

**Hudson River Monitoring at the Piermont Pier  
Annual Study for the 2002-2003 Academic Season  
Fall/Spring**

**Student Groups: 10/15/02 45 students**  
**10/29/02 22 students**  
**4/21/03 18 students**

The Hudson River Monitoring program at the Piermont Pier has been established to do chemical, physical site and benthic macro invertebrate monitoring by High School students under the supervision of their teachers and Lamont science staff.

The program was established with the goals of:

1. Establishing baseline data on the various estuary measurements being collected.
2. Identify seasonal changes in measurement, and/or analyze conditions that effect change.
3. Developing critical thinking in the student participants
4. Establishing a sense of stewardship to the river, and an understanding of the effects of various processes on the river
5. Establish a mentoring relationship between interested students and scientists and graduate students at Lamont.

Chemical monitoring stations are set up in four different locations on the pier to represent differing environments and small ecosystem differences.

1. Station #1 is set up at the South side of the pier approximately 1/4 mile from the East end of the pier. It is located in a protected shallow area with large amounts of vegetation along the shore in both spring and fall, and a small area of sandy beach evident at low tide.
2. Station #2 is set up at the South East end of the pier as a deeper water sampling station. Water samples are collected from river bottom for measurement and comparison with more surface sampling. This station is unprotected from the tides and winds and devoid of vegetation.
3. Station #3 is set up at the North East end of the pier as a second deep water sampling station with water samples collected approximately midway between bottom and surface sampling. This station is unprotected from the tides and winds and devoid of vegetation.
4. Station #4 is set up on the North side of the pier, roughly across from Station #1. This station is very protected from the tides as it is bordered on the east and north by large rocks, which act as a buffer. There is extensive vegetation in the area in both spring and fall.

See Appendices for Chemical Data Sheets.



**Surrounding Land Use:**

Estimated % Urban/residential 50  
Estimated % Marshland 25  
Estimated % Other (specify) 25 land man made jetty

**Plant Survey**

List Plants Identified in area surrounding sampling (use identifying sheets).

Check if present and list estimated percentage:

(Pier area only – not including marsh area)

Tidal Shallows:

Sago Pondweed _____	Percent of vegetation _____
Clasping Pondweed _____	Percent of vegetation _____
Water Milfoils _____	Percent of vegetation _____
Water Celery _____	Percent of vegetation _____

**No SAV present in tidal shallows**

Tidal Marshes:

Broad leaved Cattail _____	Percent of vegetation _____
Narrow-leaved Cattail _____	Percent of vegetation _____
Reed Grass _____	Percent of vegetation _____
Common Reed (phragmites) <u>X</u>	Percent of vegetation <u>55%</u>
Big Cordgrass _____	Percent of vegetation _____

Spike Grass _____	Percent of vegetation _____
Saltwater Cordgrass _____	Percent of vegetation _____
Saltmeadow Cordgrass _____	Percent of vegetation _____
Arrow Arum _____	Percent of vegetation _____
Pickerelweed _____	Percent of vegetation _____
Swamp Rose-Mallow <u>X</u>	Percent of vegetation <u>5%</u>
Purple Loosestrife <u>X</u>	Percent of vegetation <u>5%</u>
<b>Sumac Trees</b>	Percent of vegetation <u>10%</u>
<b>Willow</b>	Percent of vegetation <u>20</u>

Sketch any unidentified plant:

**Drawing on back**

List any other comments:

**Dry soil, about 1 foot tall**

**Physical Survey  
Fall 10/29/02**

A physical survey for each site should include a 200' segment extending up and downstream from your sampling site (your site bisects the segment).

Station 2 Tides: High \_\_\_ time \_\_\_ Ht  
**DATE: 10/29/02 TIME : 10:45** Low **X**  
 Weather: Today sun, very windy & COLD Temperature: Air 38 °F  
 Past 2 days rain, windy cool Water 11 °C

*Water Appearance:*

clear	tea-brown X	milky	other (describe)	unusual odor (describe)
foam	multi-color	muddy X	suspensions	algae/plant debris prevalent
Choppy X	wavy X	calm		

Detailed description:

Turbidity reading 40 cm

Oily film or unusual odor or appearance:  Yes  No

Describe \_\_\_\_\_

Algae or weed growth substantial:  Yes  No

Describe \_\_\_\_\_

*River Banks:*

THEY ARE:	In no or few areas	In some areas	In many areas
Covered with vegetation			<b>X</b>
Eroded	<b>X</b>		
Artificially protected	<b>X</b>		

*Human Impacts: (check all that apply)*

banks altered X	collected wood/debris	culverts	houses
storm drain pipe	garbage X	Roads X	Other: <i>Built deck at pier</i>

**Plant Survey – NOT DONE AS WE WERE OUT ON END OF PIER – NO PLANTS AROUND.**



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Estimated % Marshland 25  
Estimated % Other (specify) 25 land man made jetty

**Plant Survey**

List Plants Identified in area surrounding sampling (use identifying sheets).

Check if present and list estimated percentage:

(Pier area only – not including marsh area)

Tidal Shallows:

Sago Pondweed \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Clasping Pondweed \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Water Milfoils \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Water Celery \_\_\_\_\_ Percent of vegetation \_\_\_\_\_

**NO SAV present in Tidal shallows**

Tidal Marshes:

Broad leaved Cattail \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Narrow-leaved Cattail \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Reed Grass \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Common Reed (phragmites) X Percent of vegetation 55%  
Big Cordgrass \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Three Square X \_\_\_\_\_ Percent of vegetation 10%  
Spike Grass \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Saltwater Cordgrass \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Saltmeadow Cordgrass \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Arrow Arum \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Pickerelweed \_\_\_\_\_ Percent of vegetation \_\_\_\_\_  
Swamp Rose-Mallow X \_\_\_\_\_ Percent of vegetation 5%  
Purple Loosestrife X \_\_\_\_\_ Percent of vegetation 5%  
**Sumac Trees** \_\_\_\_\_ Percent of vegetation 10%  
**Willow** \_\_\_\_\_ Percent of vegetation 10%

Sketch any unidentified plant:

List any other comments:

### Biological Sampling:

A biological sampling is collected for each visit. During low tide students gather samples using plankton nets, spoons, cups and various other collection devices. Samples are then examined at a microscope set up in the Piermont Pier blockhouse, sketched and logged.

### Piermont Pier Microscope Room FALL 10/15/02

Item No.	Name	Catch Location	Net Used	Time	Description	Magn
1	Male Fiddler Crab	Tide pool north edge by road			Eyes protruded	
2	Crab (shape looks like red-jointed fiddler crab)	Center of tide pool	Sweeper net	10:00 AM	Very small, dark grey, legs lighter (yellowish tint) w/ dark spots	
3	Clam <sup>2</sup>	Center of tide pool	Sweeper net	10:15 AM	Small only half shell, light grey to white to yellow shell, lines running horizontally on body	Mag. box
4	Amphipod <sup>1</sup>	Tide pool south side	N/a	10:15	Central line visible under scope - , and dark bands along back	Dissecting scope
5	Clam <sup>2</sup>	Center of tide pool	N/a	10:30	Tan color shell with lots of dirt on top, numerous ridges and incisions along top – coating has been chipped away	
6	Barnacle <sup>3</sup>	Tide Pool North side most exposed to Hudson	Attached to debris	9:30		20
7	Zooplankton?	Tide Pool North side most exposed to Hudson	In water	9:25	Round with 6 projections mostly on one side and central mark	20
8	Plant	Tide pool	Amongst rocks	10:15	Round Multi-celled	Did

	-seaweed?	rocks – northernmost side			and the cells look as if they have walls – must be a plant	not record
9	Arthropod	Central are of tide pool		11:00	Two fighting	20
10	Cyathura <sup>4</sup> Polita	Eastern side of tidepool area		11:00	Long cylindrical body	Magnifying box
11	?	Northside of tidepool		11:00	This organism was scrunched up and squirmy – no size listed etc.?	N/a
12	Amphipod <sup>1</sup> with attached larvae	Eastern section of tidepool		11:10	It appears that the larvae is still attached to the mother as the two move together	Magnifying box
13	Amphipod <sup>1</sup>	South side of tide pool		11:28	2 claws up front, two antennae and many sections with legs	10
14	Shell – with arthropod inside	Center of pool		11:25	Shell with oblong opening. Shell has serrated lip with bottom shelf cover and opening in top. Arthropod inside shell	10
15	Blue crab	Southside of pool		11:25		Magnifying box

<sup>1</sup> Amphipod-known as scuds, shrimp like crustaceans with laterally compressed (exception Corophium) bodies and 10 pairs of legs. Two front pair developed for grasping, tearing or digging, middle five pairs for walking and last 3 pair for swimming. Can be highly mobile, or burrowing, or tube dwelling. Can be predators, scavengers or detrital eaters.

<sup>2</sup> Bivalvia – At least 10 species of bivalves live in the estuary and adjacent marshes. Some live in the mud, some require anchorage to rocks or pilings.

<sup>3</sup> Barnacle – Adult barnacles are sessile crustaceans. As adults they are covered with a calcareous shell and attach to the substrate.

<sup>4</sup> Cyathura Polita – Only isopod in the estuary with a long cylindrical body. Has dorso-lateral keels, stout gnathopods, six walking legs, 2 pairs short antennae, mottled grey body – 5-25 mm. Largest population in Tappan Zee and Haverstraw.

**Piermont Pier Microscope Room**  
**10/29/02**

<b>Item No.</b>	<b>Name</b>	<b>Catch Location</b>	<b>Time</b>	<b>Description</b>	<b>MORE INFO</b>	<b>Magn</b>
1	Anabaena species	Tide pool with spoon	10:30 AM	Two chains of round structures	Among most toxin-producing species of blue-green Algae –found in mostly fresh to brackish parts of Hudson	400X
2	Cyclotella species Diatom	Tide Pool	10:30 AM	Circle with cell wall and wheel like circles inside	Most are marine although they are found in brackish and fresh –dominant in Hudson in spring and fall	100X
3	Skeletonema species Diatom (appears to be)	Tide Pool	10:30 AM	Centric diatom has lens shaped cells. Parallel siliceous threads around margins connect them into chains.	Found in brackish section of Hudson primarily late summer early fall.	100X
4	Arthropoda Cumacea	Tide Pool	10:30	Segmented body, head identifiable with dark area (eye?), legs, and tail looks stinger-like	Small crustacean-head and thorax enlarged.	100X
5	Eteone heteropoda Hartman	Tide pool	10:30	Sub-triangular head and prominent tentacles on first segment – 2 eyes	Annelids – segmented worms – free moving and burrowing – found up to the 75km mark in the fall	40X

6	Amphipoda	Tide Pool – with spoon	10:30	Scud - crustacean	Range from GW bridge to Haverstraw Bay	40X dissect ing scope
7	Eteone heteropoda Hartman	Tide Pool – with spoon	10:30	As above	As above	40 dissect ing scope
8	Blue crab	Tide pool rocks –	10:30		One of best known crustaceans in Hudson – characterized by large pointed protrusions along front edge of carpace	200
9	Barnacle Balanus balanoides	Tide pool	10:30	A shell is formed of 6 calcareous (containing calcium carbonate) plates.	Live on hard objects; from between high- and low-tide lines to below low-tide line in shallow water. In saltier areas of the estuary and are found as far upriver as Newburgh Bay.	200
10	Scud shell	tidepool	11:15	Long cylindrical body – clear shell – legs still apparent and eye		40X dissect ing scope
11	Rhynchocoela (elongated worms)	tidepool	11:30	Transparent, yellow, orange insides, can see intestines move – looks like fine hairs on outsides		40X
12	Amphipod – gammarus daiberi	Tidepool a log on the shore –	11:30	Long antennae	Concentrated between lower TZ and	100X

		with cup			upper Haverstraw – goes down to GW bridge. Very numerous in fresh and brackish water – imp. Part of food chain.	
13	Arthropod Cyathura Polita	Tide pool	11:35	two short antennae, 6 legs, stout gnathopods, dorso-lateral keels	Only isopod in the estuary with long cylindrical body – GW to Poughkeepsie	400X
14	Leptocheirus Plumulosus shoemaker	Tidepool with spoon	11:36	Curled looks like a larva - dot looks like an eye – yellow-brown, partly transparent – dark on inner curve. ID is tentative	Most common in spring and early fall.- narrow area lower TZ to upper Haverstraw Bay	10X
15	Chironomid or Tendipedid Larvae	North section of tide pools by rocks	11:40	Larvae looking – elongated circular body, full head visible with antennae, paired, heavy clawed prolegs on the last abdominal section	Tube builders – mainly predaceous, but can be detrital feeders, can live at very low O <sup>2</sup> levels – very numerous in fresh and brackish water – imp. Part of food chain	400X
16	Leptocheirus Plumulosus shoemaker	Tide pool – spoon	11:45	It was beating its legs - had red dots that were particles being pumped through the organism		100X

17	Scolecopides Viridis	tidepool		2 large peristomial palps (tenacle like)	Widest range of estuarine polychaetes – prolific in estuary	20X
18	Amphipoda – gammarus diaberi	tide pool-spoon				100X

<sup>1</sup> Amphipod-known as scuds, shrimp like crustaceans with laterally compressed (exception Corophium) bodies and 10 pairs of legs. Two front pair developed for grasping, tearing or digging, middle five pairs for walking and last 3 pair for swimming. Can be highly mobile, or burrowing, or tube dwelling. Can be predators, scavengers or detrital eaters.

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**Piermont Pier Microscope Room**  
**SPRING**  
**4/21/03**

Item No.	Name	Catch Location	Net Used	Time	Description	Magn
1	Amphipods <sup>1</sup>	Tide pool south side	cups	10:28 AM	Two amphipods clasped together	
2	Crab (shape looks like red-jointed fiddler crab)	Center of tide pool	Sweeper net	10:00 AM	Very small, dark grey, legs lighter (yellowish tint) w/ dark spots	
3	Clam <sup>2</sup>	Center of tide pool	Sweeper net	10:15 AM	Small only half shell, light grey to white to yellow shell, lines running horizontally on body	Mag. box
4	Amphipod <sup>1</sup>	Tide pool south side	N/a	10:15	Central line visible under scope - , and dark bands along back	Dissecting scope

5	Clam <sup>2</sup>	Center of tide pool	N/a	10:30	Tan color shell with lots of dirt on top, numerous ridges and incisions along top – coating has been chipped away	
6	Barnacle <sup>3</sup>	Tide Pool North side most exposed to Hudson	Attached to debris	9:30		20
7	Zooplankton?	Tide Pool North side most exposed to Hudson	In water	9:25	Round with 6 projections mostly on one side and central mark	20
8	Plant – seaweed?	Tide pool rocks – northernmost side	Amongst rocks	10:15	Round Multi-celled and the cells look as if they have walls – must be a plant	Did not record
9	Arthropod	Central are of tide pool		11:00	Two fighting	20
10	Cyathura <sup>4</sup> Polita	Eastern side of tidepool area		11:00	Long cylindrical body	Magnifying box
11	?	Northside of tidepool		11:00	This organism was scrunched up and squirmy – no size listed etc.?	N/a
12	Amphipod <sup>1</sup> with attached larvae	Eastern section of tidepool		11:10	It appears that the larvae is still attached to the mother as the two move together	Magnifying box
13	Amphipod <sup>1</sup>	South side of tide pool		11:28	2 claws up front, two antennae and many sections with legs	10
14	Shell – with arthropod inside	Center of pool		11:25	Shell with oblong opening. Shell has serrated lip with bottom shelf cover and opening in top. Arthropod inside shell	10
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## Interpreting Your Data

**Students are asked to discuss in groups and complete this form. The answers are in bold below and are a synthesis of the student findings.**

Data interpretation is an important part of your water quality testing program. Learning to collect the data correctly is important, but determining what the data means is also important. Once the data is recorded it is important to analyze what it is telling us.

- Start by making sure all the data you have collected is recorded on one simple sheet. This allows you to review all your results quickly and trends are more evident.
- Look at your physical survey. Pay careful attention to the weather (both present and prior few days), time of day, tide, time of year, and how these conditions may have contributed to your results.

*Water Quality Sampling:*

1. Is the data collected reliable? What assurances do we have? Look at consistency or trends in the data recorded. Examine each specific test for a trend during the day, and then examine the tests in combination to evaluate for trends.

**The QA/QC program was set up so that duplicate tests were run at sites, comparisons were made between the multiple testing sites (although differences were expected between the sites due to situational changes), expected ranges for results were provided for the students to use as reference, and procedures were reviewed at the beginning of the day to establish protocols.**

2. What are the interrelationships of the tests?
  - a) Does the DO level seem to change during the day? What would cause the DO levels to change during the day?

**In a static or closed system you would expect DO to go up during the day, but tides will affect the DO level as well as wind and wave action so there was not a clear answer. Additionally, in a closed system DO levels would drop as temp. rises, again not true here.**

**The one relationship we did see was that DO and temp. levels were lower in the bottom of the river than at surface level which is to be expected . The only poor oxygen reading was from the river bottom (3mg/L) – this could reflect lack of mixing, lack of photosynthesis, higher salinity level due to the salt wedge sitting on the bottom and making the water less soluble.**

- b) How might the physical conditions have affected the results? Is it windy today? Would this affect the level of DO in the water? Why?

**It was extremely windy and very cool air temperature, and relatively cool water temperature (compared to other date readings) on 10/29, so one would expect oxygen levels to be higher on this date. DO level doesn't seem to reflect this for some reason.**

- c) DO is critical for survival of aquatic organisms. Temperature affects the solubility of oxygen in water. Be sure to use the chart to determine saturation levels of dissolved oxygen during the day...this tells us how much oxygen is really available.

**Oxygen solubility in water is poor, and salt water can absorb even less oxygen than fresh water.**

3. Nitrate is the form of Nitrogen that is an essential nutrient for plants and animals as building blocks for protein. In saltwater Nitrogen is considered the limiting nutrient as it is less abundant than in freshwater. Does the level of Nitrate-Nitrogen you recorded seem to be reasonable? Would one expect a level in this range to lead to excessive plant growth such as an algae bloom?

**Yes the nitrate-nitrogen levels seem to be reasonable for the most part, although station #2 for the spring reading appears to be somewhat high. The tide is moving the water in and out at a regular rate so nitrogen levels do not seem to suffer from run off from nearby housing. These levels are low and wouldn't be expected to lead to algae blooms.**

4. Phosphorous comes from industrial effluent, detergent wastewater and can leach from natural deposits. Phosphorous levels of 0.03 ppm can contribute to increased plant growth (eutrophication). Total phosphorous levels of 0.1 ppm may stimulate plant growth sufficiently to surpass natural eutrophication rates. How will the levels you are finding affect plant growth?

**Phosphate levels suggest that there might be some leaching from natural deposits. The levels suggest there might be a stimulation of plant growth, although none was evident.**

5. In a closed system would you expect levels of CO<sub>2</sub> to increase or decrease during the day? Is this also true in a tidal system?

**You would expect CO<sub>2</sub> to decrease during the day due to photosynthesis in a closed system. This is not true in a tidal system.**

6. Is the alkalinity reading you are recording typical for saltwater systems (check your chart to see what would be defined as typical for saltwater)? Will this level provide for good buffering?

**There is good buffering capacity in the reading ranges we obtained.**

7. Is the pH more acidic or base? (Remember 7.0 is neutral) 6.5-8.2 is considered optimal for most organisms. See chart – If pH is between 6.0 and 6.5 it can be harmful to fish if CO<sub>2</sub> is in excess of 100ppm. Changes in water pH can also affect water organisms indirectly by changing other aspects of the water chemistry. For example metals trapped in sediments are released into the water at lower pH level. Is this the case with your sampling?

**The pH ranges suggest an interesting situation – during the spring the pH level is lower than during the fall. This is supported by the lower conductivity reading.**

**Generally higher salinity/conductivity correlates with higher pH (due to the natural buffering of the carbonate and bicarbonate dissolved in the seawater).**

8. Is there data that doesn't seem to fit? Were your collection methods correct? Did you wait the proper time on each test?  
What gaps are there in your information?

**Yes there are some inconsistencies in data. More attention should be taken to evaluating the test result answers as they are collected to see that they are reasonable, and questionable results should be redone immediately.**

9. Compare the results with each of the other stations. Are the results consistent station to station? If there are differences what could be the cause of this? Are the stations at the base of the pier different from the stations at the end of the pier? Are the stations on the North side of the pier different from the stations on the South side of the pier?

**Yes there are differences station to station...end of pier has lower DO since water sampled from bottom or river, also lower temp etc.**

10. How might the physical conditions have affected the results? Compare results to the NYS DE water quality standards and guidelines. Are the results consistent with the standards? Are any findings inconsistent.

11. If comparing data over time do you see differences? Are there seasonal differences in water quality tests? What about levels of conductivity? What would account for this?

**Yes there are seasonal differences in pH, conductivity. Spring has more snow melt and rain water lowering the conductivity...fall has higher levels as more influence from the tidal part of the river.**

*Benthic Sampling:*

1. Would the physical conditions impact the benthic macro invertebrate sampling?  
**No**
2. How might the habitat affect the benthic community? (level of turbidity?, water temperature? Amount of algae etc.?)

**The water is very turbid so this limits benthics in the deeper sections of the river. Temperature is not an issue, and there is little algae growth.**

3. Are there seasonal differences in benthic sampling?

**Not noticeably.**

4. Does a single macro invertebrate appear to dominate the sample? If so, what might be the cause?

**We collected more amphipods and blue crabs (although we didn't inventory them all since we did not do a systematic sampling collection).**

*Plant Inventory:*

1. Does the plant inventory tell you anything about the salt water level of the water?  
**Not that I can think of except that the absence of SAV might be due to the salinity? The absence of SAV might also be a combination of high turbidity and salinity.**

2. Does there appear to be a balance in the plant inventory or does one species dominate?  
**Phragmites dominates, and purple loose strife.**

3. If one species is dominant does this appear to be a positive ecological balance or an invasiveness?

**Both appear to have taken over. Seems these are plants of opportunity that take over any time there is an interruption to the natural ecosystem. There is definitely life in these plants, however...rodents, birds, butterflies etc. are noted in these plant communities. It looks as if the phragmites leaves make detritus**

4 Other observations -

**Turbidity levels were significantly better on 10/15 than they were on either of the other two days. 10/29 lower readings could be due to high winds that were churning the water (water was choppy).**

12:40 EDT 0.77 Lowtide  
6:38 EDT 3.52 Hightide

Piermont Pier  
10/15/02

TESTS/Units degees C	10:30	10:45	11:00	11:30	12:00	12:20	12:45	1:20	Min	Max	Mean	Mode
Temp. deg. C #1			16	17		18	18		16.00	18.00	17.25	18.00
Temp. deg. C #2			17	17		17		16	16.00	17.00	16.75	17.00
Temp. deg. C #3		16		17					16.00	17.00	16.50	
Temp. deg. C #4	14	16	17	19	19				14.00	19.00	17.00	19.00
TESTS/Units												
Nitrite/strips/ppm #1			0.15	0.15	*0.15	*0.15	recorded as 1.5		0.15	0.15	0.15	0.15
Nitrite/strips/ppm #2						0.15		0.15	0.15	0.15	0.15	0.15
Nitrite/strips/ppm #3			0.15	0.15		0.15			0.15	0.15	0.15	0.15
Nitrite/strips/ppm #4			0.15	0.15	0.5				0.50	0.15	0.27	0.15
TESTS/Units												
Nitrate/Nitrogen/ppm#1			0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5
Nitrate/strips/ppm#2				0.1		0.5		0.5	0.1	0.5	0.37	0.5
Nitrate/strips/ppm#3			0.35	0.35		0.35			0.35	0.35	0.35	0.35
Nitrate/strips/ppm#4			0.35	0.35	0.5				0.5	0.35	0.40	0.35
TESTS/Units												
Nitrate/Nitrogen/ppm#1			0.35	0.35					0.35	0.35	0.35	0.35
Nitrate/Nitrogen/ppm#2			0.3	0.5		0.2		0	0	0.5	0.25	
Nitrate/Nitrogen/ppm#3				1.1		0.88		0	0	1.1	0.66	
Nitrate/Nitrogen/ppm#4			0	0	0				0	0	0	0.00
TESTS/Units												
Diss. O2 mg/L#1			*18						*oversaturated			
Diss. O2 mg/L#2			15	13		*19		12	12.00	19.00	14.75	
% saturation			150%	165%				120%				
Diss. O2 mg/L#3			10			10	15		10.00	15.00	11.67	10.00
% saturation			100%			100%						
Diss. O2 mg/L#4			**18	16	16			**not settling h	16.00	18.00	16.67	16.00
% saturation				160%				160%				
TESTS/Units												
CO2 mg/L#1			11.25	13.75		15	15		11.25	15	13.75	15.00
CO2 mg/L#2				7.5		6.25		14.3	6.25	14.25	9.33	n/a

12:40 EDT 0.77 Lowtide  
6:38 EDT 3.52 Hightide

Piermont Pier  
10/15/02

TESTS/Units degees C	10:30	10:45	11:00	11:30	12:00	12:20	12:45	1:20	Min	Max	Mean	Mode
CO2 mg/L#3		12.5					10		10	12.5	11.25	n/a
CO2 mg/L#4	23.2	43.75	20	20		22.5			20	43.75	25.89	20.00
TESTS/Units												
Phosphate mg/L#1			0.12	0.08		0.16	0.14		0.08	0.16	0.13	
Phosphate mg/L#2			0.08	0.08		0.9	0.28		0.08	0.9	0.34	0.08
Phosphate mg/L#3		0.13				0.19	0.24		0.13	0.24	0.19	
Phosphate mg/L	0.4	0.42	0.46	0.44	0.34				0.34	0.46	0.41	
TESTS/Units												
H2S mg/L#1			0.1	0.1		0.1	0.1		0.1	0.1	0.1	0.1
H2S mg/L#2			0.1	0.1		0.1		0.1	0.1	0.1	0.1	0.1
H2S mg/#3		0		0.1		0.1	0.1		0.00	0.1	0.08	0.1
H2S mg/L#4	0.1		0.1	0.1	0.1		0.1		0.1	0.1	0.1	0.1
TESTS/Units												
Alkalinity/ppmCaCO3 #1			70	60		56	64		56	70	62.50	
Alkalinity/ppmCaCO3 #2			80	70		80		76	70	80	76.50	80.00
Alkalinity/ppmCaCO3#3		80				55	90		55	90	75.00	
Alkalinity/ppmCaCO3 #4	60	70	65	45	50				45	70	58.00	
TESTS/Units												
Cond./mS/cm#1			13.6	15.1		16.6	17.3		13.60	17.30	15.65	
Cond./mS/cm#2			10.9	17.1		14.2		13.8	10.90	17.10	14.00	
Cond./mS/cm#3			14.4			15.6	17.9		14.40	17.90	15.97	
Cond./mS/cm#4	11.7		12.6	10.1	12.4		13		10.10	13.00	11.96	
TESTS/Units												
pH #1			7.6	7.5		7.5	7.6		7.5	7.6	7.55	7.60
pH #2		7.4	7.4			7.4		7.5	7.4	7.5	7.43	7.40
pH #3		7.4				7.6			7.4	7.6	7.50	n/a
pH #4	7.4			7.4	7.4				7.4	7.4	7.4	7.40
TURBIDITY/cm #2	90		100		100		90		90	100	95.00	
Water Depth #2	4 meters @ 10:00 AM							3 mete	3	4		

Piermont Pier Data  
October 29, 2002

9:43 EDT .8 lowtide  
3:23EDT 3.3 hightide

<b>STATION #2 TESTED FROM 1 meter Off Bottom on all tests</b>									
<b>TESTS/Units</b>	<b>10:45</b>	<b>11:00</b>	<b>11:35</b>	<b>12:05</b>	<b>12:15</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>Mode</b>
Temp. deg. C #1	11	12		12	12	11	12	11.75	12
Temp. deg. C #2	12		10		11	10	12	11	
<b>TESTS/Units</b>									
Nitrite/strips/ppm #1									
Nitrite/strips/ppm #2	0.88	0.66	0.44		>0<.88	0.44	0.88	0.61	0.44
<b>TESTS/Units</b>									
Nitrate/strips/ppm#1	0.5	0.5		0.5	0.5	0.5	0.5	0.52	0.5
Nitrate/strips/ppm#2	0.5		0.5		0.5	0.5	0.5	0.5	0.5
<b>TESTS/Units</b>									
Nitrate/Nitrogen/ppm#1	0	0		0	0	0	0	0	0
Nitrate/Nitrogen/ppm#2	0.15		0.15		0.15	0.15	0.15	0.15	0.15
<b>TESTS/Units</b>									
Diss. O2 mg/L#1					9				
% saturation					85%				
Diss. O2 mg/L#2	10		7		9	7	10	8.67	
% saturation	95%		60%		80%				
<b>TESTS/Units</b>									
CO2 mg/L#1	25				15	15	25	20	
CO2 mg/L#2		12.5	16.25		18.75	12.5	18.75	15.83	
<b>TESTS/Units</b>									
Phosphate mg/L#1	0.88				0	0	0.88	0.44	
Phosphate mg/L#2		0.2			0.26	0.2	0.26	0.13	
<b>TESTS/Units</b>									
H2S mg/L#1	0				0	0	0	0	
H2S mg/L#2	0.1		0.2		0.1	0.1	0.2	0.13	0.1

Piermont Pier Data  
 October 29, 2002

9:43 EDT .8 lowtide  
 3:23EDT 3.3 hightide

TESTS/Units	10:45	11:00	11:35	12:05	12:15	Min	Max	Mean	Mode
TESTS/Units									
Alkalinity/ppmCaCO3 #1	misread				misread				
Alkalinity/ppmCaCO3 #2		80			50	50	80	65	
TESTS/Units									
Cond./mS/cm#1	9.5				9.7	9.5	9.7	9.6	
Cond./mS/cm#2	10.8		10.1		9	9	10.8	9.97	
TESTS/Units									
pH #1	7.3				7.4	7.3	7.4	7.35	
pH #2	7.4		7.4		7.1	7.1	7.4	7.3	7.4
Light Penetration									
Secchi dish #2	40 cm				55 cm				
Water Depth									
station #1									
Station #2				4 meters					

Piermont Pier  
4/21/03

Lowtide 8:42EDT  
Hightide 14:44 EDT

TESTS/Units	10:00	10:45	11:30	Min	Max	Mean	Mode
Temp. deg. C #1	13	15	16	13	16	14.67	
Temp. deg. C #2	11	14		11	14	12.50	
				10	12	11.00	
TESTS/Units	10:00	10:45	11:30				
Nitrite/strips/ppm #1	0.5	0.5	0.5	0.5	0.5	0.50	0.5
Nitrite/strips/ppm #2		0.5		0.5	0.5	0.50	0.5
TESTS/Units	10:00	10:45	11:30				
Nitrate/strips/ppm#1	0.5	0.5	0.5	0.5	0.5	0.50	0.5
Nitrate/strips/ppm#2	0	0.35		0	0.35	0.17	
TESTS/Units	10:00	10:45	11:30				
Nitrate/Nitrogen/ppm#1	0.8	0	0.44	0	0.8	0.41	
Nitrate/Nitrogen/ppm#2	1.32	0.836		0.0836	1.32	1.08	
				*10 AM reading recorded as .12 X4.4 = .88 on indiv. Sheet ( which but as 0.4X4.4= .88 on indiv. Sheet ( which neither equals .8 reading (either .528 ppm or 1.76 ppm)			
TESTS/Units	10:00	10:45	11:30				
Diss. O2 mg/L#1	8	9	11	8	11	9.33	
% saturation	65%	85%	110%	65%	110%	87%	
Diss. O2 mg/L#2	**11	*3		3	11	7.00	
% saturation	100%	27%		27%	100%	64%	
				**surface reading * .6m @ depth of reading/temp. 14 deg. C			
TESTS/Units	10:00	10:45	11:30				
CO2 mg/L#1	18.75	25	26	18.75	26	23.25	
CO2 mg/L#2	17.5	18.75		17.5	18.75	18.13	
				*11:30 reading used mid range test/conver others used low range test			
TESTS/Units	10:00	10:45	11:30				
Phosphate mg/L#1	0.34	0.34		0.34	0.34	0.34	0.34
Phosphate mg/L#2	0.3	0.24		0.24	0.3	0.27	
TESTS/Units	10:00	10:45	11:30				
H2S mg/L#1	0.1	0.1	0	0	0.1	0.06	0.1
H2S mg/L#2		0.1	0.1	0.1	0.1	0.1	0.1

Piermont Pier  
4/21/03

Lowtide 8:42EDT  
Hightide 14:44 EDT

TESTS/Units	10:00	10:45	11:30				
Alkalinity/ppmCaCO3 #1	60	60	72		60	72	64.00
Alkalinity/ppmCaCO3 #2	62		*67	*took 3 readings (130/80/67ppm)selected	0.62	0.67	64.50
				measure - per suggestion of scientist working with student			
TESTS/Units	10:00	10:45	11:30				
Cond./mS/cm#1	6.4	6	5.9		5.9	6.4	6.10
Cond./mS/cm#2	5.7	5.5	5.6		5.5	5.7	5.60
TESTS/Units	10:00	10:45	11:30				
pH #1	6.8	6.4	6.4		6.4	6.8	6.53
pH #2		6.4	6.3		6.3	6.4	6.35
Light Penetration	10:00	10:45	11:30				
Secchi dish #2	30cm	50cm	50cm		30	50	43.33
Water Depth	10:00						
station #1	11cm						
Station #2	54 decimeters or 5.4 meters						
							60