Tijuana River (TJR) NERR Water Quality Metadata
January to December 2017
Last Revised: April 24, 2019

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

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2) Entry verification –

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch Lite in a comma separated file (CSV) and uploaded to the CDMO where they undergo automated primary QAQC; and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in ingestion into the database as provisional plus data, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12.

3) Research objectives –

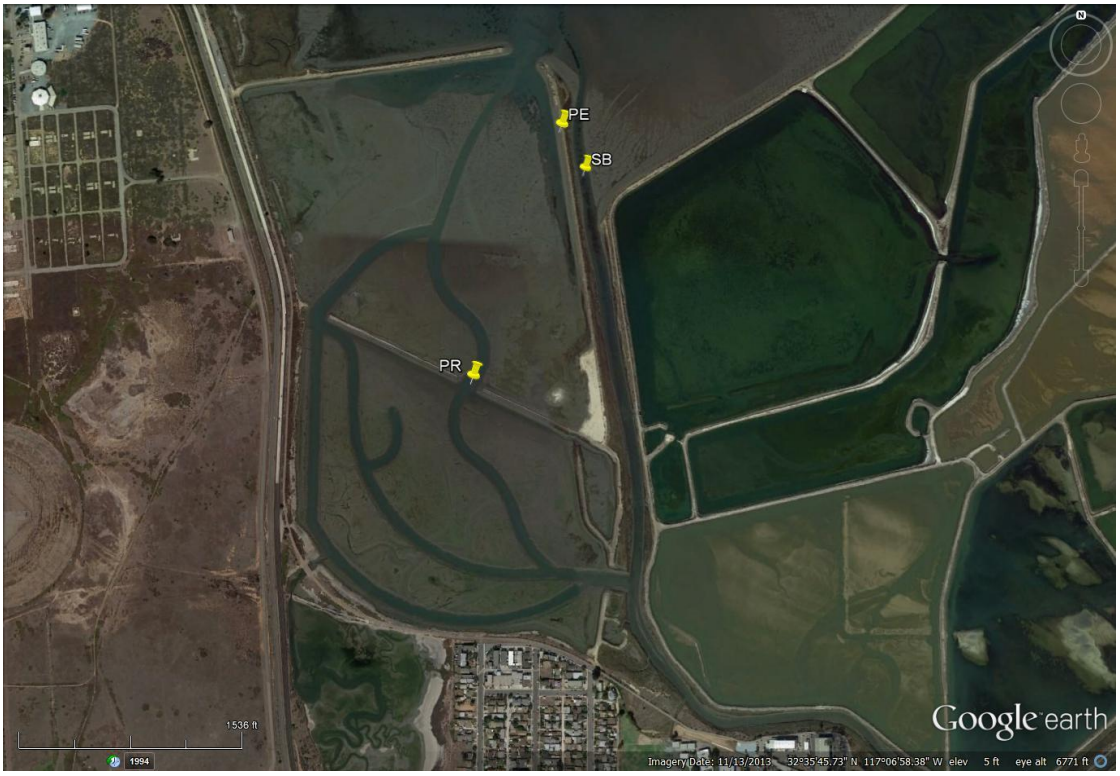
The Tijuana River National Estuarine Research Reserve (TRNERR) is impacted heavily by periodic raw sewage outflows and urban development. About a quarter of the reserve's 2,531 acres are tidally influenced and few channels are deep enough for datalogger deployment. Two stations were originally set up: a treatment station (RC) was set up close to the river mouth on the southern end of the Oneonta Slough, while a control station (OS) was set up on the northern end of Oneonta Slough. The treatment station location was chosen because it would be the site most affected by sewage outflow. Deployment at the treatment station, however, was continually halted by both shifting sediment and massive wracks of kelp (*Macrocystis pyrifera*), which would often bury the deployment set-up on incoming tides. After a number of different deployment equipment designs were implemented, without success, logging at this site was terminated in 2004.

Currently, there are two YSI datalogger stations installed at the TRNERR and two datalogger stations are located off the reserve. Station locations are designed to investigate spatial gradients of water quality parameters across the reserve, as well as document the water quality changes over time to areas in the reserve that have been restored to increase tidal flushing. The original control station (OS) in the northern end of Oneonta Slough is still in place. Another station was located at the inlet to the Model Marsh (MM), a constructed 20-acre restoration site in the southern arm of the estuary. The Model Marsh was opened to tidal flushing in February 2000 and data logging at the station began in October 2000**.** The site was discontinued in January 2008 due to heavy sedimentation. The second active datalogger site, Boca Rio (BR), was established in December 2004 and is located near the mouth of the Tijuana River. This station replaces the River Channel station (RC), which was established in August 2002 to monitor the Tijuana River, the largest source of freshwater to the reserve.

The South Bay (SB) datalogger was established in January 2008 and is located at the mouth of Otay River, which flows into South San Diego Bay. The fourth sonde location, Pond Eleven (PE), was a non-tidal salt pond adjacent to the South Bay logger. A flood gate was the only source of water into the pond. The Pond Eleven sonde was deployed from July 2008 to September 2010. The US Fish and Wildlife Service began restoration of this area, including Pond Eleven, from September 2010 to its completion in October 2011. Channels were dredged near the Pond Eleven site, the surrounding ponds and the adjacent Otay River. A levee was breached to open Pond Eleven to the bay, which made the area tidal. Due to extensive restoration, the datalogger site was relocated. Sonde deployments began in January 2012 at a new location site named Pond Restored (PR). The Pond Restored datalogger is located approximately 560 meters southwest from where the Pond Eleven datalogger was originally. The South Bay and Pond Restored sites are located within the San Diego National Wildlife Refuge Complex. The images below show pre- and post-restoration of the salt ponds and the datalogger sites. The post restoration photo includes the PE datalogger site as a reference to the new PR datalogger site. No sampling occurs at the PE site.

Pre Restoration

Post Restoration



4) Research methods –

Dataloggers at the Oneonta Slough, Boca Rio, South Bay, and Pond Restored stations are deployed using a 4-inch diameter PVC pipe that is strapped vertically to two "rail" style fence posts driven into the sediment. Multiple 1.5 inch holes have been drilled around the bottom of the tube to permit unrestricted water flow to the sensors. During deployment the datalogger units are then placed into and rest on a bolt fixed across the bottom of the tubes.
The sampling period is between two and four weeks, with measurements taken every 15 minutes. Measurements for specific conductivity, salinity, dissolved oxygen (percent saturation), dissolved oxygen (mg/l), temperature, turbidity, pH, chlorophyll (except at Boca Rio) and water level are recorded.
At the end of each sampling period, the YSI dataloggers are brought back to the laboratory for data downloading, cleaning and recalibration. These procedures are carried out according to the methods described in the YSI Operations Manual (see sections 3 and 7). Calibration standards for specific conductivity (50) and turbidity (0 and 126) are purchased from YSI, and pH standards (7 and 10) are purchased from Fisher Scientific. The QA/QC procedures for the collected data are followed from the CDMO Operations Manual version 6.6 – February 2015.
On the field, concurrently to the datalogger's deployment, the YSI Professional Plus handheld multiparameter meter is used to collect data for comparison. Parameters such as specific conductivity, salinity, DO (percent saturation and mg/l), temperature and barometric pressure, are measured and recorded. The handheld meter is calibrated in the specific conductivity standard (50) and once a month its membrane is changed.
In 2015, Tijuana River (TJR) NERR started to report level data. In January and February datalogger holders were surveyed using the Spectra Precision Epoch real-time kinematic GPS and calculations were done to find the correct depth offset. In December of 2017, two sites were re-surveyed. Dataloggers specific offsets are found in the **Specific Site characteristics** section of this document.

A Sutron Sat-Link2 transmitter was installed at the Oneonta Slough station on 12/20/2006 and transmits data to the NOAA GOES satellite, NESDIS ID #3B0252F2. (Where #3B0252F2 is the GOES ID for that particular station.) The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary

QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at http://cdmo.baruch.sc.edu.

5) Site location and character –

General site Characteristics (TRNERR)
a) Latitude and longitude: 32° 34' N, 117° 07' W
b) Tidal exchange (extremes): approx. -2 +7 MLLW
c) Salinity: 4 ppt (extreme rain events) to 38 ppt (except Pond Restored and South Bay)
d) The dominant freshwater source to the estuary is the Tijuana River, which drains a 4,483km^2 watershed, approximately 2/3 of which resides in Mexico. Stream flows in the river vary considerably from season to season and year to year, with no flow during many months and a mean annual discharge of .82m^3/s. Additional freshwater sources are storm drains located mostly in the northern arm of the estuary from the adjacent military airfield and residential area. The entire estuary is shallow and has a relatively small tidal prism (0.36 Mm^3), so even low freshwater flows result in reduced salinity throughout the reserve. Estimated residence times for freshwater entering the estuary vary from 7 hours to a few days, depending on the tide and mouth conditions. Rainfall within the watershed accounts for most of the freshwater entering the reserve, with 90% of the mean annual rainfall occurring between November and April. Freshwater discharge with untreated sewage occurs year round, although these have decreased with the construction of a binational water treatment plant. Vegetation in the area is dominated by common pickleweed (*Salicornia pacifica*) and Pacific cordgrass *(Spartina foliosa*).

Specific Site characteristics: Boca Rio (BR)
a) Location of site: the datalogger station is located approximately 400m north of the Tijuana River in the middle of a channel which runs north-south; 32° 33' 33.7" N, 117° 7' 44.4" W.
b) Elevation of sonde: .053m NAVD88, approximately .5m above the channel bottom. Surveyed and measured on January 27, 2015. – As of December 12, 2017 sonde was resurveyed after deeply cleaning logger holder and switching from YSI 6-series sondes to YSI EXO2. The new elevation is -.056m
c) Channel width: approximately 30 m.
d) Bottom type: sand, very little silt and clay.

Specific Site characteristics: Oneonta Slough (OS)
a) Location of site: the datalogger station is located on the upper portion of the Oneonta Slough in the northwest corner of the reserve, approximately 1.4km north of the Tijuana River in the middle of the same channel as the Boca Rio site; 32° 34' 6.0" N, 117° 7' 52.7" W.
b) Elevation of sonde: .332m NAVD88, approximately .5m above the channel bottom. Surveyed and measured on January 23, 2015. As of December 5, 2017 sonde was resurveyed after deeply cleaning logger holder and switching from YSI 6-series sondes to YSI EXO2. The new elevation is .295m
c) Channel width: approximately 23 meters.
d) Bottom type: silty clay.
e) The area adjacent to the west side of the channel is developed. There is a 50+ meter buffer of natural vegetation between development and the channel. The area adjacent to the east side of the channel is relatively undisturbed.
f) Direct impacts may be runoff from streets into channel during rain events.

Specific Site Characteristics: Pond Restored (PR)
a) Location of site: The datalogger is located at the middle levee breach between Pond Eleven and Pond Ten, which is part of the South San Diego Bay Coastal Wetland Restoration and Enhancement Project ; 32° 35' 46.0", 117° 7' 5.5" W.
b) Elevation of sonde: -.310m NAVD88, approximately .5m above the channel bottom. Surveyed and measured on February 25, 2015.
c) Channel width: approximately 40m.
d) Bottom type: very fine mud.
e) Tidal Exchange (extremes): approximately -2 to +7 MLLW.
f) Salinity: 2ppt (extreme rain event) to 33 ppt.

Specific Site Characteristics: South Bay (SB)

a) Location of site: The datalogger is located at the mouth of Otay River where it flows into San Diego Bay; 32º 36' 3.6" N, 117º 06' 56.9" W.

b) Elevation of sonde: -.379m NAVD88, approximately .5m above the channel bottom. Surveyed and measured on February 25, 2015.

c) Channel width: approximately 25m

d) Bottom type: very fine mud.

e) Tidal Exchange (extremes): approximately -2 to +7 MLLW.

f) Salinity: 2 ppt (extreme rain event) to 40 ppt

SWMP Station Timeline

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
tjrbrwq	P	Boca Rio	32° 33' 33.70 N, 117° 7' 44.30 W	12/23/2004 15:30	NA	NA
tjroswq	P	Oneonta Slough	32° 34' 6.00 N, 117° 7' 52.60 W	01/01/1996 00:00 -	NA	NA
tjrprwq	P	Pond Eleven Restored	32° 35' 45.90 N, 117° 07' 5.59 W	02/16/2012 11:00	NA	NA
tjrsbwq	P	South Bay	32° 36' 3.60 N, 117° 6' 57.00 W	01/02/2008 00:00 -	NA	NA
tjrmmwq	P	Model Marsh	32° 32' 52.08 N, 117° 7' 22.80 W	10/01/2000 00:00 - 01/17/2008 00:00	Heavy sedimentation compromised the station	
tjrpewq	P	Pond Eleven	32° 36' 3.54 N, 117° 06' 58.46 W	07/25/2008 00:00 - 09/29/2010 00:00	Deployments at this site were temporarily interrupted due to an extensive Restoration project	Restoration project was concluded in October 2011. Datalogger was relocated and renamed – Pond Eleven Restored, and deployments resumed in January 2012.
tjrrcwq	P	River Channel	32° 33' 28.08 N, 117° 6' 21.96 W	08/01/2002 00:00 - 11/11/2004 14:00	Heavy sedimentation compromised the station	Replaced by Boca Rio site
tjrtlwq	P	Tidal Linkage	32° 34' 27.84 N, 117° 7' 37.92 W	05/01/1997 00:00 - 10/08/2007 00:00	Heavy sedimentation compromised the station	

6) Data collection period –

Data was collected every 15 minutes for all parameters at each station from 01/01/2017 00:00 until 12/31/2017 23:45 using YSI model 6600 EDS dataloggers. YSI EXO2 models were used in the December deployment at Boca Rio and Oneonta Slough sites; chlorophyll is no longer recorded at these two sites.

Boca Rio

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/13/2016	14:45	1/24/2017	15:45
1/24/2017	16:00	2/22/2017	12:45
2/22/2017	13:00	3/28/2017	13:45
3/28/2017	14:00	4/20/2017	10:30
4/20/2017	10:45	5/18/2017	8:45
5/18/2017	9:00	6/19/2017	10:00
6/19/2017	10:15	7/20/2017	12:00
7/20/2017	12:15	8/14/2017	7:00
8/14/2017	7:15	9/18/2017	13:00
9/18/2017	13:15	10/17/2017	15:00
10/17/2017	15:15	11/14/2017	12:45
11/14/2017	13:00	12/12/2017	14:15
12/13/2017	12:45	1/16/2018	15:00

Oneonta Slough

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/13/2016	15:45	1/25/2017	15:15
1/25/2017	15:30	2/22/2017	13:45
2/22/2017	14:00	3/28/2017	12:30
3/28/2017	12:45	4/20/2017	11:45
4/20/2017	12:00	5/18/2017	10:30
5/18/2017	10:45	6/19/2017	11:30
6/19/2017	11:45	7/20/2017	12:45
7/20/2017	13:00	8/14/2017	7:45
8/14/2017	8:00	9/20/2017	14:45
9/20/2017	15:00	10/17/2017	13:30
10/17/2017	13:45	11/14/2017	13:45
11/14/2017	14:00	11/30/2017	13:00
12/6/2017	16:00	1/16/2018	15:45

Pond Restored

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/14/2016	13:45	1/26/2017	13:30
1/26/2017	13:45	2/23/2017	13:00
2/23/2017	13:15	3/29/2017	13:15
3/29/2017	13:30	4/21/2017	10:15
4/21/2017	10:30	5/19/2017	8:00
5/19/2017	8:15	6/20/2017	10:00
6/20/2017	10:15	7/21/2017	10:45
7/21/2017	11:00	8/15/2017	7:15
8/15/2017	7:30	9/19/2017	12:30
9/19/2017	12:45	10/18/2017	12:15
10/18/2017	12:30	11/15/2017	12:00
11/15/2017	12:15	12/14/2017	11:15
12/14/2017	11:30	1/17/2018	13:30

South Bay

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/14/2016	13:15	1/26/2017	13:00
1/26/2017	13:15	2/23/2017	12:30
2/23/2017	12:45	3/29/2017	13:45
3/29/2017	14:00	4/21/2017	9:45
4/21/2017	10:00	5/19/2017	8:30
5/19/2017	8:45	6/20/2017	9:30
6/20/2017	9:45	7/21/2017	10:15
7/21/2017	10:30	8/15/2017	6:45
8/15/2017	7:00	9/19/2017	12:00
9/19/2017	12:15	10/18/2017	12:45
10/18/2017	13:00	11/15/2017	11:30
11/15/2017	11:45	12/14/2017	11:45
12/14/2017	12:00	1/17/2018	13:30

7) Distribution –

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons,

nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:
NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org/; *accessed* 12 October 2017.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page www.nerrsdata.org. Data are available in comma delimited format.

8) Associated researchers and projects –

The research program at the TRNERR focuses on adaptive approaches to wetlands management, which involves coupling scientific investigation with management action. One focal area of research continues to be adaptive restoration, and the TRNERR has a long history of science-based restoration efforts. These programs incorporate descriptive and experimental approaches to investigate biotic and abiotic responses to marsh restoration, including ways to better achieve desired ecosystem responses. Two SWMP sites, based in South San Diego Bay, are associated with planned restoration of salt ponds in that area. Another active area of research is invasive species ecology and management. Although estuaries are typically invaded by a broad suite of species from many habitat types, current research is focusing on terrestrial and riparian invaders able to cross ecotones and invade salt marsh habitats. Researchers at the TRNERR are investigating mechanisms of invasions, impacts of invaders, and ecosystem recovery after exotic species control.

NERR SWMP water quality and weather data are used in a variety of reserve-based and external research and education programs. Water quality data from the Tijuana River, which rarely experiences mouth closure, provides an interesting contrast to data from other regional systems, which experience frequent closure events. Also, SWMP water quality data are incorporated into a high school curriculum developed at the reserve. Tier 1 nutrient sampling is being conducted at all water quality datalogger stations. NERR SWMP meteorological sampling is being conducted at 1 station which is located near the former Tidal Linkage water quality station. In addition, much of the reserve is used as a test bed for research related to adaptive marsh restoration, with recent attention on the Model Marsh.

II. Physical Structure Descriptors

9) Sensor specifications –
YSI 6600EDS V2-4 datasondes were used at Oneonta Slough, South Bay and Pond Restored. These datasondes had depth, temperature/conductivity, ROX DO, pH, turbidity, and chlorophyll probes. The Boca Rio site utilized an YSI 6600 EDS V2-2 datasonde with temperature/conductivity, ROX DO, pH and turbidity probes.

YSI 6600EDS data sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 6560
Range: -5 to 50 C
Accuracy: +/- 0.15
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model#: 6560
Range: 0 to 100 mS/cm
Accuracy: +/- 0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation (%)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 15% of the reading
Resolution: 0.01 mg/L

Parameter: Non-vented Level - Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH – bulb probe
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6561
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU

Accuracy: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Parameter: Chlorophyll Fluorescence
Units: micrograms/Liter
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6025
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

Depth Qualifier:
The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.02 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve's associated meteorological station during data ingestion. These corrected depth/level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

NOTE: older depth data cannot be corrected without verifying that the depth offset was in place and whether a vented or non-vented depth sensor was in use. No SWMP data prior to 2006 can be corrected using this method. The following equation is used for corrected depth/level data provided by the CDMO beginning in 2010:
((1013-BP)*0.0102)+Depth/Level = cDepth/cLevel.

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a

difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

Chlorophyll Fluorescence Disclaimer:

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual including interference from other fluorescent species, differences in calibration method, and effects of cell structure, particle size, organism type, temperature, and light on sensor measurements.

10) Coded variable definitions –

Sampling Station Name	Sampling Site Code	Station Code
Boca Rio	BR	tjrbrwq
Oneonta Slough	OS	tjroswq
Pond Restored	PR	tjrprwq
South Bay	SB	tjrsbwq

11) QAQC flag definitions –

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5 Outside High Sensor Range
-4 Outside Low Sensor Range
-3 Data Rejected due to QAQC
-2 Missing Data
-1 Optional SWMP Supported Parameter
0 Data Passed Initial QAQC Checks
1 Suspect Data
2 *Open - reserved for later flag*
3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
4 Historical Data: Pre-Auto QAQC
5 Corrected Data

12) QAQC code definitions –

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIC	No instrument deployed due to ice
GIM	Instrument malfunction

GIT	Instrument recording error; recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Corrected Depth/Level Data Codes

GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
SCS	Chlorophyll spike
SDF	Depth port frozen
SDG	Suspect due to sensor diagnostics
SDO	DO suspect
SDP	DO membrane puncture
SIC	Incorrect calibration / contaminated standard
SNV	Negative value
SOW	Sensor out of water
SPC	Post calibration out of range
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSM	Sensor malfunction
SSR	Sensor removed / not deployed
STF	Catastrophic temperature sensor failure
STS	Turbidity spike
SWM	Wiper malfunction / loss

Comments

CAB*	Algal bloom
CAF	Acceptable calibration/accuracy error of sensor
CAP	Depth sensor in water, affected by atmospheric pressure
CBF	Biofouling
CCU	Cause unknown
CDA*	DO hypoxia (<3 mg/L)
CDB*	Disturbed bottom
CDF	Data appear to fit conditions
CFK*	Fish kill
CIP*	Surface ice present at sample station
CLT*	Low tide
CMC*	In field maintenance/cleaning
CMD*	Mud in probe guard
CND	New deployment begins
CRE*	Significant rain event
CSM*	See metadata
CTS	Turbidity spike
CVT*	Possible vandalism/tampering
CWD*	Data collected at wrong depth

CWE* Significant weather event

13) Post deployment information –

Boca Rio

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time	Sonde Mode	pH Model	rpDO Mod	roxDO Mo	Turb Mod	Cond Mod	Chloro Mod	EXO Model Number					
1/24/2017	16:00	2/22/2017	13:00	6600EDSV2 (	6561		6150	6136	6560							
2/22/2017	13:00	3/28/2017	14:00	6600EDSV2 (	6561		6150	6136	6560							
3/28/2017	14:15	4/20/2017	10:45	6600EDSV2 (	6561		6150	6136	6560							
4/20/2017	10:45	5/18/2017	9:00	6600EDSV2 (	6561		6150	6136	6560							
5/18/2017	9:00	6/19/2017	10:15	6600EDSV2 (	6561		6150	6136	6560							
6/19/2017	10:15	7/20/2017	12:15	6600EDSV2 (	6561		6150	6136	6560							
7/20/2017	12:15	8/14/2017	7:15	6600EDSV2 (	6561		6150	6136	6560							
8/14/2017	7:15	9/18/2017	13:15	6600EDSV2 (	6561		6150	6136	6560							
9/18/2017	13:15	10/17/2017	15:15	6600EDSV2 (	6561		6150	6136	6560							
10/17/2017	15:15	11/14/2017	13:00	6600EDSV2 (	6561		6150	6136	6560							
11/14/2017	13:00	12/12/2017	14:15	6600EDSV2 (	6561		6150									
12/13/2017	12:45	1/16/2018	15:15	EXO2 (BR)	599702		599100-01	599101-01	599827		599090-01					

Deploy Date	Sonde Nickname	SpCond	RPDO1	RPDO2	ROXDO1	ROXDO2	pH7	pH10	pH4	Turb	Turb	Depth	Level	CHL(0)	CHL(118)
1/24/2017	SB(spare)	48.75(50.0)			99.3		7	9.97		0.3(0.0)	125.8(126.0)	-0.042	0.094(0.095)		
2/22/2017	BR2	49.4(50.0)			98.9		7.03	10.02		1.0(0.0)	126.2(126.0)	-0.033	0.081(0.086)		
3/28/2017	SB(spare)	50.14(50.0)			100.1		7.03	10.06		-0.1(0.0)	125.1(126.0)	(-0.014)	0.051(0.039)		
4/20/2017	BR2	49.45(50.0)			9.9		7.2	10.17		0.7(0.0)	124.8(126.0)	(-0.018)	0.033(0.035)		
5/18/2017	BR(spare)	49.91(50.0)			98.5		7.37	7.36		0.0(0.0)	126.9(126.0)	(-0.024)	0.026(0.029)		
6/19/2017	BR2	49.83(50.0)			97.4		7.04	9.96		0.1(0.0)	128.8(126.0)	-0.004	0.059(0.057)		
7/20/2017	SB(spare)	48.65(50.0)			99.3		7.15	10.07		0.2(0.0)	131.5(126.0)	(-0.024)	0.022(0.029)		
8/14/2017	BR2	50.15(50.0)			109.4		7.13	9.95		0.7(0.0)	128.0(126.0)	(-0.0040)	0.046(0.049)		
9/18/2017	SB(spare)	51.19(50.0)			91.4		7.06	10.04		0.0(0.0)	126.4(126.0)	0	0.049(0.053)		
10/17/2017	BR2	50.12(50.0)			1.1		7.12	10.06		0.5(0.0)	124.1(126.0)	-0.01	0.058(0.063)		
11/14/2017	BR1	50.32(50.0)			101		6.93	9.9		0.0(0.0)	125.5(126.0)	-0.005	0.066(0.058)		
12/13/2017	BR	50.2(50.0)			101.4		7.1	10.03		0.06(0.0)	123.97(124.0)	-0.05	-0.014(-0.0060)		

Oneonta Slough

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time	Sonde Mo	pH Model	rpDO Mod	roxDO Mo	Turb Mod	Cond Mod	Chloro Mo	EXO Model Number					
12/13/2016	15:45	1/25/2017	15:15													
1/25/2017	15:30	2/22/2017	13:45	6600EDSV	6561		6150	6136	6560	6025						
2/22/2017	14:00	3/28/2017	12:30	6600EDSV	6561		6150	6136	6560	6025						
3/28/2017	12:45	4/20/2017	11:45	6600EDSV	6561		6150	6136	6560	6025						
4/20/2017	12:00	5/18/2017	10:30	6600EDSV	6561		6150	6136	6560	6025						
5/18/2017	10:45	6/19/2017	11:30	6600EDSV	6561		6150	6136	6560	6025						
6/19/2017	11:45	7/20/2017	12:45	6600EDSV	6561		6150	6136	6560	6025						
7/20/2017	13:00	8/14/2017	7:45	6600EDSV	6561		6150	6136	6560	6025						
8/14/2017	8:00	9/20/2017	12:45	6600EDSV	6561		6150	6136	6560	6025						
9/20/2017	15:00	10/17/2017	13:30	6600EDSV	6561		6150	6136	6560	6025						
10/17/2017	13:45	11/14/2017	13:45	6600EDSV	6561		6150	6136	6560	6025						
11/14/2017	14:00	11/30/2017	13:00	6600EDSV	6561		6150	6136	6560	6025						
12/6/2017	16:00	1/16/2018	15:45	EXO2 (OS_	599702		599100-01	599101-01	599827		599090-01					

Deploy Date	Sonde Nickname	SpCond	RPDO1	RPDO2	ROXDO1	ROXDO2	pH7	pH10	pH4	Turb	Turb	Depth	Level	CHL(0)	CHL(118)
1/25/2017	LPL2	48.2(50.0)			98.8		7.02	9.98		0.9(0.0)	127.6(126.0)	-0.042	0.365(0.374)	0.1	
2/22/2017	OS	50.15(50.0)			98.9		7.02	9.93		0.2(0.0)	126.5(126.0)	-0.031	0.356(0.363)	0.2	
3/28/2017	LPL2	49.0(50.0)			102.6		6.93	9.67		0.2(0.0)	124.5(126.0)	(-0.018)	0.318(0.314)	0.3	
4/20/2017	OS	47.3(50.0)			98.9		7.17	10.14		0.0(0.0)	126.2(126.0)	(-0.019)	0.322(0.313)		
5/18/2017	LPL2	49.05(50.0)			96.7		7.16	10.13		0.0(0.0)	126.0(126.0)	(-0.024)	0.307(0.308)		
6/19/2017	OS	49.99(50.0)			102.5		7.05	10.01		0.5(0.0)	132.0(126.0)	-0.003	0.335(0.335)	0.5	
7/20/2017	LPL2	49.0(50.0)			97		7.19	10.1		1.1(0.0)	127.0(126.0)	(-0.015)	0.316(0.317)	0.2	
8/14/2017	OS	48.25(50.0)			101.6		7.13	9.9		0.9(0.0)	125.4(126.0)	(-0.015)	0.321(0.317)	0.1	
9/20/2017	LPL2	50.05(50.0)			99.8		7.25	10.19		-0.5(0.0)	127.9(126.0)	(-0.0050)	0.325(0.327)	0.2	
10/17/2017	OS	49.97(50.0)			87		7.18	10.17		0.2(0.0)	125.8(126.0)	-0.015	0.347(0.347)	0.1	
11/14/2017	SB(spare)	49.45(50.0)			100		7.05	9.92		0.2(0.0)	125.8(126.0)	-0.011	0.345(0.343)	0.1	
12/6/2017	OS_EXO	50.1(50.0)			101.6		7.17	10.12		0.2(0.0)	125.5(124.0)	-0.052	0.341(0.347)		

Pond Restored

Deploy Date	Deploy Ti	Retrieve Date	Retrieve T	Sonde Mo	pH Model	rpDO Mod	roxDO Mo	Turb Mod	Cond Mod	Chloro Mc	EXO Model Number					
12/14/2016	13:45	1/26/2017	13:30													
1/26/2017	13:45	2/23/2017	13:00	6600EDSV2 (PR)												
2/23/2017	13:15	3/29/2017	13:15	6600EDSV	6561		6150	6136	6560	6025						
3/29/2017	13:30	4/21/2017	10:15	6600EDSV	6561		6150	6136	6560	6025						
4/21/2017	10:30	5/19/2017	8:00	6600EDSV	6561		6150	6136	6560	6025						
5/19/2017	8:15	6/20/2017	10:00	6600EDSV	6561		6150	6136	6560	6025						
6/20/2017	10:15	7/21/2017	10:45	6600EDSV	6561		6150	6136	6560	6025						
7/21/2017	11:00	8/15/2017	7:15	6600EDSV	6561		6150	6136	6560	6025						
8/15/2017	7:30	9/19/2017	12:30	6600EDSV	6561		6150	6136	6560	6025						
9/19/2017	12:45	10/18/2017	12:15	6600EDSV	6561		6150	6136	6560	6025						
10/18/2017	12:30	11/15/2017	12:00	6600EDSV	6561		6150	6136	6560	6025						
11/15/2017	12:15	12/14/2017	11:15	6600EDSV	6561		6150	6136	6560	6025						
12/14/2017	11:30	1/17/2018	13:30	6600EDSV	6561		6150	6136	6560	6025						

Deploy Date	Sonde Nic	SpCond	RPDO1	RPDO2	ROXDO1	ROXDO2	pH7	pH10	pH4	Turb	Turb	Depth	Level	CHL(0)	CHL(118)
1/26/2017	PR	49.55(50.0)			100.1		8.24	9.13		0.4(0.0)	133.0(126.0)	-0.044	-0.276(-0.266)	3.1	
2/23/2017	Spare	48.5(50.0)			97.6		7.1	9.9		3.3(0.0)	127.9(126.0)	(-0.0010)	-0.312(-0.311)	0.6	
3/29/2017	PR2	49.41(50.0)			98.9		7.08	9.95		0.9(0.0)	125.3(126.0)	(-0.033)	-0.351(-0.343)	0.1	
4/21/2017	Spare	49.45(50.0)			99.5		7.15	10.09		0.4(0.0)	125.6(126.0)	(-0.029)	-0.342(-0.339)	0.4	
5/19/2017	PR2	50.2(50.0)			94.6	98.8	7.03	9.98		0.0(0.0)	125.6(126.0)	(-0.053)	-0.362(-0.363)	0.2	
6/20/2017	Spare	49.2(50.0)			98.3		7.1	10.03		0	-126	(-0.014)	-0.329(-0.324)		
7/21/2017	PR2	48.0(50.0)			104.4		6.97	9.88		0.2(0.0)	125.0(126.0)	-0.018	-0.294(-0.292)	0.3	
8/15/2017	LPL2	48.1(50.0)			100	105.7	7.1	9.9		0.3(0.0)	124.7(126.0)	(-0.018)	-0.329(-0.328)	-0.1	
9/19/2017	PR2	48.0(50.0)			99.2		7.01	10.01		0.0(0.0)	122.9(126.0)	(-0.0050)	-0.312(-0.315)	0	
10/18/2017	LPL2	49.0(50.0)			98.2		7.1	10.04		0.3(0.0)	125.8(126.0)	-0.003	-0.314(-0.307)	0	
11/15/2017	PR2	51.0(50.0)			100.2		7.02	9.99		0.6(0.0)	128.6(126.0)	-0.024	-0.323(-0.286)	0.1	
12/14/2017	LPL2	18.5(50.0)			38.7		7.02	9.35		0.9(0.0)	186.2(126.0)	-0.044	-0.271(-0.266)	-0.2	

South Bay

Deploy Date	Deploy Time	Retrieve Date	Retrieve Tim	Sonde M	pH Model	rpDO Mod	roxDO Mo	Turb Mod	Cond Mod	Chloro Mc	EXO Model Number					
12/14/2016	13:15	1/26/2017	13:00													
1/26/2017	13:15	2/23/2017	12:30	6600EDS'	6561		6150	6136	6560	6025						
2/23/2017	12:45	3/29/2017	13:45	6600EDS'	6561		6150	6136	6560	6025						
3/29/2017	14:00	4/21/2017	9:45	6600EDS'	6561		6150	6136	6560	6025						
4/21/2017	10:00	5/19/2017	8:30	6600EDS'	6561		6150	6136	6560	6025						
5/19/2017	8:45	6/20/2017	9:30	6600EDS'	6561		6150	6136	6560	6025						
6/20/2017	9:45	7/21/2017	10:15	6600EDS'	6561		6150	6136	6560	6025						
7/21/2017	10:30	8/15/2017	6:45	6600EDS'	6561		6150	6136	6560	6025						
8/15/2017	7:00	9/19/2017	12:00	6600EDS'	6561		6150	6136	6560	6025						
9/19/2017	12:15	10/18/2017	12:45	6600EDS'	6561		6150	6136	6560	6025						
10/18/2017	13:00	11/15/2017	11:30	6600EDS'	6561		6150	6136	6560	6025						
11/15/2017	11:45	12/14/2017	11:45	6600EDS'	6561		6150	6136	6560	6025						
12/14/2017	12:00	1/17/2018	13:30	6600EDS'	6561		6150	6136	6560	6025						

Deploy Date	Sonde Nickname	SpCond	RPDO1	RPDO2	ROXDO1	ROXDO2	pH7	pH10	pH4	Turb	Turb	Depth	Level	CHL(0)	CHL(118)
1/26/2017	SB2	48.5(50.0)			100.8		6.86	9.87		0.0(0.0)	139.4(126.0)	-0.069	-0.319(-0.31)	0.4	
2/23/2017	SB3	48.6(50.0)			97.9		7.43	10.21		0.5(0.0)	129.2(126.0)	(-0.0080)	-0.391(-0.387)	0	
3/29/2017	SB2	48.4(50.0)			99.7		6.81	9.8		0.0(0.0)	124.8(126.0)	(-0.033)	-0.403(-0.412)	0	
4/21/2017	SB3	48.95(50.0)			99		7.12	10.11		0.4(0.0)	125.0(126.0)	(-0.029)	-0.409(-0.408)		
5/19/2017	SB2	49.47(50.0)			97.2		7.15	10.1		0.3(0.0)	126.0(126.0)	(-0.052)	-0.43(-0.431)	0.1	
6/20/2017	SB3	48.8(50.0)			98.4		7.06	10.03		0.9(0.0)	128.8(126.0)	(-0.015)	-0.399(-0.394)		
7/21/2017	SB2	48.75(50.0)			98.7		7.04	9.99		0.1(0.0)	127.0(126.0)	-0.018	-0.36(-0.361)	0.1	
8/15/2017	SB3	49.0(50.0)			101.1		7.08	9.97		1.0(0.0)	126.5(126.0)	(-0.029)	-0.404(-0.408)		
9/19/2017	SB2	50.01(50.0)			98		7.07	10.06		-0.2(0.0)	122.9(126.0)	(-0.0080)	-0.388(-0.387)		
10/18/2017	SB3	48.25(50.0)			101.8		7.15	10.09		0.4(0.0)	126.0(126.0)	-0.003	-0.376(-0.376)		
11/15/2017	SB2	50.7(50.0)			101.9		7.13	10.05		0.4(0.0)	128.5(126.0)	-0.024	-0.353(-0.355)		
12/14/2017	SB3	49.0(50.0)			100.9		7.04	10		1.6(0.0)	125.5(126.0)	-0.052	-0.333(-0.327)	-0.2	

14) Other remarks/notes –

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for "not a number" and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

Precipitation and other events

1/5 - 1/9 rain

1/11 rain

1/12 - 1/14 rain

1/18 - 1/24 rain

2/1 rain

2/7 rain

2/11 – 2/12 rain

2/17-2/18 rain

2/26-2/27 rain

3/1 **severe sewage spill – millions of gallons**

3/14 rain

3/22 rain

4/18 flows into US from groundwater dewatering activities in Mexico that exceed the capacity of pump station.

4/22 – 4/25 sprinkle

5/21 @1500 gallons wastewater spilled to the Tijuana River.

5/22 approximately 400,000 gallons of wastewater flow registered 1315 to 1415 hours

5/26 flow in the Tijuana River into the US from 2130 hours to 2215 hours. Approximately 335,000 gallons.

5/27 – 5/29 rain

Three separate overflows caused by river flow exceeding the pump intake capacity of 1300 lps:
6/9 @2215 to 2245 - 42,800 gallons
6/10 @2045 to 0045 - 161,670 gallons
6/12 @0015 to 0145 - 66,570 gallons

6/20 @ 1600 - sewage spill - flow is approximately 0.2 cfs (90 gpm) as of 1600 hours.

6/27 large spill - flow estimated at 36 cfs or 23 mgd. First observed at 0730 hours. Total flow reaching the Tijuana River is estimated at 5.5 million gallons.

7/24 rain

8/1 rain

8/7 @2115 to 2400 flow in the Tijuana River into the US – 0.076 million gallons of treated groundwater

8/17 @0015 to 0245 flow in the Tijuana River into the US - 0.121 million gallons

9/4 rain

9/9 @2115 to 9/10 @0730 flow in the Tijuana River into the US - approximately 3.9 million gallons due to rain on the upper watershed

9/12 @2345 to 13/9 @0100 flow in the Tijuana River into the US - approximately 192,000 gallons

9/20 @0345 to 0430 flow in the Tijuana River into the US - approximately 38,000 gallons

10/6@2145 to 10/7 @0500 flow in the Tijuana River into the US - approximately 820,000 gallons

10/12 - @2300 to 2400 flow in the Tijuana River into the US - approximately 80,800 gallons

10/19 - @0615 to 0830 flow in the Tijuana River into the US - approximately 1 million gallons – due to a broken aqueduct, water appeared clean according to report

10/20 rain

10/22 @0115 to 0400 flow in the Tijuana River into the US - approximately 228,000 gallons due to an overflow of a water storage tank.

11/7@1600 to 11/9 @1650 flow in the Tijuana River into the US due to precipitation and runoff.

11/7-11/8 rain

12/11@0245 to 0430 flow in the Tijuana River into the US - approximately 220,000 gallons - due to windblown trash that clogged the pump station system in the Mexico side of the border.

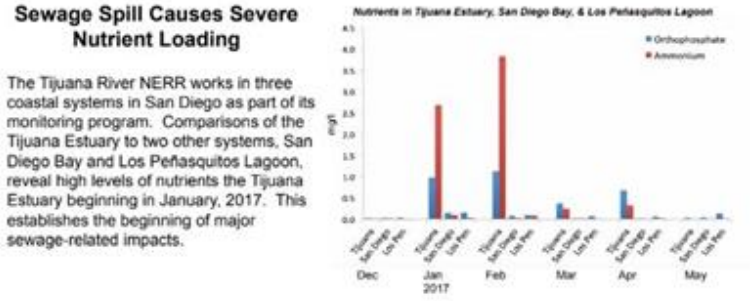
12/20 rain

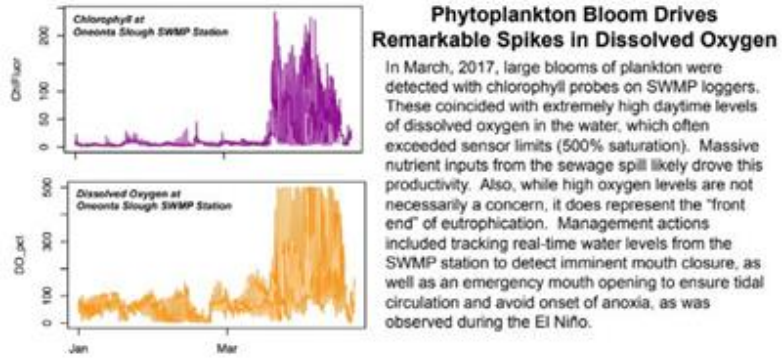
Site Specific Issues:

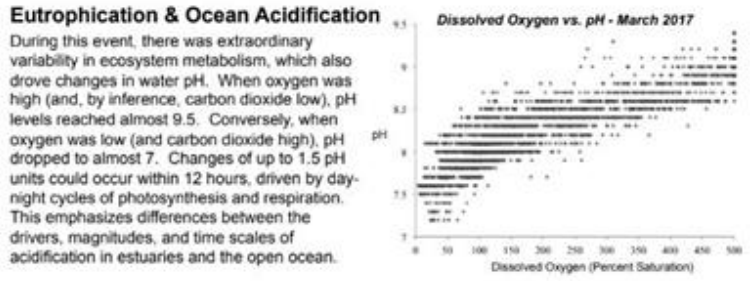
1/1 to 1/26 – South Bay (SB) chlorophyll readings were rejected; it had anomalous spikes and negative readings. The prior deployment with the same probe had same problem. However, the probe was just back from maintenance at YSI and it post checked fine. It was recorded moderate biofouling, heavy amount of mud inside the guard and sediment close to LED. No other data seems to be affected.

1/26 to 2/1 South Bay (SB) and Pond Restored (PR) specific conductivity/salinity readings were exceptionally high. Since these sites are located by salt evaporation ponds and presented similar readings in approximately same period, it seems that it was a real event. However, at SB, some readings went out of range and therefore were rejected.

A sewage spill caused large blooms of plankton seen in the Chlorophyll data as well as in high DO readings. This sewage spill also impacted pH readings during the period from March to May. The post below details the events seen and their impacts.







4/17 – 4/21 **(approximately) river mouth closure – affecting the BR and OS sites. Mouth was opened mechanically on 4/21.**

8/15 South Bay (SB) is missing chlorophyll data due to probe malfunction. Spare probes were at YSI repair center for maintenance.

12/5 Missing data from 11/30 @1315 to 12/6 @1545 - As of December 5, 2017 OS sonde was resurveyed after deeply cleaning logger holder and switching from YSI 6-series sondes to YSI EXO2. The new elevation is .295m and new deployment started on 12/6 @1600

12/12 Missing data from 12/12 @1430 to 12/13 @1245 - As of December 12, 2017 BR sonde was resurveyed after deeply cleaning logger holder and switching from YSI 6-series sondes to YSI EXO2. The new elevation is -.056m and new deployment started on 12/13 @1300.

Both BR and OS are no longer recording chlorophyll data.