

Schodack Island Hydrological
prepared September 20, 2011

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Distribution

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An example citation:

2010 Schodack Island Hydrologic Data (finalized) courtesy of the Hudson River Environmental Conditions Observing System (<http://www.hrecos.org>)

Entry Verification:

Since December 2009, data collection and verification have been performed according to the HRECOS Quality Management Plan and the HRECOS Estuary Stations Quality Assurance Project. Both are available at www.hrecos.org. This station is quality level B; the data are verified once per quarter.

Previous to December, 2009, data were collected according to the manufacturer's instructions only. Post calibration values were seldom recorded and data were not verified.

Site Location and Character:

The hydrologic site for Schodack Island is immediately south of the SISP boat launch and the instrument housing is fixed to the steel bulkhead. Sensors report Acidity, Dissolved Oxygen (% saturation and mg/L), Specific Conductance, Turbidity, Water Temperature, and Water Level. Total water depth at mean low water is about 2 m and the instrument is about 0.5 m above the bottom. With the shoreline position of the deployment the data represent the relatively shallow areas of this portion of the Hudson River. Cross-channel sampling shows this part of the River is well-mixed for DO, and dissolved ions (conductivity, pH) but there are tidal increases in turbidity near the shoreline. The site is about 10 miles downstream of Albany.

Based on summer sampling in 2009, solutes (gases, conductivity) were homogeneous across the channel and so the near-shore continuous record can probably be considered representative of the cross-section. Not surprisingly, turbidity, suspended sediment and chlorophyll varied considerably over space and time with most patterns appearing related to tide stage. At sampling times near low water and early in the flood tide the locations are dramatically different with rapid changes in which portion of the channel shows highest concentrations. At other time the three locations are fairly similar and so a single sampling point would be more representative of the suspended sediment in the cross section. The full report is given as appendix A.

Schodack Island hydrological station is located within the Schodack Island State Park, operated by the Saratoga/Capital District Region of New York State Office of Parks, Recreation, and Historic Preservation. Permission for research work can be obtained through Melissa Miller, park manager (Melissa.Miller2@oprhp.state.ny.us; (518) 732-0187).

Data collection period:

Sampling at the Schodack Island Hydrological Station began on May 9, 2008. Sampling is continuous year round unless noted in Other Remarks/Notes (section IIe).

A YSI 6600 Extended Deployment System (EDS) sonde was purchased for Schodack Island Hydrological in December 2009. Previous to this, the station was using available YSI sondes on loan from the Cary Institute. The YSI 6600 sonde was first deployed on 12/14/2009.

Dates and times for site deployments and retrievals:

| Deployment | Retrieval | YSI sonde type |
|------------|------------|----------------|
| 02/27/2008 | 04/07/2008 | 6000 |
| 04/07/2008 | 05/01/2008 | 6000 |
| 05/01/2008 | 06/20/2008 | 6000 |
| 06/20/2008 | 07/22/2008 | 6000 |
| 07/22/2008 | 12/16/2008 | 6000 |
| 12/16/2008 | 03/13/2009 | 6000 |
| 03/13/2009 | 06/16/2009 | 6920 |
| 06/16/2009 | 08/27/2009 | 6920 |
| 08/27/2009 | 12/14/2009 | 6920 |
| 12/14/2009 | 04/23/2010 | 6600 |

| | | |
|------------|------------|------|
| 04/23/2010 | 07/28/2010 | 6600 |
| 07/28/2010 | 12/21/2010 | 6600 |
| 12/21/2010 | | 6600 |

Post deployment information

| Deployment | DO 100% | SpCond | pH | Turb |
|--------------------------|--|------------------|----------|--------------|
| <i>expected values</i> | <i>100%</i> | <i>1.0 mS/cm</i> | <i>7</i> | <i>0 NTU</i> |
| 02/27/2008 to 04/07/2008 | post deployment values were not recorded | | | |
| 04/07/2008 to 05/01/2008 | post deployment values were not recorded | | | |
| 05/01/2008 to 06/20/2008 | post deployment values were not recorded | | | |
| 06/20/2008 to 07/22/2008 | post deployment values were not recorded | | | |
| 07/22/2008 to 12/16/2008 | post deployment values were not recorded | | | |
| 12/16/2008 to 03/13/2009 | post deployment values were not recorded | | | |
| 03/13/2009 to 06/16/2009 | post deployment values were not recorded | | | |
| 06/16/2009 to 08/27/2009 | 100.8 | 0.959 | 7.14 | -2.7* |
| 08/27/2009 to 12/14/2009 | 99 | 0.959 | 7.11 | 1.9* |
| 12/14/2009 to 04/23/2010 | 99.4 | 1.00 | 7.03 | 0.6 |
| 04/23/2010 to 07/28/2010 | 98.8 | 0.981 | 7.04 | -1.0 |
| 07/28/2010 to 12/21/2010 | 100.6 | 1.067 | 7.32 | 0.00 |

* indicates post deployment values exceeded alarm levels as defined by the HRECOS Estuary Station Quality Assurance Project Plan

Other remarks / notes:

Sensor Specifications

| | | |
|-------------------------------|--|--|
| General Information | Date first operational | 5/9/08 |
| | Date of first transmission | 5/9/08 |
| | Data Logger Model | CR10X_PB |
| | Data Transmitter | Airlink Raven Cellular Modem |
| | Vented to Atmosphere? | non-vented |
| | Collection Interval | 15 min |
| Conductivity | Units | mS/cm |
| | Sensor type | 4-electrode cell with autoranging |
| | Model # | YSI 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 dependent) | |
| Salinity | Units | parts per thousand (ppt) |
| | Sensor type | Calculated from conductivity and temperature |
| | Range | 0 to 70 ppt |
| | Accuracy | +/- 1.0% of reading or 0.1 ppt, whichever is greater |
| | Resolution | 0.01 ppt |
| Dissolved Oxygen % Saturation | Units | percent air saturation (%) |
| | Sensor type | Optical probe w/ mechanical cleaning |
| | Model # | YSI 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 | |
| Temperature | Units | Celsius (°C) |
| | Sensor type | Thermistor |
| | Model # | YSI 6560 |
| | Range | -5 to 45 °C |
| | Accuracy | +/-0.15 °C |
| | Resolution | 0.01 °C |

| | | |
|-----------------------------|----------------------|---|
| Dissolved Oxygen mg/L | Units | milligrams/Liter (mg/L) |
| | Sensor type | Calculated from % air saturation, temperature, and salinity |
| | Model # | YSI 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 |
| Water Level (shallow depth) | Units | meters (m) |
| | Sensor type | Stainless steel strain gauge |
| | Vented to Atmosphere | vented |
| | Range | 0 to 30 ft (9.1 m) |
| | Accuracy | 0-10 ft: +/- 0.01 ft (0.003 m); 10-30 ft: +/- 0.06 ft (0.018 m) |
| | Resolution | 0.001 ft (0.001 m) |
| pH | Units | pH units |
| | Sensor type | Glass combination electrode |
| | Model # | YSI 6561 Flat Glass |
| | Range | 0 to 14 units |
| | Accuracy | +/- 0.2 units |
| | Resolution | 0.01 units |
| Turbidity | Units | nephelometric turbidity units (NTU) |
| | Sensor type | Optical, 90 ° scatter, with mechanical cleaning |
| | Model # | YSI 6136 |
| | Range | 0 to 1000 NTU |
| | Accuracy | +/- 2 % of reading or 0.3 NTU (whichever is greater) |
| | Resolution | 0.1 NTU |
| Chlorophyll | Units | micrograms/Liter (ug/L) |
| | Sensor type | optical fluorescence sensor |
| | Model # | 6025 |
| | Range | 0 to 400 ug/L chl a; 0 to 100 RFU |
| | Detection Limit | ~ 0.1 ug/L |
| | Resolution | 0.1 ug/L chl a, 0.1% FS |

QAQC flag definitions:

| | Flag | Description |
|-----------------------------|---------|--|
| Automatic Data Flags | 0 | Acceptable data |
| | 5 | Data that demonstrate a dramatic increase or decrease from the previous value. This flag will be applied to all parameters except chlorophyll, radiation, rainfall, wind direction, and wind direction standard deviation where dramatic increases and decreases are expected. The boundaries for these flags are: <ul style="list-style-type: none"> ○ $x > 3(\text{previous value})$ for Acidity, Dissolved Oxygen, Water Level, Water Temperature, Barometric Pressure, and Absolute Pressure. ○ $x < 1/3(\text{previous value})$ for Specific Conductivity, Salinity, and Relative Humidity. ○ $x > 10 + 3(\text{previous value})$ for Turbidity, Wind Gusts, and Wind Speed. ○ $x > 10 + 3(\text{previous value})$ for Air Temperature |
| | 6 | Flat lined data (20 or more repeated records of the same value). This flag will be applied to all parameters except specific conductivity, chlorophyll, radiation, and rainfall where flat lined data is expected. For the same reason, this flag will not be applied to salinity data from Norrie Point. |
| | 30 | Hydrological data outside three standard deviations of the seasonal mean. The seasons will be defined by the solstices and equinoxes. |
| | 40 | Hydrological data outside four standard deviations of the seasonal mean. The seasons will be defined by the solstices and equinoxes. |
| | 100 | Data outside the range of the instrument. |
| Added by Site Manager | 0 | Data determined to be acceptable after a final review by the site manager. |
| | 10,000 | Suspicious data according to a final review by the site manager |
| | 20,000 | Corrected Data |
| | 500,000 | Rejected data according to a final review by the site manager. |
| Added by HRECOS Coordinator | 5,000 | Data from instruments that exceed the post-deployment warning level as defined by the HRECOS quality management plan |
| | 9,000 | Data from instruments that exceed the post-deployment alarm level as defined by the HRECOS quality management plan |

QAQC Comment Code definitions:

| | | | | | | | |
|--------------------------------------|----------------|---------------|-------|---|---|---|------------------------------------|
| Comment Codes Added By Site Managers | General Errors | Hyd + Met | [GIM] | instrument malfunction | [GPF] | power failure/low battery | |
| | | | [GIT] | instrument recording error, recovered telemetry data | [GQR] | rejected due to QAQC checks | |
| | | | [GMC] | no instrument deployed due to maintenance/calibration | [GSM] | see metadata | |
| | | Hyd | [GIC] | no instrument deployed due to ice | [GOW] | out of water event | |
| | | | [GNF] | deployment tube clogged/no flow | | | |
| | | Met | [GMT] | instrument maintenance | [GIM] | program reload | |
| | | | [GPD] | power down | | | |
| | | Sensor Errors | Hyd | [SBO] | blocked optic | [SPC] | post calibration out of range |
| | | | | [STF] | catastrophic temperature sensor failure | [SSDN] | sensor drift, record not corrected |
| | [SCF] | | | conductivity sensor failure | [SSDC] | sensor drift, record corrected | |
| | [SDF] | | | depth port frozen | [SSM] | sensor malfunction | |
| | [SDP] | | | DO membrane puncture | [SOW] | sensor out of water | |
| | [SDO] | | | DO suspect | [SSR] | sensor removed (not deployed) | |
| | [SIC] | | | incorrect calibration/contaminated standard | [STS] | turbidity spike | |
| | [SNV] | | | negative value | [SWM] | wiper malfunction/loss | |
| | Met | | [SIC] | incorrect calibration constant, multiplier or offset | [SOC] | out of calibration | |
| | | | [SNV] | negative value | [SSM] | sensor malfunction | |
| | | | [SSN] | not a number/unknown value | [SSR] | sensor removed | |
| | Comments | | Hyd | [CAF] | acceptable calibration/accuracy error of sensor | [CRE] | significant rain event |
| | | [CBF] | | biofouling | [CSM] | see metadata | |
| | | [CCU] | | cause unknown | [CTS] | turbidity spike | |
| | | [CDA] | | DO hypoxia <28 percent saturation | [CWD] | data collected at wrong depth | |
| | | [CDB] | | disturbed bottom | [CAP] | depth sensor in water, affected by atmospheric pressure | |
| | | [CDF] | | data appear to fit conditions | [CAB] | algal bloom | |
| | | [CFK] | | fish kill | [CVT] | possible vandalism/tampering | |
| | | [CIP] | | surface ice present at sample station | [CMC] | in field maintenance/cleaning | |
| | | [CLT] | | low tide | [CMD] | mud in probe guard | |
| | | [CND] | | new deployment begins | | | |
| | | Met | [CAF] | acceptable calibration/accuracy error of sensor | [CSM] | see metadata | |
| | | | [CDF] | data appear to fit conditions | [CVT] | possible vandalism/tampering | |
| | | | [CRE] | significant rain event | | | |

Appendix A

Final Report – HRECOS Installation at Schodack Island State Park

Stuart Findlay

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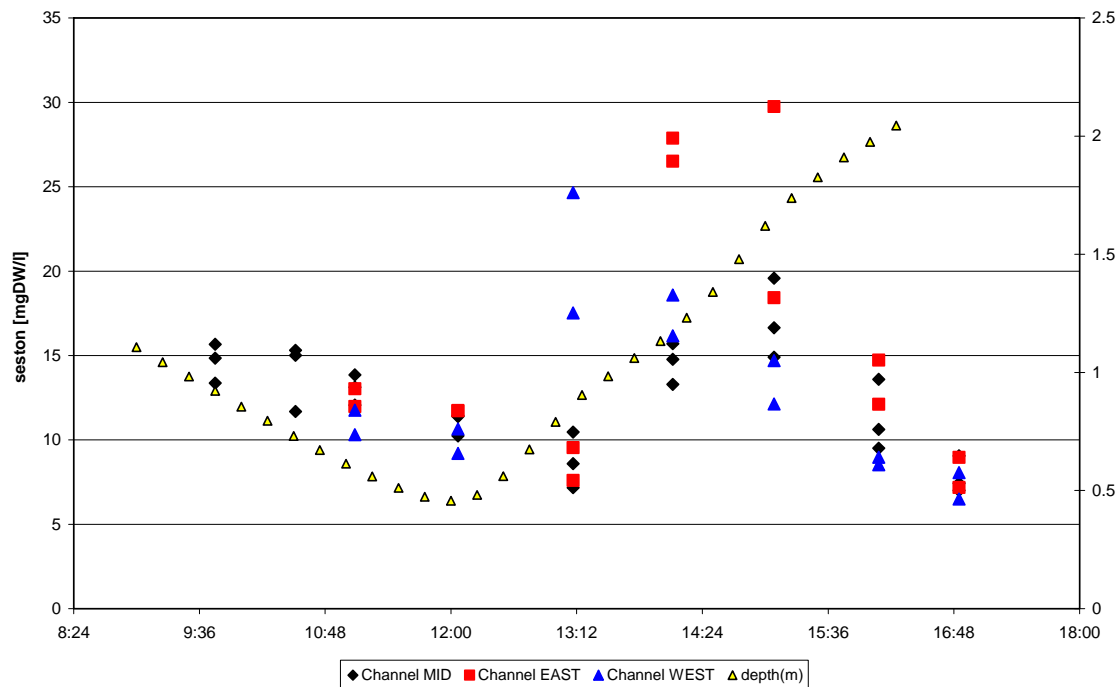
HRF Award # 001/07E

October 30, 2009

The original proposal to the Hudson River Foundation had several major goals and all these have been met and surpassed over the last two years.

1. Installation – A functional, multi-variable water quality and meteorological site has been established at the SISP in collaboration with Gary Wall of the USGS. The site has been operational with very minor gaps since spring of 2008.
2. Field sampling – To determine how well the shore-mounted site captures variability across the channel we collected water samples from the east and west shore over a 24 hr period using ISCO Automatic samplers. During the last ten hours we sampled three points across the channel cross-section with surface, mid-depth and near-bottom samples. Solutes (gases, conductivity) were homogeneous across the channel and so the near-shore continuous record can probably be considered representative of the cross-section. Not surprisingly, turbidity, suspended sediment and chlorophyll varied considerably over space and time with most patterns appearing related to tide stage. The Figure below shows the suspended matter concentrations at the East, Mid and Western channel sites over an ebbing-flooding transition. At sampling times near low water and early in the flood tide the locations are dramatically different with rapid changes in which portion of the channel shows highest concentrations. At other time the three locations are fairly similar and so a single sampling point would be more representative of the suspended sediment in the cross section.

Schodack Island Channel



3. Findings – Observations from this site have contributed to new knowledge on several fronts. Firstly, we were able to show that early in the year, turbidity at Schodack is completely controlled by water flow at the head of tide while later in the year turbidity is associated with short-term resuspension events. Additionally, a comparison with the Norrie Point station shows turbidity records were not strongly connected to flow variations but are linked with local conditions (<http://hres.org/currents/cur37-2.pdf>). Recently, Gary Wall has confirmed discrepancies between the predicted and observed tides of as much as two hours using the Schodack water level records. Such information is of use to local fisherman and those using the River for recreation. Information from the HRECOS network has been used in many scientific talks, publications and general assistance for the public.

4. Education – Cornelia Harris of the Cary Institute has developed some teaching modules suitable for High School students using HRECOS data. These modules describe the observational system and then challenge the students to explore the records for potential relationships between precipitation and pH. Students completing the exercise gain familiarity with working with large data sets and can see how different ways of extracting data can lead to differing conclusions (http://www.hrecos.org/joomla/index.php?option=com_content&view=category&layout=blog&id=36&Itemid=59).

5. Outreach – The availability and capabilities of the HRECOS system have been broadly disseminated through face-to-face meetings and the media. The Cary Institute, HRNERR and HRF held a pair of workshops to introduce stakeholders to HRECOS and how it might be of interest to them. Overall reaction was positive with suggestions for how to present results, data gaps and additions for the future. A newspaper article appeared in July of 2008 giving details on HRECOS goals and the status to date (http://www.ecostudies.org/ecofocus_2008-07-20.html). Staff of the Schodack Island State Park use the observations to answer questions from Park visitors about water temperature and other conditions.