

Padilla Bay NERR Water Quality Metadata

Bay View Channel site: January to December 1996

Joe Leary Slough site: January to December 1996

No Name Slough site: August to December 1996

Latest Update: August 28, 2001

I. Data Set and Research Descriptors

1. Principal investigator and contact persons

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2. Entry verification

The data are downloaded from the YSI 6000s to an IBM compatible PC. Graphs of all data are printed using PC6000 software and are examined for suspect, anomalous, or outlying data. Files are converted to Macintosh Excel files and edited for transfer to the NERRS CDMO. Files are merged to contain one full month of data. Missing data (from maintenance and downloading down time) are inserted into the spreadsheet and are denoted by a period (.). Suspect data are deleted and replaced by periods (.). After formatting the data, some files are more closely checked for anomalies in DeltaGraph Pro". Edited and raw files are archived on a Macintosh hard drive at Padilla Bay NERR.

3. Research Objectives

The Bay View Channel YSI 6000 has been set out to detect and monitor short-term variability and long-term changes in Padilla Bay. The Joe Leary Slough YSI 6000 has been set at the mouth of the slough to measure the effects of tidal "closure" of the tide gates on water in the slough and to detect long-term changes in water quality in the slough associated with implementation of a watershed action plan. The No Name Slough YSI 6000 has been set at the mouth of

No Name Slough to detect seasonal and long-term changes in water quality of the slough associated with residential development in the watershed and changes associated with experimental farming methods designed to reduce non-point source pollution to No Name Slough. Measurements are taken every 30 minutes at both sites unless otherwise noted in data anomalies.

4. Research methods

A YSI 6000 was deployed in Joe Leary Slough in a vertical position, 0.25 m above the bottom of the slough, in a 4 in. diameter PVC pipe which has holes and slits drilled in it to allow water circulation around the probes. The PVC pipe is attached to a steel pipe which was driven into the sediment.

A YSI 6000 was deployed in Padilla Bay in a tributary of Bayview Channel. It was deployed using the same design as that in Joe Leary Slough, except that the PVC pipe was attached to two steel pipes. The depth of the YSI 6000 probes during the first half of 1996 is not known because of a "catch" in the chain that was discovered during the summer of 1996 and corrected July 12, 1996. Approximate depth was about 0.5 to 1.0 m above chart datum (0.0 m, MLLW) and about 2 m above the bottom from January 1 to July 12, 1996. The depth of the YSI 6000 from July 12 to December 31, 1996 was -1.1 m (depth below MLLW) and about 0.75 m above the bottom along the sloping edge of a small channel draining the surrounding intertidal flats.

A YSI 6000 was deployed in No Name Slough using the same design as that in Joe Leary Slough, except that the PVC pipe was attached to a piling supporting a pumphouse in front of the tide gates. The YSI 6000 sensors are about 0.20 m above the bottom.

In all cases, measurements of temperature, specific conductivity, salinity, percent saturation, dissolved oxygen, depth and pH are recorded every half-hour. At the end of each sampling period, the YSI 6000 is brought back into the laboratory for downloading, cleaning, and recalibration.

All calibrations are conducted according to the protocols in the YSI 6000 Operation and Service Manual. For the conductivity calibration a conductivity standard of 50 mS/cm was used from Jan96 through Nov96 and 10 mS/cm was used during Dec96. The pH calibration is a 2 point calibration using standard pH buffer solutions with a pH of 7 and 10. The KCl solution and teflon membrane on the dissolved oxygen probe are changed prior to each YSI 6000 deployment and the new oxygen membrane is allowed to soak overnight in water before calibration.

5. Site location and character

General Padilla Bay (48 30' N; 122 30' W) is a shallow embayment in northern Puget Sound. The tide flats are dominated by the eelgrass *Zostera marina*, which covers approximately 3,000 ha. *Zostera japonica*, a recent invader to the region, now covers about 350 ha of the bay. Tides are mixed semi-diurnal with a mean range of 1.55m. Salinity varies from about 15 to 30 o/oo.

Padilla Bay is an "orphaned" estuary in that the Skagit River no longer empties directly into it. Most of the land in the Padilla Bay watershed is agricultural, and is drained by four sloughs, which empty into the bay. Padilla Bay also receives fresh water from the Fraser and Nooksack Rivers to the north and from the Skagit River to the south. These rivers flow into Puget Sound and the Strait of Georgia in which Padilla Bay is located.

Joe Leary Slough Site (48 31' 05" N; 122 28' 25" W) Joe Leary Slough drains land which is predominantly agricultural with some pasture land. The slough is characterized by high fecal and nutrient inputs, high turbidity, and low dissolved oxygen concentrations. During the summer, there is low flow and the depth ranges from 0.5-1.5 m. During winter flooding, the slough can reach a depth of 4 m. There is a dam at the mouth of the slough with twelve 4 ft diameter outfall pipes that have one-way hinged tide gates. Saline water from Padilla Bay seeps through the tide gates during high tide. The bottom of the

slough is composed of very soft sediment, which is periodically dredged. A YSI 6000 is deployed on the freshwater side of the tide gates at a depth of about 0.25 m above the bottom.

Bayview Channel Site (48 29' 47" N; 122 30' 07" W) Bayview Channel, a major Padilla Bay tributary/distributary, floods and drains intertidal flats including eelgrass beds, mats of macroalgae, and flats without macrovegetation. The YSI 6000 is located in a major tributary channel to Bayview Channel. The tributary drains predominately eelgrass (*Zostera marina* and *Z. Japonica*) covered intertidal flats. Bottom sediments beneath the YSI 6000 are fine silt and clay overlying sand. Pollutants entering the bay include general non-point source, agricultural non-point source, and fecal coliforms from agriculture, failing septic systems and wildlife.

No Name Slough Site (48 28' 09" N; 122 28' 03" W). No Name Slough drains a 990 ha watershed composed of an "upland" portion of rural, pasture, woodlot, and low density housing land use on a glacial moraine; and a "floodplain" portion of intensive annual crop agriculture on drained marsh land. The slough water is characterized by periodic high turbidity, high salinity in the lower part of the slough most of the year, and algal blooms in the lower slough during the summer. During summer, there is little or no freshwater flow in the slough and depth ranges from 0.25-0.50 m. During winter flooding, water depth at the mouth can be as high as 2 m. No Name Slough flows into Padilla Bay through 4 tide gates that have been placed in the sea dike. Saline water seeps through the tide gates, under the dike, or through the dike so that water is usually partially saline at the mouth of the slough on the "freshwater" side of the dike where the YSI 6000 is located. Two pumps are located at the mouth of No Name Slough. These pumps pump water over the dike into Padilla Bay during times of high rainfall and high tides when water depth in the slough reaches preset depths.

The bottom is very soft sediment which is periodically dredged. The YSI 6000 is deployed 0.20 m above the bottom on the freshwater side of the dike on one of the piles supporting the pumphouse.

6. Data collection period

Data collection was continuous from January 1 to December 31 at the Joe Leary (JL) site except for times of downloading, cleaning and recalibration as noted in the missing data section. Data collection was continuous from January 1 to December 31 at the Bayview Channel site (BY) except 1) for times of downloading, cleaning and recalibration as noted in the missing data section; and 2) for times when the probes were exposed to the air because of a 'catch' in the chain holding the YSI 6000 during January to July, which times are also noted in the missing data section. Data collection was continuous from August 17 to December 31 at the No Name site (NN) except for times of downloading, cleaning and recalibration as noted in the missing data section.

Joe Leary Slough (JL)		BayView Channel (BY)	
Deployment Date/Time	Retrieval	Deployment Date/Time	Retrieval
12/15/95 15:00:00 to 01/10/96 10:00:00	01/11/96 14:00:00	12/07/95 12:00:00 to 01/11/96 15:00:00	to
01/11/96 15:00:00 to 02/08/96 12:00:00	02/08/96 12:00:00	02/09/96 13:00:00 to 03/21/96 13:30:00	to
02/18/96 15:00:00 to 03/21/96 12:30:00	03/21/96 13:01:51	03/21/96 16:00:00 to 04/09/96 09:30:00	to
03/21/96 12:30:00 to 04/11/96 13:00:00	04/11/96 13:00:00	04/19/96 15:00:00 to 05/30/96 16:30:00	to
04/09/96 09:30:00 to 05/30/96 13:00:00	05/30/96 13:00:00	05/30/96 16:00:00 to 06/19/96 08:30:00	to
05/16/96 15:30:00 to 06/25/96 13:30:00	06/25/96 13:30:00	06/19/96 10:00:00 to 07/19/96 09:00:00	to
06/19/96 08:30:00 to 07/18/96 10:00:00	07/18/96 10:00:00	07/19/96 09:30:00 to 08/21/96 09:30:00	to
07/18/96 10:00:00 to 08/08/96 14:30:00	08/08/96 14:30:00	08/21/96 10:00:00 to 09/30/96 10:00:00	to
08/08/96 14:30:00 to 08/29/96 13:00:00	08/29/96 13:00:00	10/02/96 14:00:00 to 11/01/96 10:00:00	to
09/30/96 10:00:00 to 09/11/96 14:00:00	09/11/96 14:00:00	11/01/96 10:30:00 to 12/06/96 10:30:00	to
08/29/96 14:00:00 to 10/01/96 12:00:00	10/01/96 12:00:00	12/06/96 11:30:00 to 01/24/97 09:30:00	to
11/01/96 10:00:00 to 10/17/96 11:30:00	10/17/96 11:30:00	11/06/96 14:30:00 to 11/20/96 10:00:00	to
10/17/96 11:30:00 to 11/06/96 15:30:00	11/06/96 15:30:00		

11/26/96 14:00:00 to 12/19/96 10:30:00
12/19/96 11:30:00 to 01/16/97 14:30:00

7. Associated researchers and projects

At the Joe Leary Slough site, weekly (from January through April 1996)
water samples were collected and the concentration of inorganic nutrients,
suspended solids, and turbidity were measured by staff at Padilla Bay NERR and
the Washington State Dept Ecology Manchester Environmental Laboratory.

II. Physical Structure Descriptors

8. Variable sequence, column format, range of measurements, units

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 sec	NA
Temp	-5.0 to 45.0 (C)	0.01 C	+/-
0.15 C			
SpCond	0-100 (mS/cm)	0.01 mS/cm	+/-
0.5%			
reading + 0.001 mS/cm			
Salinity	0-70 Parts per thousand (ppt)	0.01 ppt	+/-
1.0%			
reading or 0.1ppt, (whichever is greater)			
DO	0-200 (% air saturation)	0.1% @ air sat	+/-
2.0% @			
air sat			
DO	200-500 (% air saturation)	0.1% @ air sat	+/-
6.0% @			
air sat			
DO	0-20 (mg/L)	0.01 mg/L	+/-
0.2 mg/L			
DO	20-50 (mg/L)	0.01 mg/L	+/-
0.6 mg/L			
Depth	0-9.1 (m)	0.001 m	+/-
0.018 m			
PH	2-14 units	0.01 units	+/-
0.2 units			
Turbidity	0-1000 NTU	0.1 NTU	+/-
5% of			
reading or 2 NTU (whichever is greater)			

9. Coded variable code definitions

JL - Joe Leary Slough Site; BY - Bayview Channel Site; NN - No Name Slough Site.

10. Data anomalies

January 1996

JL: The depth data are relative probably because depth was incorrectly calibrated. Low dissolved oxygen was not confirmed independently; therefore DO

values considered suspect and deleted from 1/1/96 00:00 through 1/11/96 14:00.

BY:

February 1996

JL: An electrical malfunction changed the time of the sampling interval from

every 30 minutes to every 30 minutes and 1 second starting at 11:30 on 23Feb and ending at 16:01:51 on 26Feb. Sampling interval then reverted back to every 30 minutes. The depth data are relative probably because depth was incorrectly calibrated.

BY:

March 1996

JL: An electrical malfunction in the sonde skipped the sampling from 00:00

on 1Mar96 through 17:30 on 2Mar96, and changed the time of sampling by 1 minute and 51 seconds so that samples from 18:00 on 2Mar96 through 13:00 on 15Mar96 were taken 1 minute and 51 seconds after the hour or half hour (e.g. at 18:01:51 and 18:31:51). The cause for the high turbidity values on 25Mar96 from 11:30 through 18:00 are not known and may indicate interference with the probe rather than high turbidity in the water column.

BY: Anamolous low dissolved oxygen data were observed from 0430 on 29Mar96 through 2330 on 31Mar96; the cause for these occasional low values is not known and dissolved oxygen data throughout this time period is suspect.

April 1996

JL:

BY: The YSI 6000 sonde at the Bayview Channel site was deployed at an unknown depth (because of a 'catch' in the chain holding the sonde) and the sonde and sensors were out of the water and exposed to the air during lower low water. Salinity values dropped to zero during periods of exposure and all data during periods of low salinity were removed from the data file. The effect on the calibration and reliability of the sensors is not known and all data from this site during this month should be interpreted with caution. Anamolous low dissolved oxygen data were observed from 0000 on 1Apr96 through 0830 on 9Apr96; the cause for these occasional low values is not known and dissolved oxygen data throughout this time period is suspect. The dissolved oxygen data from 1400 on 20Apr96 2330 on 30Apr96 are suspect because the probe and membrane were exposed to the air periodically.

May 1996

JL:

BY: The YSI 6000 sonde at the Bayview Channel site was deployed at an unknown depth (because of a 'catch' in the chain holding the sonde) and the sonde and sensors may have been out of the water and

exposed to the air during lower low water. Salinity values dropped to zero during periods of exposure and all data during periods of low salinity were removed from the data file. The effect on the calibration and reliability of the sensors is not known and all data from this site during this month should be interpreted with caution. The reported depth increase of 0.29 m at 1700 on 30May96 occurred when one sonde was being replaced by another and was probably caused by differences in the method of calibration. Salinity and conductivity data dropped about 20% at 1700 on 30May96 at the time that the sondes were rotated. The lower values from 1700 on 30May96 to 2330 on 31May96 are suspect and probably caused by incorrect calibration of the conductivity sensor. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from 1700 30May96 to 2330 31May96.

June 1996

JL:

BY: The YSI 6000 sonde at the Bayview Channel site was deployed at an unknown depth (because of a 'catch' in the chain holding the sonde) and the sonde and sensors may have been out of the water and exposed to the air during lower low water. Salinity values dropped to zero during periods of exposure and all data during periods of low salinity were removed from the data file. The effect on the calibration and reliability of the sensors is not known and all data from this site during this month should be interpreted with caution. Salinity and conductivity data are about 20% lower than expected and their accuracy doubtful; the lower values may have been caused by incorrect calibration or out of date calibration solutions. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month.

Negative depths were recorded at 0700 and 0830 on 27Jun96 and are probably a result of changes in atmospheric barometric pressure since the time of calibration.

July 1996

JL: A single reading of 625 NTU (turbidity) at 14:30 on 29Jul96 is anomalous; the cause is unknown but the reading may not represent water column turbidity.

BY: The YSI 6000 sonde at the Bayview Channel site was deployed at an unknown depth (because of a 'catch' in the chain holding the sonde) and the sonde and sensors may have been out of the water and exposed to the air during lower low water from July 1 through 1030 on July12. Salinity values dropped to zero during periods of exposure and all data during periods of low salinity were removed from the data file. The effect on the calibration and reliability of the sensors is not known and all data from this site during the period July 1 to 10:30 on July 12 should be interpreted with caution. The 'catch' in the chain was corrected on 12Jul at 1200 and the large increase in depth recorded at that time was due to deployment at the planned experimental depth (-1.1 m below MLLW and 0.75 m above the bottom.) Salinity and conductivity data are about 20% lower than expected throughout the month and their accuracy doubtful; the lower values may have been caused by incorrect calibration or out of date calibration solutions.

All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month. High and unexplained turbidities that probably do not reflect water quality conditions were recorded at 1330 on 21Jul, 1100 on 27Jul, and 1730 on 28Jul96.

August 1996

JL: The high turbidity reading at 10:30 on 10Aug96 is anomalous, the cause

is not known. Depth data were negative at the following times and dates: 11:30 on 10Aug96; from 09:30 to 11:30 on 25Aug96; from 10:00 to 13:30 on 26Aug96; and from 11:30 to 13:00 on 27Aug96.

BY: Salinity and conductivity data are about 20% lower than expected and

their accuracy doubtful; the lower values may have been caused by incorrect calibration or out of date calibration solutions.

All variables dependent on sal/cond were deleted (Salinity, specific conductivity

and DO mg/L) from entire month. The dissolved oxygen data indicate a drift downward and readings from 1Aug to 21 Aug 0930 should be interpreted with caution. After retrieval of the sonde on 21 Aug, the DO membrane was intact and read 81.4% saturation when placed in water saturated air. During a second deployment in August (from 21 Aug to 30 Sep) oxygen data drifted slightly downward from 27 Aug to 31 Aug and readings should be interpreted with caution. After retrieval of the sonde on Sep 30, the D.O. membrane was intact and read 92.8% saturation when placed in water saturated air.

NN: Negative depths reported on 25 to 27 Aug are probably due to changes in

atmospheric barometric pressure. High dissolved oxygen data from 16-31Aug may be due to extensive algal mats in the slough. After retrieval of the sonde on 5 Sep, the DO membrane was intact but had light fouling on the membrane and read 90% saturation when placed in water saturated air.

September 1996

JL: High and anomalous turbidity data were recorded at the following times

and probably were caused by debris in the sonde guard: 1500 on 8Sep, 0000, 0700, & 1730 on 9Sep, 1830 & 1900 on 17Sep and 900 on 26Sep.

Negative depths reported at 0600 and 0630 on 4Sep are probably due to changes in atmospheric barometric pressure. The low dissolved oxygen data from 18 to 30 Sep are anomalous, were not independently confirmed and may indicate debris or sediment in the sonde guard.

BY: Salinity and conductivity data are about 20% lower than expected and their accuracy doubtful; the lower values may have been caused by incorrect calibration or out of date calibration solutions.

All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month. During a deployment from 21 Aug to 30 Sep, oxygen data drifted slightly downward from 27 Aug to 31 Aug and readings should be interpreted

with caution. After retrieval of the sonde on Sep 30, the D.O. membrane was intact and read 92.8% saturation when placed in water saturated air. High and unexplained turbidities that probably do not reflect water quality conditions were recorded at 0800 on 6 Sep, 2330 on 16 Sep, 0630 on 17 Sep, 0200 on 19 Sep, and 0600 on 23 Sep.

NN: High dissolved oxygen data from 9-12 Sep may be due to extensive algal

mats in the slough. After retrieval of the sonde on 3 Oct, the DO membrane was intact but had light fouling on the membrane and read 92% saturation when placed in water saturated air. A single high and unexplained turbidity value of 50 NTU was reported at 1330 on 3 Sep and probably does not reflect water quality conditions at the site.

October 1996

JL: The low dissolved oxygen reported for the period 5Oct through 17Oct were not independently confirmed and may represent local conditions around the DO probe. (The DO probe registered 94% in air saturated water when returned to the lab on 17Oct.) The pH data from 1200 on 10Oct through 1000 on 17 Oct seem anomalous and may be caused by accumulation of sediment in the sonde guard around the probe.

Turbidity data from 0530 on 5Oct to 1000 on 17 Oct were erratic and negative alternating with periods of stable no change readings. Data during this period have been removed. The low dissolved oxygen reported from 22Oct to 30 Oct is anomalous and may be caused by sediment and/or debris in the sonde guard. (The DO membrane was in good condition and read 98% saturation when returned to water saturated air in the lab.) Negative depths reported for the following times are probably caused by changes in atmospheric barometric pressure: 0130 to 0730 on 18Oct, 0330 to 0630 on 19Oct and 0800 on 21 Oct.

BY: Anomalous low dissolved oxygen data were recorded at 0400 on 4 Oct, 1100 on 4 Oct, and 2000 on 21 Oct; the cause is unknown and the readings may not reflect water quality conditions at the site. Salinity and conductivity data are lower than expected and their accuracy doubtful; the lower values may have been caused by incorrect calibration or out of date calibration solutions.

All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month. Small negative turbidity readings throughout the month may be due to inadequate cleaning of the turbidity probe surface prior to calibration and deployment. Anomalous high turbidity value of 189 at 1230 on 30 Oct was removed; the cause is unknown.

NN: Anomalous high and low dissolved oxygen fluctuations were reported on

11 Oct from 8% to 101% in a 2 hour period after 2130; the cause is not known, however, after retrieval of the sonde on 16 Oct, the D.O. membrane was intact and read 89.8% saturation when placed in water saturated air. Negative depths reported on 4 Oct and 17-19 Oct are probably due to changes in atmospheric barometric pressure. Very high turbidities (over 700 NTU) were recorded on 28 Oct. Erratic data recorded from 0000 1 Oct through 1030 3 Oct were associated with low battery voltage and all parameters were removed from the data record.

November 1996

JL: High and negative turbidity values from 0000 on 1Nov96 through 1430 on 6Nov96 may be due to accumulation of debris caught in the sonde guard. Low dissolved oxygen data during the same time period may also be due to accumulated sediment in the sonde guard. When the sonde was retrieved at 1430 on 6Nov96, the DO membrane was intact and read 98% saturation when placed in water saturated air.

BY: Salinity and conductivity data are lower than expected and their accuracy doubtful from 0000 1 Nov through 1000 on 1 Nov; the lower values may have been caused by incorrect calibration or out of date calibration solutions; the increase at 1030 on 1 Nov is due to the changeover of the YSI 6000 datalogger. Both probes had been calibrated in standard solutions; the cause for the discrepancy is not known. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from 0000 1 Nov96 through 1000 1 Nov96.

Small negative turbidity readings throughout the month may be due to inadequate cleaning of the turbidity probe surface prior to calibration and deployment. An anomalous high turbidity value of 132 at 0300 on 10 Nov was removed; the cause is unknown.

NN: Negative depths reported on 11 Nov are probably due to changes in atmospheric barometric pressure. Negative depths reported from 15-30 Nov are probably indicative of calibration errors; the depths indicate relative water height above the sensor. Very high turbidities and negative turbidities were reported several times between 16 Nov and 30 Nov. These high values and negative values occurred almost always at times of high water depth and low salinities which are usually associated with times of high rainfall. The high and negative turbidities

may indicate mean water conditions at that time or may indicate debris caught on the window of the turbidity sensor.

December 1996

JL: Negative depth values were reported for 2330 on 9 December and numerous times from 20Dec96 through 30Dec96; these negative depth readings are probably associated with changes in atmospheric barometric pressure. Erratic readings for dissolved oxygen, pH, and turbidity from 0000 on 1Dec96 through 1030 on 19Dec96 were associated with accumulation of debris in the sonde guard: all DO, pH, and turbidity data were removed. pH data from 11:30 on 19Dec96 through 2330 on 31Dec96 are anomalous and suspect because of a possible failing probe.

BY: Anomalous salinity decrease on 6 Dec from 1030 to 1130 was caused by a change in instruments; both probes had been calibrated in standard solutions; the cause for the discrepancy is not known. Anomalous low dissolved oxygen data were recorded from 12-19 Dec (particularly a value of 42% at 0930 on 14 Dec); the cause is unknown. The DO membrane was intact and read 101.7% saturation when placed in water saturated air after retrieval on 24 Jan 97. High and unexplained turbidities that probably do not reflect water quality conditions at the site were recorded at 2130 on 13 Dec, 1930 on 18 Dec, and 1030 on 25 Dec.

NN: Negative depths reported from 1-31 Dec are probably indicative of

calibration errors; the depths indicate relative water height above the sensor. Temperatures below zero were recorded 27-31 Dec; these negative temperatures occurred when a very cold front remained over the watershed and when ice was observed on the surface of the slough and Padilla Bay. Very high turbidities and negative turbidities (2 values

<-1000 on 19 Dec were removed) were reported several times between 1-20 Dec. These high values and negative values (rollovers?) occurred almost always at times of high water depth and low salinities which are usually associated with times of high rainfall. The high and negative turbidities may indicate mean water conditions at that time or may indicate debris caught on the window of the turbidity sensor.

11. Missing data

January 1996

JL: No data from 1430 on 11Jan96 through 23:30 on 31 Jan96 because the data were lost during file transfer. No turbidity data because probe had not been received. Low dissolved oxygen was not confirmed independently; therefore DO

values considered suspect and deleted from 1/1/96 00:00 through 1/11/96 14:00.

BY: No data from 1030 on 10Jan96 through 23:30 on 31 Jan96 because the data were lost during file transfer. No turbidity data because probe had not been received.

February 1996

JL: No data from 00:30 on 1Feb96 through 14:30 on 18Feb96 because some data were lost during data capture and sonde was not deployed. An electrical malfunction caused some sample times to be skipped: from 3:30 on 22Feb to 10:30 on 23Feb; from 17:00 to 17:30 on 26Feb; and on 29Feb from

6:00 to 14:00 and

from 22:30 to 23:30. Turbidity data are missing from the following times because of erratic and out of range values: from 12:30 on 20Feb to 3:00 on 22Feb; on 28Feb at 16:31:51; and from 14:31:51 to 22:01:51 on 29Feb.

BY: No data from 00:00 on 1Feb96 through 12:30 on 16Feb96 because some data were lost during file transfer and the Sonde was not deployed because of bad weather. No salinity, specific conductivity, nor dissolved

oxygen data for unknown reasons. No turbidity data because probe had not been received.

March 1996

JL: No data from 00:00 1Mar96 through 17:30 on 2Mar96 because of equipment malfunction (sonde did not record). No data from 13:30 on 15Mar96 through 12:00 on 21Mar96 because the sonde was being cleaned and calibrated. No turbidity data from 1800 on 2Mar96 through 12:00 on 21Mar96 because probe was not functioning. No turbidity reading at 1400 on 25Mar96 because value was removed because it was negative.

BY: No data from 1330 to 1530 on 21 Mar 96 because the sonde was being cleaned, calibrated, and rotated. No salinity or conductivity data from

0000 on 1 Mar 96 to 1330 on 21Mar96 because unrealistic values were probably caused by incorrect calibration. No dissolved oxygen from 0000 on 1Mar96 to 1330 on 21Mar96 because probe and membrane were subjected to 7 days of unknown conditions between calibration and deployment. No turbidity data all month: probe had not been installed 0000 1Mar96 to 1330 21Mar96 and values were erratic throughout the period 1600 21Mar96 to 2330 31Mar96.

April 1996

JL: No data for all parameters at 08:00 on 7Apr96 because battery was being replaced. No data for all parameters from 13:00 on 11Apr96 through 23:30 on 30Apr96 for cleaning, calibration, rotation of YSI 6000 sondes and fitting of one of the sondes with turbidity probe. Turbidity values are missing on 4Apr96 at 08:30 and 10:00 because readings were negative.

BY: No data from 0900 on 9Apr96 to 19Apr96 because the sonde was being cleaned, calibrated, and rotated. No turbidity data all month because of erratic values throughout the month. The sonde and probes were suspected to be periodically out of the on April 20, 21, and 22; therefore, all data during the times of low salinity were removed: 1130 to 1330 on 20Apr96, 1200 to 1400 on 21Apr96, and 1330 to 1400 on 22Apr96.

May 1996

JL: No data for all parameters from 00:00 on 1May96 through 15:00 on 16May96 for cleaning, calibration, rotation of YSI 6000 sondes and fitting of one of the sondes with turbidity probe. No data at 12:30 on 30May96 for cleaning calibration and rotation of the sonde. No dissolved oxygen data from 15:30 on 16May96 through 12:00 on 30May96 because dissolved oxygen probe was not functioning properly (possibly a faulty D.O. membrane).

BY: No data is reported for the following times because the sonde and probes were apparently out of the water and exposed during low water; all data during times of low salinity are missing: 0900-1030 on 2May, 0930-1200 on 3May, 0930-1300 on 4May, 1030-1400 on 5May, 1100-1500 on 6May, 1200-1530 on 7May, 1300-1600 on 8May, 1400-1630 on 9May, 0900-0930 on 15May, 0930-1100 on 16May, 1000-1200 on 17May, 1030-1230 on 18May, 1030-1330 on 19May, 1100-1330 on 20May, 1230-1330 on 21May, 1300-1400 on 22May, 1400-1500 on 23May, 0800-1000 on 30May, 0900-1030 on 31May. No turbidity data from 00:00 on 1May96 to 1630 on 30May96 because of erratic values throughout the period of deployment. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from 1700 30May96 to 2330 31May96.

June 1996

JL: No turbidity values at 04:00 on 18Jun96 and 15:30 on 28Jun96 because readings were negative.

BY: No data at 0900 and 0930 on 19Jun96 because the sonde was being cleaned, calibrated, and rotated. No data is reported for 1 to 4 hours on

the following dates because the sonde and probes were apparently out of the water and exposed during low water (salinity dropped to zero, depth dropped to very low or negative values): all data during times of low salinity are missing: June 1-6, 13-20, and 27-30. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month. No turbidity data from 1000 on 19Jun96 to 2330 on 30Jun96 because the turbidity probe had not been installed on that sonde.

July 1996

JL: No data except depth data are reported on 9Jul96 from 05:30 through 11:30; the data were removed because the temperature readings ranged from 40 to 80 degrees Celsius.

BY: No turbidity data from 0000 1Jul96 to 0900 on 19Jul96 because the turbidity probe had not been installed on that sonde. No data is reported for 1 to 4 hours on the following dates because the sonde and probes were apparently out of the water and exposed during low water (salinity dropped to zero, depth dropped to very low or negative values): all data during times of low salinity are missing: July 1, 2, 3, 4, 5, 10, 11, and 12. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month.

August 1996

JL: No data at 13:30 on 29Aug96 because sonde was removed for cleaning, calibration, and rotation. No dissolved oxygen data from 00:00 on 1Aug96 through 14:00 on 8Aug96 and from 06:00 on 21Aug96 through 13:00 on 29Aug96 because of suspected faulty membrane. No turbidity at 14:30 on 8Aug96 because reading of 130 was removed because sediments appeared to have been stirred up during deployment of the sonde.

BY: All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month.

NN: No data for all parameters are reported from 0000 1Aug through 1130 on 16Aug because the sonde had not yet been deployed.

September 1996

JL: No data for all parameters are reported for 1400 on 11Sep96 because sonde was being cleaned, calibrated, and rotated. No turbidity data are recorded for 0100 on 9Sep96 because of a high negative value.

BY: No data for all parameters are reported from 1030 on 30 Sep to 2330 on 30 Sep because the datalogging program stopped for unknown reasons.

All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month.

NN: No data for all parameters at 1300 on 15Sep because sondes were being cleaned, calibrated and rotated. No data for all parameters are reported from 1430 19 Sep through 2330 30 Sep because a sharp drop in battery voltage was associated with erratic readings from several probes, including temperature.

October 1996

JL: No turbidity data on the following dates/times because readings were erratic with frequent high negative values: from 0530 on 5Oct to 1000 on 17Oct; at 0230 on 19Oct; from 0330 on 30Oct to 2330 on 31Oct.

BY: No data for any parameters are reported for 0000 1 Oct through 1330 on

2 Oct because the datalogging program stopped for unknown reasons.

An anomalous high turbidity value of 189 at 1230 on 30 Oct was removed; the cause is unknown. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from entire month.

NN: No data for any parameters are reported from 0000 1 Oct through 1030 3

Oct because erratic data were associated with low battery voltage and all parameters were removed from the data record.

November 1996

JL: No data at 1500 on 6Nov96 because sondes were being cleaned, calibrated and rotated. No data from 1030 on 20 Nov96 to 1330 on 26Nov96 because of battery failure in the sonde. No dissolved oxygen data because of negative readings at 1300 on 5Nov96, 2000 on 15Nov96 and 0500 and 0530 on 16Nov96. Missing turbidity data at 0230 on 17Nov96 because of negative reading; from 0430 on 19Nov96 to 1000 on 20Nov96 because of erratic and negative values before battery failure; and from 1200 on 27Nov96 to 2330 on 30Nov96 because of high and erratic values associated with accumulated sediment in sonde guard. Missing dissolved oxygen data from 1400 on 26Nov96 to 2330 on 30Nov96 because of accumulated sediment in sonde guard and suspected membrane puncture. Missing pH data from 1400 on 26Nov96 to 2330 on 30Nov96 because of accumulated sediment in the sonde guard and suspecting failing probe.

BY: An anomalous high turbidity value of 132 at 0300 on 10 Nov was removed; the cause is unknown. All variables dependent on sal/cond were deleted (Salinity, specific conductivity and DO mg/L) from 0000 1 Nov96 through 1000 1 Nov96.

NN: No data for all parameters at 1400 on 14 Nov because sondes were being cleaned, calibrated and rotated.

December 1996

JL: No data are recorded for 1100 on 19Dec96 because of sonde calibration, cleaning and rotation. No dissolved oxygen, pH, or turbidity data are recorded for the period 0000 on 1Dec96 through 1030 on 19Dec96 because readings were erratic and sediment and debris had accumulated in the sonde guard. No turbidity data at 200 and 2130 on 31Dec96 because negative values were recorded and removed.

BY: No data for all parameters at 1100 on 6 Dec because sondes were being cleaned, calibrated and rotated.

NN: No data for all parameters at 1100 on 18 Dec because sondes were being cleaned, calibrated and rotated. Turbidity readings <-1000 NTU were

removed for 1730 adn 1930 on 19 Dec.