**Mission Aransas (MAR) NERR Water Quality Metadata**

**January – December 2020**

**Latest Update: 04/26/2022**

**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 with Windows 7 or newer operating system. Files are exported from KOR Software as an Excel File (.CSV) and uploaded to the CDMO where they undergo automated primary QAQC; automated depth/level corrections for changes in barometric pressure (cDepth or cLevel parameters); 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, recalculation of cDepth or cLevel parameters, 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. Cammie Hyatt is responsible for data management.

**3) Research objectives:**

Five long-term monitoring stations have been established along the Texas Coast in the Mission-Aransas estuary to collect baseline data on environmental conditions within the bay systems and to continue monitoring the water quality to see how it changes over time. These System Wide Monitoring Program Stations (SWMPs) provide continual monitoring of temperature, salinity, oxygen and other parameters that characterize the water quality of the bays. The primary research objective is to improve the knowledge of the Texas coastal zone ecosystems and to promote public appreciation and support for stewardship of coastal resources.

**4) Research methods:**

YSI EXO 2 data loggers (sondes) are deployed at each site in the Mission-Aransas estuary. The instruments are suspended by a chain that is bolted onto the platform and hangs within a PVC tube (4” schedule 40) that is mounted vertically onto the piling of the station. The deployment tubes have holes cut into the bottom half of the tube to allow for water exchange and a bolt is in the bottom of the tube for the sonde to rest on when it is deployed to ensure vertical control. Sondes are programmed to record water quality parameter measurements every 15 minutes over a 14-30 day period. Parameters measured include Temperature, Specific Conductivity, Salinity, Dissolved Oxygen (DO), Depth, pH, Turbidity, and Chlorophyll.

One data logger is deployed at each SWMP station within the Mission-Aransas estuary. All data are recorded in Central Standard Time. The sites are usually accessed by boat at low tide, but due to the large size of the reserve, this sometimes varies. Data loggers are swapped out every other week except in winter when they are generally swapped once per month. During transport, each sonde is wrapped in a tap water-soaked white towel and placed horizontally in a cooler to protect against jarring. During deployment, the sonde connector is lubed with silicone grease, as needed, and attached to the field cable. The chain is attached to the sonde and then lowered into the PVC tube. The tubes are painted (inside and out) with Trinidad SR anti-fouling paint to discourage growth of aquatic organisms that could block the passage of the sonde inside the tube as well as foul the water on the outside.

During retrieval, the data loggers are again wrapped in damp white towels and placed in a cooler for transport back to the lab. During this time, the sonde is still in unattended mode, collecting post-deployment dissolved oxygen in 100% water-saturated air. Once in the lab, the sensors are inspected for biofouling and then the sondes are placed in a 5-gallon bucket of aerated water until post-deployment calibration checks can be conducted. Before cleaning, the other post-deployment calibration checks are performed to determine if the sensors have drifted during deployment. Sonde cleaning and calibrations of DO, Depth, Conductivity, pH, Turbidity and Chlorophyll are all performed as described in the YSI manual. For Conductivity and Salinity, YSI calibration solution 3169 (50,000 µS/cm) is used. For pH calibrations, RICCA pH 7 (p/n 15515) and pH 10 (p/n 16015) solutions are used. A two-point calibration is used for Turbidity, with 0 NTU (deionized water) and 126 NTU (YSI 6073G). Aransas Bay and Copano East are currently measuring Depth. Copano West and Mesquite Bay have been set-up to measure Level for vertical control. Offset for these calibrations are determined using the Depth/Level Offset Calculator provided on the Deployment Log Interface. For Chlorophyll, deionized water is used as the 0 ug/L standard and 0.625 mg/L Rhodamine dye is used for the second calibration point. After retrieval, the deployment file is uploaded onto a PC and a graph of the data is used to determine the validity of the data during QAQC.

As a quality assurance check, a spare 6600 V2 sonde is used to record all parameters during deployment and retrieval to compare to the data of the retrieved sonde. These readings are collected at the same depth as the sonde, if possible. We also collect readings at the surface and at 0.5 m to determine if there is stratification. In some instances, strong tidal currents (mainly at the Ship Channel site) make it difficult to keep the probe in a vertical position; however, it still provides some useful information for comparison purposes. Cloud cover and wave height observations are also recorded as well as a secchi reading. Data collected from field readings may be obtained by contacting the Data Manager of the Reserve (see Section 1 for contact information).

A Sutron Sat-Link2 transmitter was installed at the Aransas Bay station on 11/15/2006 and transmitted data to the NOAA GOES satellite, NESDIS ID #3B038660, until destroyed by Hurricane Harvey on 08/25/2017. In 2018, the telemetry at the WQ sites was updated with Storm 3 dataloggers equipped with GOES satellite transmitters. Copano East, Copano West, and Mesquite Bay were installed on 08/03/2018 with NESDIS ID #3B009CCA, #3B00A950, and #3B00BA26, respectively. Aransas Bay was installed on 03/27/2019 after the station was rebuilt. 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 [www.nerrsdata.org](http://www.nerrsdata.org).

|  |  |
| --- | --- |
| Site Name | Copano West, Mesquite Bay |
| Site infrastructure description | Sonde deployment tube is attached to a wooden platform that has 50’ pilings that are embedded ~ 30’ into the bottom of the bay for stability |
| Surveying equipment | *(model, specs, etc.)* |
| Survey monument used |  |
| Survey occupation date |  |
| Survey occupation duration |  |
| Ellipsoid height |  |
| “Quick Check” marker for deployment tube | *(provide details for this check, should be done at the beginning of each deployment)* |
| “Quick Check” for sonde being deployed at the same location | A ziptie is attached to the chain holding the sonde inside the tube at the point where it is flush with the top of the tube. |
| Annual resurveying | *(include dates of surveys and verifications)* |

**5) Site location and character:**

Mission-Aransas is an estuarine system composed of tertiary, secondary, and primary bays. Mission Bay is the only tertiary bay, and Copano, Port and St. Charles Bay are secondary bays. Mesquite, Aransas and Redfish Bay are primary bays because they are adjacent to the oceanic outlets. There is a salinity gradient which is highest at the Aransas Ship Channel and decreases into the upper bays. EXO 2 dataloggers are deployed 0.5 m off the bottom at all the sites except our deepest site, Ship Channel, where it will be deployed at 1.0 m off the bottom of the channel. The Ship Channel site has not been re-established since Hurricane Harvey destroyed it in 2017; however, construction has begun. The five sites within Mission-Aransas that are being monitored with YSI data loggers are:

1. Aransas Bay (AB): [27º 58’ 47.28 N, 97º 1’ 43.32 W]. This station is located in open water in the middle of Aransas Bay. Tidal range is approximately 1.0 meter, and yearly salinities ranged between 13-38 psu. Yearly temperatures ranged from 14-32 ºC. Aransas Bay is influenced by freshwater inflow from both San Antonio Bay (which has inflow from the San Antonio River and the Guadalupe River) and Copano Bay. The average water depth is 3.0 meters and the bottom is composed of soft sediment. The Texas Commission of Environmental Quality (TCEQ) has determined that there are no exceedences for pollutants in Aransas Bay. This station is primarily influenced by the watershed sub-basin in Aransas County with a hydrologic unit code (HUC) of 12100405.
2. Copano East (CE): [28º 7’ 56.28 N, 97º 2’ 3.84 W]. This station is located in open water on the east side of Copano Bay near the Copano Causeway. Tidal range is approximately 1.0 meter, and yearly salinities ranged between 7-33 psu. Yearly temperatures ranged from 12-32 ºC. Copano East is influenced by freshwater inflow from the Aransas River, Mission River, and Copano Creek. The average water depth is 2.5 meters and the bottom is composed of soft sediment. The TCEQ has determined that there are no exceedences for pollutants in Copano East. This station is influenced by three watershed sub-basins in several counties with HUC’s of 12100407, 12100406, and 12100405.
3. Copano West (CW): [28º 5’ 2.76 N, 97º 12’ 3.24 W]. This station is located in open water on the west side of Copano Bay near Bayside. Tidal range is approximately 1.0 meter, and yearly salinities ranged between 15-32 psu. Yearly temperatures ranged from 12-33 ºC. Copano West is primarily influenced by freshwater inflow from the Aransas River (See Table 1 in Section 14). The average water depth is 1.5 meters and the bottom is composed of soft sediment. The TCEQ has determined that there is an exceedence for enterococci bacteria in Copano West. This station is primarily influenced by the watershed sub-basin in San Patricio and Bee County with a HUC of 12100407 (see Figure 1 in Section 14).
4. Ship Channel (SC): [27º 50’ 17.88 N, 97º 3’ 0.0 W]. This station is located on the end of the UTMSI pier. Tidal range is approximately 1.0 meter, and yearly salinities ranged between 27-37 psu. Yearly temperatures ranged from 16-30 ºC. The Aransas Ship Channel is located on the Aransas Pass, which is the primary outlet to the Gulf of Mexico. This pass receives freshwater inflow from several bay systems, including Copano Bay, Aransas Bay, San Antonio Bay, and Corpus Christi Bay. The average water depth is 6.1 meters and the bottom is composed of soft sediment. The TCEQ currently has no exceedences for pollutants in the Aransas Ship Channel. This site is primarily influenced by the watershed sub-basin in Aransas County with a HUC of 12100405.
5. Mesquite Bay (MB): [28° 8’ 18.24 N, 96° 49’ 42.60 W]. This station is located in open water in Mesquite Bay which is within the Aransas National Wildlife Refuge. Tidal range is approximately 1.0 meter, and yearly salinities ranged between 20-34 psu. Yearly temperatures ranged from 11-33 ºC. Mesquite Bay is primarily influenced by freshwater inflow from San Antonio Bay, which has inflow from the San Antonio River and the Guadalupe River. The average water depth is 1.2 m and the bottom is composed of soft sediment. The TCEQ currently has no exceedences for pollutants in Mesquite Bay. The Mesquite SWMP station is influenced by the watershed sub-basin in Refugio and Calhoun County with a HUC of 12100404

SWMP Station Timeline

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Station Code** | **SWMP Status** | **Station Name** | **Location** | **Active Dates** | **Reason Decommissioned** | **Notes** |
| AB | P | Aransas Bay | 27º 58’ 28.56 N 97º 1’ 26.04 W | 04/24/07 – | NA | NA |
| CE | P | Copano East | 28º 7’ 56.28 N 97º 2’ 3.84 W | 04/24/07 – | NA | NA |
| CW | P | Copano West | 28º 5’ 2.76 N 97º 12’ 3.24 W | 07/11/07 – | NA | NA |
| SC | P | Ship Channel | 27º 50’ 17.88 N 97º 3’ 0.0 W | 08/24/07 – 08/28/17 | NA | NA |
| MB | P | Mesquite Bay | 28° 8’ 18.24 N 96° 49’ 42.60 W | 01/10/08 – | NA | NA |
|  |  |  |  |  |  |  |

**6) Data collection period:**

Initial water quality data collection for the Mission Aransas NERR began on 04/24/07 in Aransas and Copano Bays. Copano West collection began on 07/11/07 shortly followed by the Ship Channel on 08/24/07. Mesquite Bay sampling began on 01/10/08. **Due to destruction caused by Hurricane Harvey and its aftermath, water quality data collection is temporarily suspended at the Ship Channel.** EXO 2 datasondes were used at all sites in 2020.

**Aransas Bay**

Deployment Retrieval

Date/Time Date/Time

12/12/2019 08:45 01/23/2020 09:15

01/23/2020 09:30 02/25/2020 08:15

02/25/2020 08:30 03/17/2020 07:45

03/17/2020 08:00 04/07/2020 09:00

04/07/2020 09:15 04/21/2020 07:45

04/21/2020 09:00 05/18/2020 07:15

05/18/2020 07:30 06/16/2020 07:30

06/16/2020 08:00 07/07/2020 07:45

07/07/2020 08:15 07/21/2020 07:45

07/21/2020 08:00 08/04/2020 08:00

08/04/2020 08:15 08/18/2020 07:45

08/18/2020 08:00 09/11/2020 08:30

09/11/2020 09:00 09/30/2020 07:45

09/30/2020 08:00 10/13/2020 08:00

10/13/2020 08:30 11/04/2020 09:00

11/04/2020 09:15 12/08/2020 09:15

12/08/2020 09:30 01/21/2020 08:45

**Copano East**

Deployment Retrieval

Date/Time Date/Time

12/12/2019 11:00 01/23/2020 12:30

01/23/2020 13:00 02/25/2020 10:30

02/25/2020 10:45 03/17/2020 10:00

03/17/2020 10:30 04/07/2020 11:15

04/07/2020 11:30 04/21/2020 11:30

04/21/2020 11:45 05/18/2020 09:30

05/18/2020 09:45 06/16/2020 10:30

06/16/2020 11:00 07/07/2020 10:30

07/07/2020 10:45 07/21/2020 09:30

07/21/2020 09:45 08/04/2020 10:00

08/04/2020 10:15 08/18/2020 09:15

08/18/2020 09:45 09/11/2020 10:45

09/11/2020 11:15 09/30/2020 09:45

09/30/2020 10:15 10/13/2020 10:45

10/13/2020 11:15 11/04/2020 11:00

11/04/2020 11:30 12/08/2020 12:00

12/08/2020 12:15 01/21/2020 12:00

**Copano West**

Deployment Retrieval

Date/Time Date/Time

12/12/2019 10:15 01/23/2020 11:30

01/23/2020 11:45 01/31/2020 14:00 (stopped recording)

02/25/2020 10:15 03/17/2020 09:00

03/17/2020 09:15 04/07/2020 10:30

04/07/2020 10:45 04/21/2020 10:15

04/21/2020 11:00 04/30/2020 07:45 (stopped recording)

05/18/2020 08:45 06/16/2020 09:30

06/16/2020 10:00 07/07/2020 09:15

07/07/2020 09:45 07/21/2020 08:45

07/21/2020 09:00 08/04/2020 09:15\*

08/04/2020 09:30 08/18/2020 08:45

08/18/2020 09:00 09/11/2020 09:45

09/11/2020 10:15 09/30/2020 09:00

09/30/2020 09:15 10/13/2020 09:15

10/13/2020 09:45 11/04/2020 10:15

11/04/2020 10:30 12/08/2020 10:45

12/08/2020 11:45 01/21/2020 10:15

\*Part of these data were recovered via telemetry.

**Mesquite Bay**

Deployment Retrieval

Date/Time Date/Time

12/12/2019 13:00 01/23/2020 13:45

01/23/2020 14:00 02/25/2020 11:30

02/25/2020 11:45 03/17/2020 11:15

03/17/2020 11:45 04/07/2020 12:15

04/07/2020 12:45 04/21/2020 12:45

04/21/2020 13:15 05/18/2020 10:45

05/18/2020 11:00 06/16/2020 11:45

06/16/2020 12:15 07/03/2020 01:45 (stopped recording)

07/07/2020 12:15 07/21/2020 10:30

07/21/2020 10:45 07/30/2020 07:45 (stopped recording)

08/04/2020 11:30 08/18/2020 10:15

08/18/2020 10:30 09/06/2020 01:15 (stopped recording)

09/11/2020 12:30 09/30/2020 11:00

09/30/2020 11:15 10/03/2020 10:15 (stopped recording)

10/13/2020 12:45 11/04/2020 13:15

11/04/2020 13:30 12/08/2020 13:30

12/08/2020 13:45 01/21/2020 13:45

**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 2021.

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](http://www.nerrsdata.org).  Data are available in comma delimited format.

**8) Associated researchers and projects:**

As part of the SWMP long-term monitoring program, MAR NERR also monitors 15-minute meteorological data (air temperature, humidity, barometric pressure, wind speed, wind direction, precipitation, and photosynthetically active radiation) along with monthly grab samples and diel sampling for nutrient data (chlorophyll *a*, orthophosphate, ammonium, and nitrogen and silicate), and total suspended solids which may be correlated with this water quality dataset. These data are available at [www.nerrsdata.org](http://www.nerrsdata.org). Mesozooplankton samples are also collected monthly and these data may be obtained by contacting the Research Coordinator (see Section I).

The MANERR water quality monitoring project has been incorporated into the Texas Coastal Oceanic Observation Network (TCOON).

The following researchers are currently using water quality data recorded at the SWMP stations in addition to collecting water and/or samples for their own projects:

Lisa Campbell, a research scientist from Texas A & M College Station, monitors an *in*-*situ* flowcytometer (FlowCytoBot) to study the phytoplankton at the Ship Channel site in order to detect potential harmful algal blooms (HABs). This work is being conducted in conjunction with Robert Olsen of Woods Hole Oceanographic Institute.

Lindsay Scheef, a post-doc at UTMSI, is using tilt meters to study the currents and water exchange within the bays of the Mission Aransas NERR.

**II. Physical Structure Descriptors**

**9) Sensor specifications:**

MAR NERR uses YSI EXO 2 datasondes at all monitoring stations; however, YSI 6600 V2 datasondes are used to record field readings and have on hand as spares.

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

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 o

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

YSI EXO Sonde:

Parameter: Temperature

Units: Celsius (C)

Sensor Type: CT2 Probe, Thermistor

Model#: 599870

Range: -5 to 50 C

Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .005

Resolution: 0.01 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: CT2 Probe, 4-electrode cell with autoranging

Model#: 599870

Range: 0 to 200 mS/cm

Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm; 100 to 200: +/- 1% of reading

Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity

Units: practical salinity units (psu)/parts per thousand (ppt)

Sensor Type: CT2 probe, Calculated from conductivity and temperature

Range: 0 to 70 psu

Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater

Resolution: 0.01 psu

OR

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Wiped probe; Thermistor

Model#: 599827

Range: -5 to 50 C

Accuracy: ±0.2 C

Resolution: 0.001 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: Wiped probe; 4-electrode cell with autoranging

Model#: 599827

Range: 0 to 100 mS/cm

Accuracy: ±1% of the reading or 0.002 mS/cm, whichever is greater

Resolution: 0.0001 to 0.01 mS/cm (range dependent)

Parameter: Salinity

Units: practical salinity units (psu)/parts per thousand (ppt)

Model#: 599827

Sensor Type: Wiped probe; Calculated from conductivity and temperature

Range: 0 to 70 ppt

Accuracy: ±2% of the reading or 0.2 ppt, whichever is greater

Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation

Sensor Type: Optical probe w/ mechanical cleaning

Model#: 599100-01

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: +/- 5% 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#: 599100-01

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: +/- 5% 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 33 ft (10 m)

Accuracy: +/- 0.013 ft (0.004 m)

Resolution: 0.001 ft (0.001 m)

Parameter: pH

Units: pH units

Sensor Type: Glass combination electrode

Model#: 599701(guarded) or 599702(wiped)

Range: 0 to 14 units

Accuracy: +/- 0.1 units within +/- 10° of calibration temperature, +/- 0.2 units for entire temperature range

Resolution: 0.01 units

Parameter: Turbidity

Units: formazin nephelometric units (FNU)

Sensor Type: Optical, 90 degree scatter

Model#: 599101-01

Range: 0 to 4000 FNU

Accuracy: 0 to 999 FNU: 0.3 FNU or +/-2% of reading (whichever is greater); 1000 to 4000 FNU +/-5% of reading

Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU

Parameter: Chlorophyll

Units: micrograms/Liter

Sensor Type: Optical probe

Model#: 599102-01

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: Sampling site code: Station code:

Aransas Bay AB marabwq

Copano East CE marcewq

Copano West CW marcwwq

Ship Channel SC marscwq

Mesquite Bay MB marmbwq

**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**:

**Aransas Bay**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Deploy Date | SpCond | ROXDO1 | ROXDO2 | pH7 | pH10 | Turb | Turb |
|  | 50 mS | % | % |  |  | 0 FNU | 124 FNU |
| 1/23/2020 | 48.13 | 99.5 | 99.5 | 7.03 | 9.98 | 2.61 | 124.30 |
| 2/25/2020 | 47.94 | 99.6 | 99.7 | 6.95 | 10.00 | 0.15 | 122.64 |
| 3/17/2020 | 48.94 | 100.0 | 100.1 | 7.07 | 10.05 | -0.21 | 123.39 |
| 4/7/2020 | 48.80 | 99.2 | 99.2 | 7.02 | 9.97 | -0.01 | 123.13 |
| 4/21/2020 | 49.00 | 99.2 | 99.2 | 7.06 | 10.00 | 0.41 | 123.20 |
| 5/18/2020 | 49.04 | 99.5 | 99.6 | 6.65 | 6.65 | 0.50 | 122.70 |
| 6/16/2020 | 49.41 | 99.6 | 99.7 | 6.90 | 9.89 | 0.16 | 127.50 |
| 7/7/2020 | 49.00 | 99.5 | 99.4 | 7.14 | 10.07 | -0.04 | 122.20 |
| 7/21/2020 | 48.53 | 99.9 | 99.8 | 7.21 | 10.24 | 0.10 | 121.25 |
| 8/4/2020 | 49.16 | 100.0 | 99.9 | 6.94 | 10.00 | 0.54 | 121.57 |
| 8/18/2020 | 48.64 | 100.0 | 100.1 | 7.02 | 10.10 | 0.08 | 124.20 |
| 9/11/2020 | 48.89 | 99.9 | 100.2 | 6.93 | 9.92 | 0.27 | 123.50 |
| 9/30/2020 | 49.20 | 100.0 | 100.1 | 7.11 | 9.96 | 0.00 | 123.64 |
| 10/13/2020 | 46.59 | 104.5 | 104.2 | 6.98 | 9.92 | 0.04 | 120.70 |
| 11/4/2020 | 49.10 | 103.6 | 103.5 | 6.99 | 9.98 | -5.76 | 124.17 |
| 12/8/2020 | 48.67 | 100.5 | 100.5 | 6.95 | 9.93 | 0.15 | 121.86 |

**Copano East**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Deploy Date | SpCond | ROXDO1 | ROXDO2 | pH7 | pH10 | Turb | Turb |
|  | 50 mS | % | % |  |  | 0 FNU | 124 FNU |
| 1/23/2020 | 48.75 | 99.7 | 99.5 | 7.03 | 10.02 | 0.38 | 124.95 |
| 2/25/2020 | 48.94 | 99.5 | 99.5 | 7.15 | 10.06 | -0.18 | 125.80 |
| 3/17/2020 | 48.48 | 99.1 | 99.1 | 7.02 | 10.00 | 0.04 | 122.97 |
| 4/7/2020 | 49.59 | 99.1 | 99.0 | 6.97 | 9.97 | 0.03 | 123.63 |
| 4/21/2020 | 48.91 | 98.5 | 98.5 | 7.07 | 10.03 | 0.13 | 123.65 |
| 5/18/2020 | 48.76 | 101.2 | 101.1 | 7.02 | 9.98 | 0.16 | 123.07 |
| 6/16/2020 | 49.56 | 99.0 | 99.0 | 6.78 | 9.80 | -0.02 | 127.00 |
| 7/7/2020 | 49.26 | 99.2 | 99.2 | 7.03 | 10.00 | 0.03 | 123.80 |
| 7/21/2020 | 48.43 | 99.2 | 99.2 | 7.00 | 9.96 | -0.28 | 121.94 |
| 8/4/2020 | 49.32 | 99.1 | 98.9 | 7.04 | 9.98 | 0.20 | 122.46 |
| 8/18/2020 | 49.01 | 98.7 | 98.6 | 6.95 | 10.04 | -0.17 | 121.96 |
| 9/11/2020 | 47.81 | 99.7 | 99.8 | 6.99 | 9.96 | 0.25 | 122.80 |
| 9/30/2020 | 50.08 | 100.5 | 100.0 | 6.98 | 9.99 | 0.04 | 125.71 |
| 10/13/2020 | 46.55 | 103.5 | 103.5 | 6.98 | 9.97 | 0.20 | 121.30 |
| 11/4/2020 | 51.57 | 103.8 | 103.7 | 7.43 | 10.37 | -4.18 | 130.95 |
| 12/8/2020 | 49.36 | 101.5 | 101.5 | 6.98 | 9.91 | 0.17 | 121.90 |

**Copano West**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Deploy Date | SpCond | ROXDO1 | ROXDO2 | pH7 | pH10 | Turb | Turb |
|  | 50 mS | % | % |  |  | 0 FNU | 124 FNU |
| 1/23/2020 | 48.17 | 90.2 |  | 7.17 | 10.13 | 0.21 | 121.77 |
| 2/25/2020 | 49.24 | 99.8 | 99.8 | 7.37 | 10.31 | -0.16 | 124.29 |
| 3/17/2020 | 48.93 | 99.4 | 99.3 | 7.16 | 10.06 | -0.05 | 123.57 |
| 4/7/2020 | 49.50 | 99.1 | 99.1 | 7.01 | 10.03 | -0.06 | 123.09 |
| 4/21/2020 | 48.77 |  |  | 7.04 | 9.98 | 0.18 | 125.16 |
| 5/18/2020 |  | 98.3 | 98.6 | 7.27 | 10.06 | 0.03 | 123.10 |
| 6/16/2020 | 50.33 | 99.8 | 99.9 | 7.06 | 9.95 | 0.15 | 128.05 |
| 7/7/2020 | 49.82 | 99.9 | 99.9 | 7.04 | 9.99 | 0.26 | 122.98 |
| 7/21/2020 | 48.53 | 99.4 |  | 7.00 | 10.00 | 0.10 | 119.43 |
| 8/4/2020 | 48.61 | 99.1 | 99.1 | 7.03 | 9.99 | 0.02 | 121.65 |
| 8/18/2020 | 48.18 | 51.7 | 49.4 | 7.05 | 10.02 | 0.70 | 117.50 |
| 9/11/2020 | 49.10 | 99.8 | 99.6 | 6.95 | 9.87 | 0.14 | 122.68 |
| 9/30/2020 | 48.65 | 99.1 | 99.3 | 7.04 | 9.94 | 0.02 | 122.71 |
| 10/13/2020 | 46.62 | 105.6 | 105.5 | 6.95 | 9.94 | 0.07 | 119.97 |
| 11/4/2020 | 48.63 | 101.5 | 100.7 | 6.95 | 9.92 | -2.19 | 122.34 |
| 12/8/2020 | 48.57 | 99.3 | 99.6 | 7.01 | 9.90 | 0.06 | 127.33 |

**Mesquite Bay**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Deploy Date | SpCond | ROXDO1 | ROXDO2 | pH7 | pH10 | Turb | Turb |
|  | 50 mS | % | % |  |  | 0 FNU | 124 FNU |
| 1/23/2020 | 48.09 | 99.1 | 99.0 | 7.07 | 10.06 | 0.45 | 125.00 |
| 2/25/2020 | 48.54 | 99.9 | 99.9 | 6.99 | 10.00 | -0.03 | 122.80 |
| 3/17/2020 | 49.65 | 99.1 | 99.1 | 7.08 | 10.07 | 0.10 | 123.61 |
| 4/7/2020 | 48.30 | 99.3 | 99.3 | 7.06 | 9.99 | 0.03 | 123.05 |
| 4/21/2020 | 3.98 | 99.2 | 99.0 | 7.25 | 10.16 | 0.11 | 123.95 |
| 5/18/2020 | 48.25 | 100.0 | 99.9 | 7.04 | 9.94 | 0.16 | 117.24 |
| 6/16/2020 |  | 99.7 |  | 8.36 | 10.97 | 0.23 | 126.91 |
| 7/7/2020 | 49.51 | 100.6 | 100.6 | 6.97 | 9.96 | 0.04 | 119.41 |
| 7/21/2020 | 1.47 |  |  | 7.49 | 10.23 | -0.19 | 123.11 |
| 8/4/2020 | 49.23 | 99.1 | 99.0 | 7.03 | 9.99 | 0.02 | 122.81 |
| 8/18/2020 | 22.13 |  |  | 7.06 | 10.12 | -0.05 | 133.83 |
| 9/11/2020 | 49.20 | 87.3 | 88.7 | 6.56 | 6.56 | 0.46 | 121.50 |
| 9/30/2020 | 48.12 |  |  | 7.05 | 9.98 | 0.04 | 125.80 |
| 10/13/2020 | 46.62 | 102.1 | 102.1 | 8.23 | 12.80 | 0.00 | 120.70 |
| 11/4/2020 | 47.44 | 100.5 | 100.3 | 6.96 | 9.92 | -0.12 | 123.27 |
| 12/8/2020 | 48.03 | 100.6 | 100.6 | 7.10 | 9.97 | 0.35 | 118.43 |

\*Note: pH post-deployment readings are temperature dependent and minor variations are expected as a result.

**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.

Depth/Level readings may change abruptly due to large barges traveling back and forth through the Intercoastal Canal (AB) or across the bays (CE, CW, MB), displacing water near the station. Readings at the Ship Channel are most subject to abrupt changes due to large ships coming through the channel.

In general, salinity changes within 2 ppt in a 15 minute interval are accepted as being good since the water can sometimes become stratified; however, if the difference is greater than 2 ppt between 15 minute samplings, data are flagged suspect.

**Aransas Bay**

There were many instances where the salinity dropped > 2 psu within a 15-minute interval and may possibly be due to groundwater input. These data were flagged suspect since we have no way of verifying that input. 5/6/20 09:15; 5/27/20 07:45; 5/29/20 14:45; 6/7/20 15:45, 22:15, 23:15; 6/9/20 07:30-08:30, 11:00, 14:30, 16:45-17:00; 6/10/20 01:30; 6/15/20 22:30; 6/16/20 4:15; 6/19/20 03:45; 6/25/20 00:00, 10:30, 11:00; 6/26/20 01:45, 05:00, 06:15-06:30, 08:15, 16:15; 6/27/20 02:00, 02:30; 6/29/20 23:15; 6/30/20 01:00, 13:15; 7/1/20 12:00; 7/2/20 07:30, 10:15, 10:45, 12:30, 17:15, 17:45, 19:45-20:00, 22:00, 23:00; 7/3/20 00:00, 00:45, 13:15, 15:30, 17:00, 18:15, 19:15, 19:45, 22:00; 7/4/20 13:15, 14:45-15:00, 18:00, 20:30, 21:15, 22:30; 7/5/20 01:45, 03:15, 06:00, 15:00, 16:15, 17:45, 18:30, 23:00; 7/6/20 14:45, 16:30-16:45, 23:00-23:15; 7/7/20 00:30; 8/13/20 04:15, 04:45, 05:15; 8/16/20 14:45, 20:15, 22:15; 8/18/20 04:15; 8/26/20 02:30; 9/24/20 20:00; 9/27/20 15:15; 10/20/20 17:15; 10/22/20 16:15, 22:45; 10/23/20 13:00; 10/24/20 15:00, 19:00; 10/25/20 02:45, 04:30, 05:00; 10/26/20 23:30; 10/27/20 01:30, 06:15; 11/22/20 18:30; 11/24/20 06:15; 11/30/20 03:30; 12/01/20 08:00

Salinity drops that were > 15 psu within a 15-minute interval and although they may possibly be due to groundwater input, these data were rejected. 5/10/20 11:00; 5/27/20 21:00; 5/28/20 19:45; 5/29/20 13:45; 6/3/20 07:30; 6/4/20 18:15; 6//7/20 20:30; 6/9/20 11:45, 12:30, 13:00, 15:15-15:30, 18:15-18:30, 20:45, 22:00; 12/07/20 11:30

For the following deployments, the Chlorophyll sensor was calibrated using DI water only and not a 2-point calibration with rhodamine standard; therefore, those Chlorophyll data are flagged <1> SIC CSM as per CDMO guidelines.

03/17/2020 08:00 – 04/07/2020 09:00

04/07/2020 09:15 – 04/21/2020 07:45

04/21/2020 09:00 – 05/18/2020 07:15

05/18/2020 07:30 – 06/16/2020 07:30

07/21/2020 08:00 – 08/04/2020 08:00

08/18/2020 08:00 – 09/11/2020 08:30

09/11/2020 09:00 – 09/30/2020 07:45

09/30/2020 08:00 – 10/13/2020 08:00

10/13/2020 08:30 – 11/04/2020 09:00

04/07/2020 09:15 – 04/21/2020 07:45 Data were collected at the wrong Depth; all Depth data were flagged suspect 1 GSM CWD and the other parameters were left as <0> since they don’t appear to be affected.

05/18/2020 07:30 – 06/16/2020 07:30 Raw file was broken into multiple segments with extra headers which had to be removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file.

09/25/2020 09:45 – 09/27/2020 11 :15 Tropical Storm Beta

10/13/2020 08:30 – 11/04/2020 09:00 Depth stopped recording 10/13/2020 08:30 – 10/31/20 02:15 and the file was broken up with many extra headers which were removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file.

12/08/2020 09:30 – 12/31/2020 23:45 Raw file was broken into multiple segments with extra headers which had to be removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file.

**Copano East**

There were many instances where the salinity dropped > 2 psu within a 15-minute interval and may possibly be due to groundwater input. These data were flagged suspect since we have no way of verifying that input. 3/15/20 03:00; 4/06/20 09:45, 17:30; 4/07/20 06:00, 06:30, 08:45, 09:45, 10:45; 4/10/20 06:30; 4/30/20 20:00; 5/03/20 11:15; 5/07/20 08:15; 5/17/20 17:15; 5/23/20 02:45, 23:15; 5/24/20 03:15, 04:15, 17:00, 18:15; 5/25/20 22:30; 5/26/20 21:45; 5/28/20 05:30, 07:00, 08:15, 09:15; 5/29/20 11:15; 5/31/20 09:15, 15:15; 6/01/20 17:15; 6/02/20 06:30; 6/05/20 07:45, 08:00, 11:00; 6/06/20 00:15; 6/08/20 12:15, 22:15; 6/09/20 01:15-01:45, 02:30, 03:30, 05:00, 07:30; 6/10/20 03:30, 06:15; 16:45; 6/11/20 12:00-12:15, 13:00; 6/12/20 09:45; 6/13/20 16:15, 17:00; 6/15/20 09:00; 6/17/20 16:45; 6/18/20 13:00-13:15, 15:30, 21:15, 22:15; 6/19/20 02:30-02:45, 11:15, 15:30-15:45; 6/20/20 00:30, 01:30, 03:15, 05:45, 09:00, 10:45, 11:30, 21:15-21:30, 23:45; 6/21/20 00:15, 03;00-03:15, 05:00, 06:30, 08:00-08:15, 11:45, 12:45, 13:45, 20:15; 6/22/20 01:45, 03:30, 06:00, 12:00-12:30, 14:00-14:15, 15:00-15:15, 16:45, 23:00; 6/23/20 01:00, 01:45, 04:15, 04:45, 05:45, 06:30-06:45, 07:15, 07:45, 08:45-09:15, 13:45, 17:15, 18:15-18:30, 19:15; 06/24/20 01:30, 03:15, 05:30, 10:00, 11:15, 12:00, 14:30, 18:30, 19:00, 21:45; 6/25/20 02:45, 03:30,13:00, 16:00-16:15, 18:15, 20:15, 22:15; 6/26/20 00:45-01:00, 03:15, 04:15, 09:30-09:45, 18:15, 19:00, 23:30; 6/27/20 06:30-06:45, 08:30-08:45, 11:15-11:30, 12:00, 15:30-15;45, 16:45-17:00, 19:15, 23:45; 6/28/20 06:30, 07:30, 08:15, 09:30, 10:45; 06/29/20 07:15, 07:45, 08:15, 19:45; 6/30/20 05:00, 06:30-06:45, 07:30, 15:15, 19:30; 07/01/20 00:45, 03:00, 03:45, 04:15, 07:15, 07:45, 10:45, 12:15-12:45, 13:45, 23:00; 7/2/20 00:00, 10:00, 13:00, 13:45, 16:45; 7/3/20 03:30, 05:00, 05:45, 06:15, 07:30-08:00, 08:30, 09:00-09:15, 11:30, 12:15, 12:45-13:00, 20:30, 22:45; 7/4/20 08:00-08:30, 10:00-10:15, 11:15-11:30, 12:00, 19:15; 7/5/20 04:15, 10:15, 13:30, 16:30, 20:00, 20:45; 7/6/20 00:15, 14:45; 7/7/20 06:00, 10:00; 7/13/20 14:30; 7/14/20 17:00; 7/16/20 15:30; 7/18/20 20:15; 7/19/20 06:30; 7/20/20 19:30; 7/21/20 03:30; 7/23/20 19:00-19:15, 21:15; 7/24/20 13:00; 7/25/20 10:00, 14:45, 22:30; 7/26/20 01:45, 04:45, 17:00, 19:00, 19:45, 20:30, 21:45, 22:15; 7/28/20 10:45, 20:15; 7/29/20 20:00; 7/31/20 17:00, 20:45, 22:30; 8/1/20 13:30; 8/7/20 20:15, 22:00; 8/8/20 04:00, 20:30; 8/9/20 08:45; 8/10/20 08:45; 8/11/20 02:30, 08:30; 8/12/20 21:00, 21:30; 8/13/20 01:00; 8/14/20 02:30, 10:30, 11:45; 8/15/20 00:00, 05:00, 12:30; 8/16/20 08:45, 09:15; 8/17/20 05:00, 06:45, 07:30, 08:00, 11:15, 13:00, 23:45; 8/18/20 00:45, 01:15, 04:00, 05:00; 8/20/20 13:00; 8/21/20 15:30, 20:00; 8/22/20 02:45; 8/23/20 00:45-01:00, 18:45, 20:45-21:00, 21:30; 8/24/20 02:00, 03:15, 18:30; 8/25/20 23:45; 8/26/20 05:30, 12:15; 8/27/20 13:00, 14:30, 22:45, 23:15; 8/28/20 04:15, 07:15, 22:30; 8/29/20 02:00-02:15, 10:15, 15:15; 8/30/20 03:45, 10:30, 11:30-11:45, 16:00, 17:45, 21:15-21:30, 22:45, 23:15; 8/31/20 04:15, 14:45-15:00; 9/1/20 03:15, 04:45-05:00, 06:30, 07:00, 18:30, 19:15; 9/2/20 00:15, 02:45, 04:00, 08:45, 09:30, 11:15, 13:45-14:15, 21:30, 22:15, 23:00; 9/3/20 00:15-00:30, 02:30, 05:15, 06:00, 07:45, 08:15, 12:45, 14:45, 20:45; 9/4/20 01:00, 02:30, 18:00; 9/5/20 01:45, 08:45, 13:45-14:00, 15:30; 9/6/20 00:30, 01:45, 05:30, 12:15; 9/7/20 20:30; 9/8/20 04:00, 06:15, 16:45, 18:30; 9/9/20 09:15, 12:15, 14:45, 18:15, 20:45; 9/10/20 01:45, 05:30-05:45, 15:45, 16:45; 9/11/20 06:00; 9/25/20 01:30; 10/2/20 07:00; 10/3/20 08:30; 10/6/20 23:45; 10/7/20 10:45, 17:15; 10/8/20 22:30; 10/9/20 15:30, 22:15; 10/10/20 09:15-09:30, 13:00, 13:45-14:15; 10/11/20 21:15, 21:45, 23:30; 10/17/20 20:30; 10/20/20 01:00; 10/25/20 19:00; 10/26/20 20:15; 12/13/20 21:30; 12/15/20 23:45; 12/27/20 00:15

Salinity drops that were > 15 psu within a 15-minute interval and although they may possibly be due to groundwater input, these data were rejected. 5/03/20 23:30; 7/18/20 09:15; 10/3/20 09:15; 10/19/20 23:30; 10/20/20 02:45

For the following deployments, the Chlorophyll sensor was calibrated using DI water only and not a 2-point calibration with rhodamine standard; therefore, those Chlorophyll data are flagged <1> SIC CSM as per CDMO guidelines.

03/17/2020 10:30 – 04/07/2020 11:15

04/07/2020 11:30 – 04/21/2020 11:30

04/21/2020 11:45 – 05/18/2020 09:30

05/18/2020 09:45 – 06/16/2020 10:30

07/21/2020 09:45 – 08/04/2020 10:00

08/18/2020 09:45 – 09/11/2020 10:45

09/11/2020 11:15 – 09/30/2020 09:45

09/30/2020 10:15 – 10/13/2020 10:45

10/13/2020 11:15 – 11/04/2020 11:00

02/25/2020 10:45 – 03/08/2020 21:30 Sonde was hung up within the tube, but finally went to correct Depth after ~ 2 weeks. Kelley will install a zip tie to the chain at the top of the tube to indicate that the sonde is at Depth so that next time they can check that to make sure it is deployed correctly. Depth data were flagged suspect 1 GSM CWD during that time; all other parameters were left as <0> since they do not appear to be affected.

03/17/2020 10:30 – 04/07/2020 11:15 Sonde did not go to correct Depth. Depth data were flagged suspect 1 GSM CWD; all other parameters were left as <0> since they do not appear to be affected; however, there was a Turbidity spike which was rejected -3 GSM CWD.

04/21/2020 11:45 – 05/18/2020 09:30 Data were collected at wrong Depth; Depth data were flagged suspect 1 GSM CWD and all other parameters lefts as <0> since they do not appear to be affected; however, there were several Turbidity spikes which were rejected -3 GSM CWD.

05/18/2020 09:45 – 06/02/2020 12:45 Sonde was hung up within the tube, but finally went to correct Depth after ~ 2 weeks. Depth data were flagged suspect 1 GSM CWD during this time; all other parameters left as <0> since they do not appear to have been affected; however, there were several Turbidity spikes which were rejected -3 GSM CWD.

06/16/2020 11:00 – 07/07/2020 10:30 At first glance, the sonde appears to be stuck in the tube; however, subsequent deployments with this same sonde (R2D2) are also not at the correct Depth. Furthermore, looking back at data from the previous quarter, it was happening then. Depth data were flagged suspect 1 GSM CWD and all other parameters were left as <0> since they do not appear to have been affected. There was an occasional Turbidity or Chlorophyll spike which were flagged suspect 1 GSM CWD and have nothing to do with the Depth issue.

07/21/2020 09:45 – 08/04/2020 10:00 Data appear to be collected at the wrong Depth; however, this is the same sonde (R2D2) that was having Depth issues. Depth data were flagged suspect 1 GSM CWD and all other data were left as <0> since they appeared to be unaffected; however, there was a Turbidity spike rejected -3 GSM CWD.

07/25/2020 13:15 – 07/28/2020 18:30 There were higher than normal tides during this time due to storm surge effects from Hurricane Hanna.

08/04/2020 10:15 – 08/18/2020 09:15 Depth was working until the sonde was deployed and then it just stopped recording, so Depth data are missing during this time. All other parameters were left as <0> since they appear to be normal except Chlorophyll which appears to be suppressed compared to deployments both before and after this one. All Chlorophyll data were flagged suspect 1 CSM. This is a different sonde (C3PO) than the original one with which we’ve had Depth issues.

08/18/2020 09:45 – 09/11/2020 10:45 Depth data appear to have been collected at the wrong Depth; however, this is the sonde (R2D2) that has been giving us Depth issues and one of the pins in the connector broke off during retrieval. This has most likely been the issue all along and the sonde has been sent to YSI for repair. All Depth data were flagged suspect 1 GSM CWD and all other data were left as <0> since they do not appear to have been affected. There were several Turbidty spikes which were flagged 1/-3 GSM CWD and have nothing to do with the Depth issue.

09/11/2020 11:15 – 09/30/2020 09:45 Timestamp had to be corrected from UTC to CST by subtracting 6 hours from UTC; therefore, raw .CSV file uploaded to the CDMO will not match the .BIN file. This happened since a new sonde was deployed and the time was not verified before deploying. Tropical Storm Beta was in the area between 9/17/2020 and 9/25/2020, so tides were a bit higher during this time.

11/04/2020 11:30 – 12/08/2020 12:00 The sonde appears to be stuck in the tube during this time and Depth data were flagged suspect 1 GSM CWD. The other parameters were left as <0> except for Turbidity which was flagged 0/1/-3. SpCond and Salinity were flagged suspect 1 GSM CWD since readings were higher than deployments before and after this one. The cell constant was reading slightly higher than normal, but still within the acceptable range.

**Copano West**

There were several instances where the salinity dropped > 2 psu within a 15-minute interval and may possibly be due to groundwater input. These data were flagged suspect since we have no way of verifying that input. 4/01/20 10:00; 5/21/20 02:15, 17:45; 5/24/20 19:30, 21:00; 6/20/20 00:00; 6/22/20 13:45, 15:30, 17:30; 7/2/20 02:30; 7/3/20 08:45, 12:30; 7/8/20 11:00; 7/13/20 21:45; 7/15/20 11:00; 7/16/20 01:15; 7/31/20 00:30; 8/1/20 13:15; 8/9/20 20:30, 22:00; 09/13/20 20:30; 09/18/20 01:15; 09/23/20 11:30; 09/24/20 21:15; 09/25/20 22:30; 10/14/20 19:00, 20:00; 10/15/20 21:45; 10/16/20 20:30, 21:30; 10/17/20 04:30; 10/18/20 0:00; 10/19/20 15:00; 10/20/20 00:15; 10/21/20 00:00, 01:00, 19:00, 22:15; 10/22/20 00:15, 00:45, 04:45, 08:00; 10/23/20 08:00, 16:30; 10/26/20 03:30; 10/27/20 11:15; 10/29/20 17:45; 11/11/20 19:30; 11/12/20 16:45; 11/13/20 09:30, 14:45; 11/16/20 00:15, 22:30-22:45; 11/18/20 20:15-20:30, 21:15; 11/22/20 09:45, 10:45, 16:15-16:30; 11/23/20 04:00-04:15; 11/24/20 13:45, 17:30, 23:30; 11/28/20 12:45

For the following deployments, the Chlorophyll sensor was calibrated using DI water only and not a 2-point calibration with rhodamine standard; therefore, those Chlorophyll data are flagged <1> SIC CSM as per CDMO guidelines.

03/17/2020 09:15 – 04/07/2020 10:30

04/07/2020 10:45 – 04/21/2020 10:15

04/21/2020 11:00 – 04/30/2020 07:45

05/18/2020 08:45 – 06/16/2020 09:30

07/21/2020 09:00 – 08/04/2020 09:15

08/18/2020 09:00 – 09/11/2020 09:45

09/11/2020 10:15 – 09/30/2020 09:00

09/30/2020 09:15 – 10/13/2020 09:15

10/13/2020 09:45 – 11/04/2020 10:15

01/31/2020 14:00 – 02/25/2020 10:00 Data are missing during this time because something got messed up while Kelley was troubleshooting the telemetry and didn’t realize it until the next deployment.

03/17/2020 09:15 – 04/02/2020 17:30 Data were collected at wrong depth; Level data were flagged rejected -3 SPC CWD and all other parameters left as <0> GSM CWD since they do not appear to be affected; however, there were a couple of Turbidity spikes that were flagged 1/-3 that had nothing to do with Level.

04/02/2020 17:45 – 04/07/2020 10:30 Level readings during post-cal were off by 0.578 m; therefore, readings during this time were flagged suspect 1 SPC CSM. There was moderate fouling on the sonde, but I think this was the beginning of the issues that we had with depth while using Megatron.

04/21/2020 11:00 – 04/27/2020 08:30 Data collected at wrong depth for almost a week before going to correct depth; Level data were flagged suspect 1 GSM CWD and all other parameters left as 0 since they do not appear to be affected; however, there were a couple of Turbidity spikes that were flagged 1/-3 that had nothing to do with Level.

04/30/2020 08:00 – 05/18/2020 08:30 Data are missing during this time due to a possible instrument malfunction since there was still plenty of power in the batteries.

05/18/2020 08:45 – 05/28/2020 00:15 Data were collected at the wrong depth during this time. Level data were flagged suspect 1 GSM CWD and all other parameters left as <0> since they do not appear to have been affected. File was broken into multiple segments with extra headers that had to be removed prior to upload; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file.

05/28/2020 00:30 – 06/16/2020 09:30 C/T sensor stopped working for no apparent reason. All parameters except Turbidity were rejected.

07/25/2020 06:30 – 07/28/2020 19:15 There were higher than normal tides during this time due to storm surge effects from Hurricane Hanna.

08/01/2020 14:30 – 08/04/2020 09:15 Data were recovered via telemetry since sonde stopped recording at this time due to SpCond readings that were outside the acceptable range. SpCond and supported parameters (Salinity, DO mg, and Depth) were rejected -3 SCF CSM. All other data were left as 1 GIT CSM except Chlorophyll which were 1 SIC CSM due to not having had 2-point calibration.

08/04/2020 09:30 – 08/18/2020 08:45 Chlorophyll readings looked suppressed compared to deployments before and after it as well as with field readings. Chlorophyll data were flagged suspect 1 CSM.

08/18/2020 09:00 – 09/11/2020 09:45 Central wiper was not recording during this time and there were a lot of spikes for Turbidity; therefore, all Turbidity data were flagged 1/-3 SWM CSM. SpCond & Salinity look weird during this time; although, the cell constant was within the normal range at 0.47. There were SpCond/Sal drops at the other sites due to freshwater input, but since this whole deployment looks off, all SpCond and Salinity data were flagged suspect 1 GSM CCU

09/30/2020 09:15 – 10/13/2020 09:15 Central wiper did not record during deployment. Data were collected at the wrong Depth; Level data were flagged suspect 1 GSM CWD. Temp/DO/pH appear unaffected and were left as 0. Turbidity spikes were flagged 1/-3 SWM CWD since spikes most likely due to wiper not working. Chlorophyll sensor only calibrated with DI water and not a 2-pt calibration with rhodamine standard; therefore, Chlorophyl data flagged 1/-3 SIC CWD (-3 Chlorophyll flags due to spikes from wiper not working).

10/13/2020 09:45 – 11/04/2020 10:15 Sonde stuck in the deployment tube; therefore, data were collected at the wrong Depth. Level data were flagged 1 GSM CWD; other parameters were left as <0> except for Chlorophyll data which were flagged 1 SIC CSM and Turbidity which were flagged 0/1/-3 GSM CWD.

**Mesquite Bay**

There were many instances where the salinity dropped > 2 psu within a 15-minute interval and may possibly be due to groundwater input. These data were flagged suspect since we have no way of verifying that input. 5/22/20 21:45; 5/24/20 16:45, 20:00; 5/26/20 06:45, 07:45-08:00; 5/27/20 14:45, 16:15; 5/29/20 23:15; 6/04/20 13:00; 6/05/20 00:15; 6/09/20 20:30; 6/10/20 05:45; 6/13/20 20:45, 22:15; 6/16/20 06:45; 7/8/20 20:30-20:45, 21:45-22:00; 7/9/20 04:45, 07:15, 07:45, 16:15; 7/10/20 09:15, 16:00, 16:30; 7/11/20 16:15-16:30; 7/12/20 06:15-06:30, 07:30, 08:30, 19:45-20:00; 7/14/20 13:00; 8/7/20 12:00; 8/8/20 18:15; 8/13/20 13:30; 8/15/20 15:15; 8/16/20 14:00; 8/17/20 00:30, 16:00; 10/27/20 06:15

For the following deployments, the Chlorophyll sensor was calibrated using DI water only and not a 2-point calibration with rhodamine standard; therefore, those Chlorophyll data are flagged <1> SIC CSM as per CDMO guidelines.

03/17/2020 11:45 – 04/07/2020 12:15

04/07/2020 12:45 – 04/21/2020 12:45

04/21/2020 13:15 – 05/18/2020 10:45

05/18/2020 11:00 – 06/16/2020 11:45

07/21/2020 10:45 – 07/30/2020 07:45

08/18/2020 10:30 – 09/06/2020 01:15

09/11/2020 12:30 – 09/30/2020 11:00

09/30/2020 11:15 – 10/03/2020 10:15

10/13/2020 12:45 – 11/04/2020 13:15

04/07/2020 12:45 – 04/21/2020 12:45 Data were collected at the wrong depth during this time. Level data were flagged suspect 1 GSM CWD and all other parameters except Chlorophyll left as <0> since they do not appear to have been affected.

04/25/2020 07:00 – 05/18/2020 10:45 SpCond sensor stopped working properly. SpCond and supported parameters (Salinity, DO mg, and Level) were all rejected -3 SCF CSM.

05/18/2020 11:00 – 05/27/2020 16:00 Data were collected at the wrong depth for about 9 days before sonde settled to the correct depth. Level data were flagged suspect 1 GSM CWD and all other parameters were left as <0> since they do not appear to have been affected; however, there were a couple of Turbidity spikes which were flagged 1/-3.

06/16/2020 12:15 – 07/03/2020 01:45 Data were collected at the wrong Depth during this time. Since it was so far off, Level data were rejected -3 GSM CWD. Temp, DO%, Chl were left as 0 GSM CWD, and Turbidity as 0/1/-3 GSM CWD. pH sensor was initially reading high for about 4 days and those data were rejected. pH data after 06/22/20 19:30 looked normal; however, were flagged suspect due to sensor diagnostics. There was also an issue with the SpCond sensor; SpCond and Salinity were flagged suspect 1 SCF CSM until 06/17/20 19:00 after which they were rejected -3 SCF CSM along with supporting parameters (DO mg and Depth). The final reading on 7/3/20 01:45 appears to have had an issue with the Temp sensor; therefore, all data except for Turbidity were rejected -3 STF CSM. Raw file was broken into multiple segments with extra headers that needed to be removed prior to upload as per CDMO advice so that the file would ingest into the database; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file.

06/16/2020 12:15 – 07/03/2020 01:45 pH data were marked 1/-3 SSM CSM during this deployment. The post read 8.36/10.97 and pH data were odd during this time.

07/03/20 02:00 – 07/07/20 12:00 Data are missing during this time due to the C/T sensor failure which caused the sonde to stop recording.

07/21/2020 10:45 – 07/30/2020 07:45 There were several issues going on with the sonde during this deployment (Note: this is the same sonde from 06/16/20 deployment that had many issues). The Temp sensor was reading lower than normal compared to field readings and the previous deployment; therefore, Temp was flagged suspect 1 GSM for about a week before going back to normal. In addition to that, there was an unexplained change in Level for almost an hour where the sonde was not at the correct depth. Depth data during that time were flagged suspect 1 GSM CWD. Also, the pH sensor failed and pH data were rejected due to QAQC checks throughout the deployment.

07/24/2020 14:00 – 07/30/2020 07:45 SpCond sensor malfunctioned and data were rejected -3 SSM CSM until the sonde stopped recording.

07/30/2020 08:00 – 08/04/2020 11:15 Data are missing during this time due to the SpCond/Salinity sensor malfunction which caused the sonde to stop recording.

08/04/2020 11:30 – 08/18/2020 10:15 Raw file was broken into multiple segments with extra data headers and repeating timestamps and data which had to be removed before upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO does not match the .BIN file.

08/18/2020 10:30 – 09/06/2020 01:15 C/T sensor failed and all data except Turbidity were rejected -3 STF CSM. Cell constant was reading 0.62 which is outside the acceptable range for SpCond. Raw file was broken into multiple segments with extra headers which had to be removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file. Sonde (PL) stopped recording on 3 previous deployments besides this one and was finally sent in for repair after this deployment. The bulkhead, flex power cable, main and pwr/com boards were replaced under warranty.

09/06/2020 01:30 – 09/11/2020 12:15 Data are missing during this time due to the C/T sensor failure which caused the sonde to stop recording.

09/11/2020 12:30 – 09/30/2020 11:00 Raw file was broken into multiple segments with extra headers and repeating lines of data which were removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file. There were also gaps in the data due to an issue with the battery as well as a weird loss of Depth for about an hour on 9/20/2020 08:30-09:15. The bottom bracket of the deployment tube came off and the tube slid deeper into the water; Kelley discovered it when she came to retrieve the sonde on 09/30/2020. She was able to attach the tube at the top of the piling and thought it looked to be 0.5 m from the bottom; however, we were unable to dive down to verify it due to weather. Since we aren’t sure it is at the correct depth, Level data were flagged suspect 1 GSM CWD and all other parameters except pH and Chlorophyll were left as <0>.

09/21/2020 09:00 – 09/30/2020 11:00 pH bulb was somehow pushed in and readings plummeted; therefore, pH data were rejected -3 SQR CSM during this time.

09/30/2020 11:15 – 10/03/2020 10:15 Raw file was broken into multiple segments with extra headers which were removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file. Since the location of the deployment tube has not been verified as the correct placement, Level data were flagged suspect 1 GSM CWD and all other parameters left as <0>. For some unknown reason, Turbidity data are missing on 10/03/2020 06:15.

10/03/2020 10:30 – 10/13/2020 12;30 Data are missing during this time since the sonde stopped recording due to the sonde deployment tube falling and losing connection to the field cable.

10/13/2020 12:45 – 11/04/2020 13:15 The pH sensor was fine during calibration; however, once deployed it started reading 12.6 and the post slope was 120.0 V. pH data were rejected -3 SQR CSM due to QC checks. Raw file was broken into multiple segments with extra headers which were removed prior to upload as per CDMO advice; therefore, the raw .CSV file uploaded to the CDMO will not match the .BIN file. Since the location of the deployment tube has not been verified as the correct placement, Level data were flagged suspect 1 GSM CWD and all other parameters except pH and Chlorophyll were left as <0>.

11/04/2020 13:30 – 12/31/2020 23:45 The deployment tube placement has not been verified as being correct; therefore, Level data were flagged suspect 1 GSM CWD and all other parameters were left as <0>.

Table 1. The mean daily discharge for 2020

|  |  |  |  |
| --- | --- | --- | --- |
| River | Location | USGS gauge | Discharge (ft3 s-1) |
| Aransas River | Skidmore, TX | 08189700 | 11.7 |
| Mission River | Refugio, TX | 08189500 | 6.14 |
| Copano Creek | Refugio, TX | 08189200 | 0.09 |
| San Antonio River | Goliad, TX | 08188500 | 413.5 |
| Guadalupe River | Victoria, TX | 08176500 | 691.7 |

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