PROJECT CONTROL DOCUMENT

WATER QUALITY STUDY

OF

SARASOTA BAY, WHITAKER BAYOU AND LAKE MYAKKA

NOVEMBER 13, 1981

priede·sedgwick.inc.
consulting engineers

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INTRODUCTION

In order to monitor and manage activities throughout the water quality studies/wasteload allocation investigations, this Project Control Document has been developed. Included in each portion of the document are task identifications, task descriptions, input required for the task, output developed by the task, budget allocations for the task, and task responsibilities by study team participant. Each of the individual tasks identified within the document are tied to the Work Flow Diagram presented as an attachment to the report. This diagram displays the schedule for output from individual tasks and the initiation of subsequent tasks. Additionally, interrelationships between each task are tied to the time span in which those tasks are completed or initiated, along with key decision points for Level I, Level II interim outputs, and Level II.

The schedule was predicated upon the project start date of October 5, 1981, and the ability to mobilize by November 15 to initiate the field data collection activities. The time span shown for each activity between a beginning and an end point indicates the flexibility established for project activites. The two-week time span representing individual sampling events does not reflect two weeks for sampling, but provides the Study Team the flexibility of obtaining appropriate samples at one time during that two week "window". Subsequent activities associated with analysis and evaluation reflect time spans in which the work would be conducted and outputs developed.

The elements contained in the subsequent pages relate to the contractual items contained in the Contract between the Florida Department of Environmental Regulation and Priede-Sedgwick. The use of these initial identifiers provides the basis for tracking the individual task with the total dollars allocated to the project. The document identifies the field data procedures and technical approaches developed by all team members for each project activity in the Technical Appendix. The budget allocations for each individual task and subtask, were reallocated based upon the Project Control Document Workshop held in Sarasota on October 5-9, 1981, and subsequent reviews. These numbers are final and reflect budgetary dollars for invoice and project tracking purposes based upon review of the document by all Study Team participants.

As indicated under the various tasks for prime responsibility, the principle firms (Mote Marine Laboratory and Priede-Sedgwick) have been identified. Other subcontracts within the entire team to either Priede-Sedgwick or Mote Marine Laboratory are not

referenced in this document, but are identified with key firm members on the Project Team Organization (Figure 1). Those activities are the responsibility of subcontractors to those organizations and will therefore be the responsibility of each entity. However, data and information transfer will flow from subcontractors through Priede-Sedgwick to FDER for later transmittal. Information flowing from FDER will flow directly to Priede-Sedgwick for transmission to appropriate subcontractors. As lines of communication are established during the project, direct communication may take place between subcontractors and other individuals within FDER outside the Project Officer. Even though these communications are necessary for execution of the project, copies of all transmittals and directions provided must be provided to both the Project Officer for FDER and to the Project Officer for Priede-Sedgwick.

In order to facilitate use of the enclosed material, all Figures relating to field locations, are included at the end of the text. Since these figures require unfolding, this was the most efficient manner in which to handle those items. In addition, the schedule is included in a separate packet since its greatest utility is achieved when fully displayed.

PROJECT TASK DESCRIPTIONS

TASK 1.0 Project Control Document

DESCRIPTION

A document will be prepared which establishes a detailed execution plan for the entire project. A five-day workshop will be held in Sarasota with representatives of the Contractor and all Subcontractors to define specific station locations for quality and quantity measurements, confirm field procedures for obtaining quality/quantity data, review analytical procedures utilized in constituent determinations, clarify interactions between study team participants, and review station locations in the field. Each team member's responsibility and schedule will be reviewed to assure resource commitments commensurate with each activity. The workshop will establish lines of communications and data transferral procedures to assure timely evaluation of field measurements.

Following the workshop, the document will be prepared identifying the above elements. In addition, items pertinent to interim outputs, milestone decision points, and project team assignments will be developed and incorporated with the output of the workshop.

INPUT

1. Executed agreements between study participants.
2. Previous data collection activities in the study areas.
3. Field activities related to pre-dredging investigation.

OUTPUT

1. Specific task descriptions.
2. Task inputs.
3. Task outputs.
4. Budget allocation.
5. Responsibility by study participant.
6. Task scheduling.
7. Interium output definition.
8. Milestone decision points.
9. Project team organization.
10. Information transfer protocol.

BUDGET ALLOCATION $7,900

RESPONSIBILITY Priede-Sedgwick

TASK 2.1	Quality Assurance/Quality Control Manual
DESCPRITION	A manual describing all methods and procedures related to field and laboratory operations will be developed for utilization throughout the entire study program. The document will specifically identify sampling procedures, equipment calibration requirements, sample handling, replicate/duplicate samples and analyses, analytical techniques, data verification procedures, and limits of detection/accuracy. Specific forms and manifests utilized by the field/laboratory personnel will be included in the document.
INPUT	1. Project control document workshop. 2. Previous field/laboratory quality assurance/quality control manuals for saltwater/freshwater investigations.
OUTPUT	1. Quality Assurance/Quality Control Manual.
BUDGET ALLOCATION	$502
RESPONSIBILITY	Mote Marine Laboratory

TASK 2.2	Field-Laboratory Coordination/Quality Assurance
DESCRIPTION	All elements associated with field and laboratory personnel scheduling and logistics will be performed under this task. Confirmation of data requirements by other study team participants will be directed through Dr. Estevez for compatibility with field/laboratory requirements. Quality assurance audits will be conducted every other month and reports submitted within 30 calendar days following reviews for confirmation of adherence with Task 2.1.
INPUT	1. Quality Assurance/Quality Control Manual. 2. Study Team Participant data requirements.
OUTPUT	1. Monthly progress reports identifying field/laboratory activities completed that period, anticipated activities for following month, problems encountered/ resolutions, and identification of any program activities requiring modification to study plan. 2. Quality assurance review reports developed every other month.
BUDGET ALLOCATION	$19,606
RESPONSIBILITY	Mote Marine Laboratory

TASK 3.1 Sampling Station Network

DESCRIPTION

Study Team Participants identified the sampling station network commensurate with data requirements for Level III evaluation techniques anticipated to be utilitzed in Sarasota Bay. Figure 3.1 contains the continuous recording tidal and/or stage recorder locations necessary to properly delineate the tidal cycles and the freshwater inflows impacting Sarasota Bay. A total of eleven continuously recording gauge locations are identified consisting of ten locations for equipment (Fisher-Porter model 1550/1551) furnished by DER through DNR to the study team and one mutual tidal gage location for the Sarasota County circulation study (T11). Further descriptions of procedures associated with these gauges are identified in Task 3.5.1.1. (Upon initiation of Sarasota County circulation study, specific tasks and quality assurance activities related to data generated from this effort will be provided to FDER.)

Figure 3.2 delineates the locations for the 19 water quality stations required to properly identify water quality within tributary streams and subsequent impacts upon the bay system. Since the pre-dredging study was conducted before the long-term program was initiated, all water quality and sediment sampling station numbers are correlated with that numbering system. Through using identical station numbers for all subsequent work, data correlations and comparisons can be performed easily. As further detailed in Task 3.5.1.2, these stations will be monitored on a six week frequency for the water quality characteristics.

Each gauge and water chemisty station locations have been field verified by the study team as to relevancy to physical characteristics of the tributaries and the bay system. However, each location, particularly guage locations, will be further reviewed as permanent housings and

structures are defined and reviewed with Dr. Ned Smith during installation and preparation. Techniques, procedures, frequency, and duration of data collection/interpretation are further explained within Tasks 3.5.1 through 3.5.5.

INPUT

1) Bathymetry information available from navigational charts and dredging contract documents.
2) Pre-dredging investigations conducted in Whitaker Bayou and Sarasota Bay.
3. Mathematical simulation techniques judged appropriate for Level III investigations.
4. Historic impacts and changes occurring within the tributary and Bay system.
5. Field reconnaissance of proposed sampling and tidal guage locations.

OUTPUT

1. Graphical representations identifying tidal stage and water quality sampling station locations.

BUDGET ALLOCATION $2,921

RESPONSIBILITY Priede-Sedgwick

TASK 3.2 Bathymetry Studies In Sarasota Bay

DESCRIPTION

Bathymetry information will be collected within the bay during the initial portions of the project. Data will be collected by running transects with a calibrated fathometer registered to the tidal guage recorders. Specific locations will include transects from Fish Haven to New Pass, transects through each pass to the gulf, transect from City Island to Bird Key and from Bird Key to Fish Haven (Figure 3-1). Dependent upon these initial transects, additional verification of navigational map bottom topography may be necessary.

Cross-sectional data describing Whitaker Bayou have been obtained for the channels prior to dredging operations. Following completion of dredging, cross sections will be obtained to properly delineate the revised channel configuration.

INPUT

1. Intracoastal Waterway Charlotte Harbor to Tampa Bay, Florida, 7/25/81 NOAA, National Ocean Survey.
2. Cross-sectional data furnished by City of Sarasota for Whitaker Bayou prior to dredging operation.
3. Benchmarks established within the Sarasota area.

OUTPUT

1. Revised Bathymetry descriptions of Sarasota Bay and Whitaker Bayou.

BUDGET ALLOCATION $3,711

RESPONSIBILITY Mote Marine Laboratory

TASK 3.3 Meteorological Measurements in Sarasota Bay

DESCRIPTION

During the course of the field data collection, continuous recording measurements will be made at Mote Marine Laboratory for the following parameters: wind speed and direction, barometric pressure, precipitation, air temperature, and incident sunlight. This data will be supplemented by data collected at the Bradenton-Sarasota Airport and the Sarasota County air quality stations. In addition to data obtained during the course of the field investigations, historical information collected at the above locations and data obtained from the National Weather Service Station at Ruskin will be obtained to assist evaluation of previous water quality sampling studies.

INPUT

1. Data collected at the Bradenton-Sarasota Airport and Sarasota County.
2. Historical data collected at the Ruskin station.

OUTPUT

1. Definition of meteorological conditions occurring during field data collection and historical meteorological measurements.

BUDGET ALLOCATION $4,374

RESPONSIBLITY Mote Marine Laboratory

TASK 3.4.1

Whitaker Bayou Pre-Dredging Study

DESCRIPTION

In order to properly characterize the recent historical bayou conditions resulting from non-point and point source discharges, various samples and in situ measurements must be collected during a 48-hour intensive survey prior to the commencement of dredging in the Bayou. The following specific efforts are included in this task:

1. Bathymetry: in order to supplement the data provided by the City of Sarasota, cross-sections will be taken at the Riverside Drive 27th Street Bridges, along with cross-sections near the confluence of box-cuts with the Bayou. In addition, mid-channel elevations will be obtained between bridges along the Bayou. All elevations will be tied to mean sea level through benchmarks established by the City.

2. Tidal Data Collection: instantaneous staff gauge readings will be collected at each bridge and the Bayou mouth over the 48-hour period.

3. Current and Hydrographic Study: measurements of instantaneous current speed and direction will be obtained along eight cross-sections within Whitaker Bayou and at stations 63 and 64. Instantaneous measurements of pH, salinity, temperature, and DO will be obtained at each station identified in Subtask-5. Vertical measurements will be made at all bay stations and horizontal readings along channel cross-sections. Meteorological measurements will be made in conjunction with the instantaneous readings.

4. Freshwater-Saltwater Interface: identification of thickness and extent of saltwater intrusion will be documented along the Bayou.

5. Chemistry: the following parameters will be analyzed from samples collected twice during the 48-hour period (high and low tides - total of 4 samples) at stations 68, 65, 64, 63, and 44 and only during low tide at stations 97, 73, 75,

61, and 59: phosphorus series (total and ortho), nitrogen series (NO_3, NO_2, Org-N and NH_4), BOD_5, CBOD, NBOD, TOC, TSS, Turbidity, and chlorophyl "a".

6. Coliforms: Fecal coliform, total coliform, fecal streptococci will be measured from two samples collected at each of six stations during the 48-hour period (high and low tides).

7. Phytoplankton: phytoplankton samples will be collected at twenty locations (six within and near Whitaker Bayou) for later analysis of species composition and various community parameters.

8. Sediments: approximately 100 sediment samples will be taken at various stations within Whitaker Bayou and the Bay. These samples will be analyzed on a sequential basis based upon evaluation of station locations for coprostanol, TOC, and grain size distribution.

9. Benthic Fauna: approximately 20 Benthic Faunal samples will be collected (six in and near Whitaker Bayou) for possible later analysis of species composition and various community parameters. The amount of analysis performed will be dependent upon the screening of impacts within the Bay.

10. Dye Study: Rhodamine WT Dye releases will be performed to estimate the time of travel at high and low tides from the point of discharge of the City of Sarasota's wastewater treatment facility.

INPUT

1. Sample station locations identified by Study Team.
2. Schedule of Dredging contract operations by City of Sarasota's contractor.

OUTPUT	1. A summary report identifying the data collection procedures, data results, and a preliminary evaluation of the significance of the data.
BUDGET ALLOCATIONS	$11,465
RESPONSIBILITY	Mote Marine Laboratory

TASK 3.4.2 Bioassays

DESCRIPTION

Sediment samples collected from two locations within Whitaker Bayou on July 28, 1981, will be used for animal bioassay experiments. Planned bioassays include:

1) Solid phase tests utilizing the mysid shrimp, Mysidopsis, and the polychaete worm, Neanthes arenaceodentata;
2) Suspended particulate phase tests using the fish, Lagodon rhomboides, shrimp and polychaete worms. Anticipatated future monitoring will include suspended particulate phase bioassays using runoff water from the dredge material disposal operation and postdredging solid phase bioassays using Whitaker Bayou sediments.

INPUT

1) Station locations identified by Mote Marine Laboratory personnel.
2) Scheduling of sampling to obtain dredge material disposal operation runoff water and approval completion of dredging operation by the City's contractor.

OUTPUT

1) Summary report displaying data analysis, data results, and data interpretation.

BUDGET ALLOCATION $0

RESPONSIBILITY Mote Marine Laboratory

TASK 3.4.3 Post Dredging Study

DESCRIPTION Following acceptance of the City of Sarasota's dredging contractor operations, a post dredging investigation will be conducted in Whitaker Bayou and coordinated with routine sampling program in the Bayou and the Bay. The study will consist of an identical 48-hour period as identified under Task 3.4.1 for the pre-dredging study, but identification of bathymetry will be dependent upon data obtained on a timely manner from the City of Sarasota regarding final cross-sections collected in the dredging area of the channel. Additionally, sediment and benthic fauna samples will not be collected during that investigation.

INPUT
1) Acceptance of dredging contractors work by the City of Sarasota.
2) Evaluation of results obtained during inital study activities that may necessitate revising post-dredging study operation.

OUTPUT
1) A summary report presenting data collection, data results, and data interpretation.

BUDGET ALLOCATION $2,937

RESPONSIBILITY Mote Marine Laboratory

TASK 3.4.4 Data Evaluation

DESCRIPTION

Utilizing the physical characteristics of Whitaker Bayou identified in Task 3.4.1, boundary conditions and segmentation of the Bayou will be delineated for initial steady-state mathematical simulations. Combining these characteristics with the water quality/quantity data collected during the pre-dredging study and the initial Bay/Bayou sampling program, the initial steady-state model will be calibrated and verified with field data for the Whitaker Bayou area. Beyond the field data collected relative to the Bayou, additional estimates of flow contributions for freshwater and stormwater will be made. Records maintained by the City of Sarasota's wastewater treatment plant will be utilized to identify existing treatment facility discharge characteristics during the sampling program and also the historical trends of operating characteristics.

In order to properly delineate the impacts associated with wastewater treatment plant discharges, the model simulations identified for Whitaker Bayou will be a part of the entire bay model system. However, the segmentation and boundary conditions utilized within the Bayou will allow segregation of water quality impacts within the Bayou to be identified as discrete impacts prior to complete mixing with the Bay waters. Sequential analyses will be performed on the Bayou with various load scenarios for discharges from the City's wastewater treatment facility in accordance with point source discharges identified by FDER. Each iterative analysis will define required treatment facility discharge limits necessary to maintain Florida water quality standards within the Bayou and within the Bay.

Level I evaluations will be completed and included in the Level I report submitted by April 1, 1982. Based upon the review and evaluation of that submission, more complex mathematical simulation techniques

will be incorporated in Level II and, if required, Level III. For each instance, the data collection program conducted under the bay study and Bayou study will be sufficient to satisfy the time and spatial requirements of those techniques.

INPUT

1) Data collected from 3.4.1 and Task 3.5.
2) Wastewater treatment plant data from the City.
3) Load estimates for non-point and other point sources within the tributary area.

OUTPUT

1) Level I - steady-state model calibrated with data collected in present study period.
2) Level II - time variable model calibrated to field data collection program.
3) Level III (if funded) - model calibrated to field data collection program.
4) Wasteload evaluations and effluent limitations coordinated with 3.5.3.

BUDGET ALLOCATION $9,732

RESPONSIBLITY Priede-Sedgwick

TASK 3.5.1.1.1 Continuous Tidal/Stage Recorders

DESCRIPTION

Continuous recorders will be placed at 11 locations throughout the bay and principal tributary system (Figure 3-1). These locations will consist of ten Fisher-Porter model number 1550 or 1551 recorders furnished by FDER through FDNR, and one recorder at the interface between little Sarasota Bay and Sarasota Bay as part of the Sarasota County circulation study. Data will be obtained continuously for the duration of the study effort at each recorder (maximum 12 months), with tapes and charts removed from these recorders for data interpretations on a monthly basis. All tapes removed from the recorders furnished by FDNR will be transmitted to FDER for processing by FDNR. FDNR will process the tapes within 21 calendar days and provide: a) absolute elevation values for each 6 minute interval and b) plots of hourly elevation versus time.

Each tidal/stage recorder will be referenced to mean sea level through conducting a level circuit from known benchmarks.

INPUT

1) Locations identified by Study Team participants.
2) Guages furnished by FDER.
3) Analysis of tidal/stage recorder tape output by FDNR.

OUTPUT

1) Continuous water surface elevations at each of the eleven points for the duration of the field sampling program.

BUDGET ALLOCATION $12,304

RESPONSIBILITY Mote Marine Laboratory

TASKS 3.5.1.1.2 Instantaneous Current/Velocity Measurements

DESCRIPTION

Instantaneous current readings will be obtained at each of the eleven tidal/stage recorder stations identified in 3.5.1.1.1. The following procedures and frequency will be utilized:

1) Stage recorders at Bowless Creek, Whitaker Bayou (Riverside Drive and U.S. Highway 41), and Phillippi Creek. During each of the eight sampling events associated with defining bay impacts, each of these stations will have instantaneous velocity and direction measurements conducted at three hour intervals over the 24 hour period. In addition, when these recorders are visited for routine operational checks, instantaneous readings along the cross-section will be taken of velocity and direction to assist in establishing stage versus discharge relationships. At each of these recorder locations, the current meter will be used to obtain velocity and direction readings at five vertical cross sections when the maximum water depth exceeds 2.5 feet with velocity measurements obtained at the 0.2 and 0.8 points of the water depth at each vertical section. When the water depth is less than 2.5 feet, 3 vertical sections will be utilized and current and direction measurements will be obtained at 0.6 times the water depth point from the water surface. When the water depth is less than 1.5 feet, a Price AA current meter will be utilized at a minimum of 2 vertical sections with the measurement obtained at 0.6 times the water depth point from the water surface.

2) Bay tidal guages: Instantaneous current and direction readings will be taken at each of the seven tidal guages eight times during the study period over a 24-hour period at 3 hour intervals during the water quality sampling. The current meter will be utilized at each location and velocities and direction will be

obtained near the surface, mid-depth and bottom location when the water depth is greater than six feet. With water depths less than six feet, current and direction measurements will only be taken near the surface and near the bottom.

INPUT

1) Tidal/stage recorder locations.
2) Water quality sampling activity for scheduling current readings.

OUTPUT

1) Velocities and direction of current at specified depth for each of the tidal guages correlated with tides and water depths.
2) Stage versus discharge relationships for each of the freshwater tributary stage recorders.

BUDGET ALLOCATIONS $11,004

RESPONSIBILITY Mote Marine Laboratory

TASKS 3.5.1.1.3 Dye Studies

DESCRIPTION

Rhodamine WT dye release studies to estimate time of travel will be conducted during high and low tide twice during the year at the mouth of Phillippi Creek. These studies will be directed toward obtaining information regarding the impact of Phillippi Creek discharge upon Sarasota Bay. Instantaneous fluorometer readings will be taken at regular intervals on radial points established from the discharge from Phillippi Creek to allow concentration versus time graphs to be developed and time of travel/direction established for this discharge.

Each of the two dye studies will consist of split drops on both sides of the creek during low tide. Furthermore, the drop on high tide will occur at the mouth and one will be during a northwest wind, while the other dye study will attempt to be conducted during a southeast prevailing wind.

INPUT

1) Specific timing of study will be dependent upon other evalutions and field work.

OUTPUT

1) Definition of direction and time of travel for discharges from Phillippi Creek.

BUDGET ALLOCATION $7,777

RESPONSIBILITY Mote Marine Laboratory

TASK 3.5.1.1.4 Physical Parameter Measurements

DESCRIPTION

In Situ measurements will be taken in conjunction with each of the instantaneous current readings during the eight sampling periods. Parameters obtained will be temperature, salinity, disolved oxygen concentration, transparency (secchi disc) and pH. These measurements will be obtained at surface, mid-depth, and near bottom for each of the bay stations, while the four tributary stage recorders will only be sampled near surface and near bottom locations. Specific instrumentation and procedures for these parameters are defined in the Technical Appendix.

In order to obtain better correlations of transparency with the secchi disc measurements, correlations will be developed between a Photometer and the secchi disc measurements. These analyses will allow incident light readings to be correlated with the secchi disc readings and will assist in defining the extinction coefficient.

INPUT

1) Scheduled according to water quality sampling and current measurements.
2) QA/QC Manual and the Technical Appendix.

OUTPUT

1) Results obtained from these measurements, along with instantaneous current readings collected during the sampling, will be transmitted to Priede-Sedgwick within 14 calendar days following field measurements.

BUDGET ALLOCATION $11,004

RESPONSIBILITY Mote Marine Laboratory

TASK 3.5.1.2.1 Water Quality Sampling

DESCRIPTION

Samples will be collected at each of nineteen stations (Figure 3.2) within Sarasota Bay and significant tributaries eight times during the study at approximately six-week intervals. For the five stations located on the tributary streams (40, 66, 65, 64, and 116-Phillippi Creek) samples will only be obtained at mid-depth during the sampling period. The remaining fourteen sampling stations will have samples collected at surface and bottom during the sampling periods over the tidal cycles. During the initial sampling program in early December, all nineteen stations will be sampled during low tide. During the following high tide, only eleven stations will be sampled (38, 54, 59, 61, 63, 64, 65, 73, 75, 68, 97). Based upon present scheduling, the second sampling period will have all nineteen stations sampled on high tide and a subset of eight stations sampled on low tide. This procedure will alternate with subsequent sampling periods and sampling stations may be altered depending upon observed impacts.

INPUT

1) Sampling period defined by study team based upon meteorlogical conditions, tidal cycles, previous meteorlogical conditions, previous data, and budget restraints.

2) Each sampling will take place within a two-week period as indicated on the proposed schedule. Final decisions will be a joint decision of the study team.

3) Sampling station locations verified under Task 3.1.

OUTPUT

1) Collection of samples at nineteen stations during eight sampling periods with one sampling program conducted after dark.

BUDGET ALLOCATION $16,251

RESPONSIBILITY Mote Marine Laboratory

TASK 3.5.1.2.2. Water Quality Sample Analyses

DESCRIPTION

For each of the samples collected in 3.5.1.2.1, the following parameters will be analyzed: nitrogen series (NO_2, NO_3, Org-N, and NH_4) phosphorus series (total and ortho), BOD_5, CBOD, NBOD, TSS, reactive silicate, TOC and clorophyll "a". For these same sampling periods, wastewater treatment plant discharge quality and quantity will be provided by the City of Sarasota. Parameters will include BOD_5, TSS, total and ortho phosphorus, and NH_3-nitrogen.

All laboratory procedures, laboratory techniques, detection limits, and accuracy levels are defined in the Quality Control/ Quality Assurance Manual.

INPUT

1) Samples collected in Task 3.1.5.2.1.
2) QC/QA Manual.

OUTPUT

1) Data results from all sampling effort.

BUDGET ALLOCATION $16,251

RESPONSIBILITY Mote Marine Laboratory

TASK 3.5.1.2.3 Pesticide and Heavy Metals Scan

DESCRIPTION Four sampling locations will be utilized to collect sediment, water column, and tissues of selected organisms for a one-time scan for pesticides and heavy metals. One location will be selected in Whitaker Bayou and three locations in the Bay. These locations will be selected by the study team in concert with Sarasota County and the City of Sarasota.

INPUT
1) Sample station identification by study team, City of Sarasota and Sarasota County.
2) Prelimary analyses of sediment samples collected during pre-dredging study period.

OUTPUT
1) A data report identifying result of scans for pesticides and heavy metals.

BUDGET ALLOCATION $4,786

RESPONSIBITY Mote Marine Laboratory

TASK 3.5.1.3.1	<u>Bacteriological Sample Collection</u>
DESCRIPTION	The same nineteen sampling stations will have bacteriological samples collected during the same eight sampling periods. Each of these samples will be turned over to Sarasota County for analysis.
INPUT	1) Sample collection schedule coordinated with 3.5.1.2.1.
OUTPUT	1) Collected samples for analysis by Sarasota County.
BUDGET ALLOCATION	$0
RESPONSIBLITY	Mote Marine Laboratory

TASK 3.5.1.3.2	Bacteriological Sample Analysis
DESCRIPTION	Samples collected under 3.5.1.3.1 will be analyzed for total coliform, fecal coliform, fecal streptococci. A total of nineteen stations during one tide, eleven stations during the following tide for eight sampling periods will produce samples to be analyzed by Sarasota County.
INPUT	1) Samples collected from 3.5.1.3.1 will be delivered to Sarasota County.
OUTPUT	1) Analytical results from bacteriological analyses will be completed within 14 calendar days of sampling period.
BUDGET ALLOCATION	$0
RESPONSIBILITY	Sarasota County

TASK 3.5.1.4.1 Sediment Data Analysis

DESCRIPTION

Sediment samples collected in 3.4.1 will be analyzed for grain size distribution, TOC, and Coprostonol. Initial identification of characteristics in the sediment will be limited to the 21 stations identified on Figure 3.4. Based upon the results of these initial analyses, an additonal 39 samples will be analyzed for the same constituents. The objective of these analyses will be to characterize the transport of point source and non-point source pollutants discharged into the Bay. Timing in which samples will be analyzed will be dependent upon the initial analyses.

INPUT

1. Samples collected under Task 3.4.1
2. Sample site locations selected on Figure 3-4
3. Additional sample selection dependent upon Study Team evaluation.

OUTPUT

1. Identification of pollutant transport on a long-term basis within the Sarasota Bay System.

BUDGET ALLOCATION $6,200

RESPONSIBILITY Mote Marine Laboratory

TASK 3.5.1.4.2.1 Benthic Oxygen Demand Collection

DESCRIPTION Benthic oxygen demand studies will be conducted at three stations in Whitaker Bayou and six stations in Sarasota Bay at the locations identified on Figure 3-5 with a "dot" inside the circle. Each of these sampling events will be performed by EPA Athens Laboratory. The three periods for which this work will be conducted are August, 1981 (pre-dredging); February, 1982; and August, 1982.

INPUT

1. Sample station identification conducted by Study Team.
2. Assistance in locating sample stations provided by Mote Marine Laboratory.

OUTPUT

1. Field data collection of benthic oxygen demand data.

BUDGET ALLOCATION $0

RESPONSIBILITY EPA Athens Laboratory

TASKS 3.5.1.4.2.2 Benthic Oxygen Demand Study Report

DESCRIPTION	EPA - Athens Laboratory will provide a daily report describing the field work conducted in 3.5.1.4.2.1 with interpretation of the results. Each of these reports will be provided within 60 calendar days following completion of the field related activities in Sarasota Bay and Whitaker Bayou.
INPUT	1. Field data collected 3.5.1.4.2.1.
OUTPUT	1. Report summarizing data collection activities and interpretation of results associated with Benthic Oxygen Demand Studies.
BUDGET ALLOCATION	$0
RESPONSIBILITIES	EPA - Athens Laboratory

TASKS 3.5.1.4.3 Benthic Nutrient Release Study

DESCRIPTION

Sediment core samples (approximately 15 centimeters in depth) will be obtained from five locations (38, 49, 59, 63, 73) in Sarasota Bay (Figure 3-6). Each of these samples will be completely homogenized and analyzed for TOC, total nitrogen, and total phophorus. The purpose of this investigation will be to identify the quantity of organic carbon and nitrogen and phophorus available for release from the sediment to the water column. Dependent upon the fraction contained in the sediment and that in the water column, further field and/or laboratory nutrient release investigations may be required, but are not included within the present contract ceiling.

INPUT

1. Initial field sampling program and water quality data collected in 3.5.1.2.

OUTPUT

1. Data defining relationship between total organic carbon and nitrogen and phosphorus within the sediment versus that found within the Bay system water column.

BUDGET ALLOCATION $3,481

RESPONSIBILITY Mote Marine Laboratory

TASK 3.5.1.5.1	Phytoplankton Sample Collection
DESCRIPTION	During the collection of the water quality samples, sixteen sampling stations will have phytoplankton samples collected at the surface (Figure 3-7). These samples will provide the basis for further analysis and definition of later algal assay work.
INPUT	1. Water quality sampling station locations and frequency.
OUTPUT	1. Phytoplankton samples for laboratory analyses.
BUDGET ALLOCATION	$2,894
RESPONSIBILITY	Mote Marine Laboratory

TASK 3.5.1.5.2	Phytoplankton Laboratory Analyses
DESCRIPTION	Each set of sixteen samples collected during each of eight sampling periods will be analyzed for total cell counts and species identification. These data will provide meaningful information regarding algal species during different seasons of the years and will provide supportive community information for algal assays conducted in February and August.
INPUT	1. Samples collected in task 3.5.1.5.1.
OUTPUT	1. Quantity of phytoplankton and species identification.
BUDGET ALLOCATION	$9,398
RESPONSIBILITY	Mote Marine Laboratory

TASK 3.5.1.6 Algal Assay

DESCRIPTION

During the routine phytoplankton sampling in the Bay and Bayou during the latter part of January, 1982, four sample stations will have additional samples collected for performing algal assays. These four locations will be selected following the first two sampling events to allow determination of significant portions of the Bay and Bayou which contain representative algal communities for identifying algal growth characteristics in the assays. These samples will be collected and transported to FDER in Tallahassee for performance of the assays. Data generated from these analyses will allow the mathematical simulations to be more specific with respect to nutrient limitations on algal communities and also definition of limiting nutrient conditions associated with various phytoplankton communities.

INPUT

1. Samples collected by Mote Marine Laboratory will be transported to FDER in Tallahassee for analysis.
2. Species composition and total phytoplankton community data obtained by Mote Marine Laboratory.
3. Sample station identification by Study Team.

OUTPUT

1. Algal growth rates under varying nutrient and environmental conditions. Data compatible with needs of relating water column characteristics and light conditions to algal growth rates and dominant spieces.

BUDGET ALLOCATION $0

RESPONSIBLITY Florida Department of Environmental Regulation.

TASK 3.5.3 Level I Evaluation

DESCRIPTION

3.5.3.1.1 Information describing land use characteristics, hydrologic boundaries, historical water quality data, historical meteorological data, previous hydrologic/hydraulic studies, treatment facility evaluations, 201 Facilities Plan recommendations, 208 Water Quality Management Plans, and other related technical data for the study area will be obtained from local, State, and Federal sources. This information will be obtained to allow the Study Team to thoroughly understand the interrelationships between point and non-point source contributions to the Sarasota Bay and tributary stream network. Particular emphasis will be placed upon characteristics relevant to determining non-point source loading conditions to the bay.

3.5.3.1.2 In order to manage the quantity of data generated during the study and provide easy accessability to all data, a data management/transfer system and protocol will be developed. This system will allow access to all field data as it becomes verified by the laboratory and transfered into the EPA computer network. From this point, each team participant (Dr. Duke, Mr. Mancini, PSI, MML) will have access directly to the data and be able to use it for subsequent evaluations in a timely and orderly fashion. Formats will be established compatible with tables to be utilized in data interpretation report.

3.5.3.1.3 Based upon analysis of the initial data set and the sampling station locations, an initial Level I model grid will be established. The grid will be compatible with allowing analysis of Whitaker Bayou by segments and allowing analysis of various portions of the Bay and relating the interface conditions between the Gulf and the Bay. This system will be driven by the needs to determine water quality characteristics at the various boundary locations commensurate with the steady-state modeling techniques employed during Level I evaluations.

3.5.3.1.4 The physical characteristics identifying the boundary conditions for the model grid system will identify interface areas between segments, volume within segments, and depths at various locations within the segment. Other physical data relating elevations of the Bayou and tributaries to the Bay will also be input.

3.5.3.1.5 A critical element in establishing wasteload allocations for the Bay system is the impact of non-point source loadings. Annual and seasonal loadings of organic material and nutrients will be estimated employing statistical techniques equivalent to those developed in the National Urban Runoff Program (NURP). Data on constituent concentrations from projects managed by NURP will be suplemented by information from Phillippi Creek, Tampa Bay, and other appropriate sites in Florida. The concentration data can then be combined with local area rainfall records to develop mass loading estimates to the various tributaries and the Bay. As appropriate to modify loading weights, land use activities within the various tributary areas will be reviewed to determine significance with respect to various loading conditions. The end result of this analysis will be estimates of annual loadings from the tributary area into each tributary (Bowless Creek, Whitaker Bayou, and Phillippi Creek) and direct input to the Bay system. For Level I evaluations, these annual conditions will define the load data necessary for steady/state evaluations.

3.5.3.1.6 Point source options will be specified by FDER for various concentrations and flow rates identified. Review of these data along with other point source discharges within the tributary area to the Bay system will be conducted by the Study Team. Based upon these reviews, a composite presentation of point source and non-point source loadings to be utilized in the evaluations will be supplied to FDER. Following review of this information, revised loadings will be generated to reflect the case evaluations to be performed with Level I techniques.

3.5.3.1.7 The steady-state model will be placed on the EPA system for utilization by all team participants involved with mathematical simulations. The model will be tested to assure handling of input and output data will be compatible with EPA system's capability.

3.5.3.1.8 The mathematical model will be calibrated initally utilizing the pre-dredging sampling, the intital sampling run in the Bay and Bayou, the sediment oxygen demand studies performed by EPA, and the intital hydraulic/hydrologic data collected for the first 30 days. These calibration runs will attempt to identify the key factors requiring further field verification and the sensitivity of variables within the model to subtle changes.

3.5.3.1.9 Following calibration runs, intital evaluation of sewage treatment plant effluent options will be initiated. Each potential option for discharge into the Bayou and various points within the Bay will be evaluated to determine loading limitations imposed upon the treatment facility.

3.5.3.1.10 Upon receipt of the second set of Bay sampling data, verification runs will be made to test the intitial calibrated model. As required, modifications of coefficents and variables will be conducted to simulate the characteristics identified from the field data.

3.5.3.1.11 Following the model verification and/or modification, the sewage treatment plant options will be reevaluated to define necessary effluent qualities for each of the discharge locations evaluated under 3.5.3.1.9.

INPUT

1. Field data collected by MML pertaining to water quality, physical characteristics, and hydrologic/hydraulic conditions.

	2. Available data from local sources regarding characteristics impacting water quality. 3. FDER definition of point source options for City of Sarasota's treatment plant. 4. 208 Water Quality Management Plan.
OUTPUT	1. Calibrated and verified steady-state model for the Bay and Bayou system. 2. Definition of wasteload allocations to satisfy water quality for various treatment plant discharge locations.
BUDGET ALLOCATION	$17,255
RESPONSIBILITY	Priede-Sedgwick

TASK 3.5.3.2 Level I Evaluation Report

DESCRIPTION

As a result of field data collection and assimilative capacity studies, the Study Team will prepare a report identifying the techniques utilized, the conclusions reached, and recommendations regarding proceeding with Level II and Level III evaluations. Primary emphasis will be placed upon the assimilative capacities developed for different treatment plant discharge locations and quantities of discharge. This portion of the report under this task will address both discharges to the Bayou and the Bay systems. This section will be combined with the study efforts regarding Lake Myakka and presented as a total document to allow FDER and other Study Team members to review the conclusions and make decisions regarding more detailed evaluations.

INPUT

1. All preceeding tasks associated with data collection, data acquisition, data interpretation, data evaluation, and waste load projections.

OUTPUT

1. Level I report summarizing results obtained for assimilative capacities of Bayou and Bay for various treatment facility discharge levels.

BUDGET ALLOCATION $9,244

RESPONSIBILITY Priede-Sedgwick

TASK 3.5.4

Level II Evaluation Report

DESCRIPTION

Based upon the review sessions with FDER and other study participants, the Study Team would proceed with data collection activities associated with refining modeling techniques utilized in Level I. Particular emphasis would be placed upon moving from a steady-state modeling technique to a time variable modeling procedure capable of simulating seasonal and tidally averaged impacts utilizing smaller grid system identifications within the Bay. Particular emphasis will be placed upon simulating seasonal fluctuations in water quality and hydrodynamic characteristics of the Bay system. Additional delineation of non-point source loadings will be required to support the time dependence of storm water discharges into tributaries and the Bay system. Specific activities associated with the type of model and modeling inputs required to calibrate the model will be determined as Level I evaluations are being reviewed. Based upon acceptance of a mutually satisfactory model between the Study Team and FDER, work will be directed during the early phases of Level II to obtain the additional physical data required to calibrate the model from the first sampling runs conducted during Level I. As the additional intensive survey data is collected in the Bay model modifications will be made. Reevaluation of sewage treatment plant discharge impacts upon the Bayou and the Bay will be performed with this model and the additional characteristics obtained through the further field investigations and laboratory analyses.

Primary emphasis during these evaluations will be placed upon the sensitivity of predicted impacts and forcasted treatment plant discharge levels to the assumptions utilized in the modeling procedures. Dependent upon the variability of impacts and sensitivity of treatment plant discharge limitations upon these assumptions, sensitivity analyses of the key variables will be conducted to allow more complete understanding of these impacts. Particular attention will be directed toward revising field data

collection efforts to obtain further information regarding these key variables which cause broader impacts upon the Bay or require more stringent and severe treatment plant discharge criteria.

Although difficult to identify specifically at the initiation of the study, an interim output for Level II is anticipated to occur during September, 1982. This time span would allow enough additional information to be collected during the routine sampling of the Bayou and Bay area, along with the additional data required to drive the time variable modeling techniques. Furthermore, specific sampling and analytical work will be conducted during the summer months associated with sediment oxygen demands, benthic nutrient relase studies, and algal assays that will further refine data collected during the cooler portions of the year. This interim output is anticipated to assist the Study Team in early identification of additional data or additional evaluation techniques necessary to move rapidly into Level III. The possibility will exist at that point of moving directly into Level III without continuing with completing Level II presentations. The results obtained through September, 1982, will provide the necessary support material to make that decision.

INPUT

1. Level I review decisions by Study Team and FDER.

2. Routine sampling conducted from March, 1982, through end of the scheduled sampling program.

3. Interaction and meetings with all Study Team participants, FDER, EPA through the modeling efforts conducted during Level II.

OUTPUT

1. Level II Interim output presentation during September, 1982.

2. Definition of impacts throughout the Bay

associated with point and non-point source discharges.

3. Treatment facility effluent quality required to satisfy Florida water quality standards.

4. Definition of nutrient limitations required to protect the Bay system.

BUDGET ALLOCATION $19,425

RESPONSIBILITY Priede-Sedgwick

TASK 4.1 Sampling Station Network

DESCRIPTION

Stations were located to properly identify input to the lake system and output from the Lake/Slough area. Continously recording stage recorders will be located at sections where backwater impact will be minimal or non-existent. Specific sampling stations for conducting necessary water quality, sediment analyses, and benthic studies are identified to characterize the input from Howard Creek, Myakka River, Clay Gulley, and the impact of Big Flats upon flow from the Lake to Highway 72.

Specific stage recorder stations are identified in Figure 4-1 and water quality sampling stations on Figure 4-2. Each of these locations has been field evaluated during the project control document workshop. Possible relocation may be necessary depending upon physical characteristics associated with permanent recorder locations. With respect to sampling stations, each point is fairly accessible and should satisfy the needs of obtaining meaningful, realistic data regarding the tributary characteristics and the Lake's characteristics.

INPUT

1. Previous investigations by Mote Marine Laboratory.
2. Equipment availability and maps for the area.
3. Existing records for stream flow and lake bathymetry.

OUTPUT

1. Specific locations to be utilized for the field sampling program. Possible revisions of the stations may be necessary dependent upon initial sampling results.

BUDGET ALLOCATION $2,662

RESPONSIBLITY Priede-Sedgwick

TASK 4.2 Meteorological Data Collection

DESCRIPTION

Daily meteorological data (rainfall, temperature, barometric pressure, relative humidity) for the Lake area will be obtained from the Park Service Meteorological Tower. Wind velocity data will be provided through Sarasota County. For each of the field sampling trips, discrete measurements will be collected by the Study Team to properly characterize the conditions existing when samples are collected.

As indicated for the meteorological data associated with Sarasota Bay, additional historical information obtained from local sites and also Ruskin will be obtained for comparing long-term trends.

INPUT

1. Sarasota County providing recording anemometer.
2. Park service coordination on present meteorological data collection equipment.

OUTPUT

1. Identification of historical meteorological conditions impacting the study area.
2. Continuous recording of standard parameters by the park meteorological station and the relocated Sarasota County Station.
3. Specific definition of meteorological conditions associated with each field sampling effort.

BUDGET ALLOCATION $1,985

RESPONSIBLITY Mote Marine Laboratory

TASK 4.3.1 — Continuous Stream Flow and Lake Level Determinations

DESCRIPTION

Based upon the sites identified on Figure 4-1, continuously recording stage recorders will be placed at all locations except 13. A staff guage will be placed near the concession area and will be read daily by Park personnel. Each cross-sectional area will be calibrated through use of a Price AA Current Meter to obtain velocity measurements along cross-sections utilizing the same techniques described in Task 3.5.1.1.2. Following these inital identifications of velocity with depth, velocity readings at cross-sections will be obtained each time a continuous stage recorder is maintained. Based upon these multiple readings, a realistic stage versus discharge curve should be obtained for each of the stage recorder stations identifying stream flow. In order to supplement and complement the study effort, the USGS stage recorder north of highway 72 on Myakka River will also be utilized as a data source.

INPUT

1. Either USGS stage recorders for installation at each point or FDNR stage recorders for installation at the locations or lease of continuous recording stage recorders for these locations.
2. Permission from local property owners and the State Park for locating stage recorders on the specified properties.

OUTPUT

1. Continuous readings of stream flow into and out of the lake along with continuous identification of the lake level.

BUDGET ALLOCATION $4,345

RESPONSIBILITY Mote Marine Laboratory

TASK 4.3.2 Surfacial Water Table Elevations

DESCRIPTION The ground water level in the surfacial water table will be monitored through utilizing an existing observation well on S.R.780, north of the Myakka State Park. Observations will be made through recording depths correlated to mean sea level datum during other visits to this project area. Data will be tabulated and graphed in relation to rainfall, Upper Lake Myakka stage, and other pertinent variables.

INPUT

1. Identification of observation well site by USGS and permission to utilize said well.

OUTPUT

1. Data describing water table elevation with respect to lake level, precipitation, and time.

BUDGET ALLOCATION $1,000

RESPONSIBILITY Mote Marine Laboratory

TASK 4.3.3 Lake Drawdown Areas

DESCRIPTION

During the course of the investigation, measurements of the lake stage will be obtained through use of stage recorders and staff guages. Based upon these elevations being correlated with mean sea level datum (if available), and the bathymetry studies referred to in Task 4.3.4, plots of total lake volume, lake area, and exposed portion of the lake banks during drawdown will be maintained. This data will be very useful for both modeling of the lake system and the biological interpretations of field data.

INPUT

1. USGS elevation and cross-sectional information.
2. Continuous level recording data from 4.3.1.
3. Instantaneous stage recording levels.

OUTPUT

1. Plots of continuous lake level, lake area, lake volume, and exposed lake area.

BUDGET ALLOCATION $3,345

RESPONSIBLITY Mote Marine Laboratory

TASK 4.3.4 Lake Bathymetry and Channel Cross-sections

DESCRIPTIONS

4.3.4.1 USGS has cross-sections along Myakka River, Clay Gulley, Lake Myakka, Vanderipe Slough, and Myakka River below the lake at 1,000 foot intervals. These data will be utilized for initial definition of the bathymetry in the associated streams and lake. Definition of the bottom elevations and the channel elevations will be utilized as input of physical characteristics to modeling efforts.

4.3.4.2 Additional measurements of the lake bottom and organic deposition on the lake bottom will be obtained to properly characterize and revise information obtained from USGS. This data will be used to update and modify the lake volumes obtained previously to allow better definition of current conditions during the field sampling. All elevations obtained from these measurements will be related to mean sea level datum.

With respect to Vanderipe Slough, cross-sections will be obtained at areas where USGS cross-sections do not provide coverage necessary for evaluating potential discharge points from the spray irrigation site or Howard Creek.

INPUT

1. USGS cross-sectional data and topographic maps.
2. Access to locations where topography information is needed from property owners and Park Service.

OUTPUT

1. Correct identification of physical characteristics associated with channels, lake bottom, and slough.

BUDGET ALLOCATION $8,869

RESPONSIBLITY Mote Marine Laboratory

TASK 4.4 Water Quality Sampling and Analysis

DESCRIPTION

4.4.1 As indicated on Figure 4-2, 17 water quality sampling stations will be maintained for obtaining water quality data. Station 1 through 13 will be sampled on a monthly basis within a 2-week time span as identified on the schedule. In situ measurements for temperature, dissolved oxygen, pH, and conductivity will be obtained at each station when samples are collected. An entire set of 12 months of data will be obtained. In addition, one extra sampling during each extreme condition (wet, dry, temperature, and aquatic weed control) will be obtained at each of these stations. Station 14 will also be sampled at the same frequency, but only 4.4.2 analyses will be performed.

With respect to Vanderipe Slough, stations 15, 16 and 17 will be utilized for sampling during the wet and dry season only.

4.4.2 Sarasota County will perform laboratory analyses on all of the samples collected under 4.4.1 for the following parameters: phosphorus series (total and ortho), nitrogen series (NO_2, NO_3, Org-N and NH_4), chlorophyl "a", and TSS. These analyses will be performed upon delivery of samples by Mote Marine with results returned within 15 days from delivery of samples.

4.4.3 Mote Marine Laboratory will be responsible for performing BOD_5, CBOD, and NBOD analyses for samples from all stations but 14. These samples will be obtained from Task 4.4.1 with analyses completed and data available within 30 days from delivery of samples.

INPUT

1. Sampling station identification performed by Study Team.
2. Access to sample locations provided by property owners and Park Service.

OUTPUT	1. All laboratory analyses identified for each sampling station for use in defining existing conditions, predicting future impacts, and developing input for modeling procedures.
BUDGET ALLOCATION	$12,935
RESPONSIBILITY	4.4.1 and 4.4.3 - Mote Marine Laboratory 4.4.2 - Sarasota County

TASK 4.5 Macrophyte Studies

DESCRIPTION

Data describing the distribution and abundance of native and exotic macrophytes in Lake Myakka, Vanderipe Slough, Howard Creek, and Big Flats will be developed. Sampling will be conducted twice during the year utilizing aerial images and ground truthing for the initial effort on the project. These two efforts will allow identification of the magnitude of macrophytes existing within each of these areas. Through knowing these quantities, and combining with Task 4.8, some relationships may be established describing the expanse and reason for growth in the systems.

INPUT

1. Aerial photography from various agencies.
2. Access to private property locations.

OUTPUT

1. Identification of the distribution and abundence of macrophytes throughout the study area.

BUDGET ALLOCATION $6,563

RESPONSIBILITY Mote Marine Laboratory

TASK 4.6 — Sediment Data Collection and Analysis

DESCRIPTION

4.6.1 Benthic oxygen demand studies will be conducted by EPA/Athens laboratory at 3 locations in Howard Creek and 6 locations in Lake Myakka during February and August, 1982. These investigations will be identical to those conducted in the Sarasota Bay area. Results from these investigations will allow definition of impacts upon the lake system from the benthic deposits.

4.6.2 Following the data collected in the field by EPA, a report summarizing the results of the benthic oxygen demand studies will be developed and transmitted within sixty calendar days following completion of the samplings. This data and interpretation of results will be beneficial to the Study Team in identifying significant impacts (if any) resulting from benthic deposits upon the water column. Redirection of additional sampling efforts may be necessary following these studies.

4.6.3 Benthic nutrient release, sediment TOC and grain size analysis (for a wet and a dry season sample) will be conducted at the same three locations in Howard Creek and six locations in Lake Myakka. The initial benthic nutrient release study will be identical to that conducted in the Bay sediments through taking a core sample and analyzing for the total organic carbon, total nitrogen, and total phosphorus. Based upon the results of that investigation, either an *in situ* or laboratory release study will be performed. Either of these studies would be beyond the scope of the present project and the scope will need to be modified if conducted. For those samples collected, sediment TOC and grain size analysis will be performed. Specific station locations will be dependent upon mutual agreement between Study Team members and EPA personnel.

INPUT

1. EPA participations in the benthic oxygen demand studies.
2. Permission of the Park Service for performance of the studies.

OUTPUT	1. Information describing the sediment impact upon the lake water column and benthic fauna. Data will be important in describing interrelationships within the lake system during different seasons.
BUDGET ALLOCATION	$6,212
RESPONSIBILITY	4.6.1 and 4.6.2 - EPA - Athen's Laboratory 4.6.3 - Mote Marine Laboratory

TASK 4.7 Algal Assays

DESCRIPTION During the regular sampling program conducted in Lake Myakka, 4 stations will have samples collected for performance of algal assays by FDER. These stations will be determined by the Study Team prior to the January sampling for transmission to FDER in February and also again in August. Specific algal growth rates, along with limiting nutrients under various environmental conditions will be defined by FDER. Samples will be collected by Mote Marine Laboratory and shipped directly to FDER at Tallahassee.

INPUT
1. Samples collected by Mote Marine Laboratory.

OUTPUT
1. Algal assay results within 60 days of receipt of sample by FDER.

BUDGET ALLOCATION $0

RESPONSIBILITY Florida Department of Environmental Regulation

TASK 4.8 Elemental Composition Data Analysis

DESCRIPTION

During a wet season, and again during a dry season, 1 station in Howard Creek, 3 stations in Lake Myakka, and 1 station in the Vanderipe Slough area. Each of these samples will be analyzed for carbon, nitrogen, and phosphorus contained in Hydrilla and Hyacinths. In addition to those plants, the water column and sediment concentrations of carbon, nitrogen, and phosphorus will be analyzed at each of these stations during those two seasons.

Collection of these samples and this data will help establish a potential relationship between the water column concentrations and that within the cells of the plants for projecting growth rates in the field and correlating with Task 4.5. Possible redirection of additional sampling efforts and/or modification of the continuous program may be an outgrowth of these samplings.

INPUT

1. Access to the properties provided by property owners.
2. Access to the park site for sampling provided by the Park Service.

OUTPUT

1. Data describing the carbon, nitrogen, and phosphorus in water column, sediment, and the plants within the Lake, Slough, and the Creek.

BUDGET ALLOCATION $7,372

RESPONSIBILITY Mote Marine Laboratory

TASK 4.9.1 Vanderipe Slough Feasibility Evaluation

DESCRIPTION

During the initial phases of the Level I evaluation of the Lake and Bay systems, an evaluation will be performed describing the techniques that would be used in diverting flows from Upper Myakka Lake to Vanderipe Slough. In addition to the technical requirements to perform this experiment, permission must be obtained from the affected property owners to conduct this study. Specific tasks associated with performing this analysis will be identified and study objectives quantified to identify its feasability.

Furthermore, the significance of performing this study will be dependent upon first phase activities associated with the evaluation of Howard Creek and Lake Myakka. Whether or not this study needs to be conducted will be dependent upon these early modeling evaluations conducted as part of Task 4.10. The extent of description of experimental studies will be closely tied to those results.

INPUT

1. Outputs from Task 4.10.
2. Property owner permission to perform the study.
3. Water quality studies conducted in Lake Myakka and Vanderipe Slough describing quality characteristics.

OUTPUT

1. Plan of study for conducting an experimental study in the Slough to define its assimilative capacities for water presently contained in Lake Myakka.

BUDGET ALLOCATION $4,015

RESPONSIBILITY Priede-Sedgwick and Mote Marine Laboratory

TASK 4.9.2

Vanderipe Slough Experimental/Myakka River Discharge Study

DESCRIPTION

Based upon the Study Team's concept of the experimental study, water would be pumped from Upper Lake Myakka into Vanderipe Slough at rates comparable to the discharges from the spray irrigation underdrain system. Baseline data describing topography, cross-sections, and maps of wetland communities would be developed. A typical input/output budget for water, nitrogen series, phosphorus series, BOD_5, CBOD, NBOD, TSS, TOC would be generated. Input data would be obtained from the transferred water and the output data would be collected near the highway 72 bridge location. Presently, the study would be anticipated to require approximately six consecutive months with data collected either once per month or twice monthly.

Beyond the evaluations associated with quality characteristics, quantity considerations would be important with respect to flooding potential and possible increased stage levels if the dike seperating the Lake and the Slough were removed. The approach that would be proposed would allow utilization of existing programs developed by USGS during their flood investigation of Myakka River or utilize HEC-2 for simulating conditions occuring as increased flows and stages are reached in the main Myakka River Channel. Although not totally confirmed, there would be a potential for actually lower flood heights in both the Slough and Myakka River with the removal of the dike due to the large increase in cross-sectional area provided at certain flows. This is only an hypothesis presently; it would need to be confirmed through the use of properly calibrated flow models and review of topography and physical characteristics.

An additional discharge option would appear to require evaluation based upon the review session conducted with the City of Sarasota on November 4, 1981. The City is presently

considering the technical feasibility of transporting the flow from the underdrain system directly to the Myakka River, downstream of the Upper Lake Myakka dam. Since the consequences of this discharge point require considerably more information than is being obtained presently, this evaluation would have to be conducted with additional resources.

INPUT

1. As with Task 4.9.1, access to private property would be of key concern to accomplishing this activity.
2. USGS computer programs for flood routing through the system.
3. Access to the park and approval by SWMD regarding removing water from the lake into the slough.
4. Additional physical data on downstream river/lake system.

OUTPUT

1. Evaluations summarizing both impacts upon water quality and water quantity from discharging spray irrigation system underflows into Vanderipe Slough.
2. Information describing the flood height levels within the Myakka River system if the dike was removed.
3. Impact upon downstream waters from direct discharge to Myakka River.

BUDGET ALLOCATION (No budget allocated or included at this time).

RESPONSIBILITY Priede-Sedgwick and Mote Marine Laboratory

TASK 4.10 Data Evaluation and Recommendation

DESCRIPTION

4.10.1 Similiar to 3.5.3.5.1, appropriate local information describing land use, point source discharges, topography, hydraulic/hydrology, and the 201 Facilities Plan (including supplements) will be obtained. This local information will assist in defining the specific loadings that exist today and would exist in the future within this portion of the study area.

4.10.2 The specific segments to be included in the Level I modeling effort for the tributary streams and the Lake system will be established. Each of these segments will be defined such that impacts within Howard Creek and different portions of the Lake can be segregated for further analysis and redefined at a future time if needed.

4.10.3 Physical characteristics for each boundary condition of the segments in the lake will be developed. This information would include data collected from the other tasks on lake volume, lake area, cross-sectional area of streams, stream slopes, mean depths between segments, average depths over segments, and appropriate topography for the entire study area.

4.10.4 Non-point source loadings for the areas tributary to the lake will be developed. These loads will be developed in a similar fashion as those for the Sarasota Bay area. The principal difference being the existing types of land use tributary to the Lake and the appropriate loading factors for those areas. Future development within the Lake tributary areas are such that future impacts may be more severe than those occuring today.

4.10.5 Data describing the land application drainage system discharge will be provided by FDER. The Study Team will review and confirm whether these application rates appear reasonable for evaluations in Howard Creek and predicting subsequent impacts to Lake Myakka. Following review of these loads and development of those in Task

4.10.4, discussions will be conducted with FDER to receive approval of this data before proceeding with steady-state model evaluations.

4.10.6 The steady-state model will be placed on the EPA system for analysis of various alternatives.

4.10.7 The steady-state model will be calibrated with the initial sampling run and hydraulic/hydrologic/topographic information collected during the beginning of the program. Based upon this calibration, initial wasteload evaluations can be performed.

4.10.8 The specific land application effluent quality and the non-point source load impacts will be evaluated with the steady-state model. Outputs from this evaluation will be the discharge limits associated with the land application drainage system discharging to various points along Howard Creek, directly to the Lake, or directly to Vanderipe Slough.

4.10.9 Following the second sampling in the lake, the initial calibrated model will be verified with that data and/or modified to simulate the conditions monitored.

4.10.10 Depending upon the reverification of the model, additional evaluations of the land application discharge limitations will be developed.

4.10.11 The model will be further verified with the third set of sampling data from the lake and also at this point the Slough data collected during that period.

4.10.12 Dependent upon the second verification run, additional land application underdrain effluent quality will be defined.

4.10.13 As referenced under Task 3.5.3.2, a report defining Level I evaluations will be developed and transmitted by April 1, 1982. This report will contain the data

evaluations, assumptions, uncertainties of data evaluations, and the conclusions describing wasteload allocations to satisfy different discharge points.

4.10.14 As the field data collection program continues, additional verifications of the Level I evaluations will be performed. Dependent upon the output from the review sessions conducted after submission of the Level I report, a more sophisticated time variable model (dynamic model) will be developed. As this data is generated and reviewed with the modeling procedures, possible redirection of sampling efforts may be necessary. The main objective during this evaluation is to more closely simulate the complex system existing within the creeks, lake, and river system. Specific modeling procedures will be defined at the completion of Level I.

As indicated for the Bay study, by approximately September, 1982, a Level II interium output will be developed to decide which additional studies may be necessary before the completion of Level II. This report would allow study participants to make an interim assessment as to whether further more detailed evaluation techniques or additional field work would be needed in this area. Furthermore, appropriate data would be available to allow decisions regarding the Vanderipe Slough experimental study to be made.

4.10.15 As with the recommendations comming from the Bay study, a report section would be generated identifying the techniques, assumptions, results, and sensitivity of evaluations performed in the Lake system. These results would be generated to define the effluent requirements for various discharge locations from the land applications spray site.

INPUT

1. Field data collection programs.
2. Local data sources describing hydrologic/hydraulic characteristics, topographic characteristics, and water quality characteristics.
3. EPA computer system.

OUTPUT	1. Level I Output Report section. 2. Level II Interim Report section. 3. Level II Report section. 4. All of the above report sections would describe the effluent quality required from the land application site into various discharge points in Howard Creek, Lake Myakka, and Vanderipe Slough. Each of the summaries would identify the satisfaction of Water Quality Standards or the overriding impacts from sources other than the land application site.
BUDGET ALLOCATION	$54,501
RESPONSIBILITY	Priede-Sedgwick

TASK 5.1	Data Interpretation Report
DESCRIPTION	A single comprehensive technical report describing the field studies conducted and the laboratory results will be developed. This report will summarize all field data, evaluate trends relative to the data collection, and make recommendations regarding impacts upon wasteload allocations which can not be simulated by the mathematical techniques.
INPUT	1. All field data collection and laboratory analyses.
OUTPUT	1. Separate appendix to the water quality study/wasteload allocation report. This summary will contain all data collected and interpretation of general trends.
BUDGET ALLOCATION	$4,525
RESPONSIBILITY	Mote Marine Laboratory

TASK 5.2-5.3 Water Quality Studies/Wasteload Allocation Report

DESCRIPTION

The wasteload allocation report will define all assumptions, techniques, procedures, and methods utilized. This report will identify discharge limits and subsequent impacts (nutrient limiting conditions) relative to sewage treatment plant discharges into Whitaker Bayou, Sarasota Bay, and land application discharges into the Howard Creek/Lake Myakka system. Emphasis of this report will be placed upon the assimilative capacity, nutrient limiting values, growth potential of various plants, etc. This data will provide FDER with the necessary information for developing a waste load allocation for any of the discharge options. Specific elements will include seasonal variations, hydraulic/hydrologic variations, management practice impacts, non-point source/point source relationships, and time variable impacts (1982-2000). Included in the analysis of standards for satisfying water quality, will be dissolved oxygen, nutrients, bacteriological parameters, and sediment related impacts. In accordance with the results of the studies, target nutrient levels will be recommended and justification for each of these provided for the Bay and Lake.

INPUT

1. All data and evaluations conducted for Level I and Level II.

OUTPUT

2. A final report defining all the work activities conducted in both the freshwater and saltwater areas for this study. Specific recommendations regarding discharge limits which satisfy assimilative capacities of the different systems will be developed.

BUDGET ALLOCATION $10,520

RESPONSIBILITY Priede-Sedgwick

TASK 6.0 — Project Control

DESCRIPTION

6.1 Monthly project status reports defining the following information will be submitted: project accomplishments, manpower/dollars expended, cumulative manpower dollars by task, percentage completion this period and cumulative percentage by task, scheduled activities for the subsequent month, significant problems/ schedule alterations, and significant items requiring decisions from previous submissions or upcoming submissions.

6.2 A quality assurance documentation report will be prepared based upon regular submissions to FDER every two months. The two month submittals will be turned into a final report identifying and documenting the quality assurance/quality control procedures utilized throughout the project.

6.3 Mathematical formulations, computer programs, and documentation will be maintained for all wasteload allocation studies. This information will be sufficient to allow FDER to utilize the analytical tools.

INPUT

1. Study activities performed throughout the project.

OUTPUT

1. Monthly progress reports as identified above.
2. Every other month quality assurance reports and final report period.
3. Upon project completion and acceptance, all calibration and wasteload allocation computer simulations, along with sufficient documentation and user's guides, will be provided to FDER.

BUDGET ALLOCATION

$2,800 - 6.1
$0 - 6.2 (Budgeted under 2.2)
$0 - 6.3 (Budgeted under Modeling Tasks.)

RESPONSIBILITY

6.1 - Priede-Sedgwick
6.2 - Mote Marine Laboratory
6.3 - Priede-Sedgwick

TASK 4.5 Macrophyte Studies

DESCRIPTION

Data describing the distribution and abundance of native and exotic macrophytes in Lake Myakka, Vanderipe Slough, Howard Creek, and Big Flats will be developed. Sampling will be conducted twice during the year utilizing aerial images and ground truthing for the initial effort on the project. These two efforts will allow identification of the magnitude of macrophytes existing within each of these areas. Through knowing these quantities, and combining with Task 4.8, some relationships may be established describing the expanse and reason for growth in the systems.

INPUT

1. Aerial photography from various agencies.
2. Access to private property locations.

OUTPUT

1. Identification of the distribution and abundence of macrophytes throughout the study area.

BUDGET ALLOCATION $6,563

RESPONSIBILITY Mote Marine Laboratory

TASK 4.6 — Sediment Data Collection and Analysis

DESCRIPTION

4.6.1 Benthic oxygen demand studies will be conducted by EPA/Athens laboratory at 3 locations in Howard Creek and 6 locations in Lake Myakka during February and August, 1982. These investigations will be identical to those conducted in the Sarasota Bay area. Results from these investigations will allow definition of impacts upon the lake system from the benthic deposits.

4.6.2 Following the data collected in the field by EPA, a report summarizing the results of the benthic oxygen demand studies will be developed and transmitted within sixty calendar days following completion of the samplings. This data and interpretation of results will be beneficial to the Study Team in identifying significant impacts (if any) resulting from benthic deposits upon the water column. Redirection of additional sampling efforts may be necessary following these studies.

4.6.3 Benthic nutrient release, sediment TOC and grain size analysis (for a wet and a dry season sample) will be conducted at the same three locations in Howard Creek and six locations in Lake Myakka. The initial benthic nutrient release study will be identical to that conducted in the Bay sediments through taking a core sample and analyzing for the total organic carbon, total nitrogen, and total phosphorus. Based upon the results of that investigation, either an *in situ* or laboratory release study will be performed. Either of these studies would be beyond the scope of the present project and the scope will need to be modified if conducted. For those samples collected, sediment TOC and grain size analysis will be performed. Specific station locations will be dependent upon mutual agreement between Study Team members and EPA personnel.

INPUT

1. EPA participations in the benthic oxygen demand studies.
2. Permission of the Park Service for performance of the studies.

OUTPUT	1. Information describing the sediment impact upon the lake water column and benthic fauna. Data will be important in describing interrelationships within the lake system during different seasons.
BUDGET ALLOCATION	$6,212
RESPONSIBILITY	4.6.1 and 4.6.2 - EPA - Athen's Laboratory 4.6.3 - Mote Marine Laboratory

TASK 4.7 Algal Assays

DESCRIPTION During the regular sampling program conducted in Lake Myakka, 4 stations will have samples collected for performance of algal assays by FDER. These stations will be determined by the Study Team prior to the January sampling for transmission to FDER in February and also again in August. Specific algal growth rates, along with limiting nutrients under various environmental conditions will be defined by FDER. Samples will be collected by Mote Marine Laboratory and shipped directly to FDER at Tallahassee.

INPUT
1. Samples collected by Mote Marine Laboratory.

OUTPUT
1. Algal assay results within 60 days of receipt of sample by FDER.

BUDGET ALLOCATION $0

RESPONSIBILITY Florida Department of Environmental Regulation

TASK 4.8 Elemental Composition Data Analysis

DESCRIPTION

During a wet season, and again during a dry season, 1 station in Howard Creek, 3 stations in Lake Myakka, and 1 station in the Vanderipe Slough area. Each of these samples will be analyzed for carbon, nitrogen, and phosphorus contained in Hydrilla and Hyacinths. In addition to those plants, the water column and sediment concentrations of carbon, nitrogen, and phosphorus will be analyzed at each of these stations during those two seasons.

Collection of these samples and this data will help establish a potential relationship between the water column concentrations and that within the cells of the plants for projecting growth rates in the field and correlating with Task 4.5. Possible redirection of additional sampling efforts and/or modification of the continuous program may be an outgrowth of these samplings.

INPUT

1. Access to the properties provided by property owners.
2. Access to the park site for sampling provided by the Park Service.

OUTPUT

1. Data describing the carbon, nitrogen, and phosphorus in water column, sediment, and the plants within the Lake, Slough, and the Creek.

BUDGET ALLOCATION $7,372

RESPONSIBILITY Mote Marine Laboratory

TASK 4.9.1 Vanderipe Slough Feasibility Evaluation

DESCRIPTION

During the initial phases of the Level I evaluation of the Lake and Bay systems, an evaluation will be performed describing the techniques that would be used in diverting flows from Upper Myakka Lake to Vanderipe Slough. In addition to the technical requirements to perform this experiment, permission must be obtained from the affected property owners to conduct this study. Specific tasks associated with performing this analysis will be identified and study objectives quantified to identify its feasability.

Furthermore, the significance of performing this study will be dependent upon first phase activities associated with the evaluation of Howard Creek and Lake Myakka. Whether or not this study needs to be conducted will be dependent upon these early modeling evaluations conducted as part of Task 4.10. The extent of description of experimental studies will be closely tied to those results.

INPUT

1. Outputs from Task 4.10.
2. Property owner permission to perform the study.
3. Water quality studies conducted in Lake Myakka and Vanderipe Slough describing quality characteristics.

OUTPUT

1. Plan of study for conducting an experimental study in the Slough to define its assimilative capacities for water presently contained in Lake Myakka.

BUDGET ALLOCATION $4,015

RESPONSIBILITY Priede-Sedgwick and Mote Marine Laboratory

TASK 4.9.2

Vanderipe Slough Experimental/Myakka River Discharge Study

DESCRIPTION

Based upon the Study Team's concept of the experimental study, water would be pumped from Upper Lake Myakka into Vanderipe Slough at rates comparable to the discharges from the spray irrigation underdrain system. Baseline data describing topography, cross-sections, and maps of wetland communities would be developed. A typical input/output budget for water, nitrogen series, phosphorus series, BOD_5, CBOD, NBOD, TSS, TOC would be generated. Input data would be obtained from the transferred water and the output data would be collected near the highway 72 bridge location. Presently, the study would be anticipated to require approximately six consecutive months with data collected either once per month or twice monthly.

Beyond the evaluations associated with quality characteristics, quantity considerations would be important with respect to flooding potential and possible increased stage levels if the dike seperating the Lake and the Slough were removed. The approach that would be proposed would allow utilization of existing programs developed by USGS during their flood investigation of Myakka River or utilize HEC-2 for simulating conditions occuring as increased flows and stages are reached in the main Myakka River Channel. Although not totally confirmed, there would be a potential for actually lower flood heights in both the Slough and Myakka River with the removal of the dike due to the large increase in cross-sectional area provided at certain flows. This is only an hypothesis presently; it would need to be confirmed through the use of properly calibrated flow models and review of topography and physical characteristics.

An additional discharge option would appear to require evaluation based upon the review session conducted with the City of Sarasota on November 4, 1981. The City is presently

considering the technical feasibility of transporting the flow from the underdrain system directly to the Myakka River, downstream of the Upper Lake Myakka dam. Since the consequences of this discharge point require considerably more information than is being obtained presently, this evaluation would have to be conducted with additional resources.

INPUT

1. As with Task 4.9.1, access to private property would be of key concern to accomplishing this activity.
2. USGS computer programs for flood routing through the system.
3. Access to the park and approval by SWMD regarding removing water from the lake into the slough.
4. Additional physical data on downstream river/lake system.

OUTPUT

1. Evaluations summarizing both impacts upon water quality and water quantity from discharging spray irrigation system underflows into Vanderipe Slough.
2. Information describing the flood height levels within the Myakka River system if the dike was removed.
3. Impact upon downstream waters from direct discharge to Myakka River.

BUDGET ALLOCATION (No budget allocated or included at this time).

RESPONSIBILITY Priede-Sedgwick and Mote Marine Laboratory

TASK 4.10 Data Evaluation and Recommendation

DESCRIPTION

4.10.1 Similiar to 3.5.3.5.1, appropriate local information describing land use, point source discharges, topography, hydraulic/hydrology, and the 201 Facilities Plan (including supplements) will be obtained. This local information will assist in defining the specific loadings that exist today and would exist in the future within this portion of the study area.

4.10.2 The specific segments to be included in the Level I modeling effort for the tributary streams and the Lake system will be established. Each of these segments will be defined such that impacts within Howard Creek and different portions of the Lake can be segregated for further analysis and redefined at a future time if needed.

4.10.3 Physical characteristics for each boundary condition of the segments in the lake will be developed. This information would include data collected from the other tasks on lake volume, lake area, cross-sectional area of streams, stream slopes, mean depths between segments, average depths over segments, and appropriate topography for the entire study area.

4.10.4 Non-point source loadings for the areas tributary to the lake will be developed. These loads will be developed in a similar fashion as those for the Sarasota Bay area. The principal difference being the existing types of land use tributary to the Lake and the appropriate loading factors for those areas. Future development within the Lake tributary areas are such that future impacts may be more severe than those occuring today.

4.10.5 Data describing the land application drainage system discharge will be provided by FDER. The Study Team will review and confirm whether these application rates appear reasonable for evaluations in Howard Creek and predicting subsequent impacts to Lake Myakka. Following review of these loads and development of those in Task

TECHNICAL APPENDIX

Specific data collection and laboratory analysis procedures have been further defined for each task described in the Project Control Docuemnt. Beyond the general procedures, specific equipment to be utilized and the methods employed are also identified. In order to maintain consistency with contractual requirements and allow cross referencing, each sub-task requiring data collection and/or laboratory analyses is identified by the same number and title used in the Project Control Document. Reference to specific Figures correlates with the Figures prepared for the main document.

TASK 3.2. BATHYMETRY

Description:

Bathymetry information will be collected within the Bay during the initial portions of the project. Data will be collected by running transects with a Si-Tex fathometer registered to tidal gage recorders and calibrated to weighted lead lines. Transects from Fish Haven to New Pass, from City Island to Bird Key and from Bird Key to Fish Haven will be made during a period of calm, slack high water. In addition, transects through each pass will be made in order to verify U.S. Army Corps of Engineers' survey data for Longboat and New Passes. In all cases, the location of the ship will be determined by triangulation to and from fixed landmarks using Richie type hand-bearing compasses. At prearranged locations, weighted lead line measurements will be taken in conjunction with bathymetric tracing.

Cross-sectional data describing Whitaker Bayou have been obtained for the channels prior to dredging operations, and these data have been verified by field inspection. Following completion of dredging, cross sections will be obtained to properly delineate the revised configuration of the channel. In Whitaker Bayou bathymetry after dredging will be determined as it was before dredging. A graduated staff equipped at one end with a pad for the detection of fine organic deposits will be placed in the water until resistance is met. Bathymetry of the upper and lower Bayou will be determined on cross sections visited prior to dredging.

TASK 3.3. METEOROLOGY

Description:

A weather station has been established at MML to measure the following parameters:
1. Temperature (minimum/maximum; continuous)
2. Relative humidity
3. Rainfall
4. Barometric pressure (continuous)
5. Wind speed and direction
6. Sunlight

The following quality assurance measures will be taken:
1. Training: Dr. Stanley A. Rice will conduct a training course for the weather observers. Dr. Rice received his initial meteorological training and experience with the United States Army, ultimately becoming an instructor. MML's observers will receive instruction in operation and maintenance of the weather station equipment and data recording procedures.
2. Physical Plant: The weather station was installed following guidelines in both National Weather Service (NWS Observing Handbook No. 2) and manufacturer manuals. The site was inspected by Mr. Fred Crosby, Director of the area NWS office and was found to be satisfactory. Mr. Crosby has recommended MML's weather station for designation as an official NWS weather substation.

MML's weather station is comprised of new equipment. Preinstallation (and periodic) calibration checks are performed on all equipment following the manufacturer's specifications. The manufacturer's recommended maintenance procedures are being strictly followed. The instruments being used and their specifications are as follows:
1. Temperature (minimum/maximum). Science Associates (SA) Model 111 Maximum-Minimum Thermometers. Made to NWS Spec. No. 450.1016 and No. C-821-SP001.
2. Relative Humidity. SA Model No. 210 Sling Psychrometer. Range: 20/120 degrees F, with 1.0 degrees graduations.
3. Rainfall. SA Model 503 Rain Gage. Made to NWS Spec. No. 450.2301. Precision: 0.01 inch of snow or rainfall.
4. Temperature (ambient). SA Model No1 156 Thermograph. Made to British Standard Spec. 3231:1960.

TASK 3.3. METEOROLOGY

Description: (continued)

5. Barometric Pressure. SA Model No. 355 Precision Microbarograph. Made to NWS Spec. G211-SP002. Maximum error: 0.020"; readability: 0.005".
6. Wind Speed and Direction. SA Model 451-1 Mark III Wind Measuring System with accuracy of ±2%.
7. Sunlight. SA Model 645-48 Eppley black and white pyranometer with Model 644 Recorder. Made to Spec. No. A105-SP001, transparent to wavelengths of 280/2800 nm.

The temperature equipment is calibrated using a SA Model 101 official thermometer. The microbarograph is calibrated using a Model 334(3) Science Laboratory Barometer. The following table lists observation frequencies and elevations for the individual parameter/equipment.

Parameter/Equipment	Observation Frequency	Elevation (ft above sea level)*
1. Temperature (minimum-maximum)	daily	10
2. Relative Humidity	daily	10
3. Rainfall	daily	6
4. Temperature (ambient)	continuous	10
5. Barometric Pressure	continuous	18
6. Wind Speed and Direction	continuous	50
7. Sunlight	continuous	30

*Ground elevation at site is ca. 5 ft.

Weather data are recorded on standard NWS data sheets for ultimate inclusion in the NWS weather data network (Ashville, NC). Completed data sheets are checked and signed by Dr. Rice and submitted on a monthly basis.

TASK 3.4.2. BIOASSAY STUDIES

Description:

Animal bioassay tests will be completed using solid phase and suspended particulate phase samples prepared from Whitaker Bayou sediments. Additional suspended particulate phase tests will be undertaken using elutriate water from the dredged material settling area adjacent to the Bayou.

Sediment samples were collected from Whitaker Bayou with a petite Ponar sampler prior to the commencement of dredging operations. Samples were sealed in polyethylene bags and stored at 4°C in the laboratory. Test aquaria were thoroughly washed, rinsed in 10% HCl followed by distilled water and filled with reference seawater from the MML flow-through system. A layer, 30 mm thick, of reference sediment (0.5 mm sieved sand from New Pass) was added to each test aquarium. These aquaria containing reference sediment were allowed to stabilize for 48 hours before a 15 mm layer of Whitaker Bayou sediments was added to each experimental aquarium or 15 mm of references sediment was added to control aquaria. The seawater was changed (approximately 75% of the volume in each aquarium) in all aquaria one hour and 48 hours following addition of test sediment or additional reference sediment (controls).

The benthic polychaete, Neanthes arenaceodentata, and the commercial pink shrimp, Penaeus duorarum were used in solid phase bioassay experiments. A total of 30 individuals of each species were tested in three separate aquaria with two control aquaria containing ten animals each. The tests lasted for 10 days with temperature, salinity and dissolved oxygen monitored daily. All bioassay experiments were conducted in a controlled temperature room under a 14:10 light:dark regime.

Suspended particulate phase solutions were prepared by mixing one part Whitaker Bayou sediment with four parts control seawater followed by 30 minutes of vigorous agitation and one hour of undisturbed settling. The supernatant solution remaining after the one hour settling period was gently removed from the polyethylene mixing container and used in experiments.

TASK 3.4.2. BIOASSAY STUDIES

Description: (continued)

The pinfish, Lagodon rhomboides, was used in the first series of suspended particulate bioassays. Three replicate 30 liter aquaria for each concentration of suspended particulate phase solution (100%, 50% and 10% spp water) plus controls (100% control seawater) were tested over a period of 96 hours. Ten fish were tested over a period of 96 hours. Ten fish were exposed in each aquarium. Dissolved oxygen, temperature and salinity were monitored in each aquarium.

Additional suspended particulate phase bioassays are planned using the mysid, Mysidopsis bahia.

Runoff water from the dredged material disposal area will be collected and tested in laboratory bioassay experiments. Procedures for these tests will be identical to those outlined above for suspended particulate phase solution tests. Experimental organisms will include the polychaete, Neanthes arenaceodentata, the mysid, Mysidopsis bahia and the fish, Cyprinodon variegatus. Three dilutions of the field-collected runoff water plus appropriate controls will be tested.

Data analysis for all bioassay results will follow the procedures outlined by the EPA/Corps of Engineers (1977).

TASK 3.5.1.1.1. CONTINUOUS TIDAL-STAGE RECORDERS

Description:

Continuous recording tide recorders will be placed at all the locations throughout the Bay and principal tributary systems (Figure 3-1) These locations will be occupied by Fisher-Porter Model 1550 or 1551 Recorders furnished by FDNR through FDER. In addition, one Stevens type Recorder will be placed at the interface between Little Sarasota and Sarasota Bays as part of the Sarasota County Circulation Study. Locations T2 and T5, originally occupied by a New College student with Stevens type gages, will continue to be occupied by MML, using Fisher-Porter Recorders. All recorders will be equipped with monthly gears and 1/10 ft charts. Tide observers will visit each recorder once every three days during the year. In addition, maintenance visits will be made to each recorder on a monthly basis when charts are removed. All acceptance, maintenance, and completion inspections will be conducted in compliance with NOAA standards. Data will be obtained continuously for the duration of the study effort at each recorder (maximum 12 months) with tapes and charts removed on a monthly basis. All tapes removed from the recorders furnished by FDNR will be transmitted to FDER for processing by FDNR. During the first month of use each recorder will be referenced to mean sea level through conducting a level circuit from known benchmarks. As part of the installation and operation of each gage, a staff gage ranging from 0-6 ft calibrated in 100ths/ft will be placed and leveled at each site.

TASK 3.5.1.1.2. INSTANTANEOUS CURRENT AND VELOCITY MEASUREMENTS

Description:

Instantaneous current readings will be obtained at each of the tidal and stage recorder stations identified in Task 3.5.1.1.1. using the following procedures:

Stage recorders at Bowlees Creek, Whitaker Bayou, (Riverside Drive and U.S. 41) and Phillippi Creek (Cattlemen Road and Bahia Vista). During the eight samplings associated with the Bay study, each of these stations will have instantaneous current and direction measurements conducted at three hour intervals over the 24 hour period of study. In addition, when these recorders are visited for routine checks, single instantaneous readings will be taken of velocities across the cross-sectional area of the stream to a system establishing stage-discharge relationships. At each stage recorder, the current meter will be used to obtain speed and direction readings at 3-5 vertical cross sections. When water depth is greater than 2.5 ft, measurements will be obtained at 0.2 and 0.8% of the water depth at each vertical section. When the water depth is shallower than 2.5 ft, speed and direction measurements will be obtained at a depth 0.6 times the depth of the water. In all cases, a Prices AA Water Current Meter will be used. The meter has a sensor comprised of a 6 cup wheel with a switch closure and momentary closures of one per each or five revolutions. The measuring range of the sensor is 0.15 to 12 fps, and will be deployed by hand or cable.

Bay Measurements

Instantaneous current speed and direction readings will be taken at each of the seven tidal gages eight times during the study period over a 24 hour period at three hour intervals during the water quality sampling. The current meter will be utilized in the vicinity of each tide gage, and measurements will be obtained near the surface, mid-depth and bottom where water depth is greater than 6 ft. Where water depth is shallower than 6 ft, current speed and direction measurements will be taken near the surface and the bottom only. An Endeco Type 110 Current Meter with

TASK 3.5.1.1.2. INSTANTANEOUS CURRENT AND VELOCITY MEASUREMENTS

Description:
(continued)

depth, temperature, current direction and current speed sensors will be used. The unit will be modified for use in shallow quiet waters to avoid hull bias and wave action. In situ measurements will be taken simultaneously with the measurement of currents at each location. Immediately before in situ and current measurements, meteorological and other hydrographic data will be collected and all current direction measurements will be made under constant ship's compass heading.

TASK 3.5.1.1.3. DYE STUDIES

Description:

Rhodamine WT dye release studies to estimate times of travel will be conducted during high and low tides twice during the year at the mouth of Phillippi Creek. These tests will be conducted weather permitting so as to follow dye movements under prevailing northerly and prevailing southerly winds. The studies will be directed toward obtaining information regarding the impact of Phillippi Creek discharge upon Sarasota Bay. The experimental design for each study will be the same. Wind data collected at the Mote Marine Lab weather station will be used to identify periods of northerly or southerly winds. A convenient period of daylight time will be chosen for study. During falling tides, at least 15 lbs of Rhodamine WT dye will be density compensated and released in the lower reach of Phillippi Creek and allowed to travel into Sarasota Bay. Water samples will be taken before, during, and after release of the dye for flourescence measurements at MML. As necessary, the dye released during falling tides will be augmented to maintain visual contact with the dye as it moves either north or south in the Bay. Aerial photography will be used in conjunction with flourometry to determine times of travel from Phillippi Creek under each prevailing wind. On rising tides parcels of dye will be dropped in two places in Sarasota Bay, bracketing the mouth of Phillippi Creek. It is expected that one parcel of dye will move toward Phillippi Creek and the other will move away from the mouth of the Creek. The body of dye moving into Phillippi Creek will be followed and sampled for later fluorometric analysis, but aerial photography will be conducted to follow the course of both parcels of dye. Times of travel will be estimated from these studies before both rising and falling tides into and out of Sarasota Bay under prevailing northerly and southerly winds. During the course of the dye study, hydrographic measurements (current speed and direction; temperature; salinity; dissolved oxygen content; pH) will be monitored in addition to fluorescence. Fluorescence in the laboratory will be determined using a Turner Fluorometer Model 110 (discrete) with a $\pm$0.5 ppb precision.

TASK 3.5.1.1.3. DYE STUDIES

Description:
(continued)

All data will be corrected for background fluorescence as determined by preliminary samples. Data will be tabulated and, where appropriate, graphed as plumes of dye movement. Outputs include times of travel, correlated hydrographic data, and dispersion data.

TASK 3.5.1.1.4. PHYSICAL PARAMETER MEASUREMENTS

Description:

In situ measurements will be taken in conjunction with each of the instantaneous current readings during the eight sampling periods. Parameters obtained will be temperature, salinity, dissolved oxygen content, transparency (Secchi disk) and pH. These measurements will be obtained at surface (one ft below), mid-depth, and bottom (one ft above) for each of the Bay stations, while the four tributaries stations will only be sampled near surface and near bottom locations. Instruments used in these measurements will be either YSI (SCT/DO) or Hydrolab in situ meters. The YSI dissolved oxygen meters have an accuracy of ±1% and automatic temperature compensation for -5^{o} to 45^{o}C. The salinity-conductivity-temperature (SCT: YSI Model 33) meters have conductivity accuracies of ±2.5% to ±3%; salinity ±0.9 o/oo - ±1.1 o/oo; temperature $\pm 0.1^{o}$ - $\pm 0.6^{o}$C. Mote Marine Laboratory also owns an American Optical Temperature Compensated Refractometer, which may be employed in the field. The Hydrolab is a Surveyor Model 6D; it has a precision 4 1/2 taut band meter with a mirror scale for all read outs and an accuracy of 0.5% of full scale. Dissolved oxygen is measured with a temperature compensated passive polarographic cell calibrated to atmospheric oxygen with an instrument accuracy of ±2% of the reading. Conductivity is measured with a temperature compensated 4 electrode AC cell with nickel electrode and an instrument accuracy of ±1.5% using a standard KCl solution for calibration. Temperature is measured with a thermoster probe with an internal calibration standard and an instrument accuracy of $\pm 0.2^{o}$C for temperature between -5^{o} and $+25^{o}$C and $\pm 0.4^{o}$C for temperatures from 25^{o} to 40^{o}C. These instruments will be used to measure each water quality parameter at the surface, mid-depth and near bottom for each of the Bay stations. Each of the four tributary stations will be sampled only near the surface and the near bottom. A prearranged schedule of stations will be sampled and returned to the laboratory for quality assurance controls of instrumentation accuracy. Further, on board tool kits and calibration standards will be kept with the instruments for repairs and calibrations in the field. All data will

TASK 3.5.1.1.4. PHYSICAL PARAMETER MEASUREMENTS

Description: (continued)

be recorded with other hydrographic data (e.g., current speed and direction, meteorology, etc.).

To obtain a better correlation of transparency with Secchi disk measurements, correlations will be developed between pyranometers, photometers and the Secchi disk. This one time only calibration will be conducted in the following manner. The Eppley pyranometer at the Mote Marine Laboratory weather station will be calibrated under a clear mid-day sun against a standard marine photometer and chart recorder. The photometer will be placed in the field against the Secchi disk and readings of incident deck, incident sea surface, incident Secchi disk and back scatter light levels will be recorded. A variety of water conditions will be sampled, ranging from lower Whitaker Bayou to a point three miles west of Longboat Key in the Gulf of Mexico. These data should provide consultants with a predictable correlation of Secchi disk readings conducted during the year and actual incident and penetrant light.

TASK 3.5.1.2. WATER QUALITY

Description:

Water samples will be collected at depth with a Niskin-type sampler. Containers for surface samples are opened while being held just below the surface and allowed to fill. All samples are iced in the field and maintained in the dark until receipt at MML. Samples to be analyzed for total concentrations (i.e., unfiltered samples) have parameter-specific preservatives applied in the field (sulfuric acid for some nutrients, nitric acid for metals). At the laboratory, after any required filtration, the samples are preserved with the appropriate acids and all samples are maintained at $4^{\circ}C$ until analysis.

Sediment-cores are refrigerated with air excluded until analysis. Plant tissue is dissected and also refrigerated. Animal tissue samples for metals and pesticide analysis is frozen until extraction and extracts are refrigerated until quantification is complete.

TASK 3.5.1.2. (continued)

Water Quality Analyses

1. Orthophosphate and Total Phosphorus

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
365.3-1 to 365.3-4

Unacidified, unfiltered, and iced samples are warmed to room temperature, then acidified, and the reactive or orthophosphate present complexed with ammonium molybdate and a small amount of antimony potassium tartrate. The phosphomolybdic acid formed is then reduced with ascorbic acid to give molybdenum blue measurable at 650 nm on a spectrophotometer. Total phosphorus is determined as all phosphorus present as orthophosphate after the digestion of acidified samples with ammonium persulfate and addition of molybdenum and ascorbic acid as above. In both cases, sample concentrations are read directly from a standard curve prepared with distilled and double deionized water and ranging from 0.01 mg/l, the lower limit of detection, to 0.80 mg/l of PO_4-P.

2. Ammonia, Phenate Method

American Public Health Assocaition, Standard Methods for the Examination of Water and Wastewater, 15th Edition, pg. 360-361.

Iced samples are brought to room temperature and the ammonia nitrogen present, catalyzed by manganous sulfate, reacts with hypochlorite and alkaline phenol to form indophenol blue. This intensely blue compound is measured spectrophotometrically at 630 nm. Modification of this method to prevent precipitation of Ca and Mg ions in seawater by the addition of sodium potassium tartrate (see Standard Methods, Sect. 417F, 1b, pg. 364) may be necessary. Sample concentrations will be read directly from a standard curve ranging from 0.01 mg/l to 0.5 mg/l NH_3-N.

3. Nitrate-Nitrite-Nitrogen and Nitrite-Nigrogen

EPA: Methods for Chemical Analysis of Water and Wastes

EPA 600/4-79-020, March 1979

353.3-1 to 353.3-5

Filtered, iced, and acidified samples are allowed to come to room temperature. Combined nitrate and nitrite values are determined by passing the sample, buffered with ammonium chloride and EDTA, through a column of copper coated cadmium granules to reduce nitrate to nitrite. The nitrite is then diazotized with sulfanilamide and complexed with N-(1.-napthyl)-ethylenediamine dihydrochloride to form a diazo dye, measured spectrophotometrically at 540 nm.

Nitrite-nitrogen is determined on unacidified samples, filtered and buffered as above, but unreduced. In both cases, concentrations are read directly from a 7-point standard addition curve prepared in distilled and deionized water and ranging from 0.01 mg/l to 1.0 mg/l as N.

4. Total Kjeldahl Nitrogen

EPA: Methods for Chemical Analysis of Water and Wastes

EPA 600/4-79-020, March 1979

351.4-1 to 351.4-3

Acidified (H_2SO_4) and iced samples are brought to room temperature and in the presence of sulfuric acid and potassium sulfate, with mercuric sulfate as a catalyst, the organic nitrogen compounds are digested at elevated temperatures to ammonium sulfate. A pH adjustment converts the ammonium ion to ammonia, measurable by the ion selective probe. Interference from the mercuric ion and hydroxides is prevented by the addition of sodium iodide and EDTA.

The total Kjeldahl nitrogen value is obtained by direct comparison to a 7 point standard curve which ranges from the lower limit of detection, 0.1 mg/l, to 5.0 mg/l N. Standards are prepared

in distilled and double deionized water, digested, and then reconstituted with synthetic ocean water to match the ionic strength of the samples.

5. Silica, Reactive, Dissolved

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
370.1-1 to 370.1-5

Unacidified, filtered (0.45 μ membrane filter), and iced samples are warmed to room temperature. The addition of an acidic molybdate solution forms a yellow complex, molybdosilicic acid. Tannin and phosphate interferences are decreased by the addition of oxalic acid and the yellow complex is then reduced to an intense blue with the addition of 1-amino-2 napthol-4-sulfonic acid and measured spectrophotometrically at 650 nm.

Sample concentrations are read directly from standard curves prepared in distilled and deionized water and ranging from 0.01 mg/l, the lower limit of detection, to 10.00 mg/l.

6. Conductivity (Specific Conductance)

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
120.1-1

The specific conductance of a sample at 25°C is measured with a Beckman Type RC conductivity bridge, Wheatstone bridge null indicator type, with a platinum electrode conductivity cell. Standard KCl solutions are used for standardization before each use and for the computation of the cell constant.

7. Total Suspended Solids (Residue, Nonfilterable)

EPA: Methods for Chemical Analysis of Water and Wastes

EPA 600/4-79-020, March 1979

160.2-1 to 160.2-3

Representative aliquots (250-500 ml) of each unacidified and iced sample are filtered through prewashed, dried (at 103-105°C), and tared filters, Millipore HAWP 0.45 μ membranes, and the residue rinsed with distilled water. After drying to constant weight at 103-105°C (weight loss less than 0.0005 g), the nonfilterable residue is calculated as the difference between final and tare weights in milligrams, divided by the liters of sample volume filtered.

8. Chlorophyll 'a'

American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 15th edition, pg. 953.

Phytoplankton are concentrated by glass fiber filter, buffered with magnesium carbonate, and frozen at the time of collection. After homogenization of the filter in 90% acetone-water, pigments are passively extracted in the dark for 12 hrs at 4°C. Centrifugation clarifies the extract and the optical density (O.D.) at 663 nm, before the addition of 0.02 ml of 1N HCl and the O.D. at 665 nm after the acid addition is used for calculations of chlorophyll 'a'. This value is corrected for pheophytin 'a'.

$$\text{Chl 'a'} \ (\text{mg/m}^3) = \frac{26.73(\text{O.D. 663 before} - \text{O.D. 665 after}) \times V_1}{V_2 \times \ell}$$

V_1 = volume of extract, in liters

V_2 = volume of sample filtered, in m^3

ℓ = path length

9. Biochemical Oxygen Demand

U.S. Environmental Protection Agency, Office of Research and Devleopment, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio.

405.1

Sealed bottles of sample are incubated at 20°C in the dark, for 5 days and for 20 days. The difference in dissolved oxygen (DO),

measured initially and finally with a YSI Model 57 DO meter and a BOD bottle probe, is corrected for the ambient conductivity and this difference represents the oxygen required for the biochemical oxidation of organic material, sulfides and ferrous compounds. For determination of carbonaceous BOD, the oxidation of nitrogeneous compounds is prevented by the addition of 2-chloro-6 (trichloro methyl) pyridine. When required, dilutions will be performed with sterile, nutrient-enriched, synthetic ocean water with a conductivity approximating that of the individual samples. Nitrogeneous BOD is calculated as the difference between total and carbonaceous.

10. Total Organic Carbon

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
415.1-1 to 415.1-3

Total organic carbon (TOC) is determined by the persulfate oxidation method (Fredericks and Sackett, 1970) using the Ocean International Model 524 C Analyzer.

A 50 ml aliquot is transferred to a precleaned glass jar and prepared for TOC analysis within 24 hours of collection. For sample preparation, a 5 ml portion is placed in a precombusted glass ampule containing 5 ml of 10% phosphoric acid saturated with potassium persulfate. The ampule is then purged with oxygen gas to remove inorganic carbon and sealed with a portable ampule sealer. The samples are stored at room temperature until analysis. Samples are analyzed in sets of 50 with a minimum of 1 duplicate for every 10 samples. Each set is compared with a standard carbon dioxide curve, reagent blanks and 3 samples spiked with a standard amino acid solution to verify accuracy and precision. In addition to the reagent blanks field-sample blanks are collected. These consist of organic-free water added to the Niskin sampler and subsequently analyzed as described above for the natural water samples.

Analysis of the TOC samples consists of autoclaving the ampules at 130^{o}C for one hour and then measuring the infrared absorbance of the carbon dioxide generated.

11. Metals, Total Extractable

Cadmium, Copper, Lead, Zinc

EPA: Methods for Chemical Analysis of Water and Wastes

EPA 600/4-79-020, March 1979

Section 9.2 Special Extraction Procedure

Samples preserved with nitric acid to a pH of <2 and maintained at 4°C are warmed to room temperature. Metallic ions in solution are chelated with ammonium pyrollidine dithiocarbamate (APDC) and concentrated by preferential extraction into a small volume of organic solvent (methyl isobutyl ketone). The organic solvent is then directly aspirated into the air-acetylene flame of the atomic absorption spectrophotometer. Sample concentrations are determined utilizing a 7-point standard curve constructed with water of a similar matrix as the samples and values are corrected for reagent blanks.

12. Organochlorine Pesticides

American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 15th edition, pp. 493-503.

Samples, maintained until analysis at 4°C, are serially extracted with 15% methylene chloride/hexane and then hexane. The combined organic extracts are dried through sodium sulfate, reduced by gentle evaporation and then quantified by standardized injections on a gas-liquid chromatographic system with an electron capture detector. Compounds are identified on the basis of relative retention times on two separate column packings (4% SE-30 + 6% OV-210 and 1.5% OV-17 + 1.95% OV-210) and quantified by comparison of sample peak heights and areas to those of known injected standards. Interfering substances are removed from the samples if necessary through a florisil column cleanup where the compounds of interest are successively eluted with ethyl ether and petroleum ether solvent mixtures. Injection of samples and quantification then proceed as described above.

Samples will be scanned and quantified for a total of 18 chlorinated compounds including 1 polychlorinated biphenyl, Aroclor 1254.

Sediment Analyses

Total Carbon, Organic and Inorganic

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
415.1-1 to 415.1-3

Inorganic carbon is determined on field-moist and homogenized sediment subsamples by the addition of 10% phosphoric acid and potassium persulfate and the immediate quantification of the carbon dioxide produced from bicarbonates and carbonates. Total organic carbon is quantified according to Method 10, Water Quality Analyses, where the carbon dioxide produced by the inorganic carbon species of the sediments is purged from the ampules with oxygen before sealing and digestion. Each sample type is quantified with standard curves constructed of known amounts of the appropriate inorganic or organic carbon and all are analyzed using the International Model 524 C analyzer.

Determinations of % solids, combination of inorganic and organic values, and calculations based on sample weight will give mgC/kg as dry or wet weight. Plant tissue is similarly analyzed for determination of total carbon.

Nitrogen

Total Kjeldahl Nitrogen

Plumb, R.H., Jr. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. 1981, Technical Report EPA/CE-81-1. pp. 3-202 to 3-204.

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
350.3-1 to 350.3-2

A homogenized subsample of a field moist core (0.5-5.0 g dry weight equivalent) is weighed into a digestion tube. The sediment samples are then digested at elevated temperature in the presence of mercuric sulfate, potassium sulfate and sulfuric acid. Organic nitrogen compounds (and ammonia) are converted to ammonium sulfate. After dilution to a suitable volume, mineral solids are allowed to settle, and an aliquot is analyzed by the specific ion probe.

A pH change converts ammonium compounds to ammonia, which diffuses through the hydrophobic, gas-permeable membrane of the specific ion probe and produces a millivolt potential indicative of the concentration of ammonia in the sample. Concentrations are read from a simultaneously digested standard curve and are then converted to a mg TKN/kg (dry weight or wet weight) or the basis of original sample weight and percent solids composition.

Plant tissue is similarly analyzed for determination of total Kjeldahl nitrogen

Nitrate-Nitrite Nitrogen

Plumb, R.H., Jr. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. 1981, Technical Report, EPA/CE-81-1. pp. 3-183 to 3-184.

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
353.3-1 to 353.3-5

This operationally defined parameter utilizes the high solubility of nitrate and nitrite salts and is determined by boiling a 0.5-1.0 g

homogeneous subsample of field moist sediment in a standard volume of distilled water. After 15 minutes of boiling, the sample is cooled, centrifuged for clarification, and decanted. The remaining solids are rinsed and recentrifuged twice more and the rinsing combined in diluting the sample to a known volume.

The now-aqueous sample is analyzed for nitrates and nitrites by the cadmium reduction-spectrophotometric method listed in the Water Quality analyses section (method 3) and concentrations are read from a 7-point standard curve. The mg NO_3-NO_2-N/kg on a dry or wet weight basis is calculated from original sample weight and percent solids data.

Plant tissue samples are similarly treated and total Kjeldahl nitrogen and nitrate-nitrite-nitrogen values are combined to give a total nitrogen level for the sediments and plant tissue analyzed.

Total Phosphorus

Plumb, R.H., Jr. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. 1981, Technical Report, EPA/CE-81-1. pp. 3-227 to 3-229.

EPA: Methods for Chemical Analysis of Water and Wastes
EPA 600/4-79-020, March 1979
3-212 to 3-213

Subsamples of field moist cores are homogenized and 0.5 to 2.0 g are digested as for total Kheldahl nitrogen with mercuric sulfate, potassium sulfate, sulfuric acid and heat. Organic phosphorus compounds are oxidized to orthophosphate. Samples are diluted to a specified volume, solids are allowed to settle and an aliquot of the aqueous supernatant is analyzed for orthophosphate. A reducing agent,

containing antimony potassium tartrate, ammonium molybdate and ascorbic acid, converts orthophosphate to phosphomolybdic acid which is then reduced to molybdenum blue. Absorbance of samples at 650 nm is related to that of known standards for quantification. The calculations to convert aqueous concentrations to mg P/kg are performed on the basis of weight of wet sediment and percent solids composition.

Plant tissue is similarly digested and analyzed for determination of total phosphorus content.

Metals, Total, Recoverable

Cadmium, Copper, Lead, Zinc

Plumb, R.H., Jr. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. 1981, Technical Report, EPA/CE-81-1. pp. 3-96 to 3-109.

EPA: Methods for Chemical Analysis of Water and Wastes EPA 600/4-79-020, March 1979.

A lypholized subsample of sediment core is sieved and 0.05 to 1.0 g of the 2 μ fraction is digested with concentrated hydrochloric and nitric acids. Evaporation and continued acid addition destroys organic matter and solublizes metals present. Insoluble minerals are filtered out and rinsed with distilled water. The digest and rinsings are then diluted to an appropriate volume for the suspected range of the element of interest and aspirated into the flame of the atomic absorbtion unit. Sample concentrations are determined from standard curves prepared and digested simultaneously with samples. Metal concentrations are converted to mg/kg of dry sediment utilizing original sample weight and dilution volumes.

Organochlorine Pesticides

Watts, R.R., ed., Analysis of Pesticide Residues in Human and Environmental Samples.

EPA 600/8-80-038, June, 1980.

Sect. 11, B-1 to B-6.

The homogenized sediment sample is air dried for several days. The percent total solids is determined on a portion and another weighed fraction is mixed with anhydrous sodium sulfate. Organochlorine compounds are eluted from a column of the sediment sodium sulfate mixture by acetone/hexane. The acetone is removed from the eluate by washing with water and then pesticides are back-extracted from the water rinse with methylene chloride/hexane. The sediment extract is now partitioned through successive elutions of 6% and 15% ethyl ether/petroleum ether from a florisil column. Sulfur interferences are eliminated by treatment with copper fines and quantification proceeds by gas-liquid chromatography as described in Method 12, Water Quality analyses.

Tissues

Metals, Total, Recoverable

Cadmium, Copper, Lead, Zinc

Collection, Preparation and Analysis of Trace Metals in Shellfish, 1975, National Shellfish Foundation Program.

Freshly collected organisms are rinsed free of sediment with distilled water and frozen until analysis. Homogenates of tissue are passively wet digested for 24 hrs with approximately 1 ml of concentrated nitric acid per gram (wet weight) of tissue. The solution is then gently heated for 2 hrs until clear. After cooling the digestate is filtered if necessary and diluted to an appropriate volume. A 7-point standard addition curve is simultaneously digested. The concentration of metals is then determined by atomic absorbtion in an air-acetylene flame.

Organochlorine Pesticides

Watts, R.R., ed., Analysis of Pesticide Residues in Human and Environmental Samples.

EPA 600/8-80-038, June, 1980.

5A(1)(a)-1 to (a)-10

Up to 5 g of homogenized tissue is dry macerated with anhydrous sodium sulfate and sand. Soxhlet extraction with petroleum ether isolates the fat and organochlorines from the tissue matrix. Evaporation under nitrogen and weighing determines percent fat and then pesticides are partitioned from acetonitride into petroleum ether by aqueous dilution. The sample extract is then partitioned on a florisil column with 6% and 15% ethyl ether/petroleum ether elutions. Samples are concentrated to suitable volumes and quantified by the gas liquid chromatographic techniques listed in Method 12, Water Quality analyses.

TASK 3.5.1.4.1. SEDIMENT CHEMISTRY

Description:

A total of 60 samples will be analyzed for grain size distribution, total organic carbon (TOC) and coprostanol. The samples will be taken using a petite Ponar grab. Sediment grain size samples will be taken to a depth of 10 cm. The sediment will be removed from the grab and placed in two 250 ml plastic jars and marked with an internal and external label. The samples will be returned to the laboratory and stored until analyzed.

A second grab will be taken and the sediment will be used for TOC and coprostanol analyses. The sediment will be removed to a depth of 5 cm and placed in two separate bags after thorough mixing. The samples will be placed on ice and returned to the laboratory where they will be frozen and stored for later analysis.

Laboratory Procedures

One sample from each station will be utilized for grain size, TOC, and coprostanol analyses. The second sample serves as a back up. Sediment analysis procedures are illustrated in Figure Grain size analysis will be based on the Wentworth classification scale using 1 phi mesh intervals and will follow Folk's (1974) methodologies.

TOC: Total organic carbon will be determined by the persulfate oxidation method using the Ocean International Model 524 C Analyzer, capable of detecting 1 part per million (1 mg/kg) of organic carbon for a 10 mg sample. An aliquot of the frozen samples will be lyophilized (freeze-dried), homogenized and sieved through a 1 ml sieve to remove large animals, detritus and large shell fragements. The amount of material retained on the sieve will be weighed and recorded. Two 10 mg subsamples of the sieved material will be placed in glass ampules, to which 5 ml of 10% H_3PO_4 saturated with $K_2S_2O_8$ (persulfate oxidizing solution) will be added to remove carbonates and oxidize the organic matter. The ampule will then be purged with oxygen, sealed and autoclaved for one hour. Total organic carbon present in the sample will be determined by infrared absorbance of the carbon dioxide generated. The TOC present at a station will be the average of the duplicate analyses. If a variation of more than plus or minus 10% is observed, additional replicate analyses will be performed.

TASK 3.5.1.4.1.

SEDIMENT CHEMISTRY

Description:
(continued)

Coprostanol Analysis: Sediment samples are thawed and then well mixed to ensure homogeneity. Excess water is removed by vacuum filtration through glass fiber filters. The moisture content of the sediment is determined by drying a small subsample (ca. 1 g) at 105°-110°C to a constant weight. Weighed samples (ca. 100 g wet) are solvent extracted through 300 cycles on the Soxhlet extraction apparatus using a methanol: toluene (72.5:27.5) azeotrope. Following extraction, the azeotropic solution is concentrated to ca. 10 ml volume, using a Kuderna-Danish concentrator.

From the concentrated solution, two aliquots are taken with an internal standard (cholesterol) added to one. Both aliquots are then saponified to remove interference from fats. Equal volumes of water and 0.5 N potassium hydroxide in methanol are combined with the extract and the solution refluxed for 2 hours. Saturated NaCl solution (pH approx. 2) is then added and the mixture is extracted three times with dichloromethane (CH_2Cl_2). The CH_2Cl_2 extracts are combined and then reduced to ca. 5 ml volume with a Kuderna-Danish concentrator.

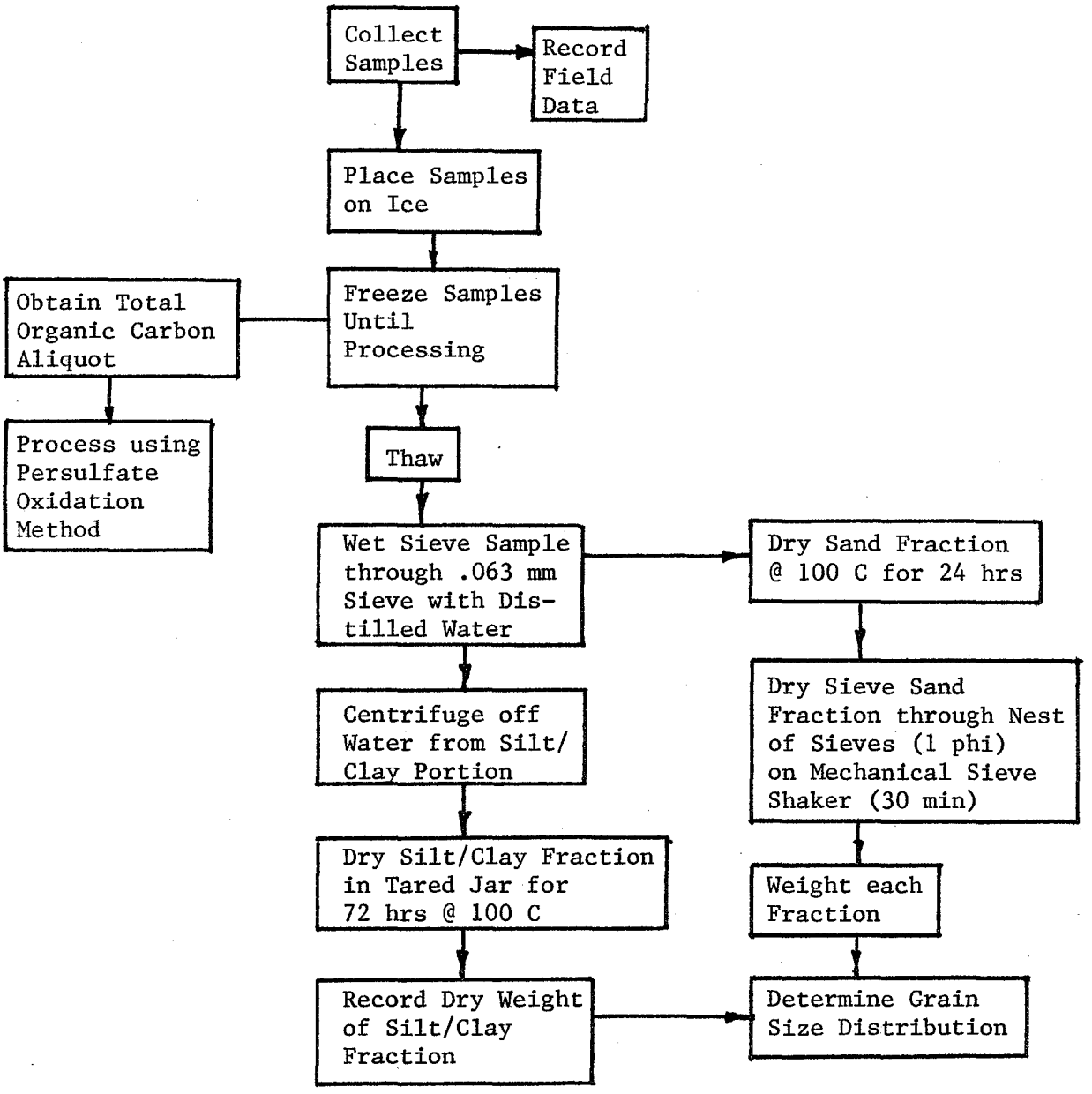
The sterols are separated from other organics in the sample by column chromatography. The concentrate is added to a glass column containing 1/1, V/V, silica gel over micron-neutral alumina. The column tube is 10 mm in diameter and packed to a height of ca. 10 cm with activated silica gel/alumina. The column is successively eluted with two bed volumes of hexane, dichloromethane, and themanol. The first two eluents are saved for hydrocarbon analysis and the methanol eluent is used for coprostanol analysis. The methanol eluate is evaporated under a stream of dry nitrogen and the trimethylsilyl (TMS) derivatives of the sterols are formed using bis(trimethylsilyl)trifluoracetamide (BSTFA). The TMS derivative of coprostanol is formed because the resulting silyl ether is much more volatile and stable for gas chromatographic analysis.

TASK 3.5.1.4.1. SEDIMENT CHEMISTRY

Description:
(continued)

Gas Chromatography: The silylated solution is dried under nitrogen, brought to a known volume with hexane, and injected into a Varian VISTA 6000 gas chromatograph coupled with a VISTA 401 chromatography data system. The instrument is equipped with dual flame-ionization detectors (FID) and has glass capillary capabilities. The columns are 25 m x 0.2 mm ID WCOT glass capillary coated with SE-30 or SE-54. The system has the option of operation in the split/spitless injection mode, depending on concentrations found in the sample. Data are reported as hard-copy chromatograms qualitative and quantitative print-out; also, optimal floppy disk storage enables further data manipulation and archiving.

Coprostanol identification is determined by relative retention time to standard mixtures and veritification by reverse phase HPLC-UV analysis. Concentrations of coprostanol are calculated with respect to the added internal standard, cholesterol, after corrections are made for the natural concentrations of cholesterol. Solvent blanks, sample blanks and standard recoveries are run daily with each set of sample analyses.



SEDIMENT ANALYSIS PROCEDURES

TASK 3.5.1.5. PHYTOPLANKTON

Description:

The phytoplankton community of Sarasota Bay will be characterized from measurements of phytoplankton taxonomic composition and abundance.

Phytoplankton samples will be collected and analyzed from sixteen locations in the Bay and Bayou once a month for 8 months. These samples will be collected with a Niskin sampler just below the surface at all stations. Phytoplankton samples will be preserved in the field by addition of Lugol's solution. In addition, one sample will be left unpreserved, and be processed live upon return to the laboratory. A minimum of two subsamples from each original sample will be placed in 0.12 ml Palmer nanoplankton counting chambers and allowed to settle. The settled cells will be identified and counted at 400X magnification using an inverted microscope. Approximately 150 cells will be counted in each subsample (filamentous blue-green algae are counted as trichomes and not cells). Identification will be carried out to the species level for large cells and to the lowest practical level for small diatoms and phytoflagellates.

The total concentration of cells in the subsample will be calculated by:

$$C = \frac{N}{V}$$

where C is the total cell numbers (cells ml^{-1}), N is cells counted (cells), and V is the volume examined (ml).

Phytoplankton taxonomic data will be tabulated as species lists for each sampling period. All data will be entered into MML's Apple II Data Processor, and analyzed monthly for patterns of community structure and similarity.

TASK 3.5.1.6. ALGAL ASSAYS

Description:

During the routine phytoplankton samplings in Sarasota Bay during February and August 1982, additional samples for phytoplankton will be collected at four stations in Sarasota Bay. The four stations will be selected following the analysis of the phytoplankton collected during the Whitaker Bayou Pre-dredging study and the December Sarasota Bay sampling. These first two sampling events will allow the determination of Bay segments which contain representative algal communities. The samples will be sieved through a plankton net for the removal of herbivorous zooplankton and stored in separate opaque bottles. The bottles will be labeled internally and externally and placed in a well insulated styrofoam chest. The chest will be sent by bus directly to Tallahassee FDER for algal assay work. A comparable number of stations in Lake Myakka will be sampled in the same manner for analysis. It should be noted that shipments of algae will therefore correspond to the timing of the Bay and Lake sampling efforts, e.g., not all algae will arrive at FDER, Tallahassee, simultaneously. Data generated from these analyses will allow the mathematical simulations of nutrient limitations and impacts on algal communities and the definition of limiting nutrient conditions associated with various phytoplankton communities.

TASK 4.2. METEOROLOGY LAKE MYAKKA

Description:

Parameters to be measured by the weather station at Myakka River State Park include:

1. Temperature (minimum/maximum)
2. Relative Humidity
3. Rainfall
4. Barometric Pressure
5. Wind Speed and Direction

Quality assurance procedures and equipment are the same as those for Sarasota Bay with one exception. The recording anemometer is a Wang Laboratories "Econowind" model, provided for this project by Sarasota County. Parameter equipment observation frequencies are as follows:

Parameter/Equipment	Observation Frequency
1. Temperature (minimum/maximum)	Daily
2. Relative Humidity	Daily
3. Rainfall	Daily
4. Barometric Pressure	Daily
5. Wind Speed and Direction	Continuous

TASK 4.3.1. CONTINUOUS STREAMFLOW DETERMINATIONS

Description:

Based upon the sites identified on Figure continuous recording stage recorders will be placed in each body of water. Cross sectional areas will be calibrated through the use of a Price AA Current Meter to obtain velocity measurements across the stream. Techniques will be the same as utilized in Task 3.5.1.1.1. Following these initial characterizations of velocity with depth, the velocity reading at the cross section will be obtained each time the continuous stage recorder is maintained (at present instruments are set with monthly gears and charts, but will be visited on at least a weekly basis). Based on these multiple readings, a stage vs. discharge curve will be obtained for each stage recorder station in order to identify stream-flow for the 12 month period. The USGS stage recorder north of Highway 72 on the Myakka River will also be utilized as a data source. As part of the data output, cross-sectional areas of each stream will be drawn based on soundings. All current measurements will be on the upstream side of bridges. Where possible and at the discretion of MML, calibrations will be made at constrictions of the stream in the vicinity of the stage recorder rather than immediately next to the recorder.

TASK 4.3.2. HYDROLOGY

Description: Water level in a surface water table observation well on S.R. 780 north of the State Park will be determined during visits to the area for other purposes. Water level will be determined by lowering a chalked and weighted line from a reference mark on the well. Data will be tabulated and graphed in relation to rainfall, Lake stage, and other pertinent variables.

TASK 4.3.3. LAKE DRAWDOWN AREAS

Description:

During the course of the investigation, measurements of lake stage will be obtained through the use of stage recorders and staff gages. Based upon these elevations, aerial photographs and ground truthing, and bathymetry studies referred to in Task 4.3.4., plots of total Lake volume, Lake area and exposed portion of the Lake banks during drawdown will be maintained. These data will be cumulative and modified after each monthly evaluation of stage. Outputs will include frequency distribution of stage, exposed and submergent Lake area, and volumes. Area determinations will be made upon annotated 1:400 aerial photographs dated 1980. Annotations will delineate areas of exposed bottom. Exposed Lake bottoms will be determined in the field by surveying, range finding and triangulation. All areas will be determined using an Apple II Computer with planimeter hardware and software.

TASK 4.3.4. LAKE BATHYMETRY AND CHANNEL CROSS SECTIONS

TASK 4.3.4.1.

Description:

The U.S. Geological Survey has cross sections along Myakka River, Clay Gully, Lake Myakka, Vanderipe Slough and Myakka River below the Lake. These data and unpublished data held by the USGS Sarasota Office will be utilized for initial definition of the bathymetry of Lake Myakka. Definition of the bottom elevations and channel elevations will be utilized as inputs to physical characteristics to modeling efforts.

TASK 4.3.4.2.
Description:

Additional measurements of the Lake bottom and organic deposition of the Lake bottom will be obtained to properly characterize and revise information obtained from USGS. These data will be used to update and modify the Lake bottoms obtained previously to allow better definition of current definitions.

With respect to Vanderipe Slough, Big Flats and other areas peripheral to the Lake, cross sections will be obtained to areas where USGS cross sections are unavailable or where the mapping of vegetation necessitates such study. Bathymetry and cross sections in peripheral areas will be determined by site leveling major discontinuities observed in aerial photographs.

TASK 4.5. MACROPHYTE STUDIES

Description:

Data describing the distribution and abundance of native and exotic macrophytes in Lake Myakka, Vanderipe Slough, Howard Creek, and Big Flats will be developed. Visits to the area will be conducted twice during the year. Satellite images, aerial photographs and ground truthing will be utilized in order to establish species composition of major plant associations, the aerial extent of each association, standing crop estimates of each association, the vegetative standing crop of each association, and the elemental standing crops of each plant association. The species composition of associations will be determined by preliminary mapping of available photographs followed by site visits with collections made in the field of representatives of each species. Materials will be keyed to species and preserved by use of plant presses and urbarium sheets (note: all urbarium materials to be deposited with Myakka River State Park upon completion of this project). Frequency distributions of the relative contribution of each species within an association will be produced, and based on these results major associations will be mapped. The distribution of associations will be correlated with the topography-bathymetry of the study areas and the vegetative and elemental standing crops of each association will be determined at two different times during the year.

During each time period, the vegetative standing crop of major plant associations will be determined by harvesting a statistically sufficient number of one m^2 quadrats harvested at random from each association. Vegetation will be dried to constant weight, sorted by species, and weighed. Elemental standing crop will be determined by measuring the total organic carbon, nitrogen, and phosphorus in plant tissues per sq m of cover among each plant association. Techniques for measurement of elemental standing crop are given in Task 3.5.1.1.2.2. These efforts will allow identification of the magnitude of macrophytes existing within each of the areas. In addition, collection of these samples will help establish a relationship between the water column concentrations, sediment concentrations and plant concentrations of nutrients throughout the study area. Possible

TASK 4.5.	MACROPHYTE STUDIES
Description: (continued)	redirection of additional sampling efforts and/or modification of the continuous program may result.

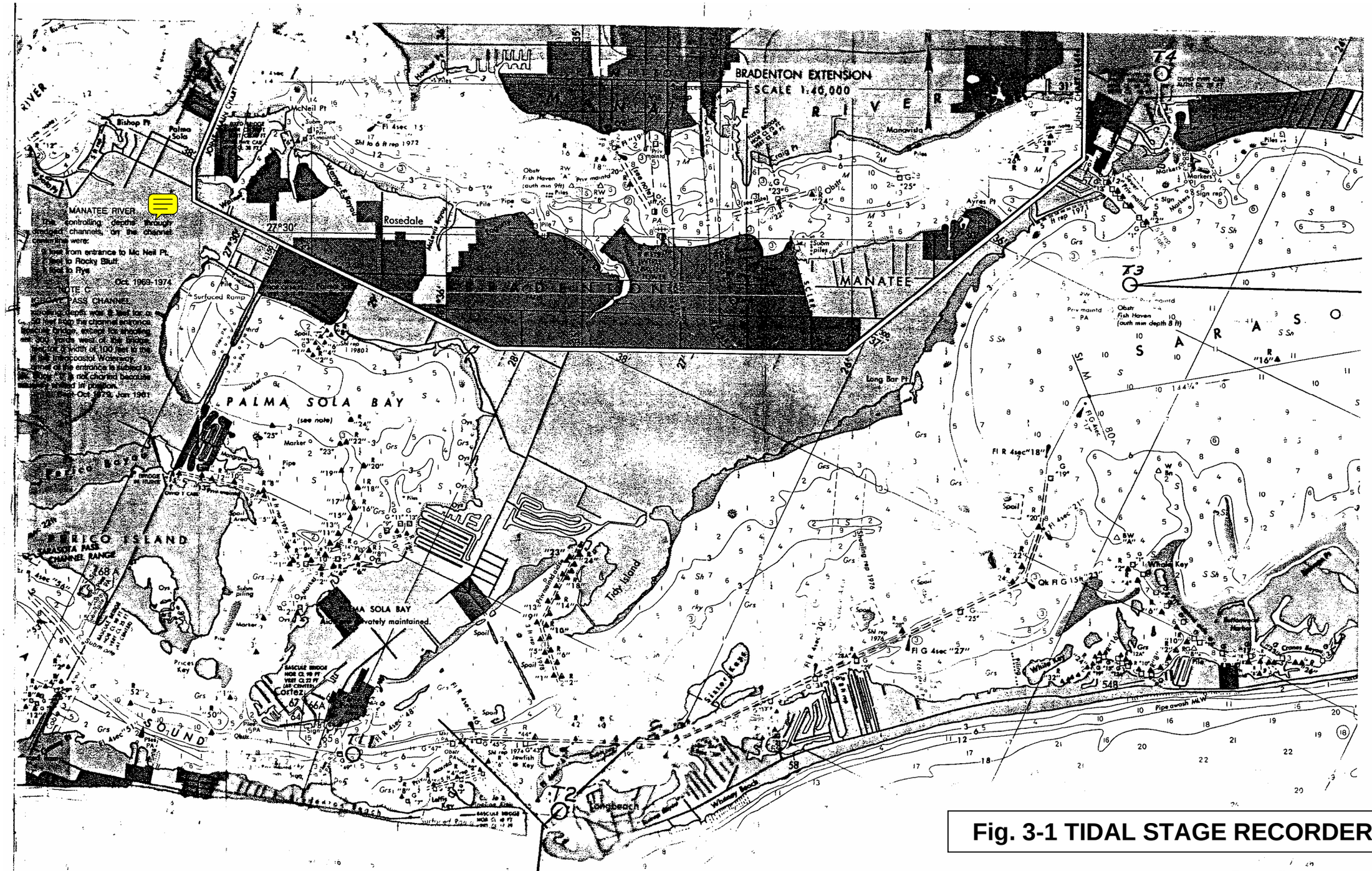
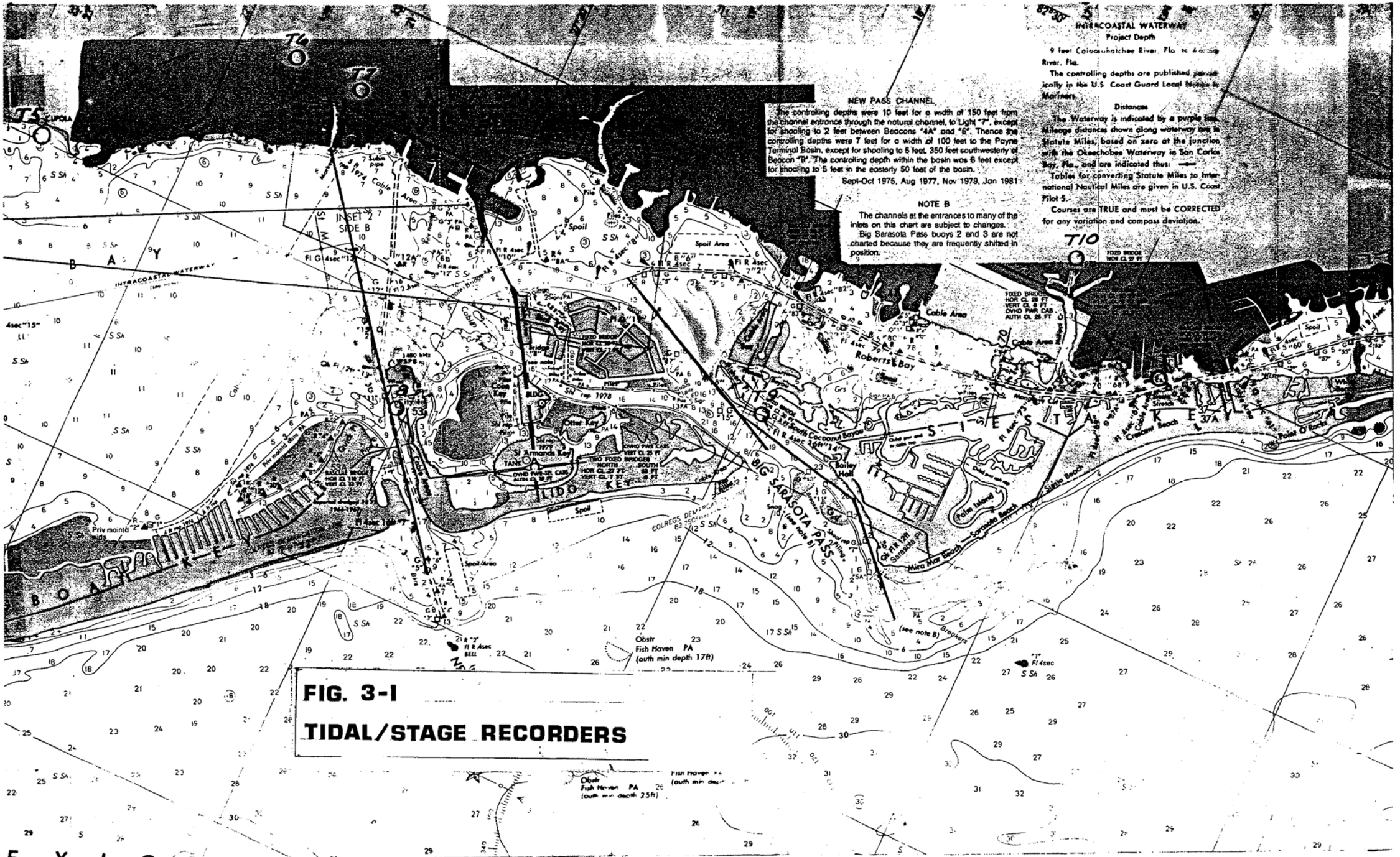


Fig. 3-1 TIDAL STAGE RECORDERS


INTRACOASTAL WATERWAY
Project Depth
9 feet Caloosahatchee River, Fla. to Anclote River, Fla.
The controlling depths are published periodically in the U.S. Coast Guard Local Notice to Mariners.
Distances
The Waterway is indicated by a purple line. Mileage distances shown along waterway are in Statute Miles, based on zero at the junction with the Okeechobee Waterway in San Carlos Bay, Fla., and are indicated thus: ——
Tables for converting Statute Miles to International Nautical Miles are given in U.S. Coast Pilot 5.
Courses are TRUE and must be CORRECTED for any variation and compass deviation.
NEW PASS CHANNEL
The controlling depths were 10 feet for a width of 150 feet from the channel entrance through the natural channel, to Light "7", except for shoaling to 2 feet between Beacons "4A" and "6". Thence the controlling depths were 7 feet for a width of 100 feet to the Payne Terminal Basin, except for shoaling to 5 feet, 350 feet southwesterly of Beacon "8". The controlling depth within the basin was 8 feet except for shoaling to 5 feet in the easterly 50 feet of the basin.
Sept-Oct 1975, Aug 1977, Nov 1979, Jan 1981
NOTE B
The channels at the entrances to many of the inlets on this chart are subject to changes.
Big Sarasota Pass buoys 2 and 3 are not charted because they are frequently shifted in position.
INSET 2 SIDE B
INTRACOASTAL WATERWAY
BIG SARASOTA PASS
LIDO KEY
SIESTA KEY
Roberts Bay
Bailey Hall
Siesta Beach
Point O'Rocks
Crescent Beach
Mira Mar Beach — Sarasota Pl
Otter Key
St Armands Key
Fish Haven PA
(south min depth 17ft)
Fish Haven PA
(south min depth 25ft)
FIG. 3-1
TIDAL/STAGE RECORDERS

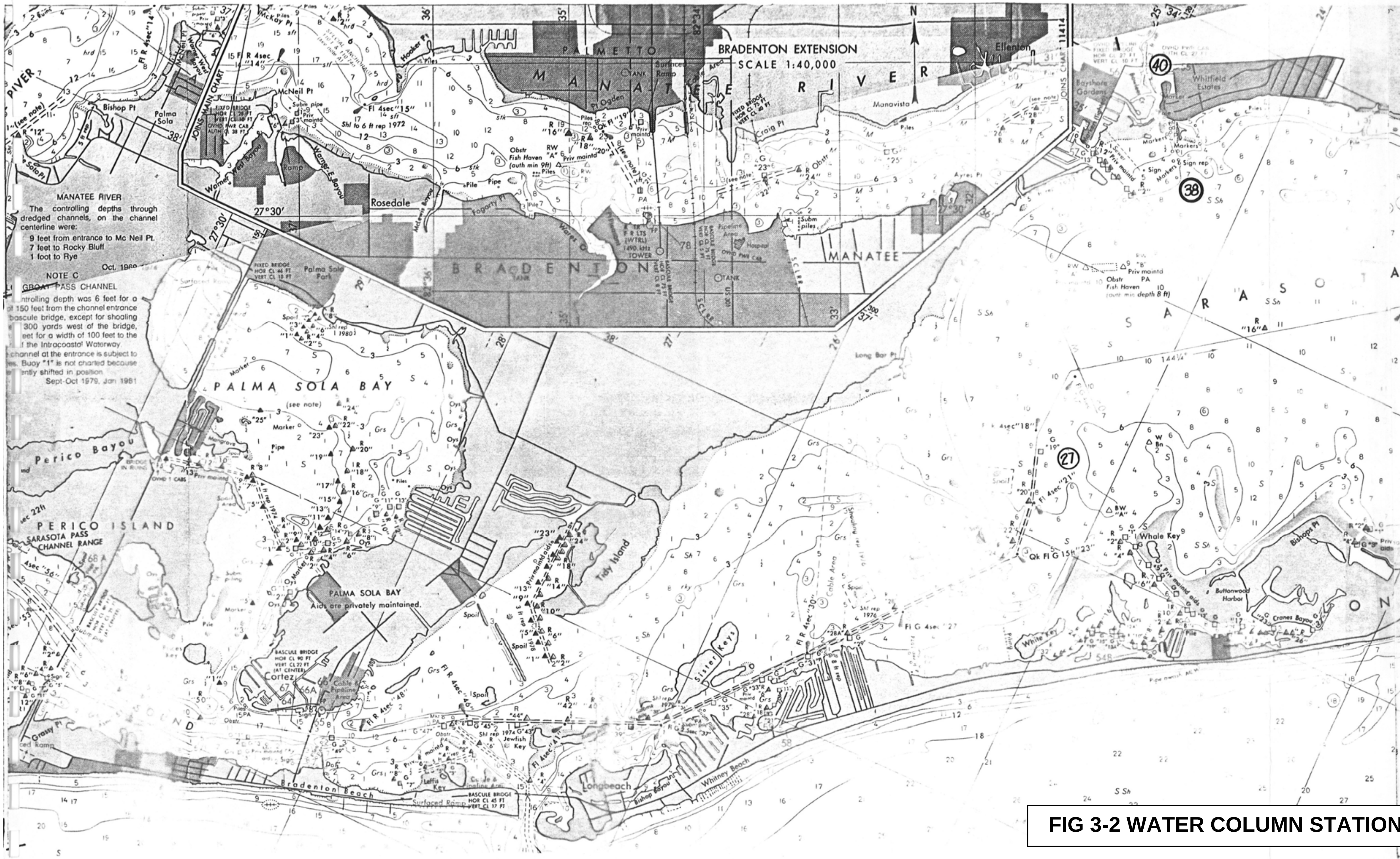


FIG 3-2 WATER COLUMN STATIONS

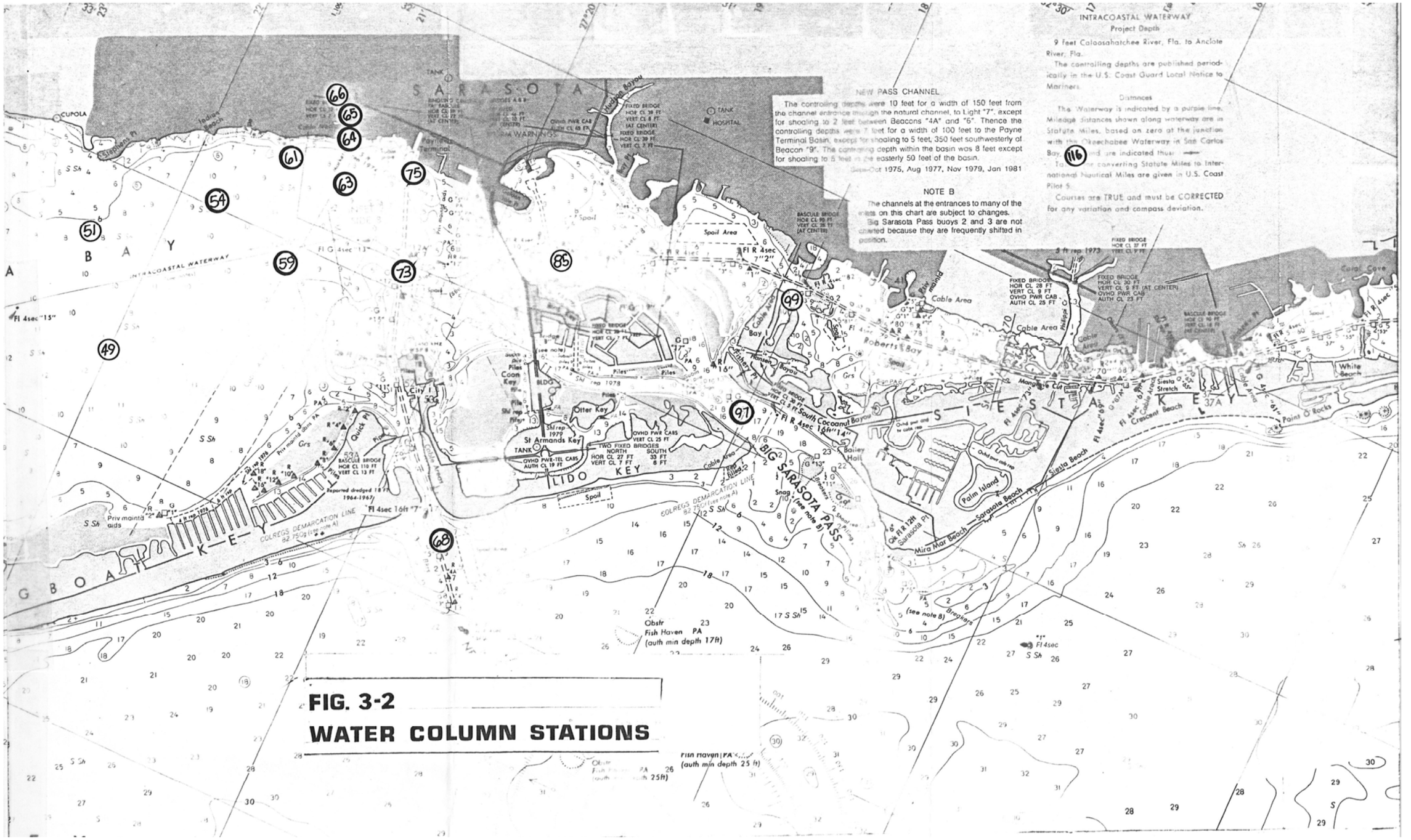


FIG. 3-2

WATER COLUMN STATIONS

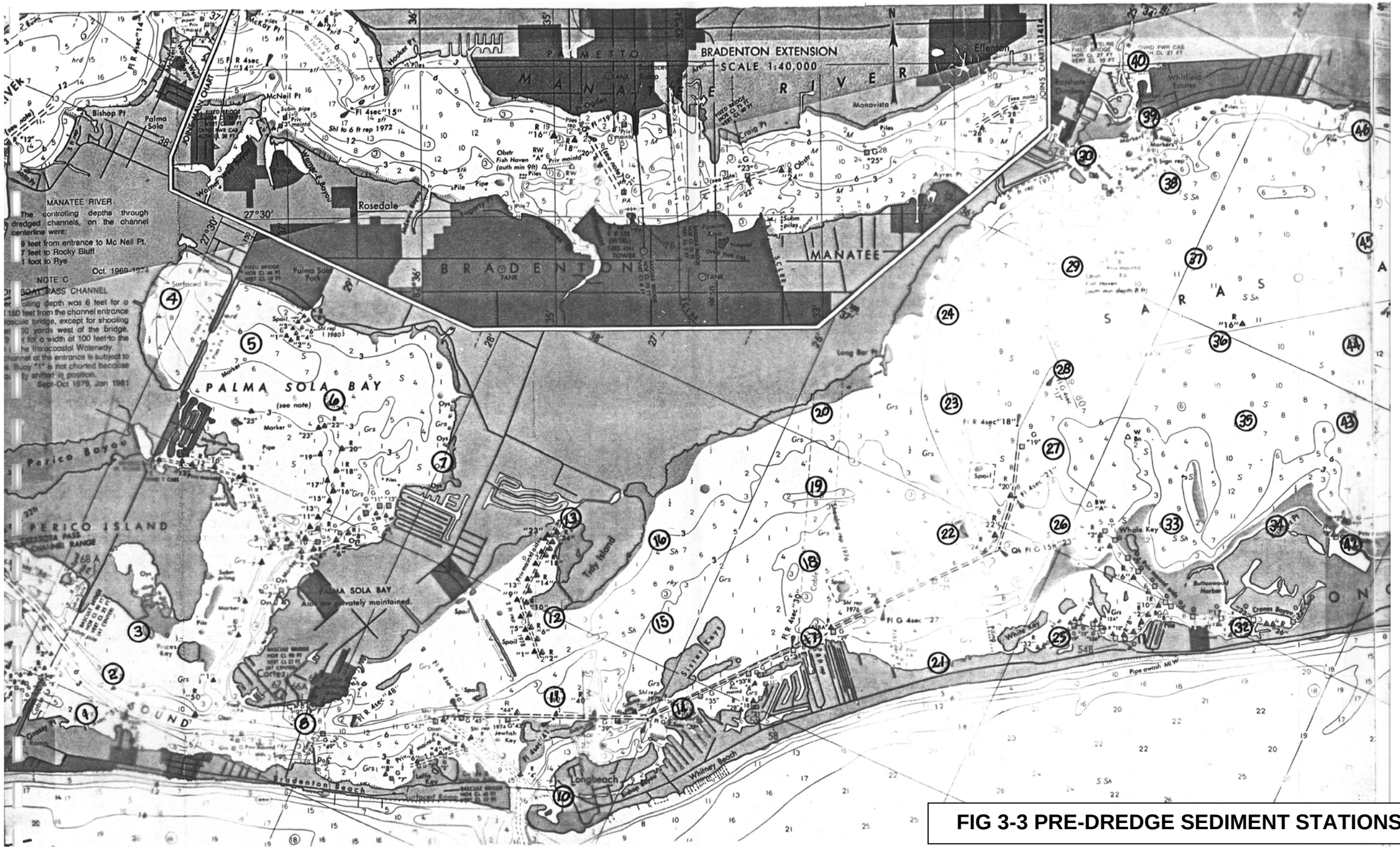


FIG 3-3 PRE-DREDGE SEDIMENT STATIONS

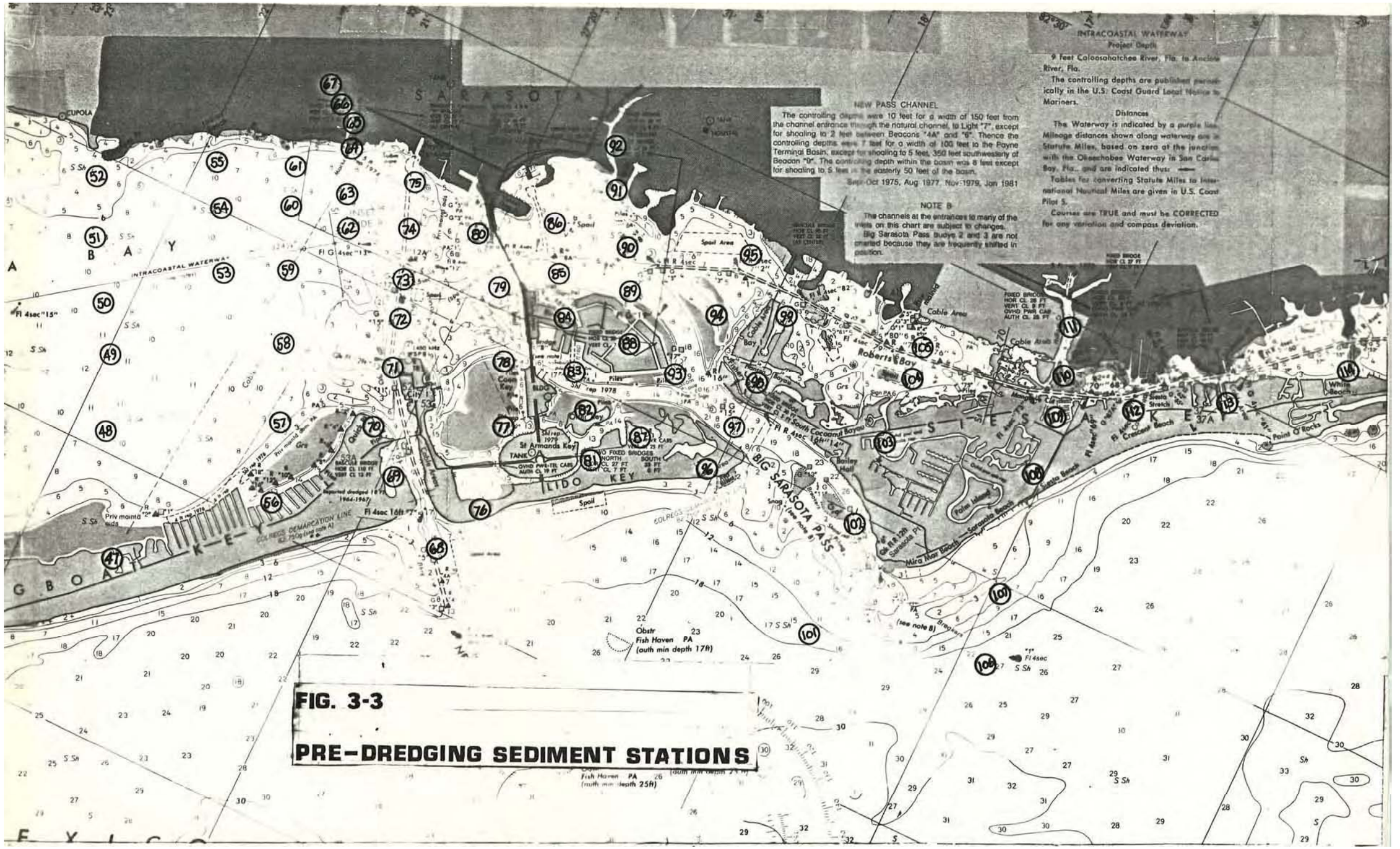


FIG. 3-3

PRE-DREDGING SEDIMENT STATIONS

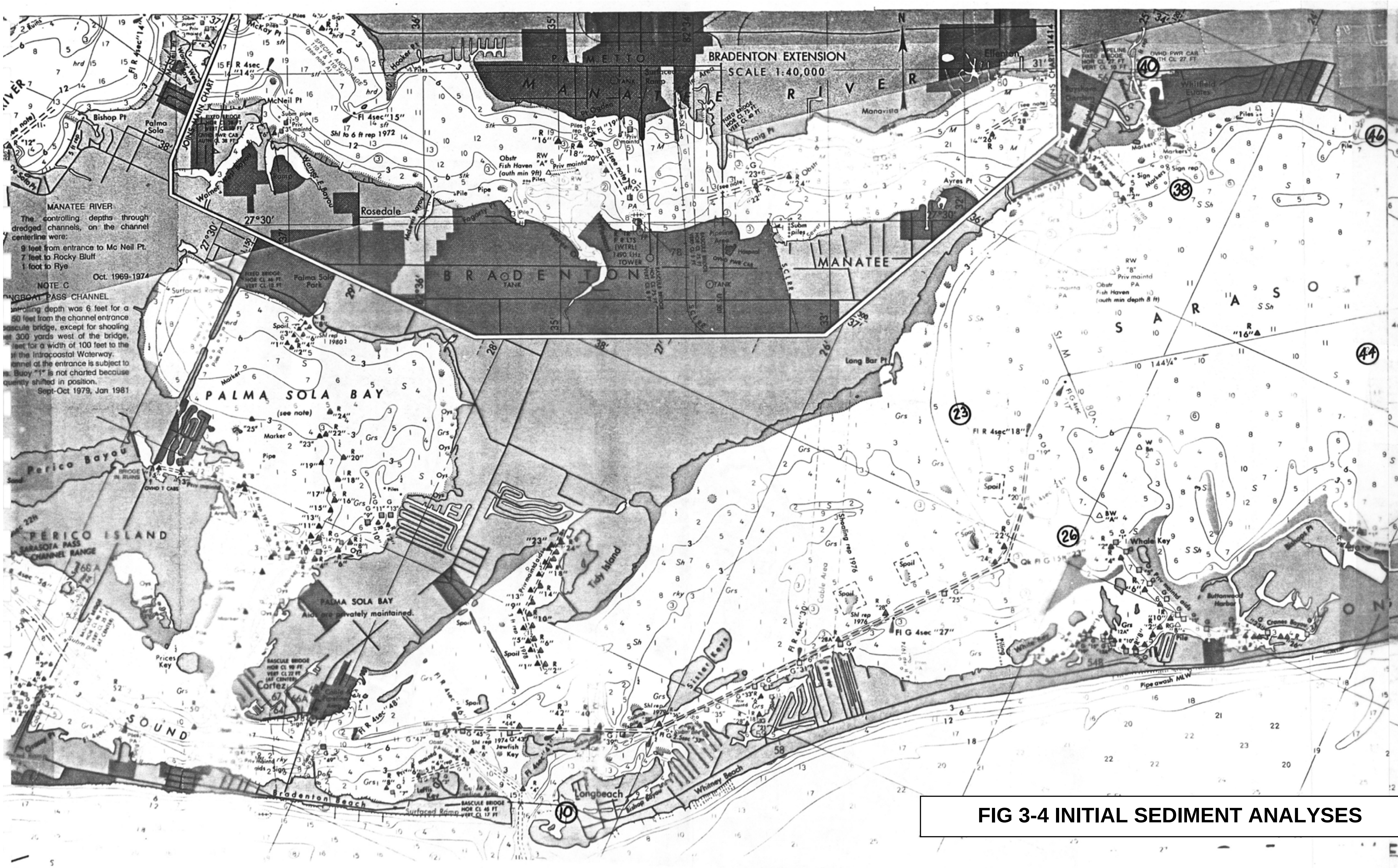


FIG 3-4 INITIAL SEDIMENT ANALYSES

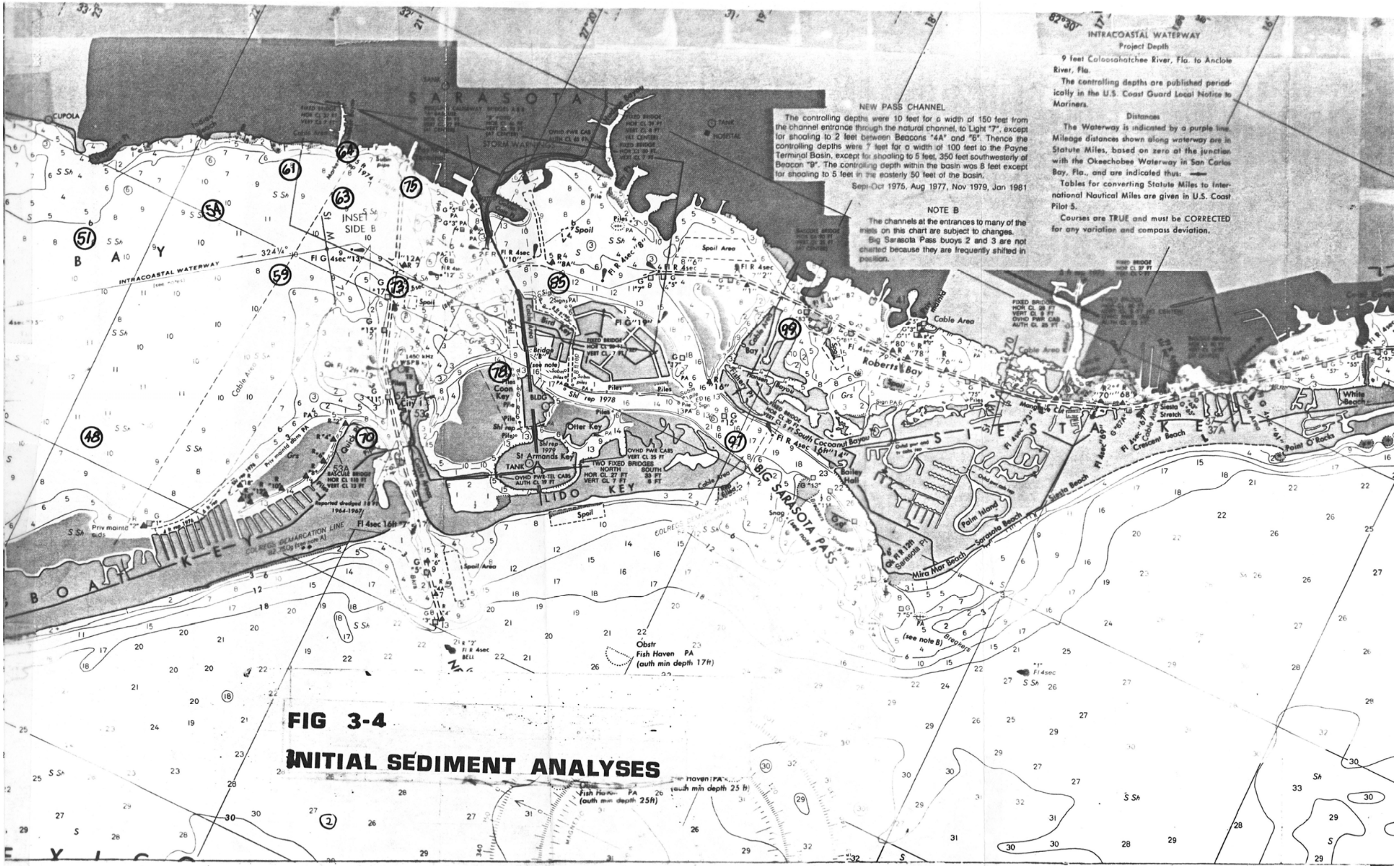


FIG 3-4

INITIAL SEDIMENT ANALYSES

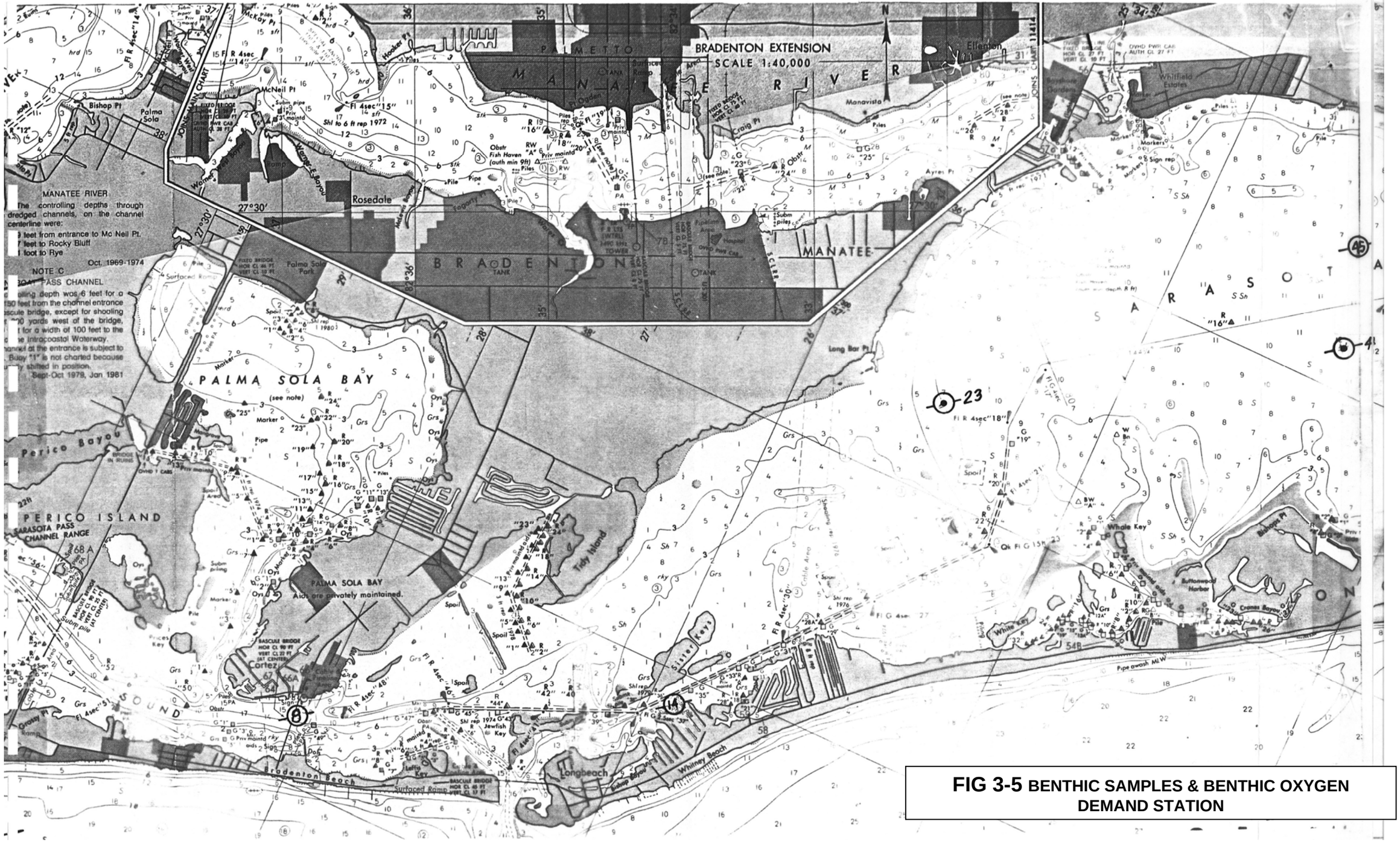


FIG 3-5 BENTHIC SAMPLES & BENTHIC OXYGEN DEMAND STATION

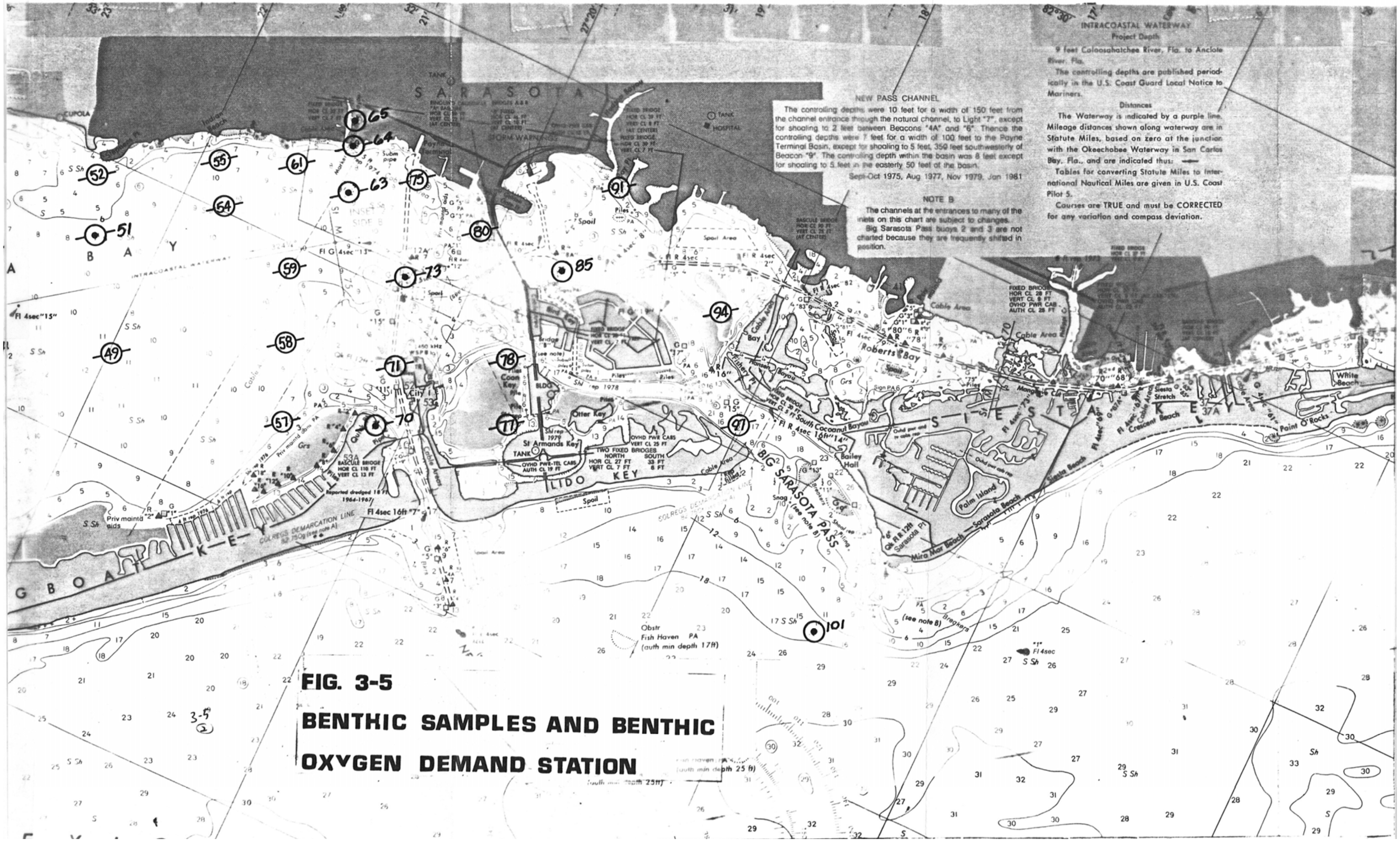


FIG. 3-5

BENTHIC SAMPLES AND BENTHIC OXYGEN DEMAND STATION

3-5
(2)

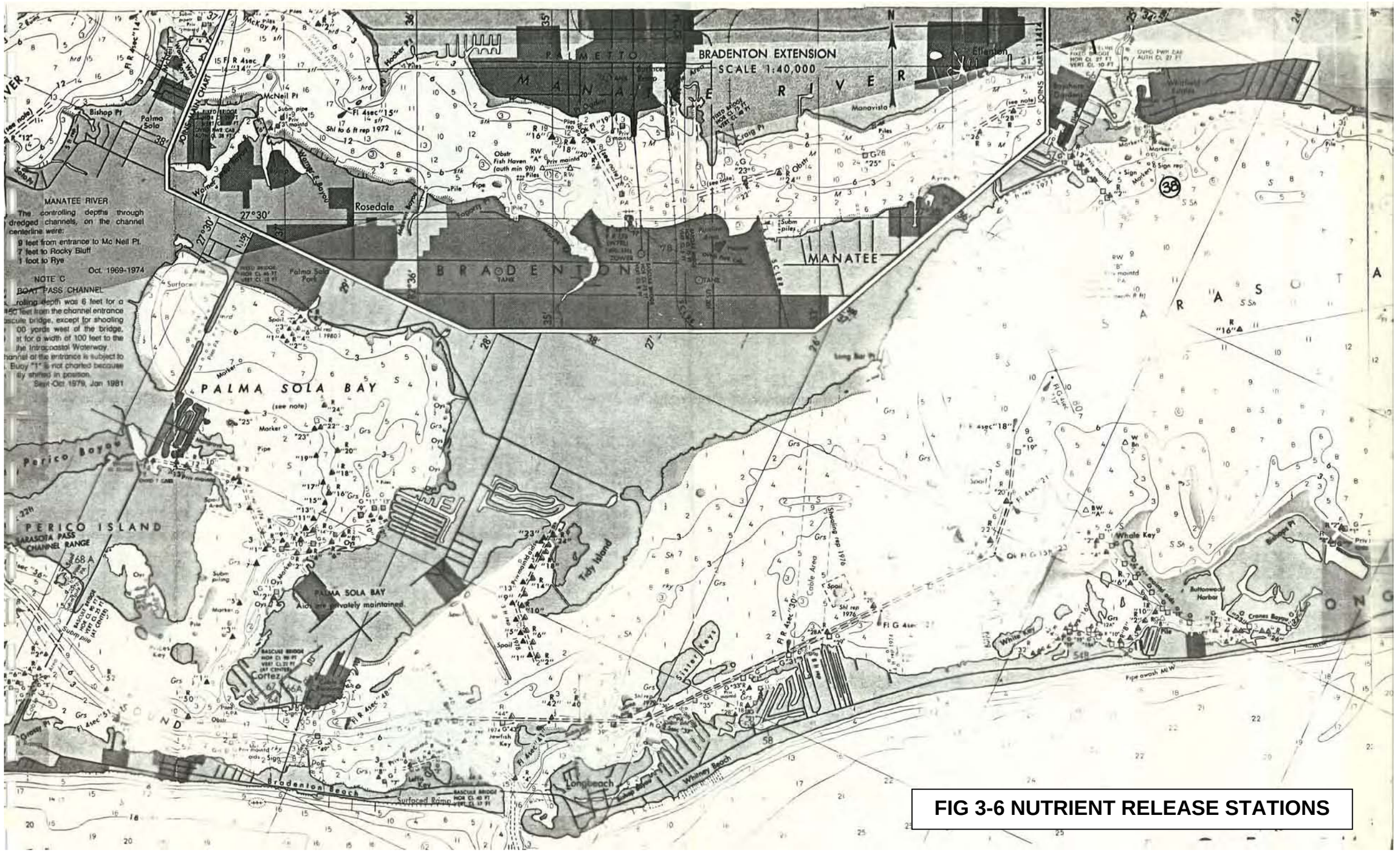


FIG 3-6 NUTRIENT RELEASE STATIONS

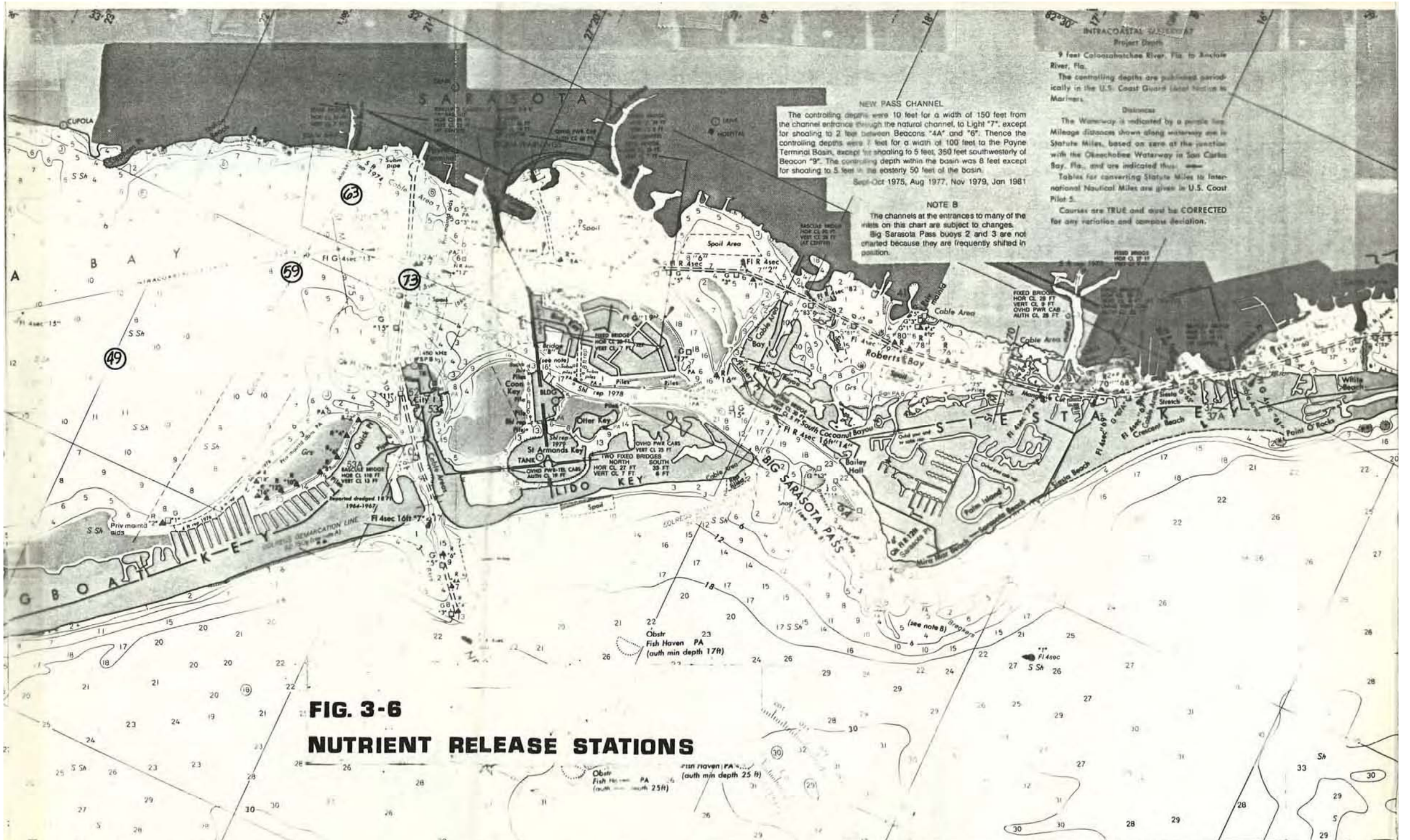


FIG. 3-6

NUTRIENT RELEASE STATIONS

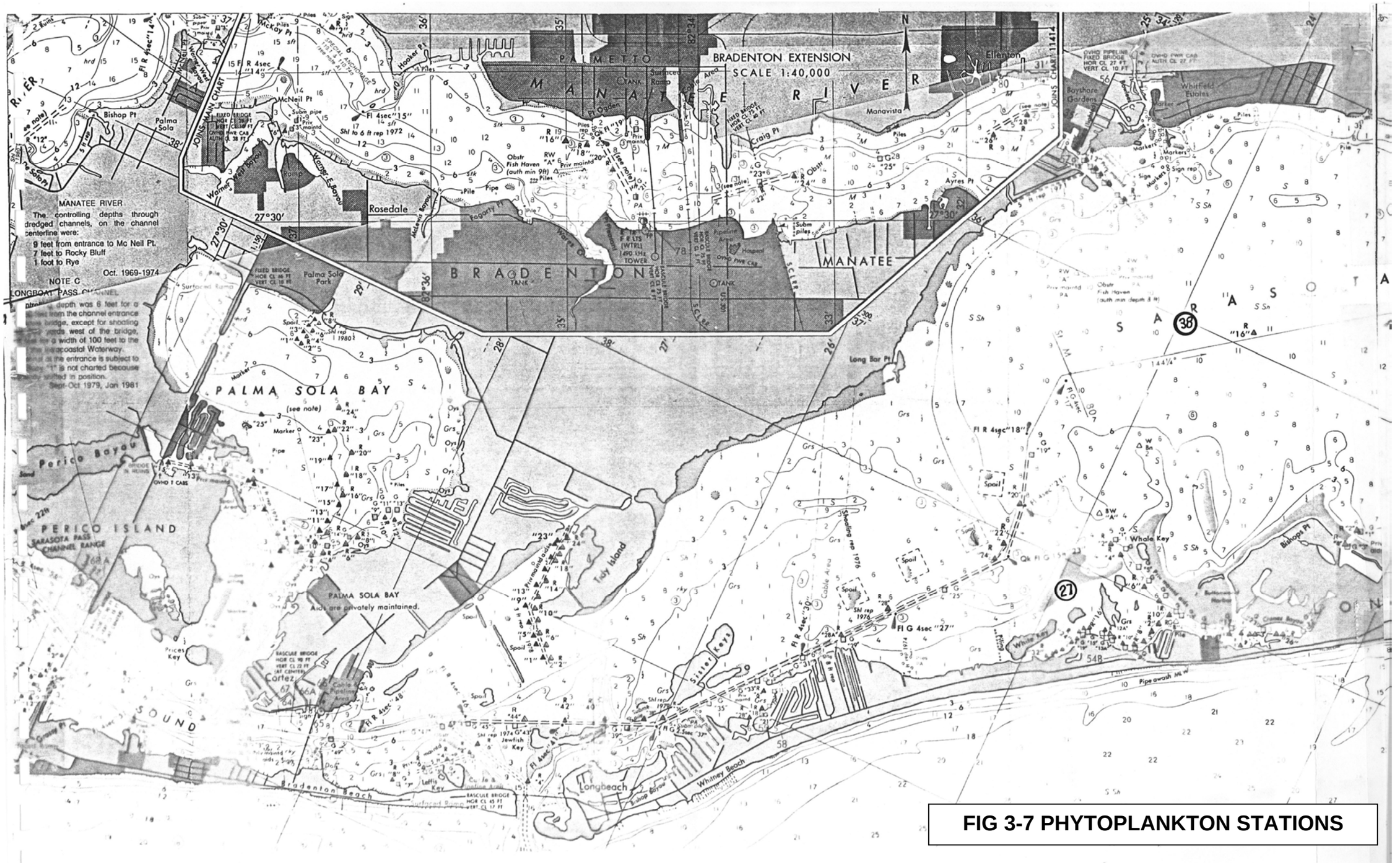


FIG 3-7 PHYTOPLANKTON STATIONS

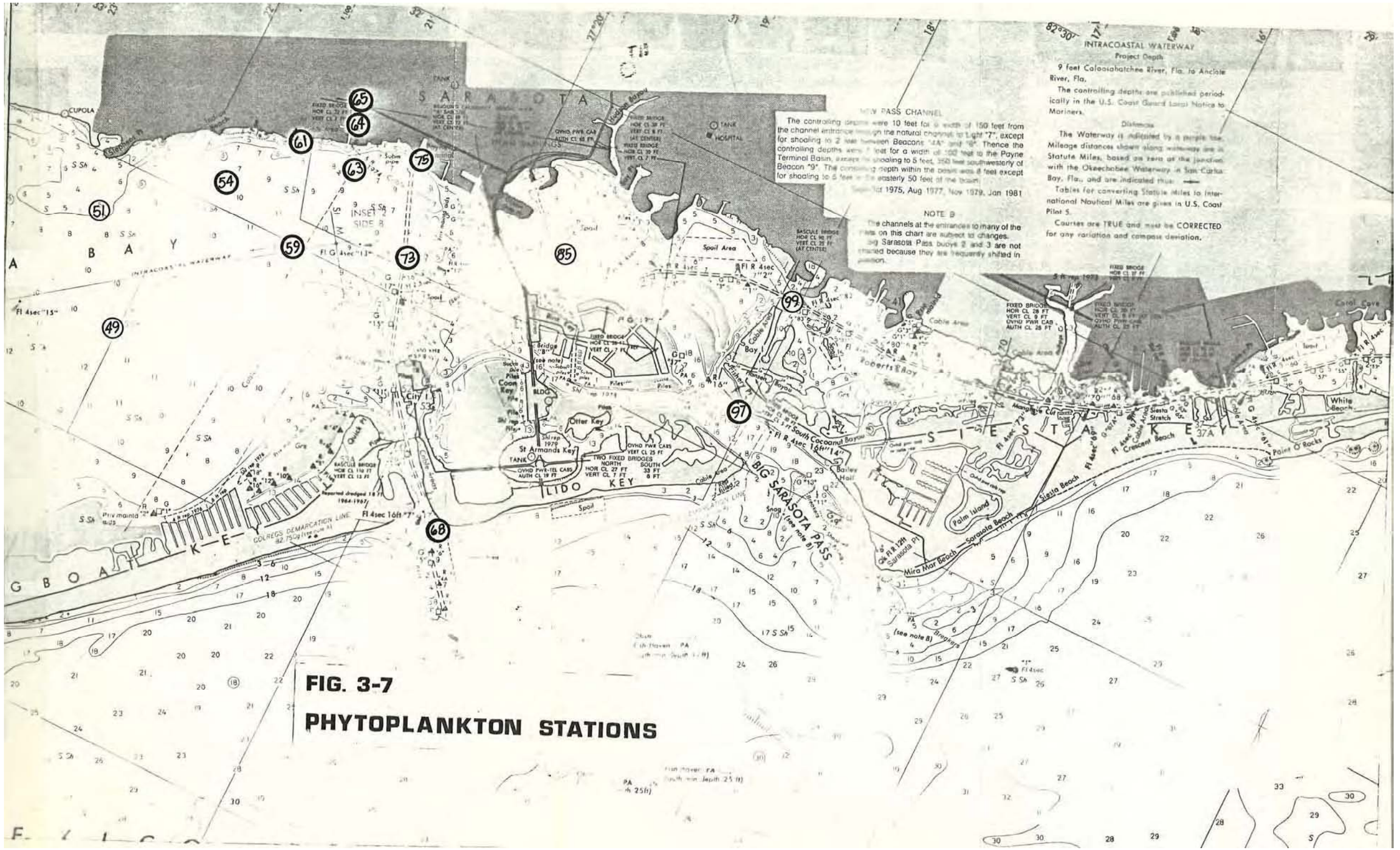


FIG. 3-7

PHYTOPLANKTON STATIONS

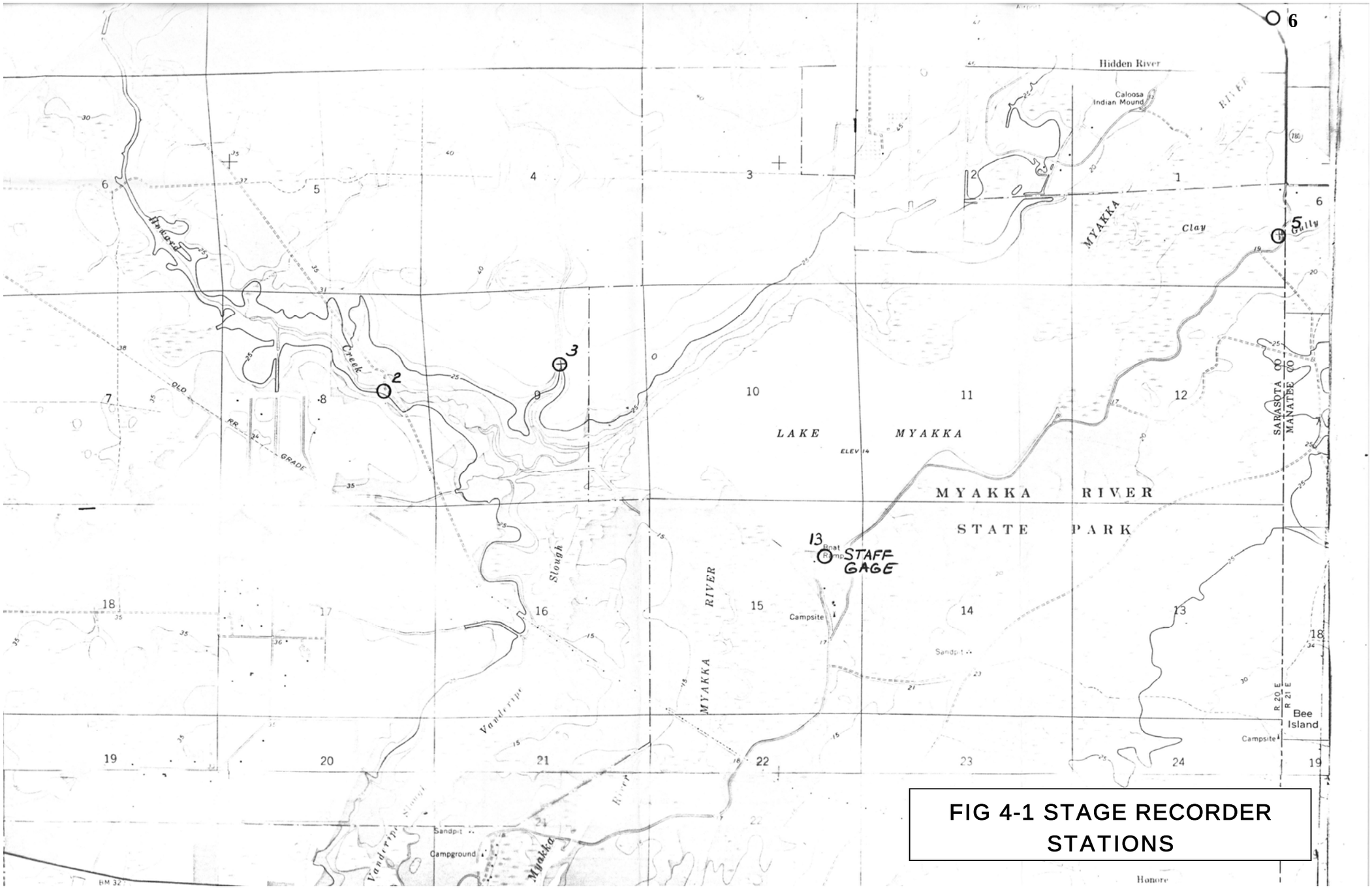


FIG 4-1 STAGE RECORDER STATIONS

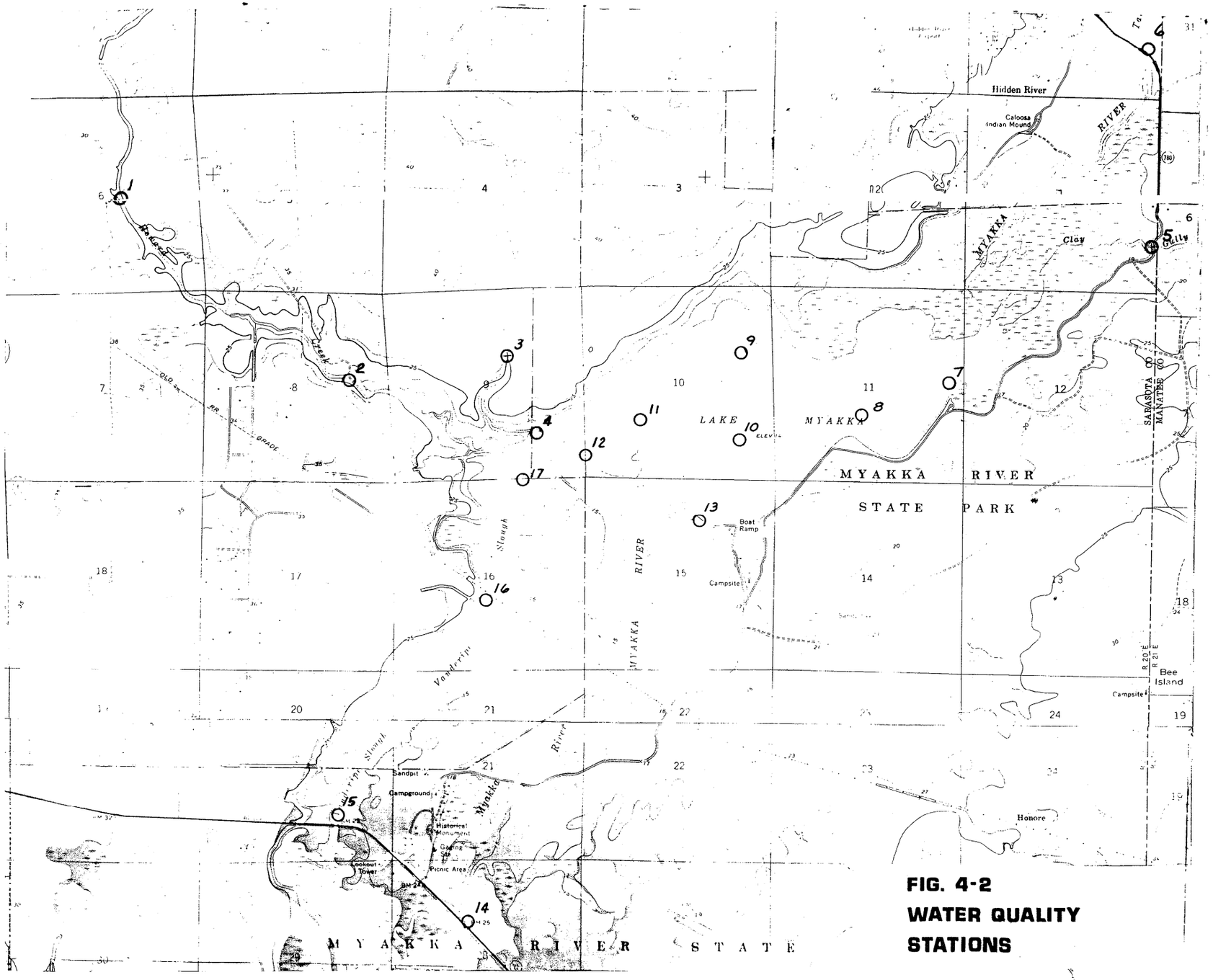


FIG. 4-2
WATER QUALITY STATIONS

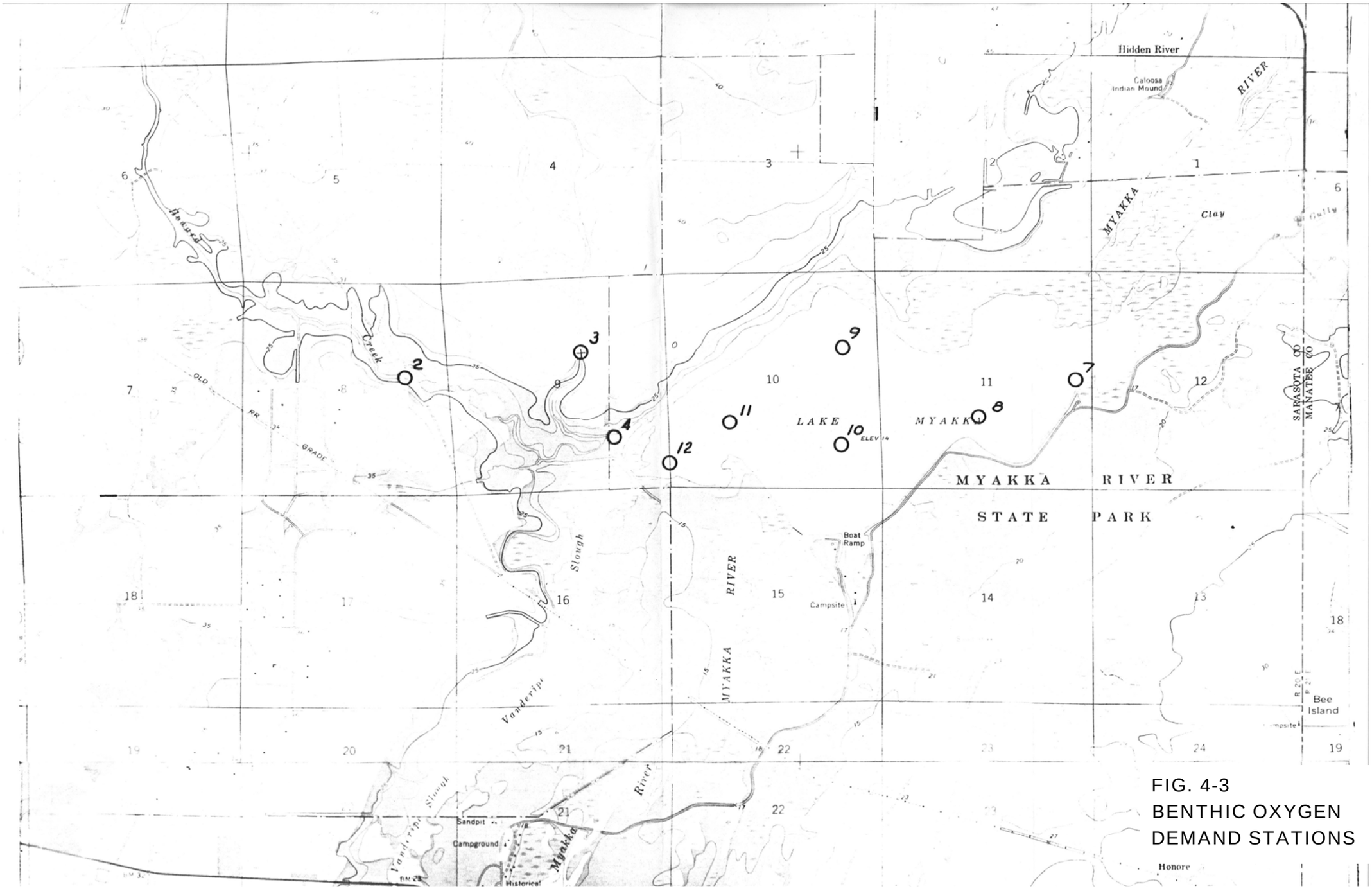


FIG. 4-3
BENTHIC OXYGEN
DEMAND STATIONS

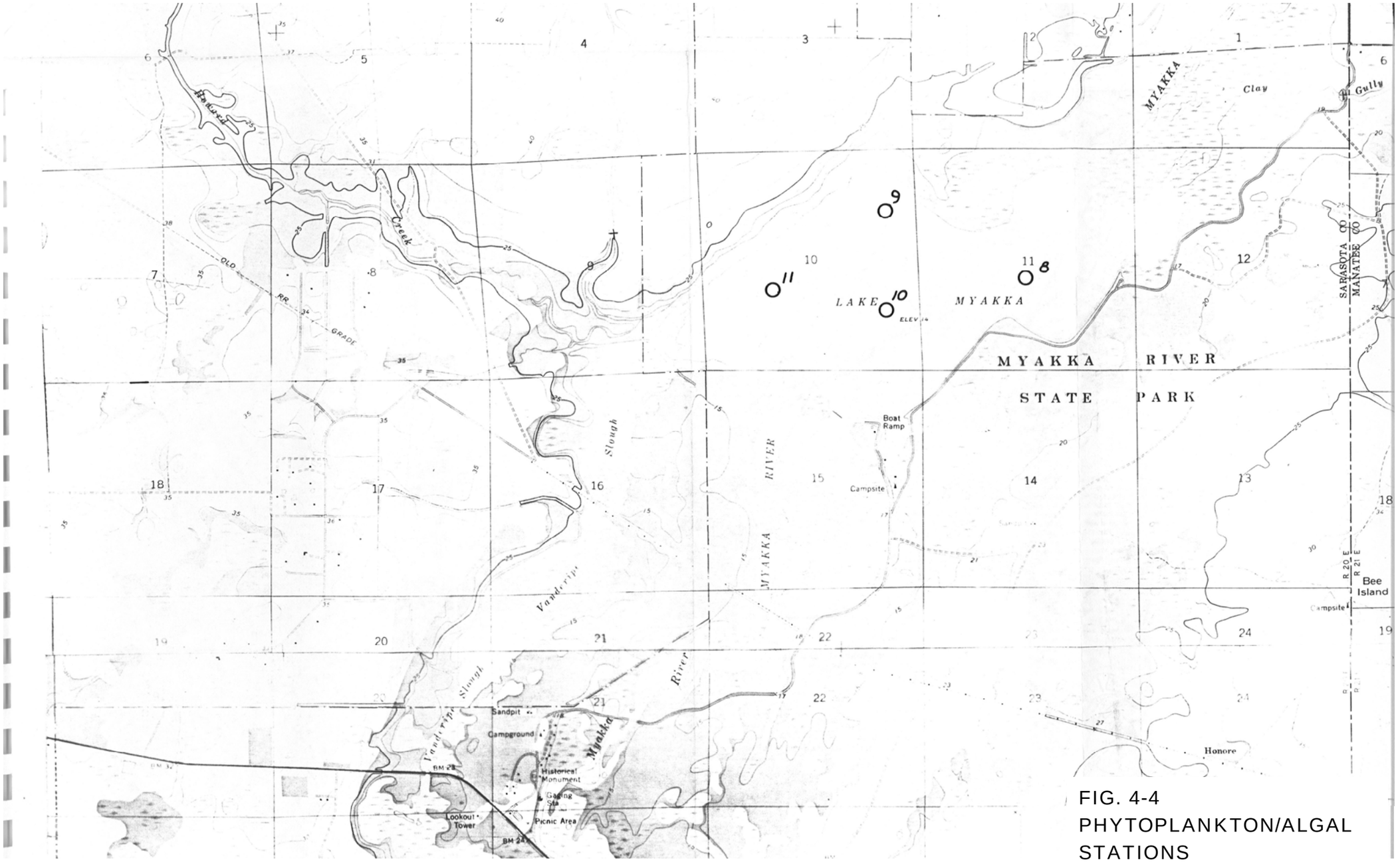


FIG. 4-4
PHYTOPLANKTON/ALGAL STATIONS

WORK FLOW DIAGRAM

1981 1982 — 1982 1983

OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL

3.3.1 — 3.3.1 (CONT)

3.5.1.1.1 — 3.5.1.1.1 (CONT)

3.5.1.4.2.2 — 3.5.1.4.2.1 — 3.5.1.4.3 — 3.5.1.4.2.2 — 3.5.1.4.2.1 — 3.5.1.4.2.2

ROUTINE SAMPLING

3.5.1.3.1 — 3.5.1.2.1 — 3.5.1.2.2 — 3.5.1.3.1 — 3.5.1.2.1 — 3.5.1.2.2 — 3.5.1.3.1 — 3.5.1.2.1 — 3.5.1.2.2

3.5.1.1.2 — 3.5.1.1.2 — 3.5.1.1.2 — 3.5.1.1.2

3.1 — 3.5.1.2.4 — 3.5.1.2.4 — 3.5.1.2.4 — 5.1

3.5.1.1.4 — 3.5.1.3.2 — 3.5.1.1.4 — 3.5.1.1.9.2 — 3.5.1.1.4 — 3.5.1.3.2

3.5.1.5.1 — 3.5.1.5.2 — 3.5.1.5.1 — 3.5.1.5.2 — 3.5.1.5.1 — 3.5.1.5.2

3.5.1.4.2 — 3.5.1.6.2 — 3.5.1.6.2

3.5.1.4.1 — 3.5.1.4.1 — 3.5.1.4.1

3.4.1 — 3.4.4 — 3.5.1.2.3

3.6.2 — 3.2 — 3.1 — 3.6.3

3.5.1.1.3 — 3.5.1.1.3

LEVEL I — LEVEL II INTERIM — LEVEL II

2.1 — 2.1 — 2.1 — 3.5.2.1.6

1.0 — 1.0 — 1.0 — 3.5.2.1.5

3.5.1.1.6.2 — 3.5.3.1.3 — 3.5.3.1.4 — 3.5.3.1.7 — 3.5.3.1.8 — 3.5.3.1.9 — 3.5.3.1.10 — 3.5.3.2 — 3.5.3.1.11

REVIEW — 3.5.4.2 — 3.5.4.3 — 6.2 — 6.3

4.10.1 — 4.10.14 — 4.10.15

4.10.2 — 4.10.3 — 4.10.6 — 4.10.7 — 4.10.8 — 4.10.9 — 4.10.10 — 4.10.12 — 4.10.11 — 4.10.13

4.10.4 — 4.9.1

4.10.5

4.3.6.1 — 4.2.4.2

ROUTINE SAMPLING

4.4.3 — 4.6.3 — 4.4.3

4.4.2 — 4.4.1 — 4.6.2 — 4.4.1 — 4.4.2 — 4.4.1

4.1 — 4.4.1 — 5.1

4.7 — 4.7

4.4.1 — 4.6.6 — 4.6.4

4.6.1 — 4.6.3 — 4.6.2 — 4.6.1 — 4.6.2

4.5 — 4.5

4.8 — 4.8

4.3.3 (CONT) — 4.3.3

4.3.1 — 4.3.1 (CONT) — 4.3.1

4.2 — 4.2 (CONT) — 4.2

2.2 (CONT)