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Water

EPA

Guide for Preparation of Quality Assurance Project Plans for the National Estuarine Program

Interim Final

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GUIDE FOR PREPARATION OF QUALITY ASSURANCE PROJECT PLANS FOR THE NATIONAL ESTUARY PROGRAM

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

BACKGROUND AND INTRODUCTION

The U.S. Environmental Protection Agency (EPA) requires participation by all Regional offices, Program offices, Laboratories, and States in a centrally managed Quality Assurance Program (Administrator's memorandum, May 30, 1979). This EPA policy for quality assurance includes all monitoring and measurement efforts mandated by or supported by EPA and therefore includes all research activities carried out under the National Estuary Program.

EPA defines quality assurance (QA) as "the total integrated program for assuring reliability of monitoring and measurement data." QA includes many items that most scientists take for granted, items such as having well-defined objectives, including strict quality control procedures in analytical work, and ensuring that technicians are properly trained for the work that they conduct. A key requirement for implementation of EPA's QA requirements is the preparation of quality assurance project plans. QA project plans serve two purposes: (1) they assure EPA's managers of being provided with exactly what they expect to receive; and (2) they assist the project manager in ensuring that everyone associated with a project has a common and thorough understanding of the objectives, scope, methods, and products associated with the work.

QA project plans for the National Estuary Program are written according to a format prescribed by EPA (1984) in OWRS QA-1, "Guidance for the preparation of combined Work/Quality Assurance Project Plans for Environmental Monitoring." The format described in OWRS QA-1 is designed to incorporate all information that will be necessary to conduct the research project and to eliminate the need for multiple documents, such as standard work plans and QA project plans. Preparation of a single document can expedite project initiation and can ensure that proper quality control procedures are integrated into every project.

Initially, some scientists find writing QA project plans difficult. This perception is probably because the plans require so much more detailed information than the proposals that have traditionally guided research. With experience, most people find that the plans can improve the quality of research by providing all participants in the project with the same clear guidelines and goals for implementation.

The document entitled "Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Bays Program Studies" (Werme, 1985) was produced for EPA Region I in 1985 based on OWRS QA-1. In the Region I document, existing guidance on preparing work/quality assurance project plans was modified to be specific for projects conducted for the Bays Program. Although that document has been used successfully since it was produced, creation of the National Estuary Program has increased both the number of estuary projects and the level of institutional experience related to managing such projects. These factors indicated that an update of the document was necessary. The current document, therefore, is a revision of the Region I document and a modification of OWRS QA-1. Its format and philosophy are identical to OWRS QA-1, but the guidance and examples are extended to encompass the multifaceted research and monitoring conducted for and required by the National Estuary Program.

QA PROJECT PLAN GUIDE

This document presents guidance for completing the elements of a QA project plan specified by OWRS QA-1, "Guidance for the Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring," May 1984. Further guidance for preparation of QA project plans may be obtained by consulting OWRS QA-1 (EPA, 1984) and QAMS-005/80, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans"

(EPA, 1980). The guidance presented in this document includes examples from projects similar to those that have been conducted under Comprehensive Estuarine Management --Pollution and Abatement (66.456, 40 CFR 29), commonly known as the "Bays Program." Because Bays Program studies are varied, each example is not relevant for each type of study. Additional guidance can be obtained from the EPA Project Monitors.

The QA project plan is made up of a cover page, a table of contents, and 19 sections as indicated below. All of these elements should be included in the plan. If a particular section does not apply to the work assignment, the section should be listed and marked with "Not Applicable."

QA project plans are controlled documents for EPA. The document control format should consist of the following information on each page: section number, revision number, date of revision, and page, presented as page __ of __. This information should be placed in the upper right-hand corner as shown in Figure 1.

COVER PAGE

Each QA project plan should include a cover page with spaces for signatures of the Principal Investigators, EPA Project Monitor, EPA Project Officer, and EPA QA Officer as well as a title, the complete address of the individual or institution preparing the Plan, and the date that the Plan is submitted to EPA. If the project is to be carried out by people from more than one institution, a Principal Investigator from each institution should sign the cover page. An example of a title page is shown in Figure 2.

Section No. ____________

Revision No. ____________

Date ____________

Page ________ of ________

FIGURE 1. EXAMPLE OF THE EPA DOCUMENT CONTROL FORMAT.

QUALITY ASSURANCE PROJECT PLAN

for

A SCOPING STUDY OF THE DISTRIBUTION, COMPOSITION,
AND DYNAMICS OF WATER-COLUMN AND BOTTOM SEDIMENTS:
ALBEMARLE-PAMLICO ESTUARINE SYSTEM

prepared by

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prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV WATER MANAGEMENT DIVISION

8 JUNE 1987

APPROVALS:

Dr. John T. Wells, Principal Investigator — Date

Dr. Douglas Rader, Project Director — Date

Dr. Ted F. Bisterfield, Region IV Project Office — Date

Dr. Wade Knight, QA Officer — Date

FIGURE 2. EXAMPLE OF A QA PLAN COVER PAGE PREPARED FOR THE EPA REGION IV NATIONAL ESTUARY PROGRAM.

TABLE OF CONTENTS

The table of contents for a QA project plan should include the 19 major elements of the plan and a listing of all appendices. At the end of the table of contents, all individuals receiving official copies of the plan and any subsequent revisions should be indicated.

PROJECT ELEMENTS

1. PROJECT NAME
2. PROJECT REQUESTED BY
3. DATE OF REQUEST
4. DATE OF PROJECT INITIATION
5. PROJECT OFFICER
6. QUALITY ASSURANCE OFFICER

These elements are one-line, fill-in-the-blank sections. "Project name" is a short, descriptive title for the project; "Project requested by" is the EPA component requesting the work, such as U.S. EPA Region I; "Date of request" is the date that EPA issues a Scope of Work for the project; "Project Officer" is the EPA official responsible for the project; and "Quality Assurance Officer" is the EPA QA Officer responsible for the project. An example of a first page of a QA project plan including these sections is provided in Figure 3.

7. PROJECT DESCRIPTION

This section describes the project objectives and explains how the project fits into the overall objectives of the National Estuary Program, the relevant National Estuary Program work plan, and the project's scope of work as provided by EPA. The section also includes background information and a description of exactly what will be done during the project. In many cases, this description can be repeated from an original proposal to EPA.

QUALITY ASSURANCE PROJECT PLAN

for

A SCOPING STUDY OF THE DISTRIBUTION, COMPOSITION,
AND DYNAMICS OF WATER-COLUMN AND BOTTOM SEDIMENTS:
ALBEMARLE-PAMLICO ESTUARINE SYSTEM

1. **PROJECT NAME:** A Scoping Study of the Distribution, Composition, and Dynamics of Water-Column and Bottom Sediments: Albemarle-Pamlico Estuarine System

2. **PROJECT REQUESTED BY:** U.S. EPA Region IV

3. **DATE OF REQUEST:** 1 May 1987

4. **DATE OF PROJECT INITIATION:** 1 September 1987

5. **PROJECT OFFICER:** Dr. Ted Bisterfield
   PROJECT DIRECTOR: Dr. Douglas Rader

6. **QUALITY ASSURANCE OFFICER:** Mr. Wade Knight

FIGURE 3. EXAMPLE OF PAGE 1 OF A QA PROJECT PLAN PREPARED FOR THE EPA REGION IV NATIONAL ESTUARY PROGRAM.

This section includes three major parts: (a) a statement of objectives and scope of the project; (b) a statement of the intended use of the data generated; and (c) an overall description of the project design. If relevant to the project, EPA also requires tables describing: (d) samples to be collected in the field, and (e) parameters to be measured in the field or in the laboratory.

EPA suggests the use of subheadings reflecting these parts as described below. These specified headings are not required by EPA if another organization better suits a project.

A. Objective and Scope Statement

This section should clearly state the project objectives and should explain these objectives with sufficient detail to justify and support the decisions to be based upon the results. Reference should be made to background and historical information when applicable. The following example could be an objective and scope statement for a project examining the sedimentary processes in an estuarine system:

> In shallow-water systems like the Albemarle-Pamlico Estuarine System, the water column and surficial sediments interact continually, exchanging and redistributing particles and solutes so as to impact the operation of the entire system. Consideration of sedimentary processes and their dynamics in the estuaries is therefore essential to management, and research into these processes is a vital part of any system-wide management effort. However, in contrast to the water, the sediments are often an unseen and apparently passive component in an estuary. Sediment distribution and properties are slow to change, and their role in water-column events is not always apparent. Yet, sediments may play a critical role in transporting pollutants, modulating productivity, and releasing nutrients.

This project specifically addresses E.6 (Sediment Distribution and Motion) and provides background for addressing E.15 (Chronic Effects of Suspended Sediments), both included in the Water Quality and Estuarine Relationships section of the Albemarle-Pamlico Sound (APES) Work Plan. The study is relevant to APES in that 1) the objectives are to generate an understanding of sediments that will be needed for management purposes, and 2) the product will be a user-oriented series of maps that will serve as a multidisciplinary tool for physical, chemical, and biological studies.

Specific objectives of this project are to: 1) collapse approximately 20 data sets from maps of various small scales (as presented in the literature) into a series of high-quality, professionally-drafted maps that reflect, in addition to sample locations, the distribution of mean grain size (or some other measure of central tendency), percent biogenic sediment, percent organic material, and grain size contours, 2) collect approximately 100 additional bottom samples in areas where no data have been collected or where overlapping sample locations show conflicting data, and 3) provide a regional survey of suspended sediments of the Albemarle-Pamlico estuarine system under several different environmental conditions using Landsat Thematic Mapper imagery.

B. Data Usage

This section should clearly describe how the data generated during the project will be used. A precise description of data usage is important because use of the data will dictate the data quality requirements and assessments discussed in Section 11. The data usage for the project used as an example above could read as follows:

The data on bottom sediments will be used to provide:

1) A reference for benthic habitat studies where substrate is a critical factor.

2) A first-order map showing potential storage sites for sediments of different sizes and composition.

3) An index for sediment resuspension, where the resuspension threshold is governed largely by grain size.

4) A characterization of bottom type that can be used as input to future modelling studies of water motion and sediment dispersal.

The Landsat imagery will be used to observe and map the distribution of suspended solids, the spreading of freshwater plumes during high river flow, and the regional surface dispersal patterns under varying wind conditions. Acquisition of Landsat data will serve as a means of 1) identifying specific areas that should be examined more closely in subsequent field studies, 2) developing hypotheses in which suspended sediments may play a role, 3) identifying areas of resuspension and persistently high background suspended-sediment concentrations, and 4) determining inferred routes of sediment transport, regardless of source.

C. Design and Rationale

This section should be a complete and detailed description of the project and the rationale behind the project design. It should include a full description of EPA-approved sampling and analytical procedures to be used. Often, much of this information can be derived from the original proposal to EPA. This section may also be entitled "Technical Approach" or "Monitoring Network and Design" if these headings better reflect a description of the particular project.

Procedures for sampling and laboratory analyses that are not EPA methods may be discussed in this section, but they are better included in Section 12.

D. Monitoring Parameters and Collection Frequency

If a program involves field sampling, a table of all field samples and measurements to be taken should be included. If parameters are collected on individual schedules or at individual locations, that information should be included in the table. If all parameters are measured during all sampling periods at all stations, duplication of that information is unnecessary. Figure 4, for example, shows a monitoring parameters table for a field program involving water sample collections at all stations for each sampling period.

A table of laboratory studies may also be included in this section. Figure 5 shows a typical monitoring parameter table for a 96-hour toxicity test.

E. Parameter Table

If the program includes laboratory analyses, a table describing the analyses to be conducted and the methods to be employed should be included. If analysis of samples within a designated time period is important to the integrity of the samples, holding times should be specified on the laboratory analysis parameter table. Analysis methods should also be included in the table, as a reference to EPA-published or other methods. EPA-published methods are required whenever they are appropriate and available. Under some circumstances where more than one EPA-published method is applicable, justification should be provided for the particular method selected. If the method includes more than one option, the option to be used should be cited or described. If methods other than EPA-published methods are to be used, a justification for their use should be included. In addition, any modifications, whether to EPA or non-EPA methods, should be fully described and justified. An example of a laboratory analysis parameter table is included in Figure 6.

TABLE X. SAMPLING PATTERNS

Parameter	Sample Volume (liters)	Sample Container	Immediate Shipboard Processing and Storage
PCB	19 (5 gal)	Glass; Glass fiber filter	Filter water; store filter on dry ice; store filtrate in darkness.
Copper	1	Polyethylene	Refrigerate.
Total suspended solids	0–1	Polyethylene; Nucleopore filter	Filter water; record volume to nearest 0.1 ml.
Particulate organic carbon	0–1	Glass; Glass fiber filter	Filter water; record volume to nearest 0.1 ml.
Temperature	—	—	Record to nearset 0.1°C.
Salinity	—	—	Record to nearest 0.5°/oo.
Depth	—	—	Record to nearest 0.1 m.
Current	—	—	Record to nearest 1.0 and 0.01 knot.

FIGURE 4. EXAMPLE OF A SAMPLING PARAMETER TABLE FOR A FIELD PROGRAM DESIGNED TO COLLECT WATER SAMPLES AT ALL STATIONS.

TABLE X. MONITORING PARAMETERS

Parameter	Sampling Frequency	Test Replicate Sampled	Immediate Processing or Measurement
Survival	3, 6, 12, 24, 48, 72, and 96 h	All chambers	Record number alive; remove carcasses.
Toxicant	0, 48, and 96 h	All chambers	Collect in glass; label; deliver to analytical laboratory.
Dissolved Oxygen	0, 48, and 96 h	Control, low, mid, high concentrations	Record to nearest 0.1 ppm
pH	0 and 96 h	Control, low, mid, high concentrations	Record to nearest 0.01 pH unit.
Salinity	Daily	All chambers	Record to nearest 0.5°/₀₀
Temperature	Daily Hourly	All chambers One chamber	Record to nearest 0.5°C. Record to nearest 0.1°C.
Total Organic Carbon	0 and 96 h	Control	Collect in glass; label; deliver to analytical laboratory.

FIGURE 5. EXAMPLE OF A SAMPLING PARAMETER TABLE FOR A LABORATORY TOXICITY TEST.

Parameter	Matrix	Units	Methodology	Reference[e]	EPA Method	Maximum Holding Time	Preservation
Volatiles	Sediment	μg/kg[a]	Purge + trap	(d)	—	14 days	—
	Fish tissue	μg/kg[b]	GC/MS	(d)	—		—
	Water	μg/L		EPA 1982a	8010		refrigerate
Pesticides	Sediment	μg/kg[a]	Extraction/	(d)	—	7 days/	—
	Fish tissue	μg/kg[b]	EC/GC	(d)	—	40 days[c]	—
	Water (part.)	μg/kg[a]		(d)	—		—
	Water	μg/L		EPA 1982a	608, 625		refrigerate
Neutrals	Sediment	μg/kg[a]	Extraction/	(d)	—	7 days/	—
	Fish tissue	μg/kg[b]	GC/MS	(d)	—	40 days[c]	—
	Water (part.)	μg/kg[a]		(d)	—		—
	Water	μg/L		EPA 1982a	625		refrigerate
Acids/Bases	Sediments	μg/kg[a]	Extraction/	(d)	—	7 days/	—
	Fish tissues	μg/kg[b]	GC/MS	(d)	—	40 days[c]	—
	Water (part.)	μg/kg[a]		(d)	—		—
	Water	μg/L		EPA 1982a	625		refrigerate
Trace Metals:							
Cr, Cu, Pb, Ni, Ag	Sediment	μg/kg[a]	Graphite or	EPA 1982b	SW-846	6 months	acidify with
	Water (part.)	μg/kg[a]	Flame AA;	EPA 1982b	SW-846		HNO_3 to pH<2
	Water	μg/L	ICP	EPA 1979	218.2, 220.2, 239.2, 249.2, and 272.2		
Cd	Sediment	μg/kg[a]	Graphite AA	EPA 1982b	SW-846	6 months	as above
	Water (part.)	μg/kg[a]		EPA 1982b	SW-846		
	Water	μg/L	ICP	EPA 1979	213.2		
Hg	Sediment	μg/kg[a]	Cold vapor AA	EPA 1982b	SW-846	6 months	as above
	Water	μg/L		EPA 1979	245.2		
Cd, Hg	Fish Tissue	μg/kg[b]	Graphite AA/ Cold vapor AA	EPA 1982b	SW-846	6 months	freeze
Zn	Fish Tissue	μg/kg[b]	Flame or Graphite AA	EPA 1982b	SW-846	6 months	freeze

a) Dry weight basis.

b) Wet weight basis.

c) Where two times are given, the first refers to maximum time prior to extraction; the second refers to maximum time prior to instrumental analysis.

d) No EPA-published methods exist at required detection limits. The methods for this project are described in Section 12.

e) References: U.S. Environmental Protection Agency. 1979 (revised 1983). Methods for chemical analysis of water and wastes. EPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

U.S. Environmental Protection Agency. 1982a. Methods for organic chemical analysis of municipal and industrial wastewater. EPA-600/4-82-057. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

U.S. Environmental Protection Agency. 1982b. Test methods for evaluating solid waste physical/chemical methods. SW-846, 2nd edition.

FIGURE 6. EXAMPLE OF A LABORATORY ANALYSIS PARAMETER TABLE.

8. PROJECT FISCAL INFORMATION

This section may be a one-line reference to identify a cost proposal previously submitted to EPA. If the QA project plan is being prepared as a proposal, EPA will specify what fiscal information to include.

9. SCHEDULE OF TASKS AND PRODUCTS

This section describes the major project milestones. It must include dates that are important to EPA, such as dates for submission of reports and commitments that EPA must meet so that the project can continue on schedule. Charts showing the duration of major project activities, such as the one depicted in Figure 7, are recommended.

10. PROJECT ORGANIZATION AND RESPONSIBILITY

This section should identify all key personnel associated with the project and should explain how they will relate to each other during the project. It should identify the person with direct responsibility to EPA. Inclusion of a project organization chart is advisable for this section; an example of a project organization chart is included in Figure 8.

A description of each key person's responsibilities for the program, either in a table or as text, should accompany the project organization chart. Telephone numbers of key personnel should be included to facilitate communications. If several organizations are involved in the program, complete addresses should also be provided. An example of text to accompany Figure 8 could read as follows:

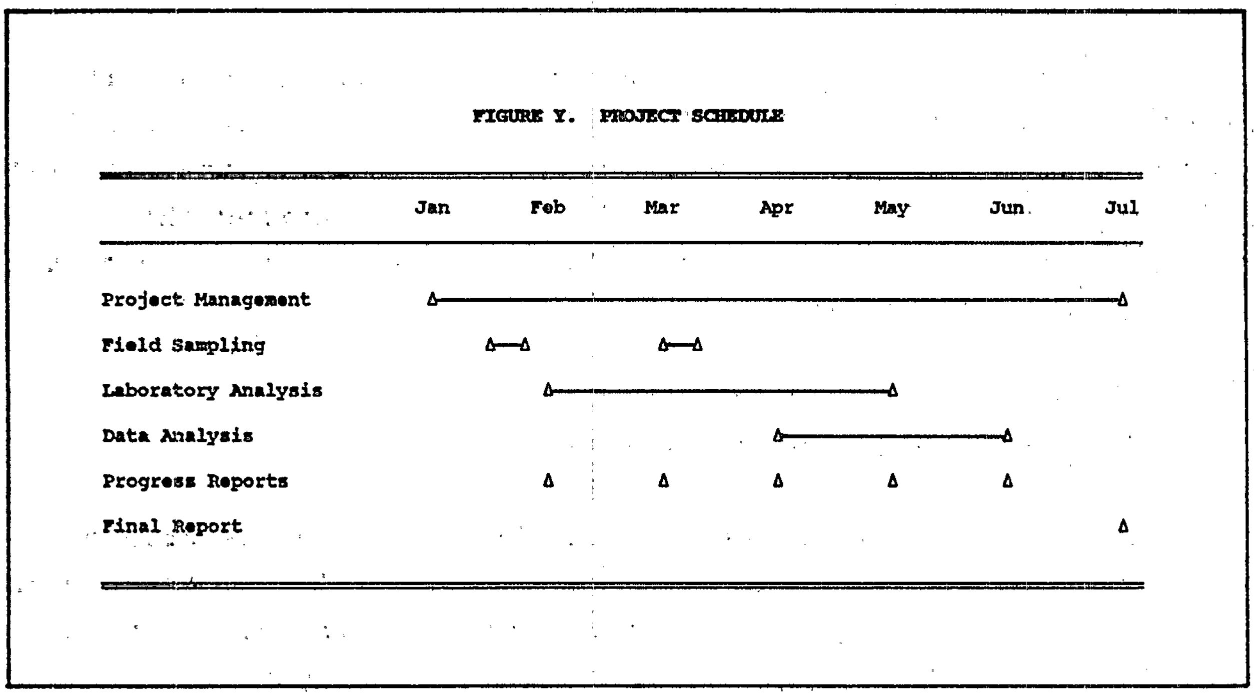

FIGURE 7. EXAMPLE OF A PROJECT SCHEDULE CHART FOR A FIELD SAMPLING AND LABORATORY ANALYSIS PROJECT.

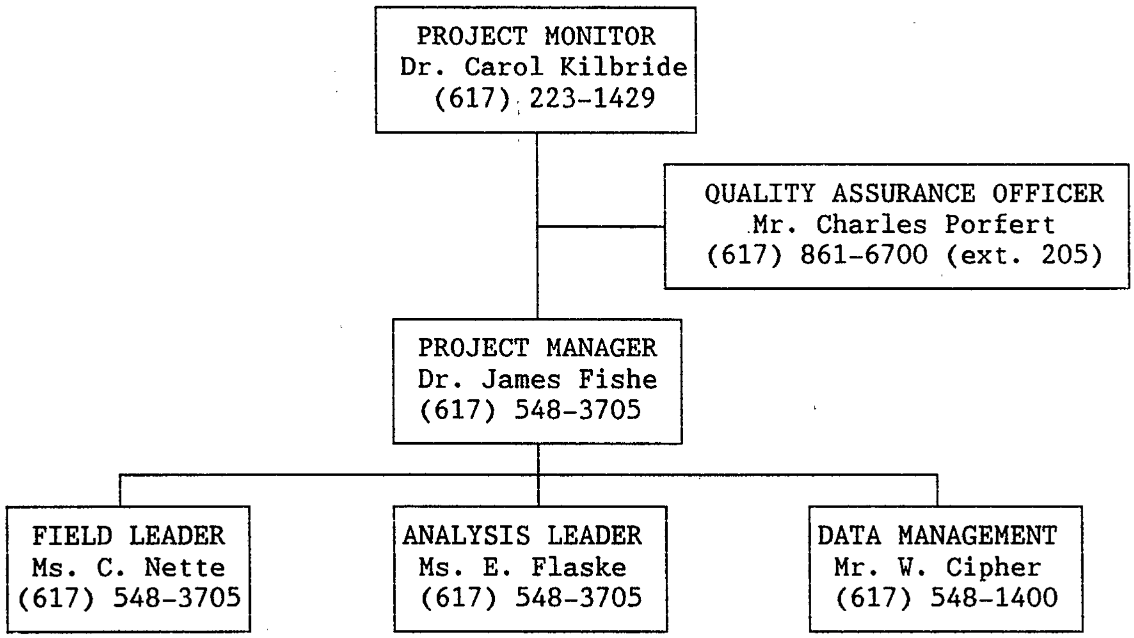

FIGURE X. PROJECT ORGANIZATION.

FIGURE 8. EXAMPLE OF A PROJECT ORGANIZATION CHART FOR A FIELD SAMPLING AND LABORATORY ANALYSIS PROJECT.

Dr. James Fishe (Marine Biological Laboratory, Woods Hole, MA 02543, Tel. (617) 548-3705) will be the Principal Investigator for this project. He will be directly responsible to EPA for the quality and timely completion of the project. He will also be responsible for data interpretation and for preparation and submission of reports to EPA.

Dr. Fishe will be assisted by three Task Leaders as shown in Figure X. Ms. C. Nette (Marine Biological Laboratory, (617) 548-3705) will be the Field Task Leader. She will be responsible for coordination and logistics of the field sampling activities and for sample tracking and control. As Analysis Task Leader, Ms. E. Flaske (Marine Biological Laboratory, (617) 548-3705) will oversee all laboratory activities and will review and evaluate all analytical data generated during the project. Data management will be the responsibility of Mr. W. Cipher (Woods Hole Oceanographic Institution, Woods Hole, MA, Tel. (617) 548-1400). Mr. Cipher will manage the storage, retrieval, and manipulation of data generated during the project.

11. DATA QUALITY REQUIREMENTS AND ASSESSMENTS

Central to EPA's QA program is the requirement that data be of known and acceptable quality. EPA environmental data-collection programs are based on the development of data quality objectives (DQOs). The DQO development process defines the quality of the data needed to make decisions, and balances this against the time and resources available. The process results in project objectives that are responsive to meeting decision-making needs in a cost effective manner.

This section defines data quality requirements for each type of measurement made during a project and describes methods for data quality assessment. Data quality parameters to be discussed in this section are (a) precision; (b) accuracy; (c) representativeness; (d) comparability; and (e) completeness. These parameters should be defined in terms of quantitative objectives in order to permit their use for determination of data acceptability and usability during data validation in Section 16.

For analytical measurements, numerical detection limits, where known, should be defined as shown in Figure 9. The procedures described in this section should include the equations used to calculate accuracy, precision and completeness and the methods used to gather data for the accuracy and precision calculations. This section should also include field and laboratory quality control checks, including QC protocols, frequencies, and acceptance criteria. A summary table of the necessary quality control samples might be included.

A. Precision

Precision is the degree of mutual agreement among independent, similar, or repeated measurements. Typically, precision is monitored through the use of replicate samples or measurements and is reported as a standard deviation, standard error, or relative standard deviation. Multiple replicates are normally taken to assess precision in field sampling.

B. Accuracy

Accuracy is the degree of agreement between a measured value and the true value. It may be monitored in a program through the use of blank samples or standard reference materials. Taxonomists monitor accuracy through the use of voucher collections that can be sent to experts for confirmation of organism identifications. For field quality control, samples are routinely spiked with a known reference material. In an analytical laboratory, accuracy is generally expressed in terms of percent recovery of a standard.

TABLE Z. OBJECTIVES FOR MEASUREMENT DATA

Variable	Matrix	Units[a]	Lower Detection Limits	Accuracy	Precision	Completeness	Method	Reference	Maximum Holding Time
Resin acids, Chlorinated phenolics and guaiacols	Sediment	μg/kg	<1	(b)	(b)	99%	Extraction Derivatization	(c)	7 days[d]
Total organic carbon	Sediment	Percent	0.01	±10%	±10%	99%	High-temp. combustion	Tetra Tech, 1986	28 days[d]
Water-soluble sulfide	Sediment	mg/kg	1	±10%	±10%	99%	Titrimetric; ion probe	Tetra Rech, 1986	7 days
Total volatile solids	Sediment	Percent	0.01	—	±5%	99%	550° combustion; gravimetric	Tetra Tech, 1986	24 hours[d]
Grain size	Sediment	Percent	0.01	—	±5%	99%	Sieve and pipet	Tetra Tech, 1986	6 months
Oil and grease	Sediment	mg/kg	10	—	±10%	99%	Freon extraction; infrared	Tetra Tech, 1986	28 days[d]
Total nitrogen	Sediment	Percent	0.01	±5%	±5%	99%	High-temp. combustion	Tetra Tech, 1986	6 months

a) Dry weight basis.

b) Accuracy to be determined with appropriate reference standard if available; precision to be determined by replicate analyses performed during the study.

c) There are no appropriate U.S. EPA approved methods for analysis of these organic compounds in sediment. The methods recommended for this study are based upon methods developed in industry and research. A more detailed summary of the methods is provided in Section 12 (Analytical Procedures).

d) If frozen, the samples may he held 6 months prior to extraction.

FIGURE 9. EXAMPLE OF A DATA QUALITY PARAMETER TABLE SHOWING ANALYTICAL DETECTION LIMITS.

C. Representativeness

Representativeness is the degree to which samples represent true systems. For most studies, representativeness is considered during project design rather than monitored throughout a project, and this section describes any bias that may be inherent in the sampling design or techniques or in the analytical protocols. For example, a program designed to monitor PCB levels in fisheries species could discuss representativeness in terms of of the status of winter flounder in the commercial and recreational fisheries.

D. Comparability

Comparability is the degree to which data from one study can be compared to other, similar studies. Like representativeness, comparability is considered during project design. A discussion of comparability could include discussion of other studies in which similar methods have been employed.

E. Completeness

Completeness is the measure of the amount of data obtained during a project compared to the amount of data expected under ideal conditions. A discussion of completeness could include definition of what percentage of the total number proposed samples must be taken for the data generated by a project to be meaningful.

The following text provides an example of how data quality parameters might be addressed:

Precision will be measured as the relative standard deviation (RSD) of triplicate sample analyses. Triplicate analyses will be performed on at least 10 percent of samples and on at least one sample from each run. Each analyst will conduct the same number of parallel analyses. If the RSD exceeds 30 percent, the analyses conducted prior to the previous triplicate analyses will be repeated.

Accuracy will be measured as percent recovery of blank samples spiked with a PCB standard mix (including Aroclors 1016, 1242, and 1254). These fortified blanks will be substituted for every third blank extraction. If recoveries are not within 90-110 percent of the spike mixture, analyses conducted within the batch will be repeated. Accuracy will also be assessed as percent recovery of a standard reference material (SRM) including NRC SRM HS-2 (PCBs in marine sediment). An equal amount of deionized water will be added to a weighed amount of the SRM to simulate the moisture content of the sediments, and the mixture will be extracted and analyzed by GC/ECD.

Samples will be taken with a 0.1-square-meter grab and will be sieved to 0.3 mm. This smaller grab and smaller sieve size has been shown to be statistically more representative of infauna than the 0.25-square-meter grab and 1.0 or 0.5-mm sieve size that were traditionally used in coastal benthic surveys.

Samples will be prepared and analyzed using the same methods that are currently being employed for the New Bedford Harbor/Buzzards Bay Remedial Action Feasibility Study for preparation and analysis of ultra low levels of metals in environmental samples. Procedures will follow the same quality control and data quality assessment protocols and will meet the same data quality requirements specified by that program.

Completeness will be measured as the percentage of total samples collected that were completely analyzed. Because excess material will be collected at each station during each survey, we anticipate achieving 100 percent completeness. Should a sample be lost or destroyed during the analytical procedure, loss of that sample will be reported to EPA. If completeness is less than 80 percent for any sampling period, the area will be resampled.

12. SAMPLING AND LABORATORY PROCEDURES

This section should describe sampling procedures and analytical procedures that have not been approved by EPA or fully described in Section 7. If analytical methods are discussed in this section, the section title should be changed to "Sampling and Analytical Methods." A table of laboratory analysis parameters similar to Figure 6 should be prepared. If the laboratory conducting sampling has written standard operating procedures (SOPs) covering these methods, the SOPs may be referenced in this section and appended to the QA project plan.

13. SAMPLE CUSTODY PROCEDURES

Proper identification and control of samples is an important consideration, particularly if the persons taking samples do not also conduct the analyses or if samples are stored for any period of time prior to analysis. For small projects with few people collecting and analyzing samples, this section is less important. This section describes the methods used to identify and track samples. The section should include examples of sample labels, sample transfer forms (Figure 10), and sample tracking forms (Figure 11) as applicable to the project, with instructions for their completion. Sample logs, if used, should be described. Responsibilities for verifying that samples are properly labeled should be discussed, and if sample transfer forms are used, the procedures for completing the forms and signing them should be described. If samples are to be archived, the archive procedures and location should be described.

CHEMISTRY LABORATORY
SAMPLE CUSTODY AND IDENTIFICATION FORM

Project Name: ______________________________

Project Number: ____________

Number of Samples: ____________

Type of Samples: __________________________

Batch Number: ____________

Chemistry Laboratory Identification Number	Sample Description

Relinquished By	Date	Received By	Date	Time	Comments

FIGURE 10. EXAMPLE OF A SAMPLE TRANSFER FORM.

SAMPLE CONTROL FORM

Project No. ____________________

Chemistry Laboratory ID No. ____________ Batch No. ________ Other ID No. ____________

Sample description ____________________

Date received ____________ Initials ____________ Comments ____________

Preservative necessary? ☐ No ☐ Yes (type, amount) ____________

Initial laboratory storage location ____________ Date ________ Initials ________

TRANSFERRED FOR SAMPLE PREPARATION

Relinquished by ____________ Date ________ Received by ____________ Date ________

Relinquished by ____________ Date ________ Received by ____________ Date ________

(Refer to Sample Preparation Form, page ____________)

Comments ____________________

TRANSFERRED FOR INSTRUMENTAL ANALYSIS

Relinquished by ____________ Date ________ Received by ____________ Date ________

Relinquished by ____________ Date ________ Received by ____________ Date ________

Type analysis ☐ GC/MS ☐ GC ECD ☐ GC FID ☐ AA ☐ UV ☐ Other (specify) ____________

Date analyzed ____________ Analyst ____________ Comments ____________

TRANSFERRED TO OUTSIDE ANALYTICAL FACILITY (specify) ____________

Contact ____________ Address ____________

Shipped Via ____________ Date ________ Initials ________

Comments ____________________

FINAL DEPOSITION OF ARCHIVED MATERIAL

Amount surplus sample ____________

Relinquished by ____________ Date ________ Received by ____________ Date ________

FINAL DEPOSITION OF SAMPLE EXTRACTS

Storage location ____________ ☐ Discarded ____________

Relinquished by ____________ Date ________ Received by ____________ Date ________

Approved by ____________ Date ________

FIGURE 11. EXAMPLE OF A SAMPLE TRACKING FORM.

14. CALIBRATION PROCEDURES AND PREVENTIVE MAINTENANCE

This section should list each key piece of equipment or instrumentation used for the project, state how frequently the equipment is calibrated and routine maintenance is performed on it, reference calibration and maintenance procedures, and indicate where calibration and maintenance records are kept in the laboratory or project files. Contingency plans, such as back-ups or alternative equipment, should also be listed for major pieces of equipment.

15. DOCUMENTATION, DATA REDUCTION AND REPORTING

Because data generated by projects conducted under the National Estuary Program may be used by EPA long after the projects are complete, careful documentation and reporting procedures are very important.

A. Documentation

This section should describe how raw data will be recorded and organized. Because EPA may wish to use data generated during the National Estuary Program for uses beyond one final report, careful record-keeping practices are very important. If standardized data sheets will be used as part of the program, examples should be included with instructions for their completion.

B. Data Reduction and Reporting

This section should include a description of how project data will be analyzed and reported to EPA, including descriptions of calculations and statistical methods. It should also include a brief description of steps taken to avoid making errors during data transcription, reduction, and transmittal, as applicable to the project.

16. DATA VALIDATION

Data validation involves all procedures used to accept or reject data after collection and prior to use, including editing, screening, checking, auditing, verification, and review. It should include an assessment of the instrument calibration information required in Section 14. These processes may be carried out by more than one person involved in a project.

An example of a data validation section for a program could be as follows:

> All data reported for this project will be subject to a 100 percent check for errors in transcription, calculation, or computer input by the Laboratory Supervisor, Ms. J. Doe. Additionally, the Project Manager, Dr. I. Green, will review all sample logs and data forms to ensure that requirements for sample holding times, sample preservation, sample integrity, data quality assessments, and equipment calibration have been met. At the discretion of the Project Manager, data which do not meet these requirements will either not be reported or will be reported with an explanation of associated problems.

17. PERFORMANCE AND SYSTEMS AUDITS

EPA may require or may perform performance or systems audits. Projects conducted under the National Estuary Program will be audited by EPA on an average of once a year. A performance audit is an independent measurement taken for comparison with similar, routinely obtained data. A systems audit consists of an on-site review of an entire project to determine whether work is progressing in accordance with the QA project plan. This section should describe special provisions for performance audits if they have not been described under Section 11, Data Quality Requirements and Assessments, and should describe internal systems reviews to be conducted by the laboratory's management or QA personnel.

18. CORRECTIVE ACTION

Ability to identify and correct problems is an important part of all research activities, both from a management and a quality control perspective. This section should explain how problems will be identified and corrected, and what records of the corrective action process will be maintained. An example of the corrective action section might read as follows:

> Data quality objectives and validation procedures for this program have been designed to ensure that personnel will be able to quickly identify and correct analytical problems. Should the results of data validation measures indicate that the integrity of data associated with the sample set is questionable, the analyses would be repeated. Quality assurance audits of the program have been proposed in the work plan to ensure that work is performed by individuals who understand the objectives and methods to be used. Audit results will be documented and reported to the Program Manager who will be responsible for implementing all necessary corrective actions.

19. REPORTS

This section should describe all reports, including progress reports, interim reports, and monthly reports that will be generated during the course of the project. The section should include internal reports as well as those issued to EPA. The reporting schedule should be identified, and a general outline of critical reports should be provided.

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Environmental Protection Agency. 1979 (revised 1983). Methods for chemical analysis of water and wastes. EPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

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INDEX

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