**Central Panhandle Aquatic Preserves (CPAP) Water Quality Metadata**

**January – June 2024**

**Latest Update:** 08/01/2024

Note: This is a provisional metadata document; it has not been authenticated as of its download date. Contents of this document are subject to change throughout the QAQC process and it should not be considered a final record of data documentation until that process is complete. Contact the Aquatic Preserve Office (Jonathan.Brucker@FloridaDEP.gov) with any additional questions.

**I. Data Set and Research Descriptors**

**1) Principal investigator(s) and contact persons –**

Principal Investigator:

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**2) Entry verification –**

Deployment data are uploaded from the YSI data sonde to a Personal Computer (IBM compatible). Files are exported from KOR Software, the software platform used for managing the EXO data sonde and water quality data, in a comma separated file (.csv) and uploaded to the NERRS Centralized Data Management Office (CDMO) Non-SWMP Data Upload Service where data undergo automated primary QAQC. 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 FCO Data Coordinator and/or the Aquatic Preserve office 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 Aquatic Preserve database. Upload after secondary QAQC results in ingestion into the Aquatic Preserve database as provisional plus data, and finally tertiary QAQC by the Florida Coastal Office’s Data Coordinator and assimilation into the Aquatic Preserve database as authenticated data. 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.

Anomalous data are evaluated to determine whether to flag or reject the suspect values. Data outside the "normal" range of water quality parameters for each site are investigated for validity based on weather data, field observations, QC checks, graphs and instrument diagnostics. Data are rejected if the anomalies are attributed to sensor malfunction and/or excessive fouling. In addition to observations of any physical damage (e.g., compromised DO probe membrane), sensor malfunctions are detected if the reading of the probe is outside the range established for the sensor or the sensor will not post calibrate. All data management and QAQC checks are handled by Jonathan Brucker and Lena Kury.

**3) Research objectives –**

The Richardson’s Hammock station collected baseline water quality data in the southwestern area of St Joseph Bay Aquatic Preserve (SJBAP). Richardson’s Hammock is surrounded by lush seagrass beds, known as a shark breeding ground, congregating snapper populations, and juvenile green turtle habitat. This southern portion of St Joseph Bay has low flow compared to the northern portion of the Bay which Gulf water flushes out more frequently. Richardson’s Hammock is separated from the Gulf of Mexico by a narrow strip of land. In the event of a large storm, it is possible that this area could be washed out and the Gulf waters flow directly into the Bay at Richardson’s Hammock.

Datalogger stations established within Alligator Harbor Aquatic Preserve (AHAP) contribute to the establishment of baseline water quality conditions and provide valuable insight into the health of AHAP. Alligator Harbor is located on the southeast coast of Franklin County just east of the Apalachicola estuary. The actual harbor is approximately 4,045 acres and is a shallow system with rather consistent salinity levels and sand/mud substrate. There is little freshwater flow into the harbor and the rather stable salinity structure does not create the estuarine conditions characteristic of the waterbodies lying to the west. However, the seagrass habitat, oyster bars, beaches, saltmarshes, and bottom communities found associated with Alligator Harbor Aquatic Preserve make it a productive and integral part of the marine ecosystem in the Franklin County area. Aquaculture is a primary use of AHAP, and a good water quality is vital to the industry. This data will be extremely useful to local stakeholders and federal, state, and local agencies managing resources in and adjacent to the preserve.

**4) Research methods –**

As an Office of Resilience and Coastal Protection-wide initiative in 2005, Central Panhandle Aquatic Preserve (CPAP) began monitoring water quality with the use of YSI 6600 dataloggers. The aquatic preserve has modeled its datalogger water quality monitoring project after the National Estuarine Research Reserve’s (NERR) System-Wide Monitoring Program (SWMP) that uses nationally standardized methods of data collection to ensure continuity and accuracy. Stations were established in St. Joseph Bay and Alligator Harbor, and abiotic factors including dissolved oxygen, salinity, temperature, conductivity, pH, turbidity, and depth were continuously monitored every 30 minutes. Dataloggers are swapped out in two-week intervals for data retrieval, instrument service and calibration, and monitoring station maintenance. The data are downloaded and reviewed as part of quality assurance and quality control, then analyzed and plotted in order to determine trends. The aquatic preserve stores data on a local server and utilizes the NERRs CDMO Data Management Office archival storage and data management. These data are used to identify trends in water quality for specific areas and allows the aquatic preserve to track environmental changes in the ecosystem.

In July 2005, the Richardson’s Hammock site was established on the St. Joseph Bay Aquatic Preserve (SJBAP), and in August 2006, another station (Windmark) was added in SJBAP. In September 2007, the Windmark station was discontinued in order to expand water quality efforts into other bays within CPAP. In October 2007, the Alligator Harbor datalogger site was added to the program. Due to budget and staffing limitations, data were collected intermittently between 2005-2011, and the 2011 office closure resulted in the suspension of the datalogger program and transfer of datalogger units to other aquatic preserve offices.

After the management of CPAP was re-established in 2016, water quality monitoring programs started to resume. In 2018, CPAP reacquired 6-Series sondes and began rebuilding the sonde program. In September 2019, two new sites were established in AHAP: one at the aquaculture sites in Alligator Harbor and one at the Florida State University Coastal and Marine Laboratory (FSUCML). In February 2022, the Alligator Harbor site switched to using an EXO2 datalogger. In July 2023, the FSUCML site was decommissioned. In March 2021, a third station utilizing an EXO2 datalogger was added on St. Joseph Bay, in very close proximity to the historical Windmark station.

The only variation from the manual is the use of two pH standards (pH 7 and pH 10) for two-point calibration of pH rather than three-point calibration. Beginning January 31, 2006, depth has been set based on the barometric pressure the day of calibration. Prior to this, a default atmospheric pressure of 760 mmHg was used to calibrate the depth to 0 meters for pre- and post- calibration. Pressure is measured using a hand-held Garmin unit and the depth offset from zero meters is determined using the tables provided in the Water Quality SOP. The dissolved oxygen % is also calibrated based on the barometric pressure for the day, changing the standard each time it is calibrated. Prior to this, a default atmospheric pressure of 760 mmHg was used to calibrate the dissolved oxygen % to 100%. The 6136 turbidity probes are given a two-point calibration to 0 NTU using deionized water, and to 126 NTU using YSI standard. Following calibration, a guard is attached to the datalogger to protect the probes. A piece of plastic mesh is placed in the bottom of the guard and another one is attached to the outside of the guard to discourage any creatures from getting to the probes and to minimize fouling. The sondes are then programmed to begin recording data at 03:59:00 AM morning of deployment. Data are collected by sondes at 15-minute intervals. They are wrapped in white towels and placed in a 5-gallon bucket with water to sit overnight. The D.O. probe is re-calibrated before deployment and the sonde is checked to ensure that the instrument is working properly.

During deployment and retrieval of the sondes, measurements of dissolved oxygen concentrations and percent saturation, as well as salinity and temperature, are taken at the sites using a hand-held YSI Pro DSS instrument. Wind is measured with a Kestrel and pH with a pH meter.

YSI EXO2 dataloggers are contained within a 10 cm (inside diameter) PVC housing pipe mounted vertically on the channel marker. To facilitate water flow across the sensors, several holes are drilled into the submerged portion of the pipe. Hole density is greatest near the base where the sonde sensors are located. The PVC pipe is placed on the channel marker using stainless steel hose clamps. Every two to three weeks the dataloggers are retrieved, downloaded, cleaned, and inspected. Freshly calibrated units are deployed at the same time, resulting in little or no data gaps in collection intervals.

**5) Site location and character –**

The Central Panhandle Aquatic Preserve Office is located in northwest Florida and is part of the Department of Environmental Protection’s Office of Resilience and Coastal Protection. The Preserve is responsible for the management of four Aquatic Preserves in Franklin, Gulf and Bay counties. These include Alligator Harbor Aquatic Preserve (14,184 acres), Apalachicola Bay Aquatic Preserve (80,000 acres), St. Joseph Bay Aquatic Preserve (55,674 acres) and St. Andrews Aquatic Preserve (24,000 acres).

St. Joseph Bay Aquatic Preserve is located in Gulf County along Highway 98 near the community of Port St. Joe, in Florida’s Northwest Panhandle approximately 35 miles southeast of Panama City and approximately 100 miles southwest of Tallahassee. St. Joseph Bay is bound on the eastern shoreline by the city of Port St. Joe and St. Joseph Bay State Buffer Preserve lands and on the west by the St. Joseph Peninsula and St. Joseph Peninsula State Park. The Bay is approximately 15 miles long north to south, with a maximum width of 6 miles, and opens north to the Gulf of Mexico, thru a relatively narrow opening. St. Joseph Bay Aquatic Preserve covers approximately 55,674 acres along the northern coast of the Gulf of Mexico. St. Joseph Bay is unique in being the only body of water in the eastern Gulf of Mexico that is not influenced by the inflow of fresh water. Because of this, these coastal waters tend to be clearer with sandier sediments than in the north central Gulf of Mexico. These conditions make the bay ideal habitat for the growth of lush seagrass communities. Much of the productivity of the region is attributed to the near shore saltmarsh and seagrass habitats that serve as nursery and foraging grounds for a variety of commercial and recreational fish and invertebrate species, sea turtles, scallops and birds. Seagrasses cover one-sixth of the bay bottom in St. Joseph Bay and expand approximately 9,669 acres. Salt marsh habitat spans approximately 762 acres.

The Richardson’s Hammock datalogger site in St. Joe Bay is in the southwestern portion of the Bay, furthest from the opening to the Gulf. The datalogger is attached at the end of a dock on state property accessed by car off Cape San Blas Road. This site in the Bay is separated from the Gulf by a very narrow strip of land (Cape San Blas). In the event of a large storm or hurricane it is possible, and has happened in the past, that the Gulf may wash into the Bay at this site. It is important to monitor this area to collect baseline data and, in the event that the Gulf connects to the Bay at this spot, to monitor the changes that may occur. The original Windmark datalogger station was located North of the Port St. Joe shipping channel; the sonde was housed at the end of a dock of a private residence and was only operational in 2006 and 2007. The original dock had been destroyed by Hurricane Michael in 2018; however, a new private dock was constructed in late 2020. This provided CPAP an opportunity to resume water quality data collection in very close proximity to the original location. The new Windmark location was installed in March of 2021. It is especially important to monitor water quality conditions at this location, since the Gulf County Canal has been considered a major cause of turbidity and salinity fluctuations in St. Joseph Bay. To accurately assess the impacts of the shipping channel on St. Joseph Bay, the establishment of baseline water quality data sets is imperative.

Alligator Harbor is located on the southeast coast of Franklin County just east of the Apalachicola estuary. The actual harbor is approximately 4,045 acres. Alligator Harbor is a shallow system with rather consistent salinity levels. There is little freshwater flow into the harbor and the rather stable salinity structure does not create the estuarine conditions characteristic of the waterbodies lying to the west. Seagrass habitat, oyster bars, beaches, saltmarshes, and bottom communities found associated with Alligator Harbor Aquatic Preserve make it a productive and integral part of the marine ecosystem in the Franklin County area. The Preserve currently does not have dataloggers located in Alligator Harbor. The Preserve maintained a datalogger in Alligator Harbor on a private dock from October 2007 through August 2008. Historically, the Division of Agriculture and Consumer Services (DACS) Aquaculture division maintained a datalogger located on Marker M at the aquaculture leases from 2002-2012. This site was decommissioned due to budget cuts. In September 2019, CPAP established two sites in AHAP: one at the aquaculture sites in Alligator Harbor (Marker M) and one at the Florida State University Coastal and Marine Laboratory (FSUCML). The FSUCML site was decommissioned in July 2023.

The Apalachicola Bay Aquatic Preserve is located within the Apalachicola National Estuarine Research Reserve boundaries and is located adjacent to the City of Apalachicola. The Reserve has been monitoring water quality through the use of dataloggers in the bay since 1992. CPAP currently does not have dataloggers located in the Apalachicola Bay Aquatic Preserve; however, the Apalachicola National Estuarine Research Reserve currently deploys four dataloggers in Apalachicola Bay with data going back to 1992.

The St. Andrews Aquatic Preserve is located in Bay County and includes St. Andrew Bay Proper, Shell Island Sound, and offshore areas. CPAP currently does not have dataloggers located in the St. Andrews Aquatic Preserve, but staff are working to secure funding for new sondes and an appropriate location for a sonde station.

|  |  |
| --- | --- |
| Site name  | Alligator Harbor  |
| Latitude and longitude | 29.91813, -84.40969 |
| Tidal range (meters) | ~0-3 m  |
| Salinity range (psu) | ~5-35 psu |
| Type and amount of freshwater input | Very little, but some comes from runoff |
| Water depth (meters, MLW) | ~1.29 m |
| Sonde distance from bottom (meters) | 0.5 |
| Bottom habitat or type | Sand, silt, mud |
| Pollutants in area |  N/A |
| Description of watershed  | The harbor is a 4,045-acre shallow-water system on the southeast coast of Franklin County east of the Apalachicola estuary. The entire aquatic preserve is 14,184 acres. |

|  |  |
| --- | --- |
| Site name  | Windmark |
| Latitude and longitude | 29.84827, -85.335843 |
| Tidal range (meters) | ~0-1.5 m |
| Salinity range (psu) |  ~11-35 psu |
| Type and amount of freshwater input | Very little, but some from the Gulf County Canal and runoff |
| Water depth (meters, MLW) | ~0.69 m |
| Sonde distance from bottom (meters) | 0.5 |
| Bottom habitat or type | Sand |
| Pollutants in area |  N/A |
| Description of watershed  | St. Joe Bay is located in Gulf County near Port St. Joe. The site is located at the end of a dock on state property and is separated from the Gulf by Cape San Blas. The entire aquatic preserve is 55,674 acres.  |

**Station Timeline:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Station Code** | **Station Name** | **Location** | **Active Dates** | **Reason Decommissioned** | **Notes** |
| HA 2005-2006RH 2006-2011 | Richardson’s Hammock | 29.687-85.3612 | July 2005 – June 2011 | Lack of staff/Office closure | It is unknown why station code was changed. |
| WI (2006)WM (2007) | Windmark | 29.84827-85.33584 | August 2006 – September 2007  | Lack of staff/Office closure | It is unknown why station code was changed. |
| AH | Alligator Harbor | 29.89782-84.37723 | October 2007 – August 2008 | Lack of staff/Office closure | NA |
| AH2 | Alligator Harbor | 29.91813-84.40969 | September 2019 – Present  | N/A | N/A |
| FS | FSUCML Channel | 29.91013-84.51112 | September 2019 – July 2023 | Discontinued due to end of agreement with FSUCML | N/A |
| WD | Windmark (2022) | 29.846419-85.333917 | March 2022 – Present  | N/A | Moved to new location-old location lost in Hurricane Michael |

**6) Data collection period –**

Deployment dates and time are as follows for 2024:

|  |  |
| --- | --- |
| **Alligator Harbor Deployment Date/Time** | **Alligator Harbor Retrieval Date/Time** |
| 12/22/2024 10:45 | 01/11/2024 13:45 |
| 01/11/2024 14:00 | 02/02/2024 11:45 |
| 02/02/2024 12:00 | 03/12/2024 11:45 |
| 03/12/2024 13:00 | 04/17/2024 11:30\* |
| 04/17/2024 11:45 | 05/20/2024 9:45 |
| 05/20/2024 10:00 | 06/28/2024 10:45 |
| 06/28/2024 11:00 | 07/30/2024 12:15 |
| 07/30/2024 12:30 |  |

|  |  |
| --- | --- |
| **Windmark Deployment Date/Time** | **Windmark Retrieval Date/Time** |
| 12/12/2023 13:00 | 01/10/2024 13:45 |
| 01/10/2024 14:00 | 02/01/2024 11:45 |
| 02/01/2024 12:00 | 02/21/2024 11:15 |
| 02/21/2024 11:30 | 03/15/2024 12:15 |
| 03/15/2024 12:30 | 04/01/2024 9:30\* |
| 04/01/2024 9:45 | 05/02/2024 9:00 |
| 05/02/2024 9:15 | 5/24/2024 10:30 |
| 05/24/2024 10:45 | 07/01/2024 9:15 |
| 07/01/2024 9:30 |  |

\*Instrument and/or battery malfunction

**7) Distribution –**

The Principal Investigator (PI) retains the right to be fully credited for having collected and process the data.  Following academic courtesy standards, the Aquatic Preserve 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.

Aquatic Preserve water quality data and metadata can be obtained from the Manager at the individual Aquatic Preserve office (please see Principal Investigators and Contact Persons) and online at the Aquatic Preserves data portal home page [www.floridaapdata.org](http://www.floridaapdata.org). Data are available in comma delimited format.

**8) Associated researchers and projects** (link to other products or programs) **–**

Additional information is currently unavailable.

**II. Physical Structure Descriptors**

**9) Sensor specifications –**

CPAP deployed mainly 6600 EDS data sondes in 2019. 6600 EDS sondes were deployed at sites AH2 and FS until 2022 and 2023 respectively. In 2021, EXO deployments began at a new WD station. In 2022, AH2 switched to using an EXO. In 2023, the FS site was decommissioned.

YSI 6600 EDS 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: Rapid Pulse - Clark type, polargraphic

Model#: 6562

Range: 0 to 500% air saturation

Accuracy: %: ±2% of reading or 2% air saturation, whichever is greater; 200 to 500%: ±6% of reading; 0-20 mg/L: ± 2% of the reading or 0.2 mg/L, whichever is greater; 20-50 mg/L: ± 6% of the reading Resolution: 0.1% air saturation

or

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: Rapid Pulse - Clark type, polargraphic

Model#: 6562

Range: 0 to 50 mg/L

Accuracy: 0-20 mg/L: +/- 2% of the reading or 0.2 mg/L, whichever is greater

20 to 50 mg/L: +/- 6% of the reading

Resolution: 0.01 mg/L

or

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 or EDS flat glass probe

Units: pH units

Sensor Type: Glass combination electrode

Model#: 6561 or 6561FG

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: ± 1% of reading or 1% of air saturation, whichever is greater; 200-500% air sat: ± 5% of 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; 20-50 mg/L: ± 5% of the reading, relative to calibration gasses

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

**Dissolved Oxygen Qualifier (Rapid Pulse / Clark type sensor):**

The reliability of dissolved oxygen (DO) data collected with the rapid pulse / Clark type sensor after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Some Reserves utilize the YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. Optical DO probes have further improved data reliability. The user is therefore advised to consult the metadata for sensor type information and to exercise caution when utilizing rapid pulse / Clark type sensor DO data beyond the initial 96-hour time period. Potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. If there are concerns about fouling impacts on DO data beyond any information documented in the metadata and/or QAQC flags/codes, please contact the Aquatic Preserve office regarding site and seasonal variation in fouling of the DO sensor.

**Depth Qualifier:**

YSI data sondes 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.

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 Aquatic Preserve calibration sheet or digital calibration log.  This offset procedure standardizes each depth calibration. If accurate atmospheric pressure data are available, non-vented sensor depth measurements can be corrected. The Principal Investigator should be contacted in order to obtain information regarding atmospheric pressure data availability.

**Salinity Units Qualifier:**

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 Aquatic Preserve purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the Aquatic Preserve program will assign psu salinity units for all data regardless of sonde type.

**Turbidity Qualifier:**

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 Aquatic Preserve purposes they will be considered equivalent. Moving forward, the Aquatic Preserve program 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 –**

Raw file naming protocol: 6-numeral deployment site name/month/date of deployment/ /year (e.g. AH091219 = Alligator Harbor deployment beginning September 12, 2019).

Pre-processed file naming protocol: YSI deployment site/month/year (e.g. AH0107 = Alligator Harbor data from January 2007).

Site definitions:

|  |  |  |
| --- | --- | --- |
| **Sampling Station:** | **Sampling Site Code:** | **Station Code:** |
| Alligator Harbor | AH2 | AH2 |
| Windmark | WD | WD |

**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** –

|  |  |
| --- | --- |
|  | **Post-deployment readings of all sondes deployed at the Alligator Harbor 2 site during 2024.** |
| **Deployment Date** | **Temp (°C)** | **SpCond (mS/cm)** | **ROX DO****%** | **ROX DO****mg/L** | **pH** | **pH** | **Turbidity (FNU)** | **Turbidity (FNU)** | **Depth (m)** |
|  | **°C** | **50.00** | **100.0** | **NA** | **7.00** | **10.00** | **0.0** | **124.0** | **m** |
| 12/22/2023 | 19.217  | 49.708  | 100.7, 100.8  | 9.37  | 6.97  |  10.10 | 0.26  | 125.1  | 0.087 |
| 01/11/2024 | 19.861  |  49.348 |  99.6, 99.1 | 8.86  |  7.09 | 10.18 | 0.01 |  121.14 |  -0.14 |
| 02/02/2024 |  19.907 |  49.985 |  99.3, 99.3 |  8.47 |  7.25 | 10.20 | 0.07 |  122.66 |  0.081 |
| 03/12/2024 |  19.408 |  50.056 |  99.5, 99.3 |  9.15 |  7.20 | 10.22 |  0.08 | 124.23 | 0.15  |
| 04/17/2024 | 19.598 | 49.784 | 101.3, 101.4 | 9.23 | 7.00 | 10.01 | 0.22 | 122.92 | 0.005 |
| 05/20/2024 | 20.677 | 50.055 | 99.7, 99.7 | 8.90 | 7.20 | 9.99 | 0.18 | 123.91 | 0.010 |
| 06/28/2024 | 20.799 | 49.483 | 102.6, 102.0 | 1.70 | 7.15 | 10.19 | 4.34 | 103.48 | 0.167 |
| 07/30/2024 |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
|  | **Post-deployment readings of all sondes deployed at the Windmark site during 2024.** |
| **Deployment Date** | **Temp (°C)** | **SpCond (mS/cm)** | **ROX DO****%** | **ROX DO****mg/L** | **pH** | **pH** | **Turbidity (FNU)** | **Turbidity (FNU)** | **Depth (m)** |
|  | **°C** | **50.00** | **100.0** | **NA** | **7.00** | **10.00** | **0.0** | **124.0** | **m** |
| 12/12/2023 | 18.55  |  49.968 | 107.4, 107.5  | 10.16  | 7.13  | 10.01  |  0.04 | 122.19 | 0.056  |
| 01/10/2024 |  19.405 |  49.703 |  99.4, 100 | 9.10  |  7.10 | 10.12 |  0.04 | 118.69 |  -0.016 |
| 02/01/2024 |  19.922 |  50.060 |  100.9, 100.9 | 9.15 |  7.03 | 10.04 |  0.02 | 126.61 |  0.038 |
| 02/21/2024 |  19.772 |  49.310 |  105.6, 105.1 | 9.67 |  7.13 | 10.03 |  0.24 | 119.3 |  0.002 |
| 03/15/2024 | 20.16 | 50.150 | 100.6, 100.6 | 9.09 | 7.00 | 9.96 | 0.26 | 125.1 | -0.076 |
| 04/01/2024 | 20.521 | 0.959 | 108.7, 109.0 | 9.86 | 6.91 | 9.90 | -0.11 | 122.8 | 0.006 |
| 05/02/2024 | 20.874 | 50.177 | 102.9, 102.9 | 9.16 | 7.13 | 9.93 | 0.10 | 123.29 | 0.006 |
| 05/24/2024 | 25.493 | 1.397 | 109, 109.4 | 8.71 | 7.11 | 10.06 | 0.18 | 120.05 | 0.008 |
| 07/01/2024 |  |  |  |  |  |  |  |  |  |

\*Data missing from calibration log

Red data indicate parameters that did not meet post calibration criteria.

**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 Aquatic Preserve office. Dates displayed below represent the duration of the deployment. Suspect, rejected, and missing data are all grouped under the deployment dates.

**See Metadata “CSM” “GSM” Notes/Comments from Data Files**

**Note #1:** Slight shifts in data are sometimes correlated with sonde exchanges. These shifts are most noticeable in pH, specific conductivity, salinity, DO% and DO conc, and may be related to sensor drift (e.g., due to fouling) and/or calibration/performance differences between sondes.

**Note #2:** Turbidity “outliers” (i.e., values that are negative or greater than 1000 NTU for 6600 series sondes and 4000 FNU for EXO series sondes) were not deleted from the monthly records. Readings greater than 1000 NTU for 6600 series sondes and 4000 FNU for EXO series sondes are considered out of range and are rejected. They have been left in the database to provide users with a complete dataset and to allow true visual representation of the data in graphs. Negative turbidity values occur. Some of these negative values are within the accuracy range of the sensor (+/- 2.0 %) and, therefore, were not removed from the dataset. They were marked suspect with the CAF code.

**Note #3**: Turbidity data is subject to single and clusters of spikes that occur in the beginning and middle of deployments. Turbidity values that fall between 500 and 1000 are not specifically indicated as suspect data, but possibly could be interpreted as suspect. Turbidity spikes may be associated with wiper malfunction but mostly the reason is unknown. Data users should exercise caution when interpreting turbidity data that fall within this range.

**Note #4**: Obvious outliers, data associated with probe malfunction, and/or calibration (both pre and post) problems are rejected as specified below. For more details about rejected data, contact the Principal Investigator.

**Note #5:** Specific conductance data is subject to occasional single ‘dips’ of reduced concentrations occurring anytime throughout a deployment. This decrease is most likely attributed to debris or live critters disrupting the signal being sent between the electrodes and the Conductivity/Temperature sensor during sample collection.

**Station CPAH2:**

**January 1-31, 2024**

1. None

**February 1-29, 2024**

1. None

**March 1-31, 2024**

1. Suspect turbidity data (x ≥ 1000 FNU) 03/08/2024 20:45; value out of range, reason unknown.
2. Originally missing all data 03/12/2024 12:00 – 12:45, but upon further inspection, times were thrown off; sonde internal clock failure, reason unknown, but could be due to user error or Daylight Savings. Times have been adjusted and there is no more missing data.

**April 1-30, 2024**

1. Suspect turbidity data (x ≥ 1000 FNU) 04/30/2024 01:45; value out of range, reason unknown.

**May 1-31, 2024**

1. Suspect turbidity data (x ≥ 1000 FNU) 05/05/2024 19:45, 05/06/2024 22:00, 05/10/2024 02:00, 05/13/2024 20:15, and 5/31/2024 03:45; values out of range, reason unknown.

**June 1-30, 2024**

1. Suspect turbidity data (x ≥ 1000 FNU) 06/07/2024 15:15, 06/08/2024 06:45, 06/09/2024 09:15, 13:00, 14:00, 14:15, 16:15, 06/10/2024 07:00 – 10:15, 06/11/2024 08:30 – 09:30, 10:00, 14:45, 21:15, 22:00, 22:30, 06/12/2024 14:15 – 15:00, 21:30, 22:15, 23:30, 23:45, 6/13/2024 09:30, 12:30, 13:00, 20:15, 06/14/2024 02:45, 18:45, 19:15, 06/15/2024 12:30, 06/17/2024 17:00, 06/20/2024 09:15, and 06/21/2024 00:15; values out of range, reason unknown.
2. Missing all data 06/30/2024 01:15 – 23:45; reason unknown, but suspect battery failure or sensors not going to sleep.

**July 1-31, 2024**

1. Missing all data 07/01/2024 00:00 – 07/30/2024 12:30; reason unknown, but suspect battery failure or sensors not going to sleep.

**August 1-31, 2024**

**September 1-30, 2024**

**October 1-31, 2024**

**November 1-30, 2024**

**December 1-31, 2024**

**Station CPWD:**

**January 1-31, 2024**

1. Suspect DO data 01/01/2024 00:00 – 01/10/2024 14:00; post-deployment check was out of range.
2. Reject all data 01/20/2024 02:15 – 06:45, 1/24/2024 00:15 – 09:00, 01/22/2024 02:45 – 07:15; values consistent with sonde coming out of water.
3. Reject all data 01/29/2024 06:30 – 07:15; values consistent with sonde coming out of water.

**February 1-29, 2024**

1. Reject all data 02/07/2024 04:15 – 07:30; values out of range, values consistent with sonde coming out of water.
2. Suspect depth data 02/06/2024 04:45 – 06:30; values out of range and negative, possibly due to changes in barometric pressure.

**March 1-31, 2024**

1. Suspect depth data 03/06/2024 03:00; value out of range and negative, possibly due to changes in barometric pressure.
2. Originally missing all data 03/15/2024 12:30 – 13:15, but upon further inspection, times were thrown off; sonde internal clock failure, reason unknown, but could be due to user error or Daylight Savings. Times have been adjusted and there is no more missing data.

**April 1-30, 2024**

1. Missing depth data 04/01/2024 09:45 – 04/30/2024 23:45; reason unknown.
2. Suspect turbidity data 04/07/2024 18:45, 21:15, 04/08/2024 03:45, 05:15, 04/10/2024 20:15, and 04/30/2024 15:30; values out of range, reason unknown.
3. Suspect specific conductivity and salinity data 04/01/2024 09:45 – 04/30/2024 23:45; failed post-deployment verification; reason unknown.

**May 1-31, 2024**

1. Suspect specific conductivity and salinity data 05/01/2024 00:00 – 05/02/2024 09:00; failed post-deployment verification; reason unknown.
2. Missing depth data 05/01/2024 00:00 – 05/02/2024 09:00; reason unknown.
3. Suspect turbidity data 05/12/2024 12:15; value out of range, reason unknown.

**June 1-30, 2024**

1. Suspect turbidity data 05/24/2024 10:45 – 06/13/2024 03:15; sensor failed post calibrations checks
2. Reject specific conductivity and all affected parameters (salinity, DO mg/L, depth) 06/13/2024 03:30 – 06/30/2024 23:45; fouling observed on specific conductivity probe face at retrieval, and post-deployment verification failed (1.397 mS/cm in 50.00 mS/cm standard).
3. Suspect turbidity data 06/10/2024 21:00, 06/28/2024 11:45, 14:15, and 19:30; values out of range, reason unknown.

**July 1-31, 2024**

**August 1-31, 2024**

**September 1-30, 2024**

**October 1-31, 2024**

**November 1-30, 2024**

**December 1-31, 2024**