HRECOS Piermont Water Quality Metadata

Last updated: 01/22/2025

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Station Overview
Location: Piermont Pier (41.043, -73.896)

Data collection period: 04/22/2008-10/29/2012; 8/28/2013 – present

Parameters: pH, dissolved oxygen, specific conductance, turbidity, salinity, water temperature, chlorophyll*, and water depth above sonde

*Chlorophyll measurements ceased 12/12/2011

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Station Description:
The Piermont Pier sampling station is situated on the end of a mile long pier stretching into the Hudson River. The pier is open to the public and regularly used for recreational purposes. It is located just north of the NERRS Piermont Marsh, a tidal salt marsh dominated by the invasive reed *Phragmites australis*, where approximately 30 MGD of secondarily treated sewage is discharged from Orangetown and Rockland County. The local tidal range varies between 3 and 5 feet and the river bottom is characterized by thick mud and rocks. A YSI 6600 multi-probe sonde was deployed in a perforated PVC tube encasing mounted to the pier until August 2023. The sensors sit ~3 feet below low tide. A USGS station is located 10 feet to the north and records water elevation.

Historic depth above sonde data is also available at this site. Because the depth sensor is non-vented to the atmosphere, we adjust depth measurements for barometric pressure using the following equation: Corrected Depth = Depth + ((1013- Barometric Pressure) * .0102). This correction is performed on all data since EST 9/23/2011 00:00:00. These corrections were made retroactively once per quarter until 4/18/2015 12:00 EST, when the correction was implemented as an automated calculation on the real-time data.

Equipment was upgraded to a YSI EXO2 sonde on 8/10/2023.

Summary of Cross Channel Analysis:
Based on sampling on December 1, 2011, the river cross-section at this location showed greater variability in turbidity and conductivity across both distance and time than other HRECOS sites examined. Due to a dysfunctional sonde at the station, a comparison of long-term patterns was not possible. On the day of sampling there was a strong West to East gradient in turbidity which (if general) means the fixed HRECOS site will overestimate turbidity of the main channel at this location. There was no conclusive evidence of an effect of the wastewater outfall or Sparkill Creek on conditions observed at the fixed HRECOS site. The full report of this analysis is given as appendix A.

Special Remarks:

Date	Remark
1/06/2011-2/07/2011	Sonde failure. Data lost.
2/07/2011-2/12/2011	Dissolved oxygen probe failure.
7/14/2011-10/23/2011	Sonde failure. Data lost.
9/23/2011	Depth corrections using barometric pressure begin.
11/08/2011 – 12/11/2011	Barometric pressure sensor failure.
10/30/2012	Sonde lost during Hurricane Sandy
8/28/2013	Station rebuilt after Hurricane Sandy
4/18/2015	Automated depth corrections begin
1/1/2015-5/2/2015	Sonde deployment surpassed 3 months. All data flagged as suspicious.
8/2/2015-10/13/2015	Sonde deployment surpassed 3 months. All data flagged as suspicious.
1/27/2016	Time lag observed in data stream. Data were post-corrected with internally logged data.
9/1/2016	Logging and telemetry issues are fixed
3/6/2017	Extreme rain even led to large flush of freshwater and low temperatures.
3/23/2017	Heavy sedimentation may have impacted sensor readings
8/10/2023	6600 sonde replaced with YSI EXO2 sonde
12/9/2024	Telemetry restored to site.

Distribution Terms:
HRECOS requests that attribution be given whenever HRECOS material is reproduced and re-disseminated and the HRECOS Coordinator be notified prior to publications including any part of the data. Example citation: "Hudson River Environmental Conditions Observing System. 2012. Albany Hydrologic Station data. Accessed April 13th, 2016. http://www.hrecos.org/."

Data Quality Assurance:
Data collection and verification have been performed on all parameters (except velocity; see below) since the establishment of this station (January 2011) according to the HRECOS Quality Assurance Project Plan, which is available at www.hrecos.org

Remark on velocity: The level gage and velocity meter have been maintained by the U.S. Geological Survey since their adoption/installation by the agency in September 2016. Water elevation is verified by USGS annually, while velocity is only a working dataset and is primarily purposed for short-term operational use. USGS-verified data may have been corrected based on field measurements, sensor calibrations, sensor cleanings, and other observations using standard USGS methodology. Unverified data is provisional and is subject to revision.

Code Definitions

Flag code definitions:

A	Accepted data
P	Provisional data
S	Suspect data, consult comment codes
R	Rejected data, consult comment codes
C	Corrected data, consult comment codes

Comment code definitions:

General Errors

[GIM]	instrument malfunction
[GIT]	instrument recording error, recovered telemetry data
[GMC]	no instrument deployed due to maintenance/calibration
[GPF]	power failure/low battery
[GQR]	rejected due to QAQC checks
[GSM]	see metadata
[GIC]	no instrument deployed due to ice
[GNF]	deployment tube clogged/no flow
[GOW]	out of water event

Sensor Errors

[SBO]	blocked optic
[STF]	catastrophic temperature sensor failure
[SCF]	conductivity sensor failure
[SDF]	depth port frozen
[SDP]	DO membrane puncture
[SDO]	DO suspect
[SIC]	incorrect calibration/contaminated standard
[SNV]	negative value
[SPC]	post calibration out of range
[SSD]	sensor drift
[SSM]	sensor malfunction
[SOW]	sensor out of water
[SSR]	sensor removed (not deployed)
[STS]	turbidity spike
[SWM]	wiper malfunction/loss

Comments

(CAB)	algal bloom
(CAF)	acceptable calibration/accuracy error of sensor
(CAP)	depth sensor in water, affected by atmospheric pressure
(CBF)	biofouling
(CCU)	cause unknown
(CDA)	DO hypoxia < 28 percent saturation
(CDB)	disturbed bottom
(CDF)	data appear to fit conditions
(CFK)	fish kill

(CIP)	surface ice present at sample station
(CLT)	low tide
(CMC)	in field maintenance/cleaning
(CMD)	mud in probe guard
(CND)	new deployment begins
(CRE)	significant rain event
(CSM)	see metadata
(CTS)	turbidity spike
(CVT)	possible vandalism/tampering
(CWD)	data collected at wrong depth
(CWE)	significant weather event

YSI EXO2 Sensor Specifications:
Consult description and remarks for upgrade dates.

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 599870-01
Range: -5 to 50 C
Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .005
Resolution: 0.01 C

Parameter: Conductivity
Units: mS/cm
Sensor Type: 4-electrode cell with autoranging
Model#: 599870-01
Range: 0-200 mS/cm
Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm; 100 to 200: +/- 1% of reading
Resolution: 0.001 mS/cm to 0.1 mS/cm

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 psu
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
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: +/- 5% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 5% of the reading
Resolution: 0.01 mg/L
Parameter: pH

Units: pH units
Sensor Type: Glass combination electrode
Model#: 599701 (guarded) or 599702 (wiped)
Range: 0 to 14 units
Accuracy: +/- 0.01 units within +/- 10° of calibration temperature, +/- 0.02 units for entire temperature range
Resolution: 0.01 units

Parameter: Turbidity
Units: formazin nephelometric units (FNU)
Sensor Type: Optical, 90-degree scatter
Model#: 599101-01
Range: 0 to 4000 FNU
Accuracy: 0 to 999 FNU: 0.3 FNU or +/-2% of reading (whichever is greater); 1000 to 4000 FNU +/-5% of reading
Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU

Parameter: Chlorophyll
Units: micrograms/Liter, RFU
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 400 ug/Liter; 0 to 100 RFU
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% RFU

Parameter: Phycocyanin
Units: micrograms/Liter, RFU
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 100 ug/Liter; 0 to 100 RFU
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L PC, 0.1% RFU

YSI 6600 Sensor Specifications
Consult description and remarks for upgrade dates.

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 6560
Range: -5 to 45 C
Accuracy: +/- 0.15 C
Resolution: 0.01 C

Parameter: Conductivity
Units: mS/cm
Sensor Type: nickel electrode
Model#: 6560
Range: 0-100 mS/cm
Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 5% of the reading
Resolution: 0.01 mg/L

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6589
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: +/-2% of reading or 0.3 NTU (whichever is greater
Resolution: 0.1 NTU

Parameter: Chlorophyll
Units: RFU, micrograms/Liter
Sensor Type: Optical probe
Model#: 6025
Range: 0 to 400 ug/Liter; 0 to 100 RFU
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% RFU

Remarks on Sensor Specifications and Units

Conductivity:

Historically, specific conductivity data from HRECOS sites was reported in millisiemens/cm. However beginning in 2019, reporting switched to microsiemens/cm. All data files available on hrecos.org have been converted to reflect this change.

Salinity:

The 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu).

Turbidity:

The 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU).

Chlorophyll and Phycocyanin Disclaimer:

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual.

Appendix A

Final Report
Characterizing cross-channel variability at the Piermont HRECOS site.

Prepared by:
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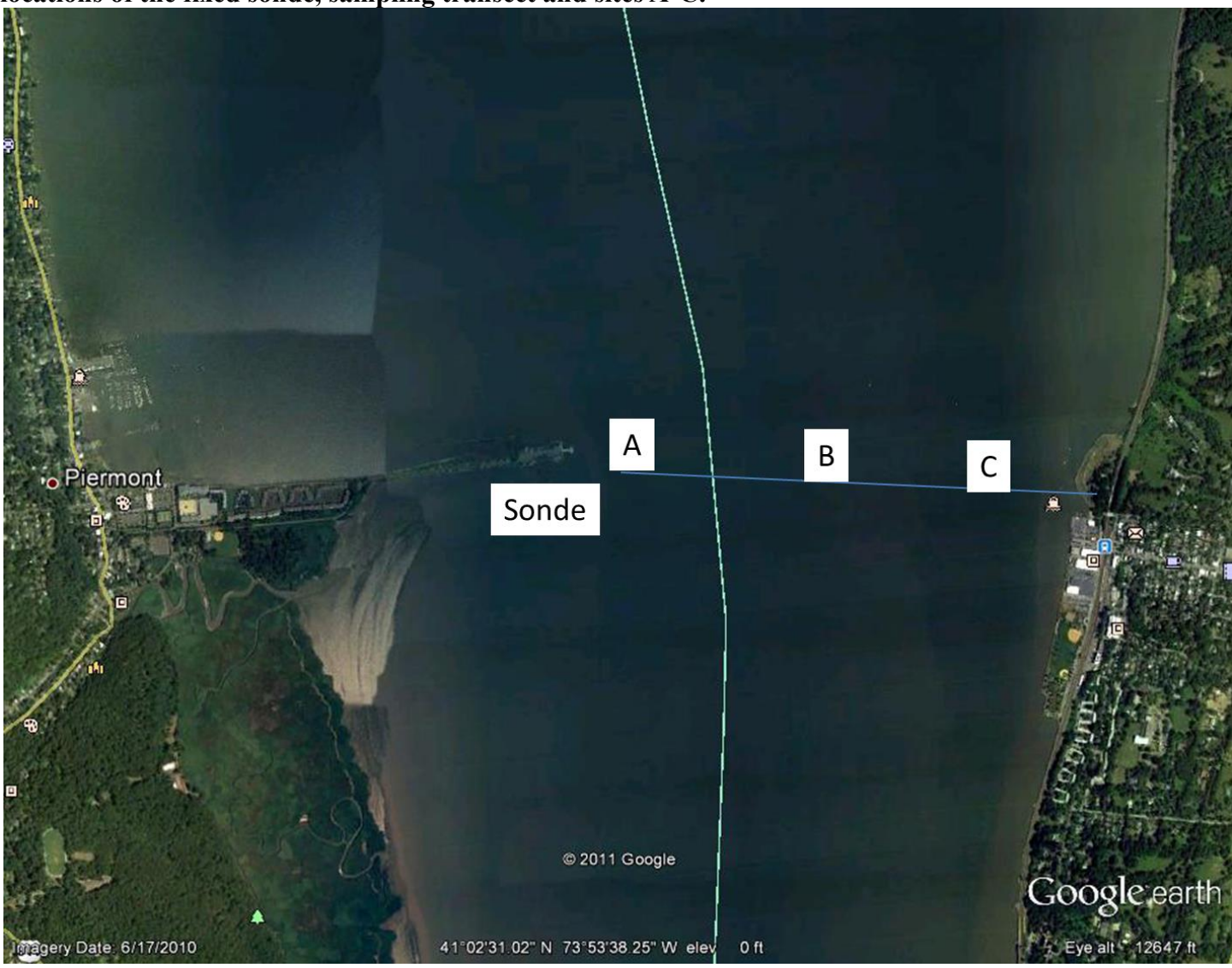
Transmitted to Alene Onion, HRECOS Coordinator on December 30, 2011

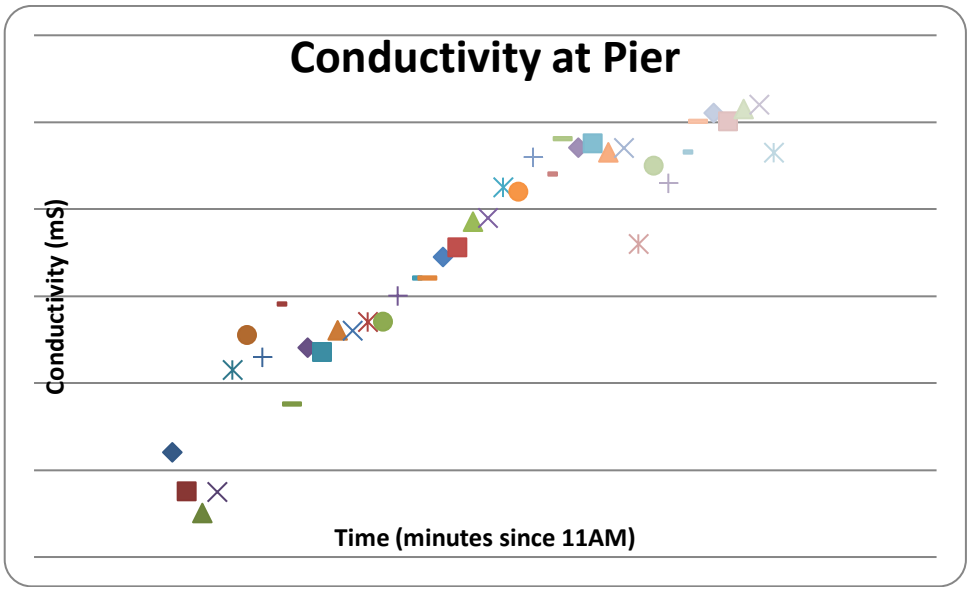
On December 1, 2011 we conducted a survey of cross-channel variability adjacent to the Piermont Pier HRECOS deployment. The HRECOS sonde is located in a pipe on the southern side of the pier in approximately 4 m water depth. Due to concern about the condition of the existing HRECOS sonde we attached a newly-calibrated sonde at the same location as the existing sonde. This sonde was programmed to log every 5 minutes for the interval of our field sampling. To assess how well this location represents conditions across the channel we conducted two sampling transects each including three locations (Fig. 1) where we conducted vertical sampling. Following established procedures we towed a YSI Water Quality sonde approximately 1 m sub-surface across the transect with logging set for 30 sec intervals. Due to the width of the Hudson at this location it required nearly an hour to traverse the channel. Sampling occurred between Noon and 3 PM (EST) during a flooding tide since the main concern at this site was the possible influence of a wastewater outfall and the Sparkill Creek both located south of the Pier. At Locations A,B,C along the transect the sonde and a sampling tube connected to a peristaltic pump were lowered to 1 and 5 m (and 10 m in the navigation channel (Site C)) to collect observations and an actual water sample from these depths.
All sonde calibration and suspended matter determinations followed established procedures.

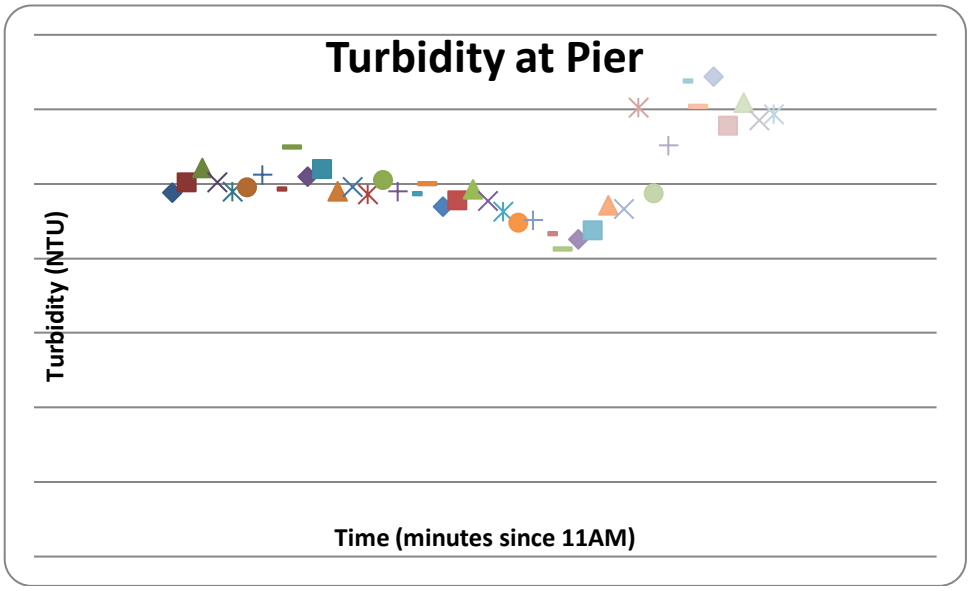
Fig. 1: Google Earth image of Piermont reach of the Hudson River showing approximate locations of the fixed sonde, sampling transect and sites A-C.



Both conductivity and turbidity records at the Pier showed increases during the three hour period of flooding tide. Conductivity is likely simply due to an upriver flow of higher salinity water. The turbidity increase could be due to either local resuspension or upriver movement of a water mass with higher turbidity.

Fig. 2: Changes in conductivity and turbidity recorded by the temporary sonde attached to the pier during the 3 hour transect sampling interval.





Sampling across the channel revealed large and distinct differences in turbidity with highest values on the west side of the channel, decreasing towards the east during both traverses (Fig. 3). Higher values occurring at ~ 80 and 120 minutes represent times the sonde was lowered for vertical profiles (see below).Samples of suspended matter showed distinct differences among locations with values at Location “A” nearly two-fold higher than Location “C” in the navigation channel (Fig. 4).

Fig. 3: Cross-channel variation in turbidity as recorded by the towed YSI Sonde. The X-axis is in minutes since 11 AM for ease of comparison with the fixed (pier) sonde. Two traverses were carried out, the first lasting from roughly 70 to 130 minutes past 11AM and the second from 140 to 210 minutes and each was from West to East.

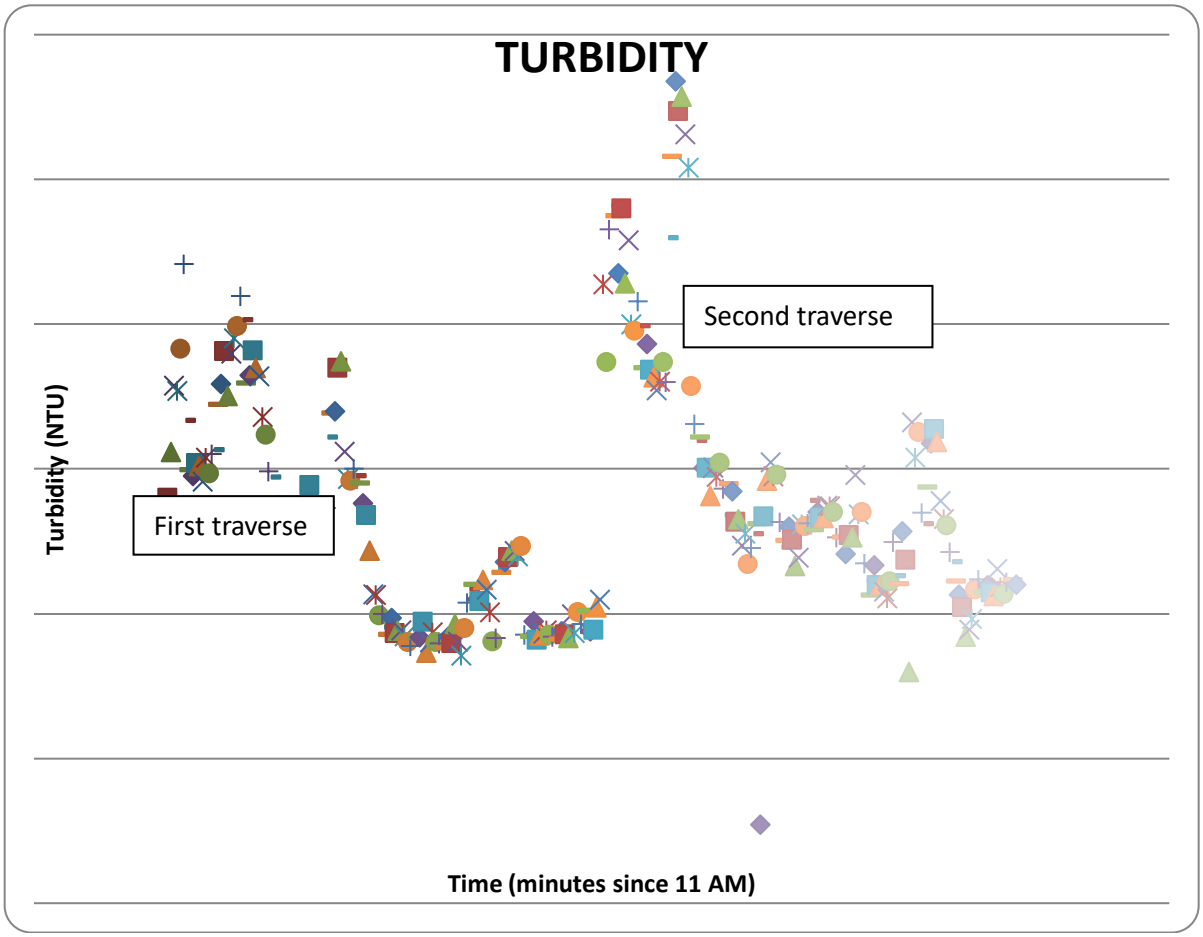
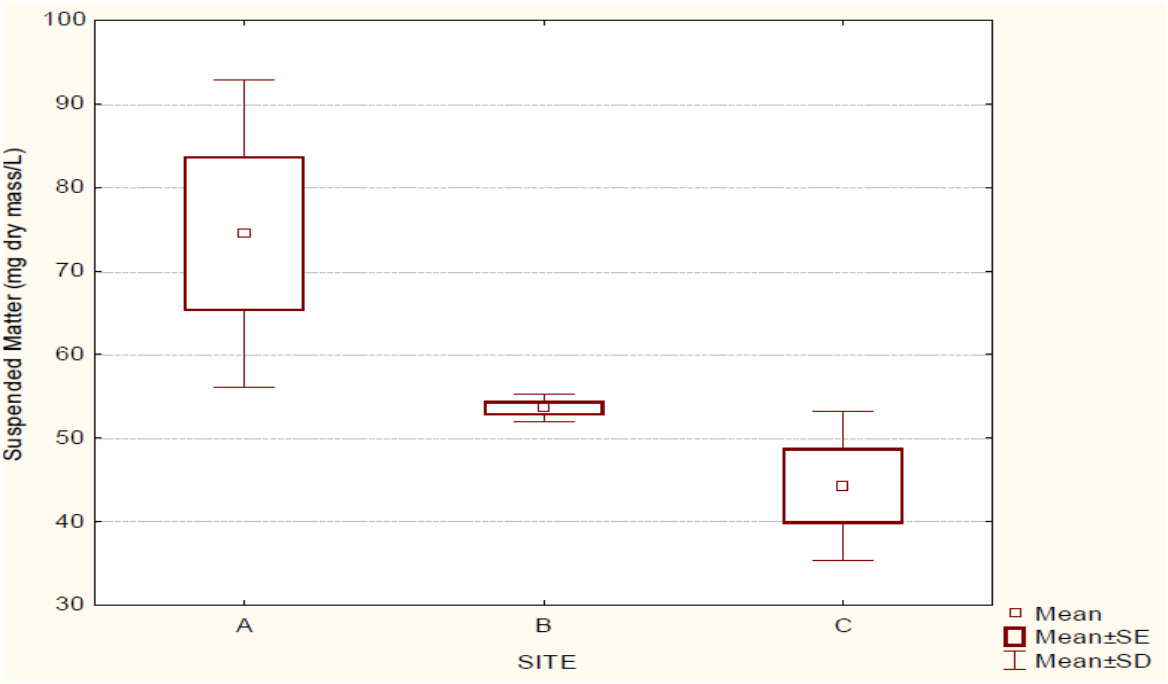
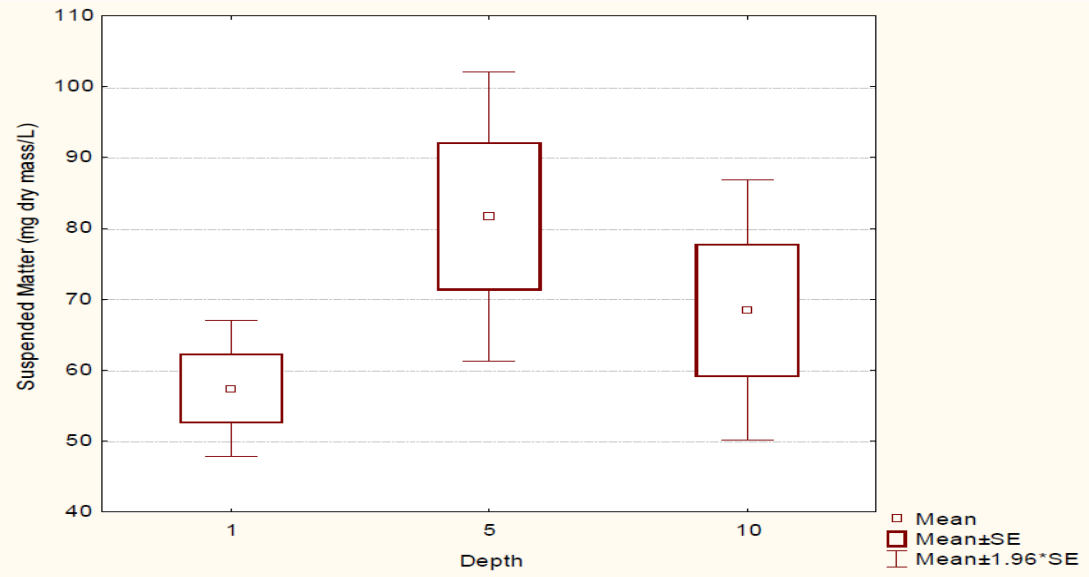


Fig. 4: Variation in suspended matter in shallow water (depth = 1 m) samples collected at locations A-C (West to East) across the transect.



Samples for suspended matter collected along vertical profiles showed higher values at depths 5 and 10 (Fig. 5) although statistical analysis was equivocal since only "Location "C" was deep enough to allow sampling at 10 m.

Fig. 5: Depth variation in suspended matter. Locations "A & B" were sampled at 1 and 5 m while Location "C" was sampled at 1,5 and 10 m.



There were slight West to East gradients in conductivity with a range of less than 0.1 mS (not shown) but little evidence of strong vertical variation in conductivity. Dissolved oxygen and pH showed no variation across the transects. The average dissolved oxygen was 11.2 mg/L with a standard deviation of only 0.1 mg/L. Mean pH was 7.9 pH units.

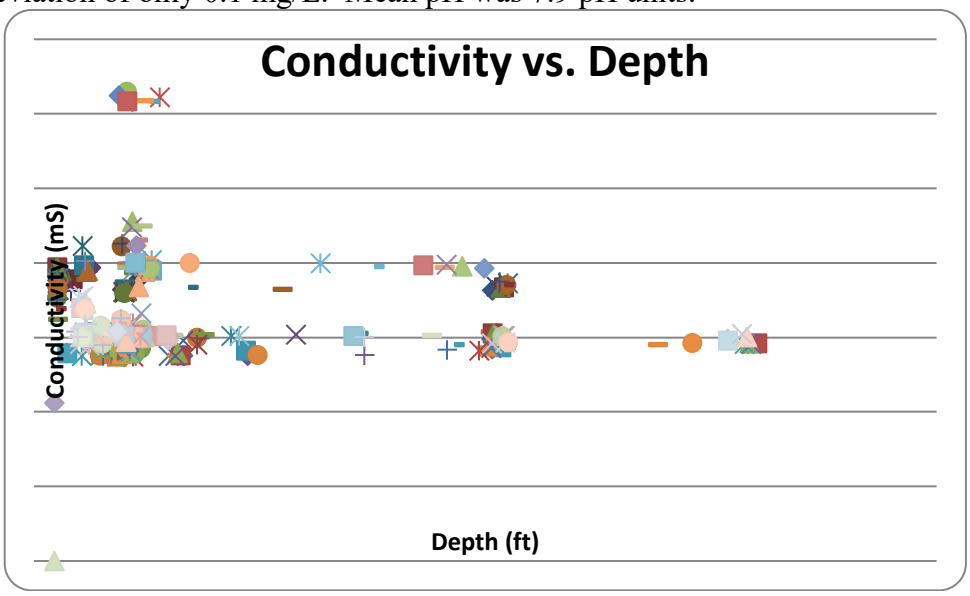


Fig. 6: Variation in conductivity across sampling depth showing no consistent stratification (higher conductivity at depth) during this three hour period.

Conclusions

1. On the date of sampling the Piermont cross-section showed greater variability in turbidity and conductivity across both distance and time than other HRECOS sites examined.
2. Lack of a functional fixed sonde makes comparison of the particular sampling dates to longer term patterns impossible.
3. On the day of sampling there was a strong West to East gradient in turbidity which (if general) means the fixed HRECOS site will overestimate turbidity of the main channel at this location.
4. There was no conclusive evidence of an effect of the wastewater outfall or Sparkill Creek on conditions observed at the fixed HRECOS site.