

GIS Mapping of Boom Locations and Other Information Needed for Tampa Bay Oil Spill Contingency Plan.

FINAL REPORT

A. Introduction:

The primary purpose of this project was to create Geographic Information System (GIS) data layers out of all the spatially referenced information found in the Tampa Bay Area Contingency Plan (ACP) issued in September, 1994. Secondary issues involved creating databases from pertinent aspatial information, building an ArcView2 (AV2) application, and designing and producing a series of USGS quad based maps displaying all of the ACP data shown on the original paper ACP maps.

This project was done in three main phases: phase 1) GIS database development, which involved identifying, converting and verifying all the appropriate spatial and aspatial data layers; phase 2) AV2 application development and implementation, which involved importing the GIS layers from phase 1 and also pertinent layers from the Marine Resources Geographic Information System (MRGIS) and creating a user-friendly interface; phase 3) the design and production of five sets (28 maps per set) of 1:24,000 scale maps as well as a final report documenting the phases of the project, methods employed and where problems occurred.

Each of the three phases was accomplished according to the task outlines described in the scope of work in the original contract. Due to unexpected problems not all the tasks were accomplished exactly as stated in the scope of work. However, the end products are what was called for. The Tampa Bay NEP office has asked that the AV2 portion of this contract linked to the AV2 Marine Spill Application System (AVMSAS) that we are currently developing for the Florida Department of Environmental Protection's (FDEP) Bureau of Emergency Response (BER). Instead of delivering the AV2 to the Tampa Bay NEP office we have been asked to deliver it to the BER office responsible for responding to spills in Tampa Bay.

B. Geographic Area:

The contract called for developing a GIS that extended from the south end of Sarasota Bay through Tampa Bay and north to Tarpon Springs. This area, along with the ACP map extents and numbering system, is shown in Figure 1. It is important to note that several of the addresses given for spill responders and response equipment storage sites are not located in this region which means that there are several points in this GIS that fall outside the specified area, however, they have been loaded and they do exist in the GIS and, therefore, can be queried in the INFO database.

C. Hardware, Software, and Projection Parameters:

All the spatially referenced data were loaded using ARC/INFO v7.0.3 on UNIX based Sun workstations. All the aspatial data were loaded into DBASE IV files using a PC. Both of these software packages work well with AV2 software. The application was developed using ArcView v2.1a , the most current version available at the time. The application was designed on a UNIX platform, however, it will also run on Macintosh, DOS, and Windows platforms.

The hard copy maps were all designed in Arcplot and plotted out on a Calcomp 68000 Electrostatic plotter. The maps were then laminated to help protect them from potential rough handling during drills and actual response situations.

Originally this contract called for the data to be stored in an ORACLE relational database management system (RDBMS) , however, due to technical problems ORACLE was not implemented on FDEP's network and, therefore, was not available. This meant that INFO and DBASE IV had to be used. However, ORACLE has been identified as the official FDEP RDBMS which means that all the ACP data will ultimately end up stored as ORACLE files.

The following projection parameters were used for all the GIS coverages:

Projection	ALBERS
Datum	NAD83
Units	METERS
Spheroid	GRS1980
1st standard parallel	24 00 00
2nd standard parallel	31 30 00
central meridian	84 00 00
latitude of projection's origin	24 00 00
false easting (meters)	400,000
false northing (meters)	0

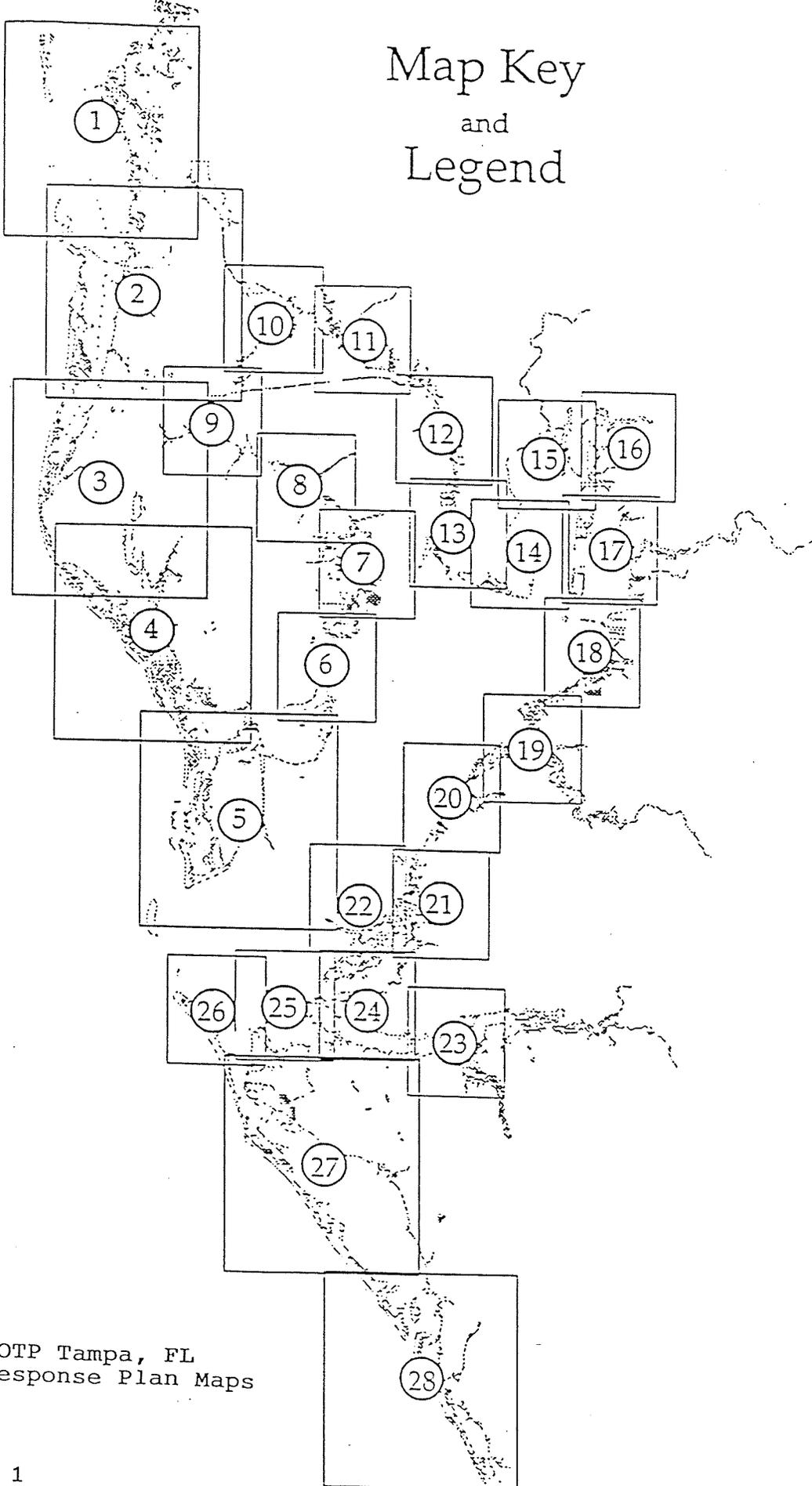
D. Development Phases:

Phase 1, GIS Database Development -

The first step in creating the GIS databases was to create the boundaries of all the ACP sub areas or "pages" (Fig. 1). These were all digitized in as polygon files and attributed with the appropriate page number. These sub areas formed the primary reference index for the AV2 application.

Next a 1:24,000 scale shoreline was created as specified in the contract. Following communication with Southwest Florida Water management District (SWFWMD), a 1:24,000 scale shoreline was built using the 1990 "Land Use" ARC/INFO coverage. There were some data gaps which were filled using the land areas from SWFWMD's 1992 "Land Use"

Map Key and Legend



USCG COTP Tampa, FL
Area Response Plan Maps

Figure 1

coverage.

Point data sets were created by digitizing location information directly from the paper ACP maps (Fig. 2). They were then grouped into three categories based upon subject type. These include: biological information (manatees, bird rookeries, seaturtle nesting sites, and mangroves), cultural information (industrial facility, water intake, marinas, and boat ramps), and protection priority sites.

Many boat ramps and marinas were not included in the ACP maps. They were added from additional sources. Locational information for boat ramps and marinas was verified using 1990 aerial photography and information from local experts. The map data sheets associated with protection priority sites (Fig. 3) were scanned into ASCII text files and formatted as AV2 ready files. These were later linked to the ACP protection priority points in AV2.

Boom locations were digitized in to the GIS as a line coverages. Those booms associated with shoreline protection were "traced" directly from the base shoreline.

Several additional data sets were created from text documents located in Annex F because they contained a spatial reference, such as an address, that allowed a GIS point data set to be created. Examples of such data sets are staging areas and airports. Their associated text files were scanned into ASCII text files and then linked to their associated points in the AV2 application. These data were not originally shown on the paper maps found in the ACP.

Additional text documents were scanned into ASCII text files, but a spatial reference was not present. Examples of these are communications logistics information, command center requirements, and personnel and information resources. These were loaded into the AV2 application, however, they were not spatially referenced.

Phase 1 problems -

The number one problem was not having access to ORACLE throughout the entire contract. This meant that all the data were stored as either INFO, DBASE or AV2 files and will have to be converted once ORACLE is fully implemented.

A second problem had to do with not receiving updated ACP information until April 10. This meant that the latest updates did not make it into this AV2 application and, of course, do not show up on the hard-copy maps. However, these updates are being loaded now and should be fully integrated by the end of May, meaning that they will be available in our AVMSAS deliverable to the BER office in Tampa.

Phase 2, AV2 Application Development and Implementation -

The goal of this phase was to develop a digital desktop mapping version of the ACP document using AV2. This digital ACP would not follow the paper version word for word,

instead it would convert it into a user-friendly product that would enable the spill responder to have quick access to whatever ACP information was needed. Furthermore, the user would be able to access all the other spill related data sets already in the FDEP's GIS as well as being able to use the functionalities already developed for the AVMSAS, currently the Florida Department of Environmental Protection's (FDEP) on-line emergency spill response software.

Although the actual ACP symbology could not be used (see Phase 2 Problems), a cohesive and intuitive legend was created for all data sets to mimic the hard copy ACP maps using the available ArcView symbols.

Point and click or index "views" were developed so that the user can quickly reference the exact map extent of either the ACP boundaries or the corresponding USGS quad sheet boundaries. Appropriate data layers are automatically turned on based on the level of information desired. In this way there is no down time before spatial information can be accessed. However, at any point the user can override the automatic data selection by selecting the data sets of interest from the legend.

The AV2 Graphical User Interface (GUI) was modified to include a menu item in which reference documents can be accessed and viewed. Currently several documents are available including: Army Diving Detachment Assistance text, the USCG National Strike Force text, Response Resource Inventory text, and NOAA Weather Service text. This GUI was designed with the novice AV2 user in mind which means that learning the application is relatively quick and simple.

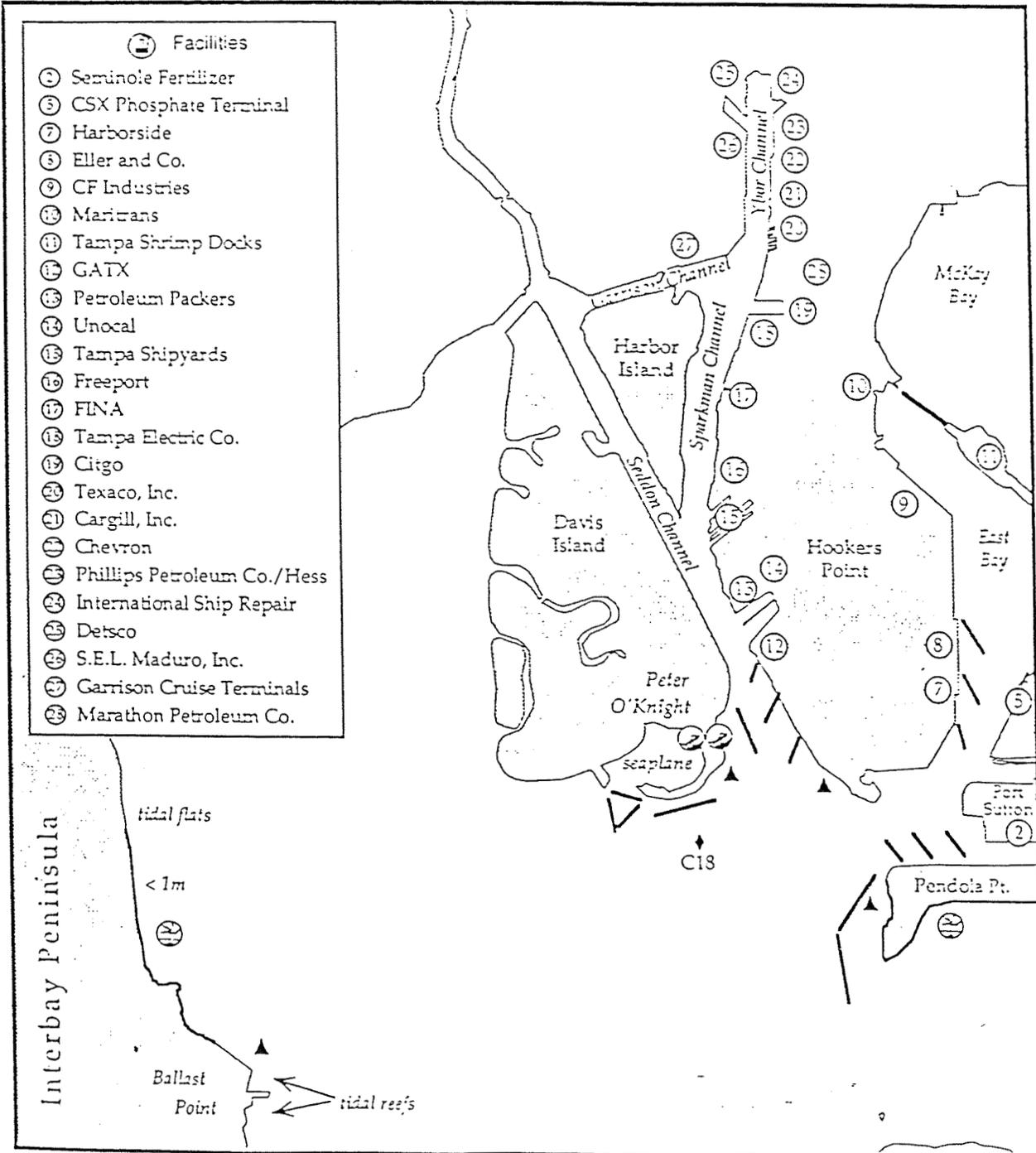
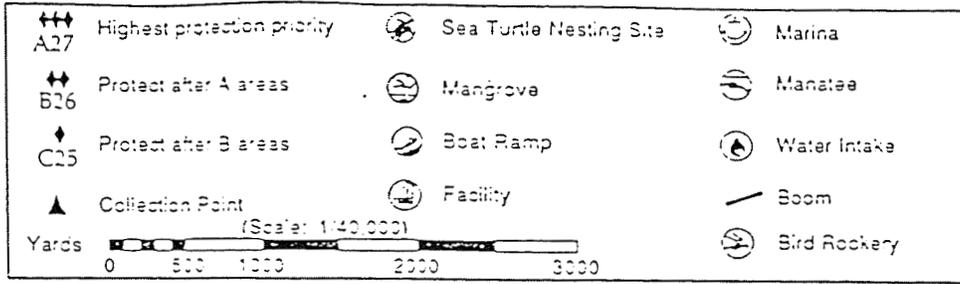
Instant attribute retrieval links were made between the spatial data sets (point data) and corresponding ASCII text files created in Phase 1. The AVMSAS functionality allows the user to update and change these links interactively. This allows the user to build links on an as needed basis depending on the application.

Data in Annex F, Appendix II of the ACP, Summary of Area Resources, were converted to and imported as tables. Each resource (ie. equipment, car and airplane rentals, barges, etc.) was placed into a separate table so that the user can reference information quickly.

The true strength of this application is that it not only contains the ACP information but it also contains other GIS data layers that are of critical importance to spill response. Chiefly among these is the Environmental Sensitivity Index (ESI) shoreline coverage which consists of a database that identifies any section of shoreline in the Tampa Bay area by a reference number which indicates a shoreline's sensitivity to oiling. For example, an ESI equal to 10 represents mangroves or salt marsh with a "high" sensitivity while an ESI of 1 represents a vertical seawall of "low" sensitivity. This data set is very important when faced with determining protection priorities and having limited equipment and personnel. Some of the other important GIS data layers are seagrass beds, mangroves, salt marshes and endangered species.

Tampa

Map 15
prepared by NOAA



Map 15.

CH1

Figure 2. Map 15 from ACP Document

C18 - Davis Island Yacht Club

Map 15

Latitude: 27° 54' 24"

Longitude: 82° 26' 55"

Trustee Agency Manager:	Contact:	Phone No:
FG & FWFC	Non-game biologist	813-646-3203
Tampa Port Authority	Dave Parsons	813-272-0555

SHORELINE HABITAT TO BE PROTECTED:
Marina, tidal flats (bayshore N. of gandy biva)

WILDLIFE/RESOURCES TO BE PROTECTED:
Wading birds, fisheries, brown pelican, roseate spoonbill

ENDANGERED SPECIES:
Manatee, brown pelican, roseate spoonbill

PROTECTION STRATEGY:
Block off the entrance to the sea plane basin with 600 feet of harbor boom. "V"

COLLECTION POINTS:
At Yacht club. Between yacht club and ramp on Seddon channel at southern berth on Hookers point and N.W. corner of Pendola Pt

ACCESS TO AREAS:

Vehicular: Helicopter: Boat: Aircraft:

ACCESS/DIRECTIONS/STAGING AREAS:

Access available at marina.
Peter O' Knight airport
Boat ramps off both sides of hook @ end of Davis island

AVAILABLE RESOURCES:

See Appendix I to Annex F

OTHER RESOURCES AVAILABLE:

Figure 3. Protection Information, Site C18, Map15

Phase 2 problems -

It was impossible to duplicate ACP map symbology in AV2 due to a software bug, however, the symbols do exist in ARC/INFO as can be seen by looking at the hardcopy maps. The software developer, ESRI, has assured us that the bug will be fixed in the next version of ArcView.

Phase 3, Map Design and Production -

Five sets of 1:24,000 scale maps following the USGS quad segmentation scheme (Fig. 4) were designed and produced. Figure 5 is a greatly reduced copy of map 12, Port of Tampa Quad, to show what the final maps look like. Each set was made up of 28 maps which displayed all the information found on the original ACP maps as well as other biological information such as seagrasses, mangroves, salt marshes. One other important data layer that was added was the 1:100,000 scale road network. All the main roads were identified by name and number (where applicable). Also roads leading to all the boat ramps were highlighted and named to make it easier to provide directions to the ramps. A final data layer displayed on these maps are the ACP map "page" boundaries. These have been drawn in as light grey boxes with the ACP map number clearly marked. This will allow the map reader to communicate more easily with another individual, located elsewhere, that has only a copy of the ACP at their disposal. This will allow both individuals to orient themselves according to a common spatial scheme.

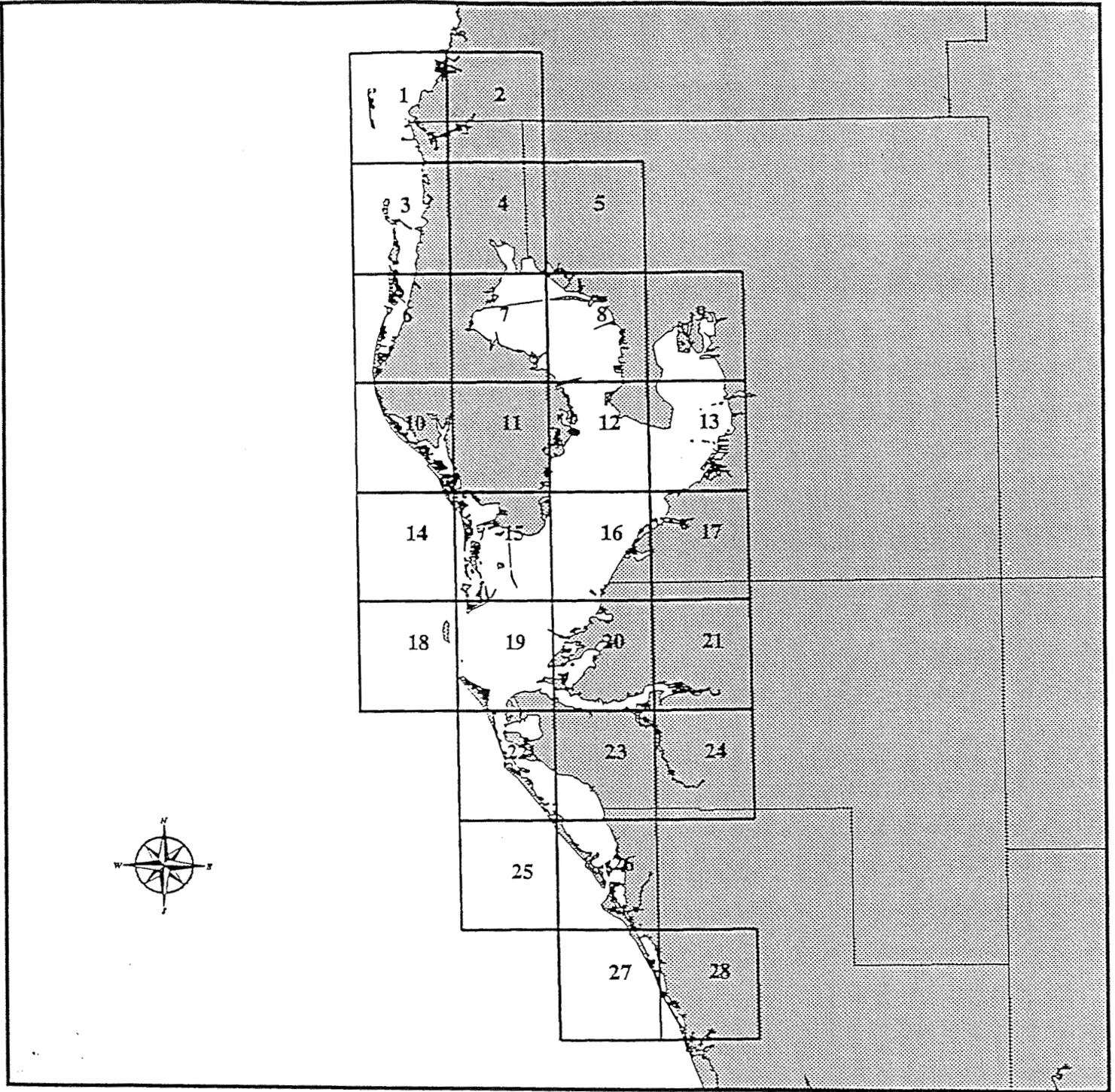
The legend is found below the map and it identifies all the symbology portrayed. Adjacent to the legend is an inset map that highlights, using a red box, the "Quad" that is being portrayed. The name of the quad is written immediately below the map and above the inset map. To the left of the inset map is found a list identifying where the data came from.

Phase 3 problems -

The main problem faced was that the latest changes to the ACP were not incorporated into these maps. Another problem involved locating all the missing boat ramps and marinas. This had been assumed to be complete at the start of the project.

E. Conclusions

The information found in the ACP is constantly changing thus making it next to impossible to maintain the plan's accuracy and currency. It is important to take note that the Coast Guard intends on updating the ACP annually only until 1997 and then every 5 years thereafter. This means that within a short time the paper version of the ACP will be several years out of date. In fact the most recent series of ACP updates for 1996 did not make it into the MRGIS under this contract and, therefore, the updates also don't show up on the hard copy maps or in the AV2 application. However, they will make it into the AVMSAS which will be delivered to the BER field offices in late July, 1996.



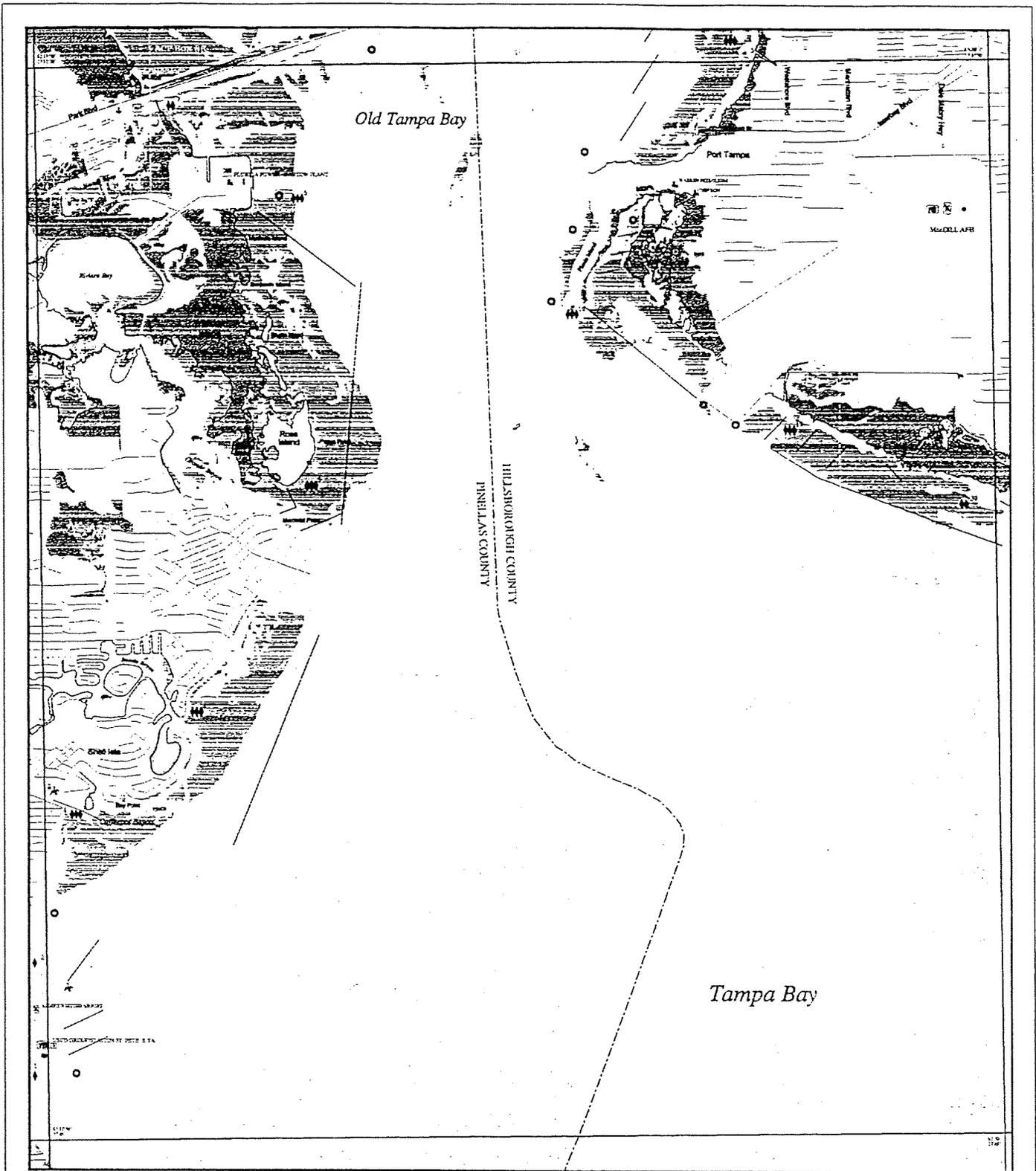
- 1 TARPON SPRINGS
- 2 ELFERS
- 3 DUNEDIN
- 4 OLDSMAR,
- 5 CITRUS PARK
- 6 CLEARWATER
- 7 SAFETY HARBOR

- 8 GANDY BRIDGE
- 9 TAMPA
- 10 SEMINOLE
- 11 ST. PETERSBURG
- 12 PORT TAMPA
- 13 GIBSONTON
- 14 PASS-A-GRILLE BEACH WEST

- 15 PASS-A-GRILLE BEACH
- 16 COCKROACH BAYO
- 17 RUSKIN
- 18 EGMONT KEY
- 19 ANNA MARIA
- 20 PALMETTO
- 21 PARRISH

- 22 BRADENTON BEACH
- 23 RUSKIN
- 24 LORRAINE
- 25 SARASOTA WEST
- 26 SARASOTA
- 27 LAUREL
- 28 BIRD KEYS

Figure 4. USGS Quads Used in ACP Map Series



MAP 12 - PORT TAMPA USGS QUAD

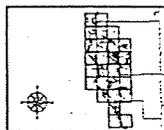
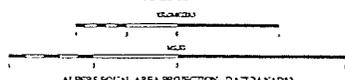
SOURCES

Response, Cultural, and Biological information was obtained from the USCG M 50 Area Contingency Plan for Oil and Hazardous Substance Pollution Response.

Aquatic and Biological Vegetation information was obtained from the Southwest Florida Water Management District. The road network was obtained from 1999 TRIPER Data. The base map is a copy from the Florida Department of Environmental Protection.



SCALE 1:24,000



LEGEND

Cultural Information	Aquatic Vegetation	Response Information
☐ Boat Ramp	▨ Seagrass	⊗ Command Center
▣ Facility	▨ Salt Marsh	⊞ Staging Area
⊥ Water Intake	▨ Mangrove	⊞ Cleanup Equipment
⬇ Marina	Biological Information	⊞ Fueling Facility
⊞ Airports	⊕ Sea Turtle Nesting	⊞ Storage Areas
⊞ Hospital	⊕ Mangroves	⊞ Maintenance Facility
⊞ Roads	⊕ Bird Rookery	⊞ Response Trailer
		⊞ Boom Placement
		⊞ ACP Map Boundaries
		⊞ Collection Point
		Protection Priority
		⊞ A - Highest Priority
		⊞ B - Protect After 'A' Areas
		⊞ C - Protect After 'B' Areas

Figure 5 Map 12, Port Tampa quad (60% reduction)

As part of its ongoing agreement with BER, the Coastal and Marine Resources Assessment (CAMRA) group will continue to acquire the natural resources data as well as selected cultural data sets, however, CAMRA does not possess the wherewithal to maintain the entire Tampa Bay ACP. A serious look needs to be taken at developing a process whereby the ACP information is at least updated on an annual basis.