Padilla Bay (PDB) NERR Water Quality Metadata

Bay View Channel site: January to December 1999
Joe Leary Slough site: January to December 1999

Latest update: January 3, 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 or 6600s to an IBM compatible PC. Graphs of all data are printed using Ecowatch 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. No CDMO Excel 5.0 macros were used. This process of entry verification was completed by Robin Cottrell, Daniel Hahn, and Douglas Bulthuis for the 1999 data. Final verification and this metadata documentation were completed by Douglas Bulthuis.

3. Research Objectives

The Bay View Channel site has been set out to detect and monitor short term variability and long-term changes in Padilla Bay. The Joe Leary Slough site 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 non point source pollution watershed action plan. Measurements are taken every 30 minutes at both sites unless otherwise noted in data anomalies.

4. Research methods

A YSI 6000 or 6600 were 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. Some dissolved oxygen data from Joe Leary Slough were anomalous and could be explained if there were poor exchange between the water inside the deployment tube and water outside the deployment tube. Therefore during four days in October 1998 and 10 days in December 1998, YSI datasondes were deployed inside and outside the deployment tube simultaneously at the same depth. All data were very similar inside and outside the deployment tube (or fluctuated in parallel indicating differences in calibration) during October and December with the exception of the dissolved oxygen data during October. During four tidal cycles in October 1998, the dissolved oxygen concentration inside the deployment tube did not increase with increasing salinity as much as dissolved oxygen in the water outside the deployment tube. (In Joe Leary Slough, salinity values typically fluctuate from 0 to 10, 20 or even 30 PSU with each tidal cycle, with higher oxygen concentrations usually observed in the high salinity water.) The October dissolved oxygen data could indicate that organic material with a high oxygen demand may have accumulated inside the deployment tube and/or epiphytic and bacterial growth along the openings in the deployment tube may be exerting a high oxygen demand on the water in the tube. If exchange between the water inside and outside the pipe were slow enough, the material and organisms inside the tube could exert a measurable decrease in dissolved oxygen. When the same experiment was repeated in December 1998, there was no difference in dissolved oxygen inside and outside the deployment tube. Therefore, dissolved

oxygen data from Joe Leary Slough need to be interpreted with caution because there may be times when the data indicate dissolved oxygen concentrations inside the deployment tube that are different than concentrations in Joe Leary Slough outside the deployment tube.

A YSI 6000 or 6600 were deployed in Padilla Bay in a tributary of Bayview Channel. They were 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 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.

In all cases, measurements of temperature, specific conductivity, salinity, percent saturation of dissolved oxygen, depth, pH and turbidity are recorded every half-hour. At the end of each sampling period, the YSI 6000 or 6600 is brought back into the laboratory for downloading, cleaning, and recalibration. All standards were purchased from scientific supply houses.

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. 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 or 6600 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 1.55 m. Salinity varies from about 15 to 30 PSU.

Padilla Bay is an "orphaned" estuary in that the Skagit River no longer

empties directly into it. Most of the land in the 9300 ha Padilla Bay watershed is agricultural, and is drained by four sloughs which empty into the bay. The salinity in Padilla Bay reflects both the sloughs that flow into the bay and the greater Puget Sound-Georgia Basin estuary in which Padilla Bay is located. Major freshwater flows into this area of the Puget Sound-Georgia Basin estuary come from the Fraser and Nooksack Rivers to the north and from the Skagit River to the south.

Joe Leary Slough Site (48° 31' 05.3" N; 122° 28' 22.8" W) Joe Leary Slough drains land that is predominantly annual crop agriculture and pasture land with some low density housing. 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 (or 6600) is deployed on the freshwater side of the tide gates at a depth of about 0.25 m above the bottom. The latitude/longitude were measured with a Trimble GeoExplorer II and differentially corrected with post processing providing a manufacturer's stated accuracy of ± 5m.

Bayview Channel Site (48° 29' 46.6" N; 122° 30' 01.8" W) Bayview Channel, a major Padilla Bay tributary/distributary, floods and drains intertidal flats including eelgrass beds, mats of macroalgae, and flats without macro-vegetation. The YSI 6000 (or 6600) is located in a 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. The YSI 6000 is deployed in a

black PVC pipe that is attached to two steel pipes set in the sediment. When deployed, the datasonde is located about 0.75 m above the bottom. During 1999 the datasonde became "stuck" inside the black PVC pipe becuase of fouling, particularly by barnacles. On September 23, 1999, the black PVC pipe was replaced with a new pipe and attached at the same location and height. Pollutants entering the bay include general non-point source, agricultural non-point source, and fecal coliform bacteria from agriculture, failing septic tanks and wildlife. The latitude/longitude were measured with a Trimble GeoExplorer II and differentially corrected with post processing providing a manufacturer's stated accuracy of ± 5m.

6. Data collection period

Data collection was continuous from January 1 to December 31 at both sites except for times of downloading, cleaning and recalibration as noted in the missing data section.

Deployment and retrieval times at the Joe Leary Slough site and the Bay View Channel site are listed below. The times indicate the first and last measurements made with each deployment.

Joe Leary Slough (JL)

Deployment Date/Time		Retrieval Date/Time	
(MM/DD/YY)	(HH:MM:SS)	(MM/DD/YY)	(HH:MM:SS)
12/22/98	12:30:00	01/06/99	14:30:00
01/06/99	15:00:00	01/27/99	10:30:00
01/27/99	11:00:00	02/17/99	13:00:00
02/17/99	13:30:00	03/11/99	11:30:00
03/11/99	12:00:00	04/07/99	12:00:00
04/07/99	12:30:00	04/28/99	12:30:00
04/28/99	13:00:00	05/19/99	12:30:00
05/19/99	13:00:00	06/01/99	12:30:00
06/01/99	13:30:00	06/16/99	11:00:00
06/16/99	11:30:00	06/22/99	14:30:00
06/23/99	12:00:00	07/08/99	09:30:00
08/09/99	14:00:00	08/26/99	12:00:00
08/26/99	12:30:00	09/01/99	11:30:00
09/01/99	12:00:00	09/09/99	14:00:00
09/09/99	14:00:40	09/20/99	13:00:40
09/20/99	14:00:00	09/28/99	13:00:00
09/28/99	13:30:00	10/11/99	13:30:00

10/11/99	14:00:40	10/20/99	09:00:40
10/21/99	16:00:00	11/09/99	14:30:00
11/09/99	14:30:40	12/06/99	11:00:40
12/06/99	12:00:00	12/28/99	21:30:00

BayView Channel (BY)

Deployment Date/Time		Retrieval Date/Time	
(MM/DD/YY)	(HH:MM:SS)	(MM/DD/YY)	(HH:MM:SS)
12/09/98	11:00:00	02/17/99	09:30:00
02/19/99	15:00:00	04/20/99	09:30:00
04/23/99	11:00:00	06/04/99	16:30:00
06/10/99	14:30:00	07/20/99	13:00:00
08/19/99	13:30:00	09/16/99	10:30:00
09/16/99	11:00:00	10/19/99	12:30:00
10/19/99	13:00:00	12/23/99	15:00:00
12/23/99	09:30:40	02/03/00	13:30:40

7. Associated researchers and projects
None

II. Physical Structure Descriptors

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

YSI 6000 datalogger

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

*Depth (level)	-0.3-9.1 (m)	0.001m	+/- 0.018m
PH	2-14 units	0.01 units	+/- 0.2units
Turb	0-1000 NTU	0.1 NTU	+/- 5% of Reading or 2 NTU (whichever is greater)

*During 1997 records were kept of the atmospheric pressure during calibration of depth and the apparent depth after each two to four week deployment. The data indicated that depth readings could read as much as 0.28 m above or below true depth. Therefore, although the sensor may accurately read ± 0.001 m, changes in atmospheric pressure when deployed indicate depth may be ± 0.3 m.

9. Coded variable code definitions

JL - Joe Leary Slough Site; BY - Bayview Channel Site.

10. Data anomalies

January 1999

JL: Turbidity values over 1000 were recorded on 2, 3, & 4 Jan, the cause is unknown but these values were associated with peak freshwater flows out of Joe Leary Slough.

Date	Time	Turb
01/02/99	21:00:00	1359
01/02/99	21:30:00	1359
01/02/99	22:00:00	1359
01/02/99	22:30:00	1358
01/02/99	23:00:00	1358
01/02/99	23:30:00	1358
01/03/99	21:00:00	1357
01/03/99	21:30:00	1219
01/03/99	22:00:00	1358
01/03/99	22:30:00	1358
01/03/99	23:00:00	1358
01/04/99	20:30:00	1140

The pH readings are somewhat erratic with isolated low readings associated with influx of high saline water. An erratic turbidity value over 1000 was recorded at 2030 on 26 Jan and removed from the database (the cause is not known.)

BY: High and erratic turbidity values were recorded at the following times and removed from the database: 0430 & 0530 on 9 Jan, 0730 & 1430 on 10 Jan, 0600 on 13 Jan, 2130 on 27 Jan, and 0700 on 30 Jan. No DO because membrane was punctured for the entire month.

February 1999
JL: High and erratic turbidity values were recorded from 1900 on 15 Feb through 1300 on 17 Feb and removed from the database, the causes for these high erratic values is not known but could be caused by vegetative debris caught in the guard around the probes.
BY: High and erratic turbidity values were recorded at the following times and removed from the database: 1300 on 6 Feb, 2200 on 12 Feb, 0230 & 1300-1330 on 20 Feb, 1730 on 24 Feb and 1730 on 25 Feb. No dissolved oxygen data from 0000 1 Feb through 0930 17 Feb because the oxygen membrane was punctured.

March 1999
JL: High (over 1000) and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known):
0000 on 18 Mar, 2330 on 18 Mar, 1330 on 22 Mar, 1400-1430 on 23 Mar, 1530 on 24 Mar, 2200 on 26 May, and 1700 on 27 Mar.
BY: High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 0930 on 1 Mar, 0600 on 2 Mar, 2130 on 4 Mar, 0900 on 10 Mar, 1500 on 11 Mar, 0800 on 12 Mar, 1100 on 18 Mar, 1800 on 26 Mar, 2300 on 27 Mar, and 1300 on 31 Mar. Erratic low dissolved oxygen data were recorded at the following times, the cause(s) are unknown, and the data removed from the database: 1700 on 7 Mar, 0030 on 26 Mar, and 0130 on 27 Mar.

April 1999
JL: Dissolved oxygen data from 0700 on 24 Apr through 1230 on 28 Apr were erratic and low toward the end of the deployment period, the cause is unknown but may be related to the debris that was found caught in the guard at the end of the deployment, the data were deleted. High and erratic turbidity values were recorded from 1000 on 3 Apr to 1200 on 7 Apr and from 1930 on 14 Apr to 1230 on 28 Apr and removed from the database (the cause(s) are not known) but may have been caused by the debris that was found caught in the guard at the end of the deployment.) High, isolated, and erratic turbidity values (cause unknown) were recorded at the following times and removed from the database:

1100 on 1 Apr, 2330 on 1 Apr, 1700 on 2 Apr, 1800 on 11 Apr, and 0900 on 29 Apr.
Negative depths were recorded at 1300 & 1330 on 30 April.
BY: Dissolved oxygen data from 0000 on 1 Apr through 0930 on 20 Apr should be interpreted with caution because the sonde may have been recording values lower than actual; the surface of the oxygen probe tip was tarnished on retrieval on 20 Apr; the probe read 88.5 % in water saturated air. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 0800 on 3 Apr, 1830 on 4 Apr, 0330 on 5 Apr, 1900 on 14 Apr, 1900 on 23 Apr, and 0200-0230 on 25 Apr.

May 1999
JL: No dissolved oxygen or turbidity data from 1330 on 6 May to 1230 on 19 May because the dissolved oxygen dropped precipitously to very low concentrations from over 100% saturation and remained low for the rest of the deployment at the same time as turbidity was erratic, high, and over 1000 NTU most of the time; a lot of debris was found in the guard at the end of the deployment. Dissolved oxygen saturation dropped to near 0 from 1600 to 1830 on 5 May, cause unknown, data deleted from the database. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 1900 on 5 May, 0600 & 1100 on 24 May, 0800 on 25 May, and 2030 on 27 May. Negative depths were recorded at the following times: 1200-1400 on 1 May, 1130-1530 on 2 May, 1200-1530 on 3 May, 1400-1700 on 6 May, 1300 on 14 May, 1430-1500 on 16 May, 1230-1600 on 17 May, and 1530-1630 on 18 May.
BY: Dissolved oxygen data from 1000-1100 on 10 May should be interpreted with caution because the data appear suspiciously low, no potential causes are known, the data were not removed. Erratic low dissolved oxygen data at 0630 on 22 May and 0300 on 23 May were removed from the database, the cause is not known. A high and erratic turbidity value was recorded 1100 on 27 May and removed from the database (the cause is not known.)

June 1999
JL: No turbidity data from 1330 on 1 Jun to 1100 on 16 Jun because data were deleted because the wiper on the probe was not working properly and the data were erratic.
BY: A high and erratic turbidity value was recorded 2030 on 19 Jun and removed

from the database (the cause is not known.)

July 1999
JL: Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 0900 on 1
Jul and 2030 on 17 Jul.
BY: High and erratic turbidity values were recorded at the following times and
removed from the database (the cause(s) are not known): 1930 & 2200 on 2 July
and 0000 on 15 July.

August 1999
JL: Negative depth recorded at 1130 on 23 Aug. Dissolved oxygen from 16 Aug
to 1200 on 26 Aug shows some decrease, cause unknown but could be failing membrane, although on retrieval of the datasonde the dissolved oxygen probe
read 92.4% satuation in water saturated air. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and
were removed from the database: 0030, 0500, and 0700 on 2 Aug, 1500 on 4
Aug, and 0500 on 9 Aug.
BY:

September 1999
JL: Negative depths were recorded 0830-0900 on 4 Sep and 0800-1100 on 5 Sep.
From 1430 on 9 Sep to 1330 on 20 Sep the times that the probes were read and
the data recorded were 40 seconds past the hour and half hour; the cause for
this anomaly is not known. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from
the database: 2100 on 10 Sep, 1000 on 16 Sep, and 0830, 0930, and 1200 on 22
Sep.
BY: High turbidities (up to 150 NTU) were recorded on Sep 24 and 25. These
high turbidities were associated with high winds and heavy rains. High and
erratic turbidity values were recorded at the following times and removed from
the database (the cause(s) are not known): 2000 on 3 Sep, 1230 on 25 Sep, and
0600 on 26 Sep.

October 1999
JL: The dissolved oxygen should be interpreted with caution from 1600 on 21

Oct to 2330 on 31 Oct because at the end of the deployment (on Nov 9) there was a scummy layer on the membrane and the read 80.5% saturation in water saturated air. From 1400 on 11 Oct to 0900 on 20 Oct the times that the probes were read and the data recorded were 40 seconds past the hour and half hour; the cause for this anomaly is not known. Negative depths were recorded at the following times: 0930-1000 on 22 Oct, 2330 on 23 Oct, 0000 and 2230-2330 on 24 Oct, 0000-0300 on 25 Oct, 0030-0330 on 26 Oct, 0000-1030 and 2230-2330 on 27 Oct, 0000-1030 on 28 Oct, 0330-0600 on 29)ct, 0300-0800 on 30 Oct, and 0430-0630 on 31 Oct.
BY: Dissolved oxygen data from 1300 on 19 Oct through 2330 on 31 Oct should be interpreted with caution; the data seem reasonable but the dissolved oxygen probe failed at 1800 on 7 Nov for no apparent reason. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 2330 on 6 Oct, 0400 on 8 Oct, 1400 on 16 Oct, and 1300 on 18 Oct.

November 1999
JL: No pH data from 1500 on 9 Nov to 2330 on 30 Nov because the probe was broken. The dissolved oxygen should be interpreted with caution from 0000 on 1 Nov to 1400 on 9 Nov because at the end of the deployment (on Nov 9) there was a scummy layer on the membrane and the read 80.5% saturation in water saturated air. From 1500 on 9 Nov to 2330 on 30 Nov the times that the probes were read and the data recorded were 40 seconds past the hour and half hour; the cause for this anomaly is not known. Negative depths were recorded at the following times: 0600-0900 on 2 Nov, 0630-0930 on 3 Nov, 2230-2300 on 4 Nov, 2130-2330 on 5 Nov, 0000-0100 and 2200-2330 on 6 Nov, 0000-0200 and 2200-2330 on 7 Nov, 0000-0330 and 2300-2330 on 8 Nov, and 0000-0300 on 9 Nov. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 0130 on 10 Nov, 0030 and 0230 on 13 Nov, 0430, 1030, and 1900 on 22 Nov, 0500 on 23 Nov, 2230 on 24 Nov, and 0830 on 27 Nov. Turbidity values from 2330 on 29 Nov to 2330 on 30 Nov were erratic , high and low and were deleted from the database; the cause is unknown.

BY: Dissolved oxygen data from 0000 on 1 Nov through 1730 on 7 Nov should be interpreted with caution; the data seem reasonable but the dissolved oxygen probe failed at 1800 on 7 Nov for no apparent reason. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 1930 on 7 Nov and 0030 on 11 Nov. No dissolved oxygen from 1800 on 7 Nov to 2330 on 30 Nov because the dissolved oxygen probe failed for unknown reasons. No turbidity data from 0130 on 11 Nov to 2330 on 30 Nov because the turbidity probe failed at 0130 on 11 Nov for unknown reasons.

December 1999

JL: From 0000 on 1 Dec to 1100 on 6 Dec the times that the probes were read and the data recorded were 40 seconds past the hour and half hour; the cause for this anomaly is not known. No pH data from 0000 on 1 Dec to 1100 on 6 Dec because the probe was broken. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 1700 on 1 Dec and 1830 on 4 Dec. Turbidity from 0000 on 1 Dec to 1100 on 6 Dec should be interpreted with caution, most of the values seem reasonable but these data were recorded after 24 hours of high erratic data on 30 Nov; at the end of the deployment (Dec 6) the turbidity probe read 100.9 in 100 NTU standard. Dissolved oxygen data from 0400 to 1300 on 16 December decreased sharply and then returned to previous values. The cause is unknown although very high turbidity values were recorded at the time; the dissolved oxygen data during this time should be interpreted with caution. Turbidity from 12 Dec to 28 Dec included many high anomalous values and many over 1000 so the data are suspect and should be interpreted with caution; however, many of these values were associated with a rain event and the data were left in the database.

Date	Time	Turb
12/13/99	23:30:00	1100
12/14/99	01:00:00	1100
12/15/99	11:30:00	1104
12/16/99	04:30:00	1036
12/16/99	06:00:00	1107

12/16/99 06:30:00 1107
12/16/99 11:00:00 1107
12/16/99 11:30:00 1107
12/16/99 12:30:00 1107
12/17/99 00:00:00 1107
12/17/99 00:30:00 1107
12/17/99 01:00:00 1107
12/17/99 01:30:00 1107
12/17/99 02:00:00 1107
12/17/99 06:00:00 1106
12/17/99 15:30:00 1106
12/17/99 16:30:00 1106
12/17/99 17:00:00 1105
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12/17/99 22:30:00 1105
12/18/99 00:00:00 1105
12/18/99 16:00:00 1075
12/18/99 21:30:00 1105
12/23/99 05:30:00 1099
12/23/99 09:00:00 1100
12/23/99 09:30:00 1100
12/23/99 10:00:00 1100
12/23/99 12:30:00 1101
12/23/99 17:00:00 1102
12/23/99 18:30:00 1103
12/23/99 19:00:00 1102
12/23/99 19:30:00 1102
12/23/99 21:00:00 1102
12/25/99 02:00:00 1102
12/25/99 22:30:00 1102
12/26/99 09:00:00 1096
12/26/99 13:00:00 1098
12/26/99 21:00:00 1101

BY: No data for all parameters at 2300 on 23 Dec because the sensors were exposed to the air and the data deleted. The following times the probes recorded data were at 40 seconds past the hour and half-hour: 12/23/99 15:30:40- 12/31/99 23:30:40 the cause for this anomaly is not known. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 1900 on 23 Dec, 1400-1430 on 24 Dec, and 0200 on 27 Dec.

11. Missing data

January 1999

JL: An erratic turbidity value over 1000 was recorded at 2030 on 26 Jan and removed from the database (the cause is not known.)

BY: No dissolved oxygen data because the oxygen membrane was punctured for whole month. High and erratic turbidity values were recorded at the following times and removed from the database: 0430 & 0530 on 9 Jan, 0730 & 1430 on 10 Jan, 0600 on 13 Jan, 2130 on 27 Jan, and 0700 on 30 Jan.

February 1999

JL: High and erratic turbidity values were recorded from 1900 on 15 Feb through 1300 on 17 Feb and removed from the database, the causes for these high erratic values is not known but could be caused by vegetative debris caught in the guard around the probes.

BY: No data for all parameters from 1000 17 Feb through 1430 on 19 Feb because of exchange of datasondes for cleaning, maintenance, and calibration. No dissolved oxygen data from 0000 1 Feb through 0930 17 Feb because the oxygen membrane was punctured. High and erratic turbidity values were recorded at the following times and removed from the database: 1300 on 6 Feb, 2200 on 12 Feb, 0230 & 1300-1330 on 20 Feb, 1730 on 24 Feb and 1730 on 25 Feb.

March 1999

JL: High (over 1000) and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known):

0000 on 18 Mar, 2330 on 18 Mar, 1330 on 22 Mar, 1400-1430 on 23 Mar, 1530 on 24 Mar, 2200 on 26 May, and 1700 on 27 Mar.

BY: High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 0930 on 1 Mar, 0600 on 2 Mar, 2130 on 4 Mar, 0900 on 10 Mar, 1500 on 11 Mar, 0800 on 12 Mar, 1100 on 18 Mar, 1800 on 26 Mar, 2300 on 27 Mar, and 1300 on 31 Mar. Erratic low dissolved oxygen data were recorded at the following times, the cause(s) are unknown, and the data removed from the database: 1700 on 7 Mar, 0030 on 26 Mar, and 0130 on 27 Mar.

April 1999
JL: Dissolved oxygen data from 0700 on 24 Apr through 1230 on 28 Apr were erratic and low toward the end of the deployment period, the cause is unknown but may be related to the debris that was found caught in the guard at the end of the deployment, the data were deleted. High and erratic turbidity values were recorded from 1000 on 3 Apr to 1200 on 7 Apr and from 1930 on 14 Apr to 1230 on 28 Apr and removed from the database (the cause(s) are not known) but may have been caused by the debris that was found caught in the guard at the end of the deployment.) High, isolated, and erratic turbidity values (cause unknown) were recorded at the following times and removed from the database:
1100 on 1 Apr, 2330 on 1 Apr, 1700 on 2 Apr, 1800 on 11 Apr, and 0900 on 29 Apr.
BY: No data for all parameters from 1000 20 Apr to 1030 23 Apr because of exchange of datasondes for cleaning, maintenance, and calibration. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 0800 on 3 Apr, 1830 on 4 Apr, 0330 on 5 Apr, 1900 on 14 Apr, 1900 on 23 Apr, and 0200-0230 on 25 Apr.

May 1999
JL: No dissolved oxygen or turbidity data from 1330 on 6 May to 1230 on 19 May because the dissolved oxygen dropped precipitously to very low concentrations from over 100% saturation and remained low for the rest of the deployment at the same time as turbidity was erratic, high, and over 1000 NTU most of the time; a lot of debris was found in the guard at the end of the deployment. Dissolved oxygen saturation dropped to near 0 from 1600 to 1830 on 5 May, cause unknown, data deleted from the database. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 1900 on 5 May, 0600 & 1100 on 24 May, 0800 on 25 May, and 2030 on 27 May.
BY: Erratic low dissolved oxygen data at 0630 on 22 May and 0300 on 23 May were removed from the database, the cause is not known. A high and erratic turbidity value was recorded 1100 on 27 May and removed from the database (the cause is not known.)

June 1999
JL: No data for all parameters at 1300 on 1 Jun because of exchange of datasondes for cleaning, maintenance, and calibration. No turbidity data from 1330 on 1 Jun to 1100 on 16 Jun because data were deleted because the wiper on the probe was not working properly and the data were erratic. No data for all parameters from 1500 on 22 Jun through 1130 on 23 Jun because of exchange of datasondes for cleaning, maintenance, and calibration.

BY: No data for all parameters from 1700 on 4 Jun through 1100 on 11 Jun because batteries died, because of exchange of datasondes for cleaning, maintenance, and calibration, and because the sonde was not fully deployed into the water during the first 24 hours on the 10th & 11th of June. A high and erratic turbidity value was recorded 2030 on 19 Jun and removed from the database (the cause is not known.)

July 1999
JL: No data for all parameters from 1000-1600 on 8 Jul and 1500 on 27 Jul because of exchange of datasondes for cleaning, maintenance, and calibration.
Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 0900 on 1 Jul and 2030 on 17 Jul.
BY: No data for all parameters from 1330 on 20 July through 2330 on 31 July because datasonde was stuck in deployment pipe and not deployed into the water.
High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 1930 & 2200 on 2 July and 0000 on 15 July.

August 1999
JL: Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 0030, 0500, and 0700 on 2 Aug, 1500 on 4 Aug, and 0500 on 9 Aug.
BY: No data for all parameters from 0000 on 1 Aug to 1300 on 19 Aug because datasonde was stuck in deployment pipe and not deployed into the water.

September 1999
JL: No data for all parameters at 1330 on 20 Sep because of exchange of

datasondes for cleaning, maintenance, and calibration. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 2100 on 10 Sep, 1000 on 16 Sep, and 0830, 0930, and 1200 on 22 Sep.
BY: No data for all parameters from 0900 to 0930 on 23 Sep because the black PVC pipe into which the datasonde is deployed was being replaced. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 2000 on 3 Sep, 1230 on 25 Sep, and 0600 on 26 Sep.

October 1999
JL: No data for all parameters from 0930 on 20 Oct to 1530 on 21 Oct because the batteries died during deployment.
BY: High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 2330 on 6 Oct, 0400 on 8 Oct, 1400 on 16 Oct, and 1300 on 18 Oct.

November 1999
JL: No data for all parameters at 1430 on 9 Nov because of exchange of datasondes for cleaning, maintenance, and calibration. No pH data from 1500 on 9 Nov to 2330 on 30 Nov because the probe was broken. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 0130 on 10 Nov, 0030 and 0230 on 13 Nov, 0430, 1030, and 1900 on 22 Nov, 0500 on 23 Nov, 2230 on 24 Nov, and 0830 on 27 Nov. Turbidity values from 2330 on 29 Nov to 2330 on 30 Nov were erratic, high and low and were deleted from the database; the cause is unknown.
BY: No dissolved oxygen from 1800 on 7 Nov to 2330 on 30 Nov because the dissolved oxygen probe failed for unknown reasons. No turbidity data from 0130 on 11 Nov to 2330 on 30 Nov because the turbidity probe failed at 0130 on 11 Nov for unknown reasons. High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 1930 on 7 Nov and 0030 on 11 Nov.

December 1999
JL: No data for all parameters at 1130 on 6 Dec because of exchange of datasondes for cleaning, maintenance, and calibration. No data for all parameters from 2200 on 28 Dec to 2330 on 31 Dec because the batteries died during deployment. No pH data from 0000 on 1 Dec to 1100 on 6 Dec because the probe was broken. Spurious, erratic, and high turbidity values (cause unknown) were recorded at the following times and were removed from the database: 1700 on 1 Dec and 1830 on 4 Dec.
BY: No data for all parameters at 2300 on 23 Dec because the sensors were exposed to the air and the data deleted. No dissolved oxygen from 0000 on 1 Dec to 1500 on 23 Dec because the dissolved oxygen probe failed for unknown reasons.
No turbidity data from 0000 on 1 Dec to1500 on 23 Dec because the turbidity probe failed at 0130 on 11 Nov for unknown reasons. No pH data from 1530 on 23 Dec to 2330 on 31 Dec because no pH probe was deployed on the datasonde.
High and erratic turbidity values were recorded at the following times and removed from the database (the cause(s) are not known): 1900 on 23 Dec, 1400-1430 on 24 Dec, and 0200 on 27 Dec.