

Reserve Name - WKB NERR Meteorological Metadata

Months and year the documentation covers – 01/01/2017 through 12/31/2017

Latest Update: 09/09/2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

Scott Phipps – Research Coordinator

scott.phipps@dcnr.alabama.gov

Address: Weeks Bay NERR

11300 Highway 98

Fairhope, AL 36532

2) Entry verification

Data are uploaded from the CR1000 data logger to a Personal Computer (IBM compatible). Files are exported from LoggerNet in a comma-delimited format and uploaded to the CDMO where they undergo automated primary QAQC and become part of the CDMO's online provisional database. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve 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, append files, and export the resulting data file to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database. These data are also converted to graphic representation and posted on the Internet at <http://cast-net.disl.org/monitoringdata/nep/index.htm> hourly with the cooperation of the Mobile Bay NEP and the Dauphin Island Sea Lab. For more information on QAQC flags and QAQC codes, see Sections 11 and 12.

Scott Phipps is responsible for all data management.

3) Research objectives

The principle objective is to record long-term meteorological data for Weeks Bay in order to 1) observe any environmental changes or trends over time, 2) use as a reference for research projects at the reserve, and 3) give meteorological context to our fifteen minute SWMP water quality data.

4) Research methods

Campbell Scientific data telemetry equipment was installed at the WKB station on 07/31/06 and transmits data to the NOAA GOES satellite, NESDIS ID 3B01A578. The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at <http://cdmo.baruch.sc.edu>.

Data are collected for the entire year in Central Standard Time (CST).

The Campbell Scientific CR1000 datalogger uses 5-second data downloaded from the weather station sensors to calculate 15-minute data. The CR1000 stores only 15 minute data. Parameters measured are air temperature, relative humidity, barometric pressure, rainfall, wind speed, and wind direction. Maximum and minimum relative humidity and barometric pressure and minimum wind speed are no longer collected with the CR1000 program. Periodically, sensors on the weather station are inspected for damage or debris. If any are found, it is repaired and/or cleaned. Sensors are removed and calibrated on an annual or every 2 year basis. Temperature sensor, barometric pressure sensor, anemometer and PAR sensor were last calibrated 05/05/2017, and precipitation on 07/05/2017. The CR1000 datalogger was calibrated and re-furbished in May 2017.

The 15 minute Data are collected in the following formats for the **CR1000**:

Averages from 5-second data:

Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction (degrees), Battery Voltage (volts)

Maximum and Minimum Air Temperature (°C) and their times from 5-second data (these data are available from the Reserve)

Maximum Wind Speed (m/s) and time from 5-second data

Wind Direction Standard Deviation (degrees)

Totals:

Precipitation (mm), PAR (millimoles/m²), and Cumulative Precipitation (mm)

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity- yearly recalibration
- Rain Gauge- yearly recalibration
- Wind Speed/Direction- yearly or every 2 years (depending on the sensor)
- Barometric Pressure- every 2 years recalibration
- PAR- every 2 years recalibration
- CR1000-every 5 years (required beginning 2014, one year initial grace period)

5) Site location and character

The Weeks Bay National Estuarine Research Reserve is located near the Gulf coast, southeast of the city of Fairhope, Alabama. Weeks Bay (30° 23' N, 87° 50' W) is a small, shallow, microtidal sub-estuary, located on the eastern shore of Mobile Bay in the northern Gulf of Mexico. The bay is nearly diamond shaped, and its longitudinal axis (3.4 km long) runs nearly north-south from the head, where the Fish River flows in, to the mouth, where water is exchanged with Mobile Bay. Its widest point (3.1 km) is located near the center of the estuary, where the Magnolia River discharges into eastern side of Weeks Bay. Average depth is 1.4 m, although there are two areas where depths are significantly greater. The first is in the mouth of the bay, where the average depth is 6 m; the second is about 100 m upstream of the mouth of the Fish River, where the average depth is 3.5 m. Tides are principally diurnal, and have a mean range of 0.4 m.

The Fish River drainage basin encompasses 14300 hectares and contributes approximately 73% to the total incoming freshwater flow with the Magnolia River supplying the rest. Mean combined discharge is 9 cubic meters per second; although freshets up to 4 times larger occur throughout the year. These characteristics result in a freshwater residence time of 13 days under average discharge conditions, with a range from 0.5 to 100 days. Salinity in Weeks Bay varies substantially both temporally and spatially. During periods of high flow in the river, salinity in the bay may be fresh from the head to the mouth, except in the deeper holes of the estuary that are not as easily flushed. However, during periods of low flow in the river, wind velocity and tidal stage are strong factors influencing salinity

structure. Salinity greater than 25 ppt is infrequently observed in Weeks Bay and is usually restricted to the southern portion of the estuary near the mouth.

CDMO Edits – station measurements updated September 2025. Previous versions of the metadata were not updated and measurements listed were from the original weather station site.

The weather station is located on a reserved owned property, near a restored marsh, about 700 meters from the west bank of Fish River (30°25'14.5"N 87°49'46.6"W) north of highway 98, on a property known to locals as "Safe Harbor". The wind sentry, temperature/RH sensor, and PAR sensor are mounted at the heights listed in the Station Measurements table below. The barometric pressure sensor, height listed below, is located in the datalogger mounting box. Tipping bucket rain gauge is located 6.5m south southwest from the tower.

Station measurements

Tower and sensor heights	Height (<i>meters</i>)	Notes
Tower	6.1	Measurements were taken from the ground for the tower and all sensors
Temperature/Relative Humidity	2.0	
Barometric Pressure	1.7	In the enclosure mounted to the tower
Wind	5.3	
PAR	3.0	
Precipitation gauge	0.6	6.5m SSW from tower

SWMP Station Timeline:

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
SH	P	Safe Harbor	30°25'14.5"N 87°49'46.6"W	01/02/2008 - Present	NA	NA
WB		Weeks Bay	30° 24.89' N 87° 49.56' W	01/01/2001 - 12/31/2007	Construction of buildings on site	

6) Data collection period

Weather data has been collected from January 1, 2001 through present.

These metadata are applicable only to data collected from January 1, 2017 through December 31, 2017.

File Start Date and Time	File End Date and Time
01/01/2015 00:00	04/12/2017 07:15
07/06/2017 11:00	07/28/2017 13:30
07/28/2017 13:45	08/02/2017 2017*
07/06/2017 11:00	10/31/2017 08:15
10/31/2017 08:30	11/01/2018 10:00

*recovered telemetered data

7) Distribution

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:

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

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

8) Associated researchers and projects

As part of the SWMP long-term monitoring program, WKB NERR also monitors 15-minute water quality along with monthly grab samples and diel sampling for nutrient data which may be correlated with this meteorological dataset. These data are available at www.nerrsdata.org

The Geological Survey of Alabama, in cooperation with the United States Geological Survey, maintains two rain gauges within the Weeks Bay watershed. One is located at the highway 98 Magnolia River overpass; the other is located at the highway 104 Fish River overpass.

The following researchers have directly requested and received meteorological data generated from the Weeks Bay weather station for use as either primary or ancillary information significant to their respective projects.

II. Physical Structure Descriptors

9) Sensor specifications

Parameters: Temperature and Relative Humidity

Units: Celsius for temperature and percent for relative humidity

Sensor type: Rotronic

Model #: HC2-S3

Operating Temperature: -40-+60°C

Temperature Measurement Range: -40 to +60°C
Temperature Accuracy: ± 0.2 °C @ 20°C
Relative Humidity Measurement Range: 0-100% non-condensing
RH Accuracy: at 20°C: $\pm 2\%$ RH(0-90%) and $\pm 3\%$ (90-100%)
Temperature dependence of RH measurement: $\pm 0.05\%$ RH/°C
Serial Number: 61247718
Date of Last calibration: 01/21/2014
Dates of Sensor Use: 09/09/2014 - 04/12/2017
This sensor was taken out of service in April of 2017

Parameter: Temperature
Units: Celsius
Sensor type: PT100 RTD, IEC 751 1/3 Class B, with calibrated signal conditioning
Model #: HC2-S3 Temperature and Relative Humidity Probe
Operating Temperature: -40°C to +60°C
Range: -40°C to +60°C
Accuracy: ± 0.1 °C @ 23°C
Serial Number: not available
Date of Calibration: 05/05/2017
Dates of Sensor Use: 07/06/2017 - current as of 12/31/2017

Parameter: Relative Humidity
Units: Percent
Sensor type: ROTRONIC® Hygromer IN-1
Model #: HC2-S3 Temperature and Relative Humidity Probe
Range: 0-100% non-condensing
Accuracy at 23°C: $\pm 0.8\%$ RH with standard configuration settings
Temperature dependence of RH measurement $\pm 3\%$ (-40 to 60C)
Serial Number: not available
Date of Calibration: 05/05/2017
Dates of Sensor Use: 07/06/2017 - current as of 12/31/2017

Parameter: Barometric Pressure
Units: millibars (mb)
Sensor type: Vaisala Barocap © silicon capacitive pressure sensor
Model #: CS-105
Operating Range: Pressure: 600 to 1060 mb; Temperature: -40°C to +60°C;
Humidity: non-condensing
Accuracy: ± 0.5 mb @ 20°C; ± 2 mb @ 0°C to 40°C; ± 4 mb @ -20°C to 45°C; ± 6 mb @ -40°C to 60°C
Stability: ± 0.1 mb per year
Serial Number: unknown
Date of Calibration: unknown
Dates of Sensor Use: 02/10/2009 - 04/12/2017

Parameter: Barometric Pressure
Units: millibars (mb)
Sensor type: Vaisala Barocap © silicon capacitive pressure sensor
Model #: CS-106
Operating Range: Pressure: 600 to 1060 mb; Temperature: -40°C to +60°C;
Humidity: non-condensing

Accuracy: ± 0.5 mb @ 20°C; ± 2 mb @ 0°C to 40°C; ± 4 mb @ -20°C to 45°C; ± 6 mb @ -40°C to 60°C

Stability: ± 0.1 mb per year

Serial Number: M0310163

Date of last calibration: 05/05/2017

Date of Sensor Use: 07/06/2017 - current as of 12/31/2018

Parameters: Wind Speed and Wind Direction

Units: Wind speed - meter per second (m/s); Wind direction – compass degrees

Sensor type: RM Young Wind Monitor (marine version)

Model # 5106m

Range: 0-50 m/s; 360° mechanical

SN 154738

Previous Date of Calibration: unknown

Previous Dates in Use: 2/10/2009 - 4/12/2017

Date of last calibration/refurbishment: 05/05/17

Dates of Sensor Use: 07/06/2017 - current as of 12/31/2017

Parameter: Photosynthetically Active Radiation (PAR)

LI-COR Quantum Sensor

Units: mmoles m^{-2} (total flux)

Sensor type: High stability silicon photovoltaic detector (blue enhanced)

Model #: LI190SB

Light spectrum waveband: 400 to 700 nm

Temperature dependence: 0.15% per °C maximum

Stability: $<\pm 2\%$ change over 1 yr

Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%

Sensitivity: typically 5 μA per 1000 $\mu\text{moles s}^{-1} \text{m}^{-2}$

Date of last calibration: 04/04/13

Dates of Sensor Use: 4/4/2013 - 04/12/2017

Taken out of service in April of 2017

Parameter: Photosynthetically Active Radiation (PAR)

Units: mmoles m^{-2} (total flux)

Sensor type: anodized aluminum with cast acrylic diffuser

Model #SQ110 Apogee Quantum Sensor

Light spectrum waveband: 410 to 655 nm

Temperature dependence: 0.06 $\pm$ 0.06% per °C

Stability: $<\pm 2\%$ change over 1 yr

Operating Temperature: -40°C to 70°C; Humidity 0 to 100%

Cosine Response: 45° zenith angle: $\pm 2\%$; 75° zenith angle: $\pm 5\%$

Sensitivity: 0.2mV per $\mu\text{mol s}^{-1} \text{m}^{-2}$

Multiplier: 0.025 (this does not change)

SN. NA; Date of last calibration: New May 2017

Dates of Sensor Use: 07/06/2017 - current as of 12/31/2017

Parameter: Precipitation

Units: millimeters (mm)

Sensor type: Tipping Bucket Rain Gauge

Model #: TE525

Rainfall per tip: 0.01 inch

Operating range: Temperature: 0° to 50°C; Humidity: 0 to 100%

Accuracy: +/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr
Date of Last calibration: 07/05/2017, previous calibration 09/09/2014

The CR1000 has 2 MB of Flash EEPROM that is used to store the Operating System. Another 128 K Flash is used to store configuration settings. A minimum of 2 MB SRAM is (4 MB optional upgrade) available for program storage (16K), operating system use, and data storage. Additional storage is available by using a compact flash card in the optional CFM100 Compact Flash Module.

Note: this datalogger was manufactured in 2006, first installed at wkbSHmet in 2007. In continuous service until 04/2017 when it was removed for calibration and replacement of motherboard battery.

SN. 5578

Initial Calibration 2006, installed 2007 - 4/7/2017

Date CR1000 Installed: 07/06/2017 - current as of 12/31/2017

Date CR1000 Calibrated: 05/05/2017

CR1000 Firmware Version (s): OS rev 31.03 installed May of 2017.

CR1000 Program Version(s): wkbWBmet_v5.5_070617.cri

10) Coded variable definitions - List the sampling station, sampling site code, and station code used in the data.

Sampling station:	Sampling site code:	Station code:
Weeks Bay	SH	wkbSHmet

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 -2, flags are applied automatically to indicate data that is above or below sensor range, or missing. All remaining data are then flagged 0, as 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 Passed Initial QAQC Checks
- 1 Suspect Data
- 2 *Open – Reserved for later flag*
- 3 *Open – Reserved for later flag*
- 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 CR1000 datalogger, 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

GIM	Instrument malfunction
GIT	Instrument recording error, recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GMT	Instrument maintenance
GPD	Power down
GPF	Power failure / low battery
GPR	Program reload
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Sensor Errors

SDG	Suspect due to sensor diagnostics
SIC	Incorrect calibration constant, multiplier or offset
SIW	Incorrect wiring
SMT	Sensor maintenance
SNV	Negative value
SOC	Out of calibration
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSN	Not a number / unknown value
SSM	Sensor malfunction
SSR	Sensor removed

Comments

CAF	Acceptable calibration/accuracy error of sensor
CCU	Cause unknown
CDF	Data appear to fit conditions
CML	Snow melt from previous snowfall event
CRE*	Significant rain event
CSM*	See metadata
CVT*	Possible vandalism/tampering
CWE*	Significant weather event

13) Other remarks/notes

Data are missing due to equipment or associated specific sensors 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.

Small negative PAR values are within range of the LI-COR sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the LI-COR sensor is +/- 2.214 mmol/m² over a 15 minute interval. These values are automatically flagged and coded as <1> (CAF).

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/-3% and are flagged and coded as suspect, <1> (CAF). Values greater than 103 are rejected <-3>.

Data recorded for all parameters (with the exception of cumulative precipitation) at the midnight timestamp (00:00) are the 15 minute averages and totals for the 23:45-23:59 time period of the previous day. Cumulative precipitation data at the midnight timestamp (00:00) are the sum of raw (unrounded) precipitation data from 00:00 to 23:59 of the previous day. Summing each individual 15-minute total precipitation value from the same period will result in small differences from cumulative precipitation due to rounding. It is especially important to note how data at the midnight timestamp are recorded when using January 1st and December 31st data. **Note: Cumulative precipitation is no longer available via export from the CDMO. Please contact the Reserve or the CDMO for more information or to obtain these data.**

Station was powered down for maintenance from 4/12/2017 07:15 until 7/6/2017 10:45 for calibration of CR1000 datalogger and sensors. Data prior to this calibration were all flagged suspect (<1> [SOC](CSM)) due to the CR1000 being past its recommended calibration date. The <1> SOC CSM flagging and coding for the CR1000 also includes the out of calibration sensors. Air temperature, relative humidity, barometric pressure, wind, PAR, and precipitation sensors are all considered out of calibration from 1/1/2017 until the tower was powered down on 4/12/2017. All data on 7/6/2017 11:00 were rejected due to the CR1000 program upload, <-3> [GPR](CSM)..

PAR data from 1/1/2017 00:00 to 4/12/2017 07:00 were rejected due to sensor malfunction, <-3> SSM CSM.

7/28/2017 13:45 - 08/02/2017 00:15 telemetered data are used to replace missing CR1000 data for this time period. Telemetered data are considered suspect and are flagged and coded as <1> GIT CSM. Cumulative precipitation data are missing from the telemetered file. Those missing records are flagged and coded as <-2> GIT CSM.