

**ACE Basin (ACE) National Estuarine Research Reserve Water Quality Metadata
January-December 2011 Report
Latest edit: 12/07/2015**

I. Data Set and Research Descriptors

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2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch in a comma-delimited format (.CDF) and uploaded to the CDMO where they undergo automated primary QAQC; automated depth/level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. Excessive pre- and post-deployment data are removed from the file prior to upload with up to 2 hours of pre- and post-deployment data retained to assist in data management. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove remaining pre- and post-deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12. Amanda Fornal and Chuck Tucker were responsible for these tasks.

3) Research objectives

Long-term water quality monitoring in the ACE Basin provides a unique opportunity to increase understanding of how various environmental factors influence estuarine processes. The Reserve research staff has elected to compare water quality conditions in shallow creeks along a salinity gradient and at different levels of development. Based on discussions with local Coastal Zone Management (CZM) personnel and ACE Basin NERR staff knowledge of land use within the Reserve, the South

Edisto River drainage basin was selected because it is well suited for studying contrasting hydrographic conditions and land use patterns. Two tributaries, St. Pierre Creek and Fishing Creek, are in areas where boat traffic is light and development is sparse, and they are designated as "control" sites. In contrast, the two "treatment" sites are in Big Bay Creek and Mosquito Creek where boat traffic is moderate to heavy and residential and commercial development is medium to dense. The four sites also are located along the salinity gradient in the South Edisto River watershed: Big Bay Creek and St. Pierre Creek are in the polyhaline zone (18-30 ppt), Mosquito Creek is in the mesohaline zone (5-18 ppt), and Fishing Creek is in the oligohaline zone. See *Section 5 - Site Location and Character* for detailed descriptions of the sites.

The water quality monitoring program began on March 3, 1995 at Big Bay Creek and St. Pierre Creek; in October 2002, a monitoring station was established in Fishing Creek and in Mosquito Creek. Initially, YSI electronic data loggers were deployed to monitor the water temperature, specific conductance, dissolved oxygen, water level, and pH conditions, approximately 0.5 meters above the creek bottom, at 15-minute intervals; on August 11, 1995, the sampling interval was changed to 30 minutes, and turbidity monitoring was added to the program on April 11, 1996. On December 12, 2007, the sampling interval was changed to 15 minutes.

4) Research methods

One data logger is deployed at each permanent monitoring station (Big Bay, St. Pierre, Fishing Creek, and Mosquito Creek). The data logger is attached to a deployment mount at each station to ensure that the sensor is positioned approximately 0.5 m from the creek bottom during a deployment. At each monitoring station, the deployment mount consists of a PVC pipe that is attached vertically to a stable structure. To facilitate water flow across the sensors, approximately two-inch diameter holes are drilled into the PVC pipes.

A Sutron Sat-Link2 transmitter was installed at the Saint Pierre station on 06/28/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3b02f20a. (Where 3b02f20a is the GOES ID for that particular station.) The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at <http://cdmo.baruch.sc.edu>.

To minimize fouling (i.e. settlement of barnacles and sponges) of data loggers, new sensors and sensor guards are wrapped in nonconductive copper tape. A plastic mesh is wrapped around the sensor guard to keep out large animals (i.e. crabs, fish); the mesh is coated with anti-fouling paint. In addition, fouling organisms are removed from the PVC deployment mounts during monthly inspections.

The YSI data loggers are deployed for one to two weeks during the summer months, and the sampling period is extended up to one month during the cooler months. A data logger is retrieved and replaced with a newly calibrated data logger prior to a 15-minute reading to prevent interruption of data collection. Swap data are collected by taking readings at the same time with the retrieved and newly deployed data logger to determine how much drift occurred during the previous deployment. A secondary field reading is taken from time to time with in-situ measurements to serve as a secondary check. After deploying the calibrated data logger, a water sample is collected from same depth as the sensor to measure several water quality parameters (water temperature, salinity, pH, dissolved oxygen [mg/l]). Water temperature, salinity, and pH are measured directly with a thermometer, refractometer and hand-held pH meter, respectively, dissolved oxygen, expressed at mg/l, is determined with a field Winkler titration kit. Water depth and meteorological conditions (i.e. precipitation and wind speed and

direction) also are recorded. The in-situ measurements are used to determine if the sensor readings drifted significantly during deployment and to evaluate anomalous oxygen readings (<28%).

When the data loggers are retrieved, they are taken to the laboratory for cleaning, post-deployment calibration checks and servicing, in accordance with guidelines set by YSI Operating and Service Manual. Upon returning to the laboratory, the data are downloaded, and the dataset is reviewed to determine if any equipment malfunctions occurred during deployment that need immediate attention. Post-deployment calibration checks of all the parameters except turbidity are done before cleaning the data loggers. Turbidity checks are performed after cleaning the data loggers to prevent contamination of the standard. Sensors are immersed in the appropriate standard solutions (i.e. pH) and readings are recorded. A DO membrane integrity test also is conducted to determine if the membrane was damaged during deployment.

A series of diagnostic values, including dissolved oxygen charge, dissolved oxygen gain, and pH millivolt value at pH 7 and at pH 10, are recorded during calibration and post-deployment calibration checks of data loggers. These diagnostic values are strong indicators of the individual sensor performance, and they are used to determine the accuracy of the data.

Before the data loggers are deployed dissolved oxygen (DO) membranes are changed and allowed to stretch for 24 hours, and the voltage of the batteries are checked. Next, the pH, conductivity, and turbidity sensors are calibrated, using the following standards: pH 7 and 10, 50 mS/cm potassium chloride solution, and 0 and 123 NTU solutions, respectively. The water level sensor is calibrated to an offset based on the barometric pressure in air, and the barometric pressure in the laboratory is recorded. Before leaving the laboratory the following day, the DO sensor is calibrated in air-saturated water at the barometric pressure reading within the lab in mmHg. In addition to the procedures outlined in the CDMO manual, we conduct a DO membrane integrity test prior to deployment to determine if the membrane was installed properly or was damaged during calibration.

5) Site location and character –

ACE Basin National Estuarine Research Reserve is one of the largest undeveloped estuaries on the East Coast. The study area encompasses the Ashepoo, Combahee and South Edisto River basins, which empty into St. Helena Sound. The NERR consists of approximately 150,000 acres of diverse estuarine wetlands providing preserved habitats for fish and wildlife.

Three monitoring stations are tributaries of the South Edisto River and one is in a tributary of both the S. Edisto and Ashepoo rivers, contributing to freshwater input to each site. The average tidal range at all stations is approximately 2.0 m (6.6 feet), with a maximum of 2.8 m (9.2 feet) and a minimum of 1.4 m (4.6 feet). The bottom habitat at each of the four sites consists of mud intermixed with dead shell hash. The descriptions of the sites are as follow:

Big Bay - GPS coordinates: 32.4941N and -80.3241W

This monitoring station is in Big Bay Creek proper, approximately 2 km (1.24 mi) from the mouth of the creek, and is located about 5 m (16.41 ft) from the southern bank of the creek. In 2010, the mean depth at the station was 2.34 m (7.67 ft), and the mean salinity was 30.8 parts per thousand (ppt).

The Big Bay monitoring station is designated as a "treatment" site because it is subject to nonpoint source pollution and has a high density of development. The southern bank of the creek is bordered by residential and commercial development, with little setback from the bordering *Spartina* marsh. For instance, there are over forty private docks, two commercial seafood docks and a marina with 75 slips, three paved boat ramps, and two fueling areas along the southern bank. Docks and bulkheads are constructed of concrete, or creosote, CCA-treated or Wolmanized material. Boat traffic is heavy,

especially during the warmer months, and the creek is closed to shellfish harvesting because of the surrounding human activities. The major sources of nonpoint source pollution are surface runoff from lawns, golf courses, and paved ramps that contain fertilizers, pesticides, herbicides and PAHs. All of the high ground along the southern bank is developed (i.e. residential homes, condominiums and restaurants); and maritime plant communities have been replaced by golf courses, lawns and ornamental gardens. Small patches of a few maritime species (i.e. live oak (*Quercus virginiana*), cabbage palmetto (*Sabal palmetto*), and Southern red cedar (*Juniperus silicicola*)) are found along the roads. In contrast, the northern bank is bordered by a wide expanse of *Spartina alterniflora* marsh, and no high ground is present. American oyster (*Crassostrea virginica*) forms a reef along the creek banks, especially the northern side, and on intertidal mud flats within the creek.

Fishing Creek – GPS coordinates: 32.6358 N and -80.3655W

This monitoring station is in a tributary of Fishing Creek, approximately 1.79 km (1.11 mi) from the mouth of the creek, and is located approximately 5 m (16.41 ft) from the northern bank of the creek. The tributary flows through the eastern half of Jehossee Island, a protected USFWS, and Fishing Creek forms the northeast border of the island. The station is surrounded by extensive *Spartina cynosuroides* marsh and vast mud flats. The upland area is characterized by slash pine, live oak, and cabbage palmetto. In 2010, the mean depth at the station was 1.77 m (5.81 ft), and the mean salinity was 9.4 parts per thousand (ppt).

Fishing Creek monitoring station is designated as a “control” site because there is no development in the immediate area, and boat traffic is relatively light in the creek. The Wildlife Management Area contains impoundments (formerly rice fields) that are managed as wildlife habitat for endangered fauna and migratory waterfowl. No pesticides or herbicides are applied to the managed wetlands. Water level in the managed wetland is regulated by rice trunks that control the flow of water between the impoundment and the South Edisto River.

Mosquito Creek – GPS coordinates: 32.5558 N and -80.4380W

This monitoring station is in Mosquito Creek proper (a tributary of both the South Edisto and Ashepoo rivers), approximately 2.51 km (1.56 mi) from the Ashepoo River and 12 km (7.46 mi) from the South Edisto River, and it is about 5 m (16.41 ft) from the southern bank of the creek. In 2010, the mean depth at the station was 3.71 m (12.17 ft), and the mean salinity was 18.2 parts per thousand (ppt).

Mosquito Creek station is designated as a "treatment" site because of the land use practices in the surrounding area. Agriculture fields and impounded wetlands are found upstream of the monitoring station. Ten docks constructed of creosote, concrete and Wolmanized pilings; a public boat landing; a commercial seafood business with three commercial shrimp boats and a fueling area are located about 0.8 km (0.5 mi) downstream of the monitoring station. The major source of nonpoint source pollution to the monitoring station is surface runoff from the impoundments and agricultural lands that contain high levels of nutrients and, at times, herbicides and pesticides. Impoundment trunks open and drain into the creek increasing the nutrient load and possibly introducing herbicides and pesticides. Vegetation in the area includes salt marsh dominated by *Spartina alterniflora* and *Juncus roemerianus*. Upland fringe areas consist of cabbage palmetto, live oaks and pine trees.

St. Pierre - GPS coordinates: 32.5233N and -80.3568W

This monitoring station is in a small tributary of St. Pierre Creek, approximately 0.25 km (0.16 mi) from the mouth of the creek, and it is about 5 m (16.41 ft) from the northern bank of the creek. The tributary flows through the southern portion of Bailey Island, and creek forms the eastern border of the island. The monitoring station is surrounded by a wide expanse of *Spartina alterniflora* marsh. Extensive mud flats and oyster reefs fringe the banks. Maritime forest communities comprised of

species such as wax myrtles, live oaks, and palmettos dominate the upland areas. In 2010, the mean depth at the station was 2.00 m (8.69 ft), and the mean salinity was 29.7 parts per thousand (ppt).

The St. Pierre station is designated as a “control” site because development in the immediate area was sparse when the station was established on March 3, 1995, and the tributary is subject to relatively light boat traffic. In 1996, the 695-acre island was sold, and the owners partnered with The Nature Conservancy to design a conservation-based development. Four hundred and three acres in the center of Bailey Island were set aside as a nature preserve that is managed by The Nature Conservancy, and number of residential lots on the remaining 292 acres is limited to 67. Access to the island is limited to one bridge and all roads on the island are single lane and made of crushed seashells. In addition, a conservation manual was developed for the property owners that provide specific lot designs and construction guidelines as well as landscaping guidelines to protect the maritime and estuarine habitats.

6) Data collection period –

Big Bay

BEGAN	ENDED
12/2/2010 – 09:00	01/5/2011 – 12:00
01/5/2011 – 12:30	02/2/2011 – 11:30
02/2/2011 – 12:00	03/2/2011 – 10:45
03/02/2011 – 11:15	04/13/2011 – 07:00
04/13/2011 – 07:30	04/29/2011 – 10:15
04/29/2011 – 10:45	05/09/2010 – 10:00
05/09/2011 – 10:15	05/24/2011 – 09:30
05/24/2011 – 10:00	06/15/2011 – 11:00
06/15/2011 – 11:30	06/29/2011 – 10:00
06/29/2011 – 10:30	07/14/2011 – 08:45
07/14/2011 – 09:00	08/02/2011 – 13:15
08/02/2011 – 13:45	08/23/2011 – 08:45
08/23/2011 – 09:00	09/14/2011 – 11:30
09/14/2011 – 12:00	09/27/2011 – 12:00
09/27/2011 – 12:15	10/12/2011 – 12:00
10/12/2011 – 12:15	11/09/2011 – 13:15
11/09/2011 – 13:30	12/14/2011 – 13:00
12/14/2011 – 13:15	01/17/2012 – 08:15

Fishing Creek

BEGAN	ENDED
12/02/2010 – 10:15	01/05/2011 – 13:15
01/05/2011 – 13:45	02/02/2011 – 12:45
02/02/2011 – 13:15	03/02/2011 – 12:00
03/02/2011 – 12:30	04/13/2011 – 08:45
04/13/2011 – 09:15	04/29/2011 – 11:15
04/29/2011 – 11:45	05/09/2011 – 11:00
05/09/2011 – 11:15	05/24/2011 – 10:30
05/24/2011 – 11:00	06/15/2011 – 12:00
06/15/2011 – 12:30	06/29/2011 – 10:45
06/29/2011 – 11:00	07/14/2011 – 08:30
07/14/2011 – 08:45	08/02/2011 – 14:15
08/02/2011 – 14:45	08/23/2011 – 09:45
08/23/2011 – 10:15	09/14/2011 – 12:30

09/14/2011 – 13:00	09/27/2011 – 13:15
09/27/2011 – 13:45	10/12/2011 – 12:45
10/12/2011 – 13:15	11/09/2011 – 12:00
11/09/2011 – 12:30	12/14/2011 – 13:45
12/14/2011 – 14:15	01/17/2012 – 11:30

Mosquito Creek

BEGAN	ENDED
12/02/2010 – 11:30	01/05/2011 – 14:30
01/05/2011 – 15:00	02/02/2011 – 13:45
02/02/2011 – 14:15	03/02/2011 – 13:00
03/02/2011 – 13:30	04/13/2011 – 10:00
04/13/2011 – 10:30	04/29/2011 – 11:30
04/29/2011 – 11:45	05/09/2011 – 09:00
05/09/2011 – 09:15	05/24/2011 – 11:30
05/24/2011 – 12:00	06/15/2011 – 12:00
06/15/2011 – 13:15	06/22/2011 – 07:15

MISSING DATA 06/22 – 07:30 THROUGH 06/29 – 12:00 DUE TO BATTERY FAILURE

06/29/2011 – 12:30	07/13/2011 – 12:30
07/13/2011 – 13:00	08/02/2011 – 15:00
08/02/2011 – 15:30	08/23/2011 – 10:30
08/23/2011 – 11:00	09/14/2011 – 13:15
09/14/2011 – 13:45	09/27/2011 – 14:00
09/27/2011 – 14:30	10/12/2011 – 13:45
10/12/2011 – 14:15	11/09/2011 – 11:00
11/09/2011 – 11:30	12/14/2011 – 14:30
12/14/2011 – 15:00	01/17/2012 – 10:45

St. Pierre

BEGAN	ENDED
12/02/2010 – 08:15	01/05/2011 – 11:15
01/05/2011 – 11:45	02/02/2011 – 10:45
02/02/2011 – 11:15	03/02/2011 – 10:00
03/02/2011 – 10:30	04/13/2011 – 07:45
04/13/2011 – 08:15	04/29/2011 – 09:30
04/29/2011 – 10:15	05/09/2011 – 09:45
05/09/2011 – 10:00	05/24/2011 – 07:45
05/24/2011 – 08:15	06/15/2011 – 10:00
06/15/2011 – 10:15	06/29/2011 – 09:15
06/29/2011 – 09:45	07/13/2011 – 09:30
07/13/2011 – 10:00	08/02/2011 – 12:45
08/02/2011 – 13:15	08/23/2011 – 08:15
08/23/2011 – 08:45	09/14/2011 – 10:45
09/14/2011 – 11:15	09/27/2011 – 11:00
09/27/2011 – 11:30	10/12/2011 – 11:00
10/12/2011 – 11:30	11/09/2011 – 13:45
11/09/2011 – 14:15	11/21/2011 – 08:30

MISSING DATA 11/21 – 08:45 THROUGH 12/14 – 12:00 DUE TO BATTERY FAILURE

12/21/2011 – 12:30	01/12/2012 – 13:30
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7) Distribution

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:

National Estuarine Research Reserve System (NERRS). 2012. System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: <http://cdmo.baruch.sc.edu/>; accessed 12 October 2012.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page <http://cdmo.baruch.sc.edu/>. Data are available in comma delimited format.

8) Associated researchers and projects

Dr. Charles Wenner of SCDNR/Marine Resources Research Institute received funding through the National Marine Fisheries Service in January of 2001 to continue an ongoing survey of red drum (*Sciaenops ocellatus*) in the South Edisto and Combahee River basins, by electrofishing in tidal freshwater and low salinity brackish water. Although red drum is the target species, all species are identified to species, measured and weighed.

As part of the System-wide Monitoring Program (SWMP), nutrient and weather data are gathered at the ACE NERR in conjunction with water quality data obtained by YSI 6600-EDS data loggers. Diehl nutrient samples are gathered once per month at the St. Pierre water quality monitoring station, and grab samples are obtained at each of the four sites once per month. The concentrations of the following parameters are measured and recorded for the nutrient monitoring program: ammonium (NH₄), nitrite + nitrate (NO₂ + NO₃), ortho-phosphate (PO₄), and chlorophyll-A (Chl-a). Real-time weather data are gathered 24/7 and is transmitted to the Centralized Data Management Office (CDMO). Historic water quality, nutrient, and weather data can be obtained at <http://cdmo.baruch.sc.edu>. Information about other studies conducted in the ACE Basin may be obtained from the Research Coordinator.

II. Physical Structure Descriptors

9) Sensor specifications

YSI 6600EDS data sonde:

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Thermistor

Model#: 6560

Range: -5 to 50 C

Accuracy: +/- 0.15

Resolution: 0.01 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: 4-electrode cell with autoranging

Model#: 6560

Range: 0 to 100 mS/cm

Accuracy: +/- 0.5% of reading + 0.001 mS/cm

Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity

Units: parts per thousand (ppt)

Sensor Type: Calculated from conductivity and temperature

Range: 0 to 70 ppt

Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater

Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation

Units: percent air saturation (%)

Sensor Type: Rapid Pulse - Clark type, polarographic

Model#: 6562

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: +/- 2% of the reading or 2% air saturation, whichever is greater; 200 to 500% air saturation: +/- 6% of the reading

Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)

Units: milligrams/Liter (mg/L)

Sensor Type: Rapid Pulse - Clark type, polarographic

Model#: 6562

Range: 0 to 50 mg/L

Accuracy: 0-20 mg/L: +/- 2% of the reading or 0.2 mg/L, whichever is greater
20 to 50 mg/L: +/- 6% of the reading

Resolution: 0.01 mg/L

Parameter: pH – bulb probe or EDS flat glass probe

Units: pH units

Sensor Type: Glass combination electrode

Model#: 6561 or 6561FG

Range: 0 to 14 units

Accuracy: +/- 0.2 units

Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Dissolved Oxygen Qualifier (Rapid Pulse / Clark type sensor):

The reliability of dissolved oxygen (DO) data collected with the rapid pulse / Clark type sensor after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Some Reserves utilize the YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. Optical DO probes have further improved data reliability. The user is therefore advised to consult the metadata for sensor type information and to exercise caution when utilizing rapid pulse / Clark type sensor DO data beyond the initial 96-hour time period. Potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. If there are concerns about fouling impacts on DO data beyond any information documented in the metadata and/or QAQC flags/codes, please contact the Research Coordinator at the specific NERR site regarding site and seasonal variation in fouling of the DO sensor.

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.03 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve's associated meteorological station during data ingestion. These corrected depth/level data are reported as cDepth and cLevel, and are

assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

Chlorophyll Fluorescence Disclaimer:

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual including interference from other fluorescent species, differences in calibration method, and effects of cell structure, particle size, organism type, temperature, and light on sensor measurements.

10) Coded variable definitions

Sampling Station:	Sampling site code:	Station Code:
St. Pierre	SP	acespwq
Big Bay	BB	acebbwq
Fishing Creek	FC	acefcwq
Mosquito Creek	MC	acemcwq

11) QAQC flag definitions

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining

data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

- 5 Outside High Sensor Range
- 4 Outside Low Sensor Range
- 3 Data Rejected due to QAQC
- 2 Missing Data
- 1 Optional SWMP Supported Parameter
- 0 Data Passed Initial QAQC Checks
- 1 Suspect Data
- 2 *Open - reserved for later flag*
- 3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

12) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIC	No instrument deployed due to ice
GIM	Instrument malfunction
GIT	Instrument recording error; recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Corrected Depth/Level Data Codes

GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
SCS	Chlorophyll spike
SDF	Depth port frozen
SDG	Suspect due to sensor diagnostics
SDO	DO suspect
SDP	DO membrane puncture

SIC	Incorrect calibration / contaminated standard
SNV	Negative value
SOW	Sensor out of water
SPC	Post calibration out of range
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSM	Sensor malfunction
SSR	Sensor removed / not deployed
STF	Catastrophic temperature sensor failure
STS	Turbidity spike
SWM	Wiper malfunction / loss

Comments

CAB*	Algal bloom
CAF	Acceptable calibration/accuracy error of sensor
CAP	Depth sensor in water, affected by atmospheric pressure
CBF	Biofouling
CCU	Cause unknown
CDA*	DO hypoxia (<3 mg/L)
CDB*	Disturbed bottom
CDF	Data appear to fit conditions
CFK*	Fish kill
CIP*	Surface ice present at sample station
CLT*	Low tide
CMC*	In field maintenance/cleaning
CMD*	Mud in probe guard
CND	New deployment begins
CRE*	Significant rain event
CSM*	See metadata
CTS	Turbidity spike
CVT*	Possible vandalism/tampering
CWD*	Data collected at wrong depth
CWE*	Significant weather event

13) Post deployment information –

Probe Identification:

Turbidity 6136 Probe

pH 116031 Probe

pH 6561FG Probe

Specific Conductivity 6560 Probe

Standards for Calibration:

YSI 6073G Turbidity Standard
126 NTU

RICCA CHEMICAL COMPANY LLC.
Buffer 7.00 and 10.00

RICCA CHEMICAL COMPANY LLC.
Buffer 7.00 and 10.00

YSI 3169 Conductivity Calibrator 50 mS/cm +/- 1%

Big Bay

Deployment

Date SpCond DO 1 DO 2 pH pH Turb Turb Depth

m/d/y	ms/cm	(100% sat)	(100% sat)	(7)	(10)	NTU	NTU	m
12/2/2010	50.03	99.6	99.8	7.06	10.04	0.2	121.2	-0.139
2/02/2011	49.52	98.9	98.8	7.15	10.10	0.6	126.7	0.130
3/02/2011	51.53	66.1	66.4	6.98	9.97	0.7	127.5	0.002
4/13/2011	50.05	102.2	102.2	7.02	10.01	0.0	124.2	0.070
4/29/2011	50.22	92.1	92.1	6.92	9.98	0.6	127.4	-0.016
5/09/2011	50.15	105.7	105.6	6.98	9.98	1.0	132.7	-0.008
5/24/2011	48.67	40.6	41.9	7.08	9.72	4.3	129.3	-0.034
6/15/2011	50.81	98.7	98.7	7.08	10.10	0.0	125.7	-0.013
6/29/2011	50.23	97.3	97.4	7.14	10.05	-0.2	120.5	-0.054
7/13/2011	49.26	109.7	109.6	7.08	10.14	0.4	121.8	-0.060
8/02/2011	49.81	106.5	106.7	7.03	9.96	-0.2	119.4	-0.026
8/23/2011	52.09	105.3	105.4	7.11	10.10	-0.2	121.8	-0.026
9/14/2011	50.62	97.6	97.6	7.00	9.94	-0.2	120.6	-0.077
9/27/2011	50.49	103.3	103.0	7.01	10.03	0.3	119.8	-0.087
10/12/2011	50.43	95.8	97.0	7.04	9.97	-0.1	120.7	-0.048
11/09/2011	51.08	107.5	107.8	7.08	10.08	0.4	119.3	0.093
12/14/2011	55.20	97.6	97.9	6.90	9.89	0.5	128.6	0.021

Fishing Creek

Deployment Date	SpCond	DO 1 (100% sat)	DO 2 (100% sat)	pH	pH	Turb	Turb	Depth
m/d/y	ms/cm	sat	sat	(7)	(10)	NTU	NTU	m
12/2/2010	49.76	100.5	100.5	7.09	10.08	0.5	123.5	-0.136
2/02/2011	50.32	100.6	100.6	7.16	10.19	0.5	126.9	0.120
3/02/2011	49.46	101.4	101.6	7.20	10.22	0.8	127.3	0.008
4/13/2011	49.10	99.6	99.6	7.04	10.02	0.4	125.0	0.078
4/29/2011	49.80	100.5	100.5	7.13	10.08	0.3	129.0	-0.020
5/06/2011	50.41	102.1	102.8	7.16	10.06	-0.3	128.7	0.004
5/24/2011	49.57	102.0	102.0	6.94	9.85	2.3	136.0	-0.054
6/15/2011	50.34	102.5	102.4	6.81	7.08	0.0	125.3	-0.013
6/29/2011	50.23	100.6	100.5	7.18	10.09	0.1	121.9	-0.065
7/13/2011	49.88	103.7	103.6	8.03	8.45	0.1	122.7	-0.067
8/02/2011	50.47	110.8	110.7	7.08	10.01	-0.3	119.2	0.009
8/23/2011	50.62	97.8	100.6	7.23	7.64	0.5	119.4	-0.033
9/14/2011	50.32	98.6	98.4	7.07	9.99	0.1	119.2	-0.098
9/27/2011	50.78	99.9	105.5	7.06	10.02	0.8	120.0	-0.092
10/12/2011	50.80	100.3	101.1	7.14	10.07	0.0	121.6	-0.058
11/09/2011	50.79	118.7	119.0	7.18	10.17	0.8	119.6	0.094
12/14/2011	50.24	101.9	102.8	7.14	10.12	0.0	128.5	0.048

Mosquito Creek

Deployment	SpCond	DO 1	DO 2	pH	pH	Turb	Turb	Depth
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Date		(100%	(100%					
m/d/y	ms/cm	sat)	sat)	(7)	(10)	NTU	NTU	m
12/2/2010	50.69	112.0	112.0	7.16	10.13	0.8	123.9	-0.137
2/02/2011	49.80	109.4	109.7	7.13	10.15	-0.2	126.8	0.126
3/02/2011	50.43	100.5	100.6	7.13	10.09	0.3	126.0	0.011
4/13/2011	49.18	99.6	99.9	6.89	9.88	0.1	125.5	0.073
4/29/2011	49.92	101.9	101.9	7.05	9.99	0.7	128.1	-0.007
5/09/2011	50.40	98.7	95.1	7.08	10.07	-1.2	129.2	-0.007
5/24/2011	50.08	110.4	110.5	7.06	9.96	-205.	-206.	-0.026
6/15/2011	50.72	87.2	84.0	7.05	10.11	0.1	124.6	-0.016
6/29/2011	50.19	107.9	107.9	7.11	10.04	0.1	123.7	-0.039
7/13/2011	50.31	95.0	95.3	6.76	9.92	1.1	122.0	-0.071
8/02/2011	49.91	80.0	80.5	7.06	9.96	-0.6	117.7	-0.033
8/23/2011	51.13	81.3	86.0	7.03	10.08	0.7	119.6	0.032
9/14/2011	50.45	76.4	77.4	7.04	9.96	0.8	119.9	-0.069
9/27/2011	50.72	107.1	106.9	6.85	9.86	3.2	120.8	-0.077
10/12/2011	51.07	105.2	105.0	7.12	10.02	-0.2	120.5	-0.058
11/09/2011	51.28	107.8	108.3	7.18	10.25	0.0	119.4	0.102
12/14/2011	49.95	106.6	107.1	7.23	10.18	-0.3	131.1	0.035

St. Pierre

Deployment								
Date	SpCond	DO 1	DO 2	pH	pH	Turb	Turb	Depth
m/d/y	ms/cm	(100% sat)	(100% sat)	(7)	(10)	NTU	NTU	m
12/2/2010	49.90	96.5	96.5	7.16	10.14	1.2	122.5	-0.174
2/02/2011	49.92	100.4	100.4	7.18	10.16	-0.2	123.9	0.032
3/03/2011	51.07	102.3	102.4	7.07	10.05	1.4	86.4	-0.002
4/13/2011	49.74	96.3	96.3	6.94	9.90	-2.5	119.5	0.021
4/29/2011	47.00	*	*	7.07	10.02	-0.1	127.2	-0.017
5/09/2011	50.15	90.2	90.1	7.06	9.98	0.4	131.6	-0.020
5/24/2011	49.48	101.2	96.9	7.11	9.98	-0.3	81.5	-0.051
6/15/2011	50.97	80.9	80.5	7.06	10.09	1.6	123.7	-0.027
6/29/2011	50.09	102.6	102.7	7.16	10.09	0.0	120..2	-0.058
7/13/2011	48.91	100.9	101.0	7.09	10.06	1.9	121.5	-0.104
8/02/2011	49.63	99.8	99.2	7.14	10.04	0.1	119.0	0.005
8/23/2011	52.90	100.5	100.5	6.88	9.75	*	*	-0.057
9/14/2011	49.50	96.4	96.6	6.97	9.90	1.0	120.2	-0.081
9/27/2010	50.69	95.3	95.1	6.85	10.06	3.1	119.4	-0.112
10/12/2011	50.27	99.1	99.2	7.11	10.02	0.1	119.7	-0.060
11/09/2011	50.70	104.2	*	6.60	9.54	0.3	119.2	0.011
12/14/2011	50.04	83.9	84.3	7.15	10.14	0.6	130.1	-0.011

14) Other remarks/notes

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform.

If additional information on missing data are needed, contact the Research Coordinator at the reserve submitting the data.

ACE NERR Water Quality Site Histories

Big Bay:

1995- Big Bay water quality station was installed in **March**. (coordinates: 32 29.662N 80 19.427W)
2001- Big Bay station replaced in **October** due to old age and excessive biofouling of oysters (coordinates changed: 32 29 38.72125N 80 19 21.69864W very accurate)
2003- Big Bay station moved to new location in **July** after embankment collapsed near data logger, causing sedimentation issues and poor data.(coordinates: 32.4941N and 80.3241W)
2005- Big Bay station modified in **December**
2009- Big Bay site mount replaced in **January** (about 0.3 meters deeper).

Fishing Creek:

2002- Fishing Creek site installed in **October** (coordinates: 32.6358 N 80.3655W)
2009- Fishing Creek site mount replaced in **May** (about 0.2 meters deeper).
2009- Fishing Creek site destroyed in **October**.
2010- Fishing Creek site replaced with 40' pylon in **January**.

Mosquito Creek:

2002- Mosquito Creek site installed in **October** (coordinates: 32.5558 N 80.4380W)
2007- Mosquito Creek mount installed 0.5 meters away from old mount in **August**. Deeper location.
2008- Mosquito Creek site mount attached to original mount after new mount broke in **October** (about 0.2 meters shallower).
2008- Mosquito Creek site mount was destroyed and repaired in **December** (about 0.2 meters shallower).
2009- Mosquito Creek site mount moved due to demolition of old bridge and construction of new one at same location in **August** (about 0.2 meters deeper)

Rock Creek:

1996- Rock Creek water quality station was installed in **March**. (coordinates: XXXXXXXXXXXXX)
1996- Rock Creek water quality station was vandalized in **July** and never replaced.

St. Pierre:

1995- St. Pierre water quality station was installed in **October**. (coordinates: 32 31.724N 81 21.573W)
1997- St. Pierre site moved away from bank in **February, March, and other times** due to sedimentation issues fouling readings
2000- St Pierre site moved to other side of channel and station modified in **April** (coordinates changed: 32 31 40.59518N 80 21 41.2548W very accurate)
2001- St. Pierre station replaced in **September**
2006- St. Pierre station PVC replaced in **April**.
2006- Sutron Sat-Link2 transmitter installed in **June** at St. Pierre to transmit real-time data
2009- St. Pierre site mount replaced in **June** (about 0.06 meters deeper).

Blanket Statement(s): All Stations:

Dissolved Oxygen Hypoxia Coding

Dissolved oxygen percent and mg/L is coded <0> (CDA) when a hypoxic event is recorded (< 3 mg/L).

Turbidity

Turbidity sensors for all sites provided unusually high values from the observed norm and have been marked as suspect data (Code: <1>). The cause of these irregular values above 300NTU is unknown (Code: CCU). However, these values could be attributed to low tide, max flood tide, and/or rain events.

Turbidity sensors for all sites provided values over 1000 NTU. Therefore, these anomalous data points have been marked as rejected (Code: <-3>). These values are marked as turbidity spike (Code: STS) And in cases where the cause is unknown (Code: CCU).

All Data

Some of the data that are anomalous are under further review. We are looking at rain levels at various sites to determine if rain played a role in data spikes. Salinity profiles will also be taken to see the variation at different levels in the water column.

Data Editing/Flagging Notes: Organized by Station, Parameter, and Code

Big Bay

All Parameters Blanket Statement for Big Bay

During the 8/02/2011 deployment the clamps that secured the deployment tube to the piling broke and the tube fell over, but the cable attached to sonde was tethered to the dock so the sonde was still deployed. The unusual fluctuations in depth readings during the deployment are probably due to the movement of the sonde during the tides. A new tube was installed at the beginning of the 9/14/2011 deployment; however, the new tube was positioned at a higher depth in the water column than the previous tube. The maximum depths recorded by the sonde in the new tube is about one meter lower than those of sonde in the old tube. A new tube was replaced on June 1, 2012 at the previously correct depth. All data after 7/24/11 16:30 are marked 1 GSM CWD for depth and 0 GSM CWD for all other parameters.

Suspect Data (Flag <1>)

Turbidity data were marked suspect when issues could be attributed to low tide, max flood tide, and/or rain events. Depth data were marked suspect starting 07/14/2011- 09:00 due to sonde being deployed at slightly different depth.

Temperature

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See Big Bay blanket statement above.

Suspect Data (Flag <1>)

See Big Bay blanket statement above.

Specific Conductivity/Salinity

Rejected Data (Flag <-3>)

Data were rejected due to sensor failure (SCF) for the following dates and times: 07/25/2011-08:00-09:15; 07/26/2011-09:00-10:15 and 07/27/2011-09:45-10:45

Missing Data (Flag <-2>)

See Big Bay blanket statement above.

Suspect Data (Flag <1>)

See Big Bay blanket statement above.

SpCond and salinity data during the 01/05 deployment and 03/02 deployment were marked 1 CSM. Data seemed erratic especially during times when the temperature dropped.

DO Percent/mg/L

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See Big Bay blanket statement above.

Suspect Data (Flag <1>)

See Big Bay blanket statement above.

Depth

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See Big Bay blanket statement above.

Suspect Data (Flag <1>)

See Big Bay blanket statement above.

pH

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See Big Bay blanket statement above.

Suspect Data (Flag <1>)

None

Turbidity

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See Big Bay blanket statement above.

Suspect Data (Flag <1>)

See Big Bay blanket statement above.

See “All Stations” blanket statement above.

Fishing Creek

All Parameters Blanket Statement for Fishing Creek

Missing Data (Flag <-2>)

Data are missing at this station for the following dates due to switching out the dataloggers at the site.

Data are missing for the following dates and times:

04/29/2011-11:30 and 05/24/2011-1045

Suspect Data (Flag <1>)

Data were marked suspect due to a turbidity readings over 300NTU. These values could be attributed to low tide, max flood tide, and/or rain events.

Temperature

Rejected Data (Flag <-3>)

See Fishing Creek blanket statement above.

Missing Data (Flag <-2>)

See Fishing Creek blanket statement above.

Suspect Data (Flag <1>)

None

Specific Conductivity/Salinity

Rejected Data (Flag <-3>)

See Fishing Creek blanket statement above.

Missing Data (Flag <-2>)

See Fishing Creek blanket statement above.

Suspect Data (Flag <1>)

None

DO Percent/mg/L

Rejected Data (Flag <-3>)

See Fishing Creek blanket statement above.

Missing Data (Flag <-2>)

See Fishing Creek blanket statement above.

Suspect Data (Flag <1>)

None

Depth

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See Fishing Creek blanket statement above.

Suspect Data (Flag <1>)

None

pH

Rejected Data (Flag <-3>)

pH data were rejected due to a equipment malfunction [SSM]. Post calibration readings show a mV slope outside of the manufacturer's recommended range and initial calibration readings were not within the probe's ± 0.2 accuracy rating. Data were rejected for the following dates and times due to equipment malfunction:

06/15/2011 – 12:15 through 06/29/2011–10:45

07/14/2011 – 08:45 through 08/02/2011–14:15

08/23/2011 – 10:15 through 09/14/2011–12:45

Missing Data (Flag <-2>)

See Fishing Creek blanket statement above.

Suspect Data (Flag <1>)

None

Turbidity

Rejected Data (Flag <-3>)

See Fishing Creek blanket statement above

Missing Data (Flag <-2>)

See Fishing Creek blanket statement above.

Suspect Data (Flag <1>)

See “All Stations” blanket statement above.

Mosquito Creek

All Parameter Blanket Statement for Mosquito Creek

Suspect Data (Flag <1>)

Data were marked suspect due to a turbidity readings over 300NTU. These values could be attributed to low tide, max flood tide, and/or rain events.

Temperature

Rejected Data (Flag <-3>)

See Mosquito Creek blanket statement.

Missing Data (Flag <-2>)

See Mosquito Creek blanket statement.

Suspect Data (Flag <1>)

None

Specific Conductivity/Salinity

Rejected Data (Flag <-3>)

See Mosquito Creek blanket statement.

Missing Data (Flag <-2>)

See Mosquito Creek blanket statement.

Suspect Data (Flag <1>)

Data marked suspect due to sensor drift also taken at the wrong depth in the sonde tube for the following times:

4/13/2011 – 10:00 through 6/15/2011 13:00

DO Percent/mg/L

Deleted Data (Flag <-3>)

See Mosquito Creek blanket statement.

Data were marked suspect due to sensor drift related to biofouling (CBF). Data were marked suspect for sensor drift relating to biofouling for the following dates and times:

06/15/2011 – 13:15 through 06/22/2011 – 07:15

Missing Data (Flag <-2>)

See Mosquito Creek blanket statement

Suspect Data (Flag <1>)

None

Depth

Rejected Data (Flag <-3>)

See Mosquito Creek blanket statement.

Missing Data (Flag <-2>)

None

Suspect Data (Flag <1>)

Depth data marked as suspect due to sonde not sitting at correct depth in the sonde tube for the following times:

04/13/2011 – 10:30 through 6/15/2011 – 12:00

pH

Rejected Data (Flag <-3>)

See Mosquito Creek blanket statement.

Missing Data (Flag <-2>)

See Mosquito Creek blanket statement.

Suspect Data (Flag <1>)

Data for pH were marked suspect due to sensor drift for the following times:

12/14/2011 – 15:15 through 12/31/2011 – 23:45

Turbidity

Rejected Data (Flag <-3>)

See Mosquito Creek blanket statement.

Missing Data (Flag <-2>)

See Mosquito Creek blanket statement.

Suspect Data (Flag <1>)

See “All Stations” blanket statement above.

St. Pierre

All Parameter Blanket Statement for St. Pierre

Missing Data (Flag <-2>)

Data are missing due to battery failure at the following times:

11/21/2011 - 08:45 through 12/14/2011 – 12:00

Suspect Data (Flag <1>)

Data were marked suspect due to a turbidity reading over 300NTU. These values could be attributed to low tide, max flood tide, and/or rain events.

Temperature

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See St. Pierre blanket statement.

Suspect Data (Flag <1>)

None

Specific Conductivity/Salinity

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See St. Pierre blanket statement.

Suspect Data (Flag <1>)

Data were marked suspect for various dates and times due to sensor drift

DO Percent/mg/L

Deleted Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See St. Pierre blanket statement.

Suspect Data (Flag <1>)

Data marked as suspect 7/25/2011 through 7/30/2011 due to biofouling on the sensor

Depth

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See St. Pierre blanket statement.

Suspect Data (Flag <1>)

See St. Pierre blanket statement

pH

Rejected Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See St. Pierre blanket statement.

Suspect Data (Flag <1>)

Data marked as suspect on 8/28/2011 – 01:45 through 8/28/2011 – 03:45 due to sensor drift

Data marked as suspect 11/9/2011 – 14:15 through 11/21/2011 – 08:30 due to sensor malfunction

Turbidity

Deleted Data (Flag <-3>)

None

Missing Data (Flag <-2>)

See St. Pierre blanket statement.

Suspect Data (Flag <1>)

See “All Stations” blanket statement above.

Rain Data: Bennetts Point Weather Station

Date	Precipitation (mm)
01/01	3.0
01/02	.8
01/05	0.5
01/17	3.0
01/18	.3
01/25	15.6
01/31	4.1
02/02	2.8
02/05	16.5
02/07	16.3
02/25	3.1

02/27	.3
03/01	13.2
03/05	.6
03/09	13.7
03/10	.9
03/20	2.3
03/26	7.9
03/27	4.9
03/30	30.2
03/31	.3
04/05	11.8
04/12	1.2
04/21	29.6
04/22	1.9
04/26	13.1
04/28	1.9
05/06	3.0
05/10	.5
05/12	.5
05/27	.5
05/28	6.9
06/13	5.7
06/15	19.6
06/16	10
06/18	3.4
06/23	5.2
06/29	4.5
06/30	0.5
07/06	3.1
07/08	.3
07/09	37.7
07/14	30.1
07/15	43.5
07/26	14.4
07/27	13.1
07/30	6.6
07/31	20.6
08/05	6.2
08/06	3.5
08/09	2.9
08/12	11.6
08/13	15
08/14	14.8

08/18	26.4
08/22	0.8
08/24	0.3
08/26	14.2
08/30	32.3
09/05	1.4
09/06	2.6
09/12	1.3
09/19	0.3
09/20	0.3
09/21	9.5
09/22	11.6
09/23	19.4
09/24	1.8
09/25	1.8
09/26	3.3
09/27	35.6
10/09	2.5
10/10	10.2
10/12	1.0
10/13	10.2
10/18	10.2
11/15	3.0
11/16	10.2
11/22	5.1
11/28	19.56
12/06	0.3
12/08	3.8
12/12	2.5
12/13	4.6
12/22	7.6
12/26	15.24
12/28	9.1