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2006 Great Bay Water Quality (DataSonde) Monitoring Program

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A Final Report to

The New Hampshire Estuaries Project

Submitted by

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Table of Contents

Introduction	2
Project Goals and Objectives	2
Methods	2
Results and Discussion	3
Conclusions and Recommendations	4
References	4
Appendix 1 (Meta-Data)	5
Appendix 2 (Data CD)	Inside Back Cover

Introduction

In situ water quality assessment has become an important source of data for monitoring, research and management activities in estuaries nationwide. As part of the National Estuarine Research Reserve System, the Great Bay System-Wide Monitoring Program (SWMP) produces *in situ* water quality data for four sites in and around Great Bay. This project extends the SWMP program to include year-round *in situ* data for a station at the University of New Hampshire Coastal Marine Lab pier at the mouth of the Piscataqua River and summer data for a station in the Salmon Falls (SF) River. This suite of stations provides a comprehensive *in situ* sampling array that monitors the major rivers and open estuary locations within the Great Bay estuarine system.

Project Goals and Objectives

UNH completed this project under contract to the NH Estuaries Project (Project ID #05-M-9). The project goals and objectives per the contract were to:

- (1) support *in situ* water quality monitoring for the April – December sampling season at the Lamprey River (LR), Squamscott River (SQ), Oyster River (OR), Great Bay (GB) and Coastal Marine Lab (CML) sites; and
- (2) fund the deployment of *in situ* water quality monitoring at the Salmon Falls (SF) for July, August and September.

The final work product was agreed to be a series of Excel data files containing monthly data records for each of these sites along with appropriate meta-data for these data.

Methods

The methods for this project followed the procedures prescribed by the National Estuarine Research Reserve Central Data Management Office (CDMO) and detailed in Small et al. (2003).

Briefly, YSI 660 DataSondes are programmed to obtain measurements of specific conductivity, salinity, dissolved oxygen, percent saturation, pH, temperature, water level, and turbidity every half-hour. The instruments are deployed continuously during ice-free seasons, except for brief periods when they are removed for cleaning, maintenance and recalibration. Pre and post-deployment calibrations are performed using the diagnostics menu of the YSI Ecowatch program and QA/QC

procedures developed by NERR Research Coordinators and YSI engineers. VWR conductivity and pH standards are used for calibration. YSI formazin is used to calibrate turbidity probes.

DataSondes are deployed approximately one meter from the bottom and recovered for data download every 2-4 weeks depending upon the time of year. Files are first examined and graphed using Ecowatch software. Missing and/or anomalous data are noted. Files are then transferred to a Macintosh computer and opened in Excel software and edited. Missing data due to routine YSI maintenance and probe failure or communication errors noted. Files are verified by means of CDMO Excel macros.

The CDMO cdmomac3.xls macro allows the user to automatically format column widths to the correct number decimal places based on the YSI sensor specifications. It also allows the user to QA/QC each data logger generated file for missing data points, and find all data points that fall outside the range of what the datalogger is designed to measure (outliers). The CDMO import.xls macro will allow PC users with 30-minute data to automatically create a monthly Excel file from a two-week deployment. In addition, in November 1999 a graphing capability was added to this macro allowing users to produce single parameter and missing point graphs on a monthly basis. All files are graphed in Excel and examined in order that anomalous data points can be identified and removed.

Results and Discussion

Data for the DataSondes deployed as part of the NERRS SWMP program have been submitted and accepted by the NERRS CDMO. So as not to create potentially different data sets (CDMO potentially modifies the data that are submitted to them), the data and all associated meta-data for the GB, LR, SQ and OR sites are available at <http://cdmo.baruch.sc.edu/home.html> and by following the links to: (a) NERR Data; (b) NERR Data and Associated Metadata; (c) NERR SWMP Water Quality Data; and (d) Great Bay (GRB).

For the CML site, DataSondes were successfully deployed as follows:

Site/Sonde	deploy date	time	retrieve date	time
CML	11/23/2005	900	1/20/2006	900
CML	1/20/2006	1000	3/17/2006	830
CML	3/17/2006	1400	5/4/2006	830
CML	5/4/2006	1300	6/6/2006	1430
CML	6/6/2006	1500	6/28/2006	1300
CML	6/28/2006	1330	7/25/2006	1530
CML	7/25/2006	1600	8/28/2006	1530
CML	8/28/2006	1600	9/26/2006	1530
CML	9/26/2006	1600	10/24/2006	1230
CML	10/24/2006	1300	12/6/2006	1530
CML	12/6/2006	1530	1/18/2007	1500

For the SF site, DataSondes were successfully deployed as follows:

Site	deploy date	time	retrieve date	time
SF	7/6/2006	1030	7/28/2006	1300
SF	7/28/2006	1400	9/6/2006	1200
SF	9/6/2005	1230	10/16/2006	930

The CD included with this report contains the following information for the CML and SF DataSonde deployments: (a) raw data files; (b) edited data files (these are the files that should be used and distributed); and (c) meta-data, calibration and deployment files.

Conclusions and Recommendations

The *in situ* water quality monitoring program provides important data on basic water quality parameters in the Great Bay estuary. The CML site at the mouth of the Piscataqua River provides particularly critical information on the marine 'end-member' for the Great Bay system necessary for modeling and other integrative studies. The SF site provides important information on water quality during the critical summer period when dissolved oxygen levels may potentially decrease. When combined with the NERRS SWMP DataSonde program, these instruments provide comprehensive coverage of the Great Bay estuary.

References

Tamara D. Small, Ashly D. Norman, Danna D. Swain, Jesse Friedmann and Dwayne E. Porter. (2003) CDMO NERR SWMP DATA MANAGEMENT MANUAL Version 5.0 (December 2003). NOAA National Estuarine Research Reserve, Centralized Data Management Office, Georgetown, SC.

2006 Water Quality (DataSonde) Monitoring Program Meta-Data (Appendix 1)

Research Methods

Datasondes are programmed to obtain measurements of specific conductivity, salinity, dissolved oxygen, percent saturation, pH, temperature, water level, and turbidity every half-hour. The instruments are deployed continuously during ice-free seasons, except for brief periods when they are removed for cleaning, maintenance and recalibration. Pre and post-deployment calibrations are performed using the diagnostics menu of the YSI Ecowatch program and QA/QC procedures developed by NERR Research Coordinators and YSI engineers. VWR conductivity and pH standards are used for calibration. YSI formazin is used to calibrate turbidity probes.

YSI 6600 datasondes are deployed approximately one meter from the bottom and recovered for data download every 2-4 weeks depending upon the time of years. Files are first examined and graphed using Ecowatch software. Missing and/or anomalous data are noted. Files are then transferred to a Macintosh computer and opened in Excel software and edited. Missing data due to routine YSI maintenance and probe failure or communication errors are inserted into the spreadsheet. Edited files are merged to contain one full month of data. Files are verified by means of CDMO Excel macros. The CDMO `cdmomac3.xls` macro will allow the user to automatically format column widths to the correct number decimal places based on the YSI sensor specifications. It also allows the user to QA/QC each data logger generated file for missing data points, fill all cells that do not contain data with periods, and find all data points that fall outside the range of what the datalogger is designed to measure (outliers). The CDMO `import.xls` macro will allow PC users with 30-minute data to automatically create a monthly Excel file from a two-week deployment and insert periods for missing data. Edited files are merged to contain one full month of data. In addition, in November 1999 a graphing capability was added to this macro allowing users to produce single parameter and missing point graphs on a monthly basis. All files are graphed in Excel and examined in order that anomalous data points can be identified.

Dissolved Oxygen Qualifier: 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. 2001). Many reserves have upgraded to the YSI 6600 EDS data sondes, which increases 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, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. 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.

Missing or Anomalous Data CML 2006

Anomalous or Suspect Data:

1st deployment 1/1/06-1/20/06

Dissolved oxygen is high for the site, but was retained. Both pre and post deployment calibrations passed

Decreases in pH and salinity values in the middle of May 2006 were caused by the Mother's Day storm, during which 308mm of rain fell over several days.

The pH values drift downward during the deployment that ended 7/25. This may have been the result of fouling because the probe passed the post calibration test.

Shortly after the sonde was deployed on 10/24, the pH probe malfunctioned and began recording numbers much lower than normal. All pH data after approximately 10/25 are probably erroneous. The probe was the flat glass top type, which is known to have problems.

Deleted Data:

The pH probe failed on 2/25. 964 data points were removed. They ranged from 4.78 to 5.89. No pH data 2/25 700 to 3/17 830.

For unknown reasons, the DO probe malfunctioned mid-deployment, then recovered. The DO probe passed post deployment calibration. The following data were removed

Date	Time	DO%	DO Conc
M/D/Y	hh:mm:ss	%	mg/L
2/6/06	17:30:00	89.7	9.99
2/6/06	18:00:00	79.8	8.8
2/6/06	18:30:00	64.4	6.98
2/6/06	19:00:00	-5.6	-0.6
2/6/06	19:30:00	-50	-5.36
2/6/06	20:00:00	-50	-5.36
2/6/06	20 30:00	-50	-5.27
2/6/06	21:00:00	-50	-5.55
2/6/06	21:30:00	-50	-5.42
2/6/06	22:00:00	-50	-5.37
2/6/06	22:30:00	500	53.94
2/6/06	23:00:00	-50	-5.44
2/6/06	23:30:00	-50	-5.5
2/7/06	0:00:00	-50	-5.55
2/7/06	0:30:00	-50	-5.6
2/7/06	1:00:00	-50	-5.67
2/7/06	1:30:00	-50	-5.72
2/7/06	2:00:00	-50	-5.77
2/7/06	2:30:00	-50	-5.79
2/7/06	3:00:00	-50	-5.72
2/7/06	3:30:00	-50	-5.73
2/7/06	4:00:00	-50	-5.73
2/7/06	4:30:00	-50	-5.75
2/7/06	5:00:00	-50	-5.62
2/7/06	5:30:00	-50	-5.57
2/7/06	6:00:00	-50	-5.48
2/7/06	6:30:00	-50	-5.44
2/7/06	7:00:00	-50	-5.36
2/7/06	7:30:00	-50	-5.39
2/7/06	8:00:00	-50	-5.32
2/7/06	8:30:00	-50	-5.31
2/7/06	9:00:00	-50	-5.46

2/7/06	9:30:00	-50	-5.4
2/7/06	10:00:00	-50	-5.35
2/7/06	10:30:00	-50	-5.33
2/7/06	11:00:00	-50	-5.37
2/7/06	11:30:00	-50	-5.44
2/7/06	12:00:00	-50	-5.48
2/7/06	12:30:00	-50	-5.55
2/7/06	13:00:00	-50	-5.6
2/7/06	13:30:00	-50	-5.68
2/7/06	14:00:00	-50	-5.74
2/7/06	14:30:00	-50	-5.77
2/7/06	15:00:00	-50	-5.81
2/7/06	15:30:00	-50	-5.82
2/7/06	16:00:00	-50	-5.81
2/7/06	16:30:00	-50	-5.79
2/7/06	17:00:00	-50	-5.84
2/7/06	17:30:00	-50	-5.76
2/7/06	18:00:00	-50	-5.73
2/7/06	18:30:00	-50	-5.59
2/7/06	19:00:00	-50	-5.51
2/7/06	19:30:00	-50	-5.34
2/7/06	20:00:00	-50	-5.36
2/7/06	20:30:00	-50	-5.28
2/7/06	21:00:00	-50	-5.31
2/7/06	21:30:00	-50	-5.28
2/7/06	22:00:00	-50	-5.19
2/7/06	22:30:00	-50	-5.44
2/7/06	23:00:00	-50	-5.38
2/7/06	23:30:00	-50	-5.33
2/8/06	0:00:00	-50	-5.37
2/8/06	0:30:00	-50	-5.39
2/8/06	1:00:00	-50	-5.45
2/8/06	1:30:00	-50	-5.5
2/8/06	2:00:00	-50	-5.56
2/8/06	2:30:00	-50	-5.63
2/8/06	3:00:00	-50	-5.67
2/8/06	3:30:00	-50	-5.69
2/8/06	4:00:00	-50	-5.61
2/8/06	4:30:00	-50	-5.66
2/8/06	5:00:00	-50	-5.63
2/8/06	5:30:00	-50	-5.62
2/8/06	6:00:00	-50	-5.53
2/8/06	6:30:00	-50	-5.51
2/8/06	7:00:00	-50	-5.43
2/8/06	7:30:00	-50	-5.31
2/8/06	8:00:00	-50	-5.3
2/8/06	8:30:00	-50	-5.27
2/8/06	9:00:00	-50	-5.43
2/8/06	9:30:00	-50	-5.33
2/8/06	10:00:00	-50	-5.36
2/8/06	10:30:00	-50	-5.37

2/8/06	11:00:00	-50	-5.33
2/8/06	11:30:00	-50	-5.28
2/8/06	12:00:00	-50	-5.29
2/8/06	12:30:00	-50	-5.36
2/8/06	13:00:00	-50	-5.41
2/8/06	13:30:00	-50	-5.47
2/8/06	14:00:00	-50	-5.52
2/8/06	14:30:00	-50	-5.58
2/8/06	15:00:00	-50	-5.65
2/8/06	15:30:00	-50	-5.7
2/8/06	16:00:00	-50	-5.75
2/8/06	16:30:00	-44.1	-5.1
2/8/06	17:00:00	-50	-5.79
2/8/06	17:30:00	-50	-5.74
2/8/06	18:00:00	-50	-5.77
2/8/06	18:30:00	-50	-5.7
2/8/06	19:00:00	-50	-5.69
2/8/06	19:30:00	-50	-5.59
2/8/06	20:00:00	-50	-5.49
2/8/06	20:30:00	-50	-5.37
2/8/06	21:00:00	-50	-5.32
2/8/06	21:30:00	-50	-5.26
2/8/06	22:00:00	-50	-5.23
2/8/06	22:30:00	-50	-5.26
2/8/06	23:00:00	-50	-5.49
2/8/06	23:30:00	-50	-5.41
2/9/06	0:00:00	-50	-5.36
2/9/06	0:30:00	-50	-5.32
2/9/06	1:00:00	-50	-5.34
2/9/06	1:30:00	-50	-5.38
2/9/06	2:00:00	-50	-5.45
2/9/06	2:30:00	-50	-5.49
2/9/06	3:00:00	-50	-5.53
2/9/06	3:30:00	-50	-5.61
2/9/06	4:00:00	-50	-5.64
2/9/06	4:30:00	-50	-5.69
2/9/06	5:00:00	-50	-5.59
2/9/06	5:30:00	-50	-5.64
2/9/06	6:00:00	-50	-5.63
2/9/06	6:30:00	-50	-5.57
2/9/06	7:00:00	-50	-5.57
2/9/06	7:30:00	-50	-5.36
2/9/06	8:00:00	-50	-5.38
2/9/06	8:30:00	-50	-5.27
2/9/06	9:00:00	-50	-5.27
2/9/06	9:30:00	-50	-5.25
2/9/06	10:00:00	-50	-5.35
2/9/06	10:30:00	-50	-5.3
2/9/06	11:00:00	-50	-5.23
2/9/06	11:30:00	-50	-5.35
2/9/06	12:00:00	-50	-5.27

2/9/06	12:30:00	-50	-5.27
2/9/06	13:00:00	-50	-5.29
2/9/06	13:30:00	-50	-5.34
2/9/06	14:00:00	-50	-5.39
2/9/06	14:30:00	-50	-5.44
2/9/06	15:00:00	-50	-5.5
2/9/06	15:30:00	-50	-5.56
2/9/06	16:00:00	-50	-5.64
2/9/06	16:30:00	-50	-5.68
2/9/06	17:00:00	-50	-5.72
2/9/06	17:30:00	-50	-5.78
2/9/06	18:00:00	-50	-5.71
2/9/06	18:30:00	-50	-5.71
2/9/06	19:00:00	-50	-5.73
2/9/06	19:30:00	-50	-5.67
2/9/06	20:00:00	-50	-5.57
2/9/06	20:30:00	-50	-5.54
2/9/06	21:00:00	-50	-5.48
2/9/06	21:30:00	-50	-5.38
2/9/06	22:00:00	-50	-5.35
2/9/06	22:30:00	-50	-5.31
2/9/06	23:00:00	-50	-5.31
2/9/06	23:30:00	-50	-5.3
2/10/06	0:00:00	-50	-5.46
2/10/06	0:30:00	-50	-5.4
2/10/06	1:00:00	-50	-5.34
2/10/06	1:30:00	-50	-5.35
2/10/06	2:00:00	-50	-5.39
2/10/06	2:30:00	-50	-5.43
2/10/06	3:00:00	-50	-5.49
2/10/06	3:30:00	-50	-5.53
2/10/06	4:00:00	-50	-5.59
2/10/06	4:30:00	-50	-5.65
2/10/06	5:00:00	-50	-5.68
2/10/06	5:30:00	-50	-5.72
2/10/06	6:00:00	-50	-5.65
2/10/06	6:30:00	-50	-5.7
2/10/06	7:00:00	-43.4	-4.95
2/10/06	7:30:00	-29.7	-3.34
2/10/06	8:00:00	4.5	0.51
2/10/06	8:30:00	-22.2	-2.43
2/10/06	9:00:00	-50	-5.33
2/10/06	9:30:00	-26.5	-2.83
2/10/06	10:00:00	-50	-5.31
2/10/06	10:30:00	-17.2	-1.85
2/10/06	11:00:00	-21.1	-2.27
2/10/06	11:30:00	-16.3	-1.74
2/10/06	12:00:00	-18.8	-2.02
2/10/06	12:30:00	-21.5	-2.29
2/10/06	13:00:00	-13	-1.38
2/10/06	13:30:00	-50	-5.3

2/10/06	14:00:00	-44.6	-4.77
2/10/06	14:30:00	-25.1	-2.72
2/10/06	15:00:00	-50	-5.47
2/10/06	15:30:00	-50	-5.54
2/10/06	16:00:00	-50	-5.59
2/10/06	16:30:00	-41.2	-4.67
2/10/06	17:00:00	-50	-5.72
2/10/06	17:30:00	-50	-5.76
2/10/06	18:00:00	-50	-5.81
2/10/06	18:30:00	-50	-5.84
2/10/06	19:00:00	-50	-5.78
2/10/06	19:30:00	-50	-5.79
2/10/06	20:00:00	-50	-5.8
2/10/06	20:30:00	-23.4	-2.7
2/10/06	21:00:00	-27	-3.06
2/10/06	21:30:00	-50	-5.6
2/10/06	22:00:00	-50	-5.54
2/10/06	22:30:00	-50	-5.39
2/10/06	23:00:00	-50	-5.41
2/10/06	23:30:00	-50	-5.39
2/11/06	0:00:00	-50	-5.31
2/11/06	0:30:00	-50	-5.27
2/11/06	1:00:00	-42.2	-4.66
2/11/06	1:30:00	-50	-5.39
2/11/06	2:00:00	-50	-5.38
2/11/06	2:30:00	-50	-5.36
2/11/06	3:00:00	-47.6	-5.14
2/11/06	3:30:00	-50	-5.44
2/11/06	4:00:00	-50	-5.5
2/11/06	4:30:00	-50	-5.55
2/11/06	5:00:00	-49.6	-5.56
2/11/06	5:30:00	-37	-4.19
2/11/06	6:00:00	-50	-5.7
2/11/06	6:30:00	-50	-5.66
2/11/06	7:00:00	-50	-5.67
2/11/06	7:30:00	-50	-5.69
2/11/06	8:00:00	-50	-5.62
2/11/06	8:30:00	-41.8	-4.69
2/11/06	9:00:00	-28.8	-3.15
2/11/06	9:30:00	-30	-3.17
2/11/06	10:00:00	-50	-5.31
2/11/06	10:30:00	10.5	1.11
2/11/06	11:00:00	-45.2	-4.8
2/11/06	11:30:00	-46.5	-5
2/11/06	12:00:00	-22.8	-2.43
2/11/06	12:30:00	-50	-5.27
2/11/06	13:00:00	-23.6	-2.53
2/11/06	13:30:00	-30.5	-3.18
2/11/06	14:00:00	-43.7	-4.61
2/11/06	14:30:00	-48.9	-5.18
2/11/06	15:00:00	-44.4	-4.71

2/11/06	15:30:00	-26.2	-2.84
2/11/06	16:00:00	-29.1	-3.17
2/11/06	16:30:00	-14.7	-1.63
2/11/06	17:00:00	1.3	0.15
2/11/06	17:30:00	-26.4	-2.97
2/11/06	18:00:00	-29.6	-3.37
2/11/06	18:30:00	-50	-5.74
2/11/06	19:00:00	-50	-5.77
2/11/06	19:30:00	-50	-5.75
2/11/06	20:00:00	-50	-5.74
2/11/06	20:30:00	-50	-5.73
2/11/06	21:00:00	-50	-5.71
2/11/06	21:30:00	-50	-5.63
2/11/06	22:00:00	-50	-5.58
2/11/06	22:30:00	-50	-5.49
2/11/06	23:00:00	-50	-5.36
2/11/06	23:30:00	-50	-5.34
2/12/06	0:00:00	-50	-5.35
2/12/06	0:30:00	-50	-5.31
2/12/06	1:00:00	-50	-5.35
2/12/06	1:30:00	-50	-5.23
2/12/06	2:00:00	-50	-5.49
2/12/06	2:30:00	-50	-5.35
2/12/06	3:00:00	-50	-5.34
2/12/06	3:30:00	-50	-5.36
2/12/06	4:00:00	-50	-5.4
2/12/06	4:30:00	-50	-5.43
2/12/06	5:00:00	-50	-5.46
2/12/06	5:30:00	-50	-5.52
2/12/06	6:00:00	-50	-5.58
2/12/06	6:30:00	-50	-5.61
2/12/06	7:00:00	-50	-5.61
2/12/06	7:30:00	-50	-5.58
2/12/06	8:00:00	-50	-5.6
2/12/06	8:30:00	-50	-5.51
2/12/06	9:00:00	-50	-5.44
2/12/06	9:30:00	-50	-5.38
2/12/06	10:00:00	-50	-5.36
2/12/06	10:30:00	-50	-5.4
2/12/06	11:00:00	-50	-5.34
2/12/06	11:30:00	-50	-5.36
2/12/06	12:00:00	-50	-5.34
2/12/06	12:30:00	-50	-5.35
2/12/06	13:00:00	-50	-5.35
2/12/06	13:30:00	-50	-5.42
2/12/06	14:00:00	-50	-5.43
2/12/06	14:30:00	-50	-5.41
2/12/06	15:00:00	-50	-5.4
2/12/06	15:30:00	-50	-5.42
2/12/06	16:00:00	-50	-5.45
2/12/06	16:30:00	-50	-5.5

2/12/06	17:00:00	-50	-5.54
2/12/06	17:30:00	-50	-5.58
2/12/06	18:00:00	-50	-5.62
2/12/06	18:30:00	-50	-5.66
2/12/06	19:00:00	-50	-5.7
2/12/06	19:30:00	-50	-5.72
2/12/06	20:00:00	-50	-5.74
2/12/06	20:30:00	-50	-5.77
2/12/06	21:00:00	-50	-5.77
2/12/06	21:30:00	-50	-5.77
2/12/06	22:00:00	-50	-5.69
2/12/06	22:30:00	-50	-5.67
2/12/06	23:00:00	-50	-5.57
2/12/06	23:30:00	-50	-5.57
2/13/06	0:00:00	-50	-5.52
2/13/06	0:30:00	-50	-5.54
2/13/06	1:00:00	-50	-5.54
2/13/06	1:30:00	-50	-5.54
2/13/06	2:00:00	-50	-5.59
2/13/06	2:30:00	-50	-5.53
2/13/06	3:00:00	-50	-5.55
2/13/06	3:30:00	-50	-5.53
2/13/06	4:00:00	-49.3	-5.5
2/13/06	4:30:00	-27	-3.03
2/13/06	5:00:00	23.2	2.62

The following turbidity data were out of range and deleted.

3/16/06	20:30:00	3385.2
7/12/06	5:30:00	1357.7
7/12/06	6:00:00	1375.3
7/13/06	19:30:00	1462.3
9/26/06	19:00:00	2028
9/30/06	23:00:00	2029.6
10/5/06	13:00:00	1380.4
10/8/06	0:00:00	2024.8
10/9/06	4:30:00	2025.3
10/10/06	5:00:00	2026.1
10/10/06	5:30:00	2026.1
10/10/06	7:00:00	1226.9
10/11/06	9:00:00	2023.8
10/12/06	12:00:00	1026.7
10/12/06	23:00:00	2021.7
10/14/06	0:30:00	1475.5
10/17/06	18:00:00	2027.7
10/18/06	2:00:00	2030.5
10/19/06	18:30:00	2027.9
10/19/06	19:00:00	2027.8

The pH probe failed on 2/25. 964 data points were removed. They ranged from 4.78 to 5.89.to 3/17 830.

DO values began to decline during the deployment that started 9/26. The values became negative on 10/12. All negative numbers have been removed from the file. There were 556 negative DO% data points that ranged from -44.9 to -0.1. Corresponding DO mg/L data were also deleted. Because the DO probe failed the post deployment calibration, any DO data from this deployment should be considered suspect because it is not known at what point the probe failed. No DO data 10/12 2100 to 10/24 1230.

The DO data for the 10/24 to 12/6 deployment are aberrant in that the DO% starts out at 79%, drifts downward, then the following data were recorded (and deleted from the file),

11/5/06	16:30:00	-30.9	-3.01
11/5/06	17:00:00	-50	-4.88
11/5/06	17:30:00	-50	-4.93
11/5/06	18:00:00	190.4	18.87

After these erroneous readings occurred, the data returned to more normal levels, and the probe passed post deployment calibration. It is unknown what caused these events.

Missing Data:

2nd deployment 1/20/06-3/17/06

The sonde was retrieved on 5/4 but stopped recording on 3/17.

Upon retrieval the batteries and memory storage were checked and found to be okay.

However, the sonde had ceased communicating with its batteries on 3/17. It functioned well back in the lab on AC power. Instrument was returned to YSI for repair.

No data 3/17/06 900 to 5/4/06 1230

During the deployment that began on 7/25, the sonde stopped recording on 8/19. This was discovered after it was retrieved on 8/28. The batteries still had 89 days on them, so the reason for the missing data is unknown.

No data 8/19 2300 to 8/28 1530

During the deployment that began on 8/28, the sonde ceased recording on 9/17. The reason for this was not determined, as the instrument functioned well in the lab and the batteries were still strong.

No data 9/17 1630 to 9/26 1530.

Notes

On 10/24 the CML sonde was moved from its fixed position on a pier that was to be torn down. It was placed in a new location, on a floating dock.

After 10/24/06 the tidal records are incorrect because the instrument was moving with the dock.

Monthly Precipitation Totals (mm)

January	109.6
February	72.3
March	21.4
April	102.7
May	430.4
June	227.1

July	107.8
August	119.6
September	78.4
October	151
November	162.7
December	85.8

Missing or Anomalous

SF Data 2006

Anomalous Data:

During the periods 7/13 to 7/17 and to a lesser degree, 7/24 to 7/26 there are dramatic changes in the data. This was the result of 3 and 1 inch of rain falling during those dates.

Salinity, temperature and pH drop noticeably, turbidity and dissolved oxygen increase.

The data are accurate and were retained.

During the deployment that began 7/28, dissolved oxygen values gradually decrease to abnormal levels. Any DO data recorded after approximately 8/3 should be considered suspect but were retained.

The sonde had a satisfactory post deployment calibration with the DO probe reading 99% in water saturated air. The low DO readings were probably due to sediment and turbidity at the site.

Similarly, the DO data declined gradually during the deployment which began 9/6. The sonde had a new DO probe and both pre and post calibrations were satisfactory.

The data were retained.

The decrease in salinity values to near zero starting on October 12 were caused by a storm that dropped 39 mm of rain on 10/12.

Deleted Data:

Deleted data

The following turbidity values were out of range and deleted

Date	Time	Turb
8/6/06	11:30:00	2497
8/6/06	18:00:00	2502.4
8/11/06	19:30:00	1242.9
8/12/06	13:30:00	1183.9
8/12/06	14:30:00	1035
8/12/06	15:00:00	1204.8
8/12/06	15:30:00	1416.2
8/12/06	16:00:00	1248.9
8/12/06	16:30:00	1322.3
8/12/06	17:00:00	1188.9
8/12/06	17:30:00	1328.1
8/12/06	18:00:00	1363.4
8/12/06	18:30:00	1355.1

8/12/06	19:00:00	1263.2
8/12/06	20:00:00	1056
8/12/06	20:30:00	1160.5
8/12/06	21:00:00	1296
8/12/06	21:30:00	1078.5
8/12/06	22:00:00	1351.2
8/12/06	22:30:00	1628.6
8/12/06	23:00:00	1183.9
8/13/06	3:00:00	1005.3
8/13/06	3:30:00	1010.7
8/13/06	4:00:00	1078.5
8/13/06	4:30:00	1204
8/13/06	5:00:00	1295.4
8/13/06	5:30:00	1318.9
8/13/06	6:00:00	1110.1
8/13/06	6:30:00	1153.9
8/13/06	8:30:00	1088.1
8/13/06	9:00:00	1281.1
8/13/06	9:30:00	1138.8
8/13/06	11:00:00	1184.5
8/13/06	15:00:00	1181.3
8/13/06	17:30:00	1022
8/13/06	19:30:00	1027.3
8/13/06	21:00:00	1031.4
8/13/06	22:00:00	1218.9
8/13/06	22:30:00	1293.2
8/13/06	23:00:00	1263.1
8/14/06	0:00:00	1493.6
8/14/06	3:00:00	1027
8/14/06	4:00:00	1111.4
8/14/06	4:30:00	1090.6
8/14/06	5:00:00	1100.9
8/14/06	5:30:00	1191.2
8/14/06	6:00:00	1667.5
8/14/06	6:30:00	1462.1
8/14/06	7:00:00	1072
8/14/06	7:30:00	1233.7
8/14/06	10:00:00	1535.4
8/14/06	15:00:00	1085
8/14/06	17:30:00	1087.2
8/14/06	18:30:00	1213.3
8/15/06	0:30:00	1144.7
8/15/06	4:00:00	1115.6
8/27/06	6:00:00	1419.2
8/29/06	8:00:00	2461.4
9/14/06	22:00:00	1973.6
9/14/06	23:00:00	1188
9/15/06	9:00:00	1970
9/15/06	10:00:00	1971.1

9/15/06	11:00:00	1966.7
9/15/06	21:00:00	1984.7
9/16/06	10:00:00	1976.5
9/17/06	10:30:00	1987.7
9/17/06	12:00:00	1988
9/18/06	12:30:00	1998.6
9/20/06	13:30:00	2005.7
9/21/06	14:00:00	1998.3
9/25/06	5:00:00	1292.7
9/27/06	0:30:00	1956.7
9/27/06	19:30:00	1959.4
9/27/06	20:30:00	1009.3
9/28/06	7:30:00	1513.9
9/28/06	8:00:00	1340.9
9/28/06	8:30:00	1202.2
9/29/06	8:30:00	1781.3
9/29/06	18:00:00	1038.9
9/29/06	20:00:00	1640.4
9/29/06	20:30:00	1156.2
9/29/06	21:00:00	1424.7
9/29/06	21:30:00	1260.2
9/30/06	21:00:00	1741.3
9/30/06	22:30:00	1956.5
9/30/06	23:00:00	1083
10/1/06	21:30:00	1696.2
10/1/06	23:00:00	1843.4
10/2/06	22:00:00	1937
10/2/06	22:30:00	1266.3
10/3/06	23:30:00	1727.5
10/4/06	7:00:00	1491
10/4/06	11:30:00	1622.4
10/4/06	19:00:00	1672.3
10/5/06	0:30:00	1674.6
10/5/06	8:00:00	1789.5
10/6/06	1:00:00	1718.6
10/6/06	2:00:00	1398.1
10/6/06	8:30:00	1932.1
10/6/06	9:00:00	1474.8
10/6/06	13:30:00	1717.6
10/6/06	15:00:00	1892
10/6/06	21:30:00	1574.5
10/7/06	1:30:00	1919.1
10/7/06	2:00:00	1437.3
10/7/06	4:00:00	1909.3
10/7/06	9:00:00	1915.6
10/7/06	9:30:00	1321.8
10/7/06	16:00:00	1914.3
10/7/06	22:00:00	1910.7
10/7/06	22:30:00	1353.8

10/8/06	3:30:00	1582.7
10/8/06	5:00:00	1418
10/8/06	9:30:00	1908.9
10/8/06	10:00:00	1212
10/8/06	15:00:00	1372.9
10/8/06	15:30:00	1088.9
10/8/06	23:30:00	1814.9
10/9/06	5:30:00	1586.4
10/9/06	16:30:00	1911.7
10/9/06	18:00:00	1916.1
10/9/06	18:30:00	1357.2
10/10/06	18:00:00	1199.6
10/10/06	19:30:00	1600.2
10/11/06	0:30:00	1918.3
10/11/06	8:00:00	1911.5
10/11/06	18:00:00	1915.5
10/11/06	18:30:00	1239
10/11/06	20:00:00	1406.8
10/12/06	6:00:00	1912.5
10/12/06	6:30:00	1402.6
10/12/06	8:00:00	1910
10/12/06	9:00:00	1096.2
10/12/06	18:00:00	1361.4
10/12/06	21:00:00	1066.3
10/12/06	23:30:00	1901.9

Notes

Precipitation totals for deployment months. (mm)

July	107.8
August	119.6
September	78.4
October	14.8