Waquoit Bay (WQB) National Estuarine Research Reserve Water Quality Metadata
January 2005-December 2005
Latest Update: August 13, 2020

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

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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 6600 data loggers to a PC with the YSI 6600 EcoWatch software. Two of these (PC6000 and ASCII text formats) are kept on file in the WBNERR archive. The comma delimited format data file (.csv) 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 contents initially are examined for anomalies (e.g., sensor malfunction, battery failure, spurious values, etc.) by visualization of data with the Ecowatch Software provided by YSI. The exported .csv files are opened in Microsoft Excel for pre-processing with the EQWin format macro that was developed by the CDMO to reformat the header columns, insert station codes, insert a corrected time column and allow the technician to remove any pre- and post- deployment data from the file. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is accepted as being the most accurate. The pre-processed file is then ready to be copied into the EQWin water.eqi file where the data are QA/QC checked and achived in a database. EQWin queries, reports, and graphs are used to discover data set outliers (values which fall outside the range that the instrument is designed to measure) and large changes in the data. Missing data (data logger malfunction or maintenance periods) are represented by a blank space. Outliers (data values not within the design range of the respective sensors except for turbidity and depth) are deleted or noted as anomalous. EQWin is also used to generate statistics, view graphs, create customized queries and reports of the data, cross query the water, weather, and nutrient data, and finally export the data to the CDMO. A record of changes is documented in the Deleted Data section of the metadata file.

Copies of all files are retained at the Reserve. Additionally, the formatted PC6000 data files (.dat), as well as the raw text files (.csv) and final exported text files (.txt) are archived at the CDMO ftp server site. During deployment year 2005, Research Assistant Heather Tschaekofske was primarily responsible for performing all instrument calibrations. Research Coordinator Chris Weidman and Research Assistant Heather Tschaekofske are responsible for data QA/QC.

3) Research objectives:

For the NERR System-Wide Monitoring Program (SWMP), the YSI data loggers are programmed to record water quality parameters every 30 minutes. A total of four SWMP sites were located in the Waquoit Bay estuarine system during 2005. These four are: 1) Metoxit Point (MP) is located in the middle of Waquoit Bay's main basin; 2) Menauhant (MH), in operation since March 2001, is located adjacent to Eel Pond Inlet on Vineyard Sound – one of the two tidal inlets into the Waquoit Bay estuary; 3) Child's River (CR), in operation since May 2002, located near the head of the tidal section of Child's River— one of the two main surface fresh water sources to Waquoit Bay; and 4) Sage Lot (SL), in operation since May 2002, located in Sage Lot Pond—a relatively pristine tidal pond surrounded by salt marsh and barrier beach, possessing one of the bay's few remaining eelgrass stands.

The main purpose of water quality monitoring program is to aid Waquoit Bay NERR in one of its priority missions - to perform as a natural laboratory and platform for coastal and estuarine research. The long term, continuous detailed monitoring of the estuary's basic hydro-physical parameters is an essential tool and context for any research activities located here. Besides this overarching mission, there are also several specific research interests. One primary issue 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 enhanced eutrophication that has contributed to the alteration of the bay's habitats. For example, thick mats of seaweeds (macroaglae) now cover the bottom where eelgrass meadows thrived in the 1970's. Unfortunately, there are few definitive records of the bay's water quality conditions during that period, which makes it difficult to evaluate the rates of change. To facilitate future evaluation, long-term records from SWMP can be used to track water column conditions. Of particular interest, in this regard are measurements of dissolved oxygen (DO) and turbidity, as well as dissolved nitrogen and chlorophyll concentration (this data is available by contacting the reserve). Such records will facilitate evaluation of changes which may come about from a continuation of watershed alteration that result from current development patterns (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 their scale, magnitude and frequency, is likely to be an important aspect of the estuarine ecosystem that may be 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 SWMP will allow for these types of studies.

4) Research methods:

YSI 6600 series sondes are deployed at each permanent water quality monitoring station at the Waquoit Bay Reserve. Since in-situ instrumentation can only record conditions at a specific location, permanent monitoring stations for SWMP are chosen to be in some way representative of the overall estuary. This is difficult in practice since estuaries by their very definition are coastal regions where large physical, chemical and biological variations tend to occur in space and time, so that often no particular location within the system is "typical" of the overall system. Establishing a number of stations can overcome this problem somewhat, and as of 2002 four permanent stations were established in the Waquoit Bay estuaries. Our current SWMP stations are situated so as to be as representative as much as possible of the estuary and its inputs/outputs. Additional details concerning the station characteristics are discussed in the next section.

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 to four weeks. Note that the pressure sensors we currently use are un-vented and so variations in atmospheric pressure are recorded as changes in water depth (atmospheric data are available from our SWMP meteorological station (as of 1/2002) and other nearby meteorological observatories), so it is possible to make this correction to the depth data (approximately +1 cm of depth is equal to +1 mb of air pressure), for increased accuracy. Also, at our Metoxit Point site (from 12/2000 to 12/2005), Child's River site (from 3/2003 through 12/2005), Menauhant site (from7/2005 to 12/2005), and our Sage Lot site (from 6/2005 to 12/2005) we have been using a YSI chlorophyll 6025 sensor and these data are available by contacting us directly at the reserve (and included in the raw files sent to CDMO).

Sondes are deployed and retrieved every two to four weeks. The "old" sonde is retrieved and a "new" replacement sonde is deployed immediately so that ideally no record gap occurs. The 2-4 week deployment duration is constrained by a combination of battery life (shorter life in colder waters) and fouling of the DO sensor (and other sensors to a lesser degree) during the warm summer months. Prior to deployment (usually within 24 hrs), each instrument is checked and its sensors re-calibrated using standard YSI (Operating Manual) protocols. Similarly, after a deployment, each sonde is brought back to the laboratory for a post-deployment check, data downloading, instrument and sensor cleaning. Salinity sensors are calibrated with reference seawater that had been previously analyzed with a Guildline salinometer at the Woods Hole Oceanographic Institution (David Wellwood is currently the technician for this instrument). pH

sensors are calibrated with 7.0 and 10.0 pH standard solutions (2-point calibrations). The turbidity standard used was YSI 6073G turbidity standard for 123.0 NTU, and distilled water (DI) for 0 NTU. Temperature sensors are checked periodically against a calibrated mercury thermometer. Oxygen sensor membranes are inspected before and after each deployment. Oxygen sensor membranes were replaced 24 hours prior to each deployment when the sensor seemed to need reconditioning. Final DO calibration was not done until the membrane had been in place for at least 8 hours. As another check on instrument performance, in-situ measurements of air and water temperature, DO, salinity, water temperature, and pH are made using a hand-held YSI 650 at deployment/retrieval times.

In 2005, SWMP water quality data were collected continuously at our two dockside sites, Child's River and Menauhant, from January through December, while data were collected at our open water sites, Metoxit Point and Sage Lot, from January 1 to mid January and then again from early April until late November for Sage Lot and late December for Metoxit. No data were collected at these open water sites from mid-January until early April owing to heavy sea ice conditions in the bay. Winter 2004 / 2005 was another extreme sea ice year similar to 2003/2004. Ice thickness on the bay was more difficult to document this year because of heavy snow cover and treacherous on-ice conditions. Duration of significant sea ice cover lasted from mid-December 2004 in Sage Lot Pond, and from mid- January 2005 in the open waters of the main bay (Metoxit) until late March in Sage Lot Pond and mid-March 2005 in the main bay (Metoxit). Because of rapid retrieval prior to a major storm in mid-January the empty sonde moorings / silos at the two open water sites were not removed, and both sustained significant ice damage over winter delaying Spring deployment by 2 weeks. Cold and moderate sea ice conditions returned earlier than usual in late November 2005. Because of a sudden freeze up in Sage Lot Pond in late November, we were unable to retrieve that sonde on the usual schedule, and waited until a thaw occurred in late December, at which time both Sage Lot and Metoxit Point sites were abandoned for the remainder of 2005 in anticipation of colder conditions.

Two types of mooring silos are used to hold the sondes. The Metoxit Point and Sage Lot stations are located offshore and away from shore structures. The sonde moorings for these stations consist of a vertical PVC pipe tower (2" ID), about 1.5 meters in height extending from a 120 lb cast concrete base resting on the bottom. Attached to this tower is a 0.7 m PVC pipe section (4" ID), referred to as the silo, that holds the sonde and is adjustable for setting the depth of the sensor package. The sondes are lowered and inserted into the 4" PVC silo from the surface at low water, when the top of the tower is only about 0.3 m below the surface. The lower part of the silo section is perforated with numerous 1.5 " holes to allow the YSI sonde's sensors direct exposure to the flow of ambient waters. The Metoxit Point and Sage Lot silos are set so that the sensor package is 0.7 m and 0.5 off the bottom, respectively. This ensures that the sensors are above the macro algal mats in the case of Metoxit Point, and sufficiently into the water column because of the thick eelgrass meadow in Sage Lot. The Menauhant and Child's River stations are dock-side locations and their moorings are a more typical type of silo – a single PVC section (4" ID) mounted vertically on a pier piling. The Menauhant site, located at a yacht club dock, is adjacent to a tidal inlet, and the Child's River site, located at commercial marina and boat yard, is adjacent to the upper reaches of a tidal river. The base of the these silos are also ventilated with large holes (1.0" diameter) and their sensor packages (bottom of the sonde) are both mounted about 0.4 m off the bottom. All mooring silos are painted with

antifouling paint at the beginning of the spring season, and periodically checked and scrubbed during the summer season.

5) Site location and character:

General description of Waquoit Bay estuarine system:
The Waquoit Bay National Estuarine Research Reserve (WBNERR) is located in the northeastern United States on the southern coast 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 times with the greatest housing concentrations immediate to the coastline (water views and frontage). In addition, the upper portions of the watershed include a military base, Otis Air Force Base and the Massachusetts Military Reservation, portions of which have been designated by the EPA as Superfund sites due to past practices of dumping jet fuel and other volatile groundwater contaminants.

WBNERR's estuaries are representative of shallow tidal lagoons that occur from Cape Cod to Sandy Hook, New Jersey. WBNERR is within the northern edge of the Virginian biogeographic province, on the transitional border (Cape Cod) with the Acadian biogeographic province to the north and east. Like many embayments located on glacial outwash plains, Waquoit Bay is shallow (< 5 m), 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 coastal forests of scrub pine and oak. Two narrow, navigable inlets, reinforced with granite jetties, pass through two barrier beaches to connect Waquoit Bay with Vineyard Sound to the south. A third shallow and generally un-navigable inlet opened through the Washburn Island barrier beach during Hurricane Bob in August 1991, and closed up in February 2002.

Bottom sediments in the bay are organic rich (Corg conc. ~ 3-4%) silts and medium sands. Sediment cores taken in summer of 2002 indicate that the depth of these estuarine sediments is up to 9 m thick in places. Dating work on these sediment cores suggests that the Waquoit Bay basin has been inundated by the sea for about 5000 years, and sedimentation rates over the past 500 years are estimated to be range from 1.6 to 4.9 mm/yr. Thick (up to 0.3 m) macroalgae (seaweed) mats overlie much of the bottom of the bay, and largely consist of species *Cladophora vagabunda*, *Gracilaria tikvahiayae*, and *Enteromorpha*. The dominant marsh vegetation in Waquoit Bay is *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 bay's watershed is about 60% natural vegetation, but the remaining land is largely residential housing, with some commercial (retail malls), and minor amounts of agriculture (~3%) (cranberry bogs).
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, dissolved nitrogen in discharges from their septic systems (via groundwater) and in fertilizer run-off from their lawns has significant effects on the functioning of the Waquoit Bay ecosystem. These impacts have been a primary subject of study at the Reserve since its designation (1988). One outcome of this research has been the delineation of

sub-watersheds 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 other land-use related impacts.

At the northern end of the bay, an area comprising a separate sub-watershed, coastal bluffs of glacial till rise 30 feet above sea level. The northern basin of the bay, just below these bluffs, is its deepest area (approximately 3 m MLW), while much of the remainder of the bay is about 1.5 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. To the east and south, other sub-watersheds surround several tidal and freshwater ponds, including Hamblin and Jehu Ponds, brackish salt ponds that are connected to the main 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 sub-watershed, and Jehu Pond and Great River are elements of a separate sub-watershed. Further south lies Sage Lot Pond. It is in the least developed sub-watershed and also contains a 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 sub-watershed, lies the highly brackish Flat Pond. It receives minimal tidal flows of salt water from Sage Lot Pond through a narrow, excavated and culverted 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 surface freshwater to Waquoit Bay is the Quashnet / Moonakis River. Although named "river", this and Child's River are more appropriately described as "streams" because of their small channels and discharge ~1.0 CFS. A component of yet another sub-watershed, 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's tidal portion has sufficient numbers of coliform bacteria to cause it to be closed to shell fishing most of the time. The source(s) of this bacteria (human or avian) is unknown at this time.

The Childs River is the second largest input of surface freshwater to the bay. A component of another sub-watershed, it runs through densely developed residential areas. The Childs River sub-watershed receives the highest nitrogen loading and is the largest nitrogen contributor to the Waquoit Bay system of all the sub-watersheds. In the upper tidal portions of the river we have consistently recorded the highest nutrient and chlorophyll levels and the lowest dissolved oxygen readings of any region in the bay and so this location represents an end-member for looking at anthropogenic inputs and impacts on the system. 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 (perhaps up to 50% of all freshwater input into the bay), precipitation and the flows of smaller brooks. 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 homo/heterogeneity of the water masses 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 BayWatchers who have collected depth profiles of Waquoit Bay water quality since 1993. Subsequent research by reserve staff (including some numerical modeling by T. Isaji) 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 main bay whereby currents follow a generally counter-clockwise flow 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 more peripheral areas of the bay. The location of the gyre meanders slightly, apparently under the influence of tides and wind). Because of the shallow conditions, restricted tidal inlets, and low amplitude tidal forcing of Vineyard Sound here (tides are semi-diurnal with a range about 0.5 m) water levels in the bay are also strongly influenced by wind forcing. Southerly winds increase tidal heights and advance the phase of the flood and retard the phase of ebb (Northerly winds have the opposite effect).

The Metoxit Point station (MP) (41º 34.131' N 70º 31.294' W, 2.2 m deep) initiated in 1998, is located in the main basin of Waquoit Bay and was selected to be within or near the outer regions of the gyre (described above) and more or less represents “typical” water mass conditions and residence times for the bay. The location is at least a half mile from shore, well flushed by tides, and is in an area that is minimally disturbed by routine activities on the bay (e.g. boat traffic, shell fishing, etc.). Bottom sediments at the site are organic rich muds often overlain by thick agal (*Cladophora*) mats. Because of this site’s fairly open exposure to south (greatest fetch over the bay), we have observed that when sustained southerly winds are greater than about 20 kts, the Metoxit Point site experiences increased turbidity (sediment suspension events). In the autumn of 2003, the absolute elevation of the station to relative to NGVD (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is uncertain at this time (but estimated to be within 0.1 m). Depth to base of the sonde (base of the sensor guard) at the Metoxit Point site is -1.02 m NGVD. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.76 m NGVD. A mean tidal range of 0.46m (SD = 0.17) is calculated based on one month of data (May 2003), with a minimum of 0.13 m and a maximum of 0.91 m. A mean monthly salinity range of 4.2 ppt, from a mean monthly min of 27.8 ppt to a mean monthly max of 32.0 ppt, has been calculated for this site based on one year of observations (2002).

The Menauhant station (MH) (41º 33.156' N 70º 32.912' W, 1.2 m deep), initiated in March 2001, is located within the Eel Pond Inlet at the Menauhant Yacht Club dock. Eel Pond Inlet is the westernmost of the two main tidal inlets into the Waquoit Bay system. The site was chosen because it occupies one of the strategic locations for gauging the system’s water mass characteristics. Entering waters represent the marine end-member while outflows represent the

final product of estuarine water mass modification and export to shelf waters. The site also has easy walk-in access to a secure private pier that extends into the throat of the inlet. Also, because of the turbulent tidal flow within the inlet, conditions are vertically well mixed, and the site can be maintained year round even through ice-over conditions in the rest of the bay. Bottom sediments at this site are clean sands and gravels with almost no attached bottom vegetation. Since inception, we have noted that strong south to southeast (onshore) winds tend to produce turbidity events at this site from the wave induced suspension of fine sediments and organic material in the upstream near-shore zone. While we have found that these type of turbidity events are localized to windward near-shore areas in the bay, the transport of these sediments at inlet mouths during such times is perhaps a dominant sedimentation process within the estuarine system. In other words while the choice of our location may be producing a localized signal in one of our measured parameters that signal may reflect key processes in the system at large. In the autumn 2003, the absolute elevation of the station to relative to NGVD (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is uncertain at this time (but estimated to be within 0.1 m). Depth to base of the sonde (base of the sensor guard) at the Menauhant site is -0.68 m NGVD. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.42 m NGVD. A mean tidal range of 0.48m (SD = 0.19) is calculated based on one month of data (May 2003), with a minimum of 0.11 m and a maximum of 0.99 m. A mean monthly salinity range of 3.9 ppt, from a mean monthly min of 28.5 ppt to a mean monthly max of 32.4 ppt, has been calculated for this site based on one year of observations (2002).

The Child's River station (CR) (41º 34.793' N 70º 31.854' W, 1.2 m deep), initiated in May 2002, is located on a dock piling at Edwards Boat Yard, a commercial marina near the upper tidal reaches of of Child's River— one of the two main surface fresh water sources to Waquoit Bay (see general description of Waquoit Bay watershed above). This location is very strongly stratified, characterized by a salt wedge with fresher river water overlying saline ocean water. Vertical salinity ranges can run from 0-10 ppm at the surface to more than 30 ppm just 1 m below. The sonde sensors are usually well within the salt wedge portion of the water column, nonetheless this location is also our freshest SWMP site, and is at the opposite end of Child's River from the seaward Menauhant station. Bottom sediments are fine organic rich muds. This location represents the most terrigenously and anthropogenically-impacted SWMP site. Monthly water quality, collected near this location for the past decade, shows very high chlorophyll concentrations during the warmer months and more recent dissolved nutrient records show very high nutrient-loads. Boat traffic at the marina likely leads to increased turbidity during the boating season as well. As this site is dockside at a private marina, general security is high along with easy access. The station is also serviceable year-round and usually not subject to seasonal shutdown due to ice over. In autumn 2003, the absolute elevation of the station to relative to NGVD (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is uncertain at this time (but estimated to be within 0.1 m). Depth to base of the sonde (base of the sensor guard) at the Child's River site is -0.86 m NGVD. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.58 m NGVD. A

mean tidal range of 0.46 m (SD = 0.17) is calculated based on one month of data (May 2003), with a minimum of 0.11 m and a maximum of 0.95 m. A mean monthly salinity range of 14.7 ppt, from a mean monthly min of15.8 ppt to a mean monthly max of 30.5 ppt, has been calculated for this site based on one year of observations (2002).

The Sage Lot station (SL) (41^{o} 33.254' N 70^{o} 30.612' W, 1.2 m deep), initiated in May 2002, is located in a deeper portion of Sage Lot Pond – a small sub-estuary of Waquoit Bay (20 ha) surrounded by salt marsh and barrier beach. Its small watershed is the least developed of all of Waquoit Bay's sub-watersheds and Sage Lot Pond is considered to be its least impacted and most pristine sub-estuary. Bottom sediments are organic rich muds. Sage Lot Pond possesses one of the few remaining eelgrass beds in the Waquoit Bay system. Indeed the Child's River and Sage Lot Pond sites are considered to represent opposite end-members of nutrient-loading and human-induced influence. Researchers often locate their experiments in these two locations to take advantage of this difference. However, Sage Lot Pond is hydrologically connected to an upstream brackish source -- Flat Pond – via a series of tidal creeks, drainage ditches and culverts. Flat Pond borders a country club and golf course and some concern exists for its impact on the water quality of Sage Lot Pond. Currently, Sage Lot Pond is closed to shellfishing because of high fecal coliform concentrations, though these are thought to be of avian source. In autumn 2003, the absolute elevation of the station to relative to NGVD (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is uncertain at this time (but estimated to be within 0.2 m). Depth to base of the sonde (base of the sensor guard) at the Sage Lot site is about -0.6 m NGVD. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.3 m NGVD. A mean tidal range of 0.40m (SD = 0.14) is calculated based on one month of data (May 2003), with a minimum of 0.11 m and a maximum of 0.67 m. A mean monthly salinity range of 4.9 ppt, from a mean monthly min of 27.2 ppt to a mean monthly max of 32.1 ppt, has been calculated for this site based on one year of observations (2002).

6) Data collection period:

SWMP water quality monitoring in Waquoit Bay was initiated in 1995. Several different pilot sites (i.e., North Basin and Central Basin) were occupied for varying durations before settling on our first permanent long term site at Metoxit Point in summer 1998. The Menauhant site was our second permanent station and began operation in March 2001. Sage Lot and Childs River sites began operation in May 2002. For 2005, data loggers were deployed at the Metoxit Point (MP), Menauhant Yacht Club (MH), Childs River (CR), and Sage Lot (SL) sites as of on the first day of the year. The Metoxit and Sage Lot sites were abandoned for the winter on 1/16/2005 due to heavy sea ice. The Metoxit site was reoccupied and back in operation on March 30, 2005, and the Sage lot site was reoccupied and back in operation on April 4, 2005. Both remained in the water until December 20, 2005, when ice conditions persisted in the bay and Sage Lot pond. The Menauhant and Childs River sites were in operation continuously throughout 2005. The deployment dates and times for 2005 are indicated below:

BEGAN	ENDED
Metoxit Point Site	
12/21/2004, 14:30:00	01/16/2005, 16:00:00
03/30/2005, 09:00:00	04/19/2005, 12:30:00
04/19/2005, 13:00:00	05/10/2005, 08:30:00
05/10/2005, 09:30:00	06/08/2005, 10:30:00
06/08/2005, 11:00:00	07/06/2005, 08:00:00
07/06/2005, 08:30:00	07/26/2005, 11:30:00
07/26/2005, 12:00:00	08/11/2005, 11:00:00
08/11/2005, 12:00:00	09/07/2005, 07:00:00
09/07/2005, 07:30:00	10/04/2005, 15:00:00
10/04/2005, 15:30:00	11/01/2005, 08:30:00
11/01/2005, 10:00:00	12/07/2005, 10:00:00
12/07/2005, 10:30:00	12/20/2005, 12:30:00
Menauhant Site	
12/21/2004, 11:00:00	01/20/2005, 12:00:00
01/20/2005, 12:30:00	02/10/2005, 11:30:00
02/10/2005, 12:00:00	03/15/2005, 14:30:00
03/15/2005, 15:00:00	04/15/2005, 08:30:00
04/15/2005, 09:00:00	05/10/2005, 07:30:00
05/10/2005, 08:00:00	06/07/2005, 06:30:00
06/07/2005, 07:00:00	07/05/2005, 13:00:00
07/05/2005, 13:30:00	07/26/2005, 08:00:00
07/26/2005, 08:30:00	08/16/2005, 12:00:00
08/16/2005, 12:30:00	09/07/2005, 09:30:00
09/07/2005, 10:00:00	10/04/2005, 07:30:00
10/04/2005, 08:00:00	11/02/2005, 09:30:00
11/02/2005, 10:00:00	12/07/2005, 09:00:00
12/07/2005, 09:30:00	01/10/2006, 09:30:00
Child’s River Site	
12/21/2004, 12:00:00	01/22/2005, 12:00:00
01/22/2005, 12:30:00	02/09/2005, 13:30:00
02/09/2005, 14:00:00	03/15/2005, 15:00:00
03/15/2005, 15:30:00	04/15/2005, 08:30:00
04/15/2005, 09:00:00	05/10/2005, 08:00:00
05/10/2005, 08:30:00	06/07/2005, 07:00:00

06/07/2005, 07:30:00	07/05/2005, 13:00:00
07/05/2005, 13:30:00	07/26/2005, 08:00:00
07/26/2005, 08:30:00	08/16/2005, 12:30:00
08/16/2005, 13:00:00	09/07/2005, 10:00:00
09/07/2005, 10:30:00	10/04/2005, 08:00:00
10/04/2005, 09:00:00	11/02/2005, 10:00:00
11/02/2005, 10:30:00	12/07/2005, 09:30:00
12/07/2005, 10:00:00	01/10/2006, 10:00:00

Sage Lot Site

12/21/2004, 13:30:00	01/16/2005, 16:00:00
04/04/2005, 10:30:00	04/28/2005, 10:30:00
04/28/2005, 11:00:00	05/31/2005, 11:00:00
05/31/2005, 11:30:00	07/07/2005, 09:30:00
07/07/2005, 10:00:00	07/26/2005, 09:30:00
07/26/2005, 10:00:00	08/11/2005, 12:30:00
08/11/2005, 13:00:00	09/07/2005, 09:00:00
09/07/2005, 09:30:00	10/04/2005, 13:00:00
10/04/2005, 13:30:00	10/31/2005, 14:30:00
10/31/2005, 15:00:00	12/20/2005, 12:00:00*

*Battery failed, and stopped taking data on 11/19/2005, 7:00:00

7) Distribution:

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program,

> NOAA/ERD 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. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from the NOAA/OCRM supported research that are produced for publication in open literature, including referred scientific journals will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. 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 of 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.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see section 1.Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under general information link on CDMO homepage) and online at the CDMO homepage http://cdmo.baruch.sc.edu. Data are available in text tab-delimited format, Microsoft Excel spreadsheet format and comma-delimited format.

8) Associated researchers and projects:

The Reserve has carried out a citizen-staffed water quality monitoring program since 1993. Water quality measurements are carried out at 8 sites within Waquoit Bay estuary for the purposes of 1) constructing a long time series of water quality information to determine trends, as well as 2) providing a sentinel role to detect unusual changes and events. Parameters currently measured are air and water temperature, salinity, water clarity (Secchi disk), dissolved oxygen, and chlorophyll a concentration, and nutrients (N, P). Monthly and Bi-weekly (June-September) measurements are made year-round on a set schedule. Chl a samples are processed and analyzed using a spectrophotometer at WBNERR. Dissolved inorganic nutrient samples are currently analyzed by Matt Charrette at WHOI. All data is processed and archived at WBNERR and is publicly available through our web site (www.waquoitbayreserve.org).

II. Physical Structure Descriptors

9) Sensor specifications:

YSI 6600/YSI 6600EDS datalogger

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model #: 6560
Range: -5 to 45 °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 % 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; 200-500 % 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 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

Parameter: Non-Vented Level – Shallow (Depth)
Units: feet or meters (ft or 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: Vented Level – Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy 0-10 ft: +/- 0.01 ft (0.003 m)
Accuracy 10-30 ft: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: Vented Level – Deep (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 656 ft (200 m)
Accuracy: +/- 1 ft (0.3 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: 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: +/- 5 % reading or 2 NTU (whichever is greater)
Resolution: 0.1 NTU

The reliability of the dissolved oxygen (DO) data 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. 200*). Many reserves have upgraded to YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and to exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, ie. periodicity analysis. It should be noted that the amount of fouling is site specific and that not all data are affected. The Research Coordinator at the specific NERR site should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor.

The NERRS System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either depth or water level sensors. Both sensors measure water depth, but by convention, level sensors refer to atmospherically vented measurements and depth refers to non-vented measurements. Standard calibration protocols for the non-vented sensor use the atmosphere pressure at the time of calibration. Therefore, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.03 cm for every 1millibar change in atmospheric pressure. This error is eliminated for level sensors because they are vented to the atmosphere throughout the deployment time interval. If proper atmospheric pressure data is available, non-vented sensor depth measurements can be corrected for deployments between calibrations. Readings for both vented and non-vented sensors are automatically compensated for water density changes due to variations in temperature and salinity. The Research Coordinator at the specific NERR site should be contacted in order to obtain information regarding atmospheric pressure data availability. All data sondes used at the DNERR sites in 2002 were non-vented models.

10) Coded variable definitions:

All NERRS sites are required to use the following file naming convention.

File definitions: NERR Reserve/YSI deployment site/data type code/year
Our sites names are designated: a) Metoxit Point= **MP**
b) Menauhant Site= **MH**
c) Child's River = **CR**
d) Sage Lot= **SL**
Example: wqbmpwq2005 (designates yearly data for the Metoxit Point site)
Station Codes:

Sampling Station	Sampling Site Code	Station Code
Metoxit Point	MP	wqbmpwq
Menauhant Site	MH	wqbmhwq
Child's River	CR	wqbcrwq
Sage Lot	SL	wqbslwq

11) Anomalous/Suspect Data:

NOTE 1: SMALL NEGATIVE TURBIDITY ANOMALIES: Slight negative turbidity values sometimes occur as a result of small calibration offsets. Often these turbidity minimum values are between 0 and -2 NTU. All of these small negative turbidity values (the minimum for a given deployment) should be considered to be within 2 NTU of the true datum for correction purposes. Consequently, we have not deleted any of these small negative turbidity data.

NOTE 2: LARGER NEGATIVE TURBIDITY ANOMALIES: Negative turbidity values greater than -2 NTU down to about -15 NTU do occur occasionally. We suspect this is a result of calibration error as these negative values act as the typical background value throughout a given run. We have also noted it occurring more frequently since converting our 6600s to EDS (since April 2004), though this may be coincidental with SWMP staff turn-over in the past year. In these cases, the minimum value of the turbidity data should generally be considered to approximate 0 NTU +- 2 NTU and the data can be adjusted accordingly by users. Consequently, we have not deleted any of these larger turbidity data.

NOTE 3: SMALL NEGATIVE DEPTH ANOMALIES: This type of anomaly occurs due to barometric pressure differences between time of calibration and the reading. In all such cases, barometric pressure differences are checked as well as comparison with other parameters for indications of aerial exposure to verify that all data are valid submerged readings.

January 2005

Metoxit Point:

Data were only collected from 01/01/2005 00:00:00 to 01/16/2005 16:00:00. Sonde was retrieved 01/16/05 at 16:00:00 and severe ice conditions prevented further deployment during January.

Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

Menauhant:

DO data for entire deployment from 1/20/2005 12:30 to 2/10/2005 11:30 are anomalous, displaying odd upward trend throughout deployment. This phenomenon is also reflected in the Child's River data (about 2 miles away) for the same time period. These data were retained.

Childs River:

DO data for entire deployment from 1/22/2005 12:30 to 2/09/2005 13:30 are anomalous, displaying odd upward trend throughout deployment. This phenomenon is also reflected in the Menauhant data (about 2 miles away) for the same time period. These data were retained.

Sage Lot:

a) Data were only collected from 01/01/2005 00:00:00 to 01/16/2005 16:00:00. Sonde was retrieved 01/16/05 at 16:15:00 and severe ice conditions prevented further deployment during January.

February 2005

Metoxit Point:

No data were collected this month due to ice.

Menauhant:

DO data for entire deployment from 1/20/2005 12:30 to 2/10/2005 11:30 are anomalous, displaying odd upward trend throughout deployment. This phenomenon is also reflected in the Child's River data for the same time period. These data were retained.

Childs River:

DO data for entire deployment from 1/22/2005 12:30 to 2/09/2005 13:30 are anomalous, displaying odd upward trend throughout deployment. This phenomenon is also reflected in the Menauhant data for the same time period. These data were retained.

Sage Lot:

No data was collected this month due to ice.

March 2005

Metoxit Point:

No data were collected until 03/30/2005, 09:00:00 due to winter sea ice.

Menauhant:

Negative depth anomalies on 03/09/2005 01:30 to 05:30 and 14:30 to 17:00 were caused by barometric pressure differences between calibration and readings. These depth readings are valid submerged readings (See Discussion above on Small Negative Depth Anomalies).

Sage Lot:

No data were collected this month due to ice.

April 2005

No retained anomalous data this month.

May 2005

Childs River:

DO data for the deployment period 05/10/2005 08:30 to 06/07/2005 07:00 are anomalously high by approximately 10 % at start of deployment, though not at end of deployment (usual DO down-drift likely accounting for trend) likely owing to slight calibration offset error. These have been retained.

Metoxit Point:

Possibility of pH sensor failure beginning around 05/17/2005 00:00 through 05/28/2005 08:30, but hard to define when sensor failure actually began, therefore data are retained but considered suspect.

June 2005

Metoxit Point:

DO data for the deployment period 06/08/2005 11:00 to 07/06/2005 08:00 are anomalously high by approximately 50 % and 4 mg/L at start of deployment and high by about 30% and 2 mg/L at end of deployment (usual DO down-drift likely accounting for trend) owing to calibration offset error. These have been retained, though they should be adjusted by users.

Childs River:

DO data for the deployment period 05/10/2005 08:30 to 06/07/2005 07:00 are anomalously high by approximately 10 % at start of deployment, though not at end of deployment (usual DO down-drift likely accounting for trend) likely owing to slight calibration offset error. These have been retained.

DO data look a bit low near end of deployment -- 06/29/2005 00:00 to 07/06/2005 08:00 – but uncertain. We have retained these data.

July 2005

Metoxit Point:

Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

August 2005

Metoxit Point:

Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

September 2005

Metoxit Point:

Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

Childs River:

Salinity data for deployment period 09/07/2005 10:30 to 010/04/2005 08:00 exhibit a downward trend, and the postcheck and deployment /retrieval comparisons indicate a ~ 2 ppt low offset at retrieval. We have retained these data, but they should be used with caution.

October 2005

Menauhant:

Negative depth anomalies on 10/16/2005 14:00 to 17:30, 10/17/2005 02:30 to 05:00, 10/17/2005 16:30 to 17:00 and on 10/18/2005 17:00 were caused by barometric pressure differences between calibration and readings. These depth readings are valid submerged readings (See Discussion above on Small Negative Depth Anomalies).

Childs River:

Salinity data for deployment period 09/07/2005 10:30 to 010/04/2005 08:00 exhibit a downward trend, and the postcheck and deployment /retrieval comparisons indicate a ~ 2 ppt low offset at retrieval. We have retained these data, but they should be used with caution.

Negative depth anomalies on 10/16/2005 16:00 to 16:30 were caused by barometric pressure differences between calibration and readings. These depth readings are valid submerged readings (See Discussion above on Small Negative Depth Anomalies).

Sage Lot:

Negative depth anomalies on 10/16/2005 04:00 to 05:00, 10/16/2005 15:00 to 20:30, 10/17/2005 02:30 to 07:30, 10/17/2005 17:00 to 19:30, 10/18/2005 05:30 to 06:00 and on 10/18/2005 18:00 to 20:00 were caused by barometric pressure differences between calibration and readings. These depth readings are valid submerged readings (See Discussion above on Small Negative Depth Anomalies).

November 2005

Childs River:

DO data for the deployment period 11/02/2005 10:30 to 12/07/2005 09:30 are anomalously high by approximately 50% throughout deployment likely owing to calibration offset error. These have been retained, but should be corrected before use.

Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

December 2005

Menauhant:

Negative depth anomalies on 12/09/2005 18:00 and 12/09/2005 23:00 to 12/10/2005 01:00 were caused by barometric pressure differences between calibration and readings. These depth readings are valid submerged readings (See Discussion above on Small Negative Depth Anomalies).

Childs River:

DO data for the deployment period 11/02/2005 10:30 to 12/07/2005 09:30 are anomalously high by approximately 50% throughout deployment likely owing to calibration offset error. These have been retained, but should be corrected before use.

Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

12) Deleted Data:

NOTE 1: BIOLOGICAL-RELATED TURBIDITY ANOMALIES: This type anomaly includes turbidity readings that are either outside of the normal range or spikes way above background and unrelated to increased sediment suspension or decreased water column clarity. We believe these records are real (and not sensor malfunction), though not reflective of actual water column turbidity. These extreme values are likely due to biological factors (such as small fish, crabs, or other marine organisms). Our criteria for flagging these data are single spikes (above rather constant background) over 50NTU that are more than 10 times surrounding values. These readings were deleted.

NOTE 2: SUSPENSION EVENT RELATED TURBIDITY ANOMALIES: This type of anomaly includes turbidity readings that were either outside the normal range, or spikes way above background that are related to elevated turbidity levels indicative of wind wave-induced suspension (at the Menauhant site typically), or prop wash-related suspension events (at the Childs River site typically). We believe these are real (and not sensor malfunction), though not reflective of actual water column turbidity. These extreme values are likely due to large floating particles (i.e., seaweeds, detritus, etc.) suspended in the water column during storm events usually from strong southerly winds in the Waquoit Bay area. (see end of section 5 for more detail on these events at this site). Our criteria for flagging these data are values over 100NTU that are more than 5 times the magnitude of surrounding values, and linked to high winds. These readings were deleted.

January:

Child's River

The following pH data was deleted due to a likely air bubble in probe following recent deployment.

01/22/2005 12:30

February:

No Deleted data this month.

March:
Menauhant:
The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

03/26/2005 14:00
03/27/2005 12:00
03/28/2005 15:00
03/30/2005 17:30

Childs River:
The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

03/20/2005 9:00

April:
Menauhant:
Sonde silo was replaced on 04/06/2005 and sonde was out of the water for 04/06/2005 16:00. These data were deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

04/04/2005 09:30

Childs River:
Sonde silo was replaced on 04/07/2005 and sonde was out of the water for 04/07/2005 15:30. These data were deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

04/25/2005 06:30

May:
Metoxit Point:
Dissolved oxygen readings from 05/27/2005 21:30 to end of deployment on 06/08/2005 10:30 are suspect, due to membrane failure, confirmed on retrieval and post check. These data were deleted.

pH data from 05/28/2005 09:00 to end of deployment on 06/08/2005 10:30 are suspect, due to sensor failure. These data were deleted.

Childs River:

The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

05/05/2005 05:30
05/08/2005 17:00
05/26/2005 07:30
05/27/2005 09:00
05/28/2005 12:30
05/29/2005 11:00

Sage Lot:
Turbidity data from start of deployment on 05/31/2005 11:30 to 06/15/2005 05:00 appears suspect, likely owing to air bubble or some other interference. These data are deleted.

The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

05/31/2005 09:00

June:
Metoxit Point:
Dissolved oxygen readings from 05/27/2005 21:30 to end of deployment on 06/08/2005 10:30 are suspect, due to membrane failure, confirmed on retrieval and post check. These data were deleted.

Turbidity data from 06/04/2005 00:00 to end of deployment on 06/08/2005 10:30 are suspect, owing to what appears to be fouling. Meteorological data do not support a suspension event for this period of time. These data are deleted.

Turbidity data from 06/22/2005 00:00 to end of deployment on 07/06/2005 08:00 are suspect, owing to what appears to be fouling. . Meteorological data do not support a suspension event for this period of time. These data are deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

06/13/2005 12:00
06/14/2005 10:00
06/18/2005 02:00, 14:00-14:30
06/19/2005 09:30

Menauhant:
Salinity and specific conductivity data for period from 06/18/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 06/28/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

pH data for period from 06/28/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

Turbidity data for period from 06/19/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

06/01/2005 10:00
06/02/2005 14:30
06/03/2005 10:30
06/04/2005 06:00
06/06/2005 06:00
06/08/2005 09:30
06/10/2005 09:30
06/11/2005 08:30, 09:00

Sage Lot:
Salinity and specific conductivity data for period from 06/28/2005 00:00 to end of deployment on 07/07/2005 09:30 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 06/28/2005 00:00 to end of deployment on 07/07/2005 09:30 are suspect, likely due to fouling. These data have been deleted.

Turbidity data from start of deployment on 05/31/2005 11:30 to 06/15/2005 05:00 appears suspect, likely owing to air bubble or some other interference. These data are deleted.

Turbidity data from 06/29/2005 00:30 to end of deployment on 07/07/2005 09:30 suspect, likely due to fouling. These data are deleted.

The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Note Turbidity data from 06/22/2005 00:00 to end of deployment on 07/06/2005 08:00 are suspect, owing to what appears to be fouling. . Meteorological data do not support a suspension event for this period of time. These data are deleted.
06/17/2005 17:00
06/20/2005 12:00

July:
Metoxit Point:
Salinity and specific conductivity data from 7/25/2005 00:00 to end of deployment on 07/26/2005 11:30 are suspect, due to likely fouling of sensor. These data are deleted.

Turbidity data from 06/22/2005 00:00 to end of deployment on 07/06/2005 08:00 are suspect, owing to what appears to be fouling. . Meteorological data do not support a suspension event for this period of time. These data are deleted.

The following Turbidity data were considered suspect owing to likely biologically relted interference (See Note 1). These data were deleted.

07/11/2005 07:30, 9:30-10:00
07/12/2005 12:00-12:30
07/14/2005 7:30, 8:30, 10:00
07/15/2005 05:00
07/16/2005 05:30, 08:00
07/17/2005 16:00
07/19/2005 11:00, 14:00, 16:30, 18:00
07/27/2005 13:30
07/31/2005 12:00

Menauhant:
Salinity and specific conductivity data for period from 06/18/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 06/28/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

pH data for period from 06/28/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

Turbidity data for period from 06/19/2005 00:00 to end of deployment on 07/05/2005 13:00 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 07/26/2005 00:00 to end of deployment on 07/26/2005 08:00 are suspect, likely due to membrane failure or fouling. These data have been deleted.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

07/30/2005 06:30

Sage Lot:
Salinity and specific conductivity data for period from 06/28/2005 00:00 to end of deployment on 07/07/2005 09:30 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 06/28/2005 00:00 to end of deployment on 07/07/2005 09:30 are suspect, likely due to fouling. These data have been deleted.

Turbidity data from 06/29/2005 00:30 to end of deployment on 07/07/2005 09:30 suspect, likely due to fouling. These data are deleted.

August:
Metoxit Point:
Salinity and specific conductivity data from 08/25/2005 15:00 to end of deployment on 09/07/2005 07:00 are suspect, due to likely fouling of sensor. These data are deleted.

Dissolved oxygen readings from 08/05/2005 00:00 to end of deployment on 08/11/2005 11:00 are suspect, due to membrane failure, confirmed on retrieval and post check. These data were deleted.

Dissolved oxygen readings from 08/25/2005 15:00 to end of deployment on 09/07/2005 07:00 are suspect, due to membrane failure, confirmed on retrieval and post check. These data were deleted.

The following Turbidity data were considered suspect owing to likely biologically relted interference (See Note 1). These data were deleted.

08/03/2005 21:30, 22:30
08/14/2005 19:30
08/26/2005 16:30

Menauhant:
Salinity and specific conductivity data for period from 08/10/2005 00:00 to end of deployment on 08/16/2005 12:00 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 08/10/2005 00:00 to end of deployment on 08/16/2005 12:00 are suspect, likely due to fouling. These data have been deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

08/05/2005 06:00
08/11/2005 04:30, 06:30

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

08/02/2005 13:00, 17:30
08/05/2005 05:30, 08:00
08/06/2005 16:30
08/07/2005 13:00, 18:30
08/08/2005 04:00, 15:30, 19:30

08/19/2005 07:30
08/20/2005 08:30
08/22/2005 05:30
08/24/2005 10:00
08/26/2005 11:30
08/27/2005 16:00
08/28/2005 13:30
08/29/2005 15:30

Sage Lot:
Salinity and specific conductivity data for period from 08/26/2005 00:00 to end of deployment on 09/07/2005 09:00 are suspect, likely due to fouling. These data have been deleted.

The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

08/30/2005 02:30

September:
Metoxit Point:
Dissolved oxygen readings from 08/27/2005 12:00 to end of deployment on 09/07/2005 07:00 are suspect, due to membrane failure, confirmed on retrieval and post check. These data were deleted.

Turbidity data from 09/07/2005 07:30 to 09/08/2005 9:30 are suspect, probably owing to a bubble or other problem related to the initial deployment. These data are deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

09/10/2005 06:30
09/11/2005 02:00-02:30, 04:30
09/16/2005 01:00
09/18/2005 00:00
09/19/2005 04:00
09/20/2005 18:00, 23:00
09/23/2005 23:00
09/24/2005 03:30, 20:30, 22:00
09/25/2005 01:30, 19:00
09/26/2005 02:30
09/27/2005 19:00
09/28/2005 00:30, 19:00, 20:00-20:30

Menauhant:
Turbidity Data from 09/30/2005 00:00 to end of deployment on 10/04/2005 07:30 are suspect, likely due to silo fouling related to previous suspension event. These data have deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

09/02/2005 02:30

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

09/01/2005 15:00
09/03/2005 16:30
09/04/2005 08:00, 11:00, 13:00
09/05/2005 09:30
09/08/2005 07:30, 10:30, 15:00
09/10/2005 14:30, 17:00
09/13/2005 15:00
09/15/2005 05:00, 13:30-14:00
09/16/2005 13:00
09/18/2005 05:00
09/19/2005 07:00, 08:00, 12:00, 15:00
09/20/2005 13:30
09/23/2005 07:00, 15:00
09/24/2005 16:30
09/25/2005 16:30
09/26/2005 09:30
09/27/2005 11:30, 12:30, 14:00
09/28/2005 16:30
09/30/2005 06:30, 07:30, 13:00, 16:00

Sage Lot:
Salinity and specific conductivity data for period from 08/26/2005 00:00 to end of deployment on 09/07/2005 09:00 are suspect, likely due to fouling. These data have been deleted.

DO data for period from 09/05/2005 00:00 to end of deployment on 09/07/2005 09:00 are suspect, likely due to fouling. These data have been deleted.

The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

09/14/2005 07:30

October:
Metoxit Point:
The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

10/01/2005 14:30, 23:30
10/02/2005 21:00
10/03/2005 21:30
10/04/2005 20:00, 21:30
10/05/2005 01:00, 03:00, 20:00
10/06/2005 05:00, 15:30
10/07/2005 03:00
10/09/2005 17:30
10/10/2005 18:30-19:00, 21:30
10/11/2005 03:30
10/13/2005 14:00, 22:00
10/14/2005 02:00
10/15/2005 00:00, 05:00
10/16/2005 03:00-03:30, 04:30
10/17/2005 01:30, 20:00
10/18/2005 03:00

Menauhant:
Turbidity Data from 09/30/2005 00:00 to end of deployment on 10/04/2005 07:30 are suspect, likely due to silo fouling related to previous suspension event. These data have deleted.

The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

10/30/2005 19:30

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

10/02/2005 05:30, 10:30
10/03/2005 06:30, 16:30
10/07/2005 13:00
10/13/2005 11:00
10/14/2005 10:00

Sage Lot:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

10/01/2005 17:30
10/04/2005 01:00
10/20/2005 05:00

November:

Metoxit Point:
Dissolved oxygen readings from 11/09/2005 12:00 to end of deployment on 12/07/2005 10:00 are suspect, due to what appears to be membrane failure. These data were deleted.

The following Turbidity data were considered suspect owing to likely biologically relted interference (See Note 1). These data were deleted.

11/03/2005 15:00-15:30
11/23/2005 16:30

Sonde silo was repaired on 11/01/2005 and sonde was out of the water for 11/01/2005 9:00-9:30. These data were deleted.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

11/11/2005 13:30
11/18/2005 11:30
11/19/2005 14:00
11/21/2005 08:00, 09:00
11/29/2005 07:30

Sage Lot:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

11/06/2005 09:00
11/11/2005 13:00
11/17/2005 13:30
11/18/2005 08:30

December:
Menauhant:
The following data were considered suspect due to sonde being out of water during strong NW winds and likely wave activity at this site. All data were deleted.
12/07/2005 21:30 – 23:00

Metoxit Point:
Dissolved oxygen readings from 11/09/2005 12:00 to end of deployment on 12/07/2005 10:00 are suspect, due to what appears to be membrane failure. These data were deleted.

Childs River:

The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

12/03/2005 14:00
12/06/2005 08:30

13) Missing data:
Data in this section are considered missing if no data were ever recorded for a given time period due to equipment failure where no probes deployed or sonde / sensors out of water due to deployment / retrieval overlap or maintenance/calibration of equipment. For more details on Deleted Data, see section 12 and on Data Anomalies, see section 11. The Waquoit Bay NERR Research Coordinator can also be contacted about other issues concerning deleted, missing or anomalous data.

Metoxit Point:
No Data were collected from 01/16/2005 16:30 to 03/30/2005 09:00 due to winter ice conditions at this open water site.

No data were collected from 12/20/2005 13:00 to 12/31/2005 23:30 due to abandonment of the site because of winter ice conditions.

All data are missing for 08/11/2005 11:30 due to deployment / retrieval operation overlap.
All data are missing for 11/01/2005 09:00 - 09:30 due to deployment / retrieval operation overlap.

Sage Lot:
No Data were collected from 01/16/2005 16:30 to 04/04/2005 10:30 due to winter ice conditions at this open water site.

No data were collected after 11/19/2005 07:00 due: 1) to unusually rapid battery failure (deployed above 10.0 V threshold) after 20 days; 2) inability to retrieve sonde at planned retrieval date on 12/07/2005 due to heavy ice conditions at Sage Lot site; 3) abandonment of Sage Lot site on 12/20/2005 for winter because of ice conditions.

Childs River:
All data are missing for 10/04/2005 08:30 due to deployment / retrieval operation overlap.

14) Post deployment information:

End of Deployment Post-calibration Readings in Standard Solutions**:**

Site	Date	Salinity (ppt) (std-31.70*,30.48ppt)	DO% (std-air)	pH (std-7.0)	Turbidity (std-0 NTU)
MP					
	01/16/05	31.7*	105.1	7.09	-1.5

04/19/05	30.77	105.5	6.94	0.2
05/10/05	30.38	101.0	7.08	0.3
06/08/05	30.06	hole	6.15	-0.1
07/06/05	30.01	141.1	7.08	-0.5
07/26/05	27.84	63.1	7.08	1.6
08/11/05	30.66	hole	6.99	-0.1
09/07/05	21.67	hole	7.02	0.3
10/04/05	30.65	92.5	7.01	4.8
11/01/05	29.63	101.3	6.88	0.1
12/07/05	30.23	86.7	7.0	2.9
12/20/05	30.55	100.3	6.94	0.0

Site	Date	Salinity (ppt) (std-31.70*,30.48ppt)	DO% (std-air)	pH (std-7.0)	Turbidity (std-0 NTU)
MH					
	01/20/05	31.08*	104.8	7.06	0.2
	02/10/05	31.8*	103.1	7.09	0.2
	03/15/05	31.81*	101.1	7.36	0.0
	04/15/05	30.36	105.0	7.04	0.1
	05/10/05	30.42	101.3	7.11	0.2
	06/07/05	30.14	100.9	7.0	-0.1
	07/05/05	23.8	101.8	6.91	0.1
	07/26/05	30.2	hole	6.98	-0.2
	08/16/05	28.53	69.7	7.02	0.1
	09/07/05	29.84	122	7.09	0.4
	10/04/05	20.9	99.2	6.91	0.2
	11/02/05	29.87	105.8	7.02	-0.3
	12/07/05	30.30	98.4	7.33	-0.4
	01/10/06	30.5	106.4	7.3	0.2

Site	Date	Salinity (ppt) (std-31.7*,30.48ppt)	DO% (std-air)	pH (std-7.0)	Turbidity (std-0 NTU)
CR					
	01/22/05	31.69*	103.3	6.91	-0.1
	02/09/05	31.68*	100.5	7.5	-0.1
	03/15/05	31.74*	100.7	6.97	0.2
	04/15/05	30.45	102.5	7.06	-0.2
	05/10/05	29.91	104.2	7.22	0.1
	06/07/05	30.18	107.5	7.03	-0.1
	07/05/05	29.26	102.3	6.86	0.1
	07/26/05	29.92	103.9	6.91	0.4
	08/16/05	29.95	108	7.05	0.0
	09/07/05	28.96	109.9	7.02	0.5
	10/04/05	28.11	93.4	7.03	0.2

	11/02/05	29.58	106.6	6.98	0.2
	12/07/05	30.31	122.7	6.86	-3.6
	01/10/06	29.06	99.6	7.25	0.1

Site	Date	Salinity (ppt) (std-31.7*,30.48ppt)	DO% (std-air)	pH (std-7.0)	Turbidity (std-0 NTU)
SL					
	01/16/05	31.71*	101.0	7.02	-0.2
	04/28/05	30.84	85.4	7.06	0.1
	05/31/05	30.25	106.5	7.03	0.0
	07/07/05	21.42	93.9	6.99	5.8
	07/26/05	30.08	98.3	7.11	0.3
	08/11/05	30.04	91.9	6.85	0.2
	09/07/05	23.20	107.3	7.06	1.0
	10/04/05	30.63	99.6	7.01	0.4
	10/31/05	29.78	108.2	7.09	0.3
	12/20/05	30.71	103.5	6.89	-0.1

15) Other remarks/notes:

On 08/13/2020 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 hand-held YSI 650 was used for field calibration and data were recorded at YSI deployment depths. Sonde deployment and retrieval (or last / first) comparisons for each site in addition to the hand-held measurements are shown below in Tables 1-4. They represent another form of post-check on retrieved sonde data as it is assumed that the recently calibrated deployed sonde is highly accurate on its initial measurement. If the assumption holds true we should expect last / first readings to be quite similar within the usual 30 minute time difference between readings if the retrieved instrument was still reading accurately. Large differences indicate potential problems. However there are some caveats to this comparison approach. If time differences between retrieval / deployment are much greater than 30 min, then parameter differences should be also greater, and certainly lose any usefulness beyond a few hours. Also, at certain times some parameters are changing quite rapidly and a 30 min interval could allow for real and rather large differences. One example is DO during late morning and early afternoon, when DO is often ramping up rapidly -- or salinity can change rapidly in areas where the gradients (both vertical and horizontal) are large (i.e., Child's River).

Table 1: MP:

MP	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH	Turbidity+ NTU
ysi 600		14:15	0.61		29.34	96.3	11.29	1.04	7.9	
Deploy	12/21/2004	14:30	00.6	048.05	30.0	105.1	12.3	0.91	08.2	0044
Retrieve	1/16/2005	16:00	03.4	046.12	29.1	108.4	11.9	1.49	08.2	0006
ICE- sonde out of water										
ysi 600- taken	4/4/2005	10:25	08.2		27.65	100.20	09.9	0.55	07.5	
Deploy	03/30/2005	09:00	07.1	038.26	24.0	106.8	11.0	0.90	07.8	0001
mid deploy	04/04/2005	10:30	07.9	045.51	29.17	101.20	09.9	1.37	07.9	0002
Retrieve	04/19/2005	12:30	13.8	044.74	28.92	139.50	12.1	1.16	08.2	0003
ysi 600			13.8		28.43	130.60	11.4	0.93	08.1	
Deploy	04/19/2005	13:00	13.8	043.36	27.94	130.20	11.3	0.92	08.1	0001
Retrieve	05/10/2005	08:30	10.1	046.49	30.02	91.50	08.5	0.92	07.8	0002
ysi 600			10.3		28.46	95.50	08.9	0.60	07.5	
Deploy	05/10/2005	09:00	10.9	044.53	28.67	101.10	09.3	0.05	07.7	0003
Retrieve	06/08/2005	10:30	19.8	043.08	27.79	37.80	02.9	1.02	06.1	2177
ysi 600			20.1		27.40	110.30	08.5	0.85	07.8	
Deploy	06/08/2005	11:00	21.2	042.20	27.15	166.30	12.6	1.02	08.0	0001
Retrieve	07/06/2005	08:00	23.3	042.08	27.03	112.30	08.2	1.05	07.8	1324
ysi 600		08:24	23.3		27.03	90.60	06.6	0.77	07.8	
Deploy	07/06/2005	08:30	23.3	043.28	27.89	88.70	06.4	1.08	07.8	0001
Retrieve	07/26/2005	11:30	24.9	039.32	25.05	127.30	09.2	1.05	07.9	0010
ysi 600		11:50	25.0		28.52	104.60	07.4	0.95	07.8	
Deploy	07/26/2005	12:00	25.0	045.19	29.23	133.30	09.3	1.22	08.0	-0002
Retrieve	08/11/2005	11:00	26.5	042.92	27.57	78.90	05.4	1.12	08.0	0000
ysi 600		11:40	26.7		27.29	101.00	07.0	0.60	07.9	
Deploy	08/11/2005	12:00	26.7	043.11	27.70	134.10	09.2	1.12	08.0	0001
Retrieve	09/07/2005	07:00	22.9	030.37	18.86	61.60	04.8	1.08	07.7	0003
ysi 600		7:23	22.7		28.60	74.10	05.4	0.84	07.7	
Deploy	09/07/2005	07:30	22.9	045.27	29.34	72.10	05.2	0.93	07.7	0023
Retrieve	10/04/2005	15:00	20.6	045.56	29.57	128.10	09.7	1.09	08.2	0004
ysi 600		15:20	20.6		29.13	133.30	10.2	1.04	08.0	
Deploy	10/04/2005	15:30	20.7	044.39	28.72	154.70	11.7	1.07	08.1	0003
Retrieve	11/01/2005	08:30	10.5	043.46	27.89	119.60	11.2	1.33	08.2	0001
ysi 600		10:00	10.5		27.36	111.30	10.5	0.90	07.8	
Deploy	11/01/2005	10:00	10.6	043.81	28.14	144.30	13.4	1.41	08.1	0002
Retrieve	12/07/2005	10:00	02.7	046.20	29.05	131.50	14.6	0.72	08.2	0004
ysi 600		10:15	02.7		28.98	114.10	12.7	0.90	07.8	
Deploy	12/07/2005	10:30	02.7	046.17	29.03	110.60	12.3	0.73	08.5	0001
Retrieve	12/20/2005	12:30	01.0	045.52	28.29	111.60	13.1	1.06	08.5	0001

Table 2: MH:

MH	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH	Turbidity+ NTU
ysi 600		10:50	02.0		30.67	094.2	10.55	0.98	07.9	

Deploy	12/21/2004	11:00	02.1	048.77	30.74	113.1	12.64	0.76	08.2	0001
Retrieve	1/20/2005	12:00	00.6	048.57	30.30	114.5	13.33	0.59	08.4	0002
ysi 600		12:05	00.8		30.15	098.9	11.60	1.02	07.5	
Deploy	01/20/2005	12:30	00.8	048.24	30.12	121.4	14.09	0.43	08.2	0003
Retrieve	02/10/2005	11:30	01.2	048.80	30.58	138.8	15.89	1.07	08.3	0007
ysi 600		11:35	01.1		30.32	119.1	13.60	1.07	07.6	
Deploy	02/10/2005	12:00	01.1	048.75	30.53	116.6	13.38	1.07	08.3	0006
Retrieve	03/15/2005	14:30	02.2	048.25	30.39	110.4	12.33	0.65	08.5	0005
ysi 600		14:46	02.0		29.87	117.0	13.19	0.80	07.7	
Deploy	03/15/2005	15:00	02.0	047.72	30.00	116.5	13.11	0.85	08.1	0007
Retrieve	04/15/2005	08:30	08.3	045.59	29.26	122.0	11.86	0.88	08.2	0004
ysi 600		08:38	08.2		29.07	112.7	11.00	0.94	07.9	
Deploy	04/15/2005	09:00	08.5	045.45	29.17	111.0	10.76	0.63	08.2	0004
Retrieve	05/10/2005	07:30	10.4	043.98	28.25	099.2	9.27	0.45	08.1	0003
ysi 600		07:47	10.1		28.22	105.1	9.88	1.00	07.4	
Deploy	05/10/2005	08:00	10.2	045.14	29.07	104.1	9.71	0.55	07.9	0003
Retrieve	06/07/2005	06:30	18.4	043.06	27.78	089.1	7.09	0.43	07.8	0003
ysi 600		06:55	16.8		29.20	098.7	8.03	0.95	07.7	
Deploy	06/07/2005	07:00	16.9	045.51	29.53	099.8	8.09	0.43	07.9	0002
Retrieve	07/05/2005	13:00	22.1	035.40	22.34	052.0	3.99	0.70	07.7	1202
ysi 600		13:08	22.0		29.17	112.2	8.28	0.80	07.8	
Deploy	07/05/2005	13:30	22.3	045.66	29.62	122.0	8.94	0.71	08.0	0001
Retrieve	07/26/2005	08:00	23.4	045.46	29.46	063.8	4.59	0.40	07.8	0003
ysi 600		9:11	23.5		29.04	072.6	5.22	1.06	07.7	
Deploy	07/26/2005	08:30	23.6	045.60	29.56	088.2	6.31	0.42	07.9	0003
Retrieve	08/16/2005	12:00	24.4	037.50	23.77	080.6	5.88	0.64	08.0	0003
ysi 600		12:18	24.5		29.05	089.7	6.34	0.77	07.7	
Deploy	08/16/2005	12:30	24.6	045.36	29.37	109.9	7.75	0.58	07.8	0004
Retrieve	09/07/2005	09:30	22.6	046.10	29.93	108.0	7.85	0.73	08.0	0003
ysi 600		9:56	22.7		30.00	096.0	6.96	0.99	07.8	
Deploy	09/07/2005	10:00	22.8	046.45	30.19	109.1	7.89	0.62	08.1	0001
Retrieve	10/04/2005	07:30	19.4	045.91	29.82	098.4	7.59	0.59	08.1	0026
ysi 600		7:53	19.4		30.02	095.7	7.37	1.17	07.8	
Deploy	10/04/2005	08:00	19.4	046.45	30.22	103.0	7.93	0.66	08.0	0001
Retrieve	11/02/2005	09:30	12.3	046.03	29.80	115.4	10.24	0.74	08.2	0057
ysi 600		9:53	12.4		29.95	104.3	9.24	0.73	07.7	
Deploy	11/02/2005	10:00	12.5	046.56	30.19	104.6	9.23	0.89	08.1	0002
Retrieve	12/07/2005	09:00	03.6	046.88	29.66	099.5	10.79	0.22	08.7	0000
ysi 600		9:12	03.3		29.38	122.0	13.36	0.77	07.7	
Deploy	12/07/2005	09:30	03.5	046.73	29.55	118.4	12.87	0.16	08.0	0002
Retrieve	01/10/2006	09:30	-03.3	060.33	37.16	132.5	16.32	0.76	08.4	0002

Table 3: CR:

CR	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH	Turbidity+ NTU
ysi 600		11:40	03.2		27.57	90.4	10.02	1.05	07.8	
Deploy	12/21/2004	12:00	03.7	043.93	27.63	102.00	11.2	0.86	08.1	0002

Retrieve	1/22/2005	12:00	00.0	046.03	28.46	112.80	13.5	1.17	08.3	0004
ysi 600		12:25	00.2		29.38	115.00	13.7	0.90	07.6	
Deploy	01/22/2005	12:30	00.0	046.31	28.64	116.90	14.0	1.03	06.2	0004
Retrieve	02/09/2005	13:30	01.6	045.69	28.53	125.70	14.4	1.21	08.9	0002
ysi 600		13:50	02.0		29.32	122.60	13.8	0.77	07.8	
Deploy	02/09/2005	14:00	01.8	044.78	27.94	128.20	14.7	1.10	08.2	0002
Retrieve	03/15/2005	15:00	04.2	044.37	28.00	169.50	18.3	0.82	08.7	0009
ysi 600		15:08	04.4		28.52	152.60	16.4	0.90	08.1	
Deploy	03/15/2005	15:30	04.4	044.72	28.26	169.40	18.2	1.01	08.5	0008
Retrieve	04/15/2005	08:30	10.7	043.57	27.97	95.30	08.9	1.09	08.2	0004
ysi 600		8:49	10.4		27.82	104.80	09.8	1.04	07.9	
Deploy	04/15/2005	09:00	10.7	043.30	27.78	104.40	09.7	0.84	08.2	0004
Retrieve	05/10/2005	08:00	10.5	043.12	27.64	90.90	08.5	0.60	08.1	0008
ysi 600		8:10	10.8		27.86	95.10	08.8	0.55	07.4	
Deploy	05/10/2005	08:30	10.5	043.70	28.06	98.10	09.2	0.70	07.9	0002
Retrieve	06/07/2005	07:00	20.2	037.32	23.70	88.50	07.0	0.59	07.7	0002
ysi 600		7:25	20.1		26.54	73.70	05.7	0.89	07.6	
Deploy	06/07/2005	07:30	20.2	037.97	24.15	90.10	07.1	0.61	07.7	0002
Retrieve	07/05/2005	13:00	23.9	033.21	20.79	55.90	04.2	0.88	07.3	0047
ysi 600		13:20	24.0		23.01	53.40	04.0	0.96	07.3	
Deploy	07/05/2005	13:30	24.3	035.38	22.29	98.20	07.2	0.84	07.4	0005
Retrieve	07/26/2005	08:00	24.8	042.03	26.97	1.00	00.1	0.62	07.5	0004
ysi 600		8:24	24.7		27.13	33.80	02.4	0.84	07.4	
Deploy	07/26/2005	08:30	24.8	042.18	27.08	42.40	03.0	0.62	07.5	0005
Retrieve	08/16/2005	12:30	25.0	040.99	26.22	57.60	04.1	0.79	07.7	0005
ysi 600		12:37	24.8		27.39	50.30	03.6	0.85	07.5	
Deploy	08/16/2005	13:00	25.0	042.12	27.03	79.40	05.6	0.70	07.7	0007
Retrieve	09/07/2005	10:00	24.2	041.20	26.39	50.50	03.7	0.86	07.6	0007
ysi 600		10:09	24.0		26.27	76.00	05.5	0.93	07.6	
Deploy	09/07/2005	10:30	24.3	040.81	26.11	108.90	07.9	0.76	07.7	0012
Retrieve	10/04/2005	08:00	20.9	038.22	24.33	80.20	06.2	0.74	07.7	0116
ysi 600		8:36	20.7		26.77	72.20	05.5	1.00	07.6	
Deploy	10/04/2005	09:00	20.8	041.61	26.73	90.70	06.9	0.82	07.9	0002
Retrieve	11/02/2005	10:00	12.3	041.29	26.42	113.10	10.3	0.88	08.3	0003
ysi 600		10:11	12.3		26.80	101.80	09.2	0.73	07.7	
Deploy	11/02/2005	10:30	12.5	042.34	27.17	156.00	14.0	1.05	08.2	-0002
Retrieve	12/07/2005	09:30	05.9	041.98	26.52	149.80	15.7	0.40	08.4	-0001
ysi 600		9:45	05.7		27.98	113.90	11.9	0.76	07.8	
Deploy	12/07/2005	10:00	05.9	042.63	26.97	103.50	10.8	0.35	08.3	0001
Retrieve	01/10/2006	10:00	04.0	041.54	26.02	115.90	12.7	1.00	08.8	0002

Table 4: SL:

SL	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH	Turbidity+ NTU
ysi 600		13:15	-0.88		27.83	95.4	11.75	0.45	7.77	
Deploy	12/21/2004	13:30	-00.8	046.80	28.8	105.4	12.9	0.47	08.0	0001
Retrieve	1/16/2005	16:00	03.2	044.69	28.1	124.5	13.8	0.77	08.1	0002

ICE- sonde out of water										
ysi 600		10:00	07.9		28.1	103.7	10.3	0.30	07.3	
Deploy	04/04/2005	10:00	06.8	000.00	00.0	101.6	12.4	-0.20	05.4	0032
Retrieve	04/28/2005	10:30	12.1	043.07	27.7	092.5	08.4	0.13	07.7	0002
ysi 600		10:40	12.8		28.5	102.2	09.1	0.54	06.7	
Deploy	04/28/2005	11:00	12.5	043.33	27.9	089.6	08.0	0.44	07.6	0001
Retrieve	05/31/2005	11:00	19.6	042.11	27.1	109.3	08.5	0.53	07.8	0001
ysi 600		11:20	18.4		27.5	147.1	11.6	0.44	08.1	
Deploy	05/31/2005	11:30	19.8	041.95	27.0	115.5	09.0	0.31	07.8	0032
Retrieve	07/07/2005	09:30	21.1	031.73	19.8	003.0	00.2	0.41	07.6	1073
ysi 600		09:52	21.1		27.6	081.8	06.2	0.53	07.6	
Deploy	07/07/2005	10:00	21.1	043.54	28.1	081.9	06.2	0.42	07.7	0001
Retrieve	07/26/2005	09:30	23.9	043.09	27.8	079.4	05.7	0.19	07.8	0000
ysi 600		09:54	23.7		29.4	091.6	06.6	0.56	07.7	
Deploy	07/26/2005	10:00	24.1	044.74	28.9	077.2	05.5	0.28	07.4	0001
Retrieve	08/11/2005	12:30	27.4	044.41	28.6	109.9	07.4	0.51	07.9	0001
ysi 600		12:40	27.2		29.1	113.7	07.6	0.73	07.8	
Deploy	08/11/2005	13:00	27.8	046.26	29.9	141.3	09.4	0.50	08.0	0001
Retrieve	09/07/2005	09:00	22.1	032.32	20.2	030.6	02.4	0.32	08.0	0001
ysi 600		09:06	22.1		28.9	098.1	07.2	0.56	07.8	
Deploy	09/07/2005	09:30	22.2	045.12	29.2	091.9	06.8	0.21	07.8	0001
Retrieve	10/04/2005	13:00	19.4	041.10	26.4	095.2	07.5	0.47	07.9	0002
ysi 600		13:08	19.7		28.8	126.5	09.8	0.82	07.9	
Deploy	10/04/2005	13:30	19.7	044.32	28.7	117.4	09.1	0.45	08.0	0002
Retrieve	10/31/2005	14:30	10.2	038.99	24.7	113.3	10.9	0.30	08.1	0001
ysi 600		14:40	10.4		25.7	134.1	12.7	0.69	07.8	
Deploy	10/31/2005	15:00	10.8	033.88	21.2	108.9	10.6	0.37	07.9	0001
Retrieve	11/19/2005	07:00	06.2	042.26	26.8	100.8	10.5	0.33	08.1	0001