2015

Great South Bay, Long Island, New York Summer Water Quality Monitoring Program

CERCOM, Molloy University

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Center for Environmental Research and Coastal Oceans Monitoring (CERCOM)
Great South Bay, Long Island, New York
Summer Water Quality Monitoring Program
2015

FINAL REPORT

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TABLE OF CONTENTS

1. Summary:

The Center for Environmental Research and Coastal Oceans Monitoring (CERCOM) visits 15 locations in Great South Bay to monitor for dissolved oxygen (DO), pH, salinity, clarity, total and fecal coliforms and temperature. This monitoring program has been conducted for the past 13 years. These parameters are critical in determining long-term water quality conditions in Long Island estuaries.

Methodologies for monitoring parameters are provided by the *Standard Methods for the Examination of Water and Wastewater 20th Edition (1998).*

Criteria for determining water quality conditions in marine eco-systems are based on the type of contact (uses) people have with the water system. The United States Environmental Protection Agency (EPA) guidelines for primary contact (bathing) have been employed for recreational use and as criteria to monitor water quality.

2. Introduction:

2.1 Background:

Samples are analyzed on a weekly basis from 2 weeks before memorial day to one week after labor day, annually for the following parameters: water temperature, pH, salinity, top and bottom water dissolved oxygen (DO), clarity, and chlorophyll-a.

A GPS (Global Positioning System) receiver is used to provide locations (site coordinates). The coordinates were entered into a GIS (Geographical Information System) database developed at Molloy College/CERCOM. All Water Quality data collected for Great South Bay from the previous years have been incorporated into the GIS database at CERCOM at Molloy College [See Appendix A, Long Island South Shore Estuary Map with Sampling Stations.]

2.2 Study Area History:

Water Quality data is collected for the following purposes:

(1) to monitor traditional water quality monitoring parameters at various sites and to determine trends in water quality; and

(2) to provide these data for the evaluation and review regarding fish and wildlife management, ecosystem health, and for visitor public health and safety.

Molloy College/CERCOM initiated long-term monitoring of several sampling stations within the Great South Bay, Long Island, New York. These sites are to be monitored for physical and biological parameters utilized for assessment of water quality conditions in its estuarine waters. Methodology for monitoring parameters are provided by the EPA, U.S. Public Health Administration (USPHA) and traditional Standard Methods for Examination of Water and Wastewater (20th Edition, 1998; American Public Health Water Environment Federation).

The EPA establishes criteria to determine conditions appropriate for "contact recreational" uses and consumptive uses of the estuary. These monitoring protocols are also critical in determining trends in overall ecosystem health. Sample locations were established for the purpose of obtaining information on the water quality conditions within Great South Bay. Specific sample locations associated with "public health" concerns, are those sites that are designated as boat recreation locations (i.e. docking, pump out facilities, etc.) or potential residential discharge locations (i.e. visitor centers and concession operations). All sites are "general monitoring" sites.

The quality of estuarine waters of Great South Bay over the last 25 years has been impacted by surface run-off from the land, wastewater discharges and atmospheric deposition from precipitation events. Water quality values in estuarine waters can fluctuate considerably due to tidal mixing, vertical water column mixing due to currents, winds and depth of water, bioturbation of bottom sediments, precipitation events, biological oxygen demand (BOD) loading, photosynthesis intensity (bloom conditions) and seasonal water temperatures. For example, it has been demonstrated that total and FCC in coastal waters are consistently higher following precipitation events requiring the closure of shellfish harvesting areas as well as contact recreational beaches on Long Island (Cardenas, R. et.al, 1983).

3. Objectives:

Water Quality programs, even the most extensive, cannot detect all possible changes, or for that matter be an early warning system to unforeseen episodic emergencies such as oil spills. However, properly planned and extensive water quality programs can establish baseline/reference data points from which changes, whether anomalous or condition-based, such as seasonal perturbations, can be compared over time. In this capacity, water quality monitoring is a means by which the conditions of the resource can be maintained or improved. Thus establishing a means for understanding the conditions of aquatic resources so that critical questions about long-term trends of degradation, or, about the effectiveness of existing pollution abatement and resource management programs, can be assessed and analyzed.

4. Sampling Frequency:

All sample sites are sampled on a weekly basis generally unless otherwise noted. The actual day of the week is subject to weather and sea conditions, but remain centered around mid-day for relative consistency within the photosynthetic oxygen evolution daily cycle. The peak summer visitation “season” is the main time period for this program (Between Memorial Day and Labor Day).

Summer 2015

Water Quality Schedule

May	June	July	August	September
28	9	6	4	1
	24	21	18	

5. Methods:

The quality of estuarine waters of Great South Bay, as well as the Atlantic Ocean waters is determined largely by pollutant inputs such as treated and untreated sewage from recreational boats, residential buildings, industrial effluents, sewage sludge, other toxic waste leachates, and runoff from landfills. Concentrations of pollutants are controlled by chemical, physical, and biological processes in the marine environment (Dyer, 1973, Tanacredi, J.T., 1990). Depending on a variety of environmental factors, water quality will fluctuate at any given time (Fleischer, J. and McFadden, R., 1979). These factors may include: tidal mixing, vertical mixing in the water column (by sun, wind and wave), bioturbation of bottom sediments, precipitation events (intensity and duration), BOD, photosynthesis by phytoplankton, and water temperature.

Precipitation is a known cause of intermittent corruption of water quality. Shock loads of pollutants from storm waters enter area waters via storm drains. TCC and FCC have been consistently higher following rainfall in local waters (Lettau, B., et.al, 1979).

Tidal currents and tidal flushing account for much of the transport and dilution in estuaries (Dyer, 1973). Sampling of all locations within FINS is performed irrespective of the tidal state.

Water Quality Parameters Measured

Depth
Dissolved Oxygen (DO)
pH
Salinity
Clarity
Water Temperature

Water Quality Parameter Methodologies

Chlorophyll-a methodology

A100ml sample is passed through a 47mm glass fiber TCLP filter under a vacuum to collect the pigment. The resulting filter is placed in a Teflon/Glass tissue grinder along with 5 ml 90% aqueous acetone solution and then it is macerated at 500rpm for 1-2 minutes. The resulting material is then transferred to a screw cap centrifuge with the total volume adjusted to 15ml using the 90% aqueous acetone solution and then the sample is allowed to steep for at least 2 hours at 4°C. The resulting sample is then centrifuged for 30min at 500g. The extract is transferred to a 1-cm cuvette and the optical density is read at 750 and 664 nm from an Unico 1100 Spectrophotometer. The sample is then acidified with 0.1 mL 0.1*N* HCl and the optical density is read again at 750 and 665 nm. The concentration of chlorophyll a μg/L is calculated.

Salinity methodology

YSI Pro 2030 Professional Series – Salinity, Conductivity, Dissolved Oxygen, Temperature Meter

Clarity methodology

8 inch Secchi Disk

pH methodology

Orion Star model A121 pH Meter with low maintenance pH probe

6. Sampling site locations: (Land proximities)

1	2	3	4	5	6	7	8	9
Sexton Island	Bay Shore	Heckscher State Park	Sayville	Patchogue	Bellport	Watch Hill/ Davis Park	Barrett Beach	The Pines

7. Results: Summary

Molloy College (CERCOM) Great South Bay WQ Averages *2015

Parameter/Site:	1	2	3	4	5	6	7	8	9
Clarity (in.)	55.0	37.3	40.6	36.8	39.9	55.6	33.7	37.6	32.7
Sal (bot) (psu)	19.6	19.9	20.6	18.2	18.1	23.2	21.2	16.6	18.6
Sal (top) (psu)	27.7	27.5	26.0	25.5	25.0	27.5	26.6	26.8	25.6
Temp (bot) (°C)	23.8	24.4	24.3	24.0	24.1	18.9	25.9	26.1	25.1
Temp (top) (°C)	23.8	24.6	24.4	24.5	24.7	22.3	25.9	26.6	25.7
pH	6.5	6.4	6.3	6.2	5.7	5.6	5.8	5.9	5.8
DO (bot) (mg/L)	4.8	4.8	3.4	1.6	2.6	3.4	5.0	4.3	1.1
Do (top) (mg/L)	4.4	4.7	4.3	4.0	4.3	4.5	4.9	4.5	3.7

*= 8 sampling dates

8. Discussion and Conclusion:

The 2014 Water Quality Sampling Program year incorporated a laboratory area established at the Center for Environmental Research and Coastal Oceans Monitoring (CERCOM) at Molloy College exclusively for water sample analysis (Bordner, R. and J. Winter, 1978). The general State-of-the-Bay regarding temperature, salinity, and pH are characteristic of the Northeast Atlantic estuarine waters off Long Island (Duedall, et. al., 1979, O'Conner, D.J. 1977). The present monitored parameters are within the range which translates into a "normal" condition for such waters. Excessive values, if detected, could be indicative of waste discharges from point sources (i.e. boat basins, pump out stations, etc.)

The top/bottom dissolved oxygen values (DO) were robust and indicative of good oxygen saturation in top and bottom waters. Such values would contribute to fostering healthy estuarine biota (Pokryfki, T.D. and R.E. Randall, 1987).

The 2015 water quality-sampling year reflects a fully QA/QC, comprehensive sampling program. Bacteriological and chlorophyll-a values were tabulated and results tabulated. Molloy student(s) were trained and oriented as to boat operations and sampling procedures.

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10. Acronyms Used in 2015 Report:

ATL = Atlantic

BOD = Biological Oxygen Demand

Chl-a = chlorophyll-a

CFU = colony forming units, (number of colonies (coln) that are counted on a bacteriologic growth plate.)

CONF = Confluent (unable to distinguish total counts of prescribed bacteria)

CSO = Combined Sewer Outflows

DO = Dissolved Oxygen

FCC = Fecal Coliform Counts

NYS = New York State

NTU's = Nephelometric Turbidity Units

TCC = Total Coliform Counts

TNTC = Too-Numerous-To-Count

11. <u>Appendices</u>:

A – Long Island South Shore Estuary map with Sampling Stations (Identified GPS)

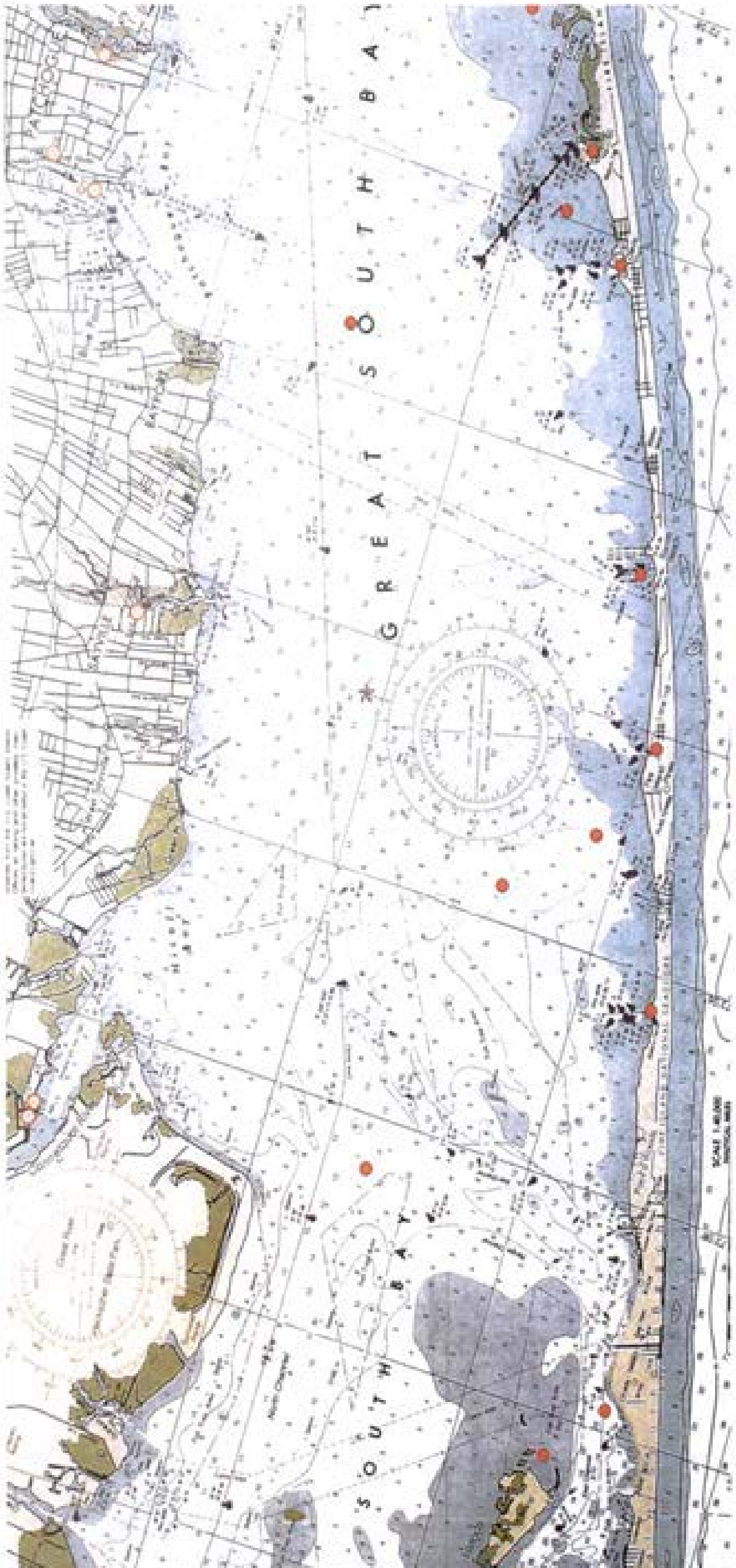
B – Data Summary

C – Average Value Charts

D – Tables of Averages and Ranges

Appendix A

Long Island South Shore Estuary Map with Sampling Stations


GREAT SOUTH BAY
SOUTH BAY

Appendix B

Data summary

Site 1								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)	142	53	49	31	36	39	42	48
sal-bot (ppth)	28.1	13.7	11.2	21.8	26.5	25.6	15.1	14.9
sal-top (ppth)	27.7	27.1	26.5	27.0	27.7	27.8	28.8	28.6
temp-bot (oC)	17.5	20.7	24.8	24.1	25.8	26.0	26.0	25.1
temp-top (oC)	17.7	20.7	24.8	24.1	25.8	26.0	25.9	25.1
pH	6.10	6.94	6.34	6.63	6.62	6.87	6.14	6.12
DO-bot (mg/L)	5.2	6.9	5.1	4.3	4.4	3.7	4.5	3.9
DO-top (mg/L)	4.9	5.5	4.5	4.0	4.4	3.9	4.1	3.7

Site 2								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)	71	44	22	25	31	26	36	43
sal-bot (ppth)	18.2	21.4	13.1	13.7	20.4	18.2	27.8	26.4
sal-top (ppth)	28.7	26.9	26.2	26.5	26.9	27.6	28.2	28.6
temp-bot (oC)	19.5	20.2	25.5	24.6	27.5	26.5	26.2	25.3
temp-top (oC)	19.6	20.7	25.5	25.5	27.6	26.6	26.2	25.3
pH	6.38	6.52	6.69	6.49	6.24	7.15	5.51	6.12
DO-bot (mg/L)	4.5	5.8	5.6	5.3	4.6	4.3	4.5	3.7
DO-top (mg/L)	4.3	5.6	5.3	5.2	4.6	4.1	4.4	3.7

Site 3								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)	87	43	24	27	26	29	34	55
sal-bot (ppth)	27.8	13.5	26.3	14.1	25.1	20.2	25.9	11.8
sal-top (ppth)	27.8	26.7	26.1	23.7	27.0	27.3	28.6	20.8
temp-bot (oC)	19.5	19.7	24.5	24.5	27.9	26.6	26.1	25.2
temp-top (oC)	19.7	19.9	25.3	24.6	27.4	26.7	26.1	25.6
pH	6.70	6.82	6.82	6.62	3.91	7.38	6.05	6.16
DO-bot (mg/L)	4.2	5.6	4.1	0.5	4.2	4.2	3.8	0.7
DO-top (mg/L)	4.1	5.5	4.8	3.6	4.5	4.4	3.9	3.6

Site 4								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)	69	36	21	31	27	24	34	52
sal-bot (ppth)	26.8	26.4	21.0	12.2	12.4	10.5	20.5	15.8
sal-top (ppth)	26.8	26.1	25.8	22.2	26.2	21.8	27.3	27.6
temp-bot (oC)	19.6	19.3	24.3	23.8	26.4	26.9	26.2	25.4
temp-top (oC)	19.6	20.2	25.2	24.9	27.0	27.1	26.3	25.6
pH	6.54	6.82	6.50	6.30	4.89	7.42	5.79	5.38
DO-bot (mg/L)	1.6	3.4	0.6	0.4	0.9	2.1	1.7	2.3
DO-top (mg/L)	3.4	5.4	4.8	4.3	3.6	3.4	3.7	3.3

Site 5								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)	54	38	23	22	26	30	49	77
sal-bot (ppth)	26.2	13.5	25.8	22.1	15.5	15.1	15.5	10.9
sal-top (ppth)	25.8	22.9	25.8	26.1	25.9	26.3	23.2	24.0
temp-bot (oC)	19.4	19.4	24.3	23.9	26.8	26.9	26.4	25.7
temp-top (oC)	19.4	20.8	25.4	24.9	27.5	27.2	26.6	26.1
pH	6.57	6.51	6.52	3.99	3.93	7.12	5.50	5.74
DO-bot (mg/L)	3.2	1.1	4.0	3.0	3.0	2.2	0.8	3.5
DO-top (mg/L)	3.8	5.7	5.3	4.5	4.0	3.0	3.9	4.2

Site 6								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)	43	61	34	78	28	34	71	96
sal-bot (ppth)	28.5	15.3	26.2	27.0	28.5	23.4	21.4	15.4
sal-top (ppth)	26.1	24.8	27.4	28.6	27.3	27.8	28.8	29.1
temp-bot (oC)	11.0	16.4	18.2	21.1	19.8	20.4	22.1	22.0
temp-top (oC)	19.4	19.6	23.7	21.2	24.8	24.4	23.2	22.0
pH	6.46	6.82	6.69	4.12	4.25	7.59	3.70	5.14
DO-bot (mg/L)	3.5	7.5	1.9	2.5	5.5	2.1	0.4	3.4
DO-top (mg/L)	3.1	6.2	5.1	4.4	4.8	3.5	4.2	4.3

Site 7								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)		39	23	21	24	24	40	65
sal-bot (ppth)		20.7	25.3	17.8	22.0	13.0	27.0	22.6
sal-top (ppth)		26.3	25.8	26.2	26.2	26.3	27.5	27.9
temp-bot (oC)		21.6	25.8	25.3	27.4	27.2	27.1	26.7
temp-top (oC)		21.6	25.9	25.5	27.4	27.2	27.1	26.7
pH		7.03	7.13	4.32	5.35	7.41	3.34	5.70
DO-bot (mg/L)		6.3	5.5	4.9	5.2	4.0	4.8	4.3
DO-top (mg/L)		6.0	5.4	4.8	4.8	4.0	4.9	4.1

Site 8								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)		40	24	21	24	25	38	91
sal-bot (ppth)		16.5	22.7	17.1	6.7	16.1	17.9	19.2
sal-top (ppth)		26.5	26.1	26.1	26.2	27.0	27.7	28.3
temp-bot (oC)		22.6	26.5	24.9	27.6	26.8	27.4	26.8
temp-top (oC)		23.4	26.8	26.2	27.8	27.2	27.5	27.1
pH		7.07	6.84	3.52	6.11	7.63	3.75	6.38
DO-bot (mg/L)		6.2	4.7	3.7	3.6	4.0	4.3	3.8
DO-top (mg/L)		5.8	4.9	4.5	4.1	3.8	4.5	3.7

Site 9								
	28-May	9-Jun	24-Jun	6-Jul	21-Jul	4-Aug	18-Aug	1-Sep
clarity (in)		36	27	21	24	29	41	51
sal-bot (ppth)		15.7	26.7	19.0	23.9	10.6	19.2	15.3
sal-top (ppth)		26.2	26.7	26.1	26.7	17.0	27.7	28.6
temp-bot (oC)		20.4	25.5	24.0	27.2	26.5	26.1	26.0
temp-top (oC)		20.9	25.7	25.4	27.4	27.3	26.6	26.8
pH		6.70	7.16	3.90	5.43	7.28	3.67	6.23
DO-bot (mg/L)		1.0	0.7	0.6	0.6	0.7	0.7	3.1
DO-top (mg/L)		4.6	4.0	4.2	3.3	3.4	3.2	3.5