

**State of the Estuary
Report on the Health of the
New York-New Jersey Harbor Estuary
Quality Assurance Project Plan**

**New York-New Jersey Harbor Estuary Program
December 3, 2009**

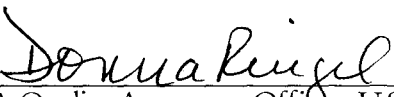
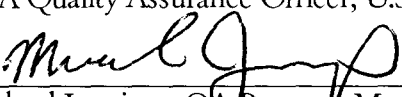
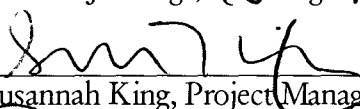
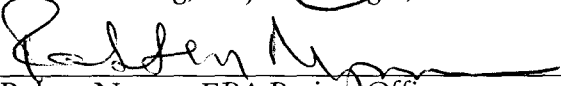
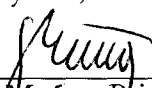
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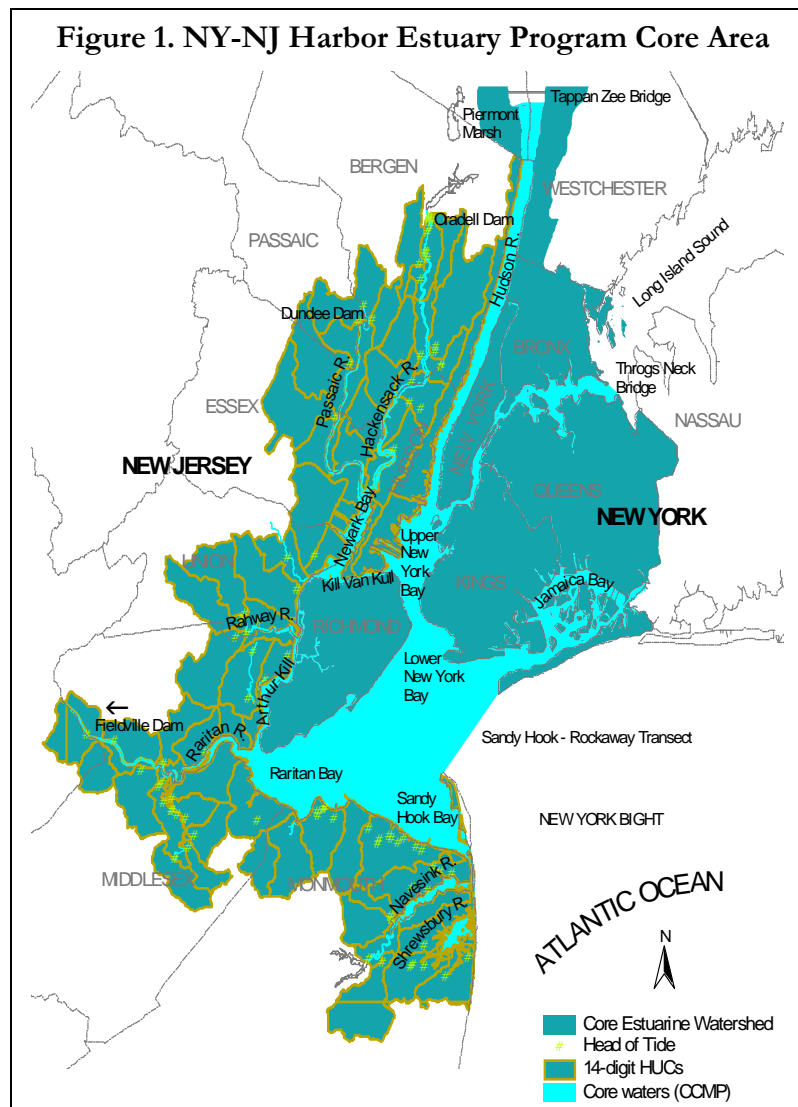
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1. Project Objectives, Organization, and Responsibilities

1.1. Purpose of Study and Background Information

The New York-New Jersey Harbor Estuary Program (HEP), authorized in 1987 by the U.S. Environmental Protection Agency, is one of 28 National Estuary Programs throughout the US. HEP is a multi-year partnership effort to develop and implement a plan to protect, conserve, and restore the NY-NJ harbor estuary (the Estuary). Participants in the program (HEP partners) include representatives from local, state, and federal environmental agencies, scientists, citizens, business interests, environmentalists, and others.



The NY-NJ Harbor Estuary encompasses the waters of the New York-New Jersey Harbor and the tidally influenced portions of all rivers and streams flowing into it. The “core area” of the NY-NJ Harbor Estuary Program extends from Piermont Marsh on the Hudson River to an imaginary line at the mouth of the Harbor connecting Sandy Hook, NJ and Rockaway Point, NY (the Sandy Hook-Rockaway Point Transect). This core area is shown in Figure 1 and includes the bi-state waters of the Hudson River, Upper and Lower Bays, Arthur Kill, Kill Van Kull, and Raritan Bay. In New Jersey, it includes the Hackensack, Passaic, Raritan, Shrewsbury, Navesink, Rahway, and Elizabeth Rivers, as well as Newark and Sandy Hook Bays. In New York, it includes the East, Harlem, and Bronx Rivers, Jamaica and Flushing Bays, and the Long Island Sound up to the Throgs Neck Bridge.

The primary planning document produced by HEP to guide its efforts is the Comprehensive Conservation and Management Plan (CCMP), completed in March of 1996 and signed by the governors of New York and New Jersey the fall of 1997 [NY-NJ Harbor Estuary Program 1996a]. The CCMP outlines a comprehensive strategy to achieve HEP’s goal of establishing and maintaining a healthy and productive ecosystem with full beneficial uses.

The NY-NJ Harbor Estuary Program convened a workshop in 1995 to develop an Environmental Monitoring Plan (EMP), which identifies a set of environmental parameters that can serve as indicators of the success of CCMP implementation. The EMP includes recommendations to periodically measure and report on a number of these environmental indicators to assess whether HEP's goals and objectives are being met.

The State of the Estuary report will report on progress in the environmental health of the Estuary by presenting data on the status and trends in a series of environmental indicators. This report is intended for a general audience that may not be aware of, or initially interested in, environmental issues in the Estuary. Therefore, environmental data (which will be displayed in charts and maps) will be accompanied by background information, discussion of any trends, current and past efforts by HEP and its partners to improve environmental conditions, pictures, resources for more information, and tips on how to get involved.

1.2. Project Objectives

The main objectives of the State of the Estuary report are to:

1. Report on the status and trends in several indicators of the environmental health of the NY-NJ Harbor Estuary
2. Serve as an education and outreach tool by presenting this information to a wide audience to:
 - a. Increase knowledge and appreciation, and foster stewardship, of the shared resources in the NY-NJ Harbor Estuary
 - b. Increase awareness and support of HEP's work
3. Uncover new sources of environmental data

Secondary data will be presented in a report to show whether the health of the Estuary is improving, deteriorating, or showing no trend over time and thus whether HEP's goals are being met.

1.3. Secondary Data Needed

The secondary data needed are environmental data that are measured in the same manner periodically and serve as indicators of the Estuary's ecological health. These data shall cover the main primary causes of ecosystem impairments, on which the Harbor Estuary Program's CCMP focuses: habitat loss and degradation, toxic contamination, floatable debris, pathogen contamination, and nutrient and organic enrichment.

Specific indicators to be presented in the report will be selected among a pool of approximately 40 indicators that were recommended during the 1995 workshop [NY-NJ Harbor Estuary Program 1996b], as well as other indicators used or considered by other National Estuary Programs.¹

¹ In particular, the Long Island Sound Study (LISS) [Long Island Sound Study 2008] and Partnership for the Delaware reports [Partnership for the Delaware Estuary 2008].

Examples of environmental data sets that will be needed include measures of water quality (concentrations of nitrogen and other nutrients, mercury and other toxic contaminants, fecal coliform and other bacteria), extent of various habitats (e.g., acreage of tidal wetlands), and abundance of key species (e.g., striped bass and other fish and crustaceans, great egret and other birds).

The full list of indicators of environmental health that will be considered can be found on CCMP Appendix 5 [NY-NJ Harbor Estuary Program 1996b] (see a series of tables on pages 11–56). The first State of the Estuary report for the NY-NJ Harbor Estuary Program was published in 2004 and was titled *Health of the Harbor* [Steinberg et al. 2004]. It included 23 indicators and will serve as a model for the present edition. However, this second version will be targeted to the general public and will thus be shorter, written in a simpler language, and will only present a handful of indicators.

Because environmental data tend to fluctuate widely, it is often the case that trends can only be detected upon evaluating long enough time series. Thus, new data that have been added to existing datasets since the publication of our previous *Health of the Harbor* report should not be presented and assessed in isolation, but within the context of all available historical data. Therefore, this edition of the *State of the Estuary* will present a new overall trends report that will include (for all indicators covered) data already presented in the 2004 report in addition to newly available data. However, if a more complete or otherwise superior dataset is uncovered, it will be preferred. This may result in (presumably slightly) different results than those presented in the 2004 edition. Even if the same dataset is used, the inclusion of new data may change the conclusions drawn previously (e.g., a formerly inconclusive trend could now be clearly defined). Regardless of the dataset used, all trends will be explained and compared to our previous findings. In particular, any changes resulting from the inclusion of a different dataset will be noted in the report.

The focus of the report will be on data collected within the NY-NJ Harbor Estuary core area (see Figure 1 and description in Section 1.1). Broad spatial coverage within this area would be preferred as it would allow a more representative depiction of conditions, but even data from a few or a single location would be useful, as long as data are collected at the same site and in a consistent manner.

In order to show temporal trends of the various indicators, datasets should ideally include recent measures (a few years old at most), go back in time for as long as available, and be relatively frequent (see Section 3.1 Quality Requirements).

Data of the best quality available will be preferred. However, data with deficiencies or gaps will not necessarily be excluded: these data could still be valuable to illustrate the state of knowledge and uncertainties in Estuary conditions, and make the case for better or additional monitoring programs.

1.4. Planned Approach

Assessing trends in various environmental indicators is the only project objective that involves data analysis. The goal is to determine whether the value of a given environmental parameter (e.g., dissolved oxygen, DDT in mussel tissue) has increased, decreased, remained the same over time, or showing no consistent trend.

In most cases, the data that will be used in this project have been collected for similar purposes as ours, and studied in detail and assessed for trends by the data generator and/or other scientists and experts involved in the subject (e.g., data on abundance of various fish species collected by NYSDEC has been examined at length by this agency and other parties). This project will rely on these available results and conclusions whenever possible.

For indicators where such previous analysis is not readily available, we will consult with scientists and other knowledgeable individuals (including those in our review team) as needed, to determine if there is a consensus position within the scientific community about trends. If there is no generally agreed interpretation of the data, we will work with these and other individuals to determine whether any trends are apparent. This process may require visual inspection of the time series and possibly trend tests (e.g., regression analysis, and Mann-Kendall-based tests, provided that sufficient data are available to apply such statistical tools). It is anticipated that for some indicators, a trend may be apparent, but data will not be sufficient to conclusively establish a trend. In those cases, the apparent trend may be mentioned, but the uncertainties and need for additional data will be noted. It is also expected that in some cases determining whether the data show a trend, or are otherwise “telling a story” may not be straightforward and may require a careful analysis of different datasets and professional judgment (e.g., interpreting data on abundance of a given anadromous fish species most likely requires considering fish counts at various sites within and outside the Estuary, as well as the effects of diseases, populations of predatory fish, food availability, and other factors). We will rely for these interpretations on scientists and experts that have been studying these issues at length.

In all cases, the report will be subject to a review process (described in Section 1.5) to ensure that the contents are scientifically sound and reflect the most current views within the scientific community.

1.5. Project Organization and Responsibilities

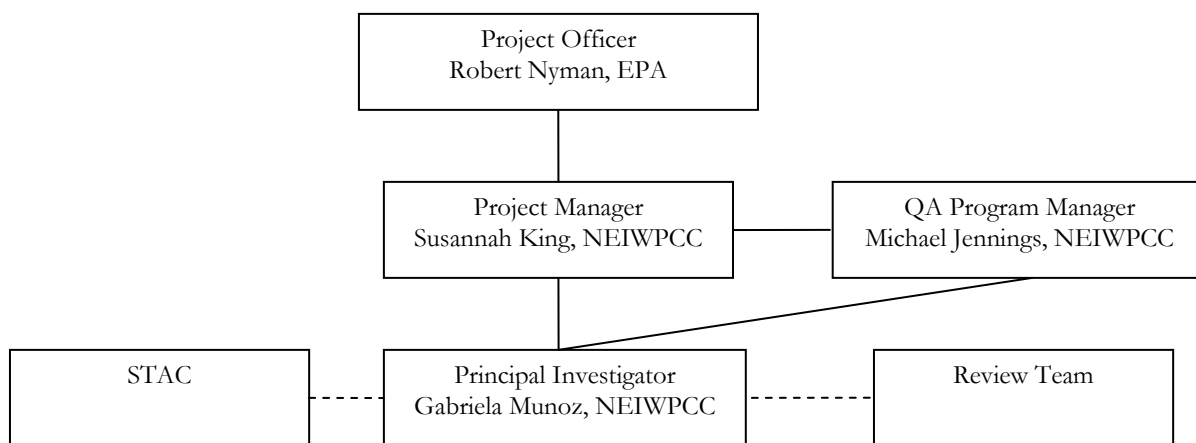
The Principal Investigator (HEP Program Associate) is responsible for carrying out nearly every aspect of this project, including data gathering and analyses, quality assurance, writing most of the report and reviewing and editing sections that are provided by contributors. The Principal Investigator will solicit guidance from a variety of scientists and experts to ensure the accuracy of the final report. More details are provided in the following list of project participants and their responsibilities.

- **Project Manager:** Susannah King, Environmental Analyst, NEIWPCC
 - Responsible for overseeing implementation of the project work plan, reviewing drafts of the report, approving final report prior to printing, managing the project budget, issuing contracts and agreements for any needed professional services, and processing invoices.
- **Principal Investigator:** Gabriela Munoz, Program Associate, NEIWPCC, NY-NJ Harbor Estuary Program
 - Responsible for implementing the project work plan with assistance from the Science and Technical Advisory Committee (STAC), other HEP partners, data providers, and team of reviewers. Specific responsibilities include:
 - Collecting existing environmental data for NY-NJ Harbor Estuary Program indicators, including collecting and compiling data in Excel spread sheets, assuring

secondary data quality, performing data analyses where necessary and appropriate, creating maps and charts, providing the data, maps and charts to the graphic designer, and working with the web developer to prepare a version of the report for the web site

- Reporting, writing, substantive editing and copy editing, assigning articles, managing the review process, obtaining photographs and images, providing ideas to the graphic designer for layout and design, and managing outside contractors, including a graphic designer, printer, and possibly illustrator and photographer
- **Project Officer:** Robert M. Nyman, Director, New York-New Jersey Harbor Estuary Program, U.S. Environmental Protection Agency Region 2
 - Responsible for reviewing drafts of the report and approving the final report prior to printing
- **Science & Technical Advisory Committee:** Dennis Suszkowski, Science Director, Hudson River Foundation and Judith Weis, Professor, Biological Sciences, Rutgers University
 - Responsible for providing general guidance and advice on all scientific and technical aspects of the report, including: selecting an adequate set of indicators for the report, reviewing this Quality Assurance Project Plan and providing guidance as needed in its implementation, suggesting possible sources of data, reviewing the report, and suggesting individuals for the review team
- **Review Team:** A team of reviewers will be assembled and subsets of the team will be asked to review different sections of the report according to their expertise. The team may include scientists conducting research in and around the NY-NJ Harbor Estuary, scientists within the organizations providing the environmental data, STAC members, NY-NJ Harbor Estuary Program staff and partners, and other knowledgeable individuals. A list of review team members will be available and kept as part of the project files once the individuals have been identified and agreed to participate in the process.
 - Responsible for ensuring the scientific soundness of the report, including adequate data interpretation and accurate background information

Figure 2. Organizational Chart. Connecting lines represent the proper lines of communication between individuals. Dotted lines represent general guidance and feedback



1.6. Project Schedule

The tentative schedule for the project is provided in the following table.

	Task	Start Date	End Date
<u>QAPP</u>	QAPP preparation	20-Sep-09	4-Dec-09
	Select/hire layout artist	9-Oct-09	30-Nov-09
<u>Contractors</u>	Select/hire illustrator?	9-Oct-09	30-Nov-09
	Select/hire printer	9-Oct-09	30-Nov-09
	Gather data/select reviewers	13-Oct-09	18-Dec-09
	QA/Define contents	11-Jan-10	10-Feb-10
<u>Report contents:</u>	Compile/arrange/present data	10-Feb-10	11-Apr-10
	Write sections	10-Feb-10	26-Apr-10
	Conduct review	12-Mar-10	11-May-10
	Obtain pictures	13-Oct-09	18-Dec-09
<u>Report graphics:</u>	Create charts & maps	10-Feb-10	11-Apr-10
<u>Layout:</u>	Work with illustrator?	11-Apr-10	11-May-10
	Select graphic design	11-Jan-10	10-Feb-10
	Produce 1st draft layout	11-May-10	26-May-10
<u>Report Printing</u>	Review 1st draft layout	26-May-10	10-Jun-10
	Produce 2 nd draft layout	10-Jun-10	25-Jun-10
	Review & approve 2nd draft layout	25-Jun-10	10-Jul-10
	Printing	10-Jul-10	30-Jul-10
<u>Report Distribution</u>	Create distribution lists & labels	11-Apr-10	21-Apr-10
	Mail out report	30-Jul-10	4-Aug-10

2. Sources of Secondary Data

2.1. Data Sources

This project will rely entirely on existing data, which will be obtained primarily from agencies, institutions and companies already conducting monitoring programs such as New York City Department of Environmental Protection's New York Harbor Water Quality Survey. Data sources include published reports and, most frequently, databases. Databases can typically be downloaded in their entirety, or queried for specific subsets of data, either by the user (HEP) or by the data generators/managers via a formal or informal data request.

Some of the data sources that have already been identified include National Oceanic and Atmospheric Administration's Mussel Watch Program and National Marine Fisheries Service, U.S. EPA's Regional Environmental Monitoring and Assessment Program (REMAP), NYC Audubon's annual Nesting Survey, NYSDEC's Nearshore fish communities of the mid-Hudson River estuary, NYCDEP's New York Harbor Water Quality Survey, and American Littoral Society's International Coastal Cleanup data, as well as all sources used in the *Health of the Harbor* report [Steinberg et al.

2004]. Additional potential data sources are listed in the Appendix 5 of the CCMP [NY-NJ Harbor Estuary Program 1996b] (see a series of tables on pages 11–56).

This project is exploratory in nature and one of its objectives is precisely to uncover new data sources that may be used to track progress in the environmental health of the Estuary. Therefore, it is possible that additional data sources will be identified during the course of the project, as we interact more closely with scientists and experts. In addition, not all data obtained will necessarily be used, even if of adequate quality. Because of size constraints, the printed report can only include a handful of indicators that will be selected upon obtaining and evaluating the data, based not only on their quality but also on the relevance and expected ability to engage the intended audience. Once data for each of the general sections of the report has been collected, the Principal Investigator will propose a draft outline with specific indicators to be included based on data availability and quality, ease of conveying a clear and relevant message to the public, and indicators included in similar reports that are also targeted to the general public. The draft will be discussed with, and modified according to input provided by, the STAC, EPA Project Officer and other parties as needed. This process will be documented in draft report outlines and STAC meeting minutes that will be kept as part of the project files.

All data sources will be fully referenced, including links to databases, and any documentation of data quality.²

2.2. Data Generators

Data generators are, generally speaking, the agencies, research institutions, and other organizations that collect (or have collected) suitable (in terms of type of data being relevant to HEP's goals, covering an adequate geographic and temporal scale, and being of adequate quality) environmental data.

The Science and Technical Advisory Committee to the NY-NJ Harbor Estuary Program held a workshop in August 1995 to obtain input in developing the Program's Environmental Monitoring Plan. A group of over 100 scientists, managers, and others attended this workshop and identified a suite of approximately 40 indicators that could be used to monitor environmental improvement within HEP's geographic core area of concern, along with regional monitoring programs that could provide appropriate data for each of the indicators.

Specific data generators will be selected from this pool of previously identified possible sources (some of the data generators were listed in Section 2.1. Data Sources). The whole suite of indicators and existing monitoring programs are tabulated in Appendix 5 of the CCMP [NY-NJ Harbor Estuary Program 1996b] (see a series of tables on pages 11–56). In addition, it is possible that data providers, scientists and researchers contacted in the preparation of this report may be able to point to other suitable monitoring programs unbeknownst to us, that we will, in turn, pursue and evaluate for relevance and adequacy.

² The size of the printed report, which is intended to a general audience, will most likely preclude inclusion of a full list of sources. In this case, the report, and any other materials produced will include a link to our website where the full references and any additional required information will be provided.

2.3. Hierarchy of Data Sources

In general, data from ongoing environmental monitoring programs going as far back in time as possible; carried out by trusted agencies, universities, or research institutions; and with known and adequate quality control and quality assurance procedures will be preferred. If these conditions are not met, less desirable data may be gathered if they can provide at least partial indication of the health of the Estuary. Any limitations and gaps in data included in the report will be fully disclosed, and it will be noted that the data should be used with caution. For example, for certain indicators, available data may only cover a limited window in time but still be crucial to complement and put in perspective other available data. Even if data are not of the best quality, they may represent the best-available knowledge of the system and may not only provide a glimpse into current conditions, but also point to the need for improved data collection efforts.

2.4. Rationale for Selecting Data Sources

Given the specificity of this project's data needs (i.e., various types of environmental monitoring data collected from the NY-NJ Harbor Estuary, covering several years), in many cases there may be a single data source available. If more than one data source is available, all will be evaluated and the highest quality, most complete (in terms of spatial and temporal coverage) data source will be used.

2.5. List of Sources of Secondary Data

The sources of all secondary data presented will be identified in any report or other project deliverables. Size constraints may make it impossible to include a full list of sources. In this case, the report, and any other materials produced will provide a link to our website where the full references will be listed, including references to data quality.

3. Quality of Secondary Data

3.1. Quality Requirements

Data should meet the following quality requirements. However, given the paucity of environmental data within our study area for some indicators, it is likely that some datasets will not meet one or more requirements. These data may still be valuable for our purposes and, if used, any shortcomings will be noted.

- Data were generated by a reliable source. Although the identity of the data generator does not guarantee data quality, it provides a simple screening criterion when multiple data sources are available. The following are indicators of data source reliability:
 - Data generator is generally trusted and respected (federal, state, and local agencies, or research institutions; examples include, but are not limited to, U.S. EPA, NOAA, NYSDEC, NJDEP, NYCDEP, Interstate Environmental Commission (IEC), State

University of New York (SUNY), Rutgers University, Meadowlands Environmental Commission)

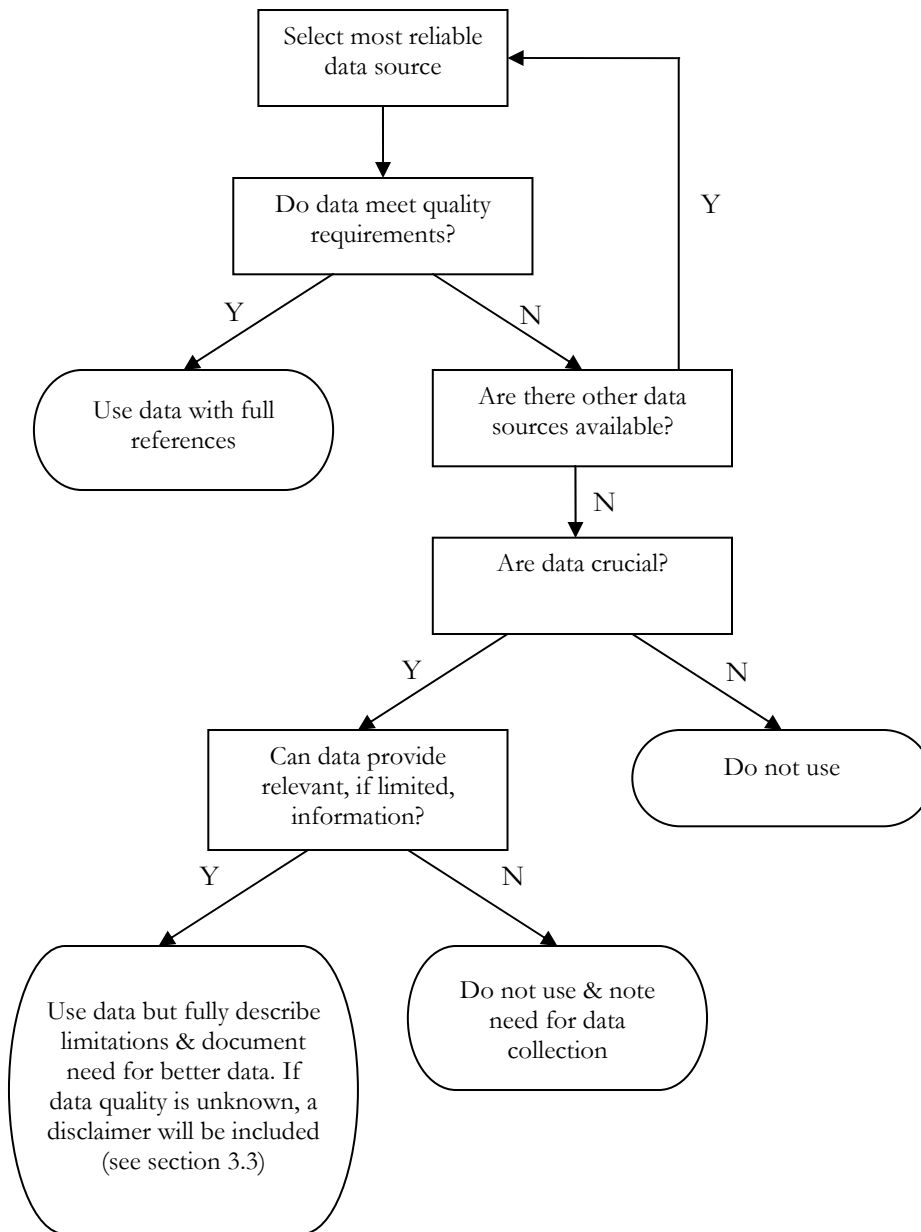
- Data are published in peer-reviewed articles or publications
- Data have been collected for purposes similar to ours; i.e., to assess the status and trends in a particular environmental indicator
- Monitoring Program has a QAPP or similar plan documenting quality assurance and quality control procedures to ensure data accuracy, precision, representativeness, and comparability.
- Data have been widely used and/or trusted by scientists and professionals in the subject
- Completeness
 - Spatial coverage
 - Dataset provides good coverage of the geographic area of interest (e.g., as many of the main bays and tributaries in the Estuary as possible are represented) and the same sites are included in each sampling effort
 - Temporal coverage
 - Enough historical data are available (the farther back in time, the better) to allow assessing any trends in the various environmental indicators
 - Adequate sampling frequency. In general, the more frequent the sampling, the better. In general, yearly (or even less frequent) data may be adequate to assess long-term trends. More frequent data may allow showing short-term changes; while this is not the main goal of the report, it may provide an interesting piece of information and may help clarify or illustrate certain concepts (e.g., how seasonal conditions affect algal growth and, consequently, chlorophyll and dissolved oxygen concentrations)
 - Data are more or less evenly distributed throughout the sampling period. In other words, there are no major periods where no data were collected. Evenly spaced sampling intervals are desirable but not strictly necessary
 - Monitoring program is ongoing. This is not strictly required, but highly desirable as the availability of future data would facilitate the preparation of upcoming reports on the Health of the Estuary

NEIWPCC may implement, at their discretion, various audits or reviews of this project to assess conformance and compliance to the quality assurance project plan in accordance with the NEIWPCC Quality Management Plan.

3.2. Data Review and Evaluation

The quality of the secondary data will be determined according to the decision tree shown in Figure 3 and based on data quality requirements defined in Section 3.1 of this document. In determining data quality, the completeness of the dataset will be assessed first, by inspecting data description (usually metadata) or the dataset itself—whichever is more easily available. If completeness is deemed adequate, other quality requirements will be assessed by inspecting the QAPP, other QA/QC documentation, metadata, and/or other information obtained from data providers.

Figure 3. Data Decision Tree



3.3. Disclaimers

All project deliverables will inform of the existence of this QAPP. As stated previously, any limitations in data quality will be fully disclosed. If a decision is made to use data of unknown quality, this will be indicated in a disclaimer that will be added to any project deliverable. The disclaimer will read: “These data are of unknown quality and presented here for illustrative purposes only. No inferences regarding the environmental health of the NY-NJ Harbor Estuary should be made based on these data until their quality can be determined.”

4. Data Reporting, Data Reduction, Data Validation, and Records Management

4.1. Data Reduction

In general, data will be manipulated as little as possible. Data reduction may be required to graphically display the information in a condensed, more easily understandable format and, in some cases, to establish or show specific data trends or characteristics.

The following are some examples of anticipated or possible data reduction procedures (provided that adequate data are available):

- For most indicators, the presence or absence of a trend over time will be shown by means of an x-y chart. It is anticipated that all available data will be plotted. However, for indicators for which there are large numbers of data points (e.g., sea level, water quality parameters), it will be considered whether plotting monthly or yearly average values provides a clearer depiction of trends
- Indicators that involve counts or otherwise depend on the level of effort will be normalized and reported per unit effort whenever possible. For example, the amount of debris collected during a coastal cleanup event will be divided by either the length of coast that was cleaned up or the number of people conducting the process; fish landings will be divided by the number of fishing trips.
- Certain data involving multiple categories and/or locations may need to be combined (summed). For example:
 - Data on the types of debris collected during coastal cleanup events may be reduced by grouping certain materials (e.g., items made of plastic) into a single category
 - Floatable debris collected by various agencies may be reported as a single value
 - Data on stranded animals may be summed across species and locations. The number or percentage of strandings caused by debris may be reported as well.
- Data units may need to be changed for report consistency and/or to allow comparisons across data sources
- Certain datasets may be reduced and presented as percentages (e.g., percentage of time a beach was closed during the swimming season, or percentage of plastic items in collected debris)
- Some data reduction may also be needed to display data in map form (maps will normally be intended to summarize some of the available information). Possible data reductions include:
 - Average values for a given water quality parameter (e.g., fecal coliform cell concentrations) across sampling locations within a sub-region of the Estuary (e.g., Jamaica Bay) at a given date.
 - Data may be reduced to show whether or not they comply with a given benchmark. For example, concentrations of DDT (and other toxic compounds) in sediments may be compared to the effects range-median (ER-M) and data displayed as above or below this benchmark.

4.2. Data Validation

The reporting of accurate project data will generally be ensured by carefully conducting and clearly expressing data reduction (if and when needed) and visual inspection of data before including in final report. Specifically:

- A copy of every original dataset obtained from each data source will be saved as a read-only, protected file in the event the integrity of the working datasets is compromised
- Working data will be stored in spreadsheet format and will include all relevant raw data, which will be locked for editing.
- Data manipulation will be minimized to decrease the chances of inadvertently introducing errors. If any data reduction or manipulation is needed, it will be calculated starting from the raw, protected dataset. All formulas, along with units and conversion factors, will be shown in the spreadsheet; in addition, the formulas will be visible in each cell containing the reduced values
- Prior to inclusion in the final report, raw and/or reduced data will be displayed in graphic form and inspected to detect any anomalous value. Most environmental indicators to be displayed have been measured in the past and values are expected to fluctuate between “generally accepted values.” If apparently anomalous values are detected, any data reduction will be verified. If the seeming anomaly is present in the original dataset, the data generator will be contacted for clarification and/or the issue will be discussed with the STAC and other appropriate parties. Any decision to eliminate “anomalous values” will be documented in the working data spreadsheets which will be kept as part of the project files and will be noted in the list of sources of secondary data (Section 2.5).
- In rare occasions, a dataset may only be available in hard copy format (the only such example encountered so far is for data on types of debris collected in cleanup efforts by the American Littoral Society). In these cases, data will be manually entered into a spreadsheet. To ensure an error-free copy, summary statistics will be checked if possible. In the example cited, the dataset consists of the number of items collected under various trash categories, along with the total across categories. This will be compared to the sum of the numbers entered manually. In addition, a few individually values will be cross-checked as well.

4.3. Deliverables

The deliverable of this project will be a report. It is expected that a one-page summary or flyer will be produced based on the final report. Both the report and the summary will be available in hard copy and online.

4.4. Records Management

The following project-related documents and records will be kept by the Harbor Estuary Program office for as long as possible and for a minimum of three years from the date of the final Financial Status Report to EPA, as stipulated by 40 CFR § 31.42:

- Original files and materials (either electronic or in print) obtained from the data providers, including datasets, data quality information, reports, and other relevant information pertaining the data and data interpretation
- Working data spreadsheets which will document any data reduction, anomalous data removal, and other issues
- Draft and final versions of the report
- Minutes from any meetings held in relation with the preparation of the report, including STAC meetings
- List of report reviewers and their written comments
- Files exchanged with graphic designer, printer, and other contractors
- Other relevant documents and materials

5. References

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