

Reserve Name - WKB NERR Meteorological Metadata

Months and year the documentation covers – 01/2016 through 12/2016

Latest Update: 09/09/2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

Scott Phipps – Research Coordinator

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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 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	Station Name	SWMP Status	Location	Active Dates	Reason Decommissioned	Notes
WKBSHMET	Safe Harbor Met Station	P	30° 25' 16.40 N, 87° 49' 42.50 W	01/01/2008 -	NA	NA
WKBWBMET	Weeks Bay	P	30° 24' 53.28 N, 87° 49' 33.60 W	01/01/2001 - 01/01/2008	building construction	shading

6) Data collection period

Weather data collection has been ongoing since January 1, 2001 through December 31, 2016. This metadata is applicable only to data collected from January 1, 2016 through December 2016.

File Start Date and Time	File End Date and Time
10/22/2015 11:45	01/26/2016 14:15
01/01/2016 00:00	05/02/2016 07:00
04/01/2016 00:00	08/01/2016 06:30*
12/22/2016 08:45*	12/31/2016 23:45

* raw files are missing for 08/01/2016 - 12/22/2016. Telemetered data were used to build file.

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 2016.

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

The System-Wide Monitoring Program (SWMP) also includes 4 hydrographic stations within Weeks Bay where dataloggers collect water temperature, salinity and conductivity, pH, dissolved oxygen turbidity and depth. These data are collected every 15 minutes continuously. At the 4 hydrographic stations, nutrient data are collected once a month at low tide and at one site twelve samples are collected for nutrients over a tidal cycle (low tide to low tide). Nutrient data collected are total dissolved phosphorus, nitrate, nitrite, ammonia, and chlorophyll. Both nutrient and hydrographic (water quality) data are maintained at the CDMO.

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.

Caffrey, Jane. University of West Florida. Modeling estuarine ecosystem trophic status using continuous nitrate and water quality data.

Canion, Andrew. University of South Alabama.

Murrah, Adam. Mississippi State University.

II. Physical Structure Descriptors

9) Sensor specifications

Parameters: Temperature and Relative Humidity

Units: Celsius for temperature and percent for relative humidity

Sensor type: Campbell Scientific
Model #: HMP45C
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: unknown,
Date of Calibration: unknown; Dates of Sensor Use: 03/23/2011 - 04/4/2013
Date of Calibration: unknown; Dates of Sensor Use: 4/4/2013 - 09/04/2014

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 Calibration: 1/21/2014; Dates of Sensor Use: 9/9/2014 - current as of 12/31/2016

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 - current as of 12/31/2016

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
Serial Number: WM00071877
Date of Calibration: unknown; Dates of Sensor Use: 02/10/2009 - current as of 12/31/2016

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 $5\ \mu\text{A}$ per $1000\ \mu\text{moles s}^{-1}\text{ m}^{-2}$

Serial Number: unknown

Multiplier: unknown

Date of Calibration: unknown; Dates of Sensor Use: 12/20/2009- 04/04/2013

Serial Number: unknown

Multiplier: unknown

Date of Calibration: unknown; Dates of Sensor Use: 04/04/2013 - current as of 12/31/2016

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: $\pm 1.0\%$ up to 1 in./hr; $\pm 0, -3\%$ from 1 to 2 in./hr; $\pm 0, -5\%$ from 2 to 3 in./hr

Dates of Calibration: 2/10/2009, 4/4/2013, 9/9/2014

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

CR1000 Serial Number: 5578

Date of Calibration: manufactured 2006

Date of Installation: 2007 - current as of 12/31/2016

CR1000 Firmware Version (s): unknown

CR1000 Program Version(s): WKBWBMET_5.5_040413, WKBSHMET_5.5_090214

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
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Weeks Bay	sh	wkbshmet
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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 sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the Licor 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>.

The recommended calibration interval for the CR1000 datalogger is 5 years. The CR1000 datalogger at the Weeks Bay Safe Harbor site has exceeded this recommended interval and therefore all data were coded <1> [SOC] (CSM) indicating suspect data, datalogger out of calibration.

In addition to the flagging and coding for an out of calibration CR1000, air temperature, relative humidity, and precipitation sensors are considered out of calibration from 9/9/2016 - 12/31/2016, BP and wind sensors are considered out of calibration from 01/01/2016 - 12/31/2016, and the PAR sensor is considered out of calibration from 4/4/2016 - 12/31/2016 (PAR is also rejected for the year due to a malfunctioning sensor). The data are flagged and coded as suspect and out of calibration, <1> SOC CSM.

All PAR data for 2016 were rejected due to sensor malfunction, <-3> SSM CSM.

F_Record is coded as {CSM} to highlight that from 08/01/2016 06:45 - 12/22/2016 08:30 the coding switched to [GIT] (CSM), while the flagging remained as suspect. The out of calibration status did not change and in addition to being collected with an out of calibration logger and sensors, the data had to be recovered using telemetered data.

From 08/01/2016 at 06:45 until 12/22/2016 at 08:30, data were retrieved from the telemetered stream instead of directly from the CR1000. Those data are considered suspect and flagged and coded as <1> GIT CSM. The data are also considered out of calibration even though they are not coded as SOC (see above explanation for out of calibration CR1000 and sensors). Gaps in telemetered data occasionally occur and where data are missing the gaps are flagged and coded as <-2> GIT CSM. Cumulative precipitation data are not available from the telemetered data and are also flagged and coded as missing.

Attached below is a table (Table 1) showing a comparison of a nearby weather station maintained through the Mobile Bay NEP. This station is approximately 27 km from the wkbsHmet station and is located over water so there would be some variation expected.

SITE	DATE	TIME	TEMP	RH	BP	WD	WS	RAIN	PAR	BATT
			°C	%	millibars	°north	m/s	mm	μE/m2/s	volts
wkbSHmet	1/6/2016	10:00	10	62	1026	69	1.6	0	667	13.5
Meaher Park	1/6/2016	10:00	8.9	63	1027	86	4.2	0	923	
wkbSHmet	2/17/2016	10:00	14.6	56	1022	4	0.9	0	838	13.3
Meaher Park	2/17/2016	10:00	11.9	64	1024	342	3.3	0	1169	
wkbSHmet	3/16/2016	10:00	24.5	78	1016	199	0.6	0	931	13.1
Meaher Park	3/16/2016	10:00	20.5	93	1017	173	2.8	0	1453	
wkbSHmet	4/20/2016	10:00	24.2	46	1018	182	0.4	0	1139	13.2
Meaher Park	4/20/2016	10:00	20.4	87	1019	221	1.2	0	1213	
wkbSHmet	5/2/2016*	7:00	23.2	96	1013	103	0	0	180	13.2
Meaher Park	5/2/2016	7:00	24.5	88	1016	189	3.9	0	173	
wkbSHmet	6/15/2016	10:00	26.2	86	1016	246	0.8	0	272	13.2
Meaher Park	6/15/2016	10:00	27.2	79	1017	2.3	6.6	0	404	
wkbSHmet	7/13/2016	10:00	32.6	63	1020	210	0.3	0	1134	13
Meaher Park	7/13/2016	10:00	29.7	71	1021	167	1.8	0	1258	
wkbSHmet	8/17/2016	10:00	32	63	1020	80	1	0	1095	
Meaher Park	8/17/2016	10:00	29.7	68	1022	86	2.7	0	1009	
wkbSHmet	9/14/2016	10:00	29.4	69	1016	33	0.6	0	934	
Meaher Park	9/14/2016	10:00	28.3	63	1018	42	3.2	0	805	
wkbSHmet	10/19/2016	10:00	28.3	66	1017	116	0.5	0	622	
Meaher Park	10/19/2016	10:00	27.1	66	1019	140	1.3	0	668	
wkbSHmet	11/16/2016	10:00	21.8	61	1015	16	0.5	0	692	
Meaher Park	11/16/2016	10:00	18.4	81	1018	350	1	0	1285	
wkbSHmet	12/22/2016*	8:45	15.8	82	1023	360	0.1	0	319	13.4
Meaher Park	12/22/2016	8:45	16.6	83	1025	149	0	0	504	

Table 1. **Monthly data comparison of wkbSHmet station with the Meaher Park station.** The Meaher Park station is maintained through the Mobile Bay National Estuary Program and is located approximately 27 km to the north-west of the wkbSHmet station. The Meaher Park station is at the head of Mobile Bay over water at the end of a long pier.