Quality Assurance Project Plan
New York Bight Monitoring
Water Quality Survey

Conducted by: U.S. Environmental Protection Agency, Region 2
Division of Environmental Planning and Protection
Division of Environmental Science and Assessment

Date Prepared: July 24, 2008

Approvals:

Project Manager/Chief Scientist:_____
Douglas Pabst, DEPP/DSOT Date

Chief Scientist: _____
Charles LoBue, DEPP/DSOT Date

Chief Scientist: _____
Mark Reiss, DEPP/DSOT Date

Modeler: _____
Robin Miller, Hydroqual, Inc. Date

QA Officer: _____
Marcus Kantz, EPA Region 2, DESA/MAB Date

TABLE OF CONTENTS

DISTRIBUTION LIST

The following project personnel will receive either electronic or hard copies of the approved QAPP and any subsequent revisions.

Douglas Pabst, DEPP-DSOT
Charles LoBue, DEPP-DSOT
Mark Reiss, DEPP-DSOT
Marcus Kantz, DESA-MAB-AWQAT
Robert Nyman, DEPP–WMB-NYNJHO
Robin Miller, Hydroqual, Inc.
EPA Survey Scientist(s)/Support Scientists To Be Determined (electronic copies)

A hard copy of the QAPP will be onboard all sampling vessels during sample collection. Any QAPP revisions must discuss all major changes including why the changes were made and their effect on the usability of the resulting data.

1.0 Project/Task Organization

The following is a list of key personnel and their corresponding responsibilities. Due to the work breakdown structure of the project, a table (Table 1) including the organization list is provided instead of an organization chart.

Table 1. Project/Task Organization

Project Personnel	Phone Number	Responsibility
Douglas Pabst, EPA	(212) 637-3797	EPA Project Manager/Chief Scientist
Charles LoBue, EPA	(212) 637-3798	Chief Scientist
Mark Reiss, EPA	(212) 637-3799	Chief Scientist
Marcus Kantz, EPA	(732) 321-6690	Quality Assurance Officer
EPA Survey Scientists	NA	Survey staffing and sampling implementation
Support Survey Scientists	NA	Survey staffing and sampling support
EPA Region 2 Laboratory	(732) 321-6728	Analytical Services
Robert Nyman	(212) 637-3809	Harbor Estuary Program (HEP) Coordinator - Data Reporting
Robin Miller HydroQual, Inc.	201-529-5151	EPA HEP contractor – SWEM verification of model outputs

The EPA Project Manager is responsible for interacting with other responsible agencies, preparation of the QAPP, coordinating with DESA, distributing copies of the final report to interested parties, evaluating the need for further action, and general project oversight

The Chief Scientist is responsible for ensuring that the survey is implemented according to this QAPP. Any problems associated with the project will be reported to the Chief Scientist who will address them. The Chief Scientist may use the expertise of the project staff to resolve specific problems.

The Project QA Officer is responsible for providing guidance and technical assistance for the preparation of the Quality Assurance Project Plan (QAPP), reviewing the final QAPP and assisting with the resolution of any quality assurance issues that may arise during the project.

The EPA Survey Scientists are responsible for implementing sampling operations at the direction of the Chief Scientist. This includes preparing the equipment, documenting

sampling activities, managing samples, and ensuring that these activities are conducted in accordance with this QAPP.

The Support Survey Scientists are responsible for assisting sampling operations at the direction of the Chief Scientist. This includes assisting with equipment preparation, sampling activities, documentation activities, and sample management, as needed in accordance with this QAPP.

The EPA Region 2 Laboratory will provide the analytical services for this project. Jim Ferretti will be overseeing the analytical staff performing the analysis for this project.

The Harbor Estuary Program (HEP) Coordinator, Robert Nyman will be responsible for the transfer of data reports to HydroQual as well as the state and local stakeholders.

EPA's HEP contractor HydroQual will be responsible for evaluating the data for use in the SWEM in order to verify the model outputs and determine if recalibration of the model is necessary.

2.0 Special Training Needs/Certification

The EPA Region 2 Scientists assigned to this project will have successfully completed EPA's (24 or 40 hour) initial field training and are to be up-to-date with the annual eight (8) hour health and safety refresher training pursuant to EPA Order 1440.2. Appropriate personal protective equipment will be provided for all participants.

The lead field personnel are trained and have extensive experience in the collection of environmental samples and data using the methods proposed in this QAPP.

All field survey support staff will be briefed on general boat safety procedures and survey objectives and procedures prior to leaving the dock. Support scientists will be assigned tasks for which they will be responsible that day and be trained on skills necessary to perform those tasks appropriately. A Chief Scientist will be aboard each survey and will provide this training.

Copies of health and safety training records are maintained by Region 2 Health and Safety Officers. Records for the New York Region 2 staff are maintained by Jonathan Blonk located at the 290 Broadway NY Regional Office. Records for Region 2 Edison staff are maintained by Mike Matarazzo located at Edison, NJ Field Office.

3.0 Background/Problem Definition

3.1 Problem Definition

Excess nutrient loading to New York/New Jersey (NY-NJ) Harbor leads to elevated nutrient levels in waters of the New York Bight Apex. Enhanced primary production associated with elevated nutrient loads increases the flux of oxygen-consuming detritus to the seafloor. During summer months, when the water column is highly stratified due to high sea surface temperatures, the increased oxygen demand can deplete dissolved oxygen concentrations in New York Bight bottom waters to levels that cannot support aquatic life. Persistent low-oxygen conditions across wide areas of the Bight can result in severe impacts to local benthic populations (and associated fisheries) due to low-oxygen related mortality.

EPA is implementing a program to monitor nutrient and dissolved oxygen concentrations in the New York Bight, and to assess hypoxic or potential hypoxic conditions in the Bight. This information will be used to alert NY-NJ Harbor stakeholder groups (e.g., state and federal resource agencies, non-governmental organizations (NGOs), fishing industry) of potential or actual low oxygen conditions. The program will also provide water quality data that are necessary for assessing the performance, refining boundary inputs to, and determining the need for recalibration of the model used by EPA (through its contractor) to describe and predict eutrophication throughout the New York New Jersey Harbor estuary system (i.e. the System Wide Eutrophication Model, or SWEM) and the efficacy of management actions (e.g., assessment of total maximum daily loads (TMDLs) and waste load allocations (WLAs)) contemplated by the Agency to reduce the effects of system eutrophication.

There are three main objectives for this monitoring program:

- Objective 1 – provide data on eutrophication-related water quality parameters at stations throughout the New York Bight Apex during the summer months (June to September) to support SWEM validation and recalibration (if necessary). The New York Bight Apex is defined as an area of approximately 2,000 km^2 extending along the New Jersey coastline from Sandy Hook south to $40^o10'$ latitude and east along the Long Island coastline from Rockaway point to $73^o30'$ longitude;

- Objective 2 – monitor New York Bight Apex for low dissolved oxygen bottom conditions (or conditions that are conducive to developing low dissolved oxygen conditions) to allow early notification of stakeholders

- Objective 3 - provide data on eutrophication-related water quality parameters at stations along the seaward boundary of the New York Bight during late summer months (August-September) to allow boundary conditions to be better defined in SWEM

The monitoring will be implemented using various Federal vessels. The program will collect environmental data/information over a wide geographic area.

Data obtained during the surveys will be reviewed by Dredging, Sediments, and Oceans Team (DSOT), and/or Monitoring Operations Section (MOS) project team members to identify whether conditions violate the EPA Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater), pursuant to section 304 (a) (1) of the Clean Water Act. These data will be relayed to the New York/New Jersey Harbor Estuary Program (HEP) coordinator for distribution to harbor stakeholders and for distribution to EPA's SWEM contractor, HydroQual. HydroQual will use the data to verify and validate the SWEM and examine the need for recalibration of the model for TMDL development.

3.2 Background

EPA established the New York Bight Water Quality Monitoring Program in 1974 as part of its mandated responsibilities under the Marine, Protection, Research and Sanctuaries Act of 1972, the Federal Water Pollution Control Act of 1972 (later amended by the Clean Water Act of 1977 and the Water Quality Act of 1987).

In response to a 2007 hypoxic event in New Jersey coastal waters, EPA Region 2 revised and refocused the monitoring conducted under the New York Bight Water Quality Monitoring Program. The revised monitoring expands the geographic scope of water quality monitoring and places emphasis on monitoring conditions that are directly associated with eutrophication (e.g., ambient nutrient concentrations) and that increase the potential for widespread low oxygen events (e.g., stratification of the water column). The revised program was also modified to provide data to allow verification, validation and recalibration (if necessary) of the SWEM.

The purpose of the sampling design is to get a qualitative picture of eutrophication status across wide areas of the Bight. The sample design of this project is based on a previous survey conducted in 1995 by NYCDEP. The SWEM sampling grid was designed to capture data at scales that are relevant for Bight-wide processes such as eutrophication.

Sampling methodology is designed to ensure that each sample will be representative of the NY Bight water at the specific sampling location and depth stratum at the time of sampling. There are many factors that can contribute to the variability of results these factors include tides, rain events, and the intensity of sunlight and temperature.

EPA Region 2 and the States of New York and New Jersey are working collaboratively through the NY-NJ Harbor Estuary Program's Nutrient Working Group (NWG) to develop nutrient TMDLs intended to abate low dissolved oxygen levels throughout the NY/NJ Harbor Estuary, including the New York Bight. These TMDLs will be developed using the SWEM.

The data collected under this work and quality assurance plan will be provided to EPA's

contractor to ensure that boundary conditions are adequately described in the SWEM and to allow verification, validation and recalibration (if necessary) of the model during its application to TMDL development.

4.0 Project/Task Description

Forty-one stations have been identified for sampling from existing stations established for the New York Harbor Estuary Program System Wide Eutrophication Model (SWEM). These stations include 21 interior stations dispersed throughout the New York Bight Apex, and 20 perimeter stations located along the eastern edge of the New York Bight. The interior stations are located throughout the Bight Apex, from the mouth of New York/ New Jersey Harbor to as far south as Barnegat Inlet, New Jersey, and as far east as Jones Beach, New York. The perimeter stations are located in a pattern associated with the 100-meter continental shelf contour from Nantucket, Massachusetts to Cape May, New Jersey.

Sampling locations were selected by EPA's contractor (Hydroqual) from previously occupied SWEM sampling stations. The purpose of the sampling design is to get a qualitative picture of eutrophication status across wide areas of the Bight. The sample design of this project is based on a previous survey conducted in 1995 by NYCDEP. The SWEM sampling grid was designed to capture data at scales that are relevant for Bight-wide processes such as eutrophication.

Sampling methodology is designed to ensure that each sample will be representative of the NY Bight water at the specific sampling location and depth stratum at the time of sampling. There are many factors that can contribute to the variability of results these factors include tides, rain events, and the intensity of sunlight and temperature.

The function of the interior samples is to characterize the distribution of nutrients discharged from the New York/New Jersey Harbor. The function of the perimeter monitoring stations is to characterize nutrient inputs to Bight waters from off-shelf sources at the SWEM model boundaries.

The 21 inshore stations will be monitored monthly throughout the summer months (June through September) for the years 2008 and 2009. Upon completion of these surveys the data will be evaluated to determine future monitoring needs, if any, or changes to the monitoring program if continued monitoring is deemed necessary. The 20 perimeter stations will be sampled in 2008 and, if necessary, 2009. The data collection/sampling of the perimeter stations is to be performed once in August and once in September. Sampling will be conducted using available EPA vessels (including the KENNETH BIGLANE, CLEAN WATERS, the Ocean Survey Vessel BOLD) and other vessels of opportunity when EPA vessels may not be available.

At each station, a profile of physical attributes and dissolved oxygen content will be measured through the water column by lowering, a conductivity, temperature and depth recorder (an electronic instrumentation package referred to as a CTD). Additional

parameters including pH, fluorescence (chlorophyll a) and light transmittance may be added to surveys after June 2008 (an addendum covering these parameters will be added to this QAPP at that time). Surface light attenuation will be estimated using a Secchi disk. Water samples will be taken from three depths and analyzed for nutrient and dissolved oxygen concentrations. Estimates of grazing pressure in surface waters will be obtained by sampling zooplankton (analyzing for biomass and carbon content) between stations using a towed plankton net. Grazing pressure results from herbivorous zooplankton (copepods) feeding on the phytoplankton, thus transferring the phytoplankton produced energy into the food chain. Grazing pressure plays a role in development of algal blooms, which can negatively impact DO. See §5.3

Following QA/QC review, data will be used to alert NY-NJ Harbor stakeholder groups (e.g., state and federal resource agencies, non-governmental organizations (NGOs), fishing industry) of potential or actual low oxygen conditions. The program will also provide water quality data that are necessary for assessing the performance, refining boundary inputs to, and determining the need for recalibration of the model used by EPA (through its contractor) to describe and predict eutrophication throughout the New York New Jersey Harbor estuary system (i.e. the System Wide Eutrophication Model, or SWEM) and the efficacy of management actions (e.g., assessment of total maximum daily loads (TMDLs) and waste load allocations (WLAs)) contemplated by the Agency to reduce the effects of system eutrophication through the Region 2 HEP coordinator. Data will be reported in spreadsheet format and a short narrative describing pertinent observations.

Table 2 presents the Project Schedule with the anticipated start dates for monitoring. Dates for monitoring are anticipated since they are dependant upon sea and weather conditions.

Table 2: Project Schedule

Task	Schedule
Project Assigned	June, 2007
QAPP Review	June 13, 2008
QAPP Approval (expected)	June 20, 2008
2008 Revised QAPP for new CTD probes	August 31, 2008
Monitoring (in shore only)	June 24, 2008 (anticipated start date)
Monitoring (in shore only)	July 14, 2008 (anticipated start date)
Monitoring (in shore and perimeter)	August 11, 2008 (anticipated start date)
Monitoring(in shore and perimeter)	September 8, 2008 (anticipated start date)
Data Review	Upon receipt of analytical results and continuing through October
Status Reports	Weekly to NewYork Bight Monitoring Workgroup

Table 2: Project Schedule	
Task	**Schedule**
	Monthly to NY/NJ Harbor Estuary Program Stakeholders
Yearly Report	January 2009
2009 QAPP Review	March 2009

5.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Since the sampling locations have been pre-selected, and the design is based on the previous studies for obtaining baseline water properties and validating the SWEM, the Agency=s Data Quality Objective Process has not been utilized in planning this survey. A systematic planning process based on a these previous data collection efforts has been used to ensure that the quality of the data collected is appropriate for the intended use.

Measurement Quality Objectives (MQOs) are typically employed to assess standard data quality parameters such as, precision, bias/accuracy, representativeness, completeness, comparability, and sensitivity. These MQOs will be used as appropriate to assess data/environmental information collected during the New York Bight Monitoring. MQOs will be established for both the field analysis components as well as the laboratory analyses performed for this project. The relative significance of each MQO depends on the type and intended use of the data being collected.

In order to evaluate the MQOs for accuracy and precision, various Quality Control (QC) samples will be collected and analyzed for most data collection activities and are discussed in the following sections. The quality control samples collected for this project and the associated acceptance criteria are presented in Tables 7 and 9 through 13.

5.1 Precision

Precision is the measure of agreement among repeated measurements under similar conditions and is used to determine reproducibility of results. It can be measured through the analysis of replicate samples.

5.1.1 Field Measurement Precision

GPS –Differential Global Positioning System (D-GPS) on board each vessel will be utilized for this survey. All sampling stations will be located using D-GPS. Each

sampling station is located within and represents a roughly 440 meter grid of the conceptual model and precise station occupancy is not necessary; therefore the vessels will not anchor (See Section 7.0 and 7.1). GPS readings will be recorded at the start and end of sampling to document drift during the entire sample collection. The drift will be considered acceptable if the sample is collected within the identified grid. A 440 meter perimeter will be established on the D-GPS around each sampling station to delineate the grid boundary.

CTD Casts –The precision of the CTD sensors reported by the manufacturer are specified in Table 3. Field precision of water quality measurements will be qualitatively assessed by visually comparing the real-time data of the upcast and downcast profiles obtained for each parameter at each station. CTD precision will be documented in the field logs for each station.

Table 3. Instrument Sensor Precision, Accuracy and Sensitivity

Instrument Sensor	Units	Measurement Range	Accuracy	Precision
Depth	m	0-500	±0.5	±0.1
Temperature	^{o}C	0-35	±0.01	±0.01
Conductivity	S/m	0-7	±0.001	±0.001
Dissolved Oxygen	% satur.	0-120	±2	±1
Chlorophyll a	TBD	Will be added in September 2008 or sooner	TBD	TBD
Transmissometer/Visibility	TBD	Will be added in September 2008 or sooner	TBD	TBD
Turbidity	TBD	Will be added in September 2008 or sooner	TBD	TBD

Note: Measurement range, accuracy and precision are those reported by sensor manufacturers.
Note: A revised QAPP will be prepared when probes are available to measure Chlorophyll a, Transmissometer, and Turbidity.

Transmissometer/Visibility (to be added in August/September, QAPP will be modified to incorporate)

Turbidity (to be added in August/September, QAPP will be modified to incorporate)

Chlorophyll a (to be added in August/September, QAPP will be modified to incorporate)

DO Winkler Titration – Precision of Winkler titrations will be assessed by performing titrations on a split water sample obtained from each depth at a single location once per day. The second titration of each of these splits will be performed blind by covering the burette reading during titration. Titrations should agree within 0.2 mg DO/l. If the two

readings do not agree within 0.2 mg/l, the titrations will be repeated using new reagents to determine whether reagent stability is the cause of the discrepancy.

Secchi Disk – The procedure for measuring and recording Secchi Depth incorporates replicate measurements, therefore precision is assessed at each sampling location by comparison of the replicate measurements. Measurements should agree within 0.5 m. See section 7.4 Quality Control for Secchi Disk measurement.

5.1.2 Analytical Measurement Precision

In the laboratory, duplicates will be analyzed, where required by the method or laboratory SOP. Acceptance criteria for laboratory duplicates will be those specified in the laboratory SOP. Sufficient sample volume must be collected at one location for each sampling event, in order to allow the analysis of laboratory duplicates, matrix spikes, and matrix spike duplicates, as required by the analytical method and/or SOP.

5.2 Accuracy

Accuracy is defined as a measure of how close a measurement is to the true value.

5.2.1 Field Measurement Accuracy

GPS – Given the grid dimensions of the SWEM, accuracy within 440 meters of the required station coordinates is sufficient for this survey.

CTD Casts - Accuracy of the CTD is also based on the manufacturer specifications. The Accuracy of the instrument sensors are specified in Table 3. In addition, the amperometric measurement of DO on the CTD will be compared to results obtained via Winkler titrations. The results of both DO measurements will be assessed quantitatively to determine how close the measurement obtained by the CTD is to the result obtained from the Winkler titration. Agreement within 0.2 mg/l **(EMAP uses 0.5)** is acceptable. Additional CTD probes will be verified twice per season (July and September) of sampling using a thermometer, and refractometer. If the CTD probe and Winkler DO value disagree by more than the acceptable limit, the CTD probe will be sent back to manufacturer for re-calibration. A replacement probe will be acquired (borrowed or rented) and profiling will be repeated as soon as permissible.

Secchi Disk – Accuracy of Secchi disk measurements are dependant on the following:

- Disk construction, which includes the size of the disk as well as the reflectance of the disk. At a minimum, the disk size should be 20 cm (8 inches) and the disk should be painted in a matte finish so that the light is reflected back as equally as possible in all directions.
- Availability of sunlight must be considered when taking secchi disk measurements since overcast conditions may affect the depth at which the secchi disk can be seen. Therefore cloudy, overcast conditions must be documented.

- The line used for Secchi disk measurements must be a type of non-stretch and non-shrinkage to avoid measurement error.
- Water color will be documented since measurements may be different in waters of different color (e.g., interior stations closer to the harbor vs interior stations farther away from the harbor vs. the perimeter stations).
- Rain events may cause an increase in the turbidity especially at the near shore stations. Therefore rain events must be documented if they occurred with the past 24 hours or during sampling activities.
- The key to consistent results is to train volunteers to follow standard sampling procedures and, if possible, have the same individual take the reading at the same site throughout the season.

5.2.2 Analytical Measurement Accuracy

The laboratory will run method and field blanks with each batch of samples and report these results with their analytical data. Field blanks will be collected once per day from each bottle by washing the inside walls of the Niskin bottles with the required volume of distilled water to perform all analyses and then collecting and preserving them according to the methods described in this document. Blank data will be compared to sample results. If an analyte is detected in both a blank (either method blank or field blank), and a field sample, the concentrations in each will be compared. If the concentration found in the field sample is less than three times the concentration found in the blank, the field data for that sample will be flagged with an appropriate qualifier. If the analytical result for the field sample is more than three times the level found in the blank, the analytical result may be used without qualification.

The laboratory will also check for bias by the analysis of standard reference materials (where available), matrix spikes, and method blanks. The standards for evaluating the results of these self checks will be those contained in the relevant laboratory SOPs and/or analytical methods. Laboratories will report any anomalies, or qualifiers with the analytical data.

5.3 Representativeness

Representativeness is the extent to which discrete measurements represent the true system being measured. It is assessed qualitatively as the "degree to which the data accurately and precisely represent a characteristic of the environmental condition." The purpose of the sampling design is to get a qualitative picture of eutrophication status across wide areas of the Bight. The sample design of this project is based on a previous survey conducted in 1995 by NYCDEP. The SWEM sampling grid was designed to capture data at scales that are relevant for Bight-wide processes such as eutrophication.

Sampling methodology is designed to ensure that each sample will be representative of the NY Bight water at the specific sampling location and depth stratum at the time of sampling. There are many factors that can contribute to the variability of results these factors include tides, rain events, and the intensity of sunlight and temperature.

The NY Bight is tidally influenced and therefore water condition may vary with each ebb and flow. Station locations will inherently capture the water flowing into and from the NY/NJ Harbor. Time of day recorded for each sample will be used to estimate tidal conditions with regard to ebb and flow from the Harbor nutrient sources.

Rain events cause additional discharges to the NY/NJ Harbor through combined sewer overflows, storm drains, and non-point source runoff. Weather conditions recorded for each sampling event will be used to estimate potential for increased nutrient sources from excessive runoff conditions.

This sampling program does not encompass multiple seasons to account for temporal variability. Sampling is expected to be performed during the summer months only.

For zooplankton sampling, an oblique tow will be taken in surface waters to ensure representativeness. The tow will be conducted in (roughly a circle) to negate the effects of tide and current on sampling.

5.4 Data Comparability

Comparability is defined as the extent to which data from one data set can be compared directly to similar or related data sets and/or decision-making standards.

Data from monthly monitoring of the 21 inshore stations are not intended for comparison to future datasets but rather to provide a snapshot of current conditions in the Bight and identify any depressed oxygen conditions for follow up work.

Data from August and September monitoring of all 41 stations will be used to verify the SWEM outputs as well as to supplement and/or update previous data sets collected in 1995 to determine if the SWEM may need recalibration. The data all needs to be compatible for SWEM. To ensure that the data provided by this survey are comparable and compatible to the data provided by the 1995 survey, survey design aspects, as well as sampling methodologies, analytical procedures, holding times, and QA/QC protocols will be compatible (the same?) with those used in the 1995 survey.

5.5 Data Completeness

Although the completeness goal is to collect of 100% the samples, situations may occur that result in the loss of data. Whether it is loss of a sample or equipment malfunction, the Chief Scientist or Project manager in consultation with the modelers will determine the need to resample any locations. As in the 1995 survey, a loss of 10 percent of the water column data for the entire project is not expected to compromise the objectives. The goal is to sample monthly from June through September. Sampling will be rescheduled as soon as possible if bad weather, ship breakdown, and/or equipment failure prevent sampling as scheduled in order to meet the 90% goal. As sampling is weather dependent, alternate dates will be selected if sampling is unable to occur on any given day. Secchi disk readings can be impacted by weather and sea conditions. Cloudy, rainy days will produce lower values than on sunny days. As such, ambient weather is recorded on our field data sheets.

5.6 Sensitivity

5.6.1 Field Measurement Sensitivity

The sensitivity, also known as the operating range, of field instrumentation is based on the manufacturer specifications. The range of the instrument sensors is presented in Table 3 and is within an acceptable operating range for this project.

5.6.2 Analytical Measurement Sensitivity

Due to the low levels of detection required for this project, some analytical methods may not be sensitive enough therefore resulting in data that are estimated values as close to the project required reporting limit as possible. The laboratory will qualify any results at or less than the reporting limits as estimated values. The project-required limit of detection and the laboratory reporting limit are provided in the Table 8 Analytical Requirements.

Because concentrations of the nutrients are expected to be very low, this could result in increased qualification or estimates of data due to various conditions, for example, field concentrations indistinguishable (i.e. <3X) from blank concentrations. This may require adjustments to field sampling procedures and/or use of a contract or other laboratory.

6.0 NON-DIRECT MEASUREMENT (SECONDARY DATA)

No secondary data will be used for this project as of this time. The sampling locations are from 1995.

7.0 FIELD MONITORING REQUIREMENTS

Bight Apex (interior) monitoring will be conducted using the EPA Region 2 vessels, CLEAN WATERS and BIGLANE. The CLEAN WATERS is 65 feet long and contains cabin facilities for processing samples. The BIGLANE is 41 feet long and has on-deck space for processing samples. Both are equipped with depth finder and a Differential Global Positioning System (D-GPS). Each also is also equipped with hydraulic winch for CTD deployment.

Sampling and profiling at the New York Bight perimeter stations will require use of an oceanographic platform capable of long-duration, live-aboard operations. EPA's Ocean Survey Vessel BOLD will be used, as available, for Bight perimeter operations. The OSV BOLD is a 224-foot fully equipped oceanographic vessel that can house up to 17 scientists for long-duration surveys. It is equipped with D-GPS, a CTD/rosette water sampling array, and indoor laboratory for sample processing. The BOLD will not be available in 2008, and an alternate suitable vessel (similar size and capabilities) will be found.

All sampling stations will be located using D-GPS. The SWEM model divides the Bight into broad geographic cells of coverage. Although the sample design identifies point locations, there is considerable tolerance for sample position within the SWEM grids (up to 440 meters). The vessels will not anchor during the sampling. The actual locations occupied at each station will be documented by recording coordinates at the beginning and end of each CTD cast and water sample collection to document vessel drift. The depth of the water column will be determined using the vessel depth finder. This QAPP specifies procedures for field sampling operations and should be utilized as the primary reference for all field activities, except as otherwise noted by reference to a specific SOP (a copy of which will be attached to the QAPP), owner's manual (a copy of which will be available for each vessel) or analytical method (laboratory use only). This QAPP will be reviewed by Chief and Survey Scientists prior to mobilizing into the field and aspects of the QAPP that are relevant to their assigned task will be discussed with support staff. A copy of the QAPP will be available on board each vessel at the time of field operations. The designated Chief Scientists will be responsible for corrective actions and decisions to modify procedures if any problems arise during sampling, as well as for documenting all such corrective actions and/or decisions in field log books.

Monitoring operations at each station will encompass:

- CTD water column profiling for physical/chemical water quality parameters (including Winkler titrations at each depth)
- Secchi depth measurement
- Surface, mid-depth and bottom waters sample collection
- Zooplankton sampling using a 0.5-meter diameter, 153-micron net

Personal safety equipment will be a modified Level D requirement with a shirt, long pants or coveralls and safety toe boots. Staff working deploying equipment or sampling off the stern or over the gunwales are required to wear personal flotation devices, nitrile or latex gloves, and safety glasses. Hardhats must be worn by field staff while working near or under the A-frame during the deployment or retrieval of equipment. A mandatory training day will be scheduled when new personnel, equipment, or new procedures are introduced into the schedule in order to allow sampling personnel time to familiarize themselves with the equipment.

7.1 Monitoring Design

The monitoring design comprises 41 sampling stations distributed throughout the New York Bight. The station locations are distributed by a biased design established for the SWEM to provide system-wide coverage of the New York Bight (Figure 1).

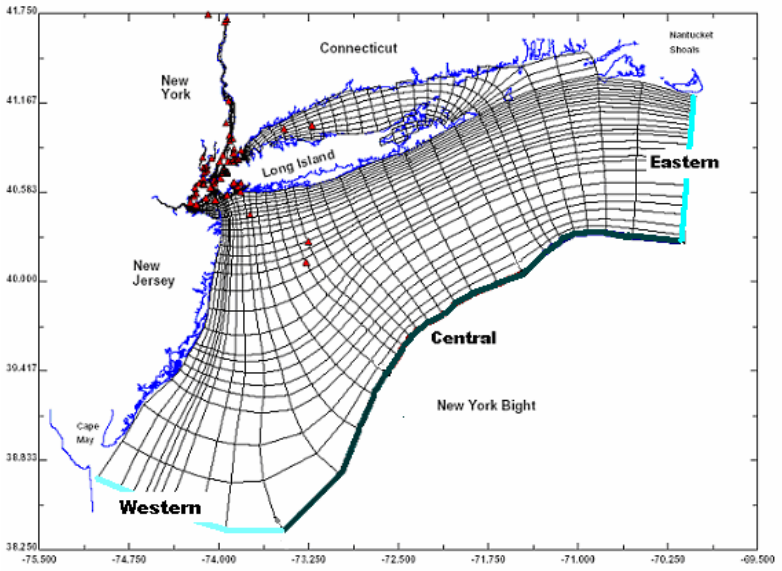

Figure 1. Grid for SWEM

All water column data will be collected for the purpose of verifying the SWEM (recalibrating if necessary) and collecting real time data for monitoring dissolved oxygen throughout the summer season.

Table Nos. 4 and 5 list the sampling stations and locations. Stations listed in Table No 4 are interior stations that will be sampled monthly from June to September; stations listed in Table No. 5 are perimeter stations that will be sampled only in the months of August and September. Figure No. 2 depicts the interior sampling stations. Figure No. 3 depicts the perimeter stations.

Table 4. New York Bight Interior Sampling Stations

Station Designation	Latitude	Longitude
H-167	40 31.800	073 57.000
H-168	40 30.600	073 58.500
H-169	40 29.400	074 00.000
H-171	40 23.400	073 56.400
H-172	40 30.000	073 47.400
H-173	40 24.000	073 45.600
H-174	40 25.200	073 37.500
H-175	40 30.595	073 39.582
H-176	40 31.484	073 32.985
H-180	39 44.987	074 00.020
H-181	40 00.000	074 00.000
H-182	40 15.064	073 56.959
H-183	40 15.000	073 45.600
H-184	40 00.000	073 45.600
H-185	39 45.000	073 45.600
H-186	40 16.800	073 36.000
H-187	40 00.000	073 33.000
H-188	39 45.000	073 30.000
H-191	40 15.000	073 18.000
H-193	40 39.000	072 54.000
H-208	40 27.303	073 52.690

Table 5. New York Bight Perimeter Sampling Stations

Station Designation	Latitude	Longitude
H-151	41 08.400	71 37.440
H-177	38 36.000	74 42.000
H-178	38 21.000	73 45.000
H-179	39 06.000	74 15.000
H-189	39 15.000	73 18.000
H-190	38 54.000	72 54.000
H-192	39 54.000	73 15.000
H-194	40 15.000	72 36.000
H-195	39 42.000	72 24.000
H-196	40 51.000	72 06.000
H-197	40 33.000	71 57.000
H-198	40 03.000	71 36.000
H-199	41 09.000	71 12.000
H-200	40 48.000	71 09.000
H-201	40 18.000	71.00.000
H-202	41 21.000	70 52.200
H-203	41 18.000	70 27.000
H-204	41 07.800	70 00.000
H-205	40 48.000	70 06.000
H-206	40 30.000	70 09.000

Note: The perimeter stations will change to accommodate availability of NOAA vessel. This will be reflected in a new QAPP for the August sampling. The modeler has agreed that some stations can be moved and we are working to make the necessary changes. Once changed, the perimeter stations will be maintained for the duration of the study. Additional stations could also be added by the modeler for future sampling.

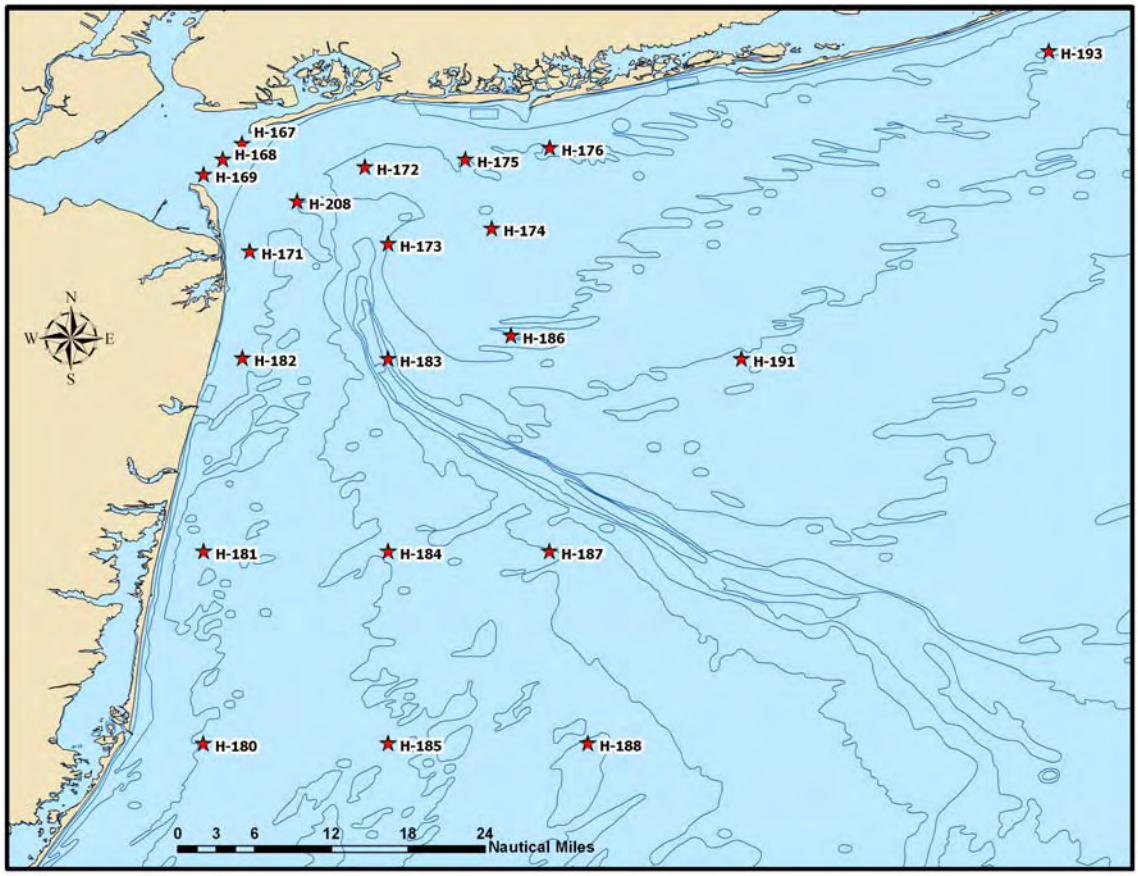

Figure 2. New York Bight Interior Sampling Stations

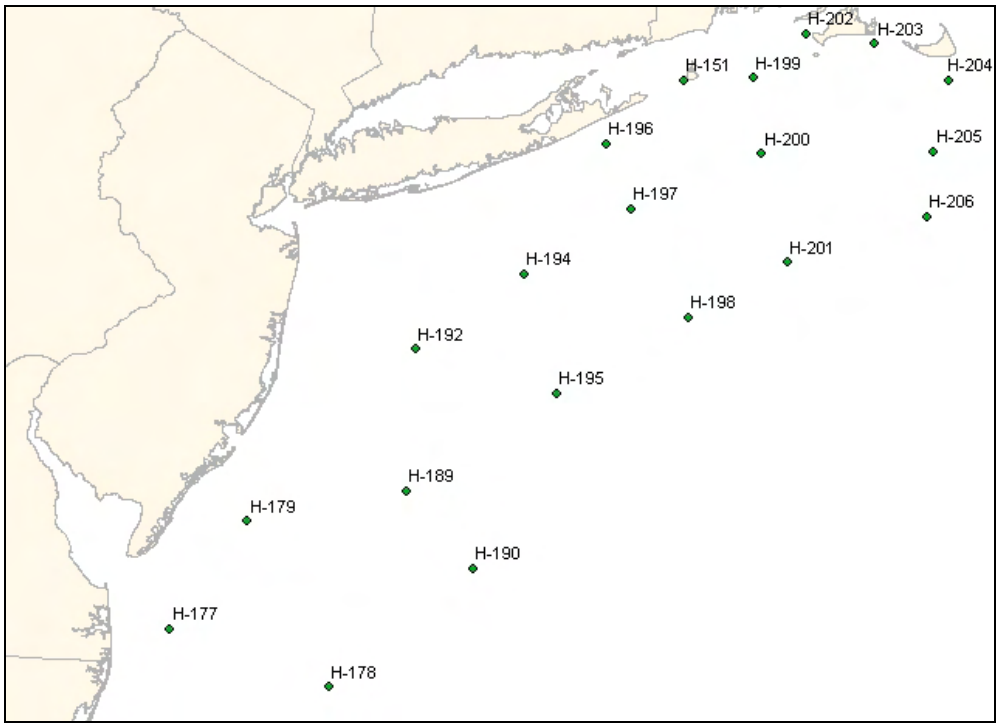

Figure 3. New York Bight Perimeter Monitoring Stations

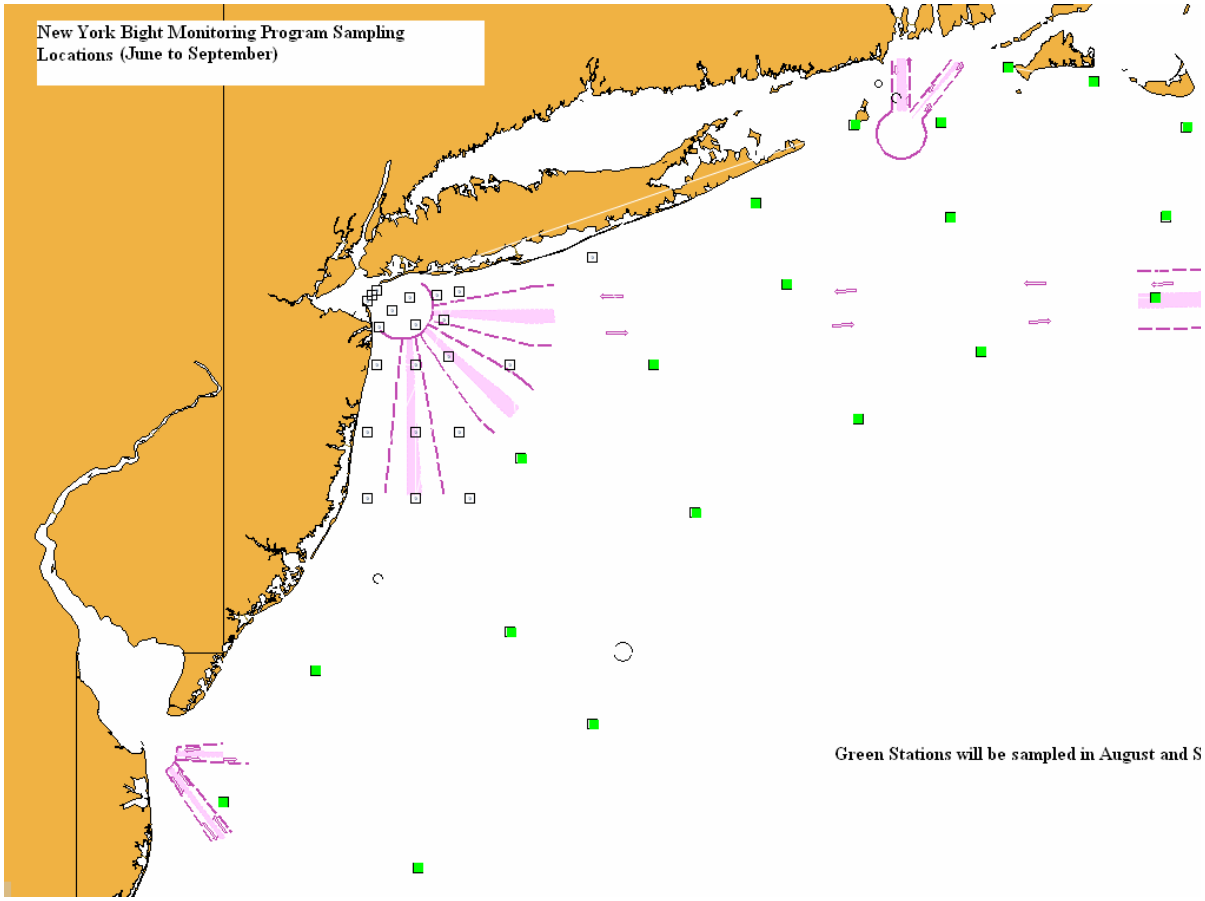

Figure 4. New York Bight Monitoring Stations

Table 7. New York Bight Interior Sampling Stations			
Station Designation	Vessel	Latitude	Longitude
H-167	CLEAN WATERS	40 31.800	073 57.000
H-168	CLEAN WATERS	40 30.600	073 58.500
H-169	CLEAN WATERS	40 29.400	074 00.000
H-171	CLEAN WATERS	40 23.400	073 56.400
H-172	CLEAN WATERS	40 30.000	073 47.400
H-173	CLEAN WATERS	40 24.000	073 45.600
H-174	CLEAN WATERS	40 25.200	073 37.500
H-175	CLEAN WATERS	40 30.595	073 39.582
H-176	CLEAN WATERS	40 31.484	073 32.985
H-208	CLEAN WATERS	40 27.303	073 52.690
H-180	BIGLANE	39 44.987	074 00.020
H-181	BIGLANE	40 00.000	074 00.000
H-182	BIGLANE	40 15.064	073 56.959
H-183	BIGLANE	40 15.000	073 45.600
H-184	BIGLANE	40 00.000	073 45.600
H-185	BIGLANE	39 45.000	073 45.600
H-186	BIGLANE	40 16.800	073 36.000
H-187	BIGLANE	40 00.000	073 33.000
H-188	BIGLANE	39 45.000	073 30.000
H-191	BIGLANE	40 15.000	073 18.000
H-193	BIGLANE	40 39.000	072 54.000

Sampling Schedule

Sampling will be conducted the last week of each month (depending upon weather). The Monday of that week will be utilized as a mobilization day to label all sample bottles, check on supplies, fuel vessels, and other field preparation activities. No sampling will be conducted on Fridays. A mandatory training day will be scheduled when new personnel, equipment, or new procedures are introduced into the schedule in order to allow sampling personnel time to familiarize themselves with the equipment.

Formatted: Bullets and Numbering

Monitoring Methods

All monitoring and sampling methods will be performed in accordance with the procedures described in this QAPP or the referenced standard operational procedures (SOPs).

7.2.1 Water Column Profiling

In situ water quality measurements will be recorded using the CTD to provide a profile of the entire depth of the water column. The following parameters will be profiled at each station:

- dissolved oxygen (DO),
- temperature,
- salinity,
- pressure (depth)
- density
- pH
- Photo-synthetically active radiation (to be added in August/September, QAPP will be modified to incorporate)
- Chlorophyll auto-fluorescence (to be added in August/September, QAPP will be modified to incorporate)
- Optical backscattering (to be added in August/September, QAPP will be modified to incorporate)
- Visibility/Transmissometer (to be added in August/September, QAPP will be modified to incorporate)

The following information will be recorded in the field notebook and data sheet (attached) for each CTD cast:

- latitude/longitude from D-GPS at start/end of cast;
- depth at start of cast;
- any cast or sample anomalies;
- observations regarding sea state and weather conditions

Profile measurements will be made by lowering the CTD through the water column at approximately one meter per second. However, because sample bottles will have to be attached to the cable during CTD lowering (see following section) and removed during CTD retrieval, detailed deployment procedures are provided below in section 7.2.3.

The CTD will be connected to a laptop to allow for real time data viewing and acquisition by using the SEASAVE program provided by the manufacturer. Assigned staff will start individual casts following the surface interval by following the dialog boxes provided by the program. Each cast will be saved as an individually named data file. A copy of the CTD and SEASAVE user's manuals will be available on the boat.

CLEAN WATERS CTD Probes:

SBE 25 Sealogger CTD installed in a cage (sn-256824-0106)

Sensors

SBE 3 Temperature (sn-031425)

SBE 4 Conductivity (sn-041044)

SBE 5 Pump (sn-050790)

SBE 29 Pressure sensor (depth) (sn-290208)

SBE 30B DO (appears that the ph probe now on this sensor) (sn-300117)

SBE 43 DO (sn-430478)

Sea-Tec Transmissometer (sn-602)

Turner Cyclops-7 Fluorometer (sn-2100615)

Transmissometer/Visibility

The attenuation (loss of light) of a narrow, well collimated beam of light is due to both **absorption** and **scattering**. When referenced to pure water, the beam attenuation coefficient describes light losses due to absorption by dissolved materials and particulates and due to scattering by particulates.

In the red part of the spectrum, attenuation due to dissolved materials is negligible, so that attenuation in the red is due primarily to particles. Light that is absorbed cannot be scattered, so that to first order the absorption and scattering processes compensate **do you mean complement?** each other. The beam attenuation coefficient in the red is an excellent proxy for the total volume of particles.

The beam attenuation coefficient at 650 nm depends on the nature of the particles, or their size, shape and internal index of refraction distribution. The beam attenuation coefficient at 532nm has been shown to be strongly negatively correlated with the visibility of a 200mm diameter black target. This is the **visibility** parameter.

Turbidity

In the realm of water quality monitoring, turbidity sensors provide one of the most widely used optical measurements. Scientists, resource managers, and other aquatic specialists use turbidity measurements to provide an estimate of water clarity, for indications of sediment transport, and for many other studies requiring an estimate of particulate loading in the water. Turbidity sensors provide in-water particulate concentrations most commonly derived from **optical backscattering** measurements. They are calibrated relative to a secondary standard such as formazin. Units of measurement are expressed in

Nephelometric Turbidity Units (NTUs) or Formazin Turbidity Units (FTUs) and pertain to a specific concentration of the given standard medium.

While turbidity measurements are useful as general indicators of suspended particulate concentrations, the measurements cannot be used as absolute indicators. Since different materials and different material sizes possess different **Volume Scattering Functions** the amount of light scattered into a given angle captured by the sensor receiver varies. This results in errors in measured concentrations.

Chlorophyll a

Chlorophyll is a measure of the biomass (abundance) of phytoplankton, the suspended microscopic algae. Phytoplankton produce organic food from inorganic substances (primary production) using the chemical energy found in sunlight. Chlorophyll is a pigment in phytoplankton that captures sunlight for the process of phytosynthesis. In the production process, plants take up nutrients, such as nitrogen and phosphorus, and trace metals that are contaminants in the marine environment, such as cadmium, zinc, and nickel.

All aquatic phytoplankton contain chlorophyll a. Excess light energy absorbed by algae is either converted to heat or fluoresced as red light. Amount of red light fluoresced is proportional to the concentration of chlorophyll. The chlorophyll concentration is a useful indicator of algal biomass.

Sea-Bird sensors (and third party) are calibrated by subjecting them to known physical conditions and measuring the sensor responses. Coefficients are then computed, which may be used with appropriate algorithms to obtain engineering units. The conductivity, temperature, and pressure sensors on the SBE 25 are supplied fully calibrated, with coefficients printed on their respective Calibration Certificates (see back of manual) and stored in the instrument configuration (.con) file. Sea-Bird recommends that the SBE 25 be returned to Sea-Bird for calibration

7.2.2 Water Sample Collection

Water will be sampled from three depths at each station. Samples will be taken 1 meter below the surface, at mid-depth of the water column as determined from the vessel echo-sounder/depth finder, and at 3 meters above the seafloor. 4900 ml must be collected from the surface water sample to provide sufficient volume for all required analytical subsamples to be taken and for Winkler titrations to be performed on board. 4700 ml is required at mid water and bottom samples. Therefore, samples will be taken using 5-L Niskin sample bottles.

Samples will be collected by Niskin or Go-Flo bottles using the following procedure: Niskin or Go-Flo Bottles water sampler will be attached to the winch cable just above the CTD; the CTD will then be lowered to a mid-depth position and another Niskin bottle

(and messenger weight) will be attached to the cable, the CTD will be lowered to 5 meters above the seafloor and the final bottle (and messenger weight) will be attached to the cable before lowering the CTD to a position 3 meters above the bottom. A messenger weight will then be sent down the line to close the bottles. Bottles will be retrieved as the CTD is raised.

Seven (7) subsamples will be taken from each water sample as outlined in Table 6. The DO subsample will be the first subsample drawn. Latex or nitrile gloves will be worn by all sampling personnel in order to minimize field contamination to samples. The MZ subsample will only be taken from the surface sample and is to be the second subsample drawn.

Table 6: Subsamples to be taken from water bottles

Sub-Sample	Analysis	Volume (ml)[#]	Jar	Preservative	Place on Ice?
MZ	Microzooplankton (surface only)	200	250 ml Rigid Plastic	4 ml of Lugol's Solution	no
A	Nitrogen* and Total Phosphorous	500	500-ml Rigid Plastic	H_2SO_4**	yes
B	Orthophosphate	50	125 ml Rigid Plastic	N/A	yes
C	Dissolved/Particulate Silica	200	250 ml Rigid Plastic	N/A***	yes
D	Particulate Organic Carbon (POC)/Dissolved Organic Carbon (DOC)	650	1-L Rigid Plastic	N/A***	yes
DO	Winkler Titration	300 (600 ml overflow)	300 ml Glass BOD bottle	MS/AZ****	N/A

* includes nitrate+nitrite, and ammonia

**pH of initial sample will be adjusted by addition of the required acid until the sample pH is 2 (as determined by use of litmus paper). The amount of acid used to adjust the initial sample volume will be noted. Subsequent samples will be preserved with that amount of acid

***Samples will be filtered in EPA Region 2 Edison Laboratory and will be preserved after they are filtered.

****See Section 7.2.4

[#] choose one sample per 20 and collect an additional volume of sample for laboratory QC

Subsamples will be preserved in the field. Colored dots will be placed on each sample bottle corresponding to surface (green), mid (brown), and bottom (yellow). Sample

volumes, sample containers, and preservation requirements are outlined in Table 6. To minimize the potential for sample contamination, the samples will be not be filtered in the field but will be transported in iced coolers to the Region 2 laboratory and filtered within 24 hours of collection. At the end of each day of sampling, the coolers containing the samples will be transported to the Region 2 Laboratory located in Edison NJ. The sample handling, transportation and custody requirements are provided in Section 9.0 of this QAPP.

7.2.3 Water Column Profiling and Sample Collection Procedure

The CTD will be deployed following the procedures described below and in DESA's "Instructions for Field Use of the Sea-bird SBE 25 CTD (Version #015, 07/16/07)"and the manufacturer's user manual. A copy of the DESA instruction and manufacturer's user manuals will be available on board.

Once the captain has guided the boat to the station, he will confirm and call out the station name and the water depth. When he has given the "all clear" signal indicating that instruments can safely be put into the water:

1. The CTD is turned on and lowered into the water (with attached bottom Niskin bottle) and left at the surface for approximately two minutes for sensor equilibration.

2. The assigned field staff records the time on station, location, and the current meteorological and sea conditions on the data sheet.

3. After equilibration, the CTD cast is started. The CTD Cast Start time and coordinates are recorded on the data sheet. The CTD then is lowered at approximately one meter per second to a mid water position and the mid-water Niskin bottle is attached to the cable with an attached messenger weight.

4. The CTD is then lowered to a depth of 5 meter above the bottom and the surface Niskin bottle is attached to the cable with an attached messenger weight.

5. The CTD is then lowered to its lowest position (surface Niskin bottle 1 meter below surface) and a messenger weight is sent down the line to close the bottles. Assigned staff confirms that messengers have triggered by holding hand around cable.

6. The CTD is then raised and bottles are retrieved and placed into rack for sub sampling as they come to surface.

7. CTD is turned off and detached from winch cable

FILTRATION FOR PARTICULATE AND DISSOLVED SILICA

Materials:

1. 500 mL HDPE sample bottle for sample collection
2. Vacuum Pump
3. Air Trap 1 L Vacuum Flask w/ ring stand, one hole stopper, and vacuum tubing
4. Millipore 0.45 micron nylon filter 47 mm diameter
5. Nalgene Filtration Cup (250 mL funnel and base) #153-0045 (w/ filter removed from funnel)
6. 50 mL flat bottom centrifuge tubes, HDPE for storage of membrane after filtration
7. DI Water
8. 10% HCL Acid for decon
9. Plastic disposable forceps

Interferences

Glassware made of borosilicate glass should be avoided (including any support equipment such as acid rinse and DI water)

Sample Preservation/Holding:

Samples must be filtered through a 0.45 micron non-glass membrane filters as soon as possible after collection. After collection and filtration, samples should be analyzed as soon as possible. If samples will be analyzed will be analyzed within 24 hours then keep refrigerated in plastic bottles at 4 degrees centigrade until analysis otherwise samples (filters and dissolved fraction) should be frozen as soon as possible. If samples are to be frozen for long-term storage (up to 60 days) the frozen samples must be taken out of the freezer and allowed to thaw in a refrigerator at 4 degrees centigrade for 4 days. After completely thawing, take samples out of the refrigerate and mix thoroughly. Keep samples in a dark at room temperature overnight before analysis. To ensure a slow process of depolymerization of polysilicate to occur, thawing the frozen samples in the dark at 4 degrees C for 4 days is critical condition for obtaining high recoveries of silicate in frozen samples. The maximum holding time for frozen samples is two months (EPA Method 366.0).

Filtration Notes:

The filtration cup/base comes from the manufacturer with a fixed filter. This filter is removed so that removable nylon filters can be used. The new filter must be centered on the bottom of the filtration funnel so that no sample bypasses the filter. The filter funnel and base should be rinsed 3X with about 50 mLs of sample. Rinse sample cap as well. An optional prerinse with 10% HCL acid followed by 3X DI can be used as a decon step prior to rinsing 3X with sample. This cleans the filter cup and base and also allows for the filtration cup to be wet before applying filter. The wet filter cup will allow for the filter to seal before pouring the sample.

Basic Filtering Procedure:

1. Rinse funnel and base 3x with sample
2. Use disposable forceps and place 47 mm nylon membrane on center of funnel
3. Turn on Vacuum filter.
4. Filter 200 mLs of sample slowly onto center of filter (**record volume filtered!!!)**

5. Allow the filter to run 60 seconds after sample has drained to bottom to allow the filter to desiccate.
6. Turn off vacuum and remove hose from funnel apparatus.
7. Carefully remove filter with clean plastic forceps and place in prelabelled 50 mL centrifuge tub. This is the sample that will be processed for Particulate Silica.
8. Preserve filtrate with conc. Nitric Acid to pH <2. Cap and label the bottom portion of the flask. This is the portion of the analysis for dissolved silica.
9. Immediately store a 4 degrees centigrade. Freeze within 24 hours

FILTRATION FOR DISSOLVED AND PARTICULATE ORGANIC CARBON

Materials:

1. 1000 mL HDPE filtration flask for dissolved fraction collection (reusable)
2. Vacuum Pump
3. Air Trap 1 L Vacuum Flask w/ ring stand, one hole stopper, and vacuum tubing
4. Whatman GF/F Glass Microfiber filters, 25 mm diameter (ashed at 475 C for 1.5 Hrs)
5. Pall Filtration Cup (200 mL funnel) Through VWR #28144-754
6. Hard plastic disk (polysulfone) for filter support in funnel VWR # 28144-638
7. 50 mL flat bottom centrifuge tubes, HDPE for storage of membrane after filtration
8. 1000 mL sample bottles to store DOC sample
7. DI Water for rinsing
8. 10% HCL for decon (if desired)
9. Plastic disposable forceps
10. Conc. H2SO4 for preservation of DOC sample

Interferences

Filters must be glass microfiber and be precombusted at 450 degrees C for 1.5 hours prior to use. The presence of Carbon compounds on preparation surfaces, fingers, detergents and dust necessitates the utililization of careful techniques (USE OF FORCEPS AND GLOVES) at all times.

Sample Preservation/Holding Field and Lab:

Homogenize each sample (600 mLs). Measure and record the required sample volume. Pour the measured sample into the filtration cup containing the glass membrane and support disk no more than 50 mL at a time. Filter 600 mL of sample whenever possible and record volume filtered. DO NOT rinse the filter after filtration. Continue vacuum filtration for 30 seconds after the final sample volume passes to desiccate the filter. Samples must be filtered through glass microfiber membrane filters as soon as possible after collection. Filters can be stored at 4 degrees C for 24 hours and then frozen for at least 100 days (or stored in a desiccator after drying at 103-105 degrees C for 24 hours). After collection and filtration, samples should be analyzed as soon as possible. If samples are to be frozen for long-term storage (up to 60 days) the frozen samples must be taken out of the freezer and allowed to thaw in a refrigerator at 4 degrees centigrade for 4

days. After completely thawing, take samples out of the refrigerator and mix thoroughly. Keep samples in a dark at room temperature overnight before analysis. To ensure a slow process of depolymerization of polysilicate to occur, thawing the frozen samples in the dark at 4 degrees C for 4 days is critical condition for obtaining high recoveries of silicate in frozen samples. The maximum holding time for frozen samples is two months (EPA Method 366.0).

Filtration Notes:

The filtration cup is from Pall and must be reused for each sample as well as the 1L Filtration flask. This filter is removed so that removable nylon filters can be used. The new filter must be centered on the bottom of the filtration funnel so that no sample bypasses the filter. The filter funnel and filtration flask should be rinsed 3X with 50 mLs of sample between samples. An optional pre-rinse with 10% HCL followed by 3X DI can be used as a decon step prior to rinsing 3X with sample. This cleans the filter cup and base and also allows for the filtration cup to be wet before applying filter. The wet filter cup will allow for the filter to seal before pouring the sample.

Basic Filtering Procedure:

1. Rinse funnel and base 3x with DI and decon w/ 10% HCL and then a final rinse with 1-3X with an aliquot of the sample.
2. Use disposable forceps and place 25 mm glass micro fiber filter on top of hard plastic disc at base of Pall Filter funnel (make sure funnel base is wet to seal filter to base). The funnel separates at the bottom by twisting clockwise.
3. Turn on Vacuum filter.
4. Filter 600 mLs of sample slowly onto center of filter (**record volume filtered!!!)**
5. Allow the filter to run 30 seconds after sample has drained to bottom to allow the filter to desiccate.
6. Turn off vacuum and remove hose from funnel apparatus.
7. Carefully remove filter with clean plastic forceps or Teflon coated forceps and place in prelabelled 50 mL centrifuge tub. This is the sample that will be processed for POC.
8. Pour the 600 mL of filtrate into 1L prelabeled sample bottle. Preserve to pH <2 using conc. Sulfuric acid. This is the portion of the analysis for dissolved organic carbon (DOC).
9. Store a 4 degrees centigrade.

QA/QC For DOC/POC & Diss/Particulate Silica

1. DI Water Blanks: Prepare one sample blank (filter and filtrate) for every 20 samples processed using Deionized water. Treat the same as test samples.

2. Sample Triplicates: Prepare triplicate samples for POC and DOC every 20 samples.

3. Sample Duplicates for Diss/Part Silica one every 20 samples:

Samples for particulate silica and POC will either be filtered in the U.S. Army Corps of

Engineers Caven Point Facility Laboratory and/or EPA's Edison Laboratory as soon as possible after field activities have concluded.

At the end of each day of sampling (or at the end of the sampling trip for the offshore stations), the coolers containing the samples will be transported to the Region 2 Laboratory located in Edison NJ. The sample handling, transportation and custody requirements are provided in Section 9.0 of this QAPP.

7.2.4 Field Analysis of Dissolved Oxygen: Winkler Method (Azide Modification)

The aliquot for DO is the <u>first</u> drawn from surface, middle and bottom Niskin sample bottles.

<u>PROCEDURE</u>

1. The hose from the water sampling bottle is placed at the bottom of a 300ml BOD bottle and water is allowed to fill the bottle. Let the bottle overflow two or three times its volume. Remove hose while water is still flowing out of it.

2. Place the stopper in the bottle so that no air is entrained while waiting to titrate samples. If a few air bubbles are present they can be removed by tapping the side of the bottle prior to stopping the bottle.

3. Add 2 ml of the Manganous sulfate ($MnSO_4$) solution to the sample below the surface. No need to refrigerate the re-agent.

4. Add 2 ml of alkaline-iodide-azide reagent to the sample below the surface. No need to refrigerate re-agent.

5. Stopper carefully to exclude air bubbles. Submerge stopped bottles in fresh water to remove any trace of caustic chemicals, and mix by inverting the bottle a few times. (The entire sample should be cloudy after the addition of these reagents.)

6. Allow precipitate to settle to approximately half of the bottle volume. (This will leave approx. 200mL of clear supernate above the manganous hydroxide floc.)

7. Carefully remove stopper and add 2 ml of sulfuric acid (H_2SO_4) to the sample above the surface by allowing the acid to run down the neck of the bottle. (This should cause the sample to turn a gold/yellow to rust/red color; depending on dissolved oxygen content).

8. Carefully restopper and submerge bottles in fresh water to remove any trace of caustic chemicals from the outside the bottle and mix by inverting the bottle several times (15 to 20) until the dissolution is complete.

9. Measure 203 ml of the solution by placing a pre-cut volumetric flask into the glass BOD bottle and inverting. (This allows the solution to empty from the glass BOD bottle to the 203 ml volumetric flask.) Discard the excess solution.

10. Pour the sample from the volumetric flask into a 500 ml Erlenmeyer flask. Begin titration by using the digital burette to slowly dispense the 0.025M Sodium Thiosulfate solution (keep covered with aluminum foil and refrigerate or place in cooler on ice at end of each day).

11. To use the burette make sure the cap is off the dispenser tube and the red control valve is opened. To fill the dispenser place the right control switch in the fill position and turn the knob clockwise. While loading the dispenser, make sure you do not have a large air bubble trapped at the top of your barrel syringe. If you do, simply empty the barrel syringe to the storage bottle and reload. (Air is compressible and can affect your readings)

12. After loading, place the right control switch in the "Titr." Position and turn the knob counterclockwise to dispense Sodium Thiosulfate. Reload dispenser as necessary.

13. Titrate to a pale straw color while gently swirling the sample. Add about 2.0 ml. of starch solution to the sample. This should cause the sample to turn a deep blue/purple color. Continue titration to the first disappearance of the blue/purple color.

14. When the endpoint has been reached, record the amount of thiosulfate titrated on the data sheet. The amount of thiosulfate titrated is equal to the amount of oxygen dissolved in the water in mg/l.

QUALITY ASSURANCE / QUALITY CONTROL

Duplicate samples are taken for each depth at one station every 6 stations (approximately 18 samples counting surface, mid, and -bottom samples). The station will be given a separate lab number and labeled duplicate. The results are compared and if the variation is greater than 0.2 mg/l the reagents are examined for stability.

Expiration dates of all reagents used will be checked and replaced prior to expiration. Sodium Thiosulfate will be stored in the dark, on ice or in a refrigerator at the end of the day.

7.2.5 Secchi Depth

The Secchi disk is used to give a measurement of the transparency of the water column, also called the Secchi depth. This measurement is made at every station and is recorded on the data sheet. A 20-cm black and white Secchi disk is held by a non-stretch/non-shrinking line or chain that is marked in 0.5 meter intervals. To determine the Secchi

depth:

1. Slowly lower the Secchi disk on the shady side of the boat until it is no longer visible and note the depth using the markings on the line (interpolate between markings to the nearest 0.25 meter). If the disk hits the bottom, meaning the Secchi depth is greater than the water depth, note this on the datasheet.

2. Slowly raise the Secchi disk until it just becomes visible and note the depth.

3. Perform steps 1 and 2 three times, noting both readings. Record all of the readings on the data sheet. Once the replicate readings have been recorded calculate the mean of the replicate readings.

QUALITY CONTROL FOR SECCHI DISK

1. If the range of measurements for the three sets of depth readings is greater than 0.5 m, the entire process should be performed again.

2. No sunglasses or any other devices should be used to shade the eyes while this procedure is being performed.

3. The Secchi depth should be determined from the shady side of the boat during daylight hours.

7.2.6 Zooplankton Collection

A 200-ml sample of water will be collected from the surface Niskin bottle at each station and fixed with 4-ml Lugol's solution and archived at room temperature to allow for eventual quantification of microzooplankton if the data user (HydroQual) determines that this parameter is necessary. An addendum to this QAPP will be prepared if this determination is made.

Larger zooplankton will be sampled in surface waters between stations by performing 10-minute oblique tow within 10 meters (depth at which we expect to find majority of zooplankton in coastal waters at this time of year) of the surface using a 0.5-m diameter, 153-micron mesh plankton net. One zooplankton tow will be performed for each sampling station. The sample tow will begin within a half mile of the station coordinates and will be performed in the following manner.

1. Net is rigged with a downrigger weight (weight to be determined in field) at bottom of mouth ring and flow meter at top of ring.

2. Flow meter start reading is entered onto the zooplankton data sheet.

3. The start position is entered onto the zooplankton data sheet and the net is lowered to depth of 10 meters, while vessel is underway at speed around 1 knot.

The net is paid out at rate of 10 meters per minute. The 10-meter depth is determined by triangulation using length and angle measurements of the towing line at the A-frame block as it pays out.

a. CLEAN WATERS. The 10-meter depth is achieved by paying out 20 meters (20 revolutions of the cable drum) after the ring of the net is at the surface and fully submerged (this is referred to below as line out from surface).

b. BIGLANE. The pay out procedure will be determined.

4. Once at depth, the net is towed for 10 minutes in a generally circular path decreasing line out from surface by 1/10 each minute (e.g., 2 revolutions per minute on the CLEAN WATERS) until the net ring is at the surface.

5. Upon retrieval, the end flow meter reading is recorded on the data sheet.

6. The net is washed into cod end using a raw water wash down hose, sprayed from the outside of the net. Any spraying inside the net should be minimized. Side of plankton net can be used to strain excess water from sample by placing it across mouth or using to sieve sample when working into cod end.

7. When all plankton appears to be washed from the net into the cod end, the cod end is unscrewed from the net and the sample is transferred into a pre-labeled 32-oz jar. This process is performed over a clean empty 5-gallon pail to catch any sample mass that is spilled. After pouring the bucket contents into the sample jar, the inside of the cod end is flushed with sea water (squirt bottle) to remove all visible material from the screen and wall. Any spilled plankton material caught in the 5-gallon pail is then flushed into the sample container using seawater. Samples dominated by gelatinous zooplankton will be discarded and note made on sampling log.

The sample will be placed on ice in a cooler and shipped to Region 2 or USACE laboratory for sample splitting and filter preparation described below.

1. Sample Splitting - The zooplankton sample is to be split down to a volume with a biomass that can be processed representatively by filtration. That processing volume will be determined subjectively by estimating the volume that will filter completely and provide a substantial and even cover on the filter. The sample splitting will be done using a 1.5-L Folsom plankton splitter as described below.

- A measured volume of plankton sample is placed into the undivided section of the drum and the volume is recorded.
- The drum is rotated 120° to divide the stirred sample with a separating blade.
- Once separated, the contents are drained into the sample holding trays.

One of one tray may be returned to the drum for further subdividing. Water may be added as needed.

- The process is repeated until the desired filterable concentration is achieved.
- The number of splits to attain the filterable subsample is recorded.

2. Filter preparation – This subsample is filtered to attain a bulk zooplankton mass as described below.

    - The subsample will be vacuum filtered through a pre-combusted (2 hours, 450^{o}C), pre-weighed 2.6-micron Whatman GF/D glass fiber filter.
    - The sample and filter will be dried in an oven to constant weight (minimum 24 hrs, 60 ^{o}C) and reweighed to obtain dry weight biomass per subsample unit.
    - The filter will then be folded, wrapped in aluminum foil, and placed into a freezer pending analysis. After completion of the year's sampling, all samples will be shipped to Office of Research and Development Atlantic Ecology Division (Narragansett, RI) for carbon analysis in a Perkin-Elmer (Model 2400) CHN analyzer to obtain the fraction carbon of the dry weight biomass.

Flow meter measurements will be used to calculate the volume of water from which the zooplankton biomass was collected. For each station an estimate of carbon dry weight biomass per unit of sea water will be calculated from the above measurements.

7.3 Field Quality Control

For those analyses and information conducted in the field, the quality control checks are specified in Table 7.

Table 7. Field QC

Field Measurement/ Method	Field QC	Frequency/Number	QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)
CTD Profiling	Replicate (Downcast and Upcast) Winkler, Refractometer, and Thermometer	Each station Daily Twice per season	Qualitative- visual comparability	Investigate and flag outliers	Precision
Dissolved Oxygen Winkler Titration	Replicate	One station per day	0.2 mg/l (EMAP uses 0.5)	Investigate and flag outliers	Precision
Secchi Depth	Replicate	3 reps. are completed at each station	$\leq$ 0.5 meters	Repeat measurement	Precision

8.0 ANALYTICAL REQUIREMENTS

This section provides the analytical requirements for this project. The parameters, analytical laboratory SOP and reporting limits for the analyses are specified in Table 8.

8.1 Analytical Methods

Table 8. Analytical Requirements

Parameter	Matrix	Method/SOP	Region 2 Reporting Limit	RLM* Guidance	Units	Holding Time**
AMMONIA	Aqueous	C-80	0.05	0.001	mg/L	28days
Nitrate + Nitrite	Aqueous	C-79	0.01	0.001	mg/L	28days
Nitrogen - Total	Aqueous	In-Line Digestion/FIA for Total Nitrogen via the Lachat IC/FIA Instrument	0.01	0.001	mg/L	28days
Orthophosphate	Aqueous	C-68	0.01	0.001	mg/L	48 hours
Phosphorus, Total	Aqueous	C-68	0.05	0.001	mg/L	28days
Particulate Organic Carbon (POC)	Filter	C-83 Rev 1.0 and C-88 Rev. 2	0.01	0.001	mg/L	Filtered within 24 hrs
Dissolved Organic Carbon (DOC)* **	Aqueous	C-83	1.0	0.1	mg/L	28days
Particulate Silica	Aqueous	C-109	0.15 (assumes 1L is filtered)	0.01	mg/L	Filtered within 24 hrs
Dissolved Silica	Aqueous	C-109	0.15	0.01	mg/L	6 Months

*RLM Suggestions were provided by HydroQual to use as a guide for this study. The RLM represents one order of magnitude lower than the lowest measured concentration from NY Bight Samples analyzed in 1994/95.

** All samples, except silica, will be held in the laboratory at 4^{o} C.

*** May choose to analyze for TOC and subtract the POC for the dissolved component; TOC is preserved with sulfuric acid as well

8.2 Analytical Quality Control

Laboratories will follow specific QC checks specified in the methods and SOPs for each analysis. These may include reagent blanks, matrix spikes, calibration standards (initial and continuing), etc. If quality control limits are exceeded during laboratory analysis, corrective action will be determined by the analyst and the laboratory quality assurance manager. Tables 9 through 13 specify Laboratory QC that will be performed and evaluated for this project.

Any QA problems encountered will be evaluated by the EPA laboratory; the laboratory QA manager will directly evaluate these issues if they arise.

Table 9. Ammonia, Nitrate+Nitrite, Total Nitrogen, Total Phosphorous, Orthophosphate

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)
Spike Sample	1 per $\leq$ 20 samples	80 – 120 % Recovery 20% RPD	Flag outliers	Accuracy
Analytical Quality Control Samples (AQC)	2 $\leq$ 20 samples	Control limits established by outside vendor* 20% RPD	Flag outliers	Accuracy Precision
ICV/CCV	Once every 10 samples and end of run	90-110% Recovery	Suspend analysis, reanalyze	Accuracy
ICB/CCB	Once every 10 samples and end of run	No result $\pm$ RL	Suspend analysis, reanalyze	Accuracy

*QC samples or other certified materials from an outside vendor are used, if available. Control limits for the AQC samples are documented and supplied by the vendor.

Table 10. Dissolved Organic Carbon

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)
Spike Sample	1 per $\leq$ 20 samples	80 – 120 % Recovery 20% RPD	Flag outliers	Accuracy
Analytical Quality Control Samples (AQC)	2 $\leq$ 20 samples	Control limits established by outside vendor* 20% RPD	Flag outliers	Accuracy Precision
ICV/CCV	Once every 10 samples and end of run	85-115% Recovery	Suspend analysis, reanalyze	Accuracy
ICB/CCB	Once every 10 samples and end of run	No result $\pm$ RL	Suspend analysis, reanalyze	Accuracy

* QC samples or other certified materials from an outside vendor are used, if available. Control limits for the AQC samples are documented and supplied by the vendor.

Table 11. Particulate Organic Carbon

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)
Sample Duplicate	All samples	50% RPD	Flag outliers	Precision
Analytical Quality Control Samples (AQC)	2 ≤ 20 samples	Control limits established by outside vendor* 20% RPD	Flag outliers	Accuracy Precision
ICV/CCV	Once every 10 samples and end of run	85-115% Recovery	Suspend analysis, reanalyze	Accuracy
ICB/CCB	Once every 10 samples and end of run	No result ± RL	Suspend analysis, reanalyze	Accuracy

* QC samples or other certified materials from an outside vendor are used, if available. Control limits for the AQC samples are documented and supplied by the vendor.

Table 12. Dissolved Silica

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)
Spike Sample	1 per ≤ 20 samples	80 – 120 % Recovery 20% RPD	Flag outliers	Accuracy
Analytical Quality Control Samples (AQC)	2 ≤ 20 samples	Control limits established by outside vendor* 20% RPD	Flag outliers	Accuracy Precision
ICV/CCV	Once every 10 samples and end of run	90-110% Recovery	Suspend analysis, reanalyze	Accuracy
ICB/CCB	Once every 10 samples and end of run	No result ± RL	Suspend analysis, reanalyze	Accuracy

* QC samples or other certified materials from an outside vendor are used, if available. Control limits for the AQC samples are documented and supplied by the vendor.

Table 13. Particulate Silica

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)
Sample Duplicate	All samples	25% RPD	Flag outliers	Precision
Analytical Quality Control Samples (AQC)	2 ≤ 20 samples	Control limits established by outside vendor* 25% RPD	Flag outliers	Accuracy Precision
ICV/CCV	Once every 10 samples and end of run	90-110% Recovery	Suspend analysis, reanalyze	Accuracy
ICB/CCB	Once every 10 samples and end of run	No result ± RL	Suspend analysis, reanalyze	Accuracy
Spike Sample	1 per ≤ 20 samples	75 – 125 % Recovery 20% RPD	Flag outliers	Accuracy

* QC samples or other certified materials from an outside vendor are used, if available. Control limits for the AQC samples are documented and supplied by the vendor.

9.0 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Each sample number will be identified as it relates to the sample station number where it was collected. Station numbers have been predetermined for the project and are provided in Tables 4 and 5. The associated geographic coordinates are also provided in these tables.

Weather proof sample labels that resist moisture, scuffing, tearing and smudging will be securely affixed to the sample containers and include the sample identification number, date of sample collection, and the preservative used (if any). In the event that sample labels can not be used, the information will be written on the sample container with permanent marker. Sample containers will be prelabeled before arriving to each station. Each sample will be collected into bottles according to the sample preservation requirements and the destination laboratory (splits). Each split sample will be identified by a unique identifier that indicates the station number, the depth from which the sample was collected, the month and year, and the split identifier. Colored dots will be placed on each sample bottle corresponding to surface, mid, and bottom.

Packaging, shipping, and chain-of-custody procedures will follow requirements in the DESA Standard Operating Procedures for Field Activities (SOP4FA) except where SCRIBE is utilized. Samples will be tracked aboard the research vessels by entering all information into SCRIBE. The entries will be verified by a second crew member. Chain-of-Custody forms will generated at the end of each sampling day using SCRIBE version 3.7. Due to the nature of this survey (i.e. ambient monitoring/non-enforcement), custody seals will not be utilized.

The Chain of Custody Forms will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for and a copy of the record will be kept in the project files and by the laboratory conducting the analyses. The chain-of-custody records will include, at a minimum, sample identification number, number of samples collected, sample collection date and time, sample type, sample matrix, sample container type, sample analysis requested, sample preservation, and the name(s) and signature(s) of samplers and all individuals who have maintained custody.

Once samples have been collected into the appropriate containers, samples will be sealed in clear plastic bags, then a cooler on board the vessel and packaged for transport to the laboratory. Prior to transport, samples will be packaged into a waterproof High Density Polyethylene (HDPE) cooler. Bags of wet ice will be inserted between samples to cushion the samples during the shipment and maintain a proper storage temperature of 4∀2EC. Chain of custody will be taped on the underside of the cooler lid inside a plastic bag. The cooler will then be sealed with strapping tape. The sample cooler will be transported directly to the EPA Region 2 Laboratory located in Edison, NJ via transportation by EPA personnel.

Samples for particulate silica and POC will either be filtered at EPA's Edison Laboratory

as soon as possible after field activities have concluded.

The BIGLANE will deliver samples on Tuesday and Wednesday of each week to the U.S. Coast Guard base in Manasquan, NJ for pickup by EPA personnel and transportation to EPA's Edison laboratory. This will save time by allowing the BIGLANE to work later on the southern samples and still have samples delivered to meet filtering holding times.

When the samples reach EPA Region 2's Laboratory Branch, EPA laboratory personnel will assume custody of samples to be analyzed there. The samples will be placed in a 4EC walk-in refrigerator. Samples to be archived for future reanalysis will be maintained at the EPA Region 2, Edison, New Jersey laboratory.

10.0 TESTING, INSPECTION, MAINTENANCE AND CALIBRATION REQUIREMENTS

10.1 Field Instruments

Conductivity, Temperature and Depth Recorder (CTD)

When using the Sea-Bird CTDs, procedures outlined in "Instructions for Field Use of the Sea-bird SBE 25 CTD (Version #015, 07/16/07)" and in the User's Manual will be followed.

Sea-Bird sensors are calibrated by subjecting them to known physical conditions and measuring the sensor responses. Coefficients are then computed, which may be used with appropriate algorithms to obtain engineering units. The conductivity, temperature, and pressure sensors on the SBE 25 are supplied fully calibrated, with coefficients printed on their respective Calibration Certificates (see back of manual) and stored in the instrument configuration (.con) file. Sea-Bird recommends that the SBE 25 be returned to Sea-Bird for calibration.

Each year, the CTDs (EPA Region 2 owns two CTDS) used for this survey will be shipped to the manufacturer for a comprehensive maintenance check and for calibration before it is scheduled for field deployment. The dates and results of these calibrations will be included along with data in final reports , etc…

Visual inspection of all CTD sensors will be performed prior at the beginning and end of each sample day. Data will be continuously monitored during collection for spurious results to identify potential equipment malfunctions. If there are signs of obvious malfunction, cables and terminations and lines will be checked to ensure that there are no damaged cables/terminations, loose connections, or blocked lines. Survey scientists will note any problems and their resolution in the field data forms or notebook and data must be flagged as necessary. The situation will be reported to the Chief Scientist, who will make the decision on repeating the water column profile with a properly functioning instrument.

The following on-board maintenance procedures will be followed at the conclusion of operations each survey day:

-ensure the CTD switch is in the "OFF" position.
-flush the conductivity cell with soapy water.
-attach tygon tube to conductivity cell and fill with DI H_2O.
-rinse with fresh water to clean off any salt that may have accumulated on the probes

At a minimum of once per season and at the conclusion of the year's monitoring, CTD sensor performance will be evaluated while at dock by deploying the instrument to a known depth (determined by measuring cable out) and: 1) comparing the instrument's depth reading and 2) collecting water samples from that depth and comparing salinity and temperature of the water sample measured with a hand held refractometer and thermometer to readings obtained with the instrument. A Winkler titration will also be performed on the water sample and compared to the DO reading.

The measurement quality objectives (MQOs) for accuracy of the CTD units, based on comparison of the unit's performance against the refractometer, thermometer and Winkler determined values, are:

Dissolved oxygen ± 0.2 mg/L
Salinity ± 1.0 ppt
Temperature ± 1.0^{o}C

The MQO for depth of ± 0.5 m (~ 2 ft) will compared by attaching a line with 1 foot increments to the CTD and deploying to a measured depth.

Conductivity??

If the values do not agree within these tolerances, the Chief Scientist shall determine whether the unit shall immediately be sent to the manufacturer for re-calibration and determination of corrections that might be applied. If that is necessary, another CTD will be rented to fill the void.

10.2 Laboratory Instruments

All laboratory equipment will be tested, calibrated, and maintained in accordance with existing Region 2 Laboratory SOPs, the laboratory QAPP and the manufacturer recommendations and instructions.

10.3 Inspection/Acceptance Requirements for Supplies and Consumables

All containers used for sample storage will be precleaned and certified. Certificates of cleanliness will be retained in project files.

Preservatives and reagents purchased from an outside source will be checked to ensure that the containers were properly sealed and the contents were not compromised. The expiration data for all preservatives and reagents will be checked prior to the start of the project. Any expired preservatives or reagent will be properly disposed at the Region 2 laboratory.

BOD bottles, Erlenmeyer flasks, and volumetric flasks and all other glassware or plasticware used for field analyses will be inspected for defects prior to mobilizing into the field. Any defective bottles or flasks will not be used.

11.0 DATA MANAGEMENT

All project data and information will be documented in a format that is usable by data users. This section of the QAPP describes how project data and information will be documented, tracked and managed from their generation in the field to final use and storage in a manner that ensures data integrity and defensibility.

11.1 Written Documentation and Field Notes

All field and sample documents will be legibly written in indelible ink. Any corrections or revisions will be made by lining through the original entry and initialing the change All field documentation and reports will be maintained by the program office DEPP DSOT. The following field measurement and sample documentation will be maintained.

- The survey field notebook is a descriptive notebook detailing the vessel survey activities and observations so that an accurate, factual account of field tasks performed may be reconstructed. The Chief Scientist or the individual acting for the Chief Scientist is required to maintain the field notebook. All entries will be signed by the individuals making them.

- Field data sheets are used to identify field measurements, sample collection, and document field sampling conditions and activities. The field data sheets will be completed at the time of the field measurement and/or sample collection. At a minimum, field data sheets will contain sample particulars including sample location, sample ID number, collection date and time, location, descriptions, methods used, daily weather conditions, field measurements, name of sampler(s), sample preservation, names of contractor/subcontractor personnel, and other site-specific observations including any deviations from protocol. See Attachment 3.

All field documentation, analytical data packages and reports, any survey reports of the results and the project files will be maintained by the program office DEPP DSOT.

11.2 CTD Data

The CTD data will be recorded electronically onto a vessel-dedicated computer. Data

will be immediately downloaded onto an external drive following conclusion of each day's monitoring. Data will be batch post-processed in the office using routines in the SEASOFT software package (including BINEDIT, LOOPEDIT and other filters) The data will then be saved as an Excel spreadsheet, with variables arranged in columns alongside the co-measured pressure (depth) and provided to the Chief Scientist. The data will be entered into a centralized data management system in managed by the DSOT. The raw data will be retained on the external drive as a backup. Only after data has been successfully transferred to an office computer and post-processed will the raw CTD data be deleted from the vessel-dedicated computer. The Chief scientist will examine the dissolved oxygen data at each depth to identify critical values (i.e., those below 3.0 ml/l) and these will be reported to appropriate state for use as appropriate. Electronic data will be transferred from the CLEAN WATERS and BIGLANE to Douglas Pabst (DEPP-DSOT) at the end of each monthly sampling event for processing and storage.

11.3 SCRIBE

EPA will manage the collection of samples using SCRIBE version 3.7. SCRIBE is a software tool developed by EPA's Environmental Response Team (ERT) to assist in the process of managing environmental data. SCRIBE will be used in this project to manage the sample collection activities as well as the analytical results of the samples upon completion of the analysis. An information sheet on SCRIBE is provided in Appendix B. The software will be utilized according to the SCRIBE User Manual Parts 1, 2, and 3.

11.4 Laboratory Data

Laboratory analytical data will be managed in accordance with methods described in the all the various SOPs. Analytical data that will be manually or electronically read from the instrument display will be recorded in laboratory notebooks in indelible black ink or stored in electronic files and hard copies made. Corrections to hand-entered data will follow the procedures listed above for field data. Analytical data results in laboratory notebooks will be manually entered into a PC-based spreadsheet. All transcriptions will be verified in the laboratory. Data will be delivered from the laboratory in both hard copy and electronic spreadsheet (.csv) formats. Diskette copies of the final results will be stored with the laboratory notebooks and project files.

12.0 ASSESSMENTS/OVERSIGHT

Formal field audits by QA personnel are not anticipated for this project. Identification of problems related to technical performance will be the responsibility of the technical staff working on this project which includes EPA Region 2 support scientists from various divisions.

Any changes to the procedures described in this QAPP or the attached documents, and/or any corrective actions will be documented and approved by the Chief Scientist, and appended to the file copy of the QAPP as a permanent record. Any significant changes

or corrective actions will also be noted in the final report. Corrective actions may be necessary when the monitoring/sampling network design is changed based upon the field conditions at the time of the survey. In such an instance, the sampling team will notify the Chief Scientist of any suspected technical or QA/QC deficiencies and note them on the field data sheets and in the field survey logbook. The Chief Scientist will be responsible for assessing the suspected deficiency and determining the impact on the quality of the data. Development of the appropriate corrective action will be the responsibility of the Chief Scientist in collaboration with the field sampling team.

13.0 DATA REVIEW, VERIFICATION, VALIDATION AND USABILITY

13.1 Data Review, Verification and Validation

Field Data

Data generated as part of the field measurement data collection activities will be reviewed for errors in transcription, calculation, completeness, and technical reasonableness. One hundred percent of the data manually input into SCRIBE or an alternate data management tool such as an Excel spreadsheet will be verified. This includes reviewing field data sheets and comparing the information on the field data sheet to the information input into SCRIBE or the Excel spreadsheet. This verification will be performed by project staff at the end of each sampling event or during the next business day by EPA Region 2 personnel in the office.

COC documentation will be reviewed for completeness and entry errors at the end of each day of sampling prior to transporting samples to the laboratory.

CTD DO measurements will be verified by Winkler Titrations conducted on board the vessels for immediate comparison. Any readings not within the acceptable range will be investigated to determine if it is a reagent problem or sample processing problem.

Laboratory Analytical Data

Data generated by the EPA Region 2 laboratory will be reviewed, verified and validated internally by the laboratory QA officer or designated representative not involved with the generation of the data. The laboratory will review all data for transcription errors and evaluate internal laboratory quality control data associated with project results in order to validate the results prior to submittal to the Project Manager. Data generated, including Laboratory QC samples, by the EPA Region 2 Laboratory will be verified internally by the Laboratory as specified in the Laboratory SOPs.

Validation of EPA Region 2 Laboratory generated data is performed by the laboratory QA officer or a second analyst not associated with the actual measurement operations for the given analytical batch, but knowledgeable in the analytical processes employed. It is the responsibility of the reviewer to ensure that all data generated are correct and of

known and documented quality. Once the review is completed, the reviewer will sign and date the appropriate QA/QC checklist according to the EPA Region 2 Laboratory's SOP. Any limitations on the use of data, as indicated by data qualifiers added during the validation process will be included in the final report for the project.

Data will be reviewed in accordance with this QAPP to determine usability. All QA acceptable (including flagged data) will be given to the modeler for use as they deem appropriate. Additional sampling may be necessary to collect additional data to verify the model as determined by the modeler.

13.2 Reconciliation with User Requirements

There are three main objectives for this monitoring program. Each objective and the reconciliation for that specific objective are provided below.

- Objective 1 – provide data on eutrophication-related water quality parameters at stations throughout the New York Bight Apex during the summer months (June to September) to support SWEM validation and recalibration (if necessary);

- Objective 3 - provide data on eutrophication-related water quality parameters at stations along the seaward boundary of the New York Bight during late summer months (August-September) to allow boundary conditions to be better defined in SWEM

All data (raw and final) generated for Objectives 1 and 3 will be evaluated and reconciled by EPA's contractor HydroQual, Inc. for use in the SWEM. Each monthly data set will be provided, regardless of completeness, to the modeler for their determination on usability for verification/validation purposes. The samples collected and the parameters analyzed for Objectives 1 and 3 were determined by HydroQual, Inc. in consultation with EPA Region 2 survey staff and the HEP program manager for use in the SWEM.

- Objective 2 – monitor New York Bight Apex for low dissolved oxygen bottom conditions (or conditions that are conducive to developing low dissolved oxygen conditions) to allow early notification of stakeholders

Data generated for Objective 2 will be evaluated and reconciled by the project manager and Chief Scientists from the Dredging Sediments and Ocean Team. Data will be reviewed in accordance with this QAPP to determine usability. All field generated data will be reviewed and evaluated to the DQIs specified in Section 7.0 of this QAPP and for any potential impacts to the data quality (e.g., instrument sensor failures, titration errors, anomalous meter readings). Once the data are determined to be usable, the data will be reported to the HEP program manager for distribution to the stakeholders and HydroQual.

All electronic data, field notes, laboratory analyses, etc… will be stored on a portable

hard disk which will be maintained by the EPA Region 2 DSOT. Data (including metadata) will be input into the Water Quality Exchange (WQX) and STORET as appropriate.

14.0 REPORTING, DOCUMENTS AND RECORDS

New York Bight Monitoring Workgroup: EPA has convened a New York Bight Monitoring Workgroup (Workgroup) comprised of Non Governmental Organizations (Clean Ocean Action, American Littoral Society, and Monmouth University) and EPA Region 2 representatives. The group is co-chaired by Douglas Pabst (DEPP) and John Kushwara (DEPP). The Workgroup meets monthly and/or has conference calls. The Workgroup is focused on the EPA New York Bight Monitoring Program, but also will track other issues related to the New York Bight. All attempts will be made to find out where these other issues can be best addressed.

Weekly Updates: EPA Region 2 will send out weekly updates from June through September describing the status of the EPA Region 2 New York Bight Monitoring Program.

Monthly Summary Reports: At completion of each monthly sampling event, an email will be prepared by DSOT and sent to the New York/New Jersey Harbor Estuary Program (HEP) coordinator for distribution to harbor stakeholders. This report will consist of an email that provides a basic summary of monitoring activities completed during the survey (e.g., dates of survey, number of stations occupied, parameters measured and samples collected), the post-processed CTD profile data in tabular and/or graphical formats, the Winkler-determined dissolved oxygen data in tabular format, and pertinent observations and considerations (e.g., meteorological conditions, stratification, ranges of observations, geographic distributions of conditions). Dissolved oxygen conditions in the study area will be emphasized. In particular, DO concentrations below EPA Ambient Aquatic Life (Saltwater) Water Quality Criterion for Dissolved Oxygen (i.e., 3.0 mg/l) will be identified and highlighted. Data will be reviewed in accordance with this QAPP to determine usability and flagged as appropriate.

Monthly SWEM Data Reports: Upon receipt of the quality assurance reviewed data package from the Region 2 laboratory, the analytical data of the water samples for each station and depth sampled in a given month will be assembled into an Excel spreadsheet. This spreadsheet will be relayed to the HEP coordinator along with the CTD data files for that month for distribution to EPA's SWEM contractor, HydroQual, Inc.. HydroQual, Inc. will use the data to verify and validate the SWEM and examine the need for recalibration of the SWEM model.

Annual Zooplankton biomass and carbon reports: Upon receipt of the quality assurance reviewed data package from the zooplankton biomass and CHN analyses, the data for each station will be assembled into an Excel spreadsheet. This spreadsheet will be

relayed to the HEP coordinator for distribution to EPA's SWEM contractor, HydroQual. HydroQual will use the data to verify and validate the SWEM and examine the need to revise zooplankton biomass and carbon in the SWEM model.

Yearly Reports: An annual report will be prepared that includes a summary of field work and laboratory results.

Attachments

Field Data Sheet
Sea-Bird Specifications