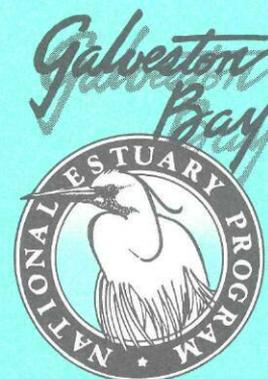


Regional Monitoring Program For The Galveston Bay Plan



**Galveston Bay
National Estuary Program**

GBNEP-45
November 1994

Regional Monitoring Program
for
The Galveston Bay Plan



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The Galveston Bay Plan

Compiled by:

The Galveston Bay National Estuary Program

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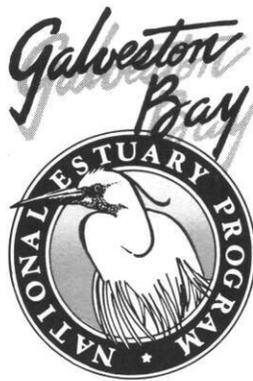
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The Galveston Bay National Estuary Program

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Texans increasingly express their expectations for a clean environment in terms of entire ecosystems. Until recently, our tendency was to view environmental problems in isolated pieces we could understand—indeed this view was institutionalized in an elaborate mosaic of fragmented jurisdictions. The Galveston Bay National Estuary Program (GBNEP) is a forerunner in elevating hands-on management of coastal environments to the level of the ecosystem; and in doing so, is encouraging an integration of traditionally disparate institutions.

The GBNEP was established under the authority of the Water Quality Act of 1987 to develop a *Comprehensive Conservation and Management Plan* (CCMP) for Galveston Bay. The CCMP for Galveston Bay is titled *The Galveston Bay Plan*. The purpose of *The Galveston Bay Plan* is to address threats to the Bay resulting from pollution, development, and overuse. To address these threats, five years of work commenced in 1990, consisting of three phases: (1) identification of the specific problems facing the Bay; (2) a Bay-wide effort to compile data and information to describe status, trends, and probable causes related to the identified problems; and (3) creation of the CCMP itself to enhance governance of the Bay at the ecosystem level. The GBNEP is accomplishing this work through a cooperative agreement between the U.S. Environmental Protection Agency (Region 6) and the State of Texas (administered by the Texas Natural Resource Conservation Commission).

The structure of the GBNEP reflects a strong commitment to consensus-building among all Galveston Bay user groups, government agencies, and the public. The GBNEP "Management Conference" consists of six Governor-appointed committees with broad representation. Meetings of these committees are open to the public, and public participation in policy-setting and in bay management are considered strengths of the program. When submitted to the Governor of Texas in late 1994, the CCMP will reflect thousands of hours of involvement (much in the form of volunteer time) by those who use, enjoy, or help govern the vital resources of Galveston Bay.

Table of Contents

<i>Executive Summary</i>	1
Chapter 1 Introduction	
Galveston Bay National Estuary Program	7
Commitment to Monitoring.....	7
Monitoring Guidance.....	8
Chapter 2 Framework For Developing The Regional Monitoring Program	
Overview	11
Programmatic Monitoring	13
Environmental Monitoring	14
Principles for Building a Regional Monitoring Program	15
Framework for Developing Components of the Regional Monitoring Program.....	19
A Note on Organization.....	24
Chapter 3 Overview of Monitoring in Galveston Bay	
Federal Agencies	
U.S. Environmental Protection Agency	27
United States Geological Survey	38
United States Corps of Engineers	40
United States Fish and Wildlife Service	42
National Oceanographic and Atmospheric Administration	43
National Marine Fisheries Service	43
State Agencies	
Texas Natural Resource Conservation Commission.....	43
Texas Water Development Board.....	45
Texas Department of Health.....	47
Texas Parks and Wildlife Department.....	47
Local Agencies	
City of Houston.....	51
Harris County Pollution Control Department.....	53
Galveston County Health District.....	53
Citizens Monitoring Programs	57
Monitoring Summary	57
Chapter 4 Habitat Protection	
Priority Problem	65
Management Goals and Objectives	65
Data Information Needs	66
Programmatic Monitoring	69
Environmental Monitoring	70
Areal Extent, Distribution, and Classification	70
Habitat Function and Value	71

Chapter 5 Species Population Protection

Priority Problems	75
Management Goals and Objectives	75
Data Information Needs	76
Programmatic Monitoring	79
Environmental Monitoring	
Phytoplankton	80
Fish and Shellfish Monitoring.....	82
Bird Populations	83
Reptiles.....	84
By-catch.....	84
Impingement/Entrainment.....	85
Endangered, Threatened and Candidate Species.....	85

Chapter 6 Public Health Protection

Priority Problem	89
Management Goals and Objectives	90
Data Information Needs	90
Programmatic Monitoring	91
Environmental Monitoring	92

Chapter 7 Freshwater Inflow And Bay Circulation

Priority Problem	97
Management Goals and Objectives	98
Data Information Needs	98
Programmatic Monitoring	101
Environmental Monitoring	
Currents.....	101
Freshwater Inflow Quantity and Timing.....	102
Freshwater Quality.....	104
Bay Monitoring	104

Chapter 8 Spills/Dumping

Priority Problem	105
Management Goals and Objectives	105
Data Information Needs	106
Programmatic Monitoring	107
Environmental Monitoring	107

Chapter 9 Shoreline Management

Priority Problem	109
Management Goals and Objectives	110
Data Information Needs	110
Programmatic Monitoring	111
Environmental Monitoring	111

Chapter 10 Water and Sediment Quality

Priority Problems	113
Management Goals and Objectives	113
Data Information Needs	114
Programmatic Monitoring	115
Environmental Monitoring	116
Water Quality Sampling Program	
Geographical Boundaries	117
Water Quality Monitoring Objectives	117
Parameter Selection and Data Quality Objectives	117
Spatial Design and Statistical Resolving Power	121
Temporal Sampling Strategies	124
Performance Criteria	124
Water Column Sampling Methods	126
Water Column Analytical Methods	128
Water Column Quality Assurance and Quality Control	128
Marine Sediment Quality	132
Sediment Quality Monitoring Objectives	132
Parameter Selection and Data Quality Objectives	132
Performance Criteria	133
Temporal Sampling Strategy	134
Toxic Chemicals of Concern	134
Sediment Sampling and Analytical Methods	134

Chapter 11 Non-Point Sources of Pollution

Priority Problems	137
Management Goals and Objectives	137
Data Information Needs	139
Programmatic Monitoring	140
Environmental Monitoring	142

Chapter 12 Point Sources of Pollution

Priority Problems	147
Management Goals and Objectives	147
Data Information Needs	148
Programmatic Monitoring	148
Environmental Monitoring	149

Chapter 13 Communicating Results: Data and Information Management

Priority Problem	151
DIMS Objectives	151
State-wide Data Integration and Exchange Efforts	152
Design of Galveston Bay DIMS	
Overall System Design	154
Local Network Design	155
Network Architecture	157
DIMS Systems Administration	158

Database Server Managers	159
Data Types	159
Standard File Structures and Formats	160
Database Queries/ Transfer	160
Data Quality Assurance / Quality Control (QA/QC).....	161
Communicating Monitoring Results.....	162
Sources of Financial Support.....	163
<i>Literature Cited</i>	165
<i>Appendix A</i> Galveston Bay Regional Monitoring Protocols.....	173
<i>Appendix B</i> TPWD Land Cover Classification System	317
<i>Appendix C</i> Sample Locations for Galveston Bay Regional Monitoring 1995-1998.....	327
<i>Appendix D</i> Power Analysis Curves.....	333
Ammonia- Bay-wide	
TOC- Bay wide	
Total Zinc- TNRCC Segment 2422	
<i>Appendix E</i> Long and Morgan Sediment Criteria Values	347

List of Tables

Table 2-1.	Definitions Of Classes Of Indicators	19
Table 2-2.	Selection Criteria For Monitoring Protocols.....	23
Table 4-1.	Candidate Indicators And Measurements For Habitat Protection	68
Table 4-2.	Land Cover Classification Scheme Used For Coastal Zone Habitat Mapping And Analysis.....	81
Table 6-1.	Recommended Indicator Species For TDH Aquatic Life Survey Program	94
Table 6-2.	Proposed Contaminants Of Concern For TDH Aquatic Life Survey Program	95
Table 7-1.	Parameters Used As Indicators Of Freshwater Inflow Quantity And Quality.	100
Table 10-1.	Parameters And Performance Criteria For Water And Sediment Quality.....	119
Table 10-2.	Contaminants Of Concern For The Galveston Bay Regional Water Quality Monitoring Program.....	120
Table 10-3.	Historical Concentration Values For Dissolved Metals In Galveston Bay. All Values Are Given In ug/l.	127
Table 10-4.	Comparable And Acceptable Analytical Methods For Those Parameters To Be Conducted By Laboratory Analyses.....	130
Table 10-5.	Required Quality Control Analysis For Galveston Bay Regional Monitoring Program.....	131
Table 10-6.	Sediment Contaminants Of Concern For USEPA EMAP Louisianian Province Sampling.....	136
Table 13-1.	Texas GIS Planning Council Membership	153
Table 13-2.	Advantages and Limitations of Distributed Data ManagementModel	156

List of Figures

Figure 2-1.	Monitoring Hierarchy in the Galveston Bay Regional Monitoring Plan.....	12
Figure 2-2.	Integration of plan actions, monitoring and ecosystem health.....	13
Figure 2-3.	Steps in the design of the Galveston Bay Regional Monitoring Program (modified from USEPA, 1992a).....	16
Figure 3-1.	U.S. EMAP sampling stations in Galveston Bay.....	39
Figure 3-2.	USCE Galveston District Houston Ship Channel “core” monitoring stations.....	41
Figure 3-3.	National Oceanic and Atmospheric Administration sampling stations in Galveston Bay.....	44
Figure 3-4.	Texas Natural Resource Conservation Commission sampling stations in Galveston Bay.....	46
Figure 3-5.	Texas Water Development Board sampling stations in Galveston Bay.....	48
Figure 3-6.	Texas Department of Health sampling stations in Galveston Bay.....	49
Figure 3-7.	City of Houston Department of Public Works and Engineering sampling stations in tidal and near tidal portions of Galveston Bay.....	52
Figure 3-8.	City of Houston Health and Human Services Department sampling stations in Galveston Bay.....	54
Figure 3-9.	Harris County Pollution Control Department sampling stations in Galveston Bay.....	55
Figure 3-10.	Galveston County Health District Pollution Control sampling stations in Galveston Bay.....	56
Figure 3-11.	Citizens monitoring sites within the Galveston Bay watershed.....	58
Figure 3-12.	Summary of physical and chemical information on Galveston Bay.....	60
Figure 3-13.	Summary of biological and ecological information on Galveston Bay provided by monitoring programs.....	61
Figure 3-14.	Summary of physical/chemical and biological information supplied by monitoring programs.....	62
Figure 7-1.	USGS flow gauging stations for Galveston Bay inflows.....	103
Figure 10-1.	Galveston Bay Regional Monitoring Program.....	123
Figure 13-1.	Distributed Data Management Model.....	155
Figure 13-2.	Decision Chart for Selection of Network Media.....	158
Figure 13-3.	Three Types of Data Processing Programs.....	161

Glossary of Acronyms

BMP	Best Management Plan
BOD	Biological Oxygen Demand
CBOD	Carbonaceous Biological; Oxygen Demand
C-CAP	Coast Watch Change Analysis Program (NOAA)
CCMP	Comprehensive Conservation and Management Plan
CMP	Coastal Management Plan
COC	Contaminant of Concern
DIMS	Data information Management System
DO	Dissolved Oxygen
DPW&E	City of Houston - Department of Public Works and Engineering
EMAP-E	Environmental Monitoring and Assessment Program - Estuaries
FC	Fecal Coliform
GIS	Geographic Information System
GBNEP	Galveston Bay National Estuary Program
GBRMP	Galveston Bay Regional Monitoring Program
GCHD	Galveston County Health District
GLO	Texas General Land Office
HCPCD	Harris County Pollution Control Department
H-GAC	Houston- Galveston Area Council
HSC	Houston Ship Channel
NAWDEX	
NEP	National Estuary Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point Source
NSSP	National Shellfish Sanitation Program
PAH	Poly Aromatic Hydrocarbons
PCB	Poly chlorinated Biphenyl
POTW	Publicly Owned Treatment Works
QA/QC	Quality Assurance and Quality Control
R-EMAP	Regional- Environmental Monitoring and Assessment Program
SWCB	Texas Soil & Water Conservation Board
TCWC	Texas Colonial Waterbird Census
TDH	Texas Department of Health
TMDL	Total Maximum Daily Load
TNRCC	Texas Natural Resource Conservation Commission
TNRIS	Texas Natural Resources Information Service
TOC	Total Organic Carbon
TPWD	Texas Parks and Wildlife Department
TSS	Total Suspended Solids
TWC	Texas Water Commission (now the TNRCC)

TWDB
USCE
USEPA
USFWS
USGS
WVA

Texas Water Development Board
United States Corps of Engineers
United States Environmental Protection Agency
United States Fish & Wildlife Service
United States Geological Survey
Wetland Value Assessment Methodology

Executive Summary

The Galveston Bay National Estuary Program (GBNEP) was established under the Water Quality Act of 1987 to develop a Comprehensive Conservation Management Plan (CCMP) for Galveston Bay. In 1990 work began to: (1) identify specific problems facing the Bay, (2) compile bay-wide data and information to describe the status, trends, and probable causes related to the identified problems, and (3) create a comprehensive plan to enhance governance of the bay at the ecosystem level. Based on five years of intensive work by the diverse members of an appointed "Management Conference", *The Galveston Bay Plan* was created in 1994 for submission to the Governor of Texas and Administrator of EPA.

National Estuary Program guidance requires the development of a detailed Environmental Monitoring Plan, as a separate support document to be submitted as a supplement to *The Galveston Bay Plan*. The two major goals for monitoring work as defined in EPA guidance are: 1) to measure the effectiveness of the management plan's actions and objectives; and 2) to provide essential information that can be used to redirect and focus actions implemented under *The Plan* as they are actually carried out.

To accomplish this task, a Monitoring Work Group of technical experts was created to develop and recommend to the Management Conference a detailed regional monitoring implementation plan. This work group built on work of a previous Monitoring/Data and Information Task Force convened during Galveston Bay Plan development, and began work under the following goal statement:

The Regional Monitoring Program will be developed as a statistically sound, holistic monitoring effort designed to provide environmental data of known quality and confidence. It will be responsive to CCMP management goals and objectives, and will also have a larger goal of providing knowledge of bay-wide ecosystems, their variability, and societal impacts both environmental and ecological. Understanding that no agency's mandate is broad enough for this undertaking, the Regional Monitoring Program is seeking to promote a cooperative effort by all agencies, organizations, and other stakeholders who participate in bay monitoring activities. The Galveston Bay Regional Monitoring Program attempts to integrate and expand the disparate monitoring efforts currently active on the Bay into a comprehensive and unified monitoring plan. The regional monitoring program will integrate current monitoring efforts to the maximum extent possible, while acceding to the independent objectives of the groups involved. The plan will be developed with full participation of all interested agencies in order to encourage cooperation, communication and to maximize the potential for successful implementation.

Based on this approach, the Monitoring Work Group began to flesh out the broad monitoring recommendations in the draft *Galveston Bay Plan*. Based on contracted work by Tetra Tech, Inc., and numerous strategy sessions, this report was drafted to meet Galveston Bay's monitoring needs and comply with the requirements for

CCMP approval by EPA. As the strategy was developed, *The Galveston Bay Plan* itself was also revised to reflect the progress of the Monitoring Work Group.

This document is intended as a supplement to Chapter VI in *The Galveston Bay Plan*, providing a technical and practical rationale for future Galveston Bay monitoring activities. The report does not attempt to provide ultimate detail for the Monitoring Program, but serves as a framework from which a comprehensive monitoring program will be implemented. An appendix to the document, *Protocols for Sample Collection and Analysis: Galveston Bay Regional Monitoring Program*, contains the detailed information necessary to implement the program at the field level.

The Galveston Bay Regional Monitoring Program is designed to address two types of monitoring efforts: programmatic and environmental. Programmatic monitoring provides information to address the questions: "Are the goals and objectives set forth in *The Plan* being met?" and "Are the regulatory agencies meeting their commitments to *The Plan*?" In contrast, environmental monitoring attempts to provide answers to the broader question "Is the health of the ecosystem improving?" The process and principles used in developing the monitoring program are discussed in Chapter 2: *Framework for Developing the Regional Monitoring Program*. Overall, regional monitoring seeks to:

- Measure the status and effectiveness of *Plan* Actions,
- Establish consistent performance criteria and develop effective quality assurance and quality control programs to promote comparability between data collection efforts,
- Characterize the status and trends of conditions in the bay,
- Integrate existing monitoring efforts to the greatest extent possible,
- Make use of ecological indicators to assess status and trends in bay resources,
- Be overseen and coordinated by a multi-agency committee which will advise the Galveston Bay Program of the TNRCC, and
- Develop a data management strategy to ensure access to monitoring information.

The various agency partners involved in Galveston Bay monitoring each have specific mandates to meet, regardless of monitoring actions tied to *The Galveston Bay Plan*. However, in most cases, the Monitoring Work Group found that ongoing agency activities were flexible enough to serve both specific agency purposes and the broader goals of *The Plan*. In support of a commitment to utilize these ongoing monitoring efforts wherever possible, the first task was to catalogue the existing monitoring activities in the Galveston Bay System. A summary of these activities is given in Chapter 3. Subsequent chapters in this report address the monitoring program for each of four primary management topics:

Habitat/Living Resources Conservation

Chapter 4 - Habitat Condition

Chapter 5 - Species Distribution and Condition

Balanced Human Uses

- Chapter 6 - Public Health
- Chapter 7 - Freshwater Inflow
- Chapter 8 - Spills / Dumping
- Chapter 9 - Shoreline Management

Water and Sediment Quality Improvement

- Chapter 10 - Water and Sediment Quality
- Chapter 11 - Non-Point Sources of Pollution
- Chapter 12 - Point Sources of Pollution

Data Information Management System

- Chapter 13- Communicating Results: Data and Information Management

Habitat/Living Resources Conservation Chapters 4 and 5 address the monitoring requirements for providing maintenance and restoration of the critical habitats which make up the Galveston Bay Estuary ecosystem, and protection of the many species which make their home in the estuary or depend on the estuary for part of their life cycle. Chapter 4 discusses a monitoring program designed to assess the management goals and objectives for Habitat Condition. A program for assessment of the quality and quantity of vegetated wetlands is presented. Assessments of wetland status, areal extent, and distribution will be accomplished through use standardized computerized technology for classification of coastal habitats from satellite thematic mapper multi-spectral imagery. The recommended protocols are the NOAA Coast Watch Change Analysis Program. These protocols have been adopted and implemented in Texas by the Texas Parks and Wildlife Department, Resource Protection Division. Landcover inventories and change analysis information for Texas coastal areas, including Galveston Bay, will be available at 3-5 year intervals. This land cover classification data is available in GIS format and can be readily integrated into the proposed Galveston Bay Data Information System.

The second element of habitat monitoring, habitat quality, will utilize information on wetland distribution to rank wetland quality assessments. Habitat quality may be defined through the functions and values that characterize a wetland. Functions, are the ecological benefits that a habitat provides. Wetland functions include fish and wildlife habitat, nursery habitat, and food web support. Wetland values are a measure of the human benefits provided by a habitat. These include flood control, groundwater recharge, and recreational opportunities. By defining a degraded wetland habitat as one that no longer performs one or more of its function or value roles, quality assessments can be defined in terms of ability to perform these roles. For assessing wetland quality the monitoring program proposes the development of the USFWS Wetland Value Assessment technique. This technique is a community-oriented approach assessment tool which can be used to quantify changes in habitat quality. The WVA works under the premise that optimal conditions of habitat quality can be characterized and that an index of wetland quality can be developed against that optimal condition. This approach emphasizes the concept that species protection is inextricably linked to habitat protection.

To address species management problems in the Bay, Chapter 5 develops a suite of monitoring programs directed at assessing the measurement of population trends of economically and ecologically important plant and animal species. This monitoring element relies heavily on the Coastal Fisheries sampling program conducted by the Texas Parks and Wildlife Department. Specific monitoring elements address: fish and crustacean population levels; oyster populations; and the effects of pressures such as commercial by-catch, and impingement and entrainment on fish and crustacean populations. The plan also addresses the issues of monitoring for assessing reductions in populations of nuisance species and enhancing endangered and threatened species populations.

Balanced Human Uses The second primary management topic, Balanced Human Uses, addresses many of the impacts to the Bay, direct and indirect, from the human population residing in close proximity to the Bay. This topic deals with maintaining a balance between public access to bay resources and the environmental requirements of a healthy ecosystem. Four categories of human uses of the bay were developed and are summarized in the ensuing discussions of Chapters 6-9.

Chapter 6, Public Health Protection, addresses issues impacting human consumption of Bay products such as fish and shellfish and contact recreation opportunities provided by the Bay. Monitoring in this section provides information to improve assessments of the safety of oyster harvest areas, development of a risk-based seafood consumption program, and development of a Contact Recreation Advisory Program. In response to these concerns the Texas Department of Health will seek funds to expand its monitoring program for the harvest of shellfish and will develop a routine fish and crustacean tissue sampling program. This program will be designed to allow for development of risk-based program to safeguard the quality of seafood production in the Bay. These programs will be coordinated with the Galveston Bay Regional Monitoring Program.

Chapter 7 addresses the important issue of the continued flow of high quality fresh water into the estuary. A balanced salt/fresh water mix is critical for the survival of most estuarine species and is vital to maintaining biodiversity within the system. The Texas Water Development Board with the Texas Parks and Wildlife Department is currently completing a freshwater inflow-biological resources optimization model which will be used to determine the quantities and timing of freshwater needed to maintain the current abundance of biological resources. Continued monitoring of freshwater inflow quantity and timing is critical to the success of Bay management. To accomplish this monitoring objective the program will work with the U.S. Geological Survey to strengthen and improve the stream flow monitoring network in the Galveston Bay system.

Chapters 8 and 9 address the impacts of spills and dumping and of shoreline development on the Bay. The plan treats monitoring for these impacts as primarily programmatic, rather than environmental. Plans for assessing activities designed to reduce impacts to the system from spills include the tracking of: adoption of improved damage assessment procedures; bay-wide baseline data on pre-release

conditions; and monitoring development of local measures to remove floating trash and debris from stormwater discharges. Tracking to assess progress in Shoreline Management actions plans will include: assessing local authorities for development of shoreline development regulations consistent with those outlined in the plan; monitoring for derelict structures and their removal; and actions directed at improving access to bay shoreline.

Water and Sediment Quality Improvement This monitoring element addresses relationships between water and sediment quality and pollutant loadings to the bay. Action plans were developed to address general water and sediment quality issues, non-point source issues and point source issues.

Monitoring of water and sediment quality emphasizes toxic substances and dissolved oxygen in certain tributaries and side bays. All monitoring activities will be made comparable through establishment of consistent performance criteria and development of effective quality assurance and quality control programs. An open-bay sampling program emphasizes the utilization of a probability-based, systematic sampling program to provide rigorous, unbiased estimates of environmental conditions in the open and tidal portions of the Bay. Monitoring in the bay watershed will be accomplished through the comparability element and coordination of efforts through local and state agencies and programs such as the Texas Clean Rivers Program.

Non-point source (NPS) runoff has been targeted as the second-most important priority problem to the bay. Chapter 11 outlines the monitoring efforts for the non-point source action plan. Plan actions to address non-point sources call for the development and implementation of Best Management Practices (BMPs) for reducing NPS loadings from existing urban development, new urban development, construction, agriculture, industry, and marinas. The major emphasis on monitoring progress toward attaining action plan objectives is reviewing the implementation and success of NPS BMPs and stormwater management plans. Most of the monitoring data to be utilized to monitor reductions in NPS loads will come from special pilot projects, NPDES stormwater permit reporting requirements (including wet weather sampling) and indirectly from other elements of the regional monitoring program.

Over the last three decades, there has been a dramatic reduction in point source loads to the bay, however there are still some areas of concern. Many municipal systems continue to bypass and have overflow and collection system problems. The primary concern being the discharge of raw or partially treated sewage to the bay. A second identified problem are the continued localized impacts of produced water discharges to aquatic life in the tidal zones of the bay. Monitoring emphasis here again emphasizes programmatic issues, such as development of dry-weather illegal connection programs and elimination of bypass and overflow problems. The monitoring of fecal coliform bacteria under other elements of the regional monitoring program will provide information to document overall reductions in fecal coliform counts in the bay system. Proposed plan action on produced water dischargers calls for the issuance of an EPA general permit which would eliminate

discharges from this source. Monitoring surveys will be developed to document environmental improvements resulting from this action.

Data Information Management System An important element of the Galveston Bay Regional Monitoring Program will be the improved management of monitoring of data to enhance communication of bay trends and conditions to managers and the public. A Data Information Management System (DIMS) is to be used to house and distribute the data collected through the monitoring activities of the program.

The program recommends development of a centralized data storage system utilizing the power of Geographical Information Systems to manage and present the data in a format useful to resource managers. The plan addresses the need to ensure long-term integrity, quality, and accessibility of data. Beyond this the system addresses the need to facilitate the integration and analysis of the data and to provide statistical, graphical, spatial analysis and mapping capabilities.

Critical to the development of a comprehensive Galveston Bay DIMS is the Texas Clean Rivers Program. The Clean Rivers program complements the Galveston Bay Program by providing a coordinated assessment of river basins, within the Galveston Bay estuary, utilizing a watershed management approach. Within the Galveston Bay watershed, the Clean Rivers Program is administered by the Houston-Galveston Area Council (H-GAC). Centralization of the data information resources of the Clean Rivers Program and the Galveston Bay Program within the H-GAC is the centerpiece of the Galveston Bay DIMS. Such an arrangement will simplify the tasks of storing, maintaining, locating, querying, and retrieving regional monitoring data.

Utilizing the Geographic Information System (GIS) already in place within H-GAC, a direct electronic link will be established between the H-GAC and the Galveston Bay Program to allow access to all information within the centralized data base. Information from this system will be available from the Galveston Bay Program as raw data, technical reports for the scientific community, and non-technical summaries for the public. This data will be used to assess plan progress with environmental actions on an annual basis. Results will be distributed through the Galveston Bay Program Publications, the State of the Bay Symposium to be held every two years, and other public and scientific forums.