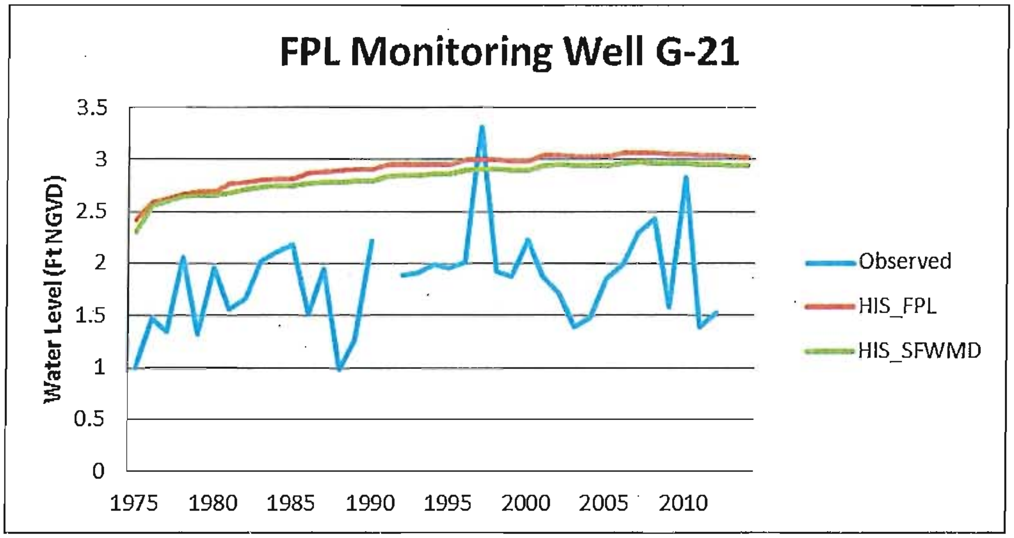


Figure 9. Water levels at well G-21.

To further illustrate this issue with the model's inability to accurately simulate water levels in the western 1/3 of the model, water levels obtained from the SFWMD South Dade Model' which is a subset of the Lower East Coast Subregional (LECsR) Model (Giddings et. al., 2006), were plotted along the model transect and compared against the results from both the **HIS_FPL** and **HIS_SFWMD** simulations. The LECsR model is a highly calibrated model and includes all hydrologic aspects of the system. It is simulated on a daily basis and the results presented here are the average water levels from 1985 through 2000 for the calibration period. **Figure 10** provides the comparison between models.

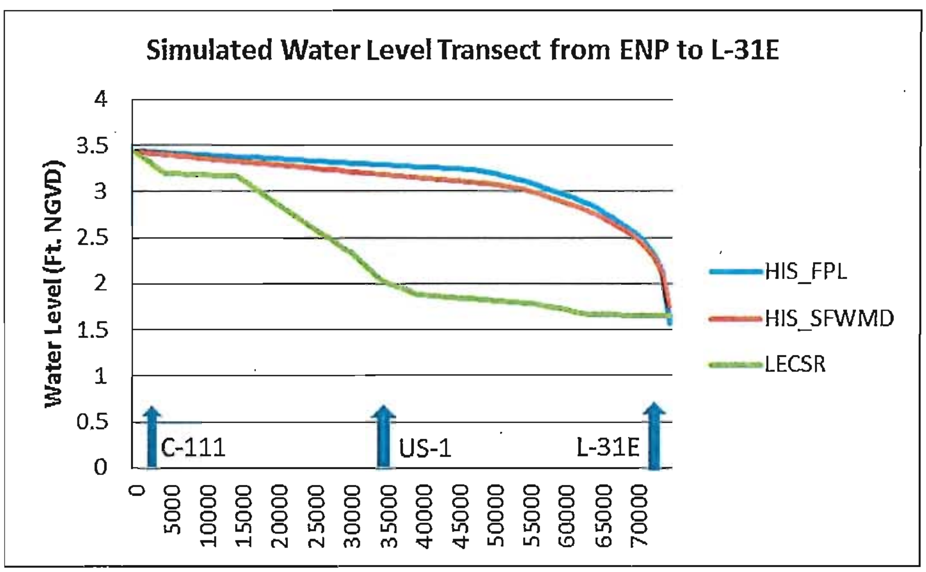


Figure 10. Water levels along the model transect.

To correct the model to more accurately simulate observed water levels would require wholesale changes to the model parameters and incorporation of packages which simulate actual conditions (i.e.,

wellfields). **Figure 11** provides the results of concentrations at well G-21 Deep for a sensitivity run where water levels in the western portion of the model were reduced 1.0 feet to represent more realistic water level conditions in the south Miami-Dade agricultural region. As shown in **Figure 11**, the salt water interface becomes highly unstable and suggests that the interface should have passed well G-21 Deep many years before actually being observed. This illustrates the limitations of the 2-D model and would require additional calibration and possibly a full 3-dimenisional model to accurately simulate conditions in southern Miami-Dade County.

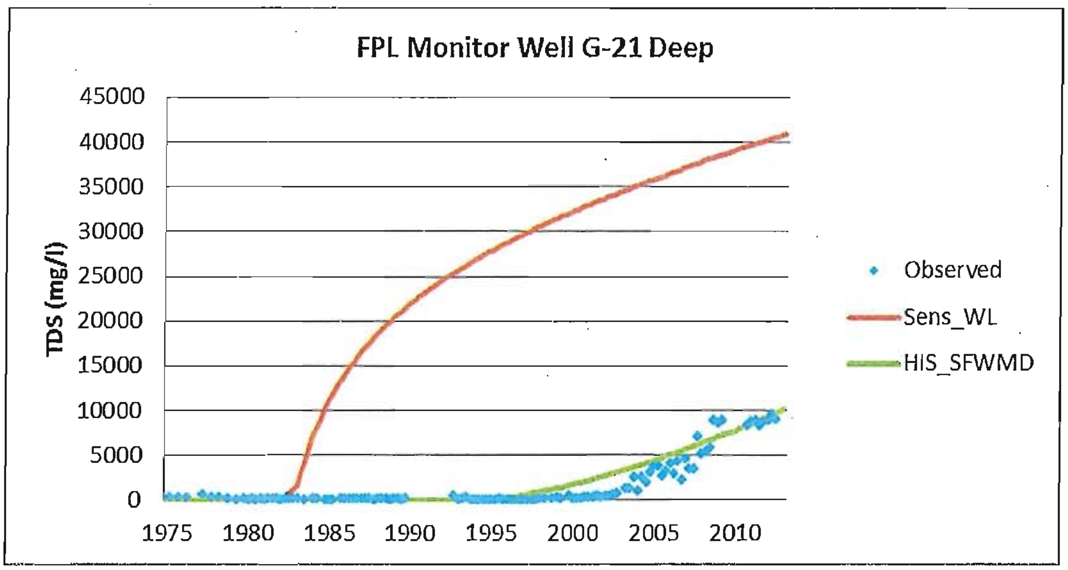


Figure 11. Sensitivity model run with observed water level conditions in south Miami-Dade County.

Calibration plots for TDS concentrations at wells L-3 Shallow, L-3 Deep, G-21 Shallow, G-12 Deep and G-1264, and water levels for wells FKS-9, G-21 and L-3 can be found in **Appendix A.** In general, the **HIS_SFWMD** model provides a reasonable calibration of the concentrations at the wells but does not do a good job simulating water levels at G-21, BBCW6GW1 or FKS-9, and the entire western portion of the model. It was also observed that water levels take up to 25 years to stabilize from the pre-development conditions in areas of the model, which is also indicative to the models lack of simulated evapotranspiration and rainfall.

5.5 CCS Future Simulation Results

Three future simulations were analyzed. These include the original FPL salinity reduction run (**SR_FPL_V1**) which includes the mixing of NAVD and NGVD datums, a revised FPL salinity reduction run which corrects FPL levels to NGVD but does not correct the canal stages to those observed in the field (**SR_FPL_V2**), and a SFWMD run, which uses the **HIS_SFWMD** model which includes the modifications to the FPL model and also uses the observed water levels at all canals (**SR_SFWMD**). Each of the graphs presented includes the previous historical simulation plus the future simulation on one graph. That is, the simulation period shown on the graphs is from 1975 through 2040 with the historical simulation

represented on each graph as the period from 1975 – 2014 and the future simulation represented on the graph from 2015 through 2040. **SR_FPL_V1** and **SR_FPL_V2** use the **HIS_FPL** historical simulation and the **SR_SFWMD** use the **HIS_SFWMD** simulation.

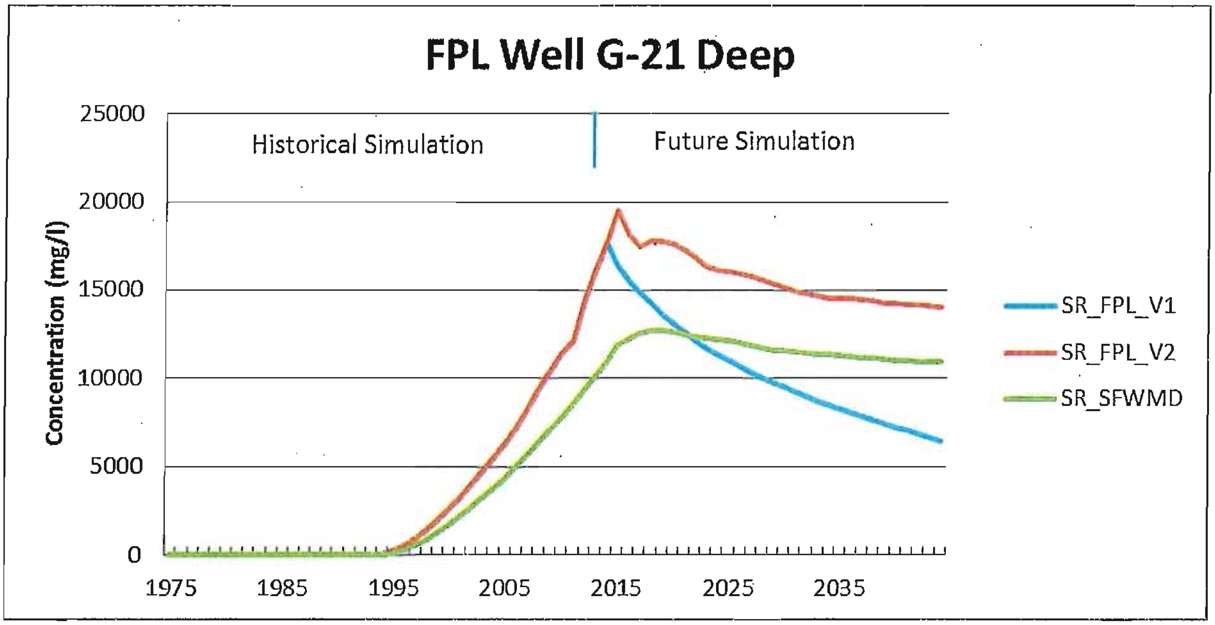


Figure 12. Salinity concentrations at well G-21 Deep.

Figure 12 provides the TDS concentration results for well G-21 Deep for the future scenarios. The rapid decrease in water quality for the **SR_FPL_V1** run is a result of the mixing of NGVD and NAVD datum assignments to the western boundary. Because the difference between the two is approximately 1.5 feet, the result for this run is that the western boundary is 1.5 feet higher than should be simulated. As a result, this higher freshwater head pushes the salt water interface further eastward than the other runs. This point is further illustrated in **Figure 13,** which shows the abrupt change in water levels for **SR_FPL_V1** at the historical and future simulation divide but is not evident in the other two simulations. The remaining two simulations are similar in trend, with the difference being that the **SR_SFWMD** does a better job of estimating the observed concentrations at the end of the historical simulation period where the **SR_FPL_V2** run tends to overestimate the TDS concentration at this well. However, both of these runs suggest that the addition of the 14 MGD of Floridan water begins to stabilize the interface at this location and aquifer depth.

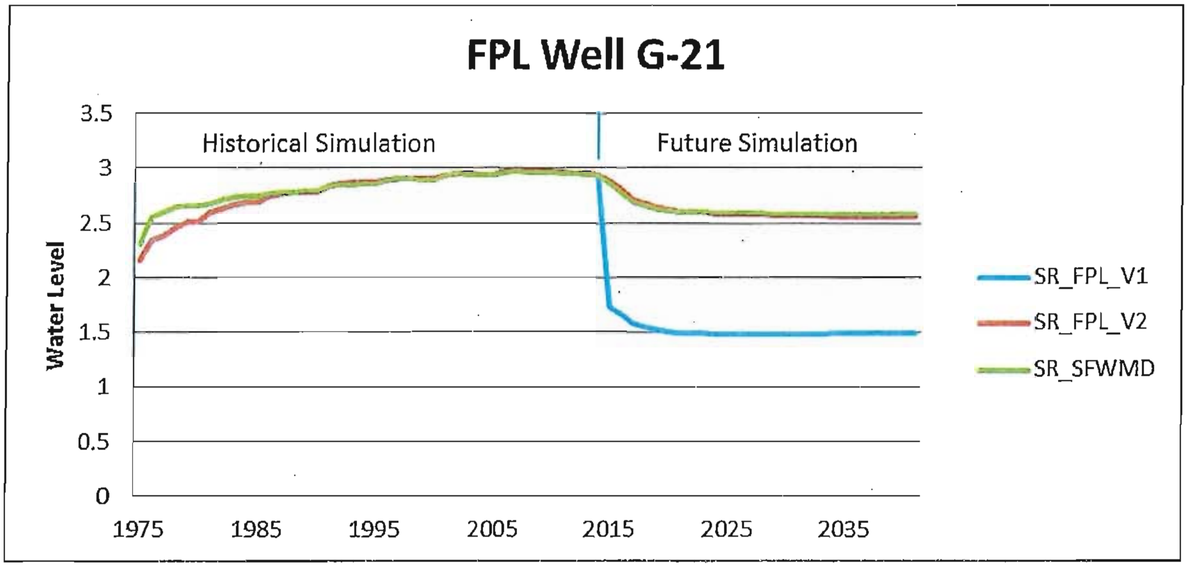


Figure 13. Water Levels at well G-21.

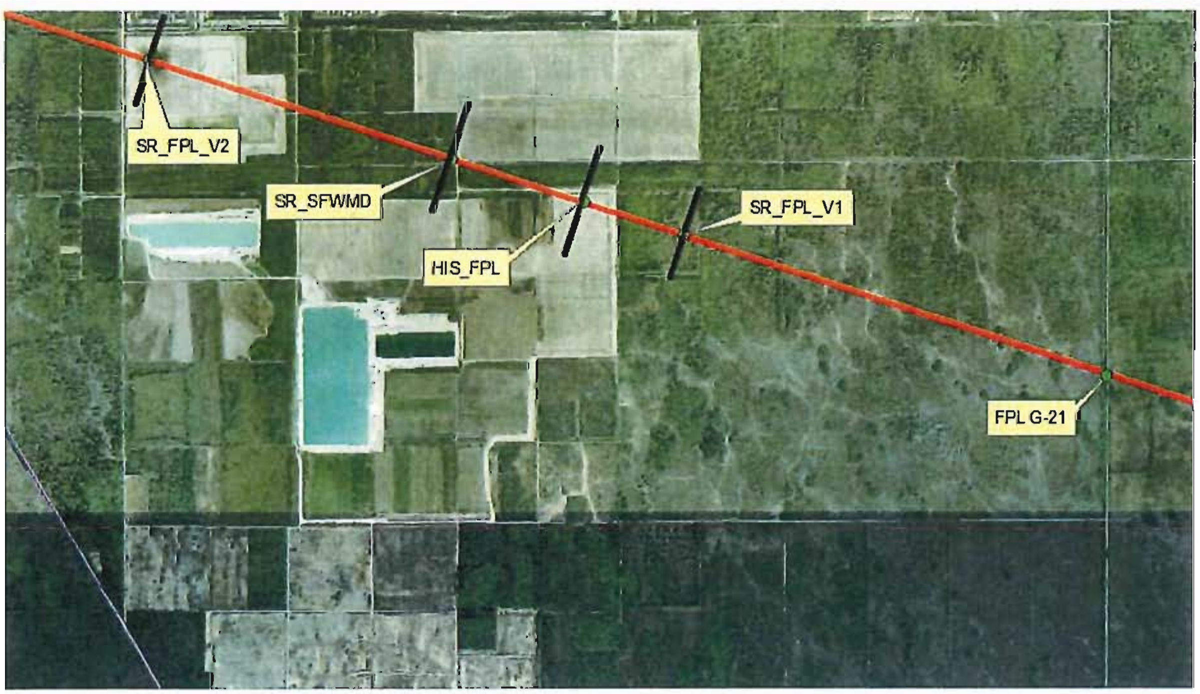


Figure 14. Location of the 10,000 mg/l TDS line at the base of the Biscayne aquifer for the FPL simulations.

Figure 14 provides the estimated location of the 10,000 mg/l TDS interface at the base of the Biscayne aquifer for the three FPL simulations. In the documentation provided by FPL, it was concluded that the salt water interface would move eastward as a result of the proposed addition of 14 mgd of

fresh/brackish water to the CCS. This is shown by comparing the position of the **HIS_FPL** and **SR_FPL_V1** lines. The position of the **SR_FPL_V1** has the incorrect head for the western boundary which gives an inaccurate conclusion. Correcting the head on the western boundary actually results in a westward movement of the interface even with the salinity reduction proposal as shown by the position of the interface at point **SR_FPL_V2**. Also note that the position of the interface as predicted by the **SR_SFWMD** run is eastward of the **SR_FPL_V2** run.

Water quality beneath the CCs was also analyzed to determine the fate of the hypersaline water once the CCS was reduced to sea water conditions with the introduction of the Floridan aquifer water. Results presented here are for the SFWMD revised simulations. **Figure 15** shows the development of the hypersaline conditions underneath the CCS at present and is consistent with the results provided by FPL. As noted, water quality not only deteriorates vertically downward with time but also expands inland and seaward from the facility. The simulation suggests that the base of the salt water interface has migrated approximately 10,000 feet westward since 1985.

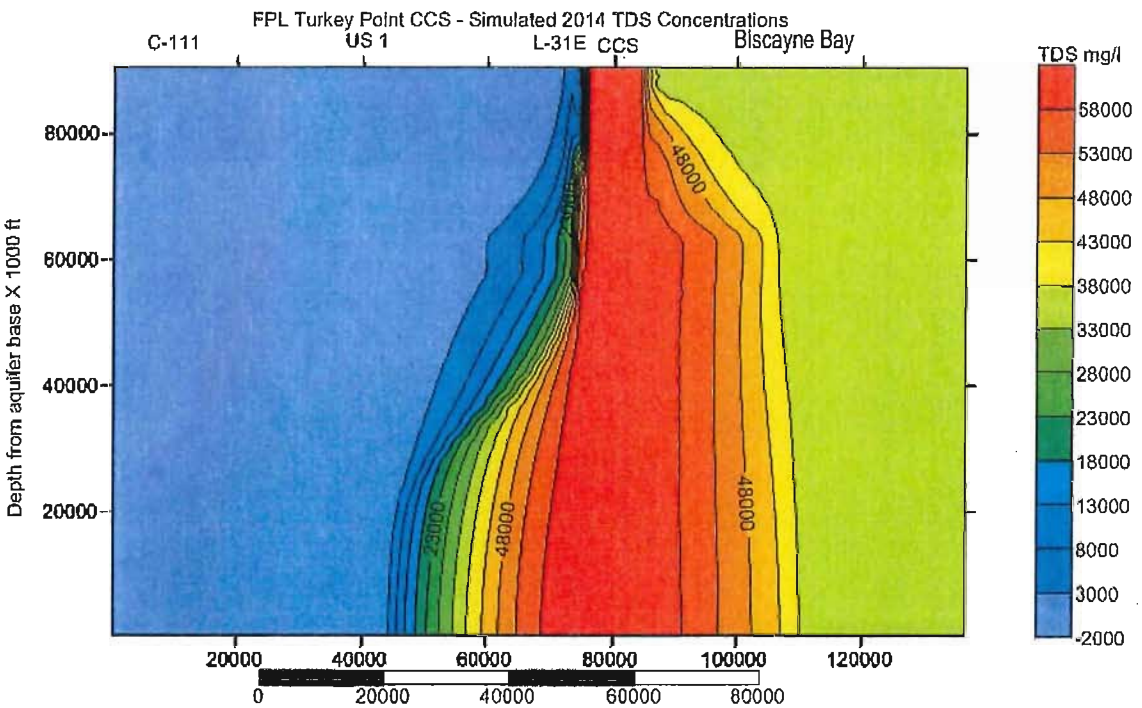


Figure 15. Simulated 2014 TDS concentrations in mg/l.

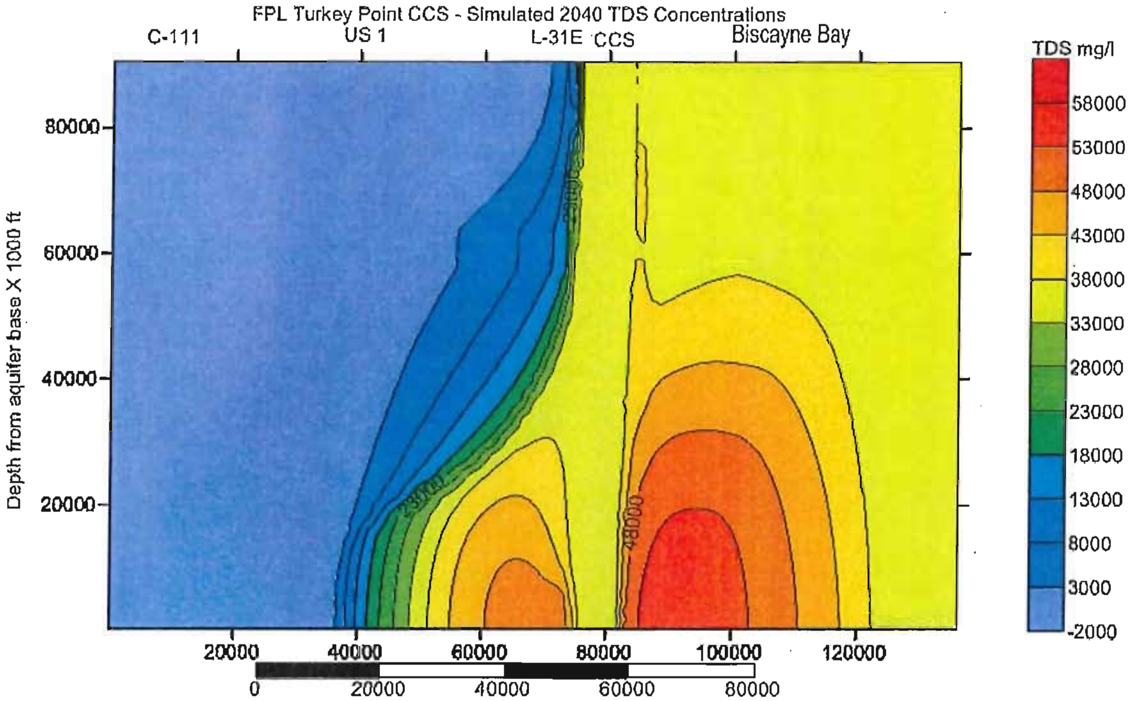


Figure 16. Simulated 2040 TDS concentrations in mg/l.

Figures 16 is the simulated water quality in the future with the introduction of the brackish water into the CCS. As shown, the introduction of the brackish water into the CCS changes the TDS concentration from approximately 60,000 to 35,000 mg/l at the surface within a short period of time. However, the denser, hypersaline water continues to remain at the base of the aquifer where it mixes and continues to radiate outward.

6 Discussion of the FPL Salinity Reduction Proposal for Turkey Point

Modeling provided by FPL, and verified by SFWMD staff, indicates that the addition of the 14 mgd of brackish water from the Floridan aquifer should help to reduce the hypersaline conditions experienced at the CCS. Water quality near the surface and beneath the site begins to change to near sea water conditions within several years after the addition of the Floridan aquifer water and continues to improve with time. However, the hypersaline water becomes trapped near the base of the aquifer and slowly mixes with the relatively fresher water surrounding it. The results provided by FPL do show potential for addressing the hypersaline conditions at the site but FPL did not provide a discussion on the future position of the saline interface in southern Miami-Dade County with or without their proposal.

ACI-05-000026

As discussed previously in this report, the 2-dimensional density-dependent solute transport groundwater model developed has its limitations. It does, however, allow for an initial look at the development of water quality conditions at the site through time and management options that could potentially be implemented, which previously was missing. While the FPL report does discuss the improvements the model suggests may occur at and below the CCS, it does not address several additional concerns including how much this remediation proposal further-mitigates the migration of the saline interface landward as a result of FPL's operations.

To address questions regarding the position of the saline interface and quantify the improvements the proposed introduction of 14 mgd of Floridan aquifer water may have on the system, several additional model simulations were conducted using the SFWMD revised version of the model. These include an evaluation of a 0.25 foot rise in sea level, not allowing the CCS water quality to exceed that of sea water from 1975 through 2040, and a no change simulation, which continues to operate the CCS at hypersaline conditions through 2040. These simulations should provide a general understanding on conditions at the site through time under various operational strategies.

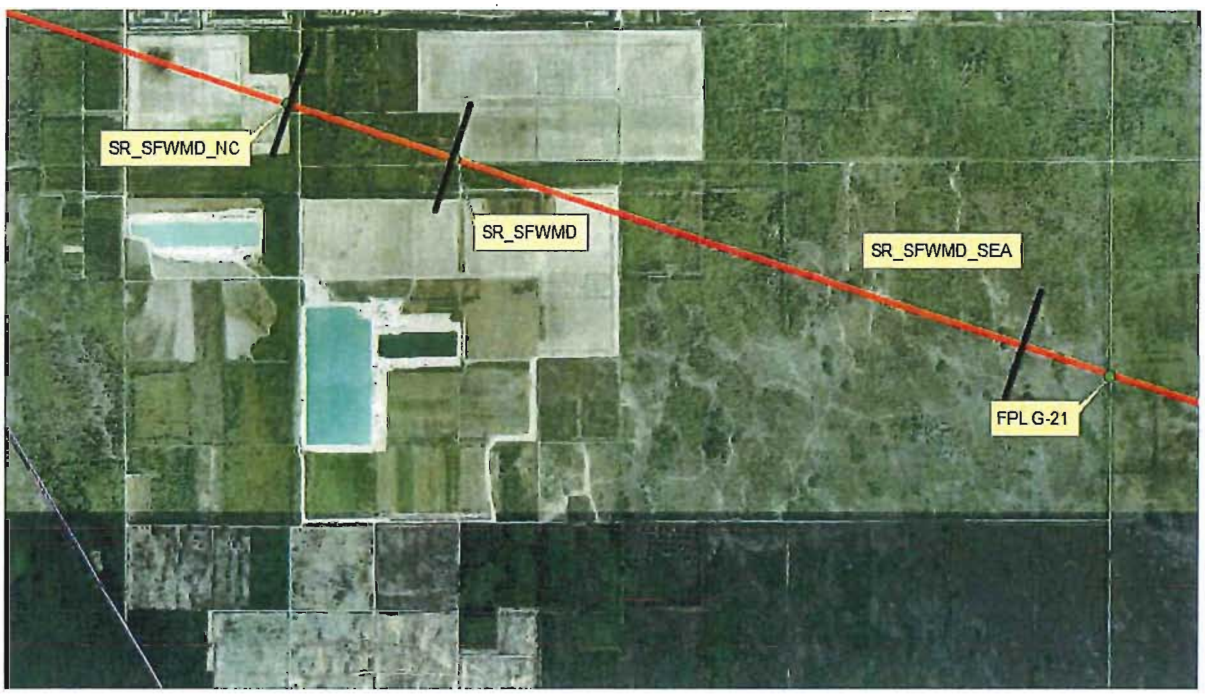


Figure 17. The position of the saline interface (10,000 mg/l TDS) at the base of the Biscayne Aquifer for the future SFWMD simulations.

Figure 17 provides the location of the interface at the base of the Biscayne aquifer for these future simulations. When the 14 md of Floridan aquifer water is added to the CCS, the position of the saline interface (**SR_SFWMD**) is seaward of the predicted position of the interface if it was not added (**SR_SFWMD_NC**). This suggests that the addition of the 14 mgd of Floridan aquifer water would have a net benefit to the Biscayne aquifer if implemented compared to existing conditions and operations. However, the proposal does not fully mitigate the last 40 years of the CCS operating at sea level to

hypersaline conditions because it does not move to a position in the vicinity of the **SR_SFWMD_SEA** simulation line, which is the approximate position of the saline interface if the CCS had been not been allowed to become hypersaline.

7 Conclusions

Modeling provided by FPL, and verified by SFWMD staff, indicates that the addition of the 14 mgd of brackish water from the Floridan aquifer should help to reduce the hypersaline conditions experience in the CCS at the site. Water quality near the surface and beneath the site begins to change to near sea water conditions within several years of the implementation of the proposal and continues to improve with time. Additional modeling conducted by District staff also shows that the FPL proposal improves conditions in the Biscayne aquifer eastward of the CCS compared to if FPL continues their current operations. The proposal does not move the western extent of the saline interface back to a position if the CCS would not have been allowed to exceed sea water concentrations.

5.0 References

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Giddings, J.B., L.L. Kuebler, J.I. Restrepo, K.A. Rodberg, A.M. Montoya, and H.A. Radin. 2006. Draft Lower East Coast SubRegional Groundwater Flow Model. South Florida Water Management District.

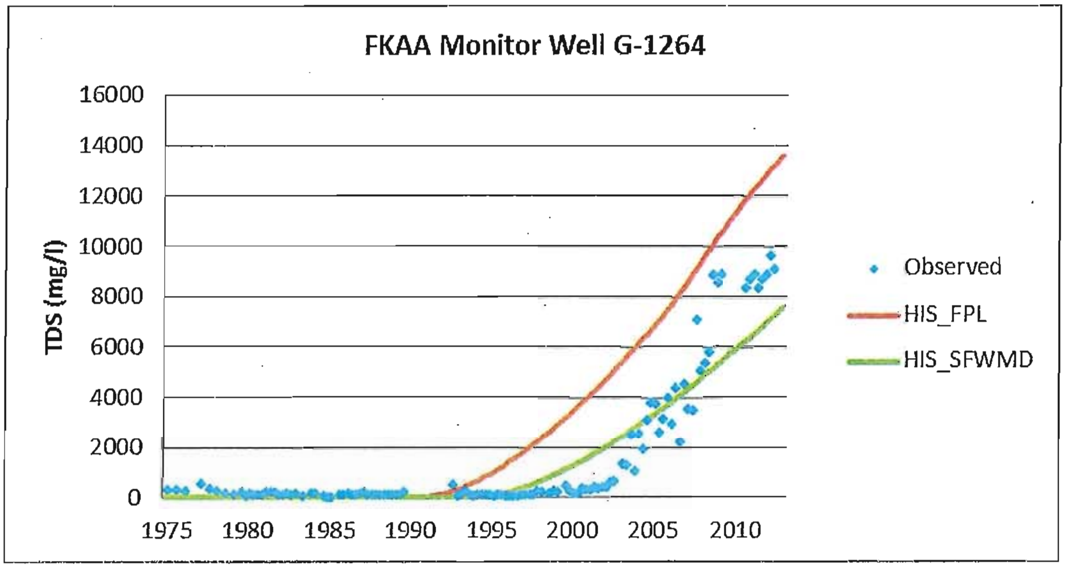
Giddings, J.B., A.M. Montoya, L. Jurado and Z. Li, 2013. East Coast Floridan Model. South Florida Water Management District.

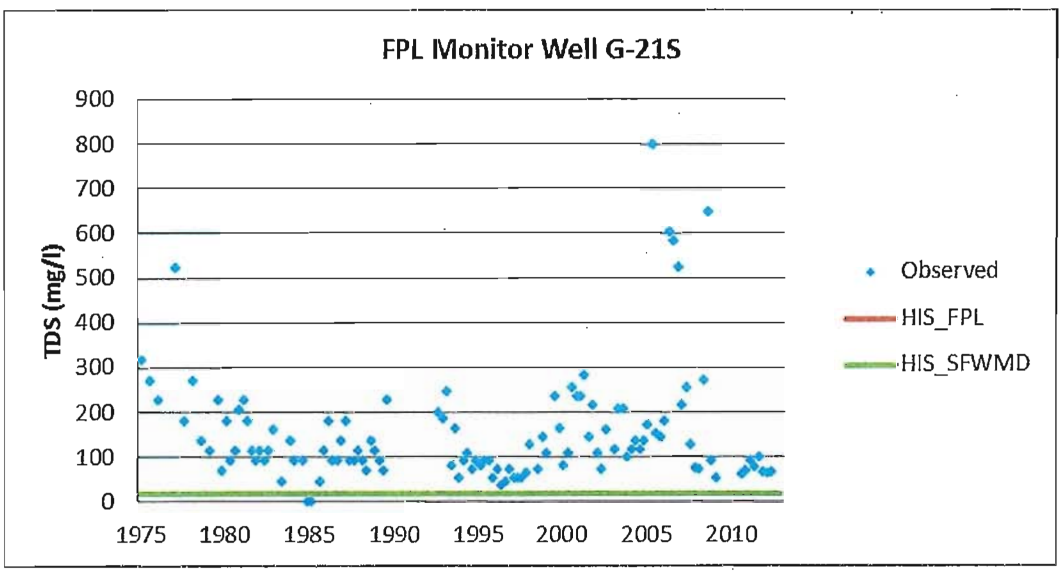
Hughes J.D., Langevin C.D., and Brakefield-Goswami, L. 2009. Effect of Hypersaline Cooling Canals on Aquifer Salinization, Hydrogeology Journal, 18:25-38.

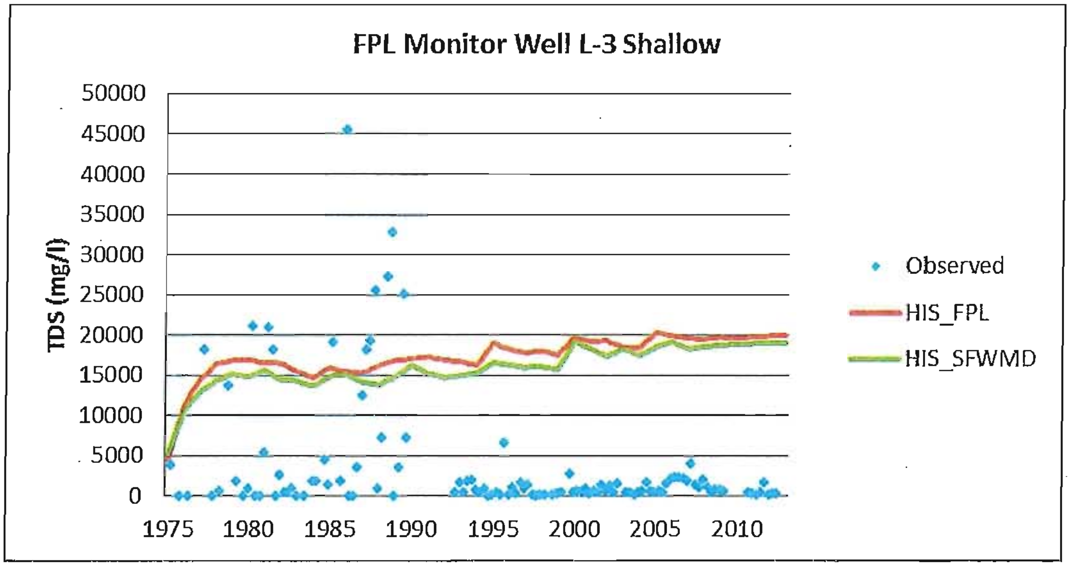
Langevin, C.D., W. B. Shoemaker, and W. Guo, 2003. MODFLOW-2000, the U.S. Geological Survey Modular Ground-Water Model—Documentation of the SEAWAT-2000 Version with the Variable-Density Flow Process (VDF) and the Integrated MT3DMS Transport Process (IMT): USGS Open-File Report 03-426, 43 p.

6.0 Appendices

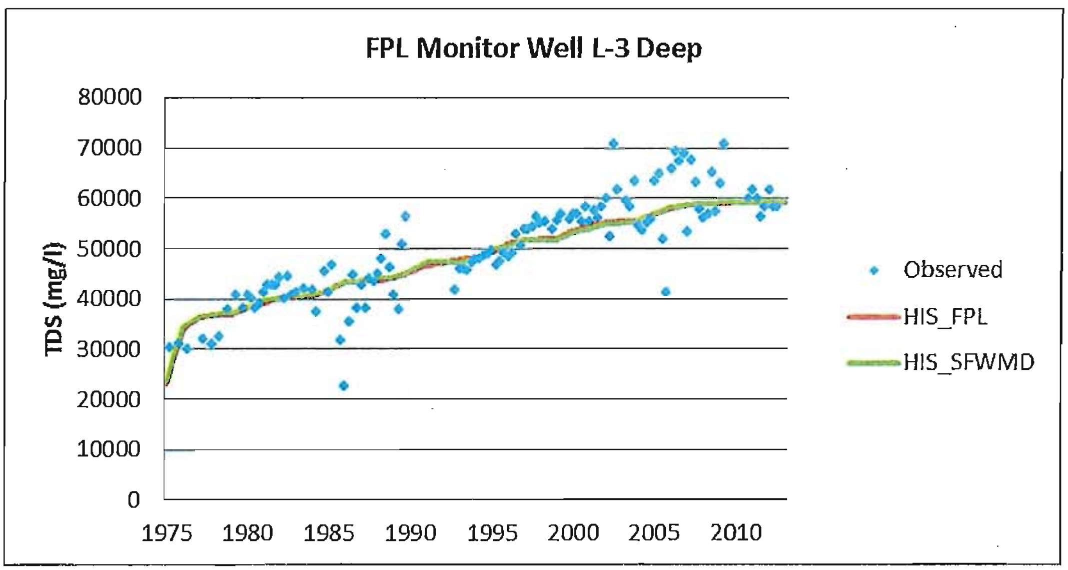
Appendix A: Calibration Plots



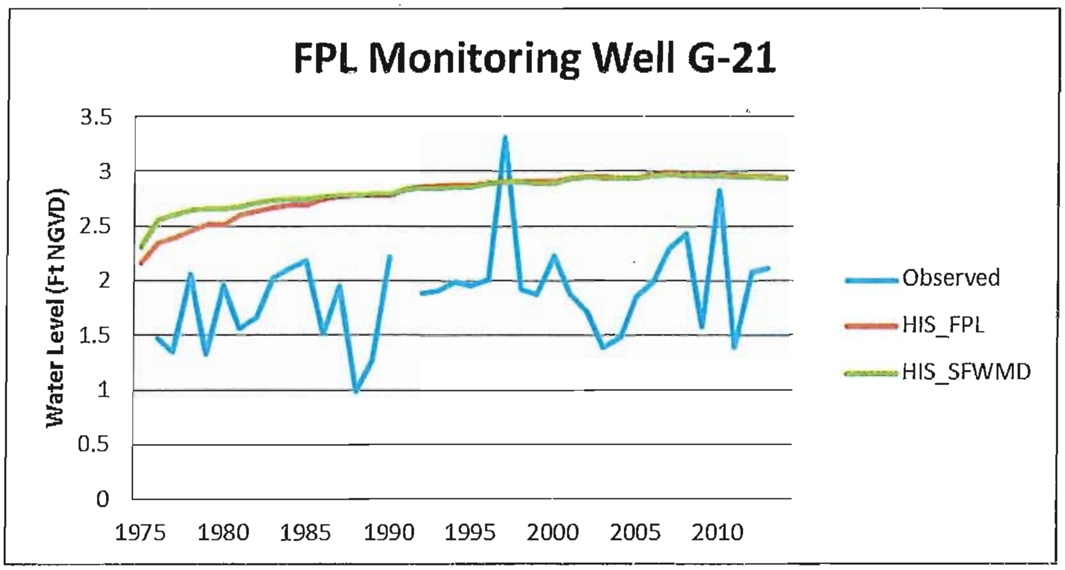


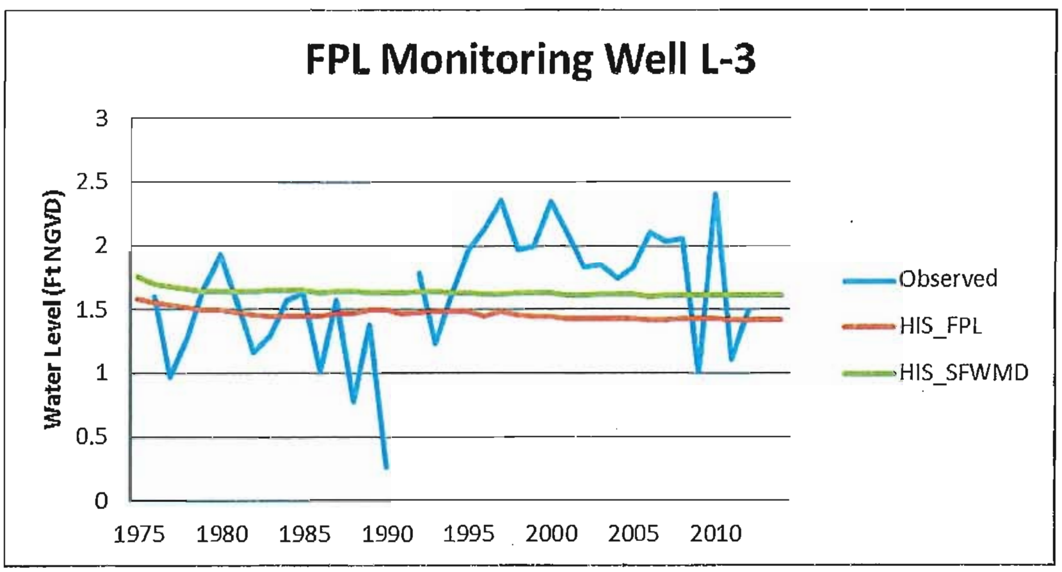


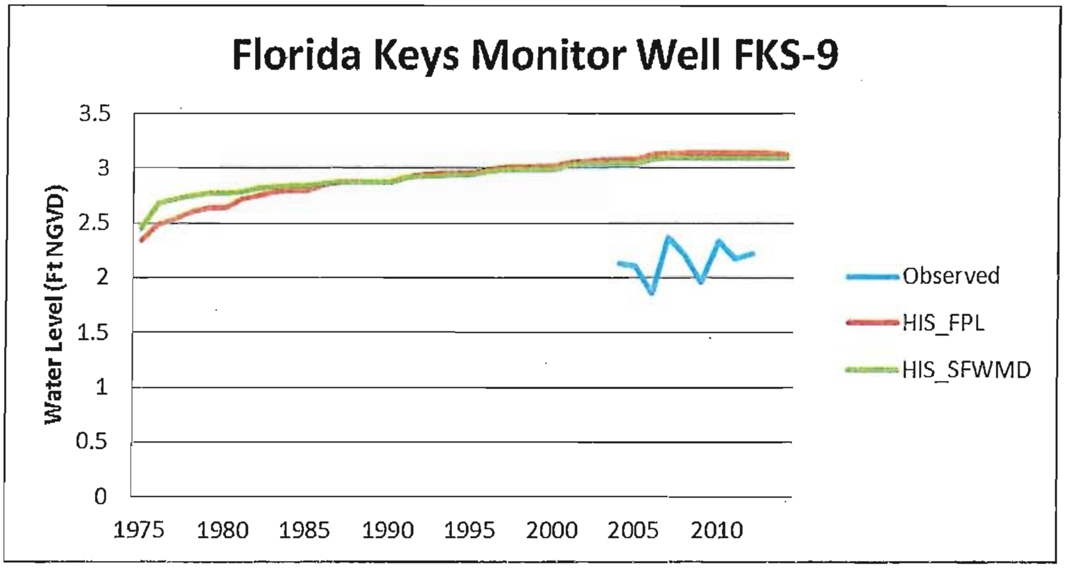
FPL Monitor Well L-3 Shallow
TDS (mg/l)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1975
1980
1985
1990
1995
2000
2005
2010
Observed
HIS_FPL
HIS_SFWMD

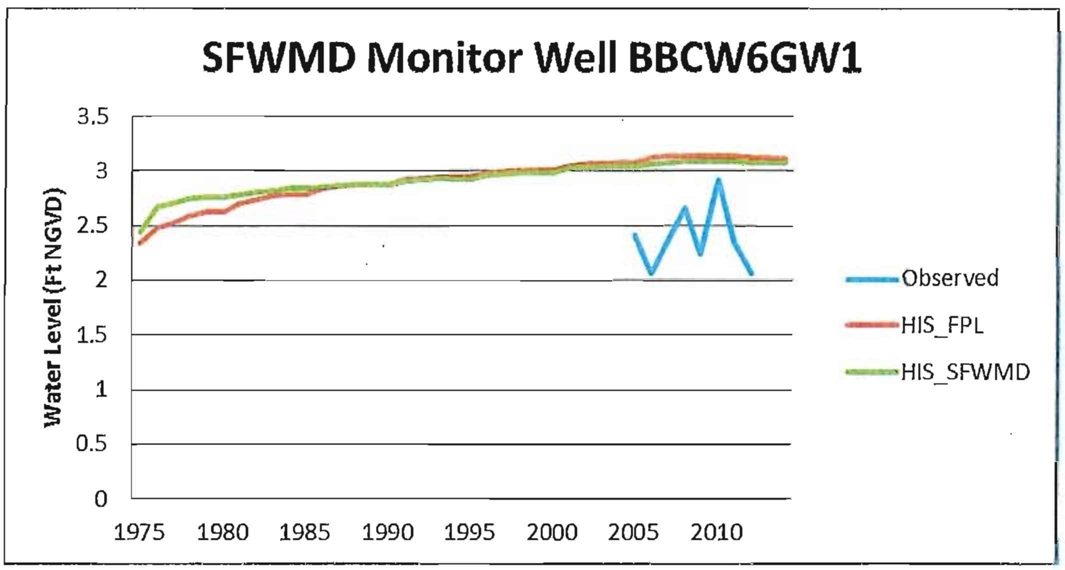


FPL Monitor Well L-3 Deep
TDS (mg/l)
80000
70000
60000
50000
40000
30000
20000
10000
0
1975
1980
1985
1990
1995
2000
2005
2010
Observed
HIS_FPL
HIS_SFWMD

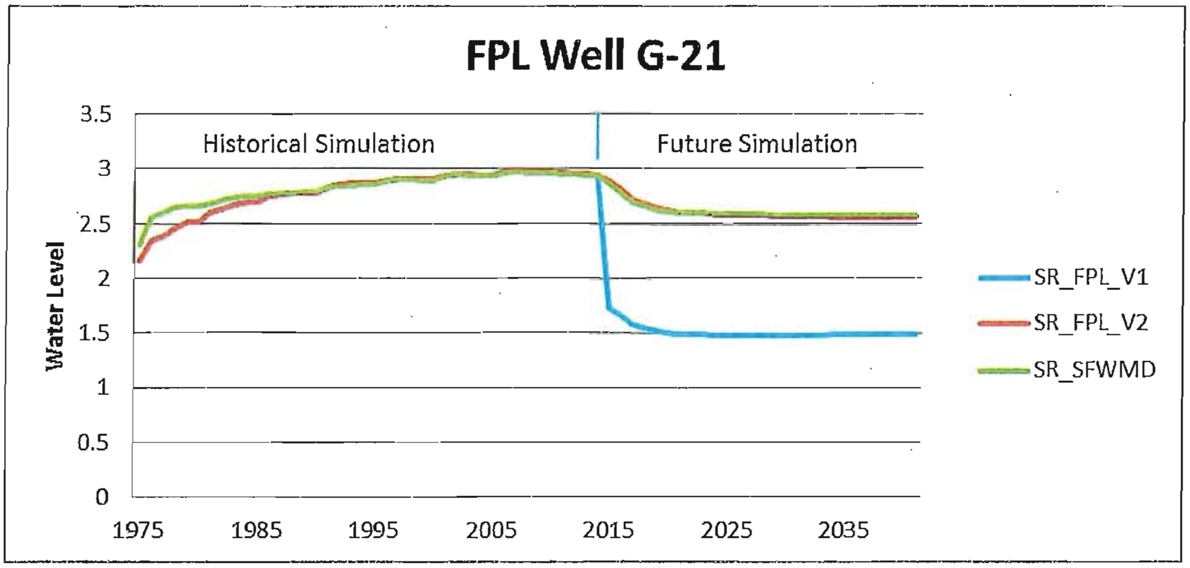

FPL Monitoring Well G-21
Water Level (Ft NGVD)
3.5
3
2.5
2
1.5
1
0.5
0
1975
1980
1985
1990
1995
2000
2005
2010
Observed
HIS_FPL
HIS_SFWMD

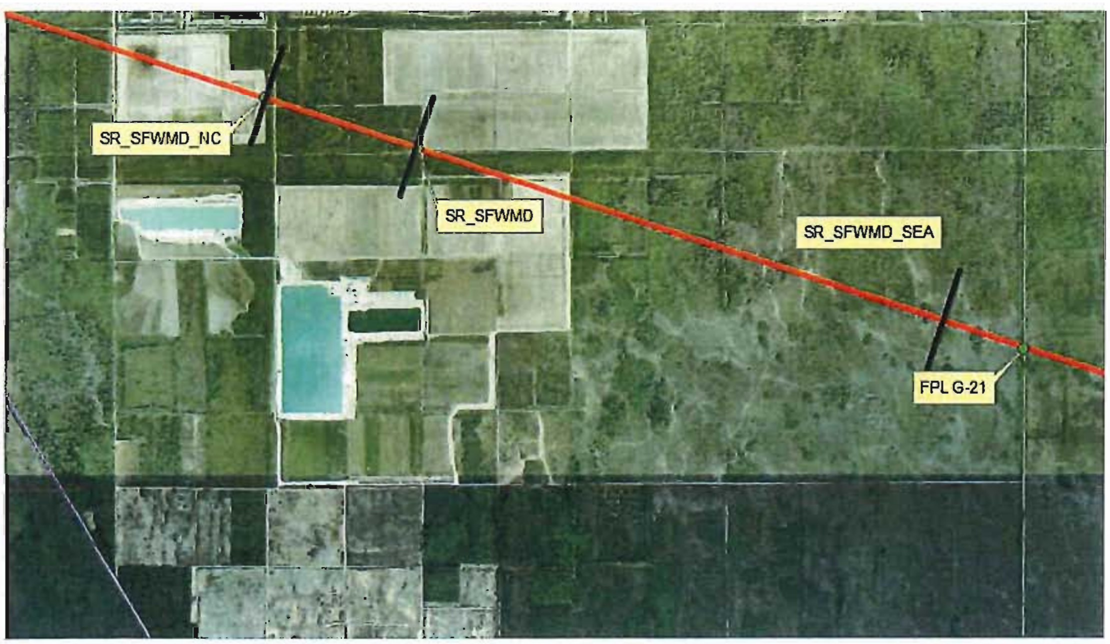

FPL Monitoring Well L-3
Water Level (Ft NGVD)
3
2.5
2
1.5
1
0.5
0
1975
1980
1985
1990
1995
2000
2005
2010
Observed
HIS_FPL
HIS_SFWMD

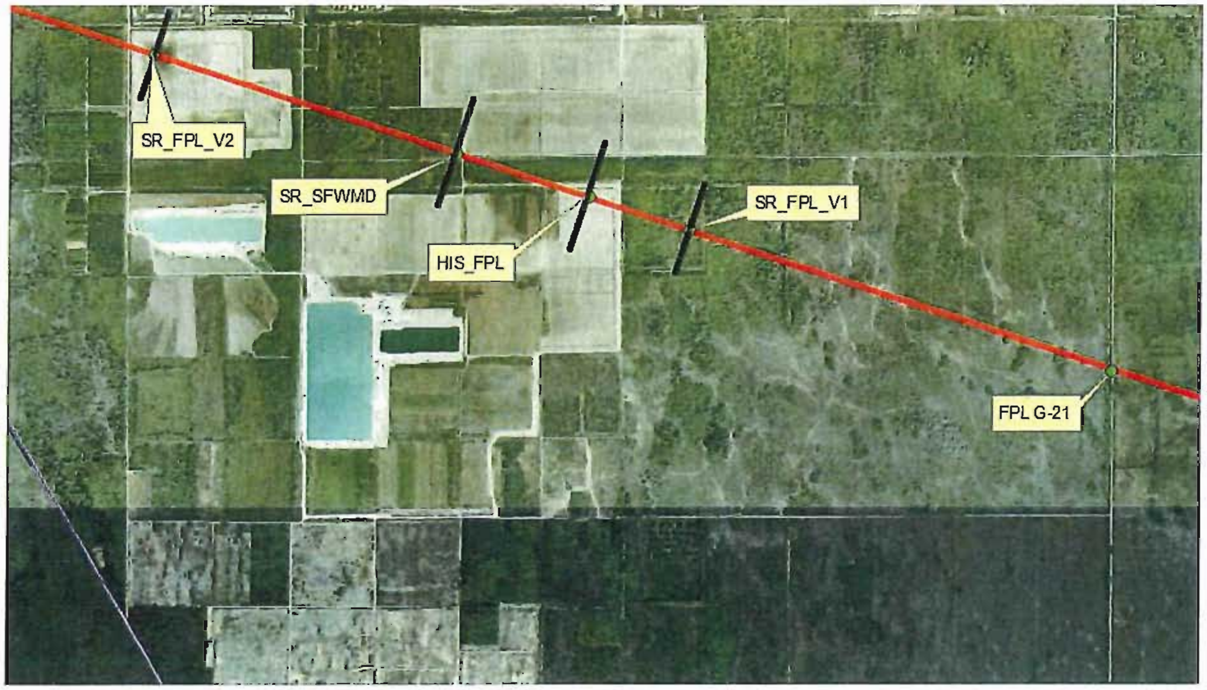

Florida Keys Monitor Well FKS-9
Water Level (Ft NGVD)
3.5
3
2.5
2
1.5
1
0.5
0
1975
1980
1985
1990
1995
2000
2005
2010
Observed
HIS_FPL
HIS_SFWMD

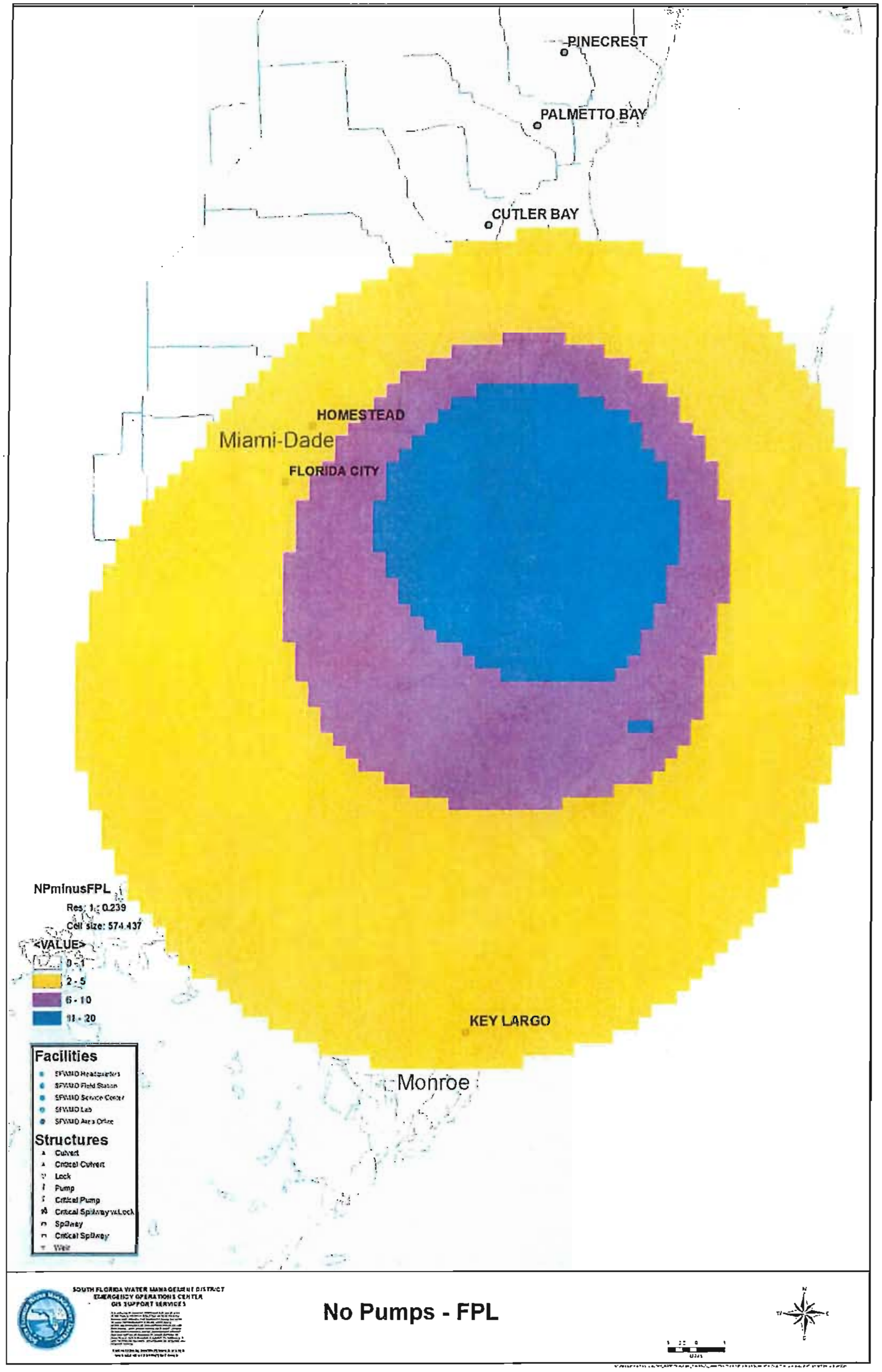

SFWMD Monitor Well BBCW6GW1
Water Level (Ft NGVD)
3.5
3
2.5
2
1.5
1
0.5
0
1975
1980
1985
1990
1995
2000
2005
2010
Observed
HIS_FPL
HIS_SFWMD

Appendix B: Simulation Plots

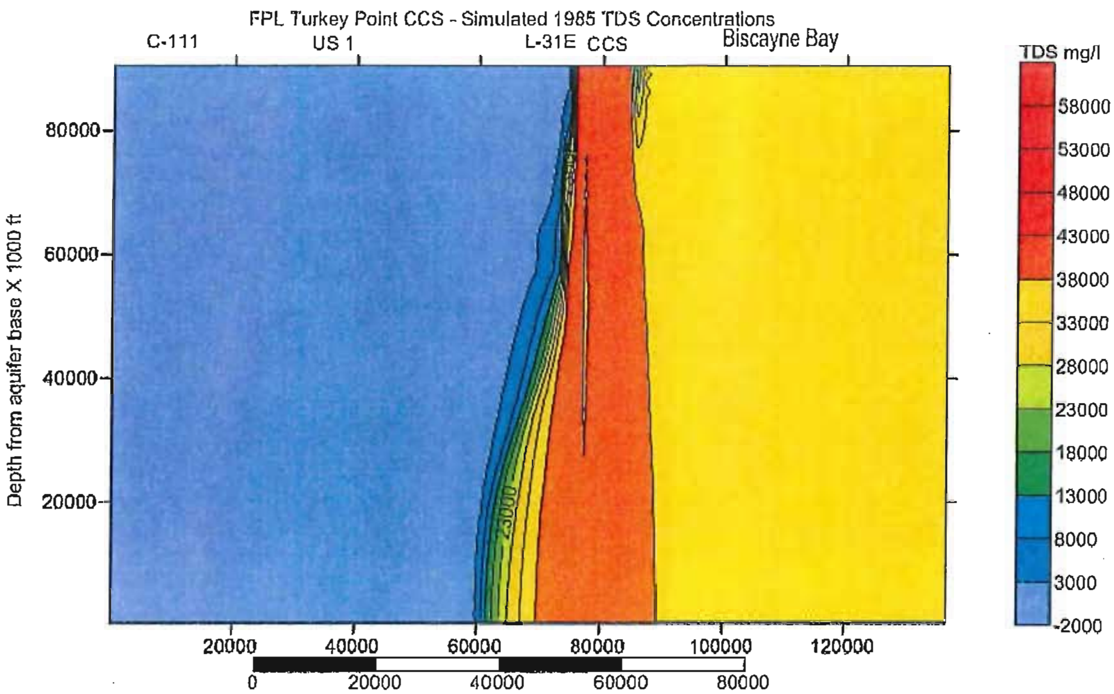




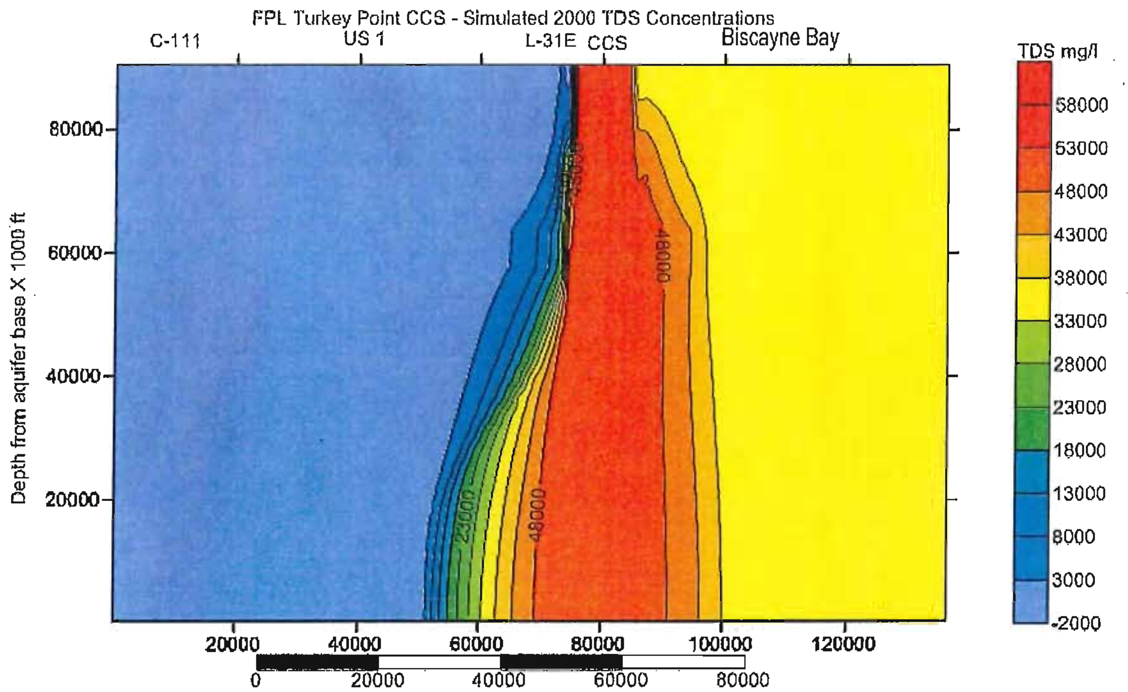

SR_FPL_V2
SR_SFWMD
HIS_FPL
SR_FPL_V1
FPL G-21


PINECREST
PALMETTO BAY
CUTLER BAY
HOMESTEAD
Miami-Dade
FLORIDA CITY
NPminusFPL
Res: 1; 0.239
Cell size: 574.437
<VALUE>
0 - 1
2 - 5
6 - 10
11 - 20
KEY LARGO
Monroe
Facilities
Structures
Culvert
Critical Culvert
Lock
Pump
Critical Pump
Spillway
Critical Spillway
No Pumps - FPL

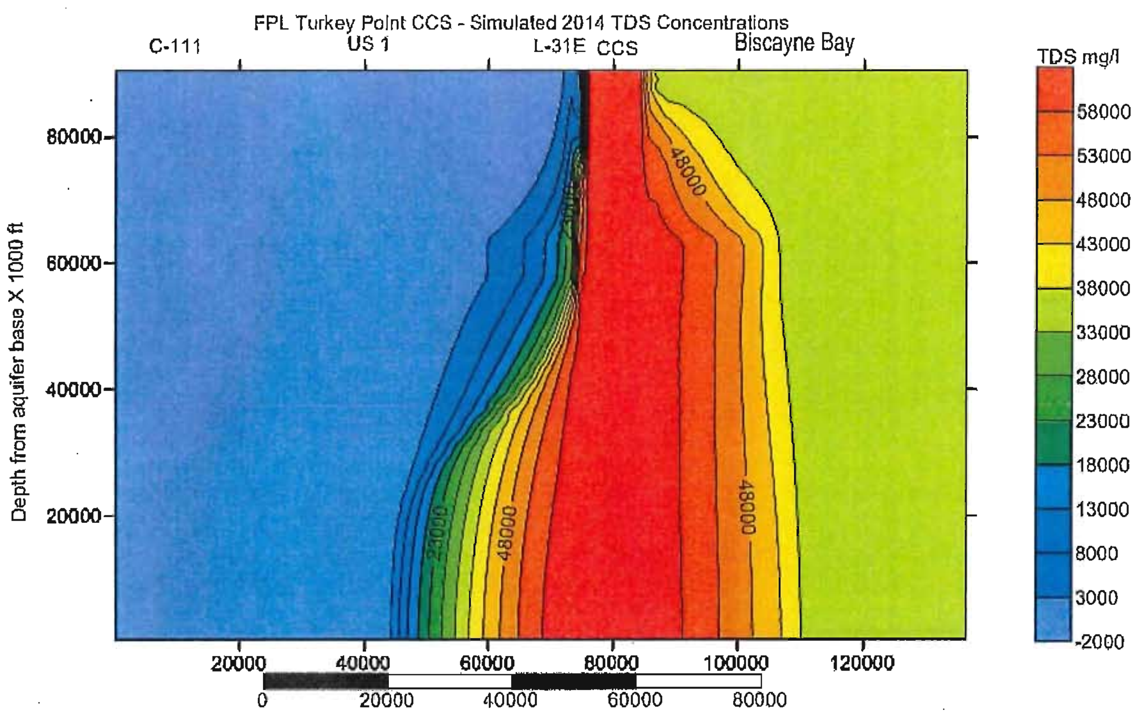
Appendix C: Cross Section Plots



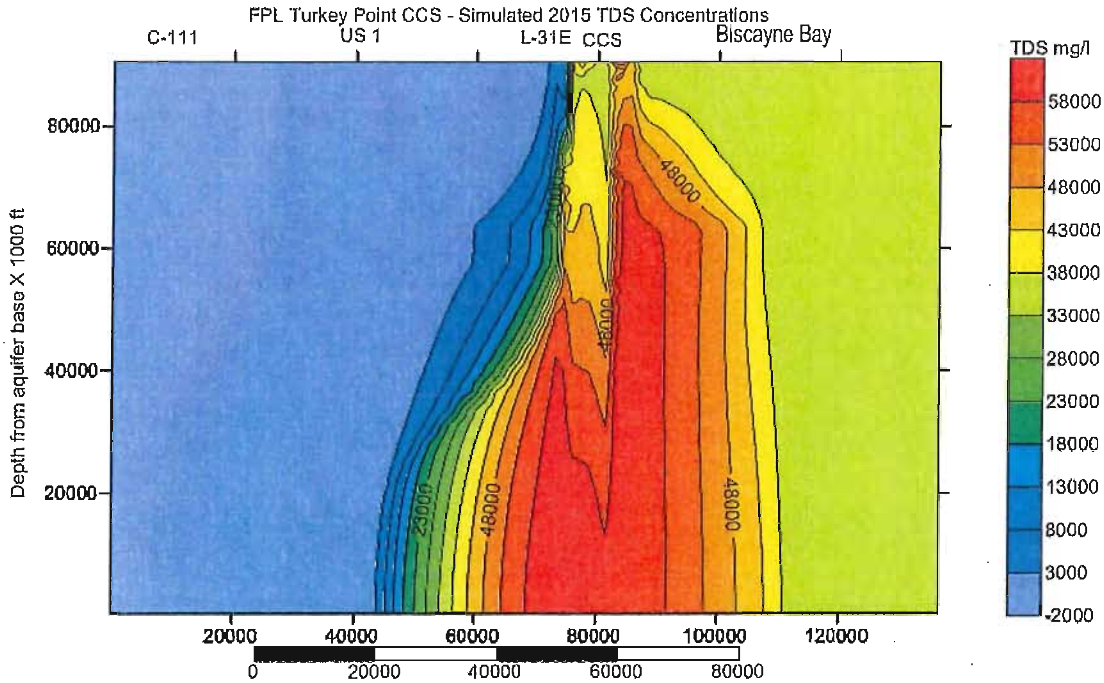
Simulated 1985 TDS concentrations in mg/l.



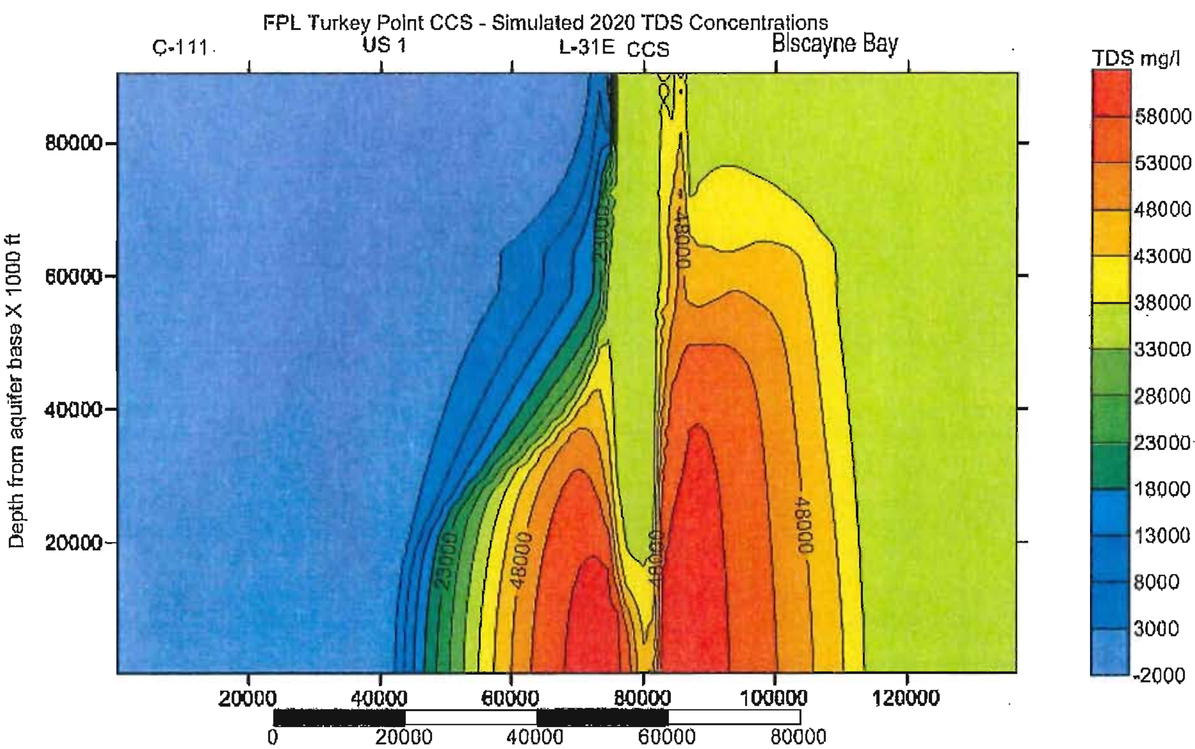
Simulated 2000 TDS concentrations in mg/l.



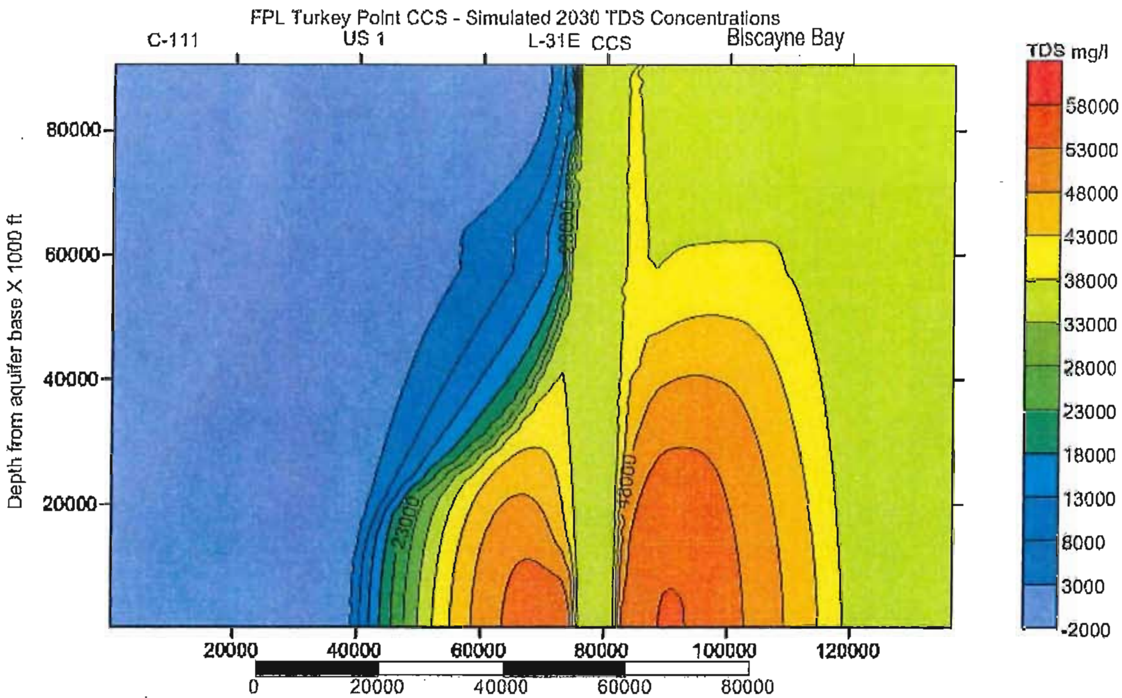
Simulated 2014 TDS concentrations in mg/l.



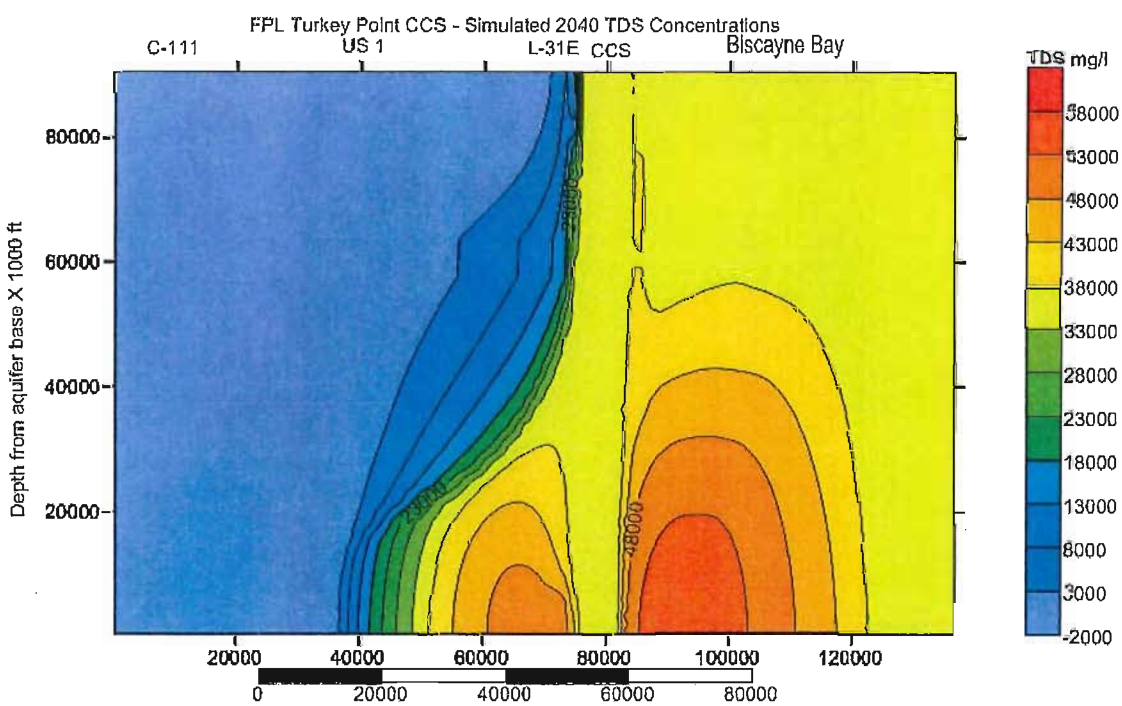
Simulated 2015 TDS concentrations in mg/l.



Simulated 2020 TDS concentrations in mg/l.



Simulated 2030 TDS concentrations in mg/l.



Simulated 2040 TDS concentrations in mg/l.

Appendix D: DBHYDRO Data

Column1	Column2	Column3	Column4
Period of Record Statistical Summary by Year			
DBKEY	Station	Year	Mean
-----	--------	----	-------- -
13037	S20_H	1990	1.955
13037	S20_H	1991	1.772
13037	S20_H	1992	1.695
13037	S20_H	1993	1.804
13037	S20_H	1994	1.909
13037	S20_H	1995	1.877
13037	S20_H	1996	1.711
13037	S20_H	1997	1.877
13037	S20_H	1998	1.802
13037	S20_H	1999	1.83
13037	S20_H	2000	1.835
13037	S20_H	2001	1.726
13037	S20_H	2002	1.694
13037	S20_H	2003	1.735
13037	S20_H	2004	1.519
13037	S20_H	2005	1.66
13037	S20_H	2006	1.564
13037	S20_H	2007	1.871
13037	S20_H	2008	1.695
13037	S20_H	2009	1.689
13037/87490	S20_H	2010	1.888
87490	S20_H	2011	1.557
87490	S20_H	2012	1.789
87490	S20_H	2013	1.557
		Average	1.750458333

DBHYDRO Data for S20_H (Used for L-31E in the model).

Column1	Column2	Column3	Column4
Period of Record Statistical Summary by Year			
DBKEY	Station	Year	Mean
-----	--------	----	-------- -
6570	S20F_T	1985	0.629
6570	S20F_T	1986	0.765
6570	S20F_T	1987	0.707
6570	S20F_T	1988	0.71
6570	S20F_T	1989	0.721
6570	S20F_T	1990	0.754
6570	S20F_T	1991	0.828
6570	S20F_T	1992	0.761
6570	S20F_T	1993	0.753
6570	S20F_T	1994	0.744
6570	S20F_T	1995	0.793
6570	S20F_T	1996	0.627
6570	S20F_T	1997	0.713
6570	S20F_T	1998	0.669
6570	S20F_T	1999	0.921
6570	S20F_T	2000	0.864
6570	S20F_T	2001	0.777
6570	S20F_T	2002	0.81
6570	S20F_T	2003	0.71
6570	S20F_T	2004	0.756
6570	S20F_T	2005	0.849
6570	S20F_T	2006	0.77
6570	S20F_T	2007	0.898
6570	S20F_T	2008	0.864
6570	S20F_T	2009	0.812
6570	S20F_T	2010	0.836
6570	S20F_T	2011	0.839
6570	S20F_T	2012	0.978
6570	S20F_T	2013	0.874
		Average	0.783862069

DBHYDRO Data for S20F_T (used in model for Biscayne Bay and Atlantic Ocean).

Column1	Column2	Column3	Column4
Period of Record Statistical Summary by Year			
DBKEY	Station	Year	Mean
-----	--------	----	-------- -
12288	S176_T	1988	3.33
12288	S176_T	1989	2.979
12288	S176_T	1990	3.047
12288	S176_T	1991	3.034
12288	S176_T	1992	3.32
12288	S176_T	1993	3.454
12288	S176_T	1994	3.631
12288	S176_T	1995	3.563
12288	S176_T	1996	3.425
12288	S176_T	1997	3.449
12288	S176_T	1998	3.519
12288	S176_T	1999	3.646
12288	S176_T	2000	3.591
12288	S176_T	2001	3.32
12288	S176_T	2002	3.542
12288	S176_T	2003	3.762
12288	S176_T	2004	3.268
12288	S176_T	2005	3.606
12288	S176_T	2006	3.515
12288	S176_T	2007	3.465
12288	S176_T	2008	3.37
12288	S176_T	2009	3.393
12288	S176_T	2010	3.74
12288	S176_T	2011	3.064
12288	S176_T	2012	3.662
12288	S176_T	2013	3.758
		Average	3.4405

DBHYDRO Data for S176_T (Used in model for C-111)

Appendix E: Dr. William Nuttle Report

Memorandum

To: Steve Krupa, South Florida Water Management District

From: William Nuttle

2 September 2013

RE: Comments on Proposed FPL Turkey Point CCS Abatement Measure

This memorandum provides my review and analysis of the abatement measure proposed by FPL to lower surface water salinity in the Turkey Point CCS and the simulation modeling of the effect this will have on the future development of the plume of CCS water in the Biscayne aquifer. To reduce salinity in the CCS, FPL proposes to supplement the current water budget by the addition of 14 mgd of either freshwater from the L31W canal, or brackish water (3 gm/l) from the Floridan aquifer. Simulations suggest that reducing salinity in the CCS surface water will cause a rapid (within years) reduction of salinity in the aquifer beneath the CCS and, over a longer period (decades), a repositioning of the saltwater wedge eastward of its current position in the aquifer.

My review and analysis addresses following specific issues of concern to the District:

1) Will the addition of 14 MGD of freshwater reduce salinity in the CCS to 35 gm/l or below, as claimed by FPL in their presentation to the District?

2) Will this reduction in salinity of the CCS suffice to eliminate the driver that is the cause of the development of the plume of CCS water in the Biscayne aquifer and its migration westward in the aquifer?

Summary Findings

1) My calculations indicate that the figure of 14 mgd is the right order of magnitude for the addition of water from the Floridan aquifer to reduce surface water salinities to 35 gm/l, even allowing for uncertainty in the estimated evaporation rate.

2) The results of the model simulations showing a repositioning of the saltwater wedge eastward of its current position are at odds with observed behavior of the saltwater wedge since 1951, twenty years before construction of the CCS. The Tetratech technical memorandum includes the comment that the calculated position of the saltwater wedge is sensitive to assumptions made in setting the hydraulic

head on the west boundary of the model domain. More information is needed about the degree of sensitivity in this behavior exhibited by the model in order to correctly interpret the simulation results.

3) In the near-term, decisions of how to proceed have to be made without the benefit of model predictions of the future behavior of the plume. The results of the model simulations are instructive as a proof of concept exercise. However, the value of this model as a source of information for management decisions is compromised by absence of any detail relating to the regional hydrology in which the CCS plume resides. Tetratech reviewed existing regional hydrologic models that cover this part of the Biscayne aquifer and finds that none takes account of the impact of CCS operations. Substantial time and effort (years) will be required to produce the type of information that regional hydrologic models might be able to provide about the future fate of the plume of CCS water.

Verification of the 14 mgd figure

I verified the 14 mgd figure by altering the long-term water budget calculations, described in my 5 April 2013 report, to take account of this new input. My approach uses a control volume similar to the control volume used in the analysis by Golder Associates[1], Figure 1. The inputs and outputs to this control volume are evaporation Q_E, rainfall Q_R, seepage of Biscayne Bay water Q_{BB}, net seepage to/from the aquifer Q_L, and seepage of fresh groundwater into the interceptor ditch Q_F. The measured water flux due to interceptor ditch pumping Q_{ID} is internal to the control volume, but it is used in the analysis to estimate Q_F. The results of the FPL water budget reported in the 2012 annual report[2] indicate that plant blowdown does not contribute significantly to either the water or salt balance, so its value is assumed to be zero for purposes of the following analysis.

Taking account of the addition of a new input of water Q_{NEW} with salinity S_{NEW}, the long-term mass balance equations for the alternative control volume are as follows: for water,

$$Q_L+E+P+Q_F+Q_{BB}+Q_{NEW}=0, \qquad \text{Eq. 1}$$

and for salt,

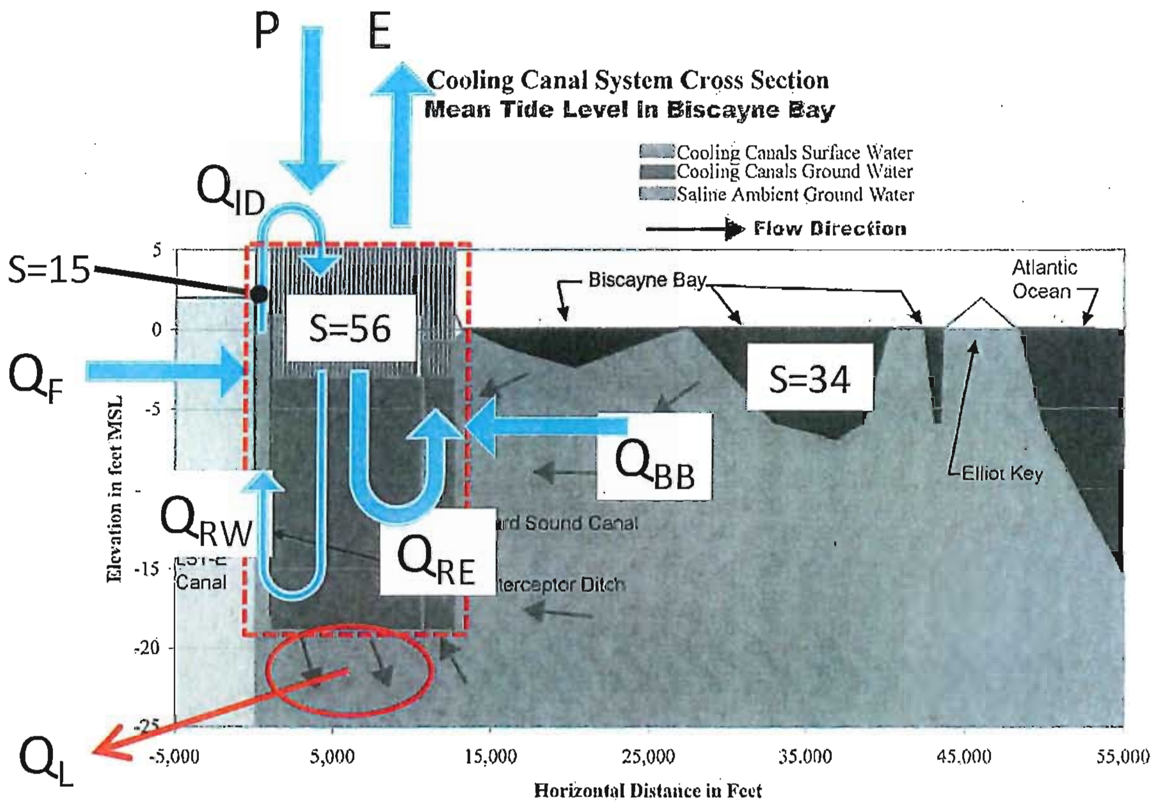
$$Q_L S_{CCS}+Q_{BB}S_{BB} + Q_{NEW}\, S_{NEW} =0, \qquad \text{Eq. 2}$$

in which S_{CCS} and S_{BB} are the average salinity values for the CCS and Biscayne Bay, respectively. In writing these equations, it is assumed that changes in the amount of water and salt contained in the CCS do not contribute to the respective mass balances over the long-term.

[1] Golder Associates, Inc., Cooling Canal System Model Report. January 13, 2008.

[2] FPL Turkey Point Comprehensive Pre-Uprate Monitoring Report for Units 3 & 4 Uprate Project. October 2012.

Figure 1: Alternative control volume for the calculation of Q_L, the net loading by seepage from the CCS into the aquifer. Average salinity values are shown for the interceptor ditch (average only for days when pumps operated), the CCS, and Biscayne Bay. Fluxes due to pumping from the interceptor ditch, Q_{ID}, and bottom seepage fluxes that are recaptured as inflow back into the CCS, Q_{RW} and Q_{RE}, are internal to this control volume.



Original figure from Golder Assoc. , January 2008; notations in color added by WK Nuttle

I investigated the sensitivity of the calculations to uncertainty in the water budget by varying the magnitude of the evaporation flux. Evaporation is the largest flux in the long-term water budget. The magnitude of uncertainty in the estimated evaporation flux can be judged from the comparison between the average value calculated by the FPL methodology, -4.2E6 cfd, and the average value for evaporation from the CCS calculated by Golder Associates, -6.0E6 cfd. Results reported below use both the average evaporation rate reported in the FPL 2012 annual report and the higher rate used in the Golder Associates study.

In applying the new inflow, I increase the seepage loss and adjust CCS salinity values as needed to balance the water and salt budgets. In doing so, I make the assumption that none of the other terms will change as a result of this change in operations. Rainfall input is determined entirely by climate. The decrease in CCS salinity will affect evaporation, but only slightly. The addition inflow of water will affect seepage fluxes, by increasing the volume and average water levels in the CCS. This can be expected to increase the seepage loss to the aquifer, which is accounted for in these calculations, and decrease the net seepage into the CCS from Biscayne Bay, which is not accounted for in these calculations. A decrease in the inflow of Biscayne Bay water would have the effect of reducing the long-term inflow of salt to the CCS and thus salinity. By ignoring this effect, the result of these calculations are conservative in that they under estimate the reduction in salinity that can be expected to result from a given rate of inflow of new water.

Results of the calculations show that the addition of an inflow of 14 mgd of brackish water from the Floridan aquifer (3 gm/l salinity) is sufficient to reduce the long-term average salinity in the CCS to near or below the target value of 35 gm/l. Calculations reported in Table 1 show the base case water budget under current operations, with Q_{NEW} set to zero, for both the lower and higher values of evaporation. Calculations reported in Table 2 show the results of balancing the water and salt budgets including the input of 14 mgd of water with a salinity of 3 gm/l. The addition of freshwater (0 gm/l) results in a slightly greater reduction in CCS salinity.

The addition of a constant input of 14 mgd of brackish water will reduce the long-term average of CCS salinity; however considerable temporal variability will remain. The range of variation in several components of the water and salt budgets exceeds 14 mgd (1.9E6 cfd), Table 3. Seasonal and year-to-year variation in rainfall and, to a lesser extent, evaporation will drive fluctuations in salinity on similar time scales. More detailed model calculations are required to fully describe the effect that the additional input of Floridan aquifer water would have on salinity in the CCS and thus on the salinity of the seepage loading to the Biscayne aquifer.

Table 1: Base case water and salt budgets for evaporation reported in FPL 2012 annual report and for the higher evaporation from Golder Associates (2008)

Base case

Inflows	ft3/day	mgd	salinity	salt flux
Rainfall (average)	3.20E+06	24	0	0.00E+00
Inflow from Biscayne B (Qbb)	1.40E+06	10	34	4.77E+07
Fresh inflow from aquifer (Qf)	4.49E+05	3	0	0.00E+00
New water source	0.00E+00	0	3	0.00E+00
Total Inflow	5.05E+06			4.77E+07
Outflows				
Evaporation (average)	-4.20E+06	-31	0	0.00E+00
Seepage loss to aquifer (Ql)	-8.52E+05	-6	56	-4.77E+07
Total Outflow	-5.05E+06			-4.77E+07
CCS Salinity			56	

Inflows	ft3/day	mgd	salinity	salt flux
Rainfall (average)	3.20E+06	24	0	0.00E+00
Inflow from Biscayne B (Qbb)	5.98E+06	45	34	2.03E+08
Fresh inflow from aquifer (Qf)	4.49E+05	3	0	0.00E+00
New water source	0.00E+00	0	3	0.00E+00
Total Inflow	9.63E+06			2.03E+08
Outflows				
Evaporation (average)	-6.00E+06	-45	0	0.00E+00
Seepage loss to aquifer (Ql)	-3.63E+06	-27	56	-2.03E+08
Total Outflow	-9.63E+06			-2.03E+08
CCS Salinity			56	

1 ft3 = 7.480519 gallons

Table 2: Water and salt budgets with additional inflow from Floridan aquifer for evaporation reported in FPL 2012 annual report and for the higher evaporation from Golder Associates (2008)

14 mgd Floridan aquifer

Inflows	ft3/day	mgd	salinity	salt flux
Rainfall (average)	3.20E+06	24	0	0.00E+00
Inflow from Biscayne B (Qbb)	1.40E+06	10	34	4.77E+07
Fresh inflow from aquifer (Qf)	4.49E+05	3	0	0.00E+00
New water source	1.87E+06	14	3	5.61E+06
Total Inflow	6.92E+06			5.33E+07
Outflows				
Evaporation (average)	-4.20E+06	-31	0	0.00E+00
Seepage loss to aquifer (Ql)	-2.72E+06	-20	20	-5.33E+07
Total Outflow	-6.92E+06			-5.33E+07
CCS Salinity			20	

Inflows	ft3/day	mgd	salinity	salt flux
Rainfall (average)	3.20E+06	24	0	0.00E+00
Inflow from Biscayne B (Qbb)	5.98E+06	45	34	2.03E+08
Fresh inflow from aquifer (Qf)	4.49E+05	3	0	0.00E+00
New water source	1.87E+06	14	3	5.61E+06
Total Inflow	1.15E+07			2.09E+08
Outflows				
Evaporation (average)	-6.00E+06	-45	0	0.00E+00
Seepage loss to aquifer (Ql)	-5.51E+06	-41	38	-2.09E+08
Total Outflow	-1.15E+07			-2.09E+08
CCS Salinity			38	

1 ft3 = 7.480519 gallons

Table 3: Comparison of the different magnitudes of water fluxes involved in the CCS water budget. Fluxes included in the FPL water budget calculations are indicated in bold.

	ft3	mg	
CCS Volume	6.303E+08	4715	Average for Sep 2010 through June 2011

Water Flux	ft3/day	mgd	Comment
CCS surface discharge	2.42E+08	1810	Average for Sep 2010 through June 2011
Max 1-day rainfall	**1.72E+08**	**1289**	Data from Sep 2010 through June 2012
N-S difference in measured CCS discharge (underflow)	2.91E+07	218	Average for Sep 2010 through June 2011
Daily change in CCS Vol	**1.19E+07**	**89**	FPL report, standard deviation of daily vol change Sep 2010 through June 2011
Evaporation (average)	**-4.16E+06**	**-31**	FPL report, data from Sep 2010 through June 2012
Rainfall (average)	**3.24E+06**	**24**	FPL report, data from Sep 2010 through June 2012
Bottom seepage (Zone A)	**-1.14E+06**	**-8**	FPL report, data from Sep 2010 through June 2012
Long-term seepage loading to aquifer	-1.00E+06	-7	W.K. Nuttle report to SFWMD
Side seepage (East)	**6.32E+05**	**5**	FPL report, data from Sep 2010 through June 2012
ID pumping	**6.13E+05**	**5**	FPL report, data from Sep 2010 through June 2012
Bottom seepage (Zone D)	**5.57E+05**	**4**	FPL report, data from Sep 2010 through June 2012
Blowdown (inflow to CCS)	**1.66E+05**	**1**	FPL report, data from Sep 2010 through June 2012
Side seepage (South)	**9.88E+04**	**1**	FPL report, data from Sep 2010 through June 2012
Side seepage (West)	**6.78E+04**	**1**	FPL report, data from Sep 2010 through June 2012
Bottom seepage (Zone C)	**4.45E+04**	**0**	FPL report, data from Sep 2010 through June 2012
Bottom seepage (Zone B)	**2.41E+04**	**0**	FPL report, data from Sep 2010 through June 2012
Side seepage (North)	**-3.59E+02**	**0**	FPL report, data from Sep 2010 through June 2012

1 ft3 = 7.4805195 gallons

Review of results of the simulation model

The technical memorandum from Tetratech to FPL, dated 15 July 2013, provides results obtained in simulations using a 2-d, variable density groundwater and salt transport numerical model. These simulations follow and extend the earlier investigation by Hughes et al. (2009)[3] of the intrusion of hypersaline CCS water into the Biscayne aquifer following initiation of the operation of the CCS. Where the focus of Hughes et al. (2008) is on early development of the plume in the vicinity of the CCS, the simulation modeling by Tetratech seeks to reproduce the development of the groundwater plume over the operating lifetime of the CCS, up to the present day, and simulate future conditions in the aquifer following a reduction in salinity of the CCS from 60 gm/l to 35 gm/l.

Tetratech claims success in calibrating the model to reproduce the historical development of the plume. And, based on this success they claim that simulations of future conditions represent development of the plume in response to salinity reduction in the CCS, all other factors being held constant. Results provided in Figure 5 show that "[t]he CCS salinity reduction alternative appears to be very effective at reducing concentrations regionally and in arresting the westward movement of the saltwater front." Moreover, "the CCS salinity reduction scenario causes a repositioning of the saltwater wedge, where by year 30 it has receded eastward of its current position

Results showing a displacement of the saltwater wedge eastward of its current position are at odds with its observed behavior. The saltwater wedge has remained more or less fixed in the vicinity of well G-12 for the period 1951 through 2008 (c.f. Figure 5.2-23 of FPL 2012 annual report). The position of the saltwater wedge was relatively static for 20 years prior to construction of the CCS, and it has remained unchanged during 40 years of CCS operations. From this one might reasonably expect that if the CCS operations were curtailed entirely, and the site returned to its original condition, the position of the saltwater wedge would still remain unchanged from what it was before the CCS was constructed.

Rather than curtail operations, the actions to reduce salinity in the CCS will, if anything, increase the seepage loading of CCS water into the aquifer at the coast, albeit water with much lower salinity. One might reasonably expect that the salinity in some parts of the plume will decrease as a result of the infiltration of lower salinity water, but it is not credible to expect that decreasing the salinity of the seepage loading to the aquifer with alter the position of the saltwater wedge in the aquifer, assuming that all other factors are held constant. In fact, the model simulation of future conditions does not hold other factors constant.

The behavior of the saltwater wedge in the model simulations likely is connected with an issue concerning selection of head boundary conditions identified on comments by Jeff Giddings (SFWMD). Values of hydraulic head applied to the model boundaries corresponding to Biscayne Bay and the CCS are reduced by about 1.4 feet in the "predictive simulations" relative to values used in the "simulations prior to and during CCS operation." The claim is made that this is done to better reflect values of head measured during the monitoring program. However, the head value on the western boundary of the model was not similarly adjusted. The net effect of making this adjustment is to increase the regional

[3] Hughes, J.D., C.D. Langevin, L. Brakefield-Goswami, 2009. Effect of hypersaline cooling canals on aquifer salinization. Hydrogeology Journal, DOI 10.1007/s 10040-009-502-7.

hydraulic gradient that drives freshwater flow to the coast. The regional head gradient is increased by about 40% by the adjustments made, and this has the effect of similarly increasing the amount of freshwater flow from the west toward the coast in the simulation of future conditions compared with the flow calculated during the historical period, which is used to calibrate the model.

The authors are apparently aware of this issue, as their conclusions include the observation that "the head and head changes on the western boundary may affect migration of the saltwater wedge as much or more than the salinity reductions." However, the technical memorandum provides no information on the results of model calculations in which they explore the sensitivity of the position of the saltwater wedge to changes in regional hydraulic gradient.

The simulation of future conditions alters two factors that affect the behavior of the plume at the same time, by altering the head values in the vicinity of the CCS while keeping the head on the western boundary unchanged and reducing the salinity in the CCS. Therefore, one cannot claim that the resulting dissipation of the plume is the result of only reducing CCS salinity. To substantiate this claim, more information must be provided about the current head values applicable to the western boundary, assumptions made in selecting the value of head applied in the model calculations, and the degree of sensitivity in the resulting position of the saltwater wedge exhibited by the model.

Ultimately, this model has limited utility as a source of information for decisions regarding managing the fate of the CCS plume. Simulations with this model are useful for developing an understanding of some of the factors that control the plume's behavior. However, limitations inherent in the model design prevent the effects of other important factors from being included. These include the following:

3-D geometry – The geometry of the CCS and its plume are poorly represented at the regional scale by the 2-D grid used in the model. Using the 2-D grid makes sense for the investigation by Hughes et al. into phenomenon related to the infiltration of CCS water into the aquifer below and in the immediate vicinity of the CCS.

Regional hydrology – Essential features of regional hydrology that can affect the behavior of the plume are missing from the model. Recharge from rainfall and water loss from the aquifer due to evaporation and well withdrawals are not accounted for. Neither are the interaction between the aquifer and canals, which can function both as sources of recharge and areas of discharge from the aquifer to surface water. Several studies have documented the role that canals have played in enhancing the inland migration of saltwater into the Biscayne aquifer (c.f. Parker et al 1955)[4]. It is likely that rock mining also affects conditions in the aquifer, but I am not aware of any studies on this topic.

Sea level rise – The rate of sea level rise has accelerated to the point where the effects of increased sea level must be taken into account when planning for more than a few years into the future. In South Florida sea level is projected to rise by between 0.5 and one foot over the next 30 years.[5] This will have two effects that can influence the fate of the CCS plume. First, a rise in sea level decreases the regional

[4] http://sofia.usgs.gov/publications/papers/wsp1255/

[5] http://southeastfloridaclimatecompact.org/pdf/Sea%20Level%20Rise.pdf

hydraulic gradient that drives freshwater flow in the aquifer, which will influence the position of the saltwater wedge as discussed above. Second, the shoreline of Biscayne Bay will retreat as sea level increases. Analysis of detailed LIDAR elevation data for Miami-Dade County, by Pete Harlem (FIU) and others, indicates that with a rise of one-foot the shoreline will retreat to a point west of the CCS.

NOTEWORTHY CORRESPONDENCE ON THE CCS AS A MAJOR CONCERN

U.S. House of Representatives

Committee on Natural Resources

Washington, DC 20515

March 11, 2016

The Honorable Gina McCarthy
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Dear Administrator McCarthy:

Earlier this week, Miami-Dade County Mayor Carlos A. Giminez released a report showing that water contaminated with radioactive material, phosphorous, ammonia, and toxic levels of salt is leaking out of cooling water canals at the Turkey Point Nuclear Power Station and into the waters of Biscayne National Park. This is irrefutable evidence that the canals are not operating as a closed loop system and therefore any discharges are subject to regulation and enforcement under the Clean Water Act. The Natural Resources Committee has jurisdiction over the National Park System, coastal habitats, living marine resources, and migratory birds, all of which stand to incur significant damage if the flow of contaminated water into Biscayne Bay is not stopped immediately.

The National Park Service and local officials in South Florida long ago identified the antiquated and insufficient cooling water canal system at Turkey Point as a significant environmental hazard and potential public health risk. That potential is being realized now, as the plume of contaminated water is not only seeping into Biscayne National Park but also encroaching on the drinking water supply of three million Floridians.

Instead of accounting for the geology of South Florida and requiring the cooling canals to be lined, the Nuclear Regulatory Commission has consistently let Florida Power and Light (FPL) – the plant's owner and a subsidiary of Fortune 200 company NextEra Energy – cut corners on environmental protection and safety. Recent examples include allowing "cooling" water in the canals to rise as high as 104 degrees and diverting water from the Everglades into the canals, depriving Biscayne Bay of a critical fresh water input.

I urge you to use your Clean Water Act authority to force FPL to stop discharging pollution into Biscayne Bay, and to work closely with your partners at other federal, state, and local agencies to ensure that existing damage is remediated and future damage does not occur. I appreciate your attention to this matter. If you have any questions, please do not hesitate to have your staff contact Matt Strickler on the Natural Resources Committee Democratic Staff at (202) 225-6065.

Sincerely,

Raúl M. Grijalva
Ranking Member
Committee on Natural Resources

Cc: The Honorable Sally Jewell, Secretary of the Interior
Dr. Kathryn Sullivan, Administrator, National Oceanic and Atmospheric Administration
Stephen G. Burns, Chairman, Nuclear Regulatory Commission
Christy Goldfuss, Managing Director, White House Council on Environmental Quality

Atlantic Civil, Inc. 9350 South Dixie Highway ■ Suite 1250 ■ Miami, FL 33156 ■ 305-670-9610 ■ Fax: 305-670-6787

January 9, 2009

Via Electronic Mail

Mr. Steven Scroggs
Director, Project Development
Florida Power & Light
700 Universe Boulevard
Juno Beach, FL 33408

Re: Saltwater Intrusion Issue

Dear Mr. Scroggs:

This letter serves as a follow-up to our initial meeting September 4, 2008 and our subsequent additional meeting.. As you are aware, I am the owner of over 2,500 acres located in South Miami-Dade County. The use of these lands is active agriculture and mining. Since our meeting in September, I have been continuing to collect and analyze information to determine the impact of saltwater intrusion in this area. I am undertaking this effort because of my desire to continue using my property for agriculture and mining.

As I reported in our previous meetings, the various regulatory agencies that I must receive permit approvals from have been raising the saltwater intrusion issue in the context of my various permit applications. Knowing that activities on my property are not significant enough to have the effect of actually moving the saltwater intrusion line, I have continued investigating other potential causes advancing the salt front in this area. My review of the data my team has collected has led me to the basic conclusion that the salt front in South Miami-Dade County is currently advancing westward. I also believe that two contributing factors to this movement are (1) current operations of the flood control system and (2) operations of the Florida Power & Light ("FP&L") Cooling Canal System.

I have brought these concerns to the South Florida Water Management District ("SFWMD") in the hopes that they would begin to better protect the water resources in this area. I see the SFWMD as one of the key agencies that can address these contributing factors because they have existing statutory authority to work on this problem and they have obligations outlined in the written Agreements for the Cooling Canal System operations to assure impacts from saltwater intrusion do not occur. It is my hope that FP&L and the SFWMD will work cooperatively together, as contemplated by those written Agreements, to determine the level of existing impact of the Cooling Canal System operations, mitigate for that impact and address any new impacts created by the Uprating of Turkey Point Units 3 and 4. Both objectives must be met to sustain the water resources in this area.

Given that the 1983 Agreement between the SFWMD and FP&L is being revised due to the Uprating, and that our earlier dialogue on this issue has not resulted in the implementation of any specific solutions, I felt it was time to protect my property interests by outlining my efforts and conclusions in detail for the SFWMD. Please note that we presented to the SFWMD some of the options that we have developed. We are open to other options as well. I've attached a copy of our recent correspondence with the SFWMD for your reference.

I am proposing these solutions because it is in the best interest of Atlantic Civil Inc., FP&L and the water resources of the area, that the advancement of saltwater intrusion in this area is halted and reversed. I am willing to meet and resume our dialogue on these issues. I also hope that we can openly engage the SFWMD in this discussion. Please contact me at 305-670-9610 or Steve Walker at 561-640-0820 to further discuss these issues or set up a meeting to discuss them in person.

Sincerely,

Steve Torcise, Jr.
President

STJ/mpf

LEWIS, LONGMAN & WALKER, P.A.
ATTORNEYS AT LAW

Reply to: *West Palm Beach*

January 8, 2009

Ms. Carol Wehle
Executive Director
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

Re: <u>Atlantic Civil, Inc.</u>

Dear Carol:

Thank you for meeting with us and representatives of Atlantic Civil, Inc. (ACI) on October 10th, regarding the salt water intrusion issue in south Miami-Dade County. Since that meeting we have followed up with your legal and technical staff to address our specific concerns with the impacts of the FPL Cooling Canal System and upcoming negotiations with FPL on amendments to the 1983 Agreement governing operations of this system. As more fully described below, we believe the 1983 Agreement provides the District with sufficient authority to protect water resources in south Miami-Dade County from salt water intrusion caused by the cooling canal system. Therefore, we are unclear regarding the need to amend this agreement at all, except to add relevant provisions from the recent Uprating of FPL's Units 3 and 4.

We have also been monitoring District operations in south Miami-Dade County, and corresponding with District operations staff to address ongoing concerns. As more fully described below, we have questions and concerns about District operations that, as yet, have not been fully resolved. Copies of this correspondence are attached.

Based on our initial meeting with you and your staff, and our follow-up discussions noted above, we are writing this letter to urge you to take immediate action to halt the threat of salt water intrusion in south Miami-Dade County. Below are several options we propose for your consideration:

- Maintain more consistent heads during the wet season by not aggressively discharging through south Miami-Dade structures, including, but not limited to S-20 and S-20F and maintain higher heads during the dry season. In fact, our recent observations of District operations suggest that you should undertake a comprehensive review of all structure settings and operational protocols in the south Miami-Dade County area to ensure that they maximize fresh water heads, consistent with flood protection obligations. The water management needs in south Miami-Dade County have changed significantly. We believe that many operational practices and protocols reflect the needs of the past, and thus need to be substantially updated.

- The District should evaluate and install structures in the Florida City and Card Sound Road Canals. This will enable the District to hold water levels higher in the Florida City and Model Lands basins. As noted in our presentation to you at our October 10th meeting, there is no significant agricultural activity remaining in the Florida City Canal and Model Lands Basins which require seasonal drawdowns. Thus, by isolating the Florida City Canal Basin from the C-103 Canal Basin, the District can continue with the seasonal drawdown in the C-103 and North Canal basis while maintaining higher heads in the Florida City Canal and Model Lands basins where the salt intrusion is posing a threat.

- The District should aggressively move forward with Phase II of the Biscayne Bay Coastal Wetlands Project. Phase II will help restore and maintain water levels in the Model Lands Basin. In conjunction with the structures requested in the previous paragraph, rehydration of this area through the CERP Project will help keep salt water intrusion at bay.

- The District should aggressively move forward with Alternative 2D of the C-111 Project. Alternative 2D is the Tentatively Selected Plan for this project, and calls for increasing the operational controls and flexibility at S-20. As noted above, we believe S-20 is unnecessarily opened to release water at the end of the wet season, thus starting the decline of ground water levels in the Model Lands Basin prematurely.

- Based on the data we have reviewed, we believe the operation of the cooling canal system significantly contributes to salt water intrusion in south Miami-Dade County. Under the authority in the 1983 Agreement with FPL and Chapters 403 and 373, F.S., the District is required to make FPL to address any adverse impacts of cooling canal operations on the salt water interface. We are of the opinion that existing data,

collected by FPL pursuant to the 1983 Agreement, along with other publicly available information, is more than sufficient to demonstrate FPL's contribution to the salt water intrusion in south Miami-Dade County, and to justify the SFWMD requiring FPL to take action to mitigate its adverse impacts as contemplated in the 1983 Agreement. There is more than enough information available to reach the conclusion that FPL's interceptor ditch system is inadequate to prevent salt water intrusion beyond that which would naturally occur, which is the standard established in the 1983 Agreement. We would encourage you to have your staff model the with and without effects of the cooling canal system as we did and are willing to provide your staff with access to our technical consultants to review the analysis we performed.

- We are concerned that FPL will seek to modify the 1983 Agreement to eliminate its liability for existing salt water intrusion problems, and insulate itself from liability for future impacts of the cooling canal system. Since we believe the District has sufficient data to take action under the existing agreement, we request that all negotiations to modify the 1983 Agreement be put on hold until the District fully investigates our claims, and takes action under the 1983 Agreement to resolve all adverse impacts from the operations of the cooling canal system. This, in our opinion, would not prevent the District and FPL from formulating additional monitoring and/or modeling conditions to augment the existing Agreement to address the increased impact which will occur from the uprate activities. But, it would prevent the District and FPL from eliminating the essential terms of the existing Agreement that address salt water intrusion from the inception of the cooling canal system to the present. Modifying the 1983 Agreement in such a way to eliminate these fundamental protections without first resolving all violations of the Agreement could potentially estop the District from taking action to enforce the original Agreement based on the data already collected under that Agreement.

- If the District must entertain proposed modifications to the 1983 Agreement at this time, we believe that exposing these negotiations to public scrutiny is the only way to ensure that the public interest is protected. Therefore, we request that negotiation meetings be publically advertised, and that the public be allowed to observe the negotiations between SFWMD and FPL concerning proposed modifications to the 1983 Agreement which addresses the issue of salt water intrusion at Turkey Point.

- Finally, we request that the District work with us to develop solutions that allow ACI to continue with permitting – without a saltwater intrusion threat or restrictions. There is nothing that ACI has done or could do to exacerbate salt water intrusion in this basin. Moreover, there is nothing that ACI can do on its property or in its operations to prevent saltwater intrusion in the area.

-

In conclusion we appreciate the challenges and competing interests the District faces in managing water resources of south Miami-Dade County. Nevertheless, ACI is faced with

immediate threats to its property rights through the action or inactions of the District, Miami-Dade County and/or FPL. We look to the District, as the public agency responsible for the protection of the area's water resources, to protect ACI's interests. We believe this responsibility cannot be diluted through inaction by the District, including failure to enforce the provisions of the 1983 Agreement. We believe that there are reasonable, short term solutions to prevent significant adverse impacts to ACI's property rights. We have outlined the basic strategies for these actions above.

We request that the District move expeditiously to implement them.

Sincerely,

Stephen A. Walker

SAW:ELD:kaa
Encls.
cc: Mr. Chip Merriam
Mr. Kenneth Ammon
Mr. Thomas Strowd
Sheryl Wood, Esq.
Mr. Steve Torcise, Jr.
Mr. Edward Swakon
Mr. John Shubin

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Florida Power & Light Company, 700 Universe Blvd., Juno Beach, FL 33408
Phone: 561-694-5051, Fax: 561-304-5233

FPL

January 23, 2009

VIA Electronic Mail

Steve Torcise, Jr.
President
Atlantic Civil, Inc.
9350 South Dixie Highway, Suite 1250
Miami, FL 33156

Dear Mr. Torcise:

I am in receipt of your letter dated January 9, 2009 in which you again set forth your view that the "salt front" in South Miami-Dade County is advancing westward. This view was conveyed to us by you in our meeting of September 4, 2008. Apparently you have come to believe that such asserted advancement has two, and only two, causes, one of which is "operations of the [FPL] Cooling Canal System." However, you offer no basis for this belief.

You further state that you have brought your views to the attention of the South Florida Water Management District ("SFWMD"). However, you do not state whether SFWMD agrees with your belief that the SFWMD's "operation of the flood control system" is one of only two causes of such advancement or that the SFWMD intends to change its operations or what effect such change would have.

In any event, please be assured that FPL intends to continue to work cooperatively with the SFWMD, as FPL has done for more than 30 years. As to your suggestion that FPL and Atlantic Civil convene another meeting regarding your assertions and belief, in the absence of any scientifically defensible substantiation of these assertions, FPL does not believe that such additional meeting is either necessary or appropriate. That being said, should Atlantic Civil possess any scientifically defensible substantiation of its assertions, FPL would request Atlantic Civil forward such information and data to FPL so that it can be reviewed to determine whether a future meeting truly would be productive.

Sincerely,

Steven D. Scroggs
Director
Project Development

LEWIS, LONGMAN & WALKER, P.A.
ATTORNEYS AT LAW

May 26, 2009

Carol Wehle, Executive Director
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

Re: Agreement between Florida Power and Light and South Florida Water Management District for the Cooling Canal System of Turkey Point

Dear Ms. Wehle:

I am writing regarding the status of negotiations for the Fifth Supplemental Agreement ("the Agreement") between the South Florida Water Management District ("SFWMD") and Florida Power and Light ("FPL"), for the Cooling Canal System ("CCS") of Turkey Point in Miami-Dade County. As you are aware, our firm represents Atlantic Civil, Inc. ("ACI"), a mining and agricultural operation located on a property in South Dade western of, but proximate to, Turkey Point. Our interest in this Agreement is that we have collected and analyzed substantial data and we believe it indicates that hypersaline water from the CCS has migrated west of that system. This conclusion is primarily based upon FPL monitoring reports, submitted to your agency by FPL, showing a steady increase in conductivity at four CCS FPL monitoring wells over the past 25 years (L3 & 5 and G21 & 28). ACI's applications to mine to a certain depth are being limited by various regulatory agencies due to concerns over regional saltwater intrusion. This is causing a direct impact to ACI. While it is true there are likely other contributing causes of saltwater intrusion in South Dade, SFWMD canal and structural operations have not changed significantly in the last several years, so it is likely these increases in conductivity are significantly influenced by operations of the CCS.

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I. Background

The CCS was conceived as a potential solution to avoid discharging CCS water directly into Biscayne Bay. This Agreement, originally signed in 1972, memorializes the rights and obligations of the SFWMD and FPL concerning the construction, operation and monitoring of the CCS for Turkey Point. The Agreement has been amended four times with the most recent amendment/supplement occurring in 1983 and that version being the Agreement that is in effect today. As part of the Turkey Point Units 3 and 4 Uprate proceeding, under the Power Plant Siting Act, Part II of Chapter 403 F.S., Condition X.A requires that FPL execute "a SFWMD approved Fifth Supplemental Turkey Point Agreement" within 180 days of October 29, 2008. This Condition would have required that the SFWMD approve the Fifth Supplemental Agreement at its April 2009 Governing Board meeting, but because the Agreement has not been finalized, FPL, the SFWMD, the Department of Environmental Protection ("DEP") and Miami-Dade County agreed to submit an extension request to the Power Plant Siting Office. The new Agreement deadline is now July 31, 2009.

The original purpose, or objective, of the CCS pursuant to the Agreement was "to restrict movement of saline water from the cooling water system westward of Levee 31E adjacent to the cooling water system to those amounts which would occur without the existence of the cooling water system." A shallow Interceptor Ditch was designed and operated with the goal of preventing that migration from occurring, but it has likely not contained the groundwater flow of hypersaline water from the CCS. Western movement of the hypersaline water from the CCS will further adversely impact the ACI property if it is not contained. As mentioned above, concerns over this issue by regulatory agencies have already been the factor in limiting the proposed mining depths at the ACI site. We do not believe, based upon the data we have reviewed, that the purpose of the existing Agreement in regard to the containment of the CCS hypersaline water has been achieved and the proposed Fifth Supplement to the Agreement must include a specific deadline oriented process to develop a plan to correct that problem. The original 1972 Agreement included a process to correct this problem if it occurred, and we believe that now since it is clear the objectives of the Agreement have not been met for the CCS, the implementation of those corrective actions should begin and that process should be carried forward in this Fifth Supplement to the Agreement. We have reviewed both the SFWMD and the FPL strike/underline versions of the Agreement and we have serious concerns regarding the content of the final Agreement. Those issues are outlined below.

II. The SFWMD Must Maintain Its Authority to Protect the Water Resources of the District

The existing Agreement provides the SFWMD with specific tools "in its sole judgment" to achieve the objectives of the Agreement. FPL must then take action to fix the problem if the CCS is not restricting the movement of saline water from the CCS to those amounts which would occur without the existence of the CCS. The original Agreement is clear on this point. The first strategy to correct CCS deficiencies is for FPL to revise the operations of the Interceptor Ditch System if instructed to do so by the SFWMD. The second strategy is to find, and implement, "other feasible engineering measures", including reasonable alterations in the design or operation of the Interceptor Ditch System, again if determined necessary by SFWMD. Finally, should that strategy fail, "other feasible engineering measures" regarding the CCS itself are to be undertaken.

After reviewing the revised version of the Agreement that FPL has produced, we are greatly concerned that the SFWMD's ability to require FPL to abate, mitigate and/or remediate the impacts from the CCS on saltwater intrusion could be severely limited. For instance, the FPL version suggests that both parties must mutually agree as to what data shall be factored into the process of revising the Interceptor Ditch Operations Procedures. The SFWMD, as the regulator, should be able to consider all relevant data in making its determinations regarding the Interceptor Ditch Operations. The FPL version also strikes language stating that the SFWMD may require certain mitigation, abatement and/or remediation measures and that those measures shall be placed into effect upon FPL's notice from the SFWMD. Finally, the strategies the FPL version employs to address mitigation, abatement or remediation of the CCS operations are 1) potentially more monitoring (if agreed to by both parties) and, if based on that monitoring, a problem still exists then 2) FPL shall make reasonable alterations in the operation and design of the interceptor ditch system or other feasible engineering measures regarding the CCS. If the parties cannot agree on these solutions, the SFWMD notifies FPL of an impasse and the alternative dispute resolution provisions are invoked. According to this suggested approach by FPL, the SFWMD would not require anything be done to address the problem as was reflected in the original Agreement.

While it is important for the SFWMD and FPL to work together to resolve the CCS operational problems, and monitoring plays a role in solving those problems, it is important for the SFWMD to maintain the regulatory approach from the original 1972 Agreement whereby it can exercise its judgment and statutory authority by requiring FPL to act.

Recommendation #1:

Maintain the approach outlined in the April 15, 2009 SFWMD version of the Agreement providing for the SFWMD's ability to require certain mitigation, abatement and remediation measures including, but not limited to, those specific actions listed in the Draft Agreement. Include paragraphs 4 and 5 under Section C. Mitigation, Abatement and Other Remedial Measures (of the SFWMD's version of the Agreement) because these paragraphs provide the SFWMD the ability provide notice to FPL that these measures may be required and if they are inadequate, FPL must take action to find other feasible engineering measures to assure the objective of the Agreement is met. Finally, as part of the statutory requirements to manage water resources of the state to ensure their sustainability, the Agreement must clearly maintain the SFWMD's ability to require revisions to the 2009 Plan and the Interceptor Ditch (and its operations).

III. **Scope of the Agreement**

While updating this Agreement is a requirement of the Final Order of Approving Site Certification for the Uprating of Turkey Point Units 3 and 4 (Condition X.A.), the Agreement itself, and the Agreement's Revised Operating Manual ("2009 Plan"), should not be limited to addressing only the impacts created from the Uprate. The Agreement has been in place since February 2, 1972 and has been supplemented/updated on several occasions, well before Condition X.A. from the Final Order was drafted. In pertinent part, Condition X.A. reads:

> In addition to the monitoring framework set forth in this consolidated condition, within 180 days after Certification, FPL shall execute a SFWMD approved Fifth Supplemental Turkey Point Agreement ("Fifth Supplemental Agreement") to the original 1972 Agreement between FPL and SFWMD pertaining to FPL's obligation to monitor for impacts of the Turkey Point cooling canal system on the water resources of the SFWMD in general and the facilities and operations of the SFWMD ("the Agreement").

Condition X.A. goes on to outline what must be included in the "Revised Operating Manual" which is incorporated into the Agreement. There is nothing in Condition X.A. limiting the scope of the Agreement to only address impacts from the Uprate of Units 3 and 4. It is important that the Agreement include language regarding the need to delineate the surface and groundwater impacts from the operation of the CCS since 1972. We agree that this is a necessary step to determine the full array of mitigation, abatement or other remedial measures to employ to solve the problem. But this does not suggest that the provisions of the existing Agreement to correct the deficiency of the CCS should not be addressed now.

Additionally, we do not believe all of the obligations undertaken by FPL and the SFWMD pursuant to the original Agreement, and its supplements, have been satisfactorily performed to date. The revision of the Agreement cannot ignore the failure of the Interceptor Ditch to serve its intended purpose or the need to correct the existing problems with the CCS.

Recommendation #2:

> The Agreement should clearly reflect the intention of the parties to address the failure of the Interceptor Ditch by formulating short term solutions and a deadline oriented long-term plan "to restrict the movement of saline water from the cooling water system westward of Levee 31E adjacent to the cooling water system to those amounts which would occur without the existence of the cooling water system," the purpose of the original 1972 Agreement. These measures should be in place before the Uprate exacerbates the problem with more increases in temperature and salinity in the CCS.

IV. Review of CCS Effects on Saltwater Intrusion in South Dade

Pursuant to the Agreement, FPL must submit monitoring reports to the SFWMD. After we reviewed many of those FPL reports submitted to SFWMD, and other regional data, we have detected a trend demonstrating western migration of the salt front. We believe that more detailed scrutiny of the FPL monitoring reports would have shown this trend earlier, and thus, the SFWMD would have been in a position much earlier to begin discussions with FPL on how to address any problems related to the CCS. More participation by SFWMD management, and

Governing Board status briefings, is needed to assure compliance with this Agreement and the success of the overall measures employed to address saltwater intrusion in South Dade overall.

While the Agreement includes a provision to convene a "Technical Advisory Group" this group is convened should "any unusual event occur or should any substantive physical, mechanical, structural or operations changes be contemplated" to the CCS by either Party. Any outcome or discussion of this Advisory Group will be closed to only the parties to the Agreement, FPL and the SFWMD. Therefore, it will be unclear to the public or the Governing Board what actions, if any, will be taken pursuant to the findings of the Technical Advisory Group. Finally, we are not sure what will qualify as an "unusual event" to trigger a meeting of the Technical Advisory Group.

Recommendation #3:

We believe the Agreement must include a mechanism to provide updates to the public and the Governing Board on the CCS operations and how those operations impact the western expansion of the salt front in South Dade. It is important to monitor corrective actions to address the problem now that it is recognized that one exists. The Agreement should include a mechanism for quarterly briefings to the Governing Board on this issue.

V. The Need for Specific Decision Points

Time is of the essence in implementing the purpose of this Agreement. Saltwater intrusion is continuing to advance westward and the groundwater resources of the ACI property, and the water resources of the SFWMD, stand to be further impacted. The SFWMD is spending a tremendous amount of time and money to construct restoration projects which will have a net positive benefit to the region in terms of restoration and rehydration of wetlands. The SFWMD is also investigating the potential of installing some structures, and revising some operational protocols, in the South Dade region with the purpose of stabilizing or reversing the impacts of its own operations on saltwater intrusion in the region. While these are positive steps to address the problem, since the operations in South Dade have not been modified, thus adding to the saltwater intrusion effect, it is clear there is an impact from the CCS. Efforts to implement these restoration projects, build structures or revise operations will not provide anticipated benefits if the migration of the hypersaline water from the CCS is not stopped.

Waiting upwards of a year to begin consultation on revising the Interceptor Ditch Operations Procedures, or other measures to achieve the objectives of the Agreement, allows another year of impacts to occur. While we understand that it takes time to determine the extent of saltwater intrusion that would have occurred, and is currently occurring, but for the CCS, beginning consultation within one year from the commencement of the 2009 Plan is far too long before beginning an evaluation of revising the Interceptor Ditch Operations. We see no reason why consultation cannot commence immediately using existing data supplemented with additional data from the 2009 Plan as it becomes available. As already stated, we have reviewed data submitted to the SFWMD by FPL, required in the context of the existing Agreement, and it shows a steady increase in conductivity at the four FPL CCS monitoring wells over the past 25 years. The monitoring requirements in the existing Agreement anticipated that the data from the four identified wells would be sufficient to ensure the objectives of the Agreement were met. While it provided a mechanism to revise the monitoring plan, the Agreement did not contemplate the need for the collection of additional data. Aside from the existing data in the SFWMD's possession submitted by FPL, there is also data available from other resources that could be used immediately to develop short term solutions. Therefore, we believe the SFWMD has enough data to begin developing solutions.

A longer term strategy can be developed based on this consultation process, but it should not start anew and ignore what 25 years of data shows. It is important that specific timeframes be established in the Agreement to solve the problem based on existing data <u>and</u> that data produced from the 2009 Plan.

The Agreement contains language allowing the SFWMD to declare an impasse, at some unknown time, in the consultation process to revise the Interceptor Ditch Operations Procedures to achieve the objectives of the Agreement. This adds a further undefined timeframe beyond the consultation process because it is unclear when the SFWMD would actually require any of the listed mitigation, abatement and/or remediation measures after the impasse is declared.

<u>Recommendation #4:</u>

The Agreement must establish a deadline oriented process to immediately:

1. Review all <u>existing</u> data to develop proposed short term solutions to address saltwater intrusion in South Dade by a certain date;
2. Develop a long-term plan, by a certain date, based upon the CCS' impact on saltwater intrusion in South Dade that could include revising the CCS' operations or other feasible engineering and/or hydrologic measures to solve the problem; and,
3. Develop a specific schedule to implement the short term solutions and the long term plan.

VI. <u>Solutions to Alleviate Saltwater Intrusion Outside of the Context of the Agreement</u>

As stated above, the planned restoration projects and adding new structures to the South Dade Conveyance System will go a long way towards addressing the saltwater intrusion problems. To fully address the problem, the SFWMD must couple this effort with revisiting how its operational protocols for existing structures can be revised to help alleviate the problem. Outside of the Agreement negotiation process, the SFWMD must determine what corrective actions it can take to alleviate regional saltwater intrusion in conjunction with the impact the CCS is creating. While we recognize the SFWMD has committed to undertake an evaluation of these issues outside of the Agreement, this effort must be completed in an ongoing publicly accessible process.

In closing, we firmly believe that it is in everyone's interest to participate in resolving the salt water intrusion issues in South Miami-Dade County. We all should be accountable for wise resource management in this area. The solution begins with the Agreement between the SFWMD and FPL that you are presently considering. We ask that you hold FPL accountable for the consequences of their actions, and adopt a deadline-oriented Agreement that retains the SFWMD's authority to require FPL to abate, mitigate and/or remediate the CCS' contribution to saltwater intrusion in South Dade.

Sincerely,

Steven A. Walker

c: Eric Buermann, SFWMD Governing Board Chair

Reply To: West Palm Beach

April 2, 2010

Mr. Mark Harris, P.E., Supervisor
Industrial Wastewater Section
Florida Department of Environmental Protection
2600 Blair Stone Road MS 3545
Tallahassee, FL 32399-2400

Re: Renewal Application for Turkey Point Power Plant Industrial Wastewater National Pollutant Discharge Elimination System ("NPDES") Permit #FL0001562

Dear Mr. Harris:

I am writing to provide comments to you on behalf of our client Atlantic Civil Inc. (hereinafter "ACI") regarding the above-referenced application to renew NPDES Permit # FL0001562. Please include these comments into the record for decision for any agency action related to the NPDES. Currently, FPL's Industrial Wastewater NPDES permit expires on May 5, 2010, and on September 9, 2009 FPL filed its application for renewal. The current NPDES Permit for Turkey Point is considered a "No Discharge" permit because it does not authorize a discharge to surface waters of the state or the United States.[1]

ACI operates limerock mines immediately due west of the Turkey Point Cooling Canal System (hereinafter "CCS"); pursuant to previously issued permits from the Florida Department of Environmental Protection (hereinafter "DEP") and the South Florida Water Management District (hereinafter "SFWMD"). After reviewing data and records responsive to a public records request filed with DEP, it is clear that discharges of hypersaline water are occurring beyond the limits of the

[1] Both previous federal court orders and the NPDES permit have only permitted discharges from the CCS under very limited and defined circumstances. For instance, the permit authorizes discharges from existing internal outfalls to the CCS and a discharge from the CCS to "the surficial Aquifer which is a Class G-III groundwater."

Class GII-GIII groundwater boundary both to the east and west of the CCS.[2] There is no data that we are aware of from this geographic area suggesting any other cause for the advancement of the hypersaline plume beyond the limits of the Class GII-GIII groundwater boundary. Continued limerock mining pursuant to ACI's permit authorizations is threatened by the unabated and unmitigated discharge of hypersaline water from the CCS into surrounding groundwater. Our concerns are not without merit because they have been raised by other agencies and even internal DEP staff.[3] In fact, I am attaching to this correspondence what appears to be a draft letter to FPL indicating concerns with data reviewed in conjunction with the Units 3 and 4 Uprate.

As you are aware, the NPDES permit is issued pursuant to the Clean Water Act to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). Moreover, the Florida Legislature "declares that it is in the public interest to promote effective and efficient regulation of the discharge of pollutants into waters of the state". Section 403.0885(1), F.S. Waters are defined as "rivers, lakes, streams, springs, impoundments, wetlands, and all other waters or bodies of water, including fresh, brackish, saline, tidal, surface, or underground waters." Section 403.031(13), F.S. The intent, therefore, of Florida's NPDES program is to regulate any and all discharges into the waters of Florida, including underground waters.

The permit authorizes discharges to Class G-III groundwater only and the Class G-III groundwater boundary is, for the most part, directly beneath the geographical extent of the CCS.[4]

[2] *See* Memorandum from Tim Powell to Mark Harris, November 16, 2009, stating, "It is inaccurate to describe the CCS as a 'closed loop' system, since we now know there is a plume of hypersaline water moving west from the CCS. It is also likely that the CCS is impacting surface waters to the west or possibly Biscayne Bay to the east." *See also*, Email correspondence from Tim Powell to Mark Harris dated march 19, 2009 stating, "What has significantly increased the degree of scrutiny is a trend analysis the district more recently provided (Fall 2008) that indicates GW west of the canals has increased in salinity in parallel to the hypersaline conditions in the cooling canals (more saline than bay water)."

[3] *See* FPL Turkey Point Units 6 & 7 Site Certification Application (SCA) SED Wastewater Section Comments, stating, "We feel it would be better to address this sooner rather than later, as there is concern of impacting the GII Aquifer and wellfields to the west, and possibly Biscayne Bay."

[4] *See* Memorandum from Tim Powell to Mark Harris, November 16, 2009, stating, "Per FAC Rule 62-520.520(8), existing cooling ponds are exempt from secondary standards for G-II ground water so long as the cooling pond waters are monitored pursuant to Department permit to ensure that the pond does not impair the designated use of the contiguous ground waters and surface waters. Review of water quality data collected by the SFWMD in Feb-Mar 2009 indicated not only exceedances of the secondary standards, but also for at least one primary standard-sodium. The following wells listed below indicate sodium levels above the standard (160 mg/L).... It's important to note that the L-3 and L-5 wells exhibit higher salinities than sea water in line with the CCW salinities."

In the permit, the discharge to the groundwater "shall not cause a violation of the minimum criteria for groundwater specified in Rule 62-520.400, F.A.C. and 62-520.430, F.A.C."[5] Accordingly, since the NPDES permit only authorizes a discharge to the Class G-III boundary the permit's monitoring requirements are limited accordingly in their scope to indicate an offsite impact. The permit contains a "reopener" clauses stating that the permit may be reopened to adjust effluent limitations or monitoring requirements should future wasteload allocation determinations, water quality studies, DEP approved changes in water quality standards, or other information show a need for a different limitation or monitoring requirement.

Data collected from monitoring by SFWMD, DEP, the Miami Dade County Department of Environmental Resources Management (hereinafter "DERM"), and FPL itself indicates discharges to ground water other than those authorized by the NPDES permit. Specifically, the data shows hypersaline groundwater plume movement west beyond the CCS and the interceptor ditch system. Moreover, ACI's own review of groundwater monitoring required by the original 1972 agreement authorizing the CCS operations (between FPL and the SFWMD predecessor, the Central and Southern Florida Flood Control District), indicates that there is a hypersaline plume expanding which is caused by the CCS. Data also shows that these discharges are more extensive than the Class G-III boundary indicating a potential violation of the permit.[6] Again, due to the location of the

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Well ID	Sodium (mg/L)
BBCW-4	2,730
BBCW-5	3,560
FKS-4	2,850
G-21	1,640
G-28	6,750
L-3	17,200
L-5	15,600

See also email correspondence from Janet Llewellyn to Jack Long, Phil Coram and Richard Drew, March 19, 2009, stating, "Terrie Bates mentioned to me yesterday that she heard District staff had determined that FPL may be in violation of our permit, and she indicated she hoped we would not take action until after we all talked at Friday's conference."

[5] Rule 62-520.400, F.A.C. provides that all ground water at all places and at all times must be free from industrial discharges which alone, or in combination with other substances or components of discharges pose a serious danger to the public health, safety, or welfare; or create or constitute a nuisance; or impair the reasonable and beneficial use of adjacent waters.

[6] *See* FPL Turkey Point Units 6 & 7 Site Certification Application SED Wastewater Section Comments stating, "In reviewing the data coming out of recent Units 3 and 4 uprate monitoring plan proposals, it has been established that

Class G-II-G-III boundary underneath the CCS it is clear why there is concern for impacts to the GII Aquifer, wellfields to the west, and possibly Biscayne Bay.

Both DERM and SFWMD have already written comment letters regarding this very matter in the context of the renewal of this NPDES permit. Salinity levels in wells beyond the Class G-III groundwater boundary show a steady rise in salinity levels, which will only be exacerbated by the proposed Uprate of Units 3 and 4 and any additional inputs of CCS discharges. Moreover, any increase in groundwater salinity could also impact surface waters of the state that are hydrologically connected to the Biscayne Aquifer. Thus, it is no longer true that FPL is not discharging to surface waters of the state. It is therefore vitally important that these factors are considered when evaluating FPL's application to renew its NPDES permit. Several agencies have requested expanded monitoring to include parameters designed specifically to identify the fate and transport of contaminants and associated waters known to original from the CCS into the environment.[7] While we support more specified monitoring in the context of this permit renewal specifically tailored to address NPDES parameters, that action alone does not abate or mitigate the existing discharges that are occurring and causing harm. Only immediate corrective actions will solve the problem and they must be implemented before more discharges are authorized in a permit renewal.

According to correspondence from Biscayne National Park and SFWMD regarding this permit renewal, there continues to be no question regarding hypersaline discharges from the CCS. But contrary to that evidence, in related correspondence that the SFWMD sent to Mark Harris on November 18, 2009, the SFWMD states, in regard to impacts to the surrounding environment from construction related stormwater runoff, it "is FPL's assertion that no monitoring or testing of the sediments or surrounding waters or environments is required because the waste is directed to the

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ground water and possibly surface water, have been impacted offsite from the hypersaline conditions of the Cooling Canal System (CCS). The IW Permit currently has no ground water or surface water monitoring provisions, because of the previously accepted assumption that seepage from the CCS is contained within the plant site boundary. Now that this assumption has been disproven, we feel that the monitoring proposal should be included with the IW permit revision." *See* VIII. General Conditions 1. "Any permit noncompliance constitutes a violation of Chapter 403, Florida Statutes, and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision. Rule 62-620.610(1), F.A.C."

[7] *See* correspondence from the U.S. Department of the Interior to Mark Harris dated November 13, 2009; *See also* correspondence from SFWMD to Mark Harris, November 18, 2009, "Given that (1) the CCS is unlined, (2) the high porosity of the underlying Biscayne Aquifer, (3) the known existence of a groundwater plume originating from the CCS into the surrounding aquifer outside of the Turkey Point Power Plan and the G-III boundary, and (4) the potential for interaction with adjacent surface waters (wetlands or within Biscayne Bay), the requested testing and other information is both relevant and necessary to determine application completeness and should also be considered in the context of the industrial wastewater permit."

'wastewater facility'" (the wastewater facility is the CCS). Even though run-off would be discharged into the 'wastewater facility' (CCS), it will have an impact beyond the CCS due to the discharges already occurring. There is significant data showing that a hypersaline plume from the CCS is already moving west and east beyond the Class-III boundary area through the Biscayne Aquifer. In fact, Biscayne National Park in its' January 6, 2010, comment letter concerning the site certification application for Units 6 & 7 queried how pumping from dewatering activities and disposal of effluent into the cooling canals would "affect the movement of the high salinity plume emanating from the Industrial Waste Facility." The CCS is discharging hypersaline water into the Biscayne Aquifer beyond the limits of its NPDES permit. ACI, therefore, must rely on the oversight and regulatory powers of the state to correct a problem that is adversely affecting the use of its property.

ACI's property and authorized activities will only be preserved and protected by fixing the problem that the public and the agencies have acknowledged plainly exists discharges from the CCS. Because there is no evidence to suggest any other causes of the impacts to the GII Aquifer, wellfields to the west, and possibly Biscayne Bay than these discharges, we therefore request that DEP, and all concerned agencies, **implement** an immediate plan to abate and mitigate the obvious hypersaline saltwater plume emanating from the CCS. This plan should not just include continued or expanded monitoring as part of the NPDES permit renewal. It is further warranted that this plan be in place before the renewal of the NPDES permit and included as part of the Conditions of Certification for Units 3 and 4 before the Uprate can commence. It must result in near term clear actions to halt the discharges of hypersaline water beyond the boundaries of the Class G-II-G-III boundary. DEP must assure that the renewal of this NPDES complies with the CWA, controlling federal court orders[8], the Florida Statutes and DEP's rules regarding the regulation of the discharge of pollutants into waters of the state.

Please notify us immediately of any agency action involving this, or any related NPDES permit. If you have any questions regarding this correspondence, please do not hesitate to call me.

Sincerely,

Stephen A. Walker

SAW/as

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[8] U.S. vs. Florida Power and Light, 53 F.R.D. 249, 1 Envtl. L. Rep. 20,461 (S.D.Fla 1971).

Summary of Comments on the Draft Environmental Assessment and Draft Finding of No Significant Impact

Background:

The U.S. Nuclear Regulatory Commission (NRC) staff published a notice in the *Federal Register* requesting public review and comment on the draft Environmental Assessment (EA) and draft Finding of No Significant Impact (FONSI) on November 17, 2011 (76 FR 71379), and established December 19, 2011, as the deadline for submitting public comments. By letters dated December 9, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11347A194), and December 12, 2011 (ML12027A023), comments were received from Florida Power & Light Company (FPL) and Mr. Steve Torcise, Jr., of the Atlantic Civil, Inc., respectively. FPL comments provided new estimates on the number of additional workers needed to support the outage work implementing the proposed Extended Power Uprate (EPU) and revised the projected outage times necessary to implement the EPU. FPL comments have been incorporated into this final EA with no change to the FONSI conclusion. Atlantic Civil, Inc., comments have been incorporated into this final EA with no change to the FONSI conclusion and are summarized below. Also, by letter dated January 12, 2012 (ML12019A348), the Southeast Regional Office of the U.S. Department of the Interior's National Park Service provided comments on the draft EA and draft FONSI. Since these comments were received after the comment period deadline of December 19, 2011, the NRC will address these comments using separate correspondence.

Disposition of Atlantic Civil, Inc. Comments

Summary of Comments:

1. FPL claims that the cooling canal is a closed system, but obviously it is not. FPL's monitoring data shows that the unlined cooling canal system exchanges water with adjacent

ground water. FDEP designated the groundwater within the cooling canal system as G-III waters (non-potable aquifer not subject to compliance with groundwater standards) and the NPDES Permit only authorized a discharge to those G-III waters. FPL's groundwater monitoring data shows that contaminants from the cooling canals have migrated west of L-31E and the interceptor ditch into G-II waters (See the attached figures).

2. In anticipation of directly causing saltwater intrusion, the interceptor ditch was intended " . . . *to restrict movement of saline water from the cooling water system westward of Levee 31E adjacent to the cooling water system to those amounts which would occur without the existence of the cooling canal system."* (SFWMD, 1983). The interceptor ditch has not been effective and has not contained the hypersaline water of the cooling canal system. FPL's monitoring data confirms this (See the attached figures 2 & 3). These figures show the chloride and tritium data collected by FPL in December 2010 and February 2011 respectively as an overlay on Figure 1 [Figures 1, 2, & 3 are provided in the December 12, 2011 letter]. This indicates water quality violations and warrants remedial action by FPL to correct the problem before the uprate is initiated.

3. FPL has not acknowledged, controlled or adequately addressed the existing water quality violation. The proposed uprate will increase the salinity in the cooling canal system, which will exacerbate the existing water quality violation.

4. Because of this unaddressed water quality violation, other property owners have had to go to extraordinary efforts and costs to prove that saltwater intrusion has not reached their property. The NPDES permit did not authorize any injury to the public or private property or any invasion of personal rights, nor authorize infringements of federal, state or local laws or regulations. The rights of nearby property owners clearly have been violated by the cooling system's influence on saltwater intrusion.

5. Until FPL addresses the existing water quality violations, the facility should not be allowed to increase its output and there should not be a Finding of No Significant Impact for the proposed uprate without mitigating the existing significant adverse impacts of the CCS. This Draft Environmental Assessment must mandate a solution to the impacts being cause by the CSS today and the increased impacts that will result from the uprate.

NRC Response:

As discussed in the EA, the closed-cycle cooling canal system (CCS), permitted by the State of Florida as an industrial wastewater facility, is used for the cooling of heated water discharged from the main condensers and auxiliary systems of Turkey Point (PTN) Units 1 through 4. The CCS is operated under an industrial wastewater facility "No Discharge" National Pollutant Discharge Elimination System (NPDES) permit issued by the State of Florida Department of Environmental Protection (FDEP) for water discharges to an onsite closed-loop recirculation cooling canal system. In this case, closed-loop recirculation means that the cooling canal does not have a pipeline connection with water bodies surrounding the PTN site such as Biscayne Bay for receiving or discharging its water. Monitoring data show that there is indirect surface water communication between the CCS and Biscayne Bay. The NRC staff revised the surface water and aquatic resources sections in the final EA to clarify that there is some water exchange between the cooling canal and other water systems and that aquatic species within the cooling canal are unable to travel into or out of the canal system.

The FDEP completed a thorough and comprehensive review under the Florida Electrical Power Plant Siting Act and issued a site certification to FPL approving the proposed EPU for PTN Units 3 and 4. In accordance with the FDEP site certification process for the proposed EPU, FPL must meet state imposed requirements contained in the Conditions of Certification (CoC). The CoC was developed based on interactions by FPL with the FDEP and other stakeholders during the FDEP site certification process. The inclusion of stakeholders'

recommendations into the CoC formed the basis for FDEP recommending approval of the site certification application for the proposed EPU. The CoC requires FPL to have a program to monitor and assess the potential direct and indirect impacts to ground and surface water from the proposed EPU. The monitoring includes measuring water temperature and salinity in the CCS and monitoring the American crocodile populations at the PTN site. The monitoring plan expands FPL's monitoring of the CCS's ground and surface water to include the land and water bodies surrounding the PTN site such as Biscayne Bay. The implementation of the CoC monitoring plan is an ongoing program coordinated by FDEP. The results of the monitoring will be publicly available via a South Florida Water Management District (SFWMD) website. If the proposed EPU is approved by the NRC, the CoC monitoring plan would continue to assess the environmental impacts. Among other measures, the CoC allows FDEP to impose additional measures if the monitoring data is insufficient to adequately evaluate environmental changes, or if the data indicates a significant degradation to aquatic resources by exceeding State or County water quality standards, or the monitoring plan is inconsistent with the goals and objectives of the Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands Project. Additional measures could include enhanced monitoring, modeling, or mitigation. Abatement actions provided in the CoC include: mitigation measures to comply with State and local water quality standards, which may include methods to reduce and mitigate salinity levels in groundwater; operational changes to the PTN cooling canal system to reduce environmental impacts; and other measures required by FDEP in consultation with SFWMD and Miami-Dade County to reduce the environmental impacts to acceptable levels.

Non-radiological conditions in the PTN cooling canal system are the responsibility of the State of Florida and its regional regulatory agencies. The implementation of the CoC monitoring plan is an ongoing program coordinated by FDEP. FDEP is responsible for evaluating the

monitoring data and has authority to impose mitigation measures, as appropriate, to ensure aquatic resources are adequately protected.

All radiological effluent discharges into the cooling canal are monitored and controlled in accordance with NRC regulations. NRC regulations require that radioactive gaseous and liquid releases from nuclear power plants be monitored and must meet radiation dose-based limits specified in 10 CFR Part 20, the "as low as is reasonably achievable" (ALARA) dose criteria in Appendix I to 10 CFR Part 50, and the Environmental Protection Agency's radiation protection standards in 40 CFR Part 190. These regulations limit the radiation dose that members of the public might receive from radioactive material released by a nuclear power plant. Nuclear power plants are required to submit an annual report to the NRC on the types and amounts of radioactive gaseous and liquid effluents released into the environment each year. The annual radioactive effluent release reports submitted to the NRC are available to the public through the NRC's ADAMS electronic reading room on the NRC website (www.nrc.gov).

The NRC provides continuous oversight of each plant under the NRC's inspection and enforcement programs. The NRC's Reactor Oversight Process integrates the NRC's inspection, assessment, and enforcement programs. The operating reactor assessment program evaluates the overall safety performance of operating commercial nuclear reactors and communicates those results to licensee management, members of the public, and other government agencies. The assessment program collects information from inspections and performance indicators in order to enable the NRC to arrive at objective conclusions about a licensee's safety performance. Based on this assessment information, the NRC determines the appropriate level of agency response, including supplemental inspection and pertinent regulatory actions ranging from management meetings up to and including orders for plant shutdown. The NRC conducts follow-up actions, as applicable, to ensure that the corrective actions designed to address performance weaknesses are effective.

Clarifying and corrective changes were made to the EA based on the comments received. No changes were made to the EA's finding of no significant environmental impact.

LEWIS
LONGMAN &
WALKER | P.A.
ATTORNEYS AT LAW
Helping Shape Florida's Future®

Reply to: West Palm Beach

VIA ELECTRONIC & OVERNIGHT MAIL

March 21, 2012

Ms. Melissa Meeker, Executive Director
South Florida Water Management District
3301 Gunn Club Road
West Palm Beach, FL 33406

Mr. Jeff Littlejohn, Assistant Secretary
Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, FL 32399

Re: Saltwater Intrusion in South Miami Dade County

Dear Ms. Meeker & Mr. Littlejohn:

Please accept this letter as a follow-up to our meeting on March 14th. We first want to thank you and your respective staff members for the opportunity to discuss this important issue and present our information. As we indicated during the meeting, we believe that sufficient data exists to clearly indicate that the interceptor ditch at the Florida Power and Light ("FPL") cooling canal system is not functioning as designed, permitted, or as required in the current agreement (5th supplement) between FPL, and the South Florida Water Management District ("SFWMD"). That agreement requires; " FPL to operate the interceptor ditch system to restrict movement of saline water from the cooling water system westward of Levee 31E adjacent to the cooling canal system to those amounts which would occur without the existence of the cooling canal system." A review of the data collected as part of the 1983 agreement (4th supplement) as well as data collected as part of the 5th supplement shows that water with a chloride concentration greater than any naturally occurring source (i.e. Biscayne Bay) exists well west of the L31 Levee. The only source for this higher-than-background groundwater is the hyper-saline water within the cooling canal system (See Exhibit 1). The interceptor ditch has not contained the higher than naturally occurring hyper-saline water.

In addition to the physical data, modeling work by Atlantic Civil clearly shows that the current position of the salt-front is significantly further west as a result of the FPL cooling canal system. The attached Exhibit 2 shows the results of our model simulations without the existence of the FPL cooling canal system and with the FPL cooling system for the years 1984, 1996 and 2010. This exhibit clearly shows that the salt-front is farther west than where it would be if the FPL cooling canals were not there. The USGS report by Hughes and Langevin supports this conclusion. Therefore, we request that the SFWMD, in accordance with paragraph II (D) 2. of the 5th supplement, notify FPL in writing that the interceptor ditch is not effective in restricting movement of the saline water westward of the levee 31E in a manner that is consistent with the objectives articulated in paragraph II (A) 1. Further, we request that SFWMD make demand on FPL to now comply with the obligation to contain its hyper-saline water and restrict the westward movement of the salt-front rather than continue to study the matter.

In addition to the commitments FPL has with respect to the 5th supplement, FPL is also operating under the terms and conditions of the existing NPDES permit. This permit was originally set to expire in May of 2010, but was automatically extended when FPL filed an application to renew it. Since that time, the permit application has remained essentially incomplete, apparently with little incentive for FPL to supply the information necessary to complete it.

The NPDES permit requires the hyper-saline water of the cooling canal system to be contained within the vertical footprint of the G-III groundwater classification. A review of Exhibit 1 clearly indicates that is not the case. That permit allows the Department of Environmental Protection ("DEP") to revise, revoke or reissue a permit if and when water quality studies or other information shows a need for different limitations or monitoring requirements. The permit also requires the permittee, FPL, to take all reasonable steps to minimize or prevent any discharge. Therefore, we request that the DEP issue the appropriate notice of permit violation to FPL under the terms and conditions of the NPDES permit.

Finally, we would like to reiterate a point made during the meeting that it is not necessary for the agencies to "fingerprint" the leading-edge of the salt-front as having originated from the cooling canal system. The test for FPL's compliance with the various agreements and permits has been, and continues to be whether the operation of the cooling canal system is resulting in the salt-front being farther west than it would have been had the cooling canal systems not been there. It clearly is.

In our opinion it is time for the agencies responsible for protecting the water resource of the State to act on this known and ongoing problem before more harm is done to the groundwater and private interests.

Again, we thank you for the opportunity to meet with the two agencies together and we look forward toward resolving this problem soon. If you have any questions please do not hesitate to contact us.

Sincerely,

Stephen A. Walker

SAW/as

Enclosure(s)

c: Steve Torcise
Steve Lewis
William Harrison
Ed Swakon
Jeff Bass

USEFUL NRC WEBLINKS

U.S. Commercial Nuclear Power Reactors

Reactor Oversight Process (ROP)
www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1649
ROP Performance Indicators Summary
www.nrc.gov/NRR/OVERSIGHT/ASSESS/pi_summary.html
New Reactor Licensing Process
www.nrc.gov/reactors/new-reactor-op-lic/licensing-process.html#licensing

Tritium

Backgrounder on Tritium, Radiation Protection Limits, and Drinking Water Standards
http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html
Groundwater Contamination (Tritium) at Nuclear Plants
http://www.nrc.gov/reactors/operating/ops-experience/tritium/sites-grndwtr-contam.html
Radionuclides in Groundwater
http://www.nrc.gov/reactors/operating/ops-experience/tritium/rn-groundwater.html
Frequently Asked Questions About Liquid Radioactive Releases
http://www.nrc.gov/reactors/operating/ops-experience/tritium/faqs.html

Public Involvement

Public Meetings and Involvement
www.nrc.gov/public-involve.html
Electronic Hearing Docket
https://adams.nrc.gov/ehd/
NRC Inspection reports:
http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/listofrpts_body.html
Effluent & Radioactive Effluent and Environmental Reports:
http://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html
Rulemaking Actions
www.regulations.gov
Significant Enforcement Actions
www.nrc.gov/reading-rm/doc-collections/enforcement/actions/
NRC Library
www.nrc.gov/reading-rm.html
Freedom of Information and Privacy Acts
www.nrc.gov/reading-rm/foia/foia-privacy.html
Agencywide Documents Access and Management System (ADAMS)
www.nrc.gov/reading-rm/adams.html
Public Document Room
www.nrc.gov/reading-rm/pdr.html
Documents for Comment
www.nrc.gov/public-involve/doc-comment.html

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

April 16, 2013

Ms. Barbara Linkiewicz
Senior Director, Environmental Licensing & Permitting
FPL & NextEra Energy Resources
700 Universe Blvd.
Juno Beach, FL 33408

Dear Ms. Linkiewicz:

Subject: Consultation Pursuant to the October 14, 2009 Fifth Supplemental Agreement between the South Florida Water Management District and Florida Power & Light

The South Florida Water Management District (SFWMD), working with the Florida Department of Environmental Protection (FDEP), has recently completed its evaluation of the data, findings and conclusions contained in Florida Power and Light's (FPL) Turkey Point Comprehensive Pre-Uprate Report, October 31, 2012. The SFWMD acknowledges the significant work FPL has put into the collection, analysis and interpretation of the data associated with implementation of the comprehensive pre-uprate monitoring plan pursuant to Conditions of Certification IX and X of the Power Plant Site Certification for the FPL Turkey Point Units 3 and 4 and the "Fifth Supplemental Agreement between the South Florida Water Management District and Florida Power and Light Company" (Agreement).

Based on technical evaluation of all available information, the SFWMD has determined that saline water from FPL's Turkey Point Power Plant cooling canal system (CCS) has moved westward of the L-31E Levee in excess of those amounts that would have occurred without the existence of the CCS and has moved into the water resources outside the plant's property boundaries. With recognition of the effort that was initiated several months ago with the FPL, FDEP and SFWMD working group, the SFWMD is providing this written notice to FPL, pursuant to paragraph II(D)2. of the Agreement, to begin consultation with the SFWMD to identify measures to mitigate, abate or remediate the movement of saline water.

We recognize that these are challenging water resources issues and FPL is committing significant resources to analyzing the environmental conditions surrounding the CCS. I want to emphasize that the SFWMD is committed to continuing to work collaboratively with FPL and FDEP to better understand the factors contributing to the western movement of saline water and develop solutions that protect the area water resources and maintain FPL's mission of maintaining critical electric power generation operations at Turkey Point.

Sincerely,

Melissa L. Meeker
Executive Director

c: Jeff Littlejohn, Deputy Secretary Regulatory Programs, DEP
Phil Coram, Water Resource Management Division, DEP
Cindy Mulkey, Administrator, Siting Coordination Office, DEP

TurkeyPointLANPEm Resource

From: Hoeg, Tim
Sent: Friday, November 21, 2014 8:23 AM
To: Sandal, Shane
Cc: Klett, Audrey; Endress, Matthew
Subject: FW: Canal Chemistry INPO team presentation
Attachments: RCE 1979256 Canal.pdf; TP Cooling Canal.docx

FYI. Additional info provided by FPL regarding UHS. I thought you might be interested.

Tim Hoeg
Senior Resident Inspector
Region II, Division of Reactor Projects
U.S. Nuclear Regulatory Commission

Turkey Point Nuclear Station — *Office: 305-245-7669*
9760 SW 344th ST. — *Fax: 305-247-0224*
Homestead, FL 33035

United States Nuclear Regulatory Commission Official Hearing Exhibit			
In the Matter of:	FLORIDA POWER & LIGHT COMPANY (Turkey Point Nuclear Generating, Units 3 and 4)		
ASLBP #:	15-935-02-LA-BD01		
Docket #:	05000250 & 05000251		
Exhibit #:	NRC-025-00-BD01	Identified:	1/4/2016
Admitted:	1/4/2016	Withdrawn:	
Rejected:		Stricken:	
Other:			

From: Tomonto, Bob [mailto:Bob.Tomonto@fpl.com]
Sent: Friday, November 21, 2014 8:12 AM
To: Hoeg, Tim; Endress, Matthew
Subject: FW: Canal Chemistry INPO team presentation

From: Scroggs, Steven
Sent: Friday, November 21, 2014 8:09 AM
To: Tomonto, Bob
Subject: FW: Canal Chemistry INPO team presentation

Best Regards,

Steve
O: 561-694-5051

From: Barnes, Philip R
Sent: Wednesday, November 19, 2014 12:53 PM
To: Mowbray, Michael; Rios, Nelayne; Scroggs, Steven
Cc: Shafer, Sam; Conboy, Thomas; Domingos, Christopher; Alvarez, Jose
Subject: Canal Chemistry INPO team presentation

The Chemistry evaluator will be presenting the canal root cause evaluation (attached) to the entire INPO evaluation team tomorrow. Also attached are his notes, taken mostly from the root cause, with some additional information added. I would encourage each of you to make sure you read this write-up and read the root cause before speaking with INPO so you understand what has already been said. We did a lot of good work in response to the canal issues and are continuing to do a lot of good work, but it is definitely in the correction mode. The root cause is focused on the lack of prevention & detection. The Chemistry evaluator is focusing on questioning why Chemistry Department didn't have controls in place to detect this sooner. The Gap Focus Area is in CY.2 "Chemistry Controls". I've pasted the PO&C below for convenience.

Phil

PERFORMANCE OBJECTIVE (CY.2)
Chemistry personnel maintain proper chemistry conditions during all phases of plant operations.
CRITERIA
1. Chemistry personnel proactively monitor, evaluate, and trend chemistry results to control chemistry parameters within a technically defined range and take actions to prevent or minimize the ingress of contaminants.

2. Chemistry personnel promptly communicate recommendations to resolve adverse chemistry trends, anomalous conditions, and out-of-specification parameters.

3. Chemistry personnel control makeup water closely to ensure it is consistently of high quality.

4. Chemistry personnel maintain and use off-normal procedures to address abnormal conditions and have contingency plans for minimizing chemistry excursions and restoring plant systems to normal operating conditions.

5. Chemistry personnel evaluate diesel fuel oil conditions to ensure a high quality of fuel oil is maintained during normal and accident conditions.

6. Chemistry personnel monitor specific parameters to validate that intended cooling water treatment is effective.

Philip R Barnes
Design Engineering Manager
Turkey Point Nuclear Plant

305-246-6820 (w)
305-219-8157 (c)
philip.r.barnes@fpl.com

Hearing Identifier: TurkeyPoint_LA_NonPublic
Email Number: 52

Mail Envelope Properties (E4001ACB4EB7EE4394ABF252F664CA6A175844A9FB)

Subject: FW: Canal Chemistry INPO team presentation
Sent Date: 11/21/2014 8:22:46 AM
Received Date: 11/21/2014 8:22:59 AM
From: Hoeg, Tim

Created By: Tim.Hoeg@nrc.gov

Recipients:
"Klett, Audrey" <Audrey.Klett@nrc.gov>
Tracking Status: None
"Endress, Matthew" <Matthew.Endress@nrc.gov>
Tracking Status: None
"Sandal, Shane" <Shane.Sandal@nrc.gov>
Tracking Status: None

Post Office: R2CLSTR01.nrc.gov

Files	Size	Date & Time
MESSAGE	3412	11/21/2014 8:22:59 AM
RCE 1979256 Canal.pdf	385832	
TP Cooling Canal.docx	630670	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Turkey Point

Canal Temperature Exceeded 100 degrees F.

Event Date:

CR Number: 1979256

Root Cause Team	Name	Dept/Group
Management Sponsor	Jose Alvarez	PID
Team Leader / RCE Evaluator	Juan Cuan	PID
Team Members	Luis Reyes-Trujillo	Operations
	Olga Hanek	Licensing
	Mike Mowbray	Engineering

Root Cause Evaluator: ______________________ **Date:** __________
Print/Sign

Management Sponsor: ______________________ **Date:** __________
Print/Sign

MRC Chair: ______________________ **Date:** __________
Print/Sign

Electronic Signature may be obtained by assigning actions in NAMS. Refer to PI-AA-202-1000 for details.

The root cause process is designed to be self critical to drive improvement. As such, specific organizational and/or programmatic causes within the plant's span of control are identified. The root cause process determines a functional cause and not a legal or contractual cause.

NEXTera ENERGY

1.0 Executive Summary

On July 20, 2014 at 1452 , Turkey Point Units 3 and 4 entered the Action for Technical Specification (TS) 3.7.4, Ultimate Heat Sink (UHS) which requires both units to be placed in Hot Standby within 12 hours and Cold Shutdown within the following 30 hours. The action was entered because the UHS temperature exceeded the limit of 100 degrees Fahrenheit (F) due to a natural event. This event was reported to the NRC in accordance with 10 CFR 50.72(b)(3)(v)(B) because UHS capability to remove residual heat was impacted. At 1800 the NRC verbally approved a natural event Notice of Enforcement Discretion (NOED) which increased the ultimate heat sink temperature from 100 degrees F to 103 degrees F and prevented the shutdown of both units.

During 2014, 0-ONOP-.011.1 (Intake Canal Low Level or High Temperature) was entered 22 times prior to the event. The first entry was on June 7, 2014 with a maximum temperature of 96.11 degrees F. The last entry occurred on July 19, 2014 at 1655 with a temperature of 99.7 degrees F culminating in the event being evaluated.

This root cause was chartered to understand the organizational drivers of this event as opposed to the actual technical or scientific causes of the rise in cooling canal water temperature.

Through its investigation the root cause team determined that the organization has not recognized signals that would indicate a need for further investigation of the Cooling Canal System (CCS), or are have not been monitoring key factors that should be been used to assess the CCS's ability to meet its mission as the UHS. These examples are:

- Monitoring cooling canal water temperature and acting on rising canal water temperatures - Average canal temperatures have shown periodic all-time highs over the last 5 years; however, the all-time highs have been consistent since September 2013 through today.

- Monitoring cooling canal Level (volume of water) and acting on reduced water levels

- Algae concentrations are not being measure or tracked on an ongoing bases

- Other cooling canal water parameters were not being used to assess the health of the CCS (Example Salinity)

Root Cause:

"Lack of a Program that monitors the overall health of the CCS and its impact on the plants' ability to meet Technical Specification 3/4.7.4, Ultimate Heat Sink requirements."

CAPR:

Establish and implement a Program evaluates the condition of the Cooling Canal System and determines if it is capable of meeting the Technical Specification 3/4.7.4, Ultimate Heat Sink requirements through the following CAPR actions:

- Create and implement Program Charter that periodically evaluates the condition of the Cooling Canal System and determine if it is capable of meeting Technical Specification 3/4.7/4, Ultimate Heat Sink requirements.
- Assign muti-discipline membership
- Proceduralize Charter

2.0 Report

1. Event Description

The Cooling Canal System (CCS) serves as the Ultimate Heat Sink (UHS) for the two fossil units (Units 1 and 2) and the two nuclear units (Units 3 and 4). The CCS/UHS temperature is monitored every shift by a reading that is taken at TI-3-3605 and TI-4-3605. Additional monitoring can also be provided by using TE-6907 (Sea Water to TPCW Heat Exchanger).

0-ONOP-011.1, Intake Canal Low Level or High Temperature, is entered whenever UHS temperature exceeds 96 degrees F per Attachment 2 of the procedure. This portion of the procedure has been in effect since 2009. Data available from PI Process Book for the TI-3/4-3605 Temperatures shows that we have entered the 0-ONOP-011.1 as follows:

During 2009, 0-ONOP-.011.1 was not entered, but data was only available for November and December.

During 2010, 0-ONOP-.011.1 was entered 7 times. The maximum indicated temperature was 97.23 degrees F.

During 2011, 0-ONOP-.011.1 was entered once. The maximum indicated temperature was96.17 degrees F.

During 2012, 0-ONOP-.011.1 was not entered. The maximum indicated temperature was 95.5 degrees F.

During 2013, 0-ONOP-.011.1 was entered once. The maximum indicated temperature was 96.16 degrees F. (This is with both Units 3 and 4 operating after EPU modifications completed)

During 2014, 0-ONOP-.011.1 was entered 22 times prior to the event. The first entry was on June 7, 2014 with a maximum indicated temperature was 96.11 degrees F. The last entry occurred on July 19, 2014 at 1655 with a temperature of 99.7 degrees F culminating in the event below.

On July 20, 2014 at 1452, Turkey Point Units 3 and 4 entered the Action for Technical Specification (TS) 3.7.4, Ultimate Heat Sink which requires both units to be placed in Hot Standby within 12 hours and Cold Shutdown within the following 30 hours. The action was entered because UHS temperature exceeded the limit of 100 degrees F due to a natural event. This event was reported to the NRC in accordance with 10 CFR 50.72(b)(3)(v)(B) because UHS capability to remove residual heat was impacted. At 1800 the NRC verbally approved a natural event Notice of Enforcement Discretion (NOED) which allows the ultimate heat sink temp to exceed 100 degrees F up to 103 degrees F and prevented the shutdown of both units. The event description is augmented by events surrounding the condition of the CCS and not just the temperature aspect. An assumption was made that other conditions in the system may affect temperature.

A search of the Corrective Action Program (CAP) identified multiple Action Requests (ARs) documenting other issues related to the CCS and changes in the CCS conditions. The following provides a summary of the issue and the related disposition.

7/18/2009 (AR 00467529)

Issue: No guidance exists on how to handle elevated Ultimate Heat Sink Temperatures.

Result: 0-ONOP-011.1 was revised to provide guidance for actions to be taken when UHS temperature exceeds 96 degrees F. The guidance was based on the EPU Cooling Canal System Modeling Report dated January 13, 2008, from Golder Associates, as a basis.

2/1/2012 (AR 01730294)

Issue: During Diving Inspections visibility at intake structure virtually zero.

Result: Walk down of areas performed by Land Utilization and cited silt in the water was causing poor visibility due to high wind and recent rain fall.

7/10/2012 (AR 01783358)

Issue: Reports cooling canal system water quality poor for some time and mentions scarcity of fish and crocodile sighting.

Result: Evaluation concluded that Turkey Point is in full compliance of Industrial Waste Water (IWW) permit FL0001562.

8/6/2012 (no AR found):

Issue: Algae bloom occurred, 682,873 Cell/ml.

Results: Monitoring showed algae count decreased to 309,311 Cells/ml on 9/18/2012, no further action or readings taken till 4/24/2014.

<u>4/23/2014 (AR 01960954)</u>

Issue: Water consistency in the canal may be contributing to poor heat exchanger performance.

Result: Algae, caused by elevated Condensate dissolved Oxygen has resulted in increased hydrazine consumption. Hydrazine thermally decomposes to ammonia, which is released to the canal system and becomes a nutrient for the algae.

<u>5/2/2014 (AR 01963338)</u>

Issue: Cooling canal salinity highest since 2010 based on quarterly environmental monitoring program.

Result: Prompt Operability Determination (POD) performed, centered on effects to heat exchangers and decrease in maximum allowable ICW temperature.

<u>5/15/2014 (AR 01966207)</u>

Issue: Requests evaluation of online risk analysis based on degraded cooling canal condition.

Results: Routine Work Assignment created (open status) to consider suggested improvements to online risk analysis.

<u>6/24/2014 at 1810</u>

Issue: Ultimate Heat Sink temperature at 98.31 Degrees F.

Results: Notified Systems to reduce load by 200 MWe on Unit 1, which was completed at 1941.

<u>6/25/2014 (AR 01974347)</u>

Issue: 0-ONOP-011.1 Intake Canal High Temperature procedure was created pre-EPU conditions. Since EPU the thermal output from Units 2, 3, and 4 has changed and warrants a reassessment to direct actions to reflect current plant conditions

Results: Several modifications to this procedure were made under PCRs 1974593/1974463, with additional modifications to be completed following revision of the associated technical specification which revised the UHS temperature limit to 104 degrees F permanently. (Only deals with load reduction)

6/27/104 (AR 01975112)

Issue: Emergency project to implement EC 281963: chemically treat the cooling canal system for elevated algae.

Result: Chemical addition started, algae concentration has decreased from 1,876,961 (cells/ml) to 1,270,000. This is above 9/18/2012 reading of 309,311.

7/14/2014 (AR 01978076)

Issue: Correlation of unit generation to Ultimate Heat Sink temperature questioned.

Result: Ultimate Heat Sink temperature changes were observed to not correlate strongly with MW loading. This condition is the subject of a company-wide mitigation effort, no AR referenced. (Condition Evaluation completed on 8/8/2014)

2. Problem Statement

Ultimate Heat Sink Temperature exceeded 100 deg. F Technical Specification 3/4.7.4 limit. This caught the organization by surprise and constitutes a violation of TS 3/4.7.4 and resulted in a Licensee Event Report.

3. Analysis

A. Analysis Methodology

A Fault Tree analysis chart was used to identify factors that affect canal heating and cooling. A support refute matrix was used to summarize results of findings for various factors identified.

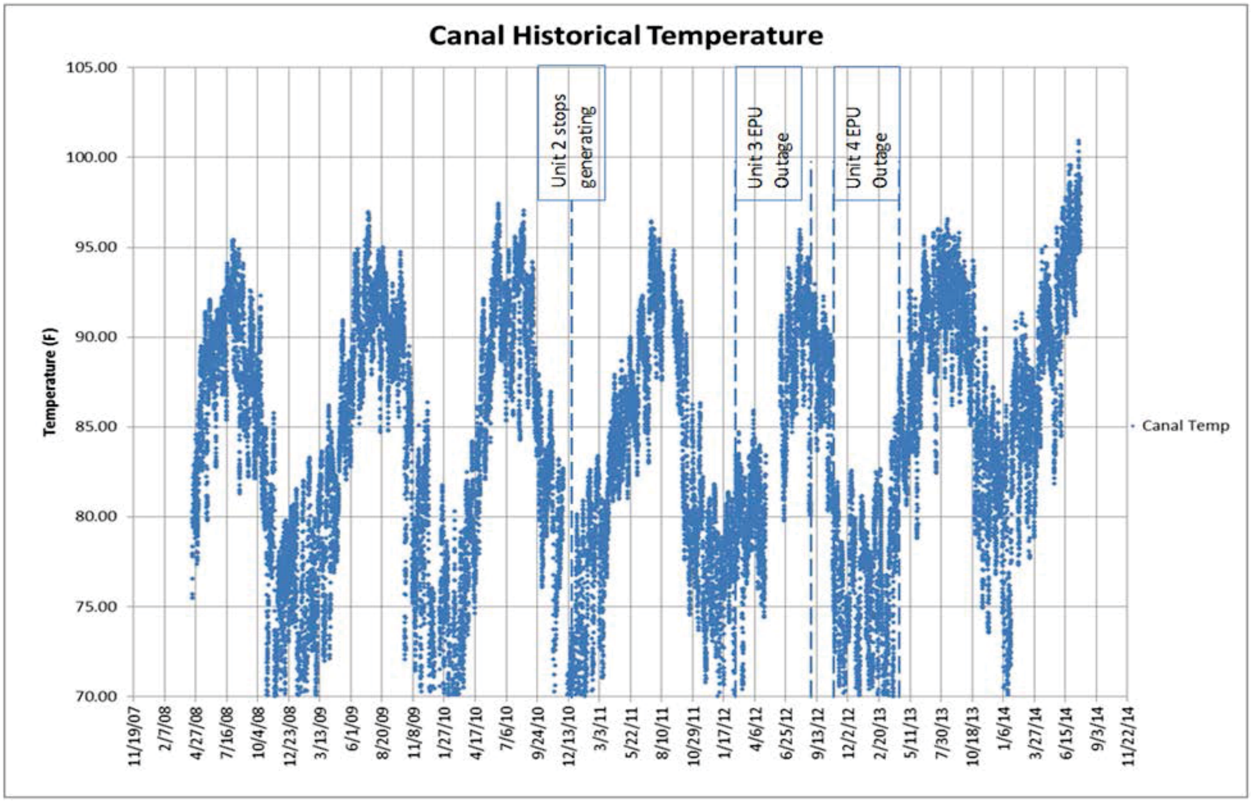
Based on the Fault Tree analysis we examined the following available parameters and attempted to determine if they could have been triggers for further evaluation of the condition of the cooling canal system to meet UHS requirements:

- Plant Generation (thermal load to CCS/UHS)
- Canal Level
- Algae
- Salinity

B. **Plant Generation**

The CCS was designed and built to support generation cooling for Units 1, 2, 3 and 4. The CCS is the UHS for the nuclear units, Units 3 and 4. Original Megawatt (MW) generation for the site was 400 MW each for Units 1 & 2 and 600 MW each for Units 3 & 4. Technical Specification 3/4.7.4, Ultimate Heat Sink was added to the Turkey Point Units 3 and 4 Technical Specifications in August 1990. TS 3/4.7.4 Limiting Condition of Operation limits the UHS average supply water temperature (from cooling canals) to less than or equal to 100 degrees F. Several changes have occurred since implementation of TS 3/4.7.4. The nuclear units were upgraded in 1996 and again in 2012-2013. Current generation capability is Unit 1 400 MW, and Units 3 and 4 835 MW each. Exceeding the UHS limit had not occurred in the site's history until the event under investigation.

TS 3/4.7.4 UHS compliance is monitored based on temperature readings from (ESOMS ICW Temperature) TI-3-3605 and TI-4-3605 which are taken every shift during Operator Rounds. UHS temperatures can also be measured from TE-*-6907 which provides more continuous data and is consistent with the data from TI-3-3605 and TI-4-3605. The following UHS Canal Historical Temperature is based on information from the TE-*-6907.



	Monthly Average Canal Temperature											
Year\Month	1	2	3	4	5	6	7	8	9	10	11	12
2008				81.1	85.4	89.0	90.8	90.2	87.1	83.3	76.8	76.1
2009	74.8	74.2	77.0	80.6	85.8	89.6	91.8	91.7	89.6	87.0	78.8	77.0
2010	69.2	71.5	74.1	80.5	87.6	92.3	90.7	92.3	88.2	82.1	77.4	67.7
2011	73.4	78.4	78.6	84.2	85.7	88.0	91.1	91.8	90.5	82.3	79.1	76.9
2012	75.2	78.3	78.8	80.5	78.8	85.5	90.1	89.9	88.8	84.3	75.2	75.6
2013	76.5	76.3	73.9	83.5	85.8	90.6	90.6	92.3	**91.6**	**88.0**	**82.4**	**82.1**
2014	**77.8**	**85.4**	**84.7**	**89.1**	**89.5**	**93.8**	**95.5**					

Several factors that should be taken into consideration when reviewing the historical canal temperature data include:

On December 28, 2010 generation was stopped on Unit 2 reducing the cooling burden on the CCS.

From February 26, 2012 to September 5, 2012 Unit 3 was not generating power due to an Extended Power Upgrade (EPU) refueling outage. This temporarily reduced the cooling burden on the Cooling Canal System.

From November 5, 2012 to April 17, 2013 Unit 4 was not generating power due to an EPU refueling outage. This reduced the cooling burden on the CCS.

Historically a general guidance has existed that a reduction in 200 MW equates to a 1 degree F reduction in CCS/UHS temperature. This was supported by an evaluation that was performed as to the impact of the EPU modifications on cooling canal temperatures (we would only see about a one degree F increase). From the above information you would have expected to have a corresponding decrease in overall temperature after the shutdown of Unit 2 and during the long EPU outages, but that is not the case, especially during the months of July, August and September.

The TE-*-6907 temperatures were used to calculate a historical monthly average CCS/UHS temperature from 2008 through 2014. The monthly average temperatures have shown periodic all-time highs over the last 5 years; however, the all-time highs have been consistent since September 2013 through July 2014. . Although all-time high temperatures may occur occasionally, the monthly all-time high record CCS/UHS temperatures since September 2013 should have triggered an investigation.

Assessment: Based on the information above, the thermal heat load from plant operations may have a short term effect (based on 1 degree F per 200 MW) on the canal temperature and not a long term effect. This was also identified in AR 0197876 originated on 7/14/2014.

Monthly average temperatures started to show periodic all-time highs over the last 5 years and consistently increasing beginning with September 2013 and continuing through July 2014. Although all-time highs may occur occasionally, the monthly all-time high record CCS/UHS temperatures trend since September 2013 **should have triggered an investigation.**

C. Canal Level

The extent to which canal level is monitored and enters into the plants operational scope is strictly based on its effect on the pumps taking suction at the intake structure. From this stand point, 0-ONOP-011.1 (Intake Canal Low Level or High Temperature) illustrates this perspective with the following note:

C A U T I O N

ICW pumps are calculated to lose suction at a well level of 20 feet 8 inches below the grating. All actions below are designed to maintain well levels above 20 feet 8 inches.

The monitoring of canal level is based on, but not limited to, the Auxiliary Operator Rounds Module. Once per day the Operator records this information and the first trigger point for attention is a reading greater than 18 feet. This reading is the distance from the bottom of the grating at the intake structure to the water level at the intake. Entry into the pertaining ONOP is not until 19”9” or per Shift Managers discretion. Land Utilization also takes readings on canal level at certain points throughout the canal system; this data, however, is not available for action plans to mitigate canal abnormalities for Control Room Operation of the Plant. (Data from land Utilization could be useful here) Other data systems used to monitor plant parameters (referring to Pi) also do not have a quick access link to canal level data.

A search into the Narrative logs Module for **0-ONOP-011.1** in conjunction with **canal level** gives 69 search hits from the time period of 2004 until present time. Only 5 of these entries pertain to canal level and all predate 2008. These entries in their majority concern themselves with suction to the screen wash pumps.

The data below was taken from a monitoring station in the middle of the Turkey Point cooling canal system. It shows that rain fall for 2014 has been very low, and that the canal water level is also low. This data is currently being captured to satisfy South Florida Water Management District required the implementation of a Groundwater, Surface Water and Ecological Monitoring Plan (GSWEMP). This could have been used as a trigger that conditions have changed that could have impact on the Ultimate Heat sink.

Year	Rain Fall (inches)	Canal Level Relative to NAVD88 (feet)
2011	52	Not available.
2012	74.2	-0.47
2013	19.6	-0.65
2014	4	-0.88

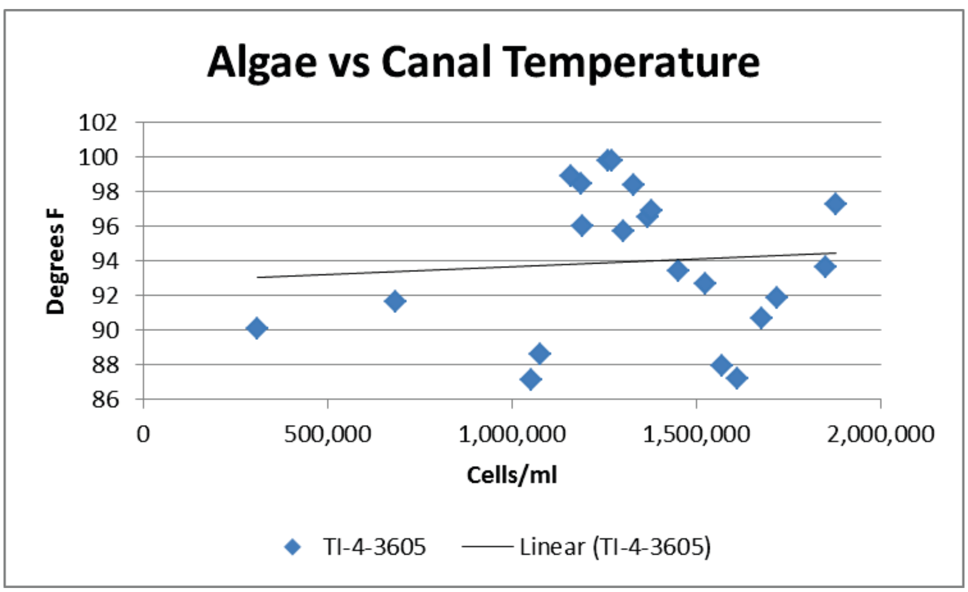
Assessment:

Canal level data and mitigating strategies present at Turkey Point are based on Intake Cooling Water (ICW) pump needs and reporting requirements. **Currently, no data are used for prognostication of a potential negative correlation between canal level and UHS temperature.**

D. Algae

This is not a parameter that was measured on a continuing basis. The first measurements of algae were taken in August of 2012 after AR 1783358 was written questioning the quality of the CCS water. The AR evaluation concluded that Turkey Point was in full compliance of IWW permit FL0001562. A subsequent sample was taken in September of 2012. No other measurements were taken until April 2014 in response to AR 01960954 when an algae bloom was observed. AR1960954 investigated the contribution of the observed CCS biological fouling on the CCW heat exchanger tubes. The investigation found that the CCS is a living marine ecosystem containing numerous species of algae. The evaluation centered on the cause of the algae and no analysis was performed on any perceivable impact on the CCS to dissipate the heat.

The following chart plots CCS algae concentration vs the temperature of the canal at the intake. This does not show a strong correlation between algae concentration and canal temperature, although both parameters have been shown to have an impact on heat exchanger performance.



Assessment:

The investigation in response to the observed high level of algae was centered on the cause of the high algae concentration and the corrective actions necessary to eliminate the algae, but **could have triggered an analysis on the health of the CCS and its ability to meet the Ultimate Heat Sink requirements.**

E. Other Cooling Canal Parameters

The CCS/UHS is a closed loop canal system fed by groundwater flow from the underlying shallow aquifer. The canal system is fed primarily by rainfall and groundwater from the Biscayne aquifer, which consists of saline water flowing west from Biscayne Bay and fresh water flowing east from the Everglades. The water quality and water level in the CCS is affected by the interaction between the external groundwater from the vicinity and the CCS water.

For most of its operating history, monitoring of the CCS was limited to that required by the National Pollutant Discharge Elimination System (NPDES) permit. In accordance with the NPDES, the following information is required to be collected:

	Monitoring Requirements OUI-1*		**Monitoring Requirements OUI-2****	
Parameters (units)	**Monitoring Frequency**	**Sample Type**	**Monitoring Frequency**	**Sample Type**
Temperature (F), Water	Monthly	Instantaneous	N/A	N/A
Solids, Total Suspended (MG.L)	Quarterly	Grab	Semiannually	Grab
pH (SU)	Quarterly	Grab	Monthly	Grab
Salinity (PPT)	Quarterly	Grab	N/A	N/A
Specific Conductance (UHMO/CM)	Quarterly	Grab	Quarterly	Grab
Copper, Total Recoverable (UG/L)	Semiannually	Grab	Semiannually	Grab
Iron, Total Recoverable (MG/L)	Semiannually	Grab	N/A	N/A
Zinc, Total Recoverable(UG/L)	Semiannually	Grab	Semiannually	Grab
Lead, Total Recoverable 9UG/L)	N/A	N/A	Semiannually	Grab
Oil and Grease (MG/L)	N/A	N/A	Semiannually	Grab

* Sample Point OUI-1: Cooling water discharge prior to entering the feeder canal within the closed loop CCS.

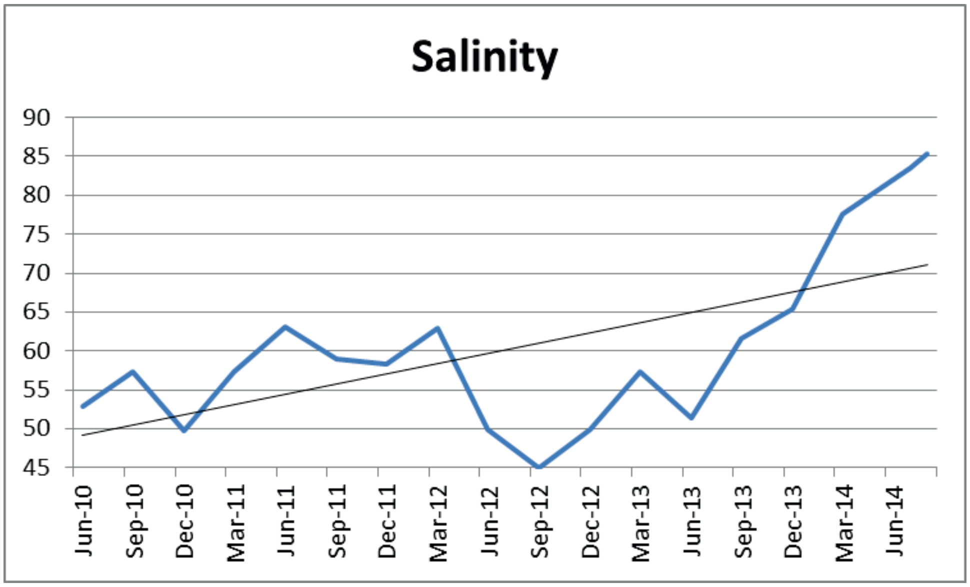
** Sample Point OUI-2: Discharge from the two solids settling basins or neutralization basin prior to mixing with water in the closed loop CCS.

In addition to the NDPES required data, a 1983 agreement between FPL and the South Florida Water Management District defined a groundwater monitoring program and interceptor ditch operation requirements. The groundwater monitoring program requires monitoring of multiple wells four times per year. The data collected includes: 1) ground elevation (feet), 2) surface water elevation, 3) conductivity and temperature (measured at one foot intervals for the total well depth), 4) two water samples per well for chloride content.

As a result of the Turkey Point EPU Project, the South Florida Water Management District required the implementation of a Groundwater, Surface Water and Ecological Monitoring Plan (GSWEMP). The purpose of the GSWEMP is to track the movement of salt water into the freshwater aquifers along the coastal United States. The GSWEMP requires monitoring 48 parameters related to water quality, water level/flow and biology parameters both inside and outside the CCS. Water quality monitoring data includes temperature, water level, specific capacity, pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), and salinity. A total of 75 water quality sample locations with quarterly sampling requirements are part of the GSWEMP. In addition, continuous monitoring equipment was installed in July 2010 to monitor temperature, specific conductance, and water level collecting over 12,000 data points daily.

Historically, monitoring of the CCS has been performed to meet the requirements of the NDPES, the groundwater monitoring program and most recently, the GSWEMP. CCS conditions and the effects of all the measured parameters on the CCS performance as the UHS of the nuclear plants has not been analyzed.

One of the “other” cooling canal monitoring parameters that could be used to determine the health of the Ultimate Heat Sink is salinity. The CCS water salinity is considered a hyper saline environment with salinities greater than 35 g/L, the salinity for seawater. Based on data available, the CCS salinity has increased greatly over the years of operation. Within the past 10 years, salinity in the CCS has ranged between 42 and 69 g/L. However, salinity levels have greatly increased above the 69 g/L since December 2013 with an observed salinity of 85 g/L in August 2014. The increased CCS temperatures lead to an increased rate of evaporation, leaving dissolved solids behind and increasing the CCS salinity.



This was another parameter that could have triggered an investigation regarding changing CCS conditions.

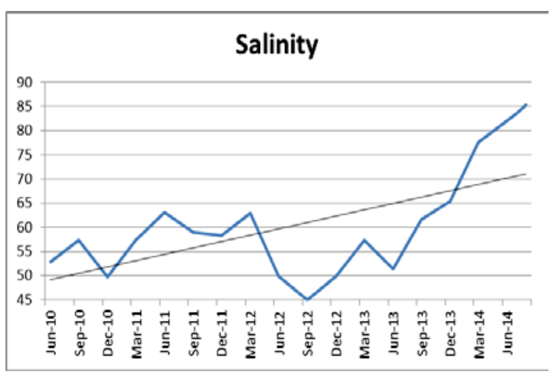
Assessment:

CCS parameters are being measured to satisfy environmental requirements. However, analysis of the CCS parameters available has not been performed to anticipate changes in CCS conditions and its ability to meet the UHS requirements. As an example, one of the parameters monitored is salinity. As previously discussed, salinity has greatly increased since September 2013 and it could possibly be used as a surrogate to canal volume/level since higher than normal salinity concentrations is most likely a result of high evaporation levels with low fresh water replenishment from rainfall and the Floridian aquifer.

There was no attempt made to correlate the increasing salinity levels to CCS/UHS performance.

F. **Summary**

Causal Factor	Discussion	Support/Refute	Conclusion
Plant Generation	Plant generation causes thermal output to the Cooling Canal System (CCS). As the amount of generation increases so does the intake temperature.	**Supported** While the plants thermal outputs are a contributor to the CCS temperature, they are not the main driver. This can be seen in the Canal Historical Temperature graph in section 3.B. showing wide variation between summer months and winter months. In addition AR 1978076 questioned the correlation of unit generation to Ultimate Heat Sink temperature since temperature kept rising while one of the nuclear units was at 50% and the fossil units not generating. Though thermal output may not be a main driver, the monitoring of thermal output to UHS temperature could have been used as a trigger to further investigate why the correlation was different from the expected, especially during the winter months (November and December 2013) when UHS temperatures were above normal. This is evidenced in the Monthly Average Canal Temperature chart in section 3.B.	Currently the only tie of UHS temperature to generation only exists in 0-ONOP-011.1 where UHS temperature limits exist and action guidance provided. **No Program correlates generation output to UHS temperature as an indication of CCS/UHShealth/ performance.**
Canal Level	The level of water in the canal affects the volume available for cooling, the less volume the less time it takes to circulate around the CCS. This lessens the time to dissipate stored heat.	**Supported** Canal level is measured by Operations to assure that sufficient amount of water exists to support plant operations. Land utilization measures canal level at several points along the CCS, this data is used for reporting purposes only.	**No Program monitors the CCS level and how that affects the CCS UHS capability.**
Algae	The amount of algae in the CCS has a direct impact on heat exchanger	**Supported** Algae is not a parameter that was being monitored on a regular basis, this does not exists as a parameter for decision making nor is it required for reporting needs. However it's presence does impact the water quality,	**No Program monitors the algae level and how that affects the CCS UHS capability.**

	efficiency. There is a belief that the algae also affects CCS temperature due to the darkening of the water, thus absorbing more heat and increasing mass thus retaining more heat.	which can be seen visually, and usually appears when water temperatures are high and there is a lack of fresh water. This should have been an indication that the CCS is not experiencing normal environmental conditions.	
Other CCS Parameters	There are other CCS parameters that could be used to further determine the health of the system.	**Supported** For most of its operating history, monitoring of the CCS was performed by Land Utilization and limited to that required by the National Pollutant Discharge Elimination System (NPDES) permit. One of the parameters monitored is salinity. Salinity could be used as a surrogate to canal volume/level since higher than normal concentrations is most likely a result of high evaporation levels with low fresh water replenishment such as rainfall. Thus affecting available water and increasing flow lessening cooling time of the CCS water. 	**No Program monitors salinity level and how that affects the CCS UHS capability.**

G. **Conclusion:**

Engineering is responsible for CCW and TPCW systems performance. CCS temperature, salinity, turbidity and specific heat are variables that contribute to CCW and TPCW performance. Land Utilization is responsible for performing CCS maintenance to ensure plant operation is not impacted. Land Utilization is also responsible for the collection and reporting of data required by the environmental permits. Operations monitors UHS temperature but only to determine if we are operationally within the technical specification limits. They also monitor intake level but only view this as a requirement for proper pump performance. There is no single owner or system engineer that is responsible for analyzing all the parameters affecting CCS performance as it pertains to UHS requirements. Nuclear Oversight does not routinely perform evaluations on the canal system but it is being considered under AR 192493 -06.

Based on information above the **Root Cause** of this event is -

"Lack of a Program that monitors the overall health of the CCS and its impact on the plants ability to meet Technical Specification 3/4.7.4, Ultimate Heat Sink requirements."

4. Causal Factor Categorization

A. Address each category - People, Programmatic, Organizational and Equipment based on the analysis.

(1) People: No human performance deficiencies were found during this analysis.

(2) Programmatic: The Root Cause ties to **Insufficient Program Details:** This occurs when a program is vague regarding what is required in a particular situation, or does not address specific aspects of program implementation, monitoring, or evaluation.

(3) Organizational: The Root Cause ties to **Poor Program Evaluation Process:** This area is very similar to the program monitoring/ management. This area is reactive, in that a program failure occurs before action is taken. (insufficient program design).

(4) Equipment: No equipment deficiencies were found during this analysis.

5. Evaluation Attributes

Causal Factor Characterization (Each causal factor identified is listed and classified in the appropriate People, Programmatic, Organizational and Equipment categories.)		
Cause Type	**Cause Statement**	**Category**
Root Cause (RC1)	Lack of a Program that monitors the overall health of the CCS and its impact on the plants ability to meet Technical Specification 3/4.7.4, Ultimate Heat Sink requirements.	Programmatic/Organizational

A. Previous Occurrences

Review of temperatures going back to late 2009 does not show the Cooling Canal System reaching the 100 Degree F threshold prior to this event.

B. Extent of Condition

The condition is where we exceeded Technical Specification 3/4.7.4, Ultimate Heat Sink requirements. The CCS is the Ultimate Heat Sink for both nuclear units. The only other Technical specification that is similar to the UHS would be containment temperature. This is currently being monitored and the components that drive containment temperature, CCW and Containment Cooling, are continuously monitored.

No further actions needed.

C. Extent of Cause

The root cause for this evaluation is:

"Lack of a Program that monitors the overall health of the CCS and its impact on the plants ability of meeting Technical Specification 3/4.7.4, Ultimate Heat Sink requirements."

This cause could apply to containment temperature, which is not a system. But the factors that affect containment temperature have programs that monitor them closely. This would be Component Cooling and Containment Cooling.

No further actions needed.

D. Safety Culture Evaluation

The safety culture evaluation is addressed in this report indicating the results of the evaluation and the corresponding corrective actions.

E. Risk/Consequence

A narrative describing the actual or potential risk associated with the event from a safety perspective (nuclear, radiological and/or industrial).

6. Operating Experience

A search was performed on the INPO database for reports in ICES that contained any of the following with no time frame specified:

- Elevated
- Intake
- Temperature

ICES #244637

On 8/14/201 Bruce Power Units 3 and 4 were operating at high power when intake temperature began to rise causing outfall temperature to approach the Ministry of the Environment (MOE) limit. Both units were derated per procedure within the limits of available reactivity, but the resulting outfall temperature reduction was not sufficient to compensate for the rising intake temperature. Unit 3 was subsequently shut down to avoid exceeding the MOE outfall temperature limit.

Bruce A is located on the shores of Lake Huron, one of the great lakes. Lake Huron (and hence intake) temperature over a typical summer range from 10C to 24C and can change from one to the other over a relatively short time frame, sometimes on the order of hours. Bruce A has a MOE limit on the outfall of 32.2C averaged from midnight to midnight. Response to rising lake temperature includes curtailing boiler blowdowns and derating units as permitted by the available reactivity.

In the shifts leading to this event, lake temperatures were approximately 21-22C. Late on 13 August 2010, the lake temperature began to rise, eventually reaching 23C. Outfall temperature exceeded the 32.2C limit at 0300 on 14 August 2010 and remained above that limit for the rest of the day.

Both units were derated by 5 percent full power which reduce the outfall temperature, but not sufficiently to reduce the 24hr average temperature below the MOE limit. An Operational Decision Making (ODM) meeting was held and the decision was made to take Unit 3 off line. The resulting reduction the outfall temperature brought the 24hr average outfall temperature to 32.1C which was below the MOE limit.

Assessment:

This event is based on conditions of Lake Huron which is not in the control of the plant, therefore no additional lessons learned for PTN, our procedures already have power reduction as part of actions to be taken.

ICES # 244622

On 08/12/10 at 2050 hours, the LaSalle Ultimate Heat Sink exceeded the 101.25oF limit per Technical Specification 3.7.3. LaSalle was in this Required Action for approximately 3 ½ hours and exited all associated time clocks when the lake cooled. The extremely high lake temperature necessitated load reductions on both units prior to reaching the Technical Specification limit. Prior to this event, Unit 1 was at 76% power due to a lost steam packing exhauster loop seal while Unit 2 was at 82% Power due to elevated main condenser backpressure.

The Root Cause of the event was the environmental weather conditions for several days preceding the event. Specifically, low wind speed, high air temperature, high humidity, and high intensity of solar radiation negatively affecting normal lake evaporation and diminishing the convective cooling mechanism of the lake.

This event also resulted in a fish impingement that affected the WS system. This condition caused the WS strainers to experience high differential pressure and a reduced WS supply pressure to both units. As a result, power was lowered to support manual backwashes of the WS strainers.

Consequences: Both the units entered into a 12-hour shutdown action statement and required action to mitigate the impingement on the WS strainers. This was not an SOER or Level 1 or 2 IER.

Assessment:

This event is based on conditions of their cooling pond, which is in the control of the plant, being impacted by the environment and deemed not preventable. Lessons Learned include the need to have contingency plans for manual operator actions to backwash critical cooling systems' screens and strainers pre-briefed by the crews with pre-established specific trigger points. This is not a condition that existed at the time of the PTN event.

ICES # 307248

On July 16, 2013, Pilgrim Unit 1 Salt Service Water inlet temperature exceeded 74.9 degrees F as measured by a calibrated instrument taken locally at screenwash discharge. This exceeded the Tech Spec limit for Ultimate Heat Sink temperature resulting in entry into a 24 hour active shutdown LCO. Cause: The apparent cause for entering the shutdown LCO was sustained increased seawater surface temperature due to hot summer weather conditions and the contribution from recirculation of water from the plant's outfall due to wind and tidal conditions. Consequences: Inlet temperatures above 75 degrees F render the salt service water (SSW) system inoperable requiring entry into a 24 hour cold shutdown LCO.

Assessment:

This event is based on environmental conditions and deemed not preventable. No lessons learned for PTN. This was not an SOER or Level 1 or 2 IER.

Conclusion

No failure in the OE program was found.

7. Lessons Learned

As part of lessons learned, the team found that there were a lot of issues previously identified related to CCS conditions and analysis that had been performed before and after the event. It would have been an advantage to the team if they were provided with a list of contacts of all personnel that had been involved so as to lessen the burden in data gathering.

8. Proof Statement:

Ultimate Heat Sink Temperature exceeded 100 deg. F. which is a violation of Technical Specifications 3/4.7.4. This has resulted in a Licensee Event Report.	**is caused by:**	Lack of a Program that monitors the overall health of the CCS and its impact on the plants ability of meeting Technical Specification 3/4.7.4, Ultimate Heat Sink requirements.
(Problem Statement)		(Root Cause)
and is corrected by:	Create and implement Program Charter that periodically evaluates the condition of the Cooling Canal System and determine if it is capable to meet Technical Specification 3/4.7/4, Ultimate Heat Sink requirements.	
	(CAPR)	

9. Corrective Actions

Category	Causal Statement	NAMS Asgn#	Corrective Action / Assignment	Assignment Type	Assigned Dept or / Individual and Due Date
Root Cause(s)	Lack of a Program that monitors the overall health of the CCS and its impact on the plants ability of meeting Technical Specification 3/4.7.4, Ultimate Heat Sink requirements.	8	Create and implement Program Charter that periodically evaluates the condition of the Cooling Canal System and determine if it is capable of meeting Technical Specification 3/4.7/4, Ultimate Heat Sink requirements. Charter membership should be as follows: Land Utilization - Program Owner (Chair) Engineering - Member Operations - Member Chemistry - Member Meeting frequency to be no less than 4 times a year. Parameters to be evaluated should be as a minimum those identified in this RCE.	CAPR	Bertelzon 10/30/2014
		9	Assign person to program Owner	CAPR	Katz

Category	Causal Statement	NAMS Asgn#	Corrective Action / Assignment	Assignment Type	Assigned Dept or / Individual and Due Date
					10/15/2014
		10	Assign Engineering Member	CAPR	Domingos 10/15/2014
		11	Assign Operations Member	CAPR	Wayland 10/15/2014
		12	Assign Chemistry Member	CAPR	Rios 10/15/2014
		13	Proceduralize Charter	CAPR	Berttelson 11/30/2014
Extent of Condition			none		
Extent of Cause			none		

Safety Culture Evaluation			none			
Effectiveness Review			Perform Effectiveness Review in accordance to the plan. This is to be performed 12 months after the closure of the last corrective action.		EFR	Cuan 12/12/2015
Other						

10. Deferral Justification

The condition of the canal is currently being evaluated, corrective actions are in place to provide water to the canal system. A license amendment was approved setting the new UHS temperature at 103 Degrees F. so the likelihood of the site exceeding the UHS requirement is low.

11. Effectiveness Review Plan

- Review all CAPR and CA to ensure satisfactory completion. Success Criteria is all CAPR and CA correctly implemented.

- Review CR database to identify any LER due to exceeding UHS temperature requirements. Success Criteria is to have none.

12. Attachments

- Root Cause Charter
- Fault Tree (Attachment B)
- Nuclear Safety Culture Evaluation

ROOT CAUSE CHARTER

Facility/CR Number: PTN / AR 1979256 (1980468 & 1980469)

Manager Sponsor: Jose Alvarez, Performance Improvement Manager

Brief Event Description:
A 8 hr. Non- Emergency 10CFR50.72(b)(3)(v)(B), RHR Capability

Detail Event Description:
At 1454 on 20 July 2014, Turkey Point Units 3 and 4 entered the Action for Technical Specification (TS) 3.7.4, Ultimate Heat Sink (UHS). The action was entered because UHS temperature exceeded the limit of 100 degrees F due to a natural event. This report is in accordance with 10 CFR 50.72(b)(3)(v)(B) because UHS capability to remove residual heat is impacted. At 1800 the NRC verbally approved a natural event Notice of Enforcement Discretion (NOED) which allows the ultimate heat sink temp to exceed 100 degrees F up to 103 degrees F. Unit power levels have been maintained at Unit 3 100% and Unit 4 95%.

Problem Statement:
Ultimate Heat Sink Temperature exceeded 100 deg. F. which is a shutdown requirement per Technical Specifications 3/4.7.4. This has resulted in a Licensee Event Report.

Investigation Scope and Methodology:
The root cause team will use, but not limited to, the following assessment tools:

- Interviews will be conducted and written documentation reviewed for data gathering
- A time line will be developed
- Causal Analysis performed using the following
  - Barrier Analysis / Why Analysis
  - Event Causal Factor Charting

The root cause scope will include:

- Determine the facts leading up to and causing the event
- Review written documents associated with the event
- Programmatic and organizational factors that influenced behaviors
- Nuclear Safety Review

Team Members:
Team Leader _Juan Cuan_______, Performance Improvement (Root Cause Evaluator)
Team Member _Mike Mowbray_____________, Engineering
Team Member _Luis Reyes__________ __ ____, Operations
Team Member _Olga Hanek______________, Licensing

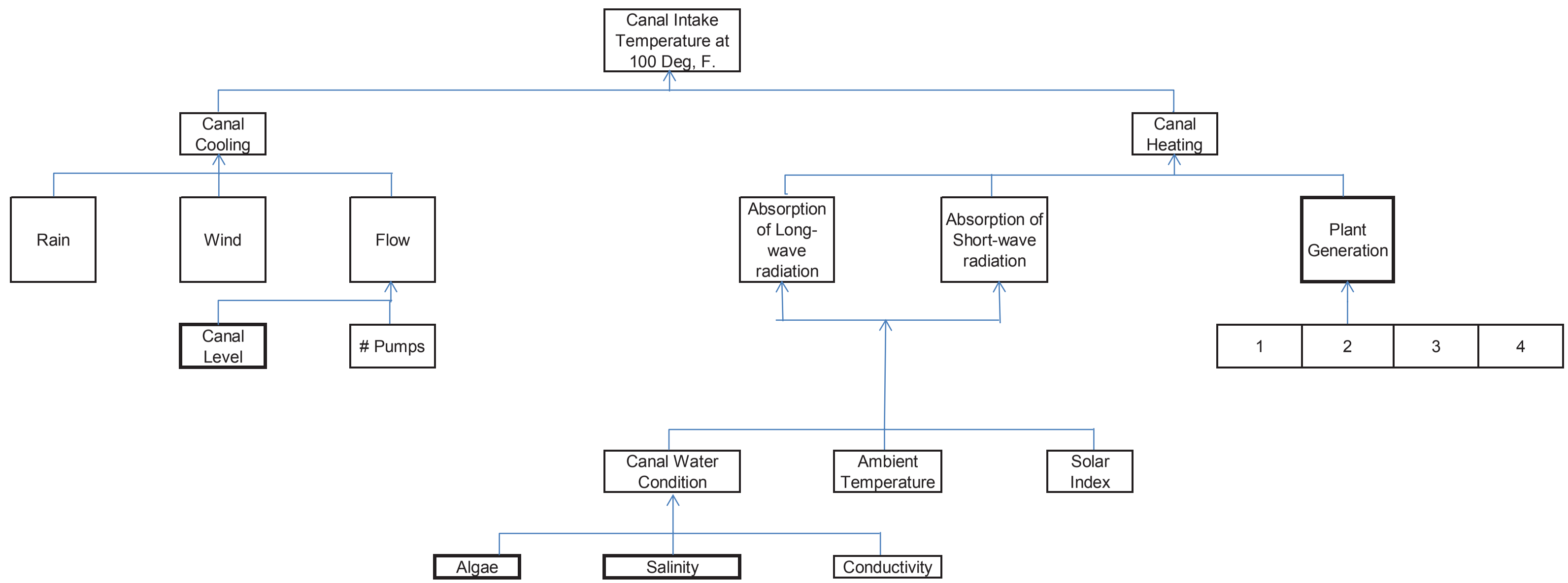
Milestones:	**Date**	**Day**
Date Assigned Date	7/31/14	0
Status Update Date	8/14/14	14
Draft Report Date	8/25/14	25
Final Report Date	8/30/14	30

Communications Plan:

Sponsor Approval: ______________________ Date: ___________

MRC Approval: ______________________ Date: ___________

ATTACHMENT B



INTRODUCTION

The safety culture evaluation is performed for each root cause evaluation. The safety culture evaluation is also performed for apparent cause evaluation when addressing a NRC finding. The purpose of a safety culture evaluation is to determine if the organization has a healthy bias towards nuclear plant safety, and demonstrates their commitment to nuclear safety culture as an overriding priority across the Reactor Oversight Program cornerstones of safety. The intent of the evaluation is to ensure the analysis assesses the root cause(s) to the Nuclear Safety Cross-Cutting Aspects and the corresponding corrective actions are aligned to mitigate repetitive events.

The following definitions are provided as an aide to understanding and performing the safety culture evaluation.

Safety Culture: The core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.

Cross-Cutting Area: Fundamental performance characteristics that extend across all of the Reactor Oversight Program cornerstones of safety. These areas are human performance (HU), problem identification and resolution (PI&R), and safety conscious work environment (SCWE).

Cross-Cutting Aspect: A performance characteristic that is the most significant contributor to a performance deficiency.

PROCESS

The Safety culture evaluation should be performed after the analysis has been done, and the root cause(s) have been determined.

1. Evaluate the root cause(s) with respect to the NRC Cross-Cutting Areas to determine if the cause(s) align with one or more of the safety culture cross cutting aspects (i.e., is there a relationship between the cause and the aspect).

2. Using the table below (Nuclear Safety Culture Evaluation Table), document the results of this evaluation.

3. Validate that corrective actions associated with the root cause(s) adequately address any identified relationships. If the existing actions do not adequately address the identified relationship, revise the actions or initiate new actions.

4. Provide a summary of the completed nuclear safety culture evaluation in the root cause report (refer to PI-AA-100-1005 F01). Clearly document the results of the evaluation, include discussion on how the team came to the conclusions of the evaluation, and list any additional actions that were developed or modified as a result of the evaluation.

During the evaluation, consider the following:

From the NRC's perspective, these components and their defining aspects make up the "management system" model for commercial nuclear power operation.

- If the root cause(s) identified by the analysis do not line up with any of the checklist aspects, this may be indicative of flaws in the analysis approach or conclusions and warrants further review.

- If there are aspects that appear to be strongly related to facts discussed in the analysis, but they are not aligned with any of the identified root cause(s) this may be indicative of flaws in the analysis approach or conclusions and warrants further review.

Nuclear Safety Culture Evaluation Table

06.01 Human Performance (H)

#	Criteria	Comment
H.1	**Resources:** Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support nuclear safety (LA.1).	N/A
H.2	**Field Presence:** Leaders are commonly seen in the work areas of the plant observing, coaching, and reinforcing standards and expectations. Deviations from standards and expectations are corrected promptly. Senior managers ensure supervisory and management oversight of work activities, including contractors and supplemental personnel (LA.2).	N/A; all permit requirements have been met. Violation of UHS TS 3/4.7.4 occurred when the canal temperature exceeded 100 degrees F.
H.3	**Change Management:** Leaders use a systematic process for evaluating and implementing change so that nuclear safety remains the overriding priority (LA.5).	N/A
H.4	**Teamwork:** Individuals and work groups communicate and coordinate their activities within and across organizational boundaries to ensure nuclear safety is maintained (PA.3).	There is no Program that analyzes all the CCS data collected per the NPDES and Conditions of Certification. Engineering is responsible for CCW and TPCW systems performance. UHS temperature, salinity, turbidity and specific heat are variables that contribute to CCW and TPCW performance. The causes of the UHS conditions are not looked at by Engineering. CCS data is collected by the Environmental JB department for purposes of meeting environmental permit requirements with no acceptance criteria or thresholds requirements. The analysis identified this as the root cause. CAPR requires creation of a comprehensive program with a cross-functional membership to analyze all contributors to CCS UHS performance. The CAPR addresses this issue.
H.5	**Work Management:** The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities (WP.1).	N/A; This event was not caused by a work activity issue.
H.6	**Design Margins:** The organization operates and maintains equipment within design margins. Margins are carefully guarded and changed only through a systematic and rigorous process. Special attention is placed on maintaining fission product barriers, defense-in-depth, and safety related equipment (WP.2).	N/A No design margin exceeded.
H.7	**Documentation:** The organization creates and maintains complete, accurate and, up-to-date documentation (WP.3).	N/A Data collected for environmental permit requirements is available for analysis.

H.8	**Procedure Adherence:** Individuals follow processes, procedures, and work instructions (WP.4).	N/A 0-ONOP-011.1 and permit requirements were met.
H.9	**Training:** The organization provides training and ensures knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values (CL.4).	N/A
H.10	**Bases for Decisions:** Leaders ensure that the bases for operational and organizational decisions are communicated in a timely manner (CO.2).	N/A Current 0-ONOP-011.1 places decision on NPS who consults with management to implement power reductions as necessary to address UHS temperature concerns.
H.11	**Challenge the Unknown:** Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding (QA.2).	N/A
H.12	**Avoid Complacency:** Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Individuals implement appropriate error reduction tools (QA.4).	N/A
H.13	**Consistent Process:** Individuals use a consistent, systematic approach to make decisions. Risk insights are incorporated as appropriate (DM.1).	N/A
H.14	**Conservative Bias:** Individuals use decision making-practices that emphasize prudent choices over those that are simply allowable. A proposed action is determined to be safe in order to proceed, rather than unsafe in order to stop (DM.2).	N/A

06.02 Problem Identification and Resolution (P)

#	Criteria	Comment
P.1	**Identification:** The organization implements a corrective action program with a low threshold for identifying issues. Individuals identify issues completely, accurately, and in a timely manner in accordance with the program (PI.1).	N/A; Multiple ARs regarding CCS conditions have been generated over the past 5 years
P.2	**Evaluation:** The organization thoroughly evaluates issues to ensure that resolutions address causes and extent of conditions commensurate with their safety significance (PI.2).	N/A, evaluations of ARs were performed appropriately for the conditions identified.
P.3	**Resolution:** The organization takes effective corrective actions to address issues in a timely manner commensurate with their safety significance (PI.3).	N/A no deficiency in corrective actions found.
P.4	**Trending:** The organization periodically analyzes information from the corrective action program and other assessments in the aggregate to identify programmatic and common cause issues (PI.4).	N/A
P.5	**Operating Experience:** The organization systematically and effectively collects, evaluates, and implements relevant internal and external operating experience in a timely manner (CL.1).	N/A; the CCS is unique in the industry and there were none that were SOER or Levelel 1 or 2 IER.
P.6	**Self-Assessment:** The organization routinely conducts self-critical and objective assessments of its programs and practices (CL.2).	N/A

06.03 Safety Conscious Work Environment (S)

#	Criteria	Comment
S.1	**SCWE Policy:** The organization effectively implements a policy that supports individuals' rights and responsibilities to raise safety concerns, and does not tolerate harassment, intimidation, retaliation, or discrimination for doing so (RC.1).	N/A
S.2	**Alternate Process for Raising Concerns**: The organization effectively implements a process for raising and resolving concerns that is independent of line management influence. Safety issues may be raised in confidence and are resolved in a timely and effective manner (RC.2).	N/A
S.3	**Free Flow of Information:** Individuals communicate openly and candidly, both up, down, and across the organization and with oversight, audit, and regulatory organizations (CO.3).	N/A

06.04 Supplemental Cross-Cutting Aspects (X)

#	Criteria	Comment
X.1	**Incentives, Sanctions, and Rewards:** Leaders ensure incentives, sanctions, and rewards are aligned with nuclear safety policies and reinforce behaviors and outcomes that reflect safety as the overriding priority (LA.3).	N/A
X.2	**Strategic Commitment to Safety:** Leaders ensure plant priorities are aligned to reflect nuclear safety as the overriding priority (LA.4).	N/A
X.3	**Roles, Responsibilities, and Authorities**: Leaders clearly define roles, responsibilities, and authorities to ensure nuclear safety (LA.6).	No comprehensive program for CCS UHS exists; there is no single owner responsible for UHS performance. CAPR addresses this aspect
X.4	**Constant Examination:** Leaders ensure that nuclear safety is constantly scrutinized through a variety of monitoring techniques, including assessments of nuclear safety culture (LA.7).	N/A
X.5	**Leader Behaviors:** Leaders exhibit behaviors that set the standard for safety (LA.8).	N/A
X.6	**Standards:** Individuals understand the importance of adherence to nuclear standards. All levels of the organization exercise accountability for shortfalls in meeting standards (PA.1).	N/A All permit requirements and procedures were met
X.7	**Job Ownership:** Individuals understand and demonstrate personal responsibility for the behaviors and work practices that support nuclear safety (PA.2).	N/A
X.8	**Benchmarking:** The organization learns from other organizations to continuously improve knowledge, skills, and safety performance (CL.3).	N/A
X.9	**Work Process Communications:** Individuals incorporate safety communications in work activities (CO.1).	N/A
X.10	**Expectations:** Leaders frequently communicate and reinforce the expectation that nuclear safety is the organization's overriding priority (CO.4).	N/A
X.11	**Challenge Assumptions:** Individuals challenge assumptions and offer opposing views when they think something is not correct (QA.3).	N/A
X.12	**Accountability for Decisions:** Single-point accountability is maintained for nuclear safety decisions (DM.3).	N/A 0-ONOP-011.1 placed responsibility of TS 3.7.4 UHS TS compliance on NPS who consults with plant management.

Turkey Point Cooling Canal

Event Description –July 20, 2014

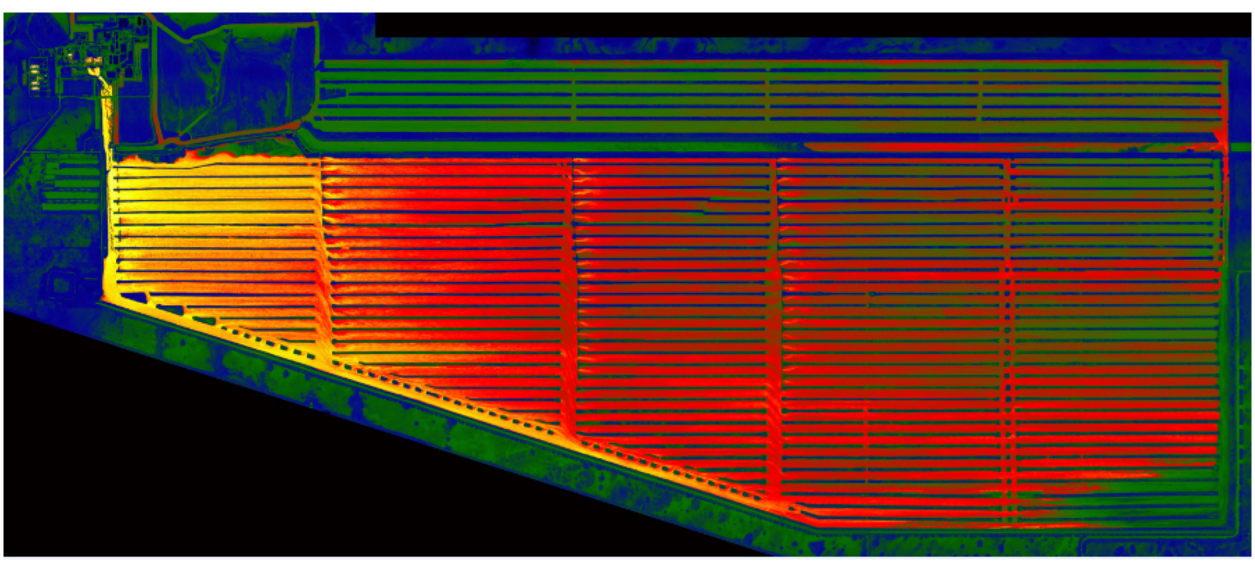
Intake canal low level or high temperature ONOP was entered 22 times during a six-week period culminating with entering Tech Spec for ultimate heat sink (UHS) which requires both units be placed in hot standby with 12 hours. A NOED was verbally given from the NRC which increased the UHS temperature limit from 100 degrees to 103 degrees.

- June 7, 2014 ONOP entered with a maximum temperature of 96.11 degrees
- July 19, 2014 ONOP entered with a maximum temperature of 99.7
- Root cause was chartered to understand the organizational drivers of these ONOP events.
- An ACE was performed in April 2014 after the first symptoms of degradation of CCW heat exchangers was observed – focused on algae bloom

System Overview

The cooling canal system represents a 168 mile series of canals that take plant cooling water discharge from two fossil units, one cogen plant, and two nuclear plants with no normal external makeup and routes the water back to the intake for cooling water to the two nuclear units.

During this period water from a neighboring canal system from a government authority (100 million gallons per day) was used to provide makeup (dilution) to increase canal water levels and decrease salinity concentrations.



Causes and Contributors

- Station Apparent Cause: Elevated dissolved oxygen concentrations requiring additional hydrazine (which breaks down into ammonia) resulted in additional nutrients in the canal system increased the algae blooms. Contributing was algae impacted heat transfer areas in the condensers and heat exchangers compounded with lowering inventory in the canal establishing conditions permitted concentration of nutrients.
- Station Root Cause: Lack of a program that monitors the overall health of the cooling canal system and its ability to meet UHS requirements.

Additional Conclusions

- Heat exchangers and condensers have been routinely cleaned yearly at a frequency to prevent entering emerging actions to address loss of heat transfer.
- Containment cooling was affected by increased CCW temperatures requiring a temporary modification to supplement CCW cooling to improve CCW performance. Hours are logged when containment temperature exceeds 120 degrees and hours were logged during this period. At no time did the limit of 125 degrees occur.
- Operations monitors cooling canal for temperaturefor UHS tech spec requirements and level to determine if it meets net pump suction head requirements.
- There is no single owner or system engineer responsible for analyzing all the factors affecting cooling canal performance for the UHS. NOS does not perform evaluations of the canal system.
- Chemistry does not perform any testing of intake cooling water (ICW) or circulating water. The only analysis was of water discharged back into the canals for compliance with established discharge permits.
- As a result of the EPU project, South Florida Water management District required a groundwater, surface water, and ecological monitoring plan. The purpose of the plan was to monitor the movement of salt water into the freshwater aquifers. This plan is implemented by the land utilization department and focused on the environmental parameters. Data monitored under the plan was not reviewed for impacts to the cooling canal's water ability to cool power block equipment.
- An amertap system was used for maintaining condenser cleanliness and equipment issues affected operation of the system. Repairs could not be accomplished until the next refueling outage.
- Normally salinity concentrations are at two times what is present in the marine environment. During this period salinity approached three times the concentration in the marine environment.

- Chemistry was not a team member working on the root cause. Their function of monitoring and treating service water or circulating water was not seen as primary function.
- Starting placing sea grass removed from the intake directly back into the discharge part of the cooling canal as a mulch with a new system put in place during EPU was not fully evaluated by engineering. The sea grass historically was disposed external to the cooling canal system.However, there were historical periods when the sea grass had been macerated in the past and returned to the canal system with no impact to cooling canal quality. The sea grass is a potential nutrient for activity in the canal system.
- Fossil operation has decreased and impacts flow back into the cooling canal system. Additionally, the two EPU outages resulted in extended operation with no flow from one of the nuclear plants. This affects the flow through the canal system which can promote more algae.

Additional Information

Monitoring the cooling canal system for its ability to provide UHS cooling requirements has not been performed. An action coming out of the root cause is to perform UHS performance monitoring. A charter group has been formed that includes land utilization, engineering, operations, and chemistry will evaluate the condition of the cooling canal and its ability to meet UHS requirements.

Cooling canal temperature exceeded normal high temperatures and canal water levels reached new lows in 2014.

For the new monitored parameters thresholds for action have not been established for each parameter. One parameter very important is for pH limits.

No actions for addressing the cause of the more tenacious scale forming in heat transfer areas. Understanding the cooling canal tendencies for depositing calcium deposits can allow actions to lower the tendencies.

More tenacious scrapers have been employed to remove scale in the heat exchangers. More tenacious amertap balls included line striped carborundum balls in the condensers.

The station currently has a team reviewing options to improve canal system performance and to prevent unit downpower. Plans include sediment removal and permanent supplemental cooling including drilling new wells to provide a continuous makeup source of fresh, cooler water into the canal. We expect that at least two wells will be flowing water before June 2015.

REASON FOR APPEAL; REQUEST FOR INFORMATION, pursuant to New Mexico Inspection of Public Records Act; and MOTION TO ADMIT EVIDENCE

Claimant [APPELLANT]:

Claimant Name: Andrew DeSalvo

Claimant ID: 8650254

Cell Number: (203)805-1581

Issue Identification Number: 0004 2501 89-01

Employer:

Gator Dredging

13630 50th Way N

Clearwater FL 33760

EAN: 00691201-1

Date: 11/18/2015

Time: 1:15PM

Authority: DWS Appeals Tribunal

Administrative Law Judge: Christman, Andrea

BACKGROUND

CLAIMANT performed a particular task assigned by EMPLOYER, “analyzing information thoroughly before it is handed over to other professionals”, pertaining to the project site for the cooling canals for Turkey Point nuclear reactors.

WATERWAY & LOCATION:

The project site for the cooling canals for Turkey Point nuclear reactors is located within the existing Turkey Point facility east of Homestead, Florida; and, proposes dredge and fill activities in, over, or under waters of the United States. See Aerial detailed view from above, with zoom in and zoom out function, at

URL: http://binged.it/1Op8z2A

HISTORY:

“Canals that keep two Turkey Point nuclear reactors from overheating need millions more gallons of water to stay cool. Florida Power & Light needs millions more gallons of freshwater to manage cooling canals that keep two nuclear reactors at Turkey Point from overheating, company officials said in an emergency request to the South Florida Water Management District. . . But despite the aquifer water and the addition of chemicals to treat the algae, canal temperatures remain high. In July and August, temperatures at times reached 102 degrees, officials said in their request to water managers. If temperatures exceed 104 degrees, the plant’s two nuclear reactors would need to start shutting down within 12 hours, “which could impact grid reliability,” the letter said. . . “We have seen some improvements, but it’s just not enough right now and we need more water in the canals,” said FPL spokesman Greg Brostowicz. . . ‘After Oct. 15 is when we don’t have the regular flows and that’s when we get really concerned that you’re going to get salinity rising and problems spiraling,’ said Jane Graham, an Everglades policy analyst for Audubon Florida. Miami-Dade County. August 28, 2014. Florida Power & Light cooling canals at Turkey Point nuclear power plant still too hot.”

URL:http://www.miamiherald.com/news/local/community/miamidade/article1983871.html#storylink=cpy

“Last year, after rising temperatures repeatedly risked shutting down nuclear reactors they help cool, FPL obtained permission to run the canals hotter at 104 degrees. But as temperatures topped 100 degrees, salinity climbed, to as much as three times nearby ocean water in Biscayne Bay. FPL hastily obtained an emergency permit to pump water from the nearby L-31 canal to freshen the canals.”

Turkey Point canals may be too salty for nesting crocs Oct 29, 2015 - McClatchy-Tribune Content Agency, LLC - Jenny Staletovich The Miami Herald.

URL: http://www.energybiz.com/article/15/10/turkey-point-canals-may-be-too-salty-nesting-crocs

STATEMENT OF REASONS FOR APPEAL

1.) The DETERMINATION is WRONG; CLAIMANT was NOT discharged because of deliberate refusal, without good cause, to perform a particular task assigned to CLAIMANT; the Reasoning and Findings are INCORRECT; and, the Reasoning and Findings are not based on the facts and the law;

KNOW ALL MEN, the laws of the state of Florida;

CITE

Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES Division of Consumer Services BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS;

CITE

2014 Florida Statutes Title X PUBLIC OFFICERS, EMPLOYEES, AND RECORDS Chapter 120 ADMINISTRATIVE PROCEDURE ACT 120.60 Licensing.— ;

CITE

2014 Florida Statutes Title XXXII REGULATION OF PROFESSIONS AND OCCUPATIONS Chapter 472 LAND SURVEYING AND MAPPING 472.031. - LAND SURVEYING AND MAPPING 472.031 - Prohibitions; penalties;

CITE

2014 Florida Statutes Title XI MUNICIPALITIES Chapter 177 LAND BOUNDARIES 177.36

2.) CLAIMANT is not in possession of the statements of EMPLOYER which describes why CLAIMANT was discharged;

NOW, CLAIMANT makes this REQUEST FOR INFORMATION, pursuant to New Mexico Inspection of Public Records Act, NMSA 1978, §§ 14-2-1 et seq. (“IPRA”), for the complete RECORD OF DETERMINATION, including Reasoning and Findings, and, EVIDENCE and STATEMENTS presented by the EMPLOYER; and,

NOW, CLAIMANT makes this MOTION TO ADMIT EVIDENCE in the style of the complete record of Employment Information, dated October 19, 2015, on file with the STATE OF NEW MEXICO DEPARTMENT OF WORKFORCE SOLUTIONS, including the Employment Information, dated October 19, 2015, Corrected 10/20/15.

3.) CLAIMANT applied to EMPLOYER for the position of Boat Operator (Homestead), and, based on experience of CLAIMANT in land surveying, Tyler McDougal, Professional Engineer, Operations Engineering Manager, interviewed CLAIMANT for the position of Survey Crew Chief, on August 19, 2015 (see EXHIBIT “E”, CORRESPONDENCE, Page C103 to C115, of C180);

CLAIMANT stated during the employment interview, on August 19, 2015, with Tyler McDougal, Professional Engineer, Operations Engineering Manager, for the position of Survey Crew Chief, that any report by CLAIMANT, which finds that EMPLOYER fails to achieve the minimum standards of accuracy, completeness, and quality premised upon the type of survey and the expected use of the survey and map, may been adverse to the ability of the CLAIMANT to perform a particular task assigned by the EMPLOYER to the CLAIMANT;

EMPLOYER, on August 19, 2015, as "Waterfront Property Services, LLC (dba Gator Dredging), wishes to extend (to CLAIMANT) the following" . . . "Offer of Employment – Survey Crew Chief" . . ."1. reporting directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager" (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 of C180, lines 27-28).

CLAIMANT was hired on Friday, August 21, 2015 as Survey Crew Chief reporting to Tyler McDougal, Professional Engineer, Operations Engineering Manager (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 - line 11, of C180; see EXHIBIT "E", CORRESPONDENCE, Page C120 - line 30, of C180);

Tyler McDougal, Professional Engineer, Operations Engineering Manager, stated to the CLAIMANT, on Friday, August 21, 2015 (see EXHIBIT "E", CORRESPONDENCE, Page C125 - lines 4-15, of C180), that management of the EMPLOYER was not able to determine if the particular task assigned to CLAIMANT is a wise approach to "KEY RESPONSIBILITIES: <u>Managing the following:</u>" "survey equipment inventory / replacement / acquisition" as follows:

"In the meantime, can you review this document I prepared regarding the types of surveys we perform now and in the expected future. I also attached two (2) quotes for RTK GPS equipment (Altus 3X and Trimble R8) to complete those tasks effectively and the associated spec sheets & training. There are 10 attachments in total. Can you advise if they are appropriate? If not, what you would recommend. Ideally we will have the proper equipment selected, purchased and delivered so it will be available upon your arrival. If this is not a wise approach and requires more research – please advise if you can further assist or if you would like to wait until you arrive."

CLAIMANT performed a particular task, assigned by the EMPLOYER, and, on Friday, August 21, 2015, made a "RESPONSE, Work & Arrival Details, at 5.) Suggest you postpone purchase until we complete SCOPE OF INVESTIGATION for the hardware and software, and until we have consensus between INTERESTED PARTIES including Operations Engineering, Information Technology, Project Manager, et al" (see Page C128 – line 6-9, of C180).

CLAIMANT performed a particular task, assigned by EMPLOYER, of travel more than thirty four hundred (3459) miles in a Privately Owned Vehicle (POV) (see EXHIBIT "C", TRAVEL EXPENSES FOR REIMBURSEMENT, Page C43 of C180); Tyler McDougal, Professional Engineer, Operations Engineering Manager, did not attend a meeting, a particular task assigned by the EMPLOYER to CLAIMANT, at the Floridian Hotel, Homestead, Florida, on Tuesday, September 1, 2015; and, Tyler McDougal did not attend a meeting, a particular task assigned by the EMPLOYER to CLAIMANT, at the Turkey Point Nuclear Plant, on Wednesday, September 2, 2015 (see EXHIBIT "E", CORRESPONDENCE, Page C156 - line 13-18, of C180),

to discuss a particular task assigned by EMPLOYER to CLAIMANT, "analyzing information thoroughly before it is handed over to other professionals" consistent with the "JOB PURPOSE: The selected candidate is responsible for: The collection of all field information related to engineering and surveying for the operations department", and "KEY RESPONSIBILITIES: Managing the following:" "survey equipment inventory / replacement / acquisition", and "performing and/or overseeing pre-, progress and post-dredge surveys" (see EXHIBIT "B", JOB

DESCRIPTION, Page C41 – line 3-21, of C180) in section 1 of canal system using current differential GPS methods.

4.) CLAIMANT believes that Mike Henderson, Project Manager for EMPLOYER at Turkey Point nuclear plant, was fired on, or before, Monday August 31, 2015, by Bill Coughlin, Chief Operating Officer; and, CLAIMANT was not able to report for work to Mike Henderson, Project Manager for EMPLOYER at Turkey Point nuclear plant, a particular task assigned by the EMPLOYER to the CLAIMANT, on Monday August 31, 2015, at the time and place specified in the "Offer of Employment – Survey Crew Chief", dated August 19, 2015, by the EMPLOYER, as "Waterfront Property Services, LLC (dba Gator Dredging) (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C39 – line 13, of C180).

5.) CLAIMANT performed a particular task, assigned by EMPLOYER, of travel more than thirty four hundred (3459) miles in a Privately Owned Vehicle (POV) (see EXHIBIT "C", TRAVEL EXPENSES FOR REIMBURSEMENT, Page C43 of C177); performed a particular task assigned by EMPLOYER of meeting with Karen Swope, Field Admin - Gator Dredging, at 8 am, Tuesday, September 1, 2015, to complete the New Hire Paperwork Gator Dredging (see EXHIBIT "E", CORRESPONDENCE, Page C164 – line 21-28, of C180); performed a particular task, assigned by EMPLOYER, of passing a physical examination and drug test (see EXHIBIT "E", CORRESPONDENCE, Page C159 – line 11-12; Page C163 – line 18-19; etc., of C180); performed a particular task, assigned by EMPLOYER, of reporting for work at the Turkey Point Nuclear Plant on Wednesday, September 2, 2015 (see EXHIBIT "E", CORRESPONDENCE, Page C156 – line 13-18; Page C159 – line 14; Page C161 – line 43; Page C162, line 14-16; etc., of C180); and, performed a particular task, assigned by EMPLOYER, of attended a safety meeting at the Turkey

Point Nuclear Plant, on Wednesday, September 2, 2015.

CLAIMANT performed a particular task assigned by EMPLOYER, after attending a safety meeting on Wednesday, September 2, 2015, of "analyzing information thoroughly before it is handed over to other professionals" related to "KEY RESPONSIBILITIES: Managing the following:" "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition", and "interpreting data using maps, charts and plans", specified in the job description for Survey Crew Chief (see EXHIBIT "B", JOB DESCRIPTION, Page C41, line 3-21, of C180); and,

CLAIMANT was fired by Bill Coughlin, Chief Operating Officer, on Wednesday, September 2, 2015, fifteen (15) minutes after attending a safety meeting, for performing a particular task assigned by the EMPLOYER to the CLAIMANT specified under the "JOB PURPOSE: The selected candidate is responsible for: The collection of all field information related to engineering and surveying for the operations department" (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-4, of C180).

6.) CLAIMANT was hired for "JOB PURPOSE" and "KEY RESPONSIBILITIES", as follows:

"JOB PURPOSE: The selected candidate is responsible for: the collection of all technical field information related to engineering/surveying for the operations department" and to perform to particular tasks assigned to the CLAIMANT by EMPLOYER, including "KEY RESPONSIBILITIES: Managing the following: performing and/or overseeing pre-, progress and post dredge surveys", "training sub-professional, technical, and clerical personnel, as required", "analyzing information thoroughly before it is handed over to other professionals", "interpreting data using maps, charts and plans", "performing and/or overseeing pre-, progress and post dredge surveys" (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-21, of C180); and,

CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task, assigned by EMPLOYER, of "analyzing information thoroughly before it is handed over to other professionals" pertaining to current differential methods using a range of equipment to produce post-dredge surveys specified by the EMPLOYER, and the "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client [Florida Power & Light Company (FPL), the principal subsidiary of NextEra Energy Inc. (formerly FPL Group, Inc.), a Juno Beach, Florida-based power utility] for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180).

7.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task assigned by EMPLOYER of "analyzing information thoroughly before it is handed over to other professionals", for BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of C180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager.

8.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of

Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task, assigned by EMPLOYER, including "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Training sub-professional, technical, and clerical personnel, as required", "analyzing information thoroughly before it is handed over to other professionals", and "interpreting data using maps, charts and plans" (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-21, of C180); and,

CLAIMANT made a report of FINDINGS that the "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58 of C180) is not consistent with Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, resulting in MISREPRESENTATION by EMPLOYER of "volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58 of C180);

9.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task, assigned by EMPLOYER, including "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Training sub-professional, technical, and clerical personnel, as required", and "Interpreting data using maps, charts and plans (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-21, of C180); CLAIMANT made a report of FINDINGS pertaining to current methods using a range of equipment to produce post-dredge surveys specified by the EMPLOYER; and,

CLAIMANT believes that EMPLOYER fired CLAIMANT after a report of FINDINGS that confirm statements of Tyler McDougal, Professional Engineer, Operations Engineering Manager, pertaining to "confusion on the schedule and timeline" and lack of awareness of use of Real Time Kenetic (RTK) technology, and even lack of awareness of use of DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS), on August 31, 2015 (see EXHIBIT "E", CORRESPONDENCE, Page C168 – line 22-33, of C180), in "Performing and/or overseeing pre-, progress and post dredge surveys", and even lack of awareness of use of Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, as follows:

"Andrew, It was nice speaking to you today and finding more about your capabilities. . . Apologize for the confusion on the schedule/timeline to implement RTK technology. I am very unaware of its detailed capabilities – hence why you are here – and did not mean to bring pressure into implementing the system and getting it ordered" (see EXHIBIT "E", CORRESPONDENCE, Page C168 – line 26-29, of C180);

10.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task assigned by EMPLOYER, including "KEY RESPONSIBILITIES: <u>Managing the following</u>:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Training sub-professional, technical, and clerical personnel, as required", "Analyzing information thoroughly before it is handed over to other professionals", "Interpreting data using maps, charts and plans", and "Performing and/or overseeing pre-, progress and post dredge surveys" (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-21, of C180); and,

CLAIMANT believes, after performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals" that Tyler McDougal, Professional Engineer, Operations Engineering Manager, and EMPLOYER failed to achieve the minimum standards of accuracy, completeness, and quality, pursuant to FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051 Minimum Technical Standards: General Survey, Map, and Report Content Requirements, as follows:

"1. The accuracy of the survey measurements shall be premised upon the type of survey and the expected use of the survey and map".

11.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task assigned by EMPLOYER, including "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Training sub-professional, technical, and clerical personnel, as required","Analyzing information thoroughly before it is handed over to other professionals", and "Interpreting data using maps, charts and plans" (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-21, of C180); and,

CLAIMANT believes that Bill Coughlin, Chief Operating Officer, discharged CLAIMANT, who performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals", pertaining to BERM STABILIZATION PLAN Exhibit No.

FIGURE A (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of C180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager; and,

CLAIMANT believes that Bill Coughlin, Chief Operating Officer, discharged CLAIMANT for a report of FINDINGS that Tyler McDougal, Professional Engineer, Operations Engineering Manager, and EMPLOYER, failed to achieve the minimum standards of accuracy, completeness, and quality pursuant to FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051 Minimum Technical Standards: General Survey, Map, and Report Content Requirements.

12.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task assigned by EMPLOYER, including "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Training sub-professional, technical, and clerical personnel, as required","Analyzing information thoroughly before it is handed over to other professionals", and "Interpreting data using maps, charts and plans" (see EXHIBIT "B", JOB DESCRIPTION, Page C41 - line 3-21, of C180);

CLAIMANT was not able to report directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager, a particular task assigned by EMPLOYER described in the Offer for Employment – Survey Crew Chief, dated August 19, 2015 (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 – line 27-28, of C180), as follows:

"1. We offer you the position of Survey Crew Chief in our Clearwater, Florida officer reporting directly to Tyler McDougal Professional Engineer Operations Engineering Manager"; and,

Tyler McDougal, Professional Engineer, Operations Engineering Manager; did not receive a report of FINDINGS directly by CLAIMANT, "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned to CLAIMANT by EMPLOYER, prior to a meeting scheduled for September 4, 2015,

"**Friday** – Same as Wednesday. *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research" (see EXHIBIT "E", CORRESPONDENCE, Page C162 – line 20-25, of C180),

CLAIMANT believes that Tyler McDougal, Professional Engineer, Operations Engineering Manager, did not attend a meeting, a particular task assigned to CLAIMANT by EMPLOYER, at at the Floridian Hotel, Homestead, Florida, on Tuesday, September 1, 2015 (see EXHIBIT "E", CORRESPONDENCE, Page C156 - line 13-18, of C180);

CLAIMANT believes that Tyler McDougal, Professional Engineer, Operations Engineering Manager, did not attend a meeting, a particular task assigned to CLAIMANT by EMPLOYER, at the Turkey Point Nuclear Plant, on Wednesday, September 2, 2015 (see EXHIBIT "E", CORRESPONDENCE, Page C159- lines 14-15; Page C156 – line 13-18; Pages C158-159; Pages C164-170, etc., of C180);

CLAIMANT was not able to report directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager, a particular task assigned by EMPLOYER described in the Offer for Employment – Survey Crew Chief, dated August 19, 2015 (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 – line 27-28, of C180); and, Tyler McDougal, Professional Engineer, Operations Engineering Manager, did not receive a report of FINDINGS directly by CLAIMANT, "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned to CLAIMANT by EMPLOYER, prior to a meeting scheduled for September 4, 2015,

"**Friday** – Same as Wednesday. *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research" (see EXHIBIT "E", CORRESPONDENCE, Page C162 – line 20-25, of C180),

pertaning to post-dredge survey work in section 1 of current differential methods using a range of equipment to produce post-dredge surveys specified by the EMPLOYER; and

CLAIMANT believes that the report by CLAIMANT shows FINDINGS that Tyler McDougal, Professional Engineer, Operations Engineering Manager, and EMPLOYER failed to achieve the minimum standards of accuracy, completeness, and quality pursuant to FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051 Minimum Technical Standards: General Survey, Map, and Report Content Requirements.

13.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task assigned by EMPLOYER, “analyzing information thoroughly before it is handed over to other professionals” pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page 50 of C180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager; and,

CLAIMANT believes EMPLOYER discharged CLAIMANT, after CLAIMANT performed a particular task assigned to CLAIMANT by EMPLOYER, and after CLAIMANT made FINDINGS that show MISREPRESENTATION of Turkey Point Nuclear Plant Cooling Canal System "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client for payment" (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58 of C180), for dredge and fill activities in, over, or under waters of the United States that may cause overheating of cooling canals for Turkey Point nuclear reactors located within the existing Turkey Point facility east of Homestead, Florida that poses immediate serious danger to the public health, safety, or welfare; and, may require emergency suspension, restriction, or limitation of a license held by Tyler McDougal Professional Engineer Operations Engineering Manager, pursuant to 2014 Florida Statutes Title X PUBLIC OFFICERS, EMPLOYEES, AND RECORDS Chapter 120 ADMINISTRATIVE PROCEDURE ACT 120.60 Licensing.— .

14.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements, and CLAIMANT performed a particular task assigned by EMPLOYER, “analyzing information thoroughly before it is handed over to other professionals” pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE

A (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page 50 of C180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager; and,

CLAIMANT believes Bill Coughlin, Chief Operating Officer, discharged CLAIMANT for FINDINGS pertaining to MISREPRESENTATION of Turkey Point Nuclear Plant Cooling Canal System "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58 of C180).

CLAIMANT believes Bill Coughlin, Chief Operating Officer, is not a licensed Professional Engineer under the laws of the state of Florida responsible for dredge and fill activities in, over, or under waters of the United States;

CLAIMANT believes Bill Coughlin, Chief Operating Officer, is not a “qualified personnel licensed by the Board of Professional Surveyors and Mappers or by representatives of the United States Government when approved by the department - authorized to inspect Work to be performed only by authorized personnel **–** The establishment of local tidal datums and the determination of the location of the mean high-water line or the mean low-water line”, a particular task assigned to the CLAIMANT by EMPLOYER, as follows:

“JOB PURPOSE KEY RESPONSIBILITY <u>Managing the following</u>:” “Field stake-out of construction controls” (see EXHIBIT “B”, JOB DESCRIPTION, Page C41 – line 3-21, of C180) for dredge and fill activities in, over, or under waters of the United States, pertaning to post-dredge survey work in section 1 of canal system using current differential GPS methods; pursuant to 2014 Florida Statutes Title XI MUNICIPALITIES Chapter 177 LAND BOUNDARIES 177.36;

CLAIMANT believes Bill Coughlan, Chief Operating Officer, discharged CLAIMANT, and CLAIMANT was not able to report directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager; and, Tyler McDougal, Professional Engineer, Operations Engineering Manager, did not receive a report of FINDINGS directly by CLAIMANT, "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned by EMPLOYER described in the Offer for Employment – Survey Crew Chief, dated August 19, 2015 (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 – line 28-28, of C180), prior to a meeting scheduled for September 4, 2015,

"**Friday** – Same as Wednesday. *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research" (see EXHIBIT "E", CORRESPONDENCE, Page C162 – line 20-25, of C180).

15.) CLAIMANT knows Florida Administrative Code (FAC): Rule: 5J-17.051 Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements; CLAIMANT knows "(1) No person shall: (a) Practice or offer to practice surveying and mapping unless such person is registered pursuant to ss. 472.001-472.037; CLAIMANT believes Bill Coughlin, Chief Operating Officer, is not a registered Professional Engineer pursuant to 2014 Florida Statutes.

CLAIMANT believes Bill Coughlin, Chief Operating Officer, discharged CLAIMANT, who performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals" pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of 180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager, fifteen minutes after the completion of the safety meeting, at that moment in time when:

the assistant Operations Engineering Manager, a member of the one (1) three man crew engaged in "post-dredge survey work in Section 1 of canal system using current Differential GPS methods", described the method specified by the EMPLOYER for location and observations of Depth, used to compute cut volume; and, at that moment in time when:

CLAIMANT performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals" for the method specified by the EMPLOYER, for location and observations of Depth; and, CLAIMANT made FINDINGS, as follows:

"FINDINGS: CLAIMANT believes, when executing the method specified by the EMPLOYER for location and observations of Depth, the boat operator attempts to keep the boat as near as possible on station line, and to have all headway off the boat when the rod man attempts to execute the actual SOUNDING at catch point and attempts to obtain frequent observations of Depth in the SOUNDING circle, at an interval of one foot, by readings of the Philadelphia rod which the rod man holds (without a hawespipe) over the gunwale of the boat, as the boat operator attempts to proceed along a course on station; and, the rod man attempts to keep the instrument man continually informed of the SOUNDING observations of Depth.

The instrument man attempts to take a fix of position from a hand-held GPS data collector, and the instrument man attempts to enter the SOUNDING observations of Depth, on the call of the rod man by readings of the Philadelphia rod, before the fix of position is recorded in the hand-held GPS data collector, and before the boat operator attempts to proceeds along a course on station line.

Since every boat has its own handling characteristics, the speed of the boat proceeding along a course on station line is difficult to specify, depending on wind and current, as the boat draws near the SOUNDING circle at an interval of one foot, and the instrument man attempts to recommend course change to the boat operator to return to a course on station, if necessary."

CLAIMANT performed a particular task assigned by EMPLOYER, after attending a safety meeting, of "analyzing information thoroughly before it is handed over to other professionals" related to "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition", and "interpreting data using maps, charts and plans"; specified in the job description for Survey Crew Chief (see EXHIBIT "B", JOB DESCRIPTION, Page C41 – line 3-21, of C180); and,

CLAIMANT believes the method of SOUNDING specified by the EMPLOYER is not an innovative method, or even a standard method, to utilize the DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) for location and observations of Depth, to conform to FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051

Minimum Technical Standards: General Survey, Map, and Report Content Requirements; and

CLAIMANT believes the method of SOUNDING specified by the EMPLOYER DOES NOT utilize a DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS); DOES NOT describe procedure to locate the pelorus, or even the hawespipe, exactly at the SOUNDING bearing on station line; DOES NOT make a record of the direction of the boat; DOES NOT describe procedure to lay off the hawsepipe to pelorus distance along the station line, DOES NOT describe procedure to lay off on the radius of the SOUNDING CIRCLE, DOES NOT describe procedure to locate the position of the Philadelphia rod at the moment of the SOUNDING, and DOES NOT result in location and observations of Depth to conform to FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051 Minimum Technical Standards: General Survey, Map, and Report Content Requirements;

resulting in MISREPRESENTATION of Turkey Point Nuclear Plant Cooling Canal System "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180) for dredge and fill activities in, over, or under waters of the United States.

CLAIMANT performed a particular task assigned by EMPLOYER, after attending a safety meeting, of "analyzing information thoroughly before it is handed over to other professionals" related to "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition", and "interpreting data using maps, charts and plans"; specified in the job description for Survey Crew Chief (see EXHIBIT "B", JOB DESCRIPTION, Page C41 – line 3-21, of C180); and,

CLAIMANT believes the method of SOUNDING specified by the EMPLOYER, using one (1) three man crew engaged in "post-dredge survey work in Section 1 of canal system using current Differential GPS methods",

a.) DOES NOT specify "Performing and/or overseeing pre-, progress and post dredge surveys", "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition" for location and observations of Depth to conform with U.S. Geological Survey Hydrographic Surveys, illustrated as follows:

b.) DOES NOT specify "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition" for location and observations of Depth to conform with U.S. Geological Survey Hydrographic Surveys, as follows:

"Overview. Maritime and river navigation are primary components that initiated the field of hydrographic surveying. Applications such as volume assessment for water supply and flood-control reservoirs, construction over waterways and adjacent inland development, flood and habitat studies, . . . all require the need for underwater surveys.

The most important information collected during hydrographic surveys is the water surface elevation. Echo sounders only provide a depth, so to create an elevation map of the bottom that will be useful at other water levels, the current water surface elevation must be determined. Determining water surface elevation can be done in three ways; it can be determined from daily stage data (typical only applicable in reservoirs), it can be determined before and after surveying using typical Real-Time Kinematic (RTK) roving techniques, or it can be determined from an accurate GPS elevation in real-time where the receiving GPS antenna is mounted on the boat at a known offset from echo sounder and the water surface. Determining water surface elevation in lakes and reservoirs is often done differently than in rivers because stage does not change as rapidly and because there is no slope to account for. Regardless of how water surface elevation is determined position must also be collected during the hydrographic survey."

c.) DOES NOT specify "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition" for location and observations of Depth to conform with U.S. Geological Survey Hydrographic Surveys, as follows:

"Approach. Most lake surveys utilize differential GPS (DGPS) when collecting data along predetermined transects throughout the water body. DGPS is used to determine position, however, DGPS elevations are typically not accurate enough to determine water surface. The DGPS positions are collected and time tagged to relate to time-tagged survey-grade echo sounding data, often with a latency or correction."

REFERENCE

U.S. Department of the Interior | U.S. Geological Survey

URL: *http://water.usgs.gov/osw/gps/GPS_projects.html*

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CLAIMANT performed a particular task assigned by EMPLOYER, after attending a safety meeting, of "analyzing information thoroughly before it is handed over to other professionals" related to "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition", and "interpreting data using maps, charts and plans"; specified in the job description for Survey Crew Chief (see EXHIBIT "B", JOB DESCRIPTION, Page C41 – line 3-21, of C180); and,

CLAIMANT believes the method of SOUNDING specified by the EMPLOYER, and the "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client for payment"(see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180) for dredge and fill activities in, over, or under waters of the United States; does not conform with the primary mission accuracy of the DGPS service, DOES NOT conform with the definition of an "innovative ways to utilize DGPS services", or even a standard method to utilize the DIFFERENTIAL GLOBAL

POSITIONING SYSTEM (DGPS) for location and observations of Depth, described in the USCG DIFFERENTIAL GPS NAVIGATION SERVICE SUMMARY, as follows:

"The primary mission of the DGPS service is to provide sub-10 meter accuracy for the harbor/harbor approach phase of marine navigation. This is the most important issue we face as DGPS service providers. However, other users have found innovative ways to utilize DGPS services and where feasible, the Coast Guard DGPS network has expanded to meet their needs."

REFERENCE

USCG DIFFERENTIAL GPS NAVIGATION SERVICE by Gene W. Hall, LCDR, USCG DGPS Operations Officer. URL: http://www.navcen.uscg.gov/pdf/dgps/dgpsdoc.pdf

CLAIMANT performed a particular task assigned by EMPLOYER, after attending a safety meeting, of "analyzing information thoroughly before it is handed over to other professionals", related to "KEY RESPONSIBILITIES: Managing the following:" "Performing and/or overseeing pre-, progress and post dredge surveys", "Survey equipment management/repair/maintenance", "Survey equipment inventory/replacement/acquisition", and "interpreting data using maps, charts and plans"; specified in the job description for Survey Crew Chief (see EXHIBIT "B", JOB DESCRIPTION, Page C41 – line 3-21, of C180); and,

CLAIMANT believes the method of SOUNDING specified by the EMPLOYER, and the "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW:

TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180) for dredge and fill activities in, over, or under waters of the United States, DOES NOT "meet the accuracy, reliability and integrity requirements outlined in the Federal Radionavigation Plan (FRP). . . .Values for accuracy and availability set by the 1992 FRP are summarized in Table 2-1", as follows:

Table 2-1

Usage Accuracy (2drme) Availability

Harbor/Harbor Approach 8-20 meters 99.7%

ATON Positioning 10 meters 95.0%

Vessel Traffic Services 10 meters 99.9%

NOAH Near Shore Surveying 15 meters 95.0%

Army Corps of Engineering 6 meters 98.0%

REFERENCE

COMMANDANT INSTRUCTION 16577.2 Subj: DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) NAVIGATION SERVICE CONCEPT OF OPERATIONS Encl. (1) to COMDTTNST 16577.2 USCG DGPS CONOP

URL: https://www.uscg.mil/directives/ci/16000-16999/CI_16577_2.pdf

CLAIMANT believes Bill Coughlin, Chief Operating Officer, discharged CLAIMANT, who performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals", pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of C180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager, fifteen minutes after the completion of the safety meeting, at that moment in time when:

the assistant Operations Engineering Manager, a member of the one (1) three man crew engaged in “post-dredge survey work in Section 1 of canal system using current Differential GPS methods”, described the method of POST-PROCESSING MANIPULATION of the location of observations of Depth, used to compute cut volume, resulting in MISREPRESENTATION of Turkey Point Nuclear Plant Cooling Canal System "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client for payment" (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180) for dredge and fill activities in, over, or under waters of the United States; and, at that moment in time when:

CLAIMANT performed a particular task assigned by EMPLOYER, “analyzing information thoroughly before it is handed over to other professionals” for the method of POST-PROCESSING MANIPULATION for location and observations of Depth specified by the EMPLOYER, as follows:

FINDINGS: CLAIMANT believes the method of SOUNDING, and the method of POST-PROCESSING MANIPULATION of the location of observations of Depth specified by the EMPLOYER, described by the the assistant Operations Engineering Manager, is not an innovative method, or even a standard method, to utilize the DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) for location and observations of Depth, to conform to FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051 Minimum Technical

Standards: General Survey, Map, and Report Content Requirements; and

the method of POST-PROCESSING MANIPULATION of the location of observations of Depth, specified by the EMPLOYER, results in MISREPRESENTATION of the cut volume, a possible cause of overheating of cooling canals for Turkey Point nuclear reactors located within the existing Turkey Point facility east of Homestead, Florida, that poses immediate serious danger to the public health, safety, or welfare; and,

may require emergency suspension, restriction, or limitation of a license held by Tyler McDougal Professional Engineer Operations Engineering Manager, pursuant to 2014 Florida Statutes Title X PUBLIC OFFICERS, EMPLOYEES, AND RECORDS Chapter 120 ADMINISTRATIVE PROCEDURE ACT 120.60 Licensing.— .

16.) CLAIMANT knows 2014 Florida Statutes Title XXXII REGULATION OF PROFESSIONS AND OCCUPATIONS Chapter 472 LAND SURVEYING AND MAPPING 472.031, - LAND SURVEYING AND MAPPING 472.031 - Prohibitions; penalties, and CLAIMANT believes Bill Coughlin, Chief Operating Officer, is not a licensed Professional Engineer.

CLAIMANT believes EMPLOYER discharged CLAIMANT, who performed a particular task assigned by EMPLOYER, for "analyzing information thoroughly before it is handed over to other professionals" pertaining to "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180), for dredge and fill activities in, over, or under waters of the United States that may cause overheating of cooling canals for Turkey Point nuclear reactors located within the existing Turkey Point facility east of Homestead, Florida that poses immediate serious danger to the public health, safety, or welfare; and,

CLAIMANT believes EMPLOYER discharged CLAIMANT, who performed a particular task assigned by EMPLOYER, for "analyzing information thoroughly before it is handed over to other professionals" that may require emergency suspension, restriction, or limitation of a license held by Tyler McDougal Professional Engineer Operations Engineering Manager, pursuant to 2014 Florida Statutes Title X PUBLIC OFFICERS, EMPLOYEES, AND RECORDS Chapter 120 ADMINISTRATIVE PROCEDURE ACT 120.60 Licensing.— ; and,

CLAIMANT knows the statute and code of the state of Florida, CLAIMANT performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals", and CLAIMANT DID NOT make a deliberate refusal, without good cause, to perform a particular task assigned by EMPLOYER.

17.) CLAIMANT believes Bill Coughlin, Chief Operating Officer, is not a "qualified personnel licensed by the Board of Professional Surveyors and Mappers"; CLAIMANT believes Bill Coughlin, Chief Operating Officer, did not identify himself to CLAIMANT by the name and title "Bill Coughlin, Chief Operating Officer"; CLAIMANT performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals", pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180), provided by Tyler McDougal Professional Engineer

Operations Engineering Manager; and, CLAIMANT made a finding of MISREPRESENTATION pertaining to "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180);

CLAIMANT was not able to report directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager, a particular task assigned by EMPLOYER described in the Offer for Employment – Survey Crew Chief, dated August 19, 2015 (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 – line 27-28, of C180); and, Tyler McDougal, Professional Engineer, Operations Engineering Manager, did not receive a report of FINDINGS directly by CLAIMANT, "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned to CLAIMANT by EMPLOYER, prior to a meeting scheduled for September 4, 2015,

"**Friday** – Same as Wednesday. *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research (see EXHIBIT "E", CORRESPONDENCE, Page C162 – line 20-25, of C180).

CLAIMANT believes Bill Coughlin, Chief Operating Officer, did not seek the professional opinion of Tyler McDougal, Professional Engineer, Operations Engineering Manager, a "qualified personnel licensed by the Board of Professional Surveyors and Mappers or by representatives of the United States Government when approved by the department - authorized to inspect Work to be performed only by authorized personnel", pertaining to a particular task assigned by EMPLOYER to CLAIMANT, “analyzing information thoroughly before it is handed over to other professionals”, for "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180); and,

CLAIMANT believes EMPLOYER fired CLAIMANT for performing a particular task assigned by EMPLOYER, “analyzing information thoroughly before it is handed over to other professionals”, pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of C180), provided by Tyler McDougal Professional Engineer Operations Engineering Manager; and, CLAIMANT made FINDINGS, pursuant to 2014 Florida Statutes Title XI MUNICIPALITIES Chapter 177 LAND BOUNDARIES 177.36, of MISREPRESENTATION pertaining to "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180), that “may cause immediate serious danger to the public health, safety, or welfare”.

18.) CLAIMANT performed a particular task assigned by EMPLOYER, “analyzing information thoroughly before it is handed over to other professionals”, pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of C180), provided by Tyler McDougal Professional Engineer Operations Engineering Manager; and, CLAIMANT made FINDINGS of MISREPRESENTATION pertaining to "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180), for dredge and fill activities in, over, or under waters of the United States that may cause overheating of cooling canals for Turkey Point nuclear reactors located within the existing Turkey Point facility east of Homestead, Florida that poses immediate serious danger to the public health, safety, or welfare;

CLAIMANT was not able to report directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager, a particular task assigned by EMPLOYER described in the Offer for Employment – Survey Crew Chief, dated August 19, 2015 (see EXHIBIT "A", EMPLOYMENT CONTRACT, Page C38 – line 27-28, of 180); and, Tyler McDougal, Professional Engineer, Operations Engineering Manager; did not receive a report of FINDINGS directly by CLAIMANT, "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned to CLAIMANT by EMPLOYER, prior to a meeting scheduled for September 4, 2015,

"**Friday** – Same as Wednesday. *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research" (see EXHIBIT "E", CORRESPONDENCE, Page C162 – line 20-25, of C180).

CLAIMANT knows the statute and code of the state of Florida, and CLAIMANT believes "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned by EMPLOYER, IS NOT "misconduct connected with the individual's employment" UNDER NMSA 1978 51-1-7A and 51-1-11B.

19.) CLAIMANT performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals", and CLAIMANT made a report of FINDINGS that "equipment selected, purchased, and delivered so it will be available upon your arrival. . . is not a wise approach", to conform with FAC Rule Title: Standards of Practice: General Survey, Map, and Report Content Requirements 5J-17.051 Minimum Technical Standards: General Survey, Map, and Report Content Requirements, as follows:

"1. The accuracy of the survey measurements shall be premised upon the type of survey and the expected use of the survey and map".

CLAIMANT knows the statute and code of the state of Florida, and CLAIMANT believes "analyzing information thoroughly before it is handed over to other professionals", a particular task assigned by EMPLOYER, IS NOT "misconduct connected with the individual's employment" UNDER NMSA 1978 51-1-7A and 51-1-11B;

20.) CLAIMANT performed a particular task assigned by EMPLOYER, "analyzing information thoroughly before it is handed over to other professionals", pertaining to BERM STABILIZATION PLAN Exhibit No. FIGURE A (see EXHIBIT "D", GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Page C50 of C180), provided by Tyler McDougal, Professional Engineer, Operations Engineering Manager;

CLAIMANT made a report of FINDINGS that a method of post-dredge survey work in section 1 of current differential methods using a range of equipment to produce post-dredge surveys specified by the EMPLOYER, resulting in MISREPRESENTATION of Turkey Point Nuclear Plant Cooling Canal System "finished product of . . . cross-sections and volume report we (EMPLOYER) generate and submit to client (FPL) for payment" (see EXHIBIT “D”, GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT – BACKGROUND, Pages C51 to C58, of C180), for dredge and fill activities in, over, or under waters of the United States that may cause overheating of cooling canals for Turkey Point nuclear reactors located within the existing Turkey Point facility east of Homestead, Florida, that poses immediate serious danger to the public health, safety, or welfare; and, may require emergency suspension, restriction, or limitation of a license;

CLAIMANT was not able to report directly to Tyler McDougal, Professional Engineer, Operations Engineering Manager, a particular task assigned by EMPLOYER described in the Offer for Employment – Survey Crew Chief, dated August 19, 2015 (see EXHIBIT “A”, EMPLOYMENT CONTRACT, Page C38 – line 27-28, of C180); and, Tyler McDougal, Professional Engineer, Operations Engineering Manager; did not receive a report of FINDINGS directly by CLAIMANT, “analyzing information thoroughly before it is handed over to other professionals”, a particular task assigned to CLAIMANT by EMPLOYER, prior to a meeting scheduled for September 4, 2015,

“**Friday** – Same as Wednesday. *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research” (see EXHIBIT “E”, CORRESPONDENCE, Page C162 – line 20-25, of C180).

CLAIMANT knows the statute and code of the state of Florida, and CLAIMANT believes “analyzing information thoroughly before it is handed over to other professionals”, a particular task assigned by EMPLOYER, IS NOT "misconduct connected with the individual's employment" UNDER NMSA 1978 51-1-7A and 51-1-11B.

NOW, CLAIMANT prays the state of NEW MEXICO DEPARTMENT OF WORKFORCE SOLUTIONS APPEALS TRIBUNAL will find: the DETERMINATION is WRONG; CLAIMANT was NOT discharged because of deliberate refusal, without good cause, to perform a particular task assigned to CLAIMANT; the Reasoning and Findings are INCORRECT; and, the Reasoning and Findings are not based on the facts and the law; and

NOW, THEREFORE, CLAIMANT prays the state of NEW MEXICO DEPARTMENT OF WORKFORCE SOLUTIONS APPEALS TRIBUNAL will find the CLAIMANT eligible to received benefits, beginning 9/1/2015.

RESPECTFULLY SUBMITTED,

/ SIGNED

ANDREW DeSALVO

Claimant Id: 8650254

DATE: November 5, 2015

EXHIBIT "A"

EMPLOYMENT CONTRACT

GATOR DREDGING
13630 50TH WAY NORTH • CLEARWATER, FLORIDA 33760
OFFICE: 727-527-1300 FAX: 727-527-1303 www.gatordredging.com

August 19, 2015

Andrew DeSalvo

Re: Offer of Employment – Survey Crew Chief

Dear Mr. DeSalvo:

Waterfront Property Services, LLC (dba Gator Dredging) wishes to extend the following Offer of Employment. We are impressed with your skills and experience. We believe that you would help sustain our reputation for professional and technical excellence. It is within that context that Gator Dredging wishes to confirm the following Offer of Employment:

1. We offer you the position of Survey Crew Chief in our Clearwater, Florida office reporting directly to Tyler McDougal, P.E. - Operations Engineering Manager.
2. Job duties include: Managing the following: Field stake-out of construction controls, gathering of data on the earth's physical and man-made features through surveys. Using a range of equipment to produce surveys, including GPS and conventional methods. Interpreting data using maps, charts and plans. Performing related work as required. Extensive travel and overtime may be directed. Will work with the Professional Engineer and Certified Equipment personnel (PLS provided by GPS provider) to set up data collection and electronic file transfer procedures.
3. Gator Dredging will provide three (3) days of motel reimbursement expense and per diem at $30.00 for the trip from Seattle, WA to Homestead, Fl. Lodging and per diem will be provided upon your arrival in Homestead. Mileage reimbursement for travel from current location to Clearwater, Florida estimated at $0.42/mile @ 3,100 miles = $1,260.
4. Planned equipment for your use: A New RTK system you can spec for your use, new high end laptop for quality performance, dedicated survey truck for your use or proper car allowance.
5. Your starting base hourly rate is offered at $25.00 hourly.
6. A probationary performance review will be conducted on the 90th day of employment with evaluation for adherence to required work production.
7. Additional Performance Reviews will be conducted annually with a review for potential wage rate increase.

8. Individual medical, life and long term disability insurance, is offered by the firm based on current health plan offered by the Company. Health care benefits are available 90 days after hire date.
9. Annual vacation of 80 hours, accrued on a weekly basis (cannot be used until one year from hire date).
10. Annual sick leave of 40 hours, accrued on a weekly basis (cannot be used until one year from hire date).
11. Paid Holidays for those company recognized holidays are included.
12. Participation in a future company profit sharing and bonus plan established by the firm, which is based on the performance of the individual and the company, as determined by the office managers and partners.
13. Specific management approved technical classes will be paid by the company.
14. We would like to offer a start date of August 31st, 2015.

Please be advised that Gator Dredging is a Drug Free Workplace and you will be required to take a drug test prior to employment with negative drug use results. A clear criminal background check is required for employment.

Compliance with the Immigration Reform and Control Act requires this offer be based upon your ability to satisfactorily complete the Immigration Form I-9, and we are confident you will be a valuable addition to our staff and you will be able to obtain the type of experience that will be challenging and will provide a growth environment for you. Please call me if you have any questions.

Please acknowledge you acceptance of this offer by signing below.

Very truly yours,

William J. Coughlin III
Managing Member

Accepted by:

_________________________________ _______________
Andrew DeSalvo Date

Employment is a mutual consent of the employee and Gator Dredging and can be terminated at will any time for any reason by the employee or Gator Dredging.

EXHIBIT "B"

JOB DESCRIPTION

	WATERFRONT PROPERTY SERVICES, LLC. **<u>Surveyor Crew Chief</u>**	**13630 50th Way North Clearwater, FL 33760**

JOB PURPOSE: The selected candidate is responsible for:

- The collection of all technical field information related to engineering/surveying for the operations department.

KEY RESPONSIBILITIES:

<u>Managing the following:</u>

- Field stake-out of construction controls
- Performing and/or overseeing pre-, progress and post-dredge surveys.
- Survey equipment management/repair/maintenance.
- Survey equipment inventory/replacement/acquisition.
- Training sub-professional, technical, and clerical personnel, as required.
- Performing related work as required.
- Providing assistance & support to sales, marketing, engineering & bid/estimating personnel as required.
- Gathering data on the earth's physical and man-made features through surveys.
- Using a range of equipment to produce surveys, including GPS and conventional methods.
- Analyzing information thoroughly before it is handed over to other professionals.
- Interpreting data using maps, charts and plans.
- Using computer-aided design (CAD), hydrographic survey (HYPACK) and other IT software to interpret data and present information.
- Keeping up to date with new and emerging technology.

DESIRED KNOWLEDGES, ABILITIES, AND SKILLS:

- Knowledge of principles and practices of the assigned area of surveying.
- Knowledge of developments and information in assigned field of surveying.
- Ability to learn to plan, design, and review the work of others.
- Ability to read and interpret engineering plans, and specifications.
- Ability to analyze surveying data and draw sound conclusions.
- Ability to develop skill in the use and care of surveying tools.
- Ability to establish and maintain effective working relationships with other employees, officials, and the general public.

QUALIFICATIONS: Graduation from an accredited college or university with a bachelor's degree in geodetics / surveying / engineering preferably related to the area of assignment is preferred.

PRIOR EXPERIENCE: Three (3) years of working experience in marine construction field operations.

LICENSES/CERTIFICATES: Possession of a valid Florida Driver's license.

EXAMINATION: Evaluation of training and experience. Drug testing is included in all pre-employment medical examinations.

Employee selected must have character suitable for this position. A background investigation will be conducted on the candidate selected for employment.

EXHIBIT "C"

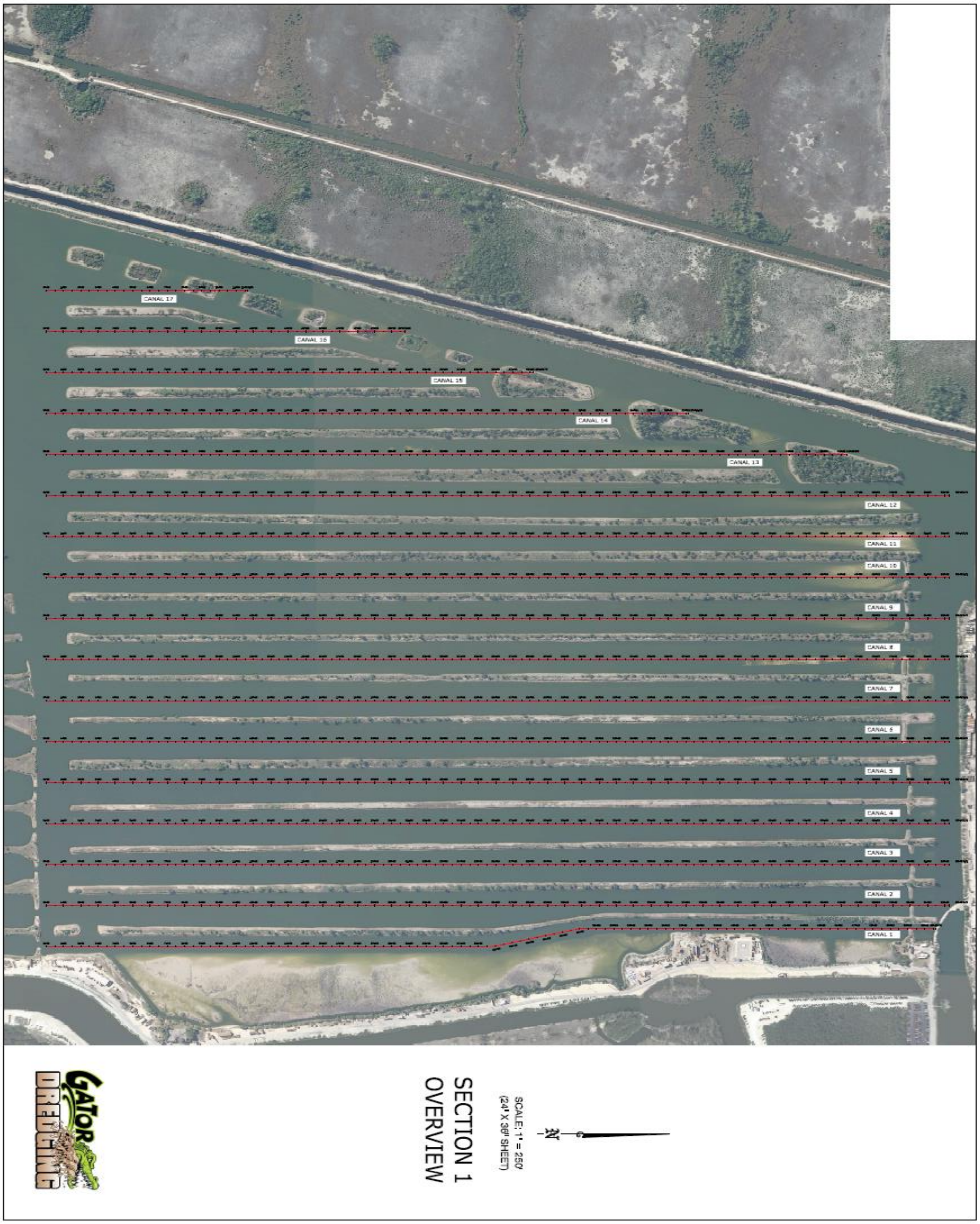
TRAVEL EXPENSES FOR REIMBURSEMENT

Andrew DeSalvo Travel Expenses For Reimbursement

Motel:	$164.25	(South Dakota, Georgia, Florida)
Per Diem (12 Days)	$360.00	
Mileage (3372 mls)	$1,416.24	(Travel from Settle, WA to Homestead, FL)
Payroll (20.5 hrs)	$512.50	
Total Due	**$2,452.99**	

EXHIBIT “D”

GATOR - WORK PLAN FOR WEEK OF 8/31 TO 8/4 FW: TURKEY POINT - BACKGROUND



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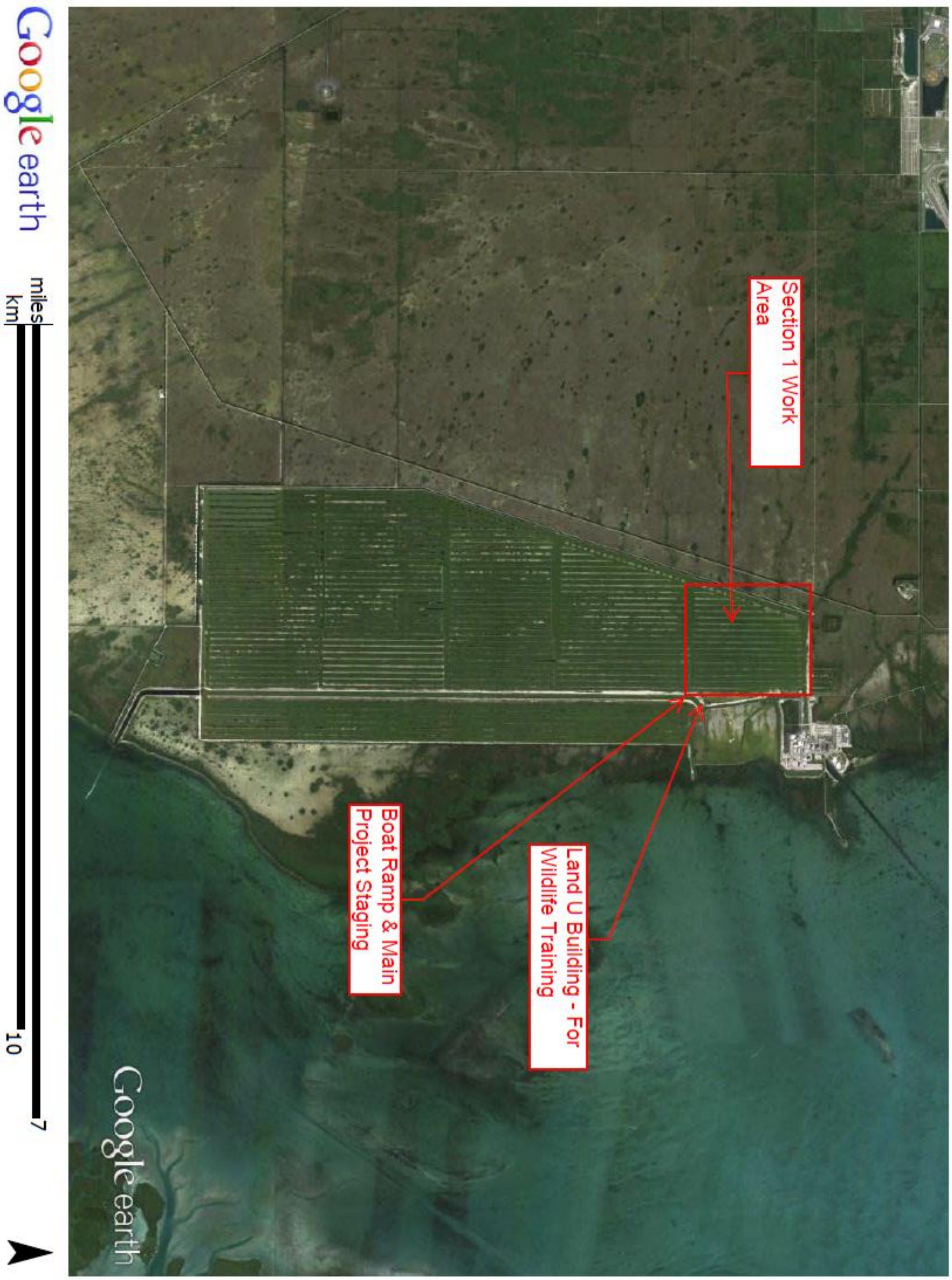

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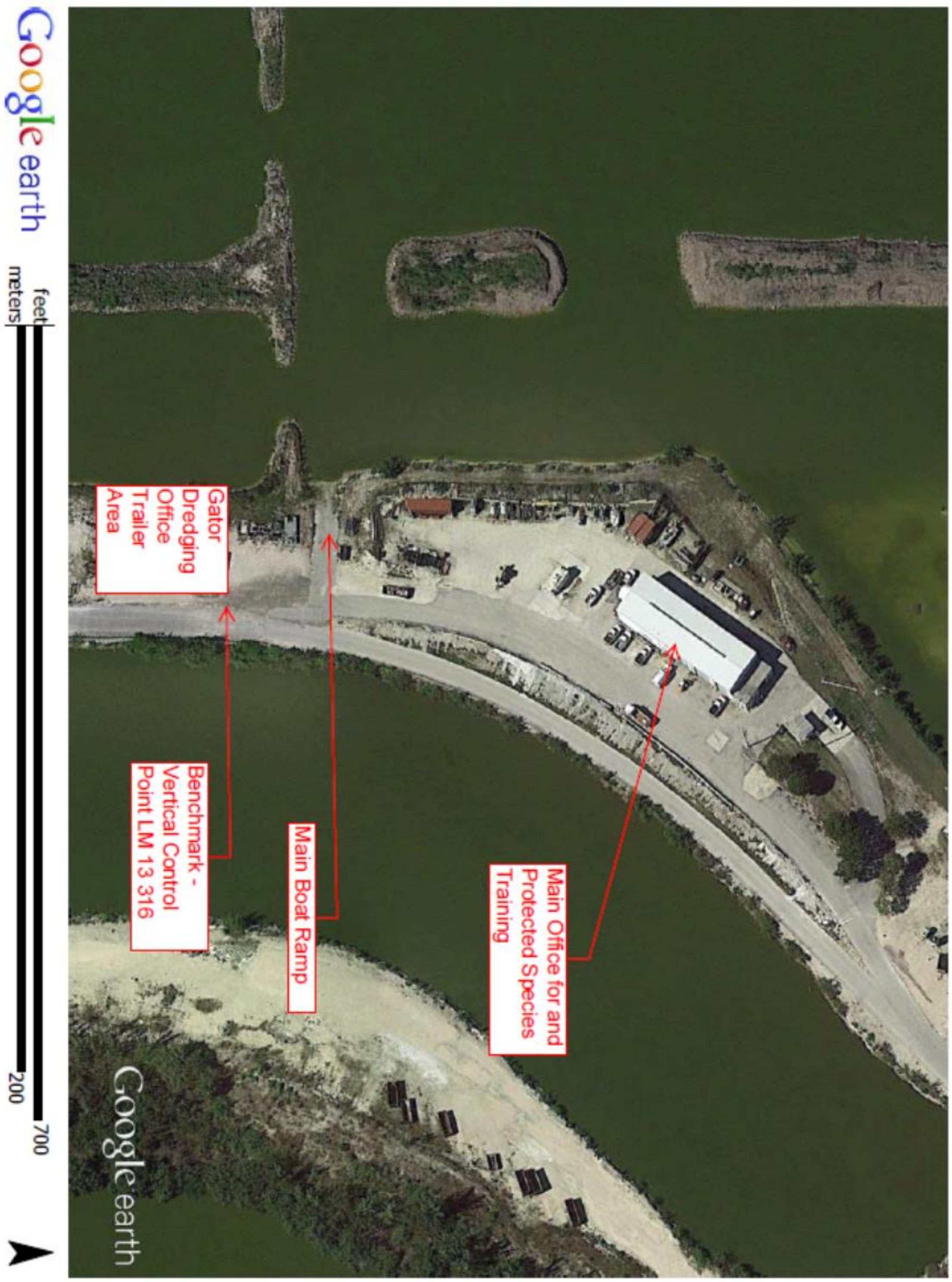

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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

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PROGRAM = datasheet95, VERSION = 8.7.1
1        National Geodetic Survey,   Retrieval Date = AUGUST 19, 2015
 AC3305 ***********************************************************************
 AC3305  DESIGNATION -  LM 13 316 FLPCO
 AC3305  PID         -  AC3305
 AC3305  STATE/COUNTY-  FL/MIAMI-DADE
 AC3305  COUNTRY     -  US
 AC3305  USGS QUAD   -  ARSENICKER KEYS (1997)
 AC3305
 AC3305                         *CURRENT SURVEY CONTROL
 AC3305  ______________________________________________________________________
 AC3305* NAD 83(1986) POSITION- 25 25 05.     (N) 080 20 21.     (W)   SCALED
 AC3305* NAVD 88 ORTHO HEIGHT -     1.700 (meters)        5.58  (feet) ADJUSTED
 AC3305  ______________________________________________________________________
 AC3305  GEOID HEIGHT    -        -25.27  (meters)                     GEOID12B
 AC3305  DYNAMIC HEIGHT  -          1.697 (meters)        5.57  (feet) COMP
 AC3305  MODELED GRAVITY -    978,973.5   (mgal)                       NAVD 88
 AC3305
 AC3305  VERT ORDER      -  SECOND    CLASS I
 AC3305
 AC3305.The horizontal coordinates were scaled from a topographic map and have
 AC3305.an estimated accuracy of +/- 6 seconds.
 AC3305.
 AC3305.The orthometric height was determined by differential leveling and
 AC3305.adjusted by the NATIONAL GEODETIC SURVEY
 AC3305.in June 1991.
 AC3305
 AC3305.The dynamic height is computed by dividing the NAVD 88
 AC3305.geopotential number by the normal gravity value computed on the
 AC3305.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AC3305.degrees latitude (g = 980.6199 gals.).
 AC3305
 AC3305.The modeled gravity was interpolated from observed gravity values.
 AC3305
 AC3305;                    North         East     Units  Estimated Accuracy
 AC3305;SPC FL E     -   120,310.      266,480.      MT  (+/- 180 meters Scaled)
 AC3305
 AC3305                          SUPERSEDED SURVEY CONTROL
 AC3305
 AC3305  NGVD 29 (09/01/92)    2.165  (m)           7.10   (f) ADJUSTED    2 1
 AC3305
 AC3305.Superseded values are not recommended for survey control.
 AC3305
 AC3305.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 AC3305.See file dsdata.txt to determine how the superseded data were derived.
 AC3305
 AC3305_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ664114(NAD 83)
 AC3305
 AC3305_MARKER: C = CAP OF CAP-AND-BOLT PAIR
 AC3305_SETTING: 47 = GALVANIZED STEEL PIPE W/O SLEEVE (10 FT.+)
 AC3305_SP_SET: GALVANIZED STEEL PIPE
 AC3305_STAMPING: LM 13 316
```


1

2 File:LM 13 316.pdf

```
AC3305_MARK LOGO: FLPCO
AC3305_PROJECTION: PROJECTING 41 CENTIMETERS
AC3305_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AC3305_ROD/PIPE-DEPTH: 6.10 meters
AC3305
AC3305  HISTORY     - Date      Condition         Report By
AC3305  HISTORY     - UNK       MONUMENTED        FLPCO
AC3305  HISTORY     - 1982      GOOD              FLDNR
AC3305
AC3305                           STATION DESCRIPTION
AC3305
AC3305'DESCRIBED BY FL DEPT OF NAT RES 1982
AC3305'12 MI ESE FROM FLORIDA CITY.
AC3305'BEGIN AT THE ENTRANCE TO THE TURKEY POINT NUCLEAR POWER PLANT, GO 1.7
AC3305'MILES SOUTH ON ROAD IN FRONT OF PLANT AND PARALLELING THE INTAKE CANAL
AC3305'TO THE MARK.  THE MARK BEARS 20 FEET WEST OF THE CENTERLINE OF THE
AC3305'ROAD, 37 FEET WEST OF THE EDGE OF THE CANAL, AND 75 FEET EAST OF A
AC3305'LINE OF VEGETATION ALONG ANOTHER CANAL.  THE MARK IS A STAINLESS STEEL
AC3305'BOLT AND WASHER, CEMENTED IN A 1.5-INCH DIAMETER STEEL PIPE.

*** retrieval complete.
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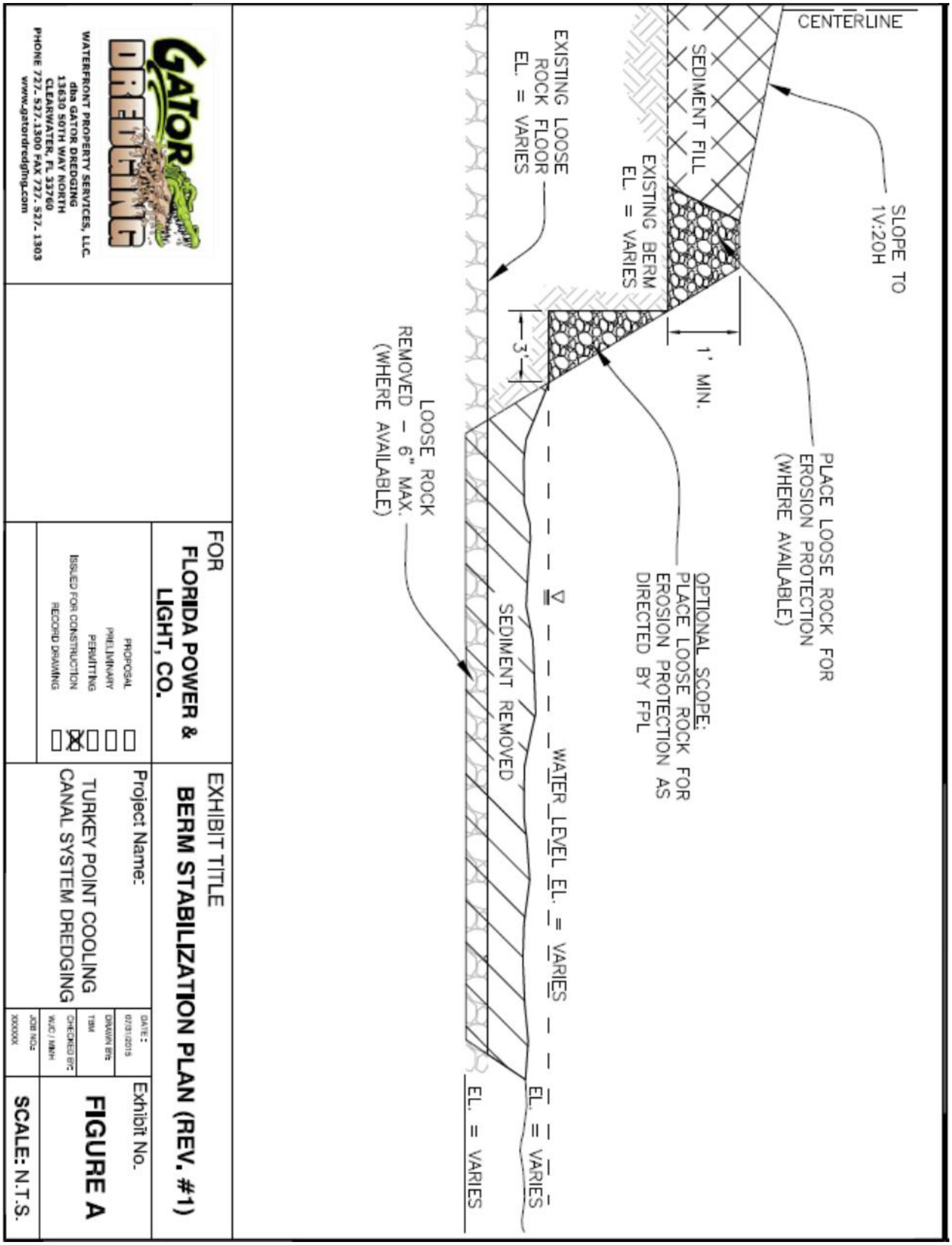

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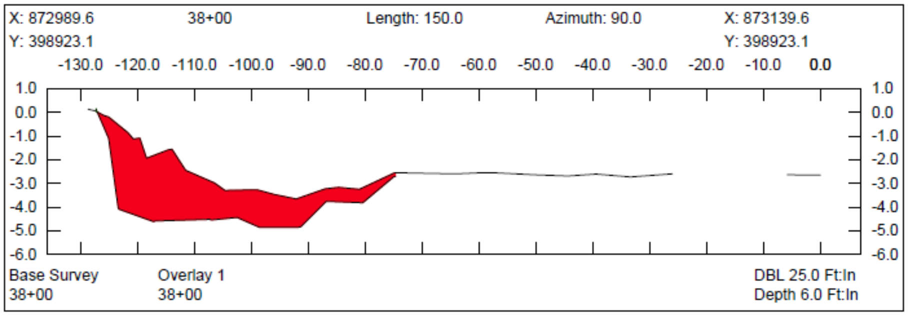

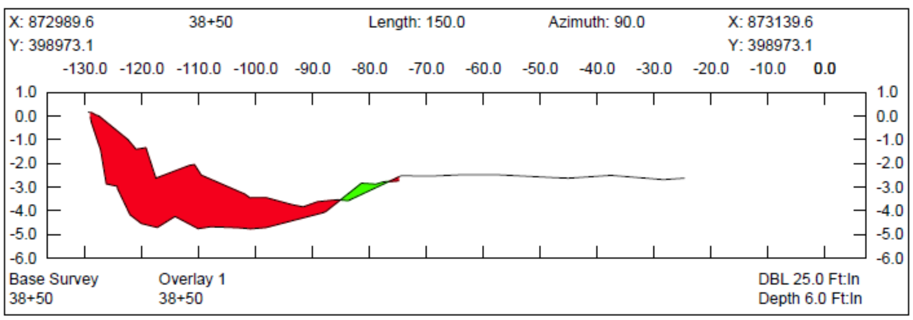

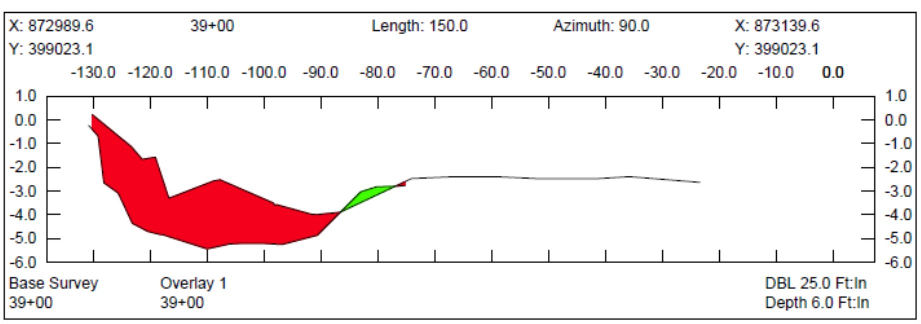

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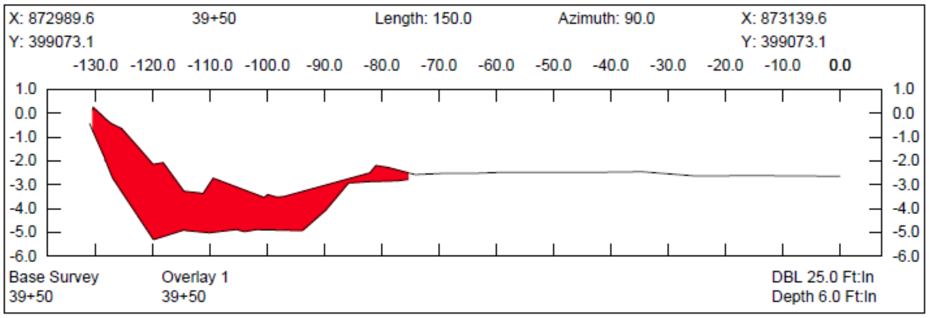

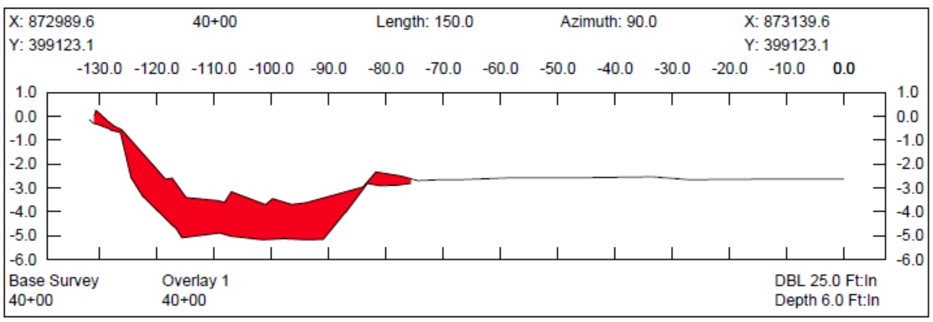

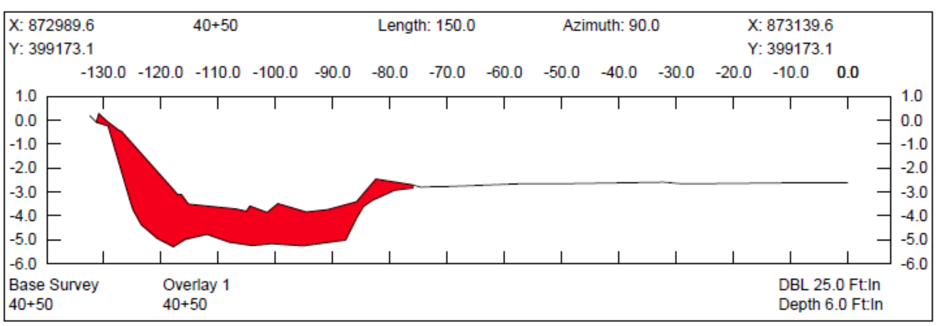

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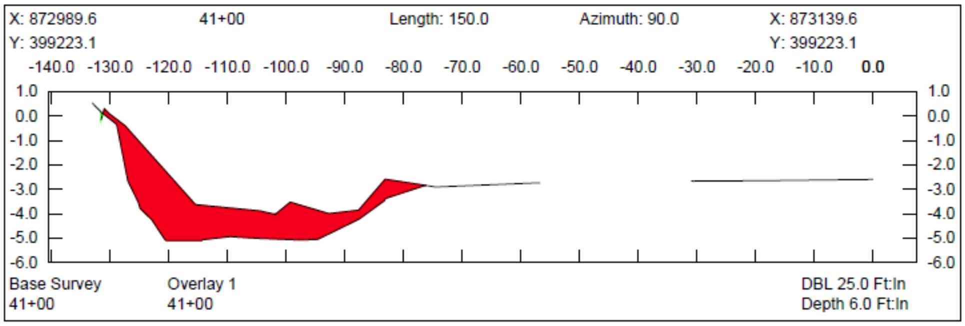

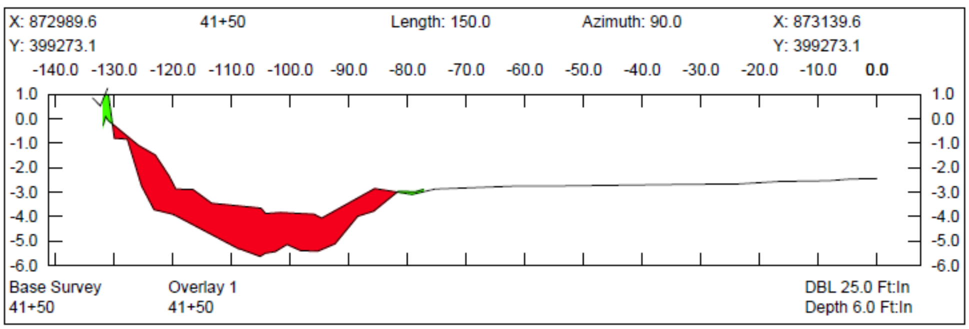

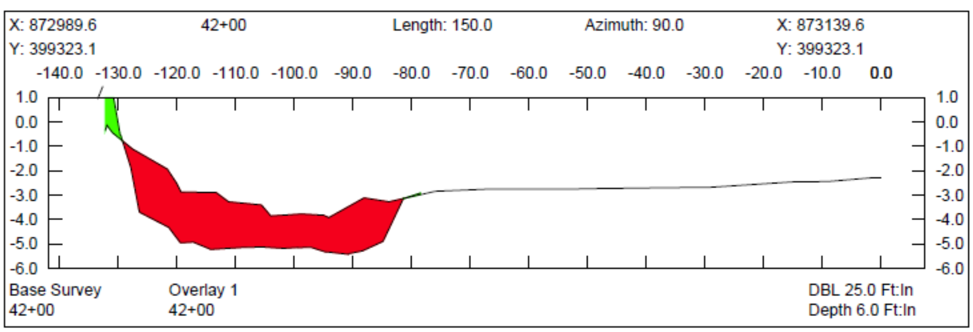

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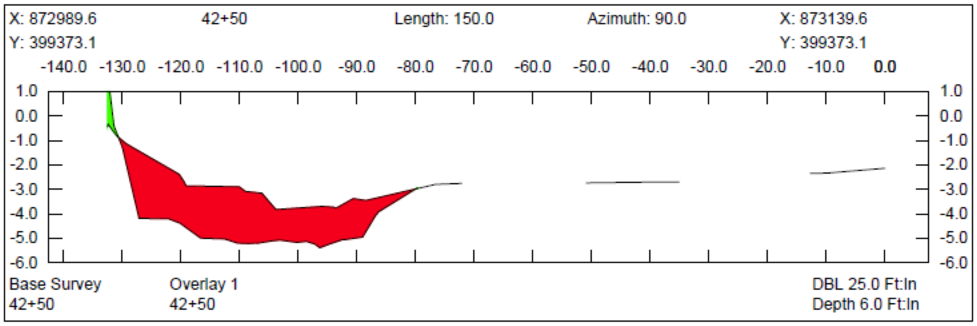

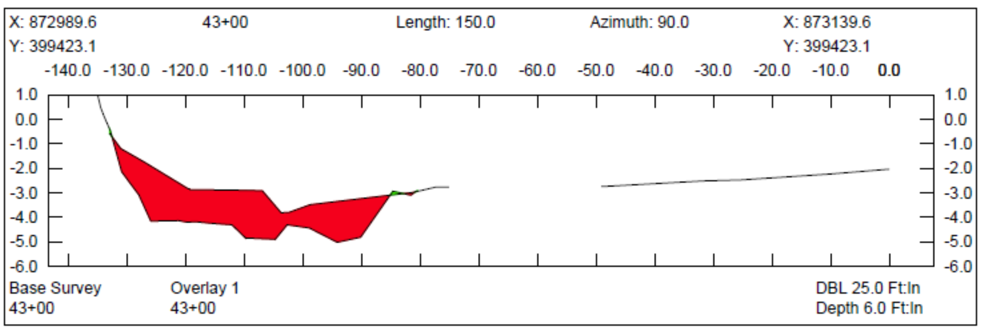

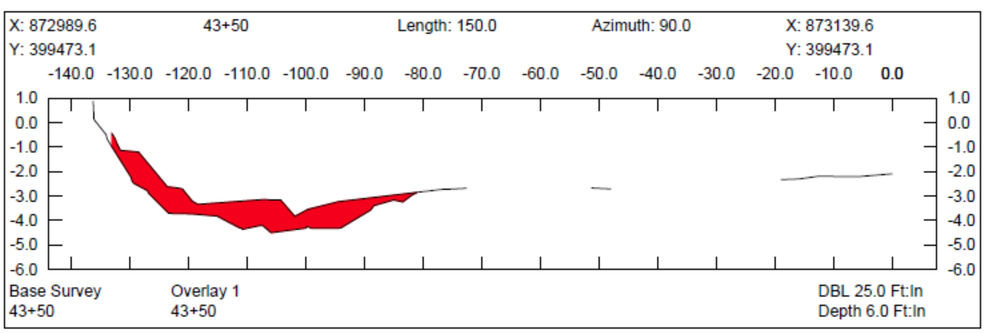

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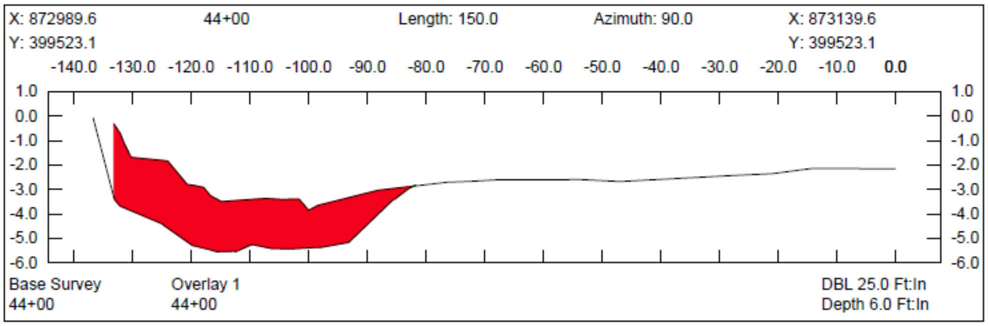

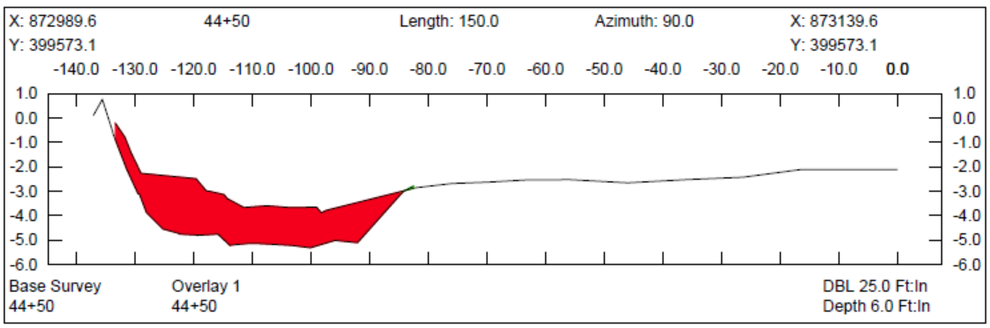

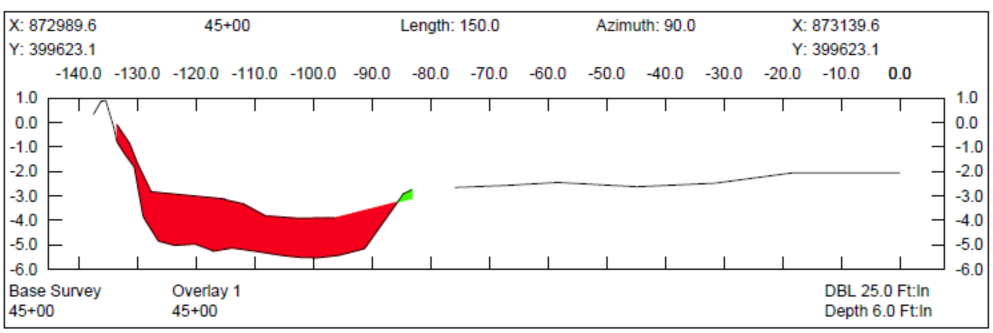

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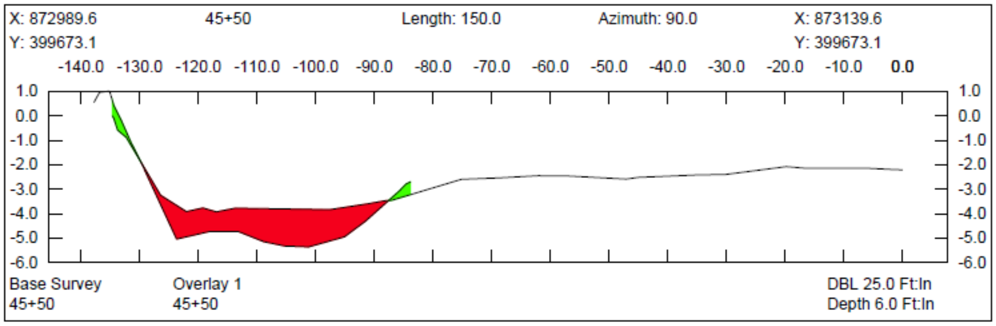

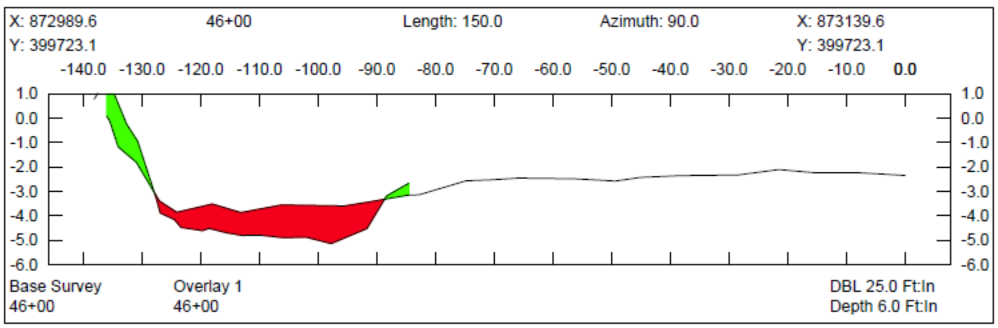

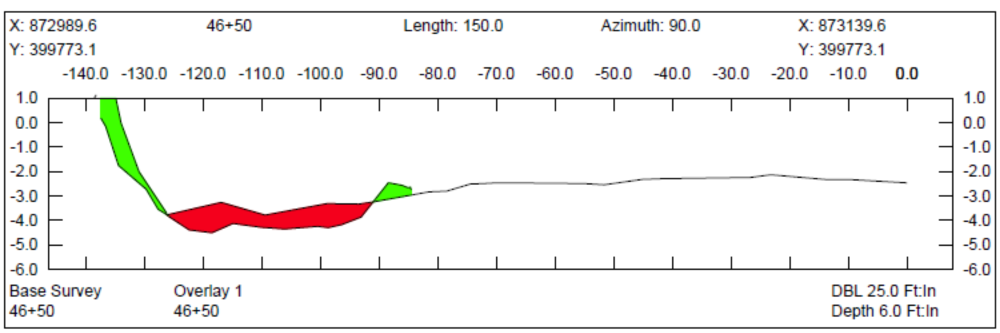

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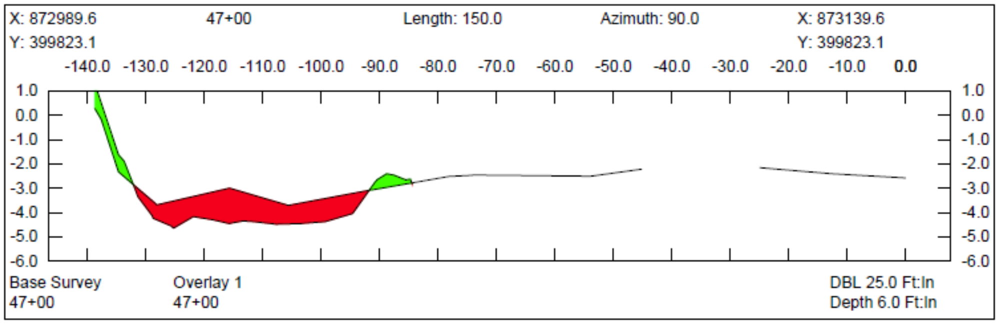

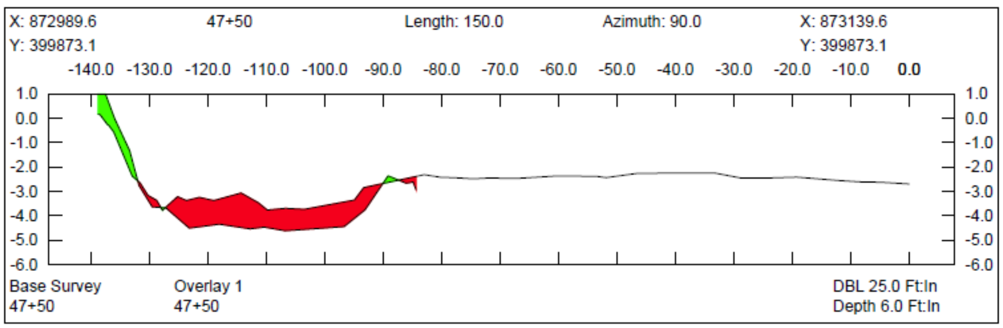

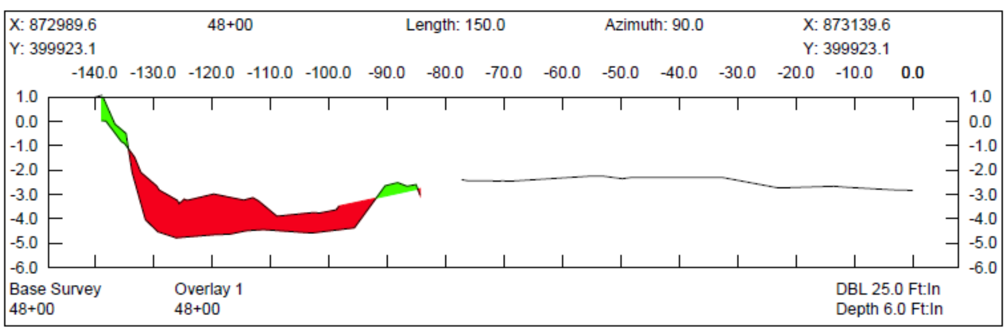

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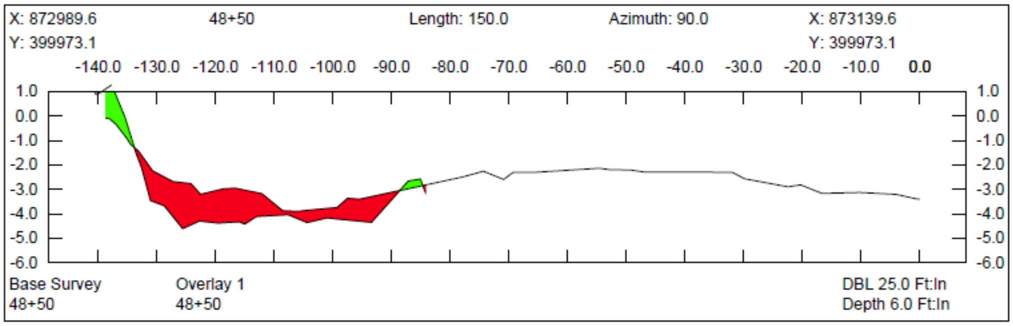

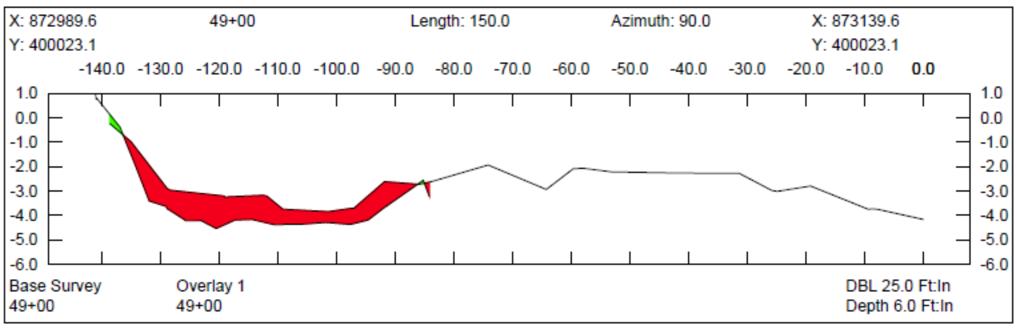

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Volume Report Plan: Method: End Area No Template 8/28/2015 2:43:31 PM
Areas: Sq Feet, Volumes: Cu Yards

Line 1 Pre-Dredge File: 38+00.PRE Post-Dredge File: 38+00.POST

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
78.9	0.0	0.0	0.0	0.0	0.0	78.9	0.0	0.0

Line 2 Pre-Dredge File: 38+50.PRE Post-Dredge File: 38+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
72.2	140.0	140.0	2.1	1.9	1.9	70.1	138.0	138.0

Line 3 Pre-Dredge File: 39+00.PRE Post-Dredge File: 39+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
87.3	147.7	287.7	2.5	4.3	6.2	84.8	143.5	281.5

Line 4 Pre-Dredge File: 39+50.PRE Post-Dredge File: 39+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
86.4	160.8	448.5	0.0	2.3	8.5	86.4	158.5	440.0

Line 5 Pre-Dredge File: 40+00.PRE Post-Dredge File: 40+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
66.9	141.9	590.4	0.0	0.0	8.5	66.9	141.9	581.9

Line 6 Pre-Dredge File: 40+50.PRE Post-Dredge File: 40+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
77.4	133.6	724.0	0.0	0.0	8.5	77.4	133.6	715.5

Line 7 Pre-Dredge File: 41+00.PRE Post-Dredge File: 41+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
66.9	133.6	857.7	0.1	0.0	8.6	66.8	133.6	849.1

Line 8 Pre-Dredge File: 41+50.PRE Post-Dredge File: 41+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
62.0	119.3	977.0	1.7	1.7	10.2	60.2	117.7	966.8

Line 9 Pre-Dredge File: 42+00.PRE Post-Dredge File: 42+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
83.0	134.2	1111.2	3.4	4.8	15.0	79.5	129.4	1096.2

Line 10 Pre-Dredge File: 42+50.PRE Post-Dredge File: 42+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
79.5	150.4	1261.6	1.5	4.6	19.6	78.0	145.8	1242.0

Line 11 Pre-Dredge File: 43+00.PRE Post-Dredge File: 43+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
63.7	132.6	1394.2	0.2	1.6	21.3	63.5	131.0	1373.0

Line 12 Pre-Dredge File: 43+50.PRE Post-Dredge File: 43+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
41.5	97.4	1491.7	0.0	0.2	21.5	41.5	97.2	1470.2

Line 13 Pre-Dredge File: 44+00.PRE Post-Dredge File: 44+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol

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96.0	127.3	1619.0	0.0	0.0	21.5	96.0	127.3	1597.5

Line 14 Pre-Dredge File: 44+50.PRE Post-Dredge File: 44+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
74.3	157.7	1776.7	0.1	0.1	21.6	74.2	157.6	1755.1

Line 15 Pre-Dredge File: 45+00.PRE Post-Dredge File: 45+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
74.7	138.0	1914.7	0.6	0.6	22.2	74.1	137.3	1892.5

Line 16 Pre-Dredge File: 45+50.PRE Post-Dredge File: 45+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
42.6	108.6	2023.3	2.6	3.0	25.2	40.0	105.6	1998.1

Line 17 Pre-Dredge File: 46+00.PRE Post-Dredge File: 46+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
40.0	76.5	2099.8	9.6	11.3	36.5	30.4	65.2	2063.3

Line 18 Pre-Dredge File: 46+50.PRE Post-Dredge File: 46+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
25.4	60.6	2160.4	14.1	21.9	58.4	11.4	38.7	2102.0

Line 19 Pre-Dredge File: 47+00.PRE Post-Dredge File: 47+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
36.0	56.9	2217.3	6.6	19.1	77.6	29.5	37.8	2139.8

Line 20 Pre-Dredge File: 47+50.PRE Post-Dredge File: 47+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
35.7	66.4	2283.8	5.6	11.3	88.9	30.1	55.1	2194.9

Line 21 Pre-Dredge File: 48+00.PRE Post-Dredge File: 48+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
48.5	77.9	2361.7	4.6	9.5	98.3	43.9	68.5	2263.3

Line 22 Pre-Dredge File: 48+50.PRE Post-Dredge File: 48+50.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
39.9	81.8	2443.5	5.3	9.2	107.5	34.6	72.7	2336.0

Line 23 Pre-Dredge File: 49+00.PRE Post-Dredge File: 49+00.POST
Distance Between Lines: 50.0

Cut Area	Cut Vol	Accum Vol	Fill Area	Fill Vol	Accum Vol	Net Area	Net Vol	Accum Vol
42.2	76.1	2519.6	0.6	5.5	113.1	41.6	70.5	2406.5

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TOUGH, PORTABLE, AND CONNECTED FIELD COMPUTER

Now you can truly connect your office to the construction site. By incorporating a cellular modem, laptop, GPS and controller, Trimble has drastically advanced in-field computing and eliminated the gap between office design and field implementation. This easy-to-use Trimble® Site Tablet allows construction professionals to make design changes in the field, connect to the office for on the spot approvals and communicate changes to field crews. From the field, to the truck cab to the office, users stay connected and work faster. With instant email access and data synchronization from the construction site, there is no more delay associated with driving data updates to and from the office and field.

Rugged Field Computer

The Trimble Site Tablet is the first tablet controller ruggedized to stand up to any construction site, in any weather. The vibrant display is powerfully illuminated, so you can finish any job fast, even in bright sunlight conditions. The long life lithium ion batteries ensure a full day of field computing and connected site operation.

Make Better Decisions from the Field

Use the Trimble Site Tablet and SCS900 with an SPS GNSS Receiver or Total Station for:

- Measuring and verifying original ground levels and site features
- Monitoring real-time cut/fill information
- Checking finished grade and laid material thickness against design elevations and tolerances
- Computing progress and material stockpile volumes
- Monitoring, and conducting quality control for earthworks and paving operations
- Assessing as-built measurements and generating high quality reports for record keeping, approvals, and payment purposes
- Synchronizing design and field data via the Internet.

Ideal for site supervisors, site engineers, grade checkers, and surveyors

Trimble
The Construction Technology Standard
www.trimble.com

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TRIMBLE SITE TABLET

HARDWARE

Size	160 mm x 246 mm x 40 mm (6.3 in x 9.6 in x 1.5 in)
Weight	1.2 kg (2.6 lb) with standard batteries 1.4 kg (3.0 lb) with extended batteries
Memory	4 GB RAM, 64 GB or 124 GB Solid State Hard Drive
Processor	1.6 GHz Intel Atom N2600 processor
Wireless	Integrated Wireless LAN
Power[1,2]	Dual hot-swappable Lithium-Ion batteries, standard battery life of up to 4 hours, extended battery life of up to 8 hours.

ENVIRONMENTAL

Temperature – Operating	–30°C to 60°C (–22°F to 144°F)
Temperature – Storage	–40°C to 70°C (–40°F to 158°F)
Humidity	MIL-STD-810F
Sand and dust	8 hours of operation with blowing talcum powder. IP67, MIL-STD-810F, Method 510.3, Procedures I&II, IEC-529 IP-X6
Water	Immersible in 1 meter of water for 30 minutes, IP65, MIL-STD-810F, Method 512.4, Procedure I, Water Jet 12.5 mm dia. @ 2.5–3 m, 100 Liter/min
Drops	26 drops from 4 ft (1.22 m) onto plywood over steel
Vibration	General Minimum Integrity and the more rigorous Loose Cargo test, MIL-STD 810F, Method 514.5, Procedure I, II

INTERFACE

Display	General
Display – Resolution	WSVGA (1024 x 600 pixels)
Audio	Integrated speaker and microphone for audio system events, warnings, and notifications
Operating system	Microsoft® Windows® 7

INPUT/OUTPUT

USB host	Yes (2)
Bluetooth® wireless technology	Version 2.1 + EDR
DC Power	Yes

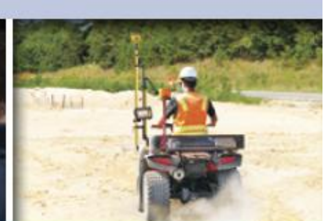
OTHER

Integrated GPS	Yes
Backward facing camera	Yes (5 MP)

1 *Battery life is subject to environmental and usage conditions including use of GPS, Bluetooth, Cellular and Wi-Fi® connections.*
2 *Extended batteries are available as an additional optional purchase.*

Specifications subject to change without notice.

Bluetooth® CE



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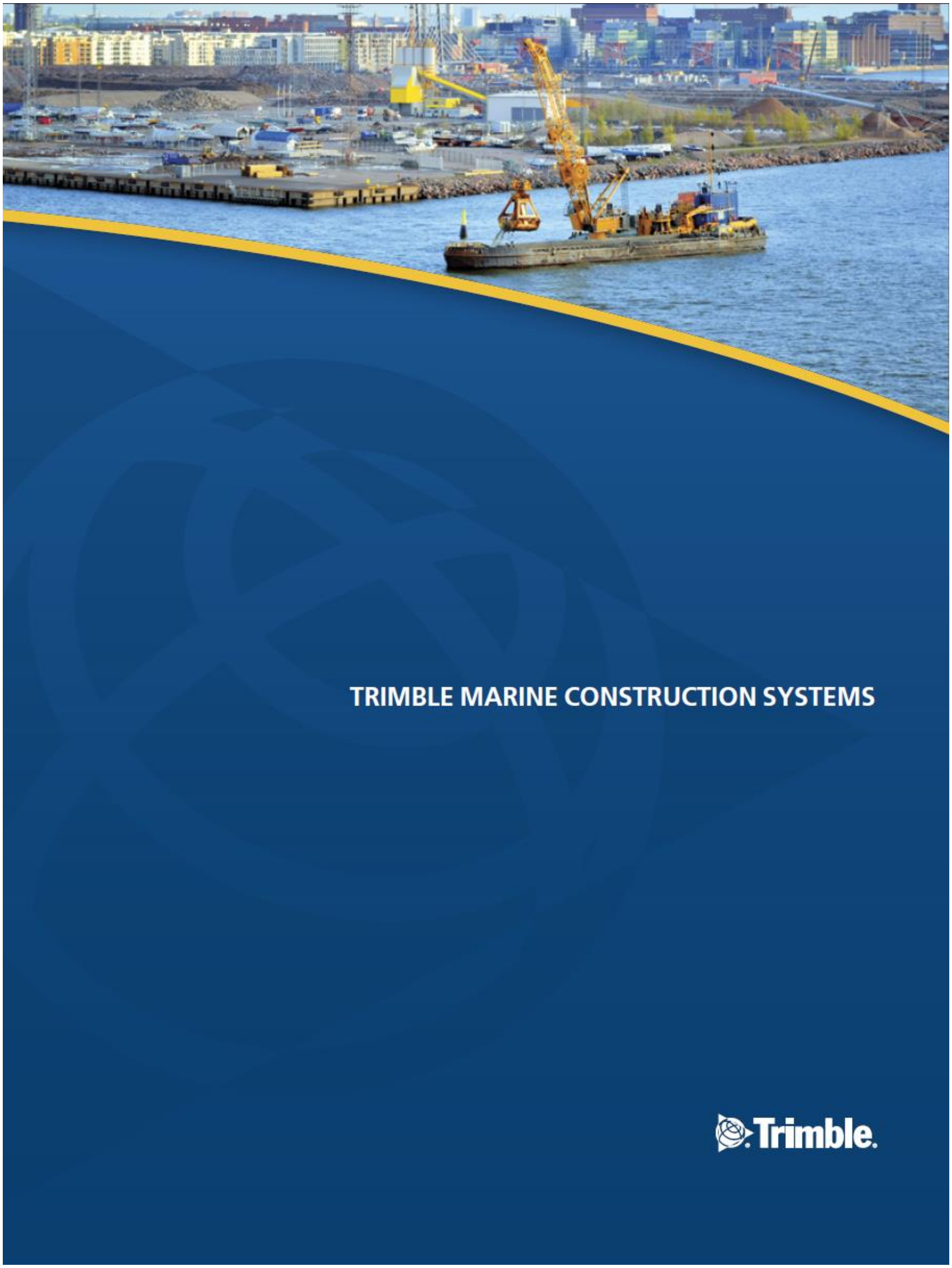

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Trimble marine construction systems deliver the accuracy and reliability you need.

A COMPLETE SOLUTION FOR MARINE CONSTRUCTION

Trimble® Site Positioning Systems GNSS receivers and antennas are advanced positioning systems developed by the leader in GNSS technology for marine solutions. Trimble offers flexible, high-performance positioning systems to meet your unique marine construction needs on both simple and complex projects. Our solutions include both hardware and software, and can be easily integrated into third-party systems.

Trimble marine GNSS receivers and antennas offer cost-effective solutions for permanent or temporary installations. Shown here: SPS356 GNSS Beacon Receiver.

Trimble Site Positioning Systems optimally partner with Trimble HYDROpro™ marine software. Trimble HYDROpro features dedicated configurations for specific applications, as well as for single beam hydrographic surveys and environmental data collection and processing.

The advanced, extremely rugged Trimble Site Tablet works with HYDROpro software, a GNSS receiver, and other sensors to provide an efficient, highly portable marine positioning solution for a wide range of applications. For shore-based work, the Trimble Site Tablet also runs Trimble SCS900 Site Controller Software for measurement and stakeout operations.

RAPID DEPLOYMENT, EASY INTEGRATION

JUST ONE RECEIVER FOR FAST INSTALLATION

Perhaps your business requires a permanently installed GNSS heading and positioning solution. Or do changing application needs demand a flexible system that can be quickly deployed to different vessels?

Trimble offers a range of receivers offering cost-effective solutions for permanent or temporary installations.

EASY INTEGRATION WITH OTHER SYSTEMS

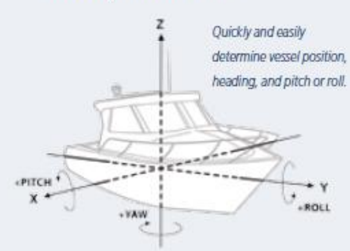
Trimble Site Positioning Systems receivers share a common interface and accessories. Each receiver integrates seamlessly with other Trimble systems so you can reuse data and accessories across multiple applications. Users who are familiar with one Trimble system require minimal training and can quickly begin working with new receivers.

HIGH-PRECISION HEADING...FAST

DUAL L1/L2 ANTENNAS: KEY TO PRECISION, FLEXIBILITY

The Trimble SPS361 and SPS461DGPS Heading Receivers with MSK Beacon are modular, dual-frequency solutions employing separate plug-in dual-frequency antennas. This antenna configuration offers significant benefits over single-frequency and fixed baseline systems:

- More precise GNSS heading—flexible antenna separation enables users to maximize precision.
- Dual-frequency ensures faster initialization and re-acquisition of satellites.



Quickly and easily determine vessel position, heading, and pitch or roll.

EASILY DETERMINE THE POSITION OF OTHER SENSORS ON A VESSEL

ONE SYSTEM DELIVERS POSITION, HEADING, AND ATTITUDE

The dual antennas of the Trimble SPS361/SPS461 provide vessel position, heading, and pitch or roll. So just one cost-effective system is needed. You can then use Trimble HYDROpro software in combination with the receiver data and other sensors, for example, an echosounder, to determine real-time position, heading, and precise elevation of the target surface.

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PRECISE GPS FOR TIDE

The Trimble SPS855 GNSS Modular Receiver provides the capability for monitoring tidal and other water level changes in real-time, providing a more precise and cost-effective solution than conventional methods. Tide gauges and associated radio links are no longer essential.

MSK BEACON SUPPORT

The MSK Beacon service is a free-to-air correction signal, and MSK transmissions are available in many coastal regions and inland waterways around the world. A receiver such as the SPS356 with internal DGNSS Beacon receiver makes effective use of MSK Beacon service.

THE POSITION ACCURACY YOU NEED

FLEXIBLE, SCALABLE, UPGRADABLE

Trimble GNSS receivers provide a range of accuracy upgrades to meet your project needs. Simply upgrade to the level of precision you require. The portfolio of Site Positioning Systems receivers supports the following correction types:

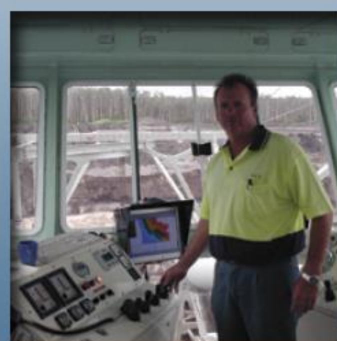
- Precision GNSS (RTK) base station
- Trimble Internet Base Station Service (IBSS)
- Virtual Reference Station (VRS)
- CenterPoint RTX (for inland waterways and port applications)
- OmniSTAR VBS, XP, or HP (for inland waterways and port applications)
- MSK Beacon (free-to-air)
- DGPS using UHF radio links (RTCM)
- Satellite-based Augmentation Systems such as WAAS, EGNOS, MSAS, and QZSS

Corrections are accessible via internal radio, internal demodulator, external radio, and cellular/Internet connectivity. The Trimble TDL 450 Series Radios provide robust UHF frequency solutions for use as repeaters or for work at longer ranges.

PUT TRIMBLE TECHNOLOGY AND EXPERIENCE TO WORK IN YOUR MARINE APPLICATION

Trimble marine systems meet the demands of a wide range of marine construction and hydrographic survey applications, including:

- Precise placement of marine structures such as breakwaters, bridges, caissons, piles, marina piers and coastal defences
- Dredge vessel positioning
- Positioning and tracking of barges, tugs and other construction vessels
- Offshore-rig-positioning and anchor-handling applications
- Hydrographic surveys for applications such as channel maintenance, dredging progress, environmental surveys, and bed erosion



Trimble heading receivers provide precise navigation that is vessel-centric. Marine operators receive simple forward/back, port/starboard, and clockwise/anti-clockwise guidance, which allows them to position the vessel quickly and efficiently.

Driving piles into a seabed requires great accuracy in a harsh environment. Trimble Site Positioning Systems utilize precision GNSS, heading sensors, and integrated software to get the job done right.

The Trimble Site Positioning Systems provide the 3D position of the dredge head and displays it with the channel design. Precise information gives marine operators "eyes under water", to see exactly where material should be dredged.

Trimble Site Positioning Systems support a diverse range of hydrographic surveys, including port and harbor maintenance, environmental, cable and pipe maintenance, and buoy mooring.

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TRIMBLE MARINE CONSTRUCTION SYSTEMS

Precise, rugged, and flexible positioning solutions for the most challenging environments. Talk to your local Trimble Marine distributor for more information on the system integration potential of Trimble receivers.

PRODUCTS IN THE COMPLETE MARINE SOLUTION FROM TRIMBLE

TRIMBLE SITE POSITIONING SYSTEM RECEIVERS

		SPS356	SPS361	SPS461	SPS555H	SPS855	BX982	SPS585	SPS985
Precision Capability	Precise RTK Rover			O		O	O		O
	Precise RTK Base					O			O
	Limited Rover (10/2)			O		O	O		O
	Limited Rover (10/10)			O		O	O	Y	O
	Limited Rover (30/30)	Y	Y	Y			Y		O
	DGPS/DGNSS Base					O			O
	Heading/Moving Base		Y	Y	Y	O	Y		O
Frequency	Single Frequency	Y	Y	Y	Y	Y	Y	Y	Y
	Dual Frequency			O	Y	Y	Y	Y	Y
	Triple Frequency				O	O	O		O
Constellation	GLONASS	O			O	O	O	Y	O
	Galileo	O			O	O	O	Y	O
	BeiDou	O			O	O	O	Y	O
	QZSS	Y	Y	Y	Y	Y	Y	Y	Y
	SBAS	Y	Y	Y		Y	Y	Y	Y
Correction Services*	xFill					Y		Y	Y
	CenterPoint RTX					Y	Y	Y 10/10	Y
	OmniSTAR VBS		Y	Y		Y	Y		Y
	OmniSTAR HP/XP			O		Y	Y		Y
	Beacon	Y	Y	Y					
General Options	Data logging	O	O	O	O	O	O		O
	1PPS	Y	Y	Y	Y	Y	Y		
	VRS/IBSS/NTRIP	Y	Y	Y		Y	Y	Y 10/10	Y
	Max Data rate	10 Hz	20 Hz	20 Hz	20 Hz	20 Hz	20 Hz	5 Hz	20 Hz
	Wi-Fi	Y						Y	Y

* Some correction services require a certain level of precision capability and also may require a subscription. Contact your local Trimble Marine Dealer for more information.

TRIMBLE ANTENNAS

	GA830	Zephyr™2	Zephyr 2 Rugged	Zephyr 2 Geodetic
Beacon	Y			
SBAS	Y	Y	Y	Y
CenterPoint RTX (MSS)	Y	Y	Y	Y
OmniSTAR (MSS)	Y	Y	Y	Y
Dual/Triple Frequency	Y	Y	Y	Y
GLONASS	Y	Y	Y	Y
Galileo	Y	Y	Y	Y
BeiDou	Y	Y	Y	Y
QZSS	Y	Y	Y	Y

HYDROpro APPLICATIONS

	HYDROpro Navigation	HYDROpro Construction	Terramodel HDMS	Business Center-HCE
Navigation / Survey	Y	Y		
Dredging	Y	Y		
Piling		Y		
Rig/Barge		Y		
NavEdit	Y	Y	Y	
Chart Plotting			Y	O
Channel design			Y	O
Volume calculations			Y	Y

Y – Yes
O – Optional
xx/xx - horizontal precision (cm) / vertical precision (cm)
MSS - Mobile Satellite Services

Trimble Heavy Civil Construction
10368 Westmoor Drive
Westminster, Colorado 80021
USA
800-361-1249 (Toll Free)
+1-937-245-5154 Phone
construction_news@trimble.com

Trimble.

construction.trimble.com

1

2 File: 022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf

DATASHEET

TARGETED SITE MEASUREMENT WORKFLOWS INCREASE PRODUCTIVITY AND ELIMINATE MISTAKES

COMPREHENSIVE TOOLS FOR STAKEOUT, ROADING, AND ADVANCED MEASUREMENT TASKS

CONTINUOUS REAL-TIME POSITION, STATION AND OFFSET, ELEVATION AND CUT/FILL TO THE SELECTED DESIGN

INTELLIGENT DATA SYNC ENSURES THAT ALL CREWS AND THE DATA MANAGER ARE USING THE LATEST INFORMATION, ELIMINATING ERRORS AND RE-WORK

Trimble SCS900 Site Controller Software

Trimble® SCS900 Site Controller Software is an easy-to-use field software that enables grade checkers, site engineers, site surveyors, supervisors, and foremen to do their jobs more efficiently. From initial site reconnaissance to finished as-built collection, SCS900 provides tools to collect and distribute site measurements, perform stake out tasks, manage multiple work orders and job sites, monitor progress, and report the results… all without the need for a contract surveyor.

Now any person on the construction site can be equipped with accurate positioning, digital designs, and the ability to stake, measure and record information. Optional Roading and Advanced Measurement Modules include additional time-saving features that are unique to those specific tasks.

Work Faster, with Fewer Errors

The software organizes job site information and facilitates instant decision-making, while troubleshooting site problems and managing day-to-day operations. This structured approach to data management reduces errors and associated rework, and allows productivity and performance of field crews to be monitored and analyzed.

Advanced communications help realize significant savings by eliminating the time and cost of driving data files to and from the field. Intelligent wireless data sync functionality ensures that all crews and the data manager are using the latest information. Engineers can send design changes and work orders to field crews, who can transfer progress reports, on-site problems, and as-built data back to the office at the touch of a button. This connectivity reduces delays and increases the likelihood that projects finish on time and under budget.

The Right Tools for the Job

Trimble SCS900 is available on the Trimble Site Tablet and TSC3 controllers. It is easy to learn and can be paired with Trimble GNSS or total station equipment for site control, high accuracy site measurement, grade checking and stakeout operations.

Ideal for contractors in highways, site preparation, earthworks, landfill, waste disposal and mining.

Trimble.
The Construction Technology Standard
www.trimble.com

File: 022482-2331A-2 Datasheet - SCS900 Site Controller Software.pdf

TRIMBLE SCS900 SITE CONTROLLER SOFTWARE

Take Control of the Job Site

Contractors can use Trimble SCS900 Site Controller Software for:

- Establishing and checking site control for GNSS or total station operations
- Performing initial site measurement and verification of original ground levels
- Measuring and locating existing site features
- Checking finished grade and laid material thickness against design elevations and tolerances
- Computing progress and material stockpile volumes
- Doing stake out for earthworks, side slopes, catch points, roads, utilities, finished grade, pads and structures
- Managing, monitoring, and conducting quality control for excavation and grading operations
- Assessing as-built measurements and generating high quality reports for record keeping, client approvals and payment
- Ensuring that all job crews and data managers are working from the latest designs and information

Roading Module

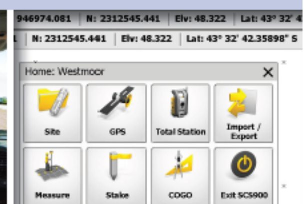
The Trimble SCS900 Roading Module supports road and highway projects by incorporating full alignment geometry, station equations, width transitions and multiple roadways within a selected road job. The Roading Module provides a single solution to all road staking needs—from roadway features to catch points to custom subgrades. In addition, the grade checking functions allow contractors to easily perform as-built checks and quality control.

Advanced Measurement Module

The Trimble SCS900 Advanced Measurement Module improves informed decision-making by capturing additional information with each measured point; for example, photos, dimensions, conditions and material type add more valuable information about a feature than just its position. This information can be remotely sent back to the office and analyzed in Business Center – HCE.

PN 022482-2331A-2 (11/12)

Specifications subject to change without notice.



YOUR SITECH® HEAVY CIVIL CONSTRUCTION TECHNOLOGY PROVIDER

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Trimble Heavy & Highway Division
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Westminster, Colorado 80021
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+1-937-245-5154 Phone
+1-720-587-4685 Fax
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Am Prime Parc 11
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ASIA-PACIFIC
Trimble Navigation
Singapore PTE Ltd.
80 Marine Parade Road
#22-06, Parkway Parade
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+65 6348 2212 Phone
+65 6348 2232 Fax

www.trimble.com

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DIFFERENTIAL GPS (DGPS) SITE OPERATIONAL ASSESSMENT

NDGPS Site: Card Sound DGPS Site (808)
Inspector(s): LT Michael Brashier, CWO3 William Iozzino
Date: 26JUN13

REFERENCES:
(1) DGPS Concept of Operations, COMDTINST 16577.2 (AUG 1995)
(2) 2010 Federal Radio Navigation Plan
(3) Broadcast Standard for the USCG DGPS Navigation Service, CIM 16577.1 (APR 1993).
(4) RTCM Recommend Standards for Differential GNSS Service, Version 2.3.

PURPOSE:

- Validate advertised DGPS coverage of the Card Sound DGPS site.
- Validate required RTCM message scheduling and delivery.
- Test differential correction accuracy versus a predetermined survey monument.

EQUIPMENT:
Trimble SPS461 Receiver
Trimble GA 530 Antenna

CARD SOUND DGPS SITE PARAMETERS:

Frequency	314 KHz
Forward Output Power	900 W
Transmission Rate	200 baud
Field Strength/Range	100μV/m (40.0 dBμV/m) at 261 km

RESULTS:
Signal Strength:
A verification of the Card Sound DGPS coverage area was conducted from the Cape Canaveral, FL to Key West, FL. The minimum service range for the Card Sound site is 261 km. Figure 1 below displays adequate signal strength, beyond the advertised and predicted coverage area. Green points represent areas of satisfactory signal strength. Areas of unsatisfactory signal strength are represented with red points. Far-Field (FF) signal strength readings were taken at the northern part of the advertised range ring from both sides of the site (Table 1). All readings were above the required 40.0 dBμV/m for signal strength.

Figure 1: Signal Strength Results

Side	Signal Strength	Signal to Noise ratio	Position
A	47 dBµV/m	15 dBµV/m	27 46.5381059 N, 080 26.844806
B	Side B was NMC at the time of the verification		

Table 1: North Far-Field Signal Strength Reading (measured w/ a Trimble SPS461)

RTCM Message Verification:
RTCM message scheduling, receipt, and content were checked during the assessment (Table 2 and 3). RTCM message scheduling on both Side A and Side B was validated with the DGPS watch and is in accordance with reference (3). Receipt of all RTCM messages was validated utilizing a Remote Desktop session whereby the assessment team witnessed the on time receipt of all messages on the Side B Integrity Monitor. All message content was verified and is in accordance with reference (4) with the exception of the Card Sound road location in the Type 7 message. **The position provided is 1.6 km to the east, which is 1.0 km greater then allowed.**

File: CardSound_FL_DGPS_OA_June2013.pdf

Message Type	Received	Scheduled	Content Verified/Accurate
Type 3	Y	Y	Y
Type 5 (ensure message is not being transmitted)	N	N	N/A
Type 7	Y	Y	N
Type 9	Y	Y	Y
Type 16	Y	Y	Y

Table 2: Side A RTCM Message Validation

Message Type	Received	Scheduled	Content Verified/Accurate
Type 3	Y	Y	Y
Type 5 (ensure message is not being transmitted)	N	N	N/A
Type 7	Y	Y	N
Type 9	Y	Y	Y
Type 16	Y	Y	Y

Table 3: Side B RTCM Message Validation

Accuracy Validation:

Positional data was collected for 10 minutes per side using the Trimble SPS 461 DGPS receiver. The data was then post processed and compared to a National Geodetic Survey (NGS) marker to verify the horizontal accuracy of the broadcast correction (Table 4 and 5). Side A was 0.3664 meters bearing 068.3°, from the monument. While side B was 0.5097 meters, bearing 047.7°, from the monument. As per reference (1) and (2), both distances are well within advertised accuracy requirements. A comparison between the GPS satellites in view at the Card Sound site and the NGS monument was conducted (Table 6) to identify any differences in the GPS satellite geometry; significant differences in satellite geometry could lead to greater position error. In this case, there were seven satellites in view by both the RS/IM and Trimble receiver located at the NGS monument. A minimum of four satellites are required to generate a two dimension correction. Furthermore a two dimension radial review of the same time period was conducted for the integrity monitors. Side A's average deviation was 0.09421 meters; Side B's average deviation was 0.09892 meters. Both findings were consistent with the findings observed in the field.

1
2 File: CardSound_FL_DGPS_OA_June2013.pdf

NGS Monument ID:	**BBCB90**
Monument LAT:	25° 46' 16.83617" N
Monument LON:	080° 08' 40.02387" W

Averaged LAT:	25° 46' 16.840560" N
Averaged LON:	-80° 08' 40.011634" W
Distance from DGPS Site:	49.8 km
Antenna Distance from Monument:	0.3664 m/1.20'
Antenna Bearing from Monument:	068.33°

Table 4: Side A Accuracy Check Results

Averaged LAT:	25° 46' 16.847285"
Averaged LON:	-80° 08" 40.010348"
Distance from DGPS Site:	49.8 km
Distance from Monument:	0.5097 m/1.67'
Bearing from Monument:	47.73 °

Table 5: Side B Accuracy Check Results

Antenna Location	***GPS Satellites Tracked (PRN)***											
Reference Station A	1	14	16	18	20	22	25	29	31	32		
Integrity Monitor A	1	14	16	18	20	22	25	29	31	32		
Reference Station B	1	14	16	20	22	25	31	32				
Integrity Monitor B	1	14	16	18	20	22	25	29	31	32		
NGS Monument Location, Side A	14	16	20	22	25	31	32					
NGS Monument Location, Side B	14	16	20	22	25	31	32					

Table 6: GPS Satellite Comparison

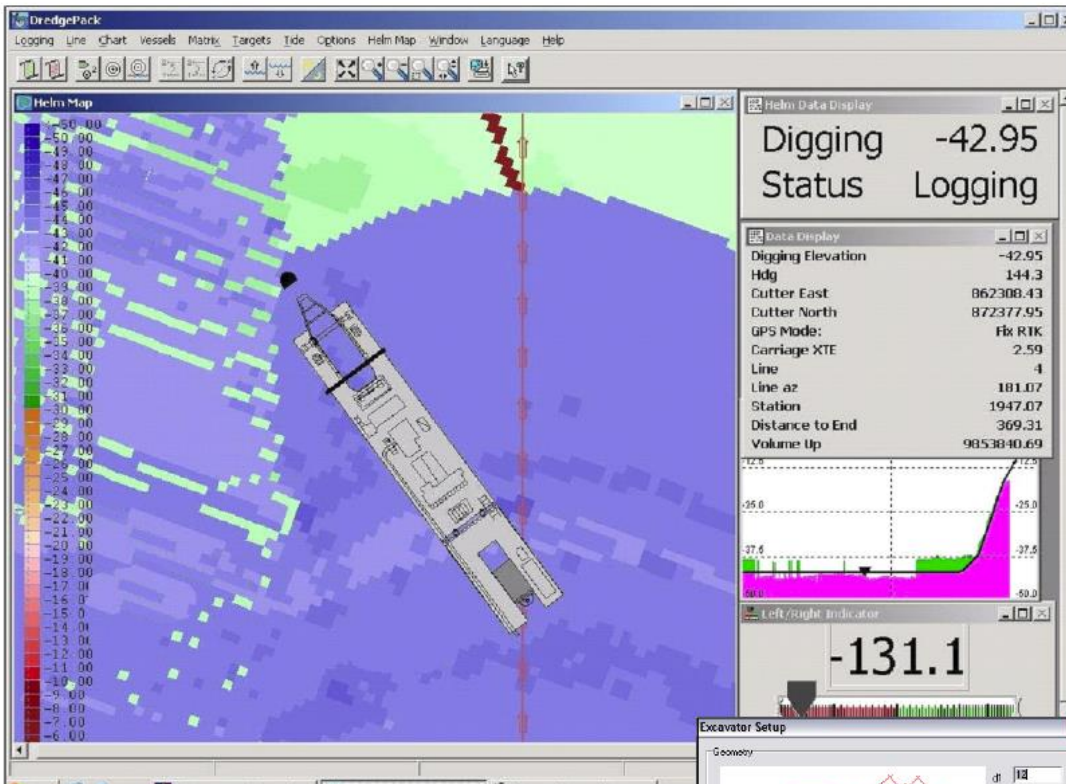
SUMMARY:

The Operational Assessment of the Cape Canaveral DGPS site revealed that the provided coverage is consistent with the predicted coverage area and advertised range. Far-Field signal strength readings exceeded minimum service requirements. Additionally the site performed as expected throughout the predicted coverage area. Overall site performance was exceptional with only one discrepancy noted in the RTCM Type 7 message.

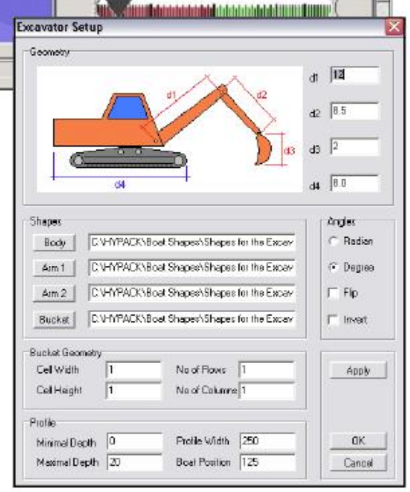
DREDGEPACK®

Real Time Dredging Information

for Excavators and Cutter Suction, Hopper and Bucket Dredges



- **Precise digging over complex plans**
- **Real time visualization:**
  - **Plan view**
  - **Sectional views**
  - **3DTV Perspective view**
- **Work in depth or elevation mode.**
- **Satisfies USACE Silent Inspector requirements.**
- **OPC Network capable.**



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DREDGEPACK® provides operators with precise digging information, showing the exact position of your dredge and digging tool in your channel. Using any XYZ file of survey data, the program creates the 'As Surveyed' surface that represents your starting point. An 'As Dredged' surface is then modified based on the position and depth of the cutting tool.

DREDGEPACK® provides real time cross section information, showing the 'As Surveyed' and 'As Dredged' sections against the Channel Plan section. This allows for precise digging on side slopes and in complex channel areas.

Real time sections in **DREDGEPACK®** can be:

- Perpendicular to Vessel
- Perpendicular to Centerline
- Parallel to Vessel
- Parallel to Centerline
- Arc Profile (Using Spud to Tool distance as arc radius.)

DREDGEPACK® also provides real time output to satisfy reporting requirements. The USACE Silent Inspector requirements are a standard part of the software. It can output selected parameters to a radio modem or across a network, making the operational parameters available to other systems.

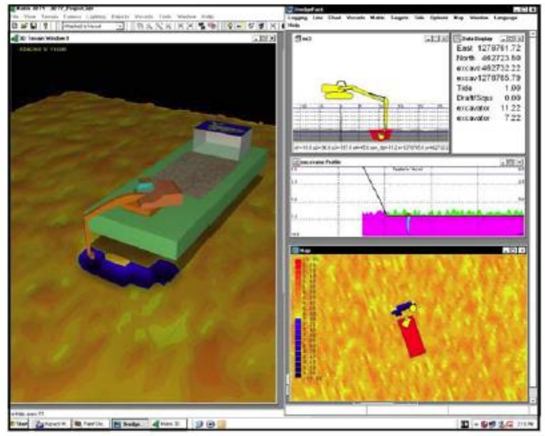
DREDGEPACK® is a special adaptation of HYPACK®, one of the most widely-used hydrographic surveying packages in the world. It contains all of the modules necessary to:

- Define your project geodesy
- Configure the hardware on the dredge
- Create the 'As Surveyed' surface
- Create your channel design plan
- Perform real time monitoring and visualization

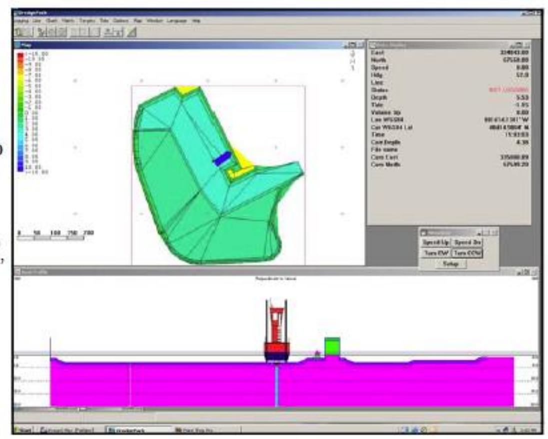
DREDGEPACK® has been successfully installed on:

- Hopper dredges
- Cutter suction dredges
- Vacuum dredges
- Clamshell and bucket dredges
- Excavators

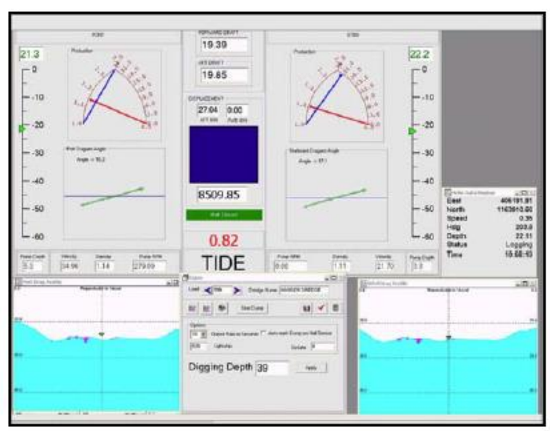
HYPACK, Inc.
56 Bradley St.
Middletown, CT 06457 USA
Web: www.hypack.com
Sales: sales@hypack.com
Phone: 860-635-1500
Fax: 860-635-1522



3D Visualization with an excavator integrated in DREDGEPACK®.



A real time cross section through the complex dredging plan.



Customized display for hopper dredge using OPC Network.

File: DREDGEPACK_Brochure.pdf

EXHIBIT “E”

CORRESPONDENCE

Gator Dredging - Employment Application & Drug Free Workplace Policy
Thursday, August 13, 2015 3:04 PM

From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

To:
"andrew.desalvo@yahoo.com" <andrew.desalvo@yahoo.com>

- **4 Files**
- 2 MB
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Dear Applicant,

Thank you for your interest in employment with Gator Dredging. We are required by law to inform you at the time of application that we are a drug free workplace.

Gator Dredging does require applicants to maintain a valid Driver's License.

The Employment Application must be completed in its entirety.

Please read, initial and sign where indicated on the attached Drug-Free Workplace Policy acknowledging your receipt of the policy.

You may email, mail, fax (#727-499-9890), or return in person your completed Employment Application and your signed Drug-Free Workplace Acknowledgement.

If you have any questions please do not hesitate to contact me.

EMAIL:
To Return your Employment Application & Drug-Free Workplace Acknowledgement via Email from the Adobe Reader Program:
(1) Go to "**FILE**"
(2) Go to **"ATTACH TO EMAIL"**

Thank you and will look forward to hearing from you.

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

Survey Crew Chief
Thursday, August 13, 2015 3:05 PM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"andrew.desalvo@yahoo.com" <andrew.desalvo@yahoo.com>

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Surveyor Crew Chief (Revised).doc
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Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

Andrew DeSalvo Fw: Survey Crew Chief
Thursday, August 13, 2015 3:20 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

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Seattle WA

August 13, 2015

Christy L. Vanderpool Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Survey Crew Chief

Andrew DeSalvo
telephone: (206)579-5021
andrew.desalvo@yahoo.com

To whom it may concern; / Dear Christy

Thanks for the opportunity to present a letter of introduction and resume for your consideration, for the Land Surveyor position.

I am a former resident of Tarpon Springs, FL.

I am available to travel within forty eight hours of transmittal of your offer for employment; and, I can begin work within forty eight hours of arrival on site.

My primary responsibility is to make exact measurements using surveying instruments to determine property boundary, shape, contour, location, elevation, or dimension of land and features on the surface of the earth for engineering, map making, land evaluation, construction, and other purposes.

I have training and experience necessary to stake construction projects at a very high rate of production, and to inspect construction projects (as built) using engineering drawings, CAD software, and robotic surveying instruments.

I record survey measurements and descriptive data using notes, drawings, and sketches; position and hold optical targets to measure angle, distance, and elevation; position and hold rods for bench mark and cross-section elevations; and search for section corners, property corners, and traverse points.

I operate surveying instruments and measuring equipment including robotic total station; data collectors; spirit and laser levels; steel tapes; target rods; Philadelphia rods; and leveling rods.

I have experience directly applicable to your requirements for PRIOR EXPERIENCE, as follows:

BATHYMETRIC/HYDROGRAPHIC
* City of Bellevue, WA - Lake Washington: bottom position, elevation, and location for subsurface utility pipeline.

ELEVATION CERTIFICATE
* Town of Cortlandt, Village of Buchanan, NY – vertical control survey (third order) differential level method; Federal Emergency Management Agency (FEMA) Elevation Certificate (EC); project elevation: 39 feet above sea level.

ENERGY

* Mississippi Canyon Block 252 Macondo Wellbore - as a Constituent Services Intern for the Office of Congressman Scott Murphy (NY-20); an investigation of existing sources of information for Eastern Gulf of Mexico Planning Area Lease Sale 224 Information included a small part of the Eastern Gulf of Mexico Planning Area, more than 125 miles off the Florida coast and completely west of the Military Mission Line: initial exploration plan; final bid recap; blocks and active leases by planning area; oil spill financial responsibility; Congressional findings on accounting with respect to royalties on oil and gas; Department of the Interior Departmental Manual; Part 118: Minerals Management Service Chapter 1: Creation, Objectives, and Functions; mc252 macondo well bore diagram and map; schematics, pressure tests, diagnostic results and other data about the malfunctioning blowout preventer.

* Operation Gasbuggy, T 29 N. R 4 W New Mexico Principal Meridian, Rio Arriba County, New Mexico - independent investigation of existing sources of information for well logs (including nuclear explosive emplacement/reentry well) for the first underground nuclear experiment for the stimulation of low-productivity gas reservoirs by U.S. Atomic Energy Commission, U.S. Department of the Interior (Bureau of Mines), and El Paso Natural Gas Company.

Please call (206)579-5021 to schedule an interview. I look forward to a discussion of your specific requirements for the position.

Yours sincerely,

/ SIGNED

Andrew DeSalvo

enclosure: resume

Andrew J. DeSalvo telephone: 206.579.5021 andrew.desalvo@yahoo.com

SURVEYING TECHNICIAN

Provide data relevant to the shape, contour, gravitation, location, elevation, or dimension of land or features on or near the surface of the Earth for engineering, map making, mining, land evaluation, construction, and other purposes. Make exact measurements and determine property boundaries.

EXPERIENCE

2003 to present- field party chief; instrument operator; and rod man. Accurate Survey, Albuquerque, NM; Baseline Engineering, Tacoma WA; TEC Civil Engineering Consultants, Reno, NV; Industrial Contract Services, Grand Forks ND; Perteet Inc., Everett WA; Gilson Engineering, Draper UT; CTS, Bellevue, WA; Harlan King, Reno, NV; Adel Construction Co., Newark, DE; Surveys Southwest, Albuquerque NM

DISTINGUISHING CHARACTERISTICS

* Exercise of judgment to determine the best approach to data collection in field operations, without immediate access to a professional land surveyor (PLS) and professional engineer (PE).
* Use of civil engineering, architectural, and land surveying rules, procedures, and manuals.
* Read engineering and architectural drawings, and record field notes using drafting standards.

ESSENTIAL TASKS

* American Land Title Association (ALTA) survey; property boundary survey; research of legal description, deed, and plat;
* Global Positioning System - static, differential (DGPS), and real-time kinetic (RTK) field techniques.
* Coordinate geometry (COGO); triangulation; trilateration; resection for LiDAR orientation system.
* Construction staking; station and offset for center-line control; slope staking; topographic survey.
* Hydrographic and bathymetric survey; wetlands survey; aerial orthometric photogrammetry.

HARDWARE

* Spirit level, laser level, and digital level; Philadelphia rod, plumb bob; steel tape; target rod.
* Hand-held peripheral data collector; wireless peripheral data collector for robotic total station.
* Total station: Trimble; Leica; Pentax; Nikon; Topcon
* NAVSTAR Global Positioning Systems: Leica; Trimble; Topcon.

SOFTWARE

* Autodesk AutoCAD Land Desktop and Civil 3D; ESRI ArcGIS; Carlson Survey 2013; Tripod Data Systems (TDS) Spectra Precision Survey Pro; Trimble Access for General Survey; Trimble Survey Controller Data Collection Software; Topcon TopSURV 8; Leica LISCAD Surveying & Engineering Software; Pentax FieldGenius 2012; Bentley MicroStation.
* Earth Gravitational Models (EGM96, EGM08); Global Navigation Satellite System (GLONASS); Digital Elevation Model (DEM) 7.5-minute series; Digital Terrain Models (DTM); Digital Line Graphs (DLG).

ENVIRONMENT

* Metes and bounds cadastral system; Public Land Survey System (PLSS).
* Remote sites; travel for extended periods; extreme altitude; all weather bivouac (110F to -20F).
* Pack forty pounds; walk, stand, and bend for extended periods; all terrain.
* Maritime - onshore; offshore; piloting and seamanship on boats from 8 feet to 135 feet length over all.
* Navigation: dead reckoning; celestial navigation; tide and current data.

EDUCATION and TRAINING

* Central New Mexico School of Applied Technologies ; course in Autodesk Land Desktop (LDT) 2007; create and edit point data, parcel area computations, and boundary information.
* Villanova University Bachelor of Science; courses in calculus, computer science, statistics, construction engineering, management, public speaking, composition, logic, navigation, meteorology, plane surveying.

AWARDS

Delaware Department of Transportation DOT award; Delaware Department of Transportation Construction Excellence Award; Small Business Administration Research Advocate (2003)-New Mexico District.

PRIME CONTRACTS:

ENERGY
* Mid American Energy Center, Council Bluffs, IA – pipeline: reconnaissance of Public Land Survey System monuments and recovery of survey control monuments for location of centerline station and offset.
* New York State Electric and Gas, Somers, NY – right-of-way: retracement of control survey for three phase alternating current (AC) overhead power transmission lines.
* Mississippi Canyon Block 252 Macondo Wellbore - as a Constituent Services Intern for the Office of Congressman Scott Murphy (NY-20); an investigation of existing sources of information for

Eastern Gulf of Mexico Planning Area Lease Sale 224 Information included a small part of the Eastern Gulf of Mexico Planning Area, more than 125 miles off the Florida coast and completely west of the Military Mission Line: initial exploration plan; final bid recap; blocks and active leases by planning area; oil spill financial responsibility; Congressional findings on accounting with respect to royalties on oil and gas; Department of the Interior Departmental Manual; Part 118: Minerals Management Service Chapter 1: Creation, Objectives, and Functions; mc252 macondo well bore diagram and map; schematics, pressure tests, diagnostic results and other data about the malfunctioning blowout preventer.
* Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA) – independent investigation of existing sources of information pertaining to efforts to dispel the confusion and secrecy currently associated with wellbore surveying and to enable the industry to produce consistent, reliable estimates of performance for wellbore survey tools.
* Operation Gasbuggy, T 29 N. R 4 W New Mexico Principal Meridian, Rio Arriba County, New Mexico - independent investigation of existing sources of information for well logs (including nuclear explosive emplacement/reentry well) for the first underground nuclear experiment for the stimulation of low-productivity gas reservoirs by U.S. Atomic Energy Commission, U.S. Department of the Interior (Bureau of Mines), and El Paso Natural Gas Company.

SUBDIVISION
* Heritage Hills Condominiums, Somers, NY – a subdivision: control survey retracement, 1100 acres.
* Washoe County, NV – various subdivisions: control survey; station and offset for centerline control; GPS construction staking for placement of utilities, curb, gutter, and sidewalk; total length in excess of 15 miles; (PLSS).
* Brenford Station, Smyrna, DE - a subdivision: control survey and retracement.

WETLANDS AND SPECIAL HABITAT
*Ice Pond Corporation, Patterson, NY - a habitat area of special significance: control survey retracement, 110 acres.

MINING
* Port of Seattle, WA Seattle-Tacoma International Airport third runway fill embankment - mine survey: monitor position of hinge point and catch point for cut slope of off-site borrow pits; volume 16.5 million cubic yards.

BATHYMETRIC/HYDROGRAPHIC
* City of Bellevue, WA - Lake Washington: bottom position, elevation, and location for subsurface utility pipeline.

RAILROAD
* Cumbres and Toltec Scenic Railroad Commission, CO/NM – railroad profile: research and budget estimate for track alignment, replacement of rail ties (30,000) and ballast (46,000 tons) - "Americas Longest & Highest Narrow Gauge Railroad"; historic and cultural property; length of project: 59 miles, elevation 9000 feet; (PLSS).

BRIDGE
* State of New York Department of Transportation, Region Eight, Poughkeepsie, NY - Peekskill Hollow Road, Putnam Valley Road Design Improvement Project (CR21): as-built survey for bridge;

length of project: 2.5 miles.

PUBLIC PROPERTY
* US Bureau of Land Management, Taos Resource Area, NM - National Environmental Protection Act (NEPA) Environmental Assessment (EA) reconnaissance survey with field notes; size of subject lands: 640 acres; (PLSS).
* Bernalillo County Metropolitan Courthouse, Albuquerque, NM – as-built survey; size of structure: 244,000 square feet with nine floors.
* Snohomish County Public Works, WA Cathcart Maintenance Facility – construction staking for placement of building, traffic control, utility and storm drainage, cut and fill, sub grade.

ELEVATION CERTIFICATE
* Town of Cortlandt, Village of Buchanan, NY – vertical control survey (third order) differential level method; Federal Emergency Management Agency (FEMA) Elevation Certificate (EC); project elevation: 39 feet above sea level.

HIGHWAY
* Porcupine Forest Road Repair, a super - elevated roadway project situated in the US Department of the Interior National Park Service Denali Park and Preserve, Denali Borough, AK, and designed by CH2MHill for the US DOT Federal Highway Administration Western Federal Lands Division - examination of plans for proposed project and existing sources of information for survey control data, center line, and profile. Length of project: 1.692 miles.
* Bothell Crossing, WA – aerial photogrammetric topographical survey: vertical control survey monument recovery; placement of targets for aerial photography.
* City of Everett, WA Evergreen Way – control survey retracement; recover property boundary monuments; as-built survey for road profile and sub-surface utility location, on-street traffic equipment
* City of Woodenville, WA SR202 / NE 177TH Place Improvements– (high traffic volume): WashDOT vertical control survey (third order) differential level method, GPS control survey retracement, elevation survey, railroad crossing survey, overhead utility location, curb, gutter, and sidewalk location, road profile
* DelDOT Lancaster Pike, Hockessin, DE – DelDOT triangulated control survey (third order) retracement; vertical control survey (order G - general) differential level method; DelDOT monument recovery; construction staking for placement of curb, gutter, and sidewalk.
* DelDOT SR141, Wilmington , DE – DelDOT triangulated control survey (third order) retracement; construction staking for placement of curb, gutter, and sidewalk.
* DelDOT SR141 and SR 100, Wilmington, DE (DOT Award) – DelDOT triangulated control survey (third order) retracement; construction staking for placement of underground utilities, curb, gutter, and sidewalk.
* DelDOT SR141 and Rockland Road, Wilmington, DE (Construction Excellence Award) – DelDOT triangulated control survey retracement; construction staking for placement of underground utilities, curb, gutter, and sidewalk.
* DelDOT SR1 AND SR1A, Rehoboth Beach, DE – (high traffic volume): DelDOT triangulated control survey (third order) retracement; station and offset centerline control. Length of project: 3.5 miles.

SPECIAL SITUATIONS
* 455th ECE Engineering Services Support, at Bagram Air Field, Afghanistan - examination of plans

for proposed project and existing sources of information for surveys, maps, and geodetic monuments set by the US Government for horizontal and vertical control. KS International (Sallyport Global) subcontract under URS Corporation prime contract with the US Airforce Contract Augumentation Program (AFCAP) rapid response contingency contract for US Government entities needing urgent assistance.

* Deputy Undersecretary of Defense for Business Transformation Task Force to Support Improved Department of Defense (DoD) Contracting and Stability in Iraq - examination of plans for proposed project and existing sources of information for reconstruction using the Iraqi Geospatial Reference System (IGRS) based on Continuously Operating Reference Stations (CORS) to support differential global positioning system (DGPS) techniques, and a high accuracy reference network (HARN) with control stations.

Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy
Friday, August 14, 2015 10:41 AM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
andrew.desalvo@yahoo.com

- **3 Files**
- 2 MB
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ONLINE-DRUG-FREE WORKPLACE POLICY.pdf
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ONLINE-Application for Employment.pdf
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ONLINE-DRUG-FREE WORKPLACE ACK.pdf
498KB
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Christy L. Vanderpool Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Boat Operator (Homestead)

To whom it may concern;

I am interested in the Boat Operator (Homestead) position. I recently completed a Criminal Offender Record Investigation.

I worked this summer at GLACIER PARK NATIONAL PARK SERVICE COMPLEX, Rising Sun on St. Mary Lake, West Glacier, MT. I was trained as boat captain operating launches 45 feet length over all.

I am accustomed to extreme WORK ENVIRONMENTS, including Remote sites; travel for extended periods; extreme altitude; all weather bivouac (110F to -20F); lift 100 pounds; pack forty pounds; walk, stand, and bend for extended periods.

Please call me at (206)579-5021 to schedule an interview, at your earliest convenence.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

enclosure: resume

Andrew J. DeSalvo telephone: (206)579-5021 andrew.desalvo@yahoo.com

SAILING COACH; SAILING INSTRUCTOR

ESSENTIAL TASKS- SAILING
* sailing instructor of beginner, intermediate, and advanced sailing courses; cruising courses; racing courses
* Steer and operate vessels, using radios, depth finders, radars, lights, buoys, or lighthouses.
* Compute positions, set courses, and determine speeds, using charts, area plotting sheets, compasses, sextants, and knowledge of local conditions.
* Inspect vessels to ensure efficient and safe operation of vessels and equipment and conformance to regulations.
* Measure depths of water, using depth-measuring equipment.
* Direct or coordinate crew members or workers performing activities such as loading or unloading cargo, steering vessels, operating engines, or operating, maintaining, or repairing ship equipment.
* Monitor the loading or discharging of cargo or passengers.
* Calculate sightings of land, using electronic sounding devices and following contour lines on charts.
* Signal passing vessels, using whistles, flashing lights, flags, or radios.
* Maintain boats or equipment on board, such as engines, winches, navigational systems, fire extinguishers, or life preservers.
* Signal crew members or deckhands to rig tow lines, open or close gates or ramps, or pull guard chains across entries.

EXPERIENCE

* SAILING INSTRUCTOR (2015 summer season) CITY OF SEATTLE MT. BAKER SAILING CENTER. Courses of Instruction: Mount Baker High School Sailing Team; Summer Racing – Fun Friday Night Racing; Sunday Open Sailing; Youth Sailing Camp - ALL skill levels (ages 10-18). Requirements: experience in sailing; strong communication and teamwork skills; First Aid/CPR certification; passed criminal background check. Vanguard 15, length 15.09 ft., beam 5.60 ft., draft

3.28 ft, sail area 77.50 sq. ft.. weight 190 lbs. Laser, length 13.78 ft., beam 4.56 ft., draft 2.62 ft, sail area 75.99 sq. ft.. weight 130 lbs.

* ASSISTANT MANAGER (2015 pre-season) GLACIER PARK BOAT COMPANY. GLACIER PARK NATIONAL PARK SERVICE COMPLEX, Rising Sun on St. Mary Lake, West Glacier, MT. Trained as LIMITED MASTER waters onshore interpretive boat captain and Assistant Manager working a cash register selling tickets, renting small watercraft (kayaks, canoes, rowboats, and motor boats), and leading short guided hikes.

* Hudson River Sloop Clearwater, Inc., Kingston, NY. Apprentice (2015 winter season). Responsible for maintenance tasks, including sanding, painting, varnishing, cleaning, organizing, moving wood, and various small carpentry projects including removal and replacement of wooden boom (60 ft length) under the direction of maintenance coordinator. Clearwater, Length: 106 ft (32 m) overall; Beam: 25 ft (7.6 m); Draft: 8 ft (2.4 m); Propulsion: sail; auxiliary engine; Sail plan: mainsail, main topsail, jib, 4305 sq ft. (387.5 m^2) total sail area. Architect: Cyrus Hamlin; Builder: 1968, Harvey Gamage Shipyard, South Bristol, Maine.

*NATIONAL PARK SERVICE NORTH CASCADES COMPLEX, Stehekin, WA. GUIDE (2014 summer season) Stehekin Fishing Adventures, special-use authorization permit holder on Lake Chelan. Operating small boat with outboard motor, fishing for kokanee, trout, and king salmon. Responsible for care of equipment, meeting clients, and promoting lake trips. On call guide for fly fishing walk and wade, and river float trips.

* Chesapeake Bay Maritime Museum St. Michaels, MD - Head Sailing Instructor (summer 2013 season). Responsible for planning and executing the sailing program; supervise and participate in instruction of basic, intermediate, and advanced classes; manage two assistant sailing instructors and one volunteer launch operator; establish reliable, enthusiastic presence with good judgment and leadership; effective use of parents and volunteers; physically assist students in launching, rigging and storing boats; ensure a safe, organized, and educational waterfront and fleet; preparation, planning and daily review of sailing instructions, notice to mariners, and report of program attendance.

* Atlantic Class Association Rules Committee, Stamford CT – public relations specialist. Engage in promoting or creating an intended public image for one design amateur yacht racing association. Confer with production or support personnel to produce or coordinate production of cable television coverage of national championship regatta. Write or select material for release to various communications media. Study the objectives, promotional policies, or needs of organizations to develop public relations strategies that will influence public opinion or promote ideas, products, or services.

* Croton Sailing School, Croton, NY - sailing instructor. Rainbow Class, designed for the Annapolis Sailing School in 1961. (Sparkman & Stephens, naval architects.) LOA: 24'2", LWL: 17'3", Beam: 6'3", Draft: 3'6", displacement: 2,200 lb., ballast 1,100 lb. (cast iron), Hull: Fiberglass, Sail Area: 214 sq. ft. Sail Inventory: Main, Storm Jib, 2 Genoa jibs and Spinnaker. Fabricate, set up, and repair rigging, cradle supporting structures, hoists, and pulling gear, using hand and power tools.

* Ole M. Amundsen, Inc., Greenwich CT - rigger; painter. Set up or repair rigging for boats up to 30 feet length over all; operate, maintain, or repair equipment, such as winches, cranes, derricks; handle

lines to moor vessels to docks, to moor docks and floats, or to rig towing lines; match color specifications or original colors, then stir and thin the paints, using spatulas or power mixing equipment; sand surfaces between coats of paint or primer to remove flaws and enhance adhesion for subsequent coats; remove accessories from boats and mask other surfaces with tape or paper in order to protect them from paint.

GUIDE; RECREATION INSTRUCTOR

* GUEST SERVICE REPRESENTATIVE (2013-2014 season) SKI SANTA FE, Santa Fe, NM. Present group sales and guest services information, including upcoming events, frequent user benefits, lodging and dining facilities, conditions report, and mountain sports activities. Provide a variety of lift tickets, lessons and workshops. Assist with planning for events, accommodations, dining, arts and culture.

* MUSEUM EDUCATOR, TOUR OFFICE ASSISTANT (2014 fall season) GEORGIA O'KEEFFE MUSEUM - Abiquiu Home, Santa Fe, NM. Collaborate and consult with the Tour Office Coordinator, provide support for the day-to-day operations, process, procedure and systems. Schedule tours by internet, phone, and customer contact. Engage with visitors in a positive manner. Work with colleagues to implement program and activities. Provide support to Director of Historic Properties. Customer facing experience, cash handling experience, office administration, operate computer sales program and Blackbaud ticketing program.

*GUIDE (2014 summer season) NORTH CASCADES NATIONAL PARK SERVICE COMPLEX, Stehekin, WA. Operating small boat with outboard motor for Stehekin Fishing Adventures, special-use authorization permit holder on Lake Chelan, fishing for kokanee, trout, and king salmon. Responsible for care of equipment, meeting clients, and promoting lake trips. On call guide for fly fishing walk and wade, and river float trips.

Chadds Ford Historical Society, Chadds Ford, PA - guide (2014 spring season) tours of historic John Chads and Barns-Brinton house museums on Brandywine Battlefield, regarding 18th century ways of life, and 18th century crafts for demonstration purposes, including wood-fired cookery. Research project pertaining to capital improvement and conservation easements, with guidance and task assignment from Executive Director and Education Coordinator.

Terrapin Adventures, Savage MD - guide (2013 fall season); completed a challenge course training program and worked as a challenge course guide, with knowledge of equipment, courses, geography, geology, history, ecology, and wildlife of the area. Duties & Responsibilities: Lead guests on tours including zip lines, climbing wall, challenge course, hiking, fishing, geo-caching, team building of both youth and adult groups.

Action Adventures, Montrose CO - guide (August, 2013) Scouting and camping in the Uncompahgre Wilderness; prepare meals for clients; pack-in and setup camps; strike and pack-out camps; daily camp chores.

Silverleaf Resorts Lee, MA - recreational assistant (summer 2012 season). Responsible for watching the pools while members swim and maintain the cleanliness of the pool area. Conduct recreation activities with groups. Organize and promote activities, such as arts and crafts, sports, games, music, dramatics, social recreation, camping, and hobbies, taking into account the needs and interests of individual members.

Great Alaska International Adventure Vacations, Sterling AK – camp assistant (2011 summer season); recreational fishing camp on the Kenai Peninsula as a driver, guide, and camp assistant, to fill a mid-season vacancy on 48 hour travel notice. My work included daily transportation driving 15 passenger vans, and passenger sedans, for travel and tours from Anchorage to Kenai Peninsula; to Seward, including hiking tours and shipboard tour escort; and transportation from camp to recreational fishing launch sites.

United States Capitol Guide Service, Washington, D.C. – guide (1998-1999). Completed training program and gave guided tours of the United States Capitol Building for the education and enlightenment of the general public", for groups of fifty people including high school students, adults, and diplomats.

SEAMANSHIP, SMALL BOAT HANDLING, and PILOTING
* Onshore; offshore; boats 8 feet to 135 feet length over all; sail; inboard; outboard.
* Celestial navigation; dead reckoning; piloting; tide, and current data; Global Positioning System (GPS); LORAN; nautical charts.

EQUIPMENT
* fixed and mobile cranes; fork lifts; swedging tools; hand tools
* dingy, centerboard, and keel boats; gaff rigs; Marconi rigs with fixed and running backstays

SEAMANSHIP, SMALL BOAT HANDLING, and PILOTING
* Onshore; offshore; boats 8 feet to 135 feet length over all; sail; inboard; outboard.
* Celestial navigation; dead reckoning; piloting; tide, and current data; Global Positioning System (GPS); LORAN; nautical charts.

YACHT RACING
* S-Boat Racing Association - Competitor, Long Island Sound Championship (summer season 1993, 1994) – sailing from Larchmont Yacht Club, New York
* International Star Class Yacht Racing Association - Competitor, World Championship (1990) - sailing from Cleveland Yachting Club, Ohio. Follia, Star yacht 7354, 22.7' x 5.7' x 3.3') Ranked eighty sixth in the world. (Competitor, Bedford Pitcher Regatta) - sailing from Cedar Point Yacht Club, Connecticut – runner-up, 1990.
* Atlantic Class Association - Competitor, National Championship (summer season 1988-1993). A-12 (ex- Briggs S. Cunningham, Spindrift) LOA: 30'7"; Dspl: 4,559 lbs.; Beam: 6'6"; Draft: 4'9"; Sail Area Main & Jib: 377 sq. ft.; Spinnaker: 217 sq. ft. (1929, W. Starling Burgess, naval architect). Sailing from Cold Spring Harbor Beach Club (Cold Spring Harbor, NY); Cedar Point YC (Westport,CT); Niantic Bay YC (Niantic, CT) Also, special staff to the Atlantic Class Association Rules Committee.
* J-Class Association - (summer season 1989). Endeavour (1934: Camper & Nicholsons, J Class Sloop, ex T.O.M. Sopwith, 130' x 22' x 15'8"). Sailing from New Bedford Rhode Island on Buzzards Bay, and sailing from North Cove Yacht Basin, New York City on Manhattan Harbor.
* Flying Scot - 1987 (Gordon K. Douglass, designer) LOA 19'; Beam 6'7"; draft 3'11"; weight 676 lbs; main & jib area 190 sq. ft; spinnaker area 200 sq. ft. Sailing from Candlewood Yacht Club, Fairfield CT.
* Hobie Cat 16 (Hobie Alter, designer) LOA 16'7"; Beam 7'11"; draft 10" weight 320 lbs; sail area

main and jib 218 sq. ft.
* Hobie Cat 18 (Hobie Alter, designer) LOA 18', Beam 8'; weight 400 lbs; draft 10", centerboard 2'6"; sail area main & jib 240 sq ft.

CRUISING YACHTS
* Pearson Ensign – (1959: Carl Alberg, naval architect) LOA 22'6"; LWL 16'9"; Beam 7' weight 3000 lbs. sail area, main and jib 235 sq. ft.

YACHT TENDERS
* Sequoia (1931, Defoe Boat Works, ex "Honey Fitz" presidential yacht) Length: 92' 3" x 16' 6" x 4' 10" Cruising Speed: 12 knots Weight: 88 tons, sailing from Newport, Rhode Island.

SPORTFISHING YACHTS
* Sunnyside Up (Egg Harbor Yachts, Length 37' beam 13' 6" displacement 28,500 lbs) sailing the waters of Long Island Sound, off the coast of New York and Connecticut.

LAUNCHES
* Little Chief, 45-foot carvel planked launch with cedar on an oak frame authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection. Original name was Rising Wolf, placed in Saint Mary Lake, Glacier National Park. Great Northern Railroad commissioned Captain Swanson in 1925, to build Little Chief
* Morning Eagle, 45-foot carvel planked launch with cedar on an oak frame, authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection. built for Glacier Park Boat Company, in 1945. Original name was Big Chief and was placed on Swiftcurrent Lake. In the spring of 1975, Morning Eagle launched on Lake Josephine, Glacier National Park, and has never been removed. All maintenance on-site.
* Chief Two Guns, 45-foot marine plywood hull launch with batten seam construction authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection, built for Glacier Park Boat Company, in 1960. Placed on Swiftcurrent Lake, Glacier National Park.
* Joy II, 41-foot marine fiberglass hull launch authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection, built in 1984, for Glacier Park Boat Company. Original name International II, operated out of Waterton, Canada, in support of the Prince of Wales Hotel. In 1986, her name changed to Joy II and she was transported across the border and launched on St. Mary Lake, Glacier National Park.

SPORTFISHING YACHTS
* Sunnyside Up (Egg Harbor Yachts, Length 37' beam 13' 6" displacement 28,500 lbs) sailing the waters of Long Island Sound, off the coast of New York and Connecticut.

SAILINGS
* state of Alaska, waters of Resurrection Bay, Nuka Bay; Aialik Bay: Blying Sound, Gulf of Alaska; Kenai River, from Seward Small Boat Harbor; Bings Landing
* state of Connecticut, waters of the Long Island Sound, from Cedar Point YC; Niantic YC; Pequot YC; Candlewood YC
* state of Maryland, waters of Chesapeake Bay including Baltimore harbor.
* state of Massachusetts, waters of Buzzards Bay, Salem Sound, Nahant Bay from New Bedford YC; Eastern YC
* state of New York, waters of the Long Island Sound, from Larchmont YC; American YC; New

York Athletic Club YC; New York YC; Manhattan YC; Cold Spring Harbor Beach Club; Hudson River, from Shattemuc YC; Croton YC.
* state of Ohio, waters of Lake Erie, from Cleveland YC; Lorain YC
* state of Rhode Island, waters of Newport Harbor, Block Island Sound; Fishers Island Sound, from Watch Hill YC; Newport YC; Ida Lewis YC; New York Yacht Club
* state of Washington, waters of Puget Sound: Shilshole Bay YC; Lake Chelan

EDUCATION and TRAINING
* Villanova University-Bachelor of Science. Courses in civil engineering, composition, computer science, construction management; business management, public speaking, logic, navigation, meteorology, plane surveying.
* Red Cross First Aid/CPR

WORK ENVIRONMENT
* Remote sites; travel for extended periods; extreme altitude; all weather bivouac (110F to -20F).
* Pack forty pounds; walk, stand, and bend for extended periods.
* Guide for groups up to fifty people, including adults and children.

LICENSE and REGISTRATION

* US Department of Agriculture Forest Service, Department of Interior Bureau of Land Management –
Special Use authorization for commercial use of public lands.
* Department of Game and Fish, state of New Mexico - registered outfitter and guide.

Boat Operator (Homestead)

compensation: DOQ
employment type: full-time

Boat Operators/ Tenders
Gator Dredging -- Homestead, FL

Five years minimum boat operating experience -- airboat operations a plus
MUST be motivated and able to work independently
Complete Daily Boat Maintenance Log/Checklist - Mandatory
Comply with safety practices, rules, and regulations while performing job duties and follow company procedure in reporting unsafe conditions or practices.
Maintain all vessel equipment in good working order and ensure that vessel is clean, well-stocked with supplies and spare parts at all times.
Facilitate alignment, movement of boats, or adjustment of machinery, equipment, or materials.
Assist in performing maintenance as needed.
Assist with washing and maintaining boats and equipment in proper working order.
Be in close proximity of work area to anticipate the needs of the crew, prepare tools and operate boats and equipment for crew members for the particular work being performed.
Load, unload, or identify building materials, machinery, or tools.

Keep work areas clean and organized. Pick up scrap wire, discarded materials, etc.
Work as a team and fulfill any and all other duties and tasks as assigned.
Able to work in extreme heat
Able to lift up to 100 lbs
A criminal background investigation will be conducted on the candidate selected for employment
OSHA Certification a plus
Drug Free Work Place/Random Testing
Equal Opportunity Employer
Benefits: Medical, Life and Long Term Disability
IRA Plan Company Match
•Principals only. Recruiters, please

Andrew DeSalvo; Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy

Friday, August 14, 2015 12:47 PM

From:

"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

To:

"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

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Andrew DeSalvo ONLINE-Application for Employment.pdf
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Christy L. Vanderpool Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Boat Operator (Homestead)

Dear Christy

I am interested in the Boat Operator (Homestead) position. I recently completed a Criminal Offender Record Investigation.

I worked this summer at GLACIER PARK NATIONAL PARK SERVICE COMPLEX, Rising Sun on St. Mary Lake, West Glacier, MT. I was trained as LIMITED MASTER boat captain operating launches 45 feet length over all, authorized by the U.S. Coast Guard to carry 49 passengers.

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Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

2 Attachments
954KB

PDF
Andrew DeSalvo ONLINE-Application for Employment.pdf
734KB

PDF
DeSalvo Andrew ONLINE-DRUG-FREE WORKPLACE ACK.pdf

enclosure: resume

Andrew J. DeSalvo telephone: (206)579-5021 andrew.desalvo@yahoo.com

SAILING COACH; SAILING INSTRUCTOR

ESSENTIAL TASKS- SAILING
* sailing instructor of beginner, intermediate, and advanced sailing courses; cruising courses; racing courses
* Steer and operate vessels, using radios, depth finders, radars, lights, buoys, or lighthouses.
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* Ole M. Amundsen, Inc., Greenwich CT - rigger; painter. Set up or repair rigging for boats up to 30 feet length over all; operate, maintain, or repair equipment, such as winches, cranes, derricks; handle lines to moor vessels to docks, to moor docks and floats, or to rig towing lines; match color specifications or original colors, then stir and thin the paints, using spatulas or power mixing equipment; sand surfaces between coats of paint or primer to remove flaws and enhance adhesion for subsequent coats; remove accessories from boats and mask other surfaces with tape or paper in order to protect them from paint.

GUIDE; RECREATION INSTRUCTOR

* GUEST SERVICE REPRESENTATIVE (2013-2014 season) SKI SANTA FE, Santa Fe, NM. Present group sales and guest services information, including upcoming events, frequent user benefits, lodging and dining facilities, conditions report, and mountain sports activities. Provide a variety of lift tickets, lessons and workshops. Assist with planning for events, accommodations, dining, arts and culture.

* MUSEUM EDUCATOR, TOUR OFFICE ASSISTANT (2014 fall season) GEORGIA O'KEEFFE MUSEUM - Abiquiu Home, Santa Fe, NM. Collaborate and consult with the Tour Office Coordinator, provide support for the day-to-day operations, process, procedure and systems. Schedule tours by internet, phone, and customer contact. Engage with visitors in a positive manner. Work with colleagues to implement program and activities. Provide support to Director of Historic Properties. Customer facing experience, cash handling experience, office administration, operate computer sales program and Blackbaud ticketing program.

*GUIDE (2014 summer season) NORTH CASCADES NATIONAL PARK SERVICE COMPLEX, Stehekin, WA. Operating small boat with outboard motor for Stehekin Fishing Adventures, special-use authorization permit holder on Lake Chelan, fishing for kokanee, trout, and king salmon. Responsible for care of equipment, meeting clients, and promoting lake trips. On call guide for fly fishing walk and wade, and river float trips.

Chadds Ford Historical Society, Chadds Ford, PA - guide (2014 spring season) tours of historic John Chads and Barns-Brinton house museums on Brandywine Battlefield, regarding 18th century ways of life, and 18th century crafts for demonstration purposes, including wood-fired cookery. Research project pertaining to capital improvement and conservation easements, with guidance and task assignment from Executive Director and Education Coordinator.

Terrapin Adventures, Savage MD - guide (2013 fall season); completed a challenge course training program and worked as a challenge course guide, with knowledge of equipment, courses, geography, geology, history, ecology, and wildlife of the area. Duties & Responsibilities: Lead guests on tours including zip lines, climbing wall, challenge course, hiking, fishing, geo-caching, team building of both youth and adult groups.

Action Adventures, Montrose CO - guide (August, 2013) Scouting and camping in the Uncompahgre Wilderness; prepare meals for clients; pack-in and setup camps; strike and pack-out camps; daily camp chores.

Silverleaf Resorts Lee, MA - recreational assistant (summer 2012 season). Responsible for watching the pools while members swim and maintain the cleanliness of the pool area. Conduct recreation activities with groups. Organize and promote activities, such as arts and crafts, sports, games, music, dramatics, social recreation, camping, and hobbies, taking into account the needs and interests of individual members.

Great Alaska International Adventure Vacations, Sterling AK – camp assistant (2011 summer season); recreational fishing camp on the Kenai Peninsula as a driver, guide, and camp assistant, to fill a mid-season vacancy on 48 hour travel notice. My work included daily transportation driving 15 passenger vans, and passenger sedans, for travel and tours from Anchorage to Kenai Peninsula; to Seward, including hiking tours and shipboard tour escort; and transportation from camp to recreational fishing launch sites.

United States Capitol Guide Service, Washington, D.C. – guide (1998-1999). Completed training program and gave guided tours of the United States Capitol Building for the education and enlightenment of the general public", for groups of fifty people including high school students, adults, and diplomats.

SEAMANSHIP, SMALL BOAT HANDLING, and PILOTING
* Onshore; offshore; boats 8 feet to 135 feet length over all; sail; inboard; outboard.
* Celestial navigation; dead reckoning; piloting; tide, and current data; Global Positioning System (GPS); LORAN; nautical charts.

EQUIPMENT
* fixed and mobile cranes; fork lifts; swedging tools; hand tools
* dingy, centerboard, and keel boats; gaff rigs; Marconi rigs with fixed and running backstays

SEAMANSHIP, SMALL BOAT HANDLING, and PILOTING
* Onshore; offshore; boats 8 feet to 135 feet length over all; sail; inboard; outboard.
* Celestial navigation; dead reckoning; piloting; tide, and current data; Global Positioning System (GPS); LORAN; nautical charts.

YACHT RACING
* S-Boat Racing Association - Competitor, Long Island Sound Championship (summer season 1993, 1994) – sailing from Larchmont Yacht Club, New York
* International Star Class Yacht Racing Association - Competitor, World Championship (1990) - sailing from Cleveland Yachting Club, Ohio. Follia, Star yacht 7354, 22.7’ x 5.7’ x 3.3’) Ranked eighty sixth in the world. (Competitor, Bedford Pitcher Regatta) - sailing from Cedar Point Yacht Club, Connecticut – runner-up, 1990.
* Atlantic Class Association - Competitor, National Championship (summer season 1988-1993). A-12 (ex- Briggs S. Cunningham, Spindrift) LOA: 30’7”; Dspl: 4,559 lbs.; Beam: 6’6”; Draft: 4’9”; Sail Area Main & Jib: 377 sq. ft.; Spinnaker: 217 sq. ft. (1929, W. Starling Burgess, naval architect). Sailing from Cold Spring Harbor Beach Club (Cold Spring Harbor, NY); Cedar Point YC (Westport,CT); Niantic Bay YC (Niantic, CT) Also, special staff to the Atlantic Class Association Rules Committee.
* J-Class Association - (summer season 1989). Endeavour (1934: Camper & Nicholsons, J Class

Sloop, ex T.O.M. Sopwith, 130’ x 22’ x 15’8”). Sailing from New Bedford Rhode Island on Buzzards Bay, and sailing from North Cove Yacht Basin, New York City on Manhattan Harbor.

* Flying Scot - 1987 (Gordon K. Douglass, designer) LOA 19’; Beam 6’7”; draft 3’11”; weight 676 lbs; main & jib area 190 sq. ft; spinnaker area 200 sq. ft. Sailing from Candlewood Yacht Club, Fairfield CT.
* Hobie Cat 16 (Hobie Alter, designer) LOA 16'7"; Beam 7'11"; draft 10" weight 320 lbs; sail area main and jib 218 sq. ft.
* Hobie Cat 18 (Hobie Alter, designer) LOA 18', Beam 8'; weight 400 lbs; draft 10", centerboard 2'6"; sail area main & jib 240 sq ft.

CRUISING YACHTS

* Pearson Ensign – (1959: Carl Alberg, naval architect) LOA 22’6”; LWL 16’9”; Beam 7’ weight 3000 lbs. sail area, main and jib 235 sq. ft.

YACHT TENDERS

* Sequoia (1931, Defoe Boat Works, ex “Honey Fitz” presidential yacht) Length: 92' 3" x 16' 6" x 4' 10" Cruising Speed: 12 knots Weight: 88 tons, sailing from Newport, Rhode Island.

SPORTFISHING YACHTS

* Sunnyside Up (Egg Harbor Yachts, Length 37' beam 13' 6" displacement 28,500 lbs) sailing the waters of Long Island Sound, off the coast of New York and Connecticut.

LAUNCHES

* Little Chief, 45-foot carvel planked launch with cedar on an oak frame authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection. Original name was Rising Wolf, placed in Saint Mary Lake, Glacier National Park. Great Northern Railroad commissioned Captain Swanson in 1925, to build Little Chief
* Morning Eagle, 45-foot carvel planked launch with cedar on an oak frame, authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection. built for Glacier Park Boat Company, in 1945. Original name was Big Chief and was placed on Swiftcurrent Lake. In the spring of 1975, Morning Eagle launched on Lake Josephine, Glacier National Park, and has never been removed. All maintenance on-site.
* Chief Two Guns, 45-foot marine plywood hull launch with batten seam construction authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection, built for Glacier Park Boat Company, in 1960. Placed on Swiftcurrent Lake, Glacier National Park.
* Joy II, 41-foot marine fiberglass hull launch authorized by the U.S. Coast Guard to carry 49 passengers with current Certificate of Inspection, built in 1984, for Glacier Park Boat Company. Original name International II, operated out of Waterton, Canada, in support of the Prince of Wales Hotel. In 1986, her name changed to Joy II and she was transported across the border and launched on St. Mary Lake, Glacier National Park.

SPORTFISHING YACHTS

* Sunnyside Up (Egg Harbor Yachts, Length 37' beam 13' 6" displacement 28,500 lbs) sailing the waters of Long Island Sound, off the coast of New York and Connecticut.

SAILINGS

* state of Alaska, waters of Resurrection Bay, Nuka Bay; Aialik Bay: Blying Sound, Gulf of Alaska; Kenai River, from Seward Small Boat Harbor; Bings Landing

* state of Connecticut, waters of the Long Island Sound, from Cedar Point YC; Niantic YC; Pequot YC; Candlewood YC
* state of Maryland, waters of Chesapeake Bay including Baltimore harbor.
* state of Massachusetts, waters of Buzzards Bay, Salem Sound, Nahant Bay from New Bedford YC; Eastern YC
* state of New York, waters of the Long Island Sound, from Larchmont YC; American YC; New York Athletic Club YC; New York YC; Manhattan YC; Cold Spring Harbor Beach Club; Hudson River, from Shattemuc YC; Croton YC.
* state of Ohio, waters of Lake Erie, from Cleveland YC; Lorain YC
* state of Rhode Island, waters of Newport Harbor, Block Island Sound; Fishers Island Sound, from Watch Hill YC; Newport YC; Ida Lewis YC; New York Yacht Club
* state of Washington, waters of Puget Sound: Shilshole Bay YC; Lake Chelan

EDUCATION and TRAINING

* Villanova University-Bachelor of Science. Courses in civil engineering, composition, computer science, construction management; business management, public speaking, logic, navigation, meteorology, plane surveying.
* Red Cross First Aid/CPR

WORK ENVIRONMENT

* Remote sites; travel for extended periods; extreme altitude; all weather bivouac (110F to -20F).
* Pack forty pounds; walk, stand, and bend for extended periods.
* Guide for groups up to fifty people, including adults and children.

LICENSE and REGISTRATION

* US Department of Agriculture Forest Service, Department of Interior Bureau of Land Management –
Special Use authorization for commercial use of public lands.
* Department of Game and Fish, state of New Mexico - registered outfitter and guide.

RE: Andrew DeSalvo; Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy
Monday, August 17, 2015 8:29 AM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Hi Andrew,

Thank you for forwarding your information . Tyler McDougal our P.E. will be contacting you today to discuss the Survey and Boat Operating position available with Gator Dredging.

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

Andrew DeSalvo; Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy
Tuesday, August 18, 2015 11:11 AM

From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

August 18, 2015

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy

Dear Christy;

I am interested in the Boat Operator (Homestead) position with Gator Dredging; and, I forwarded the Employment Application & Drug Free Workplace Policy.

Please let me know how to proceed - I have no news from Tyler McDougal, P.E

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

RE: Andrew DeSalvo; Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy
Tuesday, August 18, 2015 2:30 PM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
I just spoke to Tyler he tried to reach you earlier he is going to try and reach you again right now.

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

PLEASE FORWARD RE: Andrew DeSalvo; Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy
Tuesday, August 18, 2015 2:35 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

August , 2015

from the desk of Andrew DeSalvo

SUBJECT: Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy

Dear Christy;

Thanks for your interest in my qualifications for the Boat Operator (Homestead) position.

PLEASE FORWARD my email contact to Tyler, so that we can schedule a telephone INTERVIEW at his convenience.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

On Tue, 8/18/15, Christy Vanderpool - Gator Dredging <Christy@gatordredging.com> wrote:

Subject: RE: Andrew DeSalvo; Boat Operator (Homestead) Re: Gator Dredging - Employment Application & Drug Free Workplace Policy
To: "DeSalvo, Andrew" <andrew.desalvo@yahoo.com>
Date: Tuesday, August 18, 2015, 2:30 PM

I just spoke to Tyler he tried to reach you earlier he is going to try and reach you again right now.

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

Survey Crew Chief Position
Tuesday, August 18, 2015 2:46 PM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"andrew.desalvo@yahoo.com" <andrew.desalvo@yahoo.com>
Mr. DeSalvo,

I would like to speak with you in reference to your injury for survey crew chief position available at our Homestead Branch office in Florida.

Please call me at your earliest convenience to discuss.

Sincerely,

Tyler McDougal, P.E.
Operations Engineering Manager
Gator Dredging
(727) 776-8910
Tyler@gatordredging.com

Sent from my Verizon Wireless 4G LTE DROID

Andrew DeSalvo Re: Survey Crew Chief Position
Tuesday, August 18, 2015 5:07 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>
August 18, 2015

Tyler McDougal, P.E.
Operations Engineering Manager
Gator Dredging
(727) 776-8910
Tyler@gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Survey Crew Chief Position

Dear Mr. McDougal,

Sorry I missed your call today, and thanks for the opportunity to present a letter of introduction and resume for your consideration, for the Land Surveyor position.

I am available to travel within forty eight hours of transmittal of your offer for employment; and, I can begin work within forty eight hours of arrival on site.

My primary responsibility is to make exact measurements using surveying instruments to determine property boundary, shape, contour, location, elevation, or dimension of land and features on the surface of the earth for engineering, map making, land evaluation, construction, and other purposes.

I have training and experience necessary to stake construction projects at a very high rate of production, and to inspect construction projects (as built) using engineering drawings, CAD software, and robotic surveying instruments.

I record survey measurements and descriptive data using notes, drawings, and sketches; position and hold optical targets to measure angle, distance, and elevation; position and hold rods for bench mark and cross-section elevations; and search for section corners, property corners, and traverse points.

I operate surveying instruments and measuring equipment including robotic total station; data collectors; spirit and laser levels; steel tapes; target rods; Philadelphia rods; and leveling rods.

I have experience directly applicable to your requirements for PRIOR EXPERIENCE, as follows:

BATHYMETRIC/HYDROGRAPHIC
* City of Bellevue, WA - Lake Washington: bottom position, elevation, and location for subsurface utility pipeline.

ELEVATION CERTIFICATE

* Town of Cortlandt, Village of Buchanan, NY – vertical control survey (third order) differential level method; Federal Emergency Management Agency (FEMA) Elevation Certificate (EC); project elevation: 39 feet above sea level.

ENERGY

* Mississippi Canyon Block 252 Macondo Wellbore - as a Constituent Services Intern for the Office of Congressman Scott Murphy (NY-20); an investigation of existing sources of information for Eastern Gulf of Mexico Planning Area Lease Sale 224 Information included a small part of the Eastern Gulf of Mexico Planning Area, more than 125 miles off the Florida coast and completely west of the Military Mission Line: initial exploration plan; final bid recap; blocks and active leases by planning area; oil spill financial responsibility; Congressional findings on accounting with respect to royalties on oil and gas; Department of the Interior Departmental Manual; Part 118: Minerals Management Service Chapter 1: Creation, Objectives, and Functions; mc252 macondo well bore diagram and map; schematics, pressure tests, diagnostic results and other data about the malfunctioning blowout preventer.

* Operation Gasbuggy, T 29 N. R 4 W New Mexico Principal Meridian, Rio Arriba County, New Mexico - independent investigation of existing sources of information for well logs (including nuclear explosive emplacement/reentry well) for the first underground nuclear experiment for the stimulation of low-productivity gas reservoirs by U.S. Atomic Energy Commission, U.S. Department of the Interior (Bureau of Mines), and El Paso Natural Gas Company.

Please call (206)579-5021 to schedule an interview. I look forward to a discussion of your specific requirements for the position.

Yours sincerely,

/ SIGNED

Andrew DeSalvo

enclosure: resume

Andrew J. DeSalvo telephone: 206.579.5021 andrew.desalvo@yahoo.com

SURVEYING TECHNICIAN

Provide data relevant to the shape, contour, gravitation, location, elevation, or dimension of land or features on or near the surface of the Earth for engineering, map making, mining, land evaluation, construction, and other purposes. Make exact measurements and determine property boundaries.

EXPERIENCE

2003 to present- field party chief; instrument operator; and rod man. Accurate Survey, Albuquerque, NM; Baseline Engineering, Tacoma WA; TEC Civil Engineering Consultants, Reno, NV; Industrial Contract Services, Grand Forks ND; Perteet Inc., Everett WA; Gilson Engineering, Draper UT; CTS, Bellevue, WA; Harlan King, Reno, NV; Adel Construction Co., Newark, DE; Surveys

Southwest, Albuquerque NM

DISTINGUISHING CHARACTERISTICS

* Exercise of judgment to determine the best approach to data collection in field operations, without immediate access to a professional land surveyor (PLS) and professional engineer (PE).
* Use of civil engineering, architectural, and land surveying rules, procedures, and manuals.
* Read engineering and architectural drawings, and record field notes using drafting standards.

ESSENTIAL TASKS

* American Land Title Association (ALTA) survey; property boundary survey; research of legal description, deed, and plat;
* Global Positioning System - static, differential (DGPS), and real-time kinetic (RTK) field techniques.
* Coordinate geometry (COGO); triangulation; trilateration; resection for LiDAR orientation system.
* Construction staking; station and offset for center-line control; slope staking; topographic survey.
* Hydrographic and bathymetric survey; wetlands survey; aerial orthometric photogrammetry.

HARDWARE

* Spirit level, laser level, and digital level; Philadelphia rod, plumb bob; steel tape; target rod.
* Hand-held peripheral data collector; wireless peripheral data collector for robotic total station.
* Total station: Trimble; Leica; Pentax; Nikon; Topcon
* NAVSTAR Global Positioning Systems: Leica; Trimble; Topcon.

SOFTWARE

* Autodesk AutoCAD Land Desktop and Civil 3D; ESRI ArcGIS; Carlson Survey 2013; Tripod Data Systems (TDS) Spectra Precision Survey Pro; Trimble Access for General Survey; Trimble Survey Controller Data Collection Software; Topcon TopSURV 8; Leica LISCAD Surveying & Engineering Software; Pentax FieldGenius 2012; Bentley MicroStation.
* Earth Gravitational Models (EGM96, EGM08); Global Navigation Satellite System (GLONASS); Digital Elevation Model (DEM) 7.5-minute series; Digital Terrain Models (DTM); Digital Line Graphs (DLG).

ENVIRONMENT

* Metes and bounds cadastral system; Public Land Survey System (PLSS).
* Remote sites; travel for extended periods; extreme altitude; all weather bivouac (110F to -20F).
* Pack forty pounds; walk, stand, and bend for extended periods; all terrain.
* Maritime - onshore; offshore; piloting and seamanship on boats from 8 feet to 135 feet length over all.
* Navigation: dead reckoning; celestial navigation; tide and current data.

EDUCATION and TRAINING

* Central New Mexico School of Applied Technologies ; course in Autodesk Land Desktop (LDT) 2007; create and edit point data, parcel area computations, and boundary information.
* Villanova University Bachelor of Science; courses in calculus, computer science, statistics, construction engineering, management, public speaking, composition, logic, navigation, meteorology, plane surveying.

AWARDS

Delaware Department of Transportation DOT award; Delaware Department of Transportation Construction Excellence Award; Small Business Administration Research Advocate (2003)-New Mexico District.

PRIME CONTRACTS:

ENERGY
* Mid American Energy Center, Council Bluffs, IA – pipeline: reconnaissance of Public Land Survey System monuments and recovery of survey control monuments for location of centerline station and offset.
* New York State Electric and Gas, Somers, NY – right-of-way: retracement of control survey for three phase alternating current (AC) overhead power transmission lines.
* Mississippi Canyon Block 252 Macondo Wellbore - as a Constituent Services Intern for the Office of Congressman Scott Murphy (NY-20); an investigation of existing sources of information for Eastern Gulf of Mexico Planning Area Lease Sale 224 Information included a small part of the Eastern Gulf of Mexico Planning Area, more than 125 miles off the Florida coast and completely west of the Military Mission Line: initial exploration plan; final bid recap; blocks and active leases by planning area; oil spill financial responsibility; Congressional findings on accounting with respect to royalties on oil and gas; Department of the Interior Departmental Manual; Part 118: Minerals Management Service Chapter 1: Creation, Objectives, and Functions; mc252 macondo well bore diagram and map; schematics, pressure tests, diagnostic results and other data about the malfunctioning blowout preventer.
* Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA) – independent investigation of existing sources of information pertaining to efforts to dispel the confusion and secrecy currently associated with wellbore surveying and to enable the industry to produce consistent, reliable estimates of performance for wellbore survey tools.
* Operation Gasbuggy, T 29 N. R 4 W New Mexico Principal Meridian, Rio Arriba County, New Mexico - independent investigation of existing sources of information for well logs (including nuclear explosive emplacement/reentry well) for the first underground nuclear experiment for the stimulation of low-productivity gas reservoirs by U.S. Atomic Energy Commission, U.S. Department of the Interior (Bureau of Mines), and El Paso Natural Gas Company.

SUBDIVISION
* Heritage Hills Condominiums, Somers, NY – a subdivision: control survey retracement, 1100 acres.
* Washoe County, NV – various subdivisions: control survey; station and offset for centerline control; GPS construction staking for placement of utilities, curb, gutter, and sidewalk; total length in excess of 15 miles; (PLSS).
* Brenford Station, Smyrna, DE - a subdivision: control survey and retracement.

WETLANDS AND SPECIAL HABITAT

*Ice Pond Corporation, Patterson, NY - a habitat area of special significance: control survey retracement, 110 acres.

MINING

* Port of Seattle, WA Seattle-Tacoma International Airport third runway fill embankment - mine survey: monitor position of hinge point and catch point for cut slope of off-site borrow pits; volume 16.5 million cubic yards.

BATHYMETRIC/HYDROGRAPHIC

* City of Bellevue, WA - Lake Washington: bottom position, elevation, and location for subsurface utility pipeline.

RAILROAD

* Cumbres and Toltec Scenic Railroad Commission, CO/NM – railroad profile: research and budget estimate for track alignment, replacement of rail ties (30,000) and ballast (46,000 tons) - "Americas Longest & Highest Narrow Gauge Railroad"; historic and cultural property; length of project: 59 miles, elevation 9000 feet; (PLSS).

BRIDGE

* State of New York Department of Transportation, Region Eight, Poughkeepsie, NY - Peekskill Hollow Road, Putnam Valley Road Design Improvement Project (CR21): as-built survey for bridge; length of project: 2.5 miles.

PUBLIC PROPERTY

* US Bureau of Land Management, Taos Resource Area, NM - National Environmental Protection Act (NEPA) Environmental Assessment (EA) reconnaissance survey with field notes; size of subject lands: 640 acres; (PLSS).

* Bernalillo County Metropolitan Courthouse, Albuquerque, NM – as-built survey; size of structure: 244,000 square feet with nine floors.

* Snohomish County Public Works, WA Cathcart Maintenance Facility – construction staking for placement of building, traffic control, utility and storm drainage, cut and fill, sub grade.

ELEVATION CERTIFICATE

* Town of Cortlandt, Village of Buchanan, NY – vertical control survey (third order) differential level method; Federal Emergency Management Agency (FEMA) Elevation Certificate (EC); project elevation: 39 feet above sea level.

HIGHWAY

* Porcupine Forest Road Repair, a super - elevated roadway project situated in the US Department of the Interior National Park Service Denali Park and Preserve, Denali Borough, AK, and designed by CH2MHill for the US DOT Federal Highway Administration Western Federal Lands Division - examination of plans for proposed project and existing sources of information for survey control data, center line, and profile. Length of project: 1.692 miles.

* Bothell Crossing, WA – aerial photogrammetric topographical survey: vertical control survey monument recovery; placement of targets for aerial photography.

* City of Everett, WA Evergreen Way – control survey retracement; recover property boundary monuments; as-built survey for road profile and sub-surface utility location, on-street traffic

equipment
* City of Woodenville, WA SR202 / NE 177TH Place Improvements– (high traffic volume): WashDOT vertical control survey (third order) differential level method, GPS control survey retracement, elevation survey, railroad crossing survey, overhead utility location, curb, gutter, and sidewalk location, road profile
* DelDOT Lancaster Pike, Hockessin, DE – DelDOT triangulated control survey (third order) retracement; vertical control survey (order G - general) differential level method; DelDOT monument recovery; construction staking for placement of curb, gutter, and sidewalk.
* DelDOT SR141, Wilmington , DE – DelDOT triangulated control survey (third order) retracement; construction staking for placement of curb, gutter, and sidewalk.
* DelDOT SR141 and SR 100, Wilmington, DE (DOT Award) – DelDOT triangulated control survey (third order) retracement; construction staking for placement of underground utilities, curb, gutter, and sidewalk.
* DelDOT SR141 and Rockland Road, Wilmington, DE (Construction Excellence Award) – DelDOT triangulated control survey retracement; construction staking for placement of underground utilities, curb, gutter, and sidewalk.
* DelDOT SR1 AND SR1A, Rehoboth Beach, DE – (high traffic volume): DelDOT triangulated control survey (third order) retracement; station and offset centerline control. Length of project: 3.5 miles.

SPECIAL SITUATIONS
* 455th ECE Engineering Services Support, at Bagram Air Field, Afghanistan - examination of plans for proposed project and existing sources of information for surveys, maps, and geodetic monuments set by the US Government for horizontal and vertical control. KS International (Sallyport Global) subcontract under URS Corporation prime contract with the US Airforce Contract Augumentation Program (AFCAP) rapid response contingency contract for US Government entities needing urgent assistance.

* Deputy Undersecretary of Defense for Business Transformation Task Force to Support Improved Department of Defense (DoD) Contracting and Stability in Iraq - examination of plans for proposed project and existing sources of information for reconstruction using the Iraqi Geospatial Reference System (IGRS) based on Continuously Operating Reference Stations (CORS) to support differential global positioning system (DGPS) techniques, and a high accuracy reference network (HARN) with control stations.

Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
Wednesday, August 19, 2015 2:55 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>
Cc:
christy@gatordredging.com

- **2 Files**
- 9 MB
- Download All
-

DOC
Surveyor Crew Chief (Revised).doc
353KB
Save

-

PDF
ML15100A235.pdf
8 MB
Save

Seattle WA

August 19, 2015

Tyler McDougal, P.E.
Operations Engineering Manager
Gator Dredging
(727) 776-8910
Tyler@gatordredging.com

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Survey Crew Chief Position

Dear Mr. McDougal, / Tyler

Thanks for your interest in my qualifications for the Survey Crew Chief Position with Gator Dredging.

I appreciate the opportunity to discuss your specific requirements to support dredging operations for the cooling canal system at Florida Power & Light Turkey Point, Homestead, FL.

I am interested in the field work that you describe; and, I look forward to TRANSMITTAL of your offer for employment.

I suggest that that Gator Dredging make reservations for a hotel room in Homestead, FL, with check-in date of Saturday, August 29, 2015; and, I can start work within forty eight hours, on August 31, 2015.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

1 Attachments
353KB

DOC
Surveyor Crew Chief (Revised).doc
353KB

enclosure

ANNEX I

The cooling canal system for the existing power plants is the dominant feature of the existing Turkey Point site. The existence of the cooling canals has affected the Biscayne Bay and the underlying aquifer. Therefore, the staff closely examined the potential for alterations in the cooling canals as a result of the proposed action. Reliance on reclaimed water for water supply and discharge to deep aquifers for effluent disposal eliminates all direct impacts on the cooling canals during normal operation. The staff closely evaluated indirect effects such as dewatering and demucking during construction, leaching of muck removed during construction, deposition of chemicals from drift off the cooling towers, stormwater runoff, and temporary use of the backup water source and determined the alterations would be minor. Most alterations would be so minor that they would not be detectable.

http://pbadupws.nrc.gov/docs/ML1510/ML15100A235.pdf

ANNEX II

Boat Operator (Homestead)

compensation: DOQ
employment type: full-time

Boat Operators/ Tenders
Gator Dredging -- Homestead, FL

Five years minimum boat operating experience -- airboat operations a plus
MUST be motivated and able to work independently
Complete Daily Boat Maintenance Log/Checklist - Mandatory
Comply with safety practices, rules, and regulations while performing job duties and follow company procedure in reporting unsafe conditions or practices.
Maintain all vessel equipment in good working order and ensure that vessel is clean, well-stocked with supplies and spare parts at all times.
Facilitate alignment, movement of boats, or adjustment of machinery, equipment, or materials.
Assist in performing maintenance as needed.
Assist with washing and maintaining boats and equipment in proper working order.
Be in close proximity of work area to anticipate the needs of the crew, prepare tools and operate boats and equipment for crew members for the particular work being performed.
Load, unload, or identify building materials, machinery, or tools.
Keep work areas clean and organized. Pick up scrap wire, discarded materials, etc.
Work as a team and fulfill any and all other duties and tasks as assigned.
Able to work in extreme heat
Able to lift up to 100 lbs
A criminal background investigation will be conducted on the candidate selected for employment
OSHA Certification a plus
Drug Free Work Place/Random Testing
Equal Opportunity Employer
Benefits: Medical, Life and Long Term Disability
IRA Plan Company Match
•Principals only. Recruiters, please

RE: Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
Wednesday, August 19, 2015 3:33 PM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

- **1 Files**
- 430KB
- Download All
-

DOC
Andrew DeSalvo Offer of Employment.doc
430KB
Save

Good Afternoon Andrew,

I am happy to forward the attached Offer of Employment for the Survey Crew Chief position for your review and signature. If you have any questions please don't hesitate to contact me.

We will look forward to your response and arrival.

Sincerely,

Christy L. VanderpoolI
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

TRANSMITTAL; Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
Thursday, August 20, 2015 12:31 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

- **1 Files**
- 536KB
- Download All
-

PDF
Andrew DeSalvo Offer of Employment.doc.pdf
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Seattle WA

August 20, 2015

Christy L. VanderpoolI Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: TRANSMITTAL; Survey Crew Chief Position, Homestead, FL

Dear Christy;

Please find TRANSMITTAL of the signed Offer of Employment for the Survey Crew Chief position, attached for your records.

I anticipate departure from Seattle WA, on Saturday, August 22, 2015, with limited access to voicemail, and no access to electronic mail while in transit.

PLEASE ADVISE with the following information, prior to close of business on 5PM ET, Friday, August 21, 2015:

1.) address for place of work in Homestead, FL
2.) address for lodging in Homestead, FL.
3.) address, time and date for drug test prior to employment in Homestead, FL.

I can start work on August 31, 2015, within forty eight hours after arrival, on Friday August 28, 2015.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

1 Attachments
536KB

PDF
Andrew DeSalvo Offer of Employment.doc.pdf
536KB

On Wed, 8/19/15, Christy Vanderpool - Gator Dredging <Christy@gatordredging.com> wrote:

Subject: RE: Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
To: "DeSalvo, Andrew" <andrew.desalvo@yahoo.com>
Date: Wednesday, August 19, 2015, 3:33 PM

Good Afternoon Andrew,

I am happy to forward the attached Offer of Employment for the Survey Crew Chief position for your review and signature. If you have any questions please don't hesitate to contact me.

We will look forward to your response and arrival.

Sincerely,

Christy L. VanderpoolI
Office
Manager
Gator Dredging
13630
50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Cell:
727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

RE: TRANSMITTAL; Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
Thursday, August 20, 2015 2:48 PM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

- **3 Files**
- 2 MB
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-

PDF
Turkey Point Access Entry Instructions.pdf
595KB
Save

-

PDF
TURKEY POINT NEW HIRE LOCATIONS.pdf
295KB
Save

-

PDF
HQ to Floridian Hotel.pdf
1 MB
Save

Good Afternoon Andrew:

Welcome aboard! I want to wish you a safe and happy journey to Florida.

Please find attached the directions, address and access information to the Turkey Point Nuclear Facility. You will have accomodations at the Floridian Hotel available on Friday, August 28th (see attached directions/address) Please advise if there will be any changes to your schedule so we may adjust your reservations as needed.

You will have your orientation to Gator Dredging on Monday, August 31st. After completing the new hire process you will be scheduled for your drug test and physical

If you have any questions please don't hesitate to contact me.

Thank you and will look forward to working with you in the near future.

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760

Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

access information RE: Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
Thursday, August 20, 2015 3:38 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

August , 2015

from the desk of Andrew DeSalvo

SUBJECT:

Dear Christy;

Thanks for the Welcome aboard! and wishes for a safe and happy journey to Florida.

I have the directions, address and access information to the Turkey Point Nuclear Facility; and, accommodations at the Floridian Hotel available on Friday, August 28th attached directions/address). Also, PLEASE ADVISE since I will not have cellular phone service at Turkey Point to call Mike Henderson # 912-237-6172, to be escorted onto the property.

PLEASE ADVISE with TIME on Monday, August 31, 2015, and PLACE for orientation, and where the Gator Dredging project is on the property.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

Work & Arrival Details
Friday, August 21, 2015 12:46 PM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"andrew.desalvo@yahoo.com" <andrew.desalvo@yahoo.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

- **13 Files**
- 11 MB
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JPG
image001.jpg
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DOCX
Types of Survey and Quality Control Tasks for RTK GPS.docx
15KB
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PDF
Estimate_200_from_Higgs_Hydrographic_Tek.pdf
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PDF
Estimate_201_from_Higgs_Hydrographic_Tek.pdf
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DOCX
APS-3 configuration .docx
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- PDF
SurvCE Getting Started GPS.PDF
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SurvCE_GPS_Base-Rover.pdf
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SurvCE_V2_Tutorial.pdf
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- PDF
R8S GatorDredging B+R NoTrade NL 7-29-15.pdf
133KB
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- PDF
Trimble R8s Datasheet.pdf
80KB
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- PDF
Trimble_R8s_Configuration_Sheet.pdf
2 MB
Save

Andrew,

Thank you for accepting the offer of employment and look forward to seeing you the week of the 31st of August.

Christy, Mike Henderson (Turkey Point Project Manager) and I are currently working on the details of where and when to report. This job has some required training to complete before your work can begin, so we are figuring out the best way to get you trained and working.

In the meantime, can you review this document I prepared regarding the types of surveys we perform now and in the expected future. I also attached two (2) quotes for RTK GPS equipment (Altus 3X and Trimble R8) to complete those tasks effectively and the associated spec sheets & training. There are 10 attachments in total.

Can you advise if they are appropriate? If not, what you would recommend.

Ideally we will have the proper equipment selected, purchased and delivered so it will be available upon your arrival.

If this is not a wise approach and requires more research – please advise if you can further assist or if you would like to wait until you arrive.

Thanks and we will get you details for your arrival soon.

Sincerely,

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

RESPONSE Re: Work & Arrival Details
Friday, August 21, 2015 2:01 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

- **3 Files**
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DREDGEPACK_Brochure.pdf
2 MB
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PDF
022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf
775KB
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PDF
022482-2230B_TrimbleTablet_DS_0713_LR.pdf
328KB
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August 21, 2015

Tyler McDougal, PE Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: RESPONSE Re: Work & Arrival Details

To whom it may concern; / Tyler

Thanks for your correspondence, Date: Friday, August 21, 2015, 12:46 PM.

Please find a response by the numbers, as follows:

Work & Arrival Details, at 1.) Thank you for accepting the offer of employment and look forward to seeing you the week of the 31st of August.

RESPONSE, Work & Arrival Details, at 1.): My pleasure, and I look forward to meeting you all.

Work & Arrival Details, at 2.) Christy, Mike Henderson (Turkey Point Project Manager) and I are currently working on the details of where and when to report. This job has some required training to complete before your work can begin, so we are figuring out the best way to get you trained and working.

RESPONSE, Work & Arrival Details, at 2.): a.) Please contact me via the Floridian Hotel in Homestead, FL; b.) I have your attachment for the Altus Field Training 10 hour day Altus field training estimate - is this the required training to complete before your work can begin, that you reference?

Work & Arrival Details, at 3.) In the meantime, can you review this document I prepared regarding the types of surveys we perform now and in the expected future. I also attached two (2) quotes for RTK GPS equipment (Altus 3X and Trimble R8) to complete those tasks effectively and the associated spec sheets & training. There are 10 attachments in total.

RESPONSE, Work & Arrival Details, at 3.) I will review the document you prepared regarding the types of surveys we perform now and in the expected future; and I will review the attached two (2) quotes. QUESTION: Please describe 6" disc; and 2" disc, referenced as follows: • Shallow water 0' – 10' depth pre-dredge hand surveys with lightweight (carbon fiber rod with 6" disc) pole • Shallow water 0' – 10' depth progress and post-dredge hand surveys with heavier (steel rod with 2" disc).

Work & Arrival Details, at 4.) Can you advise if they are appropriate? If not, what you would recommend.

RESPONSE, Work & Arrival Details, at 4.)

a.) PLEASE ADVISE with RATIONALE FOR DECISION and names and addresses of INTERESTED PARTIES who specified HARDWARE: Altus 3X; Trimble R8; and SOFTWARE: Carlson SurvCE;

b.) see Offer of Employment, EXHIBIT "A", enclosed below: A New RTK system you can spec for your use: PRELIMINARY INVESTIGATION: DREDGEPACK (see ANNEX I, enclosed below) and Trimble RTK GPS (see ANNEX II, enclosed below) for survey data from GPS (differential and RTK techniques) and conventional surveying methods. Also, How Civil 3D is useful for Dredging? (see ANNEX III, enclosed below);

c.) see Offer of Employment, EXHIBIT "A", enclosed below: new high end laptop for quality performance: PRELIMINARY INVESTIGATION: Trimble Site Tablet Fully-functional Field Tablet (see ANNEX II B.); AND WHATEVER YOU HAVE IN STOCK as a desktop computer with large monitor and data collector docking station that GATOR Information Technology can install in my hotel in Homestead, and access from Clearwater, via the Internet;

Work & Arrival Details, at 5.) Ideally we will have the proper equipment selected, purchased and delivered so it will be available upon your arrival.

RESPONSE, Work & Arrival Details, at 5.) Suggest you postpone purchase until we complete SCOPE OF INVESTIGATION for the hardware and software, and until we have consensus between INTERESTED PARTIES including Operations Engineering, Information Technology, Project Manager, et al.

Work & Arrival Details, at 6.) If this is not a wise approach and requires more research – please advise if you can further assist or if you would like to wait until you arrive.

RESPONSE, Work & Arrival Details, at 6.) Please see RESPONSE, at 4., and RESPONSE, at 5.); and, please see correspondence, dated August 20, 2015 SUBJECT: Offer of Employment – Survey Crew Chief (EXHIBIT "A", enclosed below).

Work & Arrival Details, at 7.) Thanks and we will get you details for your arrival soon.

RESPONSE, Work & Arrival Details, at 7.) Please contact me via the Floridian Hotel in Homestead, FL. Please note that I will not have email or mobile telephone communications in transit, after 5PM PT on Friday August 21, 2015. My cellular phone carrier has NO COVERAGE in the state of Florida. Please issue a company cellular phone.

Yours sincerely,

/ SIGNED

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

3 Attachments
3 MB

PDF
DREDGEPACK_Brochure.pdf
2 MB

PDF
022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf
775KB

PDF
022482-2230B_TrimbleTablet_DS_0713_LR.pdf
328KB

enclosure

EXHIBIT "A"

August 20, 2015 SUBJECT: Offer of Employment – Survey Crew Chief,

August 20, 2015

Tyler McDougal, P.E. Operations Engineering Manager
Gator Dredging
(727) 776-8910
Tyler@gatordredging.com

from the desk of Andrew DeSalvo

SUBJECT: Offer of Employment – Survey Crew Chief

Dear Tyler;

Thanks again for your interest in my qualifications for the Survey Crew Chief Position.

I will start work on August 31, 2015, within forty eight hours after arrival on Friday August 28, 2015.

Please find my opinion pertaining to Offer of Employment – Survey Crew Chief - Planned equipment for use:

1.) A New RTK system you can spec for your use: PRELIMINARY INVESTIGATION: DREDGEPACK (see ANNEX I, enclosed below) and Trimble RTK GPS (see ANNEX II, enclosed below) for survey data from GPS (differential and RTK techniques) and conventional surveying methods. Also, How Civil 3D is useful for Dredging? (see ANNEX III, enclosed below);

2.) new high end laptop for quality performance: PRELIMINARY INVESTIGATION: Trimble Site Tablet Fully-functional Field Tablet (see ANNEX II B.); AND WHATEVER YOU HAVE IN STOCK as a desktop computer with large monitor and data collector docking station that GATOR Information Technology can install in my hotel in Homestead, and access from Clearwater, via the Internet;

3.) dedicated survey truck for your use or proper car allowance, PRELIMINARY INVESTIGATION: WHATEVER YOU HAVE IN STOCK; OR, (see ANNEX IV, enclosed below) as you suggested, F-150 Regular Cab XL Wheelbase - 6.5' Box; Tonneau Pickup Box Cover - Hard (or aftermarket steel toolbox) Optional; 4x4 Optional (subject to your discretion) OR JEEP Wrangler or Wrangler Unlimited;

Also, I have a preliminary design for a method for improving data collection process for a one-man marine deployed land surveying system which may be adapted to surveying the cooling canal system, the dominant feature of the existing Turkey Point power plant site.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

3 Attachments
3 MB

PDF
DREDGEPACK_Brochure.pdf
2 MB

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022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf
775KB

PDF
022482-2230B_TrimbleTablet_DS_0713_LR.pdf
328KB

enclosure

ANNEX I

DREDGEPACK® is designed to save you money. It keeps your crew working in the dredge cut and prevents them from wasting time and money by digging too deep or outside the channel. DREDGEPACK® is designed to work with cutter suction, hopper, bucket and excavator operations.

Using tools in DREDGEPACK®, your SURVEY data is loaded into a color coded matrix. Your survey data can come from single beam data, multibeam data or multiple transducer data. DREDGEPACK® will monitor the exact position and depth of the digging tool and keep track of an 'As Dredged' surface. You'll be able to see exactly where your digging tool is in plan view and in profile view. You'll also be able to see the channel design depth and channel overdepth in profile view.

Dredging plans can be simple channels or complex surfaces, as created in the ADVANCE CHANNEL DESIGN program.

For a cutter suction dredge, typical inputs to DREDGEPACK® are a directional DGPS and an inclinometer to determine the angle of the ladder arm. DREDGEPACK® integrates to several commercially available inclinometers, or can read existing equipment using OPC Network interfaces or analog/digital cards.

For more information on cutter suction or auger dredges please visit Ellicott Dredges www.dredge.com and IMS Dredges www.imsdredge.com

For a hopper dredge, DREDGEPACK® also needs to be able to determine the exact draft of the vessel. Typical inputs for a hopper system include DGPS, ship's gyro, and a bubbler system that provides forward/aft draft information and depth information at one or two points on each ladder arm.

DREDGEPACK® is being used on many excavator operations. Typical inputs are a DGPS (or RTK DGPS), heading sensor and 3-inclinometer systems (Ocala, eTrac, Prolec, etc.).

URL: http://www.hypack.com/new/Sales/Products/DREDGEPACK/tabid/60/Default.aspx

Attachments PDF DREDGEPACK_Brochure.pdf 2 MB

ANNEX II

A.) HYDROpro and Trimble marine construction GPS sensors such as the Trimble SPS855 GNSS Modular Receiver and SPS555H Heading Add-on can be installed on several types of waterway dredging machines, including:

•Dredging excavators

It offers specialized tools for:
•Positioning dredge vessels, barges, tugs and other construction vessels

http://construction.trimble.com/products/marine-systems/hydropro-software

Terramodel HDMS is a family of powerful software tools for the marine surveying and construction industry. With full drafting, design and visualization functionalities, you can generate an entire map of your wet construction project in just seconds.

The Terramodel® HDMS core module allows you to quickly import Trimble HYDROpro™ survey data into a project structure that is suitable for the way hydrographic data is handled and presented

http://construction.trimble.com/products/marine-systems/terramodel-hdms

Attachments PDF 022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf 775KB

B.) Trimble Site Tablet Fully-functional Field Tablet
•Connect your office to the construction site with a cellular modem, laptop, GPS and controller in one device
Use the Trimble Site Tablet and SCS900 Site Controller Software with a Trimble SPS GNSS Receiver or Total Station for:
•Measuring and verifying original ground levels and site features
•Monitoring real-time cut/fill information
•Checking finished grade and laid material thickness against design elevations and tolerances
•Computing progress and material stockpile volumes
•Monitoring, and conducting quality control for earthworks and paving operations
•Assessing as-built measurements and generating high quality reports for record keeping, approvals, and payment purposes
•Synchronizing design and field data via the Internet

Water . . . . Immersible in 1 meter of water for 30 minutes, IP65,
MIL-STD-810F, Method 512.4,
Procedure I, Water Jet 12.5 mm dia.
@ 2.5–3 m, 100 Liter/min

Operating system. . . . . Microsoft® Windows® 7

http://construction.trimble.com/products/site-positioning-systems/trimble-site-tablet

Attachments PDF 022482-2230B_TrimbleTablet_DS_0713_LR.pdf 328KB

C.) Trimble SPS855 Modular GNSS Receiver is a fully upgradable receiver that can be configured in a variety of ways:
•As a Rover only with Location RTK accuracy and Precise Vertical
•As a Rover only with Precision RTK accuracy

http://construction.trimble.com/products/site-positioning-systems/sps855-gnss-modular-receiver

D.) Steering Systems

Trimble offers assisted and automated steering options to help keep your farming vehicles on line-so you can focus on other farming tasks. With the added benefit of terrain compensation technology, you can operate in difficult terrain conditions while minimizing skips, overlaps, and guess rows.

http://www.trimble.com/Agriculture/autopilot/

The Trimble® EZ-Pilot® assisted steering system provides high-accuracy steering at an affordable price. When you are driving your vehicle, the EZ-Pilot system turns the wheel for you with a compact electric motor drive using guidance from Trimble displays to help keep you on line and improve your efficiency.

http://www.trimble.com/Agriculture/ez-pilot.aspx

E.) LOCATE A DEALER AND REQUEST A DEMO

Measutronics Corporation
P.O. Box 5800
Lakeland, FL 33807-5800
United States
Phone: 863-644-8712
Lou_Nash@Measutronics.com
measutronics.com

ANNEX III

AutoCAD Civil 3D General Discussion Harbor Design & Dredging

http://forums.autodesk.com/t5/autocad-civil-3d-general/harbor-design-dredging/td-p/2351830

How Civil 3D is useful for Dredging?

Typical use is:
- import hydrographic survey xyz and breakline data to create existing bathymetric surface
- add channel boundaries and specify batters to create desired channel configuration
- volume surface calcs
- utilise geotechnical module to import sediment borehole data - create sediment surfaces and show cross-section profiles
- calculate volumes of different sediment types to be dredged and visualisation of sediment strata
- overlay dredging footprint on aerial photography and environmental constraints maps - e.g. calculation of environmental offset payments
- plot out pipeline lengths, deposition areas, fill depths, etc.

http://forums.autodesk.com/t5/autocad-civil-3d-general/how-civil-3d-is-useful-for-dredging/td-p/5613663

ANNEX IV

F-150 Regular Cab XL Wheelbase - 6.5' Box
Standard Features XL
Equipment Group 100A
• 3.5L V6 Ti-VCT engine with Flex Fuel Capability
• Electronic six-speed automatic transmission with tow/haul mode
• AdvanceTrac® with RSC® (Roll Stability Control™)
• Trailer Sway Control
Cruise control option
Tonneau Pickup Box Cover - Hard (or aftermarket steel toolbox)
Optional
4x4
Optional

OBSERVATIONS: Carlson Software Fw: Work & Arrival Details
Friday, August 21, 2015 3:33 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>

- **5 Files**
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DOCX
Types of Survey and Quality Control Tasks for RTK GPS.docx
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PDF
SurvCE Getting Started GPS.PDF
557KB
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PDF
SurvCE_GPS_Base-Rover.pdf
169KB
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PDF
SurvCE_V2_Tutorial.pdf
2 MB
Save

-

PDF
MC-Catalog-Feb2014-Final-web.pdf
6 MB
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August 21, 2015

Tyler McDougal, PE Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910

Email:tyler@gatordredging.com
www.gatordredging.com

from the desk of Andrew DeSalvo

MEMORANDUM FOR: Tyler McDougal, PE Operations Engineering Manager

SUBJECT: OBSERVATIONS: Carlson Software Fw: Work & Arrival Details

1.) Thanks for your correspondence, Date: Friday, August 21, 2015, 12:46 PM Re: Work & Arrival Details.

2.) Please find REFERENCE "From the President's Desk" and OBSERVATIONS of my personal experience with Carlson Software, with FINDINGS and an OPINION, as follows;

REFERENCE

"From the President's Desk: Carlson Software Carlson SurvCE is the most popular third party data collection solution. Our software production is now led by Dave Carlson, who heads up the best programming team in the industry.

http://www.carlsonsw.com/about/companyinfo/

Carlson Machine Control's machine guidance and fleet management solutions for mining, quarrying, dredging and landfill operations".

http://www.carlsonsw.com/?s=dredging

3.) OBSERVATIONS

I was a guest of Bruce Carlson for a tour at the Carlson Software Research and Development laboratories in Massachusetts; and I was a guest of Bruce Carlson for dinner with the Carlson Software Research and Development.

Bruce Carlson told me that Dave Carlson, his nephew, was hired at the request of the brother of Bruce Carlson. I was offered a position with Carlson Software Research and Development laboratories in Colorado; and, I did not accept the position due to NO CONFIDENCE in the civil engineering training and land surveying mathematical knowledge of Dave Carlson, Executive V.P. of Development.

URL: http://www.carlsonsw.com/about/companyinfo/

4.) FINDINGS

Preliminary research investigation would show that Carlson Software is a third party data collection solution; Carlson Machine Control is the software solution for dredging; Randy Noland is Vice President of Business Development, and Director of Machine Control for Carlson Software.

URL: http://www.carlsonsw.com/about/companyinfo/

For those who have already made a receiver investment, there is a good chance that Carlson software is compatible and can maximize your previous investments. Call us with the brand and model number and we will discuss compatibility (see Attachments PDF MC-Catalog-Feb2014-Final-web.pdf 6 MB).

URL: http://www.carlsonsw.com/wordpress/wp-content/uploads/2014/02/MC-Catalog-Feb2014-Final-web.pdf

5.) OPINION

I believe that Carlson Software may not be suitable the primary specification for Gator Dredging; and, Carlson Software may not compatible for those who have already made a receiver investment. Also, I believe that liability for latent product defect may be limited by the capitalization of Carlson Software, a privately held company. NOTE: Carlson Software is not my primary specification for Gator Dredging.

Yours sincerely,

/ SIGNED

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

5 Attachments
9 MB

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Types of Survey and Quality Control Tasks for RTK GPS.docx
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169KB

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SurvCE_V2_Tutorial.pdf
2 MB

PDF
MC-Catalog-Feb2014-Final-web.pdf
6 MB

enclosure

ANNEX I

Designed for Dredging Equipped Excavators
For Excavators dredging from land or water
Most productive
calibration routine
on the market.
200% faster!

• Plan and profile views showing barge, excavator position and real-time depth information
• Real-time update of cut/fill/on-grade relative to DTM file
• Supports most GNSS receivers with the world's most extensive GNSS library
• Barge and excavator independent monitoring/visualization
• Support of angle sensors, flowmeters, and absolute or relative encoders
• Multiple attachment support
• Supports multi-boom, multi-stick and tilt bucket

Key Features

• Supports multiple surface file types directly including DXF and DWG
• Cut/Fill color map
• GSM remote support
• Ability to visualize progress in blind, underwater cuts
• Calculations menu - inverse, points on a line, create a CL from series of points, etc.
• Newly improved slope routine
• PDF output of points stored
• Coordinate editor
• Localization editor and global projections
• Unique calibration routine that is accurate and 200% faster

Special Features

• Flowmeter support means no sensors directly on the bucket for harsh environments
• Hydraulic grabber support with open/close monitoring (no sensors on the grab!)
• Add your own custom tool attachment or machine design
• Log files recorded locally for post analysis
• Compatible with Carlson Machine Control's Fleet Manager Office™

Dredging

• Software configurable for:
• Single and dual axis
• Angularity
• ID and baud rates
• CANbus emulation

• All sensors pre-calibrated in the factory so they can easily be replaced in the field with no recalibration
• Sensors have same connectors so cables can be installed bidirectionally
• Protective mounting plates and shield covers available
• Rugged! IP69K. Submersible up to 25 meters!
• Stainless steel construction for salt water applications

Hardware Components
Carlson offers a turn-key hardware and software solution including the CBx6 Control Box Console with integrated GNSS option, axial sensors, external GNSS receivers and wireless mesh infrastructure for connectivity to meet your management needs.
For those who have already made a receiver investment, there is a good chance that Carlson software is compatible and can maximize your previous investments. Call us with the brand and model number and we will discuss compatibility.

Hardware Components
Heading Options
MC Pro Vx6
Base Station Options
Sensors
All in one unit!
VSx6
User defined heading for larger machines such as shovels, draglines and platform drills.
BRx5
Mobile Base Station
Rx5
Permanent Base Station
Carlson Dual Axis/Angular Sensor
Measures pitch and roll of machine to provide better accuracies

Hardware Components
Carlson offers a turn-key hardware and software solution including the CBx6 Control Box Console with integrated GNSS option, axial sensors, external GNSS receivers and wireless mesh infrastructure for connectivity to meet your management needs.
For those who have already made a receiver investment, there is a good chance that Carlson software is compatible and can maximize your previous investments. Call us with the brand and model number and

we will discuss compatibility.
3-year
warranty!
CBx6 Control Box Console
GNSS Inside
A42 Antenna
Supervisor Rugged Microsoft Windows 7 Tablet PC

URL: http://www.carlsonsw.com/wordpress/wp-content/uploads/2014/02/MC-Catalog-Feb2014-Final-web.pdf

LEASE versus PURCHASE for PROCUREMENT of COMPUTER SOFTWARE, HARDWARE
Fw: Work & Arrival Details
Friday, August 21, 2015 4:36 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

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R8S GatorDredging B+R NoTrade NL 7-29-15.pdf
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p946.pdf
3 MB
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August , 2015

from the desk of Andrew DeSalvo

MEMORANDUM FOR: Tyler McDougal, PE Operations Engineering Manager Gator Dredging; Christy Vanderpool Office Manager Gator Dredging

SUBJECT: LEASE versus PURCHASE for PROCUREMENT of COMPUTER SOFTWARE, HARDWARE Fw: Work & Arrival Details

OBSERVATIONS

1.) Computers and peripheral equipment are considered 5 year property under General Depreciation System (GDS);

2.) computer software can be depreciated if acquired in connection with the acquisition of a business, and it may also qualify for the section 179 deduction and the special depreciation allowance. If you can depreciate the cost of computer software, use the straight line method over a useful life of 36 months.

FINDINGS

1.) I believe that computer hardware and software has minimal residual value (see PDF R8S GatorDredging B+R NoTrade NL 7-29-15.pdf) in FINANCIAL ANAYLSIS of PROCUREMENT of COMPUTER SOFTWARE, HARDWARE

2.) I believe Operations Engineering should request that the GATOR Accounting Department present FINANCIAL ANAYLSIS of LEASE versus PURCHASE for PROCUREMENT of COMPUTER SOFTWARE, HARDWARE (see PDF R8S GatorDredging B+R NoTrade NL 7-29-15.pdf 133KB).

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

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enclosure

ANNEX I

Publication 946
Cat. No. 13081F
How To
Depreciate
Property
•Section 179 Deduction
•Special Depreciation
Allowance
•MACRS
•Listed Property
For use in preparing
2014 Returns

Eligible Property

To qualify for the section 179 deduction, your property must be one of the following types of depreciable prop-erty.

5. Off-the-shelf computer software placed in service in tax in years beginning before 2015.

Off the shelf computer software. Off-the-shelf computer software placed in service in tax years beginning before 2015, is qualifying property for purposes of the section 179 deduction. This is computer software that is readily available for purchase by the general public, is subject to a nonexclusive license, and has not been substantially modified. It includes any program designed to cause a computer to perform a desired function. However, a database or similar item is not considered computer software unless it is in the public domain and is incidental to the operation of otherwise qualifying software.

Tangible personal property. Tangible personal property is any tangible property that is not real property. It includes the following property.

Machinery and equipment.

Computer software. Computer software is generally a section 197 intangible and cannot be depreciated if you acquired it in connection with the acquisition of assets constituting a business or a substantial part of a business. However, computer software is not a section 197 intangible and can be depreciated, even if acquired in connection with the acquisition of a business, if it meets all of the following tests.

It is readily available for purchase by the general public.
It is subject to a nonexclusive license.
It has not been substantially modified.
If the software meets the tests above, it may also qualify for the section 179 deduction and the special depreciation allowance, discussed later. If you can depreciate the cost of computer software, use the straight line method over a useful life of 36 months.

Also, the definition of section 179 property will not include off-the-shelf computer software.

Certain Qualified Property Acquired After December 31, 2007
You can take a 50% special depreciation deduction allow-ance for certain qualified property acquired after Decem-ber 31, 2007. Your property is qualified property if it meets the following requirements.
1.
It is one of the following types of property.

c.
Computer software that is readily available for pur-chase by the general public, is subject to a nonex-clusive license, and has not been substantially modified. (The cost of some computer software is treated as part of the cost of hardware and is de-preciated under MACRS.)

You can take a 50% special depreciation deduction allowance for certain qualified property acquired after December 31, 2007. Your property is qualified property if it meets the following requirements. Computer software that is readily available for purchase by the general public, is subject to a nonexclusive license, and has not been substantially modified. (The cost of some computer software is treated as part of the cost of hardware and is depreciated under MACRS.)

Which Property Class Applies Under General Depreciation System (GDS)?

2. 5year property.

b. Computers and peripheral equipment.

Recovery Periods Under ADS

The recovery periods for most property generally are longer under ADS than they are under GDS. The following table shows some of the ADS recovery periods.

Property	Recovery Period
Computers and peripheral equipment . . . 5 years	

Computers and Related Peripheral Equipment

A computer is a programmable, electronically activated device capable of accepting information, applying prescri-bed processes to the information, and supplying the re-sults of those processes with or without human interven-tion. It consists of a central processing unit with extensive storage, logic, arithmetic, and control capabilities.
Related peripheral equipment is any auxiliary machine which is designed to be controlled by the central process-ing unit of a computer.

The following are neither computers nor related periph-eral equipment.
Any equipment that is an integral part of other property that is not a computer.
Typewriters, calculators, adding and accounting ma-chines, copiers, duplicating equipment, and similar equipment.
Equipment of a kind used primarily for the user's amusement or entertainment, such as video games.

Table B-1. Table of Class Lives and Recovery Periods

Asset class 00.12
Description of assets included

Information Systems:
Includes computers and their peripheral equipment used in administering normal business transactions and the maintenance of business records, their retrieval and analysis.
Information systems are dened as:
1) Computers: A computer is a programmable electronically activated device capable of accepting information, applying prescribed processes to the information, and supplying the results of these processes with or without human intervention. It usually consists of a central processing unit containing extensive storage, logic, arithmetic, and control capabilities. Excluded from this category are adding machines, electronic desk calculators, etc., and other equipment described in class 00.13.
2) Peripheral equipment consists of the auxiliary machines which are designed to be placed under control of the central processing unit. Nonlimiting examples are: Card readers, card punches, magnetic tape feeds, high speed printers, optical character readers, tape cassettes, mass storage units, paper tape equipment, keypunches, data entry devices, teleprinters, terminals, tape drives, disc drives, disc les, disc packs, visual image projector tubes, card sorters, plotters, and collators. Peripheral equipment may be used on-line or off-line.
Does not incude equipment that is an integral part of other capital equipment that is included in other classes of economic activity, i.e., computers used primarily for process or production control, switching, channeling, and automating distributive trades and services such as point of sale (POS) computer systems. Also, does not include equipment of a kind used primarily for amusement or entertainment of the user.

Class Life (in years) 6
Recovery Periods (in years)
GDS (MACRS) 5
ADS 5

Asset class 00.13
Description of assets included Data Handling Equipment; except Computers:
Includes only typewriters, calculators, adding and accounting machines, copiers, and duplicating equipment.

Class Life (in years) 6
Recovery Periods (in years)
GDS (MACRS) 5
ADS 6

IRS Publication 946 Cat. No. 13081F How To Depreciate Property

URL: http://www.irs.gov/pub/irs-pdf/p946.pdf

metadata for FPL DESIGN DATA for COOLING CANALS project TURKEY POINT in re: PROCUREMENT of COMPUTER SOFTWARE, HARDWARE Fw: Work & Arrival Details
Friday, August 21, 2015 4:51 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>

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August 21, 2015

from the desk of Andrew DeSalvo

MEMORANDUM FOR: "Tyler McDougal" <tyler@gatordredging.com>

SUBJECT: metadata for FPL DESIGN DATA for COOLING CANALS project TURKEY POINT in re: PROCUREMENT of COMPUTER SOFTWARE, HARDWARE Fw: Work &

Arrival Details

Thanks for your correspondence Date: Friday, August 21, 2015, 12:46 PM

1.) NEED TO KNOW metadata for FPL DESIGN DATA for COOLING CANALS at project TURKEY POINT.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

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ANNEX I

FLORIDA POWER & LIGHT CO TURKEY POINT POWER PLANT
(2006)

Searching...

Expanded detail on TRI submissions for 2006

Facility #1 : FLORIDA POWER & LIGHT CO TURKE

Basic Facility Info facility_Basic_Facility_Info help link help link

Facility Name FLORIDA POWER & LIGHT CO TURKEY POINT POWER PLANT
Street Address 9700 SW 344 ST
City HOMESTEAD
State FL
Zip Code 33035
County MIAMI-DADE
Parent Company FLORIDA POWER & LIGHT CO
Parent Company Duns 006922371
Standardized Parent Company NEXTERA ENERGY INC
Facility Closed No
Federal Facility Commercial facility
Reporting Year 2006
TRI Facility ID 33035TRKYP9700S
113th Congressional District Florida 27

Street map around facility (from MapQuest)

Facility Mailing Address facility_Facility_Mailing_Address help link help link
All data fields in this section were blank.

Facility Lat/Long facility_Facility_Lat_Long help link help link (Facility #1 : FLORIDA POWER & LIGHT CO TURKE)

Latitude 0252609
Longitude 0801952
Preferred Latitude 0
Preferred Longitude 0
Pref. Lat/Long Accuracy 0
FRS Latitude 25.435833
FRS Longitude -80.331111
FRS Lat/Long Reference Point Code 20
FRS Lat/Long Reference Point FACILITY CENTROID
FRS Lat/Long Method 27
FRS Lat/Long Method Description UNKNOWN
FRS Lat/Long Accuracy 10
FRS Lat/Long Datum Code NAD
FRS Lat/Long Datum NAD83

Facility Contact Info facility_Facility_Contact_Info help link help link

Public Contact Name GARY ANDERSEN
Public Contact Phone 3052423826
Tech Contact Name JOHN JONES
Tech Contact Phone 5616917056

Tech Contact Email JOHN_JONES@FPL.COM

Facility Primary IDs facility_Facility_Primary_IDs help link help link (Facility #1 : FLORIDA POWER & LIGHT CO TURKE)

Primary NAICS Code 221112: Fossil Fuel Electric Power Generation
Primary Facility Duns 006922371
Primary NPDES ID FL0001562
Primary RCRA ID FLD000733683
Primary UIC ID NA

Facility Current Info facility_Facility_Current_Info help link help link

Current Facility Name FLORIDA POWER & LIGHT CO TURKEY POINT POWER PLANT
Current Street Address 9700 SW 344 ST
Current City HOMESTEAD
Current County MIAMI-DADE
Current State and County FIPS 12086
Current State FL
Current Zip Code 33035
Current Parent Company NEXTERA ENERGY INC
Current Parent Duns 006922371
Current Standard Parent Company NEXTERA ENERGY INC

RSEI Score Facility Summary facility_RSEI_Score_Facility_Summary help link help link (Facility #1 : FLORIDA POWER & LIGHT CO TURKE)

RSEI Facility Fugitive Air Score 0
RSEI Facility Stack Air Score 1,367
RSEI Facility Water Release Score 0
RSEI Facility Incineration Transfer Score 0
RSEI Facility POTW Transfer Score 0
RSEI Facility Total Score 1,367
State percent Facility total score is 0.04% of the total score for Florida in 2006
Year percent Facility total score is less than 0.01% of the total score for all of TRI for 2006

http://data.rtknet.org/tri/tri.php?facility_id=33035TRKYP9700S&reporting_year=2006&detail=3

Horizontal and Vertical Control Points for COOLING CANALS at project TURKEY POINT in re: PROCUREMENT of COMPUTER SOFTWARE, HARDWARE Fw: Work & Arrival Details
Friday, August 21, 2015 5:51 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>

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August 21, 2015

from the desk of Andrew DeSalvo

MEMORANDUM FOR: "Tyler McDougal" <tyler@gatordredging.com>

SUBJECT: Horizontal and Vertical Control Points for COOLING CANALS at project TURKEY POINT in re: PROCUREMENT of COMPUTER SOFTWARE, HARDWARE Fw: Work &

Arrival Details

Thanks for your correspondence Date: Friday, August 21, 2015, 12:46 PM pertaining to Work & Arrival Details.

1.) NEED TO KNOW Horizontal and Vertical Control Points for COOLING CANALS at project TURKEY POINT.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

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RE: RESPONSE Re: Work & Arrival Details
Saturday, August 22, 2015 11:08 AM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
Andrew,

Could you sum up those 5 emails you sent me in a list of your questions and comments. I have a busy week next week and would like to reply to quickly and effectively to all but have limited time.

I will probably need to speak with you about some of the items. What is the status of your cell phone again - I saw you mentioned you will run out of service range at some point.

Thanks,

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

ARRIVAL Re: Work & Arrival Details
Saturday, August 29, 2015 4:09 AM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
August 29, 2015

Tyler McDougal, PE Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

from the desk of Andrew DeSalvo

MEMORANDUM FOR: Tyler McDougal, PE Operations Engineering Manager

SUBJECT: ARRIVAL Re: Work & Arrival Details

My dear Mr. McDougal;

I have ARRIVAL on schedule, Friday, August 29, 2015 in Homestead Florida.

WILL CALL Mike Henderson (Turkey Point Project Manager) to report for work on schedule, Monday, August 31, 2015.

PLEASE CALL via the Floridian Hotel in Homestead, FL. NOTE: I have limited access to electronic mail at the Floridian Hotel.

My cellular phone carrier has NO COVERAGE in the state of Florida. Please issue a company cellular phone.

Yours sincerely,

/ SIGNED

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

Andrew DeSalvo; MAILING ADDRESS Re: Work & Arrival Details Re: Survey Crew Chief Position, Homestead, FL
Saturday, August 29, 2015 6:31 AM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
christy@gatordredging.com
Cc:
tyler@gatordredging.com

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August , 2015

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

MEMORANDUM FOR: Christy L. Vanderpool Office Manager Gator Dredging

SUBJECT: MAILING ADDRESS Re: Work & Arrival Details

Dear Ms. Vanderpool; / Christy

Here is the MAILING ADDRESS for payroll, as follows:

Andrew DeSalvo
Post Office Box 900838
Homestead FL 33090

Yours sincerely,

/ SIGNED

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

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595KB

PDF
TURKEY POINT NEW HIRE LOCATIONS.pdf
295KB

PDF
HQ to Floridian Hotel.pdf
1 MB

RE: ARRIVAL Re: Work & Arrival Details
Saturday, August 29, 2015 10:44 AM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
Andrew,

Our operation is canceled Monday due to the threat of the tropical storm.

I will be arriving on-site mid-day on Tuesday and would like to meet with you Tuesday afternoon.

I will call you when I arrive around 3pm to discuss. We can meet on-site or for dinner and discuss the plan and equipment and other things. We will get you paid for those hours.

We will then start you (official first day) on Wednesday morning.

Looking forward to it and apologize for the delay. Luckily the storm does not appear to be much of a threat anymore.

Sincerely,

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

CONFIRMATION 3PM Tuesday, September 1, 2015 Re: Work & Arrival Details
Saturday, August 29, 2015 2:00 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Tyler McDougal" <tyler@gatordredging.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

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Homestead FL

August , 2015

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

from the desk of Andrew DeSalvo

MEMORANDUM FOR: Tyler McDougal, PE Operations Engineering Manager

SUBJECT: CONFIRMATION 3PM Tuesday, September 1, 2015 Re: Work & Arrival Details

My dear Mr. McDougal; / Tyler

Thanks for your invitation to meet Tuesday, on-site or for dinner and discuss the plan and equipment and other things.

I believe the plan under Andrew DeSalvo Re: Offer of Employment – Survey Crew Chief (see Attachments PDF TURKEY POINT NEW HIRE LOCATIONS.pdf 297KB), presents an agreement, as follows:

"3.) Gator Dredging will provide three (3) days of motel reimbursement expense and per diem at

$30.00 for the trip from Seattle, WA to Homestead, Fl. Lodging and per diem will be provided upon your arrival in Homestead. Mileage reimbursement for travel from current location to Clearwater, Florida estimated at $0.42/mile @ 3,100 miles = $1,260."

NOTE: Actual mileage is 3,340 miles to Homestead, FL.

"14.) We would like to offer a start date of August 31st, 2015."

On Monday, August 31, 2015, I plan to visit the TURKEY POINT NEW HIRE LOCATIONS for physical examination and drug testing, to take a drug test prior to employment, on site. I have submitted the required information which returns a clear criminal background check is required for employment.

Also, I need to complete Form W-4 so that your employer can withhold the correct federal income tax from your pay; and, to complete form I-9 to document verification of identity and authorization to work in the United States.

I prefer to meet on site upon your arrival at three o'clock on Tuesday, September 1, 2015, to discuss the plan and equipment and other things.

Thanks again for your interest in my qualifications; and, for the Offer of Employment – Survey Crew Chief, with Waterfront Property Services, LLC (dba Gator Dredging).

Yours sincerely,

/ SIGNED

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

1 Attachments
297KB

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RE: CONFIRMATION 3PM Tuesday, September 1, 2015 Re: Work & Arrival Details
Saturday, August 29, 2015 2:18 PM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Cc:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

Andrew,

Sounds great if you can get your lab and physical screening/work done on Monday. I like that plan. Write down the hours it takes you to complete this.

Then we can get you the final paperwork to sign when we meet at the job site Tuesday around 3pm - I will call you before to confirm I am not running late.

I will let Christy handle your other questions regarding lodging and per diem reimbursement. She will be in the office on Monday morning and can address them at that time. Please contact her at (727) 527-1300 extension 21.

Sincerely,

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

No Page Service
Monday, August 31, 2015 6:59 AM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

- **1 Files**
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Andrew,

Was hoping you would have called by now. The Floridian doesn't have a "paging service" available. I tried reaching you on your phone in the room with no success. I can send you for your drug test but will need to get the Chain of Custody to you someway. Please call the office.

Thanks,

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300 **EXT: 21**
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

Gator - Work Plan for Week of 8/31 to 8/4
Monday, August 31, 2015 7:17 AM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

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Types of Survey and Quality Control Tasks for RTK GPS.DOCX
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Andrew,

I am in the office in Clearwater today if you need anything. I am having trouble going through the Floridian to get in touch with you so it would probably be easier to reach me.

My new office number and extension is (727) 527-1300 ext. 24.

If you could get the background check and health screening items done today it would be great.

I will be there tomorrow afternoon to get you started.

In the meantime – if you have a laptop or by using the hotel computer – if you could do some research on RTK GPS's. I attached the sheet I made on the tasks we will be using the unit for. Again I was looking at a Trimble R8 and an Altus 3X for our needs. If you could do a quick evaluation on those two units and find one or two more and do a quick evaluation on those.. I think we would have enough products and information to be able to have a meaningful discussion on which one to choose or be able to narrow it down (rule some out) and do further investigation.

My plan for this week – is to continue our process using our current differential hand GPS and get you familiar with it. We will always use this process – especially for small jobs – plus it is a safe and reliable survey process – therefore it will be beneficial for you to have that skill going forward and until we get RTK process in motion.

Summary of plan for you this week:

· **Monday** - Andrew gets background check, health screening tests completed. Perform some research on two current RTK set ups, find several more and do some quick research on them.. This research can continue through Tuesday early afternoon. Please write down all your hours worked on all these items.

· **Tuesday** – Finalize research on the RTK set-ups. Meet with Tyler on job site around 3pm (Tyler to confirm) to finalize new hire paperwork and discuss your findings on the RTK equipment. Tyler can issue you a company cell phone at this time.

· **Wednesday** – Load up crews on vessels and do post-dredge survey work in Section 1 of canal system using current Differential GPS methods. One (1) three man crew.

· **Thursday** – Same as Wednesday.

· **Friday** – Same as Wednesday.

· *** Some time Wednesday through Friday – we can take a break and meet with Bill Coughlin – Chief Operating Officer – to discuss our findings with RTK system and recommendations on purchase. Based on his input we can agree to purchase the unit or perform more research. We will also try and get you the required environmental training class through FPL for the Turkey Point site.. it is a quick 1 hour class to get your certification on this.

· **Saturday** – I believe we are taking this day off due to Labor Day holiday.

· **Monday 9/7** – Gator paid Holiday – No Work

Again I apologize for any inconvenience the weather delays have caused.

Let me know if you have any questions and feel free to contact me.

Sincerely,

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910
Email:tyler@gatordredging.com
www.gatordredging.com

RE: CONFIRMATION 3PM Tuesday, September 1, 2015 Re: Work & Arrival Details
Monday, August 31, 2015 9:18 AM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

- **1 Files**
- 1 MB
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COC - Gator Dredging.pdf
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Andrew,

Please find attached the "Chain of Custody" for your use in getting your drug test completed. Please proceed to Fox Medical to have your blood test and physical completed.

I will forward the required documents and identification needed once the audit of your New Hire Packet has been completed. I expect that to be completed and sent to you before the end of the day.

In closing I want to say I do understand your frustration but under the current situation there really isn't any other way to proceed. We are all on the same team and working on the same goal so collectively we will find a solution to all your concerns.

Thank you,

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300 EXT: 21
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

New Hire Paperwork
Monday, August 31, 2015 11:20 AM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Cc:
"karen.swope77@yahoo.com" <karen.swope77@yahoo.com> "Karen Swope" <k.swope@gatordredging.com>

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Andrew,

I am making arrangements for Karen, Field Admin to meet you at the gate at Turkey Point at 8 am, will this work for you? You may complete your New Hire Paperwork at that time and you make the copies of your ID to forward via USPS. I will need a copy of your driver's license for Insurance purposes so please include that with the items your sending USPS if you are not able to forward via email. Karen will provide you with a mileage report to record your travel miles and submit along with your receipts for the motel. I will have your expenses direct deposited as soon as I receive your completed New Hire Packet. Please be sure to include a voided blank check with your Direct Deposit Authorization.

Please advise asap if you are able to meet at 8 am so I may advise Karen.

Thank you,

Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300 **EXT: 21**
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

CONFIRMATION 8 am, Tuesday, September 1, 2015, Turkey Point gate Re: New Hire Paperwork; Gator - Work Plan for Week of 8/31 to 8/4
Monday, August 31, 2015 12:41 PM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com> "Tyler McDougal" <tyler@gatordredging.com>
Cc:
"karen.swope77@yahoo.com" <karen.swope77@yahoo.com> "Karen Swope" <k.swope@gatordredging.com>
Homestead FL

August , 2015

Christy L. Vanderpool Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300 EXT: 21
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

MEMORANDUM FOR: "Christy Vanderpool - Gator Dredging"

SUBJECT: CONFIRMATION 8 am, Tuesday, September 1, 2015, Turkey Point gate Re: New Hire Paperwork; Gator - Work Plan for Week of 8/31 to 8/4

My dear Ms. Vanderpool; / Christy

I will meet Karen Swope, Field Admin - Gator Dredging, at 8 am, Tuesday, September 1, 2015, at Turkey Point gate, to complete the New Hire Paperwork Gator Dredging.

Thanks again for your interest in my qualifications; and, for the Offer of Employment – Survey Crew Chief, with Waterfront Property Services, LLC (dba Gator Dredging).

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

cc: Karen Swope

Turkey Point - Background
Monday, August 31, 2015 1:18 PM
From:
"Tyler McDougal" <tyler@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>

- **10 Files**
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A - SECTION 1 OVERVIEW MAP (24 X 36).pdf
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CONTRACT EXHIBIT - FIGURE A - 7-31-2015.pdf
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turkey point - overview.pdf
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turkey point ramp and benchmark.pdf
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Andrew,

It was nice speaking to you today and finding more about your capabilities.

Apologize for the confusion on the schedule/timeline to implement RTK technology.

I am very unaware of its detailed capabilities – hence why you are here – and did not mean to bring pressure into implementing the system and getting it ordered.

Management asked if it was possible to have system ordered so it would be ready upon your arrival – hence why I forwarded you my preliminary research, tasks we will be using the equipment and posed the question if it was as simple as ordering the equipment and getting it delivered.

With our advanced technology in the respect of design and implementation using CAD / HYPACK (design) and DREDGEPACK (implementation/construction) software – I see why it is very important to order a data collection and field stake-out system (survey/data collection) that will be compatible with that software. It took my an hour or so of thought after our conversation to realize the exact points you were making.. bare with me.. it's a Monday.. and I am under the weather today.

I feel that once an advanced or 'up to current technology' survey/data collection system is implemented – we will be cutting edge in our business. Looking forward to getting that going with you.

Rest assured – we do not have to implement this system your first week. I believe a 2 month goal is appropriate. Anything sooner than this goal will be a great success. We do have engineering and IT assistance available and capable of merging all the systems together and implementing them. Again we already have the design and build softwares and technology in progress and working great. We have a below average survey/data collection process in progress that I will show you this week. It is cumbersome but it works great, especially on smaller scale projects.

There will be a learning curve for our engineers and IT staff to get the computer or "bench" side of the RTK system in motion. So bare with us on that.

I probably miss-spoke several times when discussing centerlines and offsets.. We do have an established canal centerline for the job and we do calculate volumes and sections based on centerline offset and pre versus post xyz information. We have a desired finished dredge template – but as I discussed.. there are many variables which prevent us from reaching the desired goal and our product is always deemed acceptable by the client. I am also attaching the vertical control point we are using and maps of where our jobsite trailer, work area and boat ramp are. Hopefully this will help you get your bearings.

Finally I attached a finished product (example) of our cross-sections and volume report we generate and submit to client for payment. We do this using HYPACK software. We do not have any dredge control systems on our excavators because the bedrock limits us from meeting the ideal template – otherwise we would have installed in all the machines. It doesn't make logical or financial sense to install DREDGEPACK on any of the machines because of the rock preventing us from reaching desired template in 90% of our instances of work.

Hopefully this helps your understanding of the project and our situation.

First day we meet I plan to go through all of this in detail with you so you have great background knowledge of this project, our company and processes and goals going forward. We can then get some work done, come up with a plan for the system we want to implement, purchase and implement the system and then we will be running at full stride.

I think it will take a month or two to get to full stride.. until then I hope you can bare with us and help us.. and hopefully it will not take that long. We have plenty of work for all for a long time and we have a great team so I see very good things in our futures.

Let me know if you have any questions. Again this is for your information and background – we will go over everything in detail tomorrow so you don't have to feel rushed. Glad your trip to Florida went well.

See you tomorrow.

Sincerely,

Tyler McDougal, PE
Operations Engineering Manager
Gator Dredging
13630 50th Way North
Clearwater, FL 33760
Phone: 727.527.1300 Voicemail Code: 224
Fax: 727.527.1303
Mobile: 727.776.8910

Email:tyler@gatordredging.com
www.gatordredging.com

MILEAGE, TIME CARD, RECEIPTS Fw: RE: TRANSMITTAL; Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL
Wednesday, September 2, 2015 10:05 AM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

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Turkey Point Access Entry Instructions.pdf
595KB
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TURKEY POINT NEW HIRE LOCATIONS.pdf
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HQ to Floridian Hotel.pdf
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Homestead FL

September 2, 2015

Christy L. Vanderpool Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

from the desk of Andrew DeSalvo

MEMORANDUM FOR: "Christy Vanderpool - Gator Dredging"

SUBJECT: MILEAGE, TIME CARD, RECEIPTS Fw: RE: TRANSMITTAL; Andrew DeSalvo Re: Survey Crew Chief Position, Homestead, FL

My dear Ms. Vanderpool;

I have made a TRANSMITTAL [eleven (11) pages with cover sheet] via fax of the MILEAGE, TIME CARD, RECEIPTS, (with Offer of Employment attached), as requested.

Please call me at (727)460-4880 to CONFIRM TRANSMITTAL of the MILEAGE, TIME CARD, RECEIPTS, (with Offer of Employment attached).

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

attachment

Fw: Gator - Work Plan for Week of 8/31 to 8/4
Wednesday, September 2, 2015 10:08 AM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

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DOCX
Types of Survey and Quality Control Tasks for RTK GPS.DOCX
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Homestead FL

September 2, 2015

from the desk of Andrew DeSalvo

MEMORANDUM FOR:

SUBJECT:

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

DOCX
Types of Survey and Quality Control Tasks for RTK GPS.DOCX
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Andrew DeSalvo; Gator - Work Plan for Week of 8/31 to 8/4 Fw: Turkey Point - Background
Wednesday, September 2, 2015 10:32 AM
From:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
To:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

- **12 Files**
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CONTRACT EXHIBIT - FIGURE A - 7-31-2015.pdf
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turkey point - overview.pdf
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022482-2230B_TrimbleTablet_DS_0713_LR.pdf
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022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf
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- PDF
022482-2331A-2 Datasheet - SCS900 Site Controller Software.pdf
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- PDF
CardSound_FL_DGPS_OA_June2013.pdf
419KB
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- PDF
DREDGEPACK_Brochure.pdf
2 MB
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Homestead FL

September 2, 2015

from the desk of Andrew DeSalvo

MEMORANDUM FOR: "Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>

SUBJECT: Gator - Work Plan for Week of 8/31 to 8/4 Fw: Turkey Point - Background

--- On Mon, 8/31/15, Tyler McDougal <tyler@gatordredging.com> wrote:

From: Tyler McDougal <tyler@gatordredging.com>
Subject: Gator - Work Plan for Week of 8/31 to 8/4
To: "DeSalvo, Andrew" <andrew.desalvo@yahoo.com>

Date: Monday, August 31, 2015, 10:17 AM

Andrew,

I am in the office in Clearwater today if you need anything. I am having trouble going through the Floridian to get in touch with you so it would probably be easier to reach me.

My new office number and extension is (727) 527-1300 ext. 24.

If you could get the background check and health screening items done today it would be great.

I will be there tomorrow afternoon to get you started.

Summary of plan for you this week:

· Monday - Andrew gets background check, health screening tests completed. Perform some research on two current RTK set ups, find several more and do some quick research on them.. This research can continue through Tuesday early afternoon. Please write down all your hours worked on all these items.

· Tuesday – Finalize research on the RTK set-ups. Meet with Tyler on job site around 3pm (Tyler to confirm) to finalize new hire paperwork and discuss your findings on the RTK equipment. Tyler can issue you a company cell phone at this time.

· Wednesday – Load up crews on vessels and do post-dredge survey work in Section 1 of canal system using current Differential GPS methods. One (1) three man crew.

Yours sincerely,

ANDREW DeSALVO
(206)579-5021
andrew.desalvo@yahoo.com

attachments

PDF
S01_C05W_CS_38+00 to 49+00.pdf
40KB

PDF
S01_C05W_VOL_38+00 to 49+00.pdf
7KB

PDF
022482-2230B_TrimbleTablet_DS_0713_LR.pdf
328KB

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022482-1623D-4_Trimble Marine Solutions_BRO_0315_LR (1).pdf
775KB

PDF
022482-2331A-2 Datasheet - SCS900 Site Controller Software.pdf
4 MB

PDF
CardSound_FL_DGPS_OA_June2013.pdf
419KB

PDF
DREDGEPACK_Brochure.pdf
2 MB

RE: Andrew DeSalvo; Gator - Work Plan for Week of 8/31 to 8/4 Fw: Turkey Point - Background
Wednesday, September 2, 2015 10:51 AM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Cc:
"Tyler McDougal" <tyler@gatordredging.com> "William Coughlin" <bill@gatordredging.com>
Mr. DeSalvo,

You will be paid as outlined in your "Offer of Employment". I will not talk with you any further.

Regards,
Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300 EXT: 21
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

Reimbursement
Wednesday, September 2, 2015 1:15 PM
From:
"Christy Vanderpool - Gator Dredging" <Christy@gatordredging.com>
To:
"DeSalvo Andrew" <andrew.desalvo@yahoo.com>
Cc:
"William Coughlin" <bill@gatordredging.com> "Tyler McDougal" <tyler@gatordredging.com>

- **2 Files**
- 17KB

Andrew,

The attached indicates your total expense reimbursement and payroll as outlined in your "Offer of Employment". Your expense reimbursement and payroll will be direct deposited into the bank you indicated and authorized in the "Direct Deposit Agreement". The funds will be available sometime after midnight tonight depending on who you bank with. If you have questions regarding this process you will need to contact your bank directly as Gator Dredging does not control in any way how various banks process direct deposits.

Regards,
Christy L. Vanderpool
Office Manager
Gator Dredging
13630 50th Way N
Clearwater, FL 33760
Phone: 727-527-1300 **EXT: 21**
Cell: 727-504-6146
Fax: 727-499-9890
Email: christy@gatordredging.com
Website: www.gatordredging.com

FIRST AMENDMENT

CITATION

BOARD OF PROFESSIONAL ENGINEERS
CHAPTER 61G15-18
ORGANIZATION AND PURPOSE
61G15-18.011 Definitions.

BOARD OF PROFESSIONAL ENGINEERS

CHAPTER 61G15-18

ORGANIZATION AND PURPOSE

61G15-18.011 Definitions.

As used in Chapter 471, F.S., and in these rules where the context will permit the following terms have the following meanings:

(1) "Responsible Charge" shall mean that degree of control an engineer is required to maintain over engineering decisions made personally or by others over which the engineer exercises supervisory direction and control authority. The engineer in responsible charge is the Engineer of Record as defined in subsection 61G15-30.002(1), F.A.C.

(a) The degree of control necessary for the Engineer of Record shall be such that the engineer:

1. Personally makes engineering decisions or reviews and approves proposed decisions prior to their implementation, including the consideration of alternatives, whenever engineering decisions which could affect the health, safety and welfare of the public are made. In making said engineering decisions, the engineer shall be physically present or, if not physically present, be available in a reasonable period of time, through the use of electronic communication devices, such as electronic mail, videoconferencing, teleconferencing, computer networking, or via facsimile transmission.

2. Judges the validity and applicability of recommendations prior to their incorporation into the work, including the qualifications of those making the recommendations.

3. Approves the inclusion of standard engineering design details into the engineering work. Standard engineering design details include details mandated or directed to be contained in engineering documents by governmental agencies (such as the Florida Department of Transportation); and details contained in engineering design manuals and catalogues that are generally accepted as authoritative in the engineering profession. In order to approve the inclusion of such details the Engineer of Record must conduct such reasonable analysis of the content of the standard detail(s) as is necessary in the sound professional judgment of the Engineer of Record to be assured that the inclusion of such detail(s) into the engineering work is acceptable engineering practice.

(b) Engineering decisions which must be made by and are the responsibility of the Engineer of Record are those decisions concerning permanent or temporary work which could create a danger to the health, safety, and welfare of the public, such as, but not limited to, the following:

1. The selection of engineering alternatives to be investigated and the comparison of alternatives for engineering works.

2. The selection or development of design standards or methods, and materials to be used.

3. The selection or development of techniques or methods of testing to be used in evaluating materials or completed works, either new or existing.

4. The development and control of operating and maintenance procedures.

(c) As a test to evaluate whether an engineer is the Engineer of Record, the following shall be considered:

1. The engineer shall be capable of answering questions relevant to the engineering decisions made during the engineer's work on the project, in sufficient detail as to leave little doubt as to the engineer's proficiency for the work performed and involvement in said work. It is not necessary to defend decisions as in an adversary situation, but only to demonstrate that the engineer in responsible charge made them and possessed sufficient knowledge of the project to make them. Examples of questions to be answered by the engineer could relate to criteria for design, applicable codes and standards, methods of analysis, selection of materials and systems, economics of alternate solutions, and environmental considerations. The individuals should be able to clearly define the span and degree of control and how it was exercised and to demonstrate that the engineer was answerable within said span and degree of control necessary for the engineering work done.

2. The engineer shall be completely in charge of, and satisfied with, the engineering aspects of the project.

3. The engineer shall have the ability to review design work at any time during the development of the project and shall be available to exercise judgment in reviewing these documents.

4. The engineer shall have personal knowledge of the technical abilities of the technical personnel doing the work and be satisfied that these capabilities are sufficient for the performance of the work.

(d) The term "responsible charge" relates to engineering decisions within the purview of the Professional Engineers Act and does not refer to management control in a hierarchy of professional engineers except as each of the individuals in the hierarchy exercises independent engineering judgement and thus responsible charge. It does not refer to administrative and personnel management functions. While an engineer may also have such duties in this position, it should not enhance or decrease one's status of being in responsible charge of the work. The phrase does not refer to the concept of financial liability.

(2) "Engineering Design" shall mean that the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. Central to the process are the essential and complementary roles of synthesis and analysis. This definition is intended to be interpreted in its broadest sense. In particular the words "system, component, or process" and

"convert resources optimally" operate to indicate that sociological, economic, aesthetic, legal, ethical, etc., considerations can be included.

(3) The term "evaluation of engineering works and systems" as used in the definition in the practice of engineering set forth in Chapter 471.005(4)(a), F.S., includes but is not limited to services provided by testing laboratories involving the following:

(a) The planning and implementation of any investigation or testing program for the purpose of developing design criteria either by an engineering testing laboratory or other professional engineers.

(b) The planning or implementation of any investigation, inspection or testing program for the purpose of determining the causes of failures.

(c) The preparation of any report documenting soils or other construction materials test data.

(d) The preparation of any report offering any engineering evaluation, advice or test results, whenever such reports go beyond the tabulation of test data. Reports which document soils or other construction materials test data will be considered as engineering reports.

(e) Services performed by any entity or provided by a testing laboratory for any entity subject to regulation by a state or federal regulatory agency which enforces standards as to testing shall be exempt from this rule except where the services otherwise would require the participation of a professional engineer.

(4) "Certification" shall mean a statement signed and sealed by a professional engineer representing that the engineering services addressed therein, as defined in Section 471.005(6), F.S., have been performed by the professional engineer, and based upon the professional engineer's knowledge, information and belief, and in accordance with commonly accepted procedures consistent with applicable standards of practice, and is not a guaranty or warranty, either expressed or implied.

(5) The term "principal officer(s) of the business organization" as used in Section 471.023(1), F.S., means the (a) President, Vice President, Secretary or Treasurer of the Corporation, or Limited Liability Company (LLC); or (b) any other officer who has management responsibilities in the corporation or LLC, as documented by the corporate charter or bylaws so long as such documentation provides that such officer is empowered to bind the corporation or LLC in all of its activities which fall within the definition of the practice of engineering as that term is defined in Section 471.005(7), F.S.

Rulemaking Authority 471.008, 471.013(1)(a)1., 2. FS. Law Implemented 471.003(2)(f), 471.005(7), 471.005(6), 471.013(1)(a)1., 2., 471.023(1), 471.025(3), 471.033(1)(j) FS. History–New 6-23-80, Amended 12-19-82, 11-22-83, Formerly 21H-18.11, Amended 1-16-91, 4-4-93, Formerly 21H-18.011, Amended 12-22-99, 4-19-01, 10-16-02, 9-15-04, 6-5-08, 6-2-09, 2-2-12.

https://www.fbpe.org/index.php/legal/statues-and-rules

cleanenergy.org
Southern Alliance for Clean Energy

1.866.522.SACE
www.cleanenergy.org

P.O. Box 1842
Knoxville, TN 37901
865.637.6055

46 Orchard Street
Asheville, NC 28801
828.254.6776

250 Arizona Avenue, NE
Atlanta, GA 30307
404.373.5832

P.O. Box 310
Indian Rocks Beach, FL 33785
954.295.5714

P.O. Box 13673
Charleston, SC 29422
843.225.2371

April 29, 2016

The Honorable Charles S. Dean, Sr.
Chair, Senate Committee on Environmental
Preservation and Conservation
311 Senate Office Bld.
404 South Monroe Street
Tallahassee, FL 32399-1100

The Honorable Denise Grimsley
Chair, Senate Committee on Communications,
Energy and Public Utilities
306 Senate Office Bld.
404 South Monroe Street
Tallahassee, FL 32399-1100

Re: Florida Power & Light Company, Turkey Point Facility

Dear Senators Grimsley and Dean:

On behalf of the Southern Alliance for Clean Energy, thank you for taking the time to examine the issues surrounding the use of the industrial wastewater cooling canal system at the Turkey Point Power Plant. The Southern Alliance for Clean Energy (SACE), founded in 1985, is a nonprofit organization that promotes responsible energy choices that work to address the impacts of global climate change and ensure clean, safe, and healthy communities throughout the Southeast. SACE is a leading voice for energy policy in Florida and focusses on moving the State to lower cost, lower risk energy solutions, such as greater energy efficiency implementation and meaningful development of clean renewable resources.

The industrial wastewater cooling canals at Turkey Point are an antiquated, 40-year old system which has outlived its useful life and must be replaced. Operating under an expired State industrial wastewater facility permit, the cooling canals discharge their waste (including but not limited to up to three million pounds of salt per day) into the drinking water supply for Miami-Dade County and into the waters of Biscayne Bay, a national park. In addition to the problem of the discharge of industrial wastewater into the drinking water supply and Biscayne National Park, the facility is one of Florida's biggest water users with at least 60 million gallons of water evaporating from the canals each day--water that is sorely needed for Everglades Restoration and

sea-level rise mitigation efforts. Because the cooling canals were designed to discharge to groundwater, they cannot be "fixed," and will continue to consume water and discharge to groundwater until their use is discontinued. Other cooling technologies now exist that are less impactful on water resources and the environment.

The State of Florida is a leader in protecting its water resources. As one example, in 2008 the State passed the Leah Schad Memorial Ocean Outfall Act, 403.086, Florida Statutes. That law phases out the use of ocean outfalls to dispose of treated wastewater and requires the reuse of that water. Likewise, for Turkey Point new technologies should be evaluated and use of the cooling canals as an industrial wastewater facility should be phased out. This can be accomplished by writing the phase-out requirement into a new permit or legislatively.

Separately, additional data is needed to enable a complete evaluation of the impacts of the discharge from the cooling canals. Over time, FPL has reduced the scope of the existing monitoring program. The monitoring should be restored to that originally required under the Fifth Supplement Agreement between FPL and the South Florida Water Management District. Additional data is also needed to improve the existing models to enable a better evaluation of the extent of canals' impacts. Also, a comprehensive study by an independent third party is needed to evaluate the extent of harm to Biscayne Bay and the surrounding wetlands.

Finally, FPL must account to the people of the State of Florida for the damage its industrial wastewater cooling canal system has inflicted on the water resources of the State. FPL used the Biscayne Aquifer as a receptacle for the disposal of its industrial wastewater and, as a consequence, billions of gallons of fresh groundwater have been rendered undrinkable. In addition, it is becoming increasingly apparent that the cooling canals have impacted the adjacent wetlands and Biscayne Bay. The State should require mitigation for harm to the drinking water and for any impacts to the wetlands and the Bay.

Thank you again for your attention to this critically important matter, contact me with any questions on the suggestions we have made, 786-543-1926 or via email; ConservationConceptsLLC@gmail.com

Sincerely,

Laura Reynolds

Laura Reynolds
Founding and Managing Member
Conservation Concepts LLC

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

April 16, 2013

Ms. Barbara Linkiewicz
Senior Director, Environmental Licensing & Permitting
FPL & NextEra Energy Resources
700 Universe Blvd.
Juno Beach, FL 33408

Dear Ms. Linkiewicz:

Subject: Consultation Pursuant to the October 14, 2009 Fifth Supplemental Agreement between the South Florida Water Management District and Florida Power & Light

The South Florida Water Management District (SFWMD), working with the Florida Department of Environmental Protection (FDEP), has recently completed its evaluation of the data, findings and conclusions contained in Florida Power and Light's (FPL) Turkey Point Comprehensive Pre-Uprate Report, October 31, 2012. The SFWMD acknowledges the significant work FPL has put into the collection, analysis and interpretation of the data associated with implementation of the comprehensive pre-uprate monitoring plan pursuant to Conditions of Certification IX and X of the Power Plant Site Certification for the FPL Turkey Point Units 3 and 4 and the "Fifth Supplemental Agreement between the South Florida Water Management District and Florida Power and Light Company" (Agreement).

Based on technical evaluation of all available information, the SFWMD has determined that saline water from FPL's Turkey Point Power Plant cooling canal system (CCS) has moved westward of the L-31E Levee in excess of those amounts that would have occurred without the existence of the CCS and has moved into the water resources outside the plant's property boundaries. With recognition of the effort that was initiated several months ago with the FPL, FDEP and SFWMD working group, the SFWMD is providing this written notice to FPL, pursuant to paragraph II(D)2. of the Agreement, to begin consultation with the SFWMD to identify measures to mitigate, abate or remediate the movement of saline water.

We recognize that these are challenging water resources issues and FPL is committing significant resources to analyzing the environmental conditions surrounding the CCS. I want to emphasize that the SFWMD is committed to continuing to work collaboratively with FPL and FDEP to better understand the factors contributing to the western movement of saline water and develop solutions that protect the area water resources and maintain FPL's mission of maintaining critical electric power generation operations at Turkey Point.

Sincerely,

Melissa L. Meeker
Executive Director

c: Jeff Littlejohn, Deputy Secretary Regulatory Programs, DEP
Phil Coram, Water Resource Management Division, DEP
Cindy Mulkey, Administrator, Siting Coordination Office, DEP

bc: Carolyn S. Ansay, General Counsel, SFWMD
Terrie Bates, Dir. Water Resources, SFWMD
Scott Burns, So. Dade Coordinator, SFWMD

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March 15, 2016

Via Certified Mail/Return Receipt

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Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

Re: Notice of Intent to File Citizen Suit Pursuant to the Federal Clean Water Act

Ladies and Gentlemen:

NOTICE

The purpose of this letter is to notify Florida Power & Light Company ("FPL") that the following organizations intend to file suit in sixty (60) days under the federal Clean Water Act ("CWA"), 33 U.S.C. § 1365(a)(1), in Federal District Court against FPL for violations of the CWA resulting from the discharge of pollutants from FPL's Turkey Point Power Plant near Homestead, Florida, into the protected waters of Biscayne Bay and to ground water, including the Biscayne Aquifer, in violation of the terms of NPDES Permit No. FL0001562 and the CWA:

Southern Alliance for Clean Energy
P.O. Box 1842,
Knoxville, TN 37901
(865) 637-6055

Tropical Audubon Society
5530 Sunset Dr.
Miami, FL 33143
(305) 667-7337

Each of these organizations has an interest in protecting the water quality of Biscayne Bay and has members who use the Bay for business and recreation, including fishing, boating, swimming, snorkeling and scuba diving. Each of these organizations also has an interest in protecting ground water quality and has members who use water from the Biscayne Aquifer for drinking water and other domestic purposes.

BACKGROUND

FPL owns and operates the Turkey Point Power Plant, located on the shores of Biscayne Bay near Homestead, Florida, about 25 miles south of downtown Miami. In the early 1970's, as the result of a federal court order to stop discharging hot cooling water into Biscayne Bay from its two nuclear power generators and other units, FPL constructed a giant, two-miles-wide-by five-miles-long, unlined cooling canal system adjacent to Biscayne Bay with the requirement to recycle the cooling water to prevent all discharges to the Bay. In 2012 and 2013, the two nuclear generators were "uprated" to increase power production, resulting in a much higher than predicted increase in the temperature and salinity of the water in the cooling canal system. The Turkey Point Power Plant and the cooling canal system are underlain by porous limestone geology, including the Biscayne Aquifer, and the contaminated water in the cooling canal system has for many years discharged, and continues to discharge, from the cooling canal system into the ground water and into Biscayne Bay, as described in detail in this Notice.

Section 301(a) of the Act, 33 U.S.C. § 1311(a), prohibits the discharge of pollutants from a point source to waters of the United States except in compliance with, among other conditions, a National Pollutant Discharge Elimination System ("NPDES") permit issued pursuant to section 402 of the Act, 33 U.S.C. § 1342. Each violation of the permit, and each discharge that is not authorized by the permit, is a violation of the CWA.

Used cooling water and other industrial wastewaters from the Turkey Point power plant are discharged through a point source of discharge – the outfalls designated I-001 and I-002 in the plant's NPDES permit. From there, they enter the FPL cooling canal system, from which they are conveyed through a direct hydrologic connection into the navigable waters of Biscayne Bay. Additionally, the FPL cooling canal system, itself, is a "point source" under the CWA. The CWA defines "point source" as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged." 33 U.S.C. § 1362(14). The Eleventh Circuit interprets the term "point source" broadly. *Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1009 (2004), following *Dague v. City of Burlington,* 935 F.2d 1343, 1354–55 (2d Cir.1991), *rev'd in part on other grounds,* 505 U.S. 557 (1992) ("The concept of a point

source was designed to further this scheme by embracing the broadest possible definition of any identifiable conveyance from which pollutants might enter waters of the United States."). The FPL cooling canal system is designed to hold cooling water and other industrial wastewater from the Turkey Point nuclear reactors, and is therefore, confined and discrete. Because the canal system is unlined and leaking pollutants into ground water which is hydrologically connected to Biscayne Bay, it is conveying pollutants to navigable waters. As a confined and discrete conveyance, the cooling canal system, itself, falls within the CWA's definition of "point source."

There is CWA jurisdiction where, as here, pollutants travel from a point source to navigable surface waters through hydrologically connected ground water. *See, e.g.*, *Sierra Club v. Virginia Elec. and Power Co.*, No. 2:15-cv-112, 2015 WL 6830301, at *5-*6 (E.D. Va. Nov. 6, 2015); *Yadkin Riverkeeper, Inc. v. Duke Energy Carolinas, LLC*, No. 1:14–CV–753, 2015 WL 6157706, at *9-*10 (M.D. NC Oct. 20, 2015); *Hawai'i Wildlife Fund v. Cty. of Maui*, 24 F. Supp. 3d 980, 995 (D. Haw.2014); *Ass'n Concerned Over Resources and Nature, Inc. v. Tennessee Aluminum Processors, Inc.*, No. 1:10–00084, 2011 WL 1357690, at *16-*17 (M.D. Tenn, April 11, 2011); *Nw. Envtl. Def. Ctr. v. Grabhorn, Inc.*, No. CV–08–548–ST, 2009 WL 3672895, at *11 (D. Or. Oct. 30, 2009); *Hernandez v. Esso Standard Oil Co.* (P.R.), 599 F. Supp. 2d 175, 181 (D.P.R.2009); *N. Cal. River Watch v. Mercer Fraser Co.*, No. C–04–4620 SC, 2005 WL 2122052, at *2 (N.D. Cal. Sept. 1, 2005). *Idaho Rural Council v. Bosma*, 143 F.Supp.2d 1169, 1180 (D. Idaho 2001); *Mutual Life Ins. Co. v. Mobil Corp.*, No. Civ. A. 96–CV1781, 1998 WL 160820, at *3 (N.D. N.Y. 1998); *Williams Pipe Line Co. v. Bayer Corp.*, 964 F. Supp. 1300, 1319 (S.D. Iowa 1997); *Friends of Santa Fe County v. LAC Minerals, Inc.*, 892 F. Supp. 1333, 1357 (D. N.M.1995); *Wash. Wilderness Coal. v. Hecla Mining Co.*, 870 F. Supp. 983, 990 (E.D. Wash.1994); *Sierra Club v. Colorado Ref. Co.*, 838 F. Supp. 1428, 1434 (D.Colo.1993); *McClellan Ecological Seepage Situation v. Weinberger*, 707 F. Supp. 1182, 1196 (E.D. Cal.1988), *rev'd on other grounds*.

Pursuant to authority delegated by the United States Environmental Protection Agency ("EPA") under section 402(b) of the CWA, 33 U.S.C. § 1342(b), the Florida Department of Environmental Protection ("FLDEP") issued NPDES permit number FL0001562 to FPL. The current version of the permit became effective May 6, 2005. The permit expired on May 5, 2010, but has been administratively extended by FLDEP.

Federal courts have jurisdiction to hear citizen suits brought pursuant to state-issued NPDES permits, including for enforcement of more stringent provisions than would be included in a federal permit. *See, e.g.*, *Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1004-08 (11th Cir. 2004); *Northwest Envtl. Advocates v. City of Portland*, 56 F.3d 979, 985–90 (9th Cir.1995); *St. Johns Riverkeeper, Inc. v. Jacksonville Elec. Authority*, 3:07-cv-739, 3:07-cv-747, 2010 WL 745494, at *3 (M.D. Fla. March 1, 2010); *Upper Chattahoochee Riverkeeper Fund, Inc. v. City of Atlanta*, 953 F. Supp. 1541, 1552–53 (N.D. Ga.1996); *Culbertson v. Coats Am., Inc.*, 913 F. Supp. 1572, 1581 (N.D. Ga.1995).

NPDES Permit No. FL0001562 authorizes the discharge of non-contact once-through condenser cooling water (OTCW), auxiliary equipment cooling water (AECW), low-volume

waste (LVW), and storm water into an onsite closed loop cooling canal system. The NPDES Permit specifically does not authorize discharge to surface waters. The NPDES Permit also contains limits on ground water discharges.

As set out in more detail below, FPL has violated and is violating its NPDES Permit by unauthorized discharges of pollutants, including, but not limited to, excess salinity, phosphorus, ammonia, TKN, total nitrogen, and radioactive tritium, into waters of the United States in Biscayne Bay. Additionally, FPL has violated its NPDES Permit by discharges of hypersaline Water contaminated with radioactive tritium into ground water, threatening the water supply for Miami-Dade County and the Florida Keys. FPL has also violated the Clean Water Act by discharging pollutants without an NPDES permit and by causing violations of water quality standards in Biscayne Bay, which is protected from degradation as Outstanding National Resource and Outstanding Florida Waters.

BISCAYNE BAY

Biscayne Bay is the largest estuary on the coast of southeast Florida and is contiguous with the southern Florida Everglades and Florida Bay. It encompasses a marine ecosystem that totals approximately 428 square miles. Its drainage area is 938 square miles, of which 350 are freshwater and coastal wetlands in Miami-Dade, Broward, and Monroe Counties. It is home to Biscayne National Park, the largest marine park in the national park system. Not only is it a source for food, transportation, and commerce, it also offers boundless opportunities for recreation, such as boating, fishing, swimming, snorkeling and scuba diving. Rimmed by mangrove wetlands, the natural bay is a shallow estuary of clear waters and sandy bay bottoms with seagrasses, corals and sponges. The bay supports rich ecological communities and a diverse variety of fish and wildlife.

Pursuant to the authority delegated to it under the CWA, FLDEP has promulgated water quality standards for waters within the state. The waters of Biscayne Bay into which FPL is discharging are classified by FLDEP in Rule 62-302.400(14) of the Florida Administrative Code ("F.A.C.") as Class III – Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. In addition, Rule 62-302.700(9), F.A.C., designates the waters of Biscayne Bay within Biscayne National Park into which FPL is discharging as Outstanding National Resource and Outstanding Florida Waters. Pursuant to Rule 62-302.700(1), F.A.C., "[i]t shall be the Department policy to afford the highest protection to Outstanding Florida Waters and Outstanding National Resource Waters. No degradation of water quality . . . is to be permitted in Outstanding Florida Waters and Outstanding National Resource Waters."

The narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., has been interpreted by FLDEP as requiring no more than 0.007 milligram per liter ("mg/L") of Total Phosphorus, 0.35 mg/L of Total Nitrogen, and 0.2 μg/L of Chlorophyll *a*, in the waters of Biscayne Bay into which FPL is discharging. Rule 62-302.532(1), F.A.C. In addition, Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances, requires 0.5 mg/L or less of ammonia in marine waters in the County.

BISCAYNE AQUIFER

The Biscayne Aquifer is the main source of potable water in Miami-Dade County and the Florida Keys and is designated by the federal government as a sole source aquifer under the Safe Drinking Water Act. FLDEP classifies Florida ground water and sets minimum standards for ground water in Rule 62-520.400, FA.C. and 62-520.430, FA.C. Rule 62-520.400, F.A.C., states:

> (1) All ground water shall at all places and at all times be free from domestic, industrial, agricultural, or other man-induced non-thermal components of discharges in concentrations which, alone or in combination with other substances, or components of discharges (whether thermal or non-thermal):
>
> (a) Are harmful to plants, animals, or organisms that are native to the soil and responsible for treatment or stabilization of the discharge relied upon by Department permits; or
>
> (b) Are carcinogenic, mutagenic, teratogenic, or toxic to human beings, unless specific criteria are established for such components in Rule 62-520.420, F.A.C.; or
>
> (c) Are acutely toxic within surface waters affected by the ground water; or
>
> (d) Pose a serious danger to the public health, safety, or welfare; or
>
> (e) Create or constitute a nuisance; or
>
> (f) Impair the reasonable and beneficial use of adjacent waters.

These standards apply to all ground water, including ground water classified as G-III ground water. For specific components, Rules 62-520.420, 62-550.310, and 62-550.828, F.A.C., establish specific ground water standards for G-III ground water and G-II ground water, including standards for sodium (160 mg/L), nitrate (10 mg/L), chlorides (250 mg/L), sulfates (250 mg/L), and tritium (20,000 pCi/L).

Tritium is produced by nuclear reactors and is often found as a ground water contaminant at nuclear power plants. Historical data from 1974 to 1975 showed tritium concentrations in the FPL cooling canal system to be in the range of 1,556 – 4,846 pCi/L, and reports submitted by FPL for the monitoring period from June 2010 through December 2015 showed cooling canal system tritium concentrations as high as 15,487 pCi/L. Tritium is a good tracer to show discharge of contaminated water with other pollutants from the cooling canal system.

Although tritium has a Maximum Contaminant Level ("MCL") for drinking water of 20,000 pCi/L, the public health goal is much lower. An MCL takes into account factors other than public health, including feasibility of treatment and economics. Tritium, like other radionuclides, is considered to be a carcinogen. Tritium, as triturated water, enters the body and distributes widely through all water containing compartments without concentrating in any one site. Tritium then readily exchanges with hydrogen in many body molecules, including ribonucleotides, proteins and others, thereby being in the position to impart its energy upon

critical molecules. For example, tritium incorporated into DNA may result in beta particle radiation altering chromosomes, allowing for the induction of cancer. EPA has not set a public health goal for tritium in drinking water, but the State of California, based on EPA risk factors, has established the public health goal at 400 pCi/L, which is equivalent to a 1-in-a-million lifetime cancer risk.

CLEAN WATER ACT VIOLATIONS

I. VIOLATIONS OF EFFLUENT LIMITATIONS IN NPDES PERMIT NO. FL0001562

A. Condition I.A.1. of the NPDES Permit

Condition I.A.1. of the NPDES Permit states: "[t]his permit does not authorize discharge to surface waters of the state." FPL has violated this effluent limitation repeatedly since at least June 2015, and continues to violate this limitation, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay. These violations have been documented based on the detection of the pollutants in monitoring by FPL and the Miami-Dade Department of Regulatory and Economic Resources ("DERM") since 2010. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations have been continuous for at least the past five (5) years and will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has known for more than six (6) years that pollutants from the cooling canal system are being discharged into Biscayne Bay. FPL began monitoring the surface waters of Biscayne Bay and surface waters connected to Biscayne Bay in 2010, pursuant to an agreement with the South Florida Water Management District ("SFWMD"). Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and tritium) from the canal system in the surface waters of Biscayne Bay or surface waters connected to the Bay at Surface Water Monitoring Stations TPBBSW-1 through 5 (Biscayne Bay stations), TPSWC-1 through 3 (L-31E Canal stations), TPSWC-4 (S-20 Discharge Canal), TPSWC-5 (Card Sound Canal), and TPSWC-6 (Card Sound Road Canal) were reported for June-July 2010, September 2010, December 2010, March 2011, June 2011, September 2011, December 2011, March 2012, June 2012, September 2012, December 2012, March 2013, June 2013, September 2013, December 2013, March 2014, September 2014, and March 2015.

DERM and FPL began monitoring near-shore surface waters of Biscayne Bay adjacent to the cooling canal system more intensively in June 2015. Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and chlorophyll *a*) from the canal system in surface waters of the Bay at Surface Water Monitoring Stations TPSWC-4B, TPSWC-5B TPBBSW-6 and TPBBSW-7 were reported for May 31 & Jun 1, 2015, June 15 & 16, 2015, June 29 & 30, 2015, July 13 & 14, 2015, July 20 & 21, 2015, July 27 & 28, 2015, August 3 & 4, 2015, August

10 & 11, August 17 & 18, 2015, August 24 & 25, 2015, August 31 to September 2, 2015, September 8 & 9, 2015, September 14 & 18, 2015, September 21 & 22, 2015, September 28 to October 2, 2015, October 5 to 7, 2015, October 19 & 20, 2015, October 26 & 27, 2015, November 2 & 4, 2015, November 9 to 13, 2015, November 16 to 19, 2015, November 23 & 24, 2015, November 30 to December 3, 2015, December 7 to 9, 2015, December 14 & 15, 2015, December 21 & 22, 2015, December 28 & 29, 2015, January 4 & 5, 2016, January 11 & 12, 2016, and January 18 & 19, 2016.

In addition, DERM and FPL sampled near-shore surface waters of Biscayne Bay adjacent to the cooling canal system at Surface Water Monitoring Stations TPBBSW-7-B, TPBBSW-7M-B, TPBBSWCSC-M-B, TPSWC-7B, TPBBSW-6B, and TPBBSW-7T-B for radioactive tritium in December 2015 and January 2016. The results showed high levels of tritium (245 to 4,317 pCi/L) in deeper near-shore waters. Levels of tritium in Biscayne Bay away from the cooling canal system are typically less than 20 pCi/L. The presence of high levels of tritium in the near -shore surface waters of Biscayne Bay and surface waters connected to Biscayne Bay also confirms the hydrologic connection between the canal system and the surface waters of Biscayne Bay.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system represent degradation of the waters of Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters. In addition, the monitoring performed demonstrates that the levels of pollutants violate the Miami-Dade County water quality standard for ammonia and violate Florida water quality standards for total nitrogen, phosphorus, and chlorophyll *a*.

B. <u>Condition I.A.14 of the NPDES Permit</u>

Condition I.A.14 of the NPDES Permit states:

> Notwithstanding any other requirements of this "No Discharge" permit, the permittee shall comply with all applicable provisions of the Final Judgement dated September 10, 1971, in Civil Action Number 70-328-CA issued by the U.S. District Judge C. Clyde Atkins of the Southern District of Florida.

FPL has violated Paragraph V of this Final Judgment by discharging water from the cooling canal system into Biscayne Bay, as set out in Section I.A. of this Notice, *supra*.

C. <u>Condition IV.1. of the NPDES Permit</u>

Condition IV.1. of the NPDES Permit states: "The Permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in Rule 62-520.400, FA.C. and 62-520.430, FA.C." This condition also serves to protect surface waters

from degradation. FPL has violated this condition by causing continuous violations of the minimum criteria for ground water during each day during the past five (5) years preceding this Notice. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has contaminated ground water extending from the cooling canal system to over four (4) miles west of the cooling canal system in violation of Condition IV.1. of the NPDES Permit. Monitoring wells west of the FPL cooling canal system have shown violations of the minimum criteria for ground water since at least 2009, including sodium levels in well G-21 and G-28, approximately 4 miles west of the cooling canal system, which exceed sodium criterion by as much as 50 times. Other wells west of the cooling canal system (BBCW- 4, BBCW-5, FKS-4, TPGW-5D) showed sodium levels as high as 100 times the criterion.

Saltwater intrusion into the area west of the cooling canal system is impairing the reasonable and beneficial use of adjacent G-II ground water and, therefore, is a violation of the minimum criteria for ground water in Rule 62-520.400, F.A.C. The continuous seepage and resulting ground water plume of contaminated cooling canal water has and continues to contaminate usable portions of the Biscayne Aquifer - steadily converting Class G-II potable water to Class G-III non-potable water as it moves west through the Biscayne Aquifer. In addition, the plume of radioactive tritium continues to move west of the cooling canal system into the Biscayne Aquifer, with levels exceeding the public health goal of 400 pCi/L as much as three (3) miles west of the cooling canal system. Furthermore, as discussed in Section I.A. of this Notice, *supra*, the contaminated ground water is also moving east into Biscayne Bay.

D. <u>Condition VIII.5. of the NPDES Permit</u>

Condition VIII.5 of the NPDES Permit states:

> The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-620.610(5), F.AC.]

FPL has violated this condition by, among other omissions, failing to take all reasonable steps to minimize or prevent the discharges to surface waters and ground water set out in this Section I.A. and I.C. of this Notice, *supra*.

E. <u>Condition VIII.7. of the NPDES Permit</u>

Condition VIII.7. of the NPDES Permit states:

> The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. [62-620.610(7), F.A C.]

FPL has violated this condition by, among other omissions, failing to adequately control the temperature of the cooling water in the cooling canal system, by failing to control the nutrient levels in the system, and by failing to properly operate the so-called "interceptor" ditch to prevent widespread contamination of the ground water by saline water and other pollutants, including radioactive tritium.

II. DISCHARGING POLLUTANTS TO SURFACE WATERS WITHOUT AN NPDES PERMIT

Since at least June 2010, FPL has violated the CWA, 42 U.S.C. § 1311(a) and 40 C.F.R. § 122.21, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay without an NPDES permit authorizing such discharges. The locations of the discharges are set out in Section I.A. of this Notice, *supra*. The requirement for an NPDES permit authorizing these discharges arose at the time that FPL first knew or should have known that pollutants were being discharged into surface waters. Each day since that time is a violation of the CWA.

III. DISCHARGES CAUSING OR CONTRIBUTING TO VIOLATIONS OF WATER QUALITY STANDARDS

Federal and state law prohibit discharges of pollutants from point sources that cause or contribute to violations of surface water quality standards. *See, e.g.*, 33 U.S.C. § 1311(b)(1)(C) and § 403.088(1), Fla. Stat. In addition to prohibiting discharges to surface waters altogether, the NPDES Permit requires compliance with water quality standards in Section VIII., 5 and 12. FPL has violated the CWA, Florida law, and the NPDES Permit by causing or contributing to violations of surface water quality standards in Biscayne Bay due to its discharges from the Turkey Point cooling canal system, as set out in Section I.A. of this Notice, including, but not limited to, the narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., and the water quality standard for ammonia in Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances. These violations began in 2010 and continue as of the date of this Notice, as shown by monitoring data generated by FPL and DERM.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system also represent degradation of the waters of

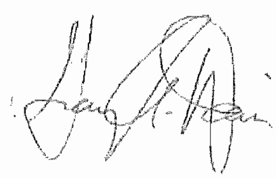
Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters.

CONCLUSION

Thank you for your prompt attention to the ongoing, serious violations of federal law and permitting requirements. Unless the EPA or FDEP commences and diligently prosecutes an action in court to address these violations within sixty (60) days, we intend to file a citizen suit against FPL under 33 U.S.C. § 1365(a)(1) for the violations discussed above. In addition to the violations set forth herein, this Notice covers all violations of the CWA evidenced by information which becomes available after the date of this Notice. Pursuant to the CWA, we will seek civil penalties, attorney's fees and costs, as well as an injunction against continued violations.

Any and all communication related to this matter should be directed to Gary A. Davis and James S. Whitlock, at the address and telephone number listed at the top of this letter, or to James M. Porter, 9350 South Dixie Highway, 10th Floor, Miami, FL 33156, (305) 671-1345.

Respectfully,



Gary A. Davis

cc: Hon. Loretta E. Lynch
Attorney General of the United States
U.S. Department of Justice
950 Pennsylvania Avenue, NW
Washington, DC 20530-0001

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March 15, 2016

Via Certified Mail/Return Receipt

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61 Forsyth Street, SW
Atlanta, GA 30303

Re: <u>Notice of Intent to File Citizen Suit Pursuant to the Federal Clean Water Act</u>

Ladies and Gentlemen:

NOTICE

The purpose of this letter is to notify Florida Power & Light Company ("FPL") that the following organizations intend to file suit in sixty (60) days under the federal Clean Water Act ("CWA"), 33 U.S.C. § 1365(a)(1), in Federal District Court against FPL for violations of the CWA resulting from the discharge of pollutants from FPL's Turkey Point Power Plant near Homestead, Florida, into the protected waters of Biscayne Bay and to ground water, including the Biscayne Aquifer, in violation of the terms of NPDES Permit No. FL0001562 and the CWA:

Southern Alliance for Clean Energy
P.O. Box 1842,
Knoxville, TN 37901
(865) 637-6055

Tropical Audubon Society
5530 Sunset Dr.
Miami, FL 33143
(305) 667-7337

Each of these organizations has an interest in protecting the water quality of Biscayne Bay and has members who use the Bay for business and recreation, including fishing, boating, swimming, snorkeling and scuba diving. Each of these organizations also has an interest in protecting ground water quality and has members who use water from the Biscayne Aquifer for drinking water and other domestic purposes.

BACKGROUND

FPL owns and operates the Turkey Point Power Plant, located on the shores of Biscayne Bay near Homestead, Florida, about 25 miles south of downtown Miami. In the early 1970's, as the result of a federal court order to stop discharging hot cooling water into Biscayne Bay from its two nuclear power generators and other units, FPL constructed a giant, two-miles-wide-by five-miles-long, unlined cooling canal system adjacent to Biscayne Bay with the requirement to recycle the cooling water to prevent all discharges to the Bay. In 2012 and 2013, the two nuclear generators were "uprated" to increase power production, resulting in a much higher than predicted increase in the temperature and salinity of the water in the cooling canal system. The Turkey Point Power Plant and the cooling canal system are underlain by porous limestone geology, including the Biscayne Aquifer, and the contaminated water in the cooling canal system has for many years discharged, and continues to discharge, from the cooling canal system into the ground water and into Biscayne Bay, as described in detail in this Notice.

Section 301(a) of the Act, 33 U.S.C. § 1311(a), prohibits the discharge of pollutants from a point source to waters of the United States except in compliance with, among other conditions, a National Pollutant Discharge Elimination System ("NPDES") permit issued pursuant to section 402 of the Act, 33 U.S.C. § 1342. Each violation of the permit, and each discharge that is not authorized by the permit, is a violation of the CWA.

Used cooling water and other industrial wastewaters from the Turkey Point power plant are discharged through a point source of discharge – the outfalls designated I-001 and I-002 in the plant's NPDES permit. From there, they enter the FPL cooling canal system, from which they are conveyed through a direct hydrologic connection into the navigable waters of Biscayne Bay. Additionally, the FPL cooling canal system, itself, is a "point source" under the CWA. The CWA defines "point source" as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged." 33 U.S.C. § 1362(14). The Eleventh Circuit interprets the term "point source" broadly. *Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1009 (2004), following *Dague v. City of Burlington,* 935 F.2d 1343, 1354–55 (2d Cir.1991), *rev'd in part on other grounds,* 505 U.S. 557 (1992) ("The concept of a point

source was designed to further this scheme by embracing the broadest possible definition of any identifiable conveyance from which pollutants might enter waters of the United States."). The FPL cooling canal system is designed to hold cooling water and other industrial wastewater from the Turkey Point nuclear reactors, and is therefore, confined and discrete. Because the canal system is unlined and leaking pollutants into ground water which is hydrologically connected to Biscayne Bay, it is conveying pollutants to navigable waters. As a confined and discrete conveyance, the cooling canal system, itself, falls within the CWA's definition of "point source."

There is CWA jurisdiction where, as here, pollutants travel from a point source to navigable surface waters through hydrologically connected ground water. *See, e.g., Sierra Club v. Virginia Elec. and Power Co.*, No. 2:15-cv-112, 2015 WL 6830301, at *5-*6 (E.D. Va. Nov. 6, 2015); *Yadkin Riverkeeper, Inc. v. Duke Energy Carolinas, LLC*, No. 1:14–CV–753, 2015 WL 6157706, at *9-*10 (M.D. NC Oct. 20, 2015); *Hawai'i Wildlife Fund v. Cty. of Maui*, 24 F. Supp. 3d 980, 995 (D. Haw.2014); *Ass'n Concerned Over Resources and Nature, Inc. v. Tennessee Aluminum Processors, Inc.*, No. 1:10–00084, 2011 WL 1357690, at *16-*17 (M.D. Tenn, April 11, 2011); *Nw. Envtl. Def. Ctr. v. Grabhorn, Inc.*, No. CV–08–548–ST, 2009 WL 3672895, at *11 (D. Or. Oct. 30, 2009); *Hernandez v. Esso Standard Oil Co.* (P.R.), 599 F. Supp. 2d 175, 181 (D.P.R.2009); *N. Cal. River Watch v. Mercer Fraser Co.*, No. C–04–4620 SC, 2005 WL 2122052, at *2 (N.D. Cal. Sept. 1, 2005). *Idaho Rural Council v. Bosma*, 143 F.Supp.2d 1169, 1180 (D. Idaho 2001); *Mutual Life Ins. Co. v. Mobil Corp.*, No. Civ. A. 96–CV1781, 1998 WL 160820, at *3 (N.D. N.Y. 1998); *Williams Pipe Line Co. v. Bayer Corp.*, 964 F. Supp. 1300, 1319 (S.D. Iowa 1997); *Friends of Santa Fe County v. LAC Minerals, Inc.*, 892 F. Supp. 1333, 1357 (D. N.M.1995); *Wash. Wilderness Coal. v. Hecla Mining Co.*, 870 F. Supp. 983, 990 (E.D. Wash.1994); *Sierra Club v. Colorado Ref. Co.*, 838 F. Supp. 1428, 1434 (D.Colo.1993); *McClellan Ecological Seepage Situation v. Weinberger*, 707 F. Supp. 1182, 1196 (E.D. Cal.1988), *rev'd on other grounds*.

Pursuant to authority delegated by the United States Environmental Protection Agency ("EPA") under section 402(b) of the CWA, 33 U.S.C. § 1342(b), the Florida Department of Environmental Protection ("FLDEP") issued NPDES permit number FL0001562 to FPL. The current version of the permit became effective May 6, 2005. The permit expired on May 5, 2010, but has been administratively extended by FLDEP.

Federal courts have jurisdiction to hear citizen suits brought pursuant to state-issued NPDES permits, including for enforcement of more stringent provisions than would be included in a federal permit. *See, e.g., Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1004-08 (11th Cir. 2004); *Northwest Envtl. Advocates v. City of Portland*, 56 F.3d 979, 985–90 (9th Cir.1995); *St. Johns Riverkeeper, Inc. v. Jacksonville Elec. Authority*, 3:07-cv-739, 3:07-cv-747, 2010 WL 745494, at *3 (M.D. Fla. March 1, 2010); *Upper Chattahoochee Riverkeeper Fund, Inc. v. City of Atlanta*, 953 F. Supp. 1541, 1552–53 (N.D. Ga.1996); *Culbertson v. Coats Am., Inc.*, 913 F. Supp. 1572, 1581 (N.D. Ga.1995).

NPDES Permit No. FL0001562 authorizes the discharge of non-contact once-through condenser cooling water (OTCW), auxiliary equipment cooling water (AECW), low-volume

waste (LVW), and storm water into an onsite closed loop cooling canal system. The NPDES Permit specifically does not authorize discharge to surface waters. The NPDES Permit also contains limits on ground water discharges.

As set out in more detail below, FPL has violated and is violating its NPDES Permit by unauthorized discharges of pollutants, including, but not limited to, excess salinity, phosphorus, ammonia, TKN, total nitrogen, and radioactive tritium, into waters of the United States in Biscayne Bay. Additionally, FPL has violated its NPDES Permit by discharges of hypersaline Water contaminated with radioactive tritium into ground water, threatening the water supply for Miami-Dade County and the Florida Keys. FPL has also violated the Clean Water Act by discharging pollutants without an NPDES permit and by causing violations of water quality standards in Biscayne Bay, which is protected from degradation as Outstanding National Resource and Outstanding Florida Waters.

BISCAYNE BAY

Biscayne Bay is the largest estuary on the coast of southeast Florida and is contiguous with the southern Florida Everglades and Florida Bay. It encompasses a marine ecosystem that totals approximately 428 square miles. Its drainage area is 938 square miles, of which 350 are freshwater and coastal wetlands in Miami-Dade, Broward, and Monroe Counties. It is home to Biscayne National Park, the largest marine park in the national park system. Not only is it a source for food, transportation, and commerce, it also offers boundless opportunities for recreation, such as boating, fishing, swimming, snorkeling and scuba diving. Rimmed by mangrove wetlands, the natural bay is a shallow estuary of clear waters and sandy bay bottoms with seagrasses, corals and sponges. The bay supports rich ecological communities and a diverse variety of fish and wildlife.

Pursuant to the authority delegated to it under the CWA, FLDEP has promulgated water quality standards for waters within the state. The waters of Biscayne Bay into which FPL is discharging are classified by FLDEP in Rule 62-302.400(14) of the Florida Administrative Code ("F.A.C.") as Class III – Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. In addition, Rule 62-302.700(9), F.A.C., designates the waters of Biscayne Bay within Biscayne National Park into which FPL is discharging as Outstanding National Resource and Outstanding Florida Waters. Pursuant to Rule 62-302.700(1), F.A.C., "[i]t shall be the Department policy to afford the highest protection to Outstanding Florida Waters and Outstanding National Resource Waters. No degradation of water quality . . . is to be permitted in Outstanding Florida Waters and Outstanding National Resource Waters."

The narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., has been interpreted by FLDEP as requiring no more than 0.007 milligram per liter ("mg/L") of Total Phosphorus, 0.35 mg/L of Total Nitrogen, and 0.2 μg/L of Chlorophyll *a*, in the waters of Biscayne Bay into which FPL is discharging. Rule 62-302.532(1), F.A.C. In addition, Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances, requires 0.5 mg/L or less of ammonia in marine waters in the County.

BISCAYNE AQUIFER

The Biscayne Aquifer is the main source of potable water in Miami-Dade County and the Florida Keys and is designated by the federal government as a sole source aquifer under the Safe Drinking Water Act. FLDEP classifies Florida ground water and sets minimum standards for ground water in Rule 62-520.400, FA.C. and 62-520.430, FA.C. Rule 62-520.400, F.A.C., states:

> (1) All ground water shall at all places and at all times be free from domestic, industrial, agricultural, or other man-induced non-thermal components of discharges in concentrations which, alone or in combination with other substances, or components of discharges (whether thermal or non-thermal):
>
> (a) Are harmful to plants, animals, or organisms that are native to the soil and responsible for treatment or stabilization of the discharge relied upon by Department permits; or
>
> (b) Are carcinogenic, mutagenic, teratogenic, or toxic to human beings, unless specific criteria are established for such components in Rule 62-520.420, F.A.C.; or
>
> (c) Are acutely toxic within surface waters affected by the ground water; or
>
> (d) Pose a serious danger to the public health, safety, or welfare; or
>
> (e) Create or constitute a nuisance; or
>
> (f) Impair the reasonable and beneficial use of adjacent waters.

These standards apply to all ground water, including ground water classified as G-III ground water. For specific components, Rules 62-520.420, 62-550.310, and 62-550.828, F.A.C., establish specific ground water standards for G-III ground water and G-II ground water, including standards for sodium (160 mg/L), nitrate (10 mg/L), chlorides (250 mg/L), sulfates (250 mg/L), and tritium (20,000 pCi/L).

Tritium is produced by nuclear reactors and is often found as a ground water contaminant at nuclear power plants. Historical data from 1974 to 1975 showed tritium concentrations in the FPL cooling canal system to be in the range of 1,556 – 4,846 pCi/L, and reports submitted by FPL for the monitoring period from June 2010 through December 2015 showed cooling canal system tritium concentrations as high as 15,487 pCi/L. Tritium is a good tracer to show discharge of contaminated water with other pollutants from the cooling canal system.

Although tritium has a Maximum Contaminant Level ("MCL") for drinking water of 20,000 pCi/L, the public health goal is much lower. An MCL takes into account factors other than public health, including feasibility of treatment and economics. Tritium, like other radionuclides, is considered to be a carcinogen. Tritium, as triturated water, enters the body and distributes widely through all water containing compartments without concentrating in any one site. Tritium then readily exchanges with hydrogen in many body molecules, including ribonucleotides, proteins and others, thereby being in the position to impart its energy upon

critical molecules. For example, tritium incorporated into DNA may result in beta particle radiation altering chromosomes, allowing for the induction of cancer. EPA has not set a public health goal for tritium in drinking water, but the State of California, based on EPA risk factors, has established the public health goal at 400 pCi/L, which is equivalent to a 1-in-a-million lifetime cancer risk.

CLEAN WATER ACT VIOLATIONS

I. VIOLATIONS OF EFFLUENT LIMITATIONS IN NPDES PERMIT NO. FL0001562

A. Condition I.A.1. of the NPDES Permit

Condition I.A.1. of the NPDES Permit states: "[t]his permit does not authorize discharge to surface waters of the state." FPL has violated this effluent limitation repeatedly since at least June 2015, and continues to violate this limitation, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay. These violations have been documented based on the detection of the pollutants in monitoring by FPL and the Miami-Dade Department of Regulatory and Economic Resources ("DERM") since 2010. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations have been continuous for at least the past five (5) years and will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has known for more than six (6) years that pollutants from the cooling canal system are being discharged into Biscayne Bay. FPL began monitoring the surface waters of Biscayne Bay and surface waters connected to Biscayne Bay in 2010, pursuant to an agreement with the South Florida Water Management District ("SFWMD"). Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and tritium) from the canal system in the surface waters of Biscayne Bay or surface waters connected to the Bay at Surface Water Monitoring Stations TPBBSW-1 through 5 (Biscayne Bay stations), TPSWC-1 through 3 (L-31E Canal stations), TPSWC-4 (S-20 Discharge Canal), TPSWC-5 (Card Sound Canal), and TPSWC-6 (Card Sound Road Canal) were reported for June-July 2010, September 2010, December 2010, March 2011, June 2011, September 2011, December 2011, March 2012, June 2012, September 2012, December 2012, March 2013, June 2013, September 2013, December 2013, March 2014, September 2014, and March 2015.

DERM and FPL began monitoring near-shore surface waters of Biscayne Bay adjacent to the cooling canal system more intensively in June 2015. Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and chlorophyll *a*) from the canal system in surface waters of the Bay at Surface Water Monitoring Stations TPSWC-4B, TPSWC-5B TPBBSW-6 and TPBBSW-7 were reported for May 31 & Jun 1, 2015, June 15 & 16, 2015, June 29 & 30, 2015, July 13 & 14, 2015, July 20 & 21, 2015, July 27 & 28, 2015, August 3 & 4, 2015, August

10 & 11, August 17 & 18, 2015, August 24 & 25, 2015, August 31 to September 2, 2015, September 8 & 9, 2015, September 14 & 18, 2015, September 21 & 22, 2015, September 28 to October 2, 2015, October 5 to 7, 2015, October 19 & 20, 2015, October 26 & 27, 2015, November 2 & 4, 2015, November 9 to 13, 2015, November 16 to 19, 2015, November 23 & 24, 2015, November 30 to December 3, 2015, December 7 to 9, 2015, December 14 & 15, 2015, December 21 & 22, 2015, December 28 & 29, 2015, January 4 & 5, 2016, January 11 & 12, 2016, and January 18 & 19, 2016.

In addition, DERM and FPL sampled near-shore surface waters of Biscayne Bay adjacent to the cooling canal system at Surface Water Monitoring Stations TPBBSW-7-B, TPBBSW-7M-B, TPBBSWCSC-M-B, TPSWC-7B, TPBBSW-6B, and TPBBSW-7T-B for radioactive tritium in December 2015 and January 2016. The results showed high levels of tritium (245 to 4,317 pCi/L) in deeper near-shore waters. Levels of tritium in Biscayne Bay away from the cooling canal system are typically less than 20 pCi/L. The presence of high levels of tritium in the near -shore surface waters of Biscayne Bay and surface waters connected to Biscayne Bay also confirms the hydrologic connection between the canal system and the surface waters of Biscayne Bay.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system represent degradation of the waters of Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters. In addition, the monitoring performed demonstrates that the levels of pollutants violate the Miami-Dade County water quality standard for ammonia and violate Florida water quality standards for total nitrogen, phosphorus, and chlorophyll *a*.

B. <u>Condition I.A.14 of the NPDES Permit</u>

Condition I.A.14 of the NPDES Permit states:

> Notwithstanding any other requirements of this "No Discharge" permit, the permittee shall comply with all applicable provisions of the Final Judgement dated September 10, 1971, in Civil Action Number 70-328-CA issued by the U.S. District Judge C. Clyde Atkins of the Southern District of Florida.

FPL has violated Paragraph V of this Final Judgment by discharging water from the cooling canal system into Biscayne Bay, as set out in Section I.A. of this Notice, *supra*.

C. <u>Condition IV.1. of the NPDES Permit</u>

Condition IV.1. of the NPDES Permit states: "The Permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in Rule 62-520.400, FA.C. and 62-520.430, FA.C." This condition also serves to protect surface waters

from degradation. FPL has violated this condition by causing continuous violations of the minimum criteria for ground water during each day during the past five (5) years preceding this Notice. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has contaminated ground water extending from the cooling canal system to over four (4) miles west of the cooling canal system in violation of Condition IV.1. of the NPDES Permit. Monitoring wells west of the FPL cooling canal system have shown violations of the minimum criteria for ground water since at least 2009, including sodium levels in well G-21 and G-28, approximately 4 miles west of the cooling canal system, which exceed sodium criterion by as much as 50 times. Other wells west of the cooling canal system (BBCW- 4, BBCW-5, FKS-4, TPGW-5D) showed sodium levels as high as 100 times the criterion.

Saltwater intrusion into the area west of the cooling canal system is impairing the reasonable and beneficial use of adjacent G-II ground water and, therefore, is a violation of the minimum criteria for ground water in Rule 62-520.400, F.A.C. The continuous seepage and resulting ground water plume of contaminated cooling canal water has and continues to contaminate usable portions of the Biscayne Aquifer - steadily converting Class G-II potable water to Class G-III non-potable water as it moves west through the Biscayne Aquifer. In addition, the plume of radioactive tritium continues to move west of the cooling canal system into the Biscayne Aquifer, with levels exceeding the public health goal of 400 pCi/L as much as three (3) miles west of the cooling canal system. Furthermore, as discussed in Section I.A. of this Notice, *supra*, the contaminated ground water is also moving east into Biscayne Bay.

D. <u>Condition VIII.5. of the NPDES Permit</u>

Condition VIII.5 of the NPDES Permit states:

> The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-620.610(5), F.AC.]

FPL has violated this condition by, among other omissions, failing to take all reasonable steps to minimize or prevent the discharges to surface waters and ground water set out in this Section I.A. and I.C. of this Notice, *supra*.

E. <u>Condition VIII.7. of the NPDES Permit</u>

Condition VIII.7. of the NPDES Permit states:

> The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. [62-620.610(7), F.A C.]

FPL has violated this condition by, among other omissions, failing to adequately control the temperature of the cooling water in the cooling canal system, by failing to control the nutrient levels in the system, and by failing to properly operate the so-called "interceptor" ditch to prevent widespread contamination of the ground water by saline water and other pollutants, including radioactive tritium.

II. DISCHARGING POLLUTANTS TO SURFACE WATERS WITHOUT AN NPDES PERMIT

Since at least June 2010, FPL has violated the CWA, 42 U.S.C. § 1311(a) and 40 C.F.R. § 122.21, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay without an NPDES permit authorizing such discharges. The locations of the discharges are set out in Section I.A. of this Notice, *supra*. The requirement for an NPDES permit authorizing these discharges arose at the time that FPL first knew or should have known that pollutants were being discharged into surface waters. Each day since that time is a violation of the CWA.

III. DISCHARGES CAUSING OR CONTRIBUTING TO VIOLATIONS OF WATER QUALITY STANDARDS

Federal and state law prohibit discharges of pollutants from point sources that cause or contribute to violations of surface water quality standards. *See, e.g.*, 33 U.S.C. § 1311(b)(1)(C) and § 403.088(1), Fla. Stat. In addition to prohibiting discharges to surface waters altogether, the NPDES Permit requires compliance with water quality standards in Section VIII., 5 and 12. FPL has violated the CWA, Florida law, and the NPDES Permit by causing or contributing to violations of surface water quality standards in Biscayne Bay due to its discharges from the Turkey Point cooling canal system, as set out in Section I.A. of this Notice, including, but not limited to, the narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., and the water quality standard for ammonia in Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances. These violations began in 2010 and continue as of the date of this Notice, as shown by monitoring data generated by FPL and DERM.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system also represent degradation of the waters of

Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters.

CONCLUSION

Thank you for your prompt attention to the ongoing, serious violations of federal law and permitting requirements. Unless the EPA or FDEP commences and diligently prosecutes an action in court to address these violations within sixty (60) days, we intend to file a citizen suit against FPL under 33 U.S.C. § 1365(a)(1) for the violations discussed above. In addition to the violations set forth herein, this Notice covers all violations of the CWA evidenced by information which becomes available after the date of this Notice. Pursuant to the CWA, we will seek civil penalties, attorney's fees and costs, as well as an injunction against continued violations.

Any and all communication related to this matter should be directed to Gary A. Davis and James S. Whitlock, at the address and telephone number listed at the top of this letter, or to James M. Porter, 9350 South Dixie Highway, 10th Floor, Miami, FL 33156, (305) 671-1345.

Respectfully,

Gary A. Davis

cc: Hon. Loretta E. Lynch
Attorney General of the United States
U.S. Department of Justice
950 Pennsylvania Avenue, NW
Washington, DC 20530-0001

cleanenergy.org
Southern Alliance for Clean Energy

IT'S TIME FOR SOLUTIONS!

PROMOTE CLEAN ENERGY

Clean energy, such as solar, wind, and energy efficiency, produces no pollution and provides jobs to our economy. Studies show that the United States could easily generate 80% of its power from clean sources by 2050. Energy efficiency can dramatically reduce the amount of power we use in our homes and businesses and lower our bills. Solar power is unlimited energy from the sun, free for the taking if our state policies are revised to level the playing field between solar and more traditional, polluting power sources like coal and nuclear. Meanwhile wind energy is cheap and abundant in the U.S. and could be brought to Florida for affordable and reliable power.

OPPOSE HIGH RISK ENERGY

Some energy sources have greater risks associated with their use. Old, inefficient and dirty coal power plants must be retired to reduce levels of pollution that trigger asthma attacks and heart and lung disease, put mercury in our water, and cause climate change. Nuclear power plants emit less carbon than coal but are extremely expensive to build, require large amounts of water to operate, generate dangerous, highly radioactive waste and can have devastating consequences should an accident occur. Our coast is too precious to be compromised by spills from offshore drilling. Clean energy is a positive alternative to each of these risky energy sources.

TAKE ACTION TODAY!

Find & Contact Your Elected Officials
http://www.bit.ly/legislator-search

Support Our Work & Become a Member of SACE Today
www.cleanenergy.org/donate

Join the Southeast Coastal Climate Network
http://seccn.groupsite.com

CONTACT YOUR ELECTED OFFICIALS

National and state-level climate and energy policies are imperative to ensure protection from the worst impacts of climate change and to secure the benefits of clean energy. Contact your elected officials in Washington D.C. and Tallahassee and tell them we must have climate and energy policies that:

- Invest in job-creating energy efficiency and clean energy
- Limit carbon pollution, such as the Clean Power Plan
- Preserve and strengthen the Clean Air Act
- Hold polluters accountable and end fossil-fuel subsidies

References and links available on the online version of this factsheet:
http://www.cleanenergy.org/fl-climate-impacts

CLIMATE CHANGE IMPACTS ON FLORIDA

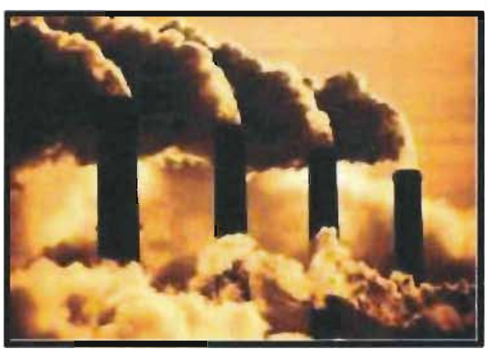
WHAT IS CLIMATE CHANGE?

The earth's climate is changing because of excess carbon dioxide pollution in the atmosphere, generated when fossil fuels like coal, oil, and natural gas are burned. This extra carbon traps more heat, like a greenhouse, which explains why 2000 to 2009 was the hottest decade ever recorded and there have been over 350 consecutive months with hotter-than-average global temperatures. Modern civilization developed in a stable climate and we have built our economy and way of life accordingly. Changes to our climate means that we are facing emerging hardships and vulnerabilities as the impacts of climate change unfold.

Some impacts from climate change include extreme storms, flooding from sea level rise, heat waves, and drought. These impacts have consequences for public health, safety, the economy, the environment, and our way of life.

Fortunately, we can protect against the worst impacts by limiting carbon pollution with energy efficiency and using clean renewable energy, like solar and wind.

Florida's coastline is a global treasure, yet is immensely vulnerable to flooding and erosion, made worse by climate change.



Over the last decade, FL coal-fired power plants produced an average of 63,200,000 tons of carbon pollution each year.

HOW WILL CLIMATE CHANGE IMPACT FL?

It is difficult to link any one event directly to climate change, and it is important to recognize that most climate data is regional or even global in scope. However, decades of expert research and centuries of historical records can be compared with recent trends to illustrate how climate change is already impacting parts of the Southeastern United States. These impacts, combined with possible future impacts, are both cause for concern and the imperative for action.

- Some of Florida's most **treasured places** are **flooding** and **eroding** away due in part to sea level rise from climate change. Sea levels rise because as the Earth warms, sea water expands and on-land glaciers melt. Our beaches, neighborhoods, and the Everglades and Keys are at great peril from sea level rise. Altogether, billions of dollars of coastal real estate and infrastructure could become inundated. Also at risk is Florida's coastal economy, which generates $17 billion and supports 441,000 jobs annually. Seas are projected to rise by between 8 inches and 6.6 feet throughout the 21st century alone.
- **Heritage foods** and **agriculture** are suffering because of global warming. Some seafood, such as oysters, are directly harmed by the carbon pollution absorbed into the ocean, while farmers are expected to lose more crops to heat stress, drought and unreliable winter weather, which is expected to become more frequent in a warmer world. For example, in 2007, 58 of Florida's 67 counties were declared natural disaster areas because of drought, and over the past few years, near back-to-back major cold snaps (2007, winter 2009/10, 2010/11, and the "polar vortex" of 2014) cost Florida citrus and vegetable farmers millions of dollars in damage and made food more expensive for buyers.
- **Hurricanes** are getting more intense in a warmer world, tending more toward category 4 and 5 storms. Coupled with flooding from sea level rise, the liability to our coastal communities is great. Insurance will likely continue to get more expensive as more extreme weather disasters take place.

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Photo Credit: Paul Marcellini

FPL's Turkey Point Nuclear Plant - Existing and Future Threats

FPL's water-guzzling, two-reactor nuclear plant is near Homestead, about 25 miles from Miami sandwiched between two internationally recognized treasures – the Everglades and Biscayne National Parks. Turkey Point requires massive amounts of water to cool down its reactors and utilizes a "once-through" cooling system that draws water from Biscayne Bay and runs it through a series of canals.

Existing Problems

Using vast amount of fresh water to generate energy conflicts with the goals of Everglades restoration and is contaminating the local South Florida drinking water supply and exacerbating salt water intrusion – putting many communities and two precious national parks at risk.[1]

•Turkey Point is already one of Florida's biggest daily water users and also discharges daily at least 600,000 pounds of salt[2] and up to 3 million-along with other contaminants such as ammonia, heavy metals and tritium (a radioactive form of hydrogen) into the Biscayne Aquifer.
•New data shows Turkey Point is contaminating the park and South Florida's main drinking water resource, the Biscayne Aquifer, a "sole source,"[3] federally-designated aquifer that serves over 3 million people.
•Enhanced salt water intrusion would likely affect all of Monroe County, South Dade county generally, Biscayne and Everglades National Parks and communities such as Cutler Bay, Florida City, Homestead, Ocean Reef, and Key Largo, among others.
•The anticipated impacts of global climate change including sea level rise, warmer temperatures and increased flooding will worsen this already unacceptable situation.

FPL's Turkey Point Plant overlooks Biscayne Park. *Photo taken by SACE*

Too Much at Risk: Biscayne & Everglades National Parks, South Florida's Drinking Water & Your Wallet

Future Threats

Despite all the problems that FPL's existing reactors are *already* causing, the big power company is actually considering building two more extremely expensive and water-intensive nuclear reactors. FPL customers are already paying in advance for costs associated with these proposed reactors, due to the anti-consumer early nuclear cost recovery law that the state legislature passed, or Florida's "nuclear tax." Between 2008 and 2015, customers have been charged over $280 million[3] with hundreds of millions of dollars more expected to be requested by FPL in the near future.

Protecting South Florida's drinking water resources for 3+ million people is critical. *Photo: Flickr/Creative Commons.*

- Radial collector wells (RCWs) underneath Biscayne Bay would provide backup cooling water for the proposed reactors and could use over 7.4 billion gallons over the course of a year [4] from under the Bay. By comparison, the entire Florida Keys use about 17 million gallons of water a day from the Biscayne Aquifer, or just over 6 billion gallons a year.[5]

- All levels of government agree that there is already not enough freshwater in South Florida. FPL admits that the new reactors will leave even less water in the area. The back-up cooling system for the new reactors threatens to make the situation worse by taking needed water from Biscayne Bay and the Biscayne Aquifer. This process risks more saltwater intrusion into our limited freshwater supply, leaving less freshwater for other needs in South Florida and allowing what is left to be contaminated by very salty water.

- Biscayne Bay and South Florida are extremely susceptible to the impacts of climate change, which will bring rising sea levels, increased extreme storms, and more flooding to the region. In the interest of public safety and environmental health, it makes no sense to expand a nuclear facility in an area that is ground zero for climate change.

Cooling canal system at FPL's Turkey Point which recent study shows are contaminating the Biscayne aquifer and National Park.
Photo: Miami-Dade Co. Environmental Resources Management

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Solutions for South Florida

The mess that FPL finds itself in with the existing Turkey Point plant is very complicated, but there are some common-sense steps that could help prevent further damage and contamination.

- Pursue clean, water-saving energy choices: Nuclear power is much more water-intensive than renewable energy sources, such as solar. Our precious water resources should not be squandered on nuclear power when other less water intensive and far more affordable energy options exist such as solar, energy efficiency and conservation.
- Energy efficiency programs provide energy savings that help customers reduce energy use and save money on bills all while protecting our water resources. FPL's proposed nuclear reactors can more cost-effectively be met with demand side management programs. Energy efficiency measures meet demand at less than 3 cents per kilowatt hour (kWh)[6], while the proposed Turkey Point nuclear reactors will meet demand at a cost of nearly 17 cents per kWh.[7]

Cutler Bay Solar Solutions employs local installers. *Photo taken by SACE.*

- Identify and implement more efficient, cooling technologies: Turkey Point's antiquated cooling canal system is not working and the unacceptable situation will only worsen given the expected impacts of global climate change. Ensuring clean, safe, plentiful water supplies and protecting the Everglades restoration efforts is worth far more than lining the pockets of big power companies. Installing cooling towers could be a viable option and should be researched along with other technologies.

- Enforce existing regulations: FPL cannot release salt outside the boundary of the cooling canal system; their existing discharge permit (NPDES permit-National Pollutant Discharge Elimination System) must be enforced and this salt loading must stop.
- Implement – **ABATE/REMEDIATE/MITIGATE:** In 2009, Miami-Dade County and the South Florida Water Management Division (SFWMD) entered in an agreement to **abate** (stop) FPL's improper management of the cooling canal system; **remediate** the damage by cleaning up the salt intrusion; and **mitigate** any damage to the Everglades or Biscayne Bay. The Florida Department of Environmental Protection (DEP) approved the agreement, which called for a 2-year monitoring period of the operations and resulting damage. But now the current DEP is trying to strip the SFWMD of the right to force the agreement to go forward.

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What You Can Do

- Sign the petition for FPL to stop the leaks, clean up Turkey Point and save Biscayne Bay online via this form[8]
- Learn more about the problems at Turkey Point here[9] along with the recent study prepared by the University of Miami (UM)[10] and an analysis by the Division of Environmental Resources Management[11]
- Tell the Public Service Commission[12] to stop approving FPL's spending on unnecessary, expensive new reactors at Turkey Point and instead advance less-water intensive, affordable clean energy choices such as solar and energy efficiency measures. Call 1-800-342-3552
- Submit a letter to editor to your local paper
- Join the Southern Alliance for Clean Energy[13] and support our work!

Sources:

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11. http://www.cleanenergy.org/wp-content/uploads/MiamiDade_DERMReportonRecentBiscayneBayWaterQualityObservations_030716.pdf
12. Contact the Florida Public Service Commission at http://www.psc.state.fl.us/AboutPSC/ContactForm
13. Join SACE today! https://salsa3.salsalabs.com/o/50500/p/salsa/donation/common/public/?donate_page_KEY=7881

Have questions or need more information?

Contact Laura Reynolds at 786-543-1926 or ConservationConceptsLLC@gmail.com

Prepared by Southern Alliance for Clean Energy | April 2016 | www.cleanenergy.org

The New York Times | http://nyti.ms/1RjrqJg

U.S.

Nuclear Plant Leak Threatens Drinking Water Wells in Florida

By LIZETTE ALVAREZ MARCH 22, 2016

MIAMI — When Florida's largest power company added two nuclear reactors to an existing plant that sat between two national parks — Biscayne Bay and the Everglades — the decision raised the concerns of environmentalists and some government officials about the possible effects on water quality and marine life.

Now more than four decades later, Florida Power & Light's reactors at Turkey Point, built to satisfy the power needs of a booming Miami, are facing their greatest crisis. A recent study commissioned by the county concluded that Turkey Point's old cooling canal system was leaking polluted water into Biscayne Bay.

This has raised alarm among county officials and environmentalists that the plant, which sits on the coastline, is polluting the bay's surface waters and its fragile ecosystem. In the past two years, bay waters near the plant have had a large saltwater plume that is slowly moving toward wells several miles away that supply drinking water to millions of residents in Miami and the Florida Keys.

Samples of the water at various depths and sites around the power plant showed elevated levels of salt, ammonia, phosphorous and tritium, a radioactive isotope that is found in nature but also frequently associated with nuclear power plants. The tritium, which was found in doses far too low to harm people, serves as a marker for scientists, enabling them to track the flow of canal water out from under the plant and into the bay. The tritium levels in December and January were much higher than they should be in ocean water.

Environmentalists, who have waged a longtime battle over water quality with the power company, among the largest in the country, said Tuesday that they planned to sue Florida Power & Light in 60 days for violating the federal Clean Water Act unless it addressed the problem.

The company has faced criticism and scrutiny from a judge and Miami-Dade County officials who said it was slow to react to the changes in water quality after the company overhauled Turkey Point in 2013 to increase its energy output. The plant, whose canals are filled with extremely hot water, was built on Florida limestone, which is highly porous.

"We now know exactly where the pollution is coming from, and we have a tracer that shows it's in the national park," said Laura Reynolds, an environmental consultant who is working with the Tropical Audubon Society and the Southern Alliance for Clean Energy, which intend to file the lawsuit. "We are worried about the marine life there and the future of Biscayne Bay."

At a news conference on Tuesday, José Javier Rodríguez, a Democratic member of the Florida House, called on the federal government to intervene. He said state regulators had failed to adequately enforce the law and had shied from forcing the politically influential energy company to address a problem it had long ignored. The power company has not been cited for any violation by the state.

"What's happening at Turkey Point is a real danger to us, to our water supply," Mr. Rodríguez said. "The fact that there is salt being dumped into the aquifer and the fact that there are contaminants in Biscayne Bay really should have sounded an alarm. But as of yet, we're still waiting for state regulators to step up."

Dee Ann Miller, a spokeswoman for the Florida Department of Environmental Protection, said the agency had acted to ensure that the power company reduce the salinity levels in the canal system, including issuing an administrative order.

Robert L. Gould, a spokesman for Florida Power & Light, said the company had been working under a consent decree with Miami-Dade County since October to address the high salinity in its canals. Salinity levels have been cut in half from their high point, he said. He attributed the high salinity levels and the algae bloom to drought conditions in 2013 and 2014, which drastically increased water temperatures in the canals, not to the overhaul of the plant's two nuclear reactors.

The company is also moving to address the spikes in nutrients, tritium and ammonia, Mr. Gould said, although he added that ammonia was not a byproduct of nuclear plants. He emphasized that the trace levels of tritium were far below the danger levels set by the Environmental Protection Agency for drinking water. The company has been in contact with the federal agency, he said.

None of these problems, Mr. Gould said, are threatening the state's drinking water supply or even the bay's health. The problem is mostly in areas right near the plant, he added. The closest the saltwater plume is to the water wells is about four miles away. "I really need to stress that there is no safety risk: There is no risk to the bay or to the drinking water," Mr. Gould said. "The way it's been portrayed by some is simply unfair. It's extremely misleading."

But last month, a Florida administrative judge, Bram Canter, chastised the state and Florida Power & Light, finding that the cooling canal system is "the major contributing cause" for the growth of the large underground saltwater plume and for its westerly move toward the drinking water well fields. He ordered the state and the company to clean up the cooling canals, which it had started to do under an October consent decree with the county.

The Biscayne Aquifer, the judge noted in his ruling, is an "important natural resource." It is the main source of drinking water in the county and is vital to irrigation and the marsh wetland communities, he added. Judge Canter made his ruling after a Florida rock mining company sued the company over the saltwater plume.

A version of this article appears in print on March 23, 2016, on page A12 of the New York edition with the headline: Nuclear Plant Leak Threatens Drinking Water Wells in Florida.

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The Problems with Turkey Point:

How the Turkey Point nuclear power plant is endangering South Florida communities and what can be done about it

The Impacts of the Uprate Were Misrepresented by FPL

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The Problem with Turkey Point

FPL's current operations at the Turkey point nuclear power plant are in violation of state and federal law - endangering our parks, communities, and aquifer by allowing their industrial waste to leave their property in all directions.

- Turkey Point is one of Florida's largest water users and is exacerbating Salt Water Intrusion to the West and consuming our potable water supply
  - ***FPL evaporates a minimum of 40 MGD and potentially up to 100 MGD***
- The impacts from Turkey Point are in direct conflict with the goals of Everglades Restoration and degrading a national park
  - **3,000,000 pounds of salt *every day***
  - ***FPL needs 2.78 Billion Gallons to operate the plant***
- Turkey Point is illegally releasing a massive plume of pollution into both Biscayne National Park and the Biscayne Aquifer:
  - ***Harmful Ammonia and Phosphorus discharges***
  - ***And Radioactive Tritium and Heavy Metals***

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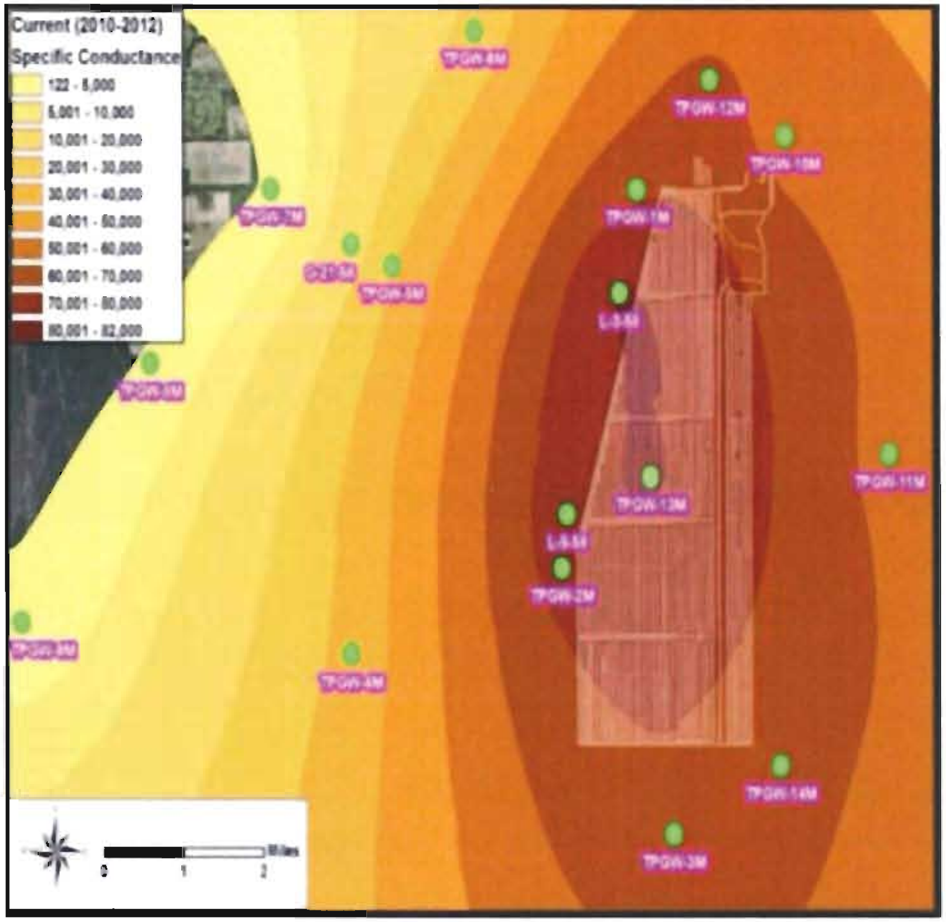
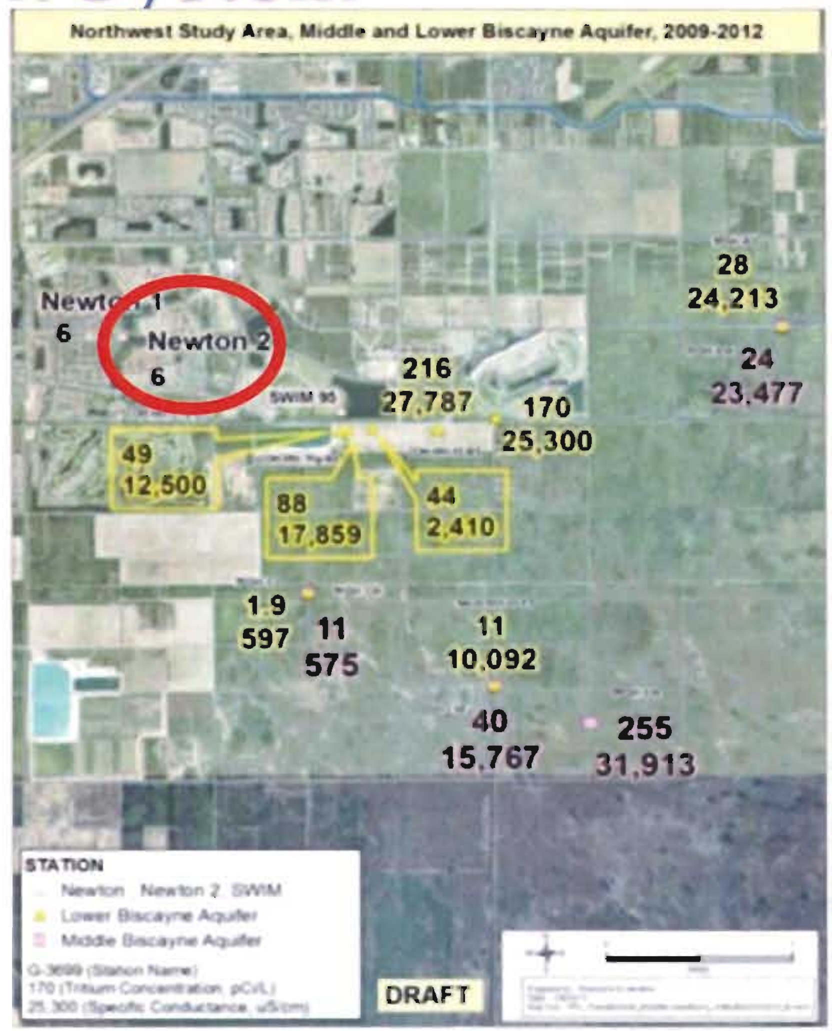
Failure of the Cooling Canal Water Containment System



Specific Conductance: Intermediate horizon



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Energy Water Nexus

Instead of using new technology, FPL's Turkey Point nuclear plant draws water from Biscayne Bay, the adjacent wetlands and the Biscayne Aquifer and runs **2.78 Billion Gallons Daily** through **6,800 acre cooling canal system** to cool the reactors---

- NPDES Permit is for a closed loop system all industrial waste captured within the red G-III class Industrial Waste Facility

- FPL has know about this contamination to the potable water supply since 1983

The Conflict with Everglades Restoration

Est. cost: **$22.5 Million of tax payer money for** phase 1 Alternative O of Biscayne Bay Costal Wetlands

- Will "improve the **ecological health** of Biscayne Bay…by adjusting the quantity, quality, timing, and **distribution of freshwater** entering Biscayne Bay…."

Source: SFWMD

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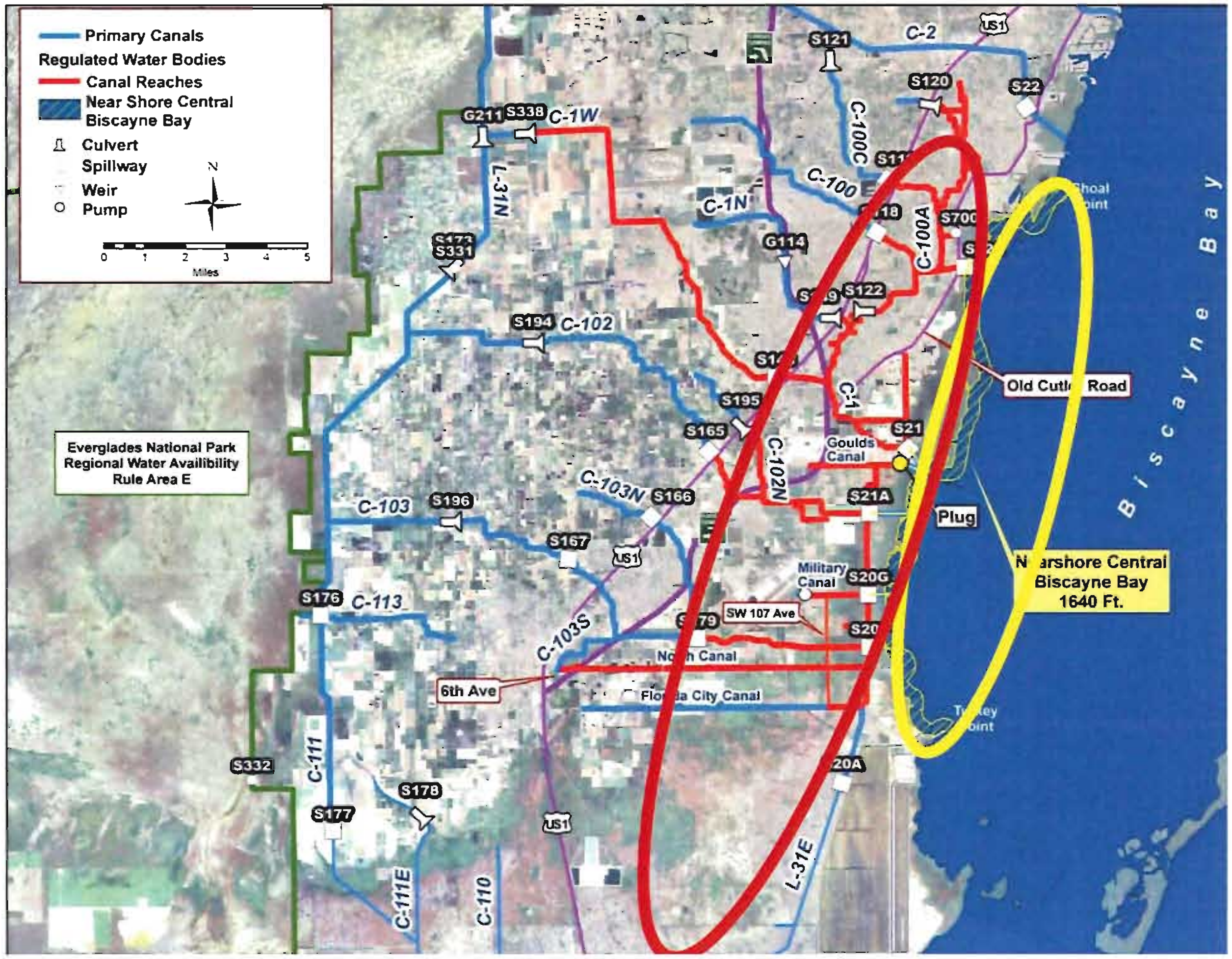
Not Enough Water for Restoration

- Water Reservation set for Biscayne Bay Costal Wetlands Phase 1 in 2012 reserved 504 acre feet per day

- **At the time this rule went into effect all agency experts agreed this was not enough water and a phase 2 water reservation would be needed ASAP**

- In addition all attempts would be made by SFWMD to keep the near shore area of Biscayne Bay from salinities higher than 34ppt or that of seawater

- Biscayne bay needs every drop of freshwater available and we must come up with another water source to complete Phase 2 BBCW to improve the conditions in BNP



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Everglades Coalition

Resolution in Support of the Protection of Biscayne Bay and Biscayne National Park from the Impacts of the Turkey Point Cooling Canal System

WHEREAS, Biscayne National Park is a national treasure, protecting some of the only living coral in the continental United States and the longest stretch of mangrove forest remaining on Florida's east coast, providing habitat and nursery grounds for important commercial and recreational fish, shellfish, and crustaceans, and offering refuge to many endangered species;

WHEREAS, Turkey Point, owned and operated by Florida Power & Light (FPL), is located directly on the shores of Biscayne Bay and Biscayne National Park;

WHEREAS, a system of unlined cooling canals covering approximately 5900 acres are used to cool water from Turkey Point operations;

WHEREAS, the plant's cooling canal system experiences heating and evaporation, which concentrates salt and other chemicals in its waters, and has created three issues of concern to the Coalition:

1. Biscayne Aquifer Contaminated by Hypersaline Cooling Canal Water

WHEREAS, the porous limestone geology of South Florida enables direct interaction between cooling canal system water and the underlying Biscayne Aquifer, resulting in the movement of dense hypersaline water from the canals into the Biscayne Aquifer and the loading of approximately 600,000 pounds of salt a day into the Aquifer;

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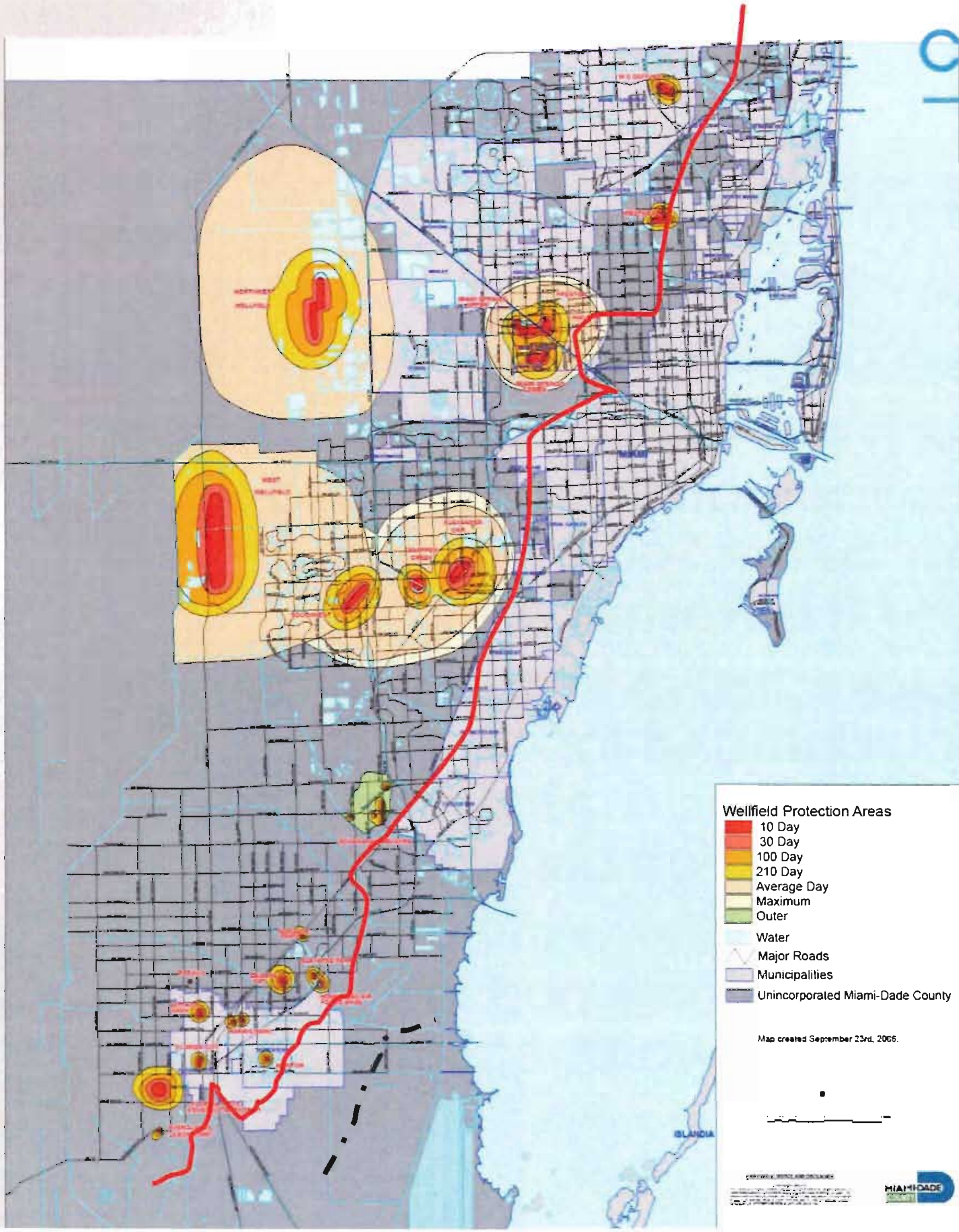
Communities at Risk: Saltwater Intrusion

- The Biscayne aquifer is a federally designated "Sole Source" aquifer, which serves over **3 million people**. Reliance on the Biscayne Aquifer is projected to increase dramatically as the South Florida population increases—**It is Freshwater**
- Climate Change is projected to increase sea-levels, cause greater human demand for water and potentially decrease precipitation in Florida, all contributing to greater stress on our water resources
- By loading the Biscayne Aquifer with hyper saline water, Turkey Point's operation is pushing the hydraulic head inland by upwards of **5 miles to the West and 3 miles to the East!**



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FPL generated a hypersaline plume 3x that of seawater and 6x that of the normal salinity of an estuary. (15-17 ppt)
Note: The saltier water gets (or the more ions it carries) the faster it moves through substrate.

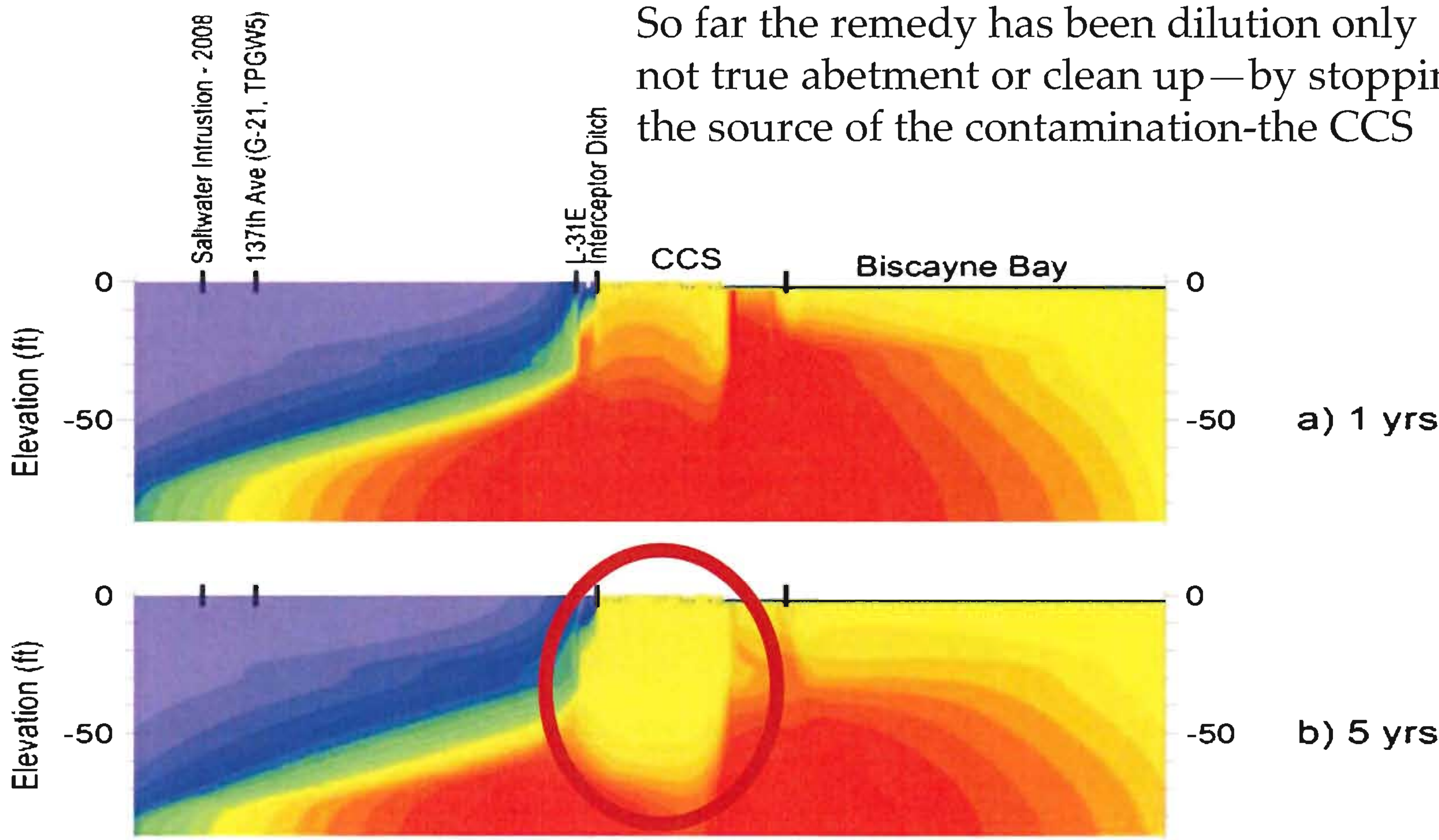
The toe of FPL's plume is advancing the normal saltwater front to a greater degree.
I wonder how far the front has migrated due to FPL operations?

Saltwater Front Presented in Prinos et al., 2014

Approximate Location Of Hypersaline Groundwater, 2015

Water Balance Model

So far the remedy has been dilution only not true abetment or clean up—by stopping the source of the contamination-the CCS



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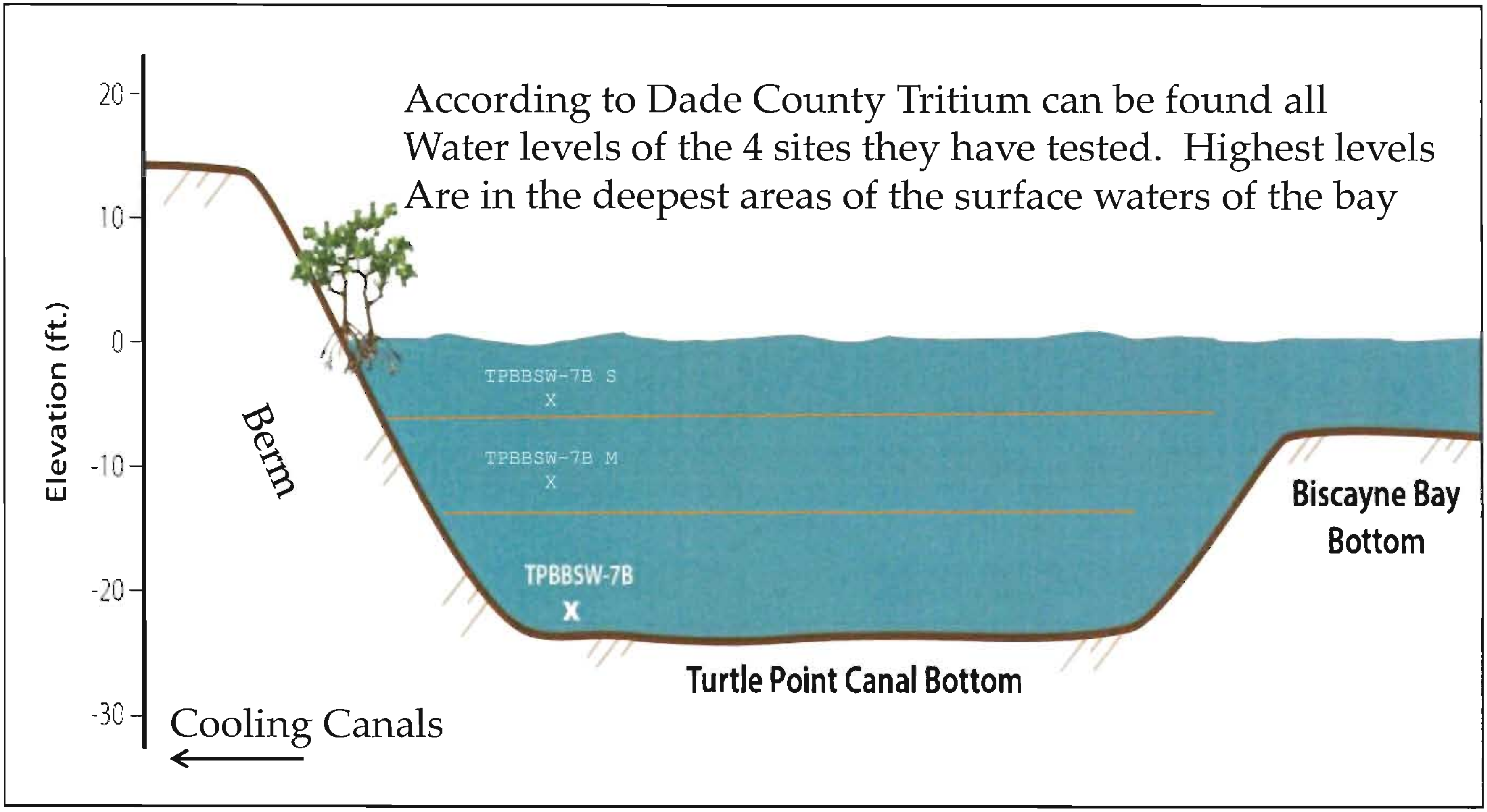
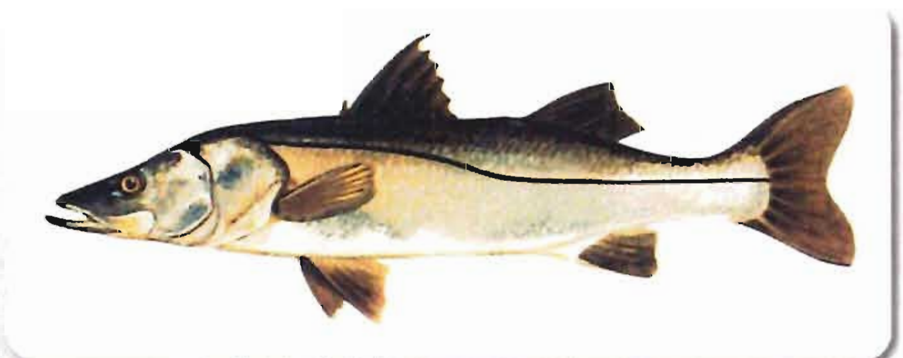
Biscayne Contamination-FPL Site Characterization



Community at Risk: Environmental Degradation

- Ammonia is known to damage fish populations
- The hypersaline conditions damage ecosystem and valuable species populations
  - o Snook, Spotted Trout, Pink Shrimp, etc.
- Conflict with the goals of Everglades Restoration
- Further study is needed on the total degradation caused to BNP by FPL's operations



Scientific Needs-30% Error

- **Evaporation**: Acoustic Doppler Wind speed sensors and Evaporative Flux meters
- **Rainfall Correction**: There is only 1 rain gauge on site there should be 8, a correlation must be done with the NEXRAD data to ground truth information
- **Flow Meters**: Measure the velocity of water circulating in the canals---add in 3 locations (Discharge, Mid South end and Intake locations)
- **Dye Study**: To see exactly where the pollution plume goes and how fast---with a ½ life of 12.5 years this is likely influencing areas much farther then the evidence shows
- **Ecosystem Harm**: a comprehensive study to determine potential harm to Biscayne Bay and surrounding wetlands
- **Update Models**: currently the ESA model does not take into account flow zones or any information to the east of the canals and there is a 30% error in water budget

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Solutions: A Four Step Process

- **REMEDIATE:** Immediately downrate the system (reduce electricity generation) to prevent any additional pollution and water demand; suspend all access to freshwater sources; demand development of a sustainable water source.

- **MITIGATE:** Repair the damage to Biscayne Bay by providing 5,000 acres of land and 60MGD of make-up water (to replace what is evaporated) to the alt O BBCW Everglades Restoration project.

- **ABATEMENT: Enforce the NPDES/CWA permit—Address the root cause of the problem**. Shut down and replace the antiquated Cooling Canal System with a newer closed loop cooling technology, like cooling towers, or something better.

- **EXPAND**: Advance solar energy in Florida. The Public Service Commission should require FPL to help change legislation to help expand solar and incentivize it, not expand water intensive salt generating energy production like nuclear power

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Future Threats

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FPL's Plans for Nuclear Expansion Will Exacerbate Negative Impacts

- **FPL proposes to build 2 new, very expensive nuclear reactors in addition to the 2 existing reactors**
- **Environmental Concerns:**
  - Additional water demand--Radial Collector wells—pump up to 125MGD or reuse water 90MGD
  - More highly radioactive, nuclear waste generated and stored at sea-level
  - Rock mining required to raise reactors 25 feet above sea level
  - Road expansions to further compartmentalize the system
  - Additional transmission lines in/near Everglades National Park and on US1 Corridor
  - Incompatibility with Everglades Restoration goals because of high water use and changes in salinity in BNP

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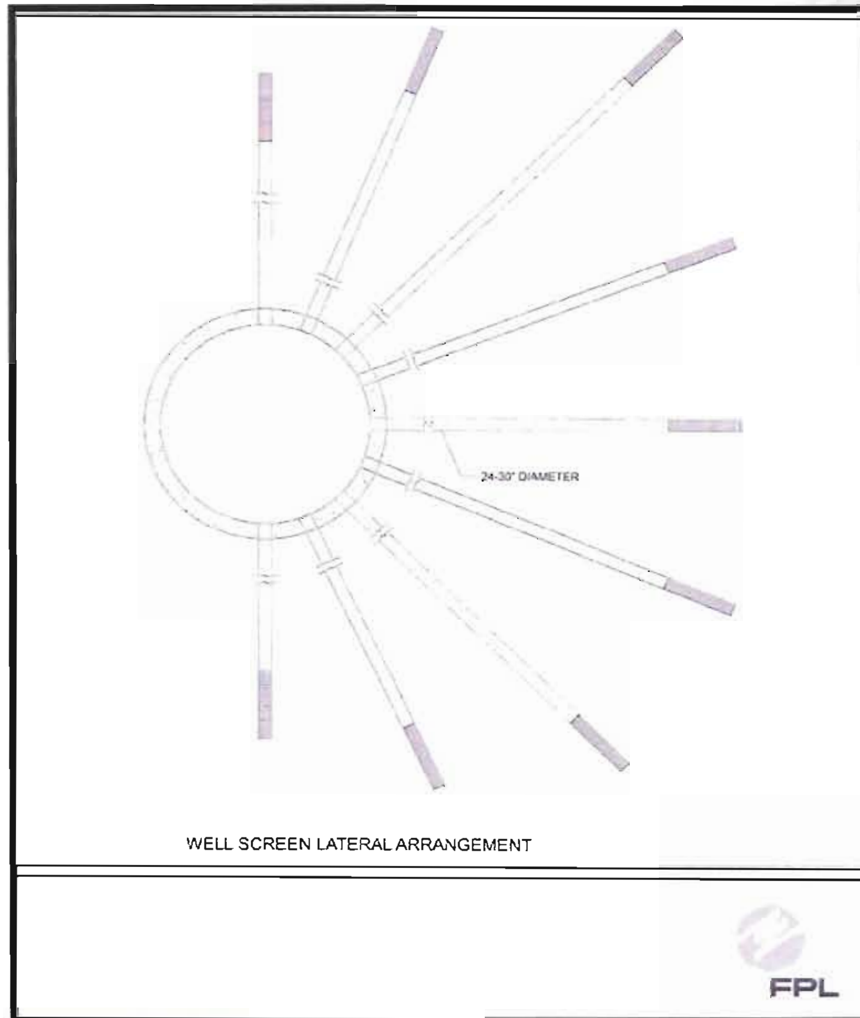
Radial Collector Wells

- Main Water source would require an additional 90 million gallons per day (MGD) reuse
- Can extract up to 125 MGD
- -35' to -45' (below BBAP)
- FPL stated it will "moderate" salinity



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March 15, 2016

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Florida Power & Light Company
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Heather McTeer Toney, Administrator
U.S. Environmental Protection Agency
Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

Re: Notice of Intent to File Citizen Suit Pursuant to the Federal Clean Water Act

Ladies and Gentlemen:

NOTICE

The purpose of this letter is to notify Florida Power & Light Company ("FPL") that the following organizations intend to file suit in sixty (60) days under the federal Clean Water Act ("CWA"), 33 U.S.C. § 1365(a)(1), in Federal District Court against FPL for violations of the CWA resulting from the discharge of pollutants from FPL's Turkey Point Power Plant near Homestead, Florida, into the protected waters of Biscayne Bay and to ground water, including the Biscayne Aquifer, in violation of the terms of NPDES Permit No. FL0001562 and the CWA:

Southern Alliance for Clean Energy
P.O. Box 1842,
Knoxville, TN 37901
(865) 637-6055

Tropical Audubon Society
5530 Sunset Dr.
Miami, FL 33143
(305) 667-7337

Each of these organizations has an interest in protecting the water quality of Biscayne Bay and has members who use the Bay for business and recreation, including fishing, boating, swimming, snorkeling and scuba diving. Each of these organizations also has an interest in protecting ground water quality and has members who use water from the Biscayne Aquifer for drinking water and other domestic purposes.

BACKGROUND

FPL owns and operates the Turkey Point Power Plant, located on the shores of Biscayne Bay near Homestead, Florida, about 25 miles south of downtown Miami. In the early 1970's, as the result of a federal court order to stop discharging hot cooling water into Biscayne Bay from its two nuclear power generators and other units, FPL constructed a giant, two-miles-wide-by five-miles-long, unlined cooling canal system adjacent to Biscayne Bay with the requirement to recycle the cooling water to prevent all discharges to the Bay. In 2012 and 2013, the two nuclear generators were "uprated" to increase power production, resulting in a much higher than predicted increase in the temperature and salinity of the water in the cooling canal system. The Turkey Point Power Plant and the cooling canal system are underlain by porous limestone geology, including the Biscayne Aquifer, and the contaminated water in the cooling canal system has for many years discharged, and continues to discharge, from the cooling canal system into the ground water and into Biscayne Bay, as described in detail in this Notice.

Section 301(a) of the Act, 33 U.S.C. § 1311(a), prohibits the discharge of pollutants from a point source to waters of the United States except in compliance with, among other conditions, a National Pollutant Discharge Elimination System ("NPDES") permit issued pursuant to section 402 of the Act, 33 U.S.C. § 1342. Each violation of the permit, and each discharge that is not authorized by the permit, is a violation of the CWA.

Used cooling water and other industrial wastewaters from the Turkey Point power plant are discharged through a point source of discharge – the outfalls designated I-001 and I-002 in the plant's NPDES permit. From there, they enter the FPL cooling canal system, from which they are conveyed through a direct hydrologic connection into the navigable waters of Biscayne Bay. Additionally, the FPL cooling canal system, itself, is a "point source" under the CWA. The CWA defines "point source" as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged." 33 U.S.C. § 1362(14). The Eleventh Circuit interprets the term "point source" broadly. *Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1009 (2004), following *Dague v. City of Burlington,* 935 F.2d 1343, 1354–55 (2d Cir.1991), *rev'd in part on other grounds,* 505 U.S. 557 (1992) ("The concept of a point

source was designed to further this scheme by embracing the broadest possible definition of any identifiable conveyance from which pollutants might enter waters of the United States."). The FPL cooling canal system is designed to hold cooling water and other industrial wastewater from the Turkey Point nuclear reactors, and is therefore, confined and discrete. Because the canal system is unlined and leaking pollutants into ground water which is hydrologically connected to Biscayne Bay, it is conveying pollutants to navigable waters. As a confined and discrete conveyance, the cooling canal system, itself, falls within the CWA's definition of "point source."

There is CWA jurisdiction where, as here, pollutants travel from a point source to navigable surface waters through hydrologically connected ground water. *See, e.g., Sierra Club v. Virginia Elec. and Power Co.*, No. 2:15-cv-112, 2015 WL 6830301, at *5-*6 (E.D. Va. Nov. 6, 2015); *Yadkin Riverkeeper, Inc. v. Duke Energy Carolinas, LLC*, No. 1:14–CV–753, 2015 WL 6157706, at *9-*10 (M.D. NC Oct. 20, 2015); *Hawai'i Wildlife Fund v. Cty. of Maui*, 24 F. Supp. 3d 980, 995 (D. Haw.2014); *Ass'n Concerned Over Resources and Nature, Inc. v. Tennessee Aluminum Processors, Inc.*, No. 1:10–00084, 2011 WL 1357690, at *16-*17 (M.D. Tenn, April 11, 2011); *Nw. Envtl. Def. Ctr. v. Grabhorn, Inc.*, No. CV–08–548–ST, 2009 WL 3672895, at *11 (D. Or. Oct. 30, 2009); *Hernandez v. Esso Standard Oil Co.* (P.R.), 599 F. Supp. 2d 175, 181 (D.P.R.2009); *N. Cal. River Watch v. Mercer Fraser Co.*, No. C–04–4620 SC, 2005 WL 2122052, at *2 (N.D. Cal. Sept. 1, 2005). *Idaho Rural Council v. Bosma*, 143 F.Supp.2d 1169, 1180 (D. Idaho 2001); *Mutual Life Ins. Co. v. Mobil Corp.*, No. Civ. A. 96–CV1781, 1998 WL 160820, at *3 (N.D. N.Y. 1998); *Williams Pipe Line Co. v. Bayer Corp.*, 964 F. Supp. 1300, 1319 (S.D. Iowa 1997); *Friends of Santa Fe County v. LAC Minerals, Inc.*, 892 F. Supp. 1333, 1357 (D. N.M.1995); *Wash. Wilderness Coal. v. Hecla Mining Co.*, 870 F. Supp. 983, 990 (E.D. Wash.1994); *Sierra Club v. Colorado Ref. Co.*, 838 F. Supp. 1428, 1434 (D.Colo.1993); *McClellan Ecological Seepage Situation v. Weinberger*, 707 F. Supp. 1182, 1196 (E.D. Cal.1988), *rev'd on other grounds*.

Pursuant to authority delegated by the United States Environmental Protection Agency ("EPA") under section 402(b) of the CWA, 33 U.S.C. § 1342(b), the Florida Department of Environmental Protection ("FLDEP") issued NPDES permit number FL0001562 to FPL. The current version of the permit became effective May 6, 2005. The permit expired on May 5, 2010, but has been administratively extended by FLDEP.

Federal courts have jurisdiction to hear citizen suits brought pursuant to state-issued NPDES permits, including for enforcement of more stringent provisions than would be included in a federal permit. *See, e.g., Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1004-08 (11th Cir. 2004); *Northwest Envtl. Advocates v. City of Portland*, 56 F.3d 979, 985–90 (9th Cir.1995); *St. Johns Riverkeeper, Inc. v. Jacksonville Elec. Authority*, 3:07-cv-739, 3:07-cv-747, 2010 WL 745494, at *3 (M.D. Fla. March 1, 2010); *Upper Chattahoochee Riverkeeper Fund, Inc. v. City of Atlanta*, 953 F. Supp. 1541, 1552–53 (N.D. Ga.1996); *Culbertson v. Coats Am., Inc.*, 913 F. Supp. 1572, 1581 (N.D. Ga.1995).

NPDES Permit No. FL0001562 authorizes the discharge of non-contact once-through condenser cooling water (OTCW), auxiliary equipment cooling water (AECW), low-volume

waste (LVW), and storm water into an onsite closed loop cooling canal system. The NPDES Permit specifically does not authorize discharge to surface waters. The NPDES Permit also contains limits on ground water discharges.

As set out in more detail below, FPL has violated and is violating its NPDES Permit by unauthorized discharges of pollutants, including, but not limited to, excess salinity, phosphorus, ammonia, TKN, total nitrogen, and radioactive tritium, into waters of the United States in Biscayne Bay. Additionally, FPL has violated its NPDES Permit by discharges of hypersaline Water contaminated with radioactive tritium into ground water, threatening the water supply for Miami-Dade County and the Florida Keys. FPL has also violated the Clean Water Act by discharging pollutants without an NPDES permit and by causing violations of water quality standards in Biscayne Bay, which is protected from degradation as Outstanding National Resource and Outstanding Florida Waters.

BISCAYNE BAY

Biscayne Bay is the largest estuary on the coast of southeast Florida and is contiguous with the southern Florida Everglades and Florida Bay. It encompasses a marine ecosystem that totals approximately 428 square miles. Its drainage area is 938 square miles, of which 350 are freshwater and coastal wetlands in Miami-Dade, Broward, and Monroe Counties. It is home to Biscayne National Park, the largest marine park in the national park system. Not only is it a source for food, transportation, and commerce, it also offers boundless opportunities for recreation, such as boating, fishing, swimming, snorkeling and scuba diving. Rimmed by mangrove wetlands, the natural bay is a shallow estuary of clear waters and sandy bay bottoms with seagrasses, corals and sponges. The bay supports rich ecological communities and a diverse variety of fish and wildlife.

Pursuant to the authority delegated to it under the CWA, FLDEP has promulgated water quality standards for waters within the state. The waters of Biscayne Bay into which FPL is discharging are classified by FLDEP in Rule 62-302.400(14) of the Florida Administrative Code ("F.A.C.") as Class III – Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. In addition, Rule 62-302.700(9), F.A.C., designates the waters of Biscayne Bay within Biscayne National Park into which FPL is discharging as Outstanding National Resource and Outstanding Florida Waters. Pursuant to Rule 62-302.700(1), F.A.C., "[i]t shall be the Department policy to afford the highest protection to Outstanding Florida Waters and Outstanding National Resource Waters. No degradation of water quality . . . is to be permitted in Outstanding Florida Waters and Outstanding National Resource Waters."

The narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., has been interpreted by FLDEP as requiring no more than 0.007 milligram per liter ("mg/L") of Total Phosphorus, 0.35 mg/L of Total Nitrogen, and 0.2 µg/L of Chlorophyll *a*, in the waters of Biscayne Bay into which FPL is discharging. Rule 62-302.532(1), F.A.C. In addition, Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances, requires 0.5 mg/L or less of ammonia in marine waters in the County.

BISCAYNE AQUIFER

The Biscayne Aquifer is the main source of potable water in Miami-Dade County and the Florida Keys and is designated by the federal government as a sole source aquifer under the Safe Drinking Water Act. FLDEP classifies Florida ground water and sets minimum standards for ground water in Rule 62-520.400, FA.C. and 62-520.430, FA.C. Rule 62-520.400, F.A.C., states:

> (1) All ground water shall at all places and at all times be free from domestic, industrial, agricultural, or other man-induced non-thermal components of discharges in concentrations which, alone or in combination with other substances, or components of discharges (whether thermal or non-thermal):
>
> (a) Are harmful to plants, animals, or organisms that are native to the soil and responsible for treatment or stabilization of the discharge relied upon by Department permits; or
>
> (b) Are carcinogenic, mutagenic, teratogenic, or toxic to human beings, unless specific criteria are established for such components in Rule 62-520.420, F.A.C.; or
>
> (c) Are acutely toxic within surface waters affected by the ground water; or
>
> (d) Pose a serious danger to the public health, safety, or welfare; or
>
> (e) Create or constitute a nuisance; or
>
> (f) Impair the reasonable and beneficial use of adjacent waters.

These standards apply to all ground water, including ground water classified as G-III ground water. For specific components, Rules 62-520.420, 62-550.310, and 62-550.828, F.A.C., establish specific ground water standards for G-III ground water and G-II ground water, including standards for sodium (160 mg/L), nitrate (10 mg/L), chlorides (250 mg/L), sulfates (250 mg/L), and tritium (20,000 pCi/L).

Tritium is produced by nuclear reactors and is often found as a ground water contaminant at nuclear power plants. Historical data from 1974 to 1975 showed tritium concentrations in the FPL cooling canal system to be in the range of 1,556 – 4,846 pCi/L, and reports submitted by FPL for the monitoring period from June 2010 through December 2015 showed cooling canal system tritium concentrations as high as 15,487 pCi/L. Tritium is a good tracer to show discharge of contaminated water with other pollutants from the cooling canal system.

Although tritium has a Maximum Contaminant Level ("MCL") for drinking water of 20,000 pCi/L, the public health goal is much lower. An MCL takes into account factors other than public health, including feasibility of treatment and economics. Tritium, like other radionuclides, is considered to be a carcinogen. Tritium, as triturated water, enters the body and distributes widely through all water containing compartments without concentrating in any one site. Tritium then readily exchanges with hydrogen in many body molecules, including ribonucleotides, proteins and others, thereby being in the position to impart its energy upon

critical molecules. For example, tritium incorporated into DNA may result in beta particle radiation altering chromosomes, allowing for the induction of cancer. EPA has not set a public health goal for tritium in drinking water, but the State of California, based on EPA risk factors, has established the public health goal at 400 pCi/L, which is equivalent to a 1-in-a-million lifetime cancer risk.

CLEAN WATER ACT VIOLATIONS

I. VIOLATIONS OF EFFLUENT LIMITATIONS IN NPDES PERMIT NO. FL0001562

A. Condition I.A.1. of the NPDES Permit

Condition I.A.1. of the NPDES Permit states: "[t]his permit does not authorize discharge to surface waters of the state." FPL has violated this effluent limitation repeatedly since at least June 2015, and continues to violate this limitation, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay. These violations have been documented based on the detection of the pollutants in monitoring by FPL and the Miami-Dade Department of Regulatory and Economic Resources ("DERM") since 2010. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations have been continuous for at least the past five (5) years and will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has known for more than six (6) years that pollutants from the cooling canal system are being discharged into Biscayne Bay. FPL began monitoring the surface waters of Biscayne Bay and surface waters connected to Biscayne Bay in 2010, pursuant to an agreement with the South Florida Water Management District ("SFWMD"). Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and tritium) from the canal system in the surface waters of Biscayne Bay or surface waters connected to the Bay at Surface Water Monitoring Stations TPBBSW-1 through 5 (Biscayne Bay stations), TPSWC-1 through 3 (L-31E Canal stations), TPSWC-4 (S-20 Discharge Canal), TPSWC-5 (Card Sound Canal), and TPSWC-6 (Card Sound Road Canal) were reported for June-July 2010, September 2010, December 2010, March 2011, June 2011, September 2011, December 2011, March 2012, June 2012, September 2012, December 2012, March 2013, June 2013, September 2013, December 2013, March 2014, September 2014, and March 2015.

DERM and FPL began monitoring near-shore surface waters of Biscayne Bay adjacent to the cooling canal system more intensively in June 2015. Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and chlorophyll *a*) from the canal system in surface waters of the Bay at Surface Water Monitoring Stations TPSWC-4B, TPSWC-5B TPBBSW-6 and TPBBSW-7 were reported for May 31 & Jun 1, 2015, June 15 & 16, 2015, June 29 & 30, 2015, July 13 & 14, 2015, July 20 & 21, 2015, July 27 & 28, 2015, August 3 & 4, 2015, August

10 & 11, August 17 & 18, 2015, August 24 & 25, 2015, August 31 to September 2, 2015, September 8 & 9, 2015, September 14 & 18, 2015, September 21 & 22, 2015, September 28 to October 2, 2015, October 5 to 7, 2015, October 19 & 20, 2015, October 26 & 27, 2015, November 2 & 4, 2015, November 9 to 13, 2015, November 16 to 19, 2015, November 23 & 24, 2015, November 30 to December 3, 2015, December 7 to 9, 2015, December 14 & 15, 2015, December 21 & 22, 2015, December 28 & 29, 2015, January 4 & 5, 2016, January 11 & 12, 2016, and January 18 & 19, 2016.

In addition, DERM and FPL sampled near-shore surface waters of Biscayne Bay adjacent to the cooling canal system at Surface Water Monitoring Stations TPBBSW-7-B, TPBBSW-7M-B, TPBBSWCSC-M-B, TPSWC-7B, TPBBSW-6B, and TPBBSW-7T-B for radioactive tritium in December 2015 and January 2016. The results showed high levels of tritium (245 to 4,317 pCi/L) in deeper near-shore waters. Levels of tritium in Biscayne Bay away from the cooling canal system are typically less than 20 pCi/L. The presence of high levels of tritium in the near -shore surface waters of Biscayne Bay and surface waters connected to Biscayne Bay also confirms the hydrologic connection between the canal system and the surface waters of Biscayne Bay.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system represent degradation of the waters of Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters. In addition, the monitoring performed demonstrates that the levels of pollutants violate the Miami-Dade County water quality standard for ammonia and violate Florida water quality standards for total nitrogen, phosphorus, and chlorophyll *a*.

B. <u>Condition I.A.14 of the NPDES Permit</u>

Condition I.A.14 of the NPDES Permit states:

> Notwithstanding any other requirements of this "No Discharge" permit, the permittee shall comply with all applicable provisions of the Final Judgement dated September 10, 1971, in Civil Action Number 70-328-CA issued by the U.S. District Judge C. Clyde Atkins of the Southern District of Florida.

FPL has violated Paragraph V of this Final Judgment by discharging water from the cooling canal system into Biscayne Bay, as set out in Section I.A. of this Notice, *supra*.

C. <u>Condition IV.1. of the NPDES Permit</u>

Condition IV.1. of the NPDES Permit states: "The Permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in Rule 62-520.400, FA.C. and 62-520.430, FA.C." This condition also serves to protect surface waters

from degradation. FPL has violated this condition by causing continuous violations of the minimum criteria for ground water during each day during the past five (5) years preceding this Notice. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has contaminated ground water extending from the cooling canal system to over four (4) miles west of the cooling canal system in violation of Condition IV.1. of the NPDES Permit. Monitoring wells west of the FPL cooling canal system have shown violations of the minimum criteria for ground water since at least 2009, including sodium levels in well G-21 and G-28, approximately 4 miles west of the cooling canal system, which exceed sodium criterion by as much as 50 times. Other wells west of the cooling canal system (BBCW- 4, BBCW-5, FKS-4, TPGW-5D) showed sodium levels as high as 100 times the criterion.

Saltwater intrusion into the area west of the cooling canal system is impairing the reasonable and beneficial use of adjacent G-II ground water and, therefore, is a violation of the minimum criteria for ground water in Rule 62-520.400, F.A.C. The continuous seepage and resulting ground water plume of contaminated cooling canal water has and continues to contaminate usable portions of the Biscayne Aquifer - steadily converting Class G-II potable water to Class G-III non-potable water as it moves west through the Biscayne Aquifer. In addition, the plume of radioactive tritium continues to move west of the cooling canal system into the Biscayne Aquifer, with levels exceeding the public health goal of 400 pCi/L as much as three (3) miles west of the cooling canal system. Furthermore, as discussed in Section I.A. of this Notice, *supra*, the contaminated ground water is also moving east into Biscayne Bay.

D. Condition VIII.5. of the NPDES Permit

Condition VIII.5 of the NPDES Permit states:

> The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-620.610(5), F.AC.]

FPL has violated this condition by, among other omissions, failing to take all reasonable steps to minimize or prevent the discharges to surface waters and ground water set out in this Section I.A. and I.C. of this Notice, *supra*.

E. Condition VIII.7. of the NPDES Permit

Condition VIII.7. of the NPDES Permit states:

> The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. [62-620.610(7), F.A C.]

FPL has violated this condition by, among other omissions, failing to adequately control the temperature of the cooling water in the cooling canal system, by failing to control the nutrient levels in the system, and by failing to properly operate the so-called "interceptor" ditch to prevent widespread contamination of the ground water by saline water and other pollutants, including radioactive tritium.

II. DISCHARGING POLLUTANTS TO SURFACE WATERS WITHOUT AN NPDES PERMIT

Since at least June 2010, FPL has violated the CWA, 42 U.S.C. § 1311(a) and 40 C.F.R. § 122.21, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay without an NPDES permit authorizing such discharges. The locations of the discharges are set out in Section I.A. of this Notice, *supra*. The requirement for an NPDES permit authorizing these discharges arose at the time that FPL first knew or should have known that pollutants were being discharged into surface waters. Each day since that time is a violation of the CWA.

III. DISCHARGES CAUSING OR CONTRIBUTING TO VIOLATIONS OF WATER QUALITY STANDARDS

Federal and state law prohibit discharges of pollutants from point sources that cause or contribute to violations of surface water quality standards. *See, e.g.*, 33 U.S.C. § 1311(b)(1)(C) and § 403.088(1), Fla. Stat. In addition to prohibiting discharges to surface waters altogether, the NPDES Permit requires compliance with water quality standards in Section VIII., 5 and 12. FPL has violated the CWA, Florida law, and the NPDES Permit by causing or contributing to violations of surface water quality standards in Biscayne Bay due to its discharges from the Turkey Point cooling canal system, as set out in Section I.A. of this Notice, including, but not limited to, the narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., and the water quality standard for ammonia in Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances. These violations began in 2010 and continue as of the date of this Notice, as shown by monitoring data generated by FPL and DERM.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system also represent degradation of the waters of

Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters.

CONCLUSION

Thank you for your prompt attention to the ongoing, serious violations of federal law and permitting requirements. Unless the EPA or FDEP commences and diligently prosecutes an action in court to address these violations within sixty (60) days, we intend to file a citizen suit against FPL under 33 U.S.C. § 1365(a)(1) for the violations discussed above. In addition to the violations set forth herein, this Notice covers all violations of the CWA evidenced by information which becomes available after the date of this Notice. Pursuant to the CWA, we will seek civil penalties, attorney's fees and costs, as well as an injunction against continued violations.

Any and all communication related to this matter should be directed to Gary A. Davis and James S. Whitlock, at the address and telephone number listed at the top of this letter, or to James M. Porter, 9350 South Dixie Highway, 10th Floor, Miami, FL 33156, (305) 671-1345.

Respectfully,

Gary A. Davis

cc. Hon. Loretta E. Lynch
Attorney General of the United States
U.S. Department of Justice
950 Pennsylvania Avenue, NW
Washington, DC 20530-0001

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March 15, 2016

Via Certified Mail/Return Receipt

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Re: <u>Notice of Intent to File Citizen Suit Pursuant to the Federal Clean Water Act</u>

Ladies and Gentlemen:

NOTICE

The purpose of this letter is to notify Florida Power & Light Company ("FPL") that the following organizations intend to file suit in sixty (60) days under the federal Clean Water Act ("CWA"), 33 U.S.C. § 1365(a)(1), in Federal District Court against FPL for violations of the CWA resulting from the discharge of pollutants from FPL's Turkey Point Power Plant near Homestead, Florida, into the protected waters of Biscayne Bay and to ground water, including the Biscayne Aquifer, in violation of the terms of NPDES Permit No. FL0001562 and the CWA:

Southern Alliance for Clean Energy
P.O. Box 1842,
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Each of these organizations has an interest in protecting the water quality of Biscayne Bay and has members who use the Bay for business and recreation, including fishing, boating, swimming, snorkeling and scuba diving. Each of these organizations also has an interest in protecting ground water quality and has members who use water from the Biscayne Aquifer for drinking water and other domestic purposes.

BACKGROUND

FPL owns and operates the Turkey Point Power Plant, located on the shores of Biscayne Bay near Homestead, Florida, about 25 miles south of downtown Miami. In the early 1970's, as the result of a federal court order to stop discharging hot cooling water into Biscayne Bay from its two nuclear power generators and other units, FPL constructed a giant, two-miles-wide-by five-miles-long, unlined cooling canal system adjacent to Biscayne Bay with the requirement to recycle the cooling water to prevent all discharges to the Bay. In 2012 and 2013, the two nuclear generators were "uprated" to increase power production, resulting in a much higher than predicted increase in the temperature and salinity of the water in the cooling canal system. The Turkey Point Power Plant and the cooling canal system are underlain by porous limestone geology, including the Biscayne Aquifer, and the contaminated water in the cooling canal system has for many years discharged, and continues to discharge, from the cooling canal system into the ground water and into Biscayne Bay, as described in detail in this Notice.

Section 301(a) of the Act, 33 U.S.C. § 1311(a), prohibits the discharge of pollutants from a point source to waters of the United States except in compliance with, among other conditions, a National Pollutant Discharge Elimination System ("NPDES") permit issued pursuant to section 402 of the Act, 33 U.S.C. § 1342. Each violation of the permit, and each discharge that is not authorized by the permit, is a violation of the CWA.

Used cooling water and other industrial wastewaters from the Turkey Point power plant are discharged through a point source of discharge – the outfalls designated I-001 and I-002 in the plant's NPDES permit. From there, they enter the FPL cooling canal system, from which they are conveyed through a direct hydrologic connection into the navigable waters of Biscayne Bay. Additionally, the FPL cooling canal system, itself, is a "point source" under the CWA. The CWA defines "point source" as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged." 33 U.S.C. § 1362(14). The Eleventh Circuit interprets the term "point source" broadly. *Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1009 (2004), following *Dague v. City of Burlington,* 935 F.2d 1343, 1354–55 (2d Cir.1991), *rev'd in part on other grounds,* 505 U.S. 557 (1992) ("The concept of a point

source was designed to further this scheme by embracing the broadest possible definition of any identifiable conveyance from which pollutants might enter waters of the United States."). The FPL cooling canal system is designed to hold cooling water and other industrial wastewater from the Turkey Point nuclear reactors, and is therefore, confined and discrete. Because the canal system is unlined and leaking pollutants into ground water which is hydrologically connected to Biscayne Bay, it is conveying pollutants to navigable waters. As a confined and discrete conveyance, the cooling canal system, itself, falls within the CWA's definition of "point source."

There is CWA jurisdiction where, as here, pollutants travel from a point source to navigable surface waters through hydrologically connected ground water. *See, e.g., Sierra Club v. Virginia Elec. and Power Co.*, No. 2:15-cv-112, 2015 WL 6830301, at *5-*6 (E.D. Va. Nov. 6, 2015); *Yadkin Riverkeeper, Inc. v. Duke Energy Carolinas, LLC*, No. 1:14–CV–753, 2015 WL 6157706, at *9-*10 (M.D. NC Oct. 20, 2015); *Hawai'i Wildlife Fund v. Cty. of Maui*, 24 F. Supp. 3d 980, 995 (D. Haw.2014); *Ass'n Concerned Over Resources and Nature, Inc. v. Tennessee Aluminum Processors, Inc.*, No. 1:10–00084, 2011 WL 1357690, at *16-*17 (M.D. Tenn, April 11, 2011); *Nw. Envtl. Def. Ctr. v. Grabhorn, Inc.*, No. CV–08–548–ST, 2009 WL 3672895, at *11 (D. Or. Oct. 30, 2009); *Hernandez v. Esso Standard Oil Co.* (P.R.), 599 F. Supp. 2d 175, 181 (D.P.R.2009); *N. Cal. River Watch v. Mercer Fraser Co.*, No. C–04–4620 SC, 2005 WL 2122052, at *2 (N.D. Cal. Sept. 1, 2005). *Idaho Rural Council v. Bosma*, 143 F.Supp.2d 1169, 1180 (D. Idaho 2001); *Mutual Life Ins. Co. v. Mobil Corp.,* No. Civ. A. 96–CV1781, 1998 WL 160820, at *3 (N.D. N.Y. 1998); *Williams Pipe Line Co. v. Bayer Corp.*, 964 F. Supp. 1300, 1319 (S.D. Iowa 1997); *Friends of Santa Fe County v. LAC Minerals, Inc.,* 892 F. Supp. 1333, 1357 (D. N.M.1995); *Wash. Wilderness Coal. v. Hecla Mining Co.*, 870 F. Supp. 983, 990 (E.D. Wash.1994); *Sierra Club v. Colorado Ref. Co.,* 838 F. Supp. 1428, 1434 (D.Colo.1993); *McClellan Ecological Seepage Situation v. Weinberger,* 707 F. Supp. 1182, 1196 (E.D. Cal.1988), *rev'd on other grounds*.

Pursuant to authority delegated by the United States Environmental Protection Agency ("EPA") under section 402(b) of the CWA, 33 U.S.C. § 1342(b), the Florida Department of Environmental Protection ("FLDEP") issued NPDES permit number FL0001562 to FPL. The current version of the permit became effective May 6, 2005. The permit expired on May 5, 2010, but has been administratively extended by FLDEP.

Federal courts have jurisdiction to hear citizen suits brought pursuant to state-issued NPDES permits, including for enforcement of more stringent provisions than would be included in a federal permit. *See, e.g., Parker v. Scrap Metal Processors, Inc.*, 386 F.3d 993, 1004-08 (11th Cir. 2004); *Northwest Envtl. Advocates v. City of Portland,* 56 F.3d 979, 985–90 (9th Cir.1995); *St. Johns Riverkeeper, Inc. v. Jacksonville Elec. Authority,* 3:07-cv-739, 3:07-cv-747, 2010 WL 745494, at *3 (M.D. Fla. March 1, 2010); *Upper Chattahoochee Riverkeeper Fund, Inc. v. City of Atlanta,* 953 F. Supp. 1541, 1552–53 (N.D. Ga.1996); *Culbertson v. Coats Am., Inc.,* 913 F. Supp. 1572, 1581 (N.D. Ga.1995).

NPDES Permit No. FL0001562 authorizes the discharge of non-contact once-through condenser cooling water (OTCW), auxiliary equipment cooling water (AECW), low-volume

waste (LVW), and storm water into an onsite closed loop cooling canal system. The NPDES Permit specifically does not authorize discharge to surface waters. The NPDES Permit also contains limits on ground water discharges.

As set out in more detail below, FPL has violated and is violating its NPDES Permit by unauthorized discharges of pollutants, including, but not limited to, excess salinity, phosphorus, ammonia, TKN, total nitrogen, and radioactive tritium, into waters of the United States in Biscayne Bay. Additionally, FPL has violated its NPDES Permit by discharges of hypersaline Water contaminated with radioactive tritium into ground water, threatening the water supply for Miami-Dade County and the Florida Keys. FPL has also violated the Clean Water Act by discharging pollutants without an NPDES permit and by causing violations of water quality standards in Biscayne Bay, which is protected from degradation as Outstanding National Resource and Outstanding Florida Waters.

BISCAYNE BAY

Biscayne Bay is the largest estuary on the coast of southeast Florida and is contiguous with the southern Florida Everglades and Florida Bay. It encompasses a marine ecosystem that totals approximately 428 square miles. Its drainage area is 938 square miles, of which 350 are freshwater and coastal wetlands in Miami-Dade, Broward, and Monroe Counties. It is home to Biscayne National Park, the largest marine park in the national park system. Not only is it a source for food, transportation, and commerce, it also offers boundless opportunities for recreation, such as boating, fishing, swimming, snorkeling and scuba diving. Rimmed by mangrove wetlands, the natural bay is a shallow estuary of clear waters and sandy bay bottoms with seagrasses, corals and sponges. The bay supports rich ecological communities and a diverse variety of fish and wildlife.

Pursuant to the authority delegated to it under the CWA, FLDEP has promulgated water quality standards for waters within the state. The waters of Biscayne Bay into which FPL is discharging are classified by FLDEP in Rule 62-302.400(14) of the Florida Administrative Code ("F.A.C.") as Class III – Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. In addition, Rule 62-302.700(9), F.A.C., designates the waters of Biscayne Bay within Biscayne National Park into which FPL is discharging as Outstanding National Resource and Outstanding Florida Waters. Pursuant to Rule 62-302.700(1), F.A.C., "[i]t shall be the Department policy to afford the highest protection to Outstanding Florida Waters and Outstanding National Resource Waters. No degradation of water quality . . . is to be permitted in Outstanding Florida Waters and Outstanding National Resource Waters."

The narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., has been interpreted by FLDEP as requiring no more than 0.007 milligram per liter ("mg/L") of Total Phosphorus, 0.35 mg/L of Total Nitrogen, and 0.2 μg/L of Chlorophyll *a*, in the waters of Biscayne Bay into which FPL is discharging. Rule 62-302.532(1), F.A.C. In addition, Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances, requires 0.5 mg/L or less of ammonia in marine waters in the County.

BISCAYNE AQUIFER

The Biscayne Aquifer is the main source of potable water in Miami-Dade County and the Florida Keys and is designated by the federal government as a sole source aquifer under the Safe Drinking Water Act. FLDEP classifies Florida ground water and sets minimum standards for ground water in Rule 62-520.400, FA.C. and 62-520.430, FA.C. Rule 62-520.400, F.A.C., states:

> (1) All ground water shall at all places and at all times be free from domestic, industrial, agricultural, or other man-induced non-thermal components of discharges in concentrations which, alone or in combination with other substances, or components of discharges (whether thermal or non-thermal):
>
> (a) Are harmful to plants, animals, or organisms that are native to the soil and responsible for treatment or stabilization of the discharge relied upon by Department permits; or
>
> (b) Are carcinogenic, mutagenic, teratogenic, or toxic to human beings, unless specific criteria are established for such components in Rule 62-520.420, F.A.C.; or
>
> (c) Are acutely toxic within surface waters affected by the ground water; or
>
> (d) Pose a serious danger to the public health, safety, or welfare; or
>
> (e) Create or constitute a nuisance; or
>
> (f) Impair the reasonable and beneficial use of adjacent waters.

These standards apply to all ground water, including ground water classified as G-III ground water. For specific components, Rules 62-520.420, 62-550.310, and 62-550.828, F.A.C., establish specific ground water standards for G-III ground water and G-II ground water, including standards for sodium (160 mg/L), nitrate (10 mg/L), chlorides (250 mg/L), sulfates (250 mg/L), and tritium (20,000 pCi/L).

Tritium is produced by nuclear reactors and is often found as a ground water contaminant at nuclear power plants. Historical data from 1974 to 1975 showed tritium concentrations in the FPL cooling canal system to be in the range of 1,556 – 4,846 pCi/L, and reports submitted by FPL for the monitoring period from June 2010 through December 2015 showed cooling canal system tritium concentrations as high as 15,487 pCi/L. Tritium is a good tracer to show discharge of contaminated water with other pollutants from the cooling canal system.

Although tritium has a Maximum Contaminant Level ("MCL") for drinking water of 20,000 pCi/L, the public health goal is much lower. An MCL takes into account factors other than public health, including feasibility of treatment and economics. Tritium, like other radionuclides, is considered to be a carcinogen. Tritium, as triturated water, enters the body and distributes widely through all water containing compartments without concentrating in any one site. Tritium then readily exchanges with hydrogen in many body molecules, including ribonucleotides, proteins and others, thereby being in the position to impart its energy upon

critical molecules. For example, tritium incorporated into DNA may result in beta particle radiation altering chromosomes, allowing for the induction of cancer. EPA has not set a public health goal for tritium in drinking water, but the State of California, based on EPA risk factors, has established the public health goal at 400 pCi/L, which is equivalent to a 1-in-a-million lifetime cancer risk.

CLEAN WATER ACT VIOLATIONS

I. VIOLATIONS OF EFFLUENT LIMITATIONS IN NPDES PERMIT NO. FL0001562

A. Condition I.A.1. of the NPDES Permit

Condition I.A.1. of the NPDES Permit states: "[t]his permit does not authorize discharge to surface waters of the state." FPL has violated this effluent limitation repeatedly since at least June 2015, and continues to violate this limitation, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay. These violations have been documented based on the detection of the pollutants in monitoring by FPL and the Miami-Dade Department of Regulatory and Economic Resources ("DERM") since 2010. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations have been continuous for at least the past five (5) years and will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has known for more than six (6) years that pollutants from the cooling canal system are being discharged into Biscayne Bay. FPL began monitoring the surface waters of Biscayne Bay and surface waters connected to Biscayne Bay in 2010, pursuant to an agreement with the South Florida Water Management District ("SFWMD"). Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and tritium) from the canal system in the surface waters of Biscayne Bay or surface waters connected to the Bay at Surface Water Monitoring Stations TPBBSW-1 through 5 (Biscayne Bay stations), TPSWC-1 through 3 (L-31E Canal stations), TPSWC-4 (S-20 Discharge Canal), TPSWC-5 (Card Sound Canal), and TPSWC-6 (Card Sound Road Canal) were reported for June-July 2010, September 2010, December 2010, March 2011, June 2011, September 2011, December 2011, March 2012, June 2012, September 2012, December 2012, March 2013, June 2013, September 2013, December 2013, March 2014, September 2014, and March 2015.

DERM and FPL began monitoring near-shore surface waters of Biscayne Bay adjacent to the cooling canal system more intensively in June 2015. Monitoring results showing pollutants (ammonia, phosphorus, TKN, total nitrogen, and chlorophyll *a*) from the canal system in surface waters of the Bay at Surface Water Monitoring Stations TPSWC-4B, TPSWC-5B TPBBSW-6 and TPBBSW-7 were reported for May 31 & Jun 1, 2015, June 15 & 16, 2015, June 29 & 30, 2015, July 13 & 14, 2015, July 20 & 21, 2015, July 27 & 28, 2015, August 3 & 4, 2015, August

10 & 11, August 17 & 18, 2015, August 24 & 25, 2015, August 31 to September 2, 2015, September 8 & 9, 2015, September 14 & 18, 2015, September 21 & 22, 2015, September 28 to October 2, 2015, October 5 to 7, 2015, October 19 & 20, 2015, October 26 & 27, 2015, November 2 & 4, 2015, November 9 to 13, 2015, November 16 to 19, 2015, November 23 & 24, 2015, November 30 to December 3, 2015, December 7 to 9, 2015, December 14 & 15, 2015, December 21 & 22, 2015, December 28 & 29, 2015, January 4 & 5, 2016, January 11 & 12, 2016, and January 18 & 19, 2016.

In addition, DERM and FPL sampled near-shore surface waters of Biscayne Bay adjacent to the cooling canal system at Surface Water Monitoring Stations TPBBSW-7-B, TPBBSW-7M-B, TPBBSWCSC-M-B, TPSWC-7B, TPBBSW-6B, and TPBBSW-7T-B for radioactive tritium in December 2015 and January 2016. The results showed high levels of tritium (245 to 4,317 pCi/L) in deeper near-shore waters. Levels of tritium in Biscayne Bay away from the cooling canal system are typically less than 20 pCi/L. The presence of high levels of tritium in the near -shore surface waters of Biscayne Bay and surface waters connected to Biscayne Bay also confirms the hydrologic connection between the canal system and the surface waters of Biscayne Bay.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system represent degradation of the waters of Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters. In addition, the monitoring performed demonstrates that the levels of pollutants violate the Miami-Dade County water quality standard for ammonia and violate Florida water quality standards for total nitrogen, phosphorus, and chlorophyll *a*.

B. <u>Condition I.A.14 of the NPDES Permit</u>

Condition I.A.14 of the NPDES Permit states:

> Notwithstanding any other requirements of this "No Discharge" permit, the permittee shall comply with all applicable provisions of the Final Judgement dated September 10, 1971, in Civil Action Number 70-328-CA issued by the U.S. District Judge C. Clyde Atkins of the Southern District of Florida.

FPL has violated Paragraph V of this Final Judgment by discharging water from the cooling canal system into Biscayne Bay, as set out in Section I.A. of this Notice, *supra*.

C. <u>Condition IV.1. of the NPDES Permit</u>

Condition IV.1. of the NPDES Permit states: "The Permittee's discharge to ground water shall not cause a violation of the minimum criteria for ground water specified in Rule 62-520.400, FA.C. and 62-520.430, FA.C." This condition also serves to protect surface waters

from degradation. FPL has violated this condition by causing continuous violations of the minimum criteria for ground water during each day during the past five (5) years preceding this Notice. Due to the contamination of the water in the cooling canal system and the ground water below and surrounding the canal system, the violations will likely continue after the date of this notice unless the source of the contamination is removed and the ground water is cleaned up.

FPL has contaminated ground water extending from the cooling canal system to over four (4) miles west of the cooling canal system in violation of Condition IV.1. of the NPDES Permit. Monitoring wells west of the FPL cooling canal system have shown violations of the minimum criteria for ground water since at least 2009, including sodium levels in well G-21 and G-28, approximately 4 miles west of the cooling canal system, which exceed sodium criterion by as much as 50 times. Other wells west of the cooling canal system (BBCW- 4, BBCW-5, FKS-4, TPGW-5D) showed sodium levels as high as 100 times the criterion.

Saltwater intrusion into the area west of the cooling canal system is impairing the reasonable and beneficial use of adjacent G-II ground water and, therefore, is a violation of the minimum criteria for ground water in Rule 62-520.400, F.A.C. The continuous seepage and resulting ground water plume of contaminated cooling canal water has and continues to contaminate usable portions of the Biscayne Aquifer - steadily converting Class G-II potable water to Class G-III non-potable water as it moves west through the Biscayne Aquifer. In addition, the plume of radioactive tritium continues to move west of the cooling canal system into the Biscayne Aquifer, with levels exceeding the public health goal of 400 pCi/L as much as three (3) miles west of the cooling canal system. Furthermore, as discussed in Section I.A. of this Notice, *supra*, the contaminated ground water is also moving east into Biscayne Bay.

D. Condition VIII.5. of the NPDES Permit

Condition VIII.5 of the NPDES Permit states:

> The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-620.610(5), F.AC.]

FPL has violated this condition by, among other omissions, failing to take all reasonable steps to minimize or prevent the discharges to surface waters and ground water set out in this Section I.A. and I.C. of this Notice, *supra*.

E. Condition VIII.7. of the NPDES Permit

Condition VIII.7. of the NPDES Permit states:

> The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. [62-620.610(7), F.A C.]

FPL has violated this condition by, among other omissions, failing to adequately control the temperature of the cooling water in the cooling canal system, by failing to control the nutrient levels in the system, and by failing to properly operate the so-called "interceptor" ditch to prevent widespread contamination of the ground water by saline water and other pollutants, including radioactive tritium.

II. DISCHARGING POLLUTANTS TO SURFACE WATERS WITHOUT AN NPDES PERMIT

Since at least June 2010, FPL has violated the CWA, 42 U.S.C. § 1311(a) and 40 C.F.R. § 122.21, by discharging pollutants (phosphorus, ammonia, TKN, total nitrogen, radioactive tritium) into Biscayne Bay through a direct hydrological connection between the ground water impacted by the cooling canal system and Biscayne Bay without an NPDES permit authorizing such discharges. The locations of the discharges are set out in Section I.A. of this Notice, *supra*. The requirement for an NPDES permit authorizing these discharges arose at the time that FPL first knew or should have known that pollutants were being discharged into surface waters. Each day since that time is a violation of the CWA.

III. DISCHARGES CAUSING OR CONTRIBUTING TO VIOLATIONS OF WATER QUALITY STANDARDS

Federal and state law prohibit discharges of pollutants from point sources that cause or contribute to violations of surface water quality standards. *See, e.g.*, 33 U.S.C. § 1311(b)(1)(C) and § 403.088(1), Fla. Stat. In addition to prohibiting discharges to surface waters altogether, the NPDES Permit requires compliance with water quality standards in Section VIII., 5 and 12. FPL has violated the CWA, Florida law, and the NPDES Permit by causing or contributing to violations of surface water quality standards in Biscayne Bay due to its discharges from the Turkey Point cooling canal system, as set out in Section I.A. of this Notice, including, but not limited to, the narrative nutrient criterion in Rule 62-302.530(47)(b), F.A.C., and the water quality standard for ammonia in Sec. 24-42(4) of the Miami-Dade County, Florida, Code of Ordinances. These violations began in 2010 and continue as of the date of this Notice, as shown by monitoring data generated by FPL and DERM.

The levels of pollutants (ammonia, phosphorus, TKN, total nitrogen, chlorophyll *a*, and tritium) found in Biscayne Bay and surface waters connected to Biscayne Bay as a result of FPL's discharges from its cooling canal system also represent degradation of the waters of

Biscayne Bay, in violation of the "no degradation" requirement stemming from the designation of these waters as Outstanding National Resource Waters and Outstanding Florida Waters.

CONCLUSION

Thank you for your prompt attention to the ongoing, serious violations of federal law and permitting requirements. Unless the EPA or FDEP commences and diligently prosecutes an action in court to address these violations within sixty (60) days, we intend to file a citizen suit against FPL under 33 U.S.C. § 1365(a)(1) for the violations discussed above. In addition to the violations set forth herein, this Notice covers all violations of the CWA evidenced by information which becomes available after the date of this Notice. Pursuant to the CWA, we will seek civil penalties, attorney's fees and costs, as well as an injunction against continued violations.

Any and all communication related to this matter should be directed to Gary A. Davis and James S. Whitlock, at the address and telephone number listed at the top of this letter, or to James M. Porter, 9350 South Dixie Highway, 10th Floor, Miami, FL 33156, (305) 671-1345.

Respectfully,

Gary A. Davis

cc: Hon. Loretta E. Lynch
Attorney General of the United States
U.S. Department of Justice
950 Pennsylvania Avenue, NW
Washington, DC 20530-0001

Allied Group
USA INC

April 29, 2016

Senate Communications, Energy and Public Utilities Committee

Re: Workshop: Discussion & Testimony only on issues related to cooling canals at Turkey Point (FP&L)

Allied Group has visited and reviewed existing conditions at FP&L's Turkey Point plant and recommends Allied Group's chemical free technology to remove/reduce the follow tasks or conditions which greatly limit effectiveness of the cooling canals:

- Bacteria and Algal mass
- Viscosity
- Phosphorus & nitrogen
- TSS & TDS
- DO & ORP
- Canal heat
- Conductivity
- Muck & nutrients within
- Canal flow
- Canal equipment

The cumulative effect of this 10 point system is to remove the heat blanket thereby restoring the cooling canal system to 90% or greater design capacity.

Once this occurs, TDS and salinity can be addressed.

Jay Barfield, Allied Group, CEO, jay.barfield@alliedgrpusa.com, 407-908-9694

Eric Endicott, Allied Group, COO, eric.endicott@alliedgrpusa.com, 407-474-2249

EXAMPLE OF AERATION PERFORMANCE

Before

After

January 19, 2016

Nuclear Regulatory Commission
The Honorable Gina McCarthy, Environmental Protection Agency
White House Council on Environmental Quality
The Honorable Bill Nelson
The Honorable Ileana Ros-Lehtinen
The Honorable Rick Scott
The Honorable Carlos Gimenez

Dear all:

This week **The Miami Herald** reported that the Florida Power and Light (FPL) Turkey Point Nuclear Power Plant has been found to have significant adverse impacts on Biscayne Bay as a result of the overhaul to enable the plant to produce more power three years ago. The resulting over-heating of the cooling canals to 104 degrees was an "unforeseen" consequence of increasing the power capacity of Turkey Point 3&4. As a result, the utility was forced to petition Miami-Dade County and the State of Florida to permit them to access fresh water from nearby canals and from the adjacent aquifer. Permits were given for **fresh** water usage on a temporary basis and of up to 100 million gallons a day, **at the same time that local cities have begun paying to desalinate salty water from the Floridan aquifer for domestic use**.

FPL's **and NRC's** projections of **no environmental consequence** for **increasing the operating temperatures** of the **reactors ("uprates") clearly underestimated** the potential **for** overheating the cooling canals, resulting in significant environmental degradation **and FPL's current request to relax long-established operating limits, allowing intake temperatures higher than any other nuclear plant in the country.**

Last year, increased salinity **and temperature virtually extinguished the nesting crocodile population and other aquatic life in the 15 square mile cooling canal complex. Now we are informed that water pollution (ammonia and phosphate) are being flushed from the cooling canal sediments into the waters of Biscayne National Park.** There is no **long-term** resolution in sight and the **environmental damage is** mounting.

Local elected officials, scientists and environmental advocates convened a Public Forum this week to discuss their concerns about the Turkey Point site, current failing as a result of cooling system and imposed upon that, the FPL plans to add two new nuclear power plants proposed to be built sometime in the next decade. We **are bewildered** how the federal and state governments could conceive of building **new nuclear plants** along the Southeast Florida coastline, now being **regularly flooded** by sea-level rise. **NOAA projects sea level to rise 4 to 6.5** feet over the lifetime of those **nuclear** plants **while FPL projects only 8 inches**. And the risks are even more acute for the short-term if another category 5 hurricane hits the coast, causing potential storm surge over 20 feet **with battering wave action on top of that**. The last time that happened to a nuclear power plant was at Fukushima, Japan, after a tsunami caused the **loss of backup power and uncontrolled** release of radioactive isotopes. Facing the potential for such a crisis affecting over 2.5 million residents living within 50 miles, if a hurricane actually hits this coastal area.

We now know that FPL's temperature projections for the 3&4 "uprate" were flat wrong, causing cooling **canal temperatures to spike out of control. To this day neither FPL nor the NRC** have identified any **long-term** solution to the problem. **Scientists and the public also know that FPL is equally wrong in its projections of sea level rise and storm surge risk.**

Public safety and environmental protection require an immediate re-assessment of the **existing** current efforts, which have **thus far** failed to solve the problems at Turkey Point, and of **and plans for new nuclear reactors in an area prone to sea level rise and storm surge.** The following steps must be implemented to avoid further disaster:

1. Denial of the request to relax operating limits of the intake temperature at the cooling canals. Conduct a review de novo of the extent of the environmental degradation and adverse impacts on the aquatic life, salinity and chemical composition of the Biscayne Bay areas surrounding the nuclear plants. Require an immediate remediation plan be submitted to restore the natural balance.

2. Immediately replace the failed cooling canals by building the cooling towers proposed in the 6&7 plans. Immediately implement water reuse plans by building the water treatment plant and lines necessary to provide an alternative to the critically deficient cooling canal plan.

3. Proposed Planning for Turkey Point 6&7 must be revised to account for at least 6 feet of sea level rise when planning for severe accidents due to flooding and storm surge. Further the plans for a proposed back up source of cooling water must be altered to prevent adverse impacts to the Biscayne aquifer; specifically, both the NRC and FPL should replace the radial collector well cooling system with an alternative less likely to increase salt water intrusion into the aquifer.

Sincerely,

Cindy Lerner
Mayor
Village of Pinecrest

Tomás Regalado
Mayor
City of Miami

Phil Stoddard
Mayor
City of South Miami

Other signees:

Municipality	Print Name	Signature
Municipality	Print Name	Signature
Municipality	Print Name	Signature
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CONSUMER ENERGY ALLIANCE
THE VOICE OF THE ENERGY CONSUMER

Statement by Consumer Energy Alliance – Florida Executive Director Kevin Doyle

Florida Senate Committee on Communications, Energy and Public Utilities and the Senate Committee on Environmental Preservation and Conservation Workshop, April 29, 2016

Thank you to Senator Flores, the Florida Senate Committee on Communications, Energy and Public Utilities and the Senate Committee on Environmental Preservation and Conservation for holding this workshop today.

Florida is a heavy energy-consuming state that depends on stable supplies of energy sources from other states and abroad. Nuclear power needs to be a part of an all-of-the-above solution to our state's energy needs. While we are currently experiencing a natural gas expansion in America that is having a positive impact on consumers in many aspects of daily life from transportation to manufacturing and electricity generation, it is important not to forget about other energy sources such as nuclear power when moving forward with a pro-America energy policy.

FPL has been transparent about the current issues associated with Turkey Point's cooling canals and what they are doing proactively to resolve them. State and federal regulators have confirmed that Turkey Point is safe, that no animal or plant life in the area has been adversely impacted and that water quality levels in the canals and in Biscayne Bay are well within the standards of the Clean Water Act.

Consumer Energy Alliance believes that FPL has proven to be a safe and reliable nuclear operator with an impressive record of environmental stewardship. Only a few years ago, the American crocodile was removed from the Endangered Species List in part due to FPL's conservation efforts at Turkey Point.

Unfortunately, there are anti-nuclear power groups using any excuse to undermine the broad public support for clean and safe nuclear energy. The recent events at FPL's Turkey Point plant show how desperate these groups have become. Misinformation, scare tactics and lawsuits might be typical ways for anti- development groups to boost their fundraising and Twitter followers, but fair-minded Floridians should trust what they know. Nuclear energy has been an affordable, reliable and clean source of energy in our state for more than four decades, and it's a big part of our state's bright future

An all-of-the-above energy policy that includes nuclear power is needed to ensure energy security for Florida consumers.

Kevin Doyle
Florida Executive Director
Consumer Energy Alliance

About Consumer Energy Alliance

Consumer Energy Alliance (CEA) brings together consumers, producers and manufacturers to engage in a meaningful dialogue about America's energy future. With more than 400,000 members nationwide, our mission is to help ensure stable prices for consumers and energy security. We believe energy development is something that touches everyone in our nation, and thus it is necessary for all consumers to actively engage in the conversation about how we develop and diversify our energy resources and about energy's importance to the economy. CEA promotes a thoughtful dialogue to help produce our abundant energy supply and to balance our energy needs with our nation's environmental and conservation goals.

Before 7:00 pm (T)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/14
Meeting Date

Bill Number (if applicable)

Topic

Amendment Barcode (if applicable)

Name Commissioner Daniella Levine-Cava

Job Title Miami-Dade Commissioner

Address
Street

Phone

City State Zip

Email

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

This form is part of the public record for this meeting.

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4-29-2016
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic FPL Turkey Point CCS

Name Lee Hefty

Job Title Assistant Director of Regulatory + Economic Resources
Director of MDC Division of Environmental Resources Mgmt

Address 701 NW 1st Ct
Street

Miami FL 33136
City State Zip

Phone 305 372 6754

Email heftyl@miamidade.gov

Speaking: ☐ For ☐ Against ☑ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing Miami Dade County FL

Appearing at request of Chair: ☑ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Topic: ______

Amendment Barcode (if applicable): ______

Name: Laura Reynolds

Job Title: ______

Address: ______ Street

Phone: ______

______ City ______ State ______ Zip

Email: ______

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: Southern Alliance for Clean Energy

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Amendment Barcode (if applicable): ______

Topic: FPL

Name: Andy Bardmann

Job Title: Attorney

Address: Street ______

City: WPB State ______ Zip ______

Phone: ______

Email: ______

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: ACT

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4-29-16
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic FPL

Name SYLVIA J. MURPHY

Job Title COMMISSIONER

Address 102050 O'SEAS HWY
Street

KEY LARGO FL 33070
City State Zip

Phone 305-453-8787

Email

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing TAVERNIER, KEY LARGO, OCEAN REEF DISTRICT 5 - MONROE COUNTY

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/16
Meeting Date

Bill Number (if applicable)

Topic

Amendment Barcode (if applicable)

Name Jay Barfield

Job Title CEO

Address 5315 N. Lake Burkette LN
Street

Winter Park FL 32792
City State Zip

Phone 407-928-9694

Email jbarfield@alliedgrpusa.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing Allied Group USA Inc

Appearing at request of Chair: ☑ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/16
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic: Turkey Point

Name: Jonathan Ullman

Job Title: Sierra Club South FL / Everglades Senior Rep.

Address: 300 Aragon Ave
Street

Coral Gables, FL 33134
City State Zip

Phone: 305-283-6070

Email: jonathan.ullman@sierraclub.org

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: Sierra Club

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

4/29/16
Meeting Date

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic: TURKEY POINT

Name: KEVIN DOYLE

Job Title: CONSUMER ENERGY ALLIANCE EXECUTIVE DIRECTOR - FLORIDA

Address: P.O. BOX 24897
Street

JACKSONVILLE FL 32241
City State Zip

Phone: 904-806-1714

Email: KDOYLE@CONSUMERENERGYALLIANCE.ORG

Speaking: [x] For [ ] Against [ ] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing: CONSUMER ENERGY ALLIANCE

Appearing at request of Chair: [ ] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [ ] No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ____________

Bill Number (if applicable): ____________

Topic: ____________

Amendment Barcode (if applicable): ____________

Name: Cindy Lerner

Job Title: Mayor, Village of Pinecrest

Address: 5901 Mess Ranch Rd
Street

Pinecrest FL 33156
City State Zip

Phone: ____________

Email: ____________

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: ____________

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

_______________ Meeting Date

_______________ Bill Number (if applicable)

Topic _______________

_______________ Amendment Barcode (if applicable)

Name ALAN FARAGO

Job Title _______________

Address 534 MENENDEZ AVE
Street

CORAL GABLES
City State Zip

Phone _______________

Email _______________

Speaking: [ ] For [A] Against [ ] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing Self

Appearing at request of Chair: [ ] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [✓] No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Amendment Barcode (if applicable): ______

Topic: FPL

Name: VALERIE ROBBIN

Job Title: RETIRED

Address: 730 PALERMO AVE (Street)

CORAL GABLES, FL 33134 (City, State, Zip)

Phone: 305-519-1949

Email: flower8349@yahoo.com

Speaking: [ ] For [ ] Against [✓] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing: myself and Sierra Club

Appearing at request of Chair: [ ] Yes [✓] No

Lobbyist registered with Legislature: [ ] Yes [ ] No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

____
Meeting Date

____
Bill Number (if applicable)

____
Amendment Barcode (if applicable)

Topic FPL

Name Skip Alford

Job Title CEO, South Dade Chamber

Address 1964 SE 10th St
Street

Homestead FL 33035
City State Zip

Phone 850 628-3490

Email skipalford@southdadechamber.org

Speaking: [x] For [ ] Against [ ] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing South Dade Chamber of Commerce B.O.D.

Appearing at request of Chair: [x] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [x] No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ____________

Bill Number (if applicable): ____________

Topic: ____________

Amendment Barcode (if applicable): ____________

Name: Richard Reynolds

Job Title: ____________

Address: 6441 Merlin drive (Street)

Coral Gables (City) Fl. (State) 33158 (Zip)

Phone: 305-970-9741

Email: mreyno2003@yahoo.com

Speaking: ☐ For ☐ Against ☒ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: ____________

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

29 Apr 16
Meeting Date

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic

Name Philip Stoddard

Job Title Mayor, City of South Miami

Address 6130 Sunset Drive
Street

South Miami FL 33143
City State Zip

Phone 305.342.0161

Email PStoddard@southmiamiFL.gov

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing City of South Miami

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4.29.2016
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic FPL

Name Steve Torcise

Job Title President

Address 9350 S. Dixie Hwy
Street

Miami
City State Zip

Phone 305.670.9610

Email stevetjr@atlanticcivil.net

Speaking: [X] For [X] Against [ ] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing Atlantic Civil, Inc

Appearing at request of Chair: [✓] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [ ] No

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

____
Meeting Date

____
Bill Number (if applicable)

____
Amendment Barcode (if applicable)

Topic Cooling Condos

Name Laura Reynolds

Job Title Consultant

Address ______________________
Street

Phone ______________________

____
City *State* *Zip*

Email ______________________

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing S. Alliance for Clean Energy

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

4/29/16 (Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date

Bill Number (if applicable)

Topic

Amendment Barcode (if applicable)

Name BRENT MINCOFF

Job Title

Address
Street

Phone

City State Zip

Email

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing SFCK

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4-29-16
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic FPL CC

Name AL GARCIA

Job Title Vice President

Address 1 SpDwy Blvd.
Street

Phone 305 230 5000

Homestead FL 33035
City *State* *Zip*

Email

Speaking: ☐ For ☐ Against ☒ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

4/29/16
Meeting Date

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic PTN Canal Senate Hearing

Name Edward R. Knuckles

Job Title Independent Nuclear Consultant

Address 15760 Rolling Meadows Cir
Street

Phone (561) 793 0551

Wellington FL 33414
City State Zip

Email eds3rdi@comcast.net

Speaking: ☐ For ☐ Against ☑ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing Self

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/16
Meeting Date

Bill Number (if applicable)

Topic

Amendment Barcode (if applicable)

Name John Barimo

Job Title Dr.

Address 15721 SW 252 Street
Street

Homestead FL 33031
City State Zip

Phone 305-849-4485

Email JBARIMO@GMAIL.COM

Speaking: [ ] For [ ] Against [x] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing Concerned Citizen representing Family

Appearing at request of Chair: [ ] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [x] No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4-29-16
Meeting Date

Bill Number (if applicable)

Topic

Amendment Barcode (if applicable)

Name Rhonda Roff

Job Title

Address 1553 Salerno Circle
Street

Phone 9543472335

Weston FL 33327
City State Zip

Email marshmaid@gmail.com

Speaking: ☐ For ☐ Against ☑ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing Sierra Club Calusa Group

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Amendment Barcode (if applicable): ______

Topic: FPL water issues

Name: Claudia Fenzer

Job Title: Conservation Intern

Address: 90 SW 3rd ST
Street

Miami FL 33130
City State Zip

Phone: (305) 4506668

Email: claudia.fenzer@yahoo.com

Speaking: ☐ For ☑ Against ☐ Information

Waive Speaking: ☐ In Support ☑ Against
(The Chair will read this information into the record.)

Representing: ~~Ieonc~~ Southern Alliance For Clean Energy

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

This form is part of the public record for this meeting.

THE FLORIDA SENATE

APPEARANCE RECORD

April 29th 2016 (Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date

_______________ *Bill Number (if applicable)*

_______________ *Amendment Barcode (if applicable)*

Topic Pollution of Biscayne Bay

Name Zachariah Cosner

Job Title Representative, Tropical Audubon

Address 7180 SW 114th Terrace 33156 *Street*

Phone 305-608-8303

Miami *City* Fl *State* 33156 *Zip*

Email ZCosner@Gmail.com

Speaking: ☐ For ☑ Against ☐ Information

Waive Speaking: ☐ In Support ☑ Against (The Chair will read this information into the record.)

Representing Tropical Audubon Society

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

This form is part of the public record for this meeting.

S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/16
Meeting Date

____
Bill Number (if applicable)

____
Amendment Barcode (if applicable)

Topic FPL Cooling Canals

Name Caroline McLaughlin

Job Title Biscayne Program Manager

Address 450 N Park Rd
Street

Hollywood, FL 33021
City *State* *Zip*

Phone _______________

Email _______________

Speaking: ☐ For ☐ Against ☒ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing National Parks Conservation Association

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

This form is part of the public record for this meeting.

THE FLORIDA SENATE

APPEARANCE RECORD

4-29-16 (Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic Turkey Point Plum Characterization

Name Albert Gomez

Job Title Coordinator / VP

Address
Street

Phone

City State Zip

Email

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing South Florida Resilience System / Industrial Components

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/16
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic

Name KERRI McNULTY

Job Title ASSISTANT CITY ATTORNEY

Address 444 SW 2ND AVE
Street

MIAMI, FL 33130
City State Zip

Phone (305) 416-1800

Email klmcnulty@miamigov.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing CITY OF MIAMI / MAYOR TOMAS REGALADO

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4/29/16
Meeting Date

____
Bill Number (if applicable)

____
Amendment Barcode (if applicable)

Topic COOLING CANALS

Name NANCY LEE

Job Title ______________________

Address 20448 NE 34 CT.
Street

AVENTURA FL 33180
City *State* *Zip*

Phone 3059316021

Email ______________________

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing ME

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

While it is a Senate tradition to encourage public testimony, time may not permit all persons wishing to speak to be heard at this meeting. Those who do speak may be asked to limit their remarks so that as many persons as possible can be heard.

This form is part of the public record for this meeting.

THE FLORIDA SENATE

APPEARANCE RECORD

4/29/16 (Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date

Bill Number (if applicable)

Topic FPL

Amendment Barcode (if applicable)

Name Renee Reichling

Job Title SVP, First National Bank of S. Miami

Address 14275 SW 232 Street

Street

Phone

Miami FL 33170

City State Zip

Email reneereichling@gmail.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Amendment Barcode (if applicable): ______

Topic: FPL

Name: Jesus Valido

Job Title: Chief, Seaport OPS

Address: 28931 SW. 134 CT
Street

Homestead FL 33033
City State Zip

Phone: 305-245-1436

Email: JCV403@AOL.COM

Speaking: [x] For [ ] Against [ ] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing: ______

Appearing at request of Chair: [ ] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [ ] No

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ____________

Bill Number (if applicable): ____________

Amendment Barcode (if applicable): ____________

Topic: FPL - Cooling Canals @ CTP

Name: Laura J Reynolds

Job Title: 20715 Leonard Lane

Address (Street): Miami FL 33189

City / State / Zip: ____________

Phone: 786-543-1926

Email: ConservationConceptsllc@gmail.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: Southern Alliance for Clean Energy

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

4/29/2016
Meeting Date

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic: Cooling Canals - Turkey Point

Name: Stephen McDuffie

Job Title: Realtor

Address: 134 SE 36th Avenue
Street

Homestead, FL 33033
City, State, Zip

Phone: 4789185040

Email:

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: The Vineyards + Isles of Oasis Communities

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Amendment Barcode (if applicable): ______

Topic: FP & L / Nuclear Plant Safety

Name: Orau Lindqvist

Job Title: Retired

Address: 9387 SW 185 St
Street

Cutler Bay, Fl 33157
City State Zip

Phone: 305-232-6788

Email: —

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: Gray Panthers

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Topic: LACK OF WATER

Amendment Barcode (if applicable): ______

Name: SOUTH MIAMI VICE MAYOR BOB WELSH

Job Title: VICE MAYOR

Address: 7437 SW 64 CT (Street)

S. MIAMI (City) FL (State) ______ (Zip)

Phone: 30566741 [illegible]

Email: BWELSH@SOUTHMIAMIFL.GOV

Speaking: ☐ For ☑ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: CITY OF SOUTH MIAMI

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

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This form is part of the public record for this meeting.

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

30Apr
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic FPL - TURKEY POINT

Name EDWARD S. COOKE

Job Title

Address 2121 N BAYSHORE DR. #419
Street

MIAMI FL 33137
City State Zip

Phone

Email ESCOOKE1@AOL.COM

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing GRAY PANTHERS OF MIAMI DADE

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ____

Bill Number (if applicable): ____

Topic: ____

Amendment Barcode (if applicable): ____

Name: d. giles

Job Title: ____

Address: 11505 SW 187 tr (Street)

Miami FL (City, State, Zip)

Phone: ____

Email: ____

Speaking: [ ] For [X] Against [ ] Information

Waive Speaking: [ ] In Support [ ] Against
(The Chair will read this information into the record.)

Representing: ____

Appearing at request of Chair: [ ] Yes [ ] No

Lobbyist registered with Legislature: [ ] Yes [ ] No

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THE FLORIDA SENATE

APPEARANCE RECORD

4/29/16
Meeting Date

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic Turkey Point cooling canals

Name Mara Shlackman

Job Title

Address 2100 S. Ocean Dr. #8E
Street

Ft. Lauderdale FL 33316
City State Zip

Phone 954-767-6123

Email marashl@hotmail.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ______

Bill Number (if applicable): ______

Amendment Barcode (if applicable): ______

Topic: FPL Safety

Name: Eric Kimmel

Job Title: Zone Mechanic

Address (Street): 12685 SW 200 ST

City: Miami State: Florida Zip: 33177

Phone: 305-345-4202

Email: Leoprd @ AOL.com

Speaking: ☐ For ☐ Against ☑ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: Family & Friends

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

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THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

______________ Meeting Date

______________ Bill Number (if applicable)

______________ Amendment Barcode (if applicable)

Topic FPL Cooling Canals

Name Dany Garcia

Job Title ______________

Address 11326 SW 73rd Lane
Street

Miami FL 33173
City State Zip

Phone (786) 231 4366

Email g-dany@live.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing ______________

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

04/29/16
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic Turkey Point

Name Barbara Ianni

Job Title

Address 14820 Naranja Lakes Blvd.
Street

Homestead, FL. 33032
City *State* *Zip*

Phone (305)245-2565

Email barbaraiannieyahoo.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

Meeting Date: ____________

Bill Number (if applicable): ____________

Topic: ____________

Amendment Barcode (if applicable): ____________

Name: Betty Osceola

Job Title: Owner Buffalo Tiger Airboats.

Address: 59070 TAmiAmi Trl E (Street)

Ochopee (City) FL (State) 34141 (Zip)

Phone: ____________

Email: ____________

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing: ____________

Appearing at request of Chair: ☐ Yes ☐ No

Lobbyist registered with Legislature: ☐ Yes ☐ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

4-29-16
Meeting Date

Bill Number (if applicable)

Amendment Barcode (if applicable)

Topic Turkey Point cooling canal system

Name DONALD MORRIS

Job Title

Address 9031 SW 48 ST
Street

MIAMI FL 33165
City State Zip

Phone 786-339-1993

Email donmia@gmail.com

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing private citizen

Appearing at request of Chair: ☐ Yes ☒ No

Lobbyist registered with Legislature: ☐ Yes ☒ No

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S-001 (10/14/14)

THE FLORIDA SENATE

APPEARANCE RECORD

(Deliver BOTH copies of this form to the Senator or Senate Professional Staff conducting the meeting)

_______________ *Meeting Date*

_______________ *Bill Number (if applicable)*

_______________ *Amendment Barcode (if applicable)*

Topic _______________

Name Andres Korge

Job Title Real Estate

Address 230 Palermo Ave
Street

Coral Gables FL 33134
City *State* *Zip*

Phone —

Email —

Speaking: ☐ For ☐ Against ☐ Information

Waive Speaking: ☐ In Support ☐ Against
(The Chair will read this information into the record.)

Representing _______________

Appearing at request of Chair: ☐ Yes ☑ No

Lobbyist registered with Legislature: ☐ Yes ☑ No

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S-001 (10/14/14)

CourtSmart Tag Report

Room: LL 37 **Case No.:** **Type:**
Caption: Senate Environmental Preservation and Public Utilities Workshop **Judge:**

Started: 5/12/2016 8:58:57 AM
Ends: 5/12/2016 12:49:03 PM Length: 03:50:07

8:58:57 AM	Call to order
8:58:57 AM	Opening Comments by Chair Hutson
8:58:57 AM	Comments on the cooling canal systems at Turkey Point
9:01:15 AM	Dr. Jacobs welcoming comments
9:05:23 AM	Chair Hutson procedure comments
9:06:55 AM	Senator Flores for comments
9:10:42 AM	Presentation by Florida Power and Light
10:14:13 AM	Presentation by Florida Department of Environmental Protection
10:47:41 AM	Presentation by DERM for Miami-Dade County
11:10:03 AM	Presentation by the Federal Nuclear Regulatory Commission
11:31:10 AM	Public Comments
12:47:55 PM	Meeting Adjourned