Waquoit Bay (WQB) NERR Water Quality Metadata
May - December, 1997
Latest Update: April 4, 2000

I. Data set and Research Descriptors

1. Principal investigators and contact persons:

Dr. Rick Crawford, Research Coordinator (PI)
Susan Bookless, Research Assistant (contact person)
Wendy Pabich Sproull, NERRS Graduate Fellow
PO Box 3092 Waquoit, MA 02536
(508) 457-0495
wbnerr@capecod.net

2. Entry verification

The data are uploaded from the YSI 6000 datalogger, to a PC with the YSI PC6000 data transfer software. Each file is uploaded in three formats, in the YSI (.dat) format, in comma delimited (labeled .csv) format, and in space delimited (labeled .txt) format. Three copies of each file in all three formats are then archived. The PC6000 software is used to plot the data which are then subject to preliminary review to detect questionable data, outliers, or probe malfunction. The dataloggers are tested for performance regarding field deployment, fouling and calibration. Copies of the plots from each deployment as well as the tests are filed with the respective field log.

Each comma delimited file is imported into Excel 5.0 where it is processed according to the NERRS CDMO operations manual. Files are merged to contain data on a monthly basis. Missing date and time stamps, along with the known or probable cause are documented in the missing data section of the metadata. If for any reason the time stamps of a file are incorrect, they are corrected and documented in anomalous data. Using an Excel macro data collected at fifteen minute intervals are sieved to contain data collected at 30-minute intervals. When possible, the Import.xls macro is run to fill in missing date and time stamps. If for some reason the Import.xls macro will not run this part of the editing procedure is performed manually. The pre and post-deployment data records or "data-tails" are removed and then the Import.xls macro is again used

to put periods in all cells missing data. At this point the files are saved in comma delimited format with the .csv extension. These files are considered to be the WQBNERR raw data files and are sent to the CDMO for archival.

The CDMO Excel macros are then run to check that every day of each month has the appropriate number of date and time stamps, and to highlight data outliers. All data outliers are documented in the anomalous data section and are removed from the data set at the discretion of the research coordinator. At this point the files are saved in the Excel workbook format with the .xls extension. A graphing program is used to graph each file and run statistical analyses to determine if any other anomalous data is present and needs removing. Any data that is deemed anomalous is documented in the anomalous data section. All removed data is also documented in the missing data section, and replaced with periods. When the editing process is complete the final CDMO Column Reformat macro is run and the file is saved in ASCII text format (with the .txt extension). These files are then sent electronically by FTP to CDMO.

Data files are archived at the Reserve as follows. Three copies of the WQBNERR monthly raw data files are archived in comma delimited format (with the .csv extension). Three copies of each final monthly data file are archived in the Excel workbook format (with the xls extension), as well as in ASCII format (with the .txt extension).

3. Research objectives:

It is well known that eutrophication is occurring in many temperate, shallow, coastal estuaries of North America, as well as around the world. Waquoit Bay is representative of shallow coastal embayments that occur from Cape Cod to Sandy Hook, New Jersey. It is within the Virginian biogeographic province, on the transitional border (Cape Cod) between the Virginian and the more northern Acadian biogeographic province. It functions as a natural laboratory from which

base line data can be collected to document trends associated with coastal development near these fragile habitats.

The temperate, shallow, coastal estuaries of this region are surrounded by sandy soils. Studies have indicated that non-point sources are the major contributors of nitrogen to these receiving waters. Waquoit Bay receives nitrogen from several non-point sources, including private on-site septic systems (their leachate percolates into groundwater which then enters the bay), run off (domestic and agricultural fertilizers, roads, animals), and atmospheric sources. On-site septic systems have been identified as the major contributing non-point source in these highly developed coastal regions.

Dense housing developments cover two peninsulas that form the western shore of the Childs and Seapit rivers, major contributors of fresh water to the reserve complex. Although these developments are outside of the Reserve boundaries, nitrogen discharged from septic systems, and in fertilizers has significant effects on the functioning of the Waquoit Bay ecosystem. The impacts of this nitrogen loading has been a subject of extensive study by researchers associated with the Reserve since its designation (1988).

It is well known that eutrophication of these ecosystems has led to alterations of habitat, negatively affecting important commercial fin and shellfisheries. In Waquoit Bay, for example, bay scallops (Argopecten irradians) were historically an important shellfishery. It has been shown that scallop survival is related to the vertical structure of eel grass (Zostera marina), and in 1951, vast meadowsof eelgrass were documented throughout Waquoit Bay. At this time, eel grass has essentially disappeared from the bay. Thick mats of seaweeds (benthic macroalgae such as Cladophora sp. And Gracilaria sp.) now cover the bottom of the bay where eelgrass meadows thrived two decades ago. As a result, the commercial harvest of bay scallops has collapsed. Unfortunately, the documentation of these changes is minimal, which makes evaluation of the rates of change resulting in these altered habitats difficult. A long term data base will make possible analyses of this type in the future.

Two sites are used to characterize conditions in Waquoit Bay. The "control" site is located in the central bay (CB). Data from this unit is considered to reflect the general conditions in the bay. This site is well flushed by the tides, is sufficiently exposed to winds from all directions, and is adequately removed from the navigation channel and mooring basins to be minimally affected by boating activities (relative to the rest of the bay). It is not a popular shellfishing spot. The "impacted" site is located in the north basin (NB) at the head of Waquoit Bay. This area is slightly deeper than the rest of the bay, and is sheltered from winds, particularly prevailing southwesterly winds during the summer months. It is presumably less mixed than the rest of the bay. It is located away from any channels, but is the site of more than 200 boat moorings, and is also a popular site for shellfishing. A second data logger has also been deployed at the North Basin site. However, this datalogger is suspended directly from a float, suspending the logger at a roughly constant water depth of approximately 0.9 m. Data files collected in this manner are labeled North Basin Surface (NS). When examined with reference to the NB data these files have the potential to document stratification of measured water quality parameters occurring in the North Basin.

Research and environmental monitoring at the Reserve is being conducted to expand our knowledge of the impacts of human activities in coastal areas. In addition to the contribution to the general body of knowledge, this work is intended to provide resource managers with information needed to formulate plans and regulations that will foster enhanced management and utilization of coastal resources. The scope of this research and monitoring includes efforts to understand ecosystem response to stresses, either natural or anthropogenic. It also includes the development of techniques to evaluate ecosystem changes, and methods and goals for habitat restoration.

During the last decade, there have been fish kills in the northern basin, as evidenced by sightings of dead and dying fish and shellfish along the shore.

Preliminary data indicate that very low concentrations of dissolved oxygen occur near dawn (daybreak hypoxia). Low dissolved oxygen levels are a result of respiration by, among other biota, the seaweeds which have become exceedingly abundant throughout the bay.

Because the bay is so shallow, sufficient sunlight for photosynthesis usually reaches the bottom and dissolved oxygen concentrations increase quickly after sunrise. However, daybreak hypoxia is exacerbated during foggy, calm mornings. If fog sufficiently reduces insolation, oxygen production by photosynthesis may be insufficient to raise dissolved oxygen concentration levels. If such conditions persist, a fish kill is likely to occur. Several species of fish and shellfish have been found to be impacted by fish kills in the bay, including the commercially-important juvenile winter flounder (Pleuronectes americanus), and the hard shell clam, or quahog (Mercenaria mercenaria). Data from the north basin site and the WBNERR meteorological station will document the frequency, and dynamics of these events. Reserve staff will also collect dissolved oxygen concentration profiles with other instruments in order to define the areal extent of the North Basin habitat that experiences unusually low levels of dissolved oxygen.

In Waquoit Bay, the primary producer community has been dominated by macroalgae since the 1970's, unlike other more typical temperate shallow coastal embayments, which are dominated by phytoplankton. Seaweed-dominated systems are thought to rely on the energy subsidy provided by eutrophication. It is thought that the shift in trophic energy flow through this ecosystem (caused by nutrient loading) may have altered the delicate system equilibrium, allowing macroalgae to proliferate.

It is possible that the system may eventually revert to a phytoplankton-dominated system. Increased phytoplankton productivity results in increased turbidity. Consequently, long-term measurements of turbidity will provide baseline measurements of this important parameter that is not only affected by

biological phenomena, but also by weather, land use, hydrography, and boating.
The addition of the WBNERR meteorological station (anticipated in Spring 1998),
and ongoing studies concerning sediment resuspension due to boating, will aid in
the analysis. This information will facilitate evaluation of changes as they
occur. In the future, these records may be useful for evaluating the efficacy of
remediation efforts intended to reduce nitrogen loading to the bay.

4. Research Methods

The 1997 YSI monitoring program season began on May 12, 1997, with the deployment of the only operational sonde available at the Reserve. This sonde
was deployed at the control site and briefly collected data without any recognizable problems. The Reserve currently owns four YSI 6000 dataloggers. The
pH and CTD/DO probes have recently been replaced for all four dataloggers; two
dataloggers have been serviced, and one is being completely overhauled due to
damage resulting from deployment during a hurricane. New QA/QC methods have been
instituted at the Reserve, including the creation of standard operating procedures. These procedures have resulted in consistent data collection, maintenance, calibration, and testing procedures. They should allow the continuation of consistent data collection and treatment, leading to a quality
long-term data base documenting the conditions of Waquoit Bay.

Each datalogger records measurements of temperature, specific conductivity,
dissolved oxygen, depth, pH, and turbidity at fifteen minute intervals during
deployment periods of approximately two weeks. During the winter months, the
deployment period is limited to two weeks by battery life; during summer months
the period is limited by biofouling. The sampling period is therefore held
constant for the entire sampling season. The sampling season generally runs from
March to December. It is, however, dependent on weather, the amount of ice on
the bay, and the operational availability of the boat that serves as tender for
the loggers. Unfortunately, because the data logger tender is small, the specifications of this system can exceed the limits of safety for data logger
deployment/retrieval operations on windy days. As such, data logger deployment

and retrieval are limited to fair weather. This contingency may result in interruptions in data collection that exceed those required for routine maintenance and calibration. Every effort is made to keep down time to a minimum. Routine maintenance usually results in a twenty-four to forty-eight
hour lapse in data.

Each data logger is anchored with a 75 pound mooring to which two lines are
attached. One line is attached to a surface float that marks the location. The
other line is also attached to a float but the line is shorter so that the float
remains submerged throughout tidal changes. The data logger is attached to the
shorter line in a vertical manner so that the sensors (pointing downward) are
suspended 0.75 m from the bottom. This system was chosen to minimize opportunities for vandalism, which has been a problem in the past.

After each deployment, dataloggers are brought back to the laboratory for downloading, instrument and sensor cleaning, calibration and testing as per the
Endeco/YSI NERR Brief, and the YSI 6000UPG Manual.

5. Site location and character

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. Like many embayments located on
glacial outwash plains, Waquoit Bay is shallow, fronted by prominent barrier
beaches of South Cape (State Park) Beach and Washburn Island beach, and backed
by salt marshes and upland forests. Two narrow, navigable inlets, reinforced
with granite jetties, have been constructed through the 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. It has not been reinforced and its fate
remains uncertain.

The western shore of uninhabited Washburn Island, with its low, steep bluffs and forested uplands, forms the western boundary of the reserve. However, tidal waters enter and leave the bay proper (and the Reserve) via the so-called Seapit and Eel rivers, which funnel tidal flows along the western shore of Washburn Island, through Eel Pond and ultimately to Nantucket Sound.

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 (2 m). Much of the remainder of the bay is only slightly shallower (e.g., 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 small, centuries of this flow has created a significant delta of sand that overlies much finer sediments found at comparable distances offshore. The source of this sand is the sandy beach over which this fresh water discharge must travel.

To the east and south, land in other subwatersheds surrounds several salt and freshwater ponds, including Hamblin and Jehu Ponds, brackish ponds that are connected to the Bay by the tidal waters of Little and Great rivers, respectively. The shorelines of these ponds are developed with residences which are occupied by both permanent and seasonal residents. 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 system of South Cape Beach State Park (also a component of the Reserve).
To the east, in 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 remainder of the input to Flat Pond is largely

groundwater, and run off, both of which are likely affected by an adjacent golf course and an up-scale residential development.

The tidal range of Waquoit Bay is approximately 0.5 meters. The salinity in most of the by ranges from 26 to 31 psu. The largest source of freshwater to Waquoit Bay is the Quashnet/Moonakis River. "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. A component of an additional subwatershed, it originates in Johns Pond situated north of the bay and traverses Reserve lands, forests, cranberry bogs, residential areas, and the Quashnet Valley Golf Course before joining the Bay, south of the southern boundary of the bay's northern basin. Although it is the largest source of fresh water, the Quashnet River delivers significantly less nitrogen to Waquoit Bay than does the Childs River, which also originates in Johns Pond.

The Childs River is the second largest input of freshwater to the Bay. A component of an additional 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 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 smaller stream flows. There is little surface water runoff entering directly into the bay due to the high percolation rates of Cape Cod's coarse, sandy soils.

The "control site", considered the baseline unit, is located in the central bay (CB) at latitude 41 deg. 34' 00" N, longitude 70 deg. 31' 47" W. The water depth at this site ranges between 1.2 m to 1.7 m. The benthic habitat is primarily characterized by a muck and organic ooze substrate, with prolific benthic macroalgae.

The Massachusetts Military Reservation (MMR) has been designated a Superfund

Site with at least one or two toxic plumes traveling in the ground water, having direct impact on Johns and Ashumet Ponds in the upper part of the watershed. Crops of cranberries from commercial bogs located on the Quashnet River have been deemed unfit for consumption due to contamination from ethylene dibromide (EDB) a jet fuel additive. The Quashnet River and the upper Childs River (north of Route 28) components of the Reserve complex have both been found to have sufficient numbers of coliform bacteria to close them to shellfishing. Two probable source of this contamination are failing septic systems, and storm water runoff. Pesticide and herbicide applications on cranberry bogs, golf courses and lawns also impact this ecosystem.

The CB site is southwest of the mouth of the Quashnet River, a small stream fed primarily by groundwater. The stream's freshwater discharge into Waquoit Bay is typically 5-10 cubic feet per second. The resultant discharge plume at these levels has an undetectable influence on salinity at the CB site. However, occasional releases of impounded water at an upstream cranberry bog significantly increases discharges to upwards of 30 cubic feet per second. The stream's discharge plume from these events results in slight reductions in salinity at the CB site. These discharges occur in the fall (harvesttime) and in the coldest periods of winter. They should be of minimal and traceable influence on the data set obtained by the CB data logger.

The north basin (NB) site latitude 41 deg. 34' 44" N, longitude 70 deg. 31' 58" W is characterized by water depths of 1.6 - 2.4m. The benthic habitat is similar to the CB site, characterized by muck or organic ooze substrate and benthic macroalgae. This site is subject to the portion of contaminant loading noted above that is mixed and cycled in to this basin. This site is sampled at two depths, NB and NS (North Basin Surface) to document the stratification of dissolved oxygen content especially in respect to daybreak hypoxia.

6. Data collection period

Central basin data collection began on May 12, 1997. Northern basin data

collection commenced on June 2, 1997. North Basin Surface data collection commenced on July 2, 1997. All monitoring is considered long term.

7. Associated researchers and projects

1996-1997 Projects by Waquoit Bay Reserve Staff:

Impacts of boating. The object of this research is to determine if motorboating sufficiently decreases the amount of light that reaches the bottom of the bay so as to result in chronic ecosystem stress. Reserve staff and volunteers measured the amount of sediment resuspended by the propeller wash of motorboats and coupled them with measurements of the reduction of light levels at various depths of water.

Remote sensing with satellites and airborne video cameras as tools for coastal management. Dr. Crawford worked with Thomas Stone of the Woods Hole Research Center to develop a technique for rapid assessment of nitrogen loading conditions in coastal waters. This approach linked analyses of remotely-sensed data with field measurements of chlorophyll concentration in various coastal areas of Cape Cod. Several volunteer water quality monitors assisted with this data collection.

Horizontal gradients of hydrologic variables and the effects of motor boats. Dr. Crawford and the research assistant, used a data logger fitted to a towed body to describe several microenvironments in the bay which were altered by the quantity of boat traffic.

Fish biology component of the 1997 Surface Heat Budget of the Arctic Ocean Study. Dr. Crawford conducted studies of Arctic fish ecology as part of this study, for climate modeling purposes, of air/sea/ice albedo feedback mechanisms.

WBNERR BayWatcher volunteer group water quality monitoring program. Citizen volunteers conduct long-term monitoring of water quality at six sites within the Reserve. Measurements are taken year round when possible, monthly during the fall, winter and spring, and bi-monthly during the summer. Parameters monitored are air and water temperature, salinity, dissolved oxygen, Secchi depth, total depth, and chlorophyll a.

Endangered Species Monitoring Project. Over 20 volunteers and the seasonal Endangered Species Coordinator monitor the Piping Plover and Least Tern

populations on South Cape beach and Washburn Island. Symbolic fencing is erected around the nesting areas to prevent foot traffic. Predator exclusion fencing is erected around the Plover nests. This year several Plover chicks successfully hatched and fledged.

Projects by guest investigators at the Reserve:

Impacts of anthropogenic nitrogen inputs. Dr. Ivan Valiela and numerous students, including J. McLelland, E. Galan, J. Hauxwell, J. Tober, C. Fritz, E. LaBreque, P. Behr, and others, continue to examine estuarine response to nitrogen loading.

Development and evaluation of an indicator of "Estuarine Biotic Integrity". For several years, Dr. Linda Deegan and her colleagues (e.g., Dr. Melissa Weaver) at the Ecosystems Center of the Marine Biological Laboratory have been searching for a few "key" parameters that describe the overall "health" of an estuary.

Coastal Wetlands Ecosystem Protection Project: an approach to assess and mitigate the impacts of nonpoint source pollution. Jan Smith and Bruce Carlisle, Massachusetts CZM; Christine Gault and Rick Crawford, WBNERR.

Macroinvertebrate biomonitoring in wetlands of the Waquoit Bay watershed. Dr. Anna Hicks, UMass Amherst.

Colonization, ecological habitat and potential impact of the western Indo-Pacific crab Hemigrapsus sanguineus. Dr. Nancy O=Connor and students, University of Massachusetts at Dartmouth.

Seasonal, interannual and interlatitudinal values for saltmarsh-fungal standing crop and productivity. Dr. Steve Newell. Marine Institute, University of Georgia.

Evaluation of management alternatives: assessment for habitat restoration in Waquoit Bay, and extension to other systems. Dr. Ivan Valiela, Boston U. Marine Program at the Marine Biological Laboratory and Maggie Geist, WBNERR.

Interaction of nutrient transfer top-down and bottom-up control and habitat mosaic in Waquoit Bay, Massachusetts. Dr. Ivan Valiela, Boston U. Marine Program at the Marine Biological Laboratory.

A stable isotopic approach for early detection of wastewater nitrogen in estuarine food webs. Dr. Ivan Valiela, Boston U. Marine Program at the Marine

Biological Laboratory.

Linkage between bacteria and nitrate levels in Waquoit bay. Samantha Joye, Texas A&M, and the Marine Biological Laboratory

Analysis of predation by fish on amphipods using fish exclusion enclosures. Peter Behr. Boston University Marine Program at the Marine Biological Laboratory.

Propagation Techniques for Agalinas acuta. Paul Somers et al. Massachusetts Natural Heritage Program, New England Wildflower Society, Massachusetts Audubon, and Nature Conservancy.

The effect of nitrogen-loading from watersheds on eelgrass growth, epiphyte load, and grazing pact on epiphyte biomass. Jennifer Hauxwell, Dr. Just Cebrian, and Dr. Ivan Valiela, Boston U. Marine Program.

Denitrification and nitrogen attenuation in the aquifer of an estuarine watershed. Wendy Pabich Sproull and Dr. Ivan Valiela. This research is crucial to a model that is being developed by Dr. Valiela and Maggie Geist, Research Translator.

Vulnerability of the soft shell clam Mya arenaria to predation by local crab species. Jill Juhasz, Northeastern Univ.

Impact and management of the European green crab: effects on the quahog fishery. Bill Walton, U. of Maryland / Smithsonian Environmental Research Center.

Anuran distributions and salinity gradients in Cape Cod estuaries. Joseph Markow, Department of Ecology and Evolutionary Biology, University of Connecticut.

Dynamics of point-source pollution discharges in estuarine waters during storm events. Lee Benaka, University of Rhode Island, Department of Marine Affairs.

The effects of ultraviolet radiation on macroalgae. Lora Harris and Dr. Paulette Peckol, Smith College.

National On-site Demonstration Project: Four on-site denitrifying systems were installed at homes within the Waquoit Bay watershed. The systems are being sampled and evaluated to determine their value, relative to Title V systems, for reducing nitrogen loading to the Bay. Team Engineering designed the systems; George Botehlo and Ron's Excavating are subcontracted to take samples; and

Brian Howes is analyzing the samples.

II. Physical Structure Descriptors

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

YSI 6000 datalogger

Variable	Range of Measurements (units)	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	0.01 C	+/-0.15C
SpCond	0-100(mS/cm)	0.01mS/cm	+/-0.5% of reading + 0.001 mS/cm
Salinity	0-70 Parts per thousand (ppt)	0.01 ppt	+/-1.0% of reading or 0.1 ppt, whichever is greater
DO	0-200 % (air saturation)	0.1% @ air sat	+/-2% @ air sat
DO	200-500 (% air saturation)	0.1% @ air sat	+/-6% @ air sat
DO	0-20 (mg/l)	0.01 mg/l	+/-0.2mg/l
DO	20-50 (mg/l)	0.01mg/l	+/-0.6mg/l
Depth	0-9.1 (m)	0.001m	+/-0.018m
PH	2-14 units	0.01 units	+/-0.2 units
Turb	0-1000 NTU	0.1 NTU	+/-5% of reading or 2 NTU, whichever is greater

Data Columns are separated by tabs.

9.Coded variable indicator and variable code definitions

The Waquoit Bay file naming convention is as follows: WQBNERR raw data files are named as follows: The first two characters are for the day of the month, the third, fourth, and fifth are for the first three letters of the month, the sixth is for the last number of the year, and the seventh and eighth are for the site description (central bay (CB), north basin (NB), or north basin surface (NS)).
These files are archived as described above.

After the WQBNERR raw data files are merged into monthly blocks they are named according to the CDMO Operations Manual. The first two characters are the site description, the second and third stand for the month, and the fourth and fifth for the year. The raw unedited monthly files are saved in comma delimited format

(with the .csv extension), and are to be archived by the CDMO as the WQBNERR raw data. Outlier files created while running the macros are saved with the same file name but with the .out extension. Final edited files are saved in Excel workbook format (with the .xls extension) and also in ASCII format (with the .txt extension). The raw unedited monthly files, and the final ASCII formatted final files are sent by FTP to the CDMO.

10. Data anomalies

After examination of calibration logs it was determined that the data from May through October was collected in local daylight time instead of local standard time or EST. All date/times for these months were corrected to local standard time on 04/20/00. All of the information on the data in this metadata file has been adjusted for that error.

Central Bay

May 1997 - File name: CB0597

Logger was deployed: 05/12/97 @ 15:30 to 05/28/97 @ 13:30
05/29/97 @ 14:30 to 05/31/97 @ 23:30.

a) QA/QC methods (the WBNERR SOP's) were still being developed, so for this deployment the procedures were performed as per the Endeco/YSI NERR Brief, and the YSI 6000UPG Manual.
b) All pH data for this file are suspect; some drifting during field deployment is probable. The probe was reading properly in buffer solutions, but the diagnostic readings never stabilized. They were exhibiting a "walking" behavior (characterized by continuous positive and negative fluctuations). The probe was found to have a loose internal connection on June 25, 1997. No pH data were removed from the file.
c) The following records contain turbidity values that were determined to be anomalous (zero values) by the CDMO outliers macro. No data were removed.

Date	Time
5/19/97	08:30:00
5/19/97	19:30:00
5/20/97	01:30:00
5/20/97	02:00:00
5/20/97	03:00:00

5/20/97	04:00:00
5/20/97	06:00:00
5/20/97	07:00:00
5/20/97	07:30:00
5/20/97	08:30:00
5/20/97	10:00:00
5/20/97	11:00:00
5/21/97	09:30:00
5/21/97	20:30:00
5/21/97	21:00:00
5/21/97	21:30:00
5/29/97	23:00:00
5/30/97	02:30:00
5/31/97	03:30:00
5/31/97	04:00:00
5/31/97	04:30:00
5/31/97	05:30:00
5/31/97	06:00:00
5/31/97	06:30:00
5/31/97	07:00:00
5/31/97	08:00:00
5/31/97	15:30:00
5/31/97	16:00:00

d) The following records contain turbidity values that were determined to be anomalous (large negative values) by the CDMO outliers macro. No data were removed.

Date	Time
5/25/97	10:30:00
5/26/97	16:00:00

e) Water level above sensors during the 05/12/97 - 05/28/97 deployment was roughly 1.8 - 1.9 m. During the 05/29-97 - 05/31/97 deployment it was roughly 1.4 m. This suggests that the logger was incorrectly reset in a shallower location after servicing (i.e., the mooring was moved).

June 1997 - File name: CB0697

Logger was deployed: 06/01/97 @ 00:00 to 06/09/97 @ 14:30
06/10/97 @ 14:00 to 06/24/97 @ 12:30
06/26/97 @ 10:00 to 06/30/97 @ 22:30

a) QA/QC methods (the WBNERR SOP's) were still being developed, so for this deployment the procedures were performed as per the Endeco/YSI NERR Brief, and the YSI 6000UPG Manual.

b) The following records contain turbidity values that were determined to be

anomalous (zero values) by the CDMO outliers macro. No data were removed.

Date	Time
6/1/97	06:30:00
6/1/97	07:30:00
6/1/97	08:00:00
6/1/97	08:30:00
6/1/97	09:00:00
6/1/97	11:30:00
6/1/97	13:00:00
6/1/97	14:00:00 - 16:00:00
6/2/97	01:00:00
6/2/97	02:00:00 – 06:30:00
6/2/97	07:30:00 - 08:30:00
6/2/97	10:30:00 - 13:00:00
6/2/97	14:00:00
6/2/97	16:30:00 - 17:00:00
6/2/97	18:00:00 - 20:00:00
6/3/97	03:30:00 – 07:00:00
6/3/97	08:00:00 - 09:00:00
6/3/97	12:00:00 - 13:30:00
6/3/97	19:00:00 - 19:30:00
6/4/97	03:00:00
6/4/97	05:30:00
6/4/97	06:00:00 - 07:00:00
6/4/97	08:00:00 - 09:00:00
6/4/97	10:00:00 - 10:30:00
6/4/97	12:00:00 - 14:00:00
6/4/97	16:00:00
6/4/97	19:30:00 - 21:00:00
6/5/97	09:00:00
6/5/97	10:00:00
6/5/97	12:00:00
6/5/97	13:00:00 - 15:00:00
6/5/97	16:00:00 - 19:30:00
6/5/97	20:00:30
6/6/97	04:30:00
6/6/97	07:00:00
6/6/97	08:00:00 - 10:30:00
6/6/97	11:30:00
6/6/97	12:00:00
6/6/97	13:30:00 - 16:00:00
6/6/97	17:00:00
6/6/97	19:30:00
6/6/97	20:30:00
6/6/97	21:30:00 - 22:30:00
6/6/97	23:00:00 – 6/7/97 00:30:00
6/7/97	1:30:00 - 02:00:00
6/7/97	06:00:00
6/7/97	07:30:00 - 10:30:00
6/7/97	11:30:00 - 15:00:00
6/7/97	17:00:00 - 21:30:00
6/8/97	01:00:00 - 01:30:00
6/8/97	04:30:00 - 05:30:00

6/8/97 06:30:00 - 07:30:00
6/8/97 09:00:00 - 11:30:00
6/8/97 14:00:00
6/9/97 04:30:00
6/10/97 14:00:00
6/10/97 20:30:00 - 21:30:00
6/11/97 06:00:00
6/13/97 12:00:00
6/13/97 21:30:00 - 22:30:00
6/13/97 23:30:00 – 6/14/97 00:00:00
6/14/97 01:00:00 - 03:00:00
6/14/97 04:00:00 - 05:00:00
6/14/97 06:00:00
6/14/97 07:00:00
6/14/97 08:00:00
6/14/97 14:00:00 - 14:30:00
6/14/97 21:30:00 - 22:30:00
6/14/97 23:30:00 – 6/15/97 05:30:00
6/15/97 06:30:00
6/15/97 09:30:00 - 11:30:00
6/15/97 17:30:00 - 18:00:00
6/15/97 19:30:00
6/17/97 04:30:00
6/17/97 07:30:00
6/17/97 08:30:00
6/17/97 09:30:00
6/18/97 03:30:00
6/18/97 08:30:00
6/18/97 22:00:00
6/19/97 01:30:00
6/19/97 03:30:00
6/19/97 04:00:00
6/20/97 01:30:00
6/20/97 07:30:00
6/24/97 07:30:00

c) The following records contain turbidity values that were determined to be anomalous (small negative values) by the CDMO outliers macro. No data were removed.

6/1/97 13:30:00
6/2/97 07:00:00
6/3/97 07:30:00

d) During 06/26/97 to 06/30/97, the DO data are suspect. This probe failed post-deployment lab tests and was retired. A new probe was installed for the 07/97 deployments.

July 1997 - File name: CB0797

Logger was deployed: 07/01/97 @ 00:00 to 07/06/97 @ 04:30*
07/11/97 @ 15:30 to 07/21/97 @ 09:00
07/23/97 @ 15:30 to 07/31/97 @ 21:00**
* Logger battery compartment flooded after 07/06/97 @ 04:30 and no data were
recorded until redeployment on 07/11/97 @ 15:30.
** Logger battery compartment began flooding sometime before 07/26/97 @ 08:30
when the record for that time period was not recorded. Logger continued to work
through 07/31/97 @ 21:00. It ceased to record after that.

a) QA/QC methods (the WBNERR SOP's) were still being developed, so for this
deployment the procedures were performed as per the Endeco/YSI NERR Brief, and
the YSI 6000UPG Manual.
b) All parameters are suspect, battery compartment leakage may have caused
voltage surges.
c) During 07/01/97 to 07/06/97, the DO data are suspect. This probe failed post-
deployment lab tests and was retired. A new probe was installed for the 07/11
deployment.
d) A new pH probe was also installed on this sonde for the 07/11 deployment.
e) The following records contain turbidity values that were determined to be
anomalous (large negative values) by the CDMO outliers macro. No data were
removed.

Date	Time
7/2/97	14:30:00

August 1997 - File name: CB0897

Logger was deployed:
08/07/97 @ 15:30 to 08/20/97 @ 15:00
08/22/97 @ 16:00 to 08/31/97 @ 22:30

* Logger was flooded during this time and no data were recorded.

a) QA/QC methods (the WBNERR SOP's) were still being developed, so for this
deployment the procedures were performed as per the Endeco/YSI NERR Brief, and
the YSI 6000UPG Manual.
b) DO data were spurious between 08/08/97 @ 15:30 through 08/11/97 @ 16:30. Bad
output was apparently due to the presence of a bubble under the membrane. These

data were deleted.
c) The salinity recorded during the 07/21/97 post-deployment check was 0.2 ppt
lower than the actual. Suspect fouling caused a slight downward drift in readings.
d) The salinity recorded during the 07/31/97 post-deployment check was 0.3 ppt
lower than the actual. Suspect fouling caused a slight downward drift in readings.
e) The following records contain turbidity values that were determined to be
anomalous (large negative values) by the CDMO outliers macro. No data were
removed.

Date	Time
8/31/97	22:30

September 1997 - File Name: CB0997

Logger was deployed: 09/01/97 00:00 to 09/03/97 @ 14:45
09/05/97 17:00 to 09/24/97 @ 09:00
09/25/97 15:45 to 09/30/97 @ 23:45

a) QA/QC methods were still being developed, so for this deployment the procedures were performed as per the Endeco/YSI NERR Brief, and the YSI 6000UPG
Manual.
b) Logger was set to record at 15 minute intervals.
c) The following records contain turbidity values that were determined to be
anomalous (large negative values) by the CDMO outliers macro. No data were
removed.

Date	Time
9/22/97	16:00:00
9/22/97	16:15:00
9/22/97	16:30:00
9/22/97	16:45:00
9/23/97	23:30:00

October 1997 - File name: CB1097

Logger was deployed: 10/01/97 @ 00:00 to 10/09/97 @ 11:45
10/17/97 @ 15:45 to 10/31/97 @ 23:45

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) Sometime soon after 10/17/97 21:00 the turbidity probe wiper mechanism failed
and the wiper "parked" on the sensor. Subsequent data for the remainder of the
deployment were incorrect. Data from 10/17/97 @ 21:15:00 to 10/31/97 @ 23:45:00

were deleted.

November 1997 - File name: CB1197

Logger was deployed: 11/01/97 @ 00:00 to 11/04/97 @ 18:45*
11/06/97 @ 16:30 to 11/17/97 @ 11:45
11/18/97 @ 16:00 to 11/24/97 @ 09:00**
* During this period the turbidity probe wiper was parked on the sensor and
turbidity data were deleted. Battery depletion caused the logger to cease recording after 11/04/97 18:45.
** Soon after 11/24/97 09:00 the logger shackle slipped from the mooring and the
logger drifted to shore. All data subsequent to that time have been deleted.

a) QA/QC methods were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) The dissolved oxygen data for the 11/06/96 to 11/17/97 deployment is suspect
due to a high DO reading (107 %) during the post deployment performance evaluation (100 % was target).
c) The dissolved oxygen sensor began to fail during 11/19/97. Data collected
during the remainder of that deployment (until 11/24/97 @ 09:00 when it left the
mooring) is suspect but has not been deleted from the file.

December 1997 - File name: CB1297

Logger was deployed 12/05/97 @ 15:00 to 12/19/97 @ 10:45.

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) Logger was adrift at the start of the month. It was recovered, recalibrated
and then redeployed on 12/05/97.
c) Logger was removed from its mooring on 12/19/97 for the end of the season. It
was not to be redeployed until the spring of 1998.

10. Data Anomalies Continued
North Basin

June 1997 - File name: NB0697

Logger was deployed 06/26/97 @ 10:30 to 06/30/97 @ 23:30.

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI

6000UPG Manual.
b) Water level data indicate the logger float--intended to always be submerged during the tidal cycle so the logger remains at a constant depth--was too far from the logger and was at the water's surface during low tides. Thus the logger's depth changed slightly (i.e., logger moved closer to the bottom) during low tides.

July File name: NB0797

Logger was deployed: 07/01/97 @ 00:00 to 07/10/97 @ 12:00
07/23/97 @ 17:00 to 07/31/97 @ 23:30.

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI 6000UPG Manual.

August 1997 - File name NB0897

Logger was deployed: 08/01/97 @ 00:00 to 08/06/97 @ 10:30
08/07/97 @ 16:00 to 08/12/97 @ 16:00
08/22/97 @ 16:00 to 08/31/97 @ 23:30

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI 6000UPG Manual.
b) The DO sensor began to fail during the morning of 08/04/97. Output improved during the 08/07/97 to 08/12/97 deployment but the probe was subsequently taken out of service because it failed post-calibration performance tests. Although the DO data are suspect, none were removed from the file. There were no DO data recorded during the Aug 22 - 31 deployment.
c) The following records contain turbidity values that were determined to be anomalous (large negative values) by the CDMO outliers macro. No data were removed.

Date	Time
8/3/97	19:00:00
8/5/97	04:30:00

d) The following records contain turbidity values that were determined to be anomalous (small negative values) by the CDMO outliers macro. No data were removed.

Date	Time
8/5/97	06:00:00

e) The salinity recorded during the Aug 22 - 31 post deployment check was 0.4
ppt lower than the actual. Suspect fouling caused a slight downward drift in
readings.
f) The logger float arrangement was corrected and the logger maintained proper
depth (0.75 m above the bottom).

September 1997, File name: NB0997

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) No dissolved oxygen data are available for the September 01 - 03 and 05 -24
deployments because there was no operational DO probe available.
c) The DO probe was reconditioned and used for the Sept 26 - 30 deployment. The
sensor worked OK until 09/27/97 @ 09:00 when spurious output began, apparently
from a bubble under the membrane. No data were deleted.
d) Low pH values during September 1997 indicate the occurrence of low DO events
but little DO data were recorded.
d) The following records contain turbidity values that were determined to be
anomalous (small and large negative values) by the CDMO outliers macro. No data
were removed.

Date	Time
9/2/97	05:30:00
9/2/97	09:00:00
9/2/97	16:30:00
9/9/97	04:30:00
9/9/97	06:30:00
9/9/97	08:30:00
9/15/97	05:00:00
9/15/97	07:30:00
9/15/97	13:30:00

October 1997, File name: NB1097

Logger was deployed: 10/01/97 @ 00:00 to 10/12/97 @ 03:15*
10/17/97 @ 16:45 to 10/27/97 @ 19:30
* Battery depletion end this deployment

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) File times were changed to account for daylight savings time.

November 1997, File name: NB1197

Logger was deployed 11/18/97 @ 15:30 to 11/30/97 @ 23:30.

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) The dissolved oxygen data for this file is suspect due to a high (106.5 %) DO
reading during the post deployment performance evaluation (target was 100 %).
c) At 11/21/97 04:30 the turbidity sensor wiper failed. All subsequent turbidity
data for this file are suspect.
d) The mooring was once again improperly set and the logger float was at the
surface during low tides. The logger changed depth during these times (got
slightly closer to the bottom).

December 1997, File name: NB1297

Logger was deployed: 12/01/97 @ 00:00 to 12/03/97 @ 13:00
12/05/97 @ 15:30 to 12/19/97 @ 11:30

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) The dissolved oxygen data for Dec 05 - 19 are suspect due to a slightly high
(103.7 %) DO reading during the post deployment performance evaluation (target
was 100%).
c) All turbidity data for December 1997 are suspect. The wiper mechanism failed
to operate for some unknown reason.
d) The mooring was incorrectly set and the logger changed depth during low
tides.

10. Data Anomalies Continued
North Basin Surface

July - File name: NS0797

Logger was deployed: 07/02/97 @ 10:30 to 07/10/97 @ 12:00
07/23/97 @ 16:30 to 07/31/97 @ 23:30

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) The DO data collected July 02 - 10 are suspect because during the post

deployment check the measurements were exhibiting some drifting. The probe
calibrated without any error messages. The NERRS YSI service representative said
as long as the proper procedures are followed during calibration the unit should
collect decent data.
c) No DO data were collected during the July 23 -31 deployment because the probe
was switched to another logger to replace a failed probe. No spare DO probe was
available.
d) The logger was moored from a surface float so it would remain at a constant
depth from the surface. Actual depth varied between roughly 0.6 m to 0.9 m. This
was probably due to twisting and snagging of mooring lines drifting in the
currents. This variation in depth persisted throughout the remainder of the data
collected at this site in 1997.
e) Noisy turbidity data may have been because of the detection of bubbles at the
top of the water column.

August File name: NS0897

Logger was deployed: 08/01/97 @ 00:00 to 08/06/97 @ 11:00
08/07/97 @ 16:00 to 08/20/97 @ 15:00

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) No DO data was collected during this deployment because no operational DO
probe was available
c) The following records contain turbidity values that were negative. No data
were removed.

Date	Time
08/05/97	03:30
	04:00
	05:00
	08:30
	11:00
	12:00
	13:00
	17:30
	18:00

September 1997, File name: NS0997

Logger was deployed: 09/25/97 @ 16:00 to 09/30/97 @ 23:30

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) No dissolved oxygen data are available because there was no operational DO
probe available.

October 1997, File name: NS1097

Logger was deployed: 10/01/97 @ 00:00 to 10/12/97 @ 02:00*
*Battery depletion ended logging

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) No dissolved oxygen data is available because there was no operational DO
probe available.

November 1997, File name: NS1197

Logger was deployed 11/18/97 @ 15:00 to 11/30/97 @ 23:30

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) No dissolved oxygen data is available because there was no operational DO
probe available.
c) pH data are suspect. They appear to drift negatively about 1 unit during
deployment. There are no records of postcalibration findings.

December 1997, File name: NS1297

Logger was deployed 12/01/97 @ 00:00 to 12/03/97 @ 13:00

a) QA/QC procedures were performed as per the Endeco/YSI NERR Brief, and the YSI
6000UPG Manual.
b) No dissolved oxygen data is available because there was no operational DO
probe available.

11. Missing data

Central Bay

January 1 - April 30, 1997 - No data are available because the loggers were not
yet deployed

May 1997 - File name: CB0597

a) No data were available until 15:30:00 on 5/12/97 because the dataloggers were
not yet deployed.
b) No data were available between 14:00:00 on 5/28/97 and 14:00:00 on 5/29/97
due to maintenance, QA/QC and transport to the field.

June 1997 - File name CB0697

a) No data are available between 15:00:00 on 6/09/97 and 13:30:00 on 6/10/97 due
to maintenance, QAQC and transport to the field.
c) No data are available between 13:00:00 on 6/24/97 and 09:30:00 on 6/26/97 due
to maintenance, QAQC and transport to the field.

July 1997 - File name: CB0797

a) The following records were deleted due to instrument malfunction caused
by water leakage into the battery compartment:

Date	Time	Explanation
7/6/97	5:00:00 - 23:30:00	Operator error
7/7/97	0:00:00 - 23:30:00	Operator error
7/8/97	0:00:00 - 23:30:00	Operator error
7/9/97	0:00:00 - 23:30:00	Operator error
7/10/97	0:00:00 - 23:30:00	Operator error

b) No data were available between 00:00:00 and 15:00:00 on 7/11/97 due to maintenance, QA/QC and transport to the field.
c) No data are available between 09:30:00 on 7/21/97 and 23:30:00 on 7/22/97 due
to transport from the field, QA/QC, and maintenance.
d) No data were available between 00:00:00 and 15:00:00 on 7/23/97 due to maintenance, QA/QC and transport to the field.
e) The following time periods contained no data because the battery compartment
was flooding and the logger was beginning to fail.

Date	Time	Explanation
7/26/97	08:30:00	Operator error
7/31/97	21:30:00 - 23:30:00	Operator error

August 1997 - File name CB0897

a) Data was not recorded during the following periods due to water leakage into

the battery compartment:

Date	Time	Explanation
8/1/97	00:00:00 – 8/7/97 15:00	Operator error

b) No DO data are available between 15:30 08/08/97 and 16:30 08/11/97 due to a bubble in the sensor.
c) No data are available at 16:30:00 on 8/12/97 due to the switching of dataloggers.
d) No data are available between 15:30:00 and 23:30:00 on 8/20/97 through 15:30:00 on 8/22/97 due to maintenance, QAQC and transport to the field.

September 1997, File name: CB0997 15 min intervals

a) No data are available between 15:00:00 on 9/3/97 and 23:45:00 on 9/4/97 due to transport from the field, QAQC, and maintenance.
b) No data are available between 0:00:00 and 16:45:00 on 9/5/97 due to QAQC, and transport to the field.
c) No data are available between 09:15:00 and 23:45:00 on 9/24/97 due to transport from the field, QAQC, and maintenance.
d) No data are available between 0:00:00 and 15:30:00 on 9/25/97 due to QAQC and transport to the field.

October 1997, File name: CB1097 15 min intervals

a) No data are available between 12:00:00 on 10/9/97 and 23:45:00 on 10/16/97 due to battery failure, transport from the field, QA/QC, and maintenance.
b) No data are available between 0:00:00 and 15:30:00 on 10/17/97 due to QA/QC, and transport to the field.
c) No turbidity data between 21:15 10/17/97 and 23:45 10/31/97 because the wiper mechanism failed and the wiper arm parked on the sensor – Data Removed.
d) No specific conductivity data from 10/17/97 15:45 to 10/31/97 23:45 because instrument was not setup to record.

November 1997, File name: CB1197

a) No data are available between 19:00:00 on 11/4/97 and 23:45:00 on 11/5/97 due to battery failure, transport from the field, QA/QC, and maintenance.
b) No data are available between 0:00:00 and 16:15:00 on 11/6/97 due to QA/QC, and transport to the field.
c) No data are available between 12:00:00 and 23:30:00 on 11/17/97 due to transport from the field, QA/QC, and maintenance.
d) No data are available between 0:00:00 and 15:45:00 on 11/18/97 due to maintenance, QA/QC, and transport to the field.
e) No data are available between 9:15:00 on 11/24/97 and 23:45:00 on 11/30/97

because the datalogger deployed at this site broke loose from the mooring and
was not discovered until after the end of the month.
f) No turbidity data between 11/01/97 00:00 through 11/04/97 18:45 because wiper
mechanism failed and the wiper arm parked on the sensor – Data Removed.

December 1997, File name: CB1297 15 min intervals

a) No data are available between 0:00:00 on 12/1/97 and 23:45:00 on 12/4/97
because the datalogger was missing, and also due to maintenance and QAQC.
b) No data are available between 0:00:00 and 14:45:00 on 12/5/97 due to maintenance, QAQC, and transport to the field.
c) No data are available between 11:00:00 on 12/19/97 and 23:45:00 on 12/31/97
due to transport from the field, QAQC, and maintenance, and because the sampling
season had ended and no dataloggers were deployed.

11. Missing data continued

North Basin

January 1 - May 31, 1997: No data are available because no dataloggers were
deployed.

June 1997 - File name: NB0697

June 1 - June 25, 1997: No data are available because no NB logger was deployed
a) No data are available between 0:00:00 and 10:00:00 on 6/26/97 maintenance,
QAQC, and transport to the field.

July 1997 - File name: NB0797

a) No data are available between 12:30:00 on 7/10/97 and 23:30:00 on 7/11/97 due
to transport from the field, QAQC and maintenance.
b) No data are available between 00:00:00 on 7/12/97 and 23:30:00 on 7/22/97
because no NB datalogger was deployed. No operational datalogger was available.
c) No data are available between 0:00:00 and 16:30:00 on 7/23/97 due to maintenance, QAQC, and transport to the field.

August 1997 - File name: NB0897

a) The DO sensor began to fail during the morning of 08/04/97. Output improved

during the 08/07/97 to 08/12/97 deployment but the probe was subsequently taken
out of service because it failed post-calibration performance tests. Although
the DO data are suspect, none were removed from the file. There were no DO data
recorded during the Aug 22 - 31 deployment.
b) No data are available between 11:00:00 and 23:30:00 on 8/6/97 due to transport from the field, QAQC and maintenance.
c) No data are available between 0:00 and 15:30:00 on 8/7/97 due to maintenance,
QAQC, and transport to the field.
d) No data are available between 16:30:00 and 23:30:00 on 8/12/97 due to transport from the field, QAQC and maintenance.
e) No data are available between 00:00:00 on 8/13/97 and 23:30:00 on 8/21/97
because no NB datalogger was deployed. No operational datalogger was available.
f) No data are available between 0:00:00 and 15:30:00 on 8/22/97 due to maintenance, QAQC, and transport to the field.

September 1997, File name: NB0997

a) No dissolved oxygen data are available for the September 01 - 03 and 05 -24
deployments because there was no operational DO probe available.
b) No data are available between 15:30:00 on 9/3/97 and 23:30:00 on 9/4/97 due
to transport from the field, QAQC, and maintenance.
c) No data are available between 0:00:00 and 16:30:00 on 9/5/97 due to QAQC, and
transport to the field.
d) No data are available between 10:00:00 on 9/24/97 and 23:45:00 on 9/25/97 due
to transport from the field, QAQC, and maintenance.
e) No data are available between 0:00:00 and 16:30:00 on 9/26/97 due to QAQC,
and transport to the field.

October 1997, File name: NB1097

a) No DO data from 10/01/97 00:00 through 10/27/97 19:30 because there was no
probe in the datalogger.
b) No data are available between 03:30:00 on 10/12/97 and 23:45:00 on 10/16/97
due to battery failure, transport from the field, QAQC, and maintenance.
c) No data are available between 0:00:00 and 16:30:00 on 10/17/97 due to QAQC,
and transport to the field.
d) The DO probe was removed from service for the Oct 17 - 27 deployment. No data
were recorded.

e) No data are available between 19:45:00 on 10/27/97 and 23:45:00 on 10/31/97
due to battery failure.

November 1997, File name: NB1197

a) No data are available between 0:00:00 on 11/1/97 and 23:30:00 on 11/17/97
because no operational datalogger was available for deployment.
b) No data are available between 0:00:00 and 15:00:00 on 11/18/97 due to QAQC,
and transport to the field.

December 1997, File name: NB1297

a) No data are available between 13:30:00 on 12/3/97 and 23:30:00 on 12/4/97 due
to transport from the field, QAQC, and maintenance.
b) No data are available between 0:00:00 and 15:00:00 on 12/5/97 due to QAQC,
and transport to the field.
c) No data are available between 12:00:00 on 12/19/97 and 23:45:00 on 12/20/97
due to transport from the field, QA/QC testing, and maintenance.
d) No data are available between 0:00:00 on 12/21/97 and 23:45:00 on 12/31/97
because the sampling season had ended and no dataloggers were deployed.

11. Missing data continued

North Basin Surface

January 1 - June 30, 1997: No data are available because no dataloggers were
deployed.

July - File name: NS0797

a) No data are available between 00:00:00 and 23:30:00 on 7/1/97 because no NS
datalogger was deployed.
b) No data are available between 00:00:00 and 10:00:00 7/2/97 due to QAQC, and
transport to the field.
c) No data are available between 12:30:00 and 23:30:00 on 7/10/97 due to
transport from the field, QA/QC testing, and maintenance.
d) No data are available between 00:00:00 on 7/11/97 and 23:30:00 on 7/22/97
because no NS datalogger was deployed.
e) No data are available between 0:00:00 and 16:00:00 on 7/23/97 due to QAQC,
and transport to the field.
f) No DO data were collected during the July 23 -31 deployment because the probe

was switched to another logger to replace a failed probe. No spare DO probe was
available.

August - File name NS0897

a) No data are available between 10:30:00 and 23:30:00 on 8/6/97 due to transport from the field, QAQC, and maintenance.
b) No data are available between 0:00:00 and 15:30:00 on 8/7/97 due to QAQC, and
transport to the field.
c) No data are available between 15:30:00 and 23:30:00 on 8/20/97 due to transport from the field, QAQC, and maintenance.
d) No data are available between 00:0:00 on 8/21/97 and 23:30:00 on 8/31/97
because no operational datalogger was available for deployment.
e) No DO data was collected during this deployment because no operational DO
probe was available

September 1997, File name: NS0997

a) No data are available between 0:00:00 on 9/1/97 and 23:30:00 on 9/24/97
because no operational datalogger was available for deployment.
b) No data are available between 0:00:00 and 15:30:00 on 9/25/97 due to QAQC and
transport to the field.
c) No dissolved oxygen data are available because there was no operational DO
probe available.

October 1997, File name: NS1097

a) No data are available between 02:30:00 and 23:30:00 on 10/12/97 due to transport from the field, QA/QC testing, and maintenance.
b) No data are available between 0:00:00 on 10/13/97 and 23:30:00 on 10/31/97
because no operational datalogger was available for deployment.
c) No dissolved oxygen data is available because there was no operational DO
probe available.

November 1997, File name: NS1197

a) No data are available between 0:00:00 on 11/1/97 and 23:30:00 on 11/17/97
because no operational datalogger was available for deployment.
b) No data are available between 0:00:00 and 14:30:00 on 11/18/97 due to QAQC
and transport to the field.

c) No dissolved oxygen data is available because there was no operational DO
probe available.

December 1997, File name: NS1297

a) No data are available between 13:30:00 and 23:30:00 on 12/3/97 due to transport from the field, QAQC, and maintenance.
b) No data are available between 0:00:00 on 12/4/97 and 23:30:00 on 12/31/97
because the sampling season had ended and no dataloggers were deployed.
c) No dissolved oxygen data is available because there was no operational DO
probe available.

12. Other remarks/Notes:
None.