Narragansett Bay (NAR) National Estuarine Research Reserve Water Quality Metadata

January to December 2012

Last updated: May 24, 2023

# I. Data Set and Research Descriptors

1. Principal investigators and contact persons

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1. Entry verification

Deployment data are uploaded from the YSI data logger to a laptop 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. All pre- and post-deployment data are removed from the file prior to upload. 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 any overlapping 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.

The person responsible for data management is Dr. Durant.

Normally, sea-truthing is conducted by measuring water quality with an additional data logger taking real-time measurements at the time of deployment (except for the Nag Creek site). The data is recorded using a hand-held YSI 556-MPS data logger. Values for temperature, salinity, dissolved oxygen (% saturation and mg/L), pH, and time are recorded real-time at either 0.5 or 1.0 meter intervals between the surface and bottom at each deployment site. The preparation and post-deployment procedures for the data logger used in sea-truthing follows the same general procedure as that for data loggers used in deployments, and is the responsibility of the Reserve’s technician. However, sea-truthing has not been possible during the period covered in this document, since the instrument was not working properly. After multiple attempts of troubleshooting and exchange of probes, the instrument had to be sent in to YSI Repair Center in Ohio for service.

1. Research objectives

YSI 6600 data loggers are being deployed off Prudence Island in Narragansett Bay as part of the National Estuarine Research Reserve's (NERR) System Wide Monitoring Program (SWMP). The goal is to develop long-term data sets for representative estuarine systems in order to track changes in water quality over time. Because Prudence Island is located in the geographic center of Narragansett Bay, it is an ideal location for monitoring the status and trends in water quality in the Bay over time. One NERR water quality monitoring station has been established at Potter Cove, on the island's northeastern shore. This area is impacted by boat traffic and storm runoff from mainland urban and residential areas. The second NERR water quality monitoring station, T-Wharf, is situated on the southeastern shore of the island, facing the open waters of Rhode Island Sound. It is approximately 6 miles south of the Potter Cove site. Boat traffic is sparse at this site and storm runoff is less likely to have a significant impact on water quality. A third monitoring site was added in March 2002. This monitoring site is located in Nag Creek, a salt marsh tidal creek which flows into the West Passage of Narragansett Bay. The addition of this site completes our representation of dominant habitat types occurring in Narragansett Bay (i.e. marsh, cove, and open water). In July of 2002, the T-Wharf monitoring station was replaced with two new monitoring sites located a short distance from the original T-Wharf location. The new stations are situated on either side of a wharf support piling. One data logger records water quality near the surface (approximately 1.0m deep) while the second records water quality parameters approximately 1.0 meter off the bottom. This allows for the identification of both the frequency and duration of any stratification which may occur in the open waters of Narragansett Bay. The Narragansett Bay water quality monitoring program began in December 1995 at Potter Cove, and in September 1996 at T-Wharf (Section 5, Site Location and Character section for description of sites). YSI electronic data loggers were deployed to measure the water temperature, specific conductance, dissolved oxygen, pH, depth, and turbidity conditions at 30-minute intervals. However, since 2004, data have been collected at 15-minute intervals.

1. Research Methods

One data logger is deployed at each permanent monitoring station in Narragansett Bay. The instruments are deployed for approximately two weeks at a time, depending on the season, and measurements are taken every 15 minutes (see note below). The monitoring station at Potter Cove was originally constructed in 1995, and it consisted of a PVC pipe mounted vertically on a piling located approximately 6 feet west of a floating dock. To facilitate water flow across the sensors, openings were cut into the PVC pipes. The pipes were positioned to ensure that the sensors were less than 1 meter from the bottom. In 2006, the infrastructure at Potter Cove was replaced. It currently consists of a short PVC tube attached to an adjacent dock, with a line attached through the pipe to an anchor on the bottom. The sonde is attached to the anchor via a shackle and hook set-up, and a float is attached to the top of the sonde to keep it approximately 0.75 m off the bottom. With this setup, the sonde is free and clear of any pipe affects since the pipe does not extend to the bottom and serves only as a “decoy pipe” to prevent vandalism.

In 1996, the original T-Wharf station was put into service using a PVC pipe mounted on a piling attached to a pier. In 2002, the two replacement T-Wharf sites (Surface and Bottom) were also deployed in PVC pipes mounted to a piling. The sonde at the T-Wharf surface station is maintained just below the surface by means of a buoy attached by rope to the adjacent wharf; the sonde at T-wharf bottom is maintained approximately 0.5 m off the bottom. The pipes are cleaned monthly with a chimney brush during the summer to reduce the impact of biofouling on the data. On 10/11/06, the PVC deployment pipes and securing structures were replaced at the T-Wharf site. The design was similar to the previous pipe design and consisted of holes drilled through the pipe and large slits at the bottom of the pipe to allow for free water movement at the sonde. The T-Wharf Bottom pipe extends approximately 6 m though the water to the bottom of the site, where the sonde is kept approximately 1.0 m off the bottom. The T-Wharf Surface pipe extends approximately 2 m under the surface of the water (at low tide), where the sonde is attached to a float to keep it approximately 0.5 m below the surface of the water. After Tropical Storm Irene in August of 2011, the deploying structure was damaged; the PVC pipe was lost and the piling where it was attached to was damaged beyond repair. A temporary deploying structure was build consisting of a steel cable attached to the wharf with an anchor at the end to keep the cable straight and in place. The Surface and Bottom sondes were attached to the cable for each deployment and lowered into the water with a security line. The Reserve made the arrangements to build a permanent deploying structure; a new piling was installed on February 2012, two PVC pipes were installed in June, and the sondes were deployed in July in these new structures. The Surface sonde is now approximately 1.0 m below the surface, and the Bottom sonde is also approximately 1.0 m above the bottom substrate.

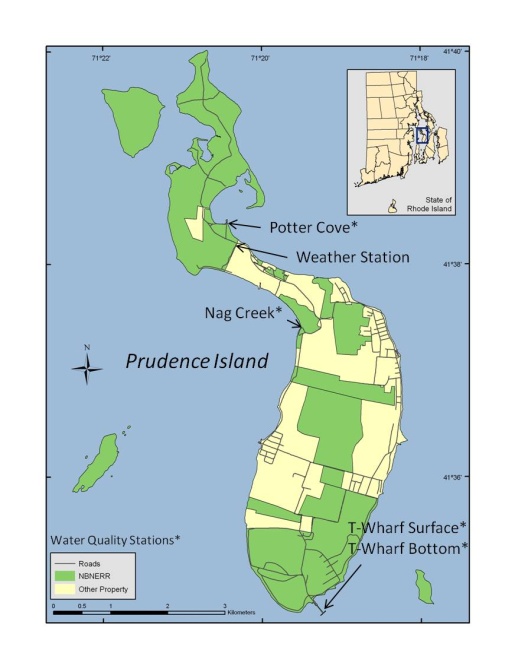
The Nag Creek sonde was originally deployed in a metal cage which was tethered to the bank. A permanent deployment structure was installed 12/31/02, consisting of a 4” x 4” pressure-treated post with a hinged 2” x 4” horizontal arm. On 09/08/06, the sonde deployment structure was redesigned and changed. The new structure consists of an L-shape wooden structure that held in place in the sediment by a large metal tripod sunk into the mud. The sonde is extended from the arm into the water via a cleat, eye and line system and hangs approximately 0.35 m from the bottom of the creek.

For each sampling period, the pH, salinity, depth, and turbidity sensors are calibrated, using the following standards: pH 7 and 10, specific conductivity standard of 50.00 mS/cm, depth in the air, and turbidity standards of 0 and 126 NTU. For EDS data loggers, the dissolved oxygen (DO) membrane is replaced and allowed to stretch for a minimum of 12 hours before the Rapid Pulse DO sensor is calibrated in air-saturated water. The sonde is programmed to begin taking measurements approximately 12 hours in advance of planned deployment, allowing the DO membrane to stabilize. The file is checked for DO sensor drift before the DO probe is calibrated. Calibration of the dissolved oxygen sensor is usually done within 2 hours of deployment. The V2 sondes have optical DO probes (DO ROX), therefore, there is no membrane to be changed and can be calibrated at the same time as the other sensors. At the end of each sampling period, the data loggers are retrieved and freshly calibrated instruments are deployed. The retrieved data loggers are brought back to the laboratory, post-deployment evaluations of the instrument are carried out, and the device is cleaned and serviced by methods outlined in the YSI Operating and Service Manual.

Note: Data from all stations was historically collected at 30-minute sampling intervals. In 2004, the Narragansett Bay NERR became involved with a statewide fixed site water quality monitoring program (refer to Section 8). Data collection at all stations was changed to 15 a minute sampling interval in order to be compliant with this local monitoring effort.

A Sutron Sat-Link2 transmitter was installed at the T-Wharf Bottom monitoring site on 07/27/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B0335EE. The transmissions are scheduled hourly and contain four (4) datasets 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](http://cdmo.baruch.sc.edu/).

1. Site location and character

The NBNERR consists of 4376 acres of diverse estuarine and terrestrial habitats ranging from deep water to salt marshes to forested uplands. The land holdings include 65% of Prudence Island, most of nearby Patience Island, and all of Hope and Dyer Islands. The Reserve is located close to the geographic center of Narragansett Bay in Rhode Island. The Narragansett Bay Watershed drains approximately 1,800 square miles and there are numerous and substantial freshwater inputs to the Bay.

Specific characteristics of the Narragansett Bay National Estuarine Research Reserve

Location: 41°38’30” N, 71°20’30” W

Tidal range: -0.2 to 1.7 meters MLW

Salinity: 15 to 32 ppt

Temperature: -1.0 to 26 C

Province: North temperate, Virginian bioregion

Specific characteristics of the Potter Cove site are:

Location: 41° 38.416’ N, 71° 20.450’ W

Depth: 0.9 to 3.9 meters

Bottom habitat: Sand, silt, some organic mud

Pollutants: Boaters’ wastes, storm runoff from mainland urban areas

Watershed: Narragansett Bay, North Prudence (4801 square km)

Specific characteristics of the Nag Creek site are:

Location: 41° 37.483’ N, 71° 19.450’ W

Depth: 0.1 to 1.4 meters

Bottom habitat: Organic mud

Pollutants: Negligible

Watershed: Narragansett Bay, West Passage

Specific characteristics of the T-Wharf Surface site are:

Location: 41° 34.700’ N, 71° 19.266’ W

Depth: 0.2 to 0.9 meters

Bottom habitat: Sand, silt, some organic mud

Pollutants: Negligible

Watershed: Narragansett Bay, South Prudence

Specific characteristics of the T-Wharf Bottom site are:

Location: 41° 34.700’ N, 71° 19.266’ W

Depth: 4.6 to 6.9 meters

Bottom habitat: Sand, silt, some organic mud

Pollutants: Negligible

Watershed: Narragansett Bay, South Prudence

1. Data collection period

Potter Cove (Data collection ongoing since 1995).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sonde | Deployment | | Retrieval | |
| Date | Time | Date | Time |
| 06C1207AA-V2 | 12/22/11 | 14:45 | 01/05/12 | 09:30 |
| 01E0566AA-V2 | 01/05/12 | 10:00 | 01/17/12 | 11:00 |
| 05E1065AE-EDS | 01/17/12 | 11:15 | 01/31/12 | 09:00 |
| 06C1207AA-V2 | 01/31/12 | 09:30 | 02/08/12 | 09:00 |
| 06C1207AA-V2 | 02/09/12 | 12:15 | 02/23/12 | 11:45 |
| 05E1300AE-EDS | 02/23/12 | 12:15 | 02/27/12 | 15:15 |
| 00E0937AD-V2 | 03/05/12 | 13:30 | 03/13/12 | 08:45 |
| 01E0566AA-V2 | 03/13/12 | 09:00 | 03/27/12 | 08:45 |
| 06C1207AA-V2 | 03/27/12 | 09:00 | 04/11/12 | 08:30 |
| 01E0876AB-V2 | 04/11/12 | 09:00 | 04/24/12 | 08:45 |
| 01E0566AA-V2 | 04/24/12 | 09:00 | 05/08/12 | 08:30 |
| 00F0937AB-V2 | 05/08/12 | 08:45 | 05/22/12 | 08:45 |
| 01E0876AB-V2 | 05/22/12 | 09:15 | 06/05/12 | 08:00 |
| 01E0566AA-V2 | 06/05/12 | 08:30 | 06/19/12 | 08:30 |
| 06C1207AA-V2 | 06/19/12 | 08:45 | 07/03/12 | 08:15 |
| 05E1065AE-V2 | 07/03/12 | 08:45 | 07/18/12 | 08:00 |
| 00E0937AD-V2 | 07/18/12 | 08:30 | 07/31/12 | 06:30 |
| 00F0937AB-V2 | 07/31/12 | 06:45 | 08/15/12 | 06:30 |
| 01E0876AB-V2 | 08/15/12 | 07:00 | 08/28/12 | 08:00 |
| 00E0937AD-V2 | 08/28/12 | 08:30 | 09/11/12 | 09:15 |
| 00F0937AB-V2 | 09/11/12 | 09:45 | 09/25/12 | 09:15 |
| 05E1065AE-V2 | 09/25/12 | 09:45 | 10/09/12 | 09:00 |
| 00E0937AD-V2 | 10/09/12 | 09:15 | 10/23/12 | 09:15 |
| 01E0876AB-V2 | 10/23/12 | 09:30 | 11/05/12 | 13:30 |
| 01E0566AA-V2 | 11/14/12 | 11:30 | 11/27/12 | 10:15 |
| 05E1065AE-V2 | 11/27/12 | 10:45 | 12/11/12 | 10:15 |
| 00E0937AD-V2 | 12/11/12 | 10:15 | 01/02/13 | 10:00 |

Nag Creek (Data collection ongoing since 2002).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sonde | Deployment | | Retrieval | |
| Date | Time | Date | Time |
| 01E0876AB-V2 | 12/20/11 | 10:00 | 01/05/12 | 10:15 |
| 01E0566AD-EDS | 01/10/12 | 14:00 | 01/18/12 | 10:30 |
| 00E0937AD-V2 | 02/09/12 | 13:30 | 02/23/12 | 12:15 |
| 05E1300AE-EDS | 02/23/12 | 12:45 | 03/13/12 | 09:00 |
| 00E0937AD-V2 | 03/13/12 | 09:30 | 03/27/12 | 09:00 |
| 00F0937AB-V2 | 03/27/12 | 09:15 | 04/11/12 | 09:15 |
| 05E1065AE-V2 | 04/11/12 | 09:30 | 04/24/12 | 09:15 |
| 05E1300AE-EDS | 04/24/12 | 09:30 | 05/08/12 | 09:15 |
| 06C1207AA-V2 | 05/08/12 | 09:30 | 05/22/12 | 09:15 |
| 02A0229AA-EDS | 05/22/12 | 09:45 | 06/05/12 | 08:30 |
| 05E1300AE-EDS | 06/05/12 | 08:45 | 06/19/12 | 09:45 |
| 00F0937AB-V2 | 06/19/12 | 10:00 | 07/03/12 | 08:45 |
| 01E0876AB-V2 | 07/03/12 | 09:00 | 07/18/12 | 08:30 |
| 01E0566AA-V2 | 07/18/12 | 08:45 | 07/31/12 | 06:45 |
| 05E1300AE-EDS | 07/31/12 | 07:00 | 08/15/12 | 07:00 |
| 05E1065AE-V2 | 08/15/12 | 07:15 | 08/28/12 | 07:45 |
| 01E0566AA-V2 | 08/28/12 | 08:00 | 09/11/12 | 10:00 |
| 02A0229AA-EDS | 09/11/12 | 10:30 | 09/25/12 | 10:00 |
| 05E1300AE-EDS | 09/25/12 | 10:15 | 10/09/12 | 09:15 |
| 02A0229AA-EDS | 10/09/12 | 09:45 | 10/23/12 | 09:45 |
| 01E0566AD-EDS | 10/23/12 | 10:00 | 11/14/12 | 10:30 |
| 02A0229AA-EDS | 11/14/12 | 10:45 | 11/27/12 | 09:45 |
| 01E0566AD-EDS | 11/27/12 | 10:00 | 12/11/12 | 10:00 |
| 02A0229AA-EDS | 12/11/12 | 10:15 | 01/02/13 | 13:45 |

T-Wharf Surface (Data collection ongoing since 2002).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sonde | Deployment | | Retrieval | |
| Date | Time | Date | Time |
| 05E1300AE-EDS | 12/28/11 | 10:15 | 01/10/12 | 10:15 |
| 06C1207AA-V2 | 01/10/12 | 10:45 | 01/24/12 | 10:30 |
| 01E0566AD-EDS | 01/24/12 | 11:15 | 02/07/12 | 09:30 |
| 05E1065AE-V2 | 02/07/12 | 09:45 | 02/22/12 | 09:45 |
| 01E0566AD-EDS | 02/22/12 | 11:00 | 03/06/12 | 10:15 |
| 00F0937AB-V2 | 03/06/12 | 11:15 | 03/21/12 | 08:45 |
| 05E1065AE-V2 | 03/21/12 | 09:15 | 04/03/12 | 08:15 |
| 05E1300AE-EDS | 04/03/12 | 09:00 | 04/17/12 | 09:30 |
| 00F0937AB-V2 | 04/17/12 | 10:15 | 05/01/12 | 08:45 |
| 01E0876AB-V2 | 05/01/12 | 09:15 | 05/15/12 | 07:45 |
| 05E1300AE-EDS | 05/15/12 | 08:30 | 05/30/12 | 08:30 |
| 00F0937AB-V2 | 05/30/12 | 09:00 | 06/12/12 | 09:30 |
| 02A0229AA-EDS | 06/12/12 | 10:15 | 06/26/12 | 08:30 |
| 01E0566AA-V2 | 06/26/12 | 08:45 | 07/10/12 | 10:15 |
| 05E1065AE-V2 | 07/10/12 | 10:45 | 07/24/12 | 09:30 |
| 05E1065AE-V2 | 07/24/12 | 09:45 | 08/07/12 | 08:00 |
| 00E0937AD-V2 | 08/07/12 | 08:15 | 08/21/12 | 11:30 |
| 05E1300AE-EDS | 08/21/12 | 11:45 | 09/05/12 | 09:15 |
| 05E1065AE-V2 | 09/05/12 | 09:30 | 09/18/12 | 09:45 |
| 00E0937AD-V2 | 09/18/12 | 12:45 | 10/02/12 | 09:00 |
| 01E0876AB-V2 | 10/02/12 | 09:30 | 10/16/12 | 09:15 |
| 01E0566AA-V2 | 10/16/12 | 10:15 | 11/06/12 | 10:00 |
| 00E0937AD-V2 | 11/06/12 | 10:30 | 11/20/12 | 10:15 |
| 01E0876AB-V2 | 11/20/12 | 10:45 | 12/04/12 | 10:00 |
| 00F0937AB-V2 | 12/04/12 | 10:30 | 12/18/12 | 09:45 |
| 01E0876AB-V2 | 12/18/12 | 10:15 | 01/08/13 | 09:45 |

T-Wharf Bottom (Data collection ongoing since 2002).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sonde | Deployment | | Retrieval | |
| Date | Time | Date | Time |
| 05E1065AE-V2 | 12/28/11 | 10:15 | 01/10/12 | 10:00 |
| 01E0876AB-V2 | 01/10/12 | 10:30 | 01/24/12 | 10:30 |
| 01E0566AA-V2 | 01/24/12 | 11:00 | 02/07/12 | 09:30 |
| 01E0876AB-V2 | 02/07/12 | 09:45 | 02/22/12 | 09:45 |
| 01E0566AA-V2 | 02/22/12 | 11:00 | 03/06/12 | 10:15 |
| 06C1207AA-V2 | 03/06/12 | 11:00 | 03/21/12 | 08:45 |
| 01E0876AB-V2 | 03/21/12 | 09:30 | 04/03/12 | 08:30 |
| 01E0566AA-V2 | 04/03/12 | 09:00 | 04/17/12 | 09:30 |
| 06C1207AA-V2 | 04/17/12 | 10:00 | 05/01/12 | 08:45 |
| 05E1065AE-V2 | 05/01/12 | 09:15 | 05/15/12 | 07:45 |
| 01E0566AA-V2 | 05/15/12 | 08:15 | 05/30/12 | 08:30 |
| 06C1207AA-V2 | 05/30/12 | 09:00 | 06/12/12 | 09:30 |
| 01E0876AB-V2 | 06/12/12 | 10:30 | 06/26/12 | 08:30 |
| 00E0937AD-V2 | 06/26/12 | 09:00 | 07/10/12 | 10:30 |
| 00F0937AB-V2 | 07/10/12 | 11:00 | 07/24/12 | 09:45 |
| 01E0876AB-V2 | 07/24/12 | 10:15 | 08/07/12 | 08:00 |
| 01E0566AA-V2 | 08/07/12 | 08:45 | 08/21/12 | 06:15 |
| 00F0937AB-V2 | 08/21/12 | 06:45 | 09/05/12 | 09:15 |
| 01E0876AB-V2 | 09/05/12 | 09:30 | 09/18/12 | 09:00 |
| 01E0566AA-V2 | 09/18/12 | 09:30 | 10/02/12 | 09:15 |
| 00F0937AB-V2 | 10/02/12 | 09:45 | 10/16/12 | 09:30 |
| 05E1065AE-V2 | 10/16/12 | 10:15 | 11/06/12 | 10:00 |
| 00F0937AB-V2 | 11/06/12 | 10:30 | 11/20/12 | 10:45 |
| 06C1207AA-V2 | 11/20/12 | 11:30 | 12/04/12 | 10:15 |
| 01E0566AA-V2 | 12/04/12 | 10:45 | 12/18/12 | 10:15 |
| 06C1207AA-V2 | 12/18/12 | 10:45 | 01/08/13 | 10:00 |

1. Distribution

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and processed 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:

NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org/; accessed 12 October 2023.

1. 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 www.nerrsdata.org. Data are available in comma delimited format. Associated researchers and projects

In addition to the continuous collection of water quality data to monitor physical and chemical variables at our four monitoring stations, NBNERR monitors nutrients (ammonium, nitrate, nitrite, orthophosphate, silicates) and chlorophyll at each station in a monthly basis to quantify seasonal patterns in nutrient and chlorophyll concentrations in different estuarine habitats. At one water quality station, water samples are collected over a 24-hour period each month; nutrients (same as above) and chlorophyll are analyzed as well. The goal of this sampling is to document changes in nutrient and chlorophyll concentrations in response to tidal forcing. To compliment the water quality, biological monitoring and research at NBNERR and at Narragansett Bay, NBNERR operates and maintains a weather station that continually collects air temperature, relative humidity, barometric pressure, wind speed and direction, photosynthetic active radiation, and precipitation. All this information is available to any interested party through the CDMO <http://cdmo.baruch.sc.edu/>, NBNERR <http://nbnerr.org/>, or directly contacting the Research Coordinator or the Marine Research Specialist II.

In 2004, the NBNERR became involved in the Bay Window Monitoring Program, which is a Bay-wide water quality monitoring program. Although the NBNERR is no longer involved with managing data from the Bay window program, NBNERR SWMP data are still shared with and used for analysis in the program. The NBNERR also provides SWMP data to:

Dr. Candace Oviatt at URI-GSO is using NAR NERR chlorophyll data to track the timing and magnitude of winter/spring blooms in Narragansett Bay.

Mrs. Heather Stoffel at URI-GSO is using NAR NERR data from T-Wharf Surface, T-Wharf Bottom, and Potter's Cove stations in a local monitoring network strategy partially funded through Bay Window and headed by RIDEM-OWR.

PhD student Ms. Courtney Schmidt from the URI-GSO, is using meteorological data from the NBNERR weather station to examine patterns in atmospheric deposition of nitrogen.

II. Physical Structure Descriptors

1. Sensor specifications

NAR NERR deployed YSI 6600EDS and 6600V2 data loggers from January through December 2012. Only YSI 6600V2 sondes equipped with optical DO ROX sensors were deployed at T-Wharf Bottom during this period. YSI 6600V2 sondes equipped with optical DO ROX sensors were deployed at T-Wharf Surface, Potter Cove and Nag Creek alternating with YSI 6600EDS sondes equipped with rapid-pulse DO sensors.

Parameter: **Temperature**

Units: Celsius - oC

Sensor Type: Thermistor

Model #: 6560

Range: -5 to 50 °C

Accuracy: ± 0.15 °C

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 dependent)

Parameter: **Salinity**

Units: Parts per thousand (ppt)

Sensor Type: Calculated from conductivity and temperature

Range: 0 to 70 ppt

Accuracy: ± 1.0% of reading or 0.1 ppt, whichever is greater

Resolution: 0.01 ppt

Parameter: Dissolved Oxygen

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

- or -

Sensor Type: Optical probe with mechanical cleaning

Model #: 6150 ROX

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: ± 1% of the reading or 1% air saturation, whichever is

greater; 200 500% air saturation: ± 15% of reading

Resolution: 0.1% air saturation

Parameter: **Dissolved Oxygen** (Calculated from % air saturation, temperature and salinity)

Units: milligrams per Liter (mg/L)

Sensor Type: Rapid Pulse – Clark type, polarographic

Model #: 6562

Range: 0 to 50 mg/L

Accuracy: 0 to 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

- or -

Sensor Type: Optical probe with mechanical cleaning

Model #: 6150 ROX

Range: 0 to 50 mg/L

Accuracy: 0 - 20 mg/L: ± 0.1% mg/L or 1% of the reading, whichever is greater; 20 to 50

mg/L: ± 15% of the reading

Resolution: 0.01 mg/L

Parameter: Non-Vented Level – Shallow (Depth)

Units: meters (m)

Sensor Type: Stainless steel strain gauge

Range: 0 to 30 ft (9.1 m)

Accuracy: ± 0.06 ft (0.018 m)

Resolution: 0.001 ft (0.001 m)

Parameter: **pH** (bulb probe)

Units: pH units

Sensor Type: Glass combination electrode

Model #: 6561

Range: 0 to 14 units

Accuracy: ± 0.2 units

Resolution: 0.01 units

Parameter: **Turbidity**

Units: Nephelometric turbidity units (NTU)

Sensor Type: Optical, 90° scatter, with mechanical cleaning

Model #: 6136

Range: 0 to 1000 NTU

Accuracy: ± 2 % reading or 0.3 NTU (whichever is greater)

Resolution: 0.1 NTU

Parameter: Chlorophyll Fluorescence

Units: micrograms/Liter

Sensor Type: Optical probe with mechanical cleaning

Model#: 6025

Range: 0 to 400 µg/Liter

Accuracy: Dependent on methodology

Resolution: 0.1 µg /L chl *a*, 0.1% FS

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.

1. **Coded variable definitions**

|  |  |  |
| --- | --- | --- |
| Sampling station | Sampling site code | Station code |
| Potter Cove | PC | narpcwq |
| Nag Creek | NC | narncwq |
| T-Wharf Surface | TS | nartswq |
| T-Wharf Bottom | TB | nartbwq |

1. 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.

|  |  |
| --- | --- |
| Flag | Description |
| -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 |

1. 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

1. Post deployment information

Readings were taken using calibration standards immediately after retrieval (for exact day see post-calibration date column). Subscript numbers on the Deployment Date column are used for clarification. Blue cells in the ROX DO 1 and 2 columns indicate the use of YSI 6600EDS sonde equipped with the rapid pulse DO probe; otherwise, a YSI 6600V2 sonde equipped with an optical DO (ROX) probe was used in the field. In any column, yellow indicates value is suspect at post-calibration. DO stands for dissolved oxygen.

Potter Cove

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Deployment Date | Post-calibration Date | Specific Conductivity | ROX DO 1 | ROX DO 2 | pH | | Turbidity | | Depth | Chl |
| mm/dd/yy | mm/dd/yy | (50) | (100% sat) | (100% sat) | (7) | (10) | (0) | (126) | (m) | (0) |
| 01/01/12 | 01/05/12 | 50.37 | 101.7 | 101.7 | 7.02 | 10.08 | -0.9 | 126.4 | -0.052 | -1.3 |
| 01/05/12 | 01/17/12 | 50.48 | 99.6 | 99.6 | 7.06 | 10.11 | 0.1 | 126.9 | -0.040 | 0.7 |
| **1** 01/17/12 | 01/31/12 | 50.06 | 104.1 | 104.1 | 7.05 | 9.73 | 0.3 | 127.8 | 0.070 | 0.2 |
| 01/31/12 | 02/09/12 | 49.74 | 101.6 | 101.6 | 7.04 | 10.11 | 0.1 | 126.9 | 0.115 | -0.3 |
| 02/09/12 | 02/23/12 | 49.64 | 99.5 | 99.5 | 7.06 | 10.08 | 0.6 | 127.2 | -0.143 | 0.3 |
| **1** 02/23/12 | 03/05/12 | 49.85 | 101.4 | 101.4 | 7.22 | 9.48 | -0.9 | 127.3 | 0.055 | -0.4 |
| 03/05/12 | 03/13/12 | 50.14 | 99.8 | 99.8 | 7.10 | 10.09 | 0.0 | 125.8 | 0.026 | 0.5 |
| 03/13/12 | 03/27/12 | 49.65 | 88.7 | 88.7 | 7.19 | 10.19 | 1.2 | 128.4 | 0.075 | 0.3 |
| 03/27/12 | 04/11/12 | 49.65 | 96.2 | 96.2 | 7.00 | 10.03 | -0.2 | 124.8 | -0.046 | -0.9 |
| 04/11/12 | 04/24/12 | 50.17 | 99.1 | 99.1 | 7.25 | 10.29 | 0.2 | 125.5 | -0.128 | -1.0 |
| 04/24/12 | 05/08/12 | 50.12 | 99.4 | 99.2 | 7.17 | 10.21 | 0.1 | 127.2 | 0.038 | -0.6 |
| 05/08/12 | 05/22/12 | 50.97 | 97.2 | 97.2 | 7.08 | 10.10 | 0.3 | 125.5 | -0.032 | 0.3 |
| 05/22/12 | 06/05/12 | 49.96 | 94.2 | 94.2 | 7.11 | 10.17 | 0.7 | 124.4 | -0.017 | 0.7 |
| 06/05/12 | 06/19/12 | 49.85 | 100.0 | 100.0 | 7.06 | 10.23 | -0.1 | 123.9 | 0.082 | 0.4 |
| **2** 06/19/12 | 07/03/12 |  |  |  |  |  |  |  |  |  |
| 07/03/12 | 07/18/12 | 50.25 | 99.9 | 99.9 | 7.12 | 10.14 | 0.3 | 127.5 | -0.047 | 0.7 |
| 07/18/12 | 07/31/12 | 49.59 | 98.3 | 98.3 | 7.14 | 10.16 | -0.1 | 124.8 | 0.055 | 1.0 |
| 07/31/12 | 08/15/12 | 50.77 | 96.3 | 96.3 | 7.16 | 10.20 | 0.2 | 124.3 | -0.020 | -0.1 |
| 08/15/12 | 08/28/12 | 50.74 | 94.4 | 94.4 | 7.26 | 10.28 | -2.6 | 110.1 | -0.057 | -0.5 |
| 08/28/12 | 09/11/12 | 49.85 | 99.7 | 99.7 | 7.11 | 10.09 | 0.2 | 140.2 | 0.109 | -0.4 |
| 09/11/12 | 09/25/12 | 50.30 | 99.9 | 99.9 | 7.07 | 10.10 | -0.2 | 124.7 | 0.076 | -0.2 |
| 09/25/12 | 10/09/12 | 50.67 | 100.8 | 100.8 | 7.00 | 10.05 | 0.1 | 124.3 | 0.097 | -0.2 |
| 10/09/12 | 10/23/12 | 50.55 | 100.7 | 100.7 | 7.04 | 10.06 | 0.2 | 132.0 | 0.046 | 0.5 |
| 10/23/12 | 11/14/12 | 50.40 | 100.1 | 100.1 | 7.04 | 10.17 | 1.3 | 124.1 | 0.091 | -0.2 |
| 11/14/12 | 11/27/12 | 51.33 | 102.2 | 102.2 | 7.06 | 10.10 | 0.2 | 127.0 | 0.107 | 0.2 |
| 11/27/12 | 12/11/12 | 50.61 | 99.1 | 99.1 | 7.13 | 10.11 | -1.5 | 125.3 | -0.028 | 0.0 |
| 12/11/12 | 01/02/13 | 50.35 | 99.4 | 99.4 | 7.07 | 10.10 | 0.3 | 127.1 | -0.001 | 0.0 |

**1** Post cal pH slope out of range.

**2** No communication could be established with this sonde due to corrosion at the pc port; hence, no post calibration was possible. It was sent to YSI for repair; they were able to save the file.

Nag Creek

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Deployment Date | Post-calibration Date | Specific Conductivity | | | ROX DO 1 | | ROX DO 2 | | pH | | | Turbidity | | | Depth | | Chl | |
| mm/dd/yy | mm/dd/yy | | (50) | (100% sat) | | (100% sat) | | (7) | | (10) | (0) | | (126) | (m) | | (0) | |
| 12/20/11 | 01/10/12 | | 50.35 | 98.7 | | 98.7 | | 7.07 | | 10.14 | -0.1 | | 127.3 | -0.048 | | 0.6 | |
| 01/10/12 | 02/09/12 | | 50.37 | 102.1 | | 102.1 | | 7.04 | | 10.13 | 0.1 | | 126.3 | -0.036 | | 0.1 | |
| 02/09/12 | 02/23/12 | | 49.87 | 44.9 | | 44.9 | | 7.07 | | 10.08 | 0.1 | | 124.7 | -0.144 | | -0.3 | |
| 02/23/12 | 03/13/12 | | 49.96 | 91.6 | | 91.6 | | 7.20 | | 10.24 | -0.4 | | 127.8 | 0.025 | | 0.1 | |
| 03/13/12 | 03/27/12 | | 49.52 | 104.1 | | 104.1 | | 7.10 | | 10.17 | 0.4 | | 126.6 | 0.075 | | 0.4 | |
| 03/27/12 | 04/11/12 | | 50.45 | 97.0 | | 97.0 | | 7.07 | | 10.09 | -0.2 | | 124.2 | -0.056 | | -1.3 | |
| 04/11/12 | 04/24/12 | | 49.66 | 99.8 | | 99.8 | | 7.14 | | 9.89 | 0.5 | | 124.8 | -0.114 | | 0.2 | |
| 04/24/12 | 05/08/12 | | 49.94 | 109.6 | | 109.3 | | 7.08 | | 10.09 | 0.2 | | 128.2 | 0.029 | | 1.0 | |
| 05/08/12 | 05/22/12 | | 49.96 | 99.1 | | 99.1 | | 7.06 | | 10.09 | 0.3 | | 123.4 | -0.043 | | 0.8 | |
| 05/22/12 | 06/05/12 | | 48.26 | 105.3 | | 105.3 | | 7.13 | | 10.16 | 0.1 | | 125.1 | -0.013 | | -1.0 | |
| 06/05/12 | 06/19/12 | | 49.88 | 126.4 | | 126.3 | | 7.09 | | 10.12 | 0.0 | | 126.1 | 0.085 | | -0.7 | |
| 06/19/12 | 07/03/12 | | 50.70 | 96.9 | | 96.9 | | 7.13 | | 10.15 | -0.2 | | 127.3 | 0.004 | | -0.9 | |
| 07/03/12 | 07/18/12 | | 50.30 | 98.1 | | 98.1 | | 7.12 | | 10.12 | 0.1 | | 127.3 | -0.063 | | 0.4 | |
| 07/18/12 | 07/31/12 | | 49.71 | 98.8 | | 98.8 | | 7.28 | | 10.33 | 1.4 | | 122.9 | 0.050 | | 0.9 | |
| 07/31/12 | 08/15/12 | | 49.54 | 98.5 | | 98.4 | | 7.95 | | 7.64 | -0.2 | | 119.8 | -0.001 | | 0.4 | |
| 08/15/12 | 08/28/12 | | 50.64 | 94.9 | | 94.9 | | 7.16 | | 10.20 | -0.4 | | 124.0 | -0.062 | | 0.6 | |
| 08/28/12 | 09/11/12 | | 50.15 | 99.1 | | 99.1 | | 7.17 | | 10.15 | 0.4 | | 140.8 | 0.106 | | 2.3 | |
| 09/11/12 | 09/25/12 | | 50.50 | 118.6 | | 117.0 | | 7.09 | | 10.13 | -0.2 | | 124.8 | 0.078 | | 0.5 | |
| **1** 09/25/12 | 10/23/12 | | 50.39 | 100.4 | | 100.2 | | 7.08 | | 10.10 | -186 | | -186.2 | 0.085 | | 228.4 | |
| 10/23/12 | 11/14/12 | | 49.70 | 112.2 | | 112.1 | | 7.03 | | 9.98 | 0.1 | | 123.7 | 0.169 | | 0.9 | |
| 11/14/12 | 11/27/12 | | 50.09 | 100.9 | | 100.0 | | 7.10 | | 10.07 | 0.1 | | 127.4 | 0.091 | | -0.2 | |
| 11/27/12 | 12/11/12 | | 49.67 | 103.1 | | 103.0 | | 7.10 | | 10.16 | 0.1 | | 126.2 | -0.022 | | 0.3 | |
| **2** 12/11/12 | 01/02/13 | | 49.88 | 109.6 | | 109.6 | | 7.11 | | 10.13 | 0.3 | | 126.3 | -0.009 | | 0.3 | |

**1** Turbidity and Chlorophyll probes failed during this deployment.

**2** During this day, we went out to deploy a sonde but, due to low temperatures, the creek had frozen up. We had to break through the ice to retrieve the sonde. No sonde was deployed after this one.

T-Wharf Surface

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Deployment Date | Post-calibration Date | Specific Conductivity | | ROX DO 1 | | ROX DO 2 | | pH | | | Turbidity | | | Depth | | Chl | |
| mm/dd/yy | mm/dd/yy | (50) | (100% sat) | | (100% sat) | | (7) | | (10) | (0) | | (126) | (m) | | (0) | |
| 12/28/11 | 01/10/12 | 50.08 | 104.4 | | 104.4 | | 7.00 | | 10.07 | 0.0 | | 127.1 | -0.025 | | -0.4 | |
| 01/10/12 | 01/24/12 | 50.14 | 103.1 | | 103.1 | | 7.04 | | 10.09 | -0.2 | | 126.4 | 0.001 | | -0.6 | |
| **1** 01/24/12 | 02/07/12 | 50.17 | 99.5 | | 99.5 | | 7.26 | | 10.37 | 0.4 | | 126.6 |  | | 1.1 | |
| 02/07/12 | 02/22/12 | 49.91 | 101.5 | | 101.5 | | 7.01 | | 10.08 | 0.8 | | 126.1 | -0.082 | | -0.1 | |
| 02/22/12 | 03/06/12 | 50.11 | 100.3 | | 100.3 | | 7.11 | | 10.15 | 0.1 | | 128.1 | 0.202 | | 1.2 | |
| **2** 03/06/12 | 03/21/12 |  |  | |  | |  | |  |  | |  |  | |  | |
| 03/21/12 | 04/03/12 | 50.09 | 89.7 | | 89.7 | | 7.09 | | 10.12 | 0.2 | | 125.1 | -0.055 | | -0.1 | |
| 04/03/12 | 04/17/12 | 49.85 | 105.2 | | 105.2 | | 7.03 | | 10.06 | -0.2 | | 126.3 | 0.032 | | -0.2 | |
| 04/17/12 | 05/01/12 | 51.66 | 91.0 | | 91.0 | | 7.07 | | 10.09 | 0.1 | | 125.3 | 0.053 | | 0.2 | |
| 05/01/12 | 05/15/12 | 50.74 | 100.1 | | 100.1 | | 7.15 | | 10.19 | -1.0 | | 127.6 | 0.064 | | -0.4 | |
| 05/15/12 | 05/30/12 | 49.96 | 105.7 | | 105.5 | | 7.09 | | 10.11 | -0.2 | | 125.4 | -0.064 | | 0.5 | |
| 05/30/12 | 06/12/12 | 50.31 | 99.5 | | 99.5 | | 7.12 | | 10.11 | -0.1 | | 124.0 | 0.069 | | 0.0 | |
| 06/12/12 | 06/26/12 | 50.46 | 72.6 | | 72.6 | | 7.11 | | 10.12 | 0.0 | | 126.4 | -0.116 | | 1.2 | |
| 06/26/12 | 07/10/12 | 50.39 | 101.0 | | 101.0 | | 7.13 | | 10.15 | 0.5 | | 127.9 | 0.032 | | -0.4 | |
| 07/10/12 | 07/24/12 | 49.22 | 76.2 | | 75.3 | | 7.16 | | 10.23 | 0.1 | | 126.9 | -0.115 | | -0.3 | |
| 07/24/12 | 08/07/12 | 50.32 | 98.5 | | 98.5 | | 7.10 | | 10.10 | -0.1 | | 125.9 | 0.027 | | 0.4 | |
| 08/07/12 | 08/21/12 | 50.96 | 100.3 | | 100.2 | | 7.10 | | 10.14 | -2.0 | | 125.8 | 0.034 | | 0.1 | |
| 08/21/12 | 09/05/12 | 51.52 | 107.0 | | 106.9 | | 7.07 | | 10.07 | -0.3 | | 127.6 | -0.045 | | -0.7 | |
| 09/05/12 | 09/18/12 | 50.96 | 100.3 | | 100.2 | | 7.10 | | 10.14 | -2.0 | | 125.8 | 0.034 | | 0.1 | |
| 09/18/12 | 10/02/12 | 49.91 | 100.6 | | 100.6 | | 7.03 | | 10.07 | -0.1 | | 125.3 | 0.031 | | 0.0 | |
| 10/02/12 | 10/16/12 | 50.38 | 98.5 | | 98.5 | | 7.08 | | 10.08 | -0.3 | | 131.2 | -0.098 | | -0.2 | |
| 10/16/12 | 11/06/12 | 51.27 | 101.9 | | 101.9 | | 7.09 | | 10.12 | 0.2 | | 126.9 | 0.097 | | 0.6 | |
| 11/06/12 | 11/20/19 | 51.28 | 99.4 | | 99.4 | | 7.03 | | 10.08 | 0.3 | | 126.4 | 0.060 | | -0.5 | |
| 11/20/19 | 12/04/12 | 50.49 | 101.3 | | 101.3 | | 7.22 | | 10.26 | -0.2 | | 126.7 | 0.110 | | -0.1 | |
| 12/04/12 | 12/18/12 | 49.89 | 97.3 | | 97.3 | | 7.07 | | 10.11 | 1.0 | | 122.8 | -0.170 | | 0.2 | |
| 12/18/12 | 01/08/13 | 50.34 | 101.6 | | 101.6 | | 7.19 | | 10.10 | 0.7 | | 127.7 | 0.130 | | -0.5 | |

**1** Post-calibration depth not recorded.

**2** No communication could be established with the sonde; hence, no post calibration was possible. It was sent to YSI for repair.

T-Wharf Bottom

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Deployment Date | Post-calibration Date | | Specific Conductivity | | ROX DO 1 | | | ROX DO 2 | | pH | | | Turbidity | | | Depth | | Chl | |
| mm/dd/yy | | mm/dd/yy | | (50.00) | | (100% sat) | (100% sat) | | (7) | | (10) | (0) | | (126) | (m) | | (0) | |
| 12/28/11 | | 01/10/12 | | 50.04 | | 99.2 | 99.2 | | 6.95 | | 10.04 | -0.1 | | 127.1 | -0.046 | | 0.4 | |
| 01/10/12 | | 01/24/12 | | 50.41 | | 104.4 | 104.4 | | 7.09 | | 10.15 | -0.2 | | 125.9 | -0.012 | | 0.3 | |
| 01/24/12 | | 02/07/12 | | 53.56 | | 50.3 | 51.6 | | 7.11 | | 9.84 | 0.3 | | 168.7 | 0.027 | | -0.3 | |
| 02/07/12 | | 02/22/12 | | 50.16 | | 101.1 | 101.1 | | 7.09 | | 10.21 | 0.1 | | 125.2 | -0.098 | | 1.4 | |
| 02/22/12 | | 03/06/12 | | 51.18 | | 92.5 | 92.5 | | 7.18 | | 10.30 | 0.0 | | 128.2 | 0.213 | | 0.4 | |
| 03/06/12 | | 03/21/12 | | 49.06 | | 100.7 | 100.7 | | 7.06 | | 10.09 | -0.2 | | 126.0 | 0.107 | | -0.4 | |
| 03/21/12 | | 04/03/12 | | 50.18 | | 97.7 | 97.7 | | 7.18 | | 10.25 | -0.9 | | 126.7 | -0.058 | | 0.1 | |
| 04/03/12 | | 04/17/12 | | 49.59 | | 102.1 | 102.1 | | 7.06 | | 10.11 | -0.4 | | 125.7 | 0.031 | | -0.7 | |
| 04/17/12 | | 05/01/12 | | 49.75 | | 99.8 | 99.8 | | 7.03 | | 10.10 | -0.2 | | 125.7 | 0.035 | | -0.2 | |
| 05/01/12 | | 05/15/12 | | 50.08 | | 99.3 | 99.3 | | 7.09 | | 10.13 | -0.5 | | 127.5 | 0.081 | | -0.2 | |
| 05/15/12 | | 05/30/12 | | 49.91 | | 101.3 | 101.3 | | 7.07 | | 10.08 | -0.1 | | 125.9 | -0.060 | | -0.6 | |
| 05/30/12 | | 06/12/12 | | 49.68 | | 100.3 | 100.3 | | 7.02 | | 10.08 | -0.3 | | 126.8 | 0.063 | | 0.2 | |
| 06/12/12 | | 06/26/12 | | 49.99 | | 98.2 | 98.2 | | 7.09 | | 10.15 | 0.3 | | 126.8 | -0.113 | | 0.0 | |
| 06/26/12 | | 07/10/12 | | 51.58 | | 99.2 | 99.1 | | 7.05 | | 10.01 | 0.0 | | 128.4 | 0.028 | | 0.6 | |
| 07/10/12 | | 07/24/12 | | 50.42 | | 97.9 | 97.9 | | 7.15 | | 10.23 | 0.2 | | 127.8 | -0.131 | | 0.4 | |
| 07/24/12 | | 08/07/12 | | 49.61 | | 103.2 | 103.2 | | 7.01 | | 10.08 | -1.0 | | 126.3 | 0.041 | | -0.4 | |
| 08/07/12 | | 08/21/12 | | 50.50 | | 97.1 | 97.1 | | 7.13 | | 10.13 | 0.5 | | 122.5 | 0.016 | | 0.2 | |
| 08/21/12 | | 09/05/12 | | 49.40 | | 97.4 | 97.4 | | 7.07 | | 10.20 | 0.0 | | 128.5 | -0.055 | | -0.4 | |
| 09/05/12 | | 09/18/12 | | 50.10 | | 99.4 | 99.4 | | 6.98 | | 9.93 | 0.0 | | 125.5 | 0.005 | | 0.1 | |
| 09/18/12 | | 10/02/12 | | 50.89 | | 100.5 | 100.5 | | 7.08 | | 10.11 | 0.3 | | 125.9 | 0.033 | | -0.1 | |
| 10/02/12 | | 10/16/12 | | 50.20 | | 98.8 | 98.8 | | 7.06 | | 10.07 | 0.4 | | 131.6 | -0.093 | | 0.1 | |
| 10/16/12 | | 11/06/12 | | 50.97 | | 104.2 | 104.2 | | 7.02 | | 10.05 | 0.3 | | 125.1 | 0.091 | | 0.1 | |
| 11/06/12 | | 11/20/12 | | 50.85 | | 98.7 | 98.6 | | 7.05 | | 10.09 | 0.2 | | 124.3 | 0.071 | | -0.1 | |
| 11/20/12 | | 12/04/12 | | 50.40 | | 101.2 | 101.2 | | 7.08 | | 10.12 | -0.8 | | 127.5 | 0.118 | | 0.3 | |
| 12/04/12 | | 12/18/12 | | 49.96 | | 92.3 | 92.3 | | 7.06 | | 10.10 | -0.3 | | 126.6 | -0.168 | | 0.5 | |
| 12/18/12 | | 01/08/13 | | 50.51 | | 101.7 | 101.7 | | 7.09 | | 10.09 | -0.1 | | 128.0 | 0.135 | | -0.1 | |

1. **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. Any NANs in the dataset stand for “not a number” and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

Slight depth anomalies occurred at the T-Wharf Surface monitoring station. The datalogger at this station is suspended from the bottom of a float attached by rope to the adjacent wharf. On occasion it became apparent that the sonde and/or float had become caught up in the rope, but never to such an extent that the sonde came out of the water unless otherwise noted. Wave action during periods of high winds may be responsible for some of the depth variation. Because this sonde is attached to a float it is readily impacted by heavy wave action. Deployment near the surface also allows for depth measurements to be altered by changes in atmospheric pressure. At no time were the variations in depth considered sufficient to alter the validity of the data.

Slight depth anomalies frequently occur at the Nag Creek deployment location. Depth at this site may have been influenced to some extent by changes in atmospheric pressure because the sonde was situated in very shallow waters. On occasion, the combination of low atmospheric pressure and shallow water resulted in negative depth values. Weather station data appear to support this theory. It is also suspected that due to its shallow location and location in a salt marsh, freshwater runoff from the island may affect specific conductivity/salinity readings several days after a rain event has occurred. Specific conductivity, salinity, and dissolved oxygen can also vary greatly in Nag Creek over tidal and diel cycles. Nag creek is a very shallow site and is highly affected by tides and rain events. On some occasions, dissolved oxygen (DO) is recorded as negative values at the Nag Creek deployment location. Dissolved oxygen frequently ranges between supersaturation and complete anoxic conditions (DO = 0 % saturation) at this site during the summer months. Ice is also common in Nag Creek. There have been occasions where ice has affected all sonde parameters and are marked in the data as “see metadata”.

Chlorophyll and fluorescence data were collected along with the data presented in this document, but because chlorophyll and fluorescence are not part of the NERR SWMP Water Quality Program, the data are not reported within this dataset. Chlorophyll fluorescence data are available upon request by contacting the Reserve.

The following are description of different events that happened during deployment and explanations to the CSM (Comment-See Metadata) code for the four water quality station data files from January to December of 2012.

Turbidity Correction

YSI notified the Reserve that the turbidity standard we were using (YSI 6073G, Lot Number 12H254538) apparently had the wrong formulation. Turbidity data affected per site was:

T-Wharf Surface Sep 05-09:30 to Dec 31-23:45

T-Wharf Bottom Sep 05-09:30 to Dec 31-23:45

Nag Creek Sep 11-10:30 to Dec 31-23:45

Potter Cove Sep 11 09:45 to Dec 31-23:45

YSI provided information on how to solve the problem by post-correcting the data with the following formula: Multiply the collected data by 0.94. With this information, we were able to correct the affected data collected during the period mentioned above. The data was flagged and coded <5> (CSM).

Depth Correction Nag Creek

The sonde at Nag Creek was calibrated with an offset of 0.113 m; however, it should have been 0.119 m. The data was corrected and flagged and coded as <5> (CSM) for the deployment period of 03/13/12-09:15 to 3/27/12-09:00.

Nag Creek

Throughout the year there are small turbidity spikes marked 1 STS CSM. Due to the sonde being deployed in a horizontal position, there is, at times, drift algae that gets caught up on the station and affects the turbidity data (see picture at right).

GSM CWD – Due to the on and off ice formation in the creek, the deploying structure fell in and the sonde was sitting at the bottom of the creek; data were rejected from 1/1 00:00 to 1/5 10:15. CIP was used in the F\_Record column to indicate all parameters collected were affected. The sonde was retrieved and kept in the lab until the creek thawed.

GIC – The sonde at Nag Creek was pulled out of the water because the low temperatures froze up the creek from January 05 - 10, then again from January 18 to February 09.

GSM CLT – Deployment at this site was done during low tide that got even lower after leaving the site, during 10/23 10:00 to 13:00. The data were considered suspect due to the possibility of sonde being barely underwater and water quality parameters seem slightly different.

Potter Cove

CSM in Record Column, depth problem. The line to the sonde appears to be slightly tangled according to depth data. However, since this is a shallow, well mixed site, the water quality parameters collected during these incidents seemed not to be affected.

02/05/12 14:15 to 08:30 & 15:30 to 20:30

02/14/12 10:00 to 15:30

03/10/12 19:15 to 23:45

03/13/12 09:00 to 03/27/12 08:45

06/26/12 08:45 to 07/10/12 10:15

07/31/12 06:45 to 08/15/12 06:45

CSM in Record Column 10/29/12 to 11/05: While collecting data, the sonde broke loose from its deploying anchor due to strong wave action of Hurricane Sandy and went floating to the surface due to an attached float. The data was rejected since it was collected at the wrong depth.

CSM in Parameters Column, the deployment structure was removed and the sonde was pulled out of the water several times during this period because the floating dock (where the deploying structure is attached) was being replaced.

02/08/12 to 02/09/12

02/27/12 to 03/05/12

CSM in Parameters Column – 11/05 to 11/14 2012. No sonde was deployed during this period because Hurricane Sandy damaged the deploying structure (PVC pipe) beyond repair. During this time, the Reserve worked on putting together and installing a new deployment structure.

CWE in Record Column for all stations, significant weather event: 10/29 – RI felt the effects of Hurricane Sandy.

T-Wharf Surface

CSM CVT in Record Column, depth problem & tampering/vandalism at the site. The T-Wharf Surface sonde is kept at the surface using a buoy that was stolen during the deployment sending the sonde about 5m down near the bottom. The data was rejected:

3/20 15:30 to 3/21 8:45

GSM CWD all data. After June 12, when the new deployment tube was installed, until the end of the year, the depth at which the sonde was located was off. The reason for this is that the floats that maintain the sonde at the surface are getting tangled with the line inside the PVC deploying structure. This prevents free movement of the sonde with the tides. Even though we have been changing the way we deploy the sonde during this period, there is no reason to believe that the data might be affected.

GSM CMC - 08/14/2012 14:00 – 15 – troubleshooting the tangling problem. The sonde had a float in the PVC pipe so it would go up and down with the tides, but it also had a security line which was getting tangled with the float. This day, we removed the security line and left the float only.

GSM CWD - 09/30/2012 23:00 – 10/1 4:30 – It seems the sonde got stuck near the surface in the PCV pipe during this deployment.

09/19 13:30 – 09/22 21:30. It seems the sonde got stuck a bit shallower than it should have been in the PVC pipe. I assume the float somehow got jammed. We could use 1 GSM CWD for depth only, 0 GSM CWD for all other parameters since this is a well-mixed station, and surface station, nonetheless.

09/22 21:45 – 09/25 10:15: here the sonde got stuck again, this time shallower than the first time.

09/25 10:30 – 10/02 09:00: depth got messy here, sonde stuck in tube during some periods.

GSM CWD – For a short period during the 11/6 deployment (11/13 11:45 – 13:30), it seems the float that keeps the sonde at the surface got tangled causing the sonde to be slightly shallower than it should, then untangled and back to its corresponding depth. Since this is a well-mixed site, parameters were not affected and flagged and coded 0 GSM CWD, and depth, 1 GSM CWD.

T-Wharf Bottom

GSM CWD – 8/21, 10/16 to 10/17

The sonde did not go all the way down the deployment structure during this short period of time, staying at about 1 m off the correct depth; data should have not been affected.

T-Wharf Surface and Bottom

1. June 06, 2012 – New deploying structures. The Reserve hired commercial divers to install new pvc pipes to deploy the sondes in.

2. CSM in Record Column 06/12/12 – Deployed both sondes in the new PVC pipes.