Narragansett Bay (NAR) National Estuarine Research Reserve Meteorological Metadata

January – December 2006

Latest Update: **October 23, 2023**

# I. Data Set & Research Descriptors

1. Principal investigator & contact persons:

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1. Entry verification

a) Data Input Procedure (January – July 2006)\*\*

\*\* NOTE: The CR10X datalogger was used for data collection from January – July 2006.

A new datalogger, the CR1000, was used for data collection from August – December 2006

The meteorological data are sampled at 5 second intervals under the control of a CDMO data logger program adjusted for this specific site (NBNERR\_4.csi). Data are output to memory in three arrays as appropriate: array 15 stores 15 minute average, sum (total), maximum, and minimum data; array 60 stores hourly average, sum (total), maximum, and minimum data; and array 144 stores daily average, sum (total), maximum and minimum data.

Data are uploaded from the CR10X data logger or storage module via PC208W software supplied by Cambell Scientific to a Personal Computer (IBM compatible) in a comma-delimited format (.DAT). These files are then opened in Microsoft Excel for pre-processing with the EQWin format macro that was developed by the CDMO to reformat the header columns, insert station codes, insert a date column (mm/dd/yyyy), correct the time column format and reformat the data to the appropriate number of decimal places. The pre-processed file is then ready to be copied into the EQWin weather.eqi file where the data are QA/QC checked and archived in a database.

August – December 2006 CR1000 Data Input Procedure

The meteorological data are sampled at 5 second intervals under the control of a CDMO/Campbell Scientific LoggerNet program. Data are output to memory in 15 minute data intervals; 15 minute average, sum (total), maximum, and minimum data. This is a change from the previous data collection with the CR10X and data are no longer arrayed in hourly arrays (60) or daily arrays (144). Data are downloaded from the CR1000 to a laptop via a RS-232 serial cable connection in a comma-delimited format (.DAT). These files are then converted by a batch conversion file program and then opened in Microsoft Excel for pre-processing with the EQWin format macro that was developed by the CDMO to reformat the header columns, insert station codes, insert a date column (mm/dd/yyyy), correct the time column format and reformat the data to the appropriate number of decimal places. The pre-processed file is then ready to be copied into the EQWin weather.eqi file where the data are QA/QC checked and archived in a database. Three different versions of Campbell LoggerNet program were uploaded to the program, once 08/01/06 (Version 2), a second on 12/19/06 (Version 3), and a third on 01/01/07 (second Ver. 3).

Data Verification – All 2006 data (CR10X and CR1000 data)

EQWin queries, reports and graphs are used to discover data set outliers (values which fall outside the range that the instrument is designed to measure) and large changes in the data. EQWin is also used to generate statistics, view graphs, create customized queries and reports of the data, cross query the water, weather and nutrient data and finally export the data to the CDMO. Throughout the data review process, anomalous data are investigated and noted in the anomalous data section (see Section 11). If warranted, data were deleted and these corrections are noted in the deleted data section (see Section 12). Monitoring Technician Christine Comeau was responsible for compiling and error checking the 2006 weather data.

b) Data Collection Schedule (CR10X)

For data collection, the CR10X datalogger was programmed to collect data in the following formats:

i) 15-minute data are collected instantaneously for Air Temperature (C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees).

ii) 15-minute average, maximum and minimum data are averages of 5-second readings for Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s) and Wind Direction (degrees). 15-minute Precipitation (mm) and PAR (mmol/m^2) data are totaled from 5-second readings.

iii) Hourly average, maximum, and minimum data are averages of 5-second readings for Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees). Hourly totals for PAR (mmol/m^2) and Precipitation (mm) are totals of 15-minute readings.

iv) Daily average, maximum and minimum data are averages of 5-second readings for Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees). Daily totals for PAR (mmol/m2) and Precipitation (mm) are totals of 15-minute readings.

Data Collection Schedule (CR1000)

Data collection for the CR1000 was programmed in the same way as collection occurred for the CR10X, except that hourly and daily averages were not collected.

With the use of CR1000 version 3 (installed on 12/19/06) relative humidity maximum and minimum, and barometric pressure maximum and minimum were no longer collected.

For data collection, the CR1000 datalogger was programmed to collect data in the following formats:

i) 15-minute data are collected instantaneously for Air Temperature (C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees).

ii) 15-minute average, maximum and minimum data are averages of 5-second readings for Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb) and Wind Speed (m/s) and Wind Direction (degrees). 15-minute Precipitation (mm) and PAR (mmol/m2) data are totaled from 5-second readings.

c) Error/Anomalous Data Criteria

EQWin queries, reports, and graphs were based on the following anomalous data criteria:

Air Temperature:

- Sample not greater than 50 C or less than –40 C

- 15 min averages not greater than max for the day

- 15 min averages not less than the min for the day

Relative Humidity:

- Sample not greater than 100% or less than 0%

- 15 min averages not greater than max for the day

- 15 min averages not less than the min for the day

Barometric Pressure:

- Pressure not greater than 1060 mb or less than 900 mb

- 15 min averages not greater than max for the day

- 15 min averages not less than the min for the day

Wind Speed:

- Wind speed not greater than 30 m/s

- Wind speed not less than 0.5 m/s for 12 consecutive hours

Wind Direction:

- Wind direction not greater than 360 degrees or less than 0 degrees

Rainfall:

- Precipitation not greater than 5 mm in 15 min

Solar Radiation (LiCor):

- Sample not greater than 5000 millimoles per meter squared (mmol/m2)

- Sample not less than 0 millimoles per meter squared (mmole/m2)

Time:

- 15-minute interval recorded (Checked in EQWinformat macro)

For all data:

- No duplicate data

1. Research objectives:

The principal objective of this monitoring program is to record long-term meteorological data for Narragansett Bay in order to observe any environmental changes or trends over time. These data are also used to support of ongoing water quality and biological monitoring, as well as scientific research.

1. Research methods:

CR10X Datalogger (January – July)

The Campbell Scientific weather station samples every 5 seconds to produce both hourly and daily averages of those measurements of air temperature, relative humidity, barometric pressure, rainfall, and wind speed and wind direction. An instantaneous sample is taken every 15 minutes and the data were stored in array 15. An approximate sampling interval was chosen so that the CR10X datalogger would not run out of memory and overwrite data. The short haul modem link was inoperable so the data had to be downloaded periodically from the storage module to a desktop computer housed at the weather station. Campbell Scientific CR10X Wiring Panel has 128K of flash memory (EEPROM), in which it stores the operating system and its program (that it uses to run the weather station). Additionally, there is 128K of SRAM, which it uses to run the program and store its measurements and for final data storage. Sensors on the weather station are inspected periodically for damage or debris. If any is found, it is repaired and/or cleaned. There were no other analyses done on the meteorological data at present.

CR1000 Datalogger (August – December)

The Campbell Scientific weather station samples every 5 seconds to produce 15 minute averages of those measurements of air temperature, relative humidity, barometric pressure, rainfall, wind speed and wind direction, and totals for precipitation and rainfall. The CR1000 program directs how and when the sensors are measured and data are stored. All data is stored in the CR1000 datalogger and are downloaded monthly via a RS-232 connection serial cable to a laptop using the Campbell Scientific LoggerNet program. The datalogger is housed in a Campbell Scientific storage unit that is attached to a platform at the weather station. The storage module that was used for data storage in with the CR10X is no longer used with the CR1000. Sensors on the weather station are inspected periodically for damage or debris. If any is found, it is repaired and/or cleaned. There were no other analyses done on the meteorological data at present.

The CR1000 has a 2 MB flash EEPROM that is used to store the Operating System. Another 128 K of flash is used to store the configuration settings. A minimum of 2 MB SRAM is available for program storage, operating system use, and data storage. Data storage in the CR1000 is stored in an internal SRAM, which is battery backed. Data are retained in memory even when the CR1000 is powered down, but are lost from memory when a new program is loaded and run. There is 1 MB of SRAM, some of which is used for operating system and program storage; the rest is available for data storage.

1. Site location and character:

The NBNERR consists of 4376 acres of diverse estuarine and terrestrial habitats ranging from open estuarine water to salt marshes to forested uplands. The land holdings include 61% of Prudence Island, most of nearby Patience Island, all of Hope Island off the west shore of Prudence Island, and Dyer Island located in the East Passage of Narragansett Bay. The Reserve is located close to the geographic center of Narragansett Bay in Rhode Island. The Bay has a drainage basin of 1,800 square miles.

The weather station is located on Prudence Island, south of Potter’s Cove (lat: 41 deg 38.335’N, long: 71 deg 20.362’ W). The Wind Sentry and the Temperature and Humidity sensor are located on an aluminum tower approximately 10m in height. The Licor sensor is located on a shorter (3m) aluminum tower. The tipping Bucket Rain gauge is located to the NE away from the tower and the platform. The barometer is located within the housing of the CR10X. All sensors were located in accordance with manufacturer recommendations to avoid the possible influence of shading, wind blocks, etc. \*\*SEE NOTES section b: Licor, Rain gauge, and Barometric Pressure sensors were moved during the latter part of 2006.

Description of the specific sampling station:

The Potter’s Cove weather station is in a grassland area bordering the cove. This location is approximately 425 yards from a water quality monitoring station maintained by the NBNERR since 1995. The water quality in the cove is considered to be adversely affected by boater’s wastes and storm runoff from urban areas. Locating the weather station near this site might help to determine whether meteorological factors further influence water quality within the cove.

1. Data collection period:

Weather data have been collected at the Potter’s Cove weather station since 1992. A CR10X datalogger was used from February 2002 until July 2006. The current datalogger, a CR1000, was installed on August 1, 2006. Data reported this period was continuously collected throughout the year in 2006 from January 1, 2006 00:15 to December 31, 2006 23:45 .

1. Distribution:

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program,

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. 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.

NERR weather 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 [http://cdmo.baruch.sc.edu/](http://cfcdmo.baruch.sc.edu/). Data are available in text tab-delimited format.

1. Associated researchers and projects:

The NERR System Wide Monitoring Program has a station located nearby at Potter’s Cove. The principal objective of this study is to record long-term water quality data for Narragansett Bay in order to observe any physical changes or trends in water quality over time. Four sites were selected; one to represent an impacted site, two in open water (at both the surface and near-bottom), and one located in a salt marsh tidal creek. The Potter’s Cove site is located on Prudence Islands’ northeastern shore and is impacted by boat traffic and storm runoff from mainland urban and residential areas. Measurements are taken every 15 minutes over a roughly two week collecting periods at all water quality monitoring locations throughout the year.

A Physical Oceanographic Real-Time System (PORTS) meteorological station is housed in the NERRS weather station at Potter’s Cove and independently records wind speed, wind direction, atmospheric pressure, and air temperature. This is one of six PORTS meteorological stations in Narragansett Bay. The purpose of PORTS is to support safe and cost efficient navigation. Data is available real-time and the system is managed for quality control.

Photosynthetic Active Radiation (PAR) data from Potter’s Cove is an integral part of a hypoxia study in Narragansett Bay (CHRP-NOAA) being conducted by Marine Ecosystems Research Lab (MERL) at the University of Rhode Island. PAR data is provided on a monthly basis and is used in a model to estimate daily productivity of the water column at six stations in Narragansett Bay cutting a north -south transect down the West Passage. This is done by using PAR data to integrate productivity through the water column and over the period of an entire day. This measure provides the upper boundary of productivity for the ecosystem. Productivity of the water column, in conjunction with physical parameters, acts as a catalyst for hypoxic events. The goal of the CHRP project is to develop a combined ecological and physical model of Narragansett Bay in order to predict susceptibility of the bay to hypoxia. After the Greenwich Bay fish kill in 2003 this has become a key topic to be studied in Narragansett Bay. The metabolism measurements at six productivity stations will be used to verify these models.

II. Physical Structure Descriptors

1. Sensor specifications, operating range, accuracy, date of last calibration

Parameter: Temperature

Units: Celsius

Sensor type: Platinum resistance temperature detector (PRT)

Model #: HMP45C Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ± 0.2 °C @ 20°C

Date of Last calibration: 04/28/06

Parameter: Relative Humidity

Units: Percent

Sensor type: Vaisala HUMICAP© 180 capacitive relative humidity sensor

Model #: HMP45C Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy at 20°C: +/- 2% RH (0-90%) and +/- 3% (90-100%)

Temperature dependence of RH measurement: +/- 0.05% RH/°C

Date of Last calibration: 4/28/06

Parameter: Barometric Sensor

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

Date of Last calibration: 4/26/06

Parameter: Wind speed

Units: meter per second (m/s)

Sensor type: 18 cm diameter 4-blade helicoids propeller molded of polypropylene

Model #: R.M. Young 05103 Wind Monitor

Range: 0-60 m/s (130 mph); gust survival 100 m/s (220 mph)

Accuracy: +/- 2%

Date of last calibration: 4/10/06

Removed on 12/19/06

Parameter: Wind direction

Units: degrees

Sensor type: balanced vane, 38 cm turning radius

Model #: R.M. Young 05103 Wind Monitor

Range: 360° mechanical, 355° electrical (5° open)

Accuracy: +/- 5%

Date of last calibration: 4/10/06

Removed on 12/19/06

Parameter: Wind Speed and Wind Direction

Model #: R.M. Young 05305 L-AQ

Wind Speed

Units: meter per second (m/s)

Sensor type: Propeller-type anemometer with fuselage and tail wind vane

Range: 0-90 mph (0-40 m/s) Starting threshold: 0.9 mph (0.4 m/s) Gust survival: 100 mph (45 m/s)

Accuracy: ±0.4 mph (±0.2 m/s)

Date of last calibration: 10/04/06

Wind Direction

Range: 0-360° mechanical, 355° electrical (5° open)

Accuracy: ±3°

Starting threshold at 10° displacement: 1.0 mph (0.5 m/s)

Date of last calibration: 10/04/06

Installed 12/19/06

Parameter: 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: <±2% change over 1 yr

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

Sensitivity: typically 5 µA per 1000 µmoles s-1 m-2

Date of last calibration: 5/10/06

Parameter: Precipitation (specify if heated rain gauge)

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: 7/31/06

Storage Module (used with the CR10X)

Model #: SM4M

Storage capacity: 2 million low-resolution data values

Program storage: stores up to 8 programs with a total capacity of 128 KB

Processor: Hitachi H8S

Operating system: 64 KB, flash memory based, user downloadable

Operating range: Temperature: -35° to +65°C

Baud rates: 9600, 76800

Memory type: user selectable for either ring style (default) or fill and drop.

Power requirements: 5 +/-0.3 VDC @ 100 mA

The CR1000 has 2 MB 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) is 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.

1. Coded variable indicator and variable code definitions:

Sampling station: Sampling site code: Station code:

Potter’s Cove PC narpcmet

1. Anomalous/Suspect Data:

**Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

From January thru August 2006 all LiCor data are considered suspect due to the sensor being installed beyond the recommended calibration schedule. On many dates and times data were found to exceed the maximum noise level for the 15 minute data (+/- 2.214mmoles/m2 and occasionally exceed the maximum noise level for the hourly data (8.856 mmoles/m2). The data were retained due to their usefulness in determining trends.

From January thru July 2006 problems occurred with a wiring connection between the wind sensor and the datalogger. When these problems with contact occurred, wind speed readings of <.5m/s were recorded. Wind speed readings recorded during this time were compared with data from a NOAA PORTS wind sensor located approximately 2 feet below the NAR NERR wind sensor. Though low wind speeds are a common at the Potter's Cove Weather Station site, it is unclear if these low wind values were a natural occurrence or due to the problem with the wind sensor and should therefore be considered suspect. All wind speed data for this time period should be considered anomalous and readings of <.5m/s that were recorded for 12hours or longer were deleted. See 12). Deleted data and 14). Other Remarks/notes.

January 2006:

a) Several negative PAR values were identified that were outside the +/- 2.214 mmoles/m2 maximum noise signal for the 15 minute data and +/- 8.856 mmoles/m2 for hourly data. Data were considered valid and were retained.

01/01/2006 24:00

01/02/2006 00:15 – 01:15, 03:45 – 08:00, 21:15 – 21:30

b) Rainfall in excess of 5 mm during a 15 minute sample occurred on the following dates and times. These data were considered to be valid and were retained in the data set.

01/18/2006 14:30

c) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

February 2006:

a) Several negative PAR values were identified that were outside the +/- 2.214 mmoles/m2 maximum noise signal for the 15 minute data and +/- 8.856 mmoles/m2 for hourly data. Data were considered valid and were retained.

02/12/2006 02:45-03:00, 03:30, 04:15

b) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

March 2006:

a) Several negative PAR values were identified that were outside the +/- 2.214 mmoles/m2 maximum noise signal for the 15 minute data and +/- 8.856 mmoles/m2 for hourly data. Data were considered valid and were retained.

03/02/2006 18:30 - 18:45, 19:00,19:30

b) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

April 2006:

a) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

May 2006:

a) Negative PAR value was identified that was outside the +/- 2.214 mmoles/m2 maximum noise signal for the 15 minute data. Data were considered valid and were retained.

05/03/2006 23:00

b) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

June 2006:

a) Several negative PAR values were identified that were outside the +/- 2.214 mmoles/m2 maximum noise signal for the 15 minute data and +/- 8.856 mmoles/m2 for hourly data. Data were considered valid and were retained.

06/01/2006 18:15 – 20:00

06/20/2006 02:15 - 02:30, 03:00

b) Rainfall in excess of 5 mm during a 15 minute sample occurred on the following dates and times. These data were considered to be valid and were retained in the data set.

06/24/2006 17:45

c) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

July 2006:

a) Rainfall in excess of 5 mm during a 15 minute sample occurred on the following dates and times. These data were considered to be valid and were retained in the data set.

07/18/2006 22:15

b) Negative PAR data have been observed during the night; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data have been retained.

August 2006:

a) Rainfall in excess of 5 mm during a 15 minute sample occurred on the following dates and times. These data were considered to be valid and were retained in the data set.

08/02/2006 18:30

08/10/2006 21:00

08/20/2006 06:00

08/28/2006 01:30 – 02:00

c) Overall Licor PAR values increased when a recently calibrated PAR sensor was put in place in a new location at the weather station.

September 2006:

No anomalous data.

October 2006:

a) Rainfall in excess of 5 mm during a 15 minute sample occurred on the following dates and times. These data were considered to be valid and were retained in the data set.

10/12/2006 03:00

10/23/2006 00:30

b) The rain gauge was moved at the weather station location sometime between 09/26/06 – 11/03/06 by construction workers without prior knowledge or permission. The exact date and time are not known and therefore it is unknown if it had any affect on the rain data during this time period.

November 2006:

a) Rainfall in excess of 5 mm during a 15 minute sample occurred on the following dates and times. These data were considered to be valid and were retained in the data set.

11/16/2006 10:00

December 2006:

a) A new wind sensor was installed on 12/19/06; wind speed data increased and values were considered to be more accurate after this installation.

1. Deleted data:

**Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

January 2006:

NONE

February 2006:

NONE

March 2006:

a) All air temperature and relative humidity data were deleted on 03/27/06 at 14:30 – 14:45. The probe was being inspected during the monthly met check and data were considered invalid. The hourly and daily data were also deleted on this date.

b) A wiring problem occurred with the wind sensor which occasionally caused extended periods of low wind speeds (<0.5 m/s).Wind speeds less than 0.5 m/s occurred for periods of 12 consecutive hours (including hourly and daily) or longer at the following dates and times and were deleted.

03/02/2006 19:15 – 24:00

All wind speed data was deleted on the following dates: 03/03/2006 – 03/26/06

03/27/2006 00:00 – 15:45, 16:00 hourly, and 24:00 daily

April 2006:

a) A wiring problem occurred with the wind sensor which occasionally caused extended periods of low wind speeds (<0.5 m/s).Wind speeds less than 0.5 m/s occurred for periods of 12 consecutive hours or longer (including hourly and daily) at the following dates and times and were deleted.

04/23/2006 20:45 – 24:00

All wind speed data was deleted on the following dates: 04/24/2006 – 04/26/06

04/27/2006 00:15 – 11:00,24:00 daily

May 2006:

a) A wiring problem occurred with the wind sensor which occasionally caused extended periods of low wind speeds (<0.5 m/s).Wind speeds less than 0.5 m/s occurred for periods of 12 consecutive hours or longer (including hourly and daily) at the following dates and times and were deleted.

05/11/2006 14:30 – 24:00

All wind speed data was deleted on the following dates: 05/12/2006 – 05/20/06

05/21/2006 00:15 – 18:00, 24:00 daily

05/27/2006 13:30 – 24:00

All wind speed data was deleted on the following dates: 05/28/2006 – 05/31/06

June 2006:

a) A wiring problem occurred with the wind sensor which occasionally caused extended periods of low wind speeds (<0.5 m/s).Wind speeds less than 0.5 m/s occurred for periods of 12 consecutive hours or longer (including hourly and daily) at the following dates and times and were deleted.

All wind speed data was deleted on the following dates: 06/01/2006 – 06/15/05

06/16/2006 00:15 – 14:15, 24:00 daily

06/20/2006 09:30 – 24:00

All wind speed data was deleted on the following dates: 06/20/2006 – 06/22/06

06/23/2006 00: 00- 07:15, 08:00 hourly and 24:00 daily

06/30/2006 09:15 – 24:00

July 2006:

a) A wiring problem occurred with the wind sensor which occasionally caused extended periods of low wind speeds (<0.5 m/s).Wind speeds less than 0.5 m/s occurred for periods of 12 consecutive hours or longer (including hourly and daily)at the following dates and times and were deleted.

All wind speed data was deleted on the following dates: 07/01/06 – 07/30/06

07/31/2006 00:15 - 09:15

August 2006:

a) Due to missing data that occurred as a result of program uploads, all data at 14:00 on 08/01/06 were deleted.

b) The error “NAN” occurred at the following dates and times in the Total PAR data record and were deleted.

08/06/06 13:30 – 13:45

08/18/06 11:45 – 12:00, 12:45

08/19/06 10:00, 12:15 – 12:30

08/20/06 12:30

08/21/06 11:00, 11:45

08/30/06 11:00 – 11:30

c) A defective wind anemometer was installed on August 01, 2006. All wind speed data were deleted from August 01, 2006 at 14:00-August 31, 2006 at 23:45.

September 2006:

a) A defective wind anemometer was installed on August 01, 2006. All wind speed data were deleted from September 01, 2006 00:15 –September 30, 2006 23:45.

October 2006:

a) A defective wind anemometer was installed on August 01, 2006. All wind speed data were deleted from October 01, 2006 00:15 –October 31, 2006 23:45.

November 2006:

a) A defective wind anemometer was installed on August 01, 2006. All wind speed data were deleted from November 01, 2006 00:15 –November 30, 2006 23:45.

December 2006:

a) A defective wind anemometer was installed on August 01, 2006. All wind speed data were deleted from December 01, 2006 00:15 – December 19, 2006 13:45.

b) Due to missing data that occurred as a result of program uploads, all data at 13:45 on 12/19/06 were deleted.

c) All wind direction data was deleted from 12/19/06 at 14:00 – 12/31/06 at 23:45. A problem with wind direction occurred due to a CR1000 version 3 programming error sent by the CDMO.

1. **Missing data:**

**Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

July 2006:

Data are missing from 07/31/06 from 09:15 - 23:45 when new telemetry hardware and software were installed.

August 2006:

Data are missing from 08/01/06 from 00:00 – 13:45 when new telemetry hardware and software were installed.

December 2006:

Data are missing on 12/19/06 from 10:45 – 13:30. A new wind sensor and CR1000 ver 3 were installed. The original version 3 program had some problems and a second ver 3 was sent later on during the day of 12/19. However, with the second program, a problem occurred with the wind direction readings. A third program was sent on 12/21/06 but technician was unable to install until 01/02/07.

1. Other Remarks/notes

**On 10/23/2023 this dataset was updated to include embedded QAQC flags for anomalous/suspect data.**System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above).  Prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all, but suspect data were only noted in the metadata document.  Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes.  No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

**Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

**Precipitation:**

During the initial years of NERRS SWMP weather data collection the CR10X programming was inconsistent in how precipitation values were recorded. For most reserves, zeros were not recorded when rainfall had not occurred between 2001-2003, instead no rainfall was represented by a blank cell. The CDMO verified which datasets were impacted by this issue for the 2001-2006 datasets and inserted zeros when the metadata indicated that no precipitation occurred and data were not missing for other reasons. In some cases, zero values for precipitation data were evaluated and removed where the metadata confirmed that no rainfall should have been in the dataset. The pre-2007 data did not go through a thorough QAQC process again at that time (in addition to previous QAQC); however, if discrepancies were noticed between what was documented in the metadata and what was in the dataset, additional updates may have been made. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout early 2023.

a) From 01/01/06 – 08/01/06 there was a wiring problem with the wind sensor which occasionally caused extended periods of low wind speeds (<0.5 m/s). We attempted to fix the wiring several times, however, the fix would last for a few days and then become defective again. Those periods of low wind speeds (<0.5m/s) that lasted 12 hours or longer were identified, deleted, and noted in the deleted data section of this document. The anemometer and wind vane were replaced with a newly calibrated one on 08/01/06. However, wind speed data from 08/01/06 – 12/19/06 were deleted. It was eventually determined that the newly calibrated and installed wind anemometer was defective and wind speeds were much too low for the area during this time period. Unfortunately due to funds and the long equipment ordering process through our state partner, it took much longer to buy a replacement wind sensor than we wished. Much of the low wind speed data was compared to a NOAA PORTS wind vane that is located on the same tower at the same site as the SWMP weather station, and every attempt was made to determine if the low wind values were true or if they were caused by the wind sensor issues.

b) New Weather station equipment platform:

A large wooden platform approximately 8 feet by 6 feet and about 7 feet off the ground has been situated at the weather station for about the past 15 years*.* It was originally constructed by the EPA to hold atmospheric deposition equipment which is no longer in use. We secured permission from the EPA to use this platform for weather station equipment. During the course of the summer, we relocated the Campbell housing unit to be situated under the platform; it was previously housed within a shed on the weather station site. This unit contains the CR1000 datalogger and all associated hardware (and telemetry equipment) as well as the barometric pressure unit. On top of the platform we placed the GPS antenna, solar panel, and Yagi antenna. The PAR meter was also relocated here to make it more accessible for cleaning than the previous location. The rain gauge was also moved to the platform in November. All sensors were located in accordance with manufacturer recommendations to avoid the possible influence of shading, wind blocks, etc.

c) Several changes were made to the weather station site during the 2006 data collection period.

Structure and equipment changes made in 2006 were:

07/31/06:

A new Campbell datalogger (CR1000) was installed and was placed in a new location than the previous datalogger. In addition to this, a newly recalibrated Barometric pressure sensor was moved from its previous location. All sensors (Temp/RH, Wind direction and speed, and PAR) except the rain gauge were replaced with newly calibrated sensors. The PAR was also sensor was moved to a new location.

11/06/06:

At the end of October new construction began at the weather station location. The old shed which had previously housed the datalogger and related equipment was being replaced with a new prefab shed along with a new cement foundation and new electrical conduits. At some point during construction the rain gauge was moved without technician/RC knowledge to an undesirable location. Upon discovery, the rain gauge was moved to a better suited location.

12/19/06:

A new wind sensor (model 05350) was installed atop the 10 m tower. A new version of the CR1000 program was also installed via the LoggerNet program on the same day.

d) Campbell Scientific data telemetry equipment is used at this station to transmit to the NOAA GOES satellite, NESDIS ID #3B0211F8. (Where 3B0211F8 is the GOES ID for that particular station.) The transmissions are scheduled hourly and contain four (4) datasets reflecting the fifteen min data sampling interval. The telemetry is "Provisional" data and not the "Authentic" Dataset used for long term monitoring and study. This data can be viewed by going to <http://cdmo.baruch.sc.edu> <http://cdmo.baruch.sc.edu/.