









Turkey Point Plant

Comprehensive Pre-Uprate Monitoring Report

Units 3 & 4 Uprate Project

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ACRONYMS AND ABBREVIATIONS

%	percent
≥	greater than or equal to
°C	degrees Celsius
µg/L	micrograms per liter
µm	micrometer
µmho/cm	micromhos per centimeter
µmols/m^2/sec	micromole per square meter per second
µS/cm	micro Siemens per centimeter
‰	parts per mille
1x1	1-meter by 1-meter (subplot)
20x20	20-meter by 20-meter (plot)
5x5	5-meter by 5-meter (subplot)
ADaPT	Automated Data Processing Tool
ADCP	Acoustic Doppler Current Profiler
ADFM	acoustic Doppler flow meter
ADVM	acoustic Doppler velocity meter
AFDW	ash-free dry weight
AEI	area of ecological interest
Agencies	South Florida Water Management District, the Florida Department of Environmental Protection, and Miami-Dade County Department of Environmental Resources Management
ANPP	Annual Net Primary Productivity
ANOVA	analysis of variance
Annual Monitoring Report	Florida Power & Light Company Turkey Point Plant Annual Monitoring Report for the Units 3 and 4 Uprate Project
AT100	Aqua TROLL® 100 (probe)

AT200	Aqua TROLL® 200 (probe)
B	bottom
Ba	Barium
BAS	Biscayne Aquifer/Surficial Aquifer System
BBCA	Braun-Blanquet Cover Abundance
BBSW	Biscayne Bay Surface Water
BNP	Biscayne National Park
BSL	below sea level
BTOC	below top of casing
C	carbon
$CaCO_3$	calcium carbonate
cc	cubic centimeter
CCS	cooling canal system
CCV	continuing calibration verification
cdb	culm diameter at the plant base
CL	carapace length
cm	centimeter(s)
CO_2	carbon dioxide
CPUE	catch per unit effort
CRM	certified reference material
CRP	continuous resistivity profiling
CW	carapace width
CWP	circulating water pump
D	deep
DERM	(Miami-Dade County) Department of Environmental Resources Management
df	degrees of freedom
D_f	freshwater density
DFA	discriminant function analysis
DIC	dissolved inorganic carbon
DMA	dimethylamine
DO	dissolved oxygen

DQO	data quality objective
DTS	distributed temperature sensing
DUS	Data Usability Summary
E & E	Ecology and Environment, Inc.
EB	equipment blank
EDMS	Electronic Data Management System
e.g.	for example
EPA	(United States) Environmental Protection Agency
f/s	foot/feet per second
F.A.C.	Florida Administrative Code
FAS	Floridan Aquifer System
FCEB	field cleaned equipment blank
FD	field duplicate
FDEP	Florida Department of Environmental Protection
FDOH/BRC	Florida Department of Health, Bureau of Radiation Control
Fe	Iron
FIU-WQM	Florida International University Water Quality Monitoring
FPL	Florida Power & Light Company
FPL database	Florida Power and Light Electronic Data Management System database
ft	foot/feet
ft/d	foot/feet per day
ft^3/s	cubic foot/feet per second
FTT	faunal throw trap
gal	gallon
g/cm^3	grams per cubic centimeter
g/m^2	grams per square meter
GIS	geographic information system
g/L	grams per liter
gpm	gallon(s) per minute
GPS	Global Positioning System
GW	groundwater

^3H	tritium
H_f	freshwater equivalent groundwater elevation
HCl	hydrocholoric acid
HCM	hydrological conceptual model
HSD	honestly significant difference
H_w	groundwater elevation
i.e.	that is
I	intermediate (well depth)
IC	initial calibration
ICV	initial calibration verification
ICWP	intake cooling water pump
ID	Interceptor Ditch
IR	initial read
K	potassium
km	kilometer
km/hr	kilometer(s) per hour
lb	pound
LCS	laboratory control sample
Li	Lithium
LL	live loss
LNWR	Loxahatchee National Wildlife Refuge
LSC	live standing crop
LT500	Level TROLL® 500 (probe)
m	meter(s)
M	Intermediate
MDL	method detection limit
MGD	million gallons per day
mg/kg	milligrams per kilogram
mg/L	milligram(s) per liter
mL	milliliter(s)
MLC	maximum likelihood classification

Monitoring Plan	Groundwater, Surface Water, and Ecological Monitoring Plan for the Florida Power & Light Company Turkey Point Nuclear Power Plant (2009)
M_P	measured pressure (psi)
ms	meters per second
MS	Matrix Spike
MS	Microsoft
mS/cm	milliSiemens per centimeter
MSL	mean sea level
mV	millivolt(s)
MW	megawatt(s)
NAVD 88	North American Vertical Datum of 1988
ND	Not Detected
NE	Northeast
NELAC	National Environmental Laboratory Accreditation Conference
NEXRAD	next generation weather radar
NGVD 29	National Geodetic Vertical Datum of 1929
NH_3	Ammonia
NIST	National Institute of Standards and Technology
NO_x	nitrate/nitrite
NRC	Nuclear Regulatory Commission
NTU	nephelometric turbidity unit(s)
NW	Northwest
OBI	optical borehole image
OCWP	open cooling water pump
OP	orthophosphate
ORP	oxidation reduction potential
PAR	photosynthetically active radiation
pCi/L	picocuries per liter
PDS	post digestion spike
PERA	(Miami-Dade County) Permitting, Environment and

	Regulatory Affairs (formerly DERM; now RER)
PPF	photosynthetic photon flux
ppt	parts per thousand
PQL	practical quantitation limits
PSS-78	Practical Salinity Scale of 1978
PSU	practical salinity unit(s)
QA	quality assurance
QAPP	Quality Assurance Project Plan
R_L	reference water level
R_P	reference pressure (psi)
RER	(Miami-Dade County) Department of Regulatory and Economic Resources (formerly PERA)
RPD	relative percent difference
RTK	Real Time Kinematic
S	shallow (well)
SAV	submerged aquatic vegetation
S.C.	specific conductance
SD	serial dilution
SDG	sample delivery group
SE	southeast
SFWMD	South Florida Water Management District
SG	specific gravity
SL	standard length
SL500	Sontek Argonaut® Side Looker 500
Std Dev	Standard Deviation
SW	surface water; *also* southwest
S_w	well screen midpoint elevation
SWI	Shannon-Wiener Index (of Diversity)
T	top
TDS	total dissolved solids
TestAmerica	TestAmerica Laboratories, Inc.
TKN	total Kjeldahl nitrogen

TL	total length
TN	total nitrogen
TP	total phosphorus
TPGW	Turkey Point Groundwater
TPM-1	Turkey Point Meteorological Station
TPRF	Turkey Point Rain Fall
TPSWC	Turkey Point Surface Water Canal
TPSWCCS	Turkey Point Surface Water Cooling Canal System
TPSWID	Turkey Point Surface Water Interceptor Ditch
USGS	United States Geological Survey
W_L	water level (feet NAVD 88)

EXECUTIVE SUMMARY

Florida Power & Light Company (FPL) has prepared this Comprehensive Pre-Uprate Monitoring Report pursuant to Conditions of Certification IX and X of its Power Plant Site Certification for the FPL Turkey Point Units 3 and 4 Nuclear Power Plant and Unit 5 Combined Cycle Plant (PA 03-45A2). The Monitoring Plan was developed with input from the Florida Department of Environmental Protection (FDEP), the South Florida Water Management District (SFWMD), and Miami-Dade County's Department of Environmental Resources Management (DERM), (collectively, the Agencies), and FPL. The Monitoring Plan requires the collection of groundwater, surface water, meteorological, flow, and ecological data in and around the plant to establish pre-Uprate baseline conditions and determine the horizontal and vertical effects and extent, if any, of the cooling canal system (CCS) water.

FPL has prepared this Comprehensive Pre-Uprate report to document its efforts to establish a pre-Uprate baseline conditions for the required two year pre-Uprate period. The purpose of this report is to summarize and provide analysis of the data collected. This report incorporates information presented in the previous semi-annual reports (FPL 2011a, FPL 2012a) and first annual report (FPL 2011b). It includes data from June 2010 through June 2012.

In accordance with the Monitoring Plan, FPL installed an extensive monitoring network of 47 groundwater wells and 20 surface water stations, a meteorological station, rainfall gauges, and flow meters in the CCS and surrounding area. The groundwater and surface water stations measure and record specific conductance, salinity, water levels, and temperature at 15-minute intervals. Groundwater and surface water samples are collected across the vast network of stations every three months and analyzed for a broad suite of parameters. FPL conducted extensive ecological monitoring and studied flora and fauna in Biscayne Bay, marshes, and mangroves. Initially, FPL collected water samples from the shallow soils (referred to as porewater) at hundreds of locations that covered a 75 square mile area in the vicinity of the CCS and analyzed for a broad suite of parameters.

As required by the Monitoring Plan, FPL has developed a water budget. This analysis calculates components of water and salt inflow and outflow from the CCS on a daily basis. The water budget helps explain the dynamics of CCS hydraulics and may be used to assess the effect of climatic or operational changes on the CCS water levels and salinities.

The Agencies and their experts considered and analyzed the previous data collected and have selected tritium as the tracer. FPL disagrees with the low tritium threshold that the Agencies selected when evaluating potential movement of the CCS. Tritium is a by-product of the nuclear fission process and is unique to and present in and around the CCS. It is important to note that tritium is being measured only as a chemical tracer in order to determine the potential movement of CCS water. At the levels being measured, the tritium is not a public health concern. Tritium is

routinely monitored in the CCS by the Florida Department of Health, Bureau of Radiation Control and there have never been results detected near the drinking water standard (20,000 picoCuries per liter).

The results of the two years of pre-Uprate data analysis are summarized below.

Biscayne Bay groundwater results support the conclusion that there is little or no influence from the CCS in the area fronting the northern half of the CCS. However, there is evidence of CCS water under Biscayne Bay in close proximity to the southern tip of the CCS. Over the two year monitoring period, the results indicate that the salt constituents and tracer have remained consistent for all wells. This is indicative of the groundwater maintaining a relatively stable condition during this time period.

Groundwater results immediately adjacent to the CCS indicate the presence of CCS water. Further west from the CCS, there is some influence of CCS water in decreasing concentrations at depth out approximately three miles. The outermost wells approximately six miles to the west are fresh at all depths. Similar to the wells in the bay, the results indicate the salt constituents and tracer have remained consistent for all wells. This is indicative of the groundwater maintaining a relatively stable condition during this time period. A shallow fresher water lens still exists west of the CCS and is supported by the induction logging conducted for this project and the continuous specific conductance profiling done in several historical wells for the interceptor ditch (ID) monitoring. This lens is 10 to 20 feet deep from the surface and generally thickens towards the west.

In most surface water stations, there is no influence of CCS water via groundwater pathway. There are two locations in the surface water canal stations immediately adjacent to the south end of the CCS where there appears to be some CCS water present.

FPL concludes the CCS does not have any ecological impact on the surrounding areas. FPL further concludes there is no evidence of CCS water in the surrounding ecosystems from a groundwater pathway.

FPL concluded that atmospheric deposition of the tracer can affect the surface water, porewater, and very shallow groundwater results as indicated by measured concentrations of tritium and must be considered when evaluating CCS surface water and porewater results. These tritium values are more concentrated immediately adjacent to the CCS and diminish with distance from the CCS.

It is important to understand the historical context of saltwater in the region and to the west of the CCS. Saltwater intrusion pre-dates the construction of the CCS and extended far inland in the 1940s (Klein 1957). Based on historical data, much of the groundwater in the vicinity of the CCS was non-potable. The extent of saltwater intrusion, as defined by the U.S. Geological Survey, varies from year to year but the landward extent of the saltwater intrusion today is still similar to that reported in the 1950s.

FPL and the Agencies conducted a joint study separate from the Monitoring Plan to determine the landward extent of the saltwater orientation in the region prior to construction of the CCS. In August 2011, FPL and the Agencies reached agreement on the conclusions as documented in a report "Saltwater Orientation in the Biscayne Aquifer in the Turkey Point Plant Vicinity Prior to Installation of the Cooling Canal System." Based on data from the Monitoring Plan, as compared to this report, the western historical extent of saltwater has not changed appreciably since the construction of the CCS in 1972. In fact, all the well clusters furthest to the west contained freshwater historically and still do today. Directly beneath and adjacent to the CCS, the saltwater wedge is closer to the land surface than it was prior to the CCS installation.

In conclusion, FPL has completed two years of pre-Uprate baseline monitoring. Many factors can cause saltwater intrusion, including groundwater withdrawals, agricultural uses, mining, government water management practices, etc. The impact of CCS water at a particular location, the relevancy of its presence, and how the water reached that location, must be considered when assessing the results and determining how to proceed.

FPL has recommended some changes to the monitoring, particularly in the interim period until 2013 when the Uprates of both Turkey Point nuclear units will be completed and those units returned to service at the Uprated power levels. Lastly, FPL makes recommendations in this report that some of the analytical parameters be eliminated.

Going forward, FPL will continue to comply with the Monitoring Plan for the required two year post-Uprate monitoring period. Since increases in temperature and salinity are expected to be minimal after the Uprate Project is implemented, there should be no presumption that the Project will cause any impact to the surrounding environment. The post-Uprate monitoring will help determine if there are any measurable impacts.

1. INTRODUCTION

Florida Power & Light Company (FPL) submits this Comprehensive Pre-Uprate Monitoring Report dated October 2012 for the Units 3 and 4 Uprate Project. This monitoring report has been prepared in accordance with the FPL Turkey Point Power Plant (Turkey Point) Groundwater, Surface Water, and Ecological Monitoring Plan, referred to herein as the Monitoring Plan (South Florida Water Management District [SFWMD] 2009a). The Monitoring Plan requires the collection of groundwater, surface water, meteorological, flow, and ecological data in and around the plant to establish pre-Uprate baseline conditions and determine the horizontal and vertical effects and extent, if any, of the cooling canal system (CCS) water. For further details, refer to the Monitoring Plan (SFWMD 2009a) and Fifth Supplemental Agreement (SFWMD 2009b). The purpose of this Comprehensive Pre-Uprate Monitoring Report is to summarize the pre-Uprate monitoring efforts, to present and summarize the data, and to discuss results. This report incorporates information presented in the previous semi-annual reports (FPL 2011a, FPL 2012a) and annual report (FPL 2011b) and includes data from June 2010 through June 2012.

Data were collected in accordance with the FPL Quality Assurance Project Plan (QAPP) that was available at the time of sample collection (FPL 2010 and 2011c) as well as changes to the QAPP that the SFWMD, the Florida Department of Environmental Protection (FDEP), and the Miami-Dade County Department of Regulatory and Economic Resources (RER, formerly known as Department of Environmental Resource Management [DERM]) (collectively described herein as the Agencies) provided to FPL in June 2011 and the suggested revisions that FPL provided to the agencies in August 2011 and March 2012. FPL's suggested revisions more accurately reflect data collection practices being performed in the field. Any notable deviations are discussed herein and/or are found in the field and laboratory audits (SFWMD 2011, 2012a, and 2012b; FPL 2012b and 2012c).

1.1 Brief Overview of Automated Monitoring Network

FPL installed an extensive automated monitoring network to collect groundwater, surface water, meteorological, and hydrologic data at 15-minute intervals over a broad area surrounding Turkey Point. Table 1.1-1 provides a summary of monitoring efforts and includes information on when the automated monitoring was initiated. A brief overview of each monitoring network is provided below, and further discussion regarding the instrumentation, data collection, and results for the network is included in Section 2 of this report. Photographs of the automated stations are included in Appendix A.

1.1.1 Groundwater

From February through June 2010, FPL installed 42 wells in 14 well clusters (TPGW-1 to TPGW-14) at and around Turkey Point (Figure 1.1-1). Coordinates of each station are provided

in Appendix A. The locations were determined based on site conditions and extensive coordination among FPL and the Agencies. The placement of station locations in Biscayne Bay also was coordinated with Biscayne National Park (BNP).

Three separate wells were installed at each location: a shallow well (S); an intermediate depth well (M); and a deep well (D). The borehole for the deep well was drilled first, and down-hole geophysical methods were used to help determine high flow zones and other subsurface characteristics. Based on a collaborative effort among FPL, JLA Geoscience, Inc., and the SFWMD, screen depths were established with screen lengths varying from 2 to 5 feet (ft) based on site conditions. Table 1.1-2 provides a brief summary of the well construction information, and further details are provided in the JLA Geosciences, Inc. (2010) Geology and Hydrogeology Report.

Following well completion, the top of each well casing was surveyed and infrastructure (probes, telemetry, solar panels, and other elements) was installed to facilitate the collection of automated groundwater quality and stage data at 15-minute intervals. Most of the locations were re-surveyed in June 2011 to confirm the elevations. The measured water quality parameters include actual conductance and temperature. Specific conductance, salinity, density, and total dissolved solids (TDS) are calculated by the instrumentation based on the measured parameters. Groundwater data are remotely transmitted via telemetry each day and uploaded to FPL's Electronic Data Management System (EDMS).

1.1.2 Surface Water

Per the Monitoring Plan and as shown on Figure 1.1-2, automated surface water stations were installed at the following locations:

- Seven stations in the CCS;
- Five stations in adjacent canals;
- Three stations in the Interceptor Ditch (ID); and
- Five stations in Biscayne Bay.

In addition, two non-automated stations were installed:

- One station in the CCS (TPSWCCS-8); and
- One station in the Card Sound Road Canal (TPSWC-6).

The locations of the monitoring stations were jointly determined with the Agencies and provide broad coverage of the key water bodies in the project area. Two additional stations (TPBBSW-10 and -14) were added at a later date to record conditions in Biscayne Bay; these stations are co-located with TPGW-10 and -14. Coordinates of each station are provided in Appendix A.

The automated surface water stations record the same water quality data parameters as the groundwater stations. Stage data are recorded at all locations except four stations in Biscayne Bay that do not have the infrastructure to support stage recorders or a telemetry system

(TPBBSW-1, TPBBSW-2, TPBBSW-4, and TPBBSW-5). The data at these four Biscayne Bay locations are retrieved manually at approximately six-week intervals and downloaded into the FPL EDMS. Data from the other stations are transmitted via telemetry daily onto a secure server system and automatically uploaded into the FPL database.

1.1.3 Meteorological

One meteorological station that includes instrumentation to measure solar radiation, wind speed, wind direction, air temperature, relative humidity, and rainfall was installed near the center of the CCS (TPM-1). Four additional rainfall gauging stations were installed around the CCS. Data are collected at 15-minute intervals. Data from the meteorological station are uploaded daily into the FPL database, while the rainfall gauges are manually downloaded during routine site visits. Seven rainfall collectors were installed around the CCS. Additionally, five evaporation pans have been installed at various locations. Figure 1.1-3 illustrates the locations of the above-mentioned stations. Coordinates of each station are provided in Appendix A.

1.1.4 Hydrological

Three acoustic Doppler velocity meters (ADVMs), otherwise known as index-velocity meters or flow meters, were originally set up to determine flow in the CCS at the following three locations: near the power plant discharge into the CCS; the southern end of the CCS before the water enters the return canal of the CCS; and near the intake into the plant from the CCS (Figure 1.1-4). All three units failed within the first two years of deployment due to the harsh conditions within the CCS; two units have subsequently been re-installed and are currently operational. Data are transmitted by telemetry and automatically uploaded to the FPL EDMS.

1.2 Quarterly Sampling for Laboratory Analysis

The aforementioned monitoring network for groundwater and surface water supports the collection of water samples for laboratory analysis. The Monitoring Plan specifies samples must be collected from the 42 new groundwater wells and the 20 surface water stations previously discussed. Samples also must be collected on a quarterly basis from one additional location on the Card Sound Road Canal. In addition, a sample must be collected one time at a localized location within the CCS, identified by the Agencies as potentially having cooler water than the rest of the CCS, based on thermal imagery. The timing of the quarterly sampling efforts is shown on Table 1.1-1. The samples are analyzed for a variety of parameters including CCS Tracer Suite constituents, ions, trace elements, nutrients, and TDS, along with field parameters, depending on the locations and whether the effort was a quarterly or semi-annual event.

Further discussion of the analytical parameters, sample collection methods, and results is provided in Section 3 of this report. The analytical data include sampling events conducted in June/July 2010, September 2010, December 2010, March 2011, June 2011, September 2011, December 2011, March 2012, and June 2012.

Samples were also collected at five existing historical wells as part of FPL's routine sampling for the ID operation. Samples were collected from historical wells L-3, L-5, G-21, G-28, and G-35 in October 2010 and January 2011. Initially, the timing of these sampling events was offset from the Monitoring Plan sampling events but, based on discussions with the Agencies following the January 2011 sampling effort, FPL changed the ID operation sampling to occur in the same month as the Monitoring Plan sampling. Results from the March 2011, June 2011, September 2011, December 2011, March 2012, and June 2012 sampling events, as well as the October 2010 and January 2011 events, are included in this report.

1.3 Ecological Monitoring

The Monitoring Plan and QAPP outline an ecological monitoring program. Biotic components of interest include marsh vegetation in adjacent wetlands, mangroves, submersed aquatic vegetation, and benthic fauna in and adjacent to Biscayne Bay. Table 1.1-1 provides a summary of the ecological monitoring efforts conducted. More detailed information on the transect plot setups, sampling methods and materials, laboratory results, findings, and conclusions are included in Section 4 of this report.

1.3.1 Marsh and Mangroves

Plant community characteristics (composition, cover, canopy, height, productivity), leaf characteristics, nutrient content in the leaves and soil/sediment, and porewater quality are being assessed in 12 transects in marsh and mangrove areas around the CCS (Figure 1.3-1). Two (one each in the marsh and mangrove) of those transects are in reference areas. Ecological monitoring efforts were initiated in October 2010 and completed by December 2010. Additional monitoring in the marsh and mangrove areas was conducted on a quarterly basis in February 2011, May 2011, August 2011, November 2011, February 2012, and May 2012.

1.3.2 Biscayne Bay

Submerged aquatic vegetation (SAV), coral and sponge community composition and cover, fish and invertebrate species composition and abundance, nutrient content in seagrass leaves and sediment, light attenuation, and porewater quality are being assessed in 20 transects that parallel the shoreline (Figure 1.3-1). The monitoring in Biscayne Bay is conducted twice a year. Originally, the plan was to conduct monitoring in May and October; however, during the setup of transects in October 2010, FPL noted that the seagrasses had already senesced by the time sampling was initiated. With concurrence from the Agencies, the subsequent ecological monitoring in Biscayne Bay was changed to April and September with the subsequent monitoring efforts conducted in April 2011, September 2011, and April 2012.

1.3.3 Broad-Scale Porewater Survey

In accordance with the Monitoring Plan and through coordination with the Agencies, an initial broad-scale survey of porewater temperature and specific conductance was conducted in March/April 2010 (dry season) at over 200 locations in adjacent wetlands and Biscayne Bay

(Figure 1.3-2). A second porewater temperature and specific conductance survey was conducted in August 2010 (wet season) at 100 locations in Biscayne Bay (Figure 1.3-3). Based on the initial temperature and specific conductance measurements, locations were established for the porewater samples that would be collected for Tracer Suite laboratory analysis. The wet season Tracer Suite sampling effort took place in October 2010 and the dry season sampling event was conducted in April 2011. While details of this effort are in the report titled "Turkey Point Plant Initial Ecological Characterization Report" (FPL 2012d), summaries of the approach and the findings are provided herein. The results, when used in conjunction with the other data, increase understanding of baseline porewater conditions across the broader landscape.

1.4 Hydrogeologic Assessment

1.4.1 CCS Water Budget

FPL has worked closely with the Agencies to develop an acceptable methodology for the CCS water budget. This methodology has evolved and is included in Section 5 of this report. Estimated monthly water budgets and salt loads from September 2010 through June 2012 are included in Section 5.

1.4.2 Regional Assessment and Extent of CCS Water

With the aid of data collected as part of the well installation efforts, automated data and analytical results, United States Geological Survey (USGS) induction logs, and other supporting documentation, FPL has conducted an initial assessment of the hydrogeologic conditions in the area surrounding Turkey Point and the CCS, which provides some insights into how the groundwater system responds to different environmental conditions and operation of the CCS. The rate of migration and extent of CCS water in the groundwater are discussed in Section 5 of this report.

1.4.3 Biscayne Bay Continuous Resistivity Profile Survey

The USGS conducted a pilot study in Biscayne Bay to assess the feasibility of using continuous resistivity profiling to determine the extent of CCS water both laterally and vertically in the subsurface. The survey in the Bay was conducted on May 25 and 26, 2011, with an additional transect surveyed in the CCS in July 2011. Following the processing and interpretation of the data, the USGS gave a PowerPoint presentation to FPL and the Agencies on August 29, 2012. No report was generated to provide the information to the Agencies. The USGS indicated that preparation and publication of a report would take approximately one year due to their extensive quality assurance/quality control (QA/QC) process. Alternatively, FPL provides a brief summary of the USGS's effort and FPL's overall interpretation of the preliminary findings in Section 5 of this report.

1.5 Interceptor Ditch Operation

The Interceptor Ditch (ID) is located immediately west of the CCS and is designed to prevent seasonal inland movement of saltwater from the CCS into the potable portion of the Biscayne Aquifer. Shallow saline groundwater is intercepted by the ID and pumped back to the CCS during the dry season or other times when the natural gradients are low and the potential for saltwater intrusion exists. Details of the ID operation are found in the 1983 Agreement (the Agreement) between the SFWMD and FPL. On October 14, 2009, the Agreement was modified to expand the monitoring program as part of the Turkey Point Units 3 and 4 Uprate Project and added well G-35 as part of the historical monitoring network. FPL submitted a revised operations plan to the SFWMD in 2011 and comments on that plan are pending.

Since 1972, FPL has been collecting groundwater data west of the CCS and recording ID pumping as part of the ID operation. Results of these efforts have been included in reports that are submitted on a quarterly and annual basis. Based on discussions between FPL and the SFWMD, reporting of the ID operations for the last year (June 2011 through May 2012) is integrated into Section 6 this report.

1.6 Data Quality Objectives and Acceptance Criteria

Data quality objectives (DQOs), along with acceptance criteria, are identified in the project QAPP. The DQOs include the following:

- Precision
- Accuracy
- Analytical Sensitivity
- Completeness
- Representativeness
- Comparability
- Availability
- Reliability
- Maintainability
- Timeliness

Quality guidelines have been established for some of the DQO which reflect quantifiable goals. A summary of performance in meeting the DQOs is described below.

Precision

Precision is a measure of mutual agreement between duplicate or co-located measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement.

Precision for laboratory samples is established by the evaluation of field and laboratory duplicate samples. If the relative percent difference (RPD) between the sample and the duplicate result differ by more than 20%, the results for that analyte in both samples are qualified as questionable. While a small percentage of sample data has been qualified due to high duplicate RPDs, overall, the analytical results are comparable to duplicate samples for those samples using the same method. These precision results indicate the sampling and analytical procedures are consistently performed and repeatable. Details are provided in the Data Usability Summary (DUS) Reports issued for each event.

To assess precision of the probes being used to collect time series water quality and water level data, field measurements are taken during cleaning and calibration events to verify the results. This is discussed further in Section 2 of this report. If the specific conductance value reported by the field verification measurement is more than 30% higher or lower than the automated probe reading, the automated probe data are qualified as questionable (?) back to the previous cleaning and calibration event or, at minimum, back to an interim point where there is an unexplained shift in the data. While most of the data do not need to be qualified, the numerical degree of variability is greater in the high saline locations.

Similarly, if a temperature verification measurement is more than 0.5 degrees Celsius (°C) different than the automated probe reading, the data are qualified in the same manner. Rarely has the water quality data been qualified for not meeting a field instrument verification reading.

For verification of water level precision, refinements were made during the monitoring program. These refinements included the collection of water level measurements with a water level indicator at different times during the cleaning and calibration event. These refinements allowed the determination of the water level before pulling the probes for cleaning and after placement of the probes to verify correct reference level settings. If the difference between the verification water level reading (before the probe is pulled for cleaning) is greater than 0.1 ft from the automated probe reading, the data are qualified as estimated (J) back to the previous cleaning and calibration event or, at minimum, back to an interim point where there is an unexplained shift in the data. The precision has improved over time; however, the biggest challenge has been associated with the surface water stations in Biscayne Bay and the CCS. Sometimes wave action at these larger surface water body locations affects the water level indicator readings, making verification of the automated reading more difficult. Only a limited amount of water level data is qualified as questionable due to verification readings.

Accuracy

Accuracy is the measure of bias in a measurement system. The closer the value of a measurement agrees with the true value, the more accurate the measurement.

For the analytical results, accuracy is evaluated using percent recoveries of analytes added, termed “spiked,” to samples (matrix spikes [MSs]) or reagents (laboratory control samples [LCSs]) and carried through the extraction and analysis procedure. Laboratory-established acceptance criteria (within method requirements) are used for LCS and MS percent recoveries.

LCS percent recoveries have consistently passed acceptance criteria for all analyses indicating the laboratories extraction and analysis procedures and materials met method requirements.

In contrast, some MS recoveries have been qualified as estimated (J) or unusable (?) due to poor recoveries. Results with MS recoveries outside laboratory-established limits are qualified as "J" and recoveries less than 10% are qualified as "?" as the low recovery indicates a significant possibility of error associated with the sample result due to the matrix effects. Results were qualified as "?" in two total phosphorus, one chloride, one sulfate, and one fluoride result in saline water samples. Results were qualified as "J" in many of the samples analyzed for matrix spikes, especially with regards to nutrients. This trend will be followed during future events as it could indicate a possible error associated with the accuracy of the results due to matrix interferences.

In addition to recoveries, accuracy is evaluated using technical comparison checks, including cation and anion charge balance; cations, anions, and TDS compared to the specific conductance; total ammonia less than total Kjeldahl nitrogen (TKN); and orthophosphate (OP) less than total phosphorus (TP). Many cation and anion results, particularly in the high salinity samples, have been qualified as either "J" or "?" due to ion charge and conductance comparisons. TDS/specific conductance and ammonia/TKN comparisons were acceptable.

TP and OP were first sampled in events from June 2010 to February 2011 and the OP had higher results than the TP. In March 2011, the OP analytical method was modified based on a FDEP Laboratory SOP (NU-070-1.8). The sample is analyzed without the color reagent to establish a background concentration. The sample is then analyzed per the method and the background concentration is subtracted from the analytical result. Since the method modification, the OP/TP comparisons have been within the criteria.

The laboratory is considering switching to saline reagent waters to better simulate the sample matrix and reduce matrix-induced interference effects. In addition, certified reference materials (CRMs) for nutrients in saline waters are being analyzed to evaluate the validity of the laboratory results for these methods.

To further evaluate laboratory accuracy, field split samples were collected by RER in the March 2012 semi-annual sampling event and analyzed by the RER laboratory. Samples were collected from select deep wells into separate containers, shipped to TestAmerica Laboratories, Inc. (TestAmerica) and the RER laboratory, and analyzed for ammonia, nitrate/nitrite, TKN, TP, and OP. While the number of data pairs compared (four) is too small to draw major conclusions, there are some significant differences (RPD>50%) among the results for ammonia, TKN, and OP. The two laboratories follow essentially the same methods; however, even minor differences in procedures or materials can affect the analytical results. At this point, it is unclear which set of results is more accurate of the actual groundwater conditions at the time of sampling. It should be noted that the RER results have ammonia consistently greater than TKN, which is not possible; TKN is the sum of ammonia, ammonium, and organic nitrogen. FPL/TestAmerica is reviewing the RER SOPs and is performing analysis of CRMs to aid in the evaluation of the overall sample results.

The instrumentation for all the automated station instruments and field equipment meets the requirements for accuracy per the QAPP. All stations were surveyed with vertical control established to second order closure (accuracy within hundredths of a foot) with the exception of three groundwater cluster stations in Biscayne Bay. The top of the groundwater wells and surface water stilling wells at these Biscayne Bay stations were surveyed with GPS instruments to an accuracy of 0.1 ft.

Analytical Sensitivity

For data validation, qualification and reporting purposes, analytical sensitivity is expressed by method detection limits (MDLs). MDLs are set such that the minimum concentration of an analyte is reported within 99% confidence that the analyte is greater than zero.

Project-required MDLs are listed in Table 3.2-1 of the QAPP. The MDLs are based on applicable criteria, MDLs listed in the Automated Data Processing Tool (ADaPT), Florida Administrative Code (F.A.C.) 62-4.246(3), and stated laboratory capabilities. While the majority of analytical detection limits have met the QAPP requirements, a few have been difficult to achieve due to the saline nature of the samples. This is particularly an issue with the trace metals and fluoride. The laboratory has had to dilute the saline samples to keep instruments from being overloaded with the major ion constituents (i.e., chloride, sodium). This has resulted in some data reported as Not Detected (U) but with detection limits above the QAPP requirements. In addition, these dilutions increase the uncertainty, or error, associated with a result. The laboratory is working to expand or tailor calibration ranges, within method requirements, to fit project samples and reduce the frequency of dilutions needed.

To achieve the required MDLs, the laboratory will be adding preparatory EPA Method 1638 (Determination of Trace Elements in Ambient Waters by Inductively Coupled Plasma Mass Spectrometry) for manganese and molybdenum and EPA Method 1640 (Determination of Trace Metals by Pre-concentration and ICP-MS) for the other trace metals listed above starting in September 2012. The added step will selectively concentrate certain metals prior to analysis to improve detection limits. For fluoride, the laboratory has modified the instrument performing the anion analysis (Method 6010) to allow for lower required dilutions and achieve the QAPP-required MDL. In addition, a fluoride selective probe method is being reviewed as a possible analytical alternative for fluoride only.

Completeness

Completeness is expressed as the percentage of valid or usable measurement to planned measurements. The higher the percentage, the more complete the measurement process. The number of planned measurements is based on when the infrastructure is in place and functional. Per the QAPP, the completeness goal for water quality measurements is 95% and 90% for all other data.

All planned groundwater, surface water, and porewater measurements have been made with a few exceptions. The well clusters at TPGW-10, TPGW-11, and TPGW-14 were not sampled

during the June 2010 event as they had not been completed at that time. Some data have been qualified as unusable and, in a few instances, the sample was lost by the lab prior to analysis.

For the nine groundwater and surface water events (four quarterly and five semi-annual) since the start of the project, approximately 31,000 groundwater and surface water analytical data points were scheduled to be reported. Of those, fifteen results were qualified as unusable and thirty results (all isotopes) were not reported due to laboratory errors. For the seven porewater sampling efforts conducted at the ecological transects since the start of the project through May 2012, a total of approximately 10,600 porewater analytical data points were scheduled to be reported. Of those, four (all OP) were reported as unusable and twelve results (isotopes and ions) were not reported due to loss of the sample by the laboratory. This results in a completion rate of greater than 99% in meeting the project objectives. It should be noted that some isotope results have not been received at the time of this assessment and as such, the totals reported above are based on available data.

All the planned ecological measurements have been made with the exception of eliminating the collection of some data in the tree islands due to health concerns about excessive poison ivy on the islands. Any changes in sampling have been agreed to by the Agencies.

The automated water quality data are calculated to be 89% complete. This percentage is lowered as a result of specific conductance oscillations related to probe or cable malfunctions or radio frequency wave interferences, most notably in well clusters TPGW-1 and TPGW-13. FPL and the probe manufacturer have conducted numerous efforts to fix the problem; oscillations still occur, but less frequently.

Meteorological data at TPM-1 are 99% complete. Rainfall data at other stations and CCS flow meter data are less complete. Some of the other rain gauges have had various problems including wiring issues, malfunctioning equipment, or excessive battery drain which have resulted in data gaps. Most of the rain gauge problems have been resolved but since they are not on telemetry, the potential for data gaps of one to two months can still exist if a gauge fails. Gaps in the rain data can be addressed by interpolating results from other stations or using Next Generation Weather Radar (NEXTRAD) data from the SFWMD. Data from the CCS flow meters are less than 50% complete due in part to a number of equipment related issues. These meters are located in a harsh environment and have been removed for various reasons due to hardware components rusting and breaking or instrument failure. The flow meters were going to be used by FPL as a check to the water budget, however, based on findings discussed by FPL in Section 5, it is doubtful if the flow meter data will be used as originally envisioned.

Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represent the environmental condition. The sampling locations and techniques as outlined in the Monitoring Plan and QAPP provide data that are representative of conditions in the CCS and the surrounding environment.

Groundwater wells are placed in discrete high flow zones and are spatially distributed to reflect changes in groundwater levels and quality across the landscape. Automated data are collected at 15-minute intervals, an adequate duration to reflect temporal changes in water levels, water quality, water flow, and various meteorological parameters.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one set of data can be compared to another. Nearly all the data, unless qualified as "?" or unusable for other reasons, are comparable. Methods of data collection and analysis have remained primarily consistent over the two years of sampling. Some refinements in data collection have helped improve efficiency or verify precision, but have not necessarily improved precision.

The most notable data that may not be directly comparable are some of the nutrient results. As noted in the "Accuracy" section above, the method of analysis for OP was modified beginning with the collection of data in the March 2011 sampling event; OP data collected prior to March 2011 using the original method are not directly comparable to data collected during and after the March 2011 event. The data prior to the March 2011 event are believed to be biased high due to background fluorescence levels interfering with the analysis.

Nitrate/nitrite samples collected in March 2012 were filtered in the field, as will be done in subsequent events. Previously, the samples were distilled in the lab and not filtered in the field. It is expected that the results are similar. Rarely does one find insoluble forms unless they are large particulates which would not be analyzed in any case; they would have to be removed as they would interfere with the analysis. This was further demonstrated by the March 2012 PERA split samples. The samples were analyzed as filtered and unfiltered for ammonia and nitrate/nitrite with essentially identical results. Therefore, the ammonia and nitrate/nitrite results from both method variations are considered comparable.

Availability

Availability is the percentage of time that a system or function is available for service according to established criteria and the probability that the system is operating satisfactorily at any point in time, excluding times when the system is under repair. This DQO applies primarily to the automated systems.

While FPL has not calculated percentages, the stations that report automated water level and water quality collectively have a high degree of availability. These systems operate round the clock, the probes have been reliable, and spare probes and cables are on-hand to fix a problem station. The meteorological station has been reliable with no down time, thus has a high degree of available data for solar radiation, wind speed and direction, air temperature, relative humidity, and rainfall. The other rain gauges and CCS flow meters appear to record good data when operational, but some of the instruments have failed for extended periods of time. Since the individual rain gauges are not on telemetry, whether the system is operating satisfactorily or not is unknown until the site is visited monthly or bi-monthly and data are downloaded and reviewed. The CCS flow meters are more difficult to maintain.

Reliability

Reliability is the probability of a system performing a specified function without failure for a specified period of time. A "failure" occurs when a measurement or control action does not comply with established accuracy, completeness, or timeliness standards. This DQO applies primarily to the automated systems.

Collectively, the stations that report automated water level and water quality are reliable in the context of data usability. The associated probes that measure and record the data meet the accuracy requirements and exhibit high percent completeness. As previously indicated, some stations have reoccurring issues with oscillating specific conductance data and the precision at some of the higher saline sites is reduced; however, only a small percentage of the data are qualified "?". Reporting of the automated data from the stations on telemetry has typically been on a daily basis. However, a number of transmission/signal issues have occurred when the data have not been consistently reported within 24 hours for all stations. Still, in most instances, the data are stored internally on the probe and eventually downloaded when a phone connection is made or the data are manually downloaded into the system. The quality guideline for reliability, as stated in the QAPP, is difficult to judge since it reflects a mean time between failures of 18 to 24 months depending on the system. While there have been "failures" in less than 18 months, the majority of the data are usable and no decisions are being made on the raw data that is being transmitted via telemetry.

The meteorological station at TPM-1 has not failed and reports regularly, thus it maintains a high level of reliability. The rain gauges at the other sites have less complete data and thus have a lower reliability.

Maintainability

Maintainability is the ease with which a component or equipment can be modified to correct faults. The quality guideline per the QAPP for completion of repairs to components or equipment is 72 hours. Given the size of the system, remote locations of some stations, and the occasional need for extended troubleshooting efforts, strict compliance with the guideline is not always possible or even appropriate. The automated groundwater and surface water stations (inshore) are easier to maintain than some of the other systems, however, some of the oscillation and daily reporting issues have required extensive troubleshooting. On at least a weekly basis, FPL checks for any automated groundwater and surface water stations that are on telemetry but are not reporting. Often the lack of reporting is related to low signal strength or loss of telephone connection the previous day and not to an equipment malfunction. Usually, the system will eventually report. Also on a regular basis, FPL looks at time series plots of the data to see if there are any unusual data trends or oscillations requiring troubleshooting and repair efforts.

The CCS flow meters are more difficult to maintain since they are the most sophisticated pieces of equipment and are affected by the harshest conditions. Rarely can the meters or the associated infrastructure be repaired in 72 hours. FPL suggests modifying the maintainability goal in the QAPP to take logistical constraints and other realities more into account.

Timeliness

Timeliness is the promptness of reporting a measurement after it is made, reporting deficiencies, submission of reports or other project documentation, addressing corrective actions, and reporting deviations within the timeframes specified in the QAPP or within the Monitoring Plan or Agreement.

Per the QAPP, the analytical data have been consistently provided to the Agencies within 48 hours following FPL's receipt of the data from the laboratory. While much of the data from the primary laboratory is in ADaPT format, such data has not undergone a full QA/QC review at the time it is submitted to the laboratory. Since the samples are analyzed by various laboratories, the results are received at different times with several of the isotope results (notably strontium and tritium) taking the longest to obtain. Once all sample results are obtained for a sampling event, a full QA/QC check of the data is conducted and FPL generates DUS Reports. The data are also further assessed during the preparation of semi-annual and annual reports; occasionally, suspect results are found and subsequently qualified.

The automated systems are currently set to report values at 15-minute intervals and, for those systems on telemetry, to upload the results daily. As previously discussed, low signal strength or other issues have prevented various telemetry units to consistently report every day. While the raw data can be viewed by the Agencies in FPL's electronic database, the data are not official until FPL has conducted a full QA/QC review.

If additional errors are noted in the data following the QA/QC process, the results are updated in the database or DUS, as applicable, and are included in an errata or the subsequent annual report.

Reports have been submitted to the Agencies per the timeframes outlined in the QAPP or in accordance with revised schedules agreed to by the Agencies.

Once there is concurrence that corrective actions from field and laboratory audits are needed, corrective action is typically implemented immediately or by the next sampling event.



TABLES

Table 1.1-1. Summary of Monitoring Efforts (June 2010 – November 2012)

	2010							2011										2011	
Monitoring Effort	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ecological Mangrove and Marsh Monitoring					Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)				Biota Porewater (field and Tracer Suite parameters)			Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)			Biota Porewater (field and Tracer Suite parameters)			Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)	
Ecological Biscayne Bay Monitoring					Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)						Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)					Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)			
Automated Data Collection	TPGW-2, TPGW-3, TPGW-6, TPGW-9, TPGW-12, TPGW-13 installed between 6/22 and 6/25	Continuous for those 6 stations	All TPSWC, TPSWID, TPSWCCS stations turned on 8/23-9/3	TPGW-10 and BBSW stations (9/2/10), TPGW-11 to TPGW-14, and TPBBSW-10 (9/17/10), and TPBBSW-14 (9/18/10) turned on. TPGW-1, -4, -5, -7, -8 installed (8/31-9/15).	Continuous	Continuous	Continuous	Continuous; TPBBSW-10 and TPBBSW-14 switched from LT500 to AT200	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
CCS Flow Meters			TPFM-1, TPFM-2 and TPFM-3 turned on	Continuous	Continuous	Continuous	TPFM-3 failed; TPFM-1 and TPFM-2 still continuous	TPFM-1 and TPFM-2 continuous	TPFM-1 and TPFM-2 continuous	TPFM-1 and TPFM-2 continuous	TPFM-1 and TPFM-2 continuous	TPFM-1 and TPFM-2 continuous	TPFM-1 and TPFM-2 continuous	TPFM-1 stopped reporting mid August	TPFM-2 stopped reporting early August			
Meteorological station		TPM-1 turned on 7/26/10	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Rainfall stations						TPRF-2, TPRF-4, TPRF-11, and TPRF-12 installed	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2, TPRF-4, and TPRF-11	Continuous data from TPRF-2, TPRF-4, and TPRF-11	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2, TPRF-4, and TPRF-11
Groundwater and Surface Water Sampling (New Stations)	Field and Tracer Suite parameters, trace metals, and nutrients with the exceptions of TPGW-10, TPGW-11, and TPGW-14 (as offshore platforms were incomplete)			Field and Tracer Suite parameters			Field and Tracer Suite parameters, TPGW-10 and TPGW-14 for trace metals, and nutrients Resampled TPGW-1 for ammonia			Field and Tracer Suite parameters, trace metals, and nutrients			Field and Tracer Suite parameters			Field and Tracer Suite parameters, trace metals, and nutrients			Field and Tracer Suite parameters
Historic Groundwater Well Sampling					Field and Tracer Suite parameters			Field and Tracer Suite parameters		Field and Tracer Suite parameters			Field and Tracer Suite parameters			Field and Tracer Suite parameters			Field and Tracer Suite parameters
Evaporation Pan Sampling										TPEVP-2, TPEVP-3, TPEVP-5, and TPEVP-12 installed	Monthly tritium	TPEVP-13A (also called TPEVP-GC) installed	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium
Rainfall Collector Sampling												TPRF-2 through TPRF-5, TPRF-7, TPRF-8, and TPRF-12 deployed		Quarterly tritium, except for TPRF-5 (stolen)		Quarterly tritium			Quarterly tritium

Notes:
Automated data collection includes groundwater and surface water quality and stage, flow, rainfall, and meteorological glow and rainfall data at several stations are limited.
Refer to Table 30-2 for field and Tracer Suite parameters and nutrients.

Key:
TPBBSW = Turkey Point Biscayne Bay Surface Water.
TPEVP = Turkey Point Evaporation Pan(s).
TPFM = Turkey Point Flow Meter(s).
TPGW = Turkey Point Groundwater.
TPRF = Turkey Point Rainfall gauge.
TPSW = Turkey Point Surface Water.
TPSWID = Turkey Point Surface Water Inteceptor Ditch.

Notes:
Automated data collection includes groundwat
rainfall, and meteorological glow and rainfal
Refer to Table 30-2 for field and Tracer Suite p

Table 1.1-1. Summary of Monitoring Efforts (June 2010 – November 2012)

Monitoring Effort	2011		2012						
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Ecological Mangrove and Marsh Monitoring	Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)			Biota Porewater (field and Tracer Suite parameters)			Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)		
Ecological Biscayne Bay Monitoring						Biota Porewater (field and Tracer Suite parameters, and nutrients) Vegetation (nutrients)			
Automated Data Collection	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
CCS Flow Meters							TPFM-1 and TPFM-2 reinstalled and turned on.	TPFM-1 and TPFM-2 continuous	TPFM-1 and TPFM-2 continuous
Meteorological station	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Rainfall stations	Continuous data from TPRF-2 and TPRF-11	Continuous data from TPRF-2, TPRF-4, and TPRF-11	Continuous data from TPRF-2, TPRF-4, and TPRF-11	Continuous data from TPRF-2, TPRF-4, and TPRF-11	Continuous data from all stations	Continuous data from all stations	Continuous data from all stations	Continuous data from all stations	Continuous data from all stations
Groundwater and Surface Water Sampling (New Stations)		Field and Tracer Suite parameters			Field and Tracer Suite parameters, trace metals, and nutrients			Field and Tracer Suite parameters	
Historic Groundwater Well Sampling		Field and Tracer Suite parameters			Field and Tracer Suite parameters			Field and Tracer Suite parameters	
Evaporation Pan Sampling	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium	Monthly tritium
Rainfall Collector Sampling		Quarterly tritium			Quarterly tritium, except for TPRF-7 (stolen)			Quarterly tritium	

Notes:

Automated data collection includes groundwater and surface water quality and stage, flow, rainfall, and meteorological glow and rainfall data at several stations are limited.

Refer to Table 30-2 for field and Tracer Suite parameters and nutrients.

Key:

TPBBSW = Turkey Point Biscayne Bay Surface Water.

TPEVP = Turkey Point Evaporation Pan(s).

TPFM = Turkey Point Flow Meter(s).

TPGW = Turkey Point Groundwater.

TPRF = Turkey Point Rainfall gauge.

TPSW = Turkey Point Surface Water.

TPSWID = Turkey Point Surface Water Inteceptor Ditch.

Table 1.1-2. Well Construction Summary

Monitoring Well	Top of Casing Elevation (ft NAVD 88)	Depth to Top of Screen from TOC (ft)	Depth to Bottom of Screen from TOC (ft)	Screen Length (ft)	Top of Screen Elevation (ft NAVD 88)	Bottom of Screen Elevation (ft NAVD 88)	Elevation Screen Midpoint (ft NAVD 88)
TPGW-1S	3.82	32.0	34.0	2	-28.18	-30.18	-29.18
TPGW-1M	3.92	52.1	54.1	2	-48.18	-50.18	-49.18
TPGW-1D	4.20	85.3	89.3	4	-81.10	-85.10	-83.10
TPGW-2S	1.36	24.7	28.7	4	-23.34	-27.34	-25.34
TPGW-2M	1.18	50.5	52.5	2	-49.32	-51.32	-50.32
TPGW-2D	1.14	85.5	87.5	2	-84.36	-86.36	-85.36
TPGW-3S	1.44	27.1	31.1	4	-25.66	-29.66	-27.66
TPGW-3M	1.22	54.7	58.7	4	-53.48	-57.48	-55.48
TPGW-3D	1.10	86.6	88.6	2	-85.50	-87.50	-86.5
TPGW-4S	2.24	23.2	25.2	2	-20.96	-22.96	-21.96
TPGW-4M	1.82	38.1	43.1	5	-36.28	-41.28	-38.78
TPGW-4D	1.92	61.6	65.6	4	-59.68	-63.68	-61.68
TPGW-5S	5.35	28.6	32.6	4	-23.25	-27.25	-25.25
TPGW-5M	5.07	49.3	54.3	5	-44.23	-49.23	-46.73
TPGW-5D	5.22	67.0	72.0	5	-61.78	-66.78	-64.28
TPGW-6S	1.56	22.3	24.3	2	-20.74	-22.74	-21.74
TPGW-6M	1.52	48.7	52.7	4	-47.18	-51.18	-49.18
TPGW-6D	1.59	81.9	85.9	4	-80.31	-84.31	-82.31
TPGW-7S	1.36	21.8	25.8	4	-20.44	-24.44	-22.44
TPGW-7M	1.25	47.7	51.7	4	-46.45	-50.45	-48.45
TPGW-7D	1.19	79.7	83.7	4	-78.51	-82.51	-80.51
TPGW-8S	1.98	16.8	20.8	4	-14.82	-18.82	-16.82
TPGW-8M	2.12	34.9	36.9	2	-32.78	-34.78	-33.78
TPGW-8D	2.01	49.2	53.2	4	-47.19	-51.19	-49.19
TPGW-9S	3.63	14.9	18.9	4	-11.27	-15.27	-13.27
TPGW-9M	3.53	34.3	36.3	2	-30.77	-32.77	-31.77
TPGW-9D	3.52	47.9	49.9	2	-44.38	-46.38	-45.38
TPGW-10S*	8.3	36.4	38.4	2	-28.1	-30.1	-29.1
TPGW-10M*	8.3	60.4	64.4	4	-52.1	-56.1	-54.1

Table 1.1-2. Well Construction Summary

Monitoring Well	Top of Casing Elevation (ft NAVD 88)	Depth to Top of Screen from TOC (ft)	Depth to Bottom of Screen from TOC (ft)	Screen Length (ft)	Top of Screen Elevation (ft NAVD 88)	Bottom of Screen Elevation (ft NAVD 88)	Elevation Screen Midpoint (ft NAVD 88)
TPGW-10D*	8.3	126.5	130.5	4	-118.2	-122.2	-120.1
TPGW-11S*	8.7	39.4	43.4	4	-30.7	-34.7	-32.7
TPGW-11M*	8.7	90.4	94.4	4	-81.7	-85.7	-83.7
TPGW-11D*	8.7	122.4	126.4	4	-113.7	-117.7	-115.7
TPGW-12S	0.52	21.6	23.6	2	-21.08	-23.08	-22.08
TPGW-12M	0.73	55.8	59.8	4	-55.07	-59.07	-57.07
TPGW-12D	0.76	89.8	93.8	4	-89.04	-93.04	-91.04
TPGW-13S	2.19	29.8	33.8	4	-27.61	-31.61	-29.61
TPGW-13M	2.13	56.7	60.7	4	-54.57	-58.57	-56.57
TPGW-13D	2.18	84.9	88.9	4	-82.72	-86.72	-84.72
TPGW-14S*	8.8	32.5	36.5	4	-23.7	-27.7	-25.7
TPGW-14M*	8.8	56.3	60.3	4	-47.5	-51.5	-49.5
TPGW-14D*	8.6	102.2	106.2	4	-93.6	-97.6	-95.6

Note:
* Offshore wells surveyed using GPS are only accurate to 0.1 foot.

Key:
ft = feet.
NAVD 88 = North American Vertical Datum of 1988.
S = Shallow.
M = Intermediate.
D = Deep.
TOC = Top of casing.

FIGURES

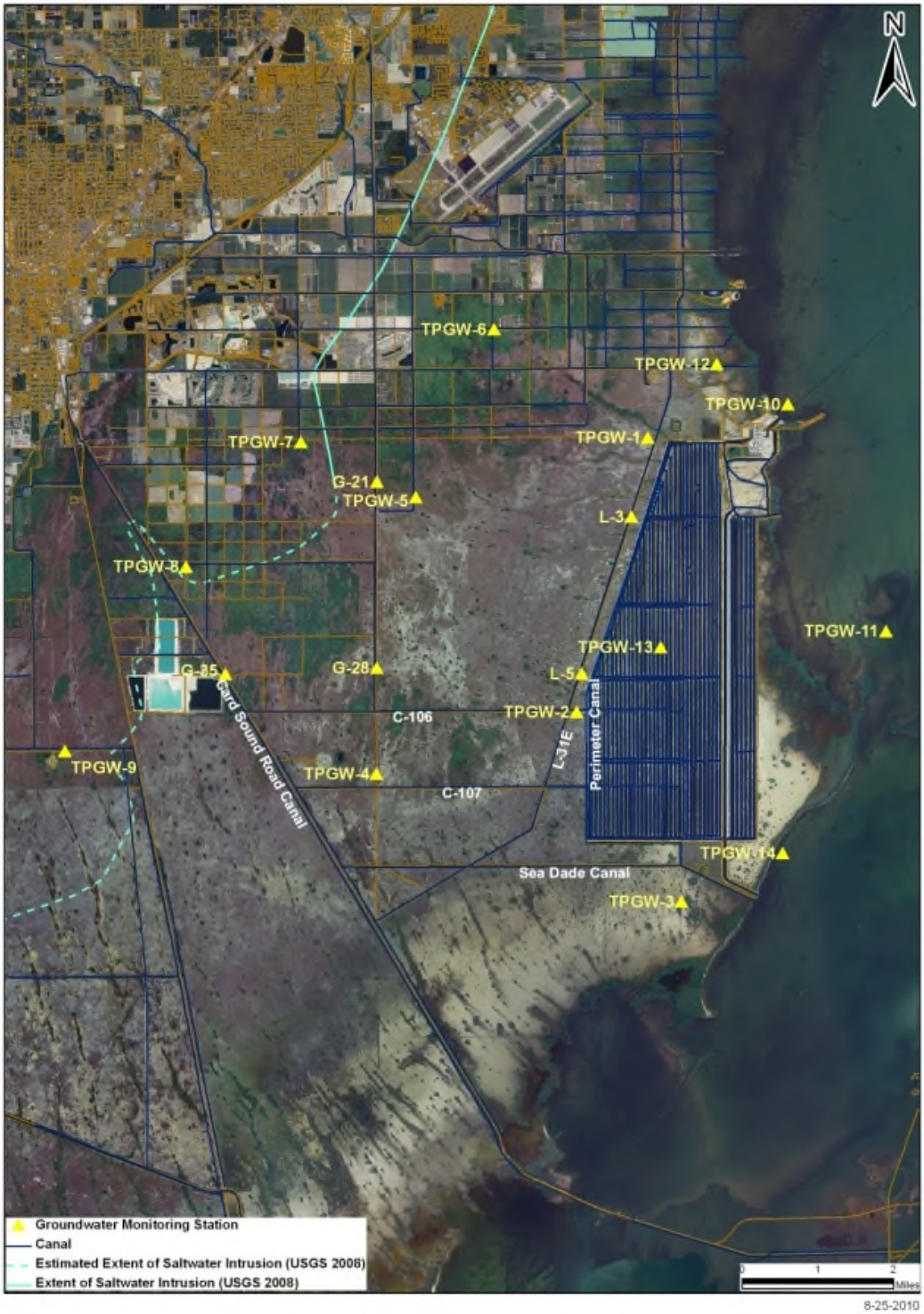


Figure 1.1-1. Locations of Groundwater Monitoring Stations.

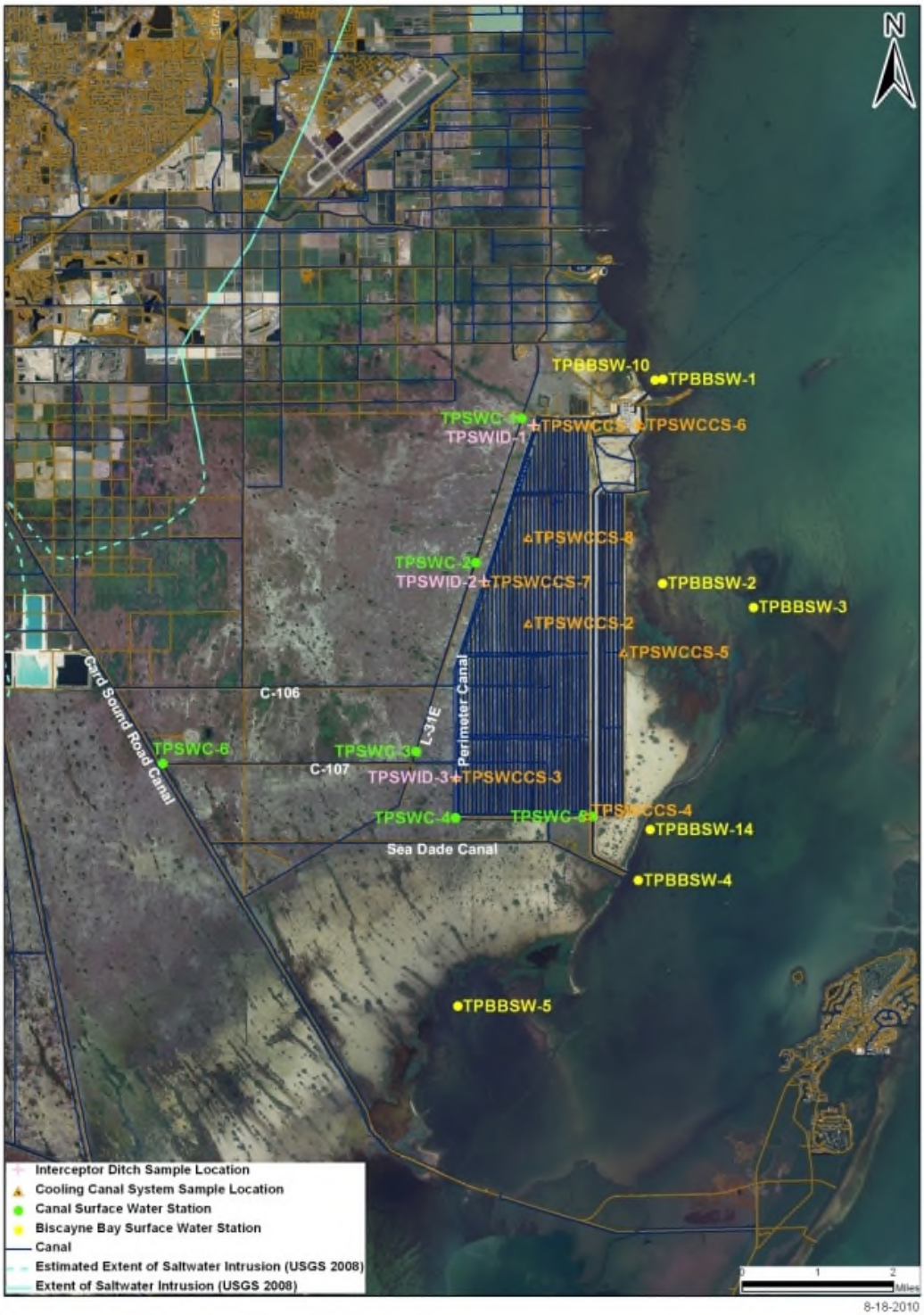


Figure 1.1-2. Locations of Surface Water Monitoring Stations.

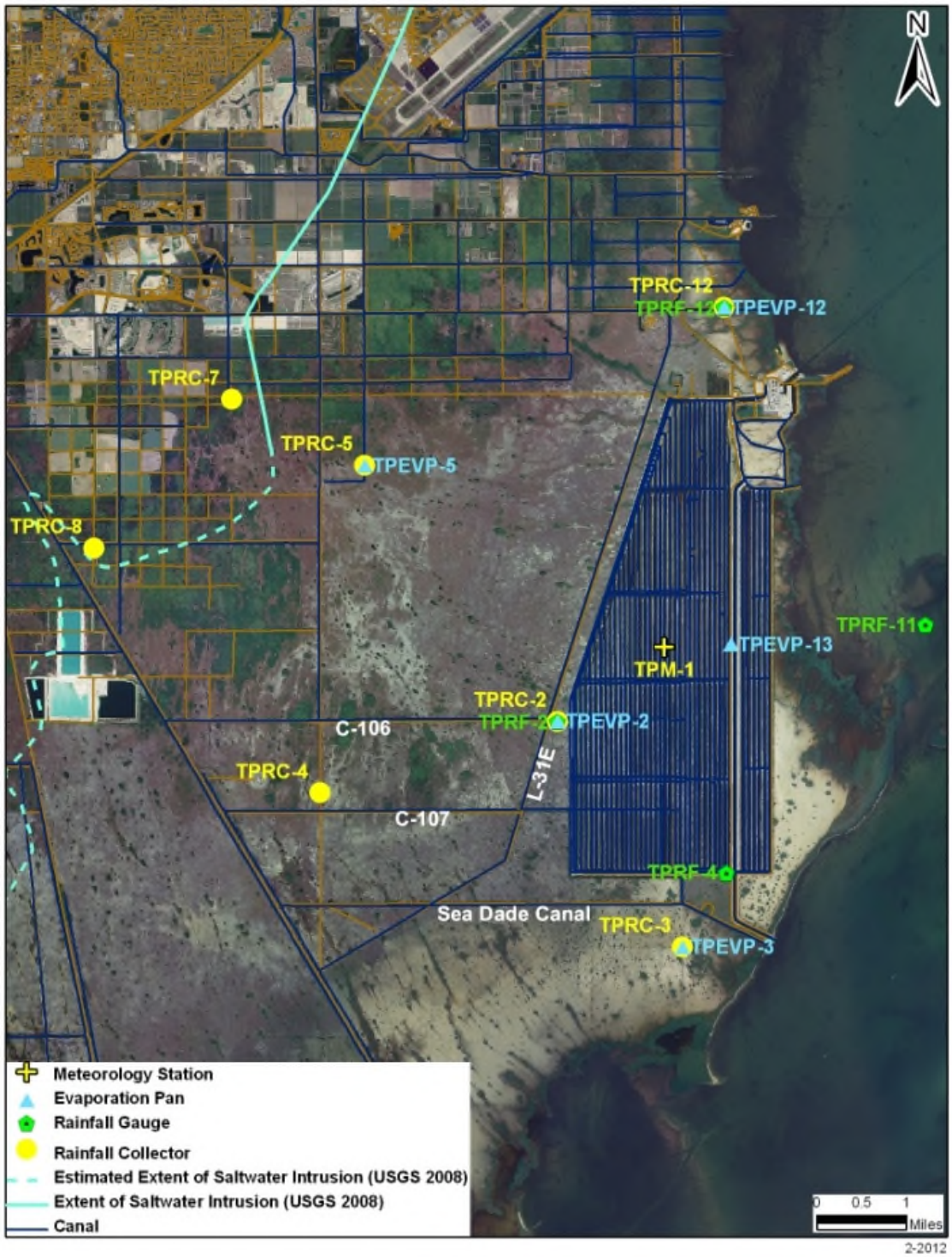


Figure 1.1-3. Locations of the Meteorological Station, Rainfall Gauging Stations, Rainfall Collectors, and Evaporation Pans.

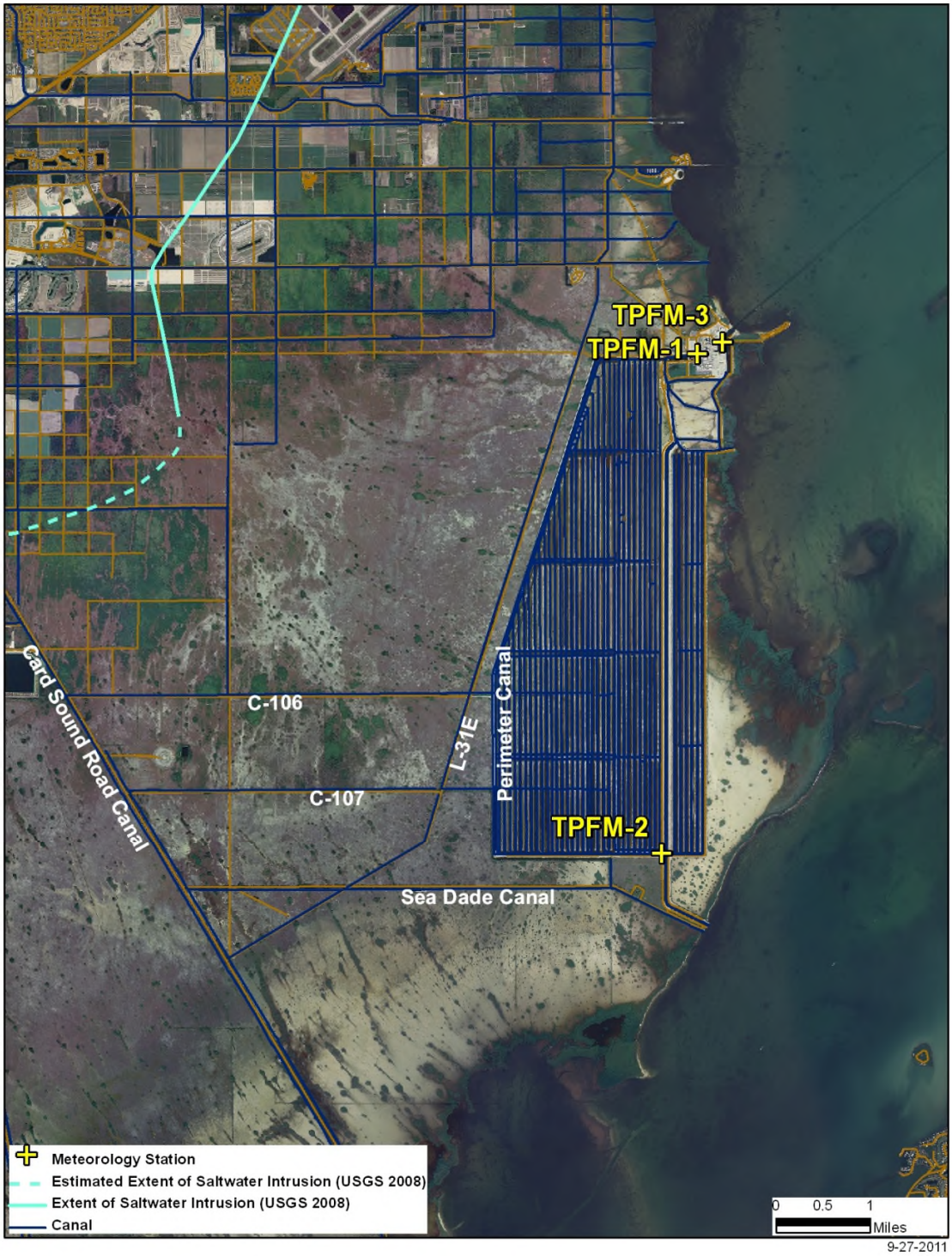


Figure 1.1-4. Flow Meter Locations in the CCS.



Figure 1.3-1. Ecological Transect Locations.

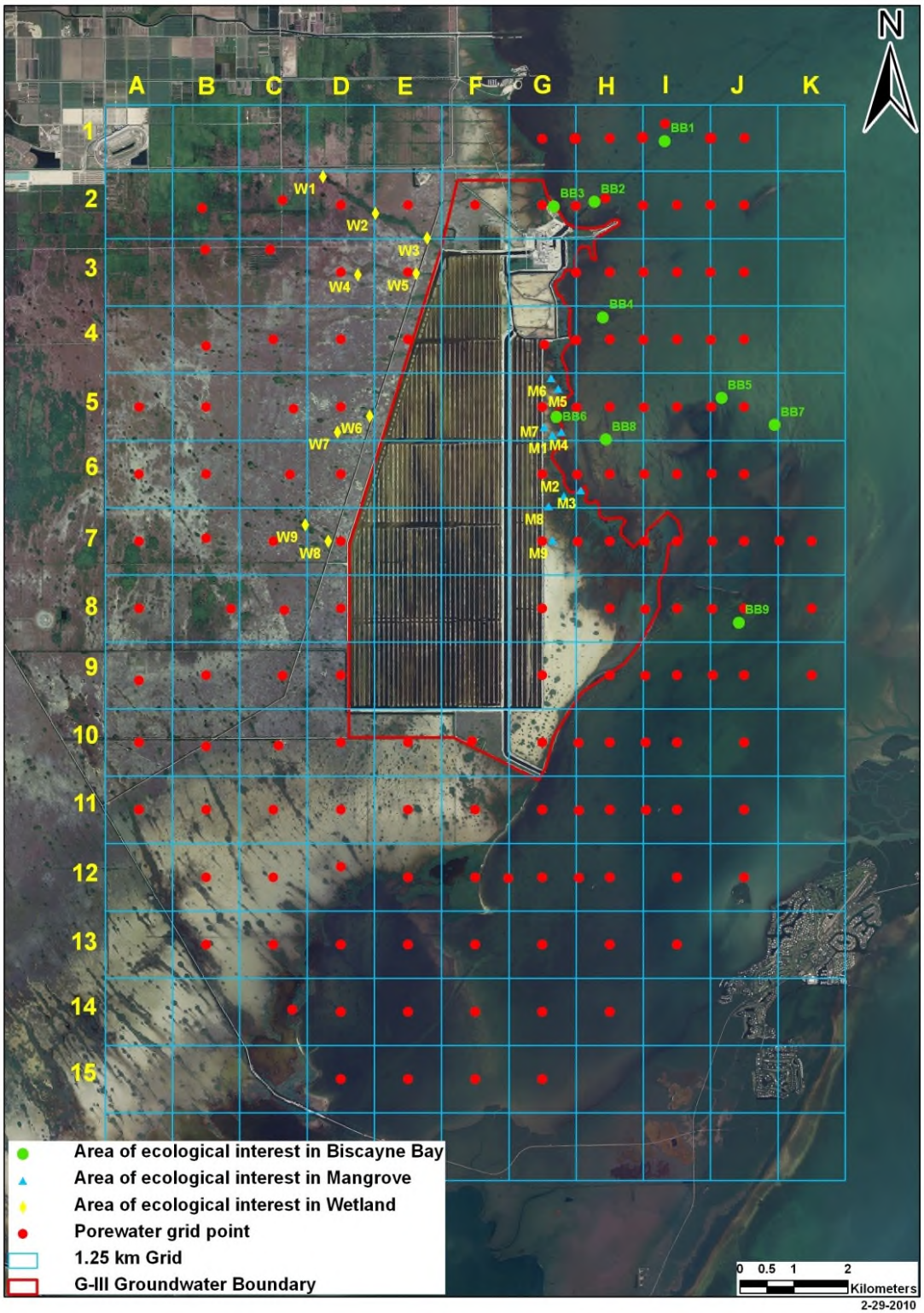


Figure 1.3-2. Initial Broad-Scale Porewater Sample Locations.

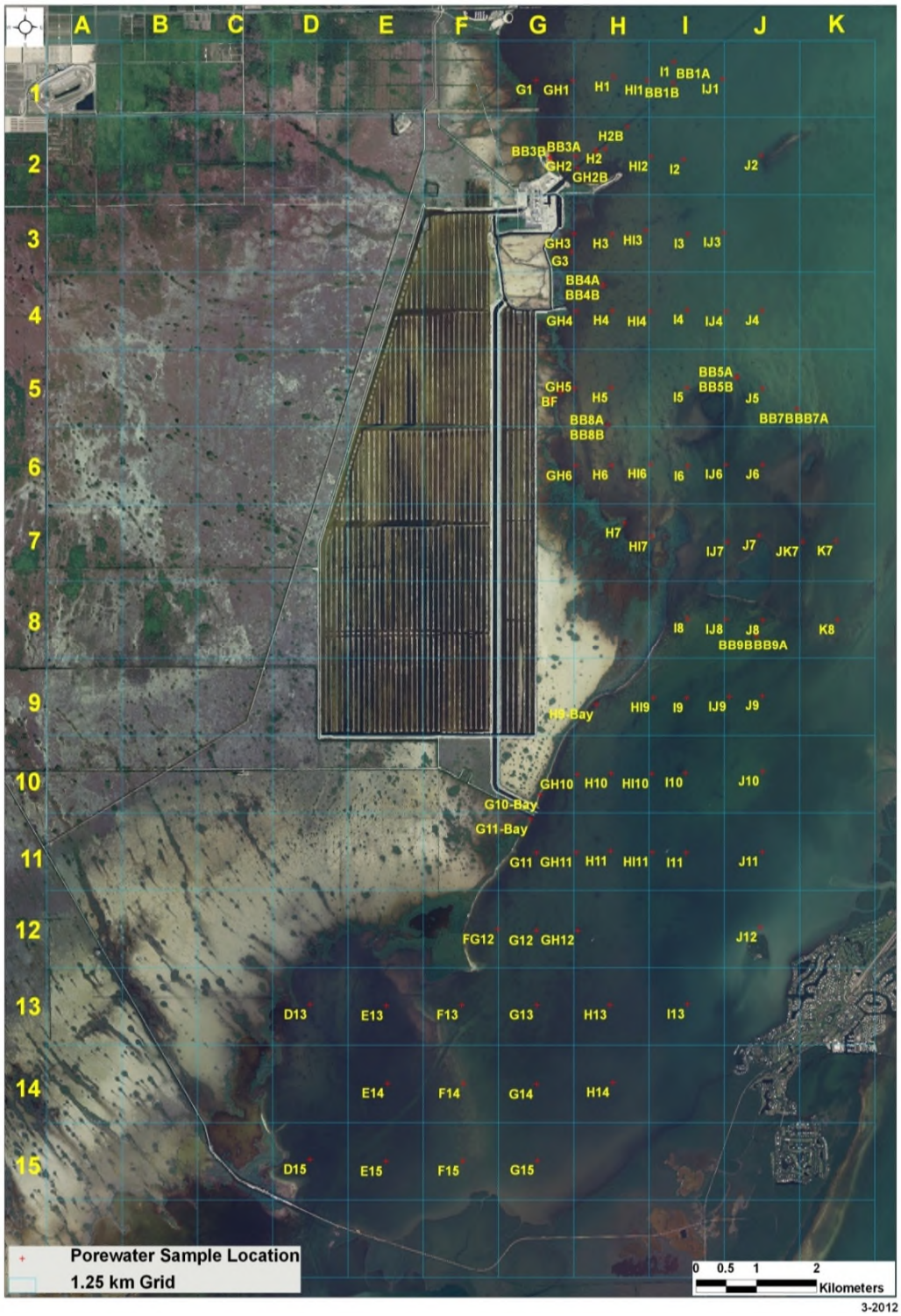


Figure 1.3-3. Wet Season Broad-Scale Porewater Sample Locations.

2. AUTOMATED DATA COLLECTION

2.1 Groundwater Quality

2.1.1 Instrumentation and Data Collection Methods

Automated groundwater monitoring stations were installed at 14 well clusters in a total of 42 wells (three wells per cluster) from February 2010 to August 2010. In each well, two probes manufactured by In-Situ, Inc. (an Aqua TROLL® 100 [AT100] and a Level TROLL® 500 [LT500]) were deployed primarily between June 2010 and September 2010 and were set to record water quality parameters and water levels, respectively, at 15-minute intervals. The probes were connected by cable to a telemetry unit and the data at each of these sites are transmitted remotely by cellular phone service to a central database once per day. The telemetry units are powered with 12-volt batteries that are recharged by solar panels. Figure 2.1-1 shows an automated groundwater station with telemetry.

The focus of this subsection is on the AT100 probe that measures groundwater quality parameters. The AT100 has a titanium body with a completely sealed, internal lithium battery, a real-time clock, a datalogger, and temperature and conductance sensors. At each well, an AT100 is placed in the middle of the screened well interval and measures actual conductance (microSiemens per centimeter [µS/cm]) and temperature (degrees Celsius [°C]). This probe also calculates specific conductance, salinity, TDS, and water density. Salinity values are calculated using actual conductance and temperature and are reported in practical salinity units (per Practical Salinity Scale 1978 [PSS-78]). TDS is based on actual conductance with a manufacturer automated default conversion factor of 0.65, and results are reported in milligrams/liter (mg/L). Water density is calculated using salinity and temperature, and results are reported in grams per cubic centimeter (g/cm^3).

Per the QAPP, the ideal cleaning and calibration schedule for the groundwater probes is approximately every eight weeks, with the Biscayne Bay probes on a rotation of approximately every six weeks. The actual schedule varies depending on field conditions and logistics.

For the cleaning and calibration efforts, probes are pulled from each well and the accuracy of the specific conductance and temperature readings are verified. For specific conductance, each AT100 is placed in a container with a known conductance solution near the expected sample value and Continuing Calibration Verification (CCV) performed. The reading on the probe and the value of the specific conductance solution is recorded. A value within 5% of the standard solution is considered acceptable; if the probe's reading falls outside the 5% range, data from the previous calibration event up to the present reading are qualified as estimated (E) or questionable (?) as discussed later in this section. Following the CCV, the probes are cleaned with analyte-

free water and a non-abrasive cloth or sponge. Sensor heads are cleaned using cotton swabs or soft pipe cleaners.

Following the CCV, an initial calibration (IC) and an initial calibration verification (ICV) are conducted with a solution at the high end of the expected sample range. The AT100 and Aqua Troll® 200 (AT200) use a single-point calibration equation. If the specific conductance reading of the probe during the IC and the value of the calibration solution is between 0.98 to 1.02 of each other (referred to as the cell constant), the reading is considered ideal, but a higher range between 0.90 and 1.10 is acceptable. Following cleaning and a successful IC, an ICV and two additional bracketing ICVs are done with standard conductance solutions, with one typically above and another typically below the expected sample value range, to bracket the range of readings. If a probe specific conductivity reading is outside of the acceptable range during any of the steps described above, the probe is replaced.

For temperature, each AT100 is verified during each cleaning and calibration event using a National Institute of Standards and Technology (NIST)-certified thermometer. The temperature reading of the probe is considered acceptable if it is within ±0.5°C of the NIST thermometer reading. If a probe temperature reading is outside the acceptable range, it is replaced with another probe.

During cleaning and calibration, operational parameters involving general system functionality are addressed. The external battery voltage that powers the telemetry system (12:00 a.m. to 1:00 a.m. and 12:00 p.m. to 1:00 p.m. each day) is checked. The 12-volt batteries and solar panels are inspected, as well as fuses and wiring connections. In addition, internal voltage and memory availability of all probes are checked. Desiccants in the system are replaced during every cleaning and calibration event, and overall cleanliness is maintained. Inoperable equipment is repaired or replaced. In the event that equipment is vandalized, it is replaced.

In addition to routine cleaning/calibration, all probes are sent for factory calibration/maintenance checks approximately once every 18 months. This effort was conducted systematically from November 2011 through March 2012. If the cleaning and calibration event occurs when a probe needs to be sent for factory maintenance, the probe undergoes a CCV and high and low ICVs first to determine if it reads within the acceptable 5% range. When a probe is sent back to the factory for recalibration, another probe that has been factory-calibrated within the past 18 months is installed in its place. Since a replacement probe would not have recorded data prior to the current calibration, it would undergo only the IC, ICV, and high and low ICVs.

From June 2010 through June 2012, the most problematic issue with the automated stations continued to be the inconsistent daily reporting by the telemetry units. In nearly all cases, the data were recorded and stored in the instrument but, due to intermittent connectivity to the network, the data were not always transmitted to the FPL database on a daily basis. In a few cases, data were lost due to lightning strikes or probe electronic resets. If the system does not reconnect after these connectivity failures, FPL has to download and manually patch in the data. Data are downloaded from probes every calibration event, typically during cleaning and

calibration events. High-gain antennas are now installed at most sites. Also, several issues are causing oscillations in some of the specific conductance values. These issues are discussed in the following subsections.

2.1.2 Results and Discussion

All raw data are made available to the Agencies upon receipt by FPL and are subsequently reviewed for accuracy. Depending upon the results, some of the data are qualified using the qualification codes outlined in the QAPP. The validation and qualification of the data are a substantial undertaking and will continue to be so in the future. For example, each groundwater well (one AT100 and one LT500) generates 576 data points each day. This results in 24,192 data points generated by the groundwater stations (42 wells) each day or approximately 8,830,080 points annually. Both the surface and groundwater stations generate approximately 16.5 million data points per year.

Data validation and qualification is a multi-step process. The first step begins with the plotting of key water quality parameters (salinity, specific conductance, and temperature) over a set validation period as well as the entire period of record. This allows a quick review of the results and identification/flagging of data that are outside expected ranges. Any evident aberrations in the resulting time series plots are then reviewed further based on specific station location, meteorological conditions, and previous results.

As a second step, the data are then compared to validation and calibration logs to ensure that the probes are recording data within the tolerances (5% for specific conductance and 0.5°C for temperature). Data within the accepted levels are deemed valid and data outside that range are qualified. For specific conductance ICVs, most probes have been verified successfully; however, some of the data have been qualified primarily due to CCVs outside acceptable levels. Nine probes have been out of range for temperature and 25 probes have been out of range for specific conductance, resulting in the qualification of data back to the time the probes last passed verification for that parameter. Most of the out-of-range data was qualified as estimated. The calibration and verification logs for the automated station probes are included in Appendix B.

In the final step, each data point for specific conductance, salinity, and temperature is compared to its previous 15-minute value to check for any unusual oscillations that may not have been caught during the calibration and verification events. Salinity differences greater than or equal to (≥) 1 practical salinity unit (per PSS-78) and temperature changes ≥1°C that occur within 15-minute intervals are flagged, and both data rows are highlighted. Data are then manually reviewed for validity. Flagged data are compared against meteorological data and other station data to help determine if they are real or spurious observations beyond normal parameters. There have been instances when a probe has exhibited extreme 15-minute oscillations (e.g., fluctuations up to 80,000 µS/cm) for a period of time before resuming function within normal ranges. Other examples of spurious data include occurrences of specific conductance values dropping drastically and instantaneously and remaining at low levels for days to weeks, or oscillating for one or two time intervals before instantaneously returning to original levels.

Once the above steps are completed and all flagged data are reviewed, the data are qualified as appropriate. The qualifiers used in the data qualification effort are "E" indicating an estimated value, "?" indicating suspect or questionable data, "G" indicating a recalculated value, and "C" indicating a calibration event. Data dependent upon other parameters, (i.e., specific conductance, salinity, density, and TDS) are also qualified for the corresponding period when these parameters are interrelated.

The "E" (estimated) qualifier has been added to data that oscillate, but not more than 5% from what is believed to be the actual value, due to a system electrical/radio frequency issue. Data from the previous cleaning and calibration event up to present are also qualified as "E" when an CCV ranges from 5% to 30%, or when verification or bracketing is not performed. For example, when In-Situ, Inc. deployed probes without performing verification (other than what was done at the factory), these data were qualified with an "E."

The "?" qualifier has been applied to data that should not be included in any analyses because they may not be an accurate depiction of actual field conditions. These include, but are not limited to, the following:

- Data from any probe with an CCV greater than 30%; however, no data have yet to be qualified as questionable for this reason;
- Specific conductance values that erroneously oscillate between high and low readings at 15-minute intervals due to problems with the automated system; or
- Specific conductance, temperature, and water levels artificially altered when the probe is pulled for cleaning and calibration.

During cleaning and calibration events, both "?" and "C" qualifiers are applied to all applicable parameters. The calibration event begins when a probe starts to be retrieved and ends when it has been set back in place and the temperature reading has stabilized. When air and water temperatures differ greatly, it can take the probe temperature several hours to return to accurate readings of ambient water temperature and, thus, all values are affected.

After a review of the key parameters in their entirety by a second QA/QC person, all qualified data from each station are validated on the EDMS and, subsequently, become available for download by the Agencies.

FPL has made refinements in the data qualification and validation process during the monitoring period and, when necessary, has retroactively applied qualifiers to previous sets of data. For example, in the last Semi-Annual Monitoring Report (FPL 2012a), FPL noted that, during a few short periods, the surface water levels exceeded the top of several groundwater well casings. The groundwater levels were qualified. Also, the water quality readings in several of the wells appeared to be slightly affected during sampling events and the data were qualified. FPL went back through all the previous data to determine whether similar events occurred and qualified the

data as appropriate. These changes only affect a small percentage of the data. The information presented in this report reflects the most current data set.

Only a small percentage of the water quality data has been qualified as questionable. The principal reason for using the "?" qualifier is erroneous oscillating specific conductance values (greater than 5% over a 15-minute interval due to obvious system malfunction). An In-Situ, Inc. representative initially stated that these abnormal fluctuations could have been caused by air bubbles on the sensor or by blocked sensor heads. However, gently shaking and tapping the probes have not necessarily alleviated this issue in every instance. FPL subsequently re-grounded some of the sites in hopes of rectifying the problem; however, oscillations were not completely eliminated. In-Situ, Inc. was able to reproduce the oscillation in the laboratory using high-frequency radio waves. These radio waves in the laboratory caused the probe cables to resonate, which caused fluctuating specific conductance readings. In-Situ, Inc. subsequently installed ferrite beads on the probe cables to eliminate cable resonance, but data oscillations still occurred, on occasion. While the oscillations appear to be less frequent than at the project's onset, it is still believed that other factors are contributing to the oscillations; therefore, testing has continued in order to determine the underlying causes of these patterns. One of the latest tests, implemented in January 2012, disconnected external power from several of the probes showing the most frequent oscillations. To date, these probes have been disconnected from the 12-volt battery (but remain connected to the telemetry system) and have been powered by the internal 1.5-volt lithium battery and, for a while, the data appeared stable. FPL has recently run new ground wires at TPGW-1 and TPGW-13, placed ferrite beads on the cables at those sites, and connected an additional grounding rod to TPGW-1, but oscillations in specific conductance still occurs. It appears this may be an ongoing issue; the associated data will continue to be qualified as questionable.

Figures 2.1-2 through 2.1-15 illustrate time series graphs of specific conductance, temperature, and salinity at each well. These graphs depict validated data and exclude suspect data that have been qualified as questionable or that were recorded during a calibration event. Appendix D provides time series graphs of these three parameters, with all reported data including questionable data. The time series graphs show data from the beginning of station reporting in 2010 (June through September 2010 depending on station) through June 2012. To facilitate closer review of the time series results by the Agencies and allow them to adjust graphic scales presented herein and/or focus on a specific time interval, FPL has included the raw time series data in separate Excel files with the report.

Tables 2.1-1, 2.1-2, and 2.1-3 show statistical summaries for time series specific conductance, temperature, and salinity data, respectively. The tables include monthly average values for each monitoring well and the minimum, maximum, average and standard deviation for the entire monitoring period; these summaries were calculated where at least 21 days of data were available for that month. The salinity values are presented since lay people often relate more directly to salinity than specific conductance. Figures 2.1-16, 2.1-17, and 2.1-18 show the average value and standard deviation for specific conductance, temperature, and salinity,

respectively, to facilitate a spatial visualization of the average automated groundwater results. Statistical files have been included in separate Excel files with the report.

Overall, the qualified groundwater specific conductance and salinity data indicated consistent readings throughout the entire monitoring period. The salinity results track the specific conductance results since salinity is calculated based on specific conductance and temperature. No observable seasonal changes occurred in any well location. Nearly all the specific conductance time series plots exhibit very little change over time. TPGW-1S was the notable exception where the specific conductance values ranged from approximately 48,000 µS/cm to 64,000 µS/cm.

Similar to what has been previously observed, the wells closest to the CCS and Biscayne Bay had higher specific conductance than the wells located farther away. Outer well clusters TPGW-7, TPGW-8 (excluding TPGW-8S), and TPGW-9 have groundwater that can be characterized as freshwater and do not appear to be affected by salt water intrusion. As discussed further in Section 3, TPGW-8S had specific conductance values that ranged from 2,067 µS/cm to 3,681 µS/cm, but ionic data indicated non-marine influences. Wells TPGW-4S, TPGW-5S, and TPGW-6S had average specific conductance values over the monitoring period of 2,163 µS/cm, 1,298 µS/cm and 1,127 µS/cm, respectively. All other wells are saltier and are influenced by marine water. Monitoring wells TPGW-1M, TPGW-1D, TPGW-2S, TPGW-2M, TPGW-2D, TPGW-3S, TPGW-3M, TPGW-3D, TPGW-12M, TPGW-12D, TPGW-13S, TPGW-13M, and TPGW-13D have the saltiest water, with specific conductance values consistently in excess of 60,000 µS/cm. The specific conductance values in well cluster TPGW-13 were the highest with average values in excess of 80,000 µS/cm.

The majority of the wells that appear to be influenced by marine water had higher specific conductance values with depth; however, the intermediate zone often exhibits values similar to the deep zone. Well cluster TPGW-13 is one of the exceptions where the average values over the monitoring period were slightly higher in the shallow zone, but the values between all zones were within 5% of each other. This is not unexpected at TPGW-13 given the hypersaline conditions in the CCS.

The groundwater temperatures in the intermediate and deep zones exhibited little to no change over the monitoring period and most appear flat-lined on the time series plots. The temperatures in the shallow zone wells were steady, but reflected minor seasonal influences; groundwater temperatures were typically higher near the end/beginning of the year and decreased to their lowest levels when air temperatures were warmer, which is the opposite of what would be expected if there was an immediate response in groundwater temperature to air temperature. This trend may be reflective of a lag in the response of the shallow groundwater (20 to 40 ft below ground surface) to winter and summer air and surface water temperatures. The highest groundwater temperatures occurred in well cluster TPGW-13 with an average value over the monitoring period of 30.0°C. By comparison, the average groundwater temperatures over the monitoring period in TPGW-10S (Biscayne Bay well), TPGW-1S (near CCS), and TPGW-9S (westernmost well) were 26.1, 25.6, and 24.7°C, respectively. The average groundwater

temperatures in nearly all the wells were less than the average value of 26.1°C measured at both TPGW10S and TPGW-11S in Biscayne Bay. Wells TPGW-14M and TPGW-14D had slightly higher groundwater temperatures of 26.2 and 26.4°C. Well cluster TPGW-2 had average groundwater temperatures that ranged from 26.5 to 27.4°C, which could suggest some effects of the CCS. Well cluster TPGW-2 did not follow the same general groundwater temperature trends exhibited by the other well clusters, indicating some external influence.

To assess differences between wells over time, Figures 2.1-19 through 2.1-25 show comparisons of specific conductance and temperature in shallow and deep interval wells. Figure 2.1-19 shows that for the wells in Biscayne Bay, TPGW-14 has the highest specific conductance values and the highest temperatures at depth. Figures 2.1-20 through 2.1-23 show changes across the landscape and include wells in Biscayne Bay, the CCS, and wells farther inland. The figures illustrate how much higher the specific conductance and temperature are in CCS well cluster TPGW-13 than the other wells. Also, the figures show how the values generally decrease in wells with distance from the coast. Figure 2.1-24 shows plots of wells in close proximity to the CCS. Figure 2.1-25 compares Biscayne Bay surface water specific conductance values and temperatures with Biscayne Bay groundwater specific conductance values and temperatures. The plots show how much less the groundwater specific conductance values and temperatures fluctuate than the surface water values. This indicates the buffering effects that groundwater has on surface water changes.

2.2 SURFACE WATER QUALITY

2.2.1 Instrumentation and Data Collection Methods

Automated surface water quality stations were located throughout the Turkey Point landscape as determined jointly with the Agencies. All stations record water quality and stage data at 15-minute intervals, with the exception of Biscayne Bay stations TPBBSW-1, TPBBSW-2, TPBBSW-4, and TPBBSW-5 which record only water quality parameters. While most sites that record surface water data have two probes (top and bottom), some have only one probe, depending on surface water depth and other logistical considerations. Stations that are in less than 3 ft of water have only one AT200 probe. Surface water quality stations with two probes have an AT100 at approximately 1 ft above the bottom and an AT200 within 3 ft of the surface. The AT200 is similar to the AT100, except the AT200 also measures water stage. Similar to the AT100, the AT200 has a titanium body with a completely sealed internal lithium battery, real-time clock, data logger, and pressure, temperature, and conductance sensors. The AT200 is also programmed to auto-correct water levels for water density based on readings recorded by the probe. This feature is explained in greater detail in Section 2.3.1.

Similar to the groundwater sites, probe cables are attached to a telemetry system that uploads once a day for most sites (Figure 2.2-1). Table 2.2-1 summarizes the probes used at each surface water station and the parameters measured. Currently, 33 probes (AT100s and AT200s) are deployed throughout the monitoring area, generating up to 6.3 million data points each year.

Four of the automated surface water quality sites in Biscayne Bay (TPBBSW-1, TPBBSW-2, TPBBSW-4, and TPBBSW-5) are not connected to a telemetry system for logistical reasons. Per the Monitoring Plan, these probes are set up similar to the BNP salinity monitoring network stations (Biscayne National Park 2007) equipped with probes that record specific conductance just above the sediment surface. Rather than installing platforms or pilings, the probes are firmly attached to a cement paver/pad and are placed at pre-determined locations on the Bay bottom. Since these probes are designated to measure only water quality parameters, AT100s are deployed at each of these four locations. The probes are swapped out approximately every six weeks, returned to the field office where they are cleaned and calibrated, and the data are manually uploaded into the online database.

All AT100 and AT200 probes are cleaned and calibrated using the same methodology as described for groundwater sites. Appendix B shows the water quality field verification/ calibration logs. Additional verification measurements are conducted for the water level measurements associated with the AT200, as detailed in Section 2.3.1.

2.2.2 Results and Discussion

The automated surface water quality data are qualified and validated in the same manner as the automated groundwater data. Figures 2.2-2 to 2.2-23 show time series graphs of specific conductance, temperature, and salinity at each surface water station. These graphs depict validated data and exclude suspect data that have been qualified as questionable (?), estimated (E), or qualified due to impacts during a calibration (C) event. Appendix C shows what data were qualified, while Appendix D shows time series graphs of the three parameters, but with all reported data including suspect data. The time series graphs show data from the beginning of station reporting in 2010 (August or September 2010, depending on station) through June 2012. Note that the salinity results for all the surface water stations track the specific conductance results since salinity is calculated based on specific conductance and temperature, thus most of the discussion focuses on specific conductance and temperature. To facilitate closer review of the time series results by the Agencies and allow them to adjust graphic scales presented herein and/or focus on a specific time interval, FPL has included the raw time series data files in separate Excel files with the report.

Tables 2.2-1, 2.2-2, and 2.2-3 show statistical summaries of the time series data for specific conductance, temperature, and salinity, respectively. The tables include monthly average values for each monitoring station and the minimum, maximum, average and standard deviation for the entire monitoring period. The salinity values are presented since lay people often relate more directly to salinity than specific conductance. Figures 2.2-24, 2.2-25, and 2.2-26 show the average value and standard deviation for specific conductance, temperature, and salinity, respectively, to facilitate a spatial visualization of the average automated surface water results. Statistical files have been included in separate Excel files with the report.

Compared to the groundwater time series graphs, the surface water time series graphs show greater variability in the data, most of which is related to seasonal and meteorological conditions.

For example, in Biscayne Bay, the highest specific conductance values are near the end of the dry season and the lowest values are near the end of the wet season with minimum and maximum values ranging from 18,922 µS/cm (TPBBSW-10B) to 66,884 µS/cm (TPBBSW-1B). The highest values in Biscayne Bay were recorded near the end of the very dry season in June 2011 at six of the seven Biscayne Bay stations. This equates to salinities throughout the project area in excess of 40 units on the practical salinity units (PSU) scale. Figure 2.2-27 compares surface water specific conductance values at Biscayne Bay stations. Station TPBBSW-14B (measured near the surface) consistently has the lowest water temperatures while TPBBSW-10B (measured near the surface) has the most variability. The specific conductance values in Biscayne Bay are within ranges observed at BBCW10 (SFWMD well located several miles north). In some instances, for example much of June 2011 specific conductance values were higher at BBCW10 than at Turkey Point Biscayne Bay stations.

The specific conductance values in the CCS show less seasonal variability than Biscayne Bay, but do change in response to rainfall events. Following a high rainfall event on October 8, 2011 (6.33 inches measured at TPM-1), the specific conductance values dropped 10% to 20% at all stations. This is similar to what occurred the previous year in September and November 2010 following several heavy rain events (7.34 and 4.36 inches, respectively, at TPM-1). The data show that there was no clear pattern of higher or lower specific conductance among the CCS stations. Variability in the results is often within the acceptable calibration limits of the instrument. Quarterly surface water sampling indicates the specific conductance values at all CCS stations are typically within 5% of each other. Over the entire monitoring period, the minimum and maximum CCS specific conductance values ranged from 50,528 µS/cm (TPSWCCS-4B) to 93,594 µS/cm (TPSWCCS-6B). The average specific conductance values in the CCS were consistently over 70,000 µS/cm in comparison to Biscayne Bay average values ranging between 43,433 µS/cm and 51,006 µS/cm for the monitoring period. Figure 2.2-28 compares time series specific conductance values between the CCS and several Biscayne Bay surface water stations. The specific conductance at TPSWC-5T is consistently higher than the Biscayne stations by over 20,000 µS/cm.

In the L-31E Canal stations, (TPSWC-1, TPSWC-2 and TPSWC-3), the specific conductance values were predominantly reflective of freshwater, however slightly more saline conditions were noted during several periods. The most notable period was near the end of the very dry season in June 2012 when maximum specific conductance values were 9,507 µS/cm (TPSWC-2B) and 22,776 µS/cm (TPSWC-3B). As is discussed in Section 3, there was not an incremental increase in tritium concentrations which might indicate regional Biscayne Bay influences instead of an influence from the CCS. Figure 2.2-29 compares time series specific conductance and temperature values for the different surface water stations in the L-31E Canal. Other spikes in specific conductance values were noted in TPSWC-3B in November 2011 and near the end of the dry season in 2012.

The specific conductance values in the two tidal stations TPSWC-4 and TPSWC-5 were more variable than the L-31E stations. TPSWC-4 is affected by releases from the S-20 structure and can transition from saline to fresh conditions quickly. Station TPSWC-5 reflects marine

conditions, but exhibited values in excess of those found in Biscayne Bay at the bottom. The water at TPSWC-5 is over 20 ft deep and is located at the end of this dead-end canal. The deep water depths and restrictions in flushing may contribute to the observed specific conductance values at this station.

The ID specific conductance values are affected by pumping of the ID ditch, which is conducted mostly in the dry season to maintain a seaward gradient between the L-31E Canal and the ID. During non-pumping periods, the water in the ID is slightly saline to brackish, but during periods of heavy pumping, the water becomes saline in the pumped segments. In June 2011, the specific conductance values reached a peak at two ID stations with values in excess of 55,000 µS/cm. The effect was most pronounced at the bottom of TPSWID-2 where specific conductance values remained the highest for the longest duration. Specific conductance values in the ID were always below the values in the CCS and reflect a mixing of CCS water, freshwater, and Biscayne Bay water. Figure 2.2-30 compares time series specific conductance and temperature values for the different surface water stations in the ID. Figures 2.2-31 through 2.2-33 compare time series specific conductance and temperature values for the ID, L-31E, and CCS, at ID operation transect A stations (TPSWID-1, TPSWC-1, and TPSWCCS-1), transect C stations (TPSWID-2, TPSWC-2, and TPSWCCS-7), and transect E stations (TPSWID-3, TPSWC-3, and TPSWCCS-3), respectively. The figures show that CCS specific conductance values are highest in the CCS and lowest in the L-31E. The figures also show the temperature difference between the water bodies as the CCS cools from transect A to transect C. Discussion of the ID operation is included Section 6 of this report.

Water temperatures at all stations are greatly affected by meteorological conditions and reflect seasonal trends as expected. Ambient air temperature changes were quickly reflected in water temperatures and both Biscayne Bay and CCS stations tracked closely the overall ambient trend (Figure 2.2-34). In Biscayne Bay, average monthly water temperatures in January 2011 were around 20°C at all stations. In July 2011, average monthly water temperatures were near 31°C at all Biscayne Bay stations and the highest recorded 15-minute temperature was 35.2°C at TPBBSW-10B.

The water temperatures in the CCS also change with air temperature but are higher than other surface water locations. The CCS water is pumped from the intake side of the plant and routed through condensers to cool the power units. As the water passes through the condensers, it is heated and eventually discharged on the west side of the plant back into the CCS. The water temperatures on the CCS discharge side of the plant at TPSWCCS-1B are 7.5°C warmer on average for the entire monitoring period (June 20110 through June 2012) than at the intake side of the plant at TPSWCCS-6B. The range in temperatures varies monthly and CCS surface water temperatures are warmer in the summer months and cooler in the winter months. For example in September 2011, the average monthly CCS water temperatures ranged from 31.9°C at TPSWCCS-6B to 40.1°C at TPSWCCS-1. In January 2012, the average monthly CCS water temperatures ranged from 23.8°C at TPSWCCS-6B to 33.1°C at TPSWCCS-1B. There did not appear to be any temperature stratification at TPSWCCS-4 and TPSWCCS-6 since the water temperature was consistently the same at the top and bottom. However, at TPSWCCS-5, the

surface water temperatures were consistently higher at the top station. Figure 2.2-35 shows time series plots for stations in the CCS and illustrates the differences in temperature between stations on the discharge side of the plant (i.e., TPSWCCS-1B, TPSWCCS-7B) and the intake side of the plant (i.e., TPSWCCS-5 and TPSWCCS-6).

CSS water temperatures are regularly higher than the daily ambient air temperatures (Figure 2.2-34) and are often higher than daily maximum temperatures (Figure 2.2-36). This rarely occurs at other surface water stations. If there are temperature effects on Biscayne Bay from the warmer CCS waters, the effects would most likely be evident during the cooler months. Figure 2.2-36 shows the water temperatures from February to June 2011 for all the Biscayne Bay stations installed for the Uprate monitoring. Surface water temperatures from a SFWMD Biscayne Bay monitoring station several miles north of the site (BBCW-10) are included on Figure 2.2-36. The Turkey Point Biscayne Bay monitoring stations track very closely both with the SFWMD station and the maximum air temperatures recorded at TPM-1.

To help assess whether CCS water temperatures are affecting Biscayne Bay water temperatures, the differences between CCS and Biscayne Bay water temperatures and the differences between ambient air and Biscayne Bay water temperatures were examined (Figure 2.2-37). The results clearly demonstrate that CCS water temperatures, both on the intake and discharges sides, are warmer than Biscayne Bay water temperatures; there is only one instance where the plot exhibits a negative value for the difference between CCS and Biscayne Bay water temperatures (February 13, 2011; TPSWCCS-6 - TPBBSW4). This occurred when there was a major drop in the low ambient air temperature on February 13, and it appears the CCS water temperature responded more quickly to the daily low temperature. When compared to ambient air temperatures, Biscayne Bay water temperatures oscillate between being higher and lower than ambient air temperatures, particularly during the cooler months. This is to be expected as cold fronts move through and air temperatures both drop and recover more quickly, and to a greater degree, than water temperatures. Later in the year, mean ambient temperatures are almost exclusively lower than Biscayne Bay water temperatures. More importantly however, differences between the northern SFWMD surface water station (BBCW10) and both the ambient air temperatures and the CCS water temperatures follow the same pattern and are of the same magnitude as the FPL Biscayne Bay stations. These results suggest that air temperatures are driving water temperatures in Biscayne Bay and do not indicate any readily evident CCS water temperature effects in Biscayne Bay.

Water temperatures in the L-31E Canal (Figure 2.2-29) are on average cooler than those in Biscayne Bay. There is some temperature stratification in L-31 in part due to the canal depths and typically limited flow. The near surface water temperatures are almost always warmer than the bottom temperatures and the surface temperature exhibits more daily variability in response to air temperature changes. Near the end of the 2011 dry season, the bottom temperatures in TPSWC-3B were similar to the near surface water temperatures at that location and the timing coincides with the increase in specific conductance discussed above.

The time series plots (Figure 2.2-30) show that there were periods when the bottom water temperatures in the ID were greater than the surface water temperatures and those periods often corresponded with pumping of the ID and reflect some influence from the CCS. As a result, the average temperatures in the ID stations are higher than at the L-31E stations based on the entire monitoring period.

The water temperatures in the two tidal canal stations (TPSWC-4 and TPSWC-5) were also affected by air temperatures, but TPSWC-4 was also affected by discharges from S-20. Generally the surface water temperatures at TPSWC-4 were higher than or similar to the bottom water temperatures; the effects of the CCS, if any, were hard to differentiate due to the variables that could affect water temperature. At TPSWC-5, the bottom water temperature was higher than the surface water temperature for months at a time.

2.3 WATER LEVELS

2.3.1 Instrumentation and Data Collection Methods

Water levels provide insight into groundwater hydrology and groundwater and surface water interactions; levels are collected at all groundwater and most surface water stations for the Uprate Project monitoring effort. Only four water quality stations in Biscayne Bay do not have stage recorders. Per the Monitoring Plan, automated surface water quality monitoring stations co-located with groundwater monitoring well clusters in Biscayne Bay were to have surface water stage recorders. During the siting of the wells and surface water stations in Biscayne Bay, only one surface water quality station (TPBBSW-3) was co-located with a well cluster (TPGW-11); thus, one stage recorder was initially installed in Biscayne Bay. FPL later opted to install two additional stage recorders in Biscayne Bay (one each at the platforms associated with TPGW-10 and TPGW-14) to better assess groundwater and surface water interactions and tidal differences across the landscape.

Water pressures are measured at 15-minute intervals, and water levels are calculated from the pressure data. The results are typically transmitted on a regular basis via telemetry. LT500 and AT200 probes are used to record water pressure/levels. The LT500 only measures water pressure and temperature. This probe model is used in all automated groundwater well sites and is co-located with AT100 water quality units, but is placed near the surface to increase the accuracy of the pressure readings. At all automated surface water stations, AT200 probes are used for water levels since the probes measure both water pressure and water quality parameters. Both types of data are needed for surface water stations, and probes can typically be placed within 3 ft of the surface. Both probe models that measure water pressure have been deployed using a vented cable. The vented cable contains a tube that applies atmospheric pressure to the back of the pressure gauge. The instrument is programmed to automatically subtract this value from the measured pressure, reflected in the following formula:

$$P_{gauge} = P_{absolute} - P_{atmosphere}$$

Aside from being able to measure water quality parameters, the biggest difference between the AT200 probe and the LT500 probe is how specific gravity (SG) is handled. In the AT200 probe, an option exists to program a fixed density value or to auto-adjust water levels based on actual measured density. In the LT500 probe, only a fixed density value can be entered based on the water type (freshwater, brackish water, or saltwater). All LT500 probes are individually set to the fixed density value that best characterizes the water in the well. The AT200 probes are programed to automatically adjust water levels based on the measured density.

Both probes are programmed to record water levels based on a depth-to-water level setting. Water levels are calculated in the instruments from the measured pressure based on the following formula:

$$W_L = R_L + (2.31 * (R_P - M_P)/SG)$$

where:
W_L – water level (measured in feet based on the North American Vertical Datum of 1988 (ft NAVD 88)
R_L – reference water level (ft NAVD 88)
R_P – reference pressure (pounds per square inch [psi])
M_P – measured pressure (psi)
SG – specific gravity (unitless)

The SG in the above formula is the same as the density reading; thus, the values come directly from the instrument.

The reference level (R_L) is a key component and is established in the field by using a water level indicator to measure the depth to water from the top of the well casing. Since the top of casing has been surveyed to an established datum (both NAVD 88 and National Geodetic Vertical Datum of 1929 [NGVD 29]), an elevation of the water is quickly determined by subtracting the depth to water from the top of casing. The resulting water level elevation is then entered into the probe as the reference level. The probe then automatically calculates the related pressure value, referred to as the reference pressure (R_P). Subsequent pressure measurements recorded by the probe are relative to the reference pressure and its associated elevation.

The AT200 probes are cleaned in the same manner as described for the AT100 probes in the previous sections. The LT500 probes are wiped down with analyte-free water, with care not to damage the pressure transducer. The same care is used on the AT200 probes. While the pressure sensor cannot be calibrated, the resulting stage readings are verified. FPL has refined their approach over the course of the monitoring effort to improve the accuracy of the data. Currently, water level measurements are taken with a water level indicator prior to the removal of the LT500/AT200 probes for cleaning. An instantaneous reading from the probe is taken and compared to the water level indicator. Readings differing less than 0.1 ft are considered acceptable. The probe is then removed for cleaning, placed back in the well, and a similar comparison is made with the water level indicator and pressure reading. If needed, the reference

level is reset so the probe reading matches the water level reading to within 0.03 ft, which is the accuracy of the pressure sensor.

Similar to the AT100 probes, all LT500 and AT200 probes are factory-calibrated every 12 to 18 months. This effort was conducted systematically during regularly scheduled cleaning and calibration events between November 2011 and March 2012.

2.3.2 Results and Discussion

2.3.2.1 Groundwater

As part of the validation process, water levels and pressures were plotted for the entire time period for each station. Sudden changes in water level were identified and checked against stage changes at other stations and against rainfall measurements. Time series plots of water levels in similar media and areas such as the CCS or in Biscayne Bay surface water were overlain and compared to one another to help identify potential problems with water level results. In addition, plots in groundwater and nearby or an overlying surface water body were overlain for similar comparisons. Careful attention was paid to periods when cleaning and calibration events occurred and for any activity that could alter the probe placement. Where stage data were available from a water level indicator or stage gauge readings, those values were compared to the reported water level measurements.

If water levels reported by the probe and field-measured values were off by more than 0.1 ft, the data were flagged for closer inspection. Also, shifts in data immediately following a calibration event or activity that could have impacted the probe placement were flagged if they were greater than 0.1 ft. The flagged data were reviewed further and, in some instances, it was clear there was an issue with an incorrect reference level and the data were corrected. In some instances, the cause for a discrepancy greater than 0.1 ft could not be established and the data were qualified as estimated; in other cases, the results were highly suspect in consideration of historical and surrounding station results, and the data were qualified as questionable. For difference of less than 0.1 ft, no correction or qualification of the data was applied.

It should be mentioned that the accuracy of the land-based station survey is better than 0.1 ft (typically within hundredths of a foot), but well locations in the Bay may have a lower level of accuracy since those stations could only be surveyed with GPS units. Thus, the survey accuracy limits should be taken into account when interpreting the results to hundredths of a foot or, in the case of the Biscayne Bay wells, to several tenths of a foot.

Figures 2.3-1 through 2.3-14 show time series graphs at all automated groundwater stations. These graphs are based on refined validated data and exclude data that are questionable or recorded during a calibration event. Stage data were typically not qualified if the density values were suspect since the differences in the instrument-calculated density had little effect on the pressure reading/stage results, given the shallow depth of probe placement. All time-series graphs are based on actual measured levels, with the probes set to a representative density setting. The values do not reflect freshwater head equivalents. In order to facilitate closer

review of the time series results by the Agencies and allow them to adjust graphic scales presented herein and/or focus on a specific time interval, FPL has included the raw time series data files in separate files in Excel with the report.

Some of the water level data reported in the first Semi-Annual Report (FPL 2011a) were revised based on a resurvey of the top of casing of groundwater wells. This updated information was included in an Errata to the 2011 Semi-Annual Report and changes were reflected in subsequent reports. Also for the first reporting period, FPL initially conducted a post-correction calculation to adjust the LT500 readings from a fixed density value to a measured value using the density from the AT100 located in the same well at depth. This post-correction used the above formula and was calculated similar to how an AT200 is programmed to calculate water levels. FPL subsequently determined (with SFWMD concurrence) that this procedure was unnecessary as the LT500 water levels readings were only affected by a few thousandths of a foot given the shallow placement of the LT500 probes. All water level data reported in the first Semi-Annual Report (FPL 2011a) were slightly readjusted based on a set density representative of that well. These adjustments have been reflected in subsequent reports.

A summary of the data collected and the patterns observed follows:

- Water levels change very quickly in response to rainfall events. This is most evident in stations not significantly influenced by tides (TPGW-1, TPGW-2, TPGW-4 through TPGW-9, and TPGW-13). Typically, wherever there is a spike in water levels on the time series graphs, there is a corresponding rainfall event. Refer to Figures 2.3-1, 2.3-2, and 2.3-4 through 2.3-9 and 2.3-13.
- At each well cluster, fluctuations in stage for all three depth intervals track closely, indicating a good hydrologic connection between intervals.
- Water levels at stations in or immediately adjacent to Biscayne Bay (TPGW-3, TPGW-10, TPGW-11, TPGW-12, and TPGW-14) exhibited tidal influence at all three depths (Figures 2.3-3, 2.3-10, 2.3-11, 2.3-12 and 2.3-14). The amplitude of the tidal changes decreases across the landscape from north to south, similar to the decrease in surface water tidal amplitude discussed below. Thus, TPGW-10 has a higher range of water levels than TPGW-14.
- Stations furthest from the coast (TPGW-7, TPGW-8, and TPGW-9) exhibit few water level differences among the shallow, intermediate, and deep wells (Figures 2.3-7, 2.3-8 and 2.3-9). These wells are all fresh per FDEP standards.
- Wells located between the westerly most wells and the CCS, such as TPGW-4 and TPGW-5, have brackish water in the intermediate and deep zones overlain by much fresher water in the shallow zone. The shallow zone water elevations in these wells are always higher than the deep zone (Figures 2.3-4 and 2.3-5).
- Closer to Biscayne Bay and the CCS, several well clusters have deep or intermediate zones with the highest elevation, such as TPGW-2. At this cluster, the deep and intermediate interval water levels alternate between having higher water levels (Figure 2.3-2).

- At TPGW-13, the shallow and intermediate zones have nearly identical water levels and the deep zone is up to 0.4 ft lower.

For the land-based stations (tidal and non-tidal), the groundwater levels ranged up to 3 ft over the monitoring period. The non-tidal inland stations had the greatest seasonal range since they are affected more by drought and rainfall conditions. The lowest groundwater elevations at all the land-based stations, with the exception of well cluster TPGW-13, were reported in late May and early June 2011. This was near the end of an extended very dry season. The lowest groundwater elevations at well cluster TPGW-13 were recorded about a month earlier. The previous semi-annual report noted that the water levels at TPGW-2 were the lowest in early May 2011, but further review of the data indicates that the groundwater levels were lowest at this cluster in late May/early June 2011.

To provide insight into the differences in groundwater water levels over the landscape, time series plots from select stations are illustrated on Figures 2.3-15 to 2.3-18. Each figure represents a transect of well clusters. Many of these figures are self-explanatory and support the discussion above. Note that the water elevations of the non-tidal stations in Figures 2.3-15 and 2.3-16 are higher than the tidal stations, with the notable exception towards the end of the very dry season between April and mid-June 2011. Also note that TPGW-13S groundwater elevations on Figures 2.3-17 and 2.3-18 typically follow along the upper range of the tidal stations. Care should be used in drawing conclusions about groundwater flow directions based solely on the transect water levels since density effects have to be considered. Basically, denser water has more driving head than freshwater, and groundwater flow is influenced by these density differences. All the times series data that are reported reflect actual measured water levels and have not been converted to freshwater head equivalents.

To provide some initial insight into the groundwater and surface water interactions, Figures 2.3-19 through 2.3-21 illustrate the differences between surface water levels and groundwater levels in a nearby or co-located well(s) and where the densities in most wells and surface water stations are somewhat similar. Figure 2.3-19 shows a time series plot of surface water stage at TPSWCCS-2 and TPGW-13S and TPGW-13M. The results indicate that the water elevations at TPGW-13S are higher more often than at the corresponding surface water station in the CCS (TPSWCCS-2). However, there was at least one extended period during the dry season of 2011 when the CCS surface water levels were higher.

Figure 2.3-20 shows surface water levels in the CCS and groundwater levels in several wells immediately to the west. Figure 2.3-21 shows daily average surface water levels in TPBBSW-3 and TPGW-11, which is in Biscayne Bay. The daily average eliminates the hourly tidal fluctuations and facilitates a visual comparison between these stations. The plot illustrates that the groundwater levels in the Bay stations are directly influenced by surface water stage and the groundwater elevation at TPGW-11S is always higher than the co-located surface water station.

Further discussion of the groundwater elevations and implications is provided in Section 5 of this report.

2.3.2.2 Surface Water

Figures 2.3-22 through 2.3-39 show time series graphs at all surface water stations where data from automated stage recorders are available. These graphs are based on validated data and exclude data that are questionable or recorded during a calibration event when the log was running. All the time series graphs are based on actual levels and do not reflect freshwater head equivalents. In order to facilitate closer review of the time series results by the Agencies and allow them to adjust graphic scales presented herein and/or focus on a specific time interval, FPL has included the raw time series data files in separate files in Excel with the report.

The precision and accuracy of the surface water levels, particularly associated with stations affected by wave activity, may be slightly lower than for groundwater stations. While wave activity is dampened in stilling wells, some oscillation occurs that can affect the ability to consistently get precise verification readings with a water level indicator. Some data end up being qualified as estimated since a verification reading is off by more than 0.1 ft when in reality it may not need to be qualified. Also, the setting of the reference levels is affected by waves and can cause readings to be off.

As expected, diurnal water level variations were observed at all tidal-influenced stations, including those located in Biscayne Bay (north to south: TPBBSW-10, TPBBSW-3, and TPBBSW-14), as well as tidal canal stations (TPSWC-4 and TPSWC-5). The tidal range declines across the landscape from north to south (Figure 2.3-40). At TPBBSW-10, tide ranges during spring tide and neap tides can be over 2.0 ft and less than 0.5 ft, respectively.

The effect of rainfall is masked in most tidal stations; however, its effect is evident at TPSWC-4 since this station is downstream of S-20 discharges. Rainfall effects are also evident on all onshore stations where water level increases up to 1 ft have been observed following significant rainfall events in L-31E, the CCS, and the ID.

Water levels in the CCS vary spatially depending upon whether the station is located on the discharge or intake side of the canal. Water levels on the plant discharge side have lower ranges in variability (<1 ft at TPSWCCS-1) than stations on the discharge side (up to 4 ft at TPSWCCS-6). Also, water levels on the discharge side of the CCS are typically at least 1 ft higher than those on the CCS plant intake side (Figure 2.3-41). The difference in stage between the discharge and intake side increased during the 2011 and 2012 dry seasons and decreased during the wet season. It was noted that the water levels at all stations were very similar in late September and October 2010, October 2011 and February 2012 following a heavy rainfall event.

Water levels in the CCS and L-31E exhibit little response to tidal influences in Biscayne Bay surface water. Figure 2.3-42 provides a representative time series plot for spring tides on December 24, 2011, and March 9, 2012, which shows the lack of tidal response in the CCS and L-31E. This suggests the hydrogeologic connection with Biscayne Bay is limited or not as direct.

Figure 2.3-43 illustrates a transect of surface water levels, over the entire time period, that includes Biscayne Bay, the CCS, and the L-31E Canal. Care should be used in drawing conclusions about gradients solely based on the transect water levels since density effects have to be considered. Basically, denser water has more driving head than freshwater, and groundwater flow is influenced by these density differences. All the times series data that are reported reflect actual measured water levels and have not been converted to freshwater head equivalents.

To facilitate closer review of the time series results by the Agencies and allow them to adjust graphic scales and/or focus on a specific time interval, FPL has included the raw time series data files in Excel with the report. Further discussion of the surface water elevations and implications is provided in Section 5 of this report.

2.4 METEOROLOGICAL DATA

One of the key parameters of interest is the amount of precipitation in the CCS and surrounding areas. Rainfall timing, duration, and amounts provide some insight into the area's hydrology. Additionally, meteorological data such as barometric pressure, wind speed, and light levels (i.e., photosynthetically active radiation [PAR]) are useful in determining water losses and gains in the CCS and in establishing a water budget.

A meteorological station (TPM-1) was set up in the middle of the CCS, co-located with TPGW-13 and TPSWCCS-2. Four additional rainfall gauges were set up in the vicinity of the plant to determine the spatial and temporal variability in rainfall on and offshore Turkey Point Plant. Locations of the rainfall and the meteorological stations are shown on Figure 2.4-1 and photos are included in Figure 2.4-2.

2.4.1 Instrumentation and Data Collection Methods

Meteorological station TPM-1 consists of a weather transmitter (WXT520, Vaisala Inc., Helsinki, Finland) and a quantum sensor (190SA, Li-Cor Inc., Lincoln, Nebraska) attached to a datalogger (CR1000, Campbell Scientific Ltd., Logan, Utah) and telemetry system, mounted 15 ft above the ground surface; the range of parameters measured is listed in Table 2.4-1. Technical specifications on the instrumentation are provided in Appendix I of the QAPP (approved 12/2/2011, FPL 2011).

The four rainfall-only stations (TPRF-2, TPRF-4, TPRF-11, and TPRF-12) consist of tipping bucket rainfall gauges (TB-3, Hydrological Services Inc., Liverpool, NSW, Australia) connected to waterproof pendant dataloggers (#UA-004-64, Onset Computer Corporation, Bourne, Massachusetts). Data are manually downloaded from these stations at approximately bi-monthly intervals. Rainfall data from the gauges are event-based. The tipping buckets fill at 0.10 inch and the time of each tip of the bucket is recorded.

Additional rainfall data for this report were also provided by a previously existing FPL meteorological station located south of the CCS by the Sea Dade Canal (LU-South) and from an

existing rainfall station in the northern portion of the CCS (LU-NEast). The FPL meteorological station (LU-South) is similarly instrumented with a weather station (Climatronics Corp., Bohemia, New York), while the rainfall collector (LU-NEast) is a tipping bucket gauge.

Monitoring at TPM-1 was initiated on July 26, 2010, while the rainfall gauges were installed on November 12, 2010. At TPM-1, data are set to record at 15-minute intervals, although a reconfiguration of the initial setup by the manufacturer resulted in 30-minute data recording until March 7, 2011; although no data were lost, the data logger was then reset to record at 15-minute intervals after March 7, 2011. Data collected at this station are uploaded via telemetry to the FPL database on a daily basis.

In the past, issues with TPRF-12 not recording data occurred, but the unit has since been rewired and is now functional. Additionally, several of the other stations ran out of memory and did not record a full time period of data. These issues have been resolved, but gaps in data from the rainfall gauges remain.

2.4.2 Results and Discussion

Rainfall and temperature (Figure 2.4-3), relative humidity and barometric pressure (Figure 2.4-3), wind speed and wind direction (Figure 2.4-4), and PAR (Figure 2.4-5) for TPM-1 are shown for the entire period.

Over the 704 days of continuous recordkeeping, (July 27, 2010, to June 30, 2012), 121 inches of rain were observed at TPM-1 (Table 2.4-2). The greatest monthly rainfall totals were observed in September 2010 (13.5 inches), followed by October 2011 (13.3 inches), and April 2012 (12 inches) (Figure 2.4-6 and Table 2.4-3). There were a total of 430 rainfall days with 39 days having recorded totals in excess of 1 inch in a calendar day (Table 2.4-4). The number of rain-days and the amount of rainfall was generally greatest during the wet season (May to November), with the driest months from December to February. The least amounts of rain in a month were observed in February 2011 (0.2 inches), November 2011 (0.3 inches) and December 2010 (0.5 inches).

During the first 11 months of monitoring, a severe drought was observed across Florida in the early half of 2011, as evidenced by the limited precipitation (6.1 inches total) from February to May 2011. The second year of monitoring (July 2011 to June 2012) was less dry, as evidenced by the higher amount of rainfall (81 7 inches). These inter-annual differences in precipitation between years (3.8 inches per month from August 2010 to June 2011 water year versus 6.8 inches per month from July 2011 to June 2012) underscore how rainfall variability can potentially influence the hydrology and ecology in coastal South Florida.

Rainfall frequency and periodicity is tied to the seasonal patterns of low pressure over South Florida during the wet season and is a consequence of cold front passage during the winter months. For example, the highest daily precipitation amounts were observed on September 29, 2010 (7.3 inches), and October 8, 2011 (6.3 inches). Both these events are tied to the passage of

low pressure systems over South Florida. The passage of cold fronts is usually evidenced by a drop in barometric pressure during the early winter days. Typically, the passage of a cold front is accompanied by higher wind speeds and decreased relative humidity following the rain event. An example of this is shown in late 2010 by the first significant cold front of that season which occurred from November 3 to 5, resulting in a significant decrease in temperature (about 10°C), relative humidity, and pressure.

Table 2.4-3 shows monthly rainfall totals from other rainfall stations around TPM-1. Although there was some variability among stations, the monthly rainfall totals in Biscayne Bay are consistently less than those on land while the totals at TPM-1 are higher than at most stations for most of the period of record. Nonetheless, the patterns at all stations are generally consistent across the months at the stations measured.

Air temperatures (at 15 ft above ground) in the middle of the CCS at TPM-1 ranged from 2.8°C to 33.8°C for the period of record, with an average of 25.5°C. The minimum temperature was observed on December 14, 2010, during the morning hours of a cold front passing through the area. The warmest temperature was observed on July 11, 2011, as July through September (monthly average > 29°C) are usually the warmest months of the year. Comparatively, the winter months of 2010/2011 (November to February) were colder than the similar time period of the following year (Figure 2.4-3).

Relative humidity at TPM-1 was an average of 71% during the period of recordkeeping. The patterns, however, were more variable in the winter months compared to the warmer months of April through June. Diurnal humidity patterns were influenced by broader seasonal patterns; for example, continued rainfall over several days in late September 2010 resulted in a few days (September 28 to 30) of 90% humidity while the passage of cold fronts (e.g., December 15, 2010) resulted in a humidity drop from 75% to 21% in 3.5 hours.

The prevailing wind directions from July 2010 through June 2012 were from the east and east-southeast, i.e., predominantly onshore (Figure 2.4-7). Average wind speed for the whole period, at 5 meters above ground, was 10 miles per hour (mph). The lull wind speeds averaged 6 mph, but several instances of strong wind gusts were observed, some in excess of 60 mph. The highest wind speed recorded at TPM-1 was observed during the passage of a frontal boundary on October 13, 2011, when a 134 mph wind gust was recorded. Similarly, wind speeds > 60 mph were seen on July 13, 2011, and April 26, 2012, with the approach of storm fronts. Forty-four percent of the time, the winds were between 7 to 11 meters per second (Figure 2.4-8).

Light levels show seasonal amplitude, with maximum light levels during the summer months and decreased light levels during the wintertime. Despite these overall trends, there were smaller patterns of decreased light levels as a consequence of cold front events (e.g., October 6 to 20, 2010) where several days of continuous cloudiness resulted in lowered light levels (Figure 2.4-5).

2.5 CCS FLOW METER DATA

2.5.1 Instrumentation and Data Collection Methods

As previously discussed in the August 2011 Annual Report (FPL 2011b), automated Acoustic Doppler Flow Meters (ADFMs) were initially installed at three constrained-flow locations in the CCS and are referred to as the outflow, southerly, and inflow stations. The outflow station (TPFM-1) was set up to measure outflow of water from the plant entering the CCS; due to the canal setup, the station was located in the discharge feeder canal approximately 0.4 mile downstream of the plant, but prior to the flow dispersing into the CCS (Figure 1.1-4). The southerly station (TPFM-2) is located on the southern end of the CCS (south collector) where all water passes as it transitions from southerly to northerly flow (Figure 1.1-4). The inflow station was originally located about 0.4 mile from the intake back into the plant. The purpose of the flow meters was to help assess losses and gains in CCS water volume and flows as part of the water budget.

Each of the stations was equipped with a side-looking ADFM (Argonaut-SL 500, Sontek/YSI, Yellow Springs, Ohio) that emits three acoustic beams in a characteristic pattern (i.e., two horizontal beams separated by 50 degrees and one vertical beam) (Figure 2.5-1). Each station is powered using a solar-charged lead acid battery. All data are stored in a datalogger (CR800, Campbell Scientific, Logan, Utah) and remotely transferred to a permanent database daily via telemetry. The data loggers are programmed to record indexed velocity and flow every 15 minutes.

Platforms to support these ADFMs were constructed in the summer of 2010. The meters were subsequently installed by YSI following industry standard protocol (i.e., mount the sensor plumb ±2 degrees, no obstructions above or in front of the sensor, etc.). Stream gauging and indexing efforts were conducted with the final installation indexing efforts completed in November 2010. Results of the initial indexing effort were provided in the August 2011 Annual Report (FPL 2011b).

Significant turbulence at TPFM-3 yielded poor data quality, and subsequent equipment failure resulted in removal of the flow meter in December 2010. This flow meter was repaired, but has not been reinstalled at TPFM-3 primarily due to issues with data quality, limitations in alternative inflow locations, and concerns of short-circuiting in the CCS. The issue of short-circuiting has been discussed with the Agencies. This issue limits the usefulness of the flow meters as originally envisioned. FPL collected temperature data to help confirm if short-circuiting of water from the discharge canals into the Grand Canal and return canals is occurring under the berms in the CCS. The greatest potential for underflow is the berm that separates the return Grand Canal and the discharge canal immediately adjacent to the Grand Canal, since the head differential between these two canals is the greatest. Results from this effort were presented to the Agencies on March 21, 2012, and indicated that some underflow may be occurring due to higher temperatures in the Grand Canal in comparison to the adjacent return canal to the east; however, the amount of underflow could not be determined.

The other two meters recorded data through July/August 2011, but became inoperable and were pulled for troubleshooting in the field. TPFM-1 was not operating in June 2011, and FPL replaced that flow meter with the one that had been previously pulled and repaired from TPFM-3. This flow meter recorded data for approximately one week (late June/early July 2011) before malfunctioning. At TPFM-2, data were collected until the mounting bracket broke in early August 2011. All flow meters were sent to YSI for diagnostics. These two meters were subsequently repaired, the mounting brackets were repaired, and the flow meters were reinstalled on May 29, 2012. Indexing was conducted during this reinstallation effort (on May 31) and the information is presented in Appendix F.

2.5.2 Results and Discussion

This report includes data that has been recorded by all flow meters since initial installation on July 27, 2010. As the Agencies have expressed interest in these data, it has been post-corrected based on the initial indexing efforts and the results are included with the entire data set for the monitoring period. Figure 2.5-2 shows the available velocity and flow meter data that were collected during the pre-Uprate period.

The results show the variations in flow over time, with the most notable changes directly associated with major plant outages at the nuclear units. Velocity in the CCS ranges from 0.33 foot per second (ft/s) to 2.4 ft/s, with generally higher values observed at TPFM-2 relative to TPFM-1 (Figure 2.5-2). Average velocity is 0.89 ± 0.19 ft/s (average ± standard deviation) at TPFM-1 and 1.62 ± 0.36 ft/s at TPFM-2. The channel is narrower at TPFM-2, hence resulting in greater velocities.

Flow rates of 1,032 cubic feet per second (ft^3/s) to 4,367 ft^3/s were observed in the CCS during the period of record. Average flow rates were 3,810 ± 613 ft^3/s at TPFM-1 and 2,507 ± 520 ft^3/s at TPFM-2. There was a significant positive correlation between the flow at both sites ($Flow_{TPFM-2} = 0.8113(Flow_{TPFM-1}) + 134.27$; $R^2 = 0.8708$), as shown on Figure 2.5-3. Flow was higher at TPFM-1 relative to TPFM-2 (Figures 2.5-3 and 2.5-4) for 92.6% of the time although this pattern was sometimes reversed. Lower flow at TPFM-1 when simultaneously compared to TPFM-2 may in part be caused by plant operations when pumps are turned on and off or varying rainfall distribution over the CCS which can affect flow in different reaches of the CCS.

During an outage, less water is typically needed for cooling and thus less water is pumped through the plant. While the pumpage rates vary, depending on factors such as the specific reason for the outage and length of time, there are some typical considerations for the plant's operating/shutdown conditions. Each nuclear unit has four circulating water pumps (CWPs; about 156,250 gallons per minute [gpm] each) and three intake cooling water pumps (ICWPs; about 16,000 gpm each). CCS water is pumped through the nuclear units for cooling. The nuclear units typically operate at full power with four CWPs and two ICWPs during operation. During a planned nuclear plant refueling shutdown (every 18 months), the CWPs are turned off and the shutdown unit uses one or two ICWPs for plant cooling purposes. The CWPs are returned to service when the unit is ready to restart. During the major scheduled Unit 3 Uprate

outage that started in March 2012, the CWPs were turned off. Figure 2.5-2 shows the drop in flow in late September 2010 through late October 2010 and again in mid-March 2011 through early May 2011 during refueling outages.

The two fossil units each have two CWPs (about 137,000 gpm each) and two open cooling water pumps (OCWPs; about 6,000 gpm each). Typically, during operation a fossil unit will use both CWPs and one or two OCWPs depending on cooling requirements. CCS water is pumped through the fossil units for cooling. Pumps in Unit 1 are periodically turned on to maintain its operational readiness as this unit is online during peak seasonal demand periods. However, Unit 2 is currently being used as a synchronous generator and is not producing megawatts (MWs; or steam heat). Unit 2 is typically using the OCWPs for cooling. The complete outage reports for this pre-Uprate period are in Appendix F.

Figures 2.5-5 and 2.5-6 illustrate representative flows over two separate weeks compared to tidal fluxes at TPBBSW-3 in Biscayne Bay. The graphs show daily patterns with a week. These flows are representative of values observed during a week of normal Turkey Point Nuclear Plant operations (January 23 through 30, 2011) and during the outage of Unit 4 (March 23 through 30, 2011). As Units 3 and 4 are the primary drivers of flow within the CCS, flows during the Unit 4 outage were approximately half of normal plant operations in March 2011 (Figure 2.5-2). When flow rates are compared against the tidal fluctuations in Biscayne Bay, there appears to be no relationship between the tidal conditions and the flow rates in the CCS.

TABLES

Table 2.1-1. Statistical Summary of Automated Groundwater Specific Conductance (µS/cm) Data

Well	2010 Avg Monthly Value						2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPGW-1S				58295	57280	54664	55610	55568	55706	59141	59450		62844	58163	54260	54062	53788	53242			62103	62319	62343	59995	47861	64171	57646	3629
TPGW-1M				72522								70281	70448		70657									72454	66640	75485	71212	1187
TPGW-1D					70950	70592	70655	70754	70789				71327	71818	71886	71369	71230		71471	71737	71801	71693	70645	70639	69525	72580	71194	552
TPGW-2S		71302	71240	71981	71574	71890	72086	71235	72629	74309	76122	76689	74842	73573	73415	73485		73543	74756	74045	73360	74381	72185	71802	68360	77088	73254	1557
TPGW-2M	74790	74155	74241	74178	75427	75845	75435	74531	75052	75499	76489		76172	75348	75262	75110	75101	74946	75785		75610	75848	75309	75206	73143	77386	75304	720
TPGW-2D	75484	75140	75100	75384	75352	75174	75487	75808	75781	75023	74922	74561	75255	75560	76250	75940	75691	75758	76014	76114	76009	76034	75214	75449	72128	77116	75529	468
TPGW-3S			63753	63720	63474	63386	62965	62654	62721	63928	63564	63526	63728	63632	63819	63741	63090	63219	63082	64647	62309	62157	63115	63891	60266	65491	63369	719
TPGW-3M			68451	68882	68976	68760	69290	69698	69416	68993	68892	68775	68519	68521	68617	68712		67852	68499	69095	67858	67749	67735	67905	66779	70236	68617	591
TPGW-3D			67200	67328	68456	68929	68824	68759	68937	68789	69262	69768	69678	69581	69575	69003	68499	68340	68968	69601	68994	69007	68889	68797	66628	70014	68861	694
TPGW-4S			1794	1992	2084	2209	2311	2110	2581	2498			2565	2193	2137	1839	1858	2014	2148	2219	2235	2360	1623	1312	1105	3867	2163	428
TPGW-4M			37773	37796	37025	36833	37360	37778	37742	37172	37074	37302	37655	37470	37583	37435	37751	37949	38303	38551	37853	37873	37529	37501	35988	38785	37602	435
TPGW-4D										43093			42474			42337		42689	43137	43814	43374	43277	42494	42489	41327	44005	42899	504
TPGW-5S				1519	1424	1449			1168	1165	1244	1231			1351		1083	1057	1216	1304	1244	1497	1327		724	1947	1298	195
TPGW-5M				30943		30646	30351	29897	29942	30647	30881	30667	30663	31300	31410	31110	31180	31442	32215	32359	32158	32100	32097	32201	29580	32469	31184	757
TPGW-5D				33701	33449	33290	33132	33125	33059	32306	31815	32490	32805	33799	33872	33632	33275	33242	33732	33818	33683	33669	34021	34248	31234	34377	33357	611
TPGW-6S	1236	1240	1234	1178	1156	1176	1175	1173	1159	1128	1115	1162	1138	1120	1136	1123	1088	1063	1052	1050	1044	1040	1019	1021	496	1258	1127	70
TPGW-6M	22897	22961	22968	23037	22654	22723	22765	22483	22659	22405	22427	22465	22401	22362	22424	22253	21979	22665	22710	22660	22691	22514	22220	22297	21669	23108	22574	271
TPGW-6D	23739	23738	23693	23638	23641	23753	23954	24093	23954	23478	23529	23551	23399	23249	23403	23366	23463	23842	23729	23674	23651	23599	23475	23421	22465	24697	23623	233
TPGW-7S				578	542	551	568	579	580	586	577	562	561	562	559		578	557	578	581	575	556	569	567	421	906	568	32
TPGW-7M				592		614	607	608	606			580	628	687	654			595				559	702	716	551	826	624	53
TPGW-7D				569	599	597	610	607	603	599	596	592	586	582	580	581	578	577	595	606	590	569	596	585	418	679	591	19
TPGW-8S				3430	3352	3320	3019	3219	3116	2918	2898	2750	2622	2349	2589	2439	2595	2621	2706	2703	2731	2599	2290	2423	2067	3681	2808	355
TPGW-8M				652	646	646	646	649	651	647	644	640	642	641	641	640	638	636	629	629	629	630	621	620	618	655	639	9
TPGW-8D				693	685	678	690	684	690	683	686	694	678	675	675	666	667	659	675	677	678	672	674	665	237	714	679	21
TPGW-9S			618	604	592	598	572	582	627	653	647	647	637	595	549	552	535	547	603	554	602	611	597	592	444	949	595	39
TPGW-9M			685	689		661	659	670	665	652	666	653	637	625	642	647	645	635	623	617	631	635	612		598	752	646	23
TPGW-9D			650	649		649	642	640	644	648	641	633	638	639	630	628	629	629	632	635	635		611	611	610	655	635	11
TPGW-10S			51822	52009	51410	50492	50344	50139	50430	50599	50478	50887	51797	51822	52115	52396	52214	52266	52803	52090	52165	52308	52594	52874	50000	53163	51639	890
TPGW-10M			55559	55279	55375	55035	54712	54076	54277	54372	54687	54881	54788	54808	54664	54323	54187	54131	54887	53993	54731	55261	55074	54895	53629	55812	54724	484
TPGW-10D				56127	55927	55568	55369	55003	54882	54795	54877	54899	55020	55498	55192	54415	54648	54676	55362	54102	54785	55273	56922	58960	53918	59934	55362	1049

Table 2.1-1. Statistical Summary of Automated Groundwater Specific Conductance (µS/cm) Data

Well	2010 Avg Monthly Value						2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPGW-11S				55476	55401	55317	55176	54860	54015	53710	54476	54541	54759	53639	53670	53710	55559		54173	54359	54454	54810	55867	54876	53281	56001	54681	732
TPGW-11M				57571	57071	56515	56166	55460	55803	55982	55793	55798	55818			56114			56258	55777	55788	55985	56601	56406	54895	57774	56200	569
TPGW-11D				58622	58515	58269	57974	57382	57455	57472	57307	57994	58080	57807	57672	57731	58859	58333	58022	58574	58632	58746	59408	59570	55275	59845	58217	696
TPGW-12S	40844	40496	40108	40344	40749	40908	40901	40531	40433	40235	40877	43061	42492	41745	41417			43049	42199	41991	42225	42646	42769	42628	38736	45533	41514	1023
TPGW-12M	64272	64305	63809	64066	64360	64241	64346	64732	64636	64281	62715		61438	62491	62812	63919	63831		63251	62882	63057	62447	63178	64288	58312	65338	63507	1108
TPGW-12D	63914	63947	63515	63452	64093	64231	64246	64273	64281	63554	64428	64509	63983	63634	63611	64324	64304		64099	64019	63332	61686	63531	64169	61509	65028	63886	686
TPGW-13S	83728	83690	84012	84762	85901	86254	85863	85691	85235	84865	84225	83291	82935	82966	82793				83078	83238	83230	83486		83154	81985	86909	84024	1140
TPGW-13M	82710							82346	80681	80066	80678	80840		79975					79642	79716	79884		79145	78646	77609	83273	80393	1155
TPGW-13D				82730		83693	83427	82430	82329	82307	82633	83566	82834	82501	81739	80932	81229		81662	81646				80605	79595	84564	82251	965
TPGW-14S				59043	59505	59259	59079	58563	58158	57756	57804	57327	57459	58813		58774	57234			57607	57100	56694	57236	57263	56335	59860	58055	881
TPGW-14M				64847	64354	63528	63631	63276	63497	63119	62310	62088	63650	65194	64573	63601	63241			62884	61970	61735		63327	60718	67002	63391	1080
TPGW-14D				74692	74283	73885	73909	73790	73678	73676	73934	73988	73924	75385	74206	72895	73346			73855	73165	72871	73494	74008	72358	75797	73820	731

Key:
µs/cm = Micro Siemens per centimeter.
Avg = Average.
Max = Maximum.
Min = Minimum.
Std Dev = Standard Deviation.

Table 2.1-2. Statistical Summary of Automated Groundwater Water Temperature (°C) Data

Well	2010 Avg Monthly Value						2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPGW-1S				25.4	25.5	25.6	25.6	25.6	25.6	25.6	25.6		25.7	25.6	25.5	25.5	25.6	25.7	25.7		25.8	25.8	25.8	25.7	25.4	25.8	25.6	0.1
TPGW-1M				26.0	26.0	26.0	26.0	26.0	25.9	25.9	25.9	26.0	26.0	26.0	26.0	25.9	25.9	25.9	25.9	25.9	25.9	25.9	26.0	25.9	25.9	26.0	25.9	0.0
TPGW-1D				26.2	26.2	26.2	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.0	26.0	26.0	26.0	26.2	26.1	0.0
TPGW-2S	25.9	26.3	26.5	26.5	26.6	26.6	26.6	26.1	26.2	26.4	27.0	27.4	27.0	26.5	26.5	26.4	26.5	26.6	26.8	26.9	26.7	26.8	26.5	26.1	25.6	27.5	26.5	0.4
TPGW-2M	27.1	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.2	27.4	27.4	27.4	27.3	27.2	27.1	27.1	27.1		27.1	27.1	27.1	27.1	26.9	27.4	27.1	0.1
TPGW-2D	27.6	27.6	27.5	27.5	27.5	27.5	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.3	27.3	27.3	27.6	27.4	0.1
TPGW-3S			25.9	26.0	26.1	26.2	26.1	26.1	25.9	25.8	25.6	25.6	25.6	25.7	25.8	26.0	26.1	26.2	26.2	26.1	26.0	25.9	25.8	25.9	25.6	26.2	25.9	0.2
TPGW-3M			25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	26.0	25.9	0.0
TPGW-3D			25.7	25.7	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.7	25.7	25.7	25.7	25.8	25.8	0.0
TPGW-4S			24.4	24.8	25.1	25.2	25.2	25.1	24.9	24.7			24.4	24.2	24.4	24.7	24.9	25.0	25.1	25.0	24.9	24.8	24.6	24.5	24.2	25.3	24.8	0.3
TPGW-4M			24.4	24.4	24.4	24.4	24.5	24.5	24.5	24.6	24.6	24.6	24.5	24.5	24.5	24.4	24.4	24.5	24.5	24.5	24.6	24.6	24.6	24.6	24.4	24.6	24.5	0.1
TPGW-4D			24.4	24.4		24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4		24.4	24.3	24.3	24.3	24.4	24.4	24.4	24.4	24.4	24.4	24.3	24.5	24.4	0.0
TPGW-5S				23.4	23.5	23.7	23.8	23.8	23.6	23.5	23.4	23.4	23.4	23.3	23.3		23.5	23.6	23.7	23.7	23.7	23.6	23.6		23.3	23.8	23.5	0.2
TPGW-5M				23.5	23.5	23.5	23.5	23.6	23.6	23.6	23.6	23.6	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.6	23.6	23.6	23.6	23.5	23.6	23.5	0.0
TPGW-5D				23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.7	23.7	0.0
TPGW-6S	23.1	23.2	23.3	23.4	23.5	23.6	23.6	23.4	23.3	23.3	23.3	23.4	23.3	23.2	23.3	23.4	23.5	23.6	23.7	23.7	23.6	23.6	23.4	23.2	23.0	23.7	23.4	0.2
TPGW-6M	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.5	23.7	23.6	0.0
TPGW-6D	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.6	23.5	0.0
TPGW-7S				23.9	23.9	24.0	24.0	24.0	23.9	23.8	23.7	23.7	23.7	23.6	23.6		23.7	23.8	23.8	23.8	23.8	23.8	23.7	23.7	23.6	24.0	23.8	0.1
TPGW-7M				23.9		23.8	23.8	23.8	23.9		23.9	23.9	23.9	23.8	23.8		23.7	23.7	23.7			23.8	23.8	23.8	23.7	24.2	23.8	0.1
TPGW-7D				23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.8	23.8	23.8	23.8	23.8	23.9	23.9	0.0
TPGW-8S				23.8	24.0	24.1	24.0	23.7	23.4	23.3	23.3	23.3	23.5	23.5	23.6	23.8	23.9	24.0	24.0	23.9	23.7	23.5	23.5	23.5	23.3	24.1	23.7	0.3
TPGW-8M				23.7	23.7	23.8	23.8	23.8	23.8	23.7	23.6	23.6	23.6	23.6	23.6	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.6	23.8	23.7	0.1
TPGW-8D				23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.5	23.8	23.7	0.0
TPGW-9S	24.4	24.4	24.6	24.8	25.1	25.3	25.1	24.8	24.5	24.4	24.3	24.4	24.4	24.3	24.5	24.8	25.2	25.3	25.2	24.9	24.6	24.5	24.4	24.4	24.2	25.3	24.7	0.3
TPGW-9M	23.7	23.6	23.8	24.0		24.1	24.1	24.2	24.1	24.1	24.0	23.9	23.8	23.8	23.9	24.0	24.0	24.0	24.0	24.1	24.1	24.0	24.0		23.6	24.2	24.0	0.1
TPGW-9D	24.1	24.0	24.0	24.0		24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.1	24.1	24.1	24.0	24.1	24.0	0.0
TPGW-10S			25.8	26.1	26.3	26.3	26.3	26.1	25.9	25.7	25.5	25.5	25.7	25.9	26.1	26.3	26.5	26.6	26.6	26.5	26.3	26.2	26.0	25.9	25.5	26.6	26.1	0.3
TPGW-10M			25.8	25.8	25.8	25.8	25.8	25.9	25.9	25.9	25.9	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.9	25.9	25.9	26.0	26.0	26.0	25.8	26.0	25.9	0.1
TPGW-10D			25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.6	25.7	25.7	0.0

Table 2.1-2. Statistical Summary of Automated Groundwater Water Temperature (°C) Data

Well	2010 Avg Monthly Value						2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPGW-11S				25.3	25.4	25.5	25.5	25.4	25.2	25.1	25.1	25.1	25.1	25.1	25.2	25.3	25.4	25.5	25.5	25.4	25.3	25.3	25.2	25.2	25.0	25.5	25.3	0.2
TPGW-11M				25.4	25.4	25.4	25.4	25.3	25.3	25.3	25.3	25.3	25.3			25.4			25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.4	25.3	0.0
TPGW-11D				25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	0.0
TPGW-12S	26.0	26.0	26.0	25.9	26.0	26.1	26.1	26.1	26.1	26.0	25.9	25.8	25.9	25.9	25.9			26.0	26.1	26.1	26.0	26.0	26.0	25.9	25.8	26.5	26.0	0.1
TPGW-12M	26.2	26.2	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.0	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.0	26.2	26.1	0.0
TPGW-12D	26.2	26.2	26.2	26.2	26.2	26.2	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.2	26.1	0.1
TPGW-13S	29.4	29.3	29.4	29.6	30.0	30.3	30.5	30.5	30.4	30.2	29.9	29.8	29.8	29.8	29.8			30.1	30.2	30.3	30.3	30.3	30.2	30.1	29.3	30.5	30.0	0.4
TPGW-13M	29.6	29.5	29.5	29.5	29.5	29.4	29.4	29.4	29.5	29.5	29.5	29.6	29.6	29.5	29.5			29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.4	29.6	29.5	0.0
TPGW-13D	29.5	29.5	29.5	29.5	29.5	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.3	29.3	29.3	29.3	29.5	29.4	0.1
TPGW-14S				26.1	26.2	26.3	26.3	26.1	25.9	25.7	25.5	25.5	25.7	25.9		26.2	26.3			26.2	26.0	25.9	25.9	25.9	25.5	26.4	26.0	0.2
TPGW-14M				26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.1	26.1	26.1	26.1	26.1			26.1	26.2	26.2	26.2	26.2	26.0	26.3	26.2	0.0
TPGW-14D				26.3	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.3	26.3			26.3	26.3	26.3	26.3	26.3	26.3	26.4	26.4	0.0

Key:
°C = Degrees Celsius.
Avg = Average.
Max = Maximum.
Min = Minimum.
Std Dev = Standard Deviation.

Table 2.1-3. Statistical Summary of Automated Groundwater Water Salinity (PSS-78) Data

Well	2010 Avg Monthly Value						2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPGW-1S				39.4	38.7	36.8	37.5	37.5	37.6	40.2	40.5		43.1	39.5	36.5	36.3	36.1	35.7			42.5	42.7	42.7	40.9	31.7	44.1	39.1	2.8
TPGW-1M				50.8								49.0	49.1		49.3									50.7	46.1	53.2	49.7	1.0
TPGW-1D					49.5	49.2	49.3	49.4	49.4				49.8	50.2	50.3	49.9	49.8		49.9	50.2	50.2	50.1	49.3	49.3	48.4	50.8	49.7	0.4
TPGW-2S		49.8	49.8	49.9	50.0	50.3	50.5	49.8	50.9	52.3	53.8	54.2	52.7	51.7	51.5	51.6		51.6	52.6	52.1	51.5	52.3	50.5	50.2	47.5	54.6	51.4	1.3
TPGW-2M	52.7	52.2	52.2	52.2	53.2	53.5	53.2	52.5	52.9	53.3	54.1		53.8	53.1	53.1	52.9	52.9	52.8	53.5		53.3	53.5	53.1	53.0	51.3	54.8	53.1	0.6
TPGW-2D	53.3	53.0	53.0	52.9	53.1	53.0	53.3	53.5	53.5	52.9	52.8	52.5	53.1	53.3	53.9	53.6	53.4	53.5	53.7	53.8	53.7	53.7	53.0	53.2	50.5	54.6	53.3	0.4
TPGW-3S			43.8	43.8	43.6	43.5	43.2	43.0	43.0	43.9	43.7	43.6	43.8	43.7	43.9	43.8	43.3	43.4	43.3	44.5	42.7	42.6	43.3	43.9	41.1	45.2	43.5	0.6
TPGW-3M			47.5	47.8	47.9	47.8	48.2	48.5	48.3	48.0	47.9	47.8	47.6	47.6	47.7	47.7		47.0	47.6	48.0	47.1	47.0	47.0	47.1	46.2	49.0	47.7	0.5
TPGW-3D			46.5	46.6	47.5	47.9	47.8	47.8	47.9	47.8	48.2	48.6	48.5	48.4	48.4	48.0	47.6	47.4	47.9	48.4	47.9	48.0	47.9	47.8	46.1	48.8	47.8	0.6
TPGW-4S			0.9	1.0	1.1	1.1	1.2	1.1	1.3	1.3			1.3	1.1	1.1	0.9	1.0	1.0	1.1	1.2	1.2	1.2	0.8	0.7	0.6	2.1	1.1	0.2
TPGW-4M			24.3	24.3	23.8	23.7	24.0	24.3	24.3	23.9	23.8	24.0	24.2	24.1	24.2	24.1	24.3	24.4	24.7	24.9	24.4	24.4	24.2	24.1	23.1	25.0	24.2	0.3
TPGW-4D										28.2			27.7			27.6		27.9	28.2	28.7	28.4	28.3	27.7	27.7	26.9	28.8	28.0	0.4
TPGW-5S				0.8	0.7	0.7			0.6	0.6	0.6	0.6			0.7		0.5	0.5	0.6	0.7	0.6	0.8	0.7		0.0	1.0	0.7	0.1
TPGW-5M				19.5		19.3	19.1	18.8	18.8	19.3	19.5	19.3	19.3	19.7	19.8	19.6	19.7	19.8	20.4	20.5	20.3	20.3	20.3	20.4	18.6	20.6	19.7	0.5
TPGW-5D				21.4	21.2	21.1	21.0	21.0	21.0	20.5	20.1	20.6	20.8	21.5	21.5	21.4	21.1	21.1	21.4	21.5	21.4	21.4	21.7	21.8	19.7	21.9	21.2	0.4
TPGW-6S	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.6	0.6	0.0
TPGW-6M	14.0	14.1	14.1	14.1	13.9	13.9	13.9	13.7	13.9	13.7	13.7	13.7	13.7	13.7	13.7	13.6	13.4	13.9	13.9	13.9	13.9	13.8	13.6	13.6	13.2	14.2	13.8	0.2
TPGW-6D	14.6	14.6	14.6	14.5	14.5	14.6	14.7	14.8	14.7	14.4	14.4	14.5	14.3	14.2	14.4	14.3	14.4	14.7	14.6	14.5	14.5	14.5	14.4	14.4	13.7	15.2	14.5	0.2
TPGW-7S				0.28	0.26	0.27	0.28	0.28	0.28	0.29	0.28	0.27	0.27	0.27	0.27		0.28	0.27	0.28	0.28	0.28	0.27	0.28	0.28	0.20	0.44	0.28	0.02
TPGW-7M				0.29		0.30	0.30	0.30	0.30			0.28	0.30	0.33	0.32			0.29				0.27	0.35	0.35	0.27	0.41	0.31	0.03
TPGW-7D				0.28	0.29	0.29	0.30	0.30	0.30	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.30	0.29	0.28	0.29	0.29	0.21	0.33	0.29	0.01
TPGW-8S				1.79	1.77	1.76	1.59	1.70	1.65	1.54	1.52	1.44	1.37	1.22	1.35	1.27	1.36	1.37	1.42	1.42	1.43	1.36	1.19	1.26	1.06	1.96	1.47	0.19
TPGW-8M				0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.30	0.30	0.30	0.32	0.31	0.00
TPGW-8D				0.34	0.34	0.33	0.34	0.34	0.34	0.34	0.33	0.34	0.33	0.33	0.33	0.33	0.33	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.11	0.35	0.33	0.01
TPGW-9S	0.33	0.32	0.30	0.30	0.29	0.29	0.28	0.28	0.31	0.32	0.32	0.32	0.31	0.29	0.27	0.27	0.26	0.27	0.30	0.27	0.29	0.30	0.29	0.29	0.22	0.47	0.29	0.02
TPGW-9M	0.32	0.34	0.34	0.34		0.32	0.32	0.33	0.33	0.32	0.33	0.32	0.31	0.30	0.31	0.32	0.32	0.31	0.31	0.30	0.31	0.31	0.30		0.29	0.37	0.32	0.01
TPGW-9D	0.33	0.32	0.32	0.32		0.32	0.32	0.31	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31		0.30	0.30	0.30	0.33	0.31	0.01
TPGW-10S			34.7	34.8	34.3	33.7	33.6	33.4	33.6	33.7	33.6	33.9	34.6	34.6	34.9	35.1	35.0	35.0	35.4	34.9	34.9	35.0	35.2	35.4	33.3	35.7	34.5	0.7
TPGW-10M			37.5	37.3	37.3	37.1	36.8	36.4	36.5	36.6	36.8	37.0	36.9	36.9	36.8	36.5	36.4	36.4	37.0	36.3	36.9	37.3	37.1	37.0	36.0	37.7	36.8	0.4
TPGW-10D				37.9	37.8	37.5	37.3	37.1	37.0	36.9	37.0	37.0	37.1	37.4	37.2	36.6	36.8	36.8	37.3	36.4	36.9	37.3	38.5	40.1	36.2	40.8	37.3	0.8

Table 2.1-3. Statistical Summary of Automated Groundwater Water Salinity (PSS-78) Data

Well	2010 Avg Monthly Value						2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPGW-11S				37.4	37.3	37.3	37.2	36.9	36.3	36.1	36.6	36.7	36.8	36.0	36.0	36.1	37.5		36.4	36.6	36.6	36.9	37.7	36.9	35.7	37.8	36.8	0.6
TPGW-11M				39.0	38.6	38.2	37.9	37.4	37.7	37.8	37.6	37.6	37.7			37.9			38.0	37.6	37.6	37.8	38.3	38.1	37.0	39.1	38.0	0.4
TPGW-11D				39.8	39.7	39.5	39.3	38.9	38.9	38.9	38.8	39.3	39.4	39.2	39.1	39.1	40.0	39.6	39.3	39.8	39.8	39.9	40.4	40.5	37.2	40.8	39.5	0.5
TPGW-12S	26.6	26.3	26.0	26.2	26.5	26.6	26.6	26.3	26.3	26.1	26.6	28.2	27.7	27.2	27.0			28.2	27.5	27.4	27.6	27.9	28.0	27.8	25.0	30.0	27.0	0.7
TPGW-12M	44.2	44.3	43.9	44.0	44.3	44.2	44.3	44.6	44.5	44.2	43.0		42.0	42.8	43.1	43.9	43.9		43.4	43.1	43.3	42.8	43.4	44.2	39.6	45.1	43.6	0.9
TPGW-12D	44.0	44.0	43.6	43.6	44.1	44.2	44.2	44.2	44.2	43.7	44.3	44.4	44.0	43.7	43.7	44.3	44.3		44.1	44.0	43.5	42.2	43.6	44.1	42.1	44.8	43.9	0.5
TPGW-13S	60.2	60.1	60.4	61.0	62.0	62.3	62.0	61.9	61.5	61.2	60.6	59.8	59.5	59.5	59.4				59.7	59.8	59.8	60.0		59.7	58.7	62.9	60.4	1.0
TPGW-13M	59.3							59.0	57.6	57.1	57.6	57.8		57.0					56.8	56.8	57.0		56.4	55.9	55.1	59.8	57.4	1.0
TPGW-13D				59.3		60.1	59.9	59.1	59.0	59.0	59.3	60.0	59.4	59.1	58.5	57.8	58.1		58.4	58.4				57.6	56.7	60.9	58.9	0.8
TPGW-14S				40.1	40.5	40.3	40.2	39.8	39.5	39.2	39.2	38.8	38.9	40.0		40.0	38.8			39.1	38.7	38.3	38.8	38.8	38.1	40.8	39.4	0.7
TPGW-14M				44.6	44.3	43.6	43.7	43.5	43.6	43.3	42.7	42.5	43.7	45.0	44.5	43.7	43.4			43.1	42.4	42.2		43.5	41.5	46.2	43.5	0.8
TPGW-14D				52.6	52.2	51.9	51.9	51.8	51.7	51.7	52.0	52.0	51.9	53.1	52.2	51.1	51.5			51.9	51.3	51.1	51.6	52.0	50.7	53.5	51.9	0.6

Key:
Avg = Average. Min = Minimum.
Max = Maximum. PSS-78 = Practical Salinity Scale of 1978.
Min = Minimum. Std Dev = Standard Deviation.

Table 2.2-1. Probe Types/Automated Measurements at Surface Water Stations

Surface Water Site	Probe	Parameters Measured
TPSWC-1T	AT200	Water Quality, Stage
TPSWC-1B	AT100	Water Quality
TPSWC-2T	AT200	Water Quality, Stage
TPSWC-2B	AT100	Water Quality
TPSWC-3T	AT200	Water Quality, Stage
TPSWC-3B	AT100	Water Quality
TPSWC-4T	AT200	Water Quality, Stage
TPSWC-4B	AT100	Water Quality
TPSWC-5T	AT200	Water Quality, Stage
TPSWC-5B	AT100	Water Quality
TPSWID-1T	AT200	Water Quality, Stage
TPSWID-1B	AT100	Water Quality
TPSWID-2T	AT200	Water Quality, Stage
TPSWID-3T	AT100	Water Quality
TPSWID-3B	AT200	Water Quality, Stage
TPSWCCS-1T	AT200	Water Quality, Stage
TPSWCCS-2T	AT200	Water Quality, Stage
TPSWCCS-3T	AT200	Water Quality, Stage
TPSWCCS-4T	AT200	Water Quality, Stage
TPSWCCS-4B	AT100	Water Quality
TPSWCCS-5T	AT200	Water Quality, Stage
TPSWCCS-5B	AT100	Water Quality
TPSWCCS-6T	AT200	Water Quality, Stage
TPSWCCS-6B	AT100	Water Quality
TPBBSW-1B	AT100	Water Quality
TPBBSW-2B	AT100	Water Quality
TPBBSW-3B	AT200	Water Quality, Stage
TPBBSW-4B	AT100	Water Quality
TPBBSW-5B	AT100	Water Quality
TPBBSW-10B	AT200[1]	Water Quality, Stage
TPBBSW-14B	AT200[1]	Water Quality, Stage

Note:
[1] Supplemental station and LT500 Probe replaced with AT200.

Key:
AT - Aqua TROLL®. B – Bottom. LT – Level TROLL®.

Table 2.2-2. Statistical Summary of Automated Surface Water Specific Conductance (µS/cm) Data

Well	2010 Avg Monthly Value				2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPBBSW-1B	45724	42762					53344	57032	59610	64190	58049	56627	52513	45601	36155	39126	44940	44670	50060	54997	50761	44443	22645	66884	49891	7952
TPBBSW-2B	41373	34673				49825	54948	56124	59448	61684	56051	57333	53210	42358	34998	37587	43359	45735	53342	55033	49983	43936	25666	64725	48567	8902
TPBBSW-3B		37956	41461	47113	48759	49422	54943	56069	58152	60703	56291	56106	53736	44183	38483	41464	45711	48065	53951	55522	51617		28789	63371	49860	7091
TPBBSW-4B	47783	40599				49015	53544	54788	57957	59923	56892	57587	54949	47918	41284			50349	52915	54719	49363	45479	36028	61649	51006	5928
TPBBSW-5B	43696	37597				45334	51811	53530	59299	61321	57395	56750	53163	45346	40014	44053	46444	48186	52001	53837	44767	40215	32263	64177	48872	7201
TPBBSW-10B							52544	56924	59322	62340	53790	55413	49749	36961	31778	33398	42807	43319	48915	54618	49431	40699	18922	64623	47922	9482
TPBBSW-14B							42086	43192	45500	47174	45572	46396	44849	41738	36603	36725	38201	40814	48929	51965	47201	40098	35635	54677	43433	4471
TPSWC-1T	489	475	470	570	584	645	729	931	1169	1344	1958	1509	893	489	453	515	545	774	947	1170	774	660	315	3574	827	411
TPSWC-1B	528	571	494	575	603	658	893	1026	1257	1392	2750	1673	1402	763	822	752	704	884	1013	1146	1006	1013	387	3158	1002	508
TPSWC-2T	529	473	513	877	1022	871	1291	1662	3010	5681			691	395	475	630	960	1019	955	1314	808	607	256	6194	1210	1194
TPSWC-2B	533	500	533	933	1047	898	1300	1686	4239	6563			716	411	505	657	1059	1057	961	1370	874	623	267	9507	1408	1593
TPSWC-3T	501	428	554	1188	1285	1099	1873	2495	3645	5251	1526	1024	672	390	606	756	1352	1208	1185	2347	889	648	265	5864	1405	1178
TPSWC-3B	505	431	578	1232	1346	1118	2310	4805	18120	17509	5596	1296	681	397	2771	1249	2024	1946	1816	12202	7338	1271	265	22776	3925	5485
TPSWC-4T	6222	1579	9673	31766	34979	30471	33065	43723	57770	60696			22855	10750	25070	35936	37531	39349	39973	45713	29681	21321	60	74428	31088	18612
TPSWC-4B	11580	3484	15289	38527	39310	36005	42633	49753	58836	61371	55943	39983	28289	13016	30417	39162	42515	45600	45932	49142	33250	24939	388	71422	36348	19188
TPSWC-5T	45137	39444	42306	48519	47488	47466	53389	56334	58480	60138	55469	57205	53548	47156	40068			51476	52962	55028	46580	42868	27741	61200	50193	6382
TPSWC-5B	60767	65681	64616	54765	52674	51298	53684	56107	58353	61156	61160	59509	58870	59042	57888	53838	52940	53196	53288	54244	52912	57393	43281	71282	56991	4298
TPSWCCS-1B	78272	64684	63074	62864	69274	75568	77378		80103	82533	81031		83438	75177	70165	80697	79769	79202	87491	87801	71512	69331	54595	92208	76054	8284
TPSWCCS-2B	86980	85197	79816	77128	77321	77459	83099	84686	79816	82246	83991	84764	79743	79056		78234	80092	84575	83962	83102	80230	80194	64216	87632	81429	3435
TPSWCCS-3B	75329	62665	62207	69578	71060	76063	76070	78122	77061	83209	81928	83603	81700	73593	74209	78496	79288	78169			72288	69004	53565	89920	75523	6823
TPSWCCS-4T	80978	68690	64984	72571	74605	78604	80626	83922	82823	86770	82251	84765	81827	74446	76829	83058	87308	83673	89413	87618	73875	71039	55754	93220	79525	7003
TPSWCCS-4B	77956	64974	63602	71296	74326	78310	80864	84194	82955	87555	83032	84956	81377	74344	77545	84233	87124	83003	88445	87011	74917	70981	50528	91928	79210	7428
TPSWCCS-5T	79719	65959	63929	71314	73373	77613	79995	81547	81406	84909	80613		81806			83420	86283		83720	85306	72073	70535	54602	92006	77986	7080
TPSWCCS-5B	75759		64911	64402									68992		70038						74863	70572	52361	82208	69291	5356
TPSWCCS-6T		67677	64745	72308	74581	76748	78687	82405	81041	84474	80666	83079	81464	75544	77191	83268	86014	82419	89150	88242	74904	70464	59558	92827	78692	6624
TPSWCCS-6B		67578	64549	71643	74391	77834	80615	83419	82126	84906	80299			74567	76503	82411	85716	82040	88737	89230	75688	71767	59570	93594	78702	7005
TPSWCCS-7B	77683	62332	61696	69669	71630	75870	73896	72184									74909	71877			70159	65900	53511	85986	70836	5727
TPSWID-1T	3676	2715	2322	3252	8812	7170	20064	18130	25260	36783	23039	9189	9404	4487	2927	8178	24415	11881	7758	11495	5978	3052	2101	45621	11233	9611
TPSWID-1B	3721	2932	2338	3271	17069	13910	23757	26535	30564	41348	28725	13234	17587	5576	3689	13169	31393	21659	12945	27658	16236	3828	2109	48037	16312	11661
TPSWID-2T	2438	1750	2337	3762	4193	4570	9685	11652	30387	41981	16310	3572	5614	2381	2574	4227	14055	8384	5531	7999	4834	2685	1441	55392	8590	10252
TPSWID-2B	6191	3888	3462	3977	9976	10091	42913	41584	57636	65081	63935	36057	36088	13900	5670	15641	58794	36705	11831	40277	15998	7385	2146	68416	26517	22339
TPSWID-3T	1900	1331	1732	3164	3774	4066	4186	4756		50100	16201	5649	4039	2495	2107	3768	9598	6885	4838	9615	4270	2563	1177	62140	7377	11342
TPSWID-3B	2405	1580	1751	3125	3782	4031	5897	7965	55059	64068	26202	5801	5842	3018	2180	4691	25329	10424	5916	27414	4929	2658	1211	66206	12372	18088

Key:
µS/cm = Micro Siemens per centimeter.
Avg = Average.
Max = Maximum.
Min = Minimum.
Std Dev = Standard Deviation.

Table 2.2-3. Statistical Summary of Automated Surface Water Temperature (°C) Data

Well	2010 Avg Monthly Value				2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPBBSW-1B	30.1	27.1					23.9	27.3	27.8	29.3	30.7	30.7	30.8	26.6	24.2	22.7	20.4	22.8	24.0	24.9	28.0	29.1	15.9	33.4	26.6	3.4
TPBBSW-2B	29.6	26.7				23.0	24.0	27.7	28.2	29.5	31.1	30.8	30.3	26.1	23.9	22.3	20.6	23.3	24.2	25.2	28.4	29.1	13.4	35.0	26.3	3.7
TPBBSW-3B		26.6	23.2	16.6	19.6	22.7	23.7	27.4	27.9	29.3	30.9	30.7	30.2	26.0	23.9	22.2	20.4	23.0	24.0	24.9	28.1		9.5	34.8	25.2	4.2
TPBBSW-4B	29.6	26.8				22.7	23.7	27.5	28.2	29.3	31.0	30.9	30.4	26.3	24.1	22.5	20.4	23.2	24.1	25.1	28.1	29.1	15.9	33.7	26.3	3.5
TPBBSW-5B	29.8	27.0				23.2	24.1	27.9	28.4	29.5	31.2	30.9	30.4	26.4	24.3	22.5	20.7	23.4	24.4	25.3	28.6	29.3	15.8	34.5	26.5	3.5
TPBBSW-10B							23.9	27.6	28.0	28.9	31.0	30.8	30.5	26.2	24.1	22.5	20.8	23.3	24.3	25.2	28.4	29.2	14.9	35.2	26.3	3.5
TPBBSW-14B							23.8	27.5	28.1	29.3	31.0	30.9	30.4	26.2	24.0	22.4	20.8	23.3	24.2	25.2	28.1	28.9	16.6	33.9	26.4	3.4
TPSWC-1T	29.6	26.9	23.3	18.6	20.1	23.0	24.6	28.3	29.1	30.2	30.6	30.4	29.7	26.4	24.5	22.8	21.0	23.5	25.3	26.1	28.3	29.3	14.5	33.7	26.0	3.8
TPSWC-1B	28.9	26.1	22.7	17.9	18.6	21.0	23.1	26.8	27.7	28.7	29.2	29.7	29.0	25.7	24.1	22.5	20.1	22.2	24.3	25.2	26.1	27.9	14.7	30.6	24.9	3.6
TPSWC-2T	29.9	27.1	23.5	18.3	20.3	23.2	24.7	28.5	29.1	30.4			29.9	26.7	24.5	22.6	20.8	23.7	25.2	26.1	28.8	29.4	14.1	34.8	25.8	3.8
TPSWC-2B	29.1	26.5	23.1	17.6	18.8	21.7	24.0	27.8	29.1	30.0			29.2	25.8	23.8	22.1	20.0	22.4	24.4	25.6	27.2	28.7	14.0	31.8	25.0	3.9
TPSWC-3T	29.8	27.1	23.5	18.7	20.4	22.9	24.9	28.6	29.0	29.7	30.5	30.6	30.5	26.8	24.6	23.2	21.3	23.5	25.6	26.4	28.6	29.4	15.1	33.6	26.2	3.7
TPSWC-3B	29.5	27.0	23.2	18.1	19.3	21.8	24.5	28.5	30.6	30.1	29.7	30.2	29.9	26.6	24.3	22.7	20.5	22.5	25.0	27.0	27.8	28.9	15.0	32.2	25.8	4.0
TPSWC-4T	29.5	27.1	24.4	22.6	24.3	25.3	25.6	29.3	29.4	30.7	29.8	29.3	29.7	26.9	26.2	24.3	22.9	25.5	25.9	27.0	28.3	29.4	18.2	34.4	26.9	2.8
TPSWC-4B	29.7	27.1	24.4	22.2	24.3	25.6	26.2	30.0	29.7	30.9	29.4	29.4	29.9	26.9	26.0	24.5	23.1	25.3	26.0	27.3	28.1	29.5	17.4	34.5	27.1	2.8
TPSWC-5T	30.1	27.2	23.7	18.8	20.2	23.2	24.4	28.2	29.0	30.0	31.2	31.5	30.8	26.7	24.6			23.8	24.9	26.0	28.3	29.5	13.8	34.5	26.5	3.9
TPSWC-5B	33.6	28.7	28.0	22.3	21.9	23.8	24.3	28.0	28.8	29.7	31.3	31.7	31.9	29.1	28.9	26.2	22.4	23.8	24.7	25.9	27.3	29.9	16.4	34.9	27.4	3.5
TPSWCCS-1B	37.3	33.3	31.4	26.7	31.1	33.8	32.7	35.6	35.7	39.7	40.6	39.7	40.1	33.8	33.0	32.3	33.1	33.9	32.3	33.2	35.7	36.3	18.0	43.8	34.4	3.9
TPSWCCS-2B		29.4	27.5	22.8	25.8	28.3	27.5	30.1	31.6	33.3	35.0	35.2	35.0	30.3		28.2	26.8	28.3	27.1	27.9	30.6	31.3	14.5	38.2	29.7	3.8
TPSWCCS-3B	32.6	28.6	26.6	22.3	24.7	26.7	26.6	29.6	30.6	32.5	34.7	35.1	35.1	29.9	28.4	27.4	26.6	28.3	27.1	28.4	31.1	31.7	14.8	39.8	29.3	4.0
TPSWCCS-4T	31.5	28.0	25.6	20.6	23.4	26.1	26.0	29.1	30.1	31.5	33.3	33.2	33.0	28.1	26.4	25.3	24.2	26.2	26.0	26.9	29.8	30.4	12.4	37.8	27.9	4.0
TPSWCCS-4B	31.5	28.0	25.6	20.6	23.4	26.1	26.0	29.0	30.1	31.6	33.4	33.3	33.0	28.2	26.4	25.3	24.3	26.2	26.0	26.8	29.9	30.4	12.3	37.9	28.0	4.0
TPSWCCS-5T	31.4	28.0	25.5	20.5	23.3	26.0	26.0	29.0	29.9	31.3	33.0		32.8	28.1	26.3	25.2	24.1	26.0	26.3	26.8	29.8	30.4	12.8	37.0	27.5	3.7
TPSWCCS-5B	31.0	28.1	26.6	23.1	23.6	25.7	25.9		27.9	29.6	31.6		32.3	28.3	26.8	25.4	24.5	26.0		26.8	29.6	30.3	18.9	33.8	27.5	2.8
TPSWCCS-6T		27.7	25.1	20.1	22.8	25.6	25.8	28.9	29.8	31.0	32.7	32.7	32.4	27.8	26.0	24.7	23.8	25.5	26.4	26.8	29.4	30.1	12.5	35.7	27.4	3.8
TPSWCCS-6B		27.7	25.1	20.1	22.8	25.6	25.8	28.9	29.8	31.0	32.6			27.8	26.0	24.8	23.8	25.6	25.8	26.7	29.3	30.0	12.4	35.7	26.9	3.5
TPSWCCS-7B	34.6	30.6	28.9	24.4	27.9	30.2	29.2	32.0	32.8	35.6	37.3	37.4	37.2	31.5	30.3	29.5	29.2	30.6	29.0	30.2	32.8	33.5	15.7	42.6	31.6	4.0
TPSWID-1T	30.2	27.1	24.3	20.0	22.4	24.1	26.3	28.6	28.3	30.1	31.9	31.5	30.4	27.0	24.9	23.9	24.1	24.7	25.6	26.5	28.9	30.0	16.8	36.3	26.9	3.4
TPSWID-1B	29.7	26.6	23.8	19.6	25.2	25.5	26.8	27.9	28.1	29.5	31.4	32.1	30.2	26.3	24.3	25.3	26.0	25.6	26.0	29.3	30.4	29.4	16.8	33.9	27.3	3.1
TPSWID-2T	29.5	27.0	24.6	21.5	23.4	24.5	25.2	28.0	28.8	30.2	31.2	30.6	29.8	26.7	25.1	24.3	24.0	24.7	25.5	26.3	28.3	29.3	18.8	33.6	26.8	2.9
TPSWID-2B	27.5	26.8	24.6	21.3	25.3	25.8	26.7	27.4	29.1	29.9	31.0	31.7	30.2	28.6	25.6	26.6	28.2	27.5	25.9	28.2	28.1	28.2	18.8	32.5	27.5	2.4
TPSWID-3T	29.8	27.3	24.7	21.5	22.8	24.7	25.2	28.1	28.8	30.7	31.7	30.8	30.2	26.9	25.3	23.8	22.6	24.5	25.8	26.4	28.5	29.6	17.0	34.4	26.8	3.1
TPSWID-3B	28.2	26.6	24.3	21.0	22.3	24.2	25.0	27.5	28.0	29.5	31.4	30.2	29.3	26.5	24.9	23.7	25.3	24.5	25.5	27.3	27.7	28.9	18.1	33.8	26.5	2.8

Key:
°C = Degrees Celsius.
Avg = Average.
Max = Maximum.
Min = Minimum.
Std Dev = Standard Deviation.

Table 2.2-4. Statistical Summary of Automated Surface Water Salinity (PSS-78) Data

	2010 Avg Monthly Value				2011 Avg Monthly Value												2012 Avg Monthly Value						Monitoring Period			
Well	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Min	Max	Avg	Std Dev
TPBBSW-1B	30.2	28.0					35.7	38.6	40.6	44.3	39.5	38.4	35.3	30.1	23.2	25.3	29.4	29.3	33.3	37.0	33.9	29.2	13.9	46.4	33.3	6.0
TPBBSW-2B	27.1	22.2				33.1	37.0	38.0	40.5	42.3	38.0	39.0	35.8	27.7	22.4	24.2	28.2	30.1	35.7	37.1	33.3	28.8	15.9	44.8	32.3	6.6
TPBBSW-3B		24.5	27.0	30.8	32.1	32.8	36.9	37.9	39.5	41.5	38.1	38.0	36.2	29.0	24.8	26.9	29.9	31.8	36.2	37.4	34.6		18.0	43.7	33.2	5.3
TPBBSW-4B	31.7	26.4				32.5	35.9	36.9	39.4	40.9	38.6	39.1	37.1	31.8	26.8			33.5	35.4	36.8	32.9	30.0	23.1	42.3	34.1	4.5
TPBBSW-5B	28.7	24.2				29.8	34.6	36.0	40.4	42.0	39.0	38.5	35.8	29.9	25.9	28.8	30.5	31.9	34.8	36.2	29.5	26.2	20.4	44.3	32.5	5.4
TPBBSW-10B							35.1	38.6	40.4	42.8	36.2	37.5	33.2	23.8	20.1	21.2	27.8	28.3	32.5	36.8	32.9	26.5	11.4	44.5	31.9	7.0
TPBBSW-14B							27.4	28.3	30.0	31.2	30.1	30.7	29.5	27.2	23.5	23.5	24.5	26.5	32.5	34.7	31.2	26.0	22.8	36.8	28.5	3.3
TPSWC-1T	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.7	1.0	0.8	0.4	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.4	0.3	0.2	1.9	0.4	0.2
TPSWC-1B	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.7	1.4	0.9	0.7	0.4	0.4	0.4	0.3	0.4	0.5	0.6	0.5	0.5	0.2	1.7	0.5	0.3
TPSWC-2T	0.3	0.2	0.3	0.4	0.5	0.4	0.7	0.8	1.6	3.1			0.3	0.2	0.2	0.3	0.5	0.5	0.5	0.7	0.4	0.3	0.1	3.4	0.6	0.7
TPSWC-2B	0.3	0.2	0.3	0.5	0.5	0.4	0.7	0.9	2.3	3.6			0.3	0.2	0.2	0.3	0.5	0.5	0.5	0.7	0.4	0.3	0.1	5.4	0.7	0.9
TPSWC-3T	0.2	0.2	0.3	0.6	0.6	0.6	1.0	1.3	1.9	2.9	0.8	0.5	0.3	0.2	0.3	0.4	0.7	0.6	0.6	1.2	0.4	0.3	0.1	3.2	0.7	0.6
TPSWC-3B	0.2	0.2	0.3	0.6	0.7	0.6	1.2	2.6	10.9	10.5	3.1	0.7	0.3	0.2	1.5	0.6	1.1	1.0	0.9	7.1	4.2	0.6	0.1	14.0	2.2	3.3
TPSWC-4T	3.7	0.8	5.6	20.1	22.4	19.3	21.1	28.8	39.3	41.6	36.9		14.6	6.9	15.8	23.0	24.2	25.5	25.9	30.2	19.2	13.4	0.0	51.8	20.2	12.6
TPSWC-4B	7.2	1.8	9.1	24.8	25.5	23.1	27.9	33.2	40.1	42.1	37.9	26.7	18.4	8.5	19.5	25.4	27.7	30.0	30.3	32.7	21.8	16.0	0.2	50.0	23.9	13.1
TPSWC-5T	29.8	25.6	27.6	31.9	31.2	31.3	35.8	38.1	39.8	41.1	37.5	38.9	36.0	31.2	26.0			34.3	35.5	37.1	30.8	28.1	17.5	42.0	33.5	4.8
TPSWC-5B	41.6	45.4	44.5	36.7	35.2	34.2	36.0	38.0	39.7	41.9	41.9	40.6	40.1	40.2	39.3	36.2	35.4	35.6	35.7	36.5	35.5	39.0	28.2	49.1	38.6	3.4
TPSWCCS-1B	55.8	45.0	43.7	43.1	48.3	53.5	55.0		57.3	59.4	58.1		60.2	53.2	49.2	57.7	57.0	56.5	63.5	63.8	50.2	48.5	36.9	67.7	54.0	6.8
TPSWCCS-2B		61.47	56.83	54.30	54.69	54.92	59.55	61.00	56.97	59.05	60.56	61.22	57.02	56.30		55.54	57.00	60.83	60.25	59.57	57.29	57.28	44.24	63.69	58.25	2.91
TPSWCCS-3B	53.32	43.00	42.61	48.20	49.54	53.70	53.72	55.54	54.67	59.87	58.82	60.24	58.63	51.82	52.25	55.72	56.35	55.50			50.78	48.14	36.72	65.19	53.40	5.62
TPSWCCS-4T	57.97	47.79	44.76	50.44	52.31	55.74	57.40	60.32	59.43	62.83	59.06	61.18	58.69	52.46	54.31	59.38	62.86	59.97	64.79	63.36	52.05	49.75	37.65	68.25	56.63	5.81
TPSWCCS-4B	55.46	45.11	43.94	49.43	52.08	55.50	57.60	60.55	59.55	63.50	59.72	61.34	58.32	52.38	54.90	60.37	62.70	59.40	63.97	62.84	52.89	49.70	36.32	67.20	56.41	6.08
TPSWCCS-5T	56.92	45.81	44.16	49.44	51.31	54.92	56.88	58.33	58.25	61.24	57.69		58.67			59.71	61.98		60.00	61.40	50.57	49.34	39.25	67.19	55.38	5.78
TPSWCCS-5B	53.63		44.79	44.20									48.15		48.82						52.86	49.37	35.08	58.98	48.30	4.35
TPSWCCS-6T		47.17	44.58	50.19	52.26	54.19	55.80	59.04	57.94	60.86	57.72	59.74	58.38	53.34	54.59	59.52	61.73	58.88	64.61	63.88	52.87	49.28	40.57	67.77	55.93	5.46
TPSWCCS-6B		47.11	44.43	49.67	52.10	55.08	57.39	59.89	58.85	61.23	57.41			52.55	54.03	58.81	61.48	58.57	64.22	64.71	53.51	50.33	40.58	68.60	55.92	5.77
TPSWCCS-7B	55.28	42.99	42.49	48.40	50.14	53.68	52.04	50.72									52.89	50.43			49.10	45.69	35.99	62.09	49.64	4.58
TPSWID-1T	1.96	1.43	1.21	1.72	5.04	4.00	12.18	10.90	15.67	23.69	14.20	5.23	5.42	2.43	1.54	4.65	15.09	6.94	4.35	6.67	3.30	1.61	1.10	30.08	6.70	6.19
TPSWID-1B	2.0	1.5	1.2	1.7	10.3	8.2	14.6	16.5	19.3	27.0	18.0	7.7	10.6	3.1	2.0	7.8	19.9	13.3	7.6	17.3	9.7	2.0	1.1	31.9	10.0	7.6
TPSWID-2T	1.3	0.9	1.2	2.0	2.3	2.5	5.5	6.8	19.2	27.5	9.9	1.9	3.1	1.2	1.3	2.3	8.4	4.7	3.0	4.5	2.6	1.4	0.7	37.4	5.1	6.7
TPSWID-2B	3.4	2.1	1.9	2.1	5.7	5.8	28.2	27.2	39.2	45.0	44.1	23.4	23.5	8.2	3.1	9.4	40.1	24.0	7.0	26.4	9.6	4.1	1.1	47.6	17.3	15.6
TPSWID-3T	1.0	0.7	0.9	1.7	2.0	2.2	2.3	2.6	19.5	33.5	9.9	3.1	2.2	1.3	1.1	2.0	5.6	3.8	2.6	5.5	2.3	1.3	0.6	42.7	4.4	7.6
TPSWID-3B	1.3	0.8	0.9	1.7	2.0	2.2	3.3	4.6	37.3	44.2	16.9	3.2	3.2	1.6	1.1	2.6	16.0	6.1	3.3	17.4	2.7	1.4	0.6	45.9	7.8	12.5

Key:
Avg = Average.
Max = Maximum.
Min = Minimum.
Min = Minimum.
PSS-78 = Practical Salinity Scale of 1978.
Std Dev = Standard Deviation.

Table 2.4-1. Parameters Collected at 15-Minute Intervals Reported by the Meteorological Station at TPM-1

Parameter	Units	Accuracy	Resolution
Rainfall – Amount	inches	Better than 5%, weather dependent	0.001
Relative Humidity	%	± 3	0.1
Temperature	°Celsius	± 0.3	± 0.1
Barometric Pressure	mmHg	0.5	0.5
Wind Speed- Average	mph	1 ft/sec	0.3 ft/sec
Wind Speed- Gusts and Lull	mph	1 ft/sec	0.3 ft/sec
Wind Direction	degrees	± 3	1
Light Level	µmol m^{-2} s^{-1}	5-10 µA/100 µmol m^{-2} s^{-1}	NA
Hail	Hits	1	1

Key:
ft/sec = Feet per second.
mmHg = Millimeters of mercury.
mph = Miles per hour.
NA = Not applicable.
µmol m^{-2} s^{-1} = Micromoles per meter square per second.

Table 2.4-2. Rainfall Recorded at the Meteorological Station TPM-1

Month	Day	Year	Rain (in)
7	27	2010	0.001
7	30	2010	0.001
8	3	2010	0.341
8	5	2010	0.13
8	8	2010	0.984
8	9	2010	3.075
8	10	2010	1.215
8	11	2010	0.001
8	15	2010	0.007
8	16	2010	0.214
8	17	2010	0.007
8	20	2010	0.16
8	21	2010	0.06
8	22	2010	0.217
8	23	2010	0.375
8	24	2010	0.02
8	26	2010	0.019
8	27	2010	0.351
8	28	2010	0.213
8	29	2010	0.084
8	30	2010	1.46
8	31	2010	0.014
9	1	2010	0.098
9	3	2010	0.479
9	4	2010	0.002
9	5	2010	0.168
9	6	2010	1.569
9	7	2010	0.114
9	8	2010	1.38
9	9	2010	0.005
9	10	2010	0.002
9	14	2010	0.004
9	15	2010	0.006
9	16	2010	0.119
9	17	2010	0.117
9	18	2010	0.041
9	19	2010	0.036
9	22	2010	0.016

Month	Day	Year	Rain (in)
9	23	2010	1.354
9	24	2010	0.019
9	25	2010	0.017
9	26	2010	0.112
9	27	2010	0.113
9	28	2010	0.363
9	29	2010	7.344
9	30	2010	0.008
10	6	2010	0.004
10	12	2010	0.57
10	13	2010	0.198
10	14	2010	0.063
10	17	2010	0.003
10	23	2010	0.303
10	24	2010	0.027
10	25	2010	0.088
10	26	2010	0.001
10	27	2010	0.140
10	28	2010	0.022
10	29	2010	0.898
10	31	2010	0.006
11	1	2010	0.053
11	3	2010	4.358
11	4	2010	0.854
11	5	2010	0.005
11	11	2010	0.002
11	12	2010	0.001
11	18	2010	0.079
11	22	2010	0.019
11	23	2010	0.021
11	24	2010	0.102
11	27	2010	0.008
11	29	2010	0.001
12	1	2010	0.008
12	5	2010	0.005
12	9	2010	0.075
12	12	2010	0.045
12	18	2010	0.221

Table 2.4-2. Rainfall Recorded at the Meteorological Station TPM-1

Month	Day	Year	Rain (in)
12	26	2010	0.182
1	3	2011	0.002
1	6	2011	0.061
1	8	2011	0.002
1	17	2011	2.829
1	19	2011	0.028
1	21	2011	0.005
1	24	2011	0.016
1	26	2011	0.584
2	11	2011	0.063
2	12	2011	0.131
2	14	2011	0.001
2	17	2011	0.034
2	24	2011	0.001
2	25	2011	0.006
3	2	2011	0.155
3	4	2011	0.004
3	5	2011	0.152
3	10	2011	0.329
3	18	2011	0.002
3	19	2011	0.002
3	20	2011	0.001
3	21	2011	0.111
3	22	2011	0.037
3	28	2011	0.55
3	29	2011	0.3
4	1	2011	0.449
4	5	2011	0.138
4	7	2011	0.001
4	13	2011	1.184
4	17	2011	0.069
4	25	2011	0.001
4	29	2011	0.001
4	30	2011	0.005
5	1	2011	0.01
5	3	2011	0.001
5	6	2011	0.151
5	7	2011	0.001

Month	Day	Year	Rain (in)
5	8	2011	0.019
5	10	2011	0.001
5	11	2011	0.037
5	12	2011	0.018
5	13	2011	0.074
5	14	2011	0.022
5	15	2011	0.298
5	16	2011	0.009
5	17	2011	0.024
5	18	2011	0.858
5	19	2011	0.02
5	20	2011	0.004
5	21	2011	0.005
5	22	2011	0.006
5	23	2011	0.001
5	24	2011	0.003
5	25	2011	0.001
5	26	2011	0.045
5	27	2011	0.073
5	28	2011	0.131
5	29	2011	0.124
5	30	2011	0.266
5	31	2011	0.201
6	1	2011	0.008
6	2	2011	0.141
6	3	2011	0.007
6	5	2011	0.001
6	6	2011	0.019
6	16	2011	0.055
6	17	2011	0.055
6	18	2011	0.085
6	19	2011	0.003
6	20	2011	0.164
6	21	2011	0.082
6	22	2011	0.012
6	23	2011	0.001
6	24	2011	0.006
6	25	2011	0.102

Table 2.4-2. Rainfall Recorded at the Meteorological Station TPM-1

Month	Day	Year	Rain (in)
6	26	2011	0.055
6	27	2011	0.100
6	28	2011	0.028
6	29	2011	0.605
6	30	2011	0.050
7	1	2011	0.064
7	2	2011	0.530
7	3	2011	0.048
7	4	2011	0.004
7	5	2011	0.330
7	6	2011	1.520
7	7	2011	3.874
7	8	2011	0.001
7	9	2011	0.008
7	10	2011	0.001
7	11	2011	0.394
7	12	2011	0.003
7	13	2011	0.380
7	15	2011	0.002
7	16	2011	0.002
7	17	2011	0.248
7	18	2011	1.343
7	19	2011	0.905
7	20	2011	0.140
7	21	2011	0.308
7	22	2011	0.047
7	23	2011	0.003
7	24	2011	0.103
7	25	2011	0.015
7	26	2011	0.001
7	27	2011	0.038
7	28	2011	0.146
7	29	2011	0.183
8	1	2011	0.003
8	2	2011	0.026
8	3	2011	0.255
8	5	2011	0.001
8	6	2011	1.472
8	7	2011	0.627
8	8	2011	0.968
8	9	2011	0.009
8	10	2011	0.028
8	11	2011	0.058
8	12	2011	0.070
8	13	2011	0.080
8	14	2011	0.599
8	15	2011	0.550
8	16	2011	0.116
8	17	2011	0.001
8	18	2011	0.033
8	19	2011	0.452
8	20	2011	0.098
8	21	2011	0.010
8	22	2011	0.170
8	23	2011	0.004
8	24	2011	0.007
8	25	2011	0.301
8	26	2011	0.301
8	27	2011	0.224
8	29	2011	0.684
8	30	2011	2.080
9	1	2011	0.017
9	2	2011	1.758
9	3	2011	0.003
9	8	2011	0.206
9	9	2011	0.022
9	10	2011	0.001
9	12	2011	0.359
9	13	2011	0.339
9	14	2011	0.006
9	16	2011	0.003
9	18	2011	0.057
9	19	2011	0.199
9	20	2011	0.004
9	21	2011	0.127
9	22	2011	1.472

Table 2.4-2. Rainfall Recorded at the Meteorological Station TPM-1

Month	Day	Year	Rain (in)
9	23	2011	0.684
9	25	2011	1.182
9	26	2011	0.148
9	27	2011	0.196
9	29	2011	0.006
9	30	2011	0.144
10	6	2011	0.008
10	7	2011	0.460
10	8	2011	6.333
10	9	2011	0.073
10	10	2011	0.016
10	11	2011	0.010
10	12	2011	0.010
10	13	2011	0.019
10	15	2011	1.053
10	16	2011	1.633
10	17	2011	0.382
10	18	2011	0.350
10	19	2011	1.330
10	22	2011	0.002
10	23	2011	0.003
10	28	2011	0.619
10	29	2011	0.139
10	30	2011	0.007
11	1	2011	0.021
11	2	2011	0.010
11	4	2011	0.004
11	5	2011	0.117
11	6	2011	0.032
11	7	2011	0.004
11	8	2011	0.002
11	9	2011	0.006
11	13	2011	0.003
11	15	2011	0.001
11	17	2011	0.014
11	18	2011	0.052
11	19	2011	0.013
11	20	2011	0.037
11	29	2011	0.001
12	1	11	0.001
12	2	11	0.003
12	4	11	0.035
12	5	11	0.043
12	7	11	0.043
12	9	11	0.061
12	10	11	0.164
12	12	11	0.001
12	13	11	0.164
12	14	11	0.013
12	16	11	0.001
12	17	11	0.007
12	18	11	0.016
12	21	11	0.003
12	22	11	0.002
12	23	11	0.001
12	27	11	0.001
12	31	11	0.001
1	2	12	0.001
1	4	12	0.022
1	5	12	0.001
1	7	12	0.004
1	10	12	0.005
1	11	12	0.009
1	12	12	0.067
1	13	12	0.283
1	14	12	0.001
1	17	12	0.006
1	18	12	0.012
1	19	12	0.013
1	21	12	0.005
1	22	12	0.001
1	23	12	0.004
1	25	12	0.001
1	26	12	0.001
1	28	12	0.017
1	29	12	0.996

Table 2.4-2. Rainfall Recorded at the Meteorological Station TPM-1

Month	Day	Year	Rain (in)
1	30	12	0.004
2	1	12	0.001
2	2	12	0.009
2	3	12	0.003
2	4	12	0.001
2	5	12	0.140
2	6	12	1.861
2	7	12	0.443
2	9	12	1.007
2	10	12	1.789
2	11	12	0.475
2	13	12	0.003
2	15	12	0.002
2	20	12	0.001
2	22	12	0.003
2	24	12	0.001
2	25	12	0.168
2	26	12	0.001
2	28	12	0.017
2	29	12	0.012
3	1	12	0.003
3	3	12	0.005
3	4	12	0.167
3	5	12	0.007
3	7	12	0.088
3	8	12	0.078
3	9	12	0.002
3	10	12	0.005
3	11	12	0.069
3	12	12	0.074
3	14	12	0.026
3	15	12	0.120
3	16	12	0.009
3	17	12	0.001
3	18	12	0.004
3	19	12	0.212
3	21	12	0.003
3	22	12	0.001
3	23	12	0.003
3	25	12	0.002
3	26	12	0.002
3	27	12	0.087
3	28	12	0.001
3	30	12	0.012
3	31	12	0.002
4	1	12	0.008
4	2	12	0.002
4	5	12	0.734
4	6	12	0.002
4	7	12	0.004
4	9	12	0.001
4	10	12	0.003
4	13	12	0.001
4	14	12	2.235
4	15	12	0.004
4	16	12	0.015
4	17	12	0.026
4	18	12	0.002
4	19	12	0.003
4	21	12	3.482
4	22	12	0.405
4	23	12	0.002
4	24	12	0.015
4	25	12	0.012
4	26	12	0.004
4	27	12	0.009
4	28	12	1.185
4	29	12	1.889
4	30	12	2.444
5	1	12	0.004
5	4	12	0.003
5	6	12	0.010
5	7	12	0.012
5	8	12	0.425
5	10	12	0.003
5	11	12	0.013

Table 2.4-2. Rainfall Recorded at the Meteorological Station TPM-1

Month	Day	Year	Rain (in)
5	12	12	0.005
5	13	12	0.003
5	15	12	0.005
5	16	12	0.081
5	17	12	2.308
5	18	12	0.119
5	19	12	0.611
5	20	12	0.688
5	21	12	0.007
5	22	12	0.904
5	23	12	0.186
5	24	12	2.896
5	25	12	0.045
5	26	12	0.026
5	27	12	0.052
5	28	12	0.104
5	29	12	0.171
5	30	12	0.138
5	31	12	0.594
6	1	2012	1.298
6	2	2012	0.209
6	3	2012	0.182
6	4	2012	0.264
6	5	2012	0.167
6	6	2012	0.096
6	7	2012	0.226
6	8	2012	0.161
6	9	2012	0.28
6	10	2012	0.164
6	11	2012	0.083
6	12	2012	0.097
6	13	2012	0.079
6	14	2012	0.315
6	15	2012	0.28
6	16	2012	0.051
6	17	2012	0.001
6	18	2012	0.004
6	19	2012	0.066
6	20	2012	2.167
6	21	2012	0.785
6	22	2012	0.573
6	23	2012	1.035
6	24	2012	0.006
6	25	2012	0.001
6	26	2012	0.001
6	27	2012	0.022
6	28	2012	0.174
6	29	2012	0.113
6	30	2012	0.001

Table 2.4-3. Total Rain Days and Rainfall Amounts Recorded Monthly at Each Station

Month	TPM-1		TPRF-2		TPRF-11		TPRF-4		TPRF-12		LU-South		LU-NEast	
	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount
Aug-10	20	8.95	NA	NA	NA	NA			NA	NA	NA	NA	25	6.85
Sep-10	24	13.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14	12.05
Oct-10	13	2.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26	6.92
Nov-10	12	5.50	5	0.25	4	0.13	NA	NA	NA	NA	6	6.12	24	2.47
Dec-10	6	0.54	3	0.42	0	0.00	NA	NA	NA	NA	6	1.00	7	1.27
Jan-11	8	3.53	4	4.01	3	0.46	NA	NA	NA	NA	4	2.81	3	3.19
Feb-11	6	0.24	3	0.16	3	0.15	NA	NA	NA	NA	3	0.11	5	1.09
Mar-11	11	1.64	6	2.07	6	1.40	NA	NA	NA	NA	4	1.13	6	2.62
Apr-11	8	1.85	6	2.83	6	1.39	NA	NA	NA	NA	1	0.06	2	0.26
May-11	27	2.40	8	0.91	6	1.06	NA	NA	NA	NA	5	0.37	7	1.37
Jun-11	20	1.58	12	2.75	9	1.93	NA	NA	NA	NA	6	0.42	10	2.86
Jul-11	29	10.64	15	10.69	15	6.99	NA	NA	NA	NA	19	8.47	18	5.79
Aug-11	29	9.24	NA	NA	20	5.44	NA	NA	NA	NA	23	6.32	23	7.96
Sep-11	21	6.93	NA	NA	15	4.44	19	4.77	NA	NA	15	4.95	12	1.89
Oct-11	19	13.25	NA	NA	14	7.07	6	6.44	NA	NA	12	14.5	12	3.60
Nov-11	18	0.32	NA	NA	5	0.23	NA	NA	NA	NA	5	0.61	6	0.27
Dec-11	18	0.56	4	0.13	7	0.68	8	0.84	NA	NA	8	1.32	7	1.52
Jan-12	20	1.45	5	0.70	NA	NA	3	0.66	NA	NA	6	0.92	3	0.11
Feb-12	19	5.94	11	0.19	NA	NA	8	7.28	NA	NA	8	5.42	9	3.81
Mar-12	25	0.98	8	0.79	NA	NA	8	0.94	8	1.95	7	1.25	10	1.31

Table 2.4-3. Total Rain Days and Rainfall Amounts Recorded Monthly at Each Station

Month	TPM-1		TPRF-2		TPRF-11		TPRF-4		TPRF-12		LU-South		LU-NEast	
	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount	# of Rain Days	Amount
Apr-12	24	12.49	16	1.83	NA	NA	7	11.45	8	8.43	9	11.69	8	10.89
May-12	26	9.41	21	0.62	NA	NA	7	3.94 *	12	7.14	12	4.39	15	9.00
Jun-12	30	8.90	19	4.12	NA	NA	NA	NA	18	4.63	NA	NA	NA	NA

Note: * Data available 5/1/2012 through 5/21/2012.

Table 2.4-4. Dates of Daily Rainfall Greater Than 1" in a 24-Hour Period for All Stations

Month	Date	Year	TPM-1	TPRF-2	TPRF-11	TPRF-12	TPRF-4	LU-South	LU-NEast
8	9	2010	3.08	NA	NA	NA	NA	NA	1.47
8	10	2010	1.22	NA	NA	NA	NA	NA	0.11
8	30	2010	1.46	NA	NA	NA	NA	NA	0.81
9	6	2010	1.57	NA	NA	NA	NA	0.89	1.19
9	8	2010	1.38	NA	NA	NA	NA	1.29	0.51
9	23	2010	1.35	NA	NA	NA	NA	NA	0.38
9	29	2010	7.34	NA	NA	NA	NA	NA	4.53
11	3	2010	4.36	NA	NA	NA	NA	5.39	0.83
1	17	2011	2.83	3.29	0.00	NA	NA	2.48	3.15
4	13	2011	1.18	0.32	1.01	NA	NA	NA	0.75
6	29	2011	0.61	1.96	0.47	NA	NA	0.00	0.00
7	6	2011	1.52	2.50	0.89	NA	NA	2.27	0.35
7	7	2011	3.87	3.39	3.89	NA	NA	2.95	2.83
7	18	2011	1.34	2.51	0.20	NA	NA	1.26	0.31
8	6	2011	1.47	0.39	0.28	NA	NA	0.23	1.37
8	8	2011	0.97	1.55	0.40	NA	NA	0.63	1.27
8	15	2011	0.55	0.01	0.41	NA	NA	1.30	0.05
8	30	2011	2.08	NA	1.48	NA	NA	1.01	0.21
9	9	2011	1.76	NA	0.35	NA	NA	1.27	0.16
9	22	2011	1.47	NA	0.17	NA	0.79	0.00	0.00
9	25	2011	1.18	NA	1.05	NA	1.04	0.00	0.00
10	8	2011	6.33	NA	2.44	NA	3.86	8.05	1.37



Table 2.4-4. Dates of Daily Rainfall Greater Than 1" in a 24-Hour Period for All Stations

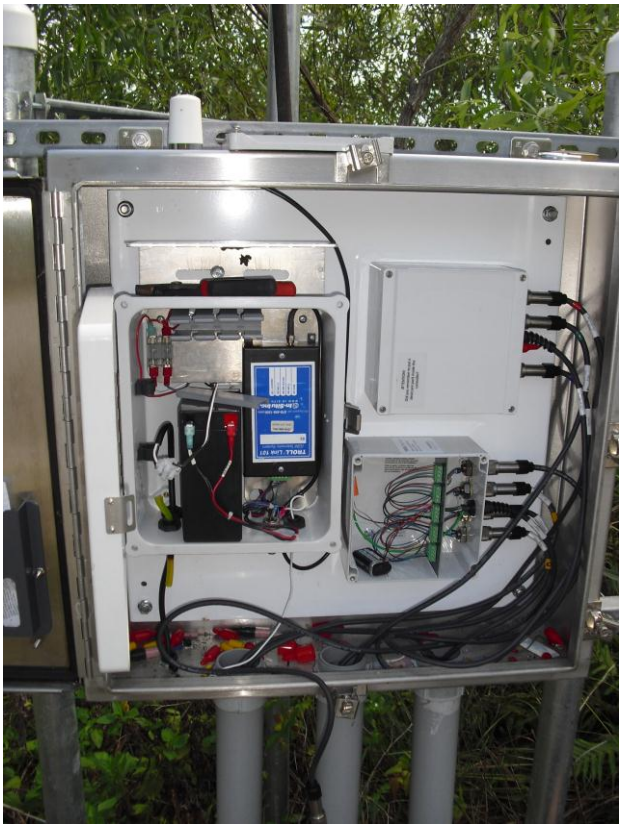
Month	Date	Year	TPM-1	TPRF-2	TPRF-11	TPRF-12	TPRF-4	LU-South	LU-NEast
10	15	2011	1.05	NA	0.45	NA	1.20	1.25	0.38
10	16	2011	1.63	NA	1.06	NA	1.23	1.27	0.53
10	19	2011	1.33	NA	0.92	NA	NA	0.90	0.24
10	31	2011	0.00	NA	0.53	NA	NA	1.27	1.06
3	6	2012	1.86	NA	0.00	0.00	0.00	0.00	0.35
3	9	2012	1.01	NA	0.03	0.00	0.00	0.03	0.00
3	10	2012	1.79	NA	NA	0.00	0.00	0.00	0.00
4	14	2012	2.24	0.56	NA	0.62	1.35	1.92	1.58
4	21	2012	3.48	0.33	NA	3.15	2.61	2.89	2.95
4	28	2012	1.19	0.01	NA	0.94	1.58	1.07	0.90
4	29	2012	1.89	0.02	NA	1.85	2.57	2.70	1.84
4	30	2012	2.44	0.04	NA	1.42	2.57	2.25	3.04
5	17	2012	2.31	0.00	NA	1.60	1.66	1.95	1.96
5	24	2012	2.90	0.16	NA	1.85	NA	0.34	2.43
6	1	2012	1.30	0.01	NA	1.02	NA	NA	NA
6	20	2012	2.17	1.89	NA	2.28	NA	NA	NA
6	23	2012	1.04	0.75	NA	NA	NA	NA	NA

Key:
LU = Land Use.
NA = Not Available.
TPM1 = Turkey Point Meteorological Station.
TPRF = Turkey Point Rainfall Gauge.

FIGURES



Land-based station.



Typical control panel and telemetry system.



Typical automated probe and cable.



Biscayne Bay station.

Figure 2.1-1. Automated Groundwater Stations.

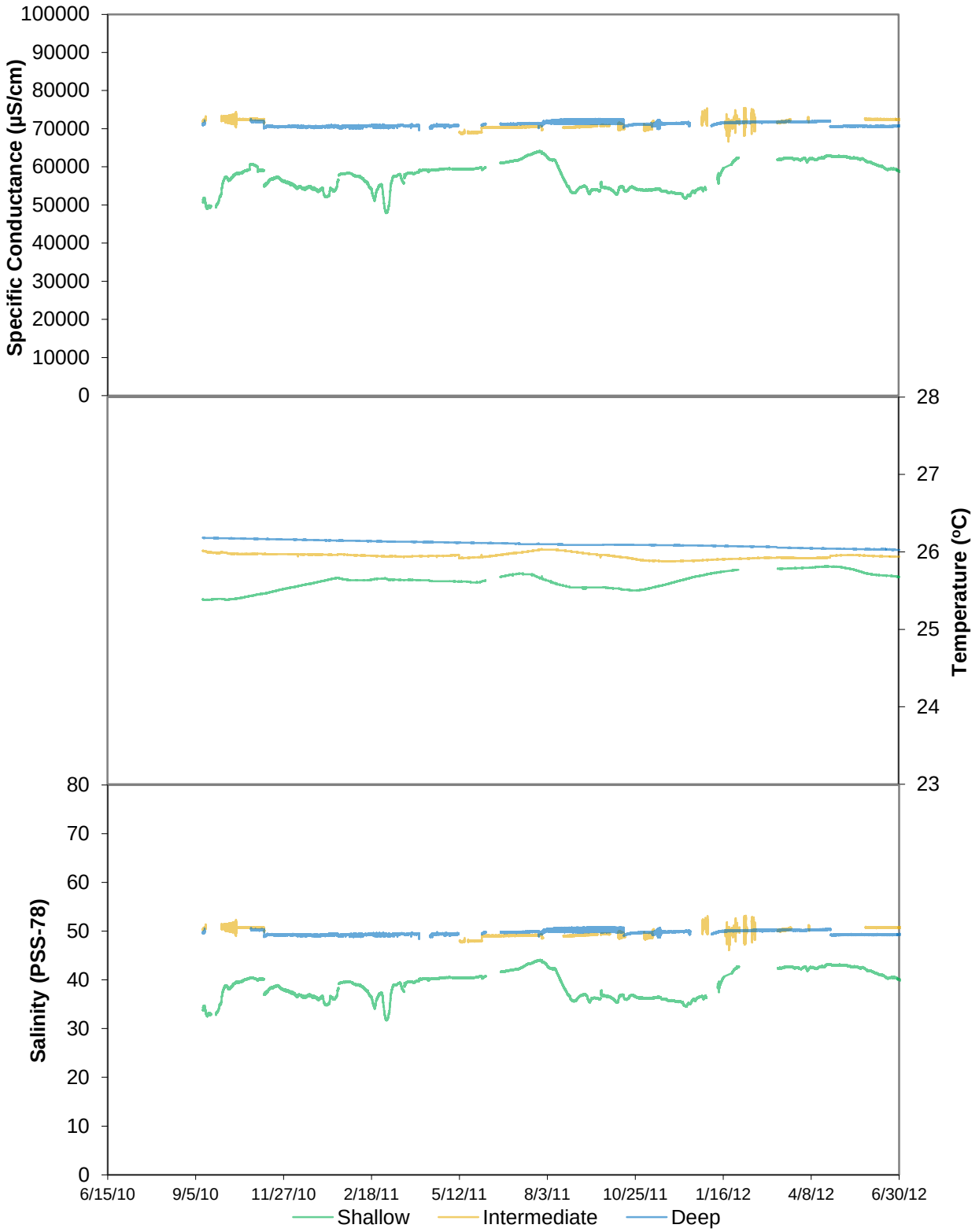


Figure 2.1-2. TPGW-1 Specific Conductance, Temperature, and Salinity.

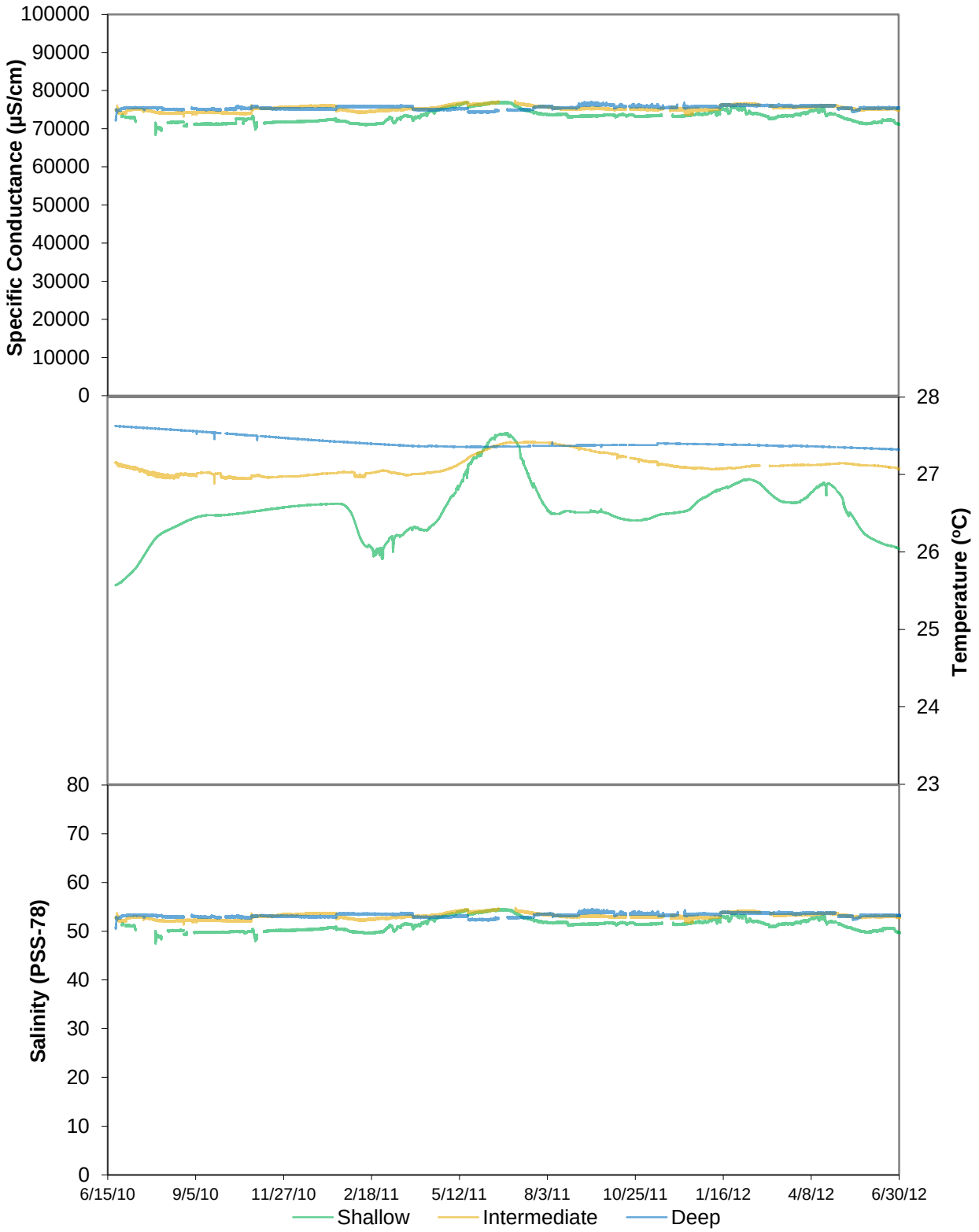


Figure 2.1-3. TPGW-2 Specific Conductance, Temperature, and Salinity.

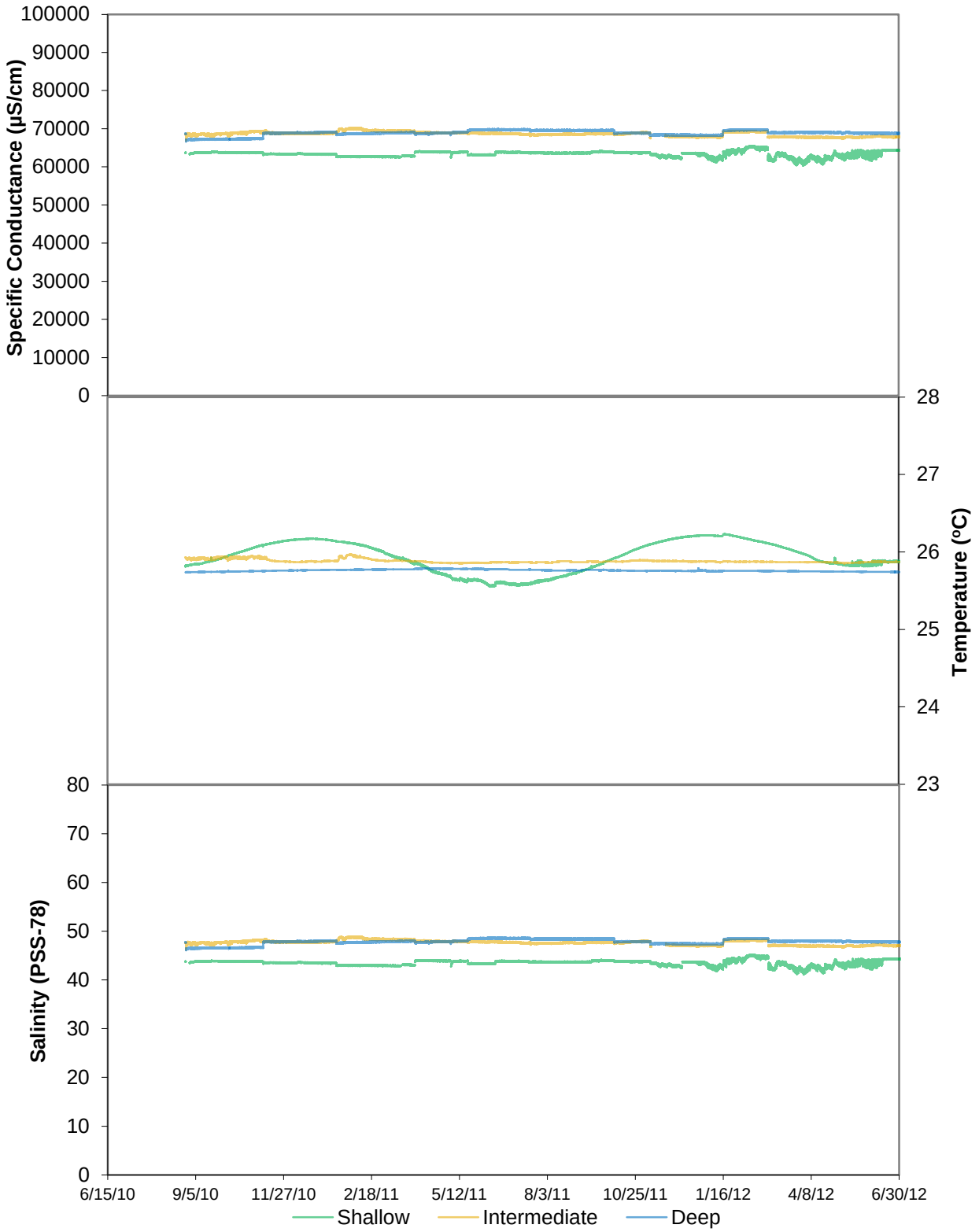


Figure 2.1-4. TPGW-3 Specific Conductance, Temperature, and Salinity.

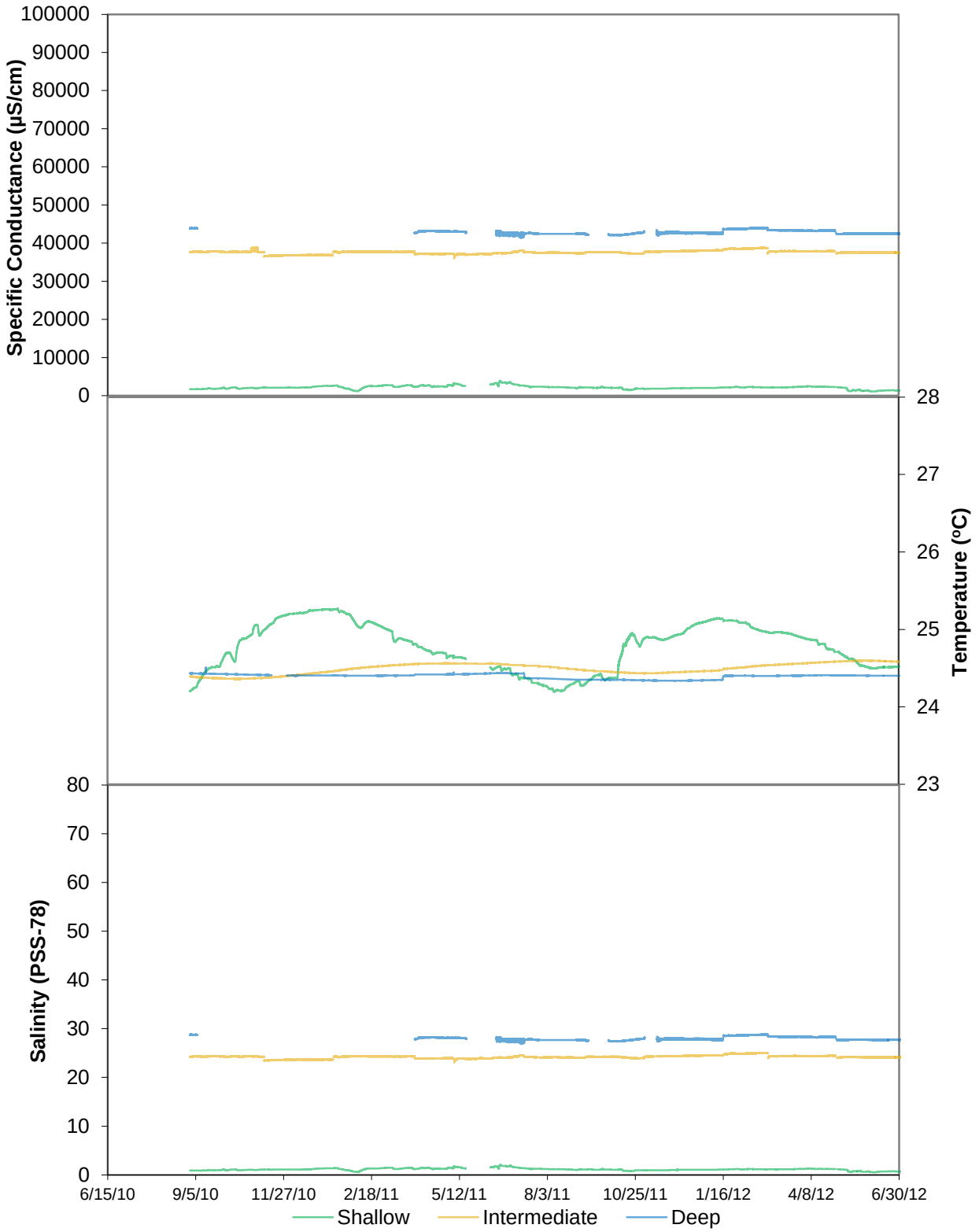


Figure 2.1-5. TPGW-4 Specific Conductance, Temperature, and Salinity.

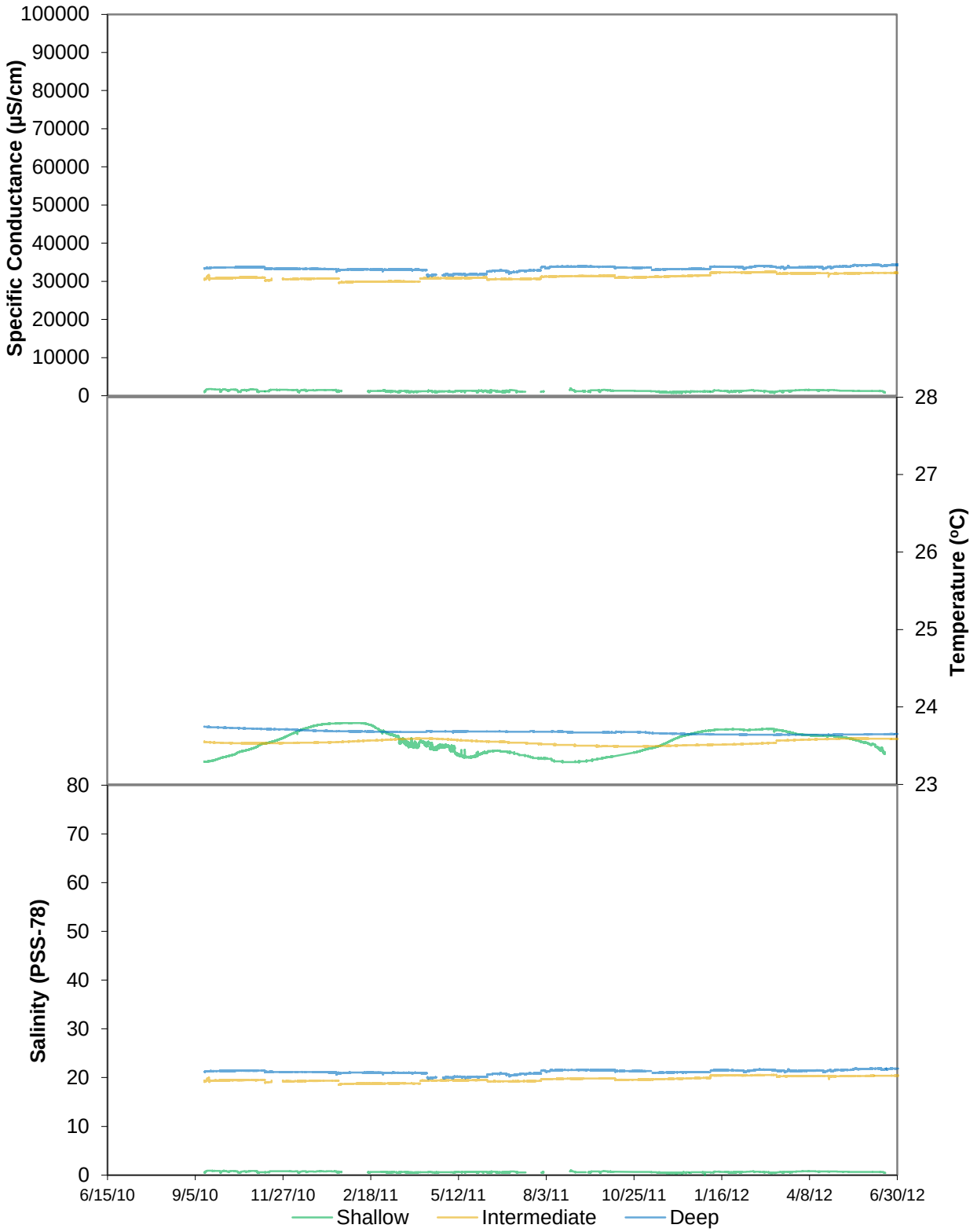


Figure 2.1-6. TPGW-5 Specific Conductance, Temperature, and Salinity.

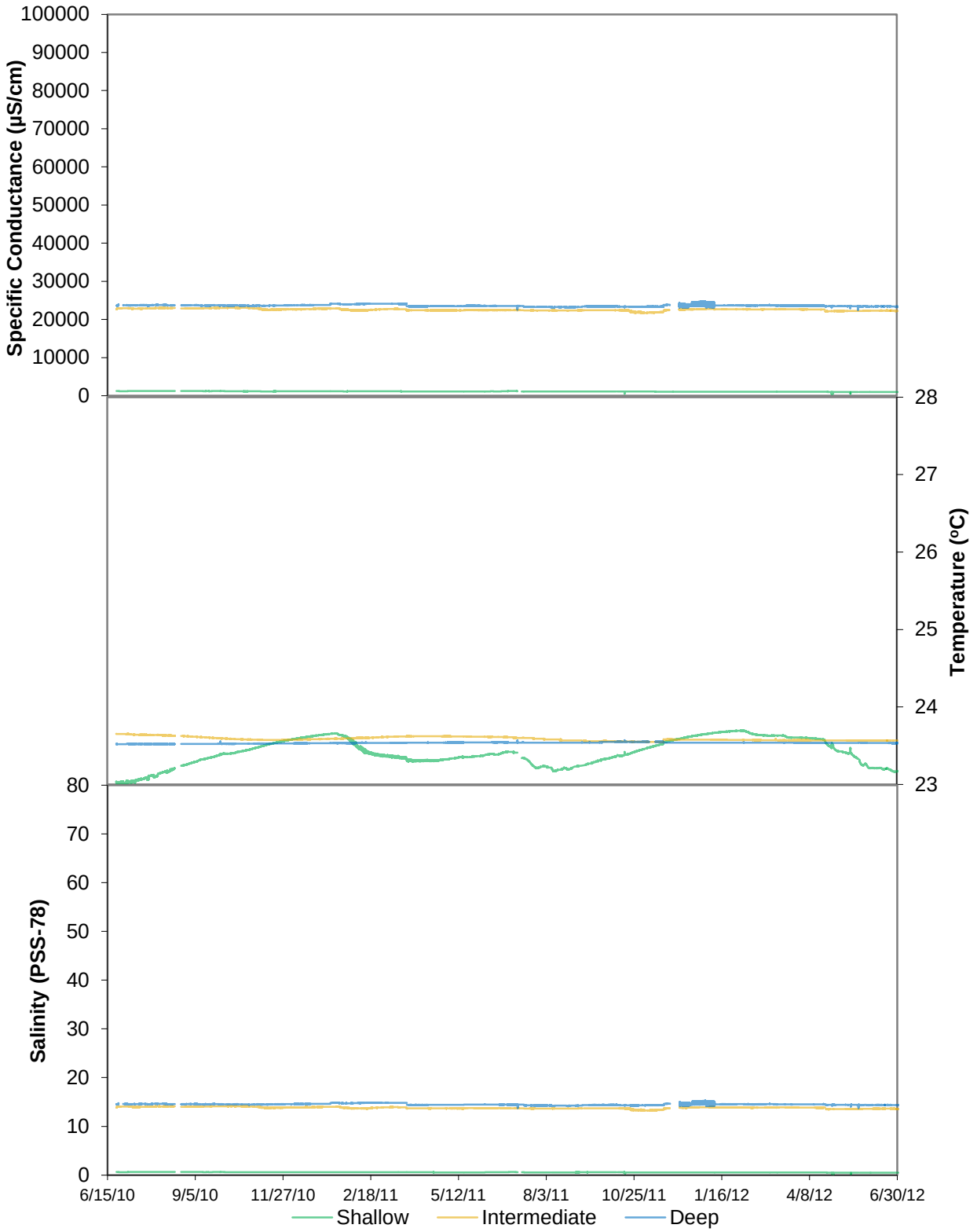


Figure 2.1-7. TPGW-6 Specific Conductance, Temperature, and Salinity.

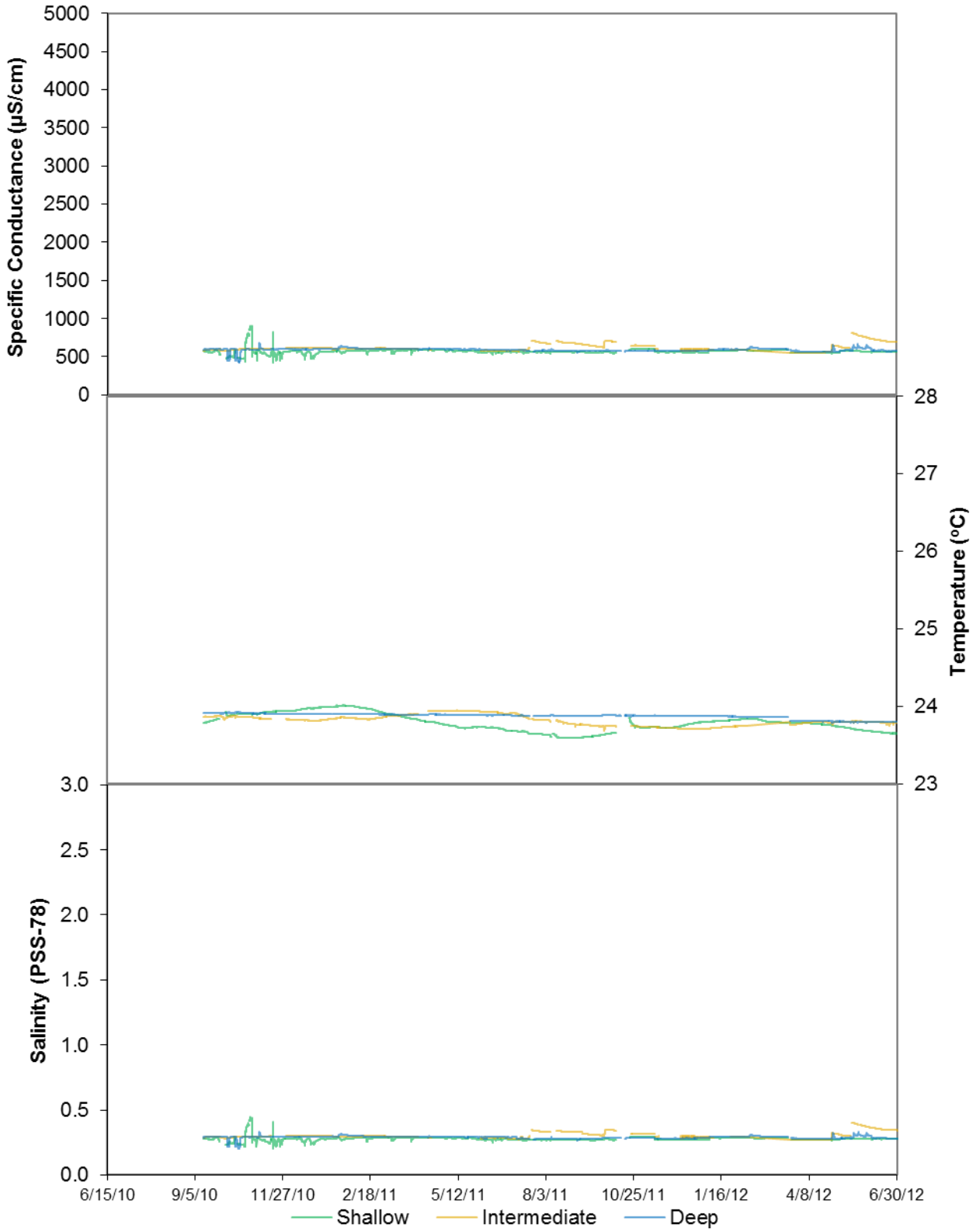


Figure 2.1-8. TPGW-7 Specific Conductance, Temperature, and Salinity.

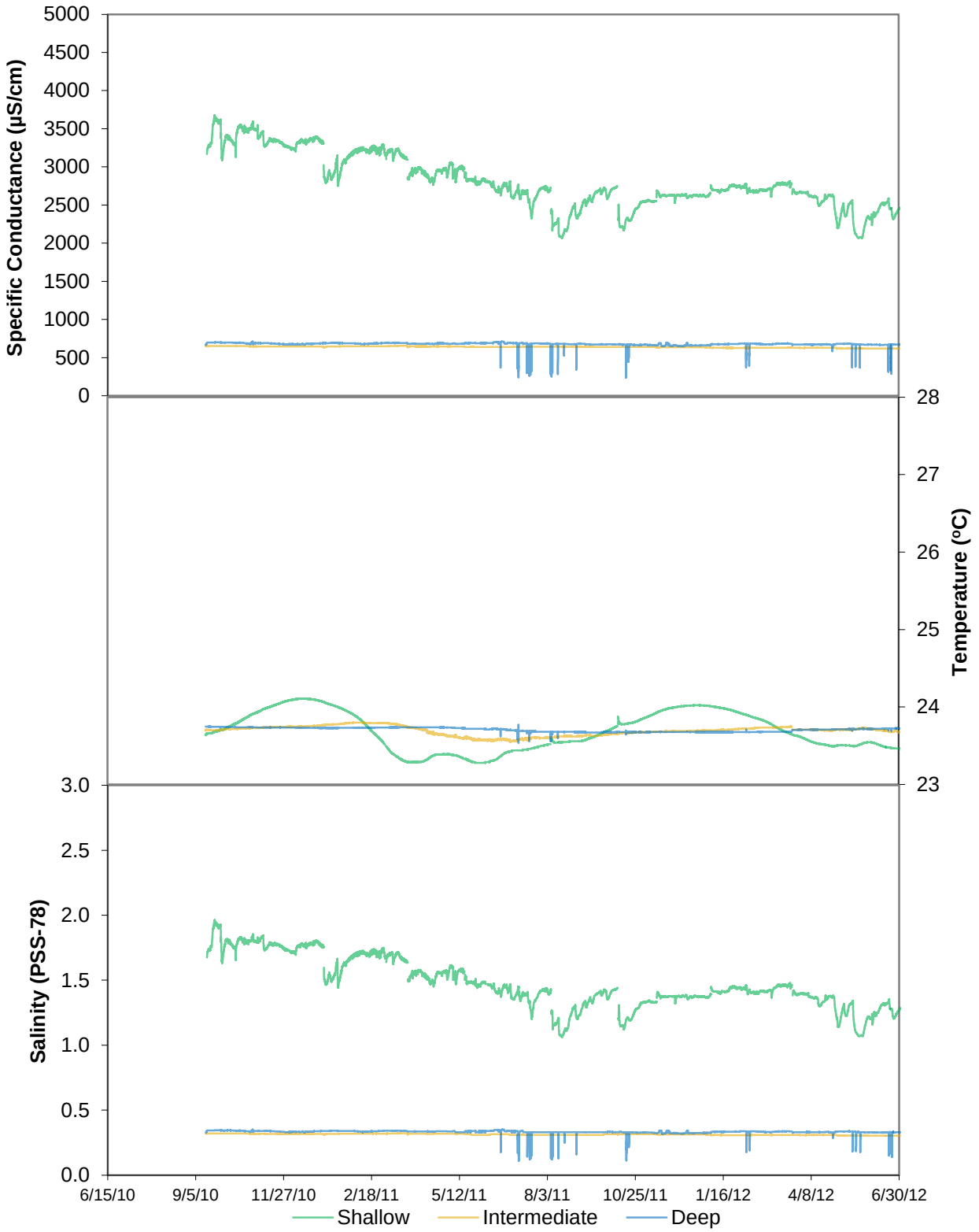


Figure 2.1-9. TPGW-8 Specific Conductance, Temperature, and Salinity.

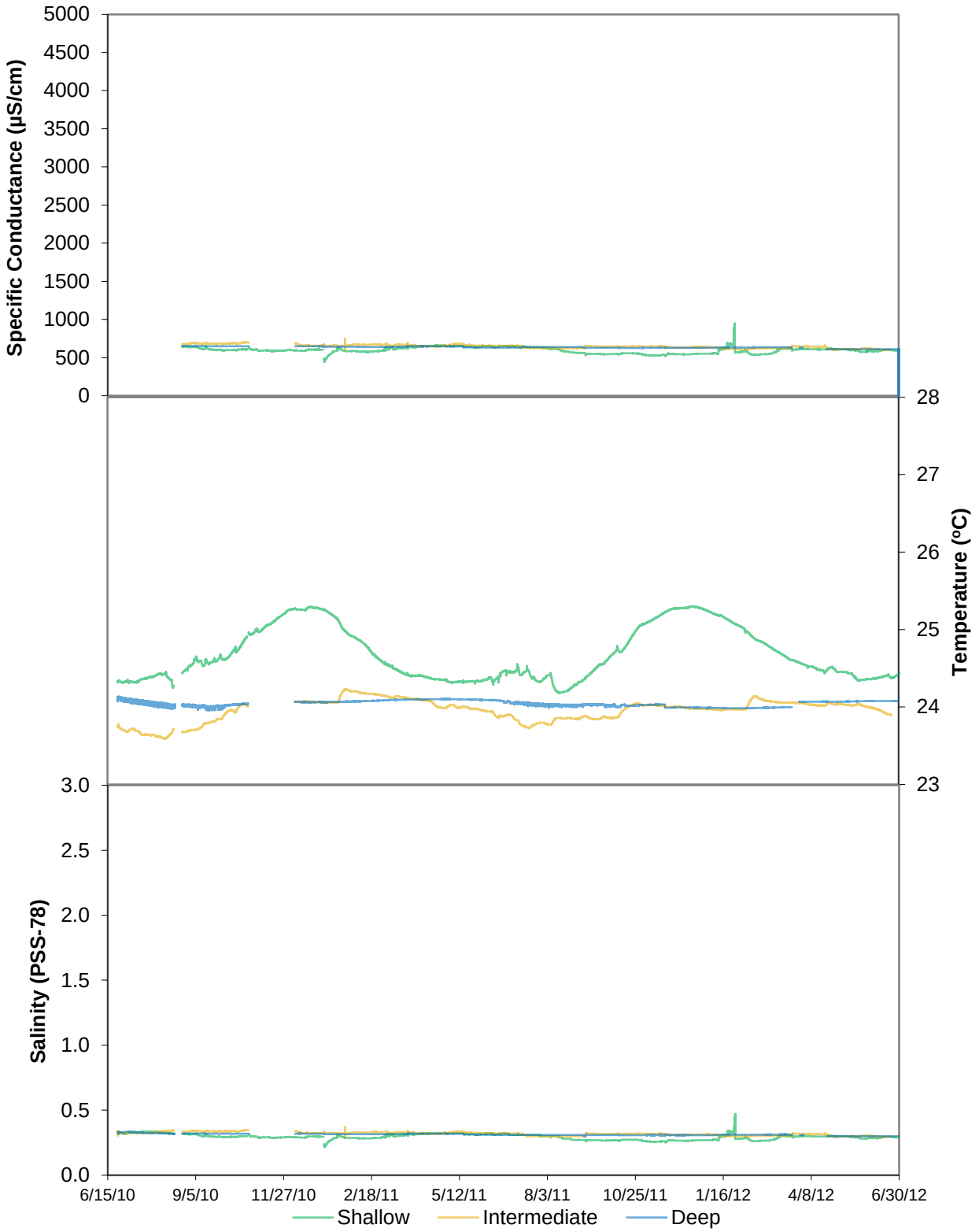


Figure 2.1-10. TPGW-9 Specific Conductance, Temperature, and Salinity.

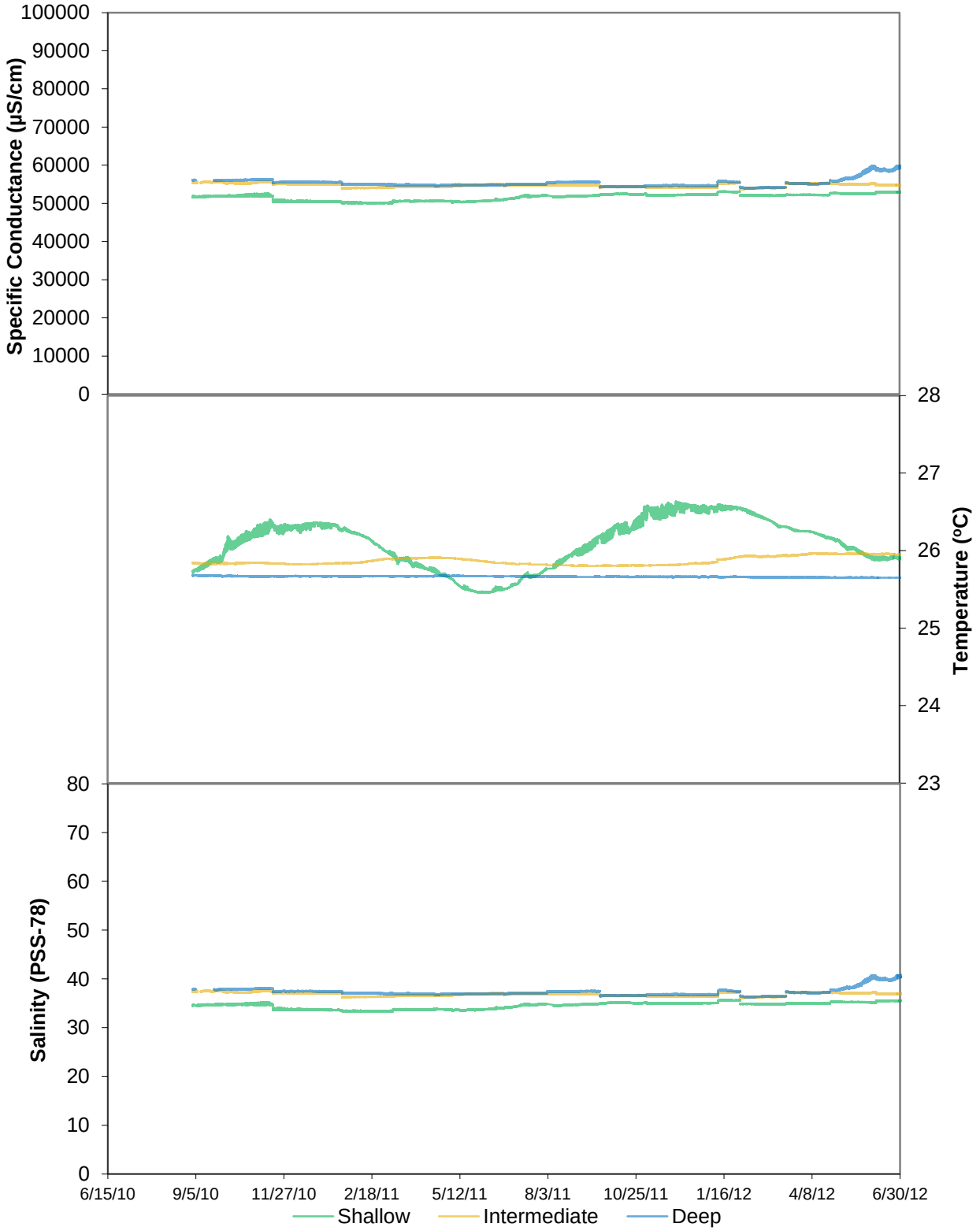


Figure 2.1-11. TPGW-10 Specific Conductance, Temperature, and Salinity.

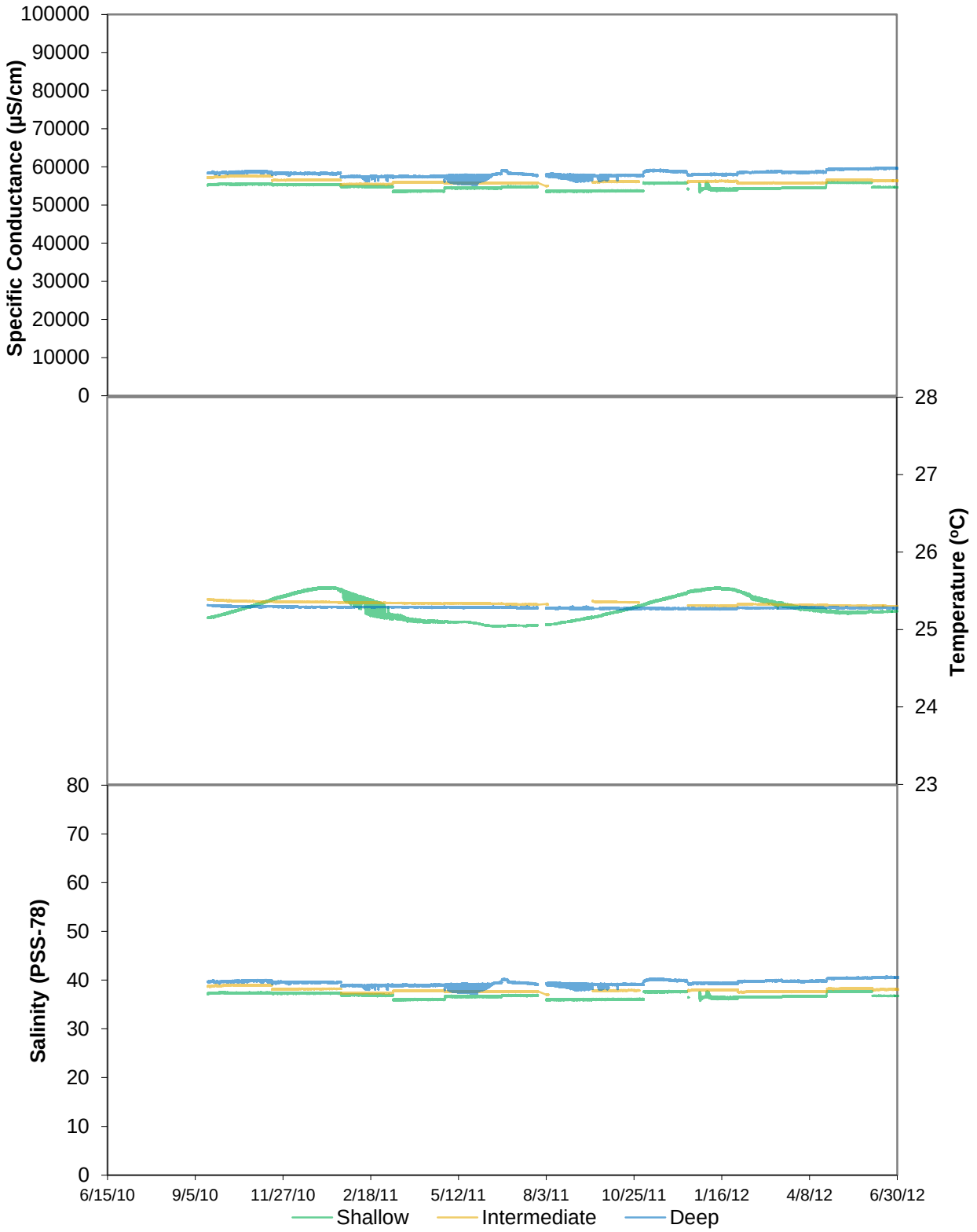


Figure 2.1-12. TPGW-11 Specific Conductance, Temperature, and Salinity.

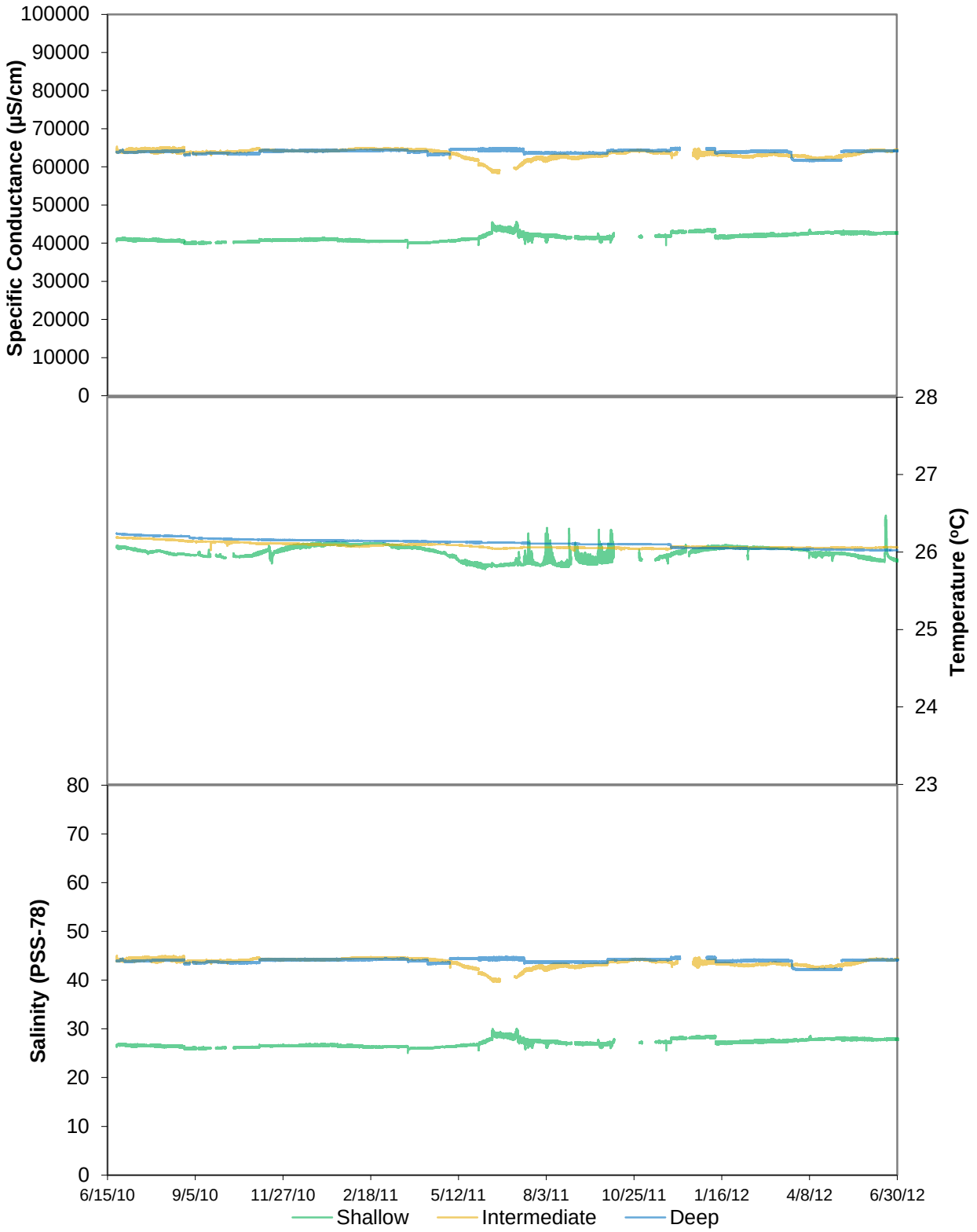


Figure 2.1-13. TPGW-12 Specific Conductance, Temperature, and Salinity.

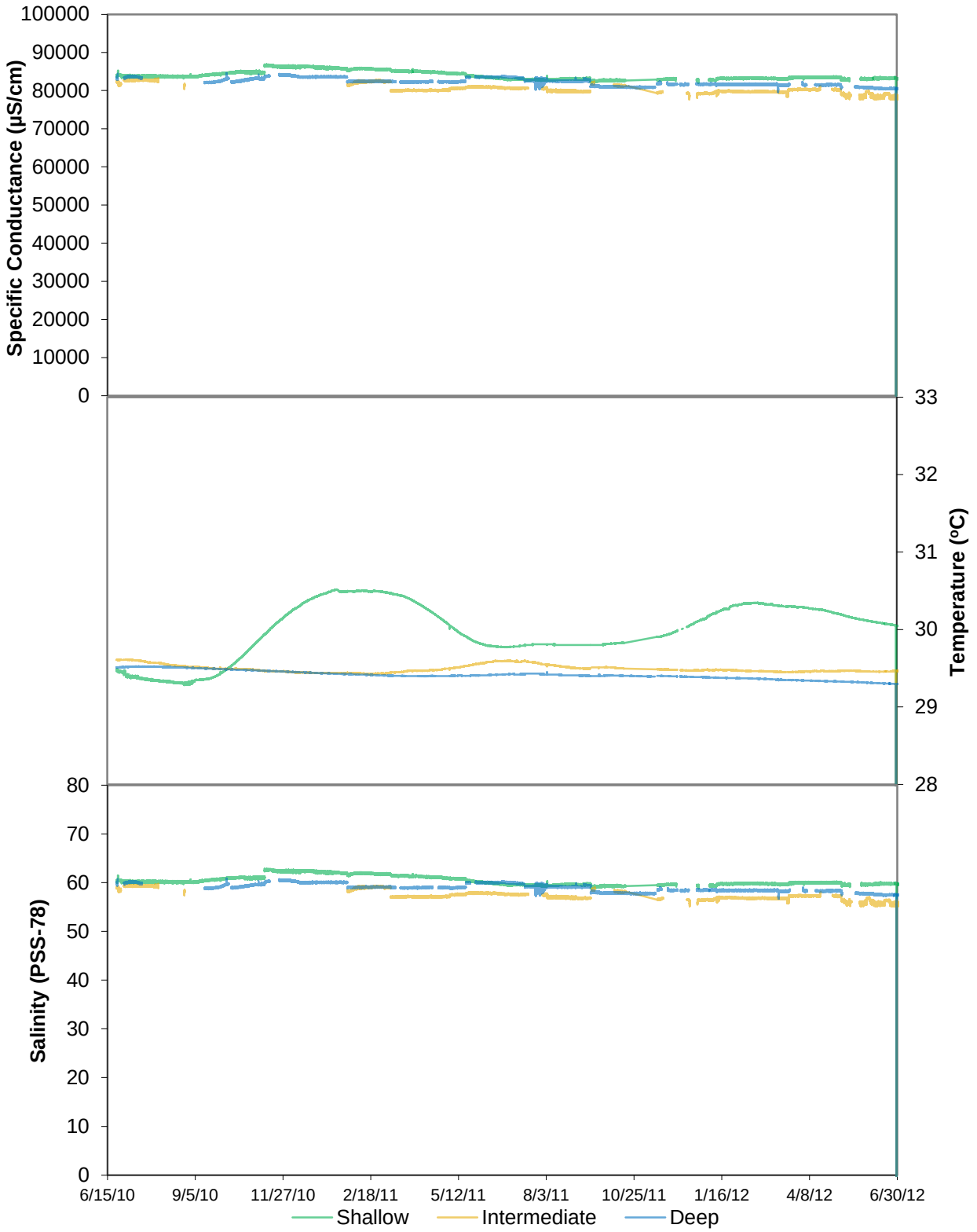


Figure 2.1-14. TPGW-13 Specific Conductance, Temperature, and Salinity.

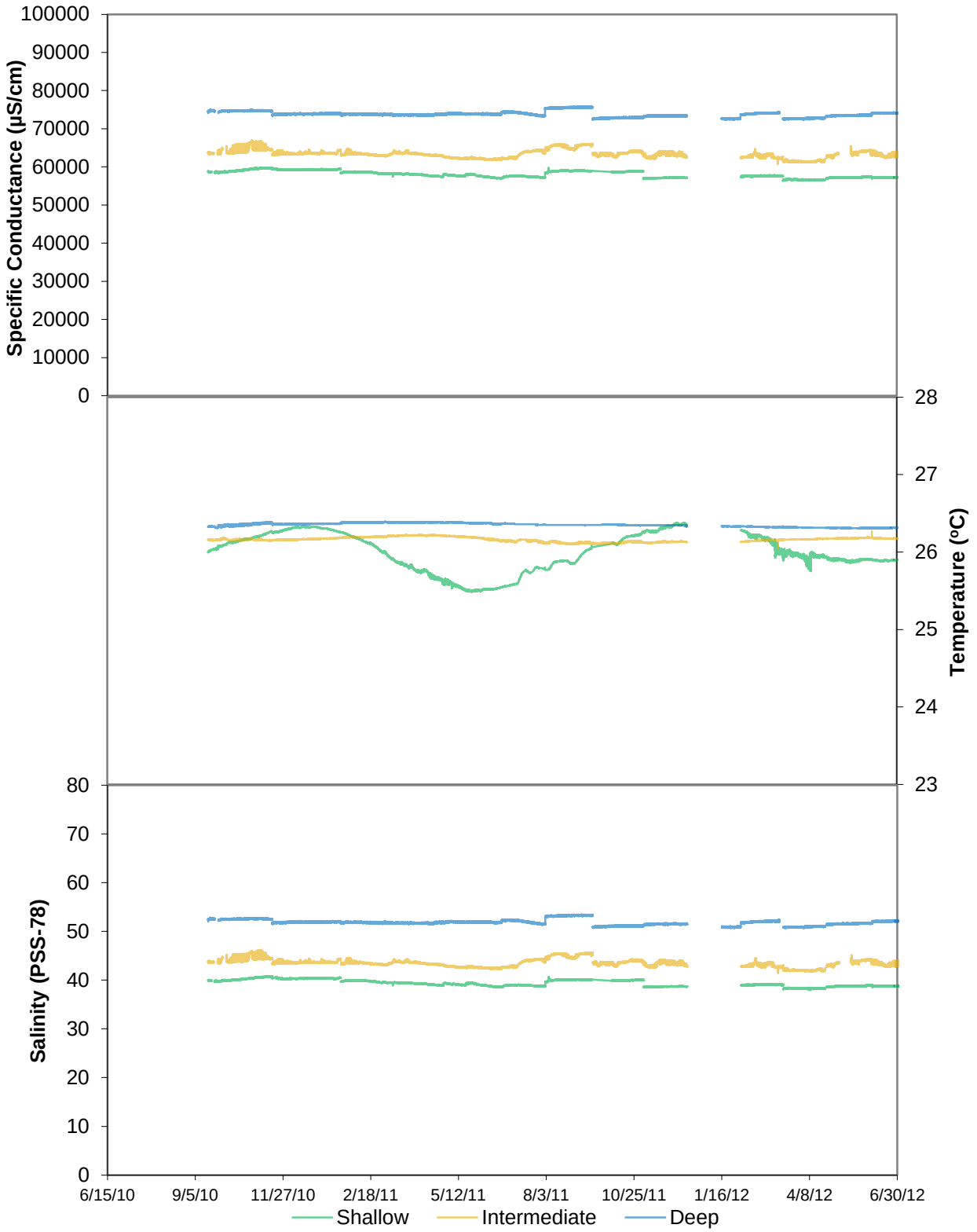
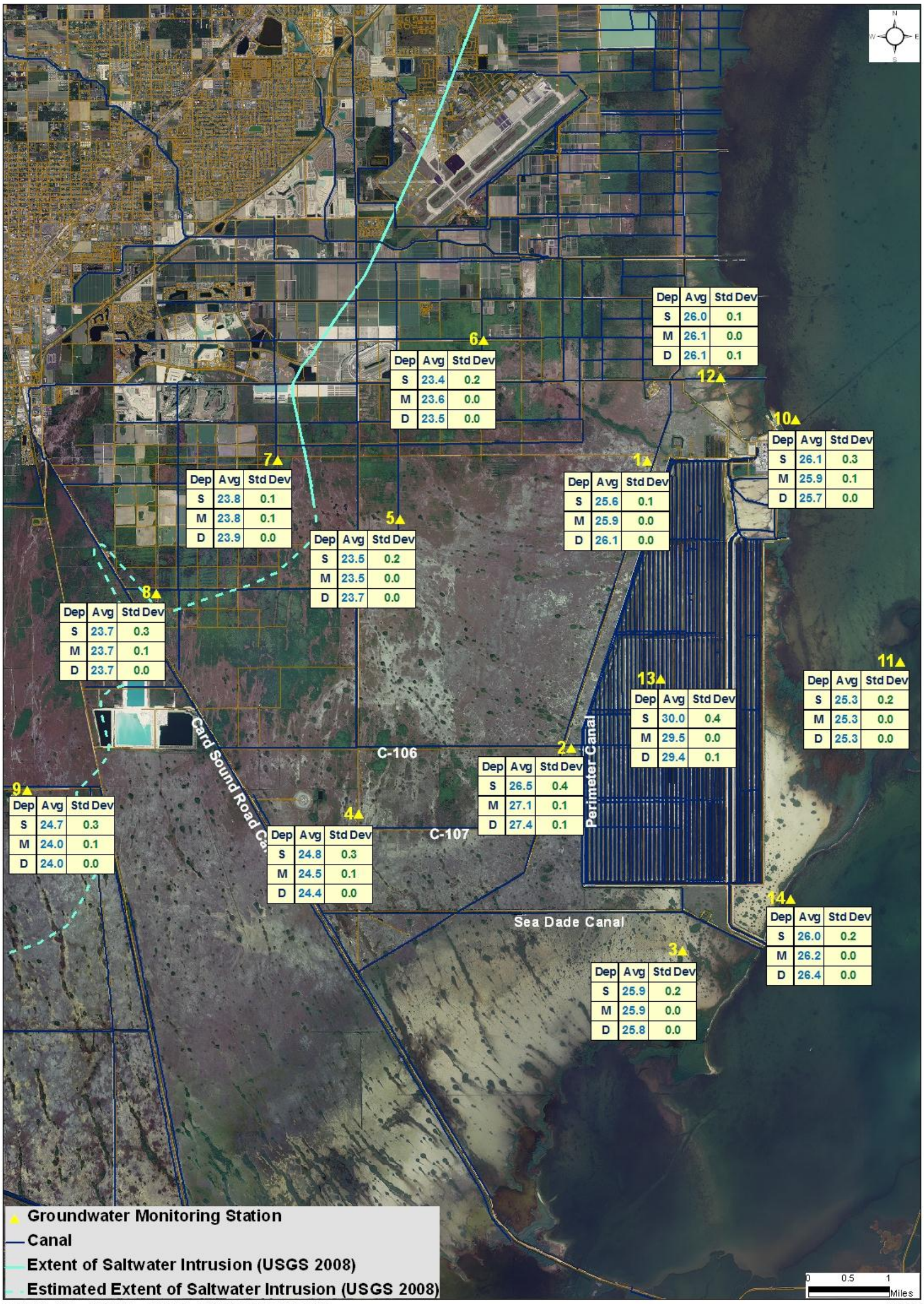


Figure 2.1-15. TPGW-14 Specific Conductance, Temperature, and Salinity.



Note: 1) Ave = Average: Jun/Sep 2010 through Jun 2012;
2) Std Dev = Standard Deviation;
3) NA: Not Available;
4) Samples Collected at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 2.1-16. Average and Standard Deviation of Specific Conductance Values (in µS/cm) for Groundwater Stations.



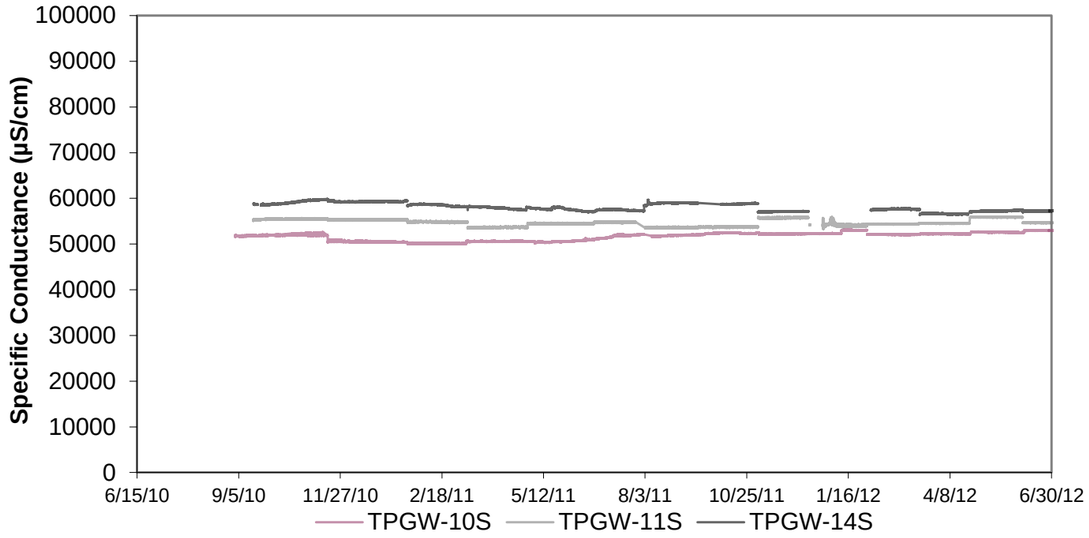
Note: 1) Ave = Average: Jun/Sep 2010 through Jun 2012;
2) Std Dev = Standard Deviation;
3) NA: Not Available;
4) Samples Collected at 3 Depths (S: shallow; M: intermediate; D: deep)

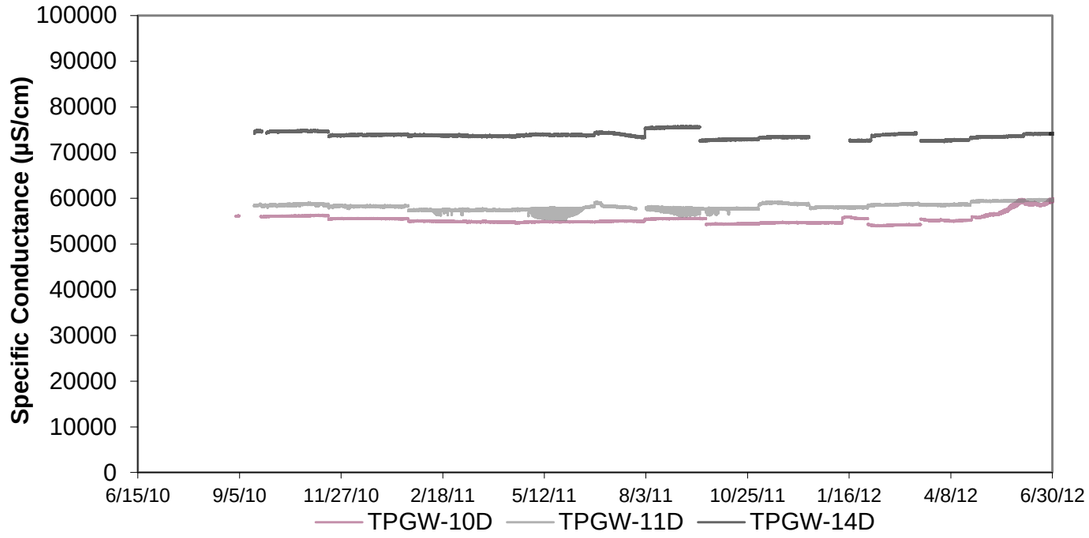
Figure 2.1-17. Average and Standard Deviation of Temperature (in ^{o}Celcius) for Groundwater Stations.

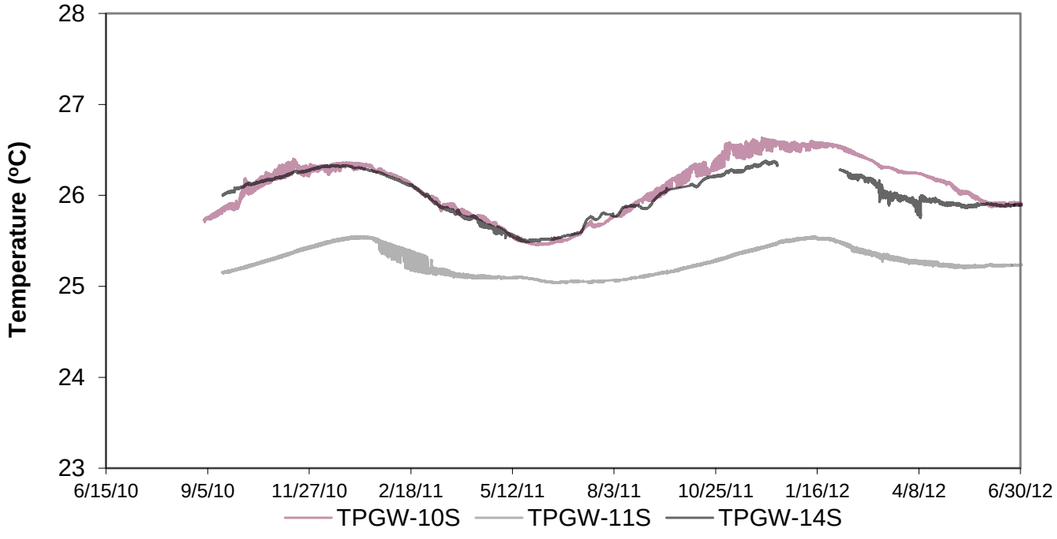


Note: 1) Ave = Average: Jun/Sep 2010 through Jun 2012;
2) Std Dev = Standard Deviation;
3) NA: Not Available;
4) Samples Collected at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 2.1-18. Average and Standard Deviation of Salinity (in PSS-78) for Groundwater Stations.







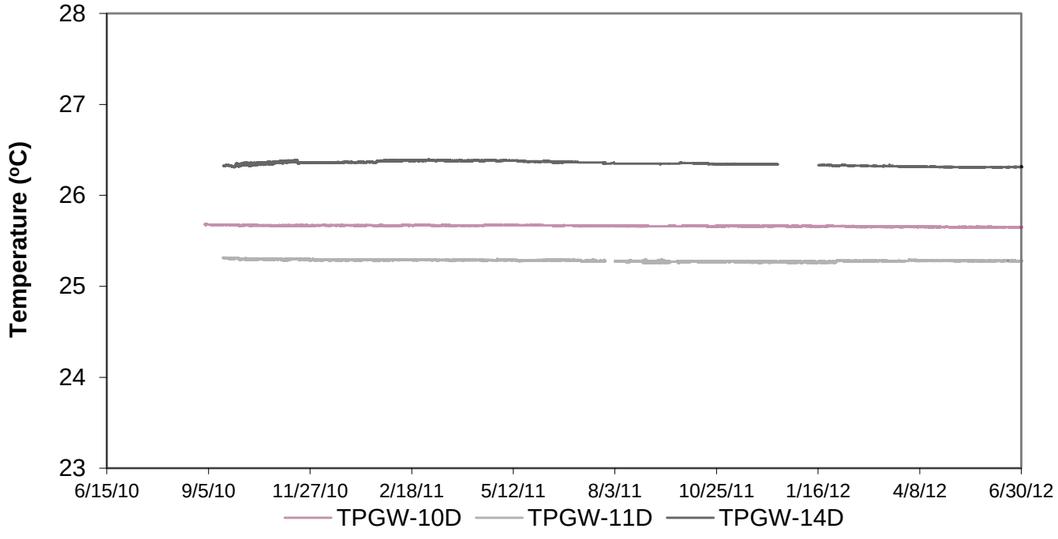
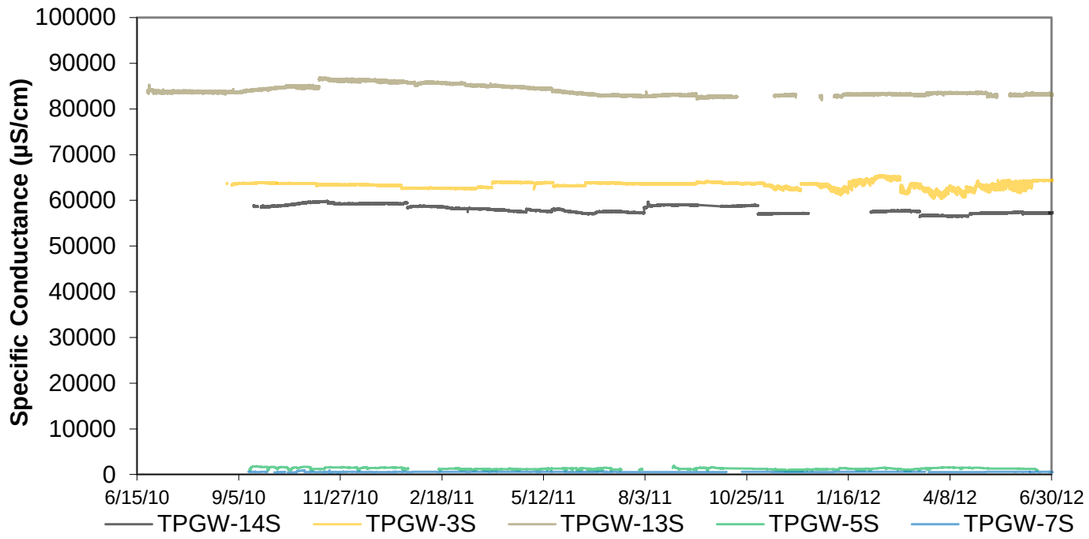
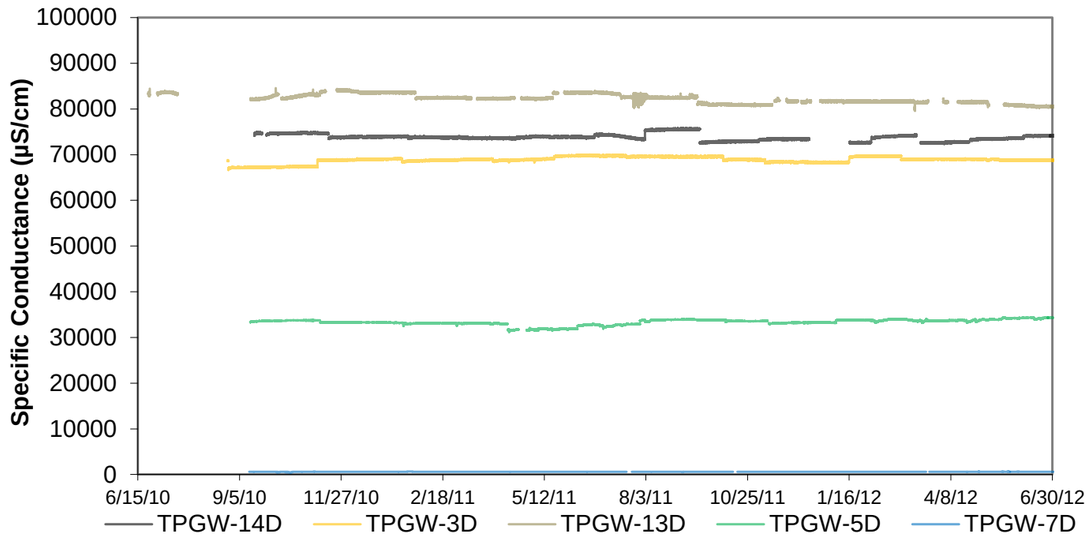
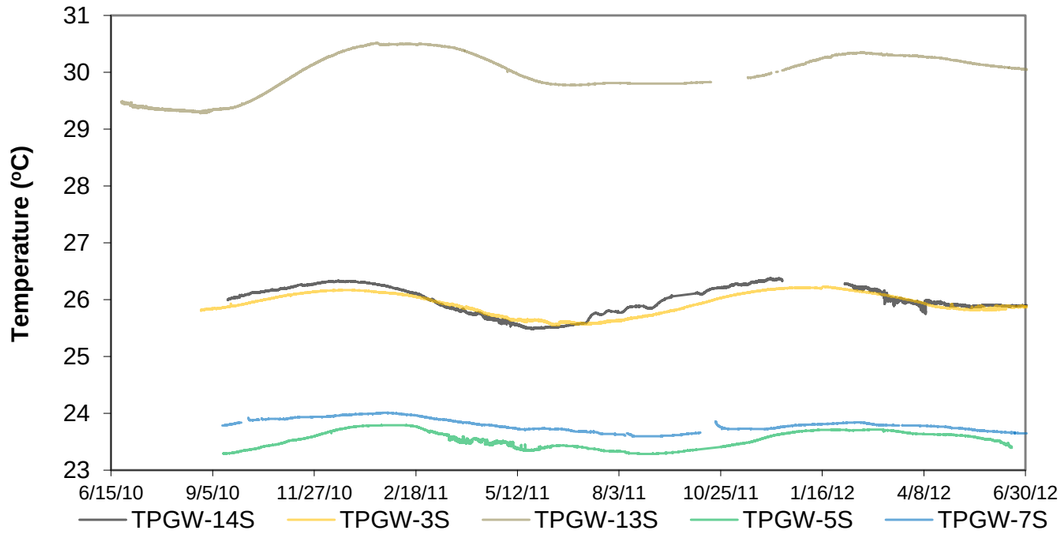


Figure 2.1-19. Comparison of Specific Conductance and Temperature in Biscayne Bay Shallow and Deep Wells TPGW-10, TPGW-11, and TPGW-14.







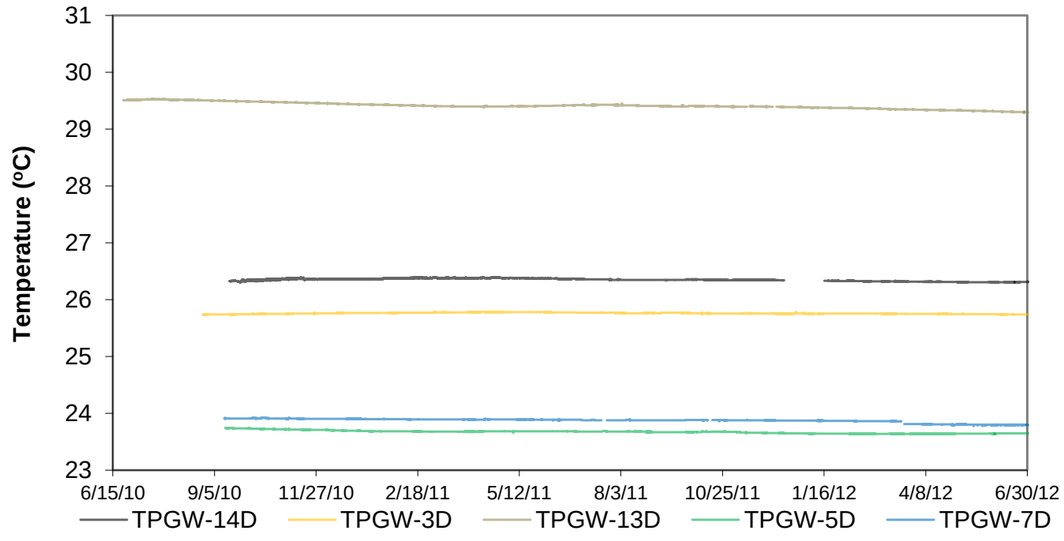
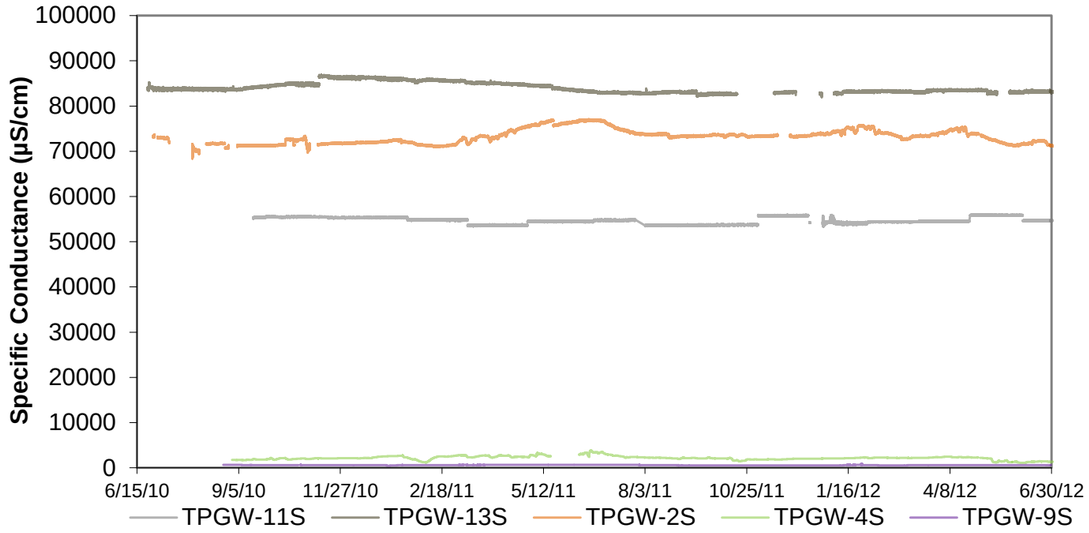
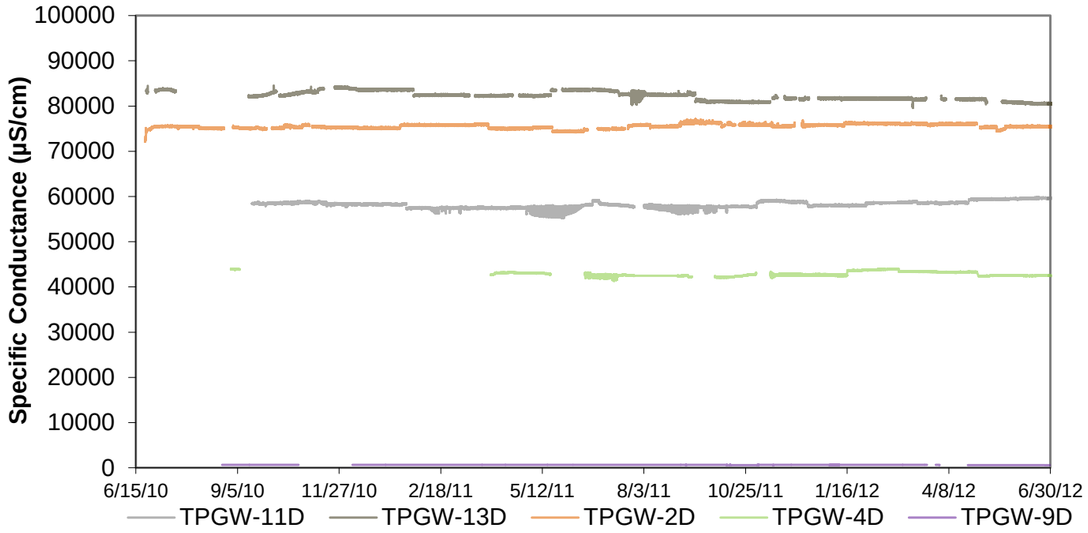
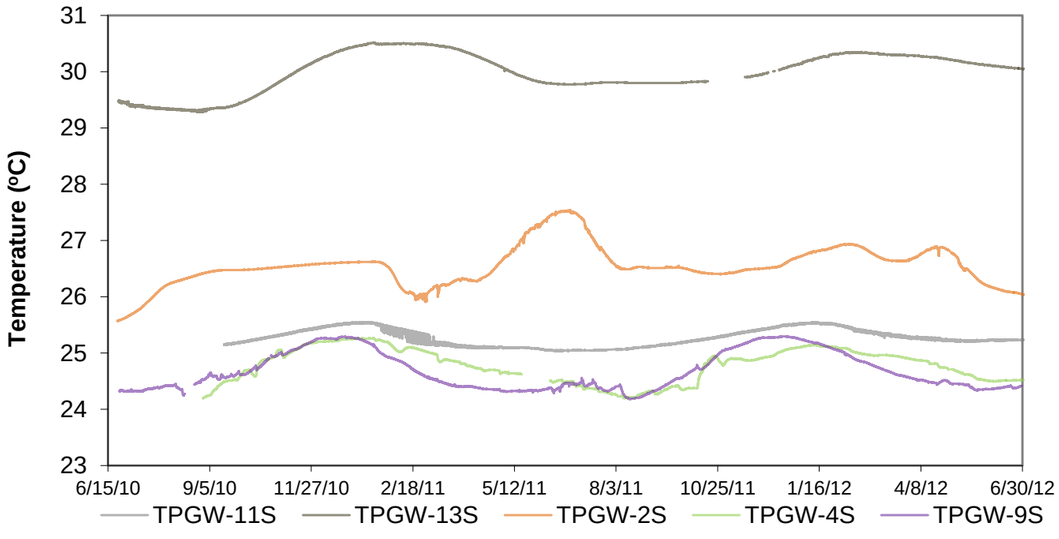


Figure 2.1-20. Comparison of Specific Conductance and Temperature across the Landscape in Shallow and Deep Wells TPGW-14, TPGW-3, TPGW-13, TPGW-5, and TPGW 7.







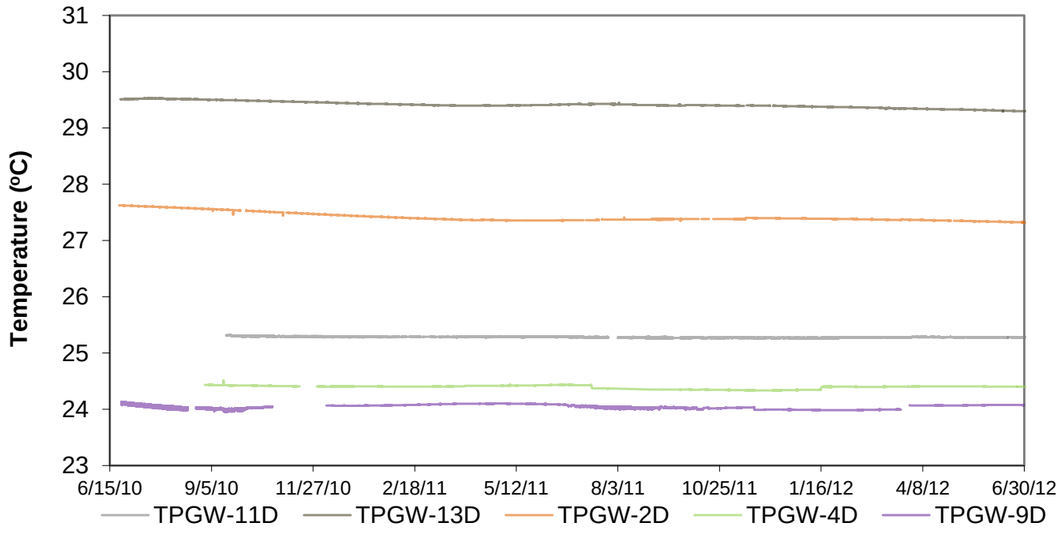
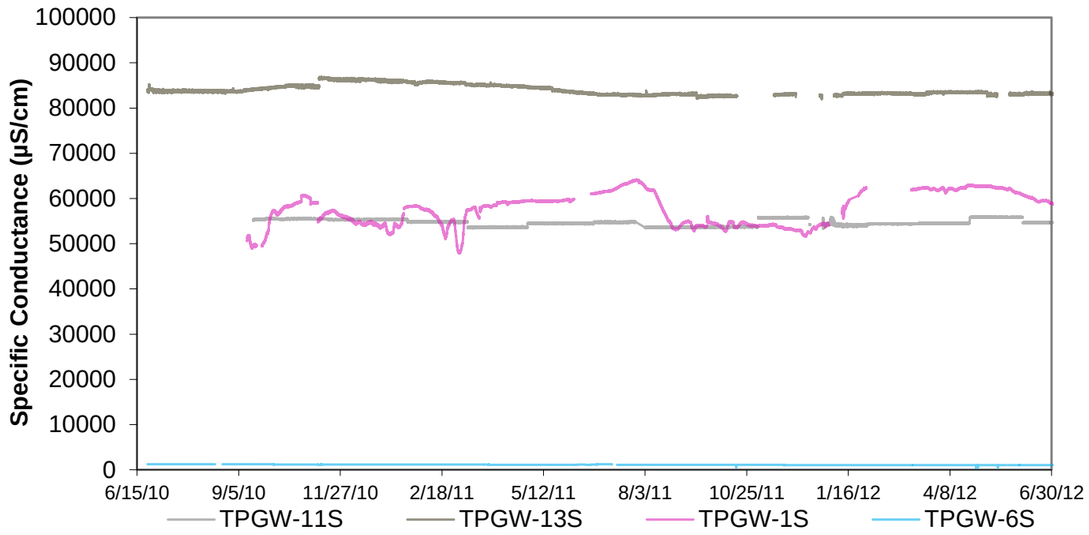
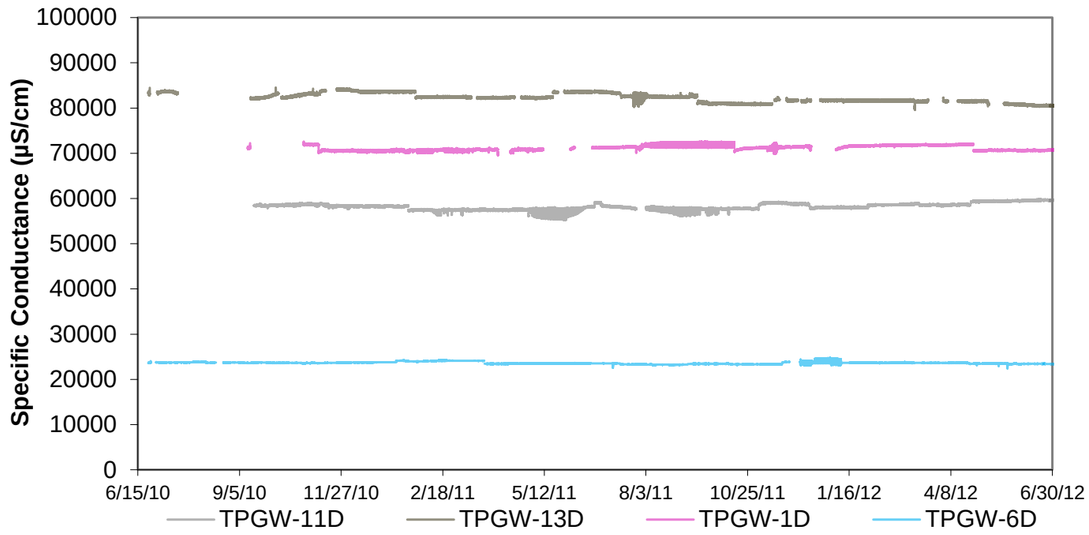
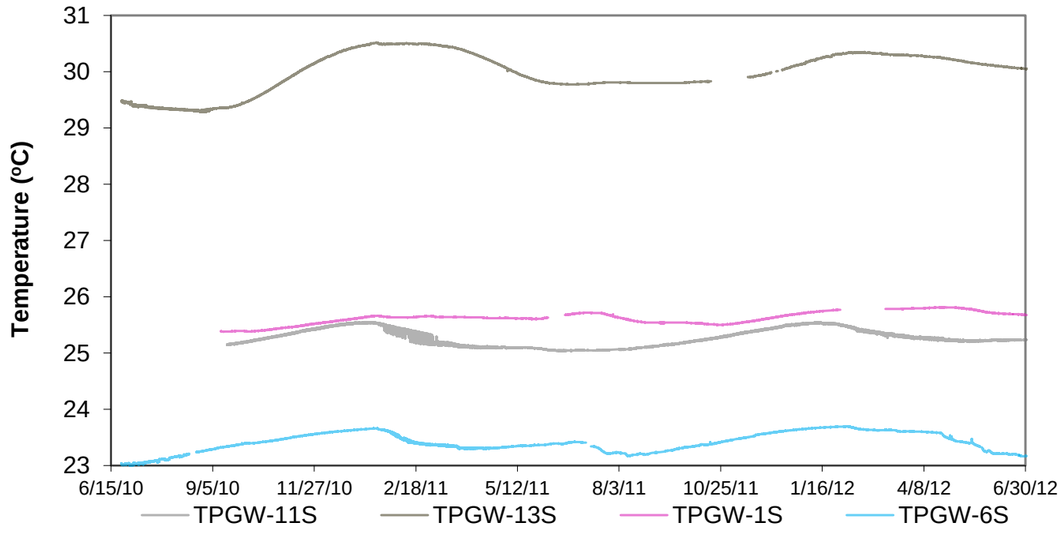


Figure 2.1-21. Comparison of Specific Conductance and Temperature across the Landscape in Shallow and Deep Wells TPGW-11, TPGW-13, TPGW-2, TPGW-4, and TPGW-9.







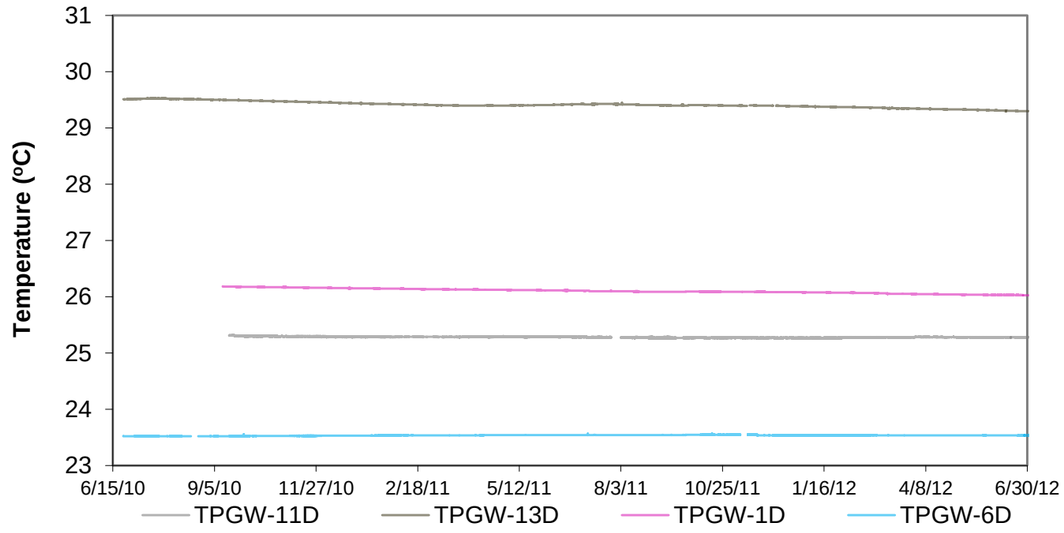
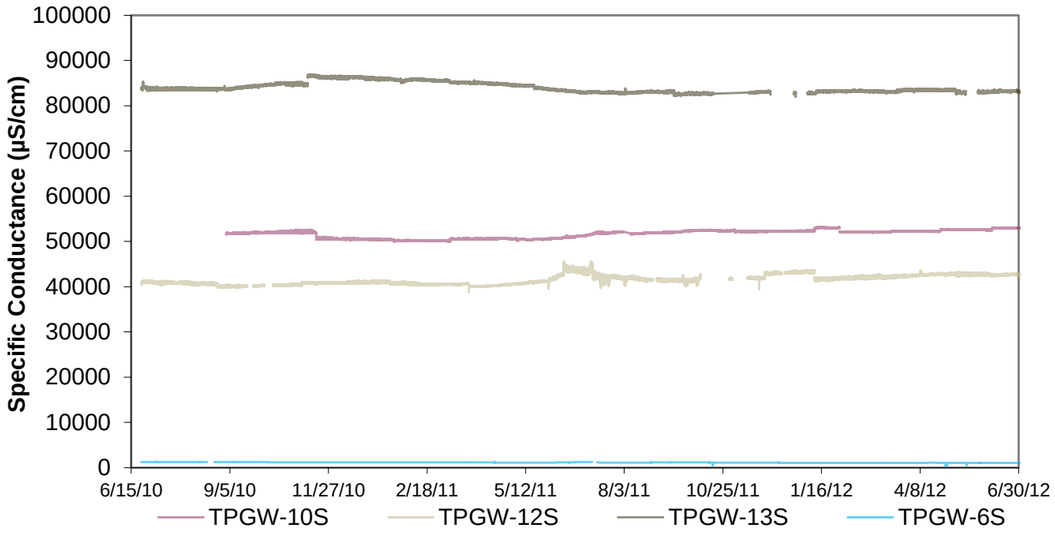
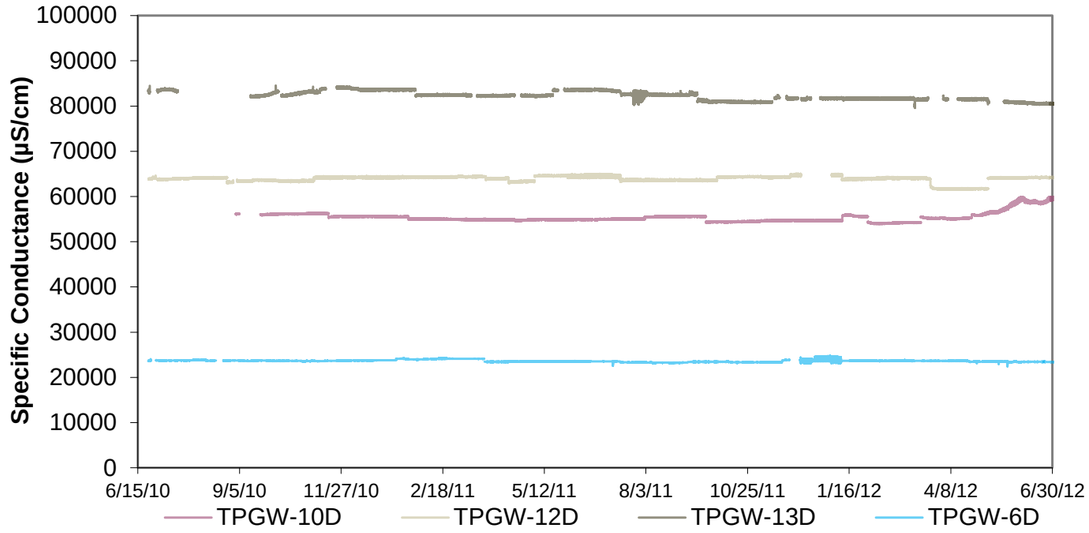
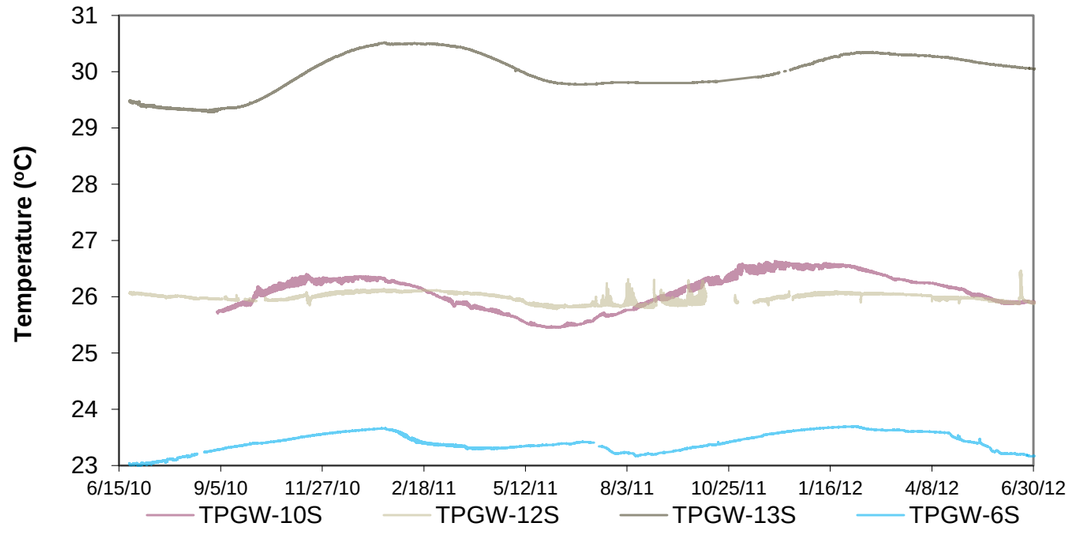


Figure 2.1-22. Comparison of Specific Conductance and Temperature across the Landscape in Shallow and Deep Wells TPGW-11, TPGW-13, TPGW-1, and TPGW-6.







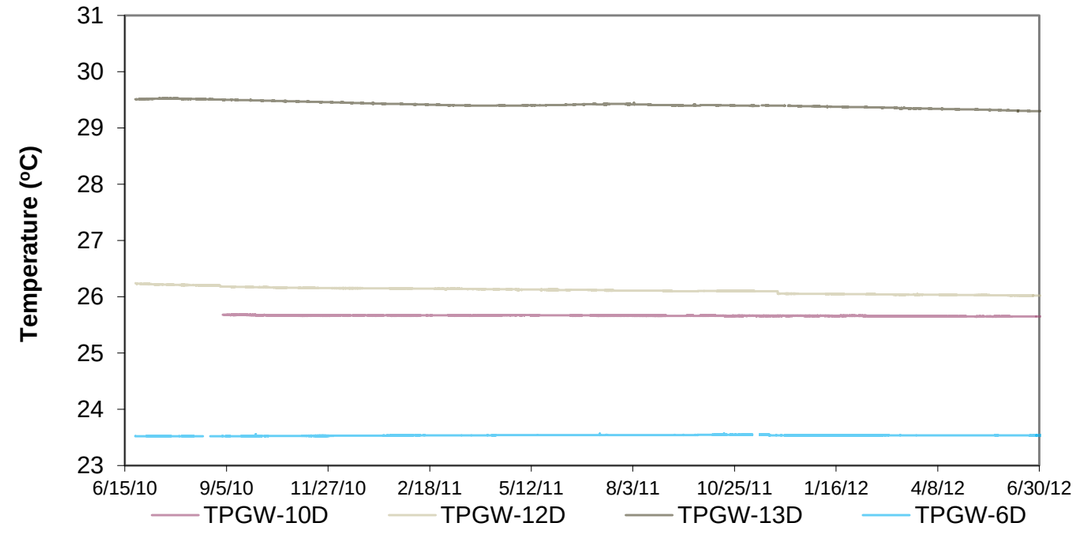
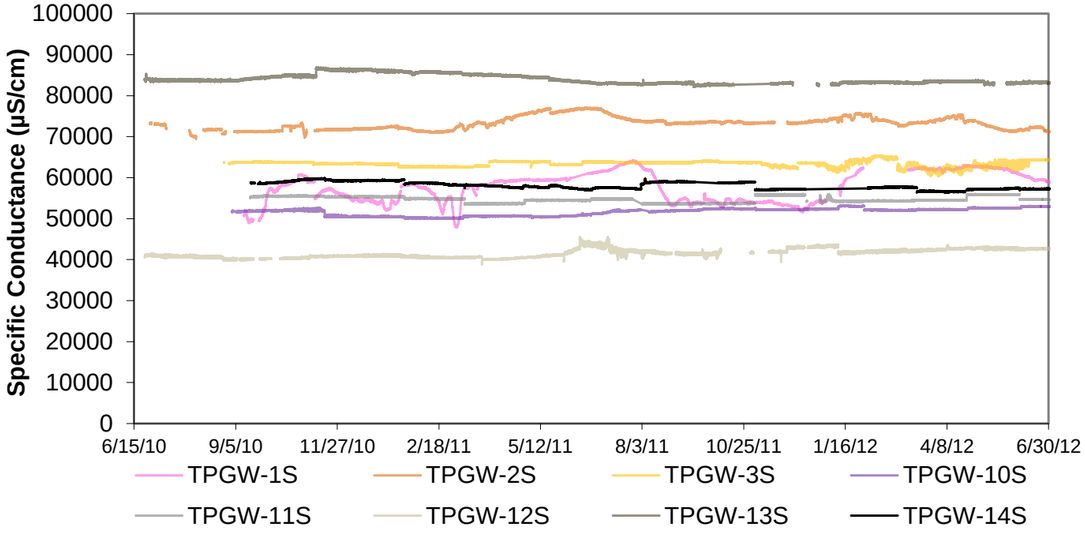
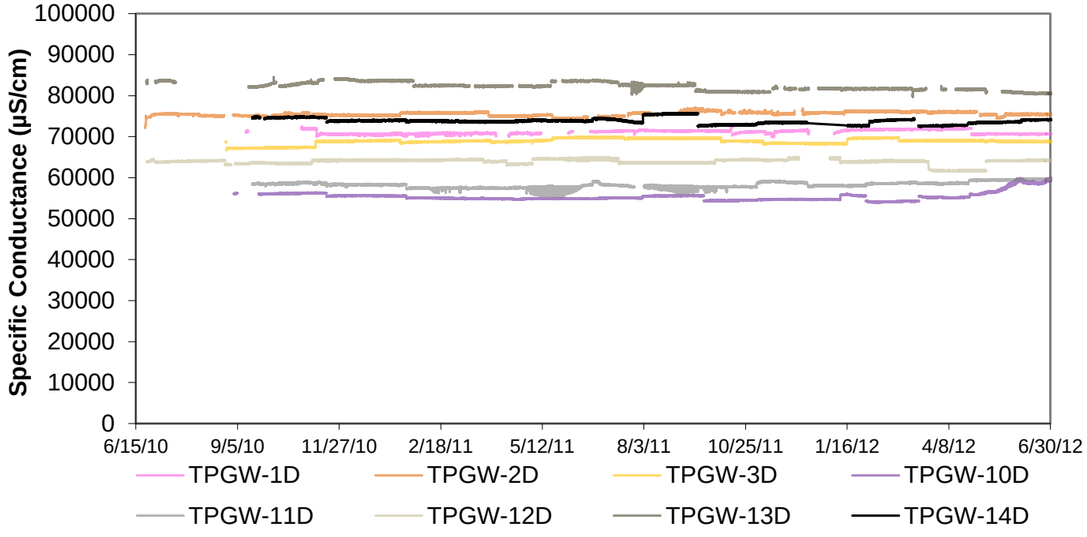
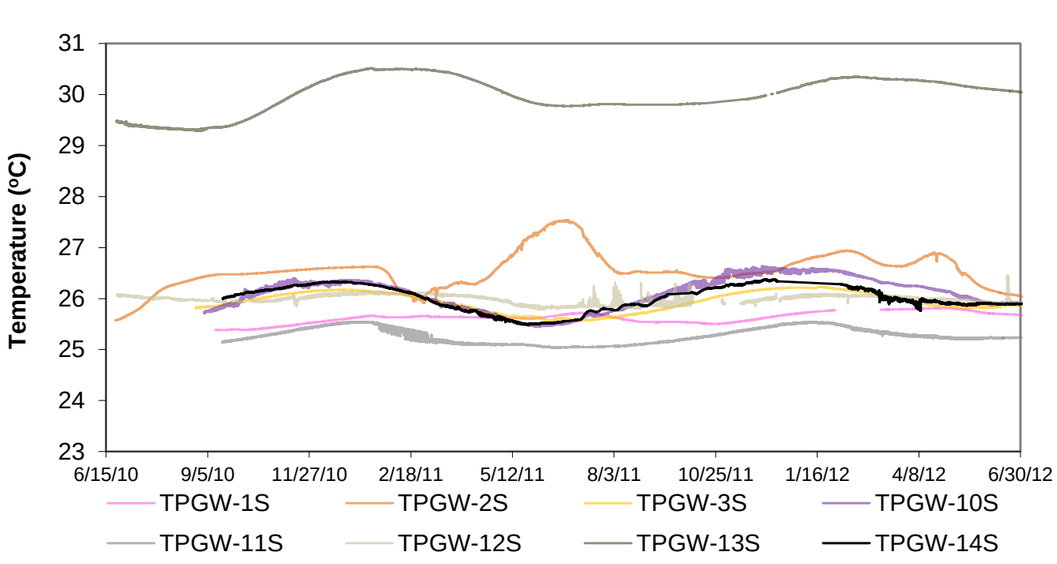


Figure 2.1-23. Comparison of Specific Conductance and Temperature across the Landscape in Shallow and Deep Wells TPGW-10, TPGW-12, TPGW-13, and TPGW-6.







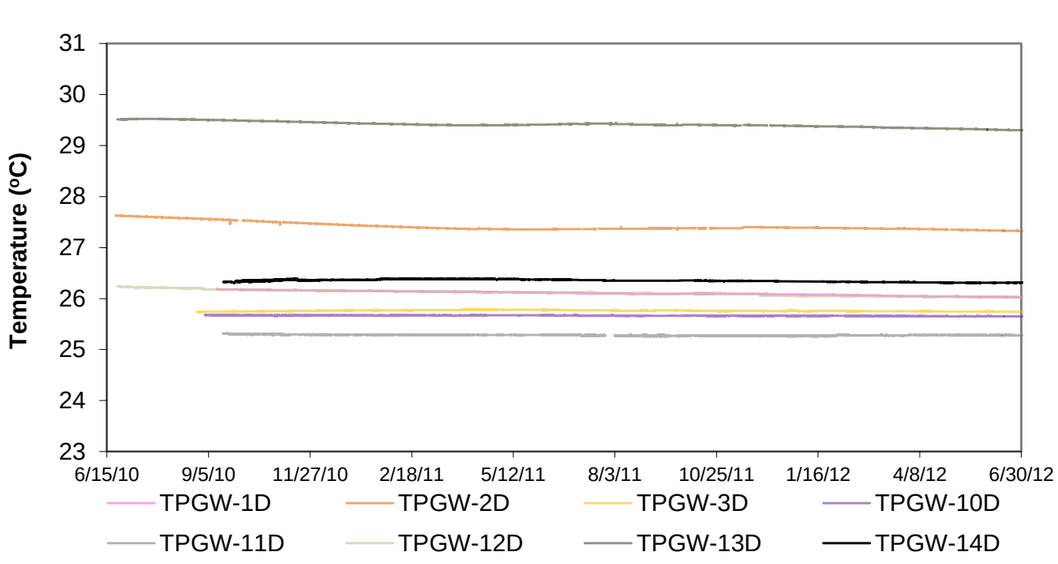
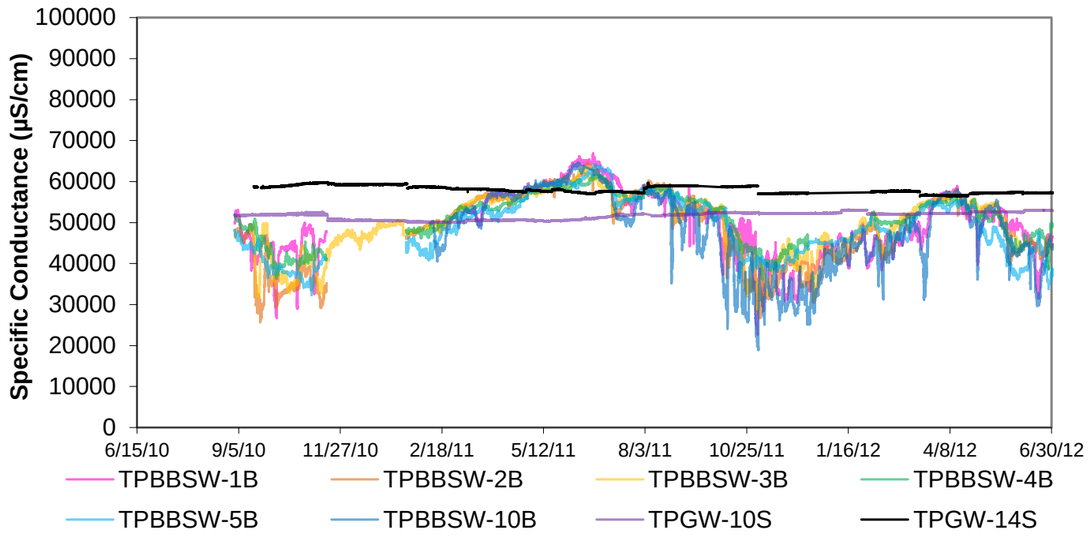
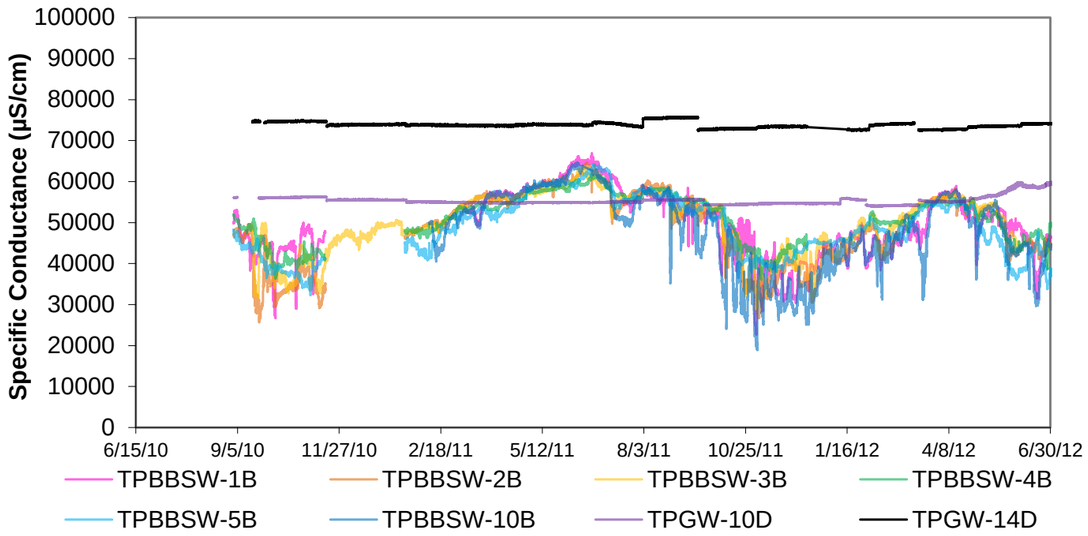
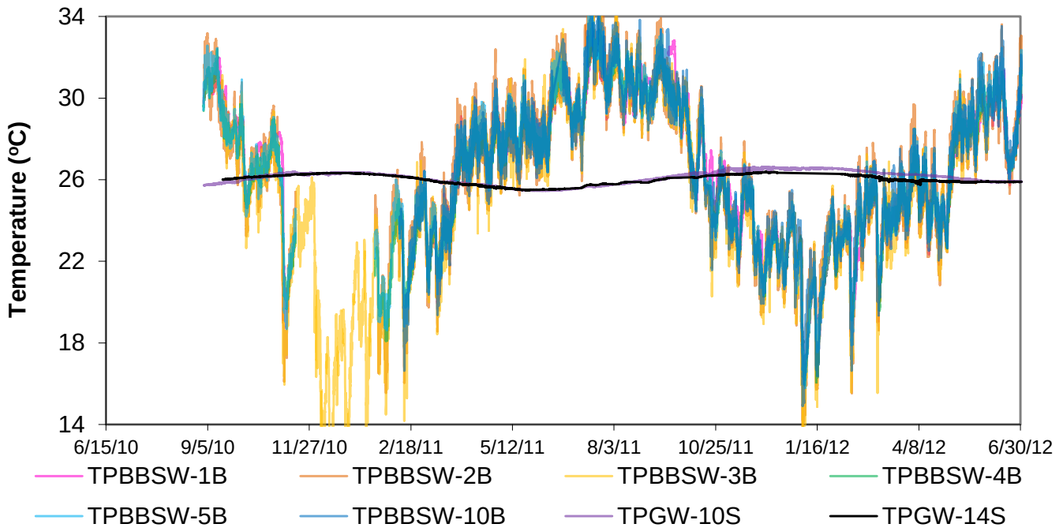


Figure 2.1-24. Comparison of Specific Conductance and Temperature across the Landscape in Shallow and Deep Wells Close to the CCS - TPGW-1, TPGW-2, TPGW-3, TPGW 10, TPGW-11, TPGW-12, TPGW-13, and TPGW-14.







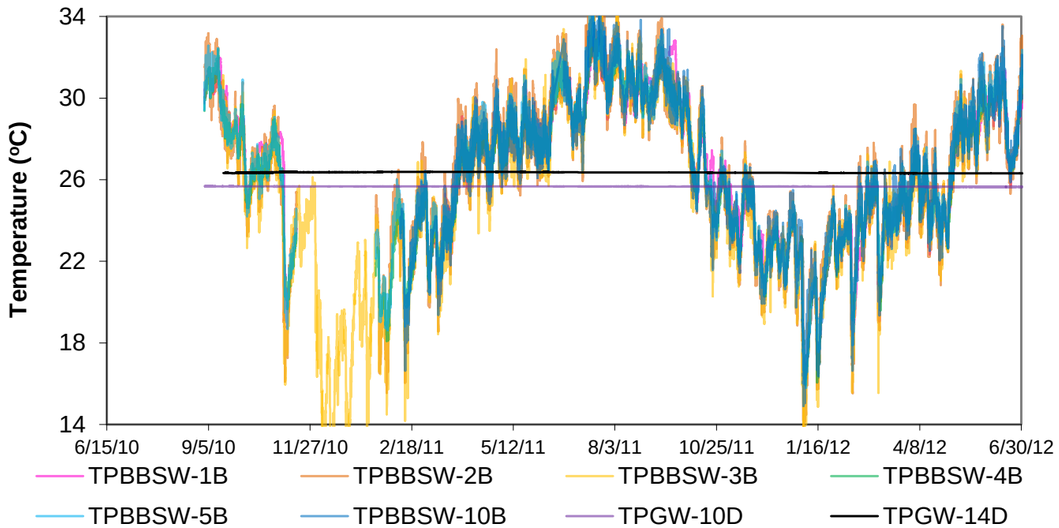
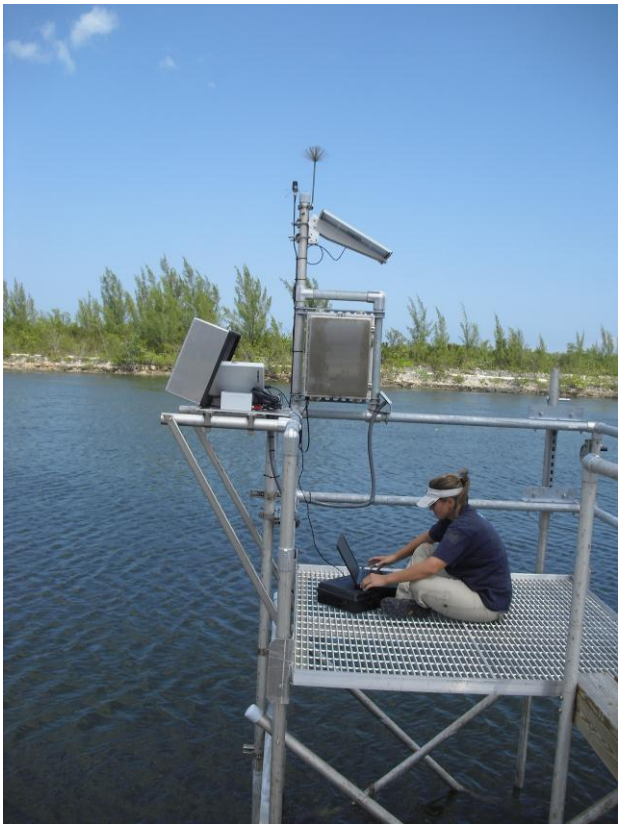


Figure 2.1-25. Comparison of Specific Conductance and Temperature in Biscayne Bay Surface Water and Biscayne Bay Shallow and Deep Wells TPGW-10 and TPGW-14.



Typical automated station in the CCS.



Close-up photo of automated station panel.



Top view of probes in stilling well.



Biscayne Bay non-telemetry setup.

Figure 2.2-1. Automated Surface Water Stations.

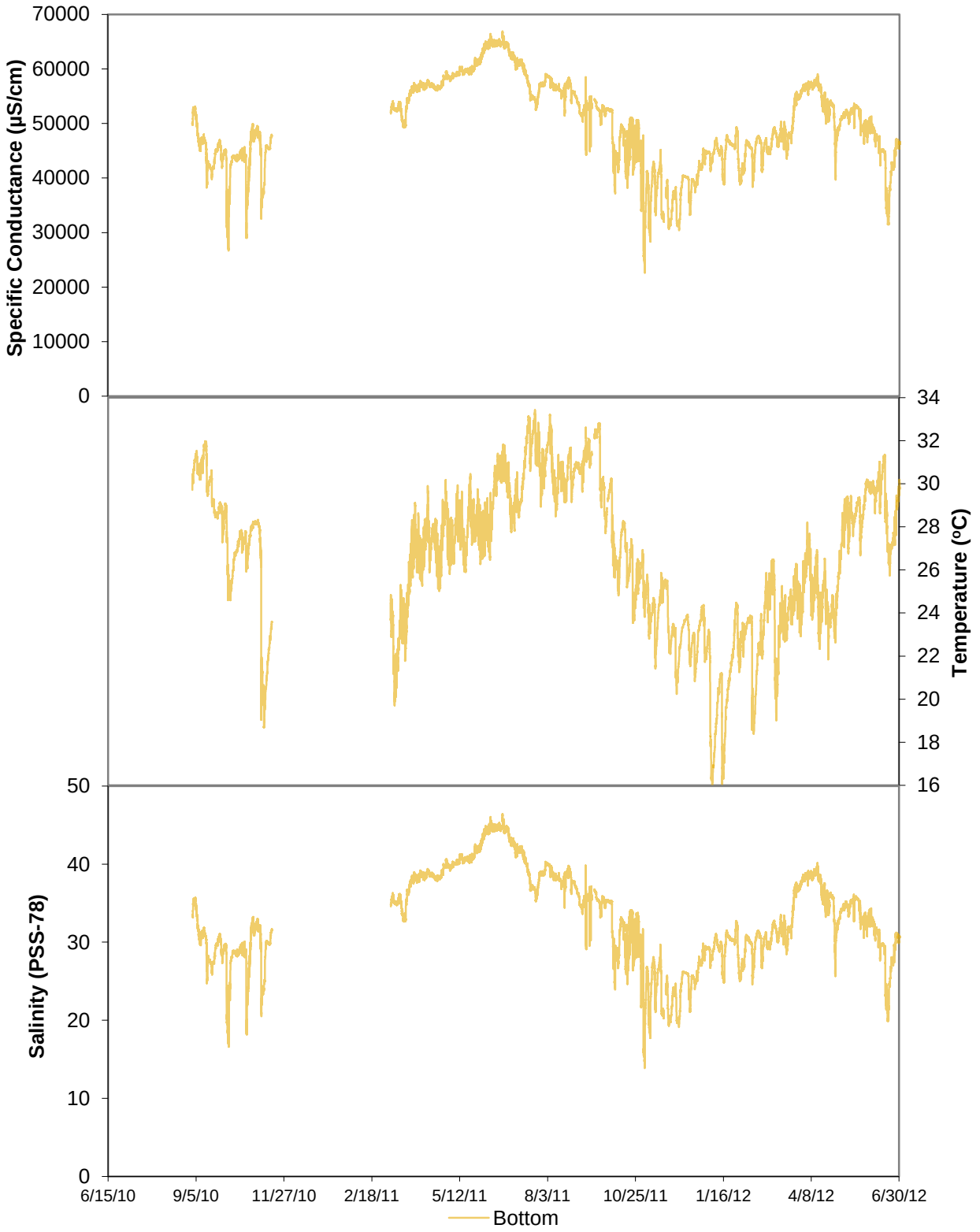


Figure 2.2-2. TPBBSW-1 Specific Conductance, Temperature, and Salinity.

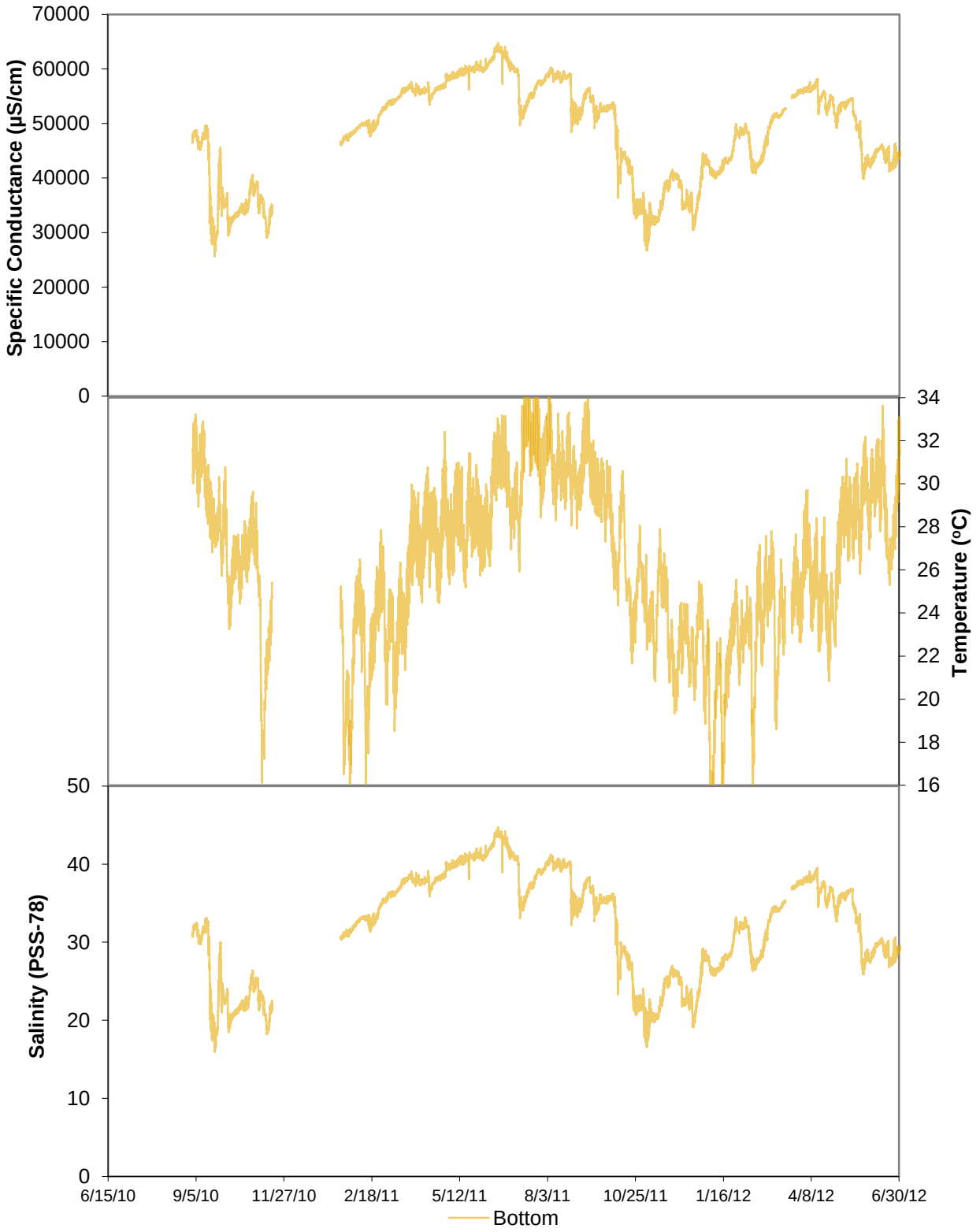


Figure 2.2-3. TPBBSW-2 Specific Conductance, Temperature, and Salinity.

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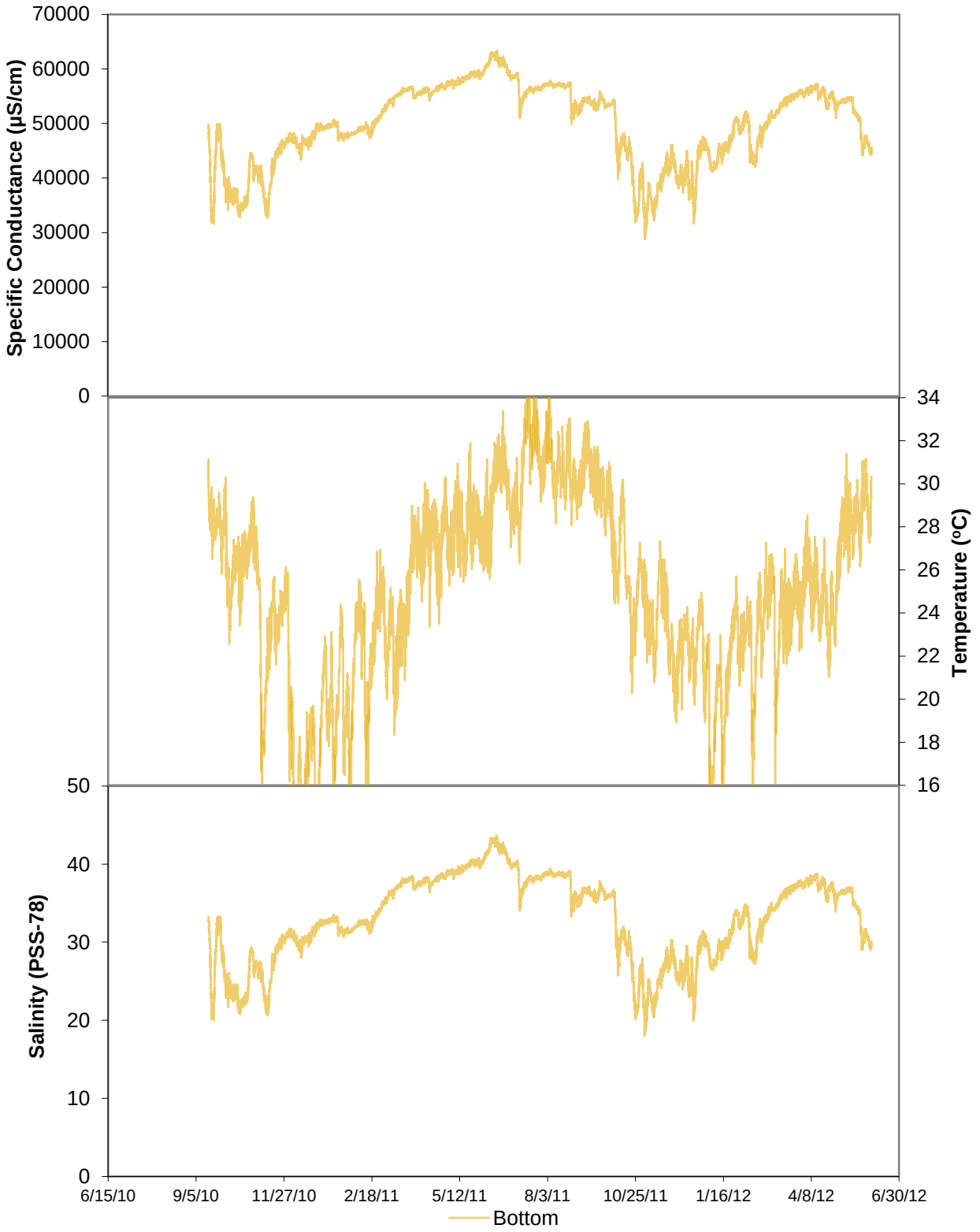


Figure 2.2-4. TPBBSW-3 Specific Conductance, Temperature, and Salinity.

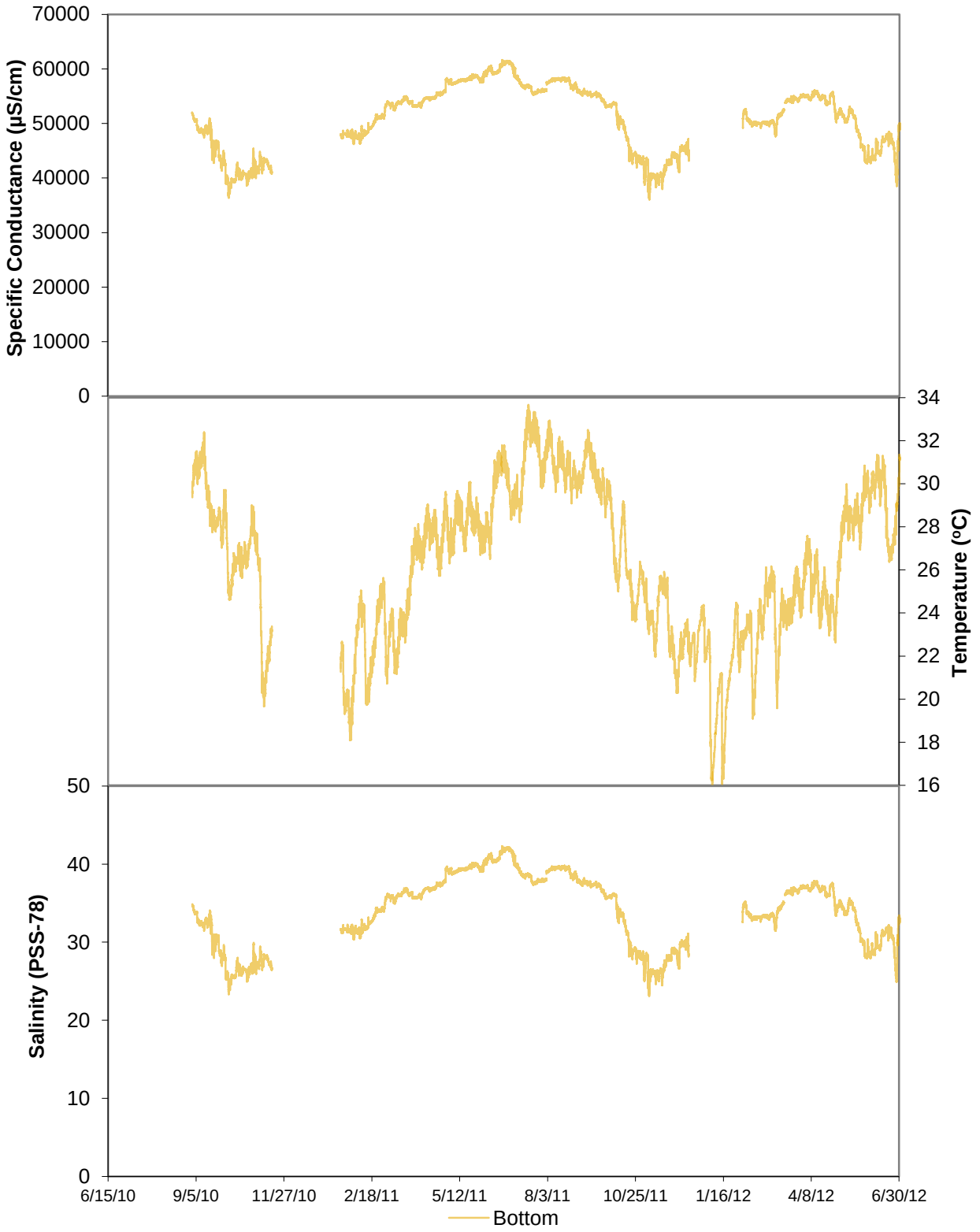


Figure 2.2-5. TPBBSW-4 Specific Conductance, Temperature, and Salinity.

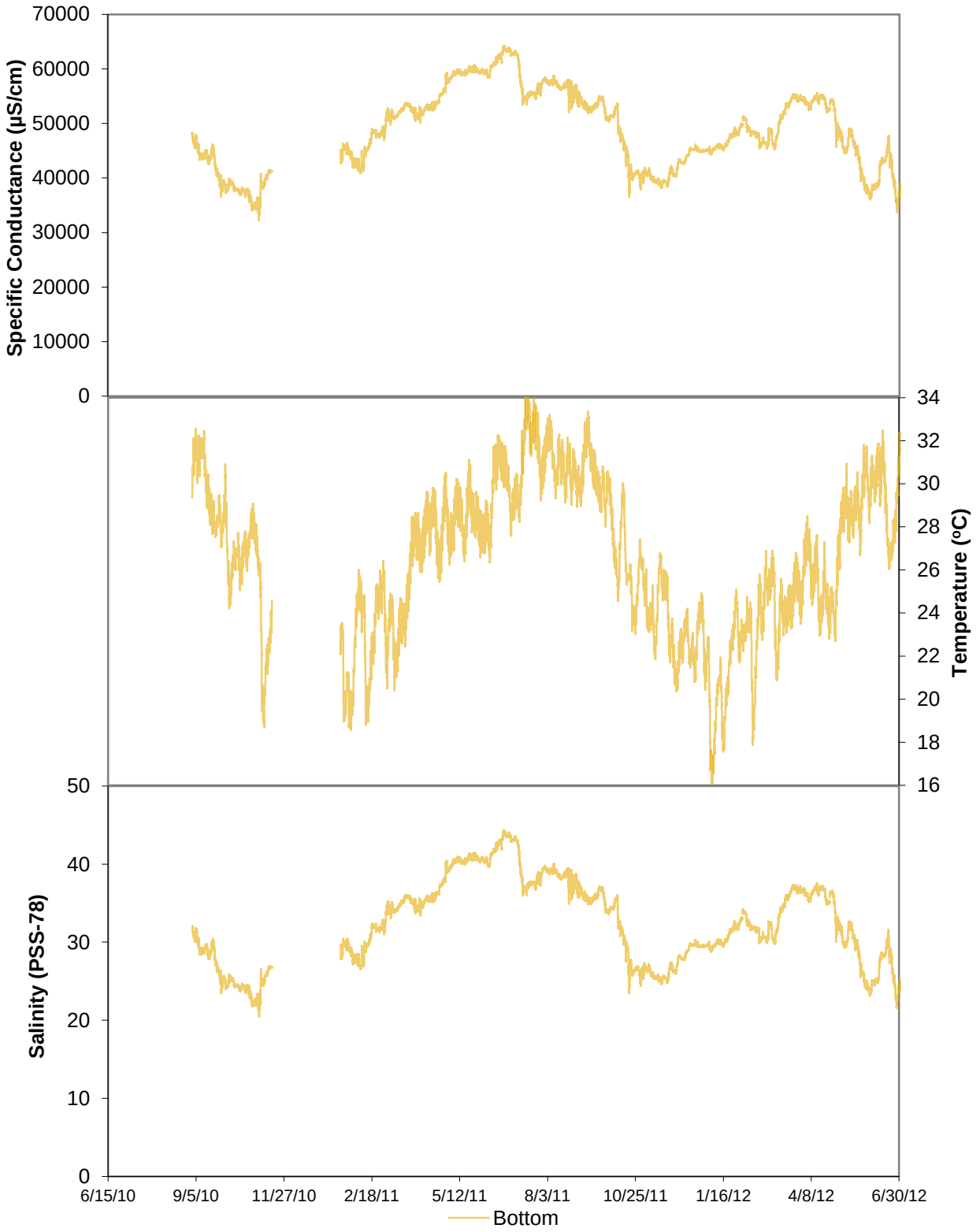


Figure 2.2-6. TPBBSW-5 Specific Conductance, Temperature, and Salinity.

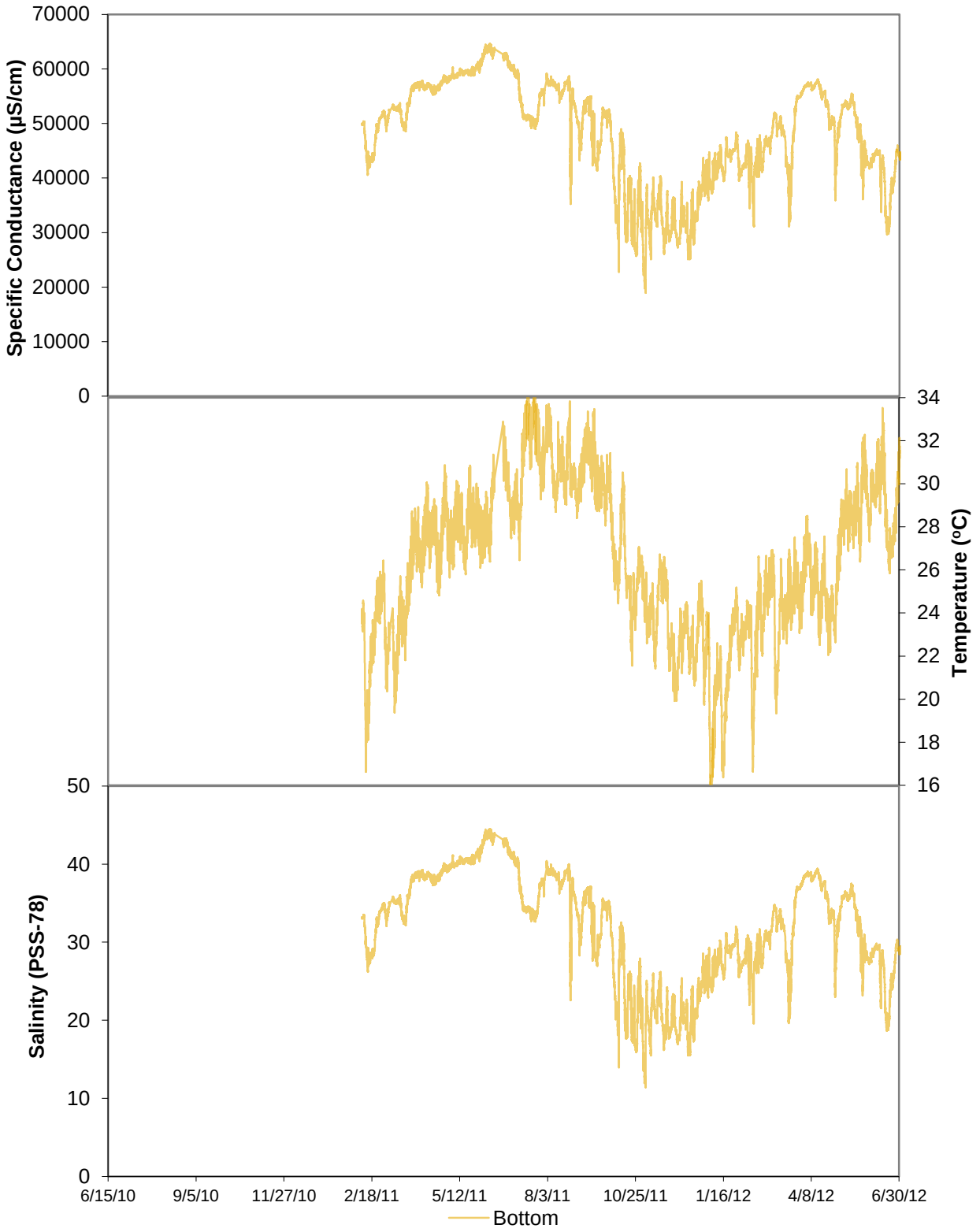


Figure 2.2-7. TPBBSW-10 Specific Conductance, Temperature, and Salinity.

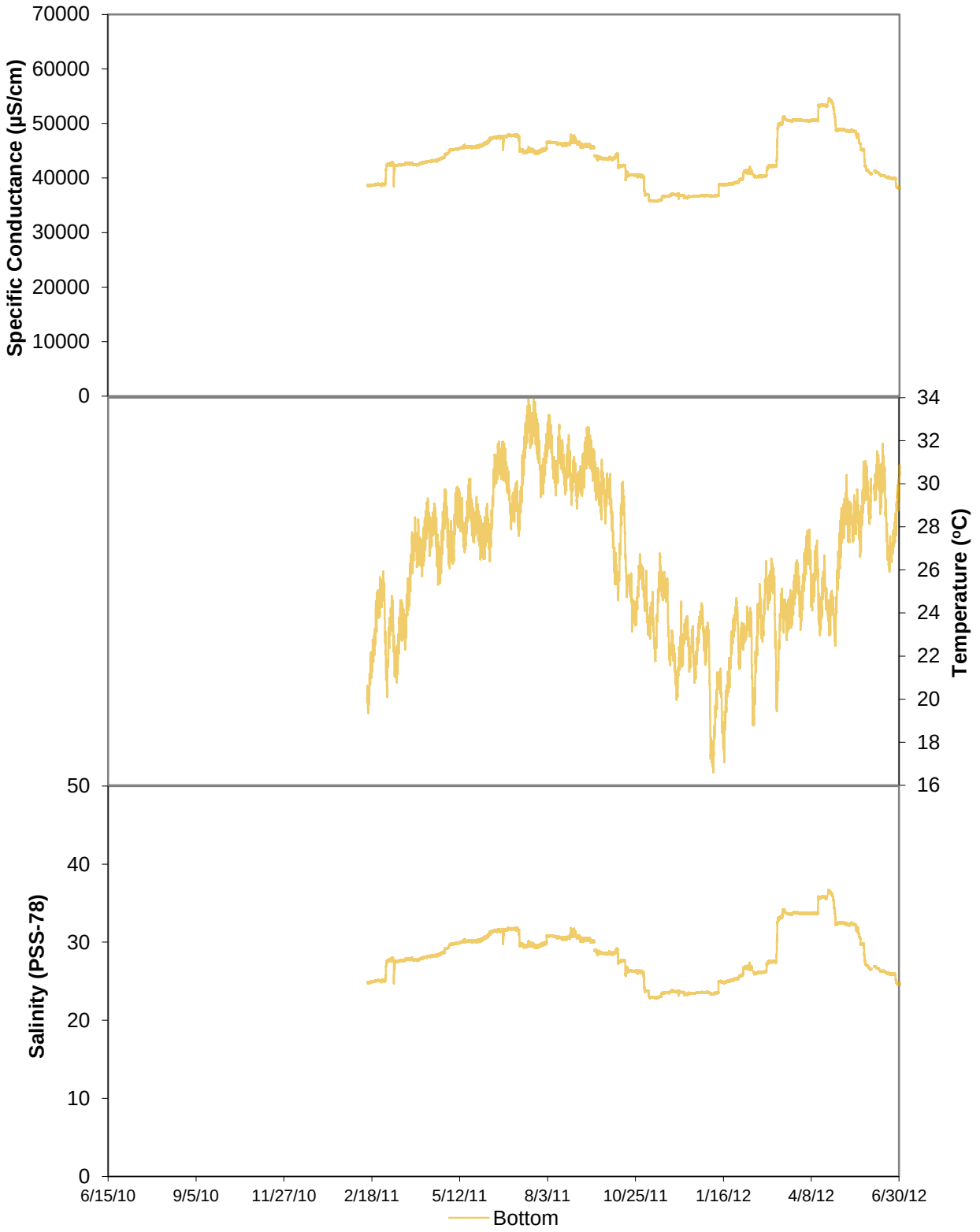


Figure 2.2-8. TPBBSW-14 Specific Conductance, Temperature, and Salinity.

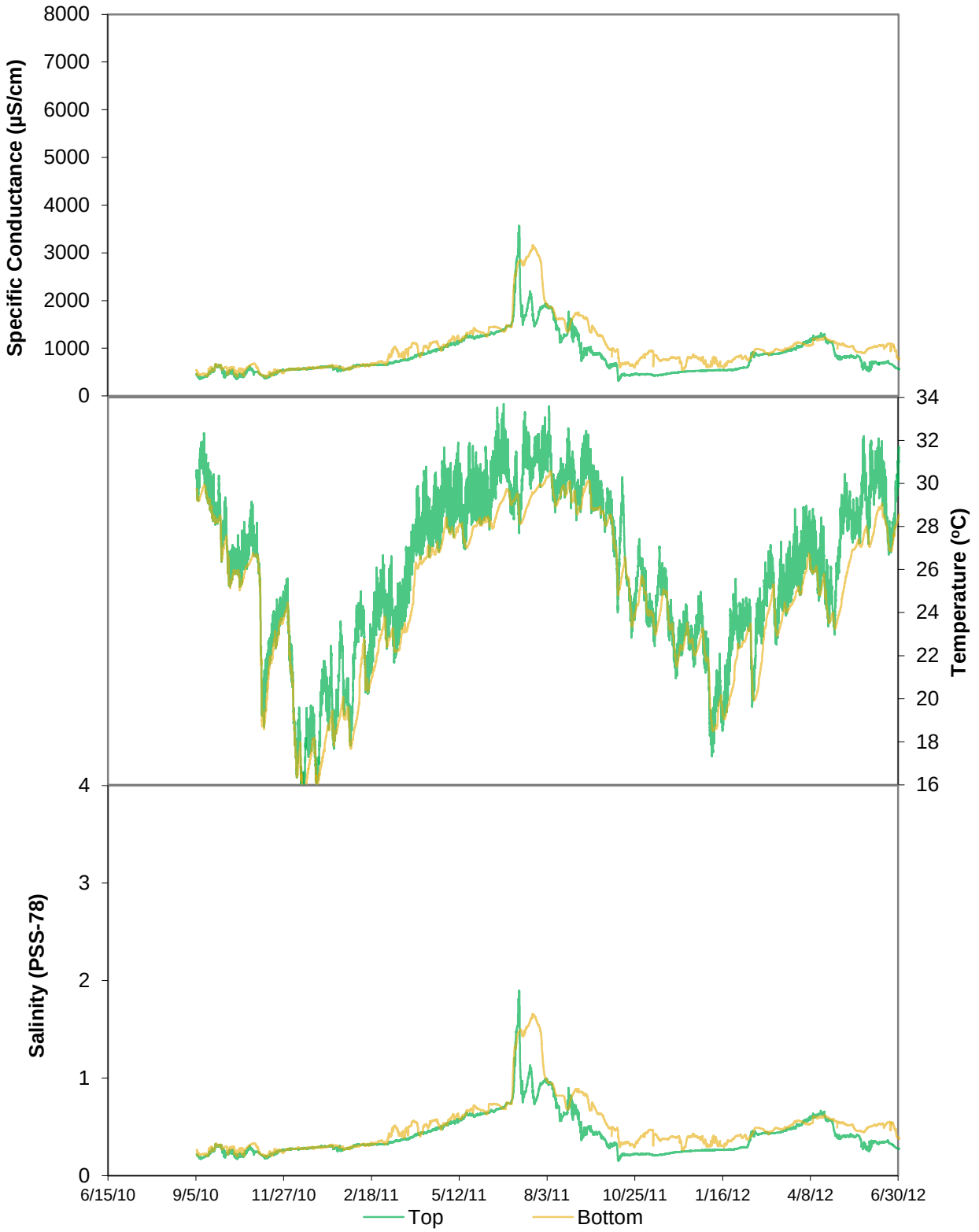


Figure 2.2-9. TPSWC-1 Specific Conductance, Temperature, and Salinity.

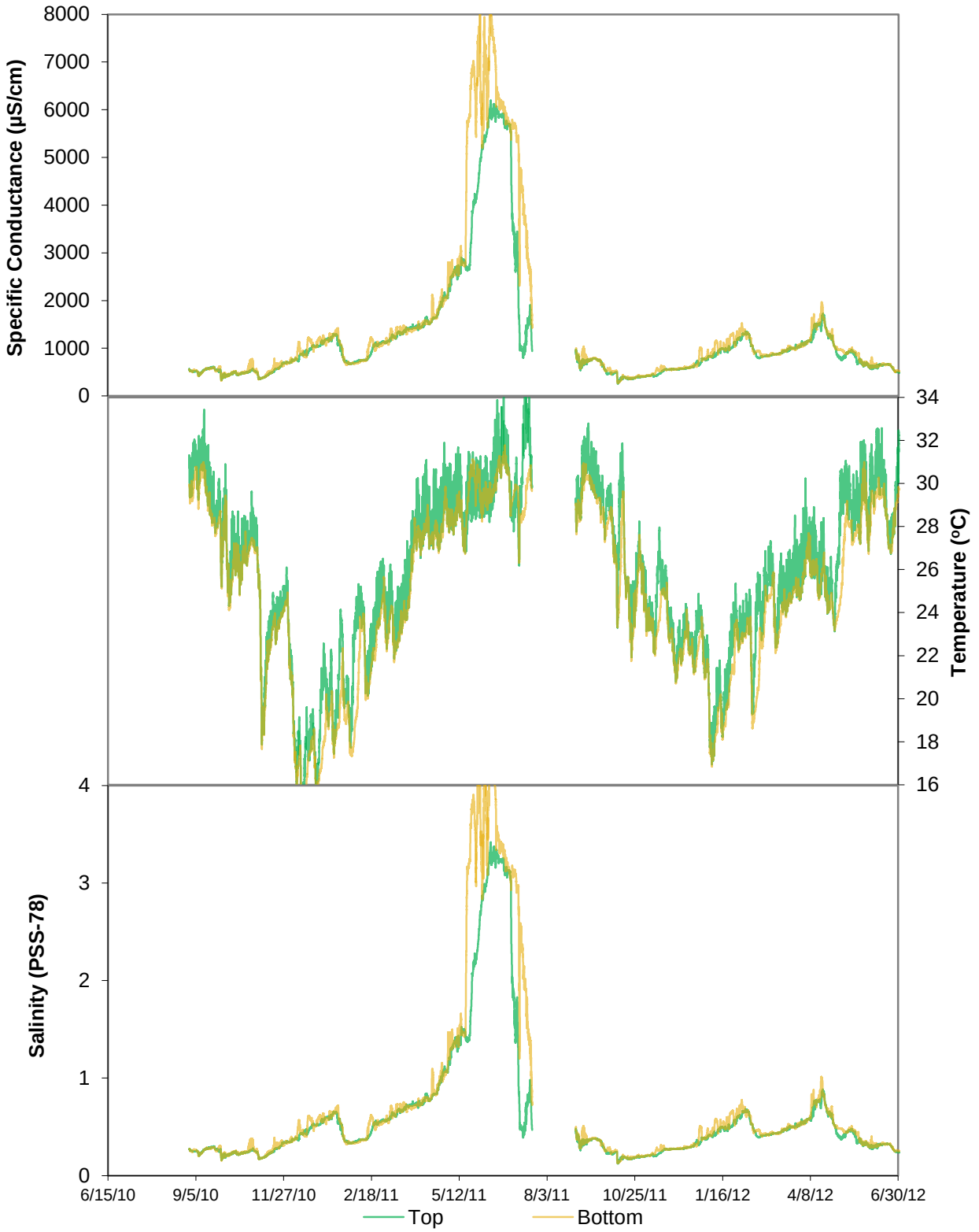


Figure 2.2-10. TPSWC-2 Specific Conductance, Temperature, and Salinity.

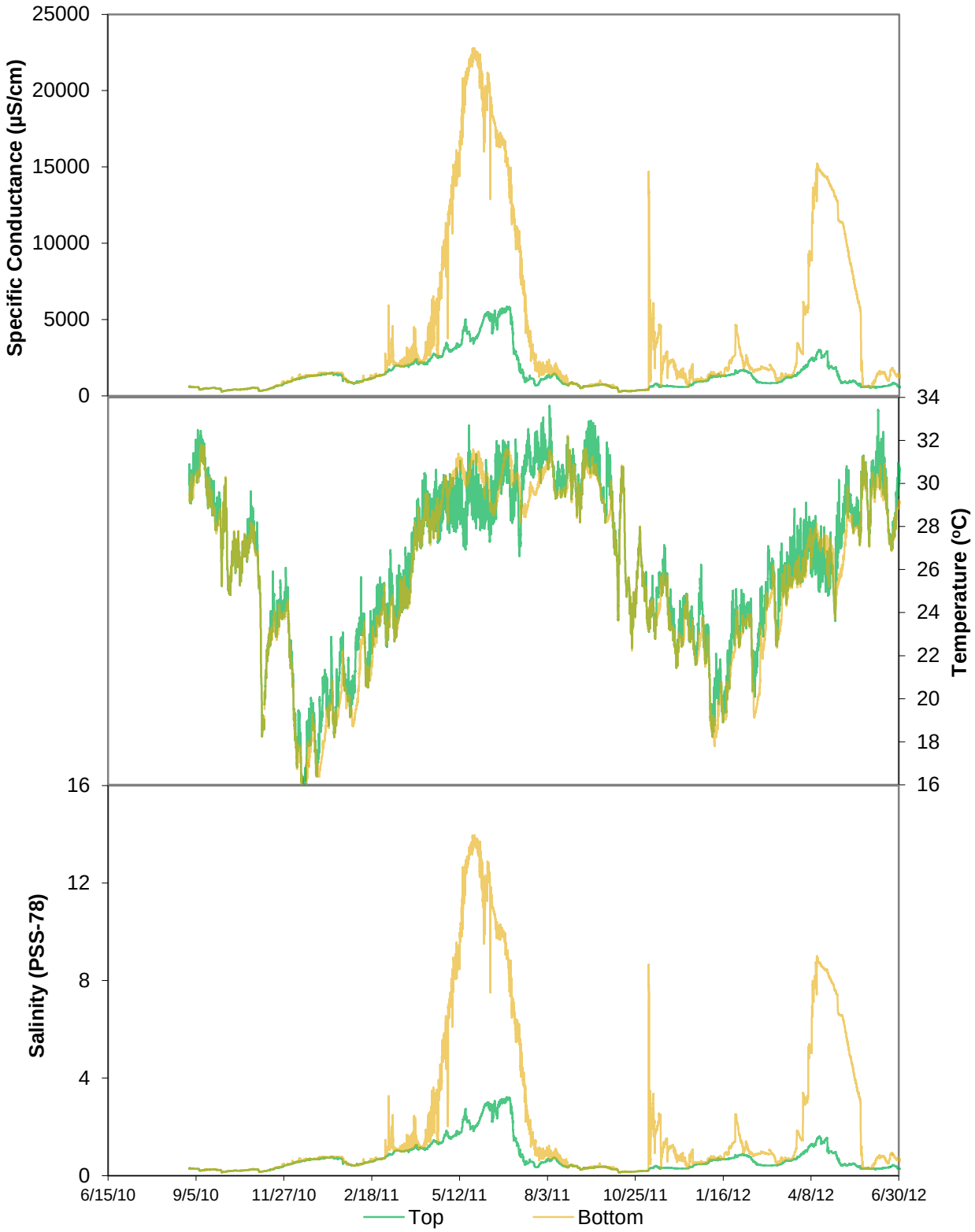


Figure 2.2-11. TPSWC-3 Specific Conductance, Temperature, and Salinity.

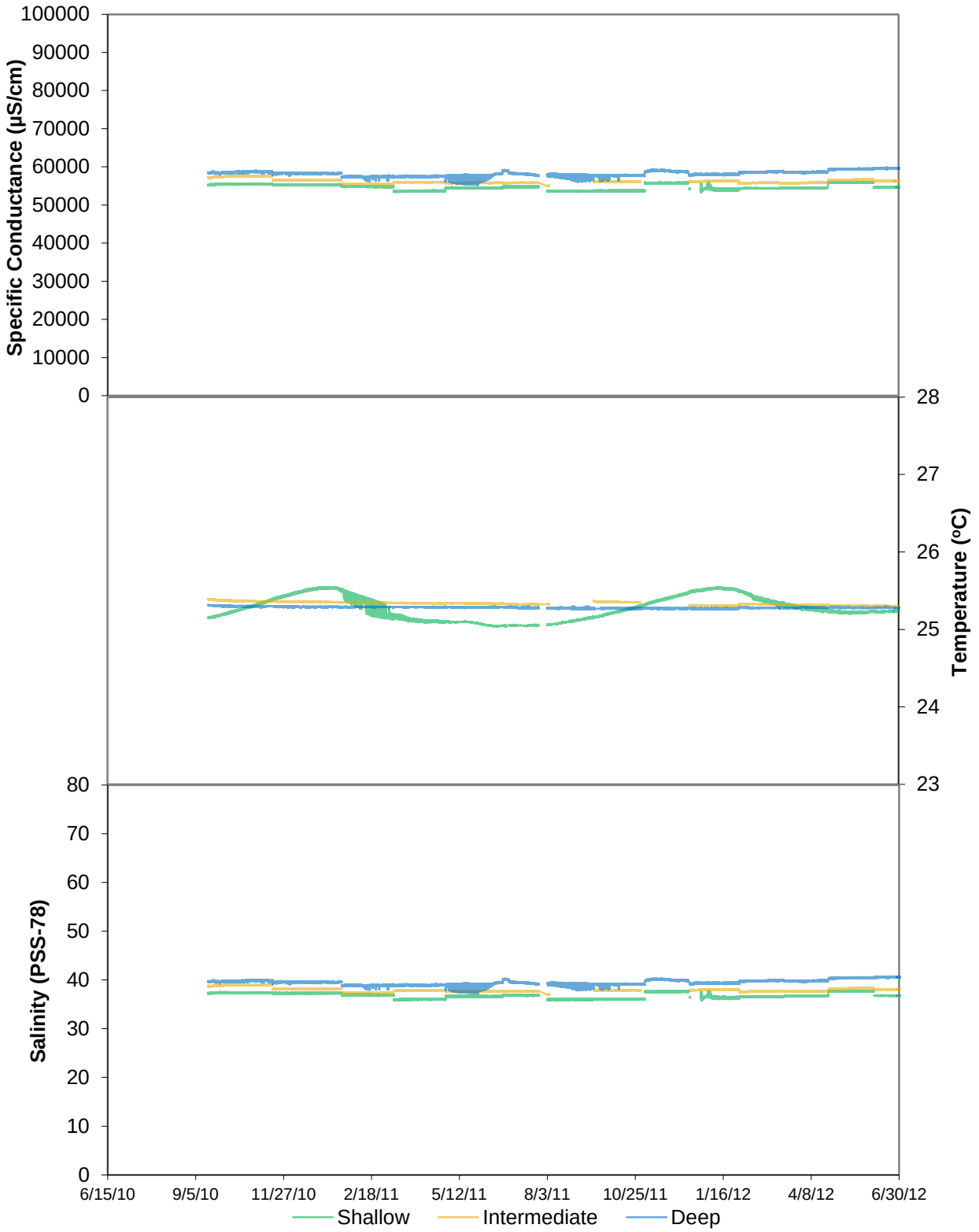


Figure 2.2-12. TPSWC-4 Specific Conductance, Temperature, and Salinity .

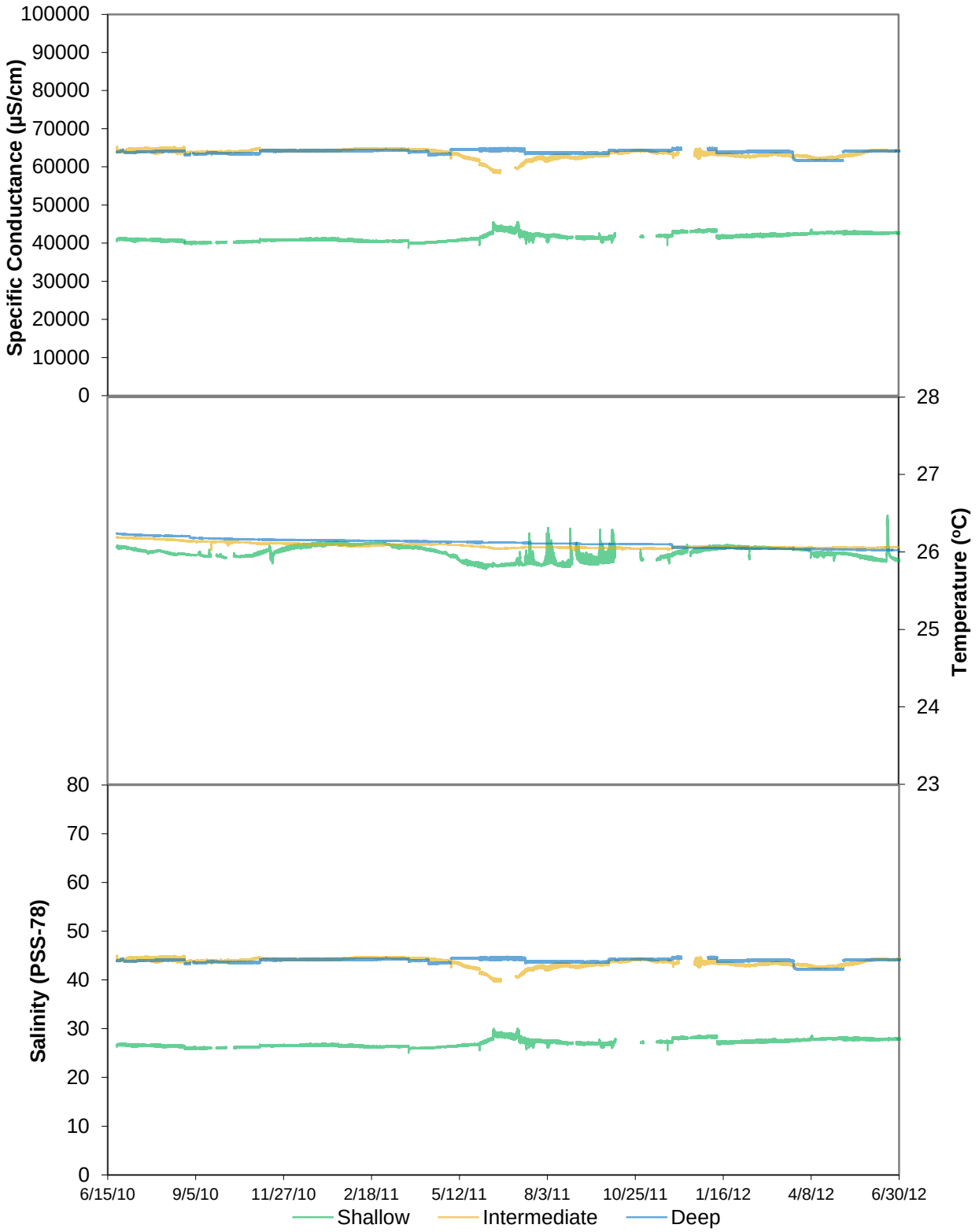


Figure 2.2-13. TPSWC-5 Specific Conductance, Temperature, and Salinity.

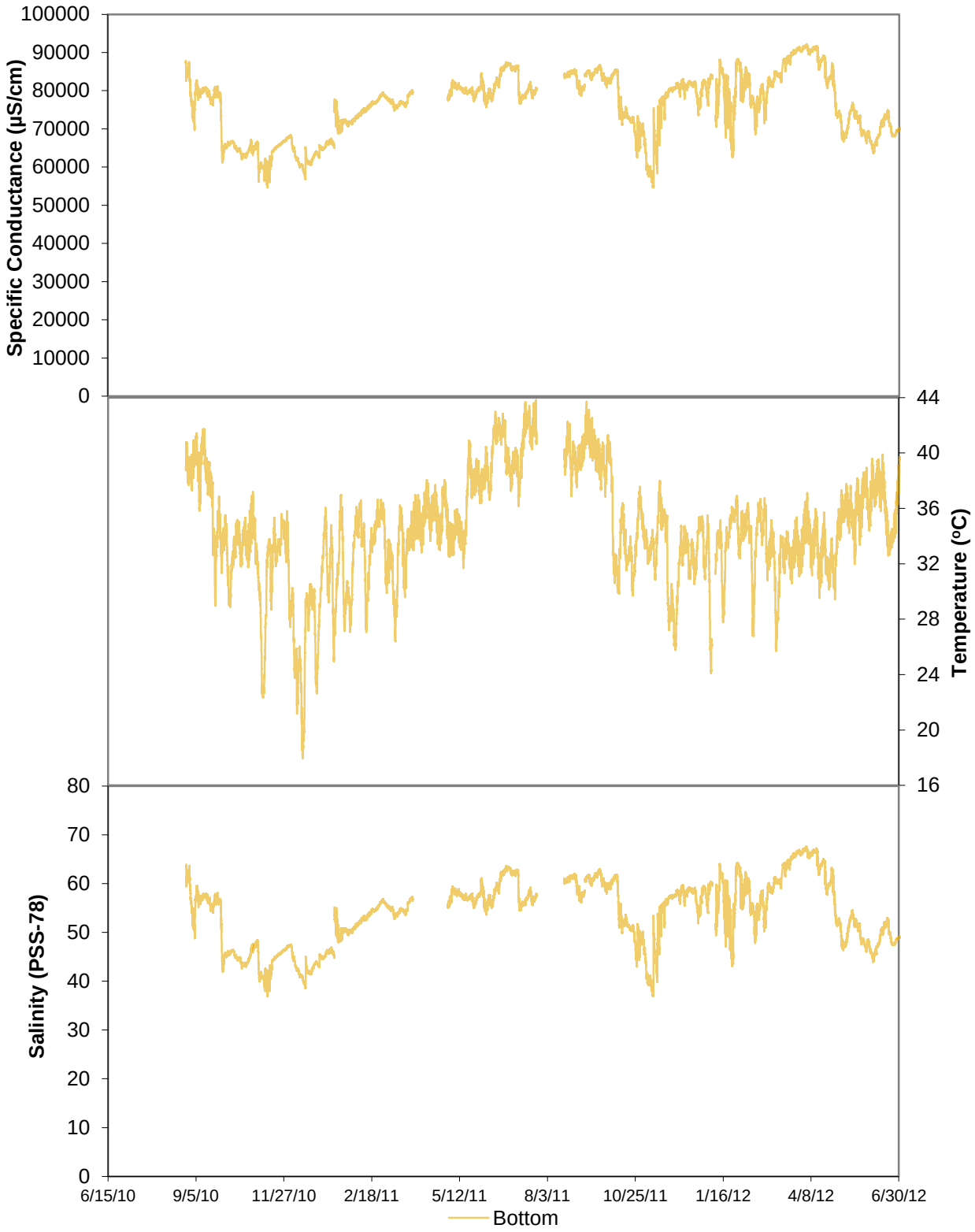


Figure 2.2-14. TPSWCCS-1 Specific Conductance, Temperature, and Salinity.

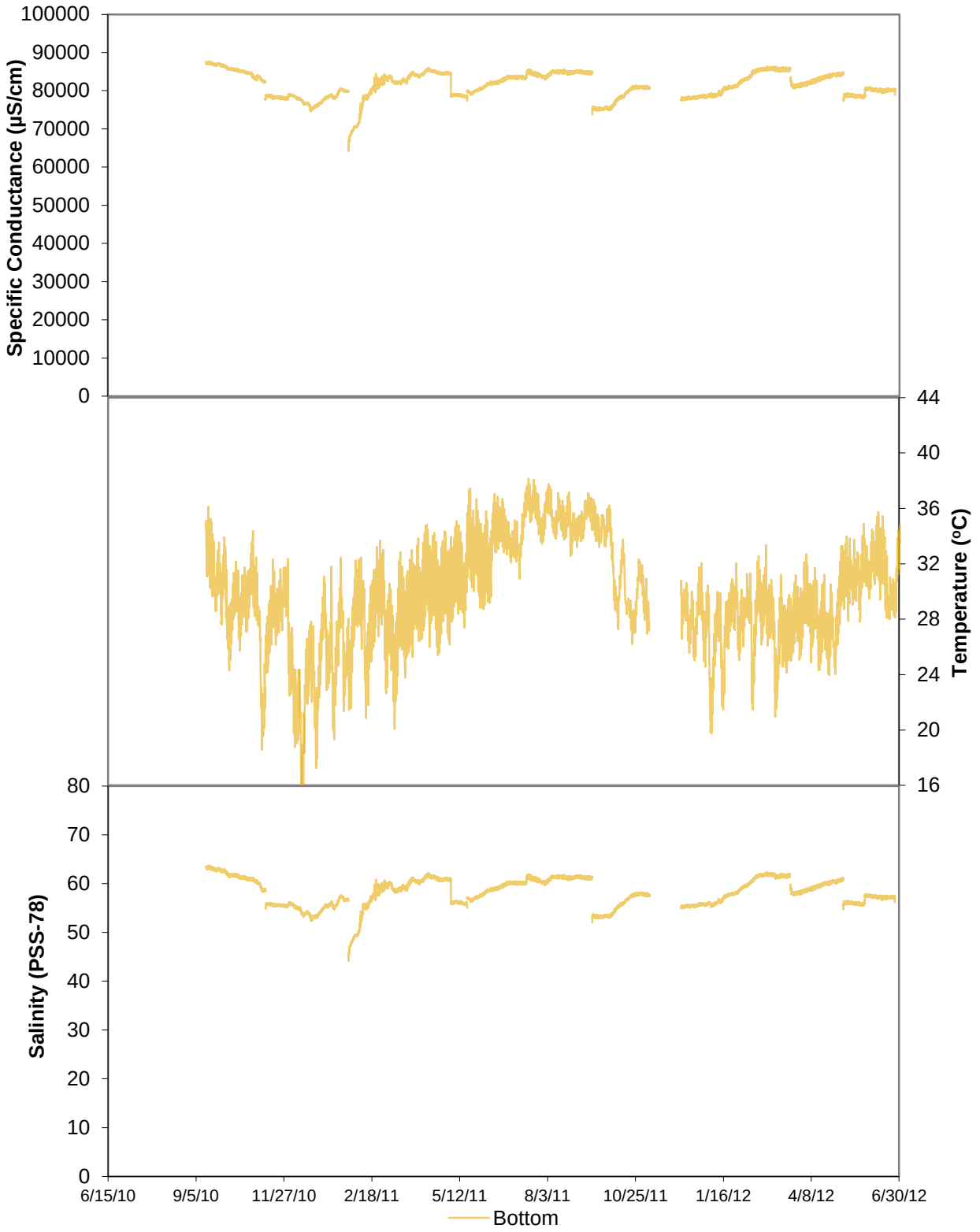


Figure 2.2-15. TPSWCCS-2 Specific Conductance, Temperature, and Salinity.

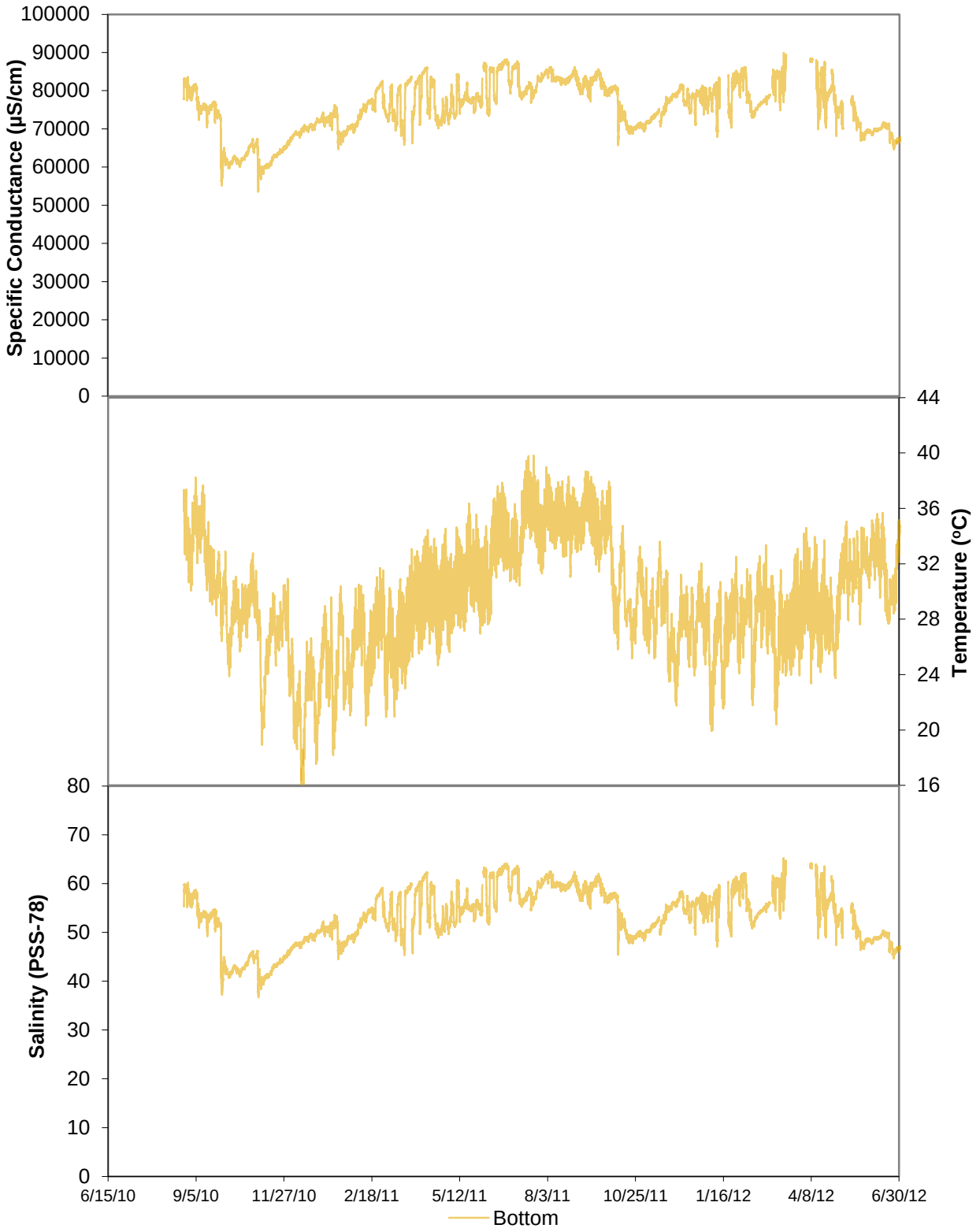


Figure 2.2-16. TPSWCCS-3 Specific Conductance, Temperature, and Salinity.

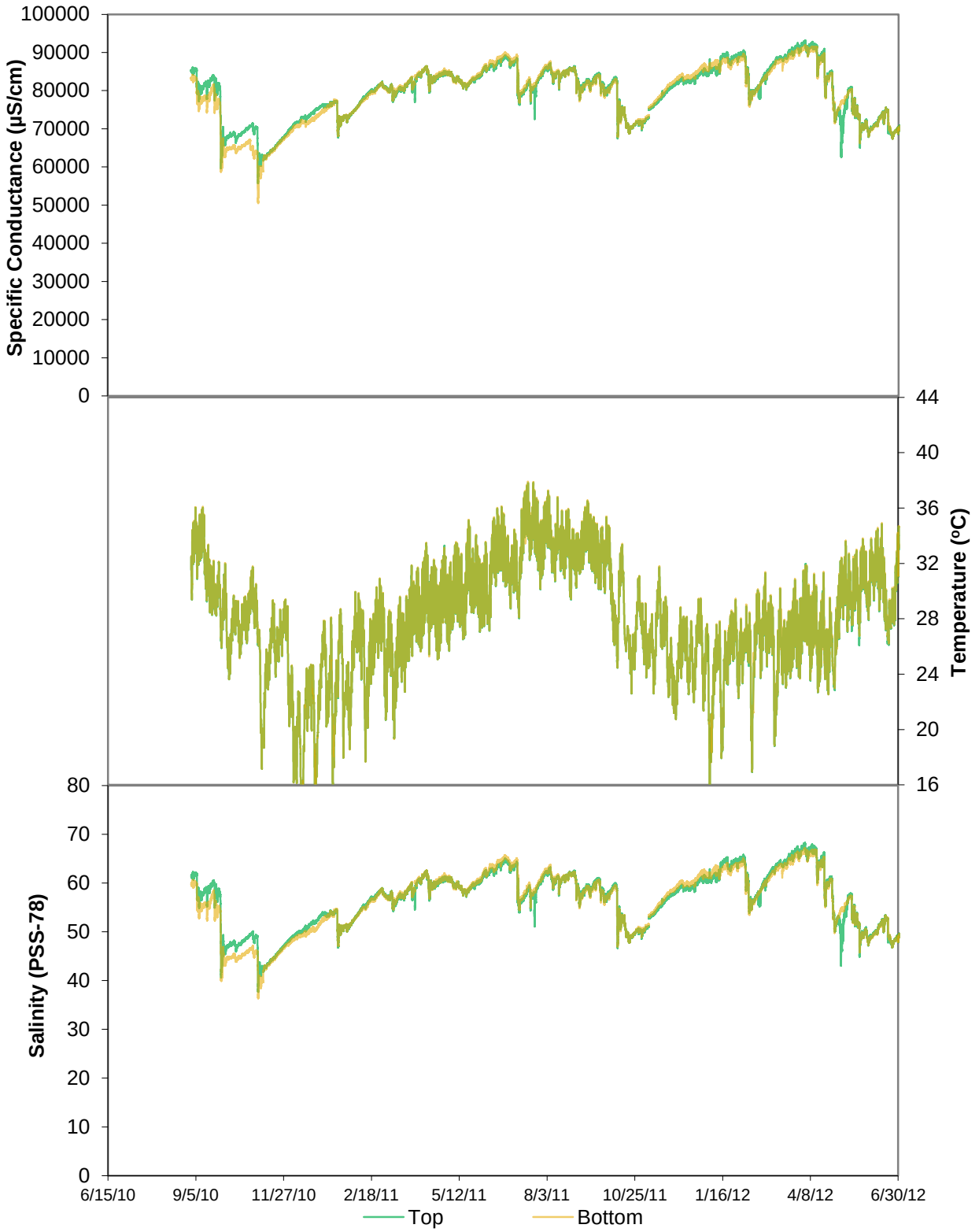


Figure 2.2-17. TPSWCCS-4 Specific Conductance, Temperature, and Salinity.

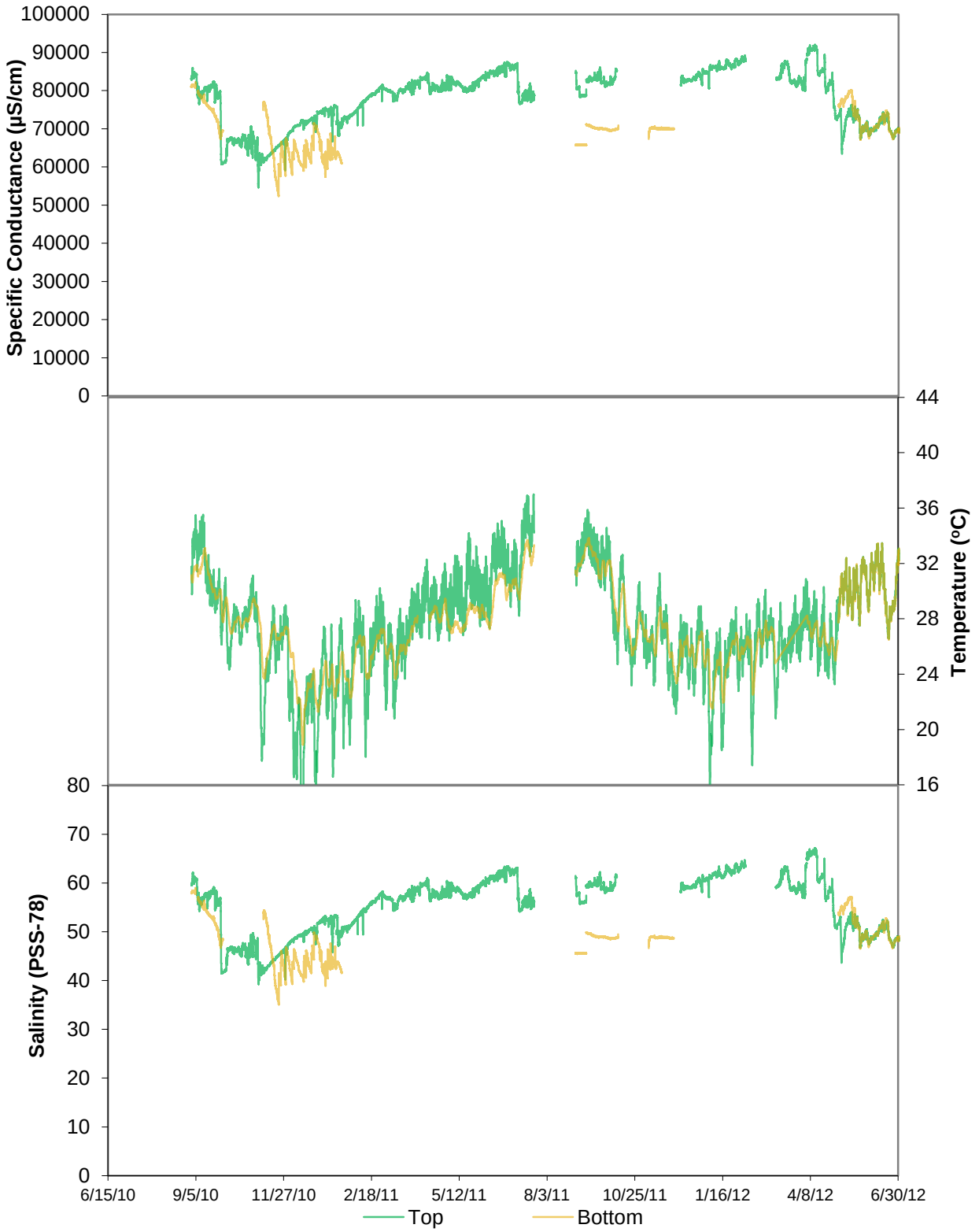


Figure 2.2-18. TPSWCCS-5 Specific Conductance, Temperature, and Salinity.

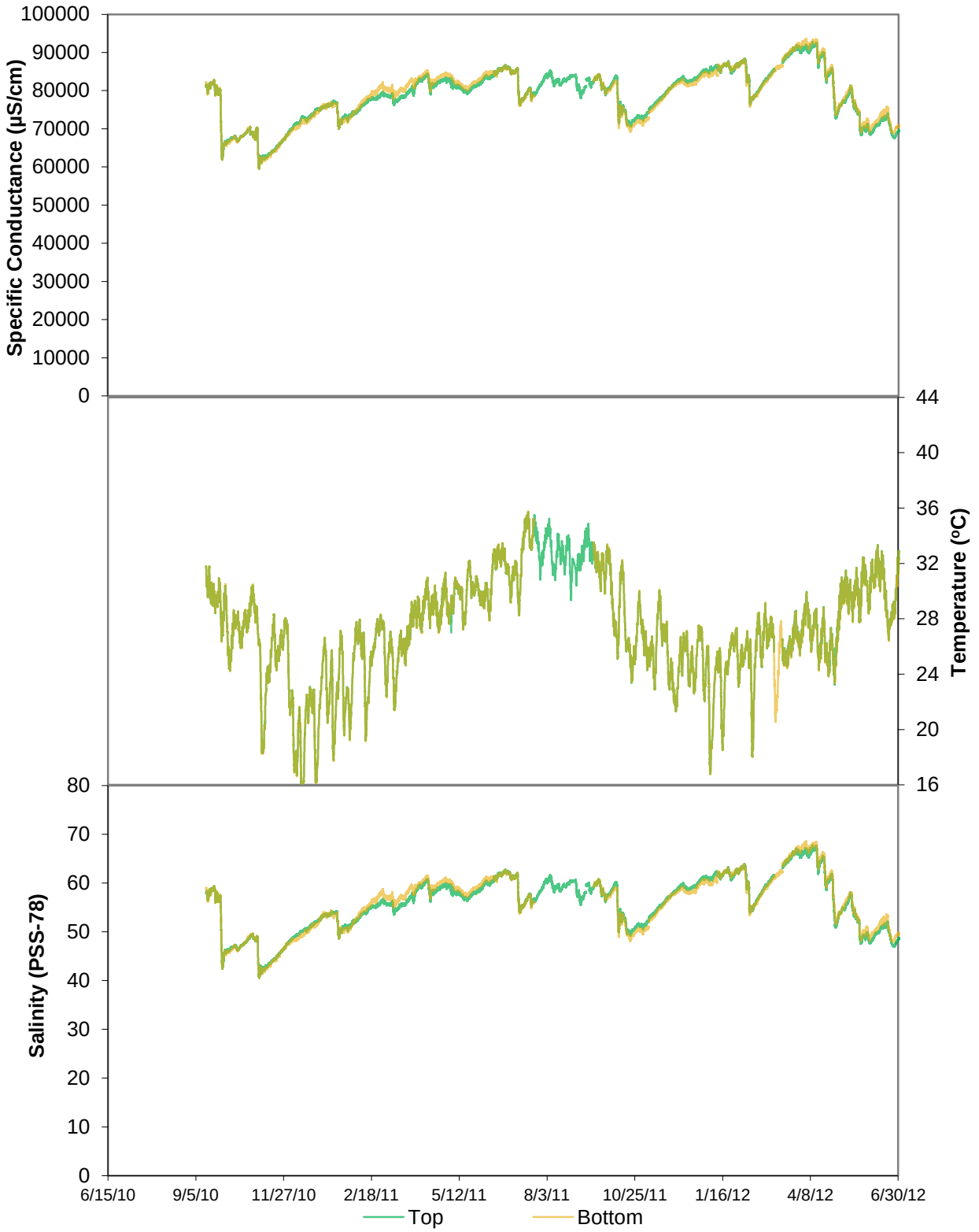


Figure 2.2-19. TPSWCCS-6 Specific Conductance, Temperature, and Salinity.

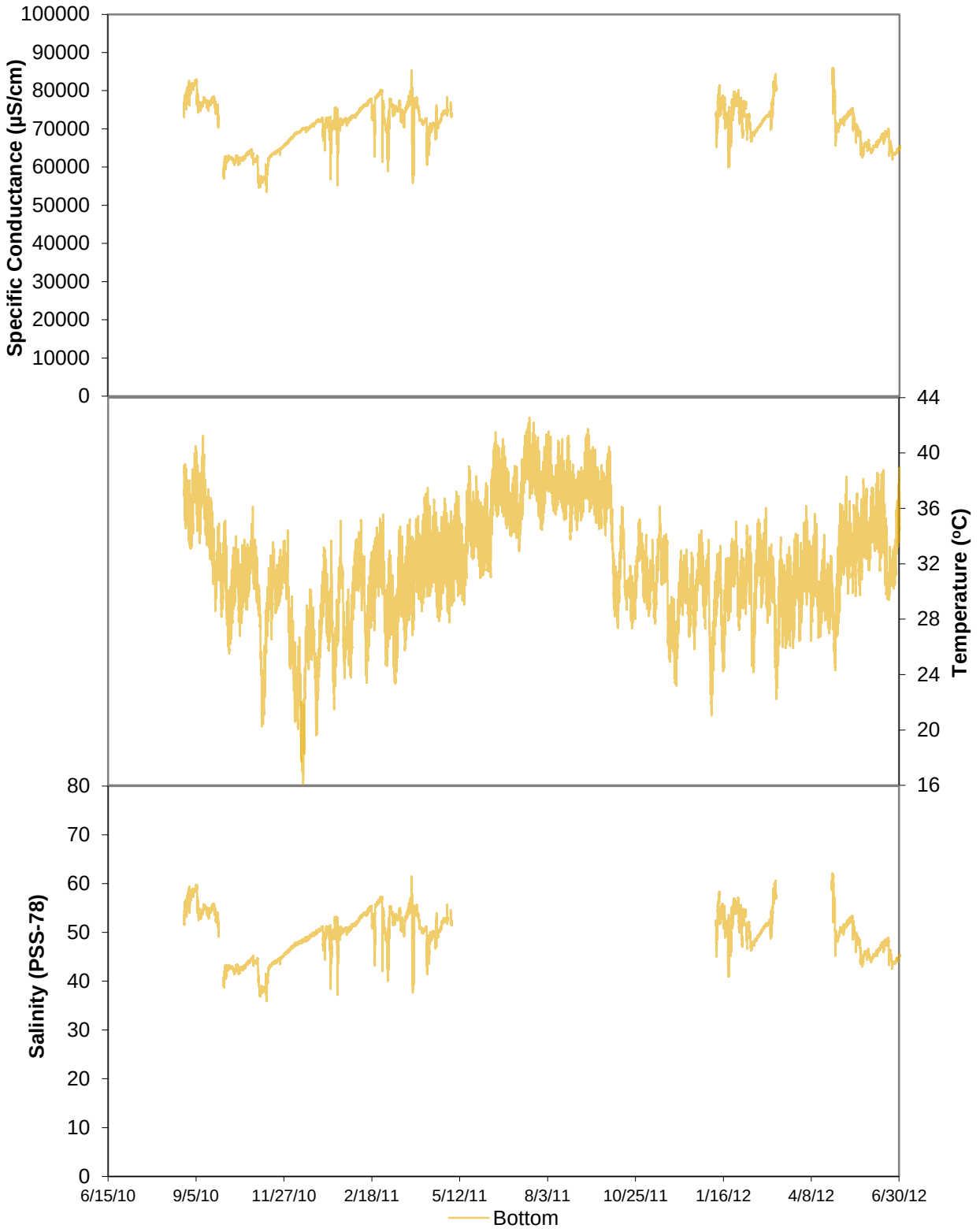


Figure 2.2-20. TPSWCCS-7 Specific Conductance, Temperature, and Salinity.

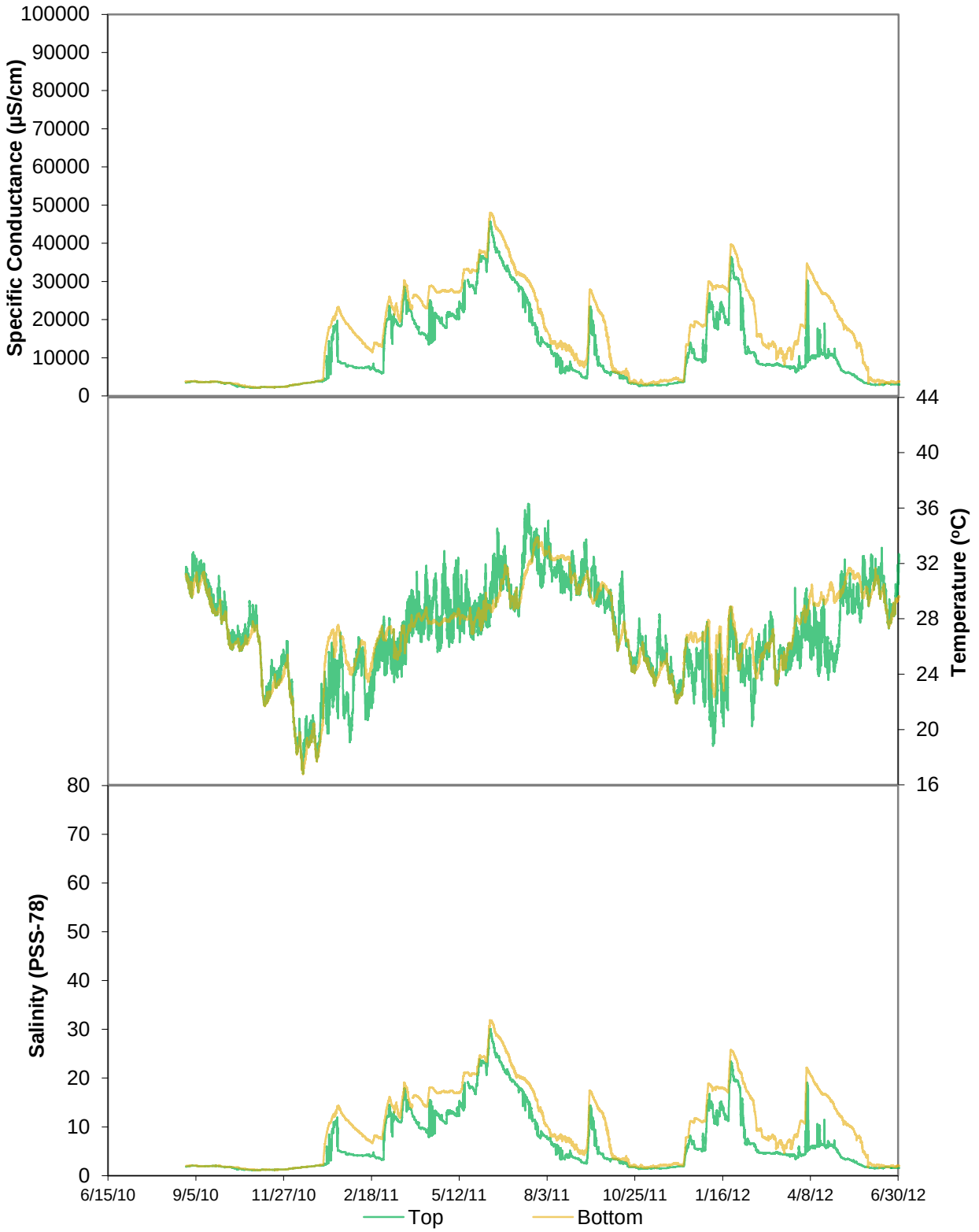


Figure 2.2-21. TPSWID-1 Specific Conductance, Temperature, and Salinity.

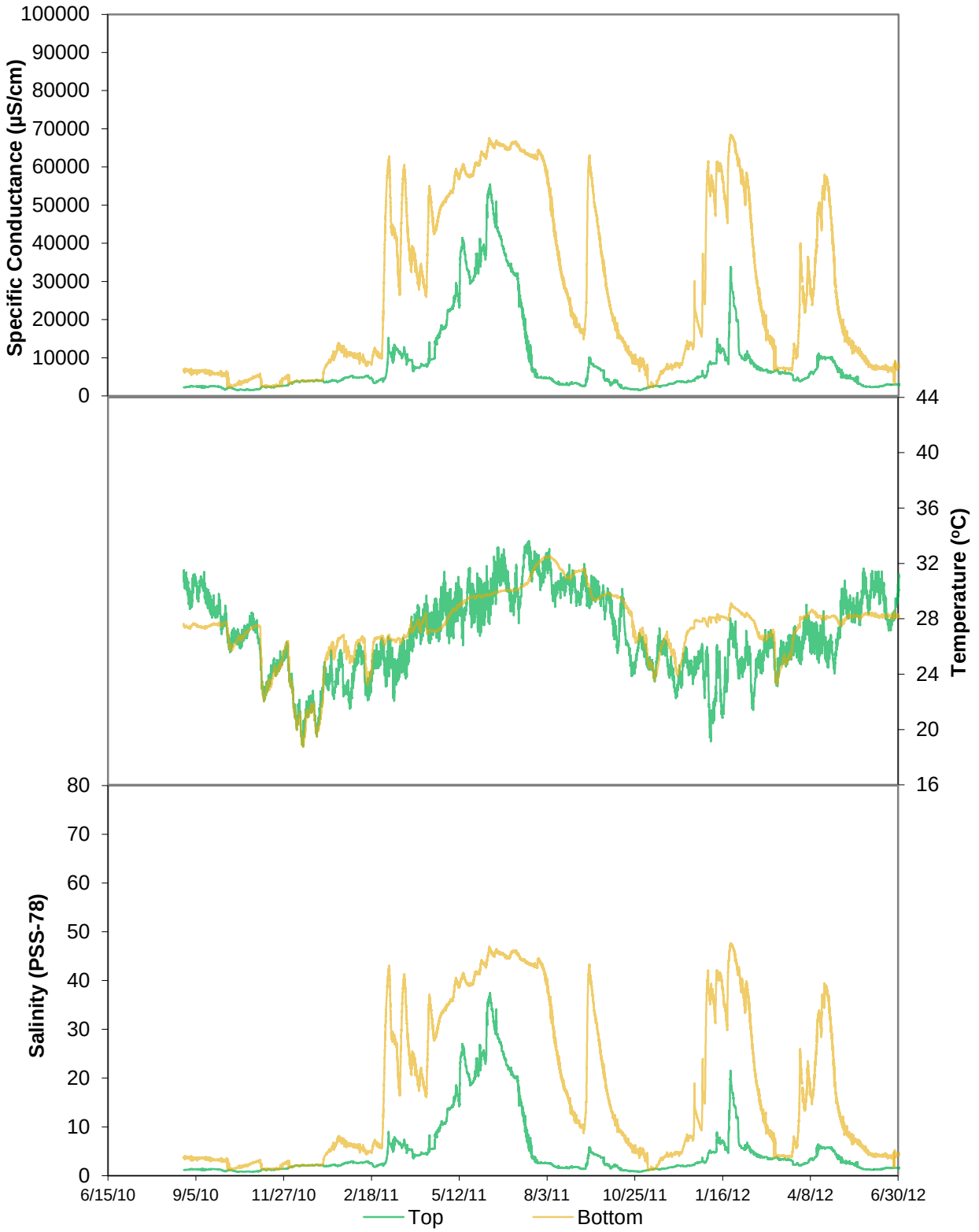


Figure 2.2-22. TPSWID-2 Specific Conductance, Temperature, and Salinity.

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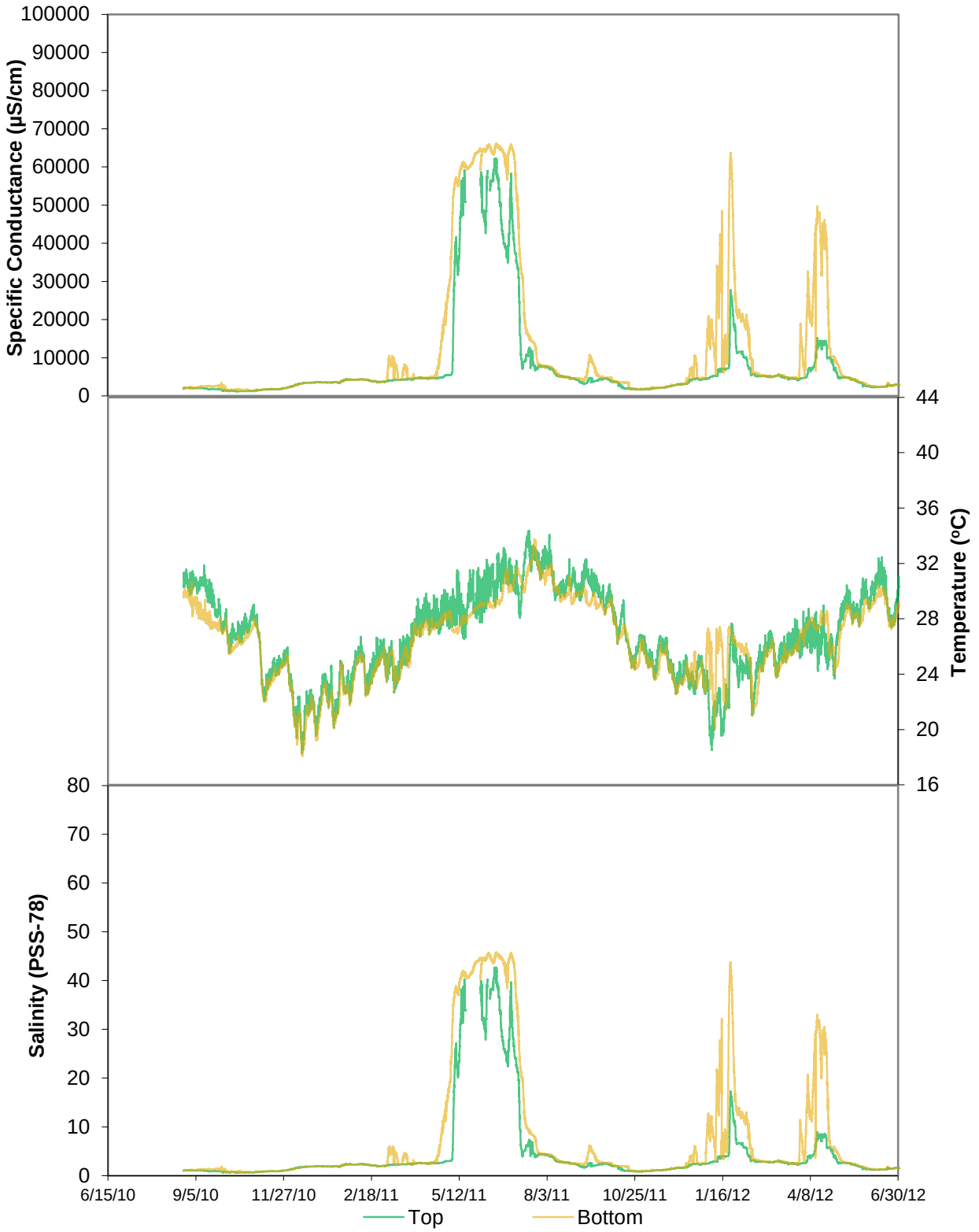
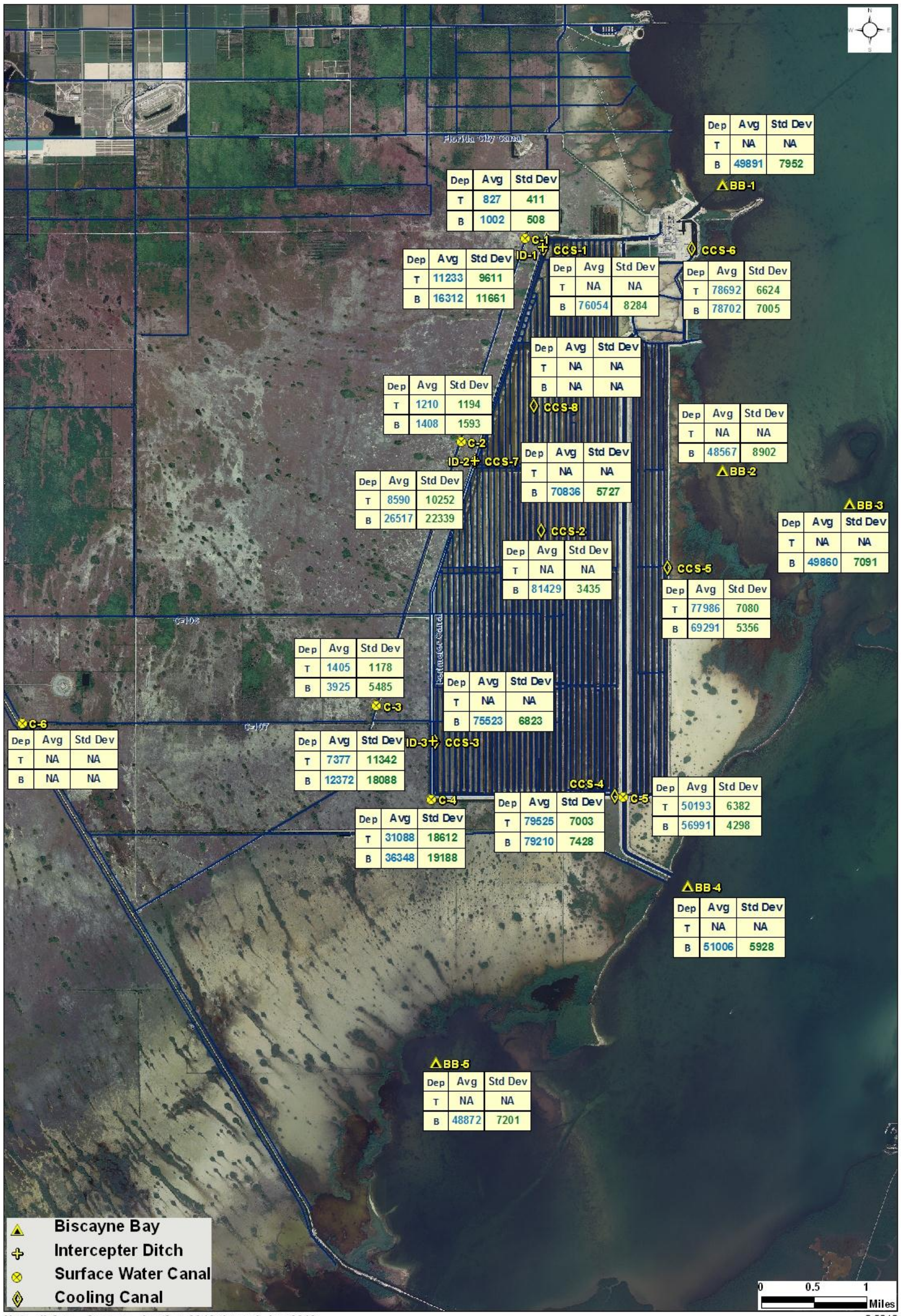
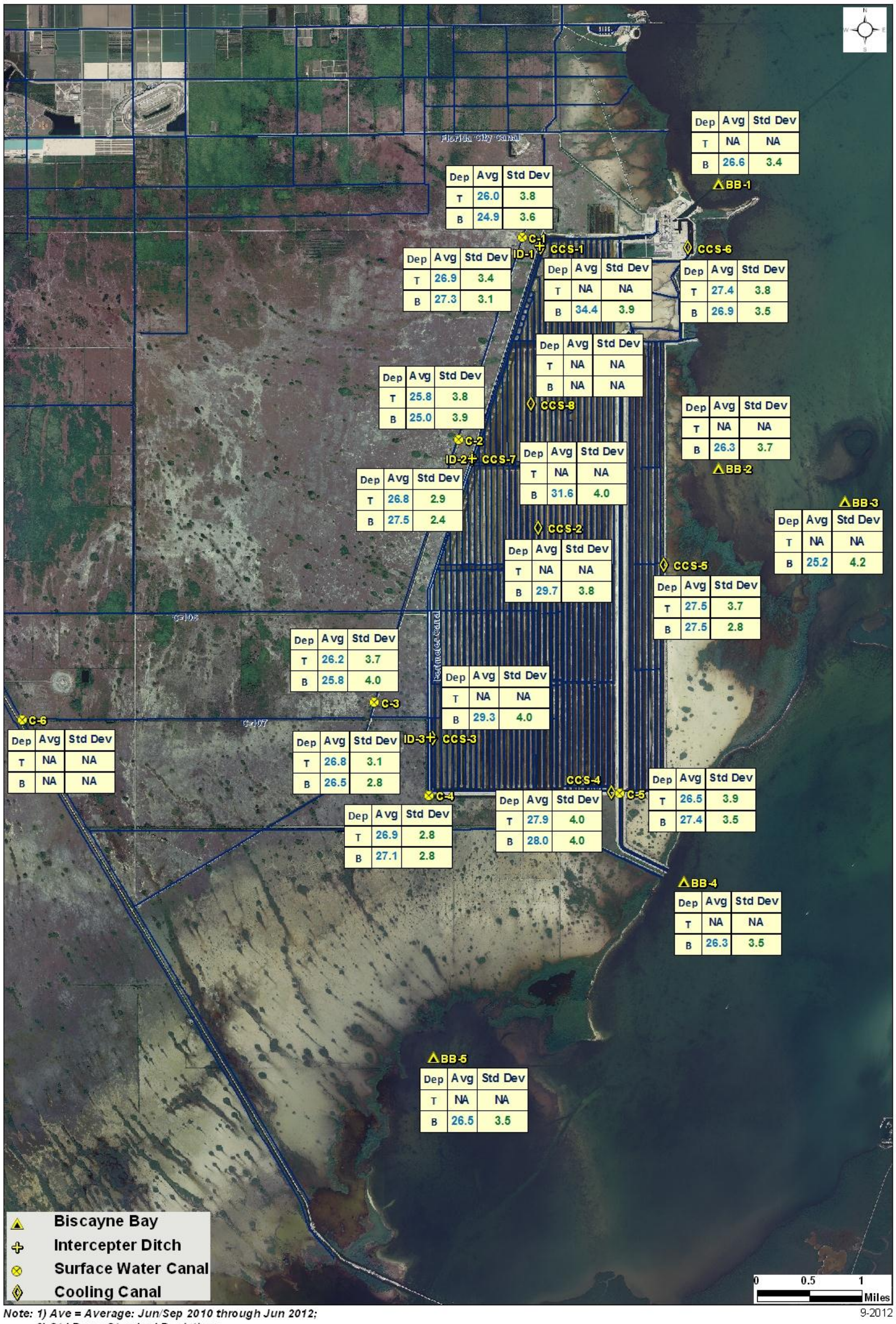


Figure 2.2-23. TPSWID-3 Specific Conductance, Temperature, and Salinity.



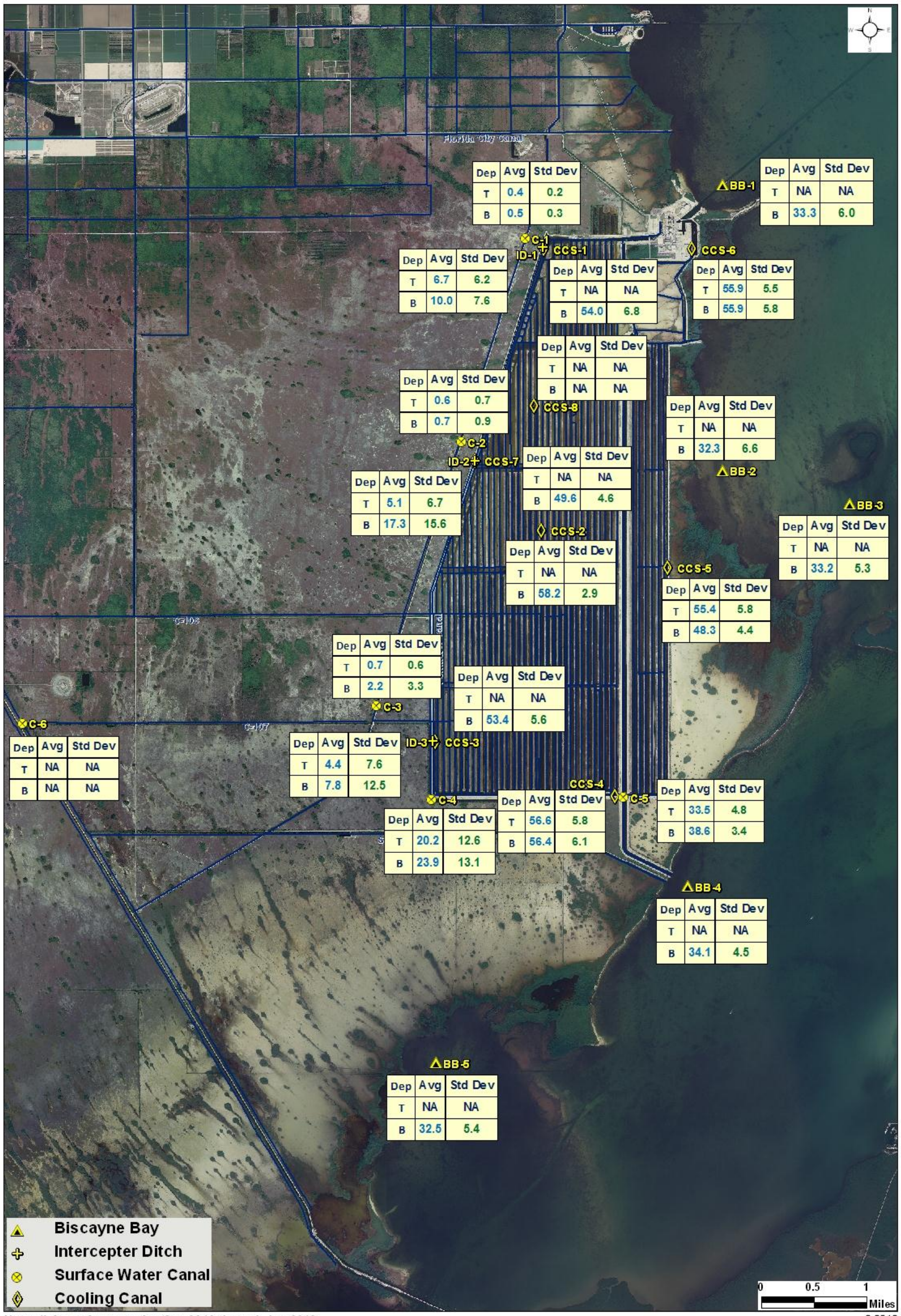
Note: 1) Ave = Average: Jun/Sep 2010 through Jun 2012;
2) Std Dev = Standard Deviation;
3) NA: Not Available;
4) Samples Collected at 2 Depths (T: Top; B: Bottom;)

Figure 2.2-24. Average and Standard Deviation of Specific Conductance Values (in µS/cm) for Surface Water Stations.



Note: 1) Ave = Average: Jun/Sep 2010 through Jun 2012;
2) Std Dev = Standard Deviation;
3) NA: Not Available;
4) Samples Collected at 2 Depths (T: Top; B: Bottom;)

Figure 2.2-25. Average and Standard Deviation of Temperature (in ^{o}Celcius) for Surface Water Stations.



Note: 1) Ave = Average: Jun/Sep 2010 through Jun 2012;
2) Std Dev = Standard Deviation;
3) NA: Not Available;
4) Samples Collected at 2 Depths (T: Top; B: Bottom;)

Figure 2.2-26. Average and Standard Deviation of Salinity (in PSS-78) for Surface Water Stations.

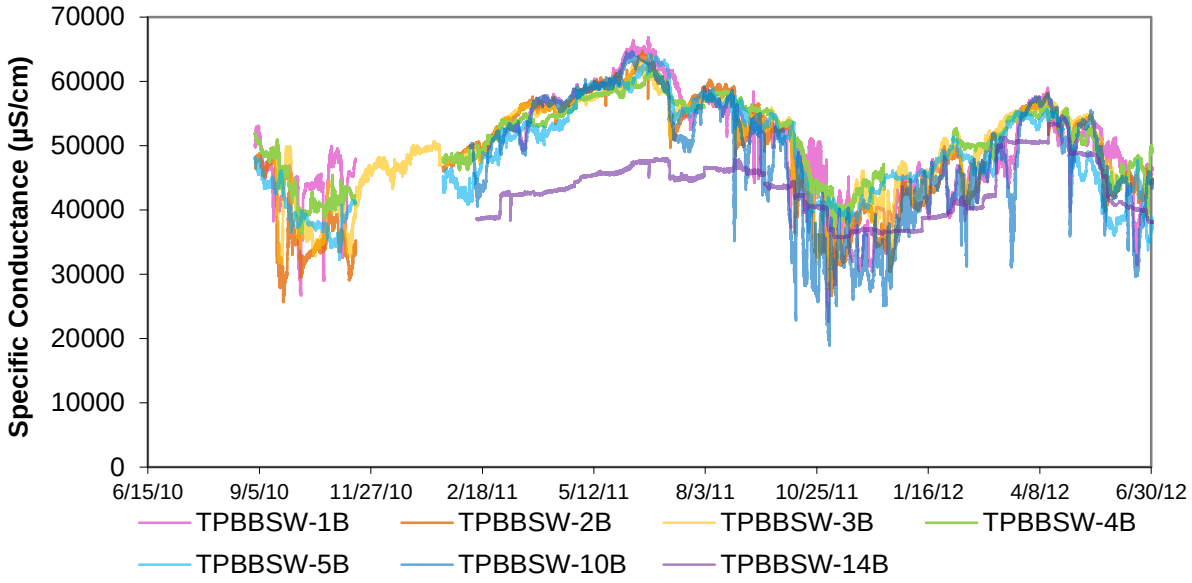


Figure 2.2-27. Comparison of Specific Conductance in Biscayne Bay Surface Water Stations.

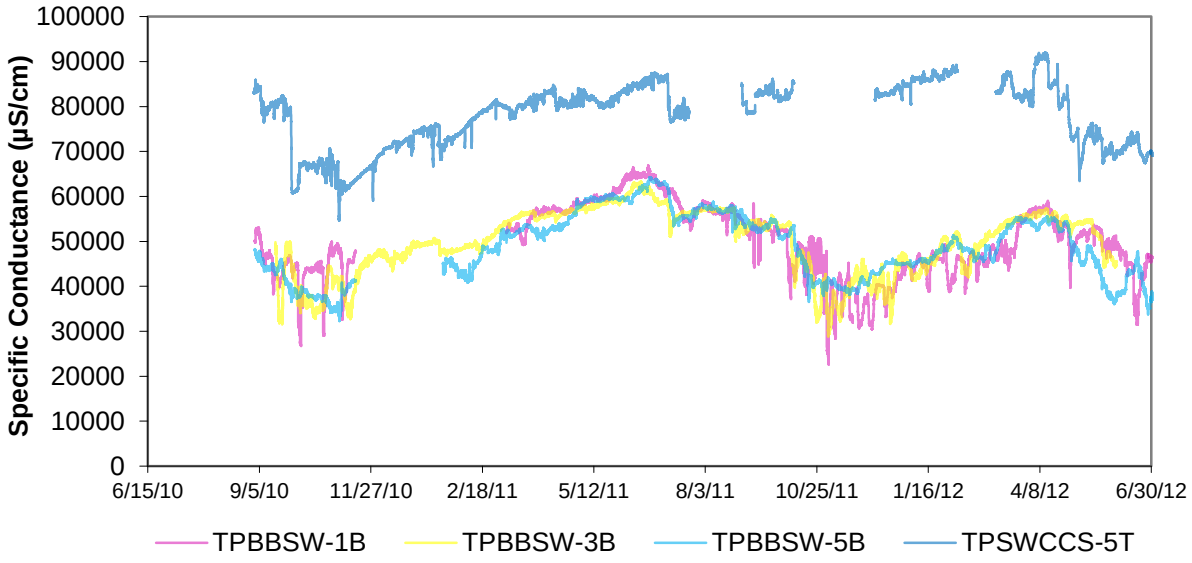
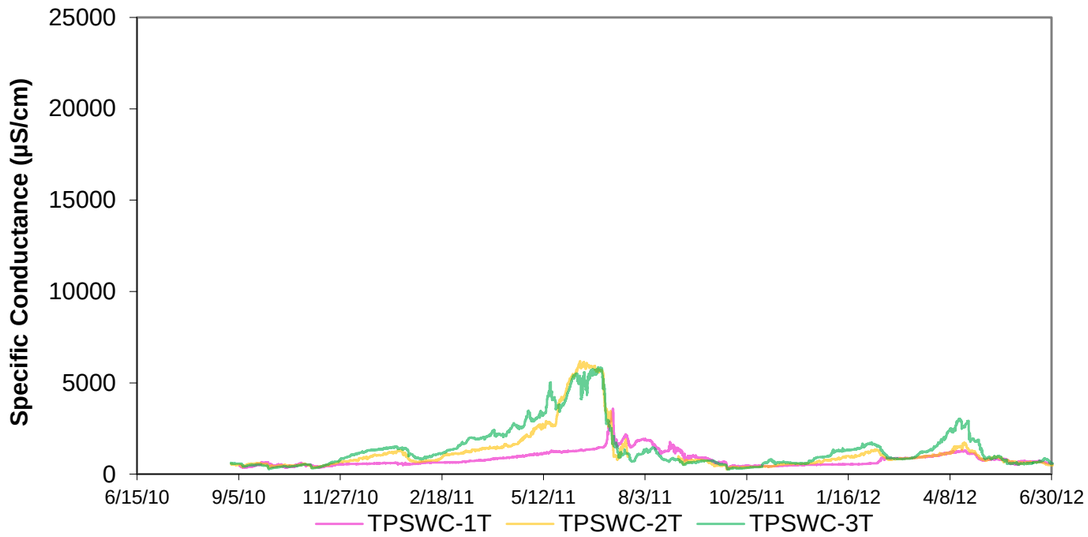
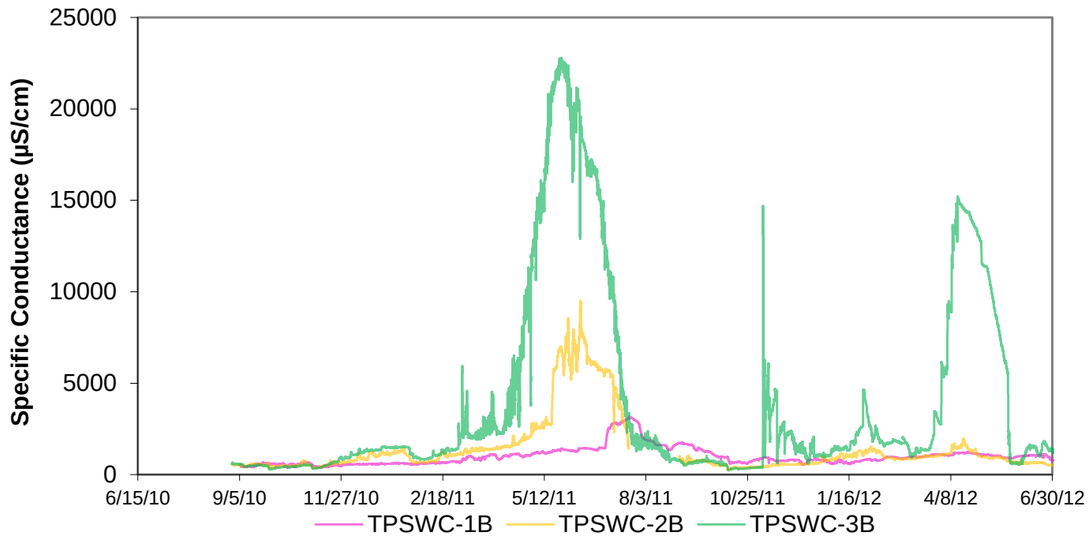
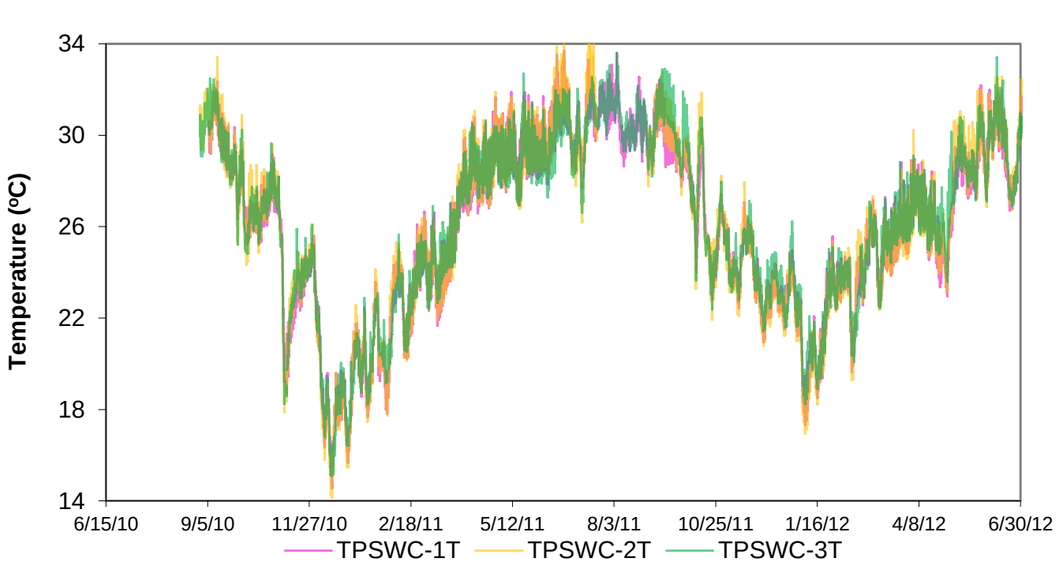


Figure 2.2-28. Comparison of Specific Conductance and Temperature in CCS and Biscayne Bay Surface Water Stations.







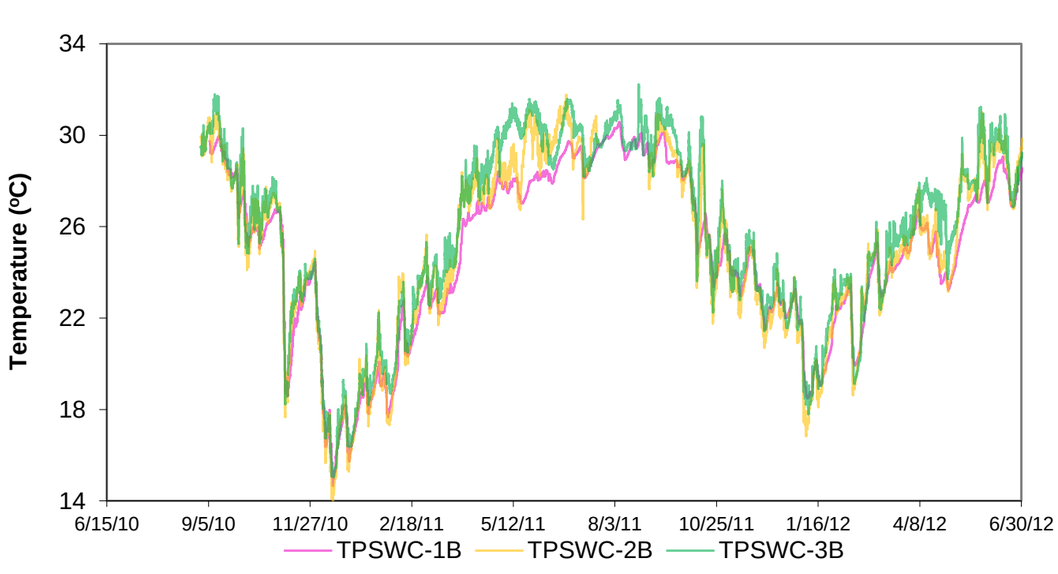
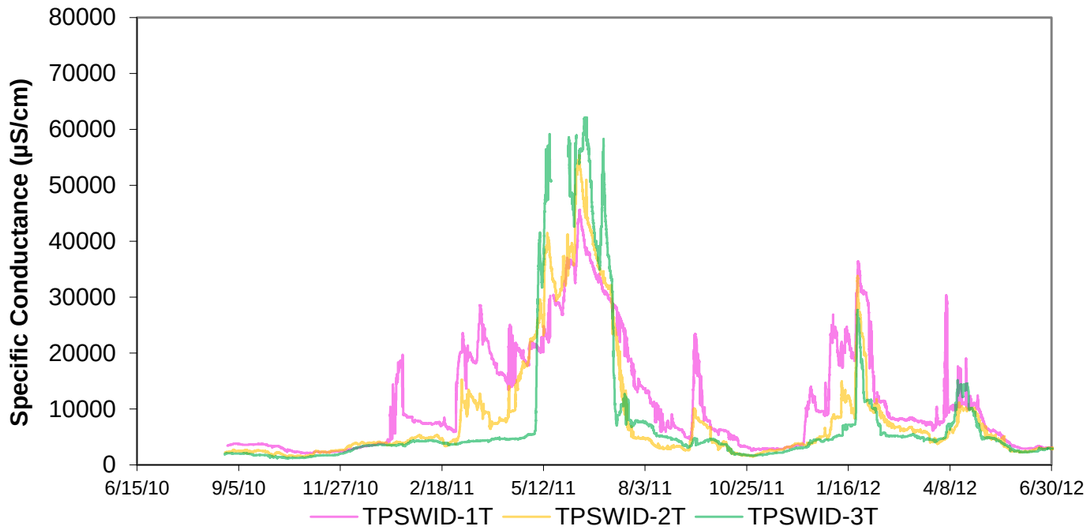
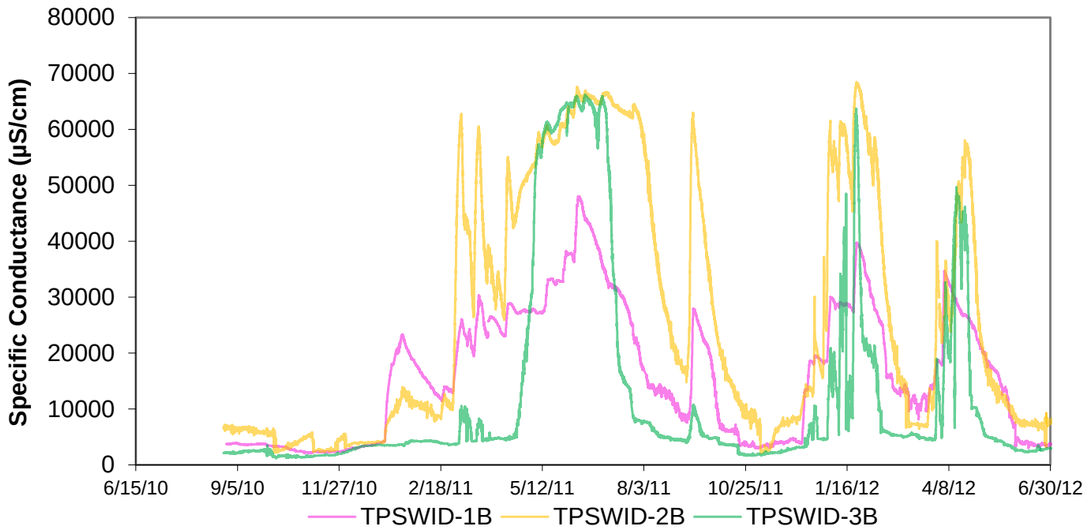
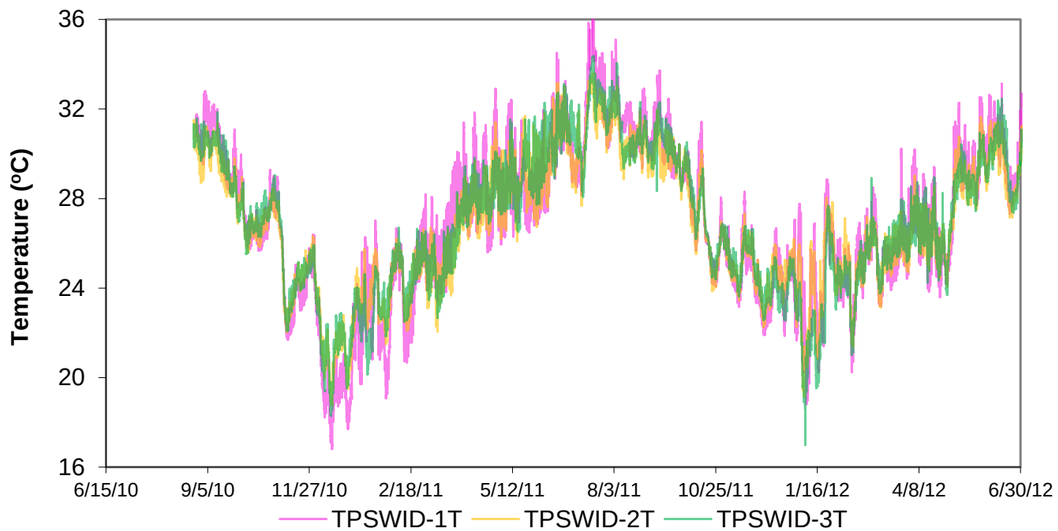


Figure 2.2-29. Comparison of Specific Conductance and Temperature in L-31E Canal for Top and Bottom Locations.







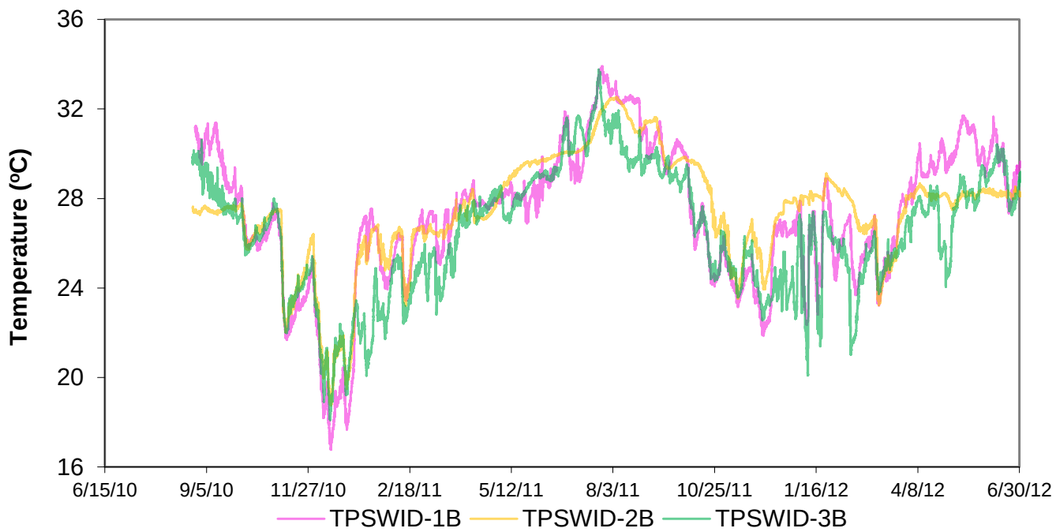
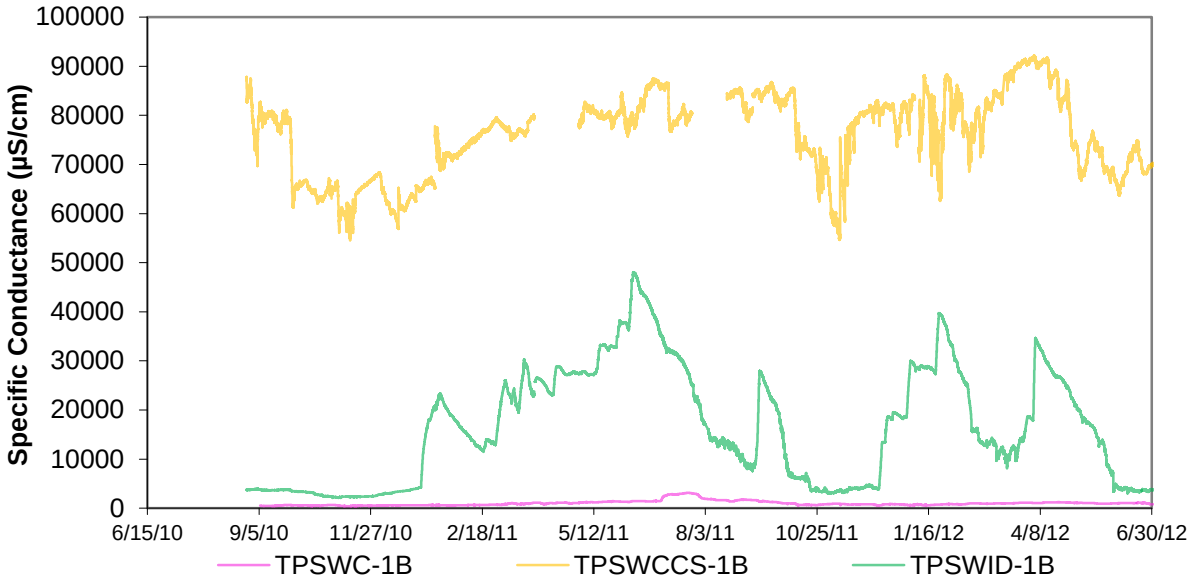


Figure 2.2-30. Comparison of Specific Conductance and Temperature in Interceptor Ditch Stations for Top and Bottom Locations.



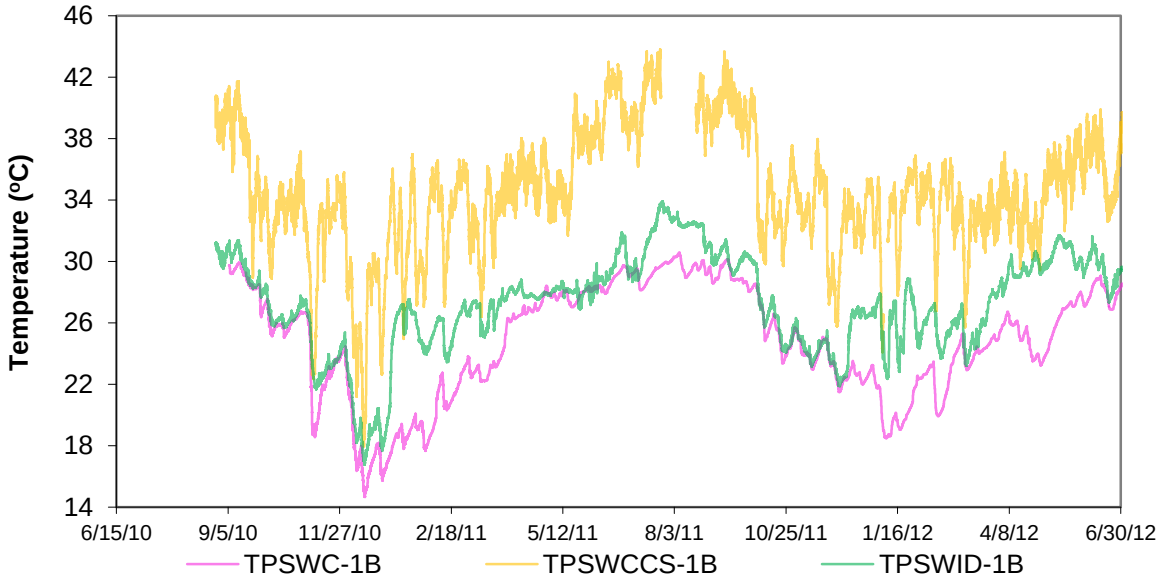


Figure 2.2-31. Comparison of Specific Conductance and Temperature at the Bottom of Interceptor Ditch Operation Transect A Stations.

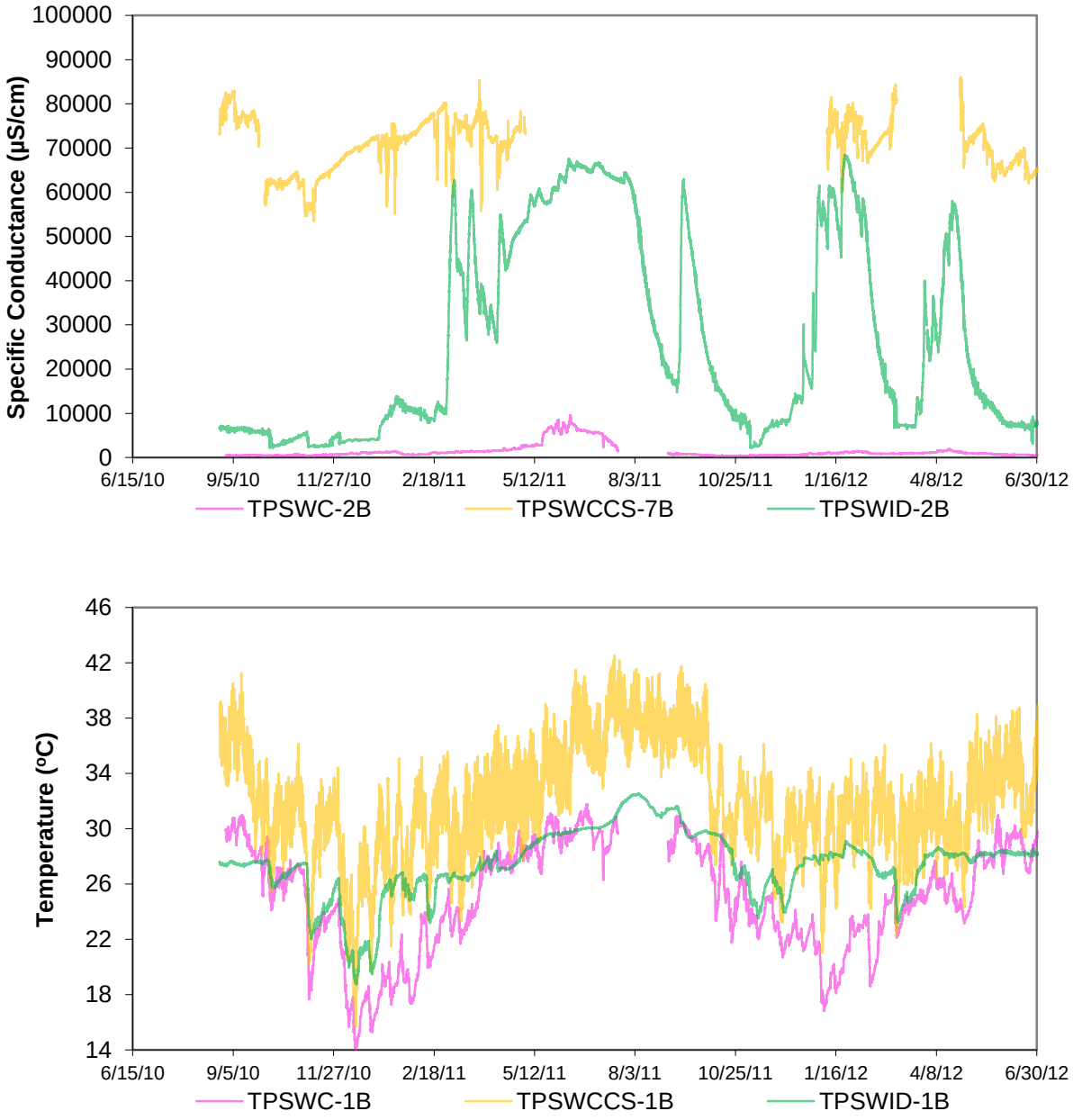


Figure 2.2-32. Comparison of Specific Conductance and Temperature at the Bottom of Interceptor Ditch Operation Transect C Stations.

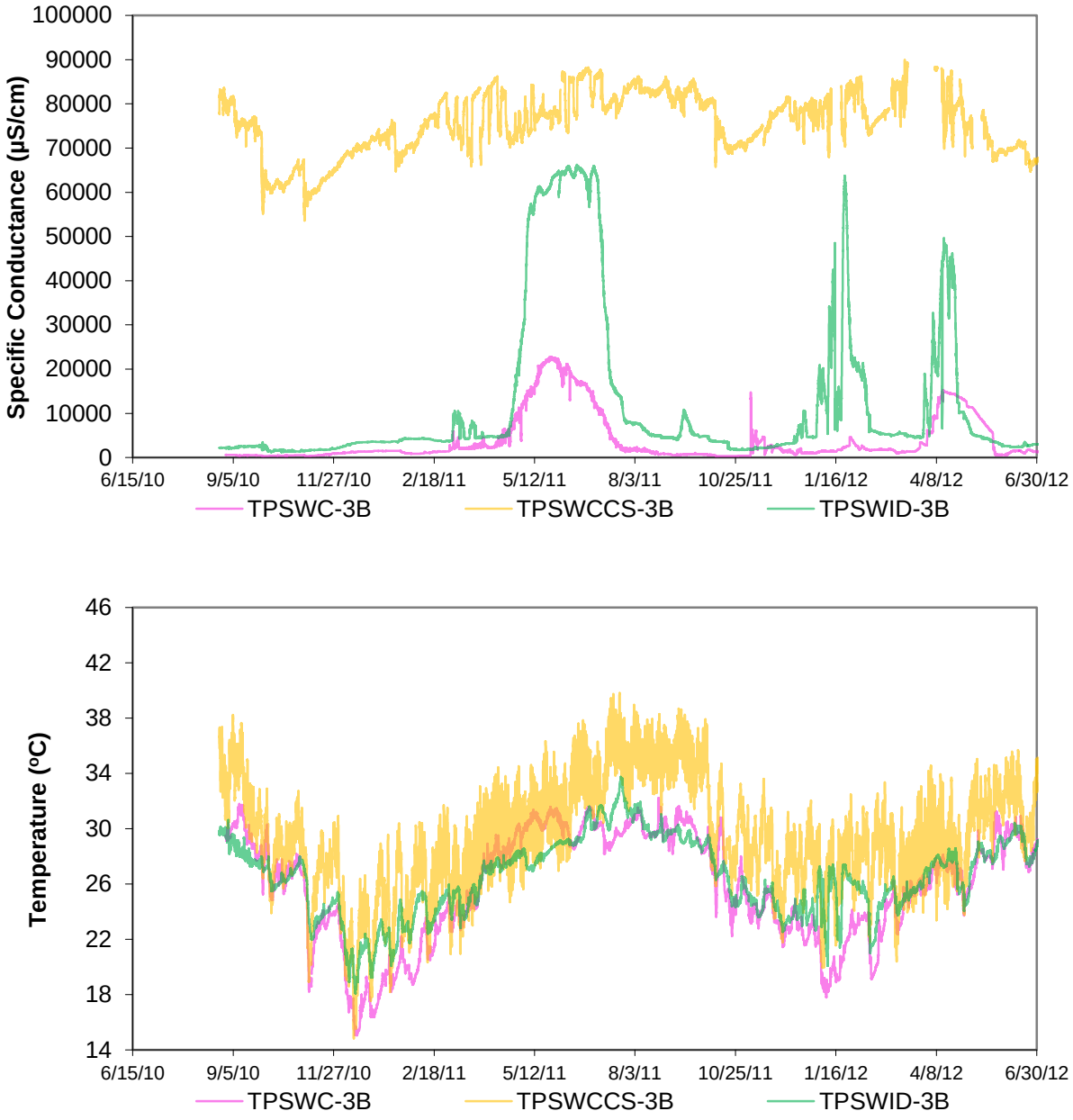


Figure 2.2-33. Comparison of Specific Conductance and Temperature at the Bottom of Interceptor Ditch Operation Transect E Stations

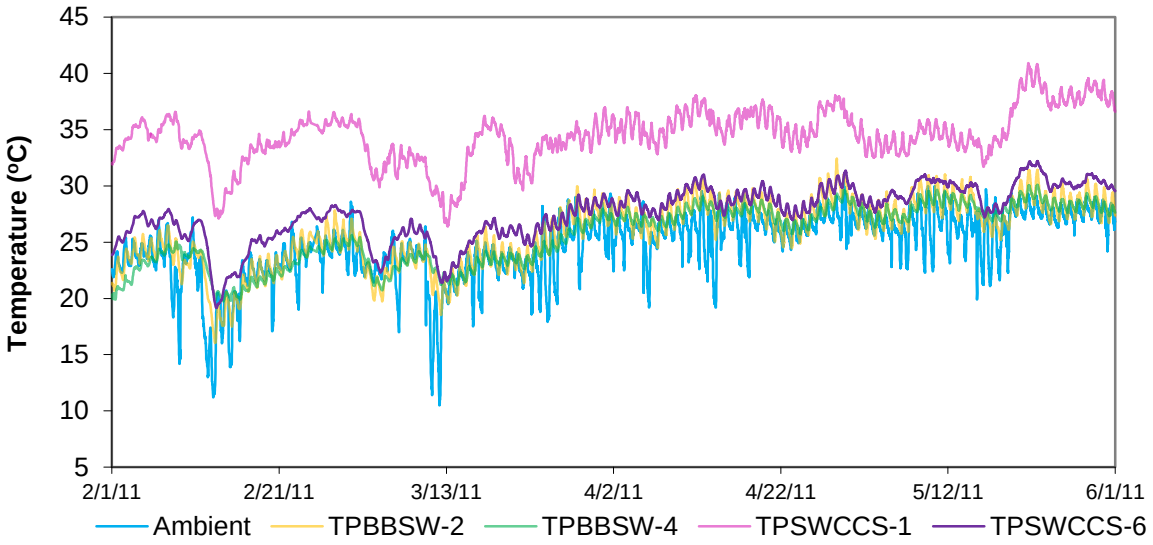


Figure 2.2-34. Biscayne Bay and CCS Water Temperatures and Ambient Air Temperature.

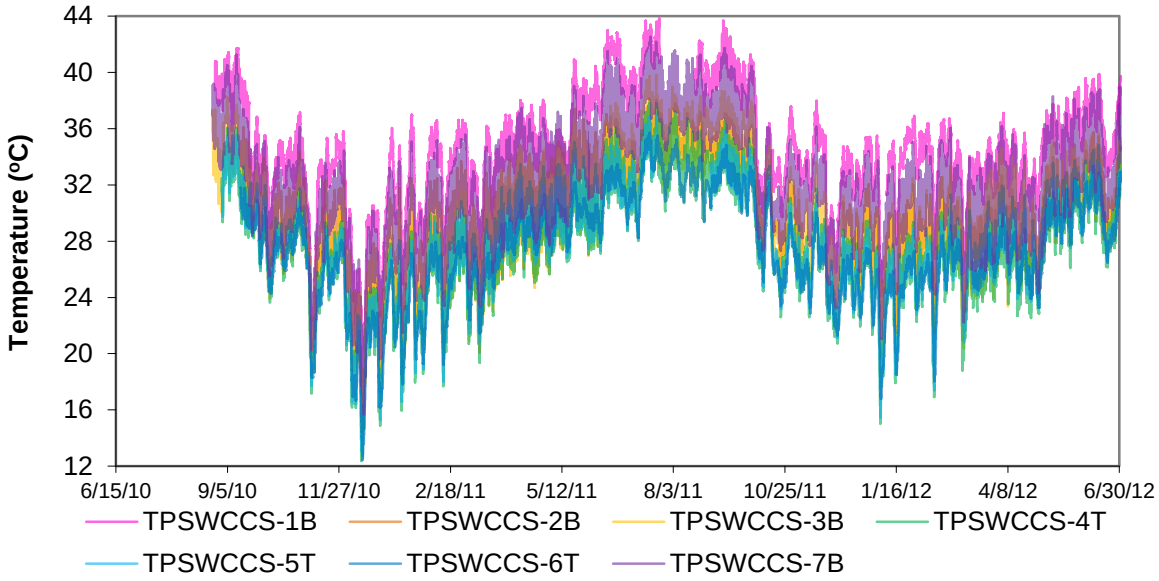


Figure 2.2-35. Comparison of Temperature in CCS Surface Water Stations.

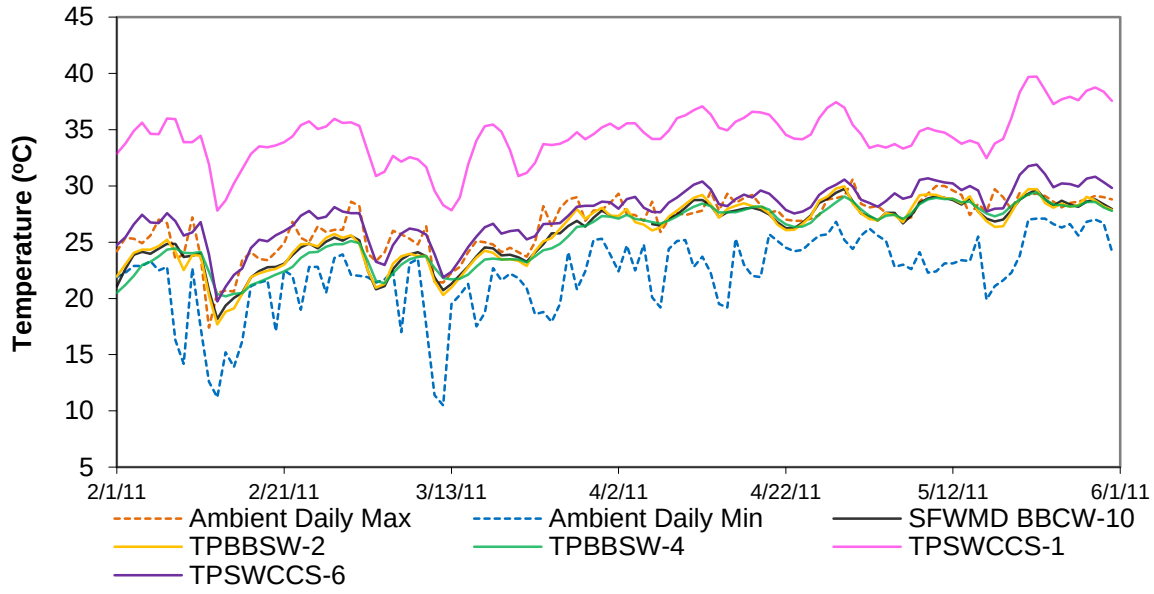


Figure 2.2-36. Biscayne Bay Surface Water Temperatures (24-Hour Averages) and Ambient Air Temperature (Maximum and Minimum Values) Time Series Plots.

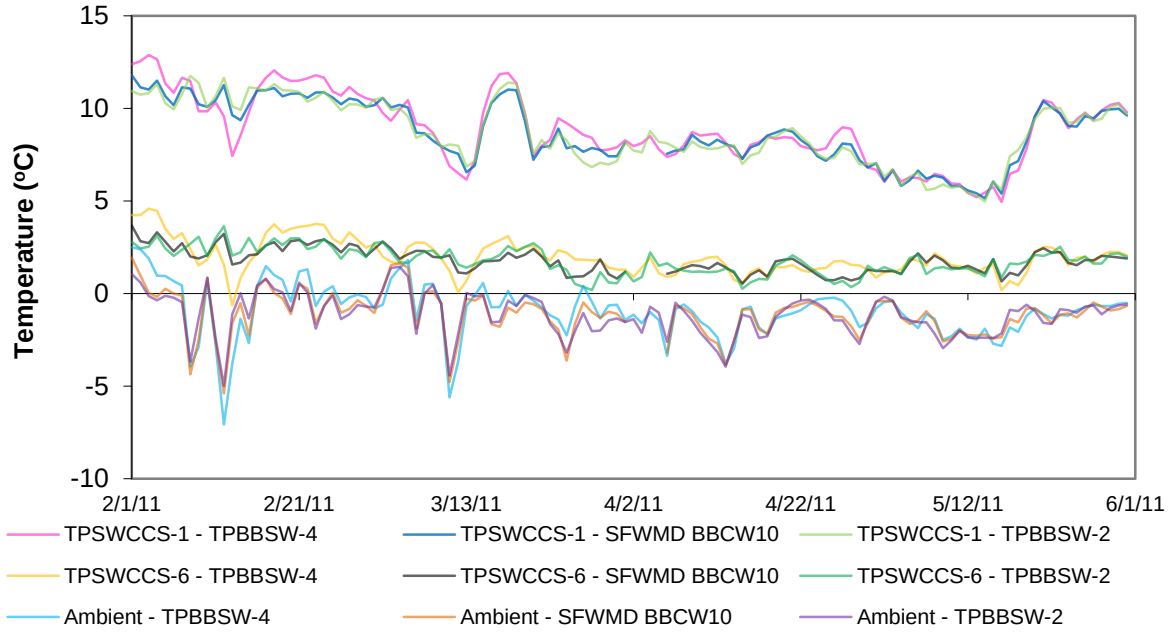


Figure 2.2-37. Differences among Ambient Air, CCS, and Biscayne Bay Water Temperatures.

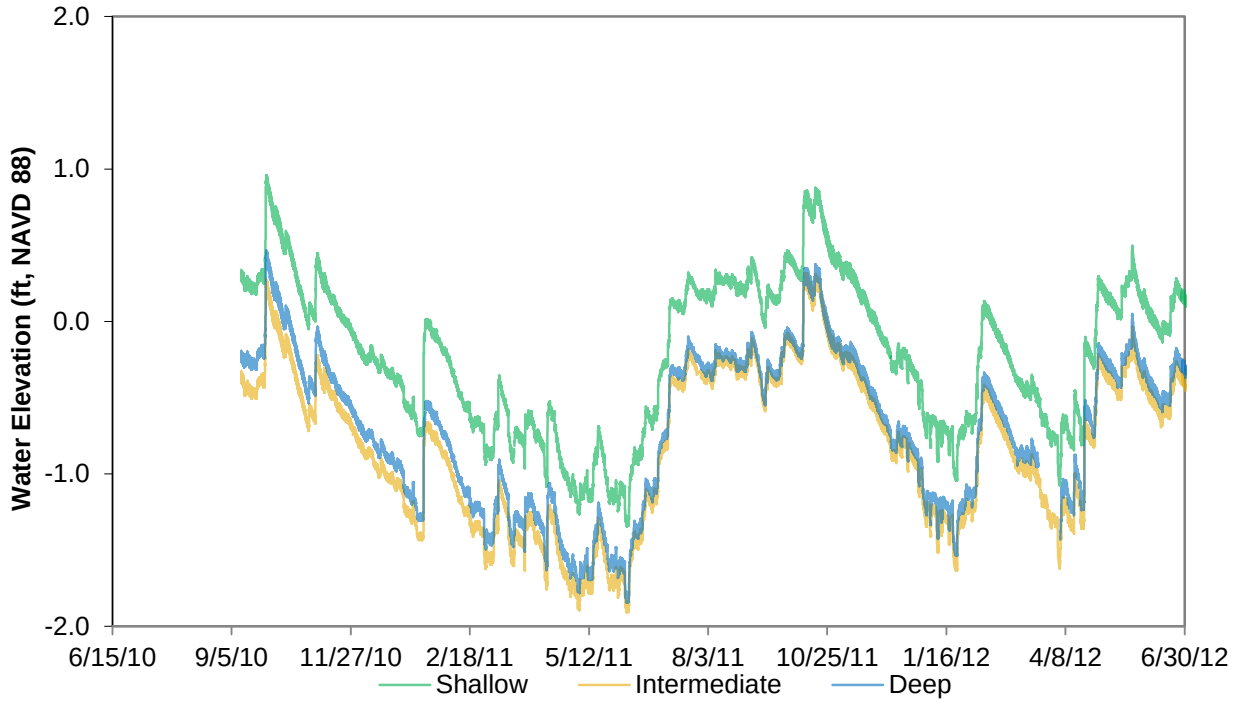


Figure 2.3-1. TPGW-1 Water Elevations.

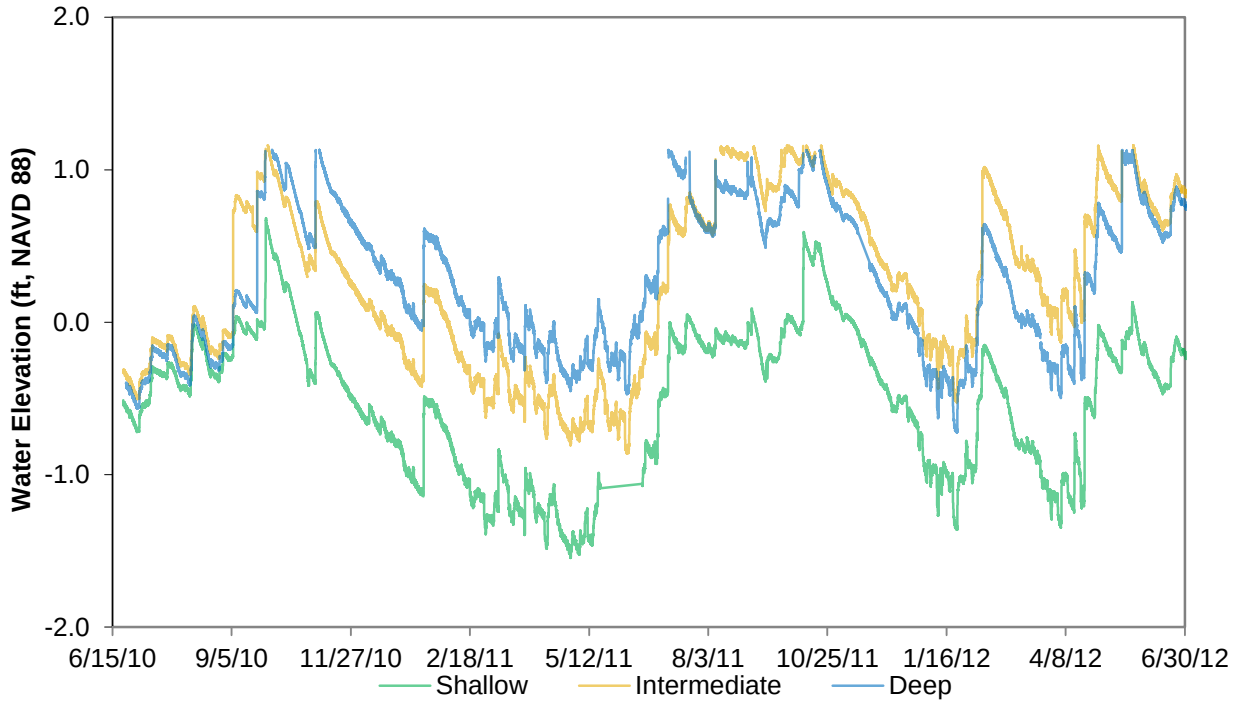


Figure 2.3-2. TPGW-2 Water Elevations.

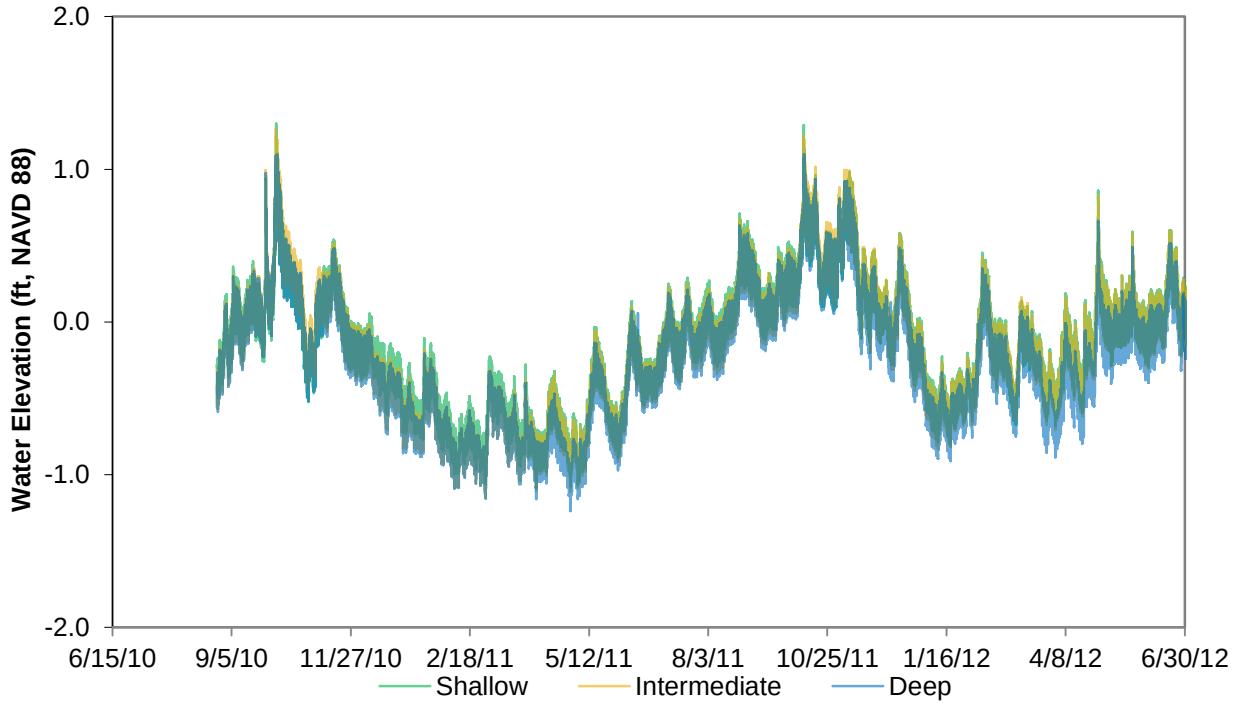


Figure 2.3-3. TPGW-3 Water Elevations.

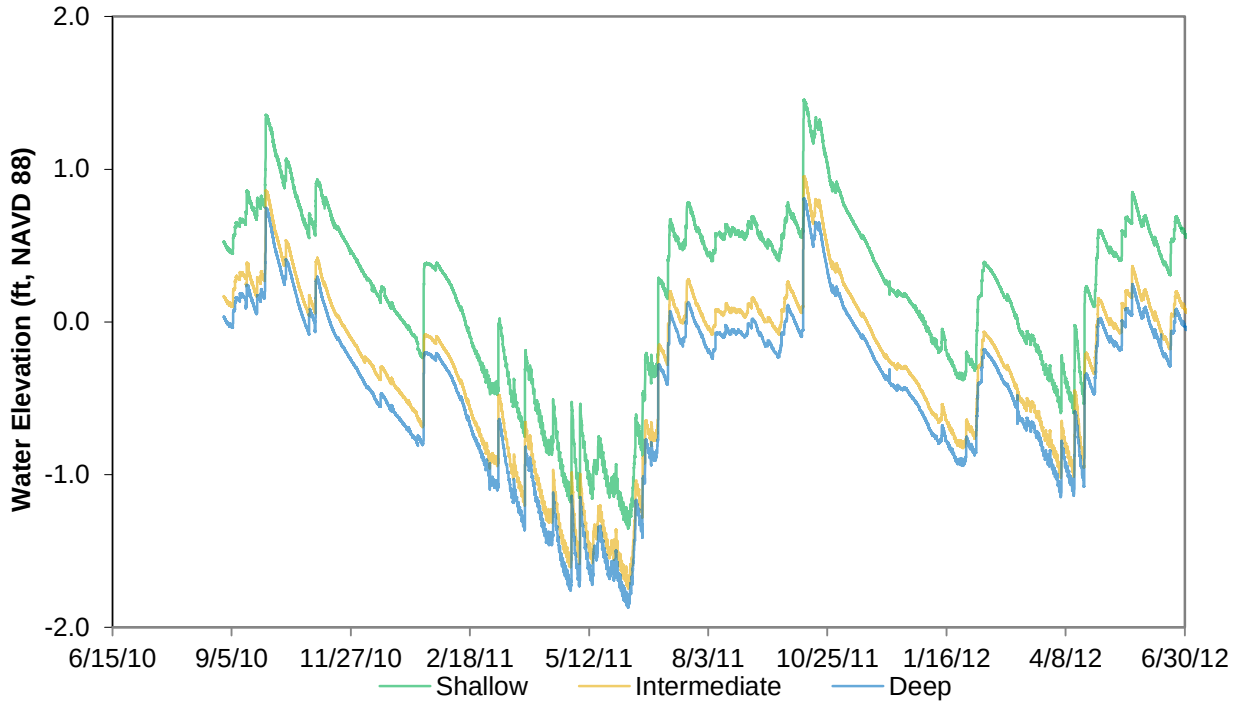


Figure 2.3-4. TPGW-4 Water Elevations.

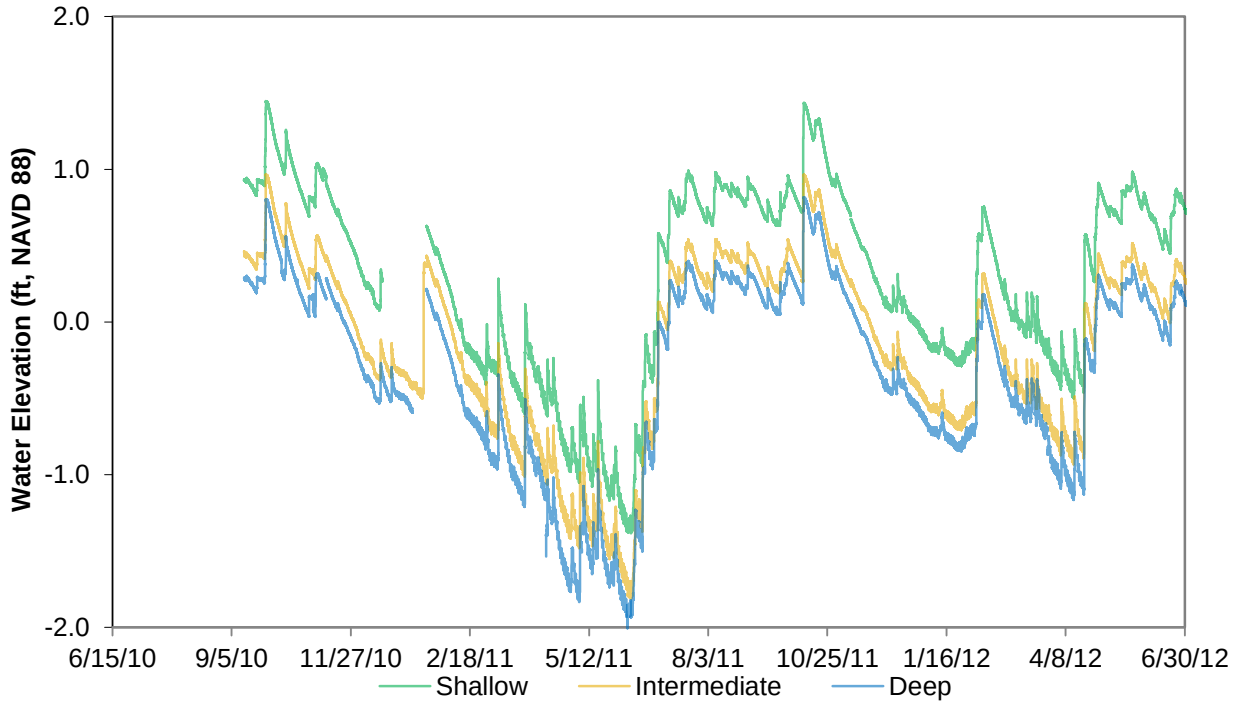


Figure 2.3-5. TPGW-5 Water Elevations.

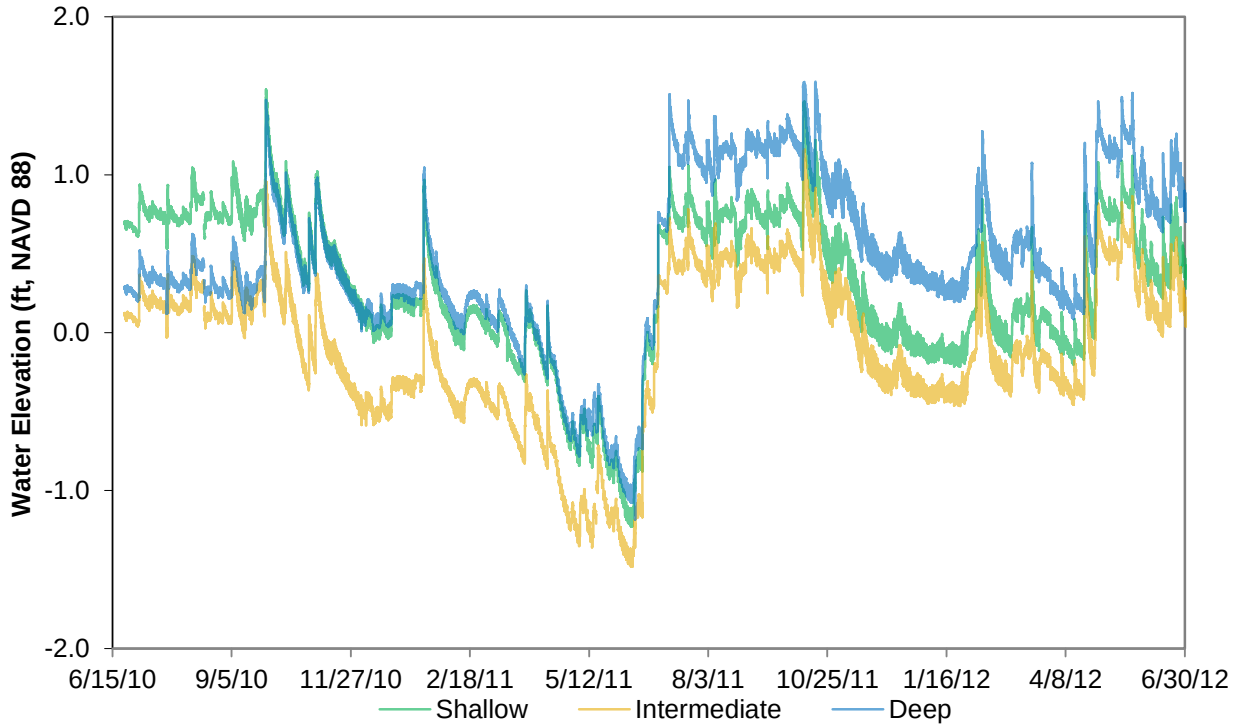


Figure 2.3-6. TPGW-6 Water Elevations.

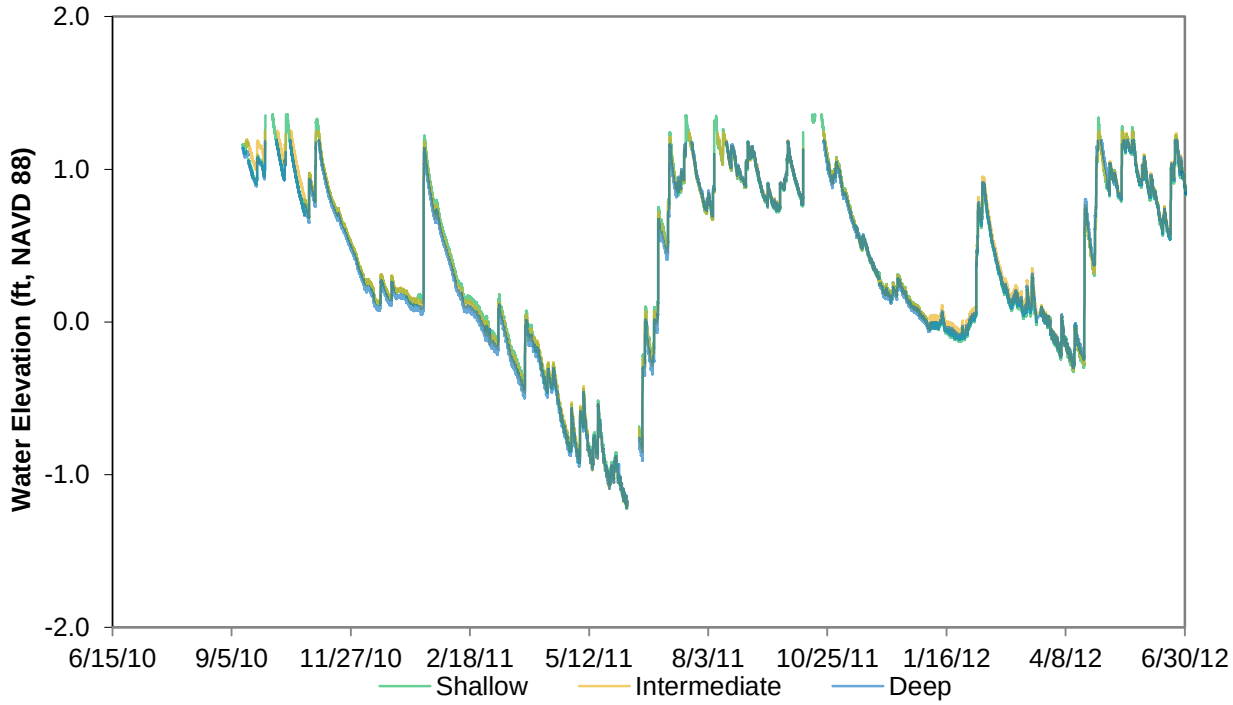


Figure 2.3-7. TPGW-7 Water Elevations.

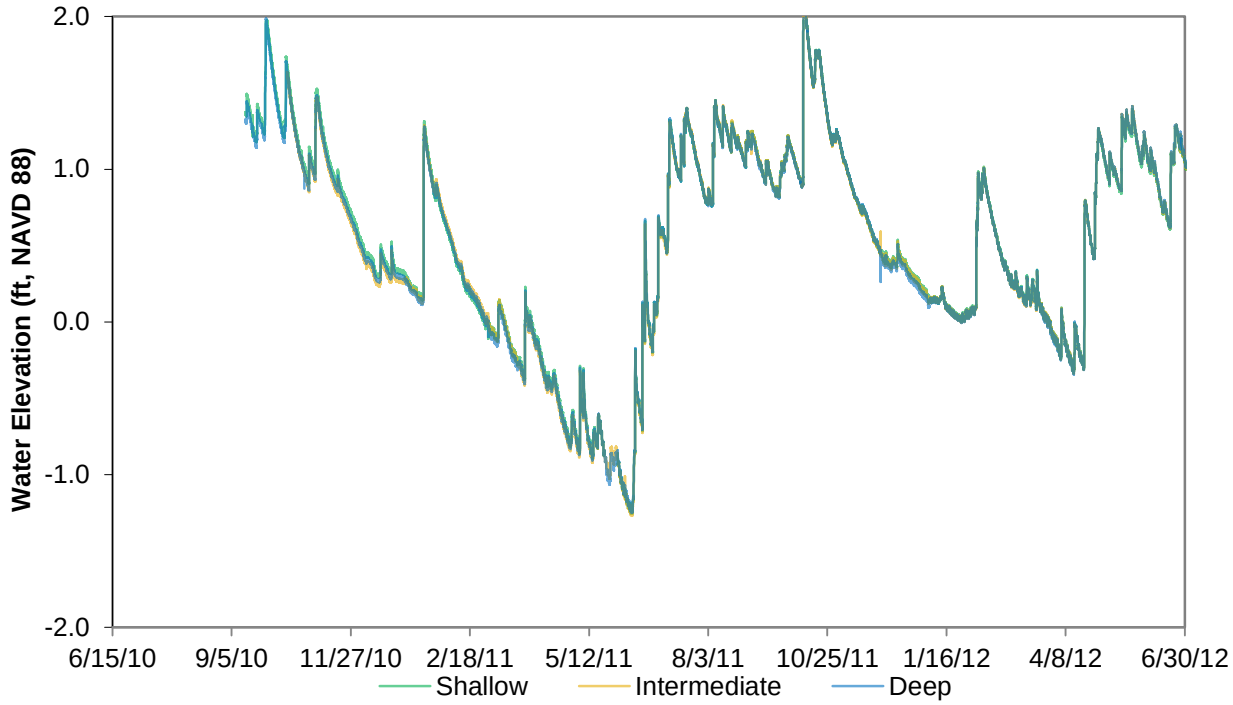


Figure 2.3-8. TPGW-8 Water Elevations.

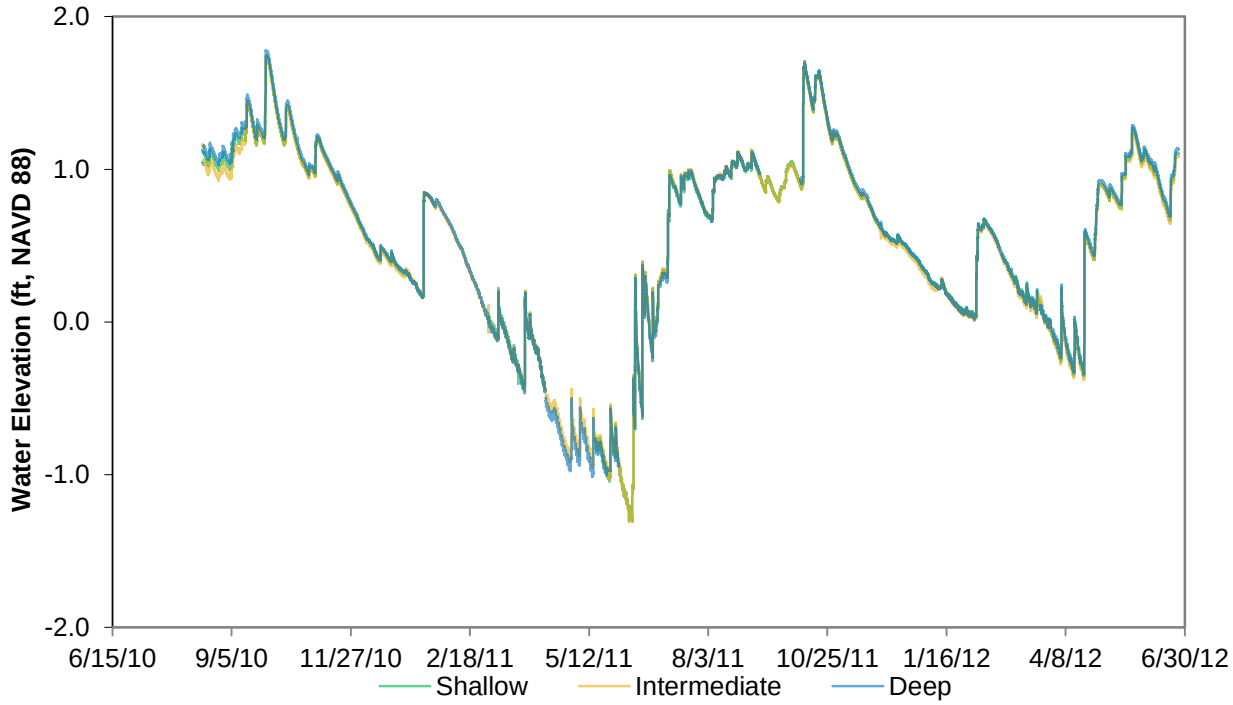


Figure 2.3-9. TPGW-9 Water Elevations.

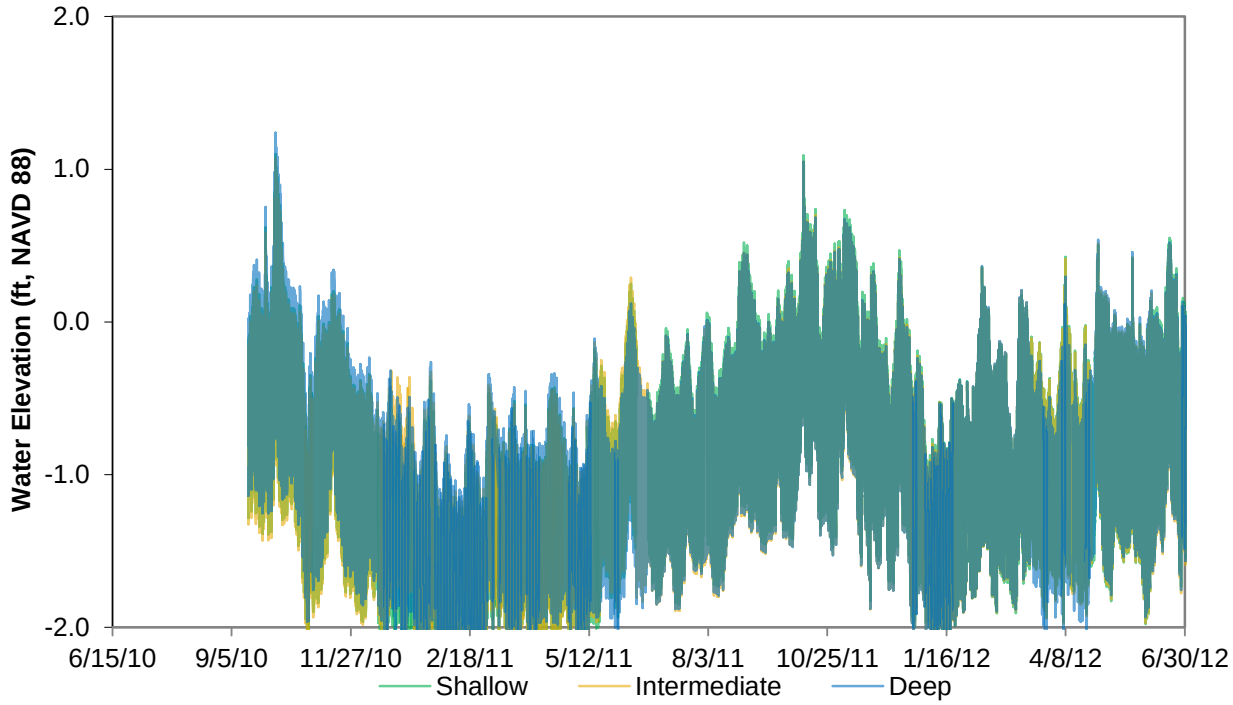


Figure 2.3-10. TPGW-10 Water Elevations.

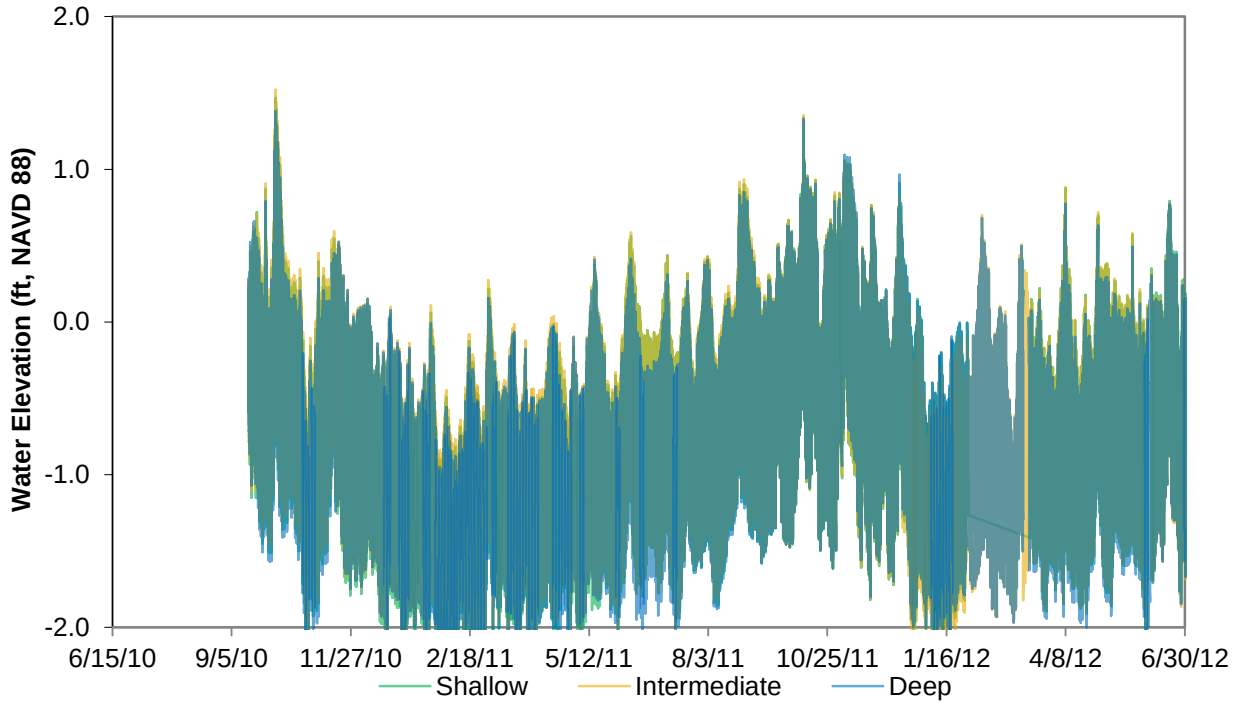


Figure 2.3-11. TPGW-11 Water Elevations.

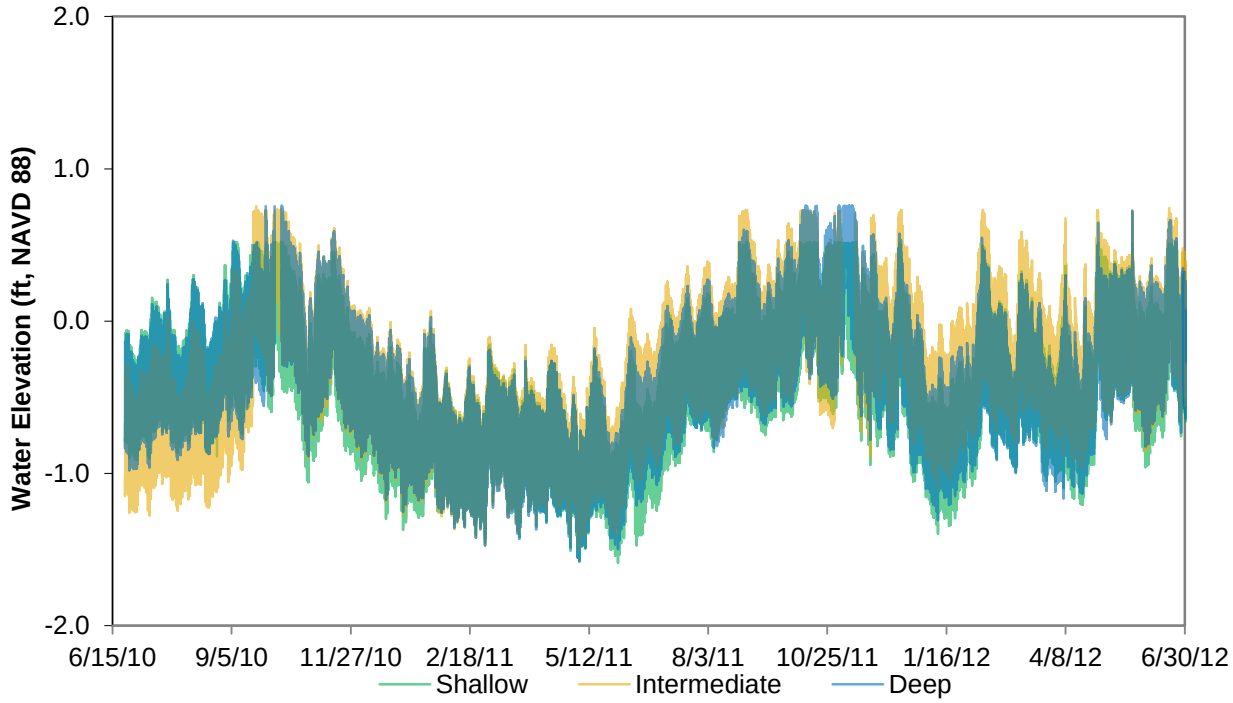


Figure 2.3-12. TPGW-12 Water Elevations.

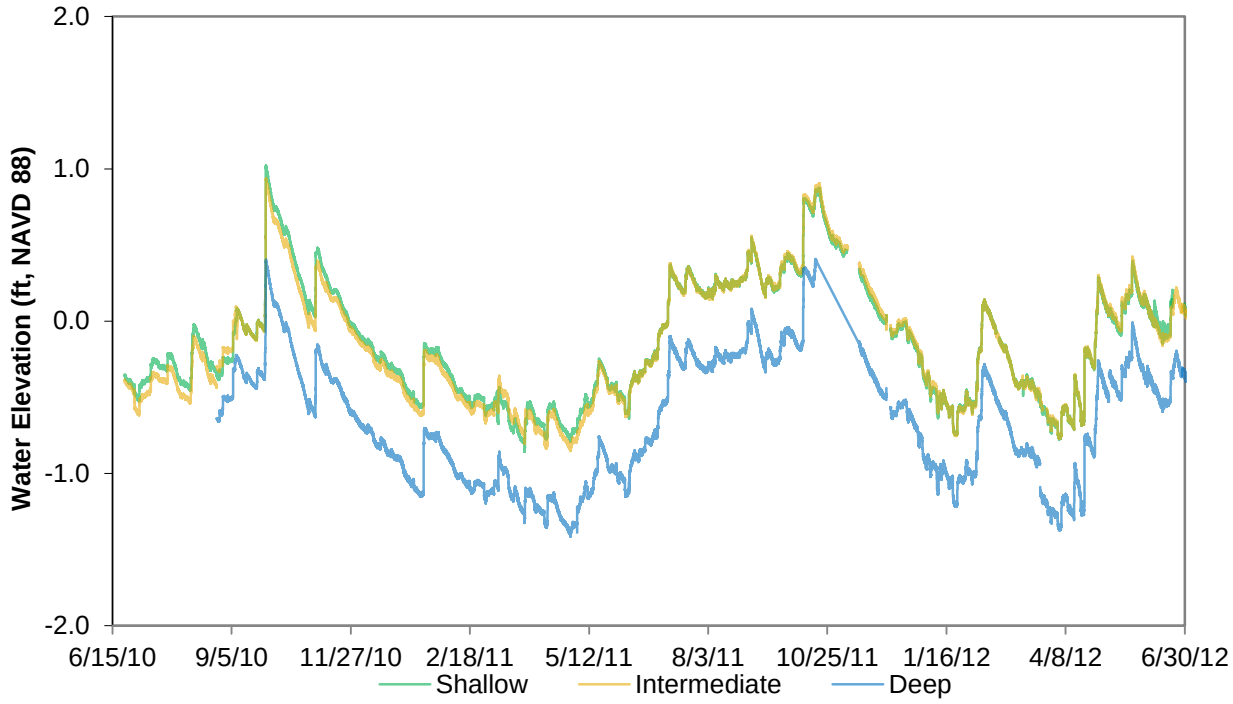


Figure 2.3-13. TPGW-13 Water Elevations.

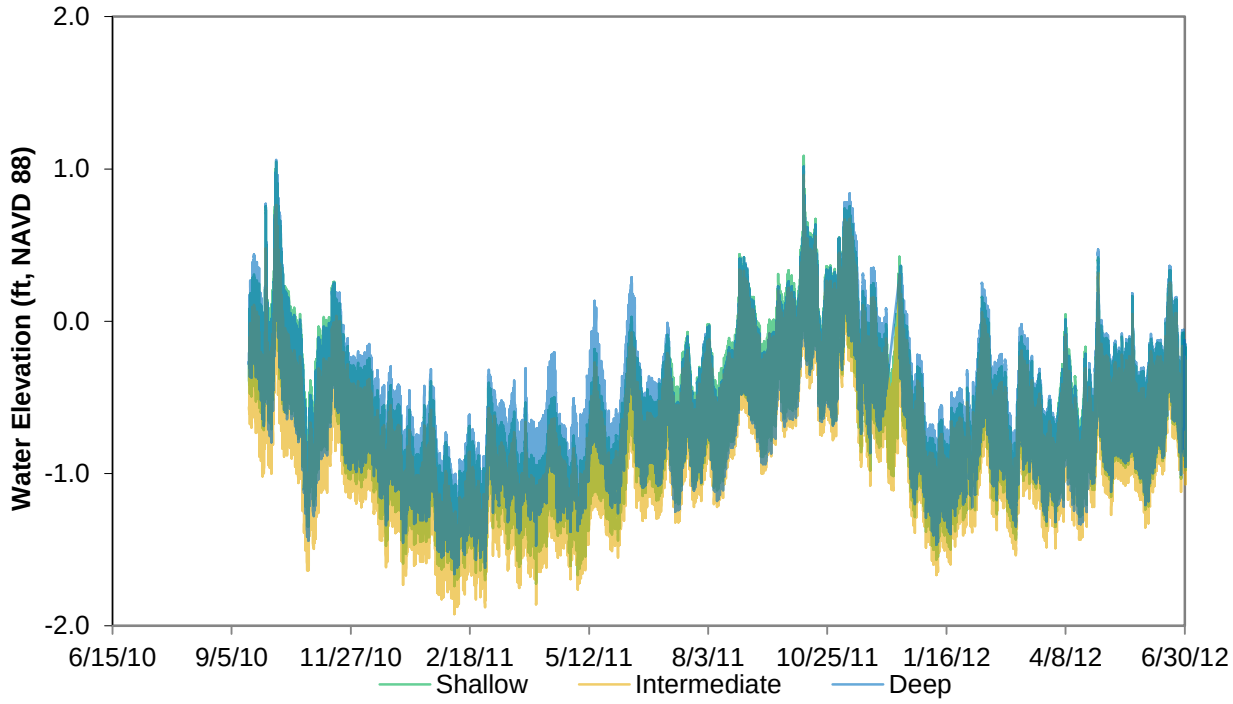


Figure 2.3-14. TPGW-14 Water Elevations.

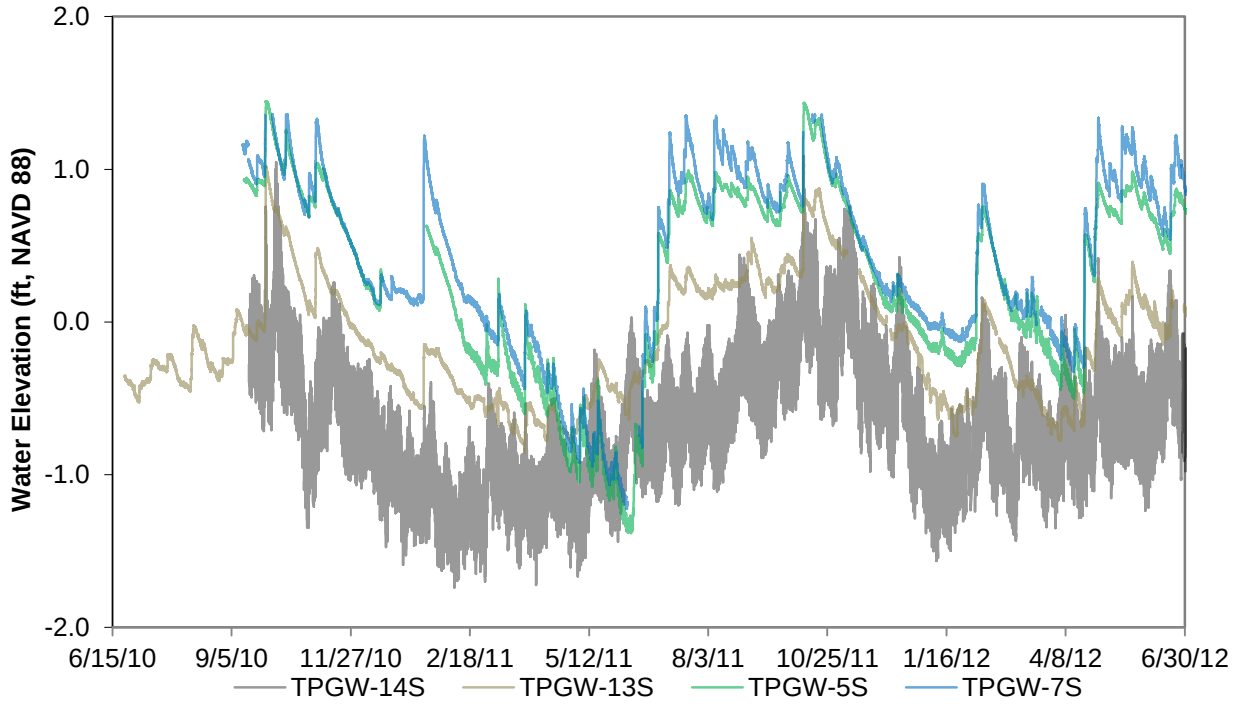


Figure 2.3-15. Comparison of Time Series Groundwater Water Elevations across the Landscape at TPGW-14, TPGW-13, TPGW-5 and TPGW-7.

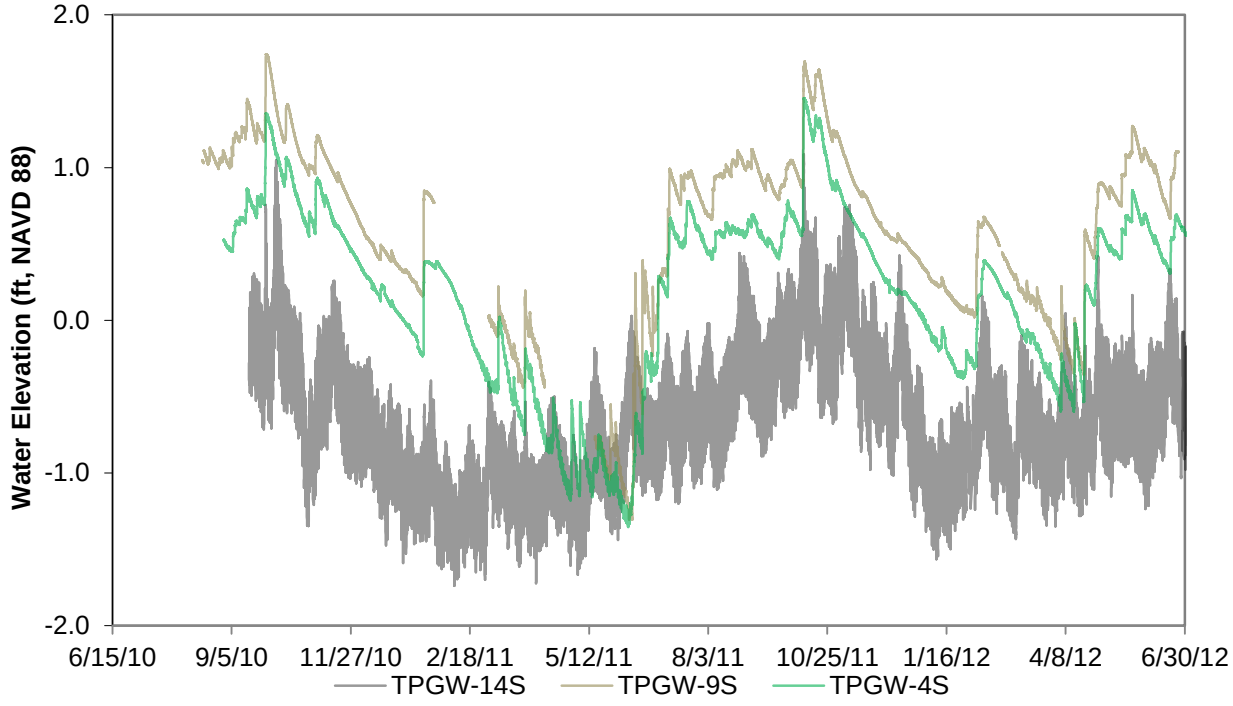


Figure 2.3-16. Comparison of Time Series Groundwater Water Elevations across the Landscape at TPGW-14, TPGW-9 and TPGW-4.

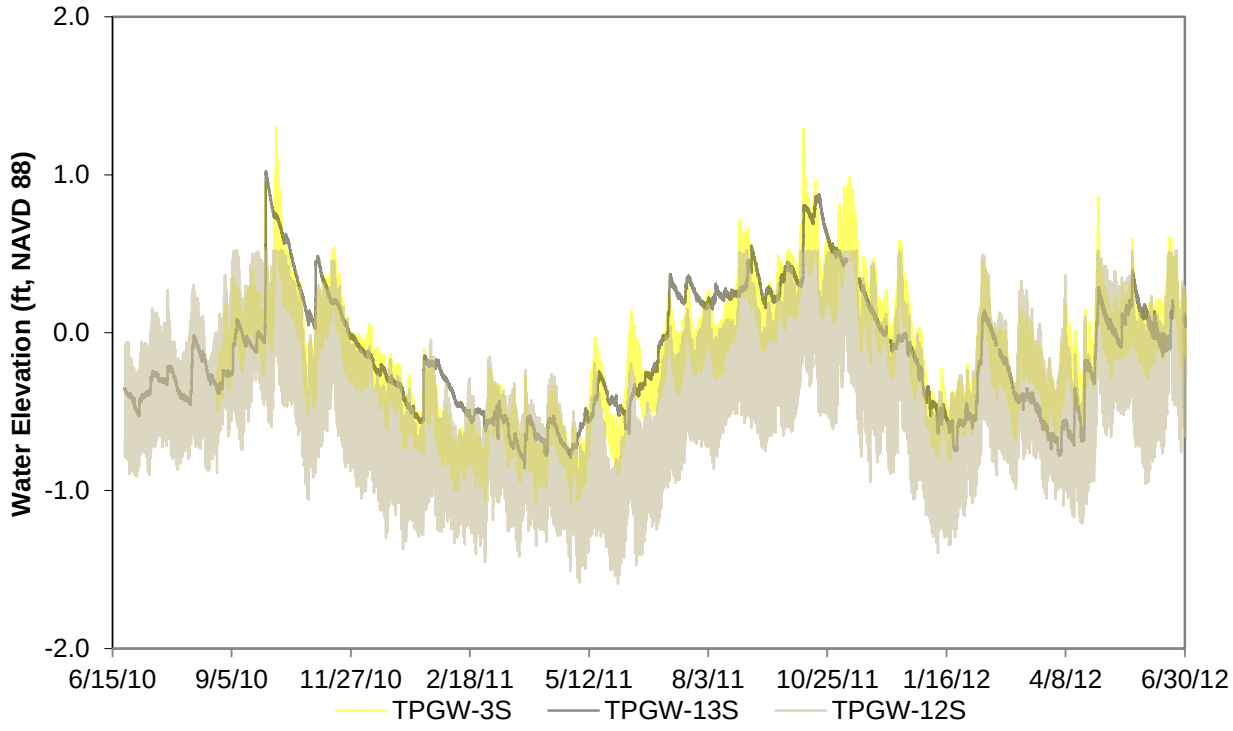


Figure 2.3-17. Comparison of Time Series Groundwater Water Elevations across the Landscape at TPGW-3, TPGW-13, and TPGW-12.

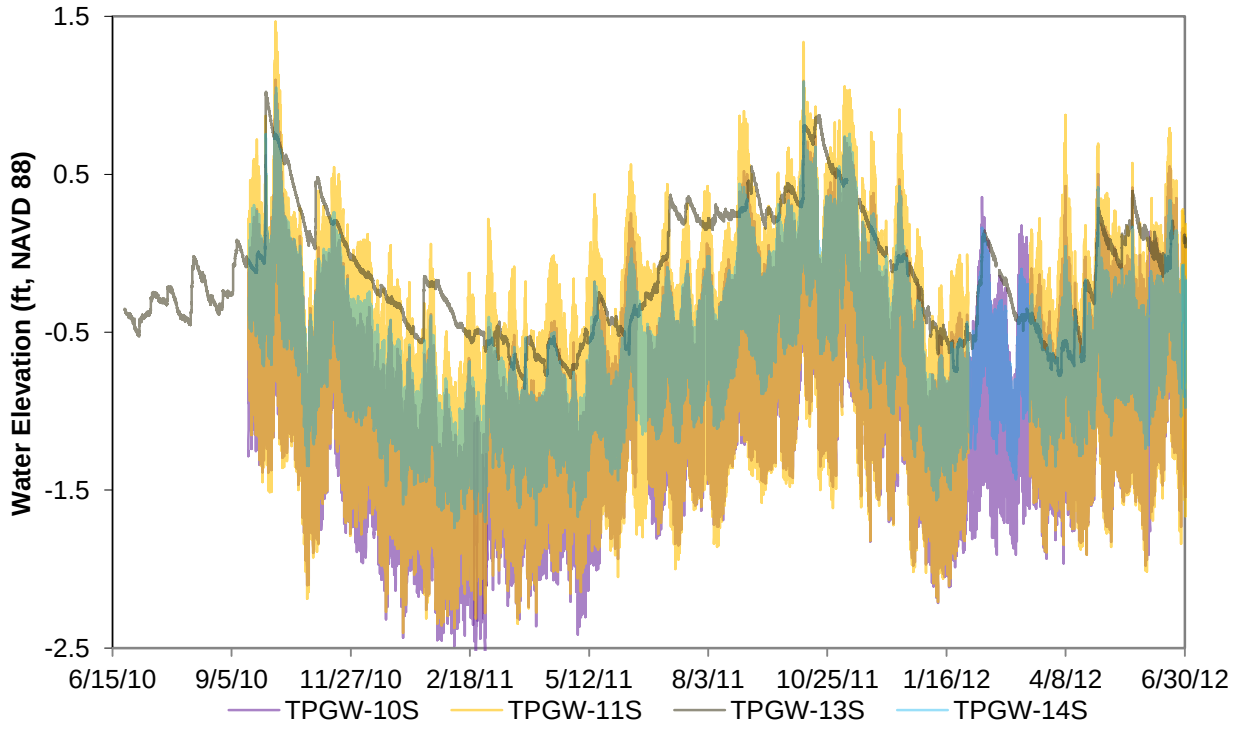


Figure 2.3-18. Comparison of Time Series Groundwater Water Elevations across the Landscape at TPGW-10, TPGW-11, TPGW-13, and TPGW-14.

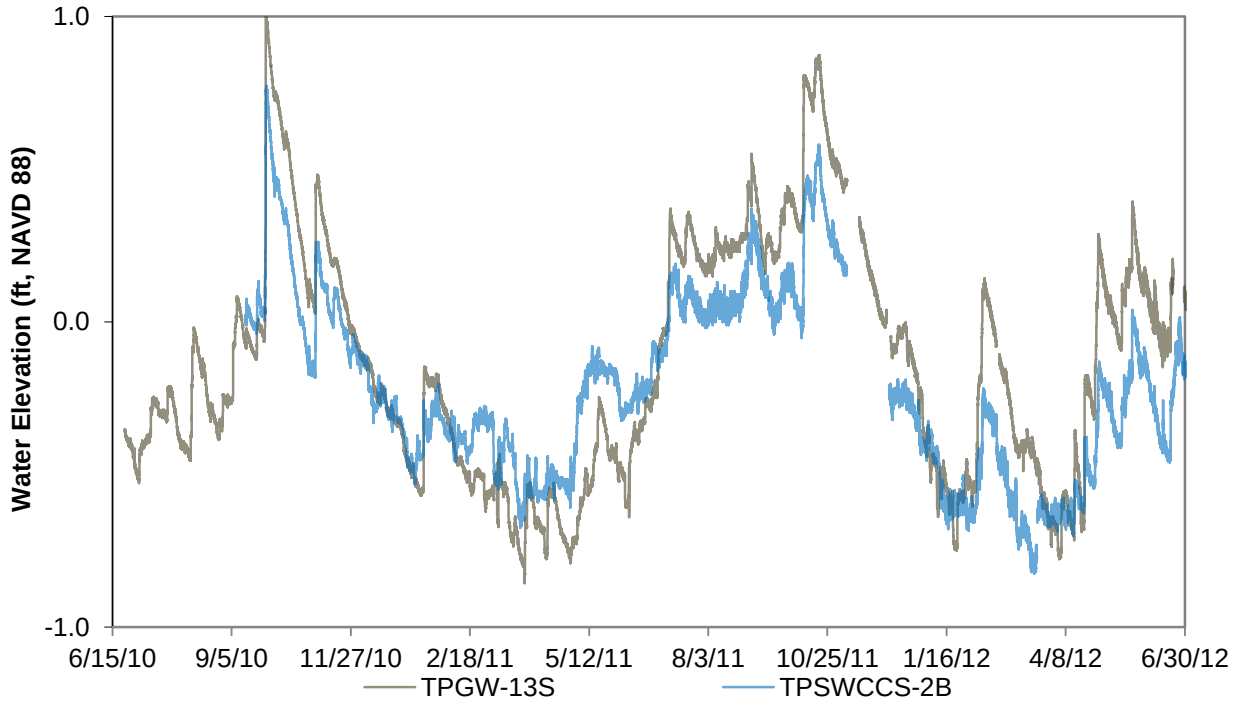


Figure 2.3-19. Comparison of Time Series Groundwater Water Elevations at TPGW-13 and TPSWCCS-2.

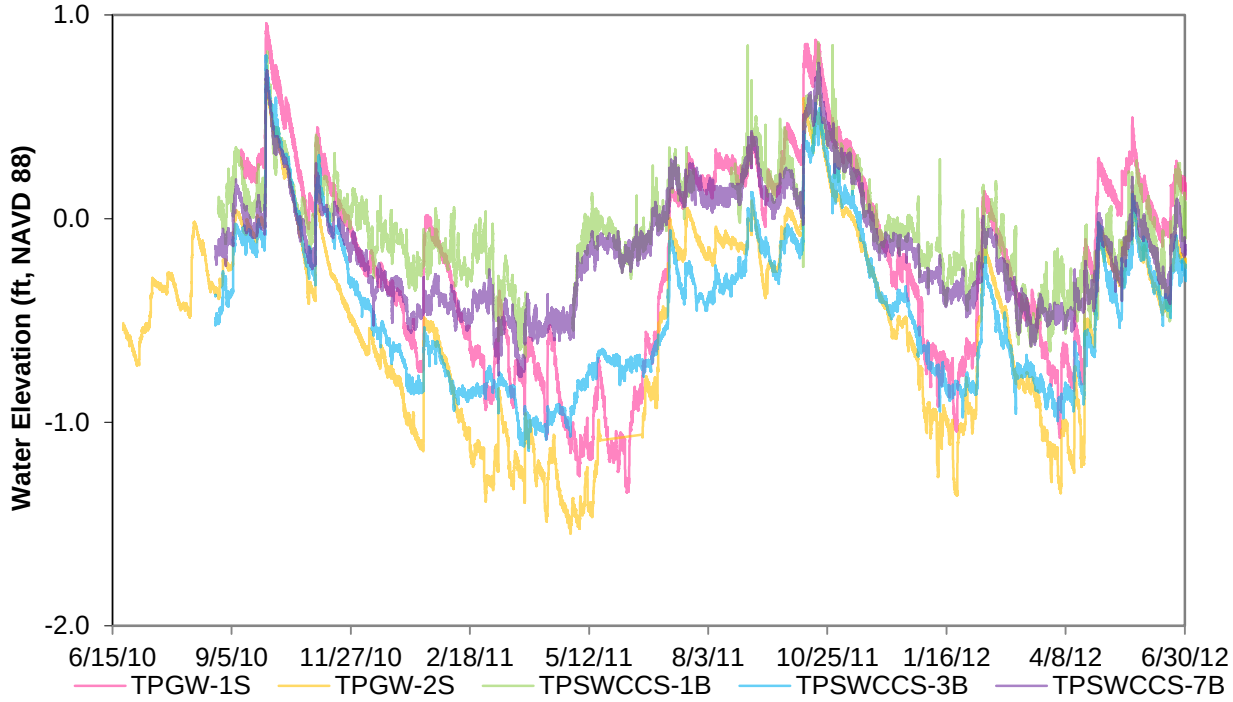


Figure 2.3-20. Comparison of Time Series Groundwater Water Elevations at TPGW-1 and TPGW-2, and CCS Surface Water Stations TPSWCCS-1, TPSWCCS-3, and TPSWCCS-7.

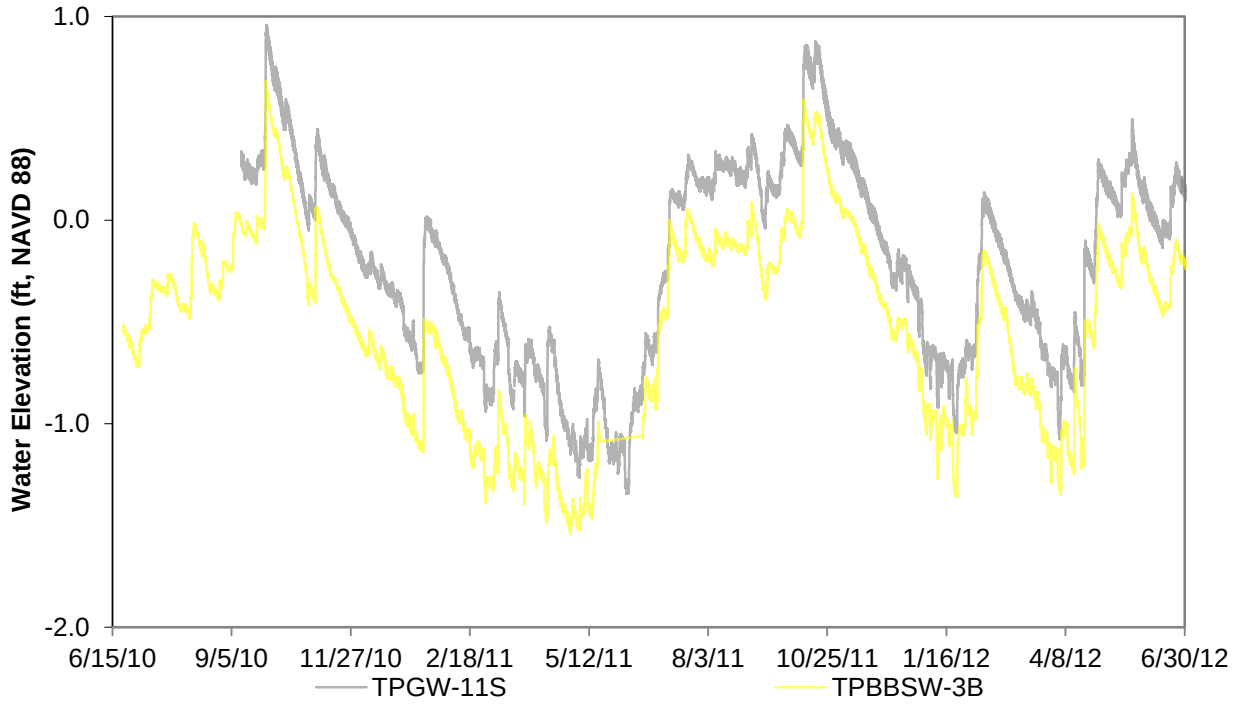


Figure 2.3-21. Comparison of Daily Average Time Series Groundwater Water Elevations in Biscayne Bay Well TPGW-11 and Biscayne Bay Surface Water Station TPBBSW-3.

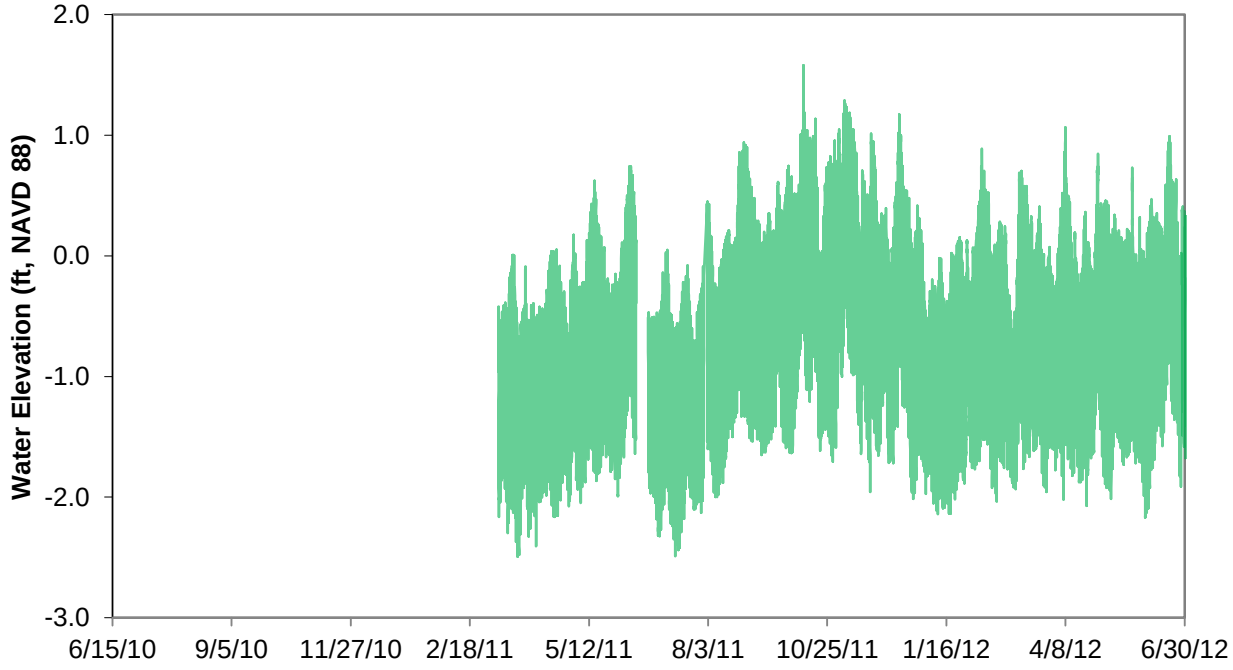


Figure 2.3-22. TPBBSW-10 Water Elevations.

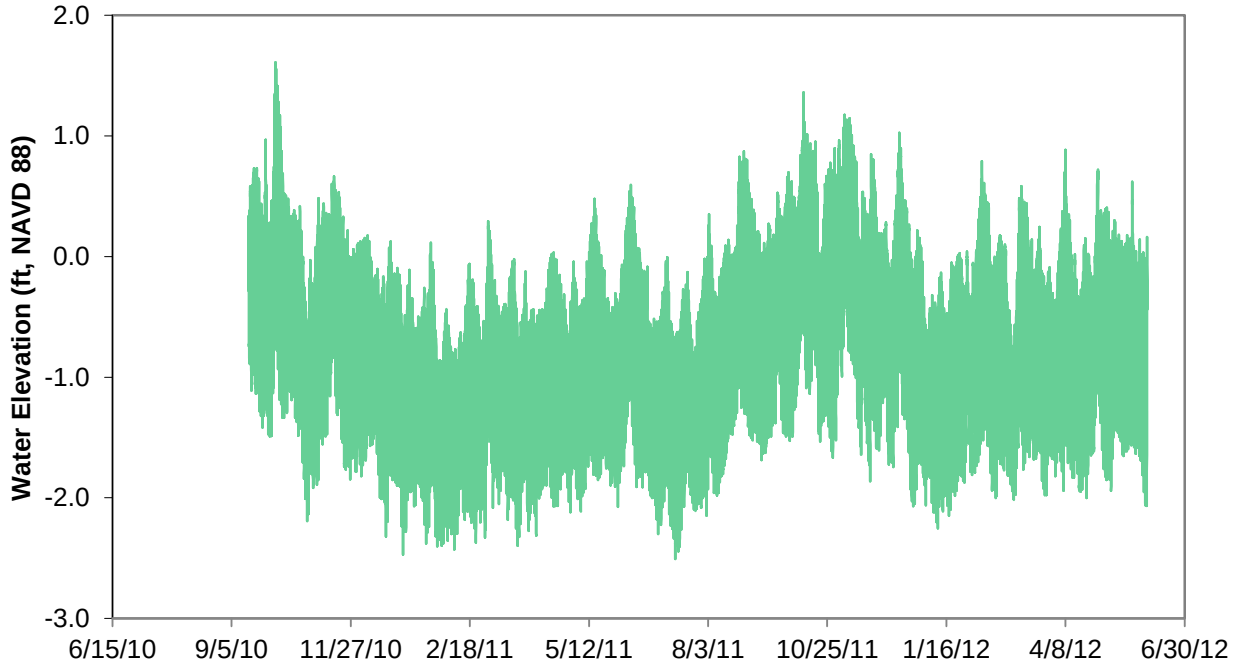


Figure 2.3-23. TPBBSW-3 Water Elevations.

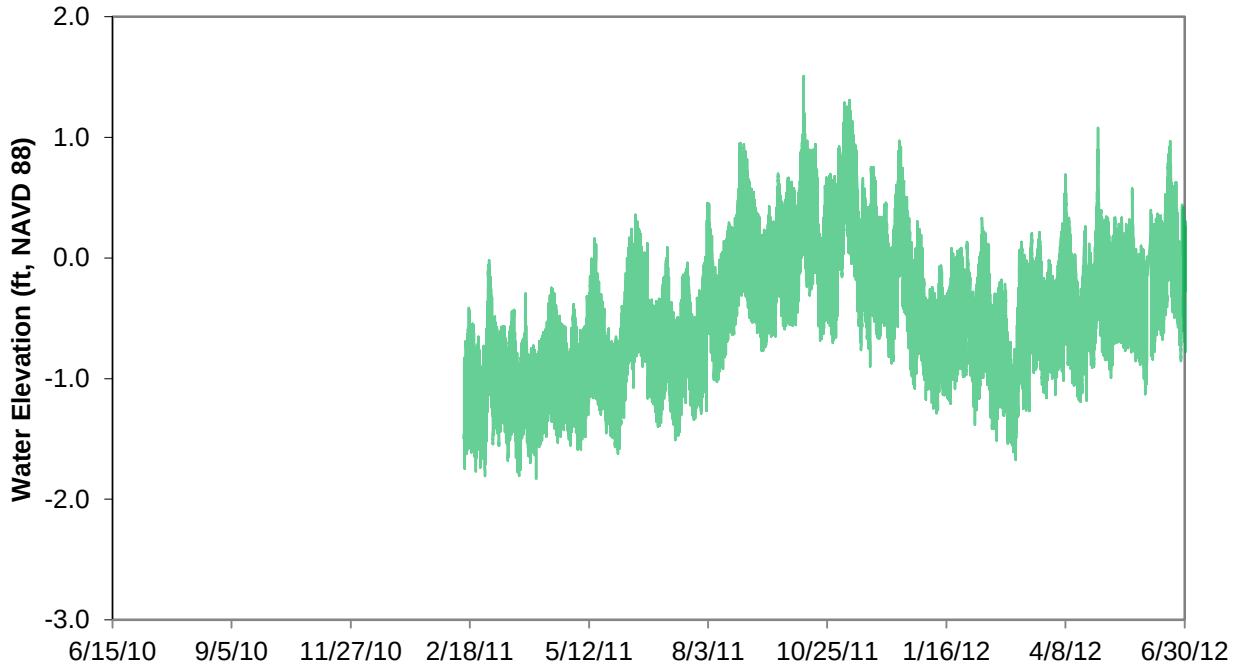


Figure 2.3-24. TPBBSW-14 Water Elevations.

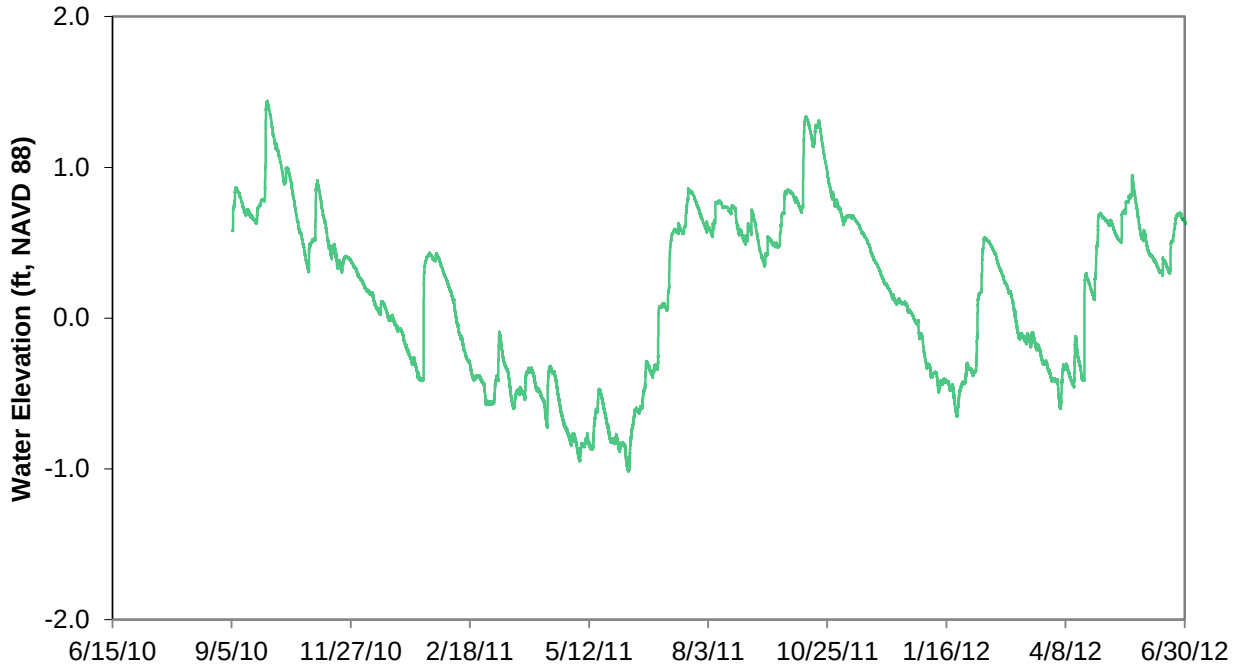


Figure 2.3-25. TPSWC-1 Water Elevations.

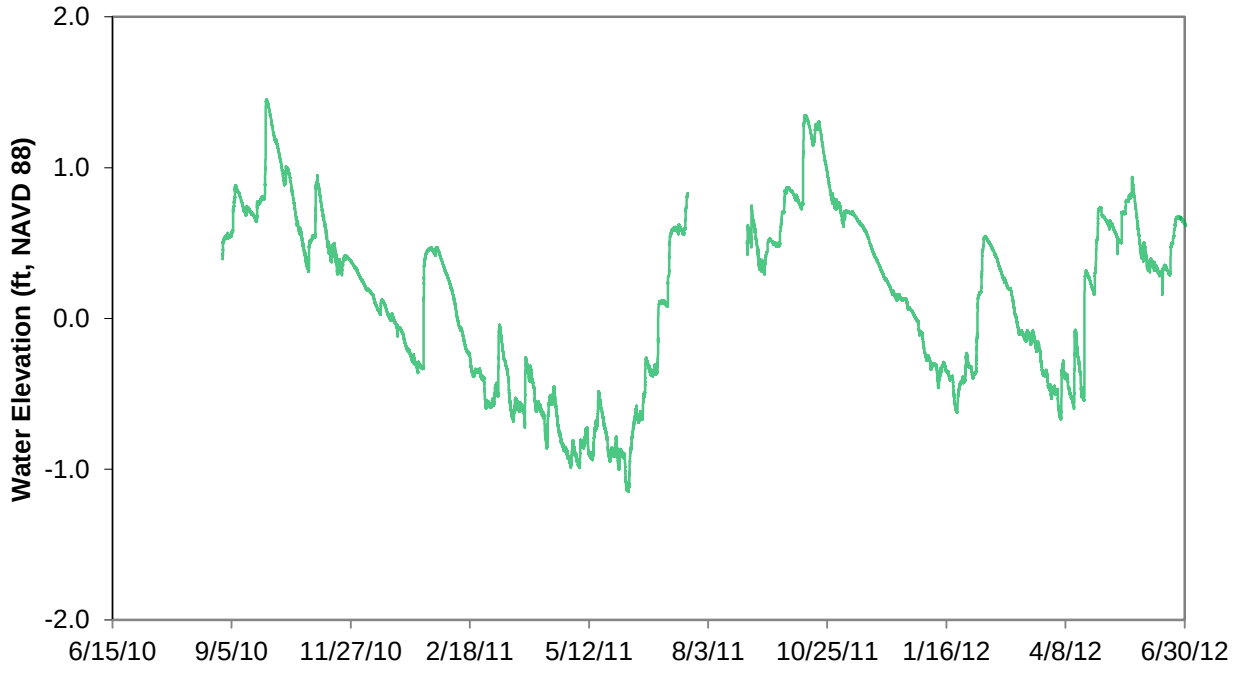


Figure 2.3-26. TPSWC-2 Water Elevations.

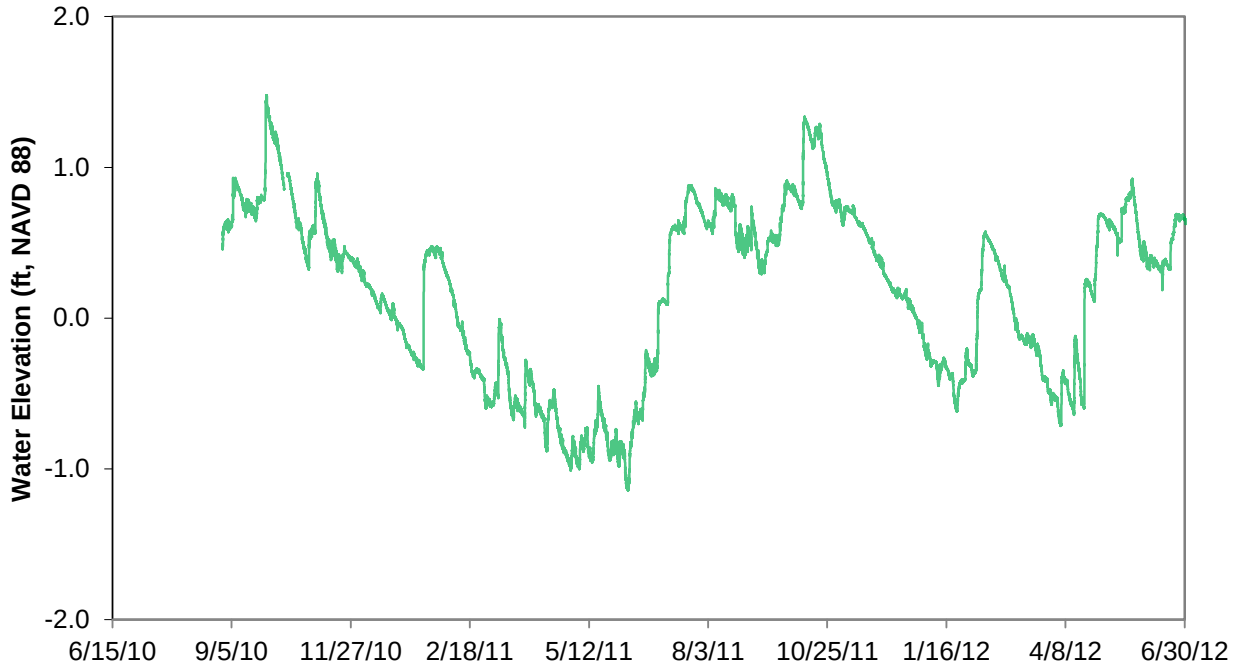


Figure 2.3-27. TPSWC-3 Water Elevations.

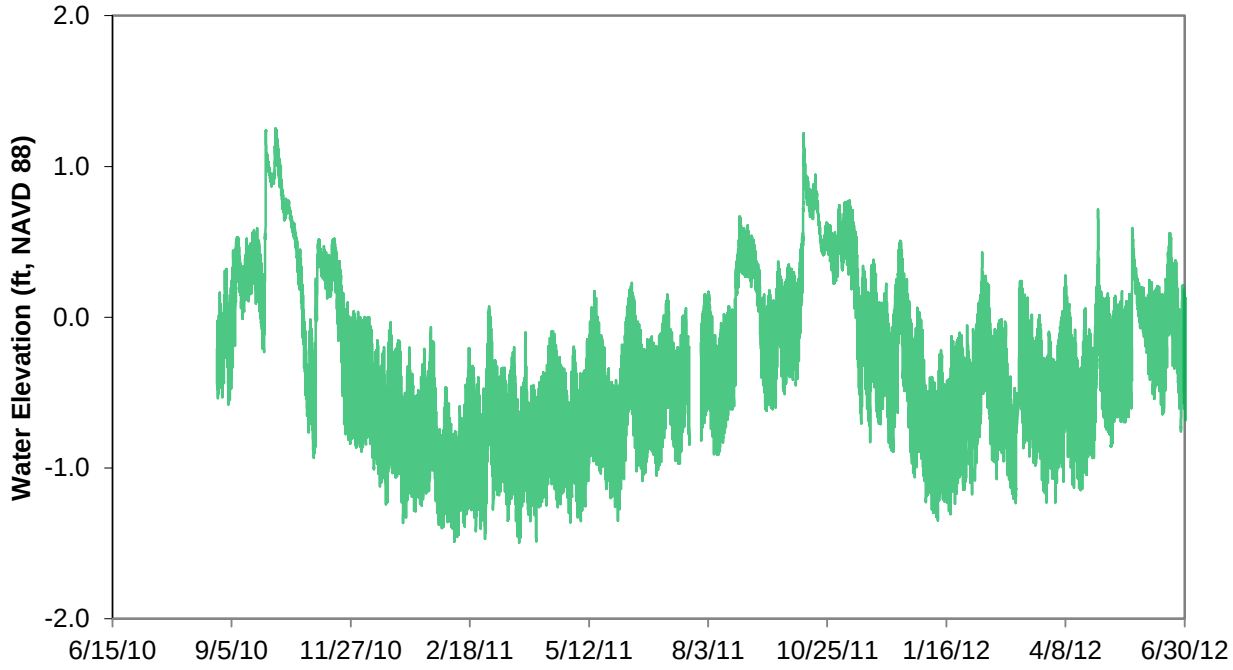


Figure 2.3-28. TPSWC-4 Water Elevations.

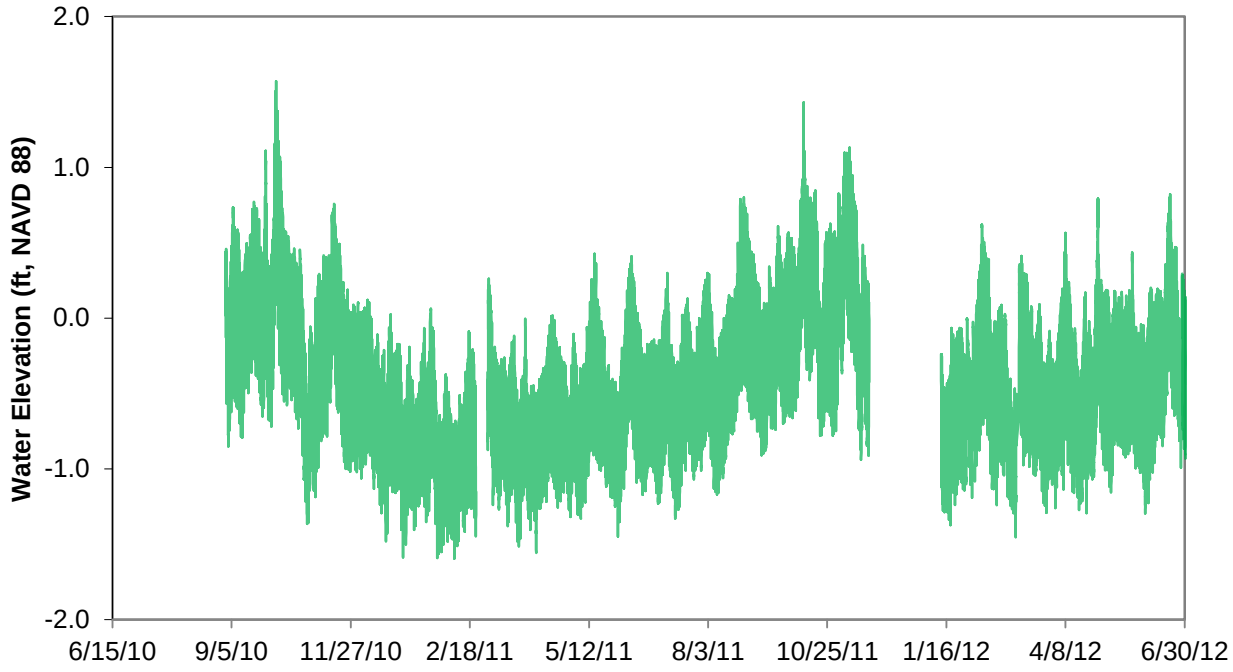


Figure 2.3-29. TPSWC-5 Water Elevations.

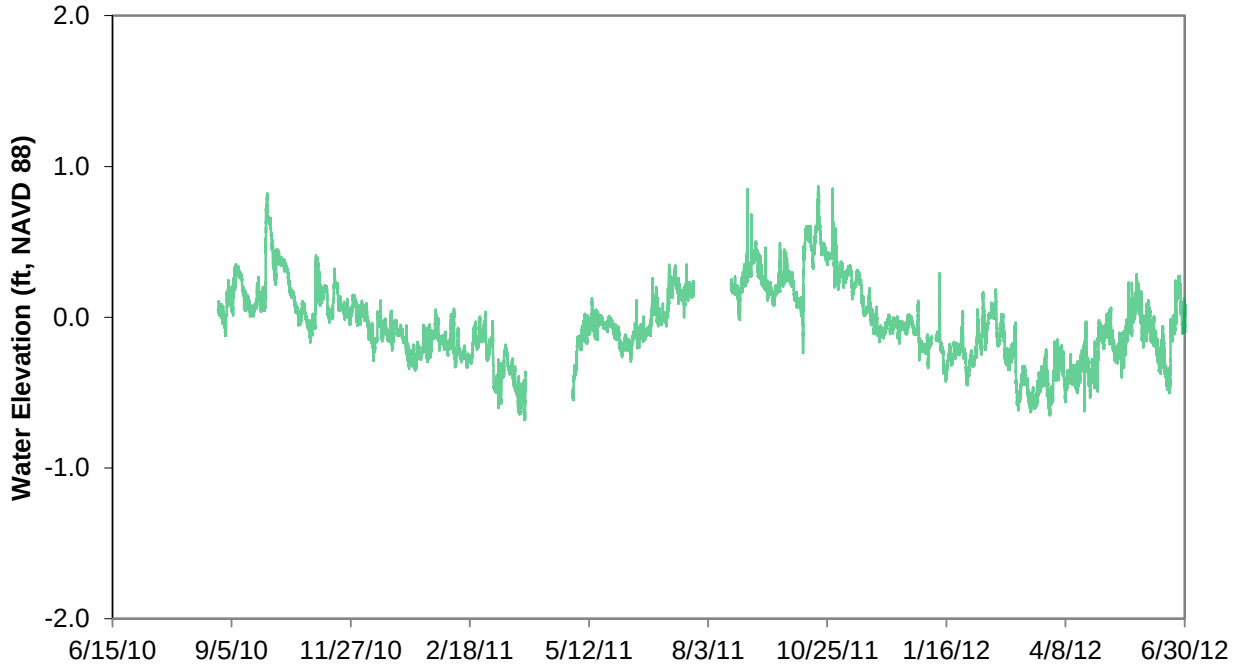


Figure 2.3-30. TPSWCCS-1 Water Elevations.

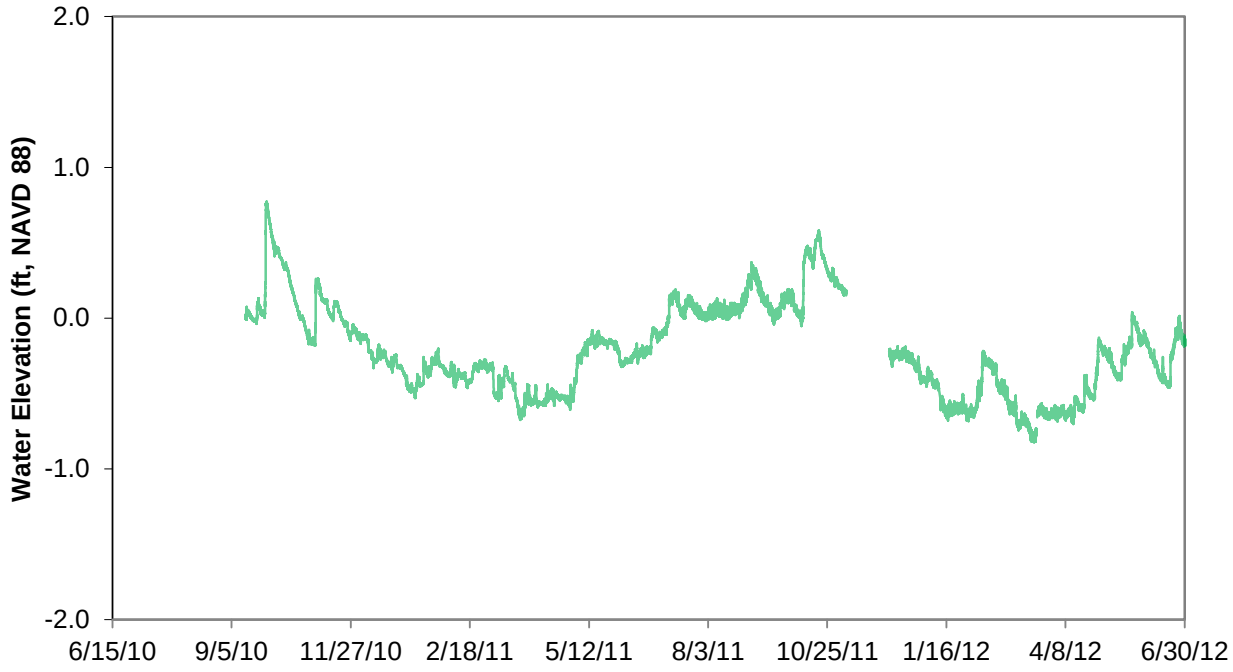


Figure 2.3-31. TPSWCCS-2 Water Elevations.



Figure 2.3-32. TPSWCCS-3 Water Elevations.

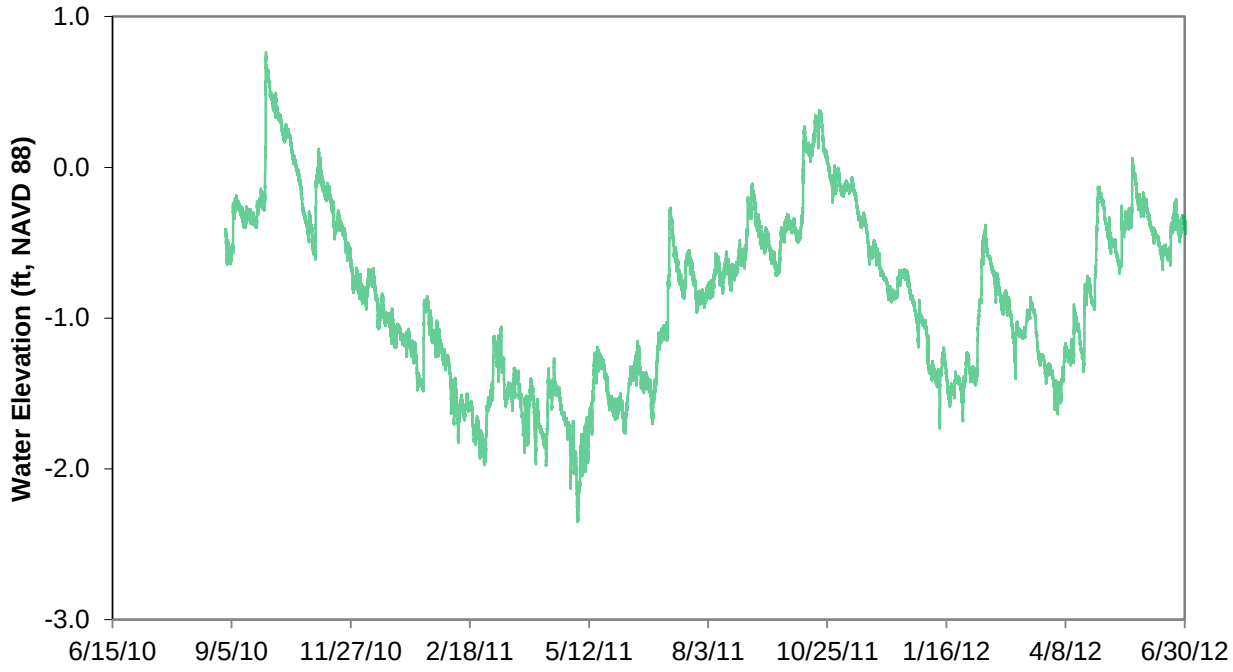


Figure 2.3-33. TPSWCCS-4 Water Elevations.

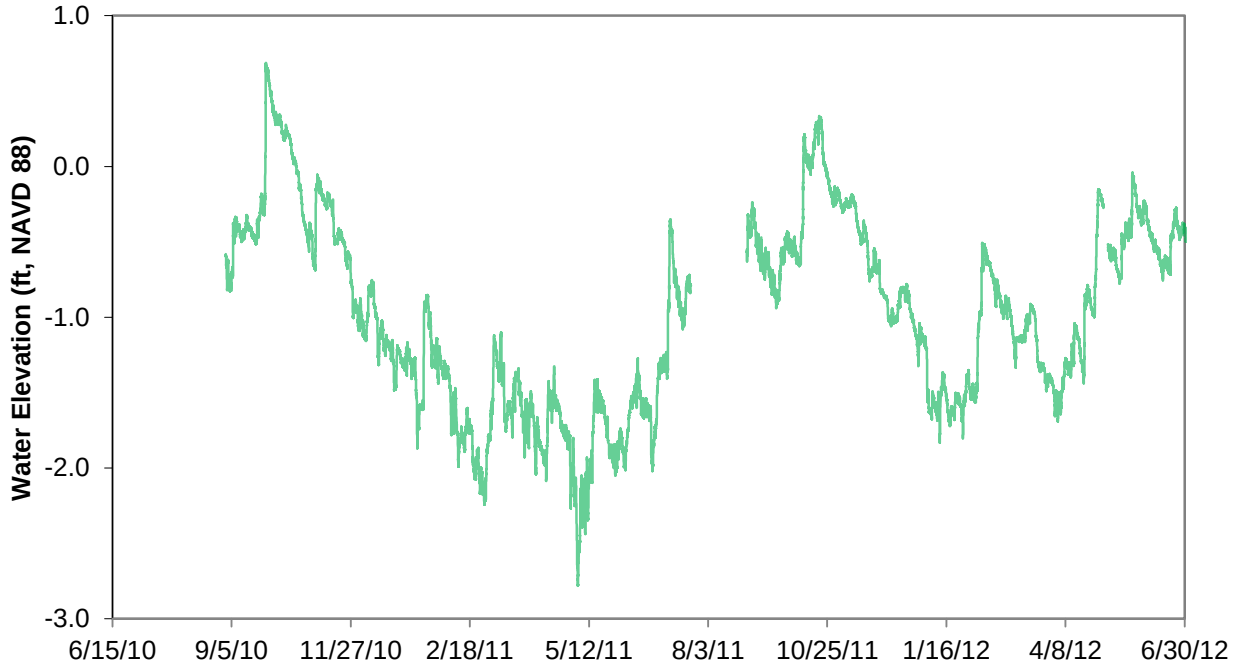


Figure 2.3-34. TPSWCCS-5 Water Elevations.

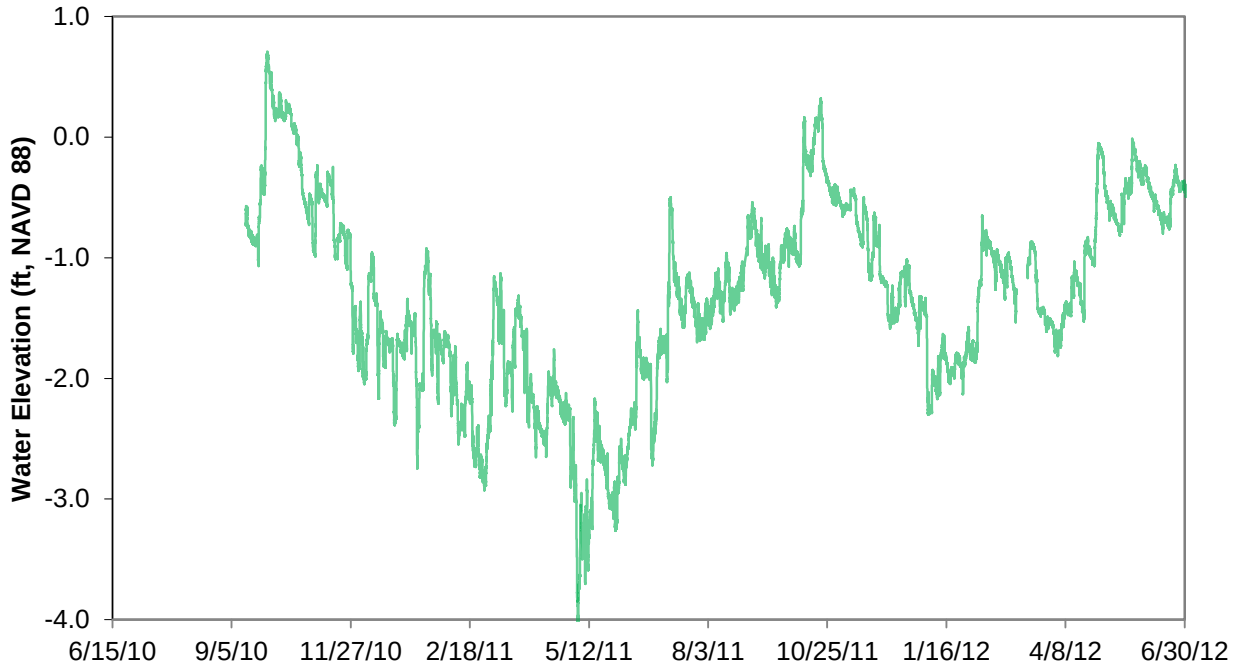


Figure 2.3-35. TPSWCCS-6 Water Elevations.

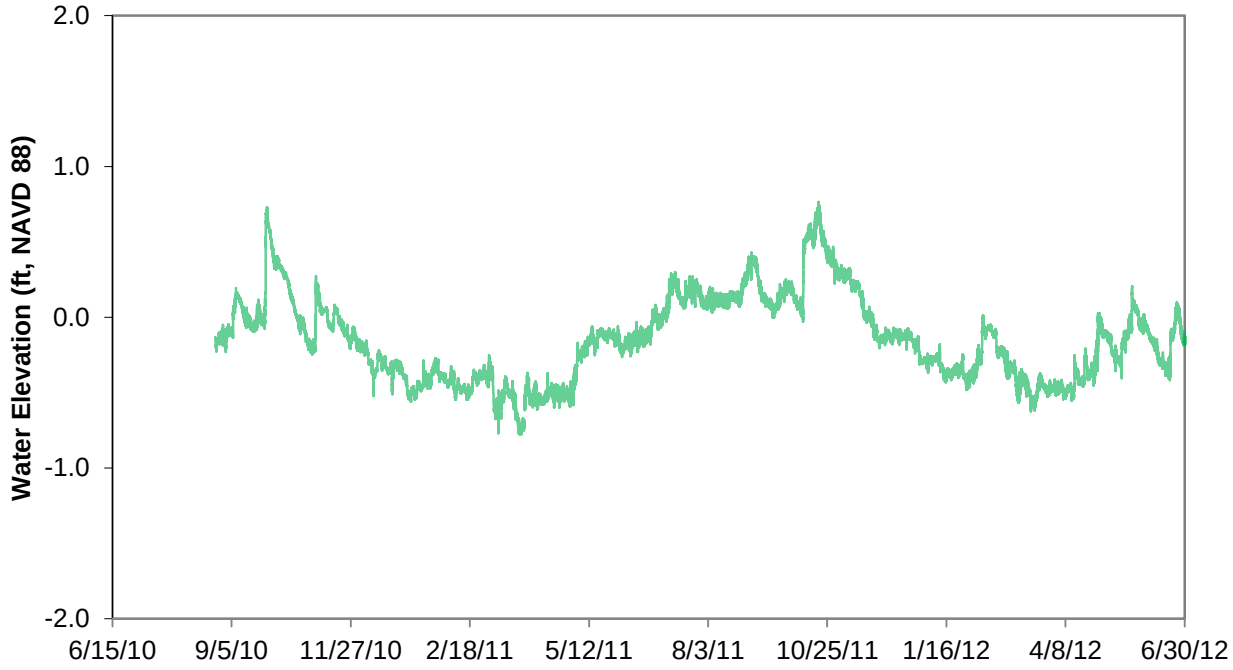


Figure 2.3-36. TPSWCCS-7 Water Elevations.

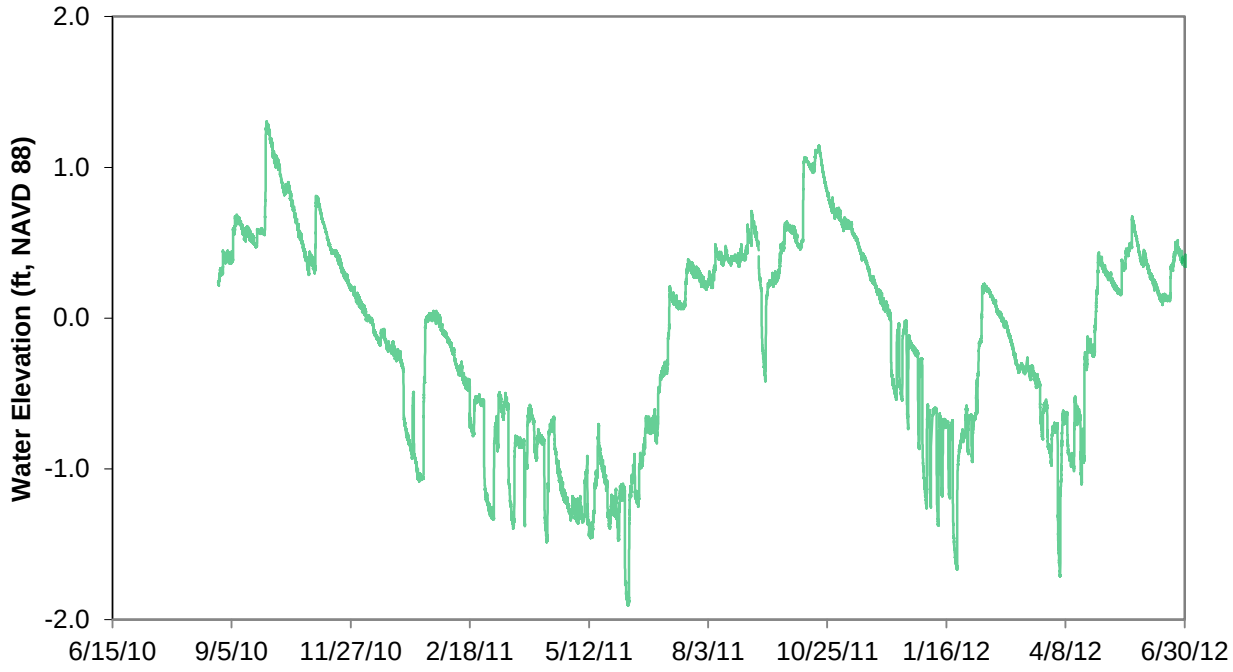


Figure 2.3-37. TPSWID-1 Water Elevations.

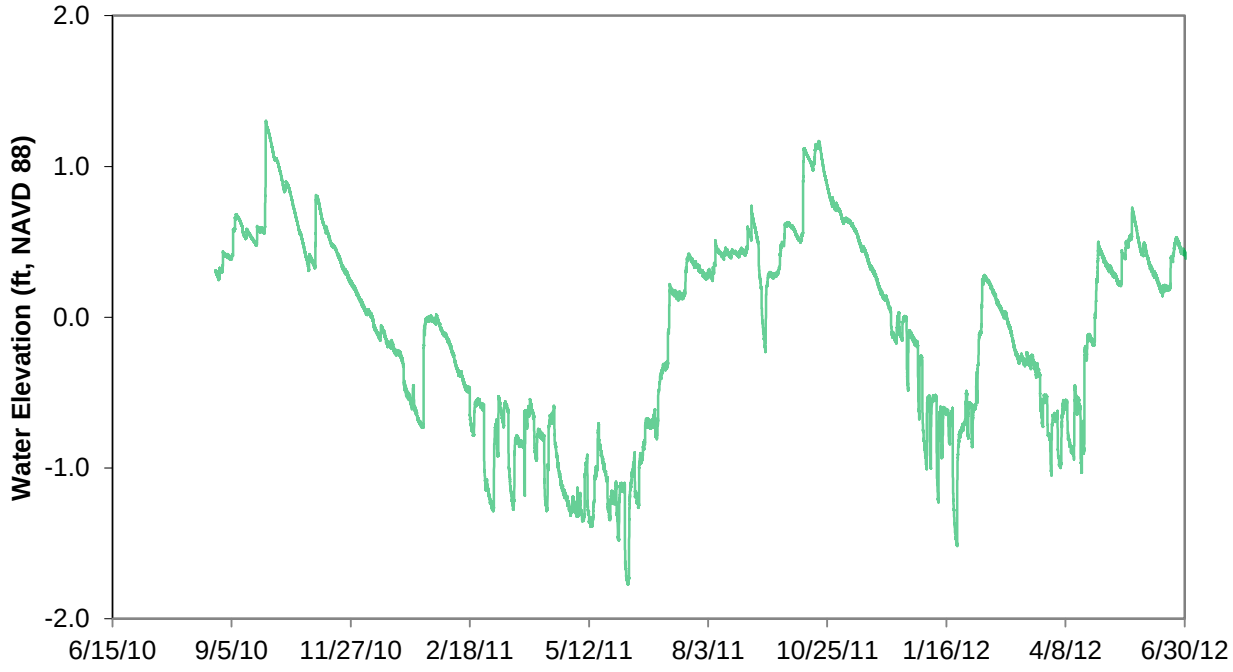


Figure 2.3-38. TPSWID-2 Water Elevations.

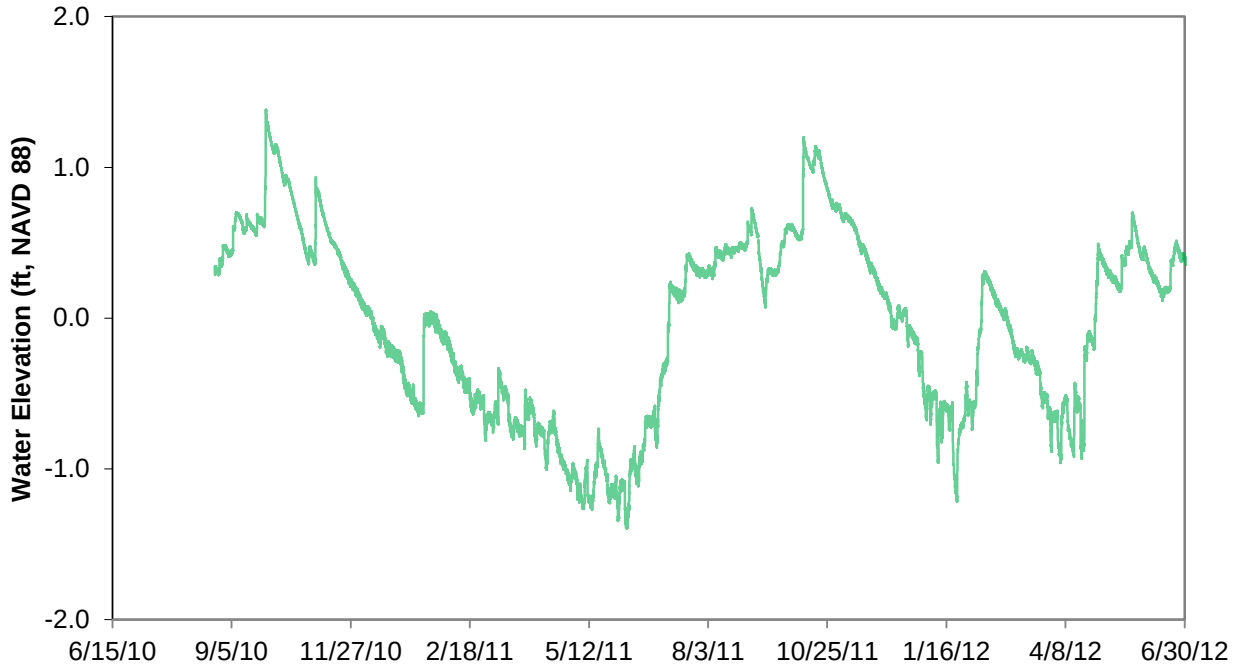
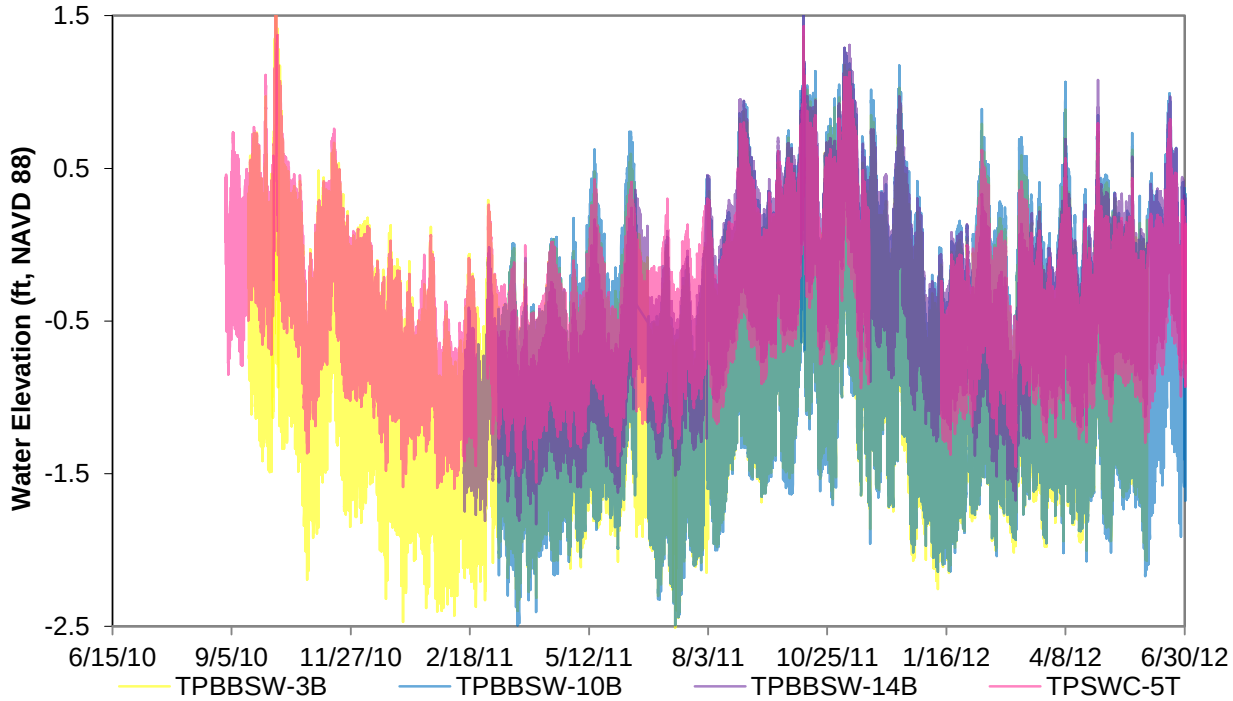
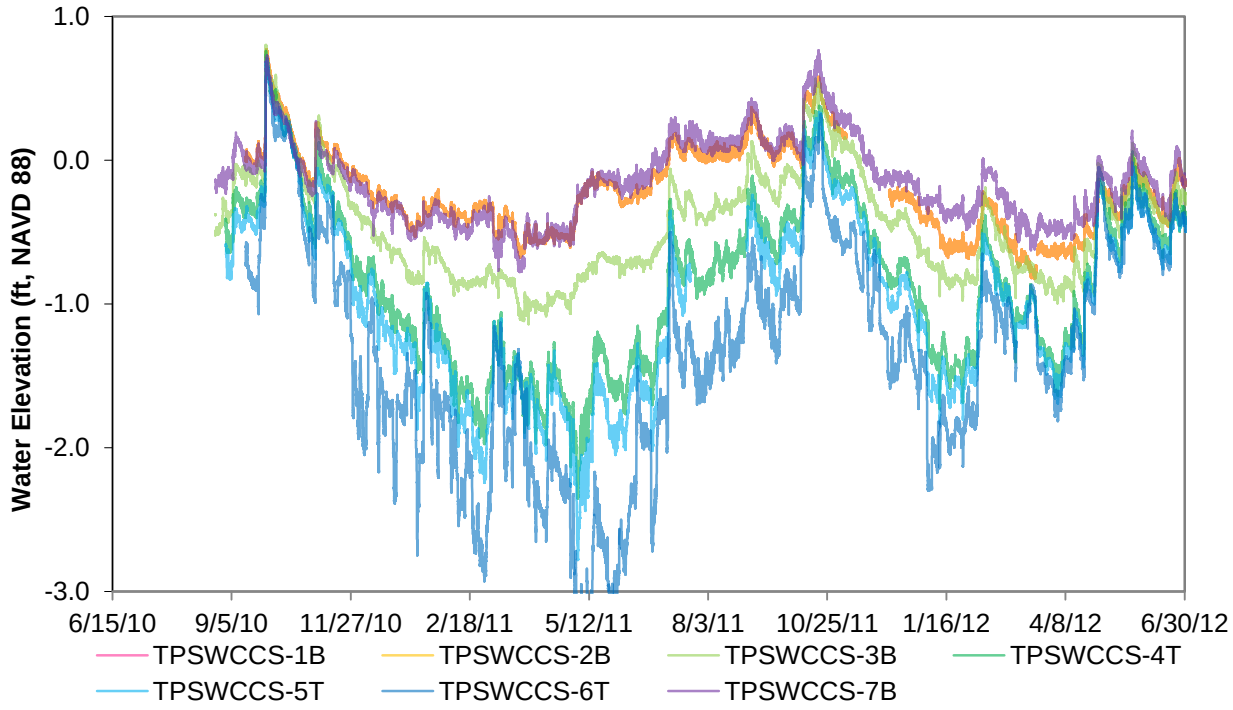


Figure 2.3-39. TPSWID-3 Water Elevations.



2.3-40 Comparison of Time Series Surface Water Elevations in Tidal Stations TPBBSW-3, TPBBSW-10, TPBBSW-14, and TPSWC-5



2.3-41 Comparison of Time Series Surface Water Elevations in CCS Stations

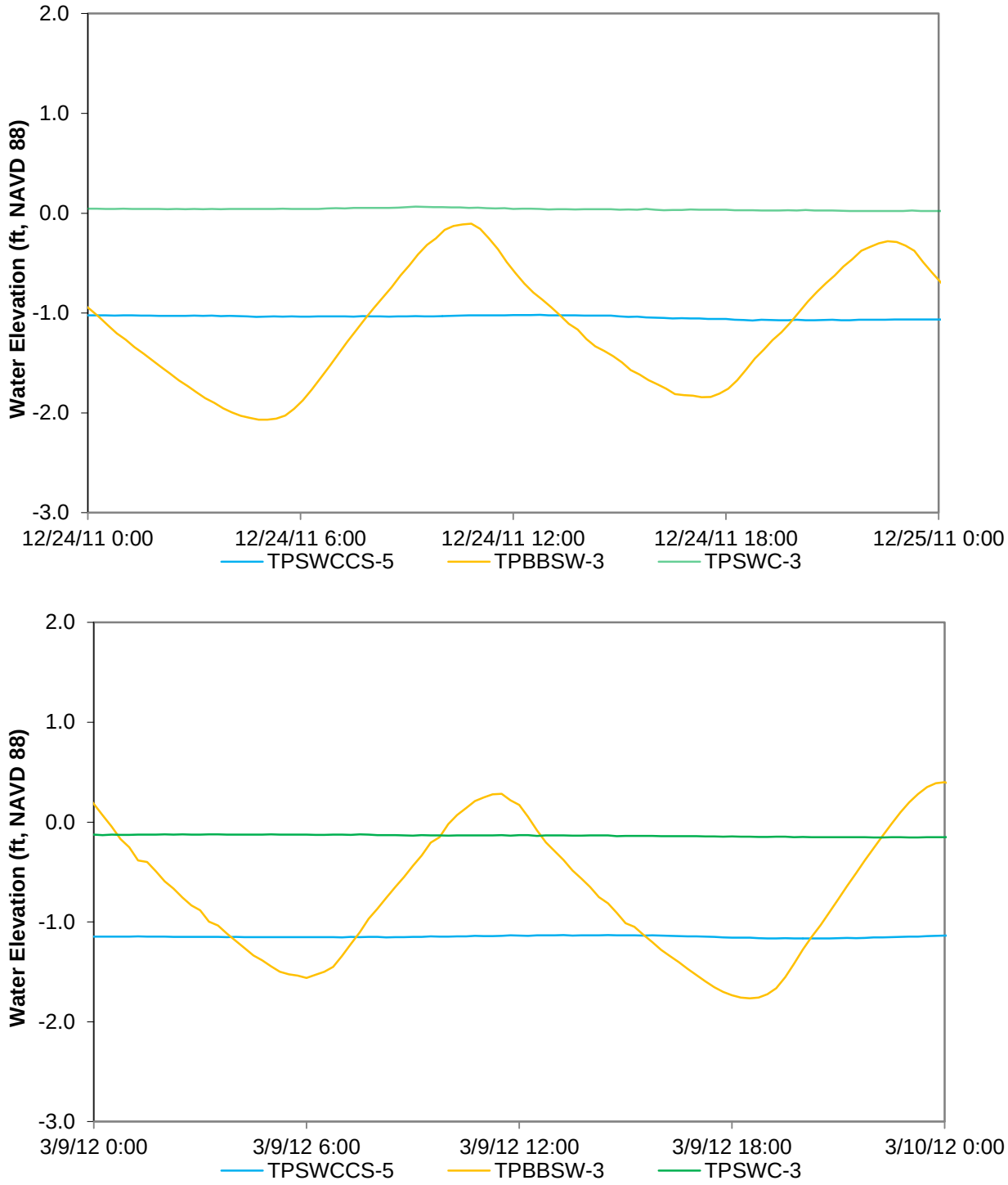


Figure 2.3-42. Lack of Tidal Response in CCS and L-31E Surface Water.

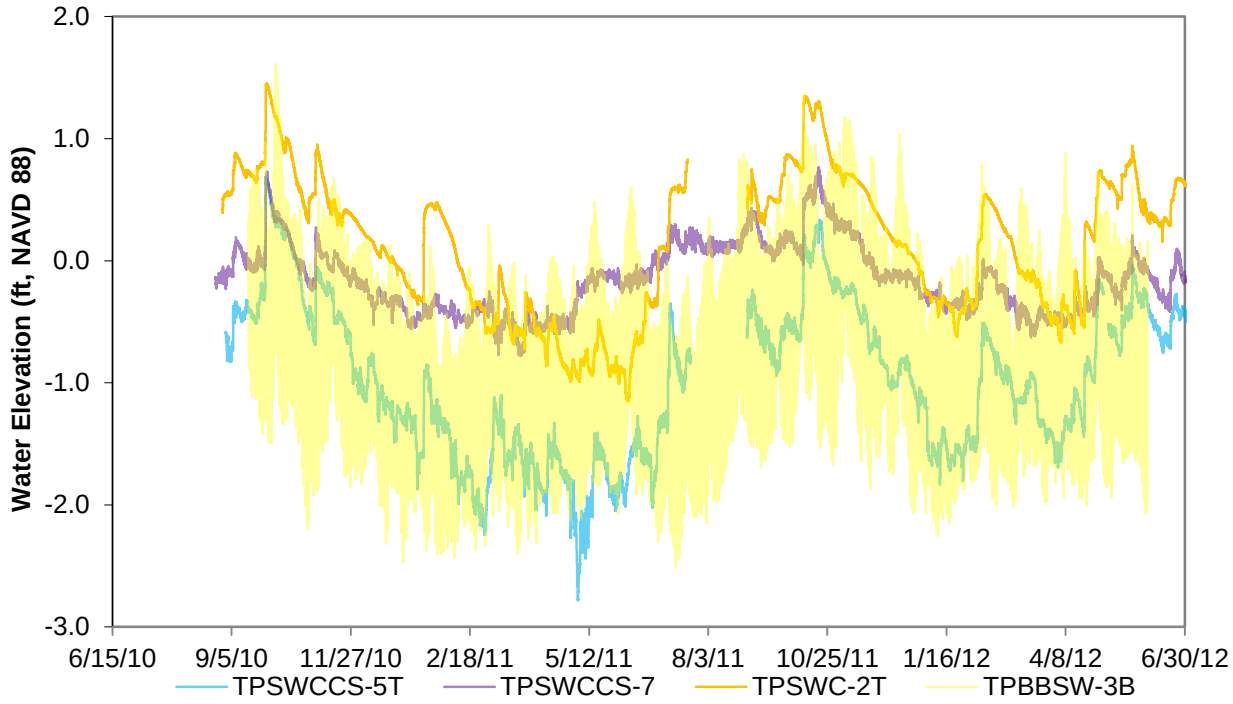


Figure 2.3-43. Comparison of Time Series Surface Water Elevations in CCS, L-31E, and Biscayne Bay.

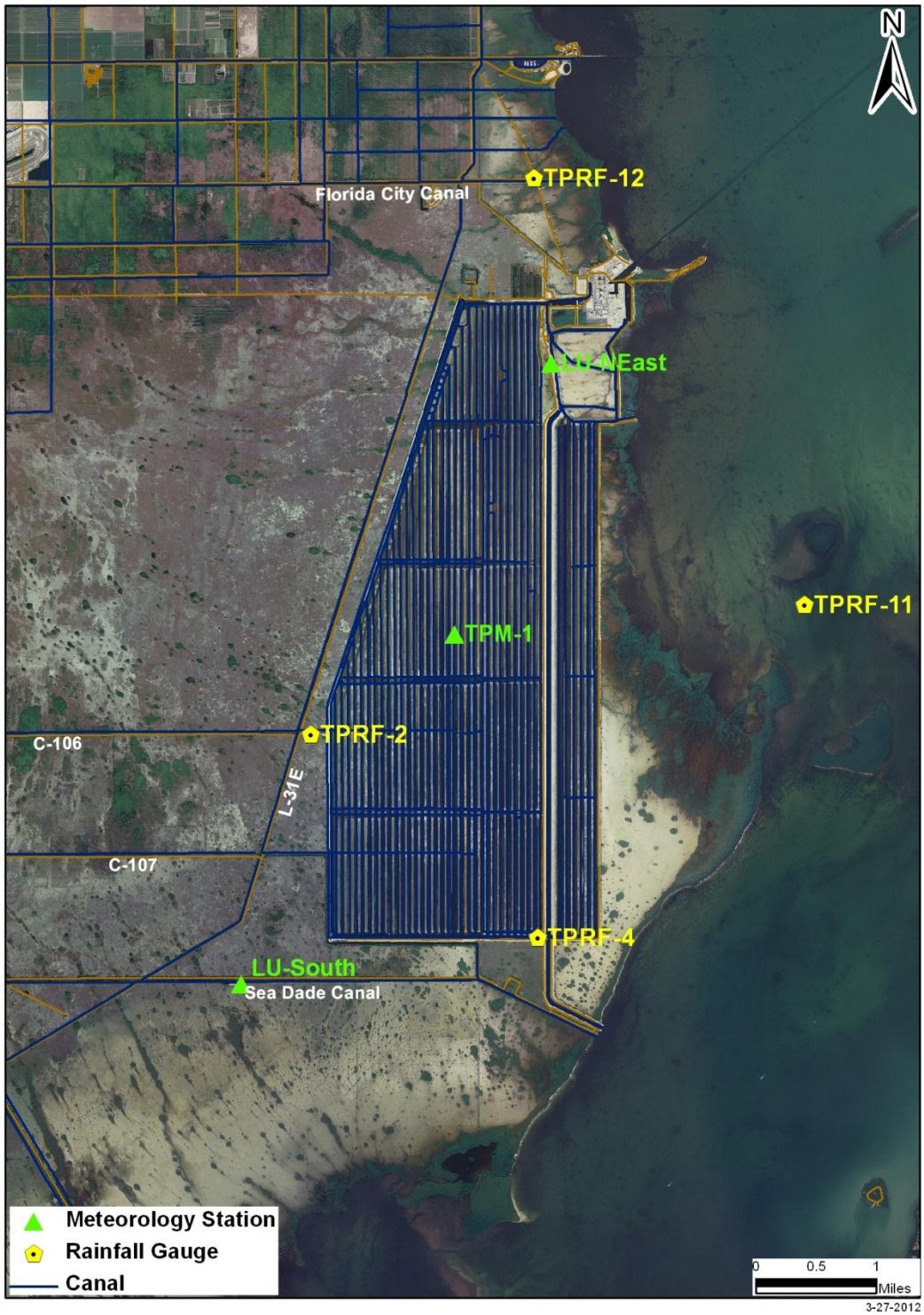
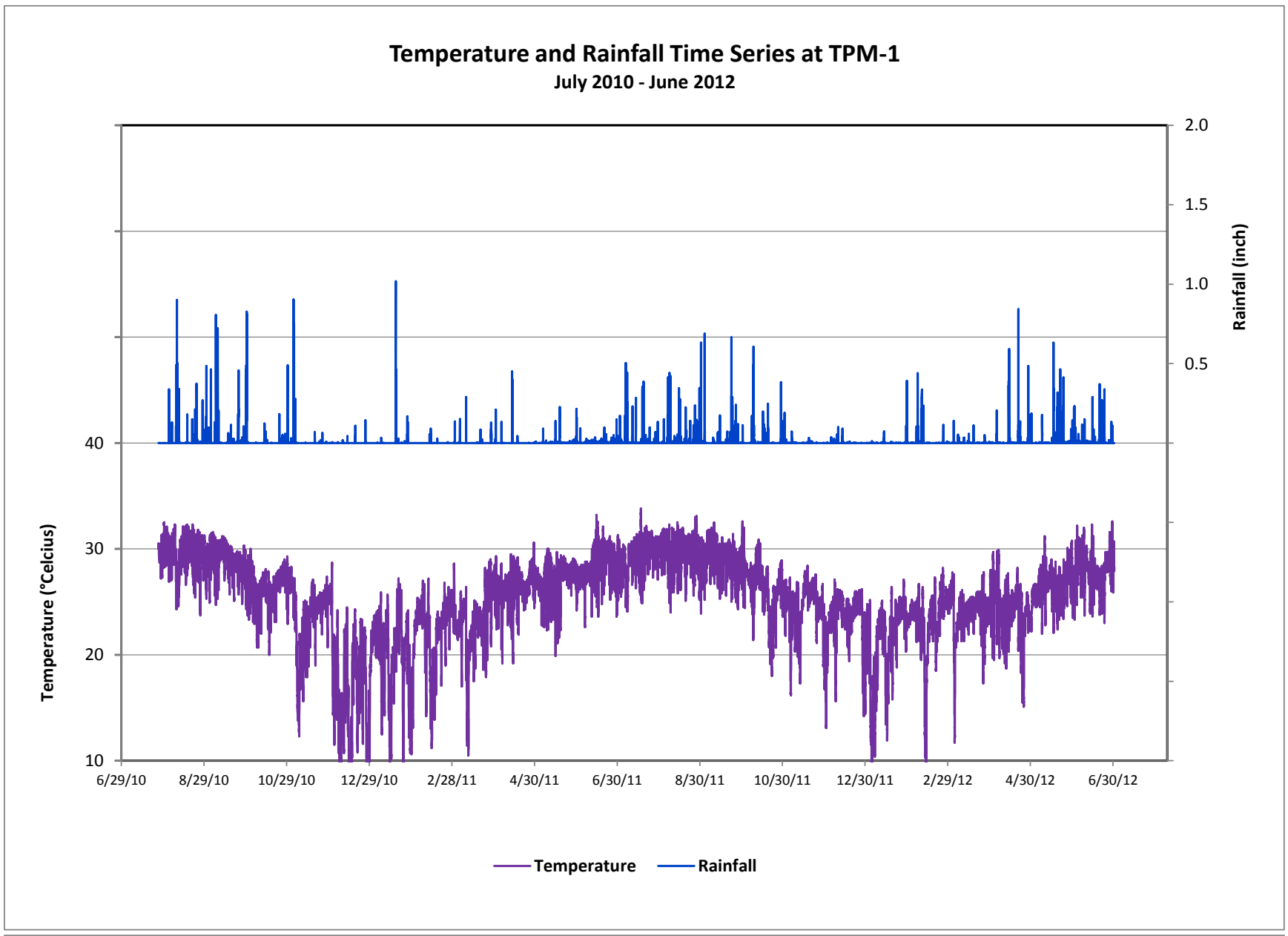


Figure 2.4-1. Locations of Meteorological Stations and Rainfall Gauges.



Figure 2.4-2. Photos of the Meteorological Station and Rainfall Collector.



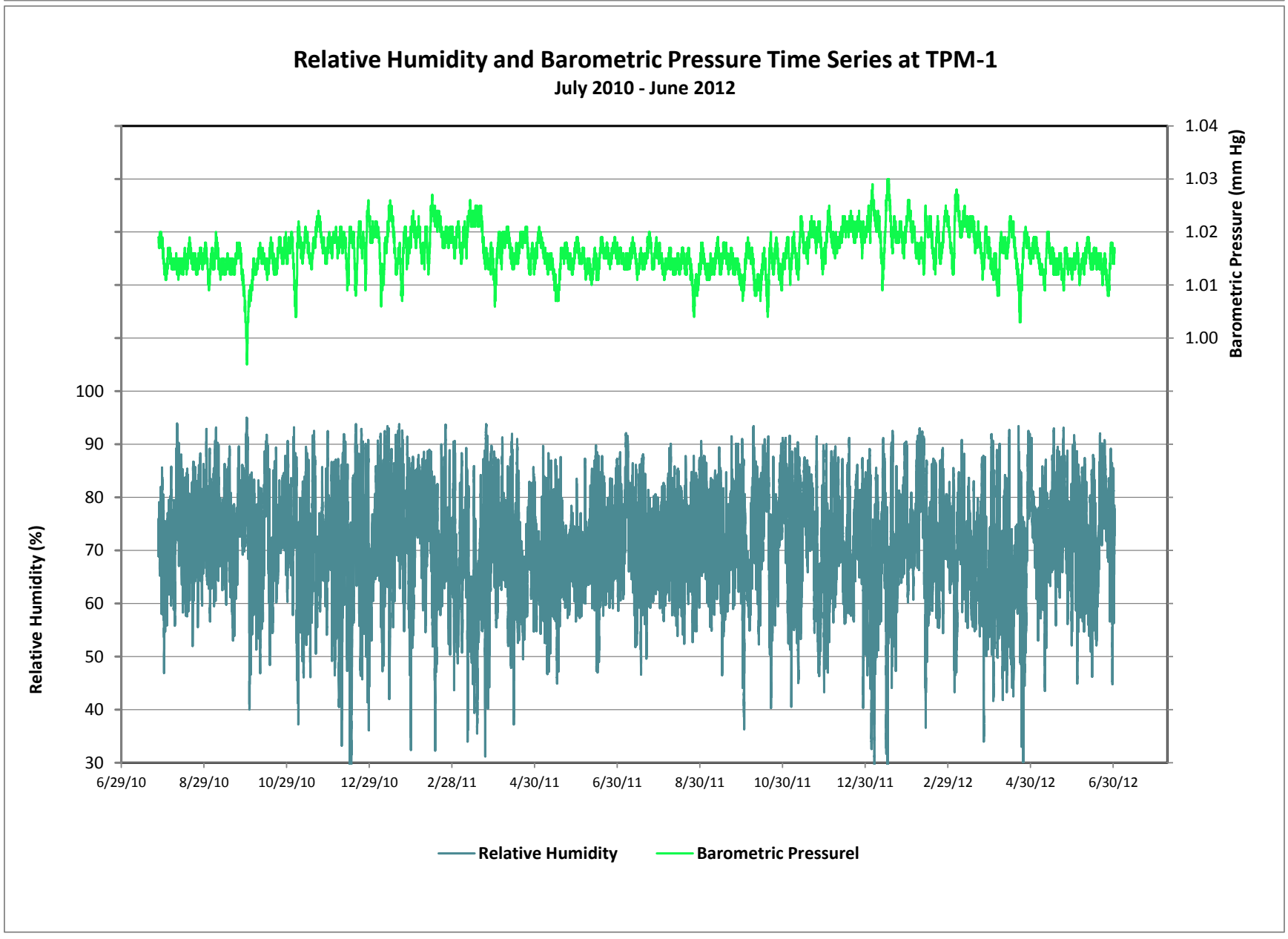
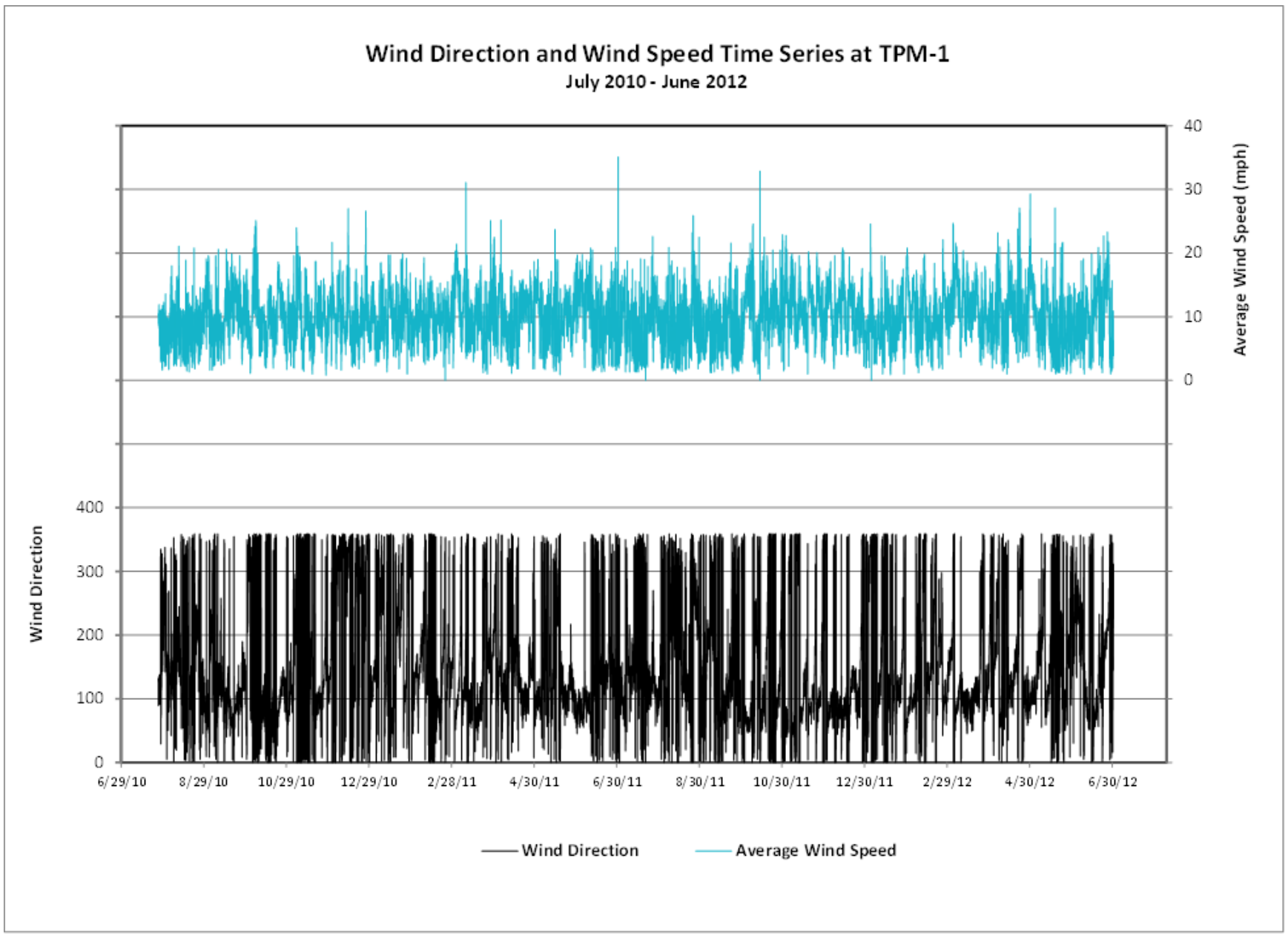


Figure 2.4-3. Time Series Rainfall, Temperature, Relative Humidity, and Barometric Pressure at TPM-1.



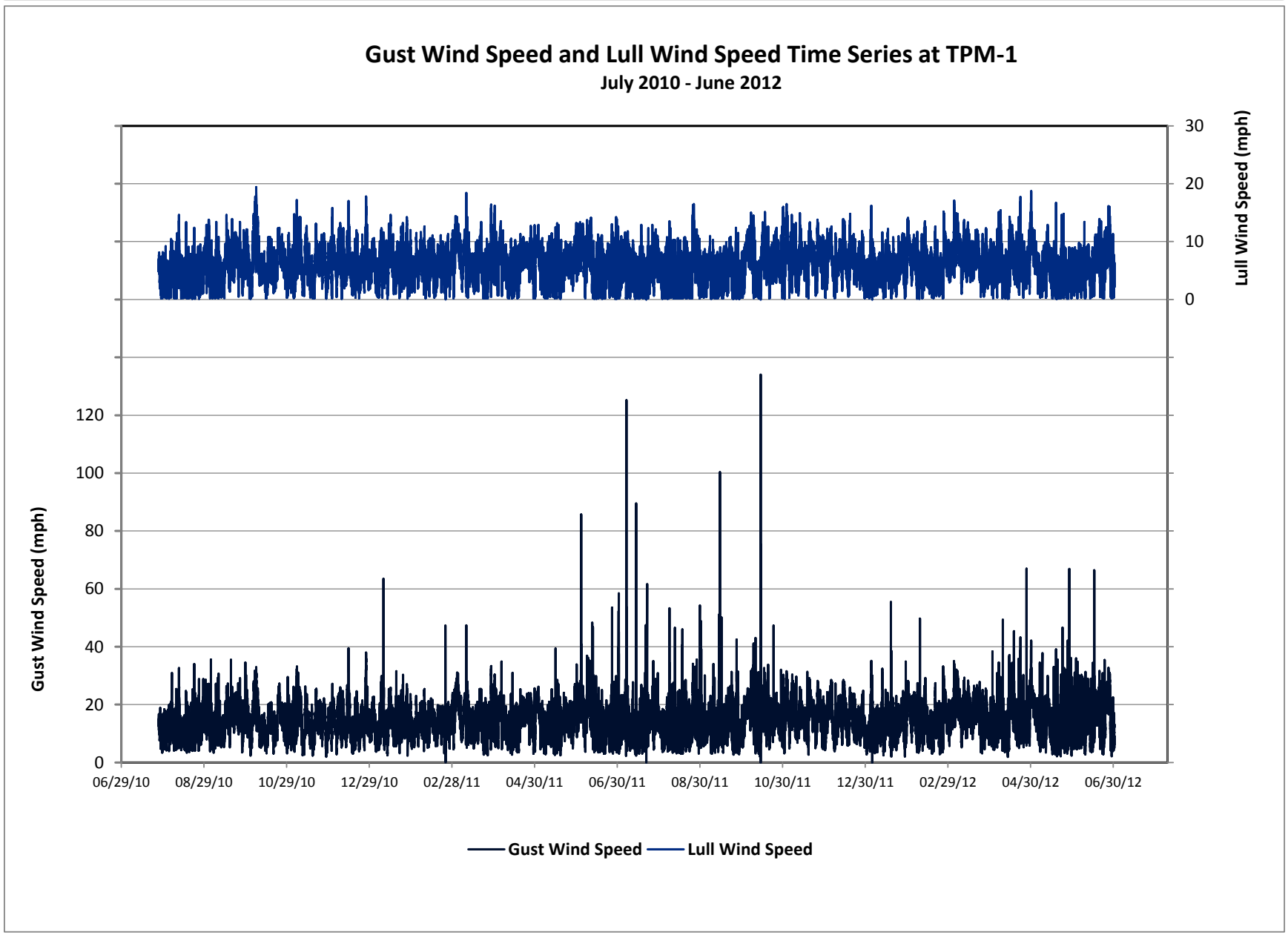


Figure 2.4-4. Time Series Wind Direction, Wind Speed, Wind Gusts, and Wind Speed at Lull for TPM-1.

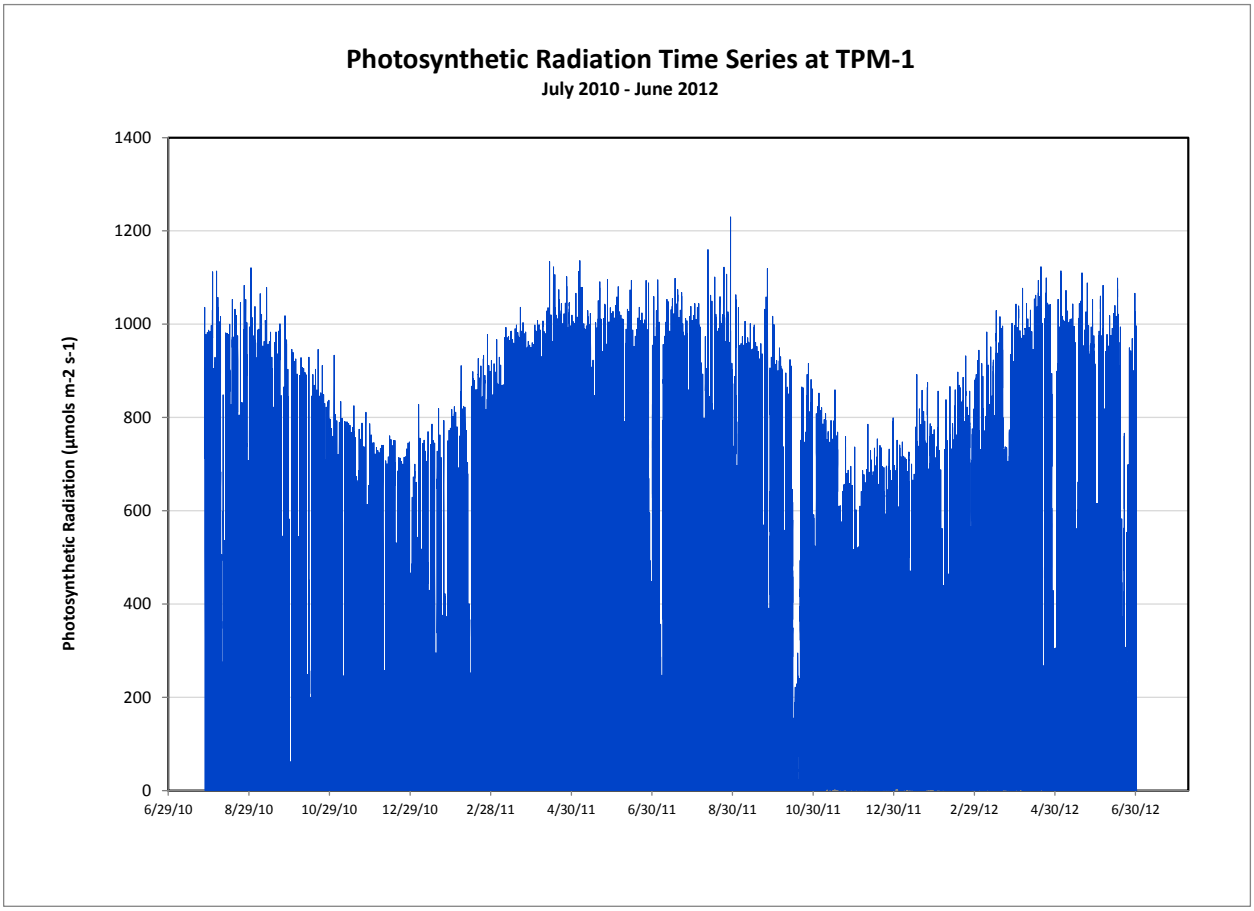


Figure 2.4-5. Time Series Photosynthetically Active Radiation (PAR) for TPM-1.

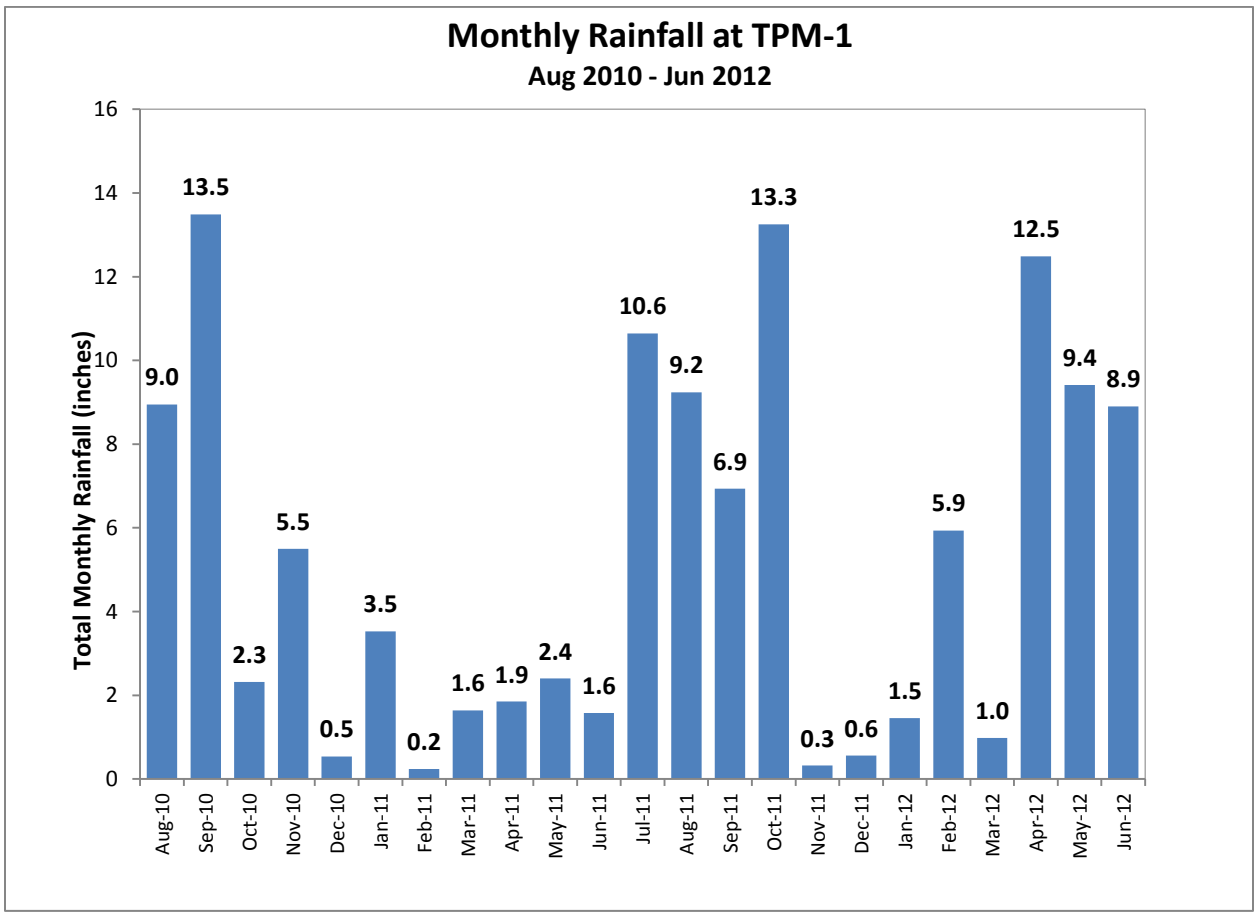


Figure 2.4-6. Monthly Rainfall at TPM-1 from August 2010 through June 2012.

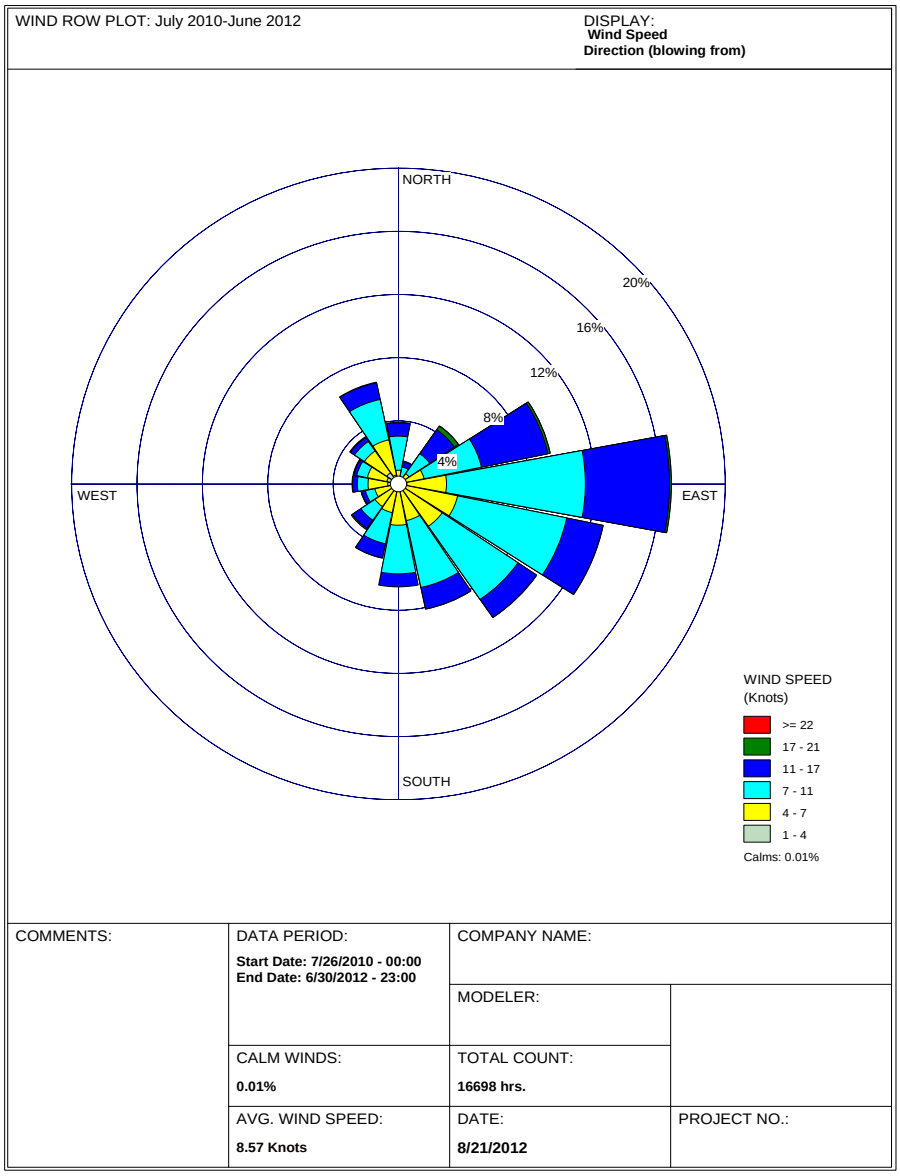


Figure 2.4-7. Wind Row Plot Indicating Wind Speed and Direction.

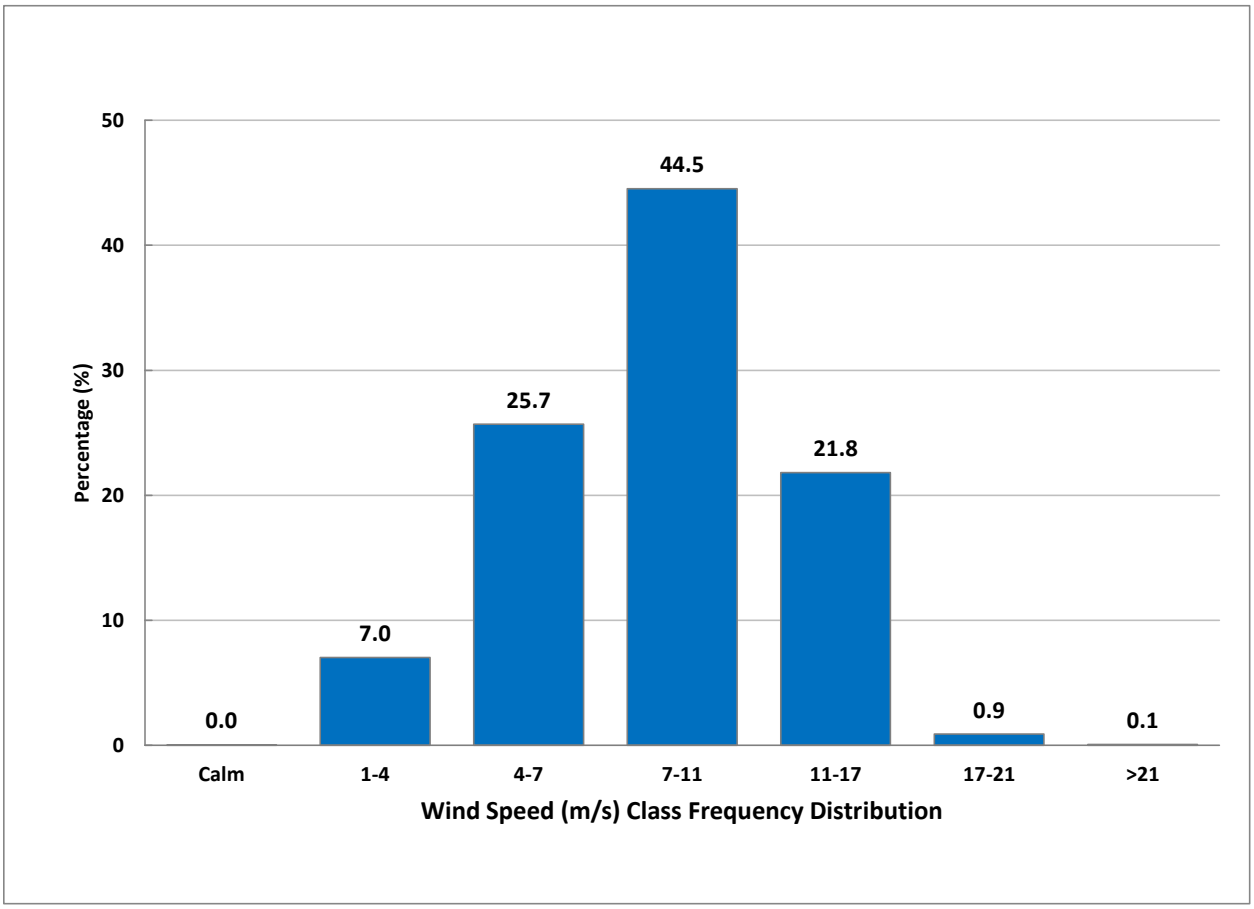


Figure 2.4-8. Wind Speed (Class) Frequency Distribution.

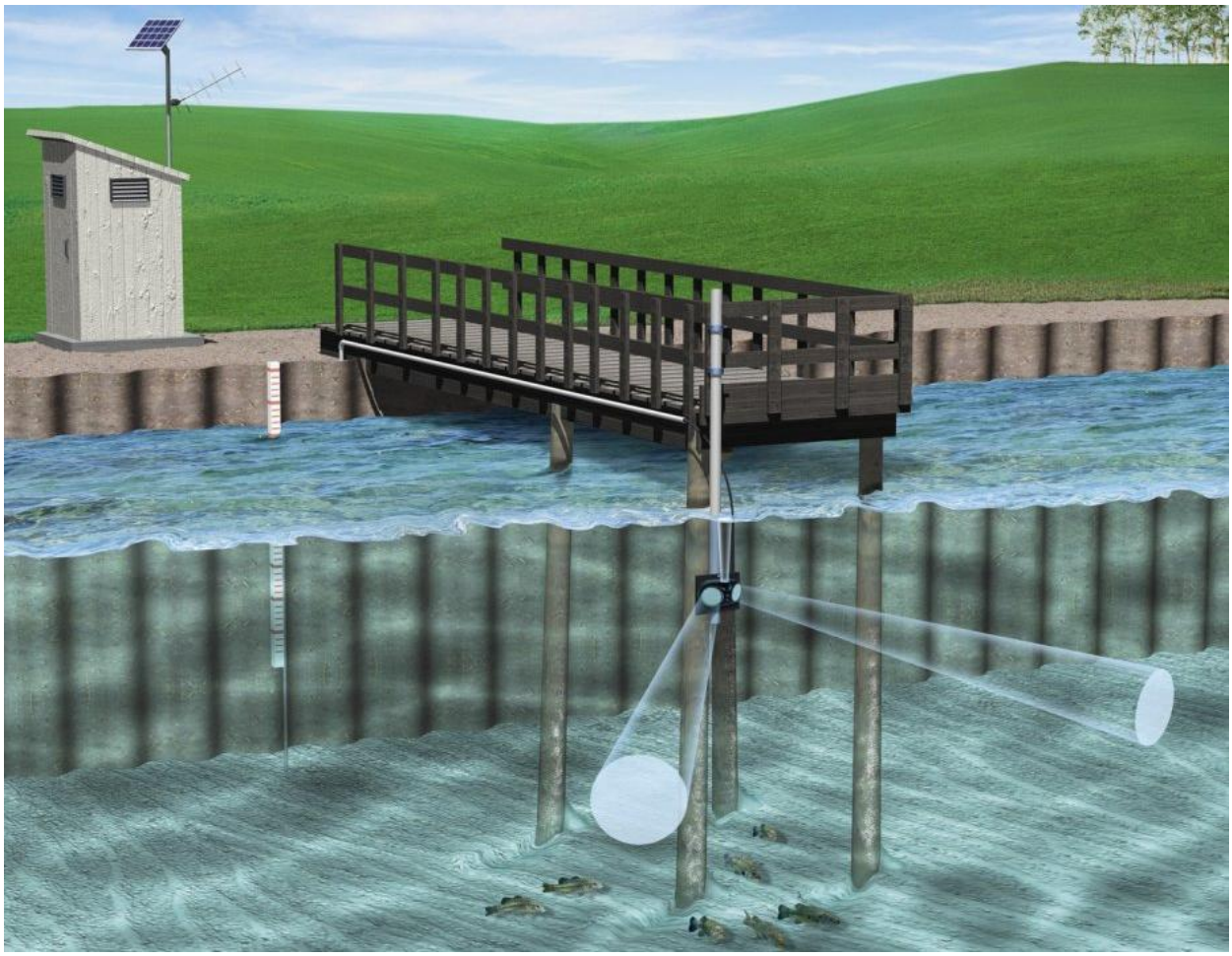


Figure 2.5-1. Acoustic Doppler Flow Meter Measurement Setup within the Water Column.

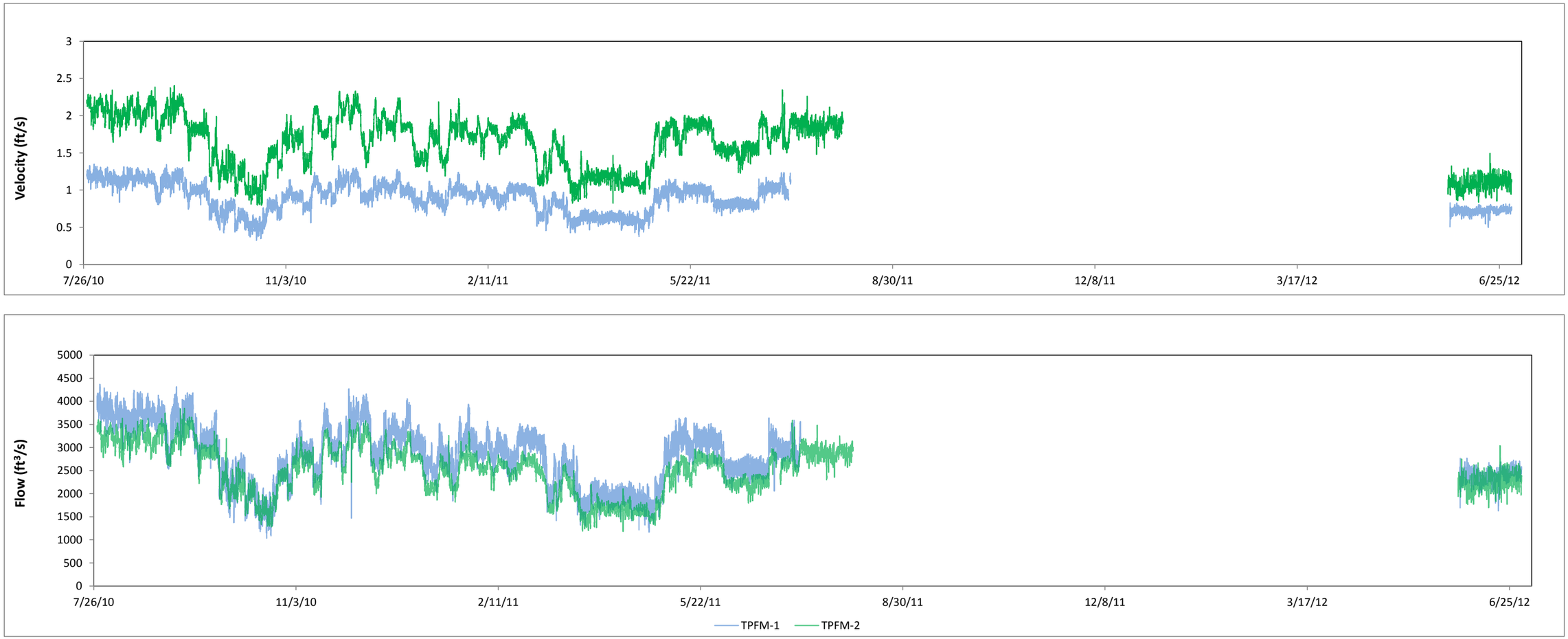


Figure 2.5-2. Indexed Velocity and Flow Rates for Flow Meter Stations TPFM-1 (Outflow from Plant) and TPFM-2 (South of CCS).

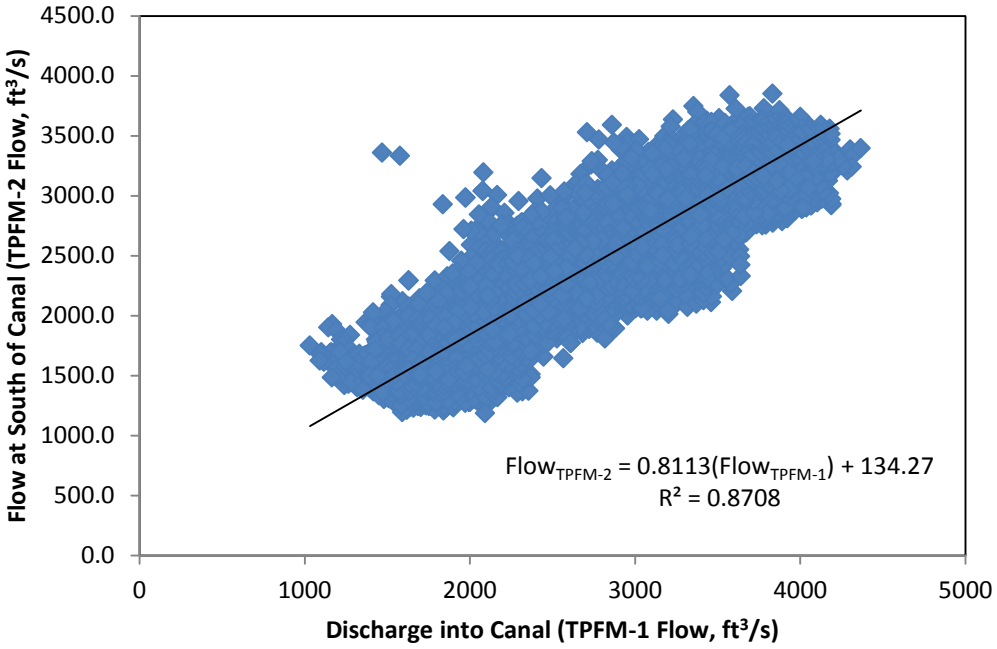


Figure 2.5-3. Flow Rates at TPFM-1 Compared to TPFM-2.

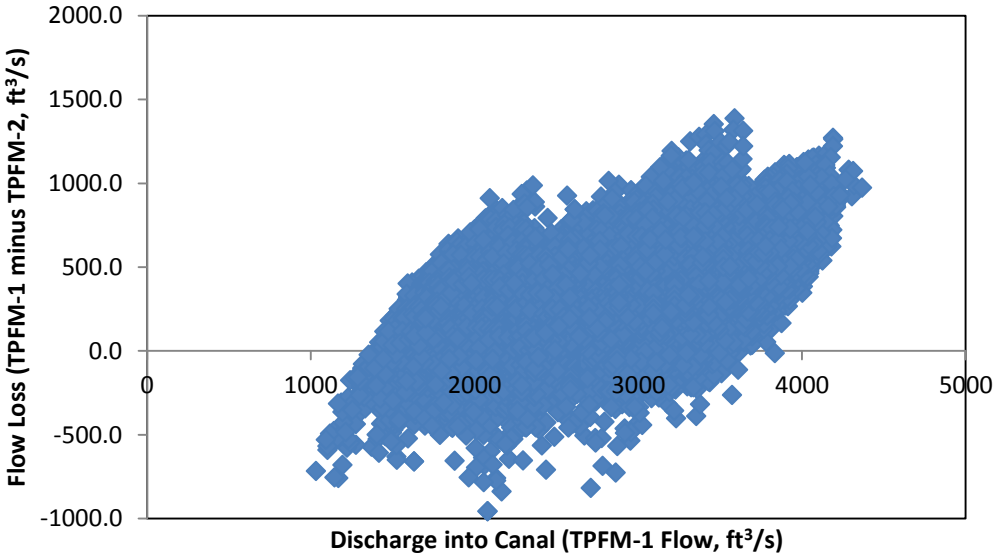
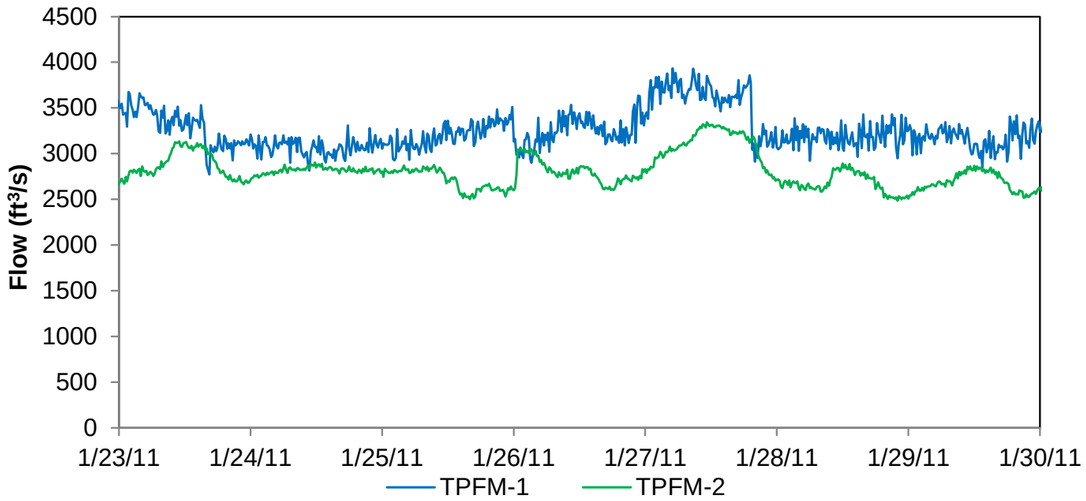
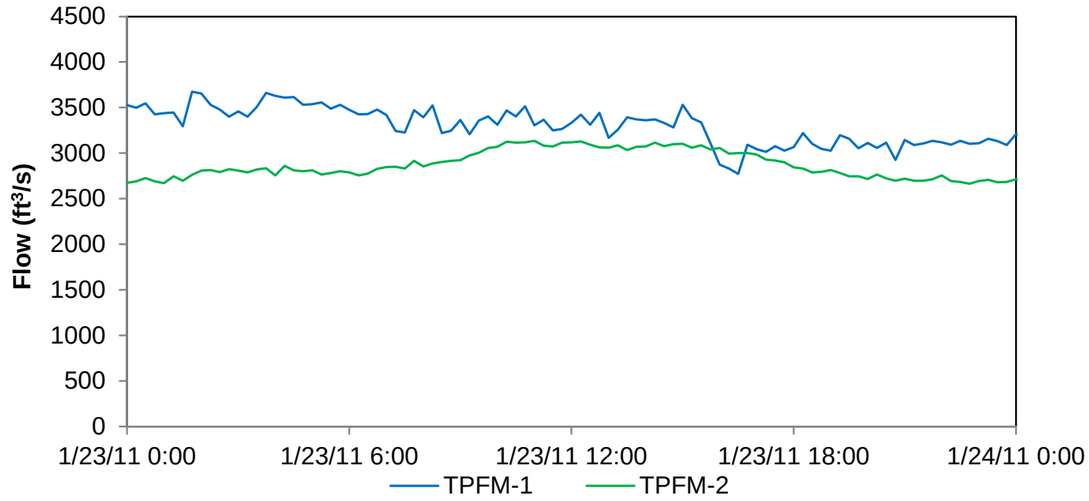
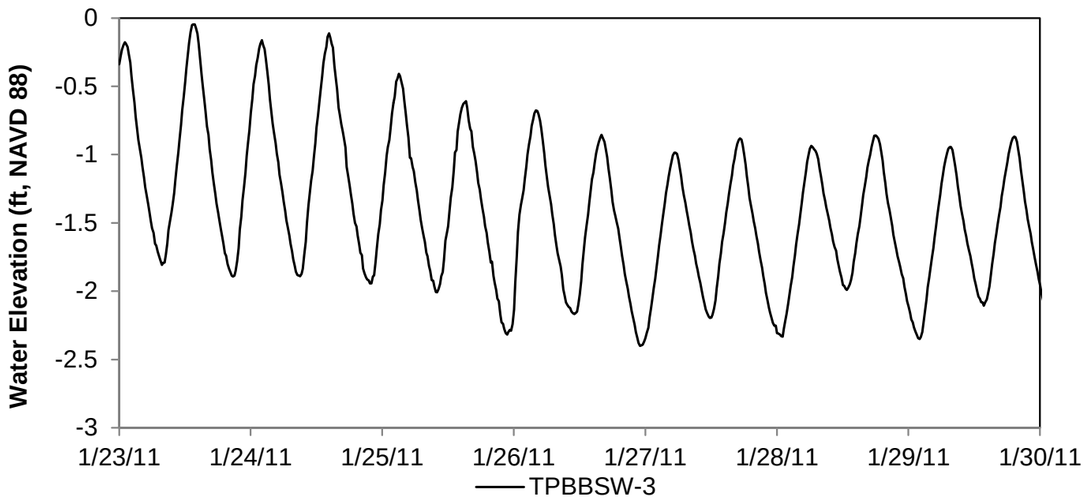


Figure 2.5-4. Flow Rates at TPFM-1 Compared to the Flow Loss of Water Traveling from North to South.







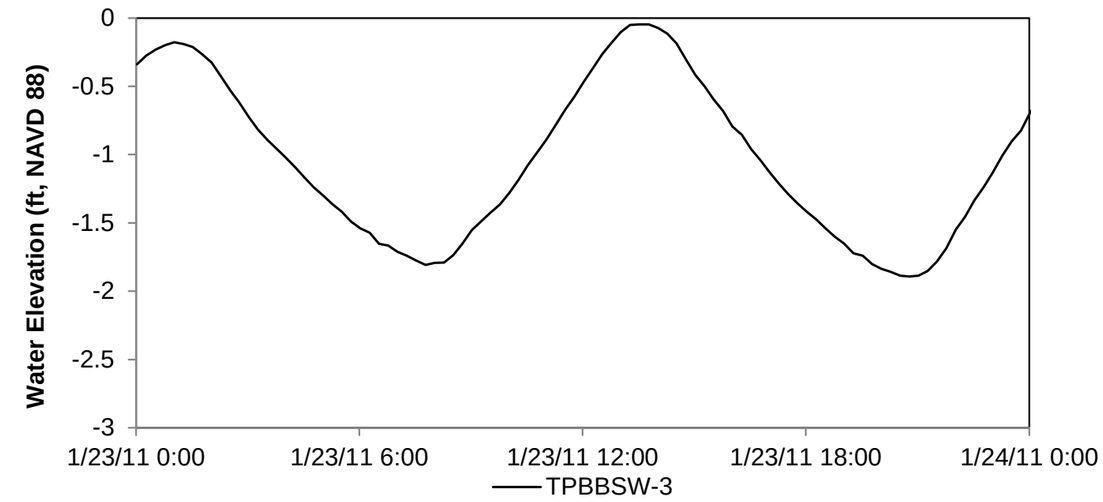
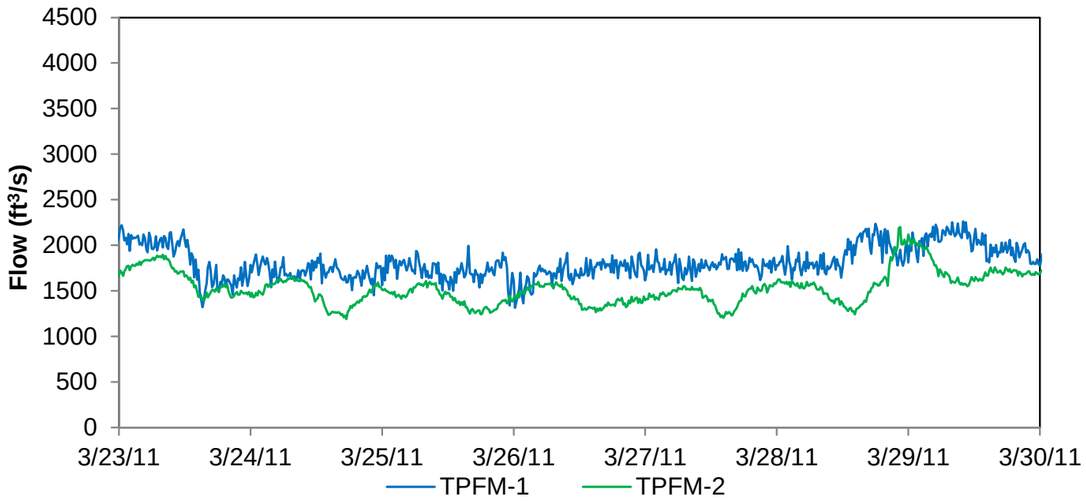
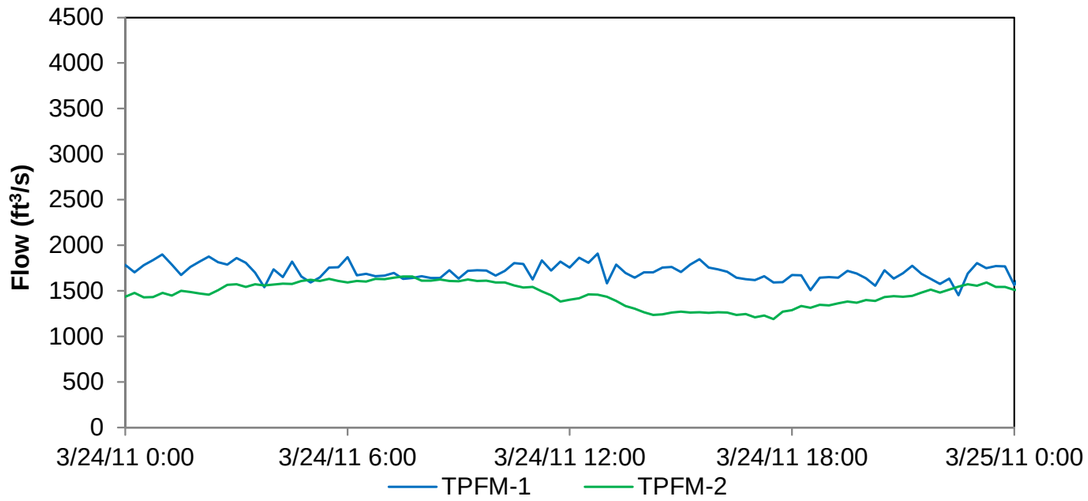
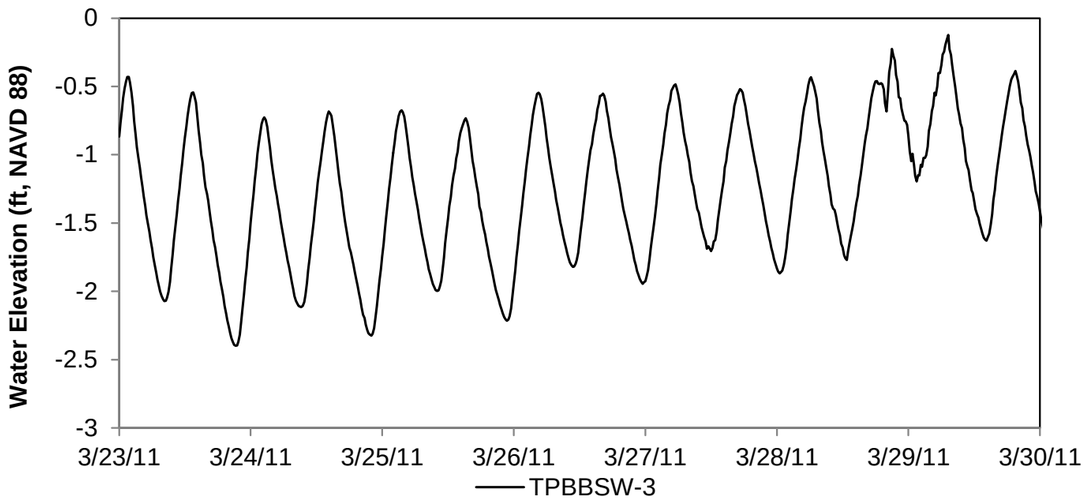


Figure 2.5-5. Flow Rates at TPFM-1 and TPFM-2 Compared to the Tidal Amplitude at TPBBSW-3 (January 23-30, 2011).







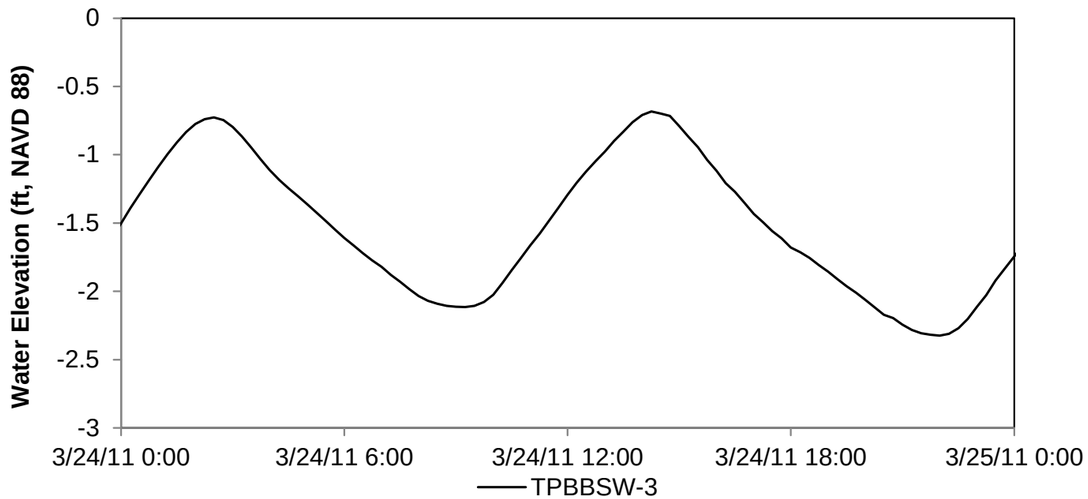


Figure 2.5-6. Flow Rates at TPFM-1 and TPFM-2 Compared to the Tidal Amplitude at TPBBSW-3 (March 23-30, 2011).

3. QUARTERLY GROUNDWATER AND SURFACE WATER SAMPLING RESULTS

The Monitoring Plan (SFWMD 2009a) and QAPP (FPL 2010) for this project outline the locations and analytes for the groundwater and surface water sampling and the analyses for quarterly and semi-annual events. Tables 3.0-1 and 3.0-2 provide a summary of the sampling locations and analyses. Each groundwater location is a cluster of three wells at different depth intervals. The groundwater wells are designated by depth and defined as "S" for shallow wells (-15.3 to -34.7 ft NAVD 88 to bottom of screen elevation), "M" for intermediate wells (-32.8 to -85.7 ft NAVD 88 to bottom of screen elevation), and "D" for deep wells (-46.4 to -122.2 ft NAVD 88 to bottom of screen elevation). Surface water samples are also designated by depth, i.e., "T" for top (1 ft below surface) and "B" for bottom (1 ft above bottom).

With a few exceptions, samples were collected quarterly at all locations from June 2010 through June 2012 and were analyzed for the parameters as required in the Monitoring Plan. Samples were collected and analyzed for ions and trace elements every quarter in both groundwater and surface water (Tables 3.0-1 and 3.0-2). Semi-annually, samples were collected from a subset of station locations and analyzed for additional parameters such as nutrients, trace elements, silica, and gross alpha (first year only); this is referred to as a semi-annual event. The first sampling event in June/July 2010 (wet season) was designated as a semi-annual event since it was conducted halfway into the calendar year. The September 2010 event was designated as a quarterly event and FPL envisioned that every June and December would be semi-annual events and every September and March would be quarterly events. However, following the September 2010 sampling effort, the Agencies requested that FPL switch the quarterly and semi-annual events. The Agencies wanted a complete semi-annual suite of parameters collected during the wet (September) and dry seasons (March) rather than in the transitional months of December and June. Therefore, the December 2010 event was changed to a quarterly event, and March 2011 was designated as a semi-annual event. Subsequently, June 2011, December 2011, and June 2012 were designated as quarterly events and September 2011 and March 2012 were designated as semi-annual events.

Samples also were collected from several of the historical wells that have been monitored as part of the ID operations. Monitoring wells L-3, L-5, G-21, G-28, and G-35 were initially sampled during their regularly scheduled events in October 2010 and January 2011, offset from the above monitoring for the Uprate project by one month. Based on discussions with the Agencies, the schedule for ID operation was adjusted after January 2011 to coincide with the Uprate monitoring. Thus, starting with the March 2011 Uprate monitoring event and quarterly thereafter, groundwater samples were collected from monitoring wells L-3, L-5, G-21, G-28, and

G-35. Since the historical wells are screened across the entire aquifer, samples were collected from two depths (18 ft and 58 ft below top of casing).

The majority of the samples were analyzed by TestAmerica; however, more specialized analyses were conducted by the following laboratories:

- University of Miami Rosenstiel School of Marine & Atmospheric Science Laboratory: carbon isotopes ($\delta^{13}C$);
- University of Miami L7 Isotope Laboratory: hydrogen (δD) and oxygen isotopes ($\delta^{18}O$);
- USGS Tritium Laboratory: tritium; and
- USGS Strontium Laboratory: strontium isotopes ($^{87}Sr/^{86}Sr$).

Details of the analytical methodologies for each analyte are provided in the project QAPP (FPL 2011c). The following subsections provide a brief overview of the methods used to collect the samples; notable exceptions in data collection methodology, sample collection, and/or laboratory analysis also are discussed. A summary of the field parameters and analytical results is included. Details regarding the sampling methodologies and laboratory procedures are described in the December 2, 2011, Agency-approved project QAPP (FPL 2011c).

3.1 GROUNDWATER QUALITY

3.1.1 Sample Collection and Analysis

Groundwater samples were collected in accordance with the QAPP using a peristaltic pump and dedicated Teflon® tubing that extended to the middle of each well screen interval. Figure 3.1-1 shows a typical setup for the groundwater sampling. Three equipment volumes were purged before stability readings were taken. Sampling was initiated when three consecutive readings were recorded after FDEP criteria for parameter stabilization had been met. Groundwater and surface water sampling logs from the March and June 2012 sampling events are provided in Appendix H of this report; sampling logs from previous events were provided in the previous semi-annual reports (February 2011 and March 2012) and the 2011 Annual Report for this project.

3.1.2 Results and Discussion

Much of the discussion during the certification of the Uprate project was related to the potential effects of hypersaline marine water from the CCS as a result of the temperature and salinity changes predicted from the Uprate. Some of the key indicator constituents and parameters of interest are chloride, sodium, and specific conductance. Additional parameters had been included for various reasons as discussed in the Monitoring Plan (SFWMD 2009a).

As saltwater intrusion has been documented in south Miami-Dade County since the early 1900s and was far inland in the 1950s (Klein 1957), the challenge is determining the source of saltwater today. A number of other constituents are being analyzed to better understand the geochemistry of the water from different sources and to determine whether the water from the CCS can be

fingerprinted. These analyses includes tritium and stable isotopes of water ($^{18}O/^{16}O$), hydrogen ($^{3}H/^{2}H$), carbon ($^{13}C/^{12}C$), strontium ($^{87}Sr/^{86}Sr$), and dissolved inorganic carbon (DIC), as well as ions listed in Table 3.0-2 of this report, barium, and iron.

Tables 3.1-1 through 3.1-9 provide a summary of the groundwater analytical results from the June 2010 through June 2012 sampling events. Results for the sampling events from the historical monitoring wells L-3, L-5, G-21, G-28, and G-35 during the same time period are provided in Tables 3.1-10 and 3.1-17. DUS Reports for all events are provided in Appendix I, and the detailed Level IV laboratory reports from TestAmerica are included in Appendix J.

3.1.2.1 Chloride, Sodium, and Specific Conductance

Figures 3.1-2, 3.1-3 and 3.1-4 show the chloride, sodium, and specific conductance values respectively, for the sampling events from June 2010 through June 2012. The concentrations at most wells remained relatively consistent for the entire sampling period.

Chloride concentrations in the CCS wells (TPGW-13S, TPGW-13M, and TPGW-13D) ranged from 26,000 to 38,000 mg/L during the pre-Uprate period from June 2010 through June 2012. The highest concentration was consistently in the shallow well (average of 35,666 mg/L), but there was limited change in concentration (less than 10%) with depth for all sampling events except for September 2011 when a much lower concentration of 26,000 mg/L was recorded at the deep interval. An analysis of variance (ANOVA) showed that there was no difference among the three well depths ($F_{1,24} = 5043.15$, $P > 0.05$), but there was a difference across seasons ($F_{1,18} = 12534.78$, $P < 0.001$), with September 2011 having the lowest average chloride values (average: 30,000 mg/L) and the highest values observed in March 2011 (average: 37,333 mg/L).

Biscayne Bay wells had lower chloride concentrations than those found in TPGW-13 wells. The typical range of chloride concentrations in the Biscayne Bay wells was between 19,000 mg/L and 24,000 mg/L, with the exception of TPGW-14M (21,000 to 27,000 mg/L) and TPGW-14D (29,000 to 32,000 mg/L). These values in the deep well at TPGW-14 are above the concentrations reported in Biscayne Bay surface water samples. Well clusters immediately to the west of the CCS (TPGW-1, TPGW-2, L-3, and L-5) had chloride levels in the intermediate and deep zones that were between 27,000 and 34,000 mg/L.

Farther to the west, shallow wells located near the northern half of Tallahassee Road (TPGW-5, TPGW-6, and G-21) had chloride levels consistently less than 250 mg/L (only one value above 250 mg/L), while the intermediate and deep wells ranged from 4,600 to 12,000 mg/L. Historical well G-28 and TPGW-4, which are located along the southern half of Tallahassee Road, were more saline in the shallow zone than wells to the north. The chloride concentration in those wells ranged from 420 to 3,300 mg/L. It is not yet clear if the occasionally high chloride concentrations in the Card Sound Road Canal surface water are affecting the shallow groundwater in the vicinity of G-28 and TPGW-4. The well clusters TPGW-7, TPGW-8, and TPGW-9 had chloride concentrations of less than 51 mg/L at all depths, which indicates freshwater throughout the water column.

Chloride levels from the historical wells (L and G series wells) were compared to chloride levels in nearby "new" Monitoring Plan wells to assess the potential differences between wells that are screened across the entire water column (broad screen interval) versus those screened at a discrete depth interval. During the development of the Monitoring Plan, the SFWMD expressed some reservations about the water quality data collected from the historical wells since the well screens extend from the surface to the base of each well for most of the wells with the exception of G-28 (which was screened from 16 ft belowground). Since there are potentially discrete flow zones, the question was raised regarding whether samples collected from historical broad-screened wells are diluted from other zones or affected in some other fashion. Based on discussions with the Agencies, the wells that were subsequently installed as part of the Monitoring Plan were screened in high flow zones with only 2 to 6 ft of screen; thus, each well only intersects one zone and reflects the concentration in that zone.

Table 3.1-18 shows the differences between L-3 and TPGW-1 (S, M, and D), L-5 and TPGW-2 (S, M, and D), G-21 and TPGW-5 (S, M, and D), and G-28 and TPGW-4 (S, M, and D). While a direct comparison is not possible since the well samples are collected from slightly different depths and are not adjacent to each other, a general assessment whether the results from the historical wells appear to be representative of groundwater quality conditions can be made. While there are some differences, the data reviewed from the L and G series wells are plausible when viewed in context of their depths and locations in the landscape.

Figure 3.1-5 shows the average chloride concentrations at each well and how these concentrations compare to average surface water concentrations in Biscayne Bay, Card Sound Road Canal, and the CCS for the period from June 2010 through June 2012. Wells with average chloride concentrations in excess of Biscayne Bay concentrations may need to be reviewed in conjunction with the tracer.

In nearly all instances, high specific conductance groundwater values (greater than 1,275 µS/cm) in the study area are attributable to marine water and high chlorides. The SFWMD and FPL have historically used a relationship with specific conductance to calculate chloride. In the case of TPGW-8, the specific conductance in the shallow zone ranged from 2,051 to 2,570 µS/cm, but the chloride values are much less than would be calculated. The specific conductance reading at this location appears to be influenced by calcium. This well also has a high pH (11.72) and may not necessarily be influenced by grout contamination and has been previously discussed with the Agencies. Note that the intermediate and deep zones at TPGW-8 have a pH around 7 and specific conductance values below 1,275 µS/cm.

Sodium results for sampling events from June 2010 through June 2012 ranged from 6.0 to 19,000 mg/L. The highest concentrations were in TPGW-13 at 16,000 to 19,000 mg/L, and the values were fairly consistent with depth. Biscayne Bay wells TPGW-10 and TPGW-11 ranged from 9,900 to 13,000 mg/L, and TPGW-14 had values that ranged from 11,000 to 17,000 mg/L. For comparison, the sodium value in Biscayne Bay surface water during the sampling period ranged from 7,500 to 14,000 mg/L. The intermediate and deep wells in TPGW-1, all depths at TPGW-2 and TPGW-3, as well as the deep depths at L-3 and L-5 had sodium concentrations that ranged from 14,000 to 21,000 mg/L, with the shallow well concentrations being much lower in

L-3 and L-5 since they intersect a fresher water lens. Sodium concentrations in TPGW-4, TPGW-5, TPGW-6, and G-21 at depth ranged from 2,000 to 9,000 mg/L, while the shallow wells had concentrations ranging from 15 to 360 mg/L. The concentrations in shallow wells TPGW-5, TPGW-6, and G-21 were all below 160 mg/L while the clusters TPGW-7, TPGW-8, and TPGW-9 had sodium concentrations below 31 mg/L at all depths.

The chloride, specific conductance, and sodium values typically did not vary by more than 10% between sampling events. The most notable exception was an increase in one or more parameters in the shallow, predominantly freshwater samples (as defined by FDEP) in L-3 and L-5 in September 2011 and June 2011, respectively. For example, the chloride concentration at L-5 increased from an average of 114 mg/L from the previous three quarters to 1,500 mg/L in June 2011, which was towards the end of the very dry period. The samples at the L-3 and L-5 wells are collected close to the freshwater (as defined by <1,275 µS/cm) and saltwater interface. Drought or rainfall conditions can impact where that interface may lie. It is suspected that the extreme drought in 2012 caused the thickness/depth of the freshwater zone to shrink, thereby raising the saltwater interface.

In reviewing the results, it is important to understand where the wells are actually screened since all wells of the same classification (shallow, intermediate, or deep) are not at the same elevation (Figure 3.1-6). For example, the bottom of the well screen in the deep well at TPGW-10 is at -122 ft NAVD 88, while the bottom of the well screen in the deep well at TPGW-5 is at -66.8 ft NAVD 88. It is equally important to understand that the placement of the well screen was based on lithology (at or near contacts between the Miami Limestone and Fort Thompson Limestone Formations and the Fort Thompson Limestone and Tamiami Formations), presence of flow zones and geophysics, and knowledge that the base of the Biscayne Aquifer is shallower to the west. Figures 3.1-7 through 3.1-10 show cross-sections of the aquifer, selected wells at the three depth intervals, and associated chloride concentrations. The results typically show higher levels of chlorides/saltwater at depth and the highest levels in wells at or in close proximity to the CCS and Biscayne Bay. However, none of the newly installed shallow wells are screened less than 20 ft below ground surface. Based on the monitoring results from the historical L and G series wells (Golder Associates Inc. 2005, 2006, 2007, 2008, 2009, 2010, and 2011b) and supported by induction logs conducted by the USGS for this project (JLA Geosciences, Inc. 2010), it appears that the upper 10 to 20 ft of the aquifer is much fresher west of the ID, and this freshwater zone generally increases in depth towards Tallahassee Road. Saltwater is beneath the freshwater lens. The Agencies commented that specific conductance values indicating more marine water were noted in TPGW-28 at 4 ft below the ground surface. Again, knowing where the wells are screened is important; that particular well is hard-cased down to 16.6 ft below the top of casing. Water measured from the surface to the downward extend of the hard casing is predominantly reflective of the water quality at 16.6 ft below the top of casing, thus not capturing the fresher overlying lens.

3.1.2.2 Ions

Ion (calcium, magnesium, potassium, sodium, boron, strontium, bromide, chloride, fluoride, and sulfate) concentrations at the TPGW sites appeared to correspond with specific conductance

values in most of the wells. Freshwater sites had low concentrations of ions, while marine-influenced sites generally had higher values. The range of values remained consistent for most of the sites during this monitoring period. The patterns and trends of ions were similar to the trends observed for specific conductance. Ionic concentrations in the marine stations (TPGW-10, TPGW-11, and TPGW-14) were similar to the values observed by Reich et al. (2006) from a well in the middle of Biscayne Bay (Mid-Bay: well GW-MB). The well cluster in the CCS, TPGW-13, had higher ionic concentrations than those of the marine stations.

Table 3.1-19 shows the range of all the ions for the entire period. Groundwater stations have been grouped based on whether the groundwater would be characterized as predominantly marine or predominantly fresh with TPGW-13 included separately. For comparison, refer to Table 3.2-10 for the range of ions in surface water.

To assess the differences of major ionic constituents in groundwater, tri-linear diagrams were generated for all quarters where completed data sets were available (Figure 3.1-11); June 2010 was omitted because the offshore wells were still under construction and not sampled that quarter. The data are consistent for the eight quarters and show that there is clear separation between the freshwater stations (TPGW-7, TPGW-8, TPGW-9) and the marine-influenced stations. The marine-influenced stations include all depths from TPGW-1, TPGW-2, TPGW-3, TPGW-10 through TPGW-14 (including TPGW-13 in the CCS), and TPGW-4, TPGW-5, and TPGW-6 at medium and deep depths. The shallow stations at TPGW-4, TPGW-5, and TPGW-6, as well as the shallow depths at L-3 and L-5 plot out close to the freshwater well clusters but depending on the season, can vary across the spectrum between the freshwater and marine-influenced clusters (Figure 3.1-11).

Several ions have been problematic during chromatogram analyses because of their low concentrations compared to the other peaks. For example, fluoride has been one of the most problematic ions in meeting project MDLs due to interference by the chloride peak. A fluoride selective probe method is being reviewed as a possible analytical alternative for fluoride only. Barium is another ion that is problematic for the same reason of interference. A third analyte of issue is sulfide, for which the majority of values for most locations has been reported as non-detect at the elevated detection limit. Starting in September 2012, TestAmerica will implement revised methods for all three analytes that will help improve the detection limits of all three parameters.

3.1.2.3 Isotopes

The trends in groundwater δD and $\delta^{18}O$ values were consistent and did not differ among seasons ($P > 0.05$), although there was a difference among sites within each season ($P < 0.001$). The groundwater well within the CCS, TPGW-13, had the highest values followed by the nearby wells (TPGW-1, TPGW-2, TPGW-3, TPGW-12), L-3, L-5 and the marine wells. The samples with the lowest isotopic signatures were the brackish (TPGW-4, TPGW-5, TPGW-6), freshwater (TPGW-7, TPGW-8, TPGW-9) and G-series (G-21, G-28, G-35) wells. The highest isotopic values indicate significant evaporative enrichment while the lowest values are representative of water with limited evaporation, reflecting water that has percolated into the groundwater after

precipitating as rainfall. These patterns remained consistent throughout the two years of monitoring, indicating consistency in water source over time.

The $^{87}Sr/^{86}Sr$ values were only available from June 2010 to March 2012. These signatures ranged from 0.70906 to 0.70923 but there were no differences among the sites or seasons ($P > 0.05$). All water is of modern-day origin and do not indicate any Floridan aquifer water (0.708236) (Reich et al. 2006) which is of a significantly lower isotopic signature than any of the groundwater well data from this project.

The $\delta^{13}C$ of a sample is the function of the processes that have influenced the DIC pool. Geophysical processes within the aqueous carbonate bedrock, biogenically derived uptake and release of carbon dioxide (CO_2), the exchange of the water with atmospheric CO_2, or mixing of carbon from various sources can all influence the $\delta^{13}C$ value observed. Sources that can influence the $\delta^{13}C$ samples include limestone dissolution (0‰), atmospheric CO_2 (-8‰), carbonate weathering by soil CO_2 in Florida aquifers which results in a $\delta^{13}C$ of -13‰ (Sackett et al. 1997), and terrestrially derived C_3 carbon (-26‰).

Carbon isotopes ($\delta^{13}C$) in the groundwater were more negative in the freshwater sites compared to the marine sites or TPGW-13 (Table 3.1-20). For most of the quarters, the well cluster with the highest $\delta^{13}C$ values was TPGW-10, indicating that this well water is likely from the carbonate dissolution of the bedrock. The marsh sites had the lowest $\delta^{13}C$ signatures indicating carbonate weathering as the water travelled through the limestone bedrock; of notable interest is TPGW-8S, which has the highest pH values (discussed in Section 3.1.2.1 above) and lowest isotopic values among all sites. With the exception of the wells discussed above, most of the other groundwater sources had $\delta^{13}C$ between -6‰ to -10‰ for most of the seasons, indicating consistency in the mix of sources contributing to the isotopic signature. Unlike Sackett et al. (1997) and Bouillon et al. (2007), which both showed significant positive relationships between $\delta^{13}C$ and salinity, the groundwater data from the current study did not demonstrate clear patterns with salinity.

Tritium values are only available from June 2010 until December 2011 as the USGS was unable to analyze and provide the last two quarters of data in time for inclusion in this report. Groundwater tritium concentrations were highest in and around the CCS, ranging from 3,460 to 6,390 picocuries per liter (pCi/L). The TPGW-7, TPGW-8, and TPGW-9 sites, farthest away from the CCS, had the lowest tritium concentrations, averaging 10 pCi/L over the seven sampling events. While tritium concentrations varied from station to station and with depth, the levels at any given station were fairly stable over seasons. This was also applicable to the old L- and G-series wells which were uncased; for most of the quarters, the values did not vary more than 10% between seasons. The only exception was L-5, which had a value of 113 pCi/L at the end of the drought in June 2011 and a concentration of 5.3 pCi/L in the subsequent quarter after the onset of the rains (Tables 3.1-12 and 3.1-13). It is important to note that under this Monitoring Plan, tritium is being measured only as a chemical tracer in order to determine potential movement of CCS water. At the levels being measured, the tritium is not a public health concern. Figure 3.1-12 shows the tritium concentrations in groundwater samples for each quarter.

Table 3.1-20 shows the range of all the isotopes. Groundwater stations have been grouped based on whether the groundwater would be characterized as predominantly marine or predominantly fresh with TPGW-13 included separately. For comparison, refer to Table 3.2-11 for the range of isotopes in surface water.

3.1.2.4 Nutrients

Figures 3.1-16 and 3.1-17 show nutrient results for the June 2010, March 2011, September 2011, and March 2012 sampling events. A brief discussion of these results is provided below.

Total nitrogen (TN) values in well clusters TPGW-1, TPGW-2, and TPGW-13 and the deep well at TPGW-14 ranged from 1.4 to 9.8 mg/L. Well cluster TPGW-10 had much lower TN levels, all below 0.68 mg/L. In most of the wells, the majority of TN (55% to nearly 100%) was comprised of ammonia which is an inorganic form of nitrogen. The exceptions include TPGW1S, TPGW-2D, and TPGW2D in March 2011 and TPGW-1S in December 2011, and TPGW-2D, TPGW-13S, TPGW-13M, and TPGW-13D in March 2012. All but two of these (wells TPGW-1D and TPGW-2D) appear to have more organic nitrogen than inorganic nitrogen. Wells TPGW-1D and TPGW-2D in March 2011 showed very high levels of nitrate/nitrite (NOx) and these two inorganic nitrogen forms comprised over 69% of the TN.

Total phosphorus (TP) concentrations ranged from 0.015 to 0.082 mg/L, with the highest value found in TPGW-2D. The results show that more than 50% of TP is orthophosphate (OP) in nearly all the wells, with concentrations ranging from 0.014 to 0.039 mg/L. There were some OP values that were higher than 0.39 mg/L, but those values are suspect since the OP was higher than the TP (OP is a subset of TP; it cannot be higher than TP). The OP values are similar to data from the USGS (Reich et al. 2006) for two wells north of the study area (onshore G3613 and Mid-Bay: SRP: 0.012 to 0.032 mg/L), although a number of the TP values obtained are higher than the USGS sites (TP: 0.012 to 0.033 mg/L).

The analysis for some of the nutrient constituents has yielded some uncertainty due in part to interferences with the high saline water; thus, care should be taken in interpreting the results. Field split samples were collected by RER in the March 2012 semi-annual sampling event and analyzed by the RER laboratory. Samples were collected from select deep wells, placed into separate containers, shipped to TestAmerica and the RER laboratory, and analyzed for ammonia, nitrate/nitrite, TKN, TP, and OP. While the number of data pairs compared (four) is too small to draw major conclusions, there are some significant differences (RPD>50%) among the results for ammonia, TKN, and OP. The two laboratories follow essentially the same methods; however, even minor differences in procedures or materials can affect the analytical results. At this point, it is unclear which set of results is more accurate of the actual groundwater conditions at the time of sampling. It should be noted that the RER results have ammonia consistently greater than TKN, which is not possible; TKN is the sum of ammonia, ammonium, and organic nitrogen. FPL/TestAmerica is reviewing the RER SOPs and is performing analysis of certified reference materials for nutrients in saline waters to aid in the evaluation of the overall sample results.

Also, for the initial nutrient sampling events, OP was higher than TP for nearly every sample. In March 2011, the OP analytical method was modified based on an FDEP Laboratory SOP (NU-070-1.8). Since the method modification, the OP/TP comparisons have been within the criteria.

3.1.2.5 Trace Elements

Per the Monitoring Plan (SFWMD 2009a), trace elements (arsenic, barium, beryllium, cadmium, hexavalent chromium, copper, iron, lead, mercury, manganese, molybdenum, nickel, selenium, thallium, vanadium, and zinc) are to be collected in TPGW-1, TPGW-2, TPGW-10, TPGW-13, and TPGW-14 during semi-annual sampling events. During the June/July 2010 event, samples were collected at TPGW-1, TPGW-3, and TPGW-13. Samples were not collected at TPGW-10 and TPGW-14 in June/July because the well infrastructure was not completed. At the direction of the Agencies, samples for trace metals at TPGW-10 and TPGW-14 only were collected during the December 2010 sampling event. In the March 2011, September 2011, and March 2012 sampling events, trace metals were collected at all five well clusters.

Most concentrations were non-detected (U) or low values between the MDL and quantitation limit and were reported as estimated values (J). While the majority of analytical detection limits have met the QAPP requirements, trace metals have been difficult to achieve due to the saline nature of the samples. The laboratory has had to dilute the saline samples to keep instruments from being overloaded with the major ion constituents (i.e., chloride, sodium). This has resulted in some data reported as non-detected but with detection limits above the QAPP requirements. In addition, these dilutions increase the uncertainty, or error, associated with a result. The laboratory is working to expand or tailor calibration ranges, within method requirements, to fit project samples and reduce the frequency of dilutions needed.

To achieve the required MDLs, the laboratory began adding preparatory EPA Method 1638 (Determination of Trace Elements in Ambient Waters by Inductively Coupled Plasma-mass Spectrometry) for manganese and molybdenum and EPA Method 1640 (Determination of Trace Metals by Pre-concentration and ICP-MS) for the other trace metals listed above in September 2012. The added step will selectively concentrate certain metals prior to analysis to improve detection limits.

Iron was one of the few parameters that had high enough values that did not consistently require an estimated qualifier. Since iron was also identified as a potential tracer, it was analyzed at all the wells. The values are somewhat variable, but elevated levels appear to be throughout the landscape, indicating regional background conditions.

The results from this sampling effort, and more significantly the lower detection limit results of the SFWMD synoptic sampling in the CCS at five locations in February 2009 (SFWMD 2009b), do not indicate any notable influence from the CCS as it relates to these parameters. The SFWMD results (Table 3.1-21) showed non-detectable to only very low concentrations of all these constituents. Furthermore, drinking water standards are not applicable as all the samples are being collected at depths where salt water intrusion/non-potable water pre-dates the CCS.

3.2 SURFACE WATER QUALITY

3.2.1 Sample Collection and Analysis

For the purposes of this discussion, surface water includes canals, the CCS, and Biscayne Bay. Surface water samples were collected using a peristaltic pump and new Teflon® or polyethylene tubing that was affixed to rigid pipe to ensure the samples were collected at the appropriate depth. Once parameters had stabilized, water was extracted from the tubing and collected directly into the sample bottles. After each sample collection, the tubing was disposed and new tubing was used. Samples for surface water are typically collected from fixed platforms or from a boat.

Samples were collected at the surface water stations identified in Table 3.0-1. Samples were collected from 1 ft below the surface (T) and 1 ft above the bottom (B) unless the water depths in the CCS, ID, or canals were less than 3 ft. In those cases, only one sample was collected at the bottom. There was some uncertainty whether this 3-ft criteria applied in Biscayne Bay, so samples were collected at depth at all stations and at the surface and depth at TPBBSW-1, TPBBSW-4, and TPBBSW-5 in June 2010. After the first sampling event, it was clarified to the field team that all Biscayne Bay samples were to be collected only at the bottom to coincide with the placement of the automated water quality probes; thus, for the subsequent events, samples were collected from the bottom only, regardless of depth.

3.2.2 Results and Discussion

Tables 3.2-1 through 3.2-9 provide a summary of the surface water analytical results from June 2010 through June 2012. DUS Reports for each event are provided in Appendix I and detailed Level IV laboratory reports from TestAmerica are included in Appendix J. Additionally, the stations have been grouped based on their general characteristics and location, and Tables 3.2-10 and 3.2-11 show the minimum, maximum, average and standard deviation of these water bodies from June 2010 through June 2012, unless otherwise explicitly stated.

3.2.2.1 Chloride, Sodium, and Specific Conductance

Figures 3.2-1, 3.2-2, and 3.2-3 detail chloride, sodium, and specific conductance values for all surface water stations for the June 2010 through September 2012 sampling events. High levels of these parameters in a coastal area are typically reflective of marine influences. For example, surface waters with chloride concentrations greater than 1,500 mg/L are defined as predominantly marine, while those with less than 1,500 mg/L are defined as predominantly fresh (F.A.C. 62-302.200). The Class I/III criteria for specific conductance in freshwater (excluding consideration of background values) is less than 1,275 µS/cm. Values higher than 1,275 µS/cm in a coastal environment are often viewed as potentially having some marine influence. Note though, other constituents not related to marine water can cause high specific conductance readings (e.g., calcium, magnesium).

Chloride concentrations in the CCS ranged from 26,000 to 46,000 mg/L based on the sampling events from June 2010 through June 2012. The average concentration was 33,922 mg/L. There was little difference (less than 10%) in concentration between samples collected near the surface or near the bottom. During the same period, Biscayne Bay chloride values ranged from 11,000 to 28,000 mg/L. Values were between 26,000 and 28,000 mg/L in June 2011 as a result of an extended dry season (refer to Section 2.4-2) and reflected the highest values recorded in the Bay since the beginning of this monitoring effort. In September 2011, with the onset of the rainy season, the chloride concentration dropped and levels ranged from 19,000 to 22,000 mg/L. In comparison, average seawater chloride levels are 19,840 mg/L at a salinity of 35 on the PSS-78 scale (Millero 1996). Chloride concentrations at TPSWC-5 (located in the deep historical outfall canal) are reflective of marine water with surface water values being similar to those found in the Biscayne Bay stations and the bottom values tending to be similar to Biscayne Bay values or higher. For three of the sampling events, the bottom chloride concentrations were 4,000 to 8,000 mg/L higher at the bottom than the top. The higher values at depth are not totally unexpected given the 20+ ft depth of this man-made canal. However, as discussed later in this section, there could be some CCS influence at this station. TPSWC-4, which is affected by both Biscayne Bay and freshwater discharges, had chloride concentrations ranging from 460 to 28,000 mg/L, with the highest values in June 2011 and the lowest values in September 2010.

Interceptor Ditch chloride concentrations varied depending, in part, on when pumping occurred; higher values were noted during periods of pumping. For example, TPSWID-2 had a maximum concentration of 27,000 mg/L in June 2011 during a period when the ID pumps were operating frequently, but concentrations were as low as 110 mg/L in December 2010 following a wetter non-pumping period.

The chloride data at the L-31E stations (TPSWC-1, TPSWC-2, TPSWC-3) show that this canal is predominantly freshwater (less than 1,500 mg/L) throughout the year with one notable exception, June 2011 near the end of an extensive drought. FPL previously reported (August 2011) that as the dry season progressed and the drought in the region continued, chloride levels in the L-31E Canal increased at all three stations. By June 2011, the values increased most notably at TPSWC-2 and TPSWC-3 to 2,500 mg/L (310 mg/L in March 2011) and 5,300 mg/L (750 mg/L in March 2011), respectively. Station TPSWC-1 showed the least increase (120 mg/L in March 2011 to 300 mg/L in June 2011). Due to the earthen plug installed by SFWMD, the segment of the canal where TPSWC-1 is located is partially blocked from portions of the canal where TPSWC-2 and TPSWC-3 are located. This explains why the chloride values are lower in this northern reach of L-31E. All the increases in chloride appear to be drought related and affected by Biscayne Bay. There was not a corresponding incremental increase in tritium and the tritium values were in line with previous sampling events. If the CCS was impacting L-31E, an increase in tritium would be expected and this was not observed. The manual monitoring station, TPSWC-6 located on the Card Sound Road Canal, had chloride levels consistently below 200 mg/L, classifying this canal as freshwater with one exception, June 2011. In this June sampling event, the chloride level at TPSWC-6 (bottom sample) was 25,000 mg/L. In September 2011, the concentration dropped to 130 mg/L. This station is about 6 miles inland, but the USGS has previously indicated that they found hypersaline conditions past this station all the way to Florida City several years ago during the last drought (Wacker 2010). This canal does not have a gate

control structure blocking inflow from Biscayne Bay southeast of the site. During drought conditions, this canal can be a contributor to groundwater salt water intrusion.

The highest sodium concentrations were in the CCS samples and were consistently between 15,000 and 22,000 mg/L. The Biscayne Bay surface water samples ranged from 5,400 to 14,000 mg/L. Average sodium levels in seawater are 11,050 mg/L (Millero 1996), but can approach 14,000 mg/L in Biscayne Bay depending on location and time of year (Reich et al. 2006). The ID samples (TPSWID-1, TPSWID-2, and TPSWID-3) had sodium levels that ranged from 290 to 14,000 mg/L and, as discussed above, the concentrations increased during periods of frequent ID pumping, with the highest values occurring in June 2011. The sodium concentrations in the L-31E Canal (TPSWC-1, TPSWC-2, and TPSWC-3) peaked in June 2011, with the highest values at TPSWC-3 (2,600 mg/L). The majority of the time, the sodium values in the L-31E were less than 100 mg/L. The sodium values in the manual station TPSWC-6 also were consistently less than 100 mg/L. However, in June 2011, a value of 12,000 mg/L was measured in the bottom probe at TPSWC-6.

The CCS is characterized as typically having hypersaline water, with values ranging between 70,000 and 90,000 µS/cm for the sampling events from June 2010 to June 2012. Biscayne Bay stations had specific conductance levels that ranged from 30,586 to 66,855 µS/cm. The highest value was recorded in June 2011 and these conditions do naturally occur in the Bay during dry conditions. At Biscayne National Park automated station BISCA6, which is located over 1 mile north of the CCS, a specific conductance value of over 66,000 µS/cm was recorded in June 2011 (Biscayne National Park, 2012). Also, at SFWMD monitoring station BBCW-10, which is several miles north of the site in Biscayne Bay, had specific conductance values over 69,000 µS/cm in the same period (SFWMD 2012c). For comparison, average seawater (salinity at 35 PSS-78 at a temperature of 25°C) has a specific conductance of 54,700 µS/cm. Lee et al. (2006) defined hypersaline conditions as salinity greater than 40 (in PSS-78 scale), which equates to a specific conductance of 61,500 µS/cm at 25°C.

3.2.2.2 Ions and Silica

Ion (calcium, magnesium, potassium, sodium, boron, strontium, bromide, chloride, fluoride, and sulfate) concentrations at the Biscayne Bay surface water sites were similar in range to the values observed in Biscayne Bay by Reich et al. (2006). Ion concentrations in the CCS were significantly higher than those of Biscayne Bay, while the TPSWC and TPSWID ions were generally lower in concentration but varied seasonally with freshwater influence.

The tri-linear diagram for each season starting in September 2010 revealed that there was distinct separation between the freshwater L-31E stations (TPSWC-1, -2, -3) and the marine-influenced (TPBBSW, TPSWCCS, TPSWC-4, and TPSWC-5) stations. These clusters remained consistent for each quarter; the only variability in ionic concentrations was observed at the TPSWID stations where the values along this canal would either be separated along the axis between the freshwater and marine stations (e.g., in September 2010 or December 2011) when conditions were wet, or cluster with the marine-influenced stations during the drier sampling events (e.g., June 2011, September 2011) (Figure 3.2-4).

Similar to the groundwater, surface water barium, iron, fluoride, and sulfide were extremely low and virtually undetectable in most of the samples. Few inferences could be made from those datasets due to the limited detectable values available.

Silica was only measured in the CCS. For three of the four quarters when silica was measured, concentrations ranged from 0.25 to 5.20 mg/L; TPSWCCS-2, TPSWCCS-3, and TPSWCCS-7 were consistently higher than the other sites for June 2010, March 2011, and September 2011. However, in March 2012, due to slightly higher pH within the CCS, silica values were between 8.1 and 8.5 mg/L.

3.2.2.3 Isotopes

Isotopic values (δD and $\delta^{18}O$) were higher during the drier months with greater separation in signatures among the water bodies, compared to the wetter months (FPL 2011b). The seasonal patterns are a consequence of evaporative enrichment and limited rainfall at the end of the dry season. After the rainy season begins, values start to drop and the isotopic signature of the water bodies converge towards values reflecting significant rainfall (Florida: $\delta D \approx 6‰$ and $\delta^{18}O \approx 0‰$) input. Despite this seasonal shift, a consistent pattern was observed; TPSWC, TPSWID, and TPBBSW showed overlap, but TPSWCCS had the highest values among all the water bodies sampled, regardless of season (Figure 3.2-6). The CCS values reflect recirculating, highly enriched water indicative of continued evaporation unlike the Biscayne Bay (TPBBSW), canal (TPSWC), or ID (TPSWID) stations which are more reflective of seasonal rainfall inputs.

The $^{87}Sr/^{86}Sr$ signatures ranged from 0.70907 to 0.70921 from June 2010 to December 2011, with no difference ($P > 0.05$) between the different water bodies among seasons. These surface water values, like the groundwater values (discussed in Section 3.1.2.3) are indicative of shallow, geologically recent water sources, and not from the Floridan Aquifer.

Carbon isotopes ($\delta^{13}C$) can provide insight into the hydrologic influences on the water (see Section 3.1.2.3 for discussion). Values ranged from -16.1‰ to 3.0‰ over the two-year period, with the broadest range observed within the CCS. Both seasonal and spatial differences were observed among the water bodies. September had the lowest $\delta^{13}C$ values for most sites with the lowest values (average less than -7‰) being observed at the TPSWID and TPSWC. The TPSWCCS and TPBBSW locations had higher $\delta^{13}C$ values which averaged around -3.5‰. The negative values indicate a predominantly limestone carbonate-derived source of $\delta^{13}C$ in the waters while the more positive values indicate a greater equilibration to atmospheric carbon, indicating in part, longer mean water residence time.

Tritium values are only available through the December 2011 sampling event, as the USGS had not completed the analyses for the March and June 2012 quarters at the time this report was prepared. Values from all sites ranged from -1.5 to 14,280 picocuries per liter (pCi/L). Average tritium concentrations were lowest in TPBBSW (16.7 pCi/L), followed by TPSWC (L-31E; 50 pCi/L), the TPSWID sites (688 pCi/L), and TPSWCCS (5,336 pCi/L). The tritium concentrations for all water bodies around the CCS appeared to be driven primarily by seasonal precipitation

patterns and atmospheric influences, with lower values observed during the rainy season compared to the dry season. The tritium concentrations in the CCS are controlled by the amount of tritium allowed to be released into the CCS as a result of plant operation. Surface water CCS values were seasonally more variable compared to the groundwater values at TPGW-13. It is important to note that under this monitoring plan, tritium is being measured only as a chemical tracer in order to determine potential movement of CCS water. At the levels being measured, the tritium is not a public health concern.

The Gross Alpha collected in June 2010 and March 2011 from the CCS did not indicate a seasonal difference (paired t-test: $T_{9,10} = 0.09$, $P > 0.5$).

3.2.2.4 Nutrients

Figures 3.2-7 and 3.2-8 show nutrient surface water results for ammonia, nitrate/nitrite, TN, and TP for June 2010 and March 2011 and September 2011 and March 2012 respectively. A brief discussion of these results is provided below.

In Biscayne Bay, the TN values in September 2011 ranged from 0.25 to 0.65 mg/L, with the highest concentrations at the southerly reference station (TPBBSW-5). The highest average concentration (0.42 mg/L, TN) is also at the southerly reference station. In most of the Biscayne Bay stations, more than two-thirds of the TN appears to be organic nitrogen. At TPBBSW-4 in March 2012, however, a larger percentage of the TN was ammonia but this appears to be an outlier. All inorganic nitrogen forms were low in Biscayne Bay, similar to observations by Reich et al. (2006) and the analytical data from the Florida International University Water Quality Monitoring (FIU-WQMN; FIU 2012) Network. Stations in the L-31E Canal (TPSWC-1, TPSWC-2, and TPSWC-3) had higher TN values in comparison to the marine stations with values that ranged from 0.47 to 1.60 mg/L. The majority of the nitrogen (greater than 65%) at the L-31E stations was organic nitrogen. A few L-31E samples had nitrate/nitrite values that were higher (up to 0.55 mg/L) which reduced the percent of organic nitrogen; however, organic nitrogen still made up the majority of the nitrogen. TPSWC-4 tends to have more inorganic nitrogen at times than the other canal station and for two events, the inorganic nitrogen (ammonia) made up the majority of the TN. The background canal station (TPSWC-6) had variable nitrogen levels that ranged from 0.25 to 3.42 mg/L with the upper value being the highest of all concentrations in the freshwater canal and Biscayne Bay stations.

In the CCS, TN values were highest and ranged from 1.7 to 5.3 mg/L. The highest TN concentrations in the CCS were measured at all stations in March 2012, which coincides with higher turbidities and pH in the CCS. Nonetheless, the 10-year (1992-2001) mean nitrate and nitrite discharges reported at the SFWMD canals C-102 (at S21A) and C-103 (at S20F) which were within 5 miles north of Turkey Point, often exceeded values reported in the CCS (Graves et al. 2005).The majority of the nitrogen in the CCS appears to be in organic form (typically over 80% to 90%). In September 2011, one station (TPSWCCS-2) had uncharacteristically high NOx values (1.0 mg/L, which results in only 67% of the nitrogen being in an organic form). The maximum value of NOx in all of the CCS samples collected since the beginning of monitoring is

only 0.13 mg/L, and the average value is less than 0.06 mg/L; therefore, the 1.0 mg/L value may be questionable.

Total phosphorus values in Biscayne Bay ranged from 0.016 to 0.020 mg/L for three of the four nutrient sampling events. In September 2011, the TP values were higher and ranged from 0.022 to 0.052 mg/L, with the highest values at the station just north of the CCS (TPBBSW-1) and the reference station (TPBBSW-5). The average TP value for the Biscayne Bay stations fronting the CCS (TPBBSW-1, TPBBSW-2, TPBBSW-3, TPBBSW-4) over the four sampling periods was 0.024 mg/L, and the average for the reference stations was similar (0.025 mg/L). The TP in all the L-31 Canal stations was typically below 0.010 mg/L. However, in March 2011, the top and bottom samples at TPSWC-1 were higher (0.033 and 0.042 mg/L, respectively). The background canal station (TPSWC-6) had TP concentrations that ranged from 0.001 to 0.014 mg/L and were similar to values typically found in the L-31E Canal stations. The highest TP concentration of all surface water sites was recorded at the bottom sample at the S-20 canal discharge station (TPSWC-4) with a concentration of 0.140 mg/L. This value is an outlier since it is over five times the next highest value at this station and is nearly twice as high as the next highest concentration of any surface water station. The total phosphorus levels in the CCS ranged from 0.004 to 0.073 mg/L, with an overall average concentration of 0.036 mg/L. These values are however similar or less than those reported in the SFWMD C-3 Canal located approximately 15 miles north of the CCS.

As discussed in Section 3.1.2.4, a new method was applied to orthophosphate in March 2011 since the majority of the previous results showed OP being higher than TP which is not possible. OP was typically very low at all sites and comprised only a small percentage of TP, with the most common value being 0.001 mg/L following the application of the new method. At four of the Biscayne Bay stations, OP ranged from 0.001 to 0.006 mg/L. The highest value was recorded at the other Biscayne Bay station, TPBBSW-1 (0.011 mg/L). The CCS orthophosphate values are typically low; however, on occasion, values up to 0.087 mg/L have been reported. Those higher values are often higher than TP values, thus bringing into question the validity of the results. The OP concentration at TPSWC-4 (which had the highest TP value as discussed above) was only 0.002 mg/L.

As a point of comparison, TP concentrations in Biscayne Bay were reported by Reich et al. (2006) in the mid-Bay area to range from 0.005 to 0.045 mg/L, while the FIU-WQMN reported an average value of <0.01 mg/L over a 13-year period (1993 to 2005) at Site 122, offshore and southwest of Turkey Point. Also, the FIU-WQMN data showed a range of 0 to 0.008 mg/L just offshore Turkey Point for OP, while Reich et al. (2006) observed a wider range, from about 0.020 to 0.041 mg/L north of Turkey Point in the middle of the Bay.

3.3 TRACER SUITE ASSESSMENT

No additional assessment of potential tracers was conducted, as FPL previously concluded that stable isotope and ion data were unable to clearly distinguish CCS water from Biscayne Bay and fresh water, especially at lower values and concentrations. FPL previously concluded that

tritium, as it is present in the CCS, may be more useful than other potential tracers in determining the presence of CCS water, even at low values of specific conductance.

The Agencies have selected tritium as a tracer for the CCS water. The Agencies have also established a threshold value of 20 pCi/L for which concentrations below 20 pCi/L are presumed not to be affected by the CCS. Concentrations in excess of 20 pCi/L may or may not reflect CCS influence from a groundwater pathway. FPL does not concur with the selection of 20 pCi/L as a threshold or background for surface water, porewater, or shallow groundwater. FPL has demonstrated that multiple factors can influence tritium levels in the region. When tritium values are above 20pCi/L FPL may, where appropriate, provide reasonable evidence and justification why 20 pCi/L is not a valid threshold and the values do not indicate a CCS groundwater pathway (i.e., atmospheric deposition/vapor exchange, laboratory issue, error band for results). To account for variability in sample results and laboratory precision, an average value for tritium is being used as directed by the Agencies. The application of tritium as a tracer is discussed further in Section 5.

3.4 RAINFALL SAMPLE RESULTS

As part of the monitoring effort, rainfall samples are collected and analyzed for tritium, once per quarter, from each of seven rainfall collectors located throughout the project area (Figure 1.1-3). As discussed in the previous section and identified in the Monitoring Plan, tritium is being used as a tracer to assess the extent of CCS water via a groundwater pathway. However, since tritium is present in rainfall, its concentration contribution via atmospheric deposition needs to be assessed.

3.4.1 Sample Collection and Analysis

The rainfall collectors were one of the last monitoring network components to be installed. These collectors were completely installed in late January 2011. Unfortunately, due to extremely dry conditions in the area, there was not enough water in the rainfall collectors until later in the year. Tritium samples were initially collected in late July/early August 2011, and then again in September 2011, December 2011, March 2012, and June 2012. The collectors at several stations were stolen, resulting in less data for those stations. Table 3.4-1 provides a summary of the samples collected from each rainfall collector and the status of sample receipt. Sample results since March 2012 are still pending from the USGS laboratory at the time of writing this report.

3.4.2 Results and Discussion

The tritium results from July 2011 through December 2011are included in Table 3.4-2 and on Figure 3.4-1. The results show tritium concentrations ranged from 4.4 pCi/L (1 sigma of 4.8 pCi/L) to 42.2 pCi/L (1 sigma of 8.6 pCi/L). While the highest concentration was reported close to the CCS at TPRC-2, the second highest value was reported over 3 miles west of the CCS with a concentration of 37.3 pCi/L. The distribution of tritium in the rainfall does not follow a consistent pattern regarding proximity to the CCS (Figure 3.4-2). It is important to note that under this monitoring plan, tritium is being measured only as a chemical tracer in order to

determine potential movement of CCS water. At the levels being measured, the tritium is not a public health concern. Results from the March 2012 and June 2012 sampling effort will be forwarded to the Agencies once they are received by FPL.

3.5 EVAPORATION PANS

Following development of the Monitoring Plan (SWFMD 2009a), FPL identified that, in addition to rainfall, there is a likely an exchange of tritium between water vapor in the atmosphere and water in its liquid form, in the environment. The rainfall collectors discussed above are designed to capture rain and prevent its evaporation. The layer of mineral oil (approximately 1-inch thick) that floats on top of the rainfall collectors essentially reduces or eliminates vapor exchange. Therefore, it does not monitor the input of vapor-phase tritium. As a result, FPL installed evaporation pans at different distances from the CCS to assess the extent of vapor exchange.

3.5.1 Sample Collection and Analysis

Evaporation pans were installed adjacent to well clusters TPGW-2, TPGW-3, TPGW-5, and TPGW-12 (TPEVP-2, TPEVP-3, TPEVP-5, and TPEVP-12), and water was initially added to them in early February 2011. A fifth evaporation pan was deployed in proximity to TPGW-13 (TPEVP-13 which is also referred to as TPEVP-GC since it is adjacent to the Grand Canal) in May 2011. The first samples were collected in March 2011 and generally have been collected every month since. The methodology used to collect and analyze the samples was included in the August 2011 Annual Report (FPL 2011b, Appendix C). Table 3.5-1 provides a summary of the samples collected from each evaporation pan and the status of sample receipt.

3.5.2 Results and Discussion

Analytical results from March 2011 through June 2012 are included in this report. Table 3.5-2 and Figure 3.5-1 reflect the tritium concentrations in the evaporation pans each month after approximately 30 to 45 days of being exposed to tritium vapor in the atmosphere. The concentrations range from non-detect to 647 pCi/L (1 sigma of 42.0 pCi/L) and are highly dependent upon distance from the CCS and the time of year. Figure 3.5-2 shows the relationship of vapor exchange with distance from the CCS. The highest values are always recorded at the station located on a berm in the CCS (TPEVP-13A). The second highest concentrations are typically found at TPEVP-2 which is less than 1,000 ft away from the CCS. The maximum value at TPEVP-2 is 361 pCi/L (1 sigma of 24.0 pCi/L). At station TPEVP-5, which is located over 3 miles west of the CCS, the tritium values have ranged from 11.0 pCi/L (1 sigma of 7.3 pCi/L) to 49.6 pCi/L (1 sigma of 7.0 pCi/L). The source water used to fill the pans has had tritium concentrations ranging from 0.3 pCi/L (1 sigma of 6.8 pCi/L) to 23.5 pCi/L (1 sigma of 5.5 pCi/L).

Tritium concentration of water vapor in the atmosphere, the amount and timing of rainfall, and the tritium concentration in rain influence the values observed in the evaporation pan. After monthly samples are collected from the evaporation pans, the water level is adjusted to a

prescribed level by adding tap water which has a low tritium concentration (approximately 13 to 23 pCi/L). The results shown in Table 3.5-2 reflect the tritium concentration in the pan before source water is added. The tritium concentration drops immediately once the source water is added since, in most instances, the tritium source water is lower in concentration than that in the evaporation pans. In the days that follow, the tritium concentration in the pan can increase due to exchange with the atmosphere and at the same time the water level declines due to evaporation. In the absence of rain, the tritium concentration in the pan would eventually reach equilibrium with atmospheric water vapor. However, if a rain event occurs during the equilibration period, the tritium concentration in the pan can decline as a result of dilution by low tritium water. After the rain event, the tritium concentration in the pan will once again start moving towards the equilibrium concentration. Thus, the concentration of tritium in the pan is dynamic during the equilibration period and can change dramatically after rain events. This dynamic behavior is likely to be similar to surface water, such as marsh water near the CCS, as tritium vapor exchange and dilution by rainwater continuously affect the tritium concentration. In this regard, the pan tritium measurements represent the dynamic nature of tritium in surface water that is influenced by vapor exchange; however, it does not necessarily reflect the upper bound of tritium concentration that might be measured in the environment. The highest tritium concentrations in the evaporation pans tend to be recorded in the dry season with lower values in the wet season.

In comparison to the rainfall data, the evaporative data indicate that vapor phase exchanges of tritium are more significant than rainfall effects, however, both rainfall and evaporative exchanges can result in tritium concentrations in excess of 20 pCi/L particularly in the surface water, porewater, and shallow groundwater where wells that are screened just below the surface (i.e., L-3 and L-5). Atmospheric influences of tritium could exceed 200 to 300 pCi/L within 1 mile of the CCS and be around 50 pCi/L at distances over 3 miles from the CCS. These influences must be considered when assessing whether the tritium concentrations observed in a particular media are the result of a groundwater pathway or an atmospheric pathway.

It is important to note that under this monitoring plan, tritium is being measured only as a chemical tracer in order to determine potential movement of CCS water. At the levels being measured, the tritium is not a public health concern. Results from the March 2012 and June 2012 sampling efforts will be forwarded to the Agencies once they are received by FPL.

TABLES

Table 3.0-1. Groundwater and Surface Water Sampling Locations and Events

Event	Locations (Refer to Figure 1.1-1)	Analytes[1]
Quarterly	TPGW–1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14; L-3, -5; G-21, -28, -35	GW
	TPBBSW – 1, 2, 3, 4, 5 TPSWC – 1, 2, 3, 4, 5, 6 TPSWID – 1, 2, 3	SW
	TPSWCCS – 1, 2, 3, 4, 5, 6, 7 and 8 (anomaly)[2]	CCS
Semi-annual	TPGW–3, 4, 5, 6, 7, 8, 9, 11, 13, L-3, L-5, G-21, G-28, G-35	GW
	TPGW – 1, 2, 10, 13, 14	GW - quarterly analytes plus nutrients and trace elements
	TPBBSW – 1, 2, 3, 4, 5 TPSWC – 1, 2, 3, 4, 5, 6 TPSWID – 1, 2, 3	SW - quarterly analytes plus nutrients
	TPSWCCS – 1, 2, 3, 4, 5, 6, 7	CCS - quarterly analytes plus nutrients and gross alpha[3]

Notes:
[1] = Analytes from Table 3.0-2 plus field parameters (temperature, specific conductivity, DO, percent oxygen saturation, pH, ORP, and salinity) at all stations.
[2] = TPSWCCS-8 sampled first event only, as directed by the Agencies.
[3] = Gross Alpha sampling performed for one year (2 semi-annual events).

Key:
CCS – Cooling Canal System.
GW – Groundwater.
ORP = Oxidation reduction potential.
SW – Surface Water.
TPBBSW – Biscayne Bay Surface Water.
TPGW – Turkey Point Groundwater.
TPSWC – Turkey Point Surface Water Canal.
TPSWID – Turkey Point Surface Water Interceptor Ditch.
TPSWCCS – Turkey Point Surface Water Cooling Canal System.

Table 3.0-2. Analytes Measured in Groundwater, Surface Water, and the Cooling Canal System

Analyte	Monitoring Plan (Table 2-1) Label	GW	SW	CCS
Metals, Total Recoverable (Ar, Be, Cd, Cr (VI), Cu, Pb, Hg, Mn, Mb, Ni, Se, Th, Vn, Zn) [1]	Elements	SA	-	-
Iron and Barium [1]	Elements/Tracer	Q / SA	Q / SA	Q / SA
Anions (Cl^-, SO_4^{2-}, F^-, Br^-)	Ions	Q / SA	Q / SA	Q / SA
Cations (Ca^{2+}, Na^+, Mg^{2+}, K^+, Sr^{2+}, B^+)[2]	Ions	Q / SA	Q / SA	Q / SA
Alkalinity	Ions	Q / SA	Q / SA	Q / SA
Ammonia + unionized	Nutrients	SA	SA	SA
Nitrate+Nitrite	Nutrients	SA	SA	SA
Total Kjeldahl Nitrogen	Nutrients	SA	SA	SA
Total Phosphorus	Nutrients	SA	SA	SA
Soluble Reactive Phosphorus	Nutrients	SA	SA	SA
Silica	Nutrients	-	-	SA
Sulfides	Ions	Q / SA	Q / SA	Q / SA
TDS	Other	Q / SA	-	-
Dissolved Inorganic Carbon	Tracer	Q / SA	Q / SA	Q / SA
^3H	Tracer	Q / SA	Q / SA	Q / SA
$^2H/^1H$	Tracer	Q / SA	Q / SA	Q / SA
$^{18}O/^{16}O$	Tracer	Q / SA	Q / SA	Q / SA
$^{87}Sr/^{86}Sr$	Tracer	Q / SA	Q / SA	Q / SA
$^{13}C/^{12}C$	Tracer	Q / SA	Q / SA	Q / SA
Gross Alpha	Other	-	-	SA

Notes:

[1] = Trace elements (arsenic, barium, beryllium, cadmium, hexavalent chromium, copper, iron, lead, mercury, manganese, molybdenum, nickel, selenium, thallium, vanadium, and zinc) are referred to by the lab as “trace metals”. Barium and Iron are also part of tracer suite so broken out separately.

[2] = Cations referred to by the lab as “metals” due to analytical method specified for cations.

Key:

Q = Quarterly event.

SA = Semi-annual event.

Table 3.1-1. Summary of Groundwater Analytical Results from the June/July 2010 Event

Parameter	Units	TPGW-1S		TPGW-1M		TPGW-1D		TPGW-2S		TPGW-2M		TPGW-2D		TPGW-DUP 1 [1]		TPGW-3S		TPGW-3M		TPGW-3D		TPGW-4S		TPGW-4M		TPGW-4D		TPGW-5S		TPGW-5M		TPGW-5D	
		7/12/2010		7/12/2010		7/12/2010		6/18/2010		6/18/2010		6/21/2010		6/21/2010		6/17/2010		6/17/2010		6/17/2010		6/24/2010		6/24/2010		6/24/2010		6/16/2010		6/16/2010		6/16/2010	
Temperature	°C	26.66		26.59		26.49		26.31		27.33		27.12		N.A.		26.52		27.04		26.96		24.99		25.66		25.29		25.80		24.61		24.69	
pH	SU	7.08		7.04		7.00		7.29		6.94		6.86		N.A.		6.74		6.99		6.92		7.31		6.88		6.92		7.47		6.92		6.85	
Dissolved Oxygen	mg/L	1.6	J	11	J	3.7	J	3.7	J	2.7	J	1.7	J	N.A.		0.9	J	2.7	J	2.4	J	1.4	J	2.3	J	2.4	J	1.2	J	1.1	J	4	J
Specific Conductance	µS/cm	53720	J	61220	J	59870	J	65980	J	61080	J	65230	J	N.A.		51890	J	62250	J	55570	J	1750	J	32010	J	37010	J	958	J	21350	J	29980	J
Turbidity	NTU	1.56		4.65		1.06		0.38		0.13		0.03		N.A.		0.35		0.53		2.30		2.52		2.00		0.02		5.27		0.16		0.46	
Arsenic	mg/L	0.012	U	0.013	I	0.012	U	0.012	UJ-	0.012	UJ-	0.012	U	0.012	U																		
Barium	mg/L	0.15		0.16		0.15		0.16		0.13		0.11	J	0.14	J	0.12		0.11	J	0.092	I	0.024	I	0.15		0.14		0.04		0.26		0.22	
Beryllium	mg/L	0.0018	U	0.0018	U	0.0018	U	0.0018	U	0.0018	U	0.0018	U	0.0018	U																		
Cadmium	mg/L	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U																		
Copper	mg/L	0.0033	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U	0.0033 U	U																		
Iron	mg/L	0.78		1.2		0.63		3.1		0.32		0.9		0.91		0.32		1.7		0.33	I	0.22	I	4.7		5.9		0.56		5.4		1.6	
Lead	mg/L	0.024	U	0.024	U	0.024	U	0.024	U	0.024	U	0.024	U	0.024	U																		
Manganese	mg/L	0.047		0.12		0.034		0.052	I	0.046	I	0.055	I	0.052	I																		
Molybdenum	mg/L	0.006	I	0.0073	I	0.0049	I	0.03	I	0.015	I	0.0047	U	0.0047	U																		
Nickel	mg/L	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U																		
Selenium	mg/L	0.034	U	0.034	U	0.034	U	0.034	UJ-	0.034	UJ-	0.034	U	0.034	U																		
Thallium	mg/L	0.016	U	0.016	U	0.028	I	0.016	U	0.016	U	0.016	U	0.016	U																		
Vanadium	mg/L	0.0094	I	0.0071	I	0.0075	I	0.021	I	0.016	I	0.014	I	0.016	I																		
Zinc	mg/L	0.047	I	0.051	I	0.054	I	0.018	U	0.018	U	0.017	U	0.017	U																		
Silica	mg/L	5		5.3		5.1		3.9		4.2		3.5		4.2																			
Calcium	mg/L	620		660		650		870		660		680		680		640	J-	640		640		120		620		620		130		570		600	
Magnesium	mg/L	1700		1900		2000		1800		2100		2000		2000		1700	J+	1800		1800		19		900		1100		8.4		540		750	
Potassium	mg/L	490		570		590		730		780		540		550		450	J+	490	J	490	J	9.2		280		420		7.7		120		210	
Sodium	mg/L	13000		15000		16000		17000	J-	18000	J-	16000		16000		13000	J+	15000		14000		250		7200		8600		110		4900	J-	6500	J-
Boron	mg/L	5.2		6.2		6.2		5.8		7.1		6.6		6.6		5	J	5.9		5.8		0.064		1.4		2.2		0.054		0.58		1.1	
Strontium	mg/L	11		12		12		15		14		13		14		11	J+	12		12		1.3		8.3		8.8		1.3		6.8		7.8	
Chromium VI	mg/L	0.002	U	0.002	U	0.006	I	0.002		0.002	U	0.002	UQJ	0.002	U																		
Mercury	mg/L	0.000072	UJ-	0.000072	UJ-	0.000072	UJ-	0.000072	UJ-	0.000072	U	0.000072	U	0.000072	U																		
Bromide	mg/L	69		82		82		98		100		100		100		83		89		87		1.7		47		54		0.74		30		40	
Chloride	mg/L	23000		27000		27000		29000		30000		29000		30000		24000		26000		26000		490		13000		16000		210		8900		12000	
Fluoride	mg/L	0.100	U	0.100	U	0.100	U	0.100	U	0.100	U	0.200	U	0.200	UJ-	0.100	U	0.100	U	0.100	U	0.055		0.010	U	0.100	U	0.051		0.040	U	0.040	U
Sulfate	mg/L	3100		3600		3600		3700		4000		4000		4000		3200		3400		3500		20		1600		1900		19		860		1300	
Total Ammonia	mg/L as N	37	?	15	?	1.9		1.7		1.8		1.8		1.7																			
Ammonium Ion (NH^{4+})	mg/L	47.231	?	19.156	?	2.429		2.161		2.301		2.304																					
Unionized NH_3	mg/L	0.34	?	0.13	?	0.014		0.025		0.013		0.01		--																			
Nitrate/Nitrite as N	mg/L	0.0047	U	0.0047	U	0.0047	U	0.0047	U	0.0047	U	0.014		0.014																			
TKN	mg/L	1.6	?	2.2	?	2.1		1.9		1.9		2		1.8																			
TN	mg/L	1.6	?	2.2	?	2.1		1.9		1.9		2		1.8																			
Orthophosphate	mg/L	0.05	J	0.055	J	0.061	J	0.12	IJ	0.11	IJ	0.1	IJ	0.1	IJ																		
Phosphorus (P)	mg/L	0.021	J	0.023	J	0.023	J	0.036	J	0.082	IJ	0.059	J	0.057	J																		
Alkalinity	mg/L ($CaCO_3$)	200		180		180		120		190		190		180		330		220		220		200		210		200		240		210		220	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	200		180		180		120		190		190		180		330		220		220		200		210		200		240		210		220	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	4.8		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	49000		61000		59000		62000		64000		62000		63000		44000		48000		47000		1100		28000		33000		690		17000		21000	
Dissolved Inorganic Carbon	mg/L	45		39		38		32		49		46		46		83		55		87		54		48		45		62		54		55	
$\delta^{18}O$	‰	3.8		4.4		4.4		4.6		4.7		4.9		5.0		3.5		4.1		2.1		-0.9		1.8		2.5		-1.2		0.2		0.8	
$\delta^{2}H$	‰	23.0		26.0		26.0		25.9		28.5		30.0		32.5		20.3		32.8		14.2		-3.2		10.0		14.8		-4.9		1.7		8.5	
$\delta^{13}C$	‰	-6.51		-6.38		-6.29		-7.69		-6.85		-6.63		-6.44		-8.59		-7.98		-8.07		-11.10		-7.34		-7.00		-10.43		-8.18		-7.52	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		35.4	J	41.8	J	40.1	J	44.7	J	41.0	J	44.1	J			34.1	J	41.9	J	36.8	J	0.88	J	19.9	J	23.4	J	0.47	J	12.8	J	18.6	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70916		0.70914				0.70918		0.70913		0.70917		0.70917		0.70917				0.70914		0.70917		0.70914		0.70908		0.70918		0.70916		0.70915	
Tritium	pCi/L (1σ)	1580.8 (57.6)		2816.0 (96.0)		2579.2 (83.2)		3168.0 (96.0)		3328.0 (96.0)		3232.0 (96.0)		3732.3 (127.6)		854.4 (32.0)		1990.4 (73.6)		1990.4 (64.0)		8.64 (3.5)		325.38 (12.8)		505.6 (16.0)		10.208 (4.1)		293.48 (9.6)		187.572 (8.0)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/21/2010) is a duplicate of TPGW-2D.

[2] Sample TPGW-Dup1 (6/18/2010) is a duplicate of TPGW-12D.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

N.A. = Not applicable.

Q = Holding time exceeded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-1. Summary of Groundwater Analytical Results from the June/July 2010 Event

Parameter	Units	TPGW-6S		TPGW-6M		TPGW-6D		TPGW-7S		TPGW-7M		TPGW-7D		TPGW-8S		TPGW-8M		TPGW-8D		TPGW-9S		TPGW-9M		TPGW-9D		TPGW-12S		TPGW-12M		TPGW-12D		TPGW-DUP 1 [2]	
		6/21/2010		6/21/2010		6/21/2010		6/24/2010		6/24/2010		6/24/2010		7/6/2010		6/25/2010		6/25/2010		6/25/2010		6/25/2010		6/25/2010		6/17/2010		6/17/2010		6/18/2010		6/18/2010		
Temperature	°C	24.75		24.92		24.83		24.80		25.05		25.12		24.99		25.29		25.23		25.82		25.10		25.09		27.16		26.85		27.04		N.A.	
pH	SU	7.03		6.92		6.84		7.22		7.19		7.19		11.67		7.06		7.10		7.13		6.99		6.99		6.65		7.02		7.29		N.A.	
Dissolved Oxygen	mg/L	4.8	J	2.1	J	4.6	J	2	J	1.5	J	2.3	J	5.3	J	10.9	J	1.6	J	2.6	J	1.5	J	2.4	J	5	J	2.6	J	3.1	J	N.A.	
Specific Conductance	µS/cm	1050	J	19640	J	20400	J	483	J	500	J	510	J	1140	J	544	J	599	J	556	J	563	J	564	J	37380	J	52270	J	57910	J	N.A.	
Turbidity	NTU	2.32		0.46		0.29		3.81		2.29		1.34		7.50		1.18		4.04		9.27		8.49		0.83		0.44		0.28		3.02		N.A.	
Arsenic	mg/L																																
Barium	mg/L							0.0081	U	0.011	I	0.0081	U	0.069	I	0.0081	U	0.012	I	0.012	I	0.0081	U	0.023	I	0.028	I	0.13		0.1		0.12	
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L							0.34	I	0.36	I	0.28	I	0.042	IVJ+	0.55		0.31	I	0.19	I	0.6		0.76		0.16	I	1.5		0.5		0.52	
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																																
Calcium	mg/L	120		510		500		91		91		91		130		110		110		120		120		110		450		590		610		580	
Magnesium	mg/L	12		480		450		4.0		4.1		3.7		0.59		3.8		6.2		2.9		3.1		3.6		980		1700		1700		1700	
Potassium	mg/L	4		130		130		9.9		9.4		4.8		13		9.2		8.5		11		6.7		3.3		440	J	470	J	640		600	
Sodium	mg/L	100		4000		3800		20		21		26		21		20		31		14		15		22		7700		13000		15000	J	14000	J-
Boron	mg/L	0.061	I	0.86		0.82		0.053		0.053		0.051		0.06		0.063		0.069		0.047	I	0.048	I	0.048	I	3.2		5.3		5.6		5.4	
Strontium	mg/L	1.2		8.6		8.3		0.91		0.92		0.88		1		1.1		1.1		0.99		0.99		1.1		7.2		11		11		11	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	0.56		29		27		0.18		0.17		0.21		0.22		0.18		0.26		0.3		0.29		0.41		50		81		87		89	
Chloride	mg/L	210		8000		7600		36		35		41		34		33		47		23		25		30		14000		24000		24000		25000	
Fluoride	mg/L	0.087		0.100	U	0.100	U	0.170		0.230		0.140		0.180		0.068		0.047 I		0.020	U	0.038	I	0.062		0.170	I	0.100	U	0.100	U	0.100	U
Sulfate	mg/L	14		880		800		27		25		29		36		43		49		18		24		33		1900		3100		3400		3500	
Total Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH_3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	270		210		200		210		200		200		240		230		220		250		270		250		510		190		180		180	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	270		210		200		210		200		200		1		230		220		250		270		250		510		190		180		180	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.1		1.0	U	1.0	U	22.0		1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	660		18000		17000		300		310		320		320		350		370		330		350		360		26000		44000		53000		53000	
Dissolved Inorganic Carbon	mg/L	69		56		52		44		47		47		3.9		51		49		62		60		58		130		49		46		46	
$\delta^{18}O$	‰	-1.6		-0.4		-0.4		-1.2		-1.2		-1.0		-1.7		-1.7		-1.7		-1.5		-1.4		-1.6		4.1		-3.2		4.2		4.3	
$\delta^{2}H$	‰	-8.9		1.9		-1.2		-8.2		-8.9		-7.0		-7.0		-5.9		-8.5		-5.2		-2.9		-7.1		23.4		-15.8		27.1		22.3	
$\delta^{13}C$	‰	-11.61		-6.60		-7.47		-9.09		-7.59		-8.92		-14.29		-9.25		-9.25		-9.25		-8.53		-9.25		-12.69		-7.20		-7.05		-7.05	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		0.52	J	11.7	J	12.2	J	0.23	J	0.24	J	0.25	J	0.57	J	0.26	J	0.29	J	0.27	J	0.27	J	0.27	J	23.6	J	34.4	J	38.6	J		
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70916		0.70911		0.70923		0.70918		0.70918		0.70912		0.70912		0.70916		0.70914		0.70916		0.70912		0.70917		0.70917		0.70914		0.70916	
Tritium	pCi/L (1σ)	9.57 (4.1)		0.957 (4.8)	UJ	12.76 (4.1)		1.6 (3.5)	UJ	3.2 (3.5)	UJ	4.48 (3.5)		4.48 (6.7)	UJ	4.48 (3.5)		6.72 (3.8)		4.16 (3.2)		16.0 (3.5)		8.0 (3.5)		236.8 (9.6)		1795.2 (67.2)		1561.6 (44.8)		1764.1 (57.4)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/21/2010) is a duplicate of TPGW-2D.

[2] Sample TPGW-Dup1 (6/18/2010) is a duplicate of TPGW-12D.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

N.A. = Not applicable.

Q = Holding time exceeded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-1. Summary of Groundwater Analytical Results from the June/July 2010 Event

Parameter	Units	TPGW-13S		TPGW-13M		TPGW-13D		TPGW-EBI		FB1	
		6/30/2010		6/30/2010		6/30/2010		6/18/2010		6/17/2010	
Temperature	°C	29.82		29.80		30.03					
pH	SU	6.89		7.07		7.02					
Dissolved Oxygen	mg/L	8.3	J	9.7	J	2.79	J				
Specific Conductance	µS/cm	72860	J	70180	J	71970	J				
Turbidity	NTU	0.66		0.39		0.16					
Arsenic	mg/L	0.016	IVJ	0.018	IV	0.012	U	0.0012	U	0.0012	U
Barium	mg/L	0.11		0.13		0.11		0.00081	U	0.00081	U
Beryllium	mg/L	0.0018	U	0.0018	U	0.0018	U	0.0018	U	0.0018	U
Cadmium	mg/L	0.0038	U	0.0038	U	0.0038	U	0.0038	U	0.0038	U
Copper	mg/L	0.0033	U	0.0033	U	0.0033	U	0.0033	U	0.0033	U
Iron	mg/L	0.13	I	8.6		1.3		0.0047	I	0.0027	U
Lead	mg/L	0.024	U	0.024	U	0.036	I	0.024	U	0.024	U
Manganese	mg/L	0.041	I	0.11		0.064	I	0.00046	U	0.00046	U
Molybdenum	mg/L	0.0047	I	0.0047	U	0.0047	U	0.0047	U	0.0047	U
Nickel	mg/L	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U
Selenium	mg/L	0.034	U	0.034	U	0.034	U	0.0034	U	0.0034	U
Thallium	mg/L	0.03	I	0.016	U	0.016	U	0.0016	U	0.0016	U
Vanadium	mg/L	0.01	I	0.0093	I	0.011	I	0.00052	U	0.00052	U
Zinc	mg/L	0.017	U	0.017	U	0.036	I	0.0068	I	0.0026	I
Silica	mg/L	4.6		6		7.1		0.05	U	0.05	U
Calcium	mg/L	790		740		760		0.33		0.1	U
Magnesium	mg/L	2500		2300		2400		0.15		0.02	U
Potassium	mg/L	800		740		750		0.19	U	0.19	U
Sodium	mg/L	19000		19000		19000		1.5		0.31	U
Boron	mg/L	8.7		7.8		8.0		0.001	U	0.01	U
Strontium	mg/L	16		15		15		0.0015	I	0.001	U
Chromium VI	mg/L	0.003	IJ-	0.002	U	0.002	U	0.002	U	0.002	U
Mercury	mg/L	0.000072	UJ-	0.000072	UJ-	0.000072	UJ-	0.000072	U	0.000072	U
Bromide	mg/L	120		110		110		0.027	U	0.027	U
Chloride	mg/L	37000		36000		37000		0.22	I	0.2	U
Fluoride	mg/L	0.100	U	0.100	U	0.100	U	0.02	U	0.02	U
Sulfate	mg/L	5000		4700		4800		0.2	U	0.2	U
Total Ammonia	mg/L as N	2.1		1.3		1.4		0.11		0.048	I
Ammonium Ion (NH^{4+})	mg/L	2.684		1.656		1.786					
Unionized NH_3	mg/L	0.016		0.015		0.014					
Nitrate/Nitrite as N	mg/L	0.014		0.028		0.014		0.023		0.0068	I
TKN	mg/L	2.6		1.5		1.7		0.05	U	0.11	I
TN	mg/L	2.6		1.5		1.7		0.25	U	0.21	U
Orthophosphate	mg/L	0.081	J	0.053		0.072	J	0.005	I	0.053	I
Phosphorus (P)	mg/L	0.049	J	0.046		0.035	J	0.0044	U	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	180		140		150		2.3		2.0	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	180		140		150		2.3		2.0	
Sulfides	mg/L	19.0		1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	75000		70000		74000		5	U	5	U
Dissolved Inorganic Carbon	mg/L	38		30		30		1.5		1	U
$\delta^{18}O$	‰	5.5		5.2		5.3		-3.1			
$\delta^{2}H$	‰	34.0		26.7		32.5		-16.2			
$\delta^{13}C$	‰	-7.86		-6.49		-7.20		-12.58		-12.16	
Gross Alpha	pCi/L										
Salinity (PSS-78)		50.0	J	47.9	J	49.3	J				
$^{87}Sr/^{86}Sr$	µg/L*	0.70913		0.70914		0.70915		0.05000	U	0.05000	U
Tritium	pCi/L (1σ)	4370.3 (127.6)		4178.9 (127.6)		4785.0 (159.5)		3.5 (4.1)	UJ	9.9 (4.1)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/21/2010) is a duplicate of TPGW-2D.

[2] Sample TPGW-Dup1 (6/18/2010) is a duplicate of TPGW-12D.

Text in blue are revised values.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
MCL = Maximum Contaminant Levels.
N.A. = Not applicable.
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-2. Summary of Groundwater Analytical Results from the September 2010 Event

Parameter	Units	TPGW-1S 9/14/2010		TPGW-1M 9/14/2010		TPGW-1D 9/14/2010		TPGW-2S 9/20/2010		TPGW-2M 9/20/2010		TPGW-2D 9/20/2010		TPGW-3S 9/20/2010		TPGW-3M 9/20/2010		TPGW-3D 9/20/2010		TPGW-4S 9/17/2010		TPGW-4M 9/17/2010		TPGW-4D 9/17/2010		TPGW-5S 9/14/2010		TPGW-5M 9/14/2010		TPGW-5D 9/14/2010		TPGW-6S 9/15/2010		TPGW-6M 9/15/2010		TPGW-6D 9/15/2010	
Temperature	°C	26.52		26.79		26.99		27.29		27.74		27.81		26.45		26.84		26.68		25.37		25.5		25.36		24.45		24.6		24.75		24.47		25.25		24.56	
pH	SU	6.79		7.11		6.88		7.04		6.75	J	6.8	J	6.65	J	6.75	J	6.79	J	6.85	J	6.8	J	6.88	J	8.15		6.76	J	6.7	J	6.93	J	6.82	J	6.76	J
Dissolved Oxygen	mg/L	0.11		0.13		0.11		0.18		0.36		0.09		0.13		0.09		0.09		0.52		0.16		0.12		0.09		0.14		0.43		0.66		0.1		0.12	
Specific Conductance	µS/cm	33,001		72,898		71,763		73,570		77,199		78,349		65826		71328		70500		2026		38628		44990		1239		30936		34157		1230		23667		24355	
Turbidity	NTU	0.7		1.53		0.71		2.57		0.7		0.18		1.21		0.84		0.78		1.53		0.47		0.09		2.02		0.32		0.29		0.41		0.54		0.34	
Arsenic	mg/L																																				
Barium	mg/L	0.1	I	0.11	I	0.099	I	0.085	I	0.056	I	0.059	I	0.043	I	0.081	I	0.086	I	0.04	U	0.15	I V	0.2	I V	0.018	I	0.23		0.19	I	0.040	U	0.16	I V	0.2	I V
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	1.40		13.0		0.810	I	3.80		1.0		1.50		0.730	I	1.80		1.20		0.14	U	5.80		10.0		0.4	I	2.50		1.50		0.14	U	2.70		1.30	I
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	400		610		650		720		690		690		660		630		640		140		600		590		140		620		610		120		520		520	
Magnesium	mg/L	690		1900		1900		1900		2000		2100		1700		1900		1900		22		860		1000		7.8		650		740		12		480		500	
Potassium	mg/L	340		540		550		470		480		530		380	I	450		420		6.0		290		420		7.2		160		220		4.7		150		150	
Sodium	mg/L	5700		15000		15000		14000		15000		17000		13000		14000		14000		210		7000		8200		100		5200		5800		110		4100		4300	
Boron	mg/L	2.2		6.1		6.0		6.2		6.5		6.8		5.1		6.0		5.9		0.07		1.4		2.0		0.048	I	0.78		1.2		0.06	I	0.87		0.91	
Strontium	mg/L	6.3		11.0		11.0		14.0		14.0		14.0		11.0		12.0		12.0		1.3		7.9		8.2		1.3		7.1		7.5		1.2		8.6		8.7	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	36		95		92		97	J	100		98		84		84		91		0.027	U	44		52		0.79		36		40		0.79	J-	28		28	
Chloride	mg/L	11000		28000		28000		30000	J	29000		31000		24000		26000		27000		420		12000		15000		230		9500		11000		210		7100		7500	
Fluoride	mg/L	0.020	U	0.020	U	0.020	U	0.10	UJ	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.076		0.020	U	0.020	U	0.11		0.020	U	0.020	U	0.12		0.020	U	0.020	U
Sulfate	mg/L	1400	J-	4400		3800		3400	J	3700		3500		3100		3100		3300		16		1400		1700		17		1000		1200		13	J-	1000		1100	
Total Ammonia	mg/L as N																																				
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	270		120		170		170	J	180		180		320		210		210		290		200		190		230		220		210		250		190		210	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	270		120		170		170	J	180		180		320		210		210		290		200		190		230		220		210		250		190		210	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	2.6		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	20000		49000		48000		48000		50000		52000		43000		47000		46000		1100		24000		27000		720		19000		21000		680		13000		14000	
Dissolved Inorganic Carbon	mg/L	70		28		42		42		46		46		84		55		54		75		52		49		59		58		55		67		50		54	
$\delta^{18}O$	‰	1.1		4.3		4.4		4.4		4.6		4.6		3.2		3.9		4.1		-0.7		1.5		2.2		-1.4		0.5		0.9		-1.7		-0.5		-0.4	
$\delta^{2}H$	‰	8.0		28.0		28.0		28.0		29.0		24.0		22.0		25.0		24.0		-3.0		12.0		14.0		-8.0		5.0		7.0		-9.0		1.0		3.0	
$\delta^{13}C$	‰	-8.22		-7.27		-6.47		-7.41		-7.23		-6.44		-8.32		-7.45		-7.71		-9.79		-8.41		-7.25		-9.95		-9.67		-8.69		-11.95		-8.07		-7.46	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		20.6		50.2		49.3		50.7		53.6		54.5		44.6		48.9		48.3		1.0		24.5		29.1		0.6		19.2		21.4		0.6		14.3		14.8	
$^{87}Sr/^{86}Sr$	µg/L*	0.70911		0.70912		0.70914		0.70916		0.70913		0.70913		0.70916		0.70910		0.70916		0.70913		0.70911		0.70912		0.70916		0.70915		0.70913		0.70917		0.70911		0.70911	
Tritium	pCi/L (1σ)	455.7 (18.5)		2653 (92)		2272 (79)		3075 (92)		3460 (102)		3522 (105)		852 (28)		2178 (67)		1041 (60)		18.5 (5.7)		321 (13)		611 (21)		20.4 (5.7)	J	175 (9)		343 (13)		2.6 (7)	UJ	4.7 (6.8)	UJ	17.9 (7)	J

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (9/23/2010) is a duplicate of TPGW-11M.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

N.A. = Not applicable.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-2. Summary of Groundwater Analytical Results from the September 2010 Event

Parameter	Units	TPGW-7S 9/17/2010		TPGW-7M 9/17/2010		TPGW-7D 9/17/2010		TPGW-8S 9/20/2010		TPGW-8M 9/20/2010		TPGW-8D 9/20/2010		TPGW-9S 9/15/2010		TPGW-9M 9/15/2010		TPGW-9D 9/15/2010		TPGW-10S 9/22/2010		TPGW-10M 9/22/2010		TPGW-10D 9/22/2010		TPGW-11S 9/23/2010		TPGW-11M 9/23/2010		TPGW-Dup 1 [1] 9/23/2010		TPGW-11D 9/27/2010		TPGW-12S 9/16/2010		TPGW-12M 9/16/2010		TPGW-12D 9/16/2010	
Temperature	°C	25.13		24.95		26.01		25.03		24.81		25.51		25.84		25.71		25.45		27.08		27.56		27.18		26.46		26.56		26.56		26.66		27.02		27.08		27.47	
pH	SU	7.27		7.33		7.1		12.1	J	7.16		7.01		6.93	J	7.09		6.9	J	7.27		7.25		7.19		8.15		6.83	J	6.83	J	6.67	J	6.45	J	7.05		7.12	
Dissolved Oxygen	mg/L	0.34		0.1		0.26		0.22		0.13		0.2		0.07		0.16		0.12		0.53		0.2		0.07		1.1		0.5		0.5		0.46		0.4		0.05		0.09	
Specific Conductance	µS/cm	554	J	588	J	608	J	2648		654	J	699	J	609	J	679	J	654	J	52243		56762		56950		56504		58174		58174		59347		41222		66088		65920	
Turbidity	NTU	0.39		0.33		0.5		1.85		0.45		1.13		4.92		0.97		0.41		0.12		0.06		0.28		0.03		0.1		0.1		0.97		2.07		0.36		7.4	
Arsenic	mg/L																																						
Barium	mg/L	0.054	I V	0.040	U	0.057	I V	0.12	I	0.016	U	0.016	U	0.04	U	0.079	I V	0.04	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	UJ	0.016	U	0.016	U	0.041	I V	0.13	I V	0.063	I V
Beryllium	mg/L																																						
Cadmium	mg/L																																						
Copper	mg/L																																						
Iron	mg/L	0.34	I	0.22	I	0.25	I	0.11	I	0.46	I	0.20	I	0.14	U	0.37	I	0.20	I	0.71	I	0.74	I	0.85	I	0.71	I	0.82	I J3	0.72	I	1.20	V	0.25	I	0.84	I	0.79	I
Lead	mg/L																																						
Manganese	mg/L																																						
Molybdenum	mg/L																																						
Nickel	mg/L																																						
Selenium	mg/L																																						
Thallium	mg/L																																						
Vanadium	mg/L																																						
Zinc	mg/L																																						
Silica	mg/L																																						
Calcium	mg/L	80		88		90		210		100		100		120		120		120		410		440		460		500		540		530		580		440		580		610	
Magnesium	mg/L	3.4		3.9		3.7		0.18		3.7		5.9		2.6		3.4		3.7		1300		1400		1400		1400		1500		1400		1500		930		1600		1700	
Potassium	mg/L	10		8.6		4.9		11		8.5		7.8		4.3		7.6		3.1		410		440		420		410		500		460		430		450		400		430	
Sodium	mg/L	19		20		26		21		20		30		9.6		13		20		11000		11000		11000		11000		13000		12000		11000		7400		13000		13000	
Boron	mg/L	0.049	I	0.051		0.051		0.032	I	0.062		0.068		0.034	I	0.052	I	0.049	I	4.7		5.1		5.0		5.1		5.2		5.2		5.2		3.1		5.1		5.2	
Strontium	mg/L	0.82		0.86		0.87		1.1		1.1		1.1		0.89		1.0		1.1		7.6		8.7		9.1		8.4		9.0		9.0		9.9		6.8		11.0		11.0	
Chromium VI	mg/L																																						
Mercury	mg/L																																						
Bromide	mg/L	0.18		0.027	U	0.19		0.21		0.20		0.27		0.18		1.4		0.45		66		80		72		62		60		65		73	U	0.14	UJ	81		0.27	U
Chloride	mg/L	35		34		41	J-	33		34		46		20		26		29		19000		21000		20000		21000		22000		22000		22000		16000	J	21000		25000	
Fluoride	mg/L	0.12		0.11		0.12		0.11		0.10		0.075		0.094		0.077		0.086		39		130		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.020	UJ	0.020	U	0.020	U
Sulfate	mg/L	23		22		25	J-	22		41		44		3.3		23		27		2400		2600		2600		2500		2700		2600		2700		1700	J	2900		3000	
Total Ammonia	mg/L as N																																						
Ammonium Ion (NH^{4+})	mg/L																																						
Unionized NH_3	mg/L																																						
Nitrate/Nitrite as N	mg/L																																						
TKN	mg/L																																						
TN	mg/L																																						
Orthophosphate	mg/L																																						
Phosphorus (P)	mg/L																																						
Alkalinity	mg/L ($CaCO_3$)	180		200		190		500		210		210		270		260		250		130		110		110		270		320		310		300		480	J	190		170	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	180		200		190		1.0	U	210		210		270		260		250		130		110		110		270		320		310		300		480	J	190		170	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.3		1.0	U	1.0	U	4.3		1.6		1.4		17		9.9		7.2		4.8		13		1.0	U	1.0	U
Total Dissolved Solids	mg/L	280		310		300		570		350		380		340		360		350		32000		35000		37000		37000		36000				36000		23000		43000		43000	
Dissolved Inorganic Carbon	mg/L	45		51		51		3.5		58		57		70		68		64		33		27		29		74		85		84		94		120		47		44	
$\delta^{18}O$	‰	-1.3		-1.3		-1.2		-1.7		-1.7		-1.8		-1.0		-1.5		-1.8		1.7		1.7		1.9		1.6		1.6		1.5		2.5		1.7		4.0		4.3	
$\delta^{2}H$	‰	-5.0		-6.0		-5.0		-13.0		-11.0		-12.0		2.0		-5.0		-7.0		16.0		23.0		17.0		20.0		17.0		18.0		18.0		11.0		27.0		27.0	
$\delta^{13}C$	‰	-9.77		-9.59		-9.33		-13.48		-9.97		-9.66		-10.6		-10.9		-10.39		-5.1		-4.39		-7.24		-10.19		-10.88		-10.88		-11.45		-12.94		-7.1		-9.33	
Gross Alpha	pCi/L																																						
Salinity (PSS-78)		0.3	J	0.3	J	0.3	J	1.4		0.3	J	0.3	J	0.3	J	0.3	J	0.3	J	34.3		37.7		37.8		37.5		38.8		0.0		39.7		26.3		44.8		44.7	
$^{87}Sr/^{86}Sr$	µg/L*	0.70919		0.70914		0.70915		0.70911		0.70915		0.70914		0.70916		0.70914		0.70913		0.70918		0.70918		0.70916		0.70913		0.70912		0.70919		0.70912		0.70916		0.70916		0.70914	
Tritium	pCi/L (1σ)	3.2 (6.8)	UJ	6.9 (6.8)		4 (6.7)	UJ	12.6 (7)	J	11.6 (6.9)	J	-2.1 (6.6)	UJ	6.9 (6.8)	J	-2.7 (6.8)	UJ	-0.6 (6.8)	UJ	21.5 (6.2)	J	7.8 (6.3)	J	2.4 (6.6)	UJ	14.9 (6.3)		26.6 (6.5)	J	20.1 (8.2)	J	347 (13)		262 (12)		1654 (58)		1830 (65)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (9/23/2010) is a duplicate of TPGW-11M.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

N.A. = Not applicable.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-2. Summary of Groundwater Analytical Results from the September 2010 Event

Parameter	Units	TPGW-13S 9/9/2010		TPGW-13M 9/9/2010		TPGW-13D 9/9/2010		TPGW-14S 9/27/2010		TPGW-14M 9/27/2010		TPGW-14D 9/27/2010		EB1 9/9/2010		FB1 9/14/2010		FB1 9/15/2010		FB1 9/16/2010		FB1 9/17/2010		FB1 9/20/2010		FB1 9/23/2010	
Temperature	°C	30.37		30.47		30.1		27.11	J	27.33	J	27.28	J														
pH	SU	7.11		6.52		6.87		7.01	J	6.76	J	6.76	J														
Dissolved Oxygen	mg/L	1		0.07		1.08		0.2	J	0.45	J	0.65	J														
Specific Conductance	µS/cm	87606		83961		86058		60063	J	63756	J	75330	J														
Turbidity	NTU	0.33		0.71		0.34		0.93	J	2.68	J	0.98	J														
Arsenic	mg/L																										
Barium	mg/L	0.033	I	0.13	I	0.11	IJ	0.016	U	0.016	U	0.016	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.001	I V	0.00081	U	0.0016	U
Beryllium	mg/L																										
Cadmium	mg/L																										
Copper	mg/L																										
Iron	mg/L	0.22	I	7.80		1.70		0.97	I V	0.97	I V	1.10	V	0.011	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0054	U
Lead	mg/L																										
Manganese	mg/L																										
Molybdenum	mg/L																										
Nickel	mg/L																										
Selenium	mg/L																										
Thallium	mg/L																										
Vanadium	mg/L																										
Zinc	mg/L																										
Silica	mg/L																										
Calcium	mg/L	750		690		710		530		580		650		0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U	0.10	U
Magnesium	mg/L	2300		2100		2200		1500		1600		2000		0.020	U	0.020	U	0.020	U	0.024	I	0.020	U	0.020	U	0.020	U
Potassium	mg/L	660		600		610		460		500		620		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	19000		18000		18000		12000		13000		16000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	8.3		7.2		7.4		5.2		5.4		6.7		0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Strontium	mg/L	14.0		14.0		14.0		9.5		10.0		13.0		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																										
Mercury	mg/L																										
Bromide	mg/L	110		100		49		73	U	79	U	160	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	33000		31000		26000		23000		25000		29000		0.20	U	0.20	U	0.20	U	0.36	I	0.20	U	0.20	U	0.20	U
Fluoride	mg/L	0.020	U	0.020	U	0.020	U	0.20	U	0.20	U	0.20	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Sulfate	mg/L	3900		3700		3900		2700		2700		3200		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Total Ammonia	mg/L as N																										
Ammonium Ion (NH^{4+})	mg/L																										
Unionized NH_3	mg/L																										
Nitrate/Nitrite as N	mg/L																										
TKN	mg/L																										
TN	mg/L																										
Orthophosphate	mg/L																										
Phosphorus (P)	mg/L																										
Alkalinity	mg/L ($CaCO_3$)	220		150		150		260		260		200		1.0	U	1.0	U	2.4		1.0	U	1.0	U	2.8		2.3	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	220		150		150		260		260		200		1.0	U	1.0	U	2.4		1.0	U	1.0	U	2.8		2.3	
Sulfides	mg/L	19		1.0	U	1.0	U	5.6		4.6		3.2		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	63000		58000		62000		35000		37000		47000						5.0	U	5.0	U	5.0	U	5.0	U		
Dissolved Inorganic Carbon	mg/L	50		38		37		83		86		67		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
$\delta^{18}O$	‰	5.4		5.0		5.3		2.4		3.2		4.3		-1.00		-1.1		-1.1		-1.0		-1.2		-1.2		-1.3	
$\delta^{2}H$	‰	34.0		32.0		35.0		21.0		22.0		26.0		-1.00		-7.0		-2.0		-7.0		-8.0		-5.0		-6.0	
$\delta^{13}C$	‰	-6.4		-6.69		-7.43		-8.54		-10.29		-7.99		-11.67		-12.90		-12.8		-11.87		-24.8		-18.87		-18.84	
Gross Alpha	pCi/L																										
Salinity (PSS-78)		61.9		58.9		60.7		40.2	J	43.0	J	52.1	J														
$^{87}Sr/^{86}Sr$	µg/L*	0.70910		0.70915		0.70914		0.70914		0.70916		0.70914		0.803		0.023		0.021		0.024		0.01	U	0.01	U	0.01	U
Tritium	pCi/L (1σ)	3554 (120)		3986 (137)		4390 (150)		228 (10)		688 (26)		2580 (90)		-		21.3 (8.4)		11.6 (8.2)		16.5 (8.4)		1.3 (7.8)	UJ	19 (7.9)		0.5 (7.6)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (9/23/2010) is a duplicate of TPGW-11M.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MCL = Maximum Contaminant Levels.

N.A. = Not applicable.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-3. Summary of Groundwater Analytical Results from the December 2010 Sampling Event

Parameter	Units	TPGW-1S 12/11/2010		TPGW-1M 12/11/2010		TPGW-1D 12/11/2010		TPGW-2S 12/10/2010		TPGW-2M 12/10/2010		TPGW-2D 12/10/2010		TPGW-3S 12/10/2010		TPGW-3M 12/10/2010		TPGW-3D 12/10/2010		TPGW-4S 12/7/2010		TPGW-4M 12/7/2010		TPGW-4D 12/7/2010		TPGW-5S 12/11/2010		TPGW-5M 12/11/2010		TPGW-5D 12/11/2010		TPGW-6S 12/8/2010		TPGW-6M 12/8/2010		TPGW-6D 12/8/2010	
Temperature	°C	25.71		26.26		26.26		26.63		26.49		27.06		25.57		25.5		25.38		25.12		24.79		24.57		23.98		24.06		24.34		23.58		23.54		23.68	
pH	SU	7.23		7.20		7.28		7.23		7.21		6.98		6.92		7		7.14		7.02		7.05		7.03		8.73		7.06		6.98		7.05		7.14		6.94	
Dissolved Oxygen	mg/L	0.26		0.2		0.3		0.08		0.46		0.2		0.24		0.39		0.19		0.16		0.07		0.15		0.2		0.25		0.14		0.12		0.18		0.11	
Specific Conductance	µS/cm	48738		70180		71044		71102		76025		74449		64606		68445		69476		2136	J	37881		43547		1224		30840		32674		1207	J	21802		23808	
Turbidity	NTU	0.02		0.24		0		1.56		0.36		0.62		0.42		0.75		0.58		0.27		0.18		0.8		0.26		0		0.02		0.42		0.37		0.73	
Arsenic	mg/L																																				
Barium	mg/L	0.099	I	0.110	I	0.092	I	0.070	I	0.051	I	0.068	I	0.041	I	0.016	U	0.058	I	0.016	U	0.140	I	0.110	I	0.034	I	0.290		0.200		0.016	I V	0.210		0.160	I
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	3.5		6.0		0.720	I	2.7		0.650	I	1.2	J	0.420	I	1.1		0.930	I	0.210	I	6.0		5.0		0.510	I	2.4		2.0		0.091	I	1.4		1.4	
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	500		650		630		760		680		670	J	650		620		630		140		570		570		130		580		590		110		450		490	
Magnesium	mg/L	1200		1900		1800		1700		1900		1900	J	1600		1700		1700		24		820		980		7.3		620		710		12		420		470	
Potassium	mg/L	350		580		560		570		600		590	J	480		520		530		5.0		160		220		7.3		110		140		4.5		100		110	
Sodium	mg/L	9800		16000		15000		15000		16000		16000	J	13000		14000		14000		240		7200		9000		110		5600		6400		100		4200		4300	
Boron	mg/L	3.6		5.9		5.6		5.6		6.1		6.1		4.7		5.4		5.4		0.080		1.3		2.0		0.051		0.760		1.1		0.058		0.720		0.820	
Strontium	mg/L	8.7		12.0		12.0		14.0		14.0		14.0		11.0		12.0		12.0		1.4		8.0		8.5		1.3		7.2		7.7		1.2		7.2		8.1	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	60		99		99		87		91		130	J	73		82		93		1.6		38	J	46		0.61		39		39		0.53		23		30	
Chloride	mg/L	17000		29000		28000		29000		31000		32000	J	25000		27000		28000		470		15000	J	16000		220		11000		12000		190		7500		8300	
Fluoride	mg/L	0.20	U	0.20	U	0.20	U	0.26	I	0.20	U	0.20	UJ	0.20	U	0.20	U	0.20	U	0.076		0.20	UJ	0.20	U	0.20	U	0.20	U	0.20	U	0.19		0.020	U	0.020	U
Sulfate	mg/L	2600		4000		4200		3600		3800		3800	J	3200		3500		3400		18		1500	J	1700		16		1200		1500		110		700		820	
Total Ammonia	mg/L as N	1.0		1.5		1.4																															
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	230		160		170		150		180		170	J	310		210		210		310		190	J	190		240		220		210		260		200		210	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	230		160		170		150		180		170	J	310		210		210		310		190	J	190		240		220		210		260		200		210	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	3.5		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	32000		49000		48000		50000		52000		54000		43000		49000		47000		1100		23000		28000		660		19000		21000		600		12000		13000	
Dissolved Inorganic Carbon	mg/L	62		42		46		42		49		49		84		57		57		82		54		64		56		59		58		68		55		56	
$\delta^{18}O$	‰	2.5		4.5		4.4		4.2		4.4		4.7		3.4		3.9		3.2		-2.5		1.2		2.2		-1.3		0.7		1		-2.5		-0.7		-1.1	
$\delta^{2}H$	‰	21.4		30.7		23.7		21.4		24.2		26.9		15.6		25.5		26.7		-2.0		10.5		15.4		-4.3		1.1		11.4		-4.9		0.3		0.9	
$\delta^{13}C$	‰	-6.66		-6.24		-6.05		-7.15		-6.67		-6.62		-8.47		-7.43		-7.72		-10.71		-7.65		-6.94		-10.43		-8.52		-8.16		-11.18		-7.39		-2.91	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		31.7		48.0		48.7		48.7		52.7		51.4		43.7		46.7		47.5		1.1	J	24.0		28.1		0.6		19.2		20.4		0.6	J	13.1		14.4	
$^{87}Sr/^{86}Sr$	mg/L*	0.70909		0.70912		0.70913		0.70911		0.70909		0.70909		0.70912		0.70912		0.70912		0.70915		0.70912		0.70908		0.70916		0.70915		0.70911		0.70913		0.70914		0.70909	
Tritium	pCi/L (1σ)	937 (57)		2535 (151)		2658 (161)		2910 (180)		3250 (200)		3420 (200)		823 (57)		2110 (132)		2053 (123)		15.0 (6.9)		277 (19)		581 (40)		-4.5 (7.6)	UJ	218 (18)		295 (22)		3.8 (6.4)	UJ	14.7 (6.8)		23.2 (6.9)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

TPGW-1 cluster sampled for total ammonia per SFWMD (rejected June results); TPGW-10 & 14 clusters were sampled for nutrients and trace metals per SFWMD request to FPL (11/30/10).

[1] Sample TPGW-DUP1 (12/7/2010) is a duplicate of TPGW-7S.

[2] Sample TPGW-DUP1 (12/14/2010) is a duplicate of TPGW-11S.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MDL = Method detection limits.

PQL = Practical quantitation limits.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

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Table 3.1-3. Summary of Groundwater Analytical Results from the December 2010 Sampling Event

Parameter	Units	TPGW-7S 12/7/2010		TPGW-DUP1 [1] 12/7/2010		TPGW-7M 12/7/2010		TPGW-7D 12/7/2010		TPGW-8S 12/8/2010		TPGW-8M 12/8/2010		TPGW-8D 12/8/2010		TPGW-9S 12/8/2010		TPGW-9M 12/8/2010		TPGW-9D 12/8/2010		TPGW-10S 12/14/2010		TPGW-10M 12/14/2010		TPGW-10D 12/14/2010		TPGW-11S 12/14/2010		TPGW-DUP1 12/14/2010		TPGW-11M 12/14/2010		TPGW-11D 12/14/2010		TPGW-12S 12/9/2010		TPGW-12M 12/9/2010		TPGW-12D 12/9/2010	
Temperature	°C	24.02				23.21		23.37		23.92		23.86		23.73		25.08		24.21		24.66		21.66		19.80		20.92		20.79				20.39		18.32		25.27		25.1		24.83	
pH	SU	8.62				7.35		7.39		12.02		7.33		7.18		7.02		7.32		7.03		7.29		7.64		7.30		6.96				6.79		7.05		6.76		7.09		7.38	
Dissolved Oxygen	mg/L	0.07				0.7		0.14		0.08		0.16		0.07		0.36		0.2		0.08		0.37		0.22		0.44		0.32				0.29		0.29		0.14		0.05		0.14	
Specific Conductance	µS/cm	516	J			632	J	585	J	3014	J	646	J	723	J	611	J	668	J	671	J	50505		55131		55483		54920				56022		58983		40997		66765		64747	
Turbidity	NTU	0.4				0.59		0.67		1.64		0.68		0.47		4.67		1.68		0.27		0.32		0.68		2.04		0.38				0.45		0.28		0.26		0.08		7.13	
Arsenic	mg/L																					0.100	I	0.061	I	0.052	I														
Barium	mg/L	0.023	I	0.016	I V	0.016	U	0.023	I	0.160	I	0.029	I	0.029	I	0.040	I	0.036	I	0.041	I	0.016	U	0.016	U	0.042	I	0.016	U	0.025	I	0.016	U	0.020	IJ	0.050	I	0.084	I	0.019	I
Beryllium	mg/L																					0.0037	U	0.0037	U	0.0043	I														
Cadmium	mg/L																					0.0076	U	0.0077	I	0.0076	U														
Copper	mg/L																					0.017	I	0.0065	U	0.0065	U														
Iron	mg/L	0.160	I	0.170	I	0.320	I	0.470	I	0.054	U	0.690	I	0.440	I	0.089	I	0.360	I	0.680	I	0.380	I	0.390	I	0.500	I	0.390	I	0.330	I	0.420	I	0.540	I	0.260	I	0.540	I	0.540	I
Lead	mg/L																					0.047	U	0.047	U	0.047	U														
Manganese	mg/L																					0.020	I	0.025	I	0.028	I														
Molybdenum	mg/L																					0.0094	U	0.023	I	0.018	I														
Nickel	mg/L																					0.028	U	0.028	U	0.028	U														
Selenium	mg/L																					0.160	I	0.160	I	0.069	I														
Thallium	mg/L																					0.084	I	0.033	U	0.110	I														
Vanadium	mg/L																					0.010	U	0.010	U	0.010	U														
Zinc	mg/L																					0.110	I	0.035	U	0.035	U														
Silica	mg/L																																								
Calcium	mg/L	78		77		85		88		230		99		99		110		120		110		440		490		520		520		530		590		600		450		570		580	
Magnesium	mg/L	3.0		3.0		3.9		3.7		0.024	I	3.7		6.0		2.3		3.4		3.8		1300		1400		1400		1400		1400		1500		1500		990		1700		1700	
Potassium	mg/L	9.7		9.6		7.3		4.4		11		9.2		8.0		3.6		7.9		3.3		380		420		430		420		420		450		440		510		520		550	
Sodium	mg/L	20		20		20		27		21		20		31		8.9		14		20		11000		11000		12000		12000		12000		12000		12000		8500		15000		15000	
Boron	mg/L	0.050		0.049	I	0.051		0.053		0.031	I	0.062		0.068		0.032	I	0.055		0.048	I	4.5		4.9		4.9		5.0		5.2		5.3		4.9		3.3		5.4		5.5	
Strontium	mg/L	0.850		0.850		0.860		0.870		0.960		1.1		1.1		0.820		1.0		1.1		8.2		9.2		9.8		9.2		9.3		10.0		10.0		7.3		11.0		11.0	
Chromium VI	mg/L																																								
Mercury	mg/L																																								
Bromide	mg/L	0.15		0.15		0.15		0.20		0.17		0.15	J	0.23		0.096	J	0.27	J	0.32	J	55		61		63		63		61		64		67		43		77		57	
Chloride	mg/L	37		37		36		43		35		33	J	51		14	J	24	J	28	J	20000		22000		22000		21000		21000		21000		22000		15000		26000		26000	
Fluoride	mg/L	0.12		0.11		0.083		0.095		0.020	U	0.020	UJ	0.020	U	0.095	J	0.020	UJ	0.020	UJ	0.54		0.43	I	0.23	I	0.55		0.62		0.39	I	0.37	I	0.37	I	0.20	U	0.20	U
Sulfate	mg/L	20	J-	21		21		24		110		130	J	45	J-	82	J	110	J	220	J	2400		2700		2800		2800		2700		2800		2800		1800		3100		2400	
Total Ammonia	mg/L as N																					0.41	J	0.31		0.30															
Ammonium Ion (NH^{4+})	mg/L																					0.52		0.39		0.38															
Unionized NH_3	mg/L																					0.0043		0.0063		0.0031															
Nitrate/Nitrite as N	mg/L																					0.10	U	0.10	U	0.10	U														
TKN	mg/L																					0.31	J	0.26		0.44															
TN	mg/L																					0.31		0.26		0.44															
Orthophosphate	mg/L																					0.054	J	0.059	J	0.067	J														
Phosphorus (P)	mg/L																					0.017	J	0.022	J	0.025	J														
Alkalinity	mg/L ($CaCO_3$)	160		160		200		190		570		220	J	210		280	J	270	J	250	J	130		110		110		300		260		320		300		490		190		180	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	160		160		200		190		1.0	U	220	J	210		280	J	270	J	250	J	130		110		110		300		260		320		300		490		190		180	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	4.8		1.8		1.3		14		13		8.3		5.1		18		1.1		1.0	U
Total Dissolved Solids	mg/L	260		260		290		300		600		350		380		330		370		360		32000		35000		34000		32000		35000		34000		37000		25000		43000		46000	
Dissolved Inorganic Carbon	mg/L	37		35		54		53		69		56		57		73		71		66		37		32		33		75		79		89		87		120		49		48	
$\delta^{18}O$	‰	-1.5		-1.6		-1.4		-1.5		-2.3		-2		-1.8		-1		-1.6		-1.7		1.9		1.8		1.9		1.6		1.6		1.5		2.3		0.9		3.6		3.9	
$\delta^{2}H$	‰	-8.9	J	-6.5	J	-4.8		-10.4		-5.2		-3.3		-12.9		-1.7		-5.1		-5.4		13.2		11.3		16.7		12.9		12.6		15.8		16.7		11.8		24.2		28.6	
$\delta^{13}C$	‰	-10.15		-10.04		-9.25		-9.24		-12.69		-9.78		-9.43		-8.13		-10.01		-9.95		-4.20		-4.26		-6.81		-9.63		-9.46		-10.58		-11.2		-12.55		-6.85		-6.58	
Gross Alpha	pCi/L																																								
Salinity (PSS-78)		0.3	J			0.3	J	0.3	J	1.6	J	0.3	J	0.4	J	0.3	J	0.3	J	0.3	J	33.2		36.6		36.9		36.4				37.3		39.5		26.2		45.4		43.8	
$^{87}Sr/^{86}Sr$	mg/L*	0.70914		0.7092		0.70913		0.70913		0.70912		0.7091		0.70913		0.70915		0.70913		0.70909		0.70916		0.70913		0.70912		0.70913		0.70915		0.70914		0.70914		0.70913		0.70912		0.70912	
Tritium	pCi/L (1σ)	1.1 (7.8)	UJ	-4.1 (7.5	UJ	13.5 (7.9)		5.9 (7.6)	UJ	-1.1 (7.7)	UJ	2.8 (6.3)	UJ	3.5 (6.5)	UJ	10.0 (6.5)		7.8 (6.5)		4.8 (6.5)	UJ	11.4 (5.3)		12.4 (5.4)		7.7 (5.2)		16.3 (5.4)		1.4 (5.1)	UJ	28.2 (8.3)		338 (25)		275 (21)		1740 (100)		1570 (90)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

TPGW-1 cluster sampled for total ammonia per SFWMD (rejected June results); TPGW-10 & 14 clusters were sampled for nutrients and trace metals per SFWMD request to FPL (11/30/10).

[1] Sample TPGW-DUP1 (12/7/2010) is a duplicate of TPGW-7S.

[2] Sample TPGW-DUP1 (12/14/2010) is a duplicate of TPGW-11S.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MDL = Method detection limits.

PQL = Practical quantitation limits.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-3. Summary of Groundwater Analytical Results from the December 2010 Sampling Event

Parameter	Units	TPGW-13S 12/9/2010		TPGW-13M 12/9/2010		TPGW-13D 12/9/2010		TPGW-14S 12/14/2010		TPGW-14M 12/14/2010		TPGW-14D 12/14/2010		FB1 12/7/2010		FB1 12/8/2010		FB1 12/9/2010		FB1 12/10/2010		FB1 12/11/2010		FB1 12/14/2010	
Temperature	°C	29.38		28.83		28.83		22.25		22.28		21.97													
pH	SU	6.91		7.1		7.05		6.84		7.10		6.9													
Dissolved Oxygen	mg/L	0.17		0.2		0.13		0.16		0.4		0.27													
Specific Conductance	µS/cm	90261		83608		86786		58631		64180		73000													
Turbidity	NTU	1.55		1.49		0.43		0.35		1.51		0.1													
Arsenic	mg/L							0.025	U	0.025	U	0.073	I												
Barium	mg/L	0.016	U	0.069	I	0.037	I	0.016	U	0.016	U	0.016	U	0.002	I V	0.00091	I V	0.0013	I V	0.00098	I V	0.00081	U	0.0033	I
Beryllium	mg/L							0.0037	U	0.0037	U	0.0037	U												
Cadmium	mg/L							0.010	I	0.017	I	0.019	I												
Copper	mg/L							0.054	I	0.019	I	0.0065	U												
Iron	mg/L	0.270	I	3.7		1.8		0.500	I	0.460	I	0.500	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0033	I	0.0042	I V
Lead	mg/L							0.075	I	0.094	I	0.047	U												
Manganese	mg/L							0.042	I	0.040	I	0.042	I												
Molybdenum	mg/L							0.020	I	0.017	I	0.013	I V												
Nickel	mg/L							0.042	I	0.028	I	0.028	U												
Selenium	mg/L							0.069	U	0.069	U	0.069	U												
Thallium	mg/L							0.033	U	0.033	U	0.033	U												
Vanadium	mg/L							0.010	U	0.010	U	0.010	U												
Zinc	mg/L							0.035	U	0.035	U	0.035	U												
Silica	mg/L																								
Calcium	mg/L	710		720		700		590		630		710		0.10	U	0.10	U	0.10	U	0.17	I	0.23	I	0.32	I
Magnesium	mg/L	2300		2300		2300		1500		1700		2000		0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.026	I
Potassium	mg/L	790		750		780		450		490		590		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	20000		19000		20000		13000		14000		16000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	8.7		7.8		7.9		5.1		5.3		6.5		0.010	U	0.010	U	0.010	U	0.010	U	0.010	U	0.010	U
Strontium	mg/L	15.0		15.0		15.0		10.0		11.0		14.0		0.001	U	0.001	U	0.001	U	0.0017	I	0.0023	I	0.0025	I
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	110		100		110		68		74		90		0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	36000		33000		35000		23000		25000		30000	J+	0.20	U	0.20	U	0.20	U	0.34	I	0.20	I	0.20	U
Fluoride	mg/L	0.30	I	0.20	U	0.20	U	0.31	I	0.28	I	0.25	I J-	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Sulfate	mg/L	4500		4100		4300		2900		3100		3700		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Total Ammonia	mg/L as N							0.68		1.0		1.7													
Ammonium Ion (NH^{4+})	mg/L							0.87		1.3		2.2													
Unionized NH_3	mg/L							0.0027		0.0071		0.0075													
Nitrate/Nitrite as N	mg/L							0.10	U	0.10	U	0.10	U												
TKN	mg/L							1.0		1.8		2.7													
TN	mg/L							1.0		1.8		2.7													
Orthophosphate	mg/L							0.083	J-	0.096	J	0.10	J												
Phosphorus (P)	mg/L							0.041	J	0.039	J	0.049	J												
Alkalinity	mg/L ($CaCO_3$)	200		170		160		280		260		200		1.0	U	1.3		3.1		1.6		1.9		1.1	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	200		170		160		280		260		200		1.0	U	1.3		3.1		1.6		1.9		1.1	
Sulfides	mg/L	25		1.0	U	1.0	U	8.8		5.9		4.8		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	62000		56000		67000		38000		39000		54000		5.0	U	5.0	U			5.0	U	5.0	U	5.0	U
Dissolved Inorganic Carbon	mg/L	45		43		43		86		70		62		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
$\delta^{18}O$	‰	5.6		4.9		5.1		2.5		3.4		4.6		-2.2		-1.3		-1.3		-1.2		-1.2		-1.1	
$\delta^{2}H$	‰	26.2		30.8		31.3		24.4		19.8		30.1		-6.9		-7.7		-8.9		-7.0		-7.5		-2.8	
$\delta^{13}C$	‰	-8.43		-7.21		-6.93		-8.58		-10		-8.07		-18.46		-17.74		-9.49		-16.01		-10.46		-9.74	
Gross Alpha	pCi/L																								
Salinity (PSS-78)		64.2		58.7		61.3		39.2		43.4		50.3													
$^{87}Sr/^{86}Sr$	mg/L*	0.70911		0.7091		0.70909		0.70912		0.70911		0.7091		0.014		0.019		0.011		0.429		0.557		0.696	
Tritium	pCi/L (1σ)	3460 (210)		3980 (240)		4180 (260)		230 (18)		851 (57)		2640 (161)		2.4 (7.9)	UJ	4.7 (6.4)	UJ	3.0 (7.9)	UJ	-0.8 (7.5)	UJ	7.0 (7.6)	UJ	0 (7.3)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

TPGW-1 cluster sampled for total ammonia per SFWMD (rejected June results); TPGW-10 & 14 clusters were sampled for nutrients and trace metals per SFWMD request to FPL (11/30/10).

[1] Sample TPGW-DUP1 (12/7/2010) is a duplicate of TPGW-7S.

[2] Sample TPGW-DUP1 (12/14/2010) is a duplicate of TPGW-11S.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

MDL = Method detection limits.

PQL = Practical quantitation limits.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-4. Summary of Groundwater Analytical Results from the March 2011 Sampling Event

Parameter	Units	TPGW-1S		PGW-DUP1		TPGW-1M		TPGW-1D		TPGW-2S		TPGW-2M		TPGW-2D		TPGW-3S		TPGW-3M		TPGW-3D		TPGW-4S		TPGW-4M		TPGW-4D		TPGW-5S		TPGW-5M		TPGW-5D		TPGW-6S		TPGW-6M		TPGW-6D	
		3/21/2011		3/21/2011		3/21/2011		3/21/2011		3/18/2011		3/18/2011		3/18/2011		3/18/2011		3/18/2011		3/18/2011		3/4/2011		3/4/2011		3/4/2011		3/2/2011		3/2/2011		3/2/2011		3/16/2011		3/16/2011		3/16/2011	
Temperature	°C	25.49				25.73		25.95		25.88		26.21		26.53		26.02		26.16		25.94		24.99		24.81		24.79		23.91		23.87		23.89		23.7		23.89		23.92	
pH	SU	7.01				7.39		7		7.22		6.99	J	7.12		6.84	J	7		7.06		7.33		7.17		6.89	J	8.06		7.02		6.72	J	7.19	J	6.95	J	7.07	J
Dissolved Oxygen	mg/L	0.12	J			0.26	J	0.12	J	0.09	J	0.13	J	0.36	J	0.14	J	0.22	J	0.1	J	0.17	J	0.15	J	0.09	J	0.12	J	0.27	J	0.21	J	0.2	J	0.07	J	0.19	J
Specific Conductance	µS/cm	43289				70962		70257		75624		73519		77912		65810		68320		71205		2790		37791		43423		1387		30324		32768		1148		21758		24028	
Turbidity	NTU	0.31				0.5		0.31		0.4	J	0.46	J	1.05	J	0.73	J	0.25	J	0.27	J	0.76		1.28		0.41		2.15		0.7		0.85		0.54		0.47		0.96	
Arsenic	mg/L	0.025	U	0.035	I	0.039	I	0.025	U	0.025	U	0.025	U	0.025	U																								
Barium	mg/L	0.09	I	0.054	I	0.07	I	0.13	I	0.04	I	0.021	I	0.032	I	0.023	I	0.024	I	0.016	I	0.018	I	0.11	I	0.069	I	0.031	I	0.37		0.21		0.016	U	0.081	I	0.094	I
Beryllium	mg/L	0.0037	U	0.0037	U	0.0037	U	0.0037	U	0.0037	U	0.0037	U	0.0037	U																								
Cadmium	mg/L	0.0076	U	0.0076	U	0.0076	U	0.0076	U	0.0076	U	0.0076	U	0.0076	U																								
Copper	mg/L	0.095	I	0.098	I	0.3	I	0.052	IVJ	0.058	I	0.069	I	0.059	I																								
Iron	mg/L	1.5		1.7		2.8		0.61	I	1.7		0.49	I	0.84	I	0.32	I	1.5		1		0.12	I	5.9		6.1		0.51	I	3.1		2.5		0.15	I	1.2		1.3	
Lead	mg/L	0.047	U	0.047	U	0.047	U	0.047	U	0.047	U	0.047	U	0.047	U																								
Manganese	mg/L	0.049	I	0.051	I	0.061	I	0.041	I	0.046	I	0.042	I	0.045	I																								
Molybdenum	mg/L	0.014	I	0.0094	U	0.016	I	0.0098	I J	0.02	I	0.0092	U	0.0094	U																								
Nickel	mg/L	0.028	U	0.028	U	0.028	U	0.028	U	0.028	U	0.028	U	0.028	U																								
Selenium	mg/L	0.069	U	0.093	I	0.078	I	0.1	I	0.069	U	0.069	U	0.069	U																								
Thallium	mg/L	0.033	U	0.033	U	0.033	U	0.033	U	0.033	U	0.033	U	0.033	U																								
Vanadium	mg/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U																								
Zinc	mg/L	0.035	U	0.035	U	0.035	U	0.035	U	0.072	I	0.087	I	0.084	I																								
Silica	mg/L																																				
Calcium	mg/L	480		490		650		640		740		720	J	700		670		660		660	J	150		570		600		140		610		590		120		470		490	
Magnesium	mg/L	1100		1000		1900		1800		1700		1800	J	1800		1500		1600		1600	J	34		800		1000		8.3		620		670		12		440		480	
Potassium	mg/L	320		310		570		560		610		650	J	630		510		570		570	J	7.8		180		260		7.8		110		140		4.6		92		100	
Sodium	mg/L	8500		8200		15000		14000		15000		16000	J	16000		13000		14000		15000	J	360		6900		8400		140		5400		5800		90		3800		4000	
Boron	mg/L	3		2.9		5.5		5.3		5.7		6.1		6		4.6		5.4		5.4		0.093		1.2		1.9		0.049		0.76		1		0.063		0.77		0.81	
Strontium	mg/L	8		7.9		11		11		14		15		14		12		13		13		1.4		7.4		8.2		1.4		6.7		6.8		1.1		7.3		7.8	
Chromium VI	mg/L	0.005	U	0.005	U	0.005	U	0.0066	I	0.005	U	0.005	U	0.005	UJ-																								
Mercury	mg/L	7.2E-05	U	7.2E-05	U	0.000072	U	0.000072	U	0.000072	U	0.000072	U	7.2E-05	UJ-																								
Bromide	mg/L	53		53		86		97	J	170	J	180	J	180	J	87	J	130	J	96	J	2.3		47		55		1.1		36		39		0.58		28		30	
Chloride	mg/L	17000		16000		29000		29000	J	30000	J	34000	J	32000	J	26000	J	31000	J	29000	J	670		13000		16000		300		10000		11000		190		7900		8400	
Fluoride	mg/L	0.2	U	0.2	U	0.2	U	0.2	U J	0.2	U J	0.2	U J	0.2	U J	0.2	U J	0.2	U J	0.2	U J	0.093		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.1		0.2	U	0.2	U
Sulfate	mg/L	2000		2000		3600		3500	J	3800	J	4200	J	3900	J	3200	J	3800	J	3400	J	40		1500		2000		19	J-	1100		1300		9.2		740		800	
Total Ammonia	mg/L as N	0.87		0.76		1.3		1.3		1.5		1.5		1.7																								
Ammonium Ion (NH^{4+})	mg/L	1.1				1.6		1.7		1.9		1.9		2.2																								
Unionized NH_3	mg/L	0.006				0.023		0.010		0.017		0.011		0.016																								
Nitrate/Nitrite as N	mg/L	0.8		0.068		1.2		8		0.026		0.15		5.3																								
TKN	mg/L	1.1		0.99		1.8		2.2		2.1		2.4		2.1																								
TN	mg/L	1.8		1.1		2.3		9.8		2.1		2.2		7.7																								
Orthophosphate	mg/L	0.019		0.017		0.03		0.039		0.024		0.029		0.043																								
Phosphorus (P)	mg/L	0.034		0.019		0.043		0.054		0.03		0.035		0.053																								
Alkalinity	mg/L ($CaCO_3$)	240		250		160		160	J	180	J	190	J	180	J	330	J	200	J	210	J	280		190		180		220		210		200		270		210		200	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	240		250		160		160	J	180	J	190	J	180	J	330	J	200	J	210	J	280		190		180		220		210		200		270		210		200	
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2.4		1	U	1	U	1.1		1	U	1	U	1	U	1	U	1	U	1.1		1	U	1	U
Total Dissolved Solids	mg/L	27000		28000		49000		50000		50000		52000		52000		43000		48000		47000		1400		22000		26000		850		18000		20000		620		13000		14000	
Dissolved Inorganic Carbon	mg/L	76		79		46		50		46		52		52		87		71		59		89		68		65		61		67		69		80		60		65	
$\delta^{18}O$	‰	1.9		-		4.3		4.5		4.6		4.7		4.8		3.5		4.0		4.2		-0.9		1.6		2.4		-1.3		0.5		0.9		-1.8		-0.7		-0.4	
$\delta^{2}H$	‰	18.0		-		24.0		31.0		25.0		32.0		27.0		22.0		28.0		23.0		-1.0		15.0		22.0		0.0		11.0		7.0		-9.0		2.0		2.0	
$\delta^{13}C$	‰	-7.35		-7.44		-6.43		-6.04		-7.03		-6.77		-6.84		-8.87		-7.41		-7.8		-10.46		-7.71		-7.06		-10.51		-8.89		-8.69		-11.56		-7.28		-6.93	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		27.8				48.7		48.1		52.4		50.7		54.2		44.6		46.6		48.8		1.4		24.0		28.0		0.7		18.8		20.5		0.6		13.1		14.6	
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70915		0.70913		0.70913		0.70911		0.70906		0.70912		0.70912		0.70912		0.70911		0.70911		0.7091		0.70911		0.70915		0.70912		0.7091		0.70911		0.70912		0.70911	
Tritium	pCi/L (1σ)	810(50)		740(50)		2440(150)		2560(160)		3030(200)		3520(200)		3320(70)		236(14)		1940(130)		1980(120)		19.4(6.7)		246(18)		519(34)		-0.1 (7.1)	UJ	222 (18)		283(21)		5.1(6.4)	UJ	14.1(6.8)		19.4(7.2)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-DUP1 (3/21/2011) is a duplicate of TPGW-1S.

Text in blue are revised values.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-4. Summary of Groundwater Analytical Results from the March 2011 Sampling Event

Parameter	Units	TPGW-7S		TPGW-7M		TPGW-7D		TPGW-8S		TPGW-8M		TPGW-8D		TPGW-9S		TPGW-9M		TPGW-9D		TPGW-10S		TPGW-10M		TPGW-10D		TPGW-11S		TPGW-11M		TPGW-11D		TPGW-12S		TPGW-12M		TPGW-12D		TPGW-13S		TPGW-13M		TPGW-13D	
		3/4/2011		3/4/2011		3/4/2011		3/3/2011		3/3/2011		3/3/2011		3/3/2011		3/3/2011		3/3/2011		3/7/2011		3/7/2011		3/7/2011		3/7/2011		3/7/2011		3/7/2011		3/23/2011		3/23/2011		3/23/2011		3/9/2011		3/9/2011		3/9/2011	
Temperature	°C	24.14		23.85		24.25		23.98		23.93		23.98		24.5		24.77		24.34		25.28		25.1		24.99		24.49		24.53		24.7		26.23		26.02		26.23		29.55		29.31		29.41	
pH	SU	7.23		7.28		7.51		12.05	J	7.44		7.18		7.28		7.31		7.16		7.35		7.6		7.31		7.01		7.07		6.78	J	6.72	J	7.22		7.19		7.06		7.2		7	
Dissolved Oxygen	mg/L	0.12	J	0.08	J	0.27	J	0.08	J	0.25	J	0.11	J	0.24	J	0.23	J	0.1	J	0.07	J	0.34	J	0.14	J	0.36	J	0.27	J	0.2	J	0.14	J	0.16	J	0.4	J	0.24	J	0.39	J	0.06	J
Specific Conductance	µS/cm	561	J	557	J	600	J	2663		647	J	669	J	621	J	662	J	638	J	51502		55706		56275		55562		56776		58825		40650		64647		64472		87096		83337		84277	
Turbidity	NTU	1.11		0.12		0.17		0.97	J	0.56	J	0.52	J	0.6	J	0.98	J	0.62	J	0.92		0.29		1.11		0.16		0.81		0.71		0.24		0.19		1.98		0.22		0.18		0.13	
Arsenic	mg/L																			0.025	U	0.025	U	0.025	U													0.025	U	0.025	U	0.025	U
Barium	mg/L	0.016	IV	0.022	I	0.016	U	0.094	I	0.016	U	0.016	IV	0.016	U	0.016	U	0.024	I	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.023	I	0.026	I	0.065	I	0.073	I
Beryllium	mg/L																			0.0037	U	0.0037	U	0.0037	U													0.0037	U	0.0037	U	0.0037	U
Cadmium	mg/L																			0.0076	U	0.0076	U	0.0076	U													0.0076	U	0.012	I	0.0076	U
Copper	mg/L																			0.058	I	0.076	I	0.032	I													0.0074	I	0.014	I	0.014	I
Iron	mg/L	0.32	I	0.25	I	0.38	I	0.054	U	0.45	I	0.23	I	0.11	I	0.35	I	0.8	I	0.63	I	0.74	I	0.34	I	0.62	I	0.66	I	0.74	I	0.85	I	0.87	I	1.1		0.78	I	3.5		1.9	
Lead	mg/L																			0.047	U	0.047	U	0.047	U													0.047	U	0.047	U	0.047	U
Manganese	mg/L																			0.012	I	0.019	I	0.014	I													0.03	I	0.067	I	0.062	I
Molybdenum	mg/L																			0.0099	I	0.015	I	0.0097	I													0.014	I	0.0094	U	0.0094	U
Nickel	mg/L																			0.039	I	0.035	I	0.028	U													0.028	U	0.03	I	0.028	U
Selenium	mg/L																			0.069	U	0.069	U	0.069	U													0.069	U	0.069	U	0.069	U
Thallium	mg/L																			0.033	U	0.077	I	0.033	U													0.033	U	0.047	I	0.033	U
Vanadium	mg/L																			0.01	U	0.01	U	0.01	U													0.01	U	0.01	U	0.01	U
Zinc	mg/L																			0.035	U	0.035	U	0.037	I													0.035	U	0.035	U	0.035	U
Silica	mg/L																																					5.4		4.7		5	
Calcium	mg/L	86		87		87		220	J	100		100		110		110		110		430		480		490		510		540		590		460		620		610		770		760		770	
Magnesium	mg/L	3.9		4		3.7		0.02	U J	3.8		6.1		2.5		3.3		3.7		1300		1400		1400		1400		1500		1500		940		1600		1600		2300		2200		2300	
Potassium	mg/L	10		8.6		4.9		12	J	10		8.7		7.4		8		3.6		410		440		450		440		450		470		300		510		500		700		670		700	
Sodium	mg/L	21		21		27		22	J	20		31		12		15		18		9900		11000		11000		11000		11000		11000		7600		13000		12000		18000		17000		17000	
Boron	mg/L	0.062		0.064		0.063		0.038	I	0.063		0.068		0.05		0.056		0.053		4.3		4.6		4.6		4.7		4.8		4.7		2.9		4.8		4.7		7.5		6.7		7.1	
Strontium	mg/L	0.87		0.86		0.85		0.83		1.1		1		0.82		0.99		1.1		7.5		8.7		9.1		8.4		9		9.8		6.9		11		10		14		14		15	
Chromium VI	mg/L																			0.005	U	0.005	U	0.005	U													0.011		0.005	U	0.005	UJ-
Mercury	mg/L																			7.2E-05	U	7.2E-05	U	7.2E-05	U													0.000072	U	0.000072	U	0.000072	UJ-
Bromide	mg/L	0.16		0.15		0.19		0.22	J	0.2		0.27		0.24		0.31		0.39		71	J	76		77		76		73	J	88	J	49		92		100	J	130	J	120	J	120	J
Chloride	mg/L	35		35		42		35	J	33		49		20		25		28		19000	J	22000		22000		22000		23000	J	24000	J	15000		26000		26000	J	38000	J	37000	J	37000	J
Fluoride	mg/L	0.11		0.11		0.1	J+	0.11	J	0.085	J+	0.071		0.085		0.079		0.087		0.2	U J	0.2	U	0.2	U	0.2	U	0.2	U J	0.2	U J	0.4	I	0.2	U	0.2	U J	2.5	I J	2.4	I J	2	U J
Sulfate	mg/L	22		23		24	J-	27	J	45	J-	46		11		22		27	J-	2500	J	2700		2700		2700		2600	J	3100	J	1800		3200		3700	J	4600	J	4300	J	4200	J
Total Ammonia	mg/L as N																			0.32		0.24		0.22														2.8		1.6	Q	1.6	
Ammonium Ion (NH^{4+})	mg/L																			0.41		0.3		0.28														3.6		2		2	
Unionized NH_3	mg/L																			0.004		0.006		0.003														0.026		0.024		0.015	
Nitrate/Nitrite as N	mg/L																			0.014	J	0.016	J	0.013	J													0.34		0.096		0.19	
TKN	mg/L																			0.56	J	0.31	J	0.32	J													3.5		1.9		2.4	
TN	mg/L																			0.57		0.33		0.33														3.8		2		2.6	
Orthophosphate	mg/L																			0.017	J	0.022	J	0.018	J													0.024		0.03		0.031	
Phosphorus (P)	mg/L																			0.026		0.029		0.028														0.044		0.047	J-	0.053	
Alkalinity	mg/L ($CaCO_3$)	200		200		190		490	J	200		200		260		250		230		120	J	110		110		240		290	J	290	J	1.9	J	180		180	J	200	J	160	J	150	J
Bicarbonate Alkalinity as $CaCO_3$	mg/L	200		200		190		1	U J	200		200		260		250		230		120	J	110		110		240		290	J	290	J	1.9	J	180		180	J	200	J	160	J	150	J
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1.1		1	U	1	U	7.5		2.1		2.4		13		7.7		5.9		14		1	U	1	U	22		1	U	1	U
Total Dissolved Solids	mg/L	300		300		310		510	J	340		370		330		350		350		33000		36000		36000		36000		39000		39000		25000		43000		44000		61000		57000		59000	
Dissolved Inorganic Carbon	mg/L	57		56		56		27		66		64		82		79		72		39		34		37		81		95		90		130		52		49		60		47		46	
$\delta^{18}O$	‰	-1.3		-1.3		-1.3		-2.1		-1.9		-1.9		-1.3		-1.5		-1.6		1.7		1.9		1.7		1.6		1.8		2.7		4.2		4.3		4.1		5.6		5.0		5.2	
$\delta^{2}H$	‰	-5.0		-4.0		-2.0		-9.0		-8.0		-6		-2.0		-1.0		-3.0		18.0		19.0		18.0		18.0		15.0		22.0		27.0		21.0		27.0		34.0		34.0		34.0	
$\delta^{13}C$	‰	-9.32		-9.37		-9.21		-12.93		-9.93		-9.48		-9.84		-10.45		-10.13		-4.74		-4.33		-7.41		-9.81		-11.09		-11.74		-13.02		-6.94		-6.65		-8.38		-6.64		-6.95	
Gross Alpha	pCi/L																																										
Salinity (PSS-78)		0.3	J	0.3	J	0.3	J	1.4		0.3	J	0.3	J	0.3	J	0.3	J	0.3	J	33.8		37.0		37.4		36.9		37.8		39.3		26.0		43.7		43.6		61.6		58.5		59.2	
$^{87}Sr/^{86}Sr$	µg/L*	0.70916		0.70918		0.70912		0.70911		0.70915		0.70915		0.70915		0.70912		0.70913		0.70912		0.70913		0.70911		0.70916		0.70915		0.7091		0.70914		0.70912		0.70913		0.7091		0.7091		0.70909	
Tritium	pCi/L (1σ)	13.5(7.5)		12.9(6.5)		2.2(6.1)	UJ	7.3(6.4)		4.4(6.3)	UJ	13(6.6)		10.6(6.1)		8.2(6.6)		1.5(6.3)	UJ	18.4(7.9)	J	2.8(7.2)	UJ	8.2(7.4)	J	2.4(7)	UJ	33.6(8.4)	J	435(31)		238(22)		1680(140)		1640(130)		3800(240)		4030(246)		3830(240)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-DUP1 (3/21/2011) is a duplicate of TPGW-1S.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

Q = Holding time exceeded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-4. Summary of Groundwater Analytical Results from the March 2011 Sampling Event

Parameter	Units	TPGW-14S 3/7/2011		TPGW-14M 3/7/2011		TPGW-14D 3/7/2011		EB1 3/2/2011		FB 3/3/2011		FB1 3/4/2011		FB1 3/7/2011		FB 3/9/2011		EB1 3/16/2011		FB1 3/23/2011	
Temperature	°C	25.15		25.24		25.23															
pH	SU	7.09		7.08		6.93	J														
Dissolved Oxygen	mg/L	0.41	J	0.32	J	0.16	J														
Specific Conductance	µS/cm	59713		64501		74875															
Turbidity	NTU	0.2		0.01		0.4															
Arsenic	mg/L	0.025	U	0.025	U	0.025	U	0.0012	U					0.0012	U	0.0012	U				
Barium	mg/L	0.016	U	0.016	U	0.05	I	0.00084	IV	0.00081	U	0.0008	U	0.00081	U	0.00081	U	0.00081	U	0.0008	U
Beryllium	mg/L	0.0037	U	0.0037	U	0.0037	U	0.00018	U					0.00018	U	0.00018	U				
Cadmium	mg/L	0.0076	U	0.0076	U	0.0076	U	0.00038	U					0.00038	U	0.00038	U				
Copper	mg/L	0.061	I	0.078	I	0.072	I	0.0029	IV					0.0007	IV	0.00034	IV				
Iron	mg/L	0.78	I	0.82	I	0.74	I	0.0033	I	0.0027	U	0.0087	I	0.0027	U	0.0032	IV	0.0059	I	0.032	I
Lead	mg/L	0.047	U	0.047	U	0.047	U	0.0024	U					0.0024	U	0.0024	U				
Manganese	mg/L	0.034	I	0.035	I	0.037	I	0.00046	U					0.00046	U	0.00046	U				
Molybdenum	mg/L	0.0094	U	0.0094	U	0.0094	U	0.00047	U					0.00068	IV	0.00065	I				
Nickel	mg/L	0.033	I	0.028	U	0.028	U	0.0014	U					0.0014	U	0.0014	U				
Selenium	mg/L	0.069	U	0.069	U	0.069	U	0.0034	U					0.0034	U	0.0034	U				
Thallium	mg/L	0.036	I	0.033	U	0.033	U	0.0016	U					0.002	I	0.0016	U				
Vanadium	mg/L	0.01	U	0.01	U	0.01	U	0.00052	U					0.00052	U	0.00052	U				
Zinc	mg/L	0.035	U	0.04	I	0.037	I	0.0022	I					0.0018	U	0.0018	U				
Silica	mg/L																				
Calcium	mg/L	570		600		680		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	1500		1600		2000		0.02	U	0.02	U	0.02	U	0.02	U	0.032	I	0.02	U	0.02	U
Potassium	mg/L	470		500		600		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	12000		13000		15000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U	0.35	I	0.31	U
Boron	mg/L	4.8		5		6.1		0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.018	I
Strontium	mg/L	9.6		10		13		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L	0.005	U	0.005	U	0.005	U									0.005	U Q				
Mercury	mg/L	7.2E-05	U	7.2E-05	U	0.000072	U	7.2E-05	U					7.2E-05	U	7.2E-05	U				
Bromide	mg/L	65		76	J	93	J	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	24000		27000	J	32000	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoride	mg/L	0.2	U	0.2	U J	0.2	U J	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	2300		2700	J	3200	J	0.44	I	0.2	U	0.2	U	0.29	I	0.2	U	0.2	U	0.2	U
Total Ammonia	mg/L as N	0.54		0.84		1.6	J-	0.026	U					0.026	U	0.026	U				
Ammonium Ion (NH^{4+})	mg/L	0.69		1.1		2															
Unionized NH_3	mg/L	0.004		0.006		0.009															
Nitrate/Nitrite as N	mg/L	0.022	J	0.02	J	0.016	J+	0.079						0.042		0.088					
TKN	mg/L	0.9	J	1.3	J	2.7		0.05	U					0.16	I	0.12	I				
TN	mg/L	0.92		1.3		2.7		0.25	U					0.25	U	0.25	U				
Orthophosphate	mg/L	0.053	J	0.046	J	0.071	J+	0.0019	I					0.0049	I	0.0017	IJ+				
Phosphorus (P)	mg/L	0.033	J	0.035	J	0.039	J	0.0044	U					0.0044	U	0.0044	U				
Alkalinity	mg/L ($CaCO_3$)	250		240	J	190	J	1	U	2.7		1	U	1	U	1.7		1	U	3.1	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	250		240	J	190	J	1	U	2.7		1	U	1	U	1.7		1	U	3.1	
Sulfides	mg/L	8.2		4.8		5		1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	39000		43000		52000		5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dissolved Inorganic Carbon	mg/L	85		83		60		10	U	10	U	10	U	10	U	10	U	10	U	10	U
$\delta^{18}O$	‰	2.5		3.5		4.3		-1.1		-1.1		-1.2		-1.2		-1.3		-1.2		-1.2	
$\delta^{2}H$	‰	23.0		22.0		29.0		-3.0		-4.0		0.0		-2.0		-1.0		-6.0		-2.0	
$\delta^{13}C$	‰	-8.89		-10.29		-8.22		-18.59		-13.31		-15.06		-15.63		-12.22		-12.92		-19.58	
Gross Alpha	pCi/L																				
Salinity (PSS-78)		40.0		43.6		51.8															
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70911		0.7091		0.105		0.05000		0.055		0.01900		0.05	U	0.049		0.05	U
Tritium	pCi/L (1σ)	247(20)		772(51)		2660(170)		0(7.4)	UJ	-4.3(7.2)	UJ	5.7(6.2)	UJ	6.8(6.3)		-2.9(6.5)	UJ	-1.5(6.5)	UJ	-1.2(7)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-DUP1 (3/21/2011) is a duplicate of TPGW-1S.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

Q = Holding time exceeded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-5. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPGW-1S 6/10/2011	TPGW-1M 6/10/2011	TPGW-1D 6/10/2011	TPGW-2S 6/15/2011	TPGW-2M 6/15/2011	TPGW-2D 6/15/2011	TPGW-3S 6/15/2011	TPGW-3M 6/15/2011	TPGW-3D 6/15/2011	TPGW-4S 6/7/2011	TPGW-4M 6/7/2011	TPGW-4D 6/7/2011	TPGW-5S 6/16/2011	TPGW-5M 6/16/2011	TPGW-5D 6/16/2011	TPGW-6S 6/6/2011	TPGW-6M 6/6/2011	TPGW-6D 6/6/2011
Temperature	°C	26.31	26.53	26.89	27.3	27.33	27.23	26.58	27.08	26.97	25.18	25.11	25.26	24.73	24.79	24.48	24.37	24.53	24.43
pH	SU	7.2	7.19	7.27	7.3	6.86 J	7.22	6.88 J	7.18	6.81	7.05	7.07	7.07	8.49	6.76 J	7.09	7.06	6.96 J	7.18
Dissolved Oxygen	mg/L	0.18	0.26	0.18	0.17	0.35	0.26	0.25	0.24	0.36	0.11	0.17	0.1	0.9	0.6	0.33	1.29 J	0.29 J	0.15
Spec Cond	µS/cm	59744	70948	70747	77917	78540	76277	64589	69075	70195	2632	37818	43139	1189	31007	32996	1120	22835	24011
Turbidity	NTU	1.06	1.29	1.2	0.94	0.93	0.6	1.05	1.02	0.59	0.36	0.62	0.15	3.27	1.31	1.43	0.34	0.65	0.59
Arsenic	mg/L																		
Barium	mg/L	0.1 I	0.39 I	0.081 U	0.081 U	0.081 U	0.081 U	0.081 U	0.081 U	0.081 U	0.590	2.4	2.0	0.081 U	0.087 I	0.081 U	0.2	2.6	3.0
Beryllium	mg/L																		
Cadmium	mg/L																		
Copper	mg/L																		
Iron	mg/L	1.2 I V	1.5 I	0.27 U	0.93 I	0.71 I	1.3 I	0.4 I	1.2 I	0.77 I	2.9	85	97	0.52 I	2.0 I	1.5 I	2.6	21	20
Lead	mg/L																		
Manganese	mg/L																		
Molybdenum	mg/L																		
Nickel	mg/L																		
Selenium	mg/L																		
Thallium	mg/L																		
Vanadium	mg/L																		
Zinc	mg/L																		
Silica, dissolved	mg/L																		
Calcium	mg/L	580	640	640	740	730	710	690	670	660	160	580	560	130	580	590	110	490	490
Magnesium	mg/L	1500	1800	1800	2100	2200	2100	1700	1900	1800	31	840	970	7.3	640	720	12	460	490
Potassium	mg/L	460	590	590	690	700	670	540	600	590	6.4	180	270	8.2	120	150	4.6	110	120
Sodium	mg/L	12000	14000	14000	16000	17000	16000	13000	15000	15000	310	6800	8000	100	5500	6100	87	3800	4000
Boron	mg/L	4.4	5.7	5.6	6.7	6.7	6.4	4.9	5.6	5.6	0.088 I J	1.3	1.9	0.048 I J	0.76	1.1	0.058 J	0.78	0.82
Strontium	mg/L	9.9	11	11	14	14	14	11	12	12	1.5	7.7	7.8	1.3	6.8	7.5	1.2	8.0	8.1
ChromiumVI	mg/L																		
Mercury	mg/L																		
Bromide	mg/L	84	100 J	110 J	100	130	100 J-	85	94	99	2	43	54	0.27 U	41	38	0.74	25	27
Chloride	mg/L	24000	30000 J	30000 J	31000	31000	32000	25000	28000	26000	610	14000	15000	200	9800	11000	180	7300	7300
Fluoride	mg/L	2 I	2 UJ	2 UJ	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.62 I	0.095	0.69	0.73	0.2 U	0.47 I	0.32 I J-	0.1	0.61	0.62
Sulfate	mg/L	2700	3400 J	3400 J	3500	3100	3300	2500	2600	3400	30	1400	1800	14	980	1100 J-	7.2	680	770
Ammonia	mg/L as N																		
Ammonium Ion (NH^{4+})	mg/L																		
Unionized NH_3	mg/L																		
Nitrate/Nitrite as N	mg/L																		
TKN	mg/L																		
TN	mg/L																		
Orthophosphate	mg/L																		
Phosphorus (P)	mg/L																		
Alkalinity	mg/L ($CaCO_3$)	80	160 J	160 J	160 J	110	140	250	190	170	290	200	190	220	200	190	270	200	210
Bicarbonate Alkalinity as CaCO3	mg/L	80	160 J	160 J	160 J	110	140	250	190	170	290	200	190	220	200	190	270	200	210
Sulfide	mg/L	1 U	1 U	1 U	2.6	2.7	1 U	4.6 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Dissolved Solids	mg/L	37000	48000	48000	54000	54000	52000	43000	47000	47000	1400	24000	28000	640	20000	20000	610	14000	14000
Dissolved Inorganic Carbon	mg/L	55	48	46	51	52	50	94	57	59	76	53	50	54	63	58	67	55	57
$d^{18}O$	‰	3.9	4.8	4.8	4.5	4.8	4.9	3.2	3.7	3.8	-0.8	1.9	2.7	-1.5	0.4	0.9	-1.5	-0.6	-0.5
$d^{2}H$	‰	22.0	26.0	26.0	27.7	32.1	31.1	23.4	26.3	28.9	-2.0	10.0	15.0	0.2	9.0	7.8	-3.0	1.0	4.0
$d^{13}C$	‰	-6.60	-6.41	-6.16	-6.88	-6.97	-6.67	-9.09	-7.57	-7.63	-10.54	-7.84	-7.17	-10.19	-8.51	-8.15	-11.24	-7.14	-7.03
Gross Alpha	pCi/L																		
Salinity		40.0	48.6	48.5	54.1	54.6	52.8	43.7	47.1	48.0	1.4	24.0	27.7	0.6	19.3	20.6	0.6	13.8	14.6
$^{87}Sr/^{86}Sr$	µg/L*	0.70914	0.70913	0.70913	0.7091	0.70911	0.70912	0.70911	0.70907	0.70911	0.70913	0.70912	0.7091	0.70915	0.70912	0.70912	0.70915	0.70911	0.70907
Tritium	pCi/L (1σ)	1320 (80)	2510 (140)	1980 (110)	3670 (210)	3690 (210)	3270 (190)	620 (40)	1960 (110)	2070 (120)	10.2 (5.6) J	281 (18)	433 (26)	16 (4.7)	156 (11)	288 (18)	19.7 (5.7) J	5.7 (5.6) J	32.7 (6.1) J

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample TPGW-Dup1 (6/14/2011) is a duplicate of TPGW-10M.
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-5. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

		TPGW-7S		TPGW-7M		TPGW-7D		TPGW-8S		TPGW-8M		TPGW-8D		TPGW-9S		TPGW-9M		TPGW-9D		TPGW-10S		TPGW-10M		TPGW-DUP1 [1]		TPGW-10D		TPGW-11S		TPGW-11M		TPGW-11D	
Parameter	**Units**	**6/16/2011**		**6/16/2011**		**6/16/2011**		**6/6/2011**		**6/6/2011**		**6/6/2011**		**6/6/2011**		**6/6/2011**		**6/6/2011**		**6/14/2011**		**6/14/2011**		**6/14/2011**		**6/14/2011**		**6/13/2011**		**6/13/2011**		**6/13/2011**	
Temperature	°C	24.33		24.47		24.47		24.22		29.18		24.46		25		25.22		24.68		26.71		26.86				27.17		26.69		27.05		26.86	
pH	SU	7.12		7.13		7.44		12.03	J	7.11		7.14		7.08		6.97	J	7.07		7.24		7.44				7.2		6.93		6.7		7.04	J
Dissolved Oxygen	mg/L	0.4		0.35		0.31		0.17		0.31	J	0.23		0.25		0.38	J	0.31		0.32		0.35				0.19		0.33		1.04		0.3	
Spec Cond	µS/cm	572	J	579	J	586	J	2570		645	J	694	J	643	J	651	J	646	J	51442		55203				55931		55906		56720		59546	
Turbidity	NTU	1.19		1.25		1.43		0.8		0.55		0.37		2.41		7		0.57		1.24		1.07				0.85		1.21		1.39		1.41	
Arsenic	mg/L																																
Barium	mg/L	0.081	U	0.081	U	0.081	U	2.2		0.31		0.32		0.39		0.35		0.35		0.081	U	0.081	U	0.15	I	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.31	I	0.27	U	0.4	I	0.068	I	8.6		3.8		1.3		5.2		13		0.63	I V	0.66	I V	0.65	I V	0.63	I V	0.54	I V	0.48	I V	0.62	I V
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica, dissolved	mg/L																																
Calcium	mg/L	87		85		86		210		100		97		110		110		110		410		450		470		470		490		520		570	
Magnesium	mg/L	4.1		3.9		3.7		0.022	I	3.7		6		3		3.1		3.7		1300		1400		1400		1400		1400		1400		1500	
Potassium	mg/L	9.5		8.3		4.5		10		8.4		7.7		6.9		6.7		3.2		420		460		470		450		460		450		490	
Sodium	mg/L	20		20		26		20		19		28		13		13		16		10000		11000		11000		11000		12000		12000		12000	
Boron	mg/L	0.051	J	0.05	J	0.05	J	0.03	I J	0.062	J	0.068	J	0.049	I J	0.047	I J	0.049	I J	4.2		4.5		4.6		4.4		4.7		4.7		4.7	
Strontium	mg/L	0.88		0.88		0.85		0.76		1.0		1.0		0.98		0.98		1.1		7.5		8.6		8.8		8.9		8.5		8.7		9.7	
ChromiumVI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	0.18		0.18		0.2		0.19		0.2		0.26		0.29		0.3		0.4	J+	74		79		82		82		70		76		81	
Chloride	mg/L	37		37		42		32		30		43		21		22		27	J-	21000		24000		21000		23000		21000		22000		23000	
Fluoride	mg/L	0.11		0.13		0.1		0.17		0.11		0.11		0.11		0.1		0.13		0.61		0.49	I J-	0.54		20	U	0.52		0.4	I	0.32	I
Sulfate	mg/L	23		23		23		22		39		46		15		15		28	J-	2400		2700		2700		2700		2400		2600		2700	
Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH_3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	200		200		200		490		220		210		270		270		250		100		100		85		110		240		290		270	
Bicarbonate Alkalinity as CaCO3	mg/L	200		200		200		1	U	220		210		270		270		250		100		100		85		110		240		290		270	
Sulfide	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1.1		1	U	1	U	5.6		1.3	J	1.6	J	1	U	12		6.2		6.1	
Total Dissolved Solids	mg/L	310		320		320		550		350		370		350		350		350		34000		37000		36000		37000		35000		37000		40000	
Dissolved Inorganic Carbon	mg/L	56		58		60		51		59		56		69		68		64		26		31		32		34		71		84		78	
$d^{18}O$	‰	-1.5		-1.3		-1.4		-2.6		-1.8		-1.9		-1.5		-1.3		-1.8		1.6		2.1		1.9		2.0		1.8		1.6		2.7	
$d^{2}H$	‰	-4.9		-7.7		-7.0		-8.0		-5.0		-10.0		-4.0		-5.0		-9.0		17.0		16.0	J	20.0	J	18.0		22.0		18.0		23.0	
$d^{13}C$	‰	-9.44		-9.23		-9.15		-11.55		-10.28		-9.84		-10.60		-10.42		-10.01		-4.57		-3.94		-4.16		-6.81		-9.84		-10.54		-11.52	
Gross Alpha	pCi/L																																
Salinity		0.3	J	0.3	J	0.3	J	1.3		0.3	J	0.3	J	0.3	J	0.3	J	0.3	J	33.7		36.5				37.1		37.1		37.7		39.8	
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70912		0.70912		0.70913		0.70912		0.70913		0.70913		0.70915		0.7091		0.70914		0.70915		0.70913		0.70915		0.70913		0.70915		0.70915	
Tritium	pCi/L (1σ)	17.5 (5.7)		-1 (4.3)	UJ	4.9 (4.4)		16.6 (6.4)	J	24.4 (6.6)	J	28.8 (6.8)	J	10.2 (6.2)	J	15.6 (7.1)	J	13.3 (6.4)	J	24.2 (5.2)		14.5 (4.9)		12 (4.9)		16.2 (5.1)		21.6 (5.2)		25.8 (5.1)		429 (27)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/14/2011) is a duplicate of TPGW-10M.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-5. Summary of Groundwater Analytical Results from the June 2011 Sampling Event

		TPGW-12S		TPGW-12M		TPGW-12D		TPGW-13S		TPGW-13M		TPGW-13D		TPGW-14S		TPGW-14M		TPGW-14D		TPGW-EB1		TPGW-FB1		TPGW-FB1		TPGW-FB1		TPGW-FB1		TPGW-FB1	
Parameter	**Units**	**6/9/2011**		**6/9/2011**		**6/9/2011**		**6/9/2011**		**6/9/2011**		**6/9/2011**		**6/13/2011**		**6/13/2011**		**6/13/2011**		**6/6/2011**		**6/7/2011**		**6/9/2011**		**6/13/2011**		**6/15/2011**		**6/16/2011**	
Temperature	°C	26.87		26.67		26.91		29.74		29.74		29.88		27.05		26.91		27.3													
pH	SU	6.64	J	7.19		7.24		6.94	J	7.13		7.02		6.86		6.96	J	6.81													
Dissolved Oxygen	mg/L	1.67		0.17	J	0.81		0.39	J	0.15	J	0.07		0.54		0.26		0.22													
Spec Cond	µS/cm	41853		60849		63264		82111		82262		82779		58014		62228		74774													
Turbidity	NTU	0.75		0.99		6.85		0.92		1.05		0.87		0.76		0.85		0.71													
Arsenic	mg/L																														
Barium	mg/L	0.081	U	0.28	I	0.16	U	0.23	I	0.16	U	0.16	U	0.081	U	0.081	U	0.081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	0.34	I	0.63	I	0.78	I V	0.72	I V	3.4	I	1.5	I V	0.63	I V	0.65	I V	0.95	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica, dissolved	mg/L																														
Calcium	mg/L	450		560		590		720	J	710		720		520		580		670		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	930		1400		1500		2100	J	2000		2100		1500		1600		2000		0.02	U	0.026	I	0.038	I	0.02	U	0.02	U	0.02	U
Potassium	mg/L	310		460		500		720	J	680		710		470		520		640		0.19	U	0.19	U	0.86	I	0.19	U	0.19	U	0.19	U
Sodium	mg/L	7700		11000		13000		17000	J	16000		16000		12000		13000		17000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	3.0		4.4		4.7		7.1		6.6		6.9		4.6		4.9		6.1		0.067		0.075		0.075		0.082		0.084		0.083	
Strontium	mg/L	6.9		9.7		10		14		14		14		9.1		10		13		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
ChromiumVI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	50		77	J	85	J	110	J	110	J	110	J	77		86		110		0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	16000	J+	24000	J	26000	J	36000	J	34000	J	35000	J	24000		24000		32000		0.21	I	0.2	U	0.2	U	0.2	I	0.2	U	0.2	U
Fluoride	mg/L	0.66		1.2	J	1.5	J	0.64	J	2.1	J	3.6	J	0.36	I	0.48	I	0.96		0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	1800		2700	J	3000	J	3800	J	3700	J	3900	J	2700		3000		3600		0.21	I	0.2	U	0.2	U	0.29	I	0.2	U	0.2	U
Ammonia	mg/L as N																														
Ammonium Ion (NH^{4+})	mg/L																														
Unionized NH_3	mg/L																														
Nitrate/Nitrite as N	mg/L																														
TKN	mg/L																														
TN	mg/L																														
Orthophosphate	mg/L																														
Phosphorus (P)	mg/L																														
Alkalinity	mg/L ($CaCO_3$)	320		48	J	120	J	54	J	150	J	150	J	220		250		160		1	U	1	U	1	U	1	U	1	U	1.8	
Bicarbonate Alkalinity as CaCO3	mg/L	320		48	J	120	J	54	J	150	J	150	J	220		250		160		1	U	1	U	1	U	1	U	1	U	1.8	
Sulfide	mg/L	9.3		3.4		1.1		14		1	U	1	U	3.4		8.8		3.5		1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	26000		39000		43000		58000		56000		56000		38000		41000		50000		5	U	16		5	U	12		5	U	12	
Dissolved Inorganic Carbon	mg/L	130		62		49		54		44		46		67		73		58		10	U	10	U	10	U	10	U	10	U	10	U
$d^{18}O$	‰	1.7		3.6		4.2		5.3		5.2		5.3		2.5		3.3		4.6		-1.4		-1.0		-1.3		-1.2		-1.1		-1.5	
$d^{2}H$	‰	16.2		21.7		18.2		34.0		33.0		36.0		21.0		20.0		24.0		-4.0		-3.0		-4.0		-3.0		-2.3		-5.9	
$d^{13}C$	‰	-12.52		-7.76		-6.63		-8.05		-6.66		-6.95		-7.94		-10.12		-8.17		-18.18		-17.89		-16.70		-20.37		-18.98		-20.34	
Gross Alpha	pCi/L																														
Salinity		26.8		40.8		42.6		57.4		57.6		58.0		38.6		41.8		51.6													
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70911		0.70911		0.70909		0.7091		0.70908		0.70911		0.70914		0.70911		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Tritium	pCi/L (1σ)	72.8 (17)		1260 (80)		1490 (90)		4190 (250)		3800 (230)		3650 (220)		186 (13)		600 (40)		2490 (140)		12.7 (6.3)		8.6 (5.6)		11 (7.8)		1.6 (6.1)	UJ	1.4 (4.6)	UJ	-1.8 (4.2)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/14/2011) is a duplicate of TPGW-10M.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-6. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPGW-1S 9/22/2011		TPGW-1M 9/22/2011		TPGW-1D 9/22/2011		TPGW-2S 9/13/2011		TPGW-2M 9/13/2011		TPGW-2D 9/13/2011		TPGW-3S 9/14/2011		TPGW-3M 9/14/2011		TPGW-3D 9/14/2011		TPGW-4S 9/6/2011		TPGW-DUP1 [1] 9/6/2011		TPGW-4M 9/6/2011		TPGW-4D 9/6/2011		TPGW-5S 9/22/2011		TPGW-5M 9/22/2011		TPGW-5D 9/22/2011	
Temperature	°C	26.17		26.49		26.59		27.26		27.67		28.11		26.85		26.88		26.50		25.37				25.43		25.95		24.23		24.57		24.28	
pH	SU	7.05		7.24		7.13		6.97	J	6.87	J	6.96		6.59	J	6.95	J	6.69	J	6.94	J			6.89	J	6.81	J	8.77		7.02		6.9	
Dissolved Oxygen	mg/L	1.11	J	0.08	J	0.19	J	0.40	J	0.16		0.15	J	0.25	J	0.10	J	0.18	J	0.54				0.24		0.08	J	0.08		0.22		0.11	
Specific Conductance	µS/cm	44022		70784		70471		74150		75599	J	76249		63997		67273		69305		2174				38273		42964		1192		31197		32965	
Turbidity	NTU	1.23		1.46		1.56		0.01		0.01		0.01		0.68		0.13		0.02		0.1				0.18		0.12		2.5		0.26		0.3	
Arsenic	mg/L	0.12	U	0.12	U	0.21	I	0.12	U	0.12	U	0.12	U																				
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.12	I	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.20	I	0.16	I
Beryllium	mg/L	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U																				
Cadmium	mg/L	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U																				
Copper	mg/L	0.03	U	0.03	U	0.07	I	0.23	I V	0.19	I V	0.26	I V																				
Iron	mg/L	1.20	I	2.60	I	1.60	I V	1.10	I V	0.92	I V	1.50	I V	0.73	I V J	0.87	I V J	0.80	I J	0.27	U	0.27	U	6.60		4.80	I V	0.50	I	2.30	I	1.60	I
Lead	mg/L	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U																				
Manganese	mg/L	0.05	U	0.05	U	0.08	I	0.05	I	0.06	I	0.05	I																				
Molybdenum	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U																				
Nickel	mg/L	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U																				
Selenium	mg/L	0.34	U	0.34	U	0.34	U	0.69	I V	0.44	I V	0.38	I V																				
Thallium	mg/L	0.16	U	0.16	U	0.16	U	0.16	U	0.16	U	0.16	U																				
Vanadium	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U																				
Zinc	mg/L	0.18	U	0.18	U	0.19	I	0.18	U	0.18	U	0.18	U																				
Silica	mg/L																																
Calcium	mg/L	510		660		660		710		690		710		740		710		700		160		150		600		610		130		600		590	
Magnesium	mg/L	1000		1800		1800		1900		2000		2100		1800		1900		1900		26		26		1000		910		7.20		630		690	
Potassium	mg/L	300		560		560		580		610		620		520		570		570		5.20		5.20		250.00		180.00		7.50		120		140	
Sodium	mg/L	8100		14000		15000		15000		16000		16000		14000		15000		14000		240		240		8400		7400		110		5400		5700	
Boron	mg/L	3.00		5.70		5.70		6.10		6.30		6.40		5.30		6.00		5.90		0.08		0.08		2.10		1.40		0.06		0.81		1.10	
Strontium	mg/L	7.70		11.00		11.00		13.00		14.00		14.00		12.00		13.00		12.00		1.50		1.50		8.50		8.10		1.30		6.90		7.10	
Chromium VI	mg/L	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U																				
Mercury	mg/L	0.00007	U	0.00007	U	0.00007	U	0.00007	U	0.00007	U	0.00007	U																				
Bromide	mg/L	49		92		88		98		110		110		100		120		180		1.80		2.30		53		47		1.20		33		36	
Chloride	mg/L	15000		27000		27000		30000		32000		32000		25000		26000		27000		480		470		15000		13000		210		10000		10000	
Fluoride	mg/L	0.40	U	0.40	U	0.40	U	2.00	U	2.00	U	2.00	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.45	I	0.40	U
Sulfate	mg/L	1900		3400		3100		3600		3700		3700		740		4200		540		24		23		1800		1500		17		1000		1100	
Total Ammonia	mg/L as N	0.38		1.10		1.50		1.80		2.00		1.80																					
Ammonium Ion (NH^{4+})	mg/L	0.48		1.40		1.90		2.30		2.60		2.30																					
Unionized NH_3	mg/L	0.004		0.013		0.014		0.014		0.013		0.015																					
Nitrate/Nitrite as N	mg/L	0.038		0.014		0.025		0.007	I	0.034		0.005	U																				
TKN	mg/L	1.40		1.70		1.90		1.80		2.00		2.20	J-																				
TN	mg/L	1.40		1.70		1.90		1.80		2.00		2.20																					
Orthophosphate	mg/L	0.038	J	0.019		0.020		0.029		0.035		0.039																					
Phosphorus (P)	mg/L	0.015	J-	0.027		0.023		0.030		0.037		0.042																					
Alkalinity	mg/L ($CaCO_3$)	220		160		160		170		180		160		330		180		180		290		300		180		190		250		200		170	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	220		160		160		170		180		160		330		180		180		290		300		180		190		250		200		170	
Sulfides	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	8.80		1.00	U	1.00	U	1.30		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L	27000	J	47000		47000		52000		54000		54000		42000		48000		48000		960		1000		27000		24000		650		19000		20000	
Dissolved Inorganic Carbon	mg/L	10	U	10	U	10	U	62		65		62		10	U	10	U	10	U	94		94		65		67		10	U	10	U	10	U
$\delta^{18}O$	‰	2.0		4.5		4.3		4.5		4.7		4.8		3.2		3.9		4.1		-1.1		-1.0		2.3		-1.1		-1.4		0.5		0.9	
$\delta^{2}H$	‰	10.0		19.0		26.0		27.0		25.0		32.0		21.0		24.0		19.0		-7.0		-7.0		14.0		-1.0		-5.0		6.0		6.0	
$\delta^{13}C$	‰	-6.1		-6.27		-6.94		-7.22		-7.14		-6.66		-9.85		-8.09		-8.30		-7.52		-		-7.19		-8.19		-10.07		-8.55		-7.87	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		28.4		48.5		49.3		51.1		52.3	J	52.8		43.2		43.5		47.3		1.1				24.3		27.6		0.6		19.4		20.6	
$^{87}Sr/^{86}Sr$	µg/L*	0.70911		0.70915		0.70915		0.70911		0.70911		0.70911		0.70913		0.7091		0.70912		0.70914		0.70914		0.70912		0.70912		0.70914		0.70911		0.7091	
Tritium	pCi/L (1σ)	830 (50)		2740 (170)		2560 (160)		3310 (200)		3720 (220)		3100 (180)		770 (50)		2130 (146)		2270 (140)		23.9 (6.4)	J	31.4 (7.3)	J	340 (22)		520 (30)		31.6 (8.3)		224 (18)		319 (24)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (9/6/2011) is a duplicate of TPGW-4S.

[2] Sample TPGW-Dup1 (9/9/2011) is a duplicate of TPGW-14D.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-6. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

		TPGW-6S		TPGW-6M		TPGW-6D		TPGW-7S		TPGW-7M		TPGW-7D		TPGW-8S		TPGW-8M		TPGW-8D		TPGW-9S		TPGW-9M		TPGW-9D		TPGW-10S		TPGW-10M		TPGW-10D		TPGW-11S		TPGW-11M		TPGW-11D	
Parameter	**Units**	**9/2/2011**		**9/2/2011**		**9/2/2011**		**9/6/2011**		**9/6/2011**		**9/6/2011**		**9/2/2011**		**9/2/2011**		**9/2/2011**		**9/2/2011**		**9/2/2011**		**9/2/2011**		**9/8/2011**		**9/8/2011**		**9/8/2011**		**9/9/2011**		**9/9/2011**		**9/9/2011**	
Temperature	°C	24.38		24.86		25.07		25.87		25.56		25.7		25.17		24.69		25.02		25.37		25.31		25.13		28.20		28.14		27.71		27.63		27.70		27.66	
pH	SU	7.29		7.33		6.76	J	7.09		7.13		7.06		11.72	J	7.10		6.99	J	7.03		6.87	J	6.96	J	7.54		7.57		7.33		7.50		6.79	J	7.09	
Dissolved Oxygen	mg/L	0.59		0.17		0.23		0.21		0.21		0.11	J	0.15		0.17		0.27		0.20		0.24		0.27		0.09		0.12		0.17		0.22		0.14		0.28	
Specific Conductance	µS/cm	1163		23018		24033		580	J	578	J	590	J	2051		651	J	702	J	582	J	657	J	651	J	52279		54719		54911		54734		56277		58768	
Turbidity	NTU	0.39		0.22		0.29		0.02		0.01		0.56		1.07		0.07		0.21		0.28		1.25		0.00		0.00		0.00		0.00		0.10		0.00		2.00	
Arsenic	mg/L																									0.12	U	0.12	U	0.12	U						
Barium	mg/L	0.08	U	0.08	I	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
Beryllium	mg/L																									0.02	U	0.02	U	0.02	U						
Cadmium	mg/L																									0.04	U	0.04	U	0.04	U						
Copper	mg/L																									0.03	U	0.03	U	0.03	U						
Iron	mg/L	0.27	U	1.20	I V J	1.20	I V J	0.31	I V	0.38	I V	0.28	I V	0.27	U	0.42	I V J	5.30	V J	0.27	U	0.27	U	0.72	I V J	0.27	U	0.31	I V	0.43	I V	1.20	I V J	1.10	I V J	1.20	I V J
Lead	mg/L																									0.24	U	0.24	U	0.26	I						
Manganese	mg/L																									0.05	U	0.05	U	0.05	U						
Molybdenum	mg/L																									0.05	U	0.05	U	0.05	U						
Nickel	mg/L																									0.14	U	0.14	U	0.14	U						
Selenium	mg/L																									0.34	U	0.34	U	0.34	U						
Thallium	mg/L																									0.16	U	0.16	U	0.16	U						
Vanadium	mg/L																									0.05	U	0.05	U	0.05	U						
Zinc	mg/L																									0.18	U	0.18	U	0.18	U						
Silica	mg/L																																				
Calcium	mg/L	120		470		510		91		90		90		180	J	100		100		120		120		110		450	J	470		500		500		550		590	
Magnesium	mg/L	12		420		450		4.10		4.00		3.80		0.08	I J	3.80		6.00		2.20		3.10		3.70		1400	J	1400		1400		1400		1400		1500	
Potassium	mg/L	4.30		95		100		9.90		8.50		4.80		10	J	8.70		7.90		3.60		7.80		3.20		420	J	440		440		420		430		460	
Sodium	mg/L	100		4100		4300		20		21		25		21	J	21		31		8.00		14		17		11000	J	11000		11000		11000		11000		12000	
Boron	mg/L	0.06		0.76		0.82		0.05		0.05		0.05		0.04	I	0.07		0.07		0.03	I	0.05		0.05		4.60		4.80		4.80		4.80		5.00		4.90	
Strontium	mg/L	1.20		7.60		8.10		0.92		0.88		0.88		0.71		1.00		1.00		0.87		0.99		1.20		7.90		8.60		9.10		8.10		8.70		9.70	
Chromium VI	mg/L																									0.005	U	0.005	U	0.005	U						
Mercury	mg/L																									0.00007	U	0.00007	U	0.00007	U						
Bromide	mg/L	0.72		37	I	40	I	0.17		0.16		0.19		0.23	J	0.20		0.27		0.17		0.30		0.03	U	78		72	J	73	J	75		76		80	
Chloride	mg/L	200		7600		8600		34		34		39	J-	36	J	35		51		15		23		28		19000		21000	J	21000	J	20000		21000		20000	
Fluoride	mg/L	0.09		0.20	U	0.20	U	0.09		0.09		0.12	J-	0.09	J	0.08		0.07		0.07		0.07	J-	0.08		0.48	I	0.40	U J	0.40	U J	0.67	I	0.40	U	0.40	U
Sulfate	mg/L	8.30		690		800		23		22		24	J-	29	J	43		47		10		20	J-	28		2400		2600	J	2600	J	2600		2600		2700	
Total Ammonia	mg/L as N																									0.46		0.32		0.32							
Ammonium Ion (NH^{4+})	mg/L																									0.58		0.40		0.41							
Unionized NH_3	mg/L																									0.012		0.011		0.005							
Nitrate/Nitrite as N	mg/L																									0.005	U	0.005	U	0.020	J+						
TKN	mg/L																									0.41		0.29		0.38							
TN	mg/L																									0.38		0.29		0.40							
Orthophosphate	mg/L																									0.014		0.015		0.016							
Phosphorus (P)	mg/L																									0.020		0.022		0.022	?						
Alkalinity	mg/L ($CaCO_3$)	290		190		200		190		200		190		380		210		210		260		270		250		120		100		110		240		290		270	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	290		190		200		190		200		190		1.00	U	210		210		260		270		250		120		100		110		240		290		270	
Sulfides	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	2.70		1.00	U	1.00	U	14.00		1.60		1.10		18.00		12.00		9.10	
Total Dissolved Solids	mg/L	560		13000		14000		280		250		300		320		320		350		280		330		330		32000		35000		36000		35000		37000		38000	
Dissolved Inorganic Carbon	mg/L	79		10	U	63		59		61		58		73		63		64		85		82		74		32		33		36		75		89		88	
$\delta^{18}O$	‰	-1.7		-0.8		-0.6		-1.3		-1.4		1.7		-2.2		-1.8		-1.9		-2.3		-1.7		-1.7		1.8		1.6		2.0		1.5		1.6		2.7	
$\delta^{2}H$	‰	-6.0		3.0		3.0		-9.0		-6.0		15.0		-7.0		-8.0		-5.0		-14.0		-8.0		-1.0		8.0		17.0		19.0		8.0		15.0		14.0	
$\delta^{13}C$	‰	-11.79		-7.38		-6.32		-9.34		-9.90		-9.36		-15.32		-10.49		-8.66		-9.84		-9.64		-10.62		-9.56		-4.34		-6.82		-9.31		-10.53		-10.94	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		0.6		13.9		14.6		0.3	J	0.3	J	0.3	J	1.0		0.3	J	0.3	J	0.3	J	0.3	J	0.3	J	34.3		36.1		36.3		36.2		37.3		39.2	
$^{87}Sr/^{86}Sr$	µg/L*	0.70917		0.70914		0.70913		0.70915		0.70919		0.70918		0.70914		0.70914		0.70916		0.70915		0.70915		0.70913		0.70914		0.70915		0.70913		0.70917		0.70919		0.70916	
Tritium	pCi/L (1σ)	21.7 (6.9)	J	14.3 (6.6)	J	32.3 (5.5)	J	12 (9)	J	13.5 (6.5)	J	25.3 (7.7)	J	24.1 (5.3)	J	16.3 (5.1)	J	12.1 (5.1)	J	23.8 (5.8)	J	18.5 (5.3)	J	16.8 (5.1)	J	18.6 (7.1)		7 (6.3)		3.2 (6.5)	UJ	25.5 (6.8)		42.8 (7.5)		467 (30)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (9/6/2011) is a duplicate of TPGW-4S.

[2] Sample TPGW-Dup1 (9/9/2011) is a duplicate of TPGW-14D.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-6. Summary of Groundwater Analytical Results from the September 2011 Sampling Event

		TPGW-12S		TPGW-12M		TPGW-12D		TPGW-13S		TPGW-13M		TPGW-13D		TPGW-14S		TPGW-14M		TPGW-14D		TPGW-DUP1 [2]		TPGW-FB-1		TPGW-FB1		TPGW-FB1		TPGW-EB1		TPGW-FB1	
Parameter	**Units**	**9/7/2011**		**9/7/2011**		**9/7/2011**		**9/7/2011**		**9/7/2011**		**9/7/2011**		**9/9/2011**		**9/9/2011**		**9/9/2011**		**9/9/2011**		**9/2/2011**		**9/6/2011**		**9/7/2011**		**9/9/2011**		**9/14/2011**	
Temperature	°C	27.72		26.97		27.70		30.37		29.90		30.08		28.45		28.32		28.10													
pH	SU	6.72	J	7.18		7.13		7.25		7.18		6.96	J	7.24		6.86	J	7.14													
Dissolved Oxygen	mg/L	0.19		0.23		0.10		0.11		0.18		0.06		0.21		0.40		0.28													
Specific Conductance	µS/cm	40848		63017		64298		82473		80616		82287		57317		62560		72650													
Turbidity	NTU	0.16		0.09		0.77		0.00		0.23		0.01		0.60		0.09		0.13													
Arsenic	mg/L							0.12	U	0.12	U	0.12	U	-		-		-								0.0012	U			0.0012	U
Barium	mg/L	0.20	I	0.16	I	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.00081	U	0.00081	U	0.0008	U	0.081	U	0.0008	U
Beryllium	mg/L							0.02	U	0.02	U	0.02	U	-		-		-								0.0002	U			0.0002	U
Cadmium	mg/L							0.04	U	0.04	U	0.04	U	-		-		-								0.0004	U			0.0004	U
Copper	mg/L							0.03	U	0.03	U	0.03	U	-		-		-								0.0003	U			0.0003	U
Iron	mg/L	0.29	I V	0.50	I V	0.47	I V	0.71	I V	2.80	I V	1.40	I V	5.20	J	5.60	J	5.10	J	6.00	J	0.01	I V	0.00	U	0.0027	U	5.00		0.0190	I
Lead	mg/L							0.24	U	0.24	U	0.24	U	-		-		-								0.0024	U			0.0024	U
Manganese	mg/L							0.05	U	0.05	U	0.05	U	-		-		-								0.0005	U			0.0005	U
Molybdenum	mg/L							0.05	U	0.05	U	0.05	U	-		-		-								0.0005	U			0.0005	U
Nickel	mg/L							0.14	U	0.14	U	0.14	U	-		-		-								0.0014	U			0.0014	U
Selenium	mg/L							0.42	I	0.34	U	0.34	U	-		-		-								0.0034	U			0.0034	U
Thallium	mg/L							0.16	U	0.18	I V	0.16	U	-		-		-								0.0016	U			0.0036	I V
Vanadium	mg/L							0.05	U	0.05	U	0.05	U	-		-		-								0.0005	U			0.0005	U
Zinc	mg/L							0.18	U	0.18	U	0.24	I	-		-		-								0.0018	U			0.0018	U
Silica	mg/L																														
Calcium	mg/L	470		630		650		790		770		770		530		590		670		670		0.10	U	0.10	U	0.10	U	0.10	U	0.10	U
Magnesium	mg/L	980		1600		1700		2300		2200		2200		1500		1600		1900		1900		0.02	U	0.02	U	0.02	U	0.02	U	0.03	I
Potassium	mg/L	310	J	490	J	510	J	710	J	670	J	680	J	450		480		580		570		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	8100	J	13000	J	13000	J	18000	J	17000	J	17000	J	12000		13000		15000		15000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	3.30	J	5.10	J	5.30	J	7.90	J	7.10	J	7.40	J	4.80		5.00		6.20		6.20		0.087		0.089		0.092		0.065		0.067	
Strontium	mg/L	6.90	J	11.00	J	11.00	J	15.00	J	14.00	J	14.00	J	9.00		9.90		12		12		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L							0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U					0.005	UQ	0.005	UQ	0.005	UQ
Mercury	mg/L							0.00007	U	0.00007	U	0.00007	U	0.00007	U	0.00007	U	0.00007	U	0.00007	U					0.00007	U	0.00007	U	0.00007	U
Bromide	mg/L	50		84		85		110		110		81		67		86		99		100		0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
Chloride	mg/L	14000		24000		24000		33000		32000		32000		21000		23000		29000		27000		0.30	I	0.20	U	0.28	I	0.20	U	0.29	I
Fluoride	mg/L	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	1700		2900		3000		4200		3900		4000		2700		2900		3500		3500		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Total Ammonia	mg/L as N							2.30		1.60		1.90		0.58		1.10		1.80		2.00						0.08		0.05		0.07	
Ammonium Ion (NH^{4+})	mg/L							2.90		2.00		2.40		0.74		1.40		2.30													
Unionized NH_3	mg/L							0.035		0.019		0.184		0.008		0.008		0.019													
Nitrate/Nitrite as N	mg/L							0.012	J+	0.080	J	0.160	J	0.025	J	0.037	J	0.031		0.025						0.020		0.500		0.005	U
TKN	mg/L							2.80		2.20		2.40		0.68		1.20		2.30		2.30						0.05	U	0.05	U	0.14	I
TN	mg/L							2.80		2.30		2.60		0.71		1.20		2.30		2.30						0.25	U	0.55		0.25	U
Orthophosphate	mg/L							0.033		0.035		0.038		0.032		0.037		0.036		0.034						0.002	I	0.001	U	0.001	U
Phosphorus (P)	mg/L							0.049	I	0.057		0.066		0.035		0.050		0.042		0.036						0.004	U	0.004	U	0.004	U
Alkalinity	mg/L ($CaCO_3$)	330		180		170		170		150		150		220		240		190		190		1.10		1.20		1.00	U	1.30		1.30	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	330		180		170		170		150		150		220		240		190		190		1.10		1.20		1.00	U	1.30		1.30	
Sulfides	mg/L	12.00		2.10		1.40		16.00		1.00	U	1.00	U	5.60		5.00		5.80		5.40		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L	25000		42000		44000		58000		57000		57000		36000		41000		50000		49000		5.00	U	5.00	U	5.00	U	5.00	U	5.00	U
Dissolved Inorganic Carbon	mg/L	110		66		61		53		50		59		70		79		66		66		10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
$\delta^{18}O$	‰	1.5		4.1		4.2		5.4		5.1		5.1		2.3		3.6		4.4		4.5		-		-1.1		-1.3		-1.3		-	
$\delta^{2}H$	‰	4.0		24.0		21.0		30.0		29.0		33.0		15.0		26.0		22.0		31.0		-		-8.0		2.0		-7.0		-	
$\delta^{13}C$	‰	-12.82		-7.74		-7.16		-8.89		-7.17		-7.72		-8.20		-9.98		-8.25		-8.22		-11.65		-		-11.13		-11.31		-10.59	
Gross Alpha	pCi/L																														
Salinity (PSS-78)		26.1		42.4		43.4		57.7		56.2		57.6		38.1		42.1		49.9													
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70913		0.70914		0.70911		0.70912		0.70912		0.70917		0.70915		0.70914		0.70914		0.1		0.1		0.1		0.05	U	0.1	
Tritium	pCi/L (1σ)	208 (15)	J	100 (10)	J	1706 (106)		6390 (390)		3910 (220)		3850 (220)		175 (14)		790 (50)		2620 (160)		2600 (160)		11.1 (4.8)		25.4 (6.9)		29.8 (8.8)		3.8 (6.3)	UJ	-1.2 (6.8)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (9/6/2011) is a duplicate of TPGW-4S.

[2] Sample TPGW-Dup1 (9/9/2011) is a duplicate of TPGW-14D.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-7. Summary of Groundwater Analytical Results from the December 2011 Sampling Event

Parameter	Units	TPGW-1S 12/8/2011		TPGW-1M 12/8/2011		TPGW-1D 12/8/2011		TPGW-2S 12/13/2011		TPGW-2M 12/13/2011		TPGW-2D 12/13/2011		TPGW-3S 12/8/2011		TPGW-3M 12/8/2011		TPGW-3D 12/8/2011		TPGW-4S 12/7/2011		TPGW-4M 12/7/2011		TPGW-4D 12/7/2011		TPGW-5S 12/16/2011		TPGW-5M 12/16/2011		TPGW-5D 12/16/2011		TPGW-6S 12/1/2011		TPGW-6M 12/1/2011		TPGW-6D 12/1/2011	
Temperature	°C	25.8		26.03		26.22		26.36		26.63		26.71		25.56		25.27		25.3		25.3		24.89		24.96		24.09		24.01		23.94		23.88		23.79		23.84	
pH	SU	7.02		7.16		7.07		7.08		6.96	J	6.95	J	6.75	J	6.9	J	6.95	J	7.03		6.95		6.97		8.48		6.86	J	6.93	J	7.02		6.94	J	6.8	J
Dissolved Oxygen	mg/L	0.31		0.23		0.11		0.17		0.17		0.08		0.19		0.17		0.07		0.24		0.29		0.3		0.18		0.17		0.23		0.94		0.35		0.16	
Specific Conductance	µS/cm	45929		71993		70715		74782		76658		77583		65411		70052		69551		2044	J	37832		43264		1100		31941		33540		1088	J	22283		23397	
Turbidity	NTU	0.32		0.37		0.38		0.48		0.83		0.61		0.44		0.67		0.42		1.52		0.71		0.82		6.31		1.59		1.47		0.73		0.93		1.57	
Arsenic	mg/L																																				
Barium	mg/L	0.081	U	0.081	U	0.16	I V	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.18	I	0.12	I	0.081	U	0.15	I	0.14	I
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	1.2	I	2.4	I	0.93	I	1.3	I V	0.98	I V	1.3	I V	0.79	I	0.97	I	0.89	I	0.27	U	5		5.8		1.3	I	2	I	1.5	I	0.27	U	1.4	I	1.1	I
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	550		680		660		760		740		750	J	720		650		640		140		600		600		120		600		600		110		500		530	
Magnesium	mg/L	1100		1900		1800		1900		2100		2100	J	1700		1700		1600		22		830		810		6.8	V	660		710		11		440		480	
Potassium	mg/L	340		620		590		620		660		660	J	550		550		530		5.3		200		170		6.5	J	130		150		4.5		110		110	
Sodium	mg/L	9300		16000		15000		15000		16000		16000	J	14000		13000		13000		220		6900		6600		87	J	5700		6000		88		3900		4200	
Boron	mg/L	3.3		6		5.7		6		6.4		6.5		5.1		5.4		5.3		0.076		1.5		1.3		0.051	J	0.89		1.1		0.058	J	0.77		0.8	
Strontium	mg/L	8.5		12		12		14		15		14		12		12		12		1.3		7.5		7.6		1.2		7.1		7.2		1.1		7.9		8.1	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	58		99		100		110	J	110		110	J	90		97	J	98	J	0.58		48	J	56	J	0.46		41		44		0.17		28		37	
Chloride	mg/L	17000		30000		27000		32000	J	32000		33000	J	26000		28000	J	30000	J	490		15000	J	17000	J	190	J	12000		12000		190		7200		8000	
Fluoride	mg/L	0.4	U	1.4		1.4		2.7	J	1.8		0.94	I J	0.4	U	0.96	I J	1.4	J	0.098		0.4	UJ	0.4	UJ	0.2	U	0.4	U J-	0.4	U	0.12		0.4	U	0.4	U
Sulfate	mg/L	2400		3900		4000		4200	J	4300		4400	J	3500		3800	J	3900	J	20		1800	J	2100	J	21		1200		1400		10		750		840	
Total Ammonia	mg/L as N																																				
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	300		190		200		190	J	210	J	210	J	390		250	J	240	J	360		240	J	230	J	240	J	260	J	250	J	310		230		240	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	300		190		200		190	J	210	J	210	J	390		250	J	240	J	360		240	J	230	J	240	J	260	J	250	J	310		230		240	
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	7.2		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	29000		47000		47000		49000		52000		54000		42000		47000		47000		300	J	21000		26000		530		19000		20000		360	J	12000		13000	
Dissolved Inorganic Carbon	mg/L	65		46		47		52	J	56	J	54	J	87		54		56		83		55		55		54	J	58	J	55	J	69		52		55	
$\delta^{18}O$	‰	-1.8		-2.0		-1.9		4.5		4.6		4.8		-1.5		-0.5		-0.9		-1.6		-2.2		-1.8		-1.5		0.6		0.9		-1.5		-1.7		-1.6	
$\delta^{2}H$	‰	17.0		26.0		26.0		22.0		26.0		28.0		21.0		23.0		25.0		-5.0		10.0		15.0		-8.0		4.0		3.0		-4.0		1.0		11.0	
$\delta^{13}C$	‰	-7.48		-6.66		-6.43		-7.52		-7.10		-6.79		-9.56		-7.78		-7.94		-11.07		-8.05		-7.38		-10.66		-8.98		-8.71		-11.22		-7.16		-6.68	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		29.74		49.46		48.45		51.66		53.16		53.90		44.33		47.95		47.56		1.04	J	23.99		28.22		0.55		19.91		21.01		0.54	J	13.42		14.15	
$^{87}Sr/^{86}Sr$	µg/L*																																				
Tritium	pCi/L (1σ)	840 (50)		2350 (140)		2230 (130)		3660 (230)		3770 (230)		3340 (190)		620 (40)		1790 (110)		2020 (120)		14.9 (5.5)		297 (19)		510 (30)		0 (6.3)	UJ	243 (17)		315 (22)		-0.3 (4)	UJ	5.1 (4.5)		13.8 (4.8)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-7. Summary of Groundwater Analytical Results from the December 2011 Sampling Event

Parameter	Units	TPGW-7S 12/8/2011		TPGW-7M 12/8/2011		TPGW-7D 12/8/2011		TPGW-8S 12/1/2011		TPGW-8M 12/1/2011		TPGW-8D 12/1/2011		TPGW-9S 12/1/2011		TPGW-9M 12/1/2011		TPGW-9D 12/1/2011		TPGW-10S 12/15/2011		TPGW-10M 12/15/2011		TPGW-10D 12/15/2011		TPGW-11S 12/14/2011		TPGW-11M 12/14/2011		TPGW-11D 12/14/2011		TPGW-12S 12/5/2011		TPGW-12M 12/5/2011		TPGW-12D 12/5/2011	
Temperature	°C	24.11		23.93		23.94		24.54		24.06		24.05		25.43		24.62		24.6		25.5		24.38		24.54		24.92		24.85		24.9		26.13		26.22		26.31	
pH	SU	7.3		7.25		7.29		12.02	J	7.03		7.13		7.01		6.99	J	6.92	J	7.35		7.39		7.34		7.02		6.8	J	6.89	J	6.74	J	7.02		7.26	
Dissolved Oxygen	mg/L	0.13		0.32		0.17		0.13		0.11		0.26		0.14		0.16		0.13		0.21		0.3		0.25		0.19		0.28		0.18		0.14		0.11		0.08	
Specific Conductance	µS/cm	568	J	566	J	594	J	2496		635	J	698	J	547	J	653	J	640	J	53203		55143		56200		55764		56330		60116		41350		63876		64538	
Turbidity	NTU	0.27		0.33		0.35		1.55		0.64		1.57		0.25		3.53		0.16		0.76		0.35		0.48		1.29		1.5		1.16		1.27		0.47		2.79	
Arsenic	mg/L																																				
Barium	mg/L	0.081	U	0.081	U	0.081	I V	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	0.44	I	0.31	I	0.46	I	0.61	I	0.36	I	0.27	U	0.27	U	0.27	U	0.56	I	0.52	I	0.45	I	0.46	I	0.48	I	0.49	I	0.45	I	0.96	IJ	0.71	IJ	0.82	IJ
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	87		87		93		220		110		97		110		120		110		450		490		510		570		550		620		500		650		640	
Magnesium	mg/L	4.1		4		3.7		0.02	U	3.9		6.1		1.9		3.1		3.8		1300		1400		1400		1500		1500		1500		960		1600		1600	
Potassium	mg/L	9.6		8		4.7		10		9.3		7.7		2.7		8.1		3.5		430		440		450		460		470		480		330		540		530	
Sodium	mg/L	21		21		27		20		20		29		6		13		17		11000		11000		11000		12000		12000		12000		8100		13000		13000	
Boron	mg/L	0.053	J	0.053	J	0.056	J	0.036	IJ	0.066	J	0.068	J	0.029	IJ	0.054	J	0.052	J	4.5		4.5		4.6		4.6		4.8		4.8		3.2		5		4.9	
Strontium	mg/L	0.96		0.9		0.91		0.73		1.1		0.99		0.73		1		1.2		7.9		8.3		8.9		9.6		9.3		9.9		7		11		10	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	0.19		0.2		0.027	U	0.25		0.24		0.087		0.083		0.075		0.095		71		75		76	J	86		78		84		54		85		92	J
Chloride	mg/L	38		38		43		37	V	35	V	51		10		24		29	V	21000		22000		22000	J	25000		23000		23000		16000		26000		27000	J
Fluoride	mg/L	0.2	J	0.11	J	0.099	J	0.096		0.093		0.079		0.087		0.081		0.087		1		0.48	I	3.3	J	0.4	U	0.4	U	0.4	U	0.53	IJ	1.7	J	1.7	J
Sulfate	mg/L	26		25		28		31		48		46		0.92	J	24		30		2900		3000		3100	J	3500		3200		3200		1900		3400		3600	J
Total Ammonia	mg/L as N																																				
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	230		240		240		580		250		260		300		310		290		150	J	130	J	130	J	300	J	280	J	340	J	550		240		200	J
Bicarbonate Alkalinity as $CaCO_3$	mg/L	230		240		240		1	U	250		260		300		310		290		150	J	130	J	130	J	300	J	280	J	340	J	550		240		200	J
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1.3		1	U	1	U	6.2		2.2		1.1		7.7		6.1		8		15		2.1		1	U
Total Dissolved Solids	mg/L	250		240		280		250	U	220	J	240	J	160	J	280		240		35000		37000		38000		41000		37000		39000		26000		42000		43000	
Dissolved Inorganic Carbon	mg/L	50		51		50		10	U	56		56		75		72		66		34	J	29	J	32	J	65	J	58	J	71	J	120		57	J	48	J
$\delta^{18}O$	‰	-2.5		-1.9		-1.7		1.3		4.1		-1.3		-0.8		-1.8		-1.2		1.7		1.9		2.1		3.2		2.4		2.8		2.3		4.4		4.3	
$\delta^{2}H$	‰	-7.0		0.0		-7.0		-9.0		-8.0		-7.0		-10.0		-8.0		-8.0		14.0		16.0		14.0		18.0		17.0		14.0		11.0		20.0		24.0	
$\delta^{13}C$	‰	-9.93		-9.78		-9.38		-11.54		-9.76		-9.39		-9.80		-10.19		-9.96		-4.99		-4.45		-7.09		-9.92		-11.33		-11.93		-13.47		-7.13		-6.94	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		0.28	J	0.27	J	0.29	J	1.31		0.31	J	0.34	J	0.26	J	0.32	J	0.31	J	35.08		36.51		37.34		37.01		37.43		40.29		26.45		43.13		43.64	
$^{87}Sr/^{86}Sr$	µg/L*																																				
Tritium	pCi/L (1σ)	12.2 (5.3)		11.9 (5.5)		12.9 (5.4)		9.7 (7.4)		12.7 (7.5)		-2 (7)	UJ	11.4 (7.5)		6.5 (7.2)	UJ	13.9 (7.6)		22.8 (7.2)		2.9 (6.8)	UJ	0.5 (7.3)	UJ	9.9 (6.8)		47.7 (7.5)		480 (30)		242 (18)		1630 (100)		1520 (90)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-7. Summary of Groundwater Analytical Results from the December 2011 Sampling Event

		TPGW-13S		TPGW-13M		TPGW-13D		TPGW-14S		TPGW-14M		TPGW-14D		TPGW-EB1		TPGW-FB1		TPGW-FB1		TPGW-FB1	
Parameter	**Units**	**12/5/2011**		**12/5/2011**		**12/5/2011**		**12/14/2011**		**12/14/2011**		**12/14/2011**		**12/1/2011**		**12/5/2011**		**12/8/2011**		**12/16/2011**	
Temperature	°C	29.75		29.47		29.5		25.42		24.83		25.18									
pH	SU	6.97	J	6.99	J	7		6.96		6.85		6.91									
Dissolved Oxygen	mg/L	0.1		0.09		0.13		0.22		0.22		0.12									
Specific Conductance	µS/cm	83469		81654		82425		58055		63012		74202									
Turbidity	NTU	0.26		0.23		0.45		1.57		1.03		1.33									
Arsenic	mg/L																				
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.00081	U	0.00081	U	0.0008	U	0.00081	U
Beryllium	mg/L																				
Cadmium	mg/L																				
Copper	mg/L																				
Iron	mg/L	0.9	IJ	2.3	IJ	1.7	IJ	0.41	I	0.44	I	0.6	I	0.0027	U	0.0032	I	0.0027	U	0.0027	U
Lead	mg/L																				
Manganese	mg/L																				
Molybdenum	mg/L																				
Nickel	mg/L																				
Selenium	mg/L																				
Thallium	mg/L																				
Vanadium	mg/L																				
Zinc	mg/L																				
Silica	mg/L																				
Calcium	mg/L	790		770	J	760		580		510		690		0.14	I	0.45	I	0.1	I	0.58	
Magnesium	mg/L	2200		2200	J	2100		1400		1400		1900		0.02	U	0.14		0.028	I	0.2	V
Potassium	mg/L	760		720	J	700		450		440		620		0.19	U	0.48	I	0.19	U	4.1	
Sodium	mg/L	17000		17000	J	17000		12000		11000		15000		0.31	U	13		0.31	U	62	
Boron	mg/L	7.7		7.1		6.8		4.8		4.8		6.3		0.073		0.058		0.071		0.059	
Strontium	mg/L	14		14		14		8.7		8.1		12		0.001	U	0.0031	I	0.001	U	0.003	I
Chromium VI	mg/L																				
Mercury	mg/L																				
Bromide	mg/L	120	J	120	J	120	J	96		74		110		0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	36000	J	35000	J	35000	J	22000		21000		29000		0.2	U	4.8		0.2	U	38	
Fluoride	mg/L	0.4	UJ	0.4	UJ	0.4	UJ	0.4	U	0.59	I	3.2		0.02	U	1.2		0.02	I	0.21	
Sulfate	mg/L	4800	J	4500	J	4600	J	3100		3100		4100		0.24	I	0.2	U	0.2	U	0.28	I
Total Ammonia	mg/L as N																				
Ammonium Ion (NH^{4+})	mg/L																				
Unionized NH_3	mg/L																				
Nitrate/Nitrite as N	mg/L																				
TKN	mg/L																				
TN	mg/L																				
Orthophosphate	mg/L																				
Phosphorus (P)	mg/L																				
Alkalinity	mg/L ($CaCO_3$)	220	J	200	J	200	J	380	J	320	J	220	J	1	U	13		1.2		140	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	220	J	200	J	200	J	380	J	320	J	220	J	1	U	13		1.2		140	
Sulfides	mg/L	21		1	U	1	U	11		12		4.6		1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	58000		57000		57000		36000		35000		53000		5	U	22		5	U		
Dissolved Inorganic Carbon	mg/L	42	J	51	J	52	J	80	J	65	J	50	J	3		6.6		10	U	30	
$\delta^{18}O$	‰	3.2		3.7		3.9		1.7		1.5		4.4		-1.9		-1.1		-1.0		-1.2	
$\delta^{2}H$	‰	28.0		27.0		26.0		12.0		11.0		24.0		-2.0		-5.0		0.0		-8.0	
$\delta^{13}C$	‰	-8.76		-6.85		-7.28		-8.55		-10.39		-8.45		-8.09		-5.30		-7.55		-3.59	
Gross Alpha	pCi/L																				
Salinity (PSS-78)		17.43		57.09		57.71		38.72		42.50		51.24									
$^{87}Sr/^{86}Sr$	µg/L*																				
Tritium	pCi/L (1σ)	4300 (250)		3640 (210)		3850 (230)		159 (12)		650 (40)		2540 (150)		-0.6 (4.3)	UJ	1.8 (5.4)	UJ	3 (5.7)	UJ	0.4 (6.6)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-8. Summary of Groundwater Analytical Results from the March 2012 Sampling Event

Parameter	Units	TPGW-1S 3/5/2012		TPGW-1M 3/5/2012		TPGW-1D 3/5/2012		TPGW-2S 3/8/2012		TPGW-2M 3/8/2012		TPGW-2D 3/8/2012		TPGW-3S 3/15/2012		TPGW-3M 3/15/2012		TPGW-3D 3/15/2012		TPGW-4S 3/5/2012		TPGW-4M 3/5/2012		TPGW-4D 3/5/2012		TPGW-5S 3/16/2012		TPGW-5M 3/16/2012		TPGW-5D 3/16/2012		TPGW-6S 3/1/2012		TPGW-6M 3/1/2012		TPGW-6D 3/1/2012	
Temperature	°C	25.49		26.12		26.29		26.33		26.50		27.30		25.91		25.64		25.69		24.86		24.77		24.53		23.54		23.40		24.21		24.14		24.09		24.00	
pH	SU	7.14		7.24		7.11		7.25		7.08		7.09		6.88		6.98		7.07		7.02		7.01		7.01		8.23		6.98		7.01		7.03		7.00		6.93	
Dissolved Oxygen	mg/L	0.15		0.13		0.17		0.11		0.12		0.36		0.46		0.37		0.16		0.23		0.16		0.23		0.30		0.45		0.29		2.70		0.14		0.22	
Specific Conductance	µS/cm	59838.00		72597.00		71660.00		74636.00		76409.00		77119.00		64474.00		67848.00		69560.00		2281.00		38574.00		43554.00		1390.00		31913.00		33043.00		1105.00		23477.00		24213.00	
Turbidity	NTU	0.36		0.27		0.50		0.29		0.12		0.10		2.35		0.36		0.52		0.37		0.93		0.85		0.95		0.51		0.32		0.58		0.32		0.46	
Arsenic	mg/L	0.12	U	0.12	U	0.13	I	0.12	U	0.12	U	0.12	U																								
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.12	I	0.08	U	0.08	U	0.08	U	0.09	I V	0.08	U	0.08	U	0.15	I	0.08	U	0.08	U	0.31	I V	0.26	I V	0.09	I	0.08	U	0.08	U
Beryllium	mg/L	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U																								
Cadmium	mg/L	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U																								
Copper	mg/L	0.09	I V	0.08	I V	0.08	I V	0.13	I V	0.06	I V	0.03	I V																								
Iron	mg/L	1.50	I V	3.00	I V	0.87	I V	1.30	I V	0.92	I V	0.11	I V	0.74	I	1.10	I	1.40	I	0.34	I	4.60	I	5.60		0.64	I	1.60	I	1.50	I	0.27	U	1.30	I	1.10	I
Lead	mg/L	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U																								
Manganese	mg/L	0.05	I	0.07	I	0.05	U	0.05	I	0.05	I	0.05	I																								
Molybdenum	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U																								
Nickel	mg/L	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U																								
Selenium	mg/L	0.34	U	0.34	U	0.34	U	0.44	I	0.39	I	0.34	U																								
Thallium	mg/L	0.16	U	0.25	I V	0.28	I V	0.37	I V	0.19	I V	0.16	U																								
Vanadium	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U																								
Zinc	mg/L	0.18	I	0.18	U	0.18	U	0.18	U	0.18	U	0.18	U																								
Silica	mg/L																																				
Calcium	mg/L	620		720		720		810		750	J	750	J	720		720.00		710.00		160.00		620.00		610.00		140.00		660.00		640.00		120.00		650.00		660.00	
Magnesium	mg/L	1500		2000		2000		1900		2000	J	2100	J	1700		1900.00		1900.00		28.00		880.00		1000.00		8.90		690.00		700.00		12.00		460.00		490.00	
Potassium	mg/L	490		670		670		650		690	J	700	J	570		650.00		640.00		6.10		190.00		270.00		7.70		150.00		160.00		4.60		120.00		120.00	
Sodium	mg/L	12000		16000		15000		15000		16000	J	16000	J	13000		15000.00		14000.00		260.00		7300.00		8400.00		140.00		5900.00		6100.00		88.00		4200.00		4500.00	
Boron	mg/L	4.50		6.30		6.30		5.90		6.40		6.50		4.90		5.70		5.70		0.09		1.40		2.10		0.05		0.93		1.10		0.06		0.82		0.86	
Strontium	mg/L	10.00		12.00		12.00		13.00		14.00		14.00		11.00		12.00		12.00		1.50		7.80		8.20		1.40		7.60		7.60		1.20		8.20		8.60	
Chromium VI	mg/L	0.0050	U	0.0050	U	0.0050	U	0.0064	I J-	0.0140		0.0110																									
Mercury	mg/L	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U																								
Bromide	mg/L	86.00		98.00		110.00		110.00	J	120.00	J	110.00	J	81.00	I	81.00	I	87.00	IJ	1.10		53.00		58.00		0.95	I	29.00	I	35.00	I	0.38		28.00		29.00	
Chloride	mg/L	23000.00		28000.00		28000.00		31000.00	J	31000.00	J	32000.00	J	26000.00		28000.00		29000.00	J	500.00		14000.00		16000.00		240.00		11000.00		11000.00		160.00	J-	7900.00		8600.00	
Fluoride	mg/L	0.40	U	1.80		0.40	U	0.09	UJ	0.09	UJ	0.09	UJ	0.35	U	0.35	U	0.35	UJ	0.09		0.40	U	0.40	U	0.07	I	0.35	U	0.35	U	0.11		0.40	U	0.40	U
Sulfate	mg/L	3300.00		3800.00		3700.00		3700.00	J	3800.00	J	3800.00	J	3500.00		3700.00		3800.00	J	25.00		1700.00		2000.00		20.00		1200.00		1300.00		8.00		800.00		860.00	
Total Ammonia	mg/L as N	1.20		1.60		1.50		2.90	J	2.00		0.35																									
Ammonium Ion (NH^{4+})	mg/L	1.50		2.00		1.90		3.70		2.60		0.45																									
Unionized NH_3	mg/L	1.07		1.86		8.25		3.37		1.92		0.36																									
Nitrate/Nitrite as N	mg/L	0.05		0.03		0.03	J+	0.02		0.02		0.02																									
TKN	mg/L	1.40		2.00		1.90		2.10	J	2.30		2.50	J-																								
TN	mg/L	1.50		2.00		1.90		2.10		2.30		2.50																									
Orthophosphate	mg/L	0.023		0.036		0.034	J-	0.014		0.029		0.034																									
Phosphorus (P)	mg/L	0.035		0.045		0.045		0.043		0.052		0.061																									
Alkalinity	mg/L ($CaCO_3$)	220		170		180		140	J	190	J	190	J	350		220		210	J	330		220		210		220		230		230		280		210		210	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	220		170		180		140	J	190	J	190	J	350		220		210	J	330		220		210		220		230		230		280		210		210	
Sulfides	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	4.20		1.00	U	1.00	U	1.00	U	1.40		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L	41000		52000		51000		50000		52000		52000		43000		46000		47000		1200		23000		28000		830		22000		19000		570		14000		15000	
Dissolved Inorganic Carbon	mg/L	46		46		48		43		50		51		82		61		59		81		54		51		46		57	J-	10	U	72		51		51	
$\delta^{18}O$	‰																																		
$\delta^{2}H$	‰																																		
$\delta^{13}C$	‰																																		
Gross Alpha	pCi/L																																		
Salinity (PSS-78)		40.1		49.9		49.2		51.5		53.0		53.5		43.6		46.2		47.6		1.2		24.5		28.1		0.7		19.9		20.7		0.5		14.2		14.7	
$^{87}Sr/^{86}Sr$	µg/L*																																		
Tritium	pCi/L (1σ)																																		

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (3/14/12) is a duplicate of TPGW-10M.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-8. Summary of Groundwater Analytical Results from the March 2012 Sampling Event

		TPGW-7S		TPGW-7M		TPGW-7D		TPGW-8S		TPGW-8M		TPGW-8D		TPGW-9S		TPGW-9M		TPGW-9D		TPGW-10S		TPGW-10M		TPGW-Dup1 [1]		TPGW-10D		TPGW-11S		TPGW-11M		TPGW-11D		TPGW-12S		TPGW-12M		TPGW-12D	
Parameter	**Units**	3/5/2012		3/5/2012		3/5/2012		3/1/2012		3/1/2012		3/1/2012		3/1/2012		3/1/2012		3/1/2012		3/14/2012		3/14/2012		3/14/2012		3/14/2012		3/13/2012		3/13/2012		3/13/2012		3/9/2012		3/9/2012		3/9/2012	
Temperature	°C	24.07		23.53		23.65		24.25		23.80		24.05		25.18		25.25		24.79		25.13		25.14				24.69		24.75		24.56		24.27		26.68		26.45		26.57	
pH	SU	7.12		7.18		7.20		11.92		7.00		7.14		6.80		6.94		7.02		7.48		7.44				7.45		7.15		6.84		6.92		6.76		7.04		7.38	
Dissolved Oxygen	mg/L	0.23		0.25		0.19		0.31		0.39		0.17		0.34		0.40		0.26		0.19		0.42				0.30		0.24		0.50		0.31		0.24		0.13		0.12	
Specific Conductance	µS/cm	581.00		575.00		597.00		2604.00		653.00		714.00		590.00		662.00		660.00		52831.00		54072.00				55544.00		55004.00		55511.00		59510.00		42960.00		64570.00		64988.00	
Turbidity	NTU	0.34		0.52		0.33		0.92		0.50		0.19		0.60		3.04		0.90		0.30		0.34				0.28		0.24		0.05		0.22		0.24		0.65		0.88	
Arsenic	mg/L																			0.12	U	0.12	U	0.12	U	0.12	U												
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.09	I	0.08	U	0.08	U	0.08	U	0.08	U	0.14	I	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.15	I V
Beryllium	mg/L																			0.02	U	0.02	U	0.02	U	0.02	U												
Cadmium	mg/L																			0.04	U	0.04	U	0.04	U	0.04	U												
Copper	mg/L																			0.16	I V	0.08	I V	0.09	I V	0.03	U												
Iron	mg/L	0.45	I	0.40	I	0.41	I	0.27	U	0.60	I	0.27	U	0.41	I	0.40	I	0.76	I	0.69	I	0.66	I	1.00	I	0.65	I	0.92	I V	0.75	I V	0.74	I V	0.41	I	0.71	I	0.93	I
Lead	mg/L																			0.24	U	0.24	U	0.29	I V	0.37	I V												
Manganese	mg/L																			0.05	U	0.05	U	0.05	U	0.05	U												
Molybdenum	mg/L																			0.10	I V	0.12	I V	0.10	I V	0.16	I V												
Nickel	mg/L																			0.14	U	0.14	U	0.14	U	0.14	U												
Selenium	mg/L																			0.34	U	0.34	U	0.34	U	0.34	U												
Thallium	mg/L																			0.21	I V	0.50	I V	0.42	I V	0.25	I V												
Vanadium	mg/L																			0.05	U	0.05	U	0.05	U	0.05	U												
Zinc	mg/L																			0.18	U	0.18	U	0.18	U	0.18	U												
Silica	mg/L																																						
Calcium	mg/L	94.00		94.00		95.00		230.00	J	110.00		110.00		110.00		120.00		110.00		490.00		530.00		520.00		540.00		550.00		620.00		650.00		520.00		660.00		650.00	
Magnesium	mg/L	4.40		4.40		4.00		0.02	IJ	3.90		6.50		2.20		3.20		3.60		1300.00		1500.00		1500.00		1400.00		1400.00		1500.00		1600.00		1000.00	V	1700.00	V	1600.00	V
Potassium	mg/L	9.40		8.70		5.00		11.00	J	9.70		8.30		3.90		8.00		3.60		480.00		520.00		530.00		510.00		500.00		530.00		530.00		340.00		560.00		550.00	
Sodium	mg/L	21.00		22.00		28.00		21.00	J	19.00		30.00		8.40		14.00		16.00		10000.00		11000.00		11000.00		11000.00		11000.00		11000.00		12000.00		8200.00		13000.00		13000.00	
Boron	mg/L	0.05		0.06		0.06		0.04	I	0.07		0.07		0.04	I	0.06		0.05		4.60		4.90		5.00		4.80		5.00		5.10		4.90		3.30		5.10		4.90	
Strontium	mg/L	0.95		0.94		0.93		0.77		1.10		1.10		0.79		1.10		1.20		7.90		8.80		8.90		9.10		8.60		9.40		10.00		7.20		11.00		10.00	
Chromium VI	mg/L																			0.0050	U	0.0058	IJ-	0.0050	U	0.0050	U												
Mercury	mg/L																			0.0001	U	0.0001	U	0.0001	U	0.0001	U												
Bromide	mg/L	0.17		0.18		0.22		0.23	J	0.24		0.30		0.12		0.20	J-	0.41		63.00	I	69.00	I	69.00	I	64.00	I	63.00	I Q J	70.00	I Q J	72.00	I Q J	43.00	J	75.00	J	64.00	J
Chloride	mg/L	35.00		36.00	J-	42.00		37.00	J	33.00		45.00		15.00		24.00	J-	28.00		20000.00		21000.00		22000.00		22000.00		21000.00	J	22000.00	J	23000.00	J	16000.00	J	26000.00	Q J	24000.00	J
Fluoride	mg/L	0.12		0.12		0.11		0.12	J	0.10		0.10		0.10		0.09		0.09		0.35	U	0.35	U	0.35	U	0.35	U	0.35	U Q J	0.35	U Q J	0.35	U Q J	1.50	IJ	1.80	I J	1.70	I J
Sulfate	mg/L	24.00		25.00		28.00		30.00	J	63.00		60.00		6.20		25.00	J-	31.00		2700.00		2900.00		3000.00		3000.00		2900.00	Q J	2900.00	Q J	3100.00	Q J	1800.00	J	3100.00	J	3100.00	J
Total Ammonia	mg/L as N																			0.46		0.35		0.34		0.30													
Ammonium Ion (NH^{4+})	mg/L																			0.58		0.44				0.38													
Unionized NH_3	mg/L																			0.99		0.75				0.64													
Nitrate/Nitrite as N	mg/L																			0.01	I	0.01	I	0.01		0.02													
TKN	mg/L																			0.67		0.44		0.44		0.56													
TN	mg/L																			0.68	I	0.45	I	0.45	I	0.58	I												
Orthophosphate	mg/L																			0.013		0.001	U	0.001	I	0.002	I												
Phosphorus (P)	mg/L																			0.028		0.027		0.028		0.031													
Alkalinity	mg/L ($CaCO_3$)	210		210		210		510	J	220		230		270		270		260		130		110		110		120		280	J	340	J	300	J	500	J	210	J	180	J
Bicarbonate Alkalinity as $CaCO_3$	mg/L	210		210		210		1	UJ	220		230		270		270		260		130		110		110		120		280	J	340	J	300	J	500	J	210	J	180	J
Sulfides	mg/L	1.00	U	1.30		1.00	U	1.00	U	1.00	U	1.00	U	1.40		1.00	U	1.00	U	5.00		1.40		1.30		1.00	U	9.00		8.00		5.90		13.00		1.10		1.00	U
Total Dissolved Solids	mg/L	260		260		280		380		320		330		310		340		340		34000		35000		35000		35000		36000		37000		38000		27000		43000		43000	
Dissolved Inorganic Carbon	mg/L	49		48		47		10	U	52		52		68		66		67		32		28		27		28		70		82		73		110		50		42	
$\delta^{18}O$	‰																																				
$\delta^{2}H$	‰																																				
$\delta^{13}C$	‰																																				
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		0.3		0.3		0.3		1.3		0.3		0.3		0.3		0.3		0.3		34.8		35.2				36.8		36.4		36.8		39.8		27.6		43.7		44.0	
$^{87}Sr/^{86}Sr$	µg/L*																																				
Tritium	pCi/L (1σ)																																				

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample TPGW-Dup1 (3/14/12) is a duplicate of TPGW-10M.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-8. Summary of Groundwater Analytical Results from the March 2012 Sampling Event

		TPGW-13S		TPGW-13M		TPGW-13D		TPGW-14S		TPGW-14M		TPGW-14D		TPGW-EB1		TPGW-FB1		TPGW-FB1		TPGW-FB1		TPGW-FB1		TPGW-FB1		TPGW-FB1	
Parameter	**Units**	**3/9/2012**		**3/9/2012**		**3/9/2012**		**3/13/2012**		**3/13/2012**		**3/13/2012**		**3/1/2012**		**3/5/2012**		**3/7/2012**		**3/8/2012**		**3/13/2012**		**3/15/2012**		**3/16/2012**	
Temperature	°C	29.96		29.34		29.52		25.05		25.10		25.31															
pH	SU	7.04		7.01		7.11		7.10		6.96		7.05															
Dissolved Oxygen	mg/L	0.11		0.16		0.08		0.18		0.53		0.21															
Specific Conductance	µS/cm	83997.00		81243.00		81700.00		57415.00		61619.00		73593.00															
Turbidity	NTU	0.25		0.37		0.29		0.30		0.53		0.53															
Arsenic	mg/L	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.0012	I V					0.12	U	0.12	U				
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.09	I	0.0008	U	0.0008	U	0.0008	U	0.0008	U	0.0008	U	0.0008	U	0.0008	U
Beryllium	mg/L	0.02	U	0.02	U	0.03	I V	0.02	U	0.02	U	0.02	U	0.0002	U					0.02	U	0.02	U				
Cadmium	mg/L	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.0004	U					0.04	U	0.04	U				
Copper	mg/L	0.10	I V	0.12	I V	0.08	I V	0.12	I V	0.08	I V	0.03	U	0.0003	U					0.11	I V	0.12	I V				
Iron	mg/L	1.00	I V	2.20	I V	2.00	I V	0.62	I V	1.10	I V	0.99	I	0.0074	I	0.0027	U	0.0028	I V	0.58	I V	0.27	U	0.0130	I V	0.0036	I V
Lead	mg/L	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U	0.24	U	0.0024	U					0.24	U	0.24	U				
Manganese	mg/L	0.05	U	0.07	I	0.09	I	0.05	U	0.05	U	0.05	U	0.0005	U					0.05	U	0.05	U				
Molybdenum	mg/L	0.05	U	0.05	U	0.07	I	0.05	U	0.05	U	0.11	I V	0.0005	U					0.05	U	0.05	U				
Nickel	mg/L	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U	0.14	U	0.0014	U					0.14	U	0.14	U				
Selenium	mg/L	0.34	U	0.34	U	0.44	I	0.34	U	0.34	U	0.34	U	0.0039	I					0.34	U	0.34	U				
Thallium	mg/L	0.16	U	0.30	I V	0.36	I V	0.16	U	0.16	U	0.16	U	0.0016	U					0.28	I V	0.30	I V				
Vanadium	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.0005	U					0.05	U	0.05	U				
Zinc	mg/L	0.18	U	180.18	U	0.18	U	0.18	U	0.18	U	0.18	U	0.0018	U					0.18	U	0.18	U				
Silica	mg/L																										
Calcium	mg/L	800.00	J	780.00	J	770.00	J	580.00		660.00	J	740.00	J	0.63		0.65		1.20		1.20		1.20		1.30		1.20	
Magnesium	mg/L	2300.00	VJ	2200.00	VJ	2200.00	VJ	1500.00		1700.00	J	2000.00	J	0.23		0.19		0.39		0.43		0.49		0.46		0.45	
Potassium	mg/L	800.00	J	740.00	J	740.00	J	520.00		570.00	J	690.00	J	4.40		4.60		17.00		19.00		19.00		18.00		18.00	
Sodium	mg/L	18000.00	J	17000.00	J	17000.00	J	11000.00		13000.00	J	15000.00	J	79.00		91.00		110.00		110.00		100.00		100.00		100.00	
Boron	mg/L	7.80		6.90		7.00		4.80		5.20		6.40		0.05		0.05		0.05	I	0.05	I	0.05	I	0.05	I	0.05	I
Strontium	mg/L	14.00		14.00		14.00		9.10		10.00		13.00		0.00	I	0.00	I	0.00	I	0.01		0.01		0.01		0.01	
Chromium VI	mg/L	0.0069	I Q	0.0050	U Q	0.0050	U Q	0.0100		0.0069	I	0.0058	I							0.0050	U	0.0075	I				
Mercury	mg/L	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U	0.0001	U					0.0001	U	0.0001	U				
Bromide	mg/L	78.00	J	87.00	J	90.00	J	68.00	I Q J	74.00	I Q J	88.00	I Q J	0.03	U	0.03	U	0.03	U	0.03	U	0.41	U Q	0.00	U	0.00	U
Chloride	mg/L	37000.00	Q J	34000.00	QJ	36000.00	QJ	23000.00	J	25000.00	J	30000.00	Q J	36.00		34.00		97.00		110.00		78.00	Q	71.00		74.00	
Fluoride	mg/L	2.50	I J	1.60	IJ	2.00	IJ	0.35	U Q J	0.35	U Q J	0.35	U Q J	0.50		0.41		0.28		0.29		0.35	U Q	0.19	I	0.16	I
Sulfate	mg/L	4300.00	J	4200.00	J	4300.00	J	3000.00	Q J	3300.00	Q J	3900.00	Q J	0.20	U	0.20	U	0.20	U	0.20	U	3.30	I Q	0.02	U	0.02	U
Total Ammonia	mg/L as N	0.61		0.76		0.06		0.55		0.85		1.50		1.30						0.41							
Ammonium Ion (NH^{4+})	mg/L	0.78		0.97		0.08		0.70		1.10		1.90															
Unionized NH_3	mg/L	0.59		0.71		0.07		0.38		0.58		1.07															
Nitrate/Nitrite as N	mg/L	0.08	J+	0.03		0.03		0.01	I	0.02		0.02		0.00	U					0.00	U						
TKN	mg/L	4.40		2.40		2.50		0.83		1.30		2.50		4.00						3.90							
TN	mg/L	4.50		2.40		2.50		0.84		1.30		2.50								3.90							
Orthophosphate	mg/L	0.023		0.016		0.016		0.034		0.001	U	0.041								0.001	U						
Phosphorus (P)	mg/L	0.056	J-	0.057		0.057		0.044		0.056		0.036		0.008	I					0.004	U						
Alkalinity	mg/L ($CaCO_3$)	160	J	180	J	180	J	250	J	280	J	210	J	140		160		120		130		150		140		150	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	160	J	180	J	180	J	250	J	280	J	210	J	140		160		120		130		150		140		150	
Sulfides	mg/L	22.00		1.00	U	1.00	U	2.90		7.70		4.20		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L	59000		57000		57000		36000		40000		50000		160		180		250		240		260		270		260	
Dissolved Inorganic Carbon	mg/L	43		43		43		61		72		57		1	U	41		29		33		36		3		38	
$\delta^{18}O$	‰																										
$\delta^{2}H$	‰																										
$\delta^{13}C$	‰																										
Gross Alpha	pCi/L																										
Salinity (PSS-78)		59.0		56.8		57.1		38.2		41.4		50.7															
$^{87}Sr/^{86}Sr$	µg/L*																										
Tritium	pCi/L (1σ)																										

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (3/14/12) is a duplicate of TPGW-10M.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-9. Summary of Groundwater Analytical Results from the June 2012 Sampling Event

Parameter	Units	TPGW-1S 6/13/2012	TPGW-1M 6/13/2012	TPGW-DUP1 [1] 6/13/2012	TPGW-1D 6/13/2012	TPGW-2S 6/14/2012	TPGW-2M 6/14/2012	TPGW-2D 6/14/2012	TPGW-3S 6/14/2012	TPGW-3M 6/14/2012	TPGW-3D 6/14/2012	TPGW-4S 6/13/2012	TPGW-4M 6/13/2012	TPGW-4D 6/13/2012	TPGW-5S 6/6/2012	TPGW-5M 6/6/2012	TPGW-5D 6/6/2012	TPGW-6S 6/4/2012	TPGW-6M 6/4/2012	TPGW-6D 6/4/2012
Temperature	°C	25.83	26.54		26.70	26.47	26.36	27.00	26.94	26.94	26.37	24.58	25.56	26.05	24.22	24.20	24.44	24.94	24.89	25.02
pH	SU	7.05	7.15		7.24	7.06	7.27	7.08	6.86	6.86	7.02	7.02	6.83	7.02	7.47	7	6.99	6.93	7.03	6.99
Dissolved Oxygen	mg/L	0.49	0.30		0.19	0.18	0.17	0.21	0.16	0.16	0.40	0.31	1.08	0.86	0.77	0.23	0.65	0.59	0.40	0.50
Specific Conductance	µS/cm	43277	54680		72817	69944	72823	75927	64651	64651	69150	601	1438	38757	1331	32196	34183	1067	22517	23704
Turbidity	NTU	0.09	0.26		0.19	0.19	0.39	0.12	0.11	0.11	0.14	0.24	0.47	0.60	0.35	0.07	0.46	0.07	0.03	0.23
Arsenic	mg/L																			
Barium	mg/L	0.14	0.14	0.013	0.14	0.15	0.12	0.12	0.093	0.089	0.092	0.019	0.16	0.14	0.028	0.26	0.22	0.013	0.16	0.18
Beryllium	mg/L																			
Cadmium	mg/L																			
Copper	mg/L																			
Iron	mg/L	1.3	3.1	0.24	0.17 I	0.4 I V	0.13 I V	0.36 I V	0.062 I V	0.25 I V	0.29 I V	0.046	4.5	5.6	0.42	1.5	1.5	0.039 I V	1.3 V	1.1
Lead	mg/L																			
Manganese	mg/L																			
Molybdenum	mg/L																			
Nickel	mg/L																			
Selenium	mg/L																			
Thallium	mg/L																			
Vanadium	mg/L																			
Zinc	mg/L																			
Silica	mg/L																			
Calcium	mg/L	590	710	91	690	1400	760	780	690	700	690	130	640	620	130	610	580	100	470	510
Magnesium	mg/L	1300	1900	4.1	1900	1400	2000	2100	1700	1800	1800	15	890	1000	8.4	700	720	12	450	460
Potassium	mg/L	400	600	8.5	590	580	620	650	490	550	550	3.2	180	250	6.2	130	150	4	96	100
Sodium	mg/L	11000	15000	21	15000	15000	16000	16000	13000	14000	14000	140	7400	8500	120	6000	6500	80	4100	4300
Boron	mg/L	4	6.1	0.053	5.9	5.4	6.4	6.7	4.8	5.6	5.6	0.055	1.4	2	0.047 I	0.85	1.1	0.054	0.77	0.77
Strontium	mg/L	9.3	12	0.9	12	15	14	14	11	12	12	1.1	8	8.3	1.2	6.9	7.3	1.1	7.5	8.2
Chromium VI	mg/L																			
Mercury	mg/L																			
Bromide	mg/L	67	99	0.15	97	97	110	110	92	92	110	0.96	46	52	0.89	40	43	0.65	27	27
Chloride	mg/L	19000	29000	35	28000	28000	30000	32000	27000	27000	30000	270	13000	15000	260	11000	12000	160	7600	7800
Fluoride	mg/L	0.2 U	0.2 U	0.11	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.084	0.2 U	0.2 U	0.12	0.2 U	0.2 U	0.16	0.47 I	0.08 U
Sulfate	mg/L	2700	3900	24	3800	3400	3800	4200	3600	3500	3900	7.4	1600	1900	20	1200	1400	8.2	780	860
Total Ammonia	mg/L as N																			
Ammonium Ion (NH^{4+})	mg/L																			
Unionized NH_3	mg/L																			
Nitrate/Nitrite as N	mg/L																			
TKN	mg/L																			
TN	mg/L																			
Orthophosphate	mg/L																			
Phosphorus (P)	mg/L																			
Alkalinity	mg/L ($CaCO_3$)	240	180	210	180	96	200	190	350	230	220	300	210	210	250	230	230	290	210	220
Bicarbonate Alkalinity as $CaCO_3$	mg/L	240	180	210	180	96	200	190	350	230	220	300	210	210	250	240	230	290	210	220
Sulfides	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Dissolved Solids	mg/L	38000	53000	310	51000	50000	35000	54000	45000	48000	50000	840	26000	31000	660	19000	21000	470	13000	14000
Dissolved Inorganic Carbon	mg/L	57	42	54	43	43	52	62	96	72	72	93	71	48	58	59	61	73	53	54
$\delta^{18}O$	‰																			
$\delta^{2}H$	‰																			
$\delta^{13}C$	‰																			
Gross Alpha	pCi/L																			
Salinity (PSS-78)		27.8	36.1		50.1	47.8	50.1	52.6	43.7	43.7	47.2	0.3	0.7	24.6	0.7	20.1	21.5	0.5	13.6	14.3
$^{87}Sr/^{86}Sr$	µg/L*																			
Tritium	pCi/L (1σ)																			

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/13/12) is a duplicate of TPGW-1M.

[2] Sample TPGW-Dup2 (6/13/12) is a duplicate of TPGW-7M.

[3] Sample TPGW-Dup1 (6/4/12) is a duplicate of TPGW-9M.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-9. Summary of Groundwater Analytical Results from the June 2012 Sampling Event

Parameter	Units	TPGW-7S 6/13/2012	TPGW-7M 6/13/2012	TPGW-DUP2 [2] 6/13/2012	TPGW-7D 6/13/2012	TPGW-8S 6/4/2012	TPGW-8M 6/4/2012	TPGW-8D 6/4/2012	TPGW-9S 6/4/2012	TPGW-9M 6/4/2012	TPGW-DUP1 [3] 6/4/2012	TPGW-9D 6/4/2012	TPGW-10S 6/5/2012	TPGW-10M 6/5/2012	TPGW-10D 6/5/2012	TPGW-11S 6/5/2012	TPGW-11M 6/5/2012	TPGW-11D 6/5/2012
Temperature	°C	24.76	24.76		24.57	24.96	24.58	24.78	26.53	26.82		25.74	29.45	29.11	27.82	27.69	27.41	27.53
pH	SU	6.95	6.95		7.11	11.87 J	6.99	7.06	6.86	6.89		6.93	7.42	7.44	7.35	7.08	6.91	6.91
Dissolved Oxygen	mg/L	0.27	0.27		0.28	0.43	0.51	0.50	0.42	0.55		0.43	0.48	0.38	0.28	0.44	1.17	0.28
Specific Conductance	µS/cm	580	580		580	2181	645	686	593	649		640	52885	55240	58923	55079	56569	59865
Turbidity	NTU	0.2	0.20		0.15	0.30	0.09	0.23	0.60	2.88		0.27	0.17	0.07	0.27	0.01	0.01	0.00
Arsenic	mg/L																	
Barium	mg/L	0.016	0.013	0.15	0.015	0.086	0.018	0.022	0.013	0.020	0.020	0.021	0.022 I	0.056	0.05	0.018 I	0.028 I	0.034 I
Beryllium	mg/L																	
Cadmium	mg/L																	
Copper	mg/L																	
Iron	mg/L	0.31	0.25	3.1	0.17	0.0053 I	0.27	0.17	0.035 I	0.097	0.096	0.55	0.055 I V	0.066 I V	0.1 I V	0.060 I V	0.058 I V	0.082 I V
Lead	mg/L																	
Manganese	mg/L																	
Molybdenum	mg/L																	
Nickel	mg/L																	
Selenium	mg/L																	
Thallium	mg/L																	
Vanadium	mg/L																	
Zinc	mg/L																	
Silica	mg/L																	
Calcium	mg/L	91	89	720	92	180	100	98	110	110	110	110	440	490	510	500	540	570
Magnesium	mg/L	4.2	4	2000	3.8	0.02 U	3.7	5.6	2.4	3	3	3.5	1400	1500	1600	1400	1500	1600
Potassium	mg/L	9	8.2	610	4.9	9.5	9.4	8.2	4.8	6.9	6.8	3.6	420	440	460	420	430	450
Sodium	mg/L	20	21	15000	26	20	19	27	9.4	12	12	15	11000	12000	12000	12000	12000	11000
Boron	mg/L	0.051	0.052	6.1	0.053	0.035 I	0.061	0.067	0.038 I	0.047 I	0.048 I	0.048 I	4.3	4.7	4.7	4.6	4.6	4.5
Strontium	mg/L	0.92	0.89	12	0.89	0.61	1.1	1.0	0.82	0.96	0.96	1.1	7.7	8.6	9.1	8.1	8.7	9.3
Chromium VI	mg/L																	
Mercury	mg/L																	
Bromide	mg/L	0.18	0.17	94	0.18	0.23	0.21	0.27	0.21	0.28	0.29	0.4	69	72	77	73	76	82
Chloride	mg/L	36	35	27000	40	35	32	47	16	20	22	27	20000	21000	22000	21000	21000	23000
Fluoride	mg/L	0.13	0.11	0.2 U	0.11	0.11	0.11	0.12	0.12	0.12	0.11	0.12	1.1	0.67	0.2 U	0.84	0.87	0.2 U
Sulfate	mg/L	25	24	3700	25	31	49	54	8.3	21	22	30	2700	2900	3100	3000	3000	3200
Total Ammonia	mg/L as N																	
Ammonium Ion (NH^{4+})	mg/L																	
Unionized NH_3	mg/L																	
Nitrate/Nitrite as N	mg/L																	
TKN	mg/L																	
TN	mg/L																	
Orthophosphate	mg/L																	
Phosphorus (P)	mg/L																	
Alkalinity	mg/L ($CaCO_3$)	210	210	180	210	430	230	230	280	280	280	260	130	130	140	300	350	310
Bicarbonate Alkalinity as $CaCO_3$	mg/L	210	210	180	210	1 U	230	230	280	280	280	260	130	130	140	300	250	310
Sulfides	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	2.6	1 U	8.3 U	4	2.6
Total Dissolved Solids	mg/L	320	330	53000	290	300	320	320	290	300	330	320	34000	36000	38000	36000	38000	40000
Dissolved Inorganic Carbon	mg/L	52	53	60	52	10 U	59	59	74	74	74	67	36	32	35	79	86	79
$\delta^{18}O$	‰																	
$\delta^{2}H$	‰																	
$\delta^{13}C$	‰																	
Gross Alpha	pCi/L																	
Salinity (PSS-78)		0.3	0.3		0.3	1.1	0.3	0.3	0.3	0.3		0.3	34.7	36.5	39.3	36.4	37.5	40.0
$^{87}Sr/^{86}Sr$	µg/L*																	
Tritium	pCi/L (1σ)																	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/13/12) is a duplicate of TPGW-1M.

[2] Sample TPGW-Dup2 (6/13/12) is a duplicate of TPGW-7M.

[3] Sample TPGW-Dup1 (6/4/12) is a duplicate of TPGW-9M.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-9. Summary of Groundwater Analytical Results from the June 2012 Sampling Event

		TPGW-12S		TPGW-12M		TPGW-12D		TPGW-13S		TPGW-13M		TPGW-13D		TPGW-14S		TPGW-14M		TPGW-14D		TPGW-EB1		TPGW-FB1		TPGW-FB1		FB1		TPGW-FB1		TPGW-FB1	
Parameter	**Units**	**6/7/2012**		**6/7/2012**		**6/7/2012**		**6/7/2012**		**6/7/2012**		**6/7/2012**		**6/5/2012**		**6/5/2012**		**6/5/2012**		**6/4/2012**		**6/5/2012**		**6/7/2012**		**6/12/2012**		**6/13/2012**		**6/14/2012**	
Temperature	°C	26.78		26.50		26.61		30.47		30.20		30.21		27.49		27.33		27.28													
pH	SU	6.77		7.04		7.23		7.05		7.08		7.08		7.04		6.96		6.97													
Dissolved Oxygen	mg/L	0.35		0.27		0.44		0.27		0.60		0.30		0.45		0.47		0.34													
Specific Conductance	µS/cm	43247		65003		65013		84225		80280		81844		57931		63535		74001													
Turbidity	NTU	0.01		0.01		0.67		0.00		0.38		0.01		0.05		0.08		0.12													
Arsenic	mg/L																														
Barium	mg/L	0.066		0.12		0.1		0.091		0.11		0.1		0.041	I	0.051		0.082		0.00035	U	0.00035	U	0.00035	U	0.00035	U	0.00035	U	0.00035	U
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	0.027	U	0.04	I	0.12	I	0.027	U	2.0		0.75		0.044	I V	0.042	I V	0.038	I V	0.014	I	0.0092	I V	0.0043	I	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica	mg/L																														
Calcium	mg/L	520		640		640		800		750		760		530		580		660		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	1100		1700		1700		2400		2100		2200		1500		1600		2100		0.02	U	0.02	U	0.02	U	0.025	I	0.02	U	0.02	U
Potassium	mg/L	330		500		500		720		650		660		440		470		590		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	9000		14000		13000		18000		17000		17000		12000		13000		16000		0.31	U	0.31	U	0.31	I	0.31	U	0.31	U	0.31	U
Boron	mg/L	3.3		4.8		4.8		7.6		6.5		6.7		4.6		4.7		5.9		0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Strontium	mg/L	7.5		10		10		14		14		14		8.8		9.7		12		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	54		89		86		120		110		110		78		85		100		0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	15000		25000		25000		35000		32000		32000		22000		25000		30000		0.2	U	0.37	I	0.34	I	0.2	U	0.2	U	0.2	U
Fluoride	mg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	2000		3500		3300		4600		4300		4300		3100		3300		4000		0.2	U	0.2	U	0.2	U	0.2	U	0.2	I	0.2	U
Total Ammonia	mg/L as N																														
Ammonium Ion (NH^{4+})	mg/L																														
Unionized NH_3	mg/L																														
Nitrate/Nitrite as N	mg/L																														
TKN	mg/L																														
TN	mg/L																														
Orthophosphate	mg/L																														
Phosphorus (P)	mg/L																														
Alkalinity	mg/L ($CaCO_3$)	530		210		200		200		190		190		260		270		210		3.5		1.9		1.6		1		1	U	1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	530		210		200		200		190		190		260		270		210		3.5		1.9		1.6		1		1	U	1	U
Sulfides	mg/L	9.9		1	U	1	U	16		1	U	1	U	2.4		4.3		1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	28000		44000		43000		60000		55000		58000		39000		43000		52000		5	U	5	U	5	U	190		5	U	60	
Dissolved Inorganic Carbon	mg/L	140		60		57		54		56		56		67		74		62		1.3		1	U	1	U	1	U	1	U	1	U
$\delta^{18}O$	‰																														
$\delta^{2}H$	‰																														
$\delta^{13}C$	‰																														
Gross Alpha	pCi/L																														
Salinity (PSS-78)		27.8		44.0		44.0		59.1		55.9		57.2		38.6		42.8		51.0													
$^{87}Sr/^{86}Sr$	µg/L*																														
Tritium	pCi/L (1σ)																														

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (6/13/12) is a duplicate of TPGW-1M.

[2] Sample TPGW-Dup2 (6/13/12) is a duplicate of TPGW-7M.

[3] Sample TPGW-Dup1 (6/4/12) is a duplicate of TPGW-9M.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.1-10. Summary of Groundwater Analytical Results from the October 2010 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18 10/19/2010		TPGW-L3-58 10/19/2010		TPGW-L5-18 10/19/2010		TPGW-L5-58 10/19/2010		TPGW-G21-18 10/21/2010		TPGW-G21-58 10/21/2010		TPGW-G28-18 10/19/2010		TPGW-G28-58 10/19/2010		TPGW-G35-18 10/19/2010		TPGW-G35-58 10/19/2010		F Blank 1 10/21/2010		F Blank 1 10/19/2010	
Temperature	°C	27.5	J	28.1	J	28.4	J	27.9	J	25.5	J	25.1	J	24.7	J	24.8	J	25.6	J	25.1	J				
pH	SU	7.1	J	7.0	J	7.8	J	7.0	J	7.5	J	6.8	J	9.0	J	7.0	J	7.1	J	7.1	J				
Dissolved Oxygen	mg/L	0.1	J	0.2	J	0.1	J	0.2	J	0.1	J	0.2	J	0.1	J	0.2	J	0.1	J	0.3	J				
Specific Conductance	µS/cm	1340.0	J	80211.0	J	494.0	J	75992.0	J	429.0	J	13419.0	J	8264.0	J	39797.0	J	736.0	J	18117.0	J				
Turbidity	NTU	1.7	J	0.5	J	1.4	J	0.8	J	6.4	J	0.4	J	11.1	J	9.0	J	0.7	J	0.2	J				
Arsenic	mg/L																								
Barium	mg/L	0.016	U	0.075	I	0.016	U	0.094	I	0.016	U	0.420		0.048	I	0.150	I	0.016	U	0.025	I	0.00081	U	0.00081	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	0.054	U	0.460	I	0.260	I	0.810	I	0.390	IJ	0.310	I	0.340	I	4.0		0.310	I	1.5		0.0037	I	0.0027	U
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	95		700		48		720		65		540		270		590		110		310		0.10	U	0.11	I
Magnesium	mg/L	19		2100		5.8		2000		2.9		150		56		880		5.7		350		0.020	U	0.020	U
Potassium	mg/L	6.2		640		2.6		590		4.4		25		14		190		6.9		100		0.19	U	0.19	U
Sodium	mg/L	140		17000		38		16000		15		2000		970		7700		26		3300		0.31	U	0.31	U
Boron	mg/L	0.095		6.7		0.030	I	6.2		0.032	I	0.140		0.150		1.4		0.061		1.6		0.010	U	0.010	U
Strontium	mg/L	1.0		13.0		0.530		14.0		0.950		6.3		2.4		7.6		1.1		4.9		0.001	U	0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	0.69		0.027	U	0.17		0.027	U	0.097		0.027	U	0.027	U	0.027	U	0.21	J-	0.027	U	0.027	U	0.027	U
Chloride	mg/L	260		33000		72		31000		34		4600		2200		15000		46		6100		0.20	U	0.46	I
Fluoride	mg/L	0.10		0.020	U	0.057		0.020	U	0.094		0.020	U	0.020	U	0.020	U	0.066		0.020	U	0.020	U	0.020	U
Sulfate	mg/L	20		3900		0.46	I	3600		2.4		0.20	U	130		1400		35		750		0.20	U	0.20	I
Total Ammonia	mg/L as N																								
Ammonium Ion (NH_4^+)	mg/L																								
Unionized NH_3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L ($CaCO_3$)	230		160		120		180		150		180		30		200		260		160		1.1		2.8	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	230		160		120		180		150		180		30		200		260		160		1.1		2.8	
Sulfides	mg/L	4.8		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	730		56000		260		53000		230		8500		3800		24000		400		10000		5.0	U	5.0	U
Dissolved Inorganic Carbon	mg/L	57		37		29		41		37		42		9.1		47		58		38		1.0	U	1.0	U
$\delta^{18}O$	‰	0.6		4.9		-4.0		4.7		-2.1		-1.0		-1.2		1.9		-1.7		-0.8		-1.1		-1.2	
$\delta^{2}H$	‰	7.0		28.0		-32.0		25.0		-12.0		-3.0		-6.0		15.0		-7.0		-4.0		-4.0		-6.0	
$\delta^{13}C$	‰	-11.1		-7.7		-9.8		-7.2		-9.4		-9.2		-12.0		-7.8		-10.8		-7.2		-10.2		-18.3	
Gross Alpha	pCi/L																								
Salinity (PSS-78)		0.7	J	56.0	J	0.2	J	52.6	J	0.2	J	7.7	J	4.6	J	25.4	J	0.4	J	10.7	J				
$^{87}Sr/^{86}Sr$	mg/L*	0.7		0.7		0.7		0.7		0.7		0.7		0.7		0.7		0.7		0.7		0.0		0.0	U
Tritium	pCi/L (1σ)	55.8(6.8)		3850(132)		84.4(7.4)		3198(114)		6.0(5.9)		13.3(5.9)		6.9(5.9)		413(17)		11.7(5.9)		1.4(5.7)	UJ	2.3(5.9)	UJ	3.2(5.8)	UJ

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.

Table 3.1-11. Summary of Groundwater Analytical Results from the January 2011 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18 1/27/2011		TPGW-L3-58 1/27/2011		TPGW-L5-18 1/27/2011		TPGW-L5-58 1/27/2011		TPGW-G21-18 1/28/2011		TPGW-G21-58 1/28/2011		TPGW-G28-18 1/28/2011		TPGW-G28-58 1/28/2011		TPGW-G35-18 1/28/2011		TPGW-G35-58 1/28/2011		EB1 1/27/2011		FB1 1/28/2011	
Temperature	°C	22.13		24.86		22.05		25.21		23.27		23.29		23.88		23.73		23.62		23.5					
pH	SU	7.42		6.82		7.19		6.76		7.23		6.74		8.06		9.92		7.05		7.02					
Dissolved Oxygen	mg/L	0.17		0.16		1.28		0.15		0.47		0.18		0.59		0.18		0.16		0.16					
Specific Conductance	µS/cm	699		84800		908		80124		548		14319		9991		41949		775		18039					
Turbidity	NTU	1.41		0.2		1.44		0.27		1.52		1.41		9		6.84		0.48		0.59					
Arsenic	mg/L																								
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.018		0.098	I	0.095	I	0.031	I	0.016	U	0.00081	U	0.0029	I
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	0.054	U	0.510	I	0.054	U	1.0		0.054	U	0.014	I	0.260	I	4.0		0.054	U	1.3		0.0027	U	0.0027	U
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	81		660		65		660		82		490		310		530		110		250		0.10	U	0.12	I
Magnesium	mg/L	9.4		2200		7.8		2100		3.7		160		96		870		5.9		340		0.020	U	0.020	U
Potassium	mg/L	4.0		1400		3.0		1300		4.3		55		38		440		7.8		230		0.19	U	0.19	U
Sodium	mg/L	89		21000		54		20000		20		2700		1800		8300		30		3500		0.31	U	0.31	U
Boron	mg/L	0.044	I	7.5		0.041	I	6.8		0.038	I	0.160		0.200		1.5		0.060		1.6		0.010	U	0.010	U
Strontium	mg/L	0.750		13.0		0.650		14.0		0.860		6.1		3.3		7.3		1.0		4.1		0.001	U	0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	0.35	I	110		0.27	U	210		0.14		16		9.0		48		0.28		19		0.027	U	0.027	U
Chloride	mg/L	170		34000		100		32000		38	J-	4800		3200		15000		52		5800		0.20	U	0.20	U
Fluoride	mg/L	0.065		0.20	U	0.069		0.20	U	0.11	J+	0.020	U	0.020	U	0.020	U	0.084		0.020	U	0.020	U	0.020	U
Sulfate	mg/L	24		4000		17		3700		11	J-	130		180		1600		40	J-	780		0.20	U	0.20	U
Total Ammonia	mg/L as N																								
Ammonium Ion (NH^{4+})	mg/L																								
Unionized NH_3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L ($CaCO_3$)	140		160		140		170		180		180		120		200		240		160		3.1		1.0	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	140		160		140		170		180		180		120		200		240		160		3.1		1.0	U
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	490		56000		350	J	55000		270		9400		5900		26000		400		11000		5.0	U	5.0	U
Dissolved Inorganic Carbon	mg/L	39		42		39		45		49		35		46		43		2.6		43		1.0	U	1.0	U
$\delta^{18}O$	‰	-0.7		5.0		-0.9		4.5		-1.8		-1.0		-1.0		1.8		-1.6		-0.7		-1.0		-1.2	
$\delta^{2}H$	‰	3.0		31.0		2.0		30.0		-11.0		1.0		-5.0		12.0		-6.0		1.0		-6.0		-5.0	
$\delta^{13}C$	‰	-9.80		-7.38		-9.02		-7.14		-9.69		9.24		-11.00		-7.66		-10.94		-7.34		-20.38		-17.07	
Gross Alpha	pCi/L																								
Salinity (PSS-78)		0.3		59.8		0.4		56.0		0.3		8.3		5.6		26.9		0.4		10.7					
$^{87}Sr/^{86}Sr$	mg/L*	0.70915		0.70912		0.70916		0.70909		0.70911		0.70912		0.70915		0.70912		0.70911		0.70915		0.177		0.177	
Tritium	pCi/L (1σ)	80.4(10.4)		4040(250)		64.7(8.9)		3320(200)		4.4(8.1)	UJ	17.3(8)		13.9(8.3)		4440(30)		16.2(8.1)		-2.6(7.7)	UJ	2.6(6.7)	UJ	0.5(7.8)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.

Table 3.1-12. Summary of Groundwater Analytical Results from the March 2011 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18 3/16/2011		TPGW-L3-58 3/16/2011		031611-DUP1 [1] 3/16/2011		TPGW-L5-18 3/16/2011		TPGW-L5-58 3/16/2011		TPGW-G21-18 3/17/2011		TPGW-G21-58 3/17/2011		TPGW-G28-18 3/17/2011		TPGW-G28-58 3/17/2011		TPGW-G35-18 3/17/2011		TPGW-G35-58 3/17/2011		EB1 40271 3/17/2011		EB1 40269 3/16/2011	
Temperature	°C	24.52		26.96				23.78		26.93		23.19		24.28		24.76		24.62		24.29		24.32					
pH	SU	7.69	J	7.08	J			7.58	J	7.07	J	7.40		6.80	J	8.29		7.01		7.36		7.13					
Dissolved Oxygen	mg/L	0.34		0.39				0.85		0.60		1.10		0.18		0.29		0.25		0.15		0.24					
Specific Conductance	µS/cm	930.00		79735.00				963.00		74971.00		592.00		13392.00		9378.00		38230.00		738.00		17867.00					
Turbidity	NTU	0.99		0.44				0.40		0.21		1.12		0.42		3.08		7.82		0.28		0.01					
Arsenic	mg/L																										
Barium	mg/L	0.016	U	0.033	I	0.034	I	0.016	U	0.140	I	0.016	U	0.390		0.086	I	0.150	I	0.016	U	0.054	I	0.007	IV	0.001	U
Beryllium	mg/L																										
Cadmium	mg/L																										
Copper	mg/L																										
Iron	mg/L	0.054	U	0.560	IJ	0.480	I	0.400	I	1.400		0.092	I	0.350	I	0.450	I	4.200		0.270	I	1.600		0.003	U	0.006	I
Lead	mg/L																										
Manganese	mg/L																										
Molybdenum	mg/L																										
Nickel	mg/L																										
Selenium	mg/L																										
Thallium	mg/L																										
Vanadium	mg/L																										
Zinc	mg/L																										
Silica	mg/L																										
Calcium	mg/L	85		710		710		86		720		90		550		320		590		89		310		0.1	U	0.1	U
Magnesium	mg/L	12		2200		2200		12		2000		4.2		160		77		910		6.7		380		0.02	U	0.02	U
Potassium	mg/L	3.7		640		630		3.9		580		5.2		25		18		190		9.1		110		0.19	U	0.19	U
Sodium	mg/L	76		16000		16000		82		15000		26		2100		1200		7300		44		3200		0.31	U	0.35	I
Boron	mg/L	0.052		6.7		6.7		0.054		6		0.056		0.15		0.17		1.4		0.074		1.6		0.037	I	0.01	U
Strontium	mg/L	0.82		13		13		0.81		14		0.9		6.2		2.9		7.4		0.92		4.8		0.001	U	0.001	U
Chromium VI	mg/L																										
Mercury	mg/L																										
Bromide	mg/L	0.29	I	99		120		0.4	I	91		0.2		17		11		48		0.37	I	23		0.027	U	0.027	U
Chloride	mg/L	150		33000		33000		170		31000		50		4900		3300		15000		82		6300		0.2	U	0.2	U
Fluoride	mg/L	0.061		0.22	I	0.2	U	0.068		0.2	U	0.096		0.2	U	0.2	U	0.2	U	0.096		0.2	U	0.02	U	0.02	U
Sulfate	mg/L	64		4200		4200		21		3700		16		130		190		1600		65	J-	890		0.2	U	0.2	U
Total Ammonia	mg/L as N																										
Ammonium Ion (NH^{4+})	mg/L																										
Unionized NH_3	mg/L																										
Nitrate/Nitrite as N	mg/L																										
TKN	mg/L																										
TN	mg/L																										
Orthophosphate	mg/L																										
Phosphorus (P)	mg/L																										
Alkalinity	mg/L ($CaCO_3$)	160		160		160		180		170		200		170		99		200		140		160		21		1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	160		160		160		180		170		200		170		99		200		140		160		21		1	U
Sulfides	mg/L	1	U	1.1		1.1		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	510		55000		55000		510		50000		340		8700		5600		24000		390		10000		5	U	5	U
Dissolved Inorganic Carbon	mg/L	51		49		47		61		52		61		55		33		67		51		49		10	U	10	U
$\delta^{18}O$	‰	-0.8		5.0		-1.5		-1.2		4.7		-1.3		-		-1.3		1.8		-1.0		-0.6		-		-1.2	
$\delta^{2}H$	‰	1.0		27.0		-7.0		-2.0		26.0		-8.0		-		-7.0		12.0		-6.0		-3.0		-		-6.0	
$\delta^{13}C$	‰	-9.77		-7.59		-7.64		-10.58		-6.93		-9.4		-9.37		-10.91		-7.81		-9.96		-7.17		-15.52		-12.92	
Gross Alpha	pCi/L																										
Salinity (PSS-78)		0.5		55.6				0.5		51.8		0.3		7.7		5.3		24.3		0.4		10.5					
$^{87}Sr/^{86}Sr$	mg/L*	0.70918		0.70911		0.70912		0.70915		0.7091		0.70912		0.7091		0.70915		0.70908		0.70913		0.70912		0.035		0.049	
Tritium	pCi/L (1σ)	93.8(10.5)		3960(240)		3900(240)		80.4(9.7)		3270(200)		18.4(7.1)		17.8(6.9)		31.1(6.7)		411(30)		11.6(6.1)		-0.7(5.9)	UJ	-1.5(6.2)	UJ	-1.5(6.5)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-DUP1 (3/16/2011) is a field duplicate of TPGW-L3-58.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

Table 3.1-13. Summary of Groundwater Analytical Results from the June 2011 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18 6/7/2011		TPGW-L3-58 6/7/2011		TPGW-L5-18 6/7/2011		TPGW-L5-58 6/7/2011		TPGW-G21-18 6/8/2011		TPGW-G21-58 6/8/2011		TPGW-G28-18 6/8/2011		TPGW-G28-58 6/8/2011		TPGW-G35-18 6/8/2011		TPGW-G35-58 6/8/2011		TPGW-FB1 6/7/2011		TPGW-FB1 6/8/2011	
Temperature	°C	25.86		28.60		29.92		29.05		24.57		24.72		26.86		24.52		24.53		24.27					
pH	SU	7.39		7.02		7.58		7.15		7.21		6.80	J	8.87		7.83		7.44		7.25					
Dissolved Oxygen	mg/L	0.29		0.26		0.17		0.16		0.20		0.28		0.27		0.25		0.25		0.30					
Specific Conductance	µS/cm	1432		81271		5724		76804		629	J	14355		7130		38862		710	J	18915					
Turbidity	NTU	1.37		0.54		0.92		0.60		1.78		0.67		22.61		25.50		1.25		1.16					
Arsenic	mg/L																								
Barium	mg/L	0.073	I	1.2	I	0.29		1.7	I	0.016	U	0.35		0.023	I	0.081	U	0.016	U	0.081	U	0.00081	U	0.00081	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	4.7		2.6	I	3		3	I	0.19	I V	0.34	I V	0.23	I V	3.6	I	0.16	I V	3.1	I	0.0027	U	0.0031	I V
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	110		720		170		720		98		560		290		590		87		310		0.1	U	0.1	U
Magnesium	mg/L	19		2200		89		2000		4.2		170		44		870		6.7		370		0.026	I	0.02	U
Potassium	mg/L	6.2		720		26		660		4.9		29		16		200		9.5		110		0.19	U	0.19	U
Sodium	mg/L	140		17000		820		16000		26		2200		1000		6900		41		3200		0.31	U	0.31	U
Boron	mg/L	0.075	J	7.1		0.26	J	6.4		0.047	I J	0.15	J	0.19	J	1.4		0.076	J	1.6		0.075		0.077	
Strontium	mg/L	1		14		1.9		14		0.96		6.7		2.6		7.7		0.94		5		0.001	U	0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	0.87		110		5.3		96		0.27	UJ	17		7		50		0.32	I	19		0.027	U	0.027	U
Chloride	mg/L	260		31000		1500		29000		43	J	4600		2000		13000		65		5900		0.2	U	0.2	U
Fluoride	mg/L	0.083		2.1		0.069		2.1		0.2	UJ	0.65		0.2	U	0.2	U	0.2	U	0.2	U	0.02	U	0.02	U
Sulfate	mg/L	100		310		150		3500		14	J	130		140		1700		62		1100		0.2	U	0.26	I
Total Ammonia	mg/L as N																								
Ammonium Ion (NH^{4+})	mg/L																								
Unionized NH_3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L ($CaCO_3$)	160		170		200		180		160	J	110	J	45		140		160		32		1	U	1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	160		170		200		180		160	J	110	J	45		140		160		32		1	U	1	U
Sulfides	mg/L	1	U	4.5		1.4		1.3		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	820		60000		3100		54000		340		9300		4400		24000		400		10000		16		14	
Dissolved Inorganic Carbon	mg/L	42		46		52		48		63		50		14		56		46		46		10	U	10	U
$\delta^{18}O$	‰	-0.2		5.6		0.6		5.0		-1.3		-0.8		-0.9		2.1		-0.7		-0.6		-1.0		-1.0	
$\delta^{2}H$	‰	3.0		28.0		6.0		26.0		-4.0		4.0		0.0		16.0		-7.0		-1.0		-3.0		-6.0	
$\delta^{13}C$	‰	-10.81		-7.74		-9.94		-7.54		-9.69		-9.31		-10.79		-7.76		-9.70		-7.16		-17.89		-17.24	
Gross Alpha	pCi/L																								
Salinity (PSS-78)		0.7		56.8		3.1		53.2		0.3	J	8.3		3.9		24.7		0.3	J	11.2					
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70912		0.70915		0.70911		0.70915		0.70913		0.70913		0.70912		0.70914		0.7091		0.1		0.1	
Tritium	pCi/L (1σ)	94.7 (8.4)		3730 (210)		113.2 (9.3)		3438 (198)		22.5 (5.8)		24 (5.8)		16.8 (7.9)		410 (27)		7.7 (7.8)	UJ	15.9 (7.8)		8.6 (5.6)		4.8 (5.5)	UJ

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-14. Summary of Groundwater Analytical Results from the September 2011 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18 9/19/2011		TPGW-L3-58 9/19/2011		TPGW-L5-18 9/19/2011		TPGW-L5-58 9/19/2011		TPGW-G21-18 9/20/2011		TPGW-G21-58 9/20/2011		TPGW-G28-18 9/20/2011		TPGW-G28-58 9/20/2011		TPGW-G35-18 9/20/2011		TPGW-G35-58 9/20/2011		TPGW-FB1 9/20/2011		TPGW-FB1 9/19/2011	
Temperature	°C	28.62		29.40		30.12		29.10		25.7		25.26		24.88		25.18		25.59		25.91					
pH	SU	7.16		7.11		7.55		7.00		7.42		6.89	J	8.23		7.09		7.36		7.34					
Dissolved Oxygen	mg/L	0.06		0.07		0.18		0.54		0.14		0.26		0.25		0.24		0.16		0.27					
Specific Conductance	µS/cm	3742		79557		797	J	75568		588	J	14409		7824		38933		697	J	16117					
Turbidity	NTU	1.37		0.37		0.42		0.06		0.65		0.47		15.04		9.67		1.06		0.17					
Arsenic	mg/L																								
Barium	mg/L	0.09	I	0.08	U	0.08	I	0.08	U	0.13	I J	0.34	I J	0.08	U	0.08	U	0.08	U	0.09	I J	0.0012	I	0.0008	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	0.27	U	1.30	I	0.27	U	1.20	I	6.90		0.51	I V J	0.76	I V J	4.30	I J	0.39	I V J	1.60	I V J	0.0063	I V	0.0027	U
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	150		720		64		730		83		560		290		570		110		250		0.1	U	0.1	U
Magnesium	mg/L	62		2100		8.6		2100		4.3		180		70		870		5.9		310		0.039	I V	0.02	U
Potassium	mg/L	18		660		3.3		630		4.2		26		18		190		8.1		98		0.19	U	0.19	U
Sodium	mg/L	480		17000		79		16000		30		2200		1200		7300		28		2800		0.31	U	0.31	U
Boron	mg/L	0.21		7		0.052	J	6.5		0.045	I	0.15		0.2		1.5		0.068		1.4		0.066		0.066	
Strontium	mg/L	1.5		13		0.66		14		0.98		6.9		3		7.7		1.1		3.9		0.001	U	0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	3.6		97		0.86	I	92		0.25	J	20		8.2		62		0.3		22		0.027	U	0.027	U
Chloride	mg/L	950	J-	32000		150		30000		55	J	4800		2300		14000		43		4600		0.35	I	0.31	I
Fluoride	mg/L	0.4	U	0.4	U	0.4	U	0.4	U	0.095	J	0.4	U	0.4	U	0.4	U	0.097		0.4	U	0.02	U	0.02	U
Sulfate	mg/L	140		3900		17		3600		12	J	170		140		1500		45		870		0.2	U	0.2	U
Total Ammonia	mg/L as N																								
Ammonium Ion (NH^{4+})	mg/L																								
Unionized NH_3	mg/L																								
Nitrate/Nitrite as N	mg/L																								
TKN	mg/L																								
TN	mg/L																								
Orthophosphate	mg/L																								
Phosphorus (P)	mg/L																								
Alkalinity	mg/L ($CaCO_3$)	250		150		120		160		160	J	170		99		190		220		150		1	U	1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	250		150		120		160		160	J	170		99		190		220		150		1	U	1	U
Sulfides	mg/L	8.3		2.4		1	U	1	U	1.4		1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	1500		56000		450		52000		320		9600		4300		25000		300		9100		5	U	5	U
Dissolved Inorganic Carbon	mg/L	72		53		42		54		57		53		27		60		67		49		10	U	10	U
$\delta^{18}O$	‰	0.00		4.90		0.10		4.60		-1.7		-1		-1.2		1.7		-1.7		-0.8		-1.30		-1.40	
$\delta^{2}H$	‰	3.00		29.00		-1.00		22.00		-9		0		-4		12		-3		-3		-2.00		-8.00	
$\delta^{13}C$	‰	-11.47		-8.13		-11.11		-7.65		-10.54		-9.86		-10.82		-8.02		-11.26		-8.02		-13.71		-12.45	
Gross Alpha	pCi/L																								
Salinity (PSS-78)		2.0		55.4		0.4	J	52.2		0.3	J	8.3		4.3		24.8		0.3	J	9.4					
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70916		0.70916		0.70911		0.7091		0.70914		0.70915		0.70912		0.70915		0.70914		0.1		0.1	
Tritium	pCi/L (1σ)	89 (9)		4010 (250)		5.3 (7.4)	UJ	3350 (210)		14.8 (7.6)		24.7 (8.1)		16.7 (7.7)		430 (30)		2.2 (7.3)	UJ	-1.7 (6.8)	UJ	6.2 (7.4)	UJ	1.1 (6.1)	UJ

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-15. Summary of Groundwater Analytical Results from the December 2011 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18		TPGW-L3-58		TPGW-L5-18		TPGW-L5-58		TPGW-G21-18		TPGW-Dup1 [1]		TPGW-G21-58		TPGW-G28-18		TPGW-G28-58		TPGW-G35-18		TPGW-G35-58		TPGW-FB1		TPGW-FB1	
		12/6/2011		12/6/2011		12/6/2011		12/6/2011		12/7/2011		12/7/2011		12/7/2011		12/7/2011		12/7/2011		12/7/2011		12/7/2011		12/6/2011		12/7/2011	
Temperature	°C	26.28		27.73		26.27		27.17		24.76				24.34		24.69		24.88		24.62		24.10					
pH	SU	7.41		6.97	J	7.43		6.93	J	7.22				6.80	J	8.18		6.96	J	7.12		7.20					
Dissolved Oxygen	mg/L	0.38		0.52		0.37		0.30		0.25				0.22		0.15		0.23		0.22		0.17					
Specific Conductance	µS/cm	657	J	79760		665	J	76281		538	J			15127		8304		39168		709	J	18279					
Turbidity	NTU	2.87		0.42		3.69		0.80		3.37				1.33		22.78		31.92		1.45		1.38					
Arsenic	mg/L																										
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.31	I	0.12	I	0.08	U	0.08	U	0.08	U	0.00081	U	0.00081	U
Beryllium	mg/L																										
Cadmium	mg/L																										
Copper	mg/L																										
Iron	mg/L	0.27	U	1.00	I	0.27	U	1.30	I	0.27	U	0.27	U	0.27	U	0.39	I	3.90	I	1.30	I	1.30	I	0.0027	U	0.0034	I
Lead	mg/L																										
Manganese	mg/L																										
Molybdenum	mg/L																										
Nickel	mg/L																										
Selenium	mg/L																										
Thallium	mg/L																										
Vanadium	mg/L																										
Zinc	mg/L																										
Silica	mg/L																										
Calcium	mg/L	65		740		64		700		83		81		570		0.1	U	300		100		320		0.11	I	0.11	I
Magnesium	mg/L	8.1		2000		7.6		1900		3.8		3.6		170		0.021	I	79		5.2		350		0.048	I	0.034	I
Potassium	mg/L	4		700		3.4		600		4.6		4.5		25		0.19	U	19		6.9		120		0.19	U	0.19	U
Sodium	mg/L	54		17000		50		15000		22		22		2200		0.31	U	1100		29		3000		0.31	U	0.31	U
Boron	mg/L	0.033	I	6.9		0.032	I	5.9		0.043	I	0.042	I	0.14		0.019	I	0.2		0.06		1.6		0.062		0.072	
Strontium	mg/L	0.64		13		0.62		14		0.84		0.82		6.2		0.001	U	2.9		0.95		4.8		0.001	U	0.001	U
Chromium VI	mg/L																										
Mercury	mg/L																										
Bromide	mg/L	0.35		110		0.33		110		0.22		0.027	U	18		9.7		50		0.027	U	21		0.027	U	0.027	U
Chloride	mg/L	99		34000		100		32000		37		37		4900		2800		15000		48		5900		0.2	U	0.2	U
Fluoride	mg/L	0.072		0.4	U	0.072		0.4	U	0.11		0.11		0.4	U	0.4	U	0.4	U	0.092		0.4	U	0.035	I	0.02	I
Sulfate	mg/L	8.9		4500		6.4		4300		17		17		170		200		1800		45		890		0.2	U	0.2	U
Total Ammonia	mg/L as N																										
Ammonium ion NH_4	mg/L																										
Unionized NH_3	mg/L																										
Nitrate/Nitrite as N	mg/L																										
TKN	mg/L																										
TN	mg/L																										
Orthophosphate	mg/L																										
Phosphorus (P)	mg/L																										
Alkalinity	mg/L ($CaCO_3$)	190		200		190		220		220		230		220		120		240		270		190		2.2		1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	190		200		190		220		220		230		220		120		240		270		190		2.2		1	U
Sulfides	mg/L	1	U	2.1		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	310		57000		330		51000		260		270		8300		3900		23000		350		9500		5	U	5	U
Dissolved Inorganic Carbon	mg/L	49		45		48		54		55		53		45		25		54		61		44		1	U	10	U
$\delta^{18}O$	‰	-1.3		-1.3		-1.1		1.9		-0.7		-0.7		-1.7		-1.9		-1.8		-1.7		-2.5		-1.2		-1	
$\delta^{2}H$	‰	1.00		27.00		-2		23		-9.00	J	-5	J	-5.00		0.00		12.00		-6.00		-3.00		-6		-4	
$\delta^{13}C$	‰	-9.38		-7.66		-10.54		-7.18		-9.92		-9.87		-9.48		-10.89		-7.92		-11.13		-7.43		-10.41		-7.98	
Gross Alpha	pCi/L																										
Salinity (PSS-78)		0.3		55.6		0.3		52.8		0.3				8.8		4.6		24.9		0.3		10.8					
$^{87}Sr/^{86}Sr$	µg/L*																										
Tritium	pCi/L (1σ)	53.9 (8.4)		4040 (240)		44.4 (8)		3440 (210)		4.3 (5.2)	UJ	10.7 (5.4)		22.3 (5.7)		7.5 (5.3)		424 (26)		18.7 (5.5)		12.1 (5.4)		6.5 (8)	UJ	-0.4 (5.4)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPGW-Dup1 (12/7/11) is a duplicate of TPGW-G21-18.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

Table 3.1-16. Summary of Groundwater Analytical Results from the March 2012 Historical Well Sampling Event

Parameter	Units	TPGW-L3-18 3/6/2012		TPGW-L3-58 3/6/2012		TPGW-L5-18 3/6/2012		TPGW-L5-58 3/6/2012		TPGW-G21-18 3/7/2012		TPGW-G21-58 3/7/2012		TPGW-G28-18 3/7/2012		TPGW-Dup1 [1] 3/7/2012		TPGW-G28-58 3/7/2012		TPGW-G35-18 3/7/2012		TPGW-G35-58 3/7/2012		TPGW-EB1 3/1/2012		TPGW-FB1 3/7/2012	
Temperature	°C	25.34		26.53		24.09		25.43		24.05		24.33		24.85				24.63		23.89		23.94					
pH	SU	7.34		7.03		7.27		6.97		7.24		6.82		9.77				7.03		7.30		7.25					
Dissolved Oxygen	mg/L	0.45		0.13		0.35		0.18		0.42		0.65		1.35				0.50		0.47		0.41					
Specific Conductance	µS/cm	976.00		80857.00		971.00		76503.00		536.00		15767.00		6087.00				39655.00		737.00		18874.00					
Turbidity	NTU	1.05		0.18		0.23		0.53		1.43		0.88		26.75				21.62		1.19		1.23					
Arsenic	mg/L																							0.0012	I V		
Barium	mg/L	0.17	I V	0.08	U	0.12	I V	0.08	U	0.17	I V	0.46	I V	0.21	I V	0.17	I V	0.21	I V	0.10	I V	0.08	U	0.0008	U	0.0008	U
Beryllium	mg/L																							0.0002	U		
Cadmium	mg/L																							0.0004	U		
Copper	mg/L																							0.0003	U		
Iron	mg/L	0.31	I	0.88	I	0.27	U	1.20	I	0.52	I	0.27	U	0.90	I	0.54	I	3.90	I	0.53	I	1.40	I	0.0074	I	0.00	I V
Lead	mg/L																							0.0024	U		
Manganese	mg/L																							0.0005	U		
Molybdenum	mg/L																							0.0005	U		
Nickel	mg/L																							0.0014	U		
Selenium	mg/L																							0.0039	I		
Thallium	mg/L																							0.0016	U		
Vanadium	mg/L																							0.0005	U		
Zinc	mg/L																							0.0018	U		
Silica	mg/L																										
Calcium	mg/L	88.00		750.00		99.00		760.00	J	85.00		980.00		350.00		340.00		660.00		90.00		340.00		0.63		1.20	
Magnesium	mg/L	11.00		2100.00		11.00		2000.00	J	3.60		190.00		100.00		97.00		870.00		6.60		380.00		0.23		0.39	
Potassium	mg/L	4.40		720.00		4.00		660.00	J	4.20		32.00		24.00		24.00		220.00		10.00		140.00		4.40		17.00	
Sodium	mg/L	82.00		16000.00		75.00		15000.00	J	21.00		2500.00		1400.00		1400.00		7300.00		45.00		3300.00		79.00		110.00	
Boron	mg/L	0.04	I	7.00		0.06		6.30		0.04	I	0.15		0.22		0.22		1.50		0.08		1.70		0.05		0.05	I
Strontium	mg/L	0.90		13.00		0.89		14.00		0.83		7.00		3.40		3.30		7.80		0.96		5.20		0.00	I	0.00	I
Chromium VI	mg/L																										
Mercury	mg/L																							0.00	U		
Bromide	mg/L	0.84	I	120.00		0.86	I	110.00		0.19		20.00		11.00		9.50		53.00		0.94	I	23.00		0.03	U	0.03	U
Chloride	mg/L	170.00		32000.00	J-	150.00		31000.00		36.00		5300.00		2700.00		2700.00		14000.00		74.00		5700.00		36.00		97.00	
Fluoride	mg/L	1.00		0.40	U	0.53	I	0.40	U	0.12		0.40	U	0.47	I	0.40	U	0.40	U	0.40	U	0.40	U	0.50		0.28	
Sulfate	mg/L	67.00		4700.00		76.00		4100.00		13.00		170.00		200.00		200.00		1700.00		79.00		900.00		0.20	U	0.20	U
Total Ammonia	mg/L as N																							1.30			
Ammonium Ion (NH^{4+})	mg/L																										
Unionized NH_3	mg/L																										
Nitrate/Nitrite as N	mg/L																							0.00	U		
TKN	mg/L																							4.00			
TN	mg/L																										
Orthophosphate	mg/L																										
Phosphorus (P)	mg/L																							0.01	I		
Alkalinity	mg/L ($CaCO_3$)	170.00		190.00		190.00		190.00		170.00		200.00		120.00		110.00		210.00		160.00		170.00		140.00		120.00	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	170.00		190.00		190.00		190.00		170.00		200.00		120.00		110.00		210.00		160.00		170.00		140.00		120.00	
Sulfides	mg/L	1.00	U	2.90		1.00	U	1.00	U	1.00	U	3.00		3.00		1.00	U	1.90		2.40		3.00		1.00	U	1.00	U
Total Dissolved Solids	mg/L	500.00		58000.00		480.00		53000.00		230.00		9300.00		4700.00		4300.00		23000.00		390.00		11000.00		160.00		250.00	
Dissolved Inorganic Carbon	mg/L	51.00		50.00		51.00		40.00		47.00		42.00		29.00		28.00		60.00		36.00		37.00		1.00	U	29.00	
$\delta^{18}O$	‰																										
$\delta^{2}H$	‰																										
$\delta^{13}C$	‰																										
Gross Alpha	pCi/L																										
Salinity (PSS-78)		0.5		56.6		0.5		53.1		0.3		9.2		3.3				25.3		0.4		11.2					
$^{87}Sr/^{86}Sr$	µg/L*																										
Tritium	pCi/L (1σ)																										

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample TPGW-DUP1 (3/7/2012) is a field duplicate of TPGW-G28-18.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.1-17. Summary of Groundwater Analytical Results from the June 2012 Historical Well Sampling Event

		TPGW-L3-18		TPGW-L3-58		TPGW-L5-18		TPGW-L5-58		TPGW-G21-18		TPGW-G21-58		TPGW-G28-18		TPGW-G28-58		TPGW-G35-18		TPGW-G35-58		FB1	
Parameter	**Units**	**6/11/2012**		**6/11/2012**		**6/11/2012**		**6/11/2012**		**6/12/2012**		**6/12/2012**		**6/12/2012**		**6/12/2012**		**6/12/2012**		**6/12/2012**		**6/12/2012**	
Temperature	°C	26.46		27.93		29.04		29.34		26.03		26.35		26.26		25.49		24.29		24.50			
pH	SU	7.21		7.07		7.5		7.04		6.98		6.87		8.49		7.06		6.99		7.28			
Dissolved Oxygen	mg/L	0.17		0.26		0.23		0.24		0.58		0.64		0.22		0.44		0.35		0.48			
Specific Conductance	µS/cm	838		79755		739		75732		543		16058		9012		39290		669		18498			
Turbidity	NTU	0.54		0.12		0.85		0.10		0.72		0.12		30.73		15.03		0.13		0.10			
Arsenic	mg/L																						
Barium	mg/L	0.0059		0.1		0.006		0.12		0.0095		0.42		0.094		0.16		0.014		0.063		0.00035	U
Beryllium	mg/L																						
Cadmium	mg/L																						
Copper	mg/L																						
Iron	mg/L	0.082		0.027	U	0.12		0.51		0.15		0.2		0.49		3.3		0.14		1.6		0.0027	U
Lead	mg/L																						
Manganese	mg/L																						
Molybdenum	mg/L																						
Nickel	mg/L																						
Selenium	mg/L																						
Thallium	mg/L																						
Vanadium	mg/L																						
Zinc	mg/L																						
Silica	mg/L																						
Calcium	mg/L	71		760		77	J3	720		85		980		340		600		99		340	J3	0.1	U
Magnesium	mg/L	9.8		2100		7.8		1900		3.8		200		100		830		5.9		350	J3	0.025	I
Potassium	mg/L	3.3		660		3.5		570		3.9		27		20		190		8.8		110		0.19	U
Sodium	mg/L	77		19000		55	J3	17000		21		2800		1600		7800		26		3300	J3	0.31	U
Boron	mg/L	0.063		6.9		0.043	I	5.9		0.041	I	0.15		0.24	I	1.4		0.069		1.6		0.01	U
Strontium	mg/L	0.73		14		0.77		14		0.87		6.9		3.3		7.5		1		5.1		0.001	U
Chromium VI	mg/L																						
Mercury	mg/L																						
Bromide	mg/L	0.37		110		0.36		120		0.19		19		11		49		0.33		20	J3	0.027	U
Chloride	mg/L	160		32000		110		30000		37		5000		3000		14000		44		5400	J3	0.2	U
Fluoride	mg/L	0.085		0.2	U	0.1		0.2	U	0.12		0.2	U	0.2	U	0.2	U	0.19		0.52		0.02	U
Sulfate	mg/L	21		4300		22		3800		8.8		180		220		1700		60		860	J3	0.2	U
Total Ammonia	mg/L as N																						
Ammonium Ion (NH^{4+})	mg/L																						
Unionized NH_3	mg/L																						
Nitrate/Nitrite as N	mg/L																						
TKN	mg/L																						
TN	mg/L																						
Orthophosphate	mg/L																						
Phosphorus (P)	mg/L																						
Alkalinity	mg/L ($CaCO_3$)	140		180		160		190		220		200		130		220		210		170		1	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	140		180		160		190		220		200		130		220		210		170		1	
Sulfides	mg/L	1.6		1.4		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	450		60000		370		55000		300		9900		5400		26000		380		11000		190	
Dissolved Inorganic Carbon	mg/L	31		47		46		48		55		52		35		62		52		44		1	U
$\delta^{18}O$	‰	-1.7		5.0		-1.8		4.6		-1.8		-1.1		-0.9		1.8		-1.6		-0.9		-0.9	
$\delta^{2}H$	‰	-14		29.0		-15.0		26.0		-13.0		1.0		-2.0		10.0		-5.0		-1.0		-5.0	
$\delta^{13}C$	‰	-11.77		-7.87		-13.03		-7.44		-10.06		-9.42		-10.92		-7.98		-10.22		-7.45		-9.38	
Gross Alpha	pCi/L																						
Salinity (PSS-78)		0.4		55.6		0.4		53.3		0.3		9.4		5.0		25.0		0.3		10.9			
$^{87}Sr/^{86}Sr$	µg/L*																						
Tritium	pCi/L (1σ)																						

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.

Table 3.1-18. Comparison of Historical Well Groundwater Chloride Concentrations to Nearby Discretely Screened Monitoring Wells

Monitoring Well	Well Depth (ft BTOC)	Screen Interval (ft)	Sample Depth (ft BTOC)	Chloride Concentration (mg/L)		Comments
				March 2011	March 2012	
L-3	66.3	62	18	150	170	L-3 shallow sample collected from freshwater lens and TPGW wells all screened below lens. Data at depth comparable.
			58	**33,000**	**32,000**	
TPGW-1S	34.0	2	33	17,000	23,000	
TPGW-1M	55.1	2	54	**29,000**	**28,000**	
TPGW-1D	89.3	4	87	29,000	28,000	
L-5	65.8	65	18	170	150	L-5 shallow sample collected from freshwater lens and TPGW wells all screened below lens. Data at depth comparable.
			58	**31,000**	**31,000**	
TPGW-2S	28.7	4	27	30,000	31,000	
TPGW-2M	52.5	2	51	**34,000**	**31,000**	
TPGW-2D	87.5	2	86	32,000	32,000	
G-21	68.9	62	18	50	36	Concentrations higher in TPGW-5S but location is closer to CCS and Biscayne Bay than G-21. Considering landscape position of G-21 relative to TPGW-5 results at G-21 appear plausible.
			58	**4,900**	**5,300**	
TPGW-5S	32.6	4	31	300	240	
TPGW-5M	54.3	5	52	**10,000**	**11,000**	
TPGW-5D	72.0	5	69	11,000	11,000	
G-28	66.7	50	18	3,300	2,700	Shallow zone at G-28 much higher, possibly due in part to location in relation to TPGW-4. Data at depth comparable.
			58	**15,000**	**14,000**	
TPGW-4S	25.2	2	24	670	500	
TPGW-4M	43.1	5	41	**13,000**	**14,000**	
TPGW-4D	65.6	4	64	16,000	16,000	

Notes:
Well Depth and Screen Intervals for L and G series wells based on USGS borehole camera logs (June 2009).
Bold print indicates closest depth intervals for comparison purposes.

Key:
BTOC = Below top of casing.
ft = Feet.
mg/L – Milligrams per liter.
USGS = United States Geologic Survey.

Table 3.1-19. Range of Ion Concentrations in Groundwater

		Marine				Fresh				TPGW-13			
Parameter	**Units**	**Min**	**Max**	**Average**	**Standard Deviation**	**Min**	**Max**	**Average**	**Standard Deviation**	**Min**	**Max**	**Average**	**Standard Deviation**
Temperature	°C	23.40	29.45	26.09	1.26	22.05	30.12	24.88	1.16	29.31	30.47	29.82	0.37
pH	SU	6.45	8.15	7.03	0.21	6.74	12.10	7.54	1.15	6.52	7.25	7.03	0.14
Dissolved Oxygen	mg/L	0.05	11.00	0.48	0.98	0.05	10.90	0.51	1.05	0.06	9.70	1.00	2.38
Specific Conductance	µS/cm	19640	84800	56973	16587	429	41949	4546	9059	70180	87606	82053	4203
Turbidity	NTU	0.00	7.40	0.67	0.84	0.00	31.92	2.70	5.49	0.00	1.05	0.33	0.28
Barium	mg/L	0.00	3.00	0.14	0.33	0.00	2.20	0.10	0.19	0.03	0.23	0.09	0.04
Iron	mg/L	0.00	97.00	2.28	8.35	0.00	13.00	0.86	1.62	0.03	8.60	2.06	2.02
Calcium	mg/L	400.00	2100.00	619.68	161.62	0.00	97.00	1.88	10.843315	690.00	800.00	759.26	28.27
Magnesium	mg/L	420	2200	1446	491	0	910	70	185	2000	2500	2230	110
Potassium	mg/L	92.00	1400.00	451.26	190.74	0.19	440.00	24.34	55.32	600.00	800.00	694.58	44.13
Sodium	mg/L	3800	21000	11630	3855	0.3	8300	674	1641.4	16000	19000	17481	849
Boron	mg/L	0.58	7.50	4.44	1.91	0.02	1.70	0.21	0.43	6.60	8.30	7.23	0.44
Strontium	mg/L	6.30	15.00	10.30	2.40	0.00	7.80	1.83	1.90	14.00	16.00	14.29	0.55
Bromide	mg/L	0	210	78	33	0	62	4	11	49	130	108	18
Chloride	mg/L	7100	34000	22388	7483	10	15000	1381	3287	26000	38000	34741	2712
Fluoride	mg/L	0.01	130.00	1.19	8.64	0.02	1.00	0.15	0.13	0.02	3.60	1.10	1.10
Sulfate	mg/L	310	4700	2746	1032	0	1800	155	375	3700	5000	4281	355
Alkalinity	mg/L ($CaCO_3$)	1.90	550	210	75	30	580	225	79	54	220	169	33
Bicarbonate Alkalinity as $CaCO_3$	mg/L	2	550	210	74	1	360	201	71	54	220	169	33
Sulfides	mg/L	1	22	3	4	1	8	1	1	1	22	7	9
Total Dissolved Solids	mg/L	12000	64000	38388	12659	160	26000	2626	5573	55000	75000	59852	5142
Dissolved Inorganic Carbon	mg/L	10	140	58	22	3	94	55	17	30	60	47	8

Key:

°C = Degrees Celsius.
$CaCO_3$ = Calcium carbonate.
Max = Maximum.
mg/L = Milligram(s) per liter.
Min = Minimum.
µS/cm = MicroSiemens per centimeter.
NTU = Nephelometric turbidity unit(s).
SU = Salinity Units

Table 3.1-20. Range of Isotope Ratios in Groundwater

		Marine				Fresh				TPGW-13			
Parameter	Units	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation
$\delta^{18}O$	‰	-3.2	5.6	2.5	1.9	-4.0	4.1	-1.2	1.0	3.2	5.6	5.0	0.6
$\delta^{2}H$	‰	-15.8	32.8	18.5	8.8	-32.0	16.0	-4.1	6.2	26.0	36.0	31.5	3.2
$\delta^{13}C$	‰	-13.5	-2.9	-7.9	1.8	-32.0	36.0	3.8	14.5	-8.9	-6.4	-7.4	0.8
$^{87}Sr/^{86}Sr$		0.00000	0.70919	0.70037	0.07855	0.70908	0.70923	0.70914	0.00002	0.70908	0.70915	0.70911	0.00002
Tritium	pCi/L	0.5	4040.0	1264.5	1299.3	-2.0	440.0	37.8	90.7	3460.0	6390.0	4101.2	612.3

Key:

‰ = Parts per mille.
C = Carbon.
H = Hydrogen.
Max = Maximum.
Min = Minimum.
O = Oxygen.
pCi/L = Picocuries per liter.
Sr = Strontium.

Table 3.1-21. SFWMD Synoptic Sampling Results from CCS (February 2009)

Parameter	Units	Detection Limits	Dilution Factor	Equipment Background	Sample										Replicate Sample	
				CCSSW01	CCSSW01T	CCSSW01B	CCSSW02T	CCSSW02B	CCSSW03T	CCSSW03B	CCSSW04T	CCSSW04B	CCSSW05T	CCSSW05B	CCSSW05B	CCSSW05B
				P43409-1	P43409-2	P43409-3	P43409-4	P43409-5	P43409-6	P43409-7	P43409-8	P43409-9	P43409-10	P43409-11	P43409-14	P43409-15
Arsenic	mg/L	0.00008	1	0.00008		0.00035		0.00034		0.00024		0.00021		0.00034	0.0003	0.00045
Barium	mg/L	0.0008	1	0.0008		0.0884		0.0902		0.0893		0.0891		0.0863	0.0884	0.0894
Beryllium	mg/L	2E-06	1	0.000035		0.000002		0.000002		0.000002		0.000002		0.000068	0.000002	0.000136
Cadmium	mg/L	6E-06	1	0.000006		0.000006		0.000006		0.000006		0.000006		0.000006	0.000006	0.000006
Chromium	mg/L	0.00004	1	0.00004		0.00008		0.00008		0.00004		0.00004		0.00006	0.00005	0.000005
Copper	mg/L	1.6E-05	1	0.000016		0.000469		0.000447		0.0004		0.000241		0.000378	0.000387	0.000384
Iron	mg/L	0.008	1	0.008		0.0124		0.0128		0.008		0.0134		0.0098	0.0166	0.013
Lead	mg/L	1.2E-05	1	0.000029		0.000019		0.000026		0.000015		0.000012		0.000097	0.000055	0.000014
Manganese	mg/L	0.0004	1	0.0004		0.0086		0.0078		0.0068		0.01		0.0124	0.0134	0.0132
Molybdenum	mg/L	0.0008	1	0.0008		0.00243		0.00233		0.00241		0.00244		0.00295	0.00298	0.0029
Nickel	mg/L	0.00004	1	0.00004		0.00099		0.00089		0.00084		0.00097		0.00097	0.00096	0.00098
Selenium	mg/L	0.0004	2	0.0004		0.0004		0.0004		0.0004		0.0004		0.0004	0.0004	0.0004
Thallium	mg/L	4E-06	1	0.000004		0.000004		0.000004		0.000004		0.000004		0.000034	0.000005	0.000004
Vanadium	mg/L	0.0016	1	0.0016		0.0016		0.0016		0.0016		0.0016		0.0016	0.0016	0.0016
Zinc	mg/L	0.0002	1	0.0003		0.0008		0.0006		0.0005		0.0004		0.0006	0.0007	0.0007
Mercury	mg/L	0.00008	1	ND		0.0005		0.0005		0.0004		0.0006		0.00049	0.00065	0.00037

Key:
CCSSW = Cooling Canal System Surface Water.
mg/L = Milligram per liter.
ND = Not detected.
SFWMD = South Florida Water Management District.

Table 3.2-1. Summary of Surface Water Analytical Results from the June/July 2010 Event

Parameter	Units	TPBBSW-1T		TPBBSW-1B		TPBBSW-2B		TPBBSW-3B		TPBBSW-4T		TPBBSW-4B		TPBBSW-5T		TPBBSW-5B		TPSWID-1T		TPSWID-1B		TPSWID-2T		TPSWID-2B		TPSWID-3T		TPSWID-3B		TPSWC-1T		TPSWC-1B	
		6/22/2010		6/22/2010		6/22/2010		6/23/2010		6/23/2010		6/23/2010		6/23/2010		6/23/2010		6/29/2010		6/29/2010		6/29/2010		6/29/2010		7/1/2010		7/1/2010		7/7/2010		7/7/2010	
Temperature	°C	31.36		31.91		31.91		31.51		30.78		30.84		30.0		30.2		31.97		31.65		31.6		29		31.72		30.05		30.53		28.89	
pH	SU	8.45		8.51		8.65		8.57		8.52		8.53		8.37		8.41		8.14		8.09		7.88		6.86		7.64		7.37		7.6		7.59	
Dissolved Oxygen	mg/L	6.45	J	7.65	J	7.8	J	7.63	J	6.23	J	5.86	J	5.71	J	6.1	J	7.1	J	6.46	J	7.91	J	0.86	J	7.15	J	9.14	J	4.59	J	5.54	J
Specific Conductance	µS/cm	45270	J	45670	J	48640	J	48300	J	47750	J	47860	J	45030	J	45040	J	5287	J	5317	J	2994	J	7524	J	2437	J	2420	J	512	J	470	J
Turbidity	NTU	0.94		0.9		0.91		1.12		3.41		3.68		1.17		1.27		1.15		1.08		2.03		5.06		0.52		0.74		1.17		1.19	
Arsenic	mg/L																																
Barium	mg/L	0.0081	U	0.009	I	0.0085	I	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.013	I	0.0081	U	0.0081	U	0.0081	U	0.0081	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.12	I	0.13	I	0.098	I	0.084	I	0.11	I	0.093	I	0.084	I	0.12	I	0.07	I	0.071	I	0.039	I	0.077	I	0.037	IVJ	0.033	IVJ	0.029	IVJ+	0.028	IVJ+
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L	0.64		0.81		1.4		0.33	I	0.46	I	0.49	I	1.0		1.0		3.6		3.5		3.2		3.4		4.2		4.3		4		6.4	
Calcium	mg/L	430		420		450		470		470		450		450		450		150		150		140		210		130		130		54		51	
Magnesium	mg/L	1300		1400		1400		1500		1500		1400		1400		1400		100		110		50		150		40		40		8.4		8.3	
Potassium	mg/L	360		370		390		420		410		400		370		380		37	J	38	J	17	J	54		14		14		5.2		5.4	
Sodium	mg/L	10000		10000		11000		12000		12000		12000		11000		11000		980		920		490		1300		390		390		49		47	
Boron	mg/L	4.8		4.9		5.1		5.4		5.3		5.2		5.0		5.0		0.36	I	0.36	I	0.17	I	0.47	I	0.130		0.130		0.072		0.072	
Strontium	mg/L	7.9		8.0		8.3		8.6		8.5		8.3		8.0		8.0		1.8		1.8		1.5		2.6		1.3		1.3		0.51		0.53	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	66		67		72		73		70		73		63		67		6.1		5.8		3.1		9.4		1.8		1.8		0.17		0.17	
Chloride	mg/L	19000		19000		21000		19000		21000		20000		21000		19000		1900		1800		940		2800		740		720		85		84	
Fluoride	mg/L	0.33		0.39		0.1	U	0.1	UJ-	0.1	U	0.1	U	0.1	U	0.32		0.13	I	3.2		0.1	U	0.1	U	0.098		0.11		0.04	I	0.081	
Sulfate	mg/L	2700		2700		2900		3000		2800		2900		2500		2700		220		210		93		300		65		70		5.9		6.5	
Total Ammonia	mg/L as N	0.085		0.082		0.08		0.12		0.036		0.05		0.042		0.14		0.16		0.15		0.19		0.2		0.18		0.19		0.16		0.21	
Ammonium Ion (NH^{4+})	mg/L	0.088		0.082		0.075		0.118		0.016		0.034		0.024		0.150		0.184		0.175		0.229		0.255		0.223		0.240		0.199		0.263	
Unionized NH_3	mg/L	0.021		0.023		0.028		0.036		0.03	U	0.03	U	0.03	U	0.03	U	0.022		0.018		0.015		0.0025		0.0083		0.0043		0.0063		0.0072	
Nitrate/Nitrite as N	mg/L	0.0047	U	0.0062	I	0.0047	U	0.0047	U	0.0077	I	0.028		0.0098	I	0.0053	I	0.12		0.11		0.011		0.0047	U	0.011		0.016	J+	0.0047	U	0.0047	U
TKN	mg/L	0.25		0.36		0.26		0.11 I		0.24		0.3		0.32		0.41		0.78		0.89		0.8		1.1		0.88		0.86		1.1		1.2	
TN	mg/L	0.25		0.37		0.26		0.25	U	0.25		0.33		0.33		0.42		0.9		1		0.81		1.1		0.87		1.7		1.1		1.2	
Orthophosphate	mg/L	0.042	IJ	0.044	IJ	0.045	IJ	0.048	IJ	0.053	IJ	0.044	IJ	0.044	IJ	0.047	IJ	0.0034	I	0.0036	I	0.0025	I	0.005	I	0.0094	J	0.0022		0.0023	I	0.002	I
Phosphorus (P)	mg/L	0.013	J	0.018	J	0.018	J	0.019	J	0.025	J	0.02	J	0.015	J	0.016	J	0.006	I	0.0054	I	0.0057	I	0.011		0.0044	UJ	0.0066		0.0044	I	0.0072	I
Alkalinity	mg/L ($CaCO_3$)	110		110		110		100		110		100		120		120		230		230		220		310		200		200		140		140	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	98		90		76		86		93		97		120		120		230		230		220		310		200		200		140		140	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	22		20		20		20		20		20		25		25		52		52		51		72		47		49		36		34	
$\delta^{18}O$	‰	2.2		2.2		2.3		2.4		2.3		2.3		2.8		2.6		1.0		1.0		0.8		0.7		0.6		0.4		0.3		0.7	
$\delta^{2}H$	‰	15.4		16.5		18.6		15.2		16.9		17.3		14.9		19.6		10.0		7.6		8.1		10.1		7.2		5.5		4.0		9.0	
$\delta^{13}C$	‰	-5.58		-4.5859		-4.2932		-1.82		-3.43		-2.62		-5.26		-3.63		-6.55		-6.99		-6.96		-6.66		-7.63		-8.42		-7.63		-7.42	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		29.1	J	29.4	J	31.5	J	31.3	J	30.9	J	31.0	J	29.0	J	29.0	J	2.8	J	2.8	J	1.5	J	4.1	J	1.2	J	1.2	J	0.2	J	0.2	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70918		0.70916		0.70917												0.70912		0.70916		0.70915		0.70909		0.70918		0.7092		0.70919		0.70918	
Tritium	pCi/L (1σ)	16.3 (4.1)		8.0 (4.5)		11.5 (4.5)												162.24 (6.7)		153.28 (6.4)		108.8 (8.6)		140.48 (6.1)		83.897 (5.7)		79.75 (5.7)		9.6 (6.7)		24.0 (6.7)	

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample TPSWC-Dup1 (7/1/10) is a duplicate of TPSWC-5B.
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

ECRC-17-009877

Table 3.2-1. Summary of Surface Water Analytical Results from the June/July 2010 Event

Parameter	Units	TPSWC-2T 7/7/2010		TPSWC-2B 7/7/2010		TPSWC-3T 7/7/2010		TPSWC-3B 7/7/2010		TPSWC-4T 7/1/2010		TPSWC-4B 7/1/2010		TPSWC-5B 7/1/2010		TPSWC-DUP1 [1] 7/1/2010		TPSWC-6T 6/21/2010		TPSWC-6B 6/21/2010		TPSWCCS-1B 7/9/2010		TPSWCCS-2B 6/30/2010		TPSWCCS-3B 6/28/2010		TPSWCCS-4T 7/1/2010		TPSWCCS-4B 7/1/2010	
Temperature	°C	31.96		30.25		32.58		30.54		31.96		28.64				N.A.		28.18		27.71		39.04		36.68		34.88		34.93		34.41	
pH	SU	7.93		7.82		8.08		7.6		7.31		6.86				N.A.		7.32		7.27		8.2		8.25		8.19		8.33		8.28	
Dissolved Oxygen	mg/L	6.61	J	5.28	J	8.04	J	5.77	J	4.9	J	0.27	J			N.A.		1.95	J	2.02	J	4.55	J	6.31	J	7.61	J	9.82	J	8.76	J
Specific Conductance	µS/cm	597	J	596	J	877	J	1019	J	23040	J	32300	J			N.A.		839	J	892	J	76510	J	76910	J	70260	J	77500	J	77590	J
Turbidity	NTU	1.79		7.12		1.21		1.55		5.17		45.96				N.A.		0.55		1.25		3.5		8.46		8.57		4.83		5.7	
Arsenic	mg/L																														
Barium	mg/L	0.0081	U	0.011	I	0.0081	U	0.013	I	0.043		0.057				0.026						0.082	I	0.083	I	0.073	I	0.057		0.041	
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	0.034	IVJ+	0.07	IVJ+	0.027	U	0.034	I	0.21	J+	0.29	J+			0.088						0.027	U	0.33	I	0.027	U	0.22		0.21	
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica	mg/L	4.7		5		4.4		4.2		3.8		4.6				1.9		2.8		2.8		0.43		1.4	I	1.6	I	1.1		1	
Calcium	mg/L	57		61		82		98		340		410				500		96		95		810		840		790		950		940	
Magnesium	mg/L	9.3		9.3		10		11		630		900				1500		12		13		2500		2600		2500		3000		3000	
Potassium	mg/L	5.0		5.0		5.1		5.2		270		410				470		9.1		9.4		790		840		710		860		870	
Sodium	mg/L	68		67		100		120		5000		7100				12000		82		90		20000		21000		21000		21000		21000	
Boron	mg/L	0.069		0.071		0.067		0.066		1.9		2.8				5.3		0.095	I	0.096	I	8.7		9.2		8.4		11		10	
Strontium	mg/L	0.61		0.65		0.89		0.99		5.3		7				9.1		1.1		1.1		15		16		15		18		18	
Chromium VI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	0.29		0.29		0.65		0.81		32		44				75		0.47		0.5		130		120		120		130		130	
Chloride	mg/L	130		120		200		250		9300		13000				22000		150		160		36000		38000		37000		37000		37000	
Fluoride	mg/L	0.075		0.04	I	0.1		0.068		0.1	U	0.11				0.1	U	0.087		0.084		0.1	U	0.1	U	0.08	U	0.1	U	0.1	U
Sulfate	mg/L	4.7		5.1		10		14		1200		1700				3000		55		56		5000		5100		4300		5100		5000	
Total Ammonia	mg/L as N	0.22		0.2		0.12		0.17		0.8		0.65				0.036		0.12		0.1		0.083		0.18		0.11		0.13		0.14	
Ammonium Ion (NH^{4+})	mg/L	0.273		0.245		0.139		0.212		1.011		0.832				0.000		0.152		0.127		0.088		0.191		0.121		0.136		0.151	
Unionized NH_3	mg/L	0.0094		0.012		0.015		0.0066		0.018		0.0042						0.0021		0.0015		0.019		0.04		0.02		0.031		0.029	
Nitrate/Nitrite as N	mg/L	0.0047	U	0.0047	U	0.0047	U	0.0047	U	0.017		0.014				0.0073		0.021		0.05		0.0047	U	0.015		0.0047	U	0.014		0.015	
TKN	mg/L	1.3		1.4		1.2		1.1		1.7		1.7				0.56		0.36		0.42		2.2		1.6		1.6		2.5		1.6	
TN	mg/L	1.3		1.4		1.2		1.1		1.7		0.89				0.57		0.38		0.47		2.2		2.6	J	1.6		0.87		1.7	
Orthophosphate	mg/L	0.0018	I	0.0026	I	0.0014	I	0.0018	I	0.024	IJ	0.03	IJ			0.05	IJ	0.014	IJ	0.014	U	0.051	IJ	0.058	J	0.071	IJ	0.076	IJ	0.078	IJ
Phosphorus (P)	mg/L	0.0044	U	0.0065	I	0.0048	I	0.0046	I	0.011	J	0.02	J			0.021	J	0.0044	UJ	0.013		0.029	J-	0.028	J	0.026	J	0.024	J	0.024	J
Alkalinity	mg/L ($CaCO_3$)	120		130		160		180		240		240				160		200		190		150		150		160		150		150	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	120		130		160		180		240		240				160		200		190		150		150		160		130		150	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U			1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																					77000		80000		71000		79000		78000	
Dissolved Inorganic Carbon	mg/L	33		33		39		44		56		53				30		49		49		30		27		32		25		27	
$\delta^{18}O$	‰	1.1		1.3		0.9		0.4		1.7		2.2		2.5		2.4		-0.6		-0.6		5.5		6.1		6.0		6.1		6.1	
$\delta^{2}H$	‰	7.0		8.0		7.0		4.0		16.8		15.5		20.4		23.9		-2.1		-0.9		31.0		31.2		27.5		32.9		34.0	
$\delta^{13}C$	‰	-6.85		-6.91		-7.05		-8.33		-8.27		-8.83		-5.25		-5.94		-9.67		-10.09		-3.79		-2.86		-3.97		-2.47		-2.69	
Gross Alpha	pCi/L																					15.8 (1.2)		57 (4)		52 (5)		38 (3)		54 (4)	
Salinity (PSS-78)		0.3	J	0.3	J	0.4	J	0.5	J	13.8	J	20.1	J					0.4	J	0.4	J	56.6	J	54.6	J	47.7	J	53.4	J	53.6	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70921		0.70917		0.70918		0.70921		0.70915		0.70917		0.70915		0.70918		0.70919		0.70915		0.70915		0.70910		0.70907		0.70909		0.70908	
Tritium	pCi/L (1σ)	34.24 (7.0)		27.52 (6.7)		35.84 (7.0)		30.08 (7.0)		890.01 (31.9)		1276.0 (44.7)		261.6 (9.6)		--		11.803 (4.1)		7.975 (3.8)		2620.8 (32.0)		3248.0 (35.2)		3052.8 (35.2)		3171.2 (35.2)		3097.6 (35.2)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (7/1/10) is a duplicate of TPSWC-5B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

Q = Holding time exceeded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-1. Summary of Surface Water Analytical Results from the June/July 2010 Event

Parameter	Units	TPSWCCS-5T 7/9/2010		TPSWCCS-5B 7/9/2010		TPSWCCS-6T 7/15/2010		TPSWCCS-6B 7/15/2010		TPSWCCS-7B 6/28/2010		TPSWCCS-8B 6/30/2010	
Temperature	°C	33.22		32.64		32.78		32.91		36.89		37.87	
pH	SU	8.15		8.14		8.18		8.19		8.24		8.29	
Dissolved Oxygen	mg/L	2.05	J	1.91	J	4.73	J	4.77	J	5.62	J	7.14	J
Specific Conductance	µS/cm	76420	J	76380	J	75290	J	74960	J	75940	J	78060	J
Turbidity	NTU	3.45		4.6		3.56		4.25		6.42		14.14	
Arsenic	mg/L												
Barium	mg/L	0.097		0.1		0.082		0.078		0.041	I	0.073	I
Beryllium	mg/L												
Cadmium	mg/L												
Copper	mg/L												
Iron	mg/L	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.29	I
Lead	mg/L												
Manganese	mg/L												
Molybdenum	mg/L												
Nickel	mg/L												
Selenium	mg/L												
Thallium	mg/L												
Vanadium	mg/L												
Zinc	mg/L												
Silica	mg/L	0.25	U	0.38		0.5	U	0.5	U	1.3	I	1.2	I
Calcium	mg/L	810		830		800		810		830		860	
Magnesium	mg/L	2500		2600		2500		2500		2600		2700	
Potassium	mg/L	800		810		800		810		760		840	
Sodium	mg/L	20000		19000		20000		21000		22000		21000	
Boron	mg/L	8.6		8.8		8.8		8.9		8.9		9.3	
Strontium	mg/L	15		16		16		16		16		16	
Chromium VI	mg/L												
Mercury	mg/L												
Bromide	mg/L	130		120		120		120		120		120	
Chloride	mg/L	37000	J-	37000		37000		36000		39000	J-	40000	
Fluoride	mg/L	0.1	U	0.1	U	0.1	UQ?	0.1	UQ	0.1		0.1	U
Sulfate	mg/L	5100		5000		4900		4900		5200		5400	
Total Ammonia	mg/L as N	0.093		0.13		0.12		0.12		0.11		0.16	
Ammonium Ion (NH^{4+})	mg/L	0.106		0.148		0.135		0.154		0.117		0.165	
Unionized NH_3	mg/L	0.014		0.019		0.019		0.000017	U	0.024		0.041	
Nitrate/Nitrite as N	mg/L	0.0047	U	0.0047	U	0.08		0.03		0.0047	U	0.017	
TKN	mg/L	2.2		2.3		1.7		1.6		1.5		2.2	
TN	mg/L	2.2		2.3		1.8		1.6		1.5		1.5	J
Orthophosphate	mg/L	0.052	IJ	0.062	IJ	0.074	IJ	0.073	IJ	0.069	IJ	0.057	J
Phosphorus (P)	mg/L	0.024	J	0.024	J	0.016	J	0.019	J	0.025	J	0.03	J
Alkalinity	mg/L ($CaCO_3$)	160		150		150		150		150		150	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	160		150		150		150		150		150	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L	75000		79000		78000		77000		77000		81000	
Dissolved Inorganic Carbon	mg/L	32		32		31		29		30		22	
$\delta^{18}O$	‰	5.6		5.7		5.6		5.5		6.2		6.3	
$\delta^{2}H$	‰	31.0		31.0		32.0		29.0		36.4		36.5	
$\delta^{13}C$	‰	-3.31		-3.91		-3.30		-3.20		-2.87		-2.69	
Gross Alpha	pCi/L	16.9 (1.3)		16.5 (1.3)		25 (2)		21 (2)		55 (5)		55 (4)	
Salinity (PSS-78)		52.7	J	52.7	J	51.8	J	51.5	J	54.0	J	56.8	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70916		0.70911		0.70912		0.70914		0.70911		0.70913	
Tritium	pCi/L (1σ)	2582.4 (32.0)		2524.8 (28.8)		2380.8 (28.8)		2339.2 (28.8)		3260.8 (35.2)		3155.2 (35.2)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (7/1/10) is a duplicate of TPSWC-5B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

Q = Holding time exceeded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-2. Summary of Surface Water Analytical Results from the September 2010 Event

Parameter	Units	BBSW-1B 9/28/2010		BBSW-2B 9/23/2010		BBSW-3B 9/27/2010		BBSW-4B 9/24/2010		BBSW-5B 9/24/2010		TPSWC-1T 9/7/2010		TPSWC-1B 9/7/2010		TPSWC-2T 9/7/2010		TPSWC-2B 9/7/2010		TPSWC-3T 9/7/2010		TPSWC-3B 9/7/2010		TPSWC-4T 9/9/2010		TPSWC-4B 9/9/2010		TPSWC-5T 9/9/2010		TPSWC-5B 9/9/2010		TPSWC-6T 9/14/2010		TPSWC-DUP1 [1] 9/14/2010		TPSWC-6B 9/14/2010	
Temperature	°C	28.83		27.9		29.69		28.07		27.71		31.37		29.94		33		30.37		31.45		30.46		30.79		30.61		31.21		33.11		28.37		28.37		28.3	
pH	SU	7.92		8.16		8.29		8.02		7.7		7.69	J	7.59	J	8.05	J	7.93	J	8.83	J	7.84	J	7.3		7.34		7.66		6.53	J	7.23	J	7.23	J	7.19	J
Dissolved Oxygen	mg/L	4		6.81		7.55		5.23		4.48		5.06		3.65		6.72		6		6.07		3.7		4.54		4.2		6.36		0.32		0.98		0.98		1.21	
Specific Conductance	µS/cm	48233		30586		49871		48063		42063		429	J	422	J	521	J	509	J	588	J	584	J	2084		2970		46455		61032		735	J	735	J	734	J
Turbidity	NTU	3.25		0.89		1.12		2.7		2.79		1.14		1.1		1.17		1.3		1		2.1		2.42		4.55		0.67		12.6		0.59		0.59		0.63	
Arsenic	mg/L																																				
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.0081	U	0.081	U	0.081	U	0.130	I	0.270	I	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	0.410	I V	0.480	I	0.410	I V	0.780	I	0.550	I	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.270	U	0.270	U	0.720	I	1.20	I	0.054	U	0.054	U	0.054	U
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	400		260		410		380		340		46		46		46		44		55		55		59		65		360		510		79		82		80	
Magnesium	mg/L	1200		650		1300		1200		990		6.0		5.8		6.9		6.6		6.1		6.2		35		52		1200		1600		8.0		8.6		8.2	
Potassium	mg/L	540		330		590		360		320		4.3		4.3		3.0		2.8	I	2.5	I	2.5	I	13		20		350		470		8.0		8.1		8.0	
Sodium	mg/L	9500		5400		9800		9200		8000		28		27		43		42		47		47		290		400		8700		12000		49		53		50	
Boron	mg/L	4.30		2.50		4.5		4.2		3.6		0.055	IJ	0.057	IJ	0.046	IJ	0.043	IJ	0.044	IJ	0.045	IJ	0.14	I	0.2		4.2		5.4		0.072	I	0.083	I	0.075	I
Strontium	mg/L	6.80		4.30		7.1		6.8		5.9		0.42		0.43		0.47		0.47		0.54		0.54		0.69		0.8		6.3		9.1		0.85		0.86		0.86	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	0.27	U	32		60		79	J	54		0.027	U	0.027	U	0.18		0.19		0.24		0.25		1.6		2.9		56		76		0.46		0.46		0.47	
Chloride	mg/L	16000		11000		16000	J+	18000	J	15000		39		42		72		88		92		92		460		860		15000		23000		87		88		88	
Fluoride	mg/L	0.77		0.47	I	0.20	U	0.20	UJ	0.20	U	0.097		0.093		0.091		0.099		0.096		0.089		0.094		0.11		0.020	U	0.020	U	0.11		0.10		0.11	
Sulfate	mg/L	2100		1200		2200	J-	3300	J	2200		6.3		6.6		3.1		2.7		2.0		2.1		44		96		2100		2800		33		34		33	
Total Ammonia	mg/L as N																																				
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	120		170		120		120	J	130		110		110		100		97		110		110		110		110		110		220		160		160		170	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	120		170		120		120	J	130		110		110		100		97		110		110		110		110		110		220		160		160		170	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																																				
Dissolved Inorganic Carbon	mg/L	30		39		28		29		32		27		27		25		26		29		27		26		27		27		55		43		42		43	
$\delta^{18}O$	‰	1.6		0.7		1.6		1.6		1.4		-0.4		-0.5		0.3		0.4		0.5		0.5		0.4		0.4		1.4		2.7		-0.5	J	-0.8	J	-0.7	
$\delta^{2}H$	‰	11.0		9.0		13.0		9.0		13.0		3.0		6.0		8.0		5.0		4.0		9.0		13.0		2.0		15.0		23.0		1.0	J	-6.0	J	2.0	
$\delta^{13}C$	‰	-4.10		-5.60		-3.02		-2.57		-5.11		-8.02		-8.34		-7.5		-8.64		-8.49		-8.22		-8.58		-8.68		-4.45		-6.41		-11.79		-11.86		-11.8	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		31.3		18.9		32.5		31.2		26.9		0.21	J	0.20	J	0.25	J	0.25	J	0.28	J	0.28	J	1.1		1.5		30.0		40.7		0.36	J			0.36	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70916		0.70917		0.70914		0.70916		0.70917		0.70919		0.70914		0.70914		0.70916		0.70917		0.70916		0.70915		0.70915		0.70913		0.70915		0.70917		0.70915		0.70914	
Tritium	pCi/L (1σ)	16.9 (6.2)		12.6 (5.9)		13.6 (6)		6.9 (6.1)		15.2 (6.3)		8.4 (9.3)	UJ	12.3 (9.2)		47.6 (10)		92 (10.5)		44.6 (10)		41 10.1)		55.9 (10.2)		74 (10.7)		178 (11)		801 (31)		17.3 (6.8)		15.3 (8.4)		43.3 (7.6)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (9/14/2010) is a duplicate of TPSWC-6T.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-2. Summary of Surface Water Analytical Results from the September 2010 Event

Parameter	Units	TPSWCCS-1B 9/8/2010		TPSWCCS-2B 9/9/2010		TPSWCCS-3B 9/8/2010		TPSWCCS-4T 9/11/2010		TPSWCCS-4B 9/11/2010		TPSWCCS-5T 9/11/2010		TPSWCCS-5B 9/11/2010		TPSWCCS-6T 9/11/2010		TPSWCCS-6B 9/11/2010		TPSWCCS-7B 9/8/2010		TPSWID-1T 9/8/2010		TPSWID-1B 9/8/2010		TPSWID-2T 9/8/2010		TPSWID-2B 9/8/2010		TPSWID-3T 9/8/2010		TPSWID-3B 9/8/2010	
Temperature	°C	38.25		36.31		33.75		33.7		33.54		32.81		32.9		33.3		33.47		37.14		31.84		30.77		30.82		29.16		30.98		28.91	
pH	SU	8.4		8.23		8.34		8.34		8.34		8.28		8.28		8.3		8.29		8.53		8.19		8.23		7.88		7.09		7.73		7.22	
Dissolved Oxygen	mg/L	3.88		7.35		3.42		6.7		6.12		3.91		4.12		4.99		5.01		5.61		6		5.88		5.68		0.2		5.09		0.22	
Specific Conductance	µS/cm	82182		82550		80056		81626		81369		80967		80899		81050		81547		80784		3749		3815		2432		4473		2076		2576	
Turbidity	NTU	4.74		7.34		7.05		5.8		4.2		3.98		5.9		4.1		3.32		9.31		1.31		2.49		1.92		14.76		0.89		3.54	
Arsenic	mg/L																																
Barium	mg/L	0.160	I	0.580	I	0.370	I	0.054	I	0.034	I	0.043	I	0.038	I	0.036	I	0.026	I	0.160	U	0.160	U	0.0081	U	0.0081	U	0.027	I	0.015	I	0.019	I
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	1.50	I	3.60	I	1.60	I	0.160	I	0.200	I	0.260	I	0.180	I	0.230	I	0.220	I	1.90	I	0.540		0.037	I	0.038	I	0.062	I	0.034	I	0.030	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																																
Calcium	mg/L	730		650		740		680	J	680		690		680		670	J	670		730		120		120		98		180		94		130	
Magnesium	mg/L	2200		2200		2300		2200	J	2200		2200		2100		2100	J	2100		2200		64		62		35		72		28		34	
Potassium	mg/L	670		670		660		670	J	640		620		670		650	J	620		670		21		21		15		26		12		14	
Sodium	mg/L	18000		17000		18000		17000	J	17000		16000		18000		17000	J	17000		18000		550		540		330		670		290		340	
Boron	mg/L	7.8		8.0		7.8		7.8		7.8		7.8		7.8		7.8		7.8		7.8		0.25	I	0.24	I	0.13		0.24	I	0.11	I	0.12	I
Strontium	mg/L	14.0		13.0		14.0		14.0		14.0		14.0		14.0		14.0		14.0		14.0		1.30		1.30		1.10		1.90		1.0		1.2	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	93		100		110		100	J	110		110	J	98		110	J	110		100		3.0		3.2	J-	1.8		3.7		1.5		1.9	
Chloride	mg/L	31000		32000		31000		37000	J	34000		33000	J	33000		34000	J	33000		32000		960		960		510		1200		460		580	
Fluoride	mg/L	0.020	U	0.020	U	0.020	U	0.020	UJ	0.020	U	0.020	UJ	0.020	U	0.020	UJ	0.020	U	0.020	U	0.12		0.14		0.12		0.14		0.12		0.11	
Sulfate	mg/L	4000		4000		3900		4800	J	4300	J-	4200	J	4200		4600	J	4200		3900		82		83	J-	40		93		30		41	
Total Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH_3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	130		120		140		130	J	130		130	J	130		130	J	130		130		200		210		170		280		160		210	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	130		120		140		130	J	130		130	J	130		110	J	130		110		200		210		170		280		160		210	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.4		1.0	U	1.1		1.1		1.0	U	1.9	
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	26		24		23		25		25		24		25		25		24		27		54		53		48		80		46		57	
$\delta^{18}O$	‰	4.2		4.4		4.2		4.5		4.4		4.3		4.3		4.3		4.4		4.1		0.8		0.8		0.7		0.6		0.8		0.1	
$\delta^{2}H$	‰	33.0		28.0		24.0		26.0		24.0		24.0		23.0		23.0		26.0		24.0		10.0		9.0		8.0		10.0		6.0		8.0	
$\delta^{13}C$	‰	-6.01		-4.94		-		-5.66		-5.52		-6.05		-5.73		-5.54		-5.6		-5.16		-7.12		-7.07		-7.81		-9.2		-8.12		-6.03	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		60.70	J	58.90	J	55.6		56.9		56.6		56.4		56.3		56.4		56.8		58.3	J	2.0		2.0		1.2		2.4		1.0		1.3	
$^{87}Sr/^{86}Sr$	µg/L*	0.70913		0.70914		0.7091		0.70915		0.70913		0.70908		0.70912		0.70917		0.70913		0.70917		0.70913		0.70917		0.70915		0.70912		0.70914		0.70918	
Tritium	pCi/L (1σ)	5020 (175)		4980 (180)		4810 (170)		5250 (190)		4990 (170)		5140 (180)		5260 (190)		5240 (180)		4030 (130)		5230 (180)		131.8 (10.7)		135.5 (12)		102.5 (11.3)		92.2 (10.9)		96.3 (10.8)		52.6 (7.5)	

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample TPSWC-Dup1 (9/14/2010) is a duplicate of TPSWC-6T.
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-2. Summary of Surface Water Analytical Results from the September 2010 Event

Parameter	Units	FB1 9/7/2010		FB1 9/8/2010		EB1 9/9/2010		FB1 9/11/2010		FB1 9/14/2010		FB1 9/24/2010		FB1 9/27/2010		FB1 9/28/2010	
Temperature	°C																
pH	SU																
Dissolved Oxygen	mg/L																
Specific Conductance	µS/cm																
Turbidity	NTU																
Arsenic	mg/L																
Barium	mg/L	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U
Beryllium	mg/L																
Cadmium	mg/L																
Copper	mg/L																
Iron	mg/L	0.0027	U	0.0027	U	0.011	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0035	I V
Lead	mg/L																
Manganese	mg/L																
Molybdenum	mg/L																
Nickel	mg/L																
Selenium	mg/L																
Thallium	mg/L																
Vanadium	mg/L																
Zinc	mg/L																
Silica	mg/L																
Calcium	mg/L	0.10	U	0.10	U	0.10	U	0.25	I	0.10	U	0.10	U	0.10	U	0.12	I
Magnesium	mg/L	0.020	U	0.020	U	0.020	U	0.050	I	0.020	U	0.020	U	0.020	U	0.026	I
Potassium	mg/L	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	0.31	U	0.31	U	0.31	U	0.34	I	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	0.012	I	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U
Strontium	mg/L	0.001	U	0.001	U	0.001	U	0.0019	I	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																
Mercury	mg/L																
Bromide	mg/L	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Fluoride	mg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Sulfate	mg/L	0.20	U	0.27	I	0.20	U	0.20	U	0.20	U	0.20	U	0.20	I	0.20	U
Total Ammonia	mg/L as N																
Ammonium Ion (NH^{4+})	mg/L																
Unionized NH_3	mg/L																
Nitrate/Nitrite as N	mg/L																
TKN	mg/L																
TN	mg/L																
Orthophosphate	mg/L																
Phosphorus (P)	mg/L																
Alkalinity	mg/L ($CaCO_3$)	1.0	U	1.7		1.0	U	2.3		1.0	U	1.5		1.2		1.6	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	1.0	U	1.7		1.0		2.3		1.0	U	1.5		1.2		1.6	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																
Dissolved Inorganic Carbon	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
$\delta^{18}O$	‰	-1.3		-1.3		-1.0		-1.2		-1.1		-1.2		-1.1		-1.2	
$\delta^{2}H$	‰	-6.0		-4.0		-1.0		-11.0		-7.0		-4.0		-8.0		-6.0	
$\delta^{13}C$	‰	-9.32		-9.54		-11.67		-6.39		-12.90		-15.77		-14.30		-24.63	
Gross Alpha	pCi/L																
Salinity (PSS-78)																	
$^{87}Sr/^{86}Sr$	µg/L*	0.01	U	0.022		0.803		0.024		0.023		0.01	U	0.01	U	0.01	U
Tritium	pCi/L (1σ)	3 (8.4)	UJ	6.8 (8.1)	UJ	53.1 (8.9)				21.3 (8.4)		11.9 (8.2)		38 (7.7)		13.8 (7.4)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (9/14/2010) is a duplicate of TPSWC-6T

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-3. Summary of Surface Water Analytical Results from the December 2010 Sampling Event

Parameter	Units	TPBBSW-1B 12/13/2010		TPBBSW-2B 12/13/2010		TPBBSW-3B 12/13/2010		TPBBSW-4B 12/13/2010		TPBBSW-5B 12/13/2010		TPSWC-1T 12/1/2010		TPSWC-1B 12/1/2010		TPSWC-2T 12/1/2010		TPSWC-2B 12/1/2010		TPSWC-3T 12/1/2010		TPSWC-3B 12/1/2010		TPSWC-4T 12/10/2010		TPSWC-4B 12/10/2010		TPSWC-5T 12/10/2010		TPSWC-DUP [1] 12/10/2010		TPSWC-5B 12/10/2010		TPSWC-6T 12/7/2010		TPSWC-6B 12/7/2010	
Temperature	°C	17.17		17.45		17.02		17.03		17.02		25.55		25.32		25.58		24.5		26.4		25.11		21.96		19.89		19.64				20.72		20.48		20.71	
pH	SU	8.5		8.57		8.47		8.41		8.17		7.8		7.68		8.03		7.95		7.78		7.51		7.33		7.33		7.77				7.29		7.72		7.57	
Dissolved Oxygen	mg/L	8.38		9.12		7.75		7.67		7.58		8.02		4.71		7.44		7.6		7.86		3.61		0.27		3.49		6.49				2.4		2.9		2.62	
Specific Conductance	µS/cm	51601		43821		46471		50029		46715		533	J	538	J	721	J	701	J	881	J	993	J	29584		42032		50080				52914		943	J	941	J
Turbidity	NTU	7.16		11.97		1.01		8.62		0.65		1.01		18.81		1.4		5.59		1.34		1.08		8.13		14.93		1.14				34.5		1.27		0.34	
Arsenic	mg/L																																				
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.021	I	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.024	I	0.016	U	0.023	I
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	0.390	I	0.410	I	0.390	I	0.370	I	0.360	I	0.063	I	0.054	U	0.310	I	0.054	U	0.054	U	0.069	I	0.360	I	0.460	I	0.400	I	0.350	I	1.1		0.054	U	0.054	U
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	410		360		380		390		370		56		57		69		68		83		94		300		380		410		420		460		98		98	
Magnesium	mg/L	1200		1000		1100		1200		1100		7.3		7.3		7.8		7.7		8.6		9.3		630		960		1200		1200		1300		10		10	
Potassium	mg/L	420		340		370		400		360		2.7		2.7		3.2		3.1		3.3		3.6		200		310		380		380		420		7.5		7.6	
Sodium	mg/L	11000		9100		9600		10000		9500		41		39		61		59		82		98		5700		8400		10000		10000		11000		73		74	
Boron	mg/L	4.3		3.6		3.7		4.1		3.7		0.034	I	0.035	I	0.035	I	0.034	I	0.038	I	0.041	I	2.1		3.3		4.1		4.2		4.4		0.074		0.074	
Strontium	mg/L	7.3		6.3		6.6		7.0		6.4		0.590		0.560		0.750		0.740		0.830		0.900		5.1		6.7		7.7		7.6		8.5		1.0		1.0	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	55		46		44		53		49		0.13		0.027	U	0.29		0.25		0.43		0.56		29		44		55		55		60		0.58		0.54	
Chloride	mg/L	19000		16000		17000		19000		17000		79		73		150		110		160		200		11000		16000		19000		19000		21000		140		170	
Fluoride	mg/L	0.59		0.54		0.56		0.56		0.51		0.048	I	0.045	I	0.049	I	0.049	I	0.050		0.051		0.27	I	0.46	I	0.67		0.54		0.49	I	0.092		0.11	
Sulfate	mg/L	2500		2100		2000		2400		2200		2.0		2.4		3.8	J	3.4		6.7		8.8		1400		2000		2600		2500		2700		45		43	
Total Ammonia	mg/L as N																																				
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	130		150		150		130		140		140		140		160		150		180		200		230		190		150		150		170		210		210	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	130		150		150		130		140		140		140		160		150		180		200		230		190		150		150		170		210		210	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																																				
Dissolved Inorganic Carbon	mg/L	33		39		40		37		37		36		37		40		40		47		51		60		51		42		43		47		56		55	
$\delta^{18}O$	‰	1.4		1.1		1.3		1.2		1.0		-0.4		-0.5		0.2		0.2		-1.4		-0.8		1.3		1.3		1.5		0.7		1.7		-1.2		-1.3	
$\delta^{2}H$	‰	13.4		8.7		8.9		11.5		13.0		-2.0		-3.0		1.9		-0.1		-3.0		-7.8		7.0		14.3		12.7		12.2		19.1		-6.3		-5.9	
$\delta^{13}C$	‰	-0.45		-2.14		-2.13		-1.03		-1.82		-6.23		-6.95		-5.72		-5.95		-6.89		-7.79		-8.23		-7.06		-3.82		-5.67		-5.46		-9.74		-9.63	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		34.0		28.3		30.2		32.8		30.4		0.3	J	0.3	J	0.4	J	0.3	J	0.4	J	0.5	J	18.3		27.0		32.9				34.9		0.5	J	0.5	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70916		0.70915		0.70917		0.70914		0.70915		0.70915		0.70916		0.70916		0.70914		0.70914		0.70913		0.70915		0.7091		0.70914		0.70912		0.70916		0.70915	
Tritium	pCi/L (1σ)	11.4(7.8)	J	23.6(8.2)	J	30.5(8.3)	J	26.7(8.3)	J	24.6(9.6)	J	110(8.4)		85.8(6.9)		114(8)		125 (8.0)		66.4(6.4)		40.8(5.9)		405(28)		310(23)		479(26)		464(28)		946(57)		10.1(6.6)		3.5(6.5)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup (12/10/2010) is a duplicate of TPSWC-5T.

[2] Sample TPSWCCS-Dup1 (12/9/2010) is a duplicate of TPSWCCS-2B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-3. Summary of Surface Water Analytical Results from the December 2010 Sampling Event

Parameter	Units	TPSWID-1T 12/2/2010		TPSWID-1B 12/2/2010		TPSWID-2T 12/2/2010		TPSWID-2B 12/2/2010		TPSWID-3T 12/2/2010		TPSWID-3B 12/2/2010		TPSWCCS-1B 12/2/2010		TPSWCCS-2B 12/9/2010		TPSWCCS-DUP1 [2] 12/9/2010		TPSWCCS-3B 12/2/2010		TPSWCCS-4T 12/3/2010		TPSWCCS-4B 12/3/2010		TPSWCCS-5T 12/3/2010		TPSWCCS-5B 12/3/2010		TPSWCCS-6T 12/3/2010		TPSWCCS-6B 12/3/2010	
Temperature	°C	24.22		24.23		24.48		24.4		23.48		23.56		30.08		19.43				24.29		22.05		22.17		20.9		20.88		21.76		21.7	
pH	SU	7.94		7.94		7.58		7.82		7.81		7.65		7.92		8.08				7.91		7.95		8.01		7.92		7.94		7.97		8.02	
Dissolved Oxygen	mg/L	6.35		5.59		4.18		3.41		3.85		4.5		4.55		7.18				3.31		8.03		7.52		4.5		4.98		6.29		6.14	
Specific Conductance	µS/cm	2625		2641		3034		3078		2143		2195		73120		73894				68344		72956		72880		71979		72132		72784		72835	
Turbidity	NTU	1.51		2.01		0.59		0.75		0.35		0.34		8.68		8.63				9.64		8.22		6.62		7.72		9.07		6.83		7.96	
Arsenic	mg/L																																
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	1.6		0.016	U	0.017	I V	0.041	I	0.016	U	0.024	I J	0.016	U	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.054	U	0.054	U	0.054	U	0.062	I J	0.054	U	0.054	U	0.054	U	0.410	I	0.420	I	0.540	I	0.490	I	0.380	I	0.400	I	0.640	I	0.430	I	0.360	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																																
Calcium	mg/L	87		87		120		110		100		100		610		630		640		580		610		620		620	J	610		630		610	
Magnesium	mg/L	45		45		48		47		31		30		1900		2000		2000		1800		1800		1800		1800	J	1800		1800		1800	
Potassium	mg/L	22		23		25		25		16		16		570		650		660		560		560		560		570	J	560		580		570	
Sodium	mg/L	370		370		430		420		300		300		15000		17000		17000		15000		15000		15000		16000	J	15000		15000		15000	
Boron	mg/L	0.180		0.190		0.170		0.170		0.110		0.100		6.9		7.3		7.5		6.5		6.2		6.2		6.3		6.2		6.4		6.3	
Strontium	mg/L	1.0		1.0		1.4		1.4		1.1		1.1		12.0		13.0		13.0		12.0		12.0		12.0		12.0		12.0		12.0		12.0	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	1.9		1.9		2.3	J	2.1		1.8		1.8		0.27	U	99		88		86		55		89		52	J	87		140		32	
Chloride	mg/L	110		850		1300	J	620		570		490		30000		31000		28000		27000		29000		28000		33000	J	28000		28000		28000	
Fluoride	mg/L	0.10		0.097		0.12	J	0.10		0.087		0.084	J-	0.78	I	94		54		0.86	I	1.9		0.20	U	0.20	UJ	1.9		0.20	U	2.1	
Sulfate	mg/L	51	J-	46		110	J	61		36		37	J-	3600		3700		3700		3200		2100		3300		1900	J	3200		3800		1300	
Total Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH_3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	210		210		240	J	240		190		200		130		130		140		140		130		130		130	J	130		120		130	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	210		210		240	J	240		190		200		130		130		140		140		130		130		130	J	130		120		130	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	52		52		60		60		51		51		32		42		41		34		35		50		37		34		32		36	
$\delta^{18}O$	‰	-0.6		-0.7		0.9		0.3		-0.1		0.0		3.3		3.9		3.7		2.4		3.4		3.3		3.7		3.5		3.4		3.5	
$\delta^{2}H$	‰	-1.0		-4.0		7.0		12.0		4.0		2.0		17.0		23.6		19.4		14.0		16.2		21.8		21.8		17.2		16.5		17.4	
$\delta^{13}C$	‰	-7.24		-7.50		-7.88		-7.95		-8.43		-8.26		-5.04		-8.40		-3.67		-5.53		-4.61		-4.61		-5.04		-5.02		-4.95		-4.71	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		1.4		1.4		1.6		1.6		1.1		1.1		50.2		51.0				46.6		50.3		50.2		49.5		49.7		50.2		50.2	
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70914		0.70915		0.70913		0.70916		0.70914		0.70911		0.70908		0.7091		0.7091		0.70908		0.70909		0.70908		0.70907		0.7091		0.7091	
Tritium	pCi/L (1σ)	325(13)		316(13)		205(10)		178(10)		180(10)		173(10)		13340(850)		12010(750)		12200(750)		11830(380)		13530(850)		13340(850)		14280(850)		13720(850)		13340(850)		13910(850)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup (12/10/2010) is a duplicate of TPSWC-5T.

[2] Sample TPSWCCS-Dup1 (12/9/2010) is a duplicate of TPSWCCS-2B.

Text in blue are revised values.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-3. Summary of Surface Water Analytical Results from the December 2010 Sampling Event

Parameter	Units	TPSWCCS-7B 12/2/2010		EB1 12/1/2010		FB1 12/2/2010		EB1 12/3/2010		FB1 12/13/2010	
Temperature	°C	28.6									
pH	SU	8.06									
Dissolved Oxygen	mg/L	5.9									
Specific Conductance	µS/cm	72843									
Turbidity	NTU	9.24									
Arsenic	mg/L										
Barium	mg/L	0.024	I	0.00081	U	0.00081	U	0.0015	I V	0.00081	I
Beryllium	mg/L										
Cadmium	mg/L										
Copper	mg/L										
Iron	mg/L	0.880	I	0.0027	U	0.030	I	0.0027	U	0.0092	I V
Lead	mg/L										
Manganese	mg/L										
Molybdenum	mg/L										
Nickel	mg/L										
Selenium	mg/L										
Thallium	mg/L										
Vanadium	mg/L										
Zinc	mg/L										
Silica	mg/L										
Calcium	mg/L	570		0.10	U	0.11	I	0.10	U	0.21	I
Magnesium	mg/L	1800		0.020	U	0.020	U	0.020	U	0.029	I
Potassium	mg/L	580		0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	15000		0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	6.6		0.010	U	0.010	U	0.010	U	0.010	U
Strontium	mg/L	12.0		0.001	U	0.001	U	0.001	U	0.0021	I
Chromium VI	mg/L										
Mercury	mg/L										
Bromide	mg/L	85		0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	28000		0.20	U	0.20	U	0.20	U	0.29	I
Fluoride	mg/L	0.80	I	0.020	U	0.020	U	0.020	U	0.020	U
Sulfate	mg/L	3000		0.20	U	0.20	U	0.20	U	0.20	U
Total Ammonia	mg/L as N										
Ammonium Ion (NH^{4+})	mg/L										
Unionized NH_3	mg/L										
Nitrate/Nitrite as N	mg/L										
TKN	mg/L										
TN	mg/L										
Orthophosphate	mg/L										
Phosphorus (P)	mg/L										
Alkalinity	mg/L ($CaCO_3$)	130		1.0	U	1.0		1.7		2.2	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	130		1.0	U	1.0		1.7		2.2	
Sulfides	mg/L	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L										
Dissolved Inorganic Carbon	mg/L	31		1.0	U	1.0	U	18		1.0	U
$\delta^{18}O$	‰	3.1		-1.4		-1.3		-1.0		-1.1	
$\delta^{2}H$	‰	19.0		-10.0		-6.0		-9.3		-5.0	
$\delta^{13}C$	‰	-4.63		-13.33		-9.44		-18.13		-	
Gross Alpha	pCi/L										
Salinity (PSS-78)		50.0									
$^{87}Sr/^{86}Sr$	µg/L*	0.7091		0.013		0.008		0.024		0.616	
Tritium	pCi/L (1σ)	13810(470)		3.4 (5.7)	UJ	4.4(5.4)	UJ	-0.4(7.5)	UJ	23.6(8.2)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup (12/10/2010) is a duplicate of TPSWC-5T.

[2] Sample TPSWCCS-Dup1 (12/9/2010) is a duplicate of TPSWCCS-2B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-4. Summary of Surface Water Analytical Results from the March 2011 Sampling Event

Parameter	Units	TPBBSW-1B 3/8/2011		TPBBSW-2B 3/8/2011		TPBBSW-3B 3/8/2011		TPBBSW-4B 3/8/2011		TPBBSW-5B 3/8/2011		TPSWC-1T 3/23/2011		TPSWC-1B 3/23/2011		TPSWC-2T 3/23/2011		TPSWC-2B 3/23/2011		TPSWC-DUP [1] 3/23/2011		TPSWC-3T 3/21/2011		TPSWC-3B 3/21/2011		TPSWC-4T 3/18/2011		TPSWC-4B 3/18/2011		TPSWC-5T 3/18/2011		TPSWC-5B 3/18/2011		TPSWC-6T 3/22/2011		TPSWC-6B 3/22/2011	
Temperature	°C	24.56		25.10		24.44		23.45		24.26		28.07		24.04		25.54		24.60				26.04		25.71		25.30		25.66		24.37		24.12		24.21		23.69	
pH	SU	8.12		8.21		8.30		8.15		8.07		8.32		7.30		7.98		8.02				8.37		8.23		7.53		7.71		8.12		8.18		8.59		8.24	
Dissolved Oxygen	mg/L	9.22	J	8.62	J	7.59	J	5.95	J	7.13	J	5.61	J	2.43	J	8.80	J	8.69	J			5.26	J	5.59	J	4.31	J	3.53	J	6.82	J	7.90	J	6.33	J	5.75	J
Specific Conductance	µS/cm	53323		55593		55893		55205		52986		726	J	856	J	1390		1379				1945		2830		29669		45172		56874		57135		776	J	775	J
Turbidity	NTU	1.75		3.97		0.88		2.23		2.18		26.27		25.93		5.18		7.02				2.51		3.60		7.26	J	13.49	J	1.17	J	3.21	J	1.10		1.38	
Arsenic	mg/L																																				
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	0.720	I V	0.680	I V	0.760	I V	0.760	I V	0.680	I V	0.054	U	0.054	U	0.170	I	0.054	U	0.058	I	0.056	I	0.054	U	0.250	I	0.330	I	0.320	I	0.250	I	0.054	U	0.054	U
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	450		460		460		460		440		68		76		97		100		98		110		120		320		410		460		470		82	J	81	
Magnesium	mg/L	1300		1400		1400		1400		1300		9.3		11		14		15		14		23		41		580	V	960	V	1200	V	1200	V	8.5	J	8.4	
Potassium	mg/L	420		440		440		440		410		3		3.7		5.1		5.2		5.1		7.5		13		200		340		440		440		11	J	11	
Sodium	mg/L	10000		11000		11000		11000		10000		62		77		150		160		150		230		380		5300		8600		11000		11000		54	J	54	
Boron	mg/L	4.4		4.6		4.6		4.6		4.3		0.037	I	0.044	I	0.056		0.058		0.056		0.092	J	0.14	J	2		3.4		4.5		4.5		0.087	J	0.086	J
Strontium	mg/L	7.7		8		8.1		8.1		7.6		0.71		0.77		1.1		1.1		1.1		1.2		1.2		5		6.9		8.2		8.3		1		0.99	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	68		77		72		95		66		0.16		0.26		0.81	J+	0.91		0.93		1.3	J+	2.6	J	36		55	J	100	J	80	J	0.48	J	0.47	
Chloride	mg/L	20000		21000		21000		21000		20000		120		150		310		310		310		470	J-	750	J	10000		20000	J	21000	J	21000	J	100	?	99	
Fluoride	mg/L	0.74		0.76		0.74		0.78		0.76		0.085		0.11		0.095		0.093		0.12		0.096		0.2	UJ	0.27	I	0.44	IJ	0.61	J	0.58	J	0.095	J	0.1	
Sulfate	mg/L	2600		2700		2700		3700		2500		18		18		28		29		30		43	J-	78	J	1300		2100	J	4000	J	3000	J	73	?	71	
Total Ammonia	mg/L as N	0.053	J	0.072	J	0.052	J	0.065	J	0.064	J	0.16		0.2		0.11		0.081		0.082		0.097		0.1		0.38		0.13		0.036	I	0.038	I	0.029	I	0.026	U
Ammonium Ion (NH^{4+})	mg/L	0.064		0.085		0.06		0.078		0.077		0.18		0.25		0.13		0.098				0.11		0.12		0.48		0.16		0.043		0.045		0.031		0.03	U
Unionized NH_3	mg/L	0.004		0.007		0.006		0.005		0.004		0.024		0.003		0.007		0.005		0.000		0.013		0.010		0.008		0.005		0.003		0.004		0.006		0.002	
Nitrate/Nitrite as N	mg/L	0.032	J	0.04	J	0.027	J	0.021	J	0.018	J	0.11		0.0047	U	0.099		0.29	J+	0.59	J	0.0047	U	0.0047	U	0.015	J+	0.017	J+	0.0092	I	0.013		0.0047	UJ	0.0047	UJ
TKN	mg/L	0.31	J	0.2	J	0.26	J	0.25	J	0.24	J	1.3		0.47		0.84		0.49	J	0.16	IJ	0.54		0.57		0.92		1.1	J-	0.33		0.18	I	0.2	J	0.29	J
TN	mg/L	0.34		0.25	U	0.29		0.27		0.26		1.4		0.47		0.94		0.78		0.75		0.54		0.57		0.94		1.1		0.34		0.25	U	0.25	U	0.29	
Orthophosphate	mg/L	0.0034	IJ	0.0062	IJ	0.0061	IJ	0.0039	IJ-	0.0049	IJ	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0071	I	0.0035	I	0.0014	UJ-	0.0014	U	0.0014	U
Phosphorus (P)	mg/L	0.017		0.017		0.016		0.016		0.017		0.033		0.042		0.018		0.011		0.0094	I	0.013		0.016		0.018		0.025		0.021		0.025		0.0089	I	0.013	
Alkalinity	mg/L ($CaCO_3$)	130		130		130		130		130		130		160		170		170		170		200		970	J	220		180	J	140	J	150	J	160	J	160	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	130		130		120		130		130		130		160		170		170		170		190		970	J	220		180	J	140	J	150	J	160	J	160	
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																																				
Dissolved Inorganic Carbon	mg/L	43		41		39		40		44		45		51		58		58		49		63		64		73		59		43		43		47		45	
$\delta^{18}O$	‰	2.0		1.9		1.9		1.8		2.0		0.5		0.3		0.0		0.0		0.2		0.0		0.0		1.4		1.9		1.9		2.1		-0.5		-0.5	
$\delta^{2}H$	‰	17.0		23.0		18.0		18.0		18.0		6.0		5.0		1.0		-1.0		1.0		1.0		3.0		8.0		15.0		18.0		17.0		1.0		-1.0	
$\delta^{13}C$	‰	-1.61		-0.26		-0.15		-0.45		-1.61		-3.64		-6.42		-5.08		-5.18		-5.07		-5.78		-5.63		-7.60		-6.05		-1.55		-1.68		-8.27		-7.99	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		35.2		36.9		37.1		36.6		35.0		0.4	J	0.4	J	0.7		0.7				1.0		1.5		18.3		29.2		37.9		38.1		0.4	J	0.4	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70915		0.70914		0.70918		0.70914		0.70915		0.70914		0.70914		0.70916		0.70913		0.70921		0.70917		0.70912		0.70914		0.70915		0.70914		0.70912		0.70912	
Tritium	pCi/L (1σ)	19.3(7.3)		13.1(7.3)		13.4(7.7)		34.5(8.4)		26.4(7.9)		102.5(12.4)		69.1(10.4)		63(9.9)		46.9(8.9)	J	81.1(11.1)	J	35.8(7.1)	J	26.8(6.6)	J	403(26)		226(18)		136(12)		152(13)		4(7.2)	UJ	24.7(8)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (3/23/2011) is a duplicate of TPSWC-2B.

[2] Sample TPSWCCS-Dup1 (3/15/2011) is a duplicate of TPSWCCS-1B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-4. Summary of Surface Water Analytical Results from the March 2011 Sampling Event

Parameter	Units	TPSWID-1T 3/15/2011		TPSWID-1B 3/15/2011		TPSWID-2T 3/15/2011		TPSWID-2B 3/15/2011		TPSWID-3T 3/15/2011		TPSWID-3B 3/15/2011		TPSWCCS-1B 3/15/2011		TPSWCCS-DUP1 [2] 3/15/2011		TPSWCCS-2B 3/9/2011		TPSWCCS-3B 3/15/2011		TPSWCCS-4B 3/22/2011		TPSWCCS-4T 3/22/2011		TPSWCCS-5B 3/22/2011		TPSWCCS-5T 3/22/2011		TPSWCCS-6B 3/22/2011		TPSWCCS-6T 3/22/2011	
Temperature	°C	28.37		25.41		25.08		26.27		23.97		24.32		32.07				25.99		23.74		24.64		24.44		24.33		24.33		25.46		25.36	
pH	SU	7.38		7.32		7.35		7.08		7.86		7.31		8.05				7.96		8.00		8.36		8.24		8.27		8.09		8.28		8.36	
Dissolved Oxygen	mg/L	3.85	J	4.95	J	3.05	J	0.04	J	6.98	J	1.10	J	6.80	J			5.72	J	4.71	J	6.09	J	6.27	J	4.10	J	4.22	J	6.09	J	5.36	J
Specific Conductance	µS/cm	18197		18785		12172		27020		4223		7935		82288				82938		80314		82638		82098		81929		81516		81426		81457	
Turbidity	NTU	1.05		1.42		0.83		47.92		0.35		0.89		6.45				10.08		6.58		5.44		8.07		5.93		5.70		5.67		6.22	
Arsenic	mg/L																																
Barium	mg/L	0.019	I	0.018	I	0.016	U	0.016	U	0.016	U	0.016	U	0.020	I	0.016	U	0.016	U	0.030	I	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.250	I	0.270	I	0.130	I	0.320	I	0.054	U	0.140	I	0.440	I	0.480	I	0.880	I V	0.470	I	0.960	I	0.870	I	0.860	I	0.850	I	0.920	I	0.850	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L													4.20	J	0.25	UJ	5.20		4.20		1.60	J	0.25	UJ	0.25	UJ	0.25	UJ	0.25	UJ	0.75	IJ
Calcium	mg/L	250		250		210		330		140		180		750		770		780		780		770	J	780		770		760		760		760	
Magnesium	mg/L	360		370		230		590		60		130		2100		2100		2200		2100		2200	J	2200		2200		2200		2200		2200	
Potassium	mg/L	130		130		77		190		23		47		700		720		690		720		700	J	700		690		690		690		690	
Sodium	mg/L	3200		3300		2000		4900		590		1200		17000		17000		17000		17000		17000	J	18000		18000		17000		17000		17000	
Boron	mg/L	1.3	J	1.3	J	0.74	J	1.8		0.19	IJ	0.39	J	6.8		7		7.2		7		7.1		7.1		6.9		6.9		7		6.9	
Strontium	mg/L	3.5		3.5		2.7		5.1		1.5		2.1		13		14		14		14		14		15		14		14		14		14	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	21		22	J	13		32		4.1		9		120	J	110		120		110		120	J	120		270		120		220		120	
Chloride	mg/L	5900		7200	J	4000		9600		1200		2700		35000	J	37000		33000		34000		36000	J	35000		35000		35000		35000		35000	
Fluoride	mg/L	0.2	U	0.21	IJ	0.027	I	0.2	U	0.038	I	0.2	U	1.1	J	1		0.2	U	0.53		0.54	J	0.43	I	0.58		0.52		0.49	I	0.48	I
Sulfate	mg/L	790		730	J	460		1200		100		280		4200	J	3900		4300		4100		4600	J	4600		4800		4500		4800		4500	
Total Ammonia	mg/L as N	0.51		0.52		0.52		1		0.2		0.32		0.3		0.3		0.54		0.32		0.17		0.17		0.18		0.19		0.17		0.18	
Ammonium Ion (NH^{4+})	mg/L	0.64		0.66		0.66		1.3		0.25		0.41		0.35				0.66		0.39		0.19		0.2		0.21		0.23		0.2		0.2	
Unionized NH_3	mg/L	0.011		0.007		0.007		0.007		0.010		0.004		0.027				0.038		0.019		0.020		0.020		0.021		0.014		0.022		0.023	
Nitrate/Nitrite as N	mg/L	0.0096	I	0.014		0.0082	I	0.077		0.093		0.0083	I	0.048	J	0.071	J	0.029		0.039		0.018	J	0.024	J	0.02	J	0.018	J+	0.049	J	0.12	J
TKN	mg/L	1.2		1.3		1		1.8		0.8		0.78		1.8		1.9		2.3		2.4		2.1		2		1.8		1.6		2.3		2.2	
TN	mg/L	1.2096		1.314		1.0082		1.877		0.893		0.7883		1.848		1.971		2.3		2.439		2.1		2		1.8		1.6		2.3		2.3	
Orthophosphate	mg/L	0.041	J	0.0014	UJ-	0.034	J	0.04	J	0.029	J	0.034	J	0.077	J	0.082		0.0014	U	0.087	J	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0042	I	0.0026	I
Phosphorus (P)	mg/L	0.011	J	0.015		0.0077	IJ	0.014	J	0.0067	IJ	0.01	J	0.032	J	0.032		0.03		0.036	J-	0.039		0.041		0.039		0.039		0.039		0.04	J-
Alkalinity	mg/L ($CaCO_3$)	300		310	J	270		270		230		250		180	J	180		180		170		190	J	180		180		180		190		190	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	300		310	J	270		270		230		250		180	J	180		180		170		190	J	180		180		180		190		190	
Sulfides	mg/L	1	U	1	U	1	U	2.2		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	86		96		78		79		74		83		51		54		51		52		46		49		50		51		45		46	
$\delta^{18}O$	‰	0.9		0.6		0.9		1.4		0.2		0.1		6.4		5.6		6.0		5.4		6.3		6.2		6.1		6.0		5.9		6.0	
$\delta^{2}H$	‰	8.0		7.0		12.0		11.0		6.0		4.0		34.0		34.0		39.0		35.0		34.0		32.0		42.0		34.0		36.0		32.0	
$\delta^{13}C$	‰	-7.79		-8.38		-8.62		-9.80		-8.11		-9.03		-1.37		-1.41		-1.42		-1.52		-1.86		-1.64		-2.30		-2.34		-1.99		-2.02	
Gross Alpha	pCi/L													40 (2)	J	28 (2)	J	20 (2)		34 (2)		35 (2)		40 (2)		31 (2)		40 (2)		34 (2)		41 (2)	
Salinity (PSS-78)		10.7		11.1		7.0		16.5		2.2		4.4		57.5				58.3		56.2		58.1		57.6		57.5		57.1		57.0		57.1	
$^{87}Sr/^{86}Sr$	µg/L*	0.70911		0.70911		0.70913		0.70913		0.70911		0.70914		0.70909		0.7091		0.7091		0.70908		0.7091		0.70909		0.7091		0.7091		0.70909		0.7091	
Tritium	pCi/L (1σ)	395(27)		5677(310)		366(26)		1070(66)		102(11.4)		169(14)		358(26)		5330(320)		4880(290)		4600(280)		7130(430)		7020(420)		6710(400)		7010(420)		4690(470)		5270(420)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (3/23/2011) is a duplicate of TPSWC-2B.

[2] Sample TPSWCCS-Dup1 (3/15/2011) is a duplicate of TPSWCCS-1B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-4. Summary of Surface Water Analytical Results from the March 2011 Sampling Event

Parameter	Units	TPSWCCS-7B 3/15/2011		FB1 3/8/2011		FB1 3/15/2011		TPSWC-FB1 3/18/2011		TPSWC-FB1 3/21/2011		TPSWCCS-FB1 3/22/2011	
Temperature	°C	29.01											
pH	SU	8.08											
Dissolved Oxygen	mg/L	7.87	J										
Specific Conductance	µS/cm	81860											
Turbidity	NTU	8.91											
Arsenic	mg/L												
Barium	mg/L	0.016	U	0.001	U	0.001	U	0.001	I V	0.001	I	0.001	U
Beryllium	mg/L												
Cadmium	mg/L												
Copper	mg/L												
Iron	mg/L	0.490	I	0.003	U	0.003	U	0.003	U	0.003	U	0.003	U
Lead	mg/L												
Manganese	mg/L												
Molybdenum	mg/L												
Nickel	mg/L												
Selenium	mg/L												
Thallium	mg/L												
Vanadium	mg/L												
Zinc	mg/L												
Silica	mg/L	4.40										3.60	
Calcium	mg/L	780		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	2200		0.034	I	0.02	U	0.06	I V	0.031	I	0.02	U
Potassium	mg/L	730		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	17000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	7.1		0.01	U	0.14		0.01	U	0.038	I	0.037	I
Strontium	mg/L	14		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L												
Mercury	mg/L												
Bromide	mg/L	120		0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	34000		0.2	U	0.2	U	0.33	I	0.2	U	0.26	I
Fluoride	mg/L	1		0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	4200		0.2	U	0.55		0.2	U	0.2	U	0.2	U
Total Ammonia	mg/L as N	0.33		0.039	I	0.026	U	0.026	U	0.026	U	0.026	U
Ammonium Ion (NH^{4+})	mg/L	0.39											
Unionized NH_3	mg/L	0.028											
Nitrate/Nitrite as N	mg/L	0.067	J+	0.42		0.0047	U	0.087		0.0047	U	0.066	
TKN	mg/L	1.8		0.079	I	0.056	I	0.05	U	0.05	U	0.092	I
TN	mg/L	1.867		0.5		0.0607		0.25	U	0.25	U	0.25	U
Orthophosphate	mg/L	0.075	J	0.0014	I	0.0018	I J-	0.0014	U	0.0014	U	0.0014	U
Phosphorus (P)	mg/L	0.035	J	0.0044	U?	0.0044	U	0.0044	U	0.0044	U	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	170		2.1		1.5		3		2.6		1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	170		2.1		1.5		3		2.6		1	U
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L												
Dissolved Inorganic Carbon	mg/L	53		10	U	10	U	10	U	10	U	10	U
$\delta^{18}O$	‰	5.7		-1.1		-1.0		-2.4		-1.4		1.7	
$\delta^{2}H$	‰	33.0		-1.0		-5.0		-6.0		-6.0		4.0	
$\delta^{13}C$	‰	-0.94		-13.44		-25.61		-17.86		-21.29		-14.40	
Gross Alpha	pCi/L	42 (3)										0.4 (0.5)	UJ
Salinity (PSS-78)		57.3											
$^{87}Sr/^{86}Sr$	µg/L*	0.70907		0.005	U	0.005	U	0.01		0.005	U	0.005	U
Tritium	pCi/L (1σ)	6750(410)		-2.1(7.1)	UJ	-0.8(6.8)	UJ	10.7(5.9)		9.3(6.4)		-4.5(5.8)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (3/23/2011) is a duplicate of TPSWC-2B.

[2] Sample TPSWCCS-Dup1 (3/15/2011) is a duplicate of TPSWCCS-1B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-5. Summary of Surface Water Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPBBSW-1B 6/14/2011		TPBBSW-2B 6/14/2011		TPBBSW-3B 6/14/2011		TPBBSW-4B 6/14/2011		TPBBSW-5B 6/14/2011		TPSWC-1T 6/10/2011		TPSWC-1B 6/10/2011		TPSWC-2T 6/10/2011		TPSWC-2B 6/10/2011		TPSWC-3T 6/10/2011		TPSWC-DUP1 [1] 6/10/2011		TPSWC-3B 6/10/2011		TPSWC-4T 6/15/2011		TPSWC-4B 6/15/2011		TPSWC-5T 6/15/2011		TPSWC-5B 6/15/2011	
Temperature	°C	30.49		30.95		31.36		31.02		31.42		29.1		28.6		29.78		29.61		29.3				29.26		31.76		31.3		32.1		31.07	
pH	SU	8.3		8.39		8.31		8.24		8		8.32		8.32		8.15		7.81		8.09				7.25		7.84		7.85		8.15		8.26	
Dissolved Oxygen	mg/L	4.56		5.29	J	6.41		5.75		4.13		8.16		7.34		6.76		3.72		7.5				0.92		3.28		3.39		5.88		5.83	
Specific Conductance	µS/cm	66855		64198		64512		61153		62727		1321		1288		6120		7942		5788				16610		63385		63421		61665		61770	
Turbidity	NTU	2.31		0.85		1.33		1.62		1.58		11.45		11.97		3.66		5.89		3.22				17.82		6.06		10.53		1.3		2.47	
Arsenic	mg/L																																
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.016	U	0.016	U	0.016	U	0.056	I	0.018	I	0.025	I	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.27	U	0.6	I V	0.68	I V	0.71	I V	0.72	I V	0.077	I	0.5	I	0.054	U	0.054	U	0.054	U	0.054	U	0.27	U	0.61	I	0.72	I	0.66	I	0.73	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																																
Calcium	mg/L	540	J	500	J	500	J	480	J	500		75		73		150		160		140		140		230		520		520		500		500	
Magnesium	mg/L	1700	J	1700	J	1700	J	1600	J	1600		19		19		100		140		86		85		320		1700		1600		1600		1600	
Potassium	mg/L	570	J	550	J	560	J	530	J	540		6.5		6.4		36		48		30		29		100		540		530		510		520	
Sodium	mg/L	14000	J	14000	J	14000	J	13000	J	13000		140		140		920		1300		780		790		2600		13000		13000		12000		12000	
Boron	mg/L	5.5		5.4		5.4		5.2		5.4		0.078		0.076		0.35		0.48		0.29		0.29		1.1		5.5		5.5		5.2		5.3	
Strontium	mg/L	9.9		9.4		9.5		9.0		9.3		0.93		0.91		1.8		2.0		1.7		1.7		3.0		9.0		8.8		8.5		8.5	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	100	J	96	J	92	J	91	J	95	J	0.84		0.88		6.8		7.8		5.4		5.1		19		96	J	110	J	94	J	93	J
Chloride	mg/L	28000	J	28000	J	26000	J	26000	J	26000	J	300		300		1700		2500		1600		1600		5300		28000	J	27000	J	27000	J	27000	J
Fluoride	mg/L	0.6	J	0.67	J	0.7	J	0.67	J	0.66	J	0.77		0.79		0.68		0.69		0.88	J	0.68	J	0.72		2	U J	2	U J	2	U J	2	U J
Sulfate	mg/L	3400	J	3200	J	3100	J	3000	J	3100	J	29		30		190		250		150		140		640		3200	J	3900	J	3100	J	3100	J
Total Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH_3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	77	J	92	J	82	J	58	J	82	J	160		160		200		200		190		190		200		42	J	81	J	76		88	J
Bicarbonate Alkalinity as $CaCO_3$	mg/L	76	J	91	J	81	J	57	J	82	J	160		160		200		200		190		190		200		42	J	81	J	76		88	J
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	27		28		29		29		32		45		42		54		54		59		54		58		31		32		33		31	
$\delta^{18}O$	‰	2.8		2.4		2.3		1.9		2.1		2.7		2.6		2.0		1.9		1.8		2.0		1.5		2.2		2.3		2.0		2.1	
$\delta^{2}H$	‰	20.0		17.0		17.0		16.0		23.0		16.0		17.0		7.0		12.0		10.0	J	6.0	J	8.0		23.2		20.9		16.2		25.7	
$\delta^{13}C$	‰	-5.18		-3.22		-2.46		-0.83		-4.25		-0.62		-0.32		-4.28		-5.16		-4.67		-4.61		-7.68		-4.92		-4.85		-2.01		-1.88	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		45.3		43.2		43.4		40.9		42.1		0.7		0.6		3.3		4.4		3.1				9.7		42.5		42.6		41.2		41.3	
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70913		0.70913		0.70914		0.70913		0.70911		0.70912		0.70913		0.70913		0.70912		0.70914		0.70915		0.70915		0.70914		0.70917		0.70915	
Tritium	pCi/L (1σ)	16.4 (5.4)	J	12.1 (4.9)	J	19.1 (5.1)	J	9.8 (4.8)	J	13.9 (5)	J	93.3 (10.5)	J	84.5 (7.7)	J	75.4 (7.6)	J	74.3 (6.9)	J	55 (6.1)	J	74.5 (7.9)	J	35 (5.1)	J	12.6 (4.5)		8.6 (4.4)		3.7 (4.3)	UJ	12.2 (4.8)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-DUP1 (6/10/2011) is a duplicate of TPSWC-3T.

[2] Sample TPSWCCS-DUP1 (6/23/2011) is a duplicate of TPSWCCS-1B.

[3] Sample TPSWID-DUP1 (6/20/11) is a duplicate of TPSWID-1T.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-5. Summary of Surface Water Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPSWC-6T 6/16/2011		TPSWC-6B 6/16/2011		TPSWCCS-1B 6/23/2011		TPSWCCS-DUP1 [2] 6/23/2011		TPSWCCS-2B 6/9/2011		TPSWCCS-3B 6/20/2011		TPSWCCS-4T 6/23/2011		TPSWCCS-4B 6/23/2011		TPSWCCS-5T 6/23/2011		TPSWCCS-5B 6/23/2011		TPSWCCS-6T 6/23/2011		TPSWCCS-6B 6/23/2011		TPSWCCS-7B 6/20/2011		TPSWID-1T 6/20/2011		TPSWID-Dup1 [3] 6/20/2011		TPSWID-1B 6/20/2011	
Temperature	°C	32.72		32.91		39.54				30.51		33.89		33.22		33.36		31.71		31.72		32.77		32.73		38.16		30.98				29.61	
pH	SU	7.51		7.35		8.23				8.38		8.24		8.35		8.36		8.11		8.15		8.23		8.26		8.23		7.28				7.04	
Dissolved Oxygen	mg/L	5.83		1.06		3.41				5.26	J	6.08		6.84		7.78		2.28		2.05		5.59		5.09		4.84		1.05				0.44	
Specific Conductance	µS/cm	33763		59045		88184				87350		87805		88902		88496		88186		88139		87799		87842		87634		36249				37557	
Turbidity	NTU	6.59		10.78		8.81				8.87		8.59		8.08		9.27		10.55		9.8		11.37		10.98		9.96		3.85				5.98	
Arsenic	mg/L																																
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.16		0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.27	I	0.71	I	1	I	0.87	I	0.87		1.0	I	0.86	I	0.8	I	0.88	I	0.91	I	0.84	I	0.86	I	0.93	I	0.27	U	0.29	I	0.27	U
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																																
Calcium	mg/L	410	J	510		810		800		810	J	810		830	J	810	J	810	J	830	J	820	J	820	J	800		380		400		380	
Magnesium	mg/L	960	J	1500		2400		2400		2300	J	2500		2500	J	2400	J	2500	J	2500	J	2500	J	2500	J	2400		800		860		830	
Potassium	mg/L	320	J	490		820		820		770	J	810		820	J	800	J	830	J	830	J	810	J	820	J	810		270		290		280	
Sodium	mg/L	7700	J	12000		18000		18000		18000	J	19000		19000	J	19000	J	18000	J	19000	J	18000	J	19000	J	19000		6700		6800		6900	
Boron	mg/L	2.9		4.6		7.7		7.7		7.7		7.8		8		7.8		7.8		8		7.9		8		7.7		2.6		2.7		2.6	
Strontium	mg/L	6.1		8.4		15		15		15		15		15		15		15		15		15		15		15		6.0		6.3		6.2	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	55	J	85	J	120		120		120	J	130		130	J	130	J	120	J	120	J	130	J	130	J	110		41		48		42	
Chloride	mg/L	15000	J	25000	J	36000		37000		37000	J	38000		38000	J	38000	J	37000	J	38000	J	38000	J	37000	J	37000		13000		13000		14000	J-
Fluoride	mg/L	0.61	J	0.6	J	4.7	I	4.6	I	6.5	J	0.2	U	5.2	J	4.6	I J	4.7	I J	4.9	I J	4.6	I J	5.1	J	0.45	I	0.2	U	2	U	0.48	I
Sulfate	mg/L	1800	J	2800	J	4400		4600		4100	J	4400		4600	J	4800	J	4600	J	4700	J	4600	J	4600	J	3700		1400		1400		1200	
Total Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH_3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	130	J	110	J	130		140				95		140	J	140	J	130	J	140	J	140	J	130	J	73		260		270		260	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	130	J	110	J	130		140				95		140	J	140	J	130	J	140	J	140	J	120	J	73		260		270		260	
Sulfides	mg/L	1	U	1.1		1	U	1	U			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2.7		3.4	
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	44		38		43.00		43.00		38		44		40.00		39.00		44.00		42.00		41.00		41.00		43		77		77		78	
$\delta^{18}O$	‰	1.6		14.3		5.6		5.9		6.0		6.4		6.1		6.1		6.2		6.2		6.0		5.9		5.7		2.1		2.0		2.2	
$\delta^{2}H$	‰	11.6		24.0		31.0		26.0		35.0		31.0		30.0		32.0		35.0		35.4		28.0		29.0		29.0		15.4	J	12.0	J	13.0	
$\delta^{13}C$	‰	-7.98		-7.89		-3.30		-3.28		-3.57		-2.88		-2.29				-3.79		-3.67		-3.15		-3.15		-3.11		-7.86		-8.82		-9.00	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		21.0		39.2		67.1	J			61.7		61.9		62.9		62.5		62.4		62.3		62.0		62.0		65.4	J	22.7				23.7	
$^{87}Sr/^{86}Sr$	µg/L*	0.70911		0.70914		0.70911		0.70909		0.7091		0.70911		0.70909		0.70909		0.70915		0.7091		0.70911		0.70909		0.70911		0.70913		0.7091		0.7091	
Tritium	pCi/L (1σ)	16.7 (4.6)		5.6 (4.3)		2973 (177)		2842 (169)		2810 (170)		2480 (140)		2704 (163)		2894 (172)		2648 (159)		2716 (161)		2430 (150)		2770 (170)		2690 (160)		1391 (8.3)		1510 (9)		1597 (9.6)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-DUP1 (6/10/2011) is a duplicate of TPSWC-3T.

[2] Sample TPSWCCS-DUP1 (6/23/2011) is a duplicate of TPSWCCS-1B.

[3] Sample TPSWID-DUP1 (6/20/11) is a duplicate of TPSWID-1T.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-5. Summary of Surface Water Analytical Results from the June 2011 Sampling Event

Parameter	Units	TPSWID-2T 6/20/2011		TPSWID-2B 6/20/2011		TPSWID-3T 6/20/2011		TPSWID-3B 6/20/2011		TPSWC-FB1 6/10/2011		TPBBSW-FB1 6/14/2011		TPSWID-FB1 6/20/2011		TPSWC-FB1 6/23/2011	
Temperature	°C	31.22		30.37		30.43		30.21									
pH	SU	7.58		6.91		7.26		7.11									
Dissolved Oxygen	mg/L	7.44		0.31		2.74		0.57									
Specific Conductance	µS/cm	41662		66251		45986		64951									
Turbidity	NTU	3.3		3.99		2.19		1.37									
Arsenic	mg/L																
Barium	mg/L	0.094	I J	0.081	U	0.081	U	0.081	U	0.00081	U	0.00081	I	0.0011	I	0.00081	U
Beryllium	mg/L																
Cadmium	mg/L																
Copper	mg/L																
Iron	mg/L	0.57	I	0.6	I	0.4	I	0.62	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L																
Manganese	mg/L																
Molybdenum	mg/L																
Nickel	mg/L																
Selenium	mg/L																
Thallium	mg/L																
Vanadium	mg/L																
Zinc	mg/L																
Silica	mg/L																
Calcium	mg/L	440		610		440		580		0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	980		1700		1100		1700		0.02	U	0.025	I	0.02	U	0.026	I
Potassium	mg/L	330		560		360		550		0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	8400		14000		8800		14000		0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	3.1		5.3		3.4		5.3		0.078		0.082		0.084		0.082	
Strontium	mg/L	7.1		11		7.1		10		0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																
Mercury	mg/L																
Bromide	mg/L	48		85		55		67		0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	15000		27000		17000		26000		0.37	I	25		0.31	I	0.67	
Fluoride	mg/L	0.47	I	0.2	U	0.49	I	0.45	I	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	1400		2900		1800		2300		0.28	I	0.2	U	0.2	U	0.29	I
Total Ammonia	mg/L as N																
Ammonium Ion (NH^{4+})	mg/L																
Unionized NH_3	mg/L																
Nitrate/Nitrite as N	mg/L																
TKN	mg/L																
TN	mg/L																
Orthophosphate	mg/L																
Phosphorus (P)	mg/L																
Alkalinity	mg/L ($CaCO_3$)	210		160		140		120		1.2		1.8		1	U	1.4	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	210		160		140		120		1.2		1.8		1	U	1.4	
Sulfides	mg/L	1	U	13		1	U	4		1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																
Dissolved Inorganic Carbon	mg/L	62		53		51		42		10.00	U	10.00	U	10.00	U	10.00	U
$\delta^{18}O$	‰	2.3		4.2		2.5		3.5		-1.1		-1.4		-1.2		-1.4	
$\delta^{2}H$	‰	17.3		27.0		11.0		24.4		-8.0		-8.0		-3.0		-13.0	
$\delta^{13}C$	‰	-6.41		-8.86		-7.70		-8.38		-16.11		-20.40		-20.60		-15.84	
Gross Alpha	pCi/L																
Salinity (PSS-78)		26.5		44.8		29.7		43.8									
$^{87}Sr/^{86}Sr$	µg/L*	0.7091		0.70912		0.70913		0.70913		0.1		0.1	U	0.1	U	0.1	U
Tritium	pCi/L (1σ)	1920 (110)		4350 (260)		1330 (80)		1990 (230)		13.6 (7.1)		11.4 (9.5)		8.1 (4.5)		8.3 (5)	

Notes:

* Strontium samples are reported as a ratio and hence unitl
while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-DUP1 (6/10/2011) is a duplicate of TPS\

[2] Sample TPSWCCS-DUP1 (6/23/2011) is a duplicate of T

[3] Sample TPSWID-DUP1 (6/20/11) is a duplicate of TPSW

Text in blue are revised values.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-6. Summary of Surface Water Analytical Results from the September 2011 Sampling Event

		TPBBSW-1B		TPBBSW-2B		TPBBSW-3B		TPBBSW-4B		TPBBSW-5B		TPSWC-1T		TPSWC-DUP1 [1]		TPSWC-1B		TPSWC-2T		TPSWC-2B		TPSWC-3T		TPSWC-3B		TPSWC-4T		TPSWC-4B		TPSWC-5T		TPSWC-5B	
Parameter	**Units**	**9/8/2011**		**9/8/2011**		**9/9/2011**		**9/8/2011**		**9/8/2011**		**9/14/2011**		**9/14/2011**		**9/14/2011**		**9/14/2011**		**9/14/2011**		**9/14/2011**		**9/14/2011**		**9/13/2011**		**9/13/2011**		**9/14/2011**		**9/14/2011**	
Temperature	°C	31.62		31.15		31.22		31.19		31.11		31.31				29.28		31.56		30.61		31.68		30.84		32.31		30.29		32.03		32.4	
pH	SU	8.94		8.45		8.18		8.21		8.33		7.47	J			7.33	J	7.66	J	7.74	J	8.19	J	7.64	J	7.66	J	7.24	J	7.72	J	7.72	J
Dissolved Oxygen	mg/L	4.66		4.47		5.05		4.69		4.72		4.37				3.72		3.27		3.16		4.91		0.46		2.19		0.22		0.45		3.17	
Specific Conductance	µS/cm	53742		54062		55918		55450		52959		952	J			888	J	742	J	753	J	663	J	651	J	9906	J	45758	J	55387		59712	
Turbidity	NTU	1.95		0.58		0.69		0.44		0.9		0.87				0.78		0.93		0.82		0.73		1.14		2.16		107.8		0.57		1.74	
Arsenic	mg/L																																
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.1	I	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	5.5		0.6	I	1.9	I V	0.56	I	0.76	I	0.27	U	0.27	U	0.27	U	0.36	I	0.27	U	0.27	U	0.39	I	0.27	U	0.52	I V	1.2	I	0.58	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																																
Calcium	mg/L	440	J	450		500		480	J	460		67	J	68		62		54	J	60	J	55	J	59	J	130		440		510		560	J
Magnesium	mg/L	1300	J	1400		1500		1500	J	1400		12	J	12		11		8.4	J	8.8	J	6.9	J	6.7	J	190		1100		1500		1600	J
Potassium	mg/L	420	J	430		470		450	J	420		4.6	J	4.6		3.7		2.9	J	3.4	J	3.4	J	3.5	J	60		320		460		510	J
Sodium	mg/L	11000	J	11000		11000		12000	J	11000		100	J	110		99		74	J	76	J	60	J	58	J	1600		8500		11000		13000	J
Boron	mg/L	4.7		4.8		5.2		5		4.7		0.062		0.063		0.06		0.05		0.056		0.048	I	0.048	I	0.65		3.4		5.2		5.7	
Strontium	mg/L	7.8		7.9		8.5		8.4		8.1		0.65		0.65		0.62		0.59		0.64		0.58		0.6		1.9		7.3		8.6		9.6	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	70		71		73		75	J	69	J	0.35		0.41		0.37		0.3		0.3		0.26		0.31		10		53		74		78	J
Chloride	mg/L	20000		19000		20000		21000	J	19000	J	170		180		190	J-	120		120		95		91		3000		16000		20000		22000	J
Fluoride	mg/L	0.51	I	0.53	I	0.76	I	0.46	I J	0.42	I J	0.06		0.12	J-	0.073		0.072		0.078		0.07		0.11		0.4	U	0.4	U	0.74	I	0.79	I J
Sulfate	mg/L	2500		2600		2600		2600	J	2500	J	26		27	J-	16		11		12		8.8		15		350		2200		2700		2900	J
Total Ammonia	mg/L as N	0.1	J	0.063	J	0.053		0.06	J	0.076	J	0.23		0.23		0.23		0.22		0.22		0.23		0.37		0.34		0.34		0.11		0.17	
Ammonium Ion (NH^{4+})	mg/L	0.072		0.065		0.06		0.068		0.082		0.29				0.29		0.27		0.27		0.26		0.46		0.42		0.43		0.13		0.21	
Unionized NH_3	mg/L	0.0474		0.0155		0.0073		0.0082		0.0127		0.0069				0.0043		0.0104		0.0104		0.0316		0.0140		0.0160		0.0052		0.0052		0.0080	
Nitrate/Nitrite as N	mg/L	0.06		0.018		0.034		0.032		0.021		0.018		0.033		0.015		0.016	J+	0.55		0.3		0.023		0.017		0.039		0.028		0.028	
TKN	mg/L	0.28	J	0.37	J	0.34		0.43	J	0.63	J	1		1.1		0.94		1.1		1	J-	1		1.1		1.1		0.97		0.34		0.42	
TN	mg/L	0.34		0.39		0.37		0.46		0.65		1		1.1		0.96		1.1		1.6		1.3		1.1		1.1		1		0.37		0.45	
Orthophosphate	mg/L	0.011		0.0016	I	0.0014	U	0.0014	U J-	0.0014	U	0.0014	U	0.0041	I	0.0037	I	0.0014	U	0.0014	U	0.0049	I	0.0045	I J-	0.0014	U J-	0.0022	I	0.0014	U	0.0014	U J-
Phosphorus (P)	mg/L	0.052		0.048	I	0.022	U	0.047	I	0.049	I J-	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.0051	I	0.14		0.033	I	0.022	U
Alkalinity	mg/L ($CaCO_3$)	120		120		120		120	J	130	J	100		96		93		91		100		110		1	U	140		240		130		130	J
Bicarbonate Alkalinity as $CaCO_3$	mg/L	120		120		120		120	J	130	J	100		96		93		91		100		110		1	U	140		240		130		130	J
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																									4800		28000					
Dissolved Inorganic Carbon	mg/L	39	J	44	J	41		44	J	47	J	35		10	U	10	U	36		35		37		41		54		88		10	U	10	U
$\delta^{18}O$	‰	1.6		1.6		2.1		2.3		2.4		-0.5		-0.5		-0.4		0.2		0.2		0.1		0.0		0.5		2.1		2.4		2.2	
$\delta^{2}H$	‰	9.0		10.0		7.0		12.0		17.0		0.0		2.0		4.0		2.0		7.0		1.0		6.0		-1.0		14.0		8.0		19.0	
$\delta^{13}C$	‰	-2.01		-2.21		-1.86		-3.01		-4.47		-9.9		-9.74		-9.28		-8.94		-8.93		-8.95		-10.17		-9.34		-10.26		-3.75		-4.64	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		35.28		35.54		36.92		36.57		34.72		0.464	J			0.433	J	0.358	J	0.365	J	0.319	J	0.314	J	5.51	J	29.49	J	36.49		39.72	
$^{87}Sr/^{86}Sr$	µg/L*	0.70916		0.70913		0.70917		0.70914		0.70915		0.70911		0.70916		0.70917		0.70916		0.70913		0.70914		0.70915		0.70914		0.70914		0.70913		0.70915	
Tritium	pCi/L (1σ)	32.6 (6.9)	J	26.5 (6.8)	J	21.9 (7)	J	30.6 (6.6)	J	23.9 (6.5)	J	18.1 (6)	J	11.4 (6)	J	17.6 (6.4)	J	13.7 (5.2)	J	15.4 (6.2)	J	15.2 (6.4)	J	10.3 (5.1)	J	209 (15)		449 (28)		41.6 (7)	J	231 (17)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-DUP1 (9/14/2011) is a field duplicate of sample TPSWC-1T.

[2] Sample TPSWCCS-DUP1 (9/12/2011) is a field duplicate of sample TPSWCCS-1B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

NR = Not recorded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-6. Summary of Surface Water Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPSWC-6T 9/1/2011		TPSWC-6B 9/1/2011		TPSWID-1T 9/12/2011		TPSWID-1B 9/12/2011		TPSWID-2T 9/12/2011		TPSWID-2B 9/12/2011		TPSWID-3T 9/12/2011		TPSWID-3B 9/12/2011		TPSWCCS-1B 9/12/2011		TPSWCCS-DUP1 [2] 9/12/2011		TPSWCCS-2B 9/7/2011		TPSWCCS-3B 9/14/2011		TPSWCCS-4T 9/1/2011		TPSWCCS-4B 9/1/2011		TPSWCCS-5T 9/1/2011		TPSWCCS-5B 9/1/2011	
Temperature	°C	26.96		26.96		28.7		29.4		30.14		30.07		30.67		29.47		40.31				36.19		34.35		33.46		33.67		32.16		32.36	
pH	SU	7.59		7.58		7.57	J	7.3	J	8.1	J	7.38	J	8.52	J	7.96	J	8.94	J			8.68		8.24	J	8.45		8.48		8.3		8.37	
Dissolved Oxygen	mg/L	2.91		2.71		2.29		0.43		2.4		0.09		5.73		0.27		4.2				5.55	J	3.65		5.89		6.13		2.45		2.11	
Specific Conductance	µS/cm	933	J	928	J	7162		23723		6789		53912		3494		11236		83866				81722		81641		85563		85590		84785		84992	
Turbidity	NTU	0.68		0.66		3.54		6.34		1.15		8.31		1.04		8.23		3.18				6.03		5.57		5.65		4.99		5.61		4.72	
Arsenic	mg/L																																
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.63	I	0.27	U	0.27	U	0.88	I	0.86	I	0.64	I V	1.1	I	0.72	I	0.71	I	0.65	I	0.7	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica	mg/L																	1.5		1.5		1.3		1.5		0.14	I J	0.14	I J	0.17	I J	0.17	I J
Calcium	mg/L	99		98		150		280		150		530		110		190		750		760		810		730	J	790		820		790		810	
Magnesium	mg/L	11		11		140		520		120		1300		56		230		2300		2300		2300		2200	J	2200		2300		2300		2300	
Potassium	mg/L	9.4		9.3		47		160		40		400		19		72		680		710		720		660	J	670		710		750		690	
Sodium	mg/L	76		74		1100		4100		1000		10000		500		1800		17000		18000		18000		17000	J	18000		19000		19000		18000	
Boron	mg/L	0.085	J	0.084	J	0.54	J	1.7		0.41	J	4.3		0.2	J	0.79		7.5		7.8		8		7.3		7.7		8		7.6		7.9	
Strontium	mg/L	1		1		1.7		4.2		1.9		9.2		1.3		2.7		14		15		15		14		14		15		14		15	
Chromium VI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	0.54	U	0.83	I	8.7		26		9.2		67		5		12		110		110		110		120	J	120		120		120		120	
Chloride	mg/L	140		130		1900		7300		1900		19000		900		3200	J-	33000		34000		33000		32000	J	35000		35000		34000		35000	
Fluoride	mg/L	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.49	I	0.4	U	0.4	U J	2	U	2	U	2	U	2	U
Sulfate	mg/L	44		43		240		800		220		2300		110		430	J-	3600		3600		4200		3900	J	4500		4500		4400		4400	
Total Ammonia	mg/L as N	0.11		0.097		0.38		1.1		0.35		1.9		0.17	J	0.41		0.12		0.087	J	0.11		0.15	J+	0.067	J	0.074	J	0.1	J	0.082	J
Ammonium Ion (NH^{4+})	mg/L	0.14		0.12		0.48		1.4		0.41		2.4		0.17		0.49		0.065				0.089		0.16		0.067		0.073		0.11		0.086	
Unionized NH_3	mg/L	0.0034		0.0030		0.0130		0.0204		0.0391		0.0457		0.0419		0.0359		0.0568				0.0385		0.0206		0.0165		0.0182		0.0168		0.0167	
Nitrate/Nitrite as N	mg/L	0.025		0.022		0.024		0.0047	U	0.0061	I	0.0047	U	0.041	J+	0.0047	U	0.01		0.015		1		0.038		0.052	J	0.13	J	0.061	J	0.054	J
TKN	mg/L	0.51		0.4		1.2	J	1.8		0.94	J	2.4		0.79	J	1	J	2.3		2.2		2		1.7		2.2		2.1		2.3		2.1	
TN	mg/L	0.54		0.42		1.2		1.8		0.95		2.4		0.83		1		2.3		2.2		3		1.7		2.3		2.2		2.4		2.2	
Orthophosphate	mg/L	0.0014	U	0.0022	I	0.0025	I	0.017		0.0014	U	0.0028	I	0.0014	U	0.0014	U	0.0014	U	0.0015	I	0.0028	I	0.0026	I	0.0027	I	0.0032	I	0.0014	U	0.0034	I
Phosphorus (P)	mg/L	0.0044	U	0.0044	U	0.0044	U	0.03		0.0044	U	0.04		0.0044	U	0.0044	U	0.073		0.072		0.025	I	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	190		200		250		270		190		200		160		200		130		130		130		120	J	130		140		130		130	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	190		200		250		270		190		200		160		200		120		110		130		120	J	130		130		130		130	
Sulfides	mg/L	1	U	1	U	1	U	8.5		1	U	12		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L	440		450																													
Dissolved Inorganic Carbon	mg/L	10	U	63		71		79		66		76		53		70		36		34		42		39		41		41		43		41	
$\delta^{18}O$	‰	-		-		0.2		1.3		0.1		3.2		0.3		0.1		4.7		4.5		4.5		-		4.7		4.7		4.8		4.7	
$\delta^{2}H$	‰	-		-		6.0		8.0		2.0		18.0		1.0		5.0		19.0		24.0		25.0		-		27.0		28.0		28.0		25.0	
$\delta^{13}C$	‰	-		-		-7.86		-9		-6.41		-9.39		-7.95		-9.29		-4.9		-5.15		-5.19		-2.88		-4.64		-4.48		-5.64		-5.59	
Gross Alpha	pCi/L																																
Salinity (PSS-78)		0.455	J	0.455	J	3.91		14.28		3.68		35.47		1.81		6.34		64.23	J			57.99	J	56.82		60.08		60.09		59.51		59.67	
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70913		0.70913		0.70914		0.70914		0.70912		0.70917		0.70915		0.70911		0.70912		0.70912		0.70907		0.70911		0.70911		0.70909		0.70912	
Tritium	pCi/L (1σ)	19.8 (4.9)	J	31.4 (5.5)	J	186 (15)		890 (60)		221 (15)		3030 (180)		83 (8)		371 (23)		1450 (90)		1270 (80)		1460 (90)		1260 (80)		1463 (84)		1575 (91)		1550 (89)		1546 (88)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-DUP1 (9/14/2011) is a field duplicate of sample TPSWC-1T.

[2] Sample TPSWCCS-DUP1 (9/12/2011) is a field duplicate of sample TPSWCCS-1B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

NR = Not recorded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-6. Summary of Surface Water Analytical Results from the September 2011 Sampling Event

Parameter	Units	TPSWCCS-6T 9/1/2011		TPSWCCS-6B 9/1/2011		TPSWCCS-7B 9/12/2011		TPSWCCS-EB1 9/1/2011		TPSWC-FB1 9/8/2011		TPSWC-FB1 9/12/2011		TPSWCCS-FB1 9/13/2011		TPSWC-FB1 9/22/2011	
Temperature	°C	31.86		31.8		37.44											
pH	SU	8.4		8.43		8.84	J										
Dissolved Oxygen	mg/L	4.45		4.28		4.56											
Specific Conductance	µS/cm	83338		83516		76581											
Turbidity	NTU	5.13		4.67		6.25											
Arsenic	mg/L																
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00094	I
Beryllium	mg/L																
Cadmium	mg/L																
Copper	mg/L																
Iron	mg/L	0.66	I	0.62	I	0.93	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L																
Manganese	mg/L																
Molybdenum	mg/L																
Nickel	mg/L																
Selenium	mg/L																
Thallium	mg/L																
Vanadium	mg/L																
Zinc	mg/L																
Silica	mg/L	0.26	I J	0.19	I J	1.6		8.1						5.1			
Calcium	mg/L	760		760		680		0.1	U	0.1	U	0.12	I	0.1	U	0.1	U
Magnesium	mg/L	2200		2200		2000		0.02	U	0.043	I V	0.04	I	0.02	U	0.022	I
Potassium	mg/L	670		650		620		0.19	U	0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	17000		17000		16000		0.31	U	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	7.5		7.5		6.9		0.073		0.09		0.064		0.064		0.068	
Strontium	mg/L	14		14		13		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																
Mercury	mg/L																
Bromide	mg/L	120		120		100		0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	34000		34000		30000		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoride	mg/L	2	U	2	U	0.42	I	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	4400		4300		3500		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Ammonia	mg/L as N	0.14	J	0.11	J	0.13	J	0.041	I	0.037	I	0.026	I	0.026	U	0.026	U
Ammonium Ion (NH^{4+})	mg/L	0.15		0.11		0.087											
Unionized NH_3	mg/L	0.0286		0.0224		0.0532											
Nitrate/Nitrite as N	mg/L	0.056	J	0.052	J+	0.031		0.021		0.0047	U	0.0047	U	0.0047	U	0.09	
TKN	mg/L	2.3		2		2.1		0.15	I	0.075	I	0.14	I	0.092	I	0.061	I
TN	mg/L	2.4		2.1		2.1		0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
Orthophosphate	mg/L	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.0014	U	0.01	U
Phosphorus (P)	mg/L	0.029	I J-	0.0044	U	0.067	J-	0.0044	U	0.0044	U	0.0044	U	0.0044	U	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	130		130		130		1	U	1	U	1	U	1.4		4.1	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	130		130		120		1	U	1	U	1	U	1.4		4.1	
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																
Dissolved Inorganic Carbon	mg/L	44		43		35		10	U	42		10	U	10	U	10	U
$\delta^{18}O$	‰	4.6		4.5		4.2		-1.5		-1.2		-1.2		-1.2		-1.1	
$\delta^{2}H$	‰	28.0		28.0		27.0		-2.0		-6.0		-1.0		-7.0		-7.0	
$\delta^{13}C$	‰	-4.66		-5.19		-5.17		-11.53		-9.87		-11.96		-11.07		-9.79	
Gross Alpha	pCi/L																
Salinity (PSS-78)		58.34		58.49		54.589	J										
$^{87}Sr/^{86}Sr$	µg/L*	NR		0.70912		0.7091		0.05	U	0.1		0.1		0.1		0.1	
Tritium	pCi/L (1σ)	1530 (90)		1610 (100)		1320 (80)		6.6 (6.3)		7.6 (6.3)		5.1 (7.2)	UJ	-0.8 (5.4)	UJ	2.2 (7.3)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-DUP1 (9/14/2011) is a field duplicate of sample TPSWC-1T.

[2] Sample TPSWCCS-DUP1 (9/12/2011) is a field duplicate of sample TPSWCCS-1B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

NR = Not recorded.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-7. Summary of Surface Water Analytical Results from the December 2011 Sampling Event

Parameter	Units	TPBBSW-1B 12/15/2011		TPBBSW-2B 12/15/2011		TPBBSW-DUP1 [1] 12/15/2011		TPBBSW-3B 12/15/2011		TPBBSW-4B 12/15/2011		TPBBSW-5B 12/15/2011		TPSWC-1T 12/6/2011		TPSWC-1B 12/6/2011		TPSWC-2T 12/6/2011		TPSWC-Dup [2] 12/6/2011		TPSWC-2B 12/6/2011		TPSWC-3T 12/6/2011		TPSWC-3B 12/6/2011		TPSWC-4T 12/13/2011		TPSWC-4B 12/13/2011		TPSWC-5T 12/5/2011		TPSWC-5B 12/5/2011	
Temperature	°C	21.94		22.15				21.81		22.21		21.91		22.89		22.86		24.10				22.76		24.65		23.49		25.82		25.40		22.73		25.52	
pH	SU	8.33		8.37				8.31		8.25		8.18		8.01		7.92		8.57				8.29		8.70		8.21		7.30		7.56		8.27		7.61	
Dissolved Oxygen	mg/L	8.16		8.16				8.28		6.87		6.86		7.01		6.52		8.64				8.34		9.44		0.73		2.43		3.39		6.99		3.78	
Specific Conductance	µS/cm	34410		35005				37725		46029		46289		506	J	509	J	560	J			561	J	614	J	618	J	32123		41629		48863		56332	
Turbidity	NTU	9.24		6.88				3.29		4.42		2.64		1.86		2.54		2.82				8.66		3.28		3.75		2.24		8.26		1.79		2.68	
Arsenic	mg/L																																		
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.10	I	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
Beryllium	mg/L																																		
Cadmium	mg/L																																		
Copper	mg/L																																		
Iron	mg/L	0.27	I	0.27	U	0.27	U	0.30	I	0.38	I	0.38	I	0.27	U	0.31	I	0.27	U	0.27	U	0.56	I	0.27	U	0.27	U	0.29	I V	0.44	I V	0.48	I	0.93	I
Lead	mg/L																																		
Manganese	mg/L																																		
Molybdenum	mg/L																																		
Nickel	mg/L																																		
Selenium	mg/L																																		
Thallium	mg/L																																		
Vanadium	mg/L																																		
Zinc	mg/L																																		
Silica	mg/L																																		
Calcium	mg/L	320		320		320		330		380		390		49		51		52		52		53		55		55		370		390		380		490	
Magnesium	mg/L	810		820		810		870		1100		1100		6.1		6.2		6.7		6.7		6.7		7.4		7.8		730		980		1000		1400	
Potassium	mg/L	260		270		270		280		350		360		3		3		3.7		3.7		3.6		3.6		3.6		230		320		330		440	
Sodium	mg/L	6600		6500		6700		7200		8800		9000		38		38		45		45		45		51		53		5800		7700		7900		11000	
Boron	mg/L	2.8		2.9		2.8		3.1		3.8		3.9		0.025	I	0.025	I	0.028	I	0.028	I	0.028	I	0.031	I	0.033	I	2.4		3.4		3.5		4.5	
Strontium	mg/L	5		5		5		5.4		6.5		6.7		0.54		0.55		0.56		0.55		0.54		0.52		0.51		5.7		6.3		6		8.4	
Chromium VI	mg/L																																		
Mercury	mg/L																																		
Bromide	mg/L	46		44		45		49		58		60	J	0.17		0.18	J	0.2		0.21		0.21		0.27		0.29		39	J	53	J	57		78	
Chloride	mg/L	12000		12000		13000		14000		17000		18000	J	74		79	J	84		85		84		90		90		12000	J	16000	J	16000		20000	
Fluoride	mg/L	0.78	I J	0.78	I J	0.77	I J	0.82	I J	0.96	I J	0.96	I J	0.074		0.09	J	0.097	J	0.07	J	0.06		0.059		0.071		0.4	UJ	0.59	IJ	0.89	I	0.52	I
Sulfate	mg/L	1800		1800		1800		2000		2400		2300	J	4.2		4.8	J	6		6.1		6.3		8.1		9.1		1600	J	2200	J	2100		2900	
Total Ammonia	mg/L as N																																		
Ammonium Ion (NH^{4+})	mg/L																																		
Unionized NH_3	mg/L																																		
Nitrate/Nitrite as N	mg/L																																		
TKN	mg/L																																		
TN	mg/L																																		
Orthophosphate	mg/L																																		
Phosphorus (P)	mg/L																																		
Alkalinity	mg/L ($CaCO_3$)	180	J	180	J	180	J	170	J	160	J	150	J	150		82	J	150		150		140		160		150		270	J	210	J	170		190	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	180	J	170	J	170	J	170	J	160	J	150	J	140		82	J	140		140		140		150		150		270	J	210	J	170		190	
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																																		
Dissolved Inorganic Carbon	mg/L	34	J	35	J	35	J	34	J	32	J	31	J	41		40		41		41		41		35		38		67	J	48	J	38		47	
$\delta^{18}O$	‰	0.5		0.4	J	0.6	J	0.7		-		1.0		0.3		0.2		0.3	J	0.0	J	0.1		-0.3		-0.3		4.8		-0.7		0.7		2.1	
$\delta^{2}H$	‰	5.0		3.0	J	7.0	J	5.0		-		9.0		0.5		5.8		2.5	J	-4.1	J	4.0		-2.8		-2.3		13.3		13.1		6.8		12.3	
$\delta^{13}C$	‰	-3.48		-3.26		-3.28		-2.53		-1.46		-1.75		-6.35		-6.67		-5.49		-5.57		-6.09		-6.06		-6.70		-8.35		-6.31		-2.24		-4.79	
Gross Alpha	pCi/L																																		
Salinity (PSS-78)		21.640		22.060				23.960		29.880		30.080		0.245		0.247		0.272				0.272		0.298		0.301		20.010		26.660		31.940		37.420	
$^{87}Sr/^{86}Sr$	µg/L*																																		
Tritium	pCi/L (1σ)	4.9 (7.4)	UJ	0 (7.3)	UJ	-1.3 (7.3)	UJ	-1.5 (6.5)	UJ	6.9 (7.1)	UJ	7.5 (6.9)		46.3 (8.3)		50.8 (8.4)		56.6 (6.7)		59.1 (6.9)		60.9 (7)		40.1 (6.2)		45.9 (6.3)		780 (50)		297 (20)		40.9 (5.6)		470 (30)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPBBSW-DUP1 (12/15/2011) is a duplicate of TPBBSW-2B.

[2] Sample TPSWC-DUP (12/6/2011) is a duplicate of TPSWC-2T.

[3] Sample TPSWCCS-DUP1 (12/2/2011) is a duplicate of TPSWCCS-5B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-7. Summary of Surface Water Analytical Results from the December 2011 Sampling Event

Parameter	Units	TPSWC-6T 12/2/2011		TPSWC-6B 12/2/2011		TPSWCCS-1B 12/12/2011		TPSWCCS-2B 12/5/2011		TPSWCCS-3B 12/12/2011		TPSWCCS-4T 12/2/2011		TPSWCCS-4B 12/2/2011		TPSWCCS-5T 12/2/2011		TPSWCCS-5B 12/2/2011		TPSWCCS-DUP1 [3] 12/2/2011		TPSWCCS-6T 12/2/2011		TPSWCCS-6B 12/2/2011		TPSWCCS-7B 12/12/2011		TPSWID-1T 12/12/2011		TPSWID-1B 12/12/2011	
Temperature	°C	22.78		22.72		32.77		26.37		28.32		22.27		22.39		22.09		21.95				22.38		22.30		31.06		26.36		26.66	
pH	SU	7.45		7.39		8.60		8.76		8.51		8.85		8.89		8.77		8.83				8.83		8.84		8.60		7.19		7.03	
Dissolved Oxygen	mg/L	1.42		1.29		5.39		6.14		5.32		7.56		7.28		5.91		8.08				5.67		6.24		6.37		0.36		0.17	
Specific Conductance	µS/cm	899	J	940	J	84315		84424		79113		83863		83921		83400		83739				83679		83593		80075		8607		12771	
Turbidity	NTU	0.57		1.19		16.77		14.60		17.27		13.10		13.33		13.57		13.29				13.68		13.75		16.80		14.01		15.83	
Arsenic	mg/L																														
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.10	I	0.12	I
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	0.27	U	0.27	U	0.86	I	1.10	I	0.82	I	1.50	I J	1.30	I J	1.50	I J	1.50	I J	1.50	I J	1.50	I J	1.40	I J	0.78	I	0.27	U	0.27	U
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica	mg/L																														
Calcium	mg/L	98		100		810		780		730	J	770		780		780		780		790		780		780		770		180		210	
Magnesium	mg/L	9.8		10		2300		2300		2100	J	2200		2200		2200		2200		2200		2200		2200		2100		160		250	
Potassium	mg/L	8.1		8.3		760		740		680	J	690		720		720		710		720		710		720		680		55		84	
Sodium	mg/L	67		75		18000		17000		17000	J	17000		18000		18000		17000		18000		17000		18000		16000		1300		2000	
Boron	mg/L	0.072	J	0.074	J	7.8		7.5		7		7.2		7.5		7.4		7.4		7.5		7.4		7.4		7.2		0.63	J	0.93	
Strontium	mg/L	0.97		0.98		15		14		14		14		14		14		14		14		14		14		14		2.2		2.7	
Chromium VI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	0.54		0.58		120		120	J	110	J	120		120		120		120		120		160		120		110	J	9.3		13	J
Chloride	mg/L	120		120		36000		33000	J	34000	J	34000		34000		34000		34000		34000		34000		34000		34000	J	2700		640	J
Fluoride	mg/L	0.4	U	0.099		0.4	U	1.3	J	2	J	0.82	I	0.94	I	1		1.1		1		1.1		1		1.3	J	0.4	U	0.4	UJ
Sulfate	mg/L	46		50		5000		4500	J	4700	J	4700		4700		4800		4800		4700		4700		4700		4700	J	320		490	J
Total Ammonia	mg/L as N																														
Ammonium Ion (NH^{4+})	mg/L																														
Unionized NH_3	mg/L																														
Nitrate/Nitrite as N	mg/L																														
TKN	mg/L																														
TN	mg/L																														
Orthophosphate	mg/L																														
Phosphorus (P)	mg/L																														
Alkalinity	mg/L ($CaCO_3$)	250		250		160		160	J	170	J	160		160		150		160		160		160		160		170	J	380		400	J
Bicarbonate Alkalinity as $CaCO_3$	mg/L	250		250		140		99	J	160	J	86		83		120		95		97		93		92		130	J	380		400	J
Sulfides	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1.6		3.2	
Total Dissolved Solids	mg/L																														
Dissolved Inorganic Carbon	mg/L	57		57		39		35		38		28		30		26		27		25		27		27		38		99		100	
$\delta^{18}O$	‰	-1.4		-0.8		4.6		4.6		4.5		-1.2		1.8		-1.4		-1.3		-0.8		1.6		2.0		4.4		0.6		0.5	
$\delta^{2}H$	‰	-13.0		-11.0		24.0		26.0		24.0		23.0		30.0		28.0		24.0		27.0		23.0		21.0		24.0		0.0		4.0	
$\delta^{13}C$	‰	-9.93		-9.85		-0.40		-0.07		-2.45		1.34		0.97		0.60		0.44	J	0.33	J	0.63		0.66		-1.72		-9.81		-9.82	
Gross Alpha	pCi/L																														
Salinity (PSS-78)		0.443		0.464		59.100		59.470		55.070		59.090		59.130		58.710		58.990				58.940		58.870		55.730		4.781		7.309	
$^{87}Sr/^{86}Sr$	µg/L*																														
Tritium	pCi/L (1σ)	16.4 (4.4)		37.9 (5.5)		7100 (400)		7300 (400)		6700 (400)		6200 (400)		6100 (400)		6900 (400)		6900 (400)		7300 (400)		6000 (400)		5800 (300)		6900 (400)		205 (14)		320 (21)	

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample TPBBSW-DUP1 (12/15/2011) is a duplicate of TPBBSW-2B.
[2] Sample TPSWC-DUP (12/6/2011) is a duplicate of TPSWC-2T.
[3] Sample TPSWCCS-DUP1 (12/2/2011) is a duplicate of TPSWCCS-5B.
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-7. Summary of Surface Water Analytical Results from the December 2011 Sampling Event

		TPSWID-2T		TPSWID-2B		TPSWID-3T		TPSWID-3B		TPSWCCS-FB1		TPSWCCS-EB1		TPSWC-FB1		TPSWC-FB1		TPSWC-FB1	
Parameter	**Units**	**12/12/2011**		**12/12/2011**		**12/12/2011**		**12/12/2011**		**12/2/2011**		**12/12/2011**		**12/13/2011**		**12/14/2011**		**12/15/2011**	
Temperature	°C	26.18		26.69		24.66		24.42											
pH	SU	7.40		6.94	J	7.77		7.63											
Dissolved Oxygen	mg/L	2.59		0.19		7.43		6.01											
Specific Conductance	µS/cm	3605		11329		3154		3200											
Turbidity	NTU	1.35		2.70		0.62		0.58											
Arsenic	mg/L																		
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U
Beryllium	mg/L																		
Cadmium	mg/L																		
Copper	mg/L																		
Iron	mg/L	0.27	U	0.27	U	0.27	U	0.27	U	0.0029	I	0.0027	U	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L																		
Manganese	mg/L																		
Molybdenum	mg/L																		
Nickel	mg/L																		
Selenium	mg/L																		
Thallium	mg/L																		
Vanadium	mg/L																		
Zinc	mg/L																		
Silica	mg/L																		
Calcium	mg/L	140		250		120		120		0.13	I	0.12	I	0.51		0.55		0.44	I
Magnesium	mg/L	52		200		45		46		0.039	I	0.043	I	0.16		0.18		0.14	
Potassium	mg/L	20		68		17		18		0.4	I	0.19	U	3.5		4.1		3.2	
Sodium	mg/L	450		1800		410		420		0.31	U	0.31	U	52		64		50	
Boron	mg/L	0.19	J	0.68	J	0.16	J	0.16	J	0.075		0.076		0.062		0.057		0.061	
Strontium	mg/L	1.6		3.3		1.3		1.4		0.001	U	0.001	U	0.0025	I	0.0029	I	0.0023	I
Chromium VI	mg/L																		
Mercury	mg/L																		
Bromide	mg/L	3.9		13	J	3.5		3.2		0.027	U	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	960		870	J	860	J-	840		0.2	U	0.2	U	30		35		28	
Fluoride	mg/L	0.4	U	0.4	UJ	0.4	U	0.4	U	0.021	I	0.02	U	0.18		0.2		0.16	
Sulfate	mg/L	110		420	J	84		82		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Ammonia	mg/L as N																		
Ammonium Ion (NH^{4+})	mg/L																		
Unionized NH_3	mg/L																		
Nitrate/Nitrite as N	mg/L																		
TKN	mg/L																		
TN	mg/L																		
Orthophosphate	mg/L																		
Phosphorus (P)	mg/L																		
Alkalinity	mg/L ($CaCO_3$)	290		360	J	240		250		1.4		1	U	110		130		98	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	290		360	J	240		250		1.4		1	U	110		130		98	
Sulfides	mg/L	1	U	3		1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																		
Dissolved Inorganic Carbon	mg/L	71		84		60		62		10	U	10	U	28		27		21	
$\delta^{18}O$	‰	-0.1		0.5		0.3		-0.1		-1.4		-1.3		-0.3		-1.3		-1.1	
$\delta^{2}H$	‰	1.0		2.0		4.0		6.0		-2.0		-7.0		1.6		-7.0		-7.0	
$\delta^{13}C$	‰	-9.11		-9.57		-7.71		-8.37		-8.22		-6.43		-4.24		-3.82		-3.77	
Gross Alpha	pCi/L																		
Salinity (PSS-78)		1.890		6.422		1.644		1.670											
$^{87}Sr/^{86}Sr$	µg/L*																		
Tritium	pCi/L (1σ)	103 (8)		199 (14)		116 (9)		105 (9)		-3.2 (7)	UJ	-0.4 (5.8)	UJ	0.5 (5.1)	UJ	2.8 (7.8)	UJ	3.5 (8.3)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPBBSW-DUP1 (12/15/2011) is a duplicate of TPBBSW-2B.

[2] Sample TPSWC-DUP (12/6/2011) is a duplicate of TPSWC-2T.

[3] Sample TPSWCCS-DUP1 (12/2/2011) is a duplicate of TPSWCCS-5B.

Text in blue are revised values.

Key:

? = Questionable data.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 3.2-8. Summary of Surface Water Analytical Results from the March 2012 Sampling Event

		TPBBSW-1B		TPBBSW-2B		TPSWCSC-Dup1 [1]		TPBBSW-3B		TPBBSW-4B		TPBBSW-5B		TPSWCCS-1B		TPSWCCS-Dup1 [2]		TPSWCCS-2B		TPSWCCS-3B		TPSWCCS-4T		TPSWCCS-4B		TPSWCCS-5T		TPSWCCS-5B	
Parameter	**Units**	**3/14/2012**		**3/14/2012**		**3/14/2012**		**3/13/2012**		**3/14/2012**		**3/14/2012**		**3/12/2012**		**3/12/2012**		**3/9/2012**		**3/12/2012**		**3/2/2012**		**3/2/2012**		**3/2/2012**		**3/2/2012**	
Temperature	°C	24.77		25.33				23.73		24.51		24.79		29.99				24.93		26.77		28.27		27.60		27.39		27.48	
pH	SU	8.50		8.56				8.47		8.45		8.37		8.61				8.54		8.59		8.71		8.75		8.68		8.67	
Dissolved Oxygen	mg/L	7.79		7.70				6.78		6.64		6.81		3.18				4.55		7.04		6.31		6.26		4.27		5.06	
Specific Conductance	µS/cm	48834.00		54595.00				54398.00		54757.00		52933.00		88599.00				88382.00		85129.00		89970.00		89768.00		89289.00		89158.00	
Turbidity	NTU	2.16		0.88				0.55		1.07		0.97		23.11				33.99		26.81		19.43		20.57		19.57		19.60	
Arsenic	mg/L																												
Barium	mg/L	0.08	U	0.08	U	0.08	U	0.08	U	0.10	I V	0.10	I V	0.11	I	0.11	I	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
Beryllium	mg/L																												
Cadmium	mg/L																												
Copper	mg/L																												
Iron	mg/L	0.54	I	0.54	I	0.63	I	0.80	I	0.54	I	0.50	I	1.20	I	1.10	I	1.30	I	1.10	I	1.10	I	1.10	I	1.00	I	1.10	I
Lead	mg/L																												
Manganese	mg/L																												
Molybdenum	mg/L																												
Nickel	mg/L																												
Selenium	mg/L																												
Thallium	mg/L																												
Vanadium	mg/L																												
Zinc	mg/L																												
Silica	mg/L													8.30		8.30		8.10		8.20		8.30		8.40		8.30		8.50	
Calcium	mg/L	520.00	J3	510.00		490.00		490.00		500.00		480.00		880.00		890.00		890.00		890.00	J3	860.00		870.00		840.00		850.00	
Magnesium	mg/L	1300.00	V J3	1400.00	V	1400.00	V	1400.00		1400.00	V	1300.00	V	2500.00		2500.00		2500.00	V	2500.00	J3	2400.00		2400.00		2300.00		2400.00	
Potassium	mg/L	480.00	J3	490.00		480.00		490.00		490.00		460.00		880.00		890.00		870.00		890.00	J3	810.00		820.00		790.00		810.00	
Sodium	mg/L	9700.00	J3	11000.00	V	11000.00	V	10000.00		11000.00	V	10000.00	V	18000.00		19000.00		19000.00		18000.00	J3	18000.00		19000.00		18000.00		18000.00	
Boron	mg/L	4.70		4.80		4.70		4.80		4.80		4.60		8.10		8.20		8.30		8.00	J3	8.30		8.40		8.00		8.10	
Strontium	mg/L	8.00		8.10		7.90		8.00		8.00		7.60		15.00		15.00		16.00		15.00	J3	15.00		15.00		15.00		15.00	
Chromium VI	mg/L																												
Mercury	mg/L																												
Bromide	mg/L	68.00		72.00		74.00		70.00		73.00		71.00		93.00	I	90.00	I	130.00		86.00	I	130.00		130.00		130.00		130.00	
Chloride	mg/L	17000.00	J3	20000.00		21000.00		21000.00		20000.00		20000.00		38000.00		37000.00		36000.00		46000.00		39000.00		37000.00		36000.00		36000.00	
Fluoride	mg/L	0.81	I J3	0.71	I	0.67	I	0.99	I	0.75	I	0.72	I	8.00	U	8.00	U	0.40	U	8.00	U	1.50		2.20		3.80		1.90	
Sulfate	mg/L	2700.00	J3	3000.00		3000.00		2900.00		3000.00		2900.00		5200.00		5200.00		5000.00		5000.00		5700.00		5200.00		5400.00		5400.00	
Total Ammonia	mg/L as N	0.06	J3	0.14		0.14		0.06		0.16		0.12		0.21		0.10		0.15		0.09		0.11		0.18		0.15		0.16	
Ammonium Ion (NH^{4+})	mg/L	0.06		0.15				0.06		0.18		0.12		0.20				0.16		0.10		0.10		0.17		0.15		0.16	
Unionized NH_3	mg/L																												
Nitrate/Nitrite as N	mg/L	0.01	I J3	0.01		0.01		0.00	U	0.01		0.02		0.03		0.03		0.03		0.03		0.02	U	0.03		0.01	U	0.02	U
TKN	mg/L	0.35		0.36		0.25		0.31		0.27	J3	0.31		4.10		4.20		4.80		5.10		3.40		2.80		5.30		4.10	
TN	mg/L	0.36	I	0.37	I	0.26	I	0.31	I	0.28	I	0.33	I	4.10		4.20		4.80		5.10									
Orthophosphate	mg/L	0.00	U J3	0.00	U	0.00	U	0.00	I V	0.00	U	0.00	U	0.04	U Q	0.04	U Q	0.01	I J3	0.04	U Q	0.01	I	0.00	U	0.00	I	0.01	I
Phosphorus (P)	mg/L	0.02		0.02		0.02		0.02		0.02		0.02		0.06		0.07		0.06		0.05		0.06		0.06		0.06		0.06	
Alkalinity	mg/L ($CaCO_3$)	150.00		130.00		130.00		130.00		130.00		140.00		160.00		160.00		170.00		170.00		170.00		170.00		170.00		170.00	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	140.00		120.00		120.00		130.00		130.00		140.00		160.00		160.00		160.00		150.00		140.00		110.00		150.00		130.00	
Sulfides	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	2.40		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L																												
Dissolved Inorganic Carbon	mg/L	37.00		28.00		31.00		30.00		29.00		34.00		2.90		10.00		16.00		25.00	Q	22.00		27.00		29.00		29.00	
$\delta^{18}O$	‰																												
$\delta^{2}H$	‰																												
$\delta^{13}C$	‰																												
Gross Alpha	pCi/L																												
Salinity (PSS-78)																													
$^{87}Sr/^{86}Sr$	µg/L*																												
Tritium	pCi/L (1σ)																												

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (3/14/2012) is a duplicate of TPBBSW-2B.

[2] Sample TPSWCCS-Dup1 (3/12/2012) is a duplicate of TPSWCCS-1B.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-8. Summary of Surface Water Analytical Results from the March 2012 Sampling Event

		TPSWCCS-6T		TPSWCCS-6B		TPSWCCS-7B		TPSWC-1T		TPSWC-1B		TPSWC-2T		TPSWC-2B		TPSWC-3T		TPSWC-3B		TPSWC-4T		TPSWC-4B		TPSWC-5T		TPSWC-5B		TPSWC-6T		TPSWC-6B	
Parameter	**Units**	**3/2/2012**		**3/2/2012**		**3/12/2012**		**3/6/2012**		**3/6/2012**		**3/6/2012**		**3/6/2012**		**3/8/2012**		**3/8/2012**		**3/8/2012**		**3/8/2012**		**3/8/2012**		**3/8/2012**		**3/2/2012**		**3/2/2012**	
Temperature	°C	27.01		27.00		27.17		22.69		22.74		23.10		22.90		23.45		24.07		25.14		24.97		25.30		25.13		24.94		24.80	
pH	SU	8.61		8.63		8.64		7.94		7.91		8.13		8.05		7.97		7.95		7.78		7.80		8.18		7.76		7.22		7.28	
Dissolved Oxygen	mg/L	2.97		2.91		6.14		7.26		6.61		7.79		7.36		7.35		7.63		6.41		6.93		6.61		1.71		1.85		1.91	
Specific Conductance	µS/cm	88529.00		88892.00		88696.00		926.00		926.00		896.00		894.00		967.00		995.00		41711.00		45172.00		52061.00		54763.00		953.00		998.00	
Turbidity	NTU	19.38		19.93		26.49		9.10		9.40		3.55		3.05		2.78		1.73		2.67		5.01		0.55		2.67		0.66		0.88	
Arsenic	mg/L																														
Barium	mg/L	0.08	U	0.08	U	0.08	I	0.10	I V	0.10	I V	0.18	I V	0.22	I V	0.13	I V	0.16	I V	0.15	I V	0.10	I V	0.08	U	0.08	U	0.08	U	0.08	U
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	1.10	I	1.10	I	1.10	I	0.71	I	0.27	U	0.27	U	0.27	U	0.27	U	0.28	I	0.43	I	2.60	I	0.57	I	0.60	I	0.00	U	0.00	U
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica	mg/L	8.40	J3	8.20		8.20																									
Calcium	mg/L	830.00		840.00		920.00		89.00		88.00		89.00		90.00		90.00		91.00		450.00		460.00		470.00		500.00		89.00		89.00	
Magnesium	mg/L	2300.00		2300.00		2600.00		11.00	V	11.00	V	10.00	V	9.90	V	10.00	V	9.90	V	960.00	V	1000.00	V	1300.00	V	1400.00	V	10.00		11.00	
Potassium	mg/L	790.00		800.00		920.00		4.40		4.20		4.60		4.60		4.80		4.70		320.00		340.00		430.00		470.00		9.90		9.90	
Sodium	mg/L	18000.00		18000.00		19000.00		83.00		81.00		76.00		76.00		87.00		84.00		7800.00		8000.00		10000.00		11000.00		72.00		78.00	
Boron	mg/L	8.00		8.10		8.30		0.04	I	0.04	I	0.04	I	0.04	I	0.05	I	0.05	I	3.10		3.20		4.30		4.60		0.08		0.08	
Strontium	mg/L	15.00		15.00		16.00		0.92		0.91		0.94		0.95		0.85		0.85		7.10		7.30		7.50		8.20		0.97		0.97	
Chromium VI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	130.00		130.00		89.00	I	0.36		0.34		0.27		0.28		0.82	I	0.84	I	54.00		57.00		75.00		76.00		1.20		1.00	
Chloride	mg/L	40000.00		38000.00		42000.00		160.00		150.00		140.00		140.00		160.00		150.00		14000.00		14000.00		18000.00		19000.00		120.00		140.00	
Fluoride	mg/L	1.80		3.70		8.00	U	0.10		0.09		0.09		0.09		0.58	I	1.20		0.45	I	0.44	I	0.67	I	0.63	I	0.70	I	0.77	I
Sulfate	mg/L	7000.00		5600.00		5200.00		72.00		71.00		77.00		76.00		57.00		56.00		2000.00		2000.00		2700.00		2600.00		63.00		64.00	
Total Ammonia	mg/L as N	0.18		0.15		0.17		0.28		0.26		0.25		0.34		0.05	I	0.15		0.03	I	0.47		0.12		0.55		0.16		0.12	
Ammonium Ion (NH^{4+})	mg/L	0.18		0.15		0.17		0.35		0.32		0.30		0.41		0.06		0.18		0.04		0.58		0.14		0.68		0.20		0.15	
Unionized NH_3	mg/L																														
Nitrate/Nitrite as N	mg/L	0.02	U	0.03		0.03		0.04		0.04		0.04	J3	0.04		0.04		0.25		0.06		0.06		0.02		0.02	U	0.03		0.03	
TKN	mg/L	5.40		5.30		3.90		1.20		1.30		1.10		1.30		1.10		0.77		1.10		0.93		0.29		0.77		0.24		0.26	
TN	mg/L					3.90		1.20		1.30		1.10		1.30		1.10		1.00		1.20		0.99		0.31	I	0.79					
Orthophosphate	mg/L	0.01	I	0.00	U	0.04	U Q	0.00	U J3	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	I	0.00	I J3
Phosphorus (P)	mg/L	0.06		0.06		0.06		0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.02		0.02		0.02		0.03		0.00	U	0.00	U
Alkalinity	mg/L ($CaCO_3$)	170.00		170.00		160.00		150.00		150.00		140.00		140.00		140.00		150.00		230.00		230.00		160.00		160.00		190.00		190.00	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	150.00		170.00		160.00		150.00		150.00		140.00		140.00		140.00		150.00		230.00		230.00		160.00		160.00		190.00		190.00	
Sulfides	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.10		1.00	U	1.10		1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L																														
Dissolved Inorganic Carbon	mg/L	30.00		20.00		34.00	Q	35.00		33.00		29.00		35.00		34.00		33.00		46.00		56.00		36.00		44.00		41.00		39.00	
$\delta^{18}O$	‰																														
$\delta^{2}H$	‰																														
$\delta^{13}C$	‰																														
Gross Alpha	pCi/L																														
Salinity (PSS-78)																															
$^{87}Sr/^{86}Sr$	µg/L*																														
Tritium	pCi/L (1σ)																														

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (3/14/2012) is a duplicate of TPBBSW-2B.

[2] Sample TPSWCCS-Dup1 (3/12/2012) is a duplicate of TPSWCCS-1B.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-8. Summary of Surface Water Analytical Results from the March 2012 Sampling Event

		TPSWID-1T		TPSWID-1B		TPSWID-2T		TPSWID-2B		TPSWID-3T		TPSWID-3B		TPSWCCS-EB1		TPSWCCS-FB1		TPBBSW-FB1		TPSWC-FB1		TPSWC-FB1	
Parameter	**Units**	**3/12/2012**		**3/12/2012**		**3/12/2012**		**3/12/2012**		**3/12/2012**		**3/12/2012**		**3/9/2012**		**3/12/2012**		**3/14/2012**		**3/2/2012**		**3/6/2012**	
Temperature	°C	24.60		24.60		25.26		25.27		26.00		25.40											
pH	SU	7.74		7.73		8.02		7.78		7.74		7.83											
Dissolved Oxygen	mg/L	5.61		6.55		6.55		5.81		6.23		6.62											
Specific Conductance	µS/cm	8084.00		8065.00		6288.00		6292.00		4800.00		5449.00											
Turbidity	NTU	1.10		1.18		0.73		0.85		0.51		0.71											
Arsenic	mg/L																						
Barium	mg/L	0.08	U	0.20	I	0.11	I	0.11	I	0.08	U	0.10	I	0.00	U	0.08	U	0.00	I V	0.00	U	0.00	U
Beryllium	mg/L																						
Cadmium	mg/L																						
Copper	mg/L																						
Iron	mg/L	0.27	U	0.27	U	0.40	I	0.27	U	0.27	U	0.27	U	0.00	I V	0.27	I V	0.00	I	0.00	U	0.00	U
Lead	mg/L																						
Manganese	mg/L																						
Molybdenum	mg/L																						
Nickel	mg/L																						
Selenium	mg/L																						
Thallium	mg/L																						
Vanadium	mg/L																						
Zinc	mg/L																						
Silica	mg/L													4.70		4.80							
Calcium	mg/L	170.00		180.00		170.00		170.00		150.00		150.00		1.30		1.30		1.30		0.59		0.70	
Magnesium	mg/L	160.00		160.00		110.00		120.00		79.00		93.00		0.47	V	0.45		0.43	V	0.22		0.21	V
Potassium	mg/L	60.00		62.00		43.00		44.00		31.00		36.00		20.00		20.00		18.00		4.30		4.30	
Sodium	mg/L	1200.00		1300.00		960.00		970.00		710.00		820.00		110.00		110.00		100.00		86.00		86.00	
Boron	mg/L	0.54		0.55		0.36		0.37		0.26		0.30		0.05	I	0.05	I	0.05	I	0.05		0.05	
Strontium	mg/L	2.00		2.10		1.90		1.90		1.60		1.60		0.01		0.01		0.01		0.00	I	0.00	I
Chromium VI	mg/L																						
Mercury	mg/L																						
Bromide	mg/L	5.50	I	6.60		4.50	I	4.50	I	3.20	I	3.80	I	0.03	U	1.00	U	0.03	U	0.03	U	0.03	U
Chloride	mg/L	3000.00	J3	2300.00		1900.00		1900.00		1400.00		1600.00		110.00		120.00		96.00		35.00		34.00	
Fluoride	mg/L	0.80	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.27		0.20	U	0.27		0.44		0.39	
Sulfate	mg/L	300.00		310.00		220.00		220.00		150.00		180.00		0.54		2.60	U	0.20	U	0.27	I	0.20	U
Total Ammonia	mg/L as N	0.28		0.23		0.30		0.31		0.18		1.50		4.20		6.50		6.50		3.00	V	3.30	J3
Ammonium Ion (NH^{4+})	mg/L	0.35		0.29		0.36		0.39		0.22		1.90											
Unionized NH_3	mg/L																						
Nitrate/Nitrite as N	mg/L	0.21	J3	0.14		0.11		0.11		0.08		0.11		0.00	U	0.02		0.00	U	0.02		0.00	U
TKN	mg/L	0.97		0.95		0.80		0.71		0.73		0.67		6.10		5.90		6.50		4.40		4.70	
TN	mg/L	1.20		1.10		0.91		0.82		0.81		0.78		6.10		5.90		6.50				4.70	
Orthophosphate	mg/L	0.00	U Q J3	0.00	U Q	0.00	U Q	0.00	U Q	0.00	U Q	0.00	U Q	0.00	I	0.01	Q V	0.00	U	0.00	I	0.00	I
Phosphorus (P)	mg/L	0.01	I	0.00	U	0.00	U	0.00	U	0.00	I	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alkalinity	mg/L ($CaCO_3$)	240.00		280.00		250.00		250.00		240.00		240.00		130.00		140.00		150.00		170.00		170.00	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	240.00		280.00		250.00		250.00		240.00		240.00		130.00		140.00		150.00		170.00		170.00	
Sulfides	mg/L	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Total Dissolved Solids	mg/L																						
Dissolved Inorganic Carbon	mg/L	62.00		63.00		58.00	Q	58.00	Q	56.00	Q			28.00		30.00		38.00		41.00		39.00	
$\delta^{18}O$	‰																						
$\delta^{2}H$	‰																						
$\delta^{13}C$	‰																						
Gross Alpha	pCi/L																						
Salinity (PSS-78)																							
$^{87}Sr/^{86}Sr$	µg/L*																						
Tritium	pCi/L (1σ)																						

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample TPSWC-Dup1 (3/14/2012) is a duplicate of TPBBSW-2B.

[2] Sample TPSWCCS-Dup1 (3/12/2012) is a duplicate of TPSWCCS-1B.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-9. Summary of Surface Water Analytical Results from the June 2012 Sampling Event

Parameter	Units	TPBBSW-1B 6/6/2012		TPBBSW-2B 6/6/2012		TPBBSW-3B 6/6/2012		TPBBSW-4B 6/6/2012		TPBBSW-5B 6/6/2012		TPSWC-1T 6/11/2012		TPSWC-1B 6/11/2012		DUP1 [1] 6/11/2012		TPSWC-2T 6/11/2012		TPSWC-2B 6/11/2012		TPSWC-3T 6/11/2012		TPSWC-3B 6/11/2012		TPSWC-4T 6/8/2012		TPSWC-4B 6/8/2012	
Temperature	°C	29.56		29.73		29.69		29.87		29.48		30.08		29.83				32.52		30.90		31.19		30.37		30.60		30.35	
pH	SU	8.27		8.66		8.56		8.34		8.34		7.69		7.20				7.01		7.40		7.50		7.11		7.51		7.40	
Dissolved Oxygen	mg/L	2.91		6.77		6.43		7.22		5.78		4.85		0.23				7.07		4.04		5.59		1.75		2.88		1.70	
Spec Cond	µS/cm	47074		45561		44994		44765		39332		679		755				686		691		607		626		5352		8007	
Turbidity	NTU	17.73		0.52		1.00		0.67		0.71		0.51		3.73				0.61		0.92		0.81		0.80		2.14		2.99	
Arsenic	mg/L																												
Barium	mg/L	0.011	I	0.0097	I	0.0084	I	0.0084	I	0.011	I	0.0029	I	0.19		0.18		.0035	I	0.012	I	0.005		0.016		0.013		0.019	
Beryllium	mg/L																												
Cadmium	mg/L																												
Copper	mg/L																												
Iron	mg/L	0.027	U	0.027	U	0.04	I	0.028	I	0.03	I	0.021	I	0.023	I	0.027	I	0.02	I	0.057	I V	0.024	I	0.029	I	0.023	I	0.034	I
Lead	mg/L																												
Manganese	mg/L																												
Molybdenum	mg/L																												
Nickel	mg/L																												
Selenium	mg/L																												
Thallium	mg/L																												
Vanadium	mg/L																												
Zinc	mg/L																												
Silica, dissolved	mg/L																												
Calcium	mg/L	400		380		390		370		330		56		62		62		52		55		53		55		93		130	
Magnesium	mg/L	1100		1100		1100		1000		910		8.2		8.6		8.5		6.9		7.1		5.8		5.9		93		170	
Potassium	mg/L	360		340		350		330		290		2.8		2.8		2.8		3.1		3.3		3.4		3.4		30		54	
Sodium	mg/L	9300		9100		9100		8600		7500		61		68		68		62		61		52		53		760		1400	
Boron	mg/L	3.9		3.8		3.8		3.5		3.1		0.048	I	0.045	I	0.044	I	0.037	I	0.043	I	0.037	I	0.038	I	0.31		0.56	
Strontium	mg/L	6.6		6.3		6.4		6		5.4		0.56		0.65		0.64		0.6		0.63		0.55		0.55		1.2		1.8	
ChromiumVI	mg/L																												
Mercury	mg/L																												
Bromide	mg/L	60		59		57		58		49		0.19		0.28		0.27		0.23		0.23		0.21		0.23		5.2		8.9	
Chloride	mg/L	17000		17000		16000		17000		14000		120		140		130		130		120		100		100		1400		2500	
Fluoride	mg/L	1.1		1.1		1.2		1.2		1.1		0.091		0.09		0.1		0.11		0.094		0.11		0.11		0.2	U	0.2	U
Sulfate	mg/L	2400		2300		2300		2300		2000		11		11		11		4.8		6		4.7		4.9		200		340	
Ammonia	mg/L as N																												
Ammonium Ion (NH^{4+})	mg/L																												
Unionized NH3	mg/L																												
Nitrate/Nitrite as N	mg/L																												
TKN	mg/L																												
TN	mg/L																												
Orthophosphate	mg/L																												
Phosphorus (P)	mg/L																												
Alkalinity	mg/L ($CaCO_3$)	130		110		120		120		130		120		130		130		110		120		120		130		140		150	
Bicarbonate Alkalinity as CaCO3	mg/L	130		84		100		120		130		120		130		130		110		120		120		130		140		150	
Sulfide	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	14		1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																												
Dissolved Inorganic Carbon	mg/L	32		30		33		32		36		40		41		40		36		37		37		38		43		48	
$d^{18}O$	‰																												
$d^{2}H$	‰																												
$d^{13}C$	‰																												
Gross Alpha	pCi/L																												
Salinity		30.5		29.4		29.0		28.8		24.9		0.3		0.4				0.3	J	0.3		0.3		0.3		2.9		4.4	
$^{87}Sr/^{86}Sr$	µg/L*																												
Tritium	pCi/L (1σ)																												

Notes:
* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).
[1] Sample DUP1 (6/11/12) is a duplicate of TPSWC-1B.
[2] Sample TPGW-Dup1 (6/8/2012) is a duplicate of TPSWC-5T.
Text in blue are revised values.

Key:
? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
MCL = Maximum Contaminant Levels.
N.A. = Not applicable.
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-9. Summary of Surface Water Analytical Results from the June 2012 Sampling Event

Parameter	Units	TPSWC-5T 6/8/2012		DUP1 [2] 6/8/2012		TPSWC-5B 6/8/2012		TPSWC-6T 6/14/2012		TPSWC-6B 6/14/2012		TPSWID-1T 6/15/2012		TPSWID-1B 6/15/2012		TPSWID-2T 6/15/2012		TPSWID-2B 6/15/2012		TPSWID-3T 6/15/2012		TPSWID-3B 6/15/2012		TPSWCCS-1B 6/15/2012		TPSWCCS-2B 6/7/2012		TPSWCCS-3B 6/15/2012		TPSWCCS-4T 6/8/2012		TPSWCCS-4B 6/8/2012	
Temperature	°C	28.65				28.90		27.63		27.38		31.84		30.42		30.21		28.71		29.77		29.42		37.77		34.14		31.06		30.63		30.80	
pH	SU	8.27				7.59		6.99		7.09		7.87		7.47		7.80		6.95		7.84		7.47		9.13		9.47		9.13		9.34		9.35	
Dissolved Oxygen	mg/L	6.27				0.42		1.39		1.41		5.47		4.36		5.57		0.28		5.21		2.60		3.17		8.72		3.73		5.53		5.69	
Spec Cond	µS/cm	38337				59492		858		873		2986		3328		2626		5657		2375		2490		73714		71681		72347		72203		72203	
Turbidity	NTU	0.51				20.46		1.03		0.56		1.91		1.08		0.98		4.50		0.49		0.61		49.41		63.00		47.87		42.78		45.09	
Arsenic	mg/L																																
Barium	mg/L	0.0098	I	0.0091	I	0.031	I	0.013		0.012		0.007		0.014		0.009		0.027		0.0098		0.01		0.062		0.062		0.062		0.058		0.057	J3
Beryllium	mg/L																																
Cadmium	mg/L																																
Copper	mg/L																																
Iron	mg/L	0.027	U	0.027	U	0.071	I	0.055	V	0.057	V	0.048	V	0.04	I V	0.023	I V	0.013	I V	0.021	I V	0.019	I V	0.08	I V	0.15	I	0.09	I V	0.13	I	0.047	I
Lead	mg/L																																
Manganese	mg/L																																
Molybdenum	mg/L																																
Nickel	mg/L																																
Selenium	mg/L																																
Thallium	mg/L																																
Vanadium	mg/L																																
Zinc	mg/L																																
Silica, dissolved	mg/L																																
Calcium	mg/L	340		340		560		90		88	J3	82		88		89		170		89		90		700		660		690		680		680	J3
Magnesium	mg/L	870		860		1500		9.3		9.4		49		56		41		84		35		36		1900		1800		1900		1900		1800	J3
Potassium	mg/L	280		280		470		8.9		8.6		17		20		15		32		12		13		620		580		610		580		570	
Sodium	mg/L	7900		7900		13000		59		61	J3	400		450		340		800		310	J3	330		15000		15000		15000		15000		16000	J3
Boron	mg/L	3.1		3.1		5		0.073		0.071		0.22		0.24		0.16		0.27		0.13		0.14		6.7		6.3		6.5		6.4		6.4	
Strontium	mg/L	5.4		5.3		9.2		0.98		0.95		0.93		1		1		2		0.98		1		13		12		13		12		12	
ChromiumVI	mg/L																																
Mercury	mg/L																																
Bromide	mg/L	49		49		72		0.53		0.56		2.3		2.5		1.9		5.4		2.7	U J3	2.1		100		100		100		94		88	J3
Chloride	mg/L	14000		13000		21000		100		110		680		810		580		1500		780	J3	550		29000		28000		29000		27000		27000	J3
Fluoride	mg/L	1		0.94		1		0.13		0.14		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.73		0.2	U	0.81		0.79	J3
Sulfate	mg/L	1900		1900		2900		47		44		96		110		83		140		97	J3	78		4000		4000		4100		3800		3600	J3
Ammonia	mg/L as N																																
Ammonium Ion (NH^{4+})	mg/L																																
Unionized NH3	mg/L																																
Nitrate/Nitrite as N	mg/L																																
TKN	mg/L																																
TN	mg/L																																
Orthophosphate	mg/L																																
Phosphorus (P)	mg/L																																
Alkalinity	mg/L ($CaCO_3$)	130		130		200		210		210		180		200		170		300		160		170		100		110		110		110		100	
Bicarbonate Alkalinity as CaCO3	mg/L	130		130		200		210		210		180		200		170		300		160		170		44		30		46		15		19	
Sulfide	mg/L	1	U	1	U	1	U	1	U	1	U													1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																																
Dissolved Inorganic Carbon	mg/L	39		38		56		61		62		53		56		60		92		56		56		49		13		68		53		78	
$d^{18}O$	‰																																
$d^{2}H$	‰																																
$d^{13}C$	‰																																
Gross Alpha	pCi/L																																
Salinity		24.3				39.7		0.4		0.4		1.5		0.2		1.3		3.0		1.2		1.3		53.0	J	48.9		49.6		49.5		49.4	
$^{87}Sr/^{86}Sr$	µg/L*																																
Tritium	pCi/L (1σ)																																

Notes:

* Strontium samples are reported as a ratio and hence unitless while blanks are reported in parts per billion (µg/L).

[1] Sample DUP1 (6/11/12) is a duplicate of TPSWC-1B.

[2] Sample TPGW-Dup1 (6/8/2012) is a duplicate of TPSWC-5

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
MCL = Maximum Contaminant Levels.
N.A. = Not applicable.
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-9. Summary of Surface Water Analytical Results from the June 2012 Sampling Event

Parameter	Units	TPSWCCS-5T 6/8/2012		TPSWCCS-5B 6/8/2012		TPSWCCS-6T 6/7/2012		TPSWCCS-6B 6/7/2012		TPSWCCS-7B 6/15/2012		FB1 6/6/2012		FB1 6/8/2012		FB1 6/11/2012		TPSWCCS-FB1 6/15/2012	
Temperature	°C	30.92		30.87		30.71		30.73		34.82									
pH	SU	9.38		9.39		9.13		9.13		9.19									
Dissolved Oxygen	mg/L	5.45		5.55		3.21		3.12		5.26									
Spec Cond	µS/cm	72342		72326		71974		72173		74151									
Turbidity	NTU	41.76		43.56		40.40		42.34		45.76									
Arsenic	mg/L																		
Barium	mg/L	0.061		0.061		0.06		0.061		0.062	J3	0.00039	I	0.00035	U	0.00035	U	0.00035	U
Beryllium	mg/L																		
Cadmium	mg/L																		
Copper	mg/L																		
Iron	mg/L	0.071	I	0.091	I	0.07	I	0.1	I	0.081	I V	0.0048	I	0.0027	U	0.0027	U	0.0033	I V
Lead	mg/L																		
Manganese	mg/L																		
Molybdenum	mg/L																		
Nickel	mg/L																		
Selenium	mg/L																		
Thallium	mg/L																		
Vanadium	mg/L																		
Zinc	mg/L																		
Silica, dissolved	mg/L																		
Calcium	mg/L	700		680		640		670		710	J3	0.1	U	0.1	U	0.1	U	0.1	U
Magnesium	mg/L	2000		1900		1800		1900		2000	J3	0.02	U	0.02	U	0.02	U	0.02	U
Potassium	mg/L	610		590		570		600		630		0.19	U	0.19	U	0.19	U	0.19	U
Sodium	mg/L	16000		15000		15000		15000		16000	J3	0.31	U	0.31	U	0.31	U	0.31	U
Boron	mg/L	6.6		6.4		6.1		6.4		6.8		0.01	U	0.001	U	0.01	U	0.01	U
Strontium	mg/L	13		12		12		12		13		0.001	U	0.001	U	0.001	U	0.001	U
ChromiumVI	mg/L																		
Mercury	mg/L																		
Bromide	mg/L	91		91		94		91		100	J3	0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	26000		27000		27000		28000		29000	J3	0.75		0.35	I	0.35	I	0.2	U
Fluoride	mg/L	0.74		0.91		0.2	U	0.2	U	0.2	U J3	0.02	U	0.02	U	0.02	U	0.02	U
Sulfate	mg/L	3800		3700		3900		3800		4100	J3	0.2	U	0.2	U	0.2	U	0.2	U
Ammonia	mg/L as N																		
Ammonium Ion (NH^{4+})	mg/L																		
Unionized NH3	mg/L																		
Nitrate/Nitrite as N	mg/L																		
TKN	mg/L																		
TN	mg/L																		
Orthophosphate	mg/L																		
Phosphorus (P)	mg/L																		
Alkalinity	mg/L ($CaCO_3$)	100		100		100		100		100		1	U	1	U	1	U	1	U
Bicarbonate Alkalinity as CaCO3	mg/L	32		34		47		35		38		1	U	1	U	1	U	1	U
Sulfide	mg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																		
Dissolved Inorganic Carbon	mg/L	34		44		7.3		22		61		1	U	1	U	1	U	1	U
$d^{18}O$	‰																		
$d^{2}H$	‰																		
$d^{13}C$	‰																		
Gross Alpha	pCi/L																		
Salinity		49.6		49.5		49.3		49.4		50.8									
$^{87}Sr/^{86}Sr$	µg/L*																		
Tritium	pCi/L (1σ)																		

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample DUP1 (6/11/12) is a duplicate of TPSWC-1B.

[2] Sample TPGW-Dup1 (6/8/2012) is a duplicate of TPSWC-5T.

Text in blue are revised values.

Key:

? = Questionable data.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
MCL = Maximum Contaminant Levels.
N.A. = Not applicable.
Q = Holding time exceeded.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 3.2-10. Range of Ion Concentrations in Surface Water

Parameter	Units	Biscayne Bay				Interceptor Ditch				L-31E				Cooling Canals			
		Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation
Temperature	°C	17.02	31.91	26.65	4.74	23.48	31.97	28.04	2.80	22.69	33.00	27.84	3.33	19.43	40.31	30.2	5.2
pH	SU	7.70	8.94	8.33	0.22	6.86	8.52	7.58	0.39	7.01	8.83	7.87	0.38	7.91	9.47	8.5	0.4
Dissolved Oxygen	mg/L	2.91	9.22	6.56	1.51	0.04	9.14	3.91	2.69	0.23	9.44	5.65	2.30	1.91	9.82	5.3	1.7
Specific Conductance	µS/cm	30586	66855	49872	7802	2076	66251	12023	16077	422	16610	1432	2536	68344	89970	80740	5897
Turbidity	NTU	0.44	17.73	2.76	3.43	0.34	47.92	3.57	7.09	0.51	26.27	4.46	5.89	46.639	67.06	56.7	4.9
Barium	mg/L	0.01	0.10	0.04	0.04	0.01	0.20	0.05	0.05	0.00	0.22	0.05	0.05	0.016	1.6	0.1	0.2
Iron	mg/L	0.03	5.50	0.57	0.82	0.01	0.63	0.20	0.17	0.02	0.71	0.16	0.16	0.027	3.6	0.7	0.6
Calcium	mg/L	260	540	426	64	82	610	194	127	44	230	75	34	570	950	758	83.8
Magnesium	mg/L	650	1700	1266	246	28	1700	260	405	6	320	21	48	1800	3000	2223	260.1
Potassium	mg/L	260	590	415	84	12	560	88	131	3	100	8	15	15000	22000	17500	1671
Sodium	mg/L	5400	14000	10167	1910	290	14000	2164	3298	27	2600	178	405	15000	22000	17500.0	1671
Boron	mg/L	2.50	5.50	4.39	0.76	0.10	5.30	0.85	1.27	0.03	1.10	0.09	0.16	6.1	11	7.5	0.9
Strontium	mg/L	4.30	9.90	7.38	1.28	0.93	11.00	2.64	2.38	0.42	3.00	0.81	0.45	12	18	14.1	1.3
Bromide	mg/L	0	100	65	18	2	85	13	19	0	19	1	3	0.27	270	113.3	30.2
Chloride	mg/L	11000	28000	18889	3797	110	27000	4040	6301	39	5300	348	814	26000	46000	33922	3837
Fluoride	mg/L	0.10	1.20	0.65	0.29	0.03	3.20	0.30	0.43	0.04	1.20	0.19	0.26	0.02	94	2.4	9.9
Sulfate	mg/L	1200	3700	2562	477	30	2900	441	646	2	640	40	96	1300	7000	4360	790
Alkalinity	mg/L ($CaCO_3$)	58.00	180	126	25	120	400	233	57	82	200	141	31	73	190	142.3	25.1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	57	180	123	28	120	400	233	57	82	200	140	31	15	190	125.5	40.6
Sulfides	mg/L	1	1	1	0	0	13	2	2	1	1	1	0	1	2.4	1.0	0.1
Total Dissolved Solids	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	80000	8567	24380
Dissolved Inorganic Carbon	mg/L	20	47	33	7	0	100	63	17	10	64	40	10	2.9	78	35.5	14.1

Key:

°C = Degrees Celsius.
$CaCO_3$ = Calcium carbonate.
Max = Maximum.
mg/L = Milligram(s) per liter.
Min = Minimum.
µS/cm = MilliSiemens per centimeter.
NTU = Nephelometric turbidity unit(s).
SU = Salinity units.

Table 3.2-11. Range of Isotope Ratios in Surface Water

Parameter	Units	Biscayne Bay				Interceptor Ditch				L-31E				Cooling Canals			
		Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation
$\delta^{18}O$	‰	0.40	2.80	1.70	0.59	-0.70	4.20	0.85	1.05	-1.40	2.70	0.39	0.82	-1.40	6.40	4.70	1.69
$\delta^{2}H$	‰	3.00	23.00	13.74	4.85	-4.00	27.00	7.92	6.16	-7.80	17.00	4.39	4.80	14.00	42.00	28.25	6.06
$\delta^{13}C$	‰	-5.60	-0.15	-2.43	1.48	-9.82	-6.03	-8.04	0.95	-10.17	-0.32	-6.68	1.94	-8.40	2.99	-2.76	2.53
Gross Alpha	pCi/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.80	57.00	35.41	13.13
$^{87}Sr/^{86}Sr$	µg/L	0.70913	0.70918	0.70915	0.00001	0.70909	0.70920	0.70914	0.00002	0.70911	0.70921	0.70916	0.00003	0.70907	0.70917	0.70911	0.00002
Tritium	pCi/L	-1.5	34.5	17.2	9.0	52.6	5677.0	688.2	1184.9	8.4	125.0	50.3	31.5	358.0	14280.0	5336.2	3774.9

Key:

‰ = Parts per mille.
Min = Minimum.
C = Carbon.
NA= Not Available, data not collected
H = Hydrogen.
O = Oxygen.
Max = Maximum.
pCi/L = PicoCuries per liter.

Table 3.4-1. Rainfall Collector Sampling Events and Sample Receipt Status

Date	TPRC-2	TPRC-3	TPRC-4	TPRC-5	TPRC-7	TPRC-8	TPRC-12
Jul-11	✓	✓	✓	NA	✓	✓	✓
Sep-11	✓	✓	✓	✓	✓	✓	✓
Dec-11	✓	✓	✓	✓	✓	✓	✓
Mar-12	P	P	P	P	NA	P	P
Jun-12	P	P	P	P	NA	P	P

Notes:
Data collected on 8/18/2011.
Pending - Samples collected but results not available.
TPRC-5 and TPRC-7 were stolen so no samples were collected in July 2011 March 2012 and June 2012.

Key:
✓ = Data available.
NA = Not available.
P = Pending.
TPRC = Turkey Point Rainfall Collector.

Table 3.4-2. Rainfall Tritium Results

Rainfall Station	Sample Date	Concentration (pCi/L)		
		Value	1-Sigma	MDL
RF-2	7/29/2011	34.1	5.4	4.6
RF-3	7/29/2011	23.5	5.5	5.0
RF-4	7/29/2011	11.3	5.2	5.0
RF-8	7/29/2011	4.4	4.8	4.8
RF-12	7/29/2011	29.2	5.8	5.1
RF-BLANK	7/29/2011	6.3	5.0	4.9
RF-7	8/18/2011	24.7	5.6	5.1
RF-2	9/29/2011	7.3	7.8	7.6
RF-3	9/29/2011	25.3	8.2	7.4
RF-4	9/29/2011	6.5	7.6	7.5
RF-5	9/29/2011	17.3	7.9	7.4
RF-7	9/29/2011	12.6	7.8	7.5
RF-8	9/29/2011	19.0	8.0	7.6
RF-12	9/29/2011	24.2	8.2	7.4
RF-BLANK	9/29/2011	3.0	7.5	7.4
RF-2	12/21/2011	42.2	8.6	7.2
RF-3	12/21/2011	9.8	7.7	7.4
RF-4	12/21/2011	8.1	7.5	7.3
RF-5	12/21/2011	37.3	8.6	7.4
RF-7	12/21/2011	11.5	7.6	7.3
RF-8	12/21/2011	10.9	7.7	7.4
RF-12	12/21/2011	18.1	7.6	7.0
RF-BLANK	12/21/2011	8.0	7.0	6.8

Key:
pCi/L = Picocuries per liter.
MDL = Minimum detection limit.
RF = Rainfall.

Table 3.5-1. Evaporation Pan Sampling Events and Sample Receipt Status

Date	TPEVP-2	TPEVP-3	TPEVP-5	TPEVP-12	TPEVP-13A[1]	TPEVP-Source	TPEVP-Pumped Source[2]
Mar-11	✓	✓	✓	✓	NA	✓	NA
Apr-11	✓	✓	✓	✓	NA	✓	✓
May-11	✓	✓	✓	✓	✓	✓	✓
Jun-11	✓	✓	✓	✓	✓	✓	✓
Aug-113	✓	✓	✓*	✓	✓	NA	NA
Sep-11	✓	✓	✓	✓	✓	✓	NA
Oct-11	✓	✓	✓	✓	✓	✓	NA
Nov-114	✓	✓	✓	✓	✓	NA	NA
Dec-11	✓	✓	✓	✓	✓	✓	✓
Jan-12	P	P	P	P	P	P	P
Feb-12	P	P	P	P	P	P	P
Mar-12	P	P	P	P	P	P	P
Apr-12	P	P	P	P	P	P	P
May-12	P	P	P	P	P	P	P
Jun-12	P	P	P	P	P	P	P

Notes:
[1] TPEVP-13A was not set up until April 2011; the first samples were collected in May 2011.
[2] TPEVP-Pumped-Source is only collected when water transported in the water bladders is used to fill pans at TPEVP-5.
[3] Pans were full in August and not refilled; therefore, there was no Source Water. TPEVP-5 was visited 7/29/11 instead of 8/2/11 (for all other sites).
[4] Pans were full in November and not refilled; therefore, there was no Source Water for that month.

Key:
✓ = Data available.
NA = Not available.
P = Pending.

Table 3.5-2. Evaporation Pan Results

Evaporation Pan Station	Sample Date	Concentration (pCi/L)		
		Value	1-Sigma	MDL
April 2011				
TPEVP-2	4/19/2011	249.0	19.0	5.1
TPEVP-3	4/19/2011	45.1	6.5	5.1
TPEVP-5	4/20/2011	49.6	7.0	5.4
TPEVP-12	4/19/2011	55.0	6.9	5.0
TPEVP-Source	4/19/2011	13.4	5.3	5.1
TPEVP-Source5[1]	4/20/2011	23.5	5.5	4.9
May 2011				
TPEVP-2	5/24/2011	283.4	19.6	6.2
TPEVP-3	5/24/2011	36.0	7.2	6.3
TPEVP-5	5/24/2011	39.2	7.2	6.1
TPEVP-12	5/24/2011	30.0	6.9	6.1
TPEVP-13A[2]	5/24/2011	490.3	31.5	6.4
TPEVP-Source	5/24/2011	15.3	8.3	7.9
TPEVP-Source5	5/24/2011	20.8	6.7	6.2
June 2011				
TPEVP-2	6/24/2011	26.3	6.8	6.1
TPEVP-3	6/24/2011	17.9	6.7	6.2
TPEVP-5	6/27/2011	39.0	7.2	6.1
TPEVP-12	6/27/2011	22.6	6.6	6.1
TPEVP-13	6/24/2011	274.7	19.0	6.1
TPEVP-Source	6/24/2011	21.4	6.7	6.2
TPEVP-Source5	6/27/2011	20.9	6.6	6.0
August 2011[3]				
TPEVP-2	8/2/2011	75.3	7.0	4.3
TPEVP-3	8/2/2011	57.2	6.3	4.4
TPEVP-5	7/29/2011	19.6	4.8	4.3
TPEVP-12	8/2/2011	10.9	4.5	4.2
TPEVP-13	8/2/2011	181.0	13.0	4.3
September 2011				
TPEVP-2	9/28/2011	38.3	8.3	7.0
TPEVP-3	9/28/2011	12.8	6.6	6.3
TPEVP-5	9/28/2011	18.9	7.6	7.0
TPEVP-12	9/28/2011	14.4	6.8	6.4

Table 3.5-2. Evaporation Pan Results

Evaporation Pan Station	Sample Date	Concentration (pCi/L)		
		Value	1-Sigma	MDL
TPEVP-GC	9/28/2011	114.4	11.3	6.4
TPEVP-Source	9/28/2011	7.3	7.2	7.0
October 2011				
TPEVP-2	10/27/2011	63.4	9.4	7.0
TPEVP-3	10/27/2011	43.0	8.3	6.8
TPEVP-5	10/27/2011	11.3	7.3	6.9
TPEVP-12	10/27/2011	18.5	7.6	7.0
TPEVP-13A	10/27/2011	115.4	11.7	6.9
TPEVP-Source	10/27/2011	18.5	7.6	7.0
TPEVP-Source Pumped	10/27/2011	7.5	7.3	7.1
November 2011[4]				
TPEVP-2	11/30/2011	180.5	13.3	4.1
TPEVP-3	11/30/2011	47.9	6.5	4.5
TPEVP-5	11/30/2011	11.3	5.0	4.6
TPEVP-12	11/30/2011	10.1	4.3	4.0
TPEVP-13	11/30/2011	374.1	24.3	4.0
December 2011				
TPEVP-12	12/20/2011	0.0	7.0	7.0
TPEVP-13	12/20/2011	647.0	42.0	6.8
TPEVP-2	12/20/2011	361.0	24.0	7.0
TPEVP-3	12/20/2011	83.9	8.5	6.0
TPEVP-Pumped Source	12/20/2011	2.8	6.9	6.8
TPEVP-Source	12/20/2011	6.1	6.9	6.8
TPEVP-5	12/21/2011	28.6	7.5	7.0
TPEVP-Source5	12/21/2011	0.3	6.8	6.8

Notes:
[1] TPEVP-Pumped Source, also labeled TPEVP-Source5, is only collected when water transported in the water bladders is used to fill pans at TPEVP-5.
[2] TPEVP-13A was not set up until April 2011; the first samples were collected in May 2011.
[3] Pans were full in August and not refilled; therefore, there was no Source Water. TPEVP-5 was visited 7/29/11 instead of 8/2/11 (for all other sites).
[4] Pans were full in November and not refilled; therefore, there was no Source Water for that month.
TPEVP-13 is also referred to as TPEVP-GC.

Key:
EVP = Evaporation pan.
GC = Grand Canal
MDL = Minimum detection level.
pCi/L = PicoCuries per liter.
TP = Turkey Point.

FIGURES



Figure 3.1-1. Typical Groundwater Field Sampling Setup.



Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	210	210	190	190	180	200	190	160	160
M	8000	7100	7500	7900	7300	7600	7200	7900	7600
D	7600	7500	8300	8400	7300	8600	8000	8600	7800

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	14000	16000	15000	15000	16000	14000	16000	16000	15000
M	24000	21000	26000	26000	24000	24000	26000	26000	25000
D	24000	25000	26000	26000	26000	24000	27000	24000	25000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	36	35	37	35	37	34	38	35	36
M	35	34	36	35	37	34	38	36	35
D	41	41	43	42	42	39	43	42	40

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	23000	11000	17000	17000	24000	15000	17000	23000	19000
M	27000	28000	29000	29000	30000	27000	30000	28000	29000
D	27000	28000	28000	29000	30000	27000	27000	28000	28000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	NA	19000	20000	19000	21000	19000	21000	20000	20000
M	NA	21000	22000	22000	24000	21000	22000	21000	21000
D	NA	20000	22000	22000	23000	21000	22000	22000	22000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	34	38	50	43	55	37	36	37
D	4600	4800	4900	4600	4800	4900	5300	5000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	210	230	220	300	200	210	190	240	260
M	8900	9500	11000	10000	9800	10000	12000	11000	11000
D	12000	11000	12000	11000	11000	10000	12000	11000	12000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	260	170	150	260	950	99	170	160
D	33000	34000	33000	31000	32000	34000	32000	32000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	34	33	35	35	32	36	37	37	35
M	33	34	33	33	30	35	35	33	32
D	47	46	51	49	43	51	51	45	47

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	NA	21000	21000	22000	21000	20000	25000	21000	21000
M	NA	22000	21000	23000	22000	21000	23000	22000	21000
D	NA	22000	22000	24000	23000	20000	23000	23000	23000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	46	52	82	65	43	48	74	44
D	6100	5800	6300	5800	4600	5900	5700	5400

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	72	100	170	1500	150	100	150	110
D	31000	32000	31000	29000	30000	32000	31000	30000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	2200	3200	3300	2000	2300	2800	2700	3000
D	15000	15000	15000	13000	14000	15000	14000	14000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	37000	33000	36000	38000	36000	33000	36000	37000	35000
M	36000	31000	33000	37000	34000	32000	35000	34000	32000
D	37000	26000	35000	37000	35000	32000	35000	36000	32000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	29000	30000	29000	30000	31000	30000	32000	31000	28000
M	30000	29000	31000	34000	31000	32000	32000	31000	30000
D	29000	31000	32000	32000	32000	32000	33000	32000	32000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	23	20	14	20	21	15	10	15	16
M	25	26	24	25	22	23	24	24	20
D	30	29	28	28	27	28	29	28	27

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	490	420	470	670	610	480	490	500	270
M	13000	12000	15000	13000	14000	15000	15000	14000	13000
D	16000	15000	16000	16000	15000	13000	17000	16000	15000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	NA	23000	23000	24000	24000	21000	22000	23000	22000
M	NA	25000	25000	27000	24000	23000	21000	25000	25000
D	NA	29000	30000	32000	32000	29000	29000	30000	30000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	24000	24000	25000	26000	25000	25000	26000	26000	27000
M	26000	26000	27000	31000	28000	26000	28000	28000	27000
D	26000	27000	28000	29000	26000	27000	30000	29000	30000

Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011; M-12: Mar 2012; J-12: Jun-2012.
2) Samples for wells L-5, L-31, G-21, G-28, and G-35 were taken at depths of 18 ft and 58 ft.
3) NA: Not Available.

9-2012

Chloride Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 3.1-2. Chloride Concentrations (mg/L) in Groundwater June 2010 through June 2012.



Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	100	110	100	90	87	100	88	88	80
M	4000	4100	4200	3800	3800	4100	3900	4200	4100
D	3800	4300	4300	4000	4000	4300	4200	4500	4300

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	7700	7400	8500	7600	7700	8100	8100	8200	9000
M	13000	13000	15000	13000	11000	13000	13000	13000	14000
D	15000	13000	15000	12000	13000	13000	13000	13000	13000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	20	19	20	21	20	20	21	21	20
M	21	20	20	21	20	21	21	22	21
D	26	26	27	27	26	25	27	28	26

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	13000	5700	9800	8500	12000	8100	9300	12000	11000
M	15000	15000	16000	15000	14000	14000	16000	16000	15000
D	16000	15000	15000	14000	14000	15000	15000	15000	15000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	NA	11000	11000	9900	10000	11000	11000	10000	11000
M	NA	11000	11000	11000	11000	11000	11000	11000	12000
D	NA	11000	12000	11000	11000	11000	11000	11000	12000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	15	20	26	26	30	22	21	21
D	2000	2700	2100	2200	2200	2200	2500	2800

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	110	100	110	NA	100	110	87	140	120
M	4900	5200	5600	NA	5500	5400	5700	5900	6000
D	6500	5800	6400	NA	6100	5700	6000	6100	6500

Dep	O-10	J-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	140	89	76	140	480	54	82	77	
D	17000	21000	16000	17000	17000	17000	16000	19000	

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	21	21	21	22	20	21	20	21	20
M	20	20	20	20	19	21	20	19	19
D	31	30	31	31	28	31	29	30	27

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	NA	11000	12000	11000	12000	11000	12000	11000	12000
M	NA	13000	12000	11000	12000	11000	12000	11000	12000
D	NA	11000	12000	11000	12000	12000	12000	12000	11000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	26	30	44	41	28	29	45	26
D	3300	3500	3200	3200	2800	3000	3300	3300

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	38	54	82	820	79	50	75	55
D	16000	20000	15000	16000	16000	15000	15000	17000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	19000	19000	20000	18000	17000	18000	17000	18000	18000
M	19000	18000	19000	17000	16000	17000	17000	17000	17000
D	19000	18000	20000	17000	16000	17000	17000	17000	17000

Dep	O-10	J-11	M-11	J-11	S-11	D-11	M-12	J-12
S	970	1800	1200	1000	1200	0	1400	1600
D	7700	8300	7300	6900	7300	1100	7300	7800

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	17000	14000	15000	15000	16000	15000	15000	15000	15000
M	18000	15000	16000	16000	17000	16000	16000	16000	16000
D	16000	17000	16000	16000	16000	16000	16000	16000	16000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	14	10	8.9	12	13	8	6	8	9
M	15	13	14	15	13	14	13	14	12
D	22	20	20	18	16	17	17	16	15

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	250	210	240	360	310	240	220	260	140
M	7200	7000	7200	6900	6800	8400	6900	7300	7400
D	8600	8200	9000	8400	8000	7400	6600	8400	8500

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	NA	12000	13000	12000	12000	12000	12000	11000	12000
M	NA	13000	14000	13000	13000	13000	11000	13000	13000
D	NA	16000	16000	15000	17000	15000	15000	15000	16000

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	13000	13000	13000	13000	13000	14000	14000	13000	13000
M	15000	14000	14000	14000	15000	15000	13000	15000	14000
D	14000	14000	14000	15000	15000	14000	13000	14000	14000

Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011; M-12: Mar 2012; J-12: Jun-2012.
2) Samples for wells L-5, L-31, G-21, G-28, and G-35 were taken at depths of 18 ft and 58 ft.
3) NA: Not Available.

Sodium Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 3.1-3. Sodium Concentrations (mg/L) in Groundwater June 2010 through June 2012.



Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	1230	1207	1148	1120	1163	1088	1105	1067
M	23667	21802	21758	22835	23018	22283	23477	22517
D	24355	23808	24028	24011	24033	23397	24213	23704

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	41222	40997	40650	41853	40848	41350	42960	43247
M	66088	66765	64647	60849	63017	63876	64570	65003
D	65920	64747	64472	63264	64298	64538	64988	65013

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	554	516	561	572	NA	568	581	580
M	588	632	557	579	NA	566	575	580
D	608	585	600	586	NA	594	597	601

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	33001	48738	43289	59744	44022	45929	59838	54680
M	72898	70180	70962	70948	70784	71993	72597	72817
D	71763	71044	70257	70747	70471	70715	71660	71401

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	52243	50505	51502	51442	52279	53203	52831	52885
M	56762	55131	55706	55203	54719	55143	54072	55240
D	56950	55483	56275	55931	54911	56200	55544	58923

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	736	775	592	629	588	538	536	543
D	18117	18039	13392	14355	14409	15127	15767	16058

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	1239	1224	1387	1189	NA	1100	1390	1331
M	30936	30840	30324	31007	NA	31941	31913	32196
D	34157	32674	32768	32996	NA	33540	33043	34183

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	1340	699	930	1432	3742	657	976	838
D	80211	84800	79735	81271	79557	79760	80857	79755

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	2648	3014	2663	2570	2051	2496	2604	2181
M	654	646	647	645	651	635	653	645
D	699	723	669	694	702	698	714	686

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	56504	54920	55562	55906	54734	55764	55004	55079
M	58174	56022	56776	56720	56277	56330	55511	56569
D	59347	58983	58825	59546	58768	60116	59510	59865

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	8264	9991	738	710	697	709	18874	669
D	39797	41949	17867	18915	16117	18279	737	18498

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	494	908	963	5724	797	665	971	739
D	75992	80124	74971	76804	75568	76281	76503	75732

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	87606	90261	87096	82111	82473	83469	83997	84225
M	83961	83608	83337	82262	80616	81654	81243	80280
D	86058	86786	84277	82779	82287	82425	81700	81844

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	429	548	9378	7130	7824	8304	6087	9012
D	13419	14319	38230	38862	38933	39168	39655	39290

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	73570	71102	75624	77917	74150	74782	74636	72823
M	77199	76025	73519	78540	75599	76658	76409	75927
D	78349	74449	77912	76277	76249	77583	77119	77125

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	609	611	621	643	582	547	590	593
M	679	668	662	651	657	653	662	649
D	654	671	638	646	651	640	660	640

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	2026	2136	2790	2632	NA	2044	2281	1438
M	38628	37881	37791	37818	NA	37832	38574	38757
D	44990	43547	43423	43139	NA	43264	43554	43277

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	60063	58631	59713	58014	57317	58055	57415	57931
M	63756	64180	64501	62228	62560	63012	61619	63535
D	75330	73000	74875	74774	72650	74202	73593	74001

Dep	S-10	D-10	M-11	J-11	S-11	D-11	M-12	J-12
S	65826	64606	65810	64589	63997	65411	64474	64651
M	71328	68445	68320	69075	67273	70052	67848	69150
D	70500	69476	71205	70195	69305	69551	69560	69944

Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011; M-12: Mar 2012; J-12: Jun-2012.
2) Samples for wells L-5, L-31, G-21, G-28, and G-35 were taken at depths of 18 ft and 58 ft.
3) NA: Not Available.

9-2012

Specific Conductance Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 3.1-4. Specific Conductance (µS/cm) in Groundwater June 2010 through June 2012.

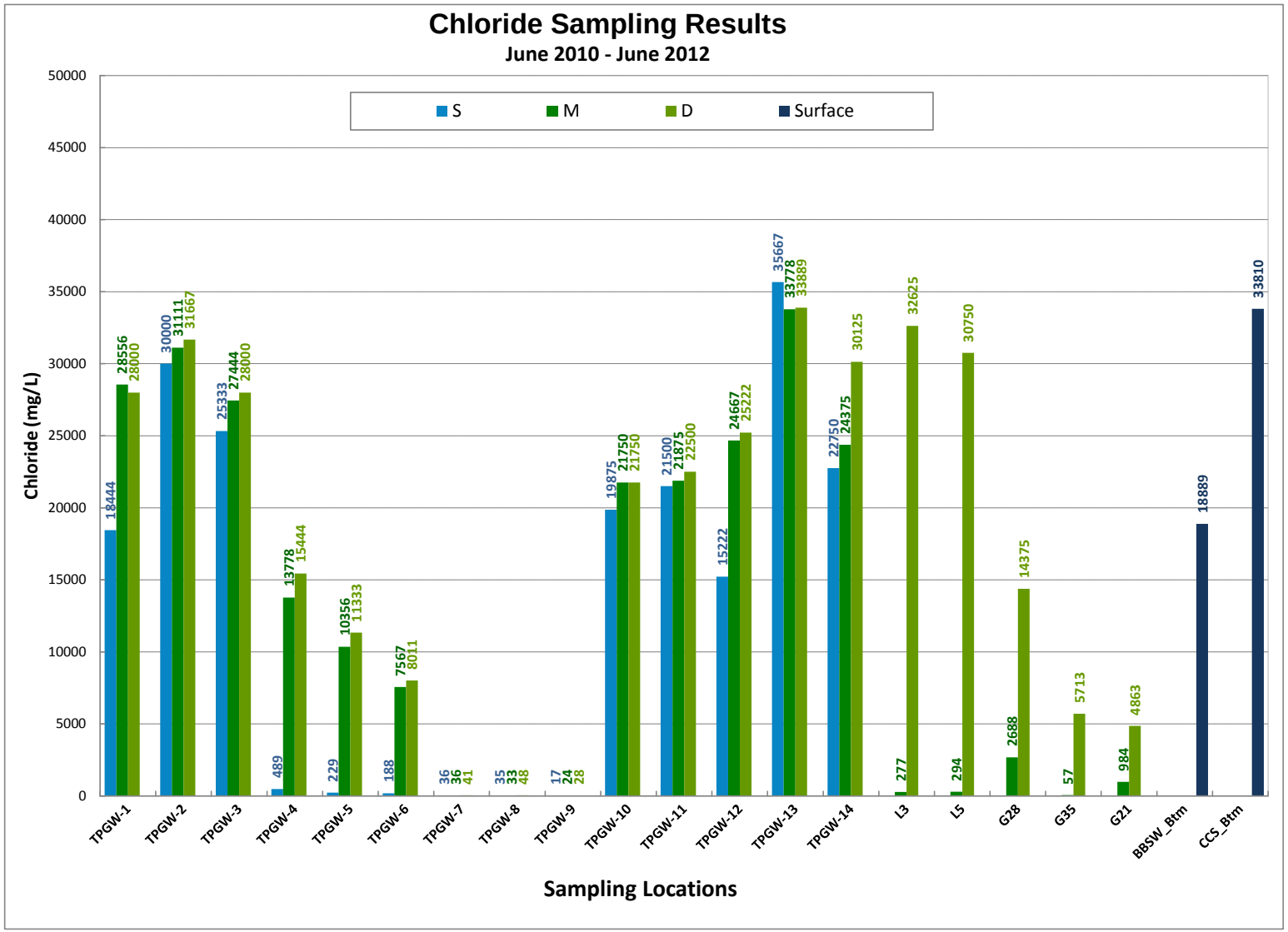


Figure 3.1-5. Average Quarterly Chloride Concentrations at Each Well Compared to Biscayne Bay and CCS Surface Water Chloride Concentrations.

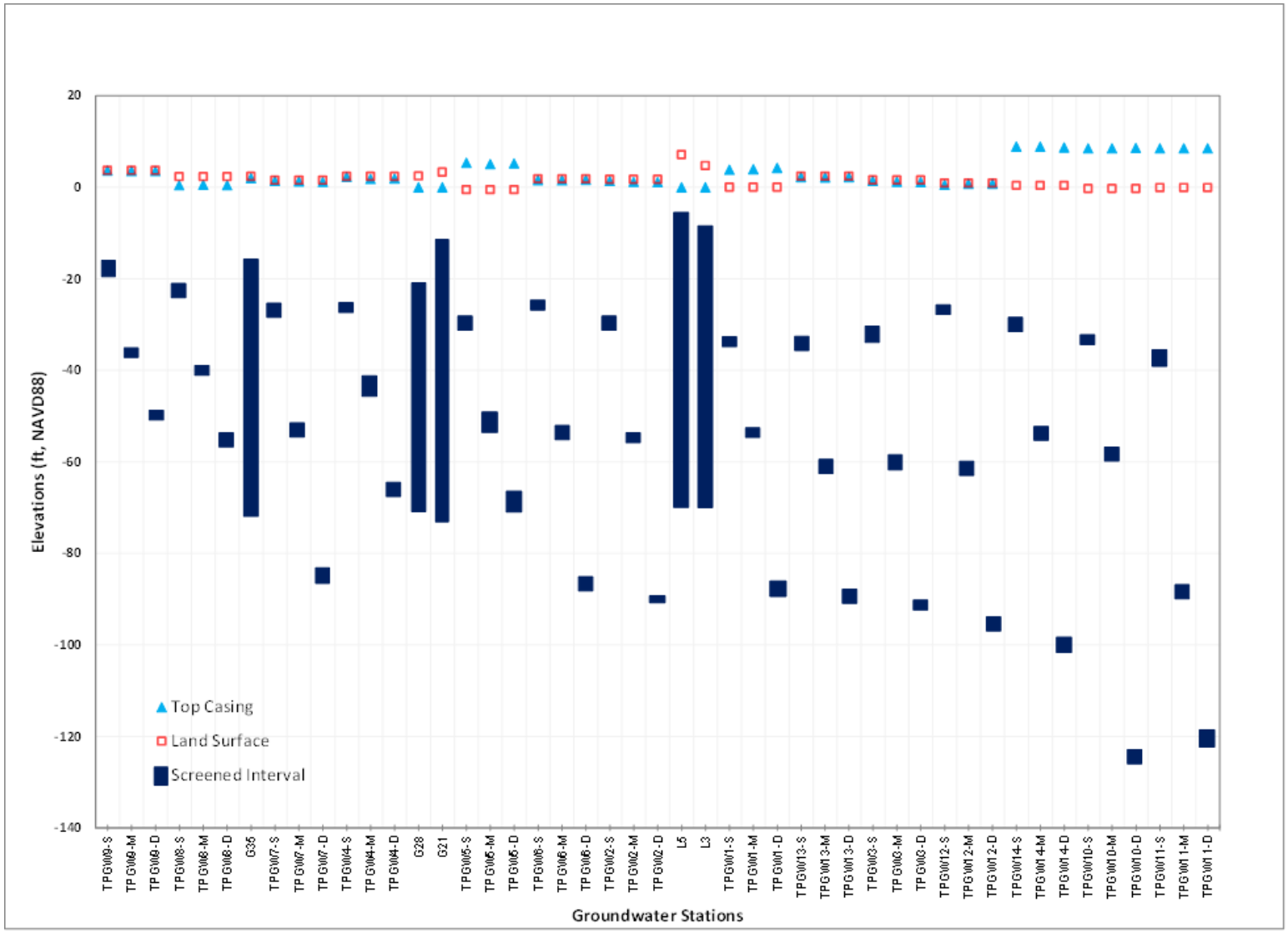


Figure 3.1-6. Monitoring Well Elevations.

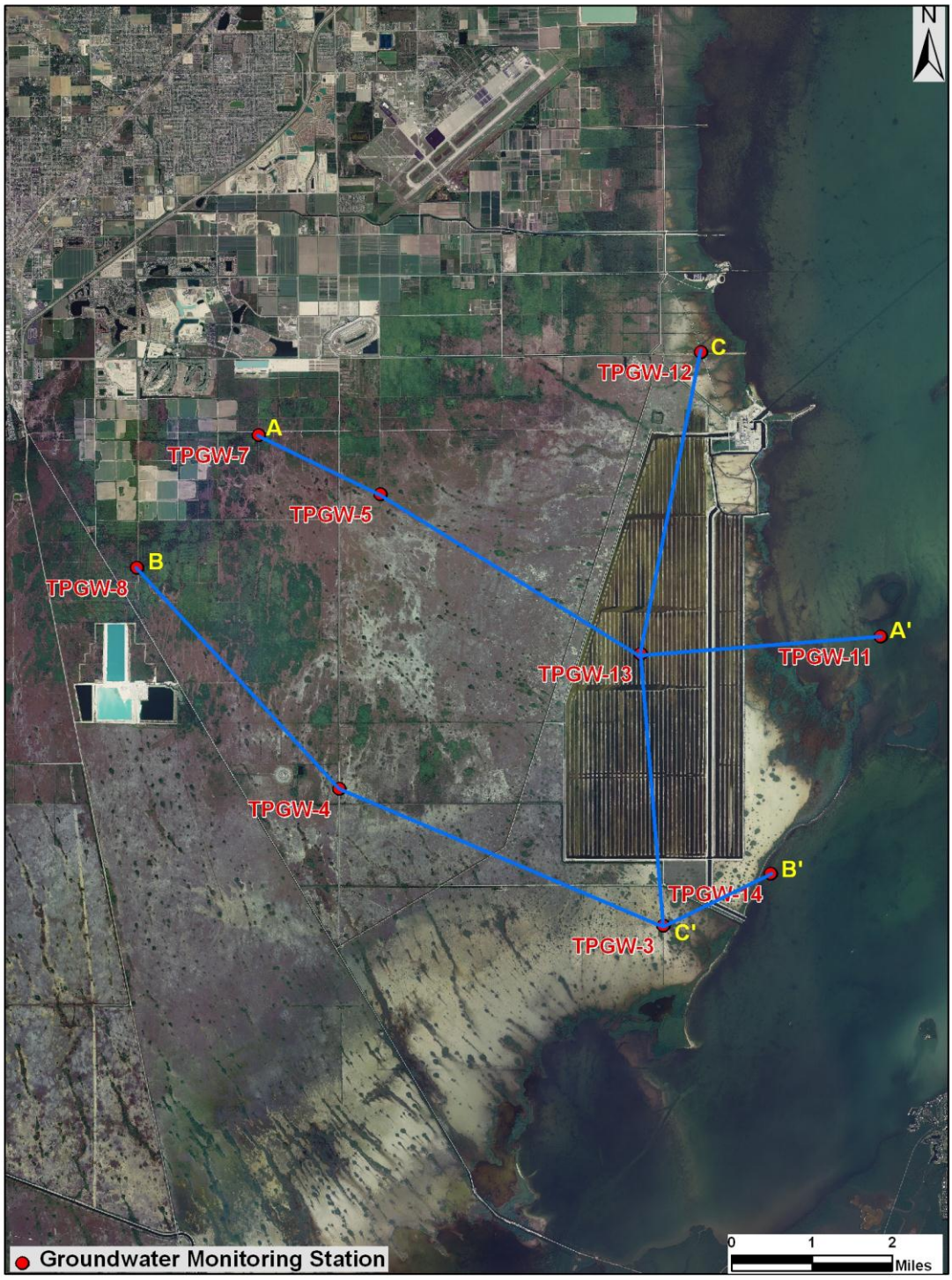


Figure 3.1-7. Locations of Aquifer Cross Sections for Groundwater Chloride Concentrations.

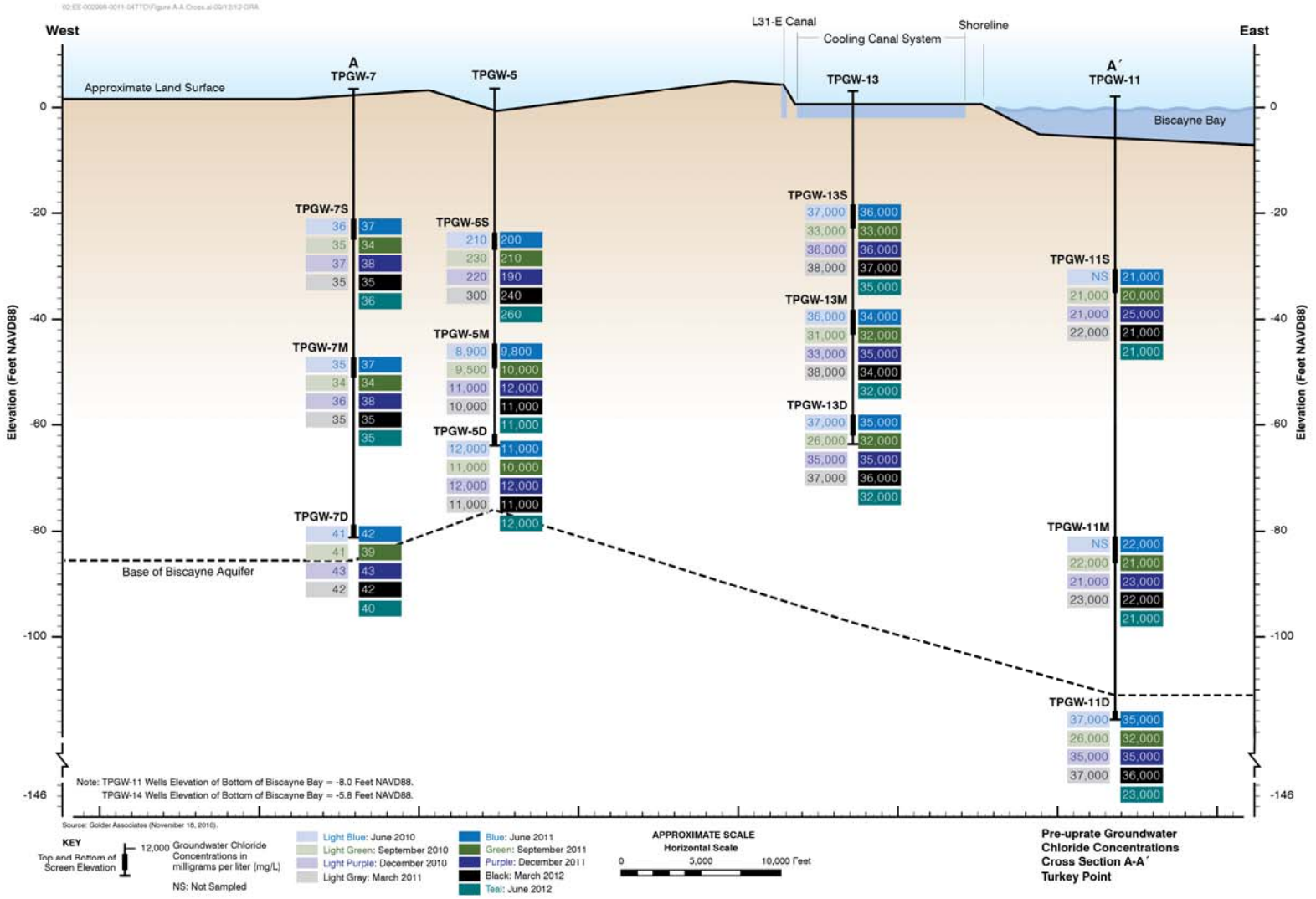


Figure 3.1-8. Cross Section A-A' Showing Groundwater Chloride Concentrations from June/July 2010 through June 2012.

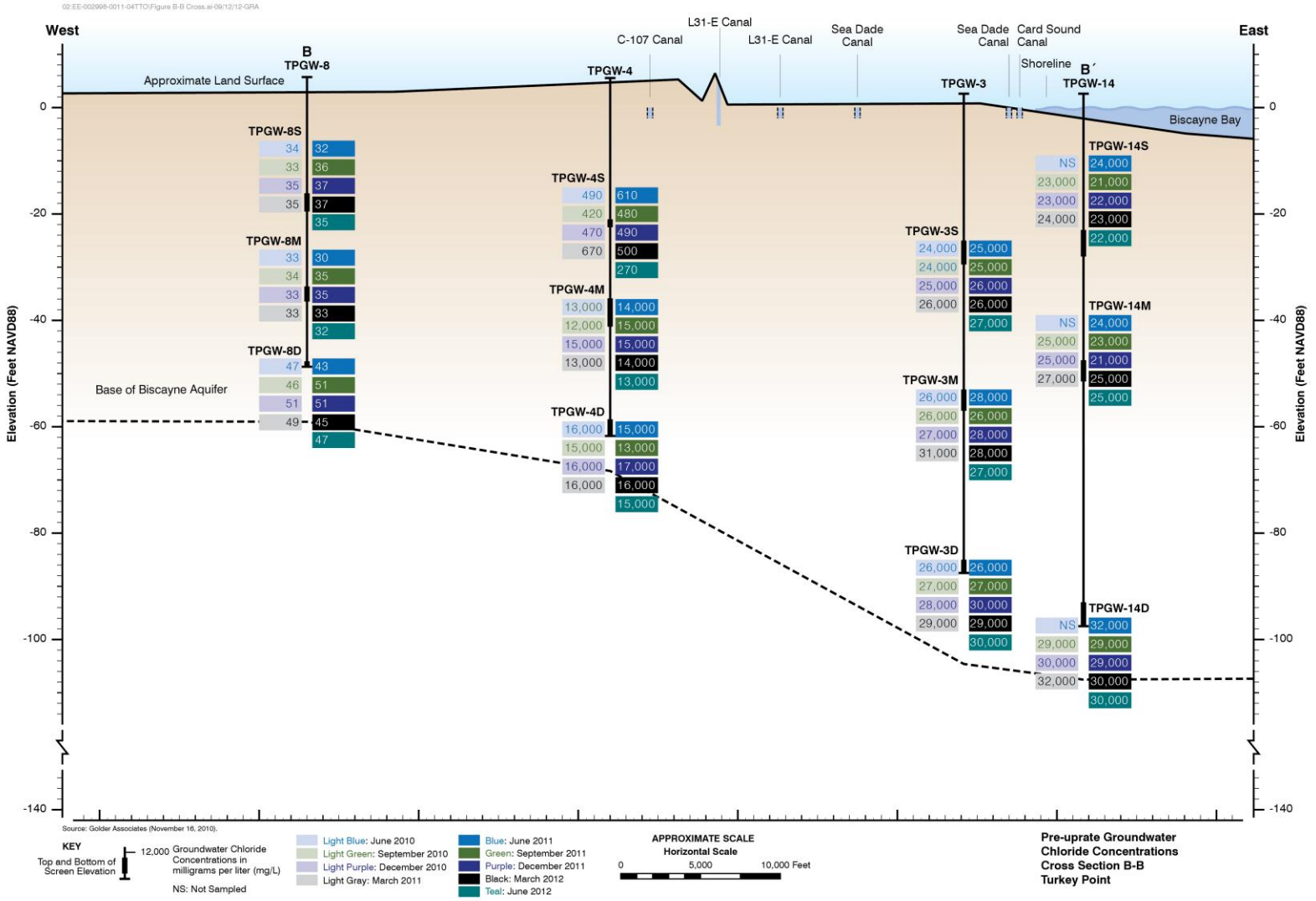


Figure 3.1-9. Cross Section B-B' Showing Groundwater Chloride Concentrations from June/July 2010 through June 2012.

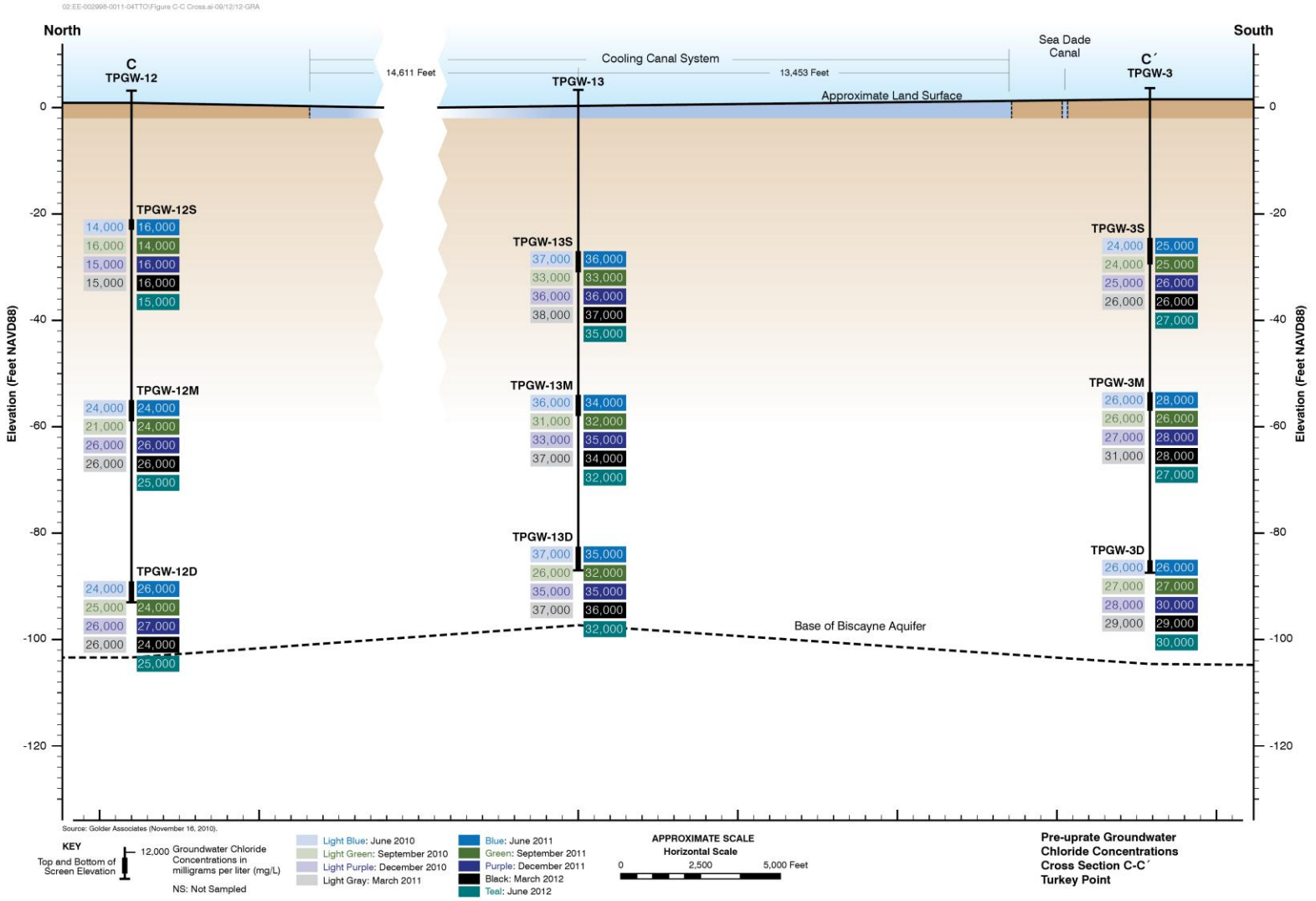
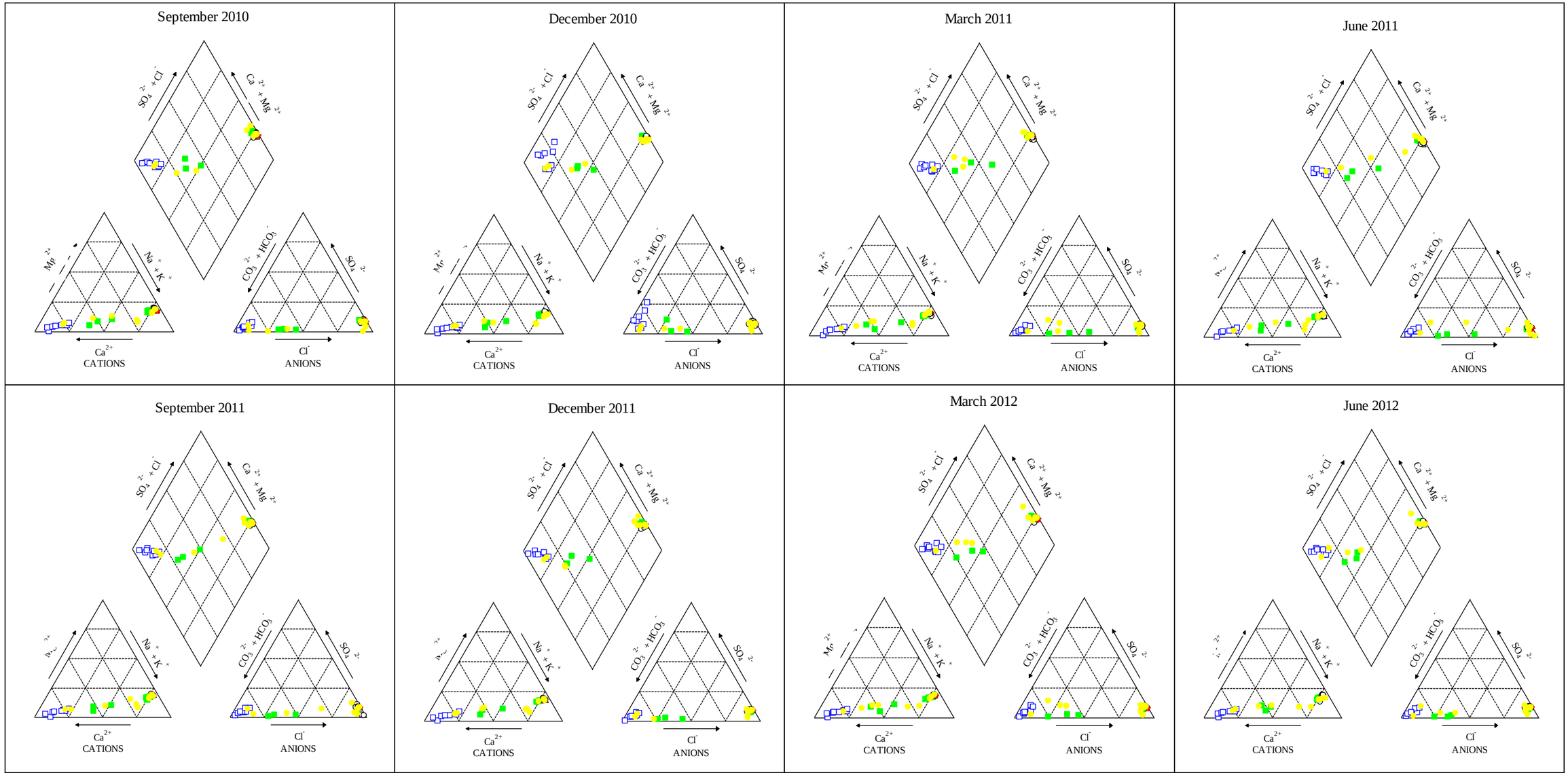


Figure 3.1-10. Cross Section C-C' Showing Groundwater Chloride Concentrations from June/July 2010 through June 2012.



Legend: TPGW-1, -2, -3, -12, -14 = ○; TPGW-4, -5, -6 = ■; TPGW-7, -8, -9 = □; TPGW-10, -11 = Δ; TPGW-13 = ☆; TPGW-L3, -L5, -G21, -G28, -G35 = ●

Figure 3.1-11. Tri-Linear Diagrams of Quarterly Groundwater Data.



Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	10	3	4	5	20	22	0
M	1	5	15	14	6	14	5
D	13	18	23	19	33	32	14

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	237	262	275	238	73	208	242
M	1795	1654	1740	1680	1260	1630	1630
D	1562	1830	1570	1640	1490	1706	1520

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	2	3	1	14	18	12	12
M	3	7	14	13	-1	14	12
D	4	4	6	2	5	25	13

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	1581	456	937	810	1320	830	840
M	2816	2653	2535	2440	2510	2740	2350
D	2579	2272	2658	2560	1980	2560	2230

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	NA	22	11	18	24	19	23
M	NA	8	12	3	15	7	3
D	NA	2	8	8	16	3	1

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	6	4	18	23	15	4
D	14	17	18	24	25	22

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	59	80	94	95	89	44
D	4070	4040	3960	3730	4010	3440

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	10	20	0	0	16	32	0
M	293	175	218	222	156	224	243
D	188	343	295	283	288	319	315

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	4	13	0	7	17	24	10
M	4	12	3	4	24	16	13
D	7	0	4	13	29	12	-2

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	NA	15	16	2	22	26	10
M	NA	27	28	34	26	43	48
D	NA	347	338	435	429	467	480

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	89	65	80	113	5	54
D	3380	3320	3270	3438	3350	4040

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	4370	3554	3460	3800	4190	6390	4300
M	4179	3986	3980	4030	3800	3910	3640
D	4785	4390	4180	3830	3650	3850	3850

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	12	16	12	8	2	19
D	2	0	0	16	-2	12

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	7	14	31	17	17	8
D	436	440	411	410	430	424

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	3168	3075	2910	3030	3670	3310	3660
M	3328	3460	3250	3520	3690	3720	3770
D	3232	3522	3420	3320	3270	3100	3340

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	4	7	10	11	10	24	11
M	16	0	8	8	16	19	7
D	8	0	5	2	13	17	14

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	9	19	15	19	10	24	15
M	325	321	277	246	281	340	297
D	506	611	581	519	433	520	510

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	NA	228	230	247	186	175	159
M	NA	688	851	772	600	790	650
D	NA	2580	2640	2660	2490	2620	2540

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	854	852	823	236	620	770	620
M	1990	2178	2110	1940	1960	2130	1790
D	1990	1041	2053	1980	2070	2270	2020

Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011.
2) Samples for wells L-5, L-31, G-21, G-28, and G-35 were taken at depths of 18 ft and 58 ft.
3) NA: Not Available.

7-2012

Tritium Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 3.1-12. Tritium Concentrations in Groundwater June 2010 through December 2011.

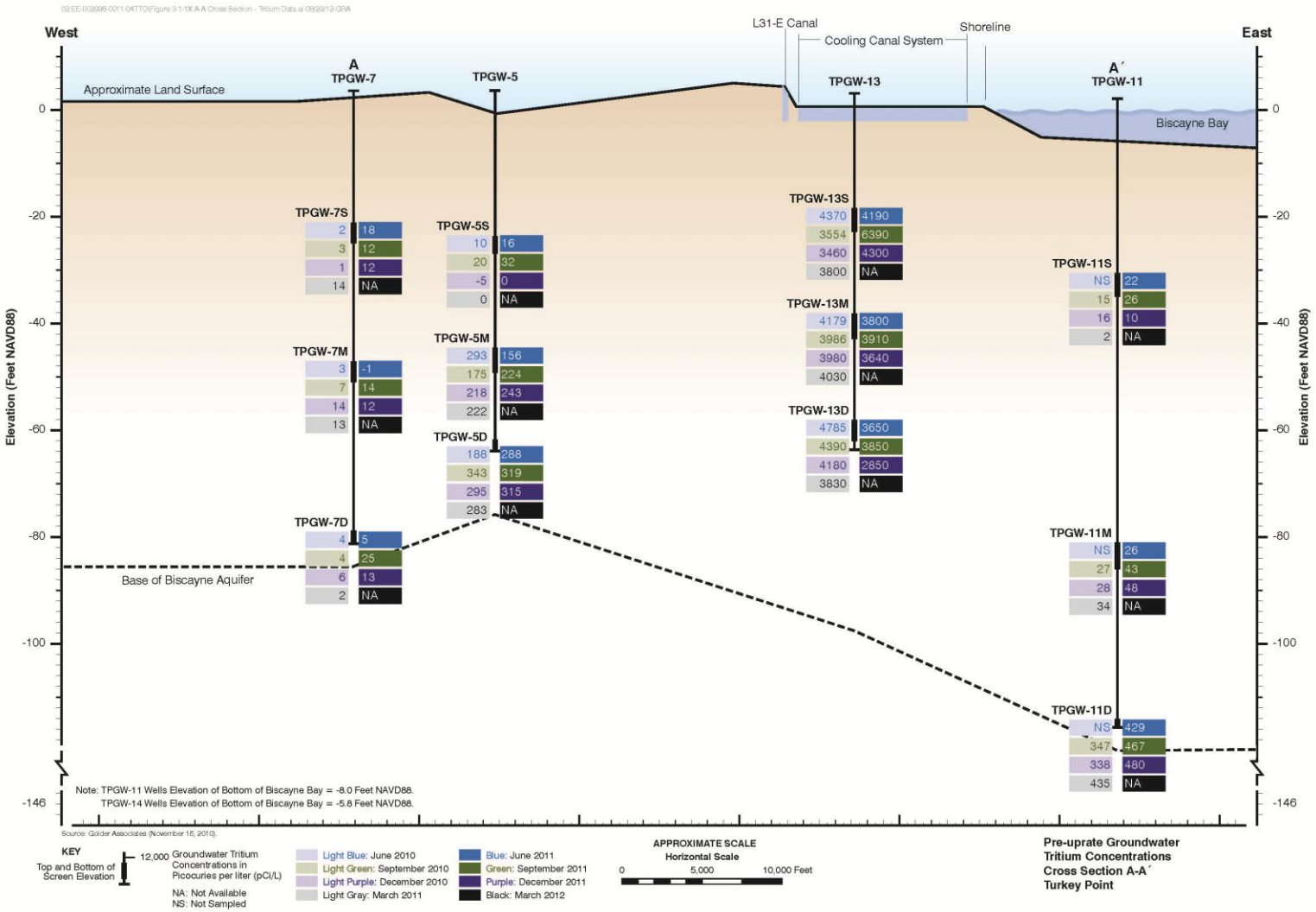


Figure 3.1-13. Cross Section A-A' Showing Quarterly Groundwater Tritium Concentrations from June/July 2010 through December 2011.

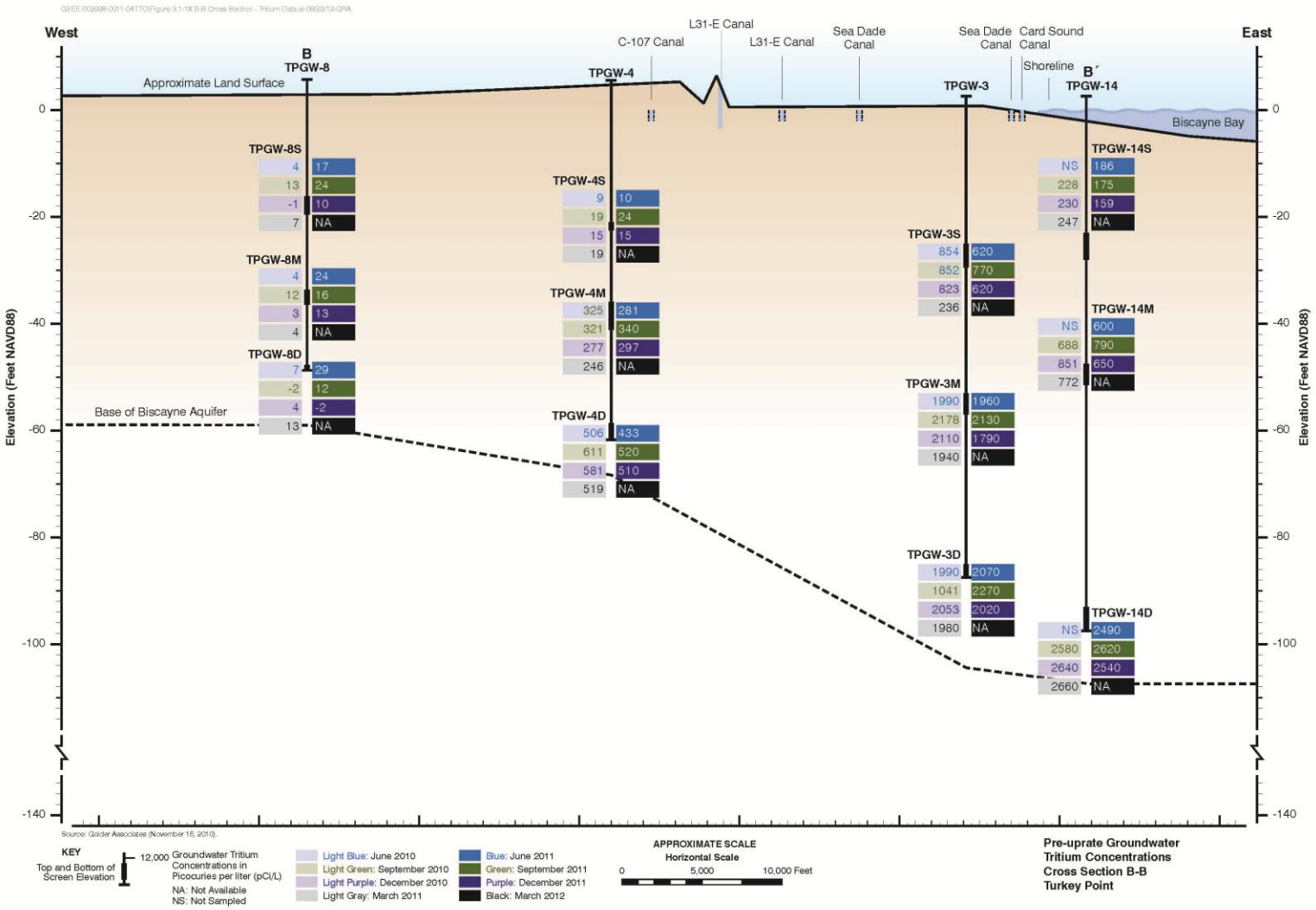


Figure 3.1-14. Cross Section B-B' Showing Quarterly Groundwater Tritium Concentrations from June/July 2010 through December 2011.

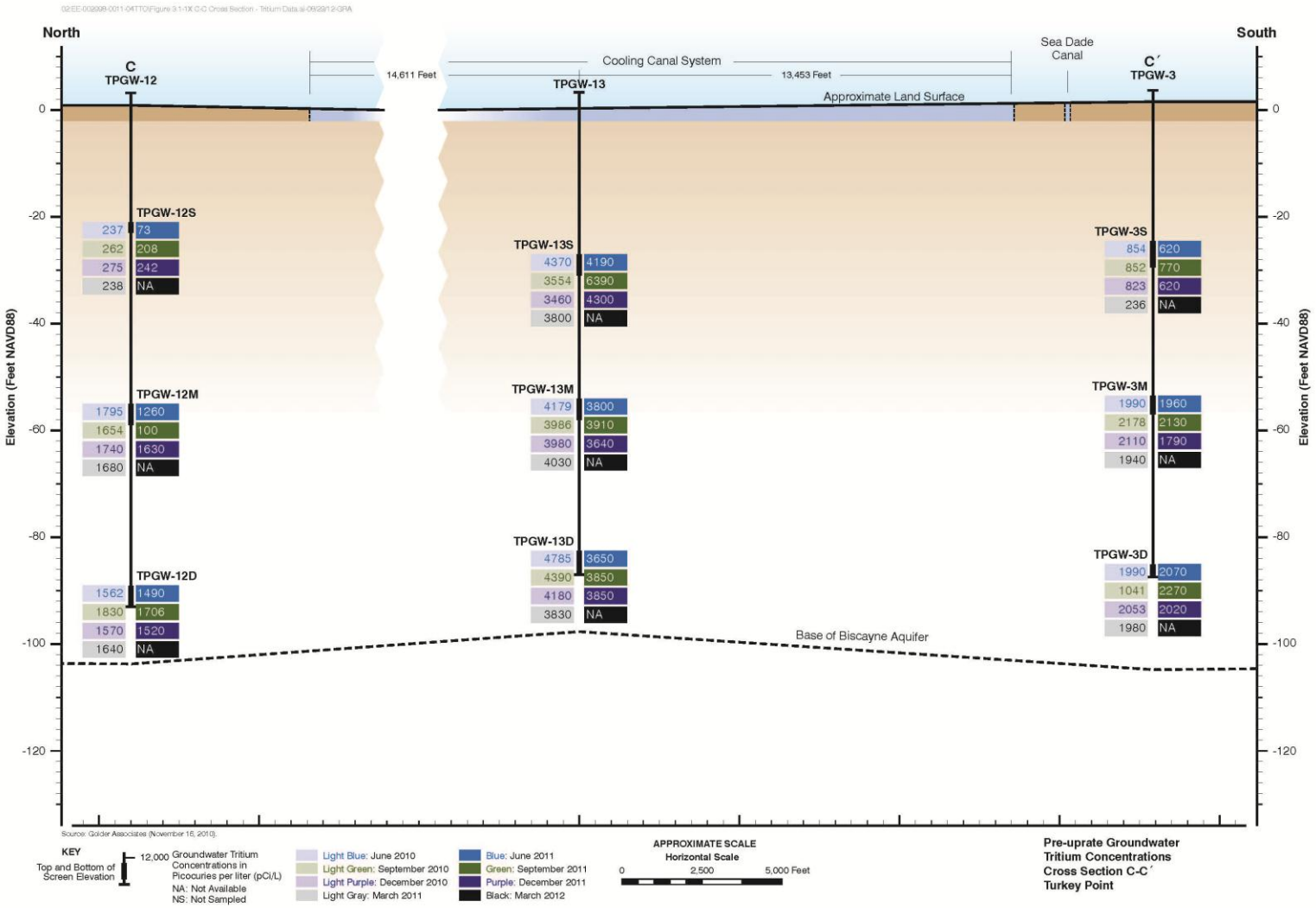
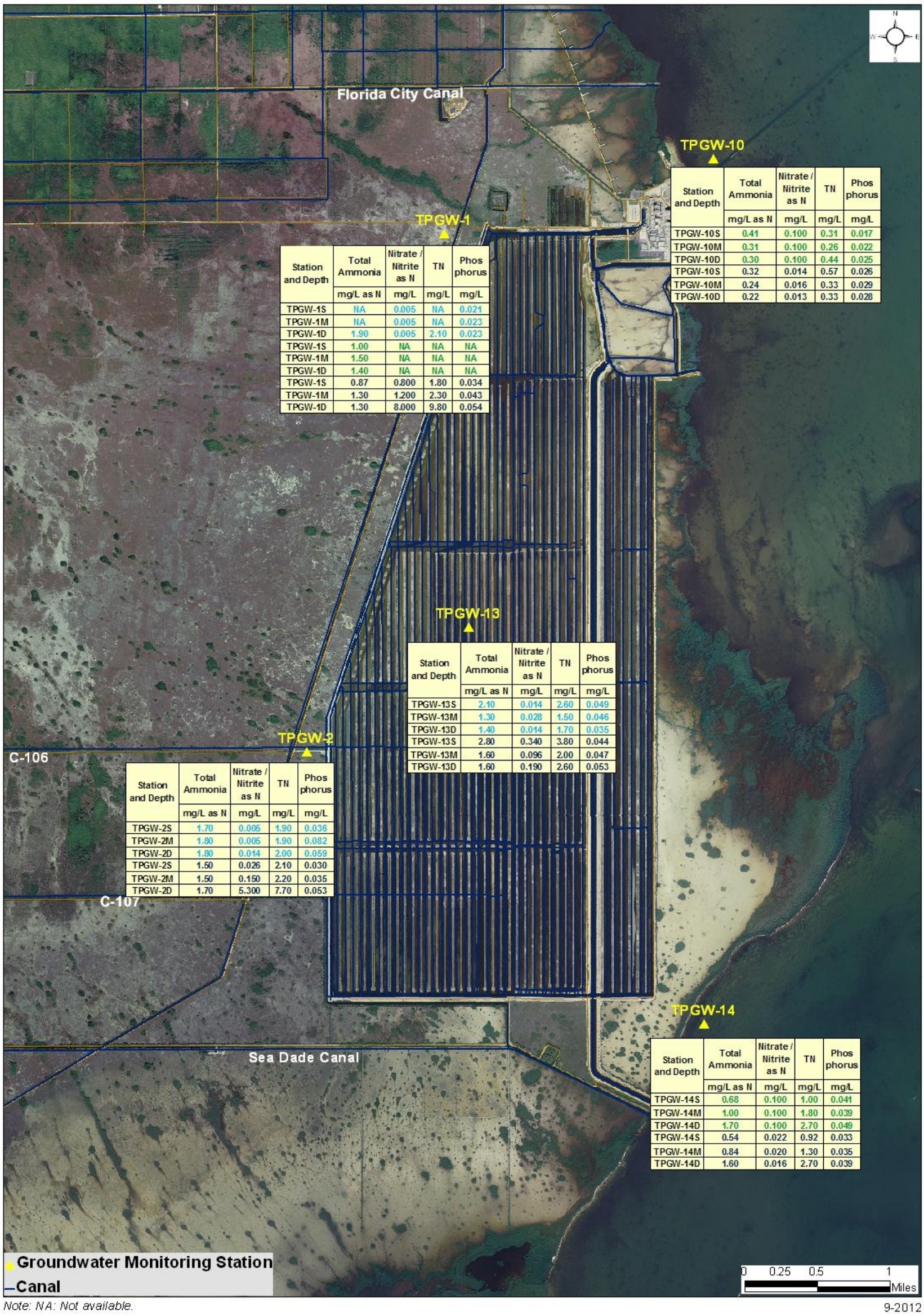


Figure 3.1-15. Cross Section C-C' Showing Quarterly Groundwater Tritium Concentrations from June/July 2010 through December 2011.



Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-1S	NA	0.005	NA	0.021
TPGW-1M	NA	0.005	NA	0.023
TPGW-1D	1.90	0.005	2.10	0.023
TPGW-1S	1.00	NA	NA	NA
TPGW-1M	1.50	NA	NA	NA
TPGW-1D	1.40	NA	NA	NA
TPGW-1S	0.87	0.800	1.80	0.034
TPGW-1M	1.30	1.200	2.30	0.043
TPGW-1D	1.30	8.000	9.80	0.054

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-10S	0.41	0.100	0.31	0.017
TPGW-10M	0.31	0.100	0.26	0.022
TPGW-10D	0.30	0.100	0.44	0.025
TPGW-10S	0.32	0.014	0.57	0.026
TPGW-10M	0.24	0.016	0.33	0.029
TPGW-10D	0.22	0.013	0.33	0.028

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-13S	2.10	0.014	2.60	0.049
TPGW-13M	1.30	0.028	1.50	0.046
TPGW-13D	1.40	0.014	1.70	0.035
TPGW-13S	2.80	0.340	3.80	0.044
TPGW-13M	1.60	0.096	2.00	0.047
TPGW-13D	1.60	0.190	2.60	0.053

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-2S	1.70	0.005	1.90	0.036
TPGW-2M	1.80	0.005	1.90	0.082
TPGW-2D	1.80	0.014	2.00	0.059
TPGW-2S	1.50	0.026	2.10	0.030
TPGW-2M	1.50	0.150	2.20	0.035
TPGW-2D	1.70	5.300	7.70	0.053

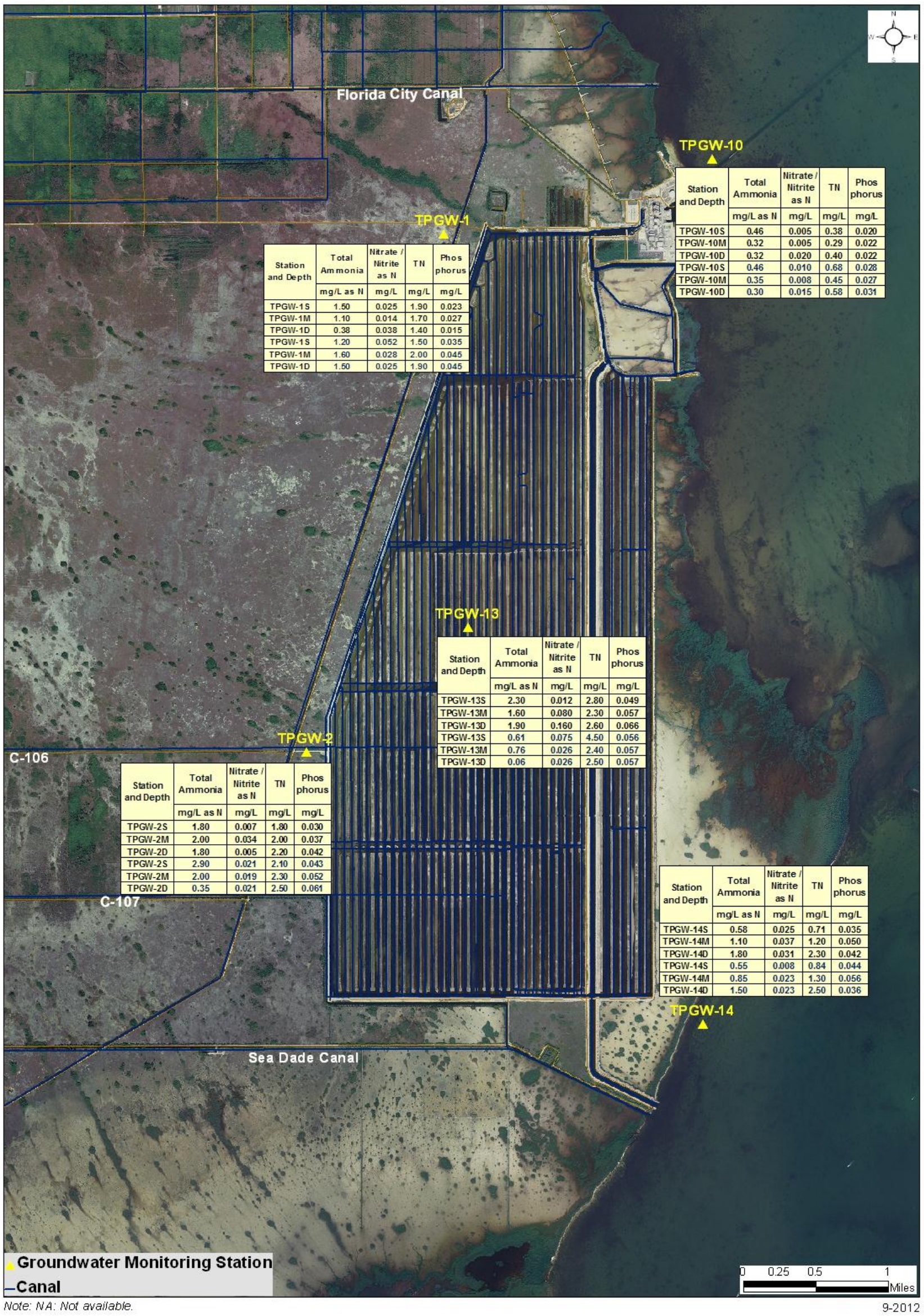
Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-14S	0.68	0.100	1.00	0.041
TPGW-14M	1.00	0.100	1.80	0.039
TPGW-14D	1.70	0.100	2.70	0.049
TPGW-14S	0.54	0.022	0.92	0.033
TPGW-14M	0.84	0.020	1.30	0.035
TPGW-14D	1.60	0.016	2.70	0.039

Note: NA: Not available.

9-2012

Nutrient Values for Groundwater Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep) in June and July 2010 (light blue), December 2010 (green), and March 2011 (dark blue).

Figure 3.1-16. Nutrient Concentrations in Groundwater June/July 2010, December 2010, and March 2011.



Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-1S	1.50	0.025	1.90	0.023
TPGW-1M	1.10	0.014	1.70	0.027
TPGW-1D	0.38	0.038	1.40	0.015
TPGW-1S	1.20	0.052	1.50	0.035
TPGW-1M	1.60	0.028	2.00	0.045
TPGW-1D	1.50	0.025	1.90	0.045

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-10S	0.46	0.005	0.38	0.020
TPGW-10M	0.32	0.005	0.29	0.022
TPGW-10D	0.32	0.020	0.40	0.022
TPGW-10S	0.46	0.010	0.68	0.028
TPGW-10M	0.35	0.008	0.45	0.027
TPGW-10D	0.30	0.015	0.58	0.031

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-13S	2.30	0.012	2.80	0.049
TPGW-13M	1.60	0.080	2.30	0.057
TPGW-13D	1.90	0.160	2.60	0.066
TPGW-13S	0.61	0.075	4.50	0.056
TPGW-13M	0.76	0.026	2.40	0.057
TPGW-13D	0.06	0.026	2.50	0.057

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-2S	1.80	0.007	1.80	0.030
TPGW-2M	2.00	0.034	2.00	0.037
TPGW-2D	1.80	0.005	2.20	0.042
TPGW-2S	2.90	0.021	2.10	0.043
TPGW-2M	2.00	0.019	2.30	0.052
TPGW-2D	0.35	0.021	2.50	0.061

Station and Depth	Total Ammonia	Nitrate / Nitrite as N	TN	Phos phorus
	mg/L as N	mg/L	mg/L	mg/L
TPGW-14S	0.58	0.025	0.71	0.035
TPGW-14M	1.10	0.037	1.20	0.050
TPGW-14D	1.80	0.031	2.30	0.042
TPGW-14S	0.55	0.008	0.84	0.044
TPGW-14M	0.85	0.023	1.30	0.056
TPGW-14D	1.50	0.023	2.50	0.036

Note: NA: Not available.

9-2012

Nutrient Values for Groundwater Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep) in September 2011 (black) and March 2012 (dark blue).

Figure 3.1-17. Nutrient Concentrations in Groundwater September 2011 and March 2012.



Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011; M-12: Mar 2012; J-12: Jun-2012.
2) NA: Not Available.

Chloride Samples Taken at T (top) and/or B (bottom)

Figure 3.2-1. Chloride Concentrations (mg/L) in Surface Water June 2010 through June 2012.



Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011; M-12: Mar 2012; J-12: Jun-2012.
2) NA: Not Available.

Sodium Samples Taken at T (top) and/or B (bottom)

Figure 3.2-2. Sodium Concentrations (mg/L) in Surface Water June 2010 through June 2012.



Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011; M-12: Mar 2012; J-12: Jun-2012.
2) NA: Not Available.

Specific Conductance Samples Taken at T (top) and/or B (bottom)

Figure 3.2-3. Specific Conductance (µS/cm) of Surface Water June 2010 through June 2012.

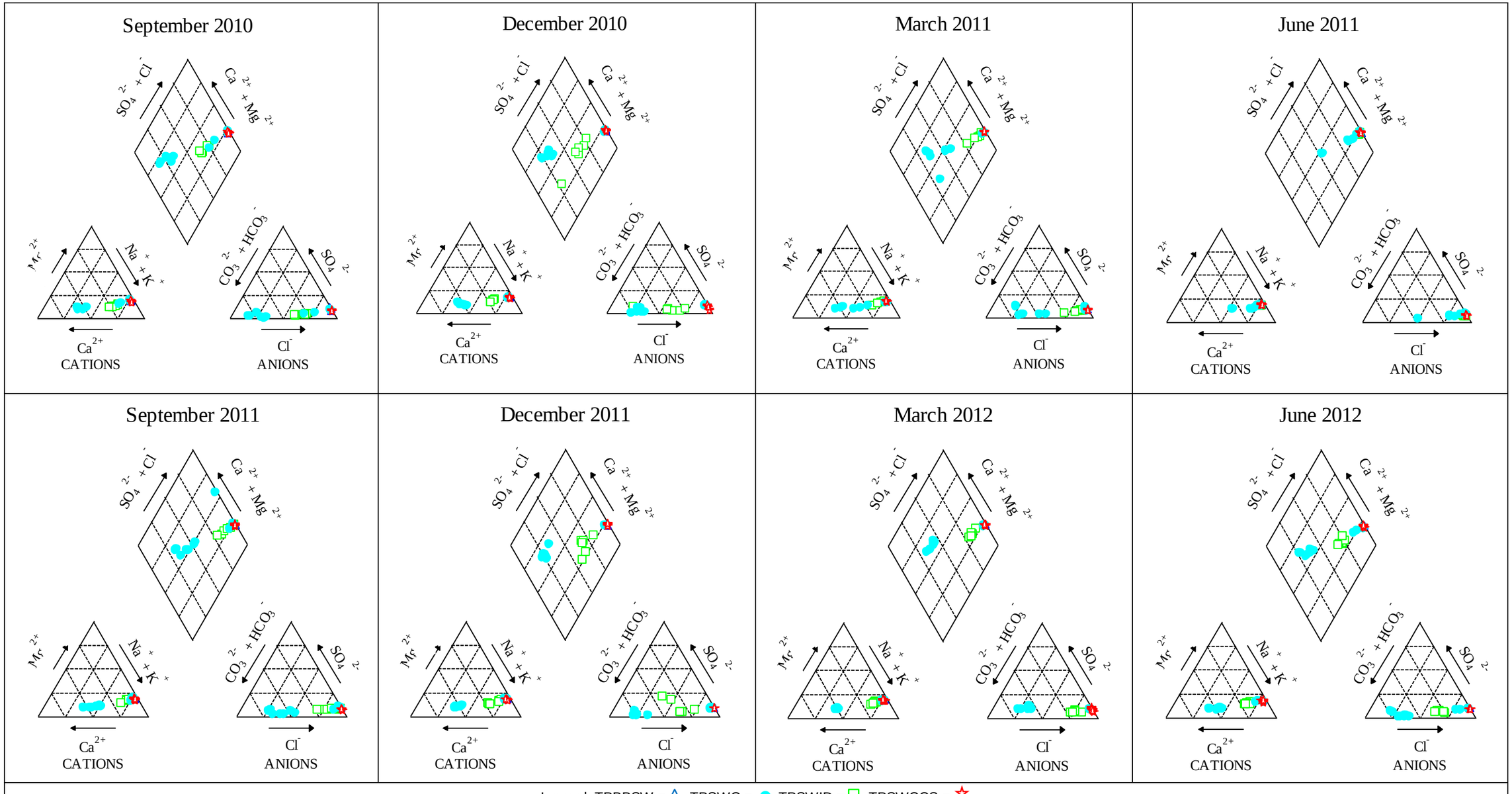
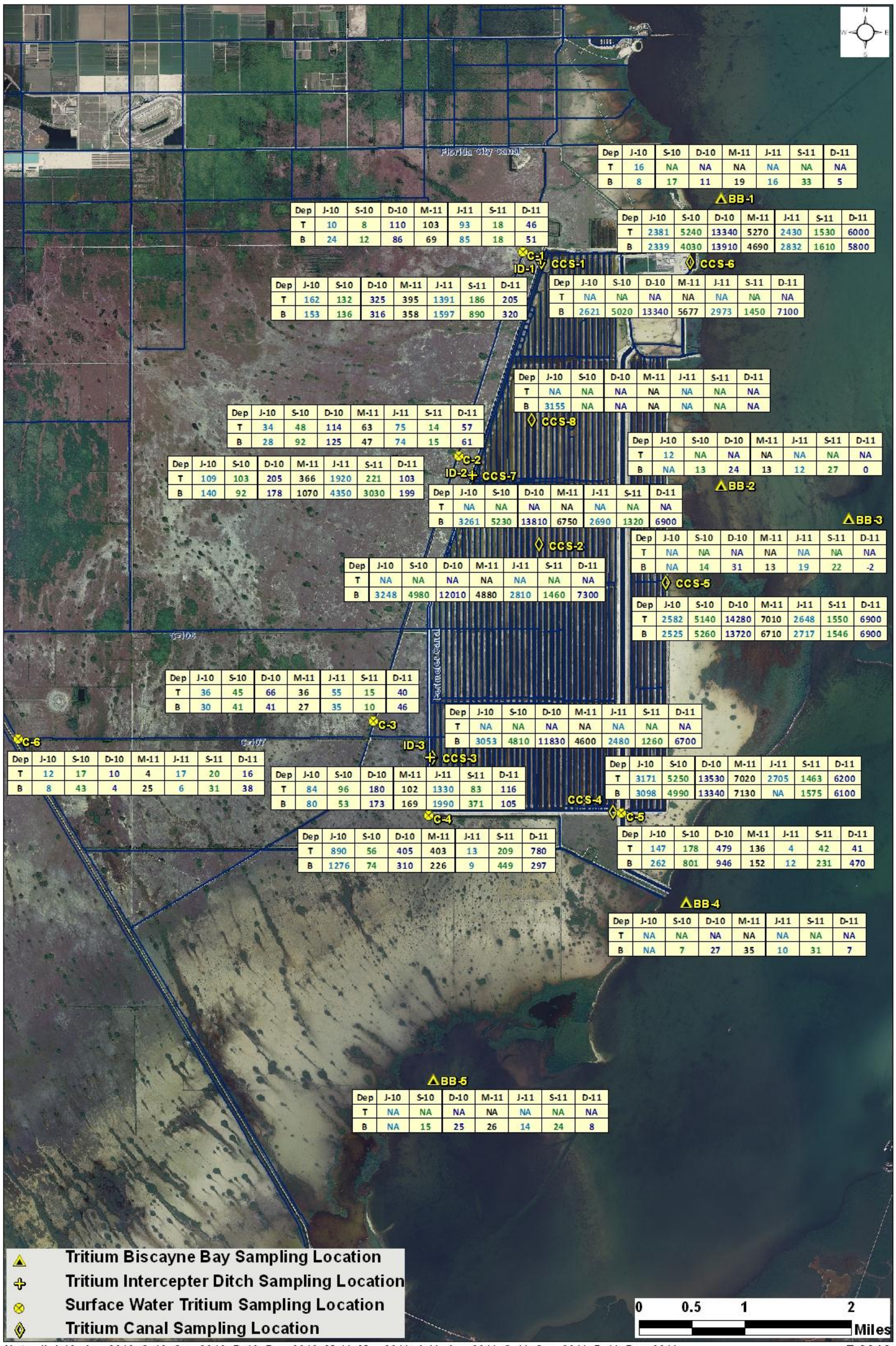


Figure 3.2-4. Tri-Linear Diagrams of Quarterly Surface Water Data.



Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	16	NA	NA	NA	NA	NA	NA
B	8	17	11	19	16	33	5

BB-1

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	10	8	110	103	93	18	46
B	24	12	86	69	85	18	51

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	2381	5240	13340	5270	2430	1530	6000
B	2339	4030	13910	4690	2832	1610	5800

CCS-6

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	162	132	325	395	1391	186	205
B	153	136	316	358	1597	890	320

CCS-1

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	2621	5020	13340	5677	2973	1450	7100

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	3155	NA	NA	NA	NA	NA	NA

CCS-8

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	34	48	114	63	75	14	57
B	28	92	125	47	74	15	61

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	12	NA	NA	NA	NA	NA	NA
B	NA	13	24	13	12	27	0

BB-2

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	109	103	205	366	1920	221	103
B	140	92	178	1070	4350	3030	199

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	3261	5230	13810	6750	2690	1320	6900

BB-3

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	NA	14	31	13	19	22	-2

CCS-2

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	3248	4980	12010	4880	2810	1460	7300

CCS-5

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	2582	5140	14280	7010	2648	1550	6900
B	2525	5260	13720	6710	2717	1546	6900

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	36	45	66	36	55	15	40
B	30	41	41	27	35	10	46

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	3053	4810	11830	4600	2480	1260	6700

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	12	17	10	4	17	20	16
B	8	43	4	25	6	31	38

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	84	96	180	102	1330	83	116
B	80	53	173	169	1990	371	105

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	3171	5250	13530	7020	2705	1463	6200
B	3098	4990	13340	7130	NA	1575	6100

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	890	56	405	403	13	209	780
B	1276	74	310	226	9	449	297

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	147	178	479	136	4	42	41
B	262	801	946	152	12	231	470

BB-4

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	NA	7	27	35	10	31	7

BB-5

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
T	NA	NA	NA	NA	NA	NA	NA
B	NA	15	25	26	14	24	8

Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011.
2) NA: Not Available.

7-2012

Tritium Samples Taken at T (top) and/or B (bottom)

Figure 3.2-5. Tritium Concentrations in Surface Water June 2010 through December 2011.

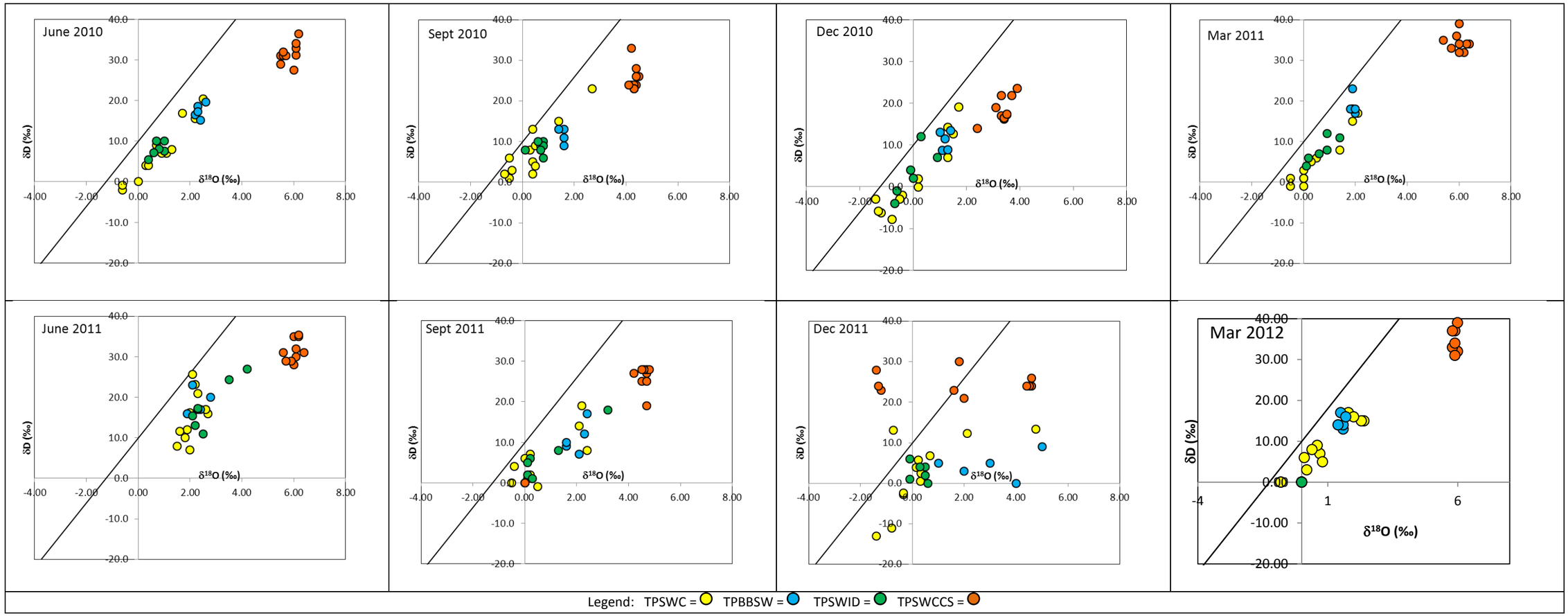
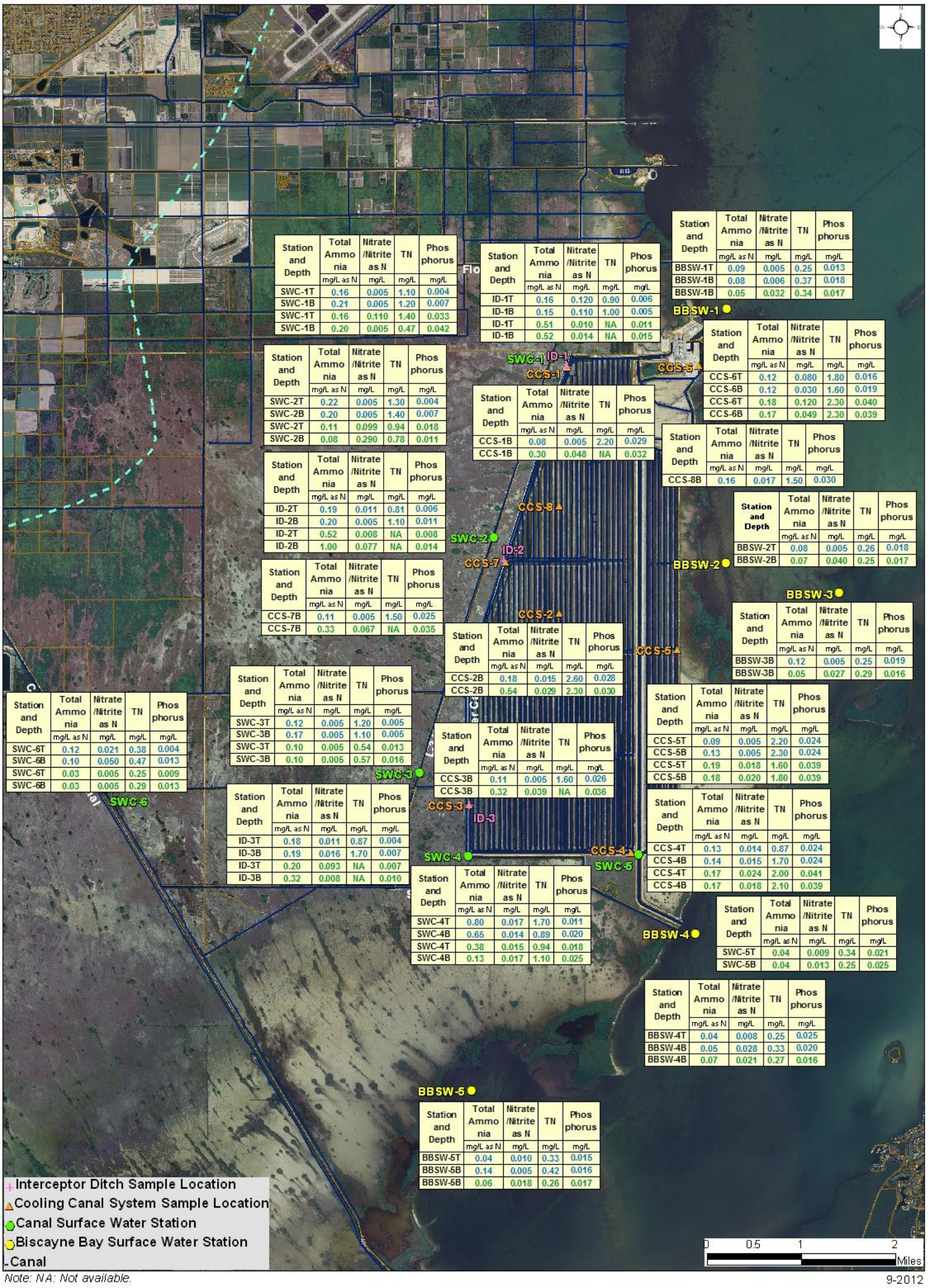


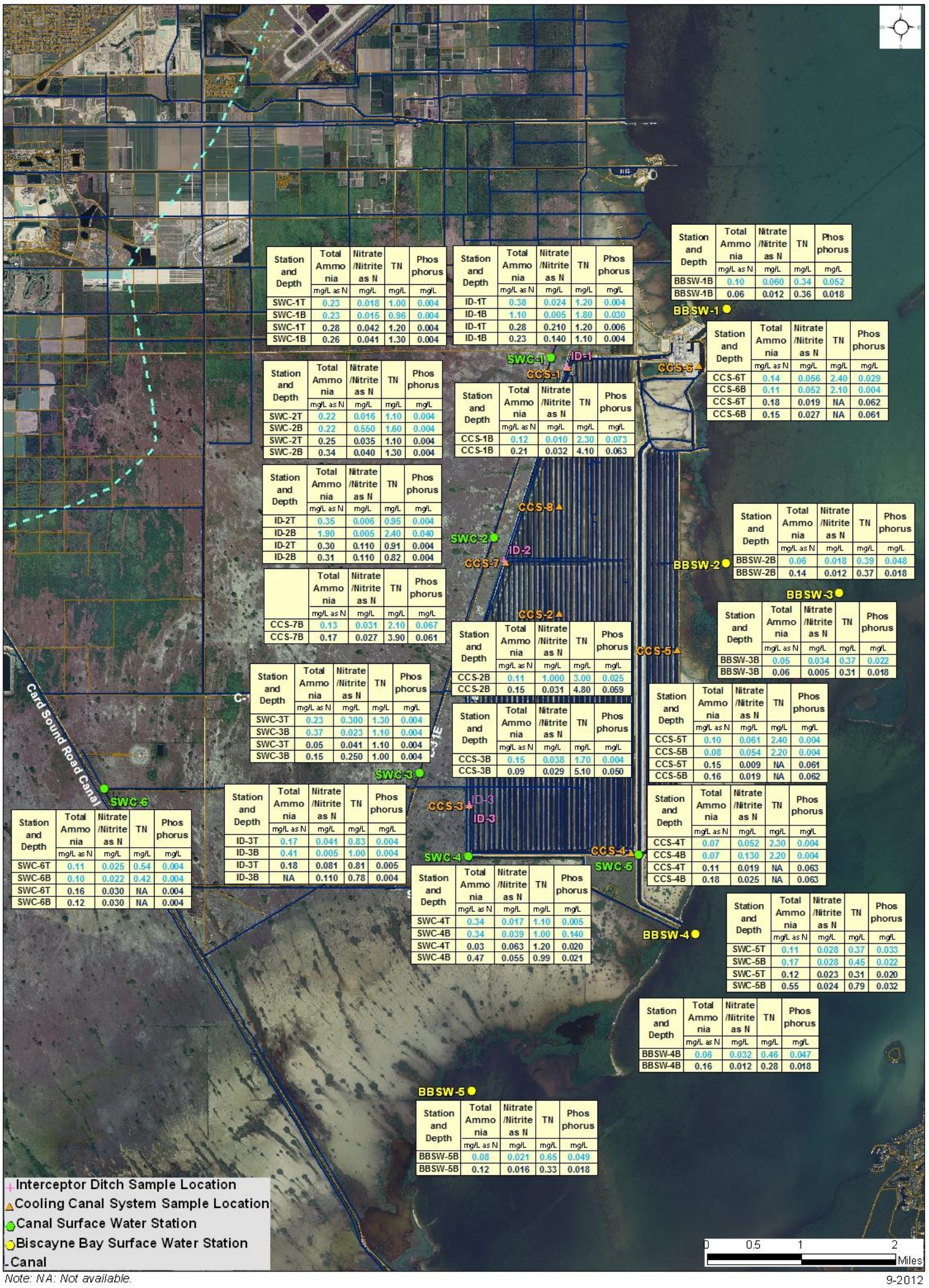
Figure 3.2-6. Surface Water Oxygen ($\delta^{18}O$) and Hydrogen ($\delta^{2}H$) Isotopes.



Note: NA: Not available.

Nutrient Values for Surface Water Samples Taken
at 2 depths (T: Top; B: Bottom) in June and July 2010 (blue), and March 2011 (green).

Figure 3.2-7. Nutrient Concentrations in Surface Water June/July 2010 and March 2011.



Nutrient Values for Surface Water Samples Taken
at 2 depths (T: Top; B: Bottom) in September 2011 (light blue), and March 2012 (dark blue).

Figure 3.2-8. Nutrient Concentrations in Surface Water September 2011 and March 2012

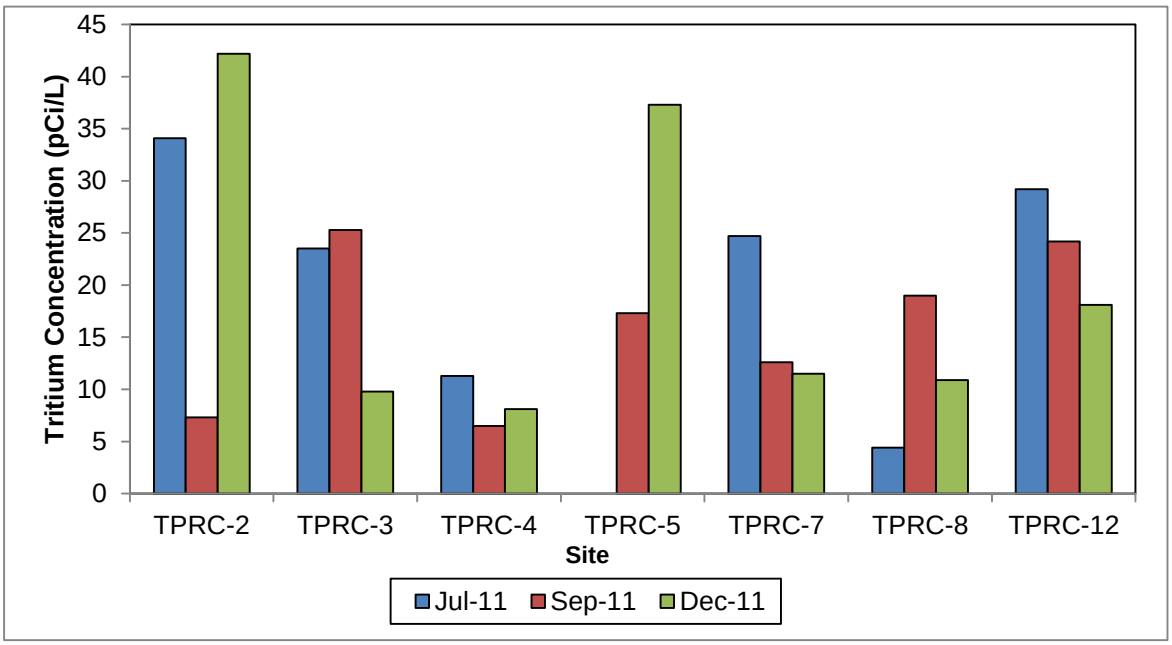


Figure 3.4-1. Tritium Concentrations (pCi/L) in Rainfall Collectors.

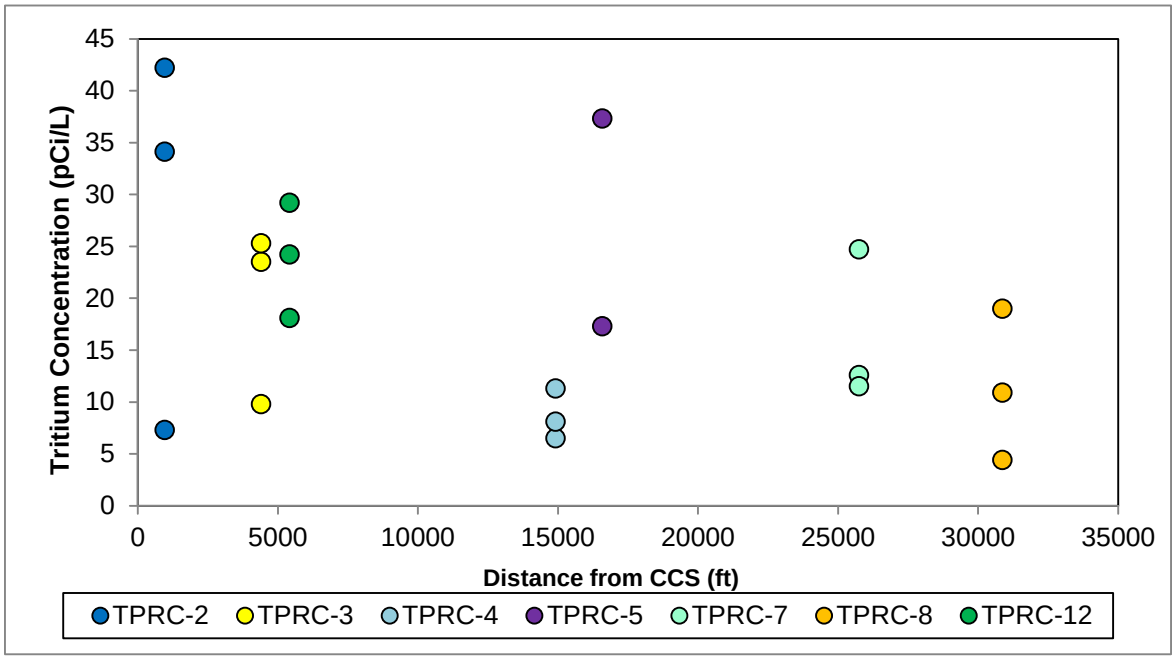


Figure 3.4-2. Tritium Concentrations (pCi/L) in Rainfall Compared to Distance from CCS.

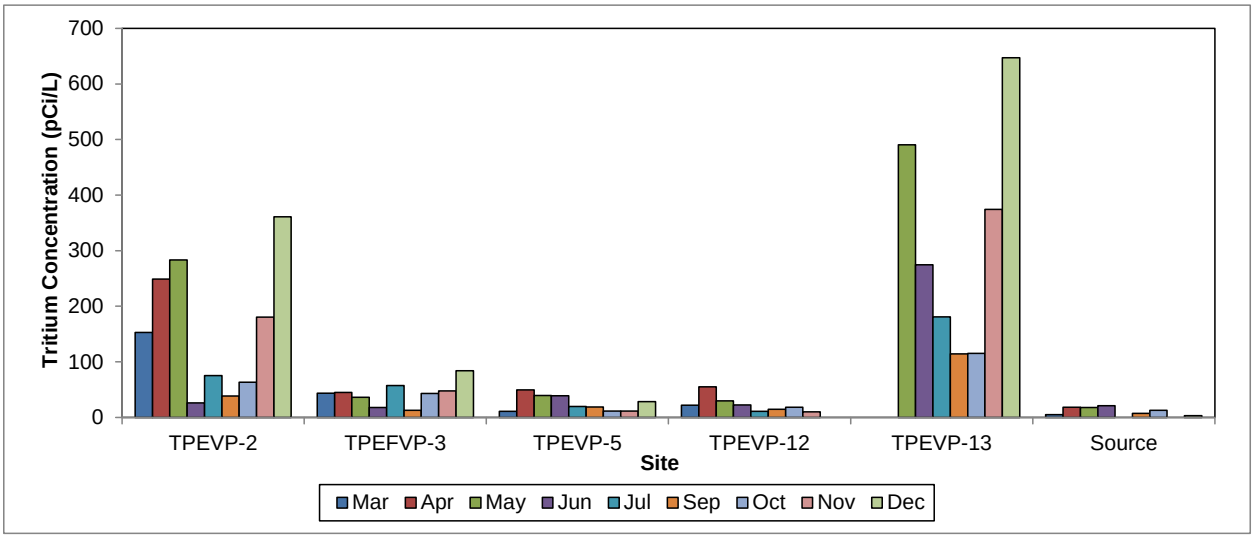


Figure 3.5-1. Tritium Concentrations (pCi/L) in Evaporation Pans in 2011.

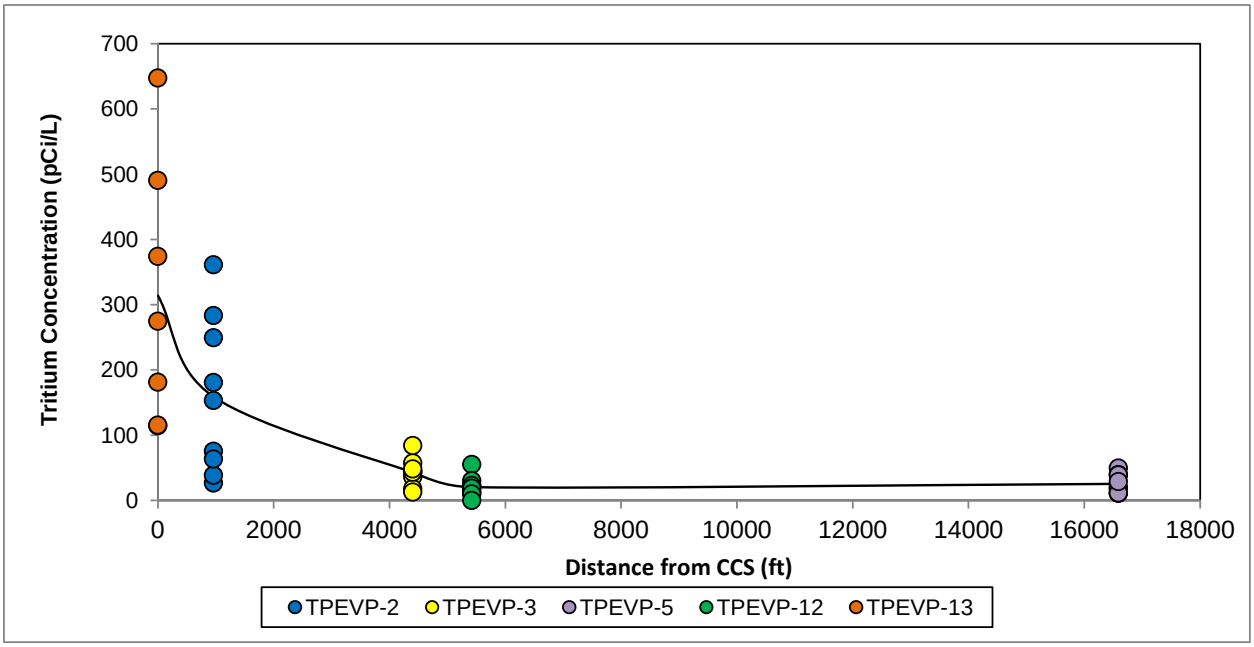


Figure 3.5-2. Tritium Concentrations (pCi/L) in Evaporation Pans Compared to Distance from CCS in 2011.

4. ECOLOGICAL MONITORING

The purpose of ecological monitoring was to identify existing baseline conditions and evaluate potential impacts, if any, as a result of the Uprate. Ecological monitoring was conducted to establish the current, pre-Uprate status of ecological conditions and biotic components, the extent to which, if any, CCS operations may impact conditions and components and the extent to which Uprate implementation may result in impacts and changes to these conditions and components. Biotic components of primary interest were marsh vegetation in adjacent wetlands, mangroves, submerged aquatic vegetation (SAV), and benthic fauna in Biscayne Bay.

4.1 Marsh, Mangroves, and Tree Islands

Per the Monitoring Plan (SFWMD 2009a), 12 transects were established to capture ecological characteristics and changes over time across the landscape surrounding the Turkey Point Plant (Figure 1.3-1). Originally, the design in the Monitoring Plan included the following: 32 20-meter (m) x 20-m (hereafter referred to as 20x20) plots, with 128 5-m x 5-m (hereafter referred to as 5x5) subplots and 128 1-m x 1-m (hereafter referred to as 1x1) subplots nested within, along six marsh and six mangrove transects. Twenty 20x20 plots were proposed in the marsh and 12 plots were proposed in the mangroves; of the 32 plots, six were proposed for the reference transects (four in the marsh and two within the mangroves).

In conjunction with Agency staff, changes to the sampling design were proposed and implemented in May 2010 where tree islands were included in lieu of one of the marsh plots from the F2, F3, F4 and F6 transects. Consequently, a total of 16 marsh, 4 tree island and 12 mangrove plots were monitored. These changes were reflected in the QAPP (FPL 2011c); transect locations are shown on Figure 1.3-1 while plot locations are shown on Figure 4.1-1.

4.1.1 Methods and Materials

Transects were set up in areas identified within the Monitoring Plan (SFWMD 2009a), but with consideration for on-the-ground practicality of access and minimization of impacts to the sensitive wetland habitats. Additional considerations included setting up in areas that would allow for accurate representation of the habitat without the data being impacted by natural (e.g., shoreline, fringe habitat, boundary impacts, recent fires) or anthropogenic (canals, levees, roads, all-terrain vehicle trails, etc.) influences. For example, care was taken to set up plots in the scrub mangroves that were at least 50 m from the tall fringe forest and from the shoreline. Marsh plots had to be situated greater than or equal to 50 m from the nearest levee and from tree islands that could potentially influence the marsh vegetation being measured.

Direction was provided by the Agencies to select islands near the end of each transect, approximately 1 kilometer (km) from the L31-E Canal. For example, the F3 tree island (F3-4)

had to be close to the end of the F3 transect. Each of the tree islands had to be large enough to fit a 20x20 plot with at least 10 to 15 m of forest on all sides to minimize boundary effects, had to be dominated by native plant populations, and had to have minimal impacts from recent fire or human disturbance. Most of the tree islands in the northern half of the Model Lands marsh had been impacted by fire that had extended into the center of these islands and, in some areas, had significantly decimated the canopy. In the southern half of the Model Lands marsh, where fire impacts were less, many of the islands had limited canopy cover due to the destruction of the canopy from the treatment and removal of invasive exotics such as Australian pine (*Casuarina* spp.), melaleuca (*Melaleuca quinquenervia*), and Old World climbing fern (*Lygodium microphyllum*). Islands with high numbers of non-native plants (e.g., Brazilian pepper [*Schinus terebinthifolius*] and shoebutton ardisia [*Ardisia elliptica*]) were also avoided.

Despite visiting all islands in the northern half of the Model Lands marsh located between 500 and 1,250 m from the end of the transect, no suitable island (i.e., no fire damage, not dominated by exotics, and large enough for the establishment of the 20x20 plot with sufficient boundary area around) was found near transect F2. An island closer to F3 was selected instead. The F3 tree island (F3-4) was, therefore, located south of the F3 transect to allow for sufficient distance (approximately 0.5 mile) between F2-4 and F3-4. No suitable tree islands near F4 were large enough to fit a 20x20 plot; instead, the eastern half of the F4-4 plot (subplots F4-4.1 and F4-4.4; 10 m by 20 m) was set up on one tree island, while the western half (10 m by 20 m) was set up on a nearby island. All islands selected and set up met with the approval of the Agencies.

One of the significant challenges of setting up in the tree islands was the prevalence of poison ivy (*Toxicodendron radicans*). Several of the biologists are severely allergic to this plant, while others have developed sensitivities due to repeated contact during the first three sampling events. Despite extra care and time spent avoiding direct contact with this plant, several biologists experienced severe reactions to poison ivy in May 2011. This represented a significant health issue and vegetation monitoring was discontinued (per the FPL and Agency meeting on June 10, 2011). However, porewater samples will continue to be collected from these sites.

All marsh and tree island plots were completely set up between October and November 2010, with the exception of transect M6 where access and land ownership issues resulted in having to reevaluate the locations of these plots. Potential plot locations were visited with RER staff in late November 2010, and new locations were identified for both M6 plots. In mid-January 2011, the RER approved a permit request for access and monitoring on Environmentally Endangered Lands, and plot setup of M6 occurred in March 2011. Work conducted to date is shown in Table 4.1-1.

Along each transect, either two or three 20x20 plots (depending on transect length) were set up within the marsh habitats. In the longer marsh transects (F2, F3, F4, and reference transect F6), three plots were set up in the marsh while the fourth plot was set up in a nearby tree island. In the shorter marsh transects (F1, F5, and mangrove transects M1 to M6), two 20x20 plots were set up. Plots were numbered 1 through 4, beginning with the plot closest to the CCS per the QAPP; the only exceptions were tree island plots which may not have been the farthest plot from the CCS. In the fall of 2010, each transect was visited by airboat, Argo (off-road track vehicle), or

on foot. Plots were set up at least 50 m from the end of the transect and, in the marsh transects, plots were set up 50 m, 500 m, and 1,000 m from the end of any anthropogenic structure such as a levy or road. The only exception to this was at transect F4 where the transect ended on RER property; the location of plot F4-3 was subsequently moved 950 m from the end of the L-31E Canal.

Each plot was divided into quadrants (NE, SE, SW, and NW). The 1x1 subplot was established in each quadrant to measure emergent herbaceous plants, and the 5x5 subplot was set up to measure woody plants. Both subplots were established in quadrants containing woody and herbaceous plants. Table 4.1-2 shows the community type of each plot and which subplots were established. Common and scientific names of plant species found during the monitoring effort are included in Appendix K.

The location of each subplot within the quadrant was determined by two randomly generated numbers. The numbers (generated in Microsoft [MS] Excel) represented the distance in meters to the west and south of the quadrant's northeast corner. For example, given the numbers 7 and 3 for a 1x1 subplot, the northeast corner of the subplot would be placed 7 m west and 3 m south of the quadrant's northeast corner (Figure 4.1-2). For a 5x5 subplot, a number between 1 and 4 was generated, where 1 designated placement in the northeast corner, 2 in the southeast corner, 3 in the southwest and 4 in the northwest. If 1x1 and 5x5 subplots overlapped, new random numbers were generated until a non-overlapping design was produced. Some subplots were shifted on site to avoid disturbances such as vehicle tracks.

To mark the corners of plots and subplots, 0.5-inch diameter galvanized pipes were inserted into the soil and the corners of each plot marked with fluorescent paint and/or flagging (Figure 4.1-3). Subplots were marked by tying string around the corner poles of each subplot to prevent accidental trampling. Once established, plots were photographed using a digital camera. Pictures were taken from the northeast corner facing southwest, as shown on Figure 4.1-4.

4.1.1.1 Vegetation Sampling

The 5x5 subplots were set up to capture changes in the woody species, and the 1x1 subplots were designed to measure changes within the herbaceous community. Percent cover was estimated quarterly for herbaceous plants (1x1 subplots) and semi-annually for woody plants (5x5 subplots). For herbaceous subplots, all individuals of the dominant and co-dominant herbaceous emergent plants were counted. These plots primarily consisted of sawgrass (*Cladium jamaicense*) and, in some plots during certain events, were co-dominant with spikerush (*Eleocharis cellulosa*) (Table 4.1-2); where present, saltgrass (*Distichlis spicata*) was the dominant herbaceous vegetation in the 1x1 subplots within the mangrove plots.

In the 1x1 plots, either 30% of the plants or 15 individuals (whichever value was greater) of the dominant species were tagged. Tagged plants were measured for the parameters needed to calculate biomass estimates. Parameters required for the biomass equations varied with species, but measurements included length, width, diameter at base, diameter at tip, and number of live leaves. Biomass estimates were subsequently used to calculate plot productivity and turnover in

grams per square meter (g/m^2). Measurements were recorded on field sheets and entered into a MS Access database. In addition to measurements, notes were taken to document significant observations. For example, live love-vine (*Cassytha filiformis*), a parasitic plant, was periodically found growing on sawgrass leaves. Its presence was noted when growing on live leaves of tagged plants.

For the woody species, three trees were tagged in each 5x5 subplot and up to six branches per tree were tagged. Only dominant species were individually measured. Tree selection was based on the dominance of each species, and individuals of a species were chosen based on which general tree sizes represented the highest percentages of biomass in the subplot. For example, if 60% of the coverage of red mangrove (*Rhizophora mangle)* in a subplot was made up of small trees and 40% of the subplot was made up of large trees, two small trees and one large tree were tagged. Height, canopy width and length, and depth (white mangrove [*Laguncularia racemosa*] only), main stem diameter, and number of branches were recorded for each tagged tree to obtain tree biomass based on published allometric equations. Leaf, flower, and fruit count were recorded on each tagged branch to determine plant productivity, biomass turnover and loss.

Leaves were collected outside of all plots and were analyzed for wet mass, dry mass, surface area, and nutrient data semi-annually. Three mature leaves, stems, or culms of each dominant species were collected to represent each subplot (minimum of 12 plants or leaves per plot). For non-broadleaf plants, stems or culms were first measured for length (all species) and diameter (sawgrass and spikerush) using plastic calipers, and then harvested just above soil level. As with herbaceous plants, broadleaf samples were collected from outside the plot near each subplot and wet mass was obtained. For sawgrass, the length and base width of the second mature leaf were measured as an index of sclerophylly (leaf hardness or toughness).

Plant samples were collected from no more than 5 m outside the plot, near the respective subplot. For broadleaf plants (e.g., red mangrove, button wood [*Conocarpus erectus*]) the second mature leaf was pulled from a stem. Leaves were kept moist, cool, and away from light before processing. Individual leaves were measured for wet mass and scanned alongside a ruler for analysis in ImageJ (v. 1.44u, National Institutes of Health). ImageJ is an open-source program that calculates an area based on user defined pixel-based scale and area for measurement (e.g., the margin of a leaf; Figure 4.1-5). Petioles of the broadleaf plants extending from the leaf bases were not included in leaf surface area measurements. All plant material was then dried in an oven at $\leq 65°C$ for a minimum of one week before dry mass was measured. Dried leaves and the second mature leaf of the sawgrass leaf were sent for nutrient analysis. The main vein on all broadleaf plants was removed prior to being sent to the laboratory. Dried leaf mass was then divided by leaf area to obtain specific leaf area, which is an index of leaf thickness and an indicator of leaf sclerophylly. In most cases, the thicker a leaf is, the greater the impact a stressor (e.g., nutrients, hydrology, salinity [Feller 1995]) will have on plant growth.

Live and total sawgrass biomass was determined for all quarters, with the exception of February 2011 when the number of culms was not counted. The biomass equation was determined from regression equations derived from bi-annual collections of sawgrass from around each plot. These bi-annual collections represented the wet (November 2011 collection) and dry (May 2011)

seasons. Twelve individual culms were selected from the outside of each plot; for each culm, diameter at base, length of longest leaf, and leaf numbers were determined. These individuals were then harvested, separated into live and dead biomass, and dried at 60 °C.

The field parameters and dried biomass from these bi-annual collections were then used to generate biomass regression equations based on field parameters for each of the seasons. Over 150 plants were used to generate the regression equation for each season. These season-specific equations were then used to calculate biomass for that quarter as well as the preceding sample (i.e., wet season November 2011 collections were used to determine biomass for August and November 2011). Live standing crop per m^2 was calculated for each subplot by multiplying the average biomass of the measured individuals by the number of individuals in the subplot. Total and live sawgrass biomass is presented in g/m^2.

Results of the annual productivity calculations are presented in this report, including total biomass for sawgrass and red mangrove, and mangrove leaf turnover. Red mangrove biomass was calculated using the phenometric equation found in Coronado-Molina et al. (2004). Percent cover was used to determine the total biomass and stand productivity per m^2. A more detailed discussion of the methods used to calculate productivity and biomass for each species is presented in Appendix L.

4.1.1.2 Porewater Sampling

Porewater was sampled concurrent with vegetation measurements each quarter (October/ November 2010; February, May, August, and November 2011; and February and May 2012); field specific conductance and temperature were recorded at 0, 30, and 60 centimeters (cm), and additional samples were collected at 30 cm for nutrient and Tracer Suite analyses (per the Monitoring Plan [SFWMD 2009a]).

Field porewater specific conductance and temperature readings were measured from the northeast 1x1 and 5x5 subplots. The method to collect porewater for field porewater assessment is detailed in Appendix A of the QAPP (FPL 2011c). In brief, porewater was extracted using a hollow, 36-inch-long, 0.25-inch-diameter, stainless steel porewater sipper (PushPoint Sampler PPX36, M.H.E. Products, East Tawas, Michigan) connected to Tygon® tubing and a 60-milliliter (mL) syringe. An aliquot (15 to 35 mL) of porewater was collected in a 50-mL centrifuge tube and measured using a hand-held conductance/temperature sensor connected to a hand-held console (AT100 probe, Rugged Reader console, In-Situ Inc., Fort Collins, Colorado). The AT100 sensors were submerged into the porewater sample and readings were allowed to stabilize (usually one to two minutes) before specific conductance and temperature values were recorded onto a field datasheet. Porewater was collected at the surface, and at 30 and 60 cm depths. Porewater characteristics (turbidity, color, odor, etc.) were also noted on the field datasheet. Samples were discarded after measurements were collected.

Nutrient and Tracer Suite samples were collected using a peristaltic pump (SP100, Global Water Instrumentation Inc., Gold River, California) with polyethylene and silicon tubing, as the nutrient and tracer analyses required significantly more volume (i.e., approximately 1,200 mL compared

to less than 50 mL for the field measurements). Upon arrival at a site, the peristaltic pump was placed on a foldable stool (which kept the setup above water) and connected to the PushPoint Sampler inserted within the boundary of the 1x1 subplot. Water was pumped for several seconds prior to collection to clear excess sediment from the tubing, and specific conductance and temperature readings were made. For the nutrient and Tracer Suite analysis, a 500- to 850-mL porewater sample was collected in a pre-cleaned 1-liter sample bottle from the 1x1 subplot at a 30-cm depth interval. The porewater from the 5x5 subplot at a 30-cm depth interval was collected in another 1-liter sample bottle. These two samples were composited by pouring the samples back and forth at least six times. When sampling nutrients, a pH reading was made using a pH meter (Extech© PH220, FLIR Systems, Waltham, Massachusetts) and was recorded on the field datasheets. The pH value is used to calculate Ammonia, and is therefore only recorded during nutrient sampling events. The sample bottles were labeled with the site name, date, initial pump start time, and the initials of the field crew per the QAPP (FPL 2011c). Pump start and stop times were recorded in the field data book. A new or field-cleaned (per FDEP protocols) porewater sipper was used at each site.

The composite sample was distributed into the sample bottles using the same tubing and pump used for sample collection. Once distributed, the sample bottles were sealed with parafilm to protect from water loss and put on ice (if necessary) or in sealed plastic bags (for samples not needing refrigeration) and were stored for laboratory analysis. Water levels were marked on each sample bottle to help the lab determine whether or not sample water was lost during transport. The porewater sipper was cleaned with a Liquinox solution, and rinsed with tap water and analyte-free water.

4.1.1.3 Aerial Survey

Aerial survey of the marsh plots was conducted on April 20, 2011, per the Monitoring Plan (Section 2.8). An FPL professional photographer took aerial plan-view photographs of each marsh plot from approximately 500 ft above ground. The camera was maintained level while the helicopter hovered over the plot.

The digital photographs from the event were saved as .jpg files and analyzed using ArcGIS® software to determine the herbaceous and woody percent vegetative cover within each 20x20 plot area (Figure 4.1-6). For each photograph, a supervised classification (Spatial Analyst module, ArcGIS v. 10 © 2010 ESRI®) was used to manually isolate and identify pixel contrast between the following set of classes (where applicable): Live sawgrass, live mangrove, dead biomass, periphyton, and open space. Once classified, the pixel values were clustered into similar reflectance groups using a maximum likelihood classification (MLC) equation. The MLC equation calculates the probability of a pixel belonging to each of a predefined set of classes, and the pixel is then assigned to the class for which the probability is the highest (Tso and Mather 2001). Each classified group was generated on a map based on the MLC analysis. Percent coverage of the live dominant vegetative species was calculated by dividing the count values of the live biomass class by the total count value of the plot.

The intent of this aerial survey effort of the marsh was to compare the results observed from field measurements; results from the analysis were compared to the coverage estimates documented by field crews in October 2010 as a quality assurance check.

4.1.1.4 Soil Sampling

Soil cores were initially collected in November and December 2010. Wet bulk density, soil total carbon (TC), total nitrogen (TN), and total phosphorus (TP) were reported; however, soil dry bulk density was not reported and new soil samples were collected again in November 2011 for dry and wet bulk density analyses (per the National Environmental Laboratory Accreditation Conference [NELAC] certified ASA-13 method).

Two soil cores were collected from outside each plot (one each from outside the northeast 1x1 and 5x5 subplots) using 3-inch-diameter, clear, acrylic tubes (Figure 4.1-7). Each sample was at least 30 cm long and had less than 10% allowable compression rate; soil compression was determined by comparing the length of the core to the depth of the core hole. Samples were stored vertically for transport back to the laboratory where each core was cut into 10-cm pieces (0- to 10-, 10- to 20-, and 20- to 30-cm); pieces in excess of 30 cm depth were discarded. Notes were taken about each of the samples, after which a composite sample was made by combining two cores from each plot. All cores were refrigerated and sent to a laboratory to be analyzed for wet and dry bulk density. Results of soil nutrient analyses performed during the first sampling event in 2010 are available in the August 2011 Annual Report (FPL 2011b) and the November 2011 results are discussed below.

4.1.1.5 Statistical Analysis

Differences among sites were examined statistically using either Statistix (v. 9.0, Analytical Software, Tallahassee, FL) or PASW Statistics (v. 17.0.2, IBM, Armonk, NY). Data were examined to determine if there were differences among locations, with distance from the CCS and with seasons. Due to the small sample size, data were assessed in separate ANOVAs; ANOVAs were used as they have been shown to be fairly robust to handling small sample sizes and non-normally distributed data. Consequently, the level of significance had to be Bonferroni-corrected by the number of analyses on each dataset. If two analyses were conducted on the dataset, the level of significance was $P < 0.05/2$ i.e., $P < 0.025$. Data that were significant were subsequently analyzed using post-hoc Bonferroni pair-wise comparisons test to identify these differences.

4.1.2 Results and Discussion

4.1.2.1 Community Description

The key vegetation communities in each of the general habitats are shown in Table 4.1-2. Not all 5x5 subplots had woody species; similarly, not all 1x1 subplots had herbaceous species. Therefore, a total of 68 5x5 subplots and 72 1x1 subplots were visited and measured each quarter.

Transects F2, F3, F4, and F6 were freshwater marsh transects dominated by sawgrass and some spikerush, although scrub woody species were periodically encountered. Although the F1 transect was designated as freshwater habitat, mangroves were present in both plots along this transect. F5 was primarily a mangrove plot, dominated by needlegrass rush (*Juncus roemerianus*), saltgrass, red mangrove, and white mangrove. Dense periphyton mats were observed in between the vegetation in the F2, F3, F4, and F6 plots, but were not present in either F1 or F5. Periphyton are present only in non-saline conditions and generally thrive in high-light, low-nutrient, flooded marsh areas. All trees in the M transects were scrub mangroves, dominated mostly by the red mangrove (Table 4.1-2). Dominant species have not changed since the August 2011 sampling event.

The Shannon-Wiener Index of Diversity (SWI) and species evenness were calculated from the 1x1 and 5x5 subplots located in the northeast corner. Nine total species of woody and herbaceous plants were documented in the northeast corners of the marsh subplots during the August 2011 sampling event. In the freshwater marsh-mangrove F plots, red mangrove and sawgrass were the two species present. In the mangrove plots, red mangrove was the most prevalent species (Table 4.1-3). Diversity ranged from one to three species within a plot and from one to five species when comparing transects (Table 4.1-4).

The SWI is a measure of the probability that a randomly sampled individual will be of a particular species. For instance, an SWI value of 0 indicates that there is only one species present with no uncertainty as to what species a randomly sampled individual will be. Values can range from 0 to 4.5 but, in the transects measured, SWI was low and all but one transect (F5) had SWI values <1. In the marsh plots, diversity was lowest in the F4 plots (SWI = 0), as all plots along the transect were dominated by a single species, sawgrass. Overall, the relatively low SWI values indicate low species diversity and low abundance of non-dominant species (i.e., most plots are dominated by sawgrass, with spikerush sparsely present). Diversity was highest in the marsh transect F3 (SWI = 0.762), as this transect had four species recorded across all plots. Diversity was also low in the mangrove plots; the mangrove sites were dominated by red mangrove with white and black mangrove sparsely present. M5 was the most diverse mangrove plot with three species (Table 4.1-3). The highest diversity community was the marsh-mangrove mix which had three (F1) and five (F5) species along those transects. F5 was the most diverse transect, as it was composed of a mix of woody and non-woody species within the different plots.

Species evenness is a measure of how evenly distributed (numerically) each species is at a site. A species evenness of 1 means an equal number of individuals of each species is present. The low evenness values of the mangrove plots indicate one highly dominant species (red mangrove) with other species sparsely intermixed. Higher evenness values for some of the marsh plots show that at plots such as F1-1, F3-1, and F5-2, most species present are well-represented. Species evenness cannot be calculated when only one species is present in a plot. The mangrove plots had the lowest species evenness, followed by the marsh and marsh-mangrove mix communities (Table 4.1-4). Species evenness was lowest in M4 (0.013), followed by M2

(0.020). The marsh plots F2, F3, and F4 had similar evenness values ranging from 0.609 to 0.694. The most diverse transect, F5, also had the highest value of species evenness, 0.715.

4.1.2.2 Freshwater Marsh Vegetation Sampling

Sawgrass was the primary herbaceous species measured in the marsh plots; therefore, to focus on landscape trends, discussion of the herbaceous vegetation is limited to sawgrass. Sawgrass cover was consistently ≤25%, and average vegetation height for each sampling event never exceeded 1.0 m (Tables 4.1-5 and 4.1-6, respectively). These vegetation patterns are consistent with the "sparse sawgrass" community commonly observed in Florida (Olmsted and Armentano 1997).

Sawgrass percent cover values are reported as percentage categories per the approved December 2011 QAPP (Table 4.1-5; FPL 2011c). Most percent cover values fell within the 6% to 25% range during the first three sampling events, with the remaining sites in the 2% to 5% range, while the opposite was true during the August 2011 through May 2012 events (Table 4.1-5). Despite the general decline, the densest sawgrass plots, F4-1 and F2-1, have remained consistently in the 6% to 25% range throughout the study.

Sawgrass height varied significantly by site, with F4-1 and F1-2 being the tallest plots and F3-1 being the shortest, but overall the patterns were not related to distance from the CCS (One-way ANOVA, $F_{13, 5976} = 219.42$, $P < 0.01$); Figures 4.1-8 and 4.1-9). No seasonal growing patterns were observed; instead, sawgrass height appears to consistently decrease with each sampling event (Table 4.1-6 and Figure 4.1-8). The reason for this decline is unclear as other parameters that are related to height (porewater nutrients, live and total biomass) do not reflect the same trend. Notably, although the field crews take as much care and precaution as possible not to damage the vegetation, anthropogenic factors related to repeated sampling of the same plants over time (specifically leaf breakage) could cause the decrease. To test for the effects of distance from the CCS on sawgrass height, the data from each close (Fx-1), mid (Fx-2) and far (Fx-3) plot were grouped and compared to one another and to the reference transect F6 with a one-way ANOVA (Figure 4.1-9). The results show that, starting in May 2011, the sites closest to the CCS had significantly taller sawgrass than the mid and far plots ($P < 0.007$). Reference transect F6 had the lowest average sawgrass height.

Both live and total sawgrass biomass were calculated using the eight equations presented in Table 4.1-7. These equations were derived from semi-annual plant harvests conducted in accordance with this project. Both live and total biomass follow the same general patterns across the landscape, with F4-1 and F1-2 having the highest values and F3-1 the lowest (Figures 4.1-10 and 4.1-11). The seasonal trends, however, show that live biomass generally fluctuates every three months, while total biomass increased during the first three to four events and then declined through May 2012 (Tables 4.1-8 and 4.1-9). Because total biomass includes both live and dead material, these values are affected by how many tagged plants die and are replaced during an event. Each plant will accrue dead biomass as it ages and is usually replaced with a new, smaller plant with less dead biomass when it dies. A drought caused an artificial drop in total biomass after May 2011 when the turnover of the tagged plants increased. Because the trends in total biomass were artificially affected in this way, statistical analyses are focused on live biomass that

appears to follow more consistent seasonal patterns and is less affected by plant mortality. Plots located closer to the CCS have higher average live biomass than plots farther from the CCS during all events, with a statistically significant difference present in February 2012 ($P < 0.008$; Figure 4.1-12). Reference transect F6 had the lowest live and total biomass during all seasons except August 2011. Because the plots closest to the CCS have greater biomass and height than those farther away, water from the CCS does not appear to cause stress to the plants near the canal. The Model Lands Marsh adjacent to the Turkey Point plant has similar hydrology and community composition as the C-111 Basin and Taylor Slough (Childers et al. 2006). Although the Model Lands is smaller in size than either the C-111 or Taylor Slough, these landscapes are very similarly characterized by sawgrass marshes, tree islands and hydrology driven by rain, canal overflow and surface water runoff (Childers et al. 2006). Historic live biomass data at study sites in the C-111 Basin and Taylor Slough (located west of the study area) generally range from 100 to 300 g/m^2 annually (Childers et al. 2006). From one year of data for this study, live biomass at 10 of the 14 sawgrass plots was less than 100 g/m^2, including all three plots along reference transect F6. None of the sawgrass plots exceeded 300 g/m^2 (Table 4.1-9).

Only one full year of leaf productivity data could be calculated for this report (Table 4.1-10). Annual Net Primary Productivity (ANPP) was not statistically different with distance from the CCS or compared to reference transect F6 (Figure 4.1-13). However, a notable trend is that sites closest to the CCS are significantly more productive than more distant sites, indicating that proximity to the CCS is not inducing any negative productivity impacts. Annual mean productivity from the C-111 Basin typically ranges from about 200 to 500 g/m^2, while mean productivity at Taylor Slough was typically less than 300 g/m^2. The values from this study, however, are consistent with the values observed at Taylor River Slough.

Sclerophylly is a measure of leaf hardness or toughness that reflects climate and nutrient conditions. Low sclerophylly values represent more ideal growing conditions compared to high sclerophylly values. Sclerophylly of sawgrass was consistently lower in October 2010 and November 2011 than in May 2011 and 2012, with the exception of sites F1-1, F4-1, F6-2, and F6-3 (Table 4.1-11, Figure 4.1-14). This is expected since October is the end of the growing season and the conditions throughout the wet season are less stressful for plants compared to the May measurements at the end of the dry season. Sclerophylly did not significantly differ with distance from the CCS or in comparison to reference transect F6 ($P > 0.012$), (Figure 4.1-15).

Soil bulk density and nutrients for all sites are presented in Tables 4.1-12 and 4.1-13, respectively. Dry bulk density values were lowest in the tree islands, ranging from 0.13 g/cm^3 at F3 to 0.21 g/cm^3 at F6; these low values are indicative of a highly organic substrate. N:P molar ratios show that the tree islands are N-limited unlike most of the marsh sites, which, with the exceptions of F4-1 and F6-2, are P-limited. The vegetation growth and composition of a P-limited system are more influenced by phosphorous availability than any other nutrient. As a result, sawgrass live biomass is highly correlated with soil phosphorous ($r = 0.6306$, $P < 0.05$; Figure 4.1-16). Bulk density showed no significant relationship with sawgrass biomass ($r = -0.0454$, $P > 0.10$), although the two plots with the highest live biomass, F4-1 and F1-2, had noticeably lower bulk densities relative to the rest of the marsh. The high productivity at these sites is likely driven by the combination of low soil bulk density and high soil phosphorous.

A summary of sawgrass leaf nutrients and stable isotopes is presented in Tables 4.1-14 through 4.1-20. C3 photosynthetic plants (e.g., sawgrass) can have carbon isotope values between -34‰ and -22‰ (Smith and Epstein, 1971), where -22‰ is representative of plants from desert conditions and -34‰ is indicative of tropical rainforest vegetation (Kohn 2010). A recent publication by Chang et al. (2009) found that carbon isotopes from sawgrass in the Loxahatchee National Wildlife Refuge (LNWR) ranged from -30.1‰ to -24.5‰. The average range of carbon isotopes from sawgrass collected in accordance with this project ranged from -28.28‰ to -24.28‰, within range of the plant community in the LNWR. The nitrogen isotopes found in sawgrass from the LNWR ranged from -5.3‰ to 7.7‰ while sawgrass adjacent to Turkey Point ranged from -5.88‰ to 2.44‰ on average. The molar ratio of C:N never fell below 47:1 which is representative of mature plants with high lignin content (Table 4.1-19). Terrestrial environments are considered nitrogen-limited when the N:P ratio is below 14 and phosphorous-limited when the N:P ratio is above 16. All N:P ratios were well above 16, indicating a P-limited system (Table 4.1-20).

Porewater specific conductance was significantly different between sites averaged across all sampling events (One-way ANOVA, $F_{17, 229} = 71.46$, $P < 0.01$), where F1-1 had the highest average (3,501.8 µS/cm) and F3-4 the lowest (596.0 µS/cm; Table 4.1-21). Because F5-1 and F5-2 are not representative of a freshwater marsh (these sites are brackish marshes dominated by woody vegetation), they were omitted from this analysis and are included in the mangrove porewater analysis. There were no significant differences in specific conductance with distance from the CCS ($P > 0.007$; Figure 4.1-17).

Porewater temperature did not significantly differ among sites averaged across all sampling events (One-way ANOVA, $F_{17, 229} = 1.19$, $P > 0.10$), although F3-2 had the highest average temperature (27.2°C) and F6-4 had the lowest (24.8°C). Notably, the four tree island plots (F2-4, F3-4, F4-4, and F6-4) had the lowest temperatures of all the sites. Temperature changed significantly with distance from the CCS during the May 2011 and May 2012 sampling events ($P < 0.007$), but the trends were inconsistent (i.e., May 2011 porewater temperature was lower along the reference transect and in May 2012 temperature decreased with distance from the CCS; Figure 4.1-18). The tree islands had significantly lower temperatures than the marsh plots during every sampling event except for February 2011 and 2012.

Porewater analytical data are presented in Tables 4.1-22 through 4.1-28. CCS water is characterized by warmer temperatures, hypersalinity, and high tritium concentrations. Investigating the relationship among porewater temperature, specific conductance, and tritium concentrations provides insight into the influence, if any, of the CCS on the marsh landscape. An analysis was performed to explore whether or not porewater temperature, specific conductance, and tritium were significantly related to one another across the marsh. F6, the reference transect, was omitted from this analysis; transect F5 also was not included because it has different vegetation than other transects and water chemistry more consistent with a brackish marsh habitat. Additionally, the tree islands were not included in this analysis because they are not considered marsh habitat. The analysis showed that there was no significant correlation between porewater temperature, specific conductance, and tritium (Table 4.1-29). The results

indicate that porewater tritium concentrations above background levels are more likely from atmospheric deposition rather than a groundwater pathway from the CCS. Further investigation into the relationship of the CCS to the marsh is provided in Section 4.3.

On a landscape scale, the data do not indicate that the CCS is negatively impacting the marsh via a groundwater pathway. The variation in sawgrass productivity and biomass across the marsh is being driven by phosphorous availability; porewater specific conductance and temperature are not indicative of a CCS influence. Overall, the vegetation characteristics summarized above (i.e., live biomass, productivity, leaf nutrient concentration, etc.) and community composition are representative of the hydrologically modified marshes found throughout southern Florida.

4.1.2.3 Mangrove Vegetation Sampling

Red mangrove is the primary woody species measured in the mangrove plots; therefore, to focus on landscape trends, discussion of the woody vegetation is limited to red mangrove.

Percent cover of red mangroves in the plots ranged from 1% to 50% (Table 4.1-30) and remained fairly consistent among time periods. Differences observed from one sampling event to the next could have been caused by tidal effects; in the October 2010 measurements, the tides were extremely high in the mangrove forests, with water depths of up to 70 cm. As many of the mangrove trees are 60 cm to 80 cm tall, cover observed during that time period was most likely affected by the water depth.

Red mangrove height remained consistent (within 5 cm of all sampling events) throughout the sampling period, indicating that very little vertical growth/die-off has occurred (Figure 4.1-19, Table 4.1-31). Lugo and Snedaker (1974) classified a scrub mangrove forest as having trees that are less than 1.5 m (150 cm) tall. All of the trees measured within the study area are consistent with this classification. Height did not significantly differ with distance from the CCS, although the trees located along reference transect M6 were significantly taller than the other transects in November 2011 ($P < 0.012$; Figure 4.1-20).

Red mangrove biomass declined slightly with each sampling event (Figure 4.1-21 and Table 4.1-32). There is no statistically significant difference in biomass with distance from the CCS or with reference transect M6, mostly due to the large standard error of the M6 plots ($P > 0.01$; Figure 4.1-22). Notably, the biomass calculation considers both the size of the plants and the percent cover within the plot. Transect M6 has larger trees as indicated by mangrove height (Table 4.1-31) but has a much lower percent cover (Table 4.1-30) and thus lower biomass than many of the other plots.

Red mangrove ANPP was calculated for one year of data (October 2010 – November 2011). Red mangrove productivity was highest at M1-1 (224.07 $g/m^2/yr$) and lowest at F1-2 (5.72 $g/m^2/yr$; Table 4.1-33). Productivity averaged across all sites (including mixed marsh plots F1-1, F1-2 and F2-2) was 61 $g/m^2/yr$. With the mixed marsh sites removed, average productivity increased to 72 $g/m^2/yr$, which is lower than productivity values of 258 and 303 $g/m^2/yr$ recorded from similar scrub red mangrove habitat in Taylor Slough (Ewe et al. 2006). The mangroves in this study are

all from an area of low productivity known as the "white zone" (Ross et al. 2000). This low productivity is reflected in the leaf ANPP values which are lower than other studies from scrub forests (e.g. Coronado et al. 2004, Ross et al. 2001). Leaf ANPP for this work is lower than other studies as a large area of the habitat is open and has low cover (average cover at all sites is approximately 13% for each season measured), so when the plant productivity values are scaled up over the area, the productivity values are significantly reduced. There was no statistically significant difference in productivity with distance from the CCS or when compared to reference transect M6 (Figure 4.1-23).

Sclerophylly of red mangrove was generally higher at the end of the dry season in May 2011 and 2012 than the preceding wet season sampling event (Table 4.1-34, Figure 4.1-24). This pattern is expected as sclerophylly increases with more difficult growing conditions. Sclerophylly was significantly lower with distance from the CCS during the May 2011 event ($P < 0.012$; Figure 4.1-25). The sites further from the canal are also closer to the shoreline, which could provide these sites with better tidal exchange and thus more water during the dry season than the sites further inland. Reference transect M6 did not significantly differ from the other mangrove sites.

Within the brackish marsh plot F5-2 and the mangrove plot M1-1, dry bulk densities of 0.60 g/cm^3 and 0.62 g/cm^3 were observed, respectively; these sites are impounded and primarily consist of marl-organic mix substrate (Table 4.1-12). Soil N:P ratios indicate that all of the mangrove plots further inland (i.e., Mx-1) are P-limited while the plots closer to the shoreline Mx-2) are either N-limited or N and P co-limited, which is consistent with the N-limitation to P-limitation gradient from shoreline to interior established by McKee et al. (2002). Unlike the marsh, however, there were no clear patterns with red mangrove biomass and soil bulk density or soil phosphorous (Table 4.1-13 and Figure 4.1-26). Although scrub mangrove forests are well-established in the literature as nutrient-limited systems (Feller 1995), the lack of nutrient trends could be because other stressors, such as waterlogged soils and salinity, are more important drivers of vegetation characteristics in saline environments than nutrient availability (Mendelssohn 1979; McKee 2002).

Mangrove leaf nutrients, stable isotopes, and molar ratios are presented in Tables 4.1-35 through 4.1-41. Carbon isotope data fell within the normal range that C3 plants are known to have (-34‰ to -22‰), reaching as high as -22.6‰ and as low as -28.4‰. Carbon isotope total average over all seasons was -25.3‰, which is representative of data from scrub red mangroves in Belize (-25.3‰ from Smallwood et al. 2003 and -26.4‰ from McKee et al. 2002). The N:P molar ratios of the leaves indicated that all mangrove sites are P-limited, unlike the soil N:P ratios that showed N-limitation closer to the shore. Red mangrove nitrogen isotopes ranged from 2.6 ‰ to -11.2 ‰ and averaged -3.6 ‰. McKee et al. (2002) found average nitrogen isotope values of -5.38 ‰ in similar scrub mangrove habitats. Low nitrogen isotope values are a consequence of the slow growth patterns and the resulting low nitrogen demand associated with scrub mangrove forests (McKee et al. 2002).

Mangrove specific conductance was statistically different among sites (One-way ANOVA, $F_{13,175} = 12.65$, $P < 0.01$) where M4-2 had the highest average (62,745 µS/cm) and F5-1 the lowest

(23,709 µS/cm; Table 4.1-21). Specific conductance was not significantly different with distance from the CCS or with reference transect M6 ($P > 0.007$; Figure 4.1-27).

Porewater temperature was not significantly different among sites, but F5-1 (28.5°C) and F5-2 (28.3°C) had the highest average values and M5-2 (26.3°C) the lowest (Table 4.1-21). The F5 plots are located within an impounded area with a high water-retention time, subjecting the water to more heat and evaporation than other sites. There was no significant difference in temperature with distance from the CCS during any of the sampling events ($P > 0.007$; Figure 4.1-28).

Similar to the marsh habitat, an analysis was performed to explore the patterns of tritium, specific conductance, and temperature across the mangrove landscape. M6, the reference transect, was omitted from this analysis; transect F5 also was not included because of its unique water chemistry (further details are presented in Section 4.3). The analysis showed that only specific conductance and temperature had a statistically significant correlation (Table 4.1-42). The results indicate that tritium concentrations above background levels are more likely from atmospheric deposition rather than a groundwater pathway from the CCS. Further investigation into this relationship is presented in Section 4.3.

On a landscape scale, the data do not indicate that the CCS is negatively impacting the mangroves. The system is driven by co-occurring stressors, including nutrient deficiency, high salinities, and saturated soil. The vegetation characteristics of the study area are consistent with scrub mangrove forests found along the coastal fringe of south Florida and the Florida Keys (Lugo and Snedaker 1974).

4.1.2.4 Aerial Survey

The results of the MLC GIS analysis are shown in Table 4.1-43. Overall, the analysis for sawgrass appears to be fairly comparable between the ground and aerial assessments (i.e., within 5% of each other). In areas where the photos were not in plan view or a complete plot photographed, effort was taken to correct the image and analysis. For several instances, the rectification of the aerial photographs resulted in good agreement between the data but in other instances, there were still some discrepancies observed. The discrepancies between the ground-truth percent covers and those calculated using the MLC are the result of the limitations encountered during the analysis of the photographs. These limitations include:

Skewed aerial photographs: The plot boundaries were determined using ImageJ software. A distance scale was specified using the known distance of one edge of a subplot boundary (either 1 m or 5 m depending on subplot size). In photographs that were skewed, a 5-m scale determined from a subplot on the north end of the plot did not translate to a 5-m scale on the south end of the same plot. This resulted in either the overestimation or underestimation of the area of the plot, which affected the percent coverage estimation results of the MLC.

Photographs did not contain the entire plot: Aerial photographs of plots F2-3, F4-3, and F5-2 did not contain the entire plot areas. Therefore, the results of the MLC analysis were not a representation of the entire plot and were lower than the percent cover determined in the field.

Lack of color contrast in the photographs: In photographs that did not contain enough color contrast between live and dead biomass, it was difficult to separate the two classes using the MLC. The MLC equation calculates the probability of a pixel belonging to each of a predefined set of classes based on the color value of the pixel. If the color values of live and dead biomass were too similar, the MLC grouped them into the same class, resulting in an overestimation of one class and an underestimation of the other.

Periphyton growing on live biomass: The MLC only recognizes the reflectance of the periphyton and is unable to distinguish the live biomass growing underneath. This results in an overestimation of periphyton and an underestimation of live biomass. Plots F4-1, F6-2, and F6-3 are noted in Table 4.1-43 as having this problem, but the values do not always reflect a discrepancy.

The numerous limitations encountered during the analysis bring into question the accuracy and usefulness of the aerial survey.

4.2 Biscayne Bay

Ecological monitoring in Biscayne Bay was conducted bi-annually between September 2010 and May 2012. The monitoring was set up as transects to document changes in SAV cover and faunal compositional shift over time and with distance from the CCS. Shoreline-parallel transects were set up to document changes in SAV cover and faunal compositional shift over time and with distance from the CCS. Sampling was designed to capture SAV and faunal composition at the start (April-May) and the end (September-October) of the seagrass growing season. In the first year of monitoring (2010), the fall event was initiated in October, just after the seagrass had senesced; monitoring was subsequently changed to start in September of each year. Data and analyses presented in this section summarize the environmental conditions of Biscayne Bay and Card Sound and offer insight into the spatial distributions and the potential impacts, if any, of the CCS on the SAV and fauna within Biscayne Bay.

4.2.1 Methods and Materials

4.2.1.1 Sampling Dates

The spring 2012 Turkey Point ecological sampling event was conducted during daylight hours between April 16 and May 4, 2012. This was the fourth bi-annual sampling event conducted to assess baseline physical and biological conditions in the vicinity of the Turkey Point Plant.

4.2.1.2 Site Locations

The QAPP for the Turkey Point Monitoring Project established four study areas within Biscayne Bay, Card Sound, and Barnes Sound for ecological sampling (Figure 1.3-1). The northernmost of these is designated BB1 and is located in Biscayne Bay near the northern end of the CCS. Areas BB2 and BB3 are located in Card Sound near the central and southern portions of the CCS, respectively. Area BB4, which is located on the western side of northern Barnes Sound

north of Middle Key, was established as a reference site outside the potential influence of the Turkey Point Plant.

Within each study area, five 2-kilometer-long, shore parallel transects were established to monitor ecological conditions (Figure 1.3-1). Transects, which were designated "*a*" through "*e*", were located 250 m, 500 m, 1,000 m, 2,000 m, and 3,000 m from shore, with *a* being closest to shore. Each transect was divided into eight 250-m-long segments. A random number generator was then used to choose a 1-m-square point along each 250-m segment as the permanent sampling location for all future sampling events (Table 4.2-1). These points were numbered 1 through 8. Thus, a sampling point designated as BB1-*b*-4 represents Area BB1, Transect *b,* and Sampling Point 4. This design produced a total of 40 sampling points per study area and 160 points per area for all areas combined.

4.2.1.3 General Methodology

All field sampling activities and recordkeeping followed the QAPP (FPL, 2011c). A field notebook was used for documenting sampling activities, including station location, times of sampling, sampling personnel, and weather conditions. Customized field datasheets were utilized for recording data for each type of sampling activity. The datasheets were reviewed for completeness by the field team leader prior to leaving each sampling point.

A 25-ft Parker, equipped with a GPS, depth finder, and davit for retrieving the faunal throw trap (FTT), was used to conduct the sampling. The boat's shallow draft allowed access to all sampling points.

A Trimble GeoXT GPS was pre-loaded with all sampling points and used to navigate to each sampling location. When the research vessel arrived on station, a weight with an attached float was deployed to precisely mark the sampling point. The boat was then anchored in a manner that positioned the boat near the marker. Depending on wind and current conditions, a second anchor was often deployed to help maintain constant position at the sampling point.

Routine sampling consisted of water quality monitoring, porewater monitoring, characterization of SAV, and characterization of benthic fauna, as described below. The first locations visited during each sampling event were those where benthic fauna were collected (80 points). Upon arrival at those locations, an FTT was first deployed, covered, and pushed into the substrate. Quadrats used to quantify SAV were then haphazardly distributed around the sampling point, and a diver inserted a porewater sampling device into the substrate. Weather conditions were documented and water quality measurements were taken by a crewmember onboard the vessel, while benthic conditions around the sampling point were recorded by divers. Subsequently, SAV was quantified by one diver, while another collected a porewater sample. The final task at each site was to collect organisms contained within the FTT. After all FTT sampling was completed, the remaining 80 sampling points were visited and the monitoring routine was repeated without benthic faunal collections. Light attenuation data were collected at a single location (Sampling Point 4) on all transects over a two-day period of clear sky conditions. Nutrient and Tracer Suite

sampling was also conducted at a single location on each transect, but the location was not static; samples were collected at the point with the highest porewater specific conductance.

4.2.1.4 Environmental Data

General environmental data collected at each sampling point included tidal cycle, air temperature, wind speed and direction, and sky conditions. The tidal cycle (high, low, ebb, or flood tide) was recorded based on published tide tables. A NIST-certified thermometer was used to determine air temperature. Wind speed was estimated, and wind direction was determined by use of a compass. Sky conditions were noted as Clear (0-25% cloud cover), Partly Cloudy (25-50% cloud cover), Mostly Cloudy (50-75% cloud cover), or Overcast (more than 75% cloud cover). Notes were made of any precipitation during the sampling event.

4.2.1.5 Water Quality Sampling

A Hach Quanta water quality meter was used to document water quality at each sampling point. Monitored variables included: specific conductance (mS/cm, converted to µS/cm for reporting purposes), temperature (°C), salinity (as a function of conductance; unitless), turbidity (nephelometric turbidity units [NTU]), dissolved oxygen (mg/L), and oxidation reduction potential (ORP; mV). Water column measurements were taken approximately 30 cm below the surface and 30 cm above the bottom. At both depths, the meter was allowed to stabilize before readings were recorded. The meter was calibrated prior to the start of daily sampling activities, and continuing calibration verifications were performed throughout the day. All calibrations were recorded in an instrument calibration log.

4.2.1.6 Porewater Temperature and Specific Conductance Measurements

Upon arrival on station, a diver with a 4-ft-long section of rebar probed the area immediately around the sampling point to determine if there was sufficient unconsolidated sediment to permit insertion of a 30-cm porewater sampler to depth. If refusal was less than 30 cm, the bottom within a 2- to 5-m radius of the sampling point was probed until the target depth could be reached. Once a suitable location was found, the porewater sampler and a temperature probe (TCTemp1000 thermocouple datalogger, ThermoWorks Inc. Lindon, UT) were fully inserted into the substrate and the time was noted.

The porewater sampler consisted of a stiffening rod to facilitate insertion into the sediment and a sipper to extract the porewater. After the sampler was inserted to depth, the stiffening rod was removed, and a flexible tube was attached to the sipper. A 60-cubic centimeter (cc) syringe was used to extract and discard a minimum of 100 cc of water. That volume was greater than the volume of water in the sipper and attached tubing and assured that the water used for porewater analysis was representative of conditions 30 cm below the sediment surface. An additional 90 to 120 cc of porewater was then extracted and a Hach Quanta water quality meter was used to measure specific conductance, which was recorded to the nearest 0.1 µS/cm.

The temperature probe remained in place for a minimum of 10 minutes, with temperature data electronically recorded every 15 seconds. The data were later downloaded and reviewed, and the

stabilized temperature near the end of the sampling period was used as the porewater temperature for that sampling point.

4.2.1.7 Submerged Aquatic Vegetation Surveys

SAV surveys were conducted at all 40 sampling points within each study area. Four quarter-meter quadrats were thrown from the boat roughly equidistant around the marked sampling point; they generally landed within 1 to 3 meters of the sampling point. The SAV within each of the four quadrats were examined and percent cover was recorded on underwater datasheets (Figure 4.2-2). Each of 26 pre-established categories of SAV (Table 4.2-2) used by the SFWMD, Florida Fish and Wildlife Fisheries Habitat Assessment Program, and the RER were scored using the Braun-Blanquet Cover Abundance (BBCA) Index methodology (Figure 4.2-3). The BBCA method assigns a code to each species or taxonomic group based on its contribution to bottom coverage, as follows:

0 = bare

0.1 = <5% cover with a solitary individual/shoot

0.5 = <5% cover with few individuals/shoots

1 = <5% cover with numerous individuals/shoots

2 = ≥5% cover and ≤25% cover

3 = >25% cover and ≤50% cover

4 = >50% cover and ≤75% cover

5 = >75% cover

Categories on the datasheet not present in the quadrat (i.e., bare) were left blank. Corals, gorgonians, and sponges were noted as present or absent, but were not scored. For each sampling point, an average BBCA index score for each category present was calculated for the four quadrats combined using the formula:

$$C_a = \sum S_{ab}/4$$

where C_a = BBCA index score of taxon *a*, *b* = quadrat number from 1 to 4, S_{ab} = the BBCA index score for taxon *a* in quadrat *b*.

At one sampling point along each transect, SAV was scored by a second diver for QA purposes. The quadrats were left in place while the independent scoring was compared between the two surveyors. If there were any differences in scoring, both surveyors reevaluated the quadrats until 100% agreement was reached. The final result from the QA was recorded separately from the original two scorings. All SAV scoring was done by scientific divers who had previously

attended an Interagency Calibration Exercise hosted by the SFWMD in Key Largo, the most recent of which was held on May 17, 2012.

4.2.1.8 Ecological Observations

A qualitative assessment of ecological conditions surrounding each sampling point out to the range of visibility was made at the beginning of each SAV survey and was recorded on the SAV datasheet. A diver characterized the benthic habitat while swimming a large circle around each sampling point. Insofar as visibility within the overall project area is highly variable, the areal extent of observations varied among locations and sampling events. However, most observations encompassed the area within a 10- to 15-m radius of the sampling point. Although these observations are qualitative in nature, they provide a reasonable characterization of benthic conditions. For consistency, all observations to date were made by the same senior scientist.

Nine categories were used to describe benthic conditions, and each category was scored as either present or absent:

- **Sparse** – Sparse seagrass coverage, whether patchy in distribution or wide spread.
- **Sparse to Moderate** – Sparse to moderate seagrass coverage, whether patchy in distribution or wide spread.
- **Moderate to Dense** – Moderate to dense seagrass coverage, whether patchy in distribution or widespread.
- **Fairly Open** – The bottom has exposed sediment over a majority of the area observed.
- **Calcareous Algae** – Calcareous alga are distributed throughout the observed area.
- **Sponges** – Multiple sponges are present in the observed area.
- **Corals** – Multiple corals are present in the observed area.
- **Gorgonians** – Multiple gorgonians are present in the observed area.
- **Drift Algae** – Drift algae is present in clumps or mats within the observed area.

The substrate was also characterized by noting the presence/absence of the following sediment types: sandy, shell hash, silty, and rubble. This assessment was confined to a smaller area around each sampling point than the area used to characterize general benthic conditions.

4.2.1.9 Faunal Throw Traps

FTT surveys were conducted at every other sampling point along each transect, yielding a total of 20 samples per study area. Sampling points alternated between transects, with even-numbered points sampled on Transect *a,* odd numbers on Transect *b*, and so on. Upon arrival at the sampling point, a 1x1 m FTT was thrown over the side of the boat. As the FTT descended to the bottom, a diver followed and covered the top of the trap with one of two net panels attached to opposite sides of the trap. Once the trap settled, the divers ensured that it was resting squarely on the bottom so organisms could not escape from under its bottom edge. When divers were ready to sample, the net panel on the top was then partially retracted and a hinged sweep net was used to collect fish and invertebrates (Figure 4.2-4). The sweep net was inserted and pushed along the bottom from front to back within the trap. After each pass, the net was closed, extracted from the

trap, and collected organisms were transported to the boat for processing. A minimum of five net sweeps of the FTT was made at each sampling point. Additional sweeps were made if the fifth sweep contained any organisms.

On the boat, all fish, penaeid and caridean shrimp, and portunid crabs were removed from the net and preserved in 10% formalin for later species-level identification and measurement in the laboratory. Other organisms were identified to order or family level in the field, counted, and returned to the water. At the laboratory, samples remained in formalin for a minimum of five days before being stepped into 70% ethanol for storage, identification, and subsequent archiving. Both standard length (SL) and total length (TL) were recorded for each fish, while post-orbital carapace length (CL) and carapace width (CW) were used for penaeid and caridean shrimps and portunid crabs, respectively.

4.2.1.10 Light Attenuation

Light attenuation was measured at a single fixed sampling point (Sampling Point 4) along each transect. A Li-Cor LI-1400 data logger was connected to a Li-Cor LI-193 spherical sensor and a Li-Cor LI-190 quantum sensor to measure light (micromoles per square meter per second [μmols/m^2/sec]) at depth and at the surface, simultaneously. The LI-193 sensor was mounted in a weighted black frame (Figure 4.2-5), while the LI-190 sensor was placed in an unshaded area on the boat (Figure 4.2-6). In water depths less than 1.5 m, three measurements were taken: 0.3 m below the surface, mid-depth, and 0.3 m above the bottom. In water depths greater than 1.5 m, five measurements were taken at equidistant depths starting at 0.3 m below the surface and finishing at 0.3 m above the bottom. Records of light measurements were made as the sensor was lowered to each depth, and again as the sensor was raised for a total of six to ten readings per sampling point. Sampling depth and time of sampling were recorded for each paired surface and underwater reading. For this report, only surface, mid-depth, and bottom values are presented.

4.2.1.11 Porewater Nutrient and Tracer Suite Sampling

After completing SAV/water quality sampling at all eight points on a transect, porewater specific conductance data were reviewed. The location with the highest conductance value was then selected as the sampling point for porewater nutrient and Tracer Suite sampling. This yielded a total of five samples, one per transect, for each study area. At each of these sampling points, the porewater sampler was inserted to a depth of 30 cm and the tubing attached to the sipper was connected to a peristaltic pump on the boat (Figure 4.2-7). Sufficient water was pumped to clear the volume of water in the tubing three times prior to collecting 500 to 750 ml of porewater. The sampler was then removed from the substrate, reinserted within 0.5 meters of the first point, and the entire process was repeated two more times. After collection, the three porewater samples were combined and homogenized prior to placing sub-samples into pre-labeled containers for subsequent laboratory analyses. The pH of the sample was measured and recorded on the field datasheets and chain-of-custody forms. Depending on the type of analysis, some sample containers were spiked with a preservative while others were not. The pH of all preserved samples was checked and additional preservative was added, if required. All sample bottles were labeled with the date of sampling, time of sampling, sample number, and initials of the personnel

collecting the samples. The sample bottles were then either placed on ice or left unchilled depending on the type of analysis to be performed.

New tubing was utilized at each sampling point and the porewater sipper was decontaminated by rinsing consecutively with tap water, Liquinox, tap water again, and deionized water. At the end of the day, the nutrient/Tracer Suite samples along with chain-of-custody forms were transferred to a laboratory courier for transport to the analytical laboratory. In the laboratory, samples were analyzed for the following variables: fluoride, sulfate, magnesium, iron, tritium, barium, $\delta^{13}C$, $\delta^{18}C$, $\delta^{18}O$, $\delta^{2}H$, alkalinity, dissolved inorganic carbon, chloride, sulfides, calcium, potassium, bicarbonate alkalinity as calcium carbonate ($CaCO_3$), bromide, strontium, boron, and sodium.

4.2.1.12 Soil Coring

Soil coring was conducted once during each fall sampling event. During the fall 2010 event, the samples were used to quantify sediment chemistry (C, N and P), and in November 2011, the cores were used to determine wet and dry bulk density. Two sites along each transect were selected for sampling: Points 1 and 4 on Transect *a*, 2 and 5 on Transect *b*, 3 and 6 on Transect *c*, 4 and 7 on Transect *d*, and at 5 and 8 on Transect *e*. These same points were used in all four study areas. At each sampling point, a diver probed the bottom with a length of rebar to locate suitable substrate for sampling. A 70-mm cylindrical polyvinyl chloride core, inserted by hand to a depth of at least 30 cm, was used to collect the samples. In those areas where the substrate did not allow penetration to 30 cm, the deepest possible core was collected. Once the corer reached 30 cm or the depth of refusal, the upper end was capped, and the corer was carefully extracted to retain the enclosed sample. As the bottom of the corer neared the substrate surface, a second cap was placed on the bottom of the corer and both top and bottom were held in place as the diver took the core to the boat. The depth of the extraction hole was measured and compared to the length of the core to verify the sample had less than 10% compression. Samples with more than 10% compression were discarded. Once on board, the caps were secured with electrical tape and the corer was labeled with the date and sample number (Figure 4.2-8). The date, sample number, time of collection and length of the soil core were also recorded on the field datasheet. Prior to transfer to the analytical laboratory, the cores were sub-divided into 10-cm horizons. Corresponding horizons (0-10, 10-20, and 20-30 cm) for both samples on each transect were combined into a single sample resulting in a total of three samples (one for each horizon) per transect. A chain-of-custody form was completed, and the samples were transferred to an analytical laboratory for analysis.

4.2.1.13 Statistical Analyses

All variables were statistically analyzed using STATISTICA 64 Version 11 software (Statsoft, Inc.). Data were first tested to determine if they met requisite requirements for parametric testing, namely normality (Shapiro-Wilks Test) and homogeneity of variance (Levene's Test). The tests revealed that much of the data did not meet either assumption, and thus non-parametric tests were used instead. A Kruskal-Wallis ANOVA by Ranks Test was first used to determine if differences in measured variables existed among transects, areas, and sampling periods, and then a Multiple Comparisons of Mean Ranks Post-hoc Test was used to determine which differences were statistically significant. Differences among transects may be indicative of nearshore to

offshore gradients, while differences among study areas may be indicative of shore-parallel gradients. Seasonal changes and/or long-term temporal patterns may be revealed by differences among sampling periods. Insofar as numerous ANOVA tests were performed on the same data set, thereby increasing the probability of a Type I/α error (accepting the null hypothesis when it is false), the Bonferroni Correction ($p = \alpha/n$, where $\alpha = 0.05$ and n = number of tests performed) was used to lower the critical p value and avoid spurious significance. Based on the results of the Bonferroni calculation, the significance value used for all ANOVA tests was set at $p \leq 0.0001$.

Comparisons of temperatures and specific conductance between porewater and the overlying water column were tested using Friedman's ANOVA, a non-parametric two-way analysis of variance. As for the Kruskal-Wallis ANOVA, the large number of individual analyses performed increased the probability of a Type I/α error and therefore the Bonferroni Correction was used to lower the critical p value and avoid spurious significance. Based on the results of the Bonferroni calculation, the significance value used for all Friedman's ANOVA was set at $p \leq 0.0001$.

Distance from each sampling point to the nearest border of the CCS was measured and correlated with each water quality variable using the non-parametric Spearman Rank Order Correlation Test. This test was also used for comparing faunal data with SAV abundance. The significance value used for the Spearman Rank Order Correlation Test was set at $P \leq 0.05$. Significant correlations were considered to be strong if $r \geq |0.6|$, weak if $r < |0.6|$ and $> |0.2|$, and very weak if $r \leq |0.2|$. Only statistically significant correlations are reported herein.

4.2.2 Results and Discussion

4.2.2.1 Water Depth

Sampling was conducted over all tidal cycles. The data presented herein are actual depths at the time of sampling, unadjusted for tides. Mean water depth for all study areas and transects combined during the spring 2012 sampling event was 2.3 m, with minimum and maximum depths of 1.1 and 4.0 m, respectively (Table 4.2-3). Area BB1 had the shallowest mean depth (1.5 m), while BB3 had the greatest (3.1 m). Generally, depths increased with distance from shore. For all study areas combined, 72 sampling points (45%) were in water depths of 1 to 2 m, 61 (38%) were in depths of 2 to 3 m, and only 27 (17%) were in depths greater than 3 m during the spring 2012 sampling event.

4.2.2.2 Water Quality Monitoring

The spring 2012 sampling event was conducted over an 18-day period. Differences in time of day, tidal stage, and weather conditions both between and during each sampling event create considerable spatial and temporal variability in water quality parameters. The lack of synoptic monitoring, which is impractical, limits meaningful statistical inferences regarding the source of variation for most parameters. Nevertheless, general characterizations can be made about similarities and differences in measured variables among transects within each study area and among study areas. Data and statistical comparisons for each monitored variable are presented

first for the spring 2012 sampling event and then data and analyses for all four baseline events are discussed.

Water Temperature

Mean surface and bottom water temperatures along each transect, all study areas combined, ranged from 21.3°C (BB1 surface) to 26.1°C (BB3 surface and bottom) during the spring 2012 ecological monitoring event (Table 4.2-4). As the result of relatively shallow water depths and thorough mixing by wind and currents, there was very little difference between mean surface and bottom temperatures along any transect.

During the spring 2012 sampling event, there were no significant differences in mean bottom water temperatures among transects within any study area (Table 4.2-5). When all transects were combined, Area BB3 was found to have significantly higher bottom water temperatures than all other study areas (Table 4.2-6). Station BB2 also had significantly higher temperatures than BB1. None of the other differences among study areas were statistically significant.

Bottom water temperature data for all four baseline sampling events are presented in Table 4.2-7. Except for the first sampling event in fall 2010, the lack of significant differences in bottom water temperatures among transects remained persistent throughout the period of monitoring (Table 4.2-5). When data for both spring events, both fall events, and all four sampling events were combined, there were no significant differences among transects in any study area. Similarly, there was no significant correlation between bottom water temperatures and distance from CCS for all events combined.

With respect to differences in bottom water temperatures among study areas, spring 2012 was the only season to show a significant difference. There were no statistically significant differences in temperatures among study areas, all transects combined, during any other sampling event, and when the spring 2011 and spring 2012 events were combined for analyses, there were no significant differences among areas (Table 4.2-6). Thus, it appears that bottom water temperatures are relatively homogenous throughout each monitoring period, and natural spatial and temporal variability exceed any anthropogenic influences that may be present within the project area.

Specific Conductance

Mean specific conductance measurements during the spring 2012 sampling event ranged from 50,700 µS/cm (BB4-*b*) to 57,500 µS/cm (BB1-*a* and BB4-*b*; Table 4.2-8). There were only slight differences in conductance values between surface and bottom waters, indicating little water column stratification during the sampling period. There were no statistically significant differences in bottom water specific conductance among transects within Areas BB1, BB2, or BB3 (Table 4.2-5). However in Area BB4, specific conductance at the two most offshore transects, *e* and *d*, was statistically higher than at Transects *a* and *b* closest to shore. Within the overall project area, Area BB4 had significantly lower bottom water conductance than any of the other three study areas, but none of the other areas differed from one another (Table 4.2-6).

Bottom water conductance data for all four baseline sampling events are presented in Table 4.2-9. During prior sampling events, there were few statistically significant differences in specific conductance among transects within any study area, and the few differences that did occur were inconsistent among sampling events (Table 4.2-5). The only exception was in Area BB4; during both spring events, mean specific conductance at the two most offshore transects was significantly higher than at the two nearshore transects. However, when both spring events were combined, differences among transects in BB4 were no longer significant, although the same pattern persisted. Similarly, when both fall events were combined, transects closest to shore had lower mean specific conductance than those farthest from shore, although none of the differences were statistically significant. The cause for this pattern of increasing conductance in an offshore direction is likely related to freshwater input from adjacent land areas; Area BB4 is located between the C-108 and C111 drainage canals. There was no significant correlation between specific conductance and distance from the CCS for all events combined.

Differences in conductance among study areas varied throughout the monitoring period (Table 4.2-6). Typically, Areas BB1 and BB4 had the lowest mean values and Areas BB2 and BB3 the highest. When data for both spring events were combined, Area BB4 had significantly lower conductance than Areas BB2 and BB3, but Area BB1 did not differ from any of the other areas. When both fall events were combined, Areas BB1 and BB4 were both significantly different from Areas BB2 and BB3, and this same result was obtained when data for all four sampling events were combined.

Salinity

Salinity is calculated (not measured directly) in the water quality meter using conductance and a temperature correction normalized to 15°C (PSS-78 scale; UNESCO method). Thus, salinity patterns within the project area were similar to those described above for specific conductance. Mean bottom values for each transect during the spring of 2012 ranged from 33.2 (BB-4*b*) to 38.2 (BB1-*a*; Table 4.2-10). There were only slight differences in salinity values between surface and bottom waters, indicating little water column stratification during the sampling period. As with conductance, there were no significant differences in bottom salinity among transects within Areas BB1, BB2, or BB3 (Table 4.2-5), but in Area BB4, Transects *d* and *e* had statistically higher values than Transects *a* and *b* closer to shore. Within the overall project area, Area BB4 had significantly lower bottom salinity than any of the other three study areas, but none of the other areas differed from one another (Table 4.2-6).

Bottom salinity data for all four baseline sampling events are presented in Table 4.2-11. Results of statistical analyses comparing salinity among transects and study areas during previous sampling events yielded the same results as described above for specific conductance, as the two are closely related (Tables 4.2-5 and 4.2-6). There was no significant correlation between mean bottom salinity and distance from the CCS for all events combined.

Dissolved Oxygen

Mean DO measurements during the spring 2012 sampling event ranged from 5.5 mg/L (BB3-*e*) to 8.1 mg/L (BB1-*d*; Table 4.2-12). As for other measured variables, there were few differences

between mean surface and bottom water values within any study area. There were no significant differences in bottom DO values among transects or study areas (Tables 4.2-5 and 4.2-6, respectively).

Bottom DO data for all four baseline sampling events are presented in Table 4.2-13. There were several significant differences in DO among transects in Area BB1 during the first two sampling events, but no differences among transects in any other area during any sampling event (Table 4.2-5). Furthermore, when both spring and both fall sampling events were combined for analyses, there were no significant differences in DO among transects in Area BB1. However, there was a significant (r = -0.08, P = 0.042), although very weak negative correlation between dissolved oxygen and distance from the CCS for all study areas and events combined.

The only difference in bottom DO among study areas occurred in spring 2011 when Areas BB1 and BB4 had significantly lower values that either BB2 or BB3 (Table 4.2-6). However, there was considerable variability in the rank of mean DO values among study areas between sampling events. For example, Areas BB1 and BB4 had the highest values during some events and lowest values during others. Even though most of these individual event differences were not statistically significant, when all four events were combined for analysis, Area BB4 was found to have significantly lower bottom DO than Areas BB1 and BB2. Area BB3 also had significantly lower DO than Area BB2, which had the highest mean value.

pH

Mean pH measurements during the spring 2012 sampling event ranged from only 8.0 to 8.4, with little difference between mean surface and bottom water values at any transect (Table 4.2-14). There were no significant differences in bottom pH values among transects within any study area (Table 4.2-5). However, despite the low range of values, there were statistically significant differences among study areas (Table 4.2-6); Areas BB-1 and BB-2 had significantly higher mean bottom values than Areas BB-3 and BB-4, and Area BB3 had significantly higher mean values than Area BB4. This indicates a trend of decreasing pH in a southerly direction. Again, however, the difference in absolute values was slight, and thus even though differences among areas may be statistically significant, they may not be ecologically significant.

Bottom pH data for all four baseline sampling events are presented in Table 4.2-15. There were a few significant differences in bottom pH among transects during the fall 2010 (Areas BB1 and BB4) and spring 2011 events (Area BB2; Table 4.2-5). However, there were no differences among transects in any area when both spring, both fall, and all four events were combined for analysis. Nevertheless, there was a significant (r = -0.16, P < 0.001), but very weak negative correlation between pH and distance from the CCS for all study areas and events combined.

The same differences in pH noted among study areas for spring 2012 were also observed during the spring 2011 sampling event (Table 4.2-6). When both spring events were combined, Area BB4 had significantly lower bottom pH than any other area, and Area BB3 had significantly lower values than either Areas BB1 or BB2. There were no significant differences among areas when both fall events were combined.

Oxidation Reduction Potential

Mean ORP measurements during the spring 2012 sampling event ranged from only 6.0 mV (BB3-*e*) to 208.0 mV (BB1-*a*), with relatively small differences between mean surface and bottom water values at any transect (Table 4.2-16). There were no significant differences in bottom ORP values among transects within any study area or among study areas (Tables 4.2-5 and 4.2-6, respectively).

Bottom ORP data for all four baseline sampling events are presented in Table 4.2-17. The only significant difference in ORP among transects during any prior sampling event occurred in spring 2011 in Area BB1 (Table 4.2-5). There were no significant differences among transects in any study area when both spring, both fall, and all four sampling events were combined for analyses. Similarly, there was no significant correlation between ORP and distance from the CCS.

Area BB1 had significantly higher bottom ORP values than any other study area during the fall 2010 sampling event, but no differences were found among study areas during any other event (Table 4.2-6). Nevertheless, significant differences were detected when both spring events (Areas BB1 and BB4 both significantly higher than either Area BB2 or BB3) and both fall events (Area BB1 significantly higher than all other areas) were combined. For all four events combined, Area BB1 had significantly higher mean ORP than all other areas, and Area BB4 had significantly higher values than Area BB3.

Turbidity

Water clarity was high throughout the project area, as reflected by the very low turbidity values, with overall means for surface and bottom values within each study area ranging from only 0.0 to 1.8 NTU (Table 4.2-18). The highest mean transect value recorded during the spring 2012 sampling event was 15.1 NTU (BB-4 *b*, bottom). Differences between mean surface and bottom water values along each transect were slight, and there were no significant differences in bottom turbidity values among transects within any study area (Table 4.2-5). However, Area BB4 had significantly higher mean turbidity values than any of the other three areas (Table 4.2-6).

Bottom turbidity data for all four baseline sampling events are presented in Table 4.2-19. There were no significant differences among transects in Areas BB1, BB2, and BB3 during any prior sampling event (Table 4.2-5). However, differences were detected among transects in Area BB4 when both spring events were combined and when all four events were combined. For both tests, Transect *a*, closest to shore, had significantly higher mean values than Transects *c* through *e*. As discussed later, nearshore areas of BB4 have substantially more sampling points with silty substrate than areas further from shore, and these sediments are prone to resuspension during periods of turbulence, thereby increasing turbidity. There was a significant ($r = 0.21$, $P < 0.001$) but weak positive correlation between turbidity with CCS distance.

Area BB4 always had higher mean turbidity values than the other three study areas, and differences among areas were statistically significant during all four sampling events (Table

4.2-6). During both individual spring events, Area BB4 had significantly higher mean turbidity than all other areas, while none of the other areas differed significantly from one another. During the fall 2010 event, Areas BB1 and BB4 were not significantly different from each other, but both had significantly higher values than the other two stations. The following fall, Area BB4 was significantly greater than only Area BB2. When all four events were combined, Area BB4 had significantly higher bottom turbidity than all other areas, and Area BB1 had significantly higher values than Areas BB2 and BB3. Thus, turbidity seems to be highest at the north and south ends of the project area, and turbidity in Area BB4 is consistently significantly higher than in other areas. Again, this relates to the more widespread occurrence of silty substrates in the control area (BB4).

4.2.2.3 Porewater Temperature and Specific Conductance Measurements

Porewater Temperature

Average porewater temperatures along each transect during spring 2012 ranged from 23.4°C (BB2-*a*) to 31.0°C (BB1-*e*; Table 4.2-20); there were no significant differences among transects in any study area (Table 4.2-5). However, mean porewater temperatures in Area BB1 were significantly lower than in any of the other areas (Table 4.2-6). As with bottom water temperatures, these differences are not likely to be of ecological significance.

Porewater temperatures for all four baseline sampling events are presented in Table 4.2-21. Significant differences in porewater temperatures were detected among transects during the fall 2010 (Areas BB1, BB2, and BB3) and spring 2011 events (Areas BB2 and BB4; Table 4.2-5). However, these differences did not persist in any study area when both spring, both fall, or all four events were combined. There was no significant correlation between porewater temperature and distance from the CCS for all events and study areas combined.

Differences in mean porewater temperatures among study areas were found during three of the four sampling events, the only exception being fall 2011 (Table 4.2-6). However, the relationships were not consistent. During fall 2010, Area BB3 had significantly higher mean values than Areas BB1 and BB2; during spring 2011, Area BB4 had significantly higher values than all other areas; and during spring 2012, BB1 had significantly lower values than all other areas. No differences were detected among study areas when both fall, both spring, or all four events were combined for analysis.

Comparison of Porewater and Bottom Water Column Temperatures

To evaluate the insular effects of sediments, porewater temperatures during the spring 2012 sampling event were compared with bottom water column temperatures (Table 4.2-22). There were no significant differences in porewater and bottom water temperatures along any transect within any study area (Table 4.2-23). Similarly, there were no significant differences between porewater and bottom water temperatures in Areas BB1, BB2 or BB3, for all transects combined (Table 4.2-24). However, in Area BB4 porewater temperatures were significantly higher than bottom water temperatures.

Differences between porewater and bottom water temperatures for all four baseline sampling events are presented in Table 4.2-25. There were no significant differences between porewater and bottom water temperatures along any transect in any study area during any prior sampling event, and no statistically significant differences were detected when both spring, both fall, and all four events were combined for analyses (Table 4.2-23).

The only sampling event in which there were no significant differences between porewater and bottom water temperatures within any study area was spring 2011 (Table 4.2-24). During both fall events, porewater temperatures were significantly higher than the overlying water column in Areas BB3 and BB4, while in Area BB2 the difference was only statistically significant during the fall 2010 event. No significant differences were detected during any sampling event in Area BB1. Due to the high variability in the data, most differences went away when seasonal data were combined. The only exception was in Area BB4 where porewater temperature remained significantly greater than bottom water temperature during the combined spring events. No differences were found in any study area when all four sampling events were combined.

Porewater Specific Conductance

During the spring 2012 sampling event, Transect BB1-*a* had the lowest average porewater specific conductance value (46,000 µS/cm) and BB2-*a* had the highest (57,100 µS/cm; Table 4.2-26). There were no significant differences in porewater conductance among transects within any study area (Table 4.2-5). However, as with bottom water conductance, Area BB4 had significantly lower porewater conductance than all other areas, and Area BB2 had significantly greater conductance than BB3 (Table 4.2-6), again suggesting a north to south gradient in conductance values.

Porewater specific conductance for all four baseline sampling events is presented in Table 4.2-27. There were no significant differences in porewater specific conductance among transects in Areas BB1, BB2, and BB3 during any prior sampling events, nor when both spring, both fall, and all four events were combined (Table 4.2-5). Although no significant differences were detected among transects in Area BB4 for any of the four individual events, there was a significant difference when both spring events were combined. For that test, Transect *d* and *e*, farthest from shore had significantly higher mean porewater conductance values than Transects *a* and *b*, closest to shore, with Transect *c* being intermediate to the two groups. These statistical differences did not persist when all four events were combined. However, there was a significant ($r = -0.18$, $P < 0.001$), but very weak negative correlation between CCS distance and porewater conductance for all study areas and events combined.

There was considerable variability in porewater conductance among study areas, with Areas BB2 and BB3 typically, but not always, having higher mean values than Areas BB1 and BB4 (Table 4.2-6). There were no statistically significant differences among study areas when data for both fall events were combined. However, when spring data were combined, Area BB4 had significantly lower mean conductance that any other area, while BB2 had significantly higher values than Area BB3. This pattern was slightly altered when data for all four events were combined; porewater conductance in Area BB4 remained significantly lower than in any other

area, but Areas BB2 and BB3 were no longer significantly different. Instead, Area BB2 was significantly different that Area BB1.

Comparison of Porewater and Bottom Water Column Specific Conductance

Porewater specific conductance during the spring 2012 sampling event was compared with bottom water column conductance (Table 4.2-28). There were no significant differences in porewater and bottom water conductance among transects within any study area (Table 4.2-23). Similarly, there were no significant differences between porewater and bottom water values among any of the four study areas (Table 4.2-24).

Differences in porewater and bottom water conductance for all four baseline sampling events are presented in Table 4.2-29. The only statistically significant difference detected between porewater and bottom water conductance was found along Transect *d* in Area BB3, when data for both spring events were combined and Transect *b* when data for both fall events were combined (Table 4.2-23). No significant differences were found when data for all four sampling events were combined.

During the fall 2010 and spring 2011 sampling events, porewater conductance was higher than the overlying water column conductance in Areas BB1, BB2, and BB3, while the opposite was true in Area BB4 (Table 4.2-24). With the exception of Area BB3 in fall 2011, those differences were not detected during the last two monitoring periods. However, when both spring and both fall events were combined, results were similar to those described for the first two events, with porewater conductance being significantly lower than bottom water values in Area BB4, whereas when statistically significant differences were found in the other areas, porewater conductance was consistently significantly higher than in the overlying water column. When data for all four events were combined, no statistically significant differences were detected in conductance between porewater and bottom water data in any study area.

4.2.2.4 Submerged Aquatic Vegetation

Study Area Characterizations

Study Area BB1 can generally be described as embayment-like and is somewhat more sheltered than the other study areas, as portions are located west of the Arsenicker Islands and south of the Turkey Point peninsula (Figure 4.2-1). It is also the shallowest of the study areas. Inshore transects within this area can be characterized as having sparse to moderate macrophyte coverage throughout (primarily turtle grass, *Thalassia testudinum*, and the green turf alga, *Batophora*). As distance from shore increases, the hardbottom is often found closer to the surface of the substrate, and the seagrasses tended to be more patchily distributed thereby creating more areas of open bottom where macroalgae, gorgonians, and sponges dominate.

During the spring 2012 sampling event, turtle grass was present along all transects in Area BB1, occurring at all 40 sampling points (Table 4.2-30). Shoal grass, *Halodule wrightii*, was present

along all transects, but at only 17 (42.5%) of the 40 sampling points, and bottom coverage never exceeded 5%.

The nearshore transects in Area BB2 had many open areas, with drift algae, gorgonians, sponges, and sparse seagrass. Shoal grass was present at 8 of the nearshore sampling points (Transects *a* through *c*), and coverage never exceeded 5%; it was completely absent at sampling points along the two transects farthest from shore (Table 4.2-30). Turtle grass was present along all transects and occurred at 34 (85%) of the 40 sampling points.

Study Area BB3 is the deepest of the four study areas. Both Areas BB2 and BB3 are in Card Sound and share similar SAV community characteristics. *Halodule* was present at only four sampling points (10% of all points), while *Thalassia* occurred in quadrats at 37 points (92.5% of all points; Table 4.2-30).

The nearshore transects in Area BB4 consisted of silty substrates, with rubble and small corals scattered throughout. The greater amount of exposed nearshore hardbottom in this area diminishes the amount of habitat suitable for dense seagrass beds. The middle transects had more open areas with large scattered patches of moderate turtle grass. The offshore transects varied from open bottom to areas of moderate seagrass coverage. Overall, *Thalassia* was present at 38 (95%) of the 40 sampling points in BB4, while *Halodule* was present at only 8 sampling points (20% of all points; Table 4.2-30). As for the other study areas, shoal grass coverage never exceeded 5%.

Macrophyte Coverage

Macrophytes in each of the four replicate quadrats at each sampling point were assigned a BBCA score and the indexed values averaged to produce a mean score for each point. BBCA scores of total macrophytes, total seagrass, and total macroalgae were then compared among transects within each study area and among study areas for all transects combined (Table 4.2-31). Average total macrophyte scores during the spring 2012 sampling event ranged from 1.1 (Transect *c* in Area BB4) to 2.9 (Transect *e* in Area BB3). Study Area BB4 had the lowest mean total macrophyte score for all transects combined (1.6), while Area BB3 had the highest (2.4). Lowest mean BBCA scores for total seagrass, all transects combined, were highest in Areas BB1 and BB2 (1.2) and lowest in Area BB4 (0.9). Mean scores for total macroalgae within each study area ranged from 1.2 (Area BB4) to 1.7 (Area BB3). Given the high degree of spatial variability in SAV coverage throughout the project area, there were no statistically significant differences in total macrophytes, total seagrass, or total macroalgae among transects within any of the four study areas during the spring 2012 event (Table 4.2-32), nor were there any significant differences in these categories among study areas, for all transects combined (Table 4.2-33).

Differences in SAV coverage for all four baseline sampling events are presented in Table 4.2-34. There were no significant differences in total macrophyte coverage among transects within any study area during any prior individual sampling event (Table 4.2-32). The only statistically significant difference occurred in Area BB1 when all sampling events were combined; Transect *e* had lower total macrophyte coverage than all other areas, while none of the other areas differed

from one another. Similar results were obtained when total macroalgae coverage was compared among transects during prior sampling events (Table 4.2-32). When data for all four events were combined, the only statistically significant difference was found in Area BB1, where total macroalgae was significantly lower on Transect *e* than on any other transect. There were significant, but very weak negative correlations between distance from the CSS and both total macrophyte coverage (r = -0.18, $P < 0.001$) and total macroalgae coverage (r = -0.14, $P < 0.001$).

The principal difference in SAV among transects was related to total seagrass coverage (Table 4.2-32). In Areas BB1 and BB4 at the north and south ends of the project area, respectively, no statistically significant differences were found among transects during any individual sampling event or when seasonal or all four events were combined. Although there were no significant differences in total seagrass coverage in Area BB3 for any individual event, Transect *e*, farthest from shore, had significantly greater seagrass coverage than Transects *b* and *c*, when both fall events were combined, and greater coverage than Transects *b*, *c*, and *d* when all four events were combined. In Area BB2, statistically significant differences in total seagrass coverage were found among transects during the spring 2011 and fall 2011 sampling events and also when both spring events, both fall events, and all four events were combined. The two transects farthest from shore in BB2 tended to have significantly greater coverage than the two transects nearest shore. Thus, in Areas BB2 and BB3, seagrass coverage was greatest at sampling points farthest from shore and least at points closest to shore. There was no statistically significant correlation between distance to the CSS and total seagrass coverage.

Total macrophyte BBCA scores indicated statistically significant differences between study areas during the spring 2011 event, when Area BB4 had significantly lower mean scores than Areas BB2 and BB3, and Area BB1 had significantly lower scores than Area BB3 (Table 4.2-33). Those differences were not present during the individual fall events or for both fall events combined. When all four events were combined, Areas BB2 and BB3 had significantly higher total macrophyte coverage than Area BB4, but none of the other areas differed. Similar results were obtained for total macroalgae coverage, with Area BB4 having significantly lower mean BBCA scores than any other area, and Area BB1 having significantly lower macroalgae coverage than Areas BB2 and BB3. Total seagrass coverage was significantly lower in Area BB4 than any other area, but none of the other areas differed from one another. Collectively, these data indicate reduced coverage of macrophytes in the control area compared with the other three study areas.

4.2.2.5 Ecological Observations

Substrate

The distribution of macrophytes, particularly seagrasses, within the study area is, to a large degree, affected by bottom type and the depth of unconsolidated sediments above limestone hardbottom. Consequently, a qualitative assessment of the substrate was made at each SAV sampling point. Four categories were used to characterize sediments: sandy, silty, shell hash, and rubble. If a quantity of substrate was picked up, released, and settled relatively quickly with little drift, it was classified as sandy. If a plume was evident and it settled more slowly, it was classified as silty. Pockets of shell fragments mixed in with the sand were classified as shell hash,

while rocks or hardbottom either exposed or just beneath a veneer of sediment were classified as rubble. Each sampling point could have one or a combination of these components.
One hundred thirty- five (135) of the 160 sampling points were classified as sandy-shell hash (84%; Table 4.2-35). A total of 19 sampling points (12%) had a silty component, all of which were located in Area BB4. Similarly, 15 points included rubble in the description, all of which were in Area BB4. Thus, the "control" area for this study, was somewhat different from the other areas in that it had a higher percentage of stations where substrates contained both silty and rubble components.

Within Areas BB1, BB2, and BB3, sediment types did not vary appreciably among transects, whereas in Area BB4, the percentage of sampling points with rubble was higher along the two nearshore transects than along transects farther from shore. Conversely, the percentage of sampling points having a sand component was highest at offshore transects. Thus, there was a noticeable difference in substrate types among transects within Area BB4. Insofar as these data are highly qualitative, they do not lend themselves to statistical comparisons. However, the patterns described above have been consistent throughout the monitoring period.

Benthic Habitat

In addition to the substrate types discussed above, observations were made to characterize the benthic habitat surrounding each sampling point. These qualitative observations, which complement the quantitative measures of SAV coverage, characterize a larger area around each sampling point and highlight some important differences among study sites.

Ecological observations were made at all 160 points for each of the four sampling events (Table 4.2-36). The observations were divided into categories with the frequency of occurrence calculated for each area (n=160; 40 points per area X 4 events).

Seagrass coverage (dominated by *Thalassia*) around each sampling point was noted as sparse, sparse to moderate, or moderate to dense. For all sampling events combined, Areas BB1 and BB4 had the highest percentage of observations of sparse seagrass (67.5% and 79.4%, respectively), and conversely the lowest percentages of sparse to moderate (14.4% and 16.9%, respectively) and moderate to dense seagrass (3.8% and 1.3%, respectively; Table 4.2-36). The number of observations of moderate to dense seagrass represented only 14.4% of all observations in Area BB2 and less than 5.0% of all observations in the other three study areas. Thus, although seagrasses were widespread, they occurred primarily in sparse or sparse to moderate assemblages around the sampling points used for this study.

Roughly similar percentages of calcareous algae occurred throughout all four study areas (35.6% to 41.9%; Table 4.2-36). However, drift algae occurred with about half the frequency in Area BB1 (15.0%) as in the other areas. Sponges and gorgonians (soft corals) were most prevalent in the areas with highest densities of seagrass (Areas BB2 and BB3) and occurred with the lowest frequency in Area BB4; gorgonians were noted in only 3.1% of all observations in Area BB4. Conversely, corals were observed with highest frequency in Area BB4 (36.3% of all

observations). The greater prevalence of hard corals in the control area probably relates to the greater amount of exposed hardbottom in that area.

Seagrass conditions within Area BB1 were fairly consistent among transects for all sampling events combined, although the percentage of observations with moderate to dense coverage tended to decrease with increasing distance from shore (Table 4.2-37). In the other three study areas, the percentages of observations with sparse seagrass tended to decrease, while the percentage of observations with sparse to moderate and moderate to dense seagrass generally increased in an offshore direction. There were no obvious trends in either calcareous or drift algae among transects within any study area.

Gorgonians tended to be more prevalent along offshore transects in Area BB1, while in Areas BB2 and BB3 they occurred with greater frequency on nearshore transects (Table 4.2-37); relatively few gorgonians were present in Area BB4. Hard corals followed the same pattern as described for gorgonians, and the pattern in Area BB4 was similar to that found in Areas BB2 and BB3.

Observations of silty and rubble substrates support the analysis of substrate types presented above, with the vast majority of observations of those two categories occurring in Area BB4. Sixty-three (63) percent of all observations along Transect *a* had a silty component (Table 4.2-37).

4.2.2.6 Faunal Throw Traps

During the spring 2012 sampling event, a total of 985 organisms, representing 49 taxa, were collected (Table 4.2-38). Common and scientific names of all taxa collected are presented in Table 4.2-39. Fish and caridean shrimp were captured at 60% and 65% of all sampling points, respectively, while Paguroidea (hermit crabs) was the most ubiquitous taxon (80% of all sampling points; Table 4.2-40). No organisms were captured at 5% of the sampling points. *Diplogrammus pauciradiatus* (spotted dragonet), *Anarchopterus criniger* (fringed pipefish), and *Hippocampus zosterae* (dwarf seahorse) were the most abundant fish species and were captured at the most sampling points throughout the project area during the spring 2012 sampling event (Tables 4.2-38 and 4.2-40). However, they were collectively represented by only 93 specimens and accounted for less than 10% of the total catch. *Thor floridanus* was the most abundant and ubiquitous caridean shrimp in the collections and comprised 20% of the total catch, all sampling points combined. Hermit crabs comprised the taxon with the greatest number of individuals, accounting for about 34% of the total catch. Minimum and maximum lengths for measured organisms collected during the spring 2012 sampling event and for all sampling events combined are provided in Tables 4.2-41 and 4.2-42, respectively.

Absolute numbers and densities (number of individuals/m^2) of all organisms collected by FTT during all four baseline sampling events are summarized in Tables 4.2-43 and 4.2-44, respectively. Overall, densities were relatively low throughout the project area and varied widely among transects, study areas, and sampling events. The highest total density recorded during any individual sampling event (99.25/m^2) was on Transect *a* in Area BB1 during fall 2011 (Table

4.2-44). The highest total density recorded on any transect for all four sampling events combined (37.88/m^2) was also on Transect *a* in Area BB1, while the lowest (0.63/m^2) occurred on Transect *e* in Area BB4. However, given the high degree of spatial and temporal variability, there were no statistically significant differences in total densities among transects in any study area for individual sampling events, for seasonal events combined, or for all four sampling events combined (Table 4.2-45).

The highest total fish density recorded during any individual sampling event (7.50/m^2) was on Transect *e* in Area BB3 in spring 2011 (Table 4.2-44). When all four sampling events were combined, total fish density ranged from 0.56/m^2 (Transect *b* in Area BB1) to 6.06/m^2 (Transect *e* in Area BB3). However, the only statistically significant difference detected for total fish density occurred in Area BB3 when all four sampling events were combined; Transect *e* had significantly more fish than Transects *b* and *c* (Table 4.2-45).

By far, the highest total caridean density during the period of study (60.0/m^2) was on Transect a in Area BB1 during fall 2011, and this accounted for the high total density of all organisms on that transect when all four sampling events were combined (Table 4.2-44). Again however, given the high amount of temporal and spatial variability in the data, there were no statistically significant differences in total caridean densities among transects in any study area during any individual sampling event, for seasonal events combined, or for all four sampling events combined (Table 4.2-45).

With respect to differences among study areas, total densities ranged from 1.55/m^2 (Area BB1 in fall 2010) to 36.45/m^2 (Area BB1 in fall 2011; Table 4.2-44). When all four sampling events were combined, Area BB1 had the highest total density (15.01/m^2) and Area BB2 the lowest (9.61/m^2). Yet when data were compared statistically, no significant differences were detected among areas for any individual sampling event or when both spring, both fall, and all four events were combined (Table 4.2-46).

Total fish densities ranged from 0.45/m^2 (Area BB1 in fall 2010) to 4.20/m^2 (Area BB3 in spring 2011; Table 4.2-44). When all sampling events were combined, Area BB1 had the lowest total fish densities (1.13/m^2) and Area BB3 the greatest (2.75/m^2). However, as with total densities, total fish densities did not differ significantly during any single event or combination of events (Table 4.2-46).

Total caridean densities varied from 0.55/m^2 (Area BB1 in fall 2010) to 18.50/m^2 (Area BB1 in fall 2011; Table 4.2-44). Area BB3 had the highest caridean densities for all sampling events combined (7.58/m^2) and Area BB4 had the lowest (4.28/m^2). The only statistically significant difference in total caridean density occurred during spring 2011, when Area BB1 had significantly lower densities than either Area BB2 or BB3 (Table 4.2-46). Those differences did not persist when both spring, both fall, and all four events were combined for analysis.

The various taxa collected by FTTs are presented for all four sampling events combined in Table 4.2-47. Throughout the period of monitoring a total of 3,827 fish and invertebrates were captured. Fish constituted 15.6% of the total catch for all events combined, with *Gobiosoma*

robustum (code goby), *Anarcopterus criniger*, *Diplogrammus pauciradiatus*, *Hippocampus zosterae*, and *Opsanus beta* (Gulf toad fish) being the most abundance species (Table 4.2-47). Caridean shrimp accounted for nearly half the total catch for all four events combined, with the genus *Thor* being the most abundant taxon (68.0% of all carideans); individuals in the genus Hippolyte constituted the next most abundant caridean taxon (13.6%). Relatively few penaeid shrimp (3.4% of the total catch) were captured, and *Farfanepenaeus duorarum* (pink shrimp) was the most abundant taxon. Crabs accounted for nearly 30% of all individuals, with hermit crabs being the most abundant (84.3% of all crabs); xanthid (mud) crabs and spider crabs accounted for most of the remaining individuals in this group.

Comparisons of dominant taxa collected by FTT among the four study sites are graphically presented on Figures 4.2-9 through 4.2-22. For all sampling periods combined, caridean shrimp accounted for the most abundant group within each study area, although they occurred in greater densities in Areas BB2 and BB3 than in the other two areas (Figure 4.2-13). Areas BB1 and BB4 were similar in that hermit crabs comprised the next most abundant group, whereas in Areas BB2 and BB3, fish were the second most abundant group.

There were appreciable differences in relative abundances of the major fish taxa among study areas when data for all four events were combined (Figure 4.2-18). The code goby, fringed pipefish, and spotted dragonet, all small cryptic species, accounted for over three quarters of all fish collected in Areas BB2 and BB3. In Area BB1, the dwarf seahorse was also relatively abundant. The spotted dragonet, which was very abundant in other areas, accounted for a much smaller percentage of total captures in Area BB4. Overall, a greater variety of fish species contributed to total density in Area BB4.

SAV provides an essential refuge for benthic invertebrates and small fish. Caridean shrimp feed on the epiphytic growth on seagrass blades, and loose lying drift algal mats provide abundant, although ephemeral, cover. Areas with some seagrass coverage, corals, gorgonians, sponges, or calcareous algaes can provide accumulation points for drift algae. Not surprisingly, the total faunal density, total fish density, and total caridean density for organisms captured in FTTs were all significantly, although weakly, correlated with SAV coverage when data for all four sampling events were combined (Figure 4.2-23. The highest significant correlations for all three parameters were found with total macroalgae ($r = 0.39$, $P < 0.001$ for total density; 0.40, $P < 0.001$ for total caridean density; and 0.35, $P < 0.001$ for total fish density), again exemplifying the importance of this SAV component. The correlations were weaker, although still statistically significant, for total seagrass density ($r = 0.17$, $P = 0.002$ for total density and total fish density and 0.20, $P < 0.001$ for total caridean density). These FTT results indicate that faunal abundances are more closely tied to macrophyte coverage than to other habitat variables, such as water quality and substrate.

4.2.2.7 Light Attenuation

Photosynthetic photon flux (PPF) is a unit of measure used to express the light quantum in photons of solar energy related specifically to photosynthesis and is measured with a quantum meter in units called micro-moles (µmols). Micro-moles reflect the number of photons per

square meter per second. Differences in the amounts of radiation striking a meter sensor on the boat and another sensor suspended within the water column allow determination of light attenuation within depth (percent attenuation per meter of depth).

Ambient light measurements taken at one point on each transect during the spring 2012 sampling event ranged from 1,133 µmols/m^2/sec (BB1-*b*) to 2,403 µmols/m^2/sec (BB2-*e*) and bottom water column values from 269 µmols/m^2/sec (BB3-*e*) to 1,771 µmols/m^2/sec (BB1-*e*; Table 4.2-48). Average percent attenuation per meter of water column between ambient and bottom values was greatest in Areas BB3 and BB4 (27% and 28%, respectively) and least in Area BB1 (19%; Table 4.2-49). Area BB4 had the highest turbidity values during SAV sampling and was characterized as having a relatively high silty sediment component. Even small amounts of suspended silt in the water can affect the amount of light reaching the bottom.

Since light attenuation was measured once per transect, the only statistical comparisons that can be made are among study areas. During the spring 2012 sampling event, Area BB1 had significantly lower light attenuation than all other areas (Table 4.2-33). Statistically significant differences were also found during prior sampling events. Areas BB3 and BB4 consistently had higher percent light attenuation than did Areas BB1 and BB2. When all four events were combined, all four areas were significantly different from one another, with Area BB1 having the lowest mean light attenuation value and Area BB3 the greatest. There was a significant ($r = 0.31$, $P < 0.001$), but weak positive correlation with CCS distance and light attenuation for all events combined.

4.2.2.8 Soil Cores

Soil cores were collected for nutrient analysis at two points along each transect in the fall 2010 sampling event and both samples combined for analysis. A second set of samples was collected in November 2011 and analyzed for dry bulk density.

Nutrient data were provided for each of the composited 10-cm horizons extracted from two core samples along each transect (Table 4.2-50). There were no obvious trends in Total Nitrogen (TN), Total Phosphorus (TP), or Total Carbon (TC) when data were compared among horizons or transects within a study area. When the means of all horizons for each transect were combined, Area BB4 had the highest mean TN (527.9 mg/kg) and Area BB3 the lowest (349.3 mg/kg). Area BB4 also had the highest TP of all study areas (44.2 mg/kg) and Area BB2 the lowest (29.8 mg/kg). Mean TC ranged from 929,301 mg/kg in Area BB1 to 959,443 mg/kg in Area BB3.

Mean TN:TP and TC:TN ratios were calculated for each horizon, transect, and study area (Table 4.2-51). At the horizon level, there was no consistency for either ratio in regards to horizon depth or distance from shore. Area BB3 had the lowest mean TN:TP of all study areas (11:1), while Areas BB1 and BB2 had the highest (13:1). Area BB4 had the lowest TC:TN ratio of all areas (2,540:1), and Area BB3 had the highest (3,171:1).

Soil chemistry and dry bulk density were collected only once during the study, with a single value per transect; therefore, the only statistical comparisons that can be made are among study

areas. There were no significant differences in TN, TP, or TC among areas when data for each depth strata were analyzed separately (Table 4.2-52). However, when data for all horizons were combined, Area BB4 had significantly higher concentrations of TP than all other study areas, and Area BB2 had significantly higher TC concentrations than Area BB1; no other comparisons resulted in statistically significant differences. Likewise, no significant differences were detected for TN:TP and TC:TN ratios for all horizons combined.

There were no significant correlations between any soil nutrient and distance from the CCS. Similarly soil dry bulk density was not significantly correlated with distance from the CCS.

Soil nutrient concentrations were compared with SAV coverage (BBCA scores) for the fall 2010 event, the only event in which sediment nutrients were analyzed. The only soil nutrient that was statistically correlated with macrophyte coverage was phosphorus, which was very weakly but negatively correlated with total macrophytes (r = -0.20, P = 0.012). The TN:TP ratio was also significantly correlated with macrophyte coverage, with total macrophytes being very weakly but positively correlated (r = 0.182, P = 0.021) and seagrasses being very weakly and negatively correlated (r = -0.19, P = 0.017).

Areas BB1 and BB4 had the lowest mean sediment dry bulk density (0.935 and 0.937 g/cc, respectively) of the four study areas, and Area BB2 had the highest (Table 4.2-50). As with nutrients, no statistically significant differences were detected among areas when each depth horizon was analyzed separately (Table 4.2-52). However, sediments in Area BB2 had significantly higher mean dry bulk density than all other areas when data for all horizons were combined. None of the other areas differed significantly from one another.

4.2.2.9 Porewater Nutrient and Tracer Suite Sampling

Laboratory results from the porewater nutrient and Tracer Suite sampling for the first three sampling events (results for spring 2012 were incomplete at the time of report preparation) are presented in Table 4.2-53. With respect to tritium, the chemical element most indicative of cooling water seepage into adjacent water bodies, Area BB4 had both the highest (15.36 pCi/L; spring 2011) and lowest mean values (1.3 pCi/L; fall 2011) for any single sampling event. However, no statistically significant differences were found among study areas for any single event, for the two fall events combined, or four the first three sampling events combined (Table 4.2-6). There was a weak negative correlation with CCS distance and tritium concentrations (r = -0.20, $P < 0.001$). If cooling water was seeping into Biscayne Bay or Card Sounds, tritium concentrations would be expected to be significantly higher near shore.

4.2.2.10 Leaf Nutrients

Leaf nutrients were collected at only one point per transect during the two fall events and results are presented in Table 4.2-54. There were no significant differences in leaf nitrogen content among areas during either fall event or when both events were combined (Table 4.2-55). Similarly, there were no significant differences in leaf carbon content among study areas during fall 2010. However, during the fall 2011 event, leaf carbon was significantly lower in Area BB1 than in either BB3 or BB4. This difference did not persist when both fall events were combined.

There was no correlation between soil nitrogen and carbon and the corresponding concentrations of these elements in seagrass leaf material collected during the fall 2010 sampling event.

4.2.3 Discussion

The results of ecological monitoring performed to date in Biscayne Bay and Card Sound provide no evidence that prior Turkey Point Plant operations are responsible for structuring the benthic communities in and around the plant site. Insofar as there are no surface water connections with Biscayne Bay and Card Sound, any influences would have to result from underground seepage from the CCS.

With respect to water quality, there were no indications of CCS effects on bottom water temperatures, bottom water conductance, salinity, ORP, or porewater temperatures. There was a very weak tendency for bottom DO values to be higher at stations closer to the CCS. However, bottom DO values for all sampling events combined were significantly lower in the control area than in any of the three study areas immediately adjacent to the plant site.

There was a weak tendency for turbidity values to increase with increasing distance from the CCS. However, it is likely that differences in turbidity values are related to differences in substrate types among the areas. The control area, BB4, had significantly higher bottom turbidity than the other three study areas, and turbidities were significantly higher at nearshore transects than at offshore transects. This is an artifact of the more silty substrates near shore in Area BB4.

There was a very weak negative correlation between distance from shore and porewater specific conductance. There were no statistical differences in porewater tritium concentrations among any of the study areas during any of the four sampling events, suggesting that the higher nearshore porewater conductivity values are not associated with CCS seepage.

Turtle grass was the dominant and widespread seagrass within the project area; however, the BBCA scores for this component of SAV were relatively low along most transects. High cover and low-standing crop of seagrasses in Biscayne Bay have been reported by others and are attributed to the shallow depth of sediments. The *Thalassia* rhizosphere typically extends 25 to 40 cm into the substrate (Enriquez et al. 2001). Areas that do not have sufficient substrate depth will not have robust seagrass beds. Sampling for all events was conducted at the same fixed points. Often the depth of unconsolidated sediment was too shallow at the sample point to allow insertion of the porewater or core sampler to 30 cm, and an expanded area had to be probed numerous times until a suitable area could be located. Generally, locations where at least 30 cm of unconsolidated sediments were present corresponded to areas where patches of turtle grass were present. Qualitatively, sediment depth appears to be the primary limiting factor in the distribution and coverage of seagrasses within the project area, as soil chemistry, porewater nutrients, and light attenuation are not reported herein in limiting quantities.

SAV conditions noted in the vicinity of the plant are not atypical of those reported elsewhere in South Florida. For example, Robblee and Browder (2007) found Thalassia generally to be the

most abundant seagrass present at their monitoring locations in both Biscayne Bay and Florida Bay (frequency of occurrence 80% to 98%). During spring 2012, Thalassia occurred in 100% of the sampling points in BB1, 85% of the BB2 points, 92.5% of the BB3 points, and 95% of the BB4 points. Robblee and Browder (2007) also report that the area from North Black Point in Biscayne Bay (about 6 miles north of BB1) to south-central Florida Bay was characterized by high Thalassia cover but low-standing crop. They explained that this pattern probably resulted from shallow sediments (31 to 37 cm) present at their sampling locations. Likewise, we contend that the low BBCA scores for seagrasses along many of our transects were due to the lack of adequate substrate depths for establishment of seagrass roots.

Four of the five most abundant fish species (*Gobiosoma robustum*, *Anarchopterus criniger*, *Diplogrammus paucradiatus*, and *Opsanus beta*) reported by Robblee and Browder (2007) in southern Biscayne Bay (South Black Point; just north of BB1) were also among the five most abundant fish species collected during this study. The notable exception was *Lucania parva* (rainwater killifish), which was the most abundant fish species collected at South Black Point but was only represented by one specimen in this study. Tomoleoni (2007) used FTTs to determine the abundance and distribution of *L. parva* along the western shoreline of Biscayne Bay from Matheson Hammock to Turkey Point and reported some of the highest densities ever recorded for the species (4.64 to 9.48 per square meter). Browder et al. (2011) similarly found *L. parva* to be the dominant species at most of their stations north of Turkey Point where it comprised over 60% of all organisms collected. Both studies associated densities of this species with salinity patterns; Tomoleoni (2007) reported catch per unit effort (CPUE) of *L. parva* in Biscayne Bay during the wet season when salinities were low was more than twice as high as CPUE during the dry season. Thus, low densities of *L. parva* in our study area may be related to salinities. However, it is more likely that the general absence of *L. parva* in our study area is related to differences in the habitats sampled between the two studies. Tomoleoni's study area was located along the shoreline in water less than 1 meter deep and near the mangrove-seagrass interface.

Robblee and Browder (2007) found that species in the *Thor floridanus/manningi* complex and the *Hippolyte pleurocanthus/zostericloa* complex dominated the caridean shrimp fauna in the seagrass habitats of Florida and Biscayne Bays. Likewise, these were the most abundant caridean shrimp in our collections.

Though Robblee and Browder (2007) found that crabs were not abundant at South Black Point, they were the second most abundant group of animals in our collections. Also, most of the crabs collected by Robblee and Browder were xanthoids while most of the crabs in our collections were paguroids. These differences between the two studies may reflect some differences in benthic habitat conditions between the two study areas.

The pink shrimp, *Farfantepenaeus duorarum*, was the most abundant Penaeid shrimp collected by Robblee and Browder (2007) in Biscayne Bay and was the most abundant Penaeid collected in our study area. As Robblee and Browder found in their South Black Point and Card Sound sampling areas, overall densities of pink shrimp in our study area were relatively low. Robblee and Browder (2007) found that the densities of organisms were generally highest associated with monitoring locations characterized by the presence of a well-developed grass

canopy regardless of seagrass community composition. Likewise, we found densities significantly correlated with SAV measurements.

4.3 Landscape Scale Assessment of Porewater and Soils

The intent of this section is to compare across the landscape to determine if there are patterns of CCS water emanating from the groundwater within the measured ecological plots, and also to provide an understanding of the larger landscape scale porewater analytical data and soil structure that might help explain some of the ecological characteristics of the habitat.

4.3.1 Initial Ecological Condition Characterization

At the start of the monitoring effort, per the Monitoring Plan, FPL conducted a broad-scale porewater survey during one wet and dry season across the landscape onshore and offshore surrounding the CCS. The porewater surveys were designed and implemented to help better characterize conditions over approximately 70 square miles around the CCS and determine whether water from the CCS can be detected in the surrounding habitats.

Understanding the porewater conditions around the CCS can be helpful in assessing the spatial distribution of environmental conditions that affect biota and are potentially influenced by CCS water. If water is upwelling from the CCS into Biscayne Bay or in the marsh and mangrove areas, it can potentially be detected in three ways: 1) significantly warmer porewater with depth that cannot be explained by meteorological or localized conditions, 2) significantly higher saline concentrations with porewater depth that cannot be explained by meteorological or localized conditions, and 3) water chemistry (ion concentrations and ratios, and isotopes) indicating the presence of CCS water.

Upon completion of the surveys, a report was prepared. This is a summary of that report. For a complete description of all methods, analyses and results, see the Initial Ecological Characterization Report (FPL 2012d).

4.3.1.1 Survey Methods

Three general habitats were identified for broad-scale porewater surveys:

- Freshwater wetlands (Marsh);
- Saline wetlands (Mangrove); and
- Biscayne Bay and Card Sound.

The sample locations were established based on a grid pattern. One hundred and one (101) points were identified in the marsh and mangroves and 102 points were selected in the Bay. Additional areas of interest were jointly defined by FPL and the Agencies. Aerial images provided by the SFWMD and Comprehensive Everglades Restoration Plan Restoration Coordination and Verification) were used to determine any areas with differing vegetation patterns and/or unusual features (i.e., mangrove ponds, areas of shorter seagrass). A total of 27

areas of ecological interest (AEIs) were selected: nine locations in freshwater wetlands, nine in saline wetlands, and nine in Biscayne Bay.

The broad-scale porewater surveys were conducted in both the wet and dry season and consisted of two phases. In the first phase, porewater specific conductance and temperature were sampled at locations throughout the landscape. Measurements were made at up to 60 cm into the soils (20cm, 40 cm, and 60 cm depths at each location when possible), and the top (surface) and bottom (0 cm) of the water column where applicable.

In the second phase, wet and dry season porewater samples were collected for laboratory analysis from a subset of locations visited during the first phase. These samples were collected from sites identified by the Agencies upon review of the first phase of data and analyzed for the Monitoring Plan (2009) Tracer Suite constituents. The sample locations in this second phase were based on the results of the first phase and samples were collected from 30 cm depth. All field events are shown in Table 4.3-1.

The dry season porewater survey was conducted in April 2010. Specific conductance and temperature measurements were taken at 101 sites in the marsh (freshwater wetlands) and mangrove areas, and 102 sites in Biscayne Bay/Card Sound. Over 800 measurements were made during the dry season. Figure 1.3-2 shows the initial porewater sample locations. Following review of the initial results, the Agencies identified 30 marsh, 30 mangrove and 30 Bay dry season Tracer Suite sample locations; the Tracer Suite sampling took place in April 2011 as April-May 2010 was wetter than normal.

The wet season porewater survey was conducted in August 2010 followed closely by the wet season Tracer Suite sampling in September 2010. The wet season survey focused only on Biscayne Bay. Measurements were collected at the same 102 locations (>400 measurements) as established in the dry season survey (Figure 1.3-3). Tracer Suite samples were collected at the same 30 locations in the Bay as the dry season.

Statistical analyses were performed on salinity and temperature field measurements to determine if there were any significant differences within each of the habitats across depth (i.e., vertically). In other words, statistical tests were performed to compare the average salinity and temperature at each depth to determine whether they were different from one another. This was done separately for each of the three habitats. This test was important because it helped determine whether salinity and temperature were higher in sediments compared to surface water, and if they increased with sediment depth, a sign that upwelling of CCS water could be occurring.

4.3.1.2 Findings

In some cases the tests indicated significant temperature differences between the overlying surface water (0 cm) and the porewater. Ambient air temperatures more directly influenced surface water than porewater, resulting in surface water temperatures that were more variable than porewater conditions. Although not statistically significant, porewater temperatures (20 to 60 cm depth) decreased slightly with depth in all habitats, a trend that was opposite of the

warming that would be expected if the CCS was affecting porewater. Salinity increased slightly with depth for the mangrove sites, but not for the Bay or marsh (Table 4.3-2). The increase in salinity with depth within the mangroves is most likely a result of salt buildup and limited tidal flushing within the marl sediments, a pattern observed in other mangrove ecosystems around Florida. As porewater salinity increases are not coupled with increased temperatures at depth or higher tritium levels across the landscape, these salinity values are not likely attributable to the CCS, but rather are a result of the inherent hydrologic dynamics of the mangrove forests around the CCS. Therefore, there was no statistical evidence that CCS waters were upwelling across the landscape.

Statistical tests were also used to determine whether the AEI sites, areas that were identified because they differed from the habitats around them, had different temperatures and salinities than the grid point samples of the same habitat type (e.g., Bay grid point salinities compared to Bay AEI salinities). The purpose of these tests was to determine whether the ecological differences between the grid point and AEI sites could be explained by differences in salinity and/or temperature. The statistical tests determined that there were no temperature differences between AEI and grid point samples of the same habitat at any depth (Table 4.3-3). The tests did identify some differences in salinity between AEI and grid point samples in both the marsh and mangrove habitats (Table 4.3-4). However, the trend was the opposite of what would be expected if the AEI sites were hypothesized to be affected by CCS water. When statistical differences were observed in April 2010 within each depth compared, the AEI sites in both the marsh and mangroves had lower salinities compared to the grid points (Table 4.3-4). These differences can likely be explained by the variability in localized conditions. The marsh grid point samples were collected in open areas with high evaporative rates while the AEI samples were located in tree islands with canopies that inhibit evaporation, resulting in slightly lower salinities. Differences in salinity between mangrove grid point samples and AEI samples can be similarly explained; several AEI mangrove points were located in deep pools that would prevent high evaporation rates in the sediment, resulting in lower salinities at depth.

Since porewater temperature and salinity did not indicate an influence from the CCS, further analyses were performed to assess differences in the porewater chemistry. Piper diagrams were used to assess the ionic composition of porewater across the landscape and with depth. The analysis only includes eight ions (calcium, magnesium, sodium, chloride, alkalinity, bicarbonate alkalinity, sulfate, total dissolved solids) but captures those ions which dominate in fresh and marine waters. Examining the ratios of various ions and presenting them in a piper diagram gives insight into the source of the water (e.g., seawater is dominated by sodium chloride). The results from April 2011 (Figure 4.3-1) revealed six grid points (A9, C3, C5, F10, G1, and HI8) with ion concentrations that fell between a seawater source and a freshwater source. All differences could be explained by local ecological factors not related to CCS waters; for example, the calcium-magnesium concentrations at A9, C3, and C5 are between that of a freshwater source and a connate well, indicating a mix of surface freshwater and connate well water. Additionally, the calcium-magnesium concentrations at mangrove site F10 resembled that of a marsh site, which was explained by its proximity to the crocodile-mitigation habitat where freshwater has been diverted to benefit nesting crocodiles. The basic ions did not provide insight

into the presence of CCS water and a more complete analysis including all chemical characteristics was warranted to further evaluate the data.

To better understand which porewater constituents had the greatest influence on the observed differences among the samples across all habitats, a discriminant function analysis (DFA) was performed using all 20 analytical parameters from the April 2011 sampling event. The DFA identified four explanatory parameters: Specific conductance, $\delta^{13}C$, sulfide concentration, and tritium. Specific conductance, $\delta^{13}C$, and tritium were then used in a singular and binary assessment to further explore patterns of distribution. Specific conductance was shown to be an excellent indicator of habitat explaining 88% of the variability in the data. As indicated in the Annual Report (FPL 2011), FPL indicated that tritium may be the most viable tracer since it may be able to distinguish CCS water from Biscayne Bay water down to lower concentrations than other isotopes or ions. During the September 2010 event, tritium values found in the Bay porewater did not exceed 30 pCi/L (Figure 4.3-2).

Evaporation pan tritium values in and around the CCS ranged from 11 to 490 pCi/L between March and June 2011, with values decreasing with distance from the plant (Figure 4.3-3). The highest value was observed at the CCS in May 2011 (TPGW-13A; 490.3 pCi/L) while 283 pCi/L was observed at TPGW-2, 0.2 mile away from the CCS, during the same month (Figure 4.3-4. During that time period, atmospheric deposition of tritium varied from 4 to 34 pCi/L in rainfall (Table 3.4-2). The porewater data showed that the 2011 dry season values were less than 283 pCi/L in 98% (86 out of 88 values) of the samples. The two samples that were higher than the evaporation pan value at TPGW-2 were from sites close to the CCS; neither sample had significantly higher levels of chloride or specific conductance values compared to other nearby samples, which would be indicative of CCS water via a groundwater pathway. This indicates that these two porewater values may be reflective of some vapor-phase transport contribution due to their proximity to the CCS. However, additional rainfall and evaporation pan data need to be collected to confirm that the several high values are attributable to an atmospheric pathway.

Tritium levels were also compared against specific conductance and chloride concentrations to determine if there were significant positive associations between these parameters that would indicate a groundwater pathway from the CCS. A Pearson correlation ($r = 0.008$, $P > 0.10$) indicated that there was no association between tritium concentrations and specific conductance. This is particularly evident in graphical form as there is no visible positive linear association between tritium and specific conductance (Figure 4.3-5). The lack of an association between tritium and specific conductance indicates that the tritium values in each habitat, as well as across the landscape, are not linked to a groundwater pathway of CCS water transfer.

Overall, there was no clear landscape-scale indication of CCS water within the marsh, mangrove, or Biscayne Bay sites. After thorough analysis of both field parameters and analytical constituents, there is no convincing evidence demonstrating an effect of CCS waters on porewater in the area surrounding the Turkey Point plant and there is an overall limited significant difference between the AEI and grid point sites in each habitat. A few above - mentioned sites (C10, D10, and F11), however, may warrant some further examination. Since it is possible the tritium values in excess of the 283 pCi/L may be a result of atmospheric

exchange, rainfall and evaporation pans should continue to be monitored for at least one full year. Since the tritium levels in the evaporation pans may never fully reach equilibrium with the atmosphere due to diluting effects of rainfall, it may be warranted to directly collect air vapor samples for short durations in both the wet and dry season.

4.3.2 Porewater Quarterly Events

A broad-scale comparison of porewater analytical data across the marsh, mangrove, and Bay were compared for all seasons and contrasted against additional evaporation pan and rainfall collector data. This assessment is meant to provide a landscape-scale assessment to determine if there was an influence of the CCS on the shallow porewater where the plots were being monitored. The data from October 2010 through May 2012 show that porewater values within the sampling plots observed (excluding reference transects) are within the ranges observed for TPEVP-2 and TPEVP -3 which are in proximity to the CCS (Figure 4.3-6).

In reviewing the specific conductance (Figure 4.3-7) and tritium data (Table 4.3-3), there did not appear to be a groundwater pathway connecting CCS water to the surrounding environment as Pearson correlations of porewater tritium (excluding reference sites F6, M6, and BB4) with their specific conductance values were non-significant ($r_{marsh} = 0.17433$, $P > 0.05$; $r_{mangrove} = -0.0225$, $P > 0.05$; $r_{Bay} = 0.21723$, $P > 0.05$). The correlations did not include the F5 plots as this transect is a unique impounded fresh-brackish marsh that is rain-derived and not connected to the Model Lands marsh or surrounding mangroves. A significant positive correlation between tritium and specific conductance would be observed if CCS water was observed in the plots; as such, no patterns were observed at any of the monitoring plots.

Average tritium values were higher in the marsh and mangrove compared to the Bay (Table 4.3-3). Tritium values from porewater in the Bay ranged from -2.5 to 26.3 pCi/L (Table 4.3-3) but the average was 11.2 pCi/L for the events measured. Tritium values in the marsh and mangrove were higher as these plots ranged from 0.07 to 0.80 mile around the CCS (range:15.8 to 146.8 pCi/L) (Figure 4.3-6); most of the values were in excess of 20 pCi/L with the exception of the M6 reference transect (13.0 pCi/L) and M1-2 (16.0 pCi/L) which were the lowest averages observed among all locations. Conversely, a few locations, such as the F5 plots, were essentially rain-derived brackish standing ponds of marsh/mangrove vegetation mix. Porewater at F5-1 and F5-2 had average tritium values in excess of 100pCi/L most likely due to the standing water which allowed for long-term atmospheric equilibration with the atmospheric tritium, hence resulting in tritium levels similar to the evaporation pan at TPEVP-3.

Values in the marsh and mangrove are more susceptible to atmospheric exchange as there is often limited water overlying these habitats for at least half the year, resulting in an exchange of porewater tritium concentration with that of the surrounding atmosphere while porewater locations in Biscayne Bay are more likely to be affected by groundwater inputs and long-term changes in the overlying water. Consequently, these tritium values indicate that the Biscayne Bay sites are most likely not encountering any groundwater inputs of CCS water but the terrestrial marsh and mangrove locations are (from atmospheric exchange). The porewater

values observed in the permanent plots are within the ranges observed at most locations in the Initial Ecological Characterization Report.

To identify other characteristics of the porewater, tri-linear diagrams were plotted for all data for each season (Figure 4.3-8). These data are remarkably consistent regardless of wet or dry season. Additionally, the diagrams show that the ionic characteristics of the Biscayne Bay samples were similar to that of the mangrove samples; both habitats were, however, different from that of the marsh. Tree island samples were similar in ionic composition to freshwater marsh porewater samples.

Oxygen and hydrogen isotope values plotted for the six sampling quarters showed that the mangrove values were consistent over all seasons sampled, but there was a slight shift in the values observed for the marsh and Biscayne Bay (Figure 4.3-9). The mangrove isotopic signatures were the most enriched while the marsh samples were the most depleted. These seasonal and spatial shifts are a function of evaporative processes and indicative of the residence time of the water within each habitat (i.e., the longer the water sits and evaporates, the more enriched the isotopic signature will be relative to rainfall).

Unlike the marsh and Bay where the values were less enriched in the wet season (e.g., October 2010, August and November 2011) compared to the dry season, the isotopic signature for the mangroves were consistently the highest regardless of season. In the dry season, the range of values observed in each habitat was also smaller than in the wet season. Overlap was observed in the isotopic values of the Bay and the mangrove during the dry season in May 2011 but in the wet season, the Bay values were intermediate to the marsh and mangrove isotopic signatures. This indicates that the mangrove samples were the most evaporated and most likely had the longest residence times in this habitat.

Carbon isotope signatures were also different among habitats although there was no difference among seasons. The $\delta^{13}C$ values were highest in the Bay porewater, followed by the marsh sites and were the most depleted in the mangroves. Dissolved inorganic carbon patterns were the exact opposite in each habitat (Table 4.3-5). Depleted $\delta^{13}C$ coupled with high dissolved inorganic carbon values in the mangroves are indicative that these carbonate waters have a longer residence time and are more equilibrated with the atmospheric conditions (hence approaching atmospheric values of $\delta^{13}C$ = -8‰) compared to either the Bay or the marsh porewaters. The water sources in all habitats however, are of similar ages, as evidenced by the similarity in $^{87}Sr/^{86}Sr$ isotopic values across seasons and among habitats (Tables 4.1-22 to 4.1-28).

4.3.3 Soils

Both dry and wet bulk densities were measured on soils collected from the marsh, mangrove and Biscayne Bay. The intent of this effort was in part to determine if there was a difference in the soil properties around the site, and if these soils could potentially help provide a baseline understanding of the patterns of vegetation and subsurface hydrology and chemistry of those areas. Samples reported for each plot are averaged values reported from the two cores

composited for each plot and averaged over the three depths (0 to 10 cm, 10 to 20 cm, 20 to 30 cm) measured.

A comparison of soil bulk density indicated that there were no differences for samples within a habitat for either the dry or wet bulk density (Table 4.3-6). Differences were however observed in both the wet and dry bulk density among habitats. Wet bulk density is a function of the saturation level of the soil and the soil density, and as all the soils in this study are from wetland areas and already saturated, this information is not especially useful. The dry bulk density however, is a useful parameter in providing insight into the soil type and compactness and water content of the soil.

The wet bulk density was significantly different than the dry bulk density as soils dried out anywhere from 40% up to 85%, depending on the soil type. The range of bulk density and visual observation of the soil cores indicated that in the marsh and mangrove, soils were primarily limestone marl with some organic matter (i.e., roots, litter) interspersed. Tree island soils consisted primarily of organic matter and had the lowest bulk density values among all sites. Soils at most of the transects within the Bay were, however, limited to limestone pockets, primarily a mix of marl and sandy shell hash; the only exception was at BBSW-4 reference transect that had a more continuous muddy substrate. Despite the visual difference in characteristics among the Bay transects, there was no difference among the Biscayne Bay soil bulk densities (wet or dry) (Table 4.3-7) among the plots or with distance from the CCS. There was, however, a difference in dry bulk densities among sites, where the Biscayne Bay sites were denser than the mangrove soils and the mangrove soils were denser than the marsh sites (Figure 4.3-5).

TABLES

Table 4.1-1. Data and Samples Collected in October 2010, February, May, August and November 2011, and February and May 2012

Measurements	October 2010	February 2011	May 2011	August 2011	November 2011	February 2012	May 2012
Collect 30 cm soil cores	X				X		
Conduct aerial survey			X				
Measure herbaceous plants in 1x1m subplots	X	X	X	X	X	X	X
Measure woody plant leaf turnover	X		X		X	X	X
Measure woody plants in 5x5m subplots	X		X		X		X
Collect leaf samples for mass and nutrient analysis	X		X		X		X
Estimate herbaceous plant cover in 1x1m subplots	X	X	X	X	X	X	X
Estimate woody plant cover in 5x5m subplots	X		X		X	X	X
Estimate herbaceous and woody cover in 20x20m plots	X				X		
Measure surface water depth	X	X	X	X	X	X	X

Table 4.1-1. Data and Samples Collected in October 2010, February, May, August and November 2011, and February and May 2012

Measurements	October 2010	February 2011	May 2011	August 2011	November 2011	February 2012	May 2012
Collect porewater samples for nutrient analysis	X		X		X		X
Collect porewater samples for tracer suite analysis	X	X	X	X	X	X	X

Key:
cm = Centimeter(s).
m = Meter(s).

Table 4.1-2. Plot Location, Community Description, Dominant Vegetation in Subplots in 2010 - 2012

Transect	Plot	Latitude (NE)	Longitude (NE)	Community	Herbaceous Dominant Species	Woody Dominant Species	Set Up	
							1m x 1m	5m x 5m
F1	1	25.43503	-80.34692	Marsh/Mangrove	*Cladium jamaicense*	*Rhizophora mangle*	Y	Y
F1	2	25.44027	-80.34042	Freshwater marsh	*C. jamaicense*	*R. mangle*	Y	Y
F2	1	25.43310	-80.35403	Freshwater marsh	*C. jamaicense*	None	Y	N
F2	2	25.43286	-80.35864	Freshwater marsh	*C. jamaicense*	*R. mangle*	Y	Y
F2	3	25.43328	-80.36346	Freshwater marsh	*C. jamaicense* *Eleocharis cellulosa*	None	Y	N
F2	4	25.41342	-80.37015	Hammock	*B. serrulatum*	*Chrysobalanus icaco* *Myrica cerifera* *R. mangle* *Conocarpus erectus*	Y	Y
F3	1	25.40840	-80.36248	Freshwater marsh	*C. jamaicense*	None	Y	N
F3	2	25.40815	-80.36722	Freshwater marsh	*C. jamaicense*	None	Y	N
F3	3	25.40806	-80.37231	Freshwater marsh	*C. jamaicense* *Eleocharis cellulosa*	None	Y	N

Table 4.1-2. Plot Location, Community Description, Dominant Vegetation in Subplots in 2010 - 2012

Transect	Plot	Latitude (NE)	Longitude (NE)	Community	Herbaceous Dominant Species	Woody Dominant Species	Set Up	
							1m x 1m	5m x 5m
F3	4	25.40583	-80.37246	Hammock	*B. serrulatum* *Thelypteris sp.*	*C. icaco* *M. cerifera* *C. erectus*	Y	Y
F4	1	25.38657	-80.37074	Freshwater marsh	*C. jamaicense* *Eleocharis cellulosa*	None	Y	N
F4	2	25.38669	-80.37492	Freshwater marsh	*C. jamaicense*	None	Y	N
F4	3	25.38655	-80.37908	Freshwater marsh	*C. jamaicense*	None	Y	N
F4	4	25.38601	-80.37723	Hammock	*B. serrulatum*	*M. cerifera* *Ilex cassine* *C. erectus*	Y	Y
F5	1	25.35570	-80.36692	Scrub mangrove	*Distichlis spicata*	*Laguncularia racemosa* *R. mangle*	Y	Y
F5	2	25.35304	-80.35600	Scrub mangrove	*D. spicata* *Juncus roemerianus*	*R. mangle*	Y	Y
F6	1	25.35469	-80.43848	Freshwater marsh	*C. jamaicense* *Eleocharis cellulosa*	None	Y	N

Table 4.1-2. Plot Location, Community Description, Dominant Vegetation in Subplots in 2010 - 2012

Transect	Plot	Latitude (NE)	Longitude (NE)	Community	Herbaceous Dominant Species	Woody Dominant Species	Set Up	
							1m x 1m	5m x 5m
F6	2	25.34966	-80.43619	Freshwater marsh	*C. jamaicense* *Eleocharis cellulosa*	None	Y	N
F6	3	25.34413	-80.43097	Freshwater marsh	*C. jamaicense* *Eleocharis cellulosa*	*C. erectus*	Y	N
F6	4	25.37166	-80.44778	Hammock	*B. serrulatum* *Peltandra virginica*	*C. icaco* *I. cassine* *M. cerifera* *M. virginiana*	Y	Y
M1	1	25.44296	-80.33598	Scrub mangrove	None	*R. mangle*	N	Y
M1	2	25.44716	-80.33269	Scrub mangrove	None	*R. mangle*	N	Y
M2	1	25.40535	-80.33070	Scrub mangrove	None	*R. mangle*	N	Y
M2	2	25.40521	-80.32990	Scrub mangrove	None	*R. mangle*	N	Y
M3	1	25.38628	-80.33083	Scrub mangrove	None	*R. mangle*	N	Y
M3	2	25.38450	-80.32794	Scrub mangrove	None	*R. mangle*	N	Y
M4	1	25.35630	-80.33138	Scrub mangrove	None	*R. mangle*	N	Y
M4	2	25.35468	-80.32911	Scrub mangrove	None	*R. mangle*	N	Y

Table 4.1-2. Plot Location, Community Description, Dominant Vegetation in Subplots in 2010 - 2012

Transect	Plot	Latitude (NE)	Longitude (NE)	Community	Herbaceous Dominant Species	Woody Dominant Species	Set Up	
							1m x 1m	5m x 5m
M5	1	25.35186	-80.35543	Scrub mangrove	*D. spicata*	*R. mangle* *Avicennia germinans*	Y	Y
M5	2	25.34507	-80.33381	Scrub mangrove	None	*R. mangle*	Y	Y
M6	1	25.29448	-80.39633	Scrub mangrove	None	*R. mangle*	N	Y
M6	2	25.29305	-80.39538	Scrub mangrove	None	*R. mangle*	N	Y

Note: NE = Location is at northeast corner of plot.

Key: m = Meter(s).

Table 4.1-3. Species and Individuals Counted in Subplots for Shannon-Wiener Index of Diversity Calculations

Community Type [1]	Plot	Species Present	# of Individuals
Marsh	F2-1	Sawgrass	69
		Gulf Coast spikerush	2
	F2-2	Red mangrove	2
		Sawgrass	39
	F2-3	Sawgrass	34
		Gulf Coast spikerush	2
	F3-1	Sawgrass	31
		Gulf Coast spikerush	20
	F3-2	Sawgrass	24
		Saltmarsh morning glory	2
	F3-3	Sawgrass	10
		Gulf Coast spikerush	37
	F4-1	Sawgrass	67
	F4-2	Sawgrass	36
	F4-3	Sawgrass	39
	F6-1	Sawgrass	47
	F6-2	Sawgrass	42
		Gulf Coast spikerush	31
	F6-3	Sawgrass	61
Brackish Marsh-Mangrove	F1-1	Red mangrove	16
		Sawgrass	39
	F1-2	Red mangrove	10
		Sawgrass	69
		Buttonwood	1
	F5-1	Red mangrove	34
		White mangrove	129
	F5-2	Red mangrove	153
		Saltgrass	53
		Needlegrass rush	9

Table 4.1-3. Species and Individuals Counted in Subplots for Shannon-Wiener Index of Diversity Calculations

Community Type [1]	Plot	Species Present	# of Individuals
		Sea oxeye	7
Mangrove	M1-1	Red mangrove	515
	M1-2	Red mangrove	151
		White mangrove	1
	M2-1	Red mangrove	18
	M2-2	Red mangrove	300
		Black mangrove	8
	M3-1	Red mangrove	53
	M3-2	Red mangrove	21
	M4-1	Red mangrove	21
	M4-2	Red mangrove	70
		Black mangrove	1
	M5-1	Red mangrove	299
		Black mangrove	6
		Saltgrass	19
	M5-2	Red mangrove	36
	M6-1	Red mangrove	18
	M6-2	Red mangrove	58

Note: [1] In the marsh plots, all plants were counted in the northeast 1x1 (1 m^2) subplot; similarly the northeast 5x5 (25 m^2) was counted for the mangrove plots.

Table 4.1-4. Shannon-Wiener Index Calculated Values for Plots and Transects

Community Type	Transect	Plot	Species Count		Shannon-Wiener Index		Species Evenness	
			Per Plot	Per Transect	Per Plot	Per Transect	Per Plot	Per Transect
Marsh	F2	F2-1	2	3	0.128	0.670	0.185	0.609
		F2-2	2		0.195		0.281	
		F2-3	2		0.215		0.310	
	F3	F3-1	2	3	0.670	0.762	0.966	0.694
		F3-2	2		0.271		0.391	
		F3-3	2		0.518		0.747	
	F4	F4-1	1	1	0.000	N/A	N/A	N/A
		F4-2	1		0.000		N/A	
		F4-3	1		0.000		N/A	
	F6	F6-1	1	2	0.000	0.458	N/A	0.661
		F6-2	2		0.682		0.984	
		F6-3	3		0.000		N/A	
Marsh-Mangrove	F1	F1-1	2	3	0.603	0.532	0.870	0.484
		F1-2	3		0.442		0.403	
	F5	F5-1	2	5	0.512	1.151	0.739	0.715
		F5-2	4		0.837		0.604	
Mangrove	M1	M1-1	1	2	0.000	0.011	N/A	0.002
		M1-2	2		0.040		0.057	
	M2	M2-1	1	2	0.000	0.115	N/A	0.020
		M2-2	2		0.120		0.174	
	M3	M3-1	1	1	0.000	N/A	N/A	N/A
		M3-2	1		0.000		N/A	
	M4	M4-1	1	2	0.000	0.060	N/A	0.013
		M4-2	2		0.074		0.563	
	M5	M5-1	3	3	0.314	0.290	0.453	0.049
		M5-2	1		0.000		N/A	
	M6	M6-1	1	1	0.000	N/A	N/A	N/A
		M6-2	1		0.000		N/A	

Key: N/A = Not applicable as the transect only had 1 species.

Table 4.1-5. Average Sawgrass Coverage per Plot and Transect for Each Quarter

Location		Coverage per Plot													
		October 2010		February 2011		May 2011		August 2011		November 2011		February 2011		May 2012	
Transect	Plot	Plot	Transect	Plot	Transect	Plot	Transect	Plot	Transect	Plot	Transect	Plot	Transect	Plot	Transect
F1	1	2-5%	6-25%	6-25%	6-25%	6-25%	6-25%	2-5%	6-25%	2-5%	2-5%	2-5%	2-5%	6-25%	6-25%
	2	6-25%		6-25%		6-25%		6-25%		2-5%		2-5%		6-25%	
F2	1	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	2-5%	6-25%	2-5%	6-25%	2-5%	6-25%	2-5%
	2	6-25%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	
	3	6-25%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	
F3	1	2-5%	6-25%	6-25%	6-25%	2-5%	6-25%	2-5%	2-5%	2-5%	2-5%	2-5%	2-5%	2-5%	2-5%
	2	6-25%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	
	3	6-25%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	
F4	1	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	2-5%	6-25%	2-5%	6-25%	2-5%
	2	6-25%		2-5%		2-5%		2-5%		2-5%		2-5%		2-5%	
	3	6-25%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	
F6	1	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	2-5%	2-5%	2-5%	2-5%	2-5%	2-5%	2-5%	2-5%
	2	2-5%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	
	3	6-25%		6-25%		6-25%		2-5%		2-5%		2-5%		2-5%	

Table 4.1-6. Average Sawgrass Height per Plot and Transect for Each Quarter

Location		Average Height (cm)																									
		October 2010				February 2011				May 2011				August 2011				November 2011				February 2012				May 2012			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	97.6	4.2	107.8	2.3	95.8	3.9	107.2	2.2	100.0	3.0	103.6	2.3	87.5	2.3	95.5	1.8	87.9	2.2	95.2	1.9	84.9	3.1	93.8	2.2	83.8	3.2	89.4	2.1
	2	114.5	2.3			114.5	2.2			106.0	3.1			102.6	2.4			101.9	2.7			100.0	2.7			93.3	2.7		
F2	1	96.3	1.6	90.3	1.2	89.6	2.3	84.6	1.5	85.5	2.0	79.4	1.4	80.6	1.6	76.0	1.1	81.7	1.7	77.4	1.2	82.0	1.7	75.5	1.4	73.7	1.7	69.3	1.2
	2	89.6	2.2			84.6	2.5			75.3	1.7			74.9	2.4			76.7	2.6			73.5	2.7			68.6	2.5		
	3	80.4	1.9			75.4	2.4			70.8	2.1			70.9	1.6			71.6	1.9			67.6	2.7			63.4	1.9		
F3	1	64.2	2.1	78.3	1.7	64.9	3.1	77.6	2.0	58.2	2.6	70.9	1.9	60.2	1.5	73.6	1.6	64.3	1.6	72.9	1.6	60.6	1.8	67.7	1.7	60.7	1.5	67.3	1.3
	2	73.0	2.0			67.5	2.3			61.7	1.8			67.7	1.6			68.2	1.8			62.7	2.4			63.5	2.2		
	3	101.1	2.3			101.6	2.1			93.4	3.4			94.0	2.9			86.3	3.4			79.8	3.5			77.5	2.5		
F4	1	116.7	3.4	96.3	1.9	123.9	5.8	90.9	2.3	106.8	2.4	87.0	1.7	108.8	2.3	85.7	1.8	110.3	2.6	87.5	1.9	103.1	3.0	80.9	2.0	98.6	2.6	77.1	1.7
	2	79.9	1.6			79.5	2.7			69.6	2.0			68.1	1.6			71.8	2.7			62.1	2.3			62.8	1.5		
	3	89.1	1.7			85.2	2.1			81.4	2.1			76.4	2.1			76.6	1.8			73.9	2.2			66.3	1.8		
F6	1	99.3	2.3	89.9	1.3	97.8	3.3	86.7	1.8	92.5	2.4	81.0	1.6	85.6	1.9	74.9	1.4	83.1	2.5	75.8	1.2	76.3	2.7	70.5	1.4	76.8	2.2	66.9	1.1
	2	87.0	1.9			82.3	3.2			74.6	2.7			72.2	2.6			73.1	1.9			66.6	2.7			62.2	1.5		
	3	81.5	1.7			79.2	1.8			74.8	2.1			67.3	1.7			70.4	1.3			68.7	1.6			61.9	1.6		

Key: cm = Centimeter(s).
Std. = Standard.

Table 4.1-7. Live and Total Sawgrass Biomass Equations for Each Season

Season	Model	R^2	p-Value	N
Total Biomass Equations				
November 2010	Biomass = -1.72003 + 1.15814$(Cdb2)^2$ + 0.0002353 $(LLL)^2$ + 0.48479(NoLL) + 1.35917$(Cdb1)^2$	0.8515	0.0009	164
May 2011	Biomass=-0.59708 + 0.000272 $(LLL)^2$ + 4.2615 $(Cdb2)^2$	0.9082	0.0001	162
November 2011	Biomass = -1.20428 + 2.14400 (Cdb1) + 2.03349 $(Cdb2)^2$ + .000205 $(LLL)^2$ + 0.1394 $(NoLL)^2$	0.8007	0.0146	164
May 2012	Biomass = -0.54863 +2.98414 $(Cdb2)^2$ + 0.0003037 $(LLL)^2$	0.8300	<0.0001	165
Live Biomass Equations				
November 2010	Live Biomass = -1.14848 + 0.0002082 $(LLL)^2$+ 0.09697 $(LeafNo)^2$ + 1.20311 $(Cdb1)^2$	0.8802	<0.0001	168
May 2011	Live Biomass = -0.88256 + 1.36570 $(Cdb2)^2$+ 0.04694 $(LeafNo)^2$ + 0.0001753 $(LLL)^2$	0.8909	<0.0001	162
November 2011	Live Biomass = -0.14832 + 1.66407 $(Cdb2)^2$ + 0.04617 $(LeafNo)^2$ + 0.00008817 $(LLL)^2$	0.7148	<0.0001	164
May 2012	Live Biomass = -2.32534 +1.47223 (Cdb2) + 0.58273(Cdb1) + 0.41872 (LeafNo) + 0.00015δ58 $(LLL)^2$	0.7672	<0.0001	165

Key: Cdb1 = Culm diameter at base 1 LLL = Longest live leaf NoLL = Number of live leaves
Cdb2 = Culm diameter at base 2 N = Sample size

Table 4.1-8. Average Sawgrass Total Biomass per Plot and Transect for Each Quarter

Location		Total Biomass (g/m^2)																							
		October 2010				May 2011				August 2011				November 2011				February 2012				May 2012			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	84.1	34.2	129.4	24.7	227.3	86.7	274.5	46.7	241.4	131.2	314.1	62.5	201.6	71.6	299.1	58.5	262.8	96.6	292.2	48.1	249.1	92.4	279.1	45.0
	2	174.8	17.5			321.6	34.6			368.7	43.3			396.7	67.1			321.6	29.8			309.1	18.1		
F2	1	203.0	34.1	116.5	22.9	304.5	22.9	191.6	28.4	306.9	24.4	198.6	26.4	366.3	38.8	216.9	34.9	306.4	40.8	195.8	31.7	195.5	40.4	121.4	22.0
	2	65.6	9.7			128.6	31.3			162.6	23.9			163.8	26.2			128.2	14.3			85.1	20.9		
	3	80.8	27.0			141.8	31.2			126.2	20.7			157.9	45.0			138.2	42.6			83.5	22.9		
F3	1	28.5	5.3	72.0	22.0	63.5	15.5	121.7	30.1	83.6	12.1	169.0	35.9	104.1	15.1	140.9	20.7	69.6	11.5	122.7	28.4	46.9	1.9	76.7	12.9
	2	45.2	6.8			80.2	9.2			138.2	20.0			128.8	21.2			82.6	10.9			67.5	10.9		
	3	142.4	52.3			221.5	68.1			285.2	79.9			189.8	52.5			205.7	59.9			115.6	29.8		
F4	1	287.6	74.7	142.9	38.3	397.7	44.4	226.7	39.9	661.8	87.9	325.9	76.5	527.3	50.9	287.5	54.4	502.0	94.4	224.6	58.4	370.9	79.7	174.8	48.9
	2	61.2	6.1			112.1	18.6			161.7	12.8			129.1	11.8			103.6	9.0			52.0	9.3		
	3	79.8	2.9			170.2	4.2			154.2	3.6			206.0	7.9			137.4	11.1			101.7	15.1		
F6	1	81.2	15.5	64.6	9.6	150.0	27.9	126.2	18.7	219.2	21.3	226.9	22.1	212.8	43.5	171.7	18.6	87.5	15.4	82.9	9.2	102.4	28.3	84.9	11.5
	2	60.4	9.7			94.9	12.4			205.8	21.5			126.6	10.3			63.3	11.7			57.5	9.4		
	3	60.5	22.4			133.6	48.6			253.7	58.1			175.6	23.9			97.9	18.5			94.7	13.6		

Key: g/m^2 = Grams per square meters.

Table 4.1-9. Average Sawgrass Live Biomass per Plot and Transect with Annual Average

Location		Live Biomass (g/m^2)																							
		October 2010				May 2011				August 2011			November 2011					February 2012				May 2012			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	84.0	31.6	126.2	22.9	66.7	23.8	105.2	19.8	110.4	59.8	139.0	27.3	85.5	30.1	123.3	23.7	85.1	16.1	122.9	11.3	145.2	58.2	184.9	28.7
	2	168.3	16.4			143.7	16.4			160.5	21.3			161.1	27.5			145.3	9.6			190.2	20.6		
F2	1	208.8	29.7	122.2	22.4	112.7	7.5	69.1	10.9	131.3	10.4	85.5	11.1	128.6	17.0	85.9	12.1	145.3	12.6	94.5	8.0	166.0	21.7	85.0	12.7
	2	74.3	7.9			42.3	10.6			69.6	9.2			65.8	10.0			63.0	5.3			71.9	6.6		
	3	83.5	28.4			52.4	12.7			55.7	9.4			63.1	17.4			63.7	8.8			75.5	23.4		
F3	1	38.6	8.2	79.4	21.0	36.8	4.9	72.4	14.9	41.9	5.9	57.4	8.5	36.6	3.0	65.6	5.9	43.3	4.7	74.9	15.3	38.09	2.9	61.3	2.3
	2	57.7	9.9			60.3	8.4			51.9	8.8			53.3	4.2			56.0	7.7			55.6	8.8		
	3	141.9	51.7			120.2	33.3			78.5	21.1			106.8	17.1			112.6	34.5			90.3	20.2		
F4	1	274.9	71.5	148.0	34.9	275.5	37.2	137.0	31.6	212.1	19.7	115.4	21.9	236.8	22.3	123.8	15.0	273.2	56.8	125.8	31.7	248.1	59.6	118.5	3.1
	2	72.2	9.5			68.9	4.6			51.2	5.0			58.4	4.4			61.7	3.9			44.8	5.3		
	3	96.8	5.4			66.6	1.0			83.0	3.8			76.1	4.2			79.3	6.0			62.5	6.5		
F6	1	98.0	19.0	73.7	12.3	90.4	8.8	92.1	8.7	84.9	17.8	68.0	7.5	85.9	7.6	75.1	4.9	48.7	9.8	50.8	6.7	72.4	17.8	58.5	2.2
	2	2.5	10.5			84.8	8.5			50.3	4.4			62.2	4.9			36.0	6.5			41.9	3.8		
	3	79.7	28.1			100.8	23.2			68.6	9.2			77.9	10.5			67.7	13.4			63.3	8.5		

Key: g/m^2 = Grams per square meters.

Table 4.1-10. Sawgrass Annual Net Primary Productivity

Transect	Plot	ANPP (g/m^2*yr)	
F1	1	148.39	430.78
	2	282.39	
F2	1	153.29	360.04
	2	108.46	
	3	98.30	
F3	1	63.29	253.06
	2	79.75	
	3	110.02	
F4	1	278.15	460.52
	2	74.45	
	3	107.92	
F6	1	134.22	373.23
	2	104.77	
	3	134.24	

Key: g = Grams. m^2 = Square meters. yr = Year.

Table 4.1-11. Sawgrass Leaf Sclerophylly per Plot and Transect

Location		Average Sawgrass Leaf Sclerophylly (g/m^2)															
		October 2010								November 2011				May 2012			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	F1-1	144.3	10.0	138.2	8.9	101.2	6.5	126.1	7.8	166.8	14.1	155.5	9.5	161.8	9.3	149.1	8.0
	F1-2	132.0	15.1			144.7	9.9			147.0	12.8			139.6	11.8		
F2	F2-1	153.7	7.7	137.6	4.1	173.4	12.3	179.7	10.6	123.2	13.5	140.7	7.8	230.9	9.9	227.1	6.2
	F2-2	133.2	7.8			206.0	25.4			158.4	12.5			235.1	10.7		
	F2-3	125.9	2.3			159.6	13.1			140.5	13.5			215.3	11.4		
F3	F3-1	128.6	6.1	136.5	6.6	155.7	18.3	178.0	12.7	134.5	13.4	130.0	5.8	174.8	18.7	180.3	9.0
	F3-2	148.1	19.5			179.2	16.3			134.0	8.3			179.8	11.3		
	F3-3	134.7	6.3			199.1	29.2			121.7	7.5			186.3	17.1		
F4	F4-1	142.4	6.2	146.1	9.5	152.3	13.9	163.9	10.3	171.0	14.0	160.6	7.0	149.8	10.9	173.2	5.6
	F4-2	148.0	21.0			176.4	23.7			156.3	10.0			183.2	6.5		
	F4-3	153.0	3.0			163.1	14.9			154.6	12.8			186.7	7.9		
F6	F6-1	127.7	4.8	125.1	4.1	166.1	13.1	142.1	7.5	118.7	6.4	139.0	8.7	170.0	30.9	159.9	11.3
	F6-2	129.2	9.0			131.6	10.7			134.8	18.8			160.7	7.7		
	F6-3	118.9	5.9			123.8	11.7			163.5	15.4			149.2	13.6		

Key: m2 = Square meter.
Std. = Standard.

Table 4.1-12. Soil Wet and Dry Bulk Density for All Sites

Transect	Site ID - Depth	Bulk Density									
		Wet (g/cc)	Dry (g/cc)	Plot Average Wet	Std. Error Wet	Plot Average Dry	Std. Error Dry	Transect Average Wet	Std. Error Wet	Transect Average Dry	Std. Error Dry
F1	F1-1-10	1.10	0.29	1.23	0.07	0.47	0.09	1.20	0.04	0.38	0.07
	F1-1-20	1.30	0.57								
	F1-1-30	1.30	0.55								
	F1-2-10	1.10	0.16	1.17	0.07	0.29	0.09				
	F1-2-20	1.10	0.26								
	F1-2-30	1.30	0.45								
F2	F2-1-10	1.10	0.31	1.30	0.10	0.57	0.13	1.23	0.05	0.43	0.06
	F2-1-20	1.40	0.70								
	F2-1-30	1.40	0.69								
	F2-2-10	1.20	0.33	1.33	0.07	0.54	0.10				
	F2-2-20	1.40	0.61								
	F2-2-30	1.40	0.67								
	F2-3-10	1.20	0.26	1.30	0.06	0.46	0.11				
	F2-3-20	1.30	0.49								
	F2-3-30	1.40	0.62								
	F2-4-10	1.00	0.14	1.00	0.00	0.17	0.02				
	F2-4-20	1.00	0.17								
	F2-4-30	1.00	0.21								
F3	F3-1-10	1.20	0.42	1.27	0.03	0.53	0.06	1.22	0.04	0.42	0.05
	F3-1-20	1.30	0.60								
	F3-1-30	1.30	0.57								

Table 4.1-12. Soil Wet and Dry Bulk Density for All Sites

Transect	Site ID - Depth	Bulk Density									
		Wet (g/cc)	Dry (g/cc)	Plot Average Wet	Std. Error Wet	Plot Average Dry	Std. Error Dry	Transect Average Wet	Std. Error Wet	Transect Average Dry	Std. Error Dry
	F3-2-10	1.30	0.49	1.30	0.00	0.51	0.03				
	F3-2-20	1.30	0.56								
	F3-2-30	1.30	0.47								
	F3-3-10	1.30	0.43	1.30	0.00	0.50	0.04				
	F3-3-20	1.30	0.57								
	F3-3-30	1.30	0.49								
	F3-4-10	1.00	0.13	1.00	0.00	0.13	0.01				
	F3-4-20	0.99	0.14								
	F3-4-30	1.00	0.12								
F4	F4-1-10	1.00	0.17	1.03	0.03	0.18	0.04	1.10	0.03	0.26	0.03
	F4-1-20	1.10	0.25								
	F4-1-30	1.00	0.12								
	F4-2-10	1.30	0.46	1.13	0.09	0.32	0.07				
	F4-2-20	1.10	0.28								
	F4-2-30	1.00	0.21								
	F4-3-10	1.20	0.35	1.20	0.00	0.37	0.01				
	F4-3-20	1.20	0.40								
	F4-3-30	1.20	0.37								
	F4-4-10	1.00	0.15	1.03	0.03	0.16	0.01				
	F4-4-20	1.00	0.18								
	F4-4-30	1.10	0.16								

Table 4.1-12. Soil Wet and Dry Bulk Density for All Sites

Transect	Site ID - Depth	Bulk Density									
		Wet (g/cc)	Dry (g/cc)	Plot Average Wet	Std. Error Wet	Plot Average Dry	Std. Error Dry	Transect Average Wet	Std. Error Wet	Transect Average Dry	Std. Error Dry
F5	F5-1-10	1.20	0.42	1.13	0.07	0.32	0.08	1.25	0.06	0.46	0.08
	F5-1-20	1.20	0.37								
	F5-1-30	1.00	0.16								
	F5-2-10	1.40	0.66	1.37	0.03	0.60	0.05				
	F5-2-20	1.40	0.65								
	F5-2-30	1.30	0.50								
F6	F6-1-10	1.10	0.20	1.03	0.03	0.20	0.01	1.13	0.04	0.30	0.05
	F6-1-20	1.00	0.23								
	F6-1-30	1.00	0.18								
	F6-2-10	1.20	0.32	1.13	0.07	0.27	0.06				
	F6-2-20	1.20	0.34								
	F6-2-30	1.00	0.16								
	F6-3-10	1.20	0.34	1.30	0.06	0.52	0.09				
	F6-3-20	1.30	0.57								
	F6-3-30	1.40	0.65								
	F6-4-10	1.00	0.16	1.07	0.03	0.21	0.03				
	F6-4-20	1.10	0.23								
	F6-4-30	1.10	0.24								
M1	M1-1-10	1.30	0.47	1.37	0.03	0.62	0.08	1.25	0.06	0.42	0.10
	M1-1-20	1.40	0.74								
	M1-1-30	1.40	0.65								

Table 4.1-12. Soil Wet and Dry Bulk Density for All Sites

Transect	Site ID - Depth	Bulk Density									
		Wet (g/cc)	Dry (g/cc)	Plot Average Wet	Std. Error Wet	Plot Average Dry	Std. Error Dry	Transect Average Wet	Std. Error Wet	Transect Average Dry	Std. Error Dry
	M1-2-10	1.20	0.26	1.13	0.03	0.22	0.02				
	M1-2-20	1.10	0.21								
	M1-2-30	1.10	0.18								
M2	M2-1-10	1.10	0.21	1.10	0.00	0.23	0.01	1.13	0.02	0.25	0.02
	M2-1-20	1.10	0.22								
	M2-1-30	1.10	0.25								
	M2-2-10	1.10	0.20	1.17	0.03	0.27	0.04				
	M2-2-20	1.20	0.34								
	M2-2-30	1.20	0.27								
M3	M3-1-10	1.20	0.37	1.23	0.03	0.43	0.03	1.23	0.02	0.43	0.02
	M3-1-20	1.30	0.48								
	M3-1-30	1.20	0.43								
	M3-2-10	1.20	0.41	1.23	0.03	0.43	0.03				
	M3-2-20	1.30	0.49								
	M3-2-30	1.20	0.39								
M4	M4-1-10	1.40	0.60	1.23	0.09	0.40	0.10	1.17	0.05	0.29	0.07
	M4-1-20	1.10	0.32								
	M4-1-30	1.20	0.29								
	M4-2-10	1.10	0.25	1.10	0.00	0.18	0.03				
	M4-2-20	1.10	0.15								
	M4-2-30	1.10	0.15								

Table 4.1-12. Soil Wet and Dry Bulk Density for All Sites

Transect	Site ID - Depth	Bulk Density									
		Wet (g/cc)	Dry (g/cc)	Plot Average Wet	Std. Error Wet	Plot Average Dry	Std. Error Dry	Transect Average Wet	Std. Error Wet	Transect Average Dry	Std. Error Dry
M5	M5-1-10	1.40	0.66	1.33	0.03	0.51	0.08	1.20	0.06	0.33	0.09
	M5-1-20	1.30	0.47								
	M5-1-30	1.30	0.41								
	M5-2-10	1.10	0.08	1.07	0.03	0.15	0.06				
	M5-2-20	1.00	0.11								
	M5-2-30	1.10	0.26								
M6	M6-1-10	1.30	0.48	1.30	0.00	0.51	0.02	1.30	0.00	0.52	0.01
	M6-1-20	1.30	0.54								
	M6-1-30	1.30	0.52								
	M6-2-10	1.30	0.49	1.30	0.00	0.53	0.02				
	M6-2-20	1.30	0.54								
	M6-2-30	1.30	0.55								

Key: g/cc = Grams per cubic centimeter.

4.1-13. Soil Nutrients and Molar Ratios for All Sites

Site	Soil Horizon (cm)	Total Nitrogen (mg/kg)	Total Phosphor-ous (mg/kg)	Total Carbon (mg/kg)	N:P Molar Ratio	C:N Molar Ratio	AFDW	Compression Rate (%)	Mean TN	Mean TP	Mean TC	Mean N:P	Mean C:N	Mean AFDW
F1-1	**10**	1000	320	318700	7:1	7086:1	0.681							
	20	2300	230	811500	22:1	2214:1	0.189							
	30	1600	96	887400	37:1	1329:1	0.113	2.9%	1633.33	215.33	327466.67	17:1	1538:1	0.67
F1-2	**10**	1700	190	797700	20:1	2475:1	0.202							
	20	1500	98	929200	34:1	1447:1	0.071							
	30	1000	58	913000	38:1	1284:1	0.087	0.0%	1400.00	115.33	120033.33	27:1	961:1	0.88
F2-1	**10**	1600	140	789600	25:1	1938:1	0.210							
	20	560	40	951100	31:1	1582:1	0.049							
	30	820	40	947900	45:1	1080:1	0.052	3.1%	993.33	73.33	103800.00	30:1	861:1	0.90
F2-2	**10**	730	110	795200	15:1	3337:1	0.205							
	20	330	44	918800	17:1	2952:1	0.081							
	30	630	42	931400	33:1	1476:1	0.069	0.0%	563.33	65.33	118200.00	19:1	1353:1	0.88
F2-3	**10**	850	120	735600	16:1	3126:1	0.264							
	20	640	56	951300	25:1	1938:1	0.049							
	30	760	43	918000	39:1	1253:1	0.082	0.0%	750.00	73.00	131700.00	23:1	1136:1	0.87
F2-4	**10**	1600	440	882200	8:1	6089:1	0.871							
	20	2400	420	939700	13:1	3875:1	0.828							
	30	5000	520	188100	21:1	2303:1	0.816	5.9%	3000.00	460.00	838200.00	14:1	1789:1	0.16
F3-1	**10**	1300	68	720100	42:1	1158:1	0.118							
	20	790	47	939800	37:1	1317:1	0.060							
	30	340	44	901100	17:1	2866:1	0.812	0.7%	810.00	53.00	330000.00	34:1	763:1	0.67
F3-2	**10**	650	58	847300	25:1	1976:1	0.280	2.1%	703.33	53.00	146333.33	29:1	879:1	0.85

4.1-13. Soil Nutrients and Molar Ratios for All Sites

Site	Soil Horizon (cm)	Total Nitrogen (mg/kg)	Total Phosphor-ous (mg/kg)	Total Carbon (mg/kg)	N:P Molar Ratio	C:N Molar Ratio	AFDW	Compression Rate (%)	Mean TN	Mean TP	Mean TC	Mean N:P	Mean C:N	Mean AFDW
	20	460	45	926700	23:1	2166:1	0.060							
	30	1000	56	689600	40:1	1240:1	0.099							
F3-3	**10**	700	60	358500	26:1	1898:1	0.153							
	20	600	49	595800	27:1	1808:1	0.073							
	30	1300	52	293300	55:1	886:1	0.310	4.9%	866.67	53.67	178800.00	36:1	722:1	0.82
F3-4	**10**	2000	420	798600	11:1	4650:1	0.889							
	20	1800	590	825300	7:1	7258:1	0.852							
	30	470	610	452600	2:1	28739:1	0.836	5.1%	1423.33	540.00	858433.33	6:1	4426:1	0.14
F4-1	**10**	2300	580	726200	9:1	5584:1	0.642							
	20	1900	200	922600	21:1	2331:1	0.404							
	30	2000	240	880700	18:1	2657:1	0.707	3.1%	2066.67	340.00	584133.33	13:1	1919:1	0.42
F4-2	**10**	560	110	840700	11:1	4349:1	0.201							
	20	1500	150	757700	22:1	2214:1	0.175							
	30	2500	320	788900	17:1	2834:1	0.547	4.6%	1520.00	193.33	307833.33	17:1	1484:1	0.69
F4-3	**10**	1300	100	958000	29:1	1703:1	0.274							
	20	1600	110	949300	32:1	1522:1	0.077							
	30	650	52	877100	28:1	1771:1	0.119	1.3%	1183.33	87.33	156833.33	30:1	861:1	0.84
F4-4	**10**	2400	430	760800	12:1	3967:1	0.733							
	20	2600	520	610900	11:1	4429:1	0.839							
	30	3300	350	414300	21:1	2348:1	0.821	6.0%	2766.67	433.33	797933.33	14:1	1827:1	0.20
F5-1	**10**	1200	150	815900	18:1	2768:1	0.159							
	20	4200	150	858700	62:1	791:1	0.242	2.8%	2833.33	203.33	204233.33	31:1	837:1	0.80

4.1-13. Soil Nutrients and Molar Ratios for All Sites

Site	Soil Horizon (cm)	Total Nitrogen (mg/kg)	Total Phosphor-ous (mg/kg)	Total Carbon (mg/kg)	N:P Molar Ratio	C:N Molar Ratio	AFDW	Compression Rate (%)	Mean TN	Mean TP	Mean TC	Mean N:P	Mean C:N	Mean AFDW
	30	3100	310	651600	22:1	2214:1	0.211							
F5-2	**10**	610	68	804700	20:1	2468:1	0.042							
	20	260	43	883900	13:1	3662:1	0.051							
	30	470	52	911500	20:1	2450:1	0.123	0.0%	446.67	54.33	71866.67	18:1	1419:1	0.93
F6-1	**10**	960	140	760800	15:1	3229:1	0.239							
	20	1700	170	610900	22:1	2214:1	0.389							
	30	1200	110	414300	24:1	2030:1	0.586	4.3%	1286.67	140.00	404666.67	20:1	1269:1	0.60
F6-2	**10**	850	140	815900	13:1	3647:1	0.184							
	20	700	160	858700	10:1	5061:1	0.141							
	30	690	92	651600	17:1	2952:1	0.348	0.0%	746.67	130.67	224600.00	13:1	2042:1	0.78
F6-3	**10**	1400	190	804700	16:1	3005:1	0.195							
	20	490	62	883900	18:1	2802:1	0.116							
	30	540	50	911500	24:1	2050:1	0.089	6.1%	810.00	100.67	133300.00	18:1	1450:1	0.87
F6-4	**10**	1100	440	137900	6:1	8857:1	0.862							
	20	2700	420	195700	14:1	3444:1	0.804							
	30	6000	630	237700	21:1	2325:1	0.762	5.3%	3266.67	496.67	809566.67	15:1	1774:1	0.19
M1-1	**10**	1700	150	690800	25:1	403:1	0.310							
	20	1500	95	781600	35:1	322:1	0.218							
	30	1900	58	792100	73:1	242:1	0.208	2.8%	1700.00	101.00	245166.67	37:1	168:1	0.75
M1-2	**10**	1300	240	719800	12:1	477:1	0.280							
	20	1500	240	549000	14:1	666:1	0.451							
	30	1500	140	440400	24:1	826:1	0.560	5.4%	1433.33	206.67	430266.67	15:1	350:1	0.57

4.1-13. Soil Nutrients and Molar Ratios for All Sites

Site	Soil Horizon (cm)	Total Nitrogen (mg/kg)	Total Phosphor-ous (mg/kg)	Total Carbon (mg/kg)	N:P Molar Ratio	C:N Molar Ratio	AFDW	Compression Rate (%)	Mean TN	Mean TP	Mean TC	Mean N:P	Mean C:N	Mean AFDW
M2-1	**10**	690	130	478400	12:1	1674:1	0.522							
	20	1100	150	663900	16:1	677:1	0.336							
	30	970	66	715100	33:1	650:1	0.285	0.0%	920.00	115.33	380866.67	18:1	483:1	0.62
M2-2	**10**	650	160	731300	9:1	915:1	0.269							
	20	1100	130	819600	19:1	363:1	0.181							
	30	940	72	768700	29:1	545:1	0.231	0.0%	896.67	120.67	226800.00	16:1	295:1	0.77
M3-1	**10**	1800	400	864700	10:1	166:1	0.135							
	20	1000	66	891400	34:1	240:1	0.109							
	30	1900	68	864500	62:1	158:1	0.136	0.0%	1566.67	178.00	126466.67	19:1	94:1	0.87
M3-2	**10**	840	140	866900	13:1	351:1	0.133							
	20	790	50	589700	35:1	1150:1	0.410							
	30	420	150	773800	6:1	1193:1	0.226	0.0%	683.33	113.33	256533.33	13:1	438:1	0.74
M4-1	**10**	1500	160	805000	21:1	288:1	0.195							
	20	1700	310	782700	12:1	283:1	0.217							
	30	1700	56	844800	67:1	202:1	0.155	4.5%	1633.33	175.33	189166.67	21:1	135:1	0.81
M4-2	**10**	2000	340	744500	13:1	283:1	0.256							
	20	980	130	582300	17:1	944:1	0.418							
	30	870	110	635700	18:1	927:1	0.364	4.1%	1283.33	193.33	345833.33	15:1	314:1	0.65
M5-1	**10**	720	64	957300	25:1	131:1	0.043							
	20	1000	46	920200	48:1	177:1	0.080							
	30	1400	47	871700	66:1	203:1	0.128	0.7%	1040.00	52.33	83600.00	44:1	94:1	0.92
M5-2	**10**	1000	240	391400	9:1	1348:1	0.609	2.9%	2110.00	202.00	509666.67	23:1	282:1	0.49

4.1-13. Soil Nutrients and Molar Ratios for All Sites

Site	Soil Horizon (cm)	Total Nitrogen (mg/kg)	Total Phosphor-ous (mg/kg)	Total Carbon (mg/kg)	N:P Molar Ratio	C:N Molar Ratio	AFDW	Compression Rate (%)	Mean TN	Mean TP	Mean TC	Mean N:P	Mean C:N	Mean AFDW
	20	4400	280	415100	35:1	294:1	0.585							
	30	930	86	664500	24:1	799:1	0.336							
M6-1	**10**	2300	60	75700	85:1	73:1	0.924							
	20	1600	48	104500	74:1	145:1	0.896							
	30	1400	50	79000	62:1	125:1	0.921	2.0%	1766.67	52.67	86400.00	34:1	57:1	0.91
M6-2	**10**	2400	69	77600	77:1	72:1	0.922							
	20	1400	49	90900	63:1	144:1	0.909							
	30	1200	49	71300	54:1	132:1	0.929	5.9%	1666.67	55.67	79933.33	30:1	56:1	0.92

Key:
ADFW = Ash-free dry weight.
cm = Centimeter(s).
mg/kg = Milligrams per kilogram.
TC = Total carbon.
TN = Total nitrogen.
TP = Total phosphorous.

Table 4.1-14. Average Leaf Carbon for Sawgrass

Location		Total Carbon (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	441033	2904	452371	4980	478015	8363	490534	5490	499000	5292	501143	2324
	2	460875	5132			499924	1403			502750	1702		
F2	1	458275	7278	458367	3197	493891	5545	498098	2078	507000	2799	503000	1614
	2	456450	3191			498840	1490			498250	1601		
	3	460375	6836			501565	2106			503750	2287		
F3	1	453150	2819	457692	1626	513174	2969	507079	1965	461750	20426	449917	7521
	2	459400	2232			505443	1891			436000	9174		
	3	460525	2373			501134	1349			452000	2858		
F4	1	438725	6681	452500	6772	489974	2659	487403	1646	442750	3568	449909	3120
	2	466275	6548			486780	2479			456250	6369		
	3	-	-			485454	3602			451000	3215		
F6	1	470025	14328	457867	11559	512279	4589	510524	2750	481500	1443	484083	1264
	2	467325	12382			508211	3027			487500	2901		
	3	436250	29600			511270	8506			483250	854		

Key: mg/kg = Milligrams per kilogram. Std. = Standard.

Table 4.1-15. Average Leaf Nitrogen for Sawgrass per Plot and Transect

Location		Total Nitrogen (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	5233	384	4771	314	9701	679	9019	490	9667	333	10286	286
	2	4425	421			8508	638			10750	250		
F2	1	6725	1250	7175	572	8506	880	9291	343	11000	408	11083	288
	2	8750	380			10040	218			10500	289		
	3	6050	758			9327	282			11750	629		
F3	1	6625	723	6308	399	7800	382	8423	260	9250	250	8083	468
	2	5975	965			8476	232			7250	854		
	3	6325	480			9185	539			7750	946		
F4	1	7725	433	6763	549	8111	507	8746	299	8250	1181	8000	486
	2	5800	775			8987	477			7750	750		
	3	-	-			9139	541			8000	577		
F6	1	6000	1270	5283	494	8444	635	8324	236	10500	645	10917	336
	2	5225	814			8067	266			12000	408		
	3	4625	309			8505	68			10250	250		

Key: mg/kg = Milligrams per kilogram. Std. = Standard.

Table 4.1-16. Average Leaf Phosphorous for Sawgrass per Plot and Transect

Location		Phosphorous (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	213	28	194	17	233	7	241	5	247	12	220	11
	2	180	22			248	6			200	8		
F2	1	175	9	143	21	228	18	230	14	218	31	209	11
	2	160	21			203	17			193	8		
	3	93	54			260	31			218	15		
F3	1	148	24	147	16	195	6	225	11	163	15	163	7
	2	170	11			220	7			163	17		
	3	123	41			273	19			165	10		
F4	1	270	21	181	43	225	17	217	8	300	47	234	22
	2	93	53			218	10			163	9		
	3	-	-			208	18			240	9		
F6	1	223	21	193	21	240	38	220	15	190	20	194	9
	2	225	17			215	9			218	13		
	3	130	44			200	25			175	10		

Key: mg/kg = Milligrams per kilogram. Std. = Standard.

Table 4.1-17. Average Leaf Carbon Isotopes for Sawgrass per Plot and Transect

Location		δ13C (‰)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	-25.51	0.21	-25.56	0.14	-28.28	0.15	-26.00	1.40	-27.07	1.09	-27.17	0.47
	2	-25.60	0.21			-24.28	2.15			-27.25	0.43		
F2	1	-25.38	0.34	-25.40	0.14	-26.45	0.47	-26.60	0.17	-26.28	0.16	-26.70	0.16
	2	-25.16	0.11			-26.59	0.17			-27.03	0.22		
	3	-25.65	0.19			-26.76	0.26			-26.80	0.31		
F3	1	-25.21	0.15	-25.14	0.15	-25.91	0.17	-25.92	0.13	-26.53	0.18	-26.14	0.24
	2	-25.14	0.39			-25.69	0.27			-26.00	0.48		
	3	-25.07	0.25			-26.23	0.21			-25.90	0.54		
F4	1	-24.89	0.29	-25.05	0.18	-26.91	0.22	-26.52	0.13	-26.68	0.43	-26.32	0.26
	2	-25.20	0.23			-26.32	0.24			-26.65	0.38		
	3	-	-			-26.33	0.12			-25.40	0.33		
F6	1	-24.78	0.09	-25.04	0.10	-26.66	0.26	-26.52	0.15	-26.30	0.16	-26.13	0.12
	2	-24.94	0.08			-26.28	0.13			-25.73	0.17		
	3	-25.39	0.15			-26.65	0.41			-26.38	0.13		

Key: ‰ = Parts per mille. C = Carbon.

Table 4.1-18. Average Leaf Nitrogen Isotopes for Sawgrass per Plot and Transect

Location		δ15N (‰)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	-3.38	1.08	-3.62	0.58	2.44	0.28	1.31	0.64	0.63	0.13	0.57	0.25
	2	-3.79	0.75			0.46	0.90			0.53	0.46		
F2	1	-3.20	0.30	-3.65	0.38	-1.43	0.41	-1.22	0.38	-0.45	0.25	-0.48	0.19
	2	-4.63	0.75			-1.97	0.78			-0.98	0.18		
	3	-3.13	0.70			-0.27	0.54			0.00	0.35		
F3	1	-4.93	0.43	-4.55	0.25	-2.95	0.40	-1.56	0.39	-2.20	0.32	-1.39	0.27
	2	-4.45	0.58			-0.73	0.40			-1.03	0.32		
	3	-4.28	0.25			-0.79	0.57			-0.95	0.49		
F4	1	-5.01	0.74	-5.45	0.43	-1.64	0.97	-2.77	0.51	-0.18	0.25	-1.32	0.34
	2	-5.88	0.42			-3.61	0.47			-2.40	0.46		
	3	-	-			-3.07	0.25			-1.40	0.26		
F6	1	-4.18	0.36	-4.32	0.24	-1.43	0.55	-1.56	0.30	-0.93	0.34	-0.98	0.29
	2	-3.72	0.15			-1.91	0.51			-1.15	0.82		
	3	-5.05	0.43			-1.28	0.73			-0.85	0.38		

Key: ‰ = Parts per mille. N = Nitrogen. Std. = Standard.

Table 4.1-19. Sawgrass Leaf C:N Molar Ratio per Plot and Transect

Location		C:N Molar Ratio of Average Total Carbon and Total Nitrogen					
		October 2010		May 2011		November 2011	
Transect	Plot	Plot	Transect	Plot	Transect	Plot	Transect
F1	1	98:1	111:1	57:1	63:1	60:1	57:1
	2	122:1		69:1		55:1	
F2	1	80:1	75:1	68:1	63:1	54:1	53:1
	2	61:1		58:1		55:1	
	3	89:1		63:1		50:1	
F3	1	80:1	85:1	77:1	70:1	58:1	65:1
	2	90:1		70:1		70:1	
	3	85:1		64:1		68:1	
F4	1	66:1	78:1	70:1	65:1	63:1	66:1
	2	94:1		63:1		69:1	
	3	-		62:1		66:1	
F6	1	91:1	101:1	71:1	72:1	54:1	52:1
	2	104:1		74:1		47:1	
	3	110:1		70:1		55:1	

Table 4.1-20. Sawgrass Leaf N:P Molar Ratio per Plot and Transect

Location		N:P Ratio of Average Total Nitrogen and Total Phosphorous					
		October 2010		May 2011		November 2011	
Transect	Plot	Plot	Transect	Plot	Transect	Plot	Transect
F1	1	54:1	54:1	92:1	83:1	87:1	104:1
	2	54:1		76:1		119:1	
F2	1	85:1	111:1	83:1	89:1	112:1	117:1
	2	121:1		110:1		121:1	
	3	144:1		79:1		120:1	
F3	1	99:1	95:1	89:1	83:1	126:1	110:1
	2	78:1		85:1		99:1	
	3	114:1		74:1		104:1	
F4	1	63:1	83:1	80:1	89:1	61:1	76:1
	2	139:1		91:1		106:1	
	3	-		98:1		74:1	
F6	1	60:1	61:1	78:1	84:1	122:1	124:1
	2	51:1		83:1		122:1	
	3	79:1		94:1		130:1	

Table 4.1-21. Average Specific Conductance and Temperature of Porewater at Each Site for Each Quarter

Transect	Plot	October 2010				February 2011				May 2011							
		Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error
F1	1	2505.75	289.75	27.80	0.50	2011.85	313.56	28.65	0.54	2260.80	213.00	23.15	1.85	1790.60	285.72	23.33	0.77
	2	1517.95	134.45	29.50	0.20					1320.40	47.50	23.50	0.20				
F2	1	1031.05	96.15	27.78	0.38	1317.88	222.39	26.06	0.85	907.95	112.35	25.60	0.50	1227.38	198.32	24.44	0.42
	2	1351.20	13.30	27.25	0.45					1230.95	21.15	24.55	0.55				
	3	2219.30	243.80	26.90	0.10					2047.95	239.95	22.80	0.30				
	4	669.95	11.45	22.30	0.70					722.65	21.25	24.80	0.10				
F3	1	1736.05	2.75	27.40	2.22	1763.26	294.23	26.30	0.58	1380.20	38.10	26.05	0.75	1436.94	257.16	24.51	0.43
	2	1631.10	40.30	26.45	0.33					1559.10	35.70	23.75	0.15				
	3	2613.95	344.45	26.65	0.44					2359.90	45.30	24.05	0.85				
	4	380.62	0.00	23.07	0.00					449.50	0.95	24.20	0.80				
F4	1	858.05	143.65	21.40	0.31	908.61	67.05	23.55	0.55	775.10	2.10	24.75	0.15	910.66	80.37	25.45	0.33
	2	689.25	65.45	21.35	1.04					N/A	N/A	N/A	N/A				
	3	978.25	43.35	24.70	1.61					827.25	17.55	26.30	0.60				
	4	1108.90	58.50	23.55	0.34					1020.15	147.89	24.90	0.28				
F5	1	22990.92	982.42	27.49	1.50	21486.48	3215.62	27.42	0.27	19168.85	19.15	26.25	0.55	19413.87	245.27	26.47	0.38
	2	19982.05	7519.95	27.35	2.00					19903.90	0.00	26.90	0.00				
F6	1	1027.15	26.75	28.65	2.02	1373.04	293.72	26.40	1.11	888.50	109.40	26.00	1.00	1282.11	278.70	26.49	0.44
	2	1094.95	53.25	27.30	2.12					1071.00	29.40	27.55	1.45				
	3	2678.95	59.55	28.25	0.84					2523.50	127.09	26.20	0.60				
	4	691.10	202.70	21.40	0.82					645.45	6.25	26.20	0.60				
M1	1	47100.80	455.20	26.15	1.09	47534.35	335.90	26.38	0.15	41983.35	253.55	25.50	0.50	44544.08	1510.05	26.28	0.54
	2	47967.90	306.30	26.60	1.84					47104.80	709.00	27.05	0.55				
M2	1	52510.25	577.55	25.90	1.06	52186.03	1978.83	25.90	0.06	46904.85	995.25	25.25	0.25	48229.13	917.11	26.13	0.53
	2	51861.80	4790.70	25.90	0.94					49553.40	740.70	27.00	0.30				
M3	1	52123.61	1227.93	26.13	0.26	51545.16	602.59	26.69	0.32	45589.05	231.85	25.90	0.30	45019.70	601.88	26.88	0.59
	2	50966.70	41.10	27.25	1.57					44450.35	1213.05	27.85	0.35				
M4	1	43344.75	2005.95	22.95	0.30	44739.50	1151.68	23.28	0.48	41543.15	358.85	26.05	0.15	44093.56	1479.77	23.28	1.63
	2	46134.25	209.05	23.61	1.00					46643.98	19.99	20.50	0.70				
M5	1	51624.45	4685.55	28.01	0.60	46472.98	3796.59	27.68	0.42	52195.15	73.55	27.25	0.25	52440.05	297.37	22.80	2.57
	2	41321.50	3384.50	27.35	1.54					52684.94	636.58	18.35	0.25				
M6	1	N/A	N/A	N/A	N/A	N/A	N/A			41186.45	101.05	26.80	0.10	42908.45	1008.21	26.25	0.38
	2	N/A	N/A	N/A	N/A					44630.45	397.75	25.70	0.50				

Transect	Plot	May 2011							
		Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error
F1	1	4036.48	325.44	30.55	0.65	3104.74	579.39	30.55	0.65
	2	2173.00	414.70	31.65	0.15				
F2	1	0.00	0.00	0.00	0.00	655.74	429.35	0.00	0.00
	2	0.00	0.00	0.00	0.00				
	3	2622.94	42.04	29.00	0.50				
	4	0.00	0.00	0.00	0.00				
F3	1	1637.74	103.74	26.90	0.20	1442.73	338.86	26.90	0.20
	2	1677.76	12.19	29.00	0.50				
	3	2455.43	63.13	32.55	2.75				
	4	0.00	0.00	0.00	0.00				
F4	1	925.27	77.94	28.85	0.55	883.32	44.69	28.85	0.55
	2	763.26	36.31	29.75	0.95				
	3	961.44	16.84	32.05	0.45				
	4	0.00	0.00	0.00	0.00				
F5	1	20357.85	885.85	34.45	0.75	29147.81	8804.83	34.45	0.75
	2	23363.87	23363.87	32.10	0.00				
F6	1	990.40	14.00	24.70	0.20	1784.74	477.42	24.70	0.20
	2	1070.28	25.43	25.85	0.35				
	3	3293.55	14.53	26.85	0.35				
	4	0.00	0.00	0.00	0.00				
M1	1	56588.71	516.61	26.30	0.00	57242.31	1117.47	26.30	0.00
	2	57895.91	2524.12	29.95	0.35				
M2	1	59849.17	1858.96	27.25	0.15	60928.38	1019.20	27.25	0.15
	2	62007.59	668.92	25.30	2.20				
M3	1	64201.38	855.17	29.75	1.05	62991.83	839.20	29.75	1.05
	2	61782.28	753.80	30.00	0.40				
M4	1	78742.86	1977.26	29.15	0.95	78150.31	3609.53	29.15	0.95
	2	77557.75	8576.75	32.35	0.35				
M5	1	55111.72	0.00	31.80	0.00	55900.22	1502.25	31.80	0.00
	2	56294.48	2510.77	28.80	0.30				
M6	1	44079.02	432.97	28.15	0.55	45899.12	1217.08	28.15	0.55
	2	47719.22	1440.38	29.35	0.05				

Key: Avg. = Average. Std. = Standard.

Table 4.1-21. Average Specific Conductance and Temperature of Porewater at Each Site for Each Quarter

Transect	Plot	August 2011								November 2011							
		Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error
F1	1	5230.92	27.50	29.51	0.12	3666.85	906.14	29.01	0.32	3196.50	27.10	24.75	0.05	2555.53	372.07	26.03	0.76
	2	2102.77	182.00	28.51	0.31					1914.55	90.35	27.30	0.50				
F2	1	2127.73	13.74	29.57	0.46	2079.96	211.62	29.25	0.25	1587.00	148.20	25.00	0.10	1721.96	251.73	25.31	0.14
	2	2362.21	91.10	28.58	0.28					1695.05	11.25	25.70	0.00				
	3	2649.11	71.28	28.86	0.08					2722.55	168.45	25.10	0.10				
	4	1180.80	161.19	30.01	0.37					883.25	17.05	25.45	0.45				
F3	1	2105.13	34.78	28.83	0.09	2047.82	327.44	29.67	0.38	1832.25	143.65	23.77	0.43	1805.73	319.40	24.73	0.36
	2	2089.18	42.73	30.13	0.18					1902.58	86.97	24.97	0.02				
	3	3214.55	176.05	31.00	0.70					2926.70	34.30	26.10	0.20				
	4	807.32	24.90	28.74	0.11					451.88	109.49	24.07	0.20				
F4	1	937.60	1.10	29.15	0.35	1243.08	145.32	29.10	0.44	758.00	51.80	26.30	0.60	1023.09	131.71	25.40	0.34
	2	825.80	9.10	31.35	0.65					567.95	27.05	26.65	0.35				
	3	1012.20	10.80	29.30	0.10					844.05	30.75	25.05	0.25				
	4	1719.90	170.59	27.86	0.13					1472.73	102.01	24.51	0.33				
F5	1	31996.60	1734.40	31.55	0.35	48523.70	9570.88	32.80	0.83	23680.70	730.90	26.05	0.05	33494.25	6031.97	26.03	0.03
	2	65050.80	559.00	34.05	0.95					43307.80	5016.20	26.00	0.00				
F6	1	1125.21	4.16	27.55	0.04	1547.24	264.94	28.53	0.47	1009.80	7.40	25.40	0.20	1577.10	362.52	26.48	0.37
	2	1206.76	5.48	29.35	0.17					1130.80	5.00	27.40	0.50				
	3	2638.41	431.98	30.13	0.04					3214.24	298.16	27.40	0.20				
	4	1218.60	431.32	27.09	0.04					953.55	28.45	25.70	0.20				
M1	1	64315.25	2518.35	31.85	0.15	64099.95	1509.95	31.45	0.24	55947.00	2906.10	26.60	0.30	55180.03	3011.43	26.15	0.30
	2	63884.65	2691.65	31.05	0.05					54413.05	6692.55	25.70	0.20				
M2	1	62515.95	78.35	32.55	0.05	63304.68	463.40	32.33	0.24	55072.40	366.80	27.95	0.05	57860.10	1641.12	28.30	0.44
	2	64093.40	195.30	32.10	0.50					60647.80	694.70	28.65	0.95				
M3	1	67367.60	599.20	31.25	0.25	66140.58	1122.06	31.13	0.13	57153.75	3078.05	25.65	0.35	56772.58	1389.34	25.30	0.25
	2	64913.55	2045.45	31.00	0.00					56391.40	1347.80	24.95	0.15				
M4	1	79855.80	1147.90	33.50	0.80	82868.13	1850.38	33.10	0.41	59996.95	3973.95	26.05	0.25	64434.60	3051.03	26.07	0.11
	2	85880.45	1038.05	32.70	0.20					68872.25	821.65	26.08	0.09				
M5	1	81750.90	215.70	32.80	1.30	70118.35	6725.89	31.90	0.78	61393.00	4368.50	26.65	0.35	57845.40	2734.40	26.05	0.46
	2	58485.80	863.90	31.00	0.60					54297.80	779.10	25.45	0.65				
M6	1	51057.40	578.10	31.50	0.30	49898.08	791.76	32.00	0.35	46514.05	650.05	26.80	0.60	47405.38	696.94	27.00	0.30
	2	48738.75	859.65	32.50	0.40					48296.70	950.20	27.20	0.30				

Key: Avg. = Average. Std. = Standard.

Table 4.1-21. Average Specific Conductance and Temperature of Porewater at Each Site for Each Quarter

Transect	Plot	February 2012								May 2012							
		Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error	Avg. Spec. Cond.	Std. Error	Avg. Temp	Std. Error
F1	1	3803.97	16.25	23.55	1.50	2804.27	579.62	21.79	1.19	3478.35	756.42	28.66	0.68	2529.27	630.59	28.13	0.45
	2	1804.58	129.26	20.03	0.17					1580.20	110.42	27.60	0.42				
F2	1	1584.84	158.86	22.60	0.10	1750.42	226.43	22.90	0.18	1313.86	94.83	29.55	0.17	1739.53	249.78	27.50	0.65
	2	1817.46	47.71	22.33	0.18					1861.17	180.14	28.28	0.47				
	3	2619.80	123.05	23.20	0.00					2745.00	17.11	27.30	0.26				
	4	979.59	104.86	23.49	0.12					1038.09	78.44	24.90	0.04				
F3	1	1627.43	3.52	22.77	0.13	1738.42	273.20	23.00	0.15	1697.14	48.03	28.77	0.07	1679.40	274.49	27.16	0.51
	2	1846.77	26.87	22.96	0.01					1825.32	9.84	27.58	0.03				
	3	2740.55	9.26	22.69	0.29					2611.98	84.88	27.25	0.01				
	4	712.08	27.40	23.59	0.23					499.49	83.67	25.06	0.05				
F4	1	965.64	9.45	23.47	0.23	1012.85	78.34	24.14	0.26	732.52	45.37	27.84	0.02	837.38	73.78	27.10	0.35
	2	721.12	4.69	24.93	0.04					670.32	26.45	28.42	0.03				
	3	915.60	6.36	25.08	0.19					958.55	20.99	27.25	0.10				
	4	1230.95	118.38	23.62	0.28					912.77	171.66	26.01	0.36				
F5	1	23955.33	232.90	25.15	0.75	29738.42	3878.93	24.95	0.33	23812.90	38.07	28.36	0.72	38254.84	8345.26	28.40	0.32
	2	35521.51	4830.53	24.75	0.05					52696.78	848.29	28.44	0.33				
F6	1	944.31	43.30	23.51	0.53	1571.44	331.10	22.95	0.37	977.58	14.75	27.15	0.23	1489.38	265.83	26.74	0.26
	2	1139.15	24.63	23.95	0.31					1097.42	55.70	27.38	0.22				
	3	3053.80	318.10	21.57	0.10					2690.39	15.19	26.61	0.21				
	4	1148.50	97.50	22.77	0.37					1192.14	169.64	25.82	0.55				
M1	1	40788.17	1028.85	22.09	0.47	43403.94	2956.17	22.73	0.44	47123.20	529.82	29.39	0.58	48632.14	905.06	29.09	0.35
	2	46019.72	6139.26	23.37	0.37					50141.08	283.34	28.79	0.47				
M2	1	43276.94	1279.33	22.78	0.55	46997.98	2257.14	22.99	0.47	45302.01	633.94	27.00	0.17	45449.17	403.45	27.05	0.12
	2	50719.03	1113.14	23.20	0.98					45596.33	729.01	27.11	0.22				
M3	1	46157.45	452.46	22.07	0.33	44903.65	959.27	21.48	0.40	51668.97	5.52	27.74	0.31	50633.02	769.14	27.54	0.22
	2	43649.86	1473.95	20.89	0.37					49597.08	1184.51	27.34	0.35				
M4	1	50471.31	398.06	23.65	0.63	51892.38	975.50	24.61	0.61	58358.67	1967.63	27.96	0.48	59586.23	1119.03	28.22	0.26
	2	53313.46	1229.75	25.58	0.09					60813.78	792.46	28.48	0.18				
M5	1	44949.39	904.17	24.16	0.80	48729.44	2251.70	24.67	0.45	44024.68	7515.87	27.57	0.15	49165.80	4270.17	27.75	0.12
	2	52509.48	1012.82	25.18	0.22					54306.91	235.72	27.93	0.02				
M6	1	45695.94	1175.34	24.28	0.16	46493.33	671.54	24.39	0.11	46691.68	180.42	27.53	0.21	46601.02	341.58	27.56	0.09
	2	47290.73	229.61	24.50	0.16					46510.35	806.90	27.59	0.06				

Key: Avg. = Average. Std. = Standard.

Table 4.1-22. Marsh and Mangrove Analytical Porewater October 2010

Parameter	Units	F1-1-30CM 10/29/2010		F1-2-30CM 10/29/2010		F2-1-30CM 10/6/2010		F2-2-30CM 10/6/2010		F2-3-30CM 10/22/2010		F2-4-30CM 12/10/2010		F3-1-30CM 10/22/2010		F3-2-30CM 10/12/2010		F3-3-30CM 10/12/2010		F3-4-30CM 11/12/2010		F4-1-30CM 11/8/2010		F4-2-30CM 11/8/2010		F4-3-30CM 11/12/2010		F4-4-30CM 12/10/2010		F5-1-30CM 11/18/2010		F5-2-30CM 11/18/2010		F6-1-30CM 10/20/2010		F6-2-30CM 10/20/2010	
Temperature	°C	27.80		29.50		27.78		27.25		26.90		22.30		27.40		26.45		26.65		23.07		21.40		21.35		24.70		23.55		27.49		27.35		28.65		27.30	
pH	SU																																				
Dissolved Oxygen	mg/L																																				
Specific Conductance	µS/cm	2505.75	J	1517.95	J	1031.05	J	1351.20	J	2219.30	J	669.95	J	1736.05	J	1631.10	J	2613.95	J	380.62	J	858.05	J	689.25	J	978.25	J	1108.90	J	2290.92	J	19982.05	J	1027.15	J	1094.95	J
Turbidity	NTU																																				
Arsenic	mg/L																																				
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.030	I	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.041	I	0.016	U	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	0.091	I	1.1		0.250	I	2.3		0.900	I	0.910	I	0.610	I	0.170	I J	0.810	I	0.380	I	0.083	I	0.220	I	0.410	I	6.4		1.7		0.870	I	1.2		0.840	I
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	71		130		160	J	500	J	360		93		390	J	230		260		24		120		82		210		130		420		360		180		140	
Magnesium	mg/L	47		26		12	J	23	J	39		11		28	J	32		34		5.9		12		7.1		10		20		450		370		13		15	
Potassium	mg/L	16		8.6		4.8	J	4.3	J	4.9		2.8		7.6	J	6.2		7.6		5.3		3.8		3.6		4.0		1.6		130		120		2.6		2.4	
Sodium	mg/L	270		150		48	J	110	J	200		74		180	J	140		300		45		59		46		57		97		3800		3300		53		68	
Boron	mg/L	0.310		0.150		0.064		0.077		0.100		0.055		0.098		0.082		0.110		0.048	I V	0.048	I	0.034	I	0.035	I V	0.120		1.4		2.0		0.038	I	0.046	I
Strontium	mg/L	0.670		0.720		0.910		2.2		2.1		0.990		1.9		1.9		2.3		0.330		0.910		0.630		1.3		1.2		5.1		3.0		1.5		1.4	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	1.4		0.38		0.29		0.75		1.0		0.43		1.0		0.97		1.6		0.21		0.41		0.26		0.40		0.54		16		18		0.43		0.49	
Chloride	mg/L	500		250		78		220		390		120		340		290		590		66		98		73		110		130		6900		5600		120		140	
Fluoride	mg/L	0.020	U	0.12		0.10		0.13		0.020	U	0.020	U	0.10		0.13		0.10		0.076		0.078		0.066		0.088		0.17		0.32	I	0.50		0.090		0.11	
Sulfate	mg/L	2.4		2.0		2.5		1.5		0.20	U	0.26	I	1.0		0.41	I	1.8		0.20	U	0.34	I	0.20	U	0.21	I	0.78		500		630		0.20	U	0.20	U
Total Ammonia	mg/L as N	0.68		0.91		0.94		2.0		0.026	U	1.6		2.9		0.026	U	0.026	U	0.28		0.026	U	0.026	U	0.28		2.0		0.026	U	0.026	U	1.6		0.026	U
Ammonium Ion (NH^{4+})	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L	0.14		0.0058	I	0.026		0.94		0.026		0.97		0.37		0.30		0.018		1.4		0.0072	I	0.0047	U	0.69		1.1		0.36		1.4		0.17		0.018	
TKN	mg/L	2.0		2.6		2.2		4.4		4.3		7.3		4.2		4.1		3.1		3.8		2.1		3.8		3.3		33		4.0		2.4		5.0		3.0	
TN	mg/L	2.14		2.6058		2.226		5.34		4.326		8.27		4.57		4.4		3.118		5.2		2.1072		3.8047		3.99		34.1		4.36		3.8		5.17		3.018	
Orthophosphate	mg/L	0.0054	I	0.0052	I	0.075	U	0.075	U	0.075	U	0.011		0.075	U	0.010	U	0.010	U	0.0027	I	0.010	J	0.0069	I J	0.0067	I	0.0088	I	0.016		0.0095	I	0.075	U	0.075	U
Phosphorus (P)	mg/L	0.0055	I	0.013		0.0052	I	0.018		0.044		0.14		0.017		0.0049	I	0.0044	U	0.022		0.0066	I J	0.0044	U J	0.031		0.26		0.042		0.042		0.015		0.0099	I
Alkalinity	mg/L ($CaCO_3$)	250		260		230		360		560		210		340		380		410		90		310		210		330		330		610		340		330		320	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	250		260		230		360		560		210		340		380		410		90		310		210		330		330		610		340		330		320	
Sulfides	mg/L	2.4		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.6		1.0	U	1.6		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	26		8.3		1.0	U	1.0	U
Total Dissolved Solids	mg/L																																				
Dissolved Inorganic Carbon	mg/L	67		69		61		84		110		52		82		95		100		35		85		57		85		83		140		85		80		76	
$\delta^{18}O$	‰	-0.9		-1.9		-1.8		0.5		-0.3				1.4		1.1		1.0				0.3		-0.3						0.2		-0.7		-0.2		0.1	
$\delta^{2}H$	‰	-10.0		-16.0		-19.0		1.0		2.0				13.0		9.0		4.0				5.0		1.0						6.0		0.0		-5.0		2.0	
$\delta^{13}C$	‰	-6.66		-7.07		-5.31		-5.98		-4.11		-4.09		-8.78		-7.03		-9.88		-7.59		-4.21		-1.55		-4.77		ND		-14.46		-10.87		-4.35		-4.64	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		1.3	J	0.8	J	0.5	J	0.7	J	1.1	J	0.3	J	0.9	J	0.8	J	1.3	J	0.2	J	0.4	J	0.3	J	0.5	J	0.5	J	1.2	J	11.9	J	0.5	J	0.5	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70915		0.70914		0.70912		0.70912		0.70914		0.70916		0.70913		0.70913		0.70915		0.70915		0.70916		0.70917		0.70914		0.70913		0.70914		0.70912		0.70913	
Tritium	pCi/L (1σ)	94.1(7.2)		20.9(6.7)		55.9(6.1)		30.8(5.3)		14.6(7.9)		45.4(5.6)		68.6(6.1)		39.8(5.5)		30.6(7.4)		77.3(6.7)		61.4(6.3)		52.1(5.8)		36.5(5.7)		29.3(5.3)		155.6(8.2)		153.7(8.1)		4.4(4.8)	UJ	4.9(4.7)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample BB2 E5-30-DUP (10/27/10) is a duplicate of BB2 E5-30.

NH^{4+} and Unionized NH_3 could not be calculated as field pH not collected.

Text in blue are revised values.

Key:

? = Unusable.

‰ = Parts per mille.

°C = Degrees Celsius.

µg/L = Micrograms per liter.

µS/cm = Micro Siemens per centimeter.

cm = Centimeters.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

mg/L = Milligram(s) per liter.

N.A. = Not applicable.

NTU = Nephelometric turbidity unit(s).

pCi/L = Picocuries per liter.

SU = Salinity units.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 4.1-22. Marsh and Mangrove Analytical Porewater October 2010

Parameter	Units	F6-3-30CM 10/20/2010		F6-4-30CM 11/9/2010		M1-2-30CM 11/16/2010		M1-1-30CM 11/17/2010		M2-1-30CM 11/15/2010		M2-2-30CM 11/15/2010		M3-2-30CM 11/17/2010		M3-1-30CM 11/18/2010		M4-1-30CM 11/5/2010		M4-2-30CM 11/5/2010		M5-1-30CM 11/18/2010		M5-2-30CM 11/18/2010		EB-1 10/6/2010		FB-1 10/29/2010		FCEB-01 11/15/2010	
Temperature	°C	28.25		21.40		26.60		26.15		25.90		25.90		27.25		26.13		22.95		23.61		28.01		27.35							
pH	SU																														
Dissolved Oxygen	mg/L																														
Specific Conductance	µS/cm	2678.95	J	691.10	J	47967.90	J	47100.80	J	52510.25	J	51861.80	J	50966.70	J	52123.61	J	43344.75	J	46134.25	J	51624.45	J	41321.50	J						
Turbidity	NTU																														
Arsenic	mg/L																														
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.00081	U	0.00081	U	0.0016	U
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	0.760	I	1.1		0.560	I	0.450	I	0.910	I	0.690	I	2.5		1.1		0.350	I	0.360	I	0.690	I	0.380	I J	0.0047	I V	0.0027	U	0.017	I V
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica	mg/L																														
Calcium	mg/L	210		110		470		460		370		530		630		460		370		420		590		450		0.10	U	0.12	I	0.10	U
Magnesium	mg/L	41		12		1200		1100		1100		1400		1200		1000		1100		1200		1500		1300		0.020	U	0.028	I	0.034	I
Potassium	mg/L	7.7		5.3		350		340		340		400		360		310		310		350		440		390		0.19	U	0.19	U	0.19	U
Sodium	mg/L	280		27		9400		9100		8800		10000		9200		7900		8700		9600		11000		9900		0.31	U	0.31	U	1.3	
Boron	mg/L	0.120		0.053		4.3		4.1		4.0		4.8		4.4		3.7		4.6		4.8		4.7		4.4		0.010	U	0.010	U	0.010	U
Strontium	mg/L	1.6		1.1		7.9		7.5		7.0		8.9		8.3		7.0		6.0		6.8		9.6		8.1		0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	1.7	J	0.58		28		30		36		20		30		24		19		33		50		28		0.027	U	0.027	U	0.027	U
Chloride	mg/L	990	J	41		17000		17000		18000		20000		18000		15000		16000		17000		21000		18000		0.20	U	0.20	U	0.20	U
Fluoride	mg/L	0.020	UJ	0.17		0.74		0.92		0.66		0.59		0.76		1.4		0.20	U	0.20	U	0.59		0.20	U	0.020	U	0.020	U	0.020	U
Sulfate	mg/L	87	J	2.8		1000		1100		1300		710		1000		910		2000		2100		1700		1000		0.20	U	0.20	U	0.20	U
Total Ammonia	mg/L as N	0.026	U	0.88		0.026	U	0.026	U	0.026	U	0.27		0.026	U	0.026	U	0.026	U	0.026	U	0.026	U	0.026	U	0.31		0.054		0.026	U
Ammonium Ion (NH^{4+})	mg/L																														
Unionized NH_3	mg/L																														
Nitrate/Nitrite as N	mg/L	0.064		0.0047	U	0.0084	I	0.064		0.078		0.061		0.13		0.063		0.021		0.034		0.018		0.021		0.054		0.023		0.19	
TKN	mg/L	5.4		2.9		0.77		1.3		1.5		1.2		2.8		2.2		1.5		1.4		2.3		1.7		0.32		0.33		0.28	
TN	mg/L	5.464		2.9047		0.7784		1.364		1.578		1.261		2.93		2.263		1.521		1.434		2.318		1.721		0.374		0.353		0.47	
Orthophosphate	mg/L	0.075	U	0.022	J	0.032	J-	0.032	J-	0.034	J-	0.041		0.038		0.027	J-	0.036	I J	0.036	I J-	0.044		0.032	J	0.075	U	0.0064	I J	0.0014	U
Phosphorus (P)	mg/L	0.012		0.018	J	0.027		0.021	J	0.029		0.038		0.044		0.045		0.018	J	0.015	J	0.038		0.024	J	0.0044	U	0.0044	U J	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	440	J	280		520		470		250		500		340		280		230		280		540		320		1.0	U	1.0	U	1.0	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	440	J	280		520		470		250		500		340		280		230		280		540		320		1.0	U	1.0	U	1.0	
Sulfides	mg/L	1.0	U	1.0	U	17		13		9.1		12		8.3		5.3		9.1		11		12		20		1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																														
Dissolved Inorganic Carbon	mg/L	99		79		150		120		62		130		76		66		63		76		130		84		1.0	U	1.0	U	1.2	
$\delta^{18}O$	‰	0.6		-0.5		1.3		1.4		0.7		1.6		1.8		1.3		1.8		1.8		2.7		1.4		-1.1		-1.3		-1.1	
$\delta^{2}H$	‰	5.0		2.0		11.0		13.0		15.0		13.0		17.0		13.0		14.0		10.0		18.0		16.0		-4.0		-2.0		-7.0	
$\delta^{13}C$	‰	-8.51		-10.39		-11.68		-11.89		-9.77		-11.27		-10.08		-9.34		-10.69		-11.38		-11.9		-11.25		-15.21		-12.40		-8.58	
Gross Alpha	pCi/L																														
Salinity (PSS-78)		1.4	J	0.3	J	31.2	J	30.6	J	34.6	J	37.1	J	33.4	J	34.3	J	27.9	J	29.9	J	33.8	J	26.4	J						
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70913		0.70914		0.70916		0.70914		0.70912		0.70917		0.70917		0.70915		0.70912		0.70914		0.70914		0.059		0.06800		0.06	
Tritium	pCi/L (1σ)	2.9(4.7)	UJ	10.1(6.1)		17.7(5.7)		17.7(5)		20.1(5.1)		28.3(5.1)		34.2(5.6)		76.6(6.4)		37.8(6.1)		16.9(6.2)		94.7(6.8)		96.9(6.9)		0.5(4.7)	UJ	2.3(5.0)	UJ	-0.6(4.9)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

[1] Sample BB2 E5-30-DUP (10/27/10) is a duplicate of BB2 E5-30.

NH^{4+} and Unionized NH_3 could not be calculated as field pH not collected.

Text in blue are revised values.

Key:

? = Unusable.

‰ = Parts per mille.

°C = Degrees Celsius.

µg/L = Micrograms per liter.

µS/cm = Micro Siemens per centimeter.

cm = Centimeters.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

mg/L = Milligram(s) per liter.

N.A. = Not applicable.

NTU = Nephelometric turbidity unit(s).

pCi/L = Picocuries per liter.

SU = Salinity units.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 4.1-23. Marsh and Mangrove Analytical Porewater February 2011

Parameter	Units	M1-2-30CM 2/2/2011		M1-2.1-30CM 3/10/2011		M2-1-30CM 2/3/2011		M2-2-30CM 2/3/2011		M3-1-30CM 2/3/2011		M3-2-30CM 2/3/2011		M4-1-30CM 2/4/2011		M4-2.1-30CM 3/11/2011		M5-1-30CM 2/4/2011		M5-2.1-30CM 3/11/2011		M6-1-30CM 3/9/2011		M6-2-30CM 3/9/2011		F1-1-30CM 2/3/2011		F1-2-30CM 2/2/2011		F2-1-30CM 2/8/2011		F2-2-30CM 2/8/2011		F2-3-30CM 2/9/2011		F2-4-30CM 2/9/2011	
Temperature	°C	27.05		27.05		25.25		27.00		25.90		27.85		26.05		20.50		27.25		18.35		26.80		25.70		21.15		23.50		25.60		24.55		22.80		24.80	
pH	SU																																				
Dissolved Oxygen	mg/L																																				
Specific Conductance	µS/cm	47104.80		41104.80		46904.85		49553.40		45589.05		44450.35		41543.15		46643.98		52195.15		52684.94		41186.45		44630.45		2260.80		1320.40		907.95		1230.95		2047.95		722.65	
Turbidity	NTU																																				
Arsenic	mg/L																																				
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.034	I	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	1.1		1.3		1.3		3.8		1.7		1.5		0.59	IJ	0.69	I	0.67	I	2.1		0.79	I	0.65	I	0.34	I	1.4		3.8		1.2		0.54	I	0.34	I
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	480		670		450		650		590		680		380		470		630		580		520		490		150		150		2400	J	400	J	240		69	
Magnesium	mg/L	1000		1200		1100		1200		1100		1100		970		1200		1300		1300		1100		1200		62		25		25	J	23	J	42		8.5	
Potassium	mg/L	310		380		360		380		360		350		310		370		400		420		290		340		17		7.3		4.4	J	2.9	J	4.6		2.2	
Sodium	mg/L	8100		9400		9200		10000		9200		8800		8000		9100		11000		10000		7800		8800		350		99		60	J	100	J	200		68	
Boron	mg/L	3.2		3.9		3.6		4.0		3.8		3.7		3.2		3.9		3.9		4.2		3.3		3.6		0.36		0.11		0.082		0.06		0.074		0.06	
Strontium	mg/L	6.7		8.6		7.0		8.4		7.6		7.7		5.9		7.3		8.4		8.6		7.0		7.3		0.98		0.76		8.0		1.9		1.7		0.77	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	47		57		56		49	I	55		53		48		58		63		67		47		53		1.1		0.27	U	0.22	J	0.42		1.0		0.25	
Chloride	mg/L	15000		17000		17000		18000		17000		17000		16000		18000		20000		20000		15000		17000		510		150		95	J	180		410		120	
Fluoride	mg/L	0.73		0.20	U	4.0		0.97		8.0		0.67		0.74		0.20	U	2.9		0.20	U	0.66		1.6		0.22	I	0.26	I	0.11	J	0.11		0.11		0.10	
Sulfate	mg/L	1900		2400		2300		2100		2200		2200		1900		2300		2400		2600		1900		1900		69		16		9.9	J	2.9		2.4		7.4	
Total Ammonia	mg/L as N																																				
Ammonium Ion (NH_4^+)	mg/L																																				
Unionized NH_3	mg/L																																				
Nitrate/Nitrite as N	mg/L																																				
TKN	mg/L																																				
TN	mg/L																																				
Orthophosphate	mg/L																																				
Phosphorus (P)	mg/L																																				
Alkalinity	mg/L ($CaCO_3$)	430		400		230		500		390		270		220		300		510		180		530		610		450		320		260	J	320		420		150	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	430		400		230		500		390		270		220		300		510		180		530		610		450		320		260	J	320	J	420		150	
Sulfides	mg/L	4.8		1.0	U	5.3		6.7		12		4.2		8.8		5.8		12		4.8		57		86		2.7		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																																				
Dissolved Inorganic Carbon	mg/L	110		130		62		130		99		70		66		100		140		63		160		190		120		90		73		97		120		41	
$\delta^{18}O$	‰	1.2		1.7		1.6		1.6		2.2		2.0		2.2		2.2		2.5		2.0		2.3		2.4		0.3		-0.9		-0.3		0.2		0.2		-0.8	
$\delta^{2}H$	‰	13.2		17.0		13.0		16.0		8.0		15.0		14.0		21.0		10.7		19.0		20.0		21.0		2.0		0.0		5.0		7.1		7.0		-5.0	
$\delta^{13}C$	‰	-11.85		-11.85		-8.99		-11.50		-10.88		-9.67		-9.65		-10.67		-12.17		-7.58		-12.78		-13.50		-7.61		-10.22		-7.79		-7.26		-4.63		-13.49	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		26.7		30.0		29.7		32.9		29.3		29.5		26.3		30.4		34.4		35.3		26.3		28.8		1.2		0.7		0.4		0.6		1.0		0.4	
$^{87}Sr/^{86}Sr$	µg/L*	0.70913		0.70914		0.70916		0.70914		0.70914		0.70913		0.70914		0.70915		0.70912		0.70915		0.70916		0.70913		0.70912		0.70915		0.70912		0.70916		0.70912		0.70916	
Tritium	pCi/L (1σ)	14.4(5)		10.8(6.5)		47.3(6.6)		40.7(5.7)		88.9(8.5)		90.8(8.5)		159(13)		81.5(9.5)		92.7(10.4)		104(10)		11.4(8.2)		0.7(5.8)	UJ	122(9.5)		38.8(5.7)		75.7(9.5)		63.4(8.5)		43.5(7.6)		60.5(9.5)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Text in blue are revised values.

Key:

? = Unusable.
‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter.
cm = Centimeters.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
N.A. = Not applicable.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
SU = Salinity units.
U = Analyzed for but not detected
V = Detected in method blank.

Table 4.1-23. Marsh and Mangrove Analytical Porewater February 2011

Parameter	Units	F3-1-30CM 2/10/2011		F3-2-30CM 2/9/2011		F3-3-30CM 2/9/2011		F4-1-30CM 2/10/2011		F4-3-30CM 2/10/2011		F4-4-30CM 2/10/2011		F5-1-30CM 2/4/2011		F5-2-30CM 3/10/2011		F6-1-30CM 3/8/2011		F6-2-30CM 3/8/2011		F6-3-30CM 3/8/2011		F6-4-30CM 3/8/2011		EB-01 2/3/2011		PW-EB1 3/8/2011		PW-FCEB1 3/9/2011	
Temperature	°C	26.05		23.75		24.05		24.75		26.30		24.90		26.25		26.90		26.00		27.55		26.20		26.40							
pH	SU																														
Dissolved Oxygen	mg/L																														
Specific Conductance	µS/cm	1380.20		1559.10		2359.90		775.10		827.25		1020.15		19168.85		19903.90		888.50		1071.00		2523.50		645.45							
Turbidity	NTU																														
Arsenic	mg/L																														
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.00081	U	0.00081	U	0.00081	U
Beryllium	mg/L																														
Cadmium	mg/L																														
Copper	mg/L																														
Iron	mg/L	0.6	I	0.34	I	0.29	I	0.36	I	0.19	I	0.53	I	0.82	I	0.87	I	1.1	J	0.5	IJ	1.2		1.3		0.0027	U	0.12		0.01	IV
Lead	mg/L																														
Manganese	mg/L																														
Molybdenum	mg/L																														
Nickel	mg/L																														
Selenium	mg/L																														
Thallium	mg/L																														
Vanadium	mg/L																														
Zinc	mg/L																														
Silica	mg/L																														
Calcium	mg/L	320	J	320	J	230		110		150	J	100		250		460		180	J	130		300	J	100		0.13	I	0.34	I	0.10	I
Magnesium	mg/L	24	J	32	J	32		11		9.2	J	15		340		870		11	J	16		44	J	12		0.056	I	0.020	U	0.020	U
Potassium	mg/L	5.9	J	6.1	J	7.6		3.3		3.5	J	0.19	U	100		250		3.4	J	2.4		7.9	J	4.2		0.19	U	0.19	U	0.19	U
Sodium	mg/L	140	J	140	J	270		42		52	J	74		3000		6500		42	J	61		280	J	28		0.31	U	0.31	U	0.31	U
Boron	mg/L	0.06		0.06		0.074		0.033	I	0.024	I	0.069		1.0		2.8		0.027	I	0.034	I	0.092		0.058		0.01	U	0.01	U	0.01	U
Strontium	mg/L	1.6		2.1		2.0		0.79		0.94		1.1		2.9		5.5		1.3		1.3		1.8		1.0		0.001	U	0.0017	I	0.001	U
Chromium VI	mg/L																														
Mercury	mg/L																														
Bromide	mg/L	0.90		0.84		1.5		0.21		0.26		0.46		17		38		0.40	J	0.47		1.6	J	0.49		0.027	U	0.027	U	0.027	U
Chloride	mg/L	280		270		540		72		92		120		5600		12000		81	J	120		500	J	44		0.20	U	0.20	U	0.20	U
Fluoride	mg/L	0.10		0.11		0.093		0.069		0.076		0.11		0.20	U	0.20	U	0.11	J	0.12		0.12	J	0.19		0.020	U	0.020	U	0.020	U
Sulfate	mg/L	16		3.0		6.0		4.4		4.2		6.1		660		1700		0.65	J	0.20	U	3.4	J	2.0		0.20	U	0.20	U	0.20	U
Total Ammonia	mg/L as N																														
Ammonium Ion (NH_4^+)	mg/L																														
Unionized NH_3	mg/L																														
Nitrate/Nitrite as N	mg/L																														
TKN	mg/L																														
TN	mg/L																														
Orthophosphate	mg/L																														
Phosphorus (P)	mg/L																														
Alkalinity	mg/L ($CaCO_3$)	300		330		340		250		250		230		380		400		300	J	350		420	J	260		2.8		1.0	U	3.5	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	300		330		340		250		250		230		380		400		300	J	350		420	J	260		2.8		1.0	U	3.5	
Sulfides	mg/L	3.5		1.3		2.4		1.8		1.8		1.3		5.0		1.4		1.0	U	1.0	U	1.6		1.0	U	1.0	U	1.0	U	1.0	U
Total Dissolved Solids	mg/L																														
Dissolved Inorganic Carbon	mg/L	80		99		100		69		74		73		100		110		96		110		120		72		10	U	10	U	10	U
$\delta^{18}O$	‰	1.2		0.8		0.6		-0.6		0.0		-1.0		0.5		0.7		0.6		0.4		0.7		-0.7		-1.0				-1.1	
$\delta^{2}H$	‰	9.0		6.0		7.0		2.6		9.1		-2.0		7.0		7.0		3.0		9.0		15.0		5.0		-5.0				6.0	
$\delta^{13}C$	‰	-8.32		-7.20		-10.06		-7.24		-5.58		-14.64		-13.48		-10.37		-5.53		-5.35		-7.87		-11.78		-9.89		-9.26		-9.75	
Gross Alpha	pCi/L																														
Salinity (PSS-78)		0.7		0.8		1.2		0.4		0.4		0.5		11.4		11.8		0.4		0.5		1.3		0.3							
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70912		0.70913		0.70910		0.70916		0.70917		0.70913		0.70916		0.70916		0.70914		0.70915		0.70914				0.146		0.071	
Tritium	pCi/L (1σ)	78.5(10.4)		54.9(10.4)		44.5(9.5)		88(11.4)		49.2(9.5)		52(10.4)		161(13)		130(12)		15.6(8.2)		22.7(8.5)		12.5(8.1)		10.8(8.2)		-1.3(4.7)	UJ	-0.8(7.9)	UJ	0.8(7.9)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Text in blue are revised values.

Key:

? = Unusable.
‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter
cm = Centimeters.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
N.A. = Not applicable.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
SU = Salinity units.
U = Analyzed for but not detected
V = Detected in method blank.

Table 4.1-24. Marsh and Mangrove Analytical Porewater May 2011

Parameter	Units	PW-F1-1 5/19/11		PW-F2-3 5/3/11		PW-F3-1 5/9/11		PW-F3-2 5/9/11		PW-F3-3 5/9/11		PW-F4-1 5/12/11		PW-F4-2 5/12/11		PW-F4-3 5/12/11		PW-F5-1 5/10/11		PW-F6-1 5/17/11		PW-F6-2 5/17/11		PW-F6-3 5/18/11		PW-M1-1 5/6/11		PW-M1-2 5/20/11		PW-M2-1 5/5/11		PW-M2-2 5/5/11		PW-M3-1 5/19/11		PW-M3-2 5/19/11	
Temperature	°C	30.55		29		26.9		29		32.55		28.85		29.75		32.05		34.45		24.7		25.85		26.85		26.3		29.95		27.25		25.3		29.75		30	
pH	SU	7.32		7.62		7.39		7.73		7.53		7.35		7.78		7.56		7.15		7.25		7.19		7.70		7.68		7.12		7.27		7.02		7.26		7.41	
Dissolved Oxygen	mg/L																																				
Specific Conductance	µS/cm	4036.48		2622.94		1637.74		1677.76		2455.43		925.27		763.26		961.44		20357.85		990.40		1070.28		3293.55		56588.71		57895.91		59849.17		62007.59		64201.38		61782.28	
Turbidity	NTU																																				
Arsenic	mg/L																																				
Barium	mg/L	0.016	U	0.023	I J	0.071	I	0.016	U	0.035	I	0.017	I	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.03	I	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U
Beryllium	mg/L																																				
Cadmium	mg/L																																				
Copper	mg/L																																				
Iron	mg/L	0.071	I	0.89	I	0.2	I	0.15	I	0.93	I	0.14	I	0.14	I	0.62	I	1.5		0.91	I	0.24	I	0.15	I	0.33	I	0.66	I	0.23	I	0.5	I	0.4	I	0.49	I
Lead	mg/L																																				
Manganese	mg/L																																				
Molybdenum	mg/L																																				
Nickel	mg/L																																				
Selenium	mg/L																																				
Thallium	mg/L																																				
Vanadium	mg/L																																				
Zinc	mg/L																																				
Silica	mg/L																																				
Calcium	mg/L	110		370		220	J	230		200		130		99		250	J	350		230	J	130		220		610		710		490		610		600		640	
Magnesium	mg/L	81		53		27	J	33		27		11		7.6		10	J	410		12	J	15		54		1400		1500		1400		1500		1400		1500	
Potassium	mg/L	23		6.2		7	J	6.4		8.5		3		3.2		4.7	J	120		2.5	J	1.9		10		450		480		460		480		490		500	
Sodium	mg/L	560		260		170	J	150		260		45		42		62	J	3400		51	J	69		400		11000		12000		11000		12000		12000		12000	
Boron	mg/L	0.58	J	0.11	J	0.091		0.079		0.1		0.039	I	0.037	I	0.046	I	1.3		0.034	I	0.043	I	0.13		3.9		4.5		4.2		4.5		4.3		4.7	
Strontium	mg/L	0.95		2.2		1.4		1.8		1.6		0.9		0.7		1.3		3.9		1.6		1.3		1.7		9.4		10		8.6		9.6		9.3		9.4	
Chromium VI	mg/L																																				
Mercury	mg/L																																				
Bromide	mg/L	1.9	I	1.7		0.89		0.93		1.8		0.21		0.21		0.36		23		0.53		0.5		2.7		76		69		80		87		77	J	74	
Chloride	mg/L	950		590		340		320		570		78		80		110		6500		93		130		800		22000		23000		22000		25000		26000	J	24000	
Fluoride	mg/L	0.2	U	0.071		0.11		0.076		0.12		0.082		0.072		0.058		0.2	U	0.1		0.11		0.28	I	0.56		1	U	0.61		0.64		1	UJ	1	U
Sulfate	mg/L	110		6.8		41		16		72		25		21		6.8		850		27		39		120		2600		3100		2700		3000		3500	J	3300	
Total Ammonia	mg/L as N	0.4		1	J	1.9		1.4		1.3		0.46		2.1		1.7		0.97		2.1		1.5		1.1		0.63		0.88		1.1		1.1		0.99		1.2	
Ammonium Ion (NH^{4+})	mg/L	0.58		1.2	J	2.4		1.7		1.6		0.58		2.6		2.1		1.2		2.7		1.9		1.4		0.79		1.1		1.4		1.4		1.3		1.5	
Unionized NH_3	mg/L	0.0096		0.0471	J	0.0385		0.0823		0.0491		0.0093		0.1234		0.0642		0.0147		0.0339		0.0208		0.0439		0.0227		0.0061		0.0191		0.0134		0.0135		0.0139	
Nitrate/Nitrite as N	mg/L	1.7		0.041	J	0.038		0.21		0.1		0.018		0.13		0.023		0.023		0.16		0.013		0.18		0.089		0.75		0.086		0.087		0.26		0.18	
TKN	mg/L	1.8		2.4	J	3		2.6		2		1.8		2.7		3.5		2.5		2.6		2.2		1.5		0.72		2.8		1.1		1.4		1.4		2.8	
TN	mg/L	3.5		2.441	J	3.038		2.81		2.1		1.818		2.83		3.523		2.523		2.76		2.213		1.68		0.809		3.6		1.186		1.487		1.66		2.98	
Orthophosphate	mg/L	0.0014	U Q	0.011	I J	0.0014	U	0.0014	U	0.0027	I	0.0014	U	0.0014	U	0.0016	I	0.0014	U Q J	0.0042	I	0.0059	I J	0.014	J	0.0018	I J	0.0042	I	0.0035	I	0.0056	I	0.0058	I	0.0014	I
Phosphorus (P)	mg/L	0.0077	I	0.014		0.0068	I	0.0079	I	0.0088	I	0.046		0.0075	I	0.02		0.052		0.0044	U	0.0044	UJ	0.0044	UJ	0.017		0.022		0.018		0.022		0.02		0.02	
Alkalinity	mg/L ($CaCO_3$)	550		430		290		350		300		290		220		310		440		310		260		320		360		390		170		360		300	J	220	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	550		430		290		350		300		290		220		310		440		310		260		320		360		390		170		360		300	J	220	
Sulfides	mg/L	1	U	1	U	1	U	1	U	1.1		1	U	1	U	1	U	5.1		1	U	1	U	1	U	4.6		5		4.8		3		4.6		4.3	
Total Dissolved Solids	mg/L																																				
Dissolved Inorganic Carbon	mg/L	140		120		80		94		76		70		53		75		140		85		75		78		110		11		41		120		78		50	
$\delta^{18}O$	‰	0.7		0.3		1		0.7		0.5		-0.4		-0.5		0.7		0.7		0.3		0.4		0.4		2.6		2.6		-1.5		0.3		3.9		3.4	
$\delta^{2}H$	‰	3.0		11.0		14.0		11.0		11.0		2.0		-3.0		3.0		6.0		3.0		0.0		8.0		20.0		18.0		-6.0		11.0		32.0		22.0	
$\delta^{13}C$	‰	-7.45		-4.39		-8.63		-6.76		-8.40		-7.32		-5.56		-5.45		-13.51		-1.30		-4.89		-7.46		-10.68		-11.74		-7.66		-10.70		-10.47		-9.52	
Gross Alpha	pCi/L																																				
Salinity (PSS-78)		2.1		1.3		0.8		0.8		1.2		0.5		0.4		0.5		12.0		0.5		0.5		1.7		37.6		38.5		40.0		41.7		43.3		41.4	
$^{87}Sr/^{86}Sr$	µg/L*	0.70915		0.70917		0.70920		0.70917		0.70917		0.70914		0.70914		0.70915		0.70916		0.70915		0.70911		0.70913		0.70918		0.70913		0.70918		0.70916		0.70914		0.70915	
Tritium	pCi/L (1σ)	83.4 (7.7)		31.4 (5.3)	J	65.4 (6.8)		48.2 (7.6)		66.2 (6.8)		88.4 (8.8)		58.6 (7.5)		51.9 (7.2)		139 (10)		1.6 (5.7)	UJ	13.5 (5.1)		15.1 (6.7)		26.6 (5.3)		30.8 (5.4)		37.8 (5.7)		39.7 (6)		56.1 (6.7)		46.2 (9.6)	

Notes:

* Strontium samples are reported as a ratio and hence while blanks are reported in parts per billion (µg/L).
Text in blue are revised values.

Key:

? = Unusable.
‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
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I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
MCL = Maximum Contaminant Levels.
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-24. Marsh and Mangrove Analytical Porewater May 2011

Parameter	Units	PW-M4-1 5/27/11		PW-M4-2 5/27/11		PW-M5-2 5/20/11		PW-M6-1 5/11/11		PW-M6-2 5/11/11		PW-EB1 5/3/11		PW-FCEB-1 5/19/11		PW-FB-1 5/27/11	
Temperature	°C	29.15		32.35		28.8		28.15		29.35							
pH	SU	6.97		6.83		7.14		7.10		7.24							
Dissolved Oxygen	mg/L																
Specific Conductance	µS/cm	78742.86		77557.75		56294.48		44079.02		47719.22							
Turbidity	NTU																
Arsenic	mg/L																
Barium	mg/L	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.0016	I	0.016	U	0.00081	U
Beryllium	mg/L																
Cadmium	mg/L																
Copper	mg/L																
Iron	mg/L	0.054	U	0.12	I	0.12	I	0.37	I	0.25	I	0.0047	I	0.91	I	0.0053	I
Lead	mg/L																
Manganese	mg/L																
Molybdenum	mg/L																
Nickel	mg/L																
Selenium	mg/L																
Thallium	mg/L																
Vanadium	mg/L																
Zinc	mg/L																
Silica	mg/L																
Calcium	mg/L	760		570		500		570		500		0.1	U	0.17	I	0.1	U
Magnesium	mg/L	2100		1400		1400		1100		1100		0.037	I	0.02	U	0.02	U
Potassium	mg/L	690		480		460		320		350		0.19	U	0.19	U	0.19	U
Sodium	mg/L	16000		11000		11000		8300		9000		0.32	I	0.31	U	0.31	U
Boron	mg/L	6.3		4.2		4.4		3.6		3.8		0.1		0.069		0.069	
Strontium	mg/L	13		9.5		8.5		7.5		7.5		0.001	U	0.0013	I	0.001	U
Chromium VI	mg/L																
Mercury	mg/L																
Bromide	mg/L	120		120	J	64		54		61		0.027	U	1	U	0.027	U
Chloride	mg/L	32000		32000	J	21000		15000		17000	V	0.2	U	1	U	0.2	U
Fluoride	mg/L	0.38	I	0.39	IJ	1	U	0.55		0.45	I	0.02	U	0.2	U	0.02	U
Sulfate	mg/L	4300		4400	J	2900		1900		1900		0.4	I	2.6	U	0.2	U
Total Ammonia	mg/L as N	1.3		1.2		1.1		2.3		2.2		0.74	J	0.79		1.1	
Ammonium Ion (NH^{4+})	mg/L	1.6		1.5		1.4		2.9		2.8							
Unionized NH_3	mg/L	0.0052		0.0035		0.0089		0.0125		0.0251							
Nitrate/Nitrite as N	mg/L	0.03		0.041		0.23		0.021		0.037		0.14		0.046		0.022	
TKN	mg/L	1.6		1.9		2		2.9		2.4		0.69		0.65		0.94	
TN	mg/L	1.63		1.941		2.2		2.921		2.437		0.83		0.696		0.962	
Orthophosphate	mg/L	0.019		0.012		0.0017	I	0.0014	U Q ?	0.0014	U Q J	0.0014	I	0.0018	I	0.0014	U
Phosphorus (P)	mg/L	0.027		0.027		0.018		0.017		0.018		0.0044	U	0.0044	U	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	220		230	J	160		450		430		14		1	U	1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	220		230	J	160		450		430		14		1	U	1	U
Sulfides	mg/L	4.2		4.3		7.5		38		45		1	U	1	U	1	U
Total Dissolved Solids	mg/L																
Dissolved Inorganic Carbon	mg/L	54		67		10	U	120		100		10	U	10	U	10	U
$\delta^{18}O$	‰	4.9		4.4		2.3		2.8		2.7		-1.5		-1.4		-1.7	
$\delta^{2}H$	‰	24.0		32.0		15.0		20.0		16.0		-6.0		-3.0		-5.0	
$\delta^{13}C$	‰	-7.20		-9.56		-8.61		-12.55		-11.62		-7.69		-17.66		-14.95	
Gross Alpha	pCi/L																
Salinity (PSS-78)		54.7		53.6		37.3		28.4		30.9							
$^{87}Sr/^{86}Sr$	µg/L*	0.70913		0.70913		0.70915		0.70917		0.70914		0.100		0.300		0.005	U
Tritium	pCi/L (1σ)	68.4 (6.9)		63.2 (7.6)		65.8 (7.8)		13.8 (6.1)		14.1 (6)		9.5 (4.9)		3.7 (4.4)	UJ	1.2 (5.7)	UJ

Notes:
* Strontium samples are reported as a ratio and hence unit while blanks are reported in parts per billion (µg/L).
Text in blue are revised values.

Key:
? = Unusable.
‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
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I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
MCL = Maximum Contaminant Levels.
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-25. Marsh and Mangrove Analytical Porewater August 2011

Parameter	Units	PW-F1-1 8/10/11		PW-F1-2 8/10/11		PW-F2-1 8/10/11		PW-F2-2 8/10/11		PW-F2-3 8/10/11		PW-F2-4 8/12/11		PW-F3-1 8/12/11		PW-F3-2 8/12/11		PW-F3-3 8/9/11		PW-F3-4 8/12/11		PW-F4-1 8/9/11		PW-F4-2 8/9/11		PW-F4-3 8/9/11		PW-F4-4 8/12/11		PW-F5-1 8/4/11		PW-F5-2 8/4/11		PW-F6-1 8/11/11		PW-F6-2 8/11/11		PW-F6-3 8/11/11		PW-F6-4 8/11/11		PW-MI-1 8/3/11		PW-M1-2 8/2/11		PW-M2-1 8/5/11		PW-M2-2 8/5/11	
Temperature	°C	29.51		28.51		29.57		28.58		28.86		30.01		28.83		30.13		31.00		28.74		29.15		31.35		29.30		27.86		31.55		34.05		27.55		29.35		30.13		27.09		31.85		31.05		32.55		32.10	
pH	SU	6.86		7.37		7.36		7.46		7.43		6.73		6.54		7.07		7.14		6.26		7.09		7.19		7.13		6.84		7.04		7.28		7.09		7.19		7.19		7.09		7.32		6.98		7.46		7.02	
Dissolved Oxygen	mg/L																																															
Specific Conductance	µS/cm	5230.92		2102.77		2127.73		2362.21		2649.11		1180.80		2105.13		2089.18		3214.55		807.32		937.60		825.80		1012.20		1719.90		31996.60		65050.80		1125.21		1206.76		2638.41		1218.60		64315.25		63884.65		62515.95		64093.40	
Turbidity	NTU																																															
Arsenic	mg/L																																															
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.130	I	0.100	I	0.081	U	0.081	U	0.081	U	0.081	U	0.016	U	0.016	U	0.081	U	0.081	U	0.081	U	0.081	U	0.016	U	0.016	U	0.081	U	0.081	U
Beryllium	mg/L																																															
Cadmium	mg/L																																															
Copper	mg/L																																															
Iron	mg/L	0.430	I	1.600	I	2.700	I	0.930	I	1.700	I	0.270	I	0.590	I	1.000	I	0.490	I	0.370	I	0.910	I	0.270	U	0.320	I	0.410	I	0.620	I V	0.780	I V	0.440	I	1.200	I	1.800	I	0.610	I	0.290	I V	0.340	I V	0.510	I	0.740	I
Lead	mg/L																																															
Manganese	mg/L																																															
Molybdenum	mg/L																																															
Nickel	mg/L																																															
Selenium	mg/L																																															
Thallium	mg/L																																															
Vanadium	mg/L																																														
Zinc	mg/L																																															
Silica	mg/L																																															
Calcium	mg/L	200		640	J	680	J	270		500	J	97		200		410	J	240		45		120		88		190		180		530		660		170		170		300		160		680		670		560		720	
Magnesium	mg/L	110		37	J	28	J	44		44	J	12		34		38	J	40		9.1		10		7.2		9.6		33		660		1700		13		18		45		22		1600		1500		1600		1700	
Potassium	mg/L	31		4.7	J	9.4	J	12		5.3	J	3.2		9.1		8.7	J	11		6.7		3.1		3.3		3.6		2.5		180		540		2.9		2.2		8.3		3.6		540		510		540		560	
Sodium	mg/L	700		240	J	220	J	220		290	J	110		220		200	J	370		93		54		59		67		190		5400		13000		55		70		300		60		13000		12000		13000		13000	
Boron	mg/L	0.55		0.086		0.093		0.19		0.087		0.083		0.098		0.085		0.11		0.063		0.047	I	0.042	I	0.035	I	0.23		1.6		4.8		0.04	I	0.05		0.093		0.1		5.1		4.9		5.7		5.7	
Strontium	mg/L	1.5		3.1		2.8		1.3		2.6		1		1.6		2.5		2.4		0.55		0.93		0.73		1.2		1.7		6.1		9.6		1.6		1.5		2.3		1.7		10		10		8.8		10	
Chromium VI	mg/L																																															
Mercury	mg/L																																															
Bromide	mg/L	4.6		1.2		1.5		1.1		1.3		1		1.1		1.2		2		0.87		0.61		0.49		0.61		1.2		33		83		0.51		0.6		1.6		0.93		85		81		85		88	
Chloride	mg/L	1300		510	J+	440		380		650		180		390		380		790		160		120		120		140		290		10000		26000		110		130		570		100		26000		24000		24000		25000	
Fluoride	mg/L	0.4	U	0.13	J-	0.11		0.14		0.14		0.1		0.14		0.14		0.14		0.091		0.13		0.1		0.13		0.19		0.4	U	0.4	U	0.13		0.13		0.13		0.17		0.4	U	2	U	1		0.78	I
Sulfate	mg/L	160		110		67		120		99		3		97		48		170		0.32	I	25		17		15		48		1200		2700		63		61		110		28		2600		2800		3000		3000	
Total Ammonia	mg/L as N																																															
Ammonium Ion (NH^{4+})	mg/L																																															
Unionized NH_3	mg/L																																															
Nitrate/Nitrite as N	mg/L																																															
TKN	mg/L																																															
TN	mg/L																																															
Orthophosphate	mg/L																																															
Phosphorus (P)	mg/L																																															
Alkalinity	mg/L ($CaCO_3$)	530		230		310		280		260		270		260		390		280		100		270		160		210		380		490		170		280		290		290		350		300		320		93		320	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	530		230		310		280		260		270		260		390		280		100		270		160		210		380		490		170		280		290		290		350		300		320		93		320	
Sulfides	mg/L	4.2		1	U	1	U	1.1		1	U	1	U	1.1		1	U	1.1		1	U	3.8		1.6		1.3		1	U	4		1	U	1	U	1	U	1	U	1	U	1	U	8.2		5.9		3.7		5	
Total Dissolved Solids	mg/L																																															
Dissolved Inorganic Carbon	mg/L	160		71		69		87		81		59		85		95		87		25		70		49		76		120		140		69		86		91		87		110		98		99		39		120	
$\delta^{18}O$	‰	1.1		0.6		1.0		-0.8		0.1		-0.8		0.8		0.2		0.3		-0.9		-1.3		-0.5		-0.7		-1.6		1.0		3.0		-0.2		0.1		0.1		-2.7		3.0		2.5		2.5		2.6	
$\delta^{2}H$	‰	8.0		2.0		9.0		0.0		4.0		-7.0		11.0		2.0		10.0		-6.0		-7.0		-5.0		-6.0		-8.0		10.0		17.0		7.0		6.0		2.0		-16.0		25.0		19.0		18.0		18.0	
$\delta^{13}C$	‰	-11.02		-7.93		-4.72		-7.60		-11.00		-10.04		-10.41		-8.91		-12.40		-7.46		-6.80		-5.63		-10.41		-9.33		-11.43		-10.66		-3.23		-7.45		-9.67		-13.43		-11.47		-11.49		-7.84		-11.55	
Gross Alpha	pCi/L																																															
Salinity (PSS-78)		2.79		1.07		1.08		1.21		1.36		0.58		1.07		1.05		1.66		0.38		0.46		0.40		0.50		0.87		19.93		43.79		9.87		0.59		1.35		0.60		43.23		43.18		41.89		43.33	
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70915		0.70913		0.70914		0.70911		0.70916		0.70916		0.70918		0.70916		0.70919		0.70916		0.70919		0.70916		0.70920		0.70916		0.70918		0.70914		0.70913		0.70916		0.70915		0.70916		0.70918		0.70916		0.70916	
Tritium	pCi/L (1σ)	85.6 (7.9)		39.2 (6)	J	53.3 (6.5)	J	29.3 (5.7)	J	24.9 (5.4)	J	21.4 (6)		87.2 (8.6)		38.5 (6.4)		52.3 (6.5)		9.6 (5.6)		35.5 (5.8)		25 (5.7)		22.2 (5.4)		25 (5.9)		134 (11)		198 (15)		9.9 (5.7)	J	14 (5.8)	J	2.9 (5.5)	UJ	15 (5.6)	J	41.9 (6.8)		20.3 (6)	J	14 (5.1)		38.5 (6)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Text in blue are revised values.

Key:

‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-25. Marsh and Mangrove Analytical Porewater August 2011

Parameter	Units	PW-M3-1 8/5/11		PW-M3-2 8/5/11		PW-M4-1 8/5/11		PW-M4-2 8/2/11		PW-M5-1 8/4/11		PW-M5-2 8/2/11		PW-M6-1 8/3/11		PW-M6-2 8/3/11		PW-EB1 8/2/11		PW-FB-1 8/10/11		PW-FCEB-1 8/11/11	
Temperature	°C	31.25		31.00		33.50		32.70		32.80		31.00		31.50		32.50							
pH	SU	7.26		7.26		7.04		7.05		7.08		7.12		7.08		7.14							
Dissolved Oxygen	mg/L																						
Specific Conductance	µS/cm	67367.60		64913.55		79855.80		85880.45		81750.90		58485.80		51057.40		48738.75							
Turbidity	NTU																						
Arsenic	mg/L																						
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.001	U	0.001	U
Beryllium	mg/L																						
Cadmium	mg/L																						
Copper	mg/L																						
Iron	mg/L	0.820	I	0.740	I	0.750	I	0.220	I V	0.460	I V	0.280	I V	0.660	I V	0.330	I V	0.054	U	0.003	U	0.005	I
Lead	mg/L																						
Manganese	mg/L																						
Molybdenum	mg/L																						
Nickel	mg/L																						
Selenium	mg/L																						
Thallium	mg/L																						
Vanadium	mg/L																						
Zinc	mg/L																						
Silica	mg/L																						
Calcium	mg/L	660		660		820		890		860	J	560		650		520		2.6		0.1	U	0.46	I
Magnesium	mg/L	1800		1700		2200		2300		2200	J	1500		1200		1100		1.6		0.02	U	0.055	I
Potassium	mg/L	590		570		770		780		700	J	500		380		350		7.2		0.19	U	0.19	U
Sodium	mg/L	14000		13000		18000		18000		17000	J	12000		9200		8600		17		0.31	U	0.5	
Boron	mg/L	6.1		5.8		7.2		6.8		5.7		5		4.1		3.8		0.068		0.086		0.069	
Strontium	mg/L	9.9		9.7		13		14		13		9.1		8		7		0.022		0.001	U	0.0036	I
Chromium VI	mg/L																						
Mercury	mg/L																						
Bromide	mg/L	92		88		120		120		120	J	75		61		59		0.087		0.027	U	0.027	U
Chloride	mg/L	27000		26000		35000		34000		35000	J	22000		18000		17000	J+	21		0.35	I	0.43	I
Fluoride	mg/L	0.96	I	0.92	I	0.4	U	2	U	2.1	J	2	U	0.4	U	1.6		0.12		0.02	U	0.02	U
Sulfate	mg/L	3300		3100		4200		3700		4100	J	2600		1600		1500	J-	2.7		0.2	U	0.2	U
Total Ammonia	mg/L as N																						
Ammonium Ion (NH^{4+})	mg/L																						
Unionized NH_3	mg/L																						
Nitrate/Nitrite as N	mg/L																						
TKN	mg/L																						
TN	mg/L																						
Orthophosphate	mg/L																						
Phosphorus (P)	mg/L																						
Alkalinity	mg/L ($CaCO_3$)	190		170		150		160		300	J	200		260		270		1	U	1.1		2.6	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	190		170		150		160		300	J	200		260		270		1	U	1.1		2.6	
Sulfides	mg/L	4.3		4.2		4.6		5.6		3.8		12		28		51		1	U	1	U	1	U
Total Dissolved Solids	mg/L																						
Dissolved Inorganic Carbon	mg/L	65		54		65		71		110		60		110		130		10	U	10	U	10	U
$\delta^{18}O$	‰	3.3		2.9		4.5		4.5		3.2		2.2		2.4		2.6		-1.3		-1.3		-1.4	
$\delta^{2}H$	‰	18.0		21.0		27.0		28.0		23.0		26.0		19.0		20.0		-5.0		-5.0		-9.0	
$\delta^{13}C$	‰	-7.08		-8.18		-11.23		-11.29		-10.87		-10.24		-11.36		-10.75		-12.67		-9.75		-10.37	
Gross Alpha	pCi/L																						
Salinity (PSS-78)		45.90		44.02		55.61		60.65		56.91		38.95		33.38		31.59							
$^{87}Sr/^{86}Sr$	µg/L*	0.70916		0.70918		0.70916		0.70916		0.70917		0.70923		0.70916		0.70919		0.9		0.005	U	0.5	
Tritium	pCi/L (1σ)	23.9 (5.6)		16 (5.3)		52.3 (7.1)		57 (7.4)	J	77 (8)		94.6 (9)		17.4 (6)		29.3 (6.3)		8.5 (6.2)		10.3 (5.1)		6.5 (6.4)	

Notes:

* Strontium sample results in parts per mille, blank results in parts per billion.

Text in blue are revised values.

Key:

‰ = Parts per mille.

°C = Degrees Celsius.

µg/L = Micrograms per liter.

µS/cm = Micro Siemens per centimeter.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

mg/L = Milligram(s) per liter.

NTU = Nephelometric turbidity unit(s).

pCi/L = Picocuries per liter.

SU = Salinity units.

U = Analyzed for but not detected at the reported value.

V = Detected in method blank.

Table 4.1-26. Marsh and Mangrove Analytical Porewater November 2011

Parameter	Units	PW-F1-1		PW-F1-2		PW-F2-1		PW-F2-2		PW-F2-3		PW-F2-4		PW-F3-1		PW-F3-2		PW-F3-3		PW-F4-1		PW-F4-3		PW-F4-4		PW-F5-1		PW-F5-2		PW-F6-1		PW-F6-2		PW-F6-3		PW-F6-4		PW-M1-1		PW-M1-2		PW-M2-1		PW-M2-2	
		11/11/11		11/15/11		11/10/11		11/10/11		11/10/11		11/10/11		11/10/11		11/10/11		11/10/11		11/8/11		11/8/11		11/8/11		11/9/11		11/9/11		11/16/11		11/16/11		11/16/11		11/16/11		11/15/11		11/4/11		11/4/11		11/4/11	
Temperature	°C	24.75		27.30		25.00		25.70		25.10		25.45		23.77		24.97		26.10		26.30		25.05		24.51		26.05		26.00		25.40		27.40		27.40		25.70		26.60		25.70		27.95		28.65	
pH	SU	7.80		6.96		7.08		7.10		6.96		6.54		7.00		6.96		7.00		7.04		7.15		6.71		6.87		7.08		6.86		7.10		6.83		6.60		6.83		6.74		7.44		6.73	
Dissolved Oxygen	mg/L																																											
Specific Conductance	µS/cm	3196.50		1914.55		1587.00		1695.05		2722.55		883.25		1832.25		1902.58		2926.70		758.00		844.05		1472.73		23680.70		43307.80		1009.80		1130.80		3214.24		953.55		55947.00		54413.05		55072.40		60647.80	
Turbidity	NTU																																										
Arsenic	mg/L																																										
Barium	mg/L	0.00081	U	0.0008	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.00081	U	0.0008	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.00081	U	0.00081	U	0.0008	U	0.00081	U	0.00081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																										
Cadmium	mg/L																																										
Copper	mg/L																																										
Iron	mg/L	0.27	U	0.27	U	0.38	I	0.43	I	0.5	I	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	0.27	U	1.9	I	0.43	I	0.27	U	0.58	I	0.56	I	0.68	I
Lead	mg/L																																										
Manganese	mg/L																																										
Molybdenum	mg/L																																										
Nickel	mg/L																																										
Selenium	mg/L																																										
Thallium	mg/L																																										
Vanadium	mg/L																																										
Zinc	mg/L																																										
Silica	mg/L																																										
Calcium	mg/L	120	J	130		490	J	750	J	580	J	86		270	J	320	J	300		90		200	J	140		320		400		140		170		550	J	140		640		650		470		660	
Magnesium	mg/L	64		32		21	J	23	J	46	J	11		27	J	37	J	36		8.2		8.2	J	24		430		790		13		17		47	J	11		1400		1500		1300		1500	
Potassium	mg/L	21	J	9.5		5.3	J	3.3	J	5.4	J	4.2		7.5	J	7.6	J	10		3.3		3.8	J	1.5		140		270		2.8		2.3		9.4	J	5.3		420		450		410		470	
Sodium	mg/L	400		160		130	J	130	J	250	J	79		170	J	170	J	320		45		49	J	120		3900		6700		53		68		330	J	41		11000		11000		10000		11000	
Boron	mg/L	0.38	J	0.14		0.071		0.06		0.081		0.058		0.074		0.069		0.082		0.039	I	0.025	I	0.13		1.3		2.8		0.037	IJ	0.042	IJ	0.091	J	0.047	I J	4.4		4.9		4.6		5	
Strontium	mg/L	0.95	J	0.74		2		3		2.7		0.93		1.6		2.2		2.3		0.72		1.2		1.4		3.6		4.9		1.3		1.3		2.7		1.4		9		9.1		7.2		9.4	
Chromium VI	mg/L																																										
Mercury	mg/L																																										
Bromide	mg/L	0.21	J	3.5	I	0.12		1.3	J	4.2	IJ	1.2		4.1	I	3.7	I	4.2	I	0.32		0.35		1.1		26		46		0.067		0.093		0.67	J	0.78	I	75	J	82	J	65	J	87	J
Chloride	mg/L	730		310	J-	300		230	J	460	J	110		350		350		540		72		78		180		6600		12000		54		150		620	J	54		3000	J	24000	J	21000	J	25000	J
Fluoride	mg/L	0.14	J	0.12	J-	0.089		0.09	J	0.11	J	0.14		0.11		0.1		0.082		0.095		0.099		0.17		0.4	U	0.4	U	0.099		0.11		0.08	J	0.17		0.55	IJ	0.84	IJ	0.67	IJ	0.89	IJ
Sulfate	mg/L	6.5	J	11	J-	4		11	J	7.9	J	79		22		8.9	J-	56		1.6		0.85		0.43	I	770		1500		16		0.45	I	20	J	0.49	I	2800	J	3000	J	2500	J	3100	J
Total Ammonia	mg/L as N	1.7	J	1.4		1.2		1.2		1.5		1.2		2.2		2.3		1.9		1.4		2.1		1.6		1.1		1.4		1.1	J	1.5	J	0.64	J	0.33	J	0.47		0.2		0.76		0.23	
Ammonium Ion (NH^{4+})	mg/L	2.1		1.8		1.5		1.5		1.9		1.5		2.8		2.9		2.4		1.8		2.7		2.1		1.4		1.8		1.4		1.9		0.82		0.42		0.6		0.26		0.96		0.29	
Unionized NH_3	mg/L	7.163		1.146		1.036		1.074		1.031		0.271		1.408		1.581		1.400		1.068		2.280		0.534		0.645		1.297		0.622		1.541		0.331		0.094		0.227		0.072		1.597		0.101	
Nitrate/Nitrite as N	mg/L	0.33	J	0.024		0.036		0.5		0.54		0.21		0.99		0.36		0.42		0.37		0.65		0.013		0.53		1.1		0.63	J+	0.29		1.3		1.8		4.3		1.8		1.5		0.089	
TKN	mg/L	3.2	J	2.5		3.1		2.9		3.3		2.5		3.1		3.8		2.9		4.3		4.4		13		5.1		2.9		2.4		2		5		3.6		0.65		0.85		1.2		0.66	
TN[9]	mg/L	3.53		2.524		3.136		3.4		3.84		2.71		4.09		4.16		3.32		4.67		5.05		13.013		5.63		4		3.03		2.29		6.3		5.4		4.95		2.65		2.7		0.749	
Orthophosphate	mg/L	0.007	U?	0.0014	U	0.012	I	0.025	IJ	0.011	IJ	0.0084	IJ	0.02	I Q J ?	0.01	IJ	0.007	U	0.007	U J-	0.007	U	0.007	U	0.0014	I	0.0014	U	0.007	U Q	0.007	U	0.007	U	0.007	U	0.0027	I V	0.0014	U	0.0014	U	0.0014	U
Phosphorus (P)	mg/L	0.013	J	0.01		0.011		0.01	J	0.0075	IJ	0.0044	UJ	0.0044	UJ	0.0071	IJ	0.0071	I	0.026		0.013		0.031		0.009	I	0.01		0.021		0.0059	I	0.026		0.095		0.015		0.014		0.014		0.016	
Alkalinity	mg/L ($CaCO_3$)	500	J	440		330		310	J	440	J	250		390		470		460		280		310		500		490		360		360		400		320	J	400		510	J	550	J	190	J	520	J
Bicarbonate Alkalinity as CaCO3	mg/L	500	J	410		330		310	J	440	J	250		390		470		460		280		310		500		490		360		360		400		320	J	390		510	J	550	J	190	J	520	J
Sulfides	mg/L	1.6	J	1.6		1.6		1	U	1.8		1.3		3.4		1.6		1.6		1	U	1	U	1	U	13		3.5		1	U	1	U	1.6		1	U	12		10		6.8		11	
Total Dissolved Solids	mg/L																																										
Dissolved Inorganic Carbon	mg/L	100	J	83		71		63		91		55		80		93		88		64		68		110		110		82		93		96		110		100		110		130		45		130	
$\delta^{18}O$	‰	0.1		-0.6		0.1		0.0		0.0		-1.1		0.7		0.4		0.1		-0.3		-0.2		-1.4		1.1		1.0		-0.4		0.0		0.1		-1.3		2.0		1.8		1.6		2.1	
$\delta^{2}H$	‰	6.0		-1.0		1.0		-1.0		0.0		-3.0		4.0		5.0		5.0		-1.0		-1.0		-6.0		8.0		10.0		0.0		1.0		3.0		-7.0		15.0		16.0		16.0		14.0	
$\delta^{13}C$	‰	-8.9				-9.5		-10.2		-9.0		-10.5		-12.6		-10.0		-13.3		-6.9		-8.2		-11.7		-13.5		-11.4												-13.1		-8.5		-12.5	
Gross Alpha	pCi/L																																										
Salinity	‰	1.7		1.0		0.8		0.9		1.4		0.4		0.9		1.0		1.5		0.4		0.4		0.7		14.3		27.9		0.5		0.5		1.7		0.5		37.1		36.0		36.4		40.6	
$^{87}Sr/^{86}Sr$	µg/L*	0.70913		0.70917		0.70914		0.70915		0.70917		0.70918		0.70918		0.70918		0.70917		0.70918		0.70917		0.70917		0.70912		0.70912		0.70921		0.70917		0.70915		0.70917		0.70916		0.70916		0.70916		0.70915	
Tritium	pCi/L (1σ)	0.2 (3.8)	UJ	24.4 (5)		20.7 (5.3)		14.3 (4.3)		18.9 (4.5)		13.8 (3.4)		63.2 (6.9)		37.7 (5.4)		35 (5.2)		24.5 (8)		11.8 (4.4)		17.5 (7)		123 (10.6)		92.6 (8.1)		-4.3 (9.4)	UJ	2.2 (4.3)	UJ	2.6 (4)	UJ	7.4 (6.5)		12.3 (4.1)		11.8 (6.9)		11 (6.8)		9.6 (6.8)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Text in blue are revised values.

Key:

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‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-26. Marsh and Mangrove Analytical Porewater November 2011

Parameter	Units	PW-M3-1 11/7/11		PW-M3-2 11/7/11		PW-M4-1 11/7/11		PW-M4-2 11/3/11		PW-M5-1 11/9/11		PW-M5-2 11/3/11		PW-M6-1 11/2/11		PW-M6-2 11/2/11		PW-EB1 11/1/11		PW-EB1 11/3/11		PW-FCEB1 11/11/11		PW-FB1 11/16/11	
Temperature	°C	25.65		24.95		26.05		26.08		26.65		25.45		26.80		27.20									
pH	SU	6.83		7.09		6.89		6.92		6.29		6.86		6.86		6.18									
Dissolved Oxygen	mg/L																								
Specific Conductance	µS/cm	57153.75		56391.40		59996.95		68872.25		61393.00		54297.80		46514.05		48296.70									
Turbidity	NTU																								
Arsenic	mg/L																								
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	1E-03	I	0.0012	I	0.0034	I	0.00081	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	0.77	I V	0.59	I V	0.61	I V	0.73	I	0.27	U	0.57	I	0.76	I	0.52	I	0.012	I	0.0027	U	0.0027	U	0.0027	U
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	640		560		520		660		630		530		580		460		0.17	I	0.15	I	52		0.18	I
Magnesium	mg/L	1600		1400		1400		1700		1400		1300		1200		1100		0.065	I	0.02	U	3.4		0.034	I
Potassium	mg/L	500		440		460		550		450		420		340		330		0.19	U	0.19	U	5.7		0.19	U
Sodium	mg/L	12000		11000		11000		14000		12000		10000		9100		8600		0.32	I	0.31	U	16		0.31	U
Boron	mg/L	5.5		4.9		5.3		5.8		4.3		4.3		3.9		3.6		0.066		0.065		0.059		0.065	
Strontium	mg/L	9.4		8.1		8.1		10		8.8		8.1		7.8		6.7		0.001	I	0.001	U	0.51		0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	81		74	J	76		94		78		70	J	64	J	62	J	0.027	U	0.027	U	0.049	I	0.027	U
Chloride	mg/L	24000		23000	J	22000	J-	23000		22000		21000	J	18000	J	18000	J	0.33	I	3		19		0.2	U
Fluoride	mg/L	0.68	I	0.75	IJ	0.85	I	0.86	I	0.48	I	0.84	IJ	1	J	0.58	IJ	0.02	U	0.02	U	0.031	I	0.02	U
Sulfate	mg/L	2900		2700	J	2700	J-	3500		2700		2600	J	2200	J	2100	J	0.2	U	0.94		6.2		0.2	U
Total Ammonia	mg/L as N	0.96		0.86		1.1		1.2		0.74		1		1.6		1.7		0.37		0.095		0.18		0.3	Q
Ammonium Ion (NH^{4+})	mg/L	1.2		1.1		1.4		1.5		0.95		1.3		2.2		0.48									
Unionized NH_3	mg/L	0.432		0.742		0.645		0.704		0.113		0.566		1.004		0.215									
Nitrate/Nitrite as N	mg/L	0.18		0.64		0.51		0.55		1.8		0.068		0.046	J	0.16	J	0.96		0.0082	I	0.74		0.025	
TKN	mg/L	1.5		1.1		1.3		2		2.4		1.1		2.5		2.1		0.13	I	0.05	U	0.46		0.14	I
TN[9]	mg/L	1.68		1.74		1.81		2.55		4.2		1.168		2.546		2.26									
Orthophosphate	mg/L	0.019	I V	0.007	U Q ?	0.007	U	0.0014	U	0.0025	IJ-	0.0014	UJ-	0.007	I V	0.0051	I V	0.001	U Q	0.0014	U	0.22	Q	0.007	U Q
Phosphorus (P)	mg/L	0.016		0.016		0.014		0.017		0.015		0.013		0.01	J	0.0044	U	0.012		0.0044	U	0.18		0.0044	U
Alkalinity	mg/L ($CaCO_3$)	340		240	J	260		290		440		270	J	490	J	500	J	1.4		1.4		95		1.7	
Bicarbonate Alkalinity as CaCO3	mg/L	340		240	J	260		290		440		270	J	490	J	500	J	1.4		1.4		95		1.7	
Sulfides	mg/L	9.2		8.8		10		4.3		6.6		24		57		29		1	U Q	1	U	1	U	1	U
Total Dissolved Solids	mg/L																								
Dissolved Inorganic Carbon	mg/L	85		62		73		80		47		73		110		130		10		2.7		29		1.3	
$\delta^{18}O$	‰	2.3		2.2		2.2		3.1		2.5		1.6		2.3		-1.1		2.7		-1.2		-1.0		-1.4	
$\delta^{2}H$	‰	12.0		12.0		11.0		21.0		10.0		16.0		20.0		-3.0		22.0		-5.0		-8.0		-9.0	
$\delta^{13}C$	‰	-11.6		-10.4		-12.4		-12.0		-11.9		-10.3		-11.5		-11.8		-8.8		-7.6		-7.0			
Gross Alpha	pCi/L																								
Salinity	‰	38.0		37.5		40.2		47.0		41.2		35.9		30.1		31.4									
$^{87}Sr/^{86}Sr$	µg/L*	0.70914		0.70913		0.70915		0.70915		0.70913		0.70914		0.70916		0.70914				0.05	U	550		0.5	
Tritium	pCi/L (1σ)	17.8 (7.1)		21.1 (7.3)		21.2 (7)		29.6 (7.4)	J	72.4 (7.2)		72.4 (9.2)	J	7.4 (7.2)		6.6 (6.7)	UJ			9.4 (6.6)		36.8 (5.4)			

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

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J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-27. Marsh and Mangrove Analytical Porewater February 2012

Parameter	Units	PW-F1-1 2/13/2012		PW-F1-2 2/13/2012		PW-F2-1 2/6/2012		PW-F2-2 2/6/2012		PW-F2-3 2/6/2012		PW-F2-4 2/8/2012		PW-F3-1 2/8/2012		PW-F3-2 2/8/2012		PW-F3-3 2/8/2012		PW-F3-4 2/8/2012		PW-F4-1 2/7/2012		PW-F4-2 2/7/2012		PW-F4-3 2/7/2012		PW-F4-4 2/8/2012		PW-F5-1 2/10/2012		PW-F5-2 2/15/2012		PW-F6-1 2/21/2012		PW-F6-2 2/9/2012		PW-F6-3 2/9/2012		PW-F6-4 2/21/2012		PW-M1-1 2/13/2012	
Temperature	°C	23.55		20.03		22.60		22.33		23.20		23.49		22.77		22.96		22.69		23.59		23.47		24.93		25.08		23.62		25.15		24.75		23.51		23.95		21.57		22.77		22.09	
pH	SU																																									
Dissolved Oxygen	mg/L																																									
Specific Conductance	µS/cm	3803.97		1804.58		1584.84		1817.46		2619.80		979.59	J	1627.43		1873.64		2740.55		712.08	J	965.64	J	721.12	J	915.60	J	1230.95		23955.33		35521.51		944.31	J	1139.15		3053.80		1148.50		40788.17	J
Turbidity	NTU																																									
Arsenic	mg/L																																									
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.11	I	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U
Beryllium	mg/L																																									
Cadmium	mg/L																																									
Copper	mg/L																																									
Iron	mg/L	0.27	U	1.3	I V	2.3	I V	1.5	I V	1.6	I V	0.27	U	0.66	I V	0.56	I V	0.34	I V	0.27	U	0.59	I V	0.51	I V	1.4	I V	0.66	I V	0.36	I V	0.84	I V	0.53	I	0.86	I V	2	I V	0.56	I	0.59	I V
Lead	mg/L																																									
Manganese	mg/L																																									
Molybdenum	mg/L																																									
Nickel	mg/L																																									
Selenium	mg/L																																									
Thallium	mg/L																																									
Vanadium	mg/L																																									
Zinc	mg/L																																									
Silica	mg/L																																									
Calcium	mg/L	160		290		960		630		560		98		350		360		230		45		140		91		230		130		360		680		200		160		370		170		440	
Magnesium	mg/L	98		39		25		30		48		13		26		37		36		10		10		7.1		9.6		21		530		770		13		16		46		18		1000	
Potassium	mg/L	25		12		5.7	J	3.7	J	5.1	J	3.1		7.5		7.8		10		3.4		3.4		3.1		3.7		1.8		160		260		3.3		2.6		10		8.4		320	
Sodium	mg/L	510		180		140	J	160	J	260	J	86		160		180		320		82		51		40		49		110		4100		6200		53		68		350		50		7800	
Boron	mg/L	0.43		0.13		0.069	J	0.065	J	0.077	J	0.075		0.074		0.071		0.079		0.062		0.032	I	0.027	I	0.025	I	0.12		1.2		2.6		0.028	I	0.034	I	0.077		0.052		3.6	
Strontium	mg/L	1.2		1.3		3.5		2.7		2.6		1.1		1.9		2.3		2.1		0.57		0.93		0.66		1.2		1.3		4.2		5.6		1.5		1.3		2.4		1.7		6	
Chromium VI	mg/L																																									
Mercury	mg/L																																									
Bromide	mg/L	2.8		1.1		0.94	I	0.98	I	1.8		0.98	I	1.1		0.95		1.5		0.35		0.26		0.22		0.28		0.77		29		39		0.89	I	0.44		1.7		1.6		52	
Chloride	mg/L	840		300		250	J	330	J	580		150		300		350		620		120		93		70		83		150		7100		11000		100		140		700		90		15000	
Fluoride	mg/L	0.4	U	0.13		0.4	U	0.4	U	0.4	U	0.8	I	0.13		0.11		0.19		0.064		0.086		0.079		0.11		0.18		0.48	I	0.62	I	0.4	U	0.1		0.18		0.4	U	0.91	I
Sulfate	mg/L	140		130		130		110		45		71		80		42		74		51		43		37		6.8		20		1100		1600		9.9	I	0.41	I	16		33		2100	
Total Ammonia	mg/L as N																																									
Ammonium Ion (NH^{4+})	mg/L																																									
Unionized NH_3	mg/L																																									
Nitrate/Nitrite as N	mg/L																																									
TKN	mg/L																																									
TN	mg/L																																									
Orthophosphate	mg/L																																									
Phosphorus (P)	mg/L																																									
Alkalinity	mg/L ($CaCO_3$)	600		390		290	J	340	J	470	J	190		300		420		420		82		320		220		360		380		340		240		400		410		460		500		450	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	600		390		290	J	340	J	470	J	190		300		420		420		82		320		220		360		380		340		240		400		410		460		500		450	
Sulfides	mg/L	3.7		1	U	2.4		1.9		1.6		1	U	1	U	1	U	1.6		1	U	1	U	1	U	1	U	1	U	3.4		1	U	1.1		3.3		1	U	1	U	6.1	
Total Dissolved Solids	mg/L																																									
Dissolved Inorganic Carbon	mg/L	110		86		74	J	79	J	79	J	29		61		67		66		10	U	70		44		67		54		59		56		91		80		91		110		87	
$\delta^{18}O$	‰	1.0		-0.3		0.5		0.5		0.1		-1.0		0.5		0.4		0.3		-1.5		-0.3		-0.1		0..2		-1.1		2.0		1.0		-0.2		0.4		0.6		-1.2		1.2	
$\delta^{2}H$	‰	6.0		3.0		9.0		7.0		3.0		-2.0		8.0		6.0		2.0		5.0		4.0		5.0		4.0		-6.0		23.0		6.0		4.0		6.0		8.0		-4.0		11.0	
$\delta^{13}C$	‰	-11.28		-11.75		-9.74		-8.55		-7.44		-11.94		-11.53		-9.84		-12.87		-14.30		-6.31		-5.55		-6.26		-10.86		-13.06		-10.48		-8.92		-6.68		-10.92		-15.50		-11.61	
Gross Alpha	pCi/L																																									
Salinity (PSS-78)		2.0		0.9		0.8		0.9		1.4		0.5	J	0.8		1.0		1.4		0.3	J	0.5	J	0.4	J	0.5	J	0.6		14.5		22.4		0.5	J	0.6		1.6		0.6		26.1	J
$^{87}Sr/^{86}Sr$	µg/L*	0.70917		0.70919		0.70914		0.70912		0.70914		0.70919		0.70915		0.70913		0.70914		0.70915		0.70913		0.70914		0.70917		0.70920		0.70914		0.70914		0.70914		0.70914		0.70914		0.70915		0.70915	
Tritium	pCi/L (1σ)	74.5 (8.9)		30.6 (7.6)		81.9 (9.3)		38.4 (7.6)		24.6 (7.2)		20 (7.2)		98.6 (9.9)		48.8 (7.9)		48.2 (7.9)		15.6 (7.1)		50.3 (8.3)		45.6 (8.3)		18.4 (7.5)		19.5 (7.1)		168 (13)		97.2 (10.7)		7.2 (7.4)	UJ	0 (6.9)	UJ	15.4 (7.1)		14 (7.7)		18 (7.6)	

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Key:

? = Unusable.
‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-27. Marsh and Mangrove Analytical Porewater February 2012

Parameter	Units	PW-M1-2 2/10/2012		PW-M2-1 2/21/2012		PW-M2-2 2/21/2012		PW-M3-1 2/14/2012		PW-M3-2 2/14/2012		PW-M4-1 2/14/2012		PW-M4-2 2/10/2012		PW-M5-1 2/15/2012		PW-M5-2 2/10/2012		PW-M6-1 2/1/2012		PW-M6-2 2/1/2012		PW-EB-1 1/31/2012		PW-EB-1 2/6/2012	
Temperature	°C	23.37		22.78		23.20		22.07		20.89		23.65		25.58		24.16		25.18		24.28		24.50					
pH	SU																										
Dissolved Oxygen	mg/L																										
Specific Conductance	µS/cm	46019.72	J	43276.94	J	50719.03	J	46157.43	J	43649.46	J	50471.31	J	53313.46	J	44949.39	J	52509.48	J	45695.94		47290.73					
Turbidity	NTU																										
Arsenic	mg/L																										
Barium	mg/L	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.081	U	0.1	I	0.081	U	0.081	U	0.081	U	0.00081	U	0.00081	U
Beryllium	mg/L																										
Cadmium	mg/L																										
Copper	mg/L																										
Iron	mg/L	0.67	I V	0.27	U	0.27	U	0.66	I V	0.96	I V	0.7	I V	0.84	I V	0.49	I V	0.7	I V	5.7	V	0.67	I V	0.012	I V	0.0027	U
Lead	mg/L																										
Manganese	mg/L																										
Molybdenum	mg/L																										
Nickel	mg/L																										
Selenium	mg/L																										
Thallium	mg/L																										
Vanadium	mg/L																										
Zinc	mg/L																										
Silica	mg/L																										
Calcium	mg/L	510		410		620		450		500		480		510		470		510		590		530		0.62		0.6	
Magnesium	mg/L	1100		1100		1300		1100		1000		1300		1400		1100		1300		1200		1200		0.19		0.21	
Potassium	mg/L	350		370		420		370		350		430		440		380		410		360		360		4.7		4.4	
Sodium	mg/L	4100		8700		10000		8700		8100		10000		10000		8600		10000		9100		8900		71		70	
Boron	mg/L	3.7		3.9		4.4		3.9		3.6		4.2		4.6		3.5		4		3.8		3.7		0.056		0.054	
Strontium	mg/L	7		6.5		8.1		6.5		6.4		7.4		8		6.6		7.7		7.7		7.2		0.0031	I	0.0027	I
Chromium VI	mg/L																										
Mercury	mg/L																										
Bromide	mg/L	57		66		72		61		54		66		96		58		74		66		66		0.027	U	0.027	U
Chloride	mg/L	16000		16000		20000		16000		15000		19000		20000		16000		17000		17000		16000		36		37	
Fluoride	mg/L	0.85	I	0.42	I	0.4	U	0.42	I Q	0.4	U Q	0.4	U Q	0.81	I	0.73	I	0.8	I	0.83	I	0.8	I	0.24		0.2	
Sulfate	mg/L	2400		2200		2600		2300		2100		2600		2900		2200		2600		2400		2100		0.2	U	0.2	U
Total Ammonia	mg/L as N																										
Ammonium Ion (NH^{4+})	mg/L																										
Unionized NH_3	mg/L																										
Nitrate/Nitrite as N	mg/L																										
TKN	mg/L																										
TN	mg/L																										
Orthophosphate	mg/L																										
Phosphorus (P)	mg/L																										
Alkalinity	mg/L ($CaCO_3$)	550		210		530		310		240		280		280		400		380		520		570		150		140	
Bicarbonate Alkalinity as $CaCO_3$	mg/L	550		210		530		310		240		280		280		400		380		520		570		150		140	
Sulfides	mg/L	10		2.7		7.5		5.8		4.5		2.6		7.3		5.3		23		36		53		1	U	1	U
Total Dissolved Solids	mg/L																										
Dissolved Inorganic Carbon	mg/L	110		47		120		66		62		57		66		68		70		120		120		37		31	
$\delta^{18}O$	‰	1.3		1.3		1.8		2.0		1.8		2.6		2.4		2.1		1.7		2.6		2.3		-1.1		-1.1	
$\delta^{2}H$	‰	11.0		13.0		17.0		15.0		16.0		20.0		24.0		15.0		12.0		14.0		18.0		-6.0		-6.0	
$\delta^{13}C$	‰	-12.28		-7.22		-11.69		-9.90		-9.68		-8.48		-9.45		-11.56		-10.70		-11.85		-12.36		-3.34		-8.28	
Gross Alpha	pCi/L																										
Salinity (PSS-78)		29.9	J	27.9	J	33.3	J	30.0	J	28.2	J	33.1	J	35.2	J	29.1	J	34.6	J	29.6		30.8					
$^{87}Sr/^{86}Sr$	µg/L*	0.70917		0.70916		0.70915		0.70916		0.70915		0.70916		0.70915		0.70914		0.70915		0.70915		0.70914		1.2		1.3	
Tritium	pCi/L (1σ)	3.1 (7)	UJ	26.4 (8.1)		15.4 (7.6)		31.9 (8)		46.4 (8.6)		46.3 (8.6)		33.2 (7.7)		59 (9.1)		68.7 (8.7)		21.9 (7.3)		11 (11.8)	UJ	3.8 (7.2)	UJ	4.9 (6.9)	UJ

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

Text in blue are revised values.

Key:

? = Unusable.
‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-28. Marsh and Mangrove Analytical Porewater May 2012

Parameter	Units	PW-F1-1 5/8/2012	PW-F1-2 5/2/2012	PW-F2-1 5/8/2012	PW-F2-2 5/8/2012	PW-F2-3 5/8/2012	PW-F2-4 5/23/2012	PW-F3-1 5/23/2012	PW-F3-2 5/23/2012	PW-F3-3 5/23/2012	PW-F4-1 5/23/2012	PW-F4-3 5/23/2012	PW-F4-4 5/23/2012	PW-F5-1 5/7/2012	PW-F5-2 5/7/2012	PW-F6-1 5/22/2012	PW-F6-2 5/22/2012	PW-F6-3 5/22/2012	PW-F6-4 5/22/2012	**PW-M1-1 5/15/2012	PW-M1-2 5/15/2012	PW-M2-1 5/3/2012	PW-M2-2 5/3/2012
Temperature	°C	28.66	27.60	29.15	28.28	27.30	24.90	28.77	27.58	27.25	27.84	27.25	26.01	28.36	28.44	27.15	27.38	26.61	25.82	29.39	28.79	27.00	27.11
pH	SU	7.09	7.55	7.07	7.28	7.10	6.83	7.14	7.09	7.08	7.04	6.86	6.72	6.82	7.13	6.90	6.86	6.81	6.67	7.02	6.82	6.95	7.15
Dissolved Oxygen	mg/L																						
Specific Conductance	µS/cm	3478.35	1580.20	1313.86	1861.17	2745	1038.09	1697.14	1825.32	2611.98	732.52	958.55	912.77	23812.90	52696.78	977.58	1097.42	2690.39	1192.14	47123.20	50141.08	45302.01	45596.33
Turbidity	NTU																						
Arsenic	mg/L																						
Barium	mg/L	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Beryllium	mg/L																						
Cadmium	mg/L																						
Copper	mg/L																						
Iron	mg/L	0.63 U	1.9 I	2 I	0.84 I	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	1.9 I	0.63 U	0.97 I	0.9 I	0.63 U	0.69 I	1.7 I	1.2 I
Lead	mg/L																						
Manganese	mg/L																						
Molybdenum	mg/L																						
Nickel	mg/L																						
Selenium	mg/L																						
Thallium	mg/L																						
Vanadium	mg/L																						
Zinc	mg/L																						
Silica	mg/L																						
Calcium	mg/L	200	220	1600 J	420	660 J	100	190	210	210 J	100	170 J	100	400	570	200 J	210 J	250	190		650 J	490	650
Magnesium	mg/L	89	37	28 J	37	56 J	13 V	28 V	34 V	32 V J	7.7 V	9.6 V J	17 V	530	1300	11 V J	16 V J	44 V	19 V		1300 V J	1200	1400
Potassium	mg/L	22	10	5 J	4.5	5.7 J	2.9	7.7	8	9.6 J	3.5	3.7 J	2.1	140	390	3.3 J	2.9 J	10	7		390 J	390	410
Sodium	mg/L	490	180	110 J	190	300 J	110	170	170	290 J	46	61 J	89	4100	10000	53 J	73 J	320	63		11000 J	11000	11000
Boron	mg/L	0.43	0.16	0.097	0.1	0.11	0.077	0.089	0.075	0.094	0.037 I	0.036 I	0.13	1.3	4	0.033 I	0.047 I	0.1	0.11		4.6	4.2	4.7
Strontium	mg/L	1.4	1.1	5.7	2.2	3.1	1.1	1.4	1.8	1.9	0.75	1.1	0.92	4.4	7.6	1.5	1.5	1.9	1.9		8.7	7.3	8.8
Chromium VI	mg/L																						
Mercury	mg/L																						
Bromide	mg/L	2.3	0.75	0.55	0.87	1.2	0.54	0.9	0.98	1.5	0.22	0.27	0.51	24	130	0.47	0.52	1.8	0.73	62	60	76	77
Chloride	mg/L	800	310	210	390	570	190	330	340	520	80	110	140	7400	20000	94	140	600	120	19000	18000	19000	21000
Fluoride	mg/L	0.2 U	0.11	0.11	0.15	0.15	0.16	0.16	0.14	0.12	0.08	0.11	0.16	0.2 U	0.2 U	0.13	0.14	0.1	0.17	0.71	0.69	0.2 U	0.2 U
Sulfate	mg/L	160	79	60	54	14	3.4	79	48	81	6.7	20	6.7	1200	2600	0.8	0.52	4.5	72	2400	2300	2500	2800
Total Ammonia	mg/L as N	0.55	0.98	0.65	0.94	7.6 J	0.82	1.4	1.1	1.2	1.4	1.2	1.2	0.98	1 J	1.6	1.3	1	0.56	0.48	0.68	1.2	0.57
Ammonium Ion (NH^{4+})	mg/L	0.7	1.2	0.83	1.2	9.7 J	1.1	1.8	1.4	1.5	1.8	1.5	1.5	1.3	1.3 J	2	1.7	1.3	0.72	0.61	0.87	1.5	0.73
Unionized NH_3	mg/L	0.0061	0.0000	0.0074	0.0158	0.0781 J	0.0036	0.0159	0.0113	0.0119	0.0118	0.0075	0.0056	0.0054	0.0110 J	0.0100	0.0085	0.0048	0.0021	0.0045	0.0039	0.0095	0.0057
Nitrate/Nitrite as N	mg/L	0.0095 I	0.042	0.2	0.076	0.0089 I	0.029	0.043	0.047	0.059	0.026	0.018	0.02	0.029	0.02	0.02	0.048	0.033	0.044	0.79	0.027	0.019	0.025
TKN	mg/L	2.1	3	1.8	2.4	2.3 U J	2.7	2.5	2.2	2.3	3	2.4	4.1	2.5	0.28 J	2.4	2.2	2	2.3	1.4	1	1.5	1
TN	mg/L	2.110	3.042	2.000	2.476	2.309 J	2.729	2.543	2.247	2.359	3.026	2.418	4.120	2.529	0.300 J	2.420	2.248	2.033	2.344	2.190	1.027	1.519	1.025
Orthophosphate	mg/L	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0015 I	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0021 I	0.0014 U	0.0014 U	0.025 J	0.024 J	0.028 J	0.032	0.0043 I	0.0044 I	0.0014 U	0.0014 U
Phosphorus (P)	mg/L	0.023	0.0044 U	0.048	0.0053 I	0.027	0.041	0.0082 I	0.0044 U	0.0082 I	0.0088 U	0.0044 U	0.0044 U	0.0057 I	0.015	0.0088 UJ	0.0055 I J	0.0088 UJ	0.054	0.008 I	0.0085 I	0.016	0.022
Alkalinity	mg/L ($CaCO_3$)	460	370	340	370	500	200	310	360	320	240	280	260	400	310	340	360	410	370	410 Q	480 Q	180	520
Bicarbonate Alkalinity as $CaCO_3$	mg/L	460	370	340	370	500	200	310	360	320	240	280	260	400	310	340	360	410	370	410 Q	480 Q	180	520
Sulfides	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	4.2	1 U	1 U	1 U	1 U	1 U	5.8	11	4	8.6
Total Dissolved Solids	mg/L																						
Dissolved Inorganic Carbon	mg/L	120	100	69	86	120	51	84	86	80	57	68	74	97	82	89	87	110	96	48	130	45	130
$\delta^{18}O$	‰	-0.5	-1.6	-0.9	0.0	0.0	-2.1	0.7	0.2	0.1	-1.4	-0.7	-1.8	1.3	1.8	0.2	0.4	0.2	-1.5	1.6	1.6	1.6	1.6
$\delta^{2}H$	‰	-2.0	-10.0	-6.0	3.0	2.0	-14.0	11.0	4.0	6.0	-7.0	-3.0	-10.0	12.0	12.0	4.0	5.0	9.0	-1.0	15.0	13.0	15.0	14.0
$\delta^{13}C$	‰	-14.68	-9.09	-10.56	-5.72	-8.55	-16.4	-12.44	-11.42	-13.02	-13.31	-11.19	-15.61	-12.28	-8.88	-7.56	-6.92	-8.83	-13.11	-11.34	-9.27	-6.82	-8.91
Gross Alpha	pCi/L																						
Salinity (PSS-78)		1.8	0.8	0.7	0.9	1.4	0.5	0.9	0.9	1.3	0.4	0.5	0.4	14.4	34.6	0.5	0.5	1.4	0.6	30.5	32.7	29.3	29.5
$^{87}Sr/^{86}Sr$	µg/L*																						
Tritium	pCi/L (1σ)																						

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

** M1-1 sample was spilled and could not be analyzed for several porewater constituents.

Text in blue are revised values.

Key:

‰ = Parts per mille.
°C = Degrees Celsius.
µg/L = Micrograms per liter.
µS/cm = Micro Siemens per centimeter.
I = Value between the MDL and PQL.
J = Estimated (+/- indicate bias).
mg/L = Milligram(s) per liter.
NTU = Nephelometric turbidity unit(s).
pCi/L = Picocuries per liter.
Q = Holding time exceeded.
SU = Salinity units.
U = Analyzed for but not detected at the reported value.
V = Detected in method blank.

Table 4.1-28. Marsh and Mangrove Analytical Porewater May 2012

Parameter	Units	PW-M3-1 5/4/2012		PW-M3-2 5/4/2012		PW-M4-1 5/3/2012		PW-M4-2 5/15/2012		PW-M5-1 5/4/2012		PW-M5-2 5/15/2012		PW-M6-1 5/16/2012		PW-M6-2 5/16/2012		PW-EB-1 5/2/2012		PW-FB-1 5/16/2012		PW-FB-1-TA 5/22/2012		PW-FCEB-1 5/23/2012	
Temperature	°C	27.74		27.34		27.96		28.48		27.57		27.93		27.53		27.59									
pH	SU	6.98		7.01		6.77		7.03		6.76		7.04		6.91		6.88									
Dissolved Oxygen	mg/L																								
Specific Conductance	µS/cm	51668.97		49597.08		58358.67		60813.78		44024.68		54306.91		46691.68		46510.35									
Turbidity	NTU																								
Arsenic	mg/L																								
Barium	mg/L	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.002	U	0.0017	U	0.0017	U	0.0017	U
Beryllium	mg/L																								
Cadmium	mg/L																								
Copper	mg/L																								
Iron	mg/L	1.8	I	1.8	I	0.86	I	0.63	U	1.4	I	0.63	U	1.5	I	0.63	U	0.009	I	0.0063	U	0.0063	U	0.019	I
Lead	mg/L																								
Manganese	mg/L																								
Molybdenum	mg/L																								
Nickel	mg/L																								
Selenium	mg/L																								
Thallium	mg/L																								
Vanadium	mg/L																								
Zinc	mg/L																								
Silica	mg/L																								
Calcium	mg/L	570		630		570		600	J	590		540	J	360	J	520		0.2	I	0.14	I	0.1	U	0.1	U
Magnesium	mg/L	1300		1300		1500		1500	V J	1000		1400	V J	720	V J	1000	V	0.081		0.075	I V	0.02	U	0.02	U
Potassium	mg/L	430		420		470		490	J	340		440	J	200	J	310		2.7		1.7		0.19	U	0.19	U
Sodium	mg/L	10000		10000		13000		13000	J	8300		12000	J	5800	J	9000		16		10		0.31	U	0.31	U
Boron	mg/L	4.5		4.3		4.8		5.5		3.4		4.7		2.4		3.6		0.01	U	0.01	U	0.01	U	0.01	U
Strontium	mg/L	8		8		9.1		9.3		6.8		8.7		4.8		6.9		0.001	U	0.001	U	0.001	U	0.001	U
Chromium VI	mg/L																								
Mercury	mg/L																								
Bromide	mg/L	71		76		72		79		60		67	J	58	J	60		0.027	U	0.027	U	0.027	U	0.027	U
Chloride	mg/L	19000		19000		22000		21000		16000		20000	J	17000	J	16000		15		8.7		0.2	U	0.2	U
Fluoride	mg/L	0.2	U	0.2	U	0.2	U	0.83		0.2	U	0.65	J	0.58	J	0.55		0.041	I	0.064		0.02	U	0.02	U
Sulfate	mg/L	2600		2600		3000		3000		2200		2600	J	2300	J	2000		0.2	U	0.2	U	0.2	U	0.2	U
Total Ammonia	mg/L as N	0.67	J	0.45	J	1.2		0.7	J	0.81		1	J	1.8		1.9		1.4		1.1		0.62		0.69	
Ammonium Ion (NH^{4+})	mg/L	0.86	J	0.57	J	1.5		0.89	J	1		1.3	J	2.3		2.4									
Unionized NH_3	mg/L	0.0055	J	0.0037	J	0.0064		0.0061	J	0.0042		0.0085	J	0.0117		0.0124									
Nitrate/Nitrite as N	mg/L	0.26		0.25		0.017		0.038		0.038		0.08		0.029		0.072		0.022		0.16		0.1		0.023	
TKN	mg/L	0.18	I J	0.15	U J	1.6		0.15	U J	1.5		0.19	I J	2.7		3.3		1.7		1.1		0.76		1.1	
TN	mg/L	0.440	J	0.400	J	1.617		0.188	J	1.538		0.270	J	2.729		3.372		1.722		1.260		0.860		1.123	
Orthophosphate	mg/L	0.0014	U	0.0014	U	0.0014	U	0.0058	I	0.0014	U	0.0095	I	0.0014	U	0.0014	U	0.001	U	0.0014	U	0.0014	U	0.0014	U
Phosphorus (P)	mg/L	0.015		0.013		0.016		0.01		0.025		0.011		0.013		0.0044	U	0.004	U Q	0.0044	U	0.0044	U	0.0044	U
Alkalinity	mg/L ($CaCO_3$)	340		200		260		260	Q	310		280	Q	480		620		29		26		7.4		1	U
Bicarbonate Alkalinity as $CaCO_3$	mg/L	340		200		260		260	Q	310		280	Q	480		620		29		26		7.4		1	U
Sulfides	mg/L	5.9		4.3		4.2		8		3		17		21		25		1	U	1	U	1	U	1	U
Total Dissolved Solids	mg/L																								
Dissolved Inorganic Carbon	mg/L	89		57		69		74		80		80		140		160		7.4		4		1	U	2.2	
$\delta^{18}O$	‰	2.4		1.9		3.6		3.1		0.9		1.8		2.4		2.1		-1.2		-1.3		-1.1		-1.0	
$\delta^{2}H$	‰	21.0		14.0		23.0		22.0		9.0		11.0		14.0		16.0		-7.0		-12.0		-4.0		-5.0	
$\delta^{13}C$	‰	-10.27		-8.37		-8.5		-8.39		-9.09		-9.75		-12.15		-12.81		-4.83		-6.11		-4.75		-9.85	
Gross Alpha	pCi/L																								
Salinity (PSS-78)		33.9		32.4		38.9		40.7		28.3		35.8		30.3		30.1									
$^{87}Sr/^{86}Sr$	µg/L*																								
Tritium	pCi/L (1σ)																								

Notes:

* Strontium samples are reported as a ratio and hence unitless, while blanks are reported in parts per billion (µg/L).

** M1-1 sample was spilled and could not be analyzed for several porewater constituents.

Text in blue are revised values.

Key:

‰ = Parts per mille.

°C = Degrees Celsius.

µg/L = Micrograms per liter.

µS/cm = Micro Siemens per centimeter.

I = Value between the MDL and PQL.

J = Estimated (+/- indicate bias).

mg/L = Milligram(s) per liter.

NTU = Nephelometric turbidity unit(s).

pCi/L = Picocuries per liter.

Q = Holding time exceeded.

Table 4.1-29. Pearson Correlation Results of Freshwater Marsh Porewater Specific Conductance, Temperature and Tritium Values

	Specific Conductance: Temperature	Specific Conductance: Tritium	Temperature: Tritium
r value	0.1533	0.1044	0.0252
p value	0.2383	0.4232	0.8473

Table 4.1-30. Percent Cover of Red Mangroves per Plot and Transect for Each Sampling Event

Location		October 2010		May 2011		November 2011		February 2012		May 2012	
Transect	Plot	Plot	Transect	Plot	Transect	Plot	Transect	Plot	Transect	Plot	Transect
F1	1	26-50%	6-25%	26-50%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	6-25%		2-5%		2-5%		0-1%		2-5%	
F2	1	0-1%	0-1%	0-1%	0-1%	0-1%	0-1%	0-1%	0-1%	0-1%	0-1%
	2	0-1%		0-1%		0-1%		0-1%		0-1%	
	3	0-1%		0-1%		0-1%		0-1%		0-1%	
F5	1	6-25%	26-50%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	26-50%		6-25%		6-25%		6-25%		6-25%	
M1	1	26-50%	26-50%	26-50%	26-50%	26-50%	26-50%	26-50%	26-50%	26-50%	26-50%
	2	26-50%		26-50%		26-50%		26-50%		26-50%	
M2	1	6-25%	26-50%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	26-50%		26-50%		26-50%		26-50%		26-50%	
M3	1	26-50%	26-50%	26-50%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	6-25%		6-25%		6-25%		6-25%		6-25%	
M4	1	26-50%	26-50%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	26-50%		26-50%		6-25%		6-25%		6-25%	
M5	1	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	6-25%		26-50%		6-25%		6-25%		6-25%	
M6	1	2-5%	2-5%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%	6-25%
	2	6-25%		6-25%		6-25%		6-25%		6-25%	

Table 4.1-31. Average Red Mangrove Height per Plot and Transect for Each Sampling Event

Location		Red Mangrove Height (cm)															
		October 2010				May 2011				November 2011				May 2012			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	112.92	6.54	102.50	4.54	112.33	5.86	99.41	4.68	114.58	6.55	100.55	5.11	112.58	5.99	100.36	4.56
	2	90.00	3.35			83.90	3.60			83.70	3.67			85.70	3.19		
F2	2	43.50	2.47	43.50	2.47	41.83	4.76	41.83	4.76	42.33	3.76	42.33	3.76	46.50	4.31	46.50	4.31
F5	1	83.20	21.40	66.32	7.90	81.20	19.69	64.71	7.36	77.10	16.49	64.68	6.68	82.20	18.71	65.18	7.36
	2	59.29	6.63			57.83	6.19			59.50	6.52			58.08	6.55		
M1	1	71.67	2.29	78.13	2.50	71.33	2.04	78.88	2.52	72.67	2.00	79.29	2.55	71.75	2.18	78.63	2.58
	2	84.58	3.64			86.42	3.49			85.92	3.90			85.50	3.81		
M2	1	88.75	5.01	79.46	3.31	87.33	4.52	77.17	3.25	87.42	4.42	78.17	3.04	88.75	4.14	78.88	3.06
	2	70.17	2.25			67.00	2.24			68.92	1.90			69.00	2.08		
M3	1	84.83	4.89	90.96	4.52	80.83	4.04	89.29	4.34	81.75	4.01	89.08	4.38	81.46	4.11	89.77	4.44
	2	97.08	7.41			97.75	7.03			96.42	7.37			98.08	7.27		
M4	1	83.00	6.69	83.33	4.34	79.08	6.12	80.92	4.26	78.58	5.55	80.46	3.97	80.58	5.39	82.88	3.93
	2	83.67	5.82			82.75	6.15			82.33	5.88			85.17	5.88		
M5	1	58.73	3.21	86.26	6.49	57.55	3.01	85.09	6.45	59.64	3.36	86.26	6.42	58.64	3.72	85.17	6.38
	2	111.50	5.65			110.33	5.54			110.67	5.94			109.50	5.67		
M6	1	103.33	5.67	96.75	4.72	100.00	5.58	94.25	4.16	103.67	5.69	99.00	4.25	104.58	5.62	97.04	4.64
	2	90.17	7.29			88.50	5.94			94.33	6.25			89.50	6.95		

Key: Std. = Standard.

Table 4.1-32. Red Mangrove Biomass per Plot and Transect for Each Sampling Event

Red Mangrove Biomass (g/m2)																				
Location		October 2010				May 2011				November 2011				February 2012				May 2012			
Transect	Plot	Plot	SE	Transect	SE	Plot	SE	Transect	SE	Plot	SE	Transect	SE	Plot	SE	Transect	SE	Plot	SE	Transect	SE
F1	1	220.2	61.6	128.5	45.2	216.6	56.9	126.7	43.3	210.0	57.9	121.7	43.1	221.0	52.4	123.0	44.3	258.5	68.3	147.3	52.8
	2	36.7	11.9			36.8	11.5			33.5	10.2			25.0	4.4			36.1	10.4		
F2	2	9.2	5.4	3.1	2.1	10.0	6.0	3.3	2.3	2.3	1.4	0.8	0.5	10.0	5.8	3.3	2.2	9.3	5.4	3.1	2.1
F5	1	118.0	46.1	205.1	43.9	118.8	45.4	211.3	46.2	105.4	40.5	179.3	39.4	93.8	31.9	193.8	42.9	91.6	31.3	178.8	37.0
	2	292.3	42.3			303.9	46.8			253.2	44.1			293.7	30.2			266.0	18.0		
M1	1	849.7	56.1	766.9	45.1	757.6	46.8	719.2	31.9	660.5	38.5	649.1	25.3	688.7	47.4	654.5	27.0	733.6	32.3	683.4	28.7
	2	684.1	42.0			680.8	39.8			637.7	37.5			620.4	19.6			633.2	33.7		
M2	1	132.3	33.2	393.6	102.9	134.0	33.3	392.9	102.3	123.0	30.0	347.7	89.2	119.0	17.9	354.7	92.2	93.0	14.0	324.2	95.4
	2	654.8	52.7			651.9	54.6			572.5	50.2			590.4	48.5			555.5	81.2		
M3	1	392.0	33.1	322.4	44.8	399.2	31.4	318.3	45.0	360.1	30.8	290.0	41.9	362.2	35.7	282.0	36.8	381.7	42.6	289.2	43.5
	2	252.8	71.0			237.5	64.0			220.0	63.1			201.8	27.9			196.7	36.1		
M4	1	226.2	37.8	307.0	37.8	225.8	37.7	303.1	36.3	204.8	34.2	273.5	33.1	201.5	26.7	276.7	32.3	201.6	27.6	267.7	30.2
	2	387.9	29.9			380.4	27.3			342.2	28.4			351.9	19.6			333.7	24.2		
M5	1	308.1	79.1	359.6	46.4	319.9	81.4	366.3	47.7	280.4	74.1	335.7	46.0	256.5	47.2	288.6	27.1	242.2	64.7	255.3	32.2
	2	411.0	45.0			412.6	50.8			391.1	48.4			320.7	22.7			268.5	23.2		
M6	1	168.4	22.6	207.3	24.1	151.6	22.5	196.1	23.7	145.3	25.1	186.2	23.1	152.9	20.6	154.8	13.0	148.4	15.4	156.3	14.0
	2	246.3	34.6			240.5	28.3			227.1	27.1			156.7	18.9			164.2	25.2		

Key:
g/m2 = Grams per square meter.
SE = Standard error.

Table 4.1-33. Red Mangrove ANPP per Plot and Transect.

Transect Location	Plot Location	ANPP (g/m2/yr)	
F1	1	20.41	13.07
	2	5.72	
F2	2	19.56	-
F5	1	36.04	63.44
	2	90.83	
M1	1	224.07	153.10
	2	82.13	
M2	1	20.38	68.30
	2	116.23	
M3	1	71.67	60.96
	2	50.26	
M4	1	43.55	59.72
	2	75.89	
M5	1	79.55	62.12
	2	44.68	
M6	1	26.46	27.86
	2	29.26	

Key: $g/m^2/yr$ = grams per square meter per year.

Table 4.1-34. Red Mangrove Leaf Sclerophylly per Plot and Transect

Location		Leaf Sclerophylly (g/m^2)															
		October 2010				May 2011				November 2011				May 2012			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
M1	1	234.9	2.3	230.5	3.2	259.6	7.5	257.0	4.8	216.8	8.2	217.5	5.3	248.6	5.2	239.9	4.2
	2	226.0	5.8			254.4	6.4			218.2	7.0			231.1	5.8		
M2	1	259.4	5.4	254.4	4.3	275.4	6.2	267.3	4.3	246.7	5.3	245.5	4.6	253.2	6.1	251.5	3.5
	2	249.4	6.6			259.1	5.2			244.3	7.8			249.7	3.8		
M3	1	248.4	7.4	235.7	4.9	298.9	20.4	275.7	11.3	233.5	15.5	236.7	8.6	248.7	3.3	241.5	3.1
	2	223.1	3.9			252.4	4.0			239.9	8.1			234.3	4.4		
M4	1	220.6	8.4	227.3	5.7	244.3	4.8	243.1	3.9	223.6	12.3	219.1	7.5	250.7	7.0	242.8	4.6
	2	234.0	7.7			242.0	6.4			214.6	8.9			234.9	5.1		
M5	1	222.3	5.7	219.3	3.7	260.5	5.0	260.7	3.5	267.9	13.0	245.5	8.4	248.3	4.1	248.9	3.5
	2	216.2	4.8			260.9	5.0			223.0	5.7			249.6	5.8		
M6	1	-		-		265.6	5.8	276.0	5.3	232.9	6.7	239.4	5.6	234.5	5.8	240.7	5.1
	2	-				286.3	8.1			245.8	8.8			246.9	8.4		

Key: g/m2 = Gram per meter squared. Std. = Standard.

Table 4.1-35. Average Leaf Carbon for Red Mangrove per Plot and Transect

Location		Total Carbon (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	462675.0	4601.3	474613	5831.6	490081.9	3873.7	483055.8	4115.3	489500.0	3122.5	490000.0	1690.3
	2	486550.0	6521.3			476029.7	5578.2			490500.0	1848.4		
F2	1	470700.0	-	448467	22534.0	-	-	488040.5	8416.5	-	-	470500.0	2500.0
	2	437350.0	33950.0			488040.5	8416.5			470500.0	2500.0		
F5	1	459200.0	16400.0	471050	8302.4	494133.5	10695.8	496441.1	4684.0	456250.0	14453.2	460750.0	7393.9
	2	476975.0	9612.2			498171.8	4154.6			465250.0	5720.9		
M1	1	492975.0	13554.3	496888	10815.6	483675.8	4792.3	483099.2	2404.8	454750.0	4110.5	456125.0	2286.9
	2	500800.0	18760.8			482522.7	1949.2			457500.0	2500.0		
M2	1	471325.0	4551.4	431738	27188.0	467915.7	3646.6	468300.0	3440.7	459250.0	5558.4	462875.0	3661.8
	2	392150.0	48826.8			468684.4	6469.0			466500.0	4787.1		
M3	1	476925.0	11607.1	436025	33127.3	459058.6	15383.6	464579.4	9269.8	462500.0	7053.4	457375.0	4659.6
	2	395125.0	62220.2			470100.2	12001.2			452250.0	5836.3		
M4	1	586650.0	125462.8	511975	68419.6	493073.9	3680.9	483991.0	3853.9	460750.0	5647.6	456250.0	3400.4
	2	437300.0	48860.3			474908.0	874.0			451750.0	2926.2		
M5	1	434450.0	32553.9	442575	16358.7	477310.5	3913.3	479168.9	2657.9	456500.0	6344.3	461000.0	4057.6
	2	450700.0	12044.6			481027.4	3918.1			465500.0	4804.5		

Table 4.1-35. Average Leaf Carbon for Red Mangrove per Plot and Transect

Location		Total Carbon (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
M6	1	-	-	-	-	471298	1784.981	470250.8	2677.4	441500.0	5605.1	442875.0	3879.6
	2	-	-			469203	5434.521			444250.0	6128.8		

Key: mg/kg = Milligrams per kilogram. Std. = Standard.

Table 4.1-36. Average Leaf Nitrogen for Red Mangrove per Plot and Transect

Location		Total Nitrogen (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	15975.0	625.0	16450.0	824.4	12355.3	623.4	12402.8	330.5	12500.0	288.7	13875.0	548.9
	2	16925.0	1621.9			12450.3	345.8			15250.0	250.0		
F2	1	17200.0	-	15400.0	1464.0	-	-	10370.9	735.3	-	-	11500.0	1500.0
	2	14500.0	2000.0			10370.9	735.3			11500.0	1500.0		
F5	1	19300.0	300.0	16433.3	972.5	13473.3	289.9	13358.9	227.4	13250.0	2495.8	12750.0	1221.1
	2	15000.0	543.1			13273.1	365.1			12250.0	750.0		
M1	1	15450.0	533.1	15862.5	348.9	12721.3	289.0	12939.1	167.3	15500.0	288.7	14250.0	700.8
	2	16275.0	413.1			13156.9	124.6			13000.0	1080.1		
M2	1	14175.0	683.6	13725.0	933.1	11961.1	258.3	11919.3	186.6	10250.0	250.0	10500.0	327.3
	2	13275.0	1860.3			11877.6	307.5			10750.0	629.2		
M3	1	13925.0	499.0	13350.0	920.2	11955.4	581.4	12336.1	314.0	11500.0	1040.8	11875.0	515.4
	2	12775.0	1866.1			12716.8	159.4			12250.0	250.0		
M4	1	20525.0	6554.6	17737.5	3275.8	13045.1	451.8	13031.2	215.2	12250.0	946.5	12625.0	497.8
	2	14950.0	1391.3			13017.3	108.6			13000.0	408.2		
M5	1	18450.0	3427.9	16862.5	1745.3	12174.7	406.8	11814.5	391.3	12000.0	577.4	12750.0	453.2
	2	15275.0	885.4			11454.4	680.0			13500.0	500.0		
M6	1	-	-	-	-	10278.6	104.1	10392.8	197.0	11750.0	478.7	11750.0	250.0
	2	-	-			10507.0	401.9			11750.0	250.0		

Key: mg/kg = Milligrams per kilogram. Std. = Standard.

Table 4.1-37. Average Leaf Phosophorous for Red Mangrove per Plot and Transect

Location		Total Phophorous (mg/kg)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	305.3	104.9	365.2	73.9	445.0	20.2	475.0	16.1	500.0	7.1	535.0	23.2
	2	425.0	110.0			505.0	14.4			570.0	40.6		
F2	1	600.0	-	403.6	201.4	-	-	360.0	50.0	-	-	560.0	60.0
	2	305.5	304.5			360.0	50.0			560.0	60.0		
F5	1	315.7	314.3	360.2	82.9	433.3	31.8	418.6	15.2	565.0	21.8	498.8	31.1
	2	382.5	15.5			407.5	14.4			432.5	33.3		
M1	1	470.0	8.2	475.0	5.3	380.0	14.1	417.5	28.2	485.0	36.6	486.3	19.2
	2	480.0	7.1			455.0	50.7			487.5	19.3		
M2	1	430.0	22.7	438.8	22.8	412.5	16.0	407.5	12.1	502.5	56.2	483.8	28.0
	2	447.5	43.1			402.5	20.2			465.0	16.6		
M3	1	233.1	134.3	344.0	76.1	480.0	14.1	468.8	15.7	497.5	13.8	517.5	10.3
	2	455.0	27.5			457.5	29.5			537.5	6.3		
M4	1	365.3	123.1	371.4	58.1	460.0	7.1	438.8	10.4	557.5	35.0	537.5	25.8
	2	377.5	23.9			417.5	12.5			517.5	40.3		
M5	1	480.0	34.2	401.4	60.7	415.0	13.2	432.5	9.2	345.0	24.0	433.8	42.0
	2	322.9	109.2			450.0	4.1			522.5	48.9		
M6	1	-	-	-	-	430.0	17.3	416.3	11.3	525.0	9.6	493.8	26.2
	2	-	-			402.5	13.1			462.5	49.6		

Key: mg/kg = Milligrams per kilogram. Std. = Standard.

Table 4.1-38. Average Leaf Carbon Isotopes for Red Mangrove per Plot and Transect

Location		Carbon Isotopes (δ13C)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1	-25.8	0.1	-25.7	0.1	-26.6	0.1	-26.8	0.1	-27.6	0.1	-27.2	0.2
	2	-25.7	0.1			-27.1	0.2			-26.7	0.2		
F2	1	-26.1	-	-26.1	0.3	-	-	-28.4	0.6	-	-	-28.3	0.7
	2	-26.1	0.6			-28.4	0.6			-28.3	0.7		
F5	1	-25.9	0.5	-25.8	0.3	-26.7	0.1	-26.5	0.1	-27.7	0.6	-26.9	0.4
	2	-25.7	0.5			-26.4	0.1			-26.1	0.3		
M1	1	-24.4	0.3	-24.3	0.2	-26.1	0.2	-26.0	0.1	-25.0	0.2	-24.8	0.2
	2	-24.2	0.2			-26.0	0.2			-24.6	0.2		
M2	1	-22.6	1.8	-23.4	0.9	-25.7	0.2	-25.6	0.1	-23.9	0.1	-24.2	0.3
	2	-24.3	0.3			-25.6	0.1			-24.4	0.5		
M3	1	-24.4	0.2	-24.1	0.1	-25.7	0.1	-25.5	0.1	-24.1	0.2	-24.4	0.2
	2	-23.9	0.2			-25.3	0.2			-24.6	0.2		
M4	1	-23.4	1.7	-24.3	0.8	-25.7	0.2	-25.9	0.2	-24.8	0.1	-24.9	0.1
	2	-25.1	0.3			-26.0	0.4			-24.9	0.2		
M5	1	-22.8	1.9	-22.9	1.2	-24.9	0.2	-25.4	0.2	-25.3	0.6	-25.1	0.3
	2	-22.9	1.8			-25.9	0.1			-25.0	0.2		
M6	1	-	-	-	-	-25.9	0.1	-25.8	0.1	-24.7	0.3	-24.9	0.2
	2	-	-			-25.6	0.1			-25.1	0.3		

Key: Std. = Standard.

Table 4.1-39. Average Leaf Nitrogen Isotopes for Red Mangrove per Plot and Transect

Location		Nitrogen Isotopes (δ15N)											
		October 2010				May 2011				November 2011			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
F1	1.0	-2.4	0.7	-4.5	0.8	-0.5	0.4	-3.2	1.1	-0.3	0.4	-3.2	1.8
	2.0	-6.5	0.3			-6.0	0.4			-6.2	0.4		
F2	1.0	-2.2	-	-1.9	0.3	-	-	-1.7	0.4	-	-	-0.7	0.9
	2.0	-1.7	0.4			-1.7	0.4			-0.7	0.6		
F5	1.0	-2.7	1.3	-2.0	0.5	-0.8	0.6	-1.6	0.7	-1.2	0.8	-1.4	1.4
	2.0	-1.6	0.5			-2.1	1.1			-1.7	1.2		
M1	1.0	-1.3	0.5	0.4	0.7	-1.0	0.5	0.8	0.7	-0.6	0.8	0.4	1.5
	2.0	2.0	0.6			2.5	0.5			1.4	1.3		
M2	1.0	-9.3	1.9	-6.0	1.6	-10.8	0.3	-6.0	1.9	-11.2	0.5	-6.8	2.3
	2.0	-2.6	1.2			-1.2	1.3			-2.4	1.5		
M3	1.0	-4.1	1.3	-6.3	1.1	-4.3	1.2	-5.7	0.9	-9.0	0.3	-7.3	1.4
	2.0	-8.5	0.5			-7.0	1.2			-5.6	0.7		
M4	1.0	-5.1	1.4	-5.8	0.9	-5.2	0.9	-4.6	0.7	-6.0	0.9	-5.5	1.2
	2.0	-6.4	1.1			-4.0	1.1			-5.1	0.5		
M5	1.0	1.3	0.6	-3.0	1.7	2.5	0.4	-1.2	1.5	2.6	1.2	-1.1	2.1
	2.0	-7.4	1.0			-5.0	0.7			-4.8	1.1		

Table 4.1-39. Average Leaf Nitrogen Isotopes for Red Mangrove per Plot and Transect

Location		Nitrogen Isotopes (δ15N)											
		October 2010				May 2011				Location			
Transect	Plot	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error	Plot	Std. Error	Transect	Std. Error
M6	1.0	-	-	-	-	-4.1	0.3	-5.6	0.7	-6.1	1.1	-6.6	1.4
	2.0	-	-			-7.2	0.9			-7.1	1.1		

Key: N = Nitrogen. Std. = Standard.

Table 4.1-40. Red Mangrove Leaf C:N Molar Ratio per Plot and Transect

Location		C:N Ratio of Average Total Carbon and Total Nitrogen					
		October 2010		May 2011		November 2011	
Transect	Plot	Plot	Transect	Plot	Transect	Plot	Transect
F1	1	34:1	34:1	46:1	45:1	46:1	41:1
	2	34:1		45:1		38:1	
F2	1	32:1	34:1		55:1		48:1
	2	35:1		55:1		48:1	
F5	1	28:1	33:1	43:1	43:1	40:1	42:1
	2	37:1		44:1		44:1	
M1	1	37:1	37:1	44:1	44:1	34:1	37:1
	2	36:1		43:1		41:1	
M2	1	39:1	37:1	46:1	46:1	52:1	51:1
	2	34:1		46:1		51:1	
M3	1	40:1	38:1	45:1	44:1	47:1	45:1
	2	36:1		43:1		43:1	
M4	1	33:1	34:1	44:1	43:1	44:1	42:1
	2	34:1		43:1		41:1	
M5	1	27:1	31:1	46:1	47:1	44:1	42:1
	2	34:1		49:1		40:1	
M6	1	-	-	53:1	53:1	44:1	44:1
	2	-		52:1		44:1	

Table 4.1-41. Red Mangrove Leaf N:P Molar Ratio per Plot and Transect

Location		N:P Ratio of Average Total Nitrogen and Total Phosphorous					
		October 2010		May 2011		November 2011	
Transect	Plot	Plot	Transect	Plot	Transect	Plot	Transect
F1	1	116:1	100:1	61:1	58:1	55:1	57:1
	2	88:1		55:1		59:1	
F2	1	63:1	84:1		64:1	-	45:1
	2	105:1		64:1		45:1	
F5	1	135:1	101:1	69:1	71:1	52:1	57:1
	2	87:1		72:1		63:1	
M1	1	73:1	74:1	74:1	69:1	71:1	65:1
	2	75:1		64:1		59:1	
M2	1	73:1	69:1	64:1	65:1	45:1	48:1
	2	66:1		65:1		51:1	
M3	1	132:1	86:1	55:1	58:1	51:1	51:1
	2	62:1		62:1		50:1	
M4	1	124:1	106:1	63:1	66:1	49:1	52:1
	2	88:1		69:1		56:1	
M5	1	85:1	93:1	65:1	60:1	77:1	65:1
	2	105:1		56:1		57:1	
M6	1	-	-	53:1	55:1	50:1	53:1
	2	-		58:1		56:1	

Table 4.1-42. Pearson Correlation Results of Mangrove Porewater Specific Conductance, Temperature and Tritium Values

	Specific Conductance: Temperature	Specific Conductance: Tritium	Temperature: Tritium
r value	0.7331	-0.0217	0.0163
p value	0	0.8705	0.9025

Table 4.1-43. Results of Aerial Survey

Site	Average Plot % Cover May 2011		Aerial Survey		Complete Photo (Y/N)	Issues
	Cladium (C) jamaicense	*Rhizophora (R) mangle*	*C. jamaicense*	*R. mangle*		
F1-1	11.30%	4.75%	11.00%	17.80%	Y	
F1-2	11.50%	32%	10.10%	51.40%	Y	
F2-1	12.25%		9.50%		Y	Poor Photos. Hard to distinguish plot corners; had to estimate using plot layouts and ImageJ.
F2-2	8.25%	0.50%	1.40%	0.01%	Y	Poor Photos. Hard to distinguish plot corners; had to estimate using plot layouts and ImageJ. Also, photos are not in aerial view.
F2-3	7.25%		5.80%		N	No photos contain the entire plot; photos are skewed. Very difficult to assess where the plot boundaries should be as scale changes so drastically across the photo.
F3-1	4.25%		6.60%		Y	Very Hard to distinguish plot corners; had to estimate using plot layouts and ImageJ.
F3-2	6%		7.10%		Y	Very hard to distinguish plot corners; had to estimate using plot layouts and ImageJ.
F3-3	9.50%		15.80%		N	No photos contain the entire plot.
F4-1	11.25%		19.50%		Y	Hard to distinguish plot corners; had to estimate using plot layouts and ImageJ. Periphyton covered a lot of live and dead plant material.
F4-2	5.75%		10.00%		Y	Subplots are skewed. Northern boundary is approximately 21 m instead of 20 m.
F4-3	7%		7.20%		N	No photos contain the entire plot.

Table 4.1-43. Results of Aerial Survey

Site	Average Plot % Cover May 2011		Aerial Survey		Complete Photo	Issues
F5-1		*30.75%		*40.30 %	Y	Includes percent cover for *A. germinans.*
F5-2		20.75%		32.10%	N	Limited amount of the plot is actually in the photo.
F6-1	8%		6.10%		Y	
F6-2	6.50%		19.10%		Y	Periphyton covered a lot of live and dead plant material.
F6-3	9%		6.80%		Y	Periphyton covered a lot of live and dead plant material.

Note: Values include *L. racemosa.*

Table 4.2-1. Latitude and Longitude of Biscayne Bay, Card Sound and Barnes Sound Ecological Sampling Points

Point	Latitude	Longitude
BB1-a-1	25.42632	80.32344
BB1-a-2	25.42355	80.32348
BB1-a-3	25.42296	80.32346
BB1-a-4	25.41888	80.32347
BB1-a-5	25.41664	80.32343
BB1-a-6	25.41644	80.32344
BB1-a-7	25.41217	80.32345
BB1-a-8	25.41074	80.32344
BB1-b-1	25.42769	80.32095
BB1-b-2	25.42335	80.32097
BB1-b-3	25.42116	80.32096
BB1-b-4	25.42049	80.32096
BB1-b-5	25.41750	80.32094
BB1-b-6	25.41514	80.32094
BB1-b-7	25.41306	80.32094
BB1-b-8	25.41130	80.32095
BB1-c-1	25.42668	80.31597
BB1-c-2	25.42545	80.31597
BB1-c-3	25.42265	80.31597
BB1-c-4	25.41907	80.31597
BB1-c-5	25.41709	80.31597
BB1-c-6	25.41626	80.31597
BB1-c-7	25.41294	80.31597
BB1-c-8	25.41097	80.31597
BB1-d-1	25.42776	80.30600
BB1-d-2	25.42519	80.30600
BB1-d-3	25.42207	80.30600
BB1-d-4	25.41909	80.30600
BB1-d-5	25.41689	80.30600
BB1-d-6	25.41594	80.30600
BB1-d-7	25.41311	80.30600
BB1-d-8	25.41173	80.30600
BB1-e-1	25.42738	80.29607
BB1-e-2	25.42353	80.29607
BB1-e-3	25.42201	80.29607

Point	Latitude	Longitude
BB2-a-1	25.37277	80.30706
BB2-a-2	25.37171	80.30782
BB2-a-3	25.37021	80.30888
BB2-a-4	25.36822	80.31030
BB2-a-5	25.36692	80.31122
BB2-a-6	25.36490	80.31265
BB2-a-7	25.36334	80.31375
BB2-a-8	25.36009	80.31604
BB2-b-1	25.37296	80.30388
BB2-b-2	25.37088	80.30538
BB2-b-3	25.36808	80.30740
BB2-b-4	25.36702	80.30816
BB2-b-5	25.36481	80.30966
BB2-b-6	25.36344	80.31065
BB2-b-7	25.36159	80.31196
BB2-b-8	25.35886	80.31391
BB2-c-1	25.36943	80.30046
BB2-c-2	25.36876	80.30094
BB2-c-3	25.36619	80.30273
BB2-c-4	25.36413	80.30421
BB2-c-5	25.36190	80.30580
BB2-c-6	25.36146	80.30609
BB2-c-7	25.36004	80.30710
BB2-c-8	25.35743	80.30896
BB2-d-1	25.36569	80.29147
BB2-d-2	25.36426	80.29251
BB2-d-3	25.36154	80.29439
BB2-d-4	25.35935	80.29598
BB2-d-5	25.35895	80.29626
BB2-d-6	25.35572	80.29853
BB2-d-7	25.35434	80.29953
BB2-d-8	25.35232	80.30095
BB2-e-1	25.36028	80.28339
BB2-e-2	25.35832	80.28483
BB2-e-3	25.35688	80.28588

Table 4.2-1. Latitude and Longitude of Biscayne Bay, Card Sound and Barnes Sound Ecological Sampling Points

Point	Latitude	Longitude
BB1-e-4	25.42071	80.29607
BB1-e-5	25.41863	80.29607
BB1-e-6	25.41573	80.29607
BB1-e-7	25.41312	80.29607
BB1-e-8	25.41017	80.29607
BB3-a-1	25.35211	80.32451
BB3-a-2	25.35034	80.32586
BB3-a-3	25.34834	80.32731
BB3-a-4	25.34671	80.32854
BB3-a-5	25.34400	80.33055
BB3-a-6	25.34172	80.33224
BB3-a-7	25.34089	80.33284
BB3-a-8	25.33927	80.33405
BB3-b-1	25.35051	80.32288
BB3-b-2	25.34832	80.32450
BB3-b-3	25.34663	80.32575
BB3-b-4	25.34426	80.32749
BB3-b-5	25.34346	80.32808
BB3-b-6	25.34202	80.32914
BB3-b-7	25.33996	80.33068
BB3-b-8	25.33817	80.33199
BB3-c-1	25.34858	80.31828
BB3-c-2	25.34651	80.31978
BB3-c-3	25.34398	80.32159
BB3-c-4	25.34213	80.32293
BB3-c-5	25.33995	80.32450
BB3-c-6	25.33916	80.32507
BB3-c-7	25.33620	80.32719
BB3-c-8	25.33442	80.32849
BB3-d-1	25.34335	80.31044
BB3-d-2	25.34053	80.31248
BB3-d-3	25.33901	80.31358
BB3-d-4	25.33764	80.31457
BB3-d-5	25.33514	80.31637
BB3-d-6	25.33371	80.31742

Point	Latitude	Longitude
BB2-e-4	25.35472	80.28749
BB2-e-5	25.35272	80.28898
BB2-e-6	25.35165	80.28976
BB2-e-7	25.34946	80.29140
BB2-e-8	25.34767	80.29273
BB4-a-1	25.28361	80.38995
BB4-a-2	25.28203	80.39109
BB4-a-3	25.28096	80.39186
BB4-a-4	25.27843	80.39368
BB4-a-5	25.27762	80.39426
BB4-a-6	25.27576	80.39561
BB4-a-7	25.27357	80.39718
BB4-a-8	25.27135	80.39879
BB4-b-1	25.28255	80.38793
BB4-b-2	25.28035	80.38951
BB4-b-3	25.27996	80.38978
BB4-b-4	25.27821	80.39103
BB4-b-5	25.27587	80.39272
BB4-b-6	25.27476	80.39350
BB4-b-7	25.27293	80.39482
BB4-b-8	25.27068	80.39641
BB4-c-1	25.28008	80.38355
BB4-c-2	25.27795	80.38512
BB4-c-3	25.27716	80.38567
BB4-c-4	25.27580	80.38667
BB4-c-5	25.27384	80.38809
BB4-c-6	25.27152	80.38977
BB4-c-7	25.26974	80.39108
BB4-c-8	25.26788	80.39242
BB4-d-1	25.27501	80.37554
BB4-d-2	25.27356	80.37659
BB4-d-3	25.27311	80.37694
BB4-d-4	25.27060	80.37874
BB4-d-5	25.26912	80.37982
BB4-d-6	25.26687	80.38145

Table 4.2-1. Latitude and Longitude of Biscayne Bay, Card Sound and Barnes Sound Ecological Sampling Points

Point	Latitude	Longitude
BB3-d-7	25.33165	80.31889
BB3-d-8	25.33121	80.31921
BB3-e-1	25.33736	80.30289
BB3-e-2	25.33698	80.30317
BB3-e-3	25.33404	80.30533
BB3-e-4	25.33295	80.30612
BB3-e-5	25.33108	80.30749
BB3-e-6	25.32836	80.30948
BB3-e-7	25.32621	80.31106
BB3-e-8	25.32586	80.31130

Point	Latitude	Longitude
BB4-d-7	25.26584	80.38219
BB4-d-8	25.26361	80.38381
BB4-e-1	25.27146	80.36615
BB4-e-2	25.26796	80.36876
BB4-e-3	25.26660	80.36974
BB4-e-4	25.26541	80.37062
BB4-e-5	25.26345	80.37209
BB4-e-6	25.26167	80.37343
BB4-e-7	25.25893	80.37544
BB4-e-8	25.25798	80.37616

Table 4.2-2. Categories of Submerged Aquatic Vegetation Scored Using Braun-Blanquet Cover Abundance Index Method at Each Ecological Sampling Point

Totals	Algae	Seagrasses	Calcareous Algae	Fleshy Green Algae	Corals/ Sponges[1]
Total Macrophytes	Total Macroalgae	*Thalassia testudinum*	*Penicillus*	*Batophora/ Dasycladus*	Corals
Total Drift Red	Total Calcareous	*Halodule wrightii*	*Rhipocephalus*	*Anadyomene*	Gorgonians/Soft Corals
Total Macrophytes Minus Drift Red	Total Green Other (Fleshy)	*Syringodium filiforme*	*Halimeda*		Sponges
Total Seagrass	Total Red Other	*Ruppia martima*	*Udotea*		
	Total Brown	*Halophila engelmannii*	*Acetabularia*		
		Halophila johnsonii			
		Halophila decipiens			

Note:
[1] Presence/absence only.

Table 4.2-3. Mean, Standard Error (SE), Minimum, and Maximum Values for Water Depth (m) by Transect and Study Area, Spring 2012

Area	Transect	Mean ± SE	Min	Max
BB1	a	1.3 ± 0.02	1.2	1.4
	b	1.4 ± 0.08	1.1	1.8
	c	1.7 ± 0.04	1.5	1.9
	d	1.5 ± 0.06	1.3	1.7
	e	1.7 ± 0.05	1.4	1.9
	Area	**1.5 ± 0.03**	**1.1**	**1.9**
BB2	a	2.1 ± 0.09	1.8	2.6
	b	2.3 ± 0.13	1.9	3.0
	c	2.8 ± 0.13	2.3	3.3
	d	2.7 ± 0.05	2.6	3.0
	e	2.7 ± 0.07	2.4	3.0
	Area	**2.5 ± 0.06**	**1.8**	**3.3**
BB3	a	2.7 ± 0.06	2.5	3.0
	b	2.8 ± 0.06	2.6	3.1
	c	3.2 ± 0.11	3.1	4.0
	d	3.3 ± 0.06	3.1	3.6
	e	3.4 ± 0.06	3.2	3.7
	Area	**3.1 ± 0.05**	**2.5**	**4.0**
BB4	a	1.8 ± 0.04	1.7	2.0
	b	1.9 ± 0.01	1.8	1.9
	c	1.9 ± 0.10	1.2	2.1
	d	2.2 ± 0.07	2.0	2.4
	e	2.6 ± 0.04	2.4	2.7
	Area	**2.1 ± 0.06**	**1.2**	**2.7**
All Areas and Transects		**2.3 ± 0.05**	**1.1**	**4.0**

Key: m = Meter(s). Max = Maximum. Min = Minimum. SE = Standard Error.

Table 4.2-4. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water Temperature (°C) by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	22.1 ± 0.22	21.3	23.0	22.1 ± 0.22	21.4	23.1
	b	24.0 ± 0.30	22.9	25.2	24.0 ± 0.29	23.0	25.2
	c	23.8 ± 0.26	23.0	24.9	23.8 ± 0.26	23.0	24.9
	d	24.0 ± 0.13	23.6	24.7	24.0 ± 0.13	23.6	24.7
	e	23.7 ± 0.24	23.0	24.9	23.7 ± 0.24	23.1	24.9
	Area	**23.5 ± 0.15**	**21.3**	**25.2**	**23.5 ± 0.15**	**21.4**	**25.2**
BB2	a	23.5 ± 0.31	22.5	24.5	23.5 ± 0.31	22.6	24.6
	b	24.4 ± 0.25	23.7	25.3	24.4 ± 0.24	23.7	25.2
	c	24.2 ± 0.18	23.7	24.8	24.2 ± 0.18	23.7	24.8
	d	24.5 ± 0.29	23.7	25.5	24.5 ± 0.28	23.7	25.4
	e	24.9 ± 0.32	24.0	25.9	24.9 ± 0.32	24.0	25.9
	Area	**24.3 ± 0.14**	**22.5**	**25.9**	**24.3 ± 0.14**	**22.6**	**25.9**
BB3	a	24.9 ± 0.30	23.9	25.8	24.8 ± 0.27	23.9	25.5
	b	25.3 ± 0.29	24.4	26.1	25.3 ± 0.29	24.4	26.1
	c	24.9 ± 0.18	24.4	25.4	24.9 ± 0.18	24.4	25.5
	d	24.9 ± 0.17	24.4	25.4	24.9 ± 0.17	24.4	25.4
	e	24.6 ± 0.16	24.2	25.4	24.7 ± 0.19	24.2	25.5
	Area	**24.9 ± 0.10**	**23.9**	**26.1**	**24.9 ± 0.10**	**23.9**	**26.1**
BB4	a	23.9 ± 0.27	22.9	24.7	23.9 ± 0.27	23.0	24.7
	b	24.4 ± 0.25	23.5	25.1	24.4 ± 0.25	23.5	25.1
	c	23.9 ± 0.05	23.7	24.1	23.9 ± 0.05	23.7	24.2
	d	24.0 ± 0.04	23.9	24.2	24.0 ± 0.03	23.8	24.1
	e	24.3 ± 0.05	24.1	24.5	24.3 ± 0.05	24.1	24.5
	Area	**24.1 ± 0.08**	**22.9**	**25.1**	**24.1 ± 0.08**	**23.0**	**25.1**

Key: °C = Degrees Celsius. Max = Maximum. Min = Minimum. SE = Standard Error.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables among Transects, All Sampling Events

Water Temperature										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	d	c	e	b	a	26.857	4	< 0.0001	40
	Spring 2011	a	b	e	d	c	10.171	4	0.0376	40
	Fall 2011	a	e	b	c	d	1.142	4	0.8876	40
	Spring 2012	a	e	c	b	d	18.748	4	0.0009	40
	Spring 2011 & 2012	a	e	b	d	c	6.2171	4	0.1835	80
	Fall 2010 & 2011	c	d	e	b	a	3.174	4	0.5291	80
	All Events	e	c	d	b	a	0.557	4	0.9677	160
BB2	Fall 2010	a	b	c	d	e	26.278	4	< 0.0001	40
	Spring 2011	c	b	a	d	e	15.172	4	0.0044	40
	Fall 2011	e	d	a	c	b	1.272	4	0.8661	40
	Spring 2012	a	c	b	d	e	8.272	4	0.0821	40
	Spring 2011 & 2012	c	b	a	d	e	4.6660	4	0.3233	80
	Fall 2010 & 2011	a	b	d	c	e	2.488	4	0.6468	80
	All Events	a	b	c	d	e	3.750	4	0.4409	160
BB3	Fall 2010	c	e	d	b	a	27.353	4	< 0.0001	40
	Spring 2011	a	b	c	d	e	21.776	4	0.0002	40
	Fall 2011	c	e	d	b	a	2.975	4	0.5619	40
	Spring 2012	e	d	a	b	b	4.412	4	0.3531	40
	Spring 2011 & 2012	a	c	b	d	e	1.6681	4	0.7965	80
	Fall 2010 & 2011	c	e	b	d	a	5.582	4	0.2326	80
	All Events	c	d	e	a	b	2.146	4	0.7090	160
BB4	Fall 2010	a	b	d	c	e	30.929	4	< 0.0001	40
	Spring 2011	e	d	c	a	b	27.849	4	< 0.0001	40
	Fall 2011	c	e	d	b	a	12.115	4	0.0165	40
	Spring 2012	c	d	a	b	e	8.724	4	0.0684	40
	Spring 2011 & 2012	d	e	c	a	b	3.4729	4	0.4820	80
	Fall 2010 & 2011	a	c	d	b	e	1.224	4	0.8741	80
	All Events	d	c	a	e	b	0.506	4	0.9729	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.

Key: ANOVA = Analysis of variance. df = Degrees of freedom.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables Among Transects, All Sampling Events

Water Column Salinity										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	c	b	d	a	e	29.2166	4	< 0.0001	40
	Spring 2011	d	e	a	c	b	2.4581	4	0.6522	40
	Fall 2011	a	b	c	e	d	5.9841	4	0.2003	40
	Spring 2012	c	d	b	a	e	1.2567	4	0.8687	40
	Spring 2011 & 2012	d	c	a	e	b	1.4264	4	0.8396	80
	Fall 2010 & 2011	b	c	d	a	e	4.5675	4	0.3346	80
	All Events	c	b	d	a	e	1.1009	4	0.8941	160
BB2	Fall 2010	a	b	c	d	e	33.7575	4	< 0.0001	40
	Spring 2011	a	b	e	d	c	15.5194	4	0.0037	40
	Fall 2011	e	a	b	d	c	20.3592	4	0.0004	40
	Spring 2012	d	a	b	e	c	0.0875	4	0.9991	40
	Spring 2011 & 2012	a	b	e	d	c	1.9582	4	0.7434	80
	Fall 2010 & 2011	a	b	e	c	d	5.3237	4	0.2557	80
	All Events	a	b	e	c	d	1.7647	4	0.7789	160
BB3	Fall 2010	c	d	a	e	b	14.6836	4	0.0054	40
	Spring 2011	d	e	c	b	a	22.9973	4	0.0001	40
	Fall 2011	e	a	b	c	d	10.2257	4	0.0368	40
	Spring 2012	d	e	a	c	b	8.5448	4	0.0735	40
	Spring 2011 & 2012	d	e	c	b	a	6.1522	4	0.1881	80
	Fall 2010 & 2011	c	e	a	d	b	1.8182	4	0.7691	80
	All Events	e	d	c	a	b	2.3594	4	0.6700	160
BB4	Fall 2010	a	e	c	b	d	11.8242	4	0.0187	40
	Spring 2011	a	b	c	e	d	27.9640	4	< 0.0001	40
	Fall 2011	a	b	c	d	e	16.9213	4	0.0020	40
	Spring 2012	a	b	c	d	e	31.2604	4	< 0.0001	40
	Spring 2011 & 2012	a	b	c	e	d	14.8944	4	0.0049	80
	Fall 2010 & 2011	a	b	c	e	d	5.2000	4	0.2674	80
	All Events	a	b	c	e	d	7.2500	4	0.1233	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.

Key: ANOVA = Analysis of variance. df = Degrees of freedom.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables Among Transects, All Sampling Events

Water Column Dissolved Oxygen										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	b	c	a	d	e	24.6412	4	0.0001	40
	Spring 2011	a	b	c	d	e	23.7292	4	0.0001	40
	Fall 2011	a	b	e	d	c	3.5709	4	0.4672	40
	Spring 2012	a	c	e	b	d	8.2317	4	0.0835	40
	Spring 2011 & 2012	a	b	c	e	d	7.4514	4	0.1139	80
	Fall 2010 & 2011	b	a	c	e	d	4.1607	4	0.3847	80
	All Events	b	a	c	e	d	8.1137	4	0.0875	160
BB2	Fall 2010	e	d	b	a	c	19.4736	4	0.0006	40
	Spring 2011	b	a	c	d	e	6.3847	4	0.1722	40
	Fall 2011	e	d	b	a	c	12.2863	4	0.0153	40
	Spring 2012	c	e	a	b	d	2.3173	4	0.6776	40
	Spring 2011 & 2012	c	b	a	d	e	3.5335	4	0.4728	80
	Fall 2010 & 2011	e	d	b	a	c	13.8880	4	0.0077	80
	All Events	e	d	c	b	a	6.2264	4	0.1829	160
BB3	Fall 2010	a	e	b	d	c	18.1010	4	0.0012	40
	Spring 2011	e	c	a	b	d	0.6776	4	0.9541	40
	Fall 2011	c	e	a	b	d	4.2693	4	0.3708	40
	Spring 2012	c	b	d	e	a	4.6315	4	0.3272	40
	Spring 2011 & 2012	c	e	b	d	a	2.2006	4	0.6989	80
	Fall 2010 & 2011	a	e	c	b	d	6.5668	4	0.1606	80
	All Events	e	a	c	b	d	2.2480	4	0.6903	160
BB4	Fall 2010	c	a	e	b	d	7.9620	4	0.0930	40
	Spring 2011	a	c	d	b	e	12.7271	4	0.0127	40
	Fall 2011	a	e	b	c	d	5.4619	4	0.2431	40
	Spring 2012	a	c	b	d	e	9.0263	4	0.0604	40
	Spring 2011 & 2012	a	c	d	b	e	6.6156	4	0.1577	80
	Fall 2010 & 2011	a	c	e	b	d	9.3842	4	0.0522	80
	All Events	a	c	b	e	d	8.8219	4	0.0657	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.

Key: ANOVA = Analysis of variance. df = Degrees of freedom.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables Among Transects, All Sampling Events

Water Column pH										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	b	c	d	e	a	35.4648	4	< 0.0001	40
	Spring 2011	e	d	b	c	a	13.9455	4	0.0075	40
	Fall 2011	a	b	e	c	d	16.1982	4	0.0028	40
	Spring 2012	c	d	e	a	b	8.4941	4	0.0751	40
	Spring 2011 & 2012	e	d	c	b	a	5.2559	4	0.2620	80
	Fall 2010 & 2011	b	c	d	e	a	21.8735	4	0.0002	80
	All Events	b	c	e	d	a	2.8840	4	0.5774	160
BB2	Fall 2010	a	e	d	c	b	22.0170	4	0.0002	40
	Spring 2011	e	d	c	a	b	23.5222	4	0.0001	40
	Fall 2011	e	d	a	b	c	6.1756	4	0.1864	40
	Spring 2012	c	e	a	d	b	6.0190	4	0.1977	40
	Spring 2011 & 2012	e	d	c	a	b	13.1432	4	0.0106	80
	Fall 2010 & 2011	a	e	d	c	b	7.7194	4	0.1024	80
	All Events	e	a	d	c	b	3.5330	4	0.4729	160
BB3	Fall 2010	e	d	a	c	b	18.6860	4	0.0009	40
	Spring 2011	d	e	c	b	a	16.0496	4	0.0030	40
	Fall 2011	a	e	b	c	d	16.6194	4	0.0023	40
	Spring 2012	e	c	d	b	a	13.6037	4	0.0087	40
	Spring 2011 & 2012	e	d	c	b	a	21.6341	4	0.0002	80
	Fall 2010 & 2011	e	a	d	c	b	8.6875	4	0.0694	80
	All Events	e	d	c	a	b	5.1214	4	0.2751	160
BB4	Fall 2010	d	e	a	b	c	29.1770	4	< 0.0001	40
	Spring 2011	b	a	e	c	d	7.5021	4	0.1116	40
	Fall 2011	d	c	a	b	e	7.0140	4	0.1352	40
	Spring 2012	a	c	b	e	d	4.1015	4	0.3925	40
	Spring 2011 & 2012	a	b	e	c	d	9.8959	4	0.0422	80
	Fall 2010 & 2011	d	a	e	c	b	10.7352	4	0.0297	80
	All Events	a	d	e	b	c	3.4759	4	0.4816	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.

Key: ANOVA = Analysis of variance. df = Degrees of freedom.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables Among Transects, All Sampling Events

Water Column ORP										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	e	d	c	b	a	17.8872	4	0.0013	40
	Spring 2011	a	b	c	d	e	23.7784	4	< 0.0001	40
	Fall 2011	e	a	c	b	d	0.7756	4	0.9417	40
	Spring 2012	e	c	d	b	a	1.1901	4	0.8797	40
	Spring 2011 & 2012	b	a	c	d	e	18.4185	4	0.0010	80
	Fall 2010 & 2011	e	d	c	a	b	10.2541	4	0.0364	80
	All Events	b	a	e	d	c	1.5216	4	0.8228	160
BB2	Fall 2010	e	b	c	d	a	16.0539	4	0.0029	40
	Spring 2011	e	d	b	c	a	11.0607	4	0.0259	40
	Fall 2011	d	e	c	a	b	12.8223	4	0.0122	40
	Spring 2012	c	d	a	e	b	2.0737	4	0.7222	40
	Spring 2011 & 2012	d	e	c	b	a	4.3769	4	0.3574	80
	Fall 2010 & 2011	e	d	c	b	a	14.5660	4	0.0057	80
	All Events	e	d	c	b	a	16.3031	4	0.0026	160
BB3	Fall 2010	b	e	d	c	a	7.8575	4	0.0969	40
	Spring 2011	a	b	d	c	e	11.3901	4	0.0225	40
	Fall 2011	b	e	d	c	a	1.8915	4	0.7557	40
	Spring 2012	b	d	c	a	e	5.7202	4	0.2210	40
	Spring 2011 & 2012	b	a	d	c	e	9.5126	4	0.0495	80
	Fall 2010 & 2011	b	d	e	c	a	7.3309	4	0.1194	80
	All Events	b	d	c	a	e	9.4151	4	0.0515	160
BB4	Fall 2010	a	b	c	d	e	7.0547	4	0.1330	40
	Spring 2011	a	b	c	d	e	11.8139	4	0.0188	40
	Fall 2011	e	a	d	c	b	3.6063	4	0.4619	40
	Spring 2012	b	a	e	d	c	2.3856	4	0.6652	40
	Spring 2011 & 2012	a	b	c	d	e	7.8944	4	0.0955	80
	Fall 2010 & 2011	a	b	d	e	c	3.1182	4	0.5382	80
	All Events	a	b	d	c	e	8.2727	4	0.0821	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.
Key: ANOVA = Analysis of variance. df = Degrees of freedom.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables Among Transects, All Sampling Events

Water Column Turbidity										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	e	b	c	a	d	6.3428	4	0.1750	40
	Spring 2011	a	b	c	d	e	0.0000	4	1.0000	40
	Fall 2011	e	d	a	c	b	7.3257	4	0.1196	40
	Spring 2012	b	c	d	a	e	6.4775	4	0.1662	40
	Spring 2011 & 2012	b	c	d	a	e	6.2317	4	0.1825	80
	Fall 2010 & 2011	e	b	c	d	a	6.5533	4	0.1615	80
	All Events	e	b	c	d	a	3.8668	4	0.4243	160
BB2	Fall 2010	b	c	d	e	a	4.0000	4	0.4060	40
	Spring 2011	a	b	c	d	e	0.0000	4	1.0000	40
	Fall 2011	a	b	c	d	e	8.2051	4	0.0843	40
	Spring 2012	a	b	c	d	e	0.0000	4	1.0000	40
	Spring 2011 & 2012	a	b	c	d	e	0.0000	4	1.0000	80
	Fall 2010 & 2011	b	c	d	a	e	5.4695	4	0.2424	80
	All Events	b	c	d	a	e	5.4007	4	0.2486	160
BB3	Fall 2010	b	c	e	d	a	16.9078	4	0.0020	40
	Spring 2011	a	b	c	d	e	0.0000	4	1.0000	40
	Fall 2011	a	b	c	d	e	12.6259	4	0.0133	40
	Spring 2012	a	b	c	d	e	0.0000	4	1.0000	40
	Spring 2011 & 2012	a	b	c	d	e	0.0000	4	1.0000	80
	Fall 2010 & 2011	b	c	d	e	a	10.9610	4	0.0270	80
	All Events	b	c	d	e	a	10.6811	4	0.0304	160
BB4	Fall 2010	c	d	b	e	a	14.8835	4	0.0049	40
	Spring 2011	c	e	d	b	a	19.0525	4	0.0008	40
	Fall 2011	c	b	e	d	a	9.7913	4	0.0441	40
	Spring 2012	d	c	e	a	b	14.2123	4	0.0066	40
	Spring 2011 & 2012	c	d	e	b	a	32.7675	4	< 0.0001	80
	Fall 2010 & 2011	c	b	d	e	a	14.7160	4	0.0053	80
	All Events	c	d	e	b	a	30.1749	4	< 0.0001	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.

Key: ANOVA = Analysis of variance. df = Degrees of freedom.

Table 4.2-5. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables among Transects, All Sampling Events

Porewater Temperature										
Area	Sampling Period	Mean Transect Value					H	df	p	n
		Lowest				Highest				
BB1	Fall 2010	e	d	c	b	a	29.4152	4	< 0.0001	40
	Spring 2011	b	a	c	e	d	20.0507	4	0.0005	40
	Fall 2011	a	c	d	b	e	0.8500	4	0.9316	40
	Spring 2012	d	c	b	a	e	9.6028	4	0.0477	40
	Spring 2011 & 2012	b	c	d	a	e	3.5741	4	0.4667	80
	Fall 2010 & 2011	e	c	d	b	a	3.3856	4	0.4955	80
	All Events	c	d	e	b	a	3.0634	4	0.5473	160
BB2	Fall 2010	b	a	c	d	e	29.3738	4	< 0.0001	40
	Spring 2011	c	b	d	e	a	25.4348	4	< 0.0001	40
	Fall 2011	c	d	e	b	a	3.8516	4	0.4265	40
	Spring 2012	a	b	d	e	c	3.4004	4	0.4932	40
	Spring 2011 & 2012	c	b	d	a	e	2.2315	4	0.6933	80
	Fall 2010 & 2011	b	a	c	d	e	2.2481	4	0.6902	80
	All Events	b	c	a	d	e	1.5623	4	0.8155	160
BB3	Fall 2010	d	e	c	a	b	28.8051	4	< 0.0001	40
	Spring 2011	c	b	a	d	e	13.8227	4	0.0079	40
	Fall 2011	d	b	a	c	e	1.9252	4	0.7495	40
	Spring 2012	a	b	c	e	d	1.3068	4	0.8602	40
	Spring 2011 & 2012	b	c	a	d	e	2.1819	4	0.7023	80
	Fall 2010 & 2011	d	e	c	a	b	3.9808	4	0.4086	80
	All Events	c	d	b	e	a	0.4782	4	0.9756	160
BB4	Fall 2010	b	c	d	a	e	14.2843	4	0.0064	40
	Spring 2011	e	d	c	b	a	30.5970	4	< 0.0001	40
	Fall 2011	e	d	c	b	a	17.3181	4	0.0017	40
	Spring 2012	d	e	c	b	a	10.8721	4	0.0280	40
	Spring 2011 & 2012	e	d	c	b	a	9.6026	4	0.0477	80
	Fall 2010 & 2011	c	d	b	e	a	1.5488	4	0.8180	80
	All Events	d	e	c	b	a	1.7411	4	0.7832	160

Note: All Water Column Comparisons are for Bottom Values. Red p values indicate a significant difference.

Key: ANOVA = Analysis of variance. dif = Degrees of freedom.

Table 4.2-6. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables among Study Areas, All Sampling Events

Water Temperature								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB1	BB2	BB3	BB4	16.9093	3	0.0007	160
Spring 2011	BB2	BB3	BB1	BB4	13.5644	3	0.0036	160
Fall 2011	BB1	BB2	BB3	BB4	0.6771	3	0.8786	160
Spring 2012	BB1	BB4	BB2	BB3	48.3449	3	< 0.0001	160
Spring 2011 & 2012	BB1	BB2	BB4	BB3	4.4179	3	0.2197	320
Fall 2010 & 2011	BB1	BB2	BB3	BB4	3.0375	3	0.3859	320
All Events	BB1	BB2	BB4	BB3	4.8000	3	0.1870	640
Water Column Specific Conductance								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB1	BB4	BB3	BB2	115.3534	3	< 0.0001	160
Spring 2011	BB1	BB4	BB3	BB2	25.0651	3	< 0.0001	160
Fall 2011	BB1	BB4	BB2	BB3	42.7599	3	< 0.0001	160
Spring 2012	BB4	BB1	BB2	BB3	65.6689	3	< 0.0001	160
Spring 2011 & 2012	BB4	BB1	BB3	BB2	21.2899	3	0.0001	320
Fall 2010 & 2011	BB1	BB4	BB3	BB2	33.9318	3	< 0.0001	320
All Events	BB4	BB1	BB2	BB3	24.2186	3	< 0.0001	640
Water Column Salinity								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB1	BB4	BB3	BB2	116.3813	3	< 0.0001	160
Spring 2011	BB1	BB4	BB3	BB2	25.2412	3	< 0.0001	160
Fall 2011	BB1	BB4	BB2	BB3	35.5272	3	< 0.0001	160
Spring 2012	BB4	BB1	BB2	BB3	73.8537	3	< 0.0001	160
Spring 2011 & 2012	BB4	BB1	BB3	BB2	21.2047	3	0.0001	320
Fall 2010 & 2011	BB1	BB4	BB3	BB2	31.8172	3	< 0.0001	320
All Events	BB4	BB1	BB2	BB3	23.3446	3	< 0.0001	640
Water Column Dissolved Oxygen								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB4	BB3	BB2	BB1	74.8676	3	<0.0001	160
Spring 2011	BB4	BB1	BB3	BB2	54.5866	3	< 0.0001	160
Fall 2011	BB1	BB3	BB2	BB4	6.3796	3	0.0945	160
Spring 2012	BB3	BB2	BB4	BB1	14.2195	3	0.0026	160
Spring 2011 & 2012	BB4	BB1	BB3	BB2	15.0455	3	0.0018	320
Fall 2010 & 2011	BB4	BB3	BB2	BB1	13.0182	3	0.0046	320
All Events	BB4	BB3	BB1	BB2	25.3325	3	< 0.0001	640

Table 4.2-6. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables among Study Areas, All Sampling Events

Water Column pH								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB1	BB4	BB3	BB2	25.5140	3	< 0.0001	160
Spring 2011	BB4	BB3	BB2	BB1	97.0675	3	< 0.0001	160
Fall 2011	BB3	BB2	BB4	BB1	44.3462	3	< 0.0001	160
Spring 2012	BB4	BB3	BB1	BB2	47.9929	3	< 0.0001	160
Spring 2011 & 2012	BB4	BB3	BB2	BB1	120.3164	3	< 0.0001	320
Fall 2010 & 2011	BB4	BB3	BB1	BB2	4.5730	3	0.2059	320
All Events	BB4	BB3	BB1	BB2	26.8695	3	< 0.0001	640
Water Column ORP								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB3	BB4	BB2	BB1	32.2445	3	< 0.0001	160
Spring 2011	BB3	BB2	BB1	BB4	16.7928	3	0.0008	160
Fall 2011	BB3	BB4	BB2	BB1	13.2676	3	0.0041	160
Spring 2012	BB3	BB2	BB1	BB4	7.7997	3	0.0503	160
Spring 2011 & 2012	BB3	BB2	BB4	BB1	23.7381	3	< 0.0001	320
Fall 2010 & 2011	BB3	BB4	BB2	BB1	43.6586	3	< 0.0001	320
All Events	BB3	BB2	BB4	BB1	53.5236	3	< 0.0001	640
Water Column Turbidity								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB2	BB3	BB1	BB4	93.5063	3	< 0.0001	160
Spring 2011	BB1	BB2	BB3	BB4	52.8063	3	< 0.0001	160
Fall 2011	BB2	BB3	BB1	BB4	23.0538	3	< 0.0001	160
Spring 2012	BB2	BB3	BB1	BB4	29.5219	3	< 0.0001	160
Spring 2011 & 2012	BB2	BB3	BB1	BB4	77.8461	3	< 0.0001	320
Fall 2010 & 2011	BB2	BB3	BB1	BB4	103.9840	3	< 0.0001	320
All Events	BB2	BB3	BB1	BB4	151.4488	3	< 0.0001	640
Porewater Temperature								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB2	BB1	BB4	BB3	26.7979	3	< 0.0001	160
Spring 2011	BB2	BB3	BB1	BB4	86.9553	3	< 0.0001	160
Fall 2011	BB4	BB3	BB1	BB2	1.0373	3	0.7922	160
Spring 2012	BB1	BB2	BB4	BB3	31.0936	3	< 0.0001	160
Spring 2011 & 2012	BB2	BB1	BB3	BB4	14.4915	3	0.0023	320
Fall 2010 & 2011	BB2	BB1	BB4	BB3	2.2447	3	0.5232	320
All Events	BB2	BB1	BB3	BB4	3.4786	3	0.3236	640

Table 4.2-6. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Water Quality Variables among Study Areas, All Sampling Events

Porewater Specific Conductance								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB4	BB1	BB3	BB2	32.2964	3	< 0.0001	160
Spring 2011	BB4	BB3	BB1	BB2	51.0467	3	< 0.0001	160
Fall 2011	BB1	BB4	BB2	BB3	31.3947	3	< 0.0001	160
Spring 2012	BB4	BB3	BB1	BB2	68.8429	3	< 0.0001	160
Spring 2011 & 2012	BB4	BB3	BB1	BB2	112.0371	3	< 0.0001	320
Fall 2010 & 2011	BB1	BB4	BB2	BB3	15.3995	3	0.0015	320
All Events	BB4	BB1	BB3	BB2	55.3879	3	< 0.0001	640
Porewater Tritium								
Sampling Event	Study Areas				H	df	p	n
	Lowest			Highest				
Fall 2010	BB1	BB2	BB3	BB4	4.1748	3	0.2432	20
Spring 2011	BB2	BB3	BB1	BB4	8.1866	3	0.0423	20
Fall 2011	BB4	BB2	BB3	BB1	10.3486	3	0.0158	20
Spring 2012[1]	N/A				N/A	N/A	N/A	N/A
Spring 2011 & 2012	N/A				N/A	N/A	N/A	N/A
Fall 2010 & 2011	BB4	BB2	BB1	BB3	2.8205	3	0.4201	40
All Events[2]	BB2	BB4	BB3	BB1	3.1026	3	0.3761	60

Notes:
[1] Analysis of samples collected in Spring 2012 had not been completed at the time of report preparation.
[2] Excludes Spring 2012.

Key:
ANOVA = Analysis of variance.
df = Degree of freedom.

Table 4.2-7. Mean and Standard Error (SE) Values for Bottom Water Temperature by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	28.4 ± 0.16	26.6 ± 0.33	30.4 ± 0.35	22.1 ± 0.22
	b	25.8 ± 0.33	27.3 ± 0.31	30.4 ± 0.50	24.0 ± 0.29
	c	23.9 ± 0.10	28.0 ± 0.22	30.5 ± 0.66	23.8 ± 0.26
	d	23.9 ± 0.16	27.6 ± 0.22	30.7 ± 0.47	24.0 ± 0.13
	e	24.3 ± 0.13	27.5 ± 0.26	30.0 ± 0.43	23.7 ± 0.24
	Area	**25.3 ± 0.29**	**27.4 ± 0.14**	**30.4 ± 0.21**	**23.5 ± 0.15**
BB2	a	25.2 ± 0.19	27.2 ± 0.40	30.6 ± 0.32	23.5 ± 0.31
	b	25.5 ± 0.16	26.5 ± 0.19	30.9 ± 0.38	24.4 ± 0.24
	c	26.0 ± 0.07	26.5 ± 0.07	30.8 ± 0.43	24.2 ± 0.18
	d	26.1 ± 0.06	27.3 ± 0.09	30.5 ± 0.17	24.5 ± 0.28
	e	26.5 ± 0.03	27.5 ± 0.22	30.4 ± 0.26	24.9 ± 0.32
	Area	**25.9 ± 0.09**	**27.0 ± 0.11**	**30.6 ± 0.14**	**24.3 ± 0.14**
BB3	a	26.6 ± 0.02	26.6 ± 0.14	30.8 ± 0.30	24.8 ± 0.27
	b	26.5 ± 0.09	26.6 ± 0.08	30.8 ± 0.32	25.3 ± 0.29
	c	25.7 ± 0.14	26.6 ± 0.09	30.4 ± 0.30	24.9 ± 0.18
	d	25.6 ± 0.04	27.6 ± 0.30	30.7 ± 0.23	24.9 ± 0.17
	e	25.5 ± 0.01	28.5 ± 0.11	30.3 ± 0.11	24.7 ± 0.19
	Area	**26.0 ± 0.08**	**27.2 ± 0.14**	**30.6 ± 0.12**	**24.9 ± 0.10**
BB4	a	25.5 ± 0.06	28.6 ± 0.11	31.0 ± 0.15	23.9 ± 0.27
	b	26.0 ± 0.09	28.8 ± 0.26	31.0 ± 0.25	24.4 ± 0.25
	c	26.3 ± 0.08	28.0 ± 0.25	30.3 ± 0.18	23.9 ± 0.05
	d	26.2 ± 0.04	27.1 ± 0.21	30.7 ± 0.09	24.0 ± 0.03
	e	26.7 ± 0.06	26.5 ± 0.09	30.4 ± 0.15	24.3 ± 0.05
	Area	**26.1 ± 0.07**	**27.8 ± 0.16**	**30.7 ± 0.09**	**24.1 ± 0.08**

Key: SE = Standard Error.

Table 4.2-8. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water Specific Conductance (µS/cm) by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	56300 ± 200	55600	57500	56300 ± 200	55600	57500
	b	54700 ± 950	51300	57400	54700 ± 930	51300	57300
	c	54400 ± 860	51400	56800	54400 ± 860	51400	56700
	d	54700 ± 730	52400	56900	54600 ± 750	52300	52500
	e	55000 ± 820	52600	57400	55000 ± 810	52600	57400
	Area	**55000 ± 340**	**51300**	**57500**	**55000 ± 340**	**51300**	**57500**
BB2	a	54900 ± 680	53000	56900	55000 ± 740	52900	57100
	b	55400 ± 500	53800	56900	55400 ± 510	53800	56900
	c	55500 ± 370	54500	56600	55600 ± 390	54500	56600
	d	55500 ± 340	54600	56600	55500 ± 330	54600	56500
	e	55500 ± 350	54500	56700	55500 ± 340	54500	56500
	Area	**55400 ± 200**	**53000**	**56900**	**55400 ± 210**	**52900**	**57100**
BB3	a	56000 ± 370	54800	57100	56100 ± 400	54800	57100
	b	56300 ± 280	55500	57200	56300 ± 290	55500	57200
	c	55600 ± 70	55300	56000	55600 ± 60	55500	56000
	d	55300 ± 90	55000	55700	55300 ± 100	55000	55600
	e	55300 ± 150	54700	55700	55400 ± 110	54800	55700
	Area	**55700 ± 110**	**54700**	**57200**	**55700 ± 110**	**54800**	**57200**
BB4	a	51300 ± 90	50900	51800	51400 ± 100	50900	51900
	b	51500 ± 150	50700	51900	52200 ± 770	50700	57500
	c	52200 ± 120	51800	52700	52200 ± 110	51900	52700
	d	52700 ± 120	52300	53300	52700 ± 130	52300	53400
	e	52800 ± 140	52400	53400	52800 ± 140	52300	53400
	Area	**52100 ± 110**	**50700**	**53400**	**52300 ± 170**	**50700**	**57500**

Key: µS/cm = Micro Siemens per centimeter. SE = Standard Error.

Table 4.2-9. Mean and Standard Error (SE) Values for Bottom Specific Conductance (µS/cm) by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	37900 ± 240	57100 ± 470	52500 ± 690	56300 ± 200
	b	33900 ± 250	58300 ± 730	52700 ± 860	54700 ± 930
	c	33600 ± 590	56800 ± 150	53000 ± 940	54400 ± 860
	d	34600 ± 380	56700 ± 170	54100 ± 670	54600 ± 750
	e	38400 ± 520	56700 ± 120	54500 ± 330	55000 ± 810
	Area	**35700 ± 370**	**57100 ± 200**	**53400 ± 330**	**55000 ± 340**
BB2	a	39700 ± 1080	57100 ± 50	55100 ± 180	55000 ± 740
	b	41200 ± 280	58300 ± 790	55200 ± 170	55400 ± 510
	c	42500 ± 150	59600 ± 480	55600 ± 60	55600 ± 390
	d	45300 ± 690	60200 ± 970	55400 ± 100	55500 ± 330
	e	48300 ± 230	58500 ± 720	54700 ± 100	55500 ± 340
	Area	**43400 ± 550**	**58700 ± 340**	**55200 ± 80**	**55400 ± 210**
BB3	a	40000 ± 380	58300 ± 40	55400 ± 60	56100 ± 400
	b	41200 ± 270	57800 ± 110	55600 ± 80	56300 ± 290
	c	39500 ± 610	57500 ± 110	55800 ± 140	55600 ± 60
	d	40100 ± 60	57300 ± 130	56000 ± 110	55300 ± 100
	e	40600 ± 160	57300 ± 90	55300 ± 150	55400 ± 110
	Area	**40300 ± 180**	**57700 ± 70**	**55600 ± 60**	**55700 ± 110**
BB4	a	38600 ± 50	56200 ± 130	53200 ± 130	51400 ± 100
	b	38800 ± 120	56600 ± 140	53500 ± 110	52200 ± 770
	c	38800 ± 70	57800 ± 280	54400 ± 360	52200 ± 110
	d	39200 ± 70	58600 ± 190	55000 ± 580	52700 ± 130
	e	38400 ± 330	58500 ± 410	55500 ± 410	52800 ± 140
	Area	**38800 ± 80**	**57600 ± 190**	**54300 ± 210**	**52300 ± 170**

Key: µS/cm = Micro Siemens per centimeter. SE = Standard Error.

Table 4.2-10. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water Salinity (PSU) by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	37.2 ± 0.15	36.7	38.2	37.2 ± 0.15	36.7	38.2
	b	36.2 ± 0.71	33.7	38.2	36.2 ± 0.68	33.7	38.1
	c	35.9 ± 0.63	33.7	37.6	35.9 ± 0.63	33.7	37.6
	d	36.1 ± 0.55	34.3	37.8	36.1 ± 0.56	34.3	37.8
	e	36.3 ± 0.62	34.5	38.2	36.3 ± 0.61	34.5	38.2
	Area	**36.3 ± 0.25**	**33.7**	**38.2**	**36.4 ± 0.25**	**33.7**	**38.2**
BB2	a	36.3 ± 0.53	34.8	37.8	36.4 ± 0.56	34.8	38.0
	b	36.7 ± 0.39	35.5	37.9	36.7 ± 0.40	35.5	37.9
	c	36.8 ± 0.29	36.0	37.6	36.8 ± 0.30	36.0	37.6
	d	36.8 ± 0.27	36.1	37.6	36.8 ± 0.27	36.1	37.6
	e	36.8 ± 0.28	36.0	37.7	36.8 ± 0.28	36.0	37.6
	Area	**36.7 ± 0.16**	**34.8**	**37.9**	**36.7 ± 0.16**	**34.8**	**38.0**
BB3	a	37.1 ± 0.30	36.2	38.0	37.2 ± 0.32	36.2	38.1
	b	37.4 ± 0.22	36.8	38.1	37.4 ± 0.23	36.8	38.1
	c	36.8 ± 0.06	36.6	37.2	36.9 ± 0.04	36.8	37.2
	d	36.6 ± 0.06	36.4	36.9	36.7 ± 0.06	36.4	36.8
	e	36.7 ± 0.09	36.3	36.9	36.7 ± 0.08	36.3	36.9
	Area	**36.9 ± 0.09**	**36.2**	**38.1**	**37.0 ± 0.09**	**36.2**	**38.1**
BB4	a	33.7 ± 0.07	33.4	34.0	33.7 ± 0.07	33.4	34.0
	b	33.8 ± 0.10	33.2	34.1	33.8 ± 0.11	33.2	34.1
	c	34.3 ± 0.08	34.1	34.7	34.3 ± 0.08	34.1	34.7
	d	34.7 ± 0.09	34.4	35.1	34.7 ± 0.10	34.3	35.2
	e	34.8 ± 0.11	34.5	35.2	34.8 ± 0.12	34.4	35.3
	Area	**34.2 ± 0.08**	**33.2**	**35.2**	**34.2 ± 0.08**	**33.2**	**35.3**

Key: SE = Standard Error. PSU = Practical Salinity Units.

Table 4.2-11. Mean and Standard Error (SE) Values for Bottom Salinity by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	24.1 ± 0.17	38.1 ± 0.35	34.8 ± 0.56	37.2 ± 0.15
	b	21.3 ± 0.18	39.1 ± 0.53	34.9 ± 0.70	36.2 ± 0.68
	c	21.0 ± 0.40	38.0 ± 0.10	35.2 ± 0.76	35.9 ± 0.63
	d	21.7 ± 0.24	37.8 ± 0.12	35.9 ± 0.57	36.1 ± 0.56
	e	24.3 ± 0.39	37.8 ± 0.08	36.2 ± 0.31	36.3 ± 0.61
	Area	**22.5 ± 0.26**	**38.2 ± 0.14**	**35.4 ± 0.27**	**36.4 ± 0.25**
BB2	a	25.3 ± 0.73	38.1 ± 0.03	36.7 ± 0.09	36.4 ± 0.56
	b	26.3 ± 0.21	39.0 ± 0.59	36.8 ± 0.08	36.7 ± 0.40
	c	27.4 ± 0.11	40.0 ± 0.36	37.1 ± 0.04	36.8 ± 0.30
	d	29.4 ± 0.49	40.5 ± 0.74	36.9 ± 0.11	36.8 ± 0.27
	e	30.9 ± 0.30	39.2 ± 0.56	36.4 ± 0.11	36.8 ± 0.28
	Area	**27.9 ± 0.38**	**39.4 ± 0.26**	**36.8 ± 0.06**	**36.7 ± 0.16**
BB3	a	26.2 ± 0.49	39.0 ± 0.02	37.0 ± 0.09	37.2 ± 0.32
	b	26.3 ± 0.21	38.7 ± 0.07	37.1 ± 0.11	37.4 ± 0.23
	c	25.2 ± 0.47	38.4 ± 0.09	37.2 ± 0.17	36.9 ± 0.04
	d	25.6 ± 0.04	38.3 ± 0.11	37.4 ± 0.05	36.7 ± 0.06
	e	25.8 ± 0.15	38.4 ± 0.08	36.9 ± 0.10	36.7 ± 0.08
	Area	**25.8 ± 0.15**	**38.6 ± 0.05**	**37.1 ± 0.06**	**37.0 ± 0.09**
BB4	a	24.5 ± 0.03	37.6 ± 0.09	35.1 ± 0.25	33.7 ± 0.07
	b	24.7 ± 0.09	37.8 ± 0.10	35.5 ± 0.12	33.8 ± 0.11
	c	24.7 ± 0.05	38.7 ± 0.22	36.2 ± 0.29	34.3 ± 0.08
	d	25.0 ± 0.06	39.3 ± 0.15	36.6 ± 0.49	34.7 ± 0.10
	e	24.4 ± 0.23	39.2 ± 0.32	37.1 ± 0.33	34.8 ± 0.12
	Area	**24.7 ± 0.06**	**38.5 ± 0.14**	**36.1 ± 0.81**	**34.2 ± 0.08**

Key: SE = Standard Error.

Table 4.2-12. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water DO (mg/L) by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	6.5 ± 0.07	6.2	6.7	6.3 ± 0.07	6.1	6.6
	b	6.9 ± 0.06	6.6	7.1	6.8 ± 0.08	6.5	7.2
	c	6.8 ± 0.25	6.2	8.0	6.8 ± 0.27	6.2	7.9
	d	7.1 ± 0.21	6.3	8.1	7.0 ± 0.24	6.1	8.1
	e	6.8 ± 0.22	5.8	7.6	6.7 ± 0.22	5.7	7.4
	Area	**6.8 ± 0.08**	**5.8**	**8.1**	**6.7 ± 0.09**	**5.7**	**8.1**
BB2	a	6.6 ± 0.24	5.8	7.3	6.6 ± 0.23	5.8	7.5
	b	6.4 ± 0.04	6.2	6.6	6.4 ± 0.04	6.2	6.6
	c	6.3 ± 0.05	6.1	6.5	6.3 ± 0.08	5.9	6.6
	d	6.4 ± 0.10	5.9	6.8	6.5 ± 0.07	6.2	6.8
	e	6.3 ± 0.09	5.9	6.7	6.4 ± 0.07	6.2	6.8
	Area	**6.4 ± 0.06**	**5.8**	**7.3**	**6.4 ± 0.05**	**5.8**	**7.5**
BB3	a	6.3 ± 0.13	5.9	6.9	6.5 ± 0.18	6.0	7.5
	b	6.3 ± 0.11	5.8	6.7	6.2 ± 0.13	5.8	6.8
	c	6.2 ± 0.10	5.9	6.8	6.0 ± 0.08	5.9	6.4
	d	6.2 ± 0.11	5.8	6.7	6.2 ± 0.16	5.7	6.9
	e	6.3 ± 0.11	5.9	6.7	6.3 ± 0.20	5.5	6.9
	Area	**6.2 ± 0.05**	**5.8**	**6.9**	**6.3 ± 0.07**	**5.5**	**7.5**
BB4	a	6.4 ± 0.04	6.3	6.5	6.2 ± 0.05	6.0	6.5
	b	6.5 ± 0.05	6.3	6.7	6.4 ± 0.10+-	6.0	7.0
	c	6.6 ± 0.20	6.0	7.5	6.5 ± 0.29	5.7	7.7
	d	6.6 ± 0.17	6.0	7.1	6.6 ± 0.21	5.9	7.2
	e	7.0 ± 0.20	6.3	7.8	7.1 ± 0.23	6.3	7.8
	Area	**6.6 ± 0.07**	**6.0**	**7.8**	**6.6 ± 0.09**	**5.7**	**7.8**

Key: mg/L = Milligrams per liter. DO = Dissolved Oxygen. mg/L = Milligram(s) per liter. Max = Maximum. Min = Minimum. SE = Standard Error.

Table 4.2-13. Mean and Standard Error (SE) Values for Bottom Dissolved Oxygen by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	6.8 ± 0.10	4.8 ± 0.19	4.4 ± 0.38	6.3 ± 0.07
	b	6.1 ± 0.07	5.0 ± 0.16	4.6 ± 0.38	6.8 ± 0.08
	c	6.7 ± 0.18	5.7 ± 0.25	5.1 ± 0.21	6.8 ± 0.27
	d	7.3 ± 0.19	5.8 ± 0.13	5.1 ± 0.29	7.0 ± 0.24
	e	7.3 ± 0.14	6.0 ± 0.07	4.7 ± 0.14	6.7 ± 0.22
	Area	**6.8 ± 0.09**	**5.5 ± 0.10**	**4.8 ± 0.13**	**6.7 ± 0.09**
BB2	a	6.9 ± 0.28	6.6 ± 0.50	5.2 ± 0.21	6.6 ± 0.23
	b	6.7 ± 0.09	6.0 ± 0.10	5.1 ± 0.29	6.4 ± 0.04
	c	7.0 ± 0.14	6.0 ± 0.08	5.1 ± 0.08	6.3 ± 0.08
	d	6.5 ± 0.20	6.2 ± 0.12	5.0 ± 0.17	6.5 ± 0.07
	e	5.3 ± 0.15	6.4 ± 0.10	4.3 ± 0.16	6.4 ± 0.07
	Area	**6.5 ± 0.13**	**6.2 ± 0.11**	**4.9 ± 0.10**	**6.4 ± 0.05**
BB3	a	5.3 ± 0.27	6.0 ± 0.13	4.9 ± 0.13	6.5 ± 0.18
	b	6.0 ± 0.11	6.0 ± 0.14	4.9 ± 0.21	6.2 ± 0.13
	c	6.2 ± 0.09	6.0 ± 0.17	4.6 ± 0.16	6.0 ± 0.08
	d	6.0 ± 0.08	6.0 ± 0.13	5.2 ± 0.16	6.2 ± 0.16
	e	5.6 ± 0.05	6.2 ± 0.42	4.7 ± 0.35	6.3 ± 0.20
	Area	**5.8 ± 0.08**	**6.0 ± 0.10**	**4.9 ± 0.10**	**6.3 ± 0.07**
BB4	a	6.2 ± 0.05	5.2 ± 0.11	4.5 ± 0.37	6.2 ± 0.05
	b	6.4 ± 0.10	5.4 ± 0.17	5.2 ± 0.41	6.4 ± 0.10
	c	6.5 ± 0.29	5.3 ± 0.14	5.5 ± 0.19	6.5 ± 0.29
	d	6.6 ± 0.21	5.4 ± 0.12	5.7 ± 0.27	6.6 ± 0.21
	e	7.1 ± 0.23	5.7 ± 0.06	5.2 ± 0.09	7.1 ± 0.23
	Area	**6.6 ± 0.09**	**5.4 ± 0.06**	**5.2 ± 0.14**	**6.6 ± 0.09**

Key: SE = Standard Error.

Table 4.2-14. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water pH by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	8.2 ± 0.04	8.0	8.3	8.3 ± 0.03	8.1	8.4
	b	8.3 ± 0.03	8.1	8.4	8.3 ± 0.02	8.2	8.4
	c	8.2 ± 0.02	8.1	8.3	8.2 ± 0.01	8.2	8.3
	d	8.2 ± 0.02	8.1	8.3	8.2 ± 0.02	8.1	8.3
	e	8.2 ± 0.02	8.1	8.3	8.2 ± 0.02	8.2	8.3
	Area	**8.2 ± 0.01**	**8.0**	**8.4**	**8.3 ± 0.01**	**8.1**	**8.4**
BB2	a	8.2 ± 0.02	8.1	8.4	8.3 ± 0.02	8.2	8.4
	b	8.3 ± 0.01	8.2	8.3	8.3 ± 0.01	8.3	8.3
	c	8.2 ± 0.04	8.0	8.4	8.2 ± 0.03	8.1	8.3
	d	8.3 ± 0.01	8.2	8.3	8.3 ± 0.01	8.2	8.3
	e	8.2 ± 0.03	8.0	8.3	8.2 ± 0.02	8.2	8.3
	Area	**8.2 ± 0.01**	**8.0**	**8.4**	**8.3 ± 0.01**	**8.1**	**8.4**
BB3	a	8.2 ± 0.02	8.1	8.3	8.2 ± 0.01	8.2	8.3
	b	8.2 ± 0.02	8.2	8.3	8.2 ± 0.01	8.2	8.3
	c	8.2 ± 0.02	8.1	8.3	8.2 ± 0.01	8.2	8.2
	d	8.2 ± 0.02	8.1	8.2	8.2 ± 0.01	8.2	8.3
	e	8.1 ± 0.02	8.0	8.2	8.2 ± 0.02	8.1	8.2
	Area	**8.2 ± 0.01**	**8.0**	**8.3**	**8.2 ± 0.01**	**8.1**	**8.3**
BB4	a	8.1 ± 0.01	8.0	8.1	8.1 ± 0.01	8.0	8.1
	b	8.1 ± 0.01	8.1	8.2	8.1 ± 0.01	8.1	8.2
	c	8.1 ± 0.03	8.0	8.2	8.1 ± 0.04	8.0	8.3
	d	8.2 ± 0.04	8.0	8.3	8.2 ± 0.04	8.0	8.3
	e	8.1 ± 0.03	8.0	8.3	8.2 ± 0.03	8.0	8.3
	Area	**8.1 ± 0.01**	**8.0**	**8.3**	**8.1 ± 0.01**	**8.0**	**8.3**

Key: Max = Maximum. Min = Minimum SE = Standard Error.

Table 4.2-15. Mean and Standard Error (SE) Values for Bottom pH by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	8.1 ± 0.01	8.6 ± 0.06	7.9 ± 0.02	8.3 ± 0.03
	b	6.9 ± 0.03	8.6 ± 0.07	7.9 ± 0.02	8.3 ± 0.02
	c	7.2 ± 0.01	8.5 ± 0.02	8.0 ± 0.02	8.2 ± 0.01
	d	7.8 ± 0.09	8.5 ± 0.02	7.9 ± 0.01	8.2 ± 0.02
	e	7.9 ± 0.03	8.4 ± 0.02	7.9 ± 0.01	8.2 ± 0.02
	Area	**7.6 ± 0.08**	**8.5 ± 0.02**	**7.9 ± 0.01**	**8.3 ± 0.01**
BB2	a	7.7 ± 0.15	8.5 ± 0.02	7.8 ± 0.01	8.3 ± 0.02
	b	8.1 ± 0.01	8.6 ± 0.05	7.8 ± 0.01	8.3 ± 0.01
	c	8.0 ± 0.01	8.6 ± 0.09	7.9 ± 0.02	8.2 ± 0.03
	d	8.0 ± 0.02	8.4 ± 0.02	7.8 ± 0.01	8.3 ± 0.01
	e	8.0 ± 0.01	8.3 ± 0.03	7.8 ± 0.02	8.2 ± 0.02
	Area	**8.0 ± 0.03**	**8.5 ± 0.03**	**7.8 ± 0.01**	**8.3 ± 0.01**
BB3	a	7.9 ± 0.05	8.3 ± 0.02	7.8 ± 0.01	8.2 ± 0.01
	b	8.0 ± 0.01	8.3 ± 0.01	7.8 ± 0.01	8.2 ± 0.01
	c	8.0 ± 0.01	8.2 ± 0.01	7.8 ± 0.01	8.2 ± 0.01
	d	7.9 ± 0.02	8.2 ± 0.02	7.9 ± 0.02	8.2 ± 0.01
	e	7.5 ± 0.37	8.2 ± 0.05	7.8 ± 0.01	8.2 ± 0.02
	Area	**7.9 ± 0.08**	**8.3 ± 0.01**	**7.8 ± 0.01**	**8.2 ± 0.01**
BB4	a	7.9 ± 0.01	8.1 ± 0.02	7.8 ± 0.01	8.1 ± 0.01
	b	8.0 ± 0.01	8.0 ± 0.02	7.8 ± 0.01	8.1 ± 0.01
	c	8.0 ± 0.01	8.2 ± 0.02	7.8 ± 0.01	8.1 ± 0.04
	d	7.8 ± 0.02	8.0 ± 0.20	7.8 ± 0.01	8.2 ± 0.04
	e	7.9 ± 0.02	8.1 ± 0.08	7.9 ± 0.02	8.2 ± 0.03
	Area	**7.9 ± 0.01**	**8.1 ± 0.04**	**7.8 ± 0.01**	**8.1 ± 0.01**

Key: SE = Standard Error.

Table 4.2-16. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water ORP (mV) by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	111.6 ± 16.70	66.0	208.0	108.4 ± 16.86	66.0	205.0
	b	89.0 ± 8.60	50.0	123.0	89.5 ± 7.46	51.0	119.0
	c	97.3 ± 16.66	57.0	207.0	96.6 ± 15.49	64.0	200.0
	d	89.8 ± 5.52	75.0	121.0	86.1 ± 4.77	72.0	112.0
	e	95.6 ± 14.86	67.0	195.0	91.9 ± 13.72	66.0	184.0
	Area	**96.7 ± 5.78**	**50.0**	**208.0**	**94.5 ± 5.47**	**51.0**	**205.0**
BB2	a	94.4 ± 14.46	50.0	171.0	92.0 ± 13.44	52.0	167.0
	b	93.5 ± 4.87	74.0	107.0	89.3 ± 4.67	75.0	104.0
	c	85.0 ± 12.96	49.0	161.0	85.0 ± 12.67	55.0	164.0
	d	90.0 ± 5.73	56.0	104.0	82.8 ± 5.28	53.0	98.0
	e	104.0 ± 11.23	48.0	163.0	94.3 ± 11.57	47.0	159.0
	Area	**93.4 ± 4.59**	**48.0**	**171.0**	**88.7 ± 4.39**	**47.0**	**167.0**
BB3	a	93.6 ± 14.08	45.0	159.0	91.1 ± 12.89	52.0	156.0
	b	60.3 ± 7.95	27.0	102.0	61.4 ± 6.20	39.0	89.0
	c	78.1 ± 12.12	53.0	161.0	74.3 ± 13.57	30.0	162.0
	d	70.5 ± 9.82	25.0	102.0	64.5 ± 8.19	29.0	92.0
	e	104.3 ± 23.99	6.0	207.0	102.3 ± 21.12	16.0	197.0
	Area	**81.4 ± 6.72**	**6.0**	**207.0**	**78.7 ± 6.22**	**16.0**	**197.0**
BB4	a	91.3 ± 15.14	33.0	164.0	90.6 ± 13.20	41.0	157.0
	b	75.5 ± 8.02	44.0	117.0	86.5 ± 14.53	46.0	175.0
	c	120.9 ± 15.71	67.0	177.0	115.8 ± 15.08	66.0	167.0
	d	95.1 ± 7.52	72.0	117.0	89.9 ± 7.73	67.0	112.0
	e	100.3 ± 7.11	62.0	119.0	86.4 ± 12.52	12.0	113.0
	Area	**96.6 ± 5.36**	**33.0**	**177.0**	**93.8 ± 5.74**	**12.0**	**175.0**

Key: Max = Maximum. Min = Minimum. mV = Millivolts. ORP = Oxidation reduction potential. SE = Standard Error.

Table 4.2-17. Mean and Standard Error (SE) Values for Bottom ORP by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	201.0 ± 29.59	12.1 ± 21.24	120.4 ± 6.36	108.4 ± 16.86
	b	192.3 ± 19.59	29.0 ± 19.29	136.9 ± 24.00	89.5 ± 7.46
	c	136.1 ± 10.09	137.1 ± 4.97	126.9 ± 17.67	96.6 ± 15.49
	d	118.1 ± 13.09	154.3 ± 9.22	135.6 ± 15.57	86.1 ± 4.77
	e	106.4 ± 12.19	151.9 ± 5.16	118.4 ± 12.16	91.9 ± 13.72
	Area	**150.8 ± 9.94**	**96.9 ± 11.64**	**127.6 ± 6.99**	**94.5 ± 5.47**
BB2	a	139.4 ± 22.14	96.1 ± 19.14	129.8 ± 8.46	92.0 ± 13.44
	b	88.3 ± 13.35	62.0 ± 14.83	136.4 ± 13.67	89.3 ± 4.67
	c	96.8 ± 19.17	72.6 ± 12.86	106.5 ± 10.91	85.0 ± 12.67
	d	114.8 ± 16.74	33.4 ± 23.09	80.8 ± 8.80	82.8 ± 5.28
	e	28.9 ± 10.41	35.1 ± 19.99	103.0 ± 15.24	94.3 ± 11.57
	Area	**93.6 ± 9.27**	**59.9 ± 8.65**	**111.3 ± 5.91**	**88.7 ± 4.39**
BB3	a	99.6 ± 13.44	26.4 ± 20.00	116.6 ± 19.58	91.1 ± 12.89
	b	30.4 ± 19.04	34.5 ± 19.32	93.0 ± 13.97	61.4 ± 6.20
	c	90.3 ± 20.18	70.1 ± 12.96	97.6 ± 8.14	74.3 ± 13.57
	d	56.3 ± 21.48	58.0 ± 13.95	92.0 ± 8.88	64.5 ± 8.19
	e	50.6 ± 25.28	94.9 ± 17.25	100.1 ± 15.48	102.3 ± 21.12
	Area	**65.4 ± 9.52**	**56.8 ± 8.19**	**99.9 ± 6.05**	**78.7 ± 6.22**
BB4	a	51.4 ± 20.72	72.8 ± 17.79	94.3 ± 8.87	90.6 ± 13.20
	b	68.4 ± 24.03	82.3 ± 15.19	113.4 ± 11.07	86.5 ± 14.53
	c	97.6 ± 25.88	83.9 ± 15.68	111.5 ± 12.29	115.8 ± 15.08
	d	103.0 ± 16.74	115.9 ± 25.41	98.1 ± 7.28	89.9 ± 7.73
	e	120.5 ± 20.87	171.3 ± 28.34	88.8 ± 17.36	86.4 ± 12.52
	Area	**88.2 ± 10.09**	**105.2 ± 10.67**	**101.2 ± 5.27**	**93.8 ± 5.74**

Key: ORP = Oxidation reduction potential. SE = Standard Error.

Table 4.2-18. Mean, Standard Error (SE), Minimum, and Maximum Values for Surface and Bottom Water Turbidity (NTU) by Transect and Study Area, Spring 2012

Area	Transect	Surface			Bottom		
		Mean ± SE	Min	Max	Mean ± SE	Min	Max
BB1	a	0.7 ± 0.67	0.0	5.4	0.8 ± 0.66	0.0	5.3
	b	0.2 ± 0.23	0.0	1.8	0.0 ± 0.00	0.0	0.0
	c	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	d	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	e	0.5 ± 0.38	0.0	3.0	0.7 ± 0.44	0.0	3.0
	Area	**0.3 ± 0.16**	**0.0**	**5.4**	**0.3 ± 0.16**	**0.0**	**5.3**
BB2	a	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	b	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	c	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	d	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	e	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	Area	**0.0 ± 0.00**	**0.0**	**0.0**	**0.0 ± 0.00**	**0.0**	**0.0**
BB3	a	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	b	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	c	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	d	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	e	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	Area	**0.0 ± 0.00**	**0.0**	**0.0**	**0.0 ± 0.00**	**0.0**	**0.0**
BB4	a	3.4 ± 1.86	0.0	14.6	3.8 ± 1.76	0.0	13.9
	b	4.8 ± 2.24	0.0	14.6	5.1 ± 2.26	0.0	15.1
	c	0.0 ± 0.00	0.0	0.0	0.0 ± 0.01	0.0	0.1
	d	0.0 ± 0.00	0.0	0.0	0.0 ± 0.00	0.0	0.0
	e	0.1 ± 0.06	0.0	0.5	0.1 ± 0.07	0.0	0.4
	Area	**1.6 ± 0.64**	**0.0**	**14.6**	**1.8 ± 0.65**	**0.0**	**15.1**

Key: Max = Maximum. Min = Minimum. NTU = Nephelometric turbidity unit(s). SE = Standard Error.

Table 4.2-19. Mean and Standard Error (SE) Values for Bottom Turbidity by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	3.5 ± 1.12	0.0 ± 0.00	4.0 ± 1.69	0.8 ± 0.66
	b	1.6 ± 1.15	0.0 ± 0.00	5.0 ± 2.08	0.0 ± 0.00
	c	2.7 ± 1.54	0.0 ± 0.00	3.9 ± 1.81	0.0 ± 0.00
	d	9.1 ± 4.22	0.0 ± 0.00	1.7 ± 1.65	0.0 ± 0.00
	e	2.4 ± 1.68	0.0 ± 0.00	0.0 ± 0.00	0.7 ± 0.44
	Area	**3.9 ± 1.05**	**0.0 ± 0.00**	**2.9 ± 0.75**	**0.3 ± 0.16**
BB2	a	0.1 ± 0.08	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	b	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	c	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	d	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	e	0.0 ± 0.00	0.0 ± 0.00	0.2 ± 0.16	0.0 ± 0.00
	Area	**0.0 ± 0.02**	**0.0 ± 0.00**	**0.0 ± 0.03**	**0.0 ± 0.00**
BB3	a	0.2 ± 0.06	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	b	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	c	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	d	0.8 ± 0.75	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.00
	e	0.0 ± 0.00	0.0 ± 0.00	5.4 ± 2.63	0.0 ± 0.00
	Area	**0.2 ± 0.15**	**0.0 ± 0.00**	**1.1 ± 0.60**	**0.0 ± 0.00**
BB4	a	8.4 ± 6.24	1.5 ± 0.46	10.1 ± 4.09	3.8 ± 1.76
	b	1.4 ± 0.39	0.5 ± 0.14	4.1 ± 2.66	5.1 ± 2.26
	c	1.0 ± 0.10	0.0 ± 0.00	0.0 ± 0.00	0.0 ± 0.01
	d	1.4 ± 0.24	0.4 ± 0.27	0.6 ± 0.19	0.0 ± 0.00
	e	1.9 ± 0.20	0.1 ± 0.10	0.7 ± 0.33	0.1 ± 0.07
	Area	**2.8 ± 1.27**	**0.5 ± 0.14**	**3.1 ± 1.11**	**1.8 ± 0.65**

Key: SE = Standard Error.

Table 4.2-20. Mean, Standard Error (SE), Minimum, and Maximum Values for Porewater Temperature (°C) by Transect and Study Area, Spring 2012

Area	Transect	Mean ± SE	Min	Max
BB1	a	24.7 ± 0.16	24.2	25.3
	b	24.4 ± 0.10	23.9	24.8
	c	24.2 ± 0.13	23.6	24.6
	d	24.1 ± 0.15	23.5	24.5
	e	24.6 ± 0.83	23.9	31.0
	Area	**24.6 ± 0.20**	**23.5**	**31.0**
BB2	a	24.3 ± 0.22	23.4	24.8
	b	24.8 ± 0.05	24.5	24.9
	c	24.8 ± 0.06	24.5	24.9
	d	24.8 ± 0.05	24.6	24.9
	e	24.7 ± 0.25	23.5	25.6
	Area	**24.7 ± 0.08**	**23.4**	**25.6**
BB3	a	24.8 ± 0.08	24.5	25.0
	b	24.8 ± 0.05	24.6	25.0
	c	24.9 ± 0.09	24.6	25.3
	d	25.0 ± 0.14	24.5	25.4
	e	25.0 ± 0.16	24.5	25.5
	Area	**24.9 ± 0.05**	**24.5**	**25.5**
BB4	a	25.0 ± 0.15	24.5	25.4
	b	25.0 ± 0.09	24.6	25.3
	c	25.0 ± 0.14	24.5	25.6
	d	24.6 ± 0.06	24.4	24.9
	e	24.8 ± 0.31	24.3	26.8
	Area	**24.9 ± 0.08**	**24.3**	**26.8**

Key: °C = Degrees Celsius. Max = Maximum. Min = Minimum. SE = Standard Error.

Table 4.2-21. Mean and Standard Error (SE) for Porewater Temperature (°C) by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	28.4 ± 0.15	27.4 ± 0.09	30.2 ± 0.31	24.7 ± 0.16
	b	27.8 ± 0.25	27.1 ± 0.07	30.5 ± 0.27	24.4 ± 0.10
	c	25.8 ± 0.45	27.4 ± 0.04	30.2 ± 0.28	24.2 ± 0.13
	d	26.0 ± 0.10	27.5 ± 0.02	30.3 ± 0.33	24.1 ± 0.15
	e	25.6 ± 0.06	27.4 ± 0.03	30.3 ± 0.32	24.6 ± 0.83
	Area	**26.7 ± 0.22**	**27.3 ± 0.04**	**30.3 ± 0.13**	**24.6 ± 0.20**
BB2	a	26.2 ± 0.06	27.3 ± 0.05	30.4 ± 0.24	24.3 ± 0.22
	b	26.1 ± 0.07	26.9 ± 0.10	30.3 ± 0.24	24.8 ± 0.05
	c	26.5 ± 0.08	26.7 ± 0.03	30.2 ± 0.23	24.8 ± 0.06
	d	26.5 ± 0.02	27.0 ± 0.08	30.3 ± 0.23	24.8 ± 0.05
	e	26.7 ± 0.02	27.3 ± 0.10	30.3 ± 0.23	24.7 ± 0.25
	Area	**26.4 ± 0.04**	**27.0 ± 0.06**	**30.3 ± 0.10**	**24.7 ± 0.08**
BB3	a	27.0 ± 0.06	27.3 ± 0.08	30.2 ± 0.15	24.8 ± 0.08
	b	27.0 ± 0.04	27.2 ± 0.04	30.2 ± 0.15	24.8 ± 0.05
	c	26.7 ± 0.05	27.2 ± 0.04	30.3 ± 0.20	24.9 ± 0.09
	d	26.6 ± 0.07	27.3 ± 0.09	30.2 ± 0.17	25.0 ± 0.14
	e	26.6 ± 0.03	27.4 ± 0.06	30.3 ± 0.13	25.0 ± 0.16
	Area	**26.8 ± 0.04**	**27.3 ± 0.03**	**30.2 ± 0.07**	**24.9 ± 0.05**
BB4	a	26.7 ± 0.05	28.3 ± 0.04	30.5 ± 0.14	25.0 ± 0.15
	b	26.6 ± 0.05	28.3 ± 0.08	30.6 ± 0.18	25.0 ±0.09
	c	26.6 ± 0.04	28.1 ± 0.06	29.8 ± 0.30	25.0 ± 0.14
	d	26.6 ± 0.03	27.7 ± 0.04	30.1 ± 0.36	24.6 ± 0.06
	e	26.7 ± 0.02	27.5 ± 0.03	29.4 ± 0.25	24.8 ± 0.31
	Area	**26.6 ± 0.02**	**28.0 ± 0.06**	**30.1 ± 0.13**	**24.9 ± 0.08**

Key: °C = Degrees. SE = Standard Error.

Table 4.2-22. Average Values for Porewater and Bottom Water Temperature (°C) by Transect and Study Area, Spring 2012

Area	Transect	Mean		Difference[1]
		Porewater	Bottom	
BB1	a	24.7	22.1	-2.5
	b	24.4	24.0	-0.4
	c	24.2	23.8	-0.4
	d	24.1	24.0	-0.1
	e	24.6	23.7	-0.8
	Area	**24.5**	**23.5**	**-1.0**
BB2	a	24.3	23.5	-0.8
	b	24.7	24.4	-0.4
	c	24.7	24.2	-0.5
	d	24.8	24.5	-0.3
	e	24.6	24.9	0.2
	Area	**24.6**	**24.3**	**-0.3**
BB3	a	24.8	24.8	0.1
	b	24.8	25.3	0.5
	c	24.9	24.9	0.0
	d	25.0	24.9	-0.1
	e	25.0	24.7	-0.3
	Area	**24.9**	**24.9**	**0.0**
BB4	a	24.9	23.9	-1.0
	b	24.9	24.4	-0.5
	c	25.0	23.9	-1.1
	d	24.5	24.0	-0.5
	e	24.8	24.3	-0.5
	Area	**24.8**	**24.1**	**-0.7**

Note: [1] Positive values indicate the porewater temperature is lower than the ambient water temperature.
Key: °C = Degrees Celsius.

Table 4.2-23. Statistical Comparisons (Friedman and Nova Test) of Temperature (°C) and Conductance between Porewater and Bottom Water Column Measurements Among Transects, All Sampling Events. Bonferroni Correction Significance Value p ≤ 0.0001.

Porewater Temperature vs. Water Column Temperature										
Area	Sampling Period	Mean Transect Value					χ^2	df	p	n
		A	B	C	D	E				
BB1	Fall 2010	NS					4.5000	1	0.0339	8
			NS				8.0000	1	0.0047	8
				NS			4.5000	1	0.0339	8
					NS		8.0000	1	0.0047	8
						NS	8.0000	1	0.0047	8
	Spring 2011	NS					3.5714	1	0.0588	8
			NS				0.0000	1	1.0000	8
				NS			8.0000	1	0.0047	8
					NS		0.0000	1	1.0000	8
						NS	0.0000	1	1.0000	8
	Fall 2011	NS					0.5000	1	0.4795	8
			NS				0.0000	1	1.0000	8
				NS			0.0000	1	1.0000	8
					NS		7.0000	1	0.0082	8
						NS	0.5000	1	0.4795	8
	Spring 2012	NS					8.0000	1	0.0047	8
			NS				2.0000	1	0.1573	8
				NS			0.0000	1	1.0000	8
					NS		0.1429	1	0.7055	8
						NS	2.0000	1	0.1573	8
	Spring 2011 & 2012	NS					11.2667	1	0.0008	16
			NS				1.0000	1	0.3173	16
				NS			4.0000	1	0.0455	16
					NS		0.0667	1	0.7963	16
						NS	1.0000	1	0.3173	16
	Fall 2010 & 2011	NS					4.0000	1	0.0455	16
			NS				4.0000	1	0.0455	16
				NS			2.2500	1	0.1336	16
					NS		0.0667	1	0.7963	16
						NS	6.2500	1	0.0124	16
	All Events	NS					0.8065	1	0.3692	32
			NS				4.5000	1	0.0339	32
				NS			0.1250	1	0.7237	32
					NS		0.1330	1	0.7150	32
						NS	6.1250	1	0.0133	32
BB2	Fall 2010	NS					8.0000	1	0.0047	8
			NS				4.5000	1	0.0339	8
				NS			4.5000	1	0.0339	8
					NS		8.0000	1	0.0047	8
						NS	8.0000	1	0.0047	8
	Spring 2011	NS					0.5000	1	0.4795	8
			NS				2.0000	1	0.1573	8
				NS			2.0000	1	0.1573	8
					NS		3.5714	1	0.0588	8
						NS	0.0000	1	1.0000	8
	Fall 2011	NS					2.0000	1	0.1573	8
			NS				2.0000	1	0.1573	8
				NS			2.0000	1	0.0157	8
					NS		4.5000	1	0.0339	8
						NS	5.0000	1	0.0254	8
	Spring 2012	NS					8.0000	1	0.0047	8
			NS				0.5000	1	0.4795	8
				NS			8.0000	1	0.0047	8
					NS		0.0000	1	1.0000	8
						NS	0.0000	1	1.0000	8
	Spring 2011 & 2012	NS					6.2500	1	0.0124	16
			NS				2.2500	1	0.1336	16
				NS			9.0000	1	0.0027	16
					NS		1.6667	1	0.1967	16
						NS	0.0000	1	1.0000	16

Table 4.2-23. Statistical Comparisons (Friedman and Nova Test) of Temperature (°C) and Conductance between Porewater and Bottom Water Column Measurements Among Transects, All Sampling Events. Bonferroni Correction Significance Value p ≤ 0.0001.

Porewater Temperature vs. Water Column Temperature										
Area	Sampling Period	Mean Transect Value					χ^2	df	p	n
		A	B	C	D	E				
BB3	Fall 2010 & 2011	NS					1.0000	1	0.3173	16
			NS				0.2500	1	0.6171	16
				NS			0.2500	1	0.6171	16
					NS		0.2500	1	0.6171	16
						NS	0.2500	1	0.6171	16
	All Events	NS					6.1250	1	0.0133	32
			NS				2.0000	1	0.1573	32
				NS			6.1250	1	0.0133	32
					NS		0.2903	1	0.5900	32
						NS	0.3103	1	0.5775	32
	Fall 2010	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	8.0000	1	0.0047	8
	Spring 2011	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		0.5000	1	0.4795	8
						NS	7.0000	1	0.0082	8
	Fall 2011	NS					8.0000	1	0.0047	8
			NS				2.0000	1	0.1573	8
				NS			0.1429	1	0.7055	8
					NS		8.0000	1	0.0047	8
						NS	4.5000	1	0.0339	8
	Spring 2012	NS					0.0000	1	1.0000	8
			NS				0.0000	1	1.0000	8
				NS			0.0000	1	1.0000	8
					NS		0.0000	1	1.0000	8
						NS	2.0000	1	0.1573	8
	Spring 2011 & 2012	NS					4.0000	1	0.0455	16
			NS				4.0000	1	0.0455	16
				NS			4.0000	1	0.0455	16
					NS		0.2500	1	0.6171	16
						NS	0.6000	1	0.4386	16
	Fall 2010 & 2011	NS					0.0000	1	1.0000	16
			NS				1.0000	1	0.3173	16
				NS			3.2667	1	0.0707	16
					NS		0.0000	1	1.0000	16
						NS	0.2500	1	0.6171	16
	All Events	NS					2.0000	1	0.1573	32
			NS				4.5000	1	0.0339	32
				NS			7.2581	1	0.0071	32
					NS		0.1250	1	0.7237	32
						NS	0.0323	1	0.8575	32
BB4	Fall 2010	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			4.5000	1	0.0339	8
					NS		8.0000	1	0.0047	8
						NS	0.1429	1	0.7055	8
	Spring 2011	NS					4.5000	1	0.0339	8
			NS				2.0000	1	0.1573	8
				NS			0.5000	1	0.4795	8
					NS		4.5000	1	0.0339	8
						NS	8.0000	1	0.0047	8
	Fall 2011	NS					8.0000	1	0.0047	8
			NS				2.0000	1	0.1573	8
				NS			8.0000	1	0.0047	8
					NS		4.5000	1	0.0339	8
						NS	8.0000	1	0.0047	8

Table 4.2-23. Statistical Comparisons (Friedman and Nova Test) of Temperature (°C) and Conductance between Porewater and Bottom Water Column Measurements Among Transects, All Sampling Events. Bonferroni Correction Significance Value p ≤ 0.0001.

Porewater Temperature vs. Water Column Temperature										
Area	Sampling Period	Mean Transect Value					χ^2	df	p	n
		A	B	C	D	E				
	Spring 2012	NS					4.5000	1	0.0339	8
			NS				0.5000	1	0.4795	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	4.5000	1	0.0339	8
	Spring 2011 & 2012	NS					0.0000	1	1.0000	16
			NS				0.2500	1	0.6171	16
				NS			6.2500	1	0.0124	16
					NS		12.2500	1	0.0005	16
						NS	12.2500	1	0.0005	16
	Fall 2010 & 2011	NS					0.0000	1	1.0000	16
			NS				1.0000	1	0.3173	16
				NS			0.2500	1	0.6171	16
					NS		0.2500	1	0.6171	16
						NS	3.2667	1	0.0707	16
	All Events	NS					0.0000	1	1.0000	32
			NS				0.1250	1	0.7237	32
				NS			2.0000	1	0.1573	32
					NS		8.0000	1	0.0047	32
						NS	1.5806	1	0.2087	32
Porewater Specific Conductance vs. Water Column Specific Conductance										
Area	Sampling Period	Mean Transect Value					χ^2	df	p	n
		A	B	C	D	E				
	Fall 2010	NS					4.5000	1	0.0339	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	4.5000	1	0.0339	8
	Spring 2011	NS					0.5000	1	0.4795	8
			NS				0.5000	1	0.4795	8
				NS			7.0000	1	0.0082	8
					NS		6.0000	1	0.0143	8
						NS	8.0000	1	0.0047	8
	Fall 2011	NS					2.0000	1	0.1573	8
			NS				0.5000	1	0.4795	8
				NS			0.5000	1	0.4795	8
					NS		0.5000	1	0.4795	8
						NS	0.5000	1	0.4795	8
BB1	Spring 2012	NS					4.5000	1	0.0339	8
			NS				0.5000	1	0.4795	8
				NS			0.5000	1	0.4795	8
					NS		0.5000	1	0.4795	8
						NS	0.0000	1	1.0000	8
	Spring 2011 & 2012	NS					4.0000	1	0.0455	16
			NS				1.0000	1	0.3173	16
				NS			5.4000	1	0.0201	16
					NS		1.1429	1	0.2851	16
						NS	4.0000	1	0.0455	16
	Fall 2010 & 2011	NS					6.2500	1	0.0124	16
			NS				6.2500	1	0.0124	16
				NS			6.2500	1	0.0124	16
					NS		2.2500	1	0.1336	16
						NS	1.0000	1	0.3173	16
	All Events	NS					0.1250	1	0.7237	32
			NS				1.1250	1	0.2889	32
				NS			0.0323	1	0.8575	32
					NS		0.1333	1	0.7150	32
						NS	0.5000	1	0.4795	32

Table 4.2-23. Statistical Comparisons (Friedman and Nova Test) of Temperature (°C) and Conductance between Porewater and Bottom Water Column Measurements Among Transects, All Sampling Events. Bonferroni correction significance value p ≤ 0.0001.

Porewater Specific Conductance vs. Water Column Specific Conductance										
Area	Sampling Period	Mean Transect Value					χ^2	df	p	n
		A	B	C	D	E				
BB2	Fall 2010	NS					4.5000	1	0.0339	8
			NS				8.0000	1	0.0047	8
				NS			4.5000	1	0.0339	8
					NS		3.5714	1	0.0588	8
						NS	0.5000	1	0.4795	8
	Spring 2011	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	7.0000	1	0.0082	8
	Fall 2011	NS					1.2857	1	0.2568	8
			NS				0.5000	1	0.4795	8
				NS			0.5000	1	0.4795	8
					NS		0.5000	1	0.4795	8
						NS	0.1429	1	0.7055	8
	Spring 2012	NS					1.2857	1	0.2568	8
			NS				0.0000	1	1.0000	8
				NS			0.5000	1	0.4795	8
					NS		0.0000	1	1.0000	8
						NS	0.1429	1	0.7055	8
	Spring 2011 & 2012	NS					1.6667	1	0.1967	16
			NS				4.0000	1	0.0455	16
				NS			6.2500	1	0.0124	16
					NS		4.0000	1	0.0455	16
						NS	0.0000	1	1.0000	16
	Fall 2010 & 2011	NS					5.4000	1	0.0201	16
			NS				6.2500	1	0.0124	16
				NS			1.0000	1	0.3173	16
					NS		0.6000	1	0.4386	16
						NS	0.6000	1	0.4386	16
	All Events	NS					0.5333	1	0.4652	32
			NS				0.1250	1	0.7237	32
				NS			1.1250	1	0.2889	32
					NS		0.8065	1	0.3692	32
						NS	0.3103	1	0.5775	32
BB3	Fall 2010	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	8.0000	1	0.0047	8
	Spring 2011	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	8.0000	1	0.0047	8
	Fall 2011	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			2.0000	1	0.1573	8
					NS		4.5000	1	0.0339	8
						NS	0.6667	1	0.4142	8
	Spring 2012	NS					4.5000	1	0.0339	8
			NS				2.0000	1	0.1573	8
				NS			0.0000	1	1.0000	8
					NS		7.0000	1	0.0082	8
						NS	4.5000	1	0.0339	8
	Spring 2011 & 2012	NS					12.2500	1	0.0005	16
			NS				9.0000	1	0.0027	16
				NS			4.0000	1	0.0455	16
					PW>WC		15.0000	1	0.0001	16
						NS	12.2500	1	0.0005	16

Table 4.2-23. Statistical Comparisons (Friedman and Nova Test) of Temperature (°C) and Conductance between Porewater and Bottom Water Column Measurements Among Transects, All Sampling Events. Bonferroni correction significance value p ≤ 0.0001.

Porewater Specific Conductance vs. Water Column Specific Conductance											
Area	Sampling Period	Mean Transect Value					χ^2	df	p	n
		A	B	C	D	E				
BB4	Fall 2010 & 2011	NS					0.0000	1	1.0000	16
			PW<WC				16.0000	1	0.0001	16
				NS			9.0000	1	0.0027	16
					NS		0.0000	1	1.0000	16
						NS	2.5714	1	0.1088	16
	All Events	NS					0.1250	1	0.7237	32
			NS				0.5000	1	0.4795	32
				NS			0.5000	1	0.4765	32
					NS		0.0323	1	0.8575	32
						NS	0.0667	1	0.1441	32
	Fall 2010	NS					4.5000	1	0.0339	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		4.5000	1	0.0339	8
						NS	8.0000	1	0.0047	8
	Spring 2011	NS					8.0000	1	0.0047	8
			NS				8.0000	1	0.0047	8
				NS			8.0000	1	0.0047	8
					NS		8.0000	1	0.0047	8
						NS	8.0000	1	0.0047	8
	Fall 2011	NS					2.0000	1	0.1573	8
			NS				1.2857	1	0.2568	8
				NS			2.6667	1	0.1025	8
					NS		2.0000	1	0.1573	8
						NS	3.5714	1	0.0588	8
	Spring 2012	NS					0.1429	1	0.7055	8
			NS				4.5000	1	0.0339	8
				NS			0.5000	1	0.4795	8
					NS		0.0000	1	1.0000	8
						NS	0.5000	1	0.4795	8
	Spring 2011 & 2012	NS					0.0000	1	1.0000	16
			NS				12.2500	1	0.0005	16
				NS			2.2500	1	0.1336	16
					NS		4.0000	1	0.0455	16
						NS	6.2500	1	0.0124	16
	Fall 2010 & 2011	NS					0.0000	1	1.0000	16
			NS				1.6667	1	0.1967	16
				NS			10.2857	1	0.0013	16
					NS		6.2500	1	0.0124	16
						NS	11.2667	1	0.0008	16
	All Events	NS					0.0000	1	1.0000	32
			NS				2.6129	1	0.1060	32
				NS			1.2000	1	0.2733	32
					NS		0.1250	1	0.7237	32
						NS	0.2903	1	0.5900	32

Note: Bonferroni correction significance value p ≤ 0.0001.
Key: df = Degrees of freedom. n = Sample size. NS = Not significant. PW = Porewater. WC = Water column.

Table 4.2-24. Statistical Comparisons (Wilcoxon Signed Rank Test) of Temperature and Conductance Between Porewater and Bottom Water Column Measurements Among Study Areas, All Sampling Events.

Sampling Period	Mean Area Value				χ^2	df	p	n
	BB1	BB2	BB3	BB4				
Porewater Temperature vs. Water Column Temperature								
Fall 2010	NS				14.4000	1	0.0002	40
		PW>WC			32.4000	1	< 0.0001	40
			PW>WC		40.0000	1	< 0.0001	40
				PW>WC	24.6410	1	< 0.0001	40
Spring 2011	NS				0.2308	1	0.6310	40
		NS			0.6410	1	0.4233	40
			NS		5.7692	1	0.0163	40
				NS	0.9000	1	0.3428	40
Fall 2011	NS				1.2564	1	0.2623	40
		NS			14.2973	1	0.0002	40
			PW>WC		18.6923	1	< 0.0001	40
				PW>WC	28.9000	1	< 0.0001	40
Spring 2012	NS				7.4103	1	0.0065	40
		NS			8.1000	1	0.0044	40
			NS		0.4000	1	0.5271	40
				PW>WC	22.5000	1	< 0.0001	40
Porewater Temperature vs. Water Column Temperature								
Spring 2011 & 2012	NS				2.5128	1	0.1129	80
		NS			6.6862	1	0.0097	80
			NS		4.5696	1	0.0325	80
				PW>WC	16.2000	1	0.0001	80
Fall 2010 & 2011	NS				3.6582	1	0.0558	80
		NS			2.1948	1	0.1385	80
			NS		2.1392	1	0.1436	80
				NS	0.1139	1	0.7357	80
All Events	NS				6.1210	1	0.0134	160
		NS			8.3077	1	0.0040	160
			NS		6.4810	1	0.0109	160
				NS	6.8491	1	0.0089	160
Porewater Specific Conductance vs. Water Column Specific Conductance								
Fall 2010	PW>WC				32.4000	1	< 0.0001	40
		PW>WC			18.6923	1	< 0.0000	40
			PW>WC		40.0000	1	< 0.0001	40
				PW<WC	32.4000	1	< 0.0001	40
Spring 2011	PW>WC				16.8919	1	< 0.0001	40
		PW>WC			39.0000	1	< 0.0001	40
			PW>WC		40.0000	1	< 0.0001	40
				PW<WC	40.0000	1	< 0.0001	40
Fall 2011	NS				0.4000	1	0.5271	40
		NS			0.1053	1	0.7456	40
			PW>WC		15.1579	1	0.0001	40
				NS	5.4444	1	0.0196	40
Spring 2012	NS				1.6000	1	0.2059	40
		NS			0.1053	1	0.7456	40
			NS		13.5641	1	0.0002	40
				NS	1.2564	1	0.2623	40
Porewater Specific Conductance vs. Water Column Specific Conductance								
Spring 2011 & 2012	NS				14.1429	1	0.0002	80
		PW>WC			17.7792	1	< 0.0001	80
			PW>WC		50.2405	1	< 0.0001	80
				PW<WC	27.9620	1	< 0.0001	80
Fall 2010 & 2011	PW>WC				20.0000	1	< 0.0001	80
		NS			10.9221	1	0.0010	80
			PW>WC		52.5128	1	< 0.0001	80
				PW<WC	32.8947	1	< 0.0001	80
All Events	NS				0.3121	1	0.5764	160
		NS			0.4156	1	0.5192	160
			NS		0.0064	1	0.9364	160
				NS	0.5806	1	0.8096	160

Note: Red p Values Indicate a Significant Difference.
Key: df = Degrees of freedom. NS = Not significant. PW = Porewater. WC = Water Column.

Table 4.2-25. Average Values for Porewater and Bottom Water Temperature (°C) by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010			Spring 2011			Fall 2011			Spring 2012		
		Mean		Δ[1]	Mean		Δ	Mean		Δ	Mean		Δ
		PW	Bottom		PW	Bottom		PW	Bottom		PW	Bottom	
BB1	a	28.4	28.4	0.0	27.4	26.6	-0.8	30.2	30.4	0.2	24.7	22.1	-2.6
	b	27.8	25.8	-2.0	27.1	27.3	0.2	30.5	30.4	-0.1	24.4	24.0	-0.4
	c	25.8	23.9	-1.9	27.4	28.0	0.6	30.2	30.5	0.3	24.2	23.8	-0.4
	d	26.0	23.9	-2.1	27.5	27.6	0.1	30.3	30.7	0.4	24.1	24.0	-0.1
	e	25.6	24.3	-1.3	27.4	27.5	0.1	30.3	30.0	-0.3	24.6	23.7	-0.9
	Area	**26.7**	**25.3**	**-1.4**	**27.3**	**27.4**	**0.1**	**30.3**	**30.4**	**0.1**	**24.6**	**23.5**	**-1.1**
BB2	a	26.2	25.2	-1.0	27.3	27.2	-0.1	30.4	30.6	0.2	24.3	23.5	-0.8
	b	26.1	25.5	-0.6	26.9	26.5	-0.4	30.3	30.9	0.6	24.8	24.4	-0.4
	c	26.5	26.0	-0.5	26.7	26.5	-0.2	30.2	30.8	0.6	24.8	24.2	-0.6
	d	26.5	26.1	-0.4	27.0	27.3	0.3	30.3	30.5	0.2	24.8	24.5	-0.3
	e	26.7	26.5	-0.2	27.3	27.5	0.2	30.3	30.4	0.1	24.7	24.9	0.2
	Area	**26.4**	**25.9**	**-0.5**	**27.0**	**27.0**	**0.0**	**30.3**	**30.6**	**0.3**	**24.7**	**24.3**	**-0.4**
BB3	a	27.0	26.6	-0.4	27.3	26.6	-0.7	30.2	30.8	0.6	24.8	24.8	0.0
	b	27.0	26.5	-0.5	27.2	26.6	-0.6	30.2	30.8	0.6	24.8	25.3	0.5
	c	26.7	25.7	-1.0	27.2	26.6	-0.6	30.3	30.4	0.1	24.9	24.9	0.0
	d	26.6	25.6	-1.0	27.3	27.6	0.3	30.2	30.7	0.5	25.0	24.9	-0.1
	e	26.6	25.5	-1.1	27.4	28.5	1.1	30.3	30.3	0.0	25.0	24.7	-0.3
	Area	**26.8**	**26.0**	**-0.8**	**27.3**	**27.2**	**-0.1**	**30.2**	**30.6**	**0.4**	**24.9**	**24.9**	**0.0**
BB4	a	26.7	25.5	-1.2	28.3	28.6	0.3	30.5	31.0	0.5	25.0	23.9	-1.1
	b	26.6	26.0	-0.6	28.3	28.8	0.5	30.6	31.0	0.4	25.0	24.4	-0.6
	c	26.6	26.3	-0.3	28.1	28.0	-0.1	29.8	30.3	0.5	25.0	23.9	-1.1
	d	26.6	26.2	-0.4	27.7	27.1	-0.6	30.1	30.7	0.6	24.6	24.0	-0.6
	e	26.7	26.7	0.0	27.5	26.5	-1.0	29.4	30.4	1.0	24.8	24.3	-0.5
	Area	**26.6**	**26.1**	**-0.5**	**28.0**	**27.8**	**-0.2**	**30.1**	**30.7**	**0.6**	**24.9**	**24.1**	**-0.8**

Note: [1] Positive values indicate the porewater temperature is lower than the ambient bottom water temperature.

Key: Δ = Change. °C = Degrees Celsius. PW = Porewater.

Table 4.2-26. Mean, Standard Error (SE), Minimum, and Maximum Values for Porewater Specific Conductance (µS/cm) by Transect and Study Area, Spring 2012

Area	Transect	Mean ± SE	Min	Max
BB1	a	53800 ± 1180	46000	56300
	b	54900 ± 660	52300	56900
	c	54800 ± 570	52700	56900
	d	54200 ± 430	53700	56700
	e	54700 ± 450	53600	56900
	Area	**54600 ± 310**	**46000**	**56900**
BB2	a	55800 ± 410	54000	57100
	b	55600 ± 270	54500	56500
	c	55700 ± 270	54400	56500
	d	55600 ± 270	53800	56100
	e	54300 ± 420	53000	56500
	Area	**55600 ± 150**	**53000**	**57100**
BB3	a	54300 ± 660	51400	56200
	b	55200 ± 380	52900	56100
	c	54900 ± 380	53700	56500
	d	53900 ± 400	52300	55800
	e	54200 ± 420	51900	55600
	Area	**54500 ± 210**	**51400**	**56500**
BB4	a	50500 ± 430	48800	52600
	b	51200 ± 170	50500	51800
	c	52000 ± 300	50500	52800
	d	52600 ± 170	51600	53200
	e	52100 ± 340	50700	53500
	Area	**51700 ± 180**	**48800**	**53500**

Key: µS/cm = Micro Siemens per centimeter(s). SE = Standard Error.

Table 4.2-27. Mean and Standard Error (SE) Values for Porewater Specific Conductance (µS/cm) by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010	Spring 2011	Fall 2011	Spring 2012
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	43100 ± 4690	56500 ± 680	53700 ± 890	53800 ± 1180
	b	43200 ± 1380	55500 ± 1510	53500 ± 1100	54900 ± 660
	c	43500 ± 1400	50400 ± 5490	53900 ± 590	54800 ± 570
	d	43000 ± 1310	55700 ± 340	54500 ± 500	54200 ± 430
	e	43500 ± 1650	54700 ± 650	55000 ± 440	54700 ± 450
	Area	**43300 ± 1050**	**54600 ± 1150**	**54100 ± 330**	**54600 ± 310**
BB2	a	46800 ± 1940	55300 ± 230	55900 ± 550	55800 ± 410
	b	48600 ± 1360	56100 ± 960	55600 ± 450	55600 ± 270
	c	48500 ± 1650	57200 ± 500	55300 ± 460	55700 ± 270
	d	49000 ± 1370	57700 ± 1000	55400 ± 310	55600 ± 270
	e	49400 ± 500	56500 ± 700	54900 ± 300	54300 ± 420
	Area	**48500 ± 630**	**56600 ± 340**	**55400 ± 190**	**55600 ± 150**
BB3	a	44200 ± 900	55100 ± 480	56900 ± 250	54300 ± 660
	b	48500 ± 810	55100 ± 590	57300 ± 290	55200 ± 380
	c	44100 ± 930	54300 ± 860	56400 ± 390	54900 ± 380
	d	46900 ± 580	54100 ± 600	56400 ± 290	53900 ± 400
	e	48300 ± 310	52700 ± 600	54800 ± 340	54200 ± 420
	Area	**46400 ± 440**	**54300 ± 310**	**56400 ± 200**	**54500 ± 210**
BB4	a	43100 ± 900	48300 ± 1150	53500 ± 530	50500 ± 430
	b	44500 ± 1040	50500 ± 1040	52900 ± 660	51200 ± 170
	c	43800 ± 1330	52400 ± 560	55000 ± 370	52000 ± 300
	d	44900 ± 1150	55100 ± 480	55000 ± 1170	52600 ± 170
	e	42300 ± 1110	51900 ± 760	57300 ± 530	52100 ± 340
	Area	**43700 ± 500**	**51600 ± 510**	**54700 ± 390**	**51700 ± 180**

Key: µS/cm = Micro Siemens per centimeter(s). SE = Standard Error.

Table 4.2-28. Average Values for Porewater and Bottom Water Specific Conductance (µS/cm) by Transect and Study Area, Spring 2012

Area	Transect	Mean		Difference
		Porewater	Bottom	
BB1	a	53800	56300	2500
	b	54900	54700	-200
	c	54800	54400	-400
	d	54200	54600	400
	e	54700	55000	300
	Area	**54600**	**55000**	**400**
BB2	a	55800	55000	-800
	b	55600	55400	-200
	c	55700	55600	-100
	d	55600	55500	-100
	e	54300	55500	1200
	Area	**55600**	**55400**	**-200**
BB3	a	54300	56100	1800
	b	55200	56300	1100
	c	54900	55600	700
	d	53900	55300	1400
	e	54200	55400	1200
	Area	**54500**	**55700**	**1200**
BB4	a	50500	51400	900
	b	51200	52200	1000
	c	52000	52200	200
	d	52600	52700	100
	e	52100	52800	700
	Area	**51700**	**52300**	**600**

Note:

[1] Positive values indicate the porewater specific conductance is lower than the ambient bottom water specific conductance.

Key: µS/cm = Micro Siemens per centimeter(s). SE = Standard Error.

Table 4.2-29. Average Values for Porewater and Bottom Water Specific Conductance (µS/cm) by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010			Spring 2011			Fall 2011			Spring 2012		
		Mean		Δ [1]	Mean		Δ [1]	Mean		Δ [1]	Mean		Δ [1]
		PW	B		PW	B		PW	B		PW	B	
BB1	a	43100	37900	-5200	56500	57100	600	53700	52500	-1200	53800	56300	2500
	b	43200	33900	-9300	55500	58300	2800	53500	52700	-800	54900	54700	-200
	c	43500	33600	-9900	50400	56800	6400	53900	53000	-900	54800	54400	-400
	d	43000	34600	-8400	55700	56700	1000	54500	54100	-400	54200	54600	400
	e	43500	38400	-5100	54700	56700	2000	55000	54500	-500	54700	55000	300
	Area	**43300**	**35700**	**-7600**	**54600**	**57100**	**2500**	**54100**	**53400**	**-700**	**54600**	**55000**	**400**
BB2	a	46800	39700	-7100	55300	57100	1800	55900	55100	-800	55800	55000	-800
	b	48600	41200	-7400	56100	58300	2200	55600	55200	-400	55600	55400	-200
	c	48500	42500	-6000	57200	59600	2400	55300	55600	300	55700	55600	-100
	d	49000	45300	-3700	57700	60200	2500	55400	55400	0	55600	55500	-100
	e	49400	48300	-1100	56500	58500	2000	54900	54700	-200	54300	55500	1200
	Area	**48500**	**43400**	**-5100**	**56600**	**58700**	**2100**	**55400**	**55200**	**-200**	**55600**	**55400**	**-200**
BB3	a	44200	40000	-4200	55100	58300	3200	56900	55400	-1500	54300	56100	1800
	b	48500	41200	-7300	55100	57800	2700	57300	55600	-1700	55200	56300	1100
	c	44100	39500	-4600	54300	57500	3200	56400	55800	-600	54900	55600	700
	d	46900	40100	-6800	54100	57300	3200	56400	56000	-400	53900	55300	1400
	e	48300	40600	-7700	52700	57300	4600	54800	55300	500	54200	55400	1200
	Area	**46400**	**40300**	**-6100**	**54300**	**57700**	**3400**	**56400**	**55600**	**-800**	**54500**	**55700**	**1200**
BB4	a	43100	38600	-4500	48300	56200	7900	53500	53200	-300	50500	51400	900
	b	44500	38800	-5700	50500	56600	6100	52900	53500	600	51200	52200	1000
	c	43800	38800	-5000	52400	57800	5400	55000	54400	-600	52000	52200	200
	d	44900	39200	-5700	55100	58600	3500	55000	55000	0	52600	52700	100
	e	42300	38400	-3900	51900	58500	6600	57300	55500	-1800	52100	52800	700
	Area	**43700**	**38800**	**-4900**	**51600**	**57600**	**6000**	**54700**	**54300**	**-400**	**51700**	**52300**	**600**

Note: [1] Positive values indicate the porewater specific conductance is lower than the ambient bottom water specific conductance.

Table 4.2-30. Presence of Seagrass, *Halodule wrightii* (HW) and *Thalassia testudinum* (TT), in at Least One Quadrat on Each Transect by Study Area, Spring 2012

Area	Transect	Point 1		Point 2		Point 3		Point 4		Point 5		Point 6		Point 7		Point 8		Total	
		HW	TT	HW	TT	HW	TT	HW	TT	HW	TT	HW	TT	HW	TT	HW	TT	HW	TT
BB1	a		X		X		X		X		X	X	X	X	X	X	X	3	8
	b	X	X	X	X		X	X	X		X	X	X	X	X	X	X	6	8
	c	X	X		X	X	X		X		X	X	X	X	X		X	4	8
	d	X	X		X		X	X	X		X		X		X		X	2	8
	e		X		X	X	X		X		X	X	X		X		X	2	8
	Total	**3**	**5**	**1**	**5**	**2**	**5**	**2**	**5**	**0**	**5**	**4**	**5**	**3**	**5**	**2**	**5**	**17**	**40**
BB2	a	X			X	X	X	X	X							X	X	4	4
	b	X	X		X	X	X		X		X			X	X			3	6
	c	X	X		X		X		X		X		X		X		X	1	8
	d		X		X		X		X		X		X		X		X	0	8
	e		X		X		X		X		X		X		X		X	0	8
	Total	**3**	**4**	**0**	**5**	**2**	**5**	**1**	**5**	**0**	**4**	**0**	**3**	**1**	**4**	**1**	**4**	**8**	**34**
BB3	a				X		X		X	X	X		X	X	X		X	2	7
	b				X		X	X	X		X		X		X		X	1	7
	c		X		X		X		X		X		X		X		X	0	8
	d		X	X	X		X		X		X		X		X		X	1	8
	e		X		X		X		X		X				X		X	0	7
	Total	**0**	**3**	**1**	**5**	**0**	**5**	**1**	**5**	**1**	**5**	**0**	**4**	**1**	**5**	**0**	**5**	**4**	**37**
BB4	a	X	X		X		X		X	X	X		X		X		X	2	8
	b		X		X	X	X	X	X		X		X		X	X	X	3	8
	c		X		X		X		X		X		X		X		X	0	8
	d		X		X		X		X		X				X		X	0	7
	e	X	X		X	X	X		X	X	X		X		X			3	7
	Total	**2**	**5**	**0**	**5**	**2**	**5**	**1**	**5**	**2**	**5**	**0**	**4**	**0**	**5**	**1**	**4**	**8**	**38**
Total All Areas																		**37**	**149**

Table 4.2-31. Mean and Standard Error of Water Depth (m) and Braun-Blanquet Coverage Abundance (BBCA) Scores for Total Macrophytes, Total Seagrass, and Total Macroalgae by Transect and Study Area, Spring 2012

Area	Transect	Depth	Macrophytes	Seagrass	Macroalgae
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
BB1	a	1.3 ± 0.02	2.3 ± 0.18	1.3 ± 0.12	1.8 ± 0.19
	b	1.4 ± 0.08	2.5 ± 0.20	1.4 ± 0.11	2.1 ± 0.13
	c	1.7 ± 0.03	1.7 ± 0.11	1.0 ± 0.06	1.6 ± 0.11
	d	1.5 ± 0.05	1.9 ± 0.13	1.3 ± 0.10	1.2 ± 0.09
	e	1.7 ± 0.06	1.3 ± 0.14	1.1 ± 0.07	1.1 ± 0.09
	Area	1.5 ± 0.03	2.0 ± 0.08	1.2 ± 0.04	1.6 ± 0.06
BB2	a	2.1 ± 0.09	2.3 ± 0.29	0.5 ± 0.10	1.5 ± 0.13
	b	2.3 ± 0.13	1.7 ± 0.18	0.7 ± 0.14	1.4 ± 0.13
	c	2.8 ± 0.13	1.6 ± 0.12	1.1 ± 0.12	1.3 ± 0.11
	d	2.7 ± 0.05	2.4 ± 0.18	1.5 ± 0.11	1.8 ± 0.14
	e	2.7 ± 0.07	2.3 ± 0.09	2.0 ± 0.03	1.6 ± 0.13
	Area	2.5 ± 0.06	2.1 ± 0.05	1.2 ± 0.06	1.5 ± 0.06
BB3	a	2.7 ± 0.06	2.8 ± 0.23	1.4 ± 0.13	1.9 ± 0.11
	b	2.8 ± 0.06	2.3 ± 0.26	0.7 ± 0.09	2.1 ± 0.25
	c	2.8 ± 0.13	1.7 ± 0.14	0.8 ± 0.11	1.3 ± 0.09
	d	3.3 ± 0.06	2.3 ± 0.15	1.1 ± 0.08	1.6 ± 0.10
	e	3.4 ± 0.06	2.9 ± 0.29	1.3 ± 0.13	1.7 ± 0.18
	Area	3.1 ± 0.05	2.4 ± 0.13	1.1 ± 0.06	1.7 ± 0.07
BB4	a	1.8 ± 0.04	1.9 ± 0.16	1.0 ± 0.04	1.6 ± 0.11
	b	1.9 ± 0.01	1.7 ± 0.20	0.7 ± 0.07	1.4 ± 0.13
	c	1.9 ± 0.10	1.1 ± 0.07	0.7 ± 0.10	1.0 ± 0.06
	d	3.3 ± 0.06	1.5 ± 0.11	0.8 ± 0.15	1.0 ± 0.03
	e	2.6 ± 0.04	1.7 ± 0.16	1.1 ± 0.13	1.1 ± 0.07
	Area	2.1 ± 0.06	1.6 ± 0.07	0.9 ± 0.05	1.2 ± 0.03

Key: BBCA = Braun-Blanquet Coverage Abundance. m = Meter(s). SE = Standard Error.

Table 4.2-32. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) among Transects, All Sampling Events. Red p Values Indicate a Significant Difference

Area	Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	n
Total Macrophytes						
BB1	Fall 2010	e b a c d	7.3496	4	0.1185	40
	Spring 2011	e a c b d	16.6129	4	0.0023	40
	Fall 2011	e d a c b	13.9536	4	0.0074	40
	Spring 2012	e d c a b	13.3632	4	0.0096	40
	Spring 2011 & 2012	e a c d b	20.8322	4	0.0003	80
	Fall 2010 & 2011	e a b c d	10.0747	4	0.0392	80
	All Events	e a c d b	29.2919	4	< 0.0001	160
BB2	Fall 2010	e b a c d	17.3881	4	0.0016	40
	Spring 2011	a b e c d	9.0510	4	0.0598	40
	Fall 2011	e d a c b	8.7029	4	0.0690	40
	Spring 2012	a b c e d	4.5815	4	0.3330	40
	Spring 2011 & 2012	a b e c d	9.0834	4	0.0591	80
	Fall 2010 & 2011	e a c b d	14.3236	4	0.0063	80
	All Events	e a b c d	15.6334	4	0.0036	160
BB3	Fall 2010	a e b d c	2.8881	4	0.5767	40
	Spring 2011	a d e c b	7.4068	4	0.1159	40
	Fall 2011	a b c d e	1.8749	4	0.7587	40

Table 4.2-32. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) among Transects, All Sampling Events. Red p Values Indicate a Significant Difference

Area	Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	n
	Spring 2012	c d e b a	4.2577	4	0.3723	40
	Spring 2011 & 2012	c d a e b	5.2332	4	0.2642	80
	Fall 2010 & 2011	a b e d c	3.2694	4	0.5138	80
	All Events	a c d e b	0.6124	4	0.9617	160
BB4	**Fall 2010**	e d a c b	4.0440	4	0.4001	40
	Spring 2011	d c e a b	10.1289	4	0.0383	40
	Fall 2011	a b c d e	1.8749	4	0.7587	40
	Spring 2012	c d e b a	13.7358	4	0.0082	40
	Spring 2011 & 2012	d c e b a	19.6196	4	0.0006	80
	Fall 2010 & 2011	e c d a b	6.0180	4	0.1978	80
	All Events	c d e b a	21.0773	4	0.0003	160
Macroalgae						
BB1	**Fall 2010**	b e a c d	11.0161	4	0.0264	40
	Spring 2011	e c a b d	20.2416	4	0.0004	40
	Fall 2011	e c d a b	11.7595	4	0.0192	40
	Spring 2012	e c d a e	12.1894	4	0.0160	40

Table 4.2-32. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) among Transects, All Sampling Events. Red p Values Indicate a Significant Difference

Area	Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	Area
	Spring 2011 & 2012	e c a d b	23.5779	4	0.0001	80
	Fall 2010 & 2011	e b c a d	11.1189	4	0.0253	80
	All Events	e c b a d	28.5692	4	< 0.0001	160
BB2	Fall 2010	b a c e d	8.8085	4	0.0661	40
	Spring 2011	b a c e d	7.9254	4	0.0944	40
	Fall 2011	a d e c b	2.3441	4	0.6728	40
	Spring 2012	c b a d e	5.9534	4	0.2027	40
	Spring 2011 & 2012	b a c e d	9.4192	4	0.0514	80
	Fall 2010 & 2011	a b c d e	5.7263	4	0.2205	80
	All Events	b a c e d	14.1781	4	0.0067	160
BB3	Fall 2010	b c d a e	16.5417	4	0.0024	40
	Spring 2011	d e c b a	9.8159	4	0.0436	40
	Fall 2011	d c b a e	4.7716	4	0.3116	40
	Spring 2012	c b d a e	4.4577	4	0.3476	40
	Spring 2011 & 2012	c d b e a	5.9178	4	0.2054	80
	Fall 2010 & 2011	b c d a e	17.7203	4	0.0014	80
	All Events	c b d a e	15.6942	4	0.0035	160

Table 4.2-32. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) among Transects, All Sampling Events. Red p Values Indicate a Significant Difference

Area	Sampling Period	Mean Transect Value					H	df	p	Area
		Lowest				Highest				
BB4	Fall 2010	e	c	a	d	b	3.2936	4	0.5099	40
	Spring 2011	d	e	c	a	b	10.3476	4	0.0350	40
	Fall 2011	c	d	e	b	a	1.2629	4	0.8676	40
	Spring 2012	c	d	b	e	a	10.1137	4	0.0386	40
	Spring 2011 & 2012	d	c	e	a	b	12.2870	4	0.0153	80
	Fall 2010 & 2011	e	c	d	a	b	3.0585	4	0.5481	80
	All Events	c	d	e	a	b	10.7348	4	0.0297	160
Seagrass										
BB1	Fall 2010	b	e	a	d	c	6.3321	4	0.1757	40
	Spring 2011	d	b	a	c	e	0.5317	4	0.9703	40
	Fall 2011	c	a	d	e	b	1.1360	4	0.8885	40
	Spring 2012	c	e	a	d	b	6.2104	4	0.1840	40
	Spring 2011 & 2012	c	e	a	d	b	1.3931	4	0.8454	80
	Fall 2010 & 2011	b	e	a	c	d	2.4000	4	0.6626	80
	All Events	e	c	b	a	d	1.5168	4	0.8237	160

Table 4.2-32. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) among Transects, All Sampling Events. Red p Values Indicate a Significant Difference

Area	Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	n
BB2	Fall 2010	b a c d e	11.9967	4	0.0174	40
	Spring 2011	a b c d e	24.3398	4	0.0001	40
	Fall 2011	a b c d e	23.8689	4	0.0001	40
	Spring 2012	a b c d e	19.6933	4	0.0006	40
	Spring 2011 & 2012	a b c d e	43.6589	4	< 0.0001	80
	Fall 2010 & 2011	b a c d e	30.2763	4	< 0.0001	80
	All Events	a b c d e	69.6791	4	< 0.0001	160
BB3	Fall 2010	b c d a e	21.2070	4	0.0003	40
	Spring 2011	b c d a e	9.8586	4	0.0429	40
	Fall 2011	b d c a e	8.9301	4	0.0629	40
	Spring 2012	b c d e a	9.6435	4	0.0469	40
	Spring 2011 & 2012	b c d a e	17.6462	4	0.0014	80
	Fall 2010 & 2011	b c d a e	28.0944	4	< 0.0001	80

Table 4.2-32. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) among Transects, All Sampling Events. Red p Values Indicate a Significant Difference

Area	Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	n
	All Events	b c d a e	43.3956	4	< 0.0001	160
BB4	**Fall 2010**	b a c d e	5.6737	4	0.2249	40
	Spring 2011	d c b a e	4.7713	4	0.3116	40
	Fall 2011	c d b a e	4.2576	4	0.3723	40
	Spring 2012	b d c a e	3.1453	4	0.5338	40
	Spring 2011 & 2012	d c b a e	5.5820	4	0.2326	80
	Fall 2010 & 2011	c b a d e	5.2943	4	0.2584	80
	All Events	c d b a e	8.3346	4	0.0801	160

Note: Red p Values Indicate a Significant Difference.

Key:

ANOVA = Analysis of variance. BBCA = Braun-Blanquet Cover Abundance. df = Degrees of freedom. SAV = Submerged aquatic vegetation.

Table 4.2-33. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) and Percent Light Attenuation Among Study Areas, All Sampling Events. Red p Values Indicate a Significant Difference

Parameter	Study Areas (Lowest → Highest)	H	df	p	n
Total Macrophytes					
Fall 2010	BB1 BB3 BB4 BB2	2.298	3	0.5129	160
Spring 2011	BB4 BB1 BB2 BB3	25.828	3	< 0.0001	160
Fall 2011	BB4 BB3 BB1 BB2	20.120	3	0.0002	160
Spring 2012	BB4 BB2 BB1 BB3	11.706	3	0.0085	160
Spring 2011 & 2012	BB4 BB1 BB2 BB3	29.913	3	< 0.0001	320
Fall 2010 & 2011	BB4 BB1 BB3 BB2	11.327	3	0.0101	320
All Events	BB4 BB1 BB2 BB3	32.400	3	< 0.0001	640
Macroalgae					
Fall 2010	BB1 BB4 BB3 BB2	20.884	3	0.0001	160
Spring 2011	BB4 BB1 BB3 BB2	24.161	3	< 0.0001	160
Fall 2011	BB4 BB1 BB3 BB2	22.409	3	0.0001	160
Spring 2012	BB4 BB1 BB2 BB3	11.841	3	0.0079	160
Spring 2011 & 2012	BB4 BB1 BB2 BB3	31.794	3	< 0.0001	320
Fall 2010 & 2011	BB4 BB1 BB3 BB2	39.127	3	< 0.0001	320
All Events	BB4 BB1 BB3 BB2	63.503	3	< 0.0001	640

Table 4.2-33. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of SAV (BBCA Scores) and Percent Light Attenuation Among Study Areas, All Sampling Events. Red p Values Indicate a Significant Difference

Parameter	Study Areas				H	df	p	n
	Lowest			Highest				
Seagrass								
Fall 2010	BB4	BB1	BB3	BB2	16.250	3	0.0010	160
Spring 2011	BB4	BB1	BB3	BB2	10.974	3	0.0119	160
Fall 2011	BB4	BB1	BB3	BB2	9.542	3	0.0229	160
Spring 2012	BB4	BB3	BB1	BB2	5.839	3	0.1197	160
Spring 2011 & 2012	BB4	BB3	BB1	BB2	15.946	3	0.0012	320
Fall 2010 & 2011	BB4	BB1	BB3	BB2	22.301	3	0.0001	320
All Events	BB4	BB1	BB3	BB2	36.432	3	< 0.0001	640
Percent Light Attenuation[1]								
Fall 2010	BB2	BB1	BB3	BB4	83.063	3	< 0.0001	160
Spring 2011	BB2	BB1	BB4	BB3	77.324	3	< 0.0001	160
Fall 2011	BB1	BB2	BB3	BB4	110.415	3	< 0.0001	160
Spring 2012	BB1	BB4	BB2	BB3	106.399	3	< 0.0001	160
Spring 2011 & 2012	BB1	BB2	BB4	BB3	136.542	3	< 0.0001	320
Fall 2010 & 2011	BB1	BB2	BB3	BB4	166.802	3	< 0.0001	320
All Events	BB1	BB2	BB4	BB3	256.072	3	< 0.0001	640

Note: [1] Light attenuation monitored at only on sampling point per transect

Table 4.2-34. Mean Braun-Blanquet Coverage Abundance (BBCA) Scores for Total Macrophytes, Total Seagrass, and Total Macroalgae by Sampling Event, Transect and Study Area

Area	Transect	Total Macrophytes				Total Seagrass				Total Macroalgae			
		Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1	a	1.8	2.3	2.3	2.3	1.5	1.4	1.4	1.3	1.0	1.6	1.8	1.9
	b	1.2	2.7	2.4	2.5	0.9	1.6	1.4	1.4	1.0	2.0	2.2	2.1
	c	2.2	2.0	2.0	1.7	1.7	1.3	1.2	1.0	1.2	1.6	1.8	1.6
	d	2.2	3.0	2.2	1.9	1.5	1.3	1.2	1.3	1.4	2.2	1.9	1.2
	e	1.4	1.7	1.4	1.3	1.2	1.3	1.3	1.1	1.0	1.1	1.1	1.1
	Area	1.8	2.4	2.1	2.0	1.4	1.4	1.3	1.2	1.1	1.7	1.7	1.6
BB2	a	2.3	2.3	2.2	2.3	1.5	0.4	0.7	0.6	1.2	1.7	1.8	1.5
	b	2.0	2.3	2.6	1.7	1.1	1.1	0.7	0.8	1.2	1.8	2.2	1.4
	c	2.6	2.7	2.1	1.6	2.3	1.6	1.3	1.3	1.4	2.1	1.8	1.3
	d	3.3	3.4	2.3	2.4	2.2	1.8	1.6	1.5	1.8	2.3	1.7	1.9
	e	3.2	2.8	2.5	2.3	2.7	2.0	2.0	2.0	0.9	1.8	1.4	1.6
	Area	2.6	2.7	2.3	2.1	2.0	1.4	1.3	1.2	1.3	1.9	1.8	1.5
BB3	a	2.5	2.8	2.1	2.8	1.8	1.3	1.3	1.4	1.1	1.9	1.5	1.9
	b	1.4	2.8	2.1	2.3	0.8	0.8	1.0	0.9	1.1	2.4	1.6	2.1
	c	2.0	2.6	1.9	1.7	1.2	1.2	1.3	0.9	1.4	2.1	1.6	1.3
	d	2.1	2.2	2.0	2.3	1.6	1.3	1.2	1.1	1.2	1.9	1.7	1.6
	e	3.1	2.4	2.5	2.9	2.6	1.8	1.7	1.3	1.2	2.0	1.7	1.7
	Area	2.2	2.6	2.1	2.4	1.6	1.3	1.3	1.1	1.2	2.1	1.6	1.7

Table 4.2-34. Mean Braun-Blanquet Coverage Abundance (BBCA) Scores for Total Macrophytes, Total Seagrass, and Total Macroalgae by Sampling Event, Transect and Study Area

Area	Transect	Total Macrophytes				Total Seagrass				Total Macroalgae			
		Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB4	a	1.7	2.0	1.8	1.9	0.9	1.1	1.0	1.0	1.2	1.8	1.5	1.6
	b	2.1	2.4	1.8	1.8	0.9	1.1	1.1	0.9	1.3	1.8	1.4	1.5
	c	1.7	2.1	1.5	1.1	1.0	0.9	0.9	1.0	1.3	1.4	1.1	1.0
	d	2.0	1.5	1.7	1.5	1.6	0.9	0.9	1.1	1.2	1.3	1.2	1.0
	e	1.5	1.8	1.6	1.7	1.4	1.2	1.2	1.2	1.0	1.4	1.3	1.1
	Area	1.8	1.9	1.7	1.6	1.2	1.0	1.0	1.0	1.2	1.5	1.3	1.2

Table 4.2-35. Number of Points within Each Study Area Containing Each of Four Substrate Types, Spring 2012

Area	Sandy	Sandy Shell Hash Silty	Sandy Shell Hash	Sandy Shell Hash Silty	Silty Rubble
			Rubble	Rubble	
BB1	40	0	0	0	0
BB2	40	0	0	0	0
BB3	37	3	0	0	0
BB4	18	7	6	6	3
Total	**135**	**10**	**6**	**6**	**3**

Table 4.2-36. General Benthic Conditions Surrounding Each Ecological Sampling Point within Each Study Area, All Sampling Events Combined

Area	Metric	Seagrass			Fairly Open	Calcar-eous Algae	Drift Algae	Sponges	Gor-gonians	Corals	Rubble	Silty
		S	S-M	M-D								
BB1	Count[1]	38	15	4	37	37	16	29	14	23	0	5
	Sum[2]	108	23	6	95	67	24	55	29	31	0	6
	Percent[3]	67.5%	14.4%	3.8%	59.4%	41.9%	15.0%	34.4%	18.1%	19.4%	0.0%	3.8%
BB2	Count	21	28	15	27	34	27	37	23	21	0	0
	Sum	53	71	23	77	57	51	105	70	40	0	0
	Percent	33.1%	44.4%	14.4%	48.1%	35.6%	31.9%	65.6%	43.8%	25.0%	0.0%	0.0%
BB3	Count	29	37	4	32	35	28	36	26	20	0	3
	Sum	52	98	5	93	63	55	90	67	36	0	3
	Percent	32.5%	61.3%	3.1%	58.1%	39.4%	34.4%	56.3%	41.9%	22.5%	0.0%	1.9%
BB4	Count	38	17	2	35	35	27	15	5	27	17	19
	Sum	127	27	2	106	65	50	18	5	58	45	42
	Percent	79.4%	16.9%	1.3%	66.3%	40.6%	31.3%	11.3%	3.1%	36.3%	28.1%	26.3%

Notes:
[1] Number of points within each Study Area (n=40) where the category was present during any of the four sampling events.
[2] Number of occurences for all 4 sampling events combined (n=160).
[3] Percentage of the average number of occurrences at each sampling point for all 4 sampling events combined.

Key:
S = Sparse.
S-M = Sparse to Moderate.
M-D = Moderate to Dense.

Table 4.2-37. Percentage of Sampling Points along Each Transect Having Different Bottom Conditions, All Sampling Events Combined

Area	Transect	Seagrass			Fairly Open	Calcar-eous Algae	Drift Algae	Sponges	Gorgon-ians	Corals	Rubble	Silty
		S	S-M	M-D								
BB1	**a**	50%	16%	9%	28%	47%	22%	3%	0%	3%	0%	9%
	b	69%	19%	6%	53%	41%	16%	16%	3%	13%	0%	3%
	c	78%	13%	3%	75%	63%	0%	34%	0%	22%	0%	6%
	d	59%	13%	0%	72%	25%	34%	66%	59%	50%	0%	0%
	e	81%	13%	0%	69%	34%	3%	53%	28%	9%	0%	0%
	Area Total	**68%**	**14%**	**4%**	**59%**	**42%**	**15%**	**34%**	**18%**	**19%**	**0%**	**4%**
BB2	a	78%	9%	0%	63%	47%	44%	72%	63%	53%	0%	0%
	b	56%	19%	3%	78%	47%	31%	69%	69%	41%	0%	0%
	c	25%	66%	9%	69%	38%	9%	63%	56%	16%	0%	0%
	d	6%	56%	34%	28%	22%	47%	50%	22%	13%	0%	0%
	e	0%	72%	25%	3%	25%	28%	75%	9%	3%	0%	0%
	Area Total	**33%**	**44%**	**14%**	**48%**	**36%**	**32%**	**66%**	**44%**	**25%**	**0%**	**0%**
BB3	**a**	28%	63%	6%	59%	25%	53%	38%	41%	41%	0%	6%
	b	50%	47%	0%	88%	50%	38%	75%	78%	38%	0%	0%
	c	53%	44%	0%	75%	44%	28%	66%	59%	25%	0%	0%
	d	19%	75%	0%	53%	41%	13%	53%	22%	0%	0%	0%
	e	13%	78%	9%	16%	38%	41%	50%	9%	9%	0%	3%
	Area Total	**33%**	**61%**	**3%**	**58%**	**39%**	**34%**	**56%**	**42%**	**23%**	**0%**	**2%**

Table 4.2-37. Percentage of Sampling Points along Each Transect Having Different Bottom Conditions, All Sampling Events Combined

Area	Transect	Seagrass			Fairly Open	Calcar-eous Algae	Drift Algae	Sponges	Gorgon-ians	Corals	Rubble	Silty
		S	S-M	M-D								
BB4	a	97%	0%	0%	25%	31%	22%	9%	0%	59%	78%	63%
	b	94%	3%	0%	78%	50%	53%	16%	3%	69%	50%	9%
	c	81%	19%	0%	94%	38%	41%	16%	6%	22%	13%	3%
	d	69%	22%	3%	78%	50%	31%	9%	6%	22%	0%	13%
	e	56%	41%	3%	56%	34%	9%	6%	0%	9%	0%	44%
	Area Total	**79%**	**17%**	**1%**	**66%**	**41%**	**31%**	**11%**	**3%**	**36%**	**28%**	**26%**

Key:
S = Sparse.
S-M = Sparse to Moderate.
M-D = Moderate to Dense.

Table 4.2-38. Total Number of Taxa and Individuals Collected by Faunal Throw Traps and Percentage of Total Catch by Taxon for Each Study Area (N=20), Spring 2012

Taxa	Area				Total	% of Total Catch
	BB1	BB2	BB3	BB4		
Fish						
Anarchopterus criniger	3	8	9	16	36	3.7%
Diplogrammus pauciradiatus	4	12	12	1	29	2.9%
Gobiosoma robustum	1	12	10	5	28	2.8%
Hippocampus zosterae	7			3	10	1.0%
Paraclinus fasciatus	1	2	1	6	10	1.0%
Opsanus beta	4	2	2		8	0.8%
Microgobius sp.				3	3	0.3%
Syngnathus floridae	1			2	3	0.3%
Lagodon rhomboides		1	1		2	0.2%
Microgobius microlepis				2	2	0.2%
Chaenopsis limbaughi			1		1	0.1%
Cosmocampus albirostris				1	1	0.1%
Ctenogobius boleosoma		1			1	0.1%
Trinectes maculatus		1			1	0.1%
Total Fish	**21**	**39**	**36**	**39**	**135**	**13.7%**
Caridean Shrimp						
Thor floridanus	17	27	53	99	196	19.9%
Thor floridanus/manningi complex	5	9	8	20	42	4.3%
Hippolyte sp.	8	7	1	25	41	4.2%
Alpheidae		5	4	15	24	2.4%
Hippolyte pleuracanthus/zostericola complex	5			9	14	1.4%
Hippolyte zostericola	9		2	2	13	1.3%
Hippolyte cf. *obliquimanus*	9			1	10	1.0%
Hippolyte cf. *zostericola*	5	1		3	9	0.9%
Processa bermudensis		2	6	1	9	0.9%
Phycomenes siankaanensis	3	1	2	1	7	0.7%
Thor sp.	3	1	2	1	7	0.7%
Caridea sp. *A*		6			6	0.6%
Hippolyte pleuracanthus				6	6	0.6%
Caridea sp. B			3		3	0.3%
Latreutes fucorum		3			3	0.3%
Caridea			2		2	0.2%
Alpheus sp.		1			1	0.1%
Hippolyte cf. *pleuracanthus*				1	1	0.1%
Leander tenuicornis			1		1	0.1%
Periclimenes americanus			1		1	0.1%
Synalpheus sp.			1		1	0.1%
Total Caridean Shrimp	**64**	**63**	**86**	**184**	**397**	**40.3%**
Penaeid Shrimp						
Farfantepenaeus duorarum	3	1	2	2	8	0.8%
Farfantepenaeus sp.	1				1	0.1%
Total Penaeid Shrimp	**4**	**1**	**2**	**2**	**9**	**0.9%**
Mysid Shrimp						
Mysinae	1				1	0.1%
Siriella thompsonii	1				1	0.1%
Total Mysid Shrimp	**2**				**2**	**0.2%**
Crabs						
Paguroidea	159	46	51	81	337	34.2%
Xanthoidea	10	7	5	22	44	4.5%
Majoidea	1	4	6	1	12	1.2%
Callinectes sp.	6				6	0.6%
Callinectes similis				1	1	0.1%
Portunus sayi		1			1	0.1%
Portunus spinimanus			1		1	0.1%
Total Crabs	**176**	**58**	**63**	**105**	**402**	**40.8%**
Echinoderms						
Ophiuroidea		3	6	12	21	2.1%
Lytechinus variegatus		4	12	1	17	1.7%
Asteroidea			2		2	0.2%
Total Echinoderms		**7**	**20**	**13**	**40**	**4.1%**
Total	**267**	**168**	**207**	**343**	**985**	**100.0%**
Percentage of Total	**27.1%**	**17.1%**	**21.0%**	**34.8%**	**100.0%**	
Species Richness	**24**	**26**	**28**	**29**	**49**	

Table 4.2-39. Scientific and Common Names of Organisms Captured During Faunal Throw Trap (FTT) Sampling, All Sampling Events Combined

Taxa	Common Name
Fish	
Achirus lineatus	Lined sole
Anarchopterus criniger	Fringed pipefish
Bollmannia communis	Ragged goby
Chaenopsis limbaughi	Yellowface pikeblenny
Chaenopsis ocellata	Bluethroat pikeblenny
Cosmocampus albirostris	Whitenose pipefish
Cosmocampus elucens	Shortfin pipefish
Ctenogobius boleosoma	Darter goby
Diplogrammus pauciradiatus	Spotted dragonet
Gobiosoma grosvenori	Rockcut goby
Gobiosoma robustum	Code goby
Haemulon plumierii	White grunt
Hippocampus erectus	Spotted seahorse
Hippocampus zosterae	Dwarf seahorse
Lagodon rhomboides	Pinfish
Lucania parva	Rainwater killifish
Microgobius gulosus	Clown goby
Microgobius microlepis	Banner goby
Microgobius sp.	bannerfin gobies
Opsanus beta	Gulf toadfish
Paraclinus fasciatus	Banded blenny
Paraclinus marmoratus	Marbled blenny
Sphoeroides spengleri	Bandtail puffer
Syngnathus floridae	Dusky pipefish
Syngnathus louisianae	Chain pipefish
Trinectes maculatus	Hogchoker
Caridean Shrimp	
Alpheidae	Snapping shrimp
Alpheus floridanus	Sand snapping shrimp
Alpheus heterochaelis/estuariensis complex	Bigclaw/estuarine shrimp complex
Alpheus normani complex	Green snapping shrimp complex
Alpheus sp.	Snapping shrimp
Caridea	Caridean shrimp
Caridea A.	Unknown caridean shrimp
Caridea sp. A	Unknown caridean shrimp
Cuapetes americanus	Long-arm shrimp
Hipployte cf. obliquimanus	Humpback shrimp
Hippolyte cf. obliquimanus	Humpback shrimp
Hippolyte cf. pleuracanthus	Humpback shrimp
Hippolyte cf. zostericola	Humpback shrimp
Hippolyte obliquimanus	Hippolyte obliquimanus
Hippolyte pleuracanthus	False zostera shrimp
Hippolyte pleuracanthus/zostericola complex	Zostera shrimp/false zostera shrimp complex
Hippolyte sp.	Humpback shrimp
Hippolyte zostericola	Zostera shrimp
Latreutes fucorum	Slender sargassum shrimp
Leander tenuicornis	Brown grass shrimp
Periclimenes americanus	American grass shrimp
Periclimenes cf. americanus	American grass shrimp
Periclimenes iridescens	Iridescent shrimp
Periclimenes spp.	Grass shrimp
Phycomenes siankaanensis	Siankaanensis grass shrimp
Processa bermudensis	Bermuda night shrimp
Synalpheus bousfieldi	Bousfields snapping shrimp
Synalpheus brooksi complex	Brooks snapping shrimp complex
Synalpheus spp.	Snapping shrimp
Thor floridanus	Bryozoan shrimp
Thor floridanus/manningi complex	Bryozoan/Manning grass shrimp complex
Thor manningi	Manning grass shrimp
Thor sp.	Hippolytid shrimp

Table 4.2-39. Scientific and Common Names of Organisms Captured During Faunal Throw Trap (FTT) Sampling, All Sampling Events Combined

Taxa	Common Name
Penaeid Shrimp	
Farfantepenaeus duorarum	Pink shrimp
Farfantepenaeus sp.	Penaeid shrimp
Sicyonia spp.	Rock shrimp
Mysid Shrimp	
Bowmaniella dissimilis	Opossum shrimp
Bowmaniella mexicana	Opossum shrimp
Mysida	Opossum shrimp
Mysinae	Opossum shrimp
Siriella thompsonii	Thompson's opossum shrimp
Crabs	
Callinectes danae	Dana swimming crab
Callinectes ornatus	Shellig
Callinectes similis	Lesser blue crab
Callinectes sp.	Swimming crab
Epialtidae	Spider crabs
Majoidea	Spider crabs
Paguridae	Right-handed hermit crabs
Paguroidea	Hermit crab
Portunus gibbesii	Iridescent swimming crab
Portunus ordwayi	Redhair swimming crab
Portunus sayi	Sargassum swimming crab
Portunus sp.	Portunid crab
Portunus spinimanus	Blotched swimming crab
Xanthoidea	Mud crabs
Echinoderms	
Asteroidea	Sea stars
Echinaster spinulosus	Small-spine sea star
Lytechinus variegatus	Green sea urchin
Ophiuroidea	Brittle stars
Mollusks	
Octopus joubini	Atlantic pygmy octopus

Table 4.2-40. Number of and Percentage of Faunal Throw Trap Sampling Points Within the Project Area (n=80) in Which Each Taxon Occurred, Spring 2012

Taxa	Number of Points	Percent of Points
Fish		
Diplogrammus pauciradiatus	24	30.0%
Anarchopterus criniger	16	20.0%
Gobiosoma robustum	16	20.0%
Hippocampus zosterae	7	8.8%
Opsanus beta	7	8.8%
Paraclinus fasciatus	7	8.8%
Microgobius sp.	3	3.8%
Syngnathus floridae	3	3.8%
Lagodon rhomboides	2	2.5%
Microgobius microlepis	2	2.5%
Chaenopsis limbaughi	1	1.3%
Cosmocampus albirostris	1	1.3%
Ctenogobius boleosoma	1	1.3%
Trinectes maculatus	1	1.3%
Sub-total	**48**	**60.0%**
Caridean Shrimp		
Thor floridanus	34	42.5%
Thor floridanus/manningi complex	18	22.5%
Alpheidae	14	17.5%
Hippolyte sp.	14	17.5%
Hippolyte pleuracanthus/zostericola complex	9	11.3%
Hippolyte zostericola	9	11.3%
Hippolyte cf. obliquimanus	6	7.5%
Hippolyte cf. zostericola	6	7.5%
Phycomenes siankaanensis	6	7.5%
Processa bermudensis	5	6.3%
Thor sp.	5	6.3%
Hippolyte pleuracanthus	4	5.0%
Caridea sp. A	3	3.8%
Latreutes fucorum	2	2.5%
Alpheus sp.	1	1.3%
Caridea	1	1.3%
Caridea sp. B	1	1.3%
Hippolyte cf. pleuracanthus	1	1.3%
Leander tenuicornis	1	1.3%
Periclimenes americanus	1	1.3%
Synalpheus sp.	1	1.3%
Sub-total	**52**	**65.0%**
Penaeid Shrimp		
Farfantepenaeus duorarum	8	10.0%
Farfantepenaeus sp.	1	1.3%
Sub-total	**9**	**11.3%**
Mysid Shrimp		
Mysinae	1	1.3%
Siriella thompsonii	1	1.3%
Sub-total	**2**	**2.5%**
Crabs		
Paguroidea	63	78.8%
Xanthoidea	16	20.0%
Majoidea	11	13.8%
Callinectes sp.	4	5.0%
Callinectes similis	1	1.3%
Paguridae	1	1.3%
Portunus sayi	1	1.3%
Portunus spinimanus	1	1.3%
Sub-total	**65**	**81.3%**
Echinoderms		
Ophiuroidea	12	15.0%
Lytechinus variegatus	11	13.8%
Asteroidea	2	2.5%
Sub-total	**20**	**25.0%**
No Catch		
No Catch	4	5.0%
Total All Taxa	**4**	**5.0%**

Table 4.2-41. Minimum and Maximum Lengths of Measured Specimens for Each Taxon Captured by Faunal Throw Trap, Spring 2012

Taxa	Number Measured	Length (mm)		Type
		Minimum	Maximum	
Fish				
Anarchopterus criniger	36	**9.0***	**68.0****	SL
Diplogrammus pauciradiatus	29	10.0	35.0	SL
Gobiosoma robustum	28	10.0	**28.0****	SL
Hippocampus zosterae	10	11.0	30.0	SL
Paraclinus fasciatus	10	13.0	**37.0****	SL
Opsanus beta	8	**11.0***	99.0	SL
Microgobius sp.	3	17.0	**28.0****	SL
Syngnathus floridae	3	27.0	196.0	SL
Lagodon rhomboides	2	34.0	39.0	SL
Microgobius microlepis	2	21.0	24.0	SL
Chaenopsis limbaughi	1	30.0	30.0	SL
Cosmocampus albirostris	1	45.0	45.0	SL
Ctenogobius boleosoma	1	30.0	30.0	SL
Trinectes maculatus	1	73.0	73.0	SL
Caridean Shrimp				
Thor floridanus	196	1.2	3.1	CL
Thor floridanus/manningi complex	42	1	3	CL
Hippolyte sp.	41	0.9	2.8	CL
Alpheidae	24	2.2	9.6	CL
Hippolyte pleuracanthus/zostericola complex	14	1.4	2.6	CL
Hippolyte zostericola	13	1.4	2.7	CL
Hippolyte cf. *obliquimanus*	10	1.4	2.4	CL
Hippolyte cf. *zostericola*	9	1.5	2.4	CL
Processa bermudensis	9	3.3	5.4	CL
Phycomenes siankaanensis	7	1.7	3.1	CL
Thor sp.	7	0.9	1.7	CL
Caridea sp. A	6	2.2	3.9	CL
Hippolyte pleuracanthus	6	1.5	2.1	CL
Caridea A.	3	3.9	4.4	CL
Latreutes fucorum	3	2.5	3.2	CL
Caridea	2	1.5	1.5	CL
Alpheus sp.	1	4	4	CL
Hippolyte cf. *pleuracanthus*	1	1.6	1.6	CL
Leander tenuicornis	1	7.36	7.36	CL
Periclimenes americanus	1	3.5	3.5	CL
Synalpheus sp.	1	10.8	10.8	CL
Penaeid Shrimp				
Farfantepenaeus duorarum	8	8.5	**21.5****	CL
Farfantepenaeus sp.	1	7.1	7.1	CL
Mysid Shrimp				
Mysinae	1	1.9	1.9	CL
Siriella thompsonii	1	2	2	CL
Crabs				
Callinectes sp.	6	**7.2***	**18.2****	CW
Callinectes similis	1	70.1	70.1	CW
Portunus sayi	1	40.5	**40.5****	CW
Portunus spinimanus	1	24.4	24.4	CW

Notes:
***** Shortest specimens captured to date.
****** Longest specimens captured to date.

Table 4.2-42. Minimum and Maximum Lengths of Measured Specimens Captured by Faunal Throw Trap, All Sampling Events Combined

Taxa	Number Captured	Length (mm)		Type
		Minimum	Maximum	
Fish				
Gobiosoma robustum	224	7.5	28.0	SL
Anarchopterus criniger	93	9.0	68.0	SL
Diplogrammus pauciradiatus	86	5.8	36.2	SL
Hippocampus zosterae	65	10.0	30.7	SL
Opsanus beta	46	11.0	104.0	SL
Paraclinus fasciatus	30	9.1	37.0	SL
Lagodon rhomboides	16	11.0	83.0	SL
Microgobius microlepis	11	17.1	34.1	SL
Microgobius sp.	4	12.6	28.0	SL
Syngnathus floridae	3	27.0	196.0	SL
Cosmocampus albirostris	2	45.0	128.5	SL
Ctenogobius boleosoma	2	18.8	30.0	SL
Achirus lineatus	1	73.6	73.6	SL
Bollmannia cf. communis	1	30.0	30.0	SL
Chaenopsis limbaughi	1	30.0	30.0	SL
Chaenopsis ocellata	1	61.4	61.4	SL
Cosmocampus elucens	1	30.0	30.0	SL
Gobiosoma grosvenori	1	19.1	19.1	SL
Haemulon plumierii	1	51.5	51.5	SL
Hippocampus erectus	1	45.0	45.0	SL
Lucania parva	1	14.4	14.4	SL
Microgobius gulosus	1	24.9	24.9	SL
Paraclinus marmoratus	1	39.3	39.3	SL
Sphoeroides spengleri	1	54.7	54.7	SL
Syngnathus louisianae	1	140.0	140.0	SL
Trinectes maculatus	1	73.0	73.0	SL
Caridean Shrimp				
Thor floridanus	536	0.7	3.1	CL
Thor floridanus/manningi complex	336	0.8	3.0	CL
Thor sp.	308	0.7	2.8	CL
Caridea	150	0.9	3.5	CL
Hippolyte zostericola	119	1.0	3.4	CL
Hippolyte sp.	64	0.9	2.8	CL
Alpheidae	63	2.2	9.6	CL
Alpheus sp.	37	1.6	10.2	CL
Hippolyte pleuracanthus/zostericola complex	24	1.0	2.6	CL
Hippolyte cf. obliquimanus	18	1.3	2.4	CL
Thor manningi	17	0.9	2.6	CL
Alpheus normani complex	14	3.7	9.0	CL
Phycomenes siankaanensis	12	1.7	3.1	CL
Hippolyte cf. zostericola	11	1.5	2.4	CL
Processa bermudensis	11	1.1	5.4	CL
Hippolyte pleuracanthus	9	1.3	2.1	CL
Cuapetes americanus	8	1.5	3.8	CL
Hipployte cf. obliquimanus	8	0.8	2.6	CL
Periclimenes iridescens	7	1.9	2.7	CL
Caridea sp. A	6	2.2	3.9	CL
Latreutes fucorum	5	1.5	3.8	CL
Periclimenes sp.	4	2.0	3.3	CL
Alpheus heterochaelis/estuariensis complex	3	6.4	10.0	CL
Caridea A.	3	3.9	4.4	CL
Hippolyte obliquimanus	3	1.2	2.1	CL
Synalpheus brooksi complex	3	3.2	4.0	CL
Periclimenes americanus	2	3.5	3.8	CL
Synalpheus sp.	2	2.8	10.8	CL
Alpheus floridanus	1	11.5	11.5	CL
Hippolyte cf. pleuracanthus	1	1.6	1.6	CL
Leander tenuicornis	1	7.4	7.4	CL
Periclimenes cf. americanus	1	3.2	3.2	CL

Table 4.2-42. Minimum and Maximum Lengths of Measured Specimens Captured by Faunal Throw Trap, All Sampling Events Combined

Taxa	Number Captured	Length (mm)		Type
		Minimum	Maximum	
Synalpheus bousfieldi	1	3.3	3.3	CL
Penaeid Shrimp				
Farfantepenaeus duorarum	111	3.5	21.5	CL
Farfantepenaeus sp.	17	2.5	9.0	CL
Sicyonia sp.	1	2.0	2.0	CL
Mysid Shrimp				
Bowmaniella dissimilis	3	1.7	2.7	CL
Mysida	2	1.2	1.5	CL
Bowmaniella mexicana	1	2.0	2.0	CL
Mysinae	1	1.9	1.9	CL
Siriella thompsonii	1	2.0	2.0	CL
Crabs				
Callinectes sp.	7	7.2	18.2	CW
Callinectes ornatus	4	31.0	47.6	CW
Portunus ordwayi	2	9.5	16.1	CW
Portunus sayi	2	25.5	40.5	CW
Portunus sp.	2	11.0	13.5	CW
Callinectes danae	1	33.4	33.4	CW
Callinectes similis	1	70.1	70.1	CW
Portunus gibbesii	1	18.0	18.0	CW
Portunus spinimanus	1	24.4	24.4	CW
Mollusks				
Octopus joubini	1	22.1	22.1	ML

Key:
CL = Carapace Length. CW = Carapace Width. ML = Mantle Length. mm = Millimeter(s).
SL = Standard Length.

Table 4.2-43. Absolute Number of Fish, Caridean Shrimp, and Total Specimens (All Taxa) Collected by Faunal Throw Trap by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010			Spring 2011			Fall 2011			2012 Spring			Total		
		Fish	Car[1]	Total	Fish	Car	Total	Fish	Car	Total	Fish	Car	Total	Fish	Car	Total
BB1	a	0	1	8	6	31	79	14	240	397	13	29	122	33	301	606
	b	1	1	3	1	3	26	5	32	88	2	11	35	9	47	152
	c	3	5	9	5	3	28	3	20	83	2	4	34	13	32	154
	d	5	4	11	10	9	32	3	2	43	4	16	59	22	31	145
	e	0	0	0	2	0	9	11	76	118	0	4	17	13	80	144
	Total	**9**	**11**	**31**	**24**	**46**	**174**	**36**	**370**	**729**	**21**	**64**	**267**	**90**	**491**	**1201**
BB2	a	5	14	24	9	30	52	5	31	64	6	25	46	25	100	186
	b	2	11	15	7	27	41	9	9	44	12	10	47	30	57	147
	c	2	1	3	8	6	17	6	20	40	2	1	7	18	28	67
	d	9	44	55	5	22	29	2	39	48	7	4	19	23	109	151
	e	11	26	42	12	26	40	10	69	87	12	23	49	45	144	218
	Total	**29**	**96**	**139**	**41**	**111**	**179**	**32**	**168**	**283**	**39**	**63**	**168**	**141**	**438**	**769**
BB3	a	5	0	8	16	89	111	15	70	98	3	6	26	39	165	243
	b	2	15	21	4	12	21	4	20	33	7	17	49	17	64	124
	c	1	2	3	13	29	57	6	23	39	2	4	18	22	58	117
	d	11	3	16	21	63	103	5	10	27	8	5	24	45	81	170
	e	23	28	56	30	73	121	28	83	127	16	54	90	97	238	394
	Total	**42**	**48**	**104**	**84**	**266**	**413**	**58**	**206**	**324**	**36**	**86**	**207**	**220**	**606**	**1048**
BB4	a	0	1	3	3	14	28	3	19	42	6	11	21	12	45	94
	b	5	7	13	17	36	112	12	4	40	12	32	98	46	79	263
	c	2	0	2	10	3	26	10	25	58	6	14	25	28	42	111
	d	8	7	19	10	20	51	7	0	17	6	74	119	31	101	206
	e	5	9	6	9	10	0	6	3	0	9	53	4	29	75	10
	Total	**20**	**24**	**52**	**49**	**83**	**242**	**38**	**51**	**172**	**39**	**184**	**343**	**146**	**342**	**809**
All Areas	**Total**	**100**	**179**	**326**	**198**	**506**	**1008**	**164**	**795**	**1508**	**135**	**397**	**985**	**597**	**1877**	**3827**

Note: [1] Caridean Shrimp.

Table 4.2-44. Density (Number of Individuals/m^2) of Fish, Caridean Shrimp, and All Taxa Combined Collected by Faunal Throw Trap by Sampling Event, Transect and Study Area

Area	Transect	Fall 2010			Spring 2011			Fall 2011			2012 Spring			Total		
		Fish	Car[1]	Total	Fish	Car[1]	Total	Fish	Car[1]	Total	Fish	Car[1]	Total	Fish	Car[1]	Total
BB1	a	0.00	0.25	2.00	1.50	7.75	19.75	3.50	60.00	99.25	3.25	7.25	30.50	2.06	18.81	37.88
	b	0.25	0.25	0.75	0.25	0.75	6.50	1.25	8.00	22.00	0.50	2.75	8.75	0.56	2.94	9.50
	c	0.75	1.25	2.25	1.25	0.75	7.00	0.75	5.00	20.75	0.50	1.00	8.50	0.81	2.00	9.63
	d	1.25	1.00	2.75	2.50	2.25	8.00	0.75	0.50	10.75	1.00	4.00	14.75	1.38	1.94	9.06
	e	0.00	0.00	0.00	0.50	0.00	2.25	2.75	19.00	29.50	0.00	1.00	4.25	0.81	5.00	9.00
	Total	**0.45**	**0.55**	**1.55**	**1.20**	**2.30**	**8.70**	**1.80**	**18.50**	**36.45**	**1.05**	**3.20**	**13.35**	**1.13**	**6.14**	**15.01**
BB2	a	1.25	3.50	6.00	2.25	7.50	13.00	1.25	7.75	16.00	1.50	6.25	11.50	1.56	6.25	11.63
	b	0.50	2.75	3.75	1.75	6.75	10.25	2.25	2.25	11.00	3.00	2.50	11.75	1.88	3.56	9.19
	c	0.50	0.25	0.75	2.00	1.50	4.25	1.50	5.00	10.00	0.50	0.25	1.75	1.13	1.75	4.19
	d	2.25	11.00	13.75	1.25	5.50	7.25	0.50	9.75	12.00	1.75	1.00	4.75	1.44	6.81	9.44
	e	2.75	6.50	10.50	3.00	6.50	10.00	2.50	17.25	21.75	3.00	5.75	12.25	2.81	9.00	13.63
	Total	**1.45**	**4.80**	**6.95**	**2.05**	**5.55**	**8.95**	**1.60**	**8.40**	**14.15**	**1.95**	**3.15**	**8.40**	**1.76**	**5.48**	**9.61**
BB3	a	1.25	0.00	2.00	4.00	22.25	27.75	3.75	17.50	24.50	0.75	1.50	6.50	2.44	10.31	15.19
	b	0.50	3.75	5.25	1.00	3.00	5.25	1.00	5.00	8.25	1.75	4.25	12.25	1.06	4.00	7.75
	c	0.25	0.50	0.75	3.25	7.25	14.25	1.50	5.75	9.75	0.50	1.00	4.50	1.38	3.63	7.31
	d	2.75	0.75	4.00	5.25	15.75	25.75	1.25	2.50	6.75	2.00	1.25	6.00	2.81	5.06	10.63
	e	5.75	7.00	14.00	7.50	18.25	30.25	7.00	20.75	31.75	4.00	13.50	22.50	6.06	14.88	24.63
	Total	**2.10**	**2.40**	**5.20**	**4.20**	**13.30**	**20.65**	**2.90**	**10.30**	**16.20**	**1.80**	**4.30**	**10.35**	**2.75**	**7.58**	**13.10**
BB4	a	0.00	0.25	0.75	0.75	3.50	7.00	0.75	4.75	10.50	1.50	2.75	5.25	0.75	2.81	5.88
	b	1.25	1.75	3.25	4.25	9.00	28.00	3.00	1.00	10.00	3.00	8.00	24.50	2.88	4.94	16.44
	c	0.50	0.00	0.50	2.50	0.75	6.50	2.50	6.25	14.50	1.50	3.50	6.25	1.75	2.63	6.94
	d	2.00	1.75	4.75	2.50	5.00	12.75	1.75	0.00	4.25	1.50	18.50	29.75	1.94	6.31	12.88
	e	1.25	2.25	1.50	2.25	2.50	0.00	1.50	0.75	0.00	2.25	13.25	1.00	1.81	4.69	0.63
	Total	**1.00**	**1.20**	**2.60**	**2.45**	**4.15**	**12.10**	**1.90**	**2.55**	**8.60**	**1.95**	**9.20**	**17.15**	**1.83**	**4.28**	**10.11**
All Areas	**Total**	**1.25**	**2.24**	**4.08**	**2.48**	**6.33**	**12.60**	**2.05**	**9.94**	**18.85**	**1.69**	**4.96**	**12.31**	**1.87**	**5.87**	**11.96**

Note: [1] Caridean Shrimp.

Table 4.2-45. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Total Faunal Density (Number of Individuals/m^2), Total Fish Density, and Total Caridean Density among Transects, All Sampling Events. p Values in Red Indicate Significant Differences

Area	Sampling Event	Transect					H	df	p	n
		Lowest				Highest				
Total Density										
BB1	**Fall 2010**	e	b	a	d	c	7.371	4	0.1175	20
	Spring 2011	e	c	b	d	a	9.849	4	0.0431	20
	Fall 2011	d	c	b	e	a	4.979	4	0.2895	20
	Spring 2012	e	b	c	d	a	8.585	4	0.0724	20
	Spring 2011 & 2012	e	b	c	d	a	17.279	4	0.0017	40
	Fall 2010 & 2011	e	d	b	c	a	1.079	4	0.8976	40
	All Events	e	b	d	c	a	8.748	4	0.0677	80
BB2	**Fall 2010**	c	b	a	d	e	7.691	4	0.1036	20
	Spring 2011	c	d	b	e	a	6.020	4	0.1977	20
	Fall 2011	a	c	d	b	e	3.317	4	0.5062	20
	Spring 2012	c	d	a	b	e	5.445	4	0.2446	20
	Spring 2011 & 2012	c	d	b	a	e	10.559	4	0.0320	40
	Fall 2010 & 2011	c	a	b	d	e	7.477	4	0.1127	40
	All Events	c	d	a	b	e	14.603	4	0.0056	80
BB3	**Fall 2010**	c	a	d	b	e	9.220	4	0.0558	20
	Spring 2011	b	c	a	e	d	8.774	4	0.0670	20
	Fall 2011	d	b	c	a	e	11.094	4	0.0255	20
	Spring 2012	c	d	a	b	e	10.372	4	0.0346	20
	Spring 2011 & 2012	b	c	a	d	e	8.721	4	0.0685	40
	Fall 2010 & 2011	c	d	b	a	e	8.779	4	0.0669	40
	All Events	c	b	d	a	e	15.808	4	0.0033	80
BB4	**Fall 2010**	c	a	b	d	e	5.535	4	0.2366	20
	Spring 2011	e	c	d	a	b	5.536	4	0.2366	20
	Fall 2011	e	d	a	b	c	7.917	4	0.0947	20
	Spring 2012	a	c	e	d	b	1.798	4	0.7729	20
	Spring 2011 & 2012	e	c	a	d	b	5.223	4	0.2651	40
	Fall 2010 & 2011	d	e	a	c	b	0.410	4	0.9816	40
	All Events	e	c	a	d	b	4.396	4	0.3551	80

Key: ANOVA = Analysis of variance. df = Degrees of freedom. m^2 = Square meter(s).

Table 4.2-45. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Total Faunal Density (Number of Individuals/m^2), Total Fish Density, and Total Caridean Density among Transects, All Sampling Events. p Values in Red Indicate Significant Differences

Area	Sampling Event	Transect (Lowest → Highest)	H	df	p	n
Total Fish Density						
BB1	Fall 2010	a e b c d	5.234	4	0.2642	20
	Spring 2011	b e c a d	7.012	4	0.1352	20
	Fall 2011	c d b e a	2.688	4	0.6112	20
	Spring 2012	e b c d a	11.715	4	0.0196	20
	Spring 2011 & 2012	e b c d a	15.830	4	0.0033	40
	Fall 2010 & 2011	e b c a d	0.253	4	0.9926	40
	All Events	e b c d a	9.948	4	0.0413	80
BB2	Fall 2010	b c a d e	7.054	4	0.1331	20
	Spring 2011	d c b a e	2.648	4	0.6184	20
	Fall 2011	a d c b e	2.423	4	0.6584	20
	Spring 2012	c a d b e	4.242	4	0.3742	20
	Spring 2011 & 2012	c d a b e	5.735	4	0.2198	40
	Fall 2010 & 2011	c a b d e	4.680	4	0.3218	40
	All Events	c d a b e	9.813	4	0.0437	80
BB3	Fall 2010	c b a d e	11.197	4	0.0244	20
	Spring 2011	b c a d e	11.465	4	0.0218	20
	Fall 2011	d b c a e	9.157	4	0.0573	20
	Spring 2012	c a b d e	4.655	4	0.3246	20
	Spring 2011 & 2012	b c a d e	9.914	4	0.0419	40
	Fall 2010 & 2011	b c a d e	15.154	4	0.0044	40
	All Events	b c a d e	23.784	4	0.0001	80
BB4	Fall 2010	a b c e d	5.787	4	0.2156	20
	Spring 2011	a e d c b	3.877	4	0.4230	20
	Fall 2011	a e d c b	3.656	4	0.4545	20
	Spring 2012	b e a c d	0.094	4	0.9989	20
	Spring 2011 & 2012	a e d c b	2.332	4	0.6750	40
	Fall 2010 & 2011	a c e b d	4.484	4	0.3444	40
	All Events	a e c d b	5.199	4	0.2675	80

Key: ANOVA = Analysis of variance. df = Degrees of freedom. m^2 = Square meter(s).

Table 4.2-45. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Total Faunal Density (Number of Individuals/m^2), Total Fish Density, and Total Caridean Density among Transects, All Sampling Events. p Values in Red Indicate Significant Differences

Area	Sampling Event	Transect (Lowest → Highest)	H	df	p	n
Total Caridean Density						
BB1	Fall 2010	e a b d c	6.367	4	0.1734	20
	Spring 2011	e b c a d	4.499	4	0.3427	20
	Fall 2011	d c b e a	9.097	4	0.0587	20
	Spring 2012	e c b d a	6.402	4	0.1710	20
	Spring 2011 & 2012	e c b d a	8.462	4	0.0760	40
	Fall 2010 & 2011	d b c e a	1.389	4	0.8461	40
	All Events	e c d b a	3.944	4	0.4137	80
BB2	Fall 2010	c b a d e	7.213	4	0.1250	20
	Spring 2011	c d b e a	6.702	4	0.1525	20
	Fall 2011	a c b d e	4.574	4	0.3339	20
	Spring 2012	c d b a e	5.743	4	0.2192	20
	Spring 2011 & 2012	c d b a e	10.048	4	0.0396	40
	Fall 2010 & 2011	c a b d e	10.866	4	0.0281	40
	All Events	c b d a e	16.875	4	0.0020	80
BB3	Fall 2010	a c d b e	7.413	4	0.1156	20
	Spring 2011	b c e a d	5.894	4	0.2072	20
	Fall 2011	d b c a e	10.072	4	0.0392	20
	Spring 2012	c a d b e	3.787	4	0.4356	20
	Spring 2011 & 2012	b c a d e	3.885	4	0.4218	40
	Fall 2010 & 2011	d c a b e	7.679	4	0.1041	40
	All Events	c d b a e	9.781	4	0.0443	80
BB4	Fall 2010	c a b d e	6.658	4	0.1551	20
	Spring 2011	c e d a b	7.132	4	0.1291	20
	Fall 2011	d b e c a	5.775	4	0.2166	20
	Spring 2012	a c e d b	1.824	4	0.7681	20
	Spring 2011 & 2012	c e a d b	6.835	4	0.1449	40
	Fall 2010 & 2011	d c b a e	1.319	4	0.8581	40
	All Events	c e d a b	3.139	4	0.5348	80

Key: ANOVA = Analysis of variance. df = Degrees of freedom. m^2 = Square meter(s).

Table 4.2-46. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Total Faunal Density (Number of Individuals/m^2), Total Fish Density, and Total Caridean Density among Study Areas, All Sampling Events. p Values in Red Indicate Significant Differences

Parameter	Study Areas				H	df	p	n
	Lowest			Highest				
Total Density								
Fall 2010	BB1	BB4	BB3	BB2	6.722	3	0.0813	80
Spring 2011	BB1	BB4	BB2	BB3	9.437	3	0.0240	80
Fall 2011	BB4	BB2	BB3	BB1	9.705	3	0.0212	80
Spring 2012	BB2	BB4	BB3	BB1	2.862	3	0.4133	80
Spring 2011 & 2012	BB2	BB4	BB1	BB3	5.490	3	0.1392	160
Fall 2010 & 2011	BB4	BB1	BB2	BB3	2.921	3	0.4040	160
All Events	BB4	BB2	BB1	BB3	6.376	3	0.0947	320
Total Fish Density								
Fall 2010	BB1	BB4	BB3	BB2	8.058	3	0.0448	80
Spring 2011	BB1	BB4	BB2	BB3	13.366	3	0.0039	80
Fall 2011	BB1	BB2	BB4	BB3	2.826	3	0.4193	80
Spring 2012	BB1	BB4	BB3	BB2	2.503	3	0.4747	80
Spring 2011 & 2012	BB1	BB4	BB2	BB3	11.441	3	0.0096	160
Fall 2010 & 2011	BB1	BB4	BB2	BB3	6.504	3	0.0895	160
All Events	BB1	BB4	BB2	BB3	17.424	3	0.0006	320
Total Caridean Density								
Fall 2010	BB1	BB4	BB3	BB2	5.938	3	0.1146	80
Spring 2011	BB1	BB4	BB2	BB3	23.276	3	< 0.0001	80
Fall 2011	BB4	BB2	BB1	BB3	10.367	3	0.0157	80
Spring 2012	BB2	BB3	BB1	BB4	2.381	3	0.4971	80
Spring 2011 & 2012	BB1	BB4	BB2	BB3	10.059	3	0.0181	160
Fall 2010 & 2011	BB4	BB1	BB2	BB3	8.498	3	0.0368	160
All Events	BB1	BB4	BB2	BB3	12.800	3	0.0051	320

Key: ANOVA = Analysis of variance. df = Degrees of freedom. m^2 = Square meter(s).

Table 4.2-47. Comparison of Taxa Collected Among Sampling Events

Taxa	Fall 2010		Spring 2011		Fall 2011		Spring 2012		All Events		
	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent of Group	Percent of Total Catch
Fish											
Gobiosoma robustum	49	15.03%	76	7.54%	72	4.77%	28	2.84%	225	37.69%	5.88%
Anarchopterus criniger	13	3.99%	14	1.39%	30	1.99%	36	3.65%	93	15.58%	2.43%
Diplogrammus pauciradiatus	14	4.29%	26	2.58%	17	1.13%	29	2.94%	86	14.41%	2.25%
Hippocampus zosterae	12	3.68%	23	2.28%	20	1.33%	10	1.02%	65	10.89%	1.70%
Opsanus beta	4	1.23%	23	2.28%	11	0.73%	8	0.81%	46	7.71%	1.20%
Paraclinus fasciatus	5	1.53%	13	1.29%	2	0.13%	10	1.02%	30	5.03%	0.78%
Lagodon rhomboides	1	0.31%	10	0.99%	3	0.20%	2	0.20%	16	2.68%	0.42%
Microgobius microlepis			6	0.60%	3	0.20%	2	0.20%	11	1.84%	0.29%
Microgobius sp.					1	0.07%	3	0.30%	4	0.67%	0.10%
Syngnathus floridae							3	0.30%	3	0.50%	0.08%
Cosmocampus albirostris			1	0.10%			1	0.10%	2	0.34%	0.05%
Ctenogobius boleosoma					1	0.07%	1	0.10%	2	0.34%	0.05%
Achirus lineatus			1	0.10%					1	0.17%	0.03%
Bollmannia cf. communis			1	0.10%					1	0.17%	0.03%
Chaenopsis limbaughi							1	0.10%	1	0.17%	0.03%
Chaenopsis ocellata			1	0.10%					1	0.17%	0.03%
Cosmocampus elucens			1	0.10%					1	0.17%	0.03%
Gobiosoma grosvenori					1	0.07%			1	0.17%	0.03%
Haemulon plumierii					1	0.07%			1	0.17%	0.03%
Hippocampus erectus			1	0.10%					1	0.17%	0.03%
Lucania parva					1	0.07%			1	0.17%	0.03%
Microgobius gulosus					1	0.07%			1	0.17%	0.03%
Paraclinus marmoratus	1	0.31%							1	0.17%	0.03%
Sphoeroides spengleri			1	0.10%					1	0.17%	0.03%
Syngnathus louisianae	1	0.31%							1	0.17%	0.03%
Trinectes maculatus							1	0.10%	1	0.17%	0.03%
Total for Fish	**100**	**30.37%**	**198**	**19.64%**	**164**	**10.88%**	**135**	**13.71%**	**597**	**100.00%**	**15.60%**
Caridean Shrimp											
Thor floridanus			192	19.05%	148	9.81%	196	19.90%	536	28.56%	14.01%
Thor floridanus/manningi complex			33	3.27%	323	21.42%	42	4.26%	398	21.20%	10.40%
Thor sp.			108	10.71%	211	13.99%	7	0.71%	326	17.37%	8.52%
Caridea	140	42.94%	5	0.50%	12	0.80%	2	0.20%	159	8.47%	4.15%
Hippolyte zostericola			85	8.43%	21	1.39%	13	1.32%	119	6.34%	3.11%
Hippolyte sp.			2	0.20%	21	1.39%	41	4.16%	64	3.41%	1.67%

Table 4.2-47. Comparison of Taxa Collected Among Sampling Events

Taxa	Fall 2010		Spring 2011		Fall 2011		Spring 2012		All Events		
	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent of Group	Percent of Total Catch
Alpheidae	39	11.96%					24	2.44%	63	3.36%	1.65%
Alpheus sp.			15	1.49%	21	1.39%	1	0.10%	37	1.97%	0.97%
Hippolyte pleuracanthus/zostericola complex			3	0.30%	7	0.46%	14	1.42%	24	1.28%	0.63%
Hippolyte cf. obliquimanus			8	0.79%	8	0.53%	10	1.02%	26	1.39%	0.68%
Thor manningi			12	1.19%	5	0.33%			17	0.91%	0.44%
Alpheus normani complex			14	1.39%					14	0.75%	0.37%
Phycomenes siankaanensis			5	0.50%			7	0.71%	12	0.64%	0.31%
Hippolyte cf. zostericola			1	0.10%	1	0.07%	9	0.91%	11	0.59%	0.29%
Processa bermudensis			2	0.20%			9	0.91%	11	0.59%	0.29%
Hippolyte pleuracanthus					3	0.20%	6	0.61%	9	0.48%	0.24%
Cuapetes americanus			8	0.79%					8	0.43%	0.21%
Periclimenes iridescens			1	0.10%	6	0.40%			7	0.37%	0.18%
Caridea sp. A							6	0.61%	6	0.32%	0.16%
Latreutes fucorum			2	0.20%			3	0.30%	5	0.27%	0.13%
Periclimenes sp.					4	0.27%			4	0.21%	0.10%
Alpheus heterochaelis/estuariensis complex			3	0.30%					3	0.16%	0.08%
Caridea sp. B							3	0.30%	3	0.16%	0.08%
Hippolyte obliquimanus			1	0.10%	2	0.13%			3	0.16%	0.08%
Synalpheus brooksi complex			3	0.30%					3	0.16%	0.08%
Periclimenes americanus					1	0.07%	1	0.10%	2	0.11%	0.05%
Synalpheus sp.			1	0.10%			1	0.10%	2	0.11%	0.05%
Alpheus floridanus			1	0.10%					1	0.05%	0.03%
Hippolyte cf. pleuracanthus						0.00%	1	0.10%	1	0.05%	0.03%
Leander tenuicornis							1	0.10%	1	0.05%	0.03%
Periclimenes cf. americanus					1	0.07%			1	0.05%	0.03%
Synalpheus bousfieldi			1	0.10%					1	0.05%	0.03%
Total for Caridean Shrimp	**179**	**55.21%**	**506**	**50.20%**	**795**	**52.72%**	**397**	**40.30%**	**1877**	**100.00%**	**49.05%**
Penaeid Shrimp											
Farfantepenaeus duorarum	16	4.91%	9	0.89%	78	5.17%	8	0.81%	111	86.05%	2.90%
Farfantepenaeus sp.			15	1.49%	2	0.13%	1	0.10%	18	13.95%	0.47%
Total for Penaeid Shrimp	**16**	**4.91%**	**24**	**2.38%**	**80**	**5.31%**	**9**	**0.91%**	**129**	**100.00%**	**3.37%**
Rock Shrimp											
Sicyonia sp.			1	0.10%					1	100.00%	0.03%
Total for Rock Shrimp			**1**	**0.10%**					**1**	**100.00%**	**0.03%**

Table 4.2-47. Comparison of Taxa Collected Among Sampling Events

Taxa	Fall 2010		Spring 2011		Fall 2011		Spring 2012		All Events		
	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent Catch	Number Collected	Percent of Group	Percent of Total Catch
Mysid Shrimp											
Bowmaniella dissimilis			1	0.10%	2	0.13%			3	37.50%	0.08%
Mysida			1	0.10%	1	0.07%			2	25.00%	0.05%
Bowmaniella mexicana					1	0.07%			1	12.50%	0.03%
Mysinae							1	0.10%	1	12.50%	0.03%
Siriella thompsonii							1	0.10%	1	12.50%	0.03%
Total for Mysid Shrimp	**0**	**0.00%**	**2**	**0.20%**	**4**	**0.27%**	**2**	**0.20%**	**8**	**100.00%**	**0.21%**
Crabs											
Paguroidea	8	2.45%	216	21.43%	389	25.80%	337	34.21%	950	84.29%	24.82%
Xanthoidea	3	0.92%	35	3.47%	22	1.46%	44	4.47%	104	9.23%	2.72%
Majoidea	17	5.21%	8	0.79%	15	0.99%	12	1.22%	52	4.61%	1.36%
Callinectes sp.					1	0.07%	6	0.61%	7	0.62%	0.18%
Callinectes ornatus	3	0.92%			1	0.07%			4	0.35%	0.10%
Portunus ordwayi					2	0.13%			2	0.18%	0.05%
Portunus sayi			1	0.10%			1	0.10%	2	0.18%	0.05%
Portunus sp.			1	0.10%	1	0.07%			2	0.18%	0.05%
Callinectes danae					1	0.07%			1	0.09%	0.03%
Callinectes similis							1	0.10%	1	0.09%	0.03%
Portunus gibbesii					1	0.07%			1	0.09%	0.03%
Portunus spinimanus							1	0.10%	1	0.09%	0.03%
Total for Crabs	**31**	**9.51%**	**261**	**25.89%**	**433**	**28.71%**	**402**	**40.81%**	**1127**	**100.00%**	**29.45%**
Echinoderms											
Ophiuroidea			12	1.19%	11	0.73%	21	2.13%	44	50.57%	1.15%
Lytechinus variegatus					5	0.33%	17	1.73%	22	25.29%	0.57%
Echinaster spinulosus			4	0.40%	15	0.99%			19	21.84%	0.50%
Asteroidea							2	0.20%	2	2.30%	0.05%
Total for Echinoderms	**0**	**0.00%**	**16**	**1.59%**	**31**	**2.06%**	**40**	**4.06%**	**87**	**100.00%**	**2.27%**
Mollusks											
Octopus joubini					1	0.07%			1	100.00%	0.03%
Total for Mollusks	**0**	**0.00%**	**0**	**0.00%**	**1**	**0.07%**	**0**	**0.00%**	**1**	**100.00%**	**0.03%**
Grand Total	**326**	**100.00%**	**1008**	**100.00%**	**1508**	**100.00%**	**985**	**100.00%**	**3827**	**NA**	**100.00%**

Table 4.2-48. Light Readings (µmols/m^2/sec) Taken Simultaneously in Air and at Each of Three Water Depths at One Point Along Each Transect, Spring 2012

Area	Transect	Sub-Surface					Mid-Depth					Off-Bottom				
		Depth (m)	Air	Water Column	ATN[1]	ATN%	Depth (m)	Air	Water Column	ATN	ATN%	Depth (m)	Air	Water Column	ATN	ATN%
BB1	a	0.3	1215	1100	115	9%	0.6	1214	1022	193	16%	0.9	1207	1114	93	8%
	b	0.3	1168	1109	59	5%	0.8	1164	1104	60	5%	1.2	1133	864	270	24%
	c	0.3	2268	2135	133	6%	0.9	2289	1913	376	16%	1.5	2302	1513	789	34%
	d	0.3	2312	2141	171	7%	0.9	2316	1864	452	19%	1.6	2321	1671	651	28%
	e	0.3	2368	2233	135	6%	1.0	2359	2093	267	11%	1.6	2359	1771	588	25%
	Area	0.3	1866	1744	122	7%	0.8	1868	1599	269	14%	1.4	1864	1386	478	24%
BB2	a	0.3	2381	2210	171	7%	1.1	2382	1869	514	22%	1.8	2381	1554	827	35%
	b	0.3	2396	2234	162	7%	1.2	2390	1796	594	25%	2.1	2391	1339	1052	44%
	c	0.3	2389	2172	217	9%	1.5	2389	1555	834	35%	2.7	2391	1044	1347	56%
	d	0.3	2396	2219	177	7%	1.5	2395	1541	854	36%	2.6	2397	1109	1288	54%
	e	0.3	2399	2189	211	9%	1.5	2403	1426	978	41%	2.6	2397	1075	1323	55%
	Area	0.3	2392	2205	187	8%	1.3	2392	1637	755	32%	2.4	2391	1224	1167	49%
BB3	a	0.3	2393	2194	200	8%	1.3	2394	1517	877	37%	2.3	2390	1109	1281	54%
	b	0.3	2360	1967	394	17%	1.5	2353	1218	1135	48%	2.8	2350	965	1386	59%
	c	0.3	2307	2181	127	5%	1.6	2307	1396	911	39%	2.9	2314	1074	1241	54%
	d	0.3	2129	1957	172	8%	1.7	2153	1237	916	43%	3.1	2158	752	1407	65%
	e	0.3	2054	1902	152	7%	1.8	2049	799	1251	61%	3.2	2067	269	1798	87%
	Area	0.3	2248	2040	209	9%	1.6	2251	1233	1018	46%	2.9	2256	834	1422	64%
BB4	a	0.3	1559	1274	285	18%	0.9	1547	893	654	42%	1.5	1552	760	792	51%
	b	0.3	1655	1636	20	1%	1.0	1645	1019	626	38%	1.7	1667	953	714	43%
	c	0.3	1732	1494	238	14%	1.0	1721	1380	341	20%	1.7	1695	960	736	43%
	d	0.3	1829	1810	19	1%	1.1	1832	1388	444	24%	2.0	1812	978	835	46%
	e	0.3	1955	1862	93	5%	1.4	1952	1140	812	42%	2.4	1958	637	1321	67%
	Area	0.3	1746	1615	131	8%	1.1	1739	1164	575	33%	1.9	1737	857	879	50%

Note: [1] Attenuation (ATN) is the difference between the air and water readings.

Key: µmols/m^2/sec = Micromoles per square meter per second. m = Meter(s).

Table 4.2-49. Percent Light Attenuation and Light Attenuation Percent Loss per Meter at Each of Three Water Depths at One Point Along Each Transect, Spring 2012

Area	Transect	Sub-Surface				Mid-Depth				Off-Bottom				All Depths
		Depth (m)	ATN[1]	ATN%	ATN% Loss per Meter	Depth (m)	ATN	ATN%	ATN% Loss per Meter	Depth (m)	ATN	ATN%	ATN% Loss per Meter	ATN% Loss per Meter
BB1	a	0.3	115	9%	32%	0.6	193	16%	26%	0.9	93	8%	9%	22%
	b	0.3	59	5%	17%	0.8	60	5%	7%	1.2	270	24%	20%	14%
	c	0.3	133	6%	19%	0.9	376	16%	18%	1.5	789	34%	22%	20%
	d	0.3	171	7%	25%	0.9	452	19%	21%	1.6	651	28%	18%	21%
	e	0.3	135	6%	19%	1.0	267	11%	12%	1.6	588	25%	15%	15%
	Area	0.3	122	7%	22%	0.8	269	14%	17%	1.4	478	24%	17%	19%
BB2	a	0.3	171	7%	24%	1.1	514	22%	20%	1.8	827	35%	19%	21%
	b	0.3	162	7%	23%	1.2	594	25%	20%	2.1	1052	44%	21%	21%
	c	0.3	217	9%	30%	1.5	834	35%	24%	2.7	1347	56%	21%	25%
	d	0.3	177	7%	25%	1.5	854	36%	25%	2.6	1288	54%	21%	23%
	e	0.3	211	9%	29%	1.5	978	41%	28%	2.6	1323	55%	21%	26%
	Area	0.3	187	8%	26%	1.3	755	32%	23%	2.4	1167	49%	21%	23%
BB3	a	0.3	200	8%	28%	1.3	877	37%	28%	2.3	1281	54%	23%	26%
	b	0.3	394	17%	56%	1.5	1135	48%	31%	2.8	1386	59%	21%	36%
	c	0.3	127	5%	18%	1.6	911	39%	25%	2.9	1241	54%	18%	20%
	d	0.3	172	8%	27%	1.7	916	43%	25%	3.1	1407	65%	21%	24%
	e	0.3	152	7%	25%	1.8	1251	61%	35%	3.2	1798	87%	27%	29%
	Area	0.3	209	9%	31%	1.6	1018	46%	29%	2.9	1422	64%	22%	27%
BB4	a	0.3	285	18%	61%	0.9	654	42%	47%	1.5	792	51%	34%	47%
	b	0.3	20	1%	4%	1.0	626	38%	38%	1.7	714	43%	25%	22%
	c	0.3	238	14%	46%	1.0	341	20%	20%	1.7	736	43%	26%	30%
	d	0.3	19	1%	3%	1.1	444	24%	21%	2.0	835	46%	23%	16%
	e	0.3	93	5%	16%	1.4	812	42%	31%	2.4	1321	67%	28%	25%
	Area	0.3	131	8%	26%	1.1	575	33%	31%	1.9	879	50%	27%	28%

Note: [1] Attenuation (ATN) is the difference between the air and water readings.

Key: m = Meter(s).

Table 4.2-50. Total Nitrogen (TN), Total Phosphorus (TP), Total Carbon (TC) and Dry Bulk Density of Sediments Composited by Depth Strata (Horizon) from Two Core Samples Collected on Each Transect, Fall 2010 (Nutrients) and Fall 2011 (Dry Bulk Density)

Area	Transect	Horizon	By Horizon				All Horizons Combined			
			TN (mg/kg)	TP (mg/kg)	TC (mg/kg)	Dry Bulk Density (g/cc)	Mean TN (mg/kg)	Mean TP (mg/kg)	Mean TC (mg/kg)	Mean Dry Bulk Density (g/cc)
BB1	a	10	630	38	866400	0.31	710.0	46.7	881366.7	0.453
		20	500	34	923400	0.42				
		30	1000	68	854300	0.63				
	b	10	710	42	933600	0.88	683.3	36.3	917470.2	0.830
		20	730	33	924100	0.96				
		30	610	34	894711	0.65				
	c	10	350	34	912400	1.10	406.7	32.3	933733.3	1.027
		20	390	33	931000	1.20				
		30	480	30	957800	0.78				
	d[1]	10	200	26	986400	1.20	200.0	26.0	986400.0	1.163
		20				0.99				
		30				1.30				
	e	10	210	26	982200	1.30	210.0	26.7	965600.0	1.200
		20	190	26	943700	1.20				
		30	230	28	970900	1.10				
	Area Means		479.2	34.8	929300.8	0.935				
BB2	a[1]	10	250	28	964800	1.30	250.0	27.0	969650.0	1.267
		20	250	26	974500	1.30				
		30				1.20				
	b[2]	10	290	27	952900	1.10	393.3	27.0	970133.3	1.100
		20	560	28	972700	1.10				
		30	330	26	984800					
	c	10	320	26	988300	1.10	306.7	27.0	984300.0	1.233
		20	170	27	985700	1.20				
		30	430	28	978900	1.40				
	d	10	390	26	975800	1.20	526.7	26.0	980966.7	1.267
		20	440	26	984200	1.30				
		30	750	26	982900	1.30				
	e	10	380	55	957300	1.00	406.7	41.0	778200.0	1.167
		20	210	31	408300	1.20				
		30	630	37	969000	1.30				
	Area Means		385.7	29.8	934292.9	1.214				
BB3	a	10	200	30	975600	1.10	490.0	29.0	967333.3	1.133
		20	290	27	973800	1.20				
		30	980	30	952600	1.10				
	b	10	280	32	959900	1.00	266.7	36.3	966903.8	1.133
		20	330	29	971212	1.10				
		30	190	48	969600	1.30				
	c	10	320	30	961700	0.96	273.3	29.7	956800.0	1.053
		20	240	29	958100	1.10				
		30	260	30	950600	1.10				
	d	10	300	34	923922	0.81	340.0	34.3	946943.3	0.917
		20	370	33	946005	0.97				
		30	350	36	970903	0.97				
	e	10	460	34	953400	0.62	376.7	32.7	959236.9	0.753
		20	340	34	959700	0.86				
		30	330	30	964611	0.78				
	Area Means		349.3	32.4	959443.5	0.998				

Table 4.2-50. Total Nitrogen (TN), Total Phosphorus (TP), Total Carbon (TC) and Dry Bulk Density of Sediments Composited by Depth Strata (Horizon) from Two Core Samples Collected on Each Transect, Fall 2010 (Nutrients) and Fall 2011 (Dry Bulk Density)

Area	Transect	Horizon	By Horizon				All Horizons Combined			
			TN (mg/kg)	TP (mg/kg)	TC (mg/kg)	Dry Bulk Density (g/cc)	Mean TN (mg/kg)	Mean TP (mg/kg)	Mean TC (mg/kg)	Mean Dry Bulk Density (g/cc)
BB4	a	10	1000	50	959200	0.78	600.0	65.7	943334.9	0.513
		20	570	78	930205	0.35				
		30	230	69	940600	0.41				
	b	10	820	42	952200	0.99	850.0	57.7	923033.3	0.873
		20	750	51	917800	1.00				
		30	980	80	899100	0.63				
	c[3]	10	370	30	942000	1.10	625.0	38.0	931333.3	1.233
		20		36	967100	1.20				
		30	880	48	884900	1.40				
	d	10	480	30	958100	0.97	386.7	28.3	967473.9	1.023
		20	260	29	976022	1.00				
		30	420	26	968300	1.10				
	e	10	200	29	959100	0.93	210.0	31.3	959133.3	1.043
		20	250	32	956700	1.20				
		30	180	33	961600	1.00				
	Area Means		527.9	44.2	944861.8	0.937				

Notes:
[1] Insufficient sediment depth to collect 30 cm core for nutrient analysis (Nov. 2010).
[2] Insufficient sediment depth to collect 30 cm core for dry bulk density (Nov. 2011).
[3] TN Value for the 20 cm horizon removed as an outlier in statistical comparisons.

Key:
g/cc = Grams per cubic centimeter.
mg/kg = Milligram(s) per kilogram.

Table 4.2-51. Total Nitrogen (TN) to Total Phosphorus (TP) and Total Carbon (TC) to Total Nitrogen Ratios in Sediments Composited by Depth Strata (Horizon) from Two Core Samples Collected on Each Transect, Fall 2010

Area	Transect	Horizon	By Horizon		Horizons Combined	
			TN:TP Ratio	TC:TN Ratio	Mean TN:TP Ratio	Mean TC:TN Ratio
BB1	a	10	17:1	1375:1	15:1	1241:1
		20	15:1	1847:1		
		30	15:1	854:1		
	b	10	17:1	1315:1	19:1	1343:1
		20	22:1	1266:1		
		30	18:1	1467:1		
	c	10	10:1	2607:1	13:1	2296:1
		20	12:1	2387:1		
		30	16:1	1995:1		
	d[1]	10	8:1	4932:1	8:1	4932:1
	e	10	8:1	4677:1	8:1	4598:1
		20	7:1	4967:1		
		30	8:1	4221:1		
	Area Means		13:1	2609:1		
BB2	a[1]	10	9:1	3859:1	9:1	3879:1
		20	10:1	3898:1		
	b	10	11:1	3286:1	15:1	2466:1
		20	20:1	1737:1		
		30	13:1	2984:1		
	c	10	12:1	3088:1	11:1	3210:1
		20	6:1	5798:1		
		30	15:1	2277:1		
	d	10	15:1	2502:1	20:1	1863:1
		20	17:1	2237:1		
		30	29:1	1311:1		
	e	10	7:1	2519:1	10:1	1914:1
		20	7:1	1944:1		
		30	17:1	1538:1		
	Area Means		13:1	2784:1		
BB3	a	10	7:1	4878:1	17:1	1974:1
		20	11:1	3358:1		
		30	33:1	972:1		
	b	10	9:1	3428:1	7:1	3626:1
		20	11:1	2943:1		
		30	4:1	5103:1		
	c	10	11:1	3005:1	9:1	3500:1
		20	8:1	3992:1		
		30	9:1	3656:1		
	d	10	9:1	3080:1	10:1	2785:1
		20	11:1	2557:1		
		30	10:1	2774:1		
	e	10	14:1	2073:1	12:1	2547:1
		20	10:1	2823:1		
		30	11:1	2923:1		
	Area Means		11:1	3171:1		
BB4	a	10	20:1	959:1	9:1	1572:1
		20	7:1	1632:1		
		30	3:1	4090:1		
	b	10	20:1	1161:1	15:1	1086:1
		20	15:1	1224:1		
		30	12:1	917:1		
	c[2]	10	12:1	2546:1	16:1	1462:1
		20				
		30	18:1	1006:1		
	d	10	16:1	1996:1	14:1	2502:1
		20	9:1	3754:1		
		30	16:1	2305:1		

Table 4.2-51. Total Nitrogen (TN) to Total Phosphorus (TP) and Total Carbon (TC) to Total Nitrogen Ratios in Sediments Composited by Depth Strata (Horizon) from Two Core Samples Collected on Each Transect, Fall 2010

Area	Transect	Horizon	By Horizon		Horizons Combined	
			TN:TP Ratio	TC:TN Ratio	Mean TN:TP Ratio	Mean TC:TN Ratio
	e	10	7:1	4796:1	7:1	4567:1
		20	8:1	3827:1		
		30	5:1	5342:1		
	Area Means		12:1	2540:1		

Notes:
[1] Insufficient sediment depth to collect 30 cm core.
[2] TN data for the 20 cm horizon removed as an outlier.

Key:
TC = Total carbon.
TN = Total nitrogen.
TP = Total phosphorus.

Table 4.2-52. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Soil Chemistry and Dry Bulk Density Among Study Areas by Depth Strata (Horizon). P Values in Red Indicate Significant Differences

Sampling Period	Mean Transect Value Lowest → Highest	H	df	p	n
Nitrogen					
0-10 cm Horizon					
Fall 2010	BB3 BB2 BB1 BB4	2.4808	3	0.4788	20
10-20 cm Horizon					
Fall 2010	BB2 BB3 BB1 BB4	1.9797	3	0.5766	18
20-30 cm Horizon					
Fall 2010	BB3 BB4 BB2 BB1	1.3172	3	0.7250	18
Nitrogen: All Horizons Combined					
Fall 2010	BB3 BB2 BB1 BB4	3.1691	3	0.3663	56
Phosphorus					
0-10 cm Horizon					
Fall 2010	BB2 BB1 BB3 BB4	2.4139	3	0.4910	20
10-20 cm Horizon					
Fall 2010	BB2 BB3 BB1 BB4	7.6448	3	0.0540	19
20-30 cm Horizon					
Fall 2010	BB2 BB1 BB3 BB4	3.8518	3	0.2779	18
Phosphorus: All Horizons Combined					
Fall 2010	BB2 BB1 BB3 BB4	12.8106	3	0.0051	57
Carbon					
0-10 cm Horizon					
Fall 2010	BB1 BB4 BB3 BB2	2.2114	3	0.5297	20
10-20 cm Horizon					
Fall 2010	BB1 BB4 BB3 BB2	5.6716	3	0.1287	19
20-30 cm Horizon					
Fall 2010	BB4 BB1 BB3 BB2	8.7421	3	0.0329	18
Carbon: All Horizons Combined					
Fall 2010	BB1 BB4 BB3 BB2	14.2244	3	0.0026	57
Nitrogen to Phosphorus Ratios for All Horizons Combined					
Fall 2010	BB3 BB4 BB2 BB1	2.4707	3	0.4806	56
Carbon to Nitrogen Ratios for All Horizons Combined					
Fall 2010	BB4 BB1 BB2 BB3	3.4401	3	0.3286	56
Dry Bulk Density					
0-10 cm Horizon					
Fall 2011	BB3 BB4 BB1 BB2	5.4107	3	0.1441	20
10-20 cm Horizon					
Fall 2011	BB1 BB3 BB4 BB2	5.6640	3	0.1292	20
20-30 cm Horizon					
Fall 2011	BB1 BB4 BB3 BB2	5.5954	3	0.1330	19
Dry Bulk Density: All Horizons Combined					
Fall 2010	BB4 BB3 BB1 BB2	14.2344	3	0.0026	59

Key:
ANOVA = Analysis of variance.
df = Degrees of freedom.
n = Sample size.

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Barium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.016	0.016	0.081	0.170
BB1 - *b*	0.016	0.016	0.081	0.170
BB1 - *c*	0.016	0.016	0.081	0.170
BB1 - *d*	0.016	0.016	0.081	0.170
BB1 - *e*	0.016	0.016	0.081	0.170
Area Total	**0.0160**	**0.0160**	**0.0810**	**0.1700**
BB2 - *a*	0.016	0.016	0.081	0.170
BB2 - *b*	0.016	0.016	0.081	0.170
BB2 - *c*	0.016	0.016	0.081	0.170
BB2 - *d*	0.016	0.016	0.081	0.170
BB2 - *e*	0.016	0.016	0.081	0.170
Area Total	**0.0160**	**0.0160**	**0.0810**	**0.1700**
BB3 - *a*	0.016	0.016	0.081	0.170
BB3 - *b*	0.016	0.016	0.081	0.170
BB3 - *c*	0.016	0.016	0.081	0.170
BB3 - *d*	0.016	0.016	0.081	0.170
BB3 - *e*	0.016	0.016	0.081	0.170
Area Total	**0.0160**	**0.0160**	**0.0810**	**0.1700**
BB4 - *a*	0.016	0.016	0.081	0.170
BB4 - *b*	0.016	0.016	0.081	0.170
BB4 - *c*	0.016	0.016	0.081	0.170
BB4 - *d*	0.016	0.016	0.081	0.170
BB4 - *e*	0.016	0.016	0.081	0.170
Area Total	**0.0160**	**0.0160**	**0.0810**	**0.1700**

Area and Transect	Iron (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.410	0.054	0.670	0.63
BB1 - *b*	1.200	1.200	0.670	0.65
BB1 - *c*	0.630	0.054	0.890	0.63
BB1 - *d*	0.270	0.230	0.550	0.63
BB1 - *e*	0.330	0.180	0.690	0.63
Area Total	**0.5680**	**0.3436**	**0.6940**	**0.6340**
BB2 - *a*	0.420	0.140	0.670	0.93
BB2 - *b*	0.520	0.170	1.900	0.92
BB2 - *c*	0.370	0.054	0.630	0.68
BB2 - *d*	0.410	0.054	0.840	0.81
BB2 - *e*	0.540	0.072	0.770	1.20
Area Total	**0.4520**	**0.0980**	**0.9620**	**0.9080**
BB3 - *a*	0.440	0.150	0.570	1.00
BB3 - *b*	0.280	0.180	0.770	0.89
BB3 - *c*	0.330	0.140	0.810	0.93
BB3 - *d*	0.420	0.150	0.650	1.20
BB3 - *e*	0.260	0.240	0.790	0.85
Area Total	**0.3460**	**0.1720**	**0.7180**	**0.9740**
BB4 - *a*	1.600	0.240	0.590	0.88
BB4 - *b*	0.680	0.730	0.720	0.73
BB4 - *c*	0.210	0.190	0.470	0.92
BB4 - *d*	0.220	0.160	0.650	0.63
BB4 - *e*	0.720	0.240	0.580	1.10
Area Total	**0.6860**	**0.3120**	**0.6020**	**0.8520**

Area and Transect	Calcium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	360	520	460	470
BB1 - *b*	400	570	430	490
BB1 - *c*	330	490	440	490
BB1 - *d*	350	500	450	490
BB1 - *e*	320	480	430	480
Area Total	**352.0**	**512.0**	**442.0**	**484.0**
BB2 - *a*	510	460	460	510
BB2 - *b*	460	470	490	490
BB2 - *c*	390	480	440	480
BB2 - *d*	360	460	440	460
BB2 - *e*	450	480	500	480
Area Total	**434.0**	**470.0**	**466.0**	**484.0**
BB3 - *a*	490	440	490	520
BB3 - *b*	430	480	470	510
BB3 - *c*	500	480	460	490
BB3 - *d*	480	460	470	460
BB3 - *e*	67	470	480	540
Area Total	**393.4**	**466.0**	**474.0**	**504.0**
BB4 - *a*	450	450	530	420
BB4 - *b*	390	520	470	510
BB4 - *c*	360	470	470	490
BB4 - *d*	370	470	470	490
BB4 - *e*	380	450	470	470
Area Total	**390.0**	**472.0**	**482.0**	**476.0**

Area and Transect	Magnesium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	1000	1500	1300	1300
BB1 - *b*	1100	1500	1200	1400
BB1 - *c*	970	1500	1300	1400
BB1 - *d*	1000	1500	1300	1400
BB1 - *e*	910	1500	1300	1400
Area Total	**996.0**	**1500.0**	**1280.0**	**1380.0**
BB2 - *a*	1200	1400	1400	1300
BB2 - *b*	1200	1400	1400	1300
BB2 - *c*	1100	1400	1300	1300
BB2 - *d*	1100	1400	1400	1300
BB2 - *e*	1200	1400	1400	1300
Area Total	**1160.0**	**1400.0**	**1380.0**	**1300.0**
BB3 - *a*	1200	1300	1300	1300
BB3 - *b*	1200	1400	1400	1300
BB3 - *c*	1400	1400	1400	1300
BB3 - *d*	1200	1400	1400	1300
BB3 - *e*	240	1300	1400	1300
Area Total	**1048.0**	**1360.0**	**1380.0**	**1300.0**
BB4 - *a*	1000	1300	1300	970
BB4 - *b*	920	1300	1300	1300
BB4 - *c*	1000	1400	1400	1300
BB4 - *d*	1000	1400	1300	1300
BB4 - *e*	940	1200	1300	1300
Area Total	**972.0**	**1320.0**	**1320.0**	**1234.0**

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Potassium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	320	530	410	430
BB1 - *b*	340	510	380	450
BB1 - *c*	300	510	390	450
BB1 - *d*	310	500	400	470
BB1 - *e*	280	490	400	470
Area Total	**310.0**	**508.0**	**396.0**	**454.0**
BB2 - *a*	360	480	430	440
BB2 - *b*	370	470	430	430
BB2 - *c*	350	490	410	380
BB2 - *d*	350	480	420	390
BB2 - *e*	360	470	430	390
Area Total	**358.0**	**478.0**	**424.0**	**406.0**
BB3 - *a*	370	430	430	390
BB3 - *b*	360	460	440	400
BB3 - *c*	430	480	430	390
BB3 - *d*	390	470	430	380
BB3 - *e*	67	440	430	380
Area Total	**323.4**	**456.0**	**432.0**	**388.0**
BB4 - *a*	300	430	420	290
BB4 - *b*	290	430	410	380
BB4 - *c*	330	440	420	370
BB4 - *d*	320	460	390	390
BB4 - *e*	290	410	400	380
Area Total	**306.0**	**434.0**	**408.0**	**362.0**

Area and Transect	Sodium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	8300	13000	10000	11000
BB1 - *b*	9100	12000	9600	11000
BB1 - *c*	7700	12000	10000	11000
BB1 - *d*	8200	12000	10000	11000
BB1 - *e*	7400	12000	10000	11000
Area Total	**8140.0**	**12200.0**	**9920.0**	**11000.0**
BB2 - *a*	9900	12000	11000	11000
BB2 - *b*	10000	11000	11000	11000
BB2 - *c*	9100	11000	11000	11000
BB2 - *d*	9000	11000	11000	10000
BB2 - *e*	10000	11000	11000	11000
Area Total	**9600.0**	**11200.0**	**11000.0**	**10800.0**
BB3 - *a*	10000	10000	11000	11000
BB3 - *b*	9900	11000	11000	11000
BB3 - *c*	11000	11000	11000	11000
BB3 - *d*	9600	11000	11000	11000
BB3 - *e*	1800	10000	11000	11000
Area Total	**8460.0**	**10600.0**	**11000.0**	**11000.0**
BB4 - *a*	8600	9800	10000	8300
BB4 - *b*	8200	11000	10000	10000
BB4 - *c*	8600	10000	11000	11000
BB4 - *d*	8500	11000	9800	11000
BB4 - *e*	8000	9700	9900	10000
Area Total	**8380.0**	**10300.0**	**10140.0**	**10060.0**

Area and Transect	Boron (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	3.60	4.80	5.00	4.40
BB1 - *b*	3.80	5.00	4.30	4.60
BB1 - *c*	3.50	5.00	4.60	4.50
BB1 - *d*	3.50	5.00	4.60	4.80
BB1 - *e*	3.20	4.90	4.40	4.90
Area Total	**3.520**	**4.940**	**4.580**	**4.640**
BB2 - *a*	5.50	4.90	4.90	4.60
BB2 - *b*	4.50	4.80	4.70	4.30
BB2 - *c*	4.20	4.90	4.80	4.50
BB2 - *d*	4.10	4.90	4.70	4.50
BB2 - *e*	4.60	4.90	4.90	4.60
Area Total	**4.580**	**4.880**	**4.800**	**4.500**
BB3 - *a*	4.50	4.10	4.70	4.40
BB3 - *b*	4.40	4.50	5.00	4.20
BB3 - *c*	5.10	4.70	4.80	4.50
BB3 - *d*	4.80	4.70	4.80	4.40
BB3 - *e*	0.68	4.60	4.70	4.10
Area Total	**3.896**	**4.520**	**4.800**	**4.320**
BB4 - *a*	3.80	4.20	4.70	3.40
BB4 - *b*	3.70	4.50	4.50	4.30
BB4 - *c*	4.10	4.60	4.60	4.20
BB4 - *d*	4.10	4.80	4.40	4.50
BB4 - *e*	3.60	4.20	4.30	4.30
Area Total	**3.860**	**4.460**	**4.500**	**4.140**

Area and Transect	Strontium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	6.3	9.3	7.7	7.5
BB1 - *b*	6.9	9.7	7.2	7.9
BB1 - *c*	6.0	9.0	7.4	7.9
BB1 - *d*	6.2	9.0	7.4	8.1
BB1 - *e*	5.8	8.6	7.6	7.9
Area Total	**6.24**	**9.12**	**7.46**	**7.86**
BB2 - *a*	7.8	8.4	8.3	8.0
BB2 - *b*	7.4	8.4	8.7	7.4
BB2 - *c*	6.6	8.9	7.9	7.5
BB2 - *d*	6.5	8.4	7.8	7.4
BB2 - *e*	7.1	8.6	8.4	7.6
Area Total	**7.08**	**8.54**	**8.22**	**7.58**
BB3 - *a*	7.7	7.7	8.1	7.9
BB3 - *b*	7.1	8.6	8.4	7.8
BB3 - *c*	8.6	8.6	8.3	7.7
BB3 - *d*	8.0	8.4	8.4	7.3
BB3 - *e*	1.3	8.4	8.3	8.0
Area Total	**6.54**	**8.34**	**8.30**	**7.74**
BB4 - *a*	6.6	8.0	8.6	6.2
BB4 - *b*	5.9	8.4	7.9	7.9
BB4 - *c*	6.3	8.2	8.0	7.6
BB4 - *d*	6.3	8.2	8.3	7.8
BB4 - *e*	6.1	7.7	7.80	7.4
Area Total	**6.24**	**8.10**	**8.12**	**7.38**

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Bromide (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.0	73.0	73.0	74.0
BB1 - *b*	0.0	73.0	69.0	72.0
BB1 - *c*	0.0	72.0	75.0	73.0
BB1 - *d*	0.0	67.0	75.0	78.0
BB1 - *e*	0.0	67.0	72.0	75.0
Area Total	**0.027**	**70.400**	**72.800**	**74.400**
BB2 - *a*	64.000	68.000	76.000	76.000
BB2 - *b*	62.0	67.0	68.0	82.0
BB2 - *c*	61.0	67.0	73.0	63.0
BB2 - *d*	57.0	67.0	76.0	67.0
BB2 - *e*	59.0	67.0	66.0	67.0
Area Total	**60.600**	**67.200**	**71.800**	**71.000**
BB3 - *a*	34.0	67.0	73.0	71.0
BB3 - *b*	57.0	65.0	74.0	68.0
BB3 - *c*	66.0	67.0	66.0	69.0
BB3 - *d*	73.0	67.0	68.0	65.0
BB3 - *e*	73.0	74.0	70.0	85.0
Area Total	**60.600**	**68.000**	**70.200**	**71.600**
BB4 - *a*	58.0	61.0	69.0	61.0
BB4 - *b*	40.0	84.0	72.0	69.0
BB4 - *c*	56.0	72.0	73.0	68.0
BB4 - *d*	58.0	83.0	75.0	71.0
BB4 - *e*	49.0	68.0	0.7	70.0
Area Total	**52.200**	**73.600**	**57.936**	**67.800**

Area and Transect	Chloride (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	16000	24000	20000	19000
BB1 - *b*	17000	24000	20000	20000
BB1 - *c*	15000	24000	20000	20000
BB1 - *d*	16000	22000	20000	20000
BB1 - *e*	14000	23000	19000	20000
Area Total	**15600**	**23400**	**19800**	**19800**
BB2 - *a*	19000	23000	19000	20000
BB2 - *b*	19000	22000	19000	20000
BB2 - *c*	17000	23000	19000	20000
BB2 - *d*	17000	23000	22000	20000
BB2 - *e*	19000	23000	20000	20000
Area Total	**18200**	**22800**	**19800**	**20000**
BB3 - *a*	20000	22000	20000	20000
BB3 - *b*	16000	21000	21000	21000
BB3 - *c*	20000	22000	20000	20000
BB3 - *d*	19000	22000	19000	20000
BB3 - *e*	19000	21000	19000	19000
Area Total	**18800**	**21600**	**19800**	**20000**
BB4 - *a*	17000	20000	19000	16000
BB4 - *b*	16000	21000	18000	18000
BB4 - *c*	16000	21000	19000	1700
BB4 - *d*	17000	22000	18000	19000
BB4 - *e*	15000	20000	18000	19000
Area Total	**16200**	**20800**	**18400**	**14740**

Area and Transect	Fluoride (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.02	1.00	0.91	0.20
BB1 - *b*	0.02	1.00	0.87	0.20
BB1 - *c*	0.02	1.00	0.76	0.20
BB1 - *d*	0.02	1.00	0.75	0.20
BB1 - *e*	0.02	1.00	0.78	0.20
Area Total	**0.020**	**1.000**	**0.814**	**0.200**
BB2 - *a*	0.20	1.00	0.72	0.20
BB2 - *b*	0.20	1.00	0.66	0.20
BB2 - *c*	0.20	1.00	0.82	0.20
BB2 - *d*	0.20	1.00	0.76	0.20
BB2 - *e*	0.20	1.00	0.76	0.20
Area Total	**0.200**	**1.000**	**0.744**	**0.200**
BB3 - *a*	0.20	1.00	0.71	0.20
BB3 - *b*	0.20	1.00	0.69	0.20
BB3 - *c*	0.20	1.00	0.63	0.20
BB3 - *d*	0.20	1.00	0.63	0.20
BB3 - *e*	0.20	0.67	0.71	0.20
Area Total	**0.200**	**0.934**	**0.674**	**0.200**
BB4 - *a*	0.59	1.00	0.72	0.20
BB4 - *b*	0.50	0.72	0.59	0.20
BB4 - *c*	0.64	0.74	0.90	0.20
BB4 - *d*	0.74	0.65	0.40	0.20
BB4 - *e*	0.20	0.76	0.65	0.20
Area Total	**0.534**	**0.774**	**0.652**	**0.200**

Area and Transect	Sulfate (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	1900	3500	2900	2500
BB1 - *b*	2100	3500	2200	2800
BB1 - *c*	1900	3500	2600	2700
BB1 - *d*	1900	3100	2000	2800
BB1 - *e*	1800	3100	2300	2700
Area Total	**1920**	**3340**	**2400**	**2700**
BB2 - *a*	2300	3300	2400	2700
BB2 - *b*	2400	3100	2500	2800
BB2 - *c*	2100	3300	2600	2800
BB2 - *d*	2100	3300	2500	2800
BB2 - *e*	2300	3300	2400	2800
Area Total	**2240**	**3260**	**2480**	**2780**
BB3 - *a*	2400	3200	2300	2700
BB3 - *b*	2300	3000	2500	2800
BB3 - *c*	2500	3100	2300	2800
BB3 - *d*	2300	3200	2300	2700
BB3 - *e*	2700	2600	2300	2600
Area Total	**2440**	**2975**	**2340**	**2720**
BB4 - *a*	2100	2700	2300	2100
BB4 - *b*	1500	2700	2200	2600
BB4 - *c*	2000	2600	2400	2600
BB4 - *d*	2100	3200	2300	2700
BB4 - *e*	2	2500	2400	2600
Area Total	**1540**	**2740**	**2320**	**2520**

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Alkalinity (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	150	120	190	140
BB1 - *b*	170	130	150	130
BB1 - *c*	160	100	170	150
BB1 - *d*	160	170	200	140
BB1 - *e*	150	130	130	120
Area Total	**158**	**130**	**168**	**136**
BB2 - *a*	330	100	190	140
BB2 - *b*	250	150	150	220
BB2 - *c*	200	140	220	200
BB2 - *d*	160	120	130	140
BB2 - *e*	250	160	340	170
Area Total	**238**	**134**	**206**	**174**
BB3 - *a*	250	58	270	220
BB3 - *b*	220	190	130	230
BB3 - *c*	290	150	160	170
BB3 - *d*	350	140	160	170
BB3 - *e*	210	190	190	350
Area Total	**264**	**146**	**182**	**228**
BB4 - *a*	230	170	170	160
BB4 - *b*	200	150	190	230
BB4 - *c*	190	180	160	180
BB4 - *d*	190	120	210	140
BB4 - *e*	180	200	200	140
Area Total	**198**	**164**	**186**	**170**

Area and Transect	Bicarbonate Alkalinity as CaCO3 (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	150	120	190	140
BB1 - *b*	170	130	150	130
BB1 - *c*	160	100	170	150
BB1 - *d*	160	170	200	140
BB1 - *e*	150	130	130	120
Area Total	**158**	**130**	**168**	**136**
BB2 - *a*	330	100	190	140
BB2 - *b*	250	150	150	220
BB2 - *c*	200	140	220	200
BB2 - *d*	160	120	130	140
BB2 - *e*	250	160	340	170
Area Total	**238**	**134**	**206**	**174**
BB3 - *a*	250	58	270	220
BB3 - *b*	220	190	130	230
BB3 - *c*	290	150	160	170
BB3 - *d*	350	140	160	170
BB3 - *e*	210	190	190	350
Area Total	**264**	**146**	**182**	**228**
BB4 - *a*	230	170	170	160
BB4 - *b*	200	150	190	230
BB4 - *c*	190	180	160	180
BB4 - *d*	190	120	210	140
BB4 - *e*	180	200	200	140
Area Total	**198**	**164**	**186**	**170**

Area and Transect	Sulfide (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	4.6	4.0	11.0	1.0
BB1 - *b*	3.2	3.2	4.0	1.0
BB1 - *c*	7.8	4.6	8.8	4.8
BB1 - *d*	5.0	6.2	6.4	1.0
BB1 - *e*	4.6	4.3	4.6	1.7
Area Total	**5.04**	**4.46**	**6.96**	**1.90**
BB2 - *a*	20.0	2.6	8.8	1.3
BB2 - *b*	11.0	4.6	5.8	9.2
BB2 - *c*	8.2	3.7	14.0	11.0
BB2 - *d*	4.3	5.1	4.3	3.0
BB2 - *e*	9.3	9.3	42.0	5.8
Area Total	**10.56**	**5.06**	**14.98**	**6.06**
BB3 - *a*	7.8	5.6	8.0	4.5
BB3 - *b*	9.6	5.0	7.7	1.9
BB3 - *c*	12.0	5.0	6.7	2.2
BB3 - *d*	13.0	4.2	6.9	6.4
BB3 - *e*	9.6	5.4	6.1	10.0
Area Total	**10.40**	**5.04**	**7.08**	**5.00**
BB4 - *a*	5.3	4.8	4.6	1.0
BB4 - *b*	8.3	3.4	5.6	3.4
BB4 - *c*	9.4	5.3	4.5	3.2
BB4 - *d*	8.0	1.8	5.1	1.6
BB4 - *e*	4.5	5.9	8.8	1.0
Area Total	**7.10**	**4.24**	**5.72**	**2.04**

Area and Transect	Dissolved Inorganic Carbon (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	37	10	10	36
BB1 - *b*	42	10	10	34
BB1 - *c*	40	10	10	39
BB1 - *d*	38	10	10	34
BB1 - *e*	49	10	10	31
Area Total	**41.2**	**10.0**	**10.0**	**34.8**
BB2 - *a*	82	10	10	36
BB2 - *b*	58	10	10	56
BB2 - *c*	47	10	10	68
BB2 - *d*	36	10	10	35
BB2 - *e*	51	10	11	38
Area Total	**54.8**	**10.0**	**10.2**	**46.6**
BB3 - *a*	48	10	10	58
BB3 - *b*	43	10	10	57
BB3 - *c*	60	10	10	41
BB3 - *d*	75	10	10	39
BB3 - *e*	53	10	10	90
Area Total	**55.8**	**10.0**	**10.0**	**57.0**
BB4 - *a*	47	10	10	43
BB4 - *b*	46	10	10	63
BB4 - *c*	44	10	10	49
BB4 - *d*	42	10	10	40
BB4 - *e*	33	10	10	39
Area Total	**42.4**	**10.0**	**10.0**	**46.8**

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Ammonia (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.03	0.50	0.38	0.68
BB1 - *b*	0.03	0.23	0.30	0.35
BB1 - *c*	0.79	0.03	0.33	0.33
BB1 - *d*	0.25	0.51	0.25	0.47
BB1 - *e*	0.24	0.23	0.55	0.64
Area Total	**0.266**	**0.299**	**0.362**	**0.494**
BB2 - *a*	0.18	0.31	0.51	0.40
BB2 - *b*	0.23	0.13	0.25	0.71
BB2 - *c*	0.17	0.12	0.57	1.10
BB2 - *d*	0.22	0.12	0.30	0.79
BB2 - *e*	0.13	0.29	0.23	0.71
Area Total	**0.186**	**0.194**	**0.372**	**0.742**
BB3 - *a*	0.41	0.14	0.26	0.71
BB3 - *b*	0.20	0.16	0.34	0.37
BB3 - *c*	0.19	0.11	0.35	0.41
BB3 - *d*	0.15	0.46	0.49	0.44
BB3 - *e*	0.03	0.19	0.27	0.47
Area Total	**0.195**	**0.212**	**0.342**	**0.480**
BB4 - *a*	0.03	0.33	0.34	0.92
BB4 - *b*	0.21	0.27	0.35	0.77
BB4 - *c*	0.29	0.11	0.18	0.69
BB4 - *d*	0.22	0.12	0.51	0.67
BB4 - *e*	0.24	0.12	0.32	1.20
Area Total	**0.197**	**0.190**	**0.340**	**0.850**

Area and Transect	Ammonium (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.000	0.630	0.486	0.870
BB1 - *b*	0.000	0.300	0.383	0.440
BB1 - *c*	0.000	0.030	0.421	0.420
BB1 - *d*	0.000	0.650	0.319	0.600
BB1 - *e*	0.000	0.290	0.701	0.800
Area Total	**0.000**	**0.380**	**0.462**	**0.626**
BB2 - *a*	0.000	0.390	0.649	0.500
BB2 - *b*	0.000	0.160	0.320	0.900
BB2 - *c*	0.000	0.140	0.729	1.400
BB2 - *d*	0.000	0.150	0.382	1.000
BB2 - *e*	0.000	0.370	0.295	0.900
Area Total	**0.000**	**0.242**	**0.475**	**0.940**
BB3 - *a*	0.000	0.180	0.332	0.900
BB3 - *b*	0.000	0.200	0.434	0.470
BB3 - *c*	0.000	0.140	0.447	0.520
BB3 - *d*	0.000	0.580	0.625	0.560
BB3 - *e*	0.000	0.240	0.345	0.600
Area Total	**0.000**	**0.268**	**0.436**	**0.610**
BB4 - *a*	0.000	0.420	0.429	1.200
BB4 - *b*	0.000	0.340	0.442	0.980
BB4 - *c*	0.000	0.140	0.226	0.880
BB4 - *d*	0.000	0.150	0.647	0.850
BB4 - *e*	0.000	0.150	0.406	1.500
Area Total	**0.000**	**0.240**	**0.430**	**1.082**

Area and Transect	Unionized Ammonia (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.000	0.003	0.003	0.000
BB1 - *b*	0.000	0.000	0.003	0.000
BB1 - *c*	0.000	0.000	0.003	0.000
BB1 - *d*	0.000	0.005	0.002	0.000
BB1 - *e*	0.000	0.003	0.006	0.000
Area Total	**0.0000**	**0.0023**	**0.0033**	**0.0000**
BB2 - *a*	0.000	0.006	0.007	0.000
BB2 - *b*	0.000	0.010	0.001	0.000
BB2 - *c*	0.000	0.001	0.004	0.000
BB2 - *d*	0.000	0.002	0.004	0.000
BB2 - *e*	0.000	0.003	0.001	0.000
Area Total	**0.0000**	**0.0044**	**0.0035**	**0.0000**
BB3 - *a*	0.000	0.000	0.002	0.000
BB3 - *b*	0.000	0.002	0.003	0.000
BB3 - *c*	0.000	0.001	0.003	0.000
BB3 - *d*	0.000	0.007	0.005	0.000
BB3 - *e*	0.000	0.003	0.002	0.000
Area Total	**0.0000**	**0.0028**	**0.0032**	**0.0000**
BB4 - *a*	0.000	0.003	0.008	0.000
BB4 - *b*	0.000	0.009	0.008	0.000
BB4 - *c*	0.000	0.002	0.005	0.000
BB4 - *d*	0.000	0.006	0.009	0.000
BB4 - *e*	0.000	0.002	0.006	0.000
Area Total	**0.0000**	**0.0043**	**0.0072**	**0.0000**

Area and Transect	Nitrate + Nitrite (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.028	0.110	0.017	0.016
BB1 - *b*	0.053	0.210	0.005	0.046
BB1 - *c*	0.015	0.030	0.006	0.022
BB1 - *d*	0.020	0.068	0.005	0.023
BB1 - *e*	0.009	0.070	0.014	0.020
Area Total	**0.0251**	**0.0976**	**0.0094**	**0.0254**
BB2 - *a*	0.005	0.026	0.005	0.050
BB2 - *b*	0.005	0.025	0.005	0.450
BB2 - *c*	0.005	0.021	0.005	0.016
BB2 - *d*	0.005	0.180	0.005	0.018
BB2 - *e*	0.007	0.084	0.005	0.015
Area Total	**0.0053**	**0.0672**	**0.0047**	**0.1098**
BB3 - *a*	0.005	0.036	0.008	0.048
BB3 - *b*	0.005	0.024	0.009	0.062
BB3 - *c*	0.005	0.022	0.200	0.040
BB3 - *d*	0.007	0.024	0.011	0.039
BB3 - *e*	0.044	0.023	0.030	0.019
Area Total	**0.0130**	**0.0258**	**0.0517**	**0.0416**
BB4 - *a*	0.028	0.130	0.009	0.093
BB4 - *b*	0.020	0.120	0.005	0.075
BB4 - *c*	0.026	0.032	0.710	0.093
BB4 - *d*	0.025	0.062	0.069	0.160
BB4 - *e*	0.048	0.017	0.076	0.031
Area Total	**0.0294**	**0.0722**	**0.1737**	**0.0904**

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Total Kjedahl Nitrogen (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.67	0.90	0.53	0.150
BB1 - *b*	0.67	1.20	0.52	0.150
BB1 - *c*	0.73	0.99	0.44	0.150
BB1 - *d*	0.29	0.47	0.44	0.150
BB1 - *e*	0.48	0.30	0.44	0.150
Area Total	**0.568**	**0.772**	**0.474**	**0.150**
BB2 - *a*	0.59	0.81	0.73	0.150
BB2 - *b*	0.60	0.46	0.35	0.150
BB2 - *c*	0.44	0.60	0.57	0.150
BB2 - *d*	0.36	0.31	0.37	0.150
BB2 - *e*	0.45	0.41	0.25	0.150
Area Total	**0.488**	**0.518**	**0.454**	**0.150**
BB3 - *a*	0.66	0.23	0.34	0.680
BB3 - *b*	0.32	0.35	0.46	0.150
BB3 - *c*	0.38	0.28	0.56	0.150
BB3 - *d*	0.69	0.81	0.51	0.150
BB3 - *e*	0.45	0.57	0.32	0.150
Area Total	**0.500**	**0.448**	**0.438**	**0.256**
BB4 - *a*	1.60	0.46	0.65	1.000
BB4 - *b*	0.75	1.00	0.62	0.760
BB4 - *c*	0.46	0.77	0.72	0.710
BB4 - *d*	0.43	0.34	0.66	0.750
BB4 - *e*	0.82	0.58	0.55	0.500
Area Total	**0.812**	**0.630**	**0.640**	**0.744**

Area and Transect	Total Nitrogen (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.000	1.010	0.547	0.000
BB1 - *b*	0.000	1.410	0.525	0.000
BB1 - *c*	0.000	1.020	0.446	0.000
BB1 - *d*	0.000	0.540	0.445	0.000
BB1 - *e*	0.000	0.370	0.454	0.000
Area Total	**0.0000**	**0.8700**	**0.4834**	**0.0000**
BB2 - *a*	0.000	0.836	0.735	0.000
BB2 - *b*	0.000	0.485	0.355	0.000
BB2 - *c*	0.000	0.621	0.575	0.000
BB2 - *d*	0.000	0.490	0.375	0.000
BB2 - *e*	0.000	0.494	0.255	0.000
Area Total	**0.0000**	**0.5852**	**0.4587**	**0.0000**
BB3 - *a*	0.000	0.266	0.348	0.728
BB3 - *b*	0.000	0.374	0.469	0.000
BB3 - *c*	0.000	0.302	0.760	0.000
BB3 - *d*	0.000	0.834	0.521	0.000
BB3 - *e*	0.000	0.593	0.350	0.000
Area Total	**0.0000**	**0.4738**	**0.4897**	**0.1456**
BB4 - *a*	0.000	0.590	0.659	1.093
BB4 - *b*	0.000	1.120	0.625	0.835
BB4 - *c*	0.000	0.802	1.430	0.803
BB4 - *d*	0.000	0.402	0.729	0.910
BB4 - *e*	0.000	0.597	0.626	0.531
Area Total	**0.0000**	**0.7022**	**0.8137**	**0.8344**

Area and Transect	Orthophosphate (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.075	0.040	0.001	0.001
BB1 - *b*	0.075	0.002	0.002	0.001
BB1 - *c*	0.075	0.002	0.002	0.001
BB1 - *d*	0.075	0.001	0.003	0.001
BB1 - *e*	0.075	0.001	0.002	0.001
Area Total	**0.0750**	**0.0093**	**0.0022**	**0.0014**
BB2 - *a*	0.011	0.004	0.003	0.001
BB2 - *b*	0.045	0.004	0.003	0.001
BB2 - *c*	0.010	0.001	0.005	0.001
BB2 - *d*	0.010	0.003	0.001	0.001
BB2 - *e*	0.130	0.002	0.012	0.001
Area Total	**0.0412**	**0.0028**	**0.0049**	**0.0014**
BB3 - *a*	0.130	0.004	0.001	0.001
BB3 - *b*	0.100	0.003	0.002	0.001
BB3 - *c*	0.010	0.004	0.001	0.002
BB3 - *d*	0.021	0.001	0.002	0.001
BB3 - *e*	0.037	0.007	0.001	0.002
Area Total	**0.0596**	**0.0038**	**0.0015**	**0.0016**
BB4 - *a*	0.031	0.002	0.001	0.001
BB4 - *b*	0.031	0.005	0.001	0.001
BB4 - *c*	0.022	0.009	0.001	0.001
BB4 - *d*	0.029	0.005	0.004	0.001
BB4 - *e*	0.026	0.010	0.001	0.001
Area Total	**0.0278**	**0.0060**	**0.0019**	**0.0014**

Area and Transect	Total Phosphorus (mg/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012
BB1 - *a*	0.012	0.023	0.012	0.013
BB1 - *b*	0.014	0.021	0.013	0.017
BB1 - *c*	0.010	0.019	0.012	0.015
BB1 - *d*	0.010	0.018	0.014	0.014
BB1 - *e*	0.009	0.018	0.022	0.015
Area Total	**0.0110**	**0.0198**	**0.0146**	**0.0148**
BB2 - *a*	0.016	0.020	0.015	0.020
BB2 - *b*	0.018	0.020	0.014	0.042
BB2 - *c*	0.016	0.019	0.014	0.050
BB2 - *d*	0.015	0.017	0.013	0.014
BB2 - *e*	0.017	0.024	0.014	0.014
Area Total	**0.0164**	**0.0200**	**0.0140**	**0.0280**
BB3 - *a*	0.023	0.019	0.013	0.016
BB3 - *b*	0.013	0.020	0.014	0.015
BB3 - *c*	0.014	0.021	0.014	0.017
BB3 - *d*	0.013	0.020	0.013	0.015
BB3 - *e*	0.017	0.024	0.013	0.014
Area Total	**0.0160**	**0.0208**	**0.0134**	**0.0154**
BB4 - *a*	0.042	0.026	0.014	0.021
BB4 - *b*	0.026	0.023	0.013	0.016
BB4 - *c*	0.017	0.020	0.011	0.014
BB4 - *d*	0.015	0.019	0.015	0.016
BB4 - *e*	0.023	0.018	0.012	0.013
Area Total	**0.0246**	**0.0212**	**0.0130**	**0.0160**

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	δ18O (‰)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012[1]
BB1 - *a*	0.7	2.4	1.7	
BB1 - *b*	0.8	2.0	1.6	
BB1 - *c*	0.4	2.1	1.7	
BB1 - *d*	0.4	2.0	1.7	
BB1 - *e*	0.2	1.6	2.0	
Area Total	**0.5**	**2.0**	**1.7**	
BB2 - *a*	1.5	2.1	2.1	
BB2 - *b*	1.2	2.3	1.8	
BB2 - *c*	0.6	1.9	1.8	
BB2 - *d*	0.4	1.6	1.5	
BB2 - *e*	0.6	0.0	1.4	
Area Total	**0.9**	**1.6**	**1.7**	
BB3 - *a*	1.3	2.0	1.9	
BB3 - *b*	1.1	2.0	2.1	
BB3 - *c*	1.9	2.2	2.0	
BB3 - *d*	0.9	2.1	1.7	
BB3 - *e*	0.7	1.9	1.8	
Area Total	**1.2**	**2.0**	**1.9**	
BB4 - *a*	1.3	3.0	2.4	
BB4 - *b*	0.7	2.9	2.4	
BB4 - *c*	0.8	2.8	2.6	
BB4 - *d*	0.6	2.7	1.9	
BB4 - *e*	0.4	2.3	2.0	
Area Total	**0.8**	**2.7**	**2.3**	

Area and Transect	δD (‰)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012[1]
BB1 - *a*	10	20	10	
BB1 - *b*	12	15	10	
BB1 - *c*	13	20	11	
BB1 - *d*	8	18	17	
BB1 - *e*	3	20	9	
Area Total	**9.2**	**18.6**	**11.4**	
BB2 - *a*	10	15	17	
BB2 - *b*	11	18	18	
BB2 - *c*	6	15	10	
BB2 - *d*	3	16	9	
BB2 - *e*	11	0	14	
Area Total	**8.2**	**12.8**	**13.6**	
BB3 - *a*	14	15	18	
BB3 - *b*	7	17	23	
BB3 - *c*	15	14	16	
BB3 - *d*	9	20	12	
BB3 - *e*	5	17	13	
Area Total	**10.0**	**16.6**	**16.4**	
BB4 - *a*	7	14	17	
BB4 - *b*	9	21	15	
BB4 - *c*	6	14	16	
BB4 - *d*	4	22	8	
BB4 - *e*	4	21	12	
Area Total	**6.0**	**18.4**	**13.6**	

Area and Transect	δ13C (‰)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012[1]
BB1 - *a*	-4.32	-4.34	-4.55	
BB1 - *b*	-4.21	-3.86	-3.08	
BB1 - *c*	-3.81	-3.44	-3.29	
BB1 - *d*	-3.42	-3.00	-2.80	
BB1 - *e*	-4.18	0.00	-3.37	
Area Total	**-3.988**	**-2.928**	**-3.418**	
BB2 - *a*	-4.73	-3.21	-5.54	
BB2 - *b*	-3.90	-3.05	-2.82	
BB2 - *c*	-3.47	-2.87	-5.24	
BB2 - *d*	-3.14	-1.95	-3.37	
BB2 - *e*	-2.58	0.00	-3.55	
Area Total	**-3.564**	**-2.216**	**-4.104**	
BB3 - *a*	-5.36	-3.74	-3.41	
BB3 - *b*	-4.75	-3.76	-4.54	
BB3 - *c*	-3.73	-3.24	-4.79	
BB3 - *d*	-2.71	-3.89	-4.36	
BB3 - *e*	-4.46	-3.65	-3.44	
Area Total	**-4.202**	**-3.656**	**-4.108**	
BB4 - *a*	-5.99	-4.30	-5.77	
BB4 - *b*	-5.76	-4.65	-6.16	
BB4 - *c*	-5.07	-4.70	-5.02	
BB4 - *d*	-4.56	-3.77	-5.82	
BB4 - *e*	-4.32	-4.41	-4.82	
Area Total	**-5.140**	**-4.366**	**-5.518**	

Area and Transect	$\delta^{87}Sr/^{86}Sr$ (‰)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012[1]
BB1 - *a*	0.709	0.709	0.709	
BB1 - *b*	0.709	0.709	0.709	
BB1 - *c*	0.709	0.709	0.709	
BB1 - *d*	0.709	0.709	0.709	
BB1 - *e*	0.709	0.709	0.709	
Area Total	**0.7091**	**0.7091**	**0.7091**	
BB2 - *a*	0.709	0.709	0.709	
BB2 - *b*	0.709	0.709	0.709	
BB2 - *c*	0.709	0.709	0.709	
BB2 - *d*	0.709	0.709	0.709	
BB2 - *e*	0.709	0.709	0.709	
Area Total	**0.7091**	**0.7091**	**0.7092**	
BB3 - *a*	0.709	0.709	0.709	
BB3 - *b*	0.709	0.709	0.709	
BB3 - *c*	0.709	0.709	0.709	
BB3 - *d*	0.709	0.709	0.709	
BB3 - *e*	0.709	0.709	0.709	
Area Total	**0.7091**	**0.7091**	**0.7092**	
BB4 - *a*	0.709	0.709	0.709	
BB4 - *b*	0.709	0.709	0.709	
BB4 - *c*	0.709	0.709	0.709	
BB4 - *d*	0.709	0.709	0.709	
BB4 - *e*	0.709	0.709	0.709	
Area Total	**0.7091**	**0.7091**	**0.7092**	

Table 4.2-53. Porewater Nutrient and Tracer Suite Results for All Study Areas and Sampling Events

Area and Transect	Tritium (pCi/L)			
	Fall 2010	Spring 2011	Fall 2011	Spring 2012[1]
BB1 - *a*	7.2	11.9	11.3	
BB1 - *b*	7.9	16.3	11.0	
BB1 - *c*	2.8	19.8	20.9	
BB1 - *d*	-0.6	6.2	17.4	
BB1 - *e*	15.0	17.2	24.0	
Area Total	**8.23**	**14.28**	**16.92**	
BB2 - *a*	13.9	13.0	13.5	
BB2 - *b*	7.8	5.8	10.1	
BB2 - *c*	19.8	4.4	6.4	
BB2 - *d*	12.7	7.7	12.7	
BB2 - *e*	7.9	6.5	-0.7	
Area Total	**12.42**	**7.48**	**8.40**	
BB3 - *a*	20.5	9.6	19.5	
BB3 - *b*	20.1	15.2	26.3	
BB3 - *c*	10.6	8.9	14.4	
BB3 - *d*	9.3	14.6	7.9	
BB3 - *e*	-0.2	8.3	4.1	
Area Total	**15.13**	**11.32**	**14.44**	
BB4 - *a*	18.2	13.7	-2.1	
BB4 - *b*	12.3	19.5	6.9	
BB4 - *c*	11.2	14.5	-0.8	
BB4 - *d*	18.0	14.6	5.0	
BB4 - *e*	10.8	14.5	-2.5	
Area Total	**14.10**	**15.36**	**1.30**	

Notes:
[1] Results of Spring 2012 not received at time of report preparation.

Key:
δ = Isotope.
‰ = Parts per mille.
C = Carbon.
$CaCO_3$
D = Hydrogen.
mg/L = Milligrams per liter.
piC/L = Pico Curies per liter.
Sr = Strontium.

Table 4.2-54. Laboratory Results for Seagrass Leaf Nutrient Sampling, Fall 2010 and Fall 2011

Area	Transect	Fall 2010				Fall 2011			
		C%	N%	Δ C	Δ N	C%	N%	Δ C	Δ N
BB1	a	42.88	2.60	-11.10	5.02	35.15	2.04	-10.91	5.28
	b	43.84	2.62	-12.56	6.29	34.01	1.97	-9.28	4.08
	c	43.17	2.69	-11.79	5.10	34.04	1.89	-10.08	4.99
	d	42.76	2.66	-11.54	4.49	31.29	1.75	-9.14	5.00
	e	41.39	2.38	-9.99	4.06	33.35	2.00	-9.29	5.30
	Area Total	**43.23**	**2.65**	**-9.62**	**5.15**	**33.57**	**1.93**	**-9.74**	**4.93**
BB2	a	42.60	2.52	-9.21	2.66	34.97	1.93	-9.00	1.45
	b	42.14	2.44	-8.42	2.38	34.72	2.00	-10.71	3.33
	c	42.62	2.52	-9.56	2.62	36.67	1.95	-9.91	3.00
	d	43.32	2.52	-9.13	3.06	38.65	1.97	-9.89	2.78
	e	42.71	2.63	-9.08	2.56	37.54	1.96	-9.50	2.63
	Area Total	**42.21**	**2.47**	**-9.85**	**2.70**	**36.51**	**1.96**	**-9.80**	**2.64**
BB3	a	52.78	3.04	-10.41	4.07	36.85	1.89	-11.36	3.70
	b	67.30	3.70	-9.82	4.04	37.19	2.06	-11.13	3.94
	c	66.90	3.74	-10.09	4.70	38.26	2.05	-11.28	3.68
	d	43.96	2.77	-10.54	3.66	37.27	1.94	-10.70	3.66
	e	43.19	2.54	-10.53	4.04	36.55	1.76	-11.23	3.25
	Area Total	**42.56**	**2.45**	**-10.79**	**3.93**	**37.22**	**1.94**	**-11.14**	**3.64**
BB4	a	43.62	2.43	-11.36	5.35	37.82	1.87	-11.55	5.51
	b	43.63	2.38	-11.65	5.19	37.49	1.96	-11.46	5.03
	c	44.22	2.46	-11.35	4.47	38.18	1.87	-11.15	5.15
	d	42.46	2.29	-11.05	5.55	38.53	2.04	-11.00	5.15
	e	43.54	2.41	-11.08	5.87	37.86	1.96	-11.07	5.34
	Area Total	**44.26**	**2.63**	**-11.68**	**5.66**	**37.97**	**1.94**	**-11.24**	**5.23**

Key:
Δ = Change.
C = Carbon.
N = Nitrogen.

Table 4.2-55. Results of Statistical Comparisons (Kruskal-Wallis ANOVA by Ranks Test) of Leaf Nutrient Concentrations Among Areas for Both Fall Events. P Values in Red Indicate Significant Differences

Carbon					
Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	n
Fall 2010	BB4 BB2 BB3 BB1	5.6187	3	0.1317	40
Fall 2011	BB1 BB2 BB3 BB4	23.1000	3	<0.0001	40
All Events	BB1 BB2 BB3 BB4	0.8785	3	0.8306	80
Nitrogen					
Sampling Period	Mean Transect Value (Lowest → Highest)	H	df	p	n
Fall 2010	BB1 BB2 BB3 BB4	8.5139	3	0.0365	40
Fall 2011	BB3 BB1 BB4 BB2	0.5634	3	0.9048	40
All Events	BB1 BB2 BB3 BB4	0.8273	3	0.8429	80

Key:
ANOVA = Analysis of variance.
df = Degrees of freedom.

Table 4.3-1. Sampling Events and Locations

Habitat	April 2010 (Dry Season)	August 2010 (Wet Season)	September 2010 (Wet Season)	April 2011 (Dry Season) *
Freshwater Wetland	Specific Conductivity and Temperature at 56 points	N.A.	N.A.	Tracer Suite Analysis at 28 locations
Mangrove Area	Specific Conductivity and Temperature at 45 points	N.A.	N.A.	Tracer Suite Analysis at 29 locations
Biscayne Bay and Card Sound	Specific Conductivity and Temperature at 102 points	Specific Conductivity and Temperature at 102 points	Tracer Suite Analysis at 30 locations	Tracer Suite Analysis at 31 locations

Note:
* Thirty Tracer Suite samples were supposed to be collected at each location in April 2011 but no water could be extracted from two locations in the Freshwater Wetland and one location in the Mangroves after pumping up to 12 spots at each site for an hour. In Biscayne Bay and Card Sound, the 31st sample was a mid-water sample collected from Biscayne Bay as a "reference" for the Bay and Sound samples.

Key:
N.A. = Not applicable.

Table 4.3-2. Within Season and Habitat Depth Comparisons for Temperature and Salinity

Within Habitat Depth Comparisons								
			Temperature (°C)			Salinity		
Season	Habitat	Depth*	Mean	ANOVA	Tukey-Kramer	Mean	ANOVA	Tukey-Kramer
April 2010	Bay	Surface	23.22	$F_{4,282}$=4.51, p=0.002	20cm ≠ Surface, 0 cm	33.19	$F_{4,282}$=0.95, p=0.44	
		0 cm	23.18			32.88		
		20 cm	23.93			32.84		
		40cm	23.64			33.04		
		60 cm	23.73			33.46		
	AEI - Bay	Surface	22.77	$F_{4,37}$=0.26, p=0.90		33.17	$F_{4,37}$=1.78, p=0.16	
		0 cm	22.73			33.41		
		20 cm	23.23			32.16		
		40cm	22.88			31.75		
		60 cm	22.80			32.10		
	Mangrove	Surface	25.81	$F_{3,75}$=3.09, p=0.03	Surface ≠ 60cm	30.13	$F_{3,75}$=6.75, p<0.001	60cm ≠ Surface, 20cm
		20 cm	24.24			33.29		
		40cm	23.83			37.28		
		60 cm	23.56			40.57		
	AEI - Mangrove	Surface	25.57	$F_{3,32}$=1.74, p=0.18		32.86	$F_{3,32}$=0.59, p=0.63	
		20 cm	24.14			32.15		
		40cm	23.68			32.56		
		60 cm	23.31			33.50		
	Marsh	20 cm	22.07	$F_{2,88}$=1.49, p=0.23		1.02	$F_{2,88}$=0.95, p=0.39	
		40cm	21.74			1.22		
		60 cm	21.52			1.33		
	AEI - Marsh	20 cm	22.54	$F_{2,25}$=0.91, p=0.42		0.46	$F_{2,25}$=0.58, p=0.57	
		40cm	21.73			0.78		
		60 cm	21.52			1.09		

Table 4.3-2. Within Season and Habitat Depth Comparisons for Temperature and Salinity

Within Habitat Depth Comparisons								
			Temperature (°C)			Salinity		
Season	Habitat	Depth*	Tukey-Kramer	Mean	Tukey-Kramer	Mean	ANOVA	Tukey-Kramer
August 2010	Bay	Surface	31.63	$F_{4,362}$=0.25, p=0.91		33.81	$F_{4,362}$=22.06, p<0.001	Surface ≠ 20, 40, 60cm 0 cm ≠ 20, 40, 60 cm
		0 cm	31.76			33.93		
		20 cm	31.76			35.03		
		40cm	31.66			35.24		
		60 cm	31.72			34.92		
	AEI - Bay	Surface	30.95	$F_{4,37}$=0.37, p=0.83		33.90	$F_{4,37}$=0.89, p=0.48	
		0 cm	31.57			34.91		
		20 cm	31.18			35.04		
		40cm	31.18			34.58		
		60 cm	31.07			34.48		
September 2010	Bay	Surface	28.63	$F_{2,89}$=1.37, p=0.26		26.29	$F_{2,89}$=6.71, p=0.002	60cm ≠ Surface, 0 cm
		0 cm	28.45			27.06		
		60 cm	28.67			30.72		
April 2011	Bay	Surface	27.09	$F_{2,81}$=10.98, p<0.001	60cm ≠ Surface, 0 cm	37.12	$F_{2,81}$=32.24, p<0.001	60cm ≠ Surface, 0 cm
		60 cm	28.44			35.16		
		Bottom	26.97			37.25		
	AEI - Bay	Bottom	26.60	$F_{2,11}$=4.71, p=0.039**		38.01	$F_{2,11}$=3.11, p<0.09	
		Surface	26.69			37.69		
		0 cm	26.60			38.01		
		60 cm	27.58			34.60		
	Mangrove	Surface	30.48	$F_{1,40}$=8.44, p=0.006	Surface ≠ 60 cm	41.82	$F_{1,40}$=9.31, p=0.004	Surface ≠ 60 cm
		60 cm	28.37			35.06		

Table 4.3-2. Within Season and Habitat Depth Comparisons for Temperature and Salinity

Within Habitat Depth Comparisons								
			Temperature (°C)			Salinity		
Season	Habitat	Depth*	Tukey-Kramer	Mean	Tukey-Kramer	Mean	ANOVA	Tukey-Kramer
April 2011	AEI - Mangrove	Surface	33.08	$F_{1,10}$=5.70, p=0.040	Surface ≠ 60 cm	42.13	$F_{1,10}$=4.54, p=0.06	
		60 cm	28.98			36.79		
	Marsh	Surface	28.66	$F_{1,25}$=0.54, p=0.47		0.85	$F_{1,25}$=2.39, p=0.13	
		60 cm	27.99			1.45		
	AEI - Marsh	0 Surface	26.40	$F_{1,10}$=5.96, p=0.037	Surface ≠ 60 cm	0.39	$F_{1,10}$=0.70, p=0.42	
		60 cm	27.54			0.66		

Notes:

* Depths are categorized as such: Surface = 5 cm from top of water surface, 0 cm = 0-5 cm from sediment surface, 20 cm = 20 cm deep in the soil, 40 cm = 40 cm deep in the soil, 60 cm = 60 cm deep in the soil.

** Indicates difference in ANOVA but not in post-hoc Tukey-Kramer pair-wise comparison.

ANOVA comparisons and the means reported in this table for AEI sites used combined replicate means as described in Section 3-2.

Shaded cells indicate statistical differences.

The Tukey-Kramer multiple comparison identifies those depths that differ from one another for significant ANOVAs.

Key:

°C = Degrees Celsius.

AEI = Area of ecological interest.

cm = Centimeter.

Table 4.3-3. Comparisons of Porewater Temperature between AEI Site and Grid Points of the Same Season, Habitat and Depth

Porewater Temperature (°C)											
		Surface		20 cm		40 cm		60 cm		0 cm	
Season	Habitat	Mean	ANOVA	Mean	ANOVA	Mean	ANOVA	Mean	ANOVA	Mean	ANOVA
April 2010	Bay	23.22	$F_{1,91}$=1.38, p=0.24	23.93	$F_{1,64}$=1.88, p=0.18	23.64	$F_{1,42}$=01.96, p=0.17	23.73	$F_{1,29}$=2.55, p=0.12	23.18	$F_{1,90}$=1.23, p=0.27
	AEI - Bay	22.77		23.23		22.88		22.80		22.73	
	Mangrove	25.81	$F_{1,14}$=0.04, p=0.85	24.24	$F_{1,29}$=0.01, p=0.91	23.83	$F_{1,31}$=0.05, p=0.83	23.56	$F_{1,31}$=0.13, p=0.73		
	AEI - Mangrove	25.57		24.14		23.68		23.31			
	Marsh			22.07	$F_{1,40}$=0.63, p=0.43	21.74	$F_{1,39}$<0.01, p=0.98	21.52	$F_{1,33}$=0.00, p=1.00		
	AEI - Marsh			22.54		21.73		21.52			
August 2010	Bay	31.63	$F_{1,83}$=2.87, p=0.09	31.76	$F_{1,90}$=2.63, p=0.11	31.66	$F_{1,77}$=2.27, p=0.14	31.72	$F_{1,59}$=2.63, p=0.11	31.76	$F_{1,87}$=0.17, p=0.68
	AEI - Bay	30.95		31.18		31.18		31.07		31.57	
April 2011	Bay	27.09*	$F_{1,31}$=0.78, p=0.39					28.44	$F_{1,31}$=0.76, p=0.39	26.97	$F_{1,29}$=0.73, p=0.40
	AEI - Bay	26.69*						27.58		26.60	
	Mangrove	30.48*	$F_{1,22}$=2.93, p=0.10					28.37	$F_{1,28}$=0.53, p=0.47		
	AEI - Mangrove	33.08*						28.98			
	Marsh	28.66*	$F_{1,11}$=3.64, p=0.09					27.99	$F_{1,24}$=0.31, p=0.59		
	AEI - Marsh	26.40*						27.54			

Notes:
Sampled depths ranged from 0 – 5cm.
ANOVA comparisons and the means reported in this table for AEI sites used combined replicate means as described in Initial Ecological Characterization Report (FPL, 2012b), Section 3-2.
Key: AEI = Areas of Ecological Interest. °C = Degrees Celsius. cm = Centimeter(s).

Table 4.3-4. Comparisons of Porewater Salinity between AEI Site and Grid Points of the Same Season, Habitat and Depth

Porewater Salinity											
		Surface		20 cm		40 cm		60 cm		0 cm	
Season	Habitat	Mean	ANOVA	Mean	ANOVA	Mean	ANOVA	Mean	ANOVA	Mean	ANOVA
April 2010	Bay	33.19	$F_{1,91}<0.01$, p=0.96	32.84	$F_{1,64}=1.16$, p=0.29	33.04	$F_{1,42}=2.96$, p=0.09	33.46	$F_{1,29}=3.02$, p=0.09	32.88	$F_{1,90}=0.88$, p=0.35
	AEI - Bay	33.17		32.16		31.75		32.1		33.41	
	Mangrove	30.13	$F_{1,14}=0.68$, p=0.42	33.29	$F_{1,29}=0.46$, p=0.50	37.28	$F_{1,31}=4.49$, p=0.04	40.57	$F_{1,31}=6.31$, p=0.02		
	AEI - Mangrove	32.86		32.15		32.56		33.50			
	Marsh			1.02	$F_{1,40}=4.55$, p=0.04	1.22	$F_{1,39}=1.41$, p=0.24	1.33	$F_{1,33}=0.26$, p=0.61		
	AEI - Marsh			0.46		0.78		1.09			
August 2010	Bay	33.81	$F_{1,83}=0.03$, p=0.86	35.03	$F_{1,90}<0.01$, p=0.99	35.24	$F_{1,77}=2.82$, p=0.10	34.92	$F_{1,59}=0.62$, p=0.44	33.93	$F_{1,87}=3.12$, p=0.08
	AEI - Bay	33.90		35.04		34.58		34.48		34.91	
April 2011	Bay	37.12*	$F_{1,31=}1.57$, p=0.22					35.16	$F_{1,31}=0.35$, p=0.56	37.25	$F_{1,29}=3.70$, p=0.06
	AEI - Bay	37.69*						34.60		38.01	
	Mangrove	41.82	$F_{1,22}=0.01$, p=0.94					35.06	$F_{1,28}=0.49$, p=0.49		
	AEI - Mangrove	42.13						36.79			
	Marsh	0.85*	$F_{1,11}=2.29$, p=0.16					1.45	$F_{1,24}=3.68$, p=0.07		
	AEI - Marsh	0.39*						0.66			

Notes:
Sampled depths ranged from 0 – 5 cm.
ANOVA comparisons and the means reported in this table for AEI sites used combined replicate means as described in the Initial Ecological Characterization Report (FPL, 2012b), Section 3-2.
Shaded cells indicate statistical differences.
Key: AEI = Areas of Ecological Interest. ANOVA = Analysis of variance. °C = Degrees Celsius. cm = Centimeter(s).

Table 4.3-5. Range of Ions and Isotopes in Porewater from the Marsh, Mangrove and Biscayne Bay around the CCS.

	Marsh				Mangrove				Biscayne Bay			
Parameter	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation
Temperature	20.03	34.45	26.55	2.84	18.60	34.40	26.59	2.91	23.10	29.40	26.98	1.53
pH	6.26	7.78	7.09	0.30	6.18	7.68	7.02	0.26	6.41	7.99	7.22	0.30
Specific Conductivity	488	65051	4551	9903	40788	85880	54356	10320	21180	60700	51914	7155
Barium (mg/L)	0.0008	0.13	0.04	0.04	0.0008	0.10	0.04	0.03	0.02	0.08	0.04	0.03
Iron (mg/L)	0.0027	6.40	0.78	0.82	0.0027	5.70	0.82	0.80	0.05	1.90	0.58	0.36
Calcium (mg/L)	24	960	265	176	360	890	567	106	67	570	456	65
Magnesium (mg/L)	6	1700	98	249	720.00	2300	1332	285	240	1500	1271	188
Potassium (mg/L)	1.50	540.00	28.50	77.76	200.00	780.00	423.75	102.94	67.00	530.00	402.71	68.34
Sodium (mg/L)	27	13000	739	1967	4100	18000	10474	2359.3	1800	13000	10238	1451
Boron (mg/L)	0.02	4.80	0.30	0.76	2.40	7.20	4.41	0.84	0.68	5.50	4.43	0.60
Strontium	0.33	9.60	2.04	1.54	4.80	14.00	8.32	1.62	1.30	9.70	7.68	1.09
Bromide	0.034	130	5	14	19	120	67	22	0.027	85	63	20
Chloride	41	26000	1385	3762	3000	35000	20123	5053	1700	24000	19359	2953
Fluoride	0.02	1.10	0.17	0.17	0.20	8.00	0.87	0.99	0.02	1.00	0.52	0.34
Sulfate	0.200	2700	171	461	710	4400	2464	735	2	3500	2539	511
Alkalinity	82.00	610	329	93	93	620	345	131	58	350	180	55
Bicarb	82	610	329	92	93	620	345	131	58	350	180	55
Sulfide	1	26	2	3	1	86	13	15	1	42	6	5
DIC	10	140	82	22	10	190	89	35	10	110	47	16
δ18O (‰)	-2.7	3.0	0.0	0.9	-1.5	4.9	2.2	1.0	0.2	3.0	1.6	0.7
δD (‰)	-19.0	23.0	3.1	6.7	-6.0	32.0	16.5	6.3	3.0	23.0	13.1	5.1
δ13C (‰)	-15.5	-1.3	-8.7	3.1	-13.5	-7.1	-10.7	1.5	-6.2	-2.0	-4.1	0.9
87Sr/86Sr (‰)	0.70910	0.70921	0.70915	0.00002	0.70912	0.70923	0.70915	0.00002	0.70911	0.70917	0.70914	0.00001
Tritium (pCi/L)	-4.3	198.0	45.7	41.6	0.7	159.0	40.6	31.3	-2.5	26.3	11.2	6.6

Key:
‰ = Parts per mille.
DIC = Dissolved inorganic carbon.
mg/L = Milligram(s) per liter.
pCi/L = Picocuries per liter.

Table 4.3-6. Range of Soil Wet and Dry Bulk Densities in the Different Habitats around the CCS

Habitat	Wet Bulk Density				Dry Bulk Density			
	Min	Max	Average	Standard Deviation	Min	Max	Average	Standard Deviation
Marsh	1.03	1.37	1.22[a]	0.10	0.18	0.60	0.42[b]	0.14
Mangrove	1.07	1.37	1.21[a]	0.10	0.15	0.62	0.37[a]	0.16
Biscayne Bay	1.30	1.80	1.65[b]	0.15	0.45	1.27	1.02[c]	0.23
Tree Islands	1.00	1.07	1.02	0.03	0.13	0.21	0.17	0.03

Note: Superscripts with similar letters for the average wet and dry bulk densities indicate non-significance at $P > 0.05$ among the marsh, mangrove and Biscayne Bay sites.

Table 4.3-7. Wet and Dry Bulk Density Statistical Comparisons Across Habitats

Habitat	Wet Bulk Density			Dry Bulk Density			Implications of findings
	df, error df	F	P-value	df, error df	F	P-value	
Within-Habitat Comparisons:							
Marsh	5,10	2.03	0.1594	5,10	2.19	0.1360	Within each habitat, the soil bulk densities are the same.
Mangrove	5,6	0.58	0.7163	5,6	0.72	0.6327	
Biscayne Bay	3,16	1.53	0.2443	3,16	1.71	0.2060	
Among-Habitat Comparisons:							
Marsh vs Mangrove vs Bay	2,45	71.32	>0.0001	2,45	147.86	>0.0001	There is a difference between the habitats (see Table 4.1-12).
Among Plots:							
Marsh	2,13	1.54	0.2514	2,13	0.90	0.4294	There is no difference in soil bulk density with distance from the CCS.
Mangrove	1,10	3.15	0.1063	1,10	3.50	0.0908	
Biscayne Bay	4,15	1.08	0.4003	4,15	0.95	0.4648	

Key: df = Degrees of freedom.

FIGURES



Figure 4.1-1. Marsh and Mangrove Plot Locations.

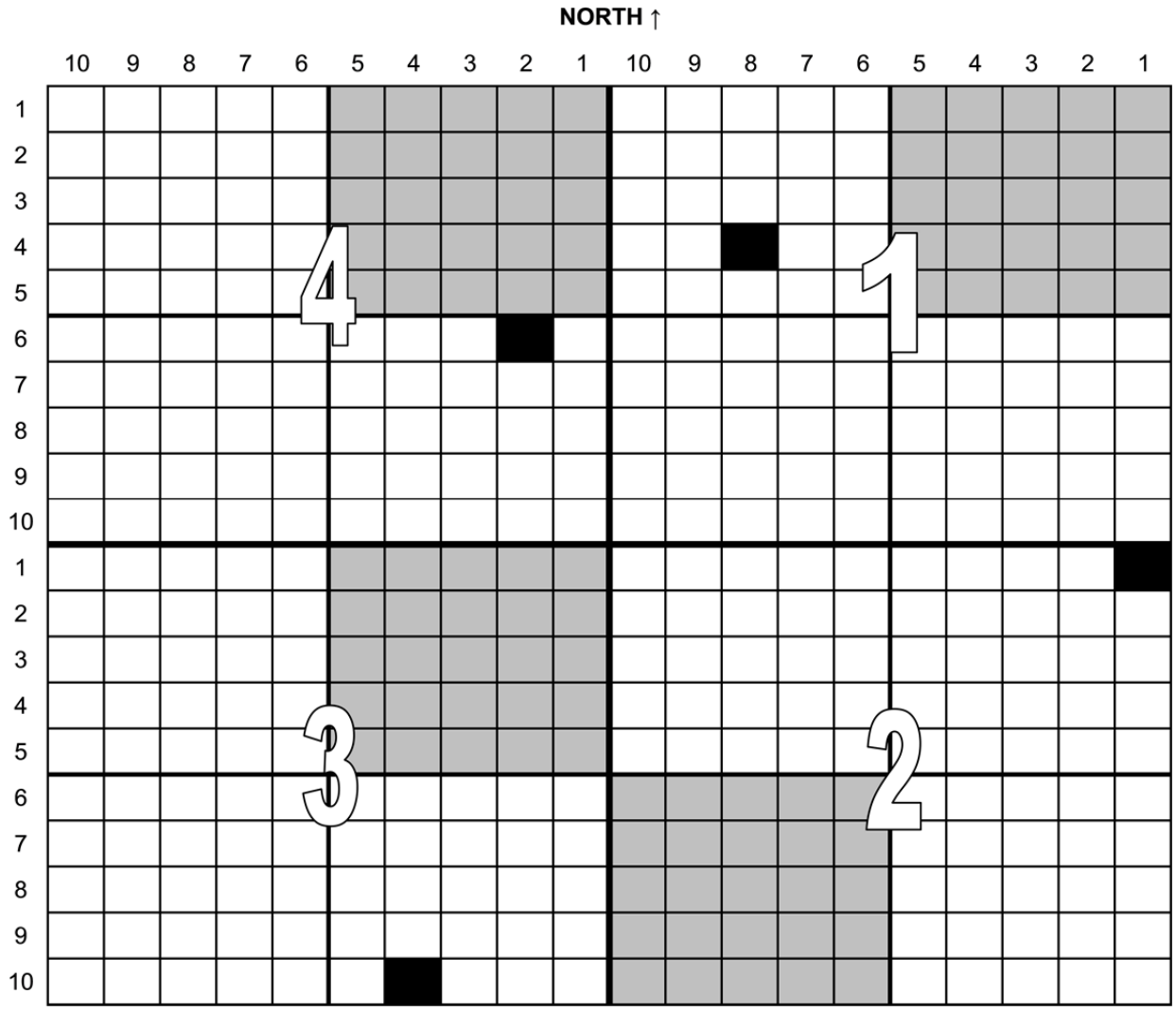


Figure 4.1-2. Example of Plot Design.

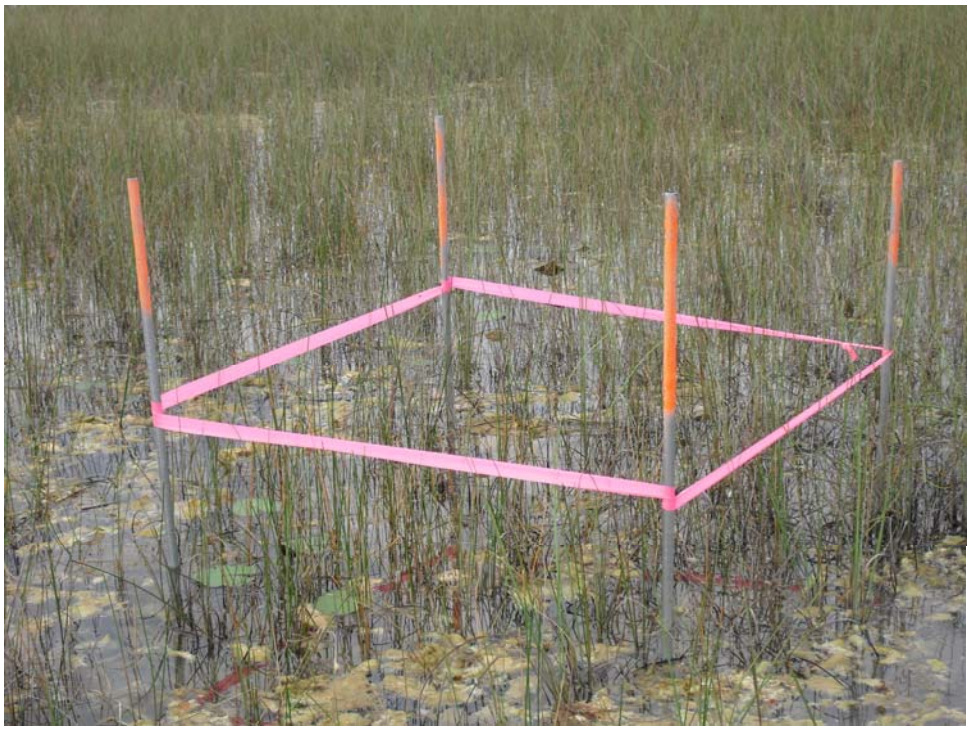


Figure 4.1-3. 1m x 1m Marsh Subplot.



Figure 4.1-4. Picture of Plot F3-3 Taken from the Northeast Corner Facing Southwest.

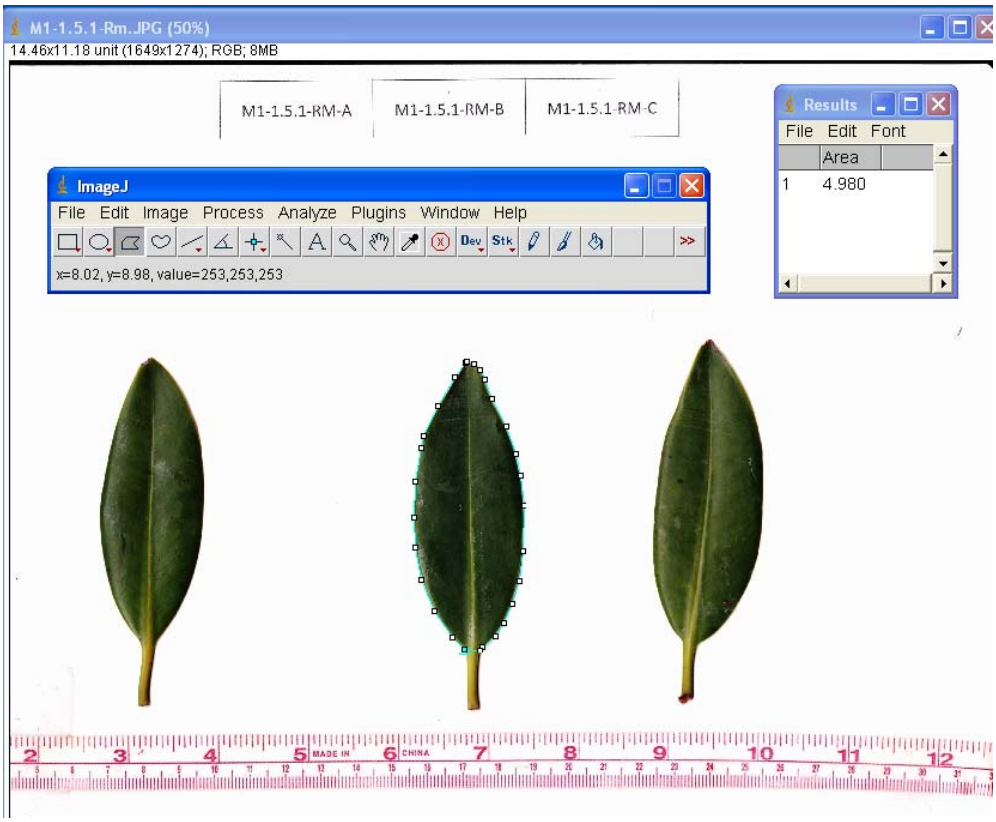


Figure 4.1-5. Screenshot of ImageJ with a Leaf Outlined for Surface Area Measurement.

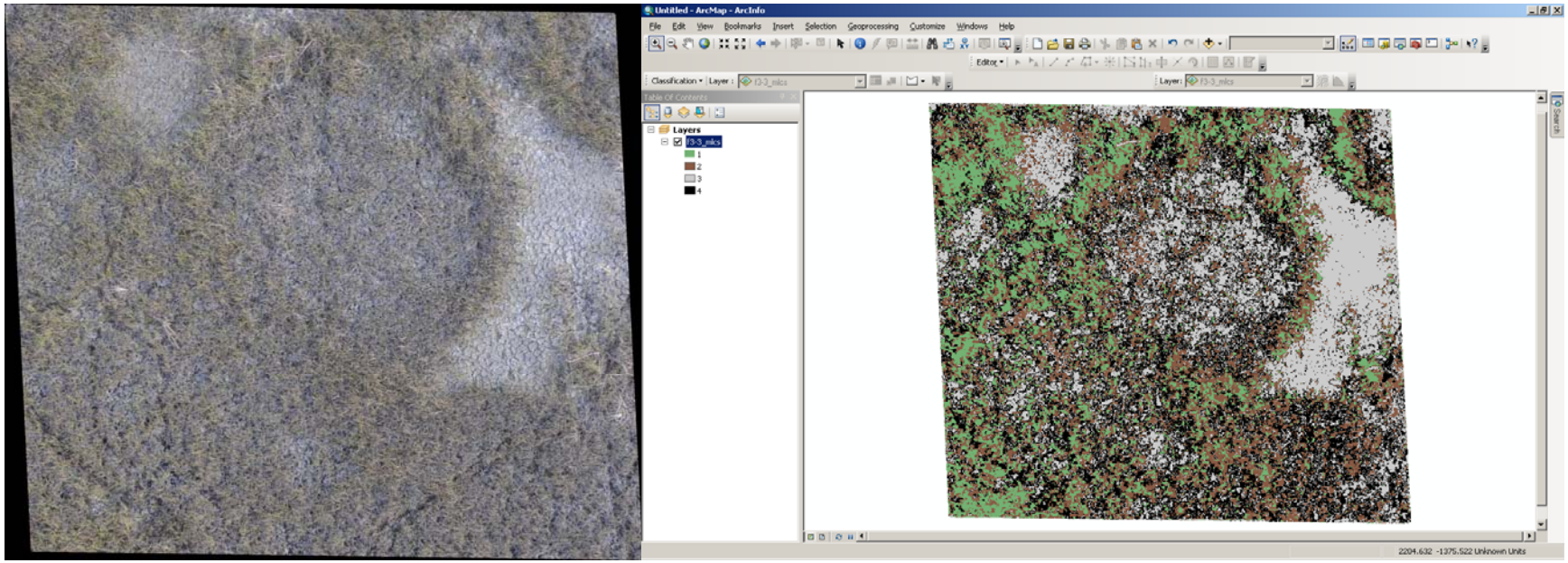
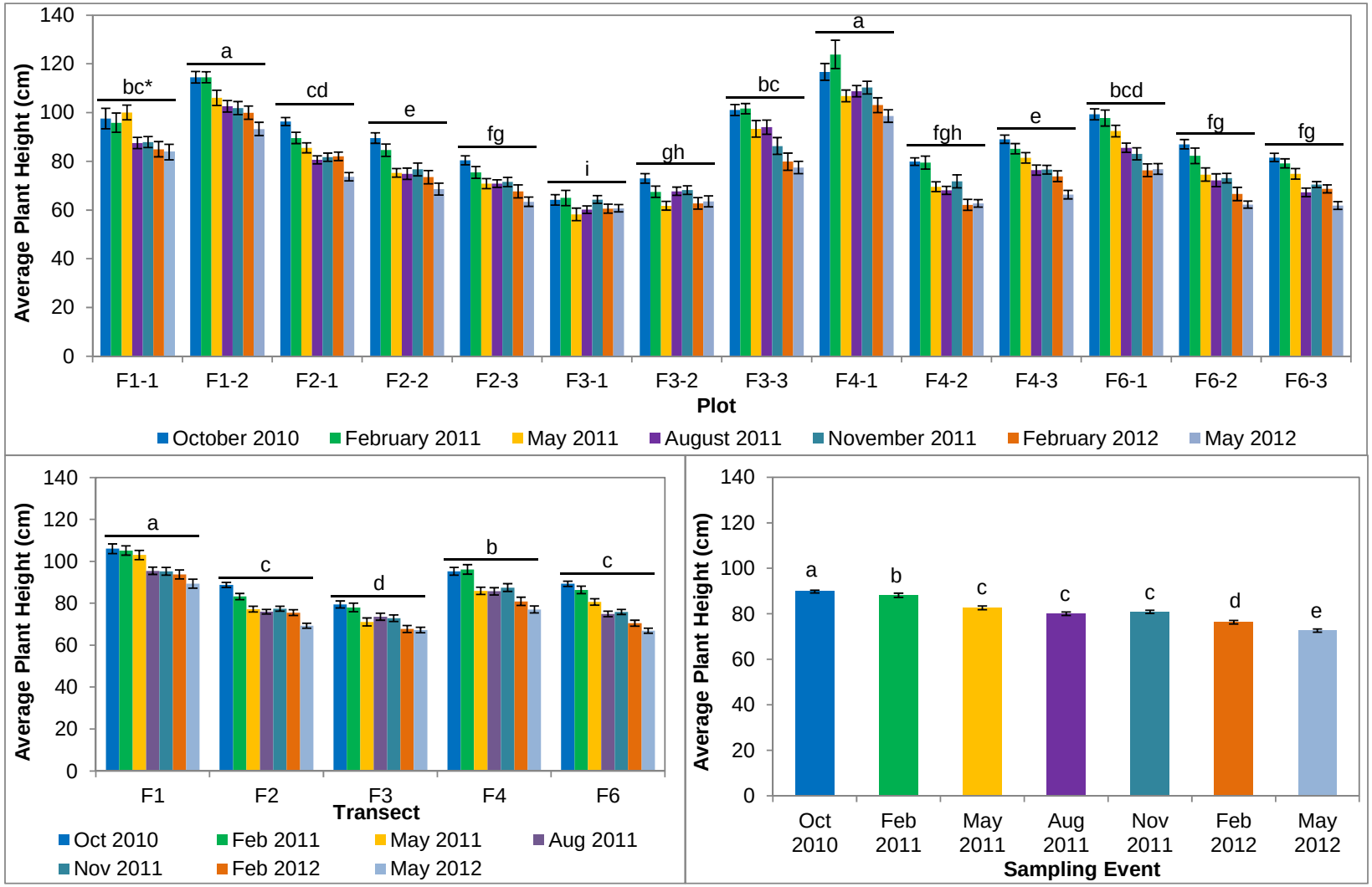


Figure 4.1-6. Aerial Photograph of Plot F3-3 (Left) and the Resulting Maximum Likelihood Classification (Right).



Figure 4.1-7. Soil Cores Capped and Ready for Transport to the Lab for Processing.



Note: Letters represent statistical groupings based on site average over all sampling events.

Figure 4.1-8. Sawgrass Height per Plot, Transect, and Sampling Event.

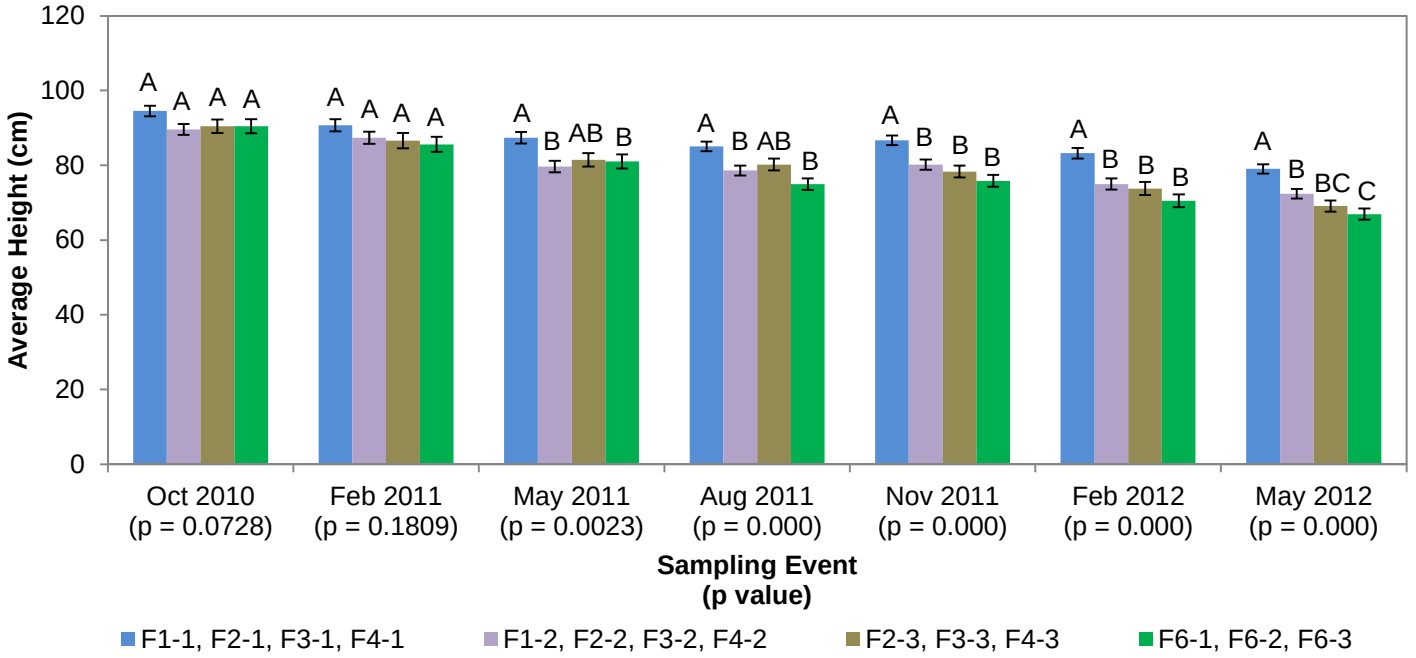


Figure 4.1-9. Sawgrass Height with Distance from the CCS (Significance at p < 0.007).

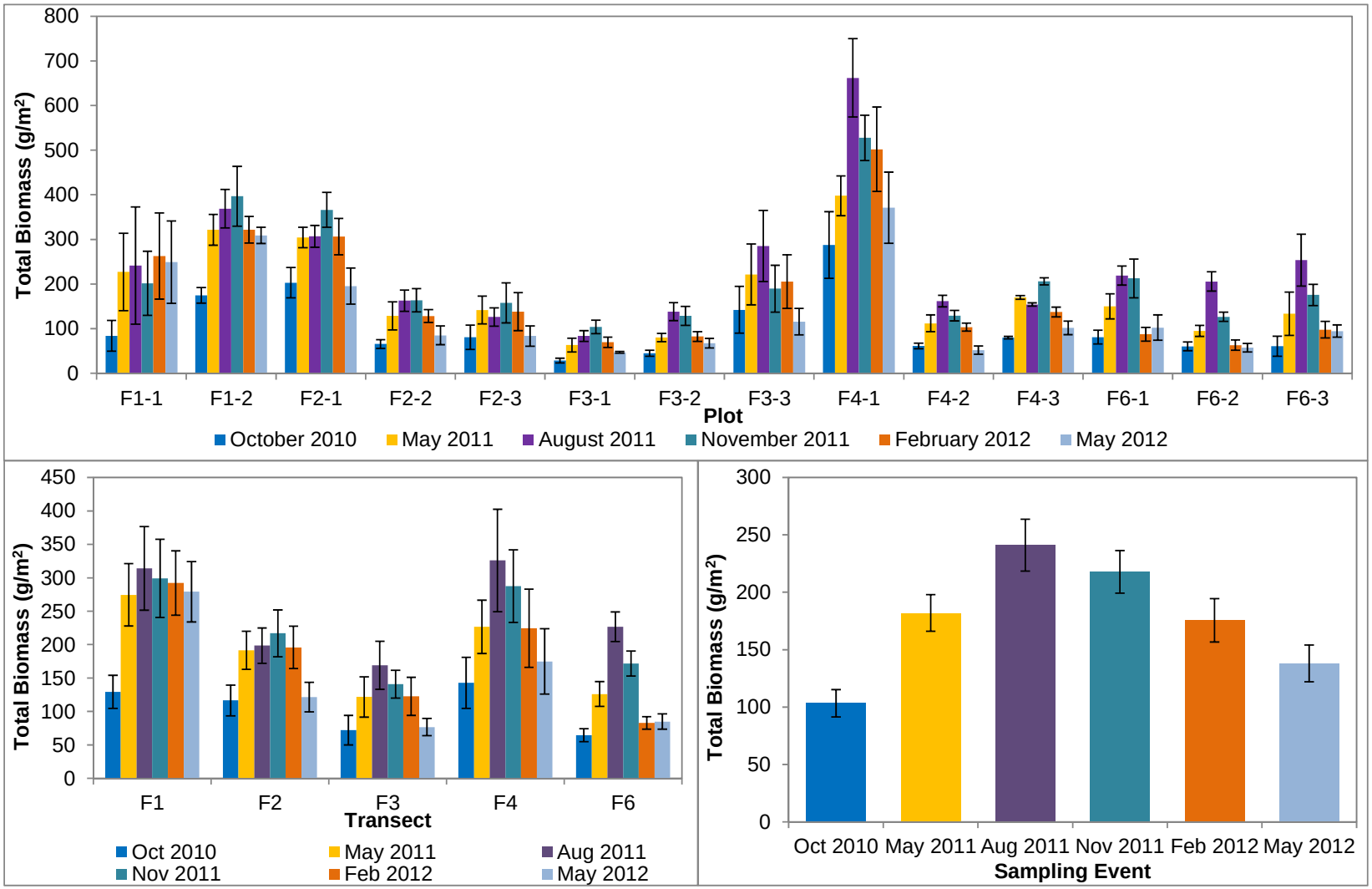
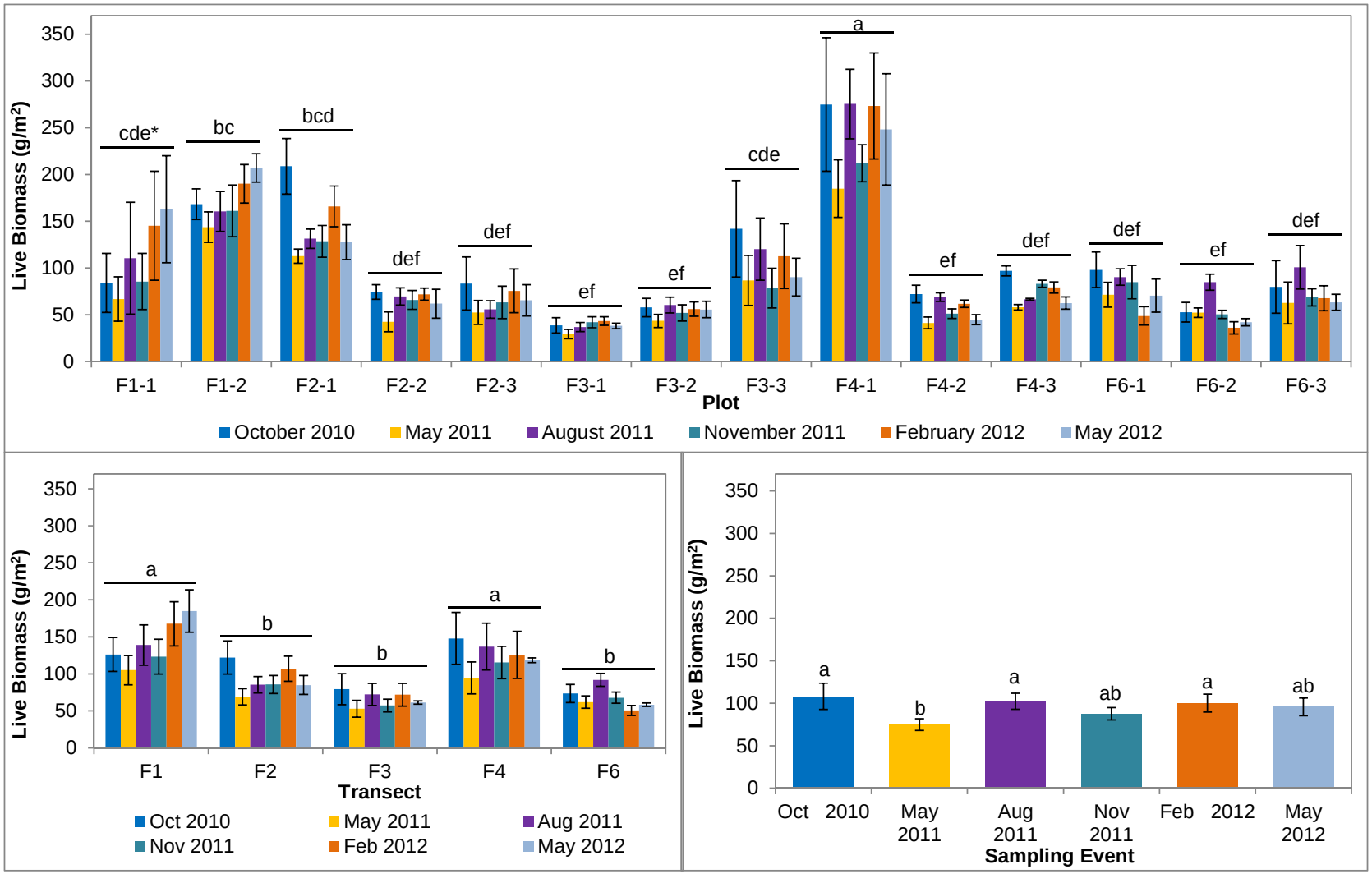


Figure 4.1-10. Sawgrass Total Biomass per Plot, Transect, and Sampling Event.



Note: Letters represent statistical groupings based on site average over all sampling events.

Figure 4.1-11. Sawgrass Live Biomass per Plot, Transect, and Sampling Event.

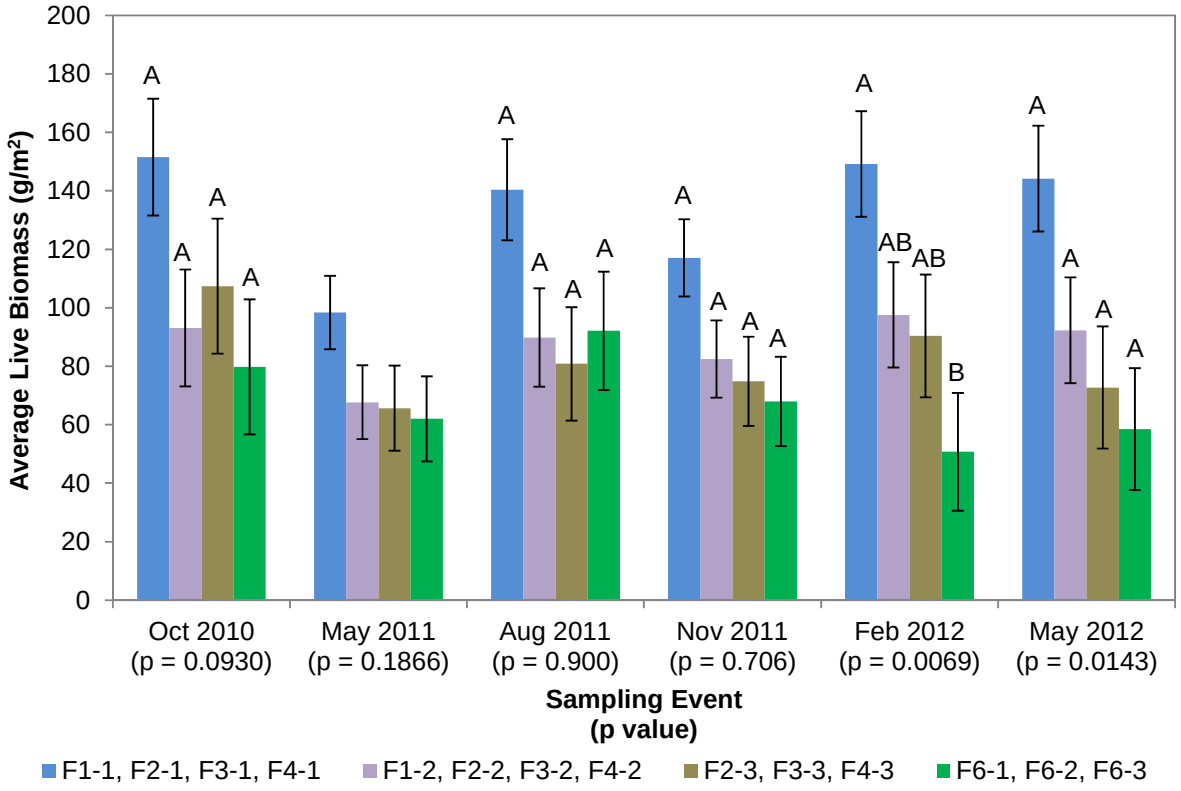


Figure 4.1-12. Sawgrass Live Biomass with Distance from the CCS (Significance at p < 0.008).

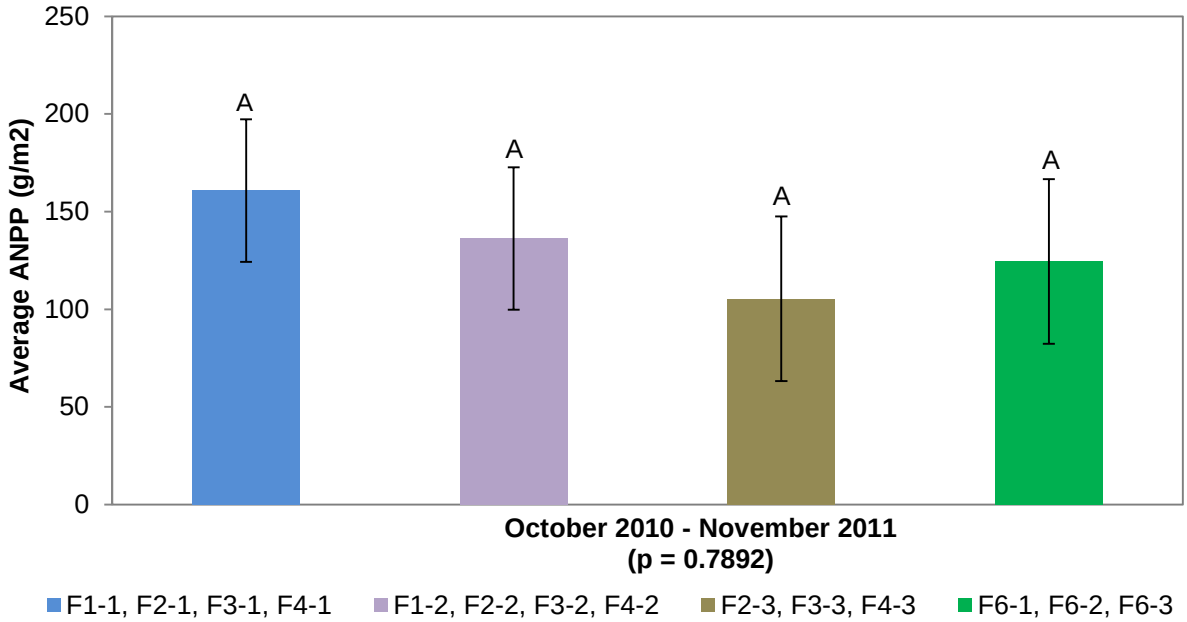


Figure 4.1-13. Sawgrass Productivity with Distance from the CCS (Significance at p < 0.05).

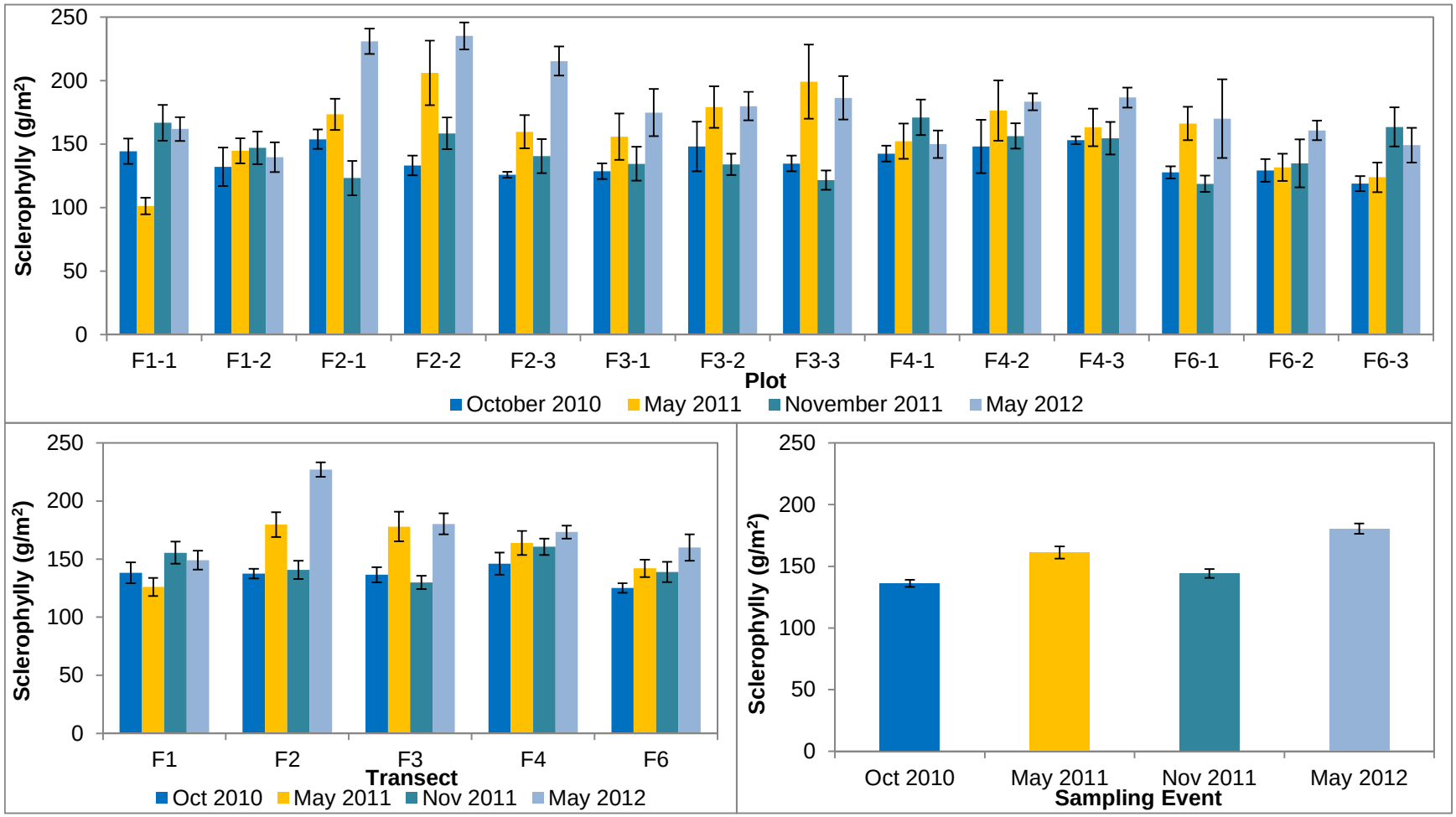


Figure 4.1-14. Sawgrass Sclerophylly per Plot, Transect, and Sampling Event.

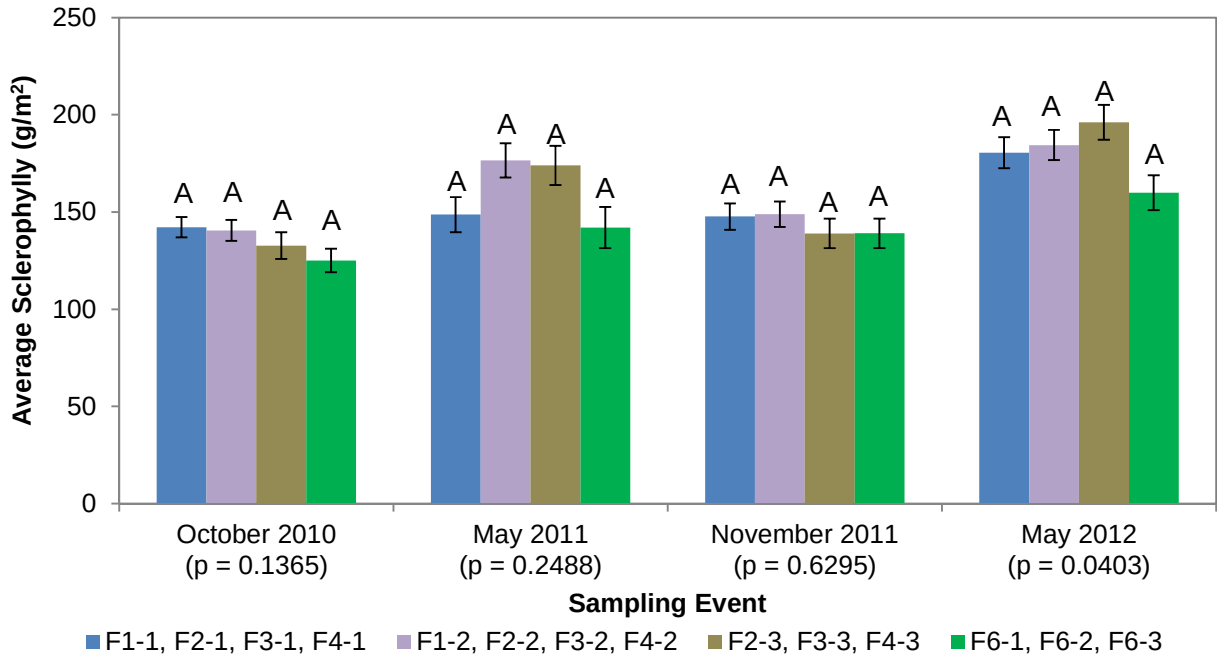
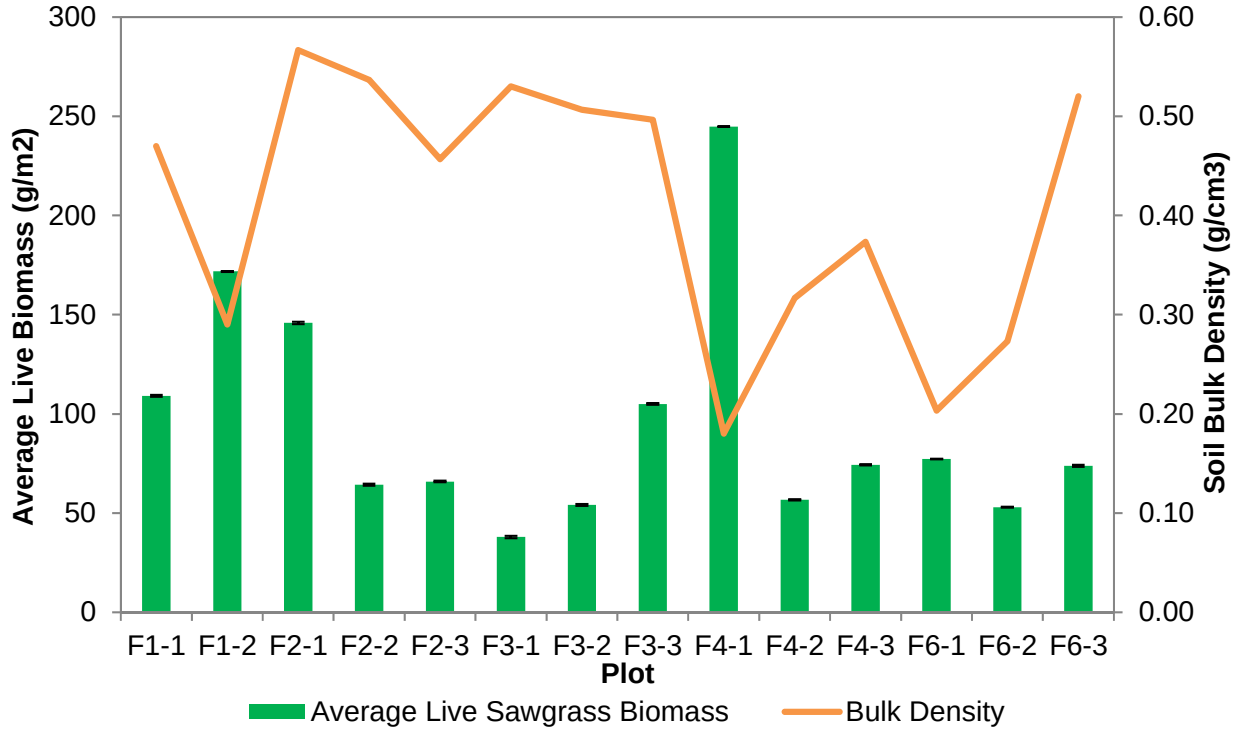


Figure 4.1-15. Sawgrass Sclerophylly with Distance from the CCS (Significance at p < 0.012).



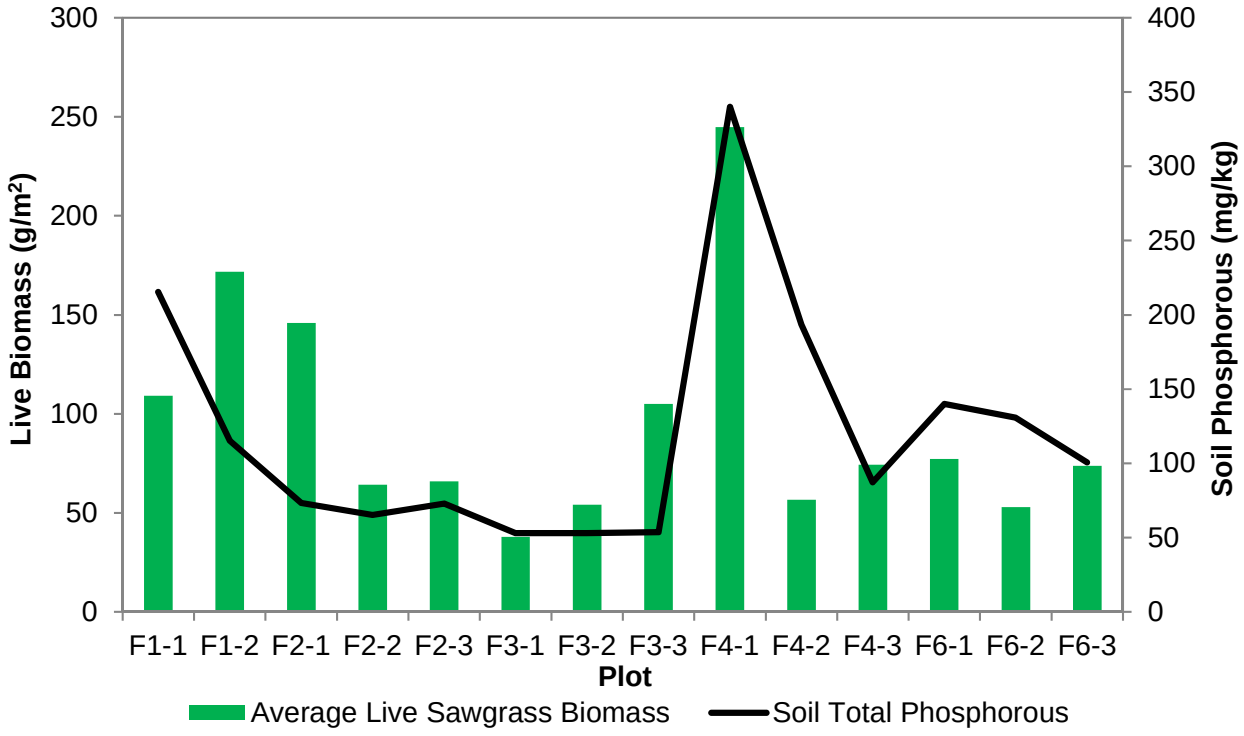


Figure 4.1-16. Soil Dry Bulk Density and Soil Phosphorus with Sawgrass Live Biomass.

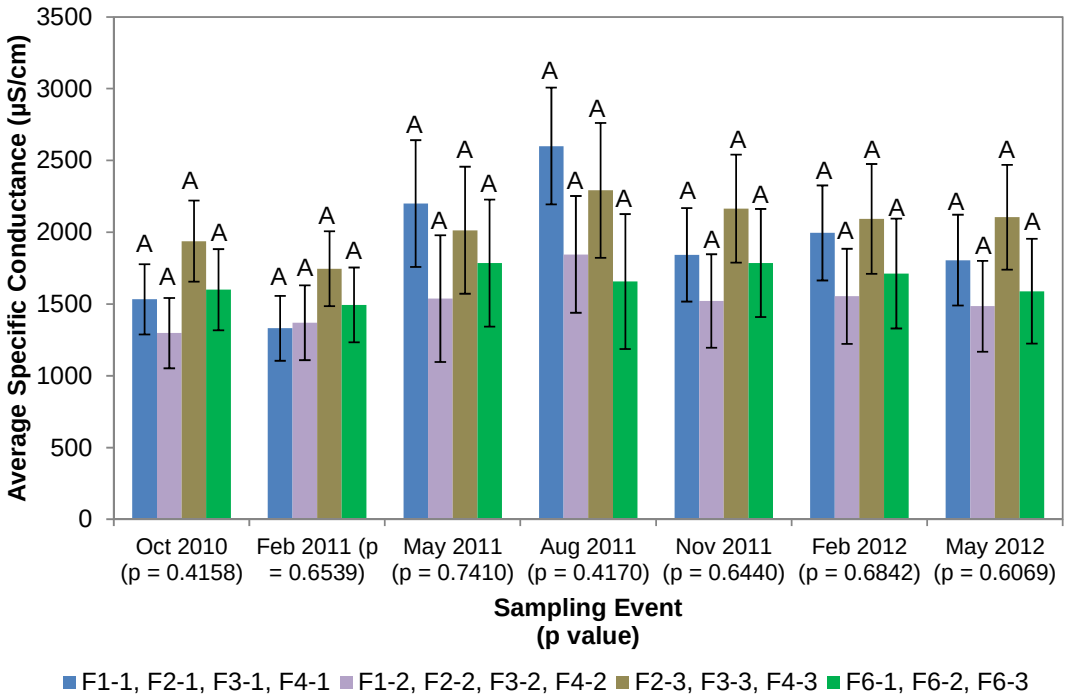


Figure 4.1-17. Marsh Porewater Specific Conductance with Distance from the CCS (Significance at p < 0.007).

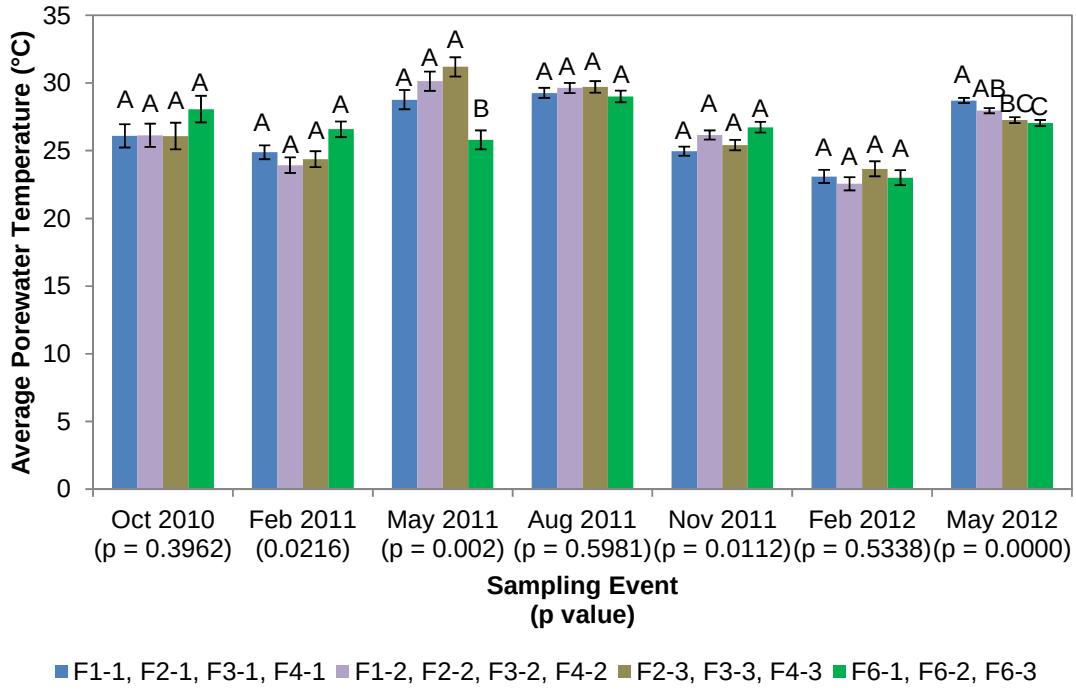
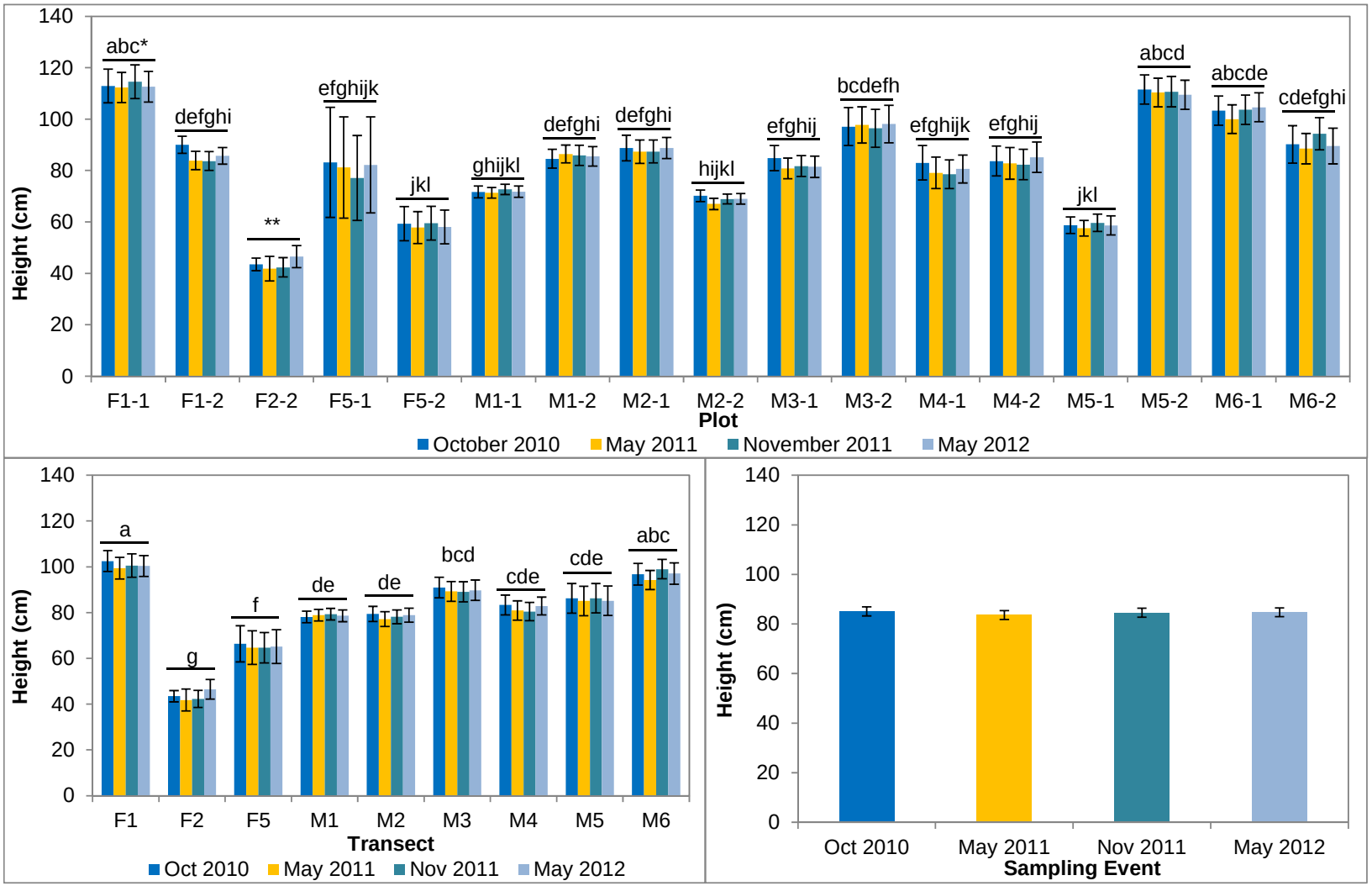


Figure 4.1-18. Marsh Porewater Temperature with Distance from the CCS (Significance at p < 0.007).



Notes: * Letters represent statistical groupings based on site average over all sampling events.
** Not included in statistical analysis.

Figure 4.1-19. Red Mangrove Height per Plot, Transect, and Sampling Event.

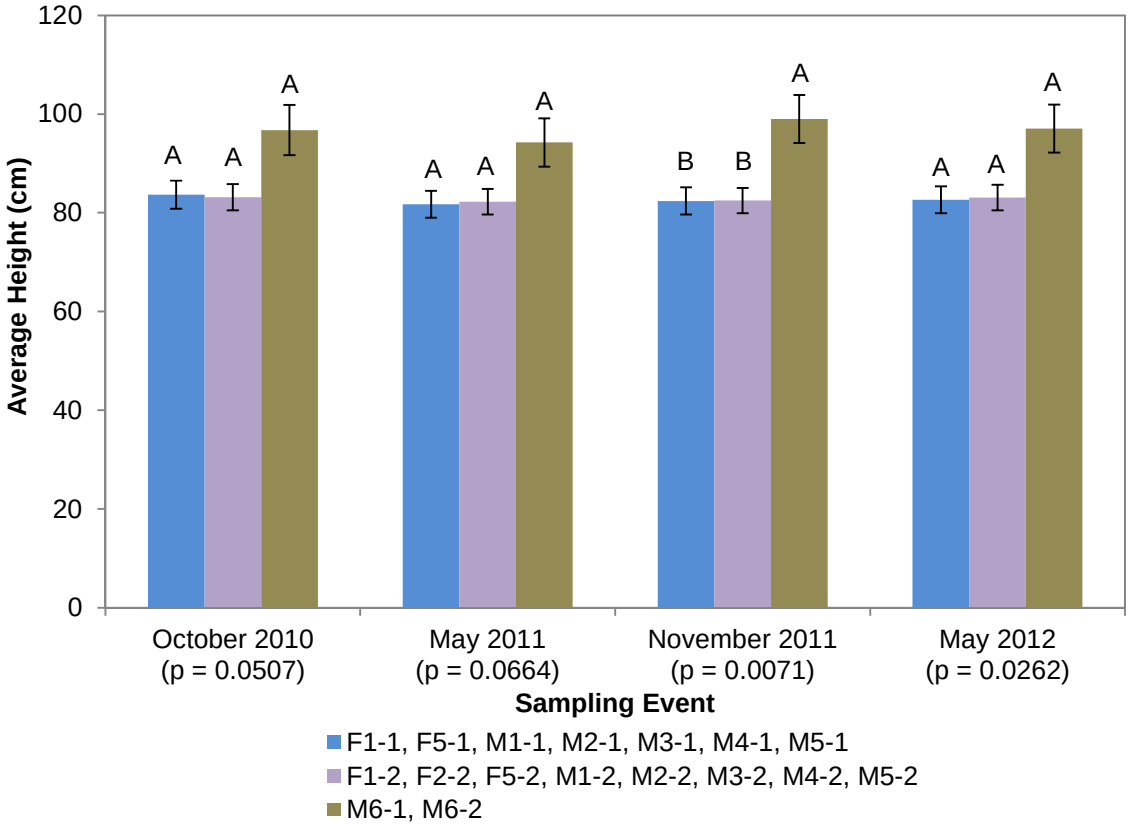
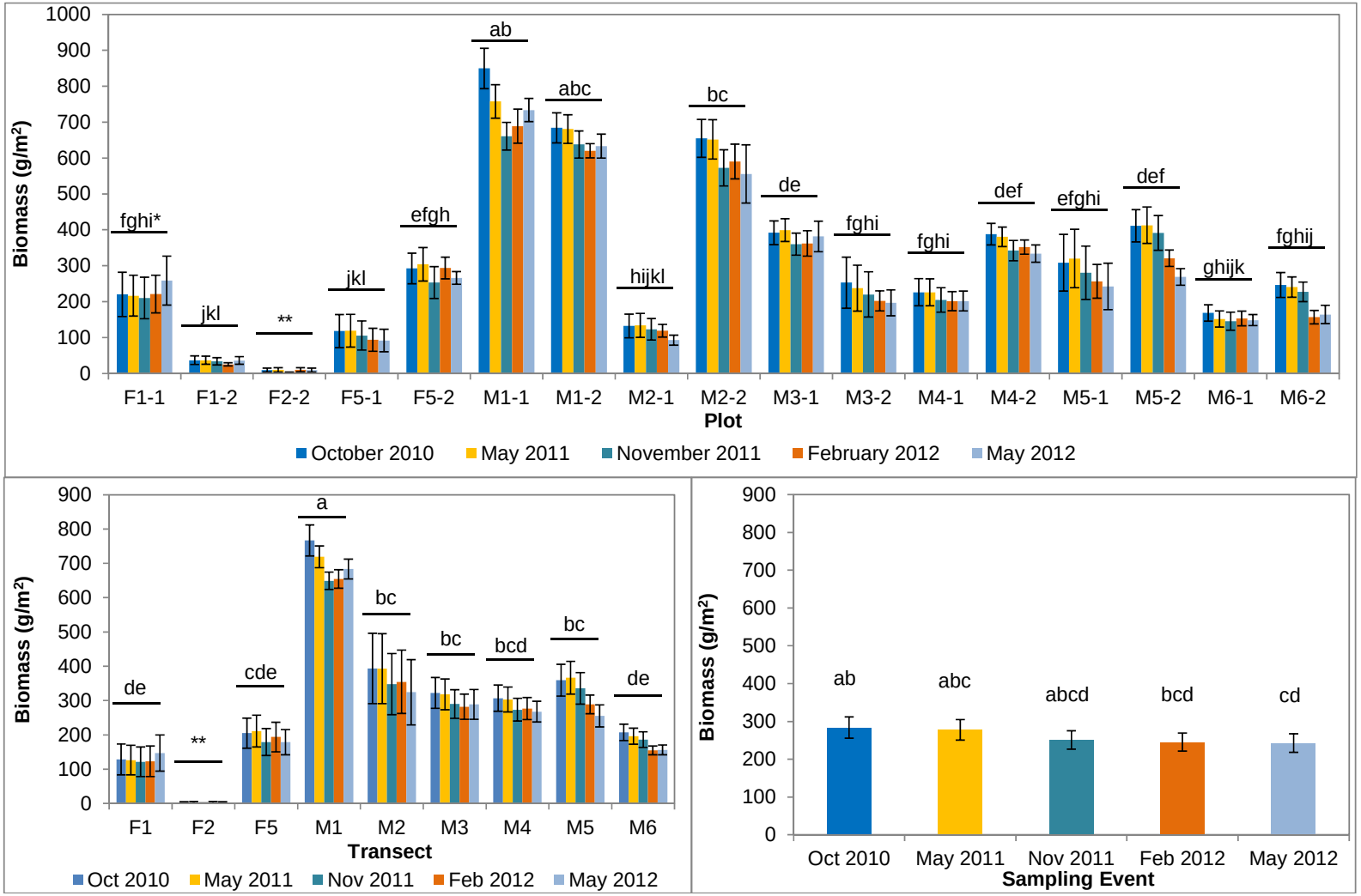


Figure 4.1-20. Red Mangrove Height with Distance From the CCS.



Notes:

* Letters represent statistical groupings based on site average over all sampling events.
** Not included in statistical analysis.

Figure 4.1-21. Red Mangrove Biomass per Plot, Transect, and Sampling Event.

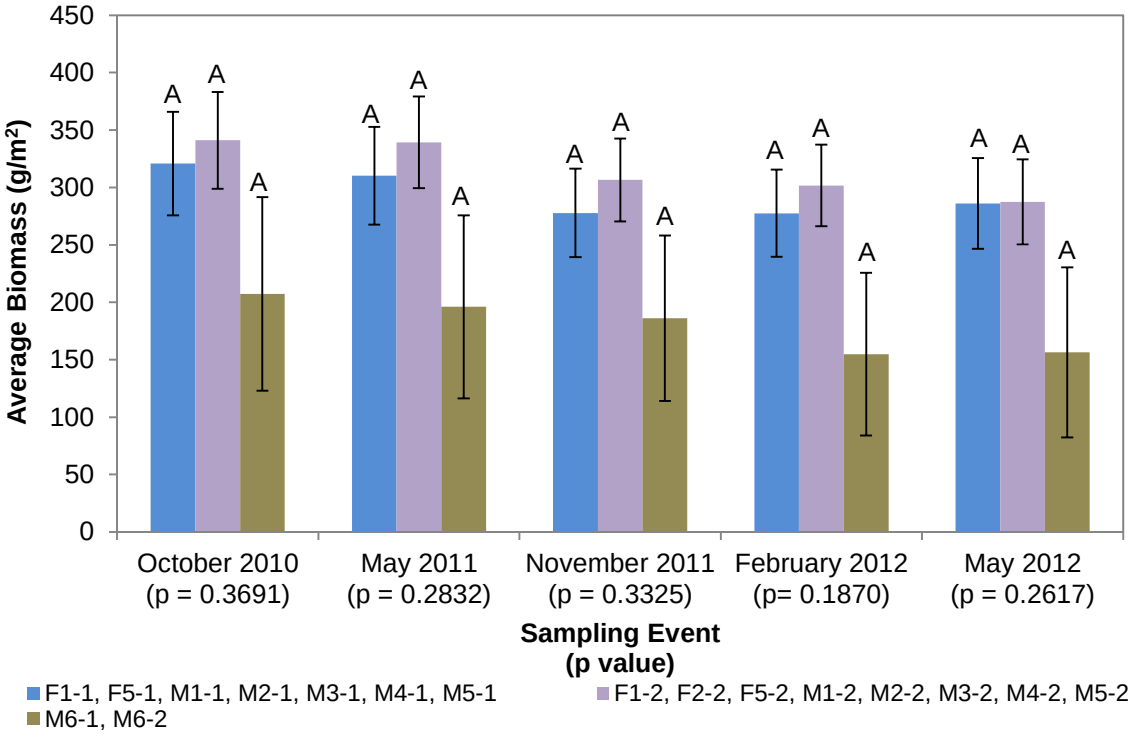


Figure 4.1-22. Red Mangrove Biomass with Distance from the CCS (Significance at p < 0.01).

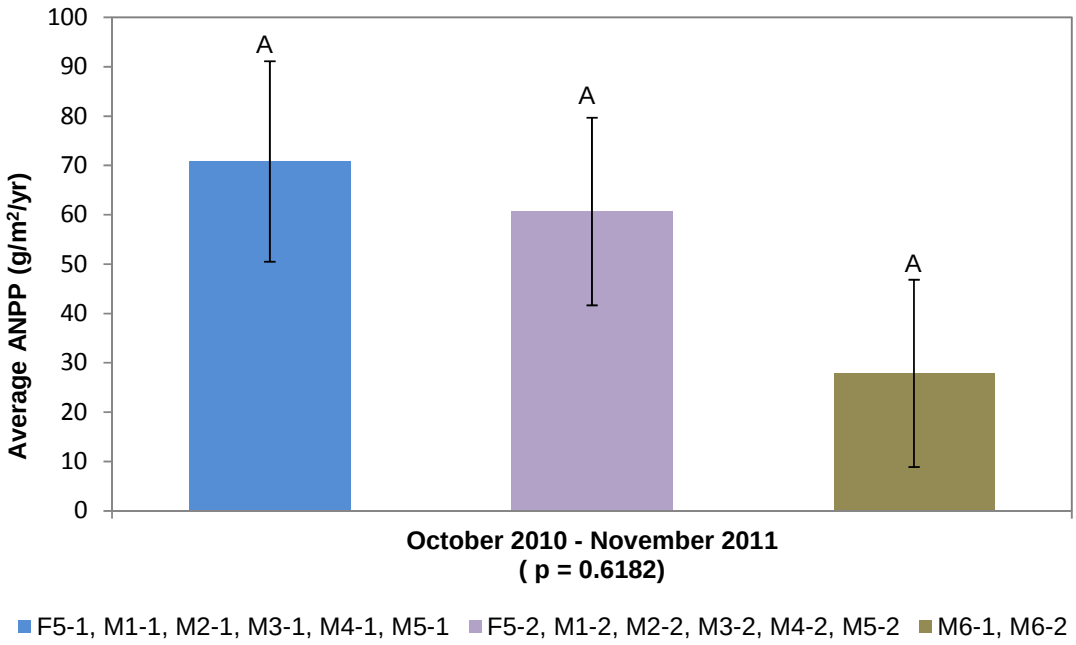


Figure 4.1-23. Red Mangrove Productivity with Distance from the CCS.

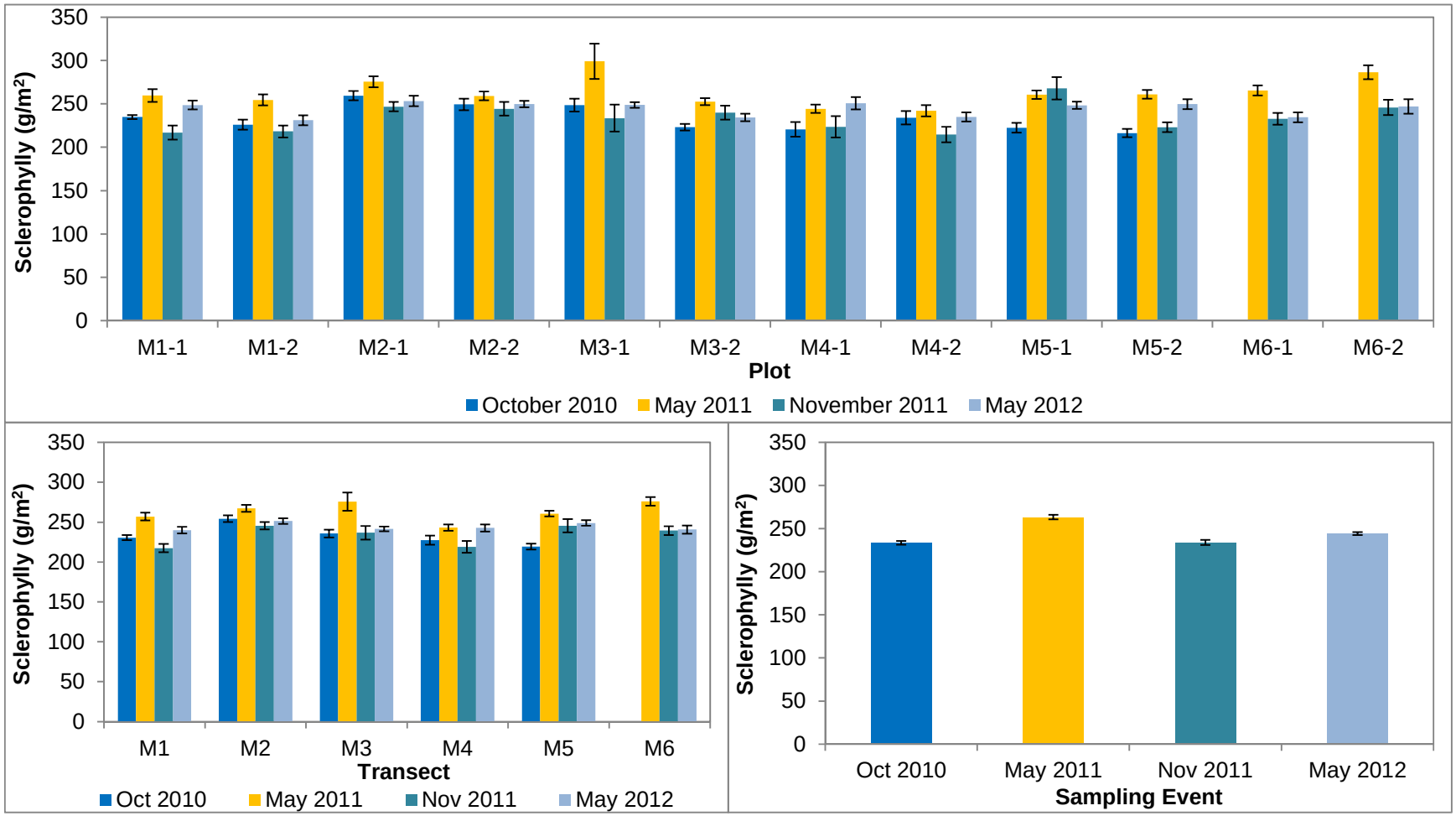


Figure 4.1-24. Red Mangrove Leaf Sclerophylly per Plot, Transect and Sampling Event.

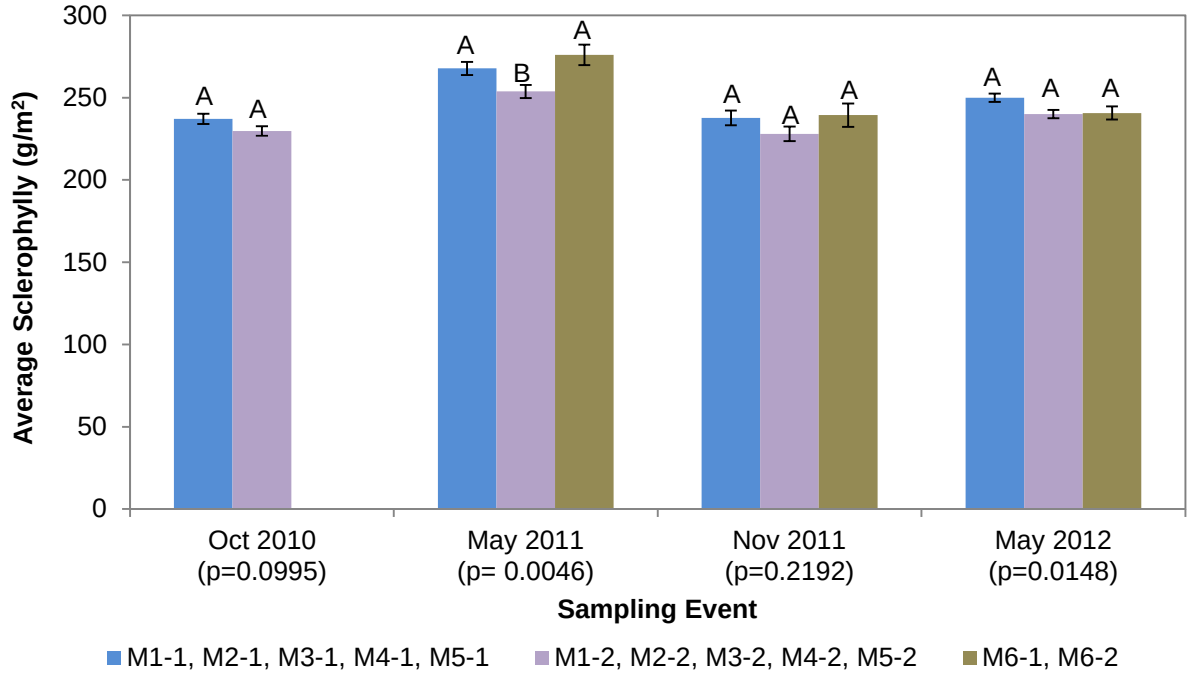


Figure 4.1-25. Red Mangrove Leaf Sclerophylly with Distance from the CCS (Significance at p < 0.012).

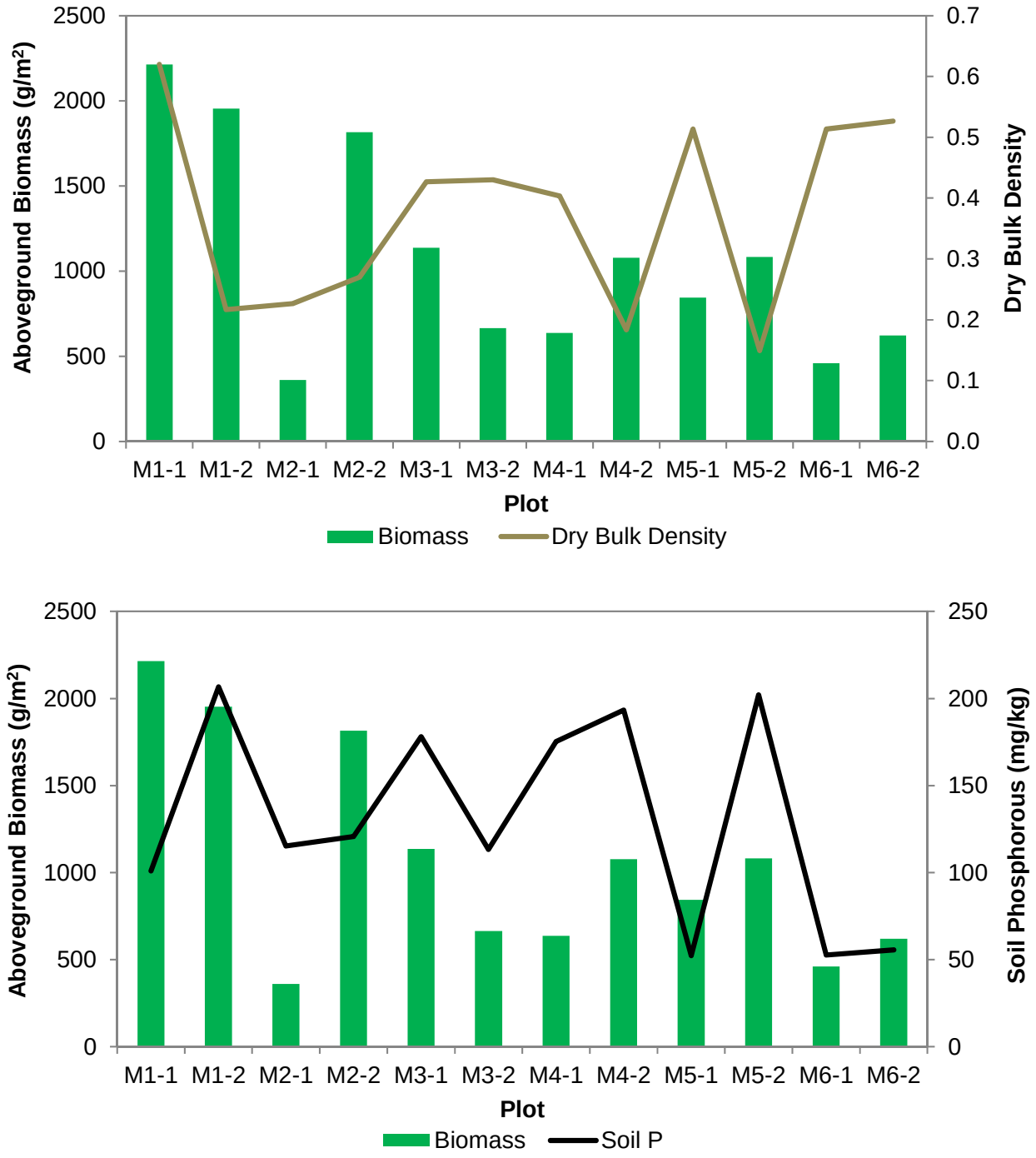


Figure 4.1-26. Soil Dry Bulk Density and Soil Phosphorous with Red Mangrove Biomass.

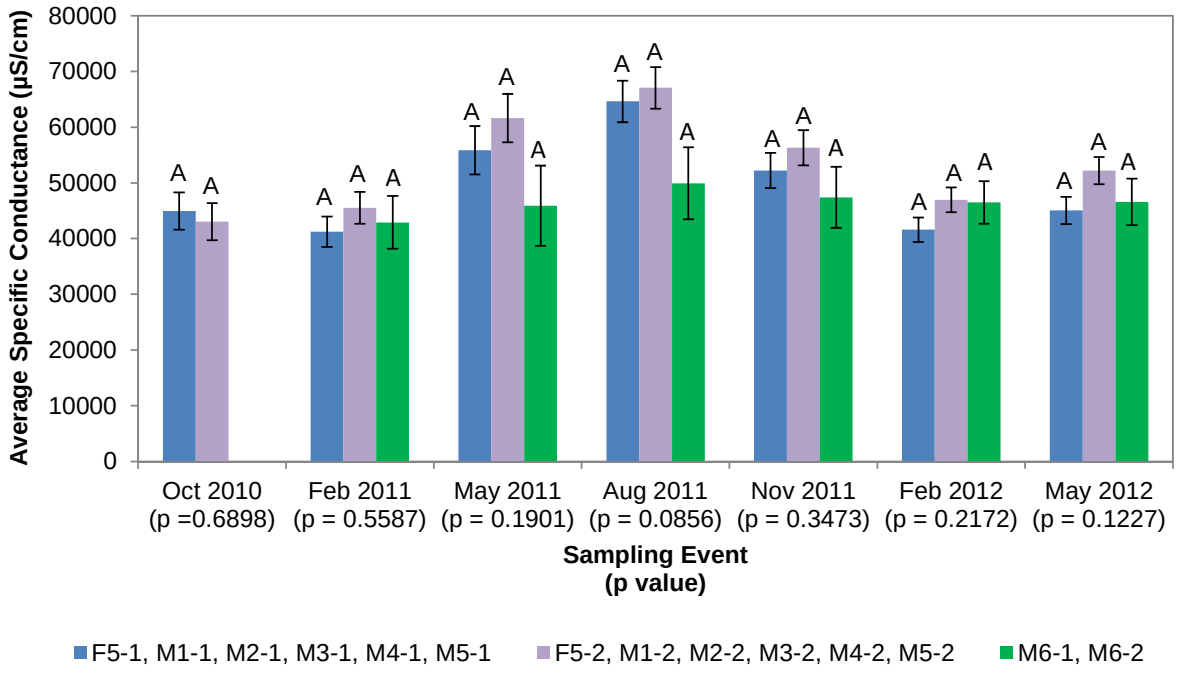


Figure 4.1-27. Mangrove Porewater Specific Conductance with Distance from the CCS (Significance at p < 0.007).

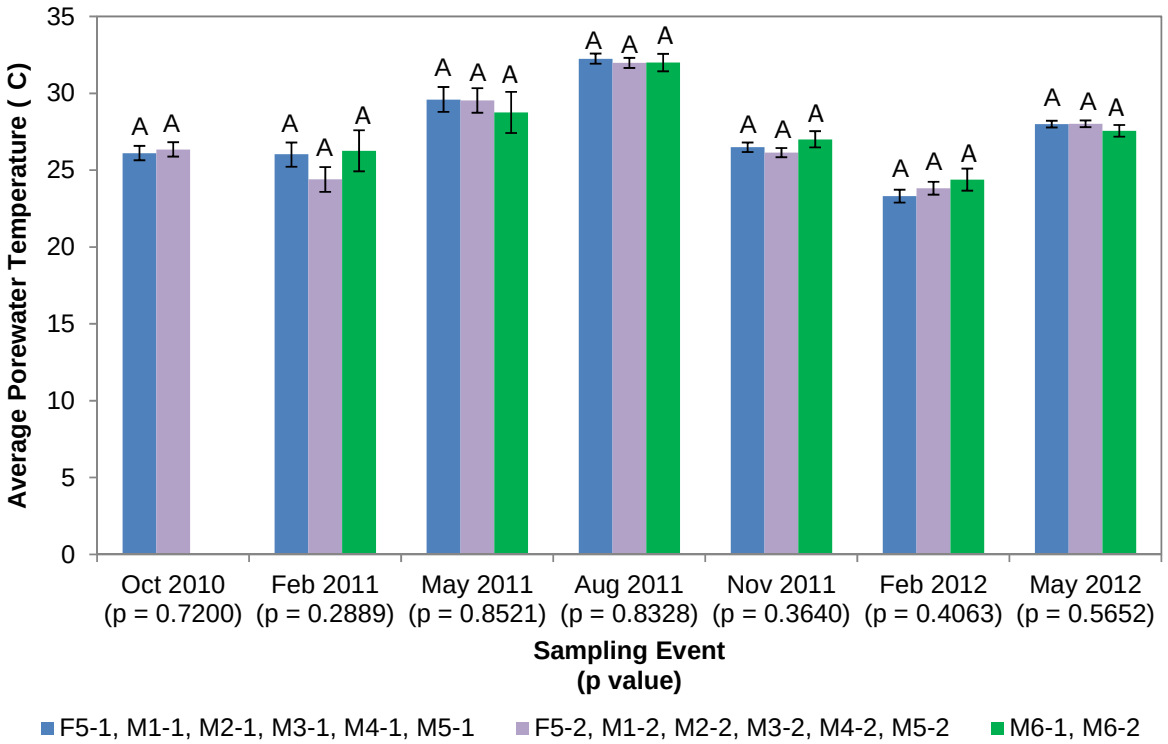


Figure 4.1-28. Mangrove Porewater Temperature with Distance from the CCS (Significance at p < 0.007).

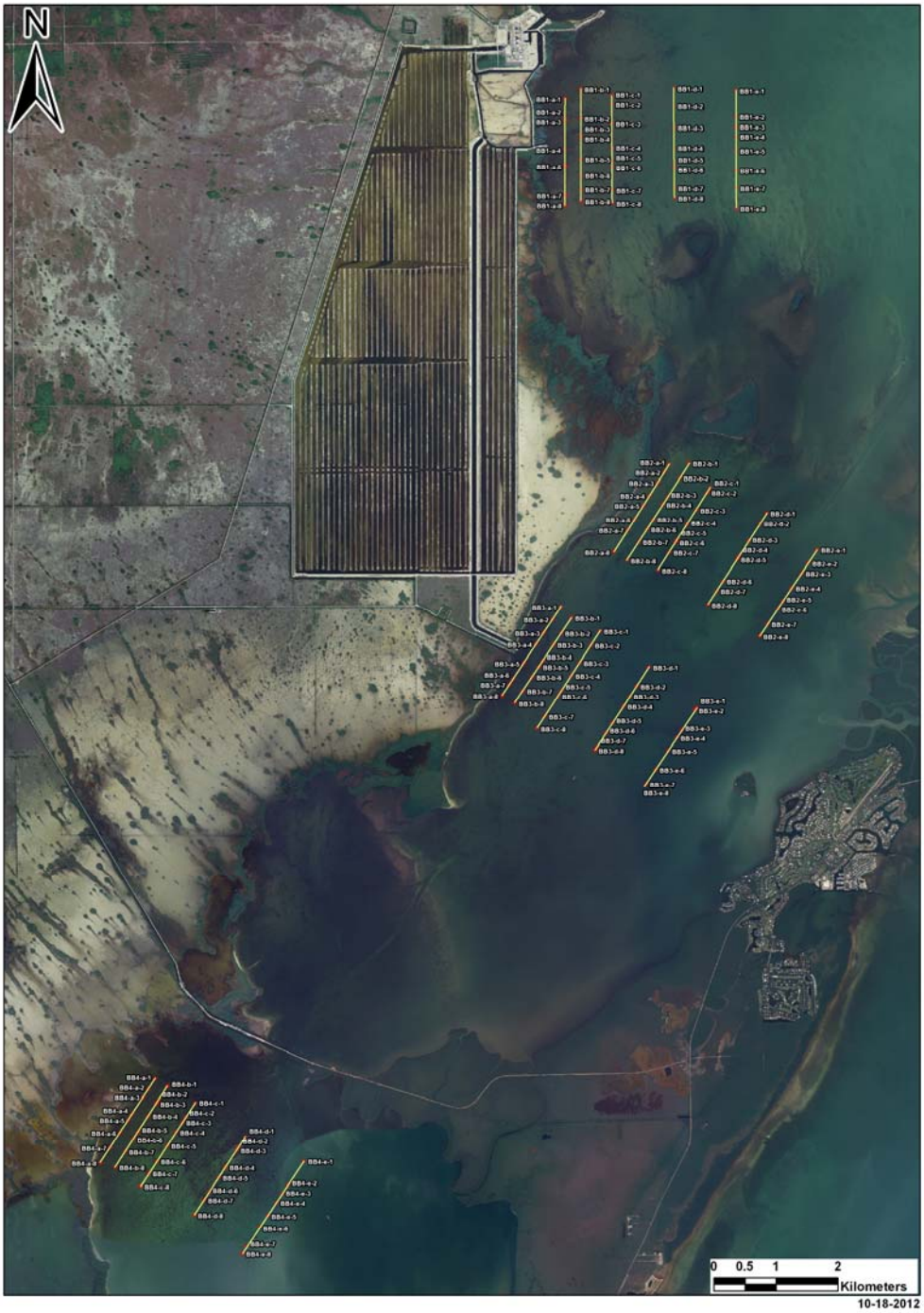


Figure 4.2-1 Map of Biscayne Bay Ecological Monitoring Areas and Transects.



Figure 4.2-2. A Biologist Records SAV Data from a ¼ m^2 Quadrat on an Underwater Data Sheet.



Figure 4.2-3. Representative SAV Components Scored Using the Braun-Blanquet Cover Abundance Index. A. *Thalassia testudinum* with Epiphytes, B. *T. testudinum* and *Batophora;* C. *Penicillus;* D. *Halimeda;* E. *Udotea;* F. *Rhipocephalus;* G. *Caulerpa prolifera;* H. *Acetabularia* and *Batophora*.

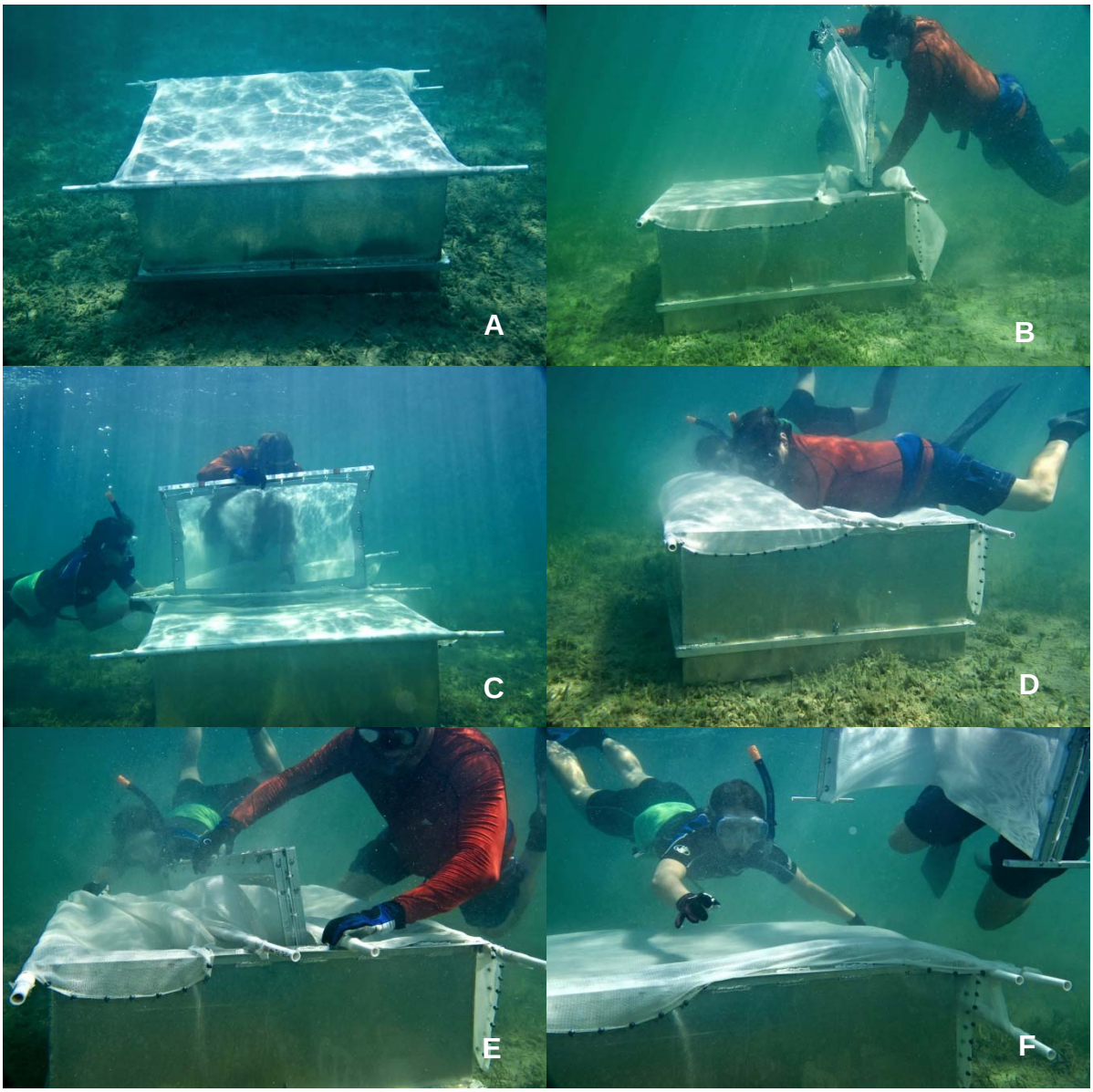


Figure 4.2-4. Faunal Throw Trap Collection Methodology. A. Faunal Throw Trap Fully Deployed with Top Covered; B. Top Panel being Retracted So Sweep Net Can be Inserted; C. Sweep Net being Inserted into the Trap; D. Net being Swept along the Bottom of the Trap while Top Remains Covered by Net Panel; E. Closed Sweep Net being Removed from the Trap for Transport to the Boat for Processing; F. Faunal Throw Trap Remains Covered between Sweeps.

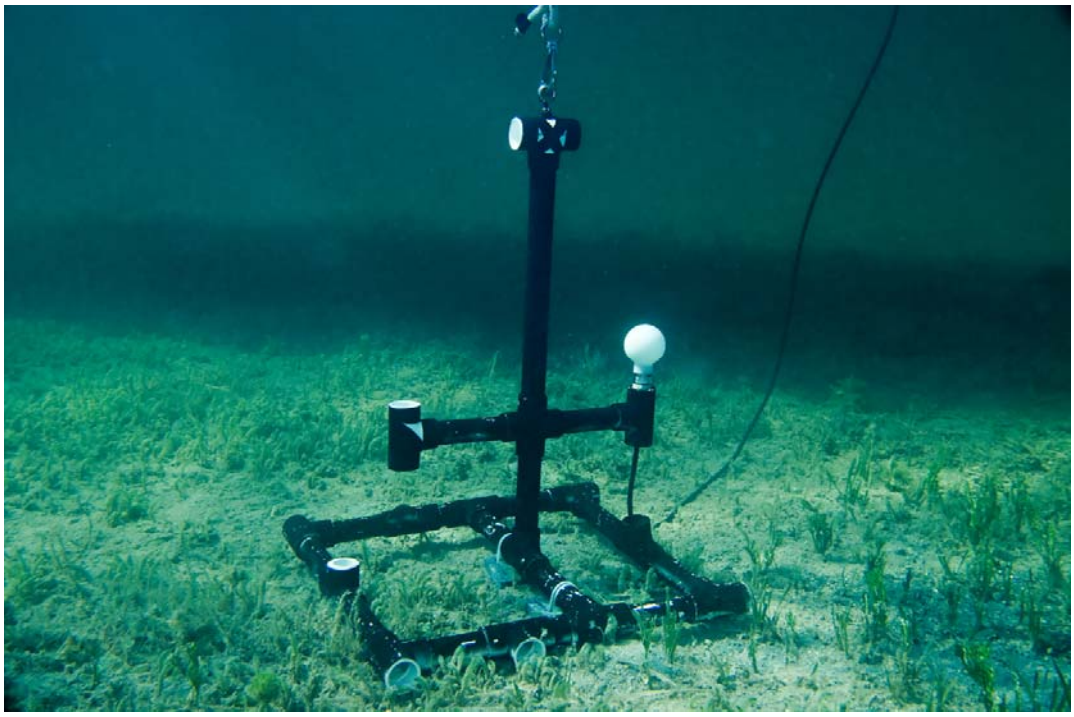


Figure 4.2-5. Licor LI-193 Sensor Mounted in a Non-Reflective Frame Used for Measuring Light at Different Depths within the Water Column, Shown Here Resting on the Bottom.



Figure 4.2-6. Licor LI-190 Sensor used to Measure Ambient Light at the Surface Simultaneously with Underwater Measurements to Calculate Light Attenuation with Depth.



Figure 4.2-7. A Peristaltic Pump (on Top of Green Coolers) Used to Collect Porewater for Nutrient and Tracer Suite Analysis.



Figure 4.2-8. Soil Cores Prepared for Transport to Shore where They will be Separated into 10 cm Horizons and Shipped to the Analytical Laboratory for Analysis of Various Chemical Constituents.

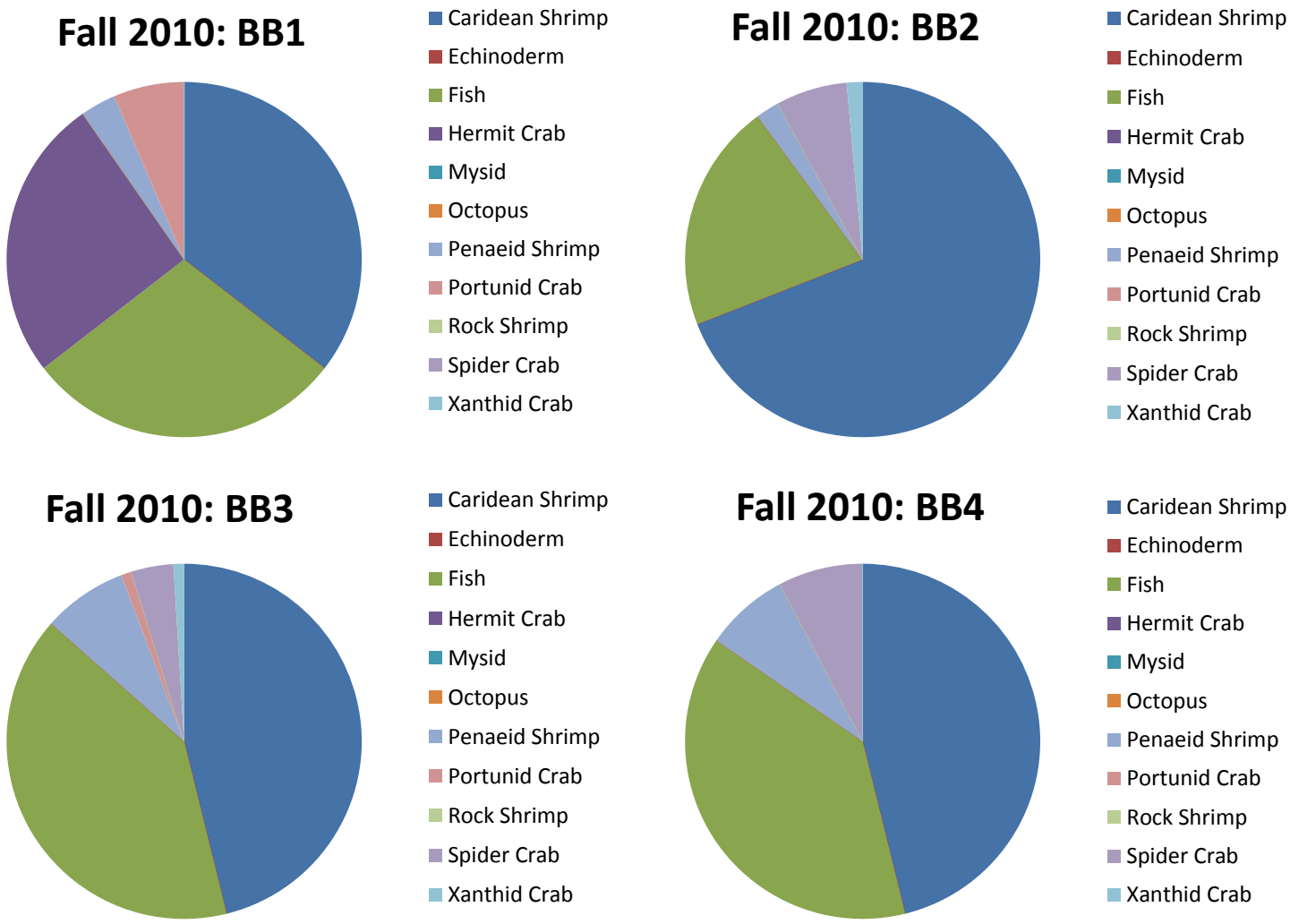


Figure 4.2-9. Total Density of All Organisms, by Major Taxonomic Group and Study Area, Collected by Faunal Throw Traps, Fall 2010.

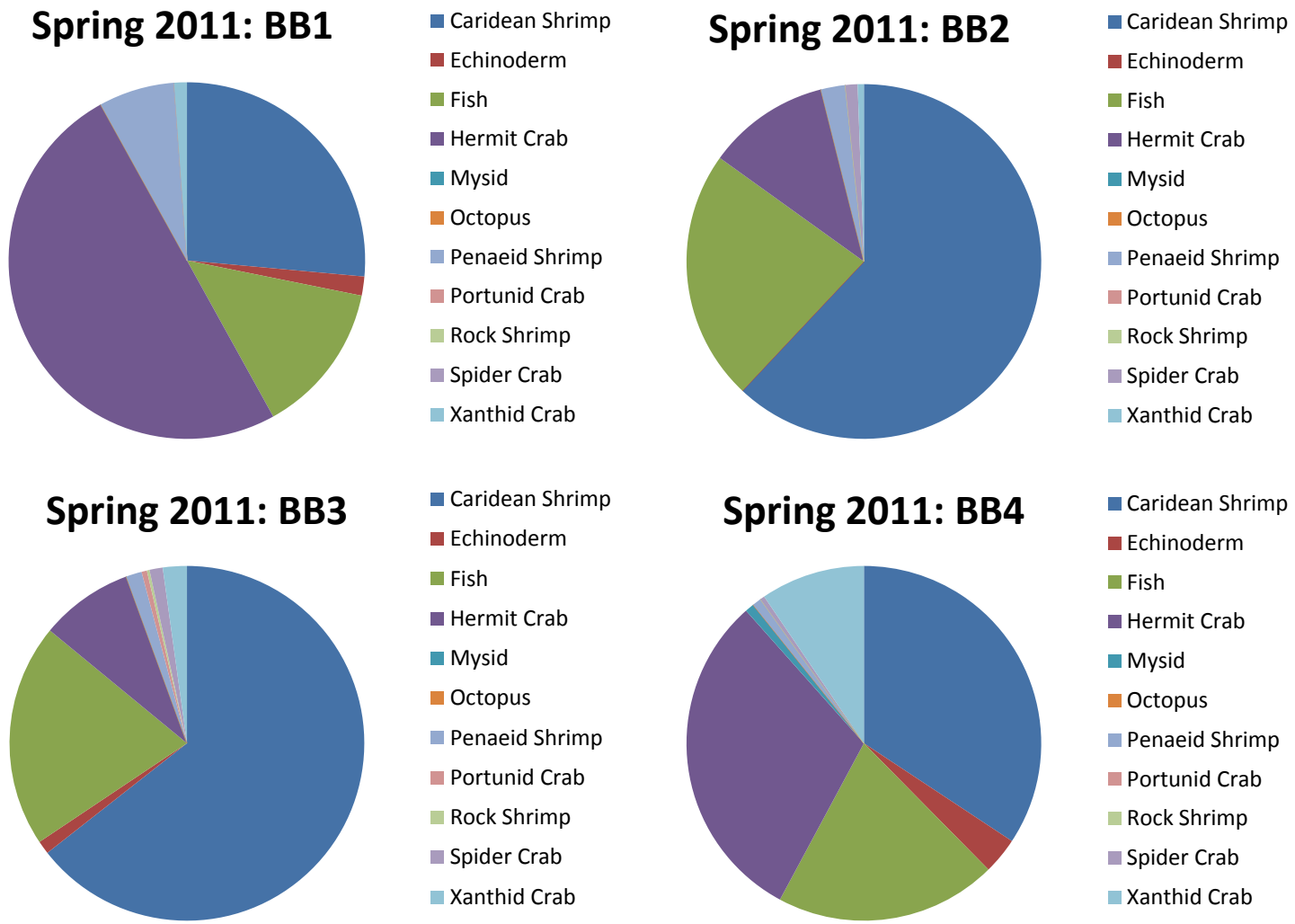


Figure 4.2-10. Total Density of All Organisms, by Major Taxonomic Group and Study Area, Collected by Faunal Throw Traps, Spring 2011.

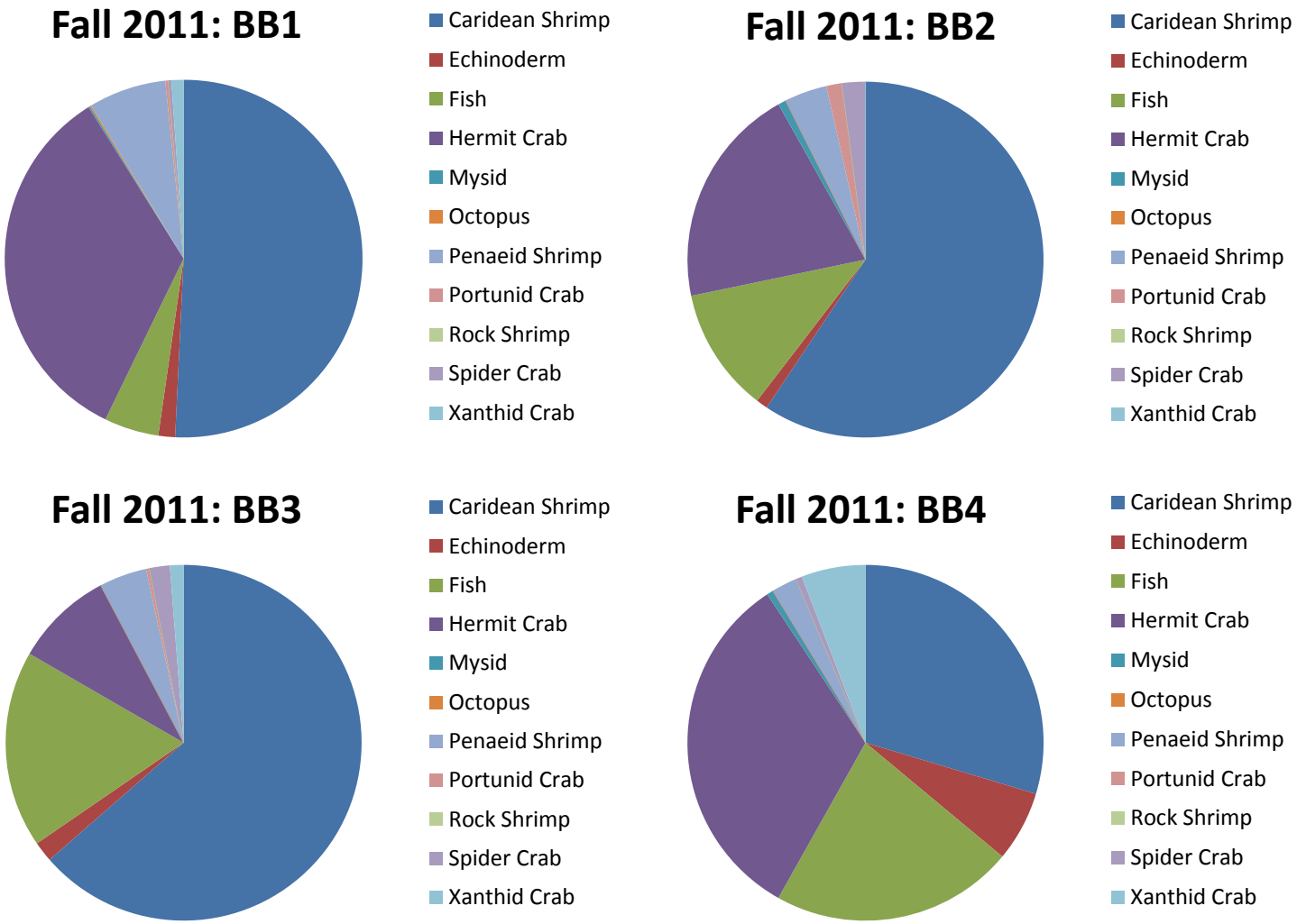


Figure 4.2-11. Total Density of All Organisms, by Major Taxonomic Group and Study Area, Collected by Faunal Throw Traps, Fall 2011.

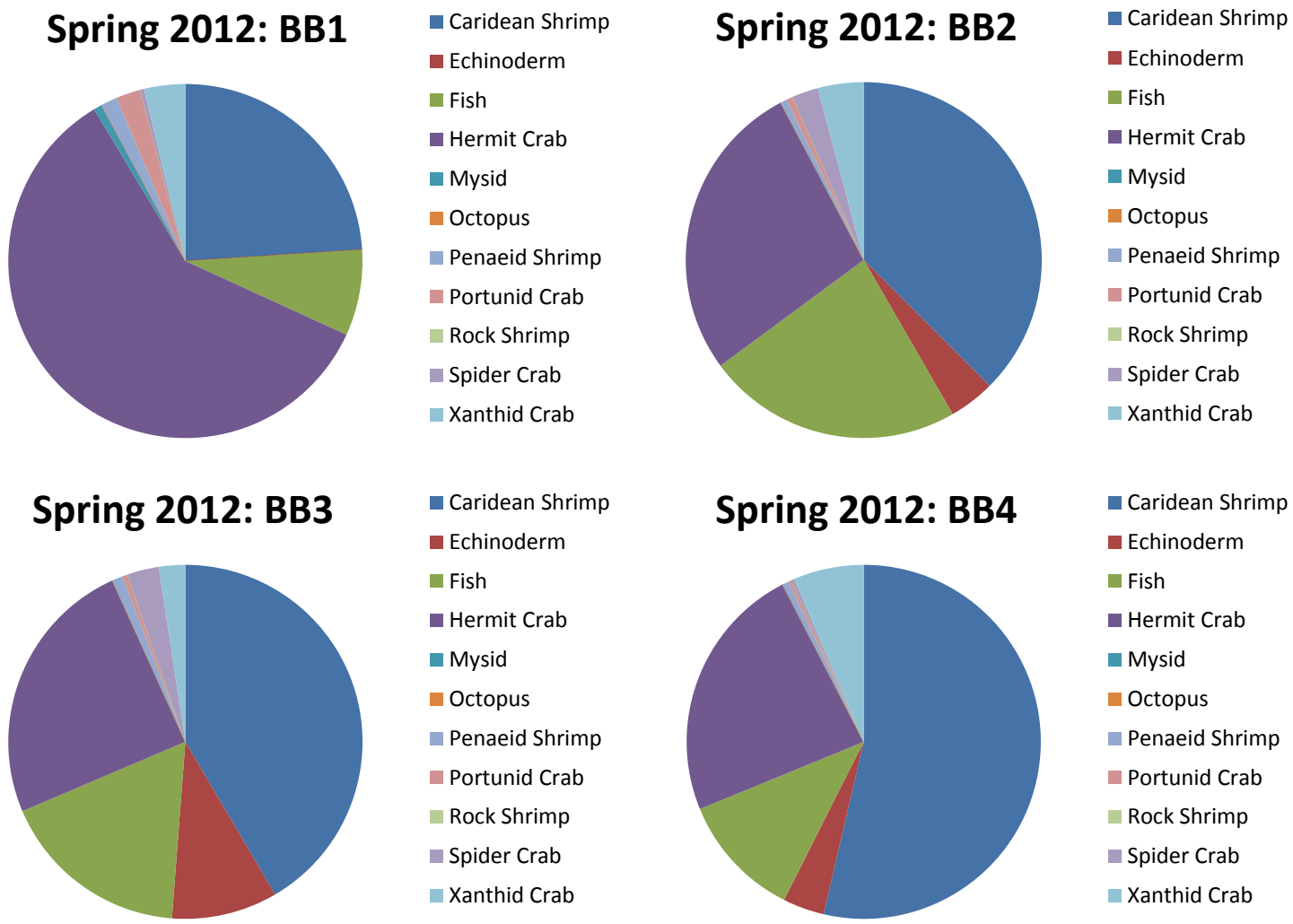


Figure 4.2-12. Total Density of All Organisms, by Major Taxonomic Group and Study Area, Collected by Faunal Throw Traps, Spring 2012.

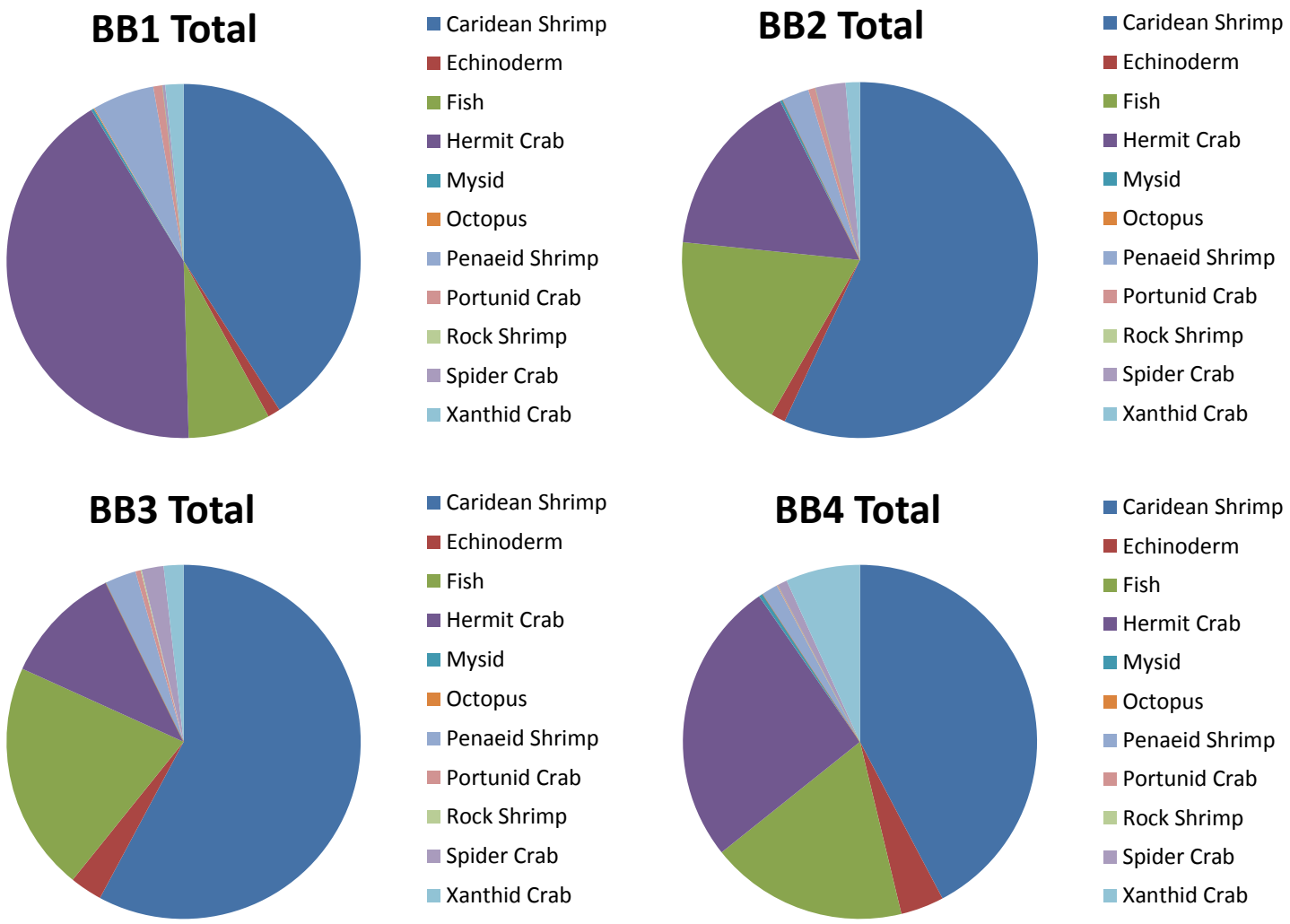


Figure 4.2-13. Total Density of All Organisms, by Major Taxonomic Group and Study Area, Collected by Faunal Throw Traps, All Sampling Events Combined.

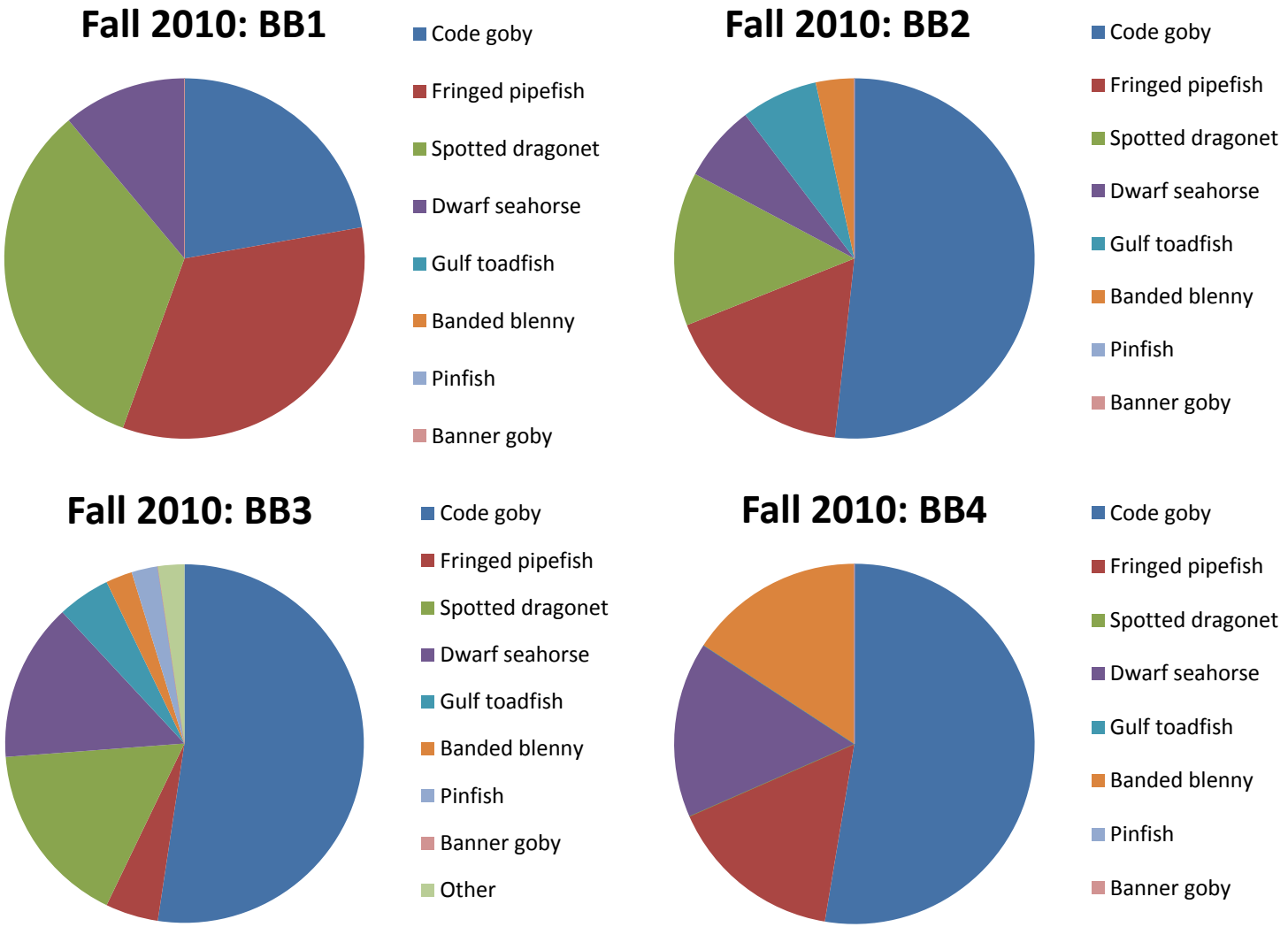


Figure 4.2-14. Total Density of Fish, by Taxon and Study Area, Collected by Faunal Throw Traps, Fall 2010.

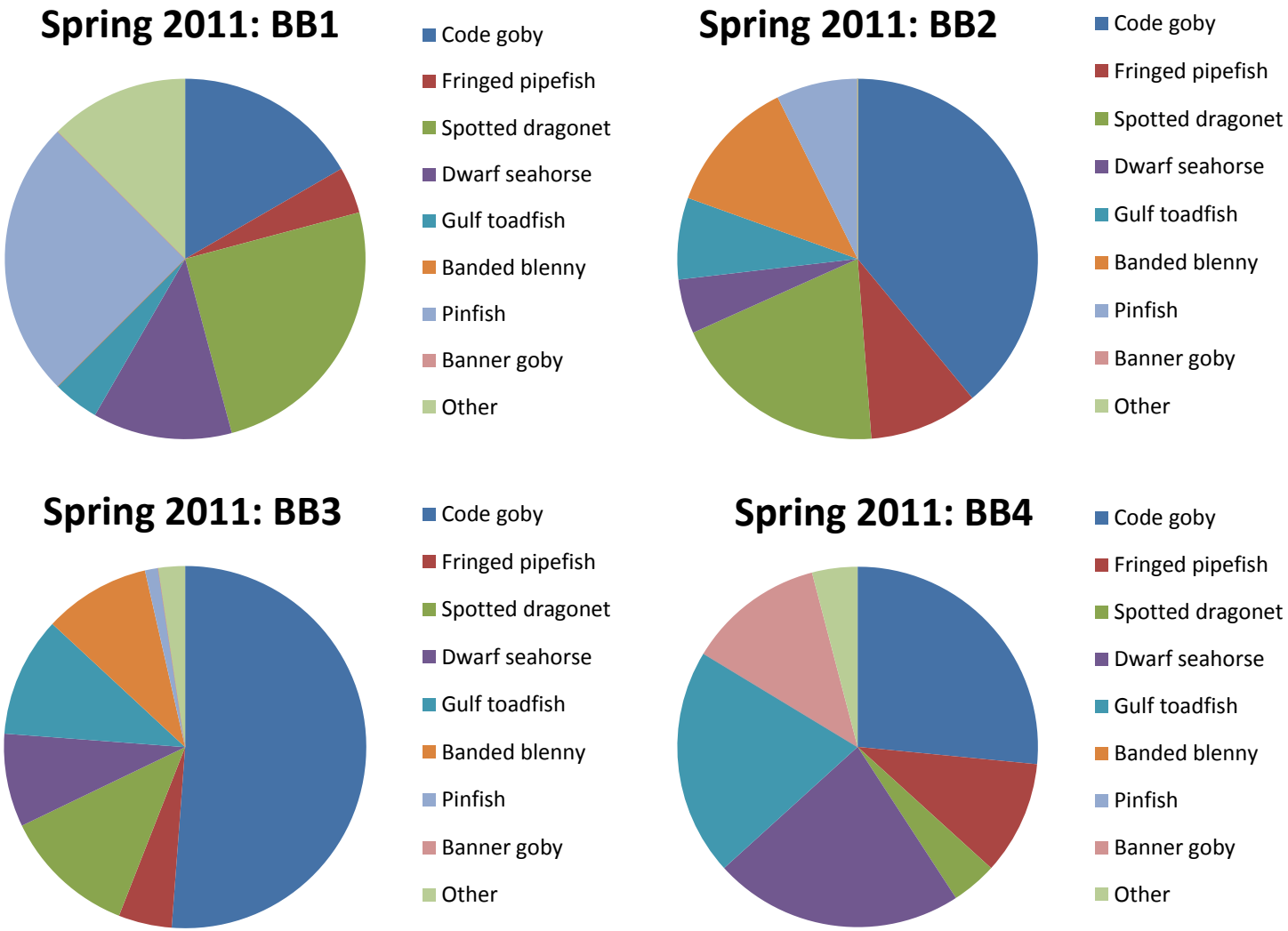


Figure 4.2-15. Total Density of Fish, by Taxon and Study Area, Collected by Faunal Throw Traps, Spring 2011.

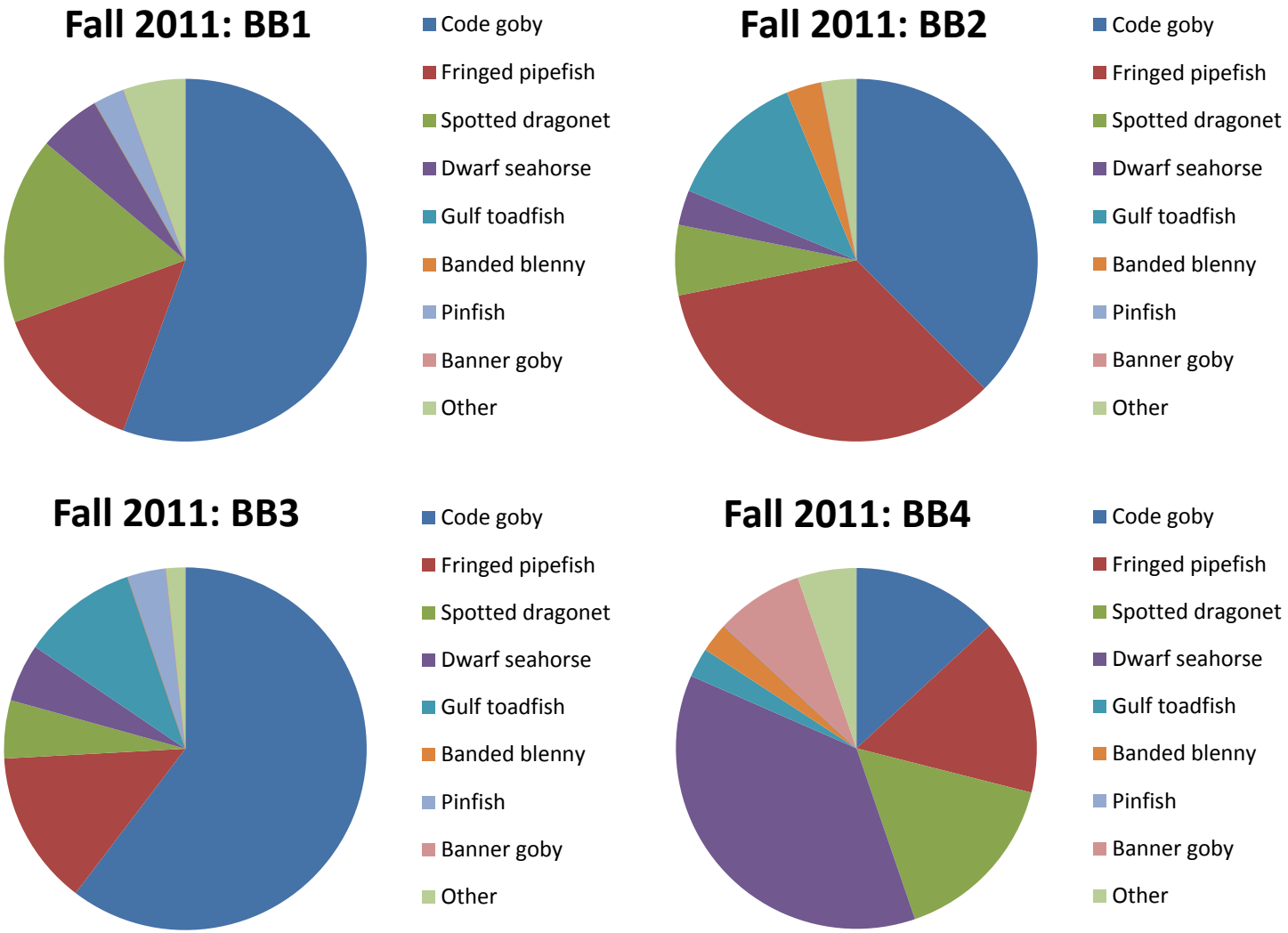


Figure 4.2-16. Total Density of Fish, by Taxon and Study Area, Collected by Faunal Throw Traps, Fall 2011.

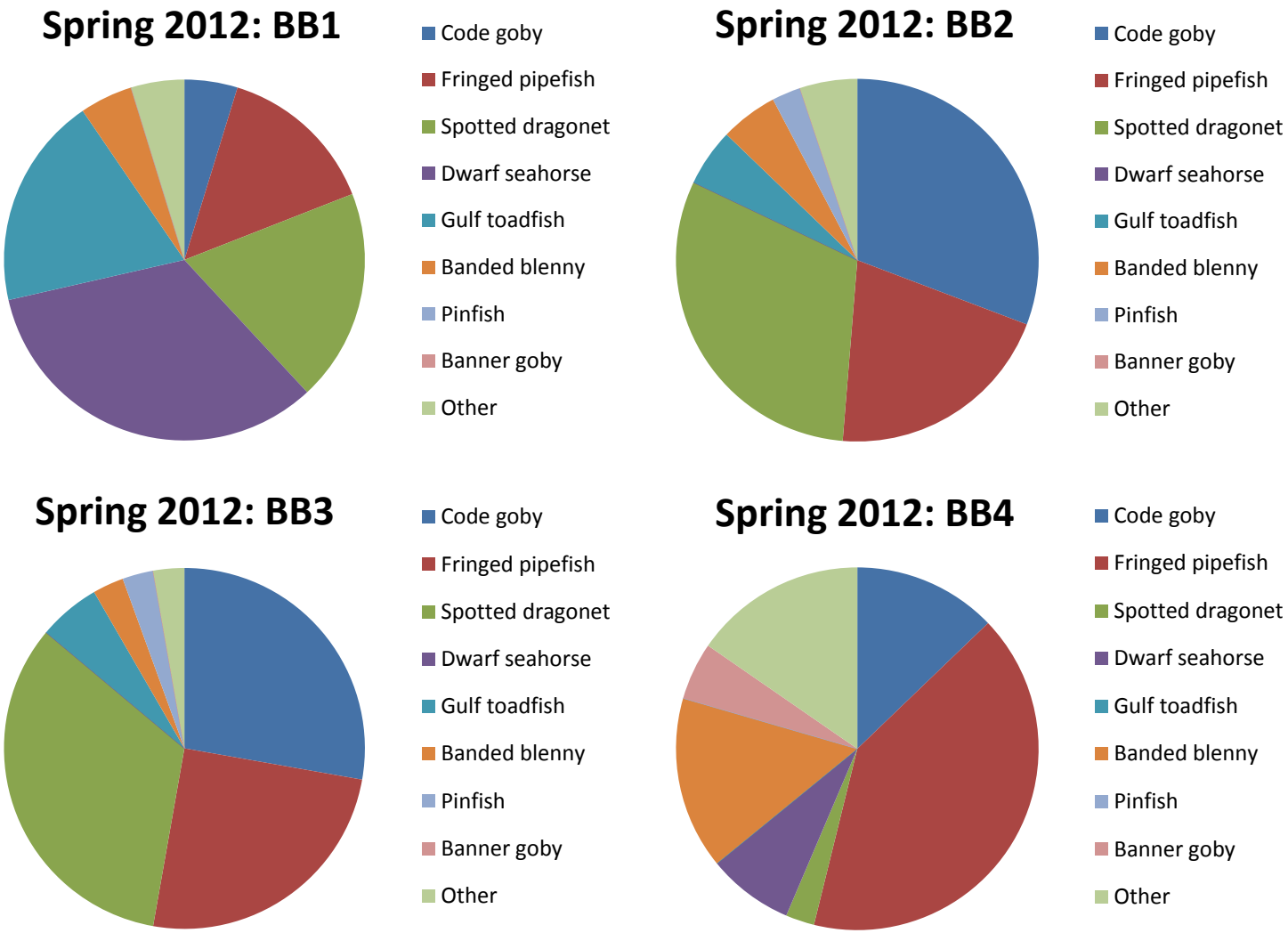


Figure 4.2-17. Total Density of Fish, by Taxon and Study Area, Collected by Faunal Throw Traps, Spring 2012.

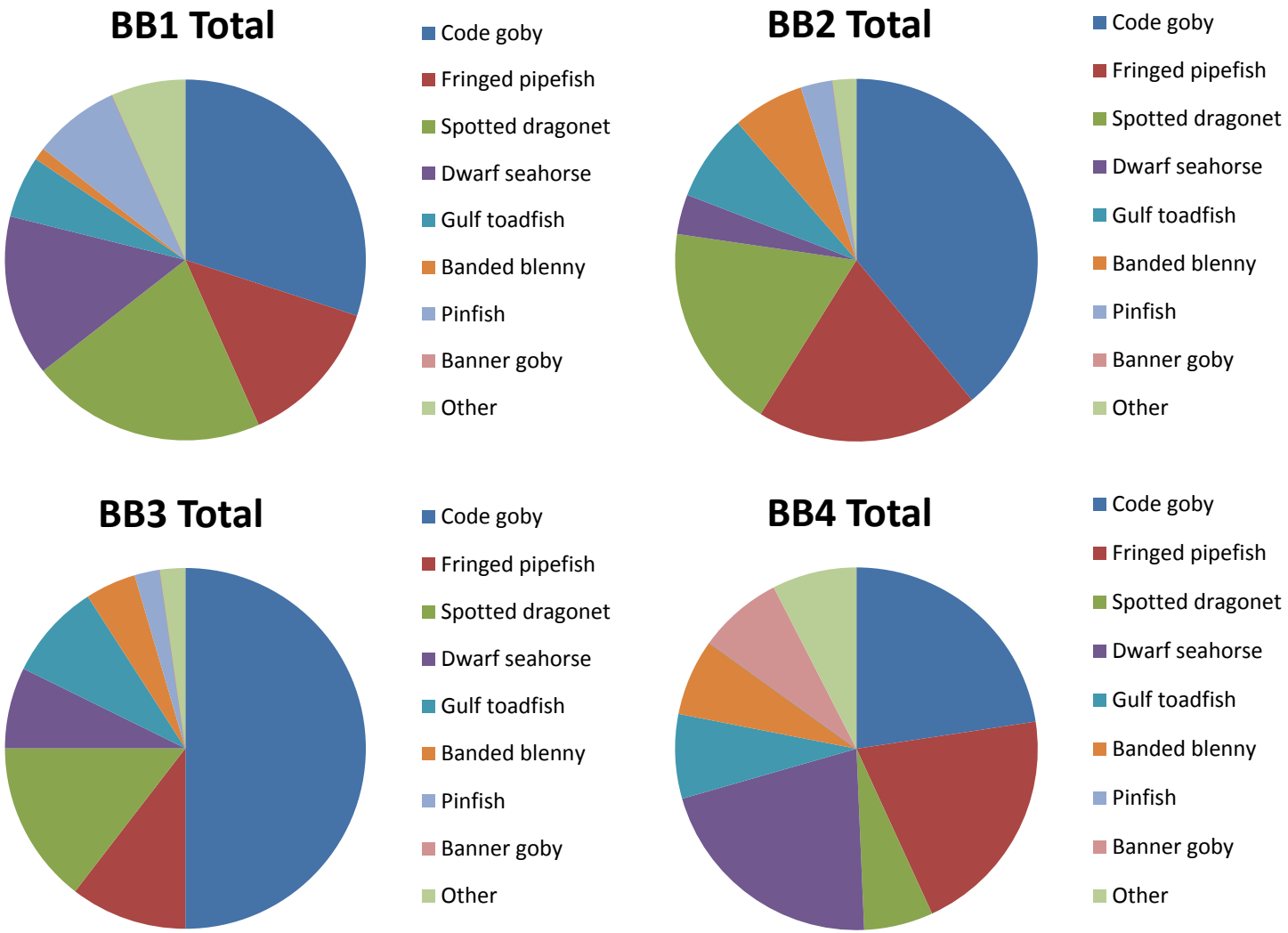


Figure 4.2-18. Total Density of Fish, by Taxon and Study Area, Collected by Faunal Throw Traps, All Sampling Events Combined.

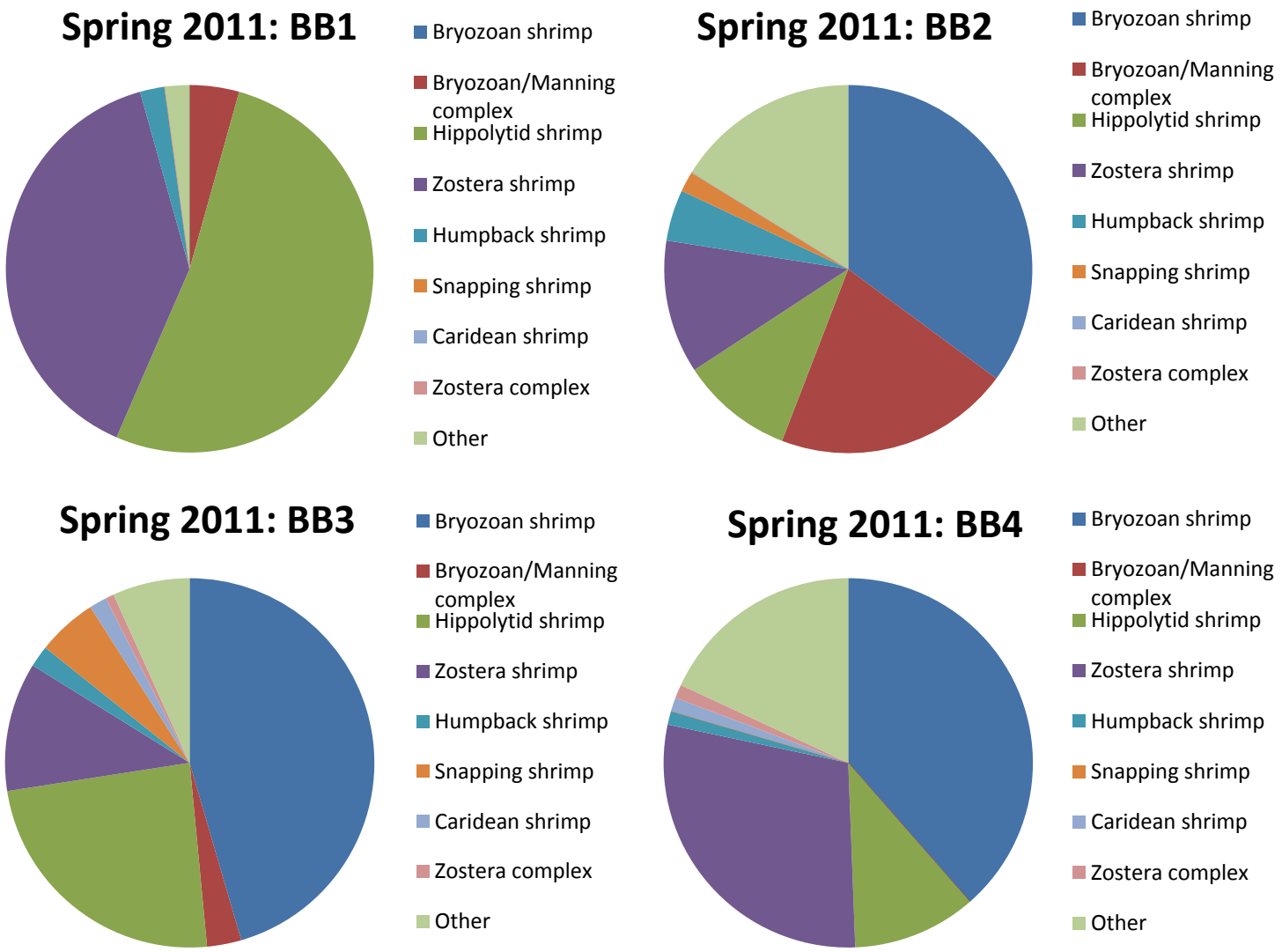


Figure 4.2-19. Total Density of Caridean Shrimp, by Taxon and Study Area, Collected by Faunal Throw Traps, Spring 2011.

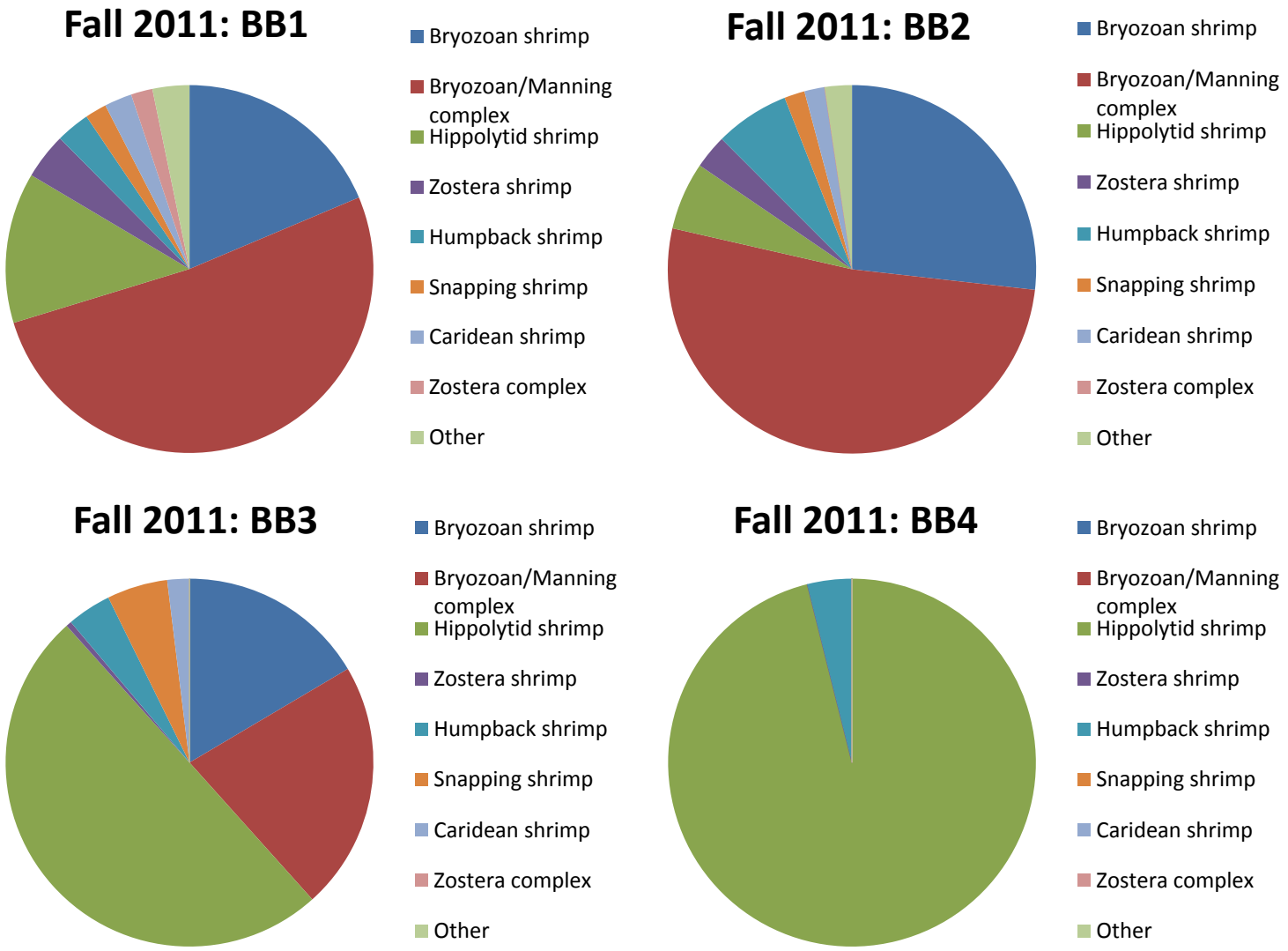


Figure 4.2-20. Total Density of Caridean Shrimp, by Taxon and Study Area, Collected by Faunal Throw Traps, Fall 2011.

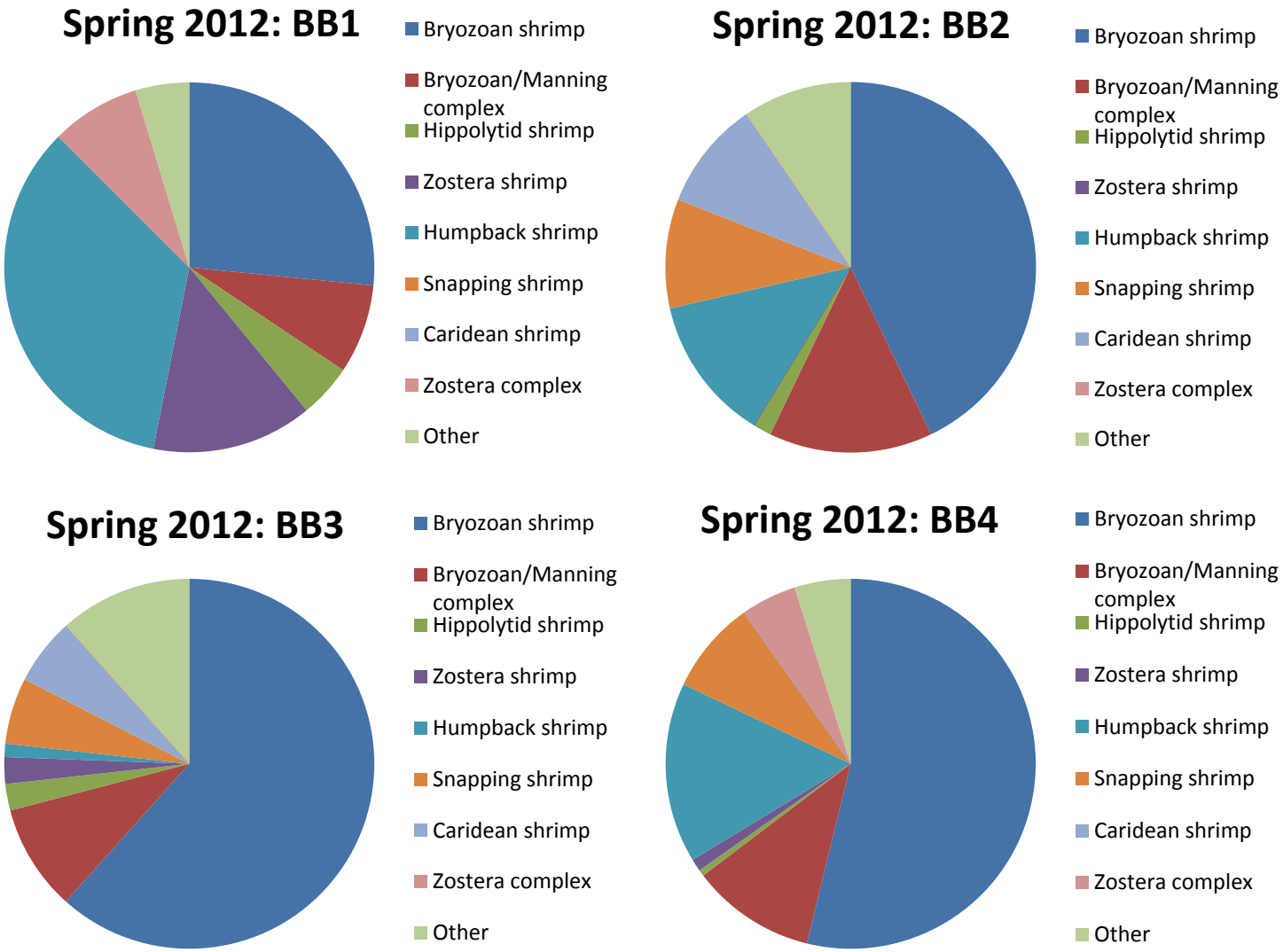


Figure 4.2-21. Total Density of Caridean Shrimp, by Taxon and Study Area, Collected by Faunal Throw Traps, Spring 2012.

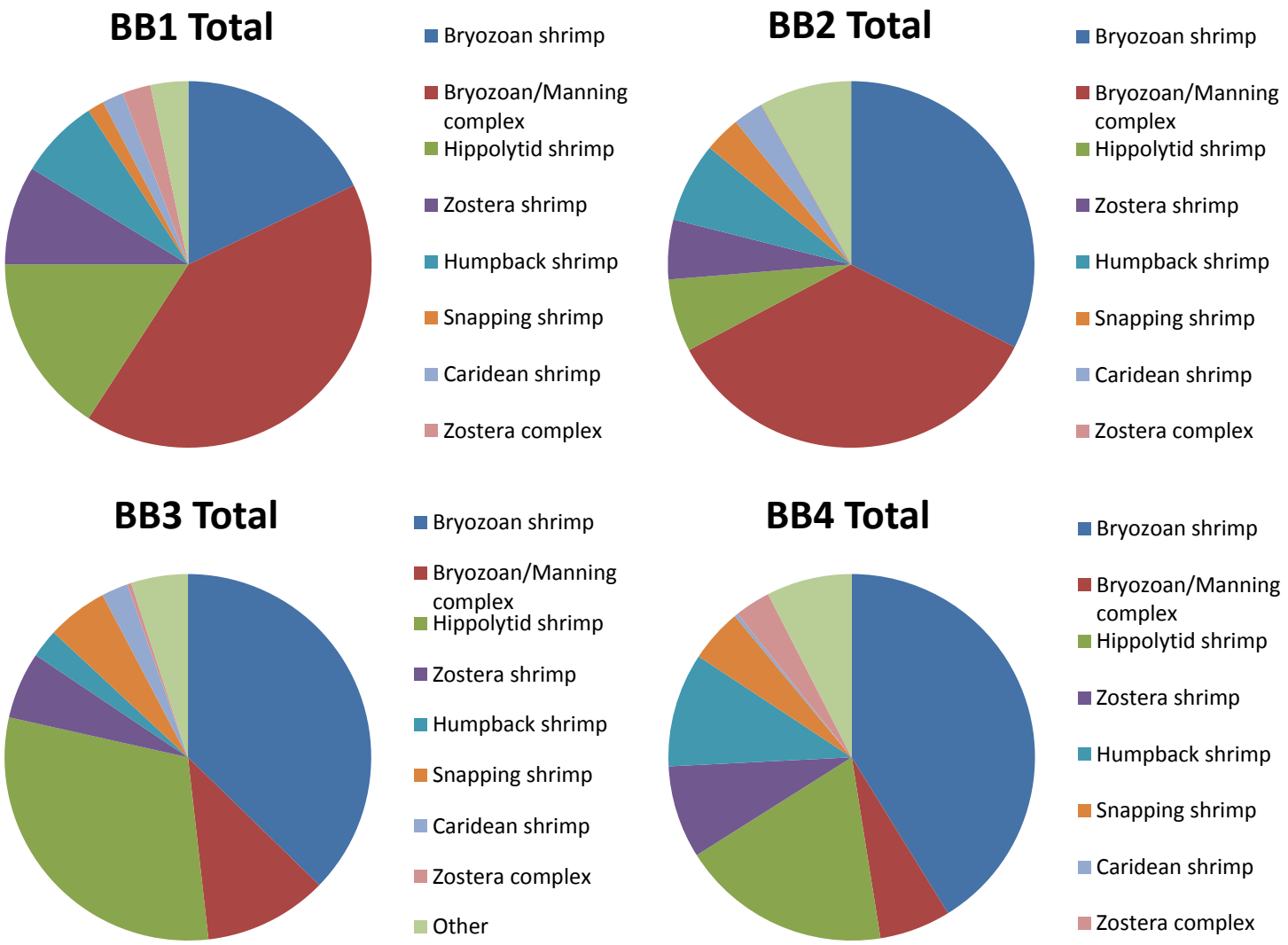


Figure 4.2-22. Total Density of Caridean Shrimp, by Taxon and Study Area, Collected by Faunal Throw Traps, All Sampling Events Combined.

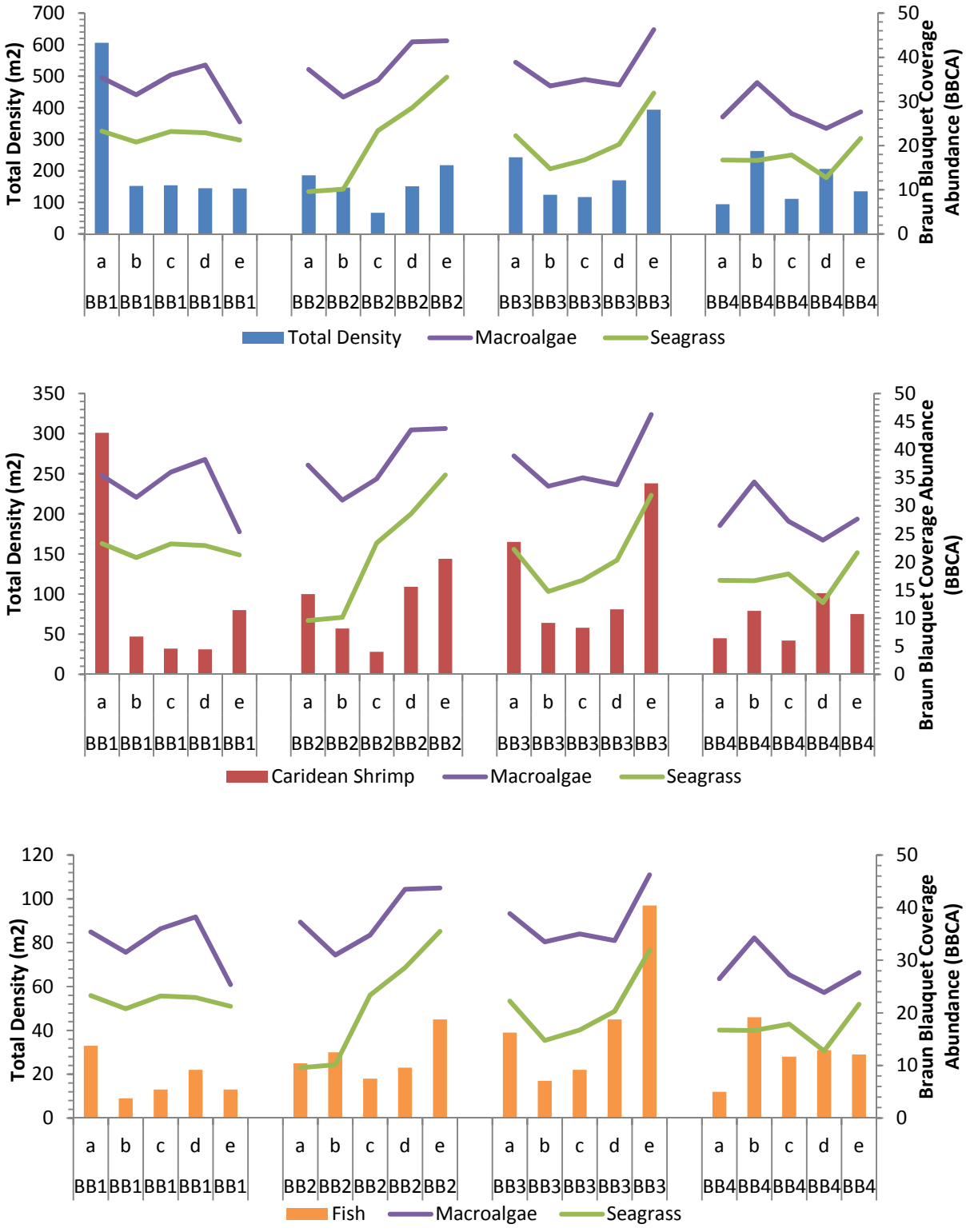


Figure 4.2-23. Total Density, Caridean Shrimp Density, and Fish Density Compared with Seagrass and Macroalgae Abundance among All Study Areas throughout All Sampling Periods.

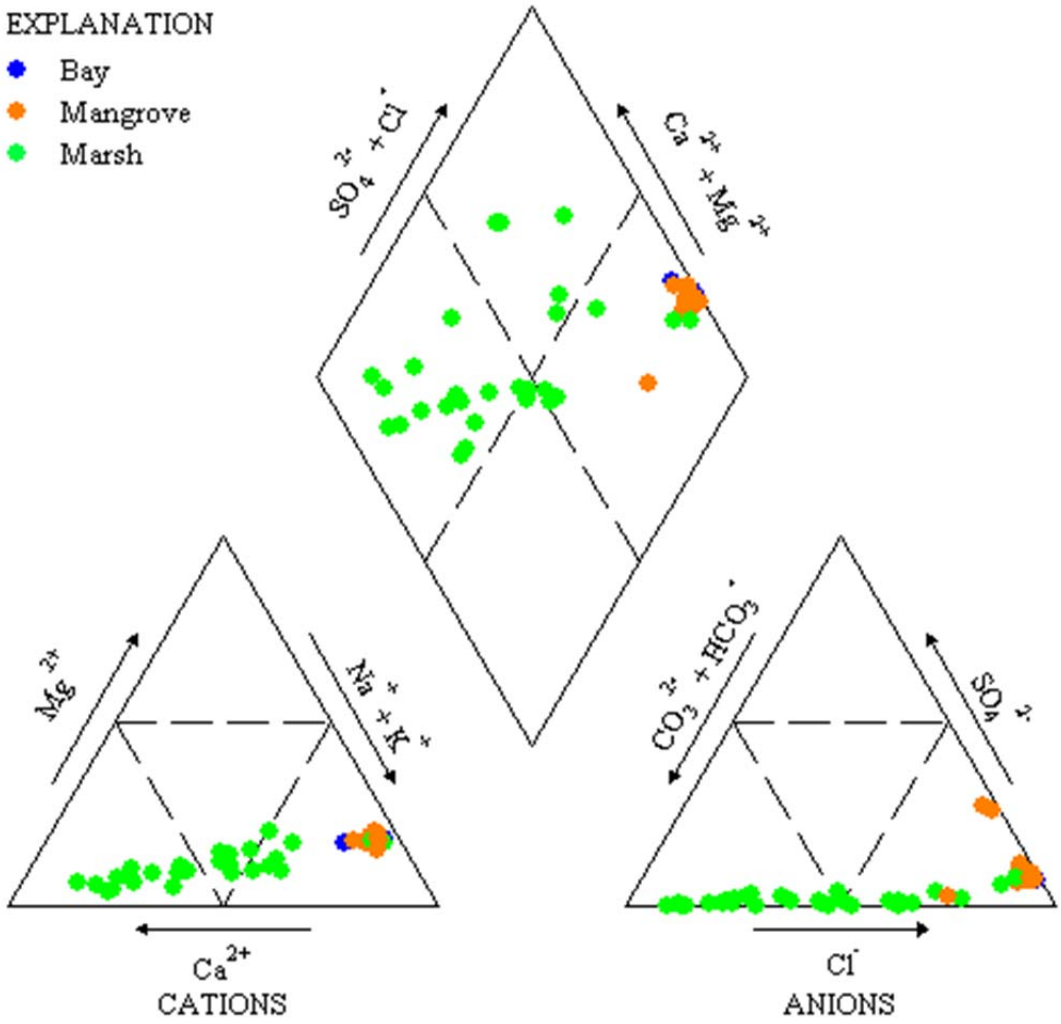


Figure 4.3-1. Piper Diagram for All Bay, Mangrove and Marsh Samples for April 2011.

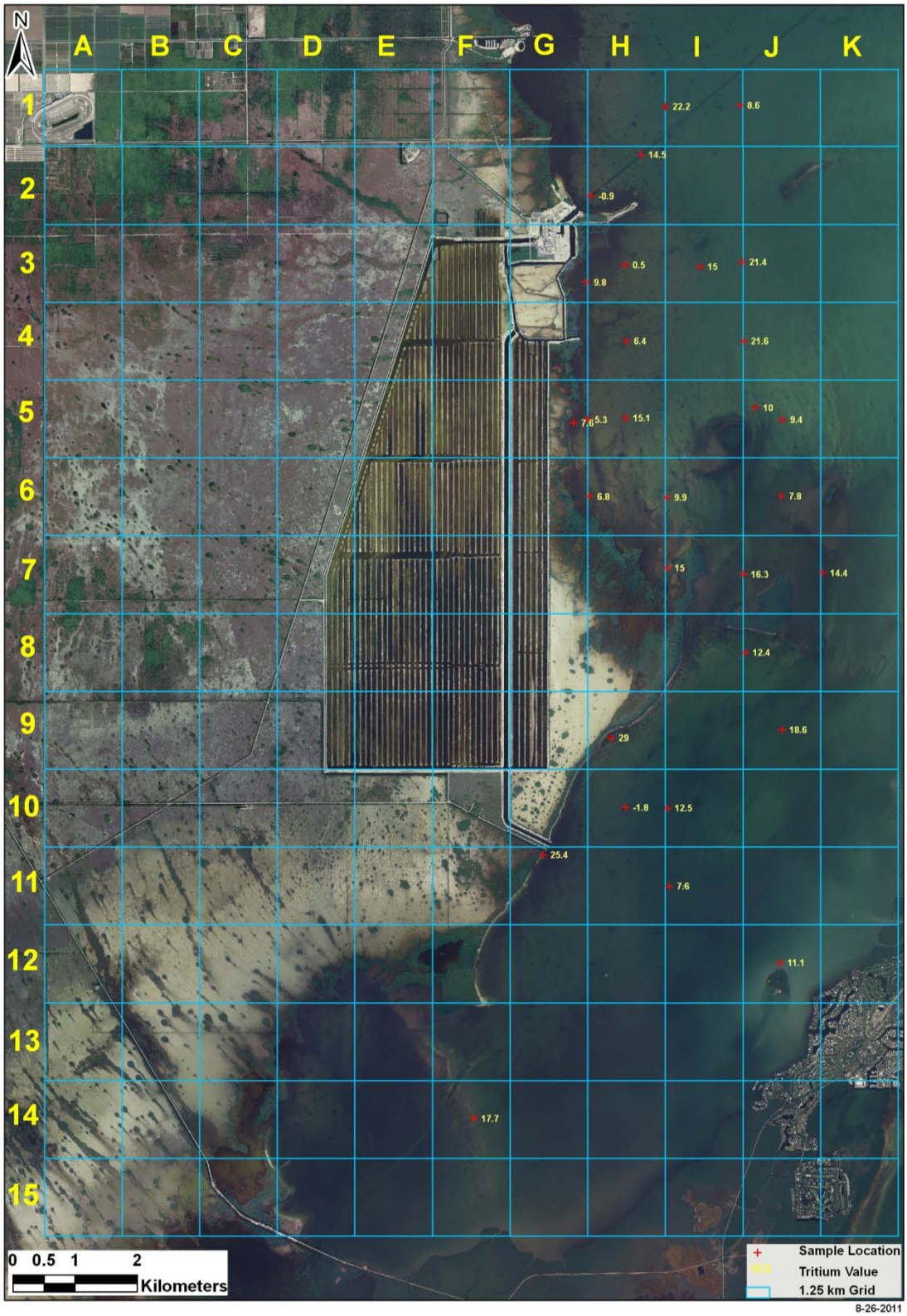


Figure 4.3-2. Wet Season (September 2010) Porewater Tritium Values.

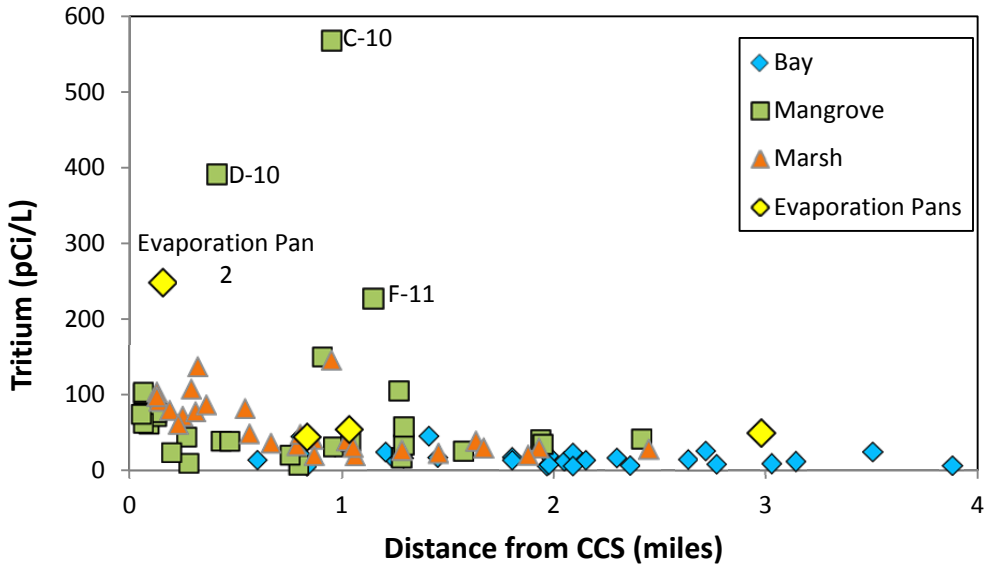


Figure 4.3-3. Porewater (Bay, Marsh and Mangrove) and April 2011 Evaporation Pan Tritium Concentrations with Distance from the CCS.

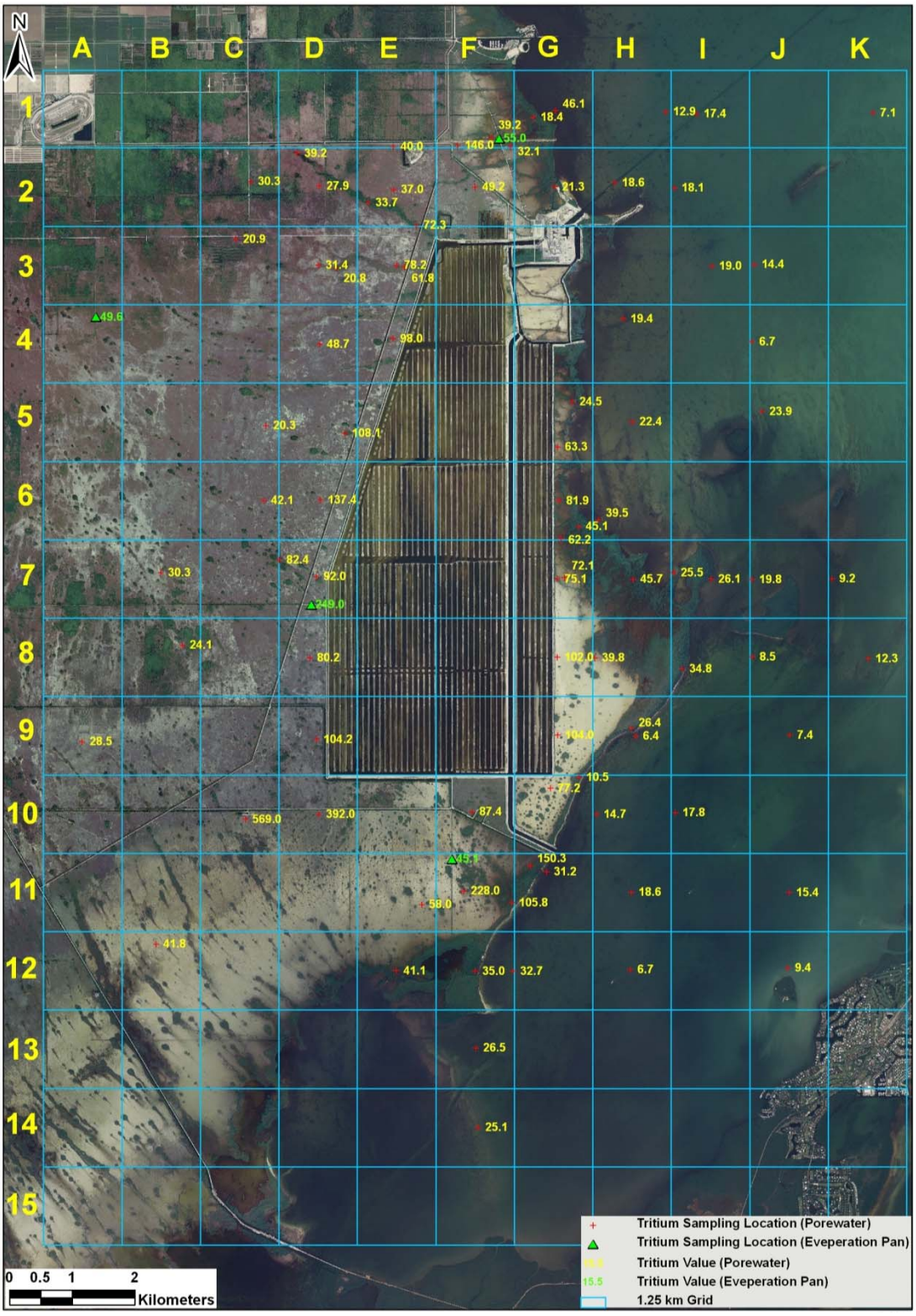


Figure 4.3-4. Dry Season (April 2011) Porewater Tritium Values.

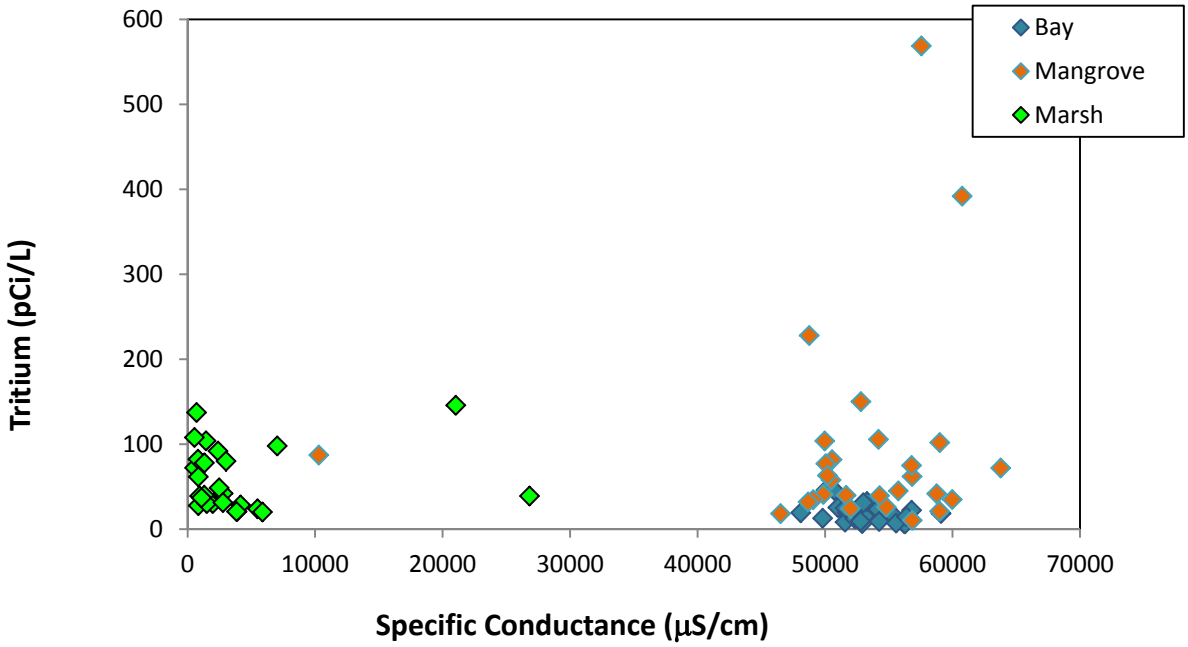
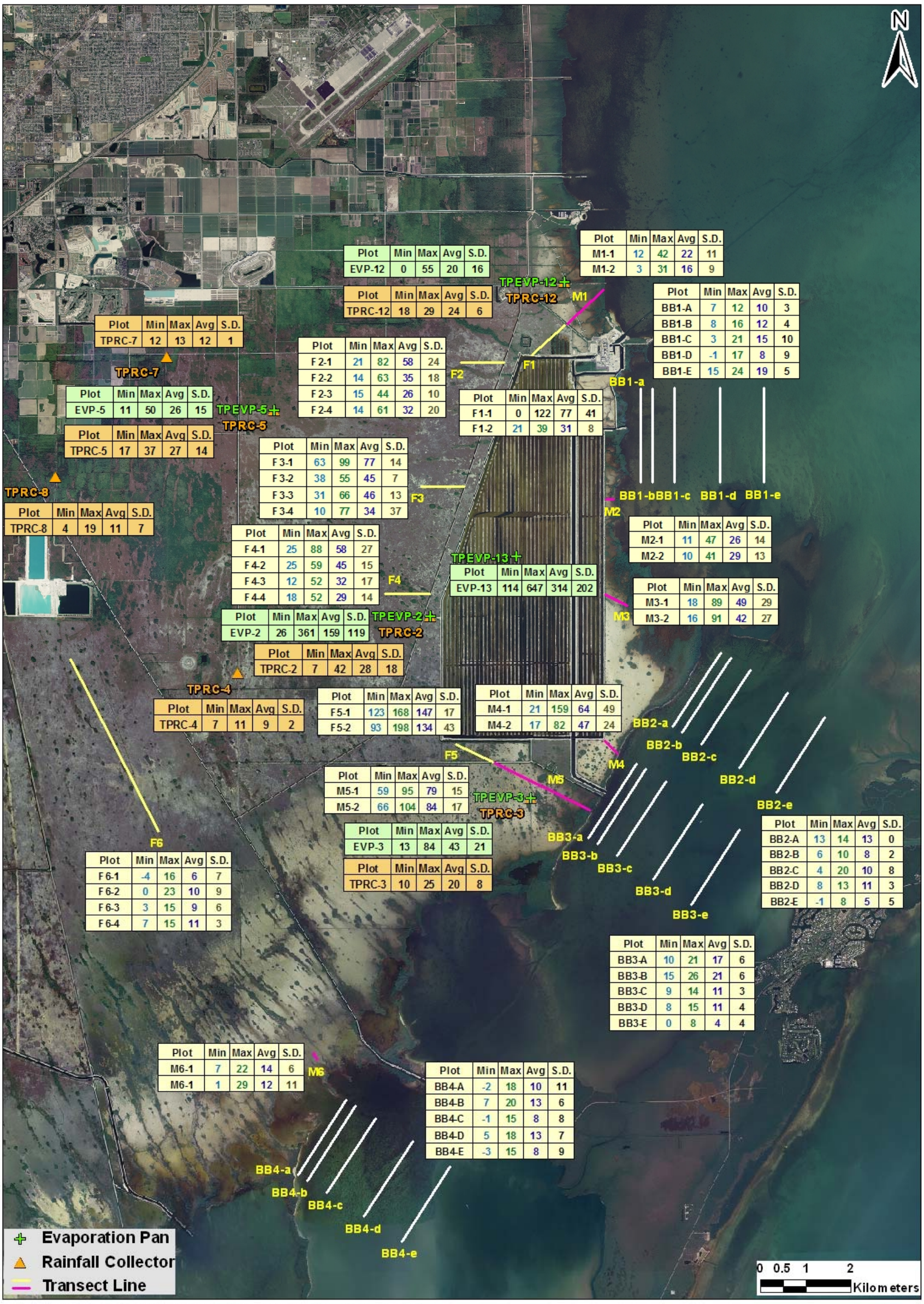


Figure 4.3-5. Porewater (Bay, Marsh and Mangrove) Specific Conductance versus Tritium Concentrations for April 2011.



Note: Min: Minimum; Max: Maximum; Ave: Average; S.D.: Standard Deviation.

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Figure 4.3-6. Minimum, Maximum, and Average Tritium in Porewater Plots.



Plot	Min	Max	Avg	S.D.
M1-1	40788	64315	51154	9327
M1-2	46020	63885	52712	7277

Plot	Min	Max	Avg	S.D.
F1-1	2473	5231	3589	997
F1-2	1272	2103	1695	355

Plot	Min	Max	Avg	S.D.
BB1-A	40550	60700	51583	10211
BB1-B	21180	59600	44427	20443
BB1-C	38520	59900	50673	10986
BB1-D	39770	57000	50423	9310
BB1-E	37790	57600	49997	10677

Plot	Min	Max	Avg	S.D.
F2-1	1020	2128	1489	441
F2-2	1209	2362	1690	449
F2-3	1808	2723	2481	340
F2-4	701	1181	915	179

Plot	Min	Max	Avg	S.D.
F3-1	1342	2105	1713	253
F3-2	1590	2089	1788	200
F3-3	2269	3215	2669	359
F3-4	544	782	679	123

Plot	Min	Max	Avg	S.D.
M2-1	43277	62516	53093	7585
M2-2	50294	64093	57402	5870

Plot	Min	Max	Avg	S.D.
F4-1	714	966	846	109
F4-2	624	826	734	85
F4-3	809	1012	913	75
F4-4	923	1720	1303	304

Plot	Min	Max	Avg	S.D.
M3-1	45357	67368	55598	9100
M3-2	43649	64914	53887	8619

Plot	Min	Max	Avg	S.D.
M4-1	41184	79856	59371	16642
M4-2	45350	85880	62939	16983

Plot	Min	Max	Avg	S.D.
F5-1	19188	31997	23859	4480
F5-2	12462	65051	36635	19581

Plot	Min	Max	Avg	S.D.
M5-1	44949	81751	57460	14997
M5-2	44706	58486	53269	4719

Plot	Min	Max	Avg	S.D.
BB2-A	51070	58100	54923	3564
BB2-B	50190	56600	54430	3672
BB2-C	47610	57800	53803	5439
BB2-D	45870	57700	52957	6253
BB2-E	49500	57100	53833	3911

Plot	Min	Max	Avg	S.D.
F6-1	944	1125	1020	62
F6-2	1070	1207	1132	46
F6-3	2638	3294	2931	293
F6-4	488	1219	892	315

Plot	Min	Max	Avg	S.D.
BB3-A	52150	56600	54683	2288
BB3-B	48130	57600	53577	4893
BB3-C	53820	57300	55807	1792
BB3-D	49190	57000	54030	4227
BB3-E	47800	56200	53333	4793

Plot	Min	Max	Avg	S.D.
M6-1	41085	51057	45686	3650
M6-1	46241	48739	47657	965

Plot	Min	Max	Avg	S.D.
BB4-A	41550	53700	49217	6671
BB4-B	40250	56300	50217	8701
BB4-C	42310	55400	50637	7236
BB4-D	41610	57100	50770	8124
BB4-E	42350	52700	48950	5733

Note: Min: Minimum; Max: Maximum; Ave: Average; S.D.: Standard Deviation. 9-2012

Figure 4.3-7. Minimum, Maximum, and Average Specific Conductance in Porewater Plots.

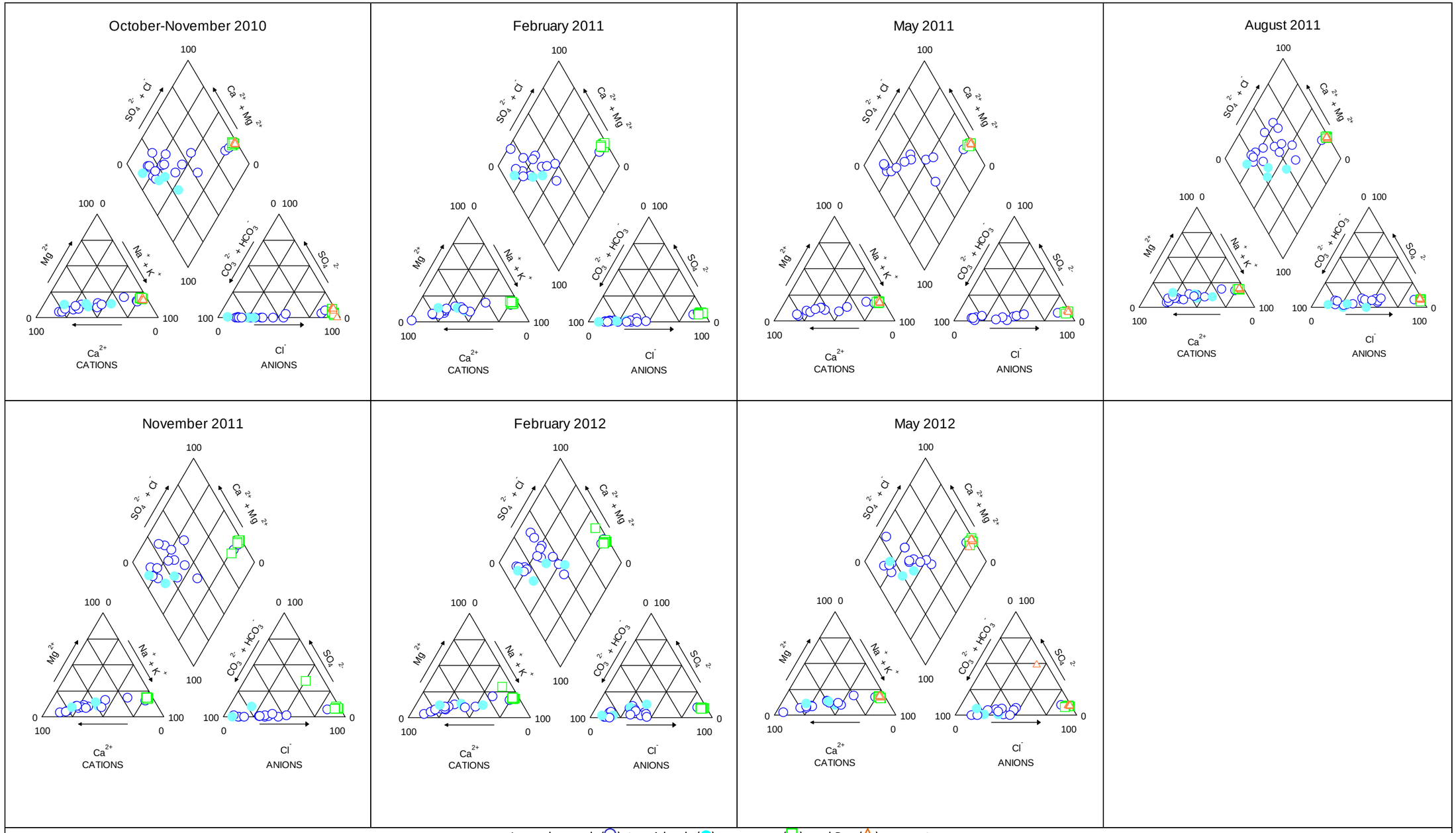
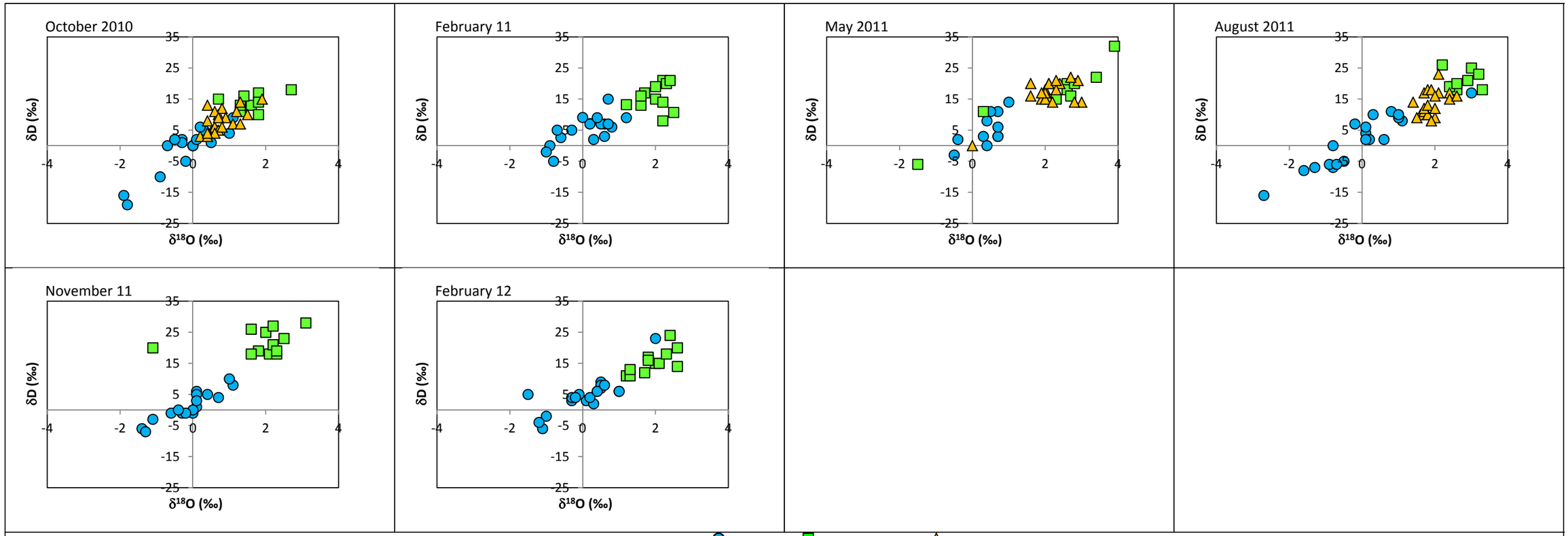


Figure 4.3-8. Tri-Linear Diagrams of Seasonal Porewater Ions. No Porewater could be Collected from a Number of Samples (e.g., Tree Islands) in May 2011 Due to the Dry Conditions.



Legend: marsh (●), mangrove (■) and Biscayne Bay (▲).

Figure 4.3-9. Quarterly Hydrogen-Oxygen Isotopes in Porewater.

5. HYDROGEOLOGIC ASSESSMENT

5.1 Introduction

Geologic and hydrogeologic data were collected as part of the monitoring effort to better understand the movement of water within the Biscayne Aquifer in the vicinity of the CCS. The associated information is relevant because subsurface conditions influence the extent and rate of CCS migration. This information coupled with water level data and water quality data reported in previous sections aid in the understanding of how the groundwater system responds to environmental inputs and CCS operation.

While details for much of the geologic and hydrogeologic data can be found in the Geology and Hydrogeology Report for Turkey Point Plant Groundwater, Surface Water and Ecological Monitoring Plan (JLA Geosciences Inc. 2010), excerpts from this report have been provided to give a high-level overview of the geologic and hydrogeologic conditions in the vicinity of the CCS.

5.1.1 Overview of Biscayne Aquifer and Geologic Formations

Southeastern Miami-Dade County is underlain by two aquifer systems; the shallow unconfined Biscayne Aquifer/Surficial Aquifer System (BAS) and the deep Floridan Aquifer System (FAS). In Miami-Dade County, the unconfined BAS consists of all rock and sediment from land surface downward to the top of the intermediate confining unit (Cunningham 2004). While all the Turkey Point monitoring wells are screened in the BAS, the borehole of each deep well fully penetrated the BAS and the top of the intermediate confining unit. The focus of the Turkey Point Uprate monitoring effort is on the BAS due to its importance to the west as a drinking water supply and its shallow unconfined depth.

During the drilling and logging of all the monitoring well boreholes associated with this project, JLA Geosciences Inc. (2010) found that the BAS near the CCS extends from land surface to a depth of approximately 106 ft below sea level (BSL), where formation materials decrease in permeability (Fish and Stewart 1991). This depth of the base of the BAS decreases to the west.

From land surface, the geologic formations encountered during drilling of the monitoring wells for this project include the Miami Limestone, the Fort Thompson Formation, and the upper Tamiami Formation. The BAS is made up primarily of the Miami Limestone and the Fort Thompson formations. Higher permeability units in the upper Tamiami Formation may also form portions of the BAS (Cunningham 2004 and 2006); however the Tamiami Formation is considered to be the intermediate confining unit underlying the BAS where a significant decrease in permeability occurs (Fish and Stewart 1991). The lower boundary of the BAS is delineated by

the transition between highly permeable beds of the Fort Thompson Formation or Tamiami Formation and lower permeability sands or silty sands of the Tamiami Formation (Fish 1988).

Based on project findings, the Miami Limestone thickness is between approximately 8 ft (TPGW-13) and 23 ft (TPGW-3) and extends to depths between approximately -11 ft to -30 ft NAVD 88 in the project area (JLA Associates, Inc. 2010). Note that the formation depths noted are slightly different than reported by JLA Geosciences, Inc.; JLA Geosciences, Inc. reported the depths in NGVD 29 and there were some subsequent corrections to survey elevations and transposing formation depths. The Miami Limestone is predominantly composed of pelloidal grainstone, packstone and wackestone, coral framestone and pedogenic limestone/calcrete (Cunningham 2004 and 2006). The base of the Miami Limestone is typically delineated by a wavy laminated calcrete and/or erosional surfaces (Cunningham 2004). In the study area, the Miami Limestone generally thins to the north and west and overlays the permeable limestone units of the Fort Thompson Formation.

The Fort Thompson Formation underlies the Miami Limestone in the study area. Regionally it has been defined as a northward thickening depositional sequence bounded by unconformities above and below corresponding to contacts with the overlying Miami Limestone and the underlying Tamiami Formation (Galli 1991). The Fort Thompson Formation is commonly composed of various sequences of floatstone, rudstone, grainstone, quartz sandstone, skeletal sandstone, pedogenic limestone, laminated calcrete, mudstone, and wackestone (Cunningham 2004 and 2006). The base of the Fort Thompson Formation is typically delineated by a wavy laminated calcrete and/or erosional surfaces (Cunningham 2004 and 2006). In the project area, the Fort Thompson Formation thickness is between approximately 46 ft (TPGW-8) and 95 ft (TPGW-12) and extends to depths between approximately -60 ft to -113 ft NAVD 88. Figures 5.1-1 through 5.1-4 show a cross-section plan view and several east-west cross-sectional views and a north-south cross-sectional view that were derived from the project boring logs.

Regionally, the units that underlie the Fort Thompson are the Tamiami Formation (Pliocene to Miocene age) and/or the formations of the Hawthorn Group (Miocene age) (Fish and Stewart 1988). Tamiami lithologies typically consist of sandy limestone, calcareous sandstone, shells and sand (Cunningham 2004 and 2006). With depth, these units undergo a downward fining trend and ultimately become the underlying confinement of the BAS. In the study area the Tamiami Formation underlies the Fort Thompson and consists of unconsolidated silty sands, shells, sandy limestone, and sandstone. It was penetrated to a total depth of approximately –154 ft NAVD 88 at site TPGW-11. The top of the Tamiami formation was encountered at depth between -46 ft NAVD 88 at site TPGW-9 and -120 ft NAVD 88 at site TPGW-11. The contact between the Tamiami Formation and the basal Fort Thompson formation generally decreased with depth to the south and west and was commonly delineated as the contact between lithified and unlithified formation materials. The intermediate confining unit was not fully penetrated during this project.

5.1.2 Overview of Biscayne Aquifer System Porosity and Flow Zones

Recent studies in northern Miami/Dade County have determined that porosity, permeability, and storage in the BAS limestone are related to lithofacies and depositional cycles identified in the

Miami Limestone and Fort Thompson Formation (Cunningham et al. 2004 and 2006). Cunningham et al. (2004) identified 16 sub-lithofacies in the BAS through use of core descriptions, thin section analysis and geophysical logs. Typically zones of high permeability in the BAS are associated with interconnected touching vug porosity, bedding planes flow zones, cavernous flow zones, and/or touching dissolutioned fossil molds (Cunningham 2004). Typically, within the Miami Limestone and Fort Thompson Formation, these high permeability zones occur at the base of depositional cycles which are characterized by touching-vug floatstone and rudstone, pelloidal packstone and grainstone, framestone, and vuggy wackestone and packstone (Cunningham 2004 and 2006). With the aid of geophysical logs, especially the optical borehole image (OBI) logs, and recovered core samples, all the wells installed as part of this monitoring effort were installed in these high flow zones of the BAS.

5.2 Regional Assessment and Extent of CCS Water

As described in Section 5.1, the BAS is a shallow aquifer with groundwater flow dominated by high permeability zones. The subsurface conditions range from hard rock to cavernous voids. For this monitoring effort, wells were installed in clusters and distinctly screened at three different depth intervals where high flow zones were observed. This well screen placement is helpful in determining the presence of CCS water vertically and its furthest lateral extent out to a point of regulatory relevance.

The USGS has previously shown that the regional groundwater flow direction in the general project area to be from the northwest to southeast (Fish and Stewart 1991). Based on data collected for the pre-Uprate monitoring effort and reports by others, the groundwater flow in the immediate vicinity of Turkey Point is affected by the CCS and local conditions. Golder Associates Inc. (2011b) reviewed groundwater density and water level data from two ID monitoring efforts (October 2010 and March 2011). Based on comparing density-corrected groundwater pressure gradients between historical monitoring wells L-3 and G-21 and L-5 and G-28, Golder Associates Inc. concluded that there was a seaward (eastward) gradient down to an elevation of approximately -35 ft NAVD 88 and a landward (westward) gradient from approximately -35 to -58 ft NAVD 88. Information presented in Section 5.4 shows that depending upon groundwater and surface water levels, groundwater flows in and out of the CCS.

While potentiometric maps can provide further insight into groundwater flow directions and gradients in the immediate project area, there are several complicating factors that make the interpretation of this information difficult and subject to errors. First, there is no guarantee that all the wells classified in the same zone are interconnected due to the complex geology of the area. The classification of shallow, intermediate, and deep wells is a function of the well placement in the upper, middle, and lower part of the Biscayne Aquifer and not a function of distinctly different lithology or hydrogeologic units. It is possible that a well classified, for example, as an intermediate zone well is interconnected to a series of shallow zone wells. Thus, any interpretation of the results would have to be used with caution.

Secondly, the presence of waters with different densities complicates the determination of groundwater flows and gradients. For groundwater of uniform density, hydraulic head gradient

is sufficient for determining groundwater flow direction. For groundwater of variable density, density-related gravity forces can be a significant component of the forces driving groundwater flow, and hydraulic head gradient is insufficient to determine groundwater flow direction.

While Lusczynski (1961) presented a simple methodology to convert measured groundwater heads to equivalent freshwater heads, various papers (Van Dam 1977; Custodio 1987) have reported a lack of understanding in the use of freshwater head equivalents. Jorgenson et al. (1982) presented information that when calculating a freshwater head equivalent, groundwater flow could only be interpreted if the wells were all at the same depth. Simmons (2005) cautioned that the concept of equivalent freshwater heads is "too simple or erroneous especially in areas where vertical flow is of interest."

Post et al. (2007) presented a paper that attempted to clarify some of the misinterpretations and provide guidance for the interpretation of head measurements in variable density groundwater systems. Post et al. (2007) also provided an approach to deal with wells screened at different depths which is important since none of the FPL monitoring wells are at the same depth. The applicability of applying the method by Post et al. (2007) to determine groundwater flow directions and gradients in the vicinity of the CCS was assessed. FPL concluded that while the methodology can be applied, definitive interpretations are still difficult due to the complex geology. Post et al. (2007) states: "we intentionally refrain from presenting an analysis of the more complicated effects of anisotropy, heterogeneity, and dipping aquifer." The subsurface geology in the project area includes all those complicated effects. Furthermore, the gradients in the area are typically small, thus small errors in the water levels greatly impact the accuracy of the gradients. While some general assessments can be made using professional judgment, numerical modeling may better address the complexities. Even with modeling, there are some overlying simplifying assumptions that will affect the accuracy of the results.

Rather than preparing freshwater head equivalent potentiometric maps, which can be misinterpreted, or conducting complex modeling efforts, FPL proposes to use other pieces of information or analysis to assess groundwater flow and interactions with the CCS. These pieces of information include, but are not limited to the following:

- Time series plots showing responses in water levels and water quality following rain events and fluctuations at specific locations over time.
- Comparative time series plots of groundwater water levels during wet and dry periods.
- Time series plots comparing groundwater and surface water level changes with tide.
- Water quality and water level data in surface water and groundwater stations near the CCS during outage and non-outage periods in the CCS.
- Water levels in wells and surface water stations during and after pumping of the ID.
- Water quality tracer constituents that show the extent of CCS movement and facilitate the calculation of an average rate of migration.
- Water budget results showing estimated losses from the CCS to groundwater and estimated gains from ground to the CCS (Section 5.4).

An assessment of this information provides baseline information on how the groundwater system responds to different meteorological and tidal conditions, how the groundwater responds to CCS operations, how the CCS affects groundwater flow, and how far and fast the CCS water moves.

5.2.1 Groundwater Responses to Environmental Conditions

Based on a review of the groundwater time series plots, it appears water levels change rapidly in response to rainfall events. This is most evident in stations not significantly influenced by tides (TPGW-1, TPGW-2, TPGW-4 through TPGW-9, and TPGW-13). Typically, when there is a spike in water levels on the time series graphs, there is a corresponding rainfall event. This increase in water level occurs simultaneously at all depth intervals, suggesting good hydrologic connection with the surface. Figures 5.2-1 and 5.2-2 show typical examples where the water levels rise in response to rain events. The increase is obviously more notable for major rain events. While the water levels increase rapidly, the water quality time series data show that the temperature and specific conductance values in the shallow, intermediate, and deep screen intervals do not change with rainfall (refer to Section 2.2), indicating the buffering capacity of the groundwater over time.

The time series data also show that the amount of change in groundwater levels at most well clusters is typically the same at all depth intervals under wet or dry conditions. In most instances, the change in water elevation between the shallow, intermediate, and deep zones is within hundreds of a foot. For illustrative purposes, Tables 5.2-1 and 5.2-2 show the extent of change in groundwater over a period just before and after a heavy rainfall event (September 29, 2010, and October 8, 2011). The data for these tables were extracted from the automated database during similar tide stages to minimize tidal effects and reflect water level changes the day after the rain event and a period of a week or two after the rain event. The results show that even under extreme events with large groundwater fluctuations, the changes in groundwater levels within each well cluster are nearly identical, with a few exceptions. This suggests there is good vertical connectivity between zones at most locations. While these tables facilitate comparison of the depth intervals at each station, care must be used in trying to interpret differences among stations since the rainfall distribution is not likely uniform across the entire area.

Table 5.2-3 shows a snapshot of water elevations for two days in the wet season (October 14, 2010, and October 22, 2011) and two days in the dry season (May 14, 2011, and April 4, 2012). The wet season days were selected within a few days or weeks following a heavy rain and the dry season days were selected after a prolonged period of little rain (less than 1 inch in four weeks). All elevations are reported during periods of similar high tide elevations (water elevations at TPBBSW-3 within 0.1 ft of each other for all dates) to minimize the effect of tides in these comparisons. Figure 5.2-3 compares the water levels during the 2010 wet season day and the 2011 dry season day. Figure 5.2-4 compares the water levels for the 2011 wet season day and the 2012 dry season day. The results show that the inland stations are affected much more by drought conditions than the stations in Biscayne Bay. This is expected since there is a continual source of water in the Bay to maintain water levels. The wet and dry season water level data show water level variations between wet and dry seasons are generally greatest at inland

stations TPGW-4, TPGW-5, and TPGW-7 through TPGW-9, and are smallest at TPGW13, TPGW12, and Biscayne Bay stations TPGW-10, TPGW-11, and TPGW14. This suggests the inland stations are affected by hydrologic conditions to a greater extent than the coastal and Biscayne Bay stations. The wet season water level data indicate gradients over the study area are generally seaward. In contrast, the dry season data indicate landward gradients can occur in eastern portions of the study area during the dry season. During both dry season events, landward gradients were present between Biscayne Bay station TPGW-10 and TPGW-1; Biscayne Bay station TPGW-11 and CCS station TPGW-13; and TPGW-3 and TPGW-4. The occurrence of landward gradients during the dry season may impact groundwater flow in the eastern portion of the study area during the dry season.

While rainfall or lack thereof affects the groundwater levels over the entire landscape, the tides only influence the stations in the Bay or in close proximity to the Bay. The time series plots presented in Section 2 clearly show that the groundwater levels at all three well clusters in the Bay are highly influenced by the tidal cycles. Also, the clusters at TPGW-12 and to a lesser extent at TPGW-3 are noticeably influenced by the tides. This influence in groundwater is not uncommon and shows good connectivity with Biscayne Bay. Further inland, there is very little (hundredths of a foot) or no influence of the tide. Figures 5.2-5 and 5.2-6 illustrates this diminishing effect of tides at groundwater stations from east to west in the northern half of the project area and the southern half of the project area, respectively. Figure 5.2-7 shows that there are negligible tidal effects in the CCS surface water and groundwater. This lack of tidal response in the CCS is consistent over the monitoring period and suggests limited direct communication between CCS with Biscayne Bay. While Section 5.4 clearly shows exchanges between the CCS and Biscayne Bay groundwater, this exchange is less than would have been estimated if the CCS responded more extensively with tidal fluctuations.

In the 2011 Annual Report (FPL 2011b), FPL reported groundwater data for two spring and two neap tide events. As expected, the tidally influenced stations in the Bay had a wider range in groundwater levels during a spring tide. Table 5.2-4 shows two additional representative spring tide events and these values are illustrated on Figures 5.2-8 and 5.2-9. These spring tide events are of interest since they have the greatest potential effect on groundwater gradients. As previously discussed, the effect of tide is limited inland so the greatest effect is at the coastline. Based on the spring tide data provided in the Annual Report (FPL 2011b) and Table 5.2-4, gradients between inland stations vary little between high and low tide during spring tide events. At low tide during spring tide events, gradients between coastal stations TPGW-1, TPGW-12, TPGW-3, CCS station TPGW-13, and the three Biscayne Bay stations become seaward, or steepen seaward relative to gradients present at high tide between these stations. For these stations, the change in gradients from high tide to low tide gradients is primarily due to water level declines in the Biscayne Bay well clusters. This variation in gradients may impact groundwater flow in the coastal portion of the study area during spring tide events. Since the CCS does not appear to respond to tidal changes, however, the increase in gradients during spring tide events has limited influence on groundwater movement in and out of the CCS.

5.2.2 Operational Effects of the CCS on Groundwater Levels

Water from the CCS is used year round to provide cooling water to fossil fuel units 1 and/or 2 and nuclear units 3 and 4. As shown in Section 2, water on the CCS discharge side of the plant ranges from 2 to 6 ft higher than water levels on the intake (eastern) side of the CCS. This results in having the highest hydraulic driving heads on the western side of the CCS and the lowest hydraulic driving heads on east/Biscayne Bay side of the CCS. Further assessment of the water movement in and out of the CCS is provided in Section 5.4.

The influence of the CCS operations on the surrounding groundwater flow is complex and in many cases is masked by meteorological or regional conditions. Some understanding of the groundwater response to CCS operations can be gained by looking at select time series plots over an extended period; before, during, and after unit outages/reduced CCS pumping; and during ID pumping. In the first Semi-Annual Report (FPL 2011a), the groundwater time series plots showed that the intermediate and shallow zone water levels were lower than the deep interval water levels in all three Biscayne Bay well clusters. This could be interpreted that the lower water levels on the east side of the CCS were also drawing down/influencing the groundwater levels in the shallow and intermediate zone to the east of the CCS. Furthermore, the time series data (FPL 2011a) showed that the groundwater water levels in the shallow and intermediate wells located between the CCS and Tallahassee Road (TPGW-1, TPGW-4, and TPGW-5) were higher than those in most of the deep zone wells. This could suggest some influence of the higher surface water levels on the west side of the CCS in the shallow and intermediate groundwater zones. The well clusters furthest to the west showed no differences in water levels which could be interpreted as there being no CCS effects. While some effect of the CCS is expected, the extent of those effects is not so clear upon further review of two years of data. It is possible that the water level differences with depth may be more reflective of, or partially masked by, groundwater responses to seasonal conditions and potentially differing hydrogeological properties.

Groundwater levels for the three well clusters in Biscayne Bay are shown on Figures 5.2-10, 5.2-11, and 5.2-12. The values reflect daily averages and the vertical scale is enhanced to facilitate a review of the differences between each zone. Since the TPGW-10 well cluster is located closest to the CCS plant intake where the CCS water levels are the lowest, the potential for drawing down the groundwater is the greatest at this location. However, based on a review of the time series plot for all wells at TPGW-10, there are times when the deep zone at this cluster is lower than the shallow and intermediate zone wells and vice versa; so the trend of the shallow and intermediate wells being lower in the TPGW-10 well is inconsistent. This same alternating trend was observed at well cluster TPGW-11. The only well cluster that consistently had the shallow and intermediate zones lower than the deeper zone groundwater levels was at well cluster TPGW-14, which is farthest away from the pump intakes in the CCS. The differences in water levels between zones seem to be more seasonally driven. During the dry season, there is more separation in water levels than during the wet season. For the TPGW-10 and TPGW-11 well clusters, there was no separation in water levels in the summer of 2011. Presumably, if the CCS was having a profound effect on the shallow and intermediate zones, those effects would exist

year round unless there were changes in operating conditions; there were no major operational changes during that period.

Well clusters west of the CCS out to Tallahassee Road (specifically TPGW-1, TPGW-4, and TPGW-5) consistently display water levels over two years of monitoring with the shallow and intermediate zone groundwater levels higher than the deep zone groundwater levels (Figures 2.3-1, 2.3-4, and 2.3-5). However, that trend does not hold up in well clusters TPGW-2 (Figure 2.3-2) and those to the north and south of the CCS (TPGW-3, TPGW-6, and TPGW-12 (Figures 2.3-3, 2.3-6, and 2.3-12) which could be influenced by higher water levels in the CCS. While an exhaustive assessment was not conducted to explain why there are differing patterns, it is possible that the vertical gradients/differing water levels between zones are the result of differing hydrogeological connections and properties. It is unclear whether the water level trends in TPGW-1, TPGW-4, and TPGW-5, as well as TPGW-7, TPGW-8, and TPGW-9 are the result of CCS influences or lack thereof, or if they are also the result of differing hydrogeological characteristics.

In an effort to further determine if and how the groundwater responds to operation of the CCS, FPL reviewed groundwater levels during periods of outages and non-outages for the plant. Water levels in the CCS are affected to some degree when there is an outage of units (typically reduced pumping) for various maintenance reasons or refueling (Units 3 and 4). Figure 5.2-13 shows when outages occurred during the monitoring period for the nuclear units; however, as discussed in Section 2, not all outages result in the same pumping reductions. Refueling outages which result in turning off the four circulating pumps for one of the nuclear units have the biggest effect since flow can be reduced almost in half depending upon what is happening at the fossil fuel units. Two refueling outages occurred at the Turkey Point nuclear units during the monitoring period (Unit 3: September 27 through November 5, 2010 and Unit 4: March 21 through May 15, 2011). When pumping and associated flow is reduced, the CCS water levels may rise on the intake side and drop on the discharge side. Figures 5.2-14 through 5.2-17 show plots of flow for the nuclear units with CCS water levels and adjacent groundwater level superimposed for TPGW-1 and TPGW-10 before, during, after the outage periods noted above. The flow is based on the run time of the four circulating water pumps and assumed configuration of the three intake cooling water pumps for each nuclear unit. TPGW-1 would be the most likely location to see an effect of reduced flows/lower water levels on the discharge side of the CCS, and TPGW-10 would be the most likely location to see an effect of reduced flows/increased water levels on the intake side of the CCS as a result of an outage. Water levels at TPSWCCS-1 and TPSWCCS-6 are also included with TPGW-1 and TPGW-10, respectively.

At TPGW-1, any effects of the outage for September 27 through November 5, 2010 are initially masked by the heavy rainfall on September 29, 2010, when over 7 inches of rain were recorded at TPM-1. Water levels in the CCS and groundwater rose significantly in response to the rain and then began to drop. However, TPGW-1 water levels continued to drop even when the refueling outage was over, which is not what would be expected if there was an effect. For the second refueling outage, TPSWCCS-1 water levels declined less than 0.5 ft when the outage occurred, but the groundwater levels at TPGW-1 increased, which is opposite of what would be

expected at TPGW-1 if there was a quick response. Even if some type of lag time is considered, there is no clear trend or influence at TPGW-1 associated with the outage.

On the intake side of the CCS, there are some changes in TPSWCCS-6 water levels in response to an outage. However, some of the associated rises or drops in TPSWCCS-6 water levels start prior to either the outage being initiated or being completed, respectively, so it is difficult to determine the exact change in water levels at TPSWCCS-6 associated with an outage. The estimated change in water at TPSWCCS-6 due to the refueling outages is between 0.5 and 1.0 ft. The groundwater levels at TPGW-10 do not correspond well with outage as there are times when the groundwater decreases rather than rises when an outage occurs or increases instead of falls when an outage is over. There is no clear evidence that the plant outages are affecting groundwater at the wells near the CCS or, if there are effects, they are too subtle and are masked by meteorological conditions. This suggests that other factors (perhaps meteorological or hydrological) exert a greater influence on groundwater in wells near the CCS than does operation of the CCS.

While there is no evident influence of outages on the adjacent groundwater levels, there does appear to be an effect of ID operations on adjacent groundwater levels. Figures 5.2-18 through 5.2-22 show the change in groundwater at various wells in response to lowering the water level in the ID during ID pumping. The results show a drop of up to 0.7 ft in the ID and a drop of 0.1 to 0.2 ft in the wells closest to the ID (TPGW-1 and TPGW-2) within hours of pumping at all depth intervals. Well clusters TPGW-4 and TPGW-5 farther west show no response to ID pumping. The fact that all wells at clusters TPGW-1 and TPGW-2 respond to ID pumping indicates that there is close communication with the ID.

5.2.3 Extent of CCS Water and Rate of Migration

When the groundwater levels are higher than water levels in the CCS, there is an increased potential for groundwater discharges into the CCS. However, when the CCS water levels are higher than the surrounding groundwater levels, flow may radiate from the CCS until equilibrium is met, it is intercepted by the ID at the shallow zone, or hydrologic conditions change. The density gradient between groundwater and surface water inside and outside the CCS also affects whether the water moves in or out of the CCS. Since there are higher densities in the CCS, the groundwater elevations outside the CCS must be higher to counteract the density effects. The estimated flows in and out of the CCS and the timing on a monthly basis are presented in Section 5.4.

While freshwater head equivalent potentiometric maps can be developed and groundwater flow directions established, FPL has previously stated these maps may yield inappropriate interpretations. As a surrogate to potentiometric maps, a review of changes in specific conductance concentrations and extent of tritium can give insight into changes over time and groundwater movement.

As discussed in the February 2011 Semi-Annual Report (FPL 2011a), the presence of saltwater in the aquifer west of Turkey Point pre-dates the CCS and was documented well inland in the

1950s (Klein 1957). This saltwater zone can move seasonally and year to year (Peters and Reynolds 2008), however, the results of FPL's two years of monitoring effort show very little change in chloride concentration west of the CCS except for some reduction in thickness of the fresher water surficial zone during the 2011 drought/dry season. Figure 5.2-23 shows the extent of saltwater intrusion as estimated by the USGS in 2008. This line is seaward of the USGS line in the 1950s (Figure 5.2-23). While the exact location of the estimated extent of the 2008 USGS line that extends to the south may be refined, it generally appears to reflect the extent of saltwater intrusion as defined by the 1,000-mg/L isochlor.

In comparing current data to historical data, there are more historical specific conductance data than chloride data in the project area, thus specific conductance provides a more robust assessment. Historical groundwater specific conductance data are available from sampling efforts conducted prior by to the startup of the CCS in the early 1970s. These data were compiled by Golder Associates, Inc. (2011a). While chloride concentrations provide more direct evidence of saltwater/ marine water intrusion, specific conductance can also be used as a surrogate, with the understanding that its value could be affected by salts found in fresh water. In nearly all the wells sampled for this current monitoring effort, a high specific conductance value (greater than 1,275 µS/cm) appears to indicate marine influences. Only one well (TPGW-8S) had specific conductance readings that were influenced by another ion (calcium) and may not reflect marine influences.

Figures 5.2-24, 5.2-25 and 5.2-26 show cross-section locations and cross-sections with pre-CCS (April 1, 1971, through February 1, 1972) and recent (March 2011) specific conductance data. Isopleths are drawn to show and the approximate change in specific conductance concentrations from the early 1970s (pre-CCS operation) to recent period. All isopleths represent estimations of historical and current water quality conditions and were developed based on interpolation methods and best professional judgment. The figures show the presence of high specific conductance water, most likely from predominantly marine influences, well inland prior to CCS operation. The figures also show that the specific conductance values in the immediate vicinity of the CCS have increased above values typically observed in Biscayne Bay, and are attributable to the CCS. Some specific conductance values to the west also increased, however, the westerly limit of the 10,000 µS/cm line has changed little. Plan view maps showing the approximate current limits of specific conductance in each zone (shallow, intermediate and deep) are provided in Figures 5.2.27, 5.2-28 and 5.2-29.

Figures 5.2-25 and 5.2-26 also show the approximate historical limit what would now be defined by FDEP as Class III groundwater (TDS greater than 10,000 mg/L per Chapter 62-520.430, F.A.C.). While historical TDS values are not available for all stations, there is a relationship between specific conductance and TDS; Based on the current analytical data the TDS value on average is 60% of the specific conductance value. This relationship was used to calculate historical TDS values and to estimate the approximate limits of GIII groundwater prior to CCS construction.

Since there is an interest in determining how much, if any, of the groundwater is affected by the hypersaline water in the CCS, a tracer or tracers that can distinguish CCS water from Biscayne

Bay marine water is needed. Based on the data and analyses conducted by FPL and the Agencies, the Agencies have selected tritium to be used as a tracer of the CCS water. Parameters such as cations, ions, or other isotopes did not distinguish CCS water from Biscayne Bay water below concentrations found in Biscayne Bay. The distribution of tritium may provide some insight into the possible movement and extent of CCS waters.

Figures 5.2-30 and 5.2-31 show cross-sections similar to the above specific conductance cross-sections except tritium values are shown. The figures include both the average tritium value for each well and corresponding average chloride value for the period when tritium data are currently available (June/September 2010 through December 2011). The figures show groundwater tritium concentrations in excess of 3,000 pCi/L near the CCS. These concentrations diminish with distance from the CCS. Values are in the hundreds of PCi/L three miles west of the CCS at depth. The extent of tritium in the groundwater is less to the east of the CCS. Note that much of the water in the vicinity of the CCS could historically be classified as non-potable based on pre-CCS TDS concentrations in the groundwater. Figures 5.2-32, 5.2-33 and 5.2-34 show plan view maps of tritium concentrations for the shallow, intermediate, and deep zones, respectively. All isopleths represent estimated locations of tritium contours and were developed based on interpolation methods and best professional judgment.

Over the two year period of monitoring, the tritium concentrations, along with chloride concentrations have remained relatively stable in the groundwater. No increasing trends were observed.

It is important to note that under this Monitoring Plan, tritium is being measured only as a chemical tracer in order to determine potential movement of CCS water. At the levels being measured, the tritium is not a public health concern. Tritium is also being routinely monitored in the CCS by the Florida Department of Health, Bureau of Radiation Control (FDOH-BRC).

Again, it is important to remember that all the new wells installed as part of this monitoring effort are screened below the shallow fresher lens of groundwater present in the area. The cross-sectional figures show that the lateral migration is not uniform in all directions. This is not unexpected due to density and hydraulic heads that are more conductive to gradients to the west than the east. Other regional factors also could be influencing movement to the west. FPL anticipates that a committee will be formed, including FPL representatives and Agency personnel, to look further into the causes of CCS migration and factors that may affect saltwater intrusions in the area surrounding the CCS.

The SFWMD has suggested that a threshold value of 20 pCi/L (averaged value) of tritium be used to reflect possible background conditions excluding effects of atmospheric exchange/deposition from the operation of Units 3 and 4 and the CCS. As discussed in Section 3, vapor exchanges and, to a lesser extent, rainfall can raise tritium concentrations in the porewater, surface water, and possibly the shallowest groundwater to hundreds of pCi/L in areas within 1 mile of the CCS. The effects of vapor exchanges diminish with distance away from the CCS; however, values of tritium near 50 pCi/L have been observed at the evaporation station next to TPGW-5. Also, the rain collector data from rainfall show a maximum tritium value

approaching 40 pCi/L near TPGW-5. Rainwater or standing water in wetlands or in canals will be most directly affected by the atmospheric tritium; however, this water will percolate into the ground and affect the groundwater. The atmospheric influences of tritium are expected to decrease with depth due to dilution and natural decay of tritium depending on the rate of vertical migration. Thus, at depth and distances well away from the CCS (such as TPGW-5, TPGW-4), the atmospheric influences are more limited.

There is no apparent evidence that there is an upwelling of high specific conductance CCS water with commensurate levels of tritium that are affecting surface water or porewater throughout the study area. The tritium concentrations in Biscayne Bay and the L-31E canal as reported in Section 3.2 and porewater in Section 4 (both broad-scale and transects) are within the ranges observed in the evaporation pans and/or did not have higher specific conductance values that would potentially indicate CCS water. There are two surface water stations located in canals immediately adjacent to the CCS that potentially could be affected by the CCS via a groundwater pathway (TPSWC-4 and TPSWC-5). At both locations tritium values approached or exceeded 1000 pCi/L at depth during one sampling event. Also on occasion water that was warmer and more saline than Biscayne Bay was detected at TPSWC-5 and which cannot be readily explained by air temperatures. Both TPSWC-4 and TPSWC-5 are separated from the CCS by approximately 150 and 40 ft of land respectively. The water depths along the CCS at that location exceed 20 ft and the water depth at TPSWC-5 is also deep so it is possible that there could be some seepage between the two water bodies near the bottom.

For groundwater, there are also stations that show evidence of CCS water via a groundwater pathway. Figure 5.2-35 shows the wells that are suspected to be influenced by a groundwater pathway. The tritium concentrations in the shallow samples at fully screened wells L-3 and L-5 may be attributable to atmospheric influences, however, the higher values found at depth are associated with a groundwater pathway. The westerly extent of CCS water in the groundwater is near Tallahassee Road.

Using a tritium concentration of 20 pCi/L at depth and for calculation purposes, the rate of migration can be estimated. The approximate limit of the 20 pCi/L line is 20,000 ft west of the CCS around G-21 and 25,000 ft from the CCS west of G-28. Given that the CCS has been in operation since 1974 (approximately 38 years), the average rate of migration to the west is between 525 (northern part) and 660 (southern part) ft per year. There are many factors can cause saltwater intrusion, including groundwater withdrawals, agricultural uses, mining, government water management practices, etc.

To the east, there does not appear to be any influence of CCS at TPGW-10, but there does appear to be some influence at depth at TPGW-11 and TPGW-14. The extent of movement to the east appears to be less than what is observed to the west and with the approximate limit of the 20 pi/L line assumed to be slightly east of TPGW-11. For calculation purposes, assume the distance is 11,000 ft to the east of the CCS, which equates to a migration rate of 290 ft per year.

It is unknown whether the migration to the east and west has been steady or if the CCS water moved quickly and then slowed. As discussed above, during the two year period of the Monitoring Plan there has been no readily apparent movement further to the west.

The Monitoring Plan requires that the percentage of CCS water be estimated at different locations. This cannot be done with a high degree of precision or accuracy due to the complex nature of the aquifer and lack of historical data. Nonetheless, an approximation is being attempted by assuming a binary mixture between water in the CCS and background water that existed before the CCS was created. This mass balance is computed as:

$$\%CCS = 100 \times ((Cl_{well} - Cl_{background}) / (Cl_{CCS} - CL_{background}))$$

Where:

- % CCS = estimated percentage of CCS water in a given well
- $Cl_{background}$ = typically interpolated value from historical specific conductance data in nearby wells
- Cl_{CCS} = the average CCS chloride concentration (mg/L) from June 2010 through June 2012 for wells close to the CCS (newer water) or estimated chloride concentration from the late 1970s/early 1980s for outer wells
- Cl_{well} = the average chloride concentration (mg/L) in a given well from June 2010 through June 2012

Chloride is used in lieu of tritium in this calculation because chloride is a conservative constituent that does not biodegrade or decay over time like tritium. While the above binary mixing model can be more readily used for those wells where there is pre-CCS and post-chloride CCS well data (i.e., L-3, L5, G-21, and G-28), estimations have to be made for the pre-CCS chloride values in the newly installed wells. A pre-CCS chloride concentration equivalent to freshwater cannot be used at most locations since the presence of marine water in the groundwater pre-dates the CCS. An estimation of pre-CCS chloride concentrations can be made by interpolating historical/pre-CCS specific conductance and limited chloride data reported by Golder Associates, Inc. (2011a) for various wells and depths. For locations where only historical specific conductance values are available, the following empirical relationship was developed using wells where both chloride and specific conductance were measured:

$$Cl\ (mg/L) = EC(\mu mhos/cm) \times 0.4428 - 3332.3.$$

When calculating the percentage of CCS water based on chloride concentration, not only must the historical and current well concentration be known or estimated, but also the historical and current CCS chloride concentration. Water in wells close to the CCS likely reflects fairly young water and current CCS concentrations may be appropriate. However, water near Tallahassee Road is likely much older and from CCS water that was less saline in the 1970s and 1980s. For the outer wells such as TPGW-4 and TPGW-5, lower chloride levels should be used for the CCS water. Based on historical data (Golder Associates Inc. 2011b), a historical CCS chloride concentration is used for the outer wells and a current (June 2010 through June 2012) chloride concentration is used for the wells near the CCS.

Table 5.2-5 provides a summary of the approximate percentage of CCS water based on the above inputs and assumptions.

As an alternative check, a similar approach was used for estimating the percent of CCS water in a given well sample, but using tritium instead of chloride concentrations. Note, however, more assumptions are required with this method which can result in more uncertainty. Since tritium decays over time, the amount of decay that has occurred also must be considered. This can be approximated based on the estimated age of the water using an average rate of migration. For example, monitoring well cluster TPGW-4 is approximately 14,900 ft from the CCS. With an average rate of migration of 660 ft per year for westerly wells on the southern half of the CCS, the approximate age of the water is 22.9 years. Using an average concentration from June 2010 through December 2011 for each well and accounting for the half-life of tritium at 12.3 years, a tritium concentration can be estimated at each well that accounts for no decay. The resulting value can then be used to calculate percent CCS water by assuming a binary mixture between water in the CCS and background water that existed before the CCS was created. This mass balance is computed as:

$$\%CCS = 100 \times ((Tritium_{well\ no\ decay} - Tritium_{reference\ background}) / (Tritium_{CCS} - Tritium_{reference\ background}))$$

Where:

- % CCS = estimated percentage of CCS water in a given well
- $Tritium_{well\ no\ decay}$ = estimated tritium concentration for a given well accounting for no tritium decay
- $Tritium_{reference\ background}$ = estimated pre CCS tritium concentration
- $Tritium_{CCS}$ = estimated average CCS tritium concentration (pCi/L)

Similar to the chloride concentrations in the CCS, tritium concentrations, current and historical, have to be estimated. This can be a challenge since the tritium concentrations in the CCS vary considerably. For the Uprate monitoring period from June 2010 through December 2011, the tritium values in the CCS ranged from 1,260 to 14,280 pCi/L. Based on historical data from 1974 to 1975, the CCS values ranged from 1,556 to 4,846 pCi/L (Ostlund and Dorsey 1976). The groundwater at TPGW-13 seems to be buffered by these short-term fluctuations in the surface water and may serve as a better overall average of the CCS water. The average concentration in TPGW-13 from June 2010 through December 2011 is 4,100 pCi/L. While there are no hard data to support this, it is assumed for calculation purposes that the concentrations in the groundwater under the CCS have been somewhat similar over much of the CCS operation period since the operations are not dramatically different. With these assumptions, use of current tritium well data, and 20 pCi/L as a reference background at depth, an estimated percentage of CCS water in the well can be calculated.

Table 5.2-6 provides a summary of values used and the resulting percent CCS water. Generally, estimated values using tritium are comparable to values calculated using the chloride approach. However, the results from both estimation methods should be viewed as rough estimates of percent CCS water.

5.3 Biscayne Bay Continuous Resistivity Profile Survey

The Monitoring Plan (SFWMD 2009) states that "broad-scale estimates of specific conductance and temperature of waters potentially influenced by the CCS are needed to assess the spatial extent and magnitude of this influence (including the identification of potential groundwater upwelling zones) and provide information to improve the monitoring design within the adaptive protocols of this Plan." Electrical resistivity or magnetic surveys can provide such broad-scale salinity estimates for both surface water and groundwater (Fitterman and Desczcz-Pan 2001; Swarzenski et al. 2006).

In this Monitoring Plan, a boat-based geophysical survey was proposed south of the latitude of the Mowry Canal and over Card Sound using a combination of continuous resistivity profiling (CRP) and distributed temperature sensing (DTS) investigation. The USGS recommended that a CRP pilot study be conducted since it was not clear how far below the ground surface resistivity readings may be interpreted and whether or not high saline zones could be identified. The USGS did not include a DTS investigation as part of the pilot effort since this is typically deployed to cover a smaller area than is described in the Monitoring Plan (SFWMD, 2009).

On May 25-26 and July 28, 2011, the USGS conducted a CRP pilot survey using a boat-towed electrode array. The details of the survey include the following:

- Tow-cable length – 100 meters
- Number of electrodes – 11 (2 current, 9 potential)
- Electrode spacing – 10 meters
- Current electrode type – graphite
- Potential-electrode type – stainless steel
- Array geometry used – dipole-dipole
- Acquisition time – 8 potential measurements every 2.8 seconds
- Tow speed – approximately 4 kilometers per hour (km/hr)
- Number of survey lines – 12
- Total linear distance – 31.3 km

The pilot study survey lines are shown on Figure 5.3-1 and are located in the CCS, historical outfall canal, and in the vicinity of TPGW-14 where the highest salinities were observed in the Biscayne Bay wells at depth. Profile lines also extended to TPGW-11. This survey area represents the most viable locations to potentially see resistive/conductive differences.

Following the field effort, the USGS processed the data and assessed the results. The preliminary findings were presented to the Agencies on August 29, 2012. Due to internal QA/QC requirements, the USGS cannot publish the results or provide hard copies or an electronic version of their presentation or results without a formal review and publication process, which could take a minimum of five to six months. FPL has requested that the USGS

present the data and, depending upon the findings, a decision could be made whether to formally publish a report.

The USGS assessed the depths at which the results could be reasonably interpreted and concluded the depth was typically limited to 12.5 to 15 m below the Bay bottom. The USGS stated that the data are considered to have a vertical resolution no better than 5 m and the horizontal resolution is generally considered to be ½ the electrode spacing (5 m).

Based primarily on the lack of depth penetration, it is FPL's interpretation that the CRP survey will not be very helpful to further delineate the extent of CCS water at depth nor conclusively discriminate between water of different densities and variations in the subsurface geology without the aid of substantial data collection. The porewater and surface water sampling in Biscayne Bay already provide insights into whether there is a measurable influence of the CCS in Biscayne Bay. As such, FPL recommends that further efforts associated with the CRP not be conducted. FPL also does not recommend the use of DTS to track warmer CCS water in the ground since the well temperature data indicate little to no thermal influences away from the CCS.

5.4 Water and Salt Balance Model

Tetra Tech GEO developed a model of the water and salt balance for the CCS. The purpose of this model is to quantify the volumes of water and mass of salt entering and exiting the CCS over a period of time. This analysis builds upon a prior study of the CCS water balance (Golder 2008) by revising methods of calculation for the various components of the CCS and by incorporating new hydrological, chemical, and meteorological data collected in and around the CCS between September 2010 and June 2012. The model described herein is an extension and update of the water and salt balance model presented in the 2011 Annual Monitoring Report (FPL 2011b). This section describes the conceptual model of the CCS water and salt balance, key calculations, and results to illustrate the components of the water and salt balance model. All assumptions are clearly indicated. These calculations are performed in an Excel spreadsheet, which is provided in a separate data file. Findings regarding the operation of the CCS are based upon the results of the current calibrated water and salt balance model and are provided herein.

5.4.1 Conceptual Model

The first step in the modeling process is the development of a hydrological conceptual model (HCM). All data available for the site are assimilated in the HCM in a framework that facilitates the development of a quantitative model. Such data includes information about the bathymetry of the CCS, Biscayne Bay, ID and SFWMD canal L-31E. The flow and chemical characteristics of these water bodies and of the underlying groundwater are thoroughly monitored. These monitoring data are also incorporated in the HCM and helped to formulate a control volume that is primarily comprised of the CCS.

A control volume defines the entity being analyzed. The transfer of water and salt within the control volume is not characterized. Rather, the water and salt balance model focuses upon the

transfer of water and salt into and out of the control volume. The control volume analyzed is comprised of the canals of the CCS and the adjacent ID. Raised earth berms between the individual canals are not considered as a part of the control volume. 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 feet NAVD 88 to approximately -30 feet NAVD 88. This interpretation of the control volume was developed based upon the hydrological monitoring plan in place for the CCS. The components of the water balance model for this control volume are depicted in Figure 5.4-1. In this figure, canal L-31E is red, the ID is green, discharge cooling canals are purple, return canals are dark blue, and Biscayne Bay is light blue.

Water elevation and quality are recorded at seven stations throughout the CCS, three locations in the ID, three stations in canal L-31E, two locations in other adjacent canals, seven locations in Biscayne Bay (four of which measure only salinity), and fourteen wells in Biscayne Aquifer (at 3 depths each); it is important to note that, based upon the control volume, only shallow groundwater monitoring stations contributed to the characterization of groundwater elevations and groundwater quality in this analysis. The surface and subsurface monitoring locations, in addition to data provided by SFWMD and FPL, facilitate straightforward calculation of the components of water and salt transfer into and out of the control volume:

- Surface water monitoring stations in canal L-31E and the ID permit a straightforward calculation of lateral seepage of water and salt between L-31E and the control volume;
- Surface water monitoring stations in the southern collector canal of the control volume and a monitoring station in a canal adjacent and parallel to the southern face of the control volume provide a means to calculate the seepage of water and salt through the southern face of the control volume;
- Surface water monitoring stations in the CCS return canals and in Biscayne Bay facilitate the calculation of seepage between Biscayne Bay and the control volume;
- Surface water monitoring stations in the CCS canals and groundwater monitoring stations beneath and adjacent to the CCS help to define water flow and salt transport through the bottom of the proposed control volume;
- Meteorological stations in the CCS and immediately to the north and south provide data to calculate the loss of water from the control volume to evaporation; and
- Next Generation Weather Radar (NEXRAD) precipitation data provided by SFWMD informed an accurate assessment of water gained by the CCS from rainfall.

Intermediate modeling results, based upon the control volume and the HCM presented herein, were presented to SFWMD for a calibration period between September 2010 and December 2011 (Andersen 2012). Based upon the intermediate results, FPL received concurrence from SFWMD on the proposed control volume and HCM.

5.4.2 Bathymetry

Certain components of the water and salt balance model require an understanding of the control volume's surface area. For instance, precipitation-based inflow to the control volume is a function of the amount of rainfall (e.g., in inches) and the surface area of the water body onto which the rain was deposited. Also, the conductances for the bottom seepage zone are a function

of the water surface area. Due to the sloping sidewalls of the canals in the CCS, the water surface area changes as the water elevations in the CCS change. Based upon a detailed survey of the CCS bathymetry (Morgan and Eklund 2010), a relationship between surface area of the control volume (sub-divided into 5 zones, Figure 5.4-2) and water elevation was defined. Thus, because water elevations in the CCS vary daily so, too, does the water surface area (surface area is proportional to the water elevation); the time-varying surface areas for each of the 5 zones in Figure 5.4-2 are known for the calibration period. Likewise, the bathymetric survey results permitted the characterization of the relationship between the CCS water elevations and CCS storage volume; like surface area, storage volume decreases as water elevations decrease. This refined understanding of surface area and volume of the CCS significantly improved the performance of the model and eliminated much uncertainty with respect to the inflows to and outflows from the control volume.

5.4.3 Water Balance Calculations

As Figure 5.4-1 depicts, the water balance for the proposed control volume is comprised of seepage (lateral through the sides and vertical through the bottom), blowdown (additional water pumped from other units to the CCS), precipitation (including runoff from earth berms between canals) and evaporation. Water pumped into and out of the CCS from Units 1 through 4 is also a component of inflow to and outflow from the control volume; however, these flows are assumed to be equal and have a net zero effect on the water and salt balance. Seepage to and from the control volume comprises a significant component of the water balance. The approach to calculating seepage to and from the control volume, as well as necessary assumptions, is provided below. Other means by which water is transferred (e.g., evaporation) are calculated in distinct manners and are discussed separately. Calculations were performed for a 22-month period from September 2010 through June 2012. This period marks an extension of that which was defined in the preliminary model presented in the 2011 Annual Report (FPL 2011b). Average flows into and out of the control volume were calculated for each day of this period. The average daily flows were summed to estimate the amount of water that enters or exits the control volume during each month and the entire 22-month period. These calculations are intended to demonstrate and validate the methodology, as well as illustrate the hydrologic mechanisms by which the CCS functions.

The general equation for seepage flow employed in the water balance analysis is:

$$Q = C \times \Delta h \quad (1)$$

Where:

- Q ≡ Volumetric flow, [Length3/Time]
- Δh ≡ Head gradient between control volume and external source/sink, [Length]
- C ≡ Conductance of the media between the control volume and the external source/sink with which it is transferring water, [Length2/Time]

$$C = \frac{K * A}{D} \quad (2)$$

Where:

- $K \equiv$ Hydraulic conductivity of the media through which water flows, [Length/Time]
- $A \equiv$ Area of the face of the control volume through which water flows, [Length2]
- $D \equiv$ Distance water flows between the external source/sink and the control volume, [Length]

In accordance with widely accepted modeling convention, flow into the control volume is positive (+) and flow out of the control volume is negative (-). Calculated flows are reported in 10^6 gallons per day (millions of gallons per day [MGD]).

The mass flux into or out of the control volume is calculated by multiplying the volumetric flow by the salinity of the body of water from which the water is flowing. Salinity was monitored at all groundwater and surface water stations employed in the ensuing calculations and was reported in the practical salinity scale (PSS-78), which is equivalent to grams per liter (g/L). Calculated mass fluxes are reported in thousands of pounds per day (lb x 1000/day).

The data monitoring locations, seepage face dimensions (where relevant), additional equations, and assumptions that support the estimation of the individual components of the water balance for the control volume are discussed below. Draft results of water and salt balance for the entire 22-month period are discussed in Section 5.4.5 and are provided at the end of Section 5.4.

5.4.3.1 Seepage To/From L-31E (Western Seepage)

Three surface water monitoring stations record the water elevations and salinities in L-31E (TPSWC-1, TPSWC-2, and TPSWC-3). Three corresponding stations (at similar longitudes) record water elevations and salinities in the ID (TPSWID-1, TPSWID-2, and TPSWID-3). The locations of these monitoring stations are plotted in Figure 5.4-3.

Using data recorded at these monitoring stations, the seepage through the west face of the control volume was calculated. In order to calculate this seepage, the western face of the control volume was subdivided into two sub-faces (Figure 5.4-3). For this calculation, the following assumptions were made and seepage face dimensions estimated:

- TPSWC-1, TPSWC-2, and TPSWC-3 were used to interpolate water elevations and salinity along the L-31E;
- TPSWID-1, TPSWID-2, and TPSWID-3 were used to interpolate water elevations and salinity along the ID;
- The northernmost section of the west seepage face is approximately 18,800 ft long; the southernmost section of the west seepage face is approximately 10,200 ft long;
- Along the northernmost section of the west seepage face, L-31E and the ID are separated by approximately 950 ft; the average separation between the two canals in the southernmost portion is approximately 2,434 ft; and

- Elevation of base of the ID is approximately -20 ft NAVD 88.

The subdivision of seepage through the west face of the control volume is based on the orientation of L-31E. The conductance of and seepage through each of the sub-faces were calculated using Equations (1) and (2). The resulting component of the water balance is presented in Table 5.4-1. Salt balance estimates for this seepage face were calculated by multiplying the salinities in the sources of water by the calculated flow (Table 5.4-2). For instance, where the flow was to be calculated into the control volume, the salinity of L-31E would be multiplied by the calculated flow to derive the mass flux of this balance component.

5.4.3.2 Southern Seepage

Seepage through the south face of the proposed control volume is primarily driven by the water elevations in the southern end of the CCS and in the canal adjacent and parallel to the southern edge of the control volume. One monitoring station records water elevations and salinity in the southern end of the CCS (TPSWCCS-4). Likewise, one monitoring station measures water elevations and salinity in the adjacent canal (TPSWC-4). These monitoring stations are plotted in Figure 5.4-4.

Using observed data recorded at these monitoring stations, the seepage through the south face of the control volume was calculated. For this calculation, the following assumptions were made and seepage face dimensions estimated:

- Water elevations and salinities recorded in TPSWC-4 are representative of the southern external canal;
- Water elevations and salinities recorded in TPSWCCS-4 are representative of the southern CCS collector canal;
- The depth of the southern CCS canal is assumed to be that at TPSWCCS-4, where the canal bottom is an approximate elevation of -22 ft NAVD 88; and
- The length of the seepage face is approximately 9,300 ft.

The southern external canal is 155 ft south of and parallel to the southern edge of the CCS.

The application of data observed at TPSWC-4 to the entire southern canal was necessitated by the absence of other monitoring stations in this external canal. Likewise, TPSWCCS-4 is by far the most proximate and relevant monitoring station to the seepage face. The conductance for this seepage face was calculated using Equation (2). The flow through this seepage face was subsequently calculated by Equation (1) using water elevation differences between the two monitoring stations. The calculation flow associated with this component of the water balance is provided in Table 5.4-1. Salinities of the source water were multiplied by the calculated flows in order to estimate the salt mass flux and total mass through this seepage face (Table 5.4-2).

5.4.3.3 Eastern Seepage

Seepage through the eastern face is assumed to flow into the control volume from Biscayne Bay or out of the control volume into Biscayne Bay. In order to calculate this seepage, the eastern face of the control volume was subdivided into two sub-faces (Figure 5.4-5). Canal depths at these two locations and stage variation within the CCS necessitated the subdivision of the eastern seepage face. The elevation of the canal bottom at TPSWCCS-5 is approximately -22 ft NAVD 88; the elevation of the canal bottom in the vicinity of TPSWCCS-6 is lower (approximately -30 ft NAVD 88). Water characteristics in Biscayne Bay are observed at a number of monitoring stations along the seepage face; the monitoring station with the longest period of record for water elevations is TPBBSW-3.

Using observed water elevations from relevant monitoring stations, the seepage through the east face of the control volume was calculated. For this calculation, the following assumptions were made and seepage face dimensions estimated:

- TPSWCCS-5 water elevations and salinities effectively reflect conditions in the return canal adjacent to the southernmost seepage sub-face;
- TPSWCCS-6 water elevations and salinities effectively reflect conditions in the return canal adjacent to the northernmost seepage sub-face (TPSWCCS-5 salinity employed when data was not available for TPSWCCS-6);
- Reliable water elevations at TPSWCCS-6 were not available for much of September 2010 and all of April and May 2011; water elevations during these times were estimated from the measurements at TPSWCCS-5 by adding the average difference in water elevations between the two sensors to TPSWCCS-6; likewise, water elevations measured at TPSWCCS-6 were adjusted and employed as surrogates for TPSWCCS-5 water elevations when the latter were not available;
- TPBBSW-3 water elevations and salinities are representative of Biscayne Bay along the eastern seepage face of the return canals (TPBBSW-10 water elevations and TPBBSW-4 salinities were employed when data for TPBBSW-3 were not available);
- TPBBSW-10 water elevations and salinities are representative of Biscayne Bay along the intake canal seepage face (water elevation and salinity measurements at TPBBSW-3 and -4 were employed when data were not available for TPBBSW-10);
- The average elevation of the canal bottom along the southernmost seepage sub-face is assumed to be -22.5 ft NAVD 88 (elevation at TPSWCCS-5);
- Interval-valued bathymetric data defines a range of depths below water for the northernmost seepage sub-face between 20 ft and 40 ft. Based on this data, an approximate elevation of the canal bottom was defined to be -30 ft NAVD 88;
- The length of the southernmost seepage sub-face is approximately 22,500 ft; and
- The length of the northernmost seepage sub-face is approximately 8,340 ft.

The conductance for this seepage face was calculated using Equation (2). The flow through this seepage face was subsequently calculated by Equation (1) using water elevation differences between the each of the two monitoring stations in the control volume and the Biscayne Bay monitoring station. The calculation of flow associated with this component of the water balance

is provided in Table 5.4-1. Salinities of the source water were multiplied by the calculated flows in order to estimate the salt mass flux and total mass through this seepage face (Table 5.4-2).

5.4.3.4 Northern Face Seepage

Seepage through the northern face of the control volume (Figure 5.4-6) is defined by the difference in water elevations between the northernmost discharge canal of the CCS and shallow groundwater elevations to the north of the control volume. TPSWCCS-1 is the most proximate monitoring station to the northern seepage face. Groundwater elevations were adjusted for freshwater equivalency and interpolated along a transect that is parallel to the northern edge of the CCS, starts at a point with the same latitude as TPGW-12 and same longitude at TPSWCCS-1, intersects TPGW-12, and terminates at a point with the same latitude at TPGW-12 and the same longitude as plant outflow meter TPFM-1 (Figure 5.4-6). Groundwater elevations along this transect were interpolated based on data recorded at shallow monitoring wells TPGW-6, TPGW-10, and TPGW-12. Freshwater equivalent heads were calculated using Equation (3).

$$h_f = (h - z) \times \left(\frac{\rho}{\rho_f} - 1\right) + h \tag{3}$$

Where:

- $h_f \equiv$ freshwater equivalent head, [Length]
- $h \equiv$ measured water elevation at the sensor, [Length]
- $z \equiv$ elevation of the sensor, [Length]
- $\rho \equiv$ measured density of water, [Mass/Length^3]
- $\rho_f \equiv$ freshwater density (0.997 g/cm^3)

Using freshwater equivalent water elevations from the CCS monitoring station and interpolated shallow groundwater elevations along the transect, the seepage through the north face of the control volume was calculated. For this calculation, the following assumptions were made and seepage face dimensions estimated:

- Water elevations, densities, and salinities recorded in TPSWCCS-1 applied to the entire north canal of the control volume (TPSWCCS-7 data were used when TPSWCCS-1 data were not reliable);
- A hydraulic gradient was calculated along a straight line between TPGW-6 and TPGW-12; this gradient was employed to estimate groundwater elevations along the transect west of TPGW-12;
- A hydraulic gradient was calculated along a straight line between TPGW-12 and TPGW-10; the gradient was employed to estimate groundwater elevations along the transect east of TPGW-12;
- The salinity at TPGW-12 was assumed to apply across the length of the transect;
- Length of the seepage face is the lateral distance between TPSWCCS-1 and the plant discharge pump station;
- The distance between the northern edge of the CCS and the transect is the difference between the latitudes of TPGW-12 and TPFM-1;

- Based on bathymetry data, the elevation of the bottom of the CCS varied from -11.5 to -25 ft NAVD 88 along the northern canal.

The conductance for this seepage face was calculated using Equation (2). The flow through this seepage face was subsequently calculated by Equation (1) using water elevation differences between the monitoring station in the control volume and interpolated shallow groundwater elevations along the transect. The calculation of flow associated with this component of the water balance is provided in Table 5.4-1. Salinities of the source water were multiplied by the calculated flows in order to estimate the salt mass flux and total mass through this seepage face (Table 5.4-2).

5.4.3.5 Bottom Seepage

The calculation of flow through the bottom of the control volume employed monitoring data from five shallow groundwater wells located beneath and adjacent to control volume (TPGW-1, TPGW-3, TPGW-11, TPGW-12, TPGW-13) and four monitoring stations in the CCS (TPSWCCS-1, TPSWCCS-2, TPSWCCS-4, TPSWCCS-5). For this calculation, the control volume was subdivided into four zones (Figure 5.4-7), based on the locations of the CCS monitoring stations and the conceptualization of bottom seepage to and from the control volume (primarily downward flow in the northern and middle portions of the discharge cooling canals; primarily upward flow in the return canals). The seepage through each zone of the control volume was calculated; bottom seepage was calculated by summing the flows through the four zones.

Surface water elevations and salinity for each zone were defined to be those measured at the monitoring station within the zone (e.g., water elevations and salinity observed at TPSWCCS-1 and TPSWCCS-7 were applied to Zone A; Zone B: TPSWCCS-2; Zone C: TPSWCCS-4; Zone D: TPSWCCS-5). In general, water elevations decreased from Zone A to Zone D. Groundwater elevations beneath each zone were defined based upon proximate groundwater monitoring stations (Zone A: TPGW-1, TPGW-10, and TPGW-12; Zone B: TPGW-13; Zone C: TPGW-3 and TPGW-11; Zone D: TPGW-11). Groundwater salinity flowing into each zone was characteristic of the salinity measured at each zone's relevant groundwater monitoring station (Zone A: average of TPGW-1 and TPGW-12; Zone B: TPGW-13; Zone C: TPGW-10; Zone D: TPGW-10); the inflowing groundwater at Zones C and D was assumed to have a fraction (80% and 90%, respectively) of the salinity measured at TPGW-10 due to the mixing of regional freshwater and saline water. The thickness of the seepage face varied amongst the zones, since the approximate average elevation of canal bottoms for each zone varied (as approximated from bathymetric survey data).

The calculation of seepage through the bottom of the control volume was predicated on the following simplifying assumptions:

- Groundwater elevations beneath each zone are reflected by the groundwater elevations at underlying or proximate monitoring wells, as described above;
- The elevation of the canal bottom as representative for each zone was interpreted from bathymetric survey data and assumed to be constant throughout the zone;

- The surface water elevation and salinity observed at a monitoring station within each zone was applied to the entire zone, as described above;
- Water elevations employed in the seepage flow calculation were not adjusted for density. This assumption was made because although the concentration of the CCS water and the groundwater beneath the CCS may be different from ground or surface waters at other locations, the concentration of the CCS water and the concentration of groundwater immediately beneath the CCS at a given monitoring location are approximately the same. Because the concentrations are the same, the densities are the same, and no adjustment to account for density difference is required to compute flows; and
- Water elevations measured at TPGW-11M acted as surrogates for TPGW-11S water elevations when the latter were not available.

Based on these assumptions, the conductance of and flows through the four zones were calculated using Equations (2) and (1), respectively. The calculated flow is provided in Table 5.4-1. Mass flux was calculated by multiplying the volumetric flow by the salinity of the source (Table 5.4-2).

5.4.3.6 Evaporation

The estimation of evaporative loss from the control volume is a unique case of evaporation from a surface water body due to the elevated heat of water entering the CCS from the FPL Turkey Point power plant and the variability of salinity of water in the control volume. The elevated heat of water has the general effect of increasing evaporative loss, whereas salinity is inversely proportional to the rate of evaporation (Salhotra et al. 1985).

Numerous approaches for estimating evaporation have been developed; they generally fall into two categories: energy balance methods and Dalton Law methods. The former method is widely applied to surface water bodies in spite of being a "costly and time-consuming method" (Mosner and Aulenbach 2003). This approach to calculating evaporative losses requires calculation of individual components of energy flux into and out of the control volume due to solar radiation, surface water, groundwater and precipitation. Evaporative loss is then indirectly estimated as the difference between net energy flux from the control volume and the sum of the individual calculated energy flux components (Lensky et al. 2005; Mosner and Aulenbach 2003). This indirect approach can necessitate the detailed measurement of solar radiation, fraction of penetrating solar radiation, brine mass and cloud cover and can be unreliable for water bodies with elevated temperatures (Leppanen and Harbeck 1960; Bowen 1926).

The Dalton Law approach, on the other hand, relies upon an understanding of the vapor pressure gradient between the surface water and the overlying air, as well as the wind speed above the surface water. Use of this method is limited in practice since wind speed is often the least known parameter in evaporation estimation (Lensky et al. 2005).

For the control volume, wind speeds are measured at 15-minute intervals at meteorological station TPM-1 (Figure 5.4-8) and at 1-hour intervals north and south of the control volume. As such, the Dalton Law approach is employed herein to estimate the rate of evaporative loss, E, from the control volume. The general form of the equation is:

$$E = f(W) \cdot \{\beta \cdot e_{sat}(T_S) - \psi \cdot e_{sat}(T_A)\} \qquad \text{[Length/Time]} \qquad (4)$$

Where:

- $f(W)$ ≡ wind function; W is wind speed, [Length/Time]
- β ≡ coefficient of water activity
- $e(T)$ ≡ saturation vapor pressure [Mass/(Length × Time^2)]
- T_S, T_A ≡ temperature of surface water and air, respectively [°C]
- ψ ≡ relative humidity [%]

The wind function, f(W), is an empirically derived formula that uses wind speed at 2 meters above surface to quantify to the effect of air convection above the water surface on the rate of evaporation. The thermal loading of the Turkey Point power plant can increase forced convection at the north end of the control volume. Approaches to explicitly consider free and forced convection are available (Adams et al. 1990), though they are tailored to estimating energy lost due to evaporation, rather than water lost due to evaporation. Though free and forced convection are not explicitly characterized herein, the wind function employed in these calculations was derived for heated cooling water and based upon the following equation:

$$f(W) = 0.301 + 0.113 \cdot W \qquad (5)$$

where wind, W, is measured in meters per second (m/s) (Williams and Tomasko 2009). In order to achieve a well-calibrated model, a coefficient C_W was incorporated into Equation (5) and was ultimately adjusted during calibration:

$$f(W) = C_W \times (0.301 + 0.113 \cdot W) \qquad (6)$$

The coefficient of water activity, β, varies in the range [0, 1] and is intended to account for the reduced evaporation from saline water bodies. It decreases with increasing salinity; at salinity levels in the CCS, β does not vary significantly (Salhotra et al. 1985) and is conservatively assumed to be 0.9; this value for β is empirically consistent with salinities approximately equal to 100 PSU (Salhotra et al. 1985).

The saturation vapor pressure relationship used in these calculations accounts for elevated water saturation gradients that result from heated water and provides reliable estimates of saturation vapor pressure for temperatures, T, up to 40 °C (Jobson and Schoelhamer 1987):

$$e_{sat}(T) = \exp\left(52.4185 - \frac{6788.6}{T-273.16} - 5.0016 \cdot \ln(T + 273.16)\right) . \qquad (7)$$

Temperature of the surface water is measured at monitoring stations TPSWCCS-1, TPSWCCS-2, TPSWCCS-4, and TPSWCCS-5. Air temperature and relative humidity are measured at meteorological station TPM-1.

In order to estimate evaporative loss, the control volume was subdivided into four zones (Figure 5.4-8). Zone 1 covers the northern area of the discharge canals; wind speeds applied to this zone are measured north of the control volume and water temperatures are measured at TPSWCCS-1. Zone 2 covers the middle area of the discharge canals; wind speeds applied to this zone are measured at TPM-1 and water temperatures are measured at TPSWCCS-2. Zone 3 covers the south area of the discharge canals; wind speeds applied to this zone are measured south of the control volume and water temperatures are measured at TPSWCCS-4. Zone 4 covers the return canals; wind speeds applied to this zone are measured at TPM-1 and water temperatures are measured at TPSWCCS-5. The surface area from which water is lost to evaporation in each of these zones changes through time with the changing water elevations in the CCS, and is calculated based upon the 5 zones presented in Figure 5.4-2.

Additional assumptions made in order to estimate evaporative flux include:

- The air temperature and relative humidity measured at TPM-1 are applicable to the entire control volume;
- Wind speeds north and south of the control volume were measured at 10 meters above ground surface; an empirical relationship between wind speed and elevation was used to estimate wind speeds at 2 meters above ground surface at these stations; and
- Wind speeds employed in evaporative loss calculations were daily averaged values.

Calculated water flow from the control volume due to evaporation is provided in Table 5.4-1. No salt mass is lost from the control volume to evaporation.

5.4.3.7 Precipitation

Precipitation is measured at the site at meteorological station TPM-1 every 15 minutes, and these data informed the precipitation-based inflow in an earlier version of the model (FPL 2011b). However, a more accurate understanding of spatially-varying precipitation-based inflow was derived from NEXRAD rainfall data and provided by SFWMD. SFWMD converted NEXRAD precipitation data into daily rainfall amounts for the 5 zones depicted in Figure 5.4-2. Coupled with a detailed understanding of the changing surface areas for these zones, the NEXRAD data produced an accurate definition of the daily volumetric inflow of water to the control volume from precipitation. This approach to the calculation of precipitation-based inflow significantly improved the model's match to observed water elevations and salinities in the CCS, as well as eliminated the uncertainty introduced by applying TPM-1 rainfall amounts to the entire CCS. Quantities of water entering the control volume due to precipitation are provided in Table 5.4-1. No salt enters the control volume through the precipitation. Runoff into the control volume from earth berms between canals was initially assumed to be 50% of precipitation that falls on the berms. This percentage was adjusted during calibration.

5.4.3.8 Blowdown

Blowdown refers to water added to the control volume from a number of sources: the Unit 5 cooling tower (originally Floridan aquifer water), Miami-Dade wastewater, and Units 1 through 4. Flow from blowdown into the control volume was initially assumed to be a constant 7.8 MGD; this is an approximate value employed in a previous study of the CCS water balance

(Golder 2008). Estimates and measurements of blowdown contributions to the model were revised based upon available measurements and institutional knowledge. Added water from Units 3 and 4 were assumed to be freshwater (non-saline); Unit 5 blowdown salinities are not known with certainty and were adjusted to between 20% and 80% of seawater (35 PSU) to improve calibration to observed salinities. Inflows to the control volume are presented in Table 5.4-1 for water and Table 5.4-2 for salt mass.

5.4.3.9 Pumped Interceptor Ditch Water

The operation of the interceptor ditch requires that large volumes of water be pumped intermittently from the interceptor ditch in order to create seaward flow from L-31E. This pumped water is a blend of ID water and groundwater and is subsequently added to the CCS, comprising a component of inflow to the control volume that is much larger than the regional inflow through the western face of the control volume. Interceptor ditch operation occurs primarily between the months of January and June; pump rates have been as high as 50 MGD and average 4.5 MGD over the 22-month calibration period. The incorporation of this pumped water in the water and salt balance model significantly improved the simulation of water elevations and salinities over prior modeling efforts.

5.4.4 Storage

The gain/loss of water and salt mass within the control volume during some period of time results in a change in the control volume's water and salt mass storage. Increased water storage, for instance, occurs when more water enters the control volume than exits. Storage, then, can be estimated by summing all of the components of the water (and salt) balance. When the net flow is positive (into the control volume) during a specified period of time, the storage of control volume increases. Conversely, a net negative (out of the control volume) flow implies a decrease in storage during a specified time period.

Another manner in which a change in storage can be estimated relies on direct measurements of water elevations and salinities within the control volume. A change in water elevation within the control volume can be calculated as a difference between water elevations at the beginning and end of a specified time period. The product of this change in water elevations and the surface area of the control volume provide an estimate of the change in the volume of water contained in the control volume during that period of time. Estimates of daily storage changes derived from this method are used to further calibrate the water and salt balance model to ensure an accurate simulation of temporal trends CCS water elevation and salinity.

5.4.5 Results and Discussion

The individual components of the water and salt balance were simulated for each month from September 2010 through June 2012, as well as for the collective 22-month period. The individual components of flow are summed in order to calculate a simulated change in volume for each month and for the 22-month period. These simulated changes in storage were compared to observed changes in CCS water and salt storage for each month and the entire calibration period. Errors between the simulated and observed storage changes were minimized by

adjusting key variables associated with the flow balance model; this process is called calibration. The calibration process ensures that the model can accurately reflect the average changes in CCS storage over the 22-month time frame, while also effectively capturing day-to-day changes in CCS water and mass storage. Calibration of the water and salt balance model was achieved by adjusting hydraulic conductivities of the aquifer materials adjacent to and beneath the CCS that factor into the calculation of seepage to/from groundwater and Biscayne Bay. Additional adjustable parameters include an evaporation factor that adjusts the coefficients in the wind function (Equation 6), the amount of runoff that enters the control volume as percentage of precipitation, the amount of Unit 5 cooling tower water that is lost to evaporation before entering the CCS, and the salinity of the Unit 5 blowdown as a percentage of seawater. The calibrated model parameter values are provided in Table 5.4-3.

The horizontal hydraulic conductivities laterally adjacent to the control volume were calibrated to range between 150 ft/day and 450 ft/day. The calibrated vertical conductivities beneath the control volume ranged from 0.1 ft/day to 2.6 ft/day. The northern portion of the discharge canals and return canals, where it is assumed deeper canals intersect a high flow zone underlying the muck and Miami limestone, were calibrated to have higher vertical hydraulic conductivities (1 ft/day and 2.6 ft/day, respectively). Lower vertical conductivities were calibrated for the mid- and southern portions of the discharge canals, as well as the southern portion of the return canals (0.1 ft/day).

Results of the simulated 22-month water and salt balance model are provided in Tables 5.4-1 and 5.4-2, respectively. Monthly balance results follow in Table 5.4-4 through Table 5.4-47. The modeled net flow of water, as calculated by the summing the components of the water balance for the 22-month calibration period, is denoted as the "Modeled Change in CCS Storage" and was calculated to be an average outflow of 0.62 MGD over the 22-month calibration period. The observed change in storage, which is the difference in the volume of water in the CCS between the final and first days of the calibration period, divided by the number of days in the period, was observed to be 0.11 MGD. Thus, the model correctly simulated an *increase* in CCS storage (a gain of water over the 22-month period). Though the model overestimated the change in storage by approximately 0.51 MGD, this error is small relative to the observed monthly changes in storage, which range between and loss of 46.6 MGD (October 2010) and a gain of 52.1 MGD (September 2010).

Likewise, the model correctly simulated a loss of salt over the 22-month period at rate of 607.9 (lb x 1000)/day. The observed rate of salt outflow was calculated by multiplying the average observed salinity in the CCS on the final and first day of the calibration period by the corresponding CCS volumes on those days. The difference between these two products, divided by the number of days in the calibration period, provides the net outflow of salt, 591 (lb x 1000)/day. As in the case of water flow, the model overestimates the rate of salt flow from the control volume; however, the overestimation is small (16.9 (lb x 1000/day) relative to the monthly average flows, which range from an outflow of 13790 (lb x 1000)/day (October 2010) to an inflow of 8659 (lb x 1000)/day (June 2011).

The model's capability to simulate day-to-day changes in average CCS water elevations and salinity is illustrated in Figure 5.4-9, which plots modeled average CCS water elevations and observed average CCS water elevations for each day in the 22-month calibration period. The observed values reflect the mean of daily-averaged water elevations across the seven sensors in the CCS. Simulated water elevations are calculated by dividing the simulated daily change in CCS storage by the average daily CCS surface area and adding the resulting value (which reflects a change in water level) to the previous day's simulated water elevation. It is evident from this figure that the model effectively captures the general trend in CCS water elevations over the 22-month period, and accurately simulates average CCS water elevations throughout much of the calibration period.

Similarly, Figure 5.4-10 demonstrates the model's ability to simulate average CCS salinity. Observed salinities are the mean of daily averaged salinities measured in the CCS sensors. The simulated CCS salinities are calculated in a manner similar to the CCS water elevations. The simulated daily net flow of salt is divided by the simulated volume of water in the CCS, which results in a change in salinity. This change in salinity is added to the simulated salinity calculated for the previous day to produce a simulated salinity for the current day. As in the case of water elevations, the model performs very well with respect to simulating both the temporal trends in CCS salinity and the magnitude of daily salinities throughout the calibration period.

Inspection of Tables 5.4-4 through 5.4-47 reveals clear trends in wet and dry season flow. For instance, bottom seepage, one of the most dominating components of the balance model, demonstrates a dichotomy associated with flow direction. Net flow through the bottom of the CCS is generally out between the months of September through February. This suggests that lower groundwater elevations from the end of the wet season through the middle of the dry season cause outward flow from the CCS. Conversely, higher water groundwater elevations during much of the wet season, drives flow into the CCS. Intuitively, precipitation-based inflows to the CCS are greater during the wet season; average inflow from precipitation during the wet season is more than twice that for the dry season.

Two major revisions that are included in this year's water and salt balance are the use of a surveyed bathymetric surface of the CCS and the use of a more spatially detailed precipitation function that relies on NEXRAD data derived by SFWMD. These two revisions are described below.

Though the surface area and storage of the CCS changes daily, as water and salt flow into and out of the CCS, the 9-month water and salt balance model (FPL 2011b) employed a constant surface area and assumed volume throughout the entire calibration period. However, based upon a bathymetric survey (Morgan and Eklund 2010), detailed information regarding CCS water surface area and volume was incorporated into the current water and salt balance model. This information provided a quantifiable relationship between CCS water elevations and both surface area and volume, such that daily averages of CCS water surface area and volume could be calculated from observed CCS water elevations. These relationships were critical to understanding how much water and salt was gained to and lost from the system on a daily and monthly basis, as wells as how these gains and losses impacted the daily water elevations and

salinities in the CCS. As a result of their incorporation, the bathymetric data improved the accuracy of the model in simulating the changing water elevations and salinities in the CCS throughout the 22-month calibration period.

In addition to a detailed assessment of measured CCS storage characteristics, the simulation of precipitation-based inflows to the control volume was improved due to the availability of SFWMD-derived NEXRAD data. The NEXRAD data provided an accurate representation of the spatial variability in precipitation across the CCS. The spatially-variable daily rainfalls were defined for the five zones for which detailed water surface area data were available. Thus, the accuracy of precipitation inflow to the model due to spatial variability was improved through use of NEXRAD data and the more accurate surface area obtained from the bathymetric data (the model computes inflow volumes as the product of daily precipitation and CCS surface area).

Incorporation of the NEXRAD data, coupled with the detailed understanding of CCS surface areas, proved to be a key element in facilitating a model match to observed monthly flows, water elevations, and salinities. The superiority of the current model calibration, relative to that which employed solely TPM-1 precipitation data, suggests that the NEXRAD data be employed in future applications of the water and salt balance model. Though precipitation data from TPM-1 are not currently used to evaluate rainfall-based freshwater inflow to the CCS, these data are valuable inasmuch as they validate NEXRAD precipitation data. However, additional rain gauges located in the vicinity of the CCS provide no value to this model; the continued measurement of precipitation at these gauges is unnecessary.

The accurate simulation of changing CCS inflows, outflows, water elevations and salinities is complex due to the different components of the balance model and their varying impacts upon CCS water and salt storage. For instance, vertical flows into and out of the control volume are substantially larger than horizontal flows, and have a greater impact upon CCS water elevation. The salinity of inflowing water, however, can vary depending upon the source of the water. For example, horizontal flow from the west (L-31E) is non-saline and has a pronounced mitigating impact upon CCS salinities; vertical flow from groundwater beneath portions of the discharge canals is hyper-saline and generally increases the salinity of the CCS. The correct balance of both water and salt mass flow is difficult to procure. This complexity, however, constrains the number of possible solutions to the correct simulation of water and salt balance and bolsters confidence in the resulting calibrated model.

In spite of the complexity, this relatively simple spreadsheet-based model accurately simulates the processes that govern and impact the operation of the CCS. The accuracy of the model is evidenced by the model's ability to accurately simulate average net water and salt flows for the 22-month calibration period (Table 5.4-1 and Table 5.4-2) and for each individual month in the calibration period (Table 5.4-4 to Table 5.4-47). The simulation of transient water elevations and salinities in the CCS (Figure 5.4-9 and Figure 5.4-10) further demonstrates the quality of the model calibration.

The ability to model complex dynamics associated with the CCS over a 22-month timeframe demonstrates the value of the model as a tool for understanding how the CCS has and will

operate under varying meteorological, hydrological, and operational conditions. The model's accuracy underpins FPL's firm understanding of processes that control the CCS and the manner in which the CCS interacts with the adjacent aquifer and water bodies. Additionally, the model accuracy validates the fact that the most appropriate data are being collected to effectively capture CCS operations, identify interactions between the CCS and the surrounding environment, and support FPL's comprehension of historical and future operations of the CCS.

TABLES

Table 5.2-1. Response in Water Levels Due to September 29, 2010 Rain Event

Monitoring Well	Water Elevations Pre-Rain Event 9/28/2010 2:00 hours (ft. NAVD 88)	Water Elevations Day after Major Rain Event 9/30/10 15:45 hours (ft. NAVD 88)	Change in Water Levels between 9/30/10 and 9/28/10 – One Day after Major Rain Event (ft.)	Water Elevations Several Weeks after Major Rain Event 10/14/10 4:30 hours (ft. NAVD 88)	Change in Water Levels between 10/14/10 and 9/30/10 – Several Weeks after Major Rain Event (ft.)
TPGW-1S	0.32	0.94	0.62	0.58	-0.36
TPGW-1M	-0.36	0.26	0.62	-0.09	-0.35
TPGW-1D	-0.17	0.45	0.62	0.09	-0.35
TPGW-2S	-0.02	0.62	0.64	0.25	0.37
TPGW-2M	0.95	NA	NC	0.82	NC
TPGW-2D	0.83	NA	NC	1.04	NC
TPGW-3S	0.04	0.38	0.34	0.48	0.10
TPGW-3M	0.09	0.43	0.34	0.57	0.13
TPGW-3D	0.07	0.41	0.34	0.48	0.07
TPGW-4S	0.77	1.34	0.57	1.04	-0.30
TPGW-4M	0.28	0.84	0.56	0.52	-0.32
TPGW-4D	0.17	0.72	0.55	0.40	-0.32
TPGW-5S	0.90	1.43	0.53	1.20	-0.23
TPGW-5M	0.43	0.95	0.52	0.72	-0.23
TPGW-5D	0.27	0.79	0.52	0.51	-0.28
TPGW-6S	0.82	1.45	0.63	1.03	-0.42
TPGW-6M	0.25	0.87	0.62	0.46	-0.41
TPGW-6D	0.34	1.37	0.63	0.96	-0.59
TPGW-7S	0.99	NA	NC	NA	NC
TPGW-7M	1.08	NA	NC	NA	NC
TPGW-7D	0.97	NA	NC	NA	NC
TPGW-8S	1.26	1.95	0.69	1.70	-0.25
TPGW-8M	NR	NA	NA	NA	NC
TPGW-8D	1.22	1.92	0.70	1.67	-0.25
TPGW-9S	1.19	1.74	0.55	1.40	-0.34
TPGW-9M	1.18	1.73	0.55	1.39	-0.34

Table 5.2-1. Response in Water Levels Due to September 29, 2010 Rain Event

Monitoring Well	Water Elevations Pre-Rain Event 9/28/2010 2:00 hours (ft. NAVD 88)	Water Elevations Day after Major Rain Event 9/30/10 15:45 hours (ft. NAVD 88)	Change in Water Levels between 9/30/10 and 9/28/10 – One Day after Major Rain Event (ft.)	Water Elevations Several Weeks after Major Rain Event 10/14/10 4:30 hours (ft. NAVD 88)	Change in Water Levels between 10/14/10 and 9/30/10 – Several Weeks after Major Rain Event (ft.)
TPGW-9D	1.22	1.77	0.55	1.43	-0.34
TPGW-10S	0.02	0.13	0.11	0.04	-0.09
TPGW-10M	-0.03	0.09	0.12	0.00	-0.09
TPGW-10D	0.15	0.26	0.11	0.18	-0.08
TPGW-11S	0.20	0.15	-0.05	0.18	0.03
TPGW-11M	0.25	0.19	-0.06	0.24	0.05
TPGW-11D	0.14	0.08	-0.06	0.11	0.03
TPGW-12S	0.39	0.41	0.02	0.39	-0.02
TPGW-12M	0.65	0.54	-0.11	0.60	0.06
TPGW-12D	0.29	0.49	0.20	0.55	0.06
TPGW-13S	-0.04	0.98	1.02	0.61	-0.37
TPGW-13M	-0.05	0.90	0.95	0.52	-0.38
TPGW-13D	-0.36	0.36	0.72	-0.03	-0.39
TPGW-14S	-0.02	0.13	0.06	0.12	-0.01
TPGW-14M	-0.30	-0.15	0.06	-0.12	-0.03
TPGW-14D	-0.02	0.11	0.04	0.09	-0.02
TPSWCCS-1	0.09	0.80	0.71	0.33	-0.47
TPSWCCS-5	-0.29	0.62	0.91	0.24	-0.38
TPBBSW-3	0.30	0.25	-0.05	0.23	-0.02

Note: 7.34 Inches recorded at TPM-1 on 9/29/10

Key:
ft NAVD 88 = Feet relative to the North American Vertical Datum of 1988.
NA = Not available.
NC = Not calculated.

Table 5.2-2. Response in Water Levels Due to October 8, 2011 Rain Event

Monitoring Well	Water Elevations Pre-Rain Event 10/7/2011 19:20 hours (ft. NAVD 88)	Water Elevations Day after Major Rain Event 10/9/10 21:00 hours (ft. NAVD 88)	Change in Water Levels between 10/9/11 and 10/7/11 – One Day after Major Rain Event (ft.)	Water Elevations 9 Days after Major Rain Event 10/7/11 1:15 hours (ft. NAVD 88)	Change in Water Levels between 10/9/11 and 10/17/11 – Several Weeks after Major Rain Event (ft.)
TPGW-1S	0.35	0.86	0.51	0.88	0.02
TPGW-1M	-0.19	0.32	0.51	0.31	-0.01
TPGW-1D	-0.15	0.35	0.50	0.37	0.02
TPGW-2S	0.00	0.54	0.54	0.52	-0.02
TPGW-2M	1.09	NA	NC	NA	NC
TPGW-2D	1.02	NA	NC	NA	NC
TPGW-3S	0.70	0.98	0.28	0.94	-0.04
TPGW-3M	0.70	1.03	0.33	0.99	-0.04
TPGW-3D	0.67	0.95	0.28	0.92	-0.03
TPGW-4S	0.60	1.44	0.84	1.32	-0.12
TPGW-4M	0.10	0.94	0.84	0.79	-0.15
TPGW-4D	-0.06	0.79	0.85	0.64	-0.15
TPGW-5S	0.73	1.42	0.69	1.30	-0.12
TPGW-5M	0.27	0.95	0.68	0.83	-0.12
TPGW-5D	0.12	0.81	0.69	0.68	-0.13
TPGW-6S	0.63	1.43	0.80	1.20	-0.23
TPGW-6M	0.34	1.12	0.78	0.91	-0.21
TPGW-6D	1.07	1.57	0.50	NA	NC
TPGW-7S	0.76	NA	NC	NA	NC
TPGW-7M	0.78	NA	NC	NA	NC
TPGW-7D	0.77	NA	NC	NA	NC
TPGW-8S	0.90	NA	NC	1.76	NC
TPGW-8M	0.90	2.07	1.17	1.75	-0.32
TPGW-8D	0.89	NA	NC	1.76	NC
TPGW-9S	0.91	1.67	0.76	1.60	-0.07
TPGW-9M	0.90	1.67	0.77	1.59	-0.08
TPGW-9D	0.94	1.68	0.74	1.60	-0.08

Table 5.2-2. Response in Water Levels Due to October 8, 2011 Rain Event

Monitoring Well	Water Elevations Pre-Rain Event 10/7/2011 19:20 hours (ft. NAVD 88)	Water Elevations Day after Major Rain Event 10/9/10 21:00 hours (ft. NAVD 88)	Change in Water Levels between 10/9/11 and 10/7/11 – One Day after Major Rain Event (ft.)	Water Elevations 9 Days after Major Rain Event 10/7/11 1:15 hours (ft. NAVD 88)	Change in Water Levels between 10/9/11 and 10/17/11 – Several Weeks after Major Rain Event (ft.)
TPGW-10S	0.55	0.63	0.10	0.70	0.07
TPGW-10M	0.49	0.58	0.09	0.65	0.07
TPGW-10D	0.49	0.57	0.08	0.66	0.09
TPGW-11S	0.83	0.85	0.02	0.90	0.05
TPGW-11M	0.84	0.85	0.01	0.92	0.07
TPGW-11D	0.83	0.85	0.02	0.89	0.04
TPGW-12S	NA	NA	NC	NA	NC
TPGW-12M	NA	NA	NC	NA	NC
TPGW-12D	0.69	NA	NC	NA	NC
TPGW-13S	0.34	0.80	0.46	0.86	0.06
TPGW-13M	0.36	0.83	0.47	0.88	0.05
TPGW-13D	-0.15	0.34	0.49	0.41	0.07
TPGW-14S	0.54	0.72	0.18	0.66	-0.06
TPGW-14M	0.44	0.61	0.17	0.56	-0.05
TPGW-14D	0.50	0.68	0.18	0.62	-0.06
TPSWCCS-1	0.08	0.48	0.40	0.52	0.04
TPSWCCS-5	-0.48	NA	NC	NA	NC
TPBBSW-3	0.90	0.93	0.03	0.95	0.02

Note: 6.33 Inches recorded at TPM-1 on 10/8/11

Key:
ft NAVD 88 = Feet relative to the North American Vertical Datum of 1988.
NA = Not available.
NC = Not calculated.

Table 5.2-3. Wet/Dry Season Water Elevations, October 14, 2010, May 14, 2011, October 22, 2011 and April 4, 2012

Monitoring	Water Elevation Well (ft. NAVD 88)			
	Wet Season 10/14/10 4:30 hours	Dry Season 5/14/11 7:30 hours	Wet Season 10/22/2011 18:45 hours	Dry Season 4/4/2012 21:00 hours
TPGW-1S	0.58	-1.10	0.68	-0.88
TPGW-1M	-0.09	-1.71	0.10	-1.41
TPGW-1D	0.09	-1.62	0.13	-1.30
TPGW-2S	0.25	-1.41	0.35	-1.33
TPGW-2M	0.82	-0.66	1.06	-0.11
TPGW-2D	1.04	-0.26	0.98	-0.48
TPGW-3S	0.48	-0.27	0.39	-0.26
TPGW-3M	0.57	-0.29	0.44	-0.29
TPGW-3D	0.48	-0.37	0.37	-0.46
TPGW-4S	1.04	-1.06	1.14	-0.59
TPGW-4M	0.52	-1.49	0.62	-1.01
TPGW-4D	0.40	-1.63	0.47	-1.14
TPGW-5S	1.20	-0.96	1.16	-0.42
TPGW-5M	0.72	-1.35	0.69	-0.86
TPGW-5D	0.51	-1.54	0.55	-1.08
TPGW-6S	1.03	-0.74	0.65	-0.10
TPGW-6M	0.46	-1.25	0.37	-0.36
TPGW-6D	0.96	-0.54	1.06	0.19
TPGW-7S	NA	-0.86	1.24	-0.24
TPGW-7M	NA	-0.89	1.24	-0.22
TPGW-7D	NA	-0.89	NA	-0.22
TPGW-8S	1.70	-0.82	1.52	-0.23
TPGW-8M	NA	-0.85	1.51	-0.23
TPGW-8D	1.67	-0.83	1.52	-0.24
TPGW-9S	1.40	NA	1.46	-0.25
TPGW-9M	1.39	-0.89	1.45	-0.27
TPGW-9D	1.43	-0.95	1.46	-0.23
TPGW-10S	0.04	-0.46	0.08	-0.17

Table 5.2-3. Wet/Dry Season Water Elevations, October 14, 2010, May 14, 2011, October 22, 2011 and April 4, 2012

Monitoring	Water Elevation Well (ft. NAVD 88)			
	Wet Season 10/14/10 4:30 hours	Dry Season 5/14/11 7:30 hours	Wet Season 10/22/2011 18:45 hours	Dry Season 4/4/2012 21:00 hours
TPGW-10M	0.00	-0.42	0.04	-0.18
TPGW-10D	0.18	-0.38	0.03	-0.30
TPGW-11S	0.18	0.00	0.23	0.23
TPGW-11M	0.24	0.23	0.23	0.22
TPGW-11D	0.11	0.21	0.21	0.13
TPGW-12S	0.39	-0.41	0.32	-0.12
TPGW-12M	0.60	-0.27	0.29	0.16
TPGW-12D	0.55	-0.41	0.42	-0.19
TPGW-13S	0.61	-0.52	0.70	-0.75
TPGW-13M	0.52	-0.57	0.73	-0.75
TPGW-13D	-0.03	-1.11	NA	-1.35
TPGW-14S	0.12	-0.41	0.09	-0.42
TPGW-14M	-0.12	-0.50	-0.02	-0.55
TPGW-14D	0.09	-0.07	0.06	-0.45
TPSWCCS-1	0.33	-0.03	0.47	-0.25
TPSWCCS-5	0.24	-1.90	0.04	-1.63
TPBBSW-3	0.33	0.28	0.31	0.23

Key:
ft NAVD 88 = Feet relative to the North American Vertical Datum of 1988.
NA = Not available.

Table 5.2-4. Spring High and Low Tide Water Elevations, December 24, 2011 and March 10, 2012

Monitoring Well	Water Elevation Well (ft. NAVD 88)			
	High Tide 12/24/11 10:15 Hours	Low Tide 12/24/11 04:30 Hours	High Tide 3/10/12 12:00 Hours	Low Tide 3/10/12 06:30 Hours
TPGW-1S	-0.30	-0.35	-0.42	-0.48
TPGW-1M	-0.86	-0.93	-0.95	-1.00
TPGW-1D	-0.81	-0.86	-0.85	-0.91
TPGW-2S	-0.63	-0.65	-0.81	-0.82
TPGW-2M	0.18	0.17	0.38	0.37
TPGW-2D	-0.01	-0.03	0.02	0.00
TPGW-3S	-0.06	-0.37	0.06	-0.25
TPGW-3M	-0.10	-0.41	0.08	-0.22
TPGW-3D	-0.18	-0.49	0.00	-0.32
TPGW-4S	0.11	0.11	-0.11	-0.10
TPGW-4M	-0.36	-0.36	-0.54	-0.54
TPGW-4D	-0.50	-0.50	-0.67	-0.67
TPGW-5S	0.02	0.03	-0.05	-0.03
TPGW-5M	-0.38	-0.38	-0.49	-0.46
TPGW-5D	-0.52	-0.51	-0.62	-0.59
TPGW-6S	-0.08	-0.06	0.15	0.16
TPGW-6M	-0.34	-0.32	-0.12	-0.11
TPGW-6D	0.38	0.40	0.56	0.58
TPGW-7S	0.12	0.12	0.06	0.07
TPGW-7M	0.11	0.12	0.12	0.13
TPGW-7D	0.10	0.09	0.08	0.09
TPGW-8S	0.31	0.31	0.15	0.17
TPGW-8M	0.30	0.30	0.14	0.16
TPGW-8D	0.27	0.28	0.15	0.17
TPGW-9S	0.44	0.44	0.16	0.18
TPGW-9M	0.41	0.41	0.13	0.14
TPGW-9D	0.44	0.44	0.15	0.17
TPGW-10S	-0.45	-1.97	0.06	-1.54

Table 5.2-4. Spring High and Low Tide Water Elevations, December 24, 2011 and March 10, 2012

Monitoring Well	Water Elevation Well (ft. NAVD 88)			
	High Tide 12/24/11 10:15 Hours	Low Tide 12/24/11 04:30 Hours	High Tide 3/10/12 12:00 Hours	Low Tide 3/10/12 06:30 Hours
TPGW-10M	-0.48	-2.02	0.09	-1.52
TPGW-10D	-0.50	-2.02	0.09	-1.51
TPGW-11S	-0.18	-2.00	NA	NA
TPGW-11M	-0.28	-2.07	0.34	-1.53
TPGW-11D	-0.20	-1.98	NA	NA
TPGW-12S	-0.18	-1.05	0.23	-0.71
TPGW-12M	0.11	-0.80	0.48	-0.50
TPGW-12D	-0.13	-0.99	0.20	-0.72
TPGW-13S	-0.13	-0.15	-0.39	-0.41
TPGW-13M	-0.11	-0.13	-0.41	-0.43
TPGW-13D	-0.65	-0.67	-0.85	-0.86
TPGW-14S	-0.52	-1.24	-0.17	-0.94
TPGW-14M	-0.62	-1.34	-0.26	-1.04
TPGW-14D	-0.44	-1.15	-0.09	-0.86
TPSWCCS-1	-0.07	-0.06	-0.37	-0.43
TPSWCCS-5	-1.03	-1.03	-1.09	-1.12
TPBBSW-3	-0.13	-2.05	0.45	-1.52

Key:
ft NAVD 88 = Feet relative to the North American Vertical Datum of 1988.
NA = Not available.

Table 5.2-5. Estimated Percent CCS Water Based on Chloride Concentrations

Well	Average Current Tritium Concentration (pCi/L)	Cl_{well}: Average Current Chloride Concentration (mg/L)	Cl_{CCS}: Assumed CCS Chloride Concentration (mg/L)	$Cl_{background}$: Estimated Pre-CCS Chloride Concentration (mg/L)	% CCS Water: Calculated Percent CCS Water
1S	968	17,714	34,000	6,483	41%
1M	2,578	28,571	34,000	14,607	72%
1D	2,406	28,000	34,000	21,667	51%
2S	3,260	30,143	34,000	5,987	86%
2M	3,534	31,286	34,000	10,748	88%
2D	3,315	31,571	34,000	15,447	87%
3S	682	25,000	34,000	18,384	42%
3M	2,014	27,429	34,000	20,804	50%
3D	1,918	27,571	34,000	21,529	48%
4M	298	13,857	24,000	2,941	52%
4D	526	15,429	24,000	8,095	46%
5M	219	10,171	24,000	32	42%
5D	290	11,286	24,000	318	46%
11M	34	22,000	34,000	21,667	3%
11D	416	22,333	34,000	21,667	5%
12S	219	15,143	34,000	14,879	1%
12M	1,408	24,429	34,000	17,894	41%
12D	1,617	25,429	34,000	18,635	44%
14S	204	22,833	34,000	21,667	9%
14M	725	24,167	34,000	21,667	20%
14D	2,588	30,167	34,000	21,667	69%
L3-58	3,938	32,625	34,000	16,594	92%
L5-58	3,364	30,750	34,000	11,103	86%
G28-58	421	14,375	24,000	11,313	24%

Notes: Wells with average current tritium concentrations below 20 pCi/L (+/- 1 sigma 5 piC/L) not shown.

Key:
Approx. = Approximate.
CCS = Cooling Canal System.
Cl = Chloride.
ft = Feet.
mg/L = Milligram(s) per liter.
NA = Not available.
pCi/L = Picocuries per liter.
yr = Year(s).

Table 5.2-6. Estimated Percent CCS Water Based on Tritium Concentrations

Monitoring Well	Approximate Distance from CCS (ft)	Approximate Rate of Migration (ft/yr)	Approximate Age of CCS Water in Well (yrs)	$Tritium_{CCS}$: Current Average Tritium Concentration (pCi/L)	$Tritium_{well\ no\ decay}$: Tritium Concentration Adjusted for No Decay (pCi/L)	%CCS: Calculated Percent CCS water (%)
TPGW-1S	1,500	525	2.9	968	1,137	28%
TPGW-1M	1,500	525	2.9	2,578	3,028	74%
TPGW-1D	1,500	525	2.9	2,406	2,826	69%
TPGW-2S	900	660	1.4	3,260	3,520	86%
TPGW-2M	900	660	1.4	3,534	3,816	93%
TPGW-2D	900	660	1.4	3,315	3,580	87%
TPGW-3S	4,400	660	6.7	682	993	24%
TPGW-3M	4,400	660	6.7	2,014	2,932	72%
TPGW-3D	4,400	660	6.7	1,918	2,793	68%
TPGW-4M	14,900	660	22.6	298	1,063	26%
TPGW-4D	14,900	660	22.6	526	1,877	46%
TPGW-5M	15,800	525	30.1	219	1,194	29%
TPGW-5D	15,800	525	30.1	290	1,581	39%
TPGW-11M	9,100	290	31.4	34	199	5%
TPGW-11D	9,100	290	31.4	416	2,438	59%
TPGW-12S	5,400	525	10.3	219	391	10%
TPGW-12M	5,400	525	10.3	1,408	2,514	61%
TPGW-12D	5,400	525	10.3	1,617	2,887	70%
TPGW-14S	2,100	290	7.2	204	307	7%
TPGW-14M	2,100	290	7.2	725	1,090	27%
TPGW-14D	2,100	290	7.2	2,588	3,892	95%

Table 5.2-6. Estimated Percent CCS Water Based on Tritium Concentrations

Monitoring Well	Approximate Distance from CCS (ft)	Approximate Rate of Migration (ft/yr)	Approximate Age of CCS Water in Well (yrs)	$Tritium_{CCS}$: Current Average Tritium Concentration (pCi/L)	$Tritium_{well\ no\ decay}$: Tritium Concentration Adjusted for No Decay (pCi/L)	%CCS: Calculated Percent CCS water (%)
L3-58	1,000	525	1.9	3,938	4,384	100%
L5-58	1,000	660	1.5	3,364	3,664	89%
G28-58	15,000	660	22.7	421	1,515	37%

Notes: Wells with average current tritium concentrations below 20 pCi/L (+/- 1 sigma 5 pCi/L) not shown.

Key:
Approx. = Approximate.
CCS = Cooling Canal System.
ft = Feet.
NA = Not available.
pCi/L = Picocuries per liter.
yr = Year(s).

Table 5.4-1. Water Balance for 22-Month Period (September 2010 through June 2012)

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.49	329.66
	E. Seepage	6.47	4329.53
	N. Seepage	0.00	2.28
	S. Seepage	0.74	493.67
	Bot Seepage	7.31	4887.72
	Precipitation and Runoff	24.20	16192.89
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.37	247.70
	Unit 5 Blowdown	0.87	583.87
	ID Pumping	4.59	3068.24
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**45.05**	**30135.56**
Out of CCS	W. Seepage	-0.06	-1.87
	E. Seepage	-1.77	-1186.58
	N. Seepage	-0.01	-3.92
	S. Seepage	0.00	-1.20
	Bot Seepage	-11.09	-7420.00
	Precipitation and Runoff	0.00	0.00
	Evaporation	-31.49	-21067.54
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-44.43**	**-29681.12**
Modeled Change in CCS Storage:		**0.62**	**454.44**
Observed Change in CCS Storage:		**0.11**	**74.55**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-2. Salt Balance for 22-Month Period (September 2010 through June 2012)

Water Balance Component		lb/day (x 1000)	Mass (lb x 1000)
Into CCS	W. Seepage	3.77	2519.53
	E. Seepage	1913.88	1280384.11
	N. Seepage	0.76	505.87
	S. Seepage	145.99	97668.79
	Bot Seepage	2021.90	1352651.06
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	50.98	34108.26
	ID Pumping	649.59	434574.13
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**4786.86**	**3202411.74**
Out of CCS	W. Seepage	-56.00	-37464.48
	E. Seepage	-656.46	-439170.75
	N. Seepage	-2.69	-1797.60
	S. Seepage	-0.78	-523.83
	Bot Seepage	-4678.82	-3130127.24
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-5394.74**	**-3609083.91**
Modeled Change in CCS Storage:		**-607.88**	**-406672.17**
Observed Change in CCS Storage:		**-590.61**	**-395118.74**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-3. Calibrated Model Parameter Values

Calibrated Model Parameter	Units	Value
Zone A Vertical Hydraulic Conductivity	ft/day	1.0
Zone B Vertical Hydraulic Conductivity	ft/day	0.10
Zone C Vertical Hydraulic Conductivity	ft/day	0.10
Zone D Vertical Hydraulic Conductivity	ft/day	2.6
North Seepage Face Horizontal Hydraulic Conductivity	ft/day	300
West Seepage Face Horizontal Hydraulic Conductivity	ft/day	450
South Seepage Face Horizontal Hydraulic Conductivity	ft/day	150
East Seepage Face Horizontal Hydraulic Conductivity	ft/day	400
Evaporation Factor (Equation 6)	Unitless	0.57
Runoff as Percentage of Rainfall (added to precipitation	Unitless	46%
Percentage of Unit 5 Blowdown Lost to Evaporation	Unitless	80%
Concentration of Unit 5 Blowdown as Percentage of Seawater (35 PSU)	Unitless	20%

Key: ft = Foot. PSU = Practical salinity units.

Table 5.4-4. Water Balance for September 2010

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.35	10.41
	E. Seepage	4.33	129.87
	N. Seepage	0.01	0.27
	S. Seepage	0.76	22.84
	Bot Seepage	2.36	70.86
	Precipitation and Runoff	81.96	2458.65
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.64
	Unit 5 Blowdown	0.98	29.36
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**91.03**	**2730.92**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-2.42	-72.73
	N. Seepage	0.00	-0.05
	S. Seepage	0.00	0.00
	Bot Seepage	-8.93	-267.82
	Precipitation and Runoff	0.00	0.00
	Evaporation	-37.98	-1139.48
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-49.34**	**-1480.08**
Modeled Change in CCS Storage:		**41.69**	**1250.84**
Observed Change in CCS Storage:		**52.14**	**1564.08**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-5. Salt Balance for September 2010

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.73	21.79
	E. Seepage	1000.37	30011.06
	N. Seepage	1.95	58.53
	S. Seepage	31.45	943.47
	Bot Seepage	492.65	14779.60
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	57.18	1715.41
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**1584.33**	**47529.85**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-977.74	-29332.09
	N. Seepage	-0.60	-18.07
	S. Seepage	0.00	0.00
	Bot Seepage	-4536.14	-136084.31
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-5514.48**	**-165434.47**
Modeled Change in CCS Storage:		**-3930.15**	**-117904.62**
Observed Change in CCS Storage:		**1464.29**	**43928.58**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-6. Water Balance for October 2010

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.12	3.73
	E. Seepage	0.30	9.19
	N. Seepage	0.00	0.09
	S. Seepage	0.61	18.96
	Bot Seepage	0.75	23.20
	Precipitation and Runoff	14.14	438.35
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.93
	Unit 5 Blowdown	0.75	23.11
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**16.95**	**525.56**
Out of CCS	W. Seepage	-0.01	-0.16
	E. Seepage	-9.77	-302.98
	N. Seepage	0.00	-0.12
	S. Seepage	-0.01	-0.34
	Bot Seepage	-22.44	-695.59
	Precipitation and Runoff	0.00	0.00
	Evaporation	-26.68	-827.09
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-58.91**	**-1826.27**
Modeled Change in CCS Storage:		**-41.96**	**-1300.71**
Observed Change in CCS Storage:		**-46.60**	**-1444.52**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-7. Salt Balance for October 2010

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.23	7.14
	E. Seepage	59.81	1854.15
	N. Seepage	0.61	19.05
	S. Seepage	2.18	67.44
	Bot Seepage	332.43	10305.45
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	43.54	1349.79
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**438.81**	**13603.03**
Out of CCS	W. Seepage	-50.77	-1573.99
	E. Seepage	-3777.60	-117105.67
	N. Seepage	-1.42	-43.87
	S. Seepage	-4.41	-136.56
	Bot Seepage	-8516.95	-264025.54
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-12351.15**	**-382885.62**
Modeled Change in CCS Storage:		**-11912.34**	**-369282.60**
Observed Change in CCS Storage:		**-13790.42**	**-427502.87**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-8. Water Balance for November 2010

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.14	4.32
	E. Seepage	1.94	58.25
	N. Seepage	0.00	0.08
	S. Seepage	0.53	15.95
	Bot Seepage	1.20	35.95
	Precipitation and Runoff	27.97	839.20
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.64
	Unit 5 Blowdown	0.50	14.98
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**32.58**	**977.38**
Out of CCS	W. Seepage	-0.03	-0.94
	E. Seepage	-3.16	-94.92
	N. Seepage	0.00	-0.06
	S. Seepage	-0.01	-0.20
	Bot Seepage	-14.43	-433.05
	Precipitation and Runoff	0.00	0.00
	Evaporation	-26.01	-780.31
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-43.65**	**-1309.48**
Modeled Change in CCS Storage:		**-11.07**	**-332.11**
Observed Change in CCS Storage:		**-5.02**	**-150.50**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-9. Salt Balance for November 2010

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.34	10.17
	E. Seepage	457.48	13724.36
	N. Seepage	0.61	18.16
	S. Seepage	19.19	575.66
	Bot Seepage	388.92	11667.59
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	29.18	875.37
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**895.71**	**26871.32**
Out of CCS	W. Seepage	-306.18	-9185.32
	E. Seepage	-1187.68	-35630.52
	N. Seepage	-0.82	-24.62
	S. Seepage	-2.61	-78.43
	Bot Seepage	-5336.39	-160091.80
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-6833.69**	**-205010.69**
Modeled Change in CCS Storage:		**-5937.98**	**-178139.37**
Observed Change in CCS Storage:		**-2876.16**	**-86284.89**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-10. Water Balance for December 2010

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.40	12.46
	E. Seepage	7.28	225.71
	N. Seepage	0.00	0.00
	S. Seepage	0.48	14.92
	Bot Seepage	3.90	120.81
	Precipitation and Runoff	3.90	120.88
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.93
	Unit 5 Blowdown	0.72	22.33
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**16.97**	**526.05**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.20	-6.10
	N. Seepage	-0.01	-0.25
	S. Seepage	0.00	-0.04
	Bot Seepage	-11.51	-356.87
	Precipitation and Runoff	0.00	0.00
	Evaporation	-24.73	-766.57
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-36.45**	**-1129.82**
Modeled Change in CCS Storage:		**-19.48**	**-603.78**
Observed Change in CCS Storage:		**-12.72**	**-394.29**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. ID = Interceptor Ditch.
MGD = Millions of gallons per day.

Table 5.4-11. Salt Balance for December 2010

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	1.44	44.71
	E. Seepage	1890.00	58590.08
	N. Seepage	0.00	0.00
	S. Seepage	90.83	2815.76
	Bot Seepage	990.62	30709.15
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	42.08	1304.34
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**3014.97**	**93464.05**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-72.24	-2239.56
	N. Seepage	-2.87	-88.91
	S. Seepage	-0.53	-16.39
	Bot Seepage	-4163.59	-129071.18
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-4239.23**	**-131416.04**
Modeled Change in CCS Storage:		**-1224.26**	**-37951.99**
Observed Change in CCS Storage:		**-1555.92**	**-48233.42**

Key: CCS = Cooling Canal System. lb = Pound.

Table 5.4-12. Water Balance for January 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.83	25.80
	E. Seepage	3.98	123.23
	N. Seepage	0.00	0.00
	S. Seepage	0.41	12.85
	Bot Seepage	2.62	81.37
	Precipitation and Runoff	19.86	615.73
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.93
	Unit 5 Blowdown	0.82	25.40
	ID Pumping	4.91	152.24
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**33.73**	**1045.54**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-1.67	-51.90
	N. Seepage	-0.01	-0.27
	S. Seepage	0.00	0.00
	Bot Seepage	-15.15	-469.50
	Precipitation and Runoff	0.00	0.00
	Evaporation	-24.18	-749.43
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-41.00**	**-1271.10**
Modeled Change in CCS Storage:		**-7.28**	**-225.56**
Observed Change in CCS Storage:		**-2.54**	**-78.88**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-13. Salt Balance for January 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	3.18	98.49
	E. Seepage	1077.95	33416.50
	N. Seepage	0.01	0.42
	S. Seepage	78.05	2419.52
	Bot Seepage	683.66	21193.44
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	47.87	1483.96
	ID Pumping	185.05	5736.69
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**2075.77**	**64349.02**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-654.00	-20273.95
	N. Seepage	-3.51	-108.76
	S. Seepage	0.00	0.00
	Bot Seepage	-6108.34	-189358.53
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-6765.85**	**-209741.24**
Modeled Change in CCS Storage:		**-4690.07**	**-145392.21**
Observed Change in CCS Storage:		**-910.35**	**-28220.95**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-14. Water Balance for February 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.59	16.65
	E. Seepage	10.09	282.47
	N. Seepage	0.00	0.00
	S. Seepage	0.84	23.51
	Bot Seepage	9.24	258.62
	Precipitation and Runoff	0.71	19.81
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.06
	Unit 5 Blowdown	0.70	19.46
	ID Pumping	2.25	63.03
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**24.70**	**691.62**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.15	-4.31
	N. Seepage	-0.01	-0.34
	S. Seepage	0.00	0.00
	Bot Seepage	-14.17	-396.64
	Precipitation and Runoff	0.00	0.00
	Evaporation	-29.42	-823.64
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-43.75**	**-1224.93**
Modeled Change in CCS Storage:		**-19.05**	**-533.31**
Observed Change in CCS Storage:		**-14.26**	**-399.40**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-15. Salt Balance for February 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	2.03	56.74
	E. Seepage	2692.11	75379.20
	N. Seepage	0.00	0.00
	S. Seepage	140.71	3939.92
	Bot Seepage	2305.86	64564.13
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	40.60	1136.86
	ID Pumping	73.70	2063.56
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**5255.02**	**147140.42**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-67.69	-1895.27
	N. Seepage	-5.44	-152.45
	S. Seepage	0.00	0.00
	Bot Seepage	-6339.60	-177508.74
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-6412.73**	**-179556.46**
Modeled Change in CCS Storage:		**-1157.72**	**-32416.04**
Observed Change in CCS Storage:		**1264.60**	**35408.76**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-16. Water Balance for March 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.67	20.71
	E. Seepage	8.33	258.32
	N. Seepage	0.00	0.04
	S. Seepage	0.92	28.50
	Bot Seepage	9.57	296.60
	Precipitation and Runoff	7.23	224.04
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.93
	Unit 5 Blowdown	0.66	20.55
	ID Pumping	9.37	290.40
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**37.04**	**1148.09**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.12	-3.80
	N. Seepage	0.00	-0.11
	S. Seepage	0.00	0.00
	Bot Seepage	-9.55	-295.97
	Precipitation and Runoff	0.00	0.00
	Evaporation	-30.85	-956.26
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-40.52**	**-1256.14**
Modeled Change in CCS Storage:		**-3.49**	**-108.05**
Observed Change in CCS Storage:		**3.19**	**99.02**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-17. Salt Balance for March 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	3.43	106.48
	E. Seepage	2496.42	77388.93
	N. Seepage	0.30	9.25
	S. Seepage	187.39	5809.16
	Bot Seepage	2394.47	74228.63
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	38.73	1200.58
	ID Pumping	774.24	24001.46
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**5894.98**	**182744.50**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-59.27	-1837.47
	N. Seepage	-1.57	-48.55
	S. Seepage	0.00	0.00
	Bot Seepage	-4384.63	-135923.56
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-4445.47**	**-137809.58**
Modeled Change in CCS Storage:		**1449.51**	**44934.91**
Observed Change in CCS Storage:		**2504.94**	**77653.08**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-18. Water Balance for April 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.53	15.82
	E. Seepage	11.76	352.70
	N. Seepage	0.00	0.00
	S. Seepage	1.13	33.79
	Bot Seepage	13.19	395.55
	Precipitation and Runoff	10.50	315.01
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.64
	Unit 5 Blowdown	1.13	33.95
	ID Pumping	7.46	223.80
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**45.98**	**1379.27**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	0.00	0.00
	N. Seepage	-0.01	-0.32
	S. Seepage	0.00	0.00
	Bot Seepage	-9.86	-295.69
	Precipitation and Runoff	0.00	0.00
	Evaporation	-31.86	-955.93
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-41.73**	**-1251.94**
Modeled Change in CCS Storage:		**4.24**	**127.33**
Observed Change in CCS Storage:		**-7.85**	**-235.45**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-19. Salt Balance for April 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	3.77	113.23
	E. Seepage	3758.99	112769.81
	N. Seepage	0.00	0.00
	S. Seepage	294.59	8837.65
	Bot Seepage	3318.51	99555.44
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	66.10	1983.01
	ID Pumping	751.05	22531.49
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**8193.02**	**245790.62**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	0.00	0.00
	N. Seepage	-4.51	-135.23
	S. Seepage	0.00	0.00
	Bot Seepage	-4200.79	-126023.58
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-4205.29**	**-126158.82**
Modeled Change in CCS Storage:		**3987.73**	**119631.80**
Observed Change in CCS Storage:		**-4057.29**	**-121718.78**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-20. Water Balance for May 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.68	21.08
	E. Seepage	19.10	592.18
	N. Seepage	0.00	0.00
	S. Seepage	1.31	40.72
	Bot Seepage	20.78	644.29
	Precipitation and Runoff	7.08	219.47
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.29	8.93
	Unit 5 Blowdown	1.16	35.93
	ID Pumping	14.81	459.13
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**65.22**	**2021.73**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	0.00	0.00
	N. Seepage	-0.02	-0.72
	S. Seepage	0.00	0.00
	Bot Seepage	-15.50	-480.56
	Precipitation and Runoff	0.00	0.00
	Evaporation	-37.32	-1156.97
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-52.85**	**-1638.25**
Modeled Change in CCS Storage:		**12.37**	**383.48**
Observed Change in CCS Storage:		**11.51**	**356.77**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-21. Salt Balance for May 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	12.42	384.92
	E. Seepage	6362.11	197225.56
	N. Seepage	0.00	0.00
	S. Seepage	433.44	13436.66
	Bot Seepage	5223.08	161915.41
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	67.70	2098.75
	ID Pumping	3405.55	105571.94
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**15504.30**	**480633.24**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	0.00	0.00
	N. Seepage	-11.06	-342.71
	S. Seepage	0.00	0.00
	Bot Seepage	-7418.52	-229974.09
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-7429.57**	**-230316.80**
Modeled Change in CCS Storage:		**8074.72**	**250316.44**
Observed Change in CCS Storage:		**6228.37**	**193079.32**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-22. Water Balance for June 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.75	22.58
	E. Seepage	15.32	459.74
	N. Seepage	0.00	0.00
	S. Seepage	1.28	38.38
	Bot Seepage	22.07	662.08
	Precipitation and Runoff	8.20	246.08
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.47	14.23
	Unit 5 Blowdown	1.02	30.60
	ID Pumping	16.13	483.83
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**65.25**	**1957.53**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	0.00	-0.11
	N. Seepage	-0.02	-0.60
	S. Seepage	0.00	0.00
	Bot Seepage	-12.21	-366.29
	Precipitation and Runoff	0.00	0.00
	Evaporation	-40.23	-1206.80
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-52.46**	**-1573.79**
Modeled Change in CCS Storage:		**12.79**	**383.74**
Observed Change in CCS Storage:		**10.30**	**309.07**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-23. Salt Balance for June 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	18.78	563.38
	E. Seepage	5643.47	169304.22
	N. Seepage	0.00	0.00
	S. Seepage	447.06	13411.94
	Bot Seepage	5591.99	167759.66
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	59.59	1787.60
	ID Pumping	4597.36	137920.85
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**16358.26**	**490747.65**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-1.84	-55.08
	N. Seepage	-9.89	-296.60
	S. Seepage	0.00	0.00
	Bot Seepage	-6075.97	-182279.20
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-6087.70**	**-182630.88**
Modeled Change in CCS Storage:		**10270.56**	**308116.77**
Observed Change in CCS Storage:		**8658.55**	**259756.64**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-24. Water Balance for July 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.91	28.14
	E. Seepage	2.01	62.39
	N. Seepage	0.00	0.00
	S. Seepage	0.47	14.67
	Bot Seepage	7.60	235.47
	Precipitation and Runoff	46.74	1449.08
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.48	14.76
	Unit 5 Blowdown	1.13	35.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**59.34**	**1839.51**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-4.11	-127.34
	N. Seepage	-0.01	-0.26
	S. Seepage	-0.02	-0.61
	Bot Seepage	-13.34	-413.61
	Precipitation and Runoff	0.00	0.00
	Evaporation	-41.06	-1272.84
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-58.54**	**-1814.66**
Modeled Change in CCS Storage:		**0.80**	**24.85**
Observed Change in CCS Storage:		**9.24**	**286.59**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-25. Salt Balance for July 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	12.43	385.28
	E. Seepage	673.04	20864.34
	N. Seepage	0.00	0.00
	S. Seepage	142.73	4424.78
	Bot Seepage	1535.56	47602.47
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	65.96	2044.75
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**2429.73**	**75321.62**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-2055.70	-63726.75
	N. Seepage	-4.13	-128.16
	S. Seepage	-9.25	-286.73
	Bot Seepage	-6701.62	-207750.29
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-8770.71**	**-271891.94**
Modeled Change in CCS Storage:		**-6340.98**	**-196570.32**
Observed Change in CCS Storage:		**3237.34**	**100357.40**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-26. Water Balance for August 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.02	0.75
	E. Seepage	6.85	212.30
	N. Seepage	0.00	0.07
	S. Seepage	0.77	23.82
	Bot Seepage	11.40	353.50
	Precipitation and Runoff	39.06	1210.89
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.47	14.56
	Unit 5 Blowdown	1.04	32.25
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**59.62**	**1848.14**
Out of CCS	W. Seepage	-0.01	-0.40
	E. Seepage	-0.38	-11.79
	N. Seepage	0.00	-0.02
	S. Seepage	0.00	0.00
	Bot Seepage	-8.82	-273.37
	Precipitation and Runoff	0.00	0.00
	Evaporation	-37.78	-1171.15
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-46.99**	**-1456.73**
Modeled Change in CCS Storage:		**12.63**	**391.41**
Observed Change in CCS Storage:		**20.17**	**625.23**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-27. Salt Balance for August 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.17	5.26
	E. Seepage	2391.19	74126.89
	N. Seepage	0.62	19.11
	S. Seepage	111.17	3446.41
	Bot Seepage	4186.36	129777.23
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	60.78	1884.07
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**6750.29**	**209258.97**
Out of CCS	W. Seepage	-483.19	-14978.79
	E. Seepage	-16.77	-519.93
	N. Seepage	-0.29	-9.02
	S. Seepage	0.00	0.00
	Bot Seepage	-3409.18	-105684.58
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-3909.43**	**-121192.33**
Modeled Change in CCS Storage:		**2840.86**	**88066.64**
Observed Change in CCS Storage:		**4028.64**	**124887.94**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-28. Water Balance for September 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.39	11.72
	E. Seepage	4.04	121.17
	N. Seepage	0.00	0.01
	S. Seepage	0.63	18.90
	Bot Seepage	3.05	91.40
	Precipitation and Runoff	38.92	1167.54
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.49	14.73
	Unit 5 Blowdown	0.98	29.36
	ID Pumping	5.74	172.08
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**54.23**	**1626.91**
Out of CCS	W. Seepage	-0.01	-0.33
	E. Seepage	-0.82	-24.55
	N. Seepage	0.00	-0.14
	S. Seepage	0.00	0.00
	Bot Seepage	-9.62	-288.60
	Precipitation and Runoff	0.00	0.00
	Evaporation	-40.57	-1217.25
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-51.03**	**-1530.87**
Modeled Change in CCS Storage:		**3.20**	**96.04**
Observed Change in CCS Storage:		**-5.14**	**-154.17**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-29. Salt Balance for September 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	1.34	40.22
	E. Seepage	1119.18	33575.49
	N. Seepage	0.07	2.07
	S. Seepage	81.28	2438.27
	Bot Seepage	888.78	26663.45
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	57.18	1715.41
	ID Pumping	406.90	12207.06
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**2554.73**	**76641.96**
Out of CCS	W. Seepage	-371.91	-11157.19
	E. Seepage	-322.30	-9669.08
	N. Seepage	-2.27	-68.02
	S. Seepage	0.00	0.00
	Bot Seepage	-4756.06	-142681.75
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-5452.53**	**-163576.04**
Modeled Change in CCS Storage:		**-2897.80**	**-86934.09**
Observed Change in CCS Storage:		**-3663.57**	**-109906.97**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-30. Water Balance for October 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.35	10.96
	E. Seepage	2.49	77.18
	N. Seepage	0.00	0.06
	S. Seepage	0.74	23.06
	Bot Seepage	2.99	92.81
	Precipitation and Runoff	55.25	1712.81
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.47	14.43
	Unit 5 Blowdown	0.75	23.11
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**63.05**	**1954.43**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-3.95	-122.51
	N. Seepage	0.00	-0.15
	S. Seepage	0.00	0.00
	Bot Seepage	-14.38	-445.78
	Precipitation and Runoff	0.00	0.00
	Evaporation	-29.09	-901.94
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-47.43**	**-1470.37**
Modeled Change in CCS Storage:		**15.61**	**484.05**
Observed Change in CCS Storage:		**8.79**	**272.51**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-31. Salt Balance for October 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.70	21.81
	E. Seepage	1244.83	38589.87
	N. Seepage	0.23	7.27
	S. Seepage	48.75	1511.19
	Bot Seepage	2437.55	75564.10
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	43.54	1349.79
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**3775.61**	**117044.03**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-440.32	-13649.83
	N. Seepage	-2.39	-74.02
	S. Seepage	0.00	0.00
	Bot Seepage	-1825.99	-56605.81
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-2268.70**	**-70329.66**
Modeled Change in CCS Storage:		**1506.92**	**46714.37**
Observed Change in CCS Storage:		**-3871.33**	**-120011.08**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-32. Water Balance for November 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.22	6.64
	E. Seepage	5.82	174.56
	N. Seepage	0.00	0.13
	S. Seepage	0.68	20.31
	Bot Seepage	4.03	120.94
	Precipitation and Runoff	1.29	38.61
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.42	12.59
	Unit 5 Blowdown	0.50	14.98
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**12.96**	**388.76**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.43	-12.93
	N. Seepage	0.00	-0.04
	S. Seepage	0.00	0.00
	Bot Seepage	-6.95	-208.54
	Precipitation and Runoff	0.00	0.00
	Evaporation	-33.96	-1018.90
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-41.35**	**-851.65**
Modeled Change in CCS Storage:		**-28.39**	**-462.88**
Observed Change in CCS Storage:		**-25.56**	**-766.91**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-33. Salt Balance for November 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.72	21.55
	E. Seepage	1026.23	30786.95
	N. Seepage	0.75	22.36
	S. Seepage	92.38	2771.44
	Bot Seepage	633.86	19015.69
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	29.18	875.37
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**1783.11**	**53493.35**
Out of CCS	W. Seepage	-1.42	-42.48
	E. Seepage	-175.61	-5268.21
	N. Seepage	-0.83	-24.90
	S. Seepage	0.00	0.00
	Bot Seepage	-3795.03	-113851.04
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-3972.89**	**-119186.63**
Modeled Change in CCS Storage:		**-2189.78**	**-65693.28**
Observed Change in CCS Storage:		**-3673.05**	**-110191.36**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-34. Water Balance for December 2011

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.49	15.07
	E. Seepage	8.46	262.14
	N. Seepage	0.00	0.09
	S. Seepage	0.76	23.45
	Bot Seepage	7.25	224.86
	Precipitation and Runoff	1.82	56.48
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.54	16.69
	Unit 5 Blowdown	0.72	22.33
	ID Pumping	9.14	283.37
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**29.18**	**904.48**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.09	-2.71
	N. Seepage	0.00	-0.08
	S. Seepage	0.00	0.00
	Bot Seepage	-7.26	-225.18
	Precipitation and Runoff	0.00	0.00
	Evaporation	-27.94	-866.27
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-35.30**	**-1094.23**
Modeled Change in CCS Storage:		**-6.12**	**-189.75**
Observed Change in CCS Storage:		**-11.66**	**-361.51**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-35. Salt Balance for December 2011

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	1.39	43.13
	E. Seepage	1598.07	49540.20
	N. Seepage	0.61	18.79
	S. Seepage	155.78	4829.10
	Bot Seepage	1112.42	34485.04
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	42.08	1304.34
	ID Pumping	431.13	13365.08
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**3341.47**	**103585.67**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-44.16	-1369.05
	N. Seepage	-1.21	-37.57
	S. Seepage	0.00	0.00
	Bot Seepage	-4135.25	-128192.86
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-4180.63**	**-129599.47**
Modeled Change in CCS Storage:		**-839.16**	**-26013.81**
Observed Change in CCS Storage:		**-3828.22**	**-118674.85**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-36. Water Balance for January 2012

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.79	24.34
	E. Seepage	10.17	315.38
	N. Seepage	0.00	0.01
	S. Seepage	0.84	25.94
	Bot Seepage	9.89	306.52
	Precipitation and Runoff	2.87	89.01
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.53	16.35
	Unit 5 Blowdown	0.89	27.50
	ID Pumping	15.39	476.96
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**41.36**	**1282.01**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.01	-0.39
	N. Seepage	-0.01	-0.33
	S. Seepage	0.00	0.00
	Bot Seepage	-11.42	-354.05
	Precipitation and Runoff	0.00	0.00
	Evaporation	-28.41	-880.83
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-39.86**	**-1235.60**
Modeled Change in CCS Storage:		**1.50**	**46.42**
Observed Change in CCS Storage:		**-9.98**	**-309.33**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-37. Salt Balance for January 2012

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	3.23	100.03
	E. Seepage	2454.87	76100.84
	N. Seepage	0.09	2.88
	S. Seepage	183.33	5683.23
	Bot Seepage	2919.37	90500.59
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	51.82	1606.43
	ID Pumping	2219.37	68800.40
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**7832.08**	**242794.40**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-6.39	-198.09
	N. Seepage	-5.00	-154.85
	S. Seepage	0.00	0.00
	Bot Seepage	-5281.53	-163727.51
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-5292.92**	**-164080.44**
Modeled Change in CCS Storage:		**2539.16**	**78713.95**
Observed Change in CCS Storage:		**-2625.35**	**-81385.79**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-38. Water Balance for February 2012

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.59	17.09
	E. Seepage	4.87	141.21
	N. Seepage	0.00	0.13
	S. Seepage	0.61	17.71
	Bot Seepage	5.40	156.46
	Precipitation and Runoff	36.40	1055.68
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.47	13.50
	Unit 5 Blowdown	0.78	22.68
	ID Pumping	1.50	43.56
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**50.62**	**1468.02**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.66	-19.12
	N. Seepage	0.00	-0.02
	S. Seepage	0.00	0.00
	Bot Seepage	-7.93	-230.08
	Precipitation and Runoff	0.00	0.00
	Evaporation	-27.84	-807.25
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-36.43**	**-1056.46**
Modeled Change in CCS Storage:		**14.19**	**411.56**
Observed Change in CCS Storage:		**12.36**	**358.44**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-39. Salt Balance for February 2012

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	2.62	75.86
	E. Seepage	1490.74	43231.51
	N. Seepage	1.06	30.70
	S. Seepage	139.50	4045.55
	Bot Seepage	2043.67	59266.34
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	45.68	1324.84
	ID Pumping	189.46	5494.29
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**3912.73**	**113469.10**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-11.04	-320.18
	N. Seepage	-0.31	-8.86
	S. Seepage	0.00	0.00
	Bot Seepage	-2808.80	-81455.07
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-2820.14**	**-81784.11**
Modeled Change in CCS Storage:		**1092.59**	**31684.99**
Observed Change in CCS Storage:		**3362.46**	**97511.42**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-40. Water Balance for March 2012

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.43	13.35
	E. Seepage	6.60	204.74
	N. Seepage	0.01	0.40
	S. Seepage	0.86	26.63
	Bot Seepage	9.11	282.49
	Precipitation and Runoff	2.46	76.17
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.32	9.78
	Unit 5 Blowdown	0.99	30.56
	ID Pumping	4.10	126.99
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**24.87**	**771.10**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.22	-6.83
	N. Seepage	0.00	-0.01
	S. Seepage	0.00	0.00
	Bot Seepage	-4.37	-135.32
	Precipitation and Runoff	0.00	0.00
	Evaporation	-28.85	-894.42
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-33.44**	**-1036.58**
Modeled Change in CCS Storage:		**-8.56**	**-265.48**
Observed Change in CCS Storage:		**-11.24**	**-348.30**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-41. Salt Balance for March 2012

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	1.91	59.15
	E. Seepage	2072.56	64249.32
	N. Seepage	2.96	91.61
	S. Seepage	199.90	6197.01
	Bot Seepage	2790.33	86500.25
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	57.59	1785.20
	ID Pumping	187.62	5816.11
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**5312.86**	**164698.66**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-16.20	-502.25
	N. Seepage	-0.13	-4.04
	S. Seepage	0.00	0.00
	Bot Seepage	-1733.97	-53753.20
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-1750.31**	**-54259.48**
Modeled Change in CCS Storage:		**3562.55**	**110439.17**
Observed Change in CCS Storage:		**-500.48**	**-15514.87**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-42. Water Balance for April 2012

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.69	20.65
	E. Seepage	7.18	215.31
	N. Seepage	0.01	0.15
	S. Seepage	0.84	25.21
	Bot Seepage	9.86	295.67
	Precipitation and Runoff	52.17	1565.03
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.35	10.44
	Unit 5 Blowdown	0.98	29.41
	ID Pumping	9.76	292.86
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**81.82**	**2454.73**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-0.11	-3.36
	N. Seepage	0.00	-0.03
	S. Seepage	0.00	0.00
	Bot Seepage	-5.44	-163.10
	Precipitation and Runoff	0.00	0.00
	Evaporation	-30.35	-910.52
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-35.90**	**-1077.01**
Modeled Change in CCS Storage:		**45.92**	**1377.72**
Observed Change in CCS Storage:		**33.69**	**1010.73**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-43. Salt Balance for April 2012

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	6.91	207.36
	E. Seepage	2259.55	67786.52
	N. Seepage	1.18	35.26
	S. Seepage	228.24	6847.28
	Bot Seepage	2634.67	79039.99
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	57.26	1717.78
	ID Pumping	1035.51	31065.19
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**6223.31**	**186699.39**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-54.03	-1620.98
	N. Seepage	-0.59	-17.72
	S. Seepage	0.00	0.00
	Bot Seepage	-2899.81	-86994.31
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-2954.43**	**-88633.01**
Modeled Change in CCS Storage:		**3268.88**	**98066.38**
Observed Change in CCS Storage:		**4132.59**	**123977.58**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-44. Water Balance for May 2012

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.58	18.00
	E. Seepage	0.22	6.82
	N. Seepage	0.01	0.44
	S. Seepage	0.28	8.68
	Bot Seepage	1.06	32.81
	Precipitation and Runoff	42.56	1319.51
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.36	11.22
	Unit 5 Blowdown	0.97	30.04
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**46.05**	**1427.54**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-6.10	-189.16
	N. Seepage	0.00	-0.01
	S. Seepage	0.00	-0.01
	Bot Seepage	-11.72	-363.27
	Precipitation and Runoff	0.00	0.00
	Evaporation	-29.06	-900.80
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-46.88**	**-1453.25**
Modeled Change in CCS Storage:		**-0.83**	**-25.72**
Observed Change in CCS Storage:		**-2.89**	**-89.62**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-45. Salt Balance for May 2012

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	3.99	123.80
	E. Seepage	66.83	2071.87
	N. Seepage	3.32	103.06
	S. Seepage	36.12	1119.86
	Bot Seepage	476.73	14778.51
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	56.61	1755.02
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**643.62**	**19952.13**
Out of CCS	W. Seepage	0.00	0.00
	E. Seepage	-2630.79	-81554.38
	N. Seepage	-0.18	-5.65
	S. Seepage	-0.18	-5.72
	Bot Seepage	-4991.24	-154728.51
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-7622.40**	**-236294.26**
Modeled Change in CCS Storage:		**-6978.78**	**-216342.13**
Observed Change in CCS Storage:		**-4664.11**	**-144587.53**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

Table 5.4-46. Water Balance for June 2012

Water Balance Component		Flow (MGD)	Volume (gal x 10^6)
Into CCS	W. Seepage	0.31	9.37
	E. Seepage	1.49	44.65
	N. Seepage	0.01	0.29
	S. Seepage	0.50	14.87
	Bot Seepage	3.52	105.45
	Precipitation and Runoff	31.83	954.85
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.19	5.80
	Unit 5 Blowdown	1.03	30.98
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**38.88**	**1166.26**
Out of CCS	W. Seepage	0.00	-0.03
	E. Seepage	-4.30	-129.06
	N. Seepage	0.00	-0.01
	S. Seepage	0.00	0.00
	Bot Seepage	-8.70	-261.14
	Precipitation and Runoff	0.00	0.00
	Evaporation	-28.76	-862.90
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-41.77**	**-1253.15**
Modeled Change in CCS Storage:		**-2.90**	**-86.88**
Observed Change in CCS Storage:		**-3.50**	**-105.04**

Key: CCS = Cooling Canal System. gal = Gallons. ID = Interceptor Ditch. MGD = Millions of gallons per day.

Table 5.4-47. Salt Balance for June 2012

Water Balance Component		lb/day (x1000)	Mass (lb x 1000)
Into CCS	W. Seepage	0.97	29.03
	E. Seepage	326.55	9796.41
	N. Seepage	2.25	67.36
	S. Seepage	69.92	2097.49
	Bot Seepage	1092.63	32778.88
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	60.32	1809.60
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total In:	**1552.63**	**46578.77**
Out of CCS	W. Seepage	-17.56	-526.71
	E. Seepage	-1746.75	-52402.41
	N. Seepage	-0.17	-5.02
	S. Seepage	0.00	0.00
	Bot Seepage	-3478.73	-104361.78
	Precipitation and Runoff	0.00	0.00
	Evaporation	0.00	0.00
	Unit 3, 4 Added Water	0.00	0.00
	Unit 5 Blowdown	0.00	0.00
	ID Pumping	0.00	0.00
	Plant Outflow	Equal to Intake	
	Plant Intake	Equal to Outflow	
	Total Out:	**-5243.20**	**-157295.92**
Modeled Change in CCS Storage:		**-3690.57**	**-110717.15**
Observed Change in CCS Storage:		**-2740.38**	**-82211.41**

Key: CCS = Cooling Canal System. ID = Interceptor Ditch. lb = Pound.

FIGURES

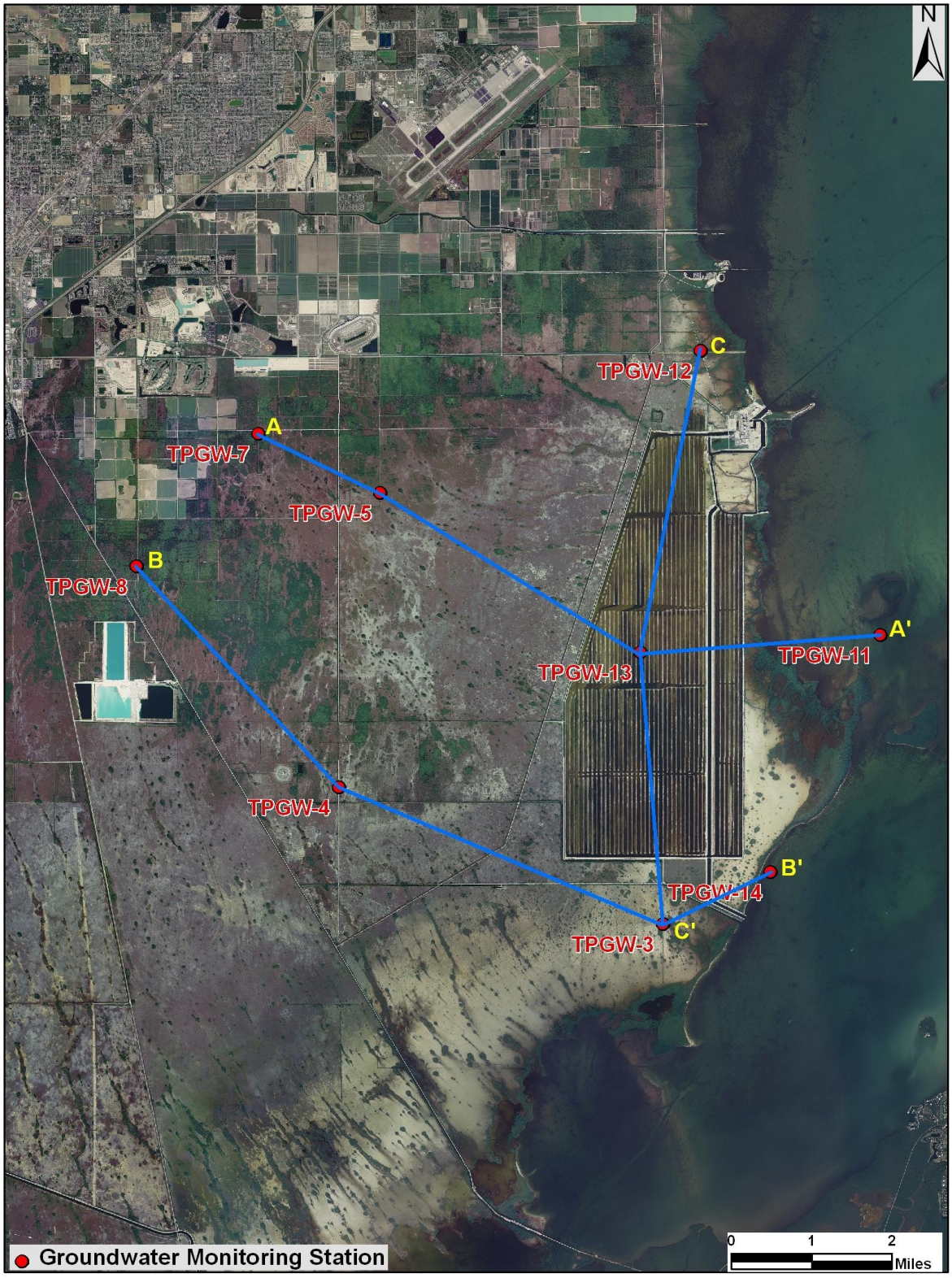


Figure 5.1-1. Geologic Formation Cross Section Location.

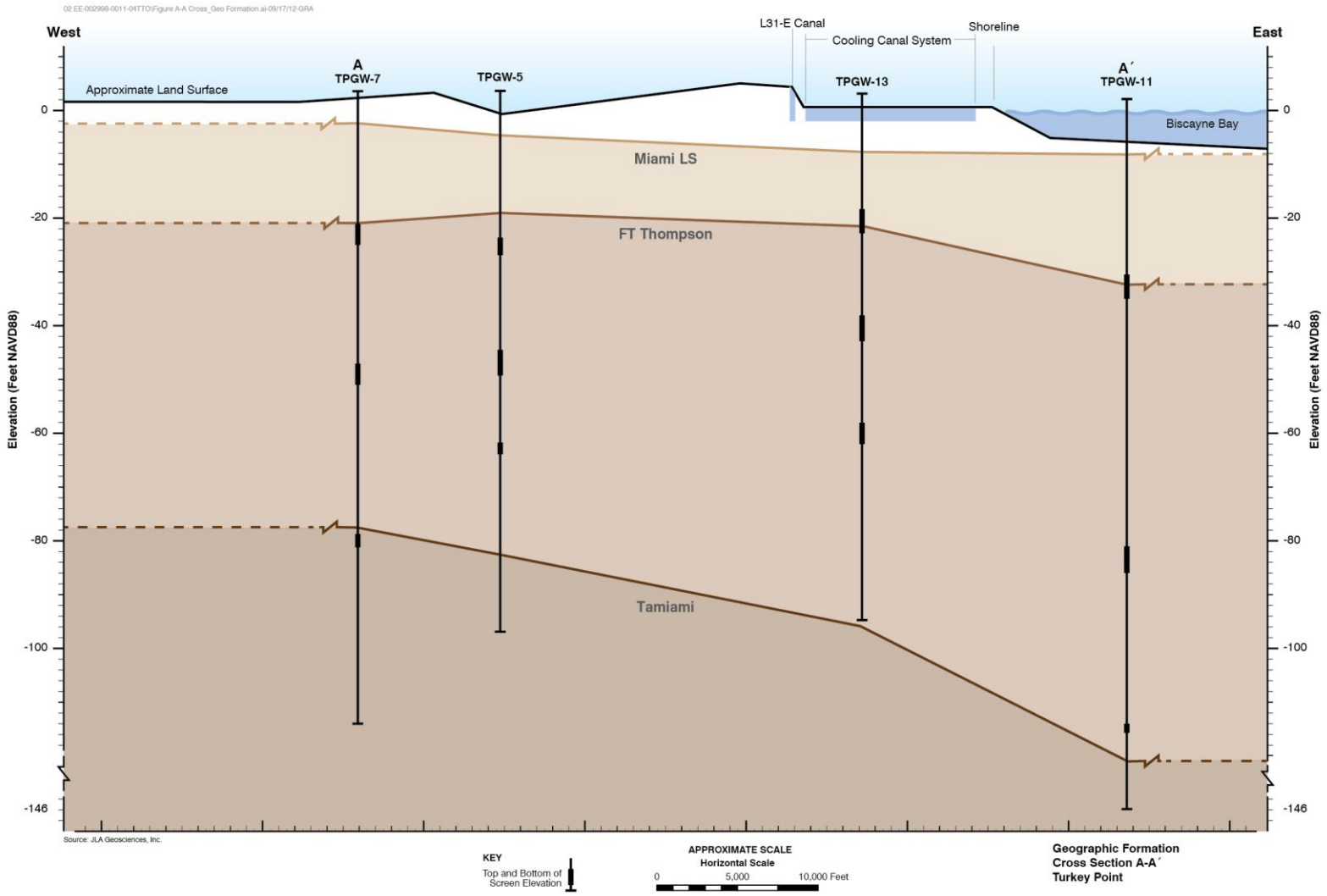


Figure 5.1-2. Geologic Cross Section A-A.

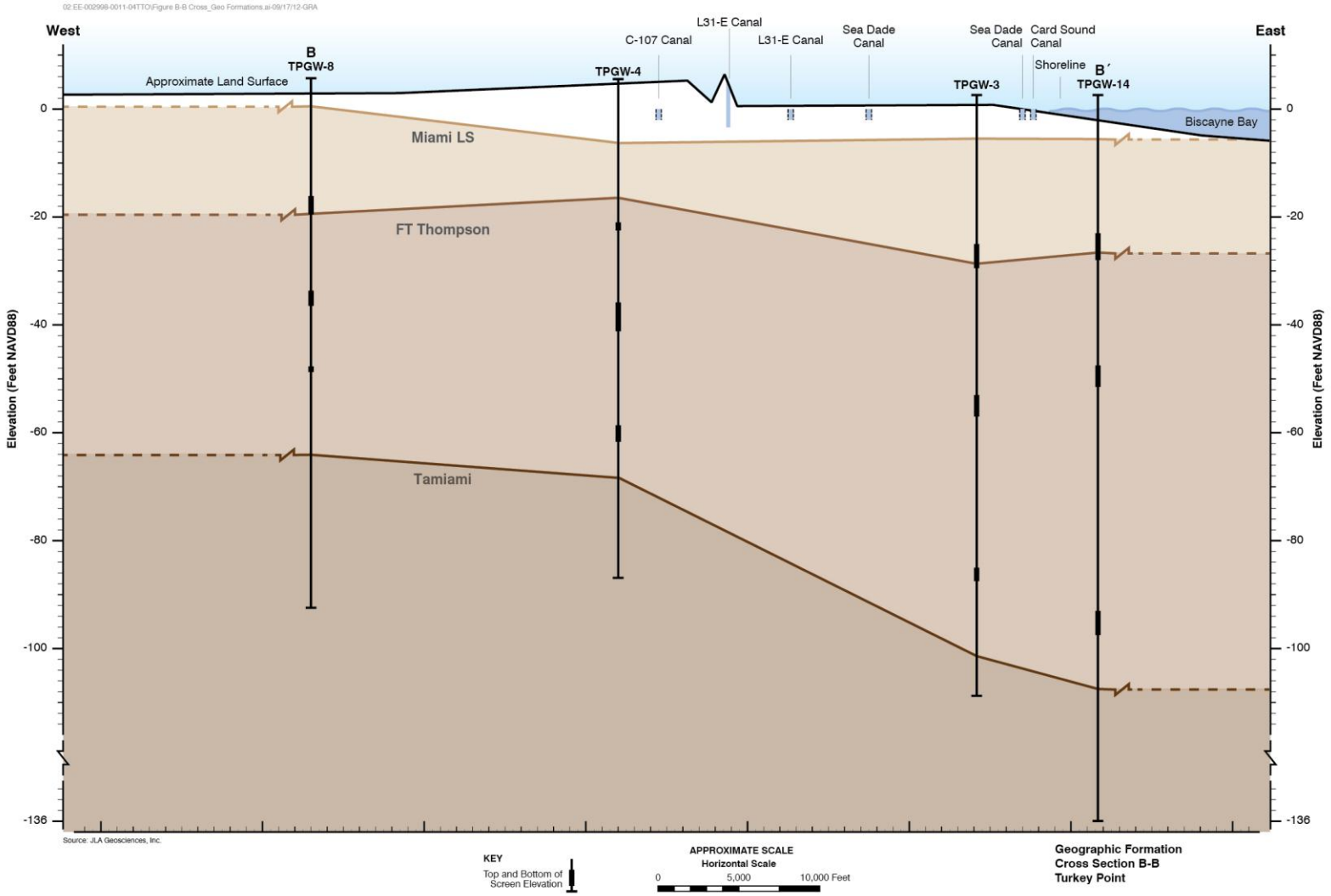


Figure 5.1-3. Geologic Cross Section B-B.

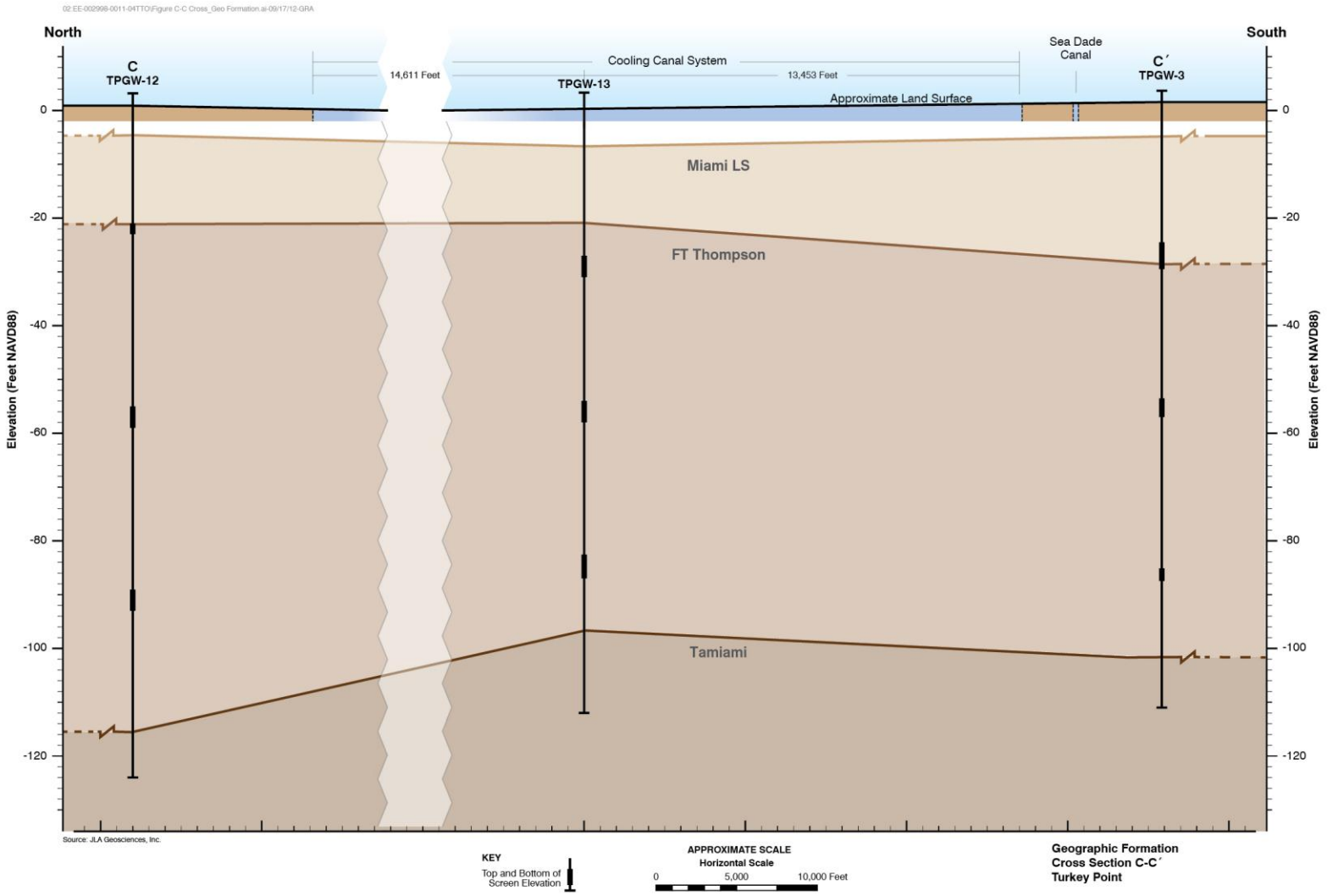


Figure 5.1-4. Geologic Cross Section C-C.

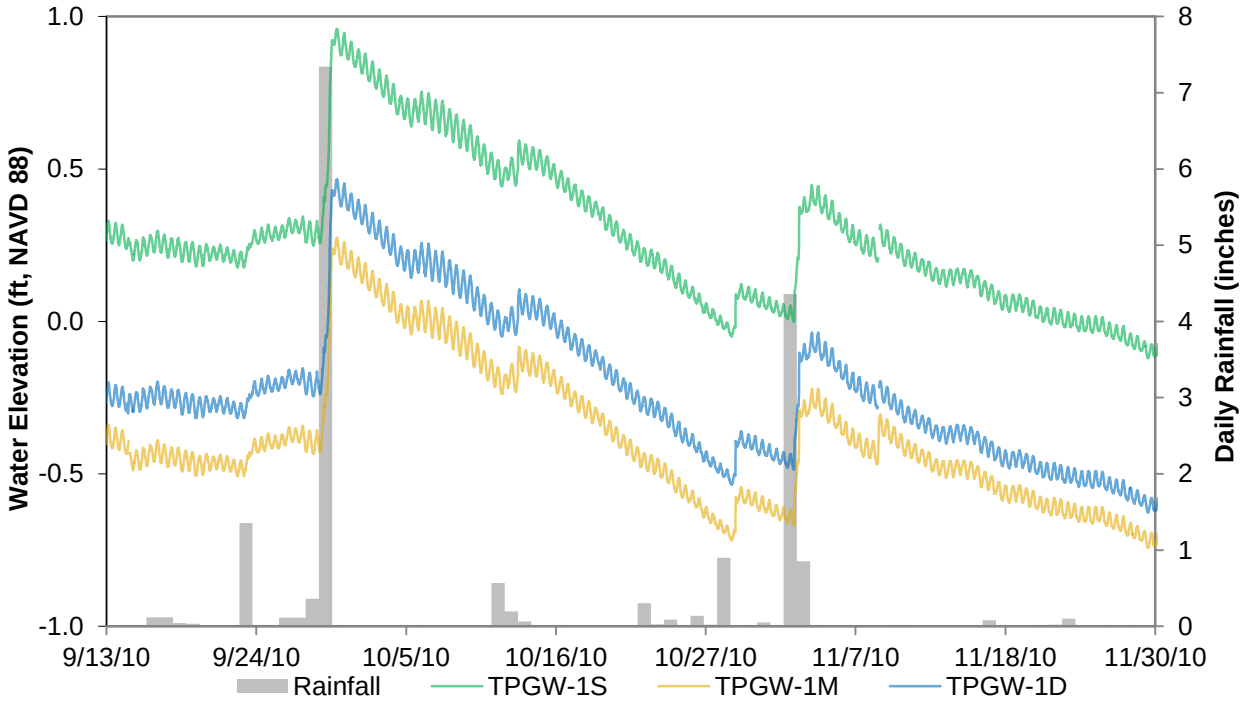


Figure 5.2-1. Groundwater Response to Rain Events – September through November 2010.

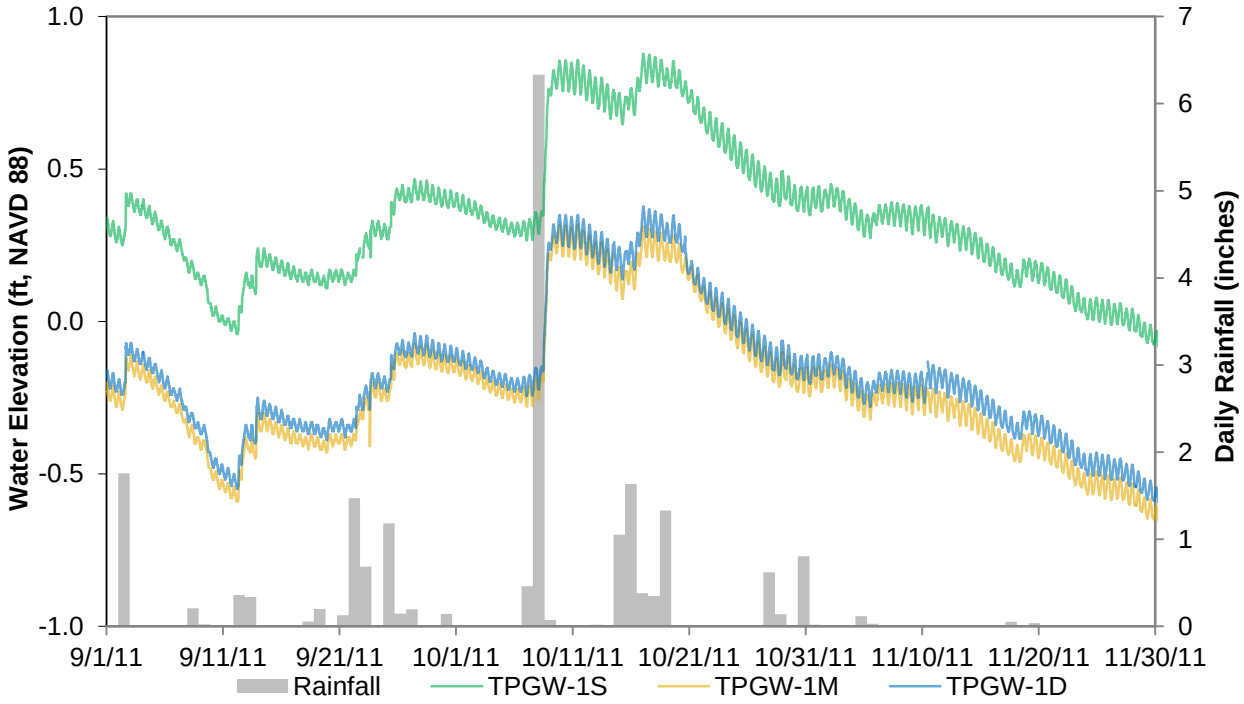
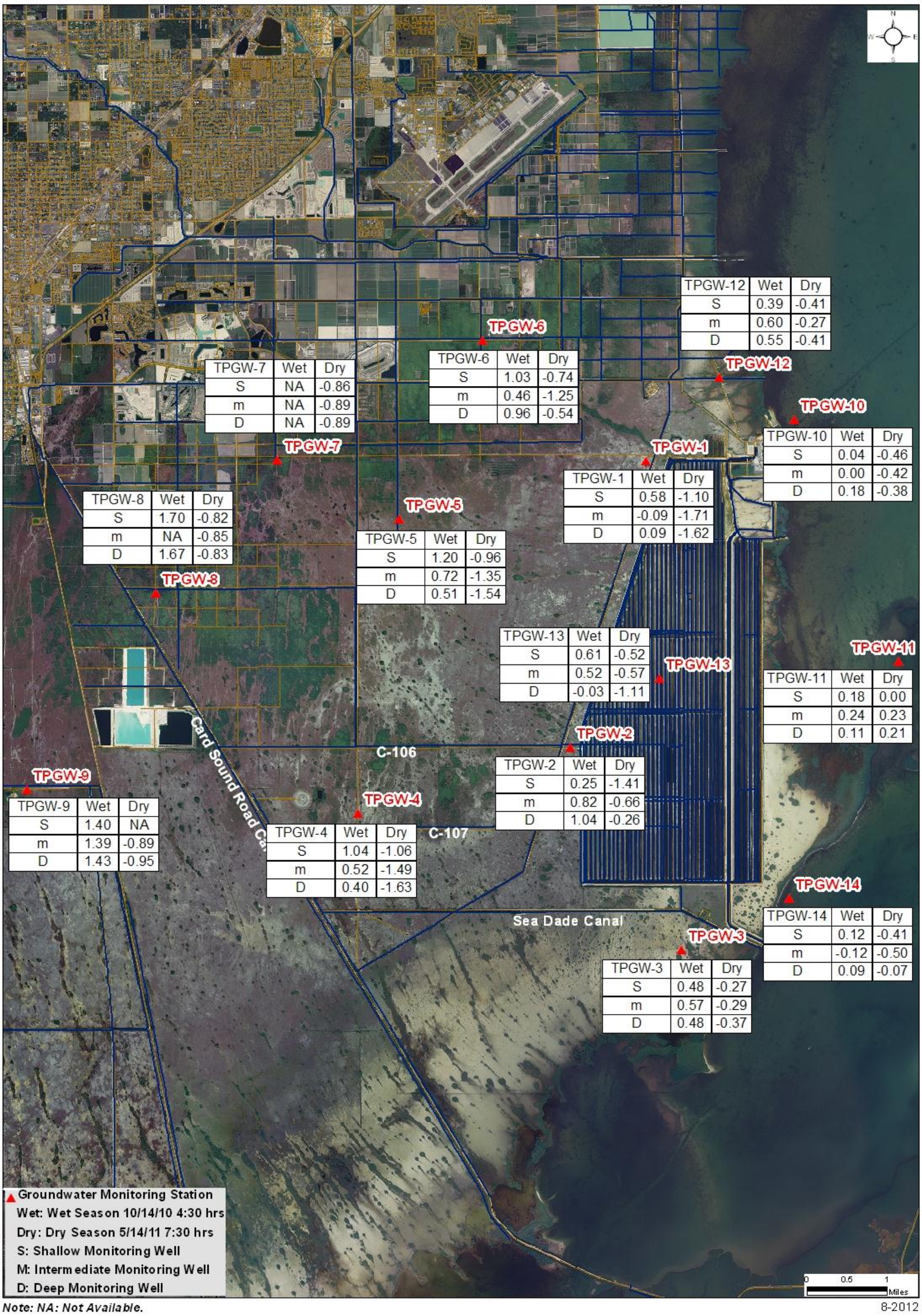
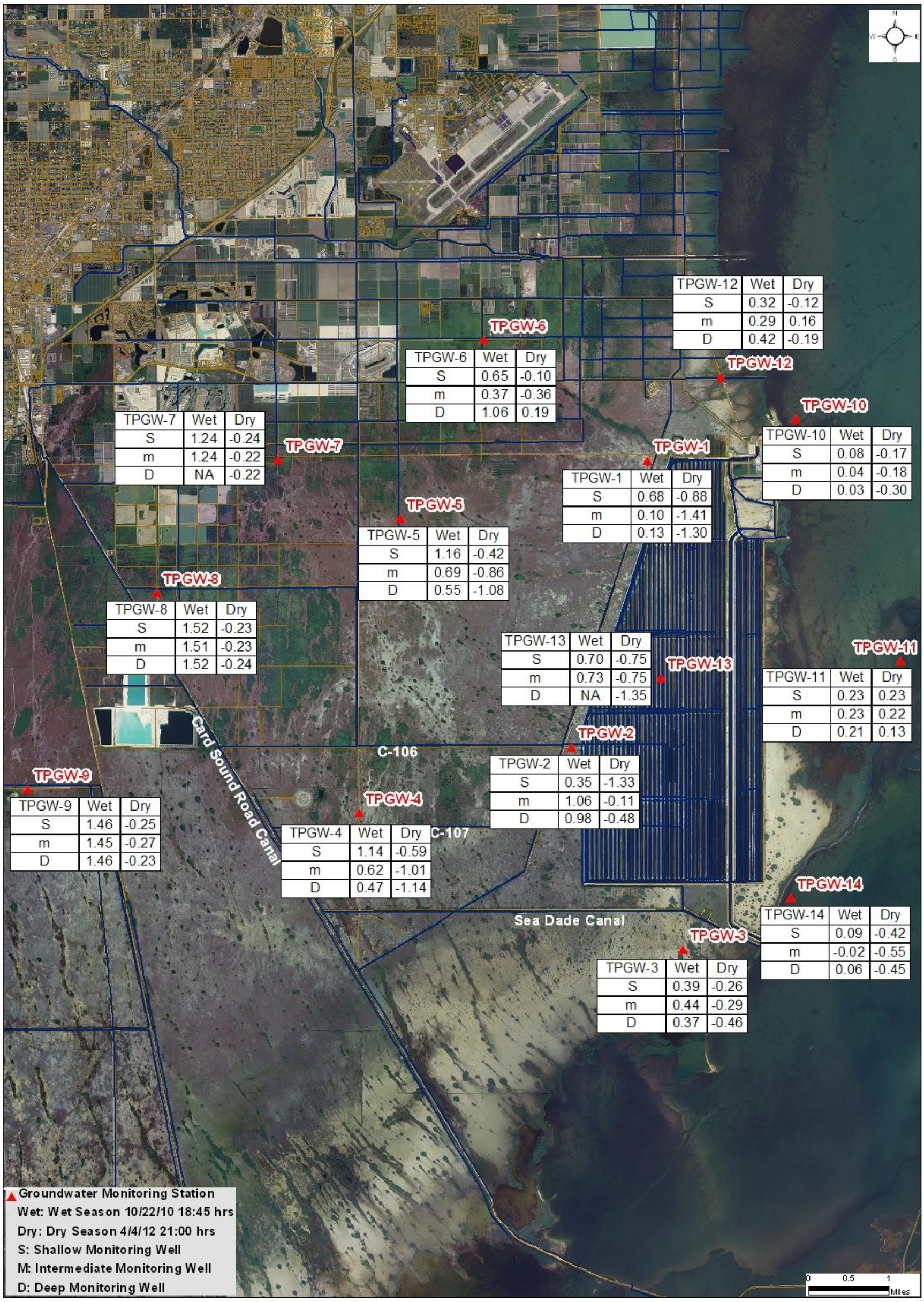


Figure 5.2-2. Groundwater Response to Rain Events – September through November 2011.



Note: NA: Not Available.

Figure 5.2-3. Wet and Dry Season Day Water Elevation Comparison – October 14, 2010 and May 14, 2011.



Note: NA: Not Available.

Figure 5.2-4. Wet and Dry Season Day Water Elevation Comparison – October 22, 2011 and April 4, 2012.

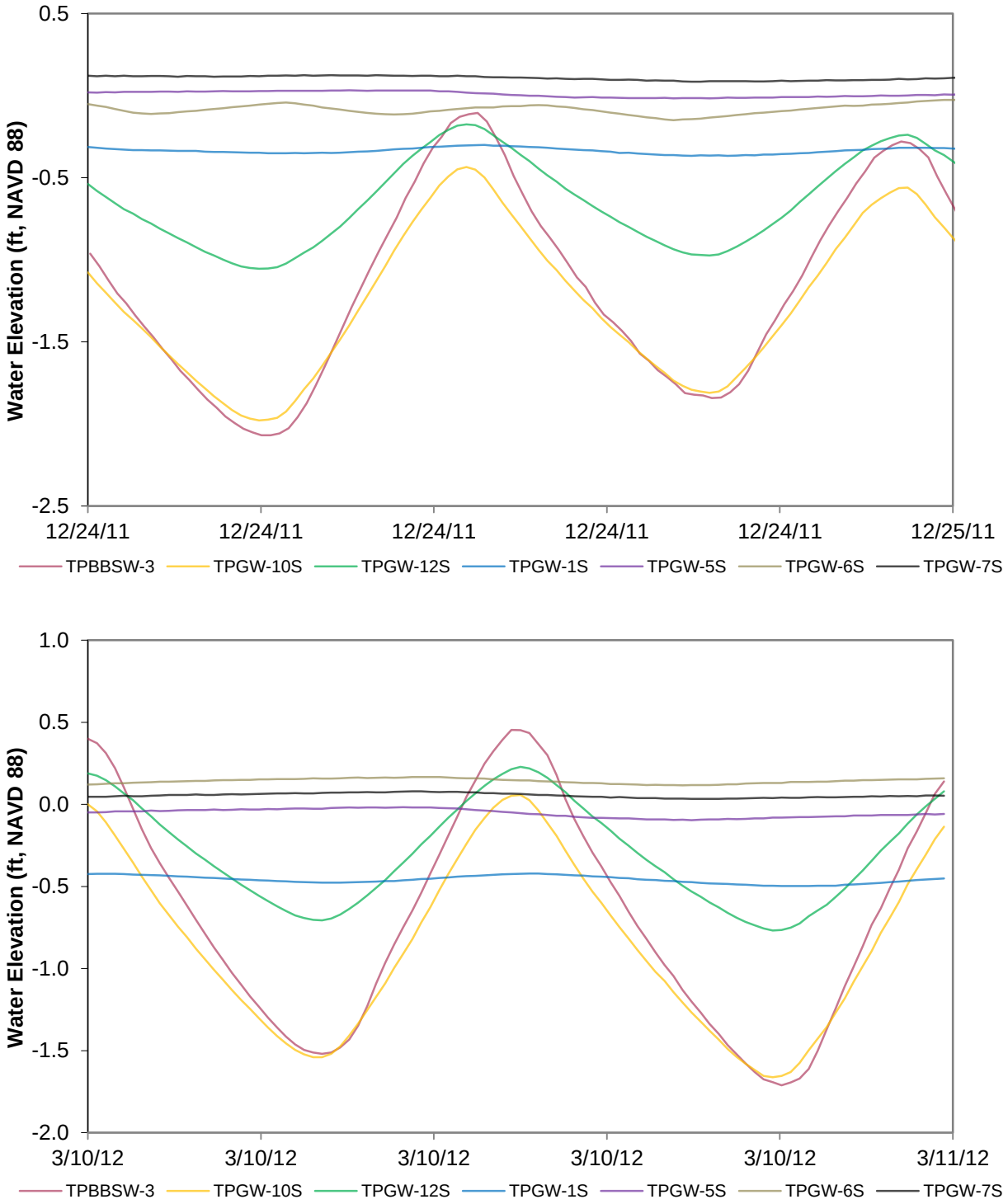


Figure 5.2-5. Tidal Effects at Biscayne Bay, Nearshore and Inland Stations in the Northern Part of Study Area.

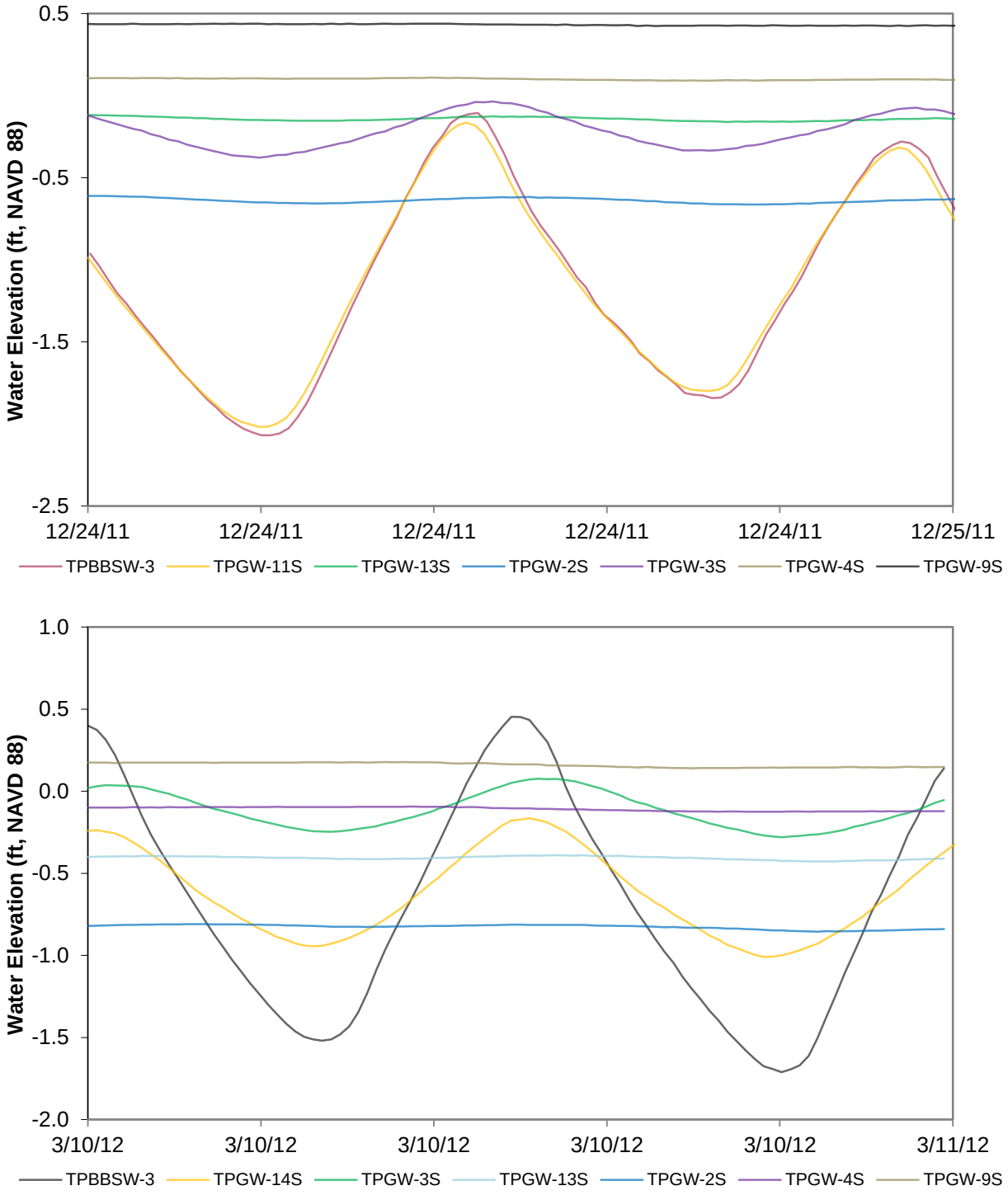


Figure 5.2-6. Tidal Effects at Biscayne Bay, Nearshore and Inland Stations in the Southern Part of Study Area

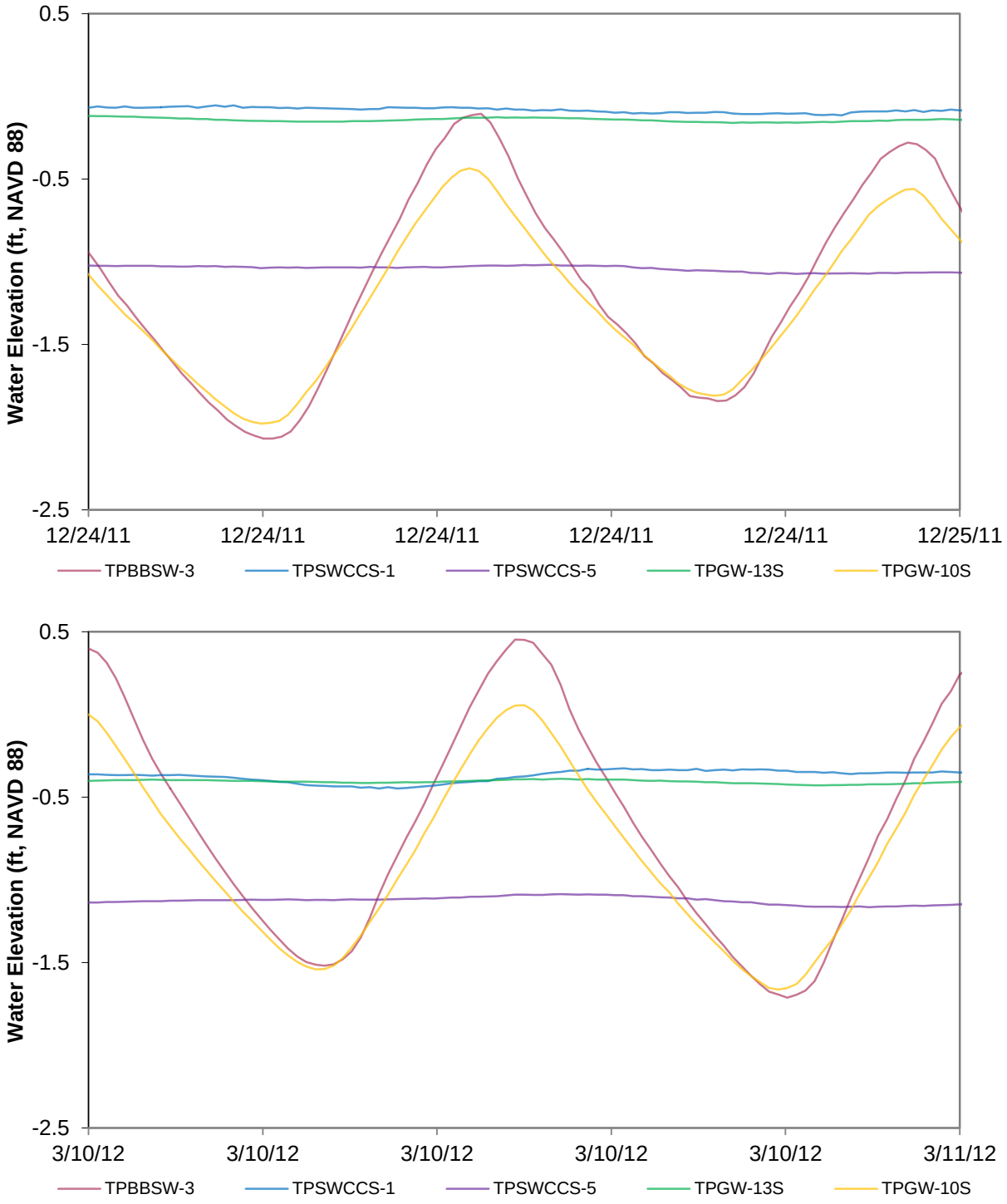
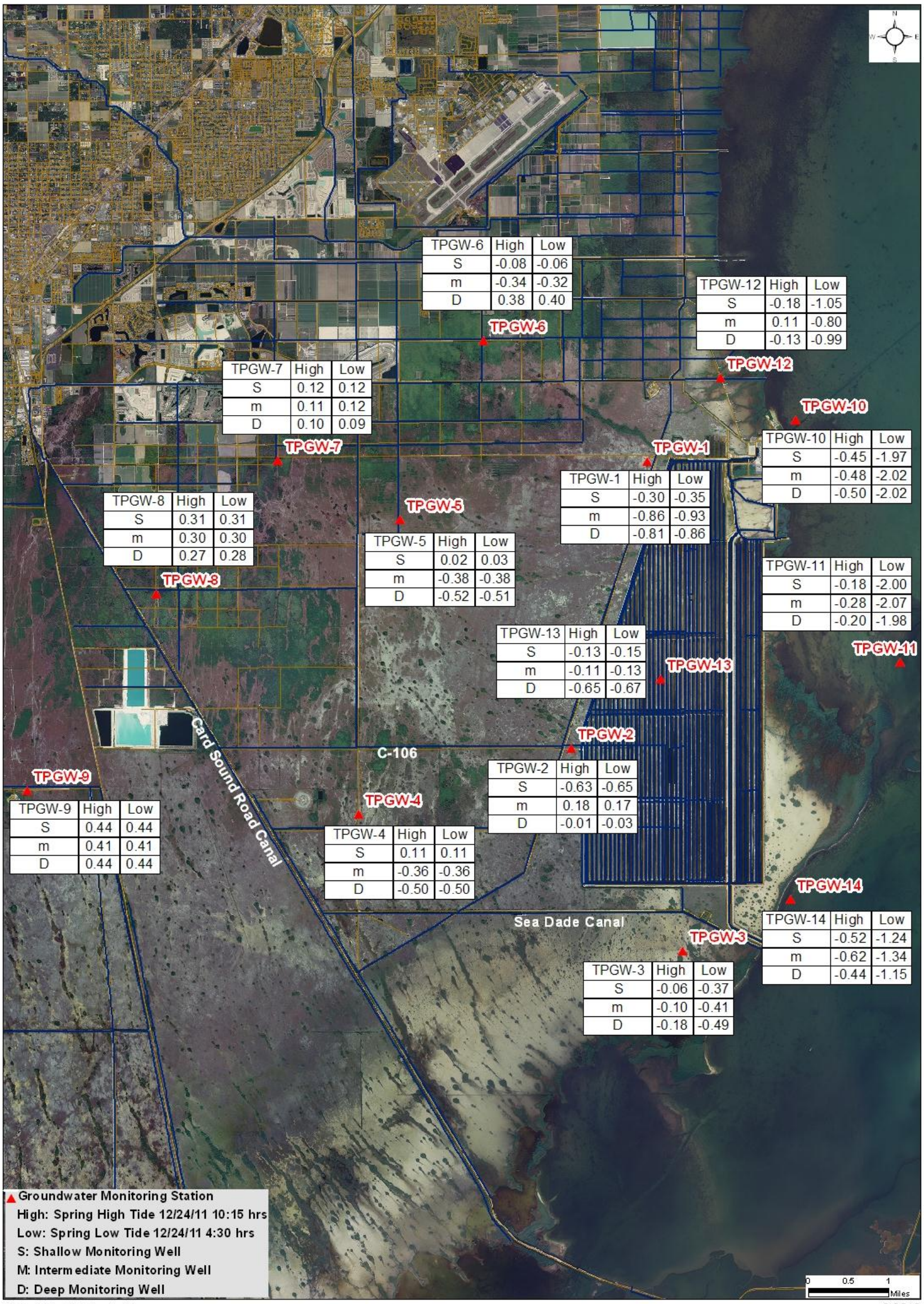


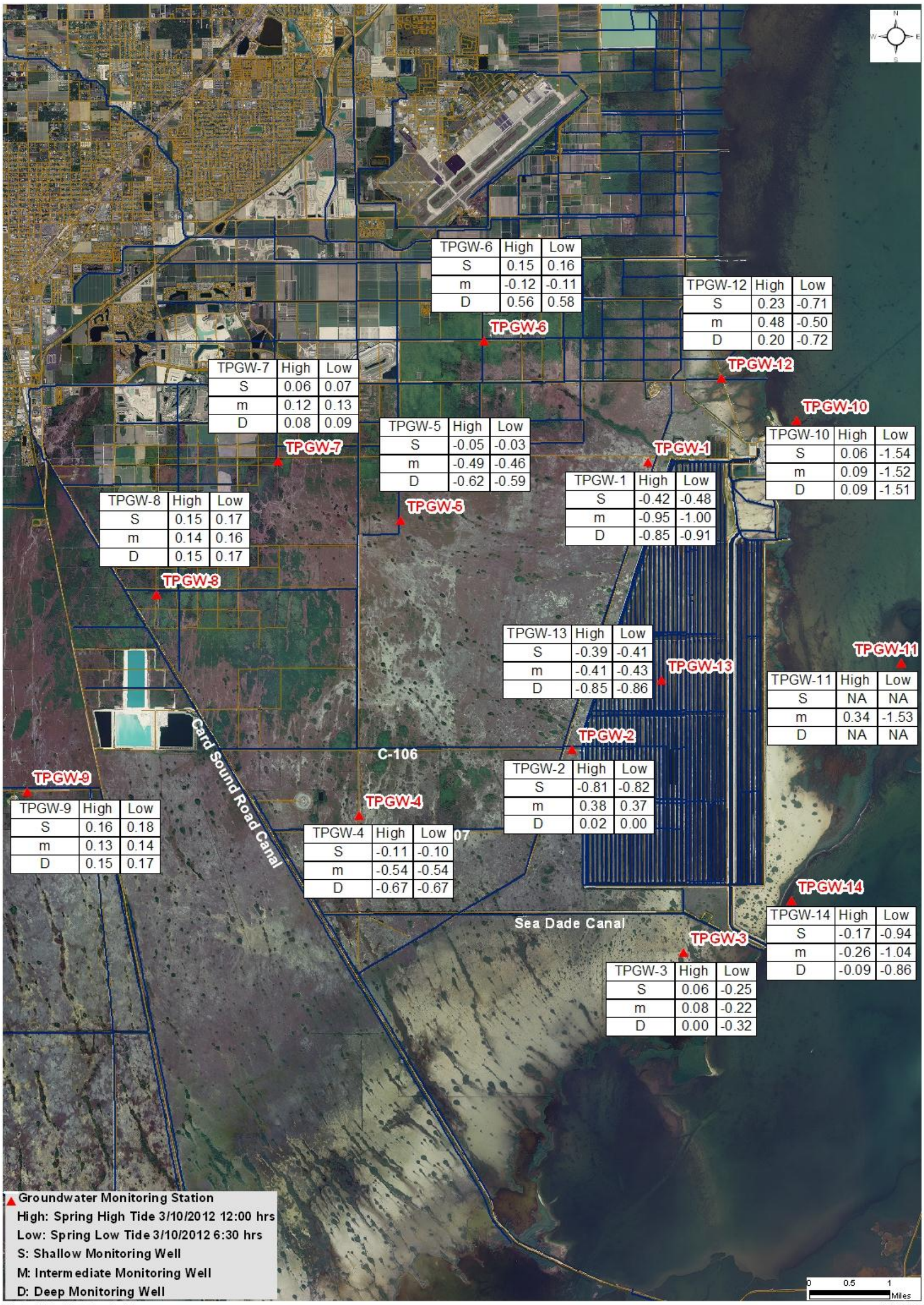
Figure 5.2-7. Lack of Tidal Effects in CCS Surface Water and Groundwater



Note: NA: Not Available.

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Figure 5.2-8. Spring Tide Groundwater Elevations, December 24, 2011.



Note: NA: Not Available.

Figure 5.2-9. Spring Tide Groundwater Elevations, March 10, 2012.

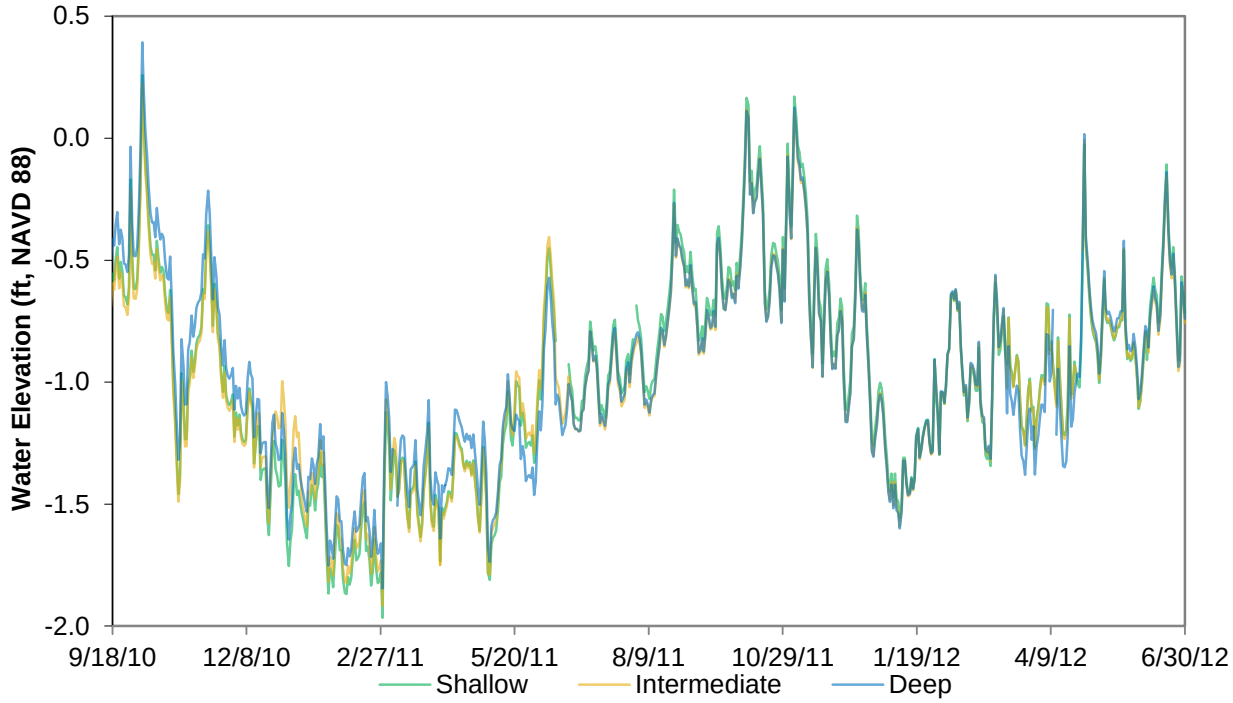


Figure 5.2-10. Averaged Daily Groundwater Elevations for TPGW-10 Wells.

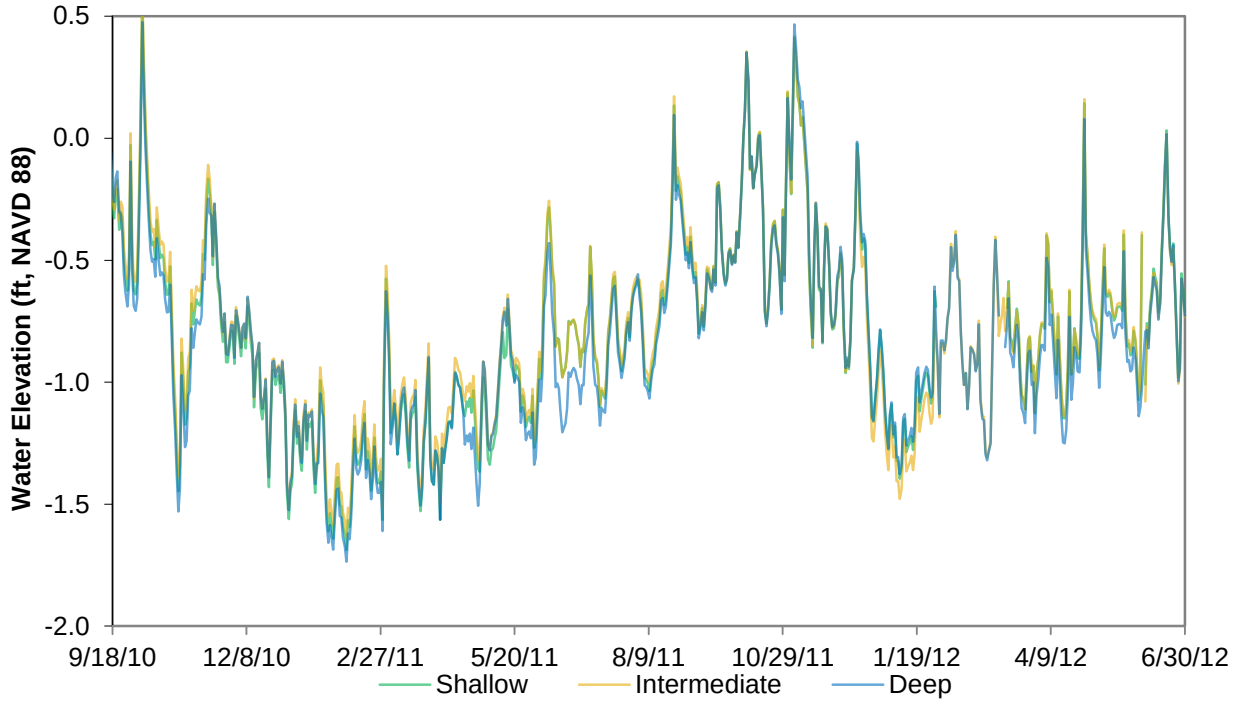


Figure 5.2-11. Averaged Daily Groundwater Elevations for TPGW-11 Wells.

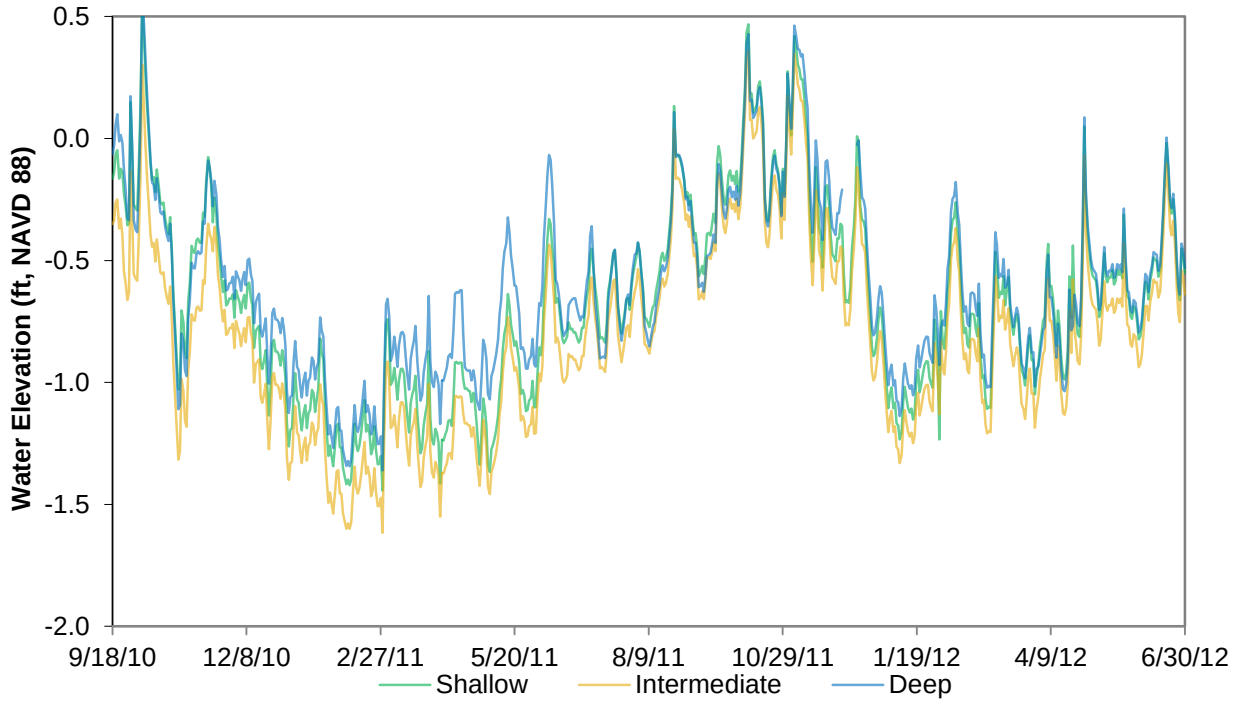


Figure 5.2-12. Averaged Daily Groundwater Elevations for TPGW-14 Wells.

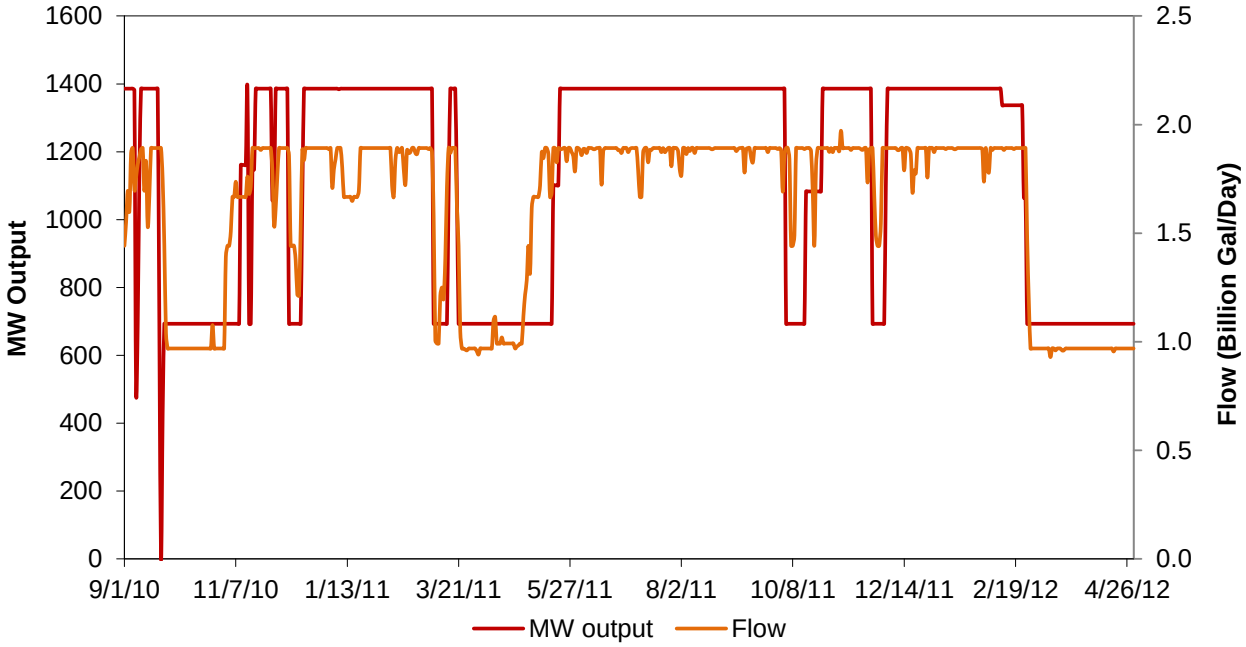


Figure 5.2-13. Nuclear Unit Estimated Flows and Outages/Megawatt (MW) Output Reduction.

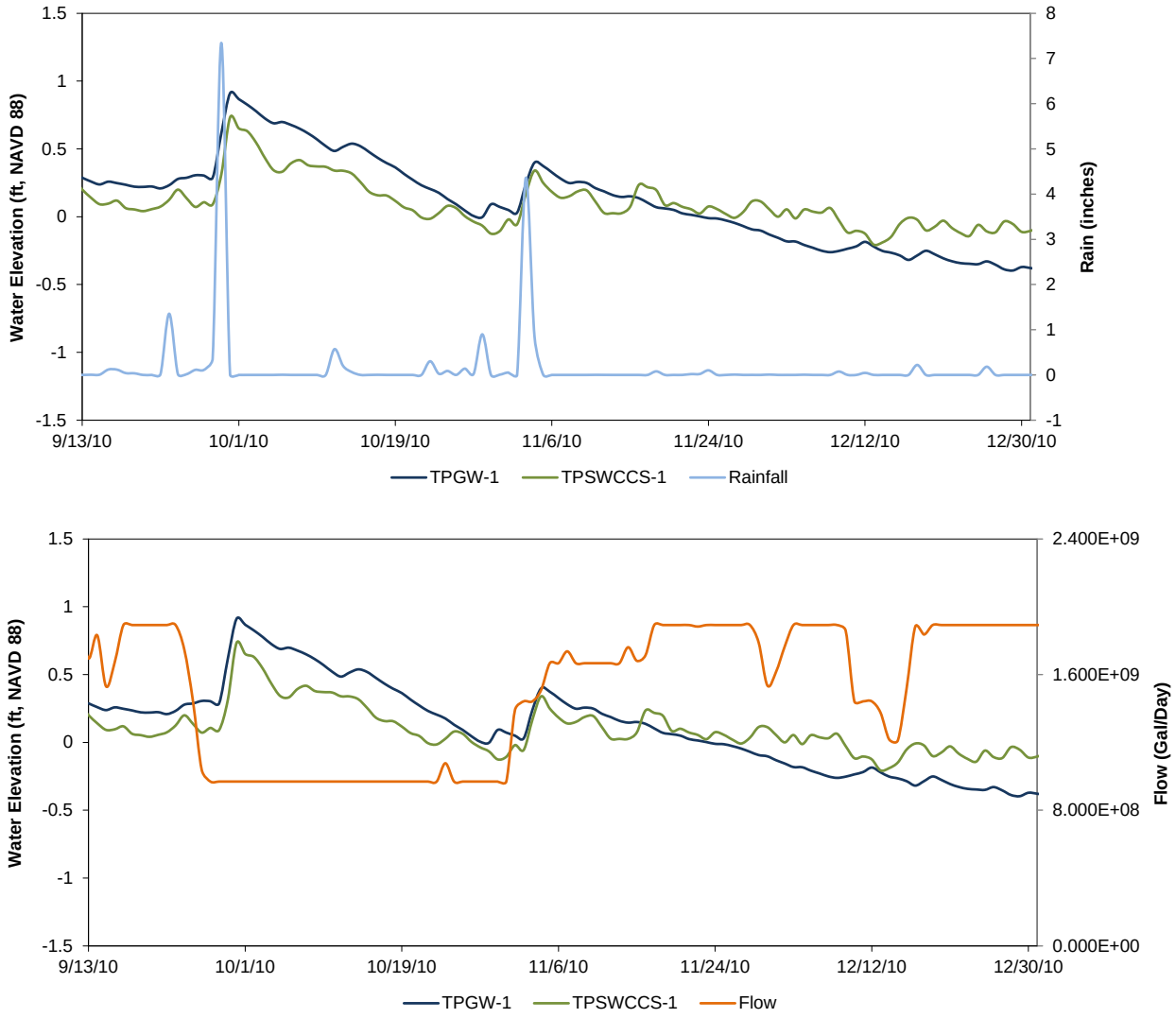


Figure 5.2-14. TPGW-1 Groundwater and TPSWCCS-1 Surface Water Responses to Rainfall and Nuclear Unit Power Outages, September 2010 – December 2010.

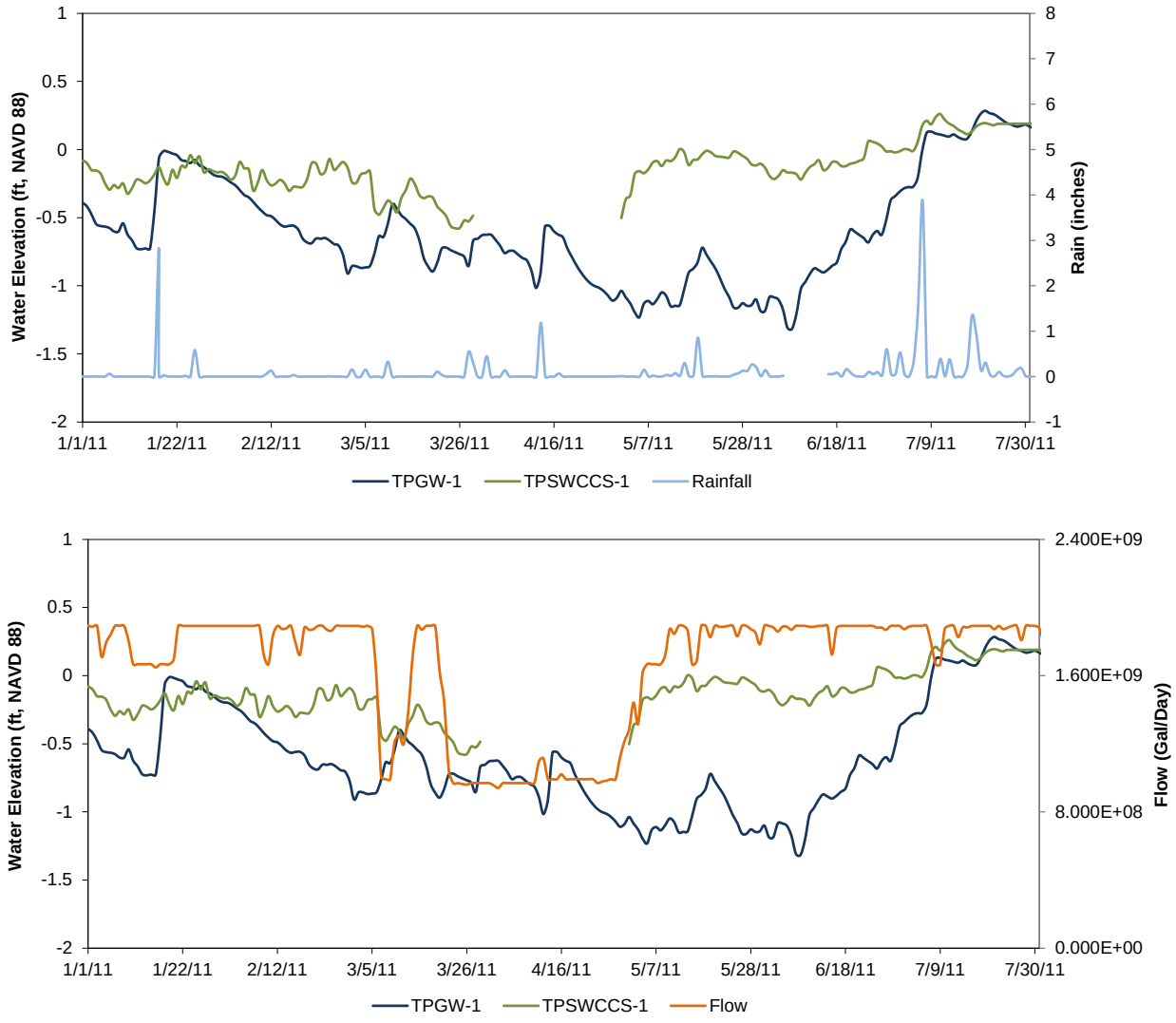


Figure 5.2-15. TPGW-1 Groundwater and TPSWCC-1 Surface Water Responses to Rainfall and Nuclear Unit Power Outages, January 2011 – June 2011.

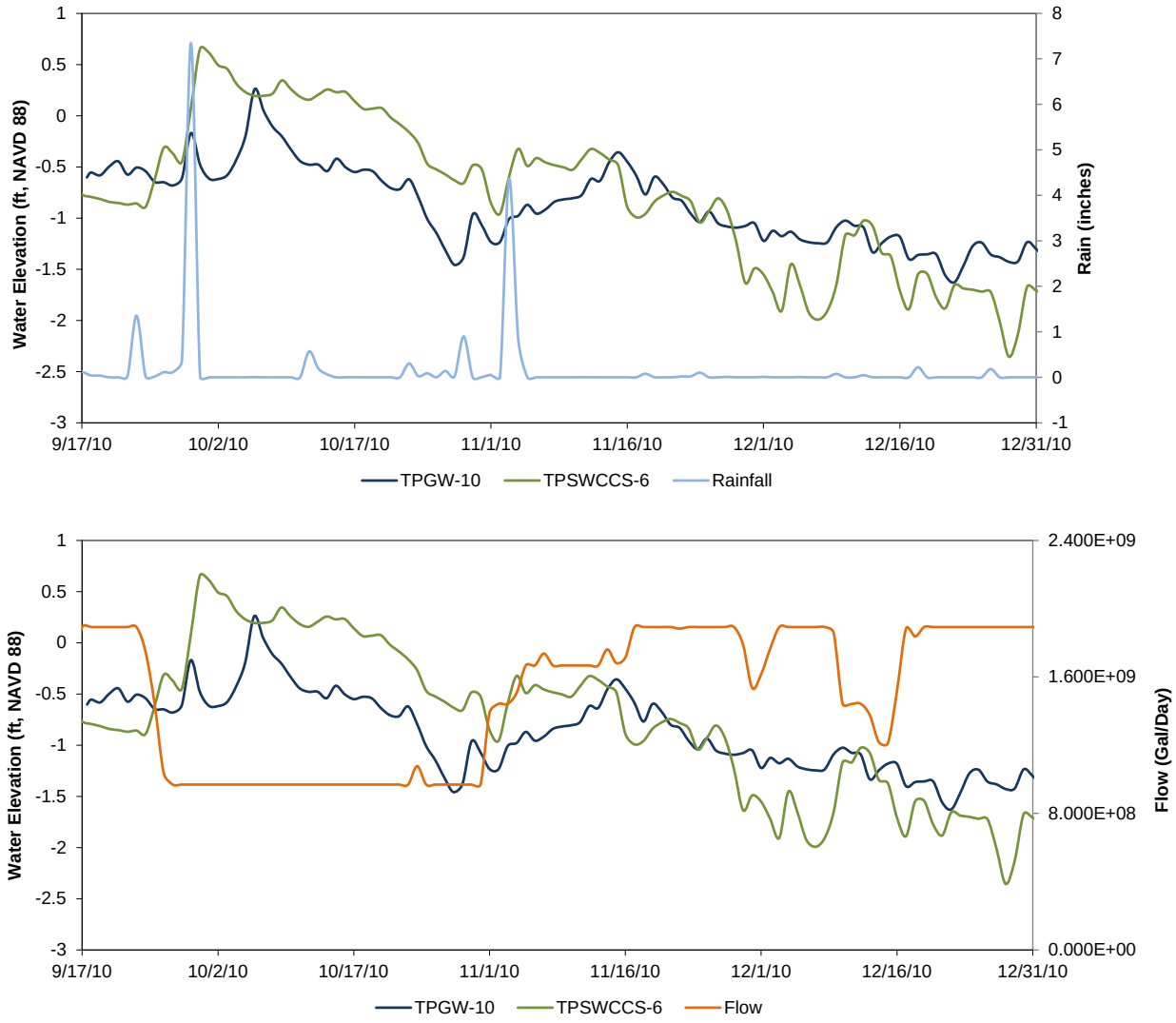


Figure 5.2-16. TPGW-10 Groundwater and TPSWCCS-6 Surface Water Responses to Rainfall and Nuclear Unit Power Outages, September 2010 – December 2010.

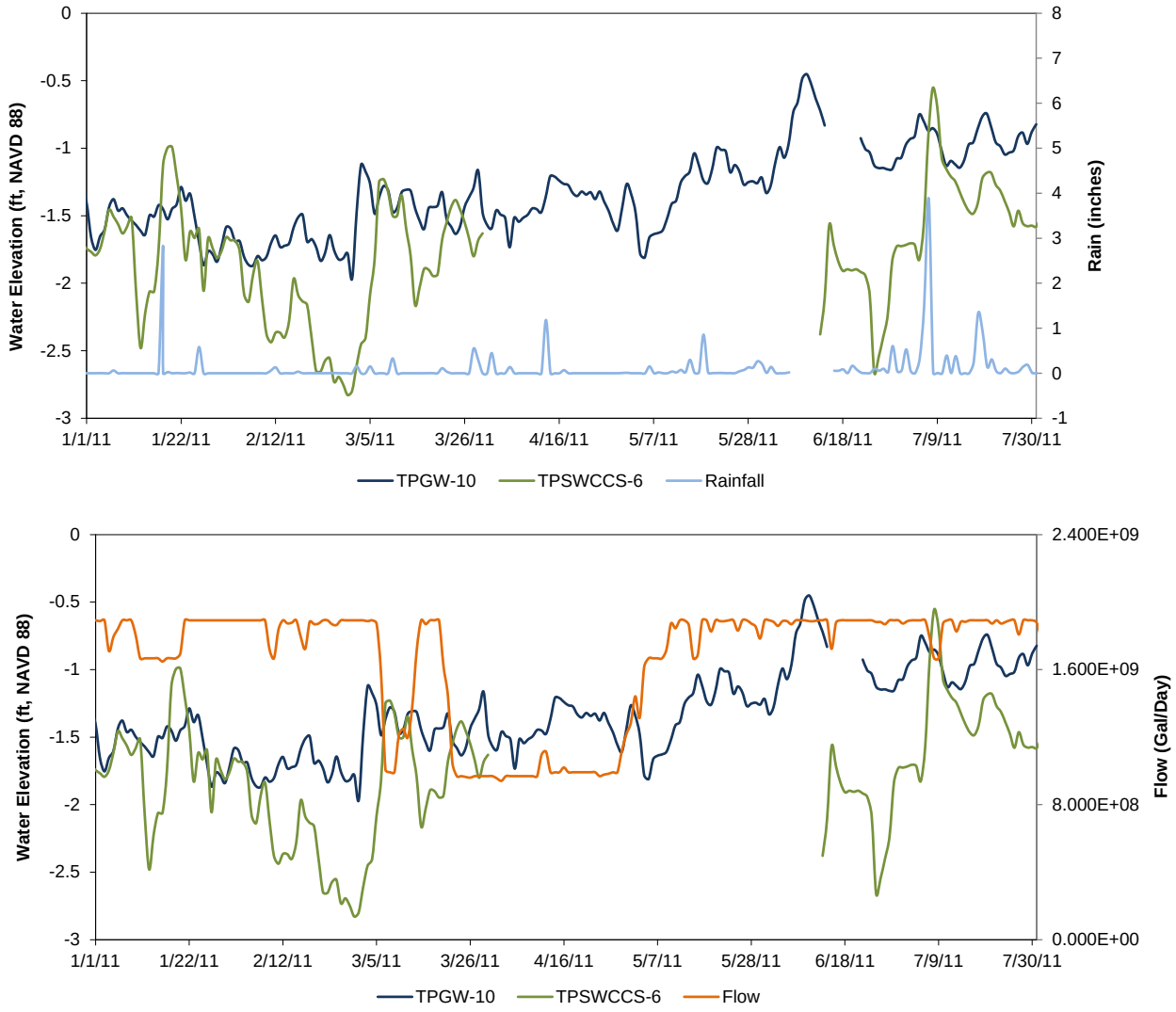


Figure 5.2-17. TPGW-10 Groundwater and TPSWCCS-6 Surface Water Responses to Rainfall and Nuclear Unit Power Outages, January 2011 – June 2011.

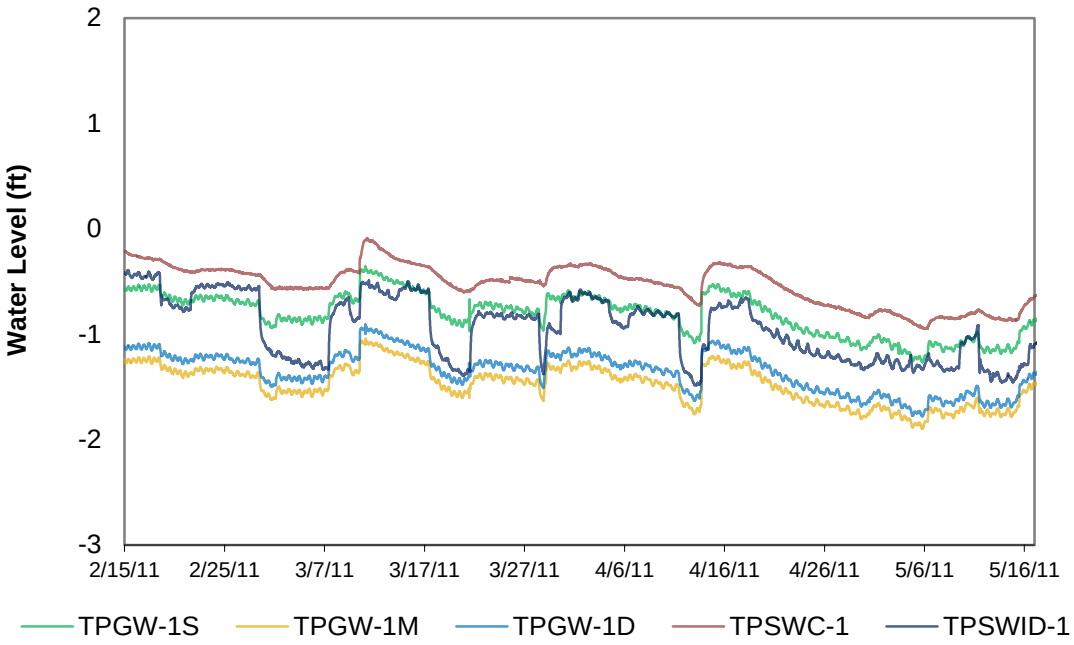


Figure 5.2-18. Effect of ID Operations on TPGW-1 Wells, TPSWC-1 and TPSWID-1.

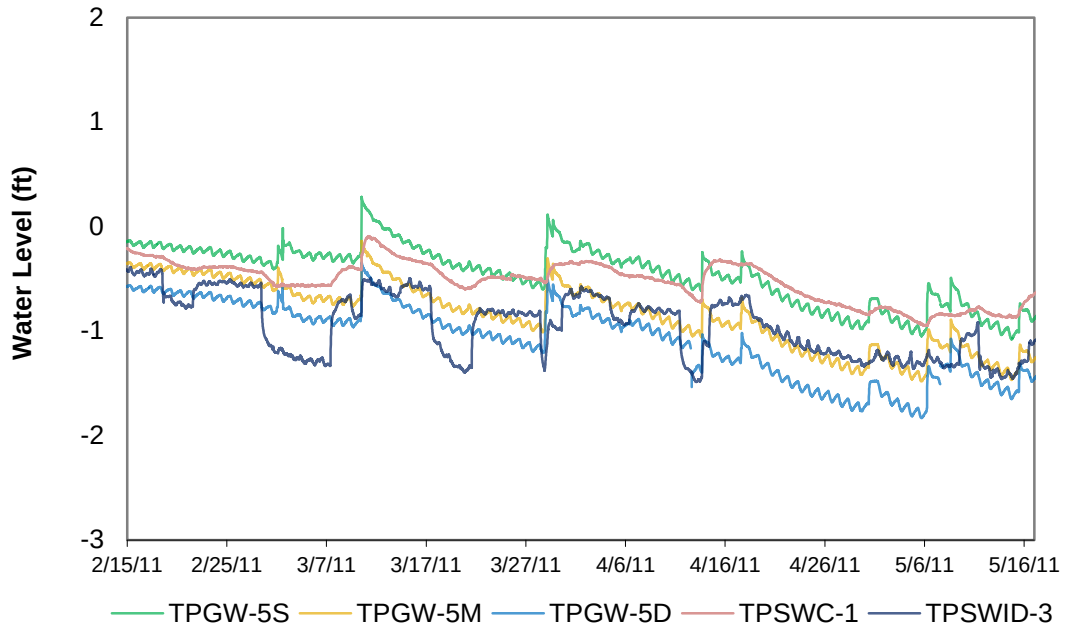


Figure 5.2-19. Effect of ID Operations on TPGW-5 Wells, TPSWC-1 and TPSWID-1.

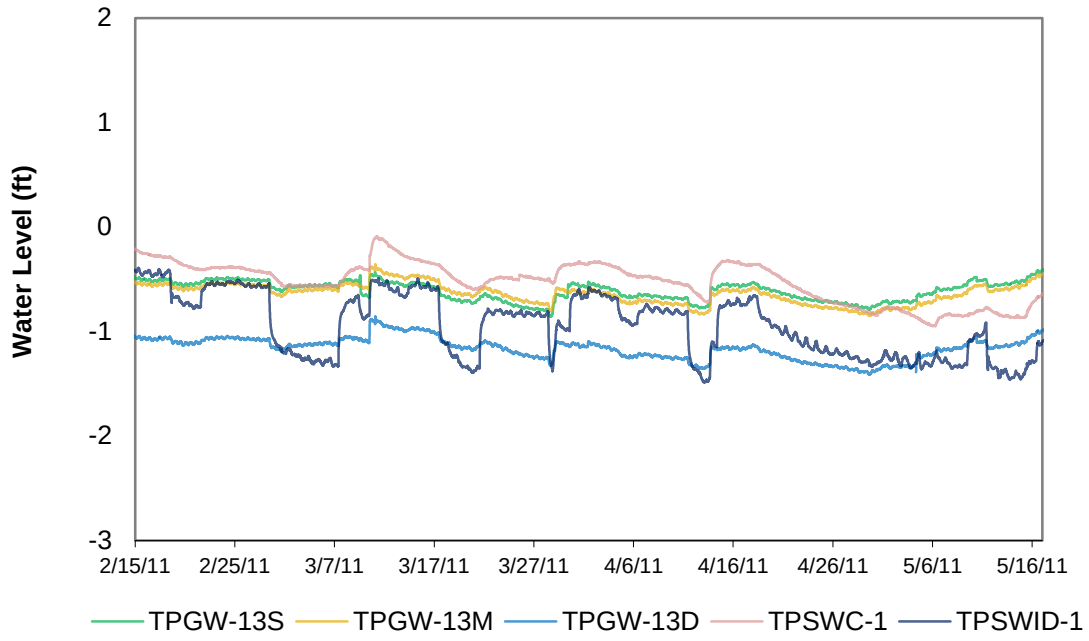


Figure 5.2-20. Effect of ID Operations on TPGW-13 Wells, TPSWC-1 and TPSWID-1.

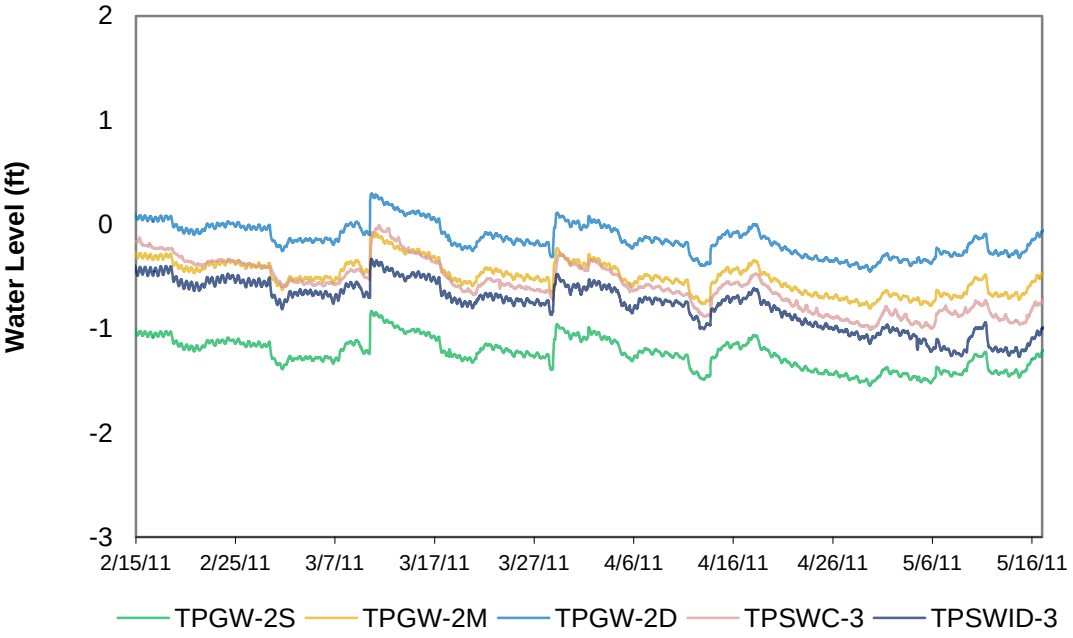


Figure 5.2-21. Effect of ID Operations on TPGW-2 Wells, TPSWC-3 and TPSWID-3.

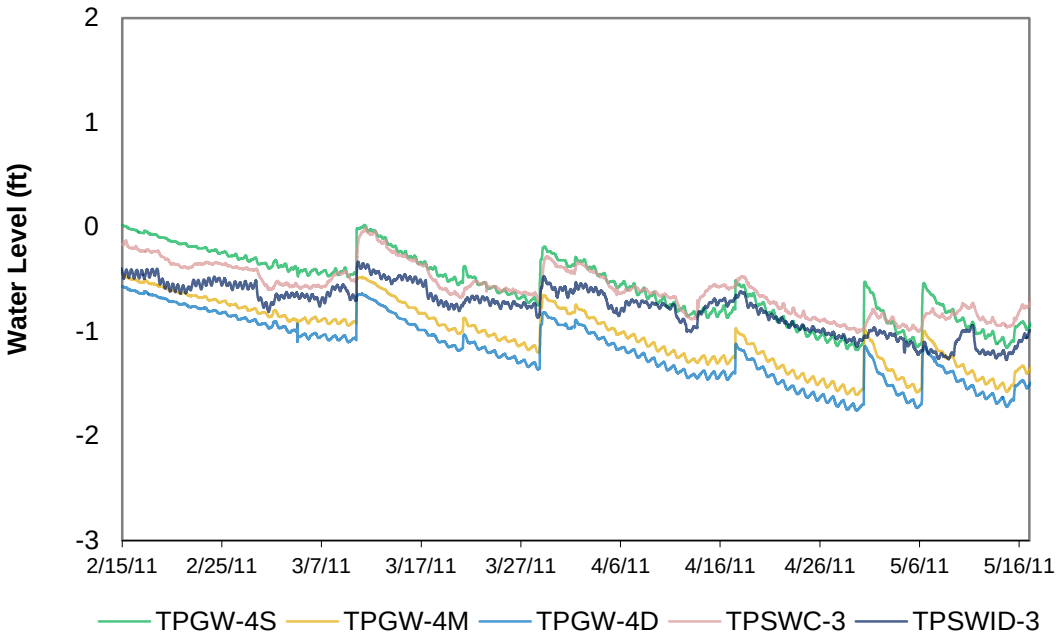
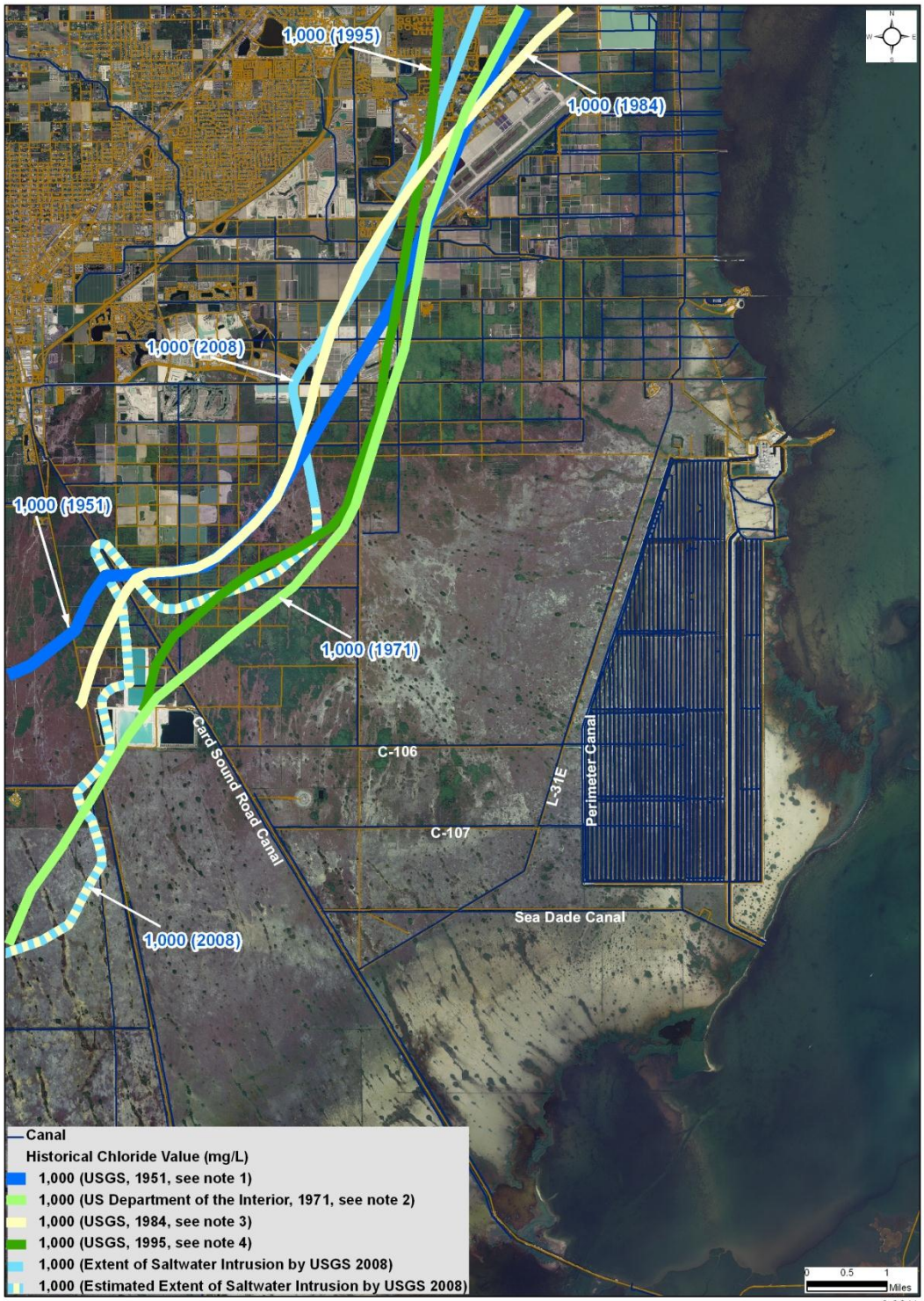


Figure 5.2-22. Effect of ID Operations on TPGW-4 Wells, TPSWC-3 and TPSWID-3.



Note 1: Source: US Department of the Interior. 1973. Resource and Land Information for South Dade County, Florida. Geological Survey Investigation I-850.
Note 2: Source: USGS, 1951. SaltWater Encroachment in Dade County, Florida. Information Circular No 9.
Note 3: Source: USGS, Delineation of Saltwater Intrusion in the Biscayne Aquifer, Eastern Dade County, Florida, 1995.
Note 4: Source: USGS, Delineation of Saltwater Intrusion in the Biscayne Aquifer, Eastern Dade County, Florida, 1995.

Figure 5.2-23. USGS Saltwater Intrusion Lines from 1951 through 2008.

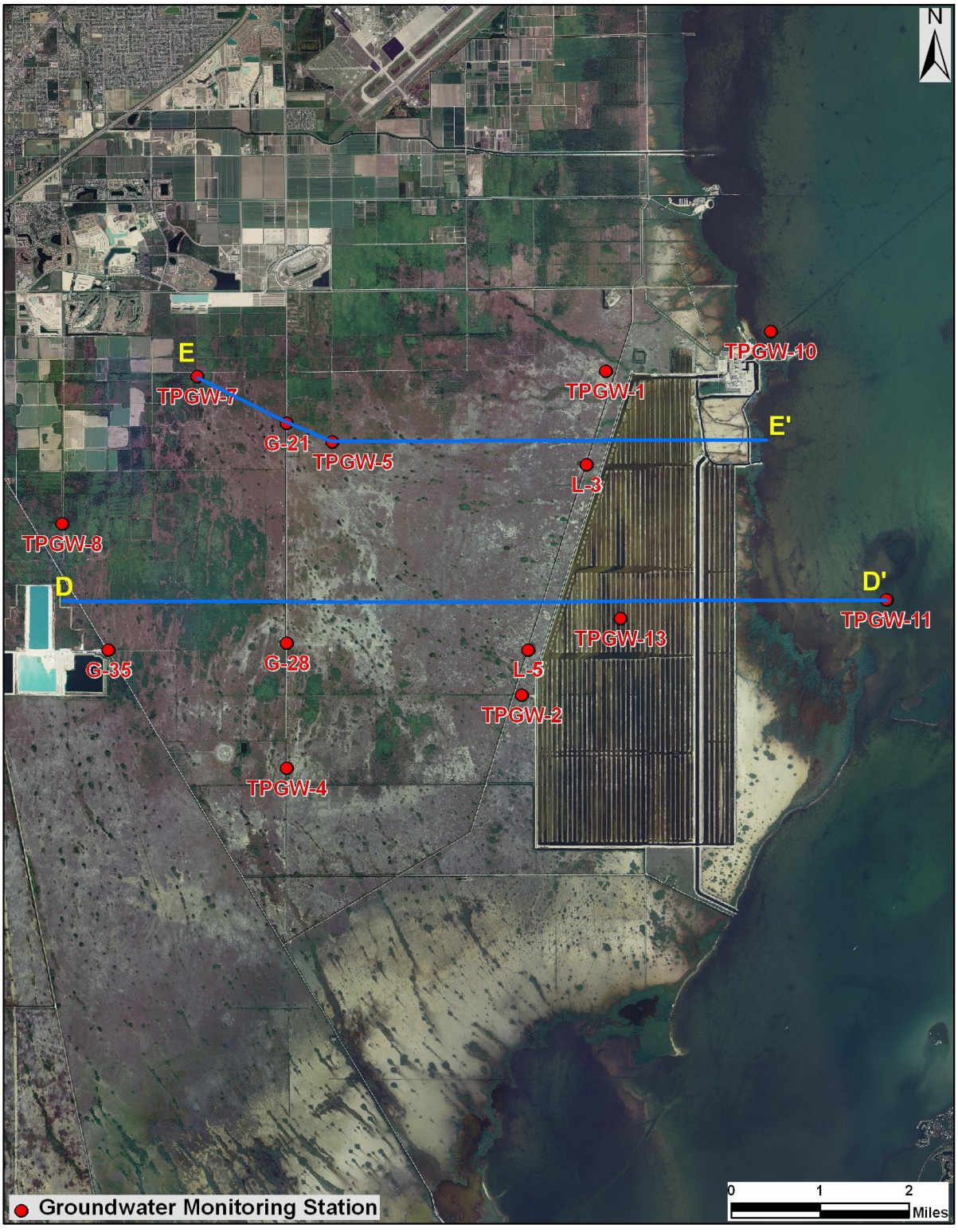


Figure 5.2-24. Locations of Specific Conductance and Tritium Cross Sections.

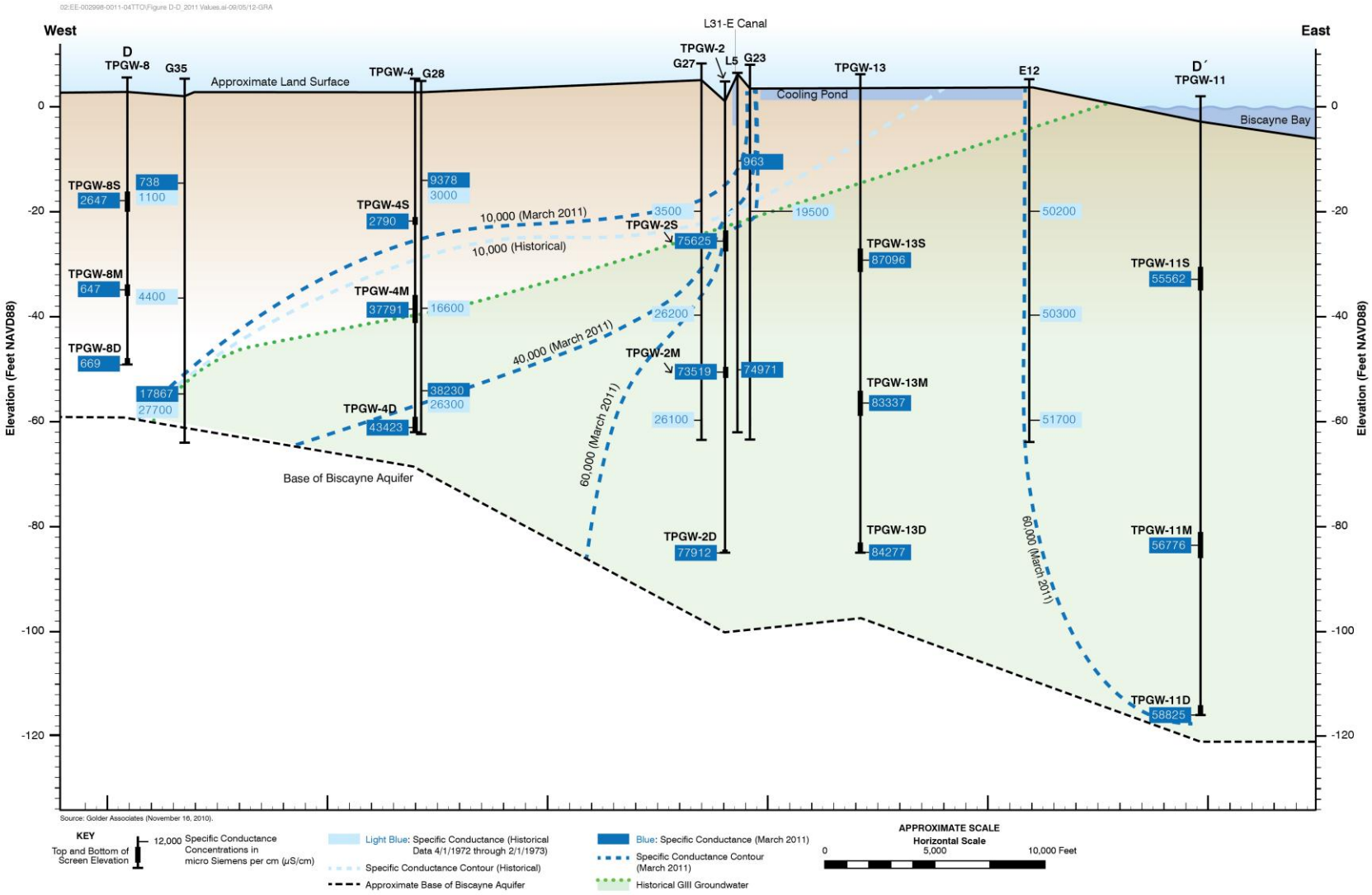


Figure 5.2-25. Specific Conductance Cross Section D-D, Historical and Current Concentration Isopleths.

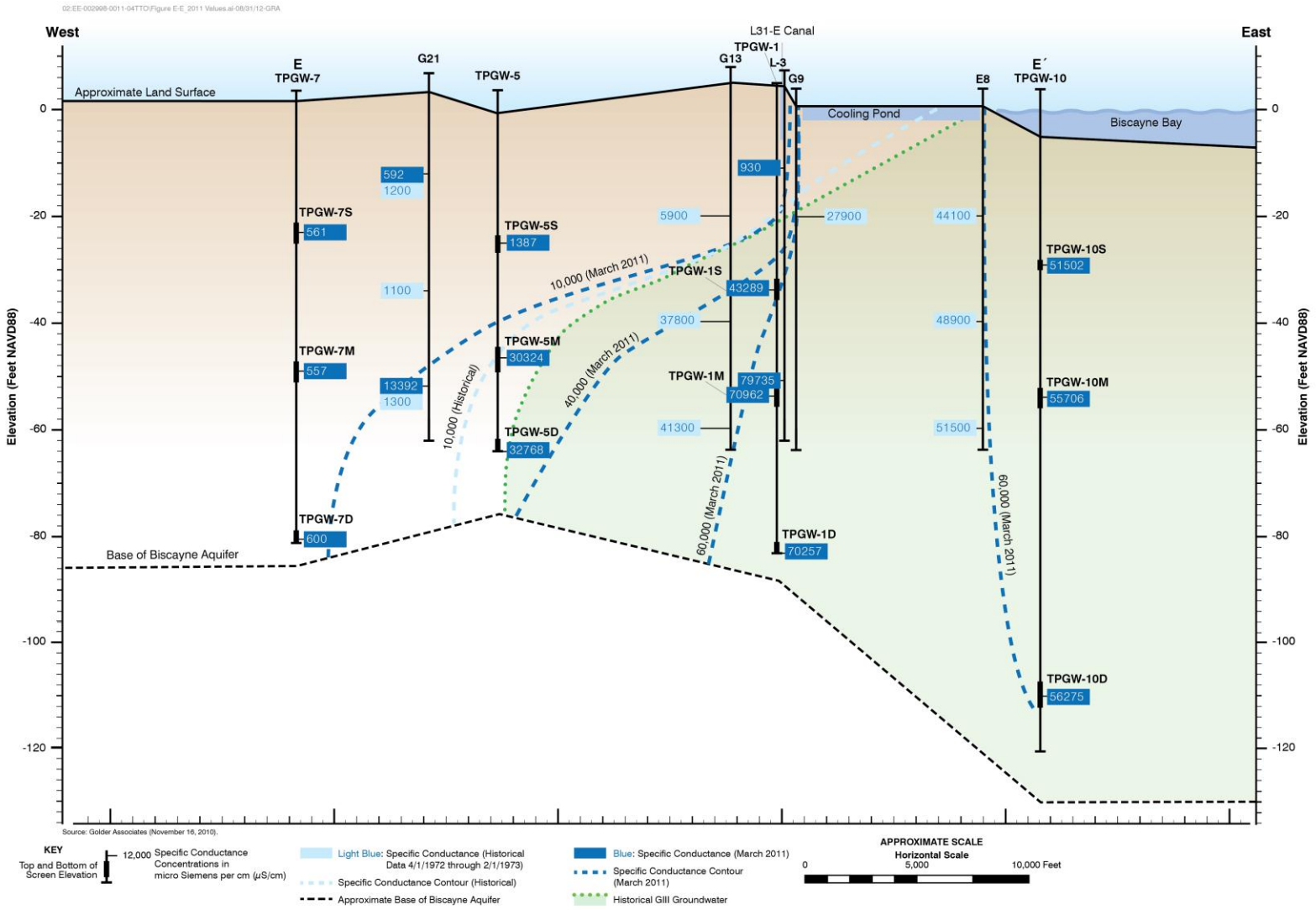


Figure 5.2-26. Specific Conductance Cross Section E-E, Historical and Current Concentration Isopleths.

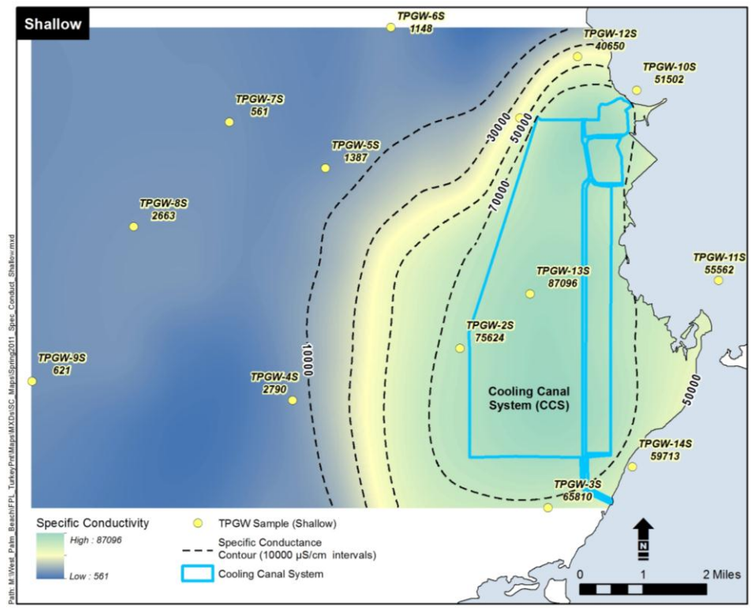


Figure 5.2-27. Plan View of Specific Conductance Isopleths, Shallow Zone Wells.

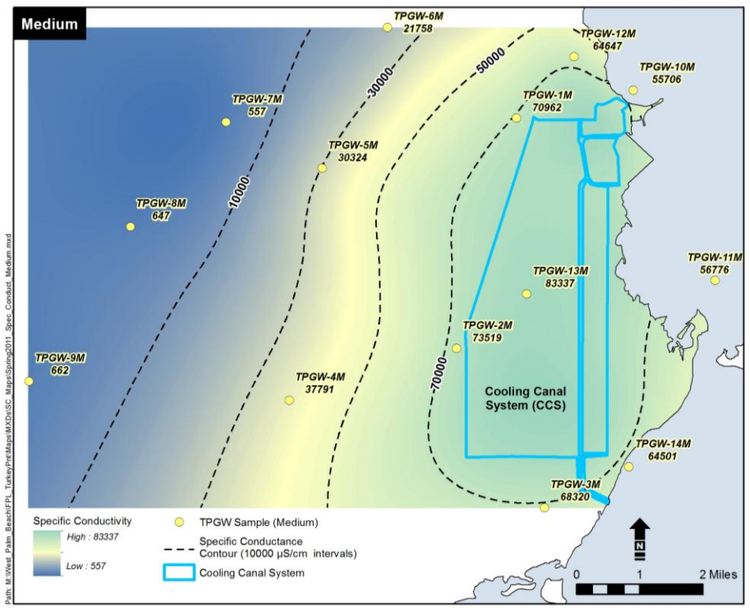


Figure 5.2-28. Plan View of Specific Conductance Isopleths, Intermediate Wells.

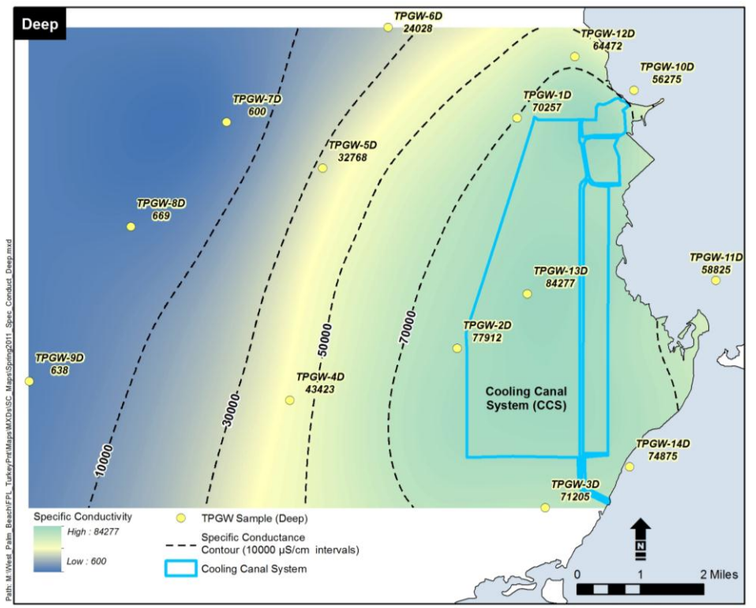


Figure 5.2-29. Plan View of Specific Conductance Isopleths, Deep Zone Wells.

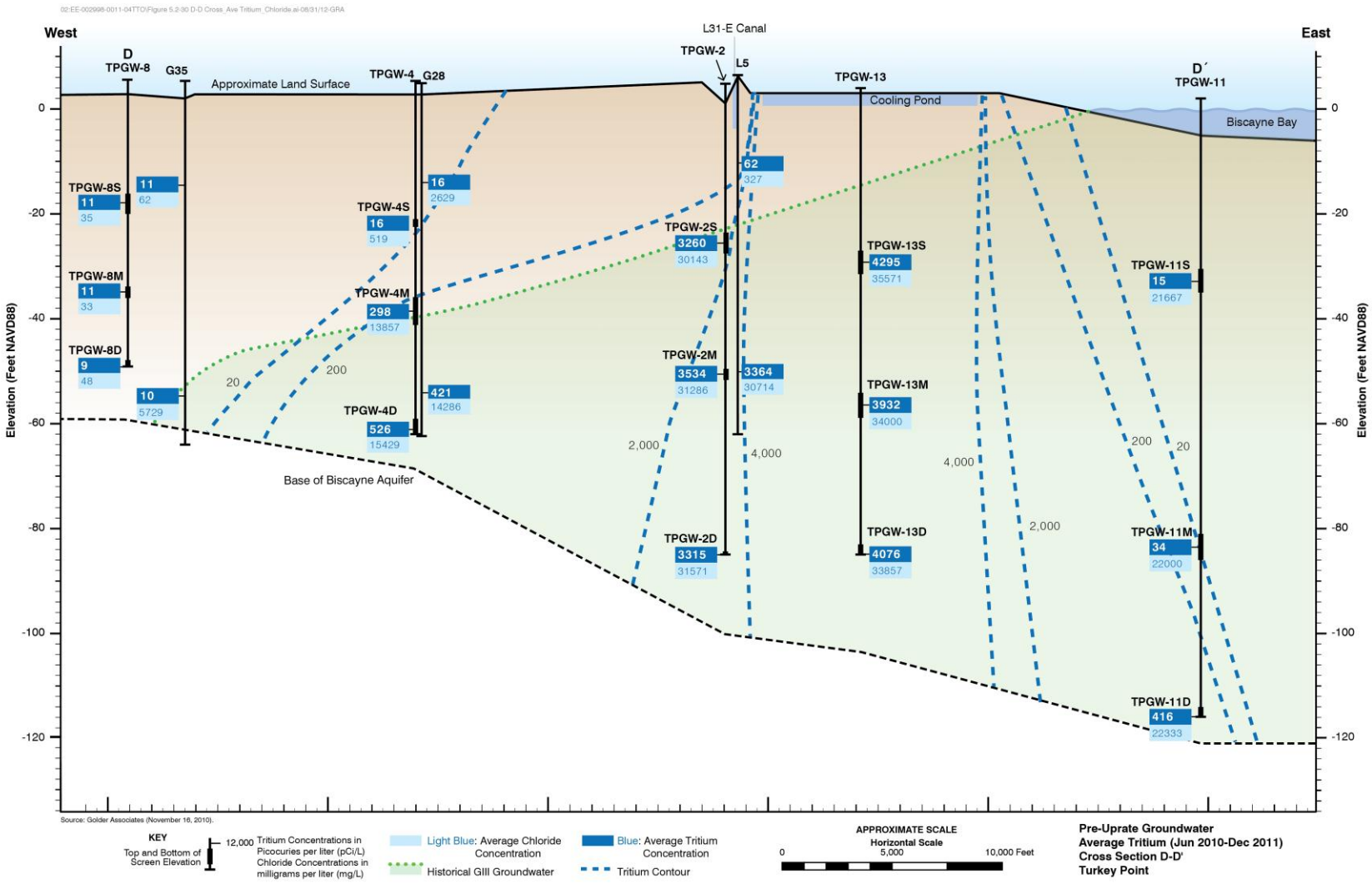


Figure 5.2-30. Tritium Cross Section D-D, Average Concentration Isopleths.

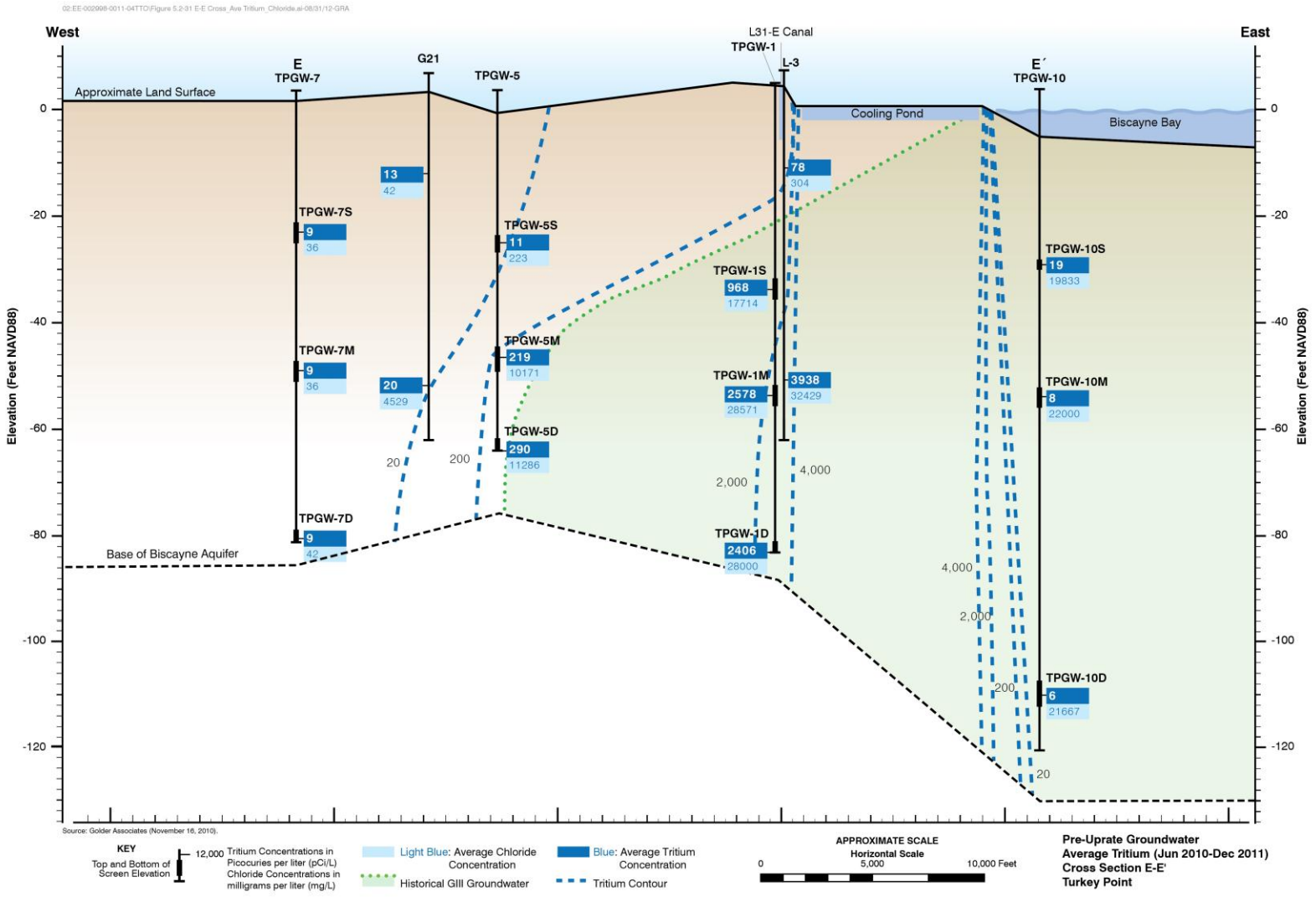


Figure 5.2-31. Tritium Cross Section E-E, Average Concentration Isopleths.

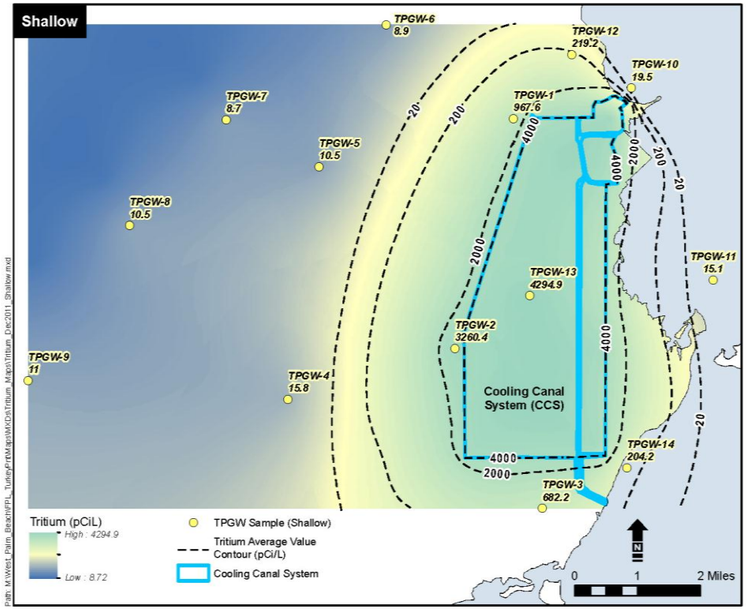


Figure 5.2-32. Plan View of Tritium Isopleths, Shallow Zone Wells.

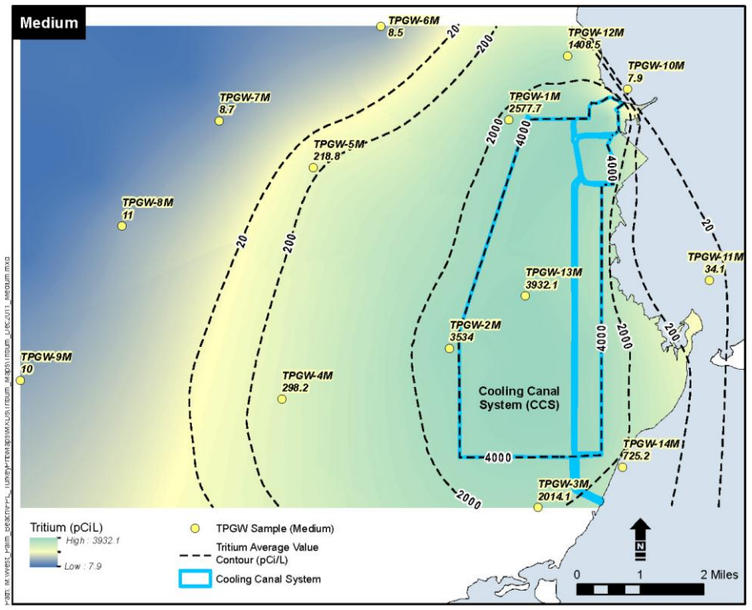


Figure 5.2-33. Plan View of Tritium Isopleths, Intermediate Zone Wells.

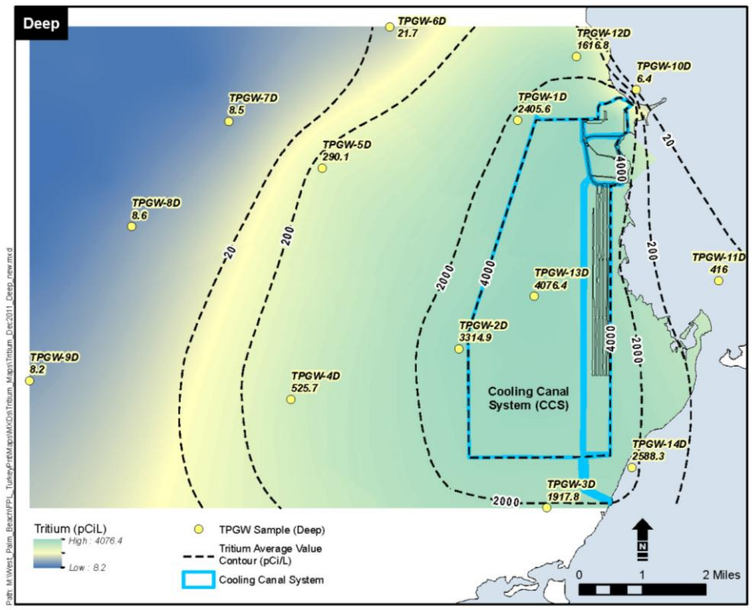


Figure 5.2-34. Plan View of Tritium Isopleths, Deep Zone Wells.



Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	10	3	4	5	20	22	0
M	1	5	15	14	6	14	5
D	13	18	23	19	33	32	14

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	237	262	275	238	73	208	242
M	1795	1654	1740	1680	1260	1630	1630
D	1562	1830	1570	1640	1490	1706	1520

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	2	3	1	14	18	12	12
M	3	7	14	13	-1	14	12
D	4	4	6	2	5	25	13

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	1581	456	937	810	1320	830	840
M	2816	2653	2535	2440	2510	2740	2350
D	2579	2272	2658	2560	1980	2560	2230

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	NA	22	11	18	24	19	23
M	NA	8	12	3	15	7	3
D	NA	2	8	8	16	3	1

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	6	4	18	23	15	4
D	14	17	18	24	25	22

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	59	80	94	95	89	44
D	4070	4040	3960	3730	4010	3440

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	10	20	0	0	16	32	0
M	293	175	218	222	156	224	243
D	188	343	295	283	288	319	315

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	NA	15	16	2	22	26	10
M	NA	27	28	34	26	43	48
D	NA	347	338	435	429	467	480

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	4	13	0	7	17	24	10
M	4	12	3	4	24	16	13
D	7	0	4	13	29	12	-2

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	89	65	80	113	5	54
D	3380	3320	3270	3438	3350	4040

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	4370	3554	3460	3800	4190	6390	4300
M	4179	3986	3980	4030	3800	3910	3640
D	4785	4390	4180	3830	3650	3850	3850

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	12	16	12	8	2	19
D	2	0	0	16	-2	12

Dep	O-10	J-11	M-11	J-11	S-11	D-11
S	7	14	31	17	17	8
D	436	440	411	410	430	424

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	3168	3075	2910	3030	3670	3310	3660
M	3328	3460	3250	3520	3690	3720	3770
D	3232	3522	3420	3320	3270	3100	3340

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	4	7	10	11	10	24	11
M	16	0	8	8	16	19	7
D	8	0	5	2	13	17	14

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	9	19	15	19	10	24	15
M	325	321	277	246	281	340	297
D	506	611	581	519	433	520	510

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	NA	228	230	247	186	175	159
M	NA	688	851	772	600	790	650
D	NA	2580	2640	2660	2490	2620	2540

Dep	J-10	S-10	D-10	M-11	J-11	S-11	D-11
S	854	852	823	236	620	770	620
M	1990	2178	2110	1940	1960	2130	1790
D	1990	1041	2053	1980	2070	2270	2020

Note: 1) J-10: Jun-2010; S-10: Sep-2010; D-10: Dec-2010; M-11: Mar-2011; J-11: Jun-2011; S-11: Sep-2011; D-11: Dec-2011.
2) Samples for wells L-5, L-31, G-21, G-28, and G-35 were taken at depths of 18 ft and 58 ft.
3) NA: Not Available.

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Tritium Samples Taken at 3 Depths (S: shallow; M: intermediate; D: deep)

Figure 5.2-35. FPL Monitoring Wells Potentially Influenced by CCS Water.

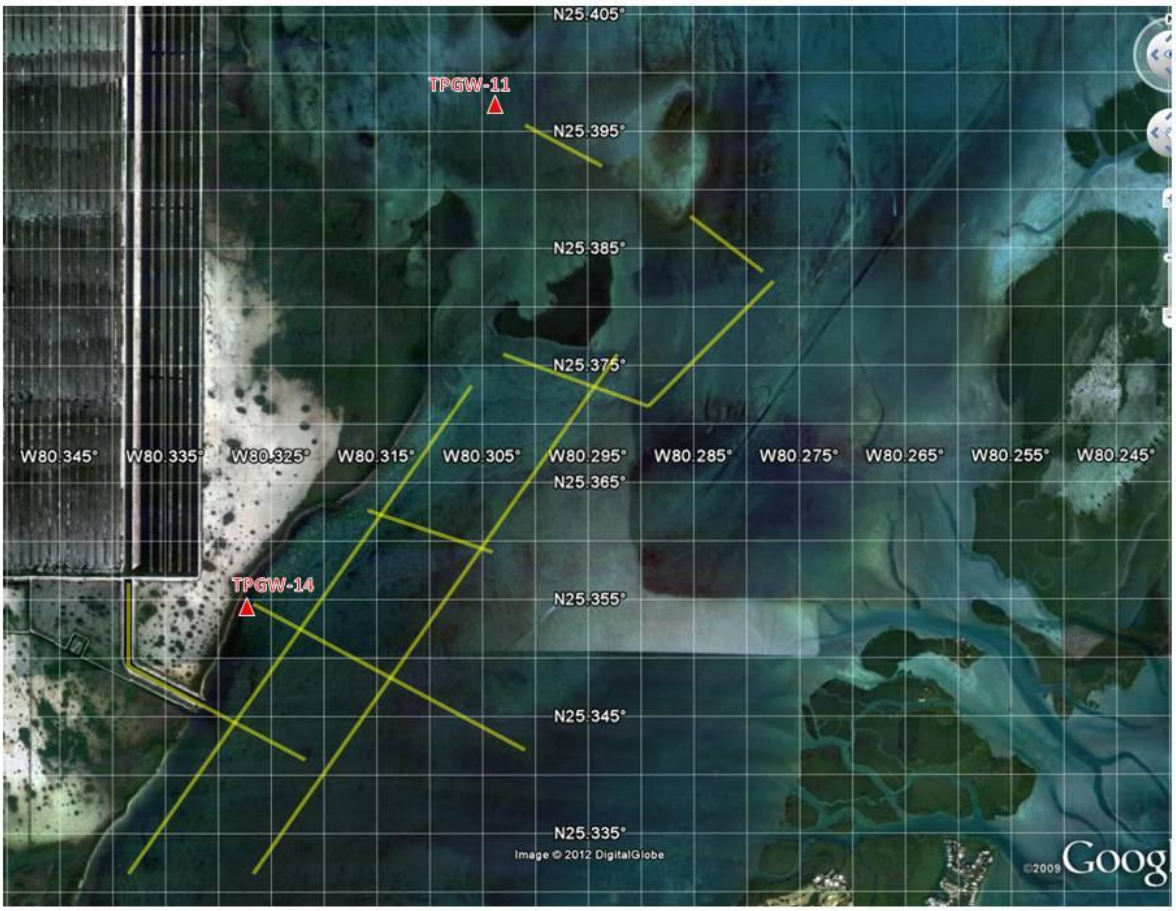
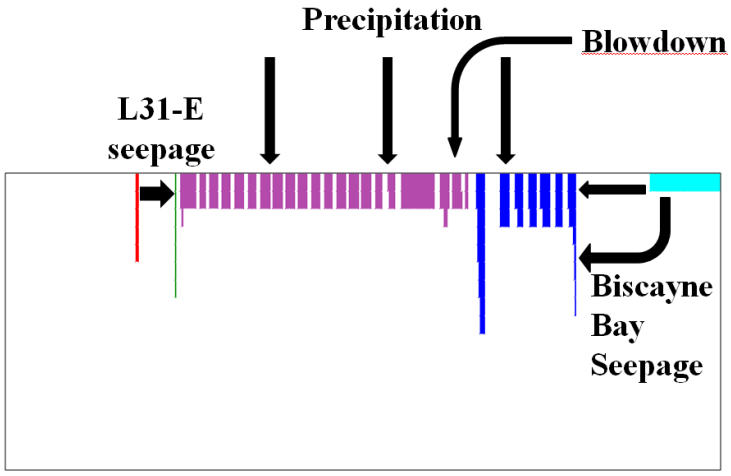
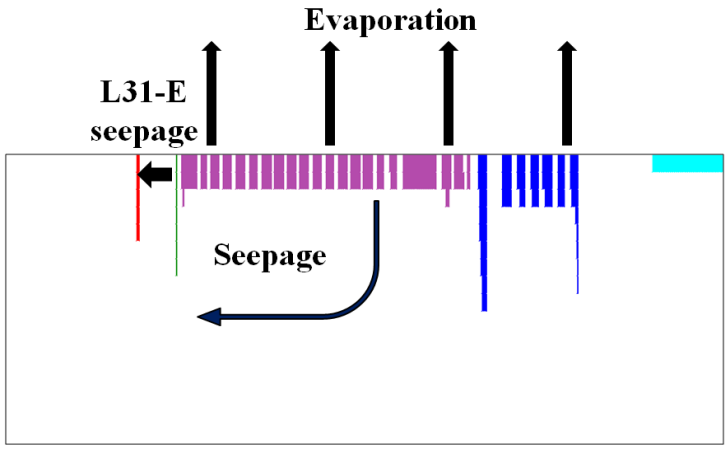


Figure 5.3-1. Transects for Biscayne Bay Pilot Geophysical Survey.



(A)



(B)

Figure 5.4-1. Flow (A) Into and (B) Out of the Proposed Control Volume, Shown in Cross-Section.

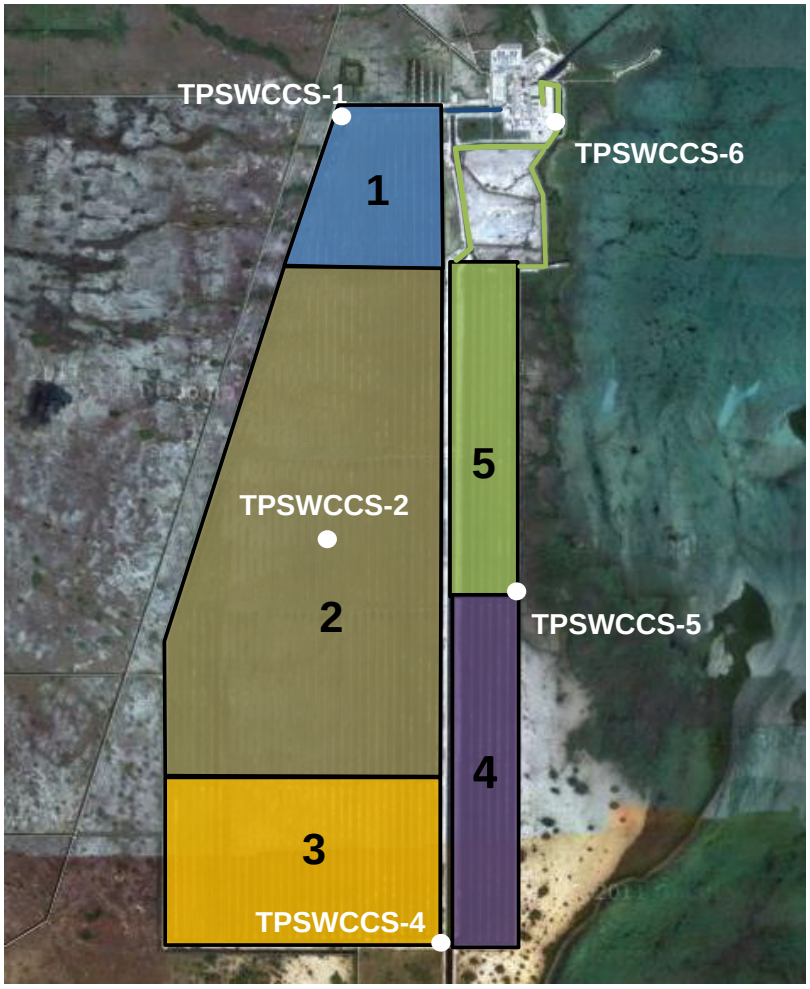


Figure 5.4-2. Locations of the Five Zones Where the Time-Varying Surface Areas and Storage Volumes are Known.



Figure 5.4-3. Locations of L-31E and ID Monitoring Stations; Conceptualized Seepage from L-31E into the ID is Shown.

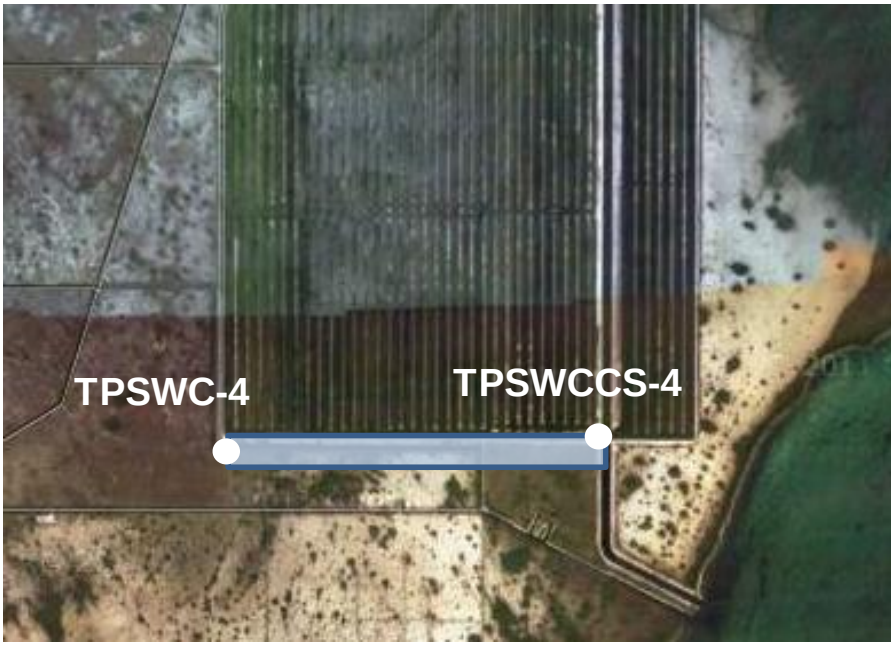


Figure 5.4-4. Locations of TPSWCCS-4 and TPSWC-4 Monitoring Stations; Conceptualized Seepage from Southern Collector Canal into the CCS is Shown.



Figure 5.4-5. Locations of TPSWCCS-5, TPSWCCS-6 and TPBBSW-3 Monitoring Stations; Conceptualized Seepage from Biscayne Bay into the CCS is Shown.

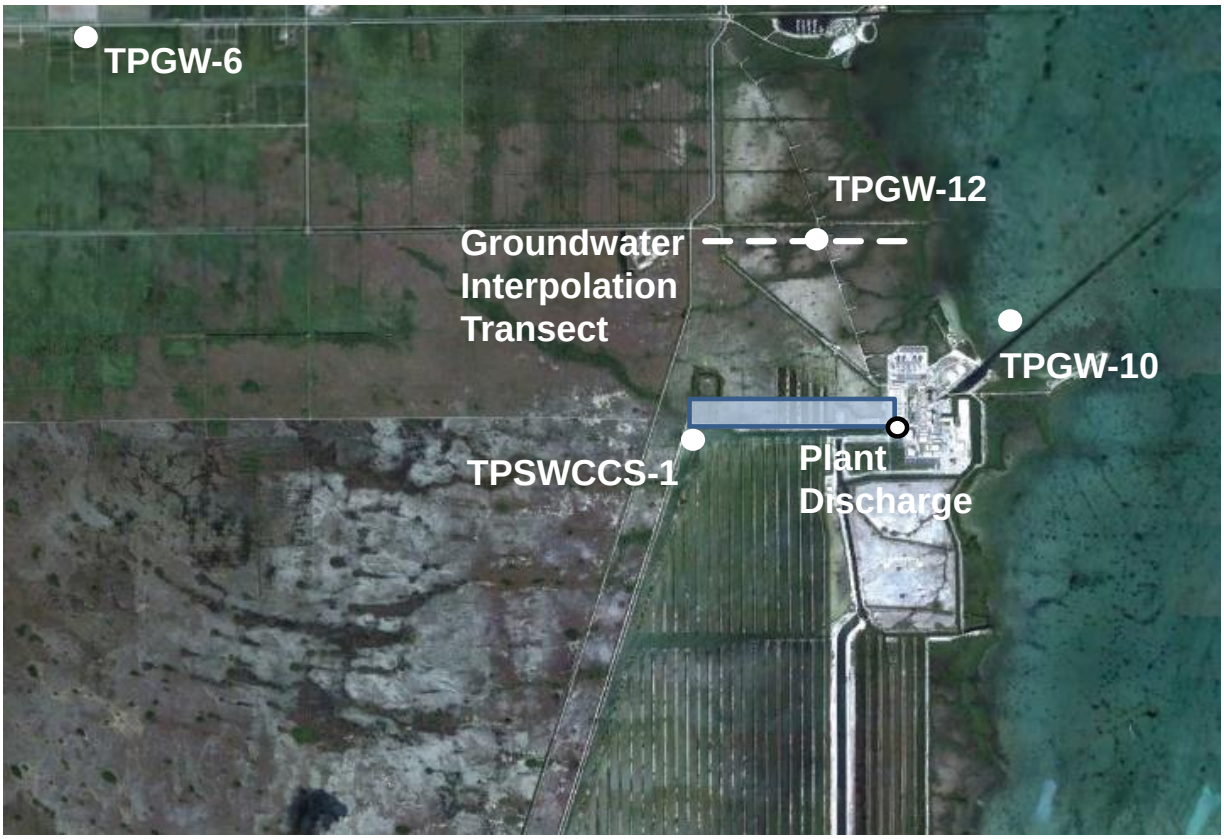


Figure 5.4-6. Locations of TPGW-6, TPGW-10, and TPGW-12 Shallow Groundwater Monitoring Stations, TPSWCCS-1 Surface Water Monitoring Station, and TPFM-1 Plant Outflow Meter; Conceptualized Seepage from the CCS into the Shallow Groundwater is Shown.

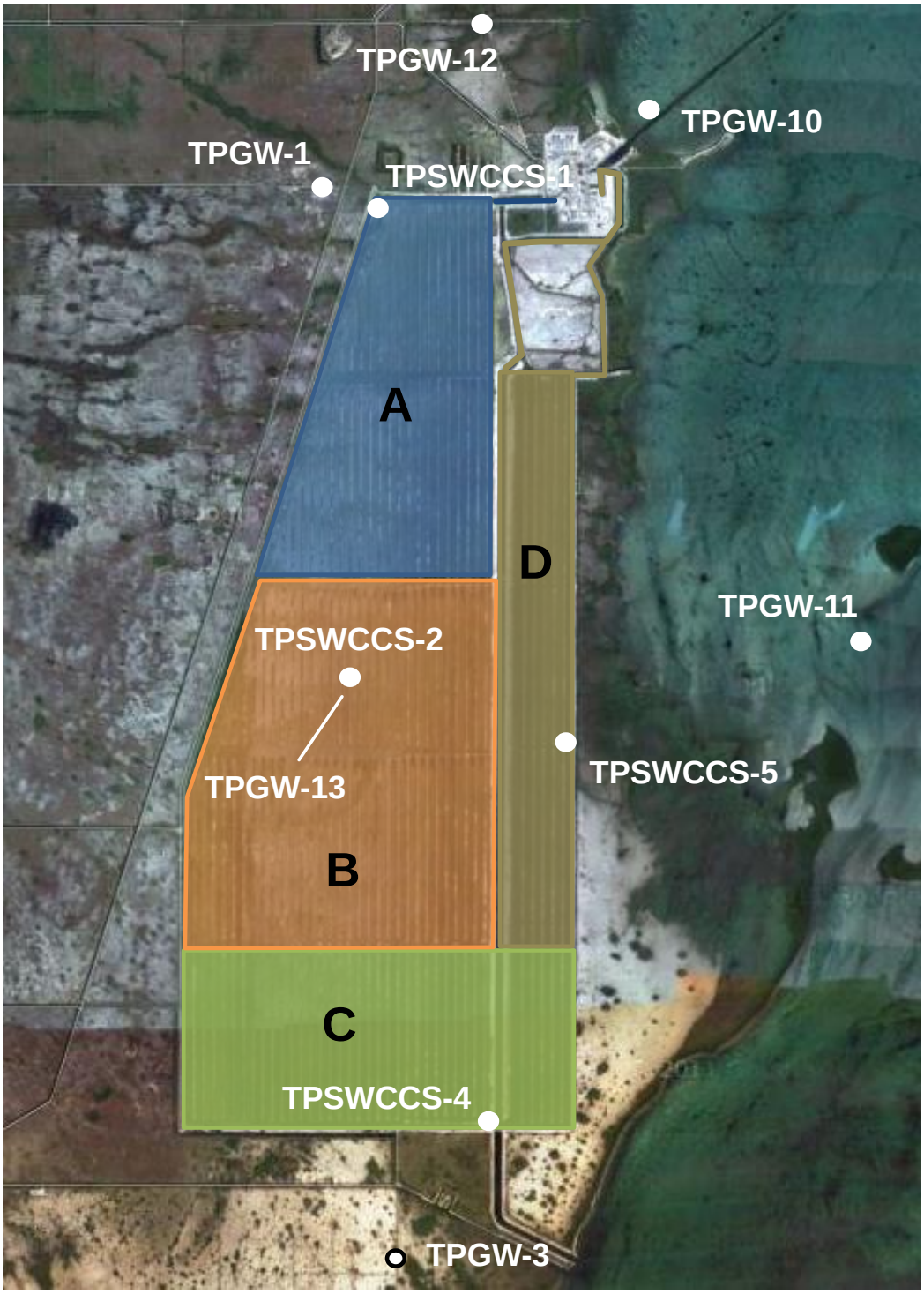


Figure 5.4-7. Locations of TPGW and TPSWCCS Monitoring Stations and Four Zones that Subdivide the Control Volume (Zone A Extends Eastward along the Northern Canal to Plant Outflow, Zone D Extends North to the Plant Intake).

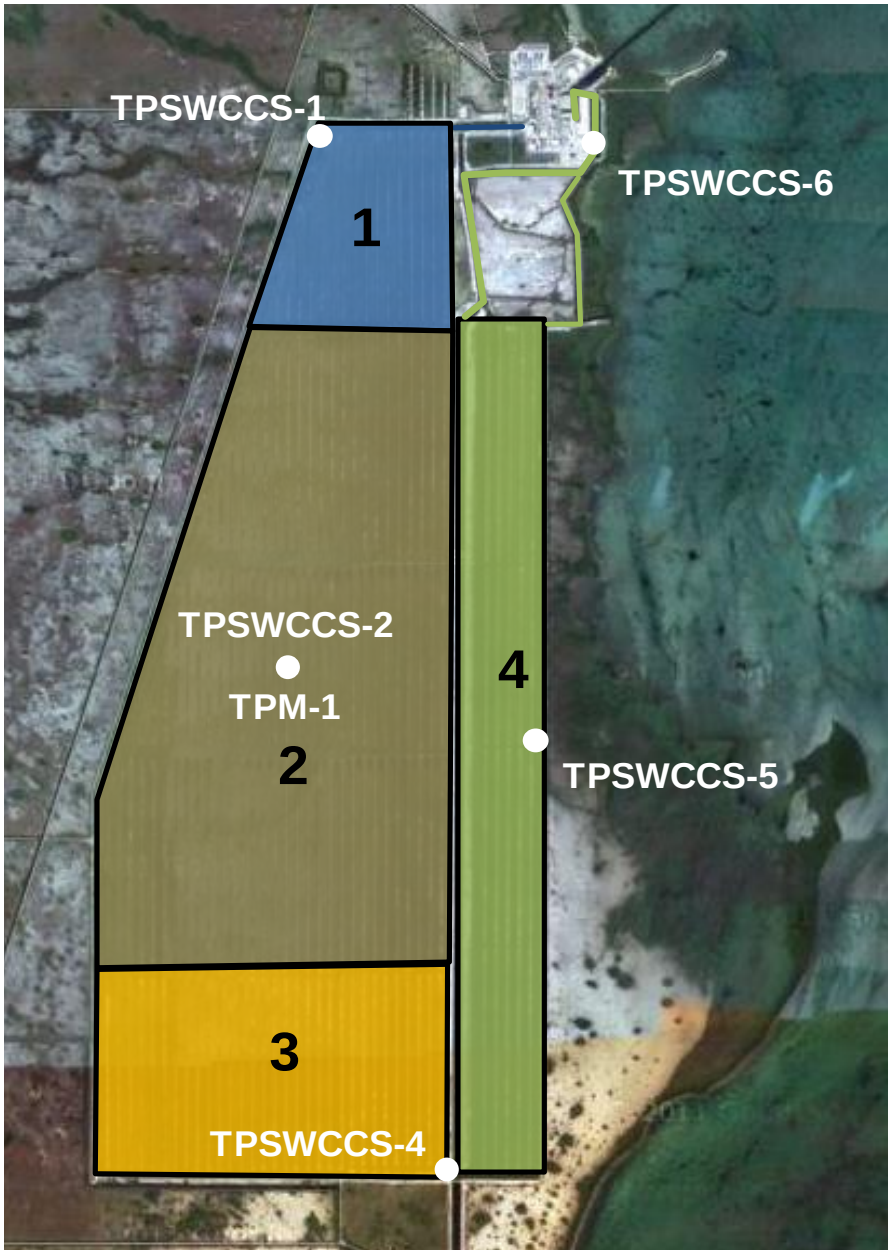


Figure 5.4-8. Locations of CCS Monitoring Stations, Meteorological Station TPM-1 and Four Zones that Subdivide the Control Volume (Zone 1 Extends Eastward along the Northern Canal to Plant Outflow, Zone 4 Extends North to the Plant Intake).

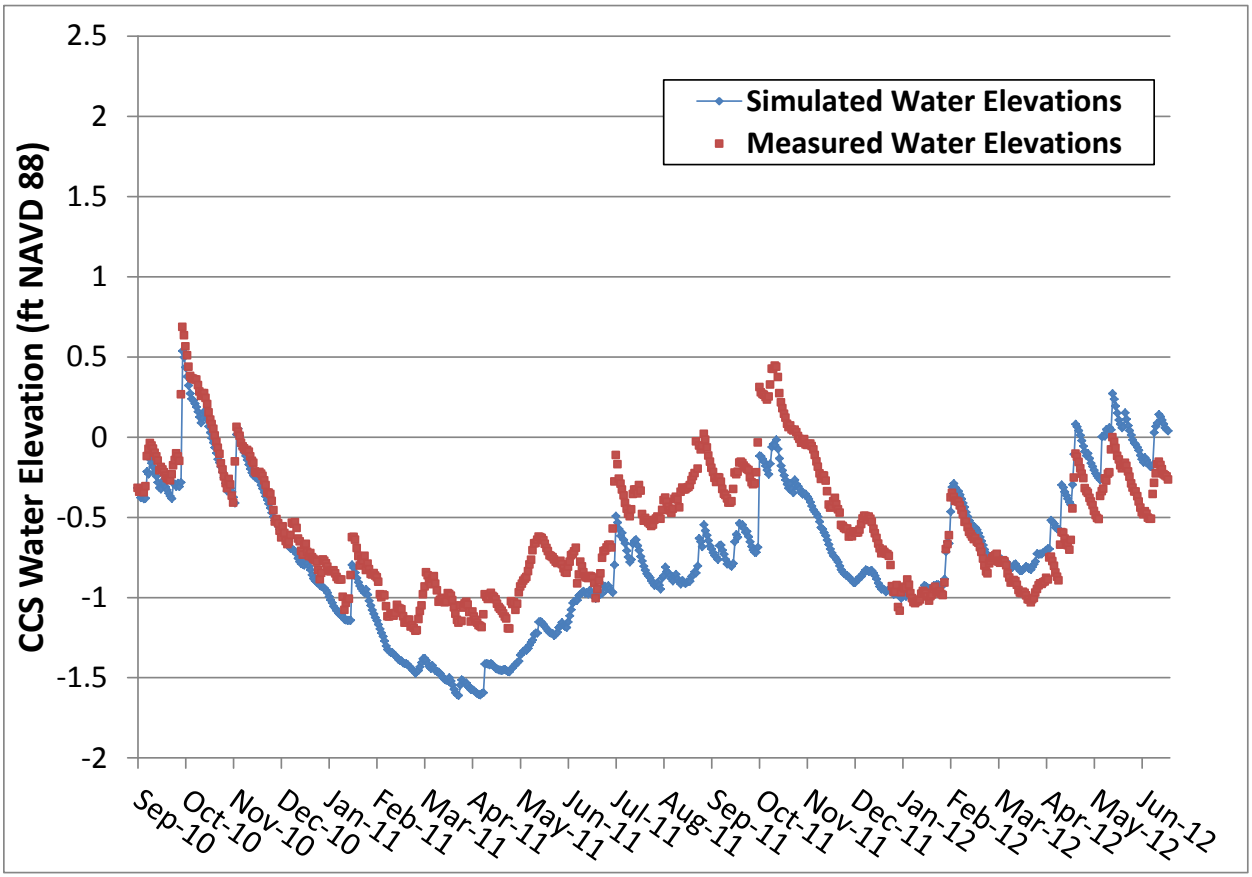


Figure 5.4-9. Modeled Versus Measured Water Elevations in the CCS over the 22-Month Period; Used to Validate the Conceptual Model and Calibrate the Water Balance Model to Temporal Trends in Water Elevation.

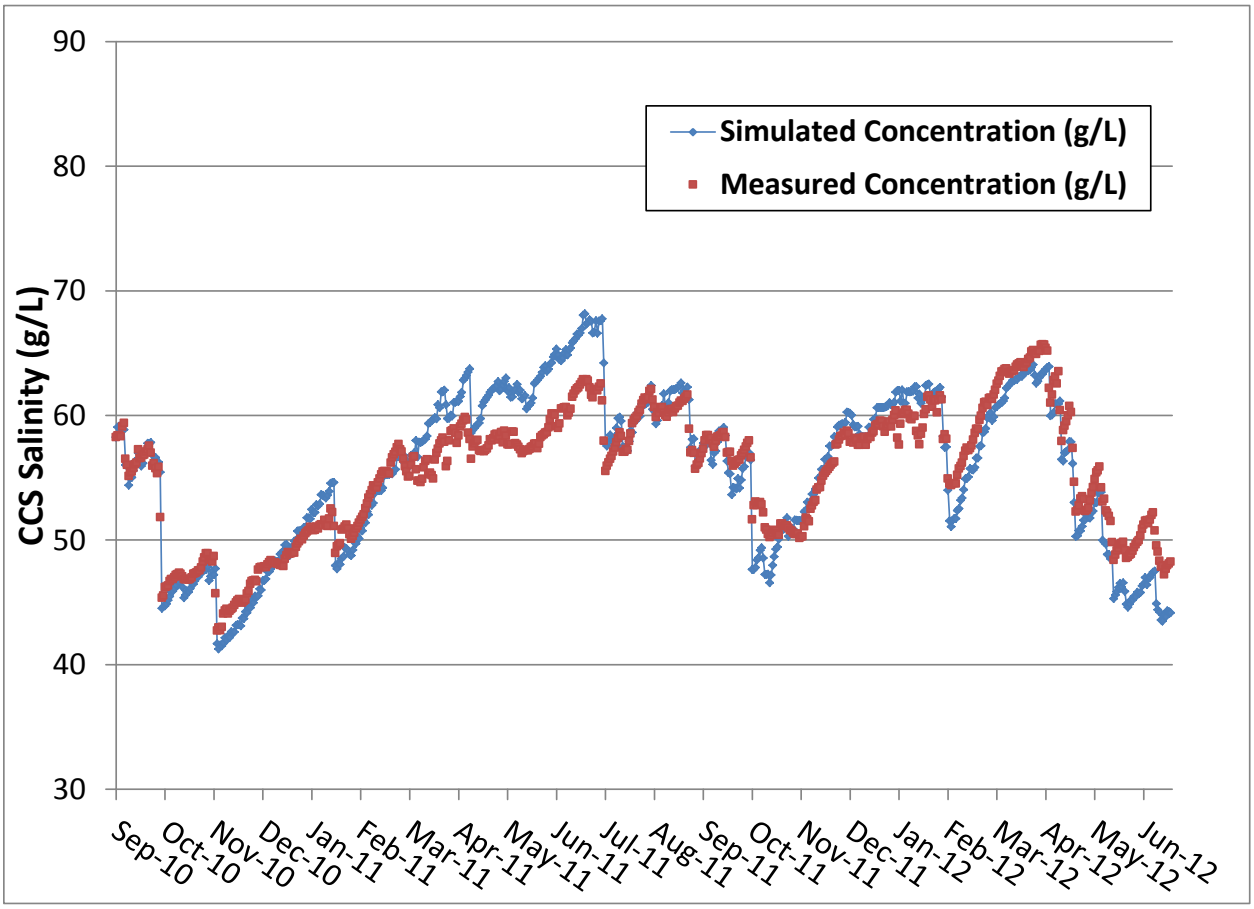


Figure 5.4-10. Modeled Versus Measured Salinities in the CCS over the 22-Month Period; Used to Validate the Conceptual Model and Calibrate the Salt Balance Model to Temporal Trends in Salinity.

6. INTERCEPTOR DITCH OPERATION

6.1 INTRODUCTION

FPL has prepared annual reports on the Interceptor Ditch (ID) operation and groundwater conditions (Annual Groundwater Monitoring Report) in compliance with the Agreement between FPL and the SFWMD, dated July 15, 1983 (the Agreement). The Agreement outlined the criteria for operating the ID pumps and the groundwater monitoring including groundwater levels, conductivities, and temperatures in wells L-3, L-5, G-21, and G-28. Also, surface water levels were required to be monitored in the L-31E, ID, and westernmost CCS canal (C-32) at five transects (A through E). The operation of the ID is designed to prevent any seasonal inland movement of the saltwater into the potable portion of the Biscayne aquifer west of the site. The saline groundwater is intercepted by the ditch and pumped back to the CCS during the dry season when natural freshwater hydraulic gradients are low and the potential for saltwater intrusion exists. Pumping the water from the ID to the CCS creates a seaward gradient east of the L-31E, thereby restricting inland movement of cooling canal water in the upper zones of the aquifer. The monitoring program provides water level information that triggers the need to pump the ID as well as assist in the evaluation of ID operations.

On October 14, 2009, the Agreement was modified to expand the monitoring program as part of the Units 3 and 4 Uprate Project and added well G-35 to the historical monitoring network. This modified agreement resulted in two annual reports being submitted: one for the ID operation/groundwater monitoring and one for the Units 3 and 4 Uprate monitoring. On August 2, 2012, FPL and SFWMD agreed to consolidate the annual ID reporting into the Turkey Point Plant Annual Report. Combining the reports helps improve the efficiency and consistency of reporting and storage of data.

The information presented in this section pertains to the operation of the ID from June 1, 2011 through May 31, 2012 and includes the same type of information as presented in previous ID operation reports (i.e., Golder Associates Inc. 2010, 2011b). For consistency, the focus of this section is the historical L and G wells and the operation of the ID. Figure 6.1-1 shows the well locations and five surface water transects A through E. Information on wells installed as part of the Uprate Project can be found in Sections 2 and 3 of this report. Where appropriate, references to the data in these sections will be made.

6.2 OPERATIONAL OR STRUCTURAL CHANGES

FPL proposed a more conservative, revised operation procedure for the ID based on consideration of freshwater head equivalents for the surface water transects. The proposed

revisions were submitted to the SFWMD in 2011. The SFWMD requested clarification of several aspects of the monitoring procedures and FPL provided further clarification in October 2012.

Per the 1983 Agreement, the criteria basically were as follows:

- If the L-31E water elevation minus the C-32 water elevation is greater than 0.20 ft then no pumping of ID is necessary, a seaward gradient exists.
- If the L-31E water elevation minus the C-32 water elevation is less than 0.20 ft, a natural seaward gradient may still exist if the L-31E water elevation minus the ID water elevation is greater than 0.30 ft.
- If a natural seaward gradient does not exist, create an artificial gradient by pumping the ID until the ID is maintained at an elevation of at least 0.30 ft lower than L-31E.

FPL followed the above criteria until December 2011. Since that time, FPL opted to follow the more conservative operational criteria which were as follows:

- If the L-31E water elevation minus the C-32 water elevation is greater than 0.30 ft then no pumping of ID is necessary, and a seaward gradient exists
- If the L-31E water elevation minus the C-32 water elevation is less than 0.30 ft, a natural seaward gradient may still exist if the L-31E water elevation minus the ID water elevation is greater than 0.30 ft and the density of the water in the ID is less than or equal to 1.012 g/cm3. If a density in the ID is higher than 1.012 g/cm3, a higher elevation difference between L-31E and the ID is necessary and can be calculated by converting the surface water levels to freshwater head equivalents.
- If a natural seaward gradient does not exist, create an artificial gradient by pumping the ID until the ID is maintained at an elevation of at least 0.30 to 0.70 ft depending on the density of the ID water.

The primary change in operation is the increase in the L31E – C32 criteria and the consideration of variable density effects in the ID.

The operation of the ID pumps is based on water level readings at each of the five surface water transects. Traditionally, FPL has taken manual water level readings at least once every week during the dry season and at least twice a month during the wet season (Appendix M). When the Uprate Monitoring Plan was approved by the Agencies, automated stations were installed at Transects A, C, and E. As discussed in Section 2, these stations report data at 15-minute intervals and typically transmit by telemetry to a database every day. FPL is still going out at least once every week at each transect during the dry season, and at least twice per month during the wet season, to manually record water levels but is using the automated data to determine if they need to visit the sites more frequently and operate the ID pumps (Appendix M).

FPL has noted that over the last two dry seasons the transects which most often trigger ID pumping have changed from the northerly transect A to the southerly transects D and E. This has occurred since an earthen plug was installed by the SFWMD between Transects A and B in

L-31E. The plug holds back water north of it in L-31E; this keeps L-31E transect A water levels higher but adversely lowers L-31E water levels south of the plug. Since one of the primary criteria for pumping is controlled by maintaining higher water levels in L-31E, the plug is affecting the ID pumping, possibly in an adverse way by requiring more pumping. FPL has made the SFWMD aware of the situation and will discuss this further with the SFWMD.

6.3 Meteorological Conditions

Meteorological data are set forth in Section 2.4 of this report and include data collected from TPM-1 and a number of other rainfall gauges installed around the project area. Daily rainfall data have been traditionally recorded by SFWMD at structure S-20 located along the L-31E. Figure 6.3-1 shows the monthly rainfall at S-20F and TPM-1 for the ID reporting period from June 2011 through May 2012 and compares them to historical averages (1968 to 2011) at S-20F.

The rainfall measured for the 2011-2012 monitoring period was above the 1968 to 2011 average for the area for Station S-20F. Also, rainfall at TPM-1 was higher than at the S-20F station for the June 2011 through May 2012 time period. The rain gauge at structure S-20F recorded 54.28 inches of precipitation from June 2011 to May 2012, while 70.80 inches of rain was recorded at TPM-1. The historical average at S-20F is 46.03 inches.

As shown on Figure 6.3-1, the rainfall distribution for this past year was concentrated in the months of July through October in 2011 with additional heavy rainfall totals in February, April, and May 2012. February and April are traditionally designated as part of the dry season and June is typically designated as part of the wet season. During an average year, approximately 74% of the precipitation occurs during the wet season with the remainder occurring during the six-month-long dry season (November to April). During this past year, approximately 70% of the annual rainfall occurred during the wet season at S-20F and TPM-1,

The 2011 hurricane season produced no significant storms during the monitoring period.

6.4 WATER QUALITY AND WATER LEVEL RESULTS AND DISCUSSION

6.4.1 Groundwater Levels

Groundwater levels are manually measured and samples are collected quarterly in the historical wells L-3, L-5, G-21, G-28, and G-35. Prior to March 2011, these levels were measured near the start of July, October, January, and April. However, since March 2011, the measurements and samples are collected in June, September, December, and March to align the ID monitoring efforts with the Uprate monitoring efforts.

Figure 6.4-1 shows the groundwater levels measured during the period from June 2011 through March 2012 and the maximum and minimum levels recorded during the historical period. The start dates for the historical period for each well are as follows:

- L-3 - April 1974
- L-5 - January 1976
- G-21 - April 1972
- G-28 - April 1972
- G-35 - April 1972

The historical period for wells L-3, L-5, G-21, and G-28 was extended to include present data for this report. Data were not recorded for well G-35 between 1983 and 2010; therefore, the historical envelope for this well covers a limited period. Since sampling is now being taken one month later than previously conducted, the historical maximum and minimum may not be entirely applicable but do still provide a frame of reference.

In June 2011, the water levels were far below historical maximum values. Well G-35 had water at its lowest level (-0.78 ft) since data began to be recorded at this site. The other four wells had water levels from approximately 0.7 to 1.7 ft above their historical minimums and, with the exception of L-5, had water levels within a few tenths of a foot to those found in G-35. L-5 had the highest water levels (-0.19 ft NAVD 88) in June 2011. For the events in September 2011, December 2011, and March 2012, the water levels were much higher with the L-3 and L-5 water levels ranging between -0.1 and 0.5 ft NAVD 88 and the G-21 and G-28 water levels ranging between 0.1 and 1.1 ft NAVD 88. Well L-5 showed the least amount of variability. The water levels in G-35 showed the greatest variability and quickly rebounded with the onset of the rains in late June and July 2011. For the remaining three monitoring periods, the water levels in G-35 ranged from 1.5 to 2.25 ft NAVD 88 and came within several tenths of a foot to the historical maximum. Except for the water levels in the L-5 well in June 2011, water levels in the G-series wells were higher than those in the L-series wells.

6.4.2 Vertical Groundwater Temperature Profiles

Groundwater temperatures are measured on a quarterly basis at 1-ft intervals throughout the water column in L-3, F-5, G-21, G-28, and G-35. For this monitoring period, temperatures were recorded in June 2011, September 2011, December 2011, and March 2012. Figures 6.4-2 through 6.4-6 show the temperature profile with depth and are compared with the historical envelope for each well where available. As reported by Golder Associates Inc. (2011b), the historical envelope represents both the highest and lowest temperatures recorded during the period from July 1981 through June 1991. The historical period represents the time during which the CCS came to equilibrium, as first described in the 1990 Annual Report.

Well L-3 had only minor excursions (< 1°C) above the historical maxima for several depths intervals in June 2011 (-41 to -53 ft NAVD 88), September 2011 (-14 to -25 ft NAVD 88), and December 2011 (-20 to -25 ft NAVD 88). At L-5, the historical maxima was exceeded (less than 2°C) in the upper part of the aquifer in June 2011 (-12 to -14 ft NAVD 88) and September 2011 (-2 to -16 ft NAVD 88). Well G-21 temperatures were within historical values and well G-28 only exhibited one value above the historical maxima at the top of the water column (-5 ft) which

is suspected to be affected by the air temperatures. The temperature profile for G-35 is similar to G-28; however, a historical profile is not available.

6.4.3 Vertical Groundwater Chloride Profiles

The groundwater is measured for specific conductance at 1-ft intervals in the entire water column in all five wells. The specific conductance data are then converted to chloride values according to the procedures outlined in the Agreement. For this monitoring period, specific conductance values were measured in June 2011, September 2011, December 2011, and March 2012 and corresponding chloride values were calculated. Similar to the temperature profiles, chloride profiles have been developed and compared to historical envelopes when available (Figures 6.4-7 through 6.4-11). The historical envelope represents both the highest and lowest chloride levels recorded during the period from July 1981 through June 1991. The historical period represents the time during which the cooling canal system came to equilibrium, as first described in the1990 Annual Report. In the 2011 Annual Report for the ID, Golder Associates Inc. (2011b) stated the following:

"Continuing the trend first reported in the 2005 Annual Report, none of the upper level recorded chloride data reported are outside the respective historical occurrence envelopes, down to the following elevations:

- L-3: -30 feet NAVD 88
- L-5: -23 feet NAVD 88
- G-21: -42 feet NAVD 88
- G-28: -14 feet NAVD 88

For the current reporting period, there are a few exceptions to the above statement. At L-3, calculated chloride values began to exceed the historical envelope in September 2011 at -15 ft NAVD 88 and in December 2011 and March 2012 at depths between -25 to -30 ft NAVD 88. Also at L-5 and G-21, one or two events have calculated chloride values at -22 and -41 feet respectively which is a foot higher than reported above by Golder Associates Inc. (2011b). At deeper depths, the chloride values exceed historical envelopes established for L-3, L-5, G-21, and G-28. The highest values are found at L-3 (39.3 ppt) and L-5 (42.1 ppt) at the bottom sample depth of approximately -53 ft NAVD 88. The lowest concentrations are at G-35 where the levels are minimal to about elevation -41 ft NAVD 88, below which they increase to about 7 ppt. Golder Associates Inc. (2011b) reports that the historical chloride levels at those depths in the 1970s ranged to about 10 ppt.

What is clear from the vertical profiles is the quick change in chloride values with depth indicating a fairly sharp transition in water quality. This transitional boundary moves up and down depending on seasonal variations. The profiles also show the presence of a shallow predominantly freshwater (per FDEP F.A.C. 62-302.200) lens in L-3, L-5, G-21, and G-35. The chloride values at G-28 indicate higher concentrations than found in the other wells in the upper 15 ft or so of the aquifer; however, that may be, in part, an artifact of the well construction. Unlike the other L and G series wells that have screen beginning near the surface, G-28 is hard-

cased to 16.6 ft below the top of casing. Thus, water measured from the surface to the downward extend of the hard casing is predominantly reflective of the water at quality at 16.6 ft below the top of casing.

6.4.4 Interceptor Ditch Operation and Transect Surface Water Levels

Surface water levels have been traditionally measured in L-31E, the ID, and C-32 as required by the ID operation procedure. The water levels are measured in these canals at pumping Lines A, B, C, D, and E, as shown previously on Figure 6.1-1. Water levels recorded during the past 12-month monitoring period are presented on Figures 6.4-12 through 6.4-16. The data for these figures are based on the manual readings by FPL staff at all five transect locations.

With a few exceptions, water levels in the L-31E were higher than in the C-32 at all transects. The exceptions include early June 2011 when the CCS water elevations at all locations were higher than L-31E water elevations. Also, for much of January 2012, the CCS water elevations in transects A, B, and C were the same as, or slightly higher than, the L-31E water elevations. Additionally, there were a few days in late March and/or early April when CCS water elevations in transects A, B, and C were the same as, or slightly higher than, the L-31E water elevations. Table 6.4-1 shows the range in head differences in L-31E and C-32 at each transect.

At all transects, the water elevations in the L-31E were higher than ID water elevations with the exception of one day on September 7, 2011. On that day, the water elevations at transects C, D, and E were reported to be less than 0.06 ft lower in the L-31E. Table 6.4-1 shows the range in head differences in L-31E and ID at each transect.

Operation of the ID pumps is shown on Figure 6.4-17, along with the measured rainfall. Table 6.4-2 shows how many days each pump operated each month. Table 6.4-3 presents data on when pumping was required by the water levels and when such pumping actually occurred.

6.4.5 Pressure Gradient Density Correction

In the previous annual report for the ID, Golder Associates Inc. (2011b) presented an analysis of the data to assess groundwater flow based on pressure gradients between L3 and G-21 and L-5 and G-28. The analysis was to address the Agencies' concerns over the fact that water level readings taken in wells and surface water bodies do not necessarily represent the actual pressure gradients within the ground or surface water because of differences in density and temperature between locations. Because surface water levels are being measured as proxies for groundwater levels in order to estimate groundwater movement, and groundwater levels are being estimated as proxies for pressure gradients, their analyses dealt with groundwater pressure gradients only.

This type of analysis lends itself favorably to the L and G series wells since they are screened across their entire (or nearly entire) depth, and temperature and specific conductance data are available at 1-ft intervals. This is important since the temperature and specific conductance do not vary linearly with depth. The temperature and specific conductance data can be used to calculate a density at each measurement point.

Using specific conductance and temperature data collected from September 2011 sampling episode, the water densities over depth for wells L-3 and G-21 have been calculated and are plotted on Figure 6.4-18. Based on the densities shown on Figure 6.4-18, the pressure over depth (pressure gradient) for wells L-3 and G-21 for the September 2011 sampling event has been calculated and is shown in Figure 6.4-19. The data shown on Figure 6.4-19 indicate that the pressure gradient at well G-21 is slightly higher than that at well L-3 from the surface down to about elevation -35 ft NAVD 88, below which that gradient is slightly higher at L-3 than at G-21. Because the pressure gradients are very close in value, it is easier to see the difference when plotted, as shown on Figure 6.4-20 which illustrates the pressure excess or deficit between the G and corresponding L series wells.

Similar analyses have been performed for wells G-21 and L-3 during the March 2012 sampling event (Figure 6.4-21) for well G-28 versus well L-5 during the September 2011 sampling episode (Figure 6.4-22) and for well G-28 versus well L-5 during the March 2012 sampling episode (Figure 6.4-23). In three of the cases examined (G-21 and L-3 in September 2011, G-28 and L-5 in September 2011, and G-28 and L-5 in March 2012), the groundwater gradient is seaward in the upper levels of the aquifer, down to about elevation -35 ft NAVD 88 for well G-21 versus well L-3, and down to about elevation -43 to -33 ft NAVD 88 for well G-28 versus well L-5. The other case (G-21 and L-3 in March 2012) did not show a seaward gradient. However, a review of the water levels in the ID during that sampling event revealed a seaward gradient from L-3 to the ID. The recorded NAVD 88 water elevation in L-3 on March 6, 2012, was -0.13 ft; the automated measurement from the ID at TPSWC-1 and TPSWC-2 were -0.35 and -0.29 ft, respectively; and the ID water had a density of fresh water. While not plotted, the water levels in June 2011did not indicate a seaward gradient from G-21 to L-3 and from G-28 to L-5. Again, the ID water levels are lower than the L-series wells which resulted in a seaward gradient from the L wells to the ID. On June 7, 2011, the recorded NAVD 88 water elevation in L-3 was -1.20 feet and L-5 was -0.3 ft. At the time the L-series well groundwater measurements were recorded, the ID water elevations in TPSWC-1, TPSWC-2, and TPSWC-3 were much lower with NAVD 88 elevation levels of -1.84, -1.73, and -1.38 ft, respectively. While the ID had densities ranging from 1.012 to 1.028 g/cm3, the elevation difference between the L-series wells and the ID was large enough to counter any effects of density. The operation of the ID still maintains a seaward gradient from the L-31E and/or the L-series wells in the upper levels of the aquifer.

TABLES

Table 6.4-1. Range in Surface Water Head Differences (ft)

Date	Line A		Line B		Line C		Line D		Line E	
	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID
6/2/11	-0.64	0.74	-0.66	0.56	-0.74	0.49	-0.53	0.48	-0.27	0.31
6/6/11	-0.54	0.44	-0.62	0.27	-0.59	0.23	-0.33	0.19	-0.10	0.17
6/7/11										
6/8/11										
6/9/11	-0.64	0.96	-0.74	0.76	-0.82	0.50	-0.64	0.42	-0.39	0.17
6/13/11	-0.33	0.48	-0.40	0.30	-0.38	0.25	-0.15	0.17	0.04	0.14
6/14/11										
6/15/11										
6/16/11	-0.31	0.79	-0.41	0.57	-0.44	0.56	-0.20	0.54		
6/20/11	-0.18	0.58	-0.27	0.37	-0.18	0.36	0.03	0.33	0.24	0.32
6/27/11	-0.21	0.50	-0.28	0.31	-0.21	0.31	0.08	0.24	0.44	0.24
6/28/11										
6/29/11										
6/30/11	0.17	0.75	0.09	0.56	0.23	0.60	0.49	0.67	0.73	0.63
7/5/11	0.26	0.60	0.22	0.42	0.27	0.45	0.47	0.41	0.65	0.39
7/18/11	0.66	0.72	0.55	0.49	0.62	0.46	0.82	0.44	1.00	0.43
8/2/11	0.69	0.63	0.60	0.44	0.65	0.43	0.65	0.43	1.07	0.38
8/17/11	0.82	0.56	0.72	0.40	0.78	0.37	0.99	0.35	1.09	0.35
9/7/11	0.33	0.26	0.31	0.07	0.25	-0.01	0.38	-0.07	0.39	-0.06
9/8/11										
9/9/11	0.30	0.48	0.22	0.27	0.22	0.22	0.37	0.07	0.50	0.02
9/10/11										
9/11/11										
9/12/11	0.32	1.00	0.30	0.80	0.34	0.76	0.47	0.32	0.57	0.29

Table 6.4-1. Range in Surface Water Head Differences (ft)

Date	Line A		Line B		Line C		Line D		Line E	
	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID
9/19/11	0.55	0.45	0.50	0.28	0.53	0.27	0.69	0.25	0.82	0.22
10/3/11	0.82	0.47	0.70	0.28	0.76	0.29	0.88	0.26	0.97	0.25
10/17/11	0.86	0.36	0.76	0.18	0.75	0.18	0.79	0.17	0.78	0.14
11/4/11	0.54	0.26	0.44	0.07	0.51	0.09	0.59	0.04	0.62	0.02
11/17/11	0.50	0.33	0.40	0.16	0.49	0.17	0.62	0.18	0.72	0.16
12/1/11	0.55	0.37	0.47	0.19	0.51	0.17	0.65	0.17	0.74	0.16
12/5/11	0.49	0.33	0.37	0.13	0.44	0.12	0.57	0.10	0.67	0.09
12/8/11	0.39	0.36	0.30	0.20	0.38	0.18	0.55	0.14	0.68	0.12
12/9/11										
12/10/11										
12/11/11										
12/12/11	0.31	0.81	0.30	0.65	0.28	0.34	0.37	0.22	0.57	0.17
12/14/11	0.39	0.37	0.30	0.16	0.34	0.16	0.49	0.12	0.53	0.09
12/15/11	0.32	0.77	0.26	0.58	0.27	0.31	0.42	0.16	0.50	0.18
12/16/11										
12/19/11	0.36	0.34	0.26	0.12	0.25	0.15	0.43	0.09	0.50	0.10
12/20/11	0.12	0.90	0.13	0.65	0.17	0.57	0.35	0.29	0.53	0.09
12/27/11	0.08	0.40	0.06	0.18	0.10	0.20	0.51	0.21	0.65	0.12
12/28/11	0.30	0.94	0.16	0.76	0.22	0.62	0.36	0.34	0.44	0.24
12/30/11	0.28	0.30	0.16	0.20	0.22	0.22	0.44	0.16	0.54	0.16
12/31/11										
1/1/12										
1/2/12	0.04	1.12	-0.04	0.90	0.06	0.78	0.26	0.42	0.40	0.38
1/4/12	0.03	0.47	-0.02	0.28	0.05	0.27	0.31	0.25	0.49	0.22

Table 6.4-1. Range in Surface Water Head Differences (ft)

Date	Line A		Line B		Line C		Line D		Line E	
	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID
1/5/12	-0.02	1.06	-0.11	0.85	-0.05	0.69	0.24	0.40	0.41	0.35
1/9/12	-0.01	0.45	-0.07	0.23	-0.01	0.27	0.28	0.22	0.43	0.21
1/10/12	-0.08	1.10	-0.16	0.90	-0.08	0.80	0.08	0.68	0.31	0.49
1/12/12	0.03	0.43	-0.05	0.25	0.06	0.31	0.30	0.25	0.45	0.24
1/13/12	0.02	1.08	-0.06	0.76	0.06	0.64	0.31	0.56	0.48	0.48
1/17/12	0.03	0.44	-0.05	0.26	0.07	0.31	0.31	0.25	0.51	0.25
1/18/12	-0.08	0.93	-0.11	0.69	0.01	0.45	0.28	0.34	0.50	0.34
1/20/12	0.05	0.41	-0.06	0.18	0.09	0.27	0.28	0.19	0.50	0.21
1/21/12										
1/22/12										
1/23/12	-0.16	1.26	-0.28	1.01	-0.23	0.89	-0.01	0.75	0.20	0.58
1/30/12	0.33	0.47	0.21	0.25	0.17	0.29	0.45	0.23	0.59	0.21
1/31/12	0.25	0.75	0.15	0.53	0.18	0.53	0.35	0.32	0.51	0.31
2/2/12	0.18	0.50	0.08	0.28	0.14	0.28	0.35	0.25	0.54	0.24
2/3/12	0.20	0.76	0.06	0.54	0.04	0.48	0.26	0.34	0.46	0.31
2/6/12	0.20	0.41	0.16	0.18	0.24	0.24	0.48	0.18	0.68	0.18
2/7/12	0.42	0.70	0.46	0.48	0.45	0.48	0.64	0.30	0.82	0.33
2/13/12	0.75	0.51	0.65	0.33	0.67	0.33	0.81	0.28	0.85	0.26
2/20/12	0.76	0.50	0.66	0.34	0.68	0.30	0.81	0.28	0.89	0.27
2/27/12	0.61	0.47	0.49	0.25	0.56	0.28	0.73	0.23	0.83	0.21
3/5/12	0.65	0.45	0.50	0.20	0.50	0.21	0.60	0.17	0.69	0.15
3/12/12	0.56	0.35	0.48	0.11	0.46	0.10	0.55	0.10	0.61	0.11
3/19/12	0.47	0.36	0.38	0.12	0.40	0.09	0.54	0.10	0.66	0.10
3/21/12	0.33	0.41	0.26	0.16	0.28	0.14	0.46	0.12	0.65	0.11

Table 6.4-1. Range in Surface Water Head Differences (ft)

Date	Line A		Line B		Line C		Line D		Line E	
	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID
3/22/12										
3/23/12	0.32	0.67	0.20	0.44	0.08	0.32	0.31	0.21	0.48	0.18
3/26/12	0.48	0.58	0.22	0.22	0.18	0.13	0.31	0.21	0.52	0.10
3/27/12										
3/28/12	0.20	0.59	0.12	0.42	0.08	0.29	0.21	0.19	0.42	0.16
3/29/12	0.14	0.60	0.04	0.48	-0.05	0.45	0.12	0.41	0.33	0.31
4/2/12	0.15	0.33	0.05	0.20	0.00	0.08	0.23	0.11	0.44	0.09
4/3/12										
4/4/12	-0.08	1.12	-0.16	1.01	-0.18	0.25	0.03	0.29	0.25	0.20
4/5/12	-0.01	0.41	-0.07	0.31	0.09	0.31	0.32	0.32	0.53	0.26
4/9/12	0.25	0.35	0.16	0.22	0.12	0.12	0.31	0.14	0.50	0.14
4/10/12										
4/11/12										
4/12/12	0.20	0.58	0.09	0.44	0.00	0.29	0.17	0.29	0.34	0.27
4/13/12	0.13	0.54	0.08	0.45	-0.02	0.30	0.14	0.30	0.35	0.40
4/14/12										
4/15/12										
4/16/12	0.19	0.50	0.12	0.37	0.20	0.37	0.30	0.38	0.52	0.36
4/18/12	0.18	0.38	0.11	0.22	0.11	0.17	0.25	0.17	0.43	0.17
4/19/12	0.07	0.73	0.06	0.60	-0.11	0.44	0.08	0.45	0.29	0.35
4/20/12	0.06	0.37	-0.01	0.25	0.00	0.17	0.16	0.16	0.38	0.16
4/23/12	0.74	0.53	0.64	0.38	0.68	0.42	0.74	0.37	0.82	0.37
4/30/12	0.76	0.20	0.67	0.16	0.70	0.21	0.64	0.25	0.64	0.24
5/7/12	0.85	0.43	0.73	0.31	0.82	0.32	0.88	0.30	0.97	0.31

Table 6.4-1. Range in Surface Water Head Differences (ft)

Date	Line A		Line B		Line C		Line D		Line E	
	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID	L31-C32	L31-ID
5/14/12	0.89	0.41	0.82	0.29	0.82	0.26	0.91	0.24	1.06	0.30
5/21/12	0.98	0.39	0.90	0.27	0.92	0.30	0.99	0.28	1.03	0.30
5/29/12	0.74	0.27	0.67	0.14	0.61	0.07	0.68	0.05	0.72	0.06

Table 6.4-2. Days of ID Pump Operation per Month

ID Pump	2011							2012			
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Mar	Apr	May
N1	3.0	0.0	0.0	2.9	0.0	0.0	8.0	7.4	0.0	0.0	0.0
N2	0.0	0.0	0.0	5.0	0.0	0.0	2.0	7.0	2.0	5.0	4.0
S1	7.4	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	7.9
S2	6.1	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.9	2.9

Table 6.4-3. Pumping Summary

Date	Pumping Required					Actual Pumping Performed
	Line A	Line B	Line C	Line D	Line E	
6/2/11		Yes				Yes
6/6/11			Yes	Yes	Yes	Yes
6/7/11	NA	NA	NA	NA	NA	Yes
6/8/11	NA	NA	NA	NA	NA	Yes
6/9/11		Yes			Yes	Yes
6/13/11			Yes	Yes	Yes	Yes
6/14/11	NA	NA	NA	NA	NA	Yes
6/15/11	NA	NA	NA	NA	NA	Yes
6/16/11		Yes				Yes
6/20/11		Yes				
6/27/11		Yes		Yes		Yes
6/28/11	NA	NA	NA	NA	NA	Yes
6/29/11	NA	NA	NA	NA	NA	Yes
6/30/11		Yes				Yes
7/5/11						
7/18/11						
8/2/11						
8/17/11						
9/7/11						Yes
9/8/11	NA	NA	NA	NA	NA	Yes
9/9/11						Yes
9/10/11	NA	NA	NA	NA	NA	Yes
9/11/11	NA	NA	NA	NA	NA	Yes
9/12/11						Yes
9/19/11						
10/3/11						
10/17/11						
11/4/11						
11/17/11						
12/1/11						
12/5/11						
12/8/11		Yes				Yes
12/9/11	NA	NA	NA	NA	NA	Yes
12/10/11	NA	NA	NA	NA	NA	Yes
12/11/11	NA	NA	NA	NA	NA	Yes

Table 6.4-3. Pumping Summary

Date	Pumping Required					Actual Pumping Performed
	Line A	Line B	Line C	Line D	Line E	
12/12/11						Yes
12/14/11		Yes				Yes
12/15/11						Yes
12/16/11	NA	NA	NA	NA	NA	Yes
12/19/11		Yes	Yes			Yes
12/20/11						Yes
12/27/11		Yes	Yes			Yes
12/28/11			Yes			Yes
12/30/11	Yes	Yes	Yes			Yes
12/31/11	NA	NA	NA	NA	NA	Yes
1/1/12	NA	NA	NA	NA	NA	Yes
1/2/12			Yes	Yes		Yes
1/4/12		Yes	Yes			Yes
1/5/12			Yes	Yes		Yes
1/9/12		Yes	Yes	Yes		Yes
1/10/12			Yes	Yes		Yes
1/12/12		Yes	Yes	Yes		Yes
1/13/12			Yes			Yes
1/17/12		Yes	Yes			Yes
1/18/12			Yes	Yes		Yes
1/20/12		Yes	Yes	Yes		Yes
1/21/12	NA	NA	NA	NA	NA	Yes
1/22/12	NA	NA	NA	NA	NA	Yes
1/23/12	Yes	Yes	Yes	Yes	Yes	Yes
1/30/12		Yes	Yes			Yes
1/31/12	Yes	Yes	Yes			Yes
2/2/12	Yes	Yes	Yes			Yes
2/3/12	Yes	Yes	Yes	Yes		Yes
2/6/12		Yes	Yes			Yes
2/7/12						Yes
2/13/12						Yes
2/20/12						Yes
2/27/12						Yes
3/5/12						Yes
3/12/12						Yes

Table 6.4-3. Pumping Summary

Date	Pumping Required					Actual Pumping Performed
	Line A	Line B	Line C	Line D	Line E	
3/19/12						Yes
3/21/12		Yes	Yes			Yes
3/22/12	NA	NA	NA	NA	NA	Yes
3/23/12						Yes
3/26/12		Yes	Yes			Yes
3/27/12	NA	NA	NA	NA	NA	Yes
3/28/12			Yes	Yes		Yes
3/29/12			Yes	Yes		Yes
4/2/12		Yes	Yes	Yes		Yes
4/3/12	NA	NA	NA	NA	NA	Yes
4/4/12	Yes	Yes	Yes	Yes	Yes	Yes
4/5/12	Yes	Yes				Yes
4/9/12		Yes	Yes			Yes
4/10/12	NA	NA	NA	NA	NA	Yes
4/11/12	NA	NA	NA	NA	NA	Yes
4/12/12			Yes	Yes		Yes
4/13/12			Yes	Yes		Yes
4/14/12	NA	NA	NA	NA	NA	Yes
4/15/12	NA	NA	NA	NA	NA	Yes
4/16/12						Yes
4/18/12		Yes	Yes	Yes		Yes
4/19/12					Yes	Yes
4/20/12		Yes	Yes	Yes		Yes
4/23/12						Yes
4/30/12						
5/7/12						
5/14/12						
5/21/12						
5/29/12						

FIGURES

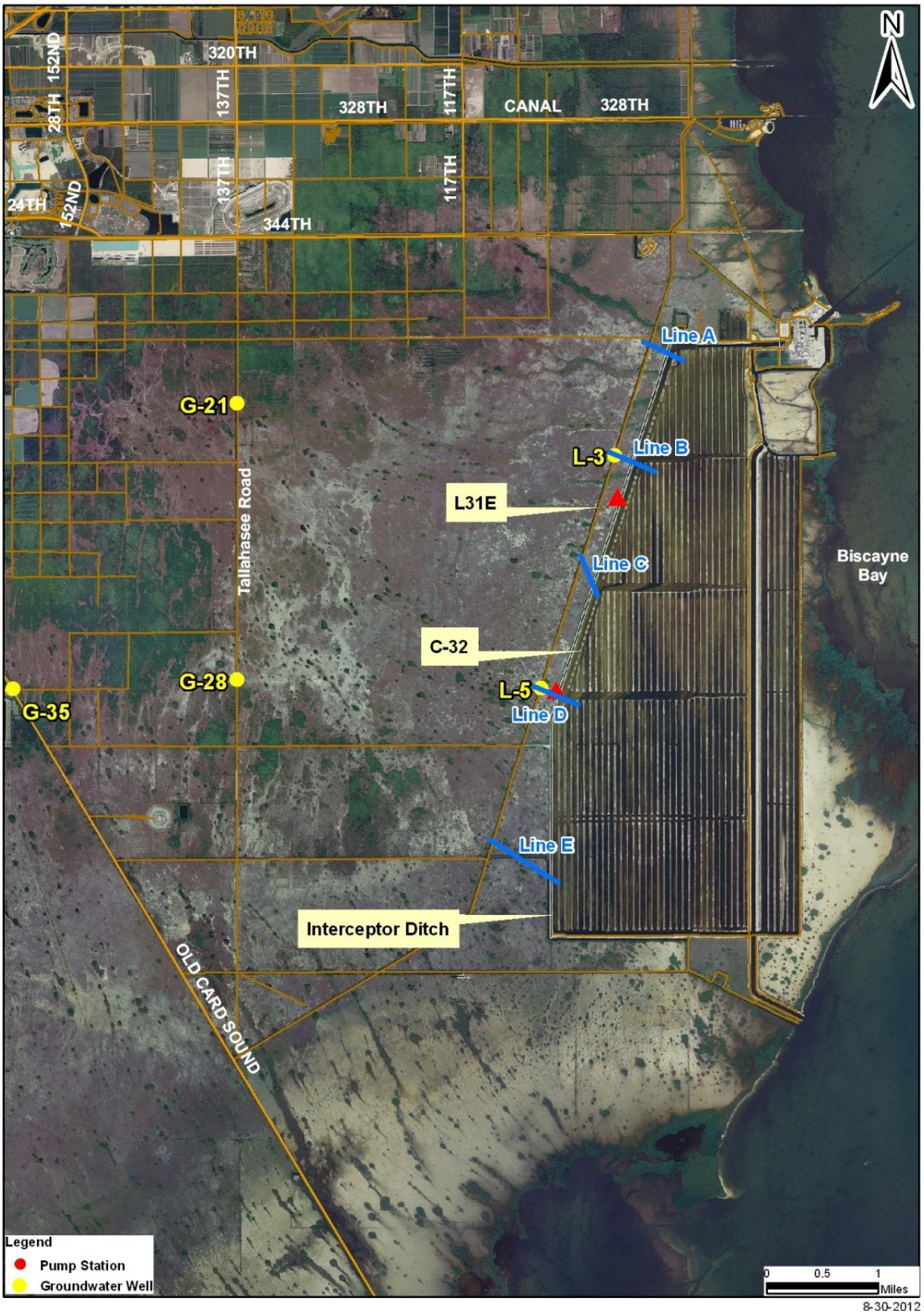


Figure 6.1-1. Historic ID Monitoring Wells and Transects.

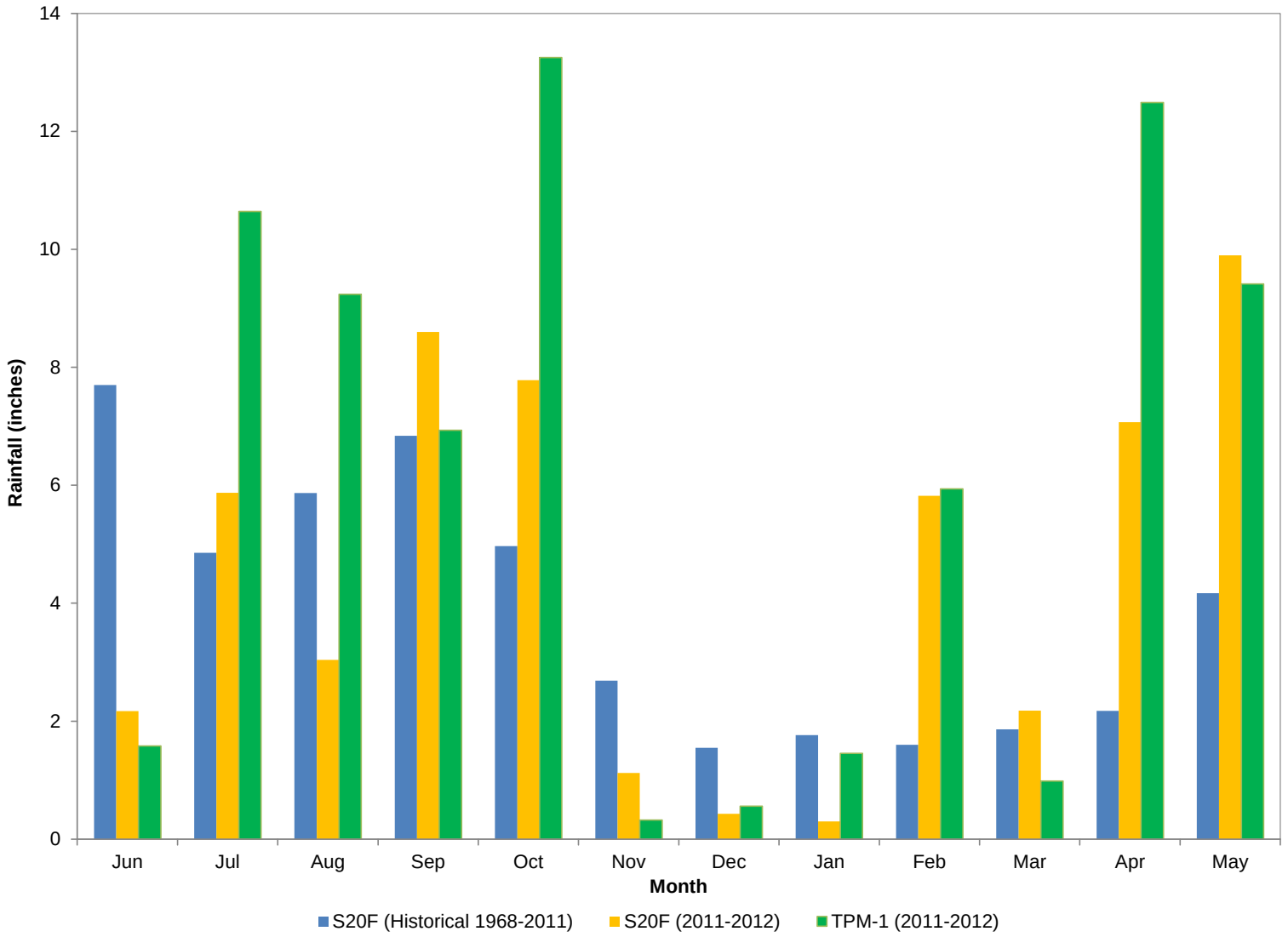


Figure 6.3-1. Comparison of ID Monitoring Period to Historic Rainfall.

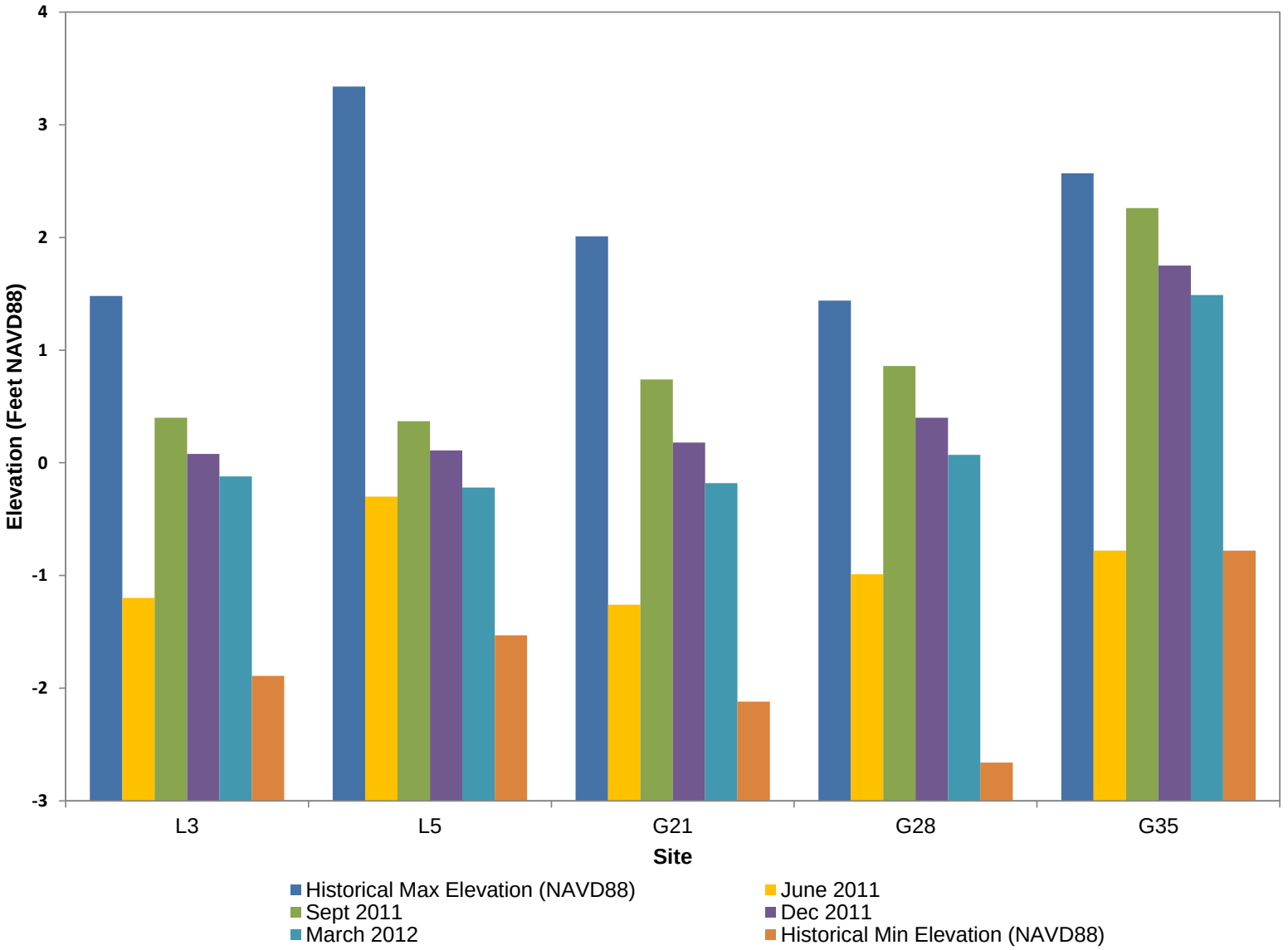


Figure 6.4-1. L-3, L-5, G-21, G-28, and G-35 Groundwater Levels.

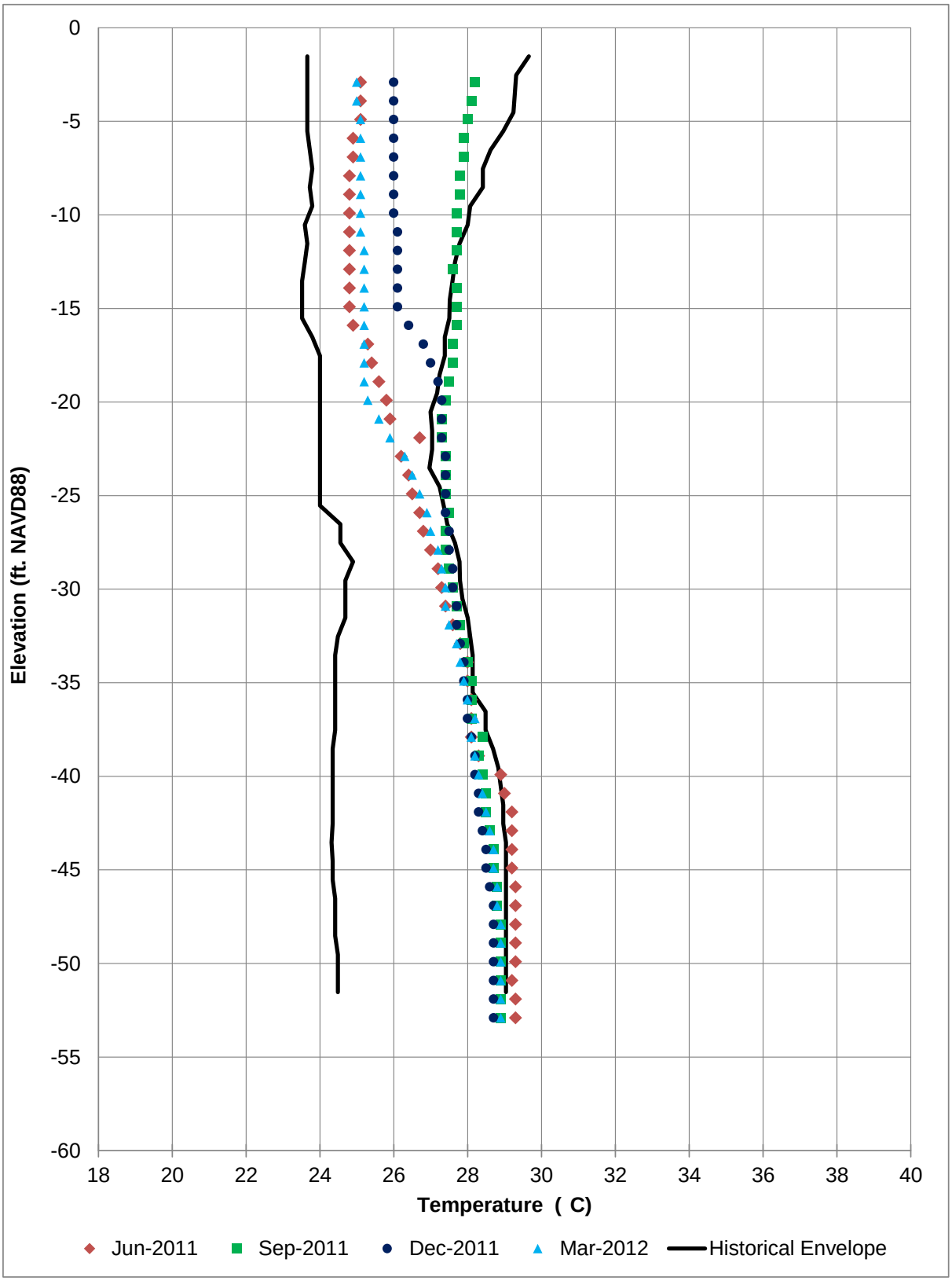


Figure 6.4-2. L-3 Vertical Temperature Profile June 2011 through March 2012.

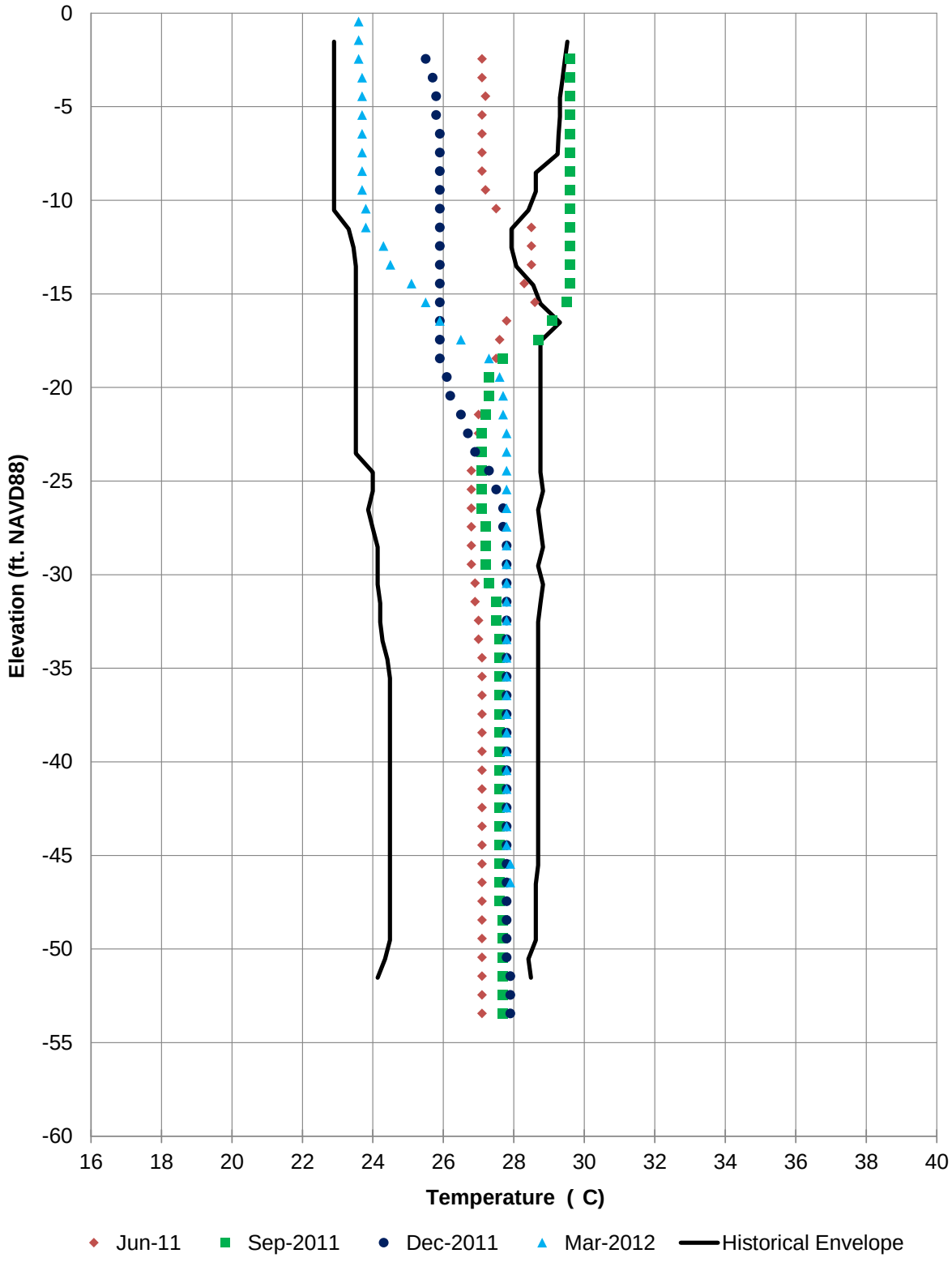


Figure 6.4-3. L-5 Vertical Temperature Profile June 2011 through March 2012.

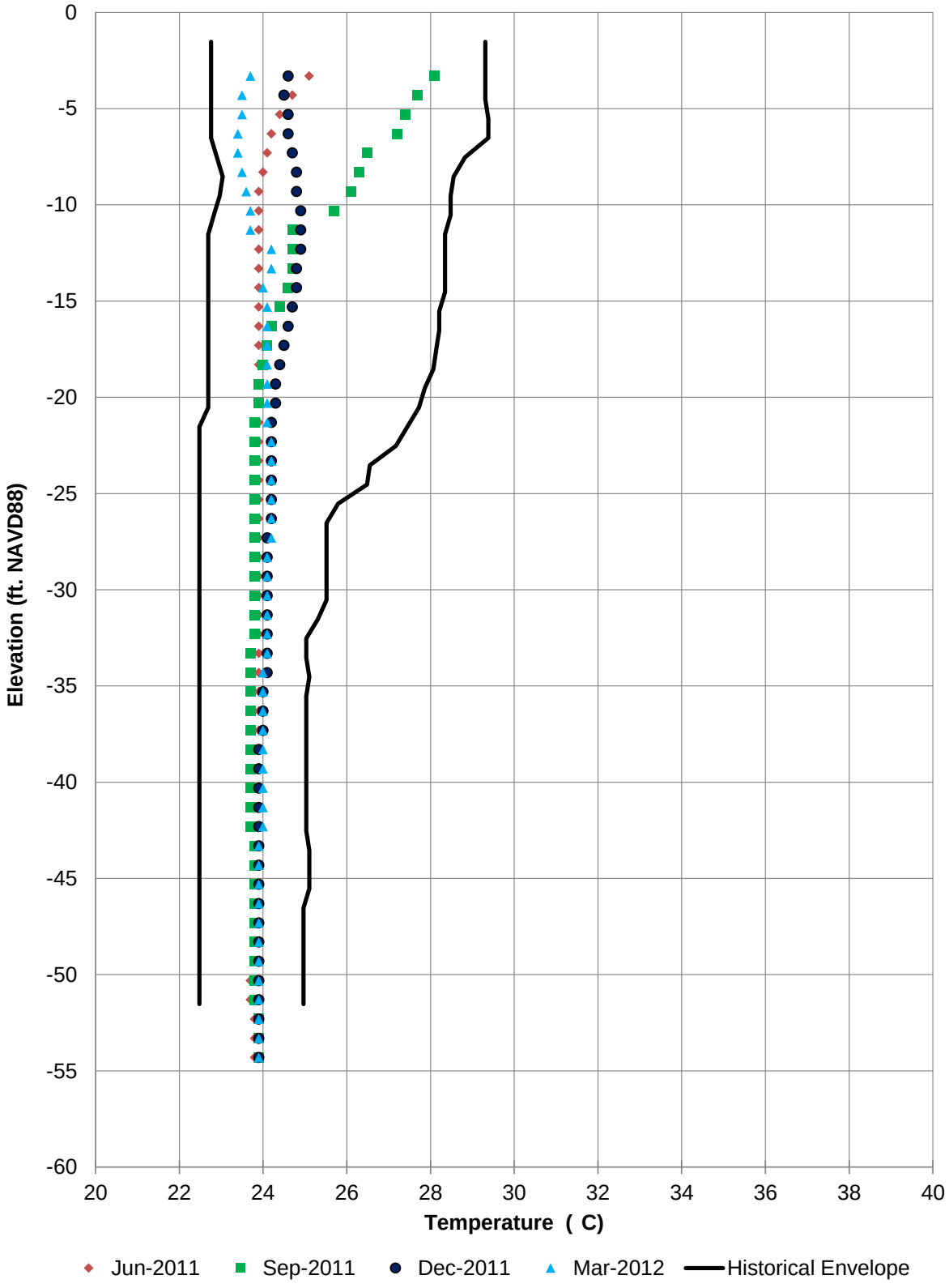


Figure 6.4-4. G-21 Vertical Temperature Profile June 2011 through March 2012.

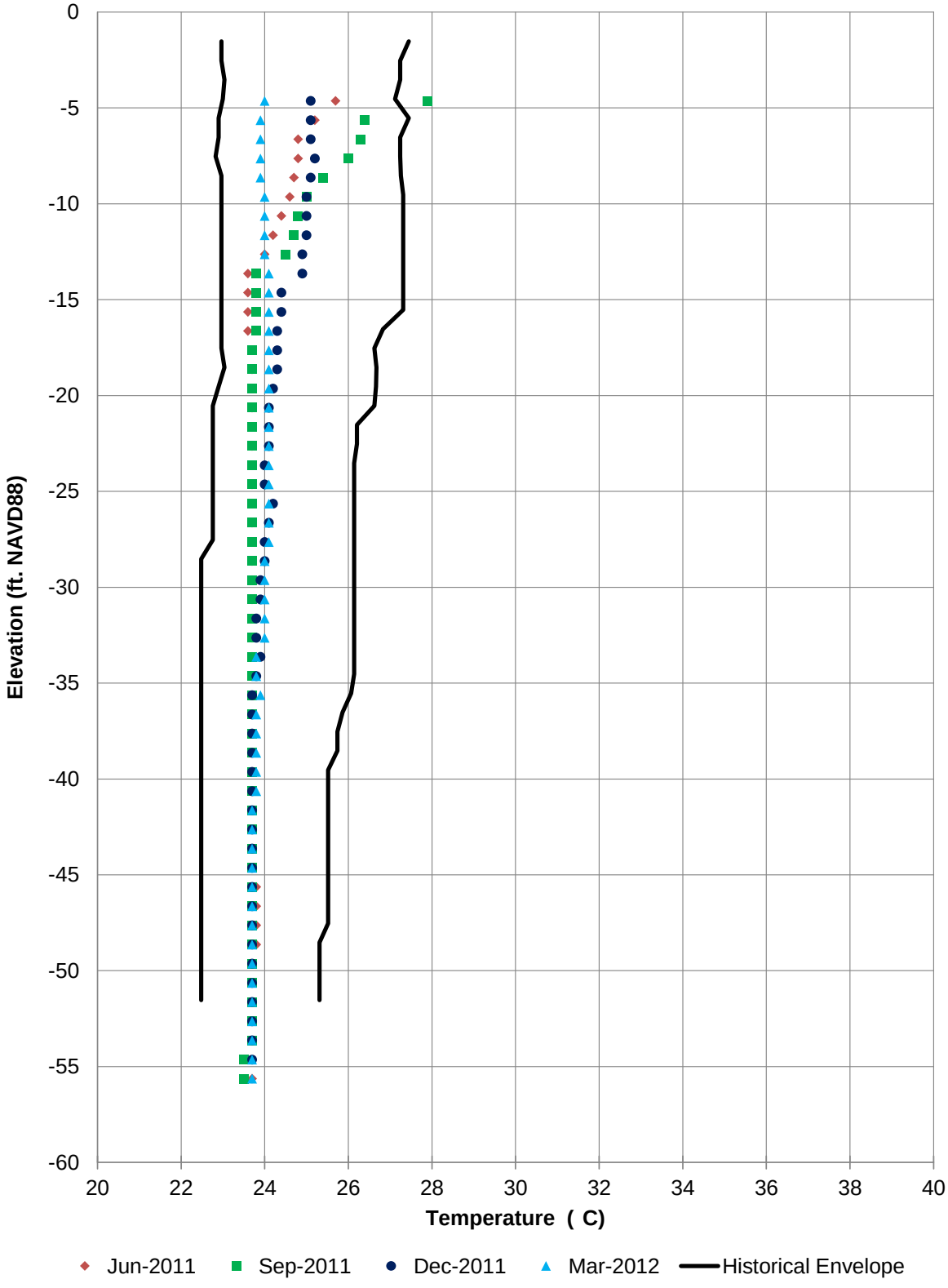


Figure 6.4-5. G-28 Vertical Temperature Profile June 2011 through March 2012.

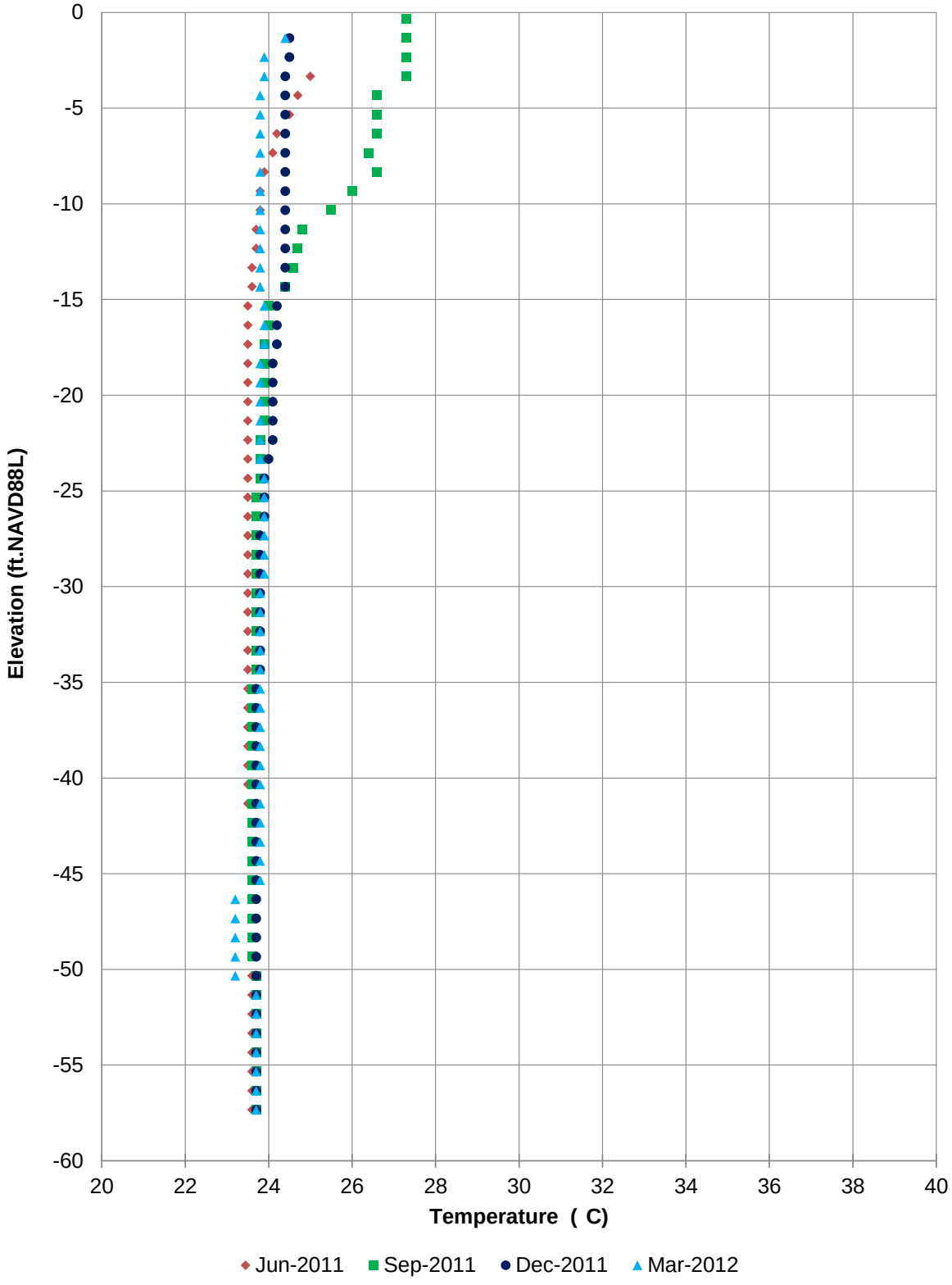


Figure 6.4-6. G-35 Vertical Temperature Profile June 2011 through March 2012.

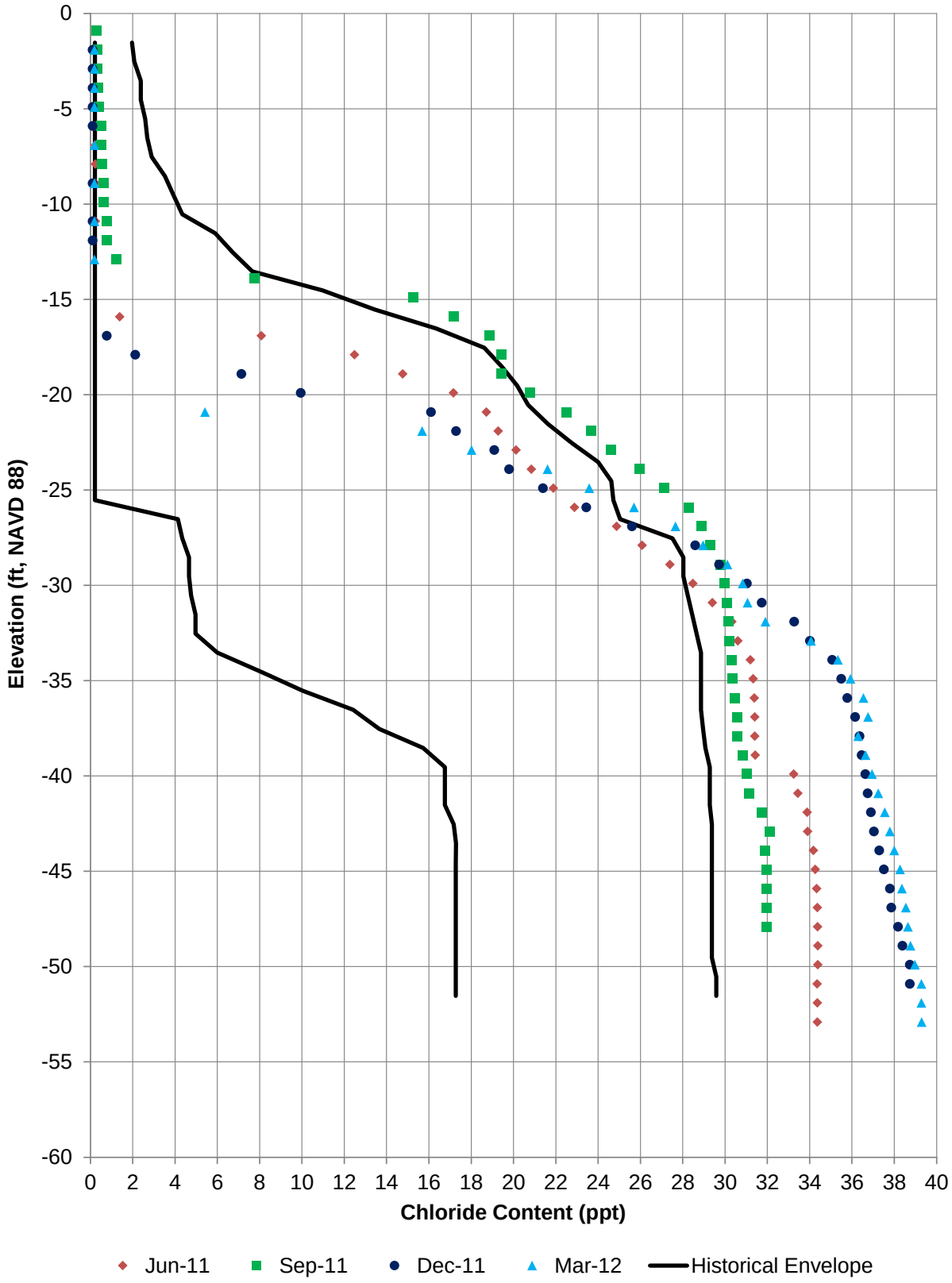


Figure 6.4-7. L-3 Vertical Chloride Profile June 2011 through March 2012.

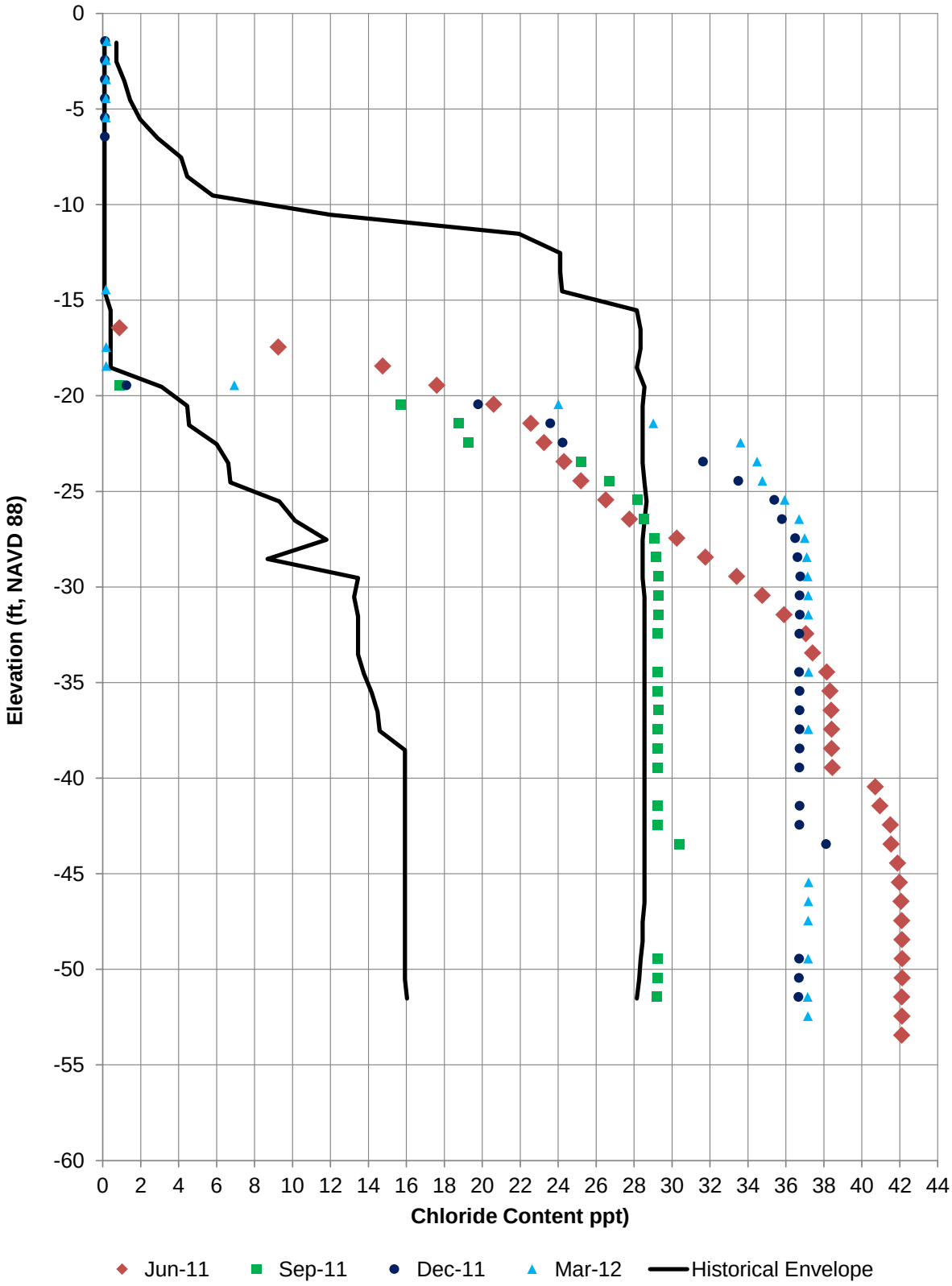


Figure 6.4-8. L-5 Vertical Chloride Profile June 2011 through March 2012.

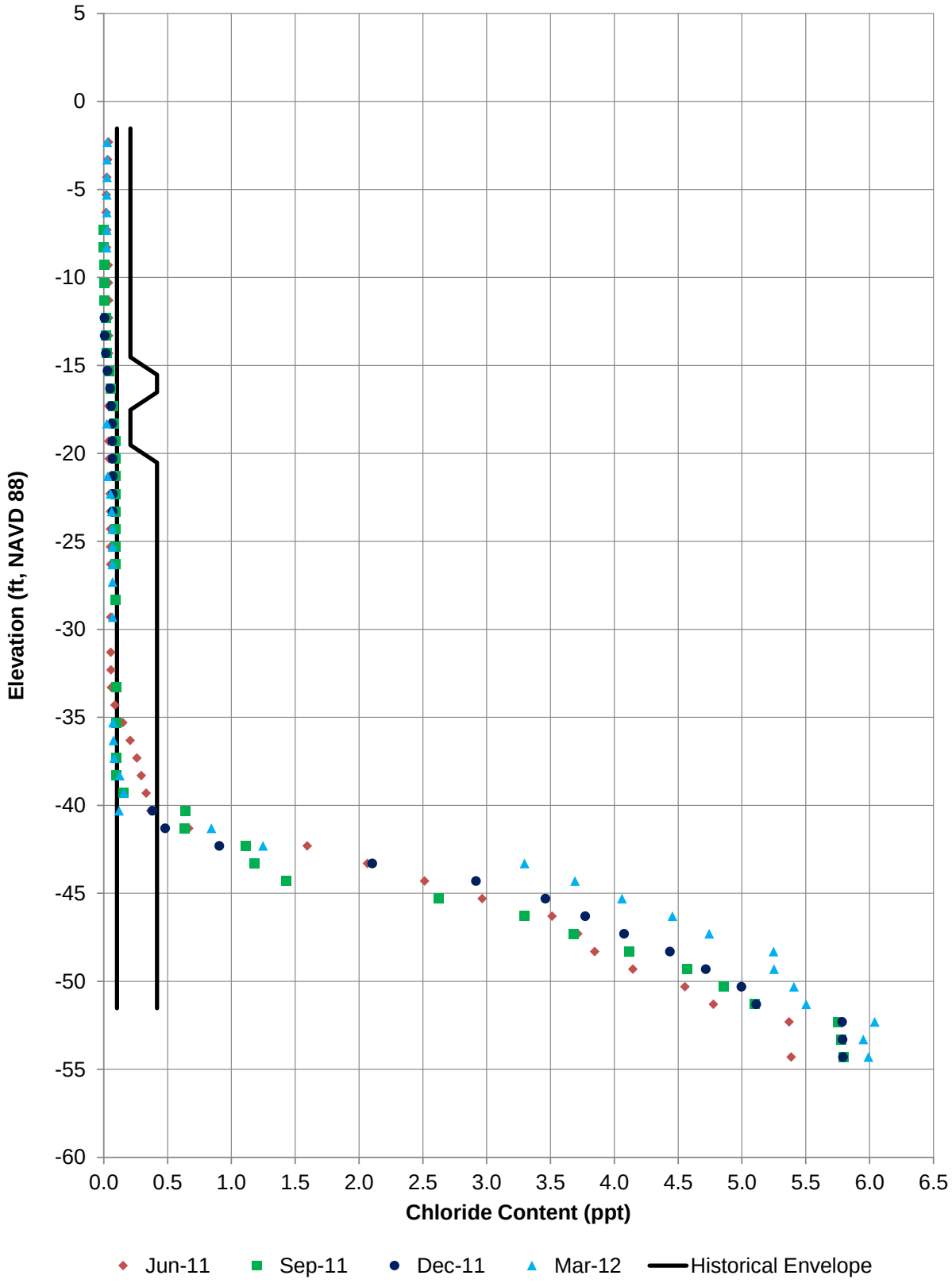


Figure 6.4-9. G-21 Vertical Chloride Profile June 2011 through March 2012.

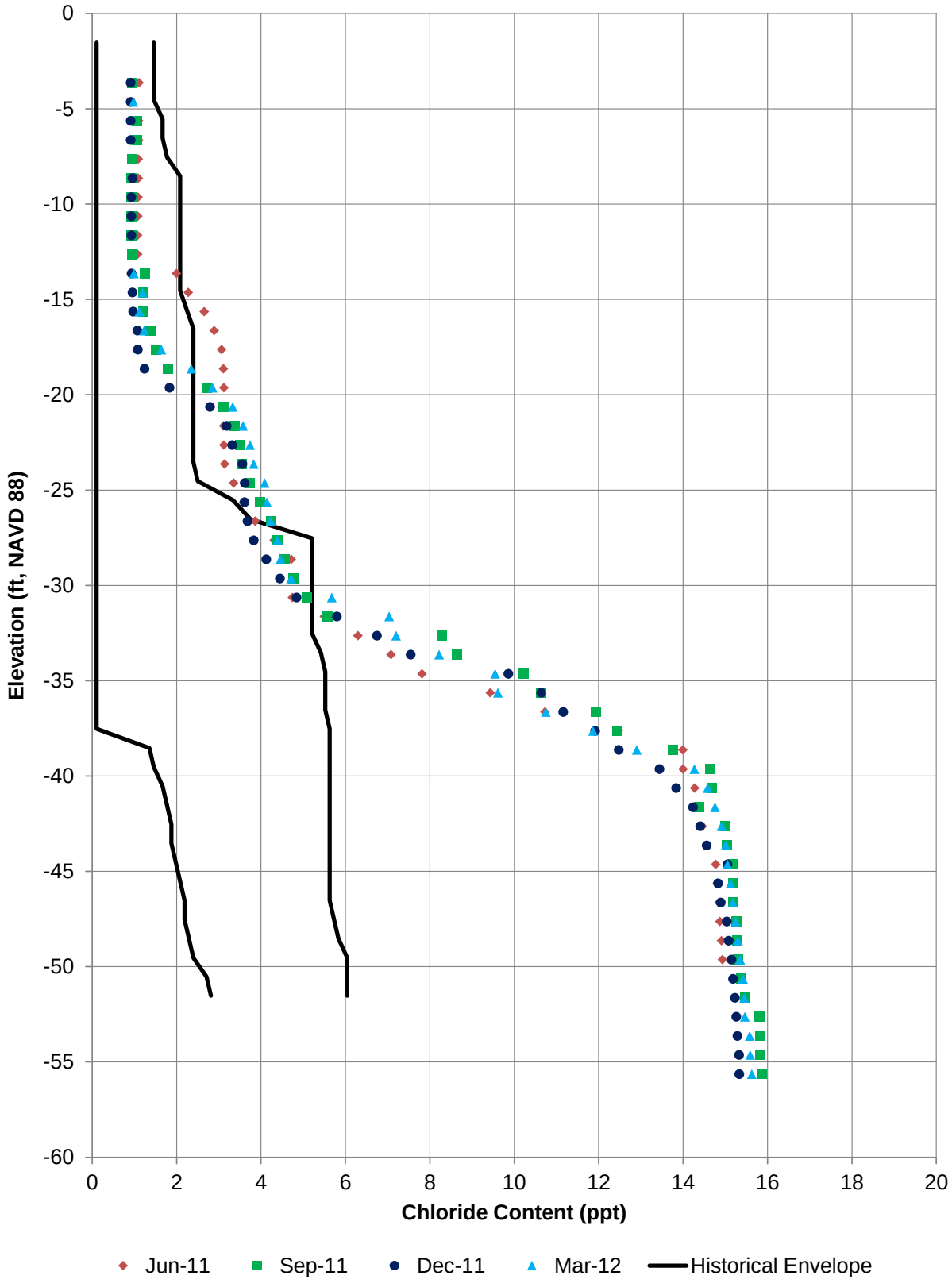


Figure 6.4-10. G-28 Vertical Chloride Profile June 2011 through March 2012.

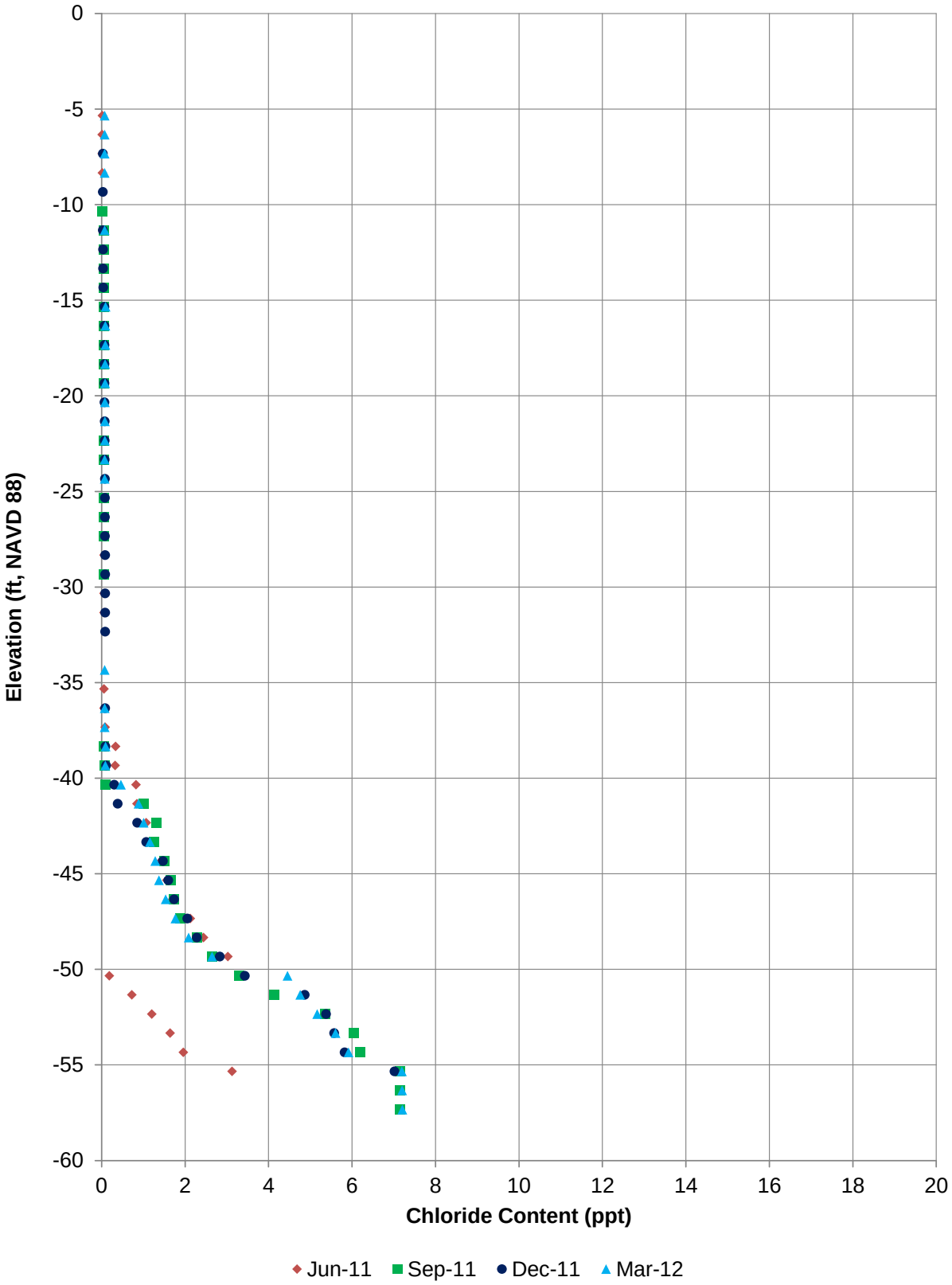


Figure 6.4-11. G-35 Vertical Chloride Profile June 2011 through March 2012.

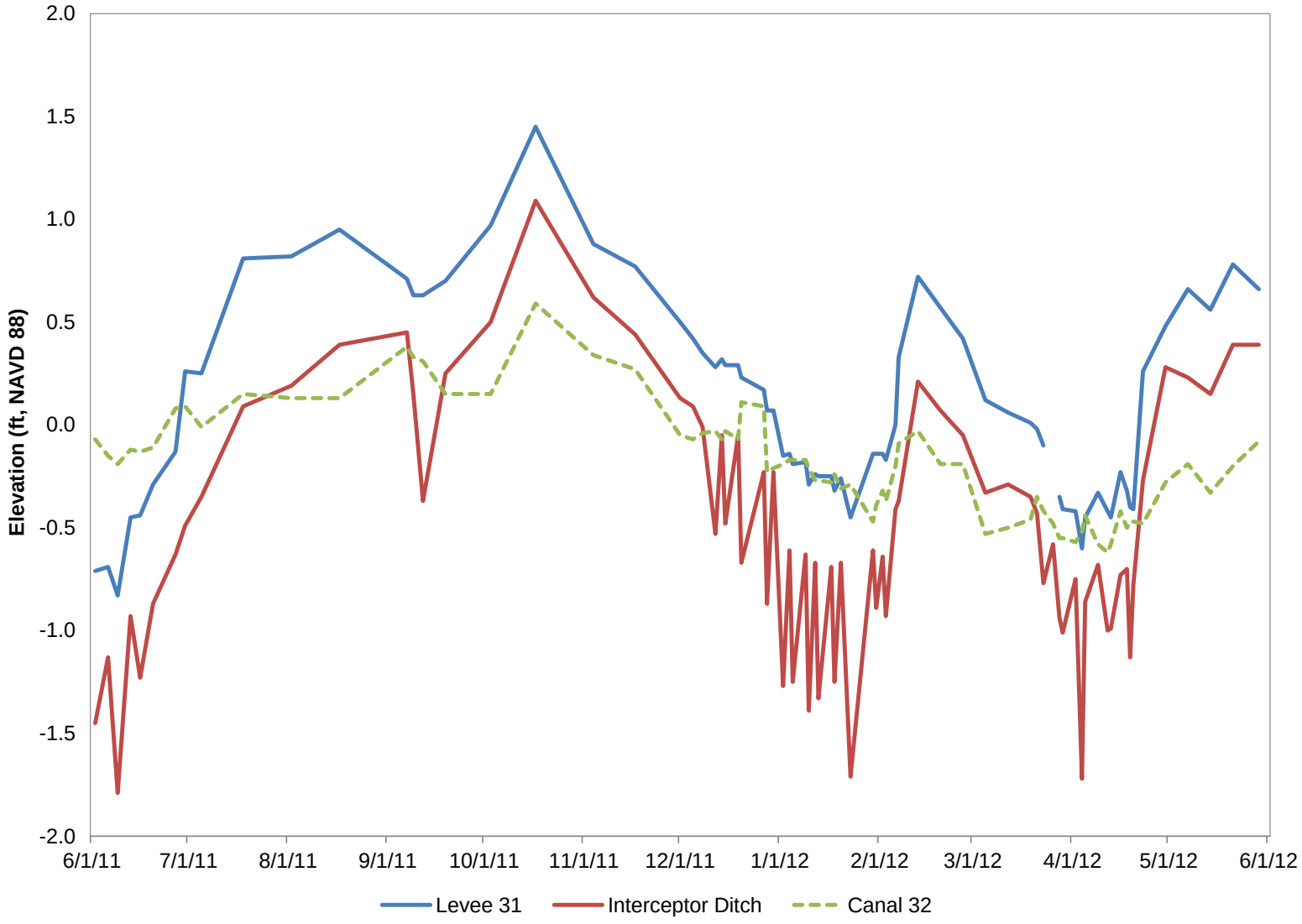


Figure 6.4.12. Transect A Water Levels June 2011 through May 2012.



Figure 6.4-13. Transect B Water Levels June 2011 through May 2012.

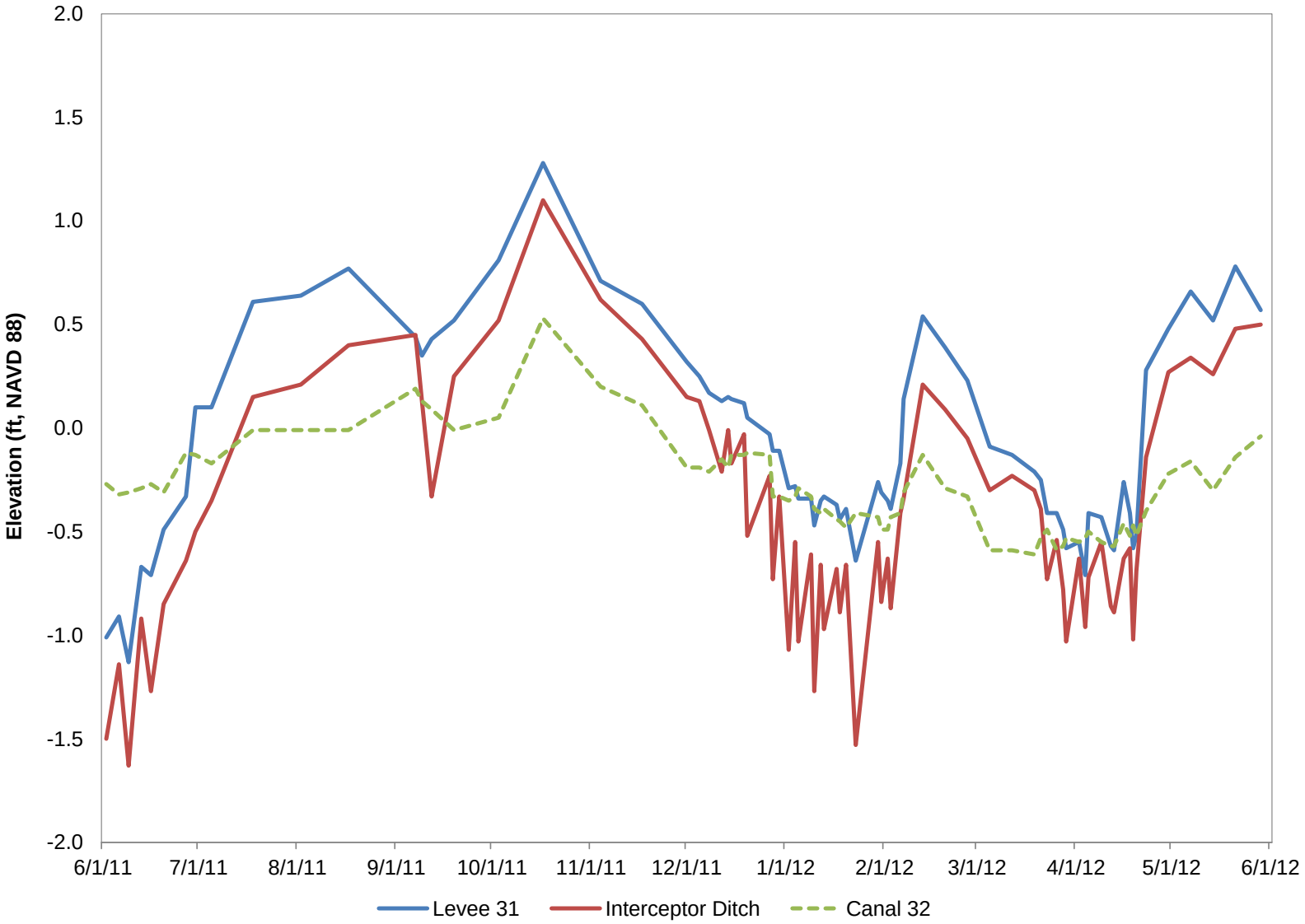


Figure 6.4-14. Transect C Water Levels June 2011 through May 2012.



Figure 6.4-15. Transect D Water Levels June 2011 through May 2012.

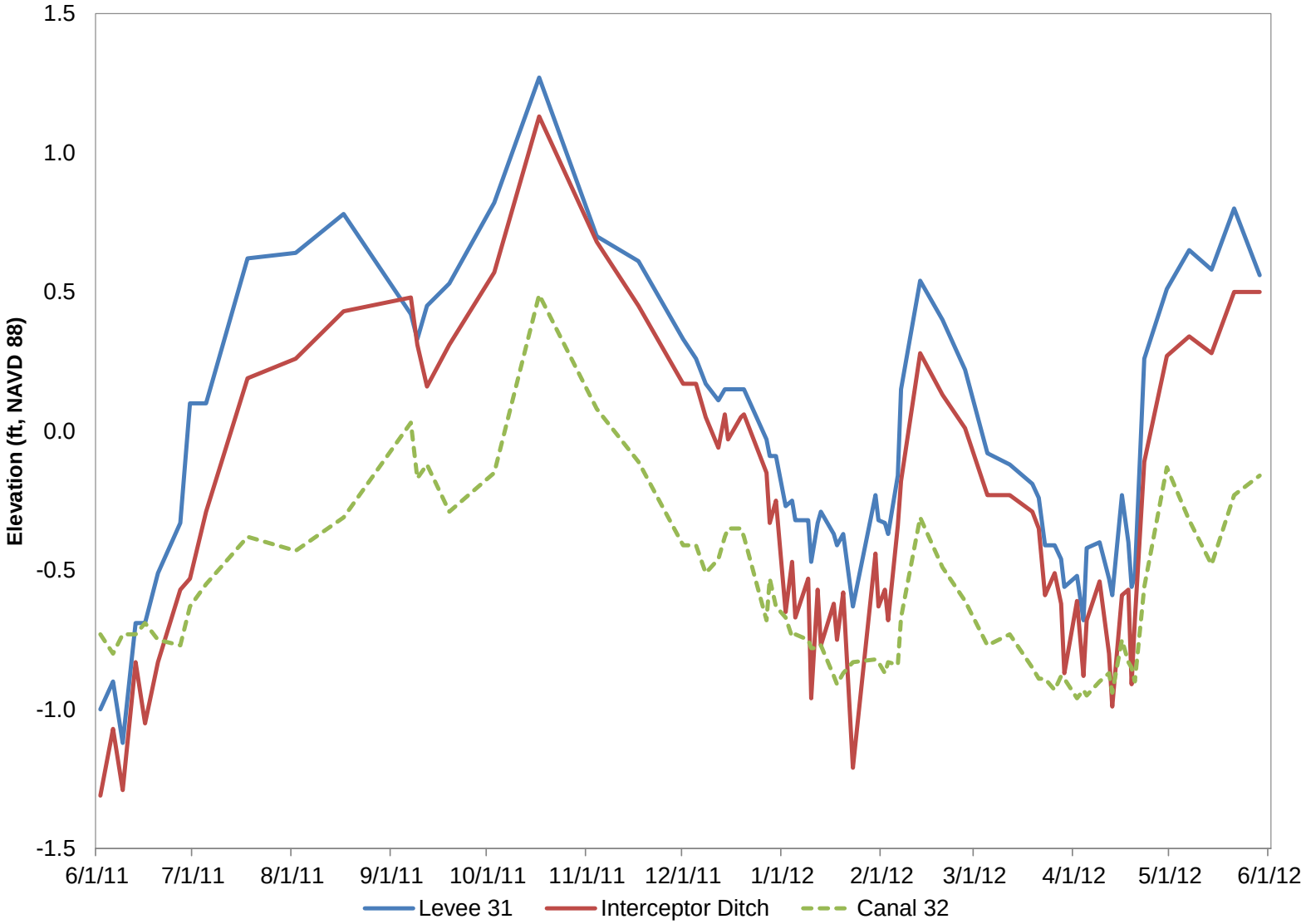


Figure 6.4-16. Transect E Water Levels June 2011 through May 2012.

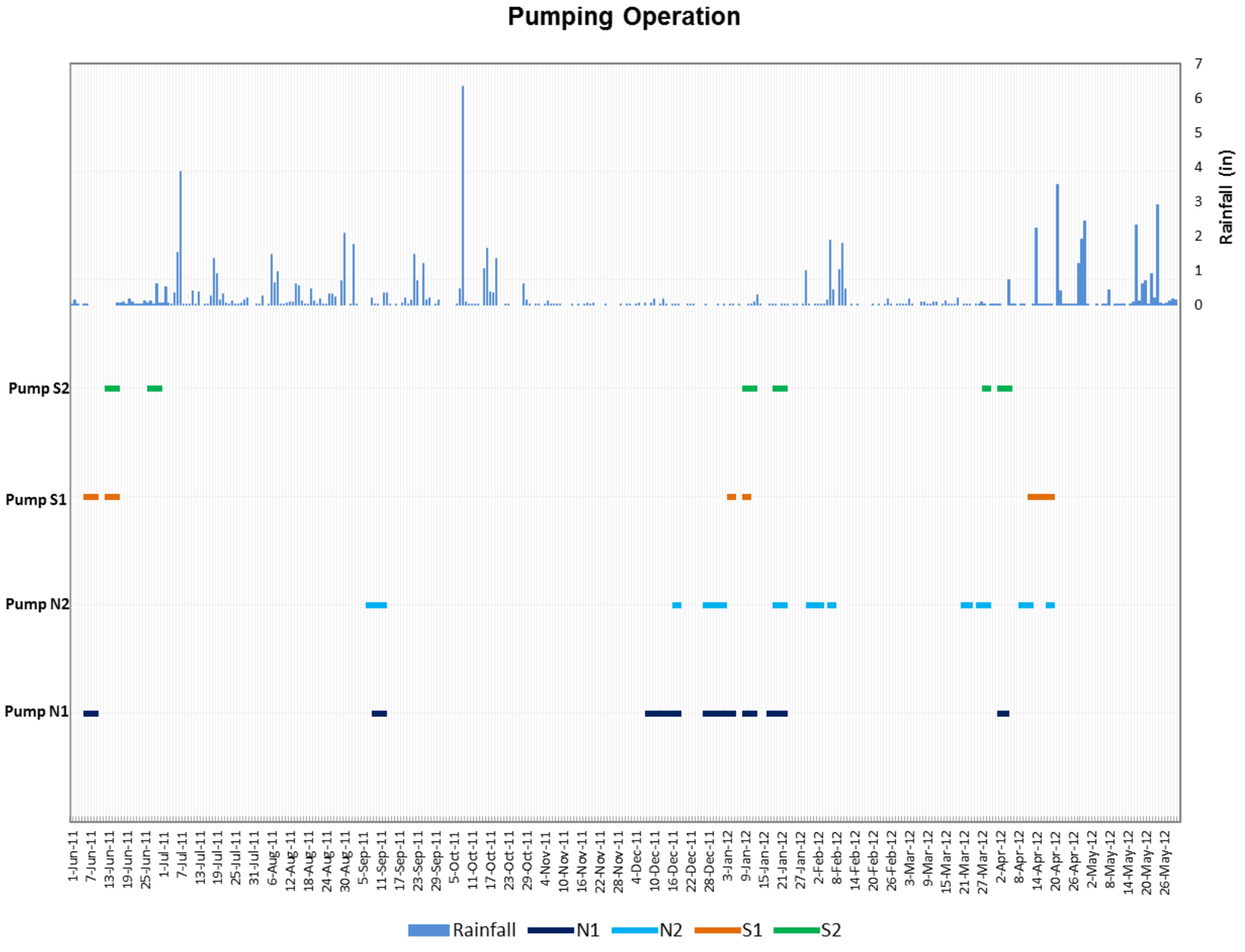


Figure 6.4-17. Inteceptor Ditch Pump Operation and Rainfall.

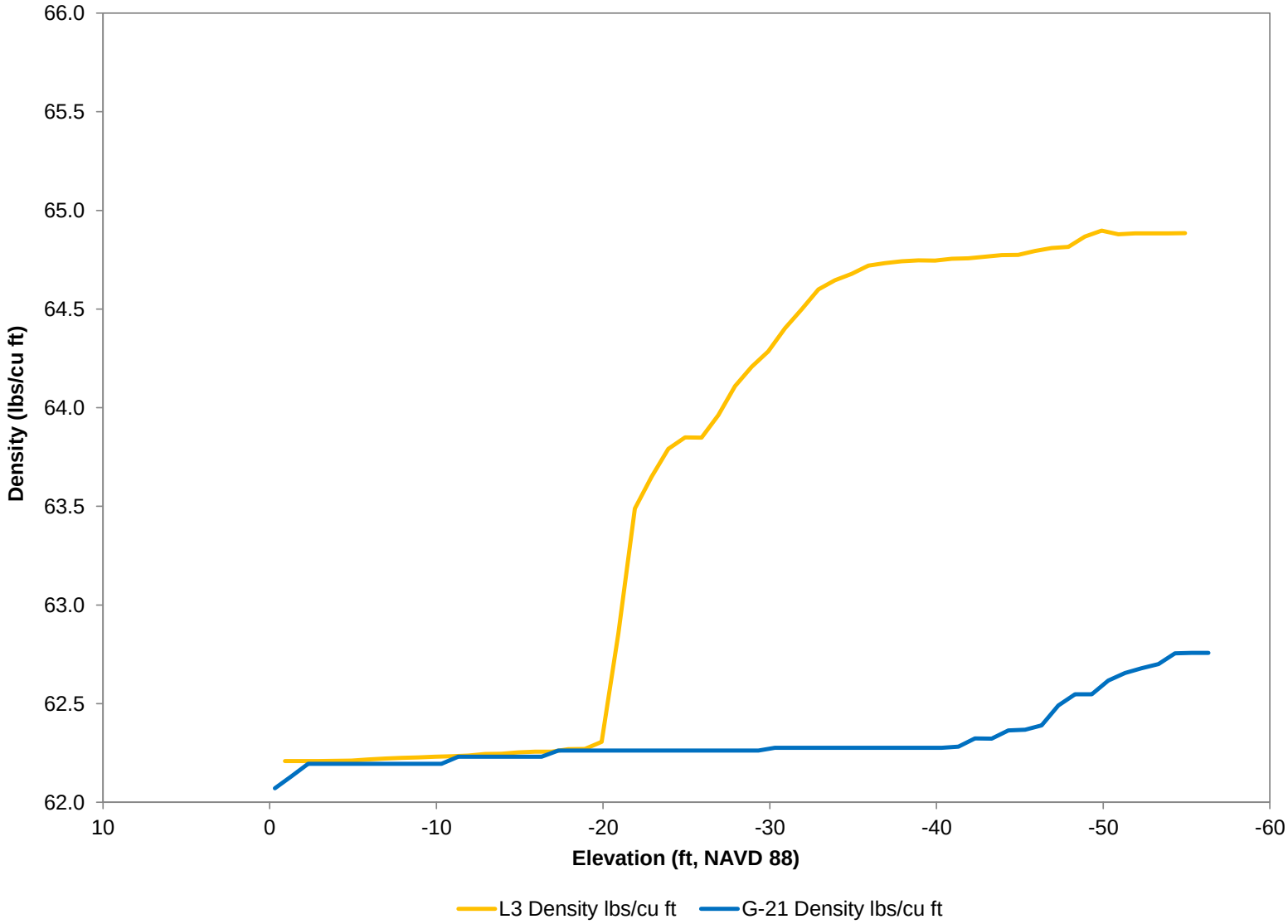


Figure 6.4-18. Density vs. Elevation Wells L-3 and G-21 during September 2011 Sampling Episode.

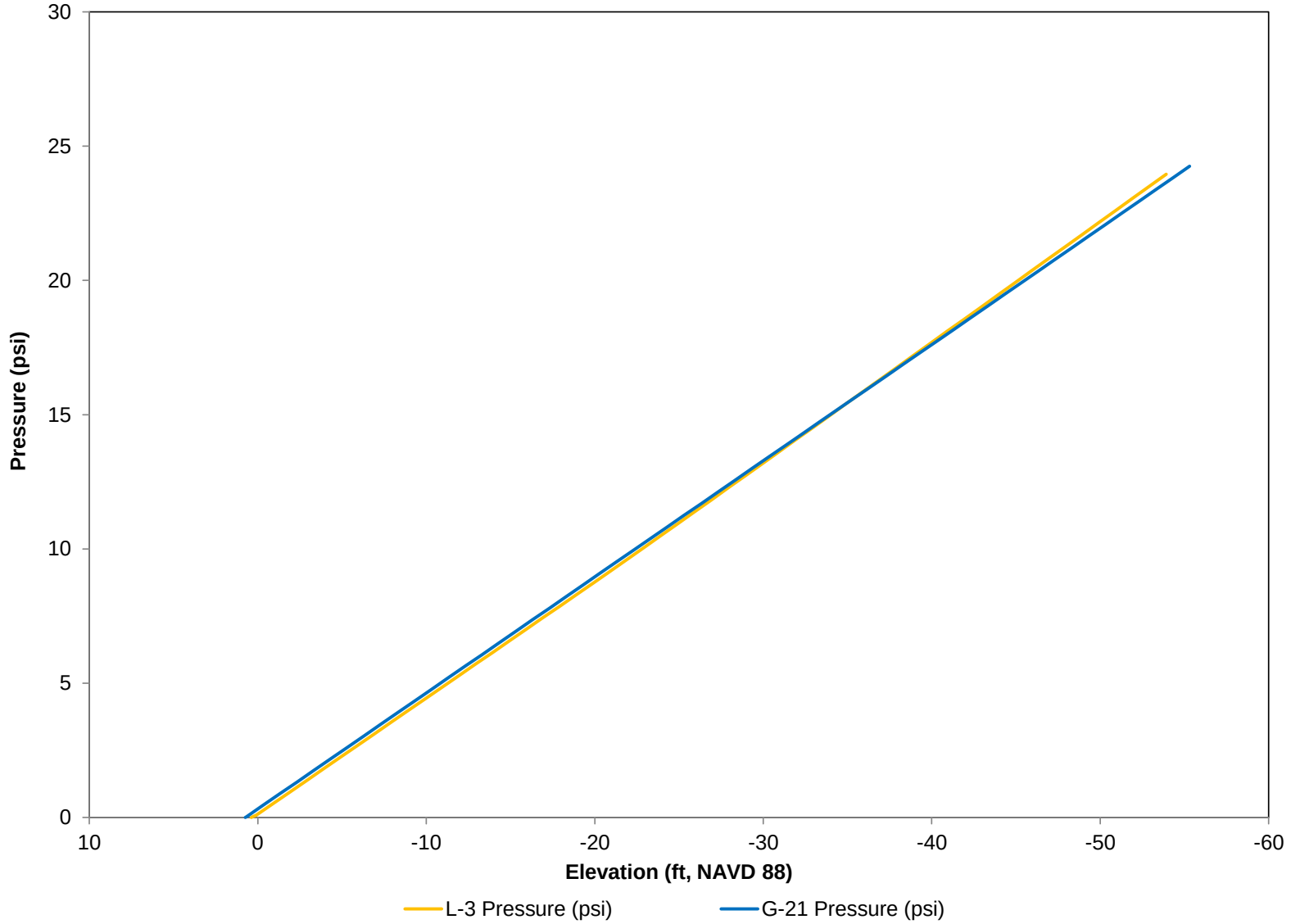


Figure 6.4-19. Pressure vs. Elevation Wells L-3 and G-21 during September, 2011 Sampling Episode.

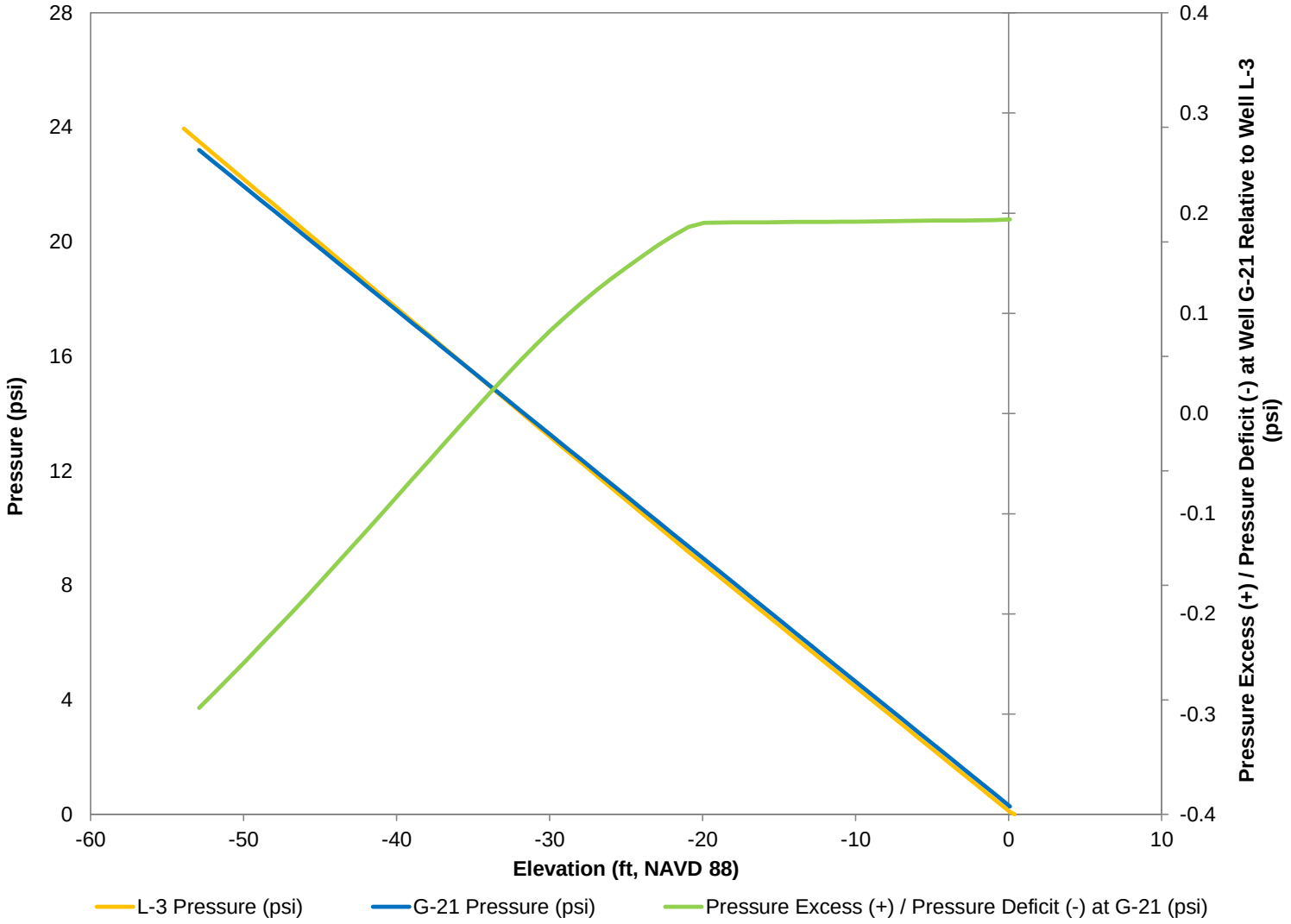


Figure 6.4-20. Pressure Gradient Difference between Well L-3 and Well G-21 during September, 2011 Sampling Episode.

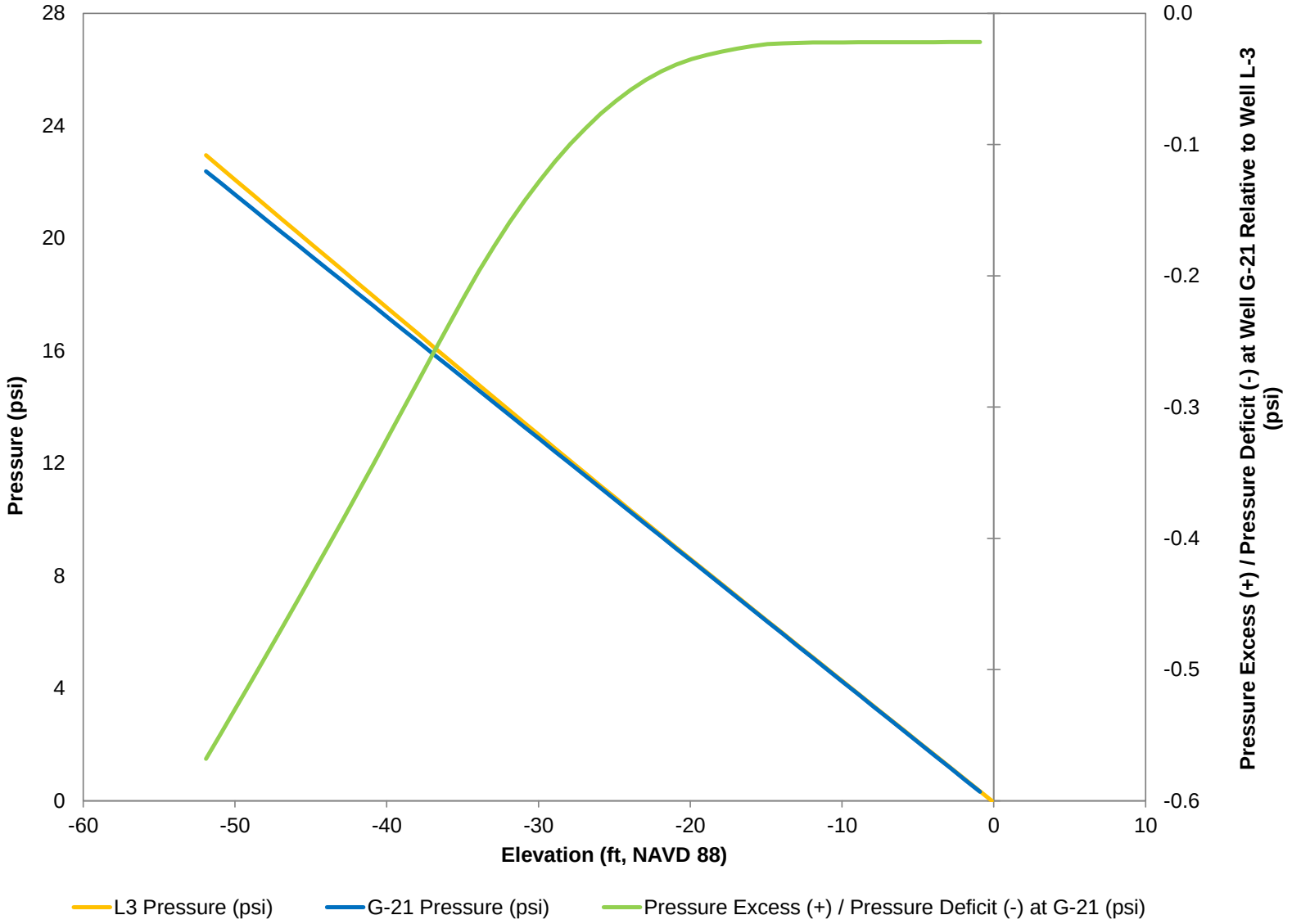


Figure 6.4-21. Pressure Gradient Difference between Well L-3 and Well G-21 during March, 2012 Sampling Episode.

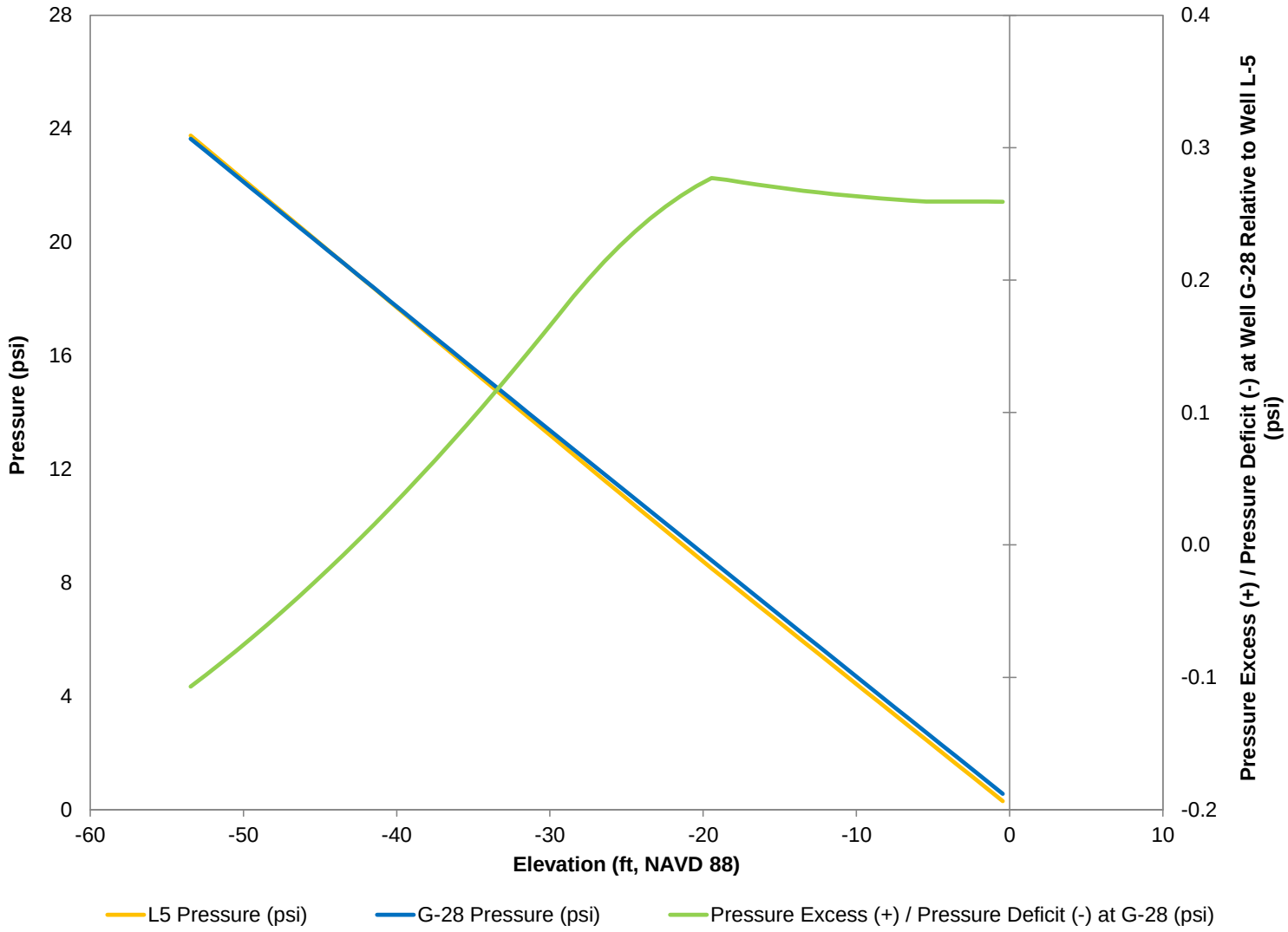


Figure 6.4-22. Pressure Gradient Difference between Well L-5 and Well G-28 during September, 2011 Sampling Episode.

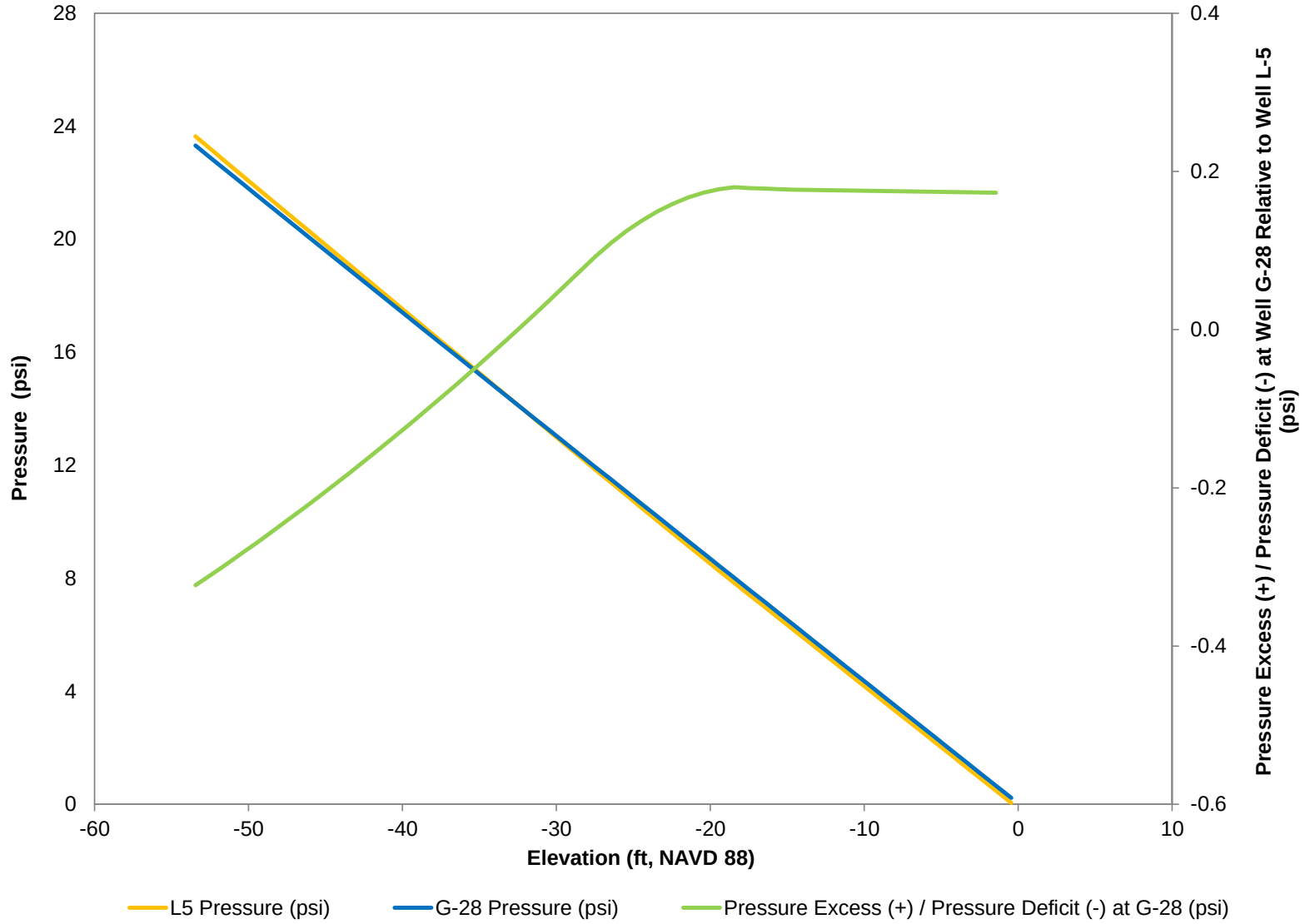


Figure 6.4-23. Pressure Gradient Difference between Well L-5 and Well G-28 during March, 2012 Sampling Episode.

7.0 SUMMARY AND INTERPRETATIONS

The Monitoring Plan incorporates contributions from the Florida Department of Environmental Protection (FDEP), the South Florida Water Management District (SFWMD), and Miami-Dade County's Department of Environmental Resources Management (DERM), (collectively, the Agencies), and FPL. The Monitoring Plan requires the collection of groundwater, surface water, meteorological, flow, and ecological data in and around the plant to establish pre-Uprate baseline conditions and determine the horizontal and vertical effects and extent, if any, of the cooling canal system (CCS) water. This annual report includes data that were collected as part of the Turkey Point Uprate monitoring that began in June 2010 and extended through June 2012. This section provides a summary and interpretation of the results.

7.1 Groundwater

7.1.1 Major Findings

- Over the two year monitoring period, the results indicate the salt constituents and tracer have remained consistent for all wells. This is indicative of the groundwater maintaining a relatively stable condition during this time period.

- Biscayne Bay groundwater results support the conclusion that there is little or no influence from the CCS in the area fronting the northern half of the CCS. However, there is evidence of CCS water under Biscayne Bay in close proximity to the southern tip of the CCS.

- The results indicate there is CCS water immediately adjacent to the west in the groundwater. Further west from the CCS, there is evidence of CCS water in decreasing concentrations at depth out approximately 3 miles. The outermost wells to the west are fresh at all depths.

- TDS values were calculated based on historic specific conductance groundwater data and the pre-CCS limits of groundwater exceeding 10,000 mg/L of TDS were estimated. Based on this determination, much of the pre-CCS groundwater in the study area would be classified as G-III groundwater and designated as non-potable.

- While there is exchange between the CCS and the surrounding environment, there appears to be a limited connection between CCS and Biscayne Bay. At well cluster TPGW-13, which is located in the CCS, water levels change only a few hundredths of a foot in response to several feet of tidal change in Biscayne Bay.

7.1.2 Additional Findings

- Groundwater levels respond quickly to rainfall events, suggesting good connectivity with the ground surface. However, the groundwater temperature and specific conductance remained unaffected following a rainfall event, suggesting a lag time in vertical migration and buffering effect of the groundwater.

- At each well cluster, fluctuations in stage for all three depth intervals track closely, indicating a good hydrologic connection between intervals.

- Water levels at stations in or immediately adjacent to Biscayne Bay (TPGW-3, TPGW-10, TPGW-11, TPGW-12, and TPGW-14) exhibit tidal influence at all three depths. The amplitude of the tidal changes decreases across the landscape from north to south.

- Groundwater levels, in general, are highest at the shallow zone, followed by the intermediate and deep wells. TPGW-2 has the opposite pattern with the deepest well having the highest elevation. For some wells, however, particularly those to the far west, the water levels are essentially the same for all intervals.

- Stations farthest from the coast (TPGW-7, TPGW-8, and TPGW-9) exhibit few water level differences among the shallow, intermediate, and deep wells. The groundwater in these wells is all fresh as defined by FDEP.

- Midpoint groundwater stations, located between the westernmost wells and the CCS (e.g., TPGW-4 and TPGW-5), have brackish water in the intermediate and deep zones and overlying fresher water in the shallow zone. The shallow zone water elevations in these wells are always higher than the deep zone.

- Closer to Biscayne Bay and the CCS, several well clusters have deep or intermediate zones with the highest water elevation, such as TPGW-2; at this cluster, the deep and intermediate interval water levels alternate between having higher water levels with time.

- At TPGW-13, the shallow and intermediate zones have nearly identical water levels but the deep zone is consistently about 0.5 ft lower.

- Following heavy rainfall events (more than several inches in a day), the groundwater level in TPGW-13 rises above water levels in the CCS and an extended period passes before these levels drop below the CCS water levels. This same response occurs in wells just west of the CCS.

- The groundwater levels in TPGW-13 tend to be within the high tide range of the wells that exhibit tidal influences.

- Despite seasonally variable groundwater elevations, the well depth measurement interval that had the highest head remained the same in most wells regardless of wet or dry conditions.

- Water levels in wells farthest from the Bay were affected more by drought conditions than wells close to or in Biscayne Bay.

- There are no evident effects of power plant outages on groundwater levels in wells near the CCS.

- When the ID is pumped, there is a quick and measurable response in water levels in L-31 and the wells closest to the ID (TPGW-1 and TPGW-2 at all depths). This indicates that there is good connectivity among the ID, L-31, and nearby wells.

- Groundwater temperature and specific conductance are consistent in nearly every well over the entire time period. The most notable exception is a regional rise in groundwater temperature in the shallow interval starting around November of each year and extending into March or April, depending on the location. Otherwise, there is little variability in values.

- Based on a comparison of induction logs from the spring of 2010 to spring of 2012, there have been no notable changes in resistivity/saltwater in the groundwater.

- Specific conductance values in groundwater greater than 60,000 µS/cm were consistently found in TPGW-1 (M and D), TPGW-2 (S, M and D), TPGW-3 (S, M and D), TPGW-12 (M and D), TPGW-13 (S, M and D), TPGW-14 (M and D), L-3, and L-5 (at depth).

- Based on USGS estimates, the limits of the 1,000 mg/L chloride line at depth extended west of Tallahassee Road prior to the construction of the CCS.

- Since the construction of the CCS, the specific conductance values within 1 mile west of the CCS have increased at depth by 20,000 to 30,000 µS/cm. The effects are less substantial to the east, further to the west, and in the shallow screened intervals. All the well clusters farthest to the west (TPGW-7, TPGW-8, and TPGW-9) contain freshwater.

- Among all the sites, groundwater chloride concentrations were lowest (<250 mg/L) at TPGW-7, TPGW-8, and TPGW-9, followed by wells TPGW-4S, TPGW-5S, and TPGW-6S. The highest chloride levels were consistently observed at TPGW-13 with an average concentration of 34,444 mg/L. These patterns are similar for the other major ions.

- Specific conductance in the historic wells versus nearby new well clusters is comparable and shows that both types of wells may be equally reflective of groundwater conditions at the screened interval.

- Trace metals in select wells adjacent to the CCS and previous samples from the CCS collected during the SFWMD synoptic sampling event in 2009 do not reveal any appreciably high levels of constituents that would be originating from the CCS. There have been some issues with the level of detection due to inferences from the saltwater and one of the Agencies noted that some of the detection limits are above drinking water standards in groundwater. However drinking water standards do not apply to the non-potable zones where trace metals samples are collected since the wells are screened in high TDS water that pre-dates the CCS.

- High levels of ammonia are found in TPGW-13 located in the CCS and adjacent wells TPGW-1, TPGW-2, and TPGW-14 with values at most locations increasing with depth.

7.2 Surface Water

7.2.1 Major Findings

- For most surface water stations there was no evidence of CCS water via groundwater pathway. However, there were two possible exceptions in two canal stations immediately adjacent to the south end of the CCS.

- Surface water levels in the CCS exhibit limited response (hundredths of a foot) to tidal changes. Similar to groundwater in the CCS, this observation indicates a limited connection of the CCS with Biscayne Bay.

7.2.2 Additional Findings

- Water levels on the plant discharge side have lower ranges in variability (<1 ft at TPSWCCS-1) than stations on the intake side (up to 4 ft at TPSWCCS-6). Water levels on the discharge side of the CCS are generally at least 1 ft higher than those on the CCS plant intake side.

- The difference in stage between the discharge and intake side increased during the 2011 and 2012 dry seasons and decreased during the wet season. CCS surface water levels at all stations were similar in late September and October 2010, October 2011 and February 2012 following a heavy rainfall event.

- Surface water temperature and specific conductance vary more with meteorological conditions than groundwater.

- The water temperatures on the CCS discharge side of the plant at TPSWCCS-1B are 7.5°C warmer on average for the entire monitoring period (June 2010 through June 2012) than at the intake side of the plant at TPSWCCS-6B. The water cools quickly as it moves south within the CCS with the average temperature at the south end of the CCS (TPSWCCS-4B) being only 1.1°C warmer than at the intake side of the plant.

- The water temperature in Biscayne Bay tracks the air temperature, and the CCS water temperatures are always higher than in Biscayne Bay with one exception. The one instance where a Biscayne Bay station was slightly higher in temperature was on February13, 2011when the air temperature dropped rapidly and the CCS cooled faster than Biscayne Bay. Also, the surface water temperature in SFWMD monitoring well location (several miles north of the CCS) BBCW-10 tracked closely with FPL's surface water stations in Biscayne Bay. There are no discernible influences of higher temperatures in the CCS on Biscayne Bay surface water.

- Specific conductance values in the CCS ranged from 50,528 µS/cm (TPSWCCS-4B) to 93,594 µS/cm (TPSWCCS-6B), while Biscayne Bay values were lower and ranged from 18,922 µS/cm (TPBBSW-10B) to 66,884 µS/cm (TPBBSW-1B). The average specific conductance values in the individual CCS stations were consistently over 70,000 µS/cm in comparison to Biscayne Bay station average values that ranged between 43,433 and 51,006 µS/cm.

- When the ID is pumped, the specific conductance values increase in the ID as a result of CCS water seepage.

- The ID continues to operate essentially as designed, however, it was noted that in June 2011 near the end of an extreme dry period, the groundwater elevations in the L series wells were higher than the G series wells. Also, in March 2012, the groundwater elevation in L-5 was higher than the L-31E canal stage. A seaward gradient was still maintained from the L series wells to the ID since the ID was maintained at a lower water elevation.

- Typically, the surface water stations in the L-31 canal (TPSWC-1, TPSWC-2, and TPSWC-3) and the background reference canal on Card Sound Road (TPSWC-6) have specific conductance values reflective of freshwater (<1,275 µS/cm). However, as a result of the drought in 2011, the specific conductance values increased in all locations. In June 2012, specific conductance values at TPSWC-2B, TPSWC-3B, and TPSWC-6B were 9,507 µS/cm, 22,776 µS/cm, and 59,045 µS/cm, respectively. Since there was not an incremental increase in tritium concentrations, these increases in specific conductance tend to indicate regional Biscayne Bay influences instead of CCS influences. Other spikes in specific conductance values have been noted in TPSWC-3B in November 2011 and near the end of the dry season in April-May 2012.

- The water in the historical outfall canal (TPSWC-5) reflects marine conditions, but the bottom of the water column periodically exhibited specific conductance values in excess of those found in Biscayne Bay and similar to those observed in the CCS. This site is over 20 ft deep and is located at the terminus of the dead-end Card Sound Canal. The depth and restricted flushing of this canal may contribute to the observed specific conductance values. However, when reviewing all the data, this station may be affected by the CCS. The water temperature for several extended periods exceeded the temperatures in the CCS and could not be explained by changes in air temperature.

Tritium concentrations, discussed further in this section, also support this preliminary conclusion.

- In Biscayne Bay, average chloride concentrations for the period from June 2010 through June 2012 were 18,900 mg/L, while CCS average chloride concentrations were 33,900 mg/L. In comparison, average seawater chloride levels are 19,840 mg/L at a salinity of 35 on PSS-78 (Millero 1996).

- Ion concentrations in the canals and Biscayne Bay surface waters are more seasonally variable when compared to the groundwater wells. The highest ionic concentrations (as well as specific conductance) were observed in June 2011 at the end of the extreme drought.

- The greatest increase in sodium and chloride concentrations from March to June 2011 was observed at the bottom of the reference station, TPSWC-6 (e.g., sodium: 54 to 12,000 mg/L, a 22,222% increase).

- Nutrient values in the CCS tend to be higher than surrounding stations. Total phosphorus (TP) concentrations in the CCS are similar or less than those reported in the SFWMD C-3 Canal located approximately 15 miles north of the CCS. The nitrate and nitrite values reported in SFWMD canals (C-102 and C-103) within 5 miles north of Turkey Point often exceed the TN reported in the CCS (Graves et al. 2005). Nitrate and nitrite are part of TN.

- In Biscayne Bay, the average TP concentration between the stations in front of the CCS (0.024 mg/L) is comparable to the average TP concentration (0.025 mg/L) in the southernmost Biscayne Bay reference station, several miles south of the CCS in Card Sound.

- Aside from the CCS, the surface station with the next highest TN level (3.42 mg/L) was recorded at the background surface water reference station (TPSWC-6) in March 2012.

- In conjunction with specific conductance and tritium data the data indicate there is no measurable contribution of nutrients in the Bay that can be attributed to the CCS.

7.3 Tracer

7.3.1 Major Findings

- The analysis of ions does not help distinguish CCS water from Biscayne Bay water at concentrations below those typically found in seawater. The isotope data also do not help distinguish CCS from the Biscayne Bay water with the possible exception of tritium.

- The Agencies have recommended that tritium be used as the tracer of CCS water. The Agencies have also established a threshold value of 20 pCi/L for which concentrations below 20 pCi/L are presumed not to be affected by the CCS. Concentrations in excess of

20 pCi/L may or may not reflect CCS influence; FPL needs to further evaluate and provide justification why the values do not indicate a groundwater pathway (i.e., laboratory issue, error band for results, atmospheric deposition/vapor exchange). To account for variability in sample results and laboratory precision, an average value for tritium is being used as directed by the Agencies.

- It is important to note that tritium is being measured only as a chemical tracer in order to determine potential movement of CCS water. At the levels being measured, the tritium is not a public health concern. Tritium is routinely monitored in the CCS by the Florida Department of Health, Bureau of Radiation Control and there have never been results detected near the drinking water standard (20,000 pCi/L).

- FPL does not concur with the selection of 20 pCi/L as a threshold or background for surface water, porewater, or very shallow groundwater. The values measured do not indicate a groundwater pathway. FPL has demonstrated that multiple factors can influence tritium levels in the region including atmospheric influences.

7.3.2 Additional Findings

- Based on evaporation pan and rainfall samples that were collected and analyzed for tritium, atmospheric influences of tritium can exceed several hundred pCi/L within 1 mile of the CCS and reach 50 pCi/L at distances over 3 miles from the CCS. Surface water, porewater, and shallow groundwater (particularly in fully screened wells) are most susceptible to atmospheric influences of tritium. There is no evidence that high chloride/specific conductance CCS water with commensurate levels of tritium are seeping up and affecting Biscayne Bay surface water, L-31 Canal surface water, or porewater in the area surrounding the CCS. These surface water bodies and the porewater have tritium concentrations similar to those found in the evaporation pans and/or rainfall and cannot be attributed to a groundwater pathway.

- Results from surface water in TPSWC-4 and TPSWC-5 indicates tritium concentrations were detected near the bottom of the water body, at levels higher than might not be solely attributable to atmospheric inputs since the highest values were at depth. The maximum tritium concentrations at both of these stations exceeded 900 to 1,000 pCi/L; however, much lower values less than 100 pCi/L have been reported. This may indicate that there is groundwater seepage on occasion through the narrow land that separates these canals from the CCS.

- Using 20 pCi/L as a reference and assuming the atmospheric effects are less with depth, the extent of CCS water in the groundwater near the base of the Biscayne Aquifer extends approximately 3 miles west of the CCS. Given that there are various mechanisms that can contribute to the movement of saltwater, it is unclear how much the CCS density gradients have affected the movement of CCS water verses other factors.

- The extent of CCS water in the offshore groundwater appears to be limited mostly to the deeper depths of TPGW-14 (between 2,490 and 2,660 pCi/L at TPGW-14D). This well

cluster is closest to the CCS where the highest water levels (biggest gradients) on the east side of the CCS occur. Some evidence of CCS water was also noted at depth in well cluster TPGW-11 with tritium concentrations ranging from 338 to 480 pCi/L. Since tritium concentrations were much lower at the shallower intervals, these values appear to be related to a groundwater pathway.

7.4 Water Budget

7.4.1 Major Findings

- Based upon data collected as a part of the pre-uprate monitoring program, as well as information furnished by SFWMD, a water and solute mass (salt) balance model was developed and calibrated to effectively match changing water levels and water quality in the CCS between September 2010 and June 2012.

- The ability to match both CCS water levels and salinities over the period of record with a relatively simple water and salt balance model indicates that FPL has a firm understanding of the processes that govern CCS hydraulics.

- Results of the water and salt balance model indicate that precipitation, Biscayne Bay water inflow, and groundwater discharge are critical to the maintenance of long-term salinity equilibrium in the CCS.

- The water and salt balance model is a useful tool for understanding the dynamics of the CCS and its effect on the environment.

7.5 Ecological

7.5.1 Major Findings

- FPL concludes the CCS does not have any ecological impact on the surrounding areas. FPL further concludes there is no evidence of CCS water in the surrounding ecosystems from a groundwater pathway.

7.5.2 Additional Findings

- The marsh transects in the Model Lands marsh (F2 to F4) are vegetatively typical of coastal marshes in South Florida. These habitats are dominated by sawgrass and spikerush. The marsh transects to the north (F1) and south (F5) of the CCS, however, are brackish mixed marsh-mangrove habitats. The marsh vegetation characteristics and sawgrass community composition are representative of the hydrologically modified marshes found throughout southern Florida.

- High conductivities (up to 3,200 µS/cm) observed at some of the F2-F4 sites are caused by the higher calcium contents rather than sodium, indicating a carbonate origin contributing to the conductance values.

- Soil phosphorous is the main driver of sawgrass community structure. The low productivity at transects F2 and F3 and the high productivity of plot F4-1 are all tied to soil phosphorous levels.

- Soil nutrient patterns indicate that there is a higher concentration of nitrogen and phosphorus in the F1 and F4 transects, as well as in the tree islands compared to the other F2, F3 and the reference F6 plots. The higher soil nutrients patterns in the tree islands are typical for South Florida and this observation helps explain, in part, the denser and taller vegetation observed at F4.

- The mangrove transects (M1 to M6) are all scrub mangroves. Areas to the east of the CCS (M2 to M4) are typical of scrub basin forests in South Florida. The scrub nature of this habitat is supported by stable isotope data supporting evaporative rates in these habitats.

- Vegetation nutrient patterns indicate that the both the marsh and mangrove habitats are both P-limited systems. The tree islands however, are N-limited.

- There are no significant differences in porewater specific conductance with distance from the CCS or compared to the reference transects in either the marsh or mangrove habitats.

- Large areas (>70%) of the Bay habitat along the transects were hard-bottom. This limits productivity to the small areas where sediment is found. Consequently, the area has low cover and is not very diverse.

- Although seagrasses were present in >80% of the quadrants along the transects, the seagrass component rarely exceeded 25% in cover. Additionally, the Bay sediments were nutrient-poor, further limiting the productivity and biodiversity of these habitats.

- The number of organisms captured reflects the habitat cover of an area. More organisms were captured in spring 2011 compared to the fall 2010 sampling event. Caridean shrimp were the most common organisms caught as the throw traps tend to capture small, cryptic, and sedentary species.

- There were no indications of CCS effects on bottom water temperatures, bottom water specific conductance, salinity, ORP, or porewater temperatures.

- There was a very weak tendency for bottom DO values to be higher at stations closer to the CCS. However, bottom DO values for all sampling events combined were significantly lower in the control area than in the three study areas.

- The control area, BB4, had significantly higher bottom turbidity than the three study areas, and turbidities were significantly higher at nearshore transects than at offshore transects. This is an artifact of the more silty substrates near shore in Area BB4.

- There was a very weak negative correlation between distance from shore and porewater specific conductance. There were no statistical differences in porewater tritium concentrations among any of the study areas during any of the four sampling events, suggesting that the higher nearshore porewater conductance values are not associated with CCS seepage.

- Thalassia sp. was the dominant seagrass and occurred throughout most of the study area, however, the Braun-Blanquet scores for seagrasses were relatively low along most transects. High cover and low-standing crops of seagrasses in Biscayne Bay have been reported by others and are attributed to the shallow depth of sediments.

- Throw-trap collections were dominated by caridean shrimp, followed by crabs (primarily hermit crabs), fish, and penaeid shrimp (primarily pink shrimp).

- Densities of organisms were generally higher in Areas BB1 and BB3 than in Areas BB2 and BB4 (the control); however, these differences were not found to be statistically significant during spring 2012. Densities of organisms were correlated with SAV (particularly macroalgae) during spring 2012.

8.0 RECOMMENDATIONS

The two year, pre-Uprate monitoring period is complete. We are now in a period of time prior to the full operation of the two Uprated nuclear units. The first unit (Unit 3) returned to service in September 2012 but to date has not operated at the uprated power levels. The second unit (Unit 4) is currently scheduled to be taken offline in November 2012 and is anticipated to return to service in the spring of 2013.

FPL recommends some reductions in the monitoring during this interim period. The post-Uprate period is defined as both units operating at the uprate power levels. This interim monitoring period reduction should include the elimination of certain water quality sampling events and the terrestrial ecological monitoring such as the December 2012 and March 2013 groundwater and surface water sampling events and February 2013 ecological event. FPL will further discuss the merits of continuing ecological monitoring after the November 2012 event with the Agencies.

In addition, FPL recommends the following changes be adopted for the post-Uprate monitoring period:

a) Discontinue sampling for the trace metals in the five well clusters in close proximity to the CCS based on the lack of findings and the lack of any relevant standards.

b) Continue chloride, sodium, and tritium sampling and analysis. Eliminate all isotopes and ions. Since the Agencies have selected tritium as the tracer for the CCS and it has been shown that the other isotopes and ions have shown no value as tracers of CCS water, continued analyses for all these parameters have limited merit.

c) Eliminate sampling and analysis of the nutrients. The discharge of nutrients into the CCS from the plant is negligible.

d) Continue automated data collection, but reprogram all stations to one-hour intervals. By reprogramming the stations to one-hour intervals, the amount of data retrieved from the automated stations on a daily basis and processed will be reduced by 75%.

e) Eliminate the rain gauge stations around the CCS and use the NEXTRAD data collected by the SFWMD. The NEXTRAD data provides better coverage of the CCS and prevents having to interpolate rain values across the CCS from rain gauge stations outside the CCS. Continue operation of the meteorological station and rain gauge within the CCS (TPM-1).

f) Eliminate the CCS flow meters. This data is not being used as originally envisioned and thus there is a limited benefit of continued data collection. These meters are located at depth in a harsh environment (i.e., within the CCS) and are difficult to maintain. Logistical and security constraints also restrict placement of the flow meters.

g) Eliminate the ID flow meters since pump operational data provides more reliable information. Pump tests more closely matched flows being discharged into the CCS from the ID compared to the flow meters.

h) Eliminate the requirement for the automated data being reported every 24 hours. The automated data will either be manually downloaded or transmitted via telemetry when a reliable signal is available.

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