Coastal Bend Bays & Estuaries Program
Regional Coastal Assessment Program (RCAP)

2004 ANNUAL UPDATE

QUALITY ASSURANCE PROJECT PLAN

CBBEP Contract Number: 0420

EPA Q-TRAK: _____
QAPP Submittal Date: June 07, 2004
TCEQ Approval Date: _____
EPA Approval Date: _____
QAPP Print Date: July 07, 2004

CCS Project Manager: Brien A. Nicolau
Center for Coastal Studies
NRC Building, Suite 3200
6300 Ocean Drive
Corpus Christi, Texas 78412

TCEQ-CBBEP Project Coordinator: Jeff Foster
NRC Building, Suite 3300
6300 Ocean Drive
Corpus Christi, Texas 78412

CBBEP Project Manager: Jim Bowman
Coastal Bend Bays & Estuaries Program, Inc.
1305 N. Shoreline, Suite 205
Corpus Christi, Texas 78401

Effective Period July 2004 to August 2005

Questions concerning this quality assurance project plan should be directed to:

Brien A. Nicolau
(361) 825-5807
bnicolau@falcon.tamucc.edu

NOTICES

This Quality Assurance Project Plan (QAPP) is intended to be a living document that will be amended as various components of the Coastal Bend Bays & Estuary Program (CBBEP) Regional Coastal Assessment Program (RCAP) are developed.

A major portion of the RCAP involves a one-time yearly sampling program within the CBBEP area scheduled each August from 2002 through 2004 that integrates with the U. S. Environmental Protection Agency (EPA), Office of Research and Development (ORD), Environmental Monitoring and Assessment Program (EMAP), National Coastal Assessment Program (NCAP) being organized and managed by the USEPA National Health and Environmental Effects Research Laboratory's Gulf Ecology Division in Gulf Breeze, FL. As a partner with EPA, the CBBEP falls under the umbrella of the QAPP written for this project. The CBBEP will therefore adhere to all requirements as specified in the QAPP entitled *Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. United States Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL.EPA/620/R-01/002 (http://www.epa.gov/emap/nca/html/docs/qaprojplan.html).*

As a partner with EPA, the CBBEP will continue to utilize those laboratories currently approved by EPA to perform analytical work performed under the NCAP–QAPP. The CBBEP also intended that laboratories approved for recently completed CBBEP monitoring and assessment projects continue to perform analysis, if applicable, so as to expedite the approval process of this RCAP QAPP. As the scope of this project involves many laboratories, the EPA has not required that individual laboratories sign the QAPP and the CBBEP intends to follow this approach. However, the designated laboratories must comply with the QA/QC requirements described in both QAPP documents.

In addition, rather than duplicate the NCAP–QAPP in its entirety, to reduce redundancy the CBBEP intends to cite the NCAP–QAPP where appropriate. This QAPP will therefore be a combination of all activities proposed by the NCAP–QAPP (USEPA 2001) and the CBBEP under the developing RCAP, and may or may not contain all specifics of the program. Both QAPP documents are intended to serve as a resource for specific information concerning sampling activities developed for the CBBEP RCAP.

It is the intent of the CBBEP RCAP that the data collected should seamlessly integrate into the Texas Regulatory and Compliance System (TRACS) and be available for state environmental agencies, federal agencies, universities, private citizens, and many others. All data will be entered using the appropriate Parameter Codes. Should Parameter Code numbers not be available for a particular parameter, a request will be made for a new Parameter Code. In addition, all stations will be assigned a Texas Commission on Environmental Quality (TCEQ) Station ID number after submittal of the proper Station Location Request form.

A1 APPROVAL PAGE

Coastal Bend Bays & Estuaries Program
Regional Coastal Assessment Program (RCAP) - Annual Update
CBBEP Contract Number: 0420

Texas Commission on Environmental Quality

Office of Compliance and Enforcement
Compliance Support Division

Jose A. Franco, Director Compliance Support Division — Date	Stephen Stubbs, Manager Quality Assurance Program — Date
Sharon Coleman, QA Specialist Quality Assurance Program — Date	

Office of Environmental, Policy, Analysis, & Assessment
Policy and Regulations Division

Jim Muse, Director Policy and Regulations Division — Date	Susan Ferguson, Manager Policy and Standards Division — Date
Frank Fuller, Grant Manager TCEQ-CBBEP — Date	Jeff Foster, Project Coordinator TCEQ-CBBEP — Date

Monitoring Operations Division

Dr. David W. Sullivan, Manager Monitoring Data Management & Analysis Section — Date	Dr. Patrick Roques SWQM Team Leader, Surface Water Quality Monitoring Program — Date

United States Environmental Protection Agency

Betty Ashley, Region 6 Date
EPA Project Officer

Sunita Singhvi, Region 6 Date
Acting Chief, Assistance Program Branch

Phil Crocker, Region 6 Date
EPA Aquatic Biologist

Coastal Bend Bays & Estuaries Program, Inc.

Jim Bowman Date
Project Manager

Leo Trevino Date
Director, Project Implementation
Quality Assurance Officer

Texas A&M University- Corpus Christi

Center for Coastal Studies

Brien A. Nicolau Date
Project Manager/Quality Assurance Officer

A2 TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

A3 DISTRIBUTION LIST

CBBEP, Inc.
1305 North Shoreline Blvd
Corpus Christi, TX 78401

Jim Bowman
Project Manager
(361) 885-6248

Leo Trevino, Director, Project Implementation
Quality Assurance Officer
(361) 885-6244

TCEQ
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Sandra Alvarado, TMDL Project Manager
TMDL Program, MC-150
(512) 239-6643

Greg Bryant, CRP Project Manager
Clean Rivers Program, MC-147
(512) 239-6941

Sharon Coleman, Quality Assurance Specialist
Quality Assurance Section
MC-176
(512) 239-6340

Frank Fuller, TCEQ-CBBEP
Grant Manager
MC-205
(512) 239-5796

Patrick Roques, SWQM Team Leader
MC-165
(512) 239-4604

Dr. David W. Sullivan, Manager
Monitoring Data Management & Analysis Section
MC-165
(512) 239-1623

TCEQ Region 14
6300 Ocean Drive
Suite 1200
Corpus Christi, Texas 78412

Carlton H. Stanley, Director
(361) 825-3100

TCEQ
6300 Ocean Drive
Corpus Christi, Texas 78412

Jeff Foster, TCEQ-CBBEP
Project Coordinator
MC-207
(361) 980-3420

USEPA, Region 6
1445 Ross Avenue
Suite 1200
Dallas, Texas 75202-2733

Betty Ashley, EPA Project Officer
(214) 665-7576

Phil Crocker, EPA Aquatic Biologist
(214) 665-6644

Center for Coastal Studies
Texas A&M University-Corpus Christi
NRC Building, Suite 3200
6300 Ocean Drive
Corpus Christi, Texas 78412

Brien A. Nicolau, Project Manager
(361) 825-5807

Analytical Laboratories

Fugro South, Inc.
1205 N. Tancahua
Corpus Christi, TX 78401
(361) 882-5411

Texas A&M University-Corpus Christi
Environmental Microbiology Laboratory
6300 Ocean Drive
Corpus Christi, Texas 78412
(361) 825-6024

Texas A&M University
College Of Geosciences
Department Of Oceanography
Technical Support Group
College Station, Texas 77843-3146
(979) 845-8385

Texas Parks and Wildlife Department
Environmental Contaminants Laboratory
505 Staples Road
San Marcos, TX 78666
(512) 353-3486

University of Texas Marine Science Institute-Port Aransas
750 Channel View Drive
Port Aransas, Texas 78373-5015
Phone (361) 749-6711

LIST OF ACRONYMS

CBBEP	**Coastal Bend Bays & Estuaries Program**
CCS	**Center for Coastal Studies**
COC	**Chain-of Custody**
CMP	**Coastal Management Program**
CRP	**Clean Rivers Program**
DQO	**Data Quality Objective**
DIMS	**Data Information Management System**
DO	**Dissolved Oxygen**
EMAP	**Environmental Monitoring and Assessment Program**
EMAP-E	**Environmental Monitoring and Assessment Program-Estuaries**
EPA	**United States Environmental Protection Agency**
FSI	**Fugro South, Inc.**
MAL	**Minimum Analytical Limit**
MDL	**Method Detection Limit**
MQO	**Measurement Quality Objective**
MDL	**Method Detection Limit**
NCAP	**National Coastal Assessment Program**
NOAA	**National Oceanic and Atmospheric Administration**
QA	**Quality Assurance**
QAO	**Quality Assurance Officer**
QAPP	**Quality Assurance Project Plan**
QAS	**Quality Assurance Specialist**
QMP	**Quality Management Plan**
ORD	**Office of Research and Development**
RCAP	**Regional Coastal Assessment Program**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
TAMU	**Texas A&M University**
TAMU-CC	**Texas A&M University – Corpus Christi**
TCEQ	**Texas Commission on Environmental Quality**
TGLO	**Texas General Land Office**
TMDL	**Total Maximum Daily Load**
TPWD	**Texas Parks and Wildlife Department**
TOC	**Total Organic Carbon**
TRACS	**Texas Regulatory and Compliance System**
TSS	**Total Suspended Solids**
ULMBB	**Upper Laguna Madre and Baffin Bay**

A4 PROJECT/TASK ORGANIZATION

The following individuals or laboratories will carry out major responsibilities for the project's activities:

CBBEP

Jim Bowman
Project Manager

As CBBEP Project Manager, is responsible for CBBEP contract management. Provides the point of contact between the CBBEP, CCS, TCEQ, and EPA to fulfill the project goals. Tracks deliverable and project progress and is responsible for submitting accurate and timely deliverables to the TCEQ and EPA. Responsible for submittal of all applicable written reports to the TCEQ and EPA.

Leo Trevino
Quality Assurance Officer

As CBBEP QAO is responsible for reviewing and approving QAPP, and any subsequent revisions or changes. Will work closely with TCEQ QA Specialist and EPA Project Officer in reviewing QAPPs and implementing CBBEP Quality Management plan. Conducts monitoring system and/or quality system audits and coordinates corrective actions, if necessary, with EPA, TCEQ, and Program Staff. Maintains QA Records that are considered central to the project. Responsible for submittal of all applicable written reports to the TCEQ and EPA.

TCEQ

Jeff Foster
Project Coordinator

Is responsible for management of the TCEQ contract. Provides the point of contact between the CBBEP and the TCEQ to fulfill the project goals. Tracks deliverable and project progress and is responsible for reviewing and approving QAPP, and any subsequent revisions or changes. Maintains TCEQ QA records of the project.

Sharon Coleman
Quality Assurance Specialist

Assists the TCEQ/CBBEP Project Coordinator in QA-related issues and is responsible for TCEQ QA oversight of CBBEP projects. Reviews the QAPP to assure projects meet stated objectives and produce reliable data and is responsible for reviewing and approving any subsequent revisions or changes to the QAPP. Notifies the TCEQ/CBBEP Project Coordinator of particular circumstances, which may adversely affect the quality of data derived from analysis of field samples. May conduct monitoring system and/or quality system audits.

Patrick Roques
Team Leader, Surface Water Quality Monitoring Program

Performs technical reviews of QAPP and provides oversight for review of data for assessment purposes.

MDM&A Data Management Staff

Serves as Monitoring Operations data management customer service representative for TCEQ program area project manager. Provides training to appropriate program area project manager to ensure proper data submittal. Reviews QAPP for valid stream monitoring stations, checks validity of parameter, program, and source codes, and ensures data will be reported following the SWQM Data Management Reference Guide, March 1999, or most recent edition. Surveys TRACS database to monitor submittal of scheduled sampling data and provides data completeness reports to TCEQ project managers as requested. Analyze TRACS database to identify Level 1 data validation inconsistencies and reports to appropriate project manager.

EPA

Betty Ashley
EPA Project Officer

Provides the point of contact between the CBBEP/TCEQ and EPA to fulfill the project goals. Tracks deliverable and project progress.

Phil Crocker
EPA Aquatic Biologist

Responsible for reviewing and approving QAPP, and any subsequent revisions or changes. Coordinates corrective actions, if necessary, with TCEQ and CBBEP Program Staff. Will work closely with EPA Project Officer and CBBEP QAO in reviewing QAPPs and implementing CBBEP Quality Management plan.

Center for Coastal Studies (CCS)

Brien A. Nicolau
Project Manager/Quality Assurance Officer

As CCS Project manager, is responsible for implementing the CBBEP requirements in the contract and in the QAPP. Coordinates activities to ensure comprehensive monitoring within the study. Identifies, receives, and maintains project quality assurance records. Responsible for overseeing field monitoring operations, sample analyses, and data processing duties. Submits accurate and timely deliverables to the CBBEP Project Manager. As CCS QAO, is responsible for implementing the quality system as defined by the contract and in the QAPP. Responsible for writing, maintaining, and distributing the QAPP and ensuring the quality of data submitted to the CBBEP. Responsible for maintaining records of QAPP distribution, including appendices and amendments.

Responsible for the validation of data prior to the submission to the CBBEP. Responsible for compiling and submitting the Final and Draft Reports to the CBBEP.

Holly Bellringer
Data Manager

Responsible for transferring data to the CCS Project Manager in standardized format as stated in the DIMS. Provides the point of contact between the CBBEP and CCS Project Manager to resolve issues related to the data. Ensures that the data management checklists are submitted with the data submitted to CBBEP.

Alex Nunez
Field Supervisor

Oversees the field personnel in conducting sampling events. Ensures that all field personnel are properly trained and equipped to conduct the necessary monitoring. Ensures that personnel, supplies, and equipment are available at all appropriate times.

Research/Field/Technical Personnel

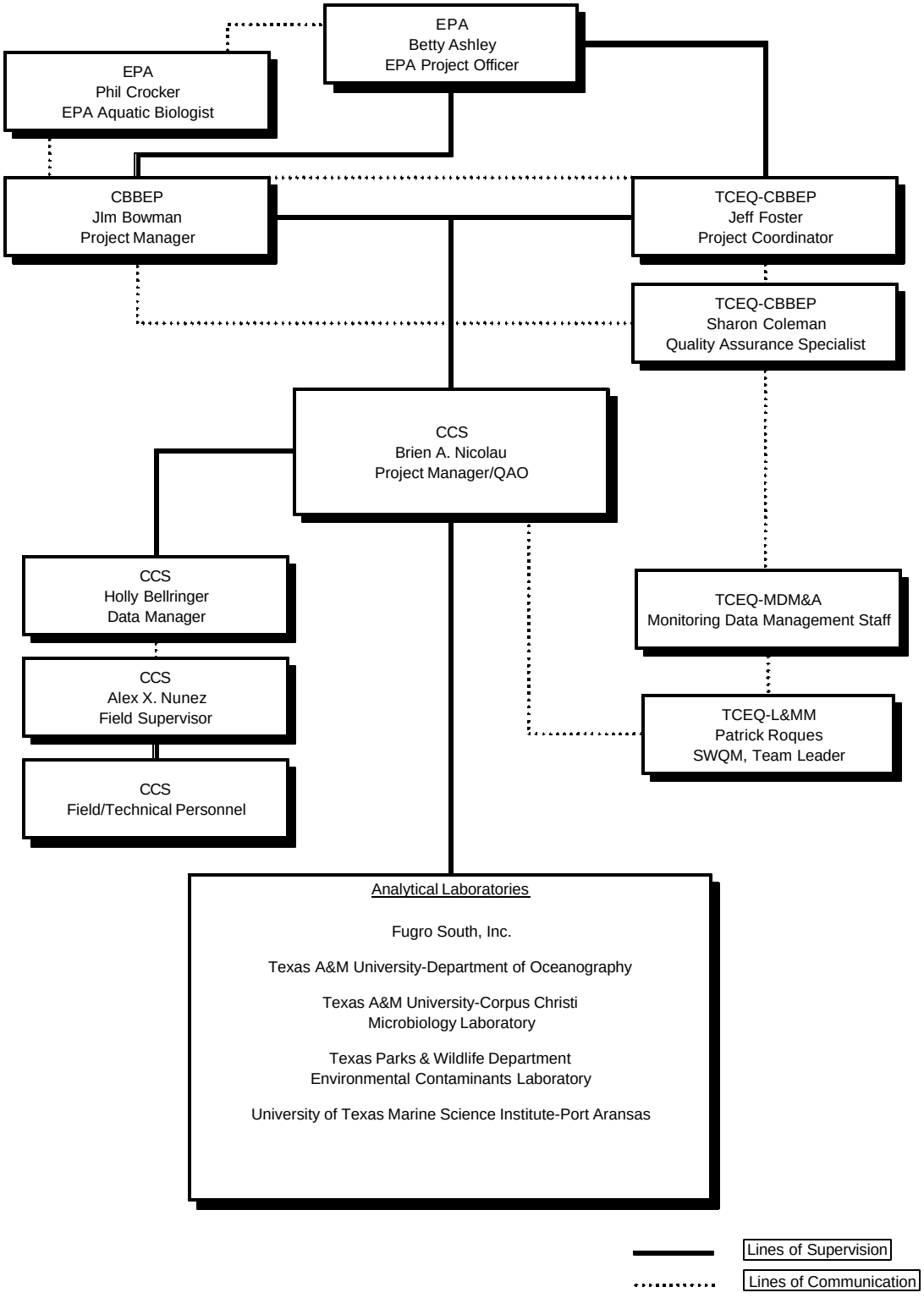
Responsible for performing field sampling, sample analyses, and data processing duties according to the project QAPP.

Analytical Laboratories

Fugro South, Inc.
Texas A&M University – Department Of Oceanography
Texas A&M University-Corpus Christi –Environmental Microbiology Laboratory
Texas Parks & Wildlife Department – Environmental Contaminants Lab
University of Texas Marine Science Institute-Port Aransas

Laboratory Directors/Managers are responsible for overseeing the laboratory sample analyses, and data processing duties related to the parameters as defined in Table A7.1 and according to guidelines included in this QAPP. Responsible for ensuring adequate training and supervision of all activities involved in generating analytical data and for all laboratory personnel having a thorough knowledge of the laboratory QAM/QAP and all SOP's specific to the analyses or task performed. Ensures analytical tests are performed in accordance with approved methods. Ensures the laboratory maintains adequate Quality Assurance/Quality Control (QA/QC) procedures during the analyses and that all results are presented in an organized manner. Responsible for oversight of all operations, ensuring requirements are met and documentation related to the analyses is completely and accurately reported. Enforces corrective action, as required. Monitors the implementation of the QA Plan within the laboratory to ensure complete compliance with QA objectives as defined by the contract and in the QAPP. Conducts in-house audits to identify potential problems and ensures compliance with written SOP's. Responsible for supervising all aspects of the QA/QC's in the laboratory and performs validation and verification of data before the report is sent to the CCS Project Manager.

Figure A.4.1. Project Organizational Chart



A5 PROBLEM DEFINITION/BACKGROUND

Background

Comprehensive understanding provides the tools required to protect, preserve, and enhance the unique estuarine and marine resources of our area. A principal component for developing this understanding is development and implementation of a sound regional water and sediment quality monitoring program consisting of the collection, analysis, and dissemination of the highest quality data. A comprehensive Regional Coastal Assessment Program (RCAP) allows the CBBEP, and communities within the program area, to interact with local, state, and federal entities in the larger goal of protecting and preserving the entire Gulf Coast environment. These interactions, established and built first at the local level, develop highly effective communication lines that provide for data sharing and improved information transfer, that ultimately fosters partnerships specifically designed to provide the means for effective coastal monitoring.

A key component in establishing the RCAP is the continued association and partnership developed with the CBBEP, TCEQ, EPA, EPA-EMAP, TGLO, Port Industries of Corpus Christi, NOAA, and stakeholders for local water and sediment quality projects conducted within the program area under approved Quality Assurance Project Plans (*Phase I and II – Surface Water Quality Monitoring and Assessment Project, Phase III – Surface Water Quality Monitoring Project, Upper Laguna Madre and Baffin Bay,* and *Bay Sediment Monitoring Project*). Development of the RCAP will require continued formation of partnerships with local, state, and federal agencies to cost-effectively produce the quality assured data required for water and sediment quality assessments in the Coastal Bend. A developing list of partners includes, but is not limited to:

United States Environmental Protection Agency
(Region 6, Gulf Ecology Division, EMAP, ORD)

Texas Parks & Wildlife Department
(Coastal Ecology, Resource Protection, Coastal Fisheries, Analytical Laboratory)

Texas Commission on Environmental Quality
(SWQM, TMDL, WQS, CRP, Houston Analytical Laboratory, Region 14)

Texas General Land Office (NOAA and the CMP-Coastal Coordination Council)

Texas A&M University-Corpus Christi Environmental Microbiology Laboratory

University of Texas Marine Science Institute-Port Aransas

City of Corpus Christi

Port of Corpus Christi Authority and Port Industries of Corpus Christi

U.S. Fish & Wildlife Service

An example of this cooperation was the relationship developed between the CCS, Texas Parks & Wildlife Department (TPWD), and the EPA Office of Research and Development (ORD) Environmental Monitoring and Assessment Program (EMAP)

Coastal 2000 Program. Discussions between agencies revealed overlaps in the FY 2001 sampling program slated to take place in the Laguna Madre in August 2001. Adaptive management strategies allowed the CCS to assist with TPWD'S responsibilities for Coastal 2000 within the Laguna Madre. Integration of the sampling programs yielded data collected by the same quality assured methods that was directly comparable, easily transferred, and significantly more detailed in scope than each program originally intended. Resource sharing, and reduced cost through collaboration, allowed additional stations to be sampled in coastal waters of the State where no sampling stations existed.

This cooperation was the primary reason for the CBBEP developing the RCAP. The RCAP will continue to sample at a minimum of 30 locations within the CBBEP area at the same time, and for the same parameters (plus additional parameters of local concern), as the EPA-EMAP National Coastal Assessment Program (NCAP), formally Coastal 2000 Program. This cooperative effort allows TPWD and EPA to sample at the 50 NCAP stations in the remaining waters of the state, thereby increasing the NCAP sampling program in the State of Texas. These extra stations will assure better coverage of the extended coastline of Texas and yield a stronger dataset for assessing coastal conditions on a local and regional level.

The EPA NCAP is a five-year effort led by EPA's Office of Research and Development (ORD) to evaluate the assessment methods it has developed to advance the science of ecosystem condition monitoring. NCAP will survey the condition of the Nation's coastal resources (estuaries and offshore waters) by creating an integrated, comprehensive coastal monitoring program among states to assess coastal ecological condition. NCAP is being organized and managed by the U.S. EPA National Health and Environmental Effects Research Laboratory's Gulf Ecology Division in Gulf Breeze, FL. The strategy for NCAP focuses on a strategic partnership with all 24 coastal states and Puerto Rico. Using a probabilistic design and a common set of survey indicators, each state will conduct the survey and assess the condition of their coastal resources, independently, yet, these estimates can be aggregated to assess conditions at the EPA Regional, biogeographical, and National levels. The first year's effort (FY 2000) involved monitoring estuarine systems in 20 coastal states and Puerto Rico; pilot studies were to be initiated in Alaska and Hawaii. In 2001, monitoring continued in most states and full-scale monitoring projects were scheduled for Alaska and Hawaii (USEPA 2001).

The purpose of NCAP is three fold: (1) to utilize the knowledge and expertise of state agencies and local scientists in implementing NCAP to uniformly assess the coastal resources of the Nation; (2) to assist the 24 coastal states and Puerto Rico in the implementation of state-wide coastal monitoring strategies, and (3) to help the states define ambient conditions for coastal waters and support the development of biocriteria in the states. Under the first year of this five-year program, the U.S. coastal states worked with EPA EMAP in implementing field and laboratory efforts to meet the first objective. This involved planning of the survey, field collection, laboratory analysis, and

information management. Ultimately, the States will be involved in the analysis of collected data to answer the following two questions:

1. What is the condition of the ecological resources in my state?
2. What stressors are associated with degradation of ecological resources in my state?

As the state data are aggregated, the same questions will be posed at regional and national levels (USEPA 2001).

The rationale of the CBBEP's continued utilization of the ORD-EMAP probability-based sampling design is to maintain continuity and compatibility with past and future monitoring assessments in determining status, extent, changes, and trends in the water quality and ecological community of the CBBEP project area with a scientifically sound monitoring plan. An EMAP sampling program is designed to determine the condition of resources, to provide information to aid in evaluation of environmental policies, and to help identify emerging environmental concerns before they become widespread problems. Designed to provide scientifically sound water quality data and a statistically powerful dataset, EMAP provides essential spatial and temporal components in the monitoring of coastal waters.

The goal of establishing an on-going monitoring program is to protect, preserve, and enhance the natural resources of our coastal environment by providing descriptive and quantitative data, develop diagnostic procedures to characterize the physical, chemical, and biological dynamics of our coastal environment, determine ecological conditions, evaluate rates and causes of possible declines within the system, and predict future conditions under various alternative water quality scenarios. It is the intent of the RCAP to sample for additional parameters, other than those prescribed in the NCAP, as the need arises to monitor the local estuarine conditions within the CBBEP region. A comprehensive RCAP addressing these goals and objectives has the unique ability to interact with most, if not all, of the other Action Plans as described in the Coastal Bend Bays Plan in an overall adaptive management structure. Therefore, the objectives of this project are to build upon the current monitoring projects and establish and implement a Regional Coastal Assessment Program that assesses the water and sediment quality of the CBBEP area while at the same time interfacing with the broader NCAP that assesses all coastal waters of the United States.

The CBBEP, TCEQ, and EPA review the QAPP to help ensure data generated for the purposes described above are scientifically valid and legally defensible. This process insures that data submitted to the SWQM section of TRACS have been collected and analyzed in a way that guarantees reliability and therefore can be used in TMDL development, permit decisions, water quality assessments, and other programs deemed appropriate. Project results will be used to support achievement of this study's goals, and CBBEP objectives.

A6 PROJECT/TASK DESCRIPTION AND SCHEDULE

Specific objectives of this project include:

1. Design and implement the RCAP for the CBBEP area incorporating all aspects of the yearly EPA-EMAP NCAP scheduled to commence sampling in August 2002 and continuing each August through 2004.

2. Address issues of local concern and provide assistance to TCEQ TMDL and SWQM programs.

Specific tasks to be accomplished represent those associated with objectives required by the CBBEP, tasks necessary to insure the quality and data reporting aspects of the project, and additional tasks currently being developed in partnerships with other agencies. These partnerships and possible funding sources will provide additional resources and data and enhance our understanding of the system. This QAPP is intended to be a living document that will be amended as various components of these plans are developed.

Specific tasks include:

Task 1. Quality Assurance Project Plan

Submit a written Quality Assurance Project Plan (QAPP) to the CBBEP Project Manager, with annual updates. Upon final review and approval by CBBEP, TCEQ, and EPA Authorized Representatives, the QAPP shall become part of this contract by reference. All project sampling, analysis, and reporting protocols will continue to meet or exceed the protocols identified in the *TCEQ Surface Water Quality Monitoring Procedures Manual 2003* (SWQMPM), the *EPA National Coastal Assessment Program* (formally Coastal 2000) *QAPP and Field Manual*, or approved alternate methods.

Task 2. Monitoring

Regional Coastal Assessment Program (RCAP)

The primary component of the RCAP will be establishment of a permanent monitoring program that continues to assess the water and sediment quality of the CBBEP area. The initial plan calls for major sampling events conducted in conjunction and cooperation with the EPA National Coastal Assessment Program (NCAP) and Texas Parks and Wildlife Department (TPWD) during the summer critical index period (July 15th through September 15th) as defined by EPA NCAP. The intent is to conduct collaborative and/or assisted sampling efforts to ensure cost effective measures for all agencies.

Conducted according to approved QAPPs, the RCAP will continue to utilize the EMAP probabilistic sampling design in the selection of monitoring locations. A minimum of thirty (30) randomly selected EMAP sites will be sampled during the critical index period thereby providing for spatial coverage of the CBBEP area (Hynes, Mesquite, Mission, Copano, St. Charles, Aransas, Redfish, Corpus Christi, Oso, and Nueces Bays, and the Upper Laguna Madre and Baffin Bay complex). In addition, the sampling design may involve selection of stations chosen to represent an area not randomly selected by EMAP protocols to ensure complete coverage.

Sampling design, development, and appropriate monitoring indicators will be selected with assistance from the EPA National Health and Environmental Effects Research Laboratory–Gulf Ecology Division located in Gulf Breeze, Florida and/or the TCEQ in Austin, Texas. Assistance provided through the developing partnership with the Gulf Ecology Division and the EMAP strategic assessment team is essential for integration of the RCAP with NCAP. Indicator development and sampling within the RCAP will be adaptive in considering other options as present and future data analysis provides insights into water and sediment quality conditions throughout the CBBEP area. The RCAP will also be flexible, so as to be responsive to possible requests from various coastal communities in providing answers to site-specific requests for sampling and analysis assistance.

Revisions to the QAPP

As this QAPP is intended to be a living document, and as portions of the QAPP may involve planning of future projects, changes will occur and revisions to the QAPP will be made. Revisions to the QAPP are necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances.

Requests for Revisions are directed from the CCS Project Manager to the CBBEP Project Manager and/or the TCEQ-CBBEP Project Coordinator in writing and are reviewed/discussed by all applicable parties involved. Any changes to the QAPP are reviewed by the CBBEP Project Manager, EPA Project Officer, TCEQ-CBBEP Project Coordinator, TCEQ-CBBEP Quality Assurance Specialist. The QAPP will be revised and re-approved, and a new signature page created. Once all parties have signed the new signature page a revised copy of the QAPP will be sent to all persons on the distribution list.

Until the work described is completed, this QAPP shall be revised as necessary and reissued annually on the anniversary date, or revised and reissued within 120 days of significant changes, whichever is sooner. The last approved versions of QAPPs shall remain in effect until revised versions have been fully approved; the revision must be

submitted to the TCEQ for approval before the last approved version has expired. If the entire QAPP is current, valid, and accurately reflects the project goals and the organization's policy, the annual re-issuance may be done by a certification that the plan is current. This can be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP.

Expedited Changes

Expedited changes to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives and methods; address deficiencies and non-conformances; improve operational efficiency; and/or accommodate unique or unanticipated circumstances. Requests for expedited changes are directed from the CCS Project Manager to the CBBEP Project Manager and/or the TCEQ-CBBEP Project Coordinator in writing. Changes are effective immediately upon approval by the CBBEB Project Manager and TCEQ Quality Assurance Specialist, or their designees. Expedited changes to the QAPP and reasons for the changes will be documented, and the CCS QAO will forward revised pages to all persons on the QAPP distribution list. Expedited changes shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process or within 120 days of the initial approval in cases of significant changes.

Table A6.1. RCAP schedule of key events

Date		Description
June/July 2004		QAPP Review, Revisions, and Approval
July 2004		RCAP EMAP sampling commences,
August 2004		RCAP EMAP sampling continues, Quarter 1 (4th Quarter FY2004) ends
September 2004		RCAP EMAP sampling ends, lab analysis commences Quarter 1 (4th Quarter FY2004) Report Due
October 2004		RCAP EMAP lab/data analysis continues
November 2004		RCAP EMAP lab/data analysis continues Quarter 2 (1st Quarter FY2005) ends
December 2004		RCAP EMAP lab/data analysis continues Quarter 2 (1st Quarter FY2005) Report Due
January 2005		RCAP EMAP lab/data analysis continues
February 2005		RCAP EMAP lab/data analysis continues Quarter 3 (2nd Quarter 2005) ends
March 2005		RCAP EMAP lab/data analysis continues Quarter 3 (2nd Quarter 2005) Report Due
April 2005		RCAP EMAP lab/data analysis continues
May 2005		Draft Report writing for all projects Quarter 4 (3rd Quarter FY2005) ends
June 2005		Draft Final Report submitted Quarter 4 (3rd Quarter FY2005) Report Due
July 2005		Final Report Comments addressed, writing continues
August 2005		Final Report and Data Submitted

A7 QUALITY OBJECTIVES AND CRITERIA

The primary focus of the CBBEP RCAP is directly related to the NCAP and a majority of the following section is taken from the NCAP–QAPP (USEPA 2001). It is directly implied that NCAP and RCAP are synonymous as it relates to the one-time summer "critical" index period (July 15th to September 15th) sampling event as defined by EPA. Other portions of the RCAP, as developed, may or may not state different objectives. However, if stated, the necessary information will be documented in the QAPP.

EPA has established the NCAP to monitor and document a set of environmental indicators to estimate the ecological condition of the coastal resources of Texas and the coastal regions of the United States; secondarily, NCAP is expected to serve as a proving ground to develop research indicators; and finally, NCAP is expected to serve as a proving ground to demonstrate the utility of this approach. These aspects do not coincide all that well with the format of typical research programs designed to answer more singular, focused questions. Therefore, for NCAP and RCAP project Data Quality Objectives (DQOs), alone, are not adequate to gauge the effectiveness of quality control for the component activities.

As with the EMAP-Estuaries (EMAP-E) quality program, the project's emphasis is directed to measurements, therefore, a more appropriate mechanism is to establish quality goals for the individual measurements, or measurement quality objectives (MQOs). Still, there needs to be some unifying level of acceptable uncertainty for the project as a whole in order to define the individual MQOs. NCAP has established target DQOs, based on inference drawn from management's 12 years of experience with EMAP-E. These preliminary DQOs should be considered as a starting point of an iterative process and, therefore, do not necessarily constitute definite rules for accepting or rejecting results, but rather provide guidelines for continued improvement. NCAP has established DQOs for status estimates. The target DQO for estimates of current status for indicators of condition is as follows:

"For each indicator of condition, estimate the portion of the resource in degraded condition within ±10% for the overall system and ±10% for sub-regions (i.e., states) with 90% confidence based on a completed sampling regime."

Measurement quality objectives for the various measurements made in RCAP and NCAP (both field and laboratory) can be expressed in terms of accuracy, precision, and completeness goals (Table A7.1). These MQOs were established by obtaining estimates of the most likely data quality that is achievable based either on the instrument manufacturer's specifications, scientific experience, or historical data. The MQOs presented in Table A7.1 are used as quality control criteria both for field and laboratory measurement processes to set the bounds of acceptable measurement error.

Generally speaking, DQOs or MQOs are usually established for five aspects of data quality: representativeness, completeness, comparability, accuracy, and precision

(Stanley and Vener 1985). These terms are described in the context of their application within the RCAP and NCAP to establish MQOs for each quality assurance parameter. The relative sensitivity of an analytical method, based on the combined factors of instrument signal, sample size, and sample processing steps, must be documented in order to make a definitive statement regarding detection of an analyte at low levels - for a specific analytical method, what is the lowest concentration at which an analyte's presence can be assured above background noise? For NCAP, this question is answered by calculating Method Detection Limits (MDLs) for each type of analysis. See NCAP–QAPP (USEPA 2001) Section 5.3.2 of Appendix A for a full discussion on determining MDLs. Table A7.1 lists the target MDLs for most analyses to be conducted with NCAP and RCAP samples. Laboratories will be expected to perform in general accord with these target MDLs.

Representativeness

The concept of representativeness, within the context of the NCAP and RCAP, refers to the ability of the project to accurately, and precisely, characterize the estuarine phenomena along the U.S. Coastline and thereby the CBBEP region through the measurement of selected environmental indicators. An unbiased sampling design that includes a sufficient number of sampling sites is required to make statistically sound determinations on a system-wide basis; both spatial and temporal aspects of sampling must be considered.

For NCAP and RCAP, a probability-based sampling approach (similar to that developed for EMAP) will be employed; the density of stations (a minimum of 30 within the CBBEP region and at least 50 per state and other special study areas with 100 or more sites) is statistically robust and ensures >90% confidence that the sampling design is representative of estuarine systems, both on regional and national scales. Temporal variation may be evaluated by continued monitoring in following years by the states or entities that elect to do so. The data quality attribute of representativeness applies not only to the overall sampling design, but also to individual measurements and samples obtained in the course of the monitoring effort.

The following examples are illustrations of sample-related factors that might affect the representativeness of the study: the integrity of the sample through periods of storage must be maintained if the sample is to be regarded as representative of the conditions at the time of sampling; the use of QA/QC samples which are similar in composition to the samples being measured to provide estimates of precision and bias that are representative of the sample measurement; and that the samples are collected in an appropriate manner by gear that is specific and standardized for the study.

Completeness

Completeness is defined as "a measure of the amount of data collected from measurement process compared to the amount that was expected to be obtained under the conditions of measurement" (Stanley and Vener 1985). NCAP and RCAP have

established a completeness goal of 100% for the various indicators being measured. Given the probability based design employed by EMAP projects, failure to achieve this goal will not preclude the within-year or between-year assessment of ecosystem condition. The major consequence of having less than 100% complete data from all expected stations is a relatively minor loss of statistical power in the areal estimate of condition, as depicted using Cumulative Distribution Functions (CDFs).

The 100% completeness goal is established in an attempt to derive maximum statistical power from the present sampling design. Based on past years' experience, failure to achieve this goal usually results from the field crew's inability to sample at some stations because of logistical barriers, such as insufficient depth, impenetrable substrate, or adverse weather conditions. In the limited number of instances where these may be encountered, extensive efforts will be made to relocate the station or re-sample the station at a later date, always in consultation with program managers. In this way, field personnel must always strive to achieve the 100% completeness goal. In addition, established protocols for tracking samples during shipment and laboratory processing must be followed to minimize data loss following successful sample collection.

Comparability

Comparability is defined as "the confidence with which one data set can be compared to another" (Stanley and Vener 1985). For NCAP/RCAP to be effective, the data generated must, first, be comparable within an individual state or region (i.e., the results for each station sampled within a state or region must be of uniform quality), and, second, be comparable to that from the other state partners and regions participating in the coastal monitoring (in effect, comparable to EMAP-E data). If the NCAP is to realize its goals, the comparability of field and laboratory procedures, reporting units and calculations, detection limits, and database management processes must all be maintained on the two levels described above.

To help ensure and document data comparability, NCAP will utilize various data quality indicators (e.g., performance demonstrations, reference materials, and other QC samples) in conjunction with uniform, standard methods. In addition, inter-laboratory calibration exercises will be conducted for certain indicators (e.g., benthic community structure or analytical chemistry) to help evaluate the degree of variability that exist between independent processing laboratories. Data comparability produced is predetermined by the staff commitment to use only approved procedures as described in this QAPP, or Table B5-3 of the NCAP–QAPP (USEPA 2001), and by reporting data in standardized units, using acceptable rules for rounding figures, and using the format for reporting data as specified in the Data Management Plan in Appendix D.

Accuracy and Precision

The term “accuracy” which is used synonymously with the term “bias” in this plan, is defined as the difference between a measured value and the true or expected value, and represents an estimate of systematic error or net bias (Kirchner 1983; Hunt and Wilson 1986). “Precision” is defined as the degree of mutual agreement among individual measurements, and represents an estimate of random error (Kirchner 1983; Hunt and Wilson 1986).

Collectively, accuracy and precision can provide an estimate of the total error or uncertainty associated with an individual measured value. Measurement quality objectives (MQOs) for the various indicators are expressed separately as maximum allowable accuracy and precision goals (Table A7.1). Accuracy and precision goals may not be definable for all parameters because of the nature of the measurement type. For example, accuracy measurements are not possible for fish pathology identifications because “true” or expected values do not exist for this measurement parameter (see Table A7.1). In order to evaluate the MQOs for precision, various/QC samples will be collected and analyzed for most data collection activities.

Table A7.2 presents a list of types of samples to be used for quality assurance/quality control for each of the various data acquisition activities except sediment and fish tissue contaminant analyses (see NCAP–QAPP USEPA 2001 Appendix A). The frequency of QA/QC measurements and the types of QA data resulting from these samples or processes are also presented in Table A7.2. Because several different types of QA/QC are required for the complex analyses of chemical contaminants in environmental samples, they are presented and discussed separately in the NCAP–QAPP (USEPA 2001) Appendix A along with presentation of warning and control limits for the various chemistry QC sample types.

Table A7.1. Measurement quality objectives for EMAP-NCAP and CBBEP RCAP monitoring indicators. Units in parentheses indicate reporting units for different agencies. Accuracy (bias) is expressed either as absolute difference (± value) or percent deviation from the "true" value; precision is expressed as relative percent difference (RPD) or relative standard deviation (RSD) between two or more replicate measurements. **Parameter Codes not listed will be applied for and no data will be submitted to TCEQ without a valid Parameter Code**.

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
WATER COLUMN/FIELD PARAMETERS									
Total Depth	Meters	Water	Field	82903	NA	± 0.5 m	10%	Field	RCAP NCAP
Depth Sample Collected	Meters	Water	Field	13850	NA	± 0.5 m	10%	Field	RCAP
Water Temperature	°C	Water	Field	00010	NA	± 1.0°C	10%	Field	RCAP NCAP
Dissolved Oxygen	mg/L	Water	Field	00300	NA	± 0.5 mg/L	10%	Field	RCAP NCAP
Dissolved Oxygen	% Saturation	Water	Field	00301	NA	± 5.0%	10%	Field	RCAP
Conductivity	FS/cm	Water	Field	00094	NA	± 5.0%	10%	Field	RCAP
Salinity	ppt (psu)	Water	Field	00480	NA	± 1.0 psu	10%	Field	RCAP NCAP
pH	p.u.	Water	Field	00400	NA	± 0.3 units	10%	Field	RCAP NCAP
Water Color	1=Brown, 2=Reddish, 3=Green, 4=Black, 5=Clear, 6=Other	Water	Field	89969	NA	NA	NA	Field	RCAP NCAP
Water Odor	1=Sewage, 2=Oily/Chemical, 3=Rotten Eggs, 4=Musky, 5=Fishy, 6=None, 7=Other	Water	Field	89971	NA	NA	NA	Field	RCAP
Water Surface	1=Calm, 2=Ripples, 3=Waves, 4=White Caps	Water	Field	89968	NA	NA	NA	Field	RCAP
Tide Stage	1=Low, 2=Falling, 3=Slack, 4=Rising, 5=High	Water	Field	89972	NA	NA	NA	Field	RCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Turbidity	1=Low, 2=Medium, 3=High	Water	Field	88842	NA	NA	NA	Field	RCAP
Turbidity	NTU	Water	Field	82078	NA	± 5.0 %	10%	Field	RCAP
Secchi Depth	Meters	Water	Field	00078	NA	± 0.05	10%	Field	RCAP NCAP
Transmittance	%	Water	Field		NA	NA	10%	Field	RCAP NCAP
PAR – Terrestrial	Fmol s^{-1} m^{-2}	Water	Field		3FA	± 5.0	10%	Field	RCAP NCAP
PAR – Flat Cosine	Fmol s^{-1} m^{-2}	Water	Field		3FA	± 5.0	10%	Field	RCAP NCAP
PAR –- Spherical	Fmol s^{-1} m^{-2}	Water	Field		3FA	± 5.0	10%	Field	RCAP NCAP
Seagrass Percent Cover	%	Water	Field		NA	NA	NA	Field	RCAP
Air Temperature	°C	Air	Field	00020	NA	± 1.0°C	10%	Field	RCAP
Present Weather	1=Clear (0 to 25%), 2=Cloudy (25 to 99%), 3=Overcast (100%), 4=Rain	Air	Field	89966	NA	NA	NA	Field	RCAP
Cloud Cover	%	Air	Field		NA	NA	NA	Field	RCAP
Wind Intensity	1=Calm (0 MPH), 2=Slight (1-7 MPH), 3=Moderate (8-18 MPH), 4=Strong (19+ MPH)	Air	Field	89965	NA	NA	NA	Field	RCAP
Wind Speed	MPH	Air	Field		NA	± 3.0 %	10%	Field	RCAP
Wind Direction	1=N, 2=S, 3=E, 4=W, 5=NE, 6=SE, 7=NW, 8=SW	Air	Field	89010	NA	NA	NA	Field	RCAP
Barometric Pressure	mm/Hg	Air	Field		NA	± 3.0 mm	10%	Field	RCAP
Relative Humidity	%	Air	Field		NA	± 3.0 %	10%	Field	RCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Wind Chill	°C	Air	Field		NA	± 1.0°C	10%	Field	RCAP
Heat Index	°C	Air	Field		NA	± 1.0°C	10%	Field	RCAP
Dew Point	°C	Air	Field		NA	± 1.0°C	10%	Field	RCAP
Days Since Last Rainfall	Days	NA	Field	72053	NA	NA	NA	Field	RCAP
Rainfall (Inches past 1 day)	Inches	Water	Field	82553	NA	NA	NA	Field	RCAP
Rainfall (Inches past 7days)	Inches	Water	Field	82554	NA	NA	NA	Field	RCAP
WATER QUALITY PARAMETERS									
Chlorophyll-*a* (Field Filtered)	Fg/l; ppb	Water	UTMSI SOP	32211	0.0002	10%	30%	UTMSI	RCAP NCAP
Ammonium (NH_4^+)-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00608	0.005	10%	30%	TAMU	RCAP NCAP
Nitrite (NO_2)-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00613	0.005	10%	30%	TAMU	RCAP NCAP
Nitrate (NO_3)-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00618	0.005	10%	30%	TAMU	RCAP NCAP
Nitrite/Nitrate (NO_2/NO_3)-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00631	0.005	10%	30%	TAMU	RCAP NCAP
Ortho-Phosphorus ($HPO4^{2+}$)-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00671	0.002	10%	30%	TAMU	RCAP NCAP
Silicate ($HSlO_3^-$)-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP		0.014	10%	30%	TAMU	RCAP
Urea-Dissolved (Field Filtered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP		0.012	10%	30%	TAMU	RCAP
Ammonium (NH_4^+)-Total (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00610	0.005	10%	30%	TAMU	RCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Nitrite (NO_2)-Total (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00615	0.005	10%	30%	TAMU	RCAP
Nitrate (NO_3)-Total (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00620	0.005	10%	30%	TAMU	RCAP
Nitrite/Nitrate (NO_2/NO_3)-Total (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP	00630	0.005	10%	30%	TAMU	RCAP
Nitrogen, (N)-Total (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	EPA 365.3	00600		10%	30%	TAMU	RCAP NCAP
Phosphorus (P) -Total (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	EPA 365.3	00665		10%	30%	TAMU	RCAP NCAP
Silicate ($HSIO_3^-$)-Dissolved (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP		0.014	10%	30%	TAMU	RCAP
Urea-Dissolved (Unfiltered)	Fg/l; ppb (mg/l; ppm)	Water	TAMU SOP		0.012	10%	30%	TAMU	RCAP
TSS	mg/l; ppm	Water	EPA 160.2	00530	2.0	10%	30%	FSI	RCAP NCAP
INORGANICS – Sediment Trace Metals									
Aluminum	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.7	01108	1500	20%	30%	TPWD ECL	RCAP NCAP
Antimony	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01098	0.2	20%	30%	TPWD ECL	RCAP NCAP
Arsenic	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01003	1.5	20%	30%	TPWD ECL	RCAP NCAP
Cadmium	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01028	0.05	20%	30%	TPWD ECL	RCAP NCA P
Chromium	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.7	01029	5.0	20%	30%	TPWD ECL	RCAP NCAP
Copper	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.7	01043	5.0	20%	30%	TPWD ECL	RCAP NCAP
Iron	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.7	01170	500	20%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Lead	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01052	1.0	20%	30%	TPWD ECL	RCAP NCAP
Manganese	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.7	01053	1.0	20%	30%	TPWD ECL	RCAP NCAP
Mercury	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 245.5	71921	.01	20%	30%	TPWD ECL	RCAP NCAP
Nickel	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01068	1.0	20%	30%	TPWD ECL	RCAP NCAP
Selenium	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01148	0.1	20%	30%	TPWD ECL	RCAP NCAP
Silver	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9	01078	0.05	20%	30%	TPWD ECL	RCAP NCAP
Tin	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.9		0.1	20%	30%	TPWD ECL	RCAP NCAP
Zinc	Fg/g dry wt.; ppm (mg/kg dry wt.; ppm)	Sediment	EPA 200.7	01093	2.0	20%	30%	TPWD ECL	RCAP NCAP
INORGANICS – Fish & Shellfish Tissue Trace Metals									
Aluminum	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.11	81666	10.0	20%	30%	TPWD ECL	RCAP NCAP
Arsenic	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	01004	2.0	20%	30%	TPWD ECL	RCAP NCAP
Cadmium	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	71940	0.2	20%	30%	TPWD ECL	RCAP NCAP
Chromium	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	71939	0.1	20%	30%	TPWD ECL	RCAP NCAP
Copper	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.11	71937	5.0	20%	30%	TPWD ECL	RCAP NCAP
Iron	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.11		50.0	20%	30%	TPWD ECL	RCAP NCAP
Lead	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	71936	0.1	20%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Mercury	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 245.6	71930	0.01	20%	30%	TPWD ECL	RCAP NCAP
Nickel	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	01069	0.5	20%	30%	TPWD ECL	RCAP NCAP
Selenium	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	01149	1.0	20%	30%	TPWD ECL	RCAP NCAP
Silver	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	34474	0.05	20%	30%	TPWD ECL	RCAP NCAP
Tin	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.9	81663	0.05	20%	30%	TPWD ECL	RCAP NCAP
Zinc	Fg/g wet wt.; ppm (mg/kg wet wt.; ppm)	Tissue	EPA 200.11	71938	50.0	20%	30%	TPWD ECL	RCAP NCAP
ORGANICS – Sediment PAHs (Polynuclear Aromatic Hydrocarbons)									
Acenaphthene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34208	10.0	35%	30%	TPWD ECL	RCAP NCAP
Anthracene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34223	10.0	35%	30%	TPWD ECL	RCAP NCAP
Benz(a)anthracene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34529	10.0	35%	30%	TPWD ECL	RCAP NCAP
Benzo(a)pyrene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34250	10.0	35%	30%	TPWD ECL	RCAP NCAP
Biphenyl	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
Chrysene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34323	10.0	35%	30%	TPWD ECL	RCAP NCAP
Dibenz(a,h)anthracene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34559	10.0	35%	30%	TPWD ECL	RCAP NCAP
Dibenzothiophene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
2,6-dimethylnaphthalene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Fluoranthene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34379	10.0	35%	30%	TPWD ECL	RCAP NCAP
Fluorene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34384	10.0	35%	30%	TPWD ECL	RCAP NCAP
2-methylnaphthalene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
1-methylnaphthalene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
1-methylphenanthrene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
2,6-dimethylnaphtalene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
Naphthalene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34445	10.0	35%	30%	TPWD ECL	RCAP NCAP
Pyrene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34472	10.0	35%	30%	TPWD ECL	RCAP NCAP
Benzo(b)fluoranthene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34233	10.0	35%	30%	TPWD ECL	RCAP NCAP
Acenaphthylene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34203	10.0	35%	30%	TPWD ECL	RCAP NCAP
Benzo(k)fluoranthene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34245	10.0	35%	30%	TPWD ECL	RCAP NCAP
Benzo(g,h,i)perylene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34524	10.0	35%	30%	TPWD ECL	RCAP NCAP
Indeno(1,2,3-c,d)pyrene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]	34406	10.0	35%	30%	TPWD ECL	RCAP NCAP
2,3,5-trimethylnaphthalene	Fg/g dry wt.; ppm (Fg/kg dry wt.; ppb)	Sediment	TPWD SOP 215[3,4]		10.0	35%	30%	TPWD ECL	RCAP NCAP
ORGANICS – Sediment PCB Congeners									
2,4'-dichlorobiphenyl PCB No. 8	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
2,2',5-trichlorobiphenyl PCB No. 18	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,4,4'-trichlorobiphenyl PCB No. 28	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,5'-tetrachlorobiphenyl PCB No. 44	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',5,5'-tetrachlorobiphenyl PCB No. 52	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,3',4,4'-tetrachlorobiphenyl PCB No. 66	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',4,5,5'-pentachlorobiphenyl PCB No. 101	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,3,3',4,4'-pentachlorobiphenyl PCB No. 105	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,3,3',4',6-pentachlorobiphenyl PCB No. 101/77	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
3,3',4,4'-tetrachlorobiphenyl PCB No.	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,3',4,4',5-pentachlorobiphenyl PCB No. 118	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
3,3',4,4',5-pentachlorobiphenyl PCB No. 126	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4'-hexachlorobiphenyl PCB No. 128	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,4,4',5'-hexachlorobiphenyl PCB No. 138	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',4,4',5,5'-hexachlorobiphenyl PCB No. 153	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4',5-heptachlorobiphenyl PCB No. 170	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,4,4',5,5'-heptachlorobiphenyl PCB No. 180	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
2,2',3,4',5,5',6-heptachlorobiphenyl PCB No. 187	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4',5,6-octachlorobiphenyl PCB No. 195	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl PCB No. 206	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,2'3,3',4,4',5,5',6,6'-decachlorobiphenyl PCB No. 209	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
ORGANICS – Sediment DDT and its metabolites									
2,4'-DDD	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
4,4'-DDD	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,4'-DDE	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
4,4'-DDE	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
2,4'-DDT	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
4,4'-DDT	ng/g; ppb (dry wt.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
ORGANICS – Chlorinated pesticides other then DDT									
Aldrin	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39333	1.0	35%	30%	TPWD ECL	RCAP NCAP
Alpha-Chlordane	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
Dieldrin	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39383	1.0	35%	30%	TPWD ECL	RCAP NCAP
Endosulfan I	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39389	1.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Endosulfan sulfate	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	34354	1.0	35%	30%	TPWD ECL	RCAP NCAP
Endrin	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39393	1.0	35%	30%	TPWD ECL	RCAP NCAP
Heptachlor	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39413	1.0	35%	30%	TPWD ECL	RCAP NCAP
Heptachlor epoxide	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39423	1.0	35%	30%	TPWD ECL	RCAP NCAP
Hexachlorobenzene	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39701	1.0	35%	30%	TPWD ECL	RCAP NCAP
Lindane (gamma-BHC)	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39783	1.0	35%	30%	TPWD ECL	RCAP NCAP
Mirex	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	79800	1.0	35%	30%	TPWD ECL	RCAP NCAP
Toxaphene	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]	39403	1.0	35%	30%	TPWD ECL	RCAP NCAP
Trans-Nonachlor	ng/g dry wt; ppb (Fg/kg dry wt.; ppb.)	Sediment	TPWD SOP 215[3,4]		1.0	35%	30%	TPWD ECL	RCAP NCAP
Total Organic Carbon	mg/kg	Sediment	EPA 9060	81951	0.1	10%	10%	FSI	RCAP NCAP
ORGANICS – Fish & Shellfish Tissue PCB Congeners									
2,4'-dichlorobiphenyl PCB No. 8	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',5-trichlorobiphenyl PCB No. 18	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,4,4'-trichlorobiphenyl PCB No. 28	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,5'-tetrachlorobiphenyl PCB No. 44	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',5,5'-tetrachlorobiphenyl PCB No. 52	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
2,3',4,4'-tetrachlorobiphenyl PCB No. 66	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',4,5,5'-pentachlorobiphenyl PCB No. 101	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,3,3',4,4'-pentachlorobiphenyl PCB No. 105	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,3,3',4',6-pentachlorobiphenyl PCB No. 101/77	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
3,3',4,4'-tetrachlorobiphenyl PCB No.	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,3',4,4',5-pentachlorobiphenyl PCB No. 118	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
3,3',4,4',5-pentachlorobiphenyl PCB No. 126	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4'-hexachlorobiphenyl PCB No. 128	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,4,4',5'-hexachlorobiphenyl PCB No. 138	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',4,4',5,5'-hexachlorobiphenyl PCB No. 153	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4',5-heptachlorobiphenyl PCB No. 170	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,4,4',5,5'-heptachlorobiphenyl PCB No. 180	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,4',5,5',6-heptachlorobiphenyl PCB No. 187	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4',5,6-octachlorobiphenyl PCB No. 195	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl PCB No. 206	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,2'3,3',4,4',5,5',6,6'-decachlorobiphenyl PCB No. 209	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
ORGANICS – Fish & Shellfish Tissue DDT and its metabolites									
2,4'-DDD	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
4,4'-DDD	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,4'-DDE	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
4,4'-DDE	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
2,4'-DDT	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
4,4'-DDT	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
ORGANICS – Fish & Shellfish Tissue Chlorinated pesticides other then DDT									
Aldrin	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	34680	2.0	35%	30%	TPWD ECL	RCAP NCAP
Alpha-Chlordane	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
Dieldrin	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	39406	2.0	35%	30%	TPWD ECL	RCAP NCAP
Endosulfan	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	81759	2.0	35%	30%	TPWD ECL	RCAP NCAP
Endrin	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	34685	2.0	35%	30%	TPWD ECL	RCAP NCAP
Heptachlor	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	34687	2.0	35%	30%	TPWD ECL	RCAP NCAP
Heptachlor epoxide	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	34686	2.0	35%	30%	TPWD ECL	RCAP NCAP
Hexachlorobenzene	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	34688	2.0	35%	30%	TPWD ECL	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
Lindane (gamma-BHC)	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	39785	2.0	35%	30%	TPWD ECL	RCAP NCAP
Mirex	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	81645	2.0	35%	30%	TPWD ECL	RCAP NCAP
Toxaphene	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]	34691	2.0	35%	30%	TPWD ECL	RCAP NCAP
Trans-Nonachlor	ng/g; wet wt.; ppb (mg/kg wet wt.; ppm)	Tissue	TPWD SOP 215[3,5]		2.0	35%	30%	TPWD ECL	RCAP NCAP
SEDIMENT GRAIN SIZE									
SGS Clay <0.0039 mm	% dry wt	Sediment	ASTM D422	82009	NA	NA	10%	FSI	RCAP NCAP
SGS Silt 0.0039 to 0.0625 mm	% dry wt	Sediment	ASTM D422	82008	NA	NA	10%	FSI	RCAP NCAP
SGS Sand 0.0625 to 2.0 mm	% dry wt	Sediment	ASTM D422	89991	NA	NA	10%	FSI	RCAP NCAP
SGS Gravel >2.0 mm	% dry wt	Sediment	ASTM D422	80256	NA	NA	10%	FSI	RCAP NCAP
SEDIMENT TOXICITY [6]									
Sediment Toxicity	%	Sediment	ASTM E136799		NA	NA	NA	**CCS**	RCAP NCAP
BENTHIC SPECIES COMPOSITION									
Sorting	Number of vials	Sediment	CCS SOP	NA	NA	10%	NA	CCS	RCAP NCAP
Counting	Integer	Sediment	CCS SOP	NA	NA	10%	NA	CCS	RCAP NCAP
Biomass	mg (Dry wt.)	Sediment	CCS SOP	90068	0.0001	10%	NA	CCS	RCAP
Taxonomy	Classification	Sediment	CCS SOP	Species Specific	NA	10%	NA	CCS	RCAP NCAP

Indicator/Data Type	Units	Matrix	Method	Parameter Code[1]	MDL[2]	Maximum Allowable Accuracy Goal	Maximum Allowable Precision Goal	Lab Analysis	Monitoring Program
FISH COMMUNITY COMPOSITION									
Counting	Integer	Water	TPWD SOP	NA	NA	10%	NA	TPWD CF	RCAP NCAP
Taxonomy	Classification	Water	TPWD SOP	Species Specific	NA	10%	NA	TPWD CF	RCAP NCAP
Gross Pathology	Various	Tissue	TPWD SOP	Species Specific	NA	NA	10%	TPWD CF	RCAP NCAP
MICROBIOLOGICAL									
Enterococci	CFU/100ml	Water	EPA 1600	31649	1	10%	10%	TAMUCC	RCAP

Notes:

1. The CCS project manager, in cooperation with TCEQ staff, will ensure that the necessary Parameter Codes are obtained before submitting data to TRACS.
2. Per requirements of the EPA NCAP-QAPP the Method Detection Limit (MDL) will be used for parameters analyzed. Data reported to TCEQ will comply with ambient water reporting limit (AWRL) quantitation requirements if possible.
3. TPWD GCQ Ion Trap Operating Procedure SOP 215 is performance based and is an in-house method published in Pesticides and Wildlife ACS Symposium Series 771.
4. TPWD uses an Accelerated Solvent Extraction method (TPWD 119.0) for Sediment based on EPA 3545
5. TPWD uses an Accelerated Solvent Extraction method (TPWD 118.0) for Tissue based on EPA 3545
6. Toxicity tests are to be conducted in accordance with the standard method described in "Section 2: Sediment Toxicity Test Method" of the EMAP Laboratory Methods Manual Volume 1 (USEPA, 1995); these protocols are based on American Society for Testing and Materials (ASTM E136799 (ASTM, 2002).
7. While the RCAP is providing additional funding and will also receive the data from this sampling activity the CCS RCAP Field Team will not be doing the sampling. This is an integral aspect of the NCAP and the TPWD-Coastal Fisheries branch has conducted the sampling in Texas since August 2000. The information provided is for documentation purposes only since the CBBEP will receive the data collected.

Table A7.2. Quality assurance sample types, frequency of use, and types of core data generated for NCAP/RCAP (see Table 5-4 in the NCAP—QAPP for chemical analysis QA/QC sample types).

Variable	QA Sample Type or Measurement Procedure	Frequency of Use	Data Generated for Measurement Quality Definition
Water Quality Parameters (YSI or Hydrolab**)**			
Dissolved oxygen (DO)	Water-saturated air calibration	Daily	Difference between probe value and saturation level
DO	Air-saturated water measurement	Weekly	Difference between probe value and saturation level
Salinity	Seawater standard (secondary standard)	Daily	Difference between probe measurement and standard value
pH	QC check with standard buffers (7 & 10)	Daily	Difference between probe and standards
Temperature	QC check against standard thermometer	Daily	Difference between probe and thermometer
Depth	QC check against depth markings on meter stick	Per use	Difference between probe measurement and standard marks on meter stick
Nutrients			
N-species	Standards and duplicates	Per batch	Relative accuracy and precision
P-species	Standards and duplicates	Per batch	Relative accuracy and precision
Chlorophyll *a*	Standards and duplicates	Per batch	Relative accuracy and precision
Total Suspended Solids (TSS)	Duplicates	Per batch	Precision

Table A7.2. (continued).

Variable	QA Sample Type or Measurement Procedure	Frequency of Use	Data Generated for Measurement Quality Definition
Sediment Toxicity Tests	Reference toxicant	Each experiment	Variance of replicated over time
Sediment Grain Size (% silt/clay)	Splits of a sample	10% of each tech's work	Duplicate results
Total Organic Carbon (TOC)	Duplicates and analysis of standards	Each batch	Duplicate results and standard recoveries
Benthic Species Composition			
Sorting	Resort of sample	10% of each tech's work	Number of animals found in re-sort
Sample counting and ID	Recount and ID of sorted animals	10% of each tech's work	Number of count and ID errors
Microbiological (Bacteria)	Standards and duplicates	Per batch	Relative accuracy and precision
Fish Identifications	Voucher collection verified by taxonomist	Per species	Number of mis IDs
Fish Gross Pathologies	Specimens preserved for confirmation	Per occurrence	Number of confirmations

A8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATIONS

All field crews participating in the RCAP/NCAP Monitoring have demonstrated team proficiency in each component of field sampling and data collection through their involvement with the CBBEP projects mentioned in Section A5-Background and through the assistance provided by the same field crews to TPWD/EPA in the NCAP August 2001 sampling event. Therefore no additional special training or certifications are required for this project.

A9 DOCUMENTS AND RECORDS

Documents that describe, specify, report, or certify activities performed in this QAPP are listed in Table A9.1. The NCAP–QAPP (USEPA 2001) provides an extensive Document and Records section. While the RCAP will follow all conditions set forth in that QAPP, the format may differ slightly to accommodate the RCAP. Differences may occur due to the additional RCAP sampling parameters and events not performed in the NCAP.

Table A9.1. Documentation Records

Document/Record	Location	Retention Time	Form
QAPP, amendments, and appendices	CBBEP/CCS	Permanently	Paper
QAPP distribution documentation	CCS	Permanently	Paper
Field notebooks or field data sheet	CCS	Permanently	Paper
Field equipment calibration and maintenance logs	CCS	Permanently	Paper
Chain of custody records	CCS	Permanently	Paper
Field SOPs	CCS	Permanently	Paper
Laboratory QA Manuals	CCS Individual Labs	Permanently 5 year minimum	Paper
Laboratory SOPs	CCS Individual Labs	Permanently 5 year minimum	Paper
Laboratory data reports	CCS Individual Labs	Permanently 5 year minimum	Paper
Laboratory equipment Maintenance logs	Individual Labs	5 year minimum	Paper
Laboratory calibration records	Individual Labs	5 year minimum	Paper
Corrective Action Documentation	CBBEP/CCS Individual Labs	Permanently 5 year minimum	Paper

The Laboratory Manager of all contract laboratories, and the CCS Project Manager will retain copies of all documentation, raw data, and calibration data that are applicable. After QC validation, a narrative report describing analytical anomalies, which could affect data interpretation, along with a summary of field, laboratory, and QA samples will be submitted to the CCS Project Manager for use in the final report. When required, a cover letter will reference specific data if an explanation of reported values is prepared. All laboratory reports will be signed and transmitted by the Laboratory Manager to the CCS Project Manager. Targeted turnaround time for laboratory data is 180 working days. The CCS Project Manager will retain custody of all project records for perpetuity except laboratory calibration and equipment maintenance records, which will remain with the laboratories. Data transfer from handwritten to computer will be handled as described in Appendix D of this QAPP.

B1 SAMPLING PROCESS DESIGN (Experimental Design)

NCAP is a large-scale, comprehensive environmental monitoring strategy designed to provide regional characterization of the Nation's coastal resources (estuaries and offshore waters) by creating an integrated, comprehensive coastal monitoring program among the coastal states to access coastal ecological condition. The strategy for NCAP focuses on a strategic partnership with all 24 coastal states. The overall design for the program is based on EPA-EMAPs sampling approach that uses Geographic Information System (GIS) technology to probabilistically generate sampling locations (Bourgeois et al 1998). There are three basic phases to EMAPs NCAP: field collection of environmental data and samples; laboratory analyses of samples; and data analysis and assessment. In addition there exists the need within the CBBEP region to sample for additional parameters deemed necessary to accurately characterize the local coastal ecological condition.

Sampling Design Rationale

Sampling design for the RCAP is based on providing scientifically sound, statistical data to identify significant long-term water and sediment quality trends, to characterize water and sediment quality conditions, and to support the TMDL process. Based on Stakeholder workgroup input, achievable water and sediment quality objectives, priorities, and the identification of water and sediment quality concerns were used to develop the work plan, which is in agreement with available resources. As part of the original stakeholder workgroup process, the CBBEP coordinated closely with the TCEQ and the EPA to ensure a comprehensive monitoring strategy within the Coastal Bend Bay System based on the EPA-EMAP sampling approach.

Site Selection Criteria

RCAP Sampling sites were selected on the basis of the following:

1. Sampling sites were selected to provide spatial information regarding water and sediment quality in the segments of concern in the Coastal Bend Bays and Estuaries Program study area.

2. The EMAP sites were selected by placement of a hexagonal grid over the study area and sites to be assessed were selected by a systematic random approach. The uniform spatial coverage provided by a grid ensures that the parameters and contaminants in question are sampled in proportion to its geographical location. A total of 32 randomly selected hexagons were selected from the study area. In every hexagonal grid, a site was selected for sampling. Two sites were determined to be inaccessible for sampling through local knowledge of the area so the first two (2) alternate sites, also randomly generated, were selected. The 32 sampling sites are shown on the station locations table (Table B1.1) and the study site map (Figure B1.1). As per EPA protocol, should conditions

prevent a site from being sampled while in the field (i.e. low tide conditions, located in shallow seagrass beds or marsh areas, or obstructed), the site will be moved to the nearest area with an acceptable depth contour and similar characteristics as the original sampling location. The new location will be recorded on GPS, and the information logged in as part of the project record.

3. The purpose of using the EMAP probability-based sampling design is to determine the current status, extent, changes, and trends in the water quality and ecological community of the CBBEP project area with a scientifically sound monitoring plan. EMAP is designed to determine the condition of resources, to provide information to aid in the evaluation of environmental policies, and to help identify emerging environmental problems before they become widespread.

4. This data collection effort involves monitoring coastal bays water and sediment quality and biological data, using procedures that are consistent with the TCEQ SWQM or EPA EMAP programs, for the purpose of utilizing data to characterize the Coastal Bend Bays water quality and for entering the data into the SWQM portion of the statewide database, which is maintained by the TCEQ.

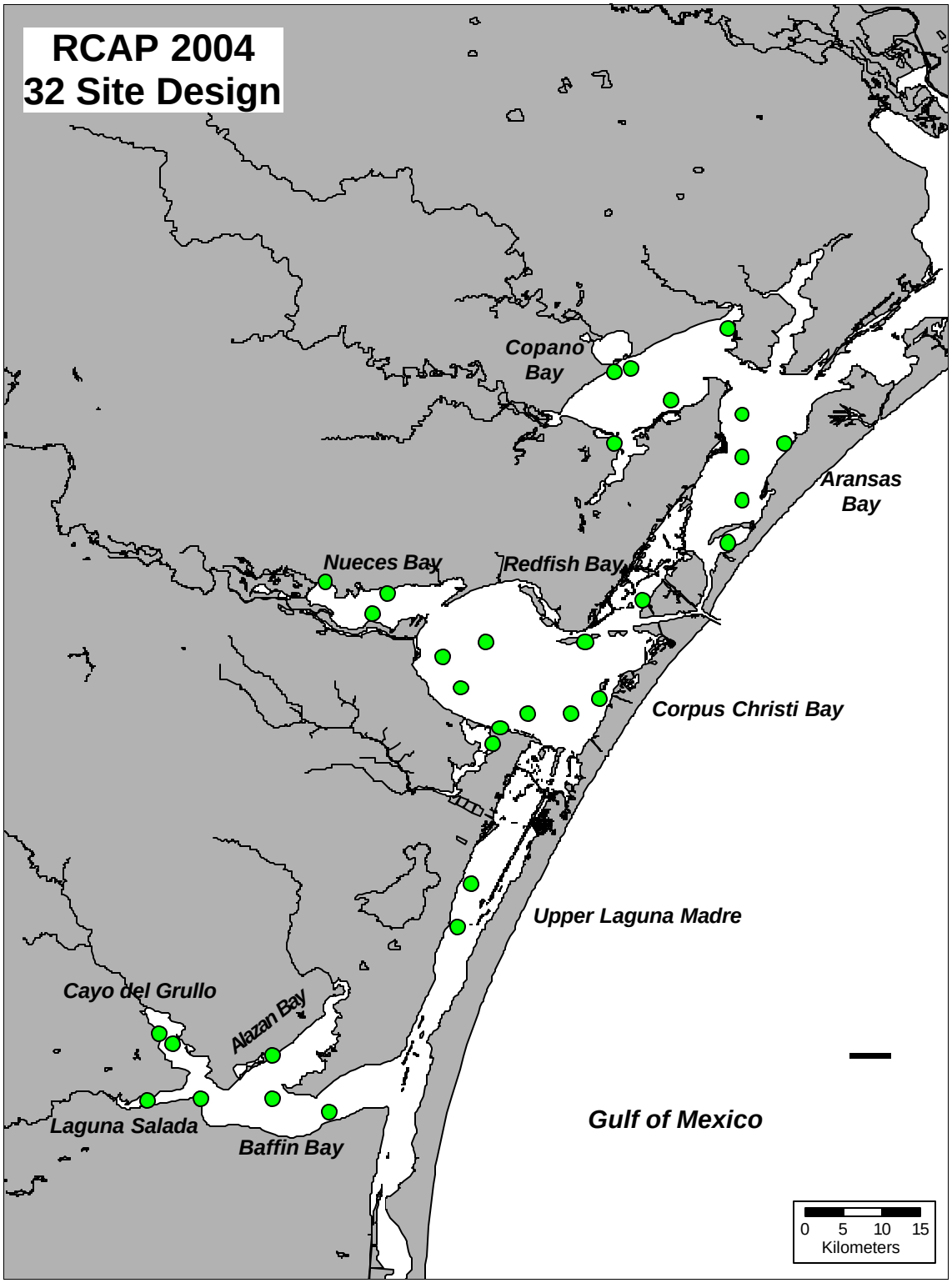
Critical vs. non-critical measurements

All data taken for the CBBEP RCAP and entered into the SWQM portion of TCEQ's TRACS database are considered critical.

Table B1.1. Location of RCAP 2004 sampling stations (upon assignment of TCEQ Station ID numbers the information will be updated and submitted to TCEQ along with appropriate Program and Source Codes).

EMAP ID	Random Latitude	Random Longitude	Bay Name	Bay Size (km^2)
CBB04-0001	-97.7045900	27.2713000	Baffin Bay	164
CBB04-0003	-97.6416670	27.2750000	Baffin Bay	164
CBB04-0005	-97.2999700	27.6900000	Oso Bay	9
CBB04-0006	-97.4957700	27.8798300	Nueces Bay	77
CBB04-0007	-97.1583330	28.0416670	Copano Bay	189
CBB04-0008	-97.2583330	27.7250000	Corpus Christi Bay	307
CBB04-0009	-97.5583330	27.3250000	Baffin Bay	164
CBB04-0010	-97.3250000	27.5250000	Laguna Madre	1874
CBB04-0011	-97.6909300	27.3508400	Baffin Bay	164
CBB04-0012	-97.0083330	28.0750000	Aransas Bay	231
CBB04-0013	-97.1389100	28.1292600	Copano Bay	189
CBB04-0014	-97.2916670	27.7083330	Corpus Christi Bay	307
CBB04-0015	-97.0250000	27.9250000	Aransas Bay	231
CBB04-0016	-97.0083330	28.0250000	Aransas Bay	231
CBB04-0017	-97.5583330	27.2750000	Baffin Bay	164
CBB04-0018	-97.1583330	28.1250000	Copano Bay	189
CBB04-0019	-96.9583330	28.0416670	Aransas Bay	231
CBB04-0020	-97.4916670	27.2583330	Baffin Bay	164
CBB04-0021	-97.1916670	27.8083330	Corpus Christi Bay	307
CBB04-0022	-97.3416670	27.4750000	Laguna Madre	1874
CBB04-0023	-97.2083330	27.7250000	Corpus Christi Bay	307
CBB04-0024	-97.4230900	27.8656300	Nueces Bay	77
CBB04-0025	-97.3373600	27.7549600	Corpus Christi Bay	307
CBB04-0026	-97.3083330	27.8083330	Corpus Christi Bay	307
CBB04-0027	-97.4416670	27.8416670	Nueces Bay	77
CBB04-0028	-97.0083330	27.9750000	Aransas Bay	231
CBB04-0029	-97.0843200	27.8906200	Redfish Bay	109
CBB04-0030	-97.3583330	27.7916670	Corpus Christi Bay	307
CBB04-0031	-97.1750000	27.7416670	Corpus Christi Bay	307
CBB04-0032	-97.0250000	28.1750000	Copano Bay	189
CBB04-ALT0001	-97.0916670	28.0916670	Copano Bay	189
CBB04-ALT0002	-97.6742400	27.3377100	Baffin Bay	164

Figure B1.1. Study Site Map of RCAP 2004 EMAP Locations



Field Collection of Environmental Data

The CCS RCAP field team will perform field sampling independently; cooperating federal or state agencies may augment the CCS field efforts, both in terms of equipment and personnel. In most instances, 3 to 4-person field crews will conduct the sampling from small craft (typically, 20-25 ft) during a seasonal window spanning from July 15th through September 15th. Sampling is planned as a one-time event per station (i.e., no scheduled repeat sampling for the base sites). The field teams will be provided with randomly selected coordinates of latitude and longitude for each of their sampling locations. The crew will locate the sites by use of Global Positioning Satellite System (GPS), preferably, differential. Agreement between the given coordinates and the actual in-the-field positioning of a sampling station should be within 0.02 nautical miles (nm), which is equivalent to a radius of approximately 120 ft. Most GPS units display the distance from an entered waypoint as 0.00 nm; therefore this is a convenient unit to use for noting distance from the given coordinates.

Field activities performed at each site should require approximately 1-2 hours per site, therefore, a team can expect to sample 4 stations in a normal day; of course, this is subject to such factors as weather, seas, and travel distance. At each sampling site, all field crews will uniformly collect a core set of data and samples following EMAP-E methods and protocols. Core field data/samples include those specifically detailed in Table A7.1 and generally listed below (these will be discussed in greater detail in following sections):

1. Instantaneous water column profile (DO, pH, salinity, temperature, depth, transmittance, clarity, etc.)
2. Ambient weather conditions (Air Temperature, Wind Speed and Direction, Cloud Cover, etc)
3. Water quality parameters (nutrient load - P and N species; chlorophyll a content; total suspended solids (TSS), microbiological
4. Surficial sediment, top 2-3 cm, (chemical contaminants - organics and trace metals; sediment toxicity; total organic carbon, TOC; and grain size)
5. Benthic macroinvertebrate community structure (richness and abundance)
6. Fish/shellfish (community structure - richness and abundance; total lengths; pathological examination; chemical contaminants - organics and trace metals
7. Habitat (general habitat-type; presence/absence: exotic species, submerged aquatic vegetation, and anthropogenic debris or perturbation).

The CCS RCAP field crew has the option of gathering additional environmental information, as long as those activities are not given precedence over the core activities. Samples collected from the field may be temporarily held at the field staging centers, under appropriate conditions for 1-5 days, to await shipment (or

delivered) to centralized storage facilities or processing laboratories. Sample handling and storage guidelines are presented in Table B2.1.

Laboratory Analyses of Samples

National Laboratories

Because some states may not be adequately equipped and staffed to conduct certain highly specialized analyses related to several of the core NCAP (RCAP) indicators, and/or the cost to contract analyses for a limited number of samples may be prohibitive, the USEPA will designate several "National Laboratories" to conduct these analyses for any entity which so elects, at a nominal cost per sample. This approach would also ensure data uniformity between the participating states. At this time, National Laboratories are being planned for the following core activities:

1. Analytical chemistry (organic and metal contaminants in both matrices)
2. Benthic community structure
3. Nutrient analyses
4. Sediment toxicity testing

The designated National Laboratories must comply with the QA/QC requirements described in this document.

In-State Laboratory Analyses

For any analyses other than those conducted through the above National Laboratories, each of the entities participating in NCAP will be responsible for the arrangements to analyze the field samples that they collect. These agreements will be negotiated by the individual entity, not through EPA. State agency laboratories or universities may conduct some analyses in-house, while others are contracted out to private laboratories or other states.

However, any laboratory selected to conduct analyses with NCAP/RCAP samples must demonstrate that they can meet the quality standards presented in the NCAP–QAPP (USEPA 2001) and this QAPP. Sections of the NCAP–QAPP (USEPA 2001) address initial demonstrations of technical capability and performance evaluations. When possible, field samples should be promptly shipped (generally within a week) to the approved analytical or processing laboratories. These facilities are generally better geared to properly hold the samples while they await analyses. At the laboratory, samples will be processed in accord with EMAP QA/QC guidelines. The results will be submitted to the sponsoring entity in a final data report. Each laboratory is expected to review their final data for completeness, accuracy, and precision to assure that the basic quality criteria are met prior to submitting their final data report to the state.

At the entity-level, the data will receive further review and validation as data sets are formatted for transmission to the regional data collection node. Regional QA Coordinators will make the initial approval/disapproval of data sets and, when warranted, assign appropriate qualifier codes. After data have been qualified, data analysis and assessments then can be jointly developed through the cooperation of state and federal environmental scientists.

The CCS and CBBEP will be responsible for posting the finalized RCAP data and supporting metadata to TCEQ and making them available to interested parties while the EPA will be responsible for posting the finalized NCAP data and supporting metadata on the Internet and making them available to interested parties. Data sets that pass project QA/QC will be posted without further qualification; data that do not pass project QA/QC, but that are characterized by minor deficiencies will be flagged with appropriate qualifier codes so that individual data users can evaluate the quality of the data for their specific needs; data that consistently fail project QA/QC standards may be dropped altogether from the database. Before data are dropped, the problematic issues will be discussed between the CCS and CBBEP Project Managers, TCEQ SWQM and QAS personnel, NCAP Regional and National QA Coordinators, EPA Project Officer, and the state's NCAP Project Manager (TPWD) for a consensus resolution.

B2 SAMPLING METHODS

Field Sampling Procedures

The field sampling procedures for this study are fully documented within the following approved state and federal documents or through previously approved QAPPs:

1. TCEQ Surface Water Quality Monitoring Procedures Manual. 2003 or subsequent editions (http://www.tnrcc.state.tx.us/admin/topdoc/rg/415/415.html);

2. USEPA National Coastal Assessment-Coastal 2001-2004 Quality Assurance Project Plan – 2001 (http://www.epa.gov/emap/nca/html/docs/qaprojplan.html).

Additional aspects outlined below reflect specific requirements for sampling parameters and/or provide additional clarification.

Procedures for field collection of environmental samples and data for the NCAP/RCAP Monitoring are based on methods developed by EMAP-Estuaries over its past 14 years of experience with large-scale, regional monitoring projects (e.g., EMAP-E Province Monitoring, the Mid-Atlantic Integrated Assessment, MAIA, and the Western Pilot Coastal Monitoring). EMAP sampling methods are described in several documents including EMAP-Estuaries Field Operations Manuals prepared for the Virginian, Louisianan/West Indian and Carolinian Provinces.

EMAP Provinces or geographic regions are differentiated by unique conditions (e.g., climate, depth, bottom type, tidal influence, biota, etc.), therefore, on occasions; it is

necessary to modify" standard" EMAP field procedures to meet the needs particular to a region or sub region. Such modifications are generally approved as long as the altered procedures meet the general guidelines of established protocol and adhere to the spirit of the QA/QC established for EMAP so that the resultant data remain comparable to that collected by standard procedures.

A flexible study design is a necessity for NCAP due to the multitude of independently equipped state field teams, because of the regional difference in estuaries, and the vast geographic sweep of U.S. coastal resources (e.g., the deep harbors of Puget Sound compared to the tidal flats in South Carolina). To accommodate these needs, the NCAP–QAPP (USEPA 2001) sets minimum performance criteria or QC requirements that field crews must meet in order to collect data that are comparable, but it will not require that the field procedures necessarily be identical. The following sections describe the general methods and procedures for each core sampling activity. Field crews should adhere to these methods as much as possible.

Site Location

The randomly selected RCAP sampling locations will be provided to the field crews as coordinates of latitude/longitude in degrees-minutes, expressed to the nearest 0.01 minute (i.e., 00° 00.00') or decimal degrees, expressed to five decimal places (i.e., 00.00000). The crews will use GPS to locate the site. The acceptable tolerance goal for site location is that the sampling station be established within 0.02 nautical miles (nm), ±120-feet (ft), or ±36.6-meters (m) of the given coordinates. This reflects the accuracy expected from a properly functioning GPS unit of the caliber that will be used for the study. The GPS's performance should be verified on a daily basis.

Field crews will strictly adhere to the above guidelines for positioning the station, unless there are substantiated reasons that prevent sampling within that defined area. Because EMAPs probabilistic sampling design is unbiased, potentially, some of the generated sites can fall in locations that are not amenable to sampling (e.g., shallow conditions, inaccessible, rocky bottom, etc.). Upfront planning by the field team will help resolve these potential problems before they are encountered on the actual day of sampling.

Coordinates of the random locations are first plotted on NOAA nautical charts, or other acceptable charts, to ascertain the spatial distribution of the sites, then reconnoitered (on paper) for obvious problem situations (e.g., water depth, hazards to navigation, etc.). If suspect sites are encountered in this exercise, a field reconnaissance will be conducted well ahead of the scheduled sampling to determine actual conditions at the site. If an intended site location presents an obvious problem, the situation is reported to the CCS Project Manager for resolution options. Depending on the nature of the situation, the CCS Project Manager, in consultation with the EPA, may elect to relocate the site within an acceptable range of the original location or use a randomly generated alternate station list. Decisions (i.e., significant changes to the sampling design) are to be made only by the CCS Project Manager and EPA, not by the field teams.

Field teams, however, will have a limited degree of onsite flexibility to relocate sampling sites when confronted with unexpected obstacles or impediments associated with locating within the ±0.02 nm guideline. The crew chief may, for good reason (e.g., danger or risk to crew, shallow conditions, excessive rocky or shelly bottom, currents, man-made obstructions), move the station to the nearest location from the intended site that is amenable to conduct the sampling; every effort must be made to relocate to an area that appears similar in character to that of the intended site. For example, if the intended site was in the channel of a stream, then the relocation should be as near to that situation as possible, it should not be relocated along side the stream bank.

When it is necessary to relocate the site >0.02 nm the reason for the shift must be documented in the field record. Any site relocation exceeding 0.05 nm (300-ft or 91.4-m) will be flagged and reviewed before data collected from the station are acceptable for inclusion to the study database. At times, crews might experience difficulty in obtaining a "good grab" when collecting sediment due to the nature of the bottom at their established site. In these situations, even after they have collected the water quality samples and data, it is permissible for them to move around within the 120-ft or 36.6-m radius to locate more favorable sediment conditions without having to resample the water quality indicators.

Water Measurements

The first activities that should be conducted upon arriving onsite are those that involve water sampling and water column measurements; these samples/data need to be collected before disturbing bottom sediments.

Hydrographic Profile

Water column profiles will be performed at each site to measure basic water quality parameters (see Table A7.1). At least one measurement of light attenuation, either transmittance or PAR, will be conducted; in addition, secchi depth also will be measured at each station. Basic water quality parameters will be measured by using a hand-held multiparameter water quality probe (e.g., Hydrolab Surveyor or YSI Sondes) with cable connection to a deck display. In cases where hand-held probes are used to profile the water column, individual measurements taken at discrete intervals (with sufficient time for equilibration) on the descent and ascent will be taken as follows:

- Shallow sites (=2 m) - every 0.5 m interval;
- Typical depths (>2 but <10 m) - 0.5 m (near-surface) and every 1-m interval to near-bottom (0.5 m off-bottom);
- Deep sites (>10 m) - 0.5 m (near-surface) and every 1-m interval to 10 m, then at 5-m intervals, thereafter, to near-bottom (0.5 m off-bottom).

Near-bottom conditions will be measured at 0.5 m off bottom by first ascertaining bottom depth, then pulling up approximately 0.5 m. Allow 2-3 minutes for disturbed conditions

to settle before taking the near-bottom measurements. The profile will be repeated on the ascent and recorded for validation purposes, but only data from the down trip will be the reported in the final data. Measurements of light penetration, taken by hand-held light meters, are recorded for conditions at discrete depth intervals in a manner similar to that for profiling water quality parameters with a hand-held probe. The underwater (UW) sensor is hand lowered at the regime described and at each discrete interval, the deck reading and UW reading are recorded. If light measurements become negative before reaching bottom, the measurement terminates at that depth. The profile is repeated on the ascent. Secchi depth will be determined by using a standard 20-cm diameter black and white secchi disc. The disc is lowered to the depth at which it can no longer be discerned, then slowly retrieved until it just reappears; depth is marked and recorded as secchi depth (rounded to nearest 0.5 m).

Water Quality Indicators

The water column is sampled at each site for the determination of dissolved and total nutrients (N and P species), chlorophyll *a* concentration, total suspended solids, and microbiological. Samples are collected by using a Van Doren sampler as follows:

- Shallow sites (<2 m) - sample at 0.5 m (near-surface) and 0.5 m off-bottom [1];
- Standard site (>2m) - sample at 0.5 m (near-surface), mid-depth, and 0.5 m off-bottom [1].

[1] Unless the depth is so shallow that near-surface and near-bottom overlap; then sample mid-depth, only.

An approximate 3-liter subsample will be pulled into a clean, wide-mouth Nalgene container to provide water for the remainder of the sample processing which essentially is filtration, with the filtrate becoming the dissolved nutrient sample and the filters retained for the chlorophyll a. Unfiltered water will be taken for TSS samples, Total nutrient, and microbiological samples and placed into appropriate containers.

Chlorophyll a

A disposable, graduated 50-cc polypropylene syringe fitted with a stainless steel or polypropylene filtering assembly will be used to filter the site water through 25-mm GF/F filters; the volume of water filtered must be documented. If conditions allow (suspended solids load), up to 200 ml of site water should be filtered for each chlorophyll sample (for a 50-cc syringe, that equates to 4 refills). At each refill, carefully detach the filter assemble and fill the syringe to the mark, replace the filter and continue with the filtration until the desired volume has been processed. Use tweezers to carefully remove the filter from its holder and fold once upon the pigment side, and then place it in a pre-labeled, disposable 50 or 60-mm petri dish and cap. Record the volume of water filtered on both the petri dish and on the field form. Wrap the petri dish in aluminum foil and

label with station ID (Sharpie ok); place the foil wrapped packet in a small instant-freeze chamber (small Styrofoam ice chest with several pounds of dry ice). Repeat the filtering process for second sample and store filter in the same petri dish containing the first sample. The samples must remain frozen until time of analysis. Discard the used syringe. Rinse the filtering apparatus with de-ionized water and store in a clean compartment between sampling stations (a small tackle box makes a good carrying kit for supplies and equipment used in this activity).

Dissolved and Total Nutrients

Approximately 40 ml of filtrate from the above chlorophyll filtration (surface water) will be collected into a pre-labeled, clean 60-ml Nalgene screw-capped bottle and stored in the dry ice freezing chamber. Before placing sample in the freezer, record the approximate salinity (±2 ppt) on the container; this is a convenience for the analyst who will perform the nutrient analysis. Depending on the analytical instrumentation used, matrix matching of solutions (e.g., standards or wash solutions) may be required for certain of the analytes. The salinity value can be obtained from the water column data or by refractometer reading of the actual water sample taken by Van Doren/Niskin. The nutrient samples should remain frozen until time of analysis. Approximately 125 ml of unfiltered seawater will be collected at the surface depth only and stored in the dry ice freezing chamber.

Total Suspended Solids.

Approximately 1 liter of unfiltered seawater will be collected at the depths described above. The samples will be held in 1-L polypropylene bottles on wet ice in the field and stored at 4ºC to await laboratory determinations.

Benthic Infaunal Community

Biological sampling and protocols are similar to procedures in the TCEQ SWQM Procedures Manual 2003 or methods already approved by the EPA EMAP or the TCEQ CRP and/or TMDL Programs. The following method will be used for benthic macroinvertebrate infauna sampling at locations where water depth is appropriate:

PVC cylindrical push corer, 10.16 cm diameter, will be used to sample benthic infauna to a depth of 10 cm. A minimum of five (5) replicate samples (81.1 cm^2) will be taken at each station yielding a total area of 405.4 cm^2. Each sample will be pre-cleaned upon collection. Sediment is placed in a 0.5 mm mesh biobag and field washed by gently homogenizing the samples by hand. Following this procedure, sediment samples are stored on ice for transport to CCS facilities and then placed in a 10% formalin and seawater mixture containing the protein stain Rose Bengal.

The following method for collecting marine benthic macroinvertebrates and seagrass samples may be used where water depth prohibits using the PVC Coring Device:

At each site a modified 0.04m^2 (400 cm^2) Van Veen sampler will be used to sample benthic infauna. Prior to dredging, all sediments adhering to the dredge will be removed. The dredge will be lowered in a controlled descent to penetrate the bottom. The dredge and its contents will be brought aboard and emptied into a plastic tub. Water will be added and the sample will be homogenized by hand. Sediments are emptied into a 0.5mm mesh biobag and placed on ice for transport to the CCS facilities where samples are placed in a 10% formalin/seawater mixture containing the protein stain Rose Bengal.

All benthic samples will be allowed a minimum of one (1) week for fixation. To reduce exposure to formalin, all samples will be rinsed with water in a 0.5 mm sieve under a ventilation hood and then preserved in 45% isopropyl alcohol.

Composited Surficial Sediment

At each site a modified 0.04m^2 Van Veen sampler, will be utilized to obtain multiple grabs and the surficial sediment layer (top 2-3 cm) will be collected by spatula or scoop and composited to provide sediment for the analyses of chemical contaminants, total organic carbon (TOC), and grain size determinations. The number of grabs required to yield an adequate volume of composited sediment depends on the surface area described by the particular grab; however, surficial sediment from a minimum of three grabs will be composited for the final sample. Surficial sediment from the individual grabs will be combined in a clean, high-grade stainless steel or Teflon vessel. Between grabs, the container of composited sediment will be held on ice and covered with a lid to protect the sample from contamination. Stirring will blend in each addition of sediment to the composite, and the final mixture will be stirred well to ensure a homogenous sample before taking sub-samples for the various analyses are taken as follows:

Organic chemical contaminants

Approximately 500 g of composited sediment will be placed in a clean, pre-labeled, glass wide-mouth I-Chem jar; fill containers to approximately 75% of capacity to allow for expansion during freezing – **DO NOT OVERFILL; full jars tend to break when frozen!!!** The sample will be held on wet ice aboard and, upon transfer to shore storage, the sample should be frozen unless it is scheduled for extraction within 7 days; in that case, the sample may be held at 4ºC to await processing.

Inorganic chemical contaminants

Approximately 500 g of composited sediment will be placed in a clean, pre-labeled, wide-mouth LDPE jar. The sample will be held on wet ice while aboard and, upon transfer to shore storage, the sample should be frozen unless it is

scheduled for digestion within 7 days; in that case, the sample may be held at 4ºC to await processing.

Toxicity testing

Approximately 4 liters (depends on the number of toxicity tests to be performed) of composited sediment will be placed in a clean, pre-labeled, wide-mouth LDPE jar. The sample will be held on wet ice aboard and, upon transfer to shore storage, the sample will be held at 4ºC (**sample is not to be frozen**) to await further processing and initiation of testing within 30 days of collection.

TOC

Approximately 500 g of composited sediment will be placed in a small, clean, pre-labeled amber glass bottle/jar. The sample will be held on wet ice aboard and upon transfer to shore storage; the sample should be **frozen** to await further laboratory analysis.

Grain size determination

Approximately 500 g of composited sediment will be placed in a clean, pre-labeled, wide-mouth LDPE jar. The sample will be held on wet ice aboard and, upon transfer to the shore storage, the sample will be held at 4ºC (**sample is not to be frozen**) to await further laboratory processing.

Habitat

Several observations will be made in the field to document certain attributes or conditions of the site that will help to characterize the overall ecological health. Observations will be made and noted for the occurrence of submerged aquatic vegetation (SAV), the presence of marine debris, the occurrence of macroalgae beds/mats. Also, if there is obvious evidence of disruptive anthropogenic activities (e.g., dredging or landfill activity), these observations should be noted with a brief description on the appropriate field form.

Exotic Species

The introduction of non-indigenous organisms and plants has the potential to upset the balance within an ecological system through opportunistic marauding. NCAP/RCAP is interested in documenting the occurrences of this condition and will designate several species of both flora and fauna as exotics to be monitored for as laboratory evaluations are conducted; field crews are not expected to make onsite evaluations for exotics.

Fish and Epibenthic Invertebrate Collection

While the RCAP is providing additional funding and will also receive the data from this sampling activity the CCS RCAP Field Team will not be doing the sampling. This is an

integral aspect of the NCAP and the TPWD-Coastal Fisheries branch has conducted the sampling in Texas since August 2000. The information provided below is for documentation purposes only since the CBBEP will receive the data collected.

Fish trawls will be conducted at each site, where possible, to collect fish/shellfish for community structure and abundance estimates; target species for contaminant analyses, and specimens for histopathological examination. Historically, standard EMAP trawls have been conducted by using a 16-ft otter trawl to conduct least one trawl for a 10 (±2) minutes duration to yield valid community structure data (i.e, the fish data on richness and abundance and individual lengths). Additional trawls of unspecified durations may be conducted to supplement the sample for contaminant analyses. Although not required, it is strongly suggested that the vessel used for trawling be equipped with a boom or A-frame assembly and a powered winch. In situations where the use of nominal craft is prohibited (e.g., narrow stream or shallow conditions), it is possible to manually deploy and retrieve a small trawl, but it is not advised as routine procedure. Trawling should be the last field activity that the crew performs while onsite because of their disturbance to conditions at the site.

In open water, the trawl should be conducted in a straight line with the site location near center. Additional trawls can be taken along the same general line by going in the opposite direction; however, tides and seas conditions may dictate the direction of the trawl. Timing of the trawl begins after the length of towline has been payed out and the net begins its plow. The speed over bottom should be approximately 3-4 knots. When possible, conduct the trawl for the entire 10-minute period, after which the boat will be placed in neutral and the trawl net retrieved and brought aboard. Contents of the bag will be emptied into an appropriately sized trough or livebox to await sorting, identifying, measuring, and sub-sampling. Every effort will be made to return any rare or endangered species back to the water before they suffer undue stress.

Community Structure

Fish from a successful trawl (fulltime on bottom with no hangs or other interruptions) will first be sorted by species and identified to genus species. Up to thirty individual per species will be measured by using a fish measuring board to the nearest centimeter (fork length when tail forked, otherwise overall length - snout to tip of caudal). The lengths will be recorded on a field form and a total count made for each species. All fish not retained for histopathology or chemistry will be returned to the estuary. Invertebrates will be sampled as directed later (still under review, will differ from region to region).

NCAP recommends that states without established fish inventorying programs adhere to the above guidelines in order to collect comparable fish community data. However, some states already have regimes in place for continuing, comprehensive fish studies that do not comply with EMAP standards. NCAP will review these states' programs on a case-by-case basis and may allow a state to substitute their procedures for the EMAP standard.

Contaminant Analyses

Several species of demersal fishes will be designated as target samples for analyses of chemical contaminants in whole-body tissue. Specific target lists will be generated for each region that generally includes flatfishes and other commonly occurring demersal species from higher trophic levels. At sites where target species are captured in sufficient numbers, five to ten individuals of a species will be combined into a composited sample. The fish will first be measured and recorded on the sampling form as chemistry fish. The fish will then be rinsed with site water and individually placed in Ziploc bags (the length of each individual fish should be imprinted on the bag to facilitate the possible later selection of specific individual at the laboratory), labeled with the Station ID Code and a Species ID Code (e.g., the first four letters of both the genus and species). The fish chemistry samples will be held on wet ice in the field until they are transferred to shore where they will frozen to await laboratory analysis.

Gross Pathology

All fish will be screened in the field for external gross pathologies as they are measured and counted for the community structure evaluation. Each fish will be briefly examined for any obvious external conditions such as lesions, lumps, tumors, and fin erosion; also, the gills will be examined for discoloration or erosion. Any fish that exhibits a pathological condition will be saved for further laboratory histopathological evaluation. Field personnel on the Fish Data form will record a generic description of the observed condition, and then, the specimen will be and tagged and immediately preserved in Dietrich's solution to await shipment to the laboratory.

Each fish to be preserved will have its body cavity opened to expose internal tissues to the fixative. Stainless steel surgical scissors will be used to open the body starting at the anal pore and cutting anteriorly through the body wall, taking care not to cause undue damage to the internal organs; the cut should continue through the thoracic region and over to the gill slits. The body cavity should then be spread apart (popped open) by hand to further ensure the fixative floods the internal organs. The tagged fish is then added to an appropriate container (e.g., a 1-2 gallon plastic bucket with enough Dietrich's to completely cover the specimen. As long as fish are well tagged, multiple samples can be held in a common container.

Table B2.1. Sampling handling and storage guidelines for NCAP/RCAP (NCAP QAPP EPA 2001).

Sample Type	Container Type	Field Holding	Lab Storage	Max Holding
Sediment				
Organic Contaminants	500 ml I-Chem jars	Wet Ice (4ºC)	Freezer (-20ºC)	1 Year
Inorganic Contaminants	125 ml LDPE	Wet Ice (4ºC)	Freezer (-20ºC)	1 Year
Total Organic Carbon	250 ml Amber Glass Jar	Wet Ice (4ºC)	Freezer (-20ºC)	1 Year
Sediment Toxicity	4 L LDPE	Wet Ice (4ºC)	Refrigerator (4ºC)	<30 Days
Grain Size	500 ml LDPE	Wet Ice (4ºC)	Refrigerator (-20ºC)	1 Year
Water Quality				
Chlorophyll	25 mm GF/F in plastic petri dish (foil wrapped)	Dry Ice	Ultra Freezer (-50ºC)	6 Months
Nutrients	30 ml LDPE Bottle	Dry Ice	Ultra Freezer (-50ºC)	6 Months
Total Suspended Solids	1 L LDPE	Wet Ice (4ºC)	Refrigerator (4ºC)	3 Months
Biota				
Benthos	0.5 mm mesh biobag	10% Buffered Formalin	Transfer to 45% Isopropyl or 70% ethanol	Indefinitely
Fish Contaminants	Individual foil wrapped combined in Ziploc bag	Wet Ice (4ºC)	Freezer (-20ºC)	1 Year
Histopathology specimens	As per sample size	Dietrich's Fixative	Transfer to 70% Ethanol	6 Months
Microbiology				
Method 1600	500-1000 ml sterile plastic bottle	Wet Ice (4ºC)	Process Immediately	6 Hours

Sample Containers

CCS will supply new or pre-cleaned sample containers for all parameters sampled. Sample containers for microbiological collections will utilize autoclaved or sterilized bottles for Method 1600 and IDEXX®, or use pre-cleaned and sterile bottles purchased directly from IDEXX®. Container certificates are maintained in a notebook by the lab.

Processes to Prevent Cross Contamination

Procedures in the TCEQ Surface Water Quality Monitoring Procedures Manual, 2003 or subsequent editions, USEPA Method 1669, and the USEPA National Coastal Assessment-Coastal 2001-2004 Quality Assurance Project Plan–2001 document the

necessary steps to prevent cross-contamination of samples. These include such things as direct collection into sample containers, when possible; clean sampling techniques for metals; and certified containers. Field QC samples as discussed in Section B5 are collected to verify that cross-contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on the field data sheets as presented in Appendix B. For all visits, station ID, location, sampling time, date, and depth and sample collector's name/signature are recorded. Values for all measured field parameters are recorded. Detailed observational data are recorded including water appearance, weather, biological activity, unusual odors, specific sample information, missing parameters, and days since last significant rainfall.

Recording Data

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the basic rules for recording information as documented below:

1. Legible writing with no modifications, write-overs or cross-outs;
2. Correction of errors with a single line followed by an initial and date;
3. Cross-outs on incomplete pages with an initialed and dated diagonal line.

Failures in Sampling Methods Requirements and/or Deviations from Sample Design and Corrective Action

Examples of failures in sampling methods and/or deviations from sample design requirements include but are not limited to such things as sample container problems, sample site considerations, etc. Failures or deviations from the QAPP are documented on the field data sheet and reported to the CCS Project Manager. The CCS Project Manager will determine if the deviation from the QAPP compromises the validity of the resulting data. The CCS Project Manager/Quality Assurance Officer, in consultation with the CBBEP/QAO, TCEQ/QAS, and EPA NCAP QAO will decide to accept or reject data associated with the sampling event, based on best professional judgment. The resolution of the situation will be reported in the quarterly report.

B3 SAMPLE HANDLING AND CUSTODY

A comprehensive project such as NCAP/RCAP requires a structured system to ensure that all pertinent data are documented and that samples are appropriately labeled, handled, stored, and transferred through all phases from field collection to final analysis. The following section will outline data/sample accountability guidelines for the project. Although standard formats for data/ sample collection and reporting will be established for field and laboratory activities, not all aspects of sample handling will be addressed by the forms alone. Therefore, additional written documentation is required to augment cradle to grave history for sample possession within NCAP/RCAP. Additional detailed information is provided in the NCAP–QAPP (USEPA 2001) in Section B3.

For microbiological samples, immediately after collection, samples, including a field blank, will be placed in an ice chest with ice packs and transported to the Texas A&M-CC Environmental Microbiology Laboratory for analyses within six hours of collection. An additional trip blank will be taken to the collection site and transported to the laboratory with the sample water bottles. The date, time, and analyst signature will be recorded for each sample collection, filtration, and colony count to maintain chain of custody. The appropriate field data and chain-of-custody forms will be completed prior to samples being returned to the laboratory.

Chain-of-Custody

Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis. A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among contractors. The following information concerning the sample is recorded on the COC form (See Appendix C).

Chain of Custody:

- Date and time of collection
- Site identification
- Sample matrix
- Number of containers
- Preservative used or if the sample was filtered
- Analyses required
- Name of collector(s)
- Custody transfer signatures and dates and time of transfer
- Bill of lading (if applicable)
- Time and date of sample shipping and receiving

Sample Labeling

To avoid potential contamination, custody seals will not be used on individual sample bottles. Custody seals will only be used on ice chest containers used to transport samples to contract laboratories that are delivered by common carrier. Label information includes the site identification, the date and time of sampling, and the preservative added or other pertinent information if applicable. All bottles for metals-in-sediment will be labeled in accordance with guidelines specified for COC conformance.

Sample Handling

Immediately after collection, water and sediment quality samples are placed on ice, and biological samples placed in appropriate containers as described in Section B2, until

transported to CCS facilities by truck. Water and sediment quality samples are transported by surface vehicle or air carrier (ex. Airborne) to the respective laboratories.

Failures in Chain-of-Custody and Corrective Action

All failures associated with chain-of-custody procedures are immediately reported to the CCS Project Manager. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The CCS Project Manager/QAO will determine if the procedural violation may have compromised the validity of the resulting data. The CCS Project Manager/QAO will decide how the issue will be resolved based on best professional judgment and will inform the field staff. Possible courses of action include, document and proceed; redo the entire sampling event; or selectively analyze the samples. The resolution of the situation will be reported in the quarterly progress report.

B4 ANALYTICAL METHODS

Analytical procedures for NCAP/RCAP range from straightforward determinations such as percent gravel/silt/sand/clay to comprehensive analyses of chemical contaminants in complex environmental matrices. Most procedures for the various analyses are based on those developed for EMAP-E and specific details for the analytical processes are documented in existing documents. Additional information is contained in Section B4 of the NCAP–QAPP (USEPA 2001). Analyses are in accordance with the most recently published edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the TCEQ *Surface Water Quality Monitoring Procedures Manual 2003*, TCEQ approved methods, or EPA approved methods as cited in the 40CFR136, Appendix B revision 1.11. See Table A7.1 for those methods not in accordance with the above mentioned documents. Copies of laboratory SOPs are available for review by the CBBEP, TCEQ, and EPA. Laboratory SOPs are consistent with EPA requirements as specified in the method.

For Bacteria analysis all water samples will be analyzed for Enterococci using EPA Method 1600: Membrane Filter Test Method for Enterococci in Water EPA-821-R-97-004 (USEPA 1997; USEPA 2000), and following procedures and quality control methods outlined in *Standard Methods for the Examination of Water and Wastewater, 20th ed., 1998*.

Standards Traceability

All standards used in the laboratory are traceable to certified reference materials. Standards preparation is fully documented and maintained in a standards log book. Each documentation includes information concerning the standard identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation.

Alternative Methodologies

Only data collected under TCEQ approved analytical methodologies as specified in the NCAP–QAPP (USEPA 2001) or this QAPP will be submitted to the TCEQ. Requests for alternative methodologies will be submitted in writing for approval to the CBBEP Project Manager. Requests for method modifications will be documented on form TCEQ-10364, the TCEQ Application for Analytical Method Modification, and submitted for approval to the TCEQ Quality Assurance Section by the CBBEP Project Manager. Approval by the TCEQ will be granted or denied based on review of the application, specifically the section documenting an initial demonstration of method equivalency conducted by the laboratory. Work will only begin after the modified procedures have been approved.

Failures or Deviations in Analytical Method Requirements and Corrective Actions

Failures in field and laboratory measurement systems involve, but are not limited to such things as, instrument malfunctions, failures in calibration, blank contamination, QC sample problems, etc. In many cases, the field technician or lab analyst will be able to correct the problem (i.e., via re-calibration or re-analysis). If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, it is then conveyed to the respective supervisor, who will make the determination. If the analytical system failure compromises the sample results, the data will not be reported to the TCEQ as part of this study. The nature and disposition of the problem is reported on the data report sent to the CBBEP Project Manager or TCEQ Project Coordinator. The CCS Project Manager will include this information on the Quarterly Report. TCEQ has determined that analyses associated with remark codes including, but not limited to, “holding time exceedance”, “did not pass all QC criteria”, “instrument failure”, etc. has measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to TRACS. Therefore, data with these types of problems will not be reported to the TCEQ.

B5 QUALITY CONTROL

Each analysis or measurement conducted for NCAP/RCAP will have prescribed quality control (QC) checks with quality criteria or acceptable tolerances established, where applicable. In general, the QC guidelines for NCAP/RCAP have been adopted from those developed for the EMAP-E quality program. For that reason, this document will summarize the key QC elements for NCAP/RCAP field and laboratory measurements. Table A7.1 and A7.2, in this document, present summaries of the measurement quality objectives and of the QA sample types for core NCAP/RCAP indicators. Because of the involved nature of the QA/QC program developed for analytical chemistry, an entire section (Appendix A of NCAP–QAPP USEPA 2001) has been dedicated to address those issues. Detailed discussion of the QC for individual field and laboratory activities follows and is contained in Section B5 of the NCAP–QAPP (USEPA 2001).

Sampling Quality Control Requirements and Acceptability Criteria

Documentation of the Minimum Field QC Requirements is outlined in the TCEQ Surface Water Quality Monitoring Procedures Manual 2003 and in the USEPA National Coastal Assessment-Coastal 2001-2004 Quality Assurance Project Plan–2001.

Laboratory Analyses

The laboratory analyses of NCAP/RCAP samples include analyses of sediment, fish, and water samples, sediment toxicity tests, evaluations of macrobenthic community structure, and the histopathological examination of fish. These laboratory activities are based upon procedures or analytical methods established for EMAP-Estuaries and the QC associated with each are well documented in existing methods manuals and QAPPs (U.S. EPA 1995 and Heitmuller and Peacher 1995). The NCAP–QAPP (USEPA 2001) and this QAPP will summarize the QC requirements for the various analytical operations, but for detailed discussion of the QC procedures for a specific activity, the user is referred to the above documents.

For the Bacteria analysis laboratory quality assurance/quality control will be based on guidelines in *Standard Methods for the Examination of Water and Wastewater, 20th ed., 1998 Section 9020*. Control cultures shown in Table 9020:V (APHA 1998) will be used for positive and negative controls.

Analyses of Chemical Contaminants in Environmental Samples

The analyses of chemical contaminants represent the more challenging and involved analytical efforts within the scope of NCAP/RCAP and include the analyses of both organic and inorganic analytes for two matrices, sediment and tissue; see Table A7.1 for the list of analytes to be measured. To be relevant for NCAP/RCAP assessments, the levels of detection required for many of the analytes are very low and may prove taxing to some analytical laboratories.

Appendix A of the NCAP–QAPP (USEPA 2001) document is a copy of the analytical chemistry section used in preexisting EMAP-Estuaries QAPPs and it presents the established QA/QC requirements for these analyses in great detail. Three primary areas are addressed: initial demonstration of the laboratory's technical capability; the actual analysis and its associated performance-based QA with quality criteria described for accuracy and precision; and data documentation and reporting. Some typical minimum requirements are outlined below. Field QC sample results are reported with the data report. See Section C2.

Field Split - A field split is a single sample subdivided by field staff immediately following collection, and submitted to the laboratory as two separate, identified samples. Split samples are preserved, handled, stored, shipped, and analyzed identically and are used to assess variability in all of these processes. This applies to all routine conventional water quality parameters. Field splits do not apply to any other parameters (unless

needed for a special project). A field split is collected by dividing an ambient water sample from a single container (for example a 5 gallon bucket, 2.5 gallon Cubitainer, Van Dorn Bottle, stainless steel mixing bowl) into two sets of containers. A field split mimics preservation, handling and shipping.

Precision of split results is calculated by the relative percent difference (RPD) as defined by 100 times the difference (range) of each split set, divided by the average value (mean) of the set. For split results, X_1 and X_2, the RPD is calculated from the following equation:

$$RPD = (X_1 - X_2)/\{(X_1+X_2)/2\} * 100$$

The current NCA QAPP does not mandate Field Splits but the RCAP will take one (1) Field Split for every ten (10) water (Nutrients, TSS, Chlorophyll *a*) and sediment samples (Sediment Toxicity, TOC, Sediment Grain Size) in accordance with TCEQ SWQM procedures, which state, "Field splits are submitted with every tenth sample. If less than 10 samples are collected in a month, submit one set of splits per month". Field Splits will not be collected for tissue samples.

Field Blank - A field blank consists of deionized water taken to the field and poured into the sample container. Field blanks are used to assess the contamination from field sources such as airborne materials, containers, and preservatives. As specified in the TCEQ SWQM Manual and the NCAP QAPP (USEPA 2001), field blanks are not required. However, for the Bacteria analysis Field Blanks will constitute ten percent of samples collected. Limits on contamination for both field blank and trip blank will be <1 cfu/100ml.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements, including attainment of MDLs through Initial Demonstration of Capability and Performance Evaluations, are contained within Section B5 of the NCAP QAPP (USEPA 2001), the EMAP – Estuaries Laboratory Methods Manual Volume 1 – Biological and Physical Analysis, and/or the individual Laboratory Quality Manuals. The minimum requirements that all participants abide by are stated below. Lab QC sample results are reported with the data report (see Section C2). Laboratories should have current QAMs.

Laboratory duplicate - Laboratory duplicates are used to assess precision and are prepared by splitting aliquots of a single sample (or a matrix spike or a laboratory control standard) in the laboratory. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates are performed on 10% of samples analyzed. Acceptability criteria are outlined in Table A7.1.

Precision is calculated by the relative percent difference (RPD) of duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the

average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

$$RPD = (X_1 - X_2)/\{(X_1+X_2)/2\} * 100$$

Laboratory Control Standard (LCS) - A laboratory control sample is analyte-free water spiked with the analyte of interest prepared from standardized reference material. The laboratory control standard is generally spiked into laboratory pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. The LCS is carried through the complete preparation and analytical process. The LCS is used to document the accuracy of the method due to the analytical process. LCSs are generally run at a rate of one per batch. Acceptability criteria are laboratory specific and usually based on results of past laboratory data. LCSs are routinely incorporated into the analysis program. The analysis of LCSs is a measure of accuracy and is calculated by Percent Recovery %R is defined as 100 times the observed concentration, divided by the true concentration of the spike.

The formula used to calculate percent recovery, where %R is percent recovery; SR is the sample result; SA is the spike added:

$$\%R = SR/SA * 100$$

Matrix spikes (MS)- A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. The MS is used to document the accuracy of a method due to sample matrix and not to control the analytical process. Acceptability criteria are outlined in Table A7.1 and are calculated by Percent Recovery. Percent Recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike. Acceptance criteria are defined in Table A7.1.

The formula used to calculate percent recovery, where %R is percent recovery; SSR is the observed spiked sample concentration; SR is the sample concentration; and, SA is the spike added; is:

$$\%R = (SSR - SR)/SA * 100$$

Laboratory Method Blank- A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values equal to the MDL. For very high-level analyses, blank value should be less then 5% of the lowest value of the batch. Laboratory Method Blanks will be run by the laboratory at a frequency according to their QA Manual.

Additional method specific QC requirements - Additional QC samples are run (e.g., surrogates, internal standards, continuing calibration samples, interference check samples) as specified in the methods. The requirements for these samples, their acceptance criteria, and corrective action are method-specific. At least one certified reference material would be analyzed with each analytical batch of samples.

For the Bacteria analysis each medium lot will be tested for satisfactory performance using control cultures (positive control). A media log sheet showing date, medium, volume, signature and comments will be kept for all media prepared. Measurement of method precision will be followed as described in Section 9020 B. 8 Analytical quality control procedures, b. (APHA 1998). Verifications for enterococci enumerated using Method 1600 will be conducted monthly based on EPA Method 1600 (EPA 1997; EPA 2000) and will be recorded on log sheets. All inoculated plates will be autoclaved in biohazard bags with indicator tape, for at least 30 minutes (121 °C) prior to disposal.

Ambient Water Reporting Limit/Method Detection Limit Calibration Standard – As referenced in Table A7.1, per requirements of the EPA NCAP-QAPP, the Method Detection Limit (MDL) will be used for parameters analyzed. The TCEQ ambient water reporting limits (AWRL) are specifications at or below which data will be reported to TCEQ. Ongoing ability to recover an analyte at the AWRL (or MDL) is demonstrated through analysis of a calibration or check standard at the AWRL (or MDL). These two limits are not mutually exclusive and typically, many EPA MDLs are lower than the TCEQ AWRLs. Data collected and reported to TCEQ under this QAPP should comply with the ambient water reporting limit (AWRL) quantitation requirements.

Failures in Field and Laboratory Quality Control and Corrective Action

The CCS Project Manager/QAO evaluates sampling QC excursions. In that differences in field duplicate sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, judgment will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for all analyses are scrutinized very closely. Field blank values in exceedance of the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination, which may be causal in putting a value above the standard. Notations of field duplicate excursions and blank contamination are noted in the quarterly report.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All pertinent sampling equipment testing and maintenance requirements are detailed in the TCEQ Surface Water Quality Monitoring Procedures Manual, 2003 and USEPA National Coastal Assessment-Coastal 2001-2004 Quality Assurance Project Plan–2001, and Section B7 and B8 of this QAPP.

Equipment records are kept on all field equipment and the CCS maintains a supply of critical spare parts. All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QAM(s). Testing and maintenance records are maintained and are available for inspection by the TCEQ and EPA. Instruments requiring daily or in-use testing include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TCEQ and EPA.

For the Bacteria analysis study, all laboratory instruments/equipment used for preparing media and buffered dilution water, sterilization, and incubation will be inspected and maintained according to manufacturer specifications and based on Standard Methods Section 9020 B.3 and 9030 B. Equipment includes autoclaves, incubators, refrigerators, freezer, balance, pH meter, membrane filtration equipment, thermometers, water deionization unit, media dispensing apparatus, refractometer, safety cabinet, water bath, microscopes, glass lens with magnification, pipettes, Bunsen burners, dilution bottles, and sample bottles. Spare parts such as lamp bulbs are kept available in case of replacement needs.

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Both field and laboratory equipment and instruments require routine calibration checks to verify that their performance is within acceptable quality standards. Field and Laboratory equipment calibration requirements are detailed in the TCEQ Surface Water Quality Monitoring Procedures Manual, 2003 and in the USEPA National Coastal Assessment - Coastal 2001-2004 Quality Assurance Project Plan–2001 for the various instrument calibrations that are key in the collection of accurate environmental data for the NCAP/RCAP.

Post calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidates associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ or EPA. Detailed Laboratory calibrations are contained within the QAM(s). The laboratory QAM identifies all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Calibration records are maintained and are available for inspection by the TCEQ and EPA. Equipment requiring periodic calibrations includes, but is not limited to, thermometers, pH meters, balances, incubators, turbidity meters, and analytical instruments. Calibration records are available to the TCEQ and EPA for review.

For Bacteria analysis, instruments requiring calibration are the pH meter, incubators, UV lamp, thermometers, pipettes, and balances. The pH meter will be calibrated prior to each use using standards at pH 7 and 10. A pH meter calibration log sheet showing date of calibration, standards used and signature of analyst will be kept. Instrument

technicians on a regular basis check balances and autoclaves. Autoclave performance is verified monthly following Standard methods 9020 B. Intra-laboratory quality control guidelines (APHA 1998). Biological safety cabinets are certified annually. The Laboratory Manager keeps records of all checks, certifications and performance tests. All incubators are checked daily when in use and log sheets are kept showing time and date, recorded temperature and analyst signature. All calibration and maintenance activities will be recorded on the instrument calibration forms. These sheets are kept on file in the TAMU-CC Environmental Microbiology Laboratory.

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The procurement of supplies, equipment and services is controlled to ensure that specifications are met for the high quality and reliability required for each laboratory task. The CCS Project Manager, who is responsible for evaluating the need and quality required for the particular item, purchases all materials and equipment, other than that purchased by the contracted laboratories. Upon receipt of materials or equipment, a designated employee receives and signs for the materials. The items are reviewed to ensure the shipment is complete and are delivered to the proper storage location. All chemicals are dated upon receipt and, upon first use, are initialed and dated. All supplies will be stored appropriately and will be discarded upon expiration date. Refer to the laboratory QAM for laboratory related supplies and consumables.

B9 NON-DIRECT MEASUREMENTS

NCAP and RCAP will utilize Geographical Information System (GIS) applications to plot data collection stations on maps that can be used for logistical planning as well as to generate gradient presentations based on the results of the monitoring (e.g., demarcation of low DO conditions). The uncertainty associated with this approach for ground positioning and graphic presentation is intrinsically linked to the resolution attainable at the scale of 1: 100,000. In addition, for the RCAP, CCS will provide data directly derived from this project to the CBBEP. The CBBEP will provide data directly derived from this project to the TCEQ. Only data collected directly under this QAPP will be submitted for entry in the SWQM portion of the TRACS database. No non-direct measurement data will be submitted for entry into TRACS. However, in the final report, the CCS may provide non-direct historical data relevant to this study, obtained from published literature and technical reports of previous studies. CCS will identify the source and the relevant time period of the historical data. The CCS will state that data are consistent with or comparable to the data protocols established in this QAPP. Data collected inconsistently with the protocols described in this QAPP will be described in terms of how the data were collected and how the data were assessed (i.e., qualified).

B10 DATA MANAGEMENT

Data Management Protocols are addressed in detail in Appendix D included in this document. All CBBEP data will follow conventions as outlined in Appendix A as per

requirements. All water and sediment chemistry data submitted to TCEQ by the CBBEP will follow the specified electronic format necessary for inclusion into the Surface Water Quality Monitoring section of the Texas Regulatory and Compliance System (TRACS) database.

EPA Information Management System

Because of the multiple organizations participating in NCAP and the sheer volume of data they will generate, a tiered, National Information Management System has been developed to systematically collect, aggregate, and transmit data (Hale et al. 1999). Individual entities will submit appropriately formatted data to respective regional data nodes. There, the data will be verified, reviewed for QA, and further formatted as specified in Appendix B: Coastal 2000 – Information Management (USEPA, 2000) for transmission to the national collection node and incorporation into the EMAP National Coastal Database. Long-term archival will be in STORET.

Each regional data collection node will have latitude in designing their own data management system as long as they comply with the requirements set by the National Information Management System for the submission of the finalized data sets to the national database. Finalized data sets will be submitted to the EMAP Information Management Coordinator at the EMAP Information Center, EPA's Atlantic Ecology Division in Narragansett, RI for archiving and posting on a public website.

C1 ASSESSMENTS AND RESPONSE ACTIONS

NCAP/RCAP represents a matrix of diverse environmental monitoring measurements and data acquisition activities. Data quality criteria have been established for most of these measurements and the QA program will monitor the success rate of NCAP/RCAP in meeting the quality goals. While all of the data acquisition activities are of value to the project, certain of them have a higher degree of importance than others and will, therefore, receive priority regarding review and assessment of the data quality, especially in the more structured format of audits. Nonetheless, for those activities that are not audited, there are sufficient QA/QC elements associated with each data generating activity to enable the responsible analyst to make a determination on the acceptability of the data. In most cases if the process fails QC checks, the QA policy requires that the samples be reanalyzed until acceptable data are attained. Complete detailed sections in the NCAP–QAPP (USEPA 2001) outline the structured data reviews and assessments of data quality planned for NCAP/RCAP. Note, if situations warrant, any QA Coordinator delegated NCAP/RCAP responsibilities will have authority to initiate an audit or review of any environmental data collection activity that fall under their purview. The States may also elect to initiate audits of their respective in-house activities, at anytime (USEPA 2001).

The CCS Project Manager may perform performance and system audits randomly during a sampling event. The following table presents the types of assessments and response action for data collection activities applicable to the RCAP QAPP. Types of assessments detailed in this section are generally not considered to be internal QA functions, such as data validation.

Table C1.1. Assessments And Response Actions

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring, Oversight, etc.	Continuous	CCS	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to CBBEP in Quarterly Report
Monitoring Systems Audit/Lab Inspection (on participants as applicable)	Dates to be determined by the CBBEP, TCEQ, or EPA	CBBEP TCEQ EPA	Field sampling, handling and measurement; facility review; and data management	30 days to respond in writing to the CCS to address corrective actions

Corrective Action

The CCS Project Manager, CBBEP Project Manager, TCEQ Project Coordinator, and if applicable, the EPA QA Coordinator as detailed in the NCAP–QAPP (USEPA 2001), are responsible for implementing and tracking corrective action procedures as a result of audit findings. The CCS, CBBEP, TCEQ and EPA maintain records of audit findings and corrective actions. The CCS Project Manager will address the audit findings by documenting the corrective actions necessary to resolve audit findings. The

documented corrective actions will be forwarded to all affected CBBEP, EPA, and TCEQ parties for comment. If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work is specified in agreements in contracts between participating organizations.

C2 REPORTS TO MANAGEMENT

During the implementation and execution of NCAP/RCAP several reports are required to appropriately document QA/QC activities and to ensure that management is aware of pertinent items related to the general status of the project. Reports will be expected on a routine basis, but other reports may be warranted as situations dictate. Detailed information concerning the reporting structure can be found in the NCAP–QAPP (USEPA 2001). At the present time all reporting for the RCAP will be between CCS, CBBEP, and TCEQ. The information above is provided to document the reporting structure should EPA require the CBBEP to submit these reports.

Contract Laboratory Data Reports

Laboratory data reports contain QC information so that the CCS Project Manager can review the information.

Reports to CCS Project Management

All subcontractors will provide project status reports, results of assessments, and significant QA issues relevant to project management to the CCS Project Manager.

Reports by TCEQ Project Management

Contractor Evaluation - The CCS participates in a Contractor Evaluation by the TCEQ-CBBEP annually for compliance with administrative and programmatic standards.

Reports to CBBEP and TCEQ Project Management

All reports detailed in this section are contract deliverables and transfer from the CCS to the CBBEP and TCEQ will be in accordance with contract requirements.

A. Quarterly Progress Reports

The CCS Project Manager will submit written quarterly progress reports by the end of each fiscal quarter, with the reports due on December 15 (Sep-Nov), March 15 (Dec-Feb), June 15 (Mar-May), and September 15 (Jun-Aug), or upon termination date of the contract. Quarterly Reports shall detail progress on all major project tasks in chronological order. The Quarterly Reports shall be submitted to the CBBEP Authorized Representative. Instructions for preparing the Quarterly Report will be provided by the CBBEP Authorized Representative.

B. Draft Report

The CCS Project Manager will develop and submit a first draft report, detailing the findings from the study, to the CBBEP Project Manager for review and comment according to the Scope of Work. The format used for the information in the draft and final report is given in Appendix A.

C. Final Report

The CCS Project Manager shall submit five copies of a written final report incorporating the comments of the CBBEP Project Manager. The final report shall include, but not be limited to, the following: The data collected will be analyzed statistically to determine significant correlations between environmental parameters and water quality and biological data. Comparisons will be made between sampling events and between site locations and a final comprehensive report will be developed that includes an integrated interpretation of the data. The report will include a discussion of implications for the study area based on the monitoring sites and will contain recommendations for future investigations based on results of this study.

D. Time Line of Tasks and Deliverables

For schedule of tasks and deliverables, please see Table A6.1. The time line includes NCAP/RCAP Analysis sampling, with quarterly reports, a draft final report, and a final report as deliverables. Summaries of meetings will be submitted as deliverables with the next quarterly report following the meeting. Total project time from commencement of sampling until submittal of draft final report is anticipated to take 18 months.

E. Other Requirements

The CCS Project Manager will make two (2) oral presentations of the project, as stated in the scope of work, if requested. Slides, charts, and figures made for the Final Report, and any final oral presentation will be delivered with the final report.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All data obtained from field and laboratory measurements will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the data quality objectives, which are listed in Section A7. Only those data that are supported by appropriate quality control data and meet the data quality objectives defined for this project will be considered acceptable, and will be reported for entry into the TCEQ TRACS and EPA database.

The procedures for verification and validation of data are described in Section D2, below. The CCS Data Manager is responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format, as defined in the SWQM Data Management Reference Guide, to the project database. Likewise, all Laboratory Managers are responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to the project database. Finally, the CCS Project Manager/QAO is responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to TCEQ.

The following information, taken from the NCAP–QAPP (USEPA 2001), documents the Data Review, Verification, and Validation process. At the time of the RCAP QAPP writing it is expected that all data will be submitted to EPA after submittal to the CBBEP and TCEQ. The information provided in below, at this time, is for documentation purpose only as data transmitted from CBBEP to EPA, may, or may not follow this exact pathway. Should the procedures change, an amendment will be submitted to CBBEP and TCEQ and this process will be incorporated into the QAPP.

The data generated by NCAP will be evaluated at several junctures along their pathway from source to final incorporation into the NCAP database. First and, therefore, a very critical level of data review, validation, and verification of NCAP data will be conducted at the state-level when the raw data from the field or laboratory are reviewed while being formatted for transmission to the Regional Data Node. Participating investigators should submit final data package(s) to NCAP State Managers that consist of: a cover letter signed by the Principal Investigator; hard copies of all results (including QA/QC results); and accompanying computer diskettes (even, as in some cases, the data are directly transmitted to the Regional Data Node). If the laboratory has adhered to NCAPs performance - based QA/QC requirements prescribed for there activity during the analytical phase, the submitted data should be in a reasonably sound condition. Data packages received by a state will first be reviewed by the state's NCAP designated QA Lead for basic completeness and content (i.e., are these the data requested and are they expressed in appropriate units and format?). The overall data quality of each data set will then be evaluated in terms of accuracy and precision (when applicable) using the quality criteria described in the NCAP–QAPP (see Section B5). Either the state's NCAP QA Coordinator may conduct these data reviews or other qualified state personnel (e.g., Project Manager, Information Manager, and persons with specific expertise).

The NCAP Regional QA Coordinators may assist with the state-level data reviews (e.g., offer advise and guidance), but should not be expected to perform these first-cut reviews, as the load would simply overwhelm them. After data are received at the Regional Data Node, the IM will further groom the data sets and ready them for review by the NCAP Regional QA Coordinator. Data sets that meet the prescribed quality criteria will be accepted without further qualification for use in making environmental assessments of the estuarine systems of the U.S. Coastal regions. Data that do not meet all of the NCAP acceptability goals because of minor deficiencies will be assigned data qualifier codes to "flag" the values in question and they may still be included in the data set as estimates. This will enable individual data users to decide for themselves whether the data are acceptable for their specific purposes. Because of the multiple indicators and the diverse nature of possible data deficits, at this point, a list of data qualifiers will not be issued, but NCAP QA and IM staff is currently developing the list. As the data are reviewed, the appropriate qualifier codes with their definitions will be appended to each data file. Flagged data will be reviewed by NCAP management on a case-by-case basis to determine if the data are acceptable for making environmental assessments of the estuarine resource on regional or national levels. Data that consistently fail one or more quality criteria by a significant margin will be rejected and not used for NCAP assessments.

D2 VERIFICATION AND VALIDATION METHODS

All data will be verified to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to project specifications. The staff and management of the respective field, laboratory, and data management tasks are responsible for verifying the data each task generates or handles. The field and laboratory tasks ensure the verification of raw data, electronically generated data, and data on chain-of-custody forms and hard copy output from instruments. The data management task deals primarily with electronic data.

Verification of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified (listed by task in Table D2.1) are evaluated against project specifications and are checked for errors, especially errors in transcription, calculations, and data input (see Appendix E for a typical CCS Data Review Checklist format). Potential outliers are identified by examination for unreasonable data, or identified using computer-based statistical software. If a question arises or an error or potential outlier is identified, the manager of the task responsible for generating the data is contacted to resolve the issue.

Issues that can be corrected are corrected and documented electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected. The performance of the data

management task is documented by completion of a data review checklist. The CCS Project Manager/QAO is responsible for validating that the verified data are usable and reportable to TCEQ and EPA. One element of the validation process involves evaluating the data again for anomalies. The manager of the task associated with the data, before data validation can be completed, must address any suspected errors or anomalous data. The CCS Project Manager/QAO validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ and EPA.

The following information, taken from the NCAP–QAPP (USEPA 2001), documents the Verification and Validation methods of the NCAP–QAPP. Data generated for the NCAP/RCAP will be systematically reviewed with varying levels of scrutiny at several junctures along the path from time of collection to final reporting; from quick, on-the-spot screening to in-depth evaluation against established criteria or standards. For much of the field collected data, the first level of validation, a cursory screening, will occur as data are recorded; persons conducting and documenting real-time observations should be aware of the range that constitutes realistic values for a specific measure. Certainly a water temperature of 40ºC in the Pacific NW should jump out as an obvious outlier and trigger an immediate response to find the source of the error. With other types of data, the initial validation may not occur in such an immediate time frame; for example, in the case of nutrient analysis, the analyst may first need to run several calculations to arrive at a meaningful result.

Nonetheless, most data are amenable to some form of quick screening soon after being generated and the responsibility for this is first-cut validation falls on the personnel performing the measurement. In addition, most laboratory analyses of NCAP/RCAP samples will be monitored by a series of in-stream QC checks that indicate the general level of data quality for a given batch of samples. If routine screens and QC checks are adhered to and proper corrective measures enacted, there is little reason for seriously flawed data to be make it any further down the data stream. However, that assumption cannot be totally relied upon, so additional, documented verifications are required to determine if data quality remains at a level acceptable for the program. Section D2 of the NCAP/RCAP (USEPA 2001) provides an outline of the format and procedures to be used for evaluating and documenting data quality for NCAP/RCAP and discusses how issues will be resolved when they occur.

Table D2.1. Primary Data Management Tasks

Data to be Verified	Field Task	Laboratory Task	Database Task
Collection and analysis techniques consistent with SOPs and QAPP	V	V	
Sample documentation complete	V	V	
QC samples collected and analyzed at required frequencies	V	V	
QC samples within acceptance limits	V	V	
Chain of custody	V	V	
Sample preservation and handling	V	V	
Sample identifications	V	V	V
Holding times	V	V	
MDL		V	V
Instrument calibration data	V	V	
Measurement results	V	V	
Calculations	V	V	
Data entered in required format	V	V	V
TCEQ ID number assigned			V
Valid Parameter Codes			V
Absence of transcription error	V	V	V
Source codes 1, 2, and Program Codes used correctly			V
Reasonableness of data		V	V
Electronic submittal errors			V
Sampling and analytical data gaps	V	V	V

D3 RECONCILIATION WITH USER REQUIREMENTS

Federal, State, and Local agencies, through various programs, have studied the bay systems of the Coastal Bend. Collectively this historical data lacks consistency in the monitoring of specific parameters and does not temporally or spatially represent the expansive area encompassed by the Coastal Bend Bay System. These problems have produced concerns in overall water and sediment quality and the health of the estuarine system (CCBNEP-13 1997; CCBNEP-23 1997).

Following the intensive initial targeted monitoring studies with an established RCAP will continue to address those concerns. As previously stated, the goal of establishing an on-going monitoring program is to protect, preserve, and enhance the natural resources of our coastal environment by providing descriptive and quantitative data, develop diagnostic procedures to characterize the physical, chemical, and biological dynamics our coastal environment, determine ecological condition, evaluate rates and causes of possible declines within the system, and predict future conditions under various alternative water quality scenarios.

A comprehensive RCAP that address these goals and objectives has the unique ability to interact with most, if not all, of the other Action Plans as described in the Coastal Bend Bays Plan in an overall adaptive management structure. Therefore, the objectives of this project are to build upon the current monitoring projects and establish and implement a Regional Coastal Assessment Program that assess the water and sediment quality of the CBBEP area while at the same time interfacing with the broader NCAP that assesses all coastal waters of the United States. It will directly support one of the primary Action areas as stated in the CBBEP's comprehensive conservation and management plan that was developed over the last five years. That action area has three goals:

1. To maintain and enhance water quality
2. To understand total loadings and the transport pathways and biological effects of loadings to the bay system
3. Improve management of all loadings to the bay system

All information collected by the partnering organizations, if collected and processed in accordance with this QAPP, will be analyzed and used for assessment and characterization of water quality of the Coastal Bend Bay System project area. This information will provide sufficient reliable data, to address areas of water quality concerns, and provide a screening program tool for future long-term monitoring needs of the system and will be utilized by the TCEQ for possible TMDL development; permit decisions, and water quality assessments.

The data collected will be analyzed statistically to determine significant correlations between environmental parameters and water quality and biological data. Comparisons will be made between sampling events and between site locations and a final comprehensive report will be developed that includes an integrated interpretation of the data. The report will include a discussion of implications for the study area based on the monitoring sites and will contain recommendations for future investigations based on results of this study.

On the larger scale, as stated in the NCAP–QAPP (USEPA 2001), the NCAP will serve multiple functions: to provide standardized data to characterize the environmental conditions in a regional (e.g., U.S. Pacific Coast) or in a sub-regional (e.g., individual states: TX, OR, and WA) estuarine system, which, in turn, can be used as a component on a national scale; and, also, to evaluate the efficacy of the U.S. EPA's role as a steering element, responsible for the coordination of the monitoring activities conducted by state and other federal agencies, rather than implementing the project solely based on EPA support.

Originally NCAP was in fact a demonstration program and, as such, the need to reconcile results from the first year (Summer 2000) of monitoring to the proposed project Data Quality Objectives (DQOs) was not totally germane. The project represented an experimental application that was not bound by success/failure criteria, but rather an iterative success/revision approach. For these reasons, NCAP used Method Quality Objectives (MQOs) to evaluate success on a component level, in addition to project DQOs as criteria for the overall sampling design.

The NCAP management team was advised on the QC results for the individual monitoring and analytical activities as evaluated against the MQOs or quality goals established in the QAPP. Each activity for which QA/QC guidelines were described submitted a summary of those results along with their analytical results. If the data quality for a particular indicator was substandard, NCAP management was charged with the decision to: 1) if consensus agreement is reached that existing criteria are overly stringent, revise the quality criteria to reflect the level of data quality attained and then use the data for environmental assessments; 2) totally reject the use of the data for environmental assessments; or, 3) flag the deficient data with qualifiers and use it conditionally for environmental assessments.

After a thorough assessment of the FY 2000 data, the NCAP management would retain those indicators that appear to be efficacious for future monitoring projects in the following year of NCAP or of other subsequent EMAP-sponsored monitoring projects. Indicators that fail to produce acceptable data were to be revamped or suspended.

REFERENCES:

American Public Health Association. 1998. Standard methods for the examination of water and wastewater, 20thth ed. American Public Health Association, Washington, D.C.

Bourgeois, P.E., V.J. Sclafani, J.K. Summers, S. C. Robb, and B.A. Vairin. 1998. Think Before You Sample. GEO World. Vol. 11: No 12.

CCBNEP-13. Current Status and Historical Trends of Ambient Water, Sediment, Fish and Shellfish Tissue Quality in the Corpus Christi Bay National Estuary Program Study Area. 1997.

CCBNEP-23. Ward, G. H. and N. E. Armstrong. Ambient Water, Sediment, Fish and Shellfish Tissue Quality of the Corpus Christi Bay National Estuary Program Study Area: Present Status and Historical Trends. 1997.

Hale, Stephen S., Jeffrey Rosen, Dillon Scott, John Paul, and Melissa Hughes. 1999. EMAP Information Management Plan: 1989-2001. EPA/620/R-99/001. U.S. Environmental Protection Agency, Office of Research and Development, Nation Health and Environmental Effects Research Laboratory, Research Triangle Park, NC.

Heitmuller, P.T. and C. Peacher. 1995. EMAP-Estuaries West Indian Province: Quality Assurance Project Plan for 1995. U.S. Environmental Protection Agency, Office of Research and Development, Gulf Ecology Division of the National Health and Environmental Effects Research Laboratory, Gulf Breeze, FL.

Hunt, D.T.E., and A.L. Wilson. 1986. The Chemical Analysis of Water: General Principles and Techniques. 2nd ed. Royal Society of Chemistry, London, England. 683 pp.

Kirchner, C.J. 1983. Quality control in water analysis. Environmental Science and Technology 17 (4):174A-181A.

Stanley, T.W., and S.S. Verner. 1985. The U.S. Environmental Protection Agency's quality assurance program. Pp 12-19 In: J.K. Taylor and T.W. Stanley (eds.). Quality Assurance for Environmental Measurements, ASTM SPT 867. American Society for Testing and Materials, Philadelphia, PA.

TCEQ SOP - TCEQ Surface Water Quality Monitoring Procedures Manual. 2003

TCEQ, Guidance for Screening and Assessing Texas Surface and Finished Drinking Water Quality Data (FY 2002). Revised 2/11/02.

18th Edition Standard Methods for the Examination of Water and Wastewater, 1989.

USEPA “Methods for Chemical Analysis of Water and Wastes”, Manual #EPA-600-4-79-020, 18th Edition Standard Methods for the Examination of Water and Wastewater, 1989.

U.S. EPA. 1995. Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analyses. U.S. Environmental Protection Agency, Office of Research and Development, Narragansett, RI. EPA/620/R-95/ 008.

USEPA “Method 1600: Membrane Filter Test Method for Enterococci in Water”. U.S. Environmental Protection Agency, Washington, DC 1997.

USEPA 2000. Improved enumeration methods for the recreational water quality indicators: Enterococci and E. coli. EPA/821/R-97/004

USEPA 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. United States Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL.EPA/620/R-01/002.

Appendix A Coastal Bend Bays & Estuaries Program data formats for contractor submission.

Coastal Bend Bays & Estuaries Program
Section 1: Data/Information Format
Submission Requirements for CBBEP Contractors

Unless otherwise specified as a requirement, all data and information must be submitted in hard and electronic copy. Appendix A describes acceptable electronic formats for contractor submissions.

Data Type	File Format	Note
Textual	MS Word for Windows	
Tabular	MS Excel (4.0 for Windows)	
Spatial	ArcView shapefile (.shp) or Interchange File (.e00)	See GIS guidelines for additional projection and metadata requirements.
Graphics - Photo-ready only	Tagged Image Format (.tif), Encapsulated Postscript (.eps) or Windows Metafile (.wmf)	These should be embedded in the text document Vector and raster images
Vector graphics - Offset printing	Encapsulated Postscript (.eps) or native Adobe Illustrator 7.0 (.ai)	Applies to all color vector files for offset printing. These should be embedded and supplied as separately
Raster graphics - Offset printing	Tagged Image Format (.tif) at 300 dots per inch (dpi)	Applies to color photographs and other raster images. These should be embedded and supplied as separately
Storage Media	PC formatted removable disks including: CD-ROM 3.5” floppy disks Iomega Zip disks 5.25” Syquest disks	Use these to media to submit data. Alternatively, contractors can post files to an ftp site for download.

Coastal Bend Bays & Estuaries Program
Section 2: Guidelines for CBBEP Publications

Contractors, principal investigators or individual authors may not copyright their work. Final report to include full (annotated) citation plus meet all publication guidelines listed below:

Organization

- Project organization follows outline specified in Scope of Services; all sections are present and complete
- No commercial identification of contracting organization, i.e., headers, footers, logos, etc.
- Final Reports. Projects involving data collection: The final reports shall incorporate Program Office & PAC comments to the draft report. The final report shall include, but not be limited to, the following information:

  A letter of transmittal to the Project Coordinator

  A title page listing project title, authors, and date

  Table of contents

  List of tables

  List of figures

  Executive summary

  Introduction (overview of project)

  Methods

  Results

  Conclusions and recommendations

  Literature cited

  Appendices

Pagination

- Pages are numbered in Roman beginning with ix (nine) for the introductory portion of the report; beginning with the Table of Contents—the CBBEP will add pages i-viii, which are a standardized title page, full title page, a list of CBBEP Conference Committee Chairs and Vice-Chairs, and a description of the CBBEP
- Page numbers are consecutive from first to last (sections do not have independent numbering systems); page numbers appear at center, bottom of each page. New chapters begin with odd page numbers, inserting blank pages where necessary. The cover page to page viii will be provided by the Program office.

- Must include 5-10 key words (plus annotations when available)

Page	Page number
Cover Page	no number
Policy/recycle page	no number
Title with PI and Publication information	i
Study area description	vi
Study area map	vii
Blank	viii
Table of Contents	ix
List of Tables	x
List of Figures	xi
Acknowledgments	xii
Executive Summary	1

Executive Summary

- Executive Summary is succinct, complete, capable of being used as a stand-alone project description for the CBBEP members and the public, and includes summary of findings as well as methods.
- Executive Summary includes complete project title with subheading “Executive Summary” and with authors’ names.

References

- References in the bibliography must be arranged alphabetically; they must be complete and in the style and format consistent with the Council of Biology Editors Style Manual.
- References in the text are cited by author and publication date.

Appendices

Page Format

- Margins are 1 “ on all sides (excepting page number) this includes pages with illustrations.
- Paragraphs in block style with no first line indents; double spaced between paragraphs.
- Text single spaced and single column; justified right and left; no hyphenated words on right margin
- Type face: 12 point font, preferably Aerial style font.

- Draft reports must be submitted with line numbering (to facilitate review and comment).
- Illustrations (including tables and figures) should be didactic and of sufficient quality (i.e., laser print or better) for report publication. All illustrations must have descriptive titles (tables) or legends (figures).

After above criteria have been met, and the CBBEP office has given formal approval, one original camera-ready document with original art work, text, etc. should be submitted to the Program Office along with three (3) copies of the camera-ready version. A disk(s) of the document must also be submitted as required in the contract, and as specified in Appendix A: Data/Information Format Submission Requirements.

Coastal Bend Bays & Estuaries Program
Section 3: Annotated bibliography Sample Records

For **annotated** bibliographies, please use the formats given below. For report bibliographies use **the** formats given in the Council of Biology Editors Style Manual.

Journal

Author: Cox, B.A., and J.W. Anderson.
Date: 1973.
Title: Some effects of No. 2 fuel oil on the brown shrimp, Penaeus aztecus.
Journal: *American Zoologist* 13: 262-264.
Key words: Brown shrimp, fuel oil, Penaeus aztecus, petroleum product, physiology.
Summary: This section contains a brief summary of the article including QA/QC activities.
Contact: This is the person and where he/she is located that is in charge of the data set and could answer questions regarding the data. This category may not apply for all references.

Book

Author: Fogg, G.E.
Date: 1975.
Title: A*lgal Cultures and Phytoplankton Ecology.*
Pages: 175.
Publisher: University of Wisconsin Press.
Key words: Algae, culturing, ecology, phytoplankton.
Summary: Contact: This category will not be applicable when source is used as a general reference i.e. no data set is being referenced.

Edited Book

Author: Baker, H.G. and I. Baker.
Date: 1981.
Chapter: Floral nectar constituents in relation to pollinator type.
Book title: *Handbook of experimental pollination biology.*
Editor: C.E. Jones and R.J. Little.
Pages: 243-64.
Publisher: New York: Van Nostrand-Rheinhold.
Key words: Fructose, nectar, pollination, pollinators, protein Summary:
Contact: N/A.

Unpublished data

Contact: Suttel, A. C.
Date: August 9-10, 1992.
Subject: Brown tide photosynthetic measurements.
Summary: This data was collected by the UTMSI summer Biological Oceanography class as part of a class project.
Methods: C14 uptake method from Strickland and Parsons, 1972.
QA/QC: Duplicate samples collected from each of two stations. 50 mL sub-samples were taken from each sample. Preserved samples also included in experiment.
Institution: University of Texas Marine Science Institute, Port Aransas, TX 78373, 512-7497000.

Coastal Bend Bays & Estuaries Program
Section 4: GIS Submission Requirements for CBBEP Contractors

Unless otherwise specified as a requirement, all GIS data must be submitted in the format listed below.

GIS DATA	REQUIREMENT
File Format	Arc Interchange (E.00)
Metadata	Adhere to Federal Geographic Data Committee (FGDC) approved "Content Standards for Digital Geospatial Metadata, ver.1 or later"
Metadata File Format	MS Word or Hypertext Markup Language (html)
Projection	Unprojected – geographic (decimal degrees)
Datum	NAD83
Readme file	Provide a simple list of files names, and coverages included. Any supporting information should be documented such as custom symbols, color sets, and legends.
Data Transfer	CD-ROM

Metadata

All GIS files submitted will include metadata conforming to the FGDC standards which have been adopted by the State of Texas. Information about this standard, including the document defining the standard, is available at the following website :

http://www.fgdc.gov/Metadata/Metadata.html.

Coastal Bend Bays & Estuaries Program, Inc.
Section 5: Work Plan Guidelines

The purpose of the work plan is to show how all the objectives and tasks of your project will be accomplished. The work plan can be based on your accepted proposal with consideration of the comments given by the CBBEP Project Manager, the Project Advisory Committee, and the EPA and/or TCEQ representative(s). Please follow the outline given below to develop the work plan for your project. Please remember to be thorough in describing the details of the project but be as concise as possible. The CBBEP Project Manager, the Project Advisory Committee, and the EPA and/or TCEQ representative(s) will review the plan and return comments to you about two weeks after submission. The work plan will need to be revised in accordance with the comments of the reviewers in order to be approved. **The work plan must be approved by the CBBEP before any substantial work on the project is initiated.**

Section 1. Title page (see attached page)

a. Name, address, phone #, e-mail address of all key personnel working on project (excluding subcontractors)
b. CBBEP Project Manager
c. Name of project
d. Contract number
e. Approval date of work plan (provide blank for date of approval)

Section 2. Approval page/distribution list (see attached page)

Section 3. Table of contents

Section 4. Project overview, objectives, and task descriptions

a. Brief background of project
b. List of objectives of project and outline of approach to meet these objectives.
c. List of tasks included in the Scope of Work with a detailed description of each task.

Section 5. List of deliverables.

Detailed description and timeline of deliverables included in the Scope of Work.

Section 6. Budget.

Please use the following budget categories and format. Include time commitments and tasks for each person including subcontractors. If you have doubt what category a particular budget item belongs under, please contact the project manager or the contracts manager.

	BUDGET			
Funding Sources				
CBBEP		x		
Others (Listed)		x		
Total Budgeted Costs			x	
DETAIL				
CBBEP	MATCH		MATCH (if any)	(if any)
Personnel/salary	x	x	x	
Fringe benefits	x	x	x	
Travel	x	x	x	
Supplies	x	x	x	
Equipment	x	x	x	
Contractual	x	x	x	
(include subcontractor	x	x	x	
budget details here)	x	x	x	
Construction	x	x	x	
Other				
(include detailed descriptions)	x	x	x	
Total direct costs	x	x	x	
Authorized indirect costs	x	x	x	
Total CBBEP funding	x			
Total match	x	x		
Total budgeted costs	**x**	**x**	**x**	

Section 7. Literature references as needed

In addition to the above sections, each page of the Work Plan should have in the upper right corner the following document control header:

Section No. ____
Revision No. ___
Date _____
Page _ of __

This header allows changes in the document to be tracked. The first submission of a document should be Revision No. 0.

Section No.
Revision No. ___
Date _____
Page _ of __

Section 1. Title page

Project Name:

Contract No:

Name(s) of Key Personnel
Name(s) Performing Party
Address(es)
Phone Number(s)

Name of CBBEP Project Manager
Coastal Bend Bays & Estuaries Program, Inc.
1305 N. Shoreline, Suite 205
Corpus Christi, Texas 78401
(361) 885-6245
e-mail: xxxxxx@cbbep.org

Approval date of Work Plan:_____

Section No. ____
Revision No. ___
Date _____
Page _ of __

Approval page/distribution list

Project Name:

Contract Number:

CBBEP Project Manager:_____ Date:_____

CBBEP Executive Director:_____ Date:_____

TCEQ Representative:_____ Date:_____

EPA Representative:_____ Date:_____

Coastal Bend Bays & Estuaries Program, Inc.
Section 6: Contractor Quarterly Report Guide

Quarterly reports are due from each contractor by the end of the calendar quarter (with the quarters beginning March, June, September, December). If a project extends beyond the proposed timeline, quarterly reports should continue to be submitted until the project's completion. The purpose of these reports is to keep the Project Manager abreast of the progress of each project. It is important that you accurately reflect the progress of your project in the Quarterly Reports and highlight any QA/QC discrepancies you may have encountered. We ask all contractors to follow the outline given below for their quarterly report. These reports excluding the title page should not exceed two pages of single-spaced text in length. Two copies of the report with a cover letter should be sent to the Project Manager so they arrive at our office by no later than the due date. Quarterly reports may be submitted via fax (361-883-7801), e-mail, or by mail (1305 N. Shoreline Blvd, Suite 205, Corpus Christi, Texas 78401).

I. Title page

A. Project name
B. Names of Performing Party Authorized Representative
C. Address and phone #
D. Reporting period (dates of quarter)
E. Date of submission
F. Include the following:

Submitted to:
Coastal Bend Bays & Estuaries Program
1305 N. Shoreline Blvd., Suite 205
Corpus Christi, TX 78401

II. Description of tasks completed

These are the tasks described in the IQA/WP.

III. Status of tasks in progress

Please indicate % completion of each task and any QA/QC discrepancies encountered.

IV. Plan for next quarter

Indicate expected times of completion of tasks.

V. Adherence to Project Timeline

A. Explanation of delays (if any)
B. Anticipated delays

Appendix B. Example of a typical Center for Coastal Studies Field Data Form

Center For Coastal Studies
Field Data Sheet

Date: _____ YSI Multiprobe #: _____
Sampling Location: _____ Station ID: _____
Time Collected: _____ Time In: _____ Time Out: _____
Lat/ Long: _____ Truck Out: _____ Truck In: _____
Sample Collector Initials: _____ Boat Out: _____ Boat In: _____
Monitor(s) Name (s): _____

STORET	FDID	VALUE	Parameter	Parameter Code
	1		Total Depth (cm)	
	2		Depth Collected (cm)	
00020	3		Air Temp (°C)	
	30		Wind Chill	
	29		Relative Humidity (%)	
	31		Heat Index	
	32		Dew Point	
	26		Wind Intensity (MPH)	
89965	25		Wind Intensity	1=Calm (0), 2=Slight (1-7), 3=Moderate (8-18), 4=Strong (19+)
89010	27		Wind Direction	1=N, 2=S, 3=E, 4=W, 5=NE, 6=SE, 7=NW, 8=SW
	24		% Cloud Cover	
89966	23		Present Weather	1=Clear (0-25%), 2=Cloudy (25-99%), 3=Overcast (100%), 4=Rain
00010	4		Water Temp (°C)	
00094	8		Conductivity (µmhos/cm)	
00480	9		Salinity (ppt)	
00301	7		DO (% Saturation)	
00300	6		DO (mg/L)	
00400	5		pH (s.u.)	
82078	37		Turbidity (NTU)	
	28		Barometric Pressure	
00078	10		Secchi Disk (meters)	
	34		LICOR-Terrestrial	
	35		LICOR-Flat Cosine	FCS/TS = Percent Light Transmittance
	36		LICOR-Spherical	SQS/TS = Percent Light Transmittance
89969	11		Water Color	1=Brown, 2=Reddish, 3=Green, 4=Black, 5=Clear, 6=Other
89971	12		Water Odor	1=Sewage, 2=Oily/Chemical, 3=Rotten Eggs, 4=Musky, 5=Fishy, 6=None, 7=Other
89968	13		Water Surface	1=Calm, 2=Ripples, 3=Waves, 4=White Caps
88842	14		Turbidity	1=Low, 2=Medium, 3=High
89972	15		Tide Stage	1=Low, 2=Falling, 3=Slack, 4=Rising, 5=High
	33		Seagrass Percent Cover	
01351	16		Flow Severity	1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry
00061	17		Flow (CFS)	
89835	18		Flow Meas. Method	1=Gauge Station, 2=Marsh-McBirney, 3=Montedoro-Whitney, 4=Price Pygmy
74069	19		Flow Estimate (CFS)	
72053	20		Days Since Last Rainfall	
82553	21		Rainfall (Inches past 1 day)	
82554	22		Rainfall (Inches past 7days)	

Appendix C. Example of a typical Center for Coastal Studies Chain of Custody Form

CUSTOMER RECORD and ANALYSIS

Send Results to: Brien A. Nicolau
Address: Center for Coastal Studies
NRC Bldg., Suite 3200
6300 Ocean Drive
Corpus Christi, TX 78412

Phone: 361-825-5807
Fax: 361-825-2770

Center for Coastal Studies

Lab Analysis Request

Project Name:
Project No.:

Sampling by:

Sampling Identification:	Lab only	No. Containers	Matrix: Liquid	Matrix: Soil	Preserved (w/Ice): H_2SO_4 Mark "X on lid"	Preserved (w/Ice): Ice Ref (Only)	Sampling: Date	Sampling: Time	Alkalinity (EPA 310.1-2)	Chloride (EPA 300 A)	TSS (EPA 160.2)	VSS (EPA 160.4)	Nitrate-N (EPA 300 A)	Nitrite-N (EPA 300 A)	Sulfate (EPA 300 A)	Ortho Phos (EPA 300 A)	TDS (SM18 2540 C)		Chlorophyll a (SM18 10200H)	Pheophytin a (SM18 10200H)		Ammonia-N (EPA 350.1)	Total Phos. (EPA 351.2)	TOC (EPA 415.1)	TKN (EPA 351.1-2)			

Relinquished by:	Date	Time	Received By:	Date	Time	Remarks: X = laboratory measurement

Appendix C (continued). Example of a Texas A&M University-Corpus Christi Environmental Microbiology Laboratory Media Log Form

Date	Media	Lot #	Volume	Initial pH	Final pH	Positive control	Negative control	Prepared by	Project Name

Appendix D. CCS Data Management Plan

Personnel

The CCS Project Manager is responsible for oversight of collection, input, verification, and validation of project data. The CCS Field Supervisor is responsible for collection of field data and the collection of water samples for laboratory analysis. The CCS Data Manager is responsible for input of field data and lab analysis data into database format, that all database tables complete and correct. The CCS Data Manager is then responsible for submittal of all data into the CCS Project Database and with supplying the datasets and corresponding data management check lists to the CCS Project Manager, who is responsible for analyzing the data for the quarterly and annual reports.

Systems Design

Hardware used to support data processing consists of PC Computers. Software used to support data processing includes but is not limited to, Windows 2000 or XP Professional, Microsoft Office 2000 or 2002 Professional, Adobe Acrobat. The project will meet the minimum requirements for submitted information to TCEQ. Data submitted to TCEQ will be in a format suitable for inclusion in the SWQM portion of the TRACS database. Terminology and field descriptions are included in the SWQM Data Management Reference Guide, March 2003.

Data Dictionary

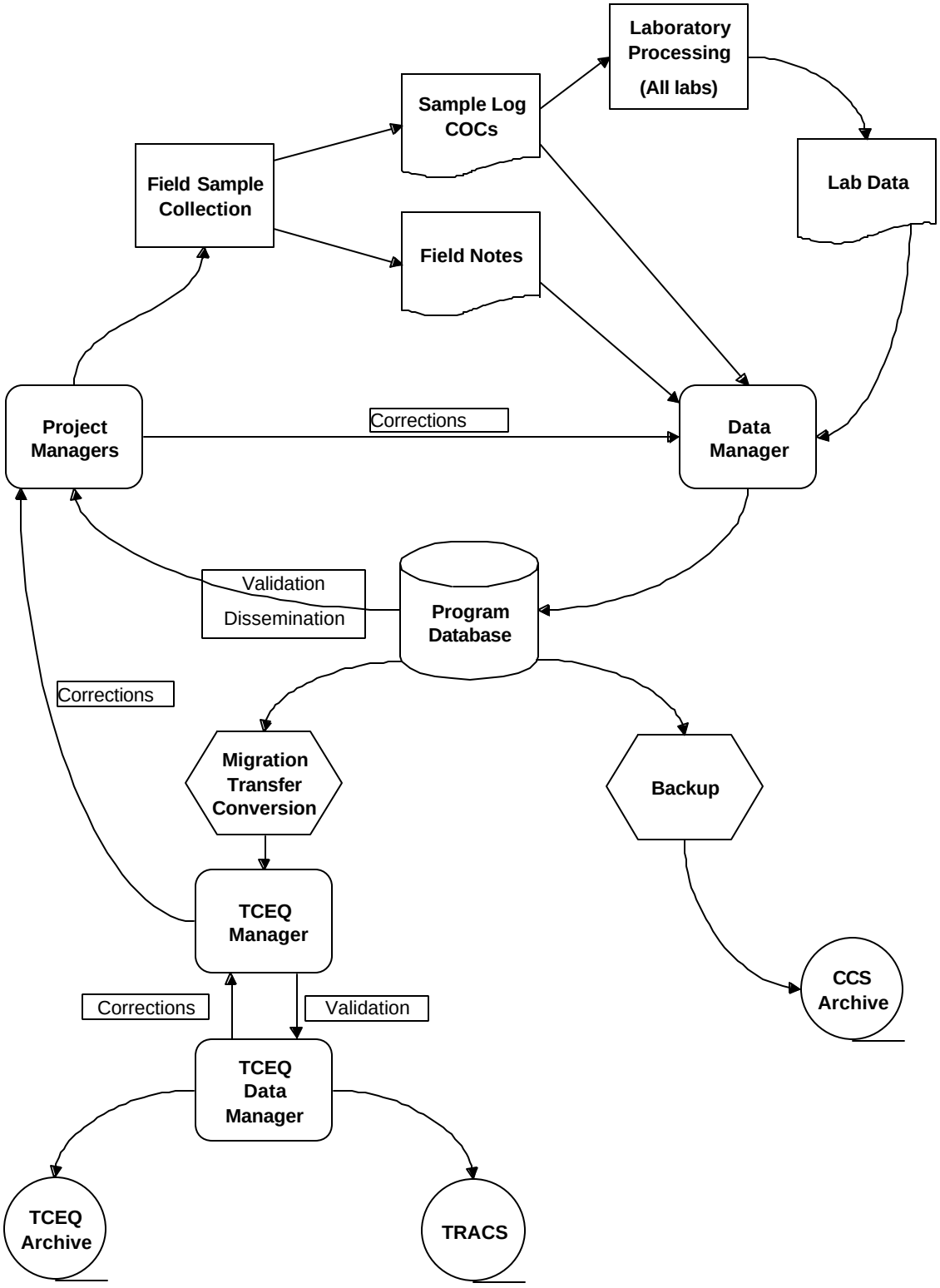
Terminology and field descriptions are included in the SWQM Data Management Reference Guide, 2003 or most recent version. For the purposes of verifying which source codes are included in this QAPP, a table outlining the codes that will be used when submitting data under this QAPP is included below.

Name of Monitoring Entity	Tag Prefix	Source Code 1	Source Code 2
Texas A&M University-Corpus Christi Center for Coastal Studies	A	CP	AM

Data Management Plan Implementation

Data collection begins with the collection of field data and samples (Fig. D1). Chain of Custody (COC) and field data sheets are completed in the field. Field data sheets are returned to CCS for digitizing, proof reading, and data entry. COC's accompany samples to the Laboratory. Lab analyses result sheets and COC's are returned to CCS. This data is digitized and proof read by field personnel and data entry personnel. Biological samples analyzed in the laboratory generate the next level of data. This data is recorded on data sheets, is digitized and proof read before data entry. Proof reading in both cases involves checks of both digitized and handwritten numbers. The CCS Data Manager, or personnel appointed by the CCS Data Manager, enters all data into the database, and the data is then transferred to CCS Project Manager.

Figure D1. Flow Chart displaying the movement and tracking of data.



Quality Assurance/Control

See QAPP.

Migration/Transfer/Conversion

Data files are identified with a unique project name and are transferred electronically from the CCS Data Manager to the CCS Project Manager via network drives. The CCS Data Manager is responsible for checking that the data imports correctly. The CCS Data Manager is responsible for maintaining the integrity of the proper migration, transfer and conversion of data procedures. The CCS Data Manager is responsible for verifying all data meets criteria and for ensuring the data is in proper format for eventual transfer to TCEQ in ASCII (DOS) pipe delimited text files. The CCS Data Manager then submits the data file electronically to the CCS Project Manager.

The CCS Project Manager is responsible for ensuring conversion of the data into acceptable TCEQ TRACS database format (ASCII) is accurate and complete before final transfer to the TCEQ SWQM Team Leader. This data will be submitted in the format specified in the *Surface Water Quality Monitoring Data Management Reference Guide, March 2003* or most recent copy to the TCEQ for entry into the SWQM portion of the TRACS database. The CCS Project Manager will verify that all data conforms to TCEQ TRACS format conventions before electronic delivery to the TCEQ. Upon review and verification by the TCEQ SWQM Data Manager, the data will be forwarded to the TCEQ Information Resources Division for loading into TRACS's.

Backup/Disaster Recovery

All data is recorded in approved software programs as outlined in the QAPP and is routinely backed up by the CCS Data Manager or CCS Project Manager to a different PC, CD-ROM, and tape format on a minimum weekly basis. Copies of the backup media are kept at a separate geographic location.

Archives/Data Retention

The CCS Project Manager will retain original lab analyses results and all field data sheets. Complete original scanned data sets will be archived on CD-ROM and retained by the CCS Data Manager or CCS Project Manager at the CCS offices.

Information Dissemination

Project updates will be provided to the CBBEP, TCEQ, and EPA Project Managers in progress reports and the information will be made available at stakeholder meetings. Environmental data collected as part of the project described in this QAPP will be accessible to the general public from the TCEQ TRACS database once the data has undergone the QA/QC protocol described herein. When the final report is complete the data will also be made available to the public via the Internet.

Appendix E. Example of a typical Center For Coastal Studies Data Review Checklist

CENTER FOR COASTAL STUDIES
DATA REVIEW CHECKLIST

✓ = yes, X = no
N/A = not applicable
*** See comments**

Data Quality Review for Field Data

1. Field Data Sheets completed?	
2. Field Duplicate and Field Blank collected for analysis?	
3. Chain of custody record properly filled out and available for review?	
4. Were there any unusual occurrences that may affect water quality?	
5. Were there any sample collection problems?	
6. QC of Field Data for Min and Max values completed and attached to this review?	
a. Outliers confirmed and documented?	
7. QC of Hydrolab calibration sheet performed and attached to this review?	
8. Checks on data reasonableness performed?	

Data Quality Review of Routine Conventional (RC) Analysis

1. QC of RC Holding times confirmed and results attached to this review?	
a. Times exceeding criteria confirmed and documented?	
2. QC of RC RPD for Field Duplicates acceptable and attached to this review?	
a. Values exceeding criteria confirmed and documented?	
3. QC of RC Field Blanks acceptable and attached to this review?	
a. Values exceeding QAPP MAL's confirmed and documented	
4. QC of RC Data for Min and Max values completed and attached to this review?	
a. Outliers confirmed and documented?	
5. QC of RC Screening Levels conducted and attached to this review?	
a. Values exceeding criteria confirmed and documented?	
6. Checks on correctness of analysis or data reasonableness performed?	
7. Has at least 10% of the data in the database been reviewed against data sheets?	

Data Quality Review of Microbiological (MB) Analysis

1. QC of MB Holding times confirmed? _____
    a. Times exceeding criteria confirmed and documented? _____
2. QC of MB Field Blanks acceptable? _____
    a. Values exceeding QAPP MAL's confirmed and documented? _____
3. QC of MB Data for Min and Max values completed? _____
    a. Outliers confirmed and documented? _____
4. QC of MB Screening Levels conducted and attached to this review? _____
    a. Values exceeding criteria confirmed and documented? _____
5. Checks on correctness of analysis or data reasonableness performed? _____
6. Has at least 10% of the data in the database been reviewed against data sheets? _____

Data Quality Review of Benthos and Nekton (BN) Analysis

1. QC Sieving/Cleaning Form completed and checked for errors? _____
2. QC Sorting Form completed and checked for errors? _____
3. QC Identification Form completed and checked for errors? _____
4. QC Sample Batch Listing Form completed and checked for errors? _____
5. QC Sample Resort Form completed and checked for errors? _____
6. QC Sample Re-Identification Form completed and checked for errors? _____
7. QC of Species Abundance and Biomass Form completed and checked for errors? _____
8. Has at least 10% of the data in the database been reviewed against data sheets? _____

Data Quality Review of Data Input and Storage

1. Has all field data been entered? _____
2. Has all routine conventional data been entered? _____
3. Has all microbiological data been entered? _____
4. Has all benthic and nektonic data been entered? _____
5. Have all data sheets been electronically filed? _____

COMMENTS: Explain any answers that may indicate a problem with the data (attach another page if necessary):

Date Submitted to TCEQ: _____

TAG Series: _____

Date Range: _____

Data Source: _____

Comments: _____

Data Manager Signature: _____ Date: _____