Santa Margarita River Lagoon Monitoring Project

Data Usability and Assessment Review Field Measured Data

Final

June 2009

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Acronyms

BOR	Bureau of Reclamation
CALTRANS	California Department of Transportation
CDM	CDM Federal Programs Corporation
DO	dissolved oxygen
DQIs	data quality indicators
DQOs	data quality objectives
MCB	Marine Corps Base
ME	Mass Emission
NC	not calculable
QAPP	Quality Assurance Project Plan
RPD	relative percent difference
SCCWRP	Southern California Coastal Water Research Project
SDRWQCB	San Diego Regional Water Quality Control Board
SWAMP	Surface Water Ambient Monitoring Program
TMDL	total maximum daily load
USGS	U.S. Geological Survey
Work Plan	Final San Diego Coastal Lagoons TMDL Monitoring Work Plan

Introduction
Data Usability and Assessment Review

CDM Federal Programs Corporation (CDM) was contracted by the Santa Margarita Lagoon Dischargers, through the Bureau of Reclamation (BOR), to perform data collection and monitoring of the Santa Margarita Lagoon per the San Diego Regional Water Quality Control Board's (SDRWQCB) Investigative Order R9-2006-0076.

The Santa Margarita Lagoon Dischargers include the following parties:

- Marine Corps Base (MCB) Camp Pendleton
- Naval Weapons Station Fallbrook
- County of San Diego
- California Department of Transportation (CALTRANS)
- Riverside County Flood Control and Water Conservation District
- City of Temecula
- City of Murrieta

The coastal lagoons of San Diego County represent approximately one-third of the remaining estuarine acreage in Southern California and provide critical natural habitat for terrestrial and aquatic species. The Santa Margarita Lagoon is listed on the State's 303(d) List for nutrients/eutrophication.

The data collected by CDM will be used by the SDRWQCB for development of models and use in developing total maximum daily loads (TMDLs) for the Santa Margarita Lagoon. Setting the appropriate TMDLs is based on an understanding of the hydrodynamics, sources, loading, transport, and cycling of constituents of interest. Dynamic simulation models are tools utilized for determining load allocations as well as fate and transport in the lagoon. Complete data required to develop these models are not currently available for the Santa Margarita Lagoon. The purpose of the monitoring program is to address the principal data needs and provide the data to the SDRWQCB for development of watershed loading and water quality models for the targeted contaminants of interest in the Santa Margarita Lagoon.

The purpose of this data evaluation is to evaluate the field data and determine whether they meet the quality objectives outlined in the Quality Assurance Project Plan (QAPP), Santa Margarita Lagoon Monitoring for the RWQCB Investigative Order R9-2006-0076, San Diego County, California, Revision 1 (CDM September 2007).

Section 1
Data Collection Objectives

CDM performed continuous measurements for five parameters (conductivity, dissolved oxygen (DO), pH, temperature, and turbidity) at three fixed sites within the Santa Margarita Lagoon and river. These three sites (Segment 1, Segment 2, and Mass Emission) correspond to the same three locations where water quality samples were collected during dry and wet weather conditions and analyzed as part of the overall Santa Margarita Lagoon Monitoring Project.

Table 1-1 describes in detail the continuous monitoring requirements versus the actual collection effort carried out by CDM as required by the Final San Diego Coastal Lagoons TMDL Monitoring Work Plan, June 18, 2007 (Work Plan). This Work Plan was developed by the Southern California Coastal Water Research Project (SCCWRP) and was the basis upon which the Lagoon Dischargers were directed to conduct the Santa Margarita Lagoon Monitoring effort.

In order to be compliant with the Surface Water Ambient Monitoring Program (SWAMP), the SDRWQCB required a QAPP to be developed. An approved QAPP Santa Margarita Lagoon Monitoring for the RWQCB Investigative Order R9-2006-0076, San Diego County, California, Revision 1, was developed in September 2007.

Table 1-1 Summary of Required Field Collected Data

Project Task	Required	Collection Effort
Continuous Monitoring	**Daily Weather information:** Collect rainfall, wind speed and direction, air temperature, and percent humidity data. Collected from January 1, 2008 through September 30, 2008.	Obtained these weather data from the Marine Corps Air Station Weather Office.
	Flow Data: Collect continuous data for flow from October 2007 to September 30, 2008. Flow data collected from existing U.S. Geological Survey (USGS) San Ysidora gage.	Obtained these data from the USGS San Ysidora gage.
	Water Level: Collect data for water level via USGS Santa Margarita River at Oceanside gage to correspond to Segment 1 and Segment 2 continuous monitoring schedule.	Obtained these data from the USGS Santa Margarita River at Oceanside was used as a proxy for the water level.
	Mass Emissions (ME) site:	
	Collect continuous data for conductivity and temperature parameters from October 2007 to September 30, 2008.	Begin recording (October 4, 2007) for conductivity and temperature
	During Four Index Dry Periods: Add continuous data for DO, pH, and turbidity only during Index periods.	Added DO, pH, turbidity (March 19, 2008); CDM collected these parameters as *additional optional* readings to provide additional data points. August 15, 2008; 0900 – last recorded reading at Mass Emission (ME) site due to dry condition.

Table 1-1 Summary of Required Field Collected Data

Project Task	Required	Collection Effort
	Segment 1 (S1) and Segment 2 (S2) sites:	
	January 1 to March 31, 2008: Collect continuous data for conductivity, temperature, and turbidity.	Begin recording for conductivity, temperature, and turbidity: Segment 1 (January 30, 2008); Segment 2 (February 5, 2008); Additional non-required parameters collected: pH and DO
	April 1 to May 31, 2008: No data collection required at Segment 1 (S1) and Segment 2 (S2).	CDM agreed with Lagoon Discharger to leave sondes in place and continue collecting all 5 parameters, beyond Work Plan requirements, in an effort to bolster dataset and to mitigate data gaps during January to March 2008.
	June 1 to September 30, 2008: Collect continuous data for conductivity, temperature, and turbidity.	CDM collected all 5 parameters (DO, temp, pH, conductivity, and turbidity) during June through September 2008 on a continual basis. DO and pH were collected beyond Index periods in effort to bolster dataset and increase completeness percentage.
	Four Index Dry Periods: Only during Index periods, add DO and pH parameters in addition to conductivity, temperature, and turbidity.	DO and pH were programmed for continual collection during the four Index periods. Index Period sample days: Index 1: January 30, 31; Feb. 1, 2, 6, 7, 8 Index 2: March 24, 25, 26, 31; April 1, 2 Index 3: July 21, 22, 23, 28, 29, 30 Index 4: Sept 23, 24, 25, 29, 30; October 1

Section 2
Summary of Continuous Data Collection Performance

Fixed sondes, measurement devices for collecting water quality parameters, were placed at three designated locations within the Santa Margarita River system. Segment 1 (S1) was located near the mouth of the lagoon and located west of the Interstate-5 Freeway bridge. Segment 2 (S2) was located upstream of S1 and west of the Stuart Mesa bridge. The third collection site was the Mass Emission (ME) site located west of the Basilone Road Bridge and serves as a data point representing loading input into the Santa Margarita Lagoon. Table 2-1 identifies the equipment used for this continuous data collection effort.

Table 2-1 List of *In Situ* Field Equipment

Site	Sonde	Duration of Use
Mass Emissions	*In Situ* Troll 9000 and YSI Environmental 6920 Compact Sonde	Troll 9000 used from collection start to May 23, 2008; YSI 6920 used after May 23, 2008. [Note: Due to equipment failure, Troll 9000 was replaced with YSI 9620 sonde after May 23, 2008]
Segment 1	YSI Environmental 6920 Compact Sonde	Entire duration of data collection
Segment 2	YSI Environmental 6920 Compact Sonde	Entire duration of data collection

The ongoing effort for maintenance and calibration of the *in situ* sondes was a challenge during the course of the project. All three sites experienced equipment malfunctions resulting in data gaps. ME and S2 sondes were particularly problematic and required replacement sondes to be installed.

The DO sensors were also problematic and susceptible to fouling. DO sensors often were "re-built" with replacement DO sensor cleaning kits during calibration servicing.

In July and August 2008, the ME site had intermittent and extended dry periods that lead to eventual removal of the ME sonde on August 15, 2008.

Table 2-2 provides a summary of the operational performance history of the three fixed sondes installed to collect for continuous monitoring at the S1, S2, and ME sites.

Table 2-2 Continuous Sonde Performance Periods

Site	Start Date/Time	End Date/Time	Interval	Parameters	Notes
Mass Emission (ME)	10/04/07; 1521	10/04/07; 1524	30 min	temperature, conductivity	Collect two required parameters
	10/04/07; 1524	11/02/07; 1105		Data Gap	Probe stopped functioning after disconnect with handheld download device; battery issue; CDM contacted BOR and offered to collect extra month at back end of project to make up for loss of data; BOR contacted RWQCB, but RWQCB declined to have CDM collect additional month.
	11/02/07; 1105	11/21/07; 1435	30 min	Temperature, conductivity	
	11/21/07; 1435	12/14/07; 1033		Data Gap	ME probe was damaged by a prior storm and was not functioning during this period.
	12/14/07; 1033	03/03/08; 2003	30 min	Temperature, conductivity	Replacement ME sonde installed on 12/14/07
	03/03/08; 2003	03/19/08; 1431		Data Gap	Low battery voltage problem ended recording; replacement conducted on 3/11/08; Clock was not reset after battery change; system date defaulted and caused a further recording error.
	03/19/08; 1431	05/08/08; 1014	30 min	Temperature, conductivity; add DO, turbidity, pH	Recording problem corrected on 03/19/08; CDM decided to collect additional non-required parameters (DO, pH, and turbidity) for extra data points
	05/08/08; 1014	05/08/08; 1131		Data Gap	Brief data gap due to servicing of sonde
	05/08/08; 1131	05/23/08; 1027	30 min	Temperature, conductivity, DO, turbidity, pH	
	05/23/08; 1027	05/28/08; 1330		Data Gap	Equipment malfunction required replacement of Troll 9000 unit with YSI 6920 unit, on 05/28/08; Equipment supplier did not have a replacement Troll 9000 available
	05/28/08; 1330	08/15/08; 0900	30 min	Temperature, conductivity, DO, turbidity, pH	ME sonde removed due to no flow conditions

Table 2-2 Continuous Sonde Performance Periods

Site	Start Date/Time	End Date/Time	Interval	Parameters	Notes
Segment 1 (S1)	01/03/08	01/30/08; 0830		Data Gap	Installed S1 sonde on 01/03/08 and left running; batteries changed on 01/27/08; Battery problem discovered after the fact; When connected with handheld download device, sonde appeared to be functioning normally but was actually being powered by the handheld device; When handheld removed, the sonde was not powered up and not actually recording
	01/30/08; 0830	08/15/08; 0930	30 min	Temperature, conductivity, DO, turbidity, pH	New battery reinstalled on 01/30/08; sonde functioning
	08/15/08; 0930	08/15/08; 1015		Data Gap	Brief data gap due to servicing of sonde
	08/15/08; 1015	10/01/08; 1300	30 min	Temperature, conductivity, DO, turbidity, pH	Experienced data download connection error; YSI sonde at S1 replaced with sonde (removed from ME site on 08/15/08); DO sensor rebuilt prior to installation; Between 08/15 and 08/19, S1 sonde had a DO sensor problem; On 08/19/08, replacement YSI 6920 sonde installed. 09/12/08 - unable to calibrate DO sensor; determined sonde installed on 08/19 to have defective optical DO sensor (confirmed by Pine Environmental Tech support); another replacement ordered and installed on 09/19

Table 2-2 Continuous Sonde Performance Periods

Site	Start Date/Time	End Date/Time	Interval	Parameters	Notes
Segment 2 (S2)	01/03/08	2/5/08; 1430		Data Gap	Installed S2 sonde on 01/03/08 and left running; batteries changed on 01/27/08; battery problem discovered after the fact; when connected with handheld download device, sonde appeared to be functioning normally but was actually being powered by the handheld device; when handheld removed, the sonde was not powered up and not actually recording; 01/30/08 - S2 sonde was discovered to have additional operability problems; replacement on 02/05/08
	02/05/08; 1430	02/10/08; 1530	30 min	Temperature, conductivity, DO, turbidity, pH	
	02/10/08; 1530	03/10/08; 1430		Data Gap	S2 sonde stopped functioning due to battery problems; 2/27/08 service revealed when handheld device is connected, sonde appears to log data; in "unattended" mode, data was not collecting
	03/10/08; 1430	05/01/08; 0830	30 min	Temperature, conductivity, DO, turbidity, pH	Replacement sonde installed
	05/01/08; 0830	05/08/08; 1130		Data Gap	Downloaded file erased mistakenly due to difference in operability/software when handheld is connected to sonde versus when handheld is operated with no sonde connection
	05/08/08; 1130	05/15/08; 1000	30 min	Temperature, conductivity, DO, turbidity, pH	
	05/15/08; 1000	05/30/08; 1430		Data Gap	S2 sonde malfunctioned and could not be corrected with tech support; replacement sonde arrived and also had defect upon deployment; Installed a working sonde on 05/30/08
	05/30/08; 1430	10/01/08; 1430	30 min	Temperature, conductivity, DO, turbidity, pH	

Section 3
Data Review

Collection of field parameters with *in situ* sondes is challenging from an operational perspective. The fixed sondes were required to log data and be operational for 24 hours per day for an extended period of time.

The dynamic nature of the lagoon due to the watershed input and ocean tidal influence further presents challenges. Since the probes are left in place, the sensors, particularly for DO, are prone to fouling and required frequent cleaning and membrane replacement.

CDM performed a review of the entire set of continuously recorded data for each parameter in order to determine which data to qualify, and which data were usable for purposes of the TMDL model effort. DO and conductivity are the most important parameters for the lagoon modeling effort.

Attachment 1 provides details of the review with general observations. Plots were produced to help examine trends. For instance, the DO readings were examined to determine if they were following a diurnal cycle pattern or experiencing drift. In the case of temperature data, it was evaluated to determine if readings were following diurnal fluctuations.

Review of these field collected data is not a perfect science but requires judgment to determine which data to qualify and which data to leave intact.

Obvious anomalous readings were identified in cases where the readings were fixed (and unchanging) over a period of time, were obvious outliers, or implausible negative readings. Negative value turbidity readings were a common observation for each of the sites). These anomalous readings were declared invalid.

Continuously collected data are summarized in separate worksheet tabs (Segment 1, Segment 2, and ME) in an Excel Workbook file named "SantaMargaritaLagoonField_Data2009 May.xls. The date, time, and recorded parameters (conductivity, DO, pH, temperature, and turbidity) are shown in each column of the worksheet. In addition, for each parameter, a qualifying column documents the reason for invalidating the data record. Qualifying reasons include a range of reasons to including the following:

- Anomalous data - data spike
- Anomalous data - data spike/fixed reading
- Anomalous data - equipment error
- Anomalous data - probe possibly out of water
- Anomalous data - prone to downward drift
- Anomalous data – data shifts after calibrations
- Damaged DO sensor

- Invalid – erratic results
- Invalid – negative value
- Invalid – no flow at ME
- Outlier

Table 3-1 lists for each of the collections sites, by parameters, the maximum number of records that potentially could have been recorded, the number of data records recorded, and the actual remaining usable records as a result of the data review. Each of the sondes at the sites collected data on a 30 minute interval, 24-hours per day, for a maximum total of 48 records each day.

As a result of the data review, data records for each parameter were qualified. The remaining data resulted in a usable dataset.

Table 3-1 Comparison of Required, Recorded, Qualified, and Usable Records

Site					
Mass Emissions	**Conductivity**	**Dissolved Oxygen**	**pH**	**Temperature**	**Turbidity**
Required	17,568	1,248	1,248	17,568	1,248
Recorded	11,962	7,168	7,168	11,962	7,168
Qualified	4,612	3,541	1,079	1,303	3,397
Usable	7,350	3,627	6,089	10,659	3,771
Segment 1					
Required	10,224	1,248	1,248	10,224	10,224
Recorded	11,747	9,676	11,747	11,747	11,747
Qualified	3,906	5,592	4	1	5,964
Usable	7,841	4,084	11,743	11,746	5,783
Segment 2					
Required	10,224	1,248	1,248	10,224	10,224
Recorded	8,738	8,738	8,738	8,738	8,738
Qualified	3,968	4,390	5	50	2,184
Usable	4,770	4,348	8,733	8,688	6,554

Section 4
Data Quality Objectives

Data quality objectives (DQOs) were established in the QAPP to ensure precision, accuracy, and completeness. The data quality indicators (DQIs) for field measured data are expressed in terms of precision, accuracy, and completeness and are listed as follows in Table 4-1. These established criteria were derived from Element 7 of the SWAMP QAPP template.

Table 4-1 Data Quality Objectives for Field Measurements

Group	Parameter	Precision	Accuracy	Completeness
Field Measurement	Temperature	± 0.5°C	±0.5°C	90%
	Conductivity	± 5%	0.5 uS/cm	90%
	Turbidity	± 5%	0.1 NTU	90%
	pH	± 5%	0.1	90%
	DO	± 5%	0.5 mg/L	90%

4.1 Precision

Precision is a quantitative term that estimates the reproducibility of a set of replicate measurements under a given set of conditions. It is defined as a measurement of mutual agreement between measurements of the same property, and is expressed in terms of relative percent difference (RPD) between duplicate determinations.

Since the field measured data were derived from *in situ* continuous monitored equipment, there was no true opportunity to collect actual "duplicate" measurements from the sondes as a means to assess precision between duplicate measurements.

However, beginning in May 2008, prior to each calibration of fixed sondes at S1, S2, and ME sites, hand-held field measurements were taken with an Horiba U-20 as a form of backup and additional readings to assist modelers in future efforts. These discrete readings are provided in Table 4-2 and compared to the readings collected from the fixed continuously recording sondes at Segment 1 and Segment 2. Table 4-3 also shows a comparison of discrete readings taken at the ME site to readings collected from the ME fixed continuously collecting sonde.

Since the autonomous sondes record data at 30 minute intervals, the exact times at which field measurements were recorded with the hand held Horiba U-20 do not always correspond directly with the times associated with autonomously logged measurements by the fixed sondes.

Table 4-2 Comparison of Discrete Readings with Fixed Sonde Collected Readings for S1 and S2

Discrete Field Measurement at S1 and S2 Sites during Calibration

Date	Segment	Time	Temp (C)	Conductivity (mS/m)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	pH
05/08/08	**S2**	11:00	18.51	6.33	3.5	10.07	7.2
05/08/08	**S1**	11:55	18.77	28.4	19	14.09	7.3
05/15/08	**S2**	11:00	20.88	3.02	0	8.87	7.4
05/15/08	**S1**	11:40	23.62	30.1	41.6	14.01	7.6
05/23/08	**S2**	11:00	20.64	24.1	40.6	7.74	7.0
05/23/08	**S1**	12:10	15.67	35.5	21	11.63	7.8
05/28/08	**S1**	14:10	22.58	2.62	66.9	12.52	8.0
05/28/08	**S2**	14:30	22.32	2	5.8	13.47	8.0
06/05/08	**S1**	9:15	20.7	48.2	147	8.33	6.8
06/05/08	**S2**	10:00	20.52	24.6	18.7	6.75	7.4
06/13/08	**S1**	9:25	22.84	55.9	50.8	6.77	7.2
06/13/08	**S2**	9:55	25.03	33.2	16.6	4.63	7.2
06/20/08	**S1**	9:15	23.56	49	60.2	6.16	7.1
06/20/08	**S2**	9:45	25.31	41.8	28.5	6.8	7.4
06/27/08	**S1**	11:50	25.53	50.7	61.7	19.99	8.0
06/27/08	**S2**	12:35	27.35	37.3	27.5	13.49	7.9
07/03/08	**S1**	11:20	22.2	56.8	142	5.69	7.4
07/03/08	**S2**	12:05	24.15	4.95	3	3.37	7.2
07/11/08	**S1**	11:05	25.3	45.2	12.8	9.41	7.0
07/11/08	**S2**	11:35	25.75	33.3	43.5	10.11	7.2
07/17/08	**S1**	15:15	27.49	54.2	165	18.62	7.1
07/17/08	**S2**	16:30	31.06	44.1	1.1	17.26	7.5
7/23/2008	**S2**	14:30	29.22	41.2	0	14	7.6
7/23/2008	**S1**	15:30	29.73	42.2	200	9.95	7.3
7/30/2008	**S1**	12:00	24.91	45.4	0	13.97	8.7
7/30/2008	**S2**	17:00	29.85	91.2	0	14.05	8.9
08/08/08	**S1**	11:10	29.14	38.6	158	19.59	9.0
08/08/08	**S2**	12:00	27.64	35.5	0	12.74	8.9
08/15/08	**S1**	10:11	24.08	50.1	0	9.82	8.8
08/15/08	**S2**	12:05	27.42	78.7	0	10.94	9.0
08/29/08	**S1**	10:55	23.95	50.5	0	NR	NR
08/29/08	**S2**	11:05	25.08	39.6	0	NR	NR
09/05/08	**S1**	14:30	25.8	75.3	69	16.25	9.4
09/05/08	**S2**	14:55	29.73	63.1	108	14.8	9.2
09/12/08	**S1**	10:10	23.26	58.8	111	5.59	8.6
09/12/08	**S2**	10:55	23.66	58.3	11.4	2.38	8.9
09/19/08	**S1**	8:52	21.8	65.2	18	6.42	8.8
09/19/08	**S2**	9:10	20.33	60	66.5	0	8.6

Note: NR - no record due to equipment error

Sonde Continuous Recorded Measurement at S1 and S2 Sites

Date	Segment	Time	Temp (C)	Conductivity (mS/m)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	pH
05/08/08	**S2**	11:30	19.22	7.184	4.00	19.40	7.32
05/08/08	**S1**	12:00	12.54	0.012	-15.60	10.28	4.77
05/15/08	**S2**	10:00	19.85	2.103	7.50	7.71	7.66
05/15/08	**S1**	11:30	20.49	28.652	-6.80	7.51	7.75
05/23/08	**S2**	NR	NR	NR	NR	NR	NR
05/23/08	**S1**	12:00	18.88	42.085	4.50	4.73	7.92
05/28/08	**S1**	13:30	20.37	2.527	9.70	11.78	8.05
05/28/08	**S2**	NR	NR	NR	NR	NR	NR
06/05/08	**S1**	9:30	20.38	47.888	414.70	-0.31	7.69
06/05/08	**S2**	10:00	20.21	16.935	3.80	4.06	7.27
06/13/08	**S1**	9:30	22.8	48.79	1.80	3.01	7.55
06/13/08	**S2**	10:00	24.18	20.452	19.20	-3.91	7.87
06/20/08	**S1**	9:30	24.05	39.149	8.00	2.37	7.37
06/20/08	**S2**	10:00	25.06	26.981	2.20	-1.83	7.57
06/27/08	**S1**	12:00	25.9	41.447	21.10	10.32	8.51
06/27/08	**S2**	13:00	29.06	18.361	-1.90	1.67	8.14
07/03/08	**S1**	11:30	21.45	74.673	13.30	2.37	13.30
07/03/08	**S2**	12:00	24.07	13.864	-34.40	1.65	6.34
07/11/08	**S1**	11:30	25.37	33.212	5.30	5.70	8.08
07/11/08	**S2**	11:00	25.83	10.98	-41.10	3.74	7.36
07/17/08	**S1**	15:00	28.62	37.903	66.90	2.05	8.39
07/17/08	**S2**	17:00	31.06	2.283	-40.50	15.02	8.74
07/23/08	**S2**	14:37	20.33	0.458	-0.10	9.85	7.88
07/23/08	**S1**	15:30	26.51	34.449	-8.60	4.76	8.69
07/30/08	**S1**	12:00	24.89	27.774	-10.30	6.34	8.43
07/30/08	**S2**	17:00	30.09	17.61	1.10	4.92	8.57
08/08/08	**S1**	11:00	20.82	0.049	-3.50	8.59	5.26
08/08/08	**S2**	12:00	28.4	16.12	-0.70	13.40	7.89
08/15/08	**S1**	10:15	25	44.38	-2.20	35.11	8.64
08/15/08	**S2**	12:00	21.47	1.225	-4.00	9.51	7.36
08/29/08	**S1**	11:00	23.89	52.151	-5.50		8.03
08/29/08	**S2**	11:00	25.07	47.476	2.10	4.31	8.27
09/05/08	**S1**	14:30	25.11	51.829	-5.30		8.2
09/05/08	**S2**	15:00	27.39	48.795	24.20	5.45	7.87
09/12/08	**S1**	9:30	24.11	51.676	-6.00		7.93
09/12/08	**S2**	11:00	20.24	0.511	-5.50	6.84	7.13
09/19/08	**S1**	9:00	22.43	48.928	2.5		7.87
09/19/08	**S2**	9:00	19.94	42.269	14	2.51	7.43

Note: NR - no record due to equipment error

Table 4-3 Comparison of Discrete Readings with Fixed Sonde Collected Readings for Mass Emissions Site

Discrete Field Measurements at Mass Emission site							Sonde Continuously Collected Measurements at Mass Emission site						
Date	**Time**	**Temp (C)**	**Conductivity (mS/m)**	**Turbidity (NTU)**	**Dissolved Oxygen (mg/L)**	**pH**	**Date**	**Time**	**Temp (C)**	**Conductivity (mS/cm)**	**Turbidity (NTU)**	**Dissolved Oxygen (mg/L)**	**pH**
05/15/08	10:15	20.28	1.42	0	10.35	7.2	05/15/08	10:01:17	16.52	1.142	1404.60	9.143	7.84
05/23/08	9:20	16.06	1.01	699	7.33	6.0	05/23/08	9:27:21	15.99	0.746	644.60	6.852	7.61
05/28/08	12:55	23.76	1.33	1.3	8.4	7.3	05/28/08	13:30:31	24.36	1.11	1.70	7.8	7.79
06/05/08	8:30	18.93	1.38	6.6	9.07	6.8	06/05/08	8:30:32	18.48	1.378	1.40	8.33	7.55
06/13/08	8:35	19.07	1.3	0	9.12	7.1	06/13/08	8:30:31	19.43	1.311	0.50	8.25	7.18
06/20/08	8:30	20.2	1.29	0	7.75	6.9	06/20/08	8:30:32	20.7	1.433	-1.40	10.85	7.62
06/27/08	10:50	25.54	1.47	1.7	8.07	7.2	06/27/08	11:00:32	26.29	1.448	-7.30	7.74	7.88
07/03/08	10:20	25.67	1.49	21.4	8.47	6.9	07/03/08	10:30:32	26.12	0.048	-8.20	5.24	7.86
07/11/08	10:10	24.97	1.44	9.8	8.28	6.9	07/11/08	10:30:32	26.41	1.281	-3.70	4.13	8.09
07/17/08	17:15	27.17	0.973	0	7.63	7.0	07/17/08	17:30:32	26.81	1.008	-1.10	2.51	8.48

As an alternative approach to evaluate the precision of the fixed field measured sondes, Table 4-4 shows RPDs for each parameter using these backup discrete readings compared to the fixed sonde readings for Segment 1 and Segment 2.

Table 4-4 RPDs Calculated for S1 and S2 Sites

Relative Percent Difference (RPD) – S1 and S2 Sites							
Date	**Segment**	**Nearest Time ***	**Temp**	**Conductivity**	**Turbidity**	**Dissolved Oxygen**	**pH**
5/8/2008	**S2**	11:00	4	13	13	63	1
5/8/2008	**S1**	11:55	40	200	2035	31	42
5/15/2008	**S2**	11:00	5	36	200	14	3
5/15/2008	**S1**	11:40	14	5	278	60	2
5/23/2008	**S2**	11:00	NC	NC	NC	NC	NC
5/23/2008	**S1**	12:10	19	17	129	84	2
5/28/2008	**S1**	14:10	10	4	149	6	1
5/28/2008	**S2**	14:30	NC	NC	NC	NC	NC
6/5/2008	**S1**	9:15	2	1	95	215	12
6/5/2008	**S2**	10:00	2	37	132	50	1
6/13/2008	**S1**	9:25	0	14	186	77	5
6/13/2008	**S2**	9:55	3	48	15	2372	9
6/20/2008	**S1**	9:15	2	22	153	89	4
6/20/2008	**S2**	9:45	1	43	171	347	3
6/27/2008	**S1**	11:50	1	20	98	64	6
6/27/2008	**S2**	12:35	6	68	230	156	3
7/3/2008	**S1**	11:20	3	27	166	82	57
7/3/2008	**S2**	12:05	0	95	NC	69	12
7/11/2008	**S1**	11:05	0	31	83	49	14
7/11/2008	**S2**	11:35	0	101	7050	92	2
7/17/2008	**S1**	15:15	4	35	85	160	16
7/17/2008	**S2**	16:30	0	180	NC	14	15
7/23/2008	**S2**	14:30	36	196	NC	35	4
7/23/2008	**S1**	15:30	11	20	218	71	18
7/30/2008	**S1**	12:00	0	48	NC	75	3
7/30/2008	**S2**	17:00	1	135	200	96	4
8/8/2008	**S1**	11:10	33	199	209	78	53
8/8/2008	**S2**	12:00	3	75	NC	5	12
8/15/2008	**S1**	10:11	4	12	NC	113	2
8/15/2008	**S2**	12:05	24	194	NC	14	19
8/29/2008	**S1**	10:55	0	3	NC	NC	NC
8/29/2008	**S2**	11:05	0	18	200	NC	NC
9/5/2008	**S1**	14:30	3	37	233	NC	14
9/5/2008	**S2**	14:55	8	26	127	92	16
9/12/2008	**S1**	10:10	4	13	223	NC	9
9/12/2008	**S2**	10:55	16	197	573	97	22
9/19/2008	**S1**	8:52	3	29	151	NC	11
9/19/2008	**S2**	9:10	2	35	130	200	15

Note: Not calculable (NC) due to no recorded (NR) measurements due to equipment error
Nearest time: Discrete measurement times are not always exactly comparable to the recorded time of reading taken by the continuous sonde.

Table 4-5 shows RPDs for each parameter using these backup discrete readings compared to the fixed sonde readings at the ME site.

Table 4-5 RPDs Calculated for Mass Emission Site

Relative Percent Difference (RPD) - ME Site						
Date	**Nearest Time ***	**Temp**	**Conductivity**	**Turbidity**	**Dissolved Oxygen**	**pH**
05/15/08	10:15	20	22	200	12	9
05/23/08	9:20	0	30	8	7	23
05/28/08	12:55	2	18	27	7	6
06/05/08	8:30	2	0	130	9	10
06/13/08	8:35	2	1	200	10	1
06/20/08	8:30	2	11	NC	33	10
06/27/08	10:50	3	2	NC	4	9
07/03/08	10:20	2	188	NC	47	13
07/11/08	10:10	6	12	NC	67	15
07/17/08	17:15	1	4	NC	101	19

Note:
Not calculable (NC) due to no recorded (NR) measurements from fixed ME sonde;
Nearest time: Discrete measurement times are not always exactly comparable to the recorded time of reading taken by the continuous sonde.

As expected, the majority of the calculated RPDs listed in Tables 4-4 and 4-5 exceeded the very stringent RPD criterion of ±5 percent. As mentioned previously, a different approach was utilized to assess precision by comparing data collected by two different types of instruments. Furthermore, the sample times using the different instrumentation did not always correspond closely with each other. As a result, higher RPD values were to be expected and were not used as a basis for qualification.

4.2 Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value, and is a measure of the bias in a system.

In the case of *in situ* sampling, accuracy is obtained by calibration. Field notes are included in Attachment 2, indicating regular sonde calibration on a frequency basis beginning in April 2008.

The sonde instruments, as described in Section 2, meet the accuracy requirements as described by the manufacturer specifications (see Attachment 3) that list the accuracy level that the instruments can achieve when sensors are calibrated according to manufacturer specifications.

4.3 Completeness

As described in Section 3, the continuous field collected data was reviewed to determine for each site (S1, S2, and ME) and for each measured parameter (conductivity, DO, pH, temperature, and turbidity) the total number of recorded data records and the number of usable data records.

Each of the sondes collected data on a 30 minute interval 24 hours a day. Based upon the required collection date periods, a maximum number of total records can be determined for each site. As discussed in Section 3, the data were reviewed and qualified, resulting in a declared number of usable records for each parameter for each of three sites.

A completeness percentage was calculated based on the number of actual total recorded readings compared to required readings. Additionally, a separate completeness for acceptable data was also calculated by comparing the number of usable data to measured data.

Table 4-6 shows the completeness percentages for each field measured parameter by site.

Table 4-6 Completeness Percentage for Measured Parameters at Fixed Sonde Collection Sites

	Conductivity	% Complete	Dissolved Oxygen	% Complete	pH	% Complete	Temperature	% Complete	Turbidity	% Complete
Mass Emission (ME)										
Required	17,568	--	1,248	--	1,248	--	17,568	--	1,248	--
Required (adjusted)*	14,688	--					14,688	--		
Recorded	11,962	81%	7,168	574%	7,168	574%	11,962	81%	7,168	574%
Qualified	4,612	--	3,541	--	1,079	--	1,303	--	3,397	--
Usable	7,350	61%	3,627	51%	6,089	85%	10,659	89%	3,771	53%
Segment 1 (S1)										
Required	10,224	--	1,248	--	1,248	--	10,224	--	10,224	--
Recorded	11,747	115%	9,676	775%	11,747	941%	11,747	115%	11,747	115%
Qualified	3,906	--	5,592	--	4	--	1	--	5,964	--
Usable	7,841	67%	4,084	42%	11,743	100%	11,746	100%	5,783	49%
Segment 2 (S2)										
Required	10,224	--	1,248	--	1,248	--	10,224	--	10,224	--
Recorded	8,738	85%	8,738	700%	8,738	700%	8,738	85%	8,738	85%
Qualified	3,968	--	4,390	--	5	--	50	--	2,184	--
Usable	4,770	55%	4,348	50%	8,733	99%	8,688	99%	6,554	75%

* ME site had no flow from August 15, 2008 to September 30, 2008; Expected required records reduced to account for dry period.

Attachment 1
Data Evaluation of Continuous Data

Attachment 2
Field Logbook Documenting Calibration Activity

Attachment 3
Sonde Manufacturer Specifications

Santa Margarita Lagoon WQ Data Review (Inception to May 2008)

General Comments

There are certainly some unusual data for these three sites with respect to normal freshwater systems. However, this is primarily due to the fact that the sites, particularly the lagoon sites, are strongly influenced by the ocean tides.

In general, the majority of the data appear to be valid, or at least potentially valid. In other words, without any site-specific knowledge of the sites, I would be reluctant to declare these data invalid. There were, however, certain data points, and periods of sampling, that appeared to be clearly anomalous. These are indicated with red circles in the attached spreadsheets, and describe further below.

Finally, in some cases, the data by themselves tell an interesting story about water quality dynamics in the lagoon.

Parameter-Specific Notes

Temperature

- No obvious invalid data;
- Generally characterized by large diurnal fluctuations and gradual mean daily temperature increase with season;
- Magnitude of diurnal cycles are large for a river, but not unrealistic for a shallow, unshaded system with large air temperature fluctuations;
- Temperature data is usually very reliable;
- Magnitude of diurnal fluctuations are somewhat erratic for Sites 1 and 2 but this is likely explained by tidal variations in depth.
- Final recommendation = keep all data.

pH

- Nearly all of these data look ok. A few outliers for Site 1 are noted and there was clearly a calibration issue at ME site (see graphs). However, these data are not critical to the water quality modeling.

Turbidity

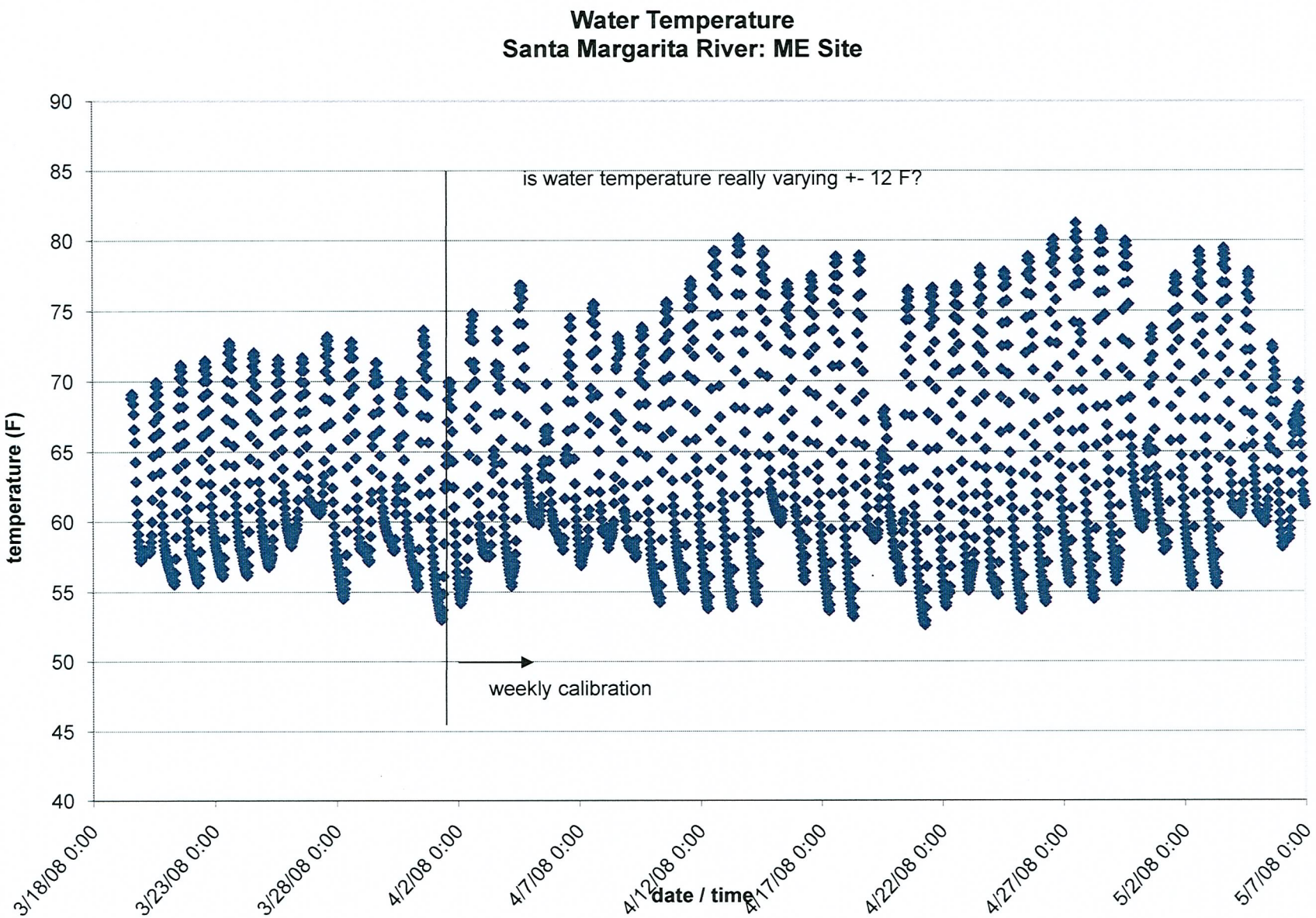
- Turbidity is a measure of suspended solids and therefore can fluctuate dramatically as a function of hydrology/hydrodynamics and local sediment disturbances;
- Many of the high turbidity values at ME Site and Site 1 appear to be anomalous (instrument error), but others could be valid;
- Clearly all negative values can be discarded;
- Any use of this data for water quality modeling will probably need to be coupled with flow data (which wasn't available to me) to make sure data make sense;
- Final recommendation = keep all "baseline" turbidity values (0 – 50 NTU), use high outliers with caution (coupled with flow data).

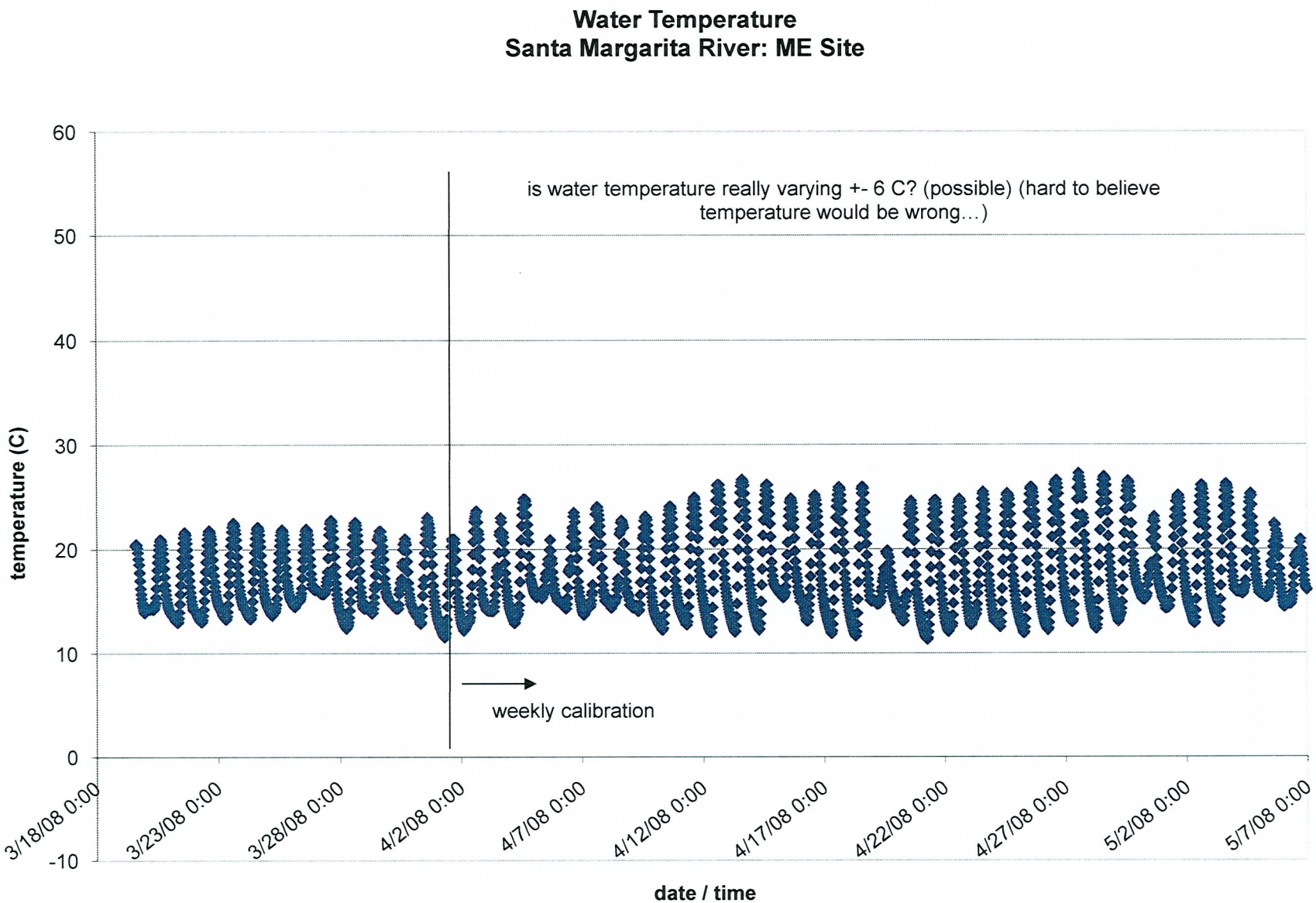
Conductivity

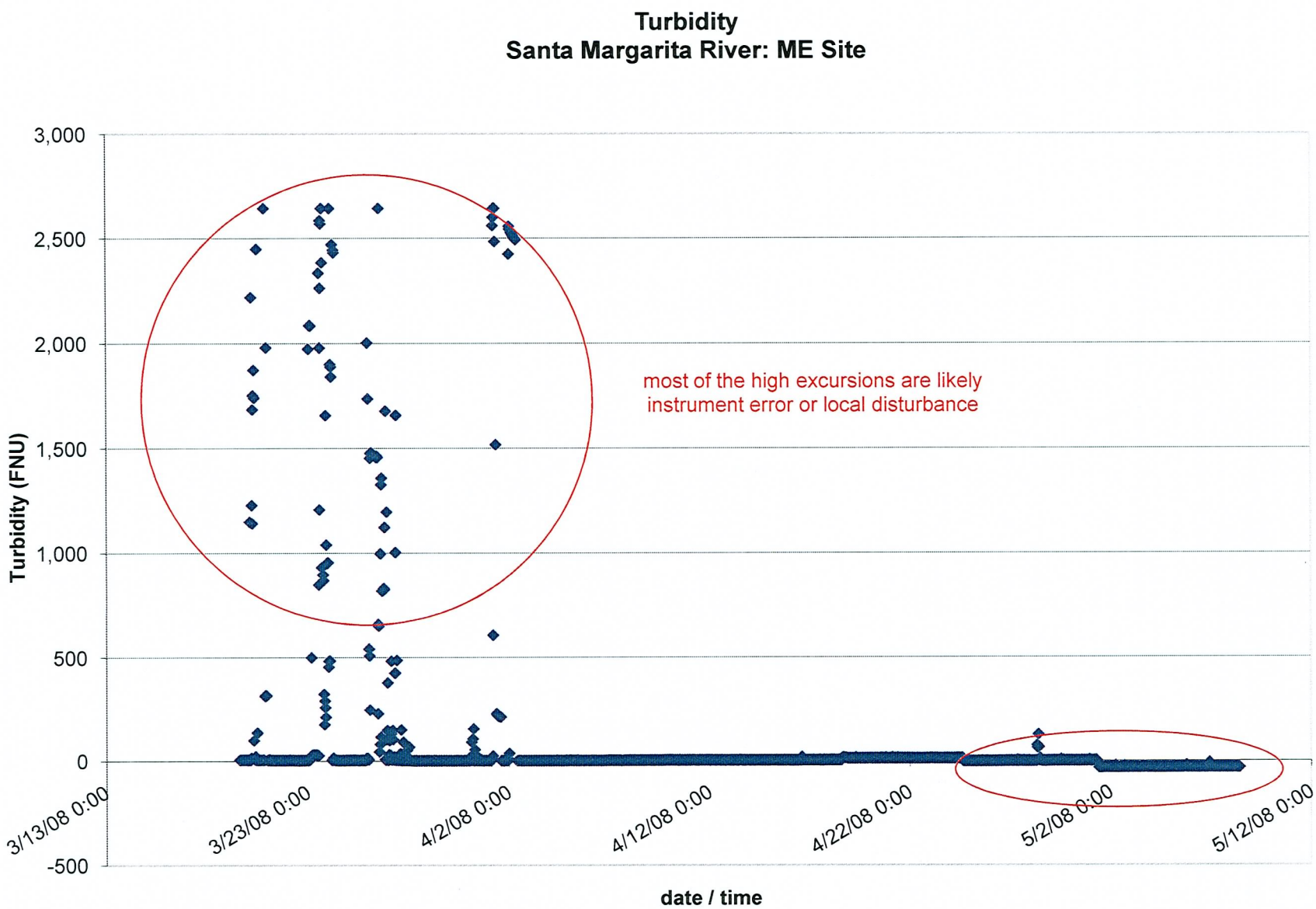
- For ME Site, most reliable data appears to be from approx. 4/4/08 onward (diurnal fluctuations in this data are plausible and would be due to large fluctuations in water temperature);
- ME Site data prior to this date should be used with caution;
- The large spike at ME Site on 1/18 – 1/21/08 is hard to explain. Or bad data?
- Sites 1 and 2 are clearly heavily impacted by tides. Cycles in EC values generally seem to follow the tides (salt water causing elevations in conductivities).

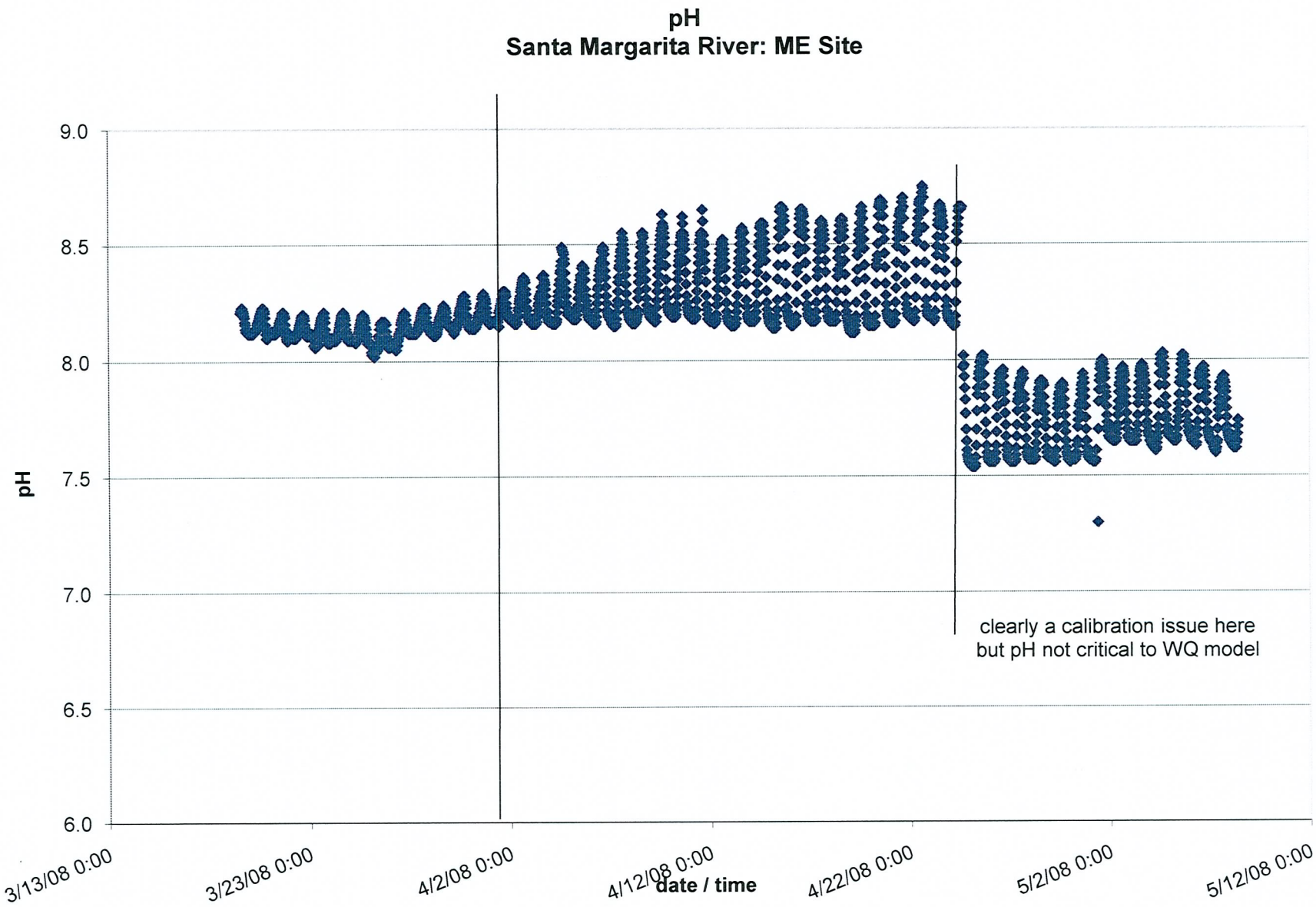
Dissolved Oxygen

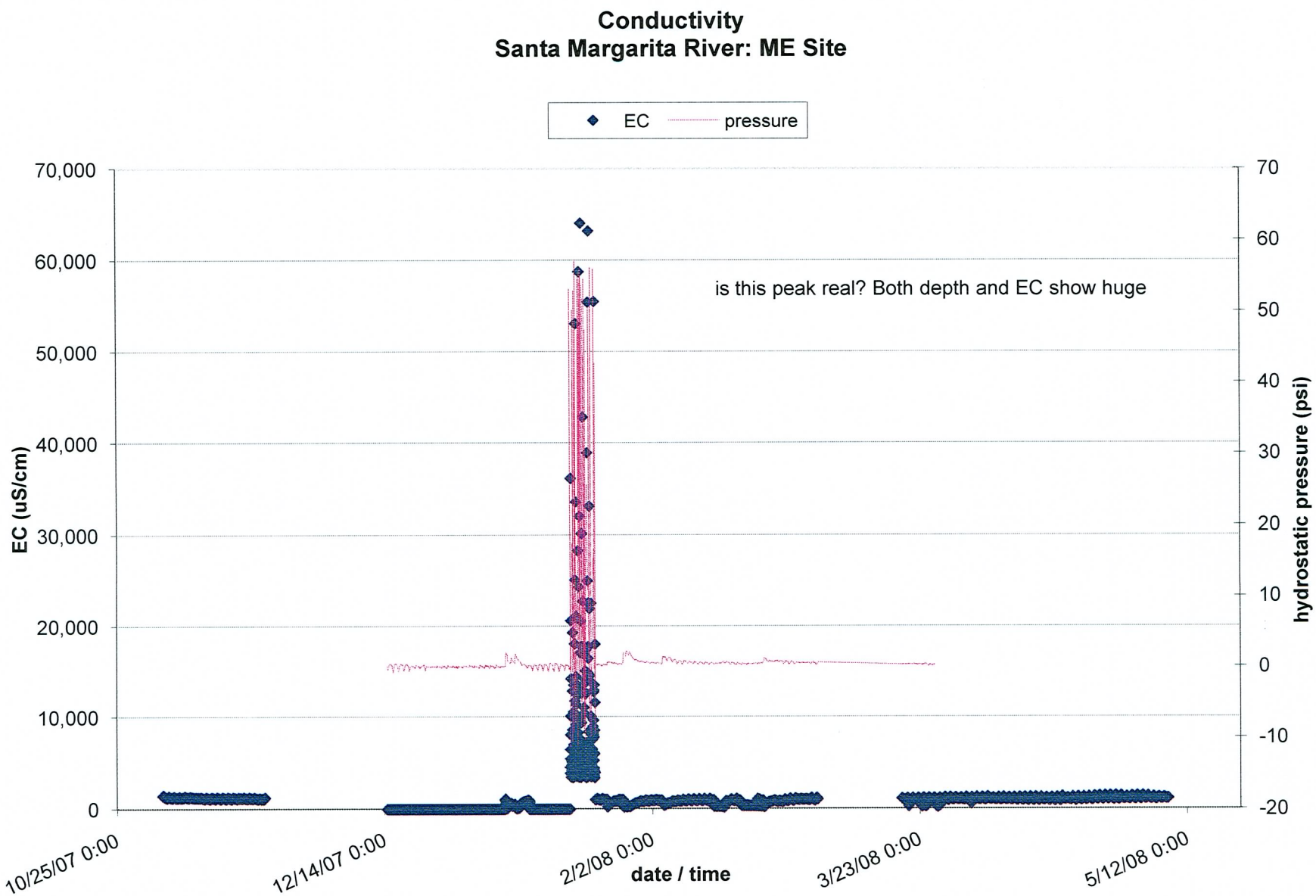
- Dissolved oxygen probes are generally prone to drift and need frequent calibration and membrane replacement;
- Given this, and from viewing the continuous data, it may be best to not put a lot of confidence in data measured prior to weekly calibration program (i.e. prior to early April). The "drift" that appears to be evident in the ME Site data prior to April 1.
- After this date, the data generally looks reliable for ME Site. There are some "super-saturated" values, but this is not uncommon – especially with prevalent biology (algae, macrophytes).
- Some independent calculations of DO saturation values (function of temperature and salinity) confirmed that the magnitudes of DO saturation measured by the probes are reasonable ("DO chart (3)"). From this figure, the actual DO profiles lag the saturation profiles by a few hours ("DO chart (4)"). This indicates that temperature is driving the diurnal swings at this site (more so, or at least as much as, the biology photosynthesis).
- For Site 2, the early February data should be discarded – looks invalid. There is also a week in mid/late April (around 18th – 24th) that should be discarded. These data are characterized by big spikes that do not follow the expected diurnal cycle.
- For Site 1, discard all DO data prior to 3/20. There are also a few outliers indicated with red circles and should be discarded.
- There are some very high DO values for both Sites 2 and 1, well above estimated saturation values. However, these are possible and are likely indicative of shallow depths and high biological productivity (are there bottom plants?).
- The fact that the high values at Sites 2 and 1 follow are sensible diurnal cycles (peak in late afternoon after a day of photosynthesis) lend credibility to these numbers.
- Also the fact that the approximately same magnitude and pattern of DO peaks are seen at both Sites (2 and 1), indicates valid data ("DO chart (3)" in Site 2.xls).
- Final recommendation = discard early measurements, as described above and confirm that the low tide depths are not dropping below the recommended minimum depths for the probes.

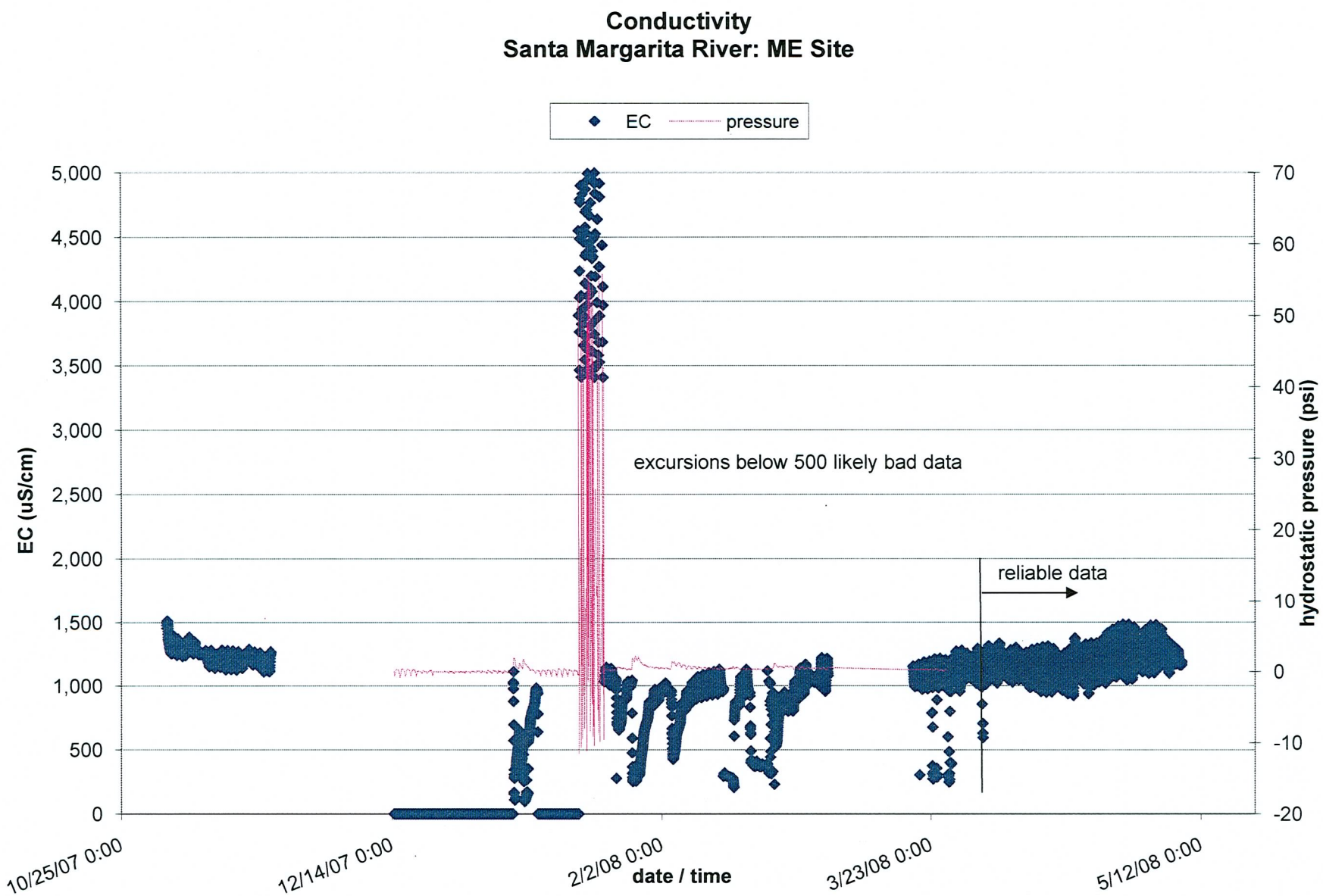

Water Temperature
Santa Margarita River: ME Site
is water temperature really varying +- 12 F?
weekly calibration
temperature (F)
90
85
80
75
70
65
60
55
50
45
40
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
date / time

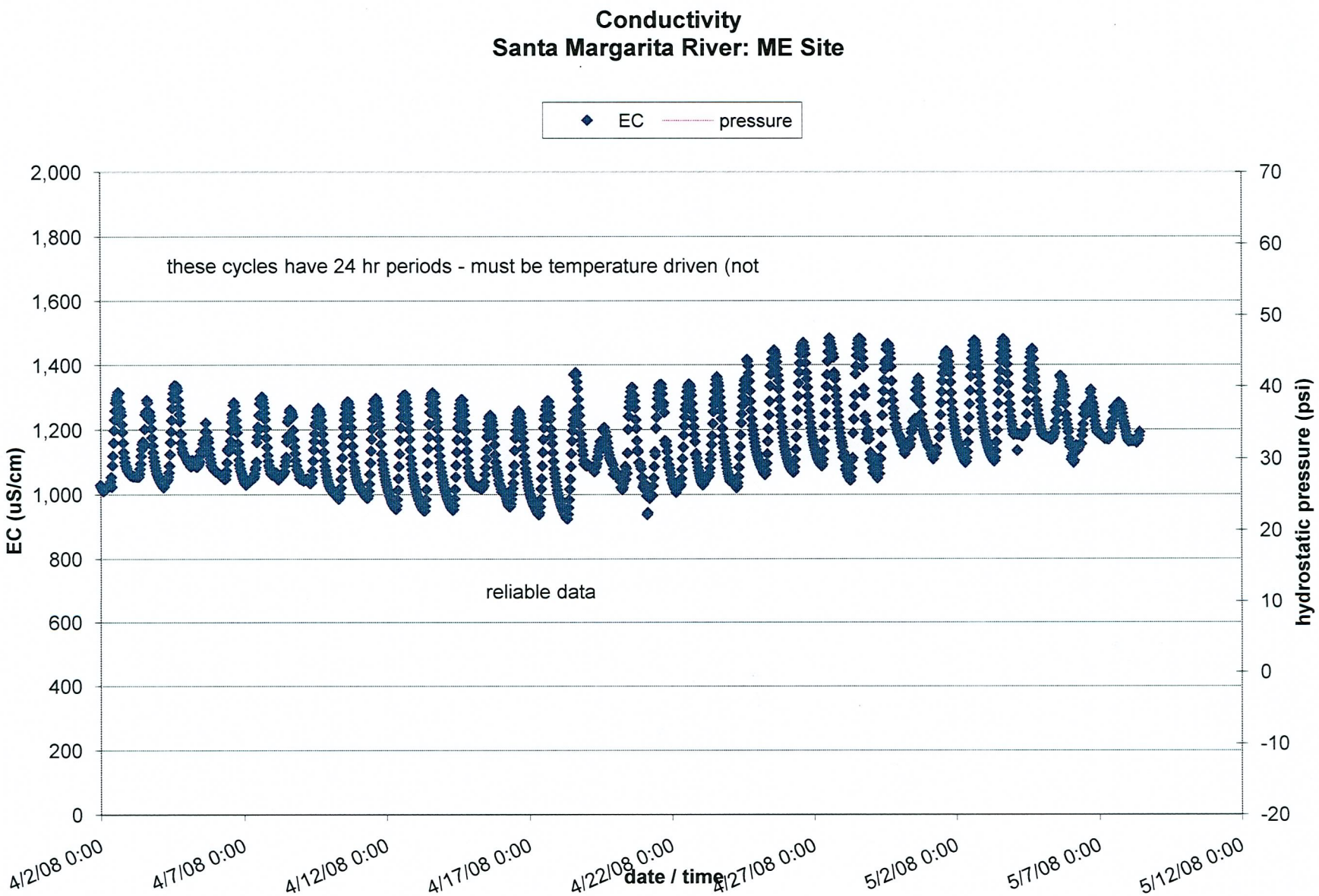

Water Temperature
Santa Margarita River: ME Site
is water temperature really varying +- 6 C? (possible) (hard to believe temperature would be wrong…)
weekly calibration
temperature (C)
60
50
40
30
20
10
0
-10
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
date / time

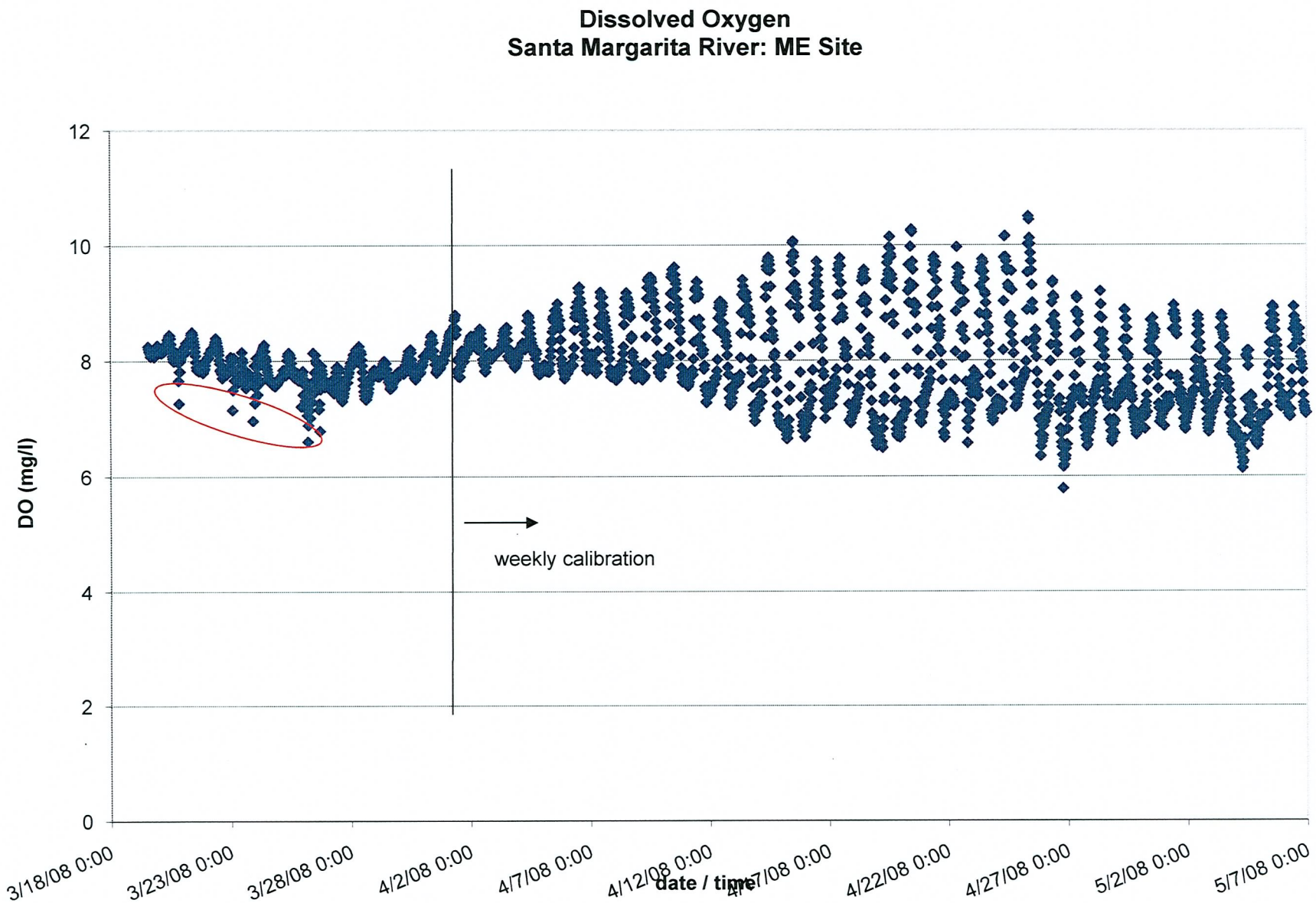

Turbidity
Santa Margarita River: ME Site
3,000
2,500
2,000
1,500
1,000
500
0
-500
Turbidity (FNU)
most of the high excursions are likely
instrument error or local disturbance
3/13/08 0:00
3/23/08 0:00
4/2/08 0:00
4/12/08 0:00
4/22/08 0:00
5/2/08 0:00
5/12/08 0:00
date / time

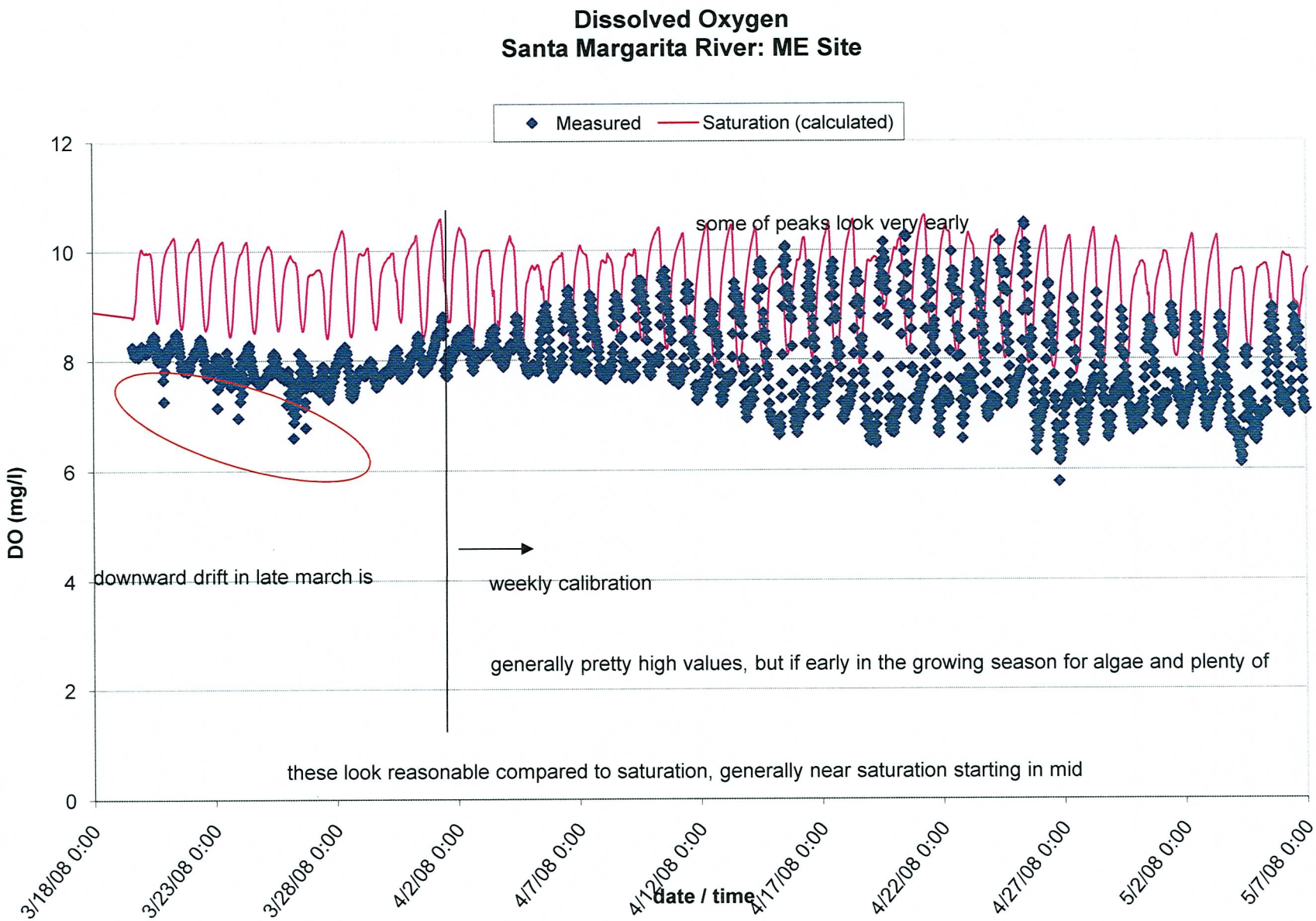

pH
Santa Margarita River: ME Site
9.0
8.5
8.0
7.5
7.0
6.5
6.0
pH
clearly a calibration issue here
but pH not critical to WQ model
3/13/08 0:00
3/23/08 0:00
4/2/08 0:00
4/12/08 0:00
4/22/08 0:00
5/2/08 0:00
5/12/08 0:00
date / time

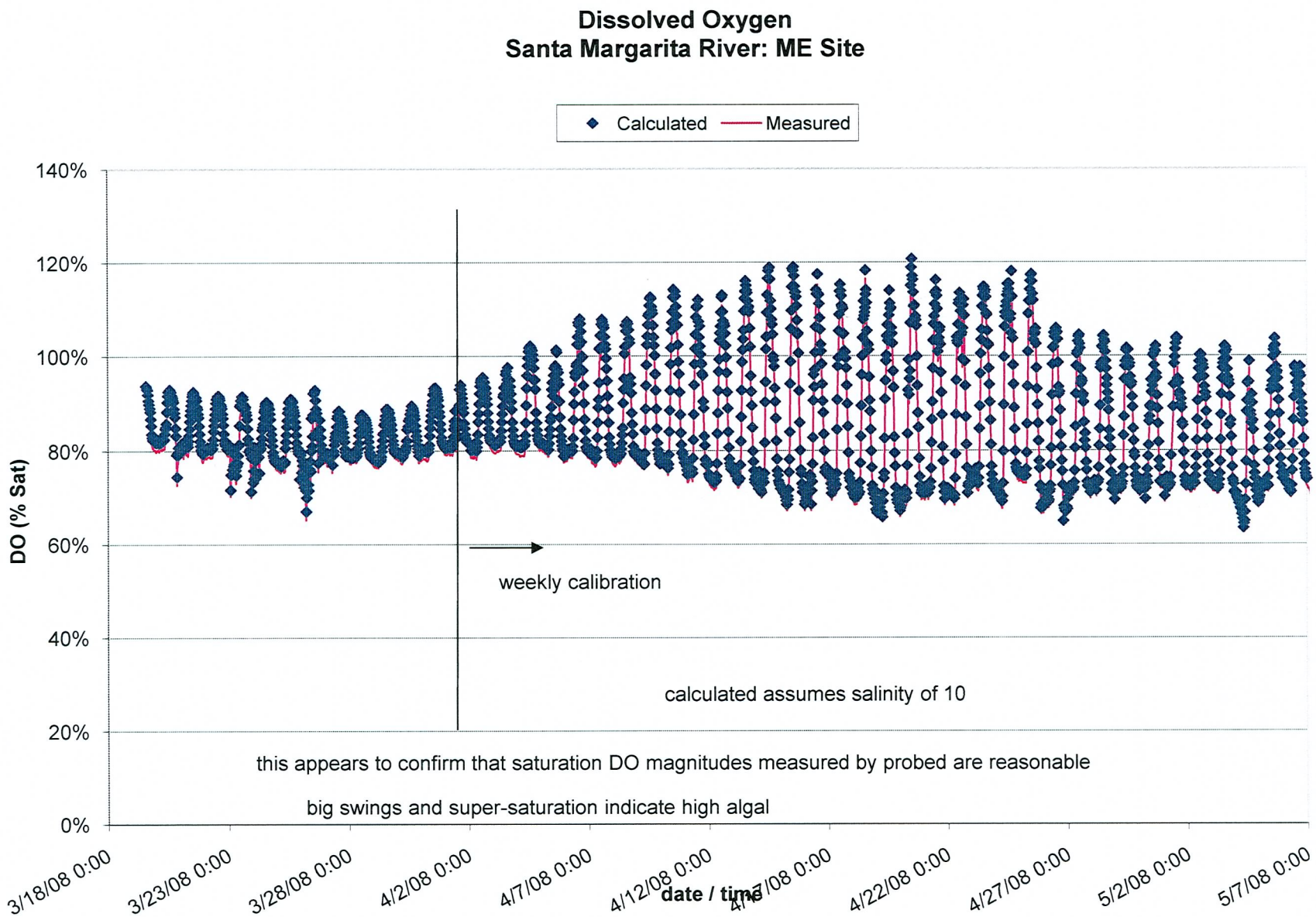

Conductivity
Santa Margarita River: ME Site
EC
pressure
is this peak real? Both depth and EC show huge
EC (uS/cm)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
hydrostatic pressure (psi)
70
60
50
40
30
20
10
0
-10
-20
10/25/07 0:00
12/14/07 0:00
2/2/08 0:00
3/23/08 0:00
5/12/08 0:00
date / time

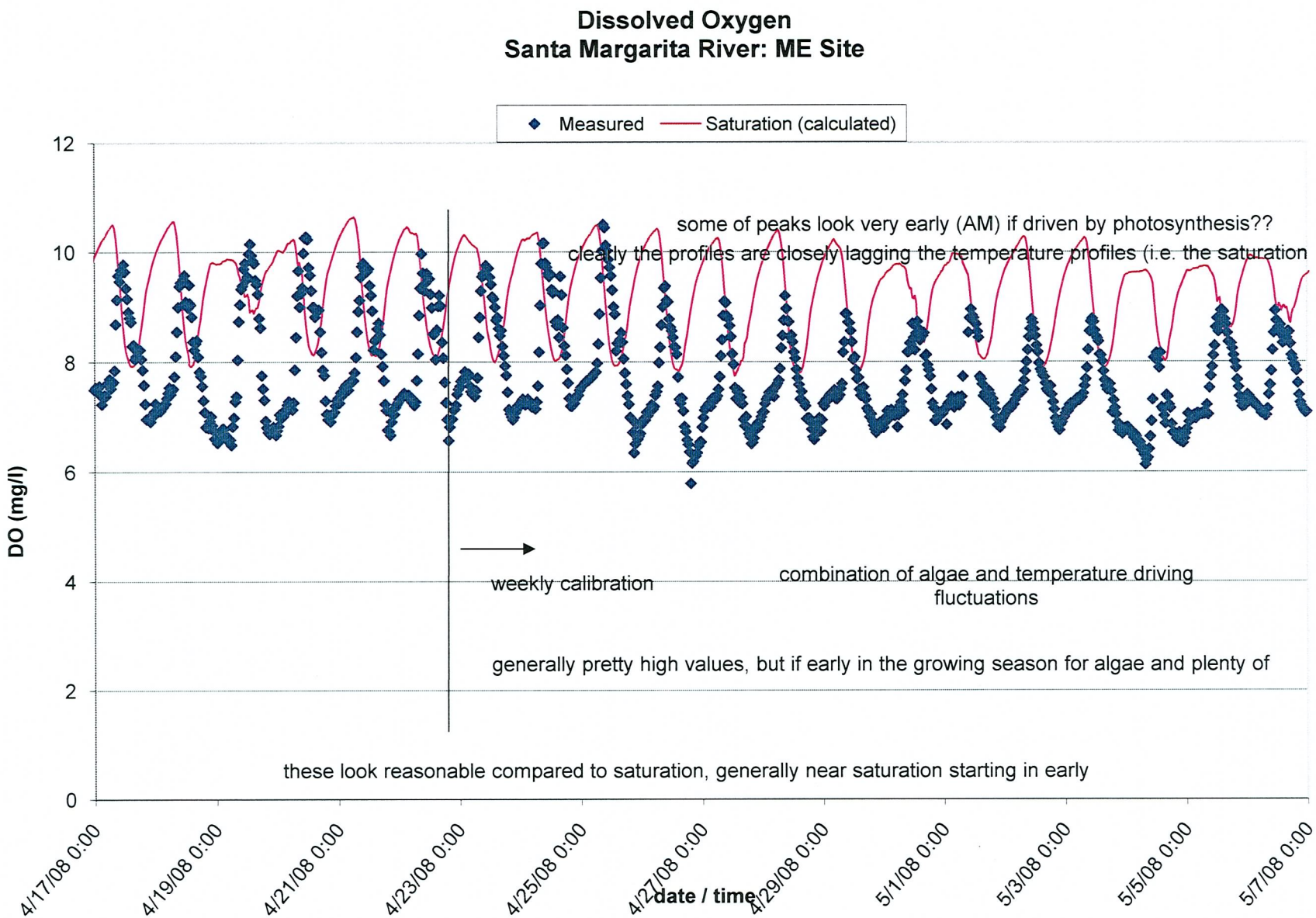

Conductivity
Santa Margarita River: ME Site
EC
pressure
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
EC (uS/cm)
70
60
50
40
30
20
10
0
-10
-20
hydrostatic pressure (psi)
excursions below 500 likely bad data
reliable data
10/25/07 0:00
12/14/07 0:00
2/2/08 0:00
3/23/08 0:00
5/12/08 0:00
date / time

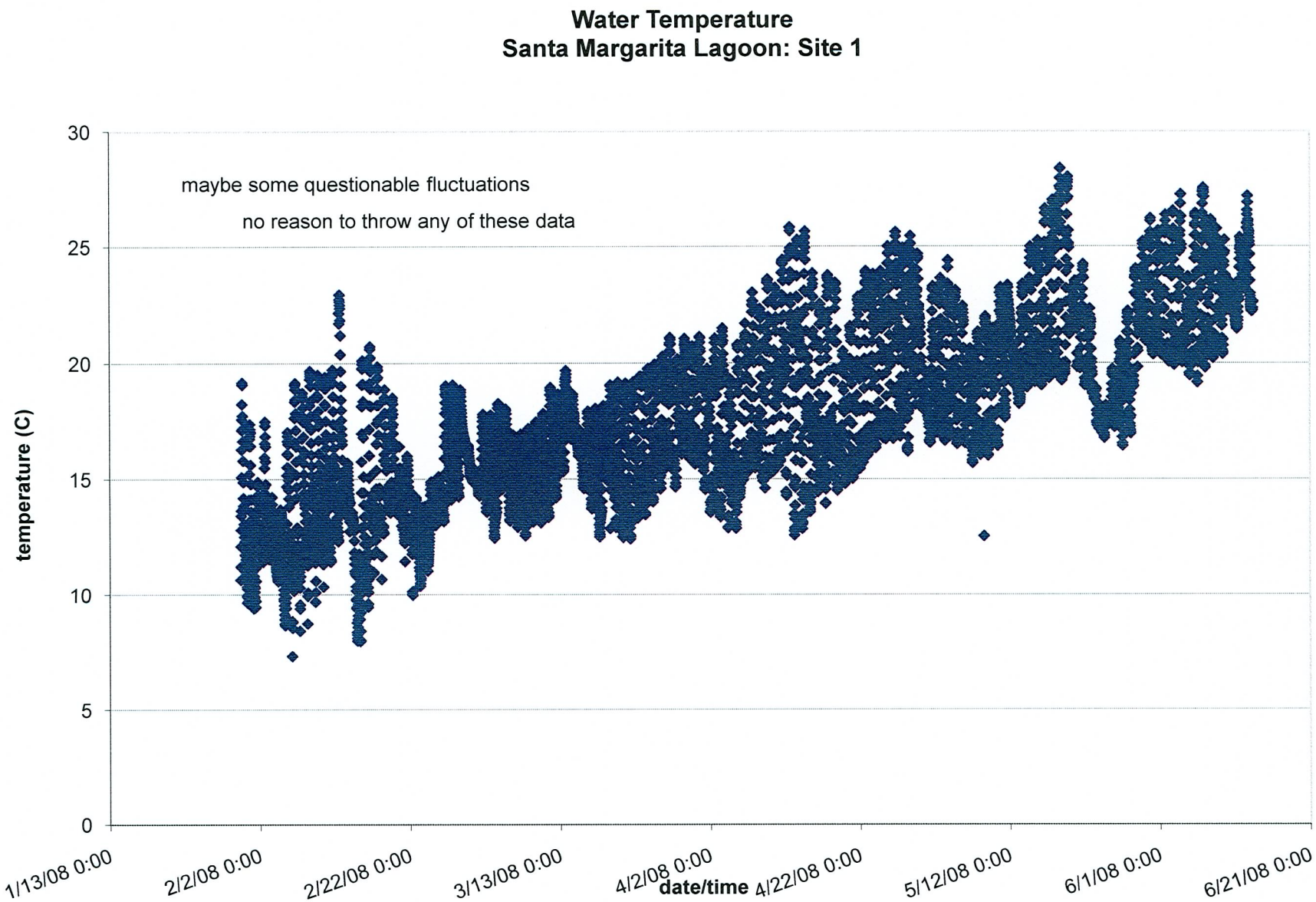

Conductivity
Santa Margarita River: ME Site
EC
pressure
these cycles have 24 hr periods - must be temperature driven (not
reliable data
EC (uS/cm)
hydrostatic pressure (psi)
date / time
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
70
60
50
40
30
20
10
0
-10
-20
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
5/12/08 0:00

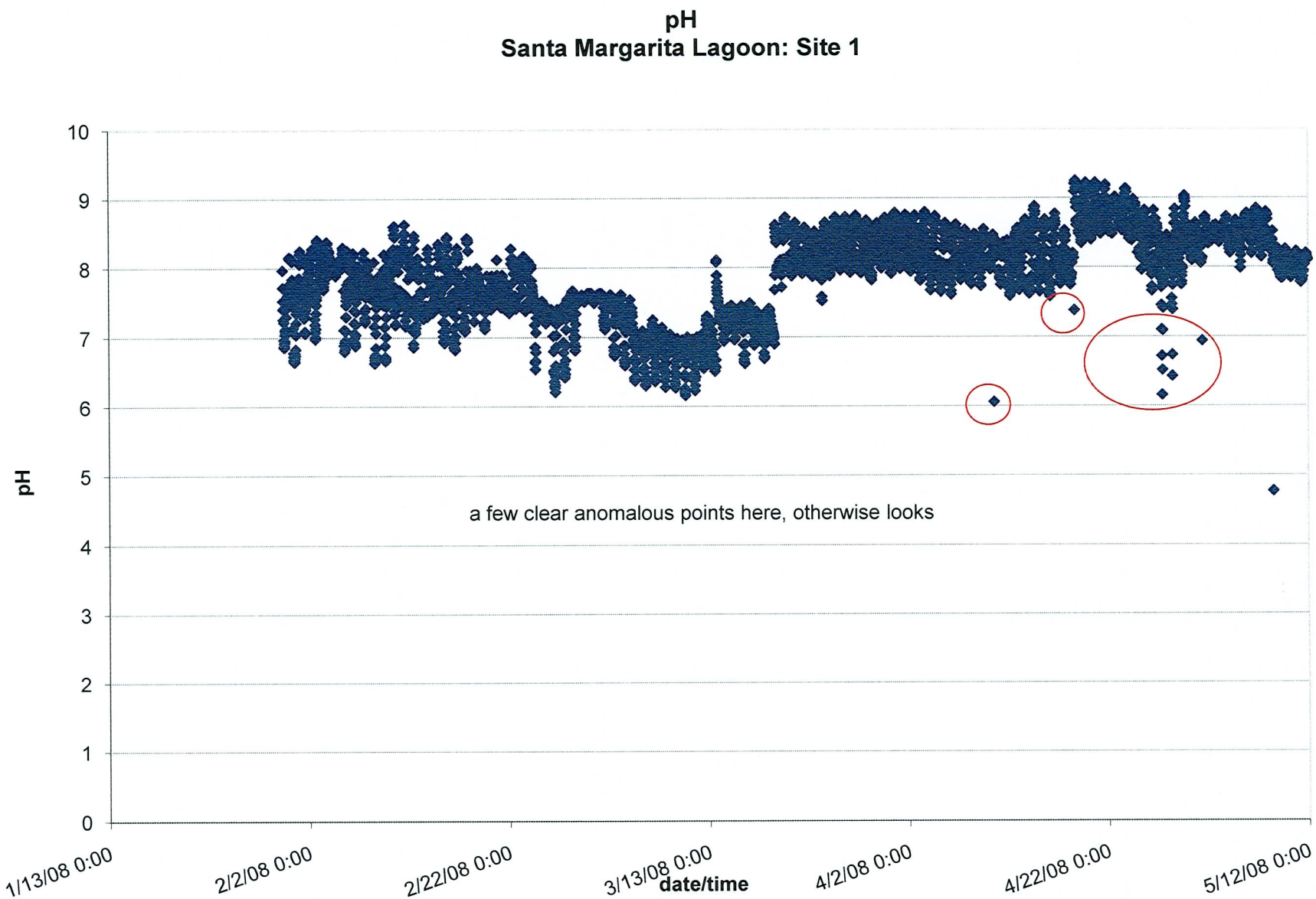

Dissolved Oxygen
Santa Margarita River: ME Site
DO (mg/l)
12
10
8
6
4
2
0
weekly calibration
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
date / time

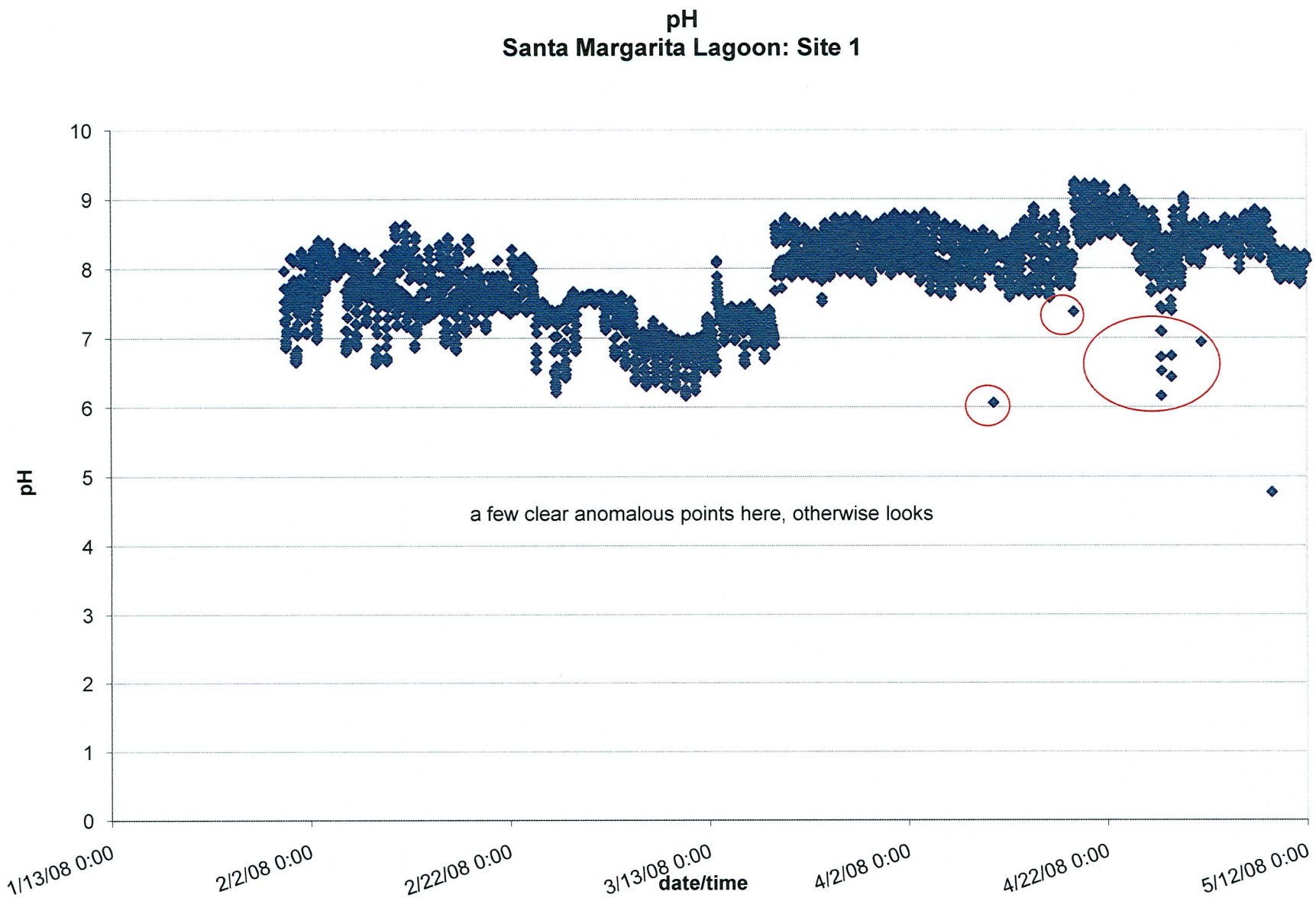

Dissolved Oxygen
Santa Margarita River: ME Site
Measured
Saturation (calculated)
DO (mg/l)
12
10
8
6
4
2
0
some of peaks look very early
downward drift in late march is
weekly calibration
generally pretty high values, but if early in the growing season for algae and plenty of
these look reasonable compared to saturation, generally near saturation starting in mid
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
date / time

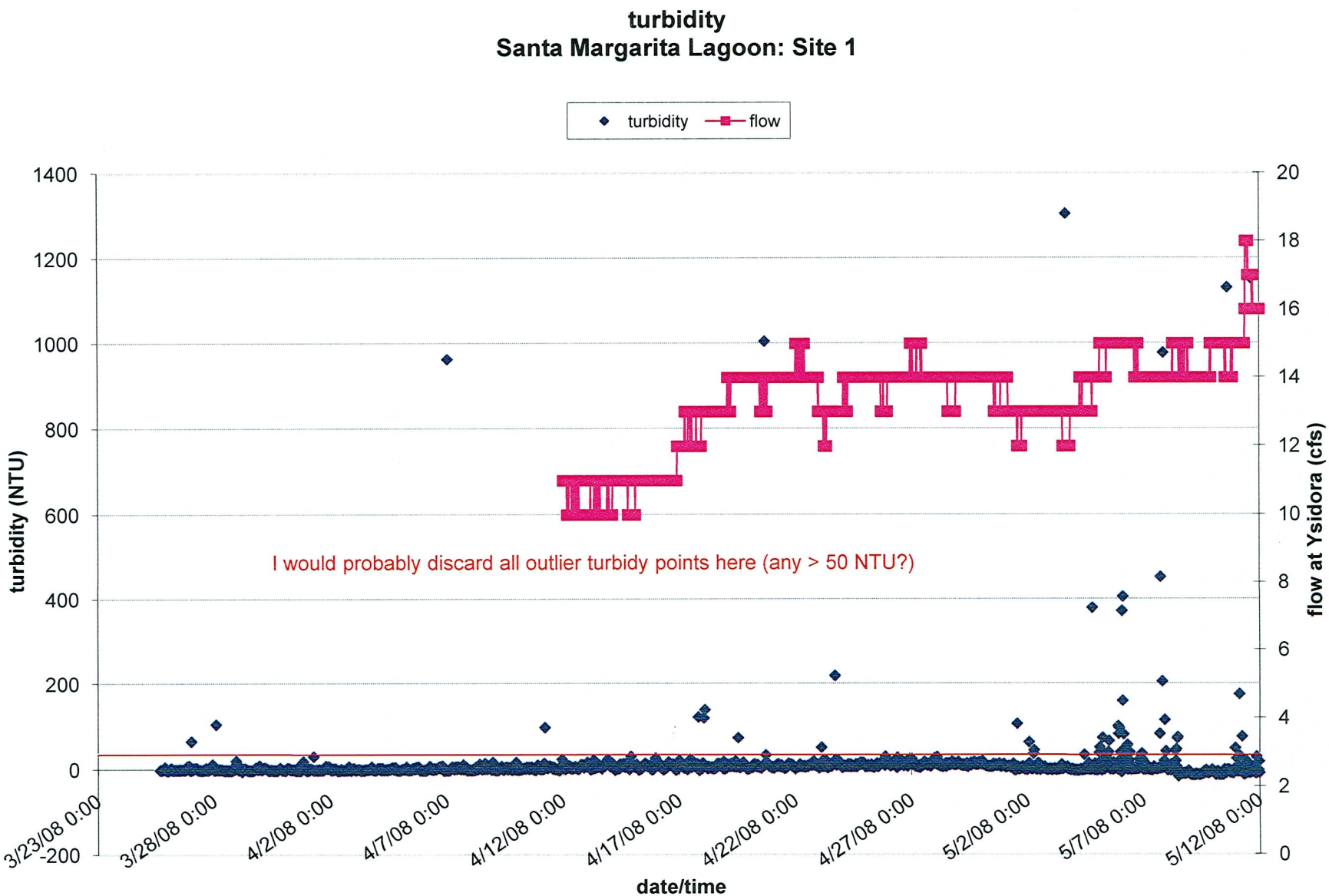

Dissolved Oxygen
Santa Margarita River: ME Site
Calculated
Measured
140%
120%
100%
80%
60%
40%
20%
0%
DO (% Sat)
weekly calibration
calculated assumes salinity of 10
this appears to confirm that saturation DO magnitudes measured by probed are reasonable
big swings and super-saturation indicate high algal
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
date / time


Dissolved Oxygen
Santa Margarita River: ME Site
Measured
Saturation (calculated)
DO (mg/l)
12
10
8
6
4
2
0
some of peaks look very early (AM) if driven by photosynthesis??
clearly the profiles are closely lagging the temperature profiles (i.e. the saturation
weekly calibration
combination of algae and temperature driving fluctuations
generally pretty high values, but if early in the growing season for algae and plenty of
these look reasonable compared to saturation, generally near saturation starting in early
4/17/08 0:00
4/19/08 0:00
4/21/08 0:00
4/23/08 0:00
4/25/08 0:00
4/27/08 0:00
4/29/08 0:00
5/1/08 0:00
5/3/08 0:00
5/5/08 0:00
5/7/08 0:00
date / time

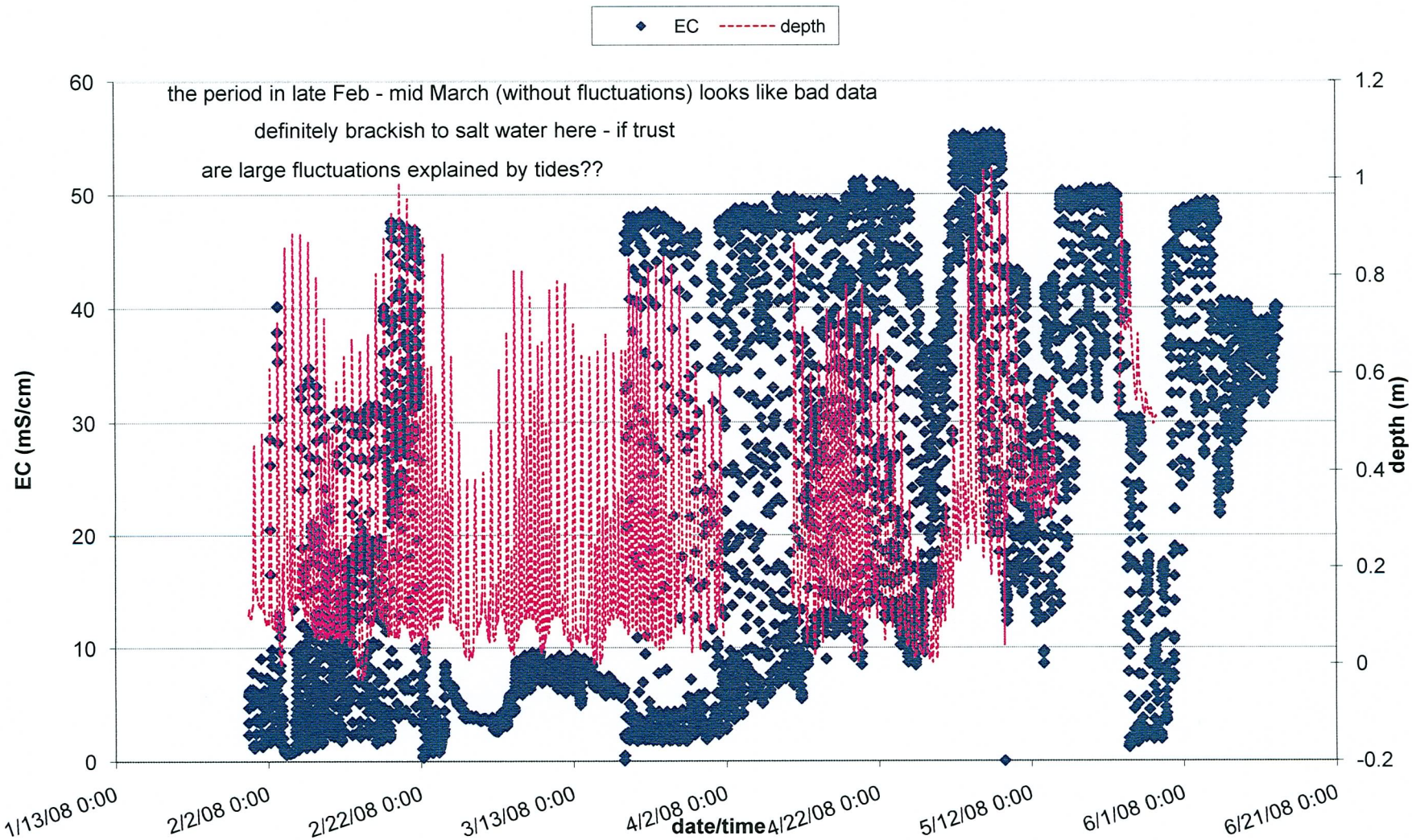

Water Temperature
Santa Margarita Lagoon: Site 1
maybe some questionable fluctuations
no reason to throw any of these data
temperature (C)
30
25
20
15
10
5
0
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
6/1/08 0:00
6/21/08 0:00
date/time

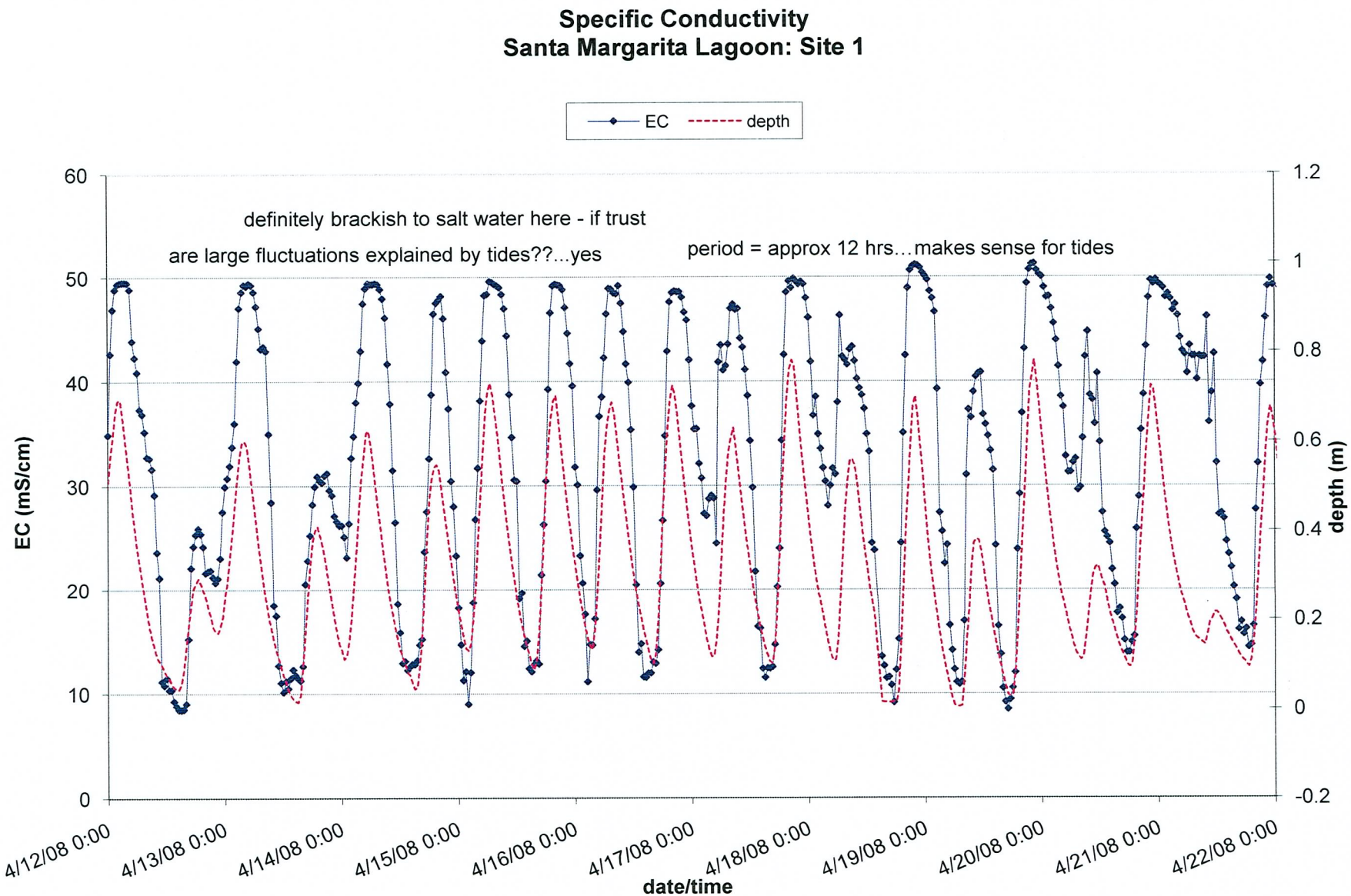

pH
Santa Margarita Lagoon: Site 1
10
9
8
7
6
5
4
3
2
1
0
pH
a few clear anomalous points here, otherwise looks
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
date/time

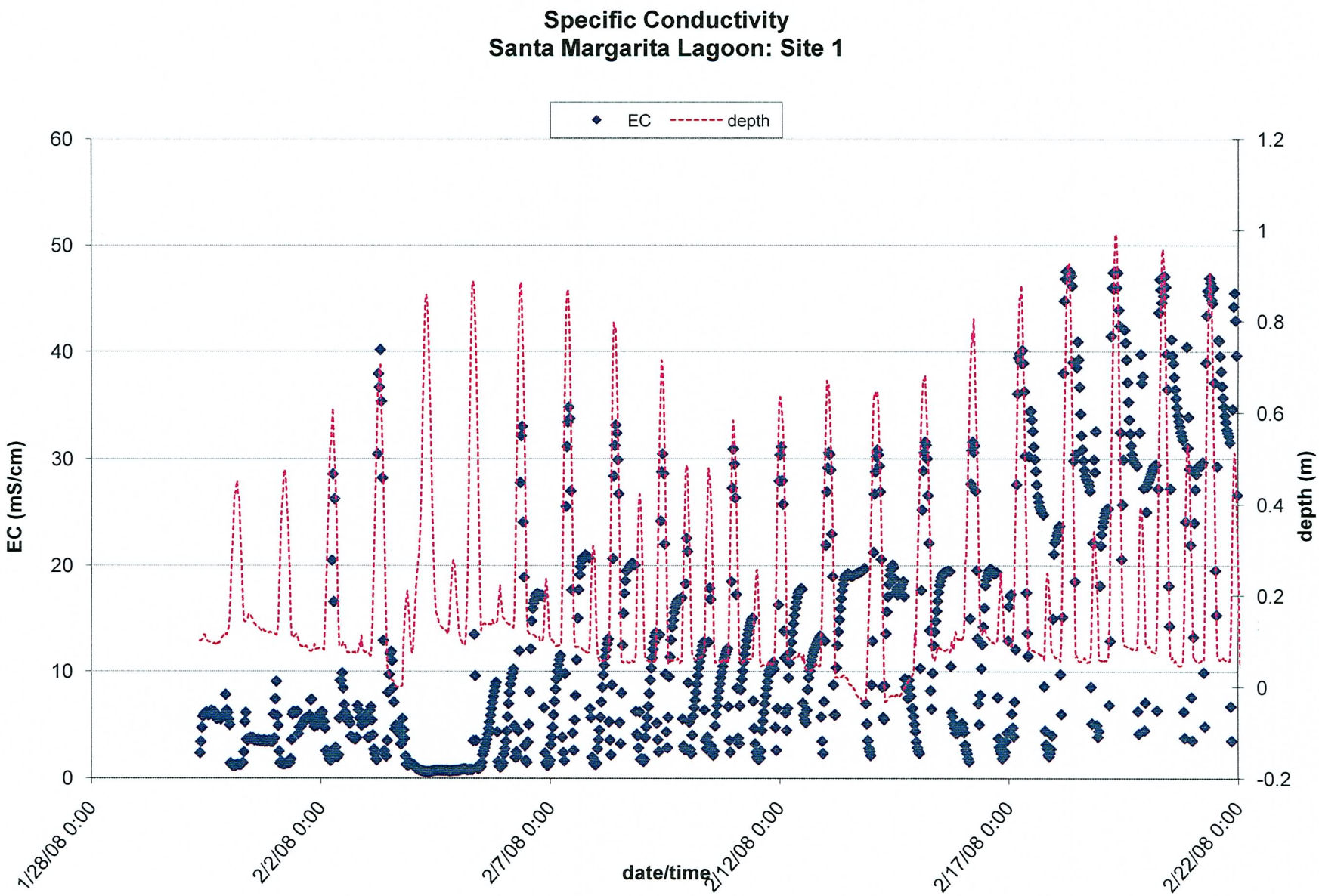

pH
Santa Margarita Lagoon: Site 1
10
9
8
7
6
5
4
3
2
1
0
pH
a few clear anomalous points here, otherwise looks
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
date/time

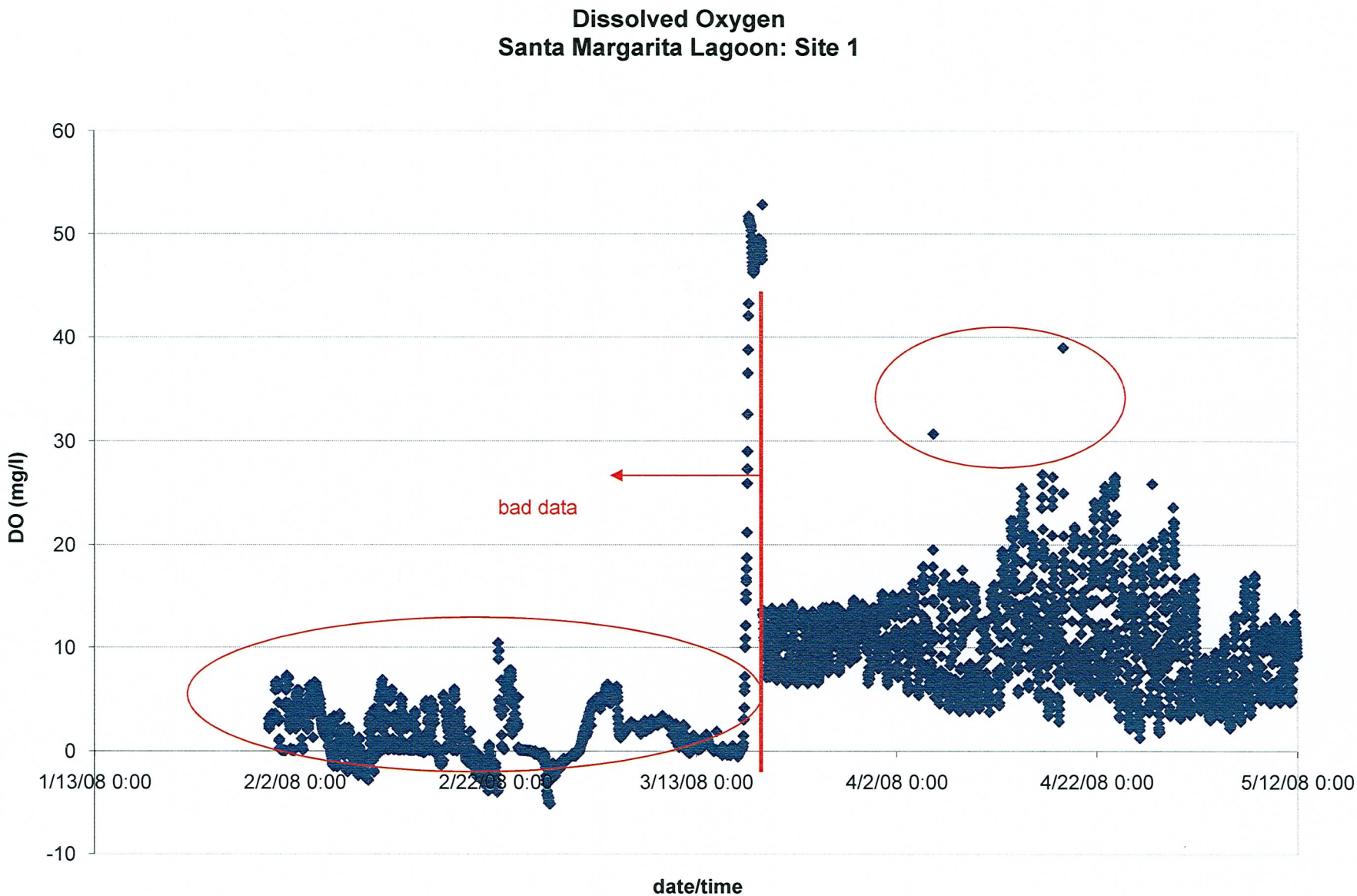

turbidity
Santa Margarita Lagoon: Site 1
turbidity
flow
1400
1200
1000
800
600
400
200
0
-200
turbidity (NTU)
20
18
16
14
12
10
8
6
4
2
0
flow at Ysidora (cfs)
I would probably discard all outlier turbidy points here (any > 50 NTU?)
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00
5/12/08 0:00
date/time

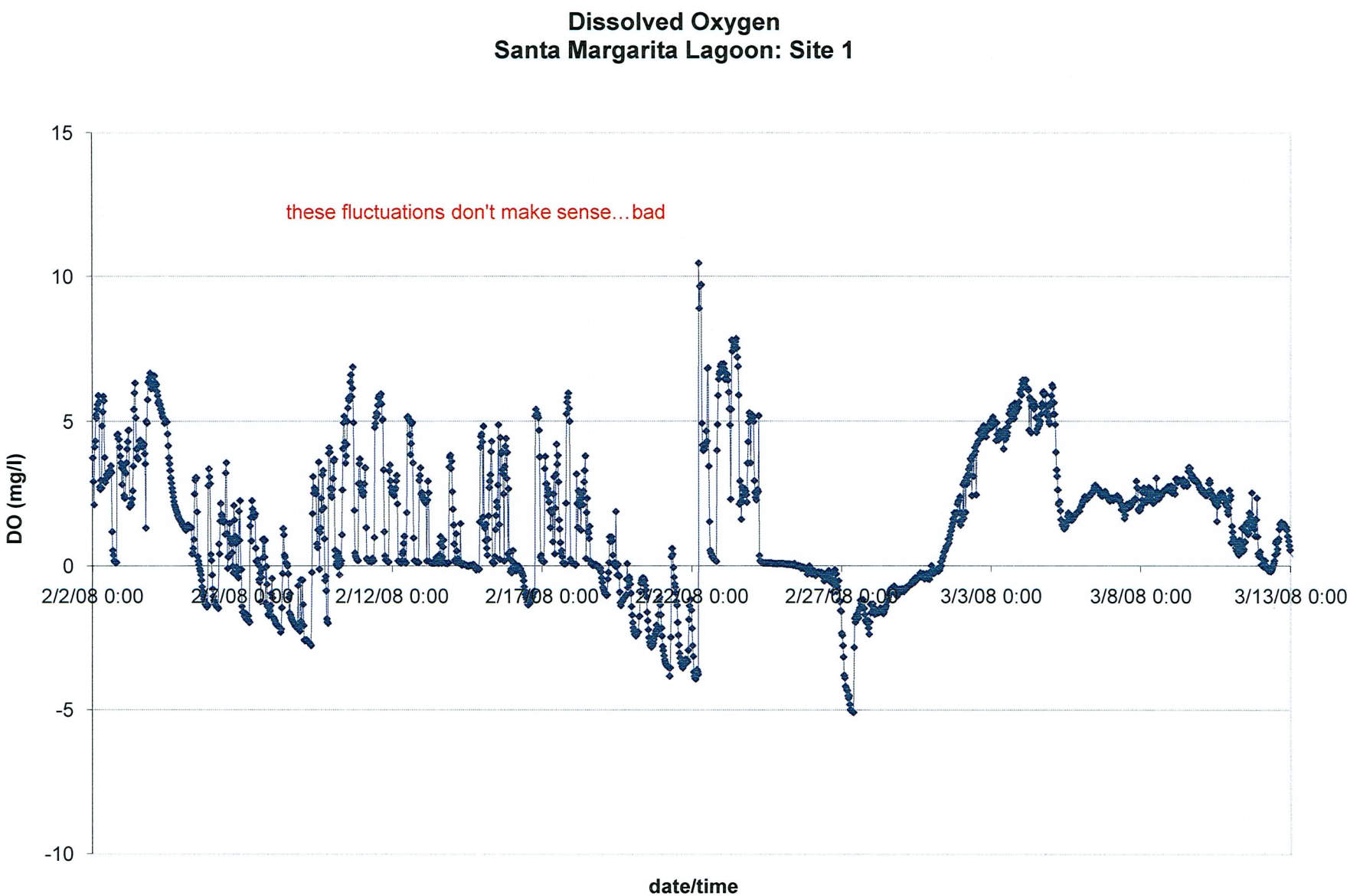
Specific Conductivity
Santa Margarita Lagoon: Site 1

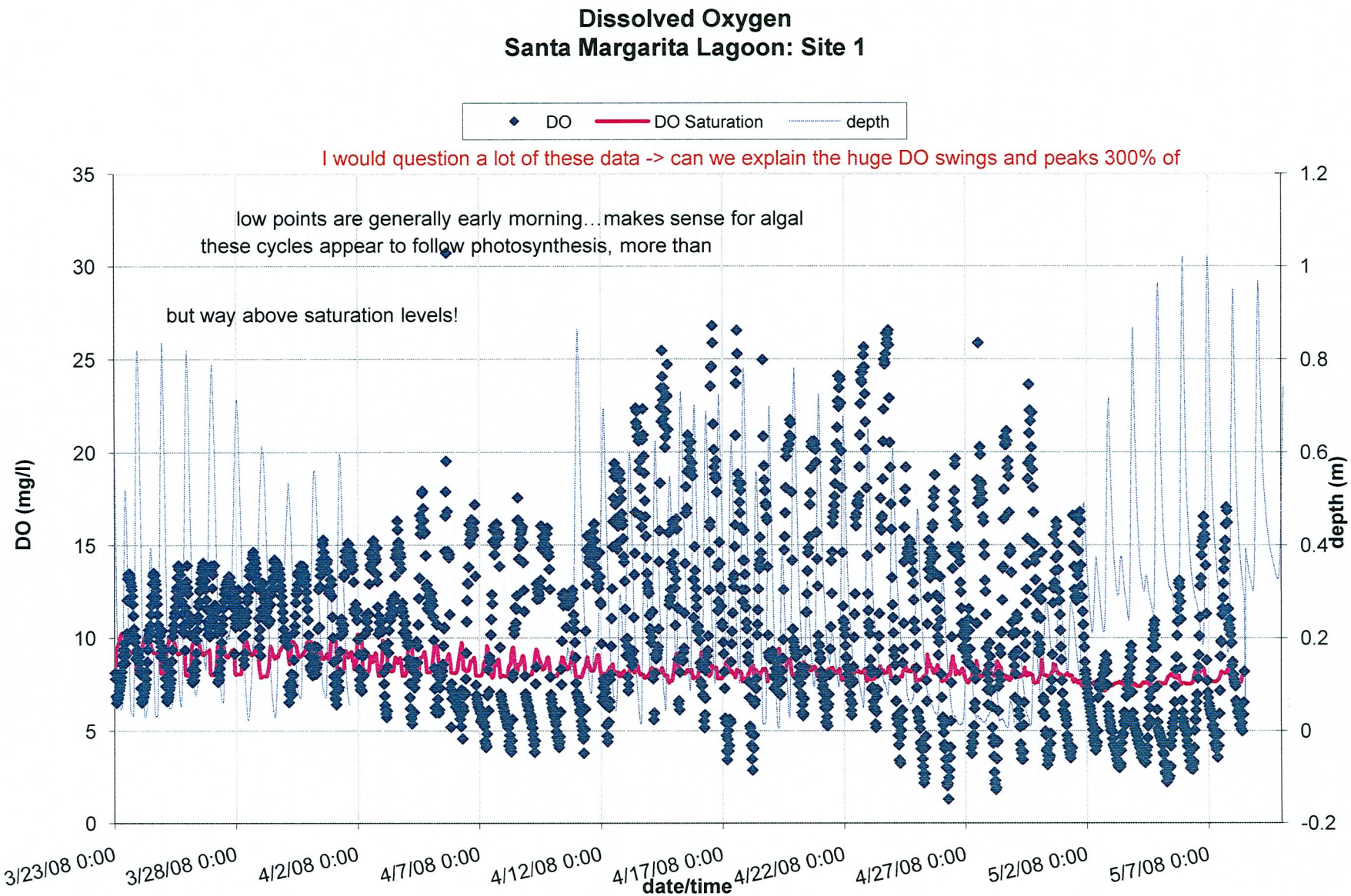


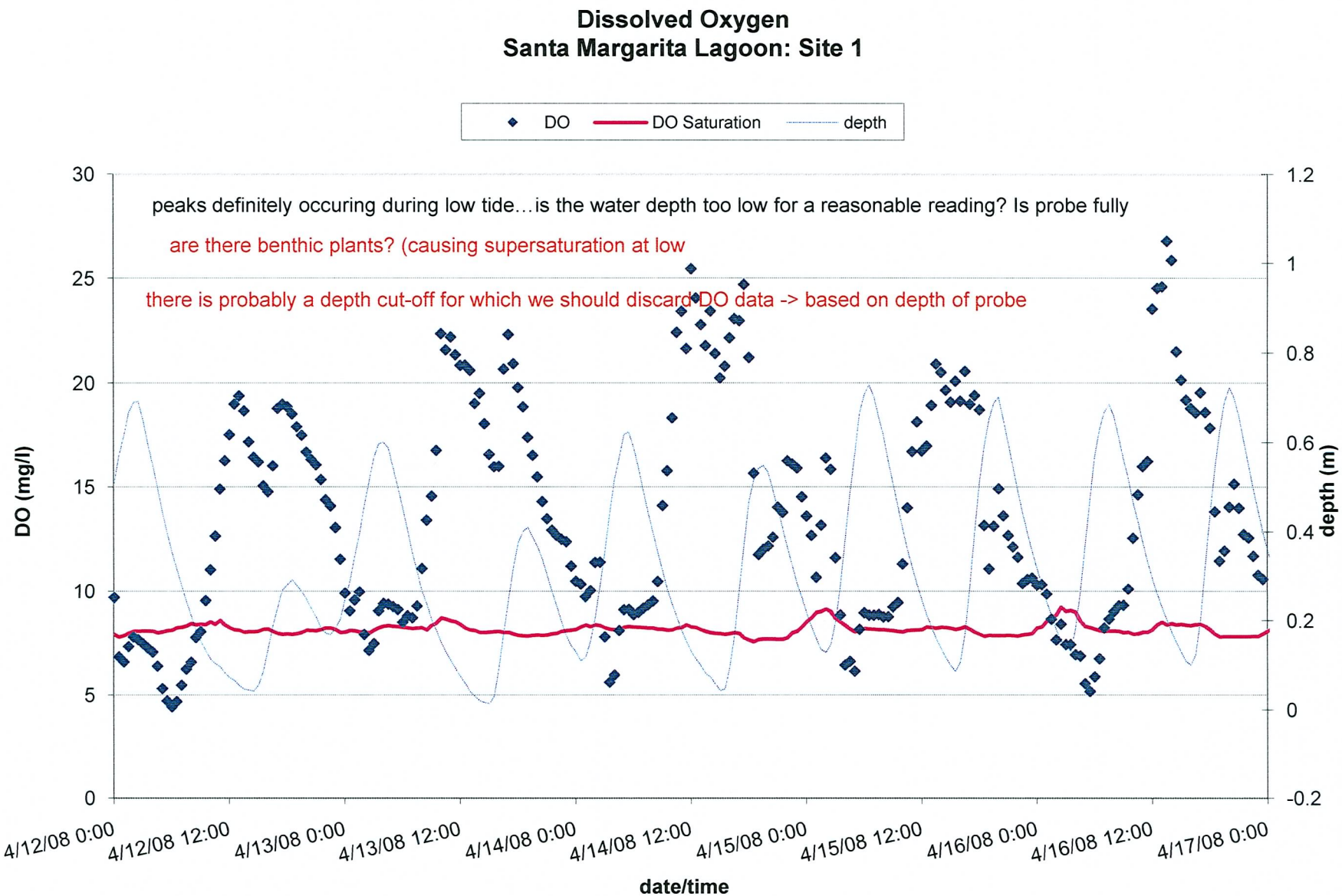

Specific Conductivity
Santa Margarita Lagoon: Site 1
EC
depth
definitely brackish to salt water here - if trust
are large fluctuations explained by tides??...yes
period = approx 12 hrs...makes sense for tides
EC (mS/cm)
depth (m)
date/time
60
50
40
30
20
10
0
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
4/12/08 0:00
4/13/08 0:00
4/14/08 0:00
4/15/08 0:00
4/16/08 0:00
4/17/08 0:00
4/18/08 0:00
4/19/08 0:00
4/20/08 0:00
4/21/08 0:00
4/22/08 0:00

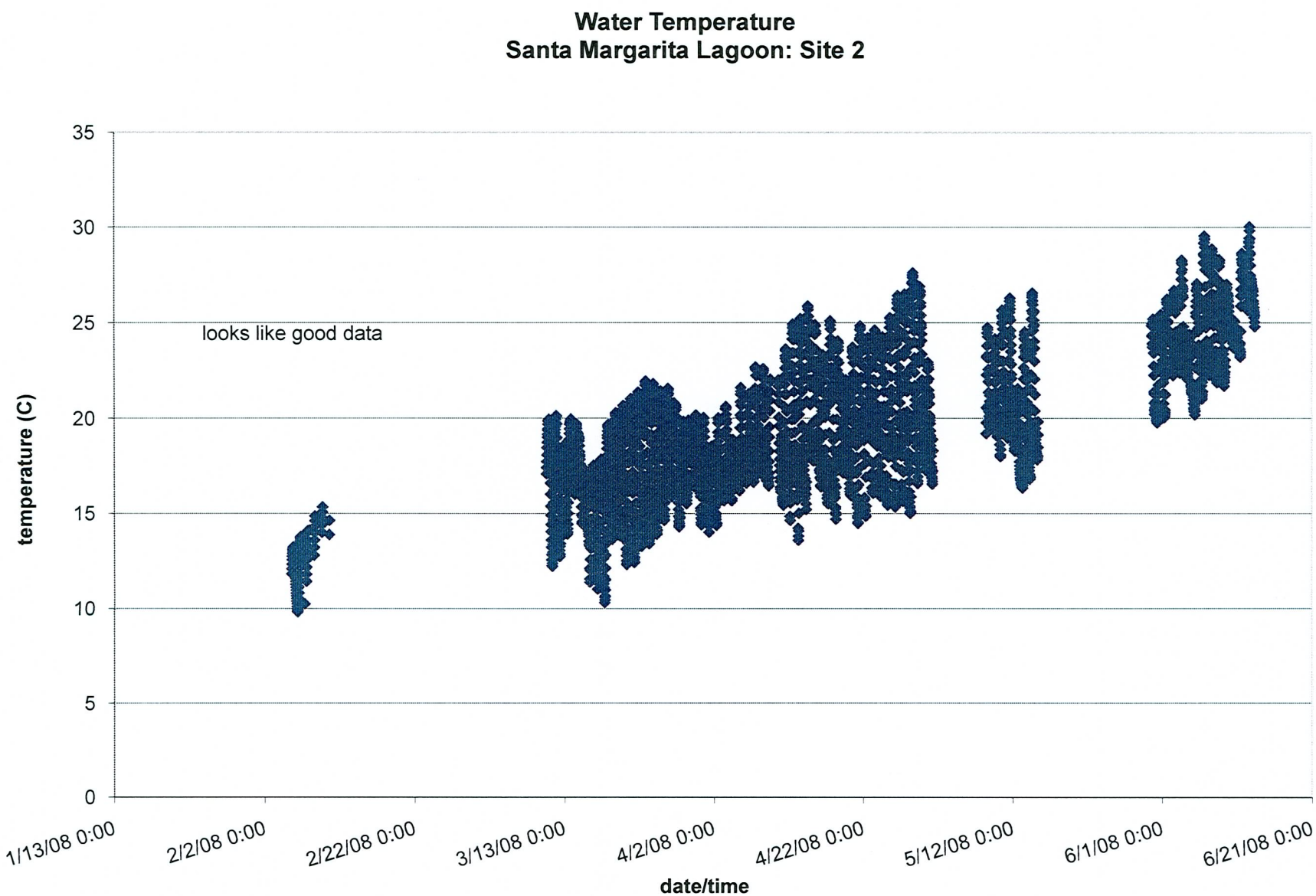

Specific Conductivity
Santa Margarita Lagoon: Site 1
EC
depth
EC (mS/cm)
depth (m)
date/time
60
50
40
30
20
10
0
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
1/28/08 0:00
2/2/08 0:00
2/7/08 0:00
2/12/08 0:00
2/17/08 0:00
2/22/08 0:00

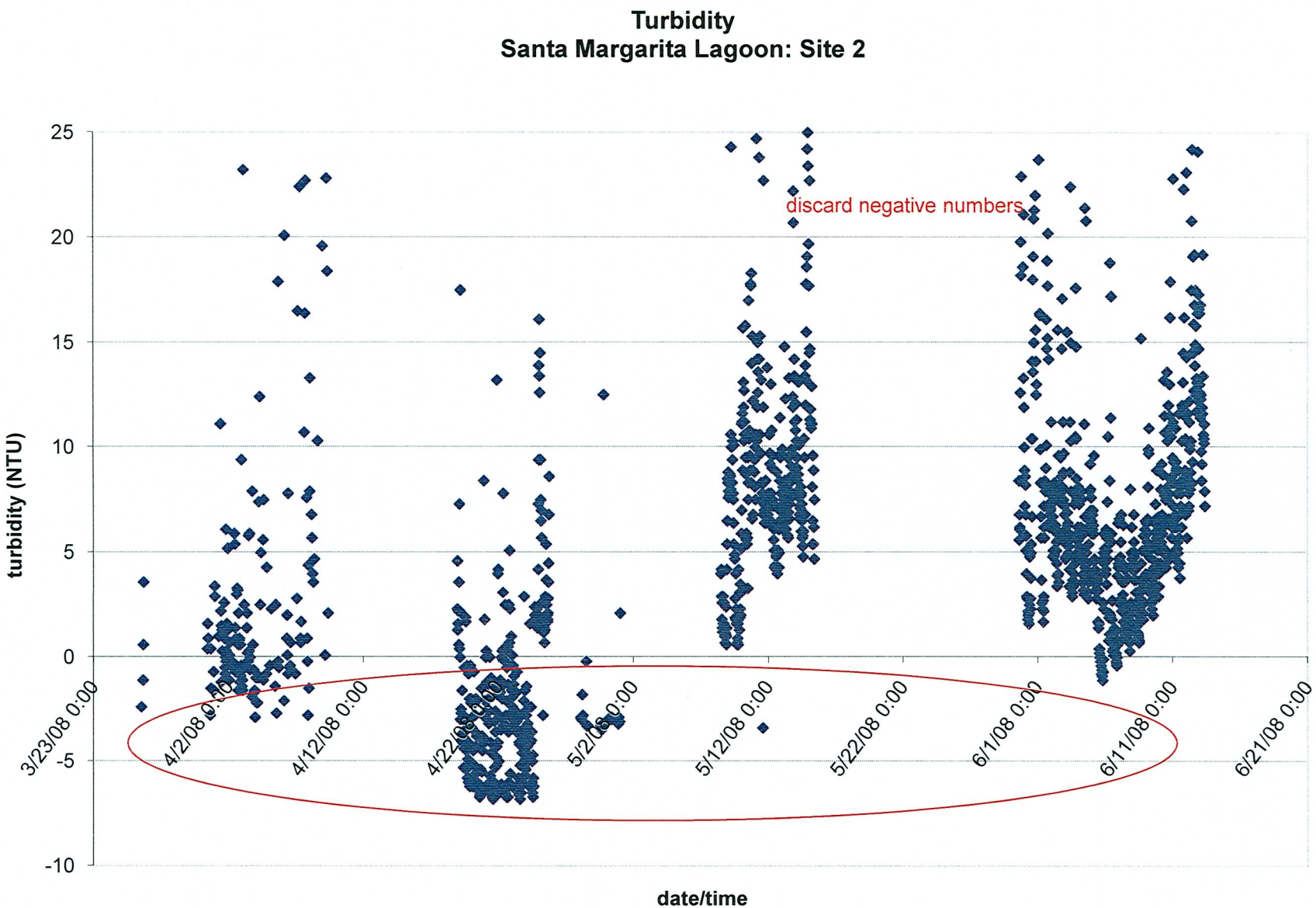

Dissolved Oxygen
Santa Margarita Lagoon: Site 1
DO (mg/l)
60
50
40
30
20
10
0
-10
bad data
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
date/time

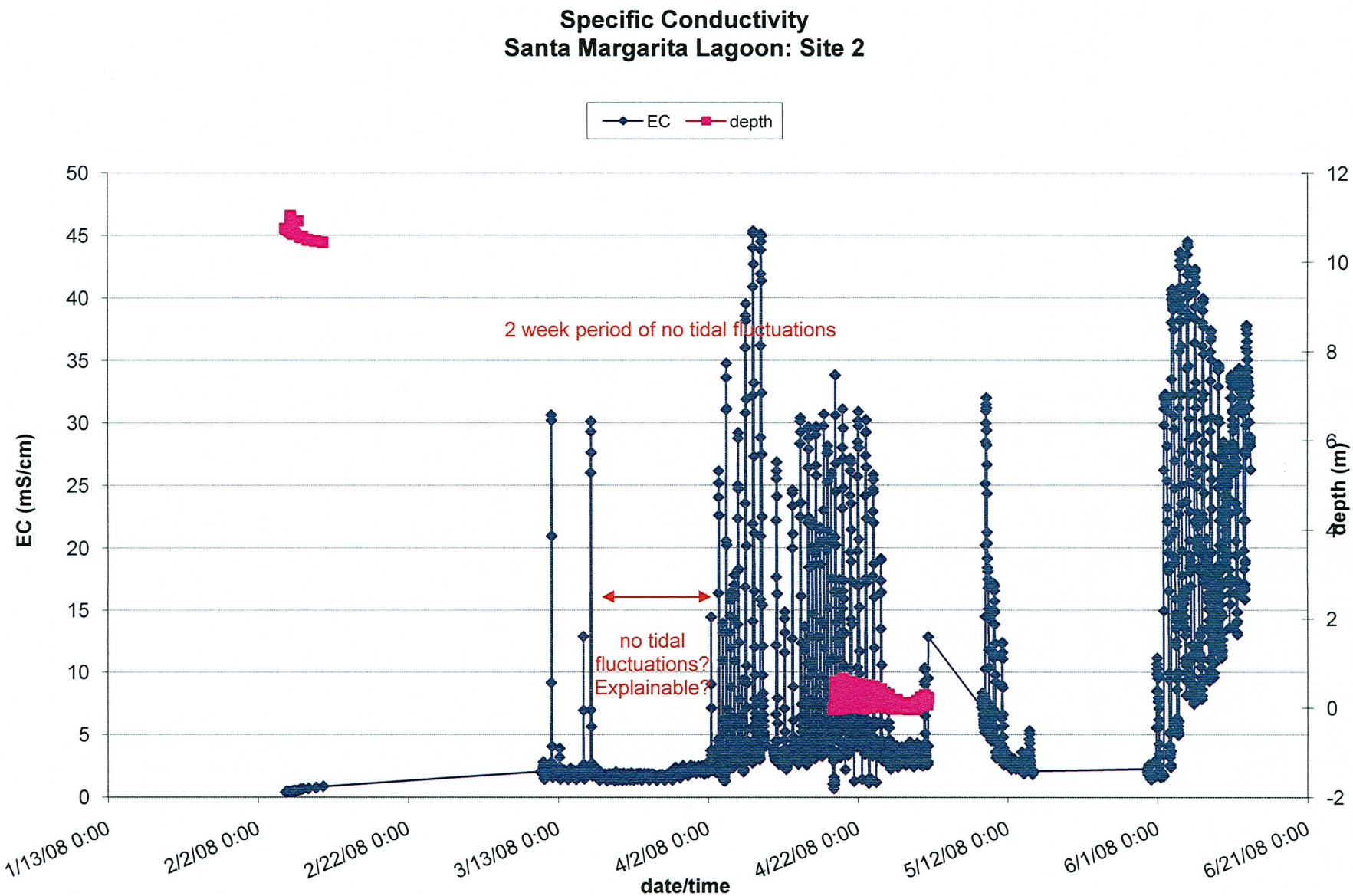

Dissolved Oxygen
Santa Margarita Lagoon: Site 1
these fluctuations don't make sense…bad
15
10
5
0
-5
-10
DO (mg/l)
2/2/08 0:00
2/7/08 0:00
2/12/08 0:00
2/17/08 0:00
2/22/08 0:00
2/27/08 0:00
3/3/08 0:00
3/8/08 0:00
3/13/08 0:00
date/time

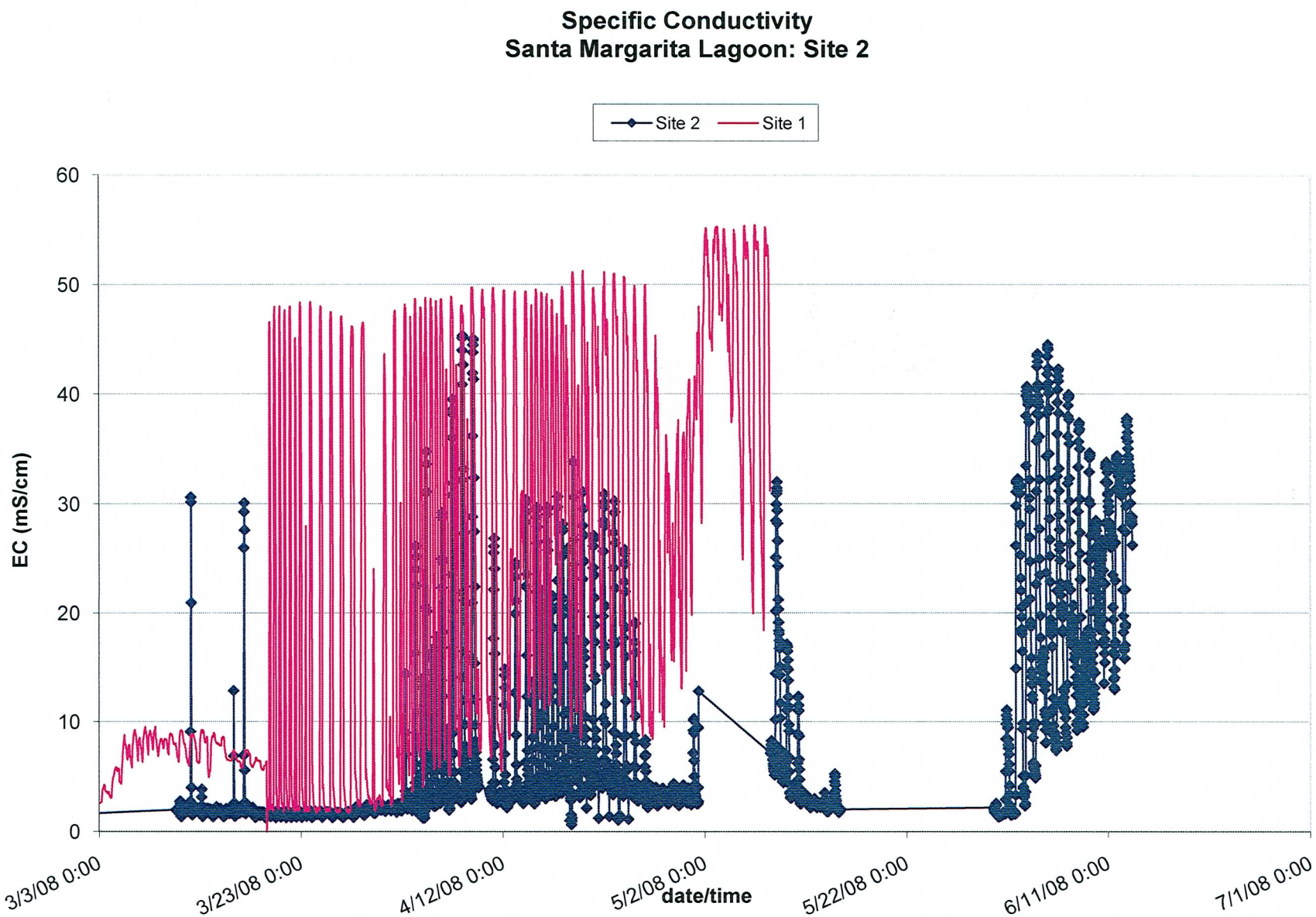

Dissolved Oxygen
Santa Margarita Lagoon: Site 1
DO
DO Saturation
depth
I would question a lot of these data -> can we explain the huge DO swings and peaks 300% of
low points are generally early morning…makes sense for algal
these cycles appear to follow photosynthesis, more than
but way above saturation levels!
DO (mg/l)
depth (m)
date/time
35
30
25
20
15
10
5
0
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00
5/7/08 0:00

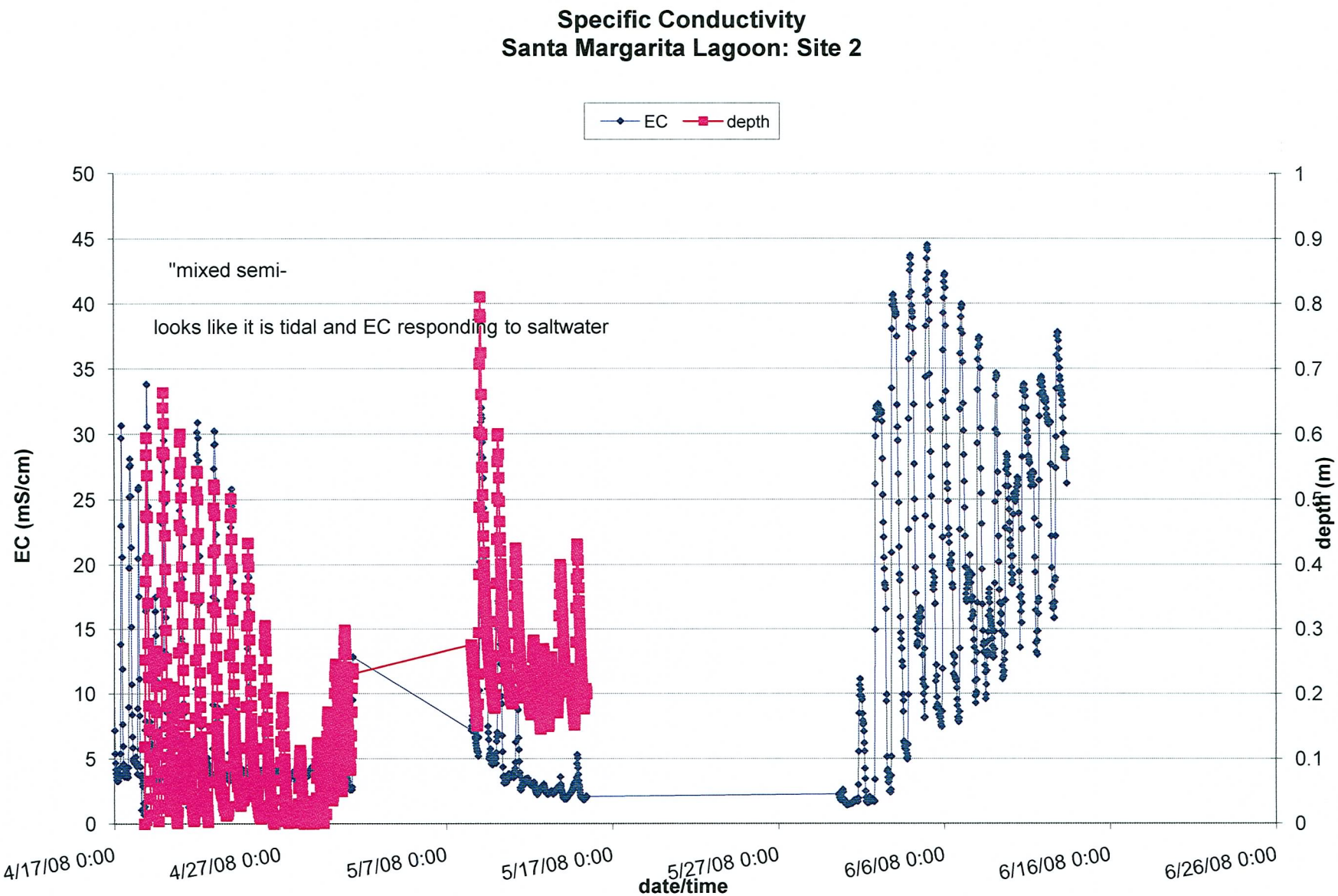

Dissolved Oxygen
Santa Margarita Lagoon: Site 1
DO
DO Saturation
depth
peaks definitely occuring during low tide…is the water depth too low for a reasonable reading? Is probe fully
are there benthic plants? (causing supersaturation at low
there is probably a depth cut-off for which we should discard DO data -> based on depth of probe
DO (mg/l)
depth (m)
date/time
30
25
20
15
10
5
0
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
4/12/08 0:00
4/12/08 12:00
4/13/08 0:00
4/13/08 12:00
4/14/08 0:00
4/14/08 12:00
4/15/08 0:00
4/15/08 12:00
4/16/08 0:00
4/16/08 12:00
4/17/08 0:00

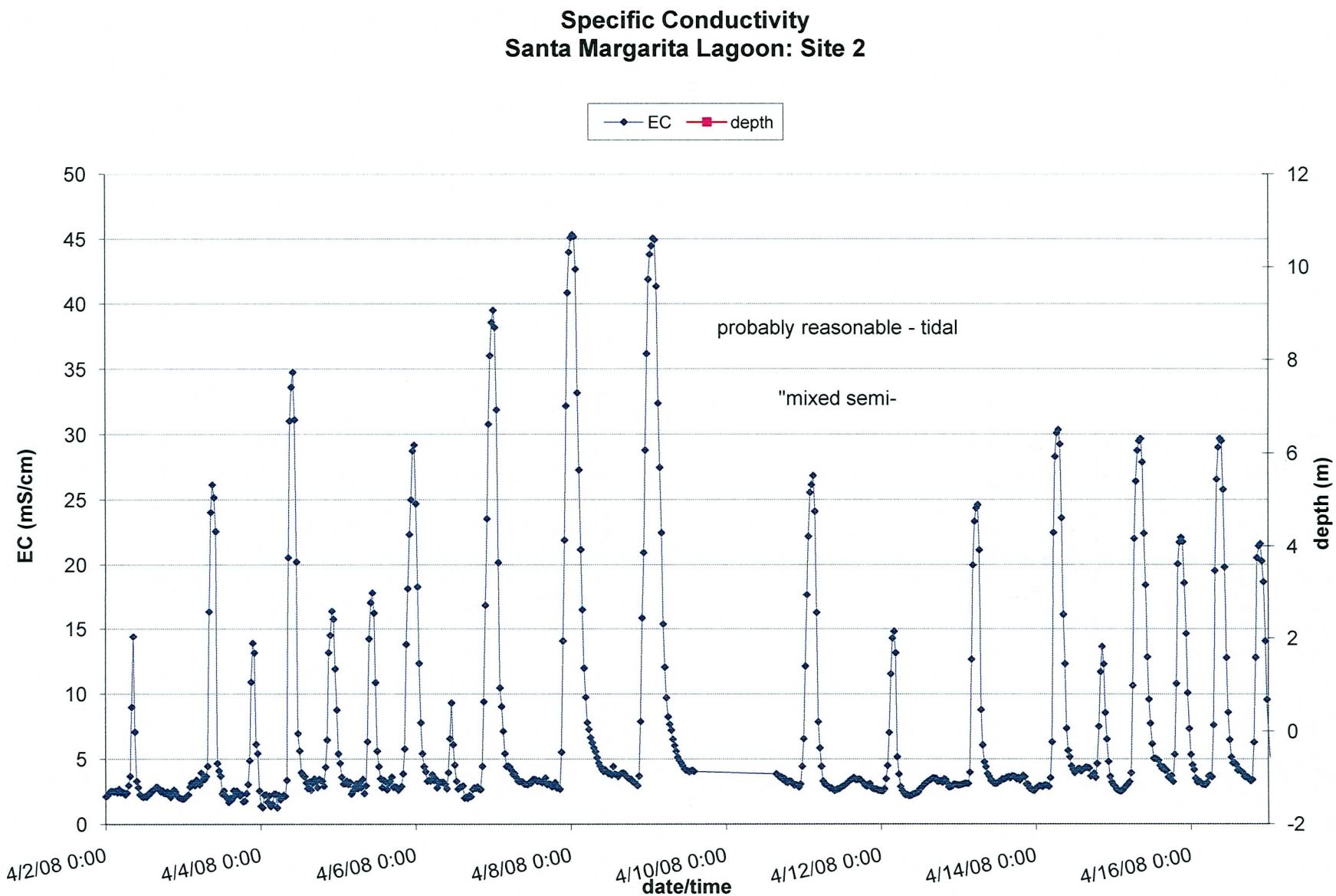

Water Temperature
Santa Margarita Lagoon: Site 2
35
30
25
20
15
10
5
0
temperature (C)
looks like good data
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
6/1/08 0:00
6/21/08 0:00
date/time

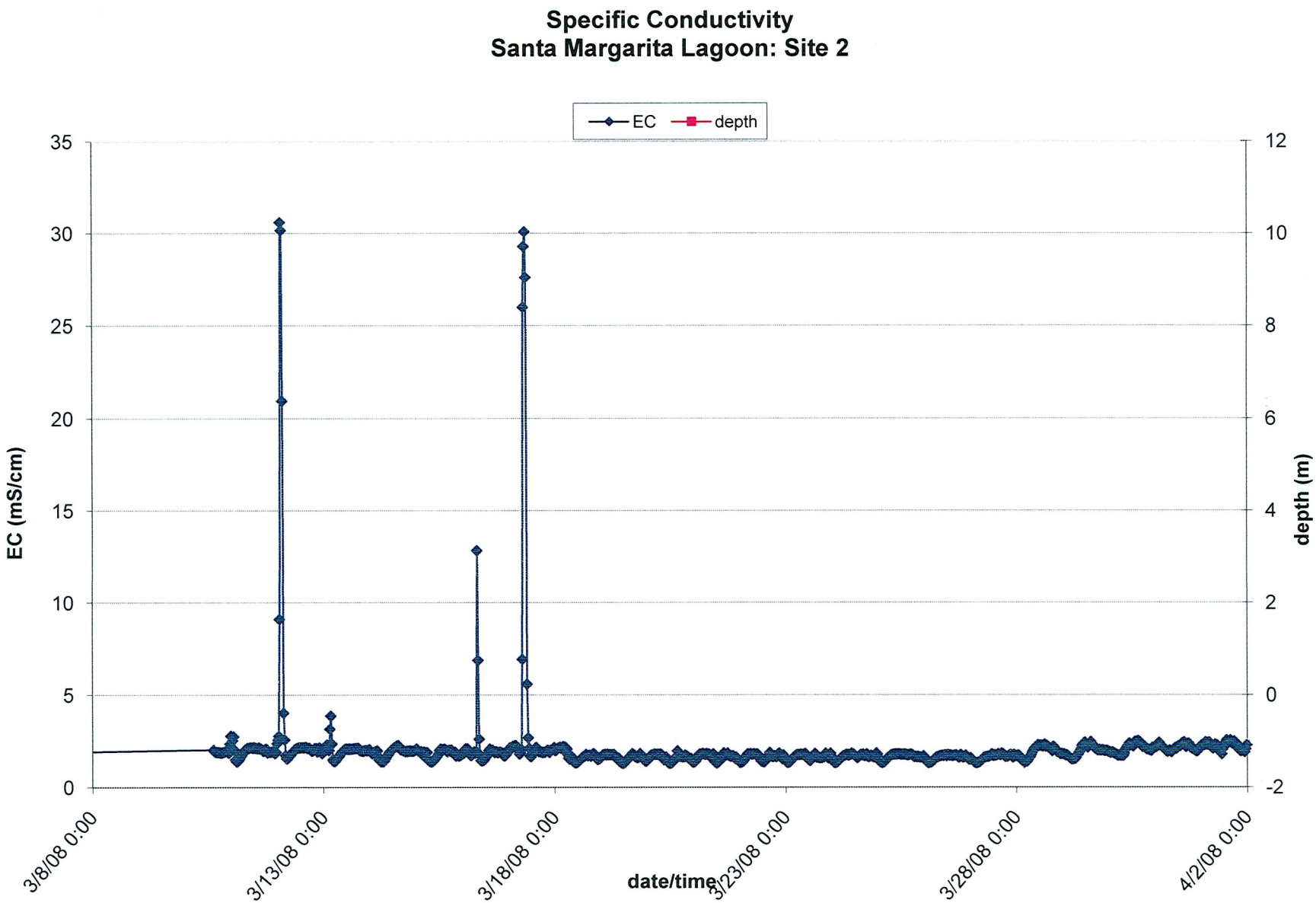

Turbidity
Santa Margarita Lagoon: Site 2
discard negative numbers
turbidity (NTU)
25
20
15
10
5
0
-5
-10
3/23/08 0:00
4/2/08 0:00
4/12/08 0:00
4/22/08 0:00
5/2/08 0:00
5/12/08 0:00
5/22/08 0:00
6/1/08 0:00
6/11/08 0:00
6/21/08 0:00
date/time

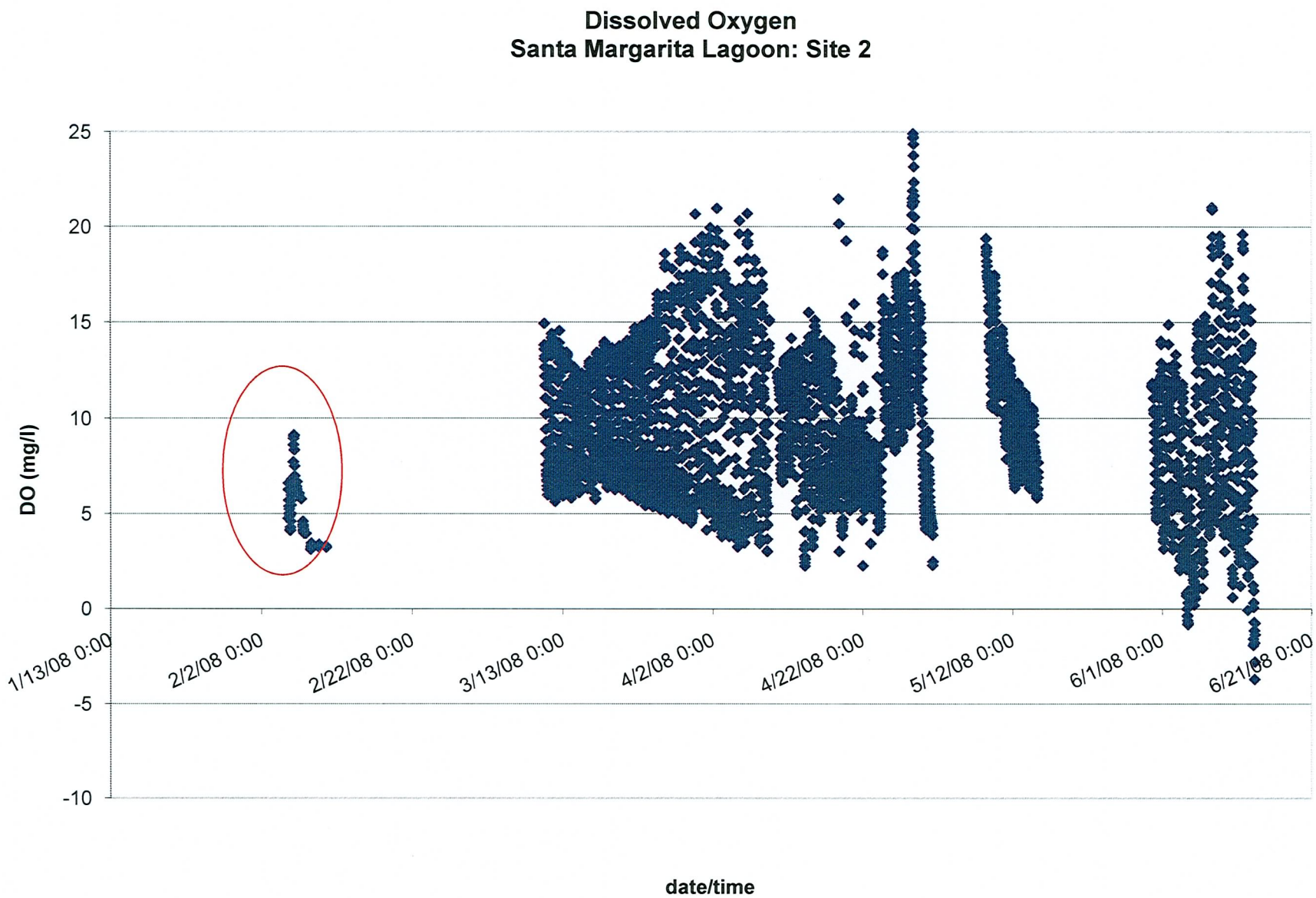

Specific Conductivity
Santa Margarita Lagoon: Site 2
EC
depth
EC (mS/cm)
depth (m)
date/time
2 week period of no tidal fluctuations
no tidal fluctuations? Explainable?
50
45
40
35
30
25
20
15
10
5
0
12
10
8
6
4
2
0
-2
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
6/1/08 0:00
6/21/08 0:00

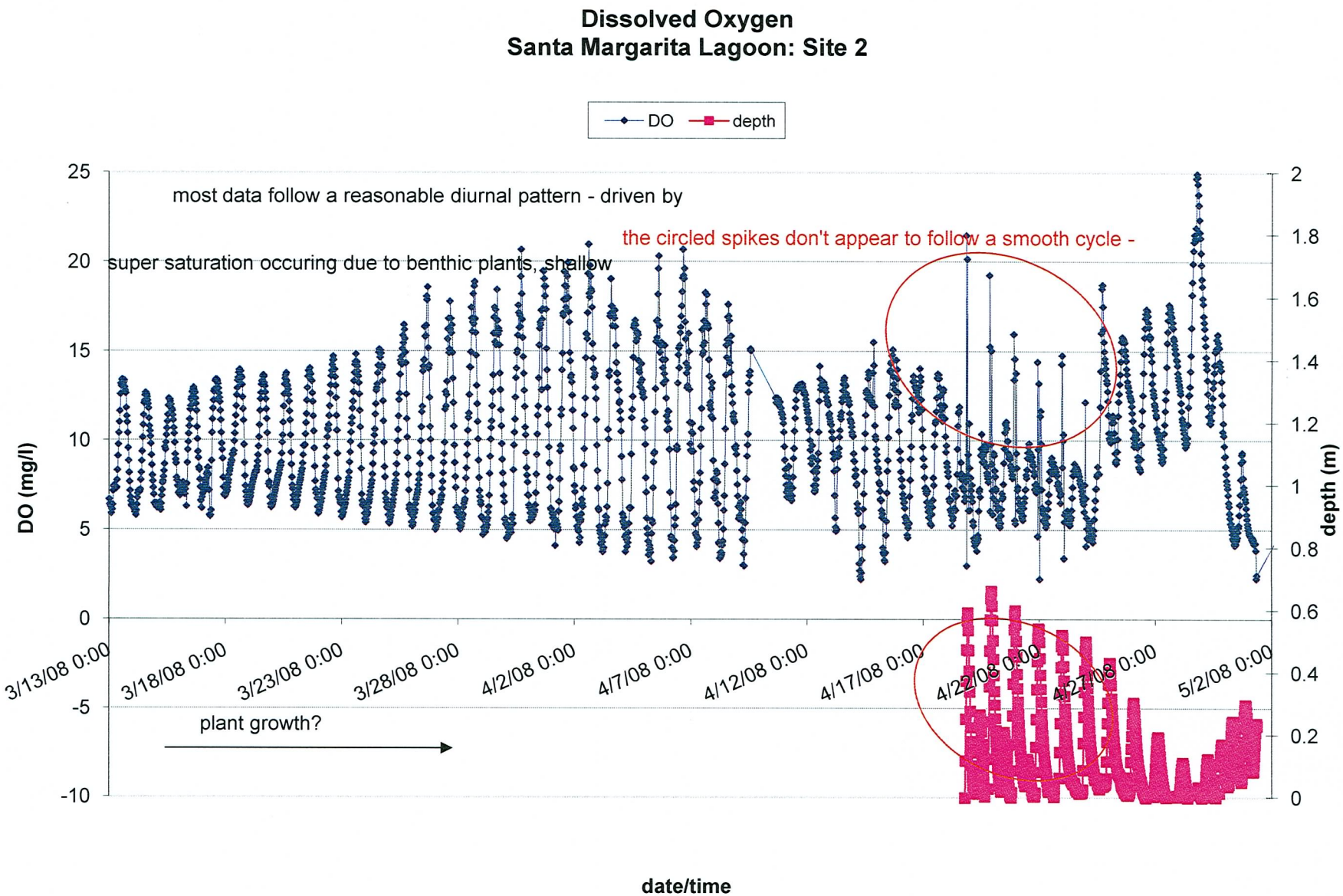

Specific Conductivity
Santa Margarita Lagoon: Site 2
Site 2
Site 1
EC (mS/cm)
60
50
40
30
20
10
0
3/3/08 0:00
3/23/08 0:00
4/12/08 0:00
5/2/08 0:00
5/22/08 0:00
6/11/08 0:00
7/1/08 0:00
date/time

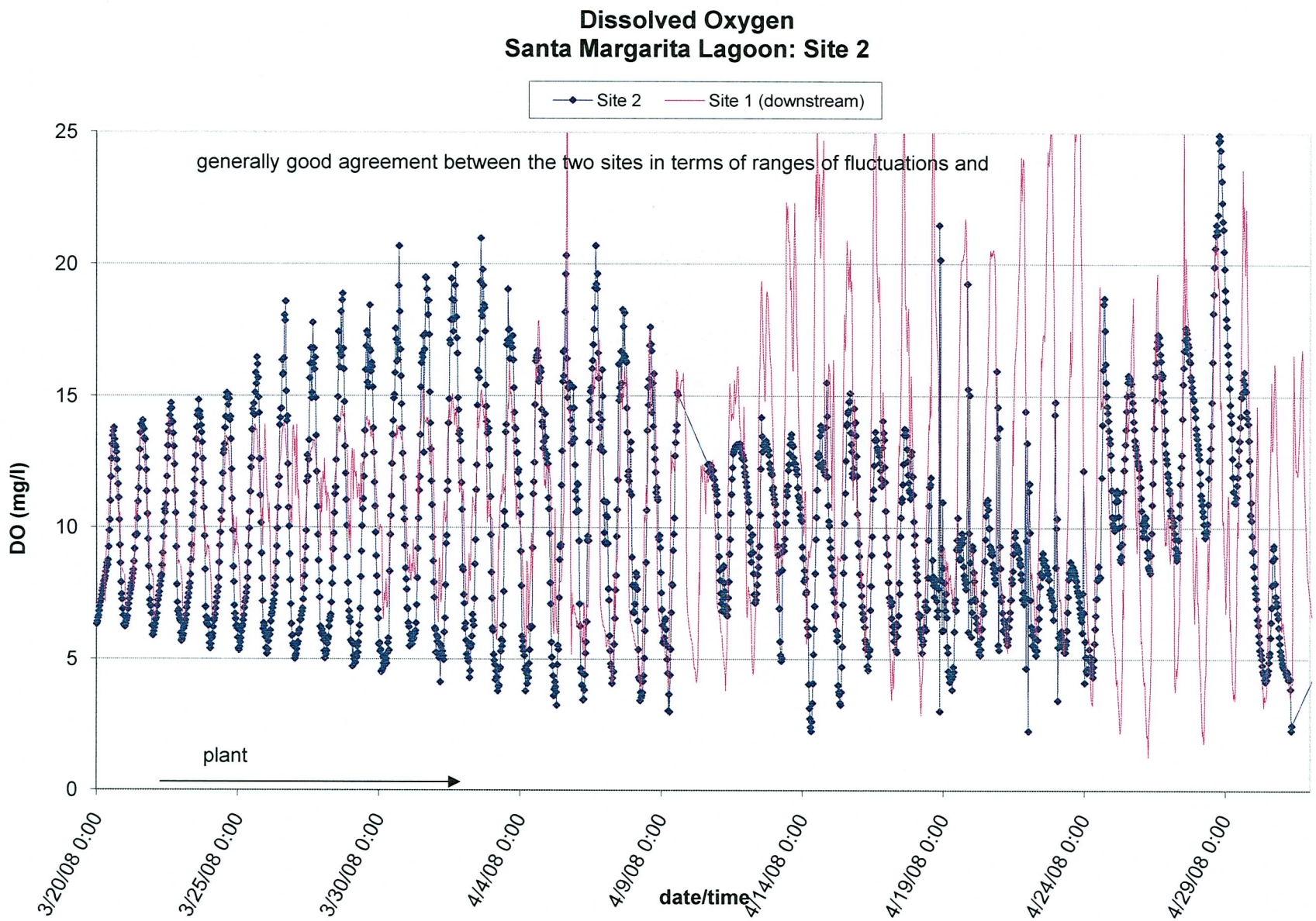

Specific Conductivity
Santa Margarita Lagoon: Site 2
EC
depth
"mixed semi-
looks like it is tidal and EC responding to saltwater
EC (mS/cm)
depth (m)
date/time
50
45
40
35
30
25
20
15
10
5
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
4/17/08 0:00
4/27/08 0:00
5/7/08 0:00
5/17/08 0:00
5/27/08 0:00
6/6/08 0:00
6/16/08 0:00
6/26/08 0:00


Specific Conductivity
Santa Margarita Lagoon: Site 2
EC
depth
probably reasonable - tidal
"mixed semi-
EC (mS/cm)
depth (m)
date/time
50
45
40
35
30
25
20
15
10
5
0
12
10
8
6
4
2
0
-2
4/2/08 0:00
4/4/08 0:00
4/6/08 0:00
4/8/08 0:00
4/10/08 0:00
4/12/08 0:00
4/14/08 0:00
4/16/08 0:00


Specific Conductivity
Santa Margarita Lagoon: Site 2
EC
depth
EC (mS/cm)
depth (m)
date/time
35
30
25
20
15
10
5
0
12
10
8
6
4
2
0
-2
3/8/08 0:00
3/13/08 0:00
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00


Dissolved Oxygen
Santa Margarita Lagoon: Site 2
DO (mg/l)
25
20
15
10
5
0
-5
-10
1/13/08 0:00
2/2/08 0:00
2/22/08 0:00
3/13/08 0:00
4/2/08 0:00
4/22/08 0:00
5/12/08 0:00
6/1/08 0:00
6/21/08 0:00
date/time


Dissolved Oxygen
Santa Margarita Lagoon: Site 2
DO
depth
most data follow a reasonable diurnal pattern - driven by
super saturation occuring due to benthic plants, shallow
the circled spikes don't appear to follow a smooth cycle -
plant growth?
DO (mg/l)
depth (m)
date/time
25
20
15
10
5
0
-5
-10
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3/13/08 0:00
3/18/08 0:00
3/23/08 0:00
3/28/08 0:00
4/2/08 0:00
4/7/08 0:00
4/12/08 0:00
4/17/08 0:00
4/22/08 0:00
4/27/08 0:00
5/2/08 0:00


Dissolved Oxygen
Santa Margarita Lagoon: Site 2
Site 2
Site 1 (downstream)
generally good agreement between the two sites in terms of ranges of fluctuations and
plant
DO (mg/l)
25
20
15
10
5
0
3/20/08 0:00
3/25/08 0:00
3/30/08 0:00
4/4/08 0:00
4/9/08 0:00
4/14/08 0:00
4/19/08 0:00
4/24/08 0:00
4/29/08 0:00
date/time

Santa Margarita Lagoon WQ Data Review (June to September 2008)

General Comments

Temperature and pH data look good at all sites. Turbidity data generally look reasonable, although could not correlate peaks with the patchy flow data that were available. However, there appear to be significant problems with conductivity and dissolved oxygen data at all three sites. Theses problems appear to be related to instrument calibration, manifesting primarily as gradual drift (after calibration) and abrupt changes immediately following weekly calibration. These issues make it difficult to have any real confidence in the magnitudes of the measured data. Relative changes and patterns, such as the diurnal swings, do appear to be reliable for various short periods and indicate significant tidal and biological effects on water quality. Depth data was very sparse for this period. Depth is a very useful parameter for evaluating water quality data quality, and it is recommended that these data be regularly recorded in future monitoring efforts.

Parameter-Specific Notes

Temperature

- A few obvious invalid data points, otherwise a very good data set;
- Generally characterized by large diurnal fluctuations;
- Magnitude of diurnal cycles are large for a river, but not unrealistic for a shallow, unshaded system with large air temperature fluctuations;
- Temperature data is usually very reliable;
- Final recommendation = keep all data except for those indicated with red circles in attached spreadsheet.

Turbidity

- Turbidity is a measure of suspended solids and therefore can fluctuate dramatically as a function of hydrology/hydrodynamics and local sediment disturbances;
- All negative values can be discarded;
- A small number of isolated spikes (single point) should be discarded (red circles)
- While not able to be correlated with the given sparse flow data set, other turbidity peaks appear to be valid and likely due to storm events.

pH

- Nearly all of these data look ok except for a few indicated anomalous points and the entire period from 7/21 onward at ME Site (clear probe malfunction).

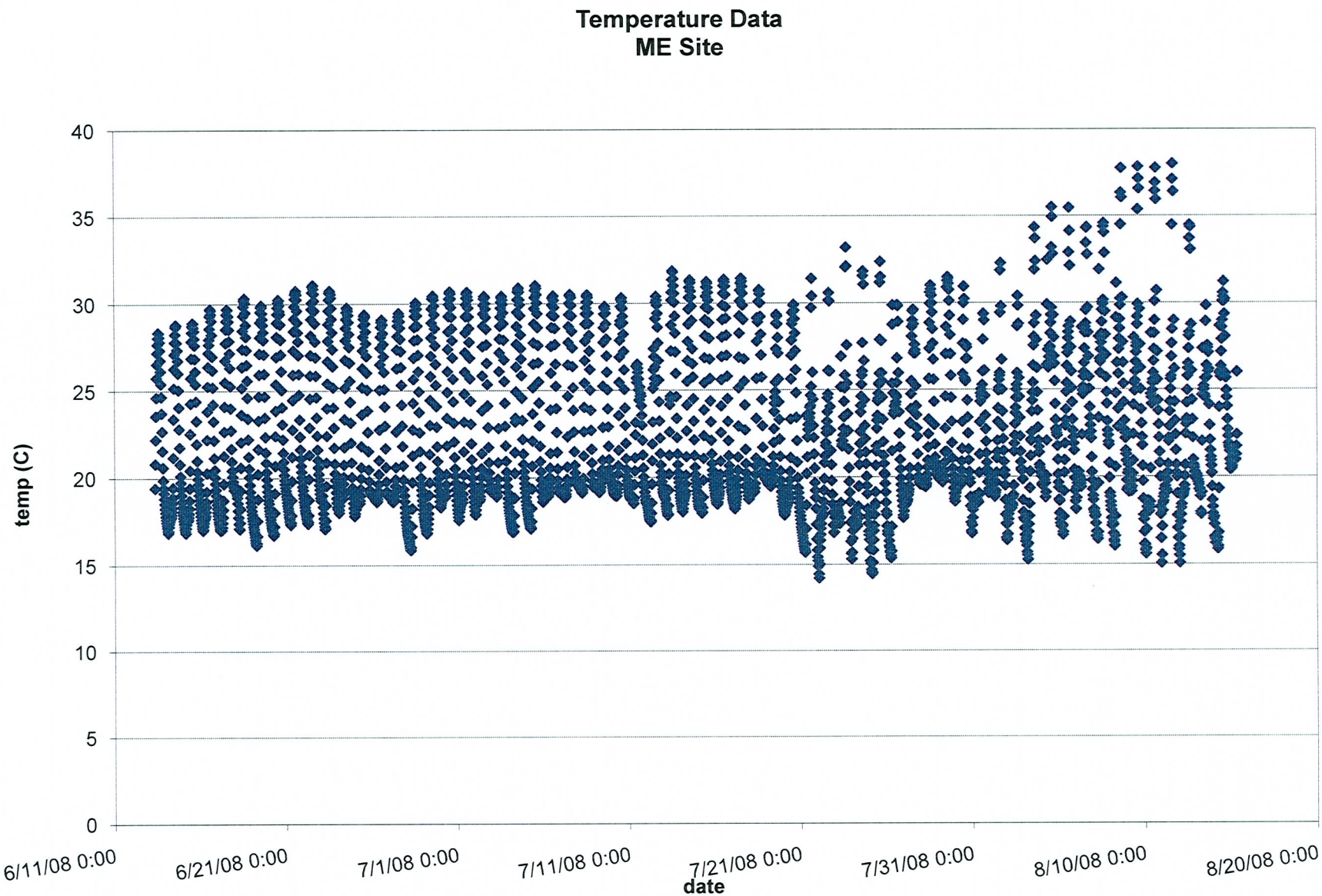
Conductivity

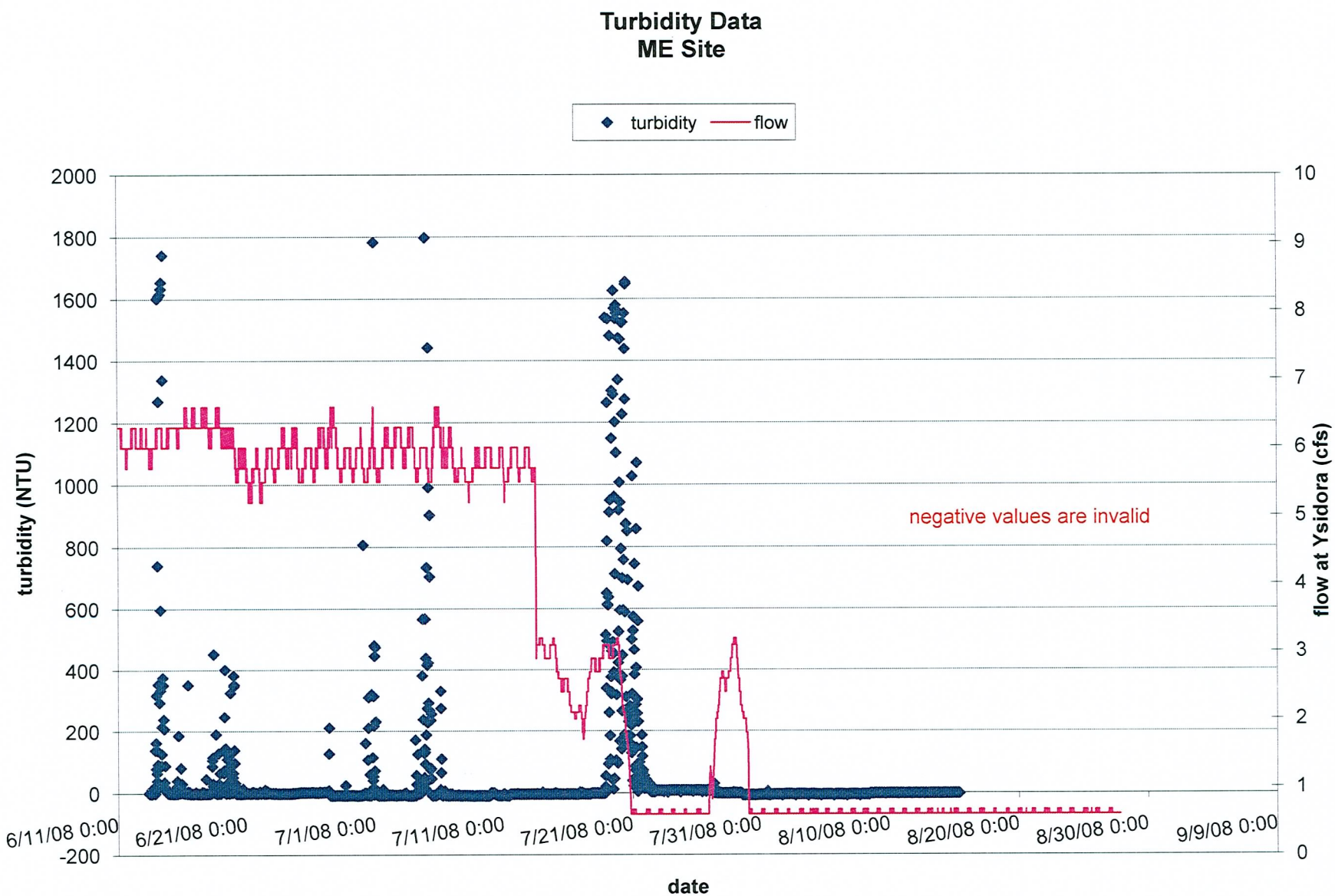
- Clusters of weekly data apparently due to re-calibration of instrument;
- Should not have big changes in measurement just due to re-calibration;
- If calibration process can’t be improved, then recommend not re-calibrating the conductivity probe unless problems are observed in the measured data (e.g. drift or abundance of anomalous measurements);

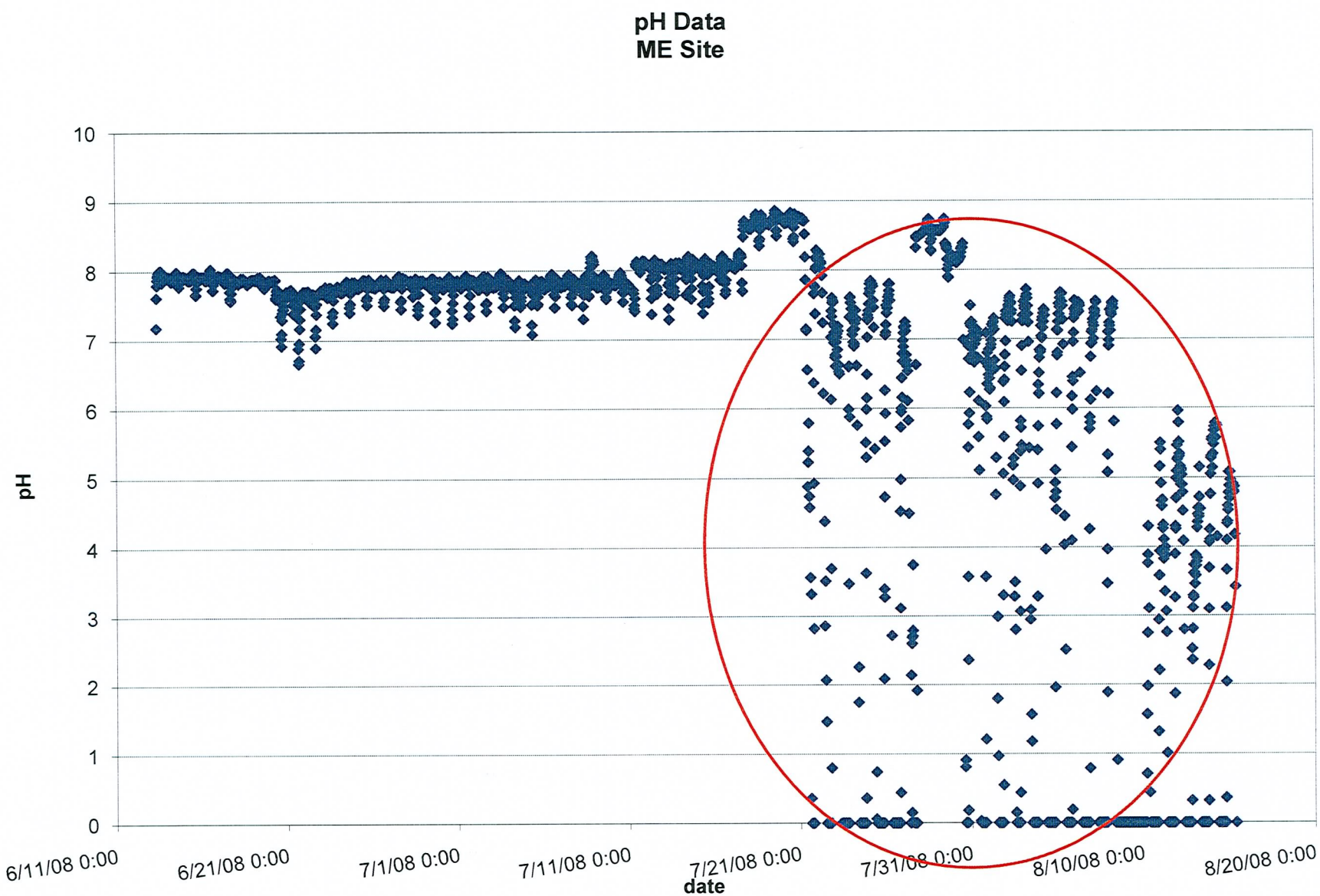
- Recommendation = discard all conductivity data measured in this period and re-assess calibration methods;
- (Keep in mind: conductivity is not an overly useful dynamic WQ parameter. You already have a good idea of the tidal impacts on the diurnal cycles and the general magnitude of conductivity in these brackish waters. Do you need to worry much about regular calibration?).

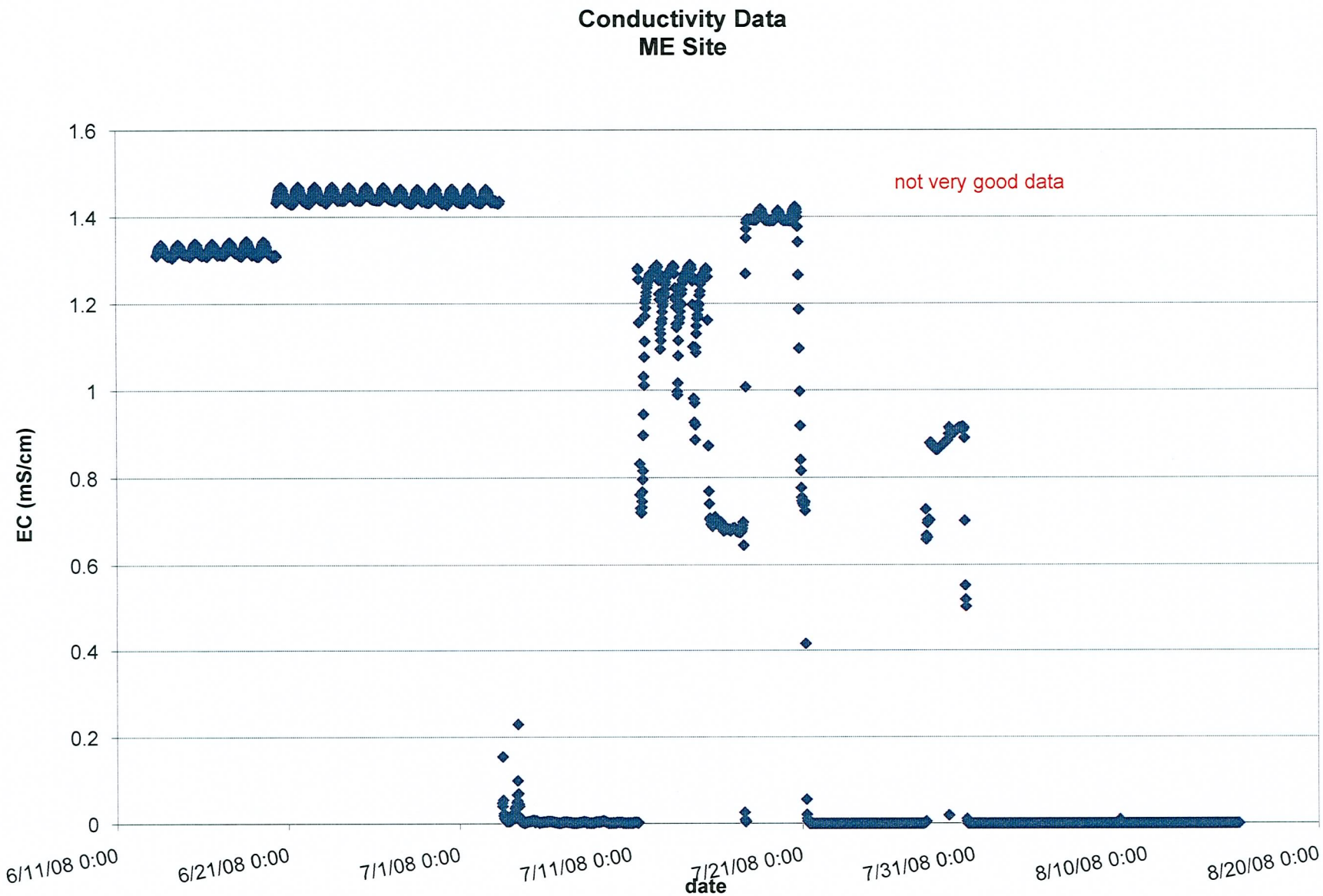
Dissolved Oxygen

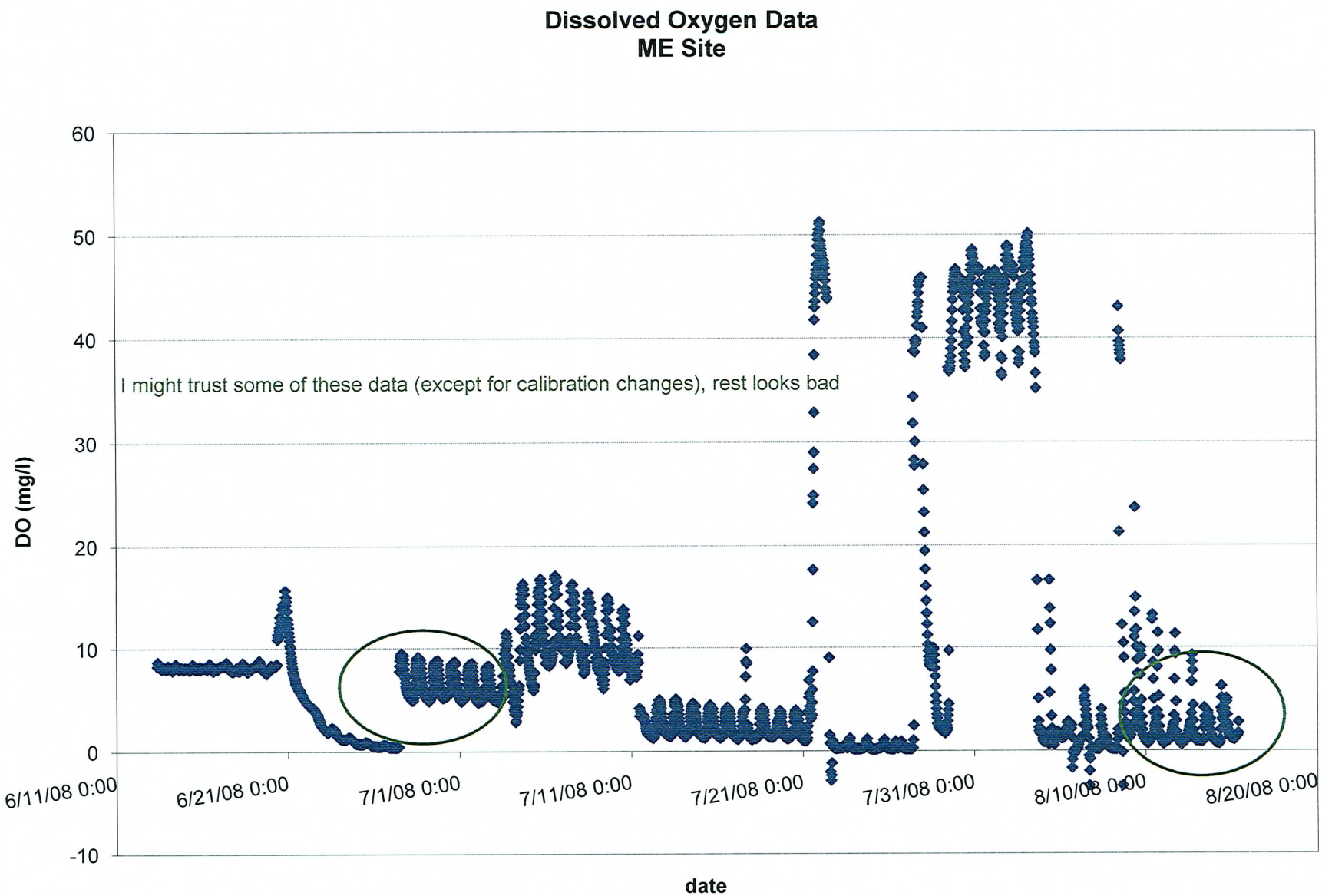
- Data generally appears to be of poor quality, characterized by large (and seemingly unrealistic) fluctuations, negative values, drift, and erratic shifts in fluctuation ranges;
- Discard all negative values
- Various anomalous data points indicated in attached figures, including extended periods of very low measured DO and periods with apparently random fluctuations (not following expected diurnal cycle);
- Also appear to be various shifts in data possibly due to re-calibration efforts;
- It is hard to say which data can be trusted, best guesses are indicated with green circles on the attached plots;
- Large diurnal swings again point to strong biological influence (couple with large temperature swings);
- As with conductivity data, there appear to be inconsistencies in the re-calibration efforts and rapid loss of calibration

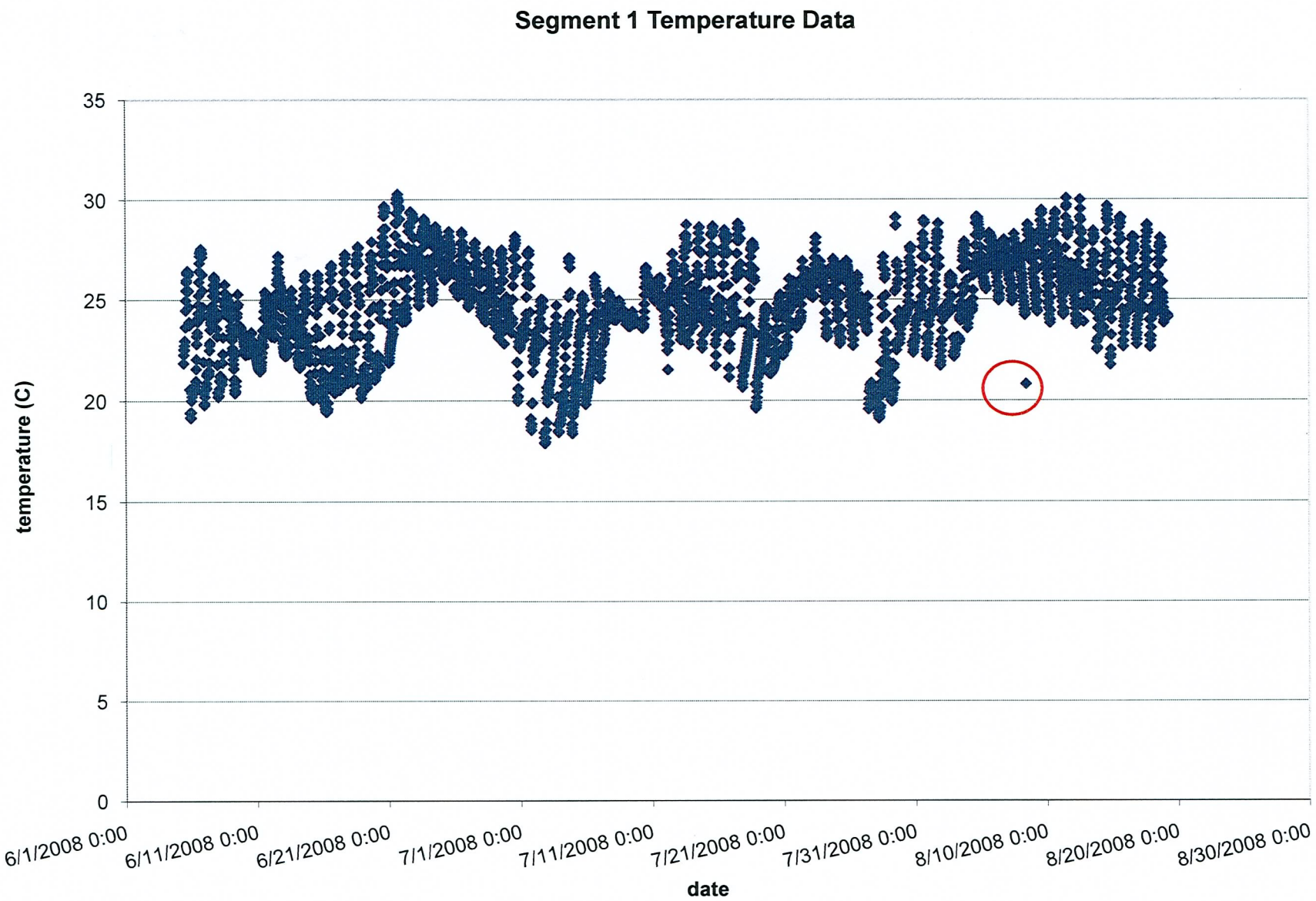

Temperature Data
ME Site
temp (C)
40
35
30
25
20
15
10
5
0
6/11/08 0:00
6/21/08 0:00
7/1/08 0:00
7/11/08 0:00
7/21/08 0:00
7/31/08 0:00
8/10/08 0:00
8/20/08 0:00
date

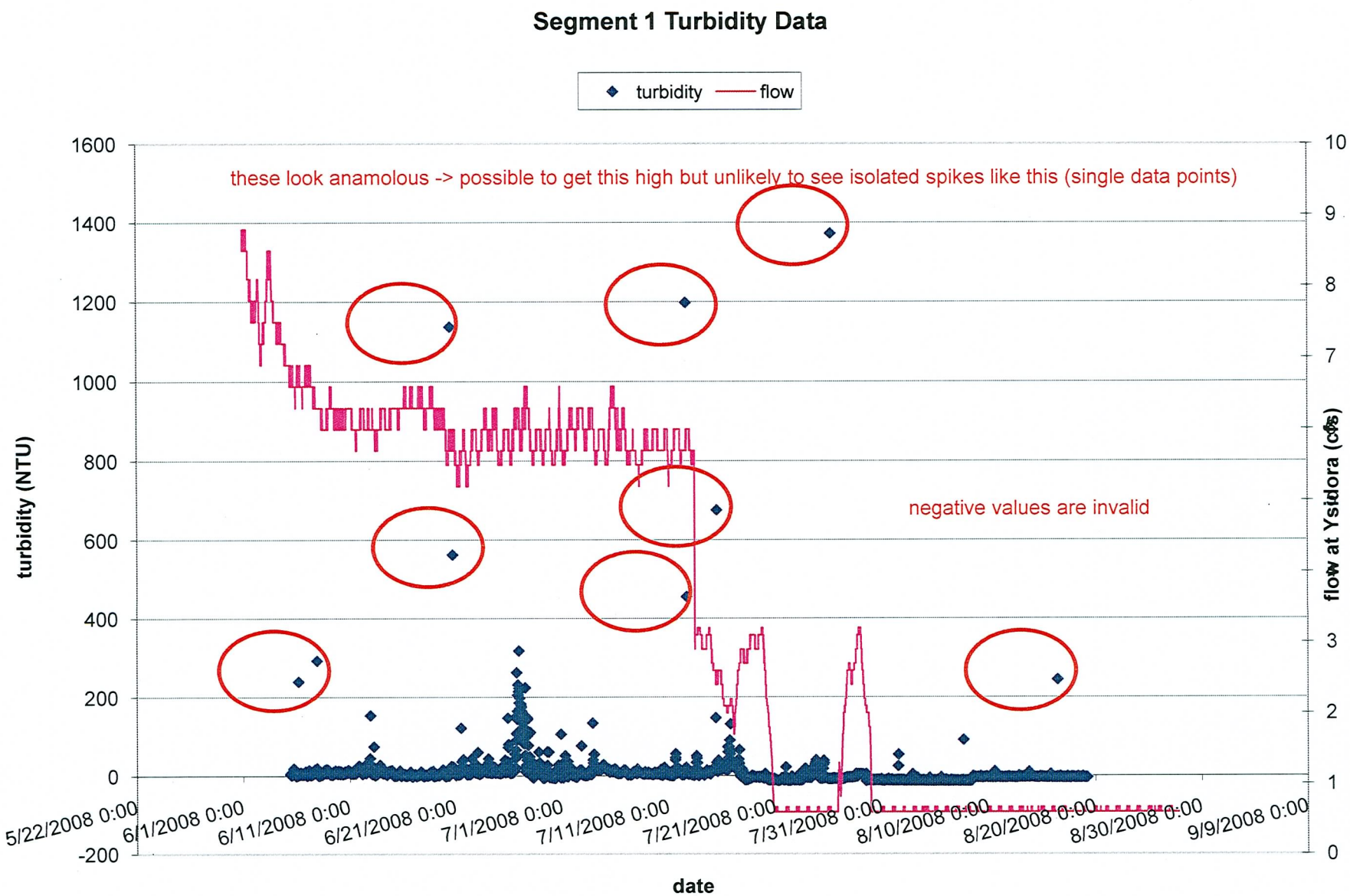

Turbidity Data
ME Site
turbidity
flow
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
turbidity (NTU)
10
9
8
7
6
5
4
3
2
1
0
flow at Ysidora (cfs)
negative values are invalid
6/11/08 0:00
6/21/08 0:00
7/1/08 0:00
7/11/08 0:00
7/21/08 0:00
7/31/08 0:00
8/10/08 0:00
8/20/08 0:00
8/30/08 0:00
9/9/08 0:00
date

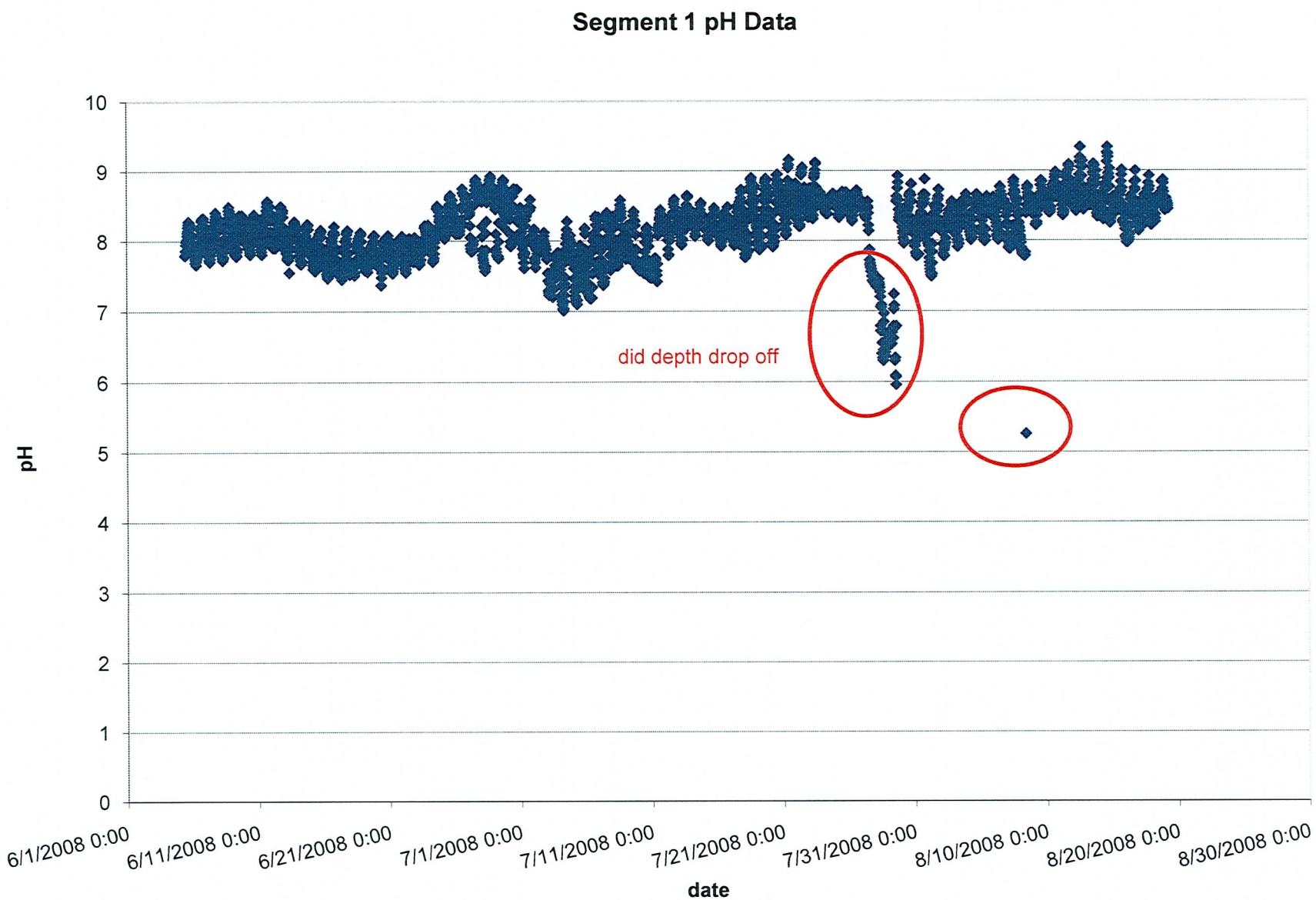

pH Data
ME Site
pH
10
9
8
7
6
5
4
3
2
1
0
6/11/08 0:00
6/21/08 0:00
7/1/08 0:00
7/11/08 0:00
7/21/08 0:00
7/31/08 0:00
8/10/08 0:00
8/20/08 0:00
date

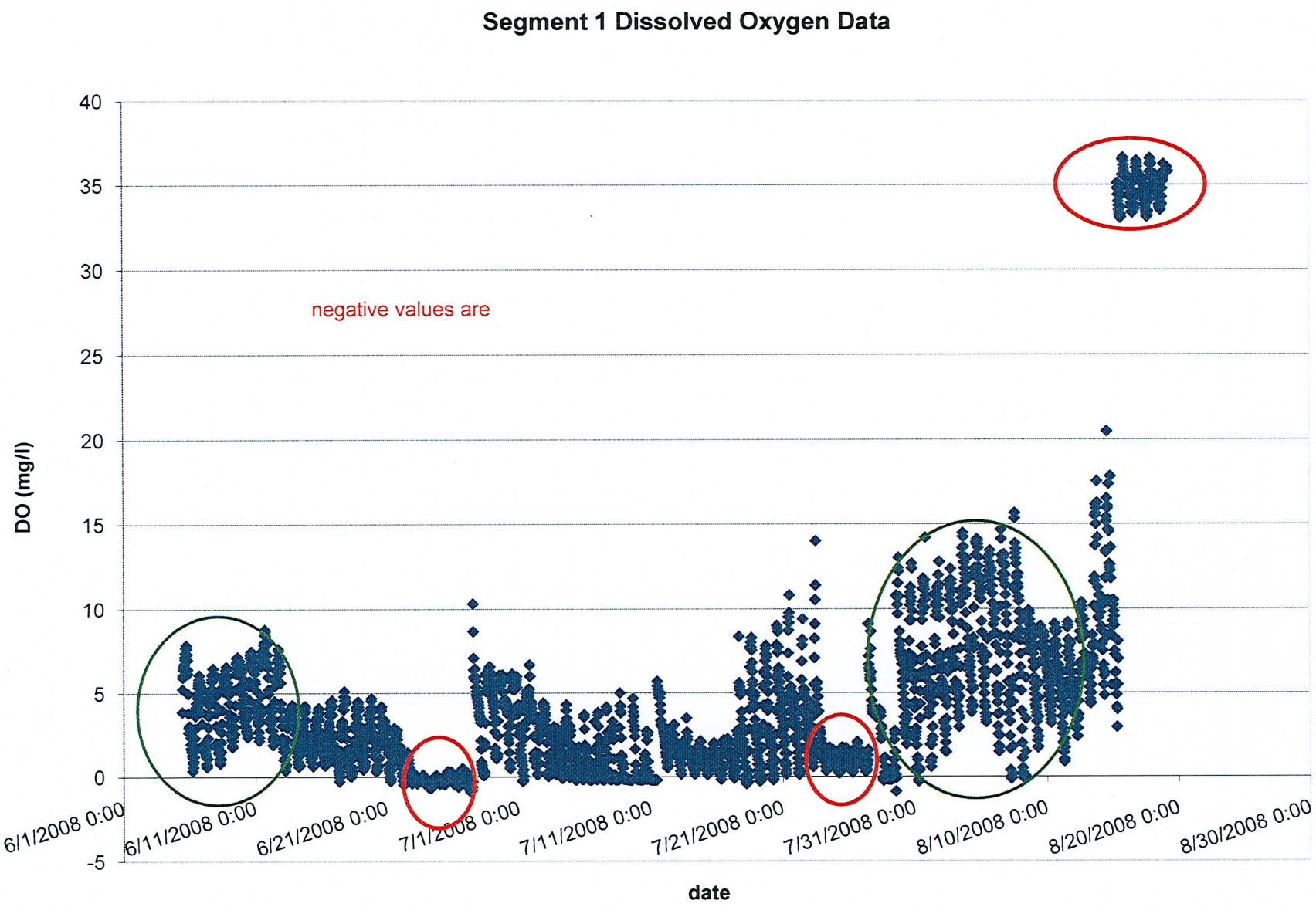

Conductivity Data
ME Site
not very good data
EC (mS/cm)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
6/11/08 0:00
6/21/08 0:00
7/1/08 0:00
7/11/08 0:00
7/21/08 0:00
7/31/08 0:00
8/10/08 0:00
8/20/08 0:00
date

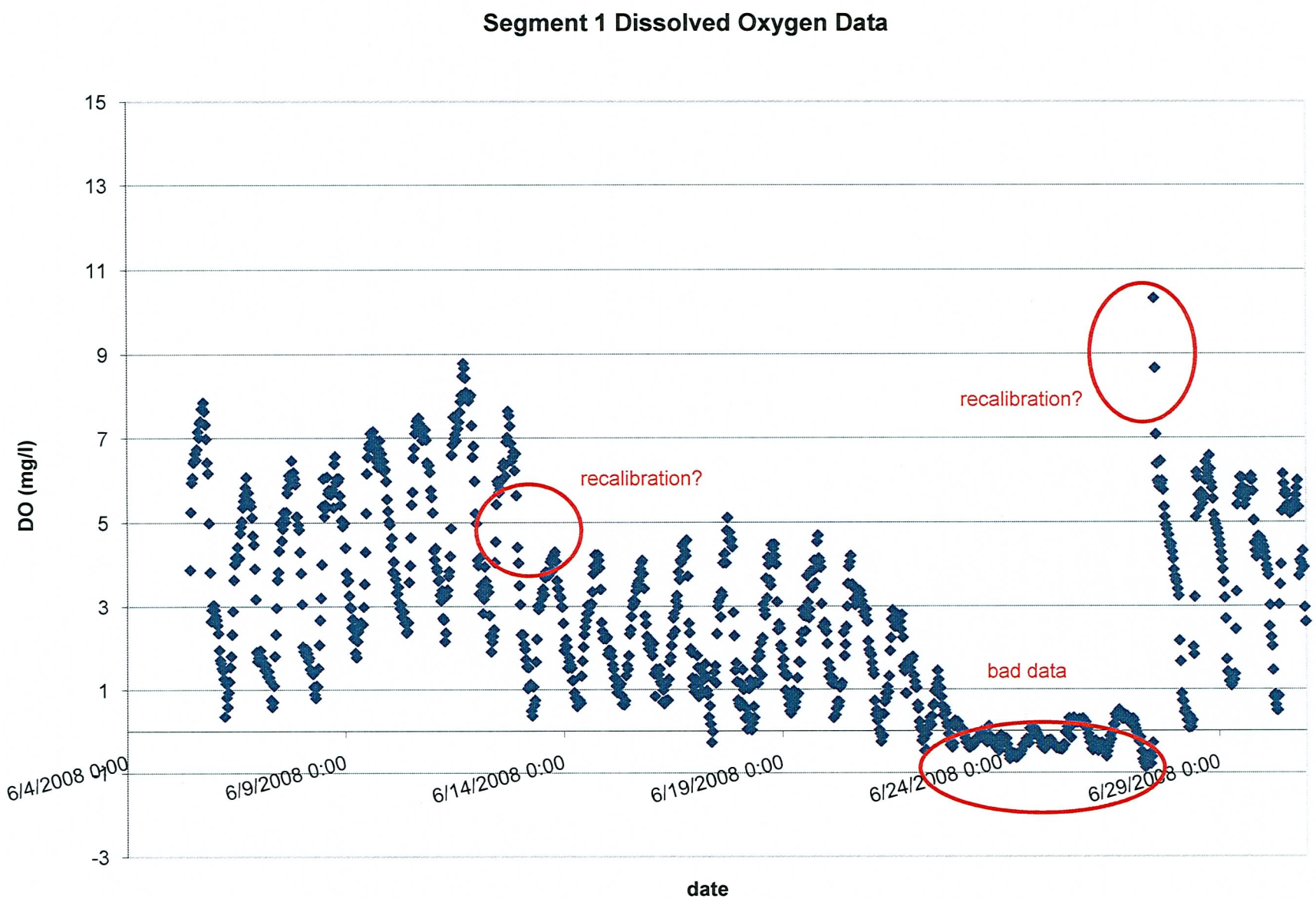

Dissolved Oxygen Data
ME Site
I might trust some of these data (except for calibration changes), rest looks bad
DO (mg/l)
60
50
40
30
20
10
0
-10
6/11/08 0:00
6/21/08 0:00
7/1/08 0:00
7/11/08 0:00
7/21/08 0:00
7/31/08 0:00
8/10/08 0:00
8/20/08 0:00
date

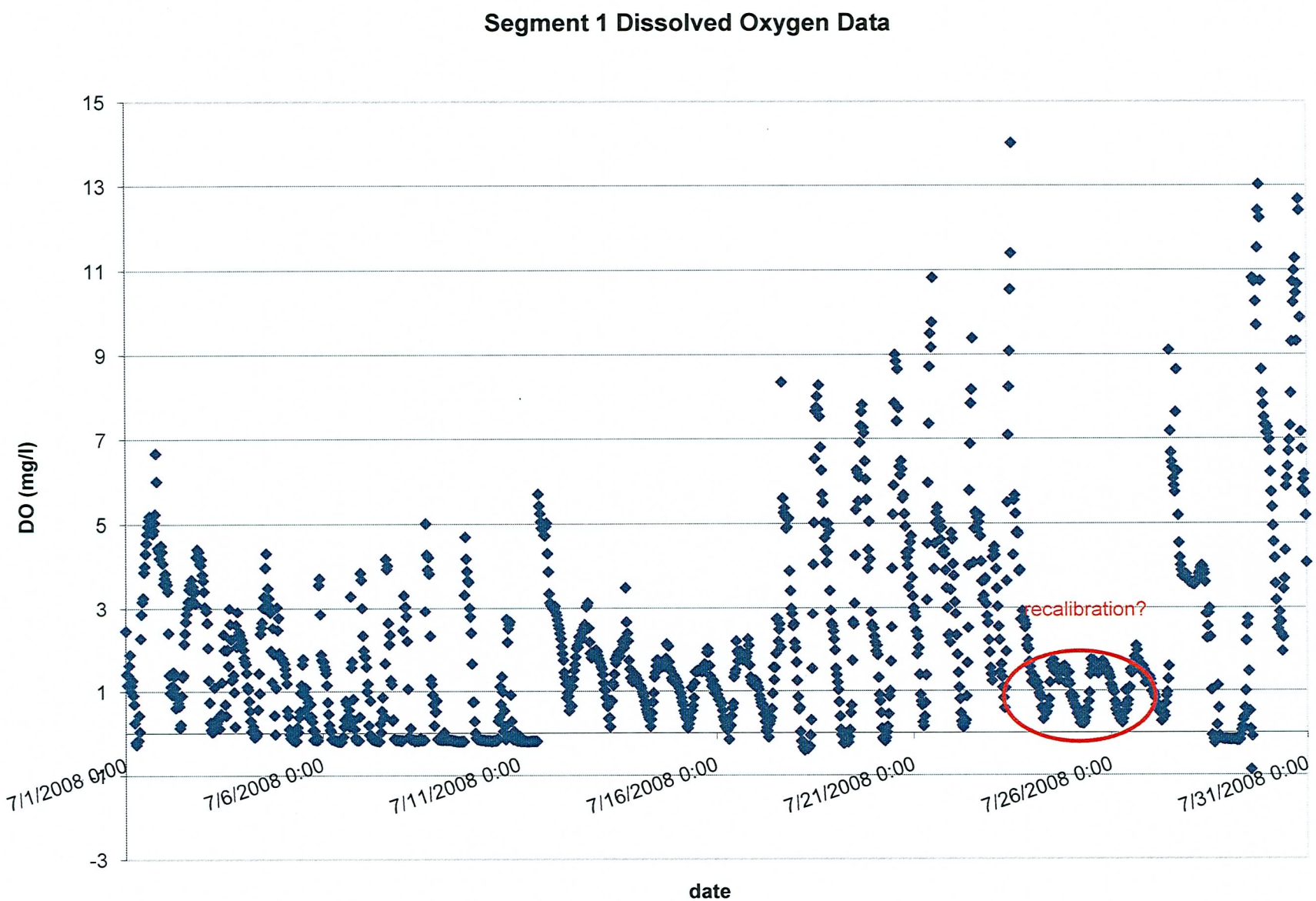

Segment 1 Temperature Data
temperature (C)
35
30
25
20
15
10
5
0
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
date

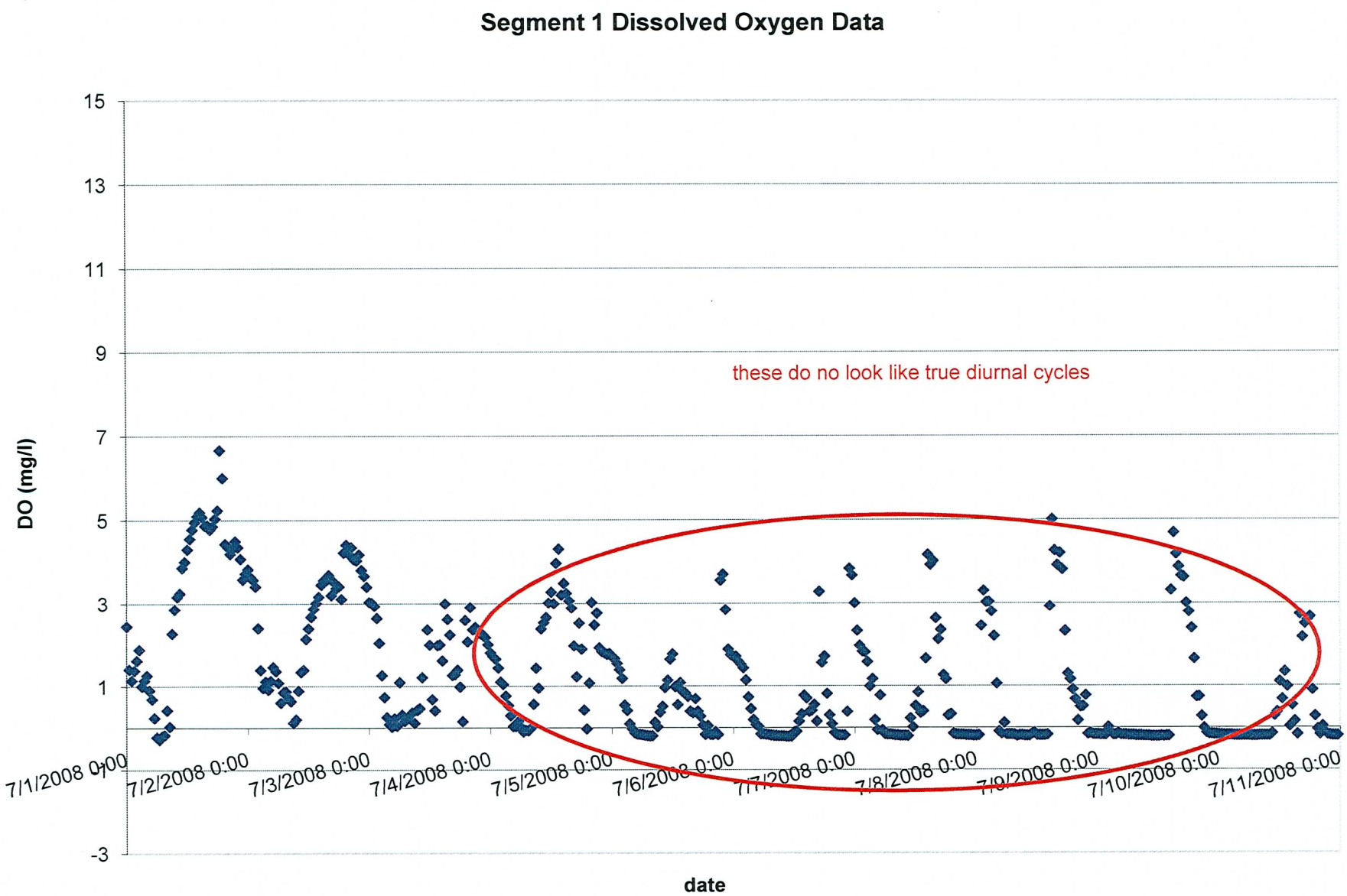

Segment 1 Turbidity Data
turbidity
flow
these look anamolous -> possible to get this high but unlikely to see isolated spikes like this (single data points)
negative values are invalid
turbidity (NTU)
flow at Ysidora (cfs)
date
1600
1400
1200
1000
800
600
400
200
0
-200
10
9
8
7
6
3
2
1
0
5/22/2008 0:00
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
9/9/2008 0:00

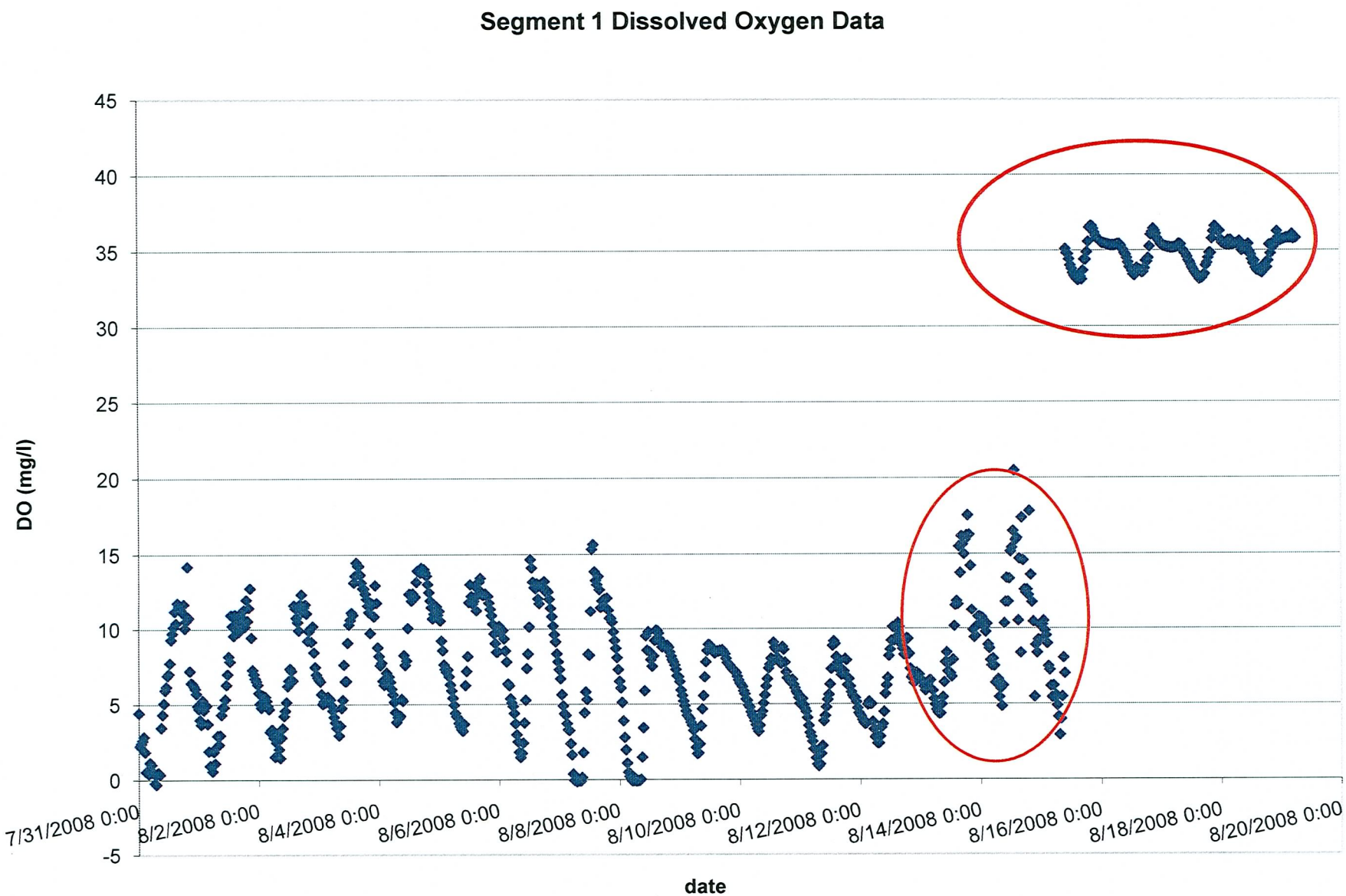

Segment 1 pH Data
10
9
8
7
6
5
4
3
2
1
0
pH
did depth drop off
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
date

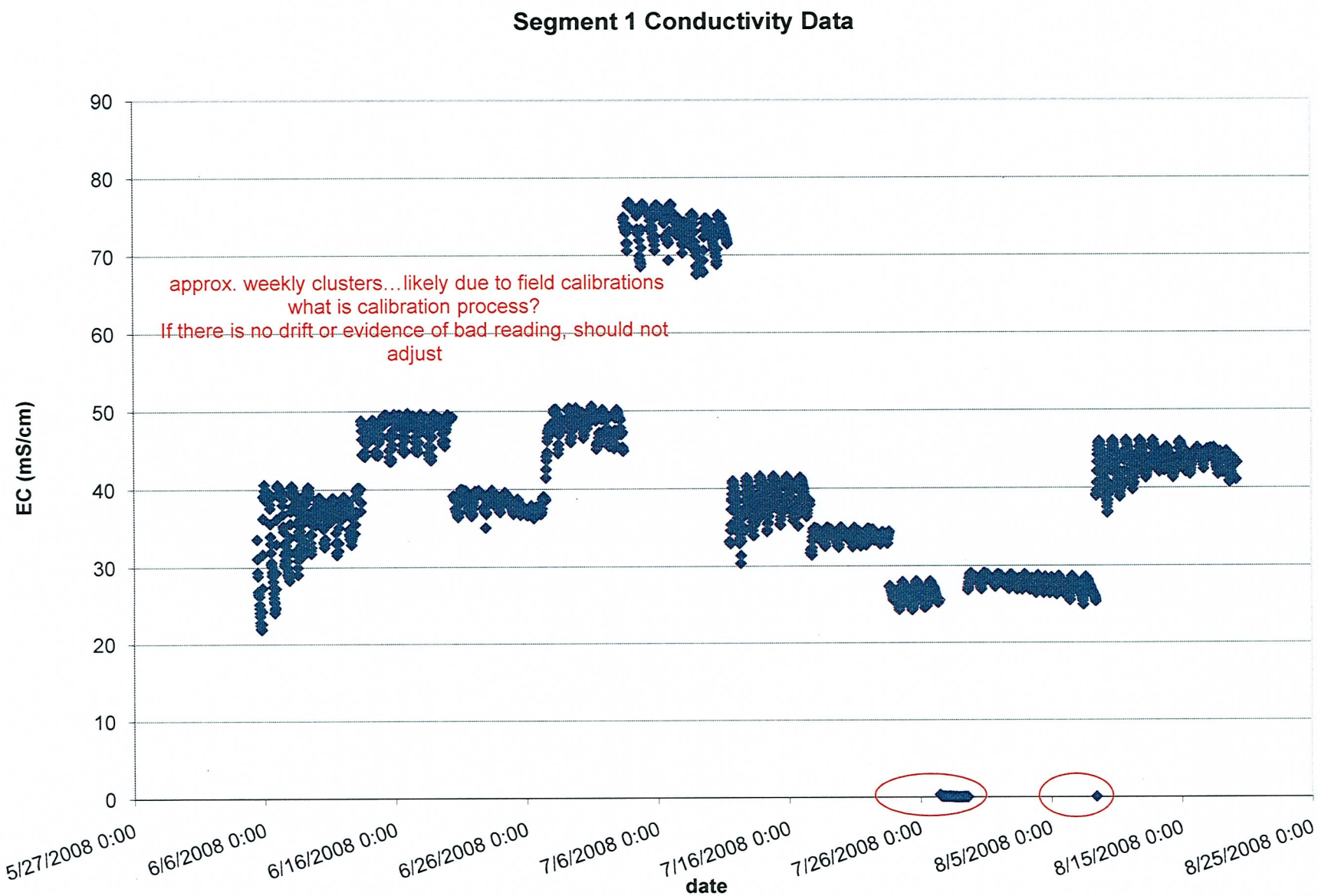

Segment 1 Dissolved Oxygen Data
negative values are
DO (mg/l)
40
35
30
25
20
15
10
5
0
-5
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
date

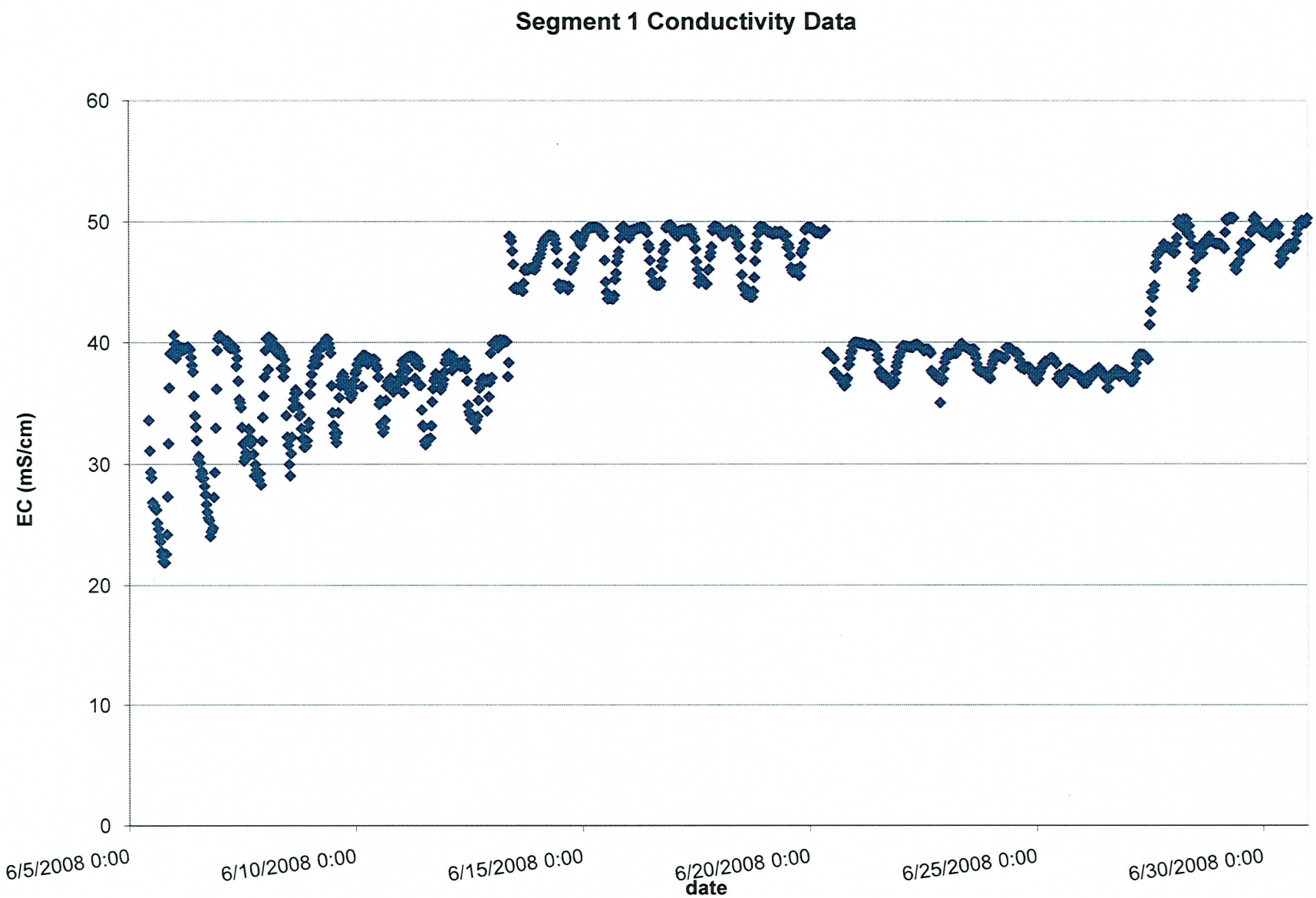

Segment 1 Dissolved Oxygen Data
DO (mg/l)
15
13
11
9
7
5
3
1
-1
-3
6/4/2008 0:00
6/9/2008 0:00
6/14/2008 0:00
6/19/2008 0:00
6/24/2008 0:00
6/29/2008 0:00
date
recalibration?
recalibration?
bad data

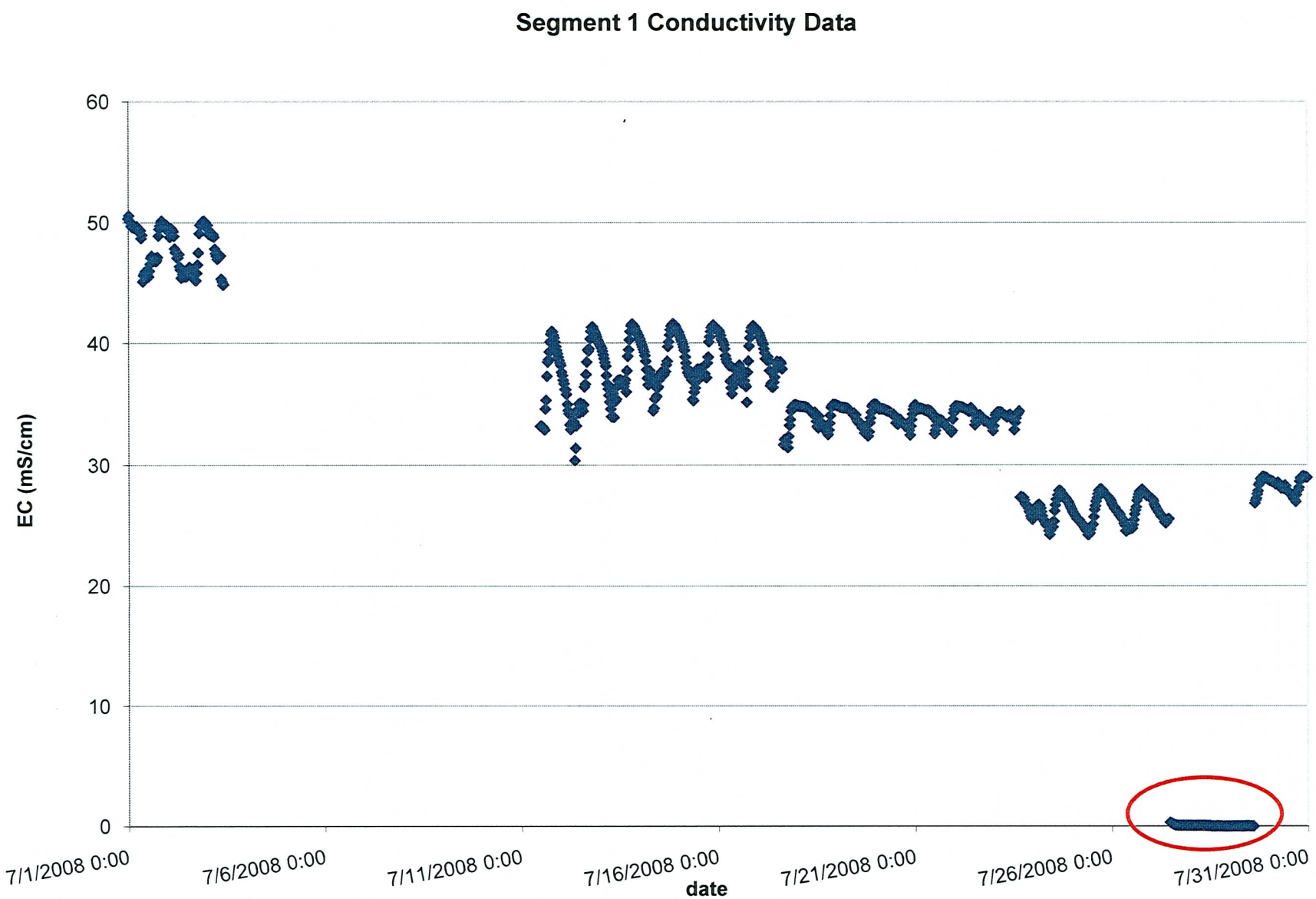

Segment 1 Dissolved Oxygen Data
DO (mg/l)
15
13
11
9
7
5
3
1
-3
7/1/2008 0:00
7/6/2008 0:00
7/11/2008 0:00
7/16/2008 0:00
7/21/2008 0:00
7/26/2008 0:00
7/31/2008 0:00
date
recalibration?

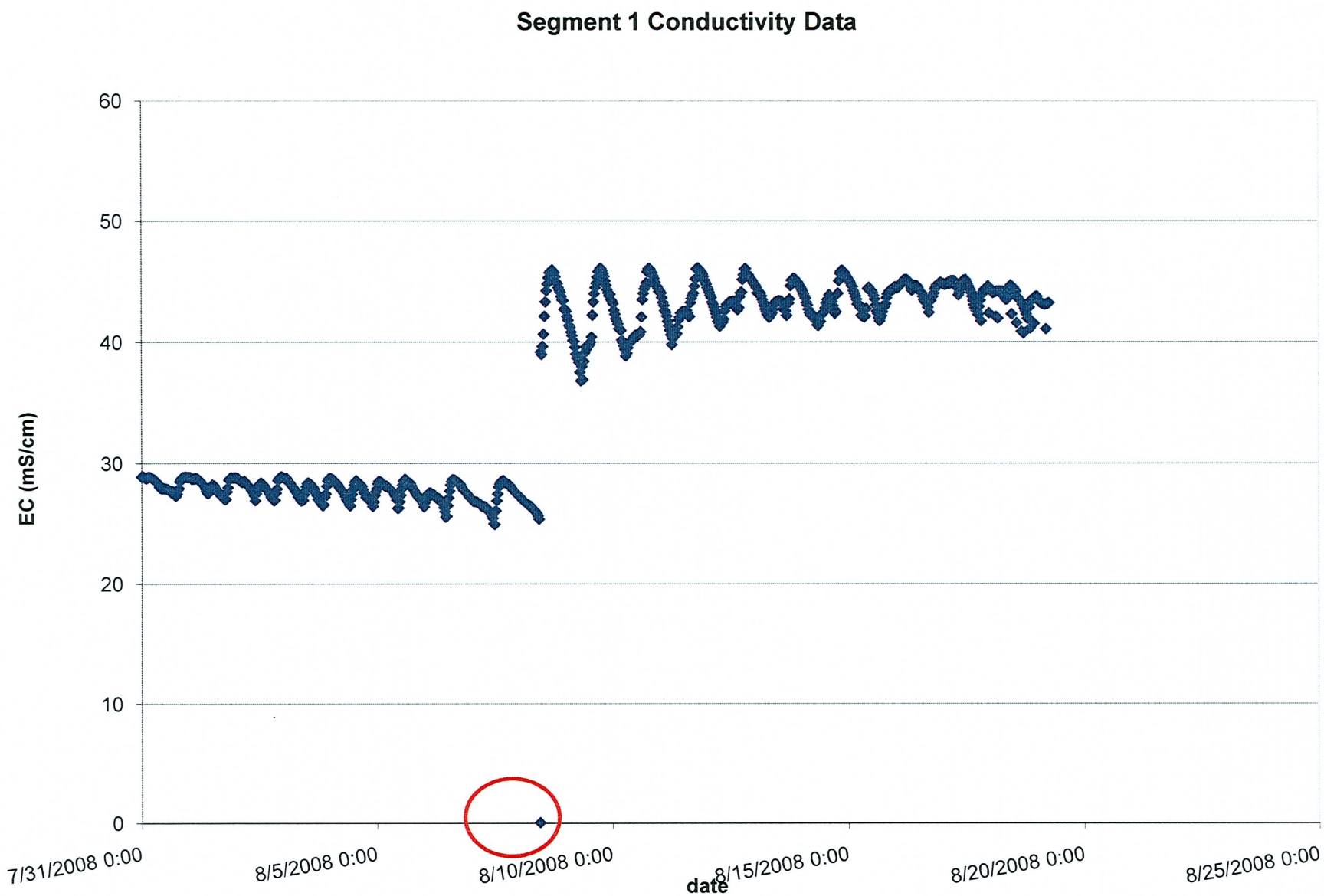

Segment 1 Dissolved Oxygen Data
these do no look like true diurnal cycles
DO (mg/l)
15
13
11
9
7
5
3
1
-3
7/1/2008 0:00
7/2/2008 0:00
7/3/2008 0:00
7/4/2008 0:00
7/5/2008 0:00
7/6/2008 0:00
7/7/2008 0:00
7/8/2008 0:00
7/9/2008 0:00
7/10/2008 0:00
7/11/2008 0:00
date

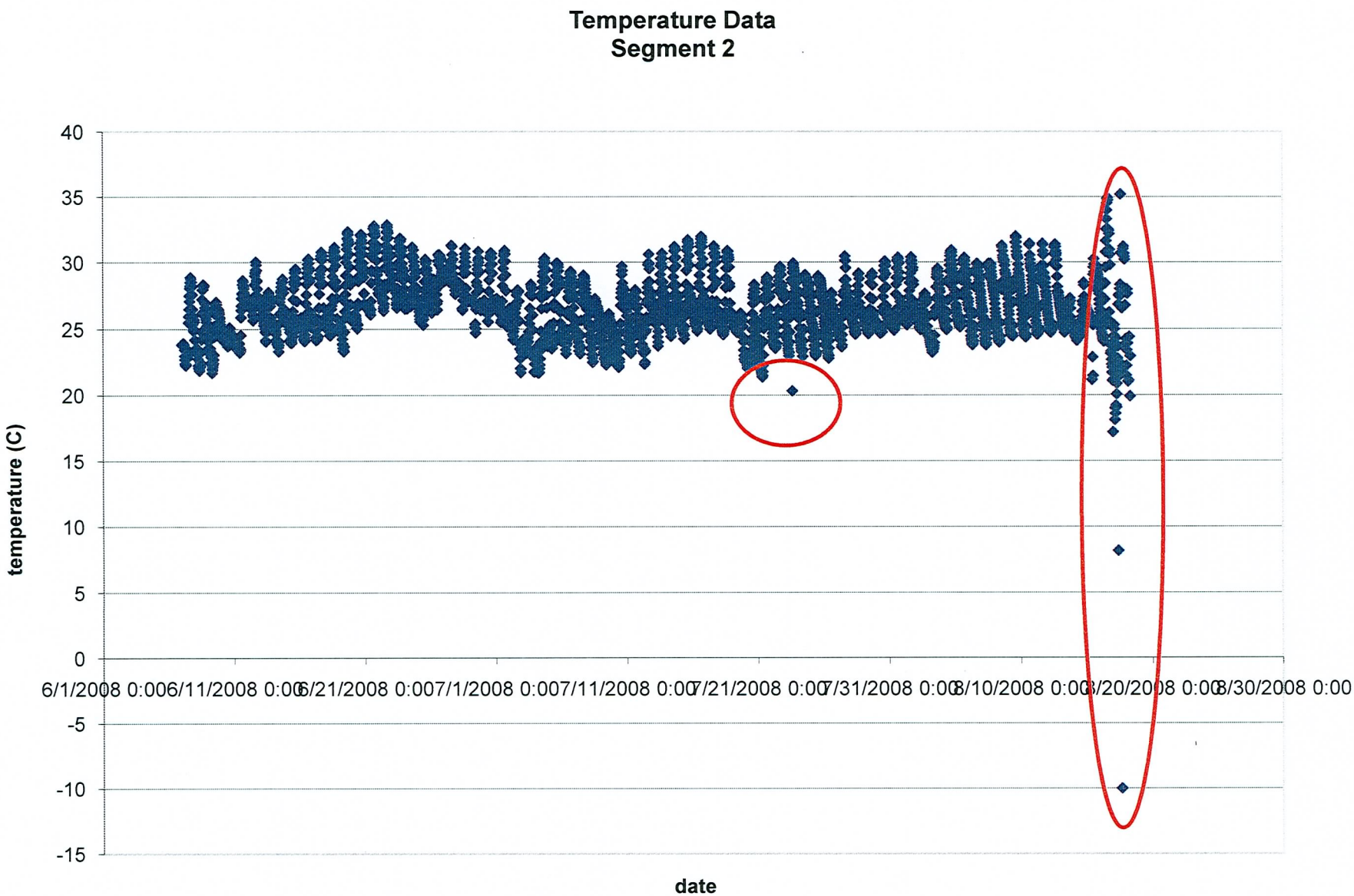

Segment 1 Dissolved Oxygen Data
DO (mg/l)
45
40
35
30
25
20
15
10
5
0
-5
7/31/2008 0:00
8/2/2008 0:00
8/4/2008 0:00
8/6/2008 0:00
8/8/2008 0:00
8/10/2008 0:00
8/12/2008 0:00
8/14/2008 0:00
8/16/2008 0:00
8/18/2008 0:00
8/20/2008 0:00
date

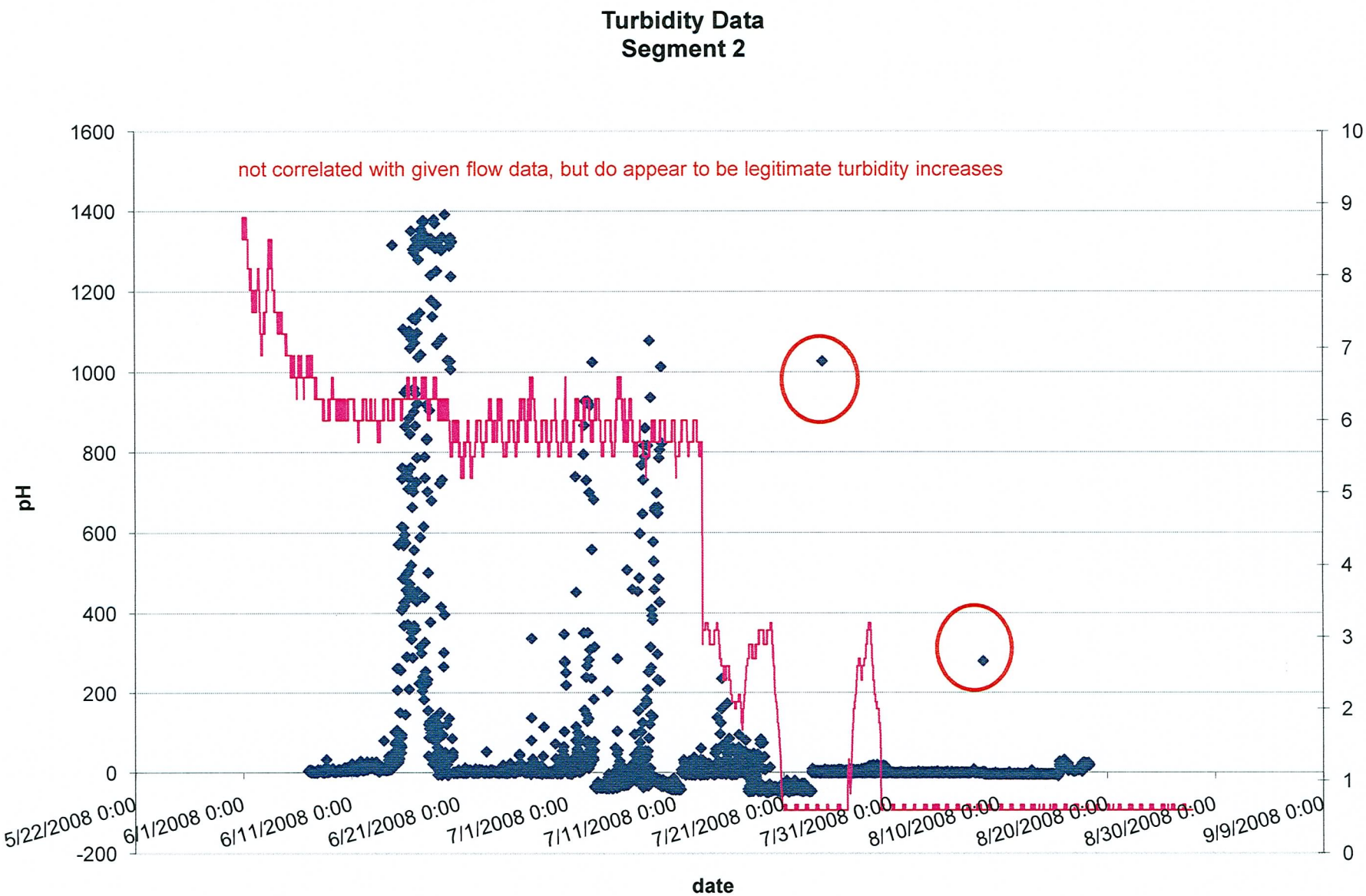

Segment 1 Conductivity Data
EC (mS/cm)
90
80
70
60
50
40
30
20
10
0
approx. weekly clusters…likely due to field calibrations
what is calibration process?
If there is no drift or evidence of bad reading, should not adjust
5/27/2008 0:00
6/6/2008 0:00
6/16/2008 0:00
6/26/2008 0:00
7/6/2008 0:00
7/16/2008 0:00
7/26/2008 0:00
8/5/2008 0:00
8/15/2008 0:00
8/25/2008 0:00
date

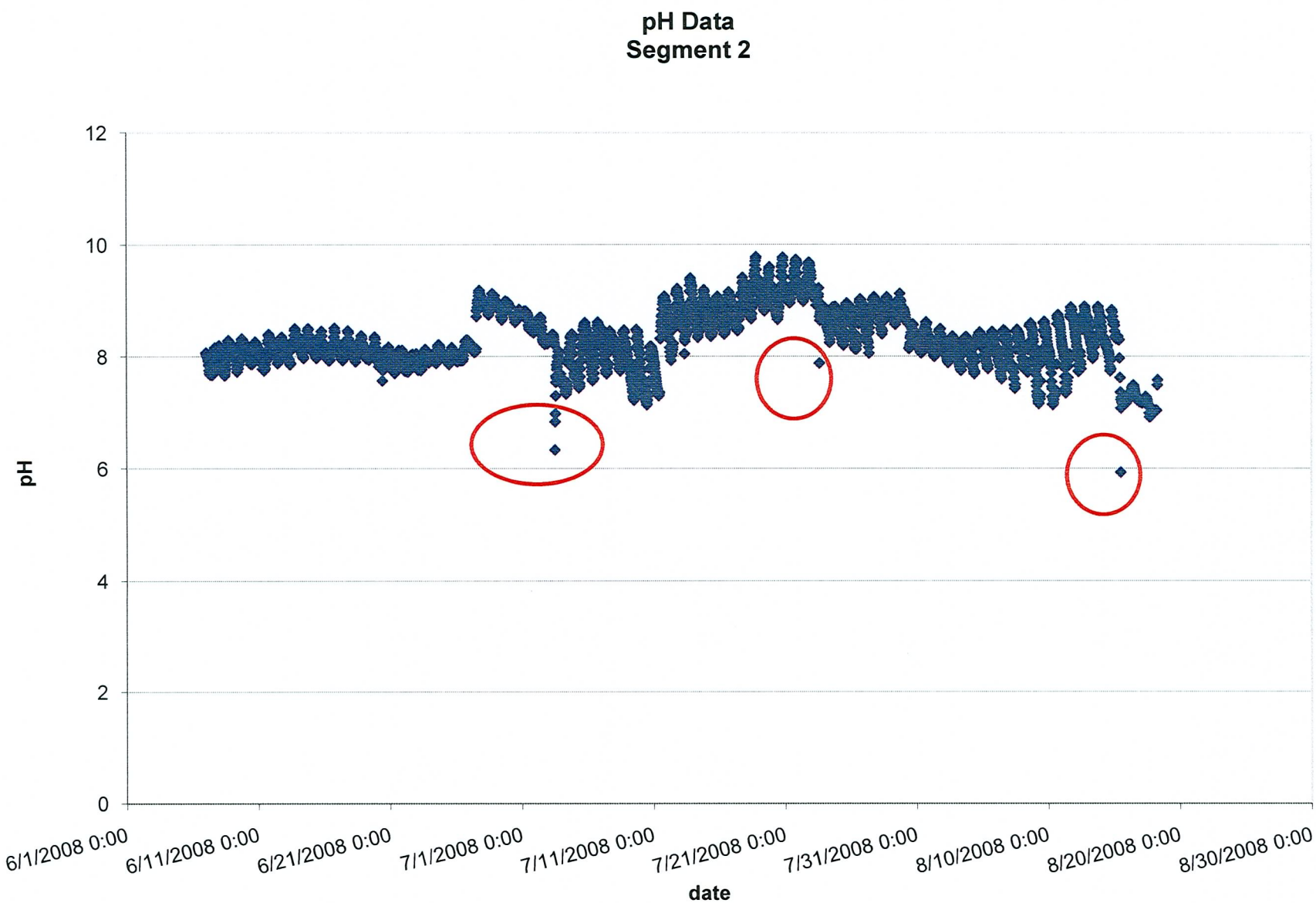

Segment 1 Conductivity Data
EC (mS/cm)
60
50
40
30
20
10
0
6/5/2008 0:00
6/10/2008 0:00
6/15/2008 0:00
6/20/2008 0:00
6/25/2008 0:00
6/30/2008 0:00
date

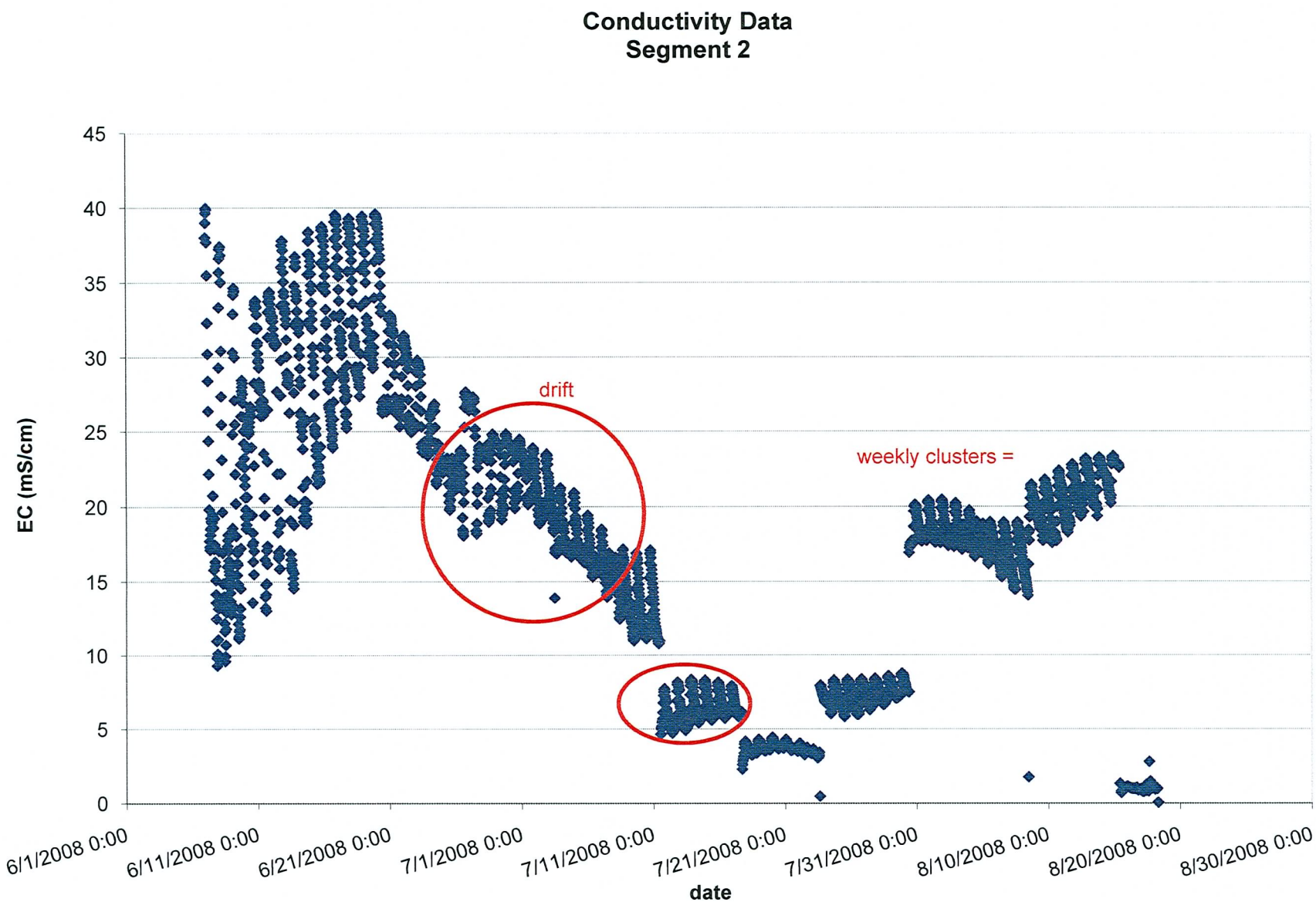

Segment 1 Conductivity Data
EC (mS/cm)
60
50
40
30
20
10
0
7/1/2008 0:00
7/6/2008 0:00
7/11/2008 0:00
7/16/2008 0:00
7/21/2008 0:00
7/26/2008 0:00
7/31/2008 0:00
date

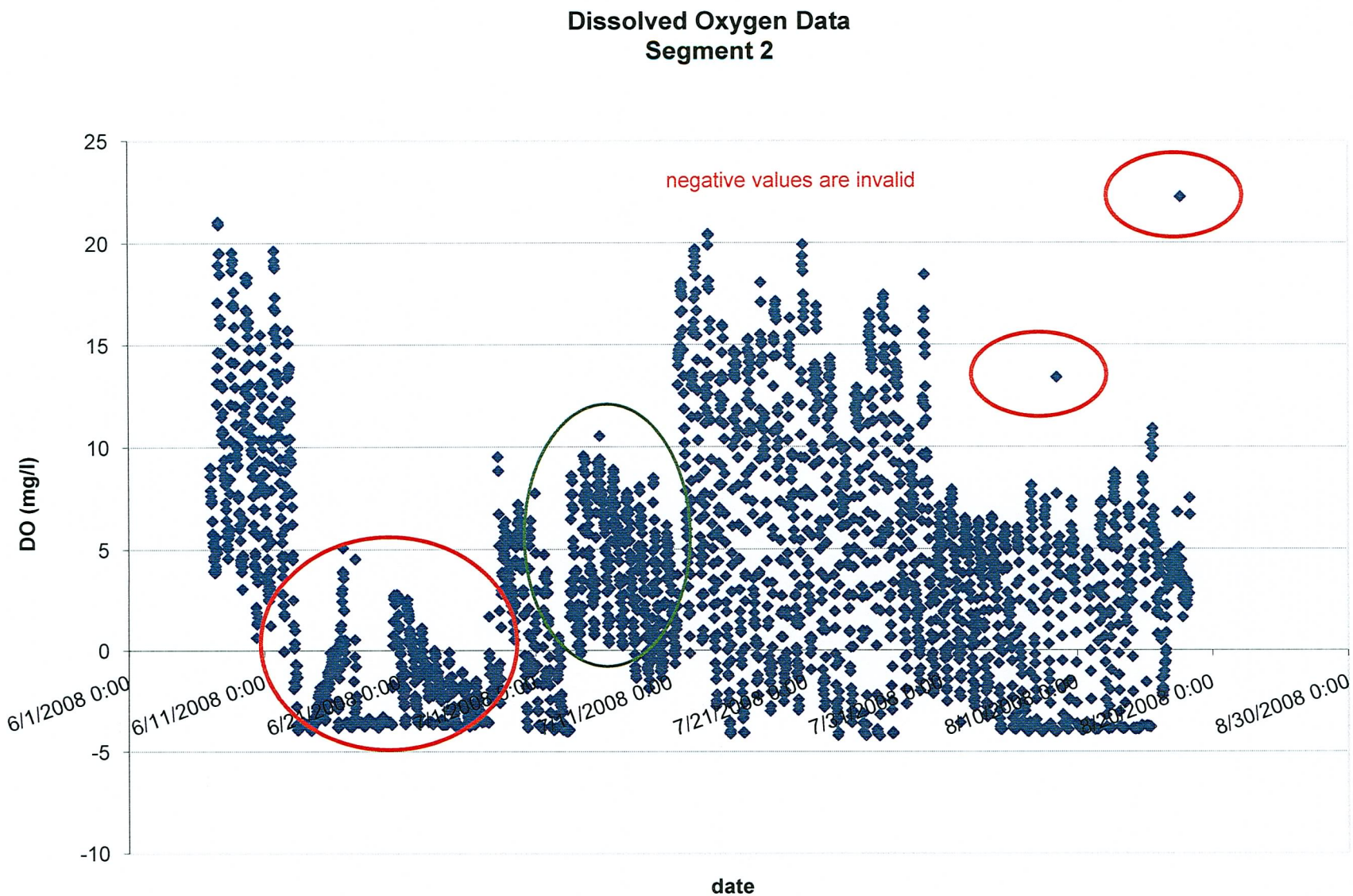

Segment 1 Conductivity Data
EC (mS/cm)
60
50
40
30
20
10
0
7/31/2008 0:00
8/5/2008 0:00
8/10/2008 0:00
8/15/2008 0:00
8/20/2008 0:00
8/25/2008 0:00
date

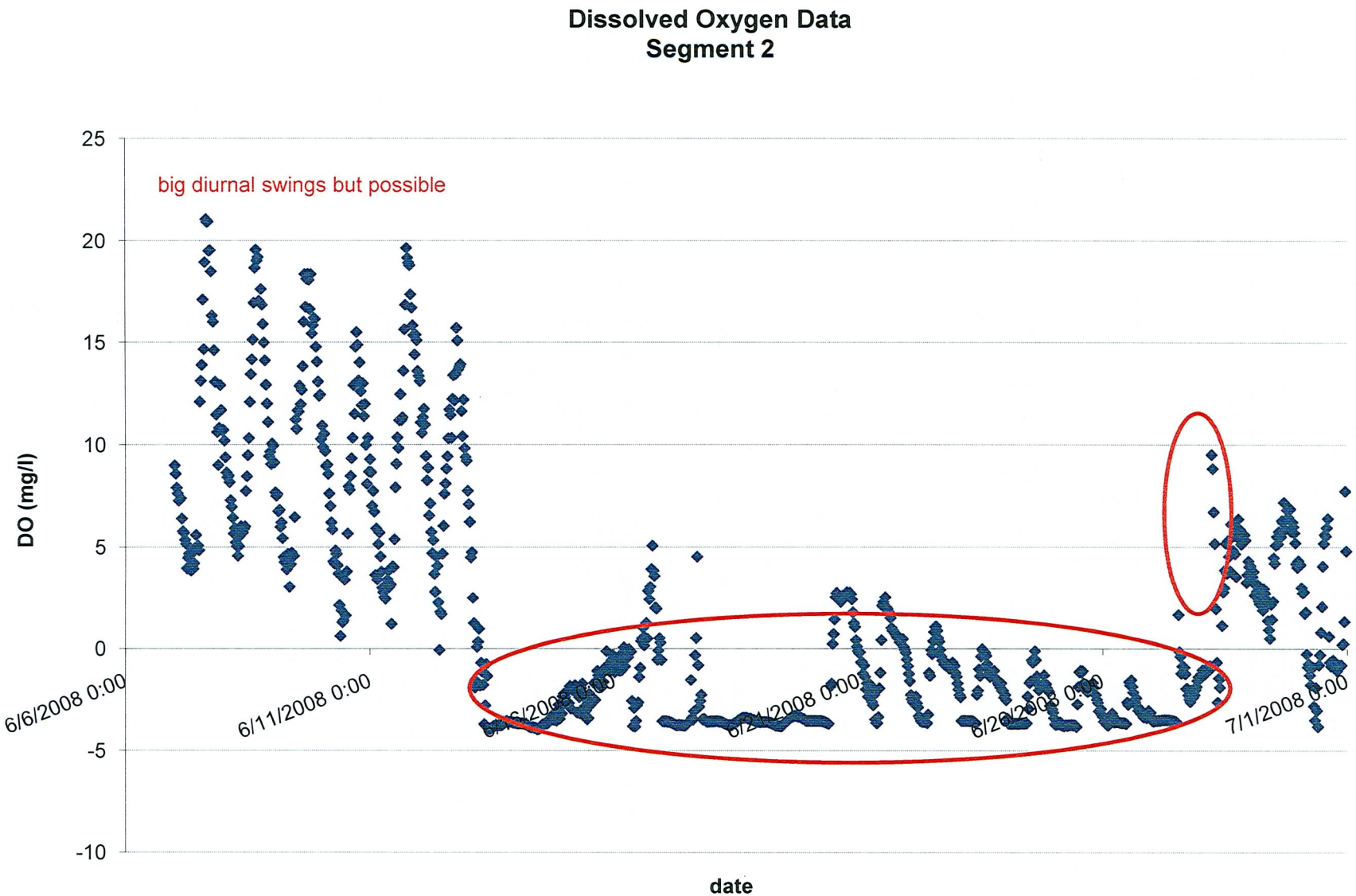

Temperature Data
Segment 2
temperature (C)
40
35
30
25
20
15
10
5
0
-5
-10
-15
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
date

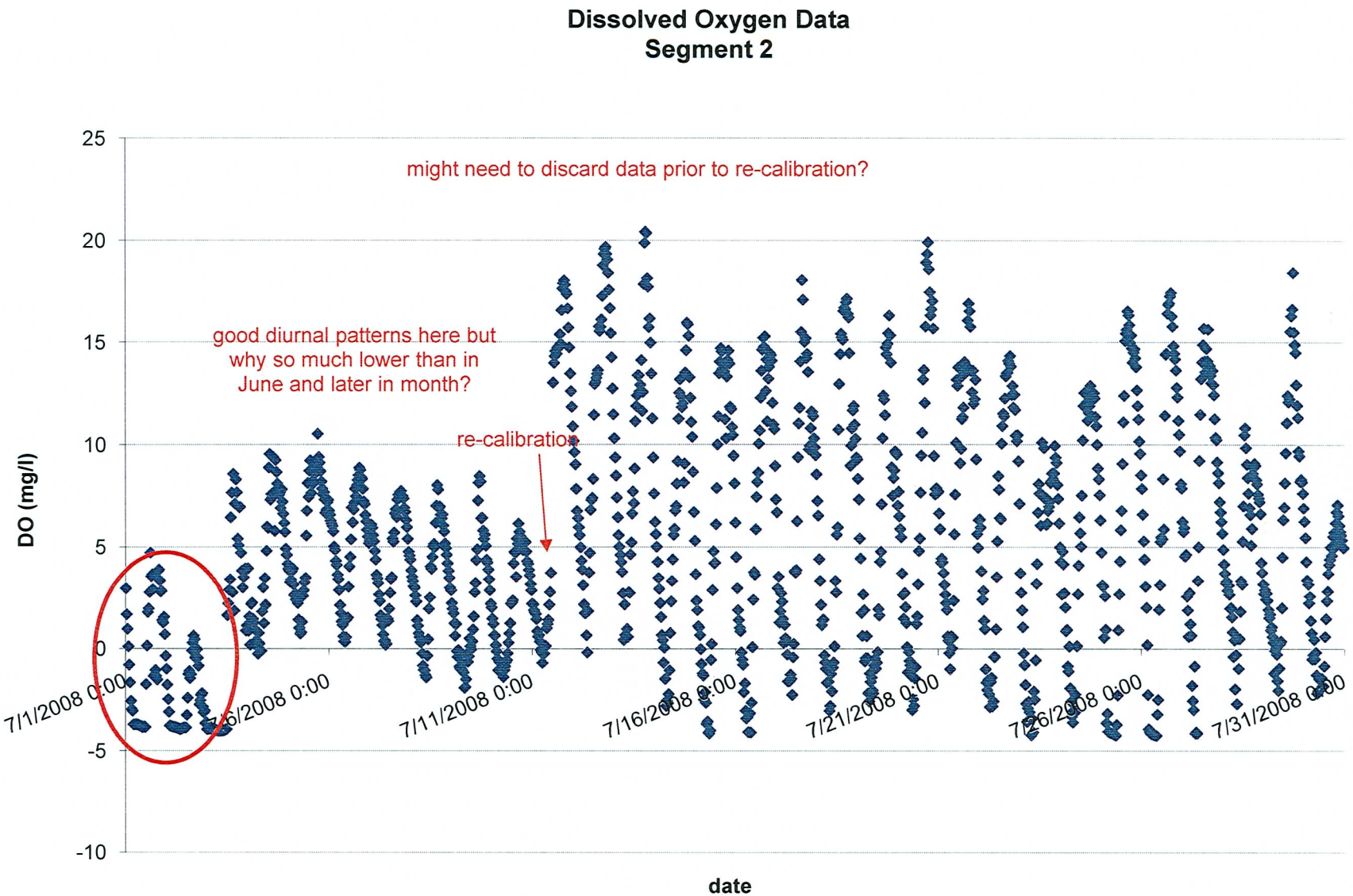

Turbidity Data
Segment 2
not correlated with given flow data, but do appear to be legitimate turbidity increases
pH
date
1600
1400
1200
1000
800
600
400
200
0
-200
10
9
8
7
6
5
4
3
2
1
0
5/22/2008 0:00
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
9/9/2008 0:00

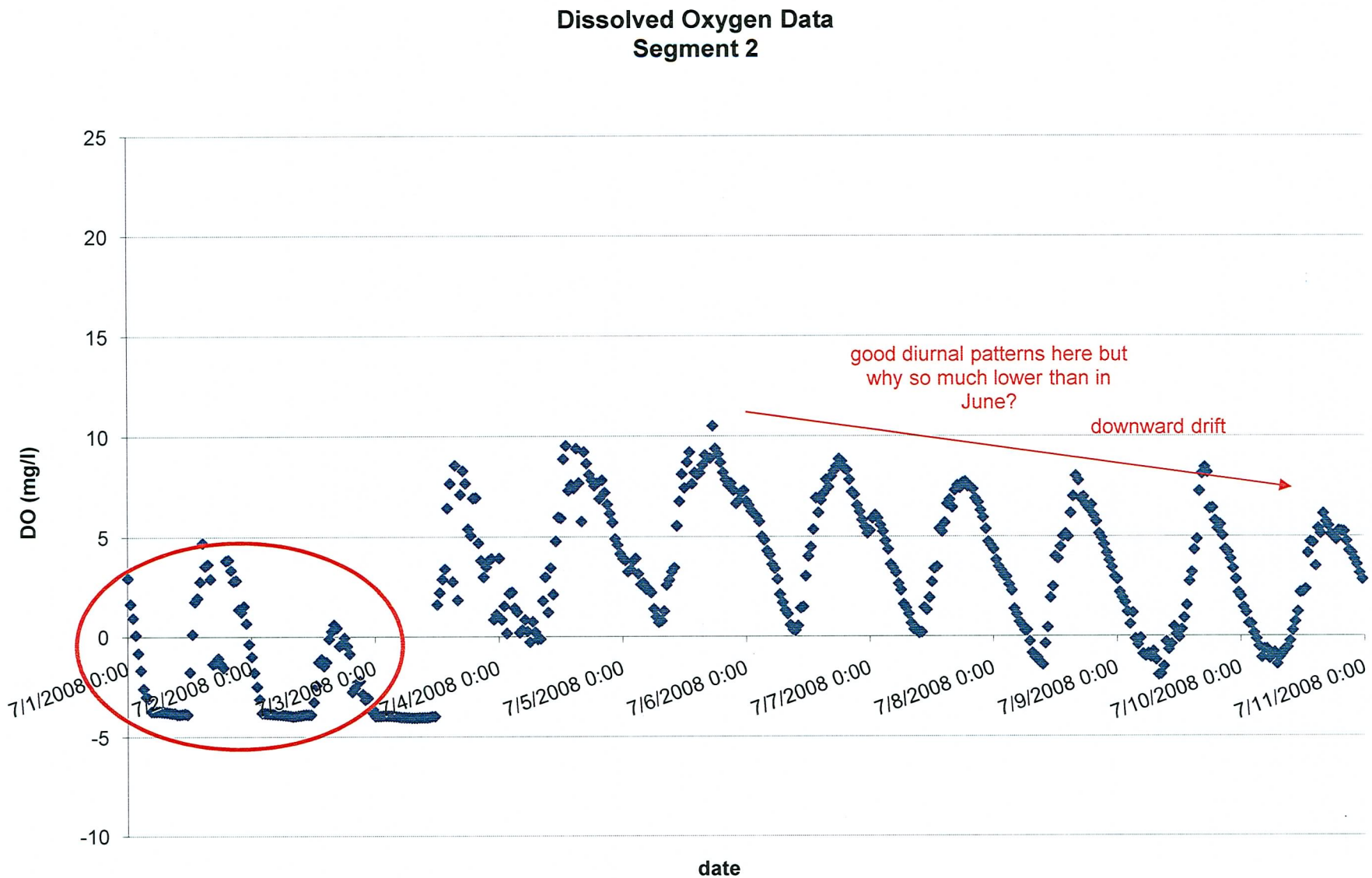

pH Data
Segment 2
pH
12
10
8
6
4
2
0
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
date

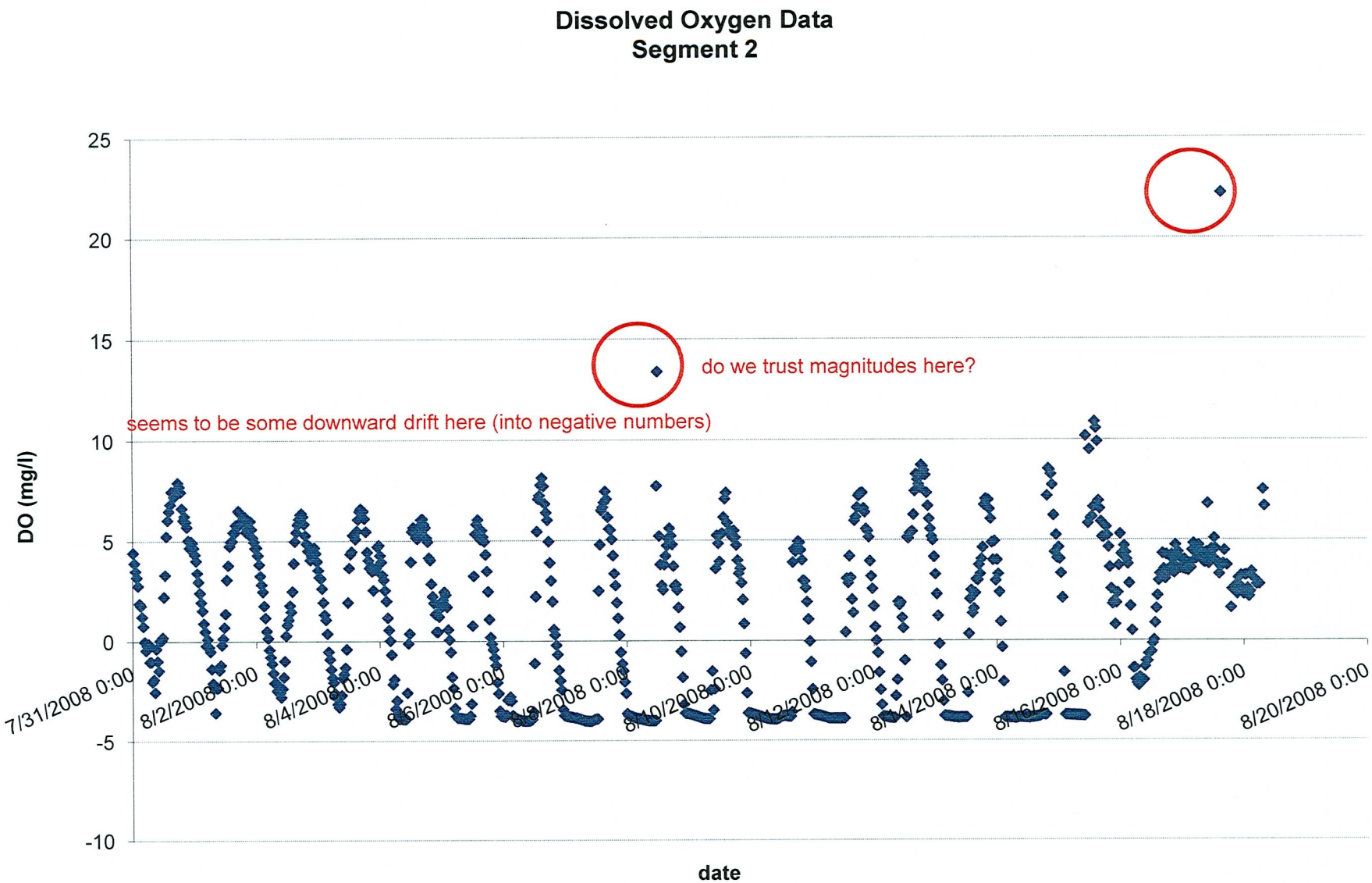

Conductivity Data
Segment 2
EC (mS/cm)
45
40
35
30
25
20
15
10
5
0
drift
weekly clusters =
6/1/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
7/11/2008 0:00
7/21/2008 0:00
7/31/2008 0:00
8/10/2008 0:00
8/20/2008 0:00
8/30/2008 0:00
date


Dissolved Oxygen Data
Segment 2
negative values are invalid
DO (mg/l)
25
20
15
10
5
0
-5
-10
6/1/2008 0:00
6/11/2008 0:00
7/21/2008 0:00
8/30/2008 0:00
date


Dissolved Oxygen Data
Segment 2
big diurnal swings but possible
DO (mg/l)
25
20
15
10
5
0
-5
-10
6/6/2008 0:00
6/11/2008 0:00
6/21/2008 0:00
7/1/2008 0:00
date


Dissolved Oxygen Data
Segment 2
might need to discard data prior to re-calibration?
good diurnal patterns here but
why so much lower than in
June and later in month?
re-calibration
DO (mg/l)
25
20
15
10
5
0
-5
-10
7/1/2008 0:00
7/6/2008 0:00
7/11/2008 0:00
7/16/2008 0:00
7/21/2008 0:00
7/26/2008 0:00
7/31/2008 0:00
date


Dissolved Oxygen Data
Segment 2
DO (mg/l)
25
20
15
10
5
0
-5
-10
7/1/2008 0:00
7/2/2008 0:00
7/3/2008 0:00
7/4/2008 0:00
7/5/2008 0:00
7/6/2008 0:00
7/7/2008 0:00
7/8/2008 0:00
7/9/2008 0:00
7/10/2008 0:00
7/11/2008 0:00
date
good diurnal patterns here but why so much lower than in June?
downward drift


Dissolved Oxygen Data
Segment 2
DO (mg/l)
25
20
15
10
5
0
-5
-10
do we trust magnitudes here?
seems to be some downward drift here (into negative numbers)
7/31/2008 0:00
8/2/2008 0:00
8/4/2008 0:00
8/6/2008 0:00
8/8/2008 0:00
8/10/2008 0:00
8/12/2008 0:00
8/14/2008 0:00
8/16/2008 0:00
8/18/2008 0:00
8/20/2008 0:00
date

Projects

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Oct 8, 2007

1025AM Drive to MB site to install continuous monitoring equipment.

Author: Matt Brookshire

Field Team: Matt Brookshire / Jon Bush

Weather: Sunny, 70°F, slight breeze

Activity: Installation of long-term water to monitor temp and conductance

PPE: Level D

Equipment: Troll 9500, Serial #

1030 Evaluated how to install

1045 Leave to purchase supplies.

1230 Return to site to install equipment

1256 Initiated measurements at 30 minute intervals

1306 Leave MB site to visit lagoon sites.

1336 Left MCB Camp Pendleton - end day.

Matt Brookshire 10/8/07

Oct 11, 2007

1450 Arrive at I-5 lagoon sample spot.

Author: Matt Brookshire

Field Team: Matt Brookshire, Bob Hunt, Jon Bush

Weather: Sunny, slight breeze, 70°F

PPE: Level D

Activity: Installing ISCO 6712, at three locations.

1503. Install ISCO #20IE01140. Used 75 ft of tubing

1600 Leave for Smart Mesa bridge site.

1605 Arrive to set up ISCO #20SA00998. Used 99 feet of tubing.

1652 Leave site.

1653 Matt Brookshire leaving/signing off to Jon Bush.

Matt Brookshire

1715 arrive at Mass Emissions Site set up ISCO #20MA01557 used 25 feet of tubing

1745 Leave MCB Camp Pendleton End of DAY.

10.11.07

November 6, 2007

1615 J. Bush arrives at Mass Emissions site to check data aquisition.
Weather: Hazy, cool
PPE: Level D

1620 Data is being collected as programmed. Extract to PDA. Take photos of tracks near probe.

1630 Leave site.

~~November~~ 12/11/07

~~November~~ 12/11/07 Notetaker: Robert Hunt
Personnel: CDM - Jon Bush, Bob Hunt
Weather: Sunny - windy + cool 50's
Forecast - high upper 50's -
PPE: Level D modified
Instruments: Trimble Recon PDA +
Calibration: NA
Activities: moving intake to ISCO Automatic sampler intake + move hose further into channel

0915 - Meet Jon Bush @ Carlsbad office - then head to Camp Pendleton to move ISCO sampler. → 0945 - @ Mass Emission site - 1st Good set vs 70 lbs purgas gas - when we arrive → transducer is jumbled up. - move transducer into channel and attempt to download data. - transducer will not connect try cable connections - disconnect programs + call Pine Ein for further advice - can not connect transducer → Notify

Robert Hunt - 12/11/07

TUESDAY DECEMBER 11, 2007

Pressure sensor is broken off transducer. - will return to office + recharge PDA - may need to order new cable + air transducer.

* Note - also need new metal support to connect transducer cable + water intake

1030 - Depart site - head to Carlsbad office to drop off Jon Bush

1130 - Back @ San Diego office.

12/11/07

Robert Hunt 12/11/07

FRIDAY DECEMBER 21, 2007

NOTEBOOK / PERSONNEL: CAM - BOB HUNT

Weather - sunny - clear 64°

PPE: Level D modified

Instruments: Mini Troll 9500 - Trimble Recon PDA.

Calibration: NA - none needed

Activities: Download data from transducer to PDA

1420 - Arrive @ Camp Pendleton drive to MB site - download data + check to see if data is on PDA

1520 - Back @ CAM office

12/21/07

12/21/07 Robert Hunt

THURSDAY JANUARY 3, 2008

Notetaker: BHB Hunt
Personnel: CDM - Andy Grancel, BHB Hunt
Weather: sunny - low 60's -
PPE: Level D modified
Instruments: YSI - continuous logging version
Calibrations: NA
Activities: Install YSI probes @ segment site 1, segment site 2, + download data @ mass emissions site

1030 Arrive @ mass emissions site - download data - troll 9500 (1) up + running - downloaded data.
- 1045 - Head to segment site 1 (I-5)
Location - install YSI + secure cable.
1100 - Head to segment site 2
- install YSI - and secure cable..
- 1150 - Leave camp pendleton
Head back to San Diego office.
1235 - Back @ San Diego office

1/3/08

THURSDAY JANUARY 3, 2008

1/3/08

Saturday JAN 5, 2008

NOTETAKER BOB HUNT

PERSONNEL: CDM JON BUSH + BOB HUNT

Weather: rain - moderate 59° -

Forecast light to Heavy rain flooding poss.

PPE: Level D modifies

Instrument - ISCO samplers

Calibration: NA

Activities: Mass Emission, lagoon + ocean inlet sampling - wet weather event.

0700 - leave for office to pick up supplies + truck

0815 - Meet Jon Bush in Oceanside

0900 - start mass emissions site

→ intake not in main flow - not enough tubing

0920 - @ start mesa Bluffs location - 2 errors with distributor arm to ISCO sampler - move on to I-5 lagoon -

0937 - Start ISCO sampler @ I-5 location

0943 - SHOTS FIRED - DUCK HUNTING IN AREA - WILL BE ON ALERT.

0945 - Head to ocean inlet area - Beach sand - there is no water

Robert Hunt 1/5/08

safe to place ISCO sampler - 1 HR to HIDE TIDE - and little area to place ISCO - will need a couple of 100' feet of tubing - + to be on the other side (southside) of inlet where there is higher ground

1020 - Head Back to start mesa location -

1037 - Get ISCO running - start sampling

1237 - @ I-5 Bridge of site - ISCO sampler - RUN - sampler collected - 1 segment 1

1300 - collect sample @ segment 1 FOR - TOTAL + DISS Nitrogen TOTAL + DISS Phosphorus, TSS, BOD + chlorophyll A Ammonium phosph, Ammonium, Nitrate, Nitrite

SM-W1-S1H-1

1400 - collect sample @ segment 2 ~~FOR~~ SM-W1-S2H-1 - FOR FOR TOTAL + DISS Nitrogen, TOTAL + DISS phosphorus, TSS, BOD, + chlorophyll A Ammonium phosph, Ammonium - Nitrate + Nitrite

Robert Hunt - 1/5/08

Saturday ~~December~~ January 5, 2008

1742 – @ Segment 1 (I-5)

SITE –

1750 – start Segment 1 ISCO

1805 – START Segment 2 ISCO

1810 – HEAD TO MASS EMISSIONS SITE

1825 – @ MASS EMISSIONS SITE

1900 – sample MASS EMISSIONS SITE

SM-WL-PG11-1

1910 – SM-WL-PG11-2

1915 SM-WL-PG11-3

1920 SM-WL-PG11-4

1925 – SM-WL-PG11-5

1930 SM-WL-PG11-6

1935 SM-WL-PG11-7

1940 SM-WL-PG11-8

~~[illegible]~~ 1/15/08

ALL sample, collected for NITROGEN, phos, ~~DISS N~~ DISS NITROGEN DISS phosphorus, Nitrate, nitrite Ammonium, soluble reactive phosphorus TSS, BOD, + chlorophyll

1/15/08

ATTEMPT TO collect ~~[illegible]~~ additional sample – intake + TUBING is ~~[illegible]~~ clogged with sand – UNABLE

Robert Hunt 1/15/08

Saturday January ~~December~~ 5, 2008

TO collect water sample – Due to conditions – Heavy stream flow – unsafe condition to retrieve + set up again.

0945 – Pack up and head to segment site 1 TO collect lower hole samples.

1/15/08

Robert Hunt – 1/15/08

Saturday January 5, 2008

2100 - @ segment SITE 1 - FOR SLACK LOW TIDE SAMPLING

2120 - Sample - SM-W1-S1IL-1 FOR - nitrogen, phosphorus (TOTAL & DISS) nitrate, nitrite, ammonium + sol react phosphorus, TSS, BOD, + chlorophyll

2125 - COLLECT DUPLICATE SAMPLE SM-W1-S1IL-3 - @ segment site 1 FOR nitrogen, phosphorus, (TOTAL & DISS), nitrate, nitrite, ammonium, sol. react. phosphorus, TSS, BOD, + chlorophyll

2200 - @ segment SITE 2 start mess BRUNCH

2215 - collect - SM-W1-S2IL-1 FOR ~~nitrate, nitrite,~~ nitrogen, phosphorus, (TOTAL & DISS) nitrate, nitrite, ammonium, soluble reactive phosphorus, TSS, BOD, + chlorophyll.

- ISCO sample @ segment site 2 is representing problems

- Robert Hunt - 1656

Saturday January 5, 2008

- NOT SUFFICIENT VOL TO COLLECT FULL VOLUME FOR all parameter
- collect FOR NUTRIENTS LOT then BOD, TSS, - last - chlorophyll - may NOT BE enough volume FOR chlorophyll analysis.

2230 - Finished sampling - Depart Camp Paddleford → drop off Jan Bush @ vehicle.

2305 - arrive @ San Diego office - DROP OFF samples on ice @ OFFICE - will PACK individual coolers for labs on Monday

2335 - Finished for day - leave OFFICE FOR Home.

Robert Hunt - 1656

1/27/2008

Activity: Santa Margarita River Stormwater Sampling
Crew: Jake Dunk, Jon Busch
Weather: Cool, wet

0730 - meet at Carlsbad office. Get field vehicle.
0800 - stop at store for supplies
0815 - Reached entrance at Camp Pendleton, main back. Drove to Las Pulgas gate.
0845 - At ME Site.
0850 - Start ISCO at ME Site collecting a 1L sample every 0.5 hours
0915 - At Stuart Mesa Bridge (Section 2)
0930 - Start ISCO: Sample (200ml) every 15min for 3hrs.
0945 - At I5 segment (1)
0950 Start I5 ISCO: sample (200ml) every 15 minutes for 3 hours
1005 At Ocean inlet
1025 Start Ocean Inlet ISCO: collect 200ml every 15 minutes/3 hours.
JB 1/27/08

1045 - Get ice and supplies on base. Take lunch
1230 - at Stuart Mesa Bridge to collect sample.
1245 - Collect SM-W2-S2HI-1
1300 - At I-5 bridge, collect sample.
1310 - Collect SM-W2-S1HI-1
1320 - Collect SM-W2-S1HI-2
1345 - at Ocean Inlet
1355 - Collect SM-W2-OIHI-1
1415 - at I-5 Bridge location to install batteries in ISI sonde.
1420 - Water level too high to service sonde. Prep bottles/labels for Latrobe samples
1530 - to store for supplies. Label bottles for ME samples
JB 1/27/08

1/27/08 continued.

1720 - arrive at Stuart Mesa Bridge (Sec. 2). Isco pulled on it's side from bridge and sample line being pulled from the current.

1745 - collect grab sample at Stuart Mesa bridge (SM-W2-S241-1)

1820 Retrieve ocean inlet Isco from beach and bring back to I5 bridge for cover. Raining hard.

1845 Collect samples from I-5 (Section 1) and Ocean inlet Iscos.
SM-W2-S141-1
SM-W2-O141-1

1930 At Mass ammitions site to collect pollutograph samples.

2100 - All pollutograph samples at MCE site collected. To Carlsbad to pick up personal vehicles.

2140 At Carlsbad office END OF Day.

1/27/08

1/30/2008

Activity - Santa Margarita River Index Sampling

CDM - J. Dunk, J. Bush

Weather - Cool, Overcast

0600 - Dunk and Bush arrive at Las Pulgas Parking lot. Check in w/ guards. Proceed to Section 2 (Stuart Musa Bridge)

0645 - At Section 2, install batteries into YSI SONDE

0715 - Program Isco for delayed start. Collect 3 samples starting at 0930 (0 min, 15 min, 30 min)

0810 - At I-5 Kreise, Section 1. Install YSI SONDE batteries

0820 - Program Isco for 0930 delayed start. Collect samples at 0 min, 15 min, 30 minutes.

0845 - At Ocean Inlet. Deploy Isco.

0900 - Matt Brookshire, Thomas Lowe, Carlos Melvin, and onsite.

1/30/08

0915 - Brookshire directs us to recheck Isco sampler intake to surf. Brookshire and others leave site. Bush and Dunk remain.

0920 - Isco moved to beach and first of 3 samples collected (0 min)

0950 - Collected Ocean Inlet sample SM-IID1-OIL-1

1000 - At I-5 (Section 1) Collect Sample SM-IID1-S1L-1

1015 - Program I-5 Isco for high tide sample. Get supplies from Las Pulgas lot. Lunch

1200 - At NE Site. ~~Collect~~ Retrieve Sample SM-IID1-NEL-1 (Sample time = 1010)

1217 - At Stuart Musa Bridge (Section 2) to retrieve sample SM-IID1-S2L-1 Sample time = 1220

1/30/08

1/30/08 continued

1330 - At Ocean Inlet. Set up to collect High tide sample. Prep Bottles and Labels

1350 - Collect SM-I1D1-OH1 at Ocean Inlet

1400 at Section 1, collect SM-I1D1-S1H-1

1420 Collect samples SM-I1D1-S2H-1 and SM-I1D1-MEH-1

1540 - No V/SI Sonde data at Section 2 Resistant log.

1610 - At ME site. Replace liner and program for 2am High-tide sampling.

1645 At Las Pulgas finishing lab. Prepare samples for courier

1700 Dunk leaves for day. Bush gets supplies.

1800 Bush meets owner.

End of Day

1/30/08

1/31/08

Activity: Twelve Sampling Day 2
SMR, Camp Pendleton
CDM: J. Dunk, J. Bush
Weather: Clear, Cool (50s)

0700 - Bush, Dunk arrive at Las Pulgas site.

0745 - At ME Site. No sample in composite bottle. Check/Download sonde data.

0810 - Collect SM-I1-D2-ME1. Go Las Pulgas for supplies

0935 - At Section 2. Retrieve last night's sample (0210 time) SM-I1D2-S2H-1. Start ISCO to collect low tide sample (SM-I1D2-S2L-1)

1000 - ~~Flat tire~~, RR, Richard jump from CDM CCR patch ~~tire~~.

1130 - At Bay auto rental for

1/31/08 JB

1/31/08 continued

1230 - cont. - tide swap
- lunch
- Call CRG, meet 2:00 pm courier to 1600.

1315 - At Ocean Inlet to retrieve high tide sample from last night. Sample time = 0200. Sample ID = SM-I1D2-01H-1
Set 1500 to sample tonight at 0200 for Ocean Inlet Day 3 High tide sample
SM I1D3-01H-1
Missed low-tide today (Ocean) due to flat tide.

1400 - Retrieved High Tide 75 sample from last night
SM-I1D2-S1H-1
Sample time: 0220
Retrieved low tide sample
SM-I1D2-S1L-1 time = 1150
1/31/08 [illegible]

1430 - At Section 2 (Stuart Neck Bridge)
Retrieve SM-I1D2-S2L-1
Sample time = 1000
Set up ~~[illegible]~~ for 0200 sample for D3 High tide.
Prep samples for courier

1540 - At Las Pulgas Lot
Drink leaves for day

1600 - J. Bush meets CRG courier.
END of Day

1/31/08

2/1/2008

Activity - Tracer Sampling
Day 3
SMR, Camp Pendleton

CDM - J. Dunk, J. Bush
Weather - Clear, cool

0730 - Dunk and Bush at Las Pulgas lot. Stock vehicle.

0745 - Stop at MCB gas station for ice.

0800 - Collect sample at ME site.
(SM-11D3-ME-1)

Sample Times 2/1/2008

SM-11D3-ME-1	0800
SM-11D3-OIH-1	0230
SM-11D3-OIL-1	1000
SM-11D3-S1H-1	0210
SM-11D3-S1H-2	0220
SM-11D3-S1L-1	1010
SM-11D3-S2H-1	0200
SM-11D3-S2L-1	1020

0915 - at Station 2 to retrieve sample from high tide and program Tsco for low tide

0935 - at Station 1 to retrieve sample from high tide and program Tsco for low tide sample

1000 - At Ocean Outlet to retrieve high tide sample from ~~High~~ ~~tide~~ 0230 last night and collect low tide sample today.

1105 - At Station 1 (I-5) to retrieve low tide sample.

1120 - At Station 2 (Stuart Mesa Bridge) to retrieve low tide sample.

1200 - Pulled MS1 sonde, will calibrate, reprogram, redeploy on Day 4 of Tracer Sampling.

1230 At Las Pulgas lot. Dunk takes Tracers and Samples for MWA + MST. Dunk leaves.

1400 J. Bush meets CRB Cadre.

End of day

2/1/2008

2/5/2008

Activity: SMR Field Prep for Index Sampling

CDM: J. Dunk, J. Bush

Weather: Clear, warm

12:30 - Dunk and Bush meet at Las Pulgas Gate

1300 - Arrive at Section 2. Reinstall SONDE, start logging

1400 At Section 1 (1.5 Buoy)
- Check probe
- Prep Jeep to sample at high tide in early morning.

1425 At Ocean Outlet to display Jeep for morning sampling.

1500 At Las Pulgas gate for POV.

1530 Bush leaves field stuck at Cardiac office.

End of Day 2/5/08

2/6/2008

Activity: SMR Index Sampling Day 4

CDM: J. Dunk, J. Bush

Weather: Clear, Cold.

0700 - Bush and Dunk meet at Las Pulgas gate. Will stop at base gas station for ice.

0740 - At ME Site for sample collection.

0745 Collect SM-I1D4-ME-1

DAY 4 Sample Times

SM-I1D4-ME-1	0745
SM-I1D4-S2H-1	0600
SM-I1D4-S1H-1	0610
SM-I1D4-S1H-2	0620
SM-I1D4-S1L-1	1200
SM-I1D4-S2L-1	1210
SM-I1D4-O1H-1	0630
SM-I1D4-O1L-1	1130

2/6/08

2/6/08 continued.

0850 - At Section 2 to Retrieve sample and set up ISCO for low tide sample.

0910 - At Section 1 to retrieve high tide sample and set up ISCO for low tide sample.

0930 - At CDM Trailer to ask about vehicle/equipment storage. Tony is person who will coordinate getting a key (Tony Arey). Will allow vehicle storage and equipment storage inside 40' container marked #1.

1000 - to meet Brian Shin at Base Environmental to exchange radio.

1100 At Ocean Inlet to retrieve high tide sample and collect low tide sample.

1245 At Section 1 to retrieve low tide sample.

2/6/08

1315 - At Section 2 to retrieve low tide sample.

1400 - At Las Pulgas gate. Pack coolers for carrier.

1415 Drive leaves for supplies. Bush to Carlsbad to drop off filled tubes.

1600 - Bush meets courier and drop. END OF DAY

2/6/08

2/7/2008

Activity: SMR Tudor Sampling
Day 5 Camp
Pendleton, Co.
CDM - A. Grazel, J. Bush
Weather - Clear, Cold -

0700 - Grazel and Bush arrive at Cas Pulgas Gate.
0730 - Meet Dave Dunk and Thomas Lowe at Section 1 to swap needed equipment
0820 At ME site
0845 Collect SM-I1D5-ME-1

Sample Times 2/7/08

SM-I1D5-ME-1	0845
SM-I1D5-D1H-1	0500
SM-I1D5-D1L-1	1250
SM-I1D5-S1H-1	0510
SM-I1D5-S1L-1-MS/MSD	1300
SM-I1D5-S2H-1	0520
SM-I1D5-S2L-1	1315
SM-I1D5-S1H-2	0530

2/7/08

2/7/2008 continued.

1000 - At Section 2 to retrieve high tide sample and set Isco to sample low tide
1020 - At Section 1 to retrieve high tide sample and set Isco to collect low tide sample.
1150 Get ice from main gate store
1220 At Ocean Inlet to retrieve high tide sample, collect low tide sample, and set up Isco for morning sampling
1220 Sample lost, Water collected outside liner.
1250 Collect grab sample at Ocean Inlet for low tide
1430 At Section 1 to retrieve sample and set up Isco for overnight high tide sampling.
1500 At Section 2 to retrieve sample and set up Isco

2/7/08

2/7/2008 [illegible]

1540 - At Las Pulgas lot to drop Creazell at his truck.

1600 - Meet Lonnie at Prop

1620 - Jake Dunk and Thomas have arrive with samples for CRG from transect sampling (Weston).

1630 J. Bush at Carlsbad CDM

END of Day

2/7/08

2/8/2008

Activity: SMR Tucker Sampling, Day 6

CDM: J. Dunk, J. Bush

Weather: clear, cool

0700 - Dunk and Bush arrive at Las Pulgas lot. Get ice at gas station.

0800 - At NE Site. Collect SM-I1D6-NE-1

Sample Times 2/8/2008

SM-I1D6-NE-1	0800
SM-I1D6-01H-1	0630
SM-I1D6-01L-1	1130
SM-I1D6-S1H-1	0610
SM-I1D6-S1L-1-MS/MSD	1210
SM-I1D6-S2H-1	0640
SM-I1D6-S2L-1	1200
SM-I1D6-S1H-2	0620

0930 At Section 2 to retrieve High-tide sample and program DSLD.

2/8/08

 2/8/2008 cont.

0950 - At Section 1 to retrieve High-Tide sample and set ISCO to sample low-tide.

1010 - at Ocean inlet to retrieve High-tide sample and collect low-tide sample

1135 - at Environmental office to meet Brian Shin.

1150 - At Storm Drain collection point

1200 - Collect SM-11-SD-1

1310 - At Section 2 to retrieve low-tide sample

1325 - At Section 1 to retrieve low-tide sample (MS MSD).

1410 - Consolidate loop in truck

1430 - Prep samples for lab courier.

~~1530~~ 1530 Dude leaves for day.

1530 - Meet courier at drop

End of Day

2/8/08

SMR - Sonde Maintenance

Camp Pendleton, Ca.

CDM - Andy Greazel, Jon Bush

Weather - clear, warm.

1350 - At ME Site. Probe adjusted and reset in stream bed. Sonde was not logging data. A new test was set up but never started

1400 - Start Test "ME" will return to check status.

1420 - At Section 2 sonde Download data.

1430 - At Section 1 sonde. Data download shows DO readings at 500% for a few days. Clean probe, change batteries, re-calibrate DO.

1500 - DO probe will not calibrate. Re-build probe with kit in case.

3/19/08

3/19/2008 continued.

1600 Probe rebuilt and calibrated to 110% DO. Instructions designate 100% as correct calibration. 110% is closest we can get after several tries.
Redeploy sonde East of T5 bridge in a location that looks like it will be less affected by tide changes.

1630 - Verify that sonde is logging

1640 - Andy G. and Jon B. leave site.

1700 - at NE Site to check logging status.
Sonde is logging but date/time is incorrectly informed to 1/10/1999. Stop logging, reset date, restart logging at 1716.

1750 - Verify correct logging.
Leave Camp Pendleton
3/19/08

3/24/2008

SMR Sampling Trip 2
Camp Pendleton, CA
CDM - R. Cholas, J. Bush
Weather - clear, warm

0700 - arrive at CDM yard to stage supplies

0730 - at S2 to set up ISCO

0750 - at S1 to set up ISCO.

0825 at NE Site. program ISCO. Start manually

Day 1 Sample Times

SM-IZDI-NE1	- 0850
-S2H-1	- 1000
-S1H-1	- 1010
-O1H1-1	- 1100
-S1H-2	- 1200 - JB Did not collect
-S2L-1	- 1500
-S1L-1	- 1510
-O1L-1	- 1520
JB (O1L-1)	

Did not collect SM-IZDI-S1HZ due to inadequate water volume
3/24/2008

3/24/2008 cont.

1015 - at Ocean Inlet.
Prep & sample.
Calibrate Horiba

T° (C)	Con S/cm	Tur (NTU)	DO	pH
15.3	4.54	0.0	9.43	3.98

1035 Ocean inlet water quality parameters

T°	Con	Tur	DO	pH
14.4	54.9	8.5	7.81	8.4

1100 collect sample. ~~SM-12D1-1~~ SM-12D1-D1H-1

1200 at S1, collect sample

1220 at S2, collect sample.

1300 lunch. plan for tomorrow. fill out sample labels. Will collect Duplicate for Low Tide sample at S1. SM-12D1-S1L-2. collection time will be 1510.

3/24/08

3/24/08 continued.

1430 at S1. Prepare sample bottles for all three samples.

1515 - at S2 to collect low tide sample.

1600 - at ocean inlet & collect low tide sample. (see grid for sample times) Water quality Measurements

T°	Con	Tur	DO	pH

1620 No measurements. Horiba U-22 is inoperative. Error message = "Type Err" All solutions from manual attempted. Will replace as soon as possible. Collected Ocean low tide as noted on grid.

1645 Secure Jeep and supplies. Leave ocean inlet.

3/24/08

3/24/08 cont

1700 prep samples for courier at CDM YARD.

1800 meet courier. relinquish samples.

END of Day

3/24/08

3/25/2008

Santa Margarita Lagoon Sampling Day 2 Event 2

CDM - R. Chalas, J. Bush

Weather - Cold, overcast.

0745 - At CDM yard for supplies.

0805 - At ME site to collect sample SM-I2D2-ME-1

Day 2 Sample times

SM-I2D2-ME-1	0830
-S2H-1	1015
-S1H-1	1005
-O1H-1	1105
-S2L-1	1350
-S1L-1	1450
-O1L-1	1545
-S1H-2	1010

0915 - to store for ice and QV batteries

3/25/08

3/25/2008 mt.

0930 - at S2. Program Isco for High tide sample.

0940 - at S1. Will collect sample by hand. Isco tube is not long enough to reach stream channel. Recent sedimentation has buried intake.

1045 at ocean inlet for high tide sample collection. Will wade in as we did at S1 location.

1055 Calibrate Horiba U-22. It is working this morning. Never found problem from yesterday.

	T(C)	Con	Turb	DO	pH
Calibration	4.46	0.4	10.5	3.95	

3/25/08

3/25/2008 mt.

1100 - Water quality readings

T°	Con	Turb	DO	pH
15.3	51.5	68	8.0	8.26

1145 Retrieve high tide sample from S2.

1315 Meet Brian Shin to swap radio.

1400 at S2 to retrieve low tide sample.

1535 at ocean inlet to collect low tide sample. Water quality readings

T° C	Con	Tur.	DO	pH

1540 Horiba U-22 in operation while wading in ocean. No parameters.

3/25/2008

3/25/2008 cont.

1615 at S1 to check sonde data.

1623 at ~~ME~~ S2 to check sonde data.

1645 at ME site to check sonde data.
All samples running and data to 3/25/08 downloaded.

1705 at CDM yard.
Get coolers ready for courier. Pick up POV

1800 meet courier. Relinquish samples.
End of Day

3/25/2008

3/26/2008

SM8 - Index 2 Sampling.
Camp Pendleton, CA.
CDM - J. Bush, R. Chokas
Weather - cool, overcast

0745 - Enter Las Pulgas gate. Were told DOD decals no longer acceptable at main gate. Initially refused entry at Las Pulgas gate due to high volume of CDM employees w/ no Rapidgate pass. Were let through after some conversation.

0800 - At CDM yard for supplies.

0830 - at ME site to collect sample.

0945 - at Section 2 Program for high tide sample.

1000 - at S1. Prep to manually take composite sample for high tide.

3/26/2008

3/26/08 cont.

Sample times 3/26/08

SM-I2D3	ME-1	0855
" "	-S1H-1	1000
" "	-S2H-1	1115
" "	-O1H-1	1125
" "	-S1H-2	1030
" "	-S1L-1	1440
" "	-S2L-1	1430
" "	-O1L-1	1535

1105 at Ocean Inlet to collect composite high tide sample

1115 Calibrate Horiba U-22

T°C	Con	Tur	DO	pH
14°C	4.46	0.0	10.23	3.94

1120 Water Quality Reading

T	Con	Tur	DO	pH
15.6	52.5	1.2	8.0	8.37

3/26/08

3/26/08 cont.

1200 - At S1 to collect High tide sample.

1415 - at S1 to collect manual composite low tide sample.

1515 at Ocean Inlet for low tide composite. Attempt to calibrate U-22. Horiba calibrated in AM. Powered on and reading normally

1530 Water Quality Reading

T	Con	Tur	DO	PH
18.5	45.5	11	8.01	8.56

1615 at S2 to collect low tide sample.

3/26/08

3/26/2008 cont.

1640 at CDM Yard. Prep samples for courier. Unloads gear.

1730 Meet courier and relinquish samples. To store for silicone tubing, gloves, tape.

End of Day

3/26/08

3/27/2008

SMR - Tudor 2

Transect Sampling

CDM - Thomas Lo, Jon Bush

Weather - overcast, cool.

0515 - Lo and Bush arrive at Las Pulgas gate.

0530 - at CDM yard to get samples.

0600 - at SZ, waiting for Weston crew

0605 - Weston arrives. Transfer bottles and instructions

0630 Weston in water.

0805 - First samples from Weston transect 7-12 low tide. Begin bottling

0910 - Transect 1-6 low tide Begin bottling

1010 - Pack coolers for courier

3/27/08

3/27/2008 cont.

1305 Transect 12-1 high tide at truck. Begin bottling.

1420 Transect 1-6 high tide at truck. Begin bottling.

1515 Prepare samples for courier.

1530 Leave transect site to meet courier. Thomas leaves site for day.

1630 at yard w/ supplies. Transfer to storage.

End of Day

3/27/08

3/31/2008

SMR Tides 2 Day 4

CDM - J. Bush, R. Cholas

Weather - cloudy, cool

0800 - at CDM yard. Loading supplies. Organizing truck.

0830 - Out the at Santa Mesa Preserve.

0840 Program S2 Tow for low tide sample.

3/31/08 Sample times

SM-I2D4-	S1L-1		0930
"	"	S2L-2	0945
"	"	(OIL) S3L-1	1020
"	"	ME - MS/MSD	1145
"	"	S1H-1	1500
"	"	S1H-2	1510
"	"	S2H-1	1425
"	"	O1H-1	1545

0910 at S1 to collect original composite sample. Regular dirt access road off of

3/31/08

3/31/2008 wnt

wnt - Stuart Mesa Rd closed due to Haz waste cleanup. Take Stuart Mesa to access Hq. by recruit depot

1000 - at Ocean Outlet for manual composite sample

1010 - Calibrate Horiba. Replaced unit from last week due to afternoon malfunctions

Calibration

T°	Con	Tur	DO	pH
15	4.48	0.2	9.87	4

Ocean Outlet Readings

T°	Con	Tur	DO	pH
16.2	36	75	9.3	7.9

3/31/08

3/31/08 wnt

1100 - at S2 to collect low tide sample

1125 - at NE site. Collect NS/NSD

1355 - Storm Drain sample collected SM-IRSD-1

1415 - to CDM yard for supplies.

1435 - at S1 to collect manual composite high tide sample and duplicate

1540 - at Ocean inlet for manual composite high tide sample.

Calibrate Horiba

T°	Con	Tur	DO	pH

Calibrated in morning

3/31/08

3/31/08 cont.

Water Quality readings

T°	Cond	Tur	DO	pH
17.9	47.4	40	9.81	8.0

1635 - at S2 to collect high tide sample.

1700 - at cond yard. Prep samples for lab. Replenish supplies.

1810. Meet courier to relinquish samples.

END of Day

3/3/2008

4/1/2008

SMR Index 2 Day 5
Camp Pendleton Ca.
J Bush R. Chojas

0730 - at cond yard. Prep truck for day

0900 - at S2. Program Iso for low tide sample.

Day 5 Sample Series

SM.	J2D5	- S1L-1		0945
"	"	- S2L-1		0930
"	"	- O1L-1		0940
"	"	- ME-	MS/MSD	1330
"	"	- S1H-1		1635
"	"	- S1H-2		1640
"	"	- S2H-1		1600
"	"	- O1H-1		1545

0815 - at S1. Program Iso to collect 0945 sample.

4/1/2008

4/1/2008 cont.

0830 - To gas station to fuel field vehicle.

0915 - at Ocean inlet to collect manual composite. Note: S1 had sufficient flowing water to collect w/ Isco as automated composite. Calibrate Horiba U-22

T°	Con	Tm	DO	pH
9.2	4.53	3.2	11.7	3.9

Water Quality Readings

T°	Con	Tm	DO	pH
14.5	42.7	83	10.66	7.3

1012 - at S1 to collect low tide sample

1030 - at S2 to collect low tide sample

4/1/08

4/1/2008 cont.

1050 - Meet David Vile at LDN yard for Rapidgate Process.

1330 - at NE Site to collect MS/MSD sample

1330 - Downloads NE Smoke data.

1430 - To Environmental Management to exchange radio.

1500 - at ocean inlet to collect High tide sample

T°	Con	Tm	DO	pH
17.1	42.6	198	9.12	7.8

1630 - at S1 to collect normal and duplicate high sample

1715 - at S2 to collect high tide sample

1730 - at yard, Prep samples.

4/1/08

4/01/2008 cont.

1800 - meet courier. Relinquish samples.

END of Day

4/1/08

COOL-005

4/02/08 - PARTLY CLOUDY

0700 - at Las Pulgas gate. WAITING TO GET ENTRY INTO BASE

0730 - MEET CREW

CDM - JOE BUSH (JB)
ROSHAN CHOLAS (RC)
TONY EVANS (TE)

0745 - Load vehicle. JB WAITS FOR SURVEYORS (RC) and (TE) GET ICE & MOBE to 1st SAMPLING LOCATION - ME-SITE (under BRIDGE)

DAY 6	SAMPLE TIMES
SM-12D6-ME-1	0845
SM-12D6-S1L-1	1015
SM-12D6-01L-1	1115
SM-12D6-S2L-1	1045
SM-12D6-S1H-1	1530
SM-12D6-S2H-1	1615
SM-12D6-01H-1	1630

0900 - secure ME-1 site. MOBE TO S2-H TO PROGRAM. 0920 ARRIVE ON SITE. MOBE TO S1-L LOCATION ARRIVE ON S1 SITE (0955) ~~MAKE~~ WHETHER ISCO WILL PRODUCE WATER. YES! TE. ~~SAED~~

RATS!!

FROM VENTURING INTO WATER W/ OVERSHOED WADERS. FLOW AT S1-L SITE V. LOW. WILL COLLECT 2-L FROM RIVER (1030) FINISH S1-L. MOVE TO OCEAN SITE.
(1050) ARRIVE AT OCEAN SITE. PREPARE TO COLLECT WATER FOR SAMPLE.
(1100) Calibrate instruments (HORIBA)

WATER QUALITY TABLE - CALIBRATION

T	Con	Tur.	D.O	pH
13.6	4.55	3.5	10.47	4.0

WATER QUALITY - Ocean Readings

T	Con	Tur	D.O	pH
15.8	~~240~~ RC 51.3	28.4	8.30	7.0

(1140) Leave Ocean Site. MOVE TO S2-L1 SITE
(1200) ARRIVE ON SITE PREPARE TO COLLECT SAMPLE.
(1210) SAMPLE SITE.
1330 - TG leaves for office.
SB takes log book.
AA ME Site to switch J. Sig back to pollutograph set up. 4/2/08

4-2-08 cont.

1458 - arrive at S1, to bottle high tide sample.
1605 - at Ocean inlet to collect manual composite sample for high tide.

Water Quality

T°	Con	Tur	DO	pH
17.7	43.6	73.7	10.24	7.8

1710 - at S2 to collect high tide sample.
1750 - at CDM yard. Stage gear. Prep samples for lab.
1745 - meet carrier. Relinquish samples. Take RC to POV.
1800 - End of day.

Date : 4/10/08
Weather: Sunny ~ 70° F
Author : ~~Author~~ as 4/10/08 Andy Greenel (CDM)
Team : Jake Dunk (CDM)
Project : Santa Margarita
Equipment: Camera

0830 Jake and I are onsite at CDM field office.
0910 Packed up truck and going to get a radio
0945 Met with Brian Stein (Base Environmental) he will accompany us to the ocean inlet to take pictures.
1010 Photos taken of beach inlet 120-2062 thru 120-2067.
1035 Dropped Brain off heading to Mass Emissions site.
1045 At Mass Emissions can't get handheld unit to turn on.
1100 Called Jon Bush to see if he knew what was wrong with handheld unit, still doesn't work.
1105 Going to lunch.
1125 Back from lunch, at

Andy G 4/10/08

4/10/08

1125 security building to set-up a Rapid Gate ID for Jake.
1210 Arrived at Site 2 and downloaded data and calibrated probe.
1340 Finished calibrations and rebuilt DO sensors. Replaced batteries in the YSI and began a new test.
1355 Arrived at Site 1.
1445 Finished rebuilding DO sensor and calibrating YSI. Data was downloaded from the probe and a new test begun.
1500 Back at CDM field office. We plugged the handheld computer into the truck with a convertor and it is working.
1535 At mass emission site. Downloaded data.
1555 Unable to calibrate Troll heading back to field office
1630 Finished ~~to~~ as 4/10/08 unloading rental truck. Jake and Andy offsite

Andy G 4/10/08

Date 4/18/08
Location Camp Pendleton
Team Jake Dunk (CDM)
Author Andy Greaze/ (CDM)
Project Santa Margarieta
Weather Sunny ~ 80°F
Equipment Camera

1125 Jake and Andy at los Pogas gate heading to Environmental Security to pick-up radio
1235 Got radio heading to mass emissions site.
1345 Downloaded data, ~~and~~ calibrated probe and set-up new test. ag 4/18/08
1357 Arrived at site 2.
1440 We updated the probe for day light savings, recalibrated and began a new test
1449 Arrived at site 1.
1530 We updated the probe for day light savings, recalibrated ~~and~~ ag 4/18/07 and begun a new test.
1555 Fueled up truck, Jake and Andy offsite

Andy G 4/18/08

Date: 4/24/08
Location: Camp Pendleton
Team: Jake Dunk (CDM)
Author: Andy Grenzel (CDM)
Project: Santa Margarieta
Weather: Sunny ~ 75°F
Equipment: Camera

1305 Jake and Andy onsite and heading to Site 1.
1400 Downloaded data from Site 1 and calibrated probe. There was a crab living in the ~~probe~~ ag 4/24/08 probe.
1415 Arrived at Site 2.
1445 Downloaded data, rebuilt DO probe because the membrane was missing. We calibrated the probe.
1500 Grabed a new radio from Base environmental.
1505 Arrived at mass emissions site
1530 Downloaded data and calibrated probe. Began new test.

Andy G 4/24/08

4/24/08

1530 A new test was begun for the site 1 and 2 probes after calibration was completed.

1550 Jake and Andy offsite

4/24/08

4/24/08

Date 5/1/08
Location Santa Margarita River, Camp Pendleton
Author Andy Gruenzel (CDM)
Team Jon Bush (CDM)
Project Santa Margarita River
Weather ~60°F Sunny
Equipment Camera

0650 Andy and Jon onsite at storage unit. We dropped off old coolers.

0715 Grabed site water.

0730 At mass emissions.

0815 We calibrated probes, downloaded old data and begun a new test, at Mass Emissions.

0915 Finished downloading data, begun a new test and calibrated probe. We grabbed the ISCO at here (site 2) and mass emissions site.

1000 Finished downloading data, calibrating probe and setup a new test at Site 1. We pick-uped the ISCO.

1030 Pictures taken at Blue Beach

1030 of Santa Margarita estuary.
1050 Offsite

5/8/08

5/8/08

Date: 5/8/08
Location: ~~S Pa~~ 5/8/08 Camp Pendleton
Author: Andy Grenzel (CDM)
Team: Jon Bush (CDM)
Project: Santa Margarita
Weather: Cloudy ~60°F
Equipment: Camera, Horiba U22
07:50 Andy onsite, Jon already at storage trailer.
08:30 At Blue Beach taking pictures of ocean inlet.
08:50 Returned radio and grabbed a new one.
09:10 At Mass Emissions.
10:00 Downloaded data and calibrated Troll and Horiba. We are taking measurements with Horiba.
pH 7.12
Conductivity 1.40 µS/cm
Turbidity 11.3 NTUs
Dissolved O_2 11.34 ~~mg~~ g/L 5/8/08
Temp 18.22 °C.
10:10 Begun new test.
10:32 Arrived at Site 2.

10:35 - Weeks file from 5-1-08 to 5-08-08 erased. Try to retrieve with no success
Calibrate sonde
11:00 Horiba readings - SZ

T°	Con	Turb	DO	pH
18.51	6.33	3.5	10.07	7.24

11:20 at Section 1 (IC)
Calibrate and downloads.
11:55 Horiba readings

T°	Con	Tur	DO	pH
18.77	28.4	19	14.09	7.34

1200 Began new test at site 1
1220 offsite

5/4/08

5/5/08

5/15/2008

SMR Sonde Maintenance
Camp Pendleton, CA
CDM - A. Greazel, J. Bush
Weather - Sunny, mild.

0730 - Greazel and Bush arrive at CDM yard.
0800 - at Blue Beach to photograph inlet.
0845 - at NE site to download data and perform sonde maintenance.
Horiba batteries dead for 2nd time. Replaced last week. May be problem.
0930 - To store for batteries and supplies
1010 - at NE site
Calibrate Horiba

5/15/08

5/15/08 cont.

1015 Water Qual Readings
Bridge U-22

T°	Con	Tur	DO	pH
20.28	1.42	0	10.35	7.17

Con = mS/cm units from meter

1030 at S2 to collect data and perform sonde maintenance.

1100 Water Quality Readings

T°	Con	Tur	DO	pH
20.88	3.02	0	8.87	7.44

1132 at S1 to collect data and perform sonde maintenance.

1140 Water Quality Readings

T°	Con	Tur	DO	pH
23.62	30.1	41.6	14.01	7.60

5/15/08

05/15/08 cont.

1225 at con yard,
A. Crazel to office.
J. Buch to environmental security office to meet w/ Biologist.
END of field day.

5/15/08

5/23/2008 SMR

Sonde Maintenance
Camp Pendleton

CDM - Bob Hunt (BH), Jim Buck (JB)

Weather - overcast, cool.

0845 - BH and JB meet by main gate.

0900 - Leave CDM storage

0915 - at ME Site & download and Calibrate sonde

1920 Calibrate Hach 2100 P

pH	T°	Con	Tur	DO
3.98	15.7	4.56	Ø	10.17

Water Quality Readings

pH	T°	Con	Tur	DO
6.04	16.04	1.01	699	7.33

5/23/08 JB

5/23/08 cont.

0930 - River at highest level since beginning of project

1030 - Could not calibrate DO
Error message 8015 (50187)
"cant communicate w/ sonde"
AND message saying Barometric Pressure unusually low.
Calibrated all other sensors and started new test.

1100 - at SZ sonde & download and do sonde maintenance
Water Quality Readings

pH	T°	Con	Tur	DO
7.02	20.4	~~33.9~~ 24.1	406	7.74

1140 - Cannot connect to SZ sonde.

5/23/08 JB

5/23/08 cont.

1140 - cont.
Called Pine Tech support changed all baudrates, detached and reattached cables.
Pine says probable cable issue.
Will request replacements ASAP.

1210 at S1 sonde for downloads and maintenance.
Water Quality Reading @

T	pH	Con	Tur	DO
15.67	7.98	35.5	21	11.63

Could not get close to sonde location due to high water level (100+ feet away).
Will not calibrate S1 sonde due to high water level. Cannot safely retrieve sonde.
Data retrieved through 5/23/08

5/23/08

5/23/08 cont

1300 - at inlet to take photos

1315 - BH and JB at CCM yard.
End of Field Day.

5/28/08

SMR, Camp Pendleton

CDM - Andy Brazil (AG)
Jon Bush (JB)

weather - clear, warm
Activity - Sonde replacement

1245 - arrive at NE site to collect data. Test ended due to error on 5/23/08. Replacing Insitu Troll 9000 with YSI 6920.

NE Calibrate Horiba U-22

1255 -	T°	pH	Con	Tur	DO
NE -	23.76	7.34	1.33	1.3	8.40

1330 - YSI 6920 installed and operation verified.

1355 - at S1 to download data and display replacement YSI sonde.

1410	T°	pH	Con	Tur	DO
S1 -	22.58	7.97	2.62	66.9	12.52

5/28/08

1430 - at S2 to collect data and display replacement YSI Sonde.

S2	T°	pH	Con	Tur	DO
	22.32	7.99	2.0	5.8	13.47

1525 - at Ocean inlet to take photos.

1545 - at S1. verify sonde is collecting data.

1600 - at S2. SONDE is not collecting data. Troubleshoot. Sonde will collect data when meter is connected. Change Batteries and resume test. Sonde still won't log samples unattended. Tech support closed.

1645 end of field day.

5/28/08

5/29/08

SMR, Camp Pendleton
CDM - J. Bush (JB)
Weather - warm, clear
Activity - Sonde troubleshoot

0800 - JB arrives at SC.
Sonde not collecting data.

0820 - To hardware store for batteries, wire ties.

0900 - Install 3rd set of batteries in sonde (NEW, assumed good).
Sonde will not run unattended.
Call Pine Tech support.
Check programming. Tech instructs me to install batteries in reverse polarity from markings. Believe terminals might have been reversed during maintenance at Pine.

5/29/08

5/29/08 cont.

1000 - Call back William at Pine to inform him that sonde still not operating. Clean exposed terminals at his instruction. Not working.

1040 - Call customer service (Pine) arrange for replacement sonde to be delivered by 10:30 am tomorrow 5/30/08

1100 - JB to SD office

5/29/08

05/30/2008

SMR Sonde Replacement
Camp Pendleton, CA
CDM: Andy Weasel (AG)
Jon Bush (JB)
Weather: warm, blue sky
1345 - arrive CDM yard
stage supplies
1400 - arrive S2 to replace
YSI sonde from yesterday
1435 - Sonde in verified
data collector
1450 - at S1, to doublecheck
operation.
operation normal
1500 - AG to CDM office
JB to ME site to
check sonde operation
1515 - ME sonde operation normal
End of field day

5/30/08

06/05/2008

SMR Sonde Maintenance
Camp Pendleton, CA.
CDM - Andy Weasel (AG)
Jon Bush (JB)
0730 - arrive at storage area,
CDM yard, Camp Pendleton.
0815 - at ME site & download
data and calibrate
sonde
0830 - calibrate Horiba U-22 to
standards
Water Quality Reading - ME

To	pH	Cond	Tm	DO
19.93	6.83	1.38	6.6	9.07

0850 - to Salvation Mesa exchange
for Batteries (Horiba)
0905 - at S1 to download
and sonde maintenance

6/5/08

6/5/08 cont.

S1 Water Quality Readings

	T°	pH	Con	Tur	DO
0915	20.70	6.81	48.2	147	8.33

0940 at S2 to download data and perform sonde maintenance

S2 Water Quality Data

	T°	pH	Con	Tur	DO
0959	~~18.22~~	~~7.22~~	~~0.028~~	155	~~10.79~~

error - cover left on probe

	T°	pH	Con	Tur	DO
1000	20.52	7.36	24.6	18.7	6.75

1030 - at inlet for photos

1045 - at CDM yard

END of field Day

6/13/2008

SMR Sonde Maintenance
Camp Pendleton, CA.

CDM - Andy Greenal (AG)
Jon Bush (JB)

weather - warm, clear.

0730 - at CDM yard

0805 - at ME site, download data, calibrate sonde, Calibrate Horiba U-22

0835 - Water Quality Data

T°	pH	Con	Tur	DO
19.07	7.08	1.30	Ø	9.12

0850 - Get Batteries at Base exchange

0905 - at S1. download and sonde maintenance.

6/13/08

6/13/08 cont.

S1

0925 Water Quality Data

T°	pH	Con	Tm	DO
22.84	7.15	55.9	50.8	6.77

0940 at S2, download and small maintenance.

0952 Water Quality Data

T°	pH	Con	Tm	DO
~~23.67~~	~~7.30~~	~~20.2~~	~~41.7~~	9.53

Cover on Recd (41.4)

0955

T°	pH	Con	Tm	DO
25.03	7.21	33.2	16.6	4.63

1015 at Ocean Inlet for photos.

1030 at CDM yard

Leave Camp Pendleton.

6/13/08

6/20/2008

SMR Small Maintenance

Camp Pendleton CA.

CDM: Andy Grand (AG), Jon Bush (JB)

Weather: Warm, clear

0730 - at CDM yard.

0805 - at ME site to download data and calibrate sonde.

Calibrate Hourly 4-22.

0830 ME Water Quality Readings

T°	pH	Con	Tm	DO
20.20	6.86	1.29	Ø	7.75

0850 at S1, download data and calibrate sonde

0915 S1 Water Quality Readings

T°	pH	Con	Tm	DO
23.56	7.05	49.0	60.2	6.16

0930 at S2, download data and perform small maintenance.

6/20/08

6/20/08 cont.

0945 SC Water Quality Data

T°	pH	Cn	Tur	DO
25.31	7.35	41.8	28.5	6.80

Cage surrounding sensors completely full of mud. Check turbidity readings.

1030 at CDM yard. leave site for day.

6/20/08

6/27/2008.

Sonde Maintenance
SMR - Camp Fundleton
CDM - Dave Lange (DL)
Jon Bish (JB)

Weather cool, clear

0930 - meet at CDM yard after getting supplies.

1010 - at ME site to clean boxes darter and maintain sondes
Calibrate Ionics U-22

1000 - Water Quality Data ME

T°	pH	Cn	Tur	DO
25.54	7.19	1.47	1.7	8.07

changed batteries on YSI 6920

1120 - at S4 (S1) clean boxes and perform sonde maintenance

6/27/08

6/27/2008 cont.

1150 - Water quality Data S1

T°	pH	Cn	Tu	DO
25.53	8.03	50.7	6.7	19.99 (errors)

Changed batteries in YSI 6920 sonde.

1205 - at S2, downstream and upstream sense
Change batteries in YSI 6920.

1235 Water Quality Data S2

T°	pH	Cn	Tu	DO
27.35	7.87	37.3	27.5	13.49

1300 at ocean inlet for photos

1330 at CDM yard
end of field day

6/27/08

7/3/2008

SMR Sonde Maintenance
Camp Pendleton, CA.
CDM - Bob Hunt, Jim Bush
weather - warm, overcast.

0930 - meet at CDM yard
1000 at NE Site, downloads data, calibrate sonde
Calibrate Horiba U-22

Cal -

T°	pH	Cn	Tu	DO
21.12	4.00	4.51	Ø	8.86

NE Water Quality Data

1020 -

T°	pH	Cn	Tu	DO
25.67	6.93	1.49	21.4	8.47

Water level very low.

1045 - at S1, downloads, sonde maintenance.

7/3/08

7/3/08 cont.

1120 - S1 Water Quality Data

T°	pH	Cn	Tm	DO
~~24.78~~ 22.2	7.4	56.8	142	5.69

- Orange cable reel for S1 YSI Data cable stolen since last week
- No pressure sensor on S1 sonde. No pressure/depth measurements possible

1130 - at S2, downloads, maintain sonde.

1205 S1 Water Quality Data

T°	pH	Cn	Tm	DO
24.15	7.16	4.95	3	3.37

- No pressure sensor on S2 YSI. No depth measurements possible.

1215 - photos at inlet.

7/3/08

7/11/2008

SMR Sonde Maintenance
Camp Pendleton, CA

CDM - Bob Hunt, Jon Bush
Weather - warm, clear

0915 - meet at CDM yard.
0940 - at ME site for downloads and maintenance
Calibrate Horiba

T°	pH	Cn	Tm	DO
22.68	4.01	4.49	0.2	8.54

Water Quality Data ME

1010 -

T°	pH	Cn	Tm	DO
24.97	6.93	1.44	0.8	8.28

1035 at S1 for downloads and maintenance

07/11/08

07/11/08 cont.

1105 Water Quality Data (S1)

T°	pH	Con	Tur	DO
25.3	4.01	45.2	12.8	9.41

1120 - at S2 for download and maintenance

1135 - S2 Water Quality Data

T°	pH	Con	Tur	DO
25.75	7.19	33.3	43.5	10.11

Change DO membrane

1225 - at Inlet for photo

1245 - B. Hemt leaves for day
J. Bush inventories storage.

Partial boxes of trash bags, Caplates
~68 0.5L Poly bottles
1+ sets of ISCO bottles
New bag of ISCO pus liners
-1 roll paper towels
48 1L Amber
300 scintillation vial
50 1L Poly bottles

7/11/08

7/17/2008

Sonde Maintenance - SMR

con: A. Graegel, J. Bush

weather - cool, overcast

1500 - arrive at CDM yard
stage gear.

1515 - at S2 to download data and maintain sonde.
Calibrate Hydrolab U-22

S1 Water Quality Data

	T°	pH	Con	Tur	DO
1515	27.49	7.12	54.2	165	18.62

1355 - JB (?) error

1610 - at S2 for download and maintenance.

S2 Water Quality Data

	T°	pH	Con	Tur	DO
1630	31.06	4.54	44.1	1.1	17.26

7/17/08

7/17/08 cont.

1655 - at NE site for downloads and maintenance
Water flow at NE site is very low. (<5% normal flow.)
NE Water Quality Data

1715 - T°	pH	Con	Tur	DO
27.17	7.03	0.973	Ø	7.63

Deployed all 7 sed samplers.

1745 at CDM yard. Stage gear
End of field day

7/17/08

7/18/2008

SMR Channel Survey Camp Pendleton
CDM - Jon Bush
O'Day Consultants - Ray, Pat
1100 - meet at Del Mar Area Campground/Beach
1110 - at SMR Outlet for survey.
1150 - leave Beach. O'Day consultants leaves.
End of Field day

7/18/08

7/21/2008

SMR Index 3

Day 1

Com. Andy Wood (AW), Jon Bush (JB)

Weather: warm, clear

0700 arrive at storage area stage gear / load truck

0745 at S2, deploy new tubing, program iso for 10:30 am (flood tide) sample

0815 at S1, deploy new tubing, programs iso for 1045.

0900 at ME site & program iso for 1100 am sample

0945 at store for ice

1000 at Ocean Cutter for sample collection. Collect samples at 1005, 1020, 1035.

1020 SM-13D1-01H-1 collected.

7/21/08

7/21/08 cont.

Calibrate Horiba U-22

Solution readings

T°	pH	Con	Tur	DO
X	4.00	4.49	Ø	Y

Calibration Readings

T°	pH	Con	Tur	DO
21.41	3.99	4.58	Ø	8.09

1025 Ocean Cutter Water Quality

T°	pH	Con	Tur	DO
20.68	6.93	62.3	Ø	9.22

1105 - at S2 to collect sample SM-13D1-S2H-1

Day 1 Sample Times

SM-13D1-01H-1	1020
" " -S2H-1	1045
" " -S1H-1	1100
" " -S1H-2	1105
" " -ME-1	1110
" " -01L-1	1355
" " -S2L-1	1430
" " -S1L-1	1445

7/21/08 cont.

1120 - Program ISCO for 1430 sample.

1130 - at S1 to collect bottle samples SM-I3D1-S1H-1 and SM-I3D1-S1H-2

1200 - Program S1 ISCO for 1445 sample time

1330 at ME site to bottle sample SM-I3D1-ME-1. Very little water collected. Stream was flowing in AM but stopped flowing during sample collection. Now water in stream channel stops approx. 50' upstream from sonde / collection point. Only 6 scintillation vials collected due to lack of water

1400 at S2 to bottle sample SM-I3D1-S2L-1

07/21/08

07/21/08 cont.

1500 at S1 to bottle sample SM-I3D1-S1L-1

1536 at inlet to collect sample SM-I3D1-D1L-1

Horiba Water Quality Data

T°	pH	Con	Tur	DO
24.58	7.41	61.2	20	9.12

1555 collect sample SM-I3D1-D1L-1

Horiba U-22 RPD Check

RPD	T°	pH	Con	Tur	DO
1	23.41	7.14	61.7	0	8.73
2	23.37	7.20	61.7	0	8.47
3	23.32	7.23	61.7	0	8.41

1630 at CDM yard. Stage sem. key samples.

1730 Meet worker. Bowl of yield clay

7/21/08

7/22/2008

SMR Index 3
Day 2

CDM - Andy Creesel, Jim Bush
Weather - clear, mild

0830 arrive at CDM yard
load supplies, get
gas for truck.

0930 at ME site. No flow.
Dry streambed.
No samples collected.

0945 at S2, program iso
for 1045 sample

1000 at S1, program iso for
1100 sample.

Day 2 Sample Times

SM-	I3D2-	01H-1	1050
"	"	S1H-1	1100
"	"	S2H-1	1045
"	"	S1H-2	1105
"	"	01A0L-1	1615
"	"	S1L-1	1630
"	"	S2L-1	1640

7/22/08 cont.

1030 at Ocean Inlet
to collect sample
SM-I3D2-01H-1
Calibrate Horiba U-22
Calibration readings

T°	pH	Con	Tur	DO
21.49	3.99	4.27	Ø	8.89

Water Quality Data

	T°	pH	Con	Tur	DO
1115	20.97	7.02	47.9	11.9	9.04

RPD check on U-22

	T	pH	Con	Tur	DO
1-	20.46	5.10	47.4	Ø	8.58
2-	21.07	5.46	47.5	Ø	8.48
3	21.1	5.65	47.2	Ø	8.47

Called Pine Environmental at
1100 to request replacement U-22.
Ohms has a battery issue.

7/22/08

07/22/08 cont

1130 - at S1 to bottle sample SM-I3D2-S1H-1 and SM-I3D2-S1H-2

1210 - at S2 to bottle sample SM-I3D2-S2H-1

1500 - at storage area to organize and restock truck.

1548 - at Ocean inlet to collect sample SM-I3D2-O1L-1

Ocean Water Quality Data

	T°	pH	Cn	Tm	DO
1605	21.92	7.31	48.3	10	9.42

1650 - at S1 to bottle sample SM-I3D2-S1L-1

1702 - at S2 to collect sample SM-I3D2-S2L-1

1720 - at CDM yard. prep samples unload.

End of field Day

7/22/08

7/23/08

SMR Tuday 3

Day 3

CDM - Andy Breazel, Jon Bush

Weather - warm, clear

0830 - arrive at CDM yard. Load supplies. Prep for day

0850 - to exchange for ice, water.

0900 - at S1. Program Tsco for 10:15 sample.

0925 - at S2, Program Tsco for 10:30 sample

Call Crystal Roberts (Weston) to locate Tommy Woods. to Arr meeting time for transect sampling established.

0950 at NE Site to check stream flow. No Flow.

1020 at ocean inlet to collect sample SM-I3D3-O1H-1

Calibrate Horiba U-22

07/23/08

07/23/08 cont.

1020 cont. Calibration readings

T°	pH	Cn	Tu	DO
22.22	3.94	4.78	Ø	8.10

RPD

	T°	pH	Cn	Tu	DO
1	22.37	6.032	47.7	Ø	7.87
2	22.44	6.027	47.8	Ø	7.82
3	22.37	6.047	47.9	Ø	7.80

1055 Water Quality Data

T°	pH	Cn	Tu	DO
22.12	7.08	48.3	Ø	8.39

Day 3 Sample Times

SM-I3D3-S1H-1		1015
" "	S1H-2	1020
" "	S2H-1	1030
" "	O1H-1	1045
" "	S1L-1	1615
" "	S2L-1	1630
" "	O1L-1	1610

07/23/08

7/23/08 cont

1180 - at S1 to bottle sample
SM-I3D3-S1H-1 and
SM-I3D3-S1H-2

1205 - at S2 to bottle sample
SM-I3D3-S2H-1

1300 at S2. Calibrate sonde, download data.

1430 S2 Water Quality

T°	pH	Cn	Tu	DO
29.22	7.6	41.2	Ø	14.0

Changed DO membrane
Battery life reads 12.0V
105 Days.

1520 at Storm drain site. Dry.
Access very difficult due to vegetation overgrowth

1530 at S1 to download data and calibrate sonde.

Water Quality Data

T°	pH	Cn	Tu	DO
24.73	7.28	42.2	200	9.95

07/23/08

1600 at ocean inlet to select sample
SM-13D3-01L-1

Water Quality Data

	T°	pH	Con	Tur	DO
1605	23.2	7.34	48.1	Ø	8.80

1645 at S1 to bottle sample SM-I3D3-S1L-1

1705 at S2 to bottle sample SM 13D3-S2L-1

1730 Bush meets course. Crew leaves site for day.

1745 Bush unloads supplies/bottles at CDM yard. To store for tape, packing materials.

1930 end of field day.

7/24/08

Transect Sampling
SMR Lagoon

0545 - CDM - J. Bush
J. Dunk
Weston: Tommie Woods
Garth

Weather: cool, overcast

0545 - Bush arrives and loads supplies for day.

0600 - Meet Weston (Tommie and Garth) at Stuart Mesa Budget. Exchange Bottles and instructions. Dunk at store for ice and supplies.

1010 - Lost samples, 6 through 12 at truck. Begin labeling filters/Bottling

1135 Transect 1 through 5 delivered to dunk.

7/24/08

7/24/08 cont.

1330 Flood tide samples bottled

lunch.

1630 Ebb tide samples 6-12 at dock

1720 Samples 1-5 at dock. Weston leaves site.

Prep samples for lab.

1840 Bush meets CRC courier. Bush leaves site.

END of field day.

07/24/08

07/28/08

SMR Tyvek 3

Day 4

CDM - Andy Weagel, Jon Bush

Weather - cool, overcast.

0830 - meet at CDM yard. organize gear / load truck.

0915 - at Section 1 to program Isco for 10:30 sample

~~1000 - at 7B~~

0930 - at Section 2 to program Isco for 10:45 sample.

1000 - at NE Site. Water is flowing again. Set Isco for 11:00 am sample.

1145 - at exchange for ice.

1155 - at Ocean inlet to collect sample SM-J3D4-012-J

7/28/08

7/28/08 cont.

1110 Calibrate Hanna U-22

T°	pH	Cond	Tur	DO
~~37.8~~ 23.27	3.8	4.41	0.2	8.92

RPD

	T°	pH	Cond	Tur	DO
1	22.37	7.51	67.4	4	9.02*
2	22.66	7.63	67.4	3.6	9.06
3	22.75	7.72	67.3	3.3	9.07

1122 Water Quality Data

T°	pH	Cond	Tur	DO
22.16	8.05	68.0	23	9.79

1150 - at S1 to bottle sample SM-I3D4-S1L-1

1210 - at S2 to bottle sample SM-I3D4-S2L-1

1240 - at ME site to bottle sample. SM-I3D4-ME-1

7/28/08

7/28/08 cont.

Day 4 Sample Times

SM-I3D4-	DIL-1	—	~~1100~~ 1105
" "	S1L-1	—	1030
" "	S2L-1	—	1045
" "	ME-1	—	1100
" "	OIH-1	—	1545
" "	S1H-1	—	1455
" "	S2H-1	—	1510
" "	FB-1	—	1445

1430 - at Provost Marshall's office to report theft/vandalism of S1 sonde/data cable. Sonde damaged, Cable missing.

1500 - Process will take 2-3 hours. Will return when there is more time. Still have 4 samples to collect today.

1530 - at Queen Anne's to collect sample SM-I3D4-OIH-1

7/28/08

07/28/08 cont

1540 - Ocean Inlet water Quality

T°	pH	Cond	Tur	DO
22.81	8.02	67.8	1.72	10.69

1620 - at S1 & bottle sample
SM-I3D4-S1H-1

1645 - at S2 & bottle sample
SM-I3D4-S2H-1

1700 - at CDM yard
unloaded. Prep samples
for kba

1730 Andy Greazel leaves site
for Bush & meet courier

1750 Bush & Provost Marshals
office & report theft of
data cable.

1955 End of field Day

07/28/08

07/29/2008

SMR Index 3

Day 5

CDM - Greazel, Bush
Weather - cool, overcast.

0800 - arrive at CDM yard
load truck. prep for day.

0900 - at NE site. Program Iso
for 11:15 sample.

0920 - at S2. Program iso for
10:45 sample

Day 5 Sample Times

SM-I3D5	-	D1L-1	—	1015
" "	-	S1L-1	—	1030
" "	-	S1L-2	—	1035
" "	-	S2L-MS/MSD	—	1045
" "	-	D1H-1	—	1545
" "	-	S1H-1	—	1600
" "	-	S2H-1	—	1615
" "	-	FB-1	—	1430
" "	-	NE-1	—	1115

7/29/08 cont.

0945 Take pictures at illicit drainage under I-5 bridge. Volume/Flow estimated at ≈ 1 gpm.

0955 at ocean inlet to collect sample SM-I3D5-OIL-1

Calibrate Horiba U-22

T°	pH	Cm	Tm	DO
20.98	3.99	4.46	Ø	4.26

RPD

	T°	pH	Cm	Tm	DO
1	21.75	8.11	55.4	Ø	8.43
2	21.74	8.11	55.4	Ø	8.43
3	21.73	8.12	55.4	Ø	8.41

1025 Water Quality Data - Ocean

T°	pH	Cm	Tm	DO
22.17	8.18	55.2	82	8.96

1050 at S1 to bottle samples
SM-I3D5-S1L-1
SM-I3D5-S1L-2
Set ISCO for 1400 1st hr tide sample

7/29/08

7/29/08 cont.

1130 - at S2 to collect sample SM-I3D5-S2L-M3MSD

1200 - at NE site to bottle SM-I3D5-NE-1

1230 - Calibrate and download data from NE sonde. DO will not calibrate and DO sensor defaulted. No DO calibration. Leave sonde running w/ other sensors calibrated. Return to take short interim the week.

1300 - No flow at storm drain on in River by storm drain location.

1405 - at S1. Make labels for S1H, S2H, and FB

1455 - calibrate and redeploy sonde after vandalism. Calibrated correctly

7/29/08

7/29/08 mt.

1527 at ocean inlet to collect sample
SM-I3D5-01H-1

1532 Water Quality Data

T°	pH	Con	Tu	DO
23.10	8.35	55.5	30	9.18

1620 - at S1 to bottle sample
SM-I3D5-S1H-1

1645 - at S2 to bottle sample
SM-I3D5-S2H-1

1715 - at CDM yard.
Unload truck, Prep samples for lab.
Grazel leaves site.

1730 Bush meets courier
End of field day.

7/29/08

7/30/2008

SMR Trucks 3
Day 6

CDM - Grazel, Bush
weather: overcast, cool

0800 - arrive at CDM yard
Usual gear

0840 - at ME site. Program Tsio for 11:30 sample.

0910 - at S1. program Tsio for 11:15 sample.

Day 6 Sample Times

SM-	I3D6-	ME-MSMSD-		1130
"	"	-01L-	1	-1125
		-S1L-	1	-~~1115~~ 1125
		-S2L-	1	-1120
		-01H-	1	-1605
		-S1H-	1	-1615
		-S2H-	1	-1630
		-FB-	1	-1500

07/30/08

1026 07/30/08 cont.

0935 at S2 to program Isco for 1120 sample time. Calibrate and clean S2 sondes.

1015 to Ocean inlet(s) for photos. To exchange for ice.

1110 at Ocean inlet (N) to collect sample SM-13D6-O1L-1

Calibrate Hydrolab

T°	pH	Con	Tur	DO
22.49	3.99	4.47	1.7	8.77

RPD

	T°	pH	Con	Tur	DO
1	22.39	7.87	48.3	Ø	8.42
2	22.45	7.92	48.4	Ø	8.43
3	22.46	7.95	48.4	Ø	8.42

1131 Water Quality Data (Ocean)

T°	pH	Con	Tur	DO
21.90	8.22	48.6	3.43	9.08

07/30/08

7/30/08 cont.

1200 - at S1 to bottle sample SM-13D6-S1L-1

Water Quality Data

T°	pH	Con	Tur	DO
24.91	8.68	45.4	Ø	13.97

1215 - Isco is inoperable. Error: Pump Jammed! Could not fix.

1225 - Collect manual grab sample SM-13D6-S2L-1

1245 - at S2 to bottle sample SM-13D6-S2L-1.

~~Water Quality Data~~

T°	pH	Con	Tur	DO

Set Isco for 1630 afternoon sample (High / Flood).

7/30/08

7/30/08 cont

1315 at NE site to bottle sample
SM-I3D6-NE-NSMSD

1330 Water Quality Data

T°	pH	Cn	Tu	DO
31.58	8.16	1.10	Ø	7.70

1400 Bottle field blank and make all label/Bottle sets for remaining samples

1550 at Ocean inlet to collect sample
SM-I3D6-OI14-1

1600 Water Quality Data

T°	pH	Cn	Tu	DO
23.36	8.34	49.6	47	10.05

1635 at Section 1 to bottle sample SM-I3D6-S114-1

Water Quality Data

T°	pH	Cn	Tu	DO

07/30/08

7/30/08 cont

1700 - at S2 to bottle
SM-I3D6-S214-1

Water Quality Data

T°	pH	Con	Tu	DO
29.85	8.93	91.2	Ø	14.05

1720 at Com pond. Unloads truck. Preps samples for lab.

1745 - met courier
End of field day.

7/30/08

SOKKIA

FIELD BOOK

Santa Margarita Lagoon
Monitoring
San Diego County, California
1801.027

Book 2
9/25/2008 to

No. 8152-60

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Date / Description	Pages
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9/25/08 - Index 4, Days 3, 4, 5, 6	5-22
11/25 to 8 - Set up for Round 3 stream samples over	23-25

9/25/2008 (5)

SMR Index 4
Day 3 and
Transect Sampling

CDM - J. Bush, A. Geazel
J. Dunk, R. Cholas

Weather - warm clear

0700 - arrive at CDM yard.
Distribute gear, bottles,
paperwork

0930 - Dunk and Cholas
meet Weston crew at
Stuart Mesa bridge.
Bush and Geazel
conduct Index 4 Day
3 sampling. Dunk
Cholas and Weston
crew conduct transect
sampling

9/25/08

⑥ 9/25/08 cont.

0945 - at S2. Program ISCO to collect 1015 sample.

1000 - at exchange to get tire.

1010 - at S1. Program ISCO to collect 1030 sample.

Day 3 Sample Times

SM-I4D3	-	S1L-1	1030
"	"	- S2L-1	1015
"	"	- O1L-1	1105
"	"	- S1L-2	1035
"	"	- S1H-1	1600
"	"	- S2H-1	1615
"	"	- O1H-1	1610
"	"	- FB-1	1500

1030 Call Pine to arrange for replacement Peristaltic pump. "James" say it will arrive Friday for use early monday.

9/28/08

9/25

1045 -

1110 - Wat

1120 -

9/25

9/25/08 cont. (7)

1045 - arrive at Ocean inlet for sample collection (SM-I4D3-01L-1)

Calibrate U-22

T°	pH	Con	Tur	DO
~~[illegible]~~	~~[illegible]~~	4.44	Ø	9.35

RPD

T°	pH	Con	Tur	DO
1 - 21.52	8.78	59.8	Ø	8.13
2 - 21.54	8.80	59.8	Ø	8.14
3 - 21.54	8.80	59.8	Ø	8.15

110 - Water Quality (Ocean)

T°	pH	Con	Tur	DO
21.37	8.92	59.5	61.0	9.11

1120 - at S1 to bottle SM-I4D3-S1L-1

Set JSon for 1600 sample (S1H-1)

9/25/08

(8) 9/25/08

1230 at S2 to collect/bottle
SM-I4D3-S2L-1
Set Isco to collect
high tide sample at Kent.

1400 make labels/bottles
sets for afternoon
samples

1500 collect field blank
SM-I4D3-FB7

1600 at ocean inlet to
collect SM-I4D3-OIH-1

Water Quality Data

1605	T°	pH	Cn	Tu	DO
	23.49	8.92	589	Ø	7.23

1640 - at S1 to bottle SM-I4D3
-S1H-1

1700 - at S2 to bottle SM-I4D3-S2H-1

9/25/08

9/25/2

1720 -

1930 -

9/25/2008 cont

(9)

1720 - at S1 Prep samples for lab. Wait on Weston Transect samples.

1930 - meet crew end of field day.

9/25/08

(10) 9/26/2008

Ocean Inlet Survey

SMR Lagoon

CDR. J. Bush

O'Day Consultants - Pat, Ray

0900 meet O'Day at Del Mar area beach Lamp ground, Wait for armored vehicles to leave beach

0915 - move down beach to inlet and begin survey.

1030 - complete survey and leave beach

1045 - breakdown equipment, loss, and leave base.

End of field day

9/26/08

9/29/2008

(11)

SMR Tudex 4
Day 4, Camp Pendleton

CDM - J. Bush, A. Weasel
Weather - cool overcast
0600 - Bush and Weasel meet at CDM yard. WAO supplies for day.
0700 - at SZ to program/start ESA for 0700 sample

Day 4 Samples	Times
SM-IUD4-S1H-1	0715
" " -S2H-1	0700
" " -O1H-1	0800
" " -S1L-1	1200
" " -S2L-1	1215
" " -S1L-2	1205
" " -O1L-1	1155
" " -FB1	1230

9/29/08

(12) 09/29/08 cont.

0653 - at S1 & start ~~[illegible]~~ 28 stations

Iso 0715 sample

0710 - to store for wa.

0740 - at ocean inlet to collect OH-1 (0800)

Calibrate Horiba U-22

pH	Cm	Tm	DO	T°
3.99	4.49	Ø	9.71	16.9

RPD

	T	pH	Cm	Tm	DO
1	~~8.74~~ 17.62	8.74	61.4	Ø	8.30
2	17.61	8.77	61.4	Ø	8.37
3	17.62	8.78	61.5	Ø	8.32

0815 Ocean Water Quality

T°	pH	Cm	Tm	DO
17.53	8.94	61.2	56	9.68

0925 at S1 to bottle OH-1. left beach due to lightning.

9/29/08

0920

0800

0945

1000

1100

1130

1145

1215

0900 - collect and bottle S1H-1. Set Isco for 1200 (low) sample

0930 - at S2 & bottle sample S2H-1. Set Isco to collect S2L-1 at 1215

0945 - to ME site to check for flow.

1000 - no flow at ME Site

1100 - Dispose of scrap cardboard and trash.

1130 - at ocean inlet to collect low tide sample at 1155

1145 Water Quality (Ocean)

T°	pH	Con	Tu	DO
17.78	8.97	58.6	95	9.66

1215 at S1 to bottle S1L-1 and S1L-2

9/29/08

(14) 9/29/08 cont.

1230 - collect Field blank at S1 site

1315 - at S2 & bottle S2L-1

1345 - at cow yard. Unloads. Prep samples for courier

1500 meet courier and relinquish samples end of field day

9/29/08

(12) 9/30/08 cont.

0725 - at S1. Set JS00 to collect 0740 sample. Stopped for ice at base gas station (0720).

0745 at Ocean inlet to collect SM-JS05-0141

Calibrate Horiba

T°	pH	Con	Tur	DO
17.22	3.98	4.471	0	9.65

RPD

	T°	pH	Con	Tur	DO
1	17.37	8.88	60.1	1.7	8.46
2	17.37	8.89	60.1	1.3	8.41
3	17.38	8.89	60.1	1.5	8.46

0817 - Ocean Water Quality

T°	pH	Con	Tur	DO
17.17	8.93	59.9	31	9.65

9/30/08

9

0835

0910

0935

1015

1105

1245

1255

18

9/30/08 cont. (17)

0835 - at S1 to bottle S1H-1
set ESCO to collect
S1L-MS MSD at 1230.

0910 - at S2 to bottle
S2H-1. Set ESCO to
collect S2L-1 at
1245.

0935 - check storm drain
location for flow - Dry

1015 - check ME site for
flow - Dry.

1105 - at S1. Prepare
remaining bottle/label sets.
Prepare to collect field
blank.

1245 - at Ocean Inlet to
collect ~~FB~~ OIL-1

1255 - Water Quality Data

T°	pH	Cond	Tur	DO
18.76	8.94	59.2	21	9.83

(18) 9/30/08 cont.

1335 - at S1 to bottle S1L-MS/MSD.

1355 - at S2 to bottle S2L-1

1415 - at CDM yard Prep samples for courier. Unloss field vehicle.

1600 meet courier - end of field day

9/30/08

10/01/08

(19)

SMR Index 4

Day 6

CDM - D. Bush, A. Breazel

Weather - warm, clear.

0630 - Bush, Breazel arrive at CDM yard and prep for day.

0700 at S2. start Iso sampler & collect 0715 sample.

Day 6 Sample Times

SM-I4D6-S1H-1 - 0740

- S2H-1 - 0715
- O1H-1 - 0800
- FB1 - 1245
- S1L-MSMSD 1300
- S2L-1 1330
- O1L-1 1400

10/01/08

(20) 10/1/08

0715 - to exchange for ice.

0725 - at S1 & start TSG for 0740 sample

0742 - at ocean inlet & collect 0800 sample.

Calibrate 11-22

T°	pH	Cn	Tu	DO
19.62	3.99	4.47	Ø	9.09

	T°	pH	Cn	Tu	DO
1	17.54	8.93	57.5	3.4	9.07
2	17.55	8.95	57.5	2.8	8.83
3	17.57	8.95	57.5	2.4	8.61

0825 Data Quality - Ocean

T°	pH	Cn	Tu	DO
14.99	8.96	57.3	3.6	9.95

10/1/08

10/1/08

0835 - at S1 to bottle S1H-1. Set Teco to collect 1300 sample for S1L-MS/MSD

0900 - at S2 to bottle S2H-1. Set Teco to collect 1330 sample (S2L-1)

0930 - check NE side for flow
Dry

1120 - at Storage area to measure and take inventory

1200 - clean and vacuum field truck.

1230 - at S1 to bottle S1L-MS/MSD

1245 - collect field blank.

1300 - retrieve S1 sample and downloads data.

1340 - at ocean inlet to collect OIL-1

10/1/08

(22) 10/1/08 cont.

1358 Ocean Water Quality

T	pH	Con	Tur	DO
22.61	8.98	54.9	56.4	11.09

1435 - at S2 to bottle samples
S2-C-1

1500 - retrieve S2 sonde
download data.

1520 - at CDM storage
unload vehicle.

1600 - meet courier
End of field Day.

10/1/08

Tuesday ~~THURSDAY~~ NOVEMBER 25, 2008 (23)

NOTETAKER: BOB HUNT
Personnel: COM. Jake Dunlap + Bob Hunt
Weather: partly cloudy. mid 60°
Forecast: high on the 60s chance of rain - thunderstorms overnight
PPE: Level D modified
Instrument: ISCO samples -
Horiba U-22
Calibration = NONE Needed
Blanks not ~~taken~~ used today
Activities: Preparing for Round 3 of storm water sampling
- setting up ISCO samples to run overnight

1245 - Leave COM office (San Diego) to head up to Camp Pendleton
1330 - Arrive @ Camp Pendleton load up vehicle with equipment and supplies.
1420 - @ Segment 2 Stuart Mesa Bridge - Set up ISCO S/N # 05974 - set to GO OFF (Sample) @ 0257 on Wednesday Morning - sample every 15 mins - 12 Samples

- Robert Hunt - ROBERT HUNT 11/25/08

(24) ~~THURSDAY~~ Tuesday NOVEMBER 25, 2008

1500 - HEAD TO SEGMENT 1 -
I-5 BRIDGE
SET UP ISCO S/N 04725
SET TO START @ 0800 ON
WEDNESDAY MORNING => SAMPLE
EVERY 15 MINUTES - 12 SAMPLES
1530 - HEAD TO ~~MASS EMISSION~~ 11/26/08
~~SITE~~ OCEAN INLET
1545 - SET UP ISCO # S/N 4773
- BURY ISCO SAMPLER - 1/2 WAY
JUST TO SUPPORT + TIE OFF
TO A BURIED PIECE OF DRIFT
WOOD TO STABILIZE - SUPPORT
AND SAFEGUARD ISCO.
INTAKE PLACED IN INLET
~~ANCHORED~~ 11/2"GS ANCHORED
TO BOTTOM WITH 1/2 GALLON
WATER JUG FILLED WITH SAND -
1610 - HEAD TO MASS EMISSION
SITE
1635 - @ MASS EMISSION SITE
SET UP ISCO # S/N - 11682
- 24 BOTTLES SET UP
SET ISCO TO SAMPLE 12
EVERY ~~24 HOURS~~ 1/2 HR FOR 24 HRS
- [signature] ROBERT HOWE - 11/25/08

~~THURSDAY~~ Tuesday November 25, 2008 (25)

Hours - Secure intake on stake in River Bed 1700 - Finished e mass emissions site - depart and head back to San Diego office 1800 - Back e San Diego office - Finished for the day

Robert Hunt 11/25/08

(28)

Water Quality Grab Samples

Time/site	Temp °C °C	Conductivity mS/cm	Turbidity nTU	pH units	DO mg/L
0705 ME1	16.48	1.40	0.0	6.47	6.65
S1H	16.80	52.5	0.0	7.65	8.58
S2H	14.99	40.4	0.0	7.84	5.19
1105 OIL	19.25	52.3	0.0	8.16	9.27
S1L	18.92	52.4	0.0	8.50	9.76
ME1	19.74	1.36	0.0	8.60	8.11
S2L	17.64	45.5	0.0	7.79	7.93

Inventory 10/1/08

Ab - 2 cases (24)
0.5L Poly - 100+
1L Poly - 25
Disc Filter (syringe) - 14
Syringes - 1 box (40)
inline filters - 14
Silicone tubing - 25'
Isco bottles (wedge) - 35
Bubble wrap 1'x30' + scraps
composite jugs - 6
scintillation vials - 300
Distilled Water - 2 gal.
Teflon tubing - 100+' in place (52)
Iscos - 3
Isco Batteries - 5 (+1?)
Misc Calibration fluids

YSI Environmental

YSI 6820 and 6920 Compact Sondes

Measure multiple parameters simultaneously

You can report sixteen parameters simultaneously with either sonde:

DO (% and mg/L)	ORP
Temperature	Depth or Level
Conductivity	Turbidity, Chlorophyll, or Rhodamine
Specific Conductance	Total Dissolved Solids
Salinity	Nitrate
Ammonia	Chloride
Ammonium-N	pH
Resistivity	

Data Analysis with Windows™

Data analysis from any YSI sonde is easy using EcoWatch™ for Windows™ for data quality review, statistical analysis, and preparation for easy importation to other data analysis packages.

Connect with Data Collection Platform

Either sonde can easily connect to the YSI 6200 DAS Data Acquisition System, or your own data collection platform, via SDI-12 for remote and real-time data acquisition applications.

Self-Cleaning and Stirring-Independent Probes

Both sondes feature YSI's self-cleaning turbidity, chlorophyll, or rhodamine sensor as well as YSI's Rapid Pulse™ stirring-independent oxygen sensor.

- **Self-cleaning turbidity, chlorophyll or rhodamine**
- **Stirring-independent Rapid Pulse™ dissolved oxygen system**
- **Field-replaceable sensors**
- **Easy connect to data collection platforms such as the YSI 6200 DAS**
- **Compatible with YSI 650 Multiparameter Display System**

In addition

The YSI 6920 is an economical logging system for long-term, *in situ* monitoring and profiling. It will log all parameters at programmable intervals, and store 150,000 readings. At 15-minute intervals, it will log data for about 30 days.

Pure Data for a Healthy Planet.™

Compact sondes for field sampling and data collection platforms.

Pure Data for a Healthy Planet.™

To order or for more information, contact YSI Environmental.

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ISO **9001**
ISO **14001**

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Printed in USA 1101 E25e

YSI *incorporated*
Who's Minding the Planet?™

6820 & 6920 Sensor Specifications

Dissolved oxygen % saturation	Range Resolution Accuracy	0 to 500% 0.1% 0 to 200%: ±2% air sat; 200 to 500%: ±6% air sat
Dissolved oxygen mg/L	Range Resolution Accuracy	0 to 50 mg/L 0.01 mg/L 0 to 20 mg/L: ±0.2 mg/L; 20 to 50 mg/L: ±0.6 mg/L
Conductivity	Range Resolution Accuracy	0 to 100 mS/cm 0.001 to 0.1 mS/cm (range-dependent) ±0.5% of reading + 0.001 mS/cm
Temperature	Range Resolution Accuracy	-5 to +45°C 0.01°C ±0.15°C
pH, includes most low-ionic-strength measurements	Range Resolution Accuracy	0 to 14 units 0.01 unit ±0.2 unit
Non-vented depth, shallow	Range Resolution Accuracy	0 to 30 feet (0 to 9 m) 0.001 foot (0.001 m) ±0.06 foot (±0.02 m)
Non-vented depth, middle	Range Resolution Accuracy	0 to 200 feet (0 to 61 m) 0.001 foot (0.001 m) ±0.4 foot (±0.12 m)
Vented level	Range Resolution Accuracy	0 to 30 feet (0 to 9 m) 0.001 feet (0.0003 m) 0 to 10 feet (0 to 3 m): ±0.01 feet (0.003 m) 10 to 30 feet (3 to 9 m): ±0.06 feet (0.01 m)
ORP	Range Resolution Accuracy	-999 to +999 mV 0.1 mV ±20 mV
Salinity	Range Resolution Accuracy	0 to 70 ppt 0.01 ppt ±1% of reading or 0.1 ppt, whichever is greater
Nitrate–nitrogen	Range Resolution Accuracy	0 to 200 mg/L-N 0.001 to 1 mg/L-N (range-dependent) ±10% of reading or 2 mg/L, whichever is greater
Ammonium–nitrogen	Range Resolution Accuracy	0 to 200 mg/L-N 0.001 to 1 mg/L-N (range-dependent) ±10% of reading or 2 mg/L, whichever is greater
Ammonia	Range Resolution Accuracy	0 to 200 mg/L-N 0.001 to 1 mg/L-N (range-dependent) ±10% of reading or 2 mg/L, whichever is greater
Turbidity	Range Resolution Accuracy Depth	0 to 1,000 NTU 0.1 NTU ±5% of reading or 2 NTU, whichever is greater 61 m (200 feet)
Chlorophyll	Range Resolution Depth	0 to 400 µg/L; 0 to 100% FS 0.1 µg/L Chl; 0.1%FS 61 m (200 feet)
Rhodamine	Range Resolution Accuracy Depth	0 to 200 µg/L; 0 to 100% FS 0.1 µg/L; 0.1%FS ±1.0 µg/L; ±5% of reading 61 m (200 feet)
Chloride	Range Resolution Accuracy	0 to 1,000 mg/L 0.001 to 1 mg/L (range-dependent) ±15% of reading or 5 mg/L, whichever is greater

YSI 6820 sonde

Medium: Fresh, sea or polluted water
Temperature: -5 to +45°C
Computer interface: RS-232, SDI-12
Software: PC-compatible, Windows™ 95 or higher; 256K RAM minimum. Graphics card recommended.
Size: 2.86″ dia, 13.5″ long, 3.4 LBS (7.3 CM dia, 34.3 CM long, 2.3 KG)
External power supply: 12 VDC

YSI 6920 sonde

Medium: Fresh, sea or polluted water
Temperature: -5 to +45°C
Computer interface: RS-232, SDI-12
Logging memory: 384K flash ROM logs, 150,000 readings
Software: PC-compatible, Windows™ 95 or higher; 256K RAM minimum. Graphics card recommended.
Size: 2.85" OD x 18" long (7.24 x 45.7 cm)
Weight with batteries: 4 lbs (1.8 kg)
External power supply: 12 VDC

TROLL 9000

Versions

	Application / use for:	Available WQ sensor ports**	Accepts 'XP' sensors	Internal data logging	Logs data with RuggedReader
Profiler	Profiling, dip and sample	4	--	--	●
Profiler XP	Profiling, dip and sample	4	●	--	●
Professional	Long-term monitoring and/or profiling	4	--	●	●
Professional XP	Long-term monitoring and/or profiling	4	●	●	●
LTS	Long-term monitoring	1	●	●	●

Sensor Specifications

Standard Sensors	Accuracy	Range	Response Time (T90)	Methodology
Barometric Pressure	± 0.3% FS	0 – 16.5 psia	< 30 sec per 30m (100 ft) cable	
Temperature	± 0.1˚C	-5˚C – 50˚C	< 30 sec	EPA 170.1
Level Depth, Pressure	± 0.05% FS	11m (35 ft, 15psi) 21m (69 ft, 30psi) 70m (231 ft, 100psi) 210m (692 ft, 300psi)	In thermal equilibrium: Instantaneous In thermal change— Instantaneous to ± 2% FS, 30 – 60 min to ± 0.1% FS, 1.5 – 2 hr to ± 0.05% FS	
pH	± 0.1 pH units	0 – 12 pH units	< 15 sec, pH 7 to pH 4	Std.Mthds. 4500-H+, EPA 150.2
ORP	± 4.0 mV	± 1400 mV	< 15 sec	Std.Mthds. 2580
RDO (Optical DO)	± 0.1 mg/L ± 0.2 mg/L	0 – 10 mg/L 10 – 20 mg/L	O_2 increasing, 16 seconds; O_2 decreasing ,45 seconds	
DO (Clark cell)	± 0.2 mg/L	0 – 20 mg/L, 0 – 200% saturation	1-mil membrane: 1 – 2 min @ 25˚C 2-mil membrane: 90 sec – 3 min	Std.Mthds. 4500-O G, EPA 360.1
Conductivity Low High	± 0.5% or 2 µS/cm ± 0.5% + 2 µS/cm	5 – 20,000 µS/cm*** 150 – 112,000 µS/cm****	Instantaneous Instantaneous	Std.Mthds. 2510, EPA 120.1 Std.Mthds. 2510, EPA 120.1
Extended Parameter (XP) Sensors				
Turbidity	± 5% or 2 NTU	0 – 2000 NTU	Instantaneous (5 sec for first reading)	ISO 7027
Nitrate (NO_3^-)	± 10%	0.14 – 14000 ppm N	< 60 sec (T98), 1.4 to 14 ppm N	Std.Mthds. 4500-NO3 D
Ammonium (NH_4^+)	± 10%	0.14 – 14000 ppm N	< 60 sec (T98), 1.4 to 14 ppm N	Std.Mthds. 4500-NH3 D, EPA 350.3
Chloride (Cl^-)	± 15%	0.35 – 35500 ppm Cl	< 60 sec (T98), 3.54 to 35.45 ppm Cl	

Hardware Specifications

Data Logging	16 programmable tests (defined, scheduled to run or stored) / Logging Modes: Linear, Linear Average, Event
Memory	4 MB (1,000,000 individual readings)
Internal Power	2 -4 internal user-replaceable D batteries (alkaline or high-power lithium) RDO requires 2 lithium batteries, 4 alkaline batteries, or external power
SDI-12	Optional with SDI-12 adapter
Dimensions	TROLL 9000: 45mm (1.79 in) OD X 47.3cm (18.6 in) / TROLL 9000E: 45mm (1.79 in) OD X 59.5cm (18.6 in) RDO sensor adapter: 88.4mm (3.5 in) OD, 20.3cm (8.0 in) long
Weight	TROLL 9000: 1.9 Kg (4.2 lbs) / TROLL 9000E: 2.7 Kg (5.8 lbs)
Wetted materials	316L stainless steel, Acetal, Viton®, nylon, PVC, FEP* or polyurethane (cable)

Battery Life Estimates (assuming a 15-minute sampling interval and 20˚C)

Battery Type	Sensors	Total Data Points	Hours	Days	Months
2 D-sized lithium batteries	Wiper, Temp, Pressure, Baro, Turb, RDO, pH, Cond	121,760	8,117	338	11
2 D-sized lithium batteries	Wiper, Temp, Pressure, Baro, Turb, DO, pH/ORP, Cond	134,110	8,941	373	12
2 D-sized alkaline batteries	Wiper, Temp, Pressure, Baro, Turb, DO, pH/ORP, Cond	69,514	4,634	193	6

* No anode or cathode to scrub or clean.
** Available water quality sensor ports. TROLL 9000 LTS version supports **L**evel, **T**emperature, and one water quality **S**ensor.
*** Full operating range 3 µS/cm – 50,000 µS/cm
**** Full operating range 70 µS/cm – 200,000 µS/cm

Purchase • Rent • Lease the MP TROLL 9000 Today!

In-Situ Inc.
The Standard for Water Quality & Level

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Accessories

Networking
Multiple unit installations are a snap using T-Boxes or Quad-Boxes. Create networks of up to 32 TROLL 9000s. Saves money!

Calibration Solutions
For best performance choose In-Situ solutions that have been designed specifically for each sensor. Always NIST traceable.

SDI-12
Now available with optional SDI-12 output. Connects to popular 3rd-party data loggers.

Reels, Well Docks and caps
Reels are available in three sizes in steel or ABS plastic. Well Docks make well installations a snap. A real asset!

Non-vented backshell
Use the TROLL 9000 without vented cable by attaching a stainless steel backshell.

Desiccants
High humidity? Try a MAXUM high-capacity desiccant. Screws right onto the cable!

Cables
Vented or non-vented Quick-Connect™ cables. Available in polyethylene, polyurethane or FEP (Teflon*).

Patented design

Printed on recycled paper

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*FEP (fluorinated ethylene propylene) is the generic equivalent of DuPont Teflon.
1/9/2005