

Waquoit Bay (WQB) National Estuarine Research Reserve Water Quality
Metadata
March 2000-December 2000
Latest Update: July 19, 2022

I. Data set and Research Descriptors

1. Principal investigator

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2. Entry verification:

The data are uploaded in three file formats (each to separate files identified with the same file name but with unique extensions) from the YSI 6000 (and 6600) data loggers to a PC with the YSI 6000 (and 6600) data transfer software (Kermit). Two of these (PC6000 and ASCII text formats) are kept on file in the WBNERR archive. The comma delimited format data file is imported to the EXCEL spreadsheet program (version 5.0), where it is processed according to standard NERRS CDMO protocol, using the CDMO Excel 5.0 macros. File size of one complete month of data each has been achieved by concatenating (and truncating if necessary) shorter files of interrupted data segments. File contents are examined for anomalies (e.g., sensor malfunction, battery failure, spurious values, etc.) by visualization of data with the Ecowatch Software provided by YSI. Data requiring editing are noted and copies of the graphs of raw data are saved at WBNERR. Data editing to CDMO protocol is conducted in EXCEL. Missing data (data logger malfunction or maintenance periods) are represented by periods ("."). Outliers (data values not within the design range of the respective sensors except for turbidity and depth) are changed to periods. Data values recorded during deployment or retrieval (i.e., when the instrument was out of

the water or in the laboratory) are deleted or replaced with periods. A record of changes is documented in the Data Anomalies section of the metadata file. The monthly files are sent electronically by FTP to CDMO. Copies of all files are retained at the reserve. Dave Giehtbrock, the Research Assistant, normally performs all data management. However, for the period from October to December, when we had no RA, the Research Coordinator, Chris Weidman, carried out this task.

3. Research Objectives:

One primary issue of concern for the Waquoit Bay ecosystem is the influence of anthropogenic-induced alterations by nitrogen enrichment. Waquoit Bay receives nitrogen from several sources, such as septic systems (their leachate percolates into groundwater which then enters the bay), run off from roads, run off containing domestic and agricultural fertilizer and animal waste, and atmospheric sources. This elevated nitrogen loading to the bay has resulted in eutrophic conditions that have contributed to alterations of habitats in the bay. For example, thick mats of seaweed now cover the bottom where eelgrass meadows thrived in the 1970's. Unfortunately, there are few definitive records of bay conditions during that period, which makes it difficult to evaluate the rates of change. To facilitate future evaluation, long-term records from data loggers are being compiled to track several parameters that describe conditions in this eutrophic system. Of particular interest are measurements of dissolved oxygen, turbidity, and chlorophyll. These long-term records will facilitate evaluation of changes which may come about from a continuation of watershed alteration that result from "traditional" development (i.e., non-sewered residential areas served by private septic systems typically consisting of septic tanks and leach fields) as well as non-industrial commercial development, such as golf courses, cranberry bogs, and retail shopping outlets. The records will be useful for evaluating the efficacy of remediation efforts intended to reduce the nitrogen loading from these sources to Waquoit Bay.

Another focus of long-term research interest is the detection of climate change and the determination of its effects on the estuarine environment. Characterizing the variability of the various water column parameters, such as its scale, magnitude and frequency, is likely to be a very important aspect of the estuarine ecosystem, that is also sensitive to climate change. Related to this focus is an interest in the impact of storms (hurricanes and northeasters) and other extreme meteorological events on the estuary. For example, what temperature and wind field thresholds exist that might bring about or trigger certain conditions within the bay? The observations recorded by the data loggers will allow for these types of studies.

4. Research methods:

This year instruments were almost continuously operated at this site from late March through late December, when sea ice conditions became severe enough on 12/27/00 to cause us to abandon the site for the winter. No data were collected at the reserve prior to late March due to ice conditions, and the related lack of boats available for deployment and retrieval, and also a lack of personnel. Logger sensors were 0.75 m above the bottom to ensure they were above the dense macro algal mat that covers the bottom of Waquoit Bay. The YSI sondes measure and record ambient water temperature, specific conductivity (and calculate salinity), dissolved oxygen (mg/L and % saturated), turbidity (NTU), water level (m), and pH at 30 minute intervals during deployment periods extending for approximately two weeks.

This year in the autumn we purchased a new YSI 6600 along with a YSI chlorophyll (6025) sensor. This gave us the potential capability of estimating chlorophyll biomass. We achieved our initial deployment of this instrument in early December and used the "chlorophyll" data to carry out a basic set of calibration experiments. Because of its preliminary nature, we have not included this data in this year's SWMP data set for CDMO, however this data is shown and discussed in our Chlorophyll Sensor Report to NERRs (1/2001).

Sonde deployment was achieved two different ways this year. The first

method, and the one used in previous years, is characterized by a mooring set up that consists of a 75 pound anchor (cinder blocks) to which two lines are attached. One line is for a surface float that marks the location. The other is shorter and terminates at a smaller float; line length is such that the float remains submerged throughout tidal changes. The data logger is attached to this line in a vertical manner so that the sensors (pointing downward) are suspended 75 cm from the bottom. This system was chosen in past because local regulations prohibited the installation of a more permanent structure that extended above water (e.g., a piling) and to minimize opportunities for vandalism. However, in mid-summer we designed, built and deployed a new mooring system that consisted of a PVC pipe tower, about 1.5 meters in height) extending from a 120 lb cast concrete base that was deployed on the bottom at the site. A larger diameter (5") PVC section, that is also adjustable (though for our current purposes set at .75 m off the bottom) , is attached to this tower and is topped with a larger funnel shaped piece, that allows the YSI instrument to be lowered and easily inserted into the 5" PVC section from the surface. The lower part of the PVC section is exposed to allow the YSI sonde's sensors direct exposure to ambient waters. This latter set up allows for faster and more convenient deployment / retrieval while being much less vulnerable to severe wave conditions during storms since it is basically independent of any surface floatation, except for site marking. Similarly, it is even less vulnerable to boating traffic and vandalism than our previous method.

During colder months, continuous operations are limited to about two weeks due to limited battery life. In the warmer months, particularly June - September, bio-fouling of the sensors also limits continuous operation to about two weeks even though battery performance during this period would allow for longer deployments.

After a deployment, each logger is brought back to the laboratory for post calibration check, data downloading, instrument and sensor cleaning, and

calibration. These procedures are carried out according to the methods described in the YSI Operating Manual. Salinity sensors were calibrated with reference seawater that had been previously analyzed with a Guildline salinometer at the Woods Hole Oceanographic Institution. pH sensors were calibrated with 7.0 and 10.0 pH standard solutions (2-point calibrations). The turbidity standard solutions were prepared from formazin dilutions to 100 NTU. Temperature sensors were not calibrated. Oxygen sensor membranes were inspected before and after each deployment. Oxygen sensor membranes were replaced 24 hours prior to each deployment per recommendation by YSI personnel. Final DO calibration was not done until the membrane had been in place for at least 24 hours. Performance was also evaluated during the post-retrieval check in the laboratory test tank prior to post-calibration.

5. Site location and character:

In 1998, it was determined that the Metoxit Point site was likely to be a more representative location for sampling of the bay's water quality conditions than the previous SWMP site referred to as the Central Basin site, and so the Metoxit Point is now the primary SWMP site for Waquoit Bay, and the Central Basin site has since been discontinued. A more in depth discussion of the reasons for this decision can be found in the 1998 and 1999 Metadata for Waquoit Bay. Note that this site is a change in location from the original "base line". This site has the coordinates, 41° 34.131' N 070° 31.294' W, and was given the designation of MP. The site is well flushed by tides, is 1.8-2.5 m deep, and is in an area that is minimally disturbed by routine activities on the bay (e.g. boat traffic, shell fishing, etc.).

The Waquoit Bay National Estuarine Research Reserve (WBNERR) is located in the northeastern United States on the southern shore of Cape Cod, Massachusetts. About 8,000 people maintain permanent residency in Waquoit Bay's drainage area, which covers parts of the towns of Falmouth, Mashpee, and Sandwich. During

summer months, the population swells 2-3 fold.

WBNERR is representative of shallow coastal lagoons that occur from Cape Cod to Sandy Hook, New Jersey. WBNERR is within the Virginian biogeographic province, on the transitional border (Cape Cod) between the Virginian and the more northern Acadian biogeographic province.

Like many embayments located on glacial outwash plains, Waquoit Bay is shallow, fronted by prominent barrier beaches (i.e., those of South Cape Beach State Park and Washburn Island), and is backed by salt marshes and upland forests. Two narrow, navigable inlets, reinforced with granite jetties, pass through two barrier beaches to connect Waquoit Bay with Nantucket Sound to the south. A third shallow and generally unnavigable inlet opened through the Washburn Island barrier beach during Hurricane Bob in August 1991, and has migrated westward since. As early as 2001, it appears to be rapidly infilling with sediments and may close within the next year.

Dense housing developments cover the two peninsulas that form the western shore of the Waquoit Bay estuarine system. Although the developments themselves are outside of the Reserve boundaries, nitrogen in the discharges from their septic systems (which flows ultimately into the bay via groundwater) and in the fertilizer run-off from their lawns has significant effects on the functioning of the Waquoit Bay ecosystem. The impacts of these effects have been a primary subject of study at the Reserve since its designation (1988). An outcome of this research has been the delineation of subwatersheds within the overall drainage area for Waquoit Bay, of which WBNERR is a small part. This knowledge allows for the design of experiments based on the spatial variation of nutrient loading and its impacts.

At the northern end of the Bay, an area comprising a separate subwatershed, coastal bluffs of glacial till rise 30 feet above sea level, the highest land within the Reserve. Adjacent to the bluffs, the northern basin of the bay is its deepest area (3 m mean low water), albeit much of the remainder of the bay is only slightly shallower (roughly 1.6 m). Bourne, Bog, and Caleb ponds are freshwater kettle hole ponds on the northern-most shore of

the bay. As components of the same sub-watershed, they have a common albeit minor freshwater outflow into the bay's northern basin via a narrow channel through a brackish marsh. Although this flow is small, over the centuries it has created a significant delta of coarse sand that overlies much finer sediments found at comparable offshore distances elsewhere. The source of this sand is the sandy beach through which this fresh water discharge must travel.

To the east and south, other subwatersheds surround several salt and freshwater ponds, including Hamblin and Jehu Ponds, brackish salt ponds that are connected to the Bay by the tidal waters of Little and Great rivers, respectively. The shorelines of the ponds are developed with residences that are occupied both seasonally and year round. Hamblin Pond and Little River are components of one subwatershed, and Jehu Pond and Great River are elements of a separate subwatershed. Further south lies Sage Lot Pond. It is in the least developed subwatershed which also contains the barrier beach and salt marsh ecosystem of the reserve's South Cape Beach State Park. To the east of Sage Lot Pond and within the same subwatershed, lies the highly brackish Flat Pond. It receives minimal tidal flows of salt water from Sage Lot Pond through a narrow, excavated channel. The preponderance of the input to Flat Pond is groundwater and run off, both of which are likely affected (e.g., nutrients, pesticides, bacteria) by an adjacent golf course and near-by upper-scale residential development.

The largest source of freshwater to Waquoit Bay is the Quashnet / Moonakis River. (Although named "river", this and the reserve's Childs River are more appropriately described as "rivulets" because of their small channels and discharge ~1.0 CFS). A component of yet another subwatershed, it originates in Johns Pond situated north of the bay and traverses forests, cranberry bogs, residential areas, and the Quashnet Valley Golf Course before entering the bay near the southern "boundary" of the northern basin. ("Quashnet" applies to that portion of the river within the town of Mashpee, and "Moonakis" refers to the

brackish estuary at the river's mouth, lying in the town of Falmouth. Quashnet will be used hereafter to refer to the entire river.) The Quashnet River is the only component of the Waquoit Bay estuary system that has sufficient numbers of coliform bacteria to cause it to be closed to shell fishing. The source(s) of this bacteria is unknown. The Quashnet River delivers significantly less nitrogen to Waquoit Bay than does the Childs River, which lies to the west and originates in Johns Pond.

The Childs River is the second largest input of freshwater to the bay. A component of another subwatershed, it runs through densely developed residential areas. The Childs River subwatershed receives the highest nitrogen loading and is the largest nitrogen contributor to the Waquoit Bay system of all the subwatersheds.

Another, albeit smaller, source of freshwater is the discharge of Red Brook through brackish marshlands into Hamblin Pond. Additional freshwater enters the bay elsewhere through groundwater seepage, precipitation and the flows of small brooks. A significant groundwater flow enters the eastern end of the mooring basin at the head of the bay. There is relatively little surface water runoff entering directly into the bay due to the high percolation rates of Cape Cod's coarse, sandy soils.

Knowledge of the degree of mixing in Waquoit Bay was originally derived from measurements made by reserve staff and from data obtained by the reserve's volunteer water quality monitoring group, the Waquoit Bay Watchers who have collected depth profiles of Waquoit Bay water quality since 1993. Subsequent research by reserve staff has revealed that lateral mixing has considerable influence because tidal currents follow a general course through the bay. This results in an overall structure to horizontal patterns of water quality characteristics. The pattern it produces is a gyre in the central portion of the bay whereby currents follow a circular pattern in an anticlockwise direction around a central area that exhibits reduced exchange with the remainder of the bay. The flushing rate within the gyre is diminished when compared with other areas of the bay. The location of the gyre meanders slightly, apparently under the

influence of tides and wind. The MP site is more consistently near the outer regions of the gyre, that is, more frequently in the circular current, and those data should be less affected by the meandering of the gyre. (Relocating the logger to the central area of the gyre is impractical because that area is frequented by boat traffic and the logger mooring would be a hazard to navigation.)

Tides in Waquoit Bay are semidiurnal with an average range of about 0.4 m.

Largely because of the shallow conditions, restricted tidal inlet, and low amplitude tidal signal, tides in the bay are also influenced by wind forcing.

Salinity in Waquoit Bay ranges from 28 to 31 ppt. At the sampling site, the depth is about 2 m (MHW). Monitoring probes are positioned about 0.75 m above

the bottom. Bottom sediments are organic rich silts and medium sands.

Thick (up

to 0.3m) macroalgae (Seaweed) mats overlie much of the bottom of the bay, and

largely consist of species *Cladophora vagabunda*, *Gracilaria tikvahiae*, and

Enteromorpha. The dominant marsh vegetation near the sampling site are *Spartina*

alterniflora and *Spartina patens*. Dominant upland vegetation includes mixed

forests of red oak, white oak, and pitch pine, and other shrubs and plants

common to coastal New England. Land-use in the bays watershed is about 60%

natural vegetation, but the remaining land is largely residential, with some

commercial (retail malls), and minor amounts of agriculture (~3%) (cranberry

bogs). The activities which most impact the site are 1) enhanced nitrogen loads

derived from individual residential septic systems, and 2) intensive recreational boating during the summer months.

6. Data collection period

Data collection occurred at site MP from March 29, 2000 to December 27, 2000.

7. Associated researchers and projects

None to report.

8. Variable sequence, range of measurements, units, resolution, and accuracy:

YSI 6000 data logger

Variable	Range of Measurements	Resolution	
Accuracy			
Date	1-12, 1-31, 00-99 (Mo,Day,Yr)	1 mo, 1 day, 1 yr	NA
Time	0-24, 0-60, 0-60 (Hr,Min,Sec)	1 hr, 1 min, 1 s	NA
Temp	-5 to 45 (c)	0.01 C	+/-
0.15C			
Sp COND	0-100 (mS/cm)	0.01mS/cm	+/-0.5%
Of			
reading + 0.001mS/Cm			
Salinity	0-70 Parts per thousand (ppt)	0.01 ppt	+/- 1%
of			
Reading or 0.1 ppt, (whichever is greater)			
DO	0-200 (% air saturation)	0.1% @air sat	+/-2%
@air			
Saturation			
DO	200-500 (% air saturation	0.1% @ air sat	+/- 6%
@			
Saturation			
DO	0-20 (mg/l)	0.01 mg/l	+/-
0.2mg/l			
DO	20-50 (mg/l)	0.01 mg/l	+/-
0.6mg/l			
Depth (shallow)	0-9.1 (m)	0.001m	+/-
0.018m			
PH	2-14 units	0.01 units	+/-
0.2units			
Turb	0-1000 NTU	0.1 NTU	+/- 5%
of			
Reading or 2 NTU (whichever is greater)			

Data columns are separated by tabs. Each file contains a two line column header at the top of the page which identifies measurements and units for each column.

9. Coded variable code definitions

The file names are labeled according to site identifier code, month, year (e.g., mp0900). The identifier code for Metoxit Point, Waquoit Bay is mp, a site about 1200 feet north of the "cb" site. "mp" was the only site where a data logger was operated during 2000.

10. Data anomalies

March 2000

Metoxit Point

A post calibration check of the data collected 10:30 03/30 to 12:30 4/13 showed

"noisy" pH readings. pH readings gave a value of 7.17 in 7.00 buffer on post

check. Fouling is the suspected reason for the drift. This data was not deleted.

April 2000

Metoxit Point

The following were small negative and/or zero turbidity values, possibly due to

a small calibration error.

These data were not deleted.

04/01/00 06:00

04/13/00 12:30-23:30

04/14/00 00:00-23:30

04/15/00 00:00-23:30

04/16/00 00:00-23:30

04/17/00 00:00-23:30

04/18/00 00:00-23:30

04/19/00 00:00-23:30

04/20/00 00:00-23:30

04/21/00 00:00-23:30

04/22/00 00:00-03:00, 06:00-23:30

04/23/00 00:00-23:30

04/24/00 00:00-23:30

04/25/00 00:00-03:30, 04:30-05:30, 06:30-23:30

04/26/00 00:00-23:30

04/27/00 00:00-12:00

04/29/00 06:00

A post calibration check of the data collected 12:30 04/27-11:30 05/11 showed

drift of the DO and pH sensors. 100% water saturated air gave a reading of

74.8%. pH readings gave a value of 7.28 in 7.00 buffer on post check.

Fouling

is the suspected reason for the drift. pH readings from 4/27 12:30 to 4/30

23:30 seem to be "noisy", this data was not deleted.

pH data on 04/04 06:00 to 04/13 16:00 appear to be suspect for unclear reasons,

however, data was not deleted.

May 2000

Metoxit Point

A post calibration check of the data collected 12:30 04/27-11:30 05/11 showed

drift of the DO and pH sensors. 100% water saturated air gave a reading of

74.8%. pH readings gave a value of 7.28 in 7.00 buffer on post check.

Fouling

is the suspected reason for the drift. pH readings from 05/01 00:00 to 5/11

11:30 seem to be "noisy", this data was not deleted.

A post calibration check of the data collected 12:00 05/11-13:30 05/25 showed

drift of the DO sensor. 100% water saturated air gave a reading of 77.2%.

The following turbidity values appear to be high but fall inside the range (0000 to 1000 NTU). Data were not deleted.
05/06 06:30

The following were small negative and/or zero turbidity values, possibly due to a small calibration error. These data were not deleted.
05/12/00 07:30:00 -0.1
05/18/00 09:30:00 -0.1

A post calibration check and graphical review of the data collected 5/22/00 14:00 until 6/8/00 9:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 5/26/00 11:30. All dissolved oxygen data from 5/26/00 11:30 to 5/31/00 23:30 were deleted and replaced with periods.

June 2000

Metoxit Point

A post calibration check and graphical review of the data collected 5/22/00 14:00 until 6/8/00 9:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 5/26/00 11:30. All dissolved oxygen data from 6/01/00 00:00 to 6/8/00 9:30 were deleted and replaced with periods.

A post calibration check and graphical review of the data collected 6/8/00 10:00 to 6/22/00 09:30 revealed suspect turbidity data near the end of the deployment possibly due to fouling even though the sensor wiper seemed to be functioning normally. The post calibration value for 0.0 NTU standard was 5.6 on this deployment.

A post calibration check of the data collected 10:00 06/22-23:30 06/30 showed drift of the DO sensor. 100% water saturated air gave a reading of 67.4%.

July 2000

Metoxit Point

A post calibration check of the data collected 10:00 06/22-10:30 07/06 showed drift of the DO sensor. 100% water saturated air gave a reading of 67.4%.

A post calibration check of the data collected 11:00 07/06-7/20 12:00 showed drift of the DO sensor. 100% water saturated air gave a reading of 90.0%.

The following were small negative and/or zero turbidity values, possibly due to a small calibration error. These data were not deleted.

07/06/00 11:00-23:30
07/07/00 00:00-23:30
07/08/00 00:00-21:30, 22:30-23:30
07/09/00 00:00-20:00, 21:00-23:30
07/10/00 00:00-10:00, 17:30-23:30
07/11/00 00:00-01:00, 02:30, 03:30, 04:00, 05:30-23:30
07/12/00 00:00-23:30
07/13/00 00:00-23:30
07/14/00 00:00-23:30
07/15/00 00:00-23:00
07/16/00 02:00-02:30, 11:00-23:30
07/17/00 00:00-20:30, 21:30-23:30
07/18/00 00:00-01:00, 02:00-23:30
07/19/00 00:00, 01:00, 01:30, 02:30, 03:30-23:30
07/20/00 00:00, 00:30, 05:30, 12:00, 14:30
07/20/00 12:30-23:30
07/21/00 00:00-23:30
07/22/00 00:00-23:30
07/23/00 00:00-23:30
07/24/00 00:00-23:30
07/25/00 00:00-23:30
07/26/00 00:00-16:30, 18:30, 20:00
07/27/00 00:00-23:30
07/28/00 00:00-23:30
07/29/00 00:00-23:30
07/30/00 00:00-23:30
07/31/00 00:00-23:30

A post calibration check and graphical review of the data collected 07/20/00 12:30 until 08/04/00 08:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 07/27/00 14:30. All dissolved oxygen data from 07/27/00 14:30 to 07/31/00 23:30 were deleted and replaced with periods.

August 2000
Metoxit Point

A post calibration check and graphical review of the data collected 07/20/00

12:30 until 08/04/00 08:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 07/27/00 14:30. All dissolved oxygen data from 08/01/00 00:00 to 08/04/00 08:30 were deleted and replaced with periods.

A post calibration check and graphical review of the data collected 08/17/00 09:30 until 09/01/00 14:00 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 07/27/00 14:30. All dissolved oxygen data from 08/30/00 17:30 to 08/31/00 23:30 were deleted and replaced with periods.

The following were small negative and/or zero turbidity values, possibly due to a small calibration error.

These data were not deleted.

08/01 00:00-23:30
08/02 00:00-22:00, 23:00, 23:30
08/03 00:30-19:00, 20:00, 20:30, 21:30, 22:30-23:30
08/04 00:00-08:30
08/17 09:30-22:00
08/18 00:30, 01:00, 05:30-8:30, 10:00-19:00, 20:00, 20:30, 21:30, 22:00, 22:30, 23:30
08/19 00:00-01:00, 02:00-03:30, 05:00-19:30, 22:00-23:30
08/20 00:30-01:30, 02:30-23:30
08/21 00:00-01:30, 04:30-22:30, 23:30
08/22 00:00-23:30
08/23 00:00-23:00
08/24 00:00-23:00
08/25 00:00-01:00, 05:00, 07:00, 09:00-17:00, 18:00-23:30
08/26 00:00-23:30
08/27 00:00-23:30
08/28 00:00-05:00, 06:00-07:00, 09:00-20:30, 21:30-23:30
08/29 00:00-2:00, 03:00, 04:30, 09:30, 10:00, 11:00-23:30
08/30 00:00-06:00 07:00-23:30
08/31 00:00-23:30

The following turbidity values were out of range (>1000 NTU). Data were not deleted.

08/29 05:00 - 07:30

September 2000

Metoxit Point

A post calibration check and graphical review of the data collected 08/17/00

09:30 until 09/01/00 14:00 revealed a catastrophic failure of the Dissolved

Oxygen Probe starting at 08/30 17:30. All dissolved oxygen data from 09/01/00 00:00 to 09/01/00 14:00 were replaced with periods.

A post calibration check and graphical review of the data collected 09/01/00 14:30 until 09/13/00 09:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 09/03/00 06:30. All dissolved oxygen data from 09/03/00 06:30 to 09/13/00 09:30 were replaced with periods.

A post calibration check and graphical review of the data collected 09/13/00 10:00 until 09/27/00 09:00 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 09/19/00 05:30. All dissolved oxygen data from 09/19/00 05:30 to 09/27/00 09:00 were replaced with periods.

The following turbidity values appear to be high but fall inside the range (0000 to 1000 NTU). Data were not deleted.
09/02 18:30 - 09/03 22:00
09/04 18:30

Specific conductivity and salinity should be considered suspect on 09/03 10:30 to 09/04 05:00. Reasons unknown. No extreme or unusual meteorological activity is recorded for this period. Data were not deleted.

The following were small negative turbidity values, possibly due to a small calibration error.
These data were not deleted.
09/01/00 00:00-14:00

October 2000
Metoxit Point
Post calibration checks of all parameters for all three deployments included in this month indicate no significant drift, with the possible exception of pH during the deployment period 10/11-10/29, which had post-calibration values of 6.73 and 9.14 for 7.00 and 10.00 standards. These data were left as is, and not deleted.

November 2000
Metoxit Point
Post calibration checks of all parameters for the two deployments included

in this month's record indicate no significant drift except for DO for the deployment ending 11/18/00, which showed a 100% saturated air post-calibration value of 91%. No data were deleted.

The following were small negative turbidity values (all -0001) , possibly due to a small calibration error. These data were not deleted.

11/20/00 11:30, 19:00
11/21/00 00:00, 1:30, 3:30, 4:30-5:00, 6:00-6:30, 8:00-11:30, 13:00-15:00, 17:00, 18:30, 19:30-23:30
11/22/00 0:00-0:30, 1:30, 2:30-8:30, 11:30-12:00, 13:00, 16:00-16:30, 17:30-23:30
11/23/00 0:00-0:30, 2:30, 3:30-5:30, 6:30-14:00, 15:00-17:00, 18:00, 19:00-20:00, 21:00-22:00, 23:00-23:30
11/24/00 0:00-0:30, 2:20-3:00, 4:00, 5:00-5:30, 6:30-7:00, 8:30, 9:30-10:00, 11:00, 12:30, 14:30-16:30, 19:00, 20:00-20:30
11/25/00 0:00, 3:30, 4:30, 6:30, 8:00-14:00, 16:30-17:30, 19:00-19:30, 21:30-22:00
11/26/00 0:00-1:00, 6:30, 7:30, 8:30-9:00, 11:00, 12:00, 13:00, 14:00, 15:00
11/27/00 5:30, 8:00-10:00, 11:00-11:30, 12:30, 13:30-14:00, 16:00
11/28/00 0:30, 4:30, 7:00, 11:00, 12:00, 18:00
11/29/00 10:00, 11:00-11:30, 13:00-13:30, 14:30, 15:30, 16:30, 17:30, 18:30, 20:30-21:00, 22:00, 23:30
11/30/00 3:30-4:00, 6:00-6:30, 7:30, 8:30-12:00, 13:00-14:00, 15:00, 16:00, 17:00, 18:30-21:00, 22:00-23:30

December 2000

Metoxit Point

Post calibration checks of all parameters for the two deployments included in this month's record indicate no significant drift. No data deleted.

The following were small negative and/or zero turbidity values (all between 0000 and -0001) possibly due to a small calibration error. These data were not deleted.

12/1 00:00-17:00, 18:30-23:30
12/2 00:00-23:30
12/3 00:00-23:30
12/4 00:00-8:30, 9:30-23:30
12/5 00:00-2:30, 3:30-23:30
12/6 00:00, 1:00, 3:30, 4:30-15:00, 16:00-17:00, 18:00-19:00, 20:00
12/7 1:00, 2:30, 5:30, 6:00-7:00, 8:00, 10:00, 11:00, 15:30, 17:30-18:00,
19:30-
20:00, 22:30-
23:30
12/8 00:30-1:00, 2:00, 3:30-7:30, 8:30-9:30, 11:00-12:00, 14:30, 16:00,
18:00-
20:30, 21:30-
23:00
12/9 00:30-2:30, 3:30-7:00, 8:30-9:30, 11:00, 12:00-23:30
12/10 00:00-1:30, 2:30, 4:30-5:00, 6:00-7:00, 8:00-9:00, 11:00-11:30,
12:30-
13:30, 15:00-16:00,
17:00, 18:00-18:30, 19:30-20:30, 23:30
12/11 00:30-1:00, 4:30-7:00, 8:00-12:00, 13:00-15:00, 16:30-19:30, 21:00,
22:00-
23:30
12/12 00:30, 2:00-2:30, 4:00-6:00

11. Missing Data

Data Loggers were not operated until March 30, 2000.

March 2000:

MP: No data collected until March 30 10:30.

April 2000:

MP: 04/27 12:00 Data missing due to probe out of the water for calibration and redeployment of another sonde.

May 2000:

MP: A post calibration check and graphical review of the data collected 5/22/00 14:00 until 6/8/00 9:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 5/26/00 11:30. All dissolved oxygen data from 5/26/00 11:30 to 5/31/00 23:30 were deleted and replaced with periods.

June 2000:

MP: A post calibration check and graphical review of the data collected 5/22/00 14:00 until 6/8/00 9:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 5/26/00 11:30. All dissolved oxygen data from 6/01/00

00:00 to 6/8/00 9:30 were deleted and replaced with periods.

July 2000:

MP: A post calibration check and graphical review of the data collected 07/20/00 12:30 until 08/04/00 08:30 revealed a catastrophic failure of the Dissolved Oxygen Probe starting at 07/27/00 14:30. All dissolved oxygen data from 07/27/00 14:30 to 07/31/00 23:30 were deleted and replaced with periods.

August 2000:

MP: 08/01/ 0:00 to 08/04 08:30 DO data was deleted due to diagnosed failure of DO membrane during this deployment period.

MP: 08/06 21:30 to 08/17 09:00 Data missing due to power failure. Servicing of the battery contacts solved the problem.

MP: 08/30 17:30 to 08/31 23:30 DO data were deleted due to catastrophic failure of the dissolved oxygen probe starting at 08/30/00 17:30.

September 2000:

MP: 09/01 00:00 to 09/01 14:00 DO data were replaced with periods due to a catastrophic failure of the dissolved oxygen probe starting at 08/30 17:30.

MP: 09/03 06:30 to 09/13 09:30 DO data were replaced with periods due to a catastrophic failure of the dissolved oxygen probe starting at 09/03 06:30.

MP: 09/19 05:30 to 09/27 09:00 DO data were replaced with periods due to a catastrophic failure of the dissolved oxygen probe starting at 09/19 05:30.

October 2000

MP: 10/10 12:00 to 10/11 09:30 Data missing because no data logger was deployed for this period.

November 2000

MP: 11/18 11:30 One half hour data interval missing owing to retrieval / deployment overlap of sampling time - no logger in water precisely at sampling time.

December 2000

MP: 12/2 11:00- 12/16 8:00 No DO concentration data (mg/L) because 6600 instrument was used for this deployment period and no concentration data were recorded.

MP: 12/27 9:30 to 12/31 23:30 No data because instruments deployments were stopped at this site for winter because of increasingly severe ice conditions (ice 3" thick on bay as of 12/27).

12. Other remarks/notes

On 01/15/2022 this dataset was updated to include embedded QAQC flags for anomalous/suspect data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above). Prior to 2006, rejected data were deleted from the dataset so they are unavailable to be used at all, but suspect data were only noted in the metadata document. Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes. No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

A) Below is a list of instrument deployment dates at Metoxit point:

- 1) 3/30-4/13
- 2) 4/13-4/27
- 3) 4/27-5/11
- 4) 5/11-5/25
- 5) 5/25-6/8
- 6) 6/8-6/22
- 7) 6/22-7/6
- 8) 7/6-7/20
- 9) 7/20-8/4
- 10) 8/4-8/17
- 11) 8/17-9/1
- 12) 9/1-9/13
- 13) 9/13-9/27
- 14) 9/27-10/10
- 15) 10/11-10/29
- 16) 10/29-11/18
- 17) 11/18-12/2
- 18) 12/2-12/16
- 19) 12/16-12/27

B) Any time a reference is made to turbidity data being negative and/or zero, it

was recorded as a negative in the raw data file and a zero in the edited data file due to the formatting of Excel. The technician edited none of these data points by hand nor did he/she delete any of them.