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St. Johns River, Florida Water Quality Feasibility Study Phase I Interim Report

Volume III

Vertical/Horizontal Control Surveys and Water Measurement Station

U.S. Army Corps of Engineers Jacksonville District South Atlantic Division St. Johns River Water Management District Palatka, Florida

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Summary of Workshop

FINAL REPORT

To: U.S. ARMY CORPS OF ENGINEERS, JACKSONVILLE

and ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

A PLAN FOR

LOWER ST. JOHNS RIVER, FLORIDA

VERTICAL/HORIZONTAL CONTROL SURVEYS

AND WATER MEASUREMENT STATION

PHASE I - St. Johns River Basin Water Quality Management Study

Douglas A. Thompson Professional Land Surveyor August 1993

Prepared under cooperative agreement by:

Bureau of Survey and Mapping Division of State Lands DEPARTMENT OF ENVIRONMENTAL PROTECTION FEDP Contract No. X-0588

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Number	Name	Preliminary	Sketch	Published
872 0186	FT GEORGE ISLAND	R-1.65	R-1.67A	R-1.68
0189	CEDAR HEIGHTS, BROWARD RIVER	R-2.43	R-2.46A	R-2.47
0194	LITTLE TALBOT ISLAND	R-1.59	R-1.62A	R-1.63
0196	SISTERS CREEK	R-1.71	R-1.74A	R-1.75
0198	CLAPBOARD CREEK	R-1.32	R-1.34A	R-1.35
0202	TROUT RIVER	R-2.50	N/A	N/A
0203	BLOUNT ISLAND BRIDGE	R-1.39	R-1.42A	R-1.43
0213	TROUT RIVER, SHERWOOD FOREST	R-2.52	R-2.54A	R-2.55
0215	JACKSONVILLE, NAVY FUEL DEPOT	R-2.22	R-2.24A	R-2.25
0216	RIBAULT RIVER, LAKE FOREST	R-2.66	R-2.68A	R-2.69
0217	MONCRIEF CREEK	R-2.58	R-2.61A	R-2.62
0219	DAME POINT	R-,2.13	R-2.15A	R-2.16
0220	MAYPORT	R-1.03	R-1.09A	R-1.10
0221	FULTON	R-1.24	R-1.27A	R-1.28
0222	CHASEVILLE	R-2.19	N/A	N/A
0225	PHOENIX PARK	R-2.28	R-2.30A	R-2.31
0232	PABLO CREEK ENTRANCE	R-1.15	R-1.18A	R-1.19

* Dame Point alternative stationing

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Numb	ber	Name	Preliminary	Sketch	Published
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C	0244	MILL COVE	R-2.04	R-2.08A	R-2.09
C	0259	ATLANTIC BEACH	R-1.56	N/A	N/A
C	0267	PABLO CREEK, ICW	R-1.78	R-1.80A	R-1.81
C	0268	JACKSONVILLE, ACOUSTA BRIDGE	R-3.04	R-3.06A	R-3.07
C	0274	LITTLE POTTSBURG CREEK	R-3.17	R-3.20A	R-3.21
. C	0291	JACKSONVILLE BEACH	R-1.47	R-1.50A	R-1.51
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C	0305	OAK LANDING	R-1.84	R-1.86A	R-1.87
C	0333	PINEY POINT	R-4.03	R-4.06A	R-4.07
C	0339	GOODSBY CREEK	R-4.10	N/A	N/A
C	0374	ORANGE PARK, MOOSE HAVEN	R-4.12	R-4.14A	R-4.15
C	0377	MANDARIN	R-4.11	N/A	N/A
C	0398	PALM VALLEY	R-4.33	R-4.35A	R-4.36
C	0406	DOCTORS LAKE, PEORIA	R-4.27	R-4.29A	R-4.30
C	0409	JULINGTON CREEK	R-4.20	R-4.23A	R-4.24
C	0411	CATFISH POINT, DOCTORS LAKE	R-5.10	N/A	N/A

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0434	BLACK CREEK	R-5.12	R-5.15A	R-5.16
0496	GREEN COVE SPRINGS	R-5.03	R-5.05A	R-5.06
. 0499	TROUT CREEK	R-6.04	N/A	N/A
0554	VILLANO BEACH INSIDE, TOLOMATO RIVER	R-7.14	R-7.16A	R-7.17
0589	LANE LANDING	R-7.04	N/A	N/A
0596	EAST TOCOI	R-6.05	R-6.07A	R-6.08
0653	PALMETTO BLUFF	R-7.05	R-7.08A	R-7.09
0767	BUFFALO BLUFF	R-9.03	R-9.05A	R-9.06
0774	PALATKA	R-8.03	R-8.05A	R-8.06
0782	SUTHERLANDS STILL, DUNNS CREEK	R-9.10	R-9.13A	R-9.14
0832	WELAKA	R-10.03	R-10.05A	R-10.06
0841	SHELL BLUFF, CRESENT LAKE	R-10.10	N/A	N/A
0855	CRESENT CITY, CRESENT LAKE	R-11.11	R-11.13A	R-11.14
0877	GEORGETOWN	R-11.03	R-11.06A	R-11.07

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ACKNOWLEDGEMENTS

The author would like to acknowledge all the support and technical assistance provided by staff of the Bureau of Survey and Mapping. Without your creativity and cooperation the manual would not be possible.

Acknowledgement of all those people who gave generously during this project is impossible however a few people came through time and again.

A special thanks to:

- Stephen Sutterfield, Civil Engineer for making possible our requests to interview U.S. Army Corps of Engineers program managers and his coordinating the records search at the Jacksonville District by Dr. Knetsch and me.
- Fredrick Morris, IV, PhD., of the St. Johns River Water Management District, whose technical know-how provided the necessary challenge for me to take that extra step to deliver the best job possible.
- to all those folks who shared their knowledge of the St. Johns River through the interview process; see directory in Task 2
- Stephen Hodges, Florida Resources and Environmental Analysis Center at Florida State University who shuffled his schedule and came to our rescue when the control network database first crashed.
- staff of the National Ocean Survey, Water Measurement Branch and Ronnie Taylor, NOS/F1 Geodetic Advisor, who taught us a better respect for geodesy.
- Marilyn who was always there supporting the effort and who tolerated my bizarre summer schedule of 1993.

Every attempt has been made to ensure that the information presented in the manual is correct, up-to-date and properly referenced. I am sure a few errors will become evident during the next few months, I take responsibility for such erros and would appreciate being informed of errors or omissions so that they may be corrected in the database and future reports.

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Horizontal/Vertical Control Survey Network and Water Level Measurements for the St. Johns River

Executive Summary

"But look! here come more crowds, pacing straight for the water, and seemingly bound for a dive. Strange! Nothing will content them but the extremist limit of land. ... No. They must get just as nigh the water as they possibly can without falling in. And there they standmiles of them-leagues! Inlanders all, they come from lanes and alleys, streets and avenues-north, east, south, and west. Yet here they all unite! Tell me, does the magnetic virtue of the needles of the compasses of all these ships attract them thither?"

Herman Melville, Moby Dick

Did the U.S. Army Corps of Engineers and the St. Johns River Water Management District have Melville's leagues of inlanders rushing to the shore in mind when they developed the scope of services for the St. Johns River Basin Water Quality Management Feasibility Study. It is certain the sponsors of the study recognized the pressure on water resource managers to quickly and efficiently develop the best tools for improved management of the Lower St. Johns River. Methodologies are presently available to model river characteristics for research and analysis to meet the public's growing demand for many conflicting uses of the resource.

Before planning, analysis and engineering studies can begin in earnest there is a need for a technical review, designed to assist the agencies managers, concerning the availability of existing geodetic and water level measurement networks in place along the river between the Atlantic Ocean and Lake George.

GEOGRAPHIC INFORMATION SYSTEM

Water resource managers now use GIS technology to analyze seemingly endless amounts of data. However high quality control survey networks are needed to build the base maps and attribute fields for GPS operation.

The Florida Department of Environmental Protection's (FDEP) responsibility in preparing this report is to develop a "technical manual" for analysis of existing control networks and recommendations for enhanced networks designed to supplement GIS requirements. Incidentally, GIS technology was utilized by FDEP in preparing graphics and analysis of hundreds of survey control points near the river. Materials making up the report have also been provided in a digital format compatible with SJRWMD geographic information system.

TOPICS

Hydrologists, scientists, surveyors and mappers will now be able to team together to design efficient use of existing survey control networks and published tidal characteristics of the St. Johns River. This technical manual will assist staff in decision making in use of existing control points or performing extension surveys of the geodetic networks.

Simultaneous with report preparation FDEP conducted an exhaustive field reconnaissance of all National Ocean Service (NOS) tide stations in the basin. **Table I** provides location and recommendations concerning tidal bench marks. The manual discusses the discovery of an official river mileage system devised in 1964 by the U.S. Geological Survey, Water Resources Division, State Office in Tallahassee, Florida. Also included is an interesting reach by reach account of early navigation submitted by the US-COE, circa 1990-1912 to the U.S. Senate / House of Representatives.

FORMAT

The manual is segmented into 10 mile reaches. All horizontal, vertical and tidal data including pertinent maps for the reach are assembled in eleven individual chapters herein after known as River Reach Reports.

CONCLUSION

A three pronged recommendation, tempered by available resources, can best be classified as immediate, short term and long term.

- The first priority would include reconnaissance and recovery of GPS control monumentation set by Geonex, Inc in 1990 for photogrammetric control projects for (1) Jacksonville Electric Authority (JEA) and (2) St. Johns River Water Management District (SJRWMD) Approximately 150 control points Estimated cost of reconnaissance \$10,000 and approximately two months effort by a two person survey field crew.
- The short term priority includes reconnaissance of all nodes to determine the amount of additional horizontal and vertical control survey extensions needed. Estimated cost of reconnaissance is \$19,100 and approximately three months effort by a two person survey field crew to perform the necessary tasks.
- The third priority is a long term effort to extend vertical control level runs along each side of the river and four river crossing vertical tie lines. Also included is establishment of GPS control points and azimuth marks at existing NOS tide stations and all nodes with deficient horizontal control monumentation. Estimated cost for control surveys is \$241,000 and approximately twelve months effort for survey and office personnel.

INTRODUCTION

Purpose:

This manual is designed for the scientist or engineer responsible for hydrology studies of the Lower St. Johns River (LSJR) and its tributaries. Future studies will be linked with existing river knowledge for analysis through a geographic information system (GIS). To evaluate spatial changes in tidal and non-tidal characteristics it is imperative that water level measurements are reported on a common datum and study sites be tied to an accurate horizontal control network for positional comparisons. This technical manual is designed to quickly bring the researcher "up to speed" with both published and unpublished data relating to horizontal, vertical and tidal datums in the LSJR.

The manual brings into focus a wide array of existing data from many public and private sources. Data is presented in a unique geo-referenced format. Each portion of the manual provides the reader access to all known water level measurement data and geodetic data in that particular reach (10 mile segment) of the river. (See "How to Use the Manual" at end of the Introduction)

An 11" x 17" color coded **Reach Map** (Arc Cad) precedes each reach. Multicolored symbology provides a complete inventory of horizontal/vertical control points and tide stations along the St. Johns River between the mouth, at the Atlantic Ocean, River Mile 0.0 and Lake George River Mile 110.0.

Individual black and white reach maps are used for orientation purposes as well as to display analysis techniques and recommendations. Reach maps feature the "Control Survey Network Zone" (CSN Zone) covering ten river miles length and extending landward approximately two miles from each river bank.

For purposes of this study the CSN Zone two mile offset was selected as a practical search area for existing control points. Extension of survey ties from control points inside the CSN Zone to any specific study site is estimated to require less then one day of effort and therefore is considered adequate. Control points found outside the CSN Zone will require extensive effort to make survey ties to the proposed study site. Areas in both categories are identified in the report.

Making the Atlas:

Basemaps for the project originated from U.S. Geological Survey

(USGS) 1:100,000 scale digital line graphs. This data was acquired by Florida Resources and Environmental Analysis Center (FREAC), Florida State University. FREAC later modified the original DLG attribute codes and provided statewide basemap coverage while under contract with the Florida Department of Environmental Protection (FDEP).

The first task in designing the manual was to define the subject area and to establish a reference line that would be used to tie together all features discussed/shown on the maps. The reference line is the centerline of the existing channel of the St. Johns River and stationing consists of a consecutive numbering system based on statute miles (See River Mile Measurement next paragraph.). Establishing limits of the study area is somewhat more difficult and is more fully described in the Methodology section. The study area is generally described as extending two miles landward, on both of the left and right side of the river, from the river bank. The manual consists of five map sets briefly described as follows:

	Title	Scale	Number Sheet	Format	Section
1.	Project Index Map	1:750,000	1 '	B/W	Cover
2.	Reach Map	1:100,000	11	11" x 17" Color	River Reach (Cover Shuet)
3.	Existing Water Level Measurement Network Reach Map	1:100,000	11	B/W	River Reach (Inventory)
4.	Existing Horizontal Control Survey Network Reach Map	1:100,000	11	B/W	River Reach (Recommendation)
5.	Existing Vertical Control Survey Network Reach Map	1:100,000	11	B/W	River Reach (Recommendation)

The atlas is the backbone of the manual, careful attention to the graphics may save countless hours of field surveying or may be of assistance to you for additional analysis.

River Mile Measurement

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FDEP made numerous efforts to locate an existing river mileage system. It was thought if such a system had been developed by the U.S. Army Corps of Engineers would have it. It is noted river mileage is referenced in each of the following US-COE publications:

1. Tidal Profiles - St. Johns River From Mouth to Lake Harney; March 1968,

- 2. Navigability Study of the St. Johns River and its Tributaries, Report No. 1, February 1975,
- 3. St. Johns River Basin: Florida; Interim Water Quality Management Plan Findings, January 1986;

Although similarities were noted between the above reports no documentation was found to substantiate how the author established river mile zero. Interviews with US-COE staff and a records search of the Jacksonville District office and Records Holding for this key information was unsuccessful. Finally a measurement scheme to set the zero station was adopted by FDEP, only to be discarded upon receipt of US-COE (1) US-COE Jacksonville Harbor, Florida reports titled: Examination Survey 30, 34 and 38-Foot Project August, 1990, and (2) Jacksonville Harbor, Florida Examination Survey 34 and 38-Foot Project, March 1992, both by Vernon F. Myer and Associates, Inc. Surveying and Photogrammetric Mapping New These examination surveys provided the Orleans, Louisiana. most definitive mapping of the Lower St. Johns River including exact locations of the north and south jetties. Unfortunately a mileage system was not used for the examination surveys, but geodetic positions were established throughout the lower portion of the river. Lacking better data FDEP decided to convert the base line control system to statute miles with zero at the ocean side end of the jetties.

The third and final attempt to establish the river mileage system was undertaken when FDEP received a publication titled River Mileage Measurement (Committee Bulletin No. 14), Revised October 1968 published by the Water Resources Council. On July 24, 1968 the Council adopted Guidelines For Federal Agencies <u>Use of Bulletin 14</u> and established an office within the U.S. Geological Survey as a central depository for river measurements. The guidelines also encouraged state and local agencies, private firms and individuals to use river mileage procedures provided in the bulletin. Several calls to USGS, Reston, Virginia established that the Water Resources Council, as such, had been disbanded years ago. The USGS, Water Resources Division, State Office located in Tallahassee, Florida was found to be the depository of an unpublished "office survey" of the St. Johns River mileage measurements as prescribed in the aforementioned Bulletin No. 14. The St. Johns River mileage measurement was performed by USGS in-house by Mr. R.E. Cunningham, a USGS cartographer during In keeping with the aforementioned guidelines and the 1960s. the standards of Bulletin No. 14 FDNR adopted Mr. Cunningham's determination of river mile zero, and re-established the mileage system using a rolling map measure. Verification using an engineer's scale eliminated blunders. USGS 1:24,000 scale topographic map sheets were used for manual measurement of each mile. Eight mileage checks with Mr. Cunninghams notes found

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the new measurements varied from 0.35 mile too short to 0.60 mile too long with a mean standard deviation of less then 0.5 mile for the eight checkpoints located between Main Street Bridge River Mile 23.2 and latitude 29° 35' 44", south of Palatka (River Mile 89.17). It is noted Mr. Cunningham used USC&GS 1:40,000 scale charts for his study. In summary FDEP checked Mr. Cunningham's computations within 475 feet for the lower 89 miles of the St. Johns River.

Alignment of the river mileage system utilized the sailing line "--- a course established through a navigable waterway as the most favorable for navigation by the largest vessels accommodated", as stated in Bulletin No. 14. USGS topographic map revisions previous to 1992 include bathymetry for easy identification of the sailing line.

The following definition, also from Bulletin 14, is very useful in locating one's self as maps and tables are reviewed: "In making the index, the river mile distances were measured upstream from the mouth to the nearest tenth mile. Tributaries are shown as entering from the right or left from a positioning facing downstream."

Organizing the Data:

Achieving the objectives of the St. John River Basin Water Quality Management Feasibility Study required easy to use dissemination of the data. Careful organization was required to help researchers quickly access existing survey control and tidal data to determine what effort was needed to tie a specific study area into the Water Level Measurement Network.

Accomplishment of this task became complex because of the many factors discovered during data collection:

- age of survey networks, some performed as early as 1853
- agency responsible for survey
- intended use/design of survey
- availability of published reports utilizing the survey network
- geographic location of the area studied
- present day capability of recovering monumentation
- accuracy standards

Criteria were established to collect, interpret and evaluate existing vertical and horizontal control survey networks. The data selected could then be compiled, organized, mapped and recommendations for future work would be referenced to the atlas. All physical and hydrologic data are summarized in Part 2: Methodology. Datums, National Geodetic Control Network

Geodesy is the determination of the magnitude and shape of positions on the earth's surface. The classification standards of the National Geodetic Control Networks are based on accuracy. This means that when control points in a particular survey are classified, they are certified as having datum values consistent with all other points in the network, not merely those within that particular survey. The network of geodetic reference stations is maintained by the National Ocean Survey (NOS) of the U.S. Department of Commerce through their divisions of the National Geodetic Survey and the Office of Charting and Geodetic Services. The elevations of NOS reference stations are determined by standard surveying techniques to first or second order accuracy. Existing benchmarks were established near the shores of the river to provide references to the established vertical network. Descriptions of benchmark locations along the St. Johns River are available from NOS and various local agencies, such as the Bureau of Survey and Mapping, FDEP and the SJRWMD. The accuracy of vertical control networks established by other agencies may have been determined to first, second, or even third order standards.

- "Datum" means any surface defined as the reference surface from which heights are measured.
- Vertical Control Network Standards
 - a) National Geodetic Vertical Datum of 1929 (NGVD 1929), a fixed reference adopted as a standard geodetic datum for elevations determined by leveling. The datum was derived for surveys from a general adjustment of first-order leveling nets of both the United States and Canada. Defined by heights of 26 tidal stations.
 - b) North American Vertical Datum of 1988 (NAVD 88) adjustment was completed in June 1991 using least squares adjustment techniques. This adjustment has become the acceptable standard for vertical control network surveys performed for the federal government.
- <u>Horizontal Control Network Standards</u>
 North American Datum of 1983 readjusted in 1990 (NAD 83/90) is the preferred adjustment used for the horizontal control network in Florida.

The FDEP uses both NAVD 88 and NAD 83/90, while also maintaining references to NGVD 1929.

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Water Levels:

National Tidal Datum Epoch is the specific 19-year period adopted by NOS as the official time segment over which tide observations were taken and reduced to obtain mean values (e.g., mean lower low water, mean high water, etc.) for tidal datums. It is necessary for standardization because of periodic and apparent secular trends in sea level. The present National Tidal Datum Epoch is 1960 through 1978.

The mean water level for tidal waterbodies is calculated from the National Tidal Datum Epoch of the period; NOS is the primary source of long records of water level of tidal waterbodies. The calculated mean value of local water level measurements will not usually coincide with NGVD, or NAVD since sea level is constantly changing. Mean water levels in tidal waters are obtained by averaging, over the National Tidal Datum Epoch, the long-term series of six minute interval tidal water level measurements as prescribed by the National Tidal Datum Convention of 1980.

Mean Sea Level (MSL) A tidal datum. The arithmetic mean of hourly heights observed over the National Tidal Datum Epoch. (Reference to MSL is specifically avoided in this manual.)

How to use the Manual:

Assume the engineer must perform a specific hydrologic study at a location approximately 5 miles north of Orange Park. The engineer wishes to know the availability and quality of horizontal/vertical control survey networks adjacent to the river's edge. The following steps are suggested:

- 1. Refer to the Project Index Map in front of the Introduction to determine the reach number and approximate river mile.
- 2. Turn to River Reach Four.
- 3. Closely determine the River Mile station of the proposed study site on the Reach Map the 11" x 17" color graphic preceding the Reach Report.
- 4. Review pertinent data about existing control survey network in Reach Four.
- 5. Review recommendations page R-4.41.
- 6. For more detailed information about existing control points see Part 2: Methodology.
- 7. Cost estimates page R-4.42 and maps of existing (and recommended) Horizontal and Vertical Control Survey Networks are found on page R-4.43 and 44.

PART I OBJECTIVES

The Phase I study effort includes the assembly and review of (1) vertical and horizontal measurement data, (2) the development of adjusted tidal data for each published tide station and (3) the design of horizontal and vertical reference system for the tidally influenced portions of the LSJR. The conceptual network design should include a priority listing of river reaches of concern to provide a sequence for establishment of horizontal/vertical control survey networks and associated cost estimates.

Task objectives presented herein are briefly described as follows:

- Task 1 Provide copies of water level measurement data and field reconnaissance to ascertain quality of NOS published tide stations located in LSJR.
- Task 2 Contact other agencies and consulting firms to collect additional tidal information that are applicable to the project.
- Task 3 Provide recommendations and cost estimates for development of an optimal network of water level measurement stations for future work related to locating the extent of Tide in all major tributaries in the LSJR.
- Task 4 Review draft NOS recommendations for areas and locations requiring further water level measurements to provide a complete understanding of the river system. Provide a report concerning the "recommended survey network" for the LSJR including cost estimates.
- Task 5 Identify all short-term (less then 30 days) water level measurement projects by other agencies and consultants including mean high water studies by professional land surveyors in performance of mean high water surveys performed under the Coastal Mapping Act.

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PART II METHODOLOGY

2.1 Tagk 1 - Water Level Measurement Network

Background

Nearly twenty years ago the state legislature passed the <u>Coastal Mapping Act of 1974</u> and established the Bureau of Survey and Mapping within the Florida Department of Natural Resources, hereinafter referred to as Florida Department of Environmental Protection (DEP), to administer the program. The Act provided the intent to establish standards for determination of various tidal datums for boundary purposes. At the same time, the State entered a cooperative agreement with the National Ocean Service of the U.S. Department of Commerce. That agreement is still in effect today and Florida has the most extensive and best maintained tidal boundary program in the County.

Tide Station Reconnaissance

An exhaustive field reconnaissance effort involving 53 tide stations in the LSJR basin was a major component of this study. The gages used to measure water levels were typically in operation less then six months during the late 1970's. Tidal datums were computed ten years later by NOS. During the intervening period FDNR tied permanent benchmarks at each tide station to the vertical control survey network.

The reconnaissance report consists of:

- (1) the published NOS Tidal Bench Mark Descriptions and elevation sheet
- (2) the FDNR preliminary tidal bench mark descriptions and elevation sheet, sent to NOS for updating the published tide station report
- (3) the tidal bench mark sketch and
- (4) color photographs of each tidal bench mark and tide station vicinity to assist in future efforts to locate tidal bench marks, (The photo album is not included in this manual but has been submitted to the SJRWMD for archival in the District library)

TIDAL BENCH MARK RECOVERY

Tidal bench marks tied to NGVD of 1929 provide permanent witness and perpetuation of the water level measurement and tidal datum computation. Table 1 provides an inventory, in numeric order, and river mile location of the existing tide stations in the project area. Existing tidal bench marks found during the reconnaissance are also shown. (NOS recommends five tidal bench marks at each tide station.) Figure 1 indicates the integrity of the tidal bench mark recovery effort.

The last page of the Tidal Bench Mark Description is known as the elevation sheet. In the River Reach Report two versions of Tidal Bench Mark Descriptions are presented:

- The "preliminary" assembled by Bureau of Survey and Mapping, FDEP as a result of the reconnaissance. This version is sent to NOS for review and approval. NOS will provide a new publish data when preliminary is accepted.
- Following the elevation sheet of the "preliminary" is the Tidal Bench Mark Sketch (ARC-CAD). The sketch is an appendix to the tidal bench mark descriptions and is identified with the suffix 'A' (See the List of Tidal Bench Mark Descriptions in the Table of Contents.)
- The next version shows "Publication Date ---" this is the official NOS Tidal Bench Mark Description and elevation sheet.

Table 1-A provides NAVD 1988 Heights of all tidal bench marks in the project area. Other references to heights or elevations of tidal datums are referenced to NGVD 1929.

TABLE 1 LOWER ST. JOHNS RIVER BASIN WATER QUALITY MANAGEMENT STUDY NOS TIDE STATION INVENTORY

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التحالي بمطلك فيستعلق والتكريب						
Station No.	Station Name	River Hile Location	Distance from Main Stem/Side	Tidal Bench Marks Fd/Req'd	NGVD Tie Y/N	1993 Recon Y/N
872 0186	FT. GEORGE ISLAND	1.4	3.0 miles/ Left	5/0	Y	Y
0189	CEDAR HEIGHTS, BROWARD RIVER	14.6	3.0 miles/ Left	5/0	Y	Y
0194	LITTLE TALBOT ISLAND	0.3	2.0 miles/ Left	6/0	Y	Y
0196	SISTERS CREEK	3.5	2.2 miles/ Left	1/0	N	Y
0198	CLAPBOARD CREEK	8.1* Left Bank	0	5/0	Y	Y
0202	TROUT RIVER	15.7	4.5 miles/ Left	0/0	Y	Ŷ
0203	BLOUNT ISLAND BRIDGE	10.0* Left Bank	0	4/1	Y	Y
0213	TROUT RIVER, SHERWOOD FOREST	15.9	6.6 miles/ Left	3/2	Y	Y
0215	JACKSONVILLE, NAVY FUEL DEPOT	15.1 Left Bank	0	5/0	Y	Y
0216	RIBAULT RIVER, LAKE FOREST	16.1	3.2 miles/ Left	4/1	Y	Y
0217	MONCRIEF CREEK	15.9	2.0 miles/ Left	5/0	Y	Y
0219	DAME POINT	11.0 Left Bank	0	3/2	Y	Y
0220	MAYPORT	2.2 Right Bank	0	10/0	Y	Y .
0221	FULTON	7.3 Right Bank	0	4/1	Y	Y
0222	CHASEVILLE	14.8 Left Bank	0	0/0	N	Y
0225	PHOENIX PARK	16.1 Left Bank	0	5/0	Y	Y
0232	PABLO CREEK ENTRANCE	3.5 Right Bank	0	5/0	Y	Y

* Dame Point alternative stationing

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Table 1 (continued)

Station No.	Station Name	River Mile Location	Distance from Main Stem/Side	Tidal Bench Marks Fd/Req'd	NGVD Tie Y/N	1993 Recon Y/N
872 0242	LONG BRANCH	18.2 Left Bank	18.2 0 Left Bank		Y	۲
0244	MILL COVE	10.5 Right Bank	0	8/0	Y	Y
0259	ATLANTIC BEACH	1.1	4.6 miles/ Right	0/0	N	Y
0267	PABLO CREEK, ICW	3.5	4.1 miles/ Right	3/2	Y	Y
0268	JACKSONVILLE, ACOSTA BRIDGE	23.2 Left Bank	0	1/4	Y	Y
0274	LITTLE POTTSBURG CREEK	21.0	0.9 miles/ Right	5/0	Y	Y
0291	JACKSONVILLE BEACH	26.5	17.0 miles/ Right	8/0	Y	Y
0296	ORTEGA RIVER ENTRANCE	26.1 Left Bank	0	5/0	Y	Y
0305	OAK LANDING	3.5	9.2 miles/ Right	5/0	Y	Y
0333	PINEY POINT	30.2 Left Bank	0	4/1	Y	Y
0339	GOODSBY CREEK	31.2 Left Bank	0	0/0	N	Y
0374	ORANGE PARK, MOOSE HAVEN	35.2 Left Bank	0	6/0	Y	Y
0377	MANDARIN	34.9 Right Bank	0	0/0	N .	Y
0398	PALM VALLEY	40.0	17.6 miles/ Right	5/0	Y	Y
0406	DOCTORS LAKE, PEORIA	39.9	5.5 miles/ Left	5/0	Y	Y
0409	JULINGTON CREEK	38.2	2.9 miles/ Right	5/0	Y	Y
0411	CATFISH POINT, DOCTORS LAKE	40.4	5.9 miles/ Left	0/0	N	У

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Station No.	Station Name	River Hile Location	Distance from Main Stem/Side	Tidal Bench Marks Fd/Reg'd	NGVD Tie Y/N	1993 Recon Y/N
872 0421	SWIMMING PEN CREEK	40.5	5.9 miles/Left	0/0	N	Y
0434	BLACK CREEK	41.8	4.5 miles/Left	3/2	Y	Y
0496	GREEN COVE SPRINGS	47.1 Left Bank	x***0	5/0	Y	Y
0499	TROUT CREEK	51.5 Right Bank	0	0/0	N	Y
0554	VILLANO BEACH INSIDE, TOLOMATO RIVER	62.0	17.8 miles/Left	6/0	Y	Y
0589	LANE LANDING	60.1 Right Bank	0	0/0	N	Y
0596	EAST TOCOI	59.8 Right Bank	0	0/0	· Y	Y
: 0653	PALMETTO BLUFF	66.5 Left Bank	0	7/0	Y	Y
0767	BUFFALO BLUFF	89.2 Left Bank	0	5/0	Y	Y
0774	PALATKA	78.6 Left Bank	0	5/0	Y	Y
0782	SUTHERLANDS STILL, DUNNS CREEK	84.8	1.6 miles/Right	5/0	Y	Y
0832	WELAKA	98.4 Right Bank	0	6/0	Y	Y
0841	SHELL BLUFF, CRESENT LAKE	98.5	11.7 miles/Right	0/0	Y	Y
0855	CRESENT CITY, CRESENT LAKE	104.5	8.8 miles/Left	3/2	Y	Y
0877	GEORGETOWN	107.7 Right Bank	0	5/0	Y	Y

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Table l-A Tidal Bench Marks NAVD 88 Heights

Hane	Agency	Navd 88	Ngvd 29 Code	Order & Class	Year Obsrv	Year Recov	Bate Adjusted	Latitude	Longitude	Plot No	Pid (۶.
872 0168 B TIDAL	- NOS	3.7660	0.000	2/1	*1985	1985G	061591	30-27-49	081-26-06	- 0	BC1403	F.
872 0168 C TIDAL	NOS	2.1210	0.000	2/1	*1985	1985G	061591	30-27-42	081-25-37	0	BC1404	F
872 0189 A TIDAL	FLDT	3.5750	0.000	2/1	*1978		061591	30-26-15	081-38-35	0	BC1474	F
872 0189 B TIDAL	PLDT	3.4800	0.000	2/1	*1978		061591	30-26-13	081-38-33	0	BC1475	F.
872 0189 C TIDAL	PLDNR	9.2940	0.000	2/1	*1978		061591	30-27-23	081-38-12	0	BC1473	F
872 0194 TIDAL-1	NOS	3.6130	0.000	2/1	1977	1977G	061591	30-25-54	081-24-38	0	BC1559	F
872 0194 TIDAL 2	NOS	3.5710	0.000	2/1	1977	1977G	061591	30-25-53	081-24-38	()	BC1560	F
872 0194 TIDAL 3	NOS	2.1730	0.000	2/1	*1985	1985G	061591	30-25-45	081-24-43	0	BC1558	F
872 0198 A TIDAL	FLDNR	1.3620	0.000	1/2	*1991	19910	061591	30-24-23	081-30-38	Ú	BC14Dō	F
872 0198 B TIDAL	FLDNR	1.2740	0.000	2/1	1977		061591	30-23-42	081-30-12	U	BC1408	ŗ
872 0215 D TIDAL	PLDNR	2.0300	0.000	2/1	1977	********	061591	30-24-05	081-37-59	U	BC1557	F
872 0215 TIDAL 2	CGS	1.2600	1.588 B	2/1	*1977	1977G	061591	30-24-02	081-37-36	0	BC0274	F.
872 0215 TIDAL 3	CGS	1.4570	0.000	2/1	*1977	19776	061591	30-24-02	081-37-31	Ç	BC027(
872 0216 A TIDAL	NOS	0.6390	0.000	2/1	*1978	1978G	061591	30-23-54	081-41-50	0	BC1505	F.
872 0216 B TIDAL	NOS	1.4450	0.000	2/1	*1978	1978G	061591	36-23-50	081-41-57	Û	BC1594	F
872 0216 C TIDAL	NOS	1.6560	0.000	2 /1	*1978	1978G	061591	30-23-53	081-41-53	• 0	BC1503	F
872 0216 D TIDAL	NOS	2.1210	0.000	2/1	*1978	1978G	061591	30-23-50	081-41-56	Û	BC1502	F
872 0216 E TIDAL	NOS	1.0920	0.000	2/1	*1978	1978G	061591	30-23-53	081-41-47	0	BC1501	ŗ
872 0217 A TIDAL	FLDNR	2.0160	0.000	2/1	*1978		061591	30-23-29	081-39-52	0	BC1464	F
872 0219 D TIDAL	NOS	2.6940	0.000	2/1	*1979	1979G	061591	30-23-31	081-33-45	0	BC1550	F
872 0219 E TIDAL	NOS	1.0680	0.000	2/1	*1979	1979G	061593	30-24-01	081-33-38	0	BC1549	F
872 0219 P TIDAL	NOS	1.8600	0.000	2/1	1977	1977G	061591	30-23-32	081-33-50	0	BC1551	 i
872 0220 TIDAL 12	CGS	2.0560	2.396 B	1/2	*19 91	1991G	061591	30-23-39	081-25-47	0	BC0481	5
872 0220 TIDAL 13	CGS	2.1060	2.445 B	1/2	* 1991	1991G	061591	30-23-35	081-25-41	0	BC0462	:
872 0221 B TIDAL	FLDNR	3.4360	0.000	2/1	¥1978	1978G	061591	36-23-15	081-30-29	Ŀ	BC14iu	ŗ
872 C221 C TIDAL	FLDNR	7.9780	Ú.000	2/1	\$1978	19786	061591	39-23-06	091-30-33	Ú	BC1411	
872 0221 P TIDAL	FLDNR	6.17?0	C.000	2/1	*1985	1985G	061591	30-22-42	081-30-38	ι	BC1412	ł
872 0221 E TIDAL	FLDNR	10.7790	0.900	2/1	*1985	1985C	061591	30-22-05	081-30-56		BC1411	;
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Table 1-A (continued) .

Naue	Agency	Navd 88	Ngvd 29 Code	Order 1 Class	Year Obsrv	Year Recov	Date Adjusted	Latitude	Longitude	Plot No	Pid
872 0225 A TIDAL	PLDNR	1.9500	0.000	2/1	*1985	1985G	061591	30-22-54	081-38-07	- 0	BC156
872 0225 B TIDAL	FLONR	2.7840	0,029	2/1	*1985	1985G	061591	30-22-55	081-38-10	0	BC156
872 0225 C TIDAL	FLDNR	3.1370	0.000	2/1	*1985	1985G	061591	30-22-53	081-38-16	0	BC15€
872 0232 A TIDAL	PLDNR	1.0230	0.000	2/1	*1978		061591	30-22-39	081-27-02	0	BC141
872 0232 B TIDAL	FLDNR	1.7690	0.000	2/1	*1978	******	061591	30-22-40	081-26-52	Û	BC141
872 0242 TIDAL 4	COS	3.2260	3.554 B	2/1	*1977	1991G	061591	30-21-18	081-37-32	0	BC03
872 0242 TIDAL 9	CGS	3.2990	0.000	2/1	1977	1977G	061591	30-21-21	081-37-34	0	BC15
872 0244 D TIDAL	FLDNR	2.8220	0.000	2/1	1977		061591	30-22-07	081-33-33	()	BC14
872 0244 E TIDAL	FLDNR	6.2390	0.000	2/1	1977		061591	30-21-59	081-33-32	Ŭ	BC14
872 0244 F TIDAL	NOS	9.9560	0.000	2/1	1977	19776	061591	30-21-27	081-32-56	0	BC14
872 0244 TIDAL 4	CGS	7.0410	0.000	2/1	1977	1977G	061591	30-21-26	081-32-32	Û	BC14
872 0267 D TIDAL	FLDNR	0.7600	0.000	2/1	*1978		061591	30-19-2?	081-26-18	Û	BC14
872 0268 TIDAL 1 RESET	COS	3.4410	0.000	1/2	*1991	19910	061591	30-19-29	081-40-01	U	BC03
872 0268 TIDAL 2	CGS	3.4170	3.748 B	1/2	*1991	1991G	061591	30-19-29	081-40-01	()	BC0:
872 0291 TIDAL 1	NOS	2.7960	0.000	2/1	1977	1977G	061591	30-17-Di	U81-23-1 7	0	BC1!
872 0291 TIDAL 2	NOS	2.8480	0.000	2/1	1977	1977G	061591	3(-17-02	081-23-18	Û	BC1
872 0291 TIDAL 3	NOS	.3 , 1760	0.000	2/1	1977	1977G	061591	30-17-08	081-23-21	0	BC1
872 0305 A TIDAL	NOS	2.3740	0.000	2/1	*1979		061591	30-15-15	081-25-50	Ű	BC1
872 0305 B TIDAL	NOS	3.2260	0.000	2/1	*1979		061591	30-15-14	081-26-02	ť	BC1
872 0305 C TIDAL	NOS	3.1800	0.000	2/1	*1979		061591	30-15-18	081-26-05	6	BC]
872 0305 D TIDAL	NOS	3.7250	0.000	2/1	1979		061591	30-15-19	081-26-20	U	BC1
872 0305 E TIDAL	NOS	3.8820	0.000	2/!	*1979		061591	30-15-28	081-26-14	(i	BC1
872-0333 TIDAL 2	CGS	2.6040	0.000	2/1	1977	19776	061591	30-13-43	081-39-59	0	BC1
872 0333 TIDAL 3	CGS	1.2780	0.000	2/1	1977	1977G	061591	39-13-35	081-40-00	0	BC1
872 0374 A TIDAL	NOS	2.6660	0.000	2/1	1978		061591	30-10-11	081-41-45	(ı	BCI
872 0374 E TIDAL	NCS	2.3548	0.080	2/1	1978	19780	06159)	30-10-28	081-41-50	[·	FC.
872 0374 C TIDAL	NOS	3.3470	0.000	2/1	1978	1978G	051591	30-10-3E	081-41-53	0	BC
872 0374 D TIDAL	NOS	3.7410	0.000	2/1	1978	1978G	061591	30-10-48	081-41-56	Ú	BC

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Table 1-A (continued)

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1432 I 1519 I 1518 F 1521 F 1520 F 1437 F 1438 F 1436 F 1435 F 1435 F 1435 F 1435 F 1539 F
1519 1518 1521 1520 1437 1438 1438 1436 1436 1434 1539 F
1518 F 1521 F 1520 F 1437 F 1438 F 1438 F 1436 F 1436 F 1436 F 1436 F
1521 F 1520 F 1437 F 1438 F 1436 F 1436 F 1436 F 1436 F
1520 F 1437 F 1438 F 1436 F 1436 F 1436 F 1434 F 1539 F
1437 F 1438 F 1436 F 1436 F 1435 F 1434 F 1539 F
1438 F 1436 F 1435 F 1434 F 1539 F
1436 F 1435 F 1434 F 1539 F
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1544 E
1587 3
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Table 1-A (continued)

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Name	Agency	Navd 88	Ngvd 29 Code	Order & Class.	Year Obsrv	Year Recov	Date Adjusted	Latitude	Longitude	Plot No	Pid
872 0653 TIDAL CY 2	FLDT	2.2150	0.000	2/1	1985	1985G	061591	29-45-47	081-33-46	· 0	AQ25
872 0686 TIDAL 1	PLDNR	3.2500	3.570 B	2/1	*1978	1978G	061591	29-42-53	081-14-00	0	AQ15
872 0686 TIDAL 2	FLDNR	3.9310	4.251 B	1/2	*1991	1991C	061591	29-42-53	081-14-10	0	AQ15
872 0686 TIDAL 3	FLDNR	1.9180	2.238 B	2/1	*1978	1978G	061591	29-42-55	081-14-02	D	AQ15:
872 0729 A TIDAL	NOS	1.3500	0.000	2/1	1978	1978G	061591	29-37-51	081-12-35	0	AQ19
872 0729 B TIDAL	FLDNR	2.6730	0.000	1/2	*1991	19916	061591	29-38-00	081-12-30	()	AQ19
872 0729 C TIDAL	FLDNR	1.5170	0.000	1/2	*1991	1991G	061591	29-38-05	081-12-25	(AQ19
872 0767 A TIDAL	NOS	3.1890	0.000	2/1	1985	1985G	061591	29-35-38	081-40-56	0	AG25
872 0767 B TIDAL	NOS	1.5980	0.000	2/1	1985	1985C	061591	29-35-41	083-40-57	ť	AQ21
872 0767 C TIDAL	NOS	3.1210	0.000	2/1	1985	1985G	061591	29-35-46	081-41-00	0	AQ2!
872 0767 D TIDAL	NOS	3.2410	0.000	2/1	1985	1985G	061591	29-35-37	081-40-54	0	AQ2:
872 0767 E TIDAL	NOS	2.9720	0.000	2/1	1985	1985G	061591	29-35-50	081-41-03	0	AQ2
872 0774 TIDAL 5	CGS	4.5830	4.873 B	2/1	*1985	1985G	061591	29-38-50	081-37-47	Q	AQU
872 0774 TIDAL 6	NGS	D.888 0	1.192 E	2/1	*1978	1978G	061591	29-38-36	081-3?-48	0	AQ]
872 0774 TIDAL 7	NGS ·	2.8970	3.185 B	2/1	*1978	1978G	061591	29-38-36	081-37-48	C	AQ1
872 0774 TIDAL 8	NGS	2.0590	2.349 B	2/1	*1978	1978G	061591	29-38-35	081-37-48	Ű	AQ1
872 0832 A TIDAL	NOS	5.1450	0.000	2/1	*1985	1925G	061591	29-28-35	081-40-33	C	AQ1
672 0832 B TIDAL	NOS	5.1880	0.000	2 /1	*1985	1985C	061591	29-28-36	081-40-30	0	AQI
872 0832 TIDAL 1	CGS	6.7940	0.000	2/1	1985	1985G	061591	29-28-46	081-40-28	Ų	AQ
872 0833 A TIDAL	NOS *	1.3320	0.000	1/2	*1991	1991G	061591	29-28-42	081-08-07	(i	AQ'
872 0833 B TIDAL	NOS	1.5600	0.000	1/2	*1991	1991G	061591	29-28-42	081-08-07	0	¢A
872 0833 C TIDAL	NOS	2.7070	0.000	2/1	1978	1978G	061591	29-28-41	081-08-09	0	AQ.
872 0877 TIDAL 3	CGS	3.9480	4.033 B	2/1	*1985	1985G	061591	29-23-18	081-38-24	0	AQ
872 0877 TIDAL 6	NOS	5.9640	0.000	2/1	1985	1985G	061591	29-23-25	081-38-22	9	AÇ
672 087? TIDAL ?	FLDNR	0.8540	0.939 B	2/1	*1985	19850	061591	28-23-13	081-33-24	(AG
872 U877 TIDAL 8	FLDRE	3.9940	4.078 E	2/1	*1985	1985C	061591	29-23-18	081-36-16		£(
872 0817 TIDAL 9	NGS	6.8510	6.977 B	2/1	*1985	19850	061591	29-23-19	081-38-12	Ð	1
872 0954 & TIDAL	FLDNR	1.5060	C.OCC	2/1	*198?	19876	061591	29-17-14	081-03-23	ģ	£.

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2.2 TASK 2 ADDITIONAL DATA AND INFORMATIONAL SUMMARY

FDEP interviewed more than 30 persons representing 14 agencies, consultants and universities during the study. In addition to searching for raw water level measurements we expanded the search to include extent of tide, control survey networks and short term tide studies.

The following questions were discussed when possible during the interview process:

(Task 2) Florida Department of Environmental Protection is preparing a collection of water level measurements of LSJR including bench marks/control surveys/stage data, high water & low water events, please provide the following:

Source Type Cost Availability Format

(Task 3) Do you have knowledge know of extent of tide analysis, reports, or studies of LSJR or its tributaries. Tributaries?

(Task 4) Do you have knowledge of published/unpublished survey control network in LSJR basin?

GPS Horizontal Vertical Tidal Other (Task 5) Are you aware of short term (less than 3 days) water · level measurement station:

Installation Date Removal Date B.M. Monumentation NGVD 29/other Purpose Location

Information learned from the interview process was minimal except in the field of GPS control surveys and leveling for aerial photogrammetry sponsored by Jacksonville Electric Authority and SJRWMD. Also the final river mileage measuring system based on methodology developed by USGS was found through telephone interviews. A listing of persons interviewed during the study is provided to minimize future redundancy.

Name	Agency	Telephone	Location		
Marvin Franklin	USGS	(904)681-7388	Tallahassee		
Larry Fayart	SJRWMD	(904)329-4500	Orlando		
Jim Sohm	USGS	(904)398-2121	Jacksonville		
Mike Schmidt	Camp, Dresser & McKee	(904)281-0170	Jacksonville		
Bobby Pittman	City of Jacksonville	(904)630-1358	Jacksonville		
Dale Smith	City of Jacksonville	(904)630-1358	Jacksonville		
George McGregor	City of Jacksonville	(904)630-1444	Jacksonville		
Robin Petzold	Stanley Associates	(319)264-6600	Muscative, Iowa		
Frank Drexel	Geonex, Inc.	(303)744-8899	Denver, Co.		
Gary Kirkland	Jacksonville Electric Authority	(904)632-6006	Jacksonville		
Matt Mason	Seminole Electric Cooperative	(904)328-9255	Palatka		
Mike Opalinski	Seminole Electric Cooperative	(813)963-0994	Tampa		
Dr. Ray Bowman	U/North Florida	(904)646-2608	Jacksonville		
Helen Twedell	U/F Coastal Engineering Archives	(904)392-2710	Gainesville		

Dr. Carol DeMort	U/NF Natural Science Dept.	(904)646-2518	Jacksonville (no contact)
Dr. Quinton White	Jacksonville University	(904)744-3950	Jacksonville
Bill Watkins	SJRWMD	(904)329-4500	Paltaka
Pete Milan	US-COE	(904)232-2215	Jacksonville
Hank Rimmer	US-COE	(904)232-1606	Jacksonville
Brian Blake	US-COE	(904)232-1132	Jacksonville
Jim Vearil	US-COE	(904)232-2116	Jacksonville
Maurice Sterling	SJRWMD	(904)329-4320	Palatka
Tommy Walters	SJRWMD	(904) 329-4277	Palatka
Greg Bruce	Vernon F. Myer & Associates	(504)733-3770	New Orleans, Louisiana
Stephen Herbert	Vernon F. Myer & Associates	(303)744-3770	New Orleans, Louisiana
Mark Morberg	Geonex, Inc.	(303)744-8899	Denver, Co
Tom Haines	Union Camp	(904)284-3059	Green Cove Springs
Oriana West	US-COE	(904)232-3643	Jacksonville
Don Foose (retired)	USGS	(904)681-7620	Tallahassee
Trish Rilley	USGS	(703)648-6803	Reston, VA
National Water Information Clearing House		(800)426-9000	Washington D.C.

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FDEP is unaware of other bibliographies or sources for published and unpublished reports concerning the LSJR. The Bibliography of U.S. Geographical Survey Report on the Water Resources of Florida, 1986-1989; USGS Open-File Report 90-143 Fifth Edition (a computerized update is available through the Tallahassee office) i recommended for additional research.

Helen Twedell, University of Florida - Coastal Engineering Archive provided the following references from the card catalog maintained at the university:

G	Edge, Billy L.
415.4	A water quality model for the St. Johns
1973	River. Clemson, S.C., Clemson University,
E3	1973.
	45p. il. (Department of Civil Engineering)

G 488

St. Johns

G	Anderson, Warren
415.4	Flow and chemical characteristics of the
1973	St. Johns River at Jacksonville, Florida, by
A5	Warren Anderson and D.A. Goolsby. 1973

G 408.5

Hoy, Nevin D. 408.5 U.S. Geological Survey reports on the water resources of Florida, 1886-1980, 2d ed., by Nevin D. Hoy, James D. Simmons and Maude Claiborne. Tallahassee, FL, U.S. Geological Survey, 1981. 212p. (Open-file report 81-816)

G 408.5

Florida Water Resources Study Commission 408.5 Florida's water resources. Gainesville, 1956. 94p.

A study of the physical, administrative, and legal aspects of water, problems and water management: agricultural, industrial, municipal, recreational.

G 407.1

99.07 Baccasio, Angelo D. **B4 A**7

Atlantic coast ecological inventory; user's guide and information base, by Angelo D. Beccasio [and others] Slidell, LA, US Fish & Wildlife Service National Coastal Ecosystems Team, 1980.

163p. (FWS/OBS-80/51)

Lists fish and wildlife of the Atlantic coast that could be impacted by coastal siting of energy facilities.

Report is housed in a box with folded maps of the Atlantic coast from Virginia to south Florida.

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Author G407.1

G 414 1966 1966 L4	Leve, Gilbert W. Ground water in Duval and Nassau Counties, Florida. Tallahassee, Florida and U.S. Geological Survey, 1966. 91p. il. (Report of Investigations 43)
-	G 415
G 415 1972 F3	Fairchild Roy W. The shallow-aquifer system in Duval County, Florida. Tallahassee, Florida and U.S. Geological Survey. 1972. 50p. il. (Report of Investigation no. 59)
	Author:
	G 415.4
07 S52 1972	Rawls, Oscar G. A case history of shoreline effects of jetties and channel improvements at the mouth of St. Johns River. 1972. (In Shore and Beach, 40(2)p.32)
	` G 415.4
G 4154 1969	U.S. Army Engineer District, Jacksonville. Flood plain information, St. Johns River, Jacksonville, Florida. 1969. 71p. illus (maps)
07 ASCE WW 98(4) 1972	Scott, Harold A. Design versus ecology in St. Johns and Indian Rivers. 1972 (In ASCE Waterways Div. Journal 98(4) p.425)
Reprint	G 415.4
G 415.4 1972 R3	Rawls, Oscar A case history of shoreline effects of jetties and channel improvements at the mouth of St. Johns River. 1972 3p. Photocopies from Shore and Beach 40(2) pp. 33-35, 1972.
	G 415.4
G 415.4 1973 A5	Anderson, Warren Flow and chemical characteristics of the St. Johns River at Jacksonville, Florida, by Warren Anderson and D.A. Goolsby. Tallahassee,

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e.	Florida and U.S. Geological Survey. 1973
L	Author: G488 St. Johns
G 415.4 1973 E3	Edge, Billy L. A water quality model for the St. Johns River. Clemson, S.C., Clemson University, 1973.
	Author: G488 (St. Johns)
	G 415.4
05 WES TR HL-79-12 1 1979	<pre>Brogdon, Noble J. Mayport-Mill Cove model study; Report 1: Hydraulic, salinity, and shoaling verification; hydraulic model investigation. Vicksburg, MI, U.S. Water Experiment Station, 1979. 40, [5]p. 177 plates, il. (WES Technical report HL-79-12)</pre>
, WES TR HL 79-12 2 1979	Brogdon, Noble J. Mayport-Mill Cove model study; Report 1: Mayport Naval Basin study; Hydraulic model investigation. Vicksburg, MI, U. S. Army Engineer Waterways Experiment Station, 1979. 402p. il. (WES Technical report HL-79-12)
*	G 415.4
05 WES WIS 7	Ebersole, Bruce A. Atlantic coast water-level climate. Vicksburg MS, U.S. Army Engineer Waterways Experiment Station, 1982. 495p. (WES WIS 7) Statistics for storm surge and water level for 20 locations on the U.S. Atlantic coast, including Mayport and Miami Beach.

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2.3 TASK 3 - SPATIAL CHANGES IN TIDAL CHARACTERISTICS

Extent of tide in major tributaries as well as the main stem of the St. Johns River is significant to the hydrologist. The tidal signal along the main stem is known to extend past Welatka, Florida (River Mile 98.4) however it dissipates before reaching Georgetown (River Mile 107.7). It is also known the tidal signal dissipates in Dunns Creek between the St. Johns River and Cresent Lake.

The hydrologist has a practical reason to identify the extent of tide - when conducting water level measurements or current studies he prefers to gage non-tidal water only. Other then boundary delineation the extend of tide has little importance in the Management Study.

Head of tide research by FDEP in 1990/91 have proved the methodology is still illusive, modeling of tidal propagation in rivers using data assimilation is still untested for this specific application. Extent of tide research for even a small number of tributaries in the LSJR basin will require data collection in the following disciplines:

- simultaneous water level measurement observations required in adjacent tidal and non-tidal reaches of the tributary
- 2. differential leveling
- 3. bathymetric surveys including river profile and cross sections at various intervals
- 4. computer modeling using data assimilation
- 5. current/velocity studies
- 6. evaluation of conclusions

It is estimated to cost \$50,000 to \$100,000 for implementation of the extent of tide study. The SJRWMD has decided this field of research bears lightly on the overall goals of the management study and has given extent of tide a low priority. FDEP will not specifically address extent of tide in the manual.

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2.4.1 Horizontal Control Survey Network

Background

Surveying activities in Florida is readily traced back to the mid 1500s. Those early endeavors were primarily used for mapping the coastline of what would become North America. Navigation of trade routes required accurate surveys to map rivers, deep water ports and new settlements. During the mid 1800s, cadastral surveys performed by the U.S. General Land Office for the purpose of subdivision and conveyance of raw land. Also during that time period various geodetic and engineering surveys were performed by the U.S. Coast and Geodetic Survey and the U.S. Army Corps of Engineers to chart existing rivers for navigational purposes and river improvement projects in the fledgling state named Florida. The USC & GS later known as the National Ocean Service, (NOS) began triangulation surveys along both sides of the St. Johns River as early as 1853. They designed various triangulation survey networks suitable to satisfy the most exacting accuracy standards.

Following the search of major survey networks in the area one must then determine which surveys and resulting monumentation to evaluate. The classification standards of the National Geodetic Control Networks are based on accuracy. This means the control points in a particular survey are classified, they are certified as having datum values consistent with all other points in the network, not merely those within that particular survey, see <u>Standards and Specification for Geodetic Control Networks</u> by Federal Geodetic Control Committee, September 1984. (See canary copy of standards at the end of **Part II**) FDEP uses NOS published control points for all geodetic network extensions. It is recommended similar standards be incorporated for future LSJR survey networks.

Evaluation

All surveys evaluated in the manual must meet or exceed the aforementioned standards. The early triangulation surveys performed by NOS apparently meet second order, class "0" standards. Several existing control networks fit this criteria:

- 1. USC & GS (NOS) adjusted and published triangulation control points
- 2. FDNR/NOS High Accuracy Reference Network (HARN) (1:1,000,000) Global Positioning System (GPS) adjusted and published circa 1990
- 3. Geonex, Inc. Aerial Photography Ground Control first and second order GPS network adjusted, unpublished. (Work performed under contracts with (1) Jacksonville Electric Authority (JEA) and (2) St. Johns River Water Management District (SJRWMD, circa 1990)

Reach Maps

Control station databases furnished by the above agencies were compiled by FDNR and presented at 1:100,000 scale computer generated maps called "Reach Maps". Order of accuracy is of prime importance, next is the frequency or interval between stations Also considered in the evaluation is age, durability and potential for disturbance. Horizontal Control Network Reach Analysis and accompanying tables provide detailed data concerning existing horizontal control survey networks.

Control Survey Network Zone (CSN Zone/Nodes)

Existing control points located more than two miles from the river's edge were determined to be too distant for normal research activities. For purposes of this study, if existing horizontal control points are more than two miles from the river's edge new survey networks need to be established. Control points within two miles can be readily used by SJRWMD staff or contract surveyors to extend high quality survey control to future study sites.

A study corridor nominally extending two miles each way from the rivers edge was established along the St. Johns River to delineate area boundaries for analysis of existing horizontal control network surveys. This corridor will be referred to as Control Survey Network (CSN Zone).

Control points within the CSN Zone have been encapsulated into 2.5 mile diameter nodes as shown on the Existing Horizontal Control Survey Network, Adjusted Reach/Node Inventory, Table 3 and the individual Reach Maps. An alphanumeric system identifies each node within the reach and also specifies if the node is on the left bank, right bank (from a position facing downstream) or if both banks are within the node.

Existing horizontal control survey utilizing GPS technology are identified below:

Agency	Order	Distance Accuracy Standards	Purpose	
FDNR/NOS	В	1:1,000,000	12 HARM*	
JEA/Geonex	first	1:100,000	Photogrammetry	
JEA/Geonex	second	1:20,000	Photogrammetry	
SJRWMD/Geonex	second	1:20,000	Photogrammetry Total	

* High Accuracy Reference Network

** points have inadequate monumentation - immediate reconnaissance and upgrade is recommended The following summary indicates conventional triangulation control surveys. Many of the monuments were observed more than 50 years ago with no recovery records:

Agency Order		Distance Accuracy Standards	Purpose		
NOS	first	1:100,000	charting		
NOS	second	1:20,000	charting		
Unknown	third	1:10,000 and 1:5,000	variable		

Natural and mechanical occurrences destroy many control points over the years. Until a detailed reconnaissance is performed one must assume older monuments will be hardest to recover. Recent GPS control points will be easiest to find. A few additional reasons to expedite GPS control point reconnaissance follow::

- Accuracy and potential for submittal to NOS in "blue book format" for adjustment and publishing
- Secondary GPS points established by Geonex, Inc. are known to be capable of GPS observation
- Good recovery potential (Geonex, Inc. has provided station reference sketches
- approximately 400 control points were set/observed by Geonex, Inc.
- many control points have been utilized for vertical bench marks

Analysis

Horizontal control points set by NOS, FDNR, JEA or SJRWMD within the CSN Zone number 644. Of these 390 (approximately 59 percent) are listed as being third order (not recommended for network expansion) and 42 percent of the remaining have not being recovered since 1973. Only 58 percent of the points have been set or last recovered since 1973. The prospect of finding 200 of these points is considered good. In nodes with a deficient quantity of horizontal control points it appears cost effective to sponsor new GPS control surveys in lieu of the weeks required looking for ancient control points.

Considerations

The fact that control points appear in a database is not indicative that the monument is actually recoverable. Reconnaissance surveys have not been performed prior to the date of these recommendations therefore a weighted analysis has been utilized to predict the probability of control point recovery. It is noted that certain risks are involved in designing such an analysis however until field reconnaissance is complete the following criteria using practically and common sense will provide the basis for recommendations. In addition to accuracy/frequency, discussed above, the following items were considered in the evaluation:

- date of survey observation and the date the point was last visited.
- whether or not the point was found during the recovery attempt
- the degree of land disturbing activities either natural or mechanical since the last time the point was recovered
- permanence durability of the monument
- quality of mark description and/or recovery report; ability to locate the correct area to begin search
- possibility of finding a secondary point (usually an underground mark or azimuth mark)

Reconnaissance of all horizonal control points in the CSN Zone is recommended before extension of the network is attempted.

The following list of exhibits were used for analysis and recommendations concerning the Horizontal Control Survey Network:

- Table 2; Existing Horizontal Control Point Inventory;
- Figure 2; Existing Horizontal Control Point Inventory, Analysis and Summary;
- Table 3; Existing Horizontal Control Survey Network; Adjusted Reach/Node Inventory;
- Figure 3; Existing Horizontal Control Survey Network, Monumentation Distribution;
- River Reach Reports; Strength of Existing Survey Control Network; Main Stem, Abstract;
- Reach Maps 1-11, 1:100,000 scale; color, 11" x 17" sheet
- Existing Horizontal Control Survey Network Inventory; Reach Maps 1-11, 1:100,000 scale

TABLE 2

LOWER ST. JOHNS RIVER HORIZONTAL CONTROL SURVEY NETWORK ZONE EXISTING CONTROL POINT INVENTORY

Following are monumentation (control point) reports within the existing horizontal control survey network zone:

- Exhibit A Inventory sorted by reach/date/order -GPS Points 5 pages
- Exhibit B Inventory sorted by date/order Triangulation (conventional) points 10 pages
- Exhibit C Inventory sorted by reach/date/order Triangulation (conventional) points 14 pages

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EXHIBIT A

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HORIZONTAL GPS POINTS

RE	COUNTY	DESIGNATION	SET		RECV	ſ	0
•		•	DATE		-DATE		
0	CLAY	FLGPS 31 AZ MK	1988 STATION	MONUMENTED	1990 GOOD		1
0	DUVAL	HERLPORT AZ MK	1988 STATION	MONUMENTED	1952 UNKNOWN -	MARK NOT F	1
0	DUVAL	FLGPS 27 AZ MK	1988 STATION	MONUMENTED	1990 GOOD		1
0	FLAGLER	FLAGPORT AZ MK	1988 STATION	NONUMENTED	1991 GOOD		1
0	ST JOHNS	195 72 B42	1973 STATION	MONUMENTED	1988 GOOD		1
0	ST JOHNS	STAUPORT AZ MK	1988 STATION	MONUMENTED	1991 GOOD		1
0	CLAY	FLGPS 31	1988 STATION	MONUMENTED	1990 GOOD	1	B
0	DUVAL	HERLPORT	1988 STATION	MONUNENTED	1952 UNKNOWN -	MARK NOT F	B
0	DUVAL	FLĢPS 27	1988 STATION	MONUMENTED	1990 GOOD	1	B
0	FLAGLER	FLAGPORT	1988 STATION	NONUMENTED	1991 GOOD	ſ	B
0	ST JOHNS	PELLICER RESET	1934 STATION	NONUMENTED	1990 GOOD	1	B
0	ST JOHNS	D 322	1970 STATION	MONUMENTED	1991 GOOD	1	ß
0	ST JOHNS	DURBIN 2	1973 STATION	MONUMENTED	1991 GOOD	i	B
0	ST JOHNS	FLGPS 30	1988 STATION	MONUMENTED	1990 GOOD	ſ	8
0	ST JOHNS	STAUPORT	1988 STATION	MONUMENTED	1991 GOOD	I	B

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HORIZONTAL GPS POINTS

RE COUNTY	DESIGNATION	SET DATE	RECV DATE	0
1 DUVAL	ARP CRG	STATION MONUMENTED	1988 GOOD	B
1 DUVAL	872 0220 A TIDAL	1978 STATION MONUMENTED	1991 GOOD	B

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•	HORIZONTAL	GPS	POINTS
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RE COUNTY	DESIGNATION	SET DATE	RECV DATE	ο.
4 DUVAL	FLGPS 32 AZ MK	1988 STATION MONUMENTED	1990 GOOD	1
4 DUVAL	FLGPS 32	1988 STATION MONUMENTED	1990 GOOD	B

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HORIZONTAL GPS POINTS

RE	COUNTY	DESIGNATION	SET			RECV		0
			DATE			DATE		
- 8	PUTNAM	PALAPORT AZ NK	1988	STATION	MONUMENTED	1987	6000	1
8	PUTNAM	PALAPORT AZ MK	1988	STATION	MONUMENTED	1987	GOOD	1
8	PUTNAM	P 263	1966	STATION	MONUMENTED	1989	GOOD	B
8	PUTNAM	P 263	1966	STATION	HONUMENTED	1989	GOOD	8
8	PUTNAM	PALAPORT	1988	STATION	HONUMENTED	1987	GOOD	B
·8	PUTNAM	PALAPORT	1988	STATION	MONUMENTED	1987	GOOD	B

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RE COUNTY	DESIGNATION		SET DATE		RECV DATE	0
11 MARION 11 PUTNAM	FLGPS 40 FRUITLAND RESET	•	1989 STATION 1933 STATION	MONUMENTED MONUMENTED	1991 GOOD 1988 GOOD	1 B
11 PUTNAM	BEAR		1935 STATION	MONUMENTED	1990 GOOD	B

EXHIBIT A SUMMARY REPORT

REACH	FREQUENCY	COUNTY	ORDER
0	l	CLAY	1
0	l	CLAY	В
0	2	DUVAL	1
0	2	DUVAL	В
0	1	FLAGLER	1
0	1	FLAGLER	В
0	2	ST. JOHNS	1
0	5	ST. JOHNS	В
1	2	DUVAL	В
4	1	DUVAL	1
4	1	DUVAL	В
8	2	PUTNAM	1
8	4	PUTNAM	B
11	1	MARION	1
11	2	PUTNAM	В

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NORIZONTAL POINTS

				•							
DATE						ORD	DATE			PID	STAMPING
RECV							SET				
1036	6000					1	1908	STATION	MONUMENTED	8C1976	ST JOHNS
1058	0000					1	1000	STATION	MONUMENTED	BC2100	LANCASTER 2
1730	0000					4	1017	STATION	MONUMENTED	802104	
1920	GUUU					-	1711	STATION	MONUMENTED	002104	MITCHEIT
1958	G000					1	1920	STATION	MUNUMENTED	862040	MITCHELL
1958	GOOD					1	1926	STATION	MONUMENTED	BC2040	MITCHELL
1958	UNKNOWN	•	MARK	NOT	F	1	1917	STATION	NONUMENTED	8CZ071	SPUR
1958	UNKNOWN	-	MARK	NOT	F	1	1926	STATION	MONUMENTED	BC1970	BM 1
1968	G000					1	1933	STATION	MONUMENTED	AQ2366	PICOLATA
1968	GOOD					1	1933	STATION	MONUMENTED	AQ2460	HASTINGS
					0	1					
					,	•					
					-	2	107/	CTATION	MONTED	402740	EI 174 3
1909	UNKNUWN	•	MAKK	NUT	Ŧ	2	1934	STATION	MUNUMENTED	A42.307	
1934						2		STATION	MONUMENTED	862001	NEAK STA GATUK
1934						2		STATION	MONUMENTED	BC2001	NEAR STA GATOR
1934	GOOD					2	1926	STATION	MONUMENTED	BC1988	CRAB 2
1935	GOOD					2	1885	STATION	MONUMENTED	AQ2386	BRIDGEPORT
1935	UNKNOWN	•	MARK	NOT	F	2	1934	STATION	MONUMENTED	AQ2358	BAYARD 3
1935	UNKNOWN	-	MARK	NOT	F	2	1934	STATION	MONUMENTED	AQ2379	STREAM 2
1035	UNKNOUN		MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2367	STRAIGHT 2
1035	HNKNOUN		MARK	NOT	Ē	2	1035	STATION	MONUMENTED	402377	HICKS 2
1075		-	MADE	NOT	-	2	1075	STATION	MONUMENTED	403207	HATED 2
1935	UNKNUWN	•	MARK	NUT	r -	2	1933	STATION	MONUMENTED	N42371	WATER 2
1935	UNKNOWN	•	MARK	NOT	F	2	1935	STATION	MONUMENTED	AU2399	MUD
1935	UNKNOWN	-	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2399	MUD
1936	GOOD					2	1934	STATION	MONUMENTED	BC2183	CUCKOO RM 2
1937	GOOD					2	1935	STATION	MONUMENTED	AQ2385	STUMP
1937	GOOD					2	1935	STATION	MONUMENTED	AQ2434	COMBS
1937	GOOD					2	1935	STATION	MONUMENTED	AQ2458	PALMETTO
1037	0000					2	1035	STATION	MONUMENTED	A02458	PALMETTO
1037	6000					2	1035	STATION	MONIMENTED	A02461	GALE
1077	0000					2	1075	CTATION	MONUMENTED	A02/45	POY
1937	6000					2	1933	STATION	MONUMENTED	A4240J	DAN
1938	GUUD					2	1422	STATION	MUNUMENTED	A42400	UAN
1940	GOOD					2	1935	STATION	MONUMENTED	A42402	LAGER
1945	GOOD					2	1934	STATION	MONUMENTED	AQ2423	P 2 FLGS 1934
1945	GOOD					2	1934	STATION	MONUMENTED	AQ2423	P 2 FLGS 1934
1950	GOOD					2	1876	STATION	MONUMENTED	BC2193	REMINGTON
1950	GOOD					2	1934	STATION	MONUMENTED	BC2176	FALSE 2
1950	GOOD					2	1934	STATION	MONUMENTED	BC2180	MIDDLE 2
1950	GDOD					2	1934	STATION	MONUMENTED	BC2180	MIDDLE 2
1950	6000					2	1934	STATION	MONUMENTED	BC2195	HALLOWES
1050	UNKNOUN		MADY	NOT	E	2	1876	STATION	MONUMENTED	A07/16	UNITE 1876
1950	UNKNOWN		HANK	NOT	-	2	10/0	OTATION	MONUMENTED	A42410	AD 37
1950	UNKNOWN	•	MAKK	NUT	1 -	2	1934	STATION	MUNUMENTED	BCZZSI	AB ZI
1950	UNKNOWN	-	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ23/5	TROUT
1952	POOR					2	1934	STATION	MONUMENTED	BC2213	MULBERRY 2
1952	POOR					2	1934	STATION	MONUMENTED	BC2213	MULBERRY 2
1958	GOOD					2	1926	STATION	MONUMENTED	BC1985	BEN
1958	GOOD					2	1926	STATION	MONUMENTED	BC1999	LITTLE
1958	6000					2	1934	STATION	MONUMENTED	BC2163	HAMPTON 2
1958	GOOD					2	1934	STATION	MONUMENTED	BC2220	VENITIA
1958	GOOD					2	1934	STATION	MONUMENTED	BC2235	JULINGTON
1058	6000					2	1075	STATION	MONUMENTED	BC1000	IONES 2- IONES 7
1059	5000					2	1075	CTATION	NONUMENTED	DC1770	DDUMMONO
1050			MARI		-	2	107/	STATION	HONDRENIEU	DC2019	
1329	UNKNUWN	-	MARK	NUT	- F	۷	10/6	STATION	MUNUMENIED	802132	LA VISIA KM

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HORIZONTAL POINTS

DATE						ORD	DATE			PID	STAMPING
RECV						•	SET				- ·
1958	UNKNOWN		MARK	NOT	F	2	1926	STATION	MONUMENTED	BC1982	RADCLIFFE 2
1958	UNKNOUN	•	MARK	NOT	F	2	1926	STATION	MONUMENTED	BC1996	CREEK 2
1958	UNKNOWN	•	MARK	NOT	F	2	1926	STATION	MONUMENTED	BC1997	JACK 2
1958	UNKNOUN		MARK	NOT	F	2	1934	STATION	MONUMENTED	AQ2353	BAY
1958	UNKNOWN	•	MARK	NOT	F	2	1934	STATION	MONUMENTED	A02355	PATRICIO 2
1958	UNKNOUN		MARK	NOT	F	2	1034	STATION	MONUMENTED	BC2038	GATOR 2
1960	6000				•	2	1034	STATION	MONIMENTED	A02422	GREEN COVE 1933
1961	UNKNOUN	-	MARK	NOT	F	2	1035	STATION	MONUMENTED	402370	I INF
1963	6000		· ····		•	2	1035	STATION	MONUMENTED	A02381	OPEN
1063	0000					2	1035	CTATION	MONUMENTED	A02381	OPEN
1064						2	1063	CTATION	MONUMENTED	BC2740	JAY CAMEDA
106/						2	106/	STATION	MONUMENTED	802240	IAY CAMERA AT MY
104/						د ۲	1904	STATION	MONUMENTED	002778	JAA CAMERA AZ FIN
1044	c000					2	107/	STATION	NONUMENTED	802230	MILDERRY 2 PM 1
1704	6000					2	107/	STATION	MONUMENTED	BC2227	MULBERKIZ KM I
1904	6000					2	1934	STATION	MONUMENTED	BU2221	NULDEKKI Z KM I
1904	GOOD					2	1904	STATION	MUNUMENTED	BL2239	KAU
1907	GUUU					2	1935	STATION	MONUMENTED	AU2232	BEASLET
1968	GOOD					2	1932	STATION	MONUMENTED	BCZZZZ	SAN JOSE
1968	GOOD .					2	1934	STATION	MONUMENTED	AQ2372	HOGARTH
1968	GOOD				•	Z	1934	STATION	MONUMENTED	BC2201	VEREEN RM 1
1968	GOOD					Z	1935	STATION	MONUMENTED	AQ2221	REA
1968	GOO D					2	1950	STATION	MONUMENTED	AQ2407	RIVERDALE 2
1968	UNKNOWN	•	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2484	EDGEWATER
1969	GOOD					2	1935	STATION	MONUMENTED	AQ2238	NORWALK
1969	G000					2	1935	STATION	MONUMENTED	AQ2238	NORWALK
1969	GOOD					2	1935	STATION	MONUMENTED	AQ2491	NASHUA
1969	GOOD					2	1935	STATION	MONUMENTED	AQ2491	NASHUA
1969	UNKNOWN	-	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2498	CAMP
1969	UNKNOWN	•	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2502	HORSE
1970	GOOD					2	1935	STATION	MONUMENTED	AQ2529	RANGE
1970	POOR					2	1934	STATION	MONUMENTED	BC2188	BLACK RM 1
1971	UNKNOWN	-	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2468	SEDAN
1972						2	1972	STATION	MONUMENTED	BC1007	1295 72 A09
1972						2	1972	STATION	MONUMENTED	BC1139	195 72 A16
1972						Z	1972	STATION	MONUMENTED	BC1144	195 72 A17
1972						2	1972	STATION	MONUMENTED	BC2142	195 72 A24A
1972						2	1972	STATION	MONUMENTED	BC2143	195 72 A24
1972						Ż	UNK	STATION	MONUMENTED	BC1005	1295 72 A08
1972						2	UNK	STATION	MONUMENTED	BC1148	195 72 A18
1972	•					2	UNK	STATION	MONUMENTED	BC1152	195 72 A19
1972						2	UNK	STATION	MONUMENTED	BC1156	195 72 420
1972						2	UNK	STATION	MONUMENTED	BC1161	105 72 421
1972			•			2	UNK	STATION	MONUMENTED	BC1166	105 72 422
1072						2	UNK	STATION	MONUMENTED	PC1171	105 72 A23
1072	6000					2	1075	STATION		A02//E	ANE NUE DECET
1072	0000					2	1075	STATION	MONIMENTED	A02/2E	ONE MILE RESET
1072	6000					2	1072	STATION	MONUMENTED	A46447	1305 73 405
1072	6000					2	1072	STATION	MONUMENTED	BC1100	1290 72 AUD
1072	6000					د ۲	1077	STATION	MONUMENTED	BLITYZ	1275 (2 AUG
1077	BOOP					2	1024	STATION	MONUMENTED	BC2161	1273 12 AU4
1712	COOD					2	1920	STATION	HUNUMENTED	801994	CALDER 2
1077	0000					2	1030	STATION	MUNUMENTED	A92402	JUHN
1077	6000					2	1972	STATION	MUNUMENTED	BC1219	110 72 AZO
1313	9000					2	1972	STATION	MUNUMENTED	BC1224	110 72 A21

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HORIZONTAL POINTS

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DATE			٠	OR	DATE			PID	STAMPING
RECV				••••	SET				
1073	6000			,	1072	CTATION		801230	110 72 422
1073	6000			2	1072	CTATION	MONUMENTED	BC1230	105 72 A25
1077	6000			2	1716	STATION	MONUMENTED	001232	105 73 437
1973	GOOD			2	19/2	STATLON		BU1239	173 12 AZI
1973	GOOD			2	1972	STATION	HUNUMENTED	BU1242	195 72 A20
1973	GOOD			Z	1972	STATION	NONUMENTED	BC1244	195 72 A29
1973	GOOD			2	1972	STATION	NONUMENTED	BC1248	195 72 A30
1973	GOOD			2	1972	STATION	MONUMENTED	BC1254	195 72 A32
1973	GOOD			2	1972	STATION	MONUMENTED	BC1262	195 72·A34
1973	GOOD			2	UNK	STATION	MONUMENTED	BC1236	195 72 A26
1973	GOOD			2	UNK	STATION	MONUMENTED	BC1258	195 72 A35
1973	GOOD			2	UNK	STATION	HONUMENTED	BC1265	195 72 A33
			10)5 2					
1909	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	AQ2373	ELIZA 1876
1909	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2170	HAMPTON
1917	6000			3	1908	STATION	NONUMENTED	BC2079	BEACON 26
1017	6000			7	1000	STATION	MONUMENTED	BC2141	REACON 25
1072		MADY	NOT	5	1074	STATION	MONIMENTED	BC1075	BILIEE 2
1932	UNKNOWN -	MADE	NOT	r 3 7 7	1920	STATION	MONUMENTED	DC1973	
107	URKNUWN -	MAKK	NUT	r 3	1030	STATION	MONOMENTED	001037	
1954	GUOD			5	1926	STATION	MUNUMENTED	BL 100/	BEACON 15
1934	GOOD			3	1926	STATION	MONUMENTED	BC1972	BEACON 22
1934	GOOD			3	1926	STATION	MONUMENTED	8C2006	BEACON 50
1934	GOOD			3	1926	STATION	MONUMENTED	BC2096	BEACON 34 GRASSY PT MID GROUND
1934	600D			3	1926	STATION	MONUMENTED	BC2102	BEACON 32 GRASSY PT MID GROUND
1934	GOOD			3	1934	STATION	MONUMENTED	BC2037	GATOR
1934	POOR			3	1905	STATION	MONUMENTED	BC1971	FORT
1934	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2138	TYSON
1934	UNKNOWN -	MARK	NOT	F3	1876	STATION	MONUMENTED	BC2158	GOODSBY
1934	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2230	DOCTOR
1934	UNKNOWN -	MARK	NOT	F 3	1909	STATION	MONUMENTED	BC2075	ANHAUSER
1934	UNKNOWN -	MARK	NOT	F 3	1926	STATION	MONUMENTED	BC1981	DAME POINT
1934	UNKNOWN -	MARK	NOT	F 3	1933	STATION	MONUMENTED	BC1919	SISTER CREEK BEACON 3
1934	UNKNOWN -	MARK	NOT	F 3	1933	STATION	MONUMENTED	BC1933	TP 7
1035	6000			<u> </u>	1855	STATION	MONUMENTED	BC2042	BIGELOWS ROBERT NORTH CHIMNEY
1035	6000			र	1026	CITATION	MONUMENTED	BC2047	HAPRED LINE DM 1 & 32 83
1035	6000			ت ح	1926	CTATION	MONIMENTED	802052	REACON 56
1035	6000			7	1026	CTATION	NONIMENTED	BC205/	HAPPOD I INE DN 38
1075	6000			7	1024	STATION	MONUMENTED	802034	HADDOD LINE DN 1 D 37 87
1933	6000 ·			2	1720	STATION	MONUMENTED	BC2033	HARBOR LINE KM I D JI GI
1955	GOOD			2	1920	STATION	MUNUMENTED	BC2060	HARBUR LINE KM 1 A 54 64
1935	6000				1920	STATION	MONUMENTED	BC2065	BEACON 65
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	AQ2352	RED
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	AQ2356	PATRICIO 1876
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	NONUMENTED	AQ2364	HOGARTHS WHARF
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	AQ2365	HALE 1876
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	A92376	HICKS 1878
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	AQ2378	STREAM 1876
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	AQ2389	TOCOI 1876
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2078	JACKSONVILLE SW BASE
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2083	JACKSONVILLE NE BASE
1935	UNKNOWN -	MARK	NOT	F3	1876	STATION	MONUMENTED	BC2169	MAGNOLIA
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2177	FALSE
1935	UNKNOWN -	MARK	NOT	F 3	1876	STATION	MONUMENTED	BC2178	RAGGED

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HORIZONTAL POINTS

DATE		ORD D	ATE	PID	STAMPING
RECV		` s	ET		
					•
1935 UNKNO	WN - MARK NOT	F 3 1	876 STATION MONUNE	NTED BC2181	NIDDLE
1935 UNKNO	WN - MARK NOT	F 3 1	876 STATION MONUME	NTED BC2181	MIDDLE
1935 UNKNO	WN - MARK NOT	F 3 1	876 STATION MONUME	NTED BC2202	WRECK BEACON
1935 UNKNO	WN - MARK NOT	F 3 1	878 STATION MONUME	NTED A02357	BAYARD 2 1878
1935 UNKNO	UN - MARK NOT	F 3 1	878 STATION MONUME	NTED 402368	STRAIGHT 1878
1935 UNKNO	LIN - MARK NOT	F 7 1	878 STATION MONUME	NTED 402382	COHANZY
1935 UNKNO	UN - MARK NOT	F 3 1	878 STATION MONUME	NTED A02395	CEDAR 1878
1935 UNKNO	UN - MARK NOT	F 3 1	878 STATION MONUME	NTED 402398	WATER 1878
1935 UNKNO	UN - MARK NOT	F 3 1	878 STATION MONUME		CHAFER 1878
1935 UNKNO	UN - MARK NOT	F T 12	885 STATION MONUME	NTED 402380	DEEP 2 1885
1035 UNENO	UN - MARK NOT	53 N	RRS STATION MONUME	NTED A02420	SIMNYSIDE 1885
1035 UNKNO	UN - MARK NOT	F 3 F 7	RRS STATION MONUME	NTED A02/33	
1075 UNKNO	HAL - MARK HUL	c 3 (* c 7 1)	SPE STATION MONUME	NTED A02/35	LNETCTONE
1035 UNKNU	WH - MARK NUT	F 3 10 F 7 40	995 STATION MONUME	NTED A02/37	COUCTUL 1995
1935 UNKNU	WN - MARK NUT	F 3 14	DOD STATION MONUMER	NIEU A42437	LUWGILL 1000 TALLY 1005
1935 UNKNO	WN - MARK NUT	F 3 10	OOD STATION MONUME	NIEU A42442	
1935 UNKNU	WN - MARK NUI	r 3 4	ODD STATION MUNUME	NIEU A42447	WASHINGTON
1935 UNKNU	WN - MARK NUT	F 3 18	885 STATION MONUME	NIED AUZ449	WARNER 1885
1935 UNKNO	WN - MARK NOT	15 10	885 STATION MONUME	NIED AQ2450	HARDING
1935 UNKNU	WN - MARK NOT	+ 5 1	885 STATION MONUME	NTED AQ2454	COLE 1885
1935 UNKNO	WN - MARK NOT	F 3 14	885 STATION MONUME	NTED AQ2456	FEDERAL POINT
1935 UNKNO	WN - MARK NOT	F 5 1	885 STATION MONUME	NTED AQ2459	BOB 1885
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2511	SKELLBANK
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2512	PALAT KA POINT
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2512	PALAT KA POINT
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2513	STEVENS 1885
1935 UNKNO	WN - MARK NOT	F 5 1	885 STATION MONUME	NTED AQ2517	BOG
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2519	MUEK
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2519	MUCK
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2531	BIGHT
1935 UNKNO	WN - MARK NOT	F 5 10	885 STATION MONUME	NTED AQ2534	SOUTH END 1885
1935 UNKNO	WN - MARK NOT	F 3 1	885 STATION MONUME	NTED AQ2536	QUAKE
1935 UNKNO	WN - MARK NOT	F 5 1'	909 STATION MONUME	NTED BC2081	DAD
1935 UNKNO	WN - MARK NOT	F 3 1	935 STATION MONUME	NTED AQ2362	BAYARD POINT BEACON 56
1935 UNKNO	WN - MARK NOT	F 3 1	935 STATION MONUME	NTED AQ2388	TOCOI CUT ENTRANCE BEACON 43 A
1935 UNKNO	WN - MARK NOT	F 3 1	935 STATION MONUME	NTED AQZ392	TOCOI RED ROOFED HOUSE CHIMNEY
1935 UNKNO	WN - MARK NOT	F 3 1	935 STATION MONUME	NTED AQ2394	TOCOI CUT FRONT RANGE BCN 43
1935 UNKNO	WN - MARK NOT	F 3 1	935 STATION MONUME	NTED AQ2403	TOCOI BARN TIN ROOF WEST GABLE
1935 UNKNO	WN - MARK NOT	F 3 1	935 STATION MONUME	NTED AQ2404	TOCOI CUPOLA
1935 UNKNO	WN - MARK NOT	F 3 1	938 STATION MONUME	NTED BC2076	JACKSONVILLE TRACTION CO STACK
1936 GOOD		3 1	926 STATION MONUME	NTED BC1936	BEACON 8
1936 GOOD		3 1	926 STATION MONUME	NTED BC1944	BEACON 20
1936 GOOD		3 1	926 STATION MONUME	NTED BC1959	BEACON 17
1936 GOOD		3 1	933 STATION MONUME	NTED BC1930	WARDS BANK REAR RANGE
1936 UNKNO	WN - MARK NOT	F 3 1	853 STATION MONUME	NTED 8C1937	ST JOHNS RIVER WEST BASE
1936 UNKNO	WN - MARK NOT	F 3 1	932 STATION MONUME	NTED BC1877	ST JOHNS RIVER MI PT MID F RNG
1936 UNKNO	WN - MARK NOT	F 3 1	938 STATION MONUME	NTED AQ2518	ST JOHNS RIVER WOOD TOWER
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2216	LAKE GEORGE NORTH END BCN 98
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2222	PUTNAM 1935
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2225	HOG 1935
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2233	FERRY 1935
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2234	GATES 1935
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2236	CAMP WELAKA WATER TANK
1937 GOOD		3 1	935 STATION MONUME	NTED AQ2237	FORT GATES WATER TANK

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HORIZONTAL POINTS

DATE				•		000	DATE			DID	STANDING
DECV						UNU	CET				
RELV							361				
1077	c000					7	1075	CTATION	MONIMENTED	4072/1	DRAY 1035
1037	C000					ב ז	1075	CTATION	MONUMENTED	A02244	2701, 212941
1077	0000					ן ד	1075	CTATION	MONUMENTED	402/39	DANCEY OT BEAD BANCE DON 51
1737	6000					2	1933	STATION	MONUMENTED	A02450	NINE MILE ELAT DEAPON 40
1937	6000					2	1933	STATION	MONUMENTED	A42433	NINE MILE FLAT BEACON OU
1957	GOOD					5	1935	STATION	MONUMENTED	A42433	NINE MILE FLAI BEAGON OU
1937	GOOD					3	1935	STATION	MONUMENTED	AU2404	DANGET PI FRUNI RANGE BON 55
1937	G000					3	1935	STATION	MONUMENTED	M42487	SISIEK 1955
1937	GOOD					3	1935	STATION	MONUMENTED	AU2490	SPRING 1955
1937	GOOD					3	1935	STATION	MONUMENTED	A02499	OKE 1935
1937	G000					3	1935	STATION	MONUMENTED	A02499	OKE 1935
1937	GOOD					3	1935	STATION	MONUMENTED	AQ2500	FEMALE 1935
1937	GOO D					3	1935	STATION	MONUMENTED	AQ2501	POSSUM 1935
1937	UNKNOWN	-	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC1998	BEACON 52
1937	UNKNOWN	•	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC2003	BEACON 51
1937	UNKNOWN ·	•	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC2020	BEACON 47
1937	UNKNOWN ·	•	MARK	NOT	F	3	1935	STATION	MONUMENTED	AQ2453	BEACON 49
1938	GOOD					3	1926	STATION	MONUMENTED	BC2045	BEACON 59
1938	GOOD					3	1933	STATION	MONUMENTED	AG2526	PALATKA PUTNAM CO CTHSE FINIAL
1938	GOOD					3	1933	STATION	MONUMENTED	AQ2526	PALATKA PUTNAM CO CTHSE FINIAL
1938	GOOD					3	1935	STATION	MONUMENTED	A92488	HENION 1935
1938	GOOD					3	1935	STATION	MONUMENTED	A92527	PALATKA ST MARKS CATH CH SPIRE
1938	GOOD					3	1935	STATION	MONUMENTED	AQ2527	PALATKA ST MARKS CATH CH SPIRE
1948	GOOD					3	1935	STATION	MONUMENTED	AQ2401	NOCCASIN 1935
1948	GOOD					3	1935	STATION	MONUMENTED	AQ2401	NOCCASIN 1935
1949	GOOD					3	1935	STATION	MONUMENTED	AQ2245	WELAKA SPRINGS WATER TANK
1950	6000					3	1876	STATION	MONUMENTED	BC2196	HALLOWES WHARF HOUSE N GABLE
1950	GDOD					3	1934	STATION	MONUMENTED	AQ2421	SPIRE
1950	6000					3	1934	STATION	MONUMENTED	BC2164	GREEN COVE SPRINGS BEACON 50
1950	0000					3	1934	STATION	MONUMENTED	BC2167	MAGNOLIA POINT BEACON 46
1950	0000					3	1934	STATION	MONUMENTED	BC2184	PETER
1050	6000					3	1034	STATION	MONUMENTED	- BC2104	UTIKIES
1050	6000					र र	1034	STATION	MONUMENTED	BC2233	SCOUT
1053	6000					र	107/	STATION	MONIMENTED	An2351	PED BAY POINT REACON 54
1055	6000					7	1075	STATION	MONTENTED	A02/27	DEVILS ELPOU BEACON 72
1059	C000					ן ז	1876	STATION	MONUMENTED	BC2203	MANDADIN
1059	6000					ן ז	1070	STATION	MONUMENTED	BC2203	
1050	6000					7	10/0	STATION	MONUMENTED	BC2203	
1730	6000					3	10/0	STATION	MONUMENTED	BUZZ34	
1050	6000					2 7	1903	STATION	MONUMENTED	BC1924	ROUND POND
1930	GOOD					2	1908	STATION	MUNUMENTED	BU 1991	
1930	6000					2	1909	STATION	MUNUMENTED	802080	JACKSUNVILLE CITY WATER TOWER
1958	6000					2	1909	STATION	MONUMENTED	802088	JACKSONVILLE BAPTIST CHURCH
1958	GOOD					3	1909	STATION	MONUMENTED	BC2090	JACKSONVILLE WINDSOR HIL FLAG
1958	GOOD					5	1909	STATION	MONUMENTED	BC2109	JACKSONVILLE PRESB CH SPIRE
1958	G000					5	1909	STATION	MONUMENTED	BC2117	JACKSONVILLE ST LUKES HOSPITAL
1958	GOOD					5	1926	STATION	MONUMENTED	BC1939	EX GOV BROWARDS HSE OPEN CUP
1958	G000					5	1926	STATION	MONUMENTED	BC1941	IXA
1958	GOOD					3	1926	STATION	MONUMENTED	BC1946	MARSH 2
1958	GOOD					3	1926	STATION	MONUMENTED	BC1946	MARSH 2
1958	GOOD					3	1926	STATION	MONUMENTED	BC1947	COVE
1958	GOOD					3	1926	STATION	MONUMENTED	BC1962	WHITE SHELL 2
1958	GOOD					3	1926	STATION	MONUMENTED	BC2012	COON
1958	GOOD					3	1926	STATION	MONUMENTED	BC2016	DRUMMOND POINT
1958	GOOD					3	1926	STATION	MONUMENTED	BC2027	RANGE=BEACON 38

HORIZONTAL POINTS

DATE		ORD	DATE			PID	STAMPING
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				•			•
1958	6000	τ	1026	STATION	NOW MENTED	802028	CHASE 2
1058	6000	ž	1026	CTATION	MONTENTED	802041	BANK
1058	6000	7	1024	CTATION	MONIMENTED	BC2041	
1730	0000	3	1920	STATION	MONUMENTED	002050	ACKOUNTLE ADMOND FEDT CO. TH
1050	6000	2	1920	STATION		002057	JACKSUNVILLE ARMOUR PERI CU IK
1920	GOOD	2	1926	STATION	MONUMENTED	BC2022	BEALON 57
1958	GOOD	3	1926	STATION	MONUMENTED	BC2056	JACKSONVILLE MUN PWR PLANT STK
1958	GOOD	3	1926	STATION	NONUMENTED	BC2057	ELECTRIC
1958	GOOD	3	1926	STATION	MONUMENTED	BC2058	JACKSONVILLE E RUSSELL WKS STK
1958	GOOD	3	1926	STATION	NONUMENTED	BC2061	DRIGGS 2 RESET
1958	GOOD	3	1926	STATION	MONUMENTED	BC2067	MATTHEWS
1958	GOOD	3	1926	STATION	MONUMENTED	BC2067	MATTHEWS
1958	GOOD	3	1926	STATION	MONUMENTED	BC2073	JACKSONVILLE HWY BRIDGE R LIFT
1958	GOOD	3	1926	STATION	MONUMENTED	BC2089	JACKSONVILLE UNION WAREHSE TK
1958	6000	3	1926	STATION	NONLIMENTED	BC2091	JACKSONVILLE FORD CO WATER TK
1958	6000	- र	1926	STATION	MONUMENTED	BC2114	JACKSONVILLE CITY HALL
1050	000	7	1024	CTATION	MONUMENTED	DC2114	ACCOUNTLE CONSTRAILS DONE
1930	GOOD	2	1920	STATION	MUNUMENTED	BL2110	JACKSONVILLE COURTHOUSE DUME
1428	GOOD	<u>з</u>	1920	STATION	MONUMENTED	802118	JACKSUNVILLE ST ANDREWS CHURCH
1958	GOOD	5	1929	STATION	MONUMENTED	BC1920	FORT GEORGE IS RIBAULT CLUB TK
1958	GOOD	3	1932	STATION	MONUMENTED	BC1918	SKEET
1958	GOOD .	3	1932	STATION	MONUMENTED	BC1921	DUKE
1958	GOOD	3	1932	STATION	MONUMENTED	BC2051	JACKSONVILLE WILSON FERT CO TK
1958	GOOD	3	1932	STATION	MONUMENTED	BC2087	JACKSONVILLE GAS CO STACK
1958	GOOD	3	1932	STATION	MONUMENTED	BC2101	JACKSONVILLE PK LANE APTS CHIM
1958	GOOD	3	1932	STATION	MONUMENTED	BC2105	JACKSONVILLE IMM CONC CATH CH
1958	GOOD	3	1932	STATION	MONUMENTED	BC2110	BARNETT NATL BANK CHIM ON COR
1958	GOOD	3	1932	STATION	MONUMENTED	8C2115	JACKSONVILLE LYNCH BLDG TANK
1958	6000	3	1032	STATION	MONIMENTED	BC2125	JACKSONVILLE ICE PLANT STACK
1058	6000	z	1072	CTATION	MONUMENTED	BC2156	SAN JOSE COLE CLUB HATED TANK
1059	6000	7	4077	STATION	MONUMERIED	00105/	SAN DOSE BUEF CEUB WATER TARK
1930	6000	2	1933	STATION	MUNUMENTED	BL 1034	FUUR PINES
1920	GOOD	3	1933	STATION	MONUMENTED	BC1925	PERRT
1958	GOOD	3	1933	STATION	MONUMENTED	BC1926	SHELL
1958	GOOD	3	1934	STATION	MONUMENTED	8C2010	LOOKOUT TOWER
1958	GOOD .	3	1934	STATION	MONUMENTED	BC2094	VINCENT
1958	GOOD	3	1934	STATION	MONUMENTED	BC2139	YACHT
1958	GOOD	3	1934	STATION	MONUMENTED	BC2139	YACHT
1958	GOOD	3	1934	STATION	MONUMENTED	BC2155	BOWDEN
1958	GOOD	3	1934	STATION	MONUMENTED	BC2221	DUPONT
1958	GOOD	3	1934	STATION	MONUMENTED	BC2232	SWING
1958	GOOD	3	1954	STATION	MONUMENTED	BC1952	ST JOHNS CG RAD BEACON TOWER
1958	GOOD	3	1958	STATION	MONIMENTED	BC2206	JACKSONVILLE NAS E PADIO MAST
1958	GOOD	3	1058	STATION	MONIMENTED	BC2207	ACKSONVILLE HAS U PADIO NAST
1058	6000	ž	1058	STATION	MONUMENTED	002207	IACKSONVILLE NAS N PADIO MAST
1059	BOOR	7	1005	STATION	MONUMENTED	001077	SACKSONVILLE MAS N KADIU MASI
1050	POOR	2	1702	STATION	HUNDHENTEU	801073	SHEKMAN
1930	POOR	2	1900	STATION	MUNUMENTED	802031	PAULINE .
1420	PUUK	2	1926	STATION	HONUMENTED	BC1974	STATION L
1729	UNKNOWN - MARK NOT F	5		STATION	MONUMENTED	BC2097	BLUFF RESET
1958	UNKNOWN - MARK NOT F	3	1858	STATION	MONUMENTED	8C1856	HAYNES
1958	UNKNOWN - MARK NOT F	3	1876	STATION	MONUMENTED	BC2131	BIGHT
1958	UNKNOWN - MARK NOT F	3	1876	STATION	MONUMENTED	BC2214	MULBERRY
1958	UNKNOWN - MARK NOT F	3	1876	STATION	MONUMENTED	BC2214	MULBERRY
1958	UNKNOWN - MARK NOT F	3	1876	STATION	MONUMENTED	BC2223	PINE
1958	UNKNOWN - MARK NOT F	3	1905	STATION	MONUMENTED	BC1855	PALMER
1958	UNKNOWN - MARK NOT F	3	1905	STATION	MONUMENTED	BC1855	PALMER

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DATE					000	DATE			010	CTANDING
DECV					UKD	DATE			P10	31007100
RELV						961				
1050				-	-	1000			003010	TEACH
1920	UNKNUWN -	MARK	NUI	1	2	1908	STATION	MONUMENTED	BL2010	IEALN
1958	UNKNOWN -	MARK	NOT	F	5	1908	STATION	MONUMENTED	862080	COMMODORE A
1958	UNKNOWN -	MARK	NOT	F	3	1909	STATION	MONUMENTED	BC2095	CLUB
1958	UNKNOWN -	MARK	NOT	F	3	1924	STATION	MONUMENTED	BC1948	SOUTH JETTY
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC1869	ISLAND Z
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC1874	CEDAR
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC1963	STATION A
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC2015	VICKS
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC2049	ARMOUR
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC2062	ARLINGTON
1958	UNKNOWN -	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC2068	HARBOR LINE RM 30
1958	UNKNOWN -	MARK	NOT	F	3	1932	STATION	MONUMENTED	BC1917	BEND
1958	UNKNOWN -	MARK	NOT	F	3	1932	STATION	MONUMENTED	BC1932	POINT
1958	UNKNOWN -	MARK	NOT	F	3	1932	STATION	MONUMENTED	BC1953	PINE
1958	UNKNOWN -	MARK	NOT	F	3	1932	STATION	MONUMENTED	BC1968	JOHN
1958	UNKNOWN -	MARK	NOT	F	3	1933	STATION	MONUMENTED	BC1922	TP 5
1958	UNKNOWN -	MARK	NOT	F	3	1934	STATION	MONUMENTED	BC1925	TP 6
1958	UNKNOWN -	MARK	NOT	F	3	1934	STATION	MONUMENTED	BC1965	TP 8
1958	UNKNOUN .	MARK	NOT	F	3	1934	STATION	MONUMENTED	BC1984	FULTON 3
1958	UNKNOUN -	MARK	NOT	F	3	1934	STATION	MONUMENTED	BC2092	COCHLEY
1058	INKNOUN -	MADE	NOT	Ē	- र	1034	STATION	MONUMENTED	BC2093	GREENVOOD
1058	UNENOUN -	MADY	NOT	F	7	1034	STATION	MONUMENTED	BC2137	TYSON 2
1058	UNKNOUN .	MADY	NOT	Ē	2 Z	1034	STATION	MONUMENTED	BC2140	DUILLING DOINT REACON 25
1058	UNKNOUN -	MADE	NOT	г с	7	1034	STATION	MONUMENTED	802740	DINEY
1059		MADE	NOT	r r	7	1075	CTATION	NONUMENTED	A03747	PINEL DOINT REACON 30
1920	UNKNUWN -	MARK	NUT	۲ ب	2	1933	STATION	MUNUMENTED	A42303	ORANGE PUINT BEACON 39
1958	UNKNOWN	MARK	NOT	+	2	1935	STATION	MONUMENTED	AUCOOD	ORANGE PUINT BEALON 39
1958	UNKNOWN -	MARK	NOT	F	5	1935	STATION	MONUMENTED	802036	DUNN 2
1958	UNKNOWN	MARK	NOT	F	3	1950	STATION	MONUMENTED	BC2226	MANDARIN POINT LIGHT 29
1958	UNKNOWN -	MARK	NOT	F	3	1950	STATION	MONUMENTED	BC2226	MANDARIN POINT LIGHT 29
1958	UNKNOWN ·	MARK	NOT	F	3	1950	STATION	MONUMENTED	BC2241	ORANGE PARK LIGHT 38
1958	UNKNOWN	MARK	NOT	F	3	1950	STATION	MONUMENTED	BC2241	ORANGE PARK LIGHT 38
1960	UNKNOWN ·	MARK	NOT	F	3	1876	STATION	MONUMENTED	BC2133	LAVISTA
1966	GOOD				3	1935	STATION	MONUMENTED	BC2166	GEAR TOPO
1967	GOOD				3	1935	STATION	MONUMENTED	AQ2235	LEG 1935
1967	GOOD				3	1935	STATION	MONUMENTED	AQ2243	TURKEY 1935
1967	POOR				3	1935	STATION	MONUMENTED	AQ2240	LAW 1935
1968	GOOD				3	1934	STATION	MONUMENTED	BC2205	VEREEN
1968	GOOD				3	1935	STATION	MONUMENTED	AQ2360	PICOLATA TREE
1968	GOOD				3	1935	STATION	MONUMENTED	AQ2361	PICOLATA FLAT BEACON 37
1968	GOOD				3	1935	STATION	MONUMENTED	AQ2393	CREEK 1935
1969	G000				3		STATION	MONUMENTED	BC1853	PABLO 2
1969	G000	•			3		STATION	MONUMENTED	BC1853	PABLO 2
1970	POOR				3	1876	STATION	MONUMENTED	BC2211	BLACK POINT WHARF FLAG
1972	GOOD				3	1853	STATION	MONUMENTED	BC1955	SANDHILL 2
1972	GOOD				3	1853	STATION	MONUMENTED	BC1964	SANDHILL 3
1972	POOR				3	1935	STATION	MONUMENTED	AQ2492	CALF 1935
					-					
			2	44	3					
						403-				
1979	GOOD				1	1932	STATION	MONUMENTED	BC1588	SUMMIT
1979	GOOD				1	1932	STATION	MONUMENTED	BC1599	BERLIN
1979	GOOD				1	1932	STATION	MONUMENTED	BC2185	REMINGTON 2
1979	GOOD				1	1963	STATION	MONUMENTED	BC2004	BERLIN RM A

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DATE						000	DATE			210	STANDING
PECV							CET			F 10	51771 FRG
NEC V						-	JC I				
							4077				
1981	GOOD					1	1955	STATION	MONUMENTED	A42473	SAN MATEU
1981	G000					1	1933	STATION	MONUMENTED	AQ2497	RODMAN RESET
1981	POOR					1	1933	STATION	NONUMENTED	AQ2443	PERRIN
1983	GOOD					1	1926	STATION	MONUMENTED	BC2113	GRAHAM
1985	GOOD					1	1933	STATION	NONUMENTED	AQ2507	BOSTWICK RESET
1990	GOOD					1	1964	STATION	HONUMENTED	BC0392	YORK
1990	G000					1	1964	STATION	MONUMENTED	BC0392	YORK
1991	UNKNOWN	•	MARK	NOT	F	1	1932	STATION	MONUMENTED	BC0259	DUVAL SOUTH BASE
					•	•		••••••			
					12	1					
						•					
1073	UNKNOUN	-	MADY	NOT	E	2	107/	CTATION	MONIMENTED	802135	
1077		_	MADY	NOT	r e	2	407/	STATION	MONUMENTED	802100	IONES
1973		-	MARK	NOT		2	1734	STATION	HUNUNENTED	802177	
19/3	UNKNUWN	•	MAKK	NUI	r	2	1934	STATION	MUNUMENTED	BU2211	BULKLET Z
1975	UNKNOWN	•	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQZSBI	OLD MARK USE 1935
1975	UNKNOWN	•	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2387	OLD MARK USE 1935
1976	GOOD					2	1934	STATION	MONUMENTED	BC2134	PHILLIPS
1976	GOOD					2	1934	STATION	MONUMENTED	BC2179	FRUIT
1976	UNKNOWN	-	MARK	NOT	F	2	1935	STATION	MONUMENTED	AQ2452	ARTHUR
1977	GOOD					2	1963	STATION	MONUMENTED	BC0394	MULBERRY CAMERA 1381 GSS
1977	GOOD					2	1963	STATION	MONUMENTED	BC0394	MULBERRY CAMERA 1381 GSS
1978	6000					2	1034	STATION	MONIMENTED	BC2204	OLIVE RM 1
1078	6000					2	103/	CTATION	MONIMENTED	BC2204	OLIVE PN 1
1079	0000					5	4073	CTATION	MONUMENTED	BC1017	1305 73 410
17/0	6000					2	1972	STATION	HUNDHENIED	BL 1013	1293 72 ATU
1978	GUUU					2	1972	STATION	MONUMENTED	BC1017	1295 72 ATT
1978	GOOD					2	1972	STATION	MONUMENTED	BC1252	195 72 A31
1978	GOOD					2	UNK	STATION	NONUMENTED	BC1196	1295 72 A07
1979	GOOD					2	1876	STATION	MONUMENTED	AQ2419	SAPPHO 1876
1979	GOOD					2	1926	STATION	MONUMENTED	BC1960	ST JOHNS LIGHT
1979	6000					2	1935	STATION	MONUMENTED	AQ2428	SUN
1979	GOOD					2	1935	STATION	MONUMENTED	AQ2451	KEPLAR
1979	GOOD					2	1935	STATION	MONUMENTED	AQ2510	HARRY
1979	GOOD					2	1935	STATION	MONUMENTED	AQ2520	WAR
1979	6000					2	1935	STATION	MONUMENTED	402537	RICE
1979	UNKNOWN		MARK	NOT	F	2	1035	STATION	NONIMENTED	A02413	PASTIME 2
1081	6000				•	2	1000	STATION	MONIMENTED	A024/1	HADT 1985
1091	0000					2	107/	STATION	MONUMENTED	DC7140	
1701	0000					2	1934	STATION	MONUMENTED	BL2 100	MAGNULIA Z
1901	GUUU				-	2	1908	STATION	MONUMENTED	A42400	BRUWNS RESET
1981	UNKNOWN	•	MARK	NOI	ł	2	1935	STATION	MONUMENTED	AQ2440	OGLESBY
1981	UNKNOWN	-	MARK	NOT	F	Z	1935	STATION	MONUMENTED	AQ2440	OGLESBY
1985	GOOD					2	1935	STATION	MONUMENTED	AQ1775	WELAKA
1985	GOOD .					2	1935	STATION	MONUMENTED	AQ2391	NINE MILE POINT
1985	GOOD					2	1935	STATION	MONUMENTED	AQ2391	NINE MILE POINT
1986	GOO D					2	1934	STATION	MONUMENTED	AQ2374	SOWELL
1987	GOOD					2	1934	STATION	MONUMENTED	AQ2424	P 37 FLGS 1934
1987	GOOD					2	1934	STATION	MONUMENTED	AQ2424	P 37 FLGS 1934
1987	G000					2	1934	STATION	MONUMENTED	A07475	P 1 FLGS 1034
1987	6000					2	107/	STATION	MONIMENTED	402/25	D 1 FLCS 1034
1088	0000					2	1075	STATION	MONIMENTED	403/11	τ (ΓLU3 1734 Μεάλ
1020	000					2	107/	CTATION	MONUMENTED	407750	COVE
1007	000					2	1734	STATION CTATION	MONUMENTED	R42339	
1707						2	1934	STATION	PUNUMENTED	802107	CUAL
1989	GUUU					2	1935	STATION	MONUMENTED	AQ2436	COW
1989	good .					2	1935	STATION	MONUMENTED	AQ2509	CITY

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DATE				·		ORD	DATE			PID	STAMPING
RECV							SET				
1989	UNKNOWN	•	MARK	NOT	F	2	1935	STATION	NONUMENTED	AQ2506	BRANT
1990	GOOD					2	1935	STATION	MONUMENTED	AQ2371	CLARK
1990	LINKNOUN		MARY	NOT	F	2	1878	STATION	NONLIMENTED	402384	RACY PT USE STA REE PIPE 1878
1000	UNYNOUN		MADY	NOT		2	1035	STATION	NONUMENTED	A02410	SHIP
1001	0000		MULT	NUI	r	2	1733	CTATION	MONUMENTED	A02204	CNAVE
1771	GOOD					2	1932	STATION	MONUMENTED	A42370	JRANC ULBERNIA 2 DM 1
1331	UNKNUWN	•	MAKK	NUI	ł	2	1934	STATION	HUNUMENTED	BC2 109	NIDEKNIA Z KM I
					48	Z					
1973	UNKNOWN	•	MARK	NOT	F	3	1934	STATION	MONUMENTED	BC2215	BUCKLEY RM 2
1973	UNKNOWN	-	MARK	NOT	F	3	1952	STATION	MONUMENTED	BC2228	MULBERRY 3
1973	UNKNOWN	•	MARK	NOT	F	3	1952	STATION	MONUMENTED	BC2228	MULBERRY 3
1974	GOOD					3	1876	STATION	NONUMENTED	BC2099	LANCASTER
1975	GOOD					3	1926	STATION	MONUMENTED	BC1929	BEACON 4
1976	6000					3	1876	STATION	MONUMENTED	BC2175	MOORE
1076	0000					τ	1876	STATION	MONUMENTED	BC2175	NOORE
1076	0000					2 7	1076	STATION	MONUMENTED	BC2035	
1770	6000					7	1075	CTATION	MONUMENTED	407578	
19/0	6000					2	1933	STATION	MONUMENTED	NU2330	SAUBLE 1005
1977	GUUD					3	1932	STATION	MUNUMENTED	BC 1943	
1978	GOOD					3	1926	STATION	MONUMENTED	BC18/1	MILE POINT
1978	GOOD					3	1926	STATION	MONUMENTED	BC1871	NILE POINT
1978	GOOD					3	1926	STATION	MONUMENTED	BC1938	NORTH JETTY
1978	GOOD					3	1926	STATION	NONUMENTED	BC1938	NORTH JETTY
1978	UNKNOWN	-	MARK	NOT	F	3	1926	STATION	MONUMENTED	BC1927	VII
1979	GOOD					3	1934	STATION	MONUMENTED	AQ2417	WHITE 2 RESET
1979	G000					3	1934	STATION	MONUMENTED	BC2162	BRIDGE
1979	GOOD					3	1935	STATION	MONUMENTED	AQ2412	DALE 1935
1979	GOOD					3	1935	STATION	MONUMENTED	AQ2457	FEDERAL 1935
1070	6000					- 3	1054	STATION	MONUMENTED	RC1973	ST JOHNS LIGHTHOUSE
1070		-	MADY	NOT	E	z	1050	STATION	MONUMENTED	BC2171	PACEED POINT LIGHT 40
1090	6000		TING	NOT	'	7	1075	STATION	MONUMENTER	BC2123	AMERICAN ACRICHT CHEM CO TANK
1001	0000					7	1075	STATION	MONUMENTED	401750	AREKICAN AGRIEDET ONEN CO TANK
1901	0000					2	1933	STATION	MONUMENTED	AQ1750	DINL CAN DATALOLO DENCON 75
1901	6000					2	1933	STATION	MONUMENTED	A42374	SAN PATRICIU BEALON 35
1981	GOOD					3	1935	STATION	MONUMENTED	AQ2482	SAN MATEO BEACON 76
1981	GOOD					3	1935	STATION	MONUMENTED	AQZ495	SHDE 1935
1981	GOOD					3	1978	STATION	MONUMENTED	AQ2559	BOSTWICK AZ MK 2
1982	UNKNOWN	-	MARK	NOT	F	3	1935	STATION	MONUMENTED	AQ2448	LOWER PALATKA BEACON 68
1983	GOOD					3	1935	STATION	MONUMENTED	AQ2503	MORSE LANDING BEACON 63
1983	GOOD					3	1935	STATION	MONUMENTED	AQ2503	MORSE LANDING BEACON 63
1983	GOOD					3	1935	STATION	MONUMENTED	BC205₽	HUE
1983	GOOD					3	1935	STATION	MONUMENTED	BC2059	MUR
1983	UNKNOWN	-	MARK	NOT	F	3	1958	STATION	MONUMENTED	802064	BIGELOW
1985	G000					3	1853	STATION	MONUMENTED	BC1926	ST JOHNS RIVER EAST BASE
1985	6000					3	1937	STATION	NONUMENTED	A02242	WELAKA FIRE TOWER
1085	0000					3	1050	STATION	MONIMENTED	RC2107	NEU SUITZERIAND DOINT I TONT 31
1085	6000					7	1050	STATION	MONUMENTED	BC2197	NEL CUITZEDIAND DOINT ITCUT 71
100/	C000					7	1000	STATION		A03/47	NUMBER 1095
1900	0000					2 7	1002	STATION	MONUMENTED	AUZ4D/	
1987	6000					ა •	1935	STATION	MONUMENTED	AU2444	FURRESTER POINT BEACON 51 A
1987	G000					5	1935	STATION	MONUMENTED	AQ2480	ASH 1935
1987	G000					3	1935	STATION	MONUMENTED	AQ2514	FORRESTER PT LOW RNG BCN 62 R
1987	GOOD					3	1935	STATION	MONUMENTED	AQ2523	FORRESTER PT MID RNG BCN 64 F
1987	GOOD					3	1935	STATION	MONUMENTED	AQ2525	FORRESTER PT UP RNG BCN 66 F
1987	GOOD					3	1935	STATION	MONUMENTED	402528	FORRESTER PT LOW RNG BCN 62 F

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HORIZONTAL POINTS

DATE			ORD	DATE			PID	STAMPING
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4007			_					
1987	GOOD		3	1935	STATION	MONUMENTED	AQ2530	FORRESTER PT UP RNG BCN 66 R
1987	GOOD		3	1935	STATION	MONUMENTED	AQ2532	FORRESTER PT MID RNG BCN 64 R
1988	UNKNOWN - MARK I	NOT F	3	1908	STATION	MONUMENTED	BC2072	MERRILL
1988	UNKNOWN - MARK I	NOT F	3	1908	STATION	NONUMENTED	BC2072	MERRILL
1989	G000 ·		3	1933	STATION	MONUMENTED	AQ2432	PALATKA W TRANSMISSION TOWER
1989	G000		3	1933	STATION	NONUMENTED	AQ2432	PALATKA W TRANSMISSION TOWER
1989	GOOD		3	1933	STATION	MONUMENTED	AQ2439	PALATKA E TRANSMISSION TOWER
1989	GOOD		3	1933	STATION	MONUMENTED	AQ2439	PALATKA E TRANSMISSION TOWER
1989	GOOD		3	1933	STATION	NONUMENTED	AQ2508	PALATKA MUNICIPAL STANDPIPE
1989	G000		3	1933	STATION	MONUMENTED	AQ2508	PALATKA MUNICIPAL STANDPIPE
1989	GOOD		3	1933	STATION	MONUMENTED	AQ2533	PALATKA BETHEL AME CH SPIRE
1989	G000		3	1933	STATION	MONUMENTED	AQ2533	PALATKA BETHEL AME CH SPIRE
1989	G000		3	1935	STATION	MONUMENTED	AQ2481	MAT 1935
1989	GOOD		3	1935	STATION	MONUMENTED	AQ2481	MAT 1935
1989	GOOD		3	1935	STATION	NONLINENTED	A02516	PALATKA PRESS CLOCK TOWER
1989	GOOD		3	1935	STATION	MONUMENTED	A02516	PALATKA PRESS CLOCK TOWER
1989	GOOD		3	1935	STATION	MONUMENTED	A02535	PALATKA FMANUFL ME CH SPIRE
1989	6000		2	1035	STATION	MONUMENTED	A02535	PALATYA EMANISI NE CH SDIDE
1980	POOR		z	1035	STATION .	MONIMENTED	AD2446	HODED DAI ATYA BEACON 70
1000	LINKNOUN - MADY N	NOT E	2 7	103/	STATION	MONUMENTED	BC1080	FULTON 2
1000	UNKNOUN - MADY I		- z	1075	STATION	MONUMENTED	A02/04	BACY DT CUT EDONT DANCE DON /7
1000	UNKNOWN - MARK P		3	1733	STATION	NONUMENTED	A42400	RACI PI LUI FRONI RANGE BUN 47
1770	UNKNOWN - MARK P	NUT F	2	1937	STATION	MUNUMENTED	AU2400	RALT PI CUI REAR RANGE BUN 45
1990	UNKNOWN - MARK I	1 100	2	1935	STATION	MONUMENTED	BC2187	ELIZ TOPO
1991	GOOD		5	1909	STATION	MONUMENTED	BCZ084	JACKSONVILLE AME CHURCH
1991	UNKNOWN - MARK N	NOT F	3	1876	STATION	MONUMENTED	BC2190	HIBERNIA
1991	UNKNOWN - MARK M	NOT F	3	1950	STATION	MONUMENTED	BC2165	HIBERNIA DAY BEACON 44

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HORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET			RECV					0
•		· ·	DATE			DATE					
1		ST JOHNS	1908	STATION	MONUMENTED	1036	6000				1
1	DUVAL	BM 1	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	1
1	DUVAL	SUMM I T	1932	STATION	MONUMENTED	1979	GDOD			•	'n
1	DUVAL	NEAR STA GATOR		STATION	MONUMENTED	1934					2
1	DUVAL	NEAR STA GATOR		STATION	MONUMENTED	1934					2
1	DUVAL	LITTLE	1926	STATION	MONUMENTED	1958	GOOD				2
1	DUVAL	CREEK 2	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	2
1	DUVAL	JACK 2	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	2
1	DUVAL	RADCLIFFE 2	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	2
1	DUVAL	CALDER 2	1926	STATION	MONUMENTED	1972	POOR				2
1	DUVAL	ST JOHNS LIGHT	1926	STATION	MONUMENTED	1979	GOOD				2
1	DUVAL	GATOR 2	1934	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	2
1	DUVAL	PABLO 2		STATION	MONUMENTED	1969	GOOD				3
1	DUVAL	PABLO 2		STATION	MONUMENTED	1969	GOOD				3
1	DUVAL	ST JOHNS RIVER WEST BASE	1853	STATION	MONUMENTED	1936	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	SANDHILL 2	1853	STATION	MONUMENTED	1972	GOOD				3
1	DUVAL	SANDHILL 3	1853	STATION	MONUMENTED	1972	GOOD				3
1	DUVAL	ST JOHNS RIVER EAST BASE	1853	STATION	MONUMENTED	1985	6000				3
1	DUVAL	PINE ISLAND	1858	STATION	MONUMENTED	1933	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	HAYNES	1858	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	FORT	1905	STATION	MONUMENTED '	1934	POOR				3
1	DUVAL	ROUND POND	1905	STATION	MONUMENTED	1958	GOOD				3
1	DUVAL	SHERMAN	1905	STATION	MONUMENTED	1958	POOR				3
1	DUVAL	PALMER	1905	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	PALMER	1905	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	TEACH	1908	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	SOUTH JETTY	1924	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	BLUFF 2	1926	STATION	MONUMENTED	1932	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	BEACON 13	1926	STATION	MONUMENTED	1934	GOOD				3
1	DUVAL	BEACON 22	1926	STATION	MONUMENTED	1934	GOOD				3
1	DUVAL	BEACON 17	1926	STATION	MONUMENTED	1936	GOOD				3
1	DUVAL	BEACON 20	1926	STATION	MONUMENTED	1936	GOOD				3
1	DUVAL	BEACON 8	1926	STATION	MONUMENTED	1936	GOOD				3
1	DUVAL	COON	1926	STATION	MONUMENTED	,1958	GOOD				3
. 1	DUVAL	COVE	1926	STATION	MONUMENTED	1958	GOOD				3
1	DUVAL	EX GOV BROWARDS HSE OPEN CUP	1926	STATION	MONUMENTED	1958	GOOD				3
1	DUVAL	IXA	1926	STATION	MONUMENTED	1958	GOOD				3
1	DUVAL	MARSH 2	1926	STATION	MONUMENTED	1958	GOOD				3
1	DUVAL	MARSH 2	1926	STATION	MONUMENTED	1958	6000				3
1	DUVAL	WHITE SHELL 2	1926	STATION	MONUMENTED	1958	GOOD				3
1	DUVAL	STATION L	1926	STATION	MONUMENTED	1958	POOR				3
1	DUVAL	CEDAR	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	ISLAND 2	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	STATION A	1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL		1926	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
1	DUVAL	BEALUN 4	1926	STATION	MONUMENTED	1975	G000				3
t •		RILE PUINI	1926	STATION	MONUMENTED	1978	6000				3
1	DUVAL	NIC FUINI Nootu ietty	1926	STATION	MONUMENTED	19/8	6000				5
1	DUVAL	NORTH JEITTY	1920	STATION	MONUMENTED	1970	6000				5
	DUVAL	NONIN VETT	1024	STATION	MONUMENTED	19/0				-	د 7
1	DUVAI	FORT GEORGE IS RIPAILT CHUR TV	1020	STATION		19/0	COOP	MAKK	NUT	r	כ 7
1	DUVAL	ST JOHNS DIVED MI DT MIN E DNO	1072	STATION		1074		MADY	NOT	F	נ ד
•		RAU	1722	PINITON	NUMBERIEU	1730	OUVUAN .	MARK		r	c

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RE	COUNTY	DESIGNATION	SET	RECV 0
			DATE	DATE
1	DUVAL	DUKE	1932 STATION MONUMENTED	1958 GOOD 3
1	DUVAL	SKEET	1932 STATION MONUMENTED	1958.GOOD 3
1	DUVAL	BEND	1932 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	ЛОНИ	1932 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	PINE	1932 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	POINT	1932 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	CLIFF	1932 STATION MONUMENTED	1977 GOOD 3
1	DUVAL	SISTER CREEK BEACON 3	1933 STATION MONUMENTED	1934 UNKNOWN - MARK NOT F 3
1	DUVAL	TP 7	1933 STATION MONUMENTED	1934 UNKNOWN - MARK NOT F 3
1	DUVAL	WARDS BANK REAR RANGE	1933 STATION MONUMENTED	1936 GOOD 3
1	DUVAL	FOUR PINES	1933 STATION MONUMENTED	1958 GOOD 3
1	DUVAL	PERRY	1933 STATION MONUMENTED	1958 GOOD 3
1	DUVAL	SHELL	1933 STATION MONUMENTED	1958 GOOD 3
1	DUVAL	TP 5	1933 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	GATOR	1934 STATION MONUMENTED	1934 GOOD 3
1	DUVAL	LOOKOUT TOWER	1934 STATION MONUMENTED	1958 GOOD 3
1	DUVAL	FULTON 3	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NCT F 3
1	DUVAL	TP 6	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	TP 8	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F 3
1	DUVAL	FULTON 2	1934 STATION MONUMENTED	1990 UNKNOWN - MARK NOT F 3
1	DUVAL	ST JOHNS CG RAD BEACON TOWER	1954 STATION MONUMENTED	1958 GOOD 3
1	DUVAL	ST JOHNS LIGHTHOUSE	1954 STATION MONUMENTED	1979 GOOD 3

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RE	COUNTY	DESIGNATION	SET			RECV				(0
		۴	DATE			DATE					
2	DUVAL	MITCHELL	1926	STATION	MONUMENTED	1958	GOOD				1
2	DUVAL	MITCHELL	1926	STATION	MONUMENTED	1958	GOOD				1
2	DUVAL	BERLIN	1932	STATION	MONUMENTED	1979	G000				1
2	DUVAL	DUVAL SOUTH BASE	1932	STATION	MONUMENTED	19 91	UNKNOWN -	MARK	NOT	F	1
2	DUVAL	BERLIN RM A	1963	STATION	NONUMENTED	1979	GOOD				1
2	DUVAL	CRAB 2	1926	STATION	MONUMENTED	1934	GOOD			;	2
2	DUVAL	BEN	1926	STATION	MONUMENTED	1958	GOOD			2	2
2	DUVAL	DRUMMOND	1935	STATION	MONUMENTED	1958	GOOD			į	2
2	DUVAL	JONES 2=JONES 3	1935	STATION	MONUMENTED	1958	GOOD			į	2
2	DUVAL	195 72 A24A	1972	STATION	NONUMENTED	1972				;	2
2	DUVAL	195 72 A25	1972	STATION	MONUMENTED	1973	GOOD			i	2
2	DUVAL	195 72 A27	1972	STATION	HONUMENTED	1973	GOOD			1	2
2	DUVAL	195 72 A28	1972	STATION	MONUMENTED	1973	GOOD			;	2
2	DUVAL	195 72 A29	1972	STATION	MONUMENTED	1973	G000			÷	2
2	DUVAL	195 72 A30	1972	STATION	MONUMENTED	1973	G000			-	2
2	DUVAL	195 72 A32	1972	STATION	MONUMENTED	1973	GOOD			-	2
2	DUVAL	195 72 A34	1972	STATION	MONUMENTED	1973	GOOD				2
2	DUVAL	195 72 A31	1972	STATION	MONUMENTED	1978	6000				2
2	DUVAL	195 72 426	LINK	STATION	MONUMENTED	1973	6000				2
2	DUVAL	195 72 433	LINK	STATION	MONIMENTED	1073	6000				2
2	DUMAI	105 72 435	INF	CTATION	MONIMENTED	1073	6000				2
2	DIRVAL	BIGELOUS BODEDT NODTH CHIMNEY	1955	STATION	MONUMENTED	1075	0000				27
2		ACKCONVILLE NE BACE	1074	STATION	MONUMENTED	1735	GOUD .	MADIC	NOT		2 7
2	DIRVAL	JACKSUNVILLE WE BASE	10/0	STATION	MONUMENTED	1933	UNKNUWN ·	MAKK	NOI	۲.	2 7
2	DUVAL		1908	STATION	MUNUMENTED	1920	6000				د -
2	DUVAL	PAULINE	1908	STATION	MONUMENTED	1958	POOR			-	3
2	DUVAL	JACKSONVILLE CITY WATER TOWER	1909	STATION	MONUMENTED	1958	GOOD				3
2	DUVAL	BEACON 50	1926	STATION	MONUMENTED	1934	GOOD				3
2	DUVAL	DAME POINT	1926	STATION	MONUMENTED	1934	UNKNOWN -	MARK	NOT	F :	3
Z	DUVAL	BEACON 56	1926	STATION	MONUMENTED	1935	good				3
Z	DUVAL	BEACON 63	1926	STATION	MONUMENTED	1935	GOOD				3
2	DUVAL	HARBER LINE RM 1 A 32 83	1926	STATION	MONUMENTED	1935	GOOD				3
2	DUVAL	HARBOR LINE RM 1 A 34 84	1926	STATION	MONUMENTED	1935	GOOD				3
2	DUVAL	HARBOR LINE RM 1 B 37 87	1926	STATION	MONUMENTED	1935	GOOD				3
2	DUVAL	HARBOR LINE RM 38	1926	STATION	MONUMENTED	1935	GOOD				3
2	DUVAL	BEACON 47	1926	STATION	MONUMENTED	1937	UNKNOWN -	MARK	NOT	F D	3
2	DUVAL	BEACON 51	1926	STATION	MONUMENTED	1937	UNKNOWN -	MARK	NOT	F 3	3
2	DUVAL	BEACON 52	1926	STATION	MONUMENTED	1937	UNKNOWN -	MARK	NOT	F 🕽	3
2	DUVAL	BEACON 59	1926	STATION	MONUMENTED	1938	GOOD			:	3
2	DUVAL	BANK	1926	STATION	MONUMENTED	1958	GOOD			:	3
2	DUVAL	BEACON 57	1926	STATION	MONUMENTED	1958	GOOD			-	3
2	DUVAL	CHASE 2	1926	STATION	MONUMENTED	1958	GOOD				3
2	DUVAL	DRIGGS 2 RESET	1926	STATION	MONUMENTED	1958	6000			-	3
2	DUVAL	DRUMMOND POINT	1926	STATION	MONUMENTED	1958	6000				ž
2	DUVAL	ELECTRIC	1926	STATION	MONUMENTED	1958	6000				2 7
2	DUVAL	FLORAL	1026	STATION	MONUMENTED	1058	6000				2 7
2	DUVAL	JACKSONVILLE ARMOUR FERT CO TK	1026	STATION	MONIMENTED	1058	6000			•	7
2	DUVAL	JACKSONVILLE F RUSSELL UKS STK	1026	STATION	MONUMENTED	1058	6000				7
2	DUVAL	JACKSONVILLE MUN PUR DIANT STY	1074	STATION	MONTENER	105.9	6000			•	ר ג
2	DUVAL	PANCE-REACON 38	1024	CTATION	MONUMENTED	1050	0000			-	כ ד
2	DUVAL		1920	STATION	MONUMENTED	1720		MARY			3
5	DIIVAL		1920	STATION	MONUMENTED	1920	UNKNUWN	MARK	NUT	1	د -
5		I AND CODNED	1920	STATION	MONUMENTED	1428	UNKNOWN -	MARK	NOT	F	ک ~
2	DUNAL		1926	STATION	MUNUMENTED	1976	6000				5
6	DUVAL	JAUKSUNVILLE ILE PLANT STACK	1932	STATION	MONUMENTED	1958	GOOD				3

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HORIZONTAL POINTS

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RE	COUNTY	DESIGNĄTION	SET DATE			RECV DATE				l	0
2	DUVAL	JACKSONVILLE WILSON FERT CO TK	1932	STATION	MONUMENTED	1958	GOOD				3
2	DUVAL	DUNN 2	1935	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
2	DUVAL	AMERICAN AGRICULT CHEM CO TANK	1935	STATION	NONUMENTED	1980	GOOD			:	3
2	DUVAL	MUN	1935	STATION	NONUMENTED	1983	GOOD			:	3
2	DUVAL	MUN	1935	STATION	MONUMENTED	1983	G000				3
2	DUVAL	BIGELOW	1958	STATION	MONUMENTED	1983	UNKNOWN -	MARK	NOT	F	3

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RE	COUNTY	DESIGNATION	SET			RECV					ſ	0
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3	DUVAL	LANCASTER 2	1909	STATION	MONUMENTED	1958	GOOD					1
3	DUVAL	UNION	1917	STATION	NONUMENTED	1958	GOOD					1
3	DUVAL	SPUR	1917	STATION	MONUMENTED	1958	UNKNOWN	MA	RK N	TO	F 1	1
3	DUVAL .	GRAHAM	1926	STATION	MONUMENTED	1983	GOOD					1
3	DUVAL	YORK	1964	STATION	NONUMENTED	1990	GOOD				,	1
3	DUVAL	YORK	1964	STATION	MONUMENTED	1990	6000				4	1
3	DUVAL	LA VISTA RM	1876	STATION	NONUMENTED	1958	UNKNOWN	MA	RK N	IOT	F 7	2
3	DUVAL	SAN JOSE	1932	STATION	MONUMENTED	1968	GOOD				;	2
3	DUVAL	VENITIA	1934	STATION	NONUMENTED	1958	GOOD				;	2
3	DUVAL	US HARBOR MON UA U 681 23	1934	STATION	MONUMENTED	1973	UNKNOWN	MA	RK N	IOT	F 7	2
3	DUVAL	PHILLIPS	1934	STATION	MONUMENTED	1976	G000				7	2
3	DUVAL	COAL	1934	STATION	MONUMENTED	1989	GOOD				;	2
3	DUVAL	JAX CAMERA	1963	STATION	MONUMENTED	1964					;	2
3	DUVAL	MULBERRY CAMERA 1381 GSS	1963	STATION	MONUMENTED	1977	GOOD				;	2
3	DUVAL	HULBERRY CAMERA 1381 GSS	1963	STATION	MONUMENTED	1977	GOOD				;	2
3	DUVAL	JAX CAMERA AZ MK	1964	STATION	MONUMENTED	1964					;	2
3	DUVAL	JAX CAMERA RM 1	1964	STATION	MONUMENTED	1964					;	2
3	DUVAL	RAD	1964	STATION	MONUMENTED	1964	GOOD				;	2
3	DUVAL	195 72 A17	1972	STATION	MONUMENTED	1972					;	2
3	DUVAL	195 72 A24	1972	STATION	MONUMENTED	1972					7	z
3	DUVAL	110 72 A20	1972	STATION	MONUMENTED '	1973	GOOD				7	2
3	DUVAL	110 72 A21	1972	STATION	MONUMENTED	1973	GOOD				1	2
3	DUVAL	110 72 A22	1972	STATION	MONUMENTED	1973	GOOD				:	2
3	DUVAL	195 72 A18	UNK	STATION	MONUMENTED	1972					;	2
3	DUVAL	195 72 A19	UNK	STATION	MONUMENTED	1972			•		;	2
3	DUVAL	195 72 A20	UNK	STATION	MONUMENTED	1972					7	2
3	DUVAL	195 72 A21	UNK	STATION	MONUMENTED	1972					-	2
3	DUVAL	195 72 A22	UNK	STATION	MONUMENTED	1972					-	2
3	DUVAL	195 72 A23	UNK	STATION	MONUMENTED	1972					-	>
3	DUVAL	BLUFF RESET	•	STATION	MONUMENTED	1958		MA	RK N	тот	F 7	- र
3	DUVAL	TYSON	1876	STATION	MONUMENTED	1934	UNKNOWN ·	MA	RKN	ют	F 7	3
3	DUVAL	JACKSONVILLE SW BASE	1876	STATION	MONUMENTED	1935	UNKNOUN .	MA	RK N	101	F 7	z
3	DUVAL	BIGHT	1876	STATION	MONUMENTED	1958	UNKNOWN .	MA	RK N		F 7	ł,
3	DUVAL	PINE	1876	STATION	MONUMENTED	1958	UNKNOWN -	MA	RK N	INT	F 7	ż
3	DUVAL	LAVISTA	1876	STATION	MONUMENTED	1960	LINKNOUN .	MA	DK N		F 7	ż
3	DUVAL	LANCASTER	1876	STATION	MONUMENTED	1974	6000					ź
3	DUVAL	BEACON 26	1008	STATION	MONUMENTED	1017	6000				7	z
3	DUVAL	COMMODORE A	1008	STATION	MONUMENTED	1058	UNKNOUN -	MA	PK N	INT	F 7	ź
3	DUVAL	MERTIL	1008	STATION	MONIMENTED	1988	UNKNOUN -	MA	PK N		F 7	z
3	DUVAL	MERSILL	1008	STATION	MONUMENTED	1988	UNKNOUN .	- MA	PK N	INT	e 7	ž
3	DUVAL	BEACON 25	1000	STATION	MONUMENTED	1017	- COOD	1.144	~~ ~			z
3	DUVAL	ANHAUSER	1000	STATION	MONUMENTED	1034	HNKNOLN .	MA	PK N	INT	E 7	z
3	DUVAL	DAD	1000	STATION	MONUMENTED	1035	LINKNOUN .	MA		107	r	, z
3	DUVAL	JACKSONVILLE RAPTIST CHURCH	1000	STATION	MONUMENTED	1058	COOD		~~ "		r 2 7	2 2
3	DUVAL	JACKSONVILLE PRESE CH SPIDE	1000	STATION	MONUMENTED	1058	6000				-	, 7
3	DUVAL	JACKSONVILLE ST LIKES HOSDITAL	1000	STATION	MONUMENTED	1059	6000					J Z
3	DUVAL	JACKSONVILLE WINDSOR HTL FLAG	1000	STATION	MONIMENTED	1059	6000				-	z
3	DUVAL	CIUR	1000	STATION	MONUMENTED	1059	UNKNOUN -	-	0Y 1	INT	2	ז ז
ž	DUVAL	JACKSONVILLE AME CHURCH	1000	STATION	MONUMENTED	1001	COOD .	MP	nn N		r 2 	י ז
3	DUVAL	BEACON 32 GRASSY PT MID CROWND	1074	STATION		107/	6000				2	י z
3	DUVAL	REACON 34 GRASSY PT MID GROUND	1024	STATION STATION	MONIMENTED	107/	6000				-	J Z
3	DUVAL	JACKSONVILLE CITY HALF	1024	STATION	MONIMENTED	1059	6000				2	y z
7	DUVAL	JACKSONVILLE CONDITIONSE DOME	1920	STATION	MONUMENTED	1720	6000				-	2 2
-		ANALONATIELE COONTHOUSE DOWE	1720	STAILON	MUNUMENIEU	(3)0	GUUU					כ

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HORIZONTAL POINTS

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RE	COUNTY	DESIGNATION	SET DATE	RECV Date	0
3	DUVAL	JACKSONVILLE FORD CO WATER TK	1926 STATION NONUMENTED	1958 6000	3
3	DUVAL	JACKSONVILLE HWY BRIDGE R LIFT	1926 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	JACKSONVILLE ST ANDREWS CHURCH	1926 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	JACKSONVILLE UNION WAREHSE TK	1926 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	MATTHEWS	1926 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	MATTHEWS	1926 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	HARBOR LINE RM 30	1926 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F	3
3	DUVAL	BARNETT NATL BANK CHIM ON COR	1932 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	JACKSONVILLE GAS CO STACK	1932 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	JACKSONVILLE IMM CONC CATH CH	1932 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	JACKSONVILLE LYNCH BLDG TANK	1932 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	JACKSONVILLE PK LANE APTS CHIM	1932 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	DUPONT	1934 STATION MONUMENTED	1958 6000	3
3	DUVAL	VINCENT	1934 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	YACHT	1934 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	YACHT	1934 STATION MONUMENTED	1958 GOOD	3
3	DUVAL	COCHLEY	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F	3
3	DUVAL	GREENWOOD	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F	3
3	DUVAL	PHILLIPS POINT BEACON 25	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F	3
3	DUVAL	PINEY	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F	3
3	DUVAL	TYSON 2	1934 STATION MONUMENTED	1958 UNKNOWN - MARK NOT F	3
3	DUVAL	JACKSONVILLE TRACTION CO STACK	1938 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F	3

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HORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET			RECV					0
•		• .	DATE		•	DATE					
4	CLAY	FALSE 2	1934	STATION	MONUMENTED	1950	GOOD				2
4	CLAY	AB 27	1934	STATION	NONUMENTED	1950	UNKNOWN -	MARK	NOT	F	2
4	CLAY	OLIVE RM 1	1934	STATION	MONUMENTED	1978	GOOD				Z
4	CLAY	OLIVE RM 1	1934	STATION	MONUMENTED	1978	GOOD				2
4	DUVAL	MULBERRY 2	1934	STATION	MONUMENTED	1952	POOR				2
-4	DUVAL	MULBERRY 2	1934	STATION	MONUMENTED	1952	POOR				2
4	DUVAL	JULINGTON	1934	STATION	MONUMENTED	1958	GOOD				2
4	DUVAL	MULBERRY 2 RM 1	1934	STATION	MONUMENTED	1964	G000				2
4	DUVAL	NULBERRY 2 RM 1	1934	STATION	MONUMENTED	1964	GOOD				2
4	DUVAL	VEREEN RM 1	1934	STATION	MONUMENTED	1968	G000				2
4	DUVAL	BUCKLEY 2	1934	STATION	MONUMENTED	1973	UNKNOWN -	MARK	NOT	F.	2
4	DUVAL	JONES	1934	STATION	MONUMENTED	1973	UNKNOWN -	MARK	NOT	F	2
4	DUVAL	1295 72 A09	1972	STATION	MONUMENTED	1972					2
4	DUVAL	195 72 A16	1972	STATION	MONUMENTED	1972					2
4	DUVAL	1295 72 A04	1972	STATION	MONUMENTED	1972	GOOD				2
4	DUVAL	1295 72 A05	1972	STATION	MONUMENTED	1972	GOOD				2
4	DUVAL	1295 72 A06	1972	STATION	MONUMENTED	1972	GOOD				2
4	DUVAL	1295 72 A10	1972	STATION	MONUMENTED	1978	GOOD				2
4	DUVAL	1295 72 A11	1972	STATION	MONUMENTED	1978	GOOD				2
4	DUVAL	1295 72 A08	UNK	STATION	MONUMENTED	1972					2
4	DUVAL	1295 72 A07	UNK	STATION	MONUMENTED	1978	6000				2
4	ST JOHNS	FRUIT	1934	STATION	MONUMENTED	1976	GOOD				2
4	CLAY	DOCTOR	1876	STATION	MONUMENTED	1934	UNKNOWN -	MARK	NOT	E	3
4	CLAY	FALSE	1876	STATION	MONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
4	CLAY	RAGGED	1876	STATION	MONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
4	CLAY	SCOUT	1934	STATION	MONUMENTED	1950	GOOD				3
4	CLAY	SWING	1934	STATION	MONUMENTED	1958	6000				3
4	CLAY	ORANGE PARK LIGHT 38	1950	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
4	CLAY	ORANGE PARK LIGHT 38	1950	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
2	CLAY	RAGGED POINT LIGHT 40	1950	STATION	MONUMENTED	1979	UNKNOWN -	MARK	NOT	F	ž
4	DUVAL	GOODSBY	1876	STATION	MONUMENTED	1934	LINKNOUN -	MARK	NOT	F	२ २
4	DUVAL	WRECK REACON	1876	STATION	MONUMENTED	1935	LINKNOWN -	MARK	NOT	F	3
4	DUVAL	HUNTINGTON	1876	STATION	MONUMENTED	1958	GOOD			•	3
4	DUVAL	MANDARIN	1876	STATION	MONUMENTED	1958	6000				3
4	DUVAL	MANDARIN	1876	STATION	MONUMENTED	1958	0000				3
4	DUVAL	MULBERRY	1876	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	٦ ٦
4	DUVAL	MULBERRY	1876	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	3
4	DUVAL	BLACK POINT WHARE FLAG	1876	STATION	MONUMENTED	1970	POOR			•	ז ז
4	DUVAL	SAN JOSE GOLF CLUB WATER TANK	1932	STATION	MONUMENTED	1958	GOOD				3
4	DUVAL	BONDEN	1034	STATION	NONIMENTED	1058	6000				- 7
4	DUVAL	VEREEN	1934	STATION	MONUMENTED	1968	0000				z.
4	DUVAL	BUCKLEY RM 2	1074	STATION	MONIMENTED	1073	LINKNOUN -	MARY	NOT	c	ב ז
4	DUVAL	MANDARIN POINT LIGHT 29	1050	STATION	MONUMENTED	1058	UNKNOUN -	MARK	NOT	י ב	ך ג
4	DUVAL	MANDARIN POINT LIGHT 29	1950	STATION	MONUMENTED	1058	UNKNOUN -	MAPE	NOT	F	2
ž	DUVAL	MULBERRY 3	1952	STATION	MONIMENTED	1077	UNKNUUN -	MADK	NOT	, F	ر ح
2	DUVAL	MULBERRY 3	1952	STATION	MONIMENTED	1073	UNKNOUN -	MADE	NOT	F	ך ג
2	DIIVAI	JACKSONVILLE NAS E PADIO MAST	105#	STATION MOLTATS	NOUIMENTED	1059	COOD -	CHARA	AUT	'	ר ד
2	DUVAL	JACKSONVILLE NAS N RADIO MAST	1958	STATION	MONUMENTED	1958	6000				7
2	DUVAL	JACKSONVILLE NAS U RADIO MAST	195R	STATION	MONIMENTED	105R	0000				र र
4	ST JOHNS	MOORE	1874	STATION	MONUMENTED	1074	6000				ן ז
2	ST JOHNS	MOORE	1874	STATION	MONIMENTED	1074	0000				7
-			1010	STREED!	NUNUNER (ED	1770	3000				

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HORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET			RECV				(0
			DATE			DATE					
5	ST JOHNS	REMINGTON 2	1932	STATION	MONUMENTED	1979	GOOD				1
5	CLAY	WHITE 1876	1876	STATION	MONUMENTED	1950	UNKNOWN -	MARK	NOT	F	2
5	CLAY	P 2 FLGS 1934	1934	STATION	MONUMENTED	1945	GOOD			1	2
5	CLAY	P 2 FLGS 1934	1934	STATION	MONUMENTED	1945	GOOD				2
5	CLAY	MIDDLE 2	1934	STATION	MONUMENTED	1950	GOOD				2
- 5	CLAY	MIDDLE 2	1934	STATION	MONUMENTED	1950	GOOD				2
5	CLAY	GREEN COVE 1933	1934	STATION	MONUMENTED	1960	GOOD			1	2
5	CLAY	BLACK RM 1	1934	STATION	MONUMENTED	1970	POOR				2
5	CLAY -	MAGNOLIA 2	1934	STATION	NONUMENTED	1981	GOOD				2
5	CLAY	P 1 FLGS 1934	1934	STATION	MONUMENTED	1987	GOOD				2
5	CLAY	P 1 FLGS 1934	1934	STATION	MONUMENTED	1987	G000				2
5	CLAY	P 37 FLGS 1934	1934	STATION	MONUMENTED	1987	GOOD				2
5	CLAY	P 37 FLGS 1934	1934	STATION	MONUMENTED	1987	GOOD				2
5	CLAY	HIBERNIA 2 RM 1	1934	STATION	MONUMENTED	1991	UNKNOWN -	MARK	NOT	F	2
- 5	ST JOHNS	REMINGTON	1876	STATION	MONUMENTED	1950	GOOD				2
5	ST JOHNS	CUCKOO RM 2	1934	STATION	MONUMENTED	1936	GOOD				2
5	ST JOHNS	HALLOWES	1934	STATION	MONUMENTED	1950	GOOD				2
5	ST JOHNS	HAMPTON 2	1934	STATION	MONUMENTED	1958	GOOD				2
5	ST JOHNS	PATRICIO 2	1934	STATION	MONUMENTED	1958	UNKNOWN -	MARK	NOT	F	2
5	CLAY	MAGNOLIA	1876	STATION	MONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
5	CLAY	MIDDLE	1876	STATION	MONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
5	CLAY	MIDDLE	1876	STAT ION	MONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
5	CLAY	HIBERNIA	1876	STATION	MONUMENTED	1991	UNKNOWN -	MARK	NOT	F	3
5	CLAY	MAGNOLIA POINT BEACON 46	1934	STATION	MONUMENTED	1950	GOOD				3
5	CLAY	PETER	1934	STATION	MONUMENTED	1950	GOOD				3
5	CLAY	SPIRE	1934	STATION	NONUMENTED	1950	GOOD				3
5	CLAY	WILKIES	1934	STATION	MONUMENTED	1950	GOOD				3
5	CLAY	WHITE 2 RESET	1934	STATION	MONUMENTED	1979	GOOD				3
5	CLAY	HIBERNIA DAY BEACON 44	1950	STATION	MONUMENTED	1991	UNKNOWN -	MARK	NOT	F	3
5	ST JOHNS	HAMPTON	1876	STATION	MONUMENTED	1909	UNKNOWN	MARK	NOT	F	3
5	ST JOHNS	HOGARTHS WHARF	1876	STATION	MONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
5	ST JOHNS	PATRICIO 1876	1876	STATION	NONUMENTED	1935	UNKNOWN -	MARK	NOT	F	3
5	ST JOHNS	HALLOWES WHARF HOUSE N GABLE	1876	STATION	MONUMENTED	1950	GOOD				3
5	ST JOHNS	GREEN COVE SPRINGS BEACON 50	1934	STATION	MONUMENTED	1950	GOOD				3
5	ST JOHNS	BRIDGE	1934	STATION	MONUMENTED	1979	GOOD				3
5	ST JOHNS	GEAR TOPO	1935	STATION	MONUMENTED	1966	GOOD				3
5	ST JOHNS	SAN PATRICIO BEACON 35	1935	STATION	MONUMENTED	1981	GOOD				3
5	ST JOHNS	ELIZ TOPO	1935	STATION	MONUMENTED	1990	UNKNOWN -	MARK	NOT	F	3
5	ST JOHNS	NEW SWITZERLAND POINT LIGHT 31	195D	STATION	MONUMENTED	1985	GOOD				3
5	ST JOHNS	NEW SWITZERLAND POINT LIGHT 31	1950	STATION	MONUMENTED	1985	GOOD				3
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NORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET			RECV						D
		L.	DATE			DATE						
6	ST JOHNS	PICOLATA	1933	STATION	MONUMENTED	1968	GOOD					1
6	CLAY	SAPPHO 1876	1876	STATION	MONUMENTED	1979	G000					2
6	CLAY	BAYARD 3	1934	STATION	MONUMENTED	1935	UNKNOWN	•	MARK	NOT	F	2
6	CLAY	STREAM 2	1934	STATION	MONUMENTED	1935	UNKNOWN	•	MARK	NOT	F	2
6	CLAY	BAY	1934	STATION	MONUMENTED	1958	UNKNOWN	-	MARK	NOT	F	2
6	CLAY	HICKS 2	1935	STATION	MONUMENTED	1935	UNKNOWN	-	MARK	NOT	F	2
6	CLAY	LINE	1935	STATION	MONUMENTED	1961	UNKNOWN	-	MARK	NOT	F	2
6	CLAY	PASTINE 2	1935	STATION	MONUMENTED	1979	UNKNOWN	-	MARK	NOT	F	2
6	CLAY	CLARK	1935	STATION	MONUMENTED	199 0	GOOD					2
6	ST JOHNS	ELIZA 2	1934	STATION	MONUMENTED	1909	UNKNOWN	-	MARK	NOT	F	2
6	ST JOHNS	HOGARTH	1934	STATION	MONUMENTED	1968	GOOD					2
6	ST JOHNS	SOWELL	1934	STATION	NONUMENTED	1986	GOOD					2
6	ST JOHNS	COVE	1934	STATION	MONUMENTED	1 9 89	GOOD					2
6	ST JOHNS	STRAIGHT 2	1935	STATION	MONUMENTED	193 5	UNKNOWN	•	MARK	NOT	F	2
6	ST JOHNS	WATER 2	1935	STATION	MONUMENTED	1935	UNKNOWN	٠	MARK	NOT	F	2
6	ST JOHNS	TROUT	1935	STATION	MONUMENTED	1950	UNKNOWN	•	MARK	NOT	F	2
6	CLAY	HICKS 1878	1876	STATION	MONUMENTED	1935	UNKNOWN	•	MARK	NOT	F	3
6	CLAY	RED	1876	STATION	MONUMENTED	1935	UNKNOWN	•	MARK	NOT	F	3
6	CLAY	STREAM 1876	1876	STATION	MONUMENTED	1935	UNKNOWN	-	MARK	NOT	F	3
6	CLAY	BAYARD 2 1878	1878	STATION	MONUMENTED	1935	UNKNOWN	•	MARK	NOT	F	3
6	CLAY	BAYARD POINT BEACON 56	1935	STATION	MONUMENTED '	1935	UNKNOWN	-	MARK	NOT	F	3
6	CLAY	DALE 1935	1935	STATION	MONUMENTED	1979	G000					3
6	ST JOHNS	ELIZA 1876	1876	STATION	MONUMENTED	1909	UNKNOWN	-	MARK	NOT	F	3
6	ST JOHNS	HALE 1876	1876	STATION	MONUMENTED	1935	UNKNOWN	•	MARK	NOT	F	3
6	ST JOHNS	STRAIGHT 1878	1878	STATION	MONUMENTED	1935	UNKNOWN	٠	MARK	NOT	F	3
6	ST JOHNS	WATER 1878	1878	STATION	MONUMENTED	1935	UNKNOWN	٠	MARK	NOT	F	3
6	ST JOHNS	RED BAY POINT BEACON 54	1934	STATION	MONUMENTED	1953	GOOD					3
6	ST JOHNS	TOCOL CUT FRONT RANGE BCN 43	1935	STATION	MONUMENTED	1935	UNKNOWN	-	MARK	NOT	F	3
6	ST JOHNS	ORANGE POINT BEACON 39	1935	STATION	MONUMENTED	1958	UNKNOWN	-	MARK	NOT	F	3
6	ST JOHNS	ORANGE POINT BEACON 39 ·	1935	STATION	MONUMENTED	1958	UNKNOWN	-	MARK	NOT	F	3
6	ST JOHNS	CREEK 1935	1935	STATION	MONUMENTED	1968	GOOD					3
6	ST JOHNS	PICOLATA FLAT BEACON 37	1935	STATION	MONUMENTED	1968	GOOD					3
6	ST JOHNS	PICOLATA TREE	1935	STATION	MONUMENTED	1968	GOOD					3

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HORIZONTAL POINTS	HOR	ZONI	AL	P01	NTS
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RE	COUNTY	DESIGNATION	SET	RECV 0	3
			DATE	DATE	
7		WARTING	1011 STATION MONIMENTED	1968 0000 1	ŕ
7	PUINAM		1933 STATION MONUMENTED	1935 coop 2	,
7	PUTNAM	BOY	1935 STATION MONUMENTED	1937 6000 2	, ,
7		CALE	1935 STATION MONUMENTED	1937 6000 2	,)
7	PLITNAM	PALMETTO	1935 STATION MONUMENTED	1937 6000 2	,
7	PUTNAM		1935 STATION MONUMENTED	1937 GOOD 2	,
7	PUTNAM	STIMP	1935 STATION MONUMENTED	1937 GOOD 2	2
7	PUTNAM	LAGER	1935 STATION MONUMENTED	1940 GOOD 2	2
7	PUTNAM	OPEN	1935 STATION MONUMENTED	1963 GOOD 2	2
7	PUTNAM	OPEN	1935 STATION MONUMENTED	1963 GOOD 2	2
7	PUTNAM	SEDAN	1935 STATION MONUMENTED	1971 UNKNOWN - MARK NOT F 2	2
7	PUTNAM	OLD MARK USE 1935	1935 STATION MONUMENTED	1975 UNKNOWN - MARK NOT F 2	2
7	PUTNAM	OLD MARK USE 1935	1935 STATION MONUMENTED	1975 UNKNOWN - MARK NOT F 2	2
7	PUTNAM	NINE MILE POINT	1935 STATION MONUMENTED	1985 GOOD 2	2
7	PUTNAM	NINE MILE POINT	1935 STATION MONUMENTED	1985 GOOD 2	2
7	PUTNAM	HEAD	1935 STATION MONUMENTED	1988 GOOD 2	2
7	PUTNAM	SHIP	1935 STATION MONUMENTED	1990 UNKNOWN - MARK NOT F 2	2
7	PUTNAM	SNAKE	1935 STATION MONUMENTED	1991 GOOD 2	2
7	ST JOHNS	RACY PT USE STA REF PIPE 1878	1878 STATION MONUMENTED	1990 UNKNOWN - MARK NOT F 2	2
7	ST JOHNS	MUD	1935 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 2	2
7	ST JOHNS	MUD	1935 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 2	2
7	ST JOHNS	JOHN	1935 STATION MONUMENTED	1973 GOOD 2	2
7	ST JOHNS	RIVERDALE 2	1950 STATION MONUMENTED	1968 GOOD 2	2
7	PUTNAM	CEDAR 1878	1878 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	PUTNAM	COHANZY	1878 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	PUTNAM	BO5 1885	1885 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	PUTNAM	COLE 1885	1885 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	PUTNAM	DEEP 2 1885	1885 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	PUTNAM	FEDERAL POINT	1885 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	PUTNAM	LYNWOOD 1885	1885 STATION MONUMENTED	1986 GOOD 3	5
7	PUTNAM	NINE MILE FLAT BEACON 60	1935 STATION MONUMENTED	1937 GOOD 3	3
7	PUTNAM	NINE MILE FLAT BEACON 60	1935 STATION MONUMENTED	1937 GOOD 3	5
7	PUTNAM	BEACON 49	1935 STATION MONUMENTED	1937 UNKNOWN - MARK NOT F 3	3
7	PUTNAM	FEDERAL 1935	1935 STATION MONUMENTED	1979 GOOD 3	5
7	ST JOHNS	TOCO1 1876	1876 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	ST JOHNS	CHAFER 1878	1878 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	3
7	ST JOHNS	TOCOL BARN TIN ROOF WEST GABLE	1935 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	ST JOHNS	TOCOI CUPOLA	1935 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	ST JOHNS	TOCOI CUT ENTRANCE BEACON 43 A	1935 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	ST JOHNS	TOCOI RED ROOFED HOUSE CHIMNEY	1935 STATION MONUMENTED	1935 UNKNOWN - MARK NOT F 3	5
7	ST JOHNS	NOCCASIN 1935	1935 STATION MONUMENTED	1948 GOOD 3	5
7	ST JOHNS	NOCCASIN 1935	1935 STATION MONUMENTED	1948 GOOD 3	3
7	ST JOHNS	RACY PT CUT FRONT RANGE BCN 47	1935 STATION MONUMENTED	1990 UNKNOWN - MARK NOT F 3	3
7	ST JOHNS	RACY PT CUT REAR RANGE BCN 45	1935 STATION MONUMENTED	1990 UNKNOWN - MARK NOT F 3	3

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WORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET			RECV		C)
		L.	DATE			DATE			
8	PUTNAM	PERIN	1933	STATION	MONUMENTED	1981	2008	1	4
8	PUTNAN	ROSTUICK DESET	1033	STATION	MONUMENTED	1085	6000	1	i
8		HART 1885	1000	STATION	MONUMENTED	1081	6000	;	,
R	DUTNAM	COMPS	1035	STATION	MONUMENTED	1037	6000	5	,
8	PUTNAM	DAN	1035	STATION	MONUMENTED	1038	6000	7	,
-8	PITNAM	DANCE	1035	STATION	MONUMENTED	1070	6000	7	,
8	DIITNAM	ONE NILE DECET	1035	STATION	MONUMENTED	1072	6000	7	,
R	DITNAM	ONE MILE RESET	1035	STATION	MONUMENTED	1072	6000	2	, ,
8	DITNAM		1035	CTATION	NONUMENTED	1076	UNKNOUN - MARK NOT	= 2	,
R	PUTNAM	NADRY	1035	STATION	NONIMENTED	1070	6000		,
R	PIITNAM	KEDI AD	1035	STATION	MONUMENTED	1070	6000	2	>
A	DITNAM	PICF	1035	STATION	MONUMENTED	1070	6000	2	>
Ř	PIITNAM	SIN	1935	STATION	MONUMENTED	1979	6000	7	,
Ř	DUTNAM		1935	STATION	MONUMENTED	1070	6000	2	,
8		CITY	1035	STATION	MONLIMENTED	1989	6000	2	;
, R	PIITNAM	CON	1035	STATION	MONUMENTED	1989	6000	2	,
R	DITNAM	BICHT	1885	STATION	MONIMENTED	1035	HNKNOLN - MARK NOT	F 7	ł
8	DITNAM	BOG	1885	STATION	MONUMENTED	1035	UNKNOUN - MARK NOT	5 7	, t
8	DITNAM .	COUCILI 1885	1885	STATION	MONUMENTED	1035	INKNOUN - MAPK NOT	с Т	į
Ř	DUTNAM	HADDING	1885	STATION	MONUMENTED	1935	UNKNOWN - MARK NOT	F 7	, t
8	DIITNAM		1885	STATION	MONUMENTED	1035	INKNOUN - MARK NOT	с т 5 т	έ
8	DITNAM	PALAT KA POINT	1885	STATION	MONUMENTED	1035	HINKNOWN - MARK NOT	г - Т Г - Т	, t
R	DUTNAM		1885	STATION	MONUMENTED	1035	INKNOWN - MARK NOT	י - ר ז	į
8	PUTNAM	OHAKE	1885	STATION	MONUMENTED	1035	UNKNOWN - MARK NOT	57	, ł
8	DIITNAM	SHELLBANY	1885	STATION	MONIMENTED	1035	UNKNOWN - MARY NOT	т – т –	έ
8	DUTNAM	SOLITH FUD 1885	1885	STATION	MONUMENTED	1035	UNKNOUN - MARK NOT	ि म इ.स.	, ł
2	DIITNAM	STEVENC 1885	1885	STATION	MONUMENTED	1035	HNKNOUN - MARK NOT	r -	, t
8	DIITMAM		1885	STATION	MONUMENTED	1035	UNKNOUN - MARK NOT	т 3 с 7	, z
Ř	DIITNAM		1885	STATION	MONUMENTED	1035	UNKNOWN - MARK NOT	с т с т	ź
R	DITNAM	UADNED 1885	1885	STATION	MONUMENTED	1035	LINKNOUN - MARK NOT	F 7	ź.
R	DUTNAM	UASHINGTON	1885	CTATION	MONIMENTED	1035	HNKNOWN - MARK NOT	F 7	ź
8	DUTNAM	UNETSTONE	1885	STATION	MONUMENTED	1035	INKNOLN - MARK NOT	с Т	έ
8	PUTNAM	PALATKA PUTNAM CO CTHSE FINIAL	1077	STATION	MONUMENTED	1938	6000	7	ź
8	PUTNAM	PALATKA PUTNAM CO CTHSE FINIAL	1033	STATION	MONUMENTED	1038	6000	7	, ł
8	PUTNAM	PALATKA RETHEL AME CH SPIRE	1033	STATION	MONUMENTED	1080	0000	7	ź
8	PUTNAM	PALATKA BETHEL AND ON STINE	1077	STATION	MONUMENTED	1080	6000	7	ż.
8	PUTNAM	PALATKA MUNICIPAL STANDPIPE	1933	STATION	MONUMENTED	1989	6000	7	ż,
8	PUTNAM	PALATKA MUNICIPAL STANDPIPE	1933	STATION	NONLIMENTED	1080	6000	7	ŝ
8	PUTNAM	DANCEY PT FRONT RANGE BCN 53	1935	STATION	MONUMENTED	1937	6000	7	Ś
8	PUTNAM	DANCEY PT REAR RANGE BON 51	1035	STATION	MONUMENTED	1037	G000 '	7	ξ.
8	PUTNAM	PALATKA ST MARKS CATH CH SPIRF	1935	STATION	MONUMENTED	1938	6000	7	ζ.
8	PUTNAM	PALATKA ST NARKS CATH CH SPIRE	1935	STATION	MONUMENTED	1938	G000 ·	7	ź.
8	PUTNAM	SAUBLE 1885	1935	STATION	MONUMENTED	1976	6000	7	š
8	PUTNAM	LOWER PALATKA BEACON 68	1935	STATION	MONUMENTED	1982	UNKNOWN - MARK NOT	F 3	3
8	PUTNAM	FORRESTER POINT BEACON 51 A	1935	STATION	MONUMENTED	1987	GOOD	7	3
8	PUTNAM	FORRESTER PT LOW RNG BCN 62 F	1935	STATION	MONUMENTED	1987	GOOD	7	3
8	PUTNAM	FORRESTER PT LOW RNG BCN 62 R	1935	STATION	MONUMENTED	1987	GOOD	7	3
8	PUTNAM	FORRESTER PT MID RNG BCN 64 F	1935	STATION	MONUMENTED	1987	GOOD	3	3
8	PUTNAM	FORRESTER PT MID RNG BCN 64 R	1935	STATION	MONUMENTED	1987	GOOD	2	3
8	PUTNAM	FORRESTER PT UP RNG BCN 66 F	1935	STATION	MONUMENTED	1987	6000	2	3
8	PUTNAM	FORRESTER PT UP RNG BCN 66 R	1935	STATION	MONUMENTED	1987	GOOD	?	3
8	PUTNAM	PALATKA EMANUEL ME CH SPIRE	1935	STATION	MONUMENTED	1989	GOOD	2	3
8	PUTNAM	PALATKA EMANUEL ME CH SPIRE	1935	STATION	MONUMENTED	1989	GOOD	7	3

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HORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET RECV D DATE DATE	
8	DUTNAM	PALATKA PRESB CLOCK TOWER	1935 STATION MONUMENTED 1989 GOOD 3	
8	PUTNAM	PALATKA PRESB CLOCK TOWER	1935 STATION MONUMENTED 1989 GOOD 3	
8	PUTNAM	UPPER PALATKA BEACON 70	1935 STATION MONUMENTED 1989 POOR 3	
8	PUTNAM	ST JOHNS RIVER WOOD TOWER	1938 STATION MONUMENTED 1936 UNKNOWN - MARK NOT F 3	
8	B PUTNAM	BOSTWICK AZ MK 2	1978 STATION MONUMENTED 1981 GOOD 3	

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HORIZONTAL POINTS

RE	COUNTY	DESIGNATION	SET DATE			RECV DATE						0
9	PUTNAM	SAN MATEO	1933	STATION	MONUMENTED	1981	GOOD					1
9	PUTNAM	EDGEWATER	193 5	STATION	MONUMENTED	1968	UNKNOWN	-	MARK	NOT	F	2
9	PUTNAM	OGLESBY	1935	STATION	MONUMENTED	1981	UNKNOWN	-	MARK	NOT	F	2
9	PUTNAM	OGLESBY	193 5	STATION	MONUMENTED	1981	UNKNOWN	-	MARK	NOT	F	2
9	PUTNAM	BRANT	1935	STATION	MONUMENTED	1989	UNKNOWN	-	MARK	NOT	F	2
9	PUTNAM	BROWNS RESET	1968	STATION	MONUMENTED	1981	GOOD					2
9	PUTNAM	HUCK	1885	STATION	NONUMENTED	1935	UNKNOWN	-	MARK	NOT	F	3
9	PUTNAM	HUCK	1885	STATION	MONUMENTED	1935	UNKNOWN	-	MARK	NOT	F	3
9	PUTNAM	PALATKA E TRANSMISSION TOWER	1933	STATION	NONUMENTED	1989	G000					3
9	PUTNAM	PALATKA E TRANSMISSION TOWER	1933	STATION	MONUMENTED	1989	GOOD					3
9	PUTNAM	PALATKA W TRANSMISSION TOWER	1933	STATION	MONUMENTED	1989	GOOD					3
9	PUTNAM	PALATKA W TRANSMISSION TOWER	1933	STATION	MONUMENTED	1989	GOOD					3
9	PUTNAM	DEVILS ELBOW BEACON 72	1935	STATION	MONUMENTED	1955	GOOD					3
9	PUTNAM	CALF 1935	1935	STATION	MONUMENTED	1972	POOR					3
9	PUTNAM	SAN MATEO BEACON 76	1935	STATION	NONUMENTED	1981	GOO D					3
9	PUTNAM	SHOE 1935	193 5	STATION	MONUMENTED	1981	GOOD					3
9	PUTNAM	STILL	1935	STATION	MONUMENTED	1981	G000					3
9	PUTNAM	ASH 1935	1935	STATION	MONUMENTED	1987	GOOD					3
9	PUTNAM	MAT 1935	193 5	STATION	MONUMENTED	1989	GOOD					3
9	PUTNAM	MAT 1935	1935	STATION	MONUMENTED	1989	6000					3

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HORIZONTAL POINTS

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RE	COUNTY	DESIGNATION	SET RECV O	
			DATE DATE	
10	PUTNAM	RODMAN RESET	1933 STATION MONUMENTED 1981 GOOD 1	
10	PUTNAM	NASHUA	1935 STATION MONUMENTED 1969 GOOD 2	
10	PUTNAM	NASHUA	1935 STATION MONUMENTED 1969 GOOD 2	
10	PUTNAM	CAMP	1935 STATION MONUMENTED 1969 UNKNOWN - MARK NOT F 2	
10	PUTNAM	HORSE	1935 STATION MONUMENTED 1969 UNKNOWN - MARK NOT F 2	
10	PUTNAM	WELAKA	1935 STATION MONUMENTED 1985 GOOD 2	
10	PUTNAM	FEMALE 1935	1935 STATION MONUMENTED 1937 GOOD 3	
10	PUTNAM	OKE 1935	1935 STATION MONUMENTED 1937 GOOD 3	
10	PUTNAM	OKE 1935	1935 STATION MONUMENTED 1937 GOOD 3	
10	PUTNAM	POSSUM 1935	1935 STATION MONUMENTED 1937 GOOD 3	
10	PUTNAM	SISTER 1935	1935 STATION MONUMENTED 1937 GOOD 3	
10	PUTNAM	SPRING 1935	1935 STATION MONUMENTED 1937 GOOD 3	
10	PUTNAM	HENION 1935	1935 STATION MONUMENTED 1938 GOOD 3	
10	PUTNAM	WELAKA SPRINGS WATER TANK	1935 STATION MONUMENTED 1949 GOOD 3	
10	PUTNAM	TURKEY 1935	1935 STATION MONUMENTED 1967 GOOD 3	
10	PUTNAM	MORSE LANDING BEACON 63	1935 STATION MONUMENTED 1983 GOOD 3	
10	PUTNAM	MORSE LANDING BEACON 63	1935 STATION MONUMENTED 1983 GOOD 3	

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HORIZONTAL POINTS

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RE	COUNTY	DESIGNATION	SET	RECV	0
			DATE	DATE	
11	PUTNAM	BEASLEY	1935 SETION MONUMENTED	1967 GOOD	2
11	PUTNAM	REA	1935 STATION MONUMENTED	1968 GOOD	2
11	PUTNAM	NORWALK	1935 SELTION MONUMENTED	1969 GOOD	2
11	PUTNAM	NORWALK	1935 STATION MONUMENTED	1969 GOOD	2
11	PUTNAM	CAMP WELAKA WATER TANK	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	DRAY 1935	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	FERRY 1935	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	FORT GATES WATER TANK	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	GATES 1935	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	HOG 1935	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	LAKE GEORGE NORTH END BCN 98	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	PUTNAM 1935	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	URSUS 1935	1935 STATION MONUMENTED	1937 GOOD	3
11	PUTNAM	LEG 1935	1935 STATION MONUMENTED	1967 GOOD	3
11	PUTNAM	LAW 1935	1935 STATION MONUMENTED	1967 POOR	3
11	PUTNAM	WELAKA FIRE TOWER	1937 STATION MONUMENTED	1985 GOOD	3
				2	

EXHIBIT C SUMMARY REPORT

REACH	FREQUENCY	COUNTY	ORDER	(
1	3	DUVAL	1	(
ľ	9	DUVAL		
1	63	DUVAL	2	
2	5	DUVAL	3	
2	16	DUVAL	1	
2	38	DUVAL	2	
3	6	DUVAL	3	
3	23	DUVAL	1	
3	46	DUVAL	2	
4	4	CLAY	3	
4	8	CLAY	2	
4	17	DUVAL	3	
4	19	DUVAL	2	
4	1	ST. JOHNS	32	
4	2	ST. JOHNS	3	
5	13	CLAY	2	
5	10	CLAY	3	
.5	1	ST. JOHNS	l	
5	5	ST. JOHNS	2	
5	11	ST.JOHNS	3	
6	8	CLAY	2	(
6	6	CLAY	3	(
6	1	ST. JOHNS	1	
6	7	ST. JOHNS	2	
6	11	ST. JOHNS	3	
7	1	PUTNAM	l	
7	17	PUTNAM	2	
7	11	PUTNAM	3	
7	5	ST. JOHNS	2	
7	10	ST. JOHNS	3	
8	2	PUTNAM	1	
8	14	PUTNAM	2	
8	42	PUTNAM	3	
9	1	PUTNAM	1	
9	5	PUTNAM	2	
9	14	PUTNAM	3	•
10	1	PUTNAM	1	
10	5	PUTNAM	2	
10	11	PUTNAM	3	
11	4	PUTNAM	2	
11	12 3	PUTNAM 5	3	

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FIGURE 2

LOWER ST. JOHNS RIVER HORIZONTAL CONTROL SURVEY NETWORK ZONE EXISTING CONTROL POINT INVENTORY ANALYSIS

It is known that monument (control point) attribution caused by natural and/or mechanical disturbances over the years will effect the chances of finding usable control points.

The following table provides a chronological analysis for estimation of monumentation recovery within two miles either side of the St. Johns River and major tributaries.

Order	A u/a	B u/a	C u/a	D u/a	E	F
в	-	-	-	18/16	18	16
First	0/0	9/5	12/10	39/35	60	50
Second		105/53	48/39	43/39	. 196	131
Third	76/11	244/122	70/56		<u>390</u>	<u>189</u>
Total	76/11	358/180	130/105	100/90	664	386

Notes:

- A Monuments set or last known recovery before 1893 (estimated chance of recovery = 15%)
- B Monument set or last known recovery 1893 to 1973
 (estimated chance of recovery = 50%)
- C Monuments set or last recovered after 1973 (estimated chance of recovery = 80%)
- D Monument observed using GPS technology
 - (estimated chance of recovery = 90%)
- E Total Monuments set in reach
- F Estimated Number of monuments recoverable in 1993
- u Unadjusted total
- a Adjusted total

Summary:

On an average three horizontal control points have been set along each side of the SJR per mile however because of attrition the estimated recovery drops to 1.75 control points. Elimination of third order control points because of questionable accuracy further reduces the average to 0.9 usable control points will be recovered on each side of the river, per mile.

Basis for Recommendations

Table 3 provides population and order of accuracy of horizontal control points located within each 2.5 mile diameter node. This data was gathered from the Existing Horizontal Control Survey Network reach map found at the end of each River Reach Report.

Node population of existing horizontal control points is considered adequate for future local water level measurement studies (without additional horizontal control points being established) if the following minimum population is met or exceeded:

- One or more GPS control point as established by NOS, FDEP, JEA or SJRWMD
- Two or more triangulation (conventional) control points as established by NOS

The reach CSN Zone strength of existing survey control monumentation is determined by adding nodes within the reach; the sum of nodes is compared to the following standards:

>	80	percent of nodes meet or exceed minimum population
	•	= adequate control in the reach
>	55 < 80	percent of nodes meet or exceed minimum population
		= reconnaissance advised (too close to call)
<	55	percent of nodes meet or exceed minimum population
		= GPS IITST OTGET CONTROL DOINTS ARE RECOMMENDED

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TABLE 3 RECOMMENDATIONS EXISTING HORIZONTAL CONTROL SURVEY NETWORK REACH/NODE INVENTORY

Reach/ Side		Description/Order		Survey		
Node		(L/R/B)		gps	Trian.	Points Total
			В	lst & 2nd	lst & 2nd	Side Reach
			-			
1. 2	A	Both	2	1	L	
1	B	B		2	l	
(с	В		1	2	
1	D	В		2	2	
1	E	в		2	3	17B
					Reach 1	Total 17
2. 2	A	Right	0	1	2	
1	в	R		2	1	6R
(с	B		3	0	
1	D	B		2	0	
1	Е	Left		2	1	
1	F	B		l	1	7B
(G	L		L	4	<u>8L</u>
					Reach	Total 21
з. 2	A	R	0	2	0	
1	В	R		3	2	
(с	R		2	1	10R
1	D	. L		2	0	
	E	L		3 ;	2	
	F	L		2	3	
	G	L		2	0	
:	н	L		3	3	<u>20L</u>
					Reach	Total 30
4.	A	R		2	1	
	В	R		2	3	
	С	R		2	3	
	D	R		.3	0	
	E	R		4	1	21R
	F	L -		2	1	
	G	L -		2	1	
	н т	ь •		1	4	
	1	ىل •		3	1	
	J 77	ىل -		2	U	201
	ĸ	ىل		2	1 Baach	Total 41

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Table 3 (continued) .

Reach/ Side			Description/Or	der	Su	irvey	
Noc	ie ie	(L/R/B)	-	GPS	Trian.	Po T	oints otal
			B	1st & 2nd	1st & 2nd	Side	Reach
c		D		5	0		
5.	n B	R		2	2		
	r C	R		2	- 1		
	מ	R		1	0		
	E	R		2	2	13R	
	F	L		1	3		
	G	L		3	0		
•	н	L		3	3		
	I	L		2	5	18L	
	-	-			Reach	Total	31
5.	A	R		0	3		
	в	R		0	2		
	с	· R		0	3	lor	
	D	R		O	2		
	Е	R		0	1	11R	
	F	R		0	2		
	G	L		0	2		
	н	L		0	l		÷ .
	I	L		Q	1		
	J	L		0	2	<u>10L</u>	
					Reach	Total	21
-	N	Р			:		
1.	n D	r. P			+ ·		
	с С	r. P					
	ت م	P			- 0		
	Ē	R			3	8R	
	F	L			2		
	G	_ L			• 1		
	H	L			3		
	I	L			2	<u>9L</u>	
	-				Reach	Total	17

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Table 3 (continued)

Beach (C i do		Description/O	rder	Survey
Node	(L/R/B)		gps	Trian.	Points Total
[•	B	1st & 2nd	lst & 2nd	Side Reach
8. A	B			3	
В	В			4	
С	В			3	
D	В	2		2	
E	В			2	<u>16B</u>
				Reach	Total 16
9. A	В			2	
В	В			3	
с	В			ο	
D	В			1	
Е	Left			o	<u>6B</u>
				Reach	n Total 6
	_			`	
10. A	B			0	
В	В			1	
С	B			1	
D	B			0	
E	B			1	<u>_3B_</u>
	•			Reach	n Total 3
11. A	В			1	
В	B	1		0	
с	В	1		; 0	
D	B			l	
E	В			l	<u>_5B</u>
				Reac	n Total 5

Total of all Reaches 208

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General Observations:

It is interesting to note the following observations:

- Reaches 2, 3 and 4 embody 102 (49%) of the monuments recorded in the database with nearly equal distribution on the right bank (44%) and left bank (56%)
- Existing monumentation appears to be adequate for the lower half of the project no additional horizontal control is recommended between river mile 0 and river mile 55.
- Only 17 nodes require additional horizontal control in the upper half of the project - between river mile 55 and river mile 110.
- In reaches 9, 10 and 11 only 5 nodes (33%) have adequate horizontal control monumentation.

Specific Recommendations

Specific recommendation and cost estimates to upgrade survey measurements along the LSJR are itemized in Task 4: Recommended Water Level Network found in each River Reach Report. •

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2.4.2 Vertical Control Survey Network

Background

Many leveling networks were established in north Florida by the US-COE for navigational projects at the turn of the century. Various route surveys for preliminary design of a long sought canal between the Gulf of Mexico and the Atlantic Ocean. Between 1930 and 1935 we noticed concentrated surveying activities along the St. Johns River, upstream of Palatka, to the Gulf of Mexico. This alignment later become the Cross Florida Barge Canal.

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A Vertical Control Survey Network provided that all points in the survey are certified as having datum values consistent with all other points in the network, not merely those within that particular survey. (see <u>Standards and Specification for</u> <u>Geodetic Control Networks</u> by Federal Geodetic Control Committee, September 1984. (Canary copy of the standards at the end of **Part II**)

Evaluation

To assure accuracy of all leveling projects being considered in this manual one must establish a consistent set of standards. It was decided vertical control surveys published by NOS would be considered. The order/class standards include only:

- First Order class I
- First Order class II
- Second Order class 0
- Second Order class I

Published level runs made by NOS and FDNR are regarded as the most consistent with the aforementioned standards. This is not to indicate contributions by other agencies are inferior in fact approximately 200 secondary stations surveyed by Geonex, Inc for the SJRWMD Julington Creek Point are shown on the reach sheets. Unfortunately the Geonex, Inc. monumentation meets only third order standards and is not recommended for extension of the vertical network.

Reach Maps

Published vertical control points were positioned on 1:100,000 scale "Reach Maps". There were no attempts to shorten the database for final analysis. It is noted that control point attrition is anticipated because of age and natural/mechanical disturbance.

Control Survey Network Zone (CSN Zone/Node)

Existing control points located more than two miles from the river's edge were determined to be too distant for normal research activities. For purposes of this study, if existing vertical control points are more than two miles from the rivers edge extensive new survey networks need to be established. Control point within two miles can be readily used by SJRWMD staff or contract surveyors to extend high quality survey control to future study sites.

A study corridor nominally extending two miles each way from the rivers edge was established along the St. Johns River to delineate area boundaries for analysis of existing vertical control network surveys. This corridor will be referred to as Control Survey Network (CSN Zone).

Control points inside the CSN Zone have been encapsulated into 2.5 mile diameter nodes as shown on the Existing Vertical Control Survey Network, Reach/Node Inventory Table 5 and each individual reach map. An alphanumeric system identifies each node within the reach and also specifies if the node is on the left bank right bank (from a position facing downstream) if both banks are within the node.

Analysis:

Vertical control points set by NOS and FDEP within the CSN Zone number 329. Of these approximately 71 monuments are tidal bench marks and are not included in Table 5 Distribution graphic because they are to equally distributed throughout the CSM Zone. Approximately 45 percent of all known control points were set between 1933-1972. It is estimated approximately 250-275 monuments will be found and in satisfactory condition.

Considerations

Photogrammetric control points established for the SJRWMD Julington Creek Project should be recovered and upgraded for future use. As stated before the fact that control points are reported in a data base does not mean the monument is actually recoverable. Reconnaissance surveys have not been attempted prior to the date of this study therefore a weighted analysis has been utilized to predict the probability of control recovery. Items to be considered in addition to accuracy/frequency reports include:

- date of observation and date the point was last visited
- whether or not the point was recovered
- the amount of land disturbing activities since the last time the point was recovered
- permanence of the monument
- quality of mark description and/or recovery report; ability to locate the correct area to begin search

Reconnaissance of all vertical control points in the CSN Zone is recommended before extension of the network is attempted.

The following list of exhibits were used for analysis and recommendations concerning the Vertical Control Survey Network:

- Table 4; Existing Vertical Control Point Inventory,
- Figure 4; Existing Vertical Control Point, Analysis;
- Table 5; Existing Vertical Control Point Survey Network; Reach/Node Inventory;
- Figure 5; Existing Vertical Control Survey Network Monumentation Distribution;
- River Reach Reports; Strength of Existing Survey Control Network, Main Stem, Abstract;
- Reach Maps 1 11; 1:1,00,000 scale; color, 11" x 17" sheet
- Existing Vertical Control Survey Network inventory; Reach Maps 1-11, 1:100,000 scale

TABLE 4 LOWER ST. JOHNS RIVER VERTICAL CONTROL SURVEY NETWORK ZONE EXISTING MONUMENTATION

Following are monumentation (control point) reports within the existing vertical control survey network zone:

Exhibit A - Inventory by reach/date/order 15 pages

Exhibit B - Inventory by date/order 9 pages

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VERTICAL CONTROL POINTS

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RE	COUNTY	DESIGNATION	YEAR OBS	RECV DATE	C	ORDR
1		4	1932	¥		1/2
1		5	1932	x		1/2
1		TIDAL 11 STA 1 17	1932	X		1/2
t		J 324	1970	1971x		2/0
1		TIDAL STA 1 17 TIDAL 9	*1975		B	2/2
1	DUVAL	2	1932	1970N		1/2
1	DUVAL	5	1932	1970N		1/2
1	DUVAL	A 30	1932	1970N		1/2
1	DUVAL	TIDAL STA 1 17 TIDAL 14	1932	1970N		1/2
1	DUVAL	TIDAL STA I 17 TIDAL 15	1932	1970N		1/2
1	DUVAL	872 0198 A TIDAL	*1991	1991G		1/2
- 1	DUVAL	4 MAYPORT NAVAL BASE	1970	1974G		2/0
1	DUVAL	6 MAYPORT NAVAL BASE	1970	1974G		2/0
1	DUVAL	872 0198 B TIDAL	1977			2/1
1	DUVAL	GMC 1	1977			2/1
1	DUVAL	872 0194 TIDAL 1	1977	1977 G		2/1
1	DUVAL	872 0194 TIDAL 2	1977	1977G		2/1
1	DUVAL	872 0244 TIDAL 4	1977	1977G		2/1
1	DUVAL	JAX 1	1977	1977G		2/1
1	DUVAL	S XAL	1977	1977G		2/1
1	DUVAL	E XAL	1977	1977G		2/1
1	DUVAL	JAX 4	1977	1977G		2/1
1	DUVAL	SUMMIT	1979	1979G		2/1
1	DUVAL	872 0232 A TIDAL	*1978			2/1
1	DUVAL	872 0232 B TIDAL	*1978			2/1
1	DUVAL	CUT 12	*1978			2/1
1	DUVAL	872 0221 B TIDAL	*1978	1978G		2/1
1	DUVAL	872 0221 C TIDAL	*1978	1978G		2/1
1	DUVAL	GMC 2	*1978	1978G		2/1
1	DUVAL	CARLOS	*1978	1991N		2/1
1	DUVAL	CARLOS RM 2	*1978	1991N		2/1
1	DUVAL	872 0194 TIDAL 3	*1985	1985G		2/1
1	DUVAL	872 0221 D TIDAL	*1985	1985G		2/1
1	DUVAL	872 U221 E TIDAL	*1985	1985G		2/1
4	DUVAL		- 1985	19856		2/1
-	DUVAL	K 22 T 325	1070	19826		2/1
4		4601	*1001	10010	D D	1/2
4		4001 872 0220 T1041 12	*1001	10010	D	1/2
4	DUVAL	872 0220 TIDAL 12	*1001	10010	5	1/2
1	DIIVAL	572 0220 110AL 15	*1001	10010	0	1/2
4	DINAL	EDM 15	*1001	10010	0	1/2
1	DIIVAL	K 325	*1001	10010	0	1/2
1	DLIVA	1 325	*1001	10010	0	1/2
1	DUVAL	M 325	*1001	10016	R	1/2
1	DUVAL	MAYPORT 2 RM 1	*1001	19016	R	1/2
1	DUVAL	N 324	*1001	19016	R	1/2
1	DUVAL	N 325	*1991	19916	B	1/2
1	DUVAL	P 324	*1991	1991G	8	1/2
1	DUVAL	Р 325	*1991	1991G	B	1/2
1	DUVAL	Q 325	*1991	1991G	8	1/2
1	DUVAL	R 325	*1991	1991G	B	1/2
1	DUVAL	s 325	*1991	1991G	B	1/2

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VERTICAL CONTROL POINTS

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RE	COUNTY	DESIGNATION	YEAR OBS	RECV DATE	C	ORDR
1	DUVAL	U 325	*1991	19916	8	1/2
1	DUVAL	V 325	*1991	1991G	8	1/2
1	DUVAL	W 325	*1991	1991G	B	1/2
1	DUVAL	X 325	*1991	1991G	8	1/2
1	DUVAL	н 324	1970		B	2/0
1	DUVAL	Q 324	1970	1973G	8	2/0
1	DUVAL	s 324	1970	1973G	B	2/0
1	DUVAL	L 324	1970	1974G	8	2/0
1	DUVAL	M 324	1970	1974G	8	2/0
1	DUVAL	R 324	1970	1977G	B	2/0
1	DUVAL	т 324	1970	1977G	₿	2/0
1	DUVAL	U 324	1970	1977G	8	2/0
1	DUVAL	Y 325	1970	1977G	8	2/0
1	DUVAL	z 325	1970	1977G	8	2/0
1	DUVAL	к 324	1970	1979G	8	2/0
1	DUVAL	A 325	*1985	1 98 5G	8	2/1
1	DUVAL	A 326	*1985	1985G	8	2/1
1	DUVAL	Z 324	*1985	1985G	8	2/1

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR OBS	RECV DATE	C	ORDR
z		TIDAL 5 STA I 25	1932	x		1/2
2		C 325	1970	1980X	B	1/2
2	DUVAL	STJ0 219	1975	1991G		1/1
2	DUVAL	X 331	1975	1991N		1/1
2	DUVAL	TIDAL STA 1 22 A	1970	1970G		1/2
2	DUVAL	A 332	*1991	1991G		1/2
2	DUVAL	S 331	*1991	1991G		1/2
2	DUVAL	T 331	*1991	1991G		1/2
2	DUVAL	U 331	*1991	1991G		1/2
2	DUVAL	V 331	*1991	1 99 16		1/2
2	DUVAL	W 331	*1991	199 16		1/2
2	DUVAL	DUVAL SOUTH BASE RM 3	1973	1973G		2/0
2	DUVAL	872 0215 D TIDAL	1977			2/1
2	DUVAL	872 0244 D TIDAL	1977			2/1
2	DUVAL	872 0244 E TIDAL	1977			2/1
2	DUVAL	872 0219 F TIDAL	1977	1977G		2/1
2	DUVAL	872 0242 TIDAL 9	1977	1977G		2/1
2	DUVAL	872 0244 F TIDAL	1977	1977G		2/1
2	DUVAL .	STJ0 175	1977	1977G		2/1
2	DUVAL	STJO 204	1977	1977G		2/1
2	DUVAL	STJO 205	1977	1977G		2/1
2	DUVAL	STJ0 213	1977	1977 G		2/1
2	DUVAL	STJO 214	1977	1977G		2/1
2	DUVAL	STJO 215	1977	1977G		2/1
2	DUVAL	STJO 218	1977	1977G		2/1
2	DUVAL	BERLIN	1979	1979G		2/1
2	DUVAL	BERLIN RM 1	1979	1979G		2/1
2	DUVAL	BERLIN RM 2	1979	1979G		2/1
2	DUVAL	8/2 0215 TIDAL 3	= 1977	1977G		2/1
2	DUVAL	872 U217 A TIDAL	*1978	4.070.0		2/1
2	DUVAL	872 0219 D TIDAL	-1979	19796		2/1
2	DUVAL	872 0225 A TION	*1979	19796		2/1
2	DUVAL	872 0225 R TIDAL	*1005	19856		2/1
2		872 0225 6 TIDAL	*1095	19026		2/1
2	DINAL	DIVAL SOUTH BASE DH 3	1075	19030	D	1/1
2	DINAL	7 142	*1075	10750	D D	1/1
2	DUVAL	DIIVAL SOUTH BASE	*1075	1001	R	1/1
2	DUVAL	DUVAL SOUTH BASE PM 1	*1075	10011	R	1/1
2	DUVAL	M 142	*1075	10011	R	1/1
2	DUVAL	T 142	*1075	1001	R	1/1
2	DUVAI	B 173	1057	1078	2	1/2
2	DUVAL	B 325	*1991	19916	B	1/2
2	DUVAL	D 142	*1991	19916	B	1/2
2	DUVAL	D 325	*1991	19916	B	1/2
2	DUVAL	E 325	*1991	1991G	B	1/2
2	DUVAL	F 325	*1991	19916	B	1/2
2	DUVAL	G 325	*1991	1991G	B	1/2
2	DUVAL	н 325	*1991	1991G	B	1/2
2	DUVAL	JACKSONVILLE 1	*19 91	1991G	8	1/2
2	DUVAL	к 142	*1991	1991G	B	1/2
2	DUVAL	L 142	*19 91	19 91G	B	1/2
2	DUVAL	N 142	*19 91	1991G	B	1/2

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR	RECV	С	ORDR
			082	DATE		
2	DUVAL	R 142	*1991	199 16	8	1/2
2	DUVAL	V 2	*1991	1991g	B	1/2
2	DUVAL	195 72 A25	1973	1973G	B	2/0
2	DUVAL	195 72 A25 RM 1	1973	1973G	B	2/0
2	DUVAL	195 72 A25 RM 2	1973	1973G	B	2/0
2	DUVAL	195 72 A26	1973	1973G	B	2/0
2	DUVAL	195 72 A26 RM 1	1973	1973G	8	2/0
2	DUVAL	195 72 A26 RM 2	1973	1973G	В	2/0
2	DUVAL	195 72 A27	1973	1973G	B	2/0
2	DUVAL	195 72 A27 RM 1	1973	1973G	B	2/0
2	DUVAL	195 72 A27 RM 2	1973	1973G	8	2/0
2	DUVAL	195 72 A28	1973	1973 G	ß	2/0
2	DUVAL	195 72 A28 RM 1	1973	1973G	B	2/0 .
2	DUVAL	195 72 A28 RM 2	1973	1973G	B	2/0
2	DUVAL	195 72 A29	1973	1973G	B	2/0
2	DUVAL	195 72 A29 RM 1	1973	1973G	B	2/0
2	DUVAL	195 72 A29 RM 2	1973	1973 G	B	2/0
2	DUVAL	195 72 A30	1973	1973G	B	2/0
2	DUVAL	195 72 A30 RM 1	· 1973	1973 G	B	2/0
2	DUVAL	195 72 A30 RM 2	1973	1973G	B	2/0
2	DUVAL	195 72 A32	1973	1973 G	8	2/0
2	DUVAL	195 72 A32 RM 1	1973	1973 G	B	2/0
2	DUVAL	195 72 A32 RM 2	1973	1973 G	B	2/0
2	DUVAL	195 72 A33	1973	1973 G	B	2/0
2	DUVAL	195 72 A33 RM 1	1973	1973 G	B	2/0
2	DUVAL	195 72 A33 RM 2	1973	1973G	B	2/0
2	DUVAL	195 72 A34	1973	1973G	В	2/0
2	DUVAL	195 72 A34 RM 1	1973	19736	B	2/0
2	DUVAL	195 72 A34 RM 2 .	1973	1973G	В	2/0
2	DUVAL	195 72 A35	1973	1973G	6	2/0
2	DUVAL	195 72 A35 RM 1	1973	1973 G	B	2/0
2	DUVAL	195 72 A35 RM 2	1973	1973 G	B	2/0
2	DUVAL	195 J 7	1973	1973 6	B	2/0
2	DUVAL	DUVAL SOUTH BASE AZ MK RE	*1973	1973 G	B	2/0
2	DUVAL	872 0215 TIDAL 2	*1977	19776	B	2/1
2	DUVAL	OIL 3	*1977	1977 G	B	2/1
2	DUVAL	872 0242 TIDAL 4	*1977	1991G	B	2/1
2	DUVAL	J 325	*1977	1991N	B	2/1
2	DUVAL	195 72 A31 RM 1	*1978		B	2/1
2	DUVAL	195 72 A31 RM 2	*1978		B	2/1
2	DUVAL	I95 H 7	*1978		В	2/1
2	DUVAL	195 72 A31	*1978	19786	B	2/1
2	DUVAL	195 G 7	*1978	1978G	B	2/1

VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR	RECV	С	ORDR
		•	OBS	DATE		
3		L 30	1932	x		1/2
3		H 30	1932	1964X		1/2
3		н 142	1954	1955x		1/2
3		AJ 26	1954	1968x		1/2
3		τ 2	*1954	x		1/2
.3		R 2	*1975	19 78 x	B	1/1
3		J 142	*1954	1975x	B	1/2
3		s 2	*1954	1975x	B	1/2
3	DUVAL	D 332	1975	1991N		1/1
3	DUVAL	z 331	1975	1991N		1/1
3	DUVAL	TIDAL 1 JACKSONVILLE	1932	1935G		1/2
3	DUVAL '	TIDAL 3 JACKSONVILLE	1932	1935G		1/2
3	DUVAL	JACKSONVILLE L	1979	1979G		1/2
3	DUVAL	872 0268 TIDAL 1 RESET	*1991	1991G		1/2
3	DUVAL	B 332	*1991	1991G		1/2
3	DUVAL	Q 350	*1991	1991G		1/2
3	DUVAL	R 350	*1991	1991G		1/2
3	DUVAL	2 14	1977			2/1
3	DUVAL	872 0333 TIDAL 2	1977	1977G		2/1
3	DUVAL	AJ 4	*1975		B	1/1
3	DUVAL	E 142	*1975	1991N	8	1/1
3	DUVAL	G 30	1932	1935G	8	1/2
3	DUVAL	J 30	1932	1964G	B	1/2
3	DUVAL	к 30	1932	1964N	B	1/2
3	DUVAL	AJ 1	1954	1968G	B	1/2
3	DUVAL	S JAX	1954	1968G	B	1/2
3	DUVAL	AJ 3	1954	1968N	B	1/2
3	DUVAL	G 142	1954	1968N	B	1/2
3	DUVAL	C 193	1964		B	1/2
3	DUVAL	JAX CAMERA AZ MK	1964		8	1/2
3	DUVAL	JAX CAMERA RM 1	1964		B	1/2
3	DUVAL	JAX CAMERA RM 2	1964		8	1/2
3	DUVAL	JAX CAMERA	1964	1964G	B	1/2
3	DUVAL	RAD	1964	1964G	B	1/2
.3	DUVAL	К 123	*1964	1964G	B	1/2
3	DUVAL	A 173	*1979		B	1/2
3	DUVAL	т 144	*1979		B	1/2
3	DUVAL	U 144	*1979		B	1/2
3	DUVAL	V 144	*1979		B	1/2
3	DUVAL	872 0268 TIDAL 2	*1991	1991G	B	1/2
3	DUVAL	AJ 2	*1991	1991G	B	1/2
3	DUVAL	F 142	*1991	1991G	8	1/2
- 3	DUVAL	G 3	*1991	1991G	B	1/2
3	DUVAL	S 144	*1991	1991G	8	1/2
3	DUVAL	195 72 A17	1972	1972G	B	2/0
3	DUVAL	195 72 A17 RM 1	1972	1972G	8	2/0
3	DUVAL	195 72 A17 RM 2	1972	1972G	В	2/0
3	DUVAL	195 72 A18	1972	1972G	8	2/0
3	DUVAL	195 72 A18 RM 1	1972	1972G	B	2/0
3	DUVAL	195 72 A18 RM 2	1972	1972G	8	2/0
3	DUVAL	195 72 A19	1972	1972G	B	2/0
3	DUVAL	195 72 A19 RM 1	1972	1972G	В	2/0
3	DUVAL	195 72 A19 RM 2	1972	1972G	B	2/0

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VERTICAL CONTROL POINTS

		VERTICAL CONTROL POINTS				
RE	COUNTY	DESIGNATION	YEAR	RECV	C	ORDR
			OBS	DATE		
7	DIRIAI	105 73 430	1072	10726	٥	2/0
יב ד	DUVAL	175 72 A20 PN 1	1972	19726	R	2/0
כ ז	DINAL	175 72 A20 RM 1	1072	19726	R	2/0
. J 7	DIWAL	175 72 A21	1972	19726	R	2/0
7	DIWAI	195 72 A21 DN 1	1072	19726	R	2/0
े. .र	DUVAL	195 72 A21 PM 2	1972	1972G	B	2/0
7	DINAL	195 72 422	1972	1972G	B	2/0
3	DUVAL	195 72 A22 RM 1	1972	1972G	8	2/0
3	DUVAL	195 72 A22 RM 2	1972	1972G	B	2/0
3	DUVAL	195 72 A23	1972	1972G	B	2/0
3	DUVAL	195 72 A23 RM 1	1972	1972G	B	2/0
3	DUVAL	195 72 A23 RM 2	1972	1972G	B	2/0
3	DUVAL	195 A 5	1972	1972G	B	2/0
3	DUVAL	195 8 5	1972	1972G	B	2/0
3	DUVAL	195 C 5	1972	1972G	6	2/0
3	DUVAL	195 D 5	1972	1972G	B	2/0
3	DUVAL	195 E 5	1972	1972G	B	2/0
3	DUVAL	195 V 4	1972	1972G	8	2/0
3	DUVAL	195 W 4	1972	1972G	B	2/0
3	DUVAL	195 X 4	1972	1972G	B	2/0
3	DUVAL	195 Y 4	1972	1972G	B	2/0
3	DUVAL	195 Z 4	1972	1972G	B	2/0
3	DUVAL	I10 72 A19	1973	1973G	8	2/0
3	DUVAL	I10 72 A19 RM 2	1973	1973G	B	2/0
3	DUVAL	110 72 A20	1973	1973G	B	2/0
3	DUVAL	110 72 A20 RM 1	1973	1973G	B	2/0
3	DUVAL	110 72 A20 RM 2	1973	1973G	B	2/0
3	DUVAL	110 72 A21	1973	1973G	B	2/0
3	DUVAL	110 72 A21 RM 1	1973	1973G	8	2/0
3	DUVAL	110 72 A21 RM 2	1973	1973G	B	2/0
3	DUVAL	I 10 72 A22	1973	1973G	B	2/0
3	DUVAL	110 72 A22 RM 1	1973	1973G	B	2/0
3	DUVAL	110 72 A22 RM 2	1973	1973G	B	2/0
3	DUVAL	110 A 6	1973	19736	R	2/0
5	DUVAL		1975	19/36	8	2/0
3	DUVAL		1973	19/36	8	2/0
د -	DUVAL		1973	19736	B	2/0
5		110 X D 110 Y S	1973	17/36	D	2/0
د -	DUVAL	110 T D 110 7 5	19/3	10720	D	2/0
2		207 IISN	(גזעו 1077 *	10770	D	2/1
נ ד	DUVAL	LUT USR VODY &7 MY	+1077	10770	p	2/1
נ ד	DUVAL	JACKSONVILLE PM 2	*1085	19850	R	2/1
נ ד	DIIVAI	H 142 RESET	1075	19750	2	1/1
2	DUTAL	1 176 NEVEL				

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VERTICAL CONTROL POINTS

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RE	COUNTY	DESIGNATION	YEAR	RECV	С	ORDR
			OBS	DATE		
,			10/5	~		1 /2
4		BB E OS RESEI	1943	× ×		1/2
7	CLAY	873 037/ A TIDAL	1079	^		2/1
2		SIZ USIA A TIDAL	1078			2/1
4	CLAY	872 A376 P TIDAI	1078	10786		2/1
.7	CLAY	872 0374 6 TIDAL	1078	10786		2/1
4	CLAY	872 0374 C TIDAL	1078	10786		2/1
4	CLAY	872 0374 E TIDAL	1978	19786		2/1
4	CLAY	BE 65	1978	1978G		2/1
4	CLAY	BE 66	1978	1978G		2/1
4	CLAY	K 45 RESET	1945	1964G	B	1/2
4	CLAY	N 30	*1945	1958G	B	1/2
4	DUVAL	F 332	1975	1991N		1/1
4	DUVAL	E 332	*1991	1991G		1/2
4	DUVAL	872 0333 TIDAL 3	1977	1977G		2/1
4	DUVAL	872 0409 B TIDAL	1978	1978G		2/1
4	DUVAL	JC 1	1978	1978G		2/1
4	DUVAL	JC 2	1978	1978G		2/1
4	DUVAL	872 0409 A TIDAL	*1978	1978G		2/1
4	DUVAL	872 0409 C TIDAL	*1978	1978G		2/1
4	DUVAL	JC 3	*1978	1978G	·	2/1
4	DUVAL	SRD DUVAL CO	*1978	1978G		2/1
4	DUVAL	6 LA	*1975		8	1/1
4	DUVAL	C 142	*1975	1991N	B	1/1
4	DUVAL	AJ 5	1954	1968G	B	1/2
4	DUVAL	1295 72 A	1972	1972G	B	2/0
4	DUVAL	1295 72 A04 RM 1	1972	1972G	B	2/0
4	DUVAL	1295 72 A04 RM 2	1972	1972G	8	2/0
4	DUVAL	1295 72 A05	1972	1972G	B	2/0
4	DUVAL	1295 72 AUS RM 1	1972	19726	8	2/0
4	DUVAL	1295 72 AUS RM 2	1972	19726	8	2/0
4	DUVAL	1293 72 AUG	-1072	19726	8	2/0
4	DUVAL	1275 72 AUG KM 2	1972	19720	P	2/0
2		1275 72 A07 KF 1	1072	10720	0	2/0
2	DIIVAI	1205 72 ANR PM 1	1072	10726	0	2/0
2	DUVAL	1295 72 409	1072	19726	2	2/0
4	DUVAL	1295 72 AD9 RM 1	1072	19726	8	2/0
4	DUVAL	1295 72 A10	1972	19726	R	2/0
4	DUVAL	1295 72 A10 RM 1	1972	19726	R	2/0
4	DUVAL	1295 72 A10 RM 2	1972	19726	8	2/0
4	DUVAL	1295 72 A11	1972	1972G	B	2/0
4	DUVAL	1295 72 A11 RM 1	1972	1972G	8	2/0
4	DUVAL	1295 72 A11 RM 2	1972	1972G	B	2/0
4	DUVAL	1295 A 1	1972	1972G	8	2/0
4	DUVAL	1295 B 1	1972	1972G	8	2/0
4	DUVAL	1295 C 1	1972	1972G	8	2/0
4	DUVAL	1295 E 1	1972	1972G	B	2/0
4	DUVAL	1295 F 1	1972	1972G	B	2/0
4	DUVAL	I295 H 1	1972	1972G	B	2/0
4	DUVAL	1295 J 1	1972	1972G	8	2/0
4	DUVAL	1295 K 1	1972	1972G	8	2/0
4	DUVAL	1295 L 1	1972	1972G	B	2/0

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR OBS	RECV DATE	С	ORDR
4	DUVAL	1295 M 1	1972	19726	8	2/0
4	DUVAL	1295 N 1	1972	1972G	B	2/0
4	DUVAL	195 72 A14 AZ NK	1972	1972G	8	2/0
4	DUVAL	195 72 A15	1972	1972 G	B	2/0
4	DUVAL	195 72 A15 RM 1	1972	1972G	B	2/0
4	DUVAL	195 72 A15 RM 2	1972	1972G	B	2/0
4	DUVAL	195 72 A16	1972	1972G	B	2/0
4	DUVAL	195 72 A16 RM 1	1972	1972G	8	2/0
4	DUVAL	195 72 A16 RM 2	1972	1972G	B	2/0
4	DUVAL	195 T 4	1972	1972G	B	2/0
4	DUVAL	195 U 4	1972	1972G	B	2/0
4	DUVAL	YORK RM 1	*1972	1972G	B	2/0
4	DUVAL	MULBERRY CAMERA 1381 GSS	*1977	1977G	8	2/1 .
4	DUVAL	YORK	*1977	1977G	В	2/1
4	DUVAL	1295 72 AD6 RM 1	*1978	1978G	B	2/1
4	DUVAL	1295 72 A07	+1978	1978G	B	2/1
4	DUVAL	1295 72 A07 RM 2	*1978	1978G	8	2/1
4	DUVAL	1295 72 AD9 RM 2	*1978	1978G	8	. 2/1
4	DUVAL	1295 D 1	*1978	1978G	В	2/1
2	DUVAI	1295 G 1	*1978	1978G	B	2/1
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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR	RECV	C	ORDR
		-	085	DATE		
5		P 37	· 1945	1958x	B	1/2
5		BP 83	1945	1972x	8	1/2
5		BP 84	1945	1975x	B	1/2
5	CLAY	. T 30	1932	1967N		1/2
5	CLAY	STTH 300	1975	1975G	8	1/1
15	CLAY	TIDAL STA 1-31 TIDAL 1	1975	1975G	B	1/1
5	CLAY	TIDAL STA 1-31 TIDAL 2	1975	1975G	B	1/1
5	CLAY	WHITE 2	1975	1975G	B	1/1
5	CLAY	WHITE 2 RM 3	1975	1975G	B	1/1
5	CLAY	G 123	*1975	1975G	B	1/1
5	CLAY	s 30	1932	1967G	B	1/2
·5	CLAY	P 2	1945	1945G	B	1/2
5	CLAY	PTS 10 K	*1945	1952G	B	1/2
5	CLAY	U 30	*19 45	1952G	B	1/2

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR OBS	RECV	C	ORDR
6	CLAY	V 30	1932	1934G		1/2
6	CLAY	H 123	*1975		B	1/1
6	CLAY	J 123	*1975	1975G ·	B	1/1
6	CLAY	W 30	1932	1934G	B	1/2
6	CLAY	X 30	1932	1948G *	B	1/2
6	CLAY	12.09	1945	1945G	8	1/2

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR OBS	RECV C Date	ORDR
7		z 30 ·	1932	UNK X	1/2
7		P 75 8 USGS	1933	x	1/2
7		G	*1933	x	1/2
7	PUTNAM	PUT 20	1985		2/1
7	PUTNAM	PUT 21	1985		2/1
7	PUTNAM	PUT 22	1985		2/1
7	PUTNAM	PUT 23	1985		2/1
7	PUTNAM	PUT 24	1985		2/1
7	PUTNAM	872 0653 A TIDAL	1985	1985G	2/1
7	PUTNAM	872 0653 B TIDAL	1985	1985G	2/1
7	PUTNAM	872 0653 TIDAL 1	1985	1985G	2/1
-7	PUTNAM	872 0653 TIDAL 2 RESET	1985	1985G	2/1
7	PUTNAM	872 0653 TIDAL 3	1985	1985G	2/1
7	PUTNAM	872 0653 TIDAL 4	1985	1985G	2/1
7	PUTNAM	872 0653 TIDAL CY 2	1985	1985G	2/1
7	PUTNAM	P 222	1964	В	1/1
7	PUTNAM	HASTINGS AZ	1964	1964G B	1/1
7	PUTNAM	HASTINGS RM 1	⁻ 1964	1964G B	1/1
7	PUTNAM	HASTINGS RM 2	1964	1964G B	1/1
7	PUTNAM	o 222 .	1964	1964G B	1/1
7	PUTNAM	Y 30	1932	1970G B	1/2
7	PUTNAM	Z 30 RESET	1985	1985G B	2/1
7	ST JOHNS	B 224	1964	8	1/1
7	ST JOHNS	BP 173	1964	1964G B	1/1
7	ST JOHNS	BP 174	1964	1964G B	1/1
7	ST JOHNS	PTS 8 RESET 1937	1964	1964G B	1/1
7	ST JOHNS	Y. 14	*1964	1964G B	1/1
7	ST JOHNS	N 222	*1985	B	2/1

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR	RECV	С	ORDR
			OBS	DATE		
8		U 14	1933	X		1/2
8		S 14	1933	1956X		1/2
8		TIDAL 3 STA I 34	1934	X		2/0
8		TIDAL 4 STA I 34	1934	X		2/0
8		J	*1934	X		2/0
8		т 14	*1934	1970X		2/0
8	PUTNAM	PTS 7 USGS	1932	1970G		1/2
8	PUTNAM .	R 14	1933	1966N		1/2
8	PUTNAM	23.6	1933	1970G		1/2
8	PUTNAM	A 81	1934	1966N		2/0
8	PUTNAM	PUT 25	1985			2/1
8	PUTNAM	PUT 26	1985			2/1
8	PUTNAM	PUT 29	1985			2/1
8	PUTNAM	PUT 30	1985			2/1
8	PUTNAM	PUT 31	1985			2/1
8	PUTNAM	BOSTWICK RESET	1985	19856		2/1
8	PUTNAM	BOSTWICK RM 2	1985	1985G		2/1
8	PUTNAM	BOSTWICK RM 3	1985	1985G		2/1
8	PUTNAM	D 31 RESET	1985	19856		2/1
8	PUTNAM	P 27	1985	19856		2/1
8	PUTNAM	PUT 27	1985	19856		2/1
8	PUTNAM	PUT 28	1985	19036	_	2/1
8	PUTNAM	C 224	1964		8	1/1
8	PUTNAM	R 222	1964		5	1/1
8	PUTNAM	S 222	1964		5	1/1
8	PUTNAM	1 222	1904		5	1/1
8	PUTNAM	0 222	1904	10740		1/1
8	PUTNAM	V 222	1904	19/04	D	1/1
8	PUINAM	E 204	1900		D	1/1
8	PUINAM	M 263	1900	•	р р	4.74
8	PUINAM	N 203	1900	•	D	1/1
8	PUINAM	Q 203	1900	10720	0 0	1/1
0	PUTNAM		*104/	10700		1/1
8	PUINAM	W 14	*1044	10440	. D	1/1
0	PUINAM	B 227 D 91	*1064	19666		5/1
0 9	DUTNAM	E 224	*1064	19666	: R	1/1
8	DITNAM	V 30	*1964	19666	R	1/1
8	DITNAM	r 31	*1966	19700	8	1/1
8	DUTNAM		*1964	19700	: R	1/1
8		F 31	*1966	19700	B	1/1
8		n 224	+1964	19770	: B	1/1
8		CERC 15	*197	19750	; R	1/1
R	PUTNAM	A 31	1932	2 19700	; B	1/2
R		B 31	193	2 19700	; B	1/2
8	PUTNAM	A 19	1933	5 19700	5 B	1/2
5	PUTNAM	872 0774 TIDAL 6	*197	3 19780	B	2/1
ę	PUTNAM	872 0774 TIDAL 7	*197	3 19780	5 B	2/1
8	PUTNAM	872 0774 TIDAL 8	*197	3 19780	i B	2/1
ε	9 PUTNAM	872 0774 TIDAL 5	*198	5 19850	S B	2/1
ε	UTNAM	PTS 6	*198	5 19850	5 B	2/1
8	PUTNAM	S 14 RESET	*198	5 19850	5 B	2/1

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VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR	RECV	C	ORDR
		Ľ	OBS	DATE		
9		E 19	1933	1970x		1/2
9		B 19	1933	1985X	B	1/2
9	PUTNAN	PUT 17	1985			2/1
9	PUTNAM	PUT 18	1985			2/1
9	PUTNAM	PUT 6	1985			2/1
.9	PUTNAN	PUT 7	1985			2/1
9	PUTNAM	PUT 8	1985			2/1
9	PUTNAM	PUT 9	1985			2/1
9	PUTNAM	872 0767 A TIDAL	1985	198 56		2/1
9	PUTNAM	872 0767 B TIDAL	1985	198 56		2/1
9	PUTNAM	872 0767 C TIDAL	1985	1985G		2/1
9	PUTNAM	872 0767 D TIDAL	1985	1 98 56		2/1
9	PUTNAM	872 0767 E TIDAL	1985	1 98 56		2/1
9	PUTNAM	PUT 4	1985	1985G		2/1
9	PUTNAM	PUT 5	1985	1985G		2/1
9	PUTNAM	X 222	1964		B	1/1
9	PUTNAM	A 227	1964	1985G	в	1/1
9	PUTNAM	W 222	1964	1985G	в	1/1
9	PUTNAM	F 31	*1964	1985G	B	1/1
9	PUTNAM	C 19	1933	1970G	B	1/2
9	PUTNAM	F 19	1933	1970G	B	1/2
9	PUTNAM	G 19	1933	19766	B	1/2
9	PUTNAM	D 19	1933	19856	8	1/2
9	PUTNAM	H 19	*1935	19706	R	2/0

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RE	COUNTY	DESIGNATION	YEAR	RECV C	: (ORDR
			065	UNIE		
10		1 USGS	1933	K		1/2
10		2 USBM	1933	ĸ	•	1/2
10		Z 80	1934	×	i	2/0
10		Y 80	1934	1961k		2/0
10		J 19	*1935	X	1	2/0
10		L 19	*1935	ĸ	1	2/0
10		M 19	*1935	X	1	2/0
10		к 19	*1935	1970x	1	2/0
10	PUTNAM	3=TIDAL STA 1-38	1933	1970G		1/2
10	PUTNAM	PUT 10	1985		÷	2/1
10	PUTNAM	PUT 11	1985		1	2/1
10	PUTNAM	PUT 12	1985			2/1
10	PUTNAM	PUT 13	1985			2/1
10	PUTNAM	PUT 14	1985			2/1
10	PUTNAM	30 13 RJN	1985	1985G		2/1
10	PUTNAM	872 0832 TIDAL 1	1985	1985G		2/1
10	PUTNAM	PTS 16	1985	1985G		2/1
10	PUTNAM	872 0832 A TIDAL	*1985	1985G		2/1
10	PUTNAM	872 0832 B TIDAL	*1985	1985G		2/1
10	PUTNAM	WELAKA	*1985	1985G		2/1
10	PUTNAM	WELAKA RM 3	*1985	1985G		2/1
10	PUTNAM	WELAKA RM 4	*1985	1 98 5G		2/1
10	PUTNAM	78 PTS 15	*1935	l	B	2/0
10	PUTNAM	N 19	*1985	1985G	B	2/1

VERTICAL CONTROL POINTS

RE	COUNTY	DESIGNATION	YEAR OBS	RECV DATE	C	ORDR
11	PUTNAM	PUT 15	⁻ 1985			2/1
11	PUTNAM	PUT 16	1985			2/1
11	PUTNAM	19 CMP	1985	1985G		2/1
11	PUTNAM	20 CMP	1985	1 98 5G		2/1
11	PUTNAM	872 0877 TIDAL 6	1985	1985G		2/1
11	PUTNAM	52.9	1933	1939G	B	1/2
11	PUTNAM	P 19	*1935	1935G	B	2/0
11	PUTNAM	т 19	*1935	1935G	B	2/0
11	PUTNAM	U 19	*1935	1935G	B	2/0
11	PUTNAM	Q 19	*1935	1954G	8	2/0
11	PUTNAM	R 19	*1935	1970G	B	2/0
11	PUTNAM	S 19	*1935	1976G	B	2/0
11	PUTNAM	21 CMP	*1985	1985G	B	2/1
11	PUTNAM	22 CMP	*1985	1985G	B	2/1
11.	PUTNAM	872 0877 TIDAL 3	*1985	1985G	8	2/1
11	PUTNAM	872 0877 TIDAL 7	*1985	1985G	B	2/1
11	PUTNAM	872 0877 TIDAL 8	*1985	1985G	B	2/1
11	PUTNAM	872 0877 TIDAL 9	*1985	1 985 6	8	2/1

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07/01/93	PAGE 1	,
VERTICAL POINTS		(
YEAR YEAR ORDR PID STAMPING	ORDR	`
RECV OBS	CLSS	
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VERTICAL POINTS					
YEAR	YEAR	ORDR	PID	STAMPING	ORDR
RECV	OBS				CLSS
				a aa/	4 / 1
	1904	1	AQ0107	B 224	1/1
	1964	4	A015/7	D 777	1/1
	1964	1	400100	R 222	1/1
	1964	1	AQ0099	s 222	1/1
•	1964	1	AQ0095	1 222	1/1
	1964	1	AQ0094	U 222	1/1
	1964	1	AQ0116	x 222	1/1
	1966	1	AQ0075	E 264	1/1
	1966	1	AQ0058	м 263	1/1
	1966	1	AQ0053	N 263	1/1
	1966	1	AQ0083	Q 263	1/1
	1964	1	BC0387	C 193	1/2
	1964	1	BC0383	JAX CAMERA AZ MK	1/2
	1964	1	BC0384	JAX CAMERA RM 1	1/2
	1964	1	BC0385	JAX CAMERA RM 2	1/2
1934G	1932	1	AQ0018	V 30	1/2
1934G	1932	1	AQ0019	W 30	1/2
1935G	1932	1	BC0371	G 30	1/2
19356	1932	1	BCU345	TIDAL 1 JACKSONVILLE	1/2
19356	1932	1	800344	TIDAL 3 JACKSONVILLE	1/2
19396	1933	1	A00008	52.9	1/2
19436	1945	1	AQ0005		1/2
10/90	1073	4	A00022	r 2 v 70	1/2
19400	+10/5	1	A00022		1/2
19526	*10/5	1	A00004	11 30	1/2
19586	*1945	1	RC0398	N 30	1/2
19646	1964	1	AQ0108	BP 173	1/1
1964G	1964	1	A00103	BP 174	1/1
1964G	1964	1	AQ0104	HASTINGS AZ	1/1
1964G	1964	1	AQ0106	HASTINGS RM 1	1/1
196 4G	1964	1	AQ0105	HASTINGS RM 2	1/1
1964G	1964	1	AQ0111	PTS 8 RESET 1937	1/1
196 4G	1964	1	AQ0102	Q 222	1/1
196 46	*1964	1	AQ0110	Y 14	1/1
1964 G	1932	1	BC0332	J 30	1/2
196 46	1945	1	BC0397	K 45 RESET	1/2
1964 G	1964	1	BC0382	JAX CAMERA	1/2
196 4G	1964	1	800386	RAD	1/2
1964G	*1964	1	BC1353	к 123	1/2
1964N	1932	1	BC0331	к 30	1/2
19666	*1966	1	AQ0091	B 227	1/1
1966G	*1966	1	AQ0056	B 81	1/1
1966G	*1966	1	A00090	E 224	1/1
1966G	=1966		AQ0054	V 39	1/1
1966N	1933		AQ0074	R 14	1/2
196/G	1932	;] 	800421	5 50	1/2
10400	105/	. i 9	AU1201	UC I	1/2
10480	105/	1	800200		1/2
19680	1954	1	BC0361	S JAX	1/2

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VERTICAL POINTS

YEAR	YEAR	ORDR	PID	STAMPING	ORDR
RECV	OBS			e.	CLSS
1968N	1954	1	BC0360	G 142	1/2
1970G	*196 4	1	AQ0097	W 14	1/1
1970 G	*1966	1	AQ0062	C 31	1/1
19706	*1966	1	AQ0065	D 31	1/1
1970G	*1966	1	AQ0092	E 31	1/1
1970G	1932	1	AQ0042	A 31	1/2
1970G	1932	1	AQ0043	B 31	1/2
1970G	1932	1	AQ0098	PTS 7 USGS	1/2
1970G	1932	1	AQ0023	Y 30	1/2
1970G	1933	1	AQ0061	23.6	1/2
1970G	1933	1	AQ0680	3=TIDAL STA 1-38	1/2
1970G	1933	1	AQ0070	A 19	1/2
1970G	1933	1	AQ0143	C 19	1/2
1970G	1933	1	AQ0144	F 19	1/2
1970G	1970	1	BC0273	TIDAL STA 1 22 A	1/2
1970N	1932	1	BC0457	2	1/2
1970N	1932	1	BC0460	5	1/2
1970N	1932	1	BC0474	A 30	1/2
1970N	1932	1	BC0456	TIDAL STA 1 17 TIDAL 14	1/2
1970N	1932	1	BC0465	JIDAL STA 1 17 TIDAL 15	1/2
1972G	1966	1	A00086	L 263	1/1
1972G	*1966	1	AQ0087	D 224	1/1
					., .
75		1			
		·			
	*1935	2	AQ0147	78 PTS 15	2/0
	1970	2	BC0475	H 324	2/0
1935G	*1935	2	AQ0675	P 19	2/0
1935G	*1935	2	AQ0671	T 19	2/0
1935G	*1935	2	AQ0669	U 19	2/0
1954G	*1935	2	AQ0674	9 19	2/0
1966N	1934	2	AQ0059	A 81	2/0
1970G	*1935	2	AQ0146	H 19	2/0
1970G	*1935	2	AQ0673	R 19	2/0
19726	1972	2	BC1184	1295 72 A	2/0
19726	1972	2	BC1183	1205 72 AD4 PM 1	2/0
19726	1972	2	BC1185	1295 72 ANL PM 2	2/0
10726	1072	2	RC1188	1205 72 405	2/0
10726	1072	2	BC1187	1205 72 ANS PM 1	2/0
10720	1072	2	001107	1205 72 A05 DM 2	2/0
10720	1072	2	BC1107	1295 72 A05 KM 2	2/0
10720	1072	- -	001102	1295 72 A06 BM 3	2/0
10720	1072	2	BC1193	1295 72 AUD RM 2	2/0
10720	1072	2	BC1005	1295 72 AUR KM (2/0
10720	17/2	2	BC1003	1275 72 AUG	2/0
10720	1072	2	BC1004	1295 72 AUG KM 1	2/0
10700	17/2	2	BC100/	1277 12 AUY	2/0
19726	1077	د ۲	BC1003	1293 72 AUY KM 1	2/0
19726	1072	2	BC1013	1273 FE RIU 1205 72 440 pm 4	2/0
19/26	1072	2	BC1012	1277 72 ATU KM 1	2/0
10720	1070	2	BC1017	1277 /2 AIU KM 2	2/0
19720	1072	2	BC101/	1277 12 ATT	2/0
19726	1972	۲ ٦	BL 1016	1297 72 ALL RM 1	2/0
1972G	1972	۷	RC1018	1295 72 ATT RM Z	Z/0

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VERTICAL POINTS

YEAR	YEAR	ORDR	PID `	STAMPING	ORDR
RECV	OBS				CLSS
1972G	1972	2	BC1182	1295 A 1	2/0
1972G	1972	2	BC1186	I295 B 1	2/0
1972G	1972	2	BC1190	1295 C 1	2/0
1972G	1972	2	BC1198	1295 E 1	2/0
1972G	1972	2	8C1002	1295 F 1	2/0
1972G	1972	2	BC1009	1295 H 1	2/0
1972G	1972	2	BC1010	1295 J 1	2/0
1972G	1972	2	BC1011	1295 K 1	2/0
1972G	1972	2	BC1015	1295 L 1	2/0
1972G	1972	2	BC1019	1295 M 1	2/0
1972G	1972	2	BC1020	1295 N 1	2/0
1972G	1972	2	BC1133	195 72 A14 AZ MK	2/0
1972G	1972	2	BC1135	195 72 A15	2/0
1972G	1972	2	BC1136	195 72 A15 RM 1	2/0
1972G	1972	2	BC1134	195 72 A15 RM 2	2/0
1972G	1972	2	8C1139	195 72 A16	2/0
1972 G	1972	2	8C1138	195 72 A16 RM 1	2/0
1972G	1972	2	BC1140	195 72 A16 RM 2	2/0
1972G	1972	2	BC1144	195 72 A17	2/0
1972G	1972	2	BC1142	195 72 A17 RM 1	2/0
1972G	1972	2	BC1143	195 72 A17 RM 2	2/0
1972G	1972	2	BC1148	195 72 A18	2/0
1972G	1972	2	BC1146	195 72 A18 RM 1	2/0
1972G	1972	2	BC1145	195 72 A18 RM 2	2/0
1972G	1972	2	BC1152	195 72 A19	2/0
1972G	1972	2	BC1151	195 72 A19 RM 1	2/0
1972G	1972	2	BC1153	195 72 A19 RM 2	2/0
1972G	1972	2	BC1156	195 72 A20	2/0
1972G	1972	2	BC1157	195 72 A20 RH 1	2/0
1972G	1972	2	BC1155	195 72 A20 RM 2	2/0
1972G	1972	2	BC1161	195 72 A21	2/0
1972G	1972	2	BC1159	195 72 A21 RM 1	2/0
1972G	1972	2	BC1158	195 72 A21 RM 2	2/0
1972G	1972	2	BC1166	195 72 A22	2/0
1972G	1972	2	BC1164	195 72 A22 RM 1	2/0
1972G	1972	2	BC1163	195 72 A22 RM 2	2/0
1972G	1972	2	BC1171	195 72 A23	2/0
1972G	1972	2	BC1169	195 72 A23 RM 1	2/0
1972G	1972	2	BC1168	195 72 A23 RM 2	2/0
1972G	1972	2	BC1162	195 A 5	2/0
1972G	1972	2	BC1165	195 B 5	2/0
1972G	1972	2	BC1167	195 C 5	2/0
1972G	1972	2	BC1170	195 D 5	2/0
1972G	1972	2	BC1172	195 E 5	2/0
1972G	1972	2	BC1137	195 T 4	2/0
1972G	1972	2	BC1141	I95 U 4	2/0
1972G	1972	2	BC1147	195 V 4	2/0
1972G	1972	2	BC1149	195 W 4	2/0
1972G	1972	2	BC1150	195 x 4	2/0
1972G	1972	2	BC1154	195 Y 4	2/0
1972G	1972	2	BC1160	195 Z 4	2/0
1972G	*1972	2	BC0393	YORK RM 1	2/0
1973g	1970	2	BC0442	Q 324	2/0

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YEAR	YEAR	ORDR	PID	SJAMPING	ORDR
RECV	OBS				CLSS
1973G	1970	2	BC0446	s 324 ·	2/0
1973G	1973	2	BC1267	DUVAL SOUTH BASE RM 3	2/0
1973G	1973	2	BC1215	110 72 A19	2/0
1973G	1973	2.	BC1214	110 72 A19 RM 2	2/0
1973G	1973	2	BC1219	110 72 A20	2/0
1973G	1973	2	BC1220	110 72 A20 RM 1	2/0
1973G	1973	2	BC1218	110 72 A20 RH 2	2/0
1973G	1973	2	BC1224	110 72 A21	2/0
1973G	1973	2	BC1226	110 72 A21 RM 1	2/0
1973G	1973	2	BC1225	110 72 A21 RM 2	2/0
1973G	1973	2	BC1230	110 72 A22	2/0
1973G	1973	2	8C1231	110 72 A22 RM 1	2/0
19736	1975	2	BC1229	110 72 A22 RM 2	2/0
1973G	1973	2	BC1228	I10 A 6	2/0
1973G	1973	2	801216	110 U 5	2/0
1973G	1973	2	BC1217	110 V 5	2/0
1973G	1973	2	BC1221	110 W 5	2/0
1973G	1973	2	BC1222	110 X 5	2/0
1973G	1973	-2	BC1223	110 Y 5	2/0
1973G	1973	2	BC1227	Į10 Z 5	2/0
1973G	1973	2	BC1232	195 72 A25	2/0
1973G	1973	2	BC1234	195 72 A25 RM 1	2/0
1973G	1973	2	BC1233	195 72 A25 RM 2	2/0
1973G	1973	2	BC1236	195 72 A26	Z/0
1973G	1973	2	BC1237	195 72 A26 RM 1	2/0
1973G	1973	Z	BC1235	195 72 A26 RM 2	2/0
19736	1973	2	BC1239	195 72 A2/	2/0
19736	1973	2	801240	195 72 A27 RM 1	2/0
19736	1973	2	BC1238	195 72 AZ7 KM 2	2/0
19736	1973	2	BC1242	195 72 A28	2/0
19736	1973	2	BL1241	190 72 A28 KM 1	2/0
19736	1077	2	BC1243	195 72 A20 KM 2	2/0
19730	1072	2	BC1244	175 72 A27	2/0
10730	1973	2	BC1240	175 72 A27 KM (2/0
10730	1073	2	DC1242	172 72 AZ7 KM 2	2/0
10730	1073	2	BC1240	195 72 A30 PM 1	2/0
10730	1073	2	BC1247	175 72 A30 RM 1	2/0
19730	1073	2	BC1247	105 72 A30 KH 2	2/0
10730	1073	2	BC1254	175 72 A32 BN 1	2/0
10730	1073	2	BC1253	175 72 A32 PM 2	2/0
10736	1073	2 ·	BC1265	195 72 A33	2/0
10730	1073	2	801265	195 72 ASS	2/0
10736	1073	2	BC1204	105 72 A33 PM 2	2/0
19736	1973	2	BC1262	195 72 434	2/0
19736	1973	2	BC1261	195 72 A34 RM 1	2/0
19730	1973	2	BC1263	195 72 A34 RM 2	2/0
19736	1973	2	BC1258	195 72 A35	2/0
19736	1973	2	BC1260	195 72 A35 RM 1	2/0
1973G	1973	2	BC1259	195 72 A35 RM 2	2/0
1973G	1973	2	BC1268	195 J 7	2/0
1973 G	*1973	2	BC0263	DUVAL SOUTH BASE AZ MK RE	2/0

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VERTICAL POINTS

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YEAR	YEAR	ORDR	PID *	STAMPING	ORDR
RECV	08 S				CLSS
	*1975	1	BC0377	AJ 4	1/1
	-19/5	1	BC0404	AJ 0	1/1
	-19/2	1	A40009	H 123	1/1
	*1070	•	BC0320	R 173	1/2
	*1070	1	BC0327	1 144	1/2
	*1070	1	BC0320	V 144	1/2
19756	1975	5	BC0358	H 142 RESET	1/1
1975G	1975	1	AQ0220	STTH 300	1/1
1975G	1975	1	AQ1552	TIDAL STA 1-31 TIDAL 1	1/1
1975G	1975	1	AQ1549	TIDAL STA 1-31 TIDAL 2	1/1
1975G	1975	1	AQ1550	WHITE 2	1/1
1975G	1975	1	AQ1548	WHITE 2 RM 3	1/1
1975G	*1975	1	AQ0085	CFBC 15	1/1
1975G	*1975	1	AQ0007	G 123	1/1
1975G	*1975	1	AQ0011	J 123	1/1
1975G	*1975	1	BC0248	2 142	1/1
1976G	1964	1	AQ0089	V 222	1/1
1976G	1933	1	AQ0145	G 19	1/2
1978N	1957	1	BC0327	в 173	1/2
1979G	1979	1	BC1484	JACKSONVILLE L	1/2
1985G	1964	1	AQ0115	A 227	1/1
1985G	1964	1	AQ0113	W 222	1/1
1985G	*1964	1	AQ0114	F 31	1/1
1985G	1933	1	AQ0080	D 19	1/2
1991G	1975	1	BC0355	STJO 219	1/1
1991G	*1991	1	BC0290	4601	1/2
1991G	*1991	1	BC1406	872 0198 A TIDAL	1/2
1991G	*1991	1	BC0461	872 0220 TIDAL 12	1/2
1 9 91G	*1991	1	BC0462	872 0220 TIDAL 13	1/2
1991G	*1991	1	BC0334	872 0268 TIDAL 1 RESET	1/2
1991G	*1991	1	BC0335	872 0268 TIDAL 2	1/2
19 916	*1991	1	BC0341	A 332	1/2
1991G	*1991	1	BC0369	AJ 2	1/2
1991G	*1991	1	BC0265	B 325	1/2
1991G	*1991	1	BC0364	8 332	1/2
1991G	*1991	1	BC0350	D 142	1/2
19916	*1991	1	BCUZ76	D 325	1/2
1991G	= 1991	-1	BCU2//	E 325	1/2
19916	- 1991	1	BC0401	E 332	1/2
19916	= 1991	1	800407	EDM 14	1/2
19916	+1001	1	BL0430	EUM 13	1/2
10010	* 1991	4	BC0300	F 142 E 325	1/2
10010	*1001	4	BC0210	F 325	1/2
10010	*1001	1	BC0303	6 J 6 325	1/6
10010	*1001	1	BC0280	н 325	1/2
19916	*1001	1	BC0342	JACKSONVILLE 1	1/2
19916	*1991	1	BC034R	K 142	1/2
19916	*1991	1	BC0282	K 325	1/2
19916	+1991	1	BC0349	L 142	1/2
1991G	*1991	1	BC0283	L 325	1/2
1991G	*1991	1	BC0284	M 325	1/2

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VERTICAL POINTS

YEAR RECV	YEAR Obs	ORDR	PID	STANPING	ORDR CLSS
1991 G	*1991	1	BC0459	MAYPORT 2 RM 1	1/2
1991G	*1991	1	BC0356	N 142	1/2
1991G	*1991	1	BC0449	N 324	1/2
1991G	*1991	1	BC0286	N 325	1/2
1991G	*1991	1	BC0450	P 324	1/2
1991G	*1991	1	BC0285	P 325	1/2
1991G	*1991	1	BC0287	9 325	1/2
1991G	*1991	1	BC1483	Q 350	1/2
1991G	*1991	1	BC0268	R 142	1/2
1991G	*1991	1	BC0288	R 325	1/2
1991G	*199 1	1	BC1482	R 350	1/2
1991G	*1991	1	BC0330	S 144	1/2
1991G	*1991	1	BC0289	s 325	1/2
1991G	*1991	1	BC0251	s 331	1/2
1991G	*1991	1	BC0256	T 331	1/2
1991G	*1991	1	BC0454	U 325	1/2
1991G	*1991	1	BC0258	U 331	1/2
1991G	*1991	1	BC0269	V 2	1/2
1991G	*19 91	1	BC0453	v 325	1/2
1991G	*1991	1	BC0264	V 331	1/2
1991G	*1991	1	BC0452	W 325	1/2
1991G	*1991	1	BC0267	W 331	1/2
1991G	*1991	1	BC0451	x 325	1/2
1991N	1975	1	BC0376	D 332	1/1
1991N	1975	1	BC0261	DUVAL SOUTH BASE RM 3	1/1
1991N	1975	1	8C0403	F 332	1/1
1991N	1975	1	BC0270	X 331	1/1
1991N	1975	1	BC0367	z 331	1/1
1991N	*1975	1	BC0402	C 142	1/1
1991 <u>N</u>	*1975	1	BC0259	DUVAL SOUTH BASE	1/1
1991N	*1975	1	BC0262	DUVAL SOUTH BASE RM 1	1/1
1991N	*1975	1	BC0370	E 142	1/1
1991N	*1975	1	BC0351	M 142	1/1
1991N	*1975	1	BC0257	T 142	1/1
1991N	1970	1	BC0455	T 325	1/2

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1977 2	BC1546	2 14	2/1
1977 2	BC1408	872 0198 B TIDAL	2/1
1977 2	BC1557	872 0215 D TIDAL	2/1
1977 2	BC1422	872 0244 D TIDAL	2/1
1977 2	BC1421	872 0244 E TIDAL	2/1
1977 2	BC1414	GMC 1	2/1
1978 2	BC1427	872 0374 A TIDAL	2/1
1978 2	BC1423	HLM 1	2/1
1978 2	BC1464	872 0217 A TIDAL	2/1
1978 2	BC1472	872 0232 A TIDAL	2/1
1978 2	BC1471	872 0232 B TIDAL	2/1
1978 2	BC1470	CUT 12	2/1
1978 2	BC1250	195 72 A31 RM 1	2/1
1978 2	BC1251	195 72 A31 RM 2	2/1
1978 2	BC1257	195 H 7	2/1

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VERTICAL POINTS

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YEAR	YEAR	ORDR	PID	STAMPING	ORDR
RECV	OBS		•		CLSS
	1985	2	AQ2557	PUT 10	2/1
	1985	Z	A92558	PUT 11	2/1
	1985	2	AQ2559	PUT 12	2/1
	1985	2	AQ2560	PUT 13	2/1
	1985	2	AQ2561	PUT 14	2/1
	1985	2	AQ2574	PUT 15	2/1
	1985	Z	AQ2575	PUT 16	2/1
	1985	2	AQ2563		2/1
	1985	2	AU2304		2/1
	1985	2	AU2391		2/1
	1965	2	AU2390		2/1
	1982	2	AU2209		2/1
	1905	2	A42300		2/1
	1982	2	AU2307	PU1 24	2/1
	1902	2	402592		2/1
	1005	2	AU2302		2/1
	1905	2	AU2079		2/1
	1902	2	AU2010		2/1
	1905	2	A423//		2/1
	1902	2	A42000		2/1
	1902	2	A42774		2/1
	1902	2	A42000		2/1
	1907	2	A42000		2/1
	*1907	2	AU0112		2/1
107/ 0	1975	2	800400	ANNONT MAYAL BASE	2/2
19740	1970	2	BC0470	4 MATPORT NAVAL BASE	2/0
19746	1970	2	BC0409	O MATPURI NAVAL BASE	2/0
19/46	1970	2	860473	L 324	2/0
19740	1970	2	800472	M 324	2/0
19/00	1070	2	A400/2	5 19	2/0
10770	1970	2	BL0448	K 324	2/0
10770	1970	2	800447	1 324	2/0
19//4	1970	2	BL0445	U 324 V 725	2/0
10770	19/0	2	800444	1 323	2/0
19770	1970	2	800443	2 323 973 010/ TIDAL 1	2/0
19770	1077	2	BC1339	872 0194 110AL 1	2/1
10770	1077	2	001551	972 0310 5 TIDAL 2	2/1
10770	1077	2	BC1551	872 02/2 TIDAL 0	2/1
10770	1077	2	BC1/00	872 0242 110AL 7	2/1
10770	1077	2	BC1420	872 0244 F TIDAL	2/1
10770	1077	2	DC1417	872 0244 TIDAL 4	2/1
19770	1077	2	BC1540	872 0333 TIDAL 2	2/1
10770	1077	2	BC1247		2/1
10770	1077	2	RC1415		2/1
10770	1077	2	RC1417	JAY 3	2/1
10770	1077	2	801417	.1AX 4	211
19770	1077	2	BC1560	ST.IO 175	2/1
19770	1077	2	801572	STJ0 204	2/1
19770	1977	2	BC1571	STJ0 205	2/1
19770	1977	2	BC1570	STJ0 213	2/1
19770	1977	2	BC1567	STJ0 214	2/1
19770	1977	2	BC1568	STJO 215	2/1

VERTICAL POINTS

YEAR	YEAR	ORDR	PID	STAMPING	ORDR
RECV	ÓBS			e	CLSS
1977G	1977	2	BC1566	STJO 218	2/1
1977G	*1977	2	BC0390	207 USN	2/1
1977G	*1977	2	BC0274	872 0215 TIDAL 2	2/1
1977G	*1977	2	BC0275	872 0215 TIDAL 3	2/1
1977G	*1977	2	BC0394	MULBERRY CAMERA 1381 GSS	2/1
1977G	*1977	2	BC0272	011 3	2/1
19776	*1977	2	800212	VORK	2/1
19776	*1077	2	RC0301	YORK AT MK	2/1
19786	1978	2	BC1626	877 0374 B TINAL	2/1
10786	1078	2	801420	872 0374 C TIDAL	2/1
10780	1078	2	BC1423	872 0374 C TIDAL	2/1
10780	1078	2	BC1424	872 0374 0 TIDAL	2/1
10780	1078	2	001432	872 0/00 P TIDAL	2/1
10780	1079	2	BC1/20	DE 45	2/1
10780	1079	2	DC1/28		2/1
10790	1079	2	DC1420		2/1
10780	17/0	2	BC1333		2/1
19700	19/0	2	BC1334		2/1
19786	-1978	2	801410	872 U221 B TIDAL	2/1
1978G	-1978	2	BC1411	872 U221 C 11DAL	2/1
1978G	=1978	2	BC1539	872 0409 A TIDAL	2/1
1978G	*1978	2	BC1536	872 0409 C TIDAL	2/1
1978G	* 1978	2	AQ1561	872 0774 TIDAL 6	2/1
1978G	*1978	2	AQ1562	872 0774 TIDAL 7	2/1
1978G	*1978	2	AQ1559	872 0774 TIDAL 8	2/1
1978 G	*1978	2	BC1409	GMC 2	2/1
1978G	*1978	2	BC1191	1295 72 A06 RM 1	2/1
1978 G	*1978	2	BC1196	1295 72 A07	2/1
1978G	*1978	2	BC1195	1295 72 A07 RM 2	2/1
1978G	*1978	2	BC1008	1295 72 A09 RM 2	2/1
1978G	*1978	Z	BC1194	1295 D 1 ·	2/1
1978G	*1978	2	BC1006	1295 G 1	2/1
1978G	*1978	Z	BC1252	195 72 A31	2/1
1978G	*1978	2	BC1256	195 G 7	2/1
1978G	*1978	2	BC1535	JC 3	2/1
1978G	*1978	2	BC1538	SRD DUVAL CO	2/1
1979G	1970	2	BC0464	к 324	2/0
1979G	1979	2	BC1599	BERLIN	2/1
1979G	1979	2	BC1600	BERLIN RM 1	2/1
1979G	1979	2	BC1601	BERLIN RM 2	2/1
1979G	1979	2	BC1588	SUMMIT	2/1
1979G	*1979	2	BC1550	872 0219 D TIDAL	2/1
1979G	*1979	2	BC1549	872 0219 E TIDAL	2/1
1985G	1985	2	A92572	19 CMP	2/1
1 98 5G	1985	2	AQ2573	20 CMP	2/1
1 985 G	1 98 5	2	AQ2562	30 13 RJN	2/1
1 98 5G	1985	2	AQ2598	872 0653 A TIDAL	2/1
9 8 5G	1985	2	AQ2596	872 0653 B TIDAL	2/1
98 5G	1985	2	AQ2595	872 0653 TIDAL 1	2/1
98 5G	1985	2	A92597	872 0653 TIDAL 2 RESET	2/1
985 G	1985	2	A92594	872 0653 TIDAL 3	2/1
98 5G	198 5	2	AQ2592	872 0653 TIDAL 4	2/1
985G	1985	2	AQ2593	872 0653 TIDAL CY 2	2/1
985 G	1985	2	AQ2566	872 0767 A TIDAL	2/1

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VERTICAL POINTS

YEAR	YEAR	ORDR	PID	STAMPING	ORDR
RECT	003				6633
1985G	1985	2	A92567	872 0767 B TIDAL	2/1
1985G	1985	2	AQ2568	872 0767 C TIDAL	2/1
1985G	1985	2	AQ2565	872 0767 D TIDAL	2/1
1985G	1985	2	AQ2569	872 0767 E TIDAL	2/1
1985G	1985	2	AQ2571	872 0832 TIDAL 1	2/1
198 5G	1985	2	AQ2576	872 0877 TIDAL 6	2/1
1985G	1985	2	AQ2507	BOSTWICK RESET	2/1
1985G	1985	2	AQ2585	BOSTWICK RM 2	2/1
1985G	1985	2	AQ2584	BOSTWICK RM 3	2/1
1985G	1985	2	AQ0069	D 31 RESET	2/1
1985G	1985	2	AQ2586	P 27	2/1
1985G	1985	2	AQ2570	PTS 16	2/1
1985G	1985	2	AQ2581	PUT 27	2/1
1985G	1985	2	AQ2580	PUT 28	2/1
1985G	1985	2	AQ2551	PUT 4	2/1
1985G	1985	2	AQ2552	PUT 5	2/1
1985G	1985	2	AQ0021	Z 30 RESET	2/1
1985G	*1985	2	AQ1541	21 CMP	2/1
1985G	*1985	2	AQ1540	22 CMP	2/1
1985G	= 1985	2	BC1558	872 0194 TIDAL 3	2/1
1985G	* 1985	2	BC1412	872 0221 D TIDAL	2/1
1985G	*1985	2	BC1413	872 UZ21 E TIDAL	2/1
19856	*1985	2	BC1564	872 U225 A TIDAL	2/1
19056	+1095	2	801505	872 0225 B TIDAL	2/1
10850	+1095	2	BU1302	872 0223 C TIDAL	2/1
19030	*1095	2	A00004	872 0872 A TIDAL	2/1
19850	*1085	2	AG1777	872 0832 R TIDAL	2/1
10850	*1085	2	401536	872 0877 TIDAL 3	2/1
19856	*1985	2	A01537	872 0877 TIDAL 7	2/1
19856	*1085	2	401538	872 0877 TIDAL 8	2/1
19856	*1985	2	A01539	872 0877 TIDAL 9	2/1
19856	*1985	2	BC0709	A 325	2/1
1985G	*1985	2	BC0437	A 326	2/1
1985G	+1985	2	BC1468	CUT 33	2/1
1985G	*1985	2	BC0333	JACKSONVILLE RM 2	2/1
1985G	*1985	2	AQ0678	N 19	2/1
1985G	*1985	2	AQ0063	PTS 6	2/1
1985G	*1985	2	BC1561	R 22	2/1
1985G	*1985	2	AQ0057	S 14 RESET	2/1
1985G	*1985	2	AQ1775	WELAKA	2/1
1985G	*1985	2	A01776	WELAKA RM 3	2/1
1 98 56	*1985	2	AQ1774	WELAKA RM 4	2/1
1985G	*1985	2	BC0710	z 324	2/1
1991G	*1977	2	BC0354	872 0242 TIDAL 4	2/1
1991N	*1977	2	BC0281	J 325	2/1
1991N	*1978	2	BC1466	CARLOS	2/1
1991N	*1978	2	BC1467	CARLOS RM 2	2/1

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FIGURE 4 LOWER ST. JOHNS RIVER VERTICAL CONTROL SURVEY NETWORK ZONE EXISTING MONUMENTATION ANALYSIS

It is known that monument (control point) attribution caused by natural and/or mechanical disturbances over the years will effect the chances of finding usable control points.

The following table provides a chronological analysis for estimation of monumentation recovery within two miles either side of the St. Johns River and major tributaries.

Order/class	A (u/a)	B (u/a)	C (u/a)	D (u/a)
1/1	30/18	28/22	58	40
1/2	45/27	60/48	105	75
2/1	0/0	158/126	158	126
2/0	133/80	<u>11/8</u>	<u>144</u>	88
Total	208/125	257/204	465	329

Notes:

A Monuments set or last known recovery 1933-1972

 (estimated chance of recovery = 60%)
 B Monuments set or last recovered since 1973
 (estimated chance of recovery = 80%)
 C Total monuments reported within CSN Zone
 D Estimated number of monuments recoverable in 1993

- u Unadjusted total
- a adjusted total

Summary:

On an average less than 1.5 control points will be recovered on each side of the river; per mile.

Basis for Recommendations:

Table 5 provides population and order of accuracy of horizontal control points located within each 2.5 mile diameter node. This data was gathered from the Existing Vertical Control Survey Network Inventory reach map found at the end of each River Reach Report.

Node population (of existing vertical control points) is considered adequate for future local water level measurement studies (without additional vertical control points being established) if the following minimum population* is met or exceeded.

- two or more first order bench marks
- three or more second order bench marks
- four or more combination first and second order bench marks
- * includes tidal bench marks

The reach CSN Zone strength of existing survey control monumentation is determined by adding the nodes within the reach; the sum of nodes is compared to the following standards:

> 80	percent of nodes meet or exceed minimum population = adequate control in the reach
> 55 < 80	<pre>percent of nodes meet or exceed minimum population = reconnaissance advised (too close to call)</pre>
< 55 .	<pre>percent of nodes meet or exceed minimum population = first order level runs are recommended</pre>

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TABLE 5RECOMMENDATIONSEXISTING VERTICAL CONTROL SURVEY NETWORKREACH/NODE INVENTORY

				Order	/Class		Survey	Control
Rea	ich/	Side	Fi	rst	Sec	cond	Poi Tot	nts al
No	ode	(L/R/B)	lst	2nd	0	lst	Side	Reach
1.	A	Both	1	5	9	0		
	в	B	0	4	0	4		
	С	В	0	2	0	2		
	D	В	0	0	0	5		
	Е	B	0	0	0	3	39B	
						Reach '	Total	39
2.	A	Right	0	0	0	7		
	в	R	0	0	0	` O	7R	
	С	В	1	0	0	7		
	D	В	0	0	0	0		
	E	Left	0	5	0	0		
	F	В	0	3	0	3	14B	
	G	L	3	6	10	6	30L	
						Reach	Total	51
3.	A	R	0	1	0	· 0		
	в	R	2	3	2	0		
	С	R	0	0	0	0	7 R	
	D	L	0	0	0	3		
	Е	L	3	· 17	0	0		
	F	L	0	1	5	1		
	G	L	0	1	0	0		
	Н	L	0	5	0	0	35L	

Reach Total

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	e.			Drder	/Class		Survey	Control
Rea	ach/	Side	Fi	rst	Sec	cond	Poi Tot	nts al
N	ode	(L/R/B)	lst	2nđ	0	lst	Side	Reach
4.	A	R	0	0	0	0		
	В	R	0	0	4	l		
	С	R	0	0	0	2		
	D	R	0	0	0	0		
	Е	R	0	0	0	4		
	F	R	0	0	0	0	llR	
	G	L	0	l	5	4		
	H	L	0	4	8	5		
	I	L	0	1	0	5		
	J	L	0	0	0 J	0		
	K	L	0	0	0	0	33L	
						Read	ch Total	42
5.	A	R	0	0	0	0		
	В	R	0	0	0	0		
	С	R.	0	0	0	0		
	D	R	0	0	0	0		
	Ε	R	0	0	0	0	OR	
	F	L	0	0	0	0		
	G	L	0	0	0	0		
	H	L	0	0	0	0		
	I	L	4	6	0	0	10L	
						Read	ch Total	10

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Table 5 (continued)

_			Order	/Class		Survey	Control
Reach	n/ Side	Fi	First		Second	Points Total	
Node	e (L/R/B)	lst	2nd	0	lst	Side	Reach
6.	A R	0	0	0	0		
	B R	. 0	0	0	0		
1	C R	0	0	0	0		
	D R	0	0	0	0		
	E R	0	0	0	0	OR	
	F L	0	0	0	0		
	G L	0	0	0	0		
	H L	0	0	О	0		
	I L	0	0	0	0		
	J. L	l	0	0	0	1L	
					Rea	ach Total	1
7.	A R	0	0	0	0		
	B R	0	0	0	0		
	C R	0	0	0	0		
•	D R	0	0	0	0		
	E R	.4	0	0	0	4R	
	F L	0	0	0	0		
	G L	0	0	0	. O		
	H L	0	0	0	0		
	I L	0	0	0	0	7L	
					Rea	ach Total	11

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	e.		Order		/Class		Survey	Control
Rea	ch/	Side	Fi	rst	Sec	ond	Poi: Tot	nts al
No	de	(L/R/B)	lst	2nd	0	lst	Side	Reach
8.	A	В	2	1	0	0		
	в	в	0	0	0	0		
	С	в	0	1	0	4		
	D	В	0	0	0	1		
	Е	В	4	2	4	3	22B	
						Read	ch Total	22
9.	A	В	0	0	0	0		
	в	B	0	0	0	2		
	С	В	0	0	0	2		
	D	В	0	0	0	0		
	Е	В	0	3	0	6	13B	
						Read	ch Total	13
10.	A	В	0	0	0	0		
	в	В	0	0	0	0		
	С	Β.	0	0	0	3		
	D	В	0	0	0	2		
	Е	В	0	3	l	5	15B	
					:	Rea	ch Total	15
11.	A	В	0	0	0	0		
	в	В	0	0	3	2		
	С	В	0	0	0	2		
	D	В	0	0	0	5		
	Έ	В	0	0	0	0	12B	
						Rea	ch Total	12

Total of all Reaches 258

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FIGURE 5 LOWER ST. JOHNS RIVER EXISTING VERTICAL CONTROL SURVEY MONUMENTATION DISTRIBUTION



* Not including Tidal Bench Marks

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General Observations:

It is interesting to note the following observations:

- Reaches 2, 3 and 4 embody 129 (51%) of the monuments recorded in the database only 36 (28%) of those are located on the right bank
- 42 monuments are located in reach 4, however only 40% of the nodes have adequate monumentation for additional work without extensive survey control
- Only 30% of the nodes in Reaches 4 11 have adequate monumentation
- In reaches 4 9 only two adjacent nodes have adequate monumentation - between river mile 35 and 94 there are not two adjacent nodes having adequate monumentation

Specific Recommendations:

Specific recommendations and cost estimates to upgrade survey measurements at all along the LSJR are itemized in Task 4: Recommended Water Level found in each River Reach Report

2.5.2 Additional Tide Stations

Background

The Department of Environmental Protection, Division of State Lands, Bureau of Survey and Mapping acting as staff of the Board of Trustees of the Internal Improvement Trust Fund entered into an agreement with the National Ocean Service, in April 1969. Since that time FDEP and NOS have cooperatively conducted surveys of the Florida tidal boundary. The program, known as the Coastal Mapping Act now consists of over 870 tide stations with published tidal datums and more the 4,000 tidal bench marks. Field acquisition of tidal data was completed in 1979, data analysis and computations by NOS progressed steadily during the 1980's. Bench mark maintenance and leveling into the National Geodetic Vertical Datum of 1929 (NGVD 29) network has been aggressively pursued by FDEP staff since 1980. Program Managers and technicians form NOS and FDEP have worked together consistently since 1981.

Mean High Water Surveys:

The Coastal Mapping Act (Chapter 177, (Part II Florida Statutes and Chapter 18-5 Florida Administrative Code) was enacted to establish the boundary between State-owned sovereignty submerged lands and uplands subject to private ownership. That boundary in navigable, tidal waters is the mean high water (MHW) line. In Florida, professional land surveyors undertaking to establish a local tidal datum or to determine the mean high water line are required to conform with standards established by the Bureau of Survey and Mapping.

Mean High Water Survey Approval

MHW surveys approved by the Department are filed in a statewide repository maintained by the Bureau. Approved surveys in the Lower St. Johns River Basin are shown on Existing Water Level Measurement Network, Reach Maps.

Methodology

• Typically MHW survey methodology for establishment of boundary consist of one (or a combination) of the following:

- Height Difference
- Amplitude Ratio
- Interpolation
- Extend Established Datum
- Extend Published Datum

Along the main stem of the St. Johns River the mean high water elevation, in NGVD 1929, at a specific site is determined by interpolation between two existing tide stations. Determination of MHW in most tributaries consists of a three day amplitude ratio or a height difference study performed by the surveyor.

Standards and Specifications for Geodetic Control Networks

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Federal Geodetic Control Committee

Rear Adm. John D. Bossler, Chairman

Rockville, Maryland September 1984



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FGCC Standards and Specifications for Geodetic Control Networks

Federal Geodetic Control Committee

John D. Bossler, Chairman

September 1984

For information write: Chairman Federal Geodetic Control Committee 6001 Executive Boulevard Rockville, Maryland 20852

For sale by the National Geodetic Information Branch (N/CG17x2), NOAA, Rockville, MD 20852

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Preface

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This single publication is designed to replace both "Classification, Standards of Accuracy and General Specifications of Geodetic Control Surveys," issued February 1974, and "Specifications to Support Classification, Standards of Accuracy, and General Specifications of Geodetic Control Surveys," issued June 1980. Because requirements and methods for acquisition of geodetic control are changing rapidly, this publication is being released in loose-leaf format so that it can be updated more conveniently and efficiently. Recipients of this publication wishing to receive updated information should complete and mail the form below. Comments on the contents and format of the publication are welcomed and should be addressed to:

> FGCC Secretariat, Code N/CG1x5 National Geodetic Survey, NOAA Rockville, Maryland 20852

(Detach and mail to: National Geodetic Information Branch, code N/CG17x2, NOAA, Rockville, Maryland 20852)

Please inform me of updated information for "Standards and Specifications for Geodetic Control Networks."

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1. Introduction

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The Government of the United States makes nationwide surveys, maps, and charts of various kinds. These are necessary to support the conduct of public business at all levels of government, for planning and carrying out national and local projects, the development and utilization of natural resources, national defense, land management, and monitoring crustal motion. Requirements for geodetic control surveys are most critical where intense development is taking place, particularly offshore areas, where surveys are used in the exploration and development of natural resources, and in delineation of state and international boundaries.

State and local governments and industry regularly cooperate in various parts of the total surveying and mapping program. In surveying and mapping large areas, it is first necessary to establish frameworks of horizontal, vertical, and gravity control. These provide a common basis for all surveying and mapping operations to ensure a coherent product. A reference system, or datum, is the set of numerical quantities that serves as a common basis. Three National Geodetic Control Networks have been created by the Government to provide the datums. It is the responsibility of the National Geodetic Survey (NGS) to actively maintain the National Geodetic Control Networks (appendix A).

These control networks consist of stable, identifiable points tied together by extremely accurate observations. From these observations, datum values (coordinates or gravity) are computed and published. These datum values provide the common basis that is so important to surveying and mapping activities.

As stated, the United States maintains three control networks. A horizontal network provides geodetic latitudes and longitudes in the North American Datum reference system; a vertical network furnishes elevations in the National Geodetic Vertical Datum reference system; and a gravity network supplies gravity values in the U.S. absolute gravity reference system. A given station may be a control point in one, two, or all three control networks.

It is not feasible for all points in the control networks to be of the highest possible accuracy. Different levels of accuracy are referred to as the "order" of a point. Orders are often subdivided further by a "class" designation. Datum values for a station are assigned an order (and plass) based upon the appropriate classification standard for each of the three control networks. Horizontal and vertical standards are defined in reasonable conformance with past practice. The recent development of highly accurate absolute gravity instrumentation now allows a gravity reference standard. In the section on "Standards," the classification standards for each of the control networks are described, sample computations performed, and monumentation requirements given.

Control networks can be produced only by making very accurate measurements which are referred to identifiable control points. The combination of survey design, instrumentation, calibration procedures, observational techniques, and data reduction methods is known as a measurement system. The section on "Specifications" describes important components and states permissible tolerances for a variety of measurement systems.

Clearly, the control networks would be of little use if the datum values were not published. The section entitled "Information" describes the various products and formats of available geodetic data.

Upon request, the National Geodetic Survey will accept data submitted in the correct formats with the proper supporting documentation (appendix C) for incorporation into the national networks. When a survey is submitted for inclusion into the national networks, the survey measurements are processed in a quality control procedure that leads to their classification of accuracy and storage in the National Geodetic Survey data base. To fully explain the process we shall trace a survey from the planning stage to admission into the data base. This example will provide an overview of the standards and specifications, and how they work together.

The user should first compare the distribution and accuracy of current geodetic control with both immediate and long-term needs. From this basis, requirements for the extent and accuracy of the planned survey are determined. The classification standards of the control networks will help in this formulation. Hereafter, the requirements for the accuracy of the planned survey will be referred to as the "intended accuracy" of the survey. A measurement system is then chosen, based on various factors such as: distribution and accuracy of present control; region of the country; extent, distribution, and accuracy of the desired control; terrain and accessibility of control; and economic factors.

Upon selection of the measurement system, a survey design can be started. The design will be strongly dependent upon the "Network Geometry" specifications for that measurement system. Of particular importance is the requirement to connect to previously established control points. If this is not done, then the survey cannot be placed on the national datum. An adequate number of existing control point connections are often required in the specifications in order to ensure strong network geometry for other users of the control, and to provide several closure checks to help measure accuracy. NGS can certify the results of a survey only if it is connected to the national network.

Situations will arise where one cannot, or prefers not to, conform to the specifications. NGS may downgrade the classification of a survey based upon failure to adhere to the measurement system specifications if the departure degrades the precision, accuracy, or utility of the survey. On the other hand, if specification requirements for the desired level of accuracy are exceeded, it may be possible to upgrade a survey to a higher classification.

Depending upon circumstances, one may wish to go into the field to recover old control and perform reconnaissance and site inspection for the new survey. Monumentation may be performed at this stage. Instruments should be checked to conform to the "Instrumentation" specifications, and to meet the "Calibration Procedures" specifications. Frequent calibration is an excellent method to help ensure accurate surveys.

In the field, the "Field Procedures" specifications are used to guide the methods for taking survey measurements. It must be stressed that the "Field Procedures" section is not an exhaustive account of how to perform observations. Reference should be made also to the appropriate manuals of observation methods and instruments.

Computational checks can be found in the "Field Procedures" as well as in the "Office Procedures" specifications, since one will probably want to perform some of the computations in the field to detect blunders. It is not necessary for the user to do the computations described in the "Office Procedures" specifications, since they will be done by NGS. However, it is certainly in the interest of the user to compute these checks before leaving the field, in case reobservations are necessary. With the tremendous increase in programmable calculator and small computer technology, any of the computations in the "Office Procedures" specifications could be done with ease in the field.

At this point the survey measurements have been collected, together with the new description and recovery notes of the stations in the new survey. They are then placed into the formats specified in the Federal Geodetic Control Committee (FGCC) publications *Input Formats* and Specifications of the National Geodetic Survey Data Base. Further details of this process can be found in appendix C, "Procedures for Submitting Data to the National Geodetic Survey."

The data and supporting documentation, after being received at NGS, are processed through a quality control procedure to make sure that all users may place 18ffidence in the new survey points. First, the data and documentation are examined for compliance with the measurement system specifications for the intended accuracy of the new survey. Then office computations are performed, including a minimally constrained least squares adjustment. (See appendix B for details.) From this adjustment, accuracy measures can be computed by error propagation. The accuracy classification thus computed is called the "provisional accuracy" of the survey.

The provisional accuracy is compared to the intended accuracy. The difference indicates the departure of the accuracy of the survey from the specifications. If the difference is small, the intended accuracy has precedence because a possible shift in classification is not warranted. However, if the difference is substantial, the provisional accuracy will supersede the intended accuracy, either as a downgrade or an upgrade.

As the final step in the quality control procedure, the variance factor ratio computation using established control, as explained in the section on "Standards," is determined for the new survey. If this result meets the criteria stated there, then the survey is classified in accordance with the provisional accuracy (or intended accuracy, whichever has precedence).

Cases arise where the variance factor ratio is significantly larger than expected. Then the control network is at fault, or the new survey is subject to some unmodeled error source which degrades its accuracy. Both the established control measurements and the new survey measurements will be scrutinized by NGS to determine the source of the problem. In difficult cases, NGS may make diagnostic measurements in the field.

Upon completion of the quality control check, the survey measurements and datum values are placed into the data base. They become immediately available for electronic retrieval, and will be distributed in the next publication cycle by the National Geodetic Information Branch of NGS.

A final remark bears on the relationship between the classification standards and measurement system specifications. Specifications are combinations of rules of thumb and studies of error propagation, based upon experience, of how to best achieve a desired level of quality. Unfortunately, there is no guarantee that a particular standard will be met if the associated specifications are followed. However, the situation is ameliorated by a safety factor of two incorporated in the standards and specifications. Because of this safety factor, it is possible that one may fail to meet the specifications and still satisfy the desired standard. This is why the geodetic control is not automatically downgraded when one does not adhere to the speci--fications. Slight departures from the specifications can be accommodated. In practice, one should always strive to meet the measurement system specifications when extending a National Geodetic Control Network.

. Standards

The classification standards of the National Geodetic Control Networks are based on accuracy. This means that when control points in a particular survey are classified, they are certified as having datum values consistent with all other points in the network, not merely those within that particular survey. It is not observation closures within a survey which are used to classify control points, but the ability of that survey to duplicate already established control values. This comparison takes into account models of crustal motion, refraction, and any other systematic effects known to influence the survey measurements.

The NGS procedure leading to classification covers four steps:

- 1. The survey measurements, field records, sketches, and other documentation are examined to verify compliance with the specifications for the intended accuracy of the survey. This examination may lead to a modification of the intended accuracy.
- 2. Results of a minimally constrained least squares adjustment of the survey measurements are examined to ensure correct weigh.²-g of the observations and freedom from blunders.
- 3. Accuracy measures computed by random error propagation determine the provisional accuracy. If the provisional accuracy is substantially different from the intended accuracy of the survey, then the provisional accuracy supersedes the intended accuracy.
- 4. A variance factor ratio for the new survey combined with network data is computed by the Iterated Almost Unbiased Estimator (IAUE) method (appendix B). If the variance factor ratio is reasonably close to 1.0 (typically less than 1.5), then the survey is considered to check with the network, and the survey is classified with the provisional (or intended) accuracy. If the variance factor ratio is much greater than 1.0 (typically 1.5 or greater), then the survey is considered to not check with the network, and both the survey and network measurements will be scrutinized for the source of the problem.

2.1 Horizontal Control Network Standards

When a horizontal control point is classified with a particular order and class, NGS certifies that the geodetic latitude and longitude of that control point bear a relation of specific accuracy to the coordinates of all other points in the horizontal control network. This relation is expressed as a distance accuracy, 1:a. A distance accuracy is the ratio of the relative positional error of a pair of control points to the horizontal separation of those points.

Table 2.1—Distance accuracy standards

Classification	Minimum distance accuracy
First-order	1:100,000
Second-order, class 1	1: 50,000
Second-order, class []	1: 20,000
Third-order, class I	1: 10.000
Third-order, class II	1: 5,000

A distance accuracy, 1:a, is computed from a minimally constrained, correctly weighted, least squares adjustment by:

$$a = d/s$$

where

a-distance accuracy denominator

s-propagated standard deviation of distance between survey points obtained from the least squares adjustment

d-distance between survey points

The distance accuracy pertains to all pairs of points (but in practice is computed for a sampling of pairs of points). The worst distance accuracy (smallest denominator) is taken as the provisional accuracy. If this is substantially larger or smaller than the intended accuracy, then the provisional accuracy takes precedence.

As a test for systematic errors, the variance factor ratio of the new survey is computed by the Iterated Almost Unbiased Estimator (IAUE) method described in appendix B. This computation combines the new survey measurements with existing network data, which are assumed to be correctly weighted and free of systematic error. If the variance factor ratio is substantially greater than unity then the survey does not check with the network, and both the survey and the network data will be examined by NGS. Computer simulations performed by NGS have shown that a variance factor ratio greater than 1.5 typically indicates systematic errors between the survey and the network. Setting a cutoff value higher than this could allow undetected systematic error to propagate into the national network. On the other hand, a higher cutoff value might be considered if the survey has only a small number of connections to the network, because this circumstance would tend to increase the variance factor ratio.

In some situations, a survey has been designed in which different sections provide different orders of control. For these multi-order surveys, the computed distance accuracy denominators should be grouped into sets appropriate to the different parts of the survey. Then, the smallest value of a in each set is used to classify the control points of that portion, as discussed above. If there are sufficient connections to the network, several variance factor ratios, one for each section of the survey, should be computed.

Horizontal Example

Suppose a survey with an intended accuracy of firstorder (1:100,000) has been performed. A series of propagated distance accuracies from a minimally constrained adjustment is now computed.

Line	s (m)	d (m)	1:a
-2	0.141	17,107	1:121.326
I-3	0.170	20,123	1:118,371
2-3	0.164	15,505	1: 94,543
*********	•	•	•
********************	•	•	•
*********	•	•	•

Suppose that the worst distance accuracy is 1:94,543. This is not substantially different from the intended accuracy of 1:100,000, which would therefore have precedence for classification. It is not feasible to precisely quantify "substantially different." Judgment and experience are determining factors.

Now assume that a solution combining survey and network data has been obtained (as per appendix B), and that a variance factor ratio of 1.2 was computed for the survey. This would be reasonably close to unity, and would indicate that the survey checks with the network. The survey would then be classified as first-order using the intended accuracy of 1:100,000.

However, if a variance factor of, say, 1.9 was computed, the survey would not check with the network. Both the survey and network measurements then would have to be scrutinized to find the problem.

Monumentation

Control points should be part of the National Geodetic Horizontal Network only if they possess permanence, horizontal stability with respect to the Earth's crust, and a horizontal location which can be defined as a point 18630centimeter-long wooden stake driven into the ground, for example, would lack both permanence and horizontal stability. A mountain peak is difficult to define as a point. Typically, corrosion resistant metal disks set in a large concrete mass have the necessary qualities. First-order and second-order, class I, control points should have an underground mark, at least two monumented reference marks at right angles to one another, and at least one monumented azimuth mark no less than 400 m from the control point. Replacement of a temporary mark by a more permanent mark is not acceptable unless the two marks are connected in timely fashion by survey observations of sufficient accuracy. Detailed information may be found in C&GS Special Publication 247, "Manual of geodetic triangulation."

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2.2 Vertical Control Network Standards

When a vertical control point is classified with a particular order and class, NGS certifies that the orthometric elevation at that point bears a relation of specific accuracy to the elevations of all other points in the vertical control network. That relation is expressed as an elevation difference accuracy, b. An elevation difference accuracy is the relative elevation error between a pair of control points that is scaled by the square root of their horizontal separation traced along existing level routes.

Table 2.2—Elevation accuracy standards

Classification	Maximum elevation difference accuracy
First-order, class I	0.5
First-order, class II	0.7
Second-order, class I	1.0
Second-order, class II	1.3
Third-order	2.0

An elevation difference accuracy, b, is computed from a minimally constrained, correctly weighted, least squares adjustment by

$$\mathbf{b} = \mathbf{S}/\sqrt{d}$$

where

- d-approximate horizontal distance in kilometers between control point positions traced along existing level routes.
- S-propagated standard deviation of elevation difference in millimeters between survey control points obtained from the least squares adjustment. Note that the units of b are $(mm)/\sqrt{(km)}$.

The elevation difference accuracy pertains to all pairs of points (but in practice is computed for a sample). The worst elevation difference accuracy (largest value) is taken as the provisional accuracy. If this is substantially larger or smaller than the intended accuracy, then the provisional accuracy takes precedence.

As a test for systematic errors, the variance factor ratio of the new survey is computed by the Iterated Almost Unbiased Estimator (IAUE) method described in appendix B. This computation combines the new survey measurements with existing network data, which are assumed to be correctly weighted and free of systematic error. If the variance factor ratio is substantially greater than unity, then the survey does not check with the network, and both the survey and the network data will be examined by NGS.

Computer simulations performed by NGS have shown that a variance factor ratio greater than 1.5 typically indicates systematic errors between the survey and the network. Setting a cutoff value higher than this could allow undetected systematic error to propagate into the national network. On the other hand, a higher cutoff value might be considered if the survey has only a small number of connections to the network, because this circumstance would tend to increase the variance factor ratio.

In some situations, a survey has been designed in which different sections provide different orders of control. For these multi-order surveys, the computed elevation difference accuracies should be grouped into sets appropriate to the different parts of the survey. Then, the largest value of b in each set is used to classify the control points of that portion, as discussed above. If there are sufficient connections to the network, several variance factor ratios, one for each section of the survey, should be computed.

Vertical Example

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Suppose a survey with an intended accuracy of secondorder, class II has been performed. A series of propagated elevation difference accuracies from a minimally constrained adjustment is now computed.

Line	S (mm)	d (km)	b (mm)/V (km)
1.2	1.574	1.718	1.20
1-3	1.743	2.321	1.14
2-3	2.647	4.039	1.32
** ***** ****************	• ·	•	•
	•	•	•
*****	•	•	•

Suppose that the worst elevation difference accuracy is 1.32. This is not substantially different from the intended accuracy of 1.3 which would therefore have precedence for classification. It is not feasible to precisely quantify "substantially different." Judgment and experience are determining factors.

Now assume that a solution combining survey and) network data has been obtained (as per appendix B), and

that a variance factor ratio of 1.2 was computed for the survey. This would be reasonably close to unity and would indicate that the survey checks with the network. The survey would then be classified as second-order, class II, using the intended accuracy of 1.3.

However, if a survey variance factor ratio of, say, 1.9 was computed, the survey would not check with the network. Both the survey and network measurements then would have to be scrutinized to find the problem.

Monumentation

Control points should be part of the National Geodetic Vertical Network only if they possess permanence, vertical stability with respect to the Earth's crust, and a vertical location that can be defined as a point. A 30-centimeter-long wooden stake driven into the ground, for example, would lack both permanence and vertical stability. A rooftop lacks stability and is difficult to define as a point. Typically, corrosion resistant metal disks set in large rock outcrops or long metal rods driven deep into the ground have the necessary qualities. Replacement of a temporary mark by a more permanent mark is not acceptable unless the two marks are connected in timely fashion by survey observations of sufficient accuracy. Detailed information may be found in NOAA Manual NOS NGS 1, "Geodetic bench marks."

2.3 Gravity Control Network Standards

When a gravity control point is classified with a particular rder and class, NGS rerifies that the gravity value at that control point possesses a specific accuracy.

Gravity is commonly expressed in units of milligals (mGal) or microgals (μ Gal) equal, respectively, to (10⁻³) meters/sec², and (10⁻⁴) meters/sec². Classification order refers to measurement accuracies and class to site stability.

Table 2.3—Gravity accuracy standards

Classification	Gravity accuracy (µGal)
First-order, class I	20 (subject to stability verification)
First-order, class II	20
Second-order	50
Third-order	100

When a survey establishes only new points, and where only absolute measurements are observed, then each survey point is classified independently. The standard deviation from the mean of measurements observed at that point is corrected by the error budget for noise sources in accordance with the following formula:

$$c^{2} = \sum_{i=1}^{n} \frac{(x_{i} - x_{m})^{2}}{n-1} + c^{2}$$

where

c -gravity accuracy

x - gravity measurement

n -number of measurements

$$\mathbf{x}_{n} = (\sum_{i=1}^{n} \mathbf{x}_{i})/n$$

e-external random error

The value obtained for c is then compared directly against the gravity accuracy standards table.

When a survey establishes points at which both absolute and relative measurements are made, the absolute determination ordinarily takes precedence and the point is classified accordingly. (However, see Example D below for an exception.)

When a survey establishes points where only relative measurements are observed, and where the survey is tied to the National Geodetic Gravity Network, then the gravity accuracy is identified with the propagated gravity standard deviation from a minimally constrained, correctly weighted, least squares adjustment.

The worst gravity accuracy of all the points in the survey is taken as the provisional accuracy. If the provisional accuracy exceeds the gravity accuracy limit set for the intended survey classification, then the survey is classified using the provisional accuracy.

As a test for systematic errors, the variance factor ratio of the new survey is computed by the Iterated Almost Unbiased Estimator (IAUE) method described in appendix B. This computation combines the new survey measurements with existing network data which are assumed to be correctly weighted and free of systematic error. If the variance factor ratio is substantially greater than unity, then the survey does not check with the network, and both the survey and the network data will be examined by NGS.

Computer simulations performed by NGS have shown that a variance factor ratio greater than 1.5 typically indicates systematic errors between the survey and the network. Setting a cutoff value higher than this could allow undetected systematic error to propagate into the national network. On the other hand, a higher cutoff value might be considered if the survey has only a minimal number of connections to the network, because this circumstance would tend to increase the variance factor ratio.

In some situations, a survey has been designed in which different sections provide different orders of control. For these multi-order surveys, the computed gravity accuracies should be grouped into sets appropriate to the different parts of the survey. Then, the largest value of c in each set is used to classify the control points of that portion, as discussed above. If there are sufficient connections to the network, several variance factor ratios, one for each part of the survey, should be computed.

Gravity Examples

Example A. Suppose a gravity survey using absolute measurement techniques has been performed. These points are then unrelated. Consider one of these survey points.

Assume n = 750

$$\sum_{i=1}^{700} (x_i - x_{in})^2 = .169 \text{ mGal}$$

$$c = 5 \mu \text{Gal}$$

$$c^2 = \frac{0.169}{750 - 1} + (.005)^2$$

$$c = 16 \mu \text{Gal}$$

The point is then classified as first-order, class II.

Example B. Suppose a relative gravity survey with an intended accuracy of second-order (50 μ Gal) has been performed. A series of propagated gravity accuracies from a minimally constrained adjustment is now computed.

Gravity standard deviation (µGal)
38
44
55
•
•
•

Suppose that the worst gravity accuracy was 55 μ Gal. This is worse than the intended accuracy of 50 μ Gal. Therefore, the provisional accuracy of 55 μ Gal would have precedence for classification, which would be set to third-order.

Now assume that a solution combining survey and network data has been obtained (as per appendix B) and that a variance factor of 1.2 was computed for the survey. This would be reasonably close to unity, and would indicate that the survey checks with the network. The survey would then be classified as third-order using the provisional accuracy of 55 μ Gal.

However, if a variance factor of, say, 1.9 was computed, the survey would not check with the network. Both the survey and network measurements then would have to be scrutinized to find the problem.

Example C. Suppose a survey consisting of both absolute and relative measurements has been made at the same points. Assume the absolute observation at one of the points yielded a classification of first-order, class II, whereas the relative measurements produced a value to second-order standards. The point in question would be classified as first-order, class II, in accordance with the absolute observation.

Example D. Suppose we have a survey similar to Case C, where the absolute measurements at a particular point yielded1g othird-order classification due to an unusually noisy observation session, but the relative measurements still satisfied the second-order standard. The point in question would be classified as second-order, in accorlance with the relative measurements.

Monumentation

Control points should be part of the National Geodetic Gravity Network only if they possess permanence, horizontal and vertical stability with respect to the Earth's crust, and a horizontal and vertical location which can be defined as a point. For all orders of accuracy, the mark should be imbedded in a stable platform such as flat, horizontal concrete. For first-order, class I stations, the platform should be imbedded in stable, hard rock, and checked at least twice for the first year to ensure stability. For first-order, class II stations, the platform should be located in an extremely stable environment, such as the concrete floor of a mature structure. For second and third-order stations, standard bench mark monumentation is adequate. Replacement of a temporary mark by a more permanent mark is not acceptable unless the two marks are connected in timely fashion by survey observations of sufficient accuracy. Detailed information is given in NOAA Manual NOS NGS 1, "Geodetic bench marks." Monuments should not be near sources of electromagnetic interference.

It is recommended, but not necessary, to monument third-order stations. However, the location associated with the gravity value should be recoverable, based upon the station description.

3. Specifications

3.1 Introduction

All measurement systems regardless of their nature have certain common qualities. Because of this, the measurement system specifications follow a prescribed structure as outlined below. These specifications describe the important components and state permissible tolerances used in a general context of accurate surveying methods. The user is cautioned that these specifications are not substitutes for manuals that detail recommended field operations and procedures.

The observations will have spatial or temporal relationships with one another as given in the "Network Geometry" section. In addition, this section specifies the frequency of incorporation of old control into the survey. Computer simulations could be performed instead of following the "Network Geometry" and "Field Procedures" specifications. However, the user should consult the National Geodetic Survey before undertaking such a departure from the specifications.

The "Instrumentation" section describes the types and characteristics of the instruments used to make observations. An instrument must be able to attain the precision requirements given in "Field Procedures."

The section "Calibration Procedures" specifies the nature and frequency of instrument calibration. An instrument must be calibrated whenever it has been damaged or repaired.

The "Field Procedures" section specifies particular rules and limits to be met while following an appropriate method of observation. For a detailed account of how to perform observations, the user should consult the appropriate manuals.

Since NGS will perform the computations described under "Office Procedures," it is not necessary for the user to do them. However, these computations provide valuable checks on the survey measurements that could indicate the need for some reobservations. This section specifies commonly applied corrections to observations, and computations which monitor the precision and accuracy of the survey. It also discusses the correctly weighted, minimally constrained least squares adjustment used to ensure that the survey work is free from blunders and able to achieve the intended accuracy. Results of the least squares adjustment are used in the quality control and accuracy classification procedures. The adjustment performed by NGS will use models of error sources, such as crustal motion, when they are judged to be significant to the level of accuracy of the survey.

3.2 Triangulation

Triangulation is a measurement system comprised of joined or overlapping triangles of angular observations supported by occasional distance and astronomic observations. Triangulation is used to extend horizontal control.

Network Geometry

Order Class	First	Second I	Second Il	Third I	Third 11
Station spacing not less than (lgn)	15	10	5	0.5	0.5
angle? of figures not less then Minimum distance angle i	40°	35°	30°	30°	25°
of all figures not less than	30°	25°	25°	20°	20°
Base line spacing not more than (triangles) Astronomic azimuth	5	10	12	15	15
spacing not more than (triangles)	8	10	10	12	15

† Distance angle is angle opposite the side through which distance is propagated.

The new survey is required to tie to at least four network control points spaced well apart. These network points must have datum values equivalent to or better than the intended order (and class) of the new survey. For example, in an arc of triangulation, at least two network control points should be occupied at each end of the arc. Whenever the distance between two new unconnected survey points is less than 20 percent of the distance between those points traced along existing or new connections, then a direct connection should be made between those two survey points. In addition, the survey should tie into any sufficiently accurate network control points within the station spacing distance of the survey. These network stations should be occupied and sufficient observations taken to make these stations integral parts of the survey. Nonredundant geodetic connections to the network stations are not considered sufficient ties. Nonredundantly determined stations are not allowed. Control stations should not be determined by intersection or resection methods. Simultaneous reciprocal vertical angles or geodetic leveling are observed along base lines. A base line need not be observed if other base lines of sufficient accuracy were observed within the base line spacing specification in the network, and similarly for astronomic azimuths.

Instrumentation

Only properly maintained theodolites are adequate for observing directions and azimuths for triangulation. Only precisely marked targets, mounted stably on tripods or supported towers, should be employed. The target should have a clearly defined center, resolvable at the minimum control spacing. Optical plummets or collimators are required to ensure that the theodolites and targets are centered over the marks. Microwave-type electronic distance measurement (EDM) equipment is not sufficiently accurate for measuring higher-order base lines.

Order	First	Second	Second	Third	Third
Class		I	II	I	II
Theodolite, least count	0.2"	0.2"	1.0"	1.0"	1.0~

Calibration Procedures

Each year and whenever the difference between direct and reverse readings of the theodolite depart from 180° by more than 30", the instrument should be adjusted for collimation error. Readjustment of the cross hairs and the level bubble should be done whenever their misadjustments affect the instrument reading by the amount of the least count.

All EDM devices and retroreflectors should be serviced regularly and checked frequently over lines of known distances. The National Geodetic Survey has established specific calibration base lines for this purpose. EDM instruments should be calibrated annually, and frequency checks made semiannually.

Field Procedures

Theodolite observations for first-order and second-order, class I surveys may only be made at night. Reciprocal vertical angles should be observed at times of best atmospheric conditions (between noon and late afternoon) for all orders of accuracy. Electronic distance measurements need a record at both ends of the line of wet and dry bulb temperatures to ± 1 °C, and barometric pressure to ± 5 mm of mercury. The theodolite and targets should be centered to within 1 mm over the survey mark or eccentric point.

Order Class	First	Second I	Second 11	Third I	Third II	•
Directions Number of positions	16	16	8 or 12†	4	2	•

					192
Order Class	First	Second I	Second II	Third I	Third II
Standard deviation of					
mean not to exceed	0.4"	0.5"	0.8"	1.2"	2.0~
Rejection limit from					
the mean	4"	4"	5"	5~	5"
Reciprocal Vertical Angles					
(along distance sight path)					
Number of independent					
observations			_		
direct/reverse	3	3	2	2	2
Maximum spread	10-	10"	10"	10"	29"
Maximum time interval					
octwoch reciproch	1	. 1	1	1	1
	•	•	•	•	•
Astronomic Azimuths				_	
Observations per night	16	. 16	16	8	4
Number of nights	2	2	I	1	1
Standard Ocylation of	A 45"	A / C"	<u>۸</u>	1 0"	1 7"
Briestian limit from	U.93	U.43	. 0.0	1.0	1.7
the mean	5"	5~	. 5 "	6"	6"
	•	-	-	~	v
Electro-Optical Distances	• ~		_	-	_
Minimum number of days	2*	2*	1	1	1
MUNIMUM NUMBER OF	-	78	76	•	
Minimum analysis of an		43	∠ §	1	1
centric chervatione /	-				
mensurement	2	2	1	1	1
Minimum number of offset	-	-:	•	•	•
observations/					
measurement	2	2	2	1	1
Maximum difference from					
mean of observations					
(mm)	40	40	50	60	60
Minimum number of				•	
readings/observation	••	10			.10
(or equivalent)	10	10	10	10	10
Maximum difference from	+	+	+	+	+
areau or resourts (umi)	+	+	+	+	+
Infrared Distances					
Minimum number of days	.	2*	1	1	1
Minimum number of				-	-
measurements	-	25	2§	1	1
MINIMUM BUINDER OF CON-					
CERTIC CONCEVEUORS/	_	1	1	1	
Minimum number of offers	_	1	1	1	1
observations/				•	
mensurement		2	1	1	1
Maximum difference from		-	-	-	•
mean of observations					
(mm)		5	5	10	10
Minimum number of					
readings/observation				_	
(or equivalent)	-	10	10	10	10
Maximum difference from					
mean of readings (mm)		Ŧ	Ŧ	Ŧ	Ŧ
Microwave Distances					
Minimum number of					
measurements			_	2	1
Minimum time span					
between measurements					
(hr)		_	—	8	-

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Order ₁₉₃	First	-Second I	Second II	Taird I	Third 11
Maximum difference between measurements (mm)				100	
Minimum number of con- centric observations/ measurement	`	-		2**	1••
mean of observations (mm)		-		100	150
readings/observation (or equivalent)	-			20.	20
mean of readings (mm)			•	+	t

* two of more instruments.

§ one measurement at each end of the line.

‡ as specified by manufacturer.

** carried out at both ends of the line.

Measurements of astronomic latitude and longitude are not required in the United States, except perhaps for first-order work, because sufficient information for determining deflections of the vertical exists. Detailed procedures can be found in Hoskinson and Duerksen (1952).

Office Procedures

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Order . Class	First	Second I	Second II	Third I	Third 11
Triangle Closure					
Average not to exceed	1.0"	1.2"	2.0"	3.0"	5.0
Maximum not to exceed	3"	3"	5"	5"	10-
Side Checks					
Mean absolute correction					
by side equation not					
10 EXCEED	0.3"	0.4**	· 0.6"	0.8	26

A minimally constrained least squares adjustment will be checked for blunders by examining the normalized residuals. The observation weights will be checked by inspecting the postadjustment estimate of the variance of unit weight. Distance standard errors computed by error propagation in this correctly weighted least squares adjustment will indicate the provisional accuracy classification. A survey variance factor ratio will be computed to check for systematic error. The least squares adjustment will use models which account for the following:

semimajor axis of the ellipsoid	(a = 6378137 m)
reciprocal flattening of the ellipsoid	$\dots (1/f = 298.257222)$
mark elevation above mean aca level	\dots (known to ± 1 m)
geoid heights	\dots (known to $\pm 6 \text{ m}$)
deflections of the vertical	(known to ±3")
geodesic correction	•
skew normal correction	
height of instrument	
height of target	
sea level correction	

section to the section section

2.3 Traverse

Traverse is a measurement system comprised of joined distance and theodolite observations supported by occasional estronomic observations. Traverse is used to densify horisontal control.

Network Geometry

Order Class	First	Second I	Second II	Third I	Third []
Station spacing not less than (km) Maximum deviation of	10	4	2	0.5	0.5
main traverse from straight line Minimum number of	20°	20°	25°	30°	40°
bench mark ties Bench mark tie spacing	2	2	2	2	2
act more than (segments) Astronomic azimuth	6	8	10	15 · _	20
(segments)	6	12	20	25	40
network control points	4	3	2	2	2

The new survey is required to tie to a minimum number of network control points spaced well apart. These network points must have datum values equivalent to or better than the intended order (and class) of the new survey. Whenever the distance between two new unconnected survey points is less than 20 percent of the distance between those points traced along existing or new connections, then a direct connection must be made between those two survey points. In addition, the survey should tie into any sufficiently accurate network control points within the station spacing distance of the survey. These ties must include EDM or taped distances. Nonredundant geodetic connections to the network stations are not considered sufficient ties. Nonredundantly determined stations are not allowed. Reciprocal vertical angles or geodetic leveling are observed along all traverse lines.

Instrumentation

Only properly maintained theodolites are adequate for observing directions and azimuths for traverse. Only precisely marked targets, mounted stably on tripods or supported towers, should be employed. The target should have a clearly defined center, resolvable at the minimum control spacing. Optical plummets or collimators are required to ensure that the theodolites and targets are centered over the marks. Microwave-type electronic distance measurement equipment is not sufficiently accurate for measuring first-order traverses.

Order	First	Second	Second	Third	Third
Class		I	II	I	II
Theodolite, least count	0.2~	1.0~	. 1.0"	1.0"	1.0"

Calibration Procedures .

Each year and whenever the difference between direct and reverse readings of the theodolite depart from 180° by more than 30", the instrument should be adjusted for collimation error. Readjustment of the cross hairs and the level bubble should be done whenever their misadjustments affect the instrument reading by the amount of the least count.

All electronic distance measuring devices and retroreflectors should be serviced regularly and checked frequently over lines of known distances. The National Geodetic Survey has established specific calibration base lines for this purpose. EDM instruments should be calibrated annually, and frequency checks made semiannually.

Field Procedures

Theodolite observations for first-order and second-order, class I surveys may be made only at night. Electronic distance measurements need a record at both ends of the line of wet and dry bulb temperatures to $\pm 1^{\circ}$ C and barometric pressure to ± 5 mm of mercury. The theodolite, EDM, and targets should be centered to within 1 mm over the survey mark or eccentric point.

			_		
Order	First	Second	Second	Third	Third
Class		1	11	1	11
Disactions		· ·			
Number of parising			(00		•
President of positions	10	6 OF 121	0 0T 8-	-	4
Standard deviation of mean					
BOL to Exceed	0.4"	0.5"	0.8"	1.27	2.0"
Rejection limit from the mean	4"	5"	5"	5"	5"
Reciprocal Vertical Angles		•			
(along distance sight path)					
Number of independent					
observations direct/reverse	3	3	2	2	2
Maximum spread	10"	10"	107	10"	20"
Maximum time interval between	••				
reciprocal angles (hr)	1	1	1	1	1
	•	•	•	•	•
Astronomic Azimuths					
Observations per night	16	16	12	8	4
Number of nights	2	2	1	1	1
Standard deviation of mean					
not to exceed	0.45"	.0.45"	0.6"	1.0"	1.7"
Rejection limit from the mean	5 "	5"	5~	6"	6~
Electro-Ontical Distances					
Minimum number of					
	1	,	1	,	,
Minimum number of concentric	• •	1	· •	1	
abternations (measurement		,	,		
Minimum number of officer		1	1	,	1
observations /measurement	,	1			-
Maximum difference from		1	-	_	.—
mean of observings (40	<i>(</i> 0			
mean or observedous (mm)	. 00	60			

Order Class	First	Second I	Second II	Third I	194 : hird II
Minimum number of readings/ observation (or equivalent)	10	10	10	10	10
mon of readings (mm)	ŧ	5	ŧ	F	ŧ
Infrared Distances Minimum number of					
measurements	1	1	1	1	1
observations/measurement Minimum number of offset	1	1	1	1	1
observations/mossurement Maximum difference from	1	1	1‡		-
mean of observations (mm) Minimum number of readings/	10	10	10‡		-
observation Maximum difference from	10	10	10	10	10
mean of readings (mm)	£	ŧ	ŧ.	ł	5
Microweve Distances Minimum number of					
measurements Minimum number of concentric	-	1' ~	1	1	1
observations/measurement Maximum difference from	-	2**	1	1••	I
mean of observations (mm) Minimum number of readings/	—	150	150	200	200
observation Maximum difference from		20	20	10	10
mean of readings (mm)		f	5	£	f

† 8 if 0.2", 12 if 1.0" resolution.

* 6 if 0.2", 8 if 1.0" resolution.

§ as specified by manufacturer.

\$ only if decimal reading near 0 or high 9's.

** carried out at both ends of the line.

Measurements of astronomic latitude and longitude are not required in the United States, except perhaps for first-order work, because sufficient information for determining deflections of the vertical exists. Detailed procedures can be found in Hoskinson and Duerksen (1952).

Office Procedures

Order First	Second	Second	Third	Third	
Class	1	II	I	11	
Azimuth closure at azimuth check point (seconds of arc). 1.7 \/h Position closure 0.04 \/ after azimuth or adjustment† 1:100,00	1 3.0√N K 0.08√K or 00 1:50,000	4.5√N 0.20√K or 1:20,000	10.0√N 0.40√K or 1:10,000	12.0√N 0.80√K or 1:5,000	

(N is number of segments, K is soute distance in km)

[†] The expression containing the square root is designed for longer lines where higher proportional accuracy is required. Use the formula that gives the stration permissible closure. The closure (e.g., 1:100,000) is obtained by computing the difference between the computed and fored values, and dividing this difference by K. Note: Do not confuse closure with distance accuracy of the survey.

A minimally constrained least squares adjustment will be checked for blunders by examining the normalized residuals. The observation weights will be checked by inspectible the postadjustment estimate of the variance of unit weight. Distance standard errors computed by error propagation in a correctly weighted least aquares adjustment will indicate the provisional accuracy classification. A survey variance factor ratio will be computed to check for systematic error. The least squares adjustment will use models which account for the following:

semimajor axis of the ellipsoid reciprocal flattening of the ellipsoid mark elevation above mean sea level geoid beights deflections of the vertical geodesic correction skew normal correction beight of instrument beight of target sea level correction are correction geoid beight correction second velocity correction crustal motion

13

(a - 6378137 m)(1/f - 298.257222)(known to ±1 m) (known to ±6 m) (known to ±3")

3.4 Inertial Surveying

Inertial surveying is a measurement system comprised of lines, or a grid, of Inertial Surveying System (ISS) observations. These specifications cover use of inertial systems only for horizontal control.

Network Geometry

Order Class	Second I	Second II	Third I	Third 11
Station spacing not less than (km)	10	4	2	1
Maximum deviation from straight line connecting endpoints	20°	25°	30 ^e	35°

Each inertial survey line is required to tie into a minimum of four horizontal network control points spaced well apart and should begin and end at network control points. These network control points must have horizontal datum values better than the intended order (and class) of the new survey. Whenever the shortest distance between two new unconnected survey points is less than 20 percent of the distance between those points traced along existing or new connections, then a direct connection should be made between those two survey points. In addition, the survey should connect to any sufficiently accurate network control points within the distance specified by the station spacing. The connections may be measured by EDM or tape traverse, or by another ISS line. If an ISS line is used, then these lines should follow the same specifications as all other ISS lines in the survey.

For extended area surveys by ISS, a grid of intersecting lines that satisfies the 20 percent rule stated above can be designed. There must be a mark at each intersection of the lines. This mark need not be a permanent monument; it may be a stake driven into the ground. For a position to receive an accuracy classification, it must be permanently monumented.

A grid of intersecting lines should contain a minimum of eight network points, and should have a network control point at each corner. The remaining network control points may be distributed about the interior or the periphery of the grid. However, there should be at least one network control point at an intersection of the grid lines near the center of the grid. If the required network points are not available, then they should be established by some other measurement system. Again, the horizontal datum values of these network control points must have an order (and class) better than the intended order (and class) of the new survey.

Instrumentation

ISS equipment falls into two types: analytic (or strapdown) and semianalytic. Analytic inertial units are not considered to possess geodetic accuracy. Semianalytic units are either "space stable" or "local level." Space stable systems maintain the orientation of the platform with respect to inertial space. Local level systems continuously torque the accelerometers to account for Earth rotation and movement of the inertial unit, and also torque the platform to coincide with the local level. This may be done on command at a coordinate update, or whenever the unit achieves zero velocity (Zero velocity UPdaTe, or "ZUPT"). Independently of the measurement technique, the recorded data may be filtered by an onboard computer. Because of the variable quality of individual ISS instruments, the user should test an instrument with existing geodetic control beforehand.

An offset measurement device accurate to within 5 mm should be affixed to the inertial unit or the vehicle.

Calibration Procedures

A static calibration should be performed yearly and immediately after repairs affecting the platform, gyroscopes, or accelerometers.

A dynamic or field calibration should be performed prior to each project or subsequent to a static calibration. The dynamic calibration should be performed only between horizontal control points of first-order accuracy and in each cardinal direction. The accelerometer scale factors from this calibration should be recorded and, if possible, stored in the onboard computer of the inertial unit.

Before each project or after repairs affecting the offset measurement device or the inertial unit, the relation between the center of the inertial unit and the zero point of the offset measurement device should be established.

Field Procedures

When surveying in a helicopter, the helicopter must come to rest on the ground for all ZUPT's and all measurements.
Order Class	Second I	Second II	Third I	Third II
Minimum number of complete runs per line	2	- 1	1	1
Maximum deviation from a uniform rate of travel				
(including ZUPT)	15%	20%	25%	30%
Maximum ZUPT interval (ZUPT to ZUPT) (eec)	200	240	300	300

A complete ISS measurement consists of measurement of the line while traveling in one direction, followed by measurement of the same line while traveling in the reverse direction (double-run). A coordinate update should not be performed at the far point or at midpoints of a line, even though those coordinates may be known.

The mark offset should be measured to the nearest 5 mm.

Office Procedures

Order	Second	Second	Third	Third
Class	I	II	I	11
Maximum difference of smoothed coordinates between forward and reverse run (cm)	60	60	70	80

A minimally constrained least squares adjustment of the raw or filtered survey data will be checked for blunders by examining the normalized residuals. The observation weights will be checked by inspecting the postadjustment estimate of the variance of unit weight. Distance standard errors computed by error propagation in this correctly weighted least squares adjustment will indicate the provisional accuracy classification. A survey variance factor ratio will be computed to check for systematic error. The least squares adjustment will use the best available model for the particular inertial system. Weighted averages of individually smoothed lines are not considered substitutes for a combined least squares adjustment to achieve geodetic accuracy.

3.5 Geodetic Leveling

Geodetic leveling is a measurement system comprised of elevation differences observed between nearby rods. Leveling is used to extend vertical control.

Network Geometry

Order Class	First I	First 11	Second I	Second II	Third
Bench mark spacing not more than (km)	3	3	3	3	٤ ۽
Average bench mark spacing not more than (km)	1.6	1.6	1.6	3.0	3.0

Order Class	First 1	First II	Second I	Second 	Roind
Line length between network control points not more	•				
than (km)	300	100	50	50	25
-				(doubk	нтп)
				25	10
				(single	-กะก)

New surveys are required to tie to existing network bench marks at the beginning and end of the leveling line. These network bench marks must have an order (and class) equivalent to or better than the intended order (and class) of the new survey. First-order surveys are required to perform check connections to a minimum of six bench marks, three at each end. All other surveys require a minimum of four check connections, two at each end. "Check connection" means that the observed elevation difference agrees with the adjusted elevation difference within the tolerance limit of the new survey. Checking the elevation difference between two bench marks located on the same structure, or so close together that both may have been affected by the same localized disturbance, is not considered a proper check. In addition, the survey is required to connect to any network control points within 3 km of its path. However, if the survey is run parallel to existing control, then the following table specifies the maximum spacing of extra connections between the survey and the control. At least one extra connection should always be made.

Distance, survey to network	Maximum spacing of extra connections (km)
0.5 km or less	5
0.5 km to 2.0 km	10
2.0 km to 3.0 km	. 20

1

Instrumentation

Order Class	First l	First [[Second I	Second Il	Third
Leveling instrument Minimum repeatability of					
line of sight	0.25"	0.25~	0.50"	0.50~	1.00"
Leveling rod construction	IDS	IDS	IDS† or ISS	ISS	Wood or Metal
Instrument and red resolution					
(combined)					
Least count (mm)	0.1	0.1	0.5-1.0*	1.0	1.0

(IDS---Iswar, double scale)

(LSS---lavar, single scale)

f if optional micrometer is used.

* 1.0 mm if 3-wire method, 0.5 mm if optical micrometer.

Only a compensator or tilting leveling instrument with an opocal micrometer should be used for first-order leveling. Leveling rods should be one piece. Wooden or metal rods may be employed only for third-order work. A turning point consisting of a steel turning pin with a driving cap should be utilized. If a steel pin cannot be driven, then a turning plate ("turtle") sweighing at least 7 kg should be substituted. In situations allowing neither turning pins nor turning plates (sandy or marshy soils), a long wooden stake with a double-headed nail should be driven to a firm depth.

Calibration Procedures

0.05	0 .10
0.02	0.04
7 7	7
1	7
)" 40"	60 ''
N M	М
	_
·· 10·	10.
, ic	
	7 7 1 1 7 40 7 M

(N-National standard)

(M-Manufacturer's standard)

Compensator-type instruments should be checked for proper operation at least every 2 weeks of use. Rod calibration should be repeated whenever the rod is dropped or damaged in any way. Rod levels should be checked for proper alignment once a week. The manufacturer's calibration standard should, as a minimum, describe scale behavior with respect to temperature.

Field Procedures

Order	First	First	Second	Second	Third
Class	I	11	I	H	
Minimal observation		-			
method	micro-	micro-	micro-	3-wire	center
	meter	meter	meter or		wire
			3-wire		
Section running	SRDS	SRDS	SRDS	SRDS	SRDS
	or DR	or DR	or DR ⁺	or DR*	or DRS
	or SP	or SP	or SP		-

Field Procedurys-Centinsued

Order Class	First I	First []	Second 1	Second []	Third
Difference of forward and backward sight lengths					
never to exceed					
DEF BELLID (ID)	2	5	5	10	10
per section (m)	4	10	10	10	10
Maximum sight length (m)	50	60	60	70	90
Minimum ground clearance	-		••		
of line of sight (m)	0.5	0.5	0.5	0.5	0.5
Even number of setups					
when not using leveling					
rods with detailed					·
calibration	yes	yes	yes	yes	
Determine temperature					
gradient for the vertical					
range of the line of sight					
at each setup	yes	yes	yes	-	—
Maximum section	-	-			-
misclosure (mm)	3√D	4 √ D	6√D	8√D	12√D
Maximum loop	-				-
misciosure (mm)	4√E	5√E	6√E	8√E	12√E
Single-run methods					
Reverse direction of single					
runs every balf day	yes	yes	yes	—	_
	•	•	•		
Nonreversible compensator					
leveling instruments					
Oli-level/relevel					
Instrument Detwoen					
observing the high					
and low rod scales	yes	yes	yes	_	
3-wire method					
Reading check (difference					
between top and bottom					
intervals) for one setup		•			
not to exceed (tenths of					
rod units)		—	2	2	3
Read rod 1 first in			-	-	-
alternate setup method	-	_	yes	yes	yes
· · ·			•	•	•
Double scale rods					
Low-high scale elevation					
duterence for one setup					
Bot to exceed (mm)					
With reversible	•				
compensator	0.40	1.00	1.00	2.00	2.00
Other instrument types:			.		
Hall-contineter rods	0.25	0.30	0.60	0.70	1.30
rull-centimeter rods	0.30	0.30	0.60	Q .70	1.30

(SRDS-Single-Run, Double Simultaneous procedure)

(DR-Double-Run)

(SP-SPur, less than 25 km, double-run)

D---shortest length of section (one-way) in hm

E-perimeter of loop in km

† Must double-run when using 3-wire method.

" May single-ran if line length between network control points is less than 25 km.

§ May single-run if line length between network control points is less than 10 km.

Double-run leveling may always be used, but singlerun leveling done with the double simultaneous procedure may be used only where it can be evaluated by loop closures. Rods should be leap-frogged between setups (alternate setup method). The date, beginning and ending times, cloud coverage, air temperature (to the nearest degree), temperature scale, and average wind speed should be recorded for each section plus any changes in the date, instrumentation, observer or time zone. The instrument need not be off-leveled/releveled between observing the high and low scales when using an instrument with a reversible compensator. The low-high scale difference tolerance for a reversible compensator is used only for the control of blunders.

With double scale rods, the following observing sequence should be used:

backnight, low-scale backnight, stadia foresight, stadia foresight, stadia off-level/relevel or reverse compensator foresight, high-scale backnight, high-scale

Office Procedures

Order Class	First I	First II	Second I	Second 11	Third
Section miscionnes					
(backward and forward)					
Algebraic sum of all-					
corrected section misclosures					
of a leveling line					
not to exceed (mm)	3√D	4 \ D	6√D	.8√D	12√D
Section misclosure not to	• .	•	•	•	•
exceed (mm)	3√E	4√E	6√E	8√ E	12√E
Loop misclosures					
Algebraic sum of all					
corrected misclosures					
not to exceed (mm)	4√F	5√F	6√F	8√ F	12√F
Loop misclosure not	•	·		•	•
to exceed (mm)	4√F	5√F	6√F	8√F	12√F

(D--shortest length of leveling line (one-way) in km)

(E-shortest one-way length of section in km)

(F-length of loop in km)

The normalized residuals from a minimally constrained least squares adjustment will be checked for blunders. The observation weights will be checked by inspecting the postadjustment estimate of the variance of unit weight. Elevation difference standard errors computed by error propagation in a correctly weighted least squares adjustment will indicate the provisional accuracy classification. A survey variance factor ratio will be computed to check for systematic error. The least squares adjustment will use models that account for:

gravity effect or orthometric correction rod scale errors rod (Invar) temperature refraction—mood latitude and longitude to 6" or vertical tempera-

ture difference observations between 0.5 and 2.5 m above the ground earth tides and magnetic field collimation error

crustal motion

3.6 Photogrammetry

Photogrammetry is a measurement system comprised of photographs taken by a precise metric camera and measured by a comparator. Photogrammetry is used for densification of horizontal control. The following specifications apply only to analytic methods.

Network Geometry

Order Class	Second I	Second II	Third I	Third II
Forward overlap not less than	66%	66%	60%	60%
Side overlap not less than	66%	66%	20%	20%
Intersecting rays per point not less than (design criteria)	9	8	3	3

The photogrammetric survey should be areal: single strips of photography are not acceptable. The survey should encompass, ideally, a minimum of eight horizontal control points and four vertical points spaced about the perimeter of the survey. In addition, the horizontal control points should be spaced no farther apart than seven air bases. The horizontal control points should have an order (and class) better than the intended order (and class) of the survey. The vertical points need not meet geodetic control standards. If the required control points are not available, then they must be established by some other measurement system.

Instrumentation

Order Class	Second	Second II	Third I	Third 11
Metric Camera				
Maximum warp of platen not				
more than (um)	10	10	10	10
Dimensional control not				
less than	rescau	8	8	8
	with	fiducials	fiducials	fiducials
	meximut	'n		
,	spacing			
	of 2 cm			
Competitor				

The camera should be of at least the quality of those employed for large-scale mapping. A platen should be included onto which the film must be satisfactorily flattened during exposure. Note that a reseau should be used for second-order, class I surveys.

Calibration Procedures

Order	Second	Second	Third	Third
Class	I	II	I	11
Metric camera Root mean square of calibrated radial distortion not more than (µm)	1	3	3	5

Calibration Procedures-Continued

Order Class	Second I	Second II	Third 1	Third II
Root mean square of calibrated		<u> </u>		
than (um)	1	51	51	5†
coordinates not more than (am)	1	1	3	3
coordinates not more than (um)		1	3	3

t not usually treated separately in camera calibration facilities; manufacturer's certification is satisfactory.

The metric camera should be calibrated every 2 years, and the comparator should be calibrated every 6 months. These instruments should also be calibrated after repair or modifications.

Characteristics of the camera's internal geometry (radial symmetric distortion, decentered lens distortion, principal point and point of symmetry coordinates, and reseau coordinates) should be determined using recognized calibration techniques, like those described in the current edition of the Manual of Photogrammetry. These characteristics will be applied as corrections to the measured image coordinates.

Field Procedures

Photogrammetry involves hybrid measurements: a metric camera photographs targets and features in the field, and a comparator measures these photographs in an office environment. Although this section is entitled "Field Procedures," it deals with the actual measurement process and thus includes comparator specifications.

Order Class	Second I	Second II	Third I	Third II
Targets				
Control points targeted	yes	yes	yes	yes
Pass points targeted	yes	yes	optional	optional
Comparator				
Pointings per target not less than	4	3	2	2
Pointings per rescau (or fiducial)		-	-	-
not less than	. 4	3	2	2
Number of different rescau		• •	-	. –
intersections per target not				
less than	. 4	—	_	
Rejection limit from mean of				
pointings per target (um)	3	3	3	3

Office Procedures

Order	Second	Second	Third	Third
Class	I	II	I	II
Root mean square of adjusted photococordinates not more than (µm)	4	6	8	12

A least squares adjustment of the photocoordinates, constrained by the coordinates of the horizontal and vertical control points, will be checked for blunders by examining the normalized residuals. The observation weights will be checked by inspecting the postadjustment estimate of the variance of unit weight. Distance standard errors computed by error propagation in this correctly weighted least aquares adjustment will indicate the provisional accuracy classification. A survey variance factor ratio will be computed to check for systematic error. The least squares adjustment will use models that incorporate the quantities determined by calibration.

3.7 Satellite Doppler Positioning

Satellite Doppler positioning is a three-dimensional measurement system based on the radio signals of the U.S. Navy Navigational Satellite System (NNSS), commonly referred to as the TRANSIT system. Satellite Doppler positioning is used primarily to establish horizontal control.

The Doppler observations are processed to determine station positions in Cartesian coordinates, which can be transformed to geodetic coordinates (geodetic latitude and longitude and height above reference ellipsoid). There are two methods by which station positions can be derived: point positioning and relative positioning.

Point positioning, for geodetic applications, requires that the processing of the Doppler data be performed with the precise ephemerides that are supplied by the Defense Mapping Agency. In this method, data from a single station is processed to yield the station coordinates.

Relative positioning is possible when two or more receivers are operated together in the survey area. The processing of the Doppler data can be performed in four modes: simultaneous point positioning, translocation, semishort arc, and short arc. The specifications for relative positioning are valid only for data reduced by the semishort or short arc methods. The semishort arc mode allows up to 5 degrees of freedom in the ephemerides; the short arc mode allows 6 or more degrees of freedom. These modes allow the use of the broadcast ephemerides in place of the precise ephemerides.

The specifications quoted in the following sections are based on the experience gained from the analysis of Doppler surveys performed by agencies of the Federal government. Since the data are primarily from surveys performed within the continental United States, the precisions and related specifications may not be appropriate for other areas of the world.

Network Geometry

The order of a Doppler survey is determined by: the spacing between primary Doppler stations, the order of the base network stations from which the primaries are established, and the method of data reduction that is used. The order and class of a survey cannot exceed the lowest order (and class) of the base stations used to establish the survey.

The primary stations should be spaced at segular intervals which meet or exceed the spacing required for the desired accuracy of the survey. The primary stations will carry the same order, as the survey.

Supplemental stations may be established in the same survey as the primary stations. The lowest order (and class) of a supplemental station is determined either by its spacing with, or by the order of, the nearest Doppler or other horizontal control station. The processing mode determines the allowable station spacing.

In carrying out a Doppler survey, one should occupy, using the same Doppler equipment and procedures, at least two existing horizontal network (base) stations of order (and class) equivalent to, or better than, the intended order (and class) of the Doppler survey. If the Doppler survey is to be first-order, at least three base stations must be occupied. If relative positioning is to be used, all base station base lines must be directly observed during the survey. Base stations should be selected near the perimeter of the survey, so as to encompass the entire survey.

Stations which have a precise elevation referenced by geodetic leveling to the National Geodetic Vertical Datum (NGVD) are preferred. This will allow geoidal heights to be determined. As many base stations as possible should be tied to the NGVD. If a selection is to be made, those stations should be chosen which span the largest portion of the survey.

If none of the selected base stations is tied to the NGVD, at least two, preferably more, bench marks of the NGVD should be occupied. An attempt should be made to span the entire survey area.

Datum shifts for transformation of point position solutions should be derived from the observations made on the base stations.

The minimum spacing, D, of the Doppler stations may be computed by a formula determined by the processing mode to be employed. This spacing is also used in conjunction with established control, and other Doppler control, to determine the order and class of the supplemental stations.

By using the appropriate formula, tables can be constructed showing station spacing as a function of point or relative one-sigma position precision $(s_p \text{ or } s_r)$ and desired survey (or station) order.

Point Positioning

$D = 2\sqrt{2} s_{pa}a$

where

÷

 a = denominator of distance accuracy classification standard (e.g., a = 100,000 for first-order standard).

Order	First	Second	Second	Third Third		
Class		I	11	I	11	
sp (cm)			D (km)		<u></u> _,	-
200	566	242	114	56	28	1
100	283	141	57	28	14	(
70	200	100	40	20	10	
50	141	71	26	14	7	

Relative Positioning

$$\mathbf{D} = 2 \mathbf{s}_{\mathbf{r}} \mathbf{s}_{\mathbf{r}}$$

where

L	-	denominator	of	distance	accuracy	class ification
		standard (c.e.	a -	100,000 1	for first-orde	r standard).

Order Class	First	Second I	Second II	Third I	Third II
\$ _r (cm)		. .	D (km)		
50	100	50	20	10	5
35	70	35	14	7	4
20	40	20	8	4	2

However, the spacing for relative positioning should not exceed 500 km.

Instrumentation

The receivers should receive the two carrier frequencies transmitted by the NNSS. The receivers should record the Doppler count of the satellite, the receiver clock (times, and the signal strength. The integration interval should be approximately 4.6 sec. Typically six or seven of these intervals are accumulated to form a 30-second Doppler count observation. The reference frequency should be stable to within $5.0(10^{-11})$ per 100 sec. The maximum difference from the average receiver delay should not exceed 50 µsec. The best estimate of the mean electrical center of the antenna should be marked. This mark will be the reference point for all height-of-antenna measurements.

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Calibration Procedures

Receivers should be calibrated at least once a year, or whenever a modification to the equipment is made. It is desirable to perform a calibration before every project to verify that the equipment is operational. The two-receiver method explained next is preferred and should be used whenever possible.

Two-Receiver Method

The observations are made on a vector base line, of internal accuracy sufficient to serve as a comparison standard, 10 to 50 m in length. The base line should be located in an area free of radio interference in the 150 and 400 MHz frequencies. The procedures found in the table on relative positioning in "Field Procedures" under the 20 cm column heading will be used. The data are reduced by either shortarc or semishort arc methods. The receiver will be considered operational if the differences between the Doppler and the terrestrial base line components do not exceed 40 cm (along any coordinate axis).

Single-Receiver Method

Observations are made on a first-order station using the procedures found in the table on relative positioning in "Field Procedures" under the 50 cm column heading. The data are reduced with the precise ephemerides. The resultant position must agree within 1 m of the network position.

Field Procedures

The following tables of field procedures are valid only for measurements made with the Navy Navigational Satellite System (TRANSIT).

Point Positioning

s, (precise ephemerides)	50 cm	70 cm	100 cm	200 cm
Max. standard deviation of mean				•
ephemerides	25	25	25	25
Period of observation not less				
than (hr)	48	36	24	12
Number of observed passes not				
less than [†]	40	30	15	8
Number of acceptable passes (evaluated by on-site point				
processing) not less than	30	20	9	4
passes within each quadrant [®]	6	4	2	1
Frequency standard warm-up				
time (hr)				
CTYSEL	48	48	24	24
atomic	1.5	1.5	1.0	1.0
Maximum interval between				
meteorological observations (hr)	6	£	S.	5

* Number of passes refers to those for which the precise ephemerides are available for reduction.

* There should be a nearly equal number of northward and southward passes. § each setup, visit and takedown.

Relative positioning

s,	20 cm	35 cm	50 cm
Maximum standard deviation of mean of			
counts/pass (cm), broadcast ephemerides	25	25	25
Period of observation not less than (hr)	48	36	24
Number of observed passes not less than the	40	30	15
Number of acceptable passes (evaluated by on-site point position processing)			
not less than	30	20	9
Minimum number of acceptable passes			
within each quadrant*	6	4	2
Frequency standard warm-up time (hr)			
Crystal	48	48	48
stonic	1.5	1.5	1.5
Maximum interval between meteorological			
observations (hr)	6	6	6

Number of observed passes refers to all satellites available for tracking and
 reduction with the broadcast or procise ephemerides.

* Number of northward and southward passes should be nearly equal.

§ Each setup, visit and takedown.

The antenna should be located where radio interference is minimal for the 150 and 400 MHz frequencies. Medium frequency radar, high voltage power lines, transformers, excessive noise from automotive ignition systems, and high power radio and television transmission antennas should be avoided. The horizon should not be obstructed above 7.5°.

The antenna should not be located near metal structures, or, when on the roof of a building, less than 2 m from the edge. The antenna must be stably located within 1 mm over the station mark for the duration of the observations. The height difference between the mark and the reference point for the antenna phase center should be measured to the nearest millimeter. If an antenna is moved while a pass is in progress, that pass is not acceptable. If moved, the antenna height; otherwise the data may have to be processed as if two separate stations were established. In the case of a reoccupation of an existing Doppler station, the antenna should be relocated within 5 mm of the original observing height.

Long-term reference frequency drift should be monitored to ensure it does not exceed the manufacturer's specifications.

Observations of temperature and relative humidity should be collected, if possible, at or near the height of the phase center of the antenna. Observations of wet-bulb and drybulb temperature readings should be recorded to the nearest 0.5°C. Barometric readings at the station site should be recorded to the nearest millibar and corrected for difference in height between the antenna and barometer.

Office Procedures

The processing constants and criteria for determining the quality of point and relative positioning results are as follows:

- 1. For all passes for a given station occupation, the average number of Doppler counts per pass should be at least 20 (before processing).
- 2. The cutoff angle for both data points and passes should be 7.5°.
- 3. For a given pass, the maximum allowable rejection of counts, 3 sigma postprocessing, will be 10.
- 4. Counts rejected (excluding cutoff angle) for a solution should be less than 10 percent.
- 5. Depending on number of passes and quality of data, the standard deviation of the range residuals for all passes of a solution should range between:

Point positioning-10 to 20 cm

Relative positioning-5 to 20 cm

A minimally constrained least squares adjustment will be checked for blunders by examining the normalized residuals. The observation weights will be checked by inspecting the postadjustment estimate of the variance of unit weight. Distance standard errors computed by error propagation between points in this correctly weighted least squares adjustment will indicate the maximum achievable accuracy classification. The formula presented in "Standards" will be used to arrive at the actual classification. The least squares adjustment will use models which account for:

tropospheric scale bias, 10 percent uncertainty receiver time delay satellite/receiver frequency offset precise ophemoris tropospheric refraction ionospheric refraction long-term ophemeris variations crustal motion

3.8 Absolute Gravimetry

Absolute gravimetry is a measurement system which determines the magnitude of gravity at a station at a specific time. Absolute gravity measurements are used to establish and extend gravity control. Within the context of a geodetic gravity network, as discussed in "Standards," a series of absolute measurements at a control point is in itself sufficient to establish an absolute gravity value for that location.

The value of gravity at a point is time dependent, being subject to dynamic effects in the Earth. The extent of gravimetric stability can be determined only by repeated observations over many years.

Network Geometry

Network geometry cannot by systematized since absolute observations at a specific location are discrete and uncorrelated with other points. In absolute gravimetry, a network may consist of a single point.

A first-order, class I station must possess gravimetric stability, which only repeated measurements can determine. This gravimetric stability should not be confused with the accuracy determined at a specific time. It is possible for a value to be determined very precisely at two different dates and for the values at each of these respective dates to differ. Although the ultimate stability of a point cannot be determined by a single observation session, an attempt should be made to select sites which are believed to be tectonically stable, and sufficiently distant from large bodies of water to minimize ocean tide coastal loading.

The classification of first-order, class I is reserved for network points which have demonstrated long-term stability. To ensure this stability, the point should be reobserved at least twice during the year of establishment and thereafter at sufficient intervals to ensure the continuing stability of the point. The long-term drift should indicate that the value will not change by more than 20 μ Gal for at least 5 years. A point intended as first-order, class I will initially be classified as first-order, class II until stability during the first year is demonstrated.

Instrumentation

The system currently being used is a ballistic-laser device and is the only one at the current state of technology considered sufficiently accurate for absolute gravity measurements. An absolute instrument measures gravity at a specific elevat: a above the surface, usually about 1 m. For this reason, the gravity value is referenced to that level. A measurement of the vertical gravity gradient, using a relative gravity meter and a tripod, must be made to transfer the gravity value to ground level. The accuracy of the relative gravimeter must satisfy the gravity gradient specifications found in "Field Procedures."

Calibration Procedures

Ballistic-laser instruments are extremely delicate and each one represents a unique entity with its own characteristics. It is impossible to identify common systematic errors for all instruments. Therefore, the manufacturer's recommendations for individual instrument calibration should be followed rigorously.

To identify any possible bias associated with a particular instrument, comparisons with other absolute devices are strongly recommended whenever possible. Comparisons with previously established first-order, class I network points, as well as first-order, class II network points tied to the class I points, are also useful.

Field Procedures

The following specifications were determined from results of a prototype device built by J. Faller and M. Zumberge (Zumberge, M., "A Portable Apparatus for Absolute Measurements of the Earth's Gravity," Department of Physics, University of Colorado, 1981) and are given merely as a guideline. It is possible that some of these values may be inappropriate for other instruments or models. Therefore, exceptions to these specifications are allowed on a caseby-case basis upon the recommendation of the manufacturer. Deviations from the specifications should be noted upon submission of data for classification.

Order : Class	First 1	First 11	Second	Third
Absolute monourement				
Standard deviation of each scorepted measurement set				
act to exceed (#Gal)	20	20	50	100
Minimum number of sets/	1			
observation	5	· 5	5	5
Maximum difference of a				
measurement set from mean of				
ali measurements (#Gal)	12	12	37	48
Barometric pressure standard				
error (mber)	4	4		
Gradient mensurement				
Standard deviation of measurement				
of vertical gravity gradient at				
time of observation (#Gal/m)	5	5	5	5
Standard deviation of height of				
instrument above point (mm)	1	1	5	10

The manufacturer of an absolute gravity instrument usually provides a reduction process which identifies and accounts for error sources and identifiable parameters. This procedure may be sufficient, making further office adjustments unnecessary.

A least squares adjustment will be checked for blunders by examining the normalized residuals. The observation weights will be checked by inspecting the postadjustment estimate of the variance of unit weight. Gravity value standard deviations computed by error propagation in a correctly weighted, least squares adjustment will indicate the provisional accuracy classification. The least squares adjustment, as well as digital filtering techniques and/or sampling, should use models which account for:

atmospheric mass attraction microseismic activity instrumental characteristics hunisolar attraction elastic and plastic response of the Earth (tidal loading)

3.9 Relative Gravimetry

Relative gravimetry is a measurement system which determines the difference in magnitude of gravity between two stations. Relative gravity measurements are used to extend and densify gravity control.

Network Geometry

A first-order, class I station must possess gravimetric stability, which only repeated measurements can determine. This gravimetric stability should not be confused with the accuracy determined at a specific time. It is possible for a value to be determined very precisely at two different dates, and for the values at each of these respective dates to differ. Although the ultimate stability of a point cannot be determined by a single observation session, an attempt should be made to select sites which are believed to be tectonically stable.

The classification of first-order, class I is reserved for network points that have demonstrated long-term stability. To ensure this stability, the point should be reobserved at least twice during the year of establishment and theseafter at sufficient intervals. The long-term drift should indicate that the value will not change by more than the 20 μ Gal for at least 5 years. A point intended as first-order, class I will initially be classified as first-order, class II until stability during the first year is demonstrated.

The new survey is required to tie at least two network points, which should have an order (and class) equivalent to or better than the intended order (and class) of the new survey. This is required to check the validity of existing network points as well as to ensure instrument calibration. Users are encouraged to exceed this minimal requirement. However, if one of the network stations is a firstorder, class I mark, then that station alone can satisfy the aninimum connecting requirement if the intended order of the newsurvey is less than first-order.

Instrumentation

Regardless of the type of a relative gravimeter, the statemal error is of primary concern.

Order Class	First 1	First 11	Second	Third
Minimust instrument internal error (mosigma), (#Gal)	10	10	20	30

The instrument's internal accuracy may be determined by performing a relative survey over a calibration line (see below) and examining the standard deviation of a single reading. This determination should be performed after the instrument is calibrated using the latest calibration information. Thus the internal error is the measure of instrument uncertainty after all possible systematic error sources have been eliminated by calibration.

Calibration Procedures

An instrument abould be properly calibrated before a geodetic survey is performed. The most important calibration item is the determination of the mathematical model that relates dial units, voltage, or some other observable to milligals. This may consist only of a scale factor. In other cases the model may demonstrate nonlinarity or periodicity. Must manufacturers provide tables or scale factors with each instrument. Care must be taken to ensure the validity of these data over time.

When performing first-order work, this calibration model should be determined by a combination of bench tests and field measurements. The bench tests are specified by the manufacturer. A field calibration should be performed over existing control points of first-order, class I or II. The entire usable gravimeter range interval should be sampled to ensure an uncertainty of less than 5 μ Gal. FGCC member agencies have established calibration lines for this specific purpose.

The response of an instrument to air pressure and temperature should be determined. The meter should be adjusted or calibrated for various pressures and temperatures so that the allowable uncertainty from these sources does not exceed the values in the table below.

The manufacturer's recommendations should be followed to ensure that all internal criteria, such as galvanometer sensitivity, long and cross level or tilt sensitivity, and mading line, are within the manufacturer's allowable tolerances.

The response of an instrument due to local orientation should also be determined. Systematic differences may be due to an instrument's sensitivity to local magnetic variations. Manufacturers attempt to limit or negate such a response. However, if a meter displays a variation with respect to orientation, then one must either have the instrument repaired by the manufacturer, or minimize the effect by fixing the orientation of the instrument throughout a survey.

Order Clare	First	First	Second	Third	•
	1				
Nocessary for user to determine					
calibration model	Yes	Ya	Yes	No	
Allowable uncertainty of					
calibration model (#Gal)	5	5	10	15	
Allowable uncertainty due to					
external air temperature					
changes (#Gal)	1	1	3	-	
Maximum uncertainty due to					
external air pressure					
changes (#Gal)	1	1	2	_	
Allowable uncertainty due to					
other factors (#Gal)	3	3	5	_	
	-				

Field Procedures

A relative gravity survey is performed using a sequence of measurements known as a loop sequence. There are three common types: ladder, modified ladder, and line.

The ladder sequence begins and ends at the same network point, with the survey points being observed twice during the sequence: once in forward running and once in backward running. Of course, more than one network point may be present in a ladder sequence.

Order	First	First	Second	Third
Class	· 1 · ·	.11		
Minimum number of instruments				
used in survey	2	2.	2	1
Recommended number of				
instruments used in survey	3	3	2	1
Allowable loop sequence	8	8	a,b	a,b,c
Minimum number of readings at				
each observation/instrument	5	5	21	1
Standard deviation of consecutive				
readings (unclamped) from				
mean* not to exceed (#Gal)	2	2	5	—
Monitor external temperature and				
air pressure	Yes	Ya	No	No
Standard deviation of temperature				
EDEASUREIDERIS (°C)	0.1	0.1		
Standard deviation of air pressure				
Encloyed deviation of bright of	1	1		—
instrument above saint (mm)	1			10
morement source point (mm)	4 .	1	2	10

(a-ladder) (b-modified ladder) (c-line)

+ Akhough two readings are required, only one reading need be recorded.

· corrected for hunisolar attraction.

The modified ladder sequence also begins and end94at the same setwork point. However, not all the survey points are observed twice during the sequence. Again, more than one network point may be observed in the sequence.

The line sequence begins at a network point and ends at a different network point. A survey point in a line sequence is usually observed only once.

One should always monitor the internal temperature of the instrument to ensure it does not fluctuate beyond the manufacturer's recommended limits. The time of each reading should be recorded to the nearest minute.

Office Procedures

Order	First 1	First II	Second	Third
Rejection Limits				
Maximum standard error of a				
gravity value ("Gal)	20	20	50	100
Total allowable instrument				
uncertainty (#Gal)	10 😚	10	20	30
Model Uncertainties	· •.			
Uncertainty of atmospheric mass				
model (uGal)	0.5	0.5		—
Uncertainty of Junisolar				
attraction (#Gal)	1	1	5	5
Uncertainty of Earth elastic and				
plastic response to tidal				
loading (#Gal)	2	2	5	

A least squares adjustment, constrained by the network configuration and precision of established gravity control, will be checked for blunders by examining the normalized residuals. The observation weights wil' be checked by inspecting the postadjustment estimate of the variance of unit weight. Gravity standard errors computed by error propagation in a correctly weighted least squares adjustment will indicate the provisional accuracy classification. A survey variance factor ratio will be computed to check for systematic error. The least squares adjustment will use models which account for:

instrument calibrations

1) conversion factors

2) thermal response

3) atmospheric pressure response

(if necessary)

instrument drift

1) static

2) dynamic

atmospheric mass attraction (if pocessary)

Earth tides

1) Junisolar attraction

2) Earth elastic and plastic response (if necessary)

4. Information

Geodetic control data and cartographic information that pertain to the National Geodetic Control Networks are widely distributed by a component of the National Geodetic Survey, the National Geodetic Information Branch (NGIB). Users of this information include Federal, State, and local agencies, universities, private companies, and individuals. Data are furnished in response to individual orders, or by an automatic mailing service (the mechanism whereby users who maintain active geodetic files automatically receive newly published data for specified areas). Electronic retrieval of data can be carried out directly from the NGS data base by a user.

Geodetic control data for the national networks are primarily published as standard quadrangles of 30' in latitude by 30' in longitude. However, in congested areas, the standard quadrangles are 15' in latitude by 15' in longitude. In most areas of Alaska, because of the sparseness of control, quadrangle units are 1° in latitude by 1° in longitude. Data are now available in these formats for all horizontal control and approximately 65 percent of the Pvertical control. The remaining 35 percent are presented in the old formats; i.e., State leveling lines and description booklets. Until the old format data have been converted to the standard quadrangle formats, the vertical control data in the unconverted areas will be available only by complete county coverage. Field data and recently adjusted projects with data in manuscript form are available from NGS upon special request. The National Geodetic Control Networks are cartographically depicted on approximately 850 different control diagrams. NGS provides other related geodetic information: e.g., geoid heights, deflections of the vertical, calibration base lines, gravity values, astronomic positions, borizontal and vertical data for crustal movement studies, satellite-derived positions, UTM coordinates, computer programs, geodetic calculator programs, and reference materials from the NGS data bases.

The NGIB receives data from all NOAA geodetic field operations and mark-recovery programs. In addition, other Federal, State, and local governments, and private organizations contribute survey data from their field operations. These are incorporated into the NGS data base. NOAA has entered into formal agreements with several Federal and State Government agencies whereby NGIB publishes, maintains, and distributes geodetic data received from these organizations. Guidelines and formats have been established to standardize the data for processing and inclusion into the NGS data base. These formats are available to organizations interested in participating in the transfer of their files to NOAA (appendix C).

Upon completion of the geodetic data base management system, information generated from the data base will be automatically revised. A new data output format is being designed for both horizontal and vertical published control information. These formats, which were necessitated by the requirements of the new adjustments of the horizontal and vertical geodetic networks, will be more comprehensive than the present versions.

New micropublishing techniques are being introduced in the form of computer-generated microforms. Some geodetic data are available on magnetic tape, microfilm, and microfiche. These services will be expanded as the automation system is fully implemented. Charges for digital data are determined on the basis of the individual requests, and reflect processing time, materials, and postage. The booklets *Publications of the National Geodetic Survey* and *Products and Services of the National Geodetic Survey* are available from NGIB.

For additional information, write:

Chief, National Geodetic Information

Branch, N/CG17

National Oceanic and Atmospheric Administration Rockville, MD 20852

To order by telephone:

data:	301-443-8631
publications:	
computer programs or digital data:	301-443-8623

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Governmental Authority

A.1 Authority

The U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) is responsible for establishing and maintaining the basic national horizontal, vertical, and gravity geodetic control networks to meet the needs of the Nation. Within NOAA this task is assigned to the National Geodetic Survey, a Division of the Office of Charting and Geodetic Services within the National Ocean Service. This responsibility has evolved from legislation dating back to the Act of February 10, 1807 (2 Stat. 413, which created the first scientific Federal agency, known as the "Survey of the Coast." Current authority is contained in United States Code, Title 33, USC 883a, as amended, and specifically defined by Executive Directive, Bureau of the Budget (now the Office of Management and Budget) Circular No. A-16, Revised (Bureau of the Budget 1967).

To coordinate national mapping, charting, and surveying activities, the Board of Surveys and Maps of the Federal Government was formed December 30, 1919, by Executive Order No. 3206. "Specifications for Horizontal and Vertical Control" were agreed upon by Federal surveying and mapping agencies and approved by the Board on May 9, 1933. When the Board was abolished March 10, 1942, its functions were transferred to the Bureau of the Budget, now the Office of Management and Budget, by Executive Order No. 9094. The basic survey specifications continued in effect. Bureau of the Budget Circular No. A-16, published January 16, 1953, and revised May 6, 1967 (Bureau of the Budget 1967), provides for the coordination of Federal surveying and mapping activities. "Classification and Standards of Accuracy of Geodetic Control Surveys," published March 1, 1957, replaced the 1933 specifications. Exhibit C to Circular A-16, dated October 10, 1958 (Bureau of the Budget 1958), established procedures for the required coordination of Federal geodetic and control surveys performed in accordance with the Bureau of the Budget classifications and standards.

The Federal Geodetic Control Committee (FGCC) was chartered December 11, 1968, and a Federal Coordinator for Geodetic Control and Related Surveys was appointed April 4, 1969. The FGCC Circular No. 1, "Exchange of Information," dated October 16, 1972, prescribes reporting procedures for the committee (vice Exhibit C of Circular A-16) (Federal Geodetic Control Committee 1972).

The Federal Coordinator for Geodetic Control and Related Surveys, Department of Commerce, is responsible for coordinating, planning, and executing national geodetic control surveys and related survey activities of Federal agencies, financed in whole or in part by Federal funds. The Executive Directive (Bureau of the Budget 1967: p. 2) states:

- (1) The geodetic control needs of Government agencies and the public at large are met in the most expeditious and economical manner possible with available resources; and
- (2) all surveying activities financed in whole or in part by Federal funds contribute to the National Networks of Geodetic Control when it is practicable and economical to do so.

The Federal Geodetic Control Committee assists and advises the Federal Coordinator for Geodetic Control and Related Surveys.

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Variance Factor Estimation

B.1 Introduction

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The classification accuracies for the National Geodetic Control Networks measure how well a survey can provide position, elevation, and gravity. (More specifically, a distance accuracy is used for horizontal networks, and an elevation difference accuracy is used for vertical networks.) The interpretation of what is meant by "how well" contains two parts. A survey must be precise, i.e., fairly free of random error; it must also be accurate, i.e., relatively free of systematic error. This leads to a natural question of how to test for random and systematic error.

Testing for random error is an extremely broad subject, and is not examined here. It is assumed that the standard deviation of distance, elevation difference, or gravity provides an adequate basis to describe the amount of random error in a survey. Further, it is assumed that the selection of the worst instance of the classification accuracy computed at all points (or between all pairs of points) provides a satisfactory means of classifying a new survey. This procedure n ay seers 'harsh, but it allows the user of geodetic control to rely better upon a minimum cuality of survey work. The nominal quality of a survey could be much higher.

Consider the method of observation equations (see Mikhail (1976) for a general discussion):

$$\mathbf{L}_{\mathbf{a}} = \mathbf{F}(\mathbf{X}_{\mathbf{a}})$$

where

L_a is a vector of computed values for the observations of dimension n,

 X_a is a vector of coordinate and model paraméters of dimension u, and

F is a vector of functions that describes the observations in terms of the parameters.

The design matrix, A, is defined as

$$A = \frac{\partial F}{\partial X_a} | X_a = X_a$$

where A is a matrix of differential changes in the observation model F with respect to the parameters, X_a , evaluated at a particular set of parameter values, X_o . A vector of observation misclosures is

$$L = L_b - L_a$$

where L_b is the vector of actual observations and L_a is the vector described above.

Associated with the observation vector L_b is a symmetric variance-covariance matrix Σ_{L_b} , which contains information on observation precision and correlation.

The observation equation may now be written in linearized form

$$AX = L + V$$

where V is a vector of residual errors and X is a vector of corrections to the parameter vector X_{a} . The least squares estimate of X is

$$\mathbf{X} = (\mathbf{A}'(\boldsymbol{\Sigma}_{L_{\mathbf{L}}})'\mathbf{A})' \mathbf{A}'(\boldsymbol{\Sigma}_{L_{\mathbf{L}}})'\mathbf{L}$$

where the superscripts ' and ' denote transpose and inverse (of a usatrix) respectively.

The estimate provides a new set of values for the parameters by

$$X_{a} + X - X_{a}$$

If the observation model $F(X_n)$ is nonlinear (that is, A is not constant for any set of X_n), then the entire process, marting with the first equation, must be iterated until the vector X reaches a stationary point.

Once convergence is achieved, L_a , computed from the first equation, is the vector of adjusted observations. The vector of observation residual errors, V, is

$$\mathbf{V} = \mathbf{L}_{\mathbf{a}} - \mathbf{L}_{\mathbf{b}}$$

Estimates of parameter precision and correlations are given by the adjusted parameter variance-covariance matrix, Σ_{χ} computed by

$$\Sigma_{\chi_{L}} = (A^{t}(\Sigma_{L_{L}})^{t}A)^{t}.$$

The precision of any other quantity that can be derived from the parameters may also be computed. Suppose one wishes to compute a vector of quantities, S,

B-1

$$S = S(X_{-})$$

from the adjusted parameters, X_n . A geometry matrix, G, is defined as

$$G \doteq \frac{\partial S}{\partial X_s} | X_s - X_s$$

where G is a matrix of differential changes in the functions, S, with respect to the parameters, X_{e} , evaluated at a particular set of parameter values, X_{e} . By the principle of linear error propagation,

 $\Sigma_s = G \Sigma_x G^s$

or

$$\Sigma_{\rm S} = {\rm G}({\rm A}'(\Sigma_{\rm L})'{\rm A})' {\rm G}^{\rm I}$$

where Σ_S is the variance-covariance matrix of the computed quantities.

This last equation is important since its terms are variances and covariances such as those for distance or height difference. Use of this equation assumes that the model is not too nonlinear, that the parameter vector X_a has been adequately estimated by the method of least squares, that the design matrix A, the geometry matrix G, and the variance-covariance matrix of the observations Σ_{L_b} are known. This last assumption is the focal point for the remainder of this appendix.

We must somehow estimate the n (n + 1)/2 elements of Σ_{L} . Usually, we know Σ_{L} subject to some global variance factor, f. We would then assume that

$$\Sigma_1 = f \Sigma_1^\circ$$

where

 $\Sigma_{\rm L}$ - the "true" variance-covariance matrix of the observations

 Σ_{L}° = initial estimate of variance-covariance matrix of the observations

Our assumption about the the structure of Σ_L^{\bullet} relative to a single factor usually suffices. But this assumption can be improved if we generalize the idea. Consider a partition of the observations into k homogeneous groups. We now estimate k different local variance factors



As will be discussed later, we may also detect systematic error if one of the variance components is based on certified network observations.

B.2 Global Variance Factor Estimation $(k = 2^{1}k)$

The global variance factor, f, is simply the a posteriori variance of unit weight, $\hat{\sigma}_{e}^{2}$, when given an a priori variance of unit weight, σ_{e}^{2} , equal to 1.

)

It can be shown that

$$E(V(\Sigma_L)^{+}V) = n - u.$$
 (Mikhail 1976: p. 287)

For a single variance factor

$$\Sigma_{L} = \int \Sigma_{L}^{\circ}$$

so that

$$\frac{1}{f}\Sigma(\mathsf{V}^{\mathsf{t}}(\Sigma^0_\mathsf{L})^{-1}\mathsf{V})=\mathsf{n}-\mathsf{u}$$

or for f to be unbiased (Hamilton 1964, p. 130)

$$f = \frac{E(V^{t}(\Sigma_{L}^{0})^{-1}V)}{n-u} = \frac{V^{t}(\Sigma_{L}^{0})^{-1}V}{n-u}$$

This is identical to the form $\hat{\sigma}_0^2 = \frac{V'PV}{n-u}$, where P is defined as $\sigma_0^2(\Sigma_L^0)^{-1}$

Since we are given that $\sigma_0^2 = 1$, then $P = (\Sigma_L^0)^{-1}$. Then $f = \hat{\sigma}_0^2$, as we wished to prove.

The derivation assumes that there is no bias in the residuals (Mikhail 1976), i.e.,

$$E(V) = 0.$$

However, outliers, as well as systematic errors, can produce a biased global variance factor. We must be satisfied that the observations contain no blunders, and that our mathematical model is satisfactory in order to use the global variance factor.

Particular types of systematic errors—global scale or orientation errors—are not detectable in a survey adjustment. They will not bias the residuals and will not influence the global variance factor. For example, to detect a global scale error, it must be transformed into a local scale error by addition of more data or measurements that can discriminate between global and local.

B.3 Local Variance Factor Estimation (k = 2.3...)

Let us separate our observations into k homogeneous groups, and assume that we know the variance-covariance matrices of all k groups, $\Sigma_{L_1}^{\bullet}$, subject to k local variance factors, f_{L} Then



A variety of methods has been proposed that can be used to estimate local variance factors. Among them are MInimum Norm Quadratic Unbiased Estimation (MINQUE) (Rao 1971), Iterated MInimum Norm Quadratic Estimation (IMINQE) (Rao 1972), Almost Unbiased Estimation (AUE) (Horn et al. 1975), and Iterated Almost Unbiased Estimation (IAUE) (Lucas 1984). Underlying these methods is the assumption that there is no bias in any group of residuals; that is

í,

$$E(V_{L})=0$$

This assumption can be turned to our advantage in the detection of local systematic error.

Consider the partition of observations into a network group, subscript N, and a survey group, subscript S (k = 2). Then

$$\sum_{L} = \begin{pmatrix} f_{N} \Sigma_{N}^{0} & 0 \\ & \\ 0 & f_{S} \Sigma_{S}^{0} \end{pmatrix}$$

For an adjustment of the network only, we may estimate

$$\Sigma_{\rm N} = f_{\rm N} \Sigma_{\rm N}^0$$

and for an adjustment of the survey only, we may estimate

$$\Sigma_{\rm S}^{\rm i}=f_{\rm S}\Sigma_{\rm S}^{\rm 0}$$

where f's is the global variance factor of the survey observations computed by a least squares adjustment free of outliers and known systematic errors.

With perfect information and an unbiased model we compute $f_N = f'_N$ and $f_S = f'_S$. On the other hand, if our model is biased, this may not be the case. In other words, we have a linkage between systematic error and consistent estimation of local variance factors.

Now assume that our network observations are certified as having no systematic error, and that we have perfect knowledge of their weights. Then $f'_N = 1$ and $\Sigma_N = \Sigma_N^{\circ}$. In the absence of residual bias in the survey, we should compute $f_N = 1$ and $f_S = f'_S$. In fact, we could impose a constraint on the computation, $f_N = 1$, to ensure this result. A survey systematic error could then manifest itself as an increase in f_S over f'_S .

There is no guarantee that systematic error in a survey will increase f_s over f'_s . For example, a survey may be connected to the network at only one control point. A scale error local to the survey would remain undetectable with combined variance factor estimation. With a second connection to the network, the survey scale error will begin to be detectable. As the survey is more closely connected to the network, the capability to detect a survey scale error becomes much better. We see that systematic error in a survey that is well-connected to a certified geodetic network can be discovered by local variance factor estimation. Of course a systematic error, such as a scale factor influencing both the network and the survey, would continue to remain hidden.

B.4 Iterated Almost Unbiased Estimation (IAUE)

The IAUE method (Lucas 1984) can be used to estimate covariance elements as well as the variance elements of $\Sigma_{\rm L}$. However, in testing for systematic error we are concerned only with the survey and the network variance factors (k = 2).

As suggested by the title, the method is iterative. We start with the initial values

$$\mathbf{f}_{N}^{0}$$
 and $\boldsymbol{\Sigma}_{N}^{0}$, with \mathbf{f}_{N}^{0} set to 1

Let

$$\sum_{L}^{0} = \begin{pmatrix} f_{N}^{0} \Sigma_{N}^{0} & 0 \\ & \\ 0 & f_{S}^{0} \Sigma_{S}^{0} \end{pmatrix}$$

$$P_{L}^{0} = (\Sigma_{L}^{0})^{-1} = \begin{pmatrix} P_{N}^{0} & 0 \\ & \\ 0 & P_{S}^{0} \end{pmatrix}$$

We now iterate from i - 0 to convergence

1) Perform least squares adjustment for

$$\hat{\mathbf{X}} = (\mathbf{A}^{\mathbf{i}}\mathbf{P}_{\mathbf{L}}^{\mathbf{i}}\mathbf{A})^{-1} \mathbf{A}^{\mathbf{i}}\mathbf{P}_{\mathbf{L}}^{\mathbf{i}}\mathbf{L} \ .$$

2)
$$\Sigma_{V_{S}}^{i} = (P_{S}^{i})^{-1} - A_{S}(A^{i}P_{L}^{i}A)^{-1} A_{S}^{i}$$
.
3) $f_{S}^{i+1} = \frac{(V_{S}^{i})^{i}P_{S}^{i}V_{S}^{i}}{tr(\Sigma_{V_{S}}^{i}P_{S}^{i})}$

where tr is the trace function.

$$4) \Sigma_{\rm S}^{\rm i+1} = \mathbf{f}_{\rm S}^{\rm i+1} \Sigma_{\rm S}^{\rm i} \ .$$

We test for convergence by

$$\frac{f_{s}^{i+1}-f_{s}^{i}}{f_{s}^{i}} < \epsilon$$

where ϵ is a preset quantity > 0. The local survey variance factor is

$$f_{S} = \prod_{i=0}^{m} f_{S}^{i}$$

B-3

where m is the number of iterations to convergence. We can then compute a survey variance factor ratio,

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of the normal equations. Thus, the usual apparatus of aparae least equares adjustments can be retained. 214

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Computer simulations have shown that when the survey vey variance factor ratio exceeds 1.5, then the survey contains systematic error. This rule becomes less reliable when a survey is minimally connected to a network.

We note that for k = 1, the third step of the method yields

$$f^{i+1} = \frac{(V^{i}PV)^{i}}{n-u}$$

It is immediately recognized as the a posteriori estimate of the variance of unit weight. In this special case, IAUE convergence is correct, immediate, and unbiased.

The IAUE method is particularly attractive from a computational point of view. If Σ_L is diagonal, or nearly so, then the requisite elements of Σ_L may be computed from elements of Σ_X that lie completely within the profile

- **B.5 References**
- Hamilton, Walter Clark, 1964: Statistics in Physical Science, The Ronald Press Company, New York.
- Horn, S.D., Horn, R.A., and Duncan, D.B., 1975: Estimating heteroscedastic variances in linear models, *Journal* of the American Statistical Association, 70, 380-385.
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- Rao, C.R., 1972: Estimation of variance and covariance components in linear models, Journal of the American Statistical Association, 67, 112-115.
- Rao, C.R., 1971: Estimation of variance and covariance components—MINQUE theory, Journal of Multivariate Analysis, 1, 257-275.

APPENDIX C Procedures for Submitting Data to the National Geodetic Survey

The National Geodetic Survey (NGS) has determined that the value to the national network of geodetic observations performed by other Federal, State, and local organizations compensates for the costs of analyzing, adjusting, and publishing the associated data. Consequently, a procedure has been established for data from horizontal, vertical, and gravity control surveys to be submitted to NGS. Persons submitting data must adhere to the requirements stated herein, but in any event, the final decision of acceptance on data will be the responsibility of the Chief, NGS.

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The survey data must be submitted in the format specified in the Federal Geodetic Control Committee (FGCC) publication, Input Formats and Specifications of the National Geodetic Survey Data Base, which describes the procedures for submission of data for adjustment and assimilation into the National Geodetic Survey data base. Volume I (Horizontal control data), volume II (Vertical control data) or volume III (Gravity control data) may be purchased from:

National Geodetic Information Branch (N/CG17x2) National Oceanic and Atmospheric Administration Rockville, MD 20852

Horizontal control surveys must be accomplished to at least third-order, class I standards and tied to the National Geodetic Horizontal Network. Vertical control surveys must be accomplished in accordance with third-order or higher standards and tied to the National Geodetic Vertical Network. Gravity control surveys must be accomplished to at least second-order standards and tied to the National Geodetic Gravity Network. Third-order gravity surveys ("detail" surveys) will be accepted by NGS for inclusion into the NGS Gravity Working Files only in accordance with the above mentioned FGCC publication. A clear and accurate station description should be provided for all control points.

The original field records (or acceptable copies), including sketches, record books, and project reports, are required. NGS will retain these records in the National Archives. This is necessary if questions arise concerning the surveys on which the adjusted data are based. In lieu of the original notes, high quality photo copies and microfilm are acceptable. The material in the original field books or sheets are needed, not the abstracts or intermediate computations.

Recompaissance reports should be submitted before beginning the field measurements, describing proposed connections to the national network, the instrumentation, and the field procedures to be used. This will enable NGS to commute on the proposed survey, drawing in the information available in the NGS data base concerning the accuracy and condition of these points, and to determine if the proposed survey can meet its anticipated accuracy. This project review saves the submitting agency the expense of placing data that would fail to meet accuracy criteria into computer-readable form.

U.S. Government Printing Office : 1985 - 465-201/20664

REACH ONE

RIVER MILE 0.0 TO RIVER MILE 10.0





- 수 2ND ORDER GPS (JEA)
- B ORDER HARN, GPS (NOS)
- 2ND ORDER GPS (SJRWMD)

- VI	ERTICAL CONTROL POINTS
*	1ST ORDER - CLASS
*	1ST ORDER - CLASS I
*	2ND ORDER - CLASS O
*	2ND ORDER - CLASS

00 COMMONWEALTH BLVD., MAIL STATION 105 MLAHASSEE, FLORIDA 32308 04) 488-2427	JACKSONVILLE JACKSONVILLE CLAY ST. PARATKA PUTNAN PUTNAN FLAGLER GEORGE REACH LOCATION	
PREPARED BY: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING (9	LOWER ST. JOHNS RIVER REACH MAP WATER QUALITY MANAGEMENT FEASIBILITY STUDY PHASE 1 – VERTICAL/HORIZONTAL CONTOL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH ONE - RIVER MILE 0.0 TO RIVER MILE 10.0	

USGS Quad Sheets: Mayport, Eastport

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LOWER ST. JOHNS RIVER MAIN STEM REACH ONE ABSTRACT MILE 0.0 TO MILE 10.0

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Task 1: Readily Available Tidal Data:

HISTORIC NOTE

Construction of the North and South Jetty and channel improvements at the entrance to St. Johns River, known as St. Johns Bar, was well under way in June 1890 (Senate Ex. Doc. No 163). The report noted a 6.43 feet range of tide. The Corps of Engineers requested additional funding to complete the existing project and maintain navigation during the project. Once completed a channel 15 feet deep, at mean low water, from Jacksonville to the ocean was accomplished.

Senate Ex. Doc. No. 61, February 4, 1890, provides Corps of Engineers condition report: "Dame's Point (River Mile 10.1*) to Beacon No. 1 (River Mile 3.5): One mile below St. Johns Bluff. Total distance, 8.5 miles; total length of defective channels 2 miles; average width between 9 feet contours, 850 feet; minimum width between 9 foot contours, 300 feet; minimum depth of defective portions, 12.5 feet" also "Beacon No. 1 (River Mile 3.5) to mouth (River Mile 0.0): Total distance 5 miles; average width between 15 foot contours, 870 feet; minimum width between 15 foot contours, 400 feet; minimum midchannel depth (except at one place), 20 feet; depth at excepted place (one half mile long), 15 feet.

*modern river mileage system added for location purposes

Station No. Name	River Mile Location	Control Station No. Name	Length of Series (Months)	Dat from M/Y	to M/Y
872 0220 Mayport	2.2 Right Bank	First Reduction	228	1960	1978
872 0232 Pablo Creek	3.5 Right Bank	872 0220 Mayport	1	9/77	9/77
872 0221 Fulton	7.2 Right Bank	872 0220 Mayport	4	9/77	2/78
872 0198 Clapboard Creek Pelotes Island	8.1* Left Bank	872 0220 Mayport	5	8/77	1/78
872 0203 Blount Island Bridge	10.0* Left Bank	872 0220 Mayport	3	9/77	11/77

EXISTING NOAA/NOS TIDE STATION(S)

* Dame Point Alternative Stationing

MAIN STEM REACH ONE ABSTRACT Continued

Station No.	Elevation (Feet, NGVD 1929)		NGVD	Mean Range (Feet)	Tidal Bench Marks
	MHW	MTL	MLW		Fd/Req'd.
872 0220	2.55	0.30	-1.96	4.51	10/0
872 0232	2.36	0.41	1.53	3.89	5/0
872 0221	2.29	0.46	-1.37	3.66	4/1
872 0198	2.29	0.47	-1.35	3.64	5/0
872 0203	2.18	0.43	-1.33	3.51	4/1

STRENGTH OF EXISTING SURVEY CONTROL NETWORK



MISCELLANEOUS

The tide station nearest to the mouth of the St. Johns River, on the Atlantic Ocean, is identified as 872 0194. Little Talbot Island, approximately 2 miles north of the North Jetty. The 1960-78 Tidal Epoch for this station indicates mean high water elevation 3.28 feet, NGVD and a mean range of 5.49 feet. Tide Station 872 0291 Jacksonville Beach, approximately 8 miles south of the mouth has published mean high water elevation 2.97 feet, NGVD and a mean range of 5.11 feet.

A copy of each Main Stem (1)<u>NOS</u> <u>Published</u> <u>Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP</u> <u>Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

R-1.2

FLORIDA 872-0220

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING TIDAL BENCH MARKS

MAYPORT, ST. JOHNS RIVER

LATITUDE: 30°23.5'N LONGITUDE: 081°25.9'W NOAA CHART: 11490 USGS QUAD: MAYPORT

This to reach statement changed on 01/11/93

To reach the tidal bench marks from the St. Johns River Ferry landing at the intersection of Broad and Ocean Streets in Mayport, proceed SW on Ocean Street to the Florida Department of Transportation Ferry Maintenance facility. The bench marks are on the ferry maintenance facility grounds and along Palmer Avenue. The tide gage and staff are located at the north corner of the ferry maintenance pier.

To reach the tidal bench marks from the St. Johns River Ferry landing at the intersection of Broad and Ocean Streets in Mayport, proceed <u>about 0.2 mile (0.3 km)</u> SW on Ocean Street to the Florida Department of Transportation Ferry Maintenance facility. The bench marks are on the ferry maintenance facility grounds and along Palmer Avenue. The tide gage and staff are located at the north corner of the ferry maintenance pier.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: 12 7.861 1928 This Bench Mark Description Changed On 01/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Retaining Wall

The bench mark is set in the top of a concrete retaining wall at the corner of Palmer Avenue and Ocean Street, 94.5 feet (28.8 m) SE of the centerline of Ocean Street, 18.9 feet (5.8 m) SSW of utility pole #146, 16.3 feet (5.0 m) NE of the centerline of Palmer Avenue, 2 feet (1 m) above the level of Palmer Avenue, and 0.5 foot (0.2 m) south of a witness post.

The bench mark is set in the top of a concrete retaining wall at near the corner of Palmer Avenue and Ocean Street, 94.5 feet (28.8 m) SE of the centerline of Ocean Street, 18.9 feet (5.8 m) SSW of utility pole #146, 16.3 feet (5.0 m) NE of the centerline of Palmer Avenue, 2 feet (1 m) above the level of Palmer Avenue, $\frac{1.5 \text{ feet}}{(0.5 \text{ m})}$ SE of the point where the wall steps down about 1.0 feet (0.3 m), about 1 foot (0.3 m) lower than the top section of the wall, and 0.5 foot (0.2 m) south of a witness post.

BENCHMARK STAMPING: 13 8.022 1928 This Bench Mark Description Changed On 01/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is set in the NW end of the second step at the Marine Science Education Center School No. 32 on the east side of Palmer Avenue, 900 feet (274 m) SE of the intersection of Palmer Avenue and Ocean Street, 34 feet (10 m) NNW of the centerline of Palmer Avenue, 20 feet (6 m) NE of a flagpole, and 6.5 feet (2.0 m) WSW of the entrance to the school.

The bench mark is set in the NW end of the second step at the Marine Science Education Center School No. 32 on the east side of Palmer Avenue, <u>about</u> 900 feet (274 m) SE of the intersection of Palmer Avenue and Ocean Street, 34 feet (10 m) <u>NNW NNE</u> of the centerline of Palmer Avenue, 20 feet (6 m) NE of a flagpole, and 6.5 feet (2.0 m) WSW of the entrance to the school.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: MAYPORT 2 R.M. NO 1 1946 This Bench Mark Was Recovered AS Described On 01/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: U.S. Army COE Bench Mark SETTING CLASSIFICATION: Terra Cotta Pipe

The bench mark is set in the top of a 4-inch concrete filled terra cotta pipe on the ferry maintenance facility grounds, 52 feet (16 m) NE of a flagpole, 51 feet (16 m) north of a 1-foot (0.3 m) diameter cabbage palm, 17.5 feet (5.3 m) east of the SW corner of the porch of the warehouse, 3 feet (1 m) south of the south side of the warehouse, and 0.2 foot (0.1 m) above ground level.

BENCHMARK STAMPING: 0220 A 1978 This Bench Mark Was Recovered AS Described On 01/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Unspecified Steel Rod

The bench mark is on the ferry maintenance facility grounds, 43.7 feet (13.3 m) south of the south corner of an office, 43.0 feet (13.1 m) west of the west corner of the warehouse, 8.8 feet (2.7 m) SE of a flagpole, and 0.7 foot (0.2 m) SE of a witness post. The bench mark is crimped to an unspecified steel rod driven and unspecified depth to refusal, and encased in a PVC pipe and concrete kickblock.

BENCHMARK STAMPING: 0220 B 1978 This Bench Mark Was Recovered AS Described On 01/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Unspecified Steel Rod

The bench mark is on the ferry maintenance facility grounds, 66.7 feet (20.3 m) ENE of a flagpole, 23.7 feet (7.2 m) east of the east corner of a bathroom, and 2.0 feet (0.6 m) ENE of the steps on the NW side of the warehouse. The bench mark is crimped to an unspecified steel rod driven an unspecified depth to refusal, and encased in a PVC pipe and concrete kickblock.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: 0220 C 1978 This Bench Mark Description Changed On 01/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Unspecified Steel Rod

The bench mark is one block south of the ferry landing, 165.4 feet (50.4 m) SE of the centerline of Ocean Street, 46.0 feet (14.0 m) NE of the bottom step of the front porch of the residence at 1456 Palmer Avenue, and 16.7 feet (5.1 m) NE of the centerline of Palmer Avenue. The bench mark is crimped to an unspecified steel rod driven an unspecified depth to refusal, encased in a PVC pipe and concrete kickblock and 0.5 foot (0.2 m) SSW of a witness post.

The bench mark is one block south of the ferry landing, 165.4 feet (50.4 m) SE of the centerline of Ocean Street, 46.0 feet (14.0 m) NE of the bottom step of the front porch of the residence at 1456 Palmer Avenue, 23.3 feet south of the SE corner of a concrete waste water tank, and 16.7 feet (5.1 m) NE of the centerline of Palmer Avenue, and 1.0 foot SW of a carsonite witness post. The bench mark is crimped to an unspecified steel rod driven an unspecified depth to refusal, encased in a PVC pipe and concrete kickblock and 0.5 foot (0.2 m) SSW of a witness post.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: 15 This Bench Mark Description Changed On 01/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument on the ferry maintenance facility grounds, 60.5 feet (18.4 m) SW of a 1-foot (0.3 m) diameter cabbage palm, 41 feet (12 m) NE of a 0.8-foot (0.2 m) diameter cabbage palm, 40.5 feet (12.3 m) NW of the SW corner of a dwelling on the grounds (in line with the NE face of the dwelling), 36 feet (11 m) east of the NE corner of a garage, and 2 feet (1 m) below ground level in a wooden-covered box which is 0.3 foot (0.1 m) below ground level.

The bench mark is set in the top of a concrete monument on the ferry maintenance facility grounds, $\frac{60.5 \text{ feet (18.4 m) SW of a 1 foot (0.3 m) diameter cabbage palm,}}{(12.m) (12.5 m)}$ NE of a 0.8-foot (0.2 m) diameter cabbage palm, 40.5 feet (12.3 m) NW of the SW corner of a dwelling on the grounds (in line with the NE face of the dwelling), 40 feet (12.2 m) SW of a 1-foot (0.3 m) diameter cabbage palm, 36 feet (11 m) east SE of the NE corner of a garage, and $\frac{2 \text{ feet (1 m)}}{1.3 \text{ feet (0.4 m)}}$ below ground level in a wooden-covered wood box which is 0.3 foot (0.1 m) below ground level and protected by two bricks on top of an 8" by 8" concrete block.

BENCHMARK STAMPING: NO STAMPING 1 This Bench Mark Description Changed On 01/11/93

MONUMENTATION: Iron Cap AGENCY/DISK TYPE: Unknown/No Disk SETTING CLASSIFICATION: Iron Pipe

The bench mark is on the ferry maintenance facility grounds, 46 feet (14 m) west of the centerline of Ocean Street, 34 feet (10 m) SE of a fence corner in the NE corner of the grounds, and 3 feet (1 m) east of the NE corner of the warehouse. The bench mark is an iron cap riveted on top of a 1-inch galvanized iron pipe, 1.5 feet (0.5 m) below ground level, encased by a 6-inch PVC pipe projecting 1.0 foot (0.3 m) above ground level.

The bench mark is on the ferry maintenance facility grounds, 46 feet (14 m) west of the centerline of Ocean Street, 34 feet (10 m) SE of a fence corner in the NE corner of the grounds, and 3 feet (1 m) east of the NE corner of the warehouse. The bench mark is an iron cap riveted on top of a 1-inch galvanized iron pipe, 1.5 feet (0.5 m) below ground level, encased by a 6-inch PVC pipe projecting 1.0 foot (0.3 m) above ground level. The PVC pipe top is covered by a metal witness sign.

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PRELIMINARY DATE: 1/11/93

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

Tidal datums at MAYPORT, ST. JOHNS RIVER are based on the following:

LENGTH OF SERIES	=	19 YEARS
TIME PERIOD	=	1960-1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (09/09/64)	Ħ	7.50	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.92	FEET
MEAN HIGH WATER (MHW)	=	4.66	FEET
MEAN TIDE LEVEL (MTL)	=	2.41	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	2.10	FEET
MEAN LOW WATER (MLW)	=	0.15	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/24/70)	Ħ	-3.20	FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1987.

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEET MLLW	ABOVE: <u>MHW</u>
12 7.861 1928 13 8.022 1928	9.95 10.14	5.29 5.48
EDM 1942 BM E.D.M. 14 1942 MSL	7.12 6.68	2.46 2.02
BM E.D.M. 15 1942 MSL MAYPORT 2 R.M. NO 1 1946	8.96 7.33	4.30
0220 A 1978 0220 B 1978 0220 C 1978	7.41 7.05	2.75
15 NO STAMPING 1	6.16 6.25	1.50 1.59

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PUBLICATION DATE: 12/08/88

FLORIDA 872-0220

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

MAYPORT, ST. JOHNS RIVER

LATITUDE: 30°23.5'N LONGITUDE: 081°25.9'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the St. Johns River Ferry landing at the intersection of Broad and Ocean Streets in Mayport, proceed SW on Ocean Street to the Florida Department of Transportation Ferry Maintenance facility. The bench marks are on the ferry maintenance facility grounds and along Palmer Avenue. The tide gage and staff are located at the north corner of the ferry maintenance pier.

BENCHMARK STAMPING: 12 7.861 1928

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Retaining Wall

The bench mark is set in the top of a concrete retaining wall at the corner of Palmer Avenue and Ocean Street, 94.5 feet (28.8 m) SE of the centerline of Ocean Street, 18.9 feet (5.8 m) SSW of utility pole #146, 16.3 feet (5.0 m) NE of the centerline of Palmer Avenue, 2 feet (1 m) above the level of Palmer Avenue, and 0.5 foot (0.2 m) south of a witness post.

BENCHMARK STAMPING: 13 8.022 1928

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is set in the NW end of the second step at the Marine Science Education Center School No. 32 on the east side of Palmer Avenue, 900 feet (274 m) SE of the intersection of Palmer Avenue and Ocean Street, 34 feet (10 m) NNW of the centerline of Palmer Avenue, 20 feet (6 m) NE of a flagpole, and 6.5 feet (2.0 m) WSW of the entrance to the school.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: EDM 1942

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: U.S. Army COE Bench Mark SETTING CLASSIFICATION: Pipe Mark

The bench mark is set atop a pipe, 17.5 feet (5.3 m) SW of the NW corner of a warehouse at the ferry maintenance facility, 4.5 feet (1.4 m) west of the west wall of the warehouse, 1.5 feet (0.5 m) WSW of bench mark NO STAMPING 1, and 0.5 foot (0.2 m) south of a concrete slab inside a wooden fence area used for garbage can storage.

BENCHMARK STAMPING: BM E.D.M. 14 1942 MSL

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: U.S. Army COE Bench Mark SETTING CLASSIFICATION: Concrete Block

The bench mark is set in the top of a concrete block on the ferry maintenace facility grounds, 85 feet (26 m) SW of a flagpole, 60 feet (18 m) NW of a dwelling on the grounds, 52 feet (16 m) east of a bulkhead, 10.5 feet (3.2 m) west of the NE corner of a garage, and 0.2 foot (0.1 m) below ground level.

BENCHMARK STAMPING: BM E.D.M. 15 1942 MSL

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: U.S. Army COE Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is set in the south end of the bottom concrete step at the front entrance to a dwelling at the NE corner of Ocean and Henry Streets on the ferry maintenance facility grounds, 77 feet (23 m) SSW of the centerline of the entrance way to the facility, 44 feet (13 m) SSE of the south corner of the property, and 15 feet (5 m) WNW of an 8-foot (2 m) high chain link fence.

BENCHMARK STAMPING: MAYPORT 2 R.M. NO 1 1946

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: U.S. Army COE Bench Mark SETTING CLASSIFICATION: Terra Cotta Pipe

The bench mark is set in the top of a 4-inch concrete filled terra cotta pipe on the ferry maintenance facility grounds, 52 feet (16 m) NE of a flagpole, 51 feet (16 m) north of a 1-foot (0.3 m) diameter cabbage palm, 17.5 feet (5.3 m) east of the SW corner of the porch of the warehouse, 3 feet (1 m) south of the south side of the warehouse, and 0.2 foot (0.1 m) above ground level.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: 0220 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Unspecified Steel Rod

The bench mark is on the ferry maintenance facility grounds, 43.7 feet (13.3 m) south of the south corner of an office, 43.0 feet (13.1 m) west of the west corner of the warehouse, 8.8 feet (2.7 m) SE of a flagpole, and 0.7 foot (0.2 m) SE of a witness post. The bench mark is crimped to an unspecified steel rod driven and unspecified depth to refusal, and encased in a PVC pipe and concrete kickblock.

BENCHMARK STAMPING: 0220 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Unspecified Steel Rod

The bench mark is on the ferry maintenance facility grounds, 66.7 feet (20.3 m) ENE of a flagpole, 23.7 feet (7.2 m) east of the east corner of a bathroom, and 2.0 feet (0.6 m) ENE of the steps on the NW side of the warehouse. The bench mark is crimped to an unspecified steel rod driven an unspecified depth to refusal, and encased in a PVC pipe and concrete kickblock.

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FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

BENCHMARK STAMPING: 0220 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Unspecified Steel Rod

The bench mark is one block south of the ferry landing, 165.4 feet (50.4 m) SE of the centerline of Ocean Street, 46.0 feet (14.0 m) NE of the bottom step of the front porch of the residence at 1456 Palmer Avenue, 16.7 feet (5.1 m) NE of of the centerline of Palmer Avenue, and 0.5 foot (0.2 m) SSW of a witness post. The bench mark is crimped to an unspecified steel rod driven an unspecified depth to refusal, and encased in a PVC pipe and concrete kickblock.

BENCHMARK STAMPING: 15

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument on the ferry maintenance facility grounds, 60.5 feet (18.4 m) SW of a 1-foot (0.3 m) diameter cabbage palm, 41 feet (12 m) NE of a 0.8-foot (0.2 m) diameter cabbage palm, 40.5 feet (12.3 m) NW of the SW corner of a dwelling on the grounds (in line with the NE face of the dwelling), 36 feet (11 m) east of the NE corner of a garage, and 2 feet (1 m) below ground level (in a wooden covered box which is 0.3 foot (0.1 m) below ground level).

BENCHMARK STAMPING: NO STAMPING 1

MONUMENTATION: Iron Cap AGENCY/DISK TYPE: Unknown/No Disk SETTING CLASSIFICATION: Iron Pipe

The bench mark is on the ferry maintenance facility grounds, 46 feet (14 m) west of the centerline of Ocean Street, 34 feet (10 m) SE of a fence corner at the NE corner of the grounds, and 3 feet (1 m) east of the NE corner of the warehouse. The bench mark is an iron cap riveted on top of a 1-inch galvanized iron pipe, 1.5 feet (0.5 m) below ground level, encased by a 6-inch PVC pipe projecting 1.0 foot (0.3 m) above ground level.

FLORIDA 872-0220

MAYPORT, ST. JOHNS RIVER

Tidal datums at MAYPORT, ST. JOHNS RIVER are based on the following:

LENGTH OF SERIES		=	19 YEARS
TIME PERIOD	•	=	1960-1978
TIDAL EPOCH		=	1960-1978
CONTROL TIDE STATION		=	

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (09/09/64)	=	7.50	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.92	FEET
MEAN HIGH WATER (MHW)	=	4.66	FEET
MEAN TIDE LEVEL (MTL)	=	2.41	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	2.10	FEET
MEAN LOW WATER (MLW)	=	0.15	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/24/70)	=	-3.20	FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1987.

Bench mark elevation information:

	ELEVATION IN F	'EET ABOVE:
BENCHMARK STAMPING	<u>MLLW</u>	<u>MHW</u>
12 7.861 1928	9.95	5.29
13 8.022 1928	10.14	5.48
EDM 1942	7.12	2.46
BM E.D.M. 14 1942 MSL BM E.D.M. 15 1942 MSL	6.68 8.96	2.02
MAYPORT 2 R.M. NO 1 1946	7.33	2.67
0220 A 1978	7.41	2.75
0220 B 1978	7.05	2.39
0220 C 1978	8.11	3.45
15	6.16	1.50
NO STAMPING 1	6.25	1.59

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PRELIMINARY DATE: 05/13/93

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FLORIDA 872 0232

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PABLO CREEK ENTRANCE

LATITUDE: 30°22.6'N LONGITUDE: 81°26.9'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the Post Office in Mayport, proceed SW on Highway AlA for approximately 0.9 mile (1.4 km) to a sand road leading west onto the sand spit known as Little Jetties, follow the sand road west for 0.8 mile (1.3 km), and then south to the water's edge. The bench marks are along the sand spit. The tide gage and staff were on a small wooden offshore platform, 420 feet (128 m) SW of Bench Mark 0232 B 1977, and 250 feet (76 m) NNE of the two side by side range markers.

BENCH MARK STAMPING: NO 12 RE 600 LOWER 1945 This Bench Mark Was Searched For And Not Found On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 158 feet (48 m) west of a navigation light located on the spit, 92 feet (28 m) south of the approximate bank of St. Johns River, 2.3 feet (0.7 m) north of a witness post, and 5.0 feet (1.5 m) above the bank.

BENCH MARK STAMPING: ANC B RG 50 UPPER 1947 This Bench Mark Was Searched For And Not Found On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Unknown

The bench mark is 140 feet (43 m) SW of Bench Mark A 325 1970, 122 feet (37 m) SW of a light tower, 89 feet (27 m) south of the approximate shoreline, 66 feet (20 m) north of the centerline of the SE dirt road, and 63 feet (19 m) south of the centerline of the northerly dirt road.

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PRELIMINARY DATE: 05/13/93

FLORIDA 872 0232

PABLO CREEK ENTRANCE

BENCH MARK STAMPING: Z 324 1970 This Bench Mark Description Changed On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 89 feet (27 m) west of the centerline of the U.S. Highway AlA, 62.5 feet (19.0 m) north of the centerline of the sand road, near the south side of six small cedar trees, 31 feet (9 m) east of the centerline of a road leading NW to St. Johns River, 2 feet (1 m) south of a metal witness post, 2 feet (1 m) below the level of the highway, and 0.3 foot (0.1 m) above ground level.

The bench mark is set in the top of a concrete monument, <u>in the center of a triangle</u> formed by three 4 inch steel pipes,89 feet (27 m) west of the centerline of the U.S. Highway AlA, 62.5 feet (19.0 m) north of the centerline of the sand road, near the south side of six small cedar trees, 31 feet (9 m) east of the centerline of a road leading NW to St. Johns River, 2 feet (1 m) south of a metal witness post, 2 feet (1 m) below the level of the highway, and 0.3 foot (0.1 m) above ground level.

> BENCH MARK STAMPING: A 325 1970 This Bench Mark Description Changed On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.5 mile (0.8 km) west along the sand road from State Highway A1A, 157.5 feet (48.0 m) north of the centerline of the sand road, 55.5 feet (16.9 m) south of the center of the rip-rap along the south bank of St. Johns River, 20.0 feet (6.1 m) SW of the SW corner of the concrete base supporting a light, 1.5 feet (0.5 m) west of a witness post, and 0.4 foot (0.1 m) above ground level.

The bench mark is set in the top of a concrete monument, 0.5 mile (0.8 km) west along the sand road from State Highway A1A, 157.5 feet (48.0 m) north of the centerline of the sand road, 55.5 feet (16.9 m) south of the center of the rip-rap along the south bank of St. Johns River, 20.0 feet (6.1 m) SW of the SW corner of the concrete base supporting a light, 1.5 feet (0.5 m) west of a witness post, and 0.4 foot (0.1 m) above ground level, 1.5 feet (0.5 m) above the level of the ground, and 1 foot (0.3 m) south of a witness post

BENCH MARK STAMPING: 0232 A 1977 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 792 feet (241 m) NW of the navigation light located on the spit, 343 feet (105 m) south of the centerline of the main dirt road, 50 feet (15 m) north of the approximate water's edge, 13 feet (4 m) west of a 0.3 foot (0.1 m) diameter cabbage palm. The bench mark is level with the ground, crimped to a copper-clad steel rod driven 48 feet (15 m), and encased in a pipe and concrete kickblock. NOTE: The bench mark is severely bent and should be used with caution.

PRELIMINARY DATE: 05/13/93

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FLORIDA 872 0232

PABLO CREEK ENTRANCE

BENCH MARK STAMPING: 0232 B 1977 This Bench Mark Was Searched For And Not Found On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 528 feet (161 m) NW of a navigation light on the spit, 225 feet (69 m) south of the approximate bank of St. Johns River, 34 feet (10 m) south of the centerline of the main dirt road, 2 feet (1 m) east of a witness post, and at ground level.

BENCH MARK STAMPING: 0232 C 1982 This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 0.6 mile (1.0 km) west along the sand road from State Highway AlA, 0.1 mile (0.2 km) west of the first navigation light on the spit, 163.0 feet (49.7 km) west of the centerline of a track road leading north, 74.8 feet (22.8 m) east of the centerline of another track road also leading north, 65.2 feet (19.9 m) WSW of a cabbage palm, and 1.5 feet (0.5 m) south of a witness post. The bench mark is crimped to a stainless steel rod driven 20 feet (6 m) to refusal, and encased in a wood collar and concrete kickblock.

BENCH MARK ST MPING: 0232 D 1982 This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.15 mile (0.24 km) west of Bench Mark 0232 C 1982, 36.8 feet (11.2 m) west of the centerline of a track road leading north, 30.3 feet (9.2 m) east of the centerline of a track road leading NW, 19.2 feet (5.9 m) ESE of the center of two cabbage palms, 1.5 feet (0.5 m) south of a witness post, and 0.3 foot (0.1 m) above ground level.

> BENCH MARK STAMPING: 0232 E 1982 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 0.05 mile (0.08 km) west of Bench Mark 0232 D 1982, 94.3 feet (28.7 m) WSW of the intersection of the main sand road and four track roads which converge, 23.0 feet (7.0 m) north of the centerline of the main sand road, 20.8 feet (6.3 m) SW of the centerline of a track road, 14.0 feet (4.3 m) east of a cedar tree, and 1.1 feet (0.3 m) south of a witness post. The bench mark is crimped to a stainless steel rod driven 20 feet (6 m) to refusal, and encased in a wood collar and concrete kickblock.

PRELIMINARY DATE: 05/13/93

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FLORIDA 872 0232

PABLO CREEK ENTRANCE

Tidal datums at Pablo Creek Entrance are based on the following:

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= 1 MONTH
= SEPTEMBER 1977
= 1960-1978
= MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	= .	5.29 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.24 FEET
MEAN HIGH WATER (MHW)	=	4.00 FEET
MEAN TIDE LEVEL (MTL)	=	2.05 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	1.64 FEET
MEAN LOW WATER (MLW)	=	0.11 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (11/11/77)	=	-0.52 FEET

*NGVD is based on elevations published in Quad 300812, February 1973, and NOS leveling of December 1982.

Bench mark elevation information:

ELEVAT	ION IN FEET ABOVE:
MLLW	MHW
7.36	3.36
4.45	0.45
7.36	3.36
6.42	2.42
6.11**	2.11**
8.55	4.55
6.76	2.76
8.30	4.30
9.40	5.40
	ELEVAT: <u>MLLW</u> 7.36 4.45 7.36 6.42 6.11** 8.55 6.76 8.30 9.40

The estimated highest water level to the nearest half-foot is 7.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

**NOTE: Bench Mark 0232 A 1977 is severely bent and should be used with caution.

ASSEMBLED BY: ... BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES



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PUBLICATION DATE: 10/30/89

FLORIDA 872 0232

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PABLO CREEK ENTRANCE

LATITUDE: 30°22.6'N LONGITUDE: 81°26.9'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the Post Office in Mayport, proceed SW on Highway AlA for approximately 0.9 mile (1.4 km) to a sand road leading west onto the sand spit known as Little Jetties, follow the sand road west for 0.8 mile (1.3 km), and then south to the water's edge. The bench marks are along the sand spit. The tide gage and staff were on a small wooden offshore platform, 420 feet (128 m) SW of Bench Mark 0232 B 1977, and 250 feet (76 m) NNE of the two side by side range markers.

BENCH MARK STAMPING: NO 12 RE 600 LOWER 1945

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 158 feet (48 m) west of a navigation light located on the spit, 92 feet (28 m) south of the approximate bank of St. Johns River, 2.3 feet (0.7 m) north of a witness post, and 5.0 feet (1.5 m) above the bank.

BENCH MARK STAMPING: ANC B RG 50 UPPER 1947

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Unknown

The bench mark is 140 feet (43 m) SW of Bench Mark A 325 1970, 122 feet (37 m) SW of a light tower, 89 feet (27 m) south of the approximate shoreline, 66 feet (20 m) north of the centerline of the SE dirt road, and 63 feet (19 m) south of the centerline of the northerly dirt road.

PUBLICATION DATE: 10/30/89

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FLORIDA 872 0232

PABLO CREEK ENTRANCE

BENCH MARK STAMPING: Z 324 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 89 feet (27 m) west of the centerline of the U.S. Highway AlA, 62.5 feet (19.0 m) north of the centerline of the sand road, near the south side of six small cedar trees, 31 feet (9 m) east of the centerline of a road leading NW to St. Johns River, 2 feet (1 m) south of a metal witness post, 2 feet (1 m) below the level of the highway, and 0.3 foot (0.1 m) above ground level.

BENCH MARK STAMPING: A 325 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.5 mile (0.8 km) west along the sand road from State Highway AlA, 157.5 feet (48.0 m) north of the centerline of the sand road, 55.5 feet (16.9 m) south of the center of the rip-rap along the south bank of St. Johns River, 20.0 feet (6.1 m) SW of the SW corner of the concrete base supporting a light, 1.5 feet (0.5 m) west of a witness post, and 0.4 foot (0.1 m) above ground level.

BENCH MARK STAMPING: 0232 A 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 792 feet (241 m) NW of the navigation light located on the spit, 343 feet (105 m) south of the centerline of the main dirt road, 50 feet (15 m) north of the approximate water's edge, 13 feet (4 m) west of a 0.3 foot (0.1 m) diameter cabbage palm. The bench mark is level with the ground, crimped to a copper-clad steel rod driven 48 feet (15 m), and encased in a pipe and concrete kickblock. NOTE: The bench mark is severely bent and should be used with caution.

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PUBLICATION DATE: 10/30/89

FLORIDA 872 0232

PABLO CREEK ENTRANCE

BENCH MARK STAMPING: 0232 B 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 528 feet (161 m) NW of a navigation light on the spit, 225 feet (69 m) south of the approximate bank of St. Johns River, 34 feet (10 m) south of the centerline of the main dirt road, 2 feet (1 m) east of a witness post, and at ground level.

BENCH MARK STAMPING: 0232 C 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 0.6 mile (1.0 km) west along the sand road from State Highway AlA, 0.1 mile (0.2 km) west of the first navigation light on the spit, 163.0 feet (49.7 km) west of the centerline of a track road leading north, 74.8 feet (22.8 m) east of the centerline of another track road also leading north, 65.2 feet (19.9 m) WSW of a cabbage palm, and 1.5 feet (0.5 m) south of a witness post. The bench mark is crimped to a stainless steel rod driven 20 feet (6 m) to refusal, and encased in a wood collar and concrete kickblock.

BENCH MARK STAMPING: 0232 D 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.15 mile (0.24 km) west of Bench Mark 0232 C 1982, 36.8 feet (11.2 m) west of the centerline of a track road leading north, 30.3 feet (9.2 m) east of the centerline of a track road leading NW, 19.2 feet (5.9 m) ESE of the center of two cabbage palms, 1.5 feet (0.5 m) south of a witness post, and 0.3 foot (0.1 m) above ground level.

PUBLICATION DATE: 10/30/89

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FLORIDA 872 0232

PABLO CREEK ENTRANCE

BENCH MARK STAMPING: 0232 E 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 0.05 mile (0.08 km) west of Bench Mark 0232 D 1982, 94.3 feet (28.7 m) WSW of the intersection of the main sand road and four track roads which converge, 23.0 feet (7.0 m) north of the centerline of the main sand road, 20.8 feet (6.3 m) SW of the centerline of a track road, 14.0 feet (4.3 m) east of a cedar tree, and 1.1 feet (0.3 m) south of a witness post. The bench mark is crimped to a stainless steel rod driven 20 feet (6 m) to refusal, and encased in a wood collar and concrete kickblock.

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PUBLICATION DATE: 10/30/89

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FLORIDA 872 0232

PABLO CREEK ENTRANCE

Tidal datums at Pablo Creek Entrance are based on the following:

LENGTH OF SERIES	=	1 Month
TIME PERIOD	=	SEPTEMBER 1977
TIDAL EPOCH	z	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77) =	;	5.29 FEET
MEAN HIGHER HIGH WATER (MHHW) =	;	4.24 FEET
MEAN HIGH WATER (MHW) =	:	4.00 FEET
MEAN TIDE LEVEL (MTL) =	:	2.05 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD) =	:	1.64 FEET
MEAN LOW WATER (MLW) =	:	0.11 FEET
MEAN LOWER LOW WATER (MLLW) =	:	0.00 FEET
LOWEST OBSERVED WATER LEVEL (11/11/77) =	:	-0.52 FEET

*NGVD is based on elevations published in Quad 300812, February 1973, and NOS leveling of December 1982.

Bench mark elevation information:

	ELEVATIO	ON IN FEET ABOVE:
BENCH MARK STAMPING	MLLW	MHW
NO 12 RE 600 LOWER 1945	7.36	3.36
ANC B RG 50 UPPER 1947	4.45	0.45
Z 324 1970	7.36	3.36
A 325 1970	6.42	2.42
0232 A 1977	6.11**	2.11**
0232 B 1977	8.55	4.55
0232 C 1982	6.76	2.76
0232 D 1982	8.30	4.30
0232 E 1982	9.40	5.40

The estimated highest water level to the nearest half-foot is 7.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

**NOTE: Bench Mark 0232 A 1977 is severely bent and should be used with caution.

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PRELIMINARY DATE: 05/28/93

FLORIDA 872 0221

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING TIDAL BENCH MARKS

FULTON, ST. JOHNS RIVER

LATITUDE: 30°23.4'N LONGITUDE: 81°30.4'W NOAA CHART: 11488 USGS QUAD: EASTPORT

To reach the tidal bench marks from the intersection of Monument and Fort Caroline Roads, proceed 0.5 mile (0.8 km) west of Fort Caroline Road to Fulton Road, then 0.5 mile (0.8 km) north on Fulton Road to the end of the pavement, continue 0.2 mile (0.3 km) on the dirt road to a fork in the road, then follow the east fork to the water's edge. The bench marks are on the shore and along the roads leading to the station. The tide gage and staff were 70 feet (21 m) offshore on a 4 x 4-foot (1x1 m) support platform.

BENCH MARK STAMPING: 0211 D 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 153 feet (47 m) north of the intersection of Fort Caroline and Fulton Roads, 17.5 feet (5.3 m) east of the centerline of Fulton Road, 15.0 feet (4.6 m) SW of a 2.0-foot (0.6 m) diameter oak tree, and 1.5 feet (0.5 m) west of a witness sign.

The bench mark is set in the top of a concrete monument, 153 feet (47 m) north of the intersection of Fort Caroline and Fulton Roads, 17.5 feet (5.3 m) east of the centerline of Fulton Road, 15.0 feet $(4.6 \text{ m}) \frac{6W}{6} \frac{SSW}{SSW}$ of a 2.0-foot (0.6 m) diameter oak tree, 1.5 feet (0.5 m) west of a witness sign, and 0.8 feet N of the N edge of a the concrete drive to number 4301 Fulton Road.

BENCH MARK STAMPING: 0221 E 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the SW corner of the base of the northernmost powerline structure, 0.8 mile (1.3 km) west and south of Bench Mark 0221 D 1977, 415 feet (126 m) NE of a power pole, 80.0 feet (24.4 m) east of the centerline of Fort Caroline Road, 66.0 feet (20.1 m) NW of the SE powerline transformer, and 1.5 feet (0.5 m) north of a witness sign.

The banch mark is set in the SW corner of the base of the northernmost powerline structure, 0.8 mile (1.3 km) west and south of Bench Mark 0221 D 1977, 415 feet (126 m) NE of a power pole, 80.0 feet (24.4 m) east of the centerline of Fort Caroline Road, 66.0 feet (20.1 m) NW of the SE powerline transformer, and 1.5 feet (0.5 m) north of a witness sign., and 1.0 foot E of a carsonite witness post.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/28/93

FLORIDA 872 0221

FULTON, ST. JOHNS RIVER

BENCH MARK STAMPING: 0221 F 1982 This Bench Mark Was Searched For And Not Found On 01/01/84 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 24.5 feet (7.5 m) east of the centerline of Fulton Road, 7.5 feet (2.3 m) west of a wooden fence, 2.6 feet (0.8 m) south of power pole #5049, and 1.0 foot (0.3 m) west of a witness post. The bench mark is level with the road, crimped to a stainless steel rod driven 32 feet (10 m) to refusal, and surrounded by a wooden collar projecting 0.2 foot (0.1 m).

BENCH MARK STAMPING: 0221 G 1982 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 74.5 feet (22.7 m) south of a power pole, 57.5 feet (17.5 m) north of the centerline of Martha's Vineyard Court, 26.9 feet (8.2 m) east of the centerline of Fulton Road, 5.4 feet (1.6 m) NW of the south end of a wooden fence with a stone fence post, and 1 foot (0.3 m) west of a witness post. The bench mark is 3 feet (1 m) above the road, crimped to a stainless steel rod driven 32 feet (10 m) to refusal, and surrounded by a wooden collar projecting 0.3 foot (0.1 m).

The bench mark is 0.6 mile (0.96 km) north of Fort Caroline Road, 74.5 feet (22.7 m) south of a power pole, 57.5 feet (17.5 m) north of the centerline of Martha's Vineyard Court, 26.9 feet (8.2 m) east of the centerline of Fulton Road, 5.4 feet (1.6 m) NW of the south end of a wooden fence with a stone fence post, and 1 foot (0.3 m) west of a witness post. The bench mark is 3 feet (1 m) above the road, crimped to a stainless steel rod driven 32 feet (10 m) to refusal, and surrounded by a wooden collar projecting 0.3 foot (0.1 m). and 0.2 feet below the level of the ground.

BENCH MARK STAMPING: 0221 H 1982 This Bench Mark Was Searched For And Not Found On 01/01/84 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 24.5 feet (10.5 m) NE of the extended centerline of Charles Bennett Drive, 19.2 feet (5.9 m) NW of the centerline of Fulton Road, 3.6 feet (1.1 m) SW of a power pole, 2.0 feet (0.6 m) SE of a metal witness post, and level with the ground.

PRELIMINARY DATE: 05/28/93

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FLORIDA 872 0221

FULTON, ST. JOHNS RIVER

BENCH MARK STAMPING: 0221 J 1984 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 0.75 mile (1.21 km) north of Fort Caroline Road, at the end of Fulton Road, 31.0 feet (9.4 m) east of the centerline of Fulton Road, 9.7 feet (3.0 m) SSW of a 2 x 2-foot (1x1 m) high stone column, 5.5 feet (1.7 m) SSE of the last power pole with a lamp, 4.0 feet (1.2 m) west of a wooden fence, and 1.6 feet (0.5 m) west of a witness post. The bench mark is crimped to a stainless steel rod driven 43 feet (13 m) to refusal, and encased in a PVC pipe and concrete kickblock.

Broken concrete was found at the above described location, after digging no sign of the rod or disk was found. The mark is believed destroyed.

BENCH MARK STAMPING: 0221 K 1984 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.25 mile (0.40 km) south of Bench Mark 0221 J 1984, 49.0 feet (14.9 m) NE of the centerline of Charles Bennett Drive, 29.8 feet (9.1 m) SE of the centerline of Fulton Road, 17.7 feet (5.4 m) NE of a wooden fence corner, 6.2 feet (1.9 m) SW of a 2 x 2-foot (1x1 m) stone column, 1.9 feet (0.6 m) SW of a witness post, 1.3 feet (0.4 m) NW of the wooden fence, and level with the ground.

The bench mark is set in the top of a concrete monument, 0.25 mile (0.40 km) south of Bench Mark 0221 J 1984, 49.0 feet (14.9 m) NE of the centerline of Charles Bennett Drive, 29.8 feet (9.1 m) SE of the centerline of Fulton Road, 17.7 feet (5.4 m) NE of a wooden fence corner, 6.2 feet (1.9 m) SW of a 2 x 2-foot (1x1 m) stone column, 1.9 feet (0.6 m) SW of a witness post, 1.3 feet (0.4 m) NW of the wooden fence, and level with the ground.

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FLORIDA 872 0221

FULTON, ST. JOHNS RIVER

Tidal datums at Fulton, St. Johns River are based on the following:

LENGTH OF SERIES	= 4 MONTHS
TIME PERIOD	= OCTOBER-NOVEMBER 1977
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	4.99	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	3.97	FEET	
MEAN HIGH WATER (MHW)	=	3.77	FEET	
MEAN TIDE LEVEL (MTL)	=	1.94	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	#	1.48	FEET	
MEAN LOW WATER (MLW)	=	0.11	FEET	
MEAN LOWER LOW WATER (MLLW)	Ŧ	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (01/10/78)	=	-1.79	FEET	

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHW</u>
0221 D 1977	22.87	19.10
0221 E 1977	37.97	34.20
0221 F 1982	9.23	5.46
0221 G 1982	35.14	31.37
0221 H 1982	30.57	26.80
0221 J 1984	7.58	3.81
0221 K 1984 -	30.83	27.06

The estimated highest water level to the nearest half-foot is 6.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



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PUBLICATION DATE: 05/31/89

FLORIDA 872 0221

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

FULTON, ST. JOHNS RIVER

LATITUDE: 30°23.4'N LONGITUDE: 81°30.4'W NOAA CHART: 11488 USGS QUAD: EASTPORT

To reach the tidal bench marks from the intersection of Monument and Fort Caroline Roads, proceed 0.5 mile (0.8 km) west of Fort Caroline Road to Fulton Road, then 0.5 mile (0.8 km) north on Fulton Road to the end of the pavement, continue 0.2 mile (0.3 km) on the dirt road to a fork in the road, then follow the east fork to the water's edge. The bench marks are on the shore and along the roads leading to the station. The tide gage and staff were 70 feet (21 m) offshore on a 4 x 4-foot (1x1 m) support platform.

BENCH MARK STAMPING: 0211 D 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 153 feet (47 m) north of the intersection of Fort Caroline and Fulton Roads, 17.5 feet (5.3 m) east of the centerline of Fulton Road, 15.0 feet (4.6 m) SW of a 2.0-foot (0.6 m) diameter oak tree, and 1.5 feet (0.5 m) west of a witness sign.

BENCH MARK STAMPING: 0221 E 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the SW corner of the base of the northernmost powerline structure, 0.8 mile (1.3 km) west and south of Bench Mark 0221 D 1977, 415 feet (126 m) NE of a power pole, 80.0 feet (24.4 m) east of the centerline of Fort Caroline Road, 66.0 feet (20.1 m) NW of the SE powerline transformer, and 1.5 feet (0.5 m) north of a witness sign.

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FLORIDA 872 0221

FULTON, ST. JOHNS RIVER

BENCH MARK STAMPING: 0221 F 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 24.5 feet (7.5 m) east of the centerline of Fulton Road, 7.5 feet (2.3 m) west of a wooden fence, 2.6 feet (0.8 m) south of power pole #5049, and 1.0 foot (0.3 m) west of a witness post. The bench mark is level with the road, crimped to a stainless steel rod driven 32 feet (10 m) to refusal, and surrounded by a wooden collar projecting 0.2 foot (0.1 m).

BENCH MARK STAMPING: 0221 G 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 74.5 feet (22.7 m) south of a power pole, 57.5 feet (17.5 m) north of the centerline of Martha's Vineyard Court, 26.9 feet (8.2 m) east of the centerline of Fulton Road, 5.4 feet (1.6 m) NW of the south end of a wooden fence with a stone fence post, and 1 foot (0.3 m) west of a witness post. The bench mark is 3 feet (1 m) above the road, crimped to a stainless steel rod driven 32 feet (10 m) to refusal, and surrounded by a wooden collar projecting 0.3 foot (0.1 m).

BENCH MARK STAMPING: 0221 H 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 24.5 feet (10.5 m) NE of the extended centerline of Charles Bennett Drive, 19.2 feet (5.9 m) NW of the centerline of Fulton Road, 3.6 feet (1.1 m) SW of a power pole, 2.0 feet (0.6 m) SE of a metal witness post, and level with the ground.

BENCH MARK STAMPING: 0221 J 1984

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Stainless Steel Rod

The bench mark is 0.75 mile (1.21 km) north of Fort Caroline Road, at the end of Fulton Road, 31.0 feet (9.4 m) east of the centerline of Fulton Road, 9.7 feet (3.0 m) SSW of a 2 x 2-foot (1x1 m) high stone column, 5.5 feet (1.7 m) SSE of the last power pole with a lamp, 4.0 feet (1.2 m) west of a wooden fence, and 1.6 feet (0.5 m) west of a witness post. The bench mark is crimped to a stainless steel rod driven 43 feet (13 m) to refusal, and encased in a PVC pipe and concrete kickblock.

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PUBLICATION DATE: 05/31/89

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FLORIDA 872 0221

FULTON, ST. JOHNS RIVER

BENCH MARK STAMPING: 0221 K 1984

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.25 mile (0.40 km) south of Bench Mark 0221 J 1984, 49.0 feet (14.9 m) NE of the centerline of Charles Bennett Drive, 29.8 feet (9.1 m) SE of the centerline of Fulton Road, 17.7 feet (5.4 m) NE of a wooden fence corner, 6.2 feet (1.9 m) SW of a 2 x 2-foot (1x1 m) stone column, 1.9 feet (0.6 m) SW of a witness post, 1.3 feet (0.4 m) NW of the wooden fence, and level with the ground.

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FLORIDA 872 0221

FULTON, ST. JOHNS RIVER

Tidal datums at Fulton, St. Johns River are based on the following:

LENGTH OF SERIES	2	4 MONTHS
TIME PERIOD	z	OCTOBER-NOVEMBER 1977
		JANUARY-FEBRUARY 1978
TIDAL EPOCH	2	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	4.99	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	3.97	FEET	
MEAN HIGH WATER (MHW)	Ŧ	3.77	FEET	
MEAN TIDE LEVEL (MTL)	=	1.94	FEET	
MEAN LOW WATER (MLW)	=	0.11	FEET	
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (01/10/78)	=	-1.79	FEET	

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0221 D 1977	22.87	19.10
0221 E 1977	37.97	34.20
0221 F 1982	9.23	5.46
0221 G 1982	35.14	31.37
0221 H 1982 ·	30.57	26.80
0221 J 1984	7.58	3.81
0221 K 1984	30.83	27.06

The estimated highest water level to the nearest half-foot is 6.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 05/18/93

FLORIDA 872 0198

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING FLORIDA 872 0198

TIDAL BENCH MARKS

CLAPBOARD CREEK, PELOTES ISLAND

LATITUDE: 30°24.4'N LONGITUDE: 81°30.6'W NOAA CHART: 11488 USGS QUAD: 300813 EASTPORT

To reach the tidal bench marks from the intersection of Heckscher Drive (SR-105) and I-95 north of Jacksonville, proceed 9.2 miles (14.8 km) east on Heckscher Drive to the concrete bridge over Clapboard Creek. The bench marks are at the bridge, along Heckscher Drive, and along Ramoth Drive. The tide gage and staff were located on the dock of the Clapboard Creek Fish Camp located NE of the NW corner of the bridge.

BENCH MARK STAMPING: 0198 A This Bench Mark Description Changed On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at the bridge, 50.5 feet (15.4 m) SW of a large concrete utility pole, 34.5 feet (10.5 m) NE of the centerline of Heckscher Drive, 15.5 feet (4.7 m) north of the NW bridge abutment, and 2 feet (0.6 m) SW of a witness post. The bench mark is 3 feet (1 m) below roadway level, crimped to a copper-clad steel rod driven 40 feet (12 m), and encased in a pipe and concrete kickblock.

The bench mark is at the bridge, 50.5 feet (15.4 m) SW of a large concrete utility pole, 34.5 feet (10.5 m) NE of the centerline of Heckscher Drive, 15.5 feet (4.7 m) north of the NW bridge abutment, and 2 feet (0.6 m) SW of a witness post. The bench mark is 3 feet (1 m) below roadway level, crimped to a copper-clad steel rod driven 40 feet (12 m), and encased in a <u>damaged PVC</u> pipe and concrete kickblock. <u>The disk</u> is 0.2 ft (0.06 m) above the level of the ground.

PRELIMINARY DATE: 05/18/93

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FLORIDA 872 0198

CLAPBOARD CREEK, PELOTES ISLAND

BENCH MARK STAMPING: 0198 B This Bench Mark Description Changed On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is SE of Clapboard Creek along Heckscher Drive to Ramoth Drive, then 0.4 mile (0.6 km) east on Ramoth Drive to the intersection of I-75 and Palm Glen Drive, near the banks of St. Johns River, 191 feet (58 m) SW of the centerline of Ramoth Drive, 52 feet (16 m) NE of the river shoreline, 30 feet (9 m) SE of a metal fence, 2 feet (0.6 m) NE of a witness post, and set in a concrete monument projecting 0.2 foot (0.1 m) above ground level and 4 feet (1 m) below roadway level.

The bench mark is SE of Clapboard Creek along Heckscher Drive to Ramoth Drive, then 0.4 mile (0.6 km) east on Ramoth Drive to the intersection of I-75 Ramoth Drive and Palm Glen Drive. The mark is located in an easement between lots 6686 and 6706 Ramoth drive, near the banks of St. Johns River, 191 feet (58 m) SW of the centerline of Ramoth Drive, 52 feet (16 m) NE of the river shoreline, 30 feet (9 m) SE of a metal fence, 2 feet (0.6 m) NE of a witness post, and set in a concrete monument projecting 0.2 foot (0.1 m) above ground level and 4 feet (1 m) below roadway level.

BENCH MARK STAMPING: R 325 1970 This Bench Mark Description Changed On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is NW of Clapboard Creek along Heckscher Drive, 0.7 mile (1.1 km) west of the west end of the Clapboard Creek Bridge, 49.5 feet (15.1 m) north of the centerline of Heckscher Drive, 33.5 feet (10.2 m) SE of the SE corner of a block house at # 5719, 24.4 feet (7.4 m) west of the center of a steel gate in a fence, 12 feet (4 m) NW of a 1-foot (0.3 m) diameter cabbage palm, 6 feet (2 m) north of a utility pole, 2 feet (0.6 m) east of the SW corner of a hurricane fence post, 1 foot (0.3 m) south of the fence, 1 foot (0.3 m) west of a witness post, and set in the top of a concrete monument 0.1 foot (0.03 m) above ground level.

The bench mark is NW of Clapboard Creek along Heckscher Drive, 0.7 mile (1.1 km) west of the west end of the Clapboard Creek Bridge, 49.5 feet (15.1 m) north of the centerline of Heckscher Drive, 33.5 feet (10.2 m) SE of the SE corner of a block house at # 5719 <u>number 5731 Heckscher Drive</u>, 24.4 feet (7.4 m) west of the center of a steel gate in a fence, 12 feet (4 m) NW of a 1-foot (0.3 m) diameter cabbage palm, 6 feet (2 m) north of a utility pole, 2 feet (0.6 m) east of the SW corner of a <u>hurricane</u> <u>chain link</u> fence post, 1 foot (0.3 m) south of the fence, 1 foot (0.3 m) west of a witness post, and set in the top of a concrete monument 0.1 foot (0.03 m) above ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/18/93

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FLORIDA 872 0198

CLAPBOARD CREEK, PELOTES ISLAND

BENCH MARK STAMPING: S 325 This Bench Mark Was Recovered AS Described On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FL SRD Bench Mark SETTING CLASSIFICATION: Concrete Abutment

The bench mark is set on the top of the SW end of the NW concrete abutment of the bridge, 20.3 feet (6.2 m) SW of the centerline of Heckscher Drive, and at highway level.

BENCH MARK STAMPING: NO STAMPING This Bench Mark Was Recovered AS Described On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FL SRD Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set on the top of the NE end of the SE abutment of the bridge, 20.0 feet (6.1 m) NE of the centerline of Heckscher Drive, and 0.5 foot (0.2 m) above highway level. (Note: Formerly designated as 4601)

PRELIMINARY DATE: 05/18/93

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FLORIDA 872 0198

CLAPBOARD CREEK, PELOTES ISLAND

Tidal datums at Clapboard Creek, Pelotes Island are based on the following:

LENGTH OF SERIES	Ŧ	5 MONTHS
TIME PERIOD	=	SEPTEMBER 1977-JANUARY 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	5.02	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	3.94	FEET
MEAN HIGH WATER (MHW)	=	3.76	FEET
MEAN TIDE LEVEL (MTL)	=	1.94	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	1.47	FEET
MEAN LOW WATER (MLW)	=	0.12	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (1/10/78)	=	-1.77	FEET

*NGVD is based on elevations published in Quad 300813, 1/73 and NOS leveling of 8/17/77.

ELEVATION IN FEET ABOVE:

Bench mark elevation information:

BENCH MARK STAMPING	MLLW	MHW
0198 A ·	7.03	3.27
0198 B	6.74	2.98
R 325 1970	7.07	3.31
S 325	10.77	7.01
NO STAMPING	10.97	7.21

The estimated highest water level to the nearest half-foot is 6.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 12/12/86

FLORIDA 872 0198

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

CLAPBOARD CREEK, PELOTES ISLAND

LATITUDE: 30°24.4'N LONGITUDE: 81°30.6'W NOAA CHART: 11488 USGS QUAD: 300813

To reach the tidal bench marks from the intersection of Heckscher Drive (SR-105) and I-95 north of Jacksonville, proceed 9.2 miles (14.8 km) east on Heckscher Drive to the concrete bridge over Clapboard Creek. The bench marks are at the bridge, along Heckscher Drive, and along Ramoth Drive. The tide gage and staff were located on the dock of the Clapboard Creek Fish Camp located NE of the NW corner of the bridge.

BENCH MARK STAMPING: 0198 A

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at the bridge, 50.5 feet (15.4 m) SW of a large concrete utility pole, 34.5 feet (10.5 m) NE of the centerline of Heckscher Drive, 15.5 feet (4.7 m) north of the NW bridge abutment, and 2 feet (0.6 m) SW of a witness post. The bench mark is 3 feet (1 m) below roadway level, crimped to a copper-clad steel rod driven 40 feet (12 m), and encased in a pipe and concrete kickblock.

BENCH MARK STAMPING: 0198 B

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is SE of Clapboard Creek along Heckscher Drive to Ramoth Drive, then 0.4 mile (0.6 km) east on Ramoth Drive to the intersection of I-75 and Palm Glen Drive, near the banks of St. Johns River, 191 feet (58 m) SW of the centerline of Ramoth Drive, 52 feet (16 m) NE of the river shoreline, 30 feet (9 m) SE of a metal fence, 2 feet (0.6 m) NE of a witness post, and set in a concrete monument projecting 0.2 foot (0.1 m) above ground level and 4 feet (1 m) below roadway level.

PUBLICATION DATE: 12/12/86

FLORIDA 872 0198

CLAPBOARD CREEK, PELOTES ISLAND

BENCH MARK STAMPING: R 325 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is NW of Clapboard Creek along Heckscher Drive, 0.7 mile (1.1 km) west of the west end of the Clapboard Creek Bridge, 49.5 feet (15.1 m) north of the centerline of Heckscher Drive, 33.5 feet (10.2 m) SE of the SE corner of a block house at # 5719, 24.4 feet (7.4 m) west of the center of a steel gate in a fence, 12 feet (4 m) NW of a 1-foot (0.3 m) diameter cabbage palm, 6 feet (2 m) north of a utility pole, 2 feet (0.6 m) east of the SW corner of a hurricane fence post, 1 foot (0.3 m) south of the fence, 1 foot (0.3 m) west of a witness post, and set in the top of a concrete monument 0.1 foot (0.03 m) above ground level.

BENCH MARK STAMPING: S 325

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FL SRD Bench Mark SETTING CLASSIFICATION: Concrete Abutment

The bench mark is set on the top of the SW end of the NW concrete abutment of the bridge, 20.3 feet (6.2 m) SW of the centerline of Heckscher Drive, and at highway level.

BENCH MARK STAMPING: NO STAMPING

MONUMENTATION: Survey Disk. AGENCY/DISK TYPE: FL SRD Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set on the top of the NE end of the SE abutment of the bridge, 20.0 feet (6.1 m) NE of the centerline of Heckscher Drive, and 0.5 foot (0.2 m) above highway level. (Note: Formerly designated as 4601)

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PUBLICATION DATE: 12/12/86

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FLORIDA 872 0198

CLAPBOARD CREEK, PELOTES ISLAND

Tidal datums at Clapboard Creek, Pelotes Island are based on the following:

LENGTH OF SERIES	=	5 MONTHS	
TIME PERIOD	=	SEPTEMBER 1977-JANUARY	1978
TIDAL EPOCH	=	1960-1978	
CONTROL TIDE STATION	=	MAYPORT (872 0220)	

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	5.02 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	3.94 FEET
MEAN HIGH WATER (MHW)	=	3.76 FEET
MEAN TIDE LEVEL (MTL)	=	1.94 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	1.47 FEET
MEAN LOW WATER (MLW)	=	0.12 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (1/10/78)	=	-1.77 FEET

*NGVD is based on elevations published in Quad 300813, 1/73 and NOS leveling of 8/17/77.

ELEVATION IN FEET ABOVE:

Bench mark elevation information:

BENCH MARK STAMPING	MLLW	MHW
0198 A ·	7.03	3.27
0198 B	6.74	2.98
R 325 1970	7.07	3.31
S 325	10.77	7.01
NO STAMPING	10.97	7.21

The estimated highest water level to the nearest half-foot is 6.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Page 1 of 4

PRELIMINARY DATE: 05/11/93

FLORIDA 872 0203

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

LATITUDE: 30°24.8'N LONGITUDE: 81°32.7'W NOAA CHART: 11491 USGS QUAD: EASTPORT

To reach the tidal bench marks from the intersection of New Berlin Road and State Road 105 in Jacksonville, proceed 1.4 miles (2.3 km) east on State Road 105 to the residence at 4822 Heckscher Drive on the south side of the road. The bench marks are located along Heckscher Drive. The tide gage and staff were located on a privately owned pier behind the residence.

BENCH MARK STAMPING: CUT NO 33 1945 RG 50 UPPER This Bench Mark Was Found Destroyed On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument behind the house at 4822 Heckscher Drive, 145 feet (44 m) SE of the centerline of Heckscher Drive, 91.8 feet (28.0 m) SE of a utility pole, 11.6 feet (3.5 m) SW of the corner of a metal fence, 6.9 feet (2.1 m) NW of the river bank, and 2.2 feet (0.7 m) below the level of Heckscher Drive.

The bench mark is set in a concrete monument behind the house at 4822 Heckscher Drive, 145 feet (44 m) SE of the centerline of Heckscher Drive, 91.8 feet (28.0 m) SE of a utility pole, 11.6 feet (3.5 m) SW of the corner of a metal fence, 6.9 feet (2.1 m) NW of the river bank, and 2.2 feet (0.7 m) below the level of Heckscher Drive. The house at 4822 Heckscher as well as the adjacent houses have been demolished. The river bank has been modified. A 6 inch steel pipe filled with concrete with a brass stem embedded in the center was located at the described location. The disk was not located but is believed destroyed.

> BENCH MARK STAMPING: CARLOS RM 2 1946 This Bench Mark Was Searched For And Not Found On 01/01/84 This Bench Mark Was Searched For And Not Found Again On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Ref Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, in the 4700 block of Heckscher Drive, 132 feet (40 m) NW of the centerline of Heckscher Drive, 127 feet (39 m) NW of utility pole #4761, 10 feet (3 m) east of a 0.8-foot (0.2 m) cabbage palm, and 0.4 foot (0.1 m) above the level of Heckscher Drive.

PRELIMINARY DATE: 05/11/93

Page 2 of 4

FLORIDA 872 0203

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

BENCH MARK STAMPING: P 325 1970 This Bench Mark Description Changed On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Base of a Tower

The bench mark is set on the top of the SW corner of the SE concrete base of the easternmost of two transmission line towers, 0.8 mile (1.3 km) west of the bridge over Browns Creek, 0.35 mile (0.56 km) NE of the east end of the highway bridge over San Carlos Creek, opposite a fishing bridge on Heckscher Drive, 213.0 feet (64.9 m) north of the centerline of Heckscher Drive, and 3.5 feet (1.1 m) above the ground.

The bench mark is set on the top of the SW corner of the SE concrete base of the easternmost of two middle one of three transmission line towers, 0.8 mile (1.3 km) west of the bridge over Browns Creek, 0.35 mile (0.56 km) NE of the east end of the highway old wooden bridge over San Carlos Creek, opposite That is now a fishing bridge on Heckscher Drive, 213.0 feet (64.9 m) north of the centerline of Heckscher Drive, 3.5 feet (1.1 m) above the ground, and 1.0 ft NW of a carsonite witness post. the mark has been defaced, use with caution.

BENCH MARK STAMPING: 0203 A 1982 This Bench Mark Description Changed On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 0.1 mile (0.2 km) east of the San Carlos Creek Bridge, 56.1 feet (17.1 m) SE of the centerline of Heckscher Drive, 11.3 feet (3.4 m) WSW of the north fence corner of Jacksonville City property, 11.1 feet (3.4 m) SW of a utility pole, and 1.2 feet (0.4 m) NW of a metal witness monument.

The bench mark is set in a concrete monument 0.1 mile (0.2 km) east of the San Carlos Creek Bridge, 56.1 feet (17.1 m) SE of the centerline of Heckscher Drive, 11.3 feet (3.4 m) WSW of the north fence corner of Jacksonville City property, 11.1 feet (3.4 m) SW of a utility pole, and 1.2 feet (0.4 m) NW of a metal witness monument. <u>3 feet NNW of a fence line, and 2.5 feet NNW of a carsonite witness post.</u>

PRELIMINARY DATE: 05/11/93

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FLORIDA 872 0203

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

BENCH MARK STAMPING: L 325 This Bench Mark Was Recovered AS Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLSRD Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set on top of the south concrete walkway of the highway bridge over San Carlos Creek, 18.2 feet (5.5 m) south of the centerline of the highway, 1.6 feet (0.5 m) east of the west end of the walkway, and 1 foot (0.3 m) above the level of highway.

- 44.53

BENCH MARK STAMPING: M 325 This Bench Mark Was Recovered AS Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLSRD Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set on the north concrete walkway of the highway bridge over San Carlos Creek, 17.5 feet (5.3 m) north of the centerline of the highway, 1.5 feet (0.5 m) west of the east end of walkway, and 1 foot (0.3 m) above the level of the highway.

PRELIMINARY DATE: 05/11/93

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FLORIDA 872 0203

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

Tidal datums at Blount Island Bridge, St Johns River are based on the following:

LENGTH OF SERIES	z	3 MONTHS
TIME PERIOD	=	SEPTEMBER-NOVEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	×	4.96	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	3.80	FEET	
MEAN HIGH WATER (MHW)	=	3.62	FEET	
MEAN TIDE LEVEL (MTL)	=	1.87	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	=	1.44	FEET	
MEAN LOW WATER (MLW)	=	0.11	FEET	
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (01/07/78)	Ξ	-0.72	FEET	

*NGVD is based on elevations published in Quad 300813, 02/73 and NOS leveling of 01/78.

Bench mark elevation information:

BENCH MARK STAMPING	ELEVATION I MLLW	N FEET ABOVE: <u>MHW</u>
CUT NO 33 1945 RG 50 UPPER	7.22	3.60
CARLOS RM 2 1946	14.25	10.63
P 325 1970	12.88	9.26
0203 A 1982	6.86	3.24
L 325	14.75	11.13
M 325	14.73	11.11

The estimated highest water level to the nearest half-foot is 6.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0203

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

LATITUDE: 30°24.8'N LONGITUDE: 81°32.7'W NOAA CHART: 11491 USGS QUAD: EASTPORT

To reach the tidal bench marks from the intersection of New Berlin Road and State Road 105 in Jacksonville, proceed 1.4 miles (2.3 km) east on State Road 105 to the residence at 4822 Heckscher Drive on the south side of the road. The bench marks are located along Heckscher Drive. The tide gage and staff were located on a privately owned pier behind the residence.

BENCH MARK STAMPING: CUT NO 33 1945 RG 50 UPPER

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument behind the house at 4822 Heckscher Drive, 145 feet (44 m) SE of the centerline of Heckscher Drive, 91.8 feet (28.0 m) SE of a utility pole, 11.6 feet (3.5 m) SW of the corner of a metal fence, 6.9 feet (2.1 m) NW of the river bank, and 2.2 feet (0.7 m) below the level of Heckscher Drive.

BENCH MARK STAMPING: CARLOS RM 2 1946

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Ref Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, in the 4700 block of Heckscher Drive, 132 feet (40 m) NW of the centerline of Heckscher Drive, 127 feet (39 m) NW of utility pole #4761, 10 feet (3 m) east of a 0.8-foot (0.2 m) cabbage palm, and 0.4 foot (0.1 m) above the level of Heckscher Drive.

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PUBLICATION DATE: 09/22/87

FLORIDA 872 0203

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

BENCH MARK STAMPING: P 325 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Base of a Tower

The bench mark is set on the top of the SW corner of the SE concrete base of the easternmost of two transmission line towers, 0.8 mile (1.3 km) west of the bridge over Browns Creek, 0.35 mile (0.56 km) NE of the east end of the highway bridge over San Carlos Creek, opposite a fishing bridge on Heckscher Drive, 213.0 feet (64.9 m) north of the centerline of Heckscher Drive, and 3.5 feet (1.1 m) above the ground.

BENCH MARK STAMPING: 0203 A 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 0.1 mile (0.2 km) east of the San Carlos Creek Bridge, 56.1 feet (17.1 m) SE of the centerline of Heckscher Drive, 11.3 feet (3.4 m) WSW of the north fence corner of Jacksonville City property, 11.1 feet (3.4 m) SW of a utility pole, and 1.2 feet (0.4 m) NW of a metal witness monument.

BENCH MARK STAMPING: L 325

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLSRD Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set on top of the south concrete walkway of the highway bridge over San Carlos Creek, 18.2 feet (5.5 m) south of the centerline of the highway, 1.6 feet (0.5 m) east of the west end of the walkway, and 1 foot (0.3 m) above the level of highway.

BENCH MARK STAMPING: M 325

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLSRD Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set on the north concrete walkway of the highway bridge over San Carlos Creek, 17.5 feet (5.3 m) north of the centerline of the highway, 1.5 feet (0.5 m) west of the east end of walkway, and 1 foot (0.3 m) above the level of the highway.

PUBLICATION DATE: 09/22/87

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FLORIDA 872 0203

BLOUNT ISLAND BRIDGE, ST JOHNS RIVER

Tidal datums at Blount Island Bridge, St Johns River are based on the following:

=	3 MONTHS
=	SEPTEMBER-NOVEMBER 1977
=	1960-1978
=	MAYPORT (872 0220)
	= = =

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77) = 4.96 FEET MEAN HIGHER HIGH WATER (MHHW) 3.80 FEET = 3.62 FEET MEAN HIGH WATER (MHW) = MEAN TIDE LEVEL (MTL) 1.87 FEET = *NATIONAL GEODETIC VERTICAL DATUM-1.44 FEET 1929 (NGVD) = MEAN LOW WATER (MLW) 0.11 FEET ≕ MEAN LOWER LOW WATER (MLLW) = 0.00 FEET LOWEST OBSERVED WATER LEVEL (01/07/78) = -0.72 FEET

*NGVD is based on elevations published in Quad 300813, 02/73 and NOS leveling of 01/78.

Bench mark elevation information:

BENCH MARK STAMPING	MLLW	MHW
CUT NO 33 1945 RG 50 UPPER	7.22	3.60
CARLOS RM 2 1946	14.25	10.63
P 325 1970	12.88	9.26
0203 A 1982	6.86	3.24
L 325	14.75	11.13
M 325	14.73	11.11

The estimated highest water level to the nearest half-foot is 6.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

LOWER ST. JOHNS RIVER VICINITY REACH ONE ABSTRACT MILE 0.0 TO MILE 10.0

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EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y	
872 0291 Jacksonville Beach	(-) 2.1	7.9 miles/ Right	872 0030 Fernandina Beach	12	5/74 4/75	
872 0259 Atlantic Beach	(-) 1.1	4.6 miles/ Right	N/A	4	11/58 3/58	
872 0194 Little Talbot Island	0.3	2.0 miles/ Left	872 0030 Fernandina	4	5/74 8/74	
872 0186 Ft. George Island	1.4	3.0 miles/ Left	872 0220 Mayport	5	4/78 9/78	
872 0196 Sisters Creek	1.8	1.7 miles/ Left	872 0220 Mayport	3	10/77 12/77	R
872 0267 Pablo Creek - ICW	3.5	4.1 miles/ Right	872 0220 Mayport	4	9/77 12/77	(
872 0305 Oak Landing	3.5	9.2 miles/ Right	872 0220 Mayport	2	9/78 11/78	

Station No.	Elevation (Feet, NGVD 1929)			Mean Range	Tidal Bench
	мнพ	MTL	: MLW	(Feet)	Marks Fd/Reg'd.
872 0291	2.97	0.42	-2.14	5.11	8/0
872 0259	N/A	N/A	N/A	5.20	0/0
872 0194	3.28	0.53	-2.21	5.49	6/0
872 0186	2.88	0.46	-1.96	4.84	5/0
872 0196	N/A	N/A	N/A	4.34	?/?
872 0267	2.20	0.29	-1.62	3.82	3/2
872 0305 A copy of each	2.33 Vicinity (1	0.30 L) NOS Pub	-1.74 lished Tidal	4.07 <u>Bench Mark</u>	5/0
Descriptions with Elevation Sheet and (2) FDEP Preliminary Tidal Bench Mark Descriptions with Elevation Sheet dated May or					
June 1993 follows:					

R-1.46

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PRELIMINARY DATE: 01/27/93

FLORIDA 872-0291

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

JACKSONVILLE BEACH

LATITUDE: 30°17.0'N LONGITUDE: 081°23.2'W NOAA CHART: 11490 USGS QUAD: JACKSONVILLE BEACH

To reach the tidal bench marks from the intersection of Beach Boulevard and U.S. Highway AlA, proceed south on U.S. Highway AlA (3rd Street) for 0.4 mile (0.6 km) to 6th Avenue South, then east on 6th Avenue South to its end at the Jacksonville Beach Fishing Pier. The bench marks are along the sea wall north of the pier, along U.S. Highway AlA, and along Beach Boulevard east of Highway AlA. The tide gage and staff were on the west end of the pier.

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BENCHMARK STAMPING: C-30 RESET 1963 This Bench Mark Was Recovered AS Described On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is in the north end of the bottom step of the east entrance to the City Hall building at the NE corner of the intersection of U.S. Highway AlA and Beach Boulevard, 25.4 feet (7.7 m) NE of the east entrance to City Hall, 0.8 foot (0.2 m) south of the north end of the step, and 0.3 foot (0.1 m) above ground.

Page 2 of 5

PRELIMINARY DATE: 01/27/93

FLORIDA 872-0291

JACKSONVILLE BEACH

BENCHMARK STAMPING: U 323 1970 This Bench Mark Description Changed On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument on the property of a high rise apartment building at the NE corner of the intersection of U.S. Highway AlA and 2nd Avenue South, 36 feet (11 m) north of the centerline of 2nd Avenue South, 31.5 feet (9.6 m) east of the centerline of northbound U.S. Highway AlA, 1.8 feet (0.5 m) west of a witness post, and 0.5 foot (0.2 m) above ground.

The bench mark is set in a concrete monument on the property of a high rise apartment building at the NE corner of the intersection of U.S. Highway AlA and 2nd Avenue South, 36 feet (11 m) north of the centerline of 2nd Avenue South, 31.5 feet (9.6 m) east of the centerline of northbound U.S. Highway AlA, $\frac{1.8 - \text{feet}}{1.0 \text{ foot west of a carsonite witness post}}$ and $\frac{0.5 - \text{foot}}{0.2 - \text{m}}$ above level with the ground.

BENCHMARK STAMPING: X 323 1970 This Bench Mark Was Recovered AS Described On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is in the NE corner of a 4 x 4-foot $(1 \times 1 m)$ concrete catch basin at the intersection of U.S. Highway AlA and 11th Avenue South, 47 feet (14 m) east of the centerline of northbound U.S. Highway AlA, 28.5 feet (8.7 m) north of the centerline of 11th Avenue South, and level with the highway.



Page 5 of 5

PRELIMINARY DATE: 01/27/93

FLORIDA 872-0291

JACKSONVILLE BEACH

Tidal datums at JACKSONVILLE BEACH are based on the following:

LENGTH OF SERIES	= 12 MONTHS
TIME PERIOD	= MAY 1974 - APRIL 1975
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= FERNANDINA BEACH (872 0030

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (04/03/73)	=	7.60 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	5.65 FEET
MEAN HIGH WATER (MHW)	=	5.28 FEET
MEAN TIDE LEVEL (MTL)	=	2.73 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	2.30 FEET
MEAN LOW WATER (MLW)	=	0.17 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (01/27/75)	=	-2.20 FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1976.

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEET MLLW	ABOVE: <u>MHW</u>
C 30 RESET 1963	13.31	8.03
U 323 1970	12.74	7.46
X 323 1970	15.22	9.94
Y 324 1970	13.97	8.69
NO 1 1973	12.57	7.29
NO 2 1973	12.74	7.46
NO 3 1973	13.82	8.54
DUVAL R-67 1974	14.06	8.78

The estimated highest water level to the nearest half-foot is 13.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 4.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Fernandina Beach (872 0030).

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PUBLICATION DATE: 07/22/89

FLORIDA 872-0291

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

JACKSONVILLE BEACH

LATITUDE: 30°17.0'N LONGITUDE: 081°23.2'W NOAA CHART: 11490 USGS QUAD: JACKSONVILLE BEACH

To reach the tidal bench marks from the intersection of Beach Boulevard and U.S. Highway AlA, proceed south on U.S. Highway AlA (3rd Street) for 0.4 mile (0.6 km) to 6th Avenue South, then east on 6th Avenue South to its end at the Jacksonville Beach Fishing Pier. The bench marks are along the sea wall north of the pier, along U.S. Highway AlA, and along Beach Boulevard east of Highway AlA. The tide gage and staff were on the west end of the pier.

BENCHMARK STAMPING: C-30 RESET 1963

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is in the north end of the bottom step of the east entrance to the City Hall building at the NE corner of the intersection of U.S. Highway AlA and Beach Boulevard, 25.4 feet (7.7 m) NE of the east entrance to City Hall, 0.8 foot (0.2 m) south of the north end of the step, and 0.3 foot (0.1 m) above ground.

BENCHMARK STAMPING: U 323 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument on the property of a high rise apartment building at the NE corner of the intersection of U.S. Highway AlA and 2nd Avenue South, 36 feet (11 m) north of the centerline of 2nd Avenue South, 31.5 feet (9.6 m) east of the centerline of northbound U.S. Highway AlA, 1.8 feet (0.5 m) west of a witness post, and 0.5 foot (0.2 m) above ground.

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Page 2 of 4

PUBLICATION DATE: 07/22/89

FLORIDA 872-0291

JACKSONVILLE BEACH

BENCHMARK STAMPING: X 323 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is in the NE corner of a 4 x 4-foot $(1 \times 1 m)$ concrete catch basin at the intersection of U.S. Highway AlA and 11th Avenue South, 47 feet (14 m) east of the centerline of northbound U.S. Highway AlA, 28.5 feet (8.7 m) north of the centerline of 11th Avenue South, and level with the highway.

BENCHMARK STAMPING: Y 324 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Sea Wall

The bench mark is set in a concrete sea wall at the east end of the southern side of Beach Boulevard, 28.5 feet (8.7 m) south of the centerline of Beach Boulevard, 22.6 feet (6.9 m) north of the south steps leading to the beach, 2.1 feet (0.6 m) east of the east concrete support of a pedestrian overpass, and 5.3 feet (1.6 m) above the sidewalk.

BENCHMARK STAMPING: NO 1 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sea Wall

The bench mark is set in a concrete sea wall, 99.1 feet (30.2 m) south of Bench Mark NO 2 1973, 63.5 feet (19.4 m) north of the Jacksonville Beach Fishing Pier, and 1.0 foot (0.3 m) west of the east edge of the sea wall.

BENCHMARK STAMPING: NO 2 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sea Wall

The bench mark is set in a concrete sea wall 162.6 feet (49.6 m) north of the Jacksonville Beach Fishing Pier, 86.7 feet (26.4 m) south of the east end of 5th Avenue South and 0.7 foot (0.2 m) west of the east edge of the sea wall.

Page 3 of 4

FLORIDA 872-0291

JACKSONVILLE BEACH

BENCHMARK STAMPING: NO 3 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sea Wall

The bench mark is set in a concrete sea wall north of the Jacksonville Beach Fishing Pier, 69.6 feet (21.2 m) NE of the NE corner of the Greens Motel at 3rd Avenue South and 1st Street South, 28.4 feet (8.7 m) east of the east end of 3rd Avenue South, 9.0 feet (2.7 m) north of the steps leading to the beach from 3rd Avenue South, and 1.2 feet (0.4 m) west of the east edge of the sea wall.

BENCHMARK STAMPING: DUVAL R-67 1974

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DNR Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument at the east end of 1st Avenue South, 34.6 feet (10.5 m) south of the centerline of 1st Avenue South, 10.5 feet (3.2 m) west of the east edge of the concrete sea wall, and level with the sidewalk. above the sidewalk.

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PUBLICATION DATE: 07/22/89

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FLORIDA 872-0291

JACKSONVILLE BEACH

Tidal datums at JACKSONVILLE BEACH are based on the following:

LENGTH OF SERIES	=	12 MONTHS			
TIME PERIOD	=	MAY 1974 -	APRIL	1975	
TIDAL EPOCH	=	1960-1978			
CONTROL TIDE STATION	Ħ	FERNANDINA	BEACH	(872	0030)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (04/03/7	3) =	7.60	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	5.65 1	FEET
MEAN HIGH WATER (MHW)	=	5.28	FEET
MEAN TIDE LEVEL (MTL)	=	2.73	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	2.30	FEET
MEAN LOW WATER (MLW)	=	0.17	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/27/7	5) =	-2.20	FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1976.

Bench mark elevation information:

The estimated highest water level to the nearest half-foot is 13.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 4.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Fernandina Beach (872 0030).

PRELIMINARY DATE: 05/18/93 Not Published By NOS

FLORIDA 872-0259

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

ATLANTIC BEACH

LATITUDE: 30°20.1'N LONGITUDE: 081°23.7'W NOAA CHART: USGS QUAD:

BENCHMARK STAMPING: BENCH MARK 1 This Bench Mark Was Searched For And Not Found On 06/07/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: PIPE

BENCH MARK 1 (USE) = 1 (F.S.R.D.) is a chiseled cross on top of flange of north ell of a 6-inch pipe line in artesian well on property of Atlantic Beach Hotel. It is 20 feet east of the stand pipe, and 17 feet west of the reservoir. Elevation: 21.79 feet above mean low water.

BENCHMARK STAMPING: BENCH MARK 4 This Bench Mark Was Searched For And Not Found On 06/07/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Brass Disk SETTING CLASSIFICATION: Concrete Post

BENCH MARK 4 (USE) is a brass plug set in top of concrete post, 6 inches below the ground on the property of the Atlantic Beach Hotel. It is 38 feet west and 6 feet south of southeast corner of south wing of the hotel, 58 feet north of a cast iron ornamental light post and 100 feet west of outer face of lower sea wall. Elevation: 19.06 feet above mean low water.

BENCHMARK STAMPING: BENCH MARK 1 This Bench Mark Was Searched For And Not Found On 06/07/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: Concrete Block Wall

BENCH MARK 1 (1958) is a standard disk, stamped "NO 1 1958," set flush in top of concrete block retaining wall parallel to sea wall on property of Atlantic Beach Hotel. It is 75 feet east of green ornamental lamppost located in center of traffic circle at hotel entrance, 17 feet northeast of green ornamental lamppost located at entrance to fishing pier and 14 feet west of a north-south seawall. Elevation: 16.38 feet above mean low water.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/18/93 Not Published By NOS

FLORIDA 872-0259

ATLANTIC BEACH

BENCHMARK STAMPING: BENCH MARK 2 This Bench Mark Was Searched For And Not Found On 06/07/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE SEAWALL

BENCH MARK 2 (1958) is a standard disk, stamped "NO 2 1958," set in flush in top of concrete seawall on property of the Atlantic Beach Hotel. It is 143 feet southsoutheast of southeast corner of south wing of the hotel, 104 feet east-southeast of green ornamental lamppost located in center of traffic circle at hotel parking lot and 44 feet south of south edge of the fishing pier. Elevation: 13.42 feet above mean low water.

> . BENCHMARK STAMPING: BENCH MARK 3 This Bench Mark Was Searched For And Not Found On 06/07/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 3 (1958) is a standard disk, stmaped "NO 3 1958," set flush in concrete base of green ornamental lamppost on property of Atlantic Beach Hotel. It is 167 feet north fo northwest corner of junction of fishing pier and black-top area, 110 feet northeast of southeast corner of south wing of the Hotel entrance and 21 feet west of edge of north-south seawall.

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Elevation: 18.21 feet above mean low water.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/18/93 Not Published By NOS

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FLORIDA 872-0259

ATLANTIC BEACH

Mean low water at Atlantic Beach is based on 4 months of records, November 14, 1958 - March 16, 1959, reduced to mean values. Elevations of other tide planes referred to this datum are as follows.

MEAN	HIGH WATER	(MHW)	=	5.20	FEET
MEAN	TIDE LEVEL	(MTL)	=	2.60	FEET
MEAN	LOW WATER (MLW)	=	0.00	FEET

The estimated highest water level to the nearest half-foot is 8.5 feet above mean low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean low water.

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Page 1 of 3

PRELIMINARY DATE: 05/11/93

FLORIDA 872 0194

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

LITTLE TALBOT ISLAND, ATLANTIC OCEAN

LATITUDE: 30°25.8'N LONGITUDE: 81°24.3'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the west landing of the Mayport Ferry at Mayport, proceed north northeast on State Highway AlA for 5 miles (8 km) to the entrance of Little Talbot Island State Park, then travel south in the Park for 2.15 miles (3.46 km) to the South Recreation Area and fishing pier. The bench marks are in the South Recreation Area and along State Highway AlA. The tide gage and staff were located at the end of the pier.

BENCH MARK STAMPING: A 326 1970 This Bench Mark Was Recovered AS Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is in the top of a concrete monument at the old (now closed) entrance to the South Recreation Area, 92 feet (28 m) east of the centerline of State Highway AlA, 29 feet (9 m) north of the centerline of the old (now closed) entrance road, 1.5 feet (0.5 m) south of a metal witness post, and 0.5 foot (0.2 m) above ground level.

BENCH MARK STAMPING: B 326 1970 This Bench Mark Was Recovered AS Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument about 1.1 miles (1.8 km) north of Bench Mark A 326 1970 at the junction of State Highway AlA and a sand road leading westerly, 116.5 feet (35.5 m) west of the centerline of State Highway AlA, 71.5 feet (21.8 m) north of the centerline of the sand road, 34 feet (10.4 m) northwest of a lone 1.3 feet (0.4 m) diameter cabbage palm tree, 2 feet (1 m) west of a metal witness post, and 1 foot (0.3 m) below the level of the highway.

PRELIMINARY DATE: 05/11/93

Page 2 of 3

FLORIDA 872 0194

LITTLE TALBOT ISLAND, ATLANTIC OCEAN

BENCH MARK STAMPING: NO 3 1974 This Bench Mark Was Recovered AS Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Culvert Headwall

The bench mark is set in the south end of a culvert, 183 feet (56 m) south of the old (now closed) entrance to the South Recreation Area, and 22.7 feet (6.9 m) west of the centerline of State Highway AlA.

BENCH MARK STAMPING: DUVAL R-22 1974 This Bench Mark Was Recovered AS Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DNR Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument in the first sand dune north of the parking lot west of the fishing pier, 58.0 feet (17.7 m) NW of the NE corner of the parking lot, and 0.2 foot (0.1 m) above the sand level.

BENCH MARK STAMPING: NO 1 1974 RESET 1979 This Bench Mark Was added On 01/01/79

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Base

The bench mark is set in the concrete base for the south east corner support column of the middle picnic pavilion at the south recreation area, 71.3 ft (21.7 m) east of the centerline of the northbound drive, and 4.8 ft (1.5 m) northwest of a wooden walkway to the beach.

BENCH MARK STAMPING: NO 2 1974 RESET 1979 This Bench Mark Was added On 01/01/79

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete post, 24.7 ft (7.5 m) east of the centerline of the northbound drive at the south recreation area, 1.0 ft (0.3 m) northwest of a power pole, 26.3 ft (8.0 m) west northwest of the northwest corner of the southernmost picnic pavilion, 1.0 ft (0.3 m) north of a metal witness post, and flush with the ground

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0194

LITTLE TALBOT ISLAND, ATLANTIC OCEAN

Tidal datums at Little Talbot Island, Atlantic Ocean are based on the following:

LENGTH OF SERIES	=	4 MONTHS		
TIME PERIOD	=	MAY-AUGUST	1974	
TIDAL EPOCH	=	1960-1978		
CONTROL TIDE STATION	=	FERNANDINA	(872	0030)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/06/74)	=	8.17 FEET
MEAN HIGHER HIGH WATER (MHHW)	. =	6.09 FEET
MEAN HIGH WATER (MHW)	=	5.69 FEET
MEAN TIDE LEVEL (MTL)	=	2.94 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	2.41 FEET
MEAN LOW WATER (MLW)	=	0.20 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (01/27/75)	=	-3.17 FEET

*NGVD is based on elevations published in Quad 300812, 2/73 and NOS leveling of 12/77.

Bench mark elevation information:

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	ELEVATION I	N FEET	ABOVE :
BENCH MARK STAMPING	MLLW		<u>MHW</u>
A 326 1970	10.61		4.92
B 326 1970 .	12.33		6.64
NO 3 1974	10.68		4.99
DUVAL R-22 1974	19.26		13.57

The estimated highest water level to the nearest half-foot is 13.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 4.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Fernandina (872 0030).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 02/11/88

FLORIDA 872 0194

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

LITTLE TALBOT ISLAND, ATLANTIC OCEAN

LATITUDE: 30°25.8'N LONGITUDE: 81°24.3'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the west landing of the Mayport Ferry at Mayport, proceed north northeast on State Highway AlA for 5 miles (8 km) to the entrance of Little Talbot Island State Park, then travel south in the Park for 2.15 miles (3.46 km) to the South Recreation Area and fishing pier. The bench marks are in the South Recreation Area and along State Highway AlA. The tide gage and staff were located at the end of the pier.

BENCH MARK STAMPING: A 326 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is in the top of a concrete monument at the old (now closed) entrance to the South Recreation Area, 92 feet (28 m) east of the centerline of State Highway AlA, 29 feet (9 m) north of the centerline of the old (now closed) entrance road, 1.5 feet (0.5 m) south of a metal witness post, and 0.5 foot (0.2 m) above ground level.

BENCH MARK STAMPING: B 326 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument about 1.1 miles (1.8 km) north of Bench Mark A 326 1970 at the junction of State Highway A1A and a sand road leading westerly, 116.5 feet (35.5 m) west of the centerline of State Highway A1A, 71.5 feet (21.8 m) north of the centerline of the sand road, 34 feet (10.4 m) northwest of a lone 1.3 feet (0.4 m) diameter cabbage palm tree, 2 feet (1 m) west of a metal witness post, and 1 foot (0.3 m) below the level of the highway.



PUBLICATION DATE: 02/11/88

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FLORIDA 872 0194

LITTLE TALBOT ISLAND, ATLANTIC OCEAN

BENCH MARK STAMPING: NO 3 1974

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Culvert Headwall

The bench mark is set in the south end of a culvert, 183 feet (56 m) south of the old (now closed) entrance to the South Recreation Area, and 22.7 feet (6.9 m) west of the centerline of State Highway A1A.

BENCH MARK STAMPING: DUVAL R-22 1974

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DNR Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument in the first sand dune north of the parking lot west of the fishing pier, 58.0 feet (17.7 m) NW of the NE corner of the parking lot, and 0.2 foot (0.1 m) above the sand level.

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PUBLICATION DATE: 02/11/88

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FLORIDA 872 0194

LITTLE TALBOT ISLAND, ATLANTIC OCEAN

Tidal datums at Little Talbot Island, Atlantic Ocean are based on the following:

LENGTH OF SERIES	=	4 MONTHS		
TIME PERIOD	=	MAY-AUGUST	1974	
TIDAL EPOCH	z	1960-1978		
CONTROL TIDE STATION	=	FERNANDINA	(872	0030)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/06/74)	=	8.17	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	6.09	FEET
MEAN HIGH WATER (MHW)	=	5.69	FEET
MEAN TIDE LEVEL (MTL)	=	2.94	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	2.41	FEET
MEAN LOW WATER (MLW)	=	0.20	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/27/75)	=	-3.17	FEET

*NGVD is based on elevations published in Quad 300812, 2/73 and NOS leveling of 12/77.

Bench mark elevation information:

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	ELEVATION IN FEE	r above:
BENCH MARK STAMPING	MLLW	мнш
A 326 1970 B 326 1970 NO 3 1974 DUVAL 8-22 1974	10.61 12.33 10.68	4.92 6.64 4.99

The estimated highest water level to the nearest half-foot is 13.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 4.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Fernandina (872 0030).

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PRELIMINARY DATE: 05/11/93

FLORIDA 872-0186

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

FORT GEORGE ISLAND, FT. GEORGE RIVER

LATITUDE: 30°26.4'N LONGITUDE: 81°26.3'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the intersection of State Highway AlA and the Mayport Ferry proceed NE on State Highway AlA for 0.6 mile (1.0 km) to Edgewood Drive, then north on Edgewood Drive for 0.5 mile (0.8 km) to Palmetto Avenue, then north on Palmetto Avenue for 2 miles (3 km) to the Kingsley Plantation, follow the western leading drive to the NW corner of the plantation property. The bench marks are located in the area around the Park Ranger residence. The tide gage and staff were located on a free standing structure, 200 feet (61 m) NW of the NW corner of the largest white house on the plantation, and 50 feet (15 m) north of the shoreline.

BENCH MARK STAMPING: FT GEORGE NO 1 RESET 1977 This Bench Mark Was Recovered As Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 191.0 feet (58.2 m) ENE of the NE corner of the north one of the two plantation houses. 98.0 feet (29.9 m) NNW of the east end of the north row of hedges forming a lane, 28.0 feet (8.5 m) NW of the east one of several palm trees, 24.5 feet (7.5 m) south of the embankment of Ft. George River and 20.5 feet (6.2 m) SE of a 2.0 foot (0.6 m) diameter cypress tree.

BENCH MARK STAMPING: FT GEORGE NO 2 RESET 1977 This Bench Mark Was Recovered As Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 151.5 feet (46.2 m) NE of the center of a brick and concrete cistern, 54.0 feet (16.5 m) south of the east one of several palm trees, 31.0 feet (9.4 m) east of the east side of a 3 foot (0.9 m) diameter tree, 19.0 feet (5.8 m) north of the north hedge row of two east-west hedge rows that form a lane, and 10.0 feet (3.0 m) west of a 1.2 foot (0.4 m) diameter tree.

PRELIMINARY DĂTE: 05/11/93

Page 2 of 3

FLORIDA 872 0186

FORT GEORGE ISLAND, FT. GEORGE RIVER

BENCH MARK STAMPING: FT GEORGE NO 3 RESET 1977 This Bench Mark Was Recovered As Described On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 147 feet (45 m) east of the center of a brick and concrete cistern, 123 feet (37 m) NE of the NE corner of the stable and carriage house, 14.5 feet (4.4 m) SE of the east edge of the south one of two east-west hedge rows that form a lane and 11.0 feet (3.4 m) SW of a 4.0 foot (1.2 m) diameter cedar tree.

BENCH MARK STAMPING: 0186 A 1978 This Bench Mark Description Changed On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 130 feet (40 m) NW of the NW corner of a large white house, 24.5 feet (7.5 m) east of the walk leading to the north shoreline of Fort George Island, 16 feet (5 m) south of high ground south of the north shoreline of Fort George Island and 0.2 foot (0.1 m) below ground level.

The bench mark is set in a concrete monument 130 feet (40 m) NW of the NW corner of a large white house, 24.5 feet (7.5 m) east of the walk leading to the north shoreline of Fort George Island, 16 feet (5 m) south of high ground south of the north shoreline of Fort George Island, 1 foot (0.3 m) west of a witness post, and 0.2 foot (0.1 m) below ground level.

BENCH MARK STAMPING: 0186 E 1978 This Bench Mark Description Changed On 05/11/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is 290 feet (88 m) west of the centerline of the drive to Kingsley Plantation, 18 feet (5 m) SW of the SW corner of the eighth slave quarter west of the drive to Kingsley Plantation, 6 feet (2 m) NW of a witness post, 5.1 feet (1.6 m) north of a 1.2 foot (0.4 m) diameter palmetto palm, 5 feet (2 m) SW of a 1.2 foot (0.4 m) diameter oak tree marked with a "X" 6 feet (2 m) above ground, and level with the ground.

The bench mark is 290 feet (88 m) west of the centerline of the drive to Kingsley Plantation, 18 feet (5 m) SW of the SW corner of the eighth westernmost slave quarter west of the drive to Kingsley Plantation, 6 feet (2 m) NW of a witness post, 5.1 feet (1.6 m) north of a 1.2 foot (0.4 m) diameter palmetto palm, 5 feet (2 m) SW of a 1.2 foot (0.4 m) diameter oak tree marked with a "X" 6 feet (2 m) above ground, and level with the ground.

PRELIMINARY DATE: 05/11/93

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FLORIDA 872 0186

FORT GEORGE ISLAND, FT. GEORGE RIVER

Tidal datums at Fort George Island, Ft. George River are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	APRIL-SEPTEMBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (07/19/78)	=	6.73	FEET
MEAN HIGH WATER (MHW)	=	5.00	FEET
MEAN TIDE LEVEL (MTL) *NATIONAL GEODETIC VERTICAL DATUM~	=	2.58	FEET
1929 (NGVD)	=	2.12	FEET
MEAN LOW WATER (MLW) MEAN LOWER LOW WATER (MLLW)	=	0.10	FEET
LOWEST OBSERVED WATER LEVEL (05/22/78)	z	-1.31	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHW</u>
FT GEORGE NO 1 RESET 1977	12.60	7.60
FT GEORGE NO 2 RESET 1977	12.96	7.96
FT GEORGE NO 3 RESET 1977	13.31	8.31
0186 A 1978	11.46	6.46
0186 E 1978	10.29	5.29

The estimated highest water level to the nearest half-foot is 8.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 11/30/87

FLORIDA 872 0186

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

FORT GEORGE ISLAND, FT. GEORGE RIVER

LATITUDE: 30°26.4'N LONGITUDE: 81°26.3'W NOAA CHART: 11490 USGS QUAD: MAYPORT

To reach the tidal bench marks from the intersection of State Highway A1A and the Mayport Ferry proceed NE on State Highway A1A for 0.6 mile (1.0 km) to Edgewood Drive, then north on Edgewood Drive for 0.5 mile (0.8 km) to Palmetto Avenue, then north on Palmetto Avenue for 2 miles (3 km) to the Kingsley Plantation, follow the western leading drive to the NW corner of the plantation property. The bench marks are located in the area around the Park Ranger residence. The tide gage and staff were located on a free standing structure, 200 feet (61 m) NW of the NW corner of the largest white house on the plantation, and 50 feet (15 m) north of the shoreline.

BENCH MARK STAMPING: FT GEORGE NO 1 RESET 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 191.0 feet (58.2 m) ENE of the NE corner of the north one of the two plantation houses. 98.0 feet (29.9 m) NNW of the east end of the north row of hedges forming a lane, 28.0 feet (8.5 m) NW of the east one of several palm trees, 24.5 feet (7.5 m) south of the embankment of Ft. George River and 20.5 feet (6.2 m) SE of a 2.0 foot (0.6 m) diameter cypress tree.

BENCH MARK STAMPING: FT GEORGE NO 2 RESET 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 151.5 feet (46.2 m) NE of the center of a brick and concrete cistern, 54.0 feet (16.5 m) south of the east one of several palm trees, 31.0 feet (9.4 m) east of the east side of a 3 foot (0.9 m) diameter tree, 19.0 feet (5.8 m) north of the north hedge row of two east-west hedge rows that form a lane, and 10.0 feet (3.0 m) west of a 1.2 foot (0.4 m) diameter tree.

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PUBLICATION DATE: 11/30/87

FLORIDA 872 0186

FORT GEORGE ISLAND, FT. GEORGE RIVER

BENCH MARK STAMPING: FT GEORGE NO 3 RESET 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 147 feet (45 m) east of the center of a brick and concrete cistern, 123 feet (37 m) NE of the NE corner of the stable and carriage house, 14.5 feet (4.4 m) SE of the east edge of the south one of two east-west hedge rows that form a lane and 11.0 feet (3.4 m) SW of a 4.0 foot (1.2 m) diameter cedar tree.

BENCH MARK STAMPING: 0186 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument 130 feet (40 m) NW of the NW corner of a large white house, 24.5 feet (7.5 m) east of the walk leading to the north shoreline of Fort George Island, 16 feet (5 m) south of high ground south of the north shoreline of Fort George Island and 0.2 foot (0.1 m) below ground level.

BENCH MARK STAMPING: 0186 E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is 290 feet (88 m) west of the centerline of the drive to Kingsley Plantation, 18 feet (5 m) SW of the SW corner of the eighth slave quarter west of the drive to Kingsley Plantation, 6 feet (2 m) NW of a witness post, 5.1 feet (1.6 m) north of a 1.2 foot (0.4 m) diameter palmetto palm, 5 feet (2 m) SW of a 1.2 foot (0.4 m) diameter oak tree marked with a "X" 6 feet (2 m) above ground, and level with the ground.

PUBLICATION DATE: 11/30/87

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FLORIDA 872 0186

FORT GEORGE ISLAND, FT. GEORGE RIVER

Tidal datums at Fort George Island, Ft. George River are based on the following:

LENGTH OF SERIES	= 5 MONTHS
TIME PERIOD	= APRIL-SEPTEMBER 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (07/19/78)	=	6.73	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	5.29	FEET
MEAN HIGH WATER (MHW)	Ħ	5.00	FEET
MEAN TIDE LEVEL (MTL)	Ŧ	2.58	FEET
MEAN LOW WATER (MLW)	=	0.16	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (05/22/78)	=	-1.31	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHW</u>
FT GEORGE NO 1 RESET 1977	12.60	7.60
FT GEORGE NO 2 RESET 1977	12.96	7.96
FT GEORGE NO 3 RESET 1977	13.31	8.31
O186 A 1978	11.46	6.46
O186 E 1978	10.29	5.29

The estimated highest water level to the nearest half-foot is 8.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 06/17/93

FLORIDA 872 0196

COUNTY: DUVAL OUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

SISTERS CREEK

LATITUDE: 30°25.0'N LONGITUDE: 81°27.2'W USGS QUAD: MAYPORT NOAA CHART: 11491

To reach the tidal bench marks from Fort George Island, proceed west on Heckscher Drive to the bridge over Sisters Creek, then by boat 1.6 miles (2.6 km) north on Sisters Creek. Bench marks are located on the eastern shore of Sisters Creek. The gage was located 0.2 mile (0.3 km) NNE of Coast Guard Light No. 81, and 68.9 feet (21.0 m) west of the east shore of Sisters Creek. Tide staff was 2.8 feet (0.8 m) south of the tide gage.

To reach the tidal bench marks from Fort George Island, proceed west on Heckscher Drive to the bridge over Sisters Creek, then by boat 1.6 miles (2.6 km) north on Sisters Creek. Bench marks are located on the eastern shore of Sisters Creek. The gage was located 0.2 mile (0.3 km) NNE of Coast Guard Light No. 81, and 68.9 feet (21.0 m) west of the east shore of Sisters Creek. Tide staff was 2.8 feet (0.8 m) south of the tidegage. Coast Guard Light No. 81 (buoy no. 81) is no longer present. The bench marks are located on two small islands that rise out of the salt marsh and are covered with cedar trees.

BENCH MARK STAMPING: SHELL 1933 This Bench Mark Description Changed On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 0.35 mile (0.56 km) NNE of Coast Guard Light No. 82, 0.2 mile (0.3 km) SSE of Coast Guard Light No. 81, 0.2 mile (0.3 km) south of Bench Mark 0196 A 1977, and 196.8 feet (60.0 m) east of the east shore of Sisters Creek.

The bench mark is set in a square concrete monument, located in a semicurcular opening on a small island on the east shore of Sisters Creek 0.35 mile (0.56 km) NNE of Coast Guard Light No. 82, 0.2 mile (0.3 km) ESE of Coast Guard Light No. 81, 0.2 mile (0.3 km) south of Bench Mark 0196 A 1977, and 196.8 feet (60.0 m) east of the east shore of Sisters Creek. 81 feet (24.7 m) E of the top of the highest shell bank on the east shore of Sisters creek, 77 feet (23.5 m) S of a groupe of cedar trees, 74 feet (22.5 m) w of a group of cedar trees, 53 feet (16.15 m) N of a group of cedar trees,

PRELIMINARY DATE: 06/17/93

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FLORIDA 872 0196

SISTERS CREEK

BENCH MARK STAMPING: PERRY USE NO 1 1933 This Bench Mark Was Searched For And Not Found On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 0.15 mile (0.24 km) north of Bench Mark 0196 A 1977, 164 feet (50 m) west of the line of cedars, and 131.2 feet (40 m) from the shore line.

The bench mark is set in a concrete monument, 0.15 mile (0.24 km) north of Bench Mark 0196 A 1977, 164 feet (50 m) west of the line of cedars, and 131.2 feet (40 m) from the shore line. Sisters creek has been dredged and is much wider that when the mark was set. At the point 0.15 miles north of 0196 A 1977 a measurement of 164 feet (49.98 m) west of the cedar trees places you 55 feet (16.8 m) west of the east bank of Sisters creek in 6.0 feet (1.8 m) of water. The bench mark is presumed destroyed.

BENCH MARK STAMPING: PERRY USE NO 2 1933 This Bench Mark Was Found Destroyed On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument north of Bench Mark Perry Use NO 1 1933, 180.4 feet (55.0 m) east of the east shore of Sisters Creek, and 82 feet (25 m) west of the line of cedars.

The bench mark is set in a concrete monument north of Bench Mark Perry Use NO 1 1933, 180.4 feet (55.0 m) east of the east shore of Sisters Creek, and 82 feet (25 m) west of the line of cedars. The bench mark disk and 3 feet of the concrete post were located in a spoil pile on the east shore of Sisters creek. The mark appeared to have been dredged from the bottom of the creek as it was covered with barnacles and ostyer shells

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PRELIMINARY DATE: 06/17/93

FLORIDA 872 0196

SISTERS CREEK

BENCH MARK STAMPING: 0196 A 1977 This Bench Mark Description Changed On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 0.2 mile (0.3 km) north of Bench Mark Shell 1933, 0.2 mile (0.3 km) south of Bench Mark Perry Use No. 2 1933, 0.1 mile (0.3 km) east of Coast Guard Light No. 81, and 30 feet (9 m) east of the east shore of Sisters Creek. The bench mark is 0.3 foot (0.1 m) below ground level, crimped to the top of a copper-clad steel rod driven 48 feet (15 m), encased in a PVC pipe surrounded by concrete.

The bench mark is 0.2 mile (0.3 km) north of Bench Mark Shell 1933, 0.2 mile (0.3 km) south of Bench Mark Perry Use No. 2 1933, 0.1 mile (0.3 km) east of Coast Guard Light No. 81, and 30 feet (9 m) 0.55 miles (0.34 K) NNE of buoy number 82, 12.0 feet (3.6 m) east of the east shore of Sisters Creek and 0.5 foot (0.15 m)west of a carsonite witness post. The bench mark is 0.3 foot (0.1 m) below 2.0 feet (0.6 m) above ground level, crimped to the top of a copper-clad steel rod driven 48 feet (15 m), encased in a PVC pipe surrounded by concrete.

NOTE The mark is leaning to the west at a 15° angle. The concrete footer that protected the mark is now 1.5 feet (0.5 m) above ground level and supported by the PVC pipe.

PRELIMINARY DATE: 06/17/93

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FLORIDA 872 0196

SISTERS CREEK

Tidal datums at Sisters Creek are based on the following:

LENGTH OF SERIES	=	3 MONTHS
TIME PERIOD	Ŧ	OCTOBER-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	5.99	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.70	FEET
MEAN HIGH WATER (MHW)	=	4.48	FEET
MEAN TIDE LEVEL (MTL)	=	2.31	FEET
MEAN LOW WATER (MLW)	=	0.14	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/10/77)	Ξ	-0.86	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
SHELL 1933	5.27	0.79
PERRY USE NO 1 1933	5.45	0.97
PERRY USE NO 2 1933	5.52	1.04
** 0196 A 1977 **	5.73	1.25

The estimated highest water level to the nearest half-foot is 7.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

** 0196 A 1977 is leaning and should be used with caution.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 03/24/88

FLORIDA 872-0196

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

SISTERS CREEK

LATITUDE: 30°25.0'N LONGITUDE: 081°27.2'W NOAA CHART: 11491 USGS QUAD: MAYPORT

To reach the tidal bench marks from Fort George Island, proceed west on Heckscher Drive to the bridge over Sisters Creek, then by boat 1.6 miles (2.6 km) north on Sisters Creek. The bench marks are located on the eastern shore of Sisters Creek. The gage was located 0.2 mile (0.3 km) NNE of Coast Guard Light No. 81, and 68.9 feet (21.0 m) west of the east shore of Sisters Creek. The tide staff was 2.8 feet (0.8 m) south of the tide gage.

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BENCHMARK STAMPING: PERRY USE NO 1 1933

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 0.15 mile (0.24 km) north of bench mark 0196 A 1977, 164 feet (50 m) west of the line of cedars, and 131.2 feet (40 m) from the shoreline.

BENCHMARK STAMPING: PERRY USE NO 2 1933

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, north of reference mark PERRY USE NO 1 1933, 180.4 feet (55.0 m) east of the east shore of Sisters Creek, and 82 feet (25 m) west of the line of cedars.

BENCHMARK STAMPING: SHELL 1933

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 0.35 mile (0.56 km) NNE of Coast Guard Light No. 82, 0.2 mile (0.3 km) SSE of Coast Guard Light No. 81, 0.2 mile (0.3 km) south of bench mark 0196 A 1977, and 196.8 feet (60 m) east of the east shore of Sisters Creek.

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PUBLICATION DATE: 03/24/88

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FLORIDA 872-0196

SISTERS CREEK

BENCHMARK STAMPING: 0196 A 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 0.2 mile (0.3 km) north of triangulation station SHELL 1933, 0.2 mile (0.3 km) south of reference mark PERRY USE NO 2 1933, 0.1 mile (0.3km) east of Coast Guard Light No. 81, and 30 feet (9 m) east of the east shore of Sisters Creek. The bench mark is 0.3 foot (0.1 m) below ground level, crimped to the top of a copper-clad steel roo driven 48 feet (15 m), and encased in a PVC pipe surrounded by concrete.

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FLORIDA 872-0196

SISTERS CREEK

Tidal datums at SISTERS CREEK are based on the following:

LENGTH OF SERIES	=	3 MONTHS
TIME PERIOD	=	OCTOBER-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	5.99	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.70	FEET
MEAN HIGH WATER (MHW)	=	4.48	FEET
MEAN TIDE LEVEL (MTL)	=	2.31	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=		FEET
MEAN LOW WATER (MLW)	=	0.14	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/10/77)	=	-0.86	FEET

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN : <u>MLLW</u>	FEET ABOVE: <u>MHW</u>
PERRY USE NO 1 1933	5.45	0.97
PERRY USE NO 2 1933	5.52	1.04
SHELL 1933	5.27	0.79
0196 A 1977	5.73 [·]	1.25

The estimated highest water level to the nearest half-foot is 7.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 05/27/93

FLORIDA 872 0267

COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PABLO CREEK, INTRACOASTAL WATERWAY

LATITUDE: 30°19.4'N LONGITUDE: 081°26.3'W NOAA CHART: 11488 USGS QUAD: JACKSONVILLE BEACH

To reach the tidal bench marks from the intersection of State Highway AlA and State Highway 10 in Jacksonville, proceed west on State Highway 10 for 0.75 mile (1.21 km) to the old highway which is 75 feet (23 m) north of the new high rise bridge over the Intracoastal Waterway, proceed west on the old highway for 0.4 mile (0.6 km) to the east bank of the waterway and Capt. Johnsons Fish Camp. The bench marks are located in the area around the fish camp. The tide gage and staff were located on the fish camp pier.

> BENCHMARK STAMPING: 0267 D This Bench Mark Description Changed On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at Capt. Johnsons Fish Camp, 270 feet (82 m) NW of the centerline of Old Atlantic Boulevard, 89 feet (27 m) west of a 16-inch Cabbage Palm, 3 feet (1 m) east of the NE corner of a metal building and 1.5 feet (0.4 m) east of a witness post. The bench mark is 2.2 feet (0.7 m) above ground level, crimped to the top of a copper-clad steel rod, driven 24 feet (7 m) to refusal, and encased in a PVC pipe and concrete kickblock.

The bench mark is at Capt. Johnsons Fish Camp, 270 feet (82 m) NW of the centerline of Old Atlantic Boulevard, 89 feet (27 m) west of a 16-inch Cabbage Palm, 3 feet (1 m) east of the NE corner of a metal building and 1.5 feet (0.4 m) east of a witness post. The bench mark is $2\cdot2$ feet (0.7 m) above 1.0 foot (0.3 m) below ground level, crimped to the top of a copper-clad steel rod, driven 24 feet (7 m) to refusal, and encased in a PVC pipe and concrete kickblock. NOTE: A railroad tie retaining wall has been constructed on top of the mark. One third of the disk is accessible.

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PRELIMINARY DATE: 10/05/88

FLORIDA 872-0267

PABLO CREEK, INTRACOASTAL WATERWAY

BENCHMARK STAMPING: 3229 This Bench Mark Was Found Destroyed On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida SRD Bench Mark SETTING CLASSIFICATION: Concrete Walkway

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The bench mark is set in the top of the west end of the north concrete walkway for the State Highway 10 overpass over State Highway AlA (Mayport Road), 38 feet (12 m) west of the extended centerline of State Highway AlA (Mayport Road), 15 feet (5 m) north of the centerline of the westbound lane of State Highway 10 and 0.8 foot (0.2 m) above the level of the bridge floor.

> BENCHMARK STAMPING: BM W8 1940 This Bench Mark Was Found Destroyed On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set in the top of the south end of the east abutment for the old bridge over the Intracoastal Waterway, 17.5 feet (5.3 m) south of the centerline of the old highway, 5.8 feet (1.8 m) north of the south edge of the abutment, and 0.5 foot (0.2 m) above the level of the old highway.

BENCHMARK STAMPING: W 324 1970 This Bench Mark Was Recovered AS Described On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set on the top of the east end of the north concrete walkway for the new highrise bridge over the Intracoastal Waterway, 13.9 feet (4.2 m) north of the centerline of the westbound lane of the highway, 11.4 feet (3.5 m) west of the east end of the walkway, and 0.5 foot (0.2 m) above the level of the bridge floor.

BENCHMARK STAMPING: X 324 This Bench Mark Was Recovered AS Described On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida SRD Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set in the top of the south end of the west abutment of the old 150 foot (46 m) long bridge over the creek, east of Bench Mark BM W8 1940, 23 feet (7 m) south of the centerline of the old highway, and 1 foot (0.3 m) above the level of the bridge floor.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 10/05/88

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FLORIDA 872-0267

PABLO CREEK, INTRACOASTAL WATERWAY

TIDAL DATUMS ARE BASED ON THE FOLLOWING:

LENGTH OF SERIES	=	4 MONTHS	
TIME PERIOD	=	SEPTEMBER-DECEMBER	1977
TIDAL EPOCH	Ξ	1960-1978	
CONTROL TIDE STATION	=	MAYPORT (872 0220)	

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	5.23	FEET			
MEAN HIGHER HIGH WATER (MHHW)	=	4.16	FEET			
MEAN HIGH WATER (MHW)	=	3.97	FEET			
MEAN TIDE LEVEL (MTL)	=	2.06	FEET			
*NATIONAL GEODETIC VERTICAL DATUM-						
1929 (NGVD)	=	1.77	FEET			
MEAN LOW WATER (MLW)	=	0.15	FEET			
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET			
LOWEST OBSERVED WATER LEVEL (01/10/78)	Ħ	-1.97	FEET			

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEET <u>MLLW</u>	ABOVE: <u>MHW</u>
0267 D	5.36	1.39
BM W8 1940	15.97	12.00
W 324 1970 X 324	15.74 10.34	11.77 6.37

The estimated highest water level to the nearest half-foot is 7.00 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).


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PUBLICATION DATE: 12/28/87

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FLORIDA 872-0267

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PABLO CREEK, INTRACOASTAL WATERWAY

LATITUDE: 30°19.4'N LONGITUDE: 081°26.3'W NOAA CHART: 11488 USGS QUAD: JACKSONVILLE BEACH

To reach the tidal bench marks from the intersection of State Highway AlA and State Highway 10 in Jacksonville, proceed west on State Highway 10 for 0.75 mile (1.21 km) to the old highway which is 75 feet (23 m) north of the new high rise bridge over the Intracoastal Waterway, proceed west on the old highway 0.4 mile (0.6 km) to the east bank of the waterway and Capt. Johnsons Fish Camp. The bench marks are located in the area around the fish camp. The tide gage and staff were located on the fish camp pier.

BENCHMARK STAMPING: 0267 D

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at Capt. Johnsons Fish Camp, 270 feet (82 m) NW of the centerline of Old Atlantic Boulevard, 89 feet (27 m) west of a 16-inch Cabbage Palm, 3 feet (1 m) east of the NE corner of a metal building and 1.5 feet (0.4 m) east of a witness post. The bench mark is 2.2 feet (0.7 m) above ground level, crimped to the top of a copper-clad steel rod, driven 24 feet (7 m) to refusal, and encased in a PVC pipe and concrete kickblock.

BENCHMARK STAMPING: 3229

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida SRD Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set in the top of the west end of the north concrete walkway for the State Highway 10 overpass over State Highway AlA (Mayport Road), 38 feet (12 m) west of the extended centerline of State Highway AlA (Mayport Road), 15 feet (5 m) north of the centerline of the westbound lane of State Highway 10 and 0.8 foot (0.2 m) above the level of the bridge floor.

BENCHMARK STAMPING: BM W8 1940

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set in the top of the south end of the east abutment for the old bridge over the Intracoastal Waterway, 17.5 feet (5.3 m) south of the centerline of the old highway, 5.8 feet (1.8 m) north of the south edge of the abutment, and 0.5 foot (0.2 m) above the level of the old highway.

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FLORIDA 872-0267

PABLO CREEK, INTRACOASTAL WATERWAY

BENCHMARK STAMPING: X 324

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida SRD Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set in the top of the south end of the west abutment of the old 150 foot (46 m) long bridge over the creek, east of Bench Mark BM W8 1940, 23 feet (7 m) south of the centerline of the old highway, and 1 foot (0.3 m) above the level of the bridge floor.

BENCHMARK STAMPING: W 324 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Walkway

The bench mark is set on the top of the east end of the north concrete walkway for the new highrise bridge over the Intracoastal Waterway, 13.9 feet (4.2 m) north of the centerline of the westbound lane of the highway, 11.4 feet (3.5 m) west of the east end of the walkway, and 0.5 foot (0.2 m) above the level of the bridge floor.

PUBLICATION DATE: 12/28/87

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FLORIDA 872-0267

PABLO CREEK, INTRACOASTAL WATERWAY

Tidal datums at PABLO CREEK, INTRACOASTAL WATERWAY are based on the following:

= 4 MONTHS
= SEPTEMBER-DECEMBER 1977
= 1960-1978
= MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/13/77)	=	5.23	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.16	FEET
MEAN HIGH WATER (MHW)	=	3.97	FEET
MEAN TIDE LEVEL (MTL)	=	2.06	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	1.77	FEET
MEAN LOW WATER (MLW)	=	0.15	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/10/78)	=	-1.97	FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1978.

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION <u>MLLW</u>	IN	FEET	ABOVE: <u>MHW</u>
0267 D 3229 BM W8 1940 X 324	5.36 33.93 15.97 10.34	;		1.39 29.96 12.00 6.37
W 324 1970	15.74			11.77

The estimated highest water level to the nearest half-foot is 7.00 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 01/27/93

FLORIDA 872 0305 COUNTY: DUVAL QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

OAK LANDING, INTRACOASTAL WATERWAY

LATITUDE: 30°15.2'N LONGITUDE: 081°25.8'W NOAA CHART: 11488 USGS QUAD: JACKSONVILLE BEACH

To reach the tidal bench marks from the intersection of U.S. Highway 90 (Beach Boulevard) and U.S. Highway AlA in Jacksonville Beach, proceed 2.75 miles (4.43 km) west along U.S. Highway 90 to the intersection with San Pablo Road, then 2.3 miles (3.7 km) south along San Pablo Road to its intersection with a dirt road, proceed east along the dirt road for 0.4 mile (0.6 km) to the dirt drive leading to the residence #4933. The bench marks are located along San Pablo Road and in the vicinity of residence #4933. The tide gage and staff were located at the east end of the dock behind the residence #4933.

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BENCHMARK STAMPING: 0305 A 1978 This Bench Mark Description Changed On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: -Concrete Foundation Concrete Pad

The bench mark is set flush in the top of a concrete foundation, 72.6 feet (22.1 m) SE of the SE corner of a concrete swimming pool, 44 feet (13 m) west of the west shoreline of the Intracoastal Waterway, 42 feet (13 m) west of a wooden dock, 31 feet (9 m) south of a large oak tree south of the swimming pool, and at ground level.

The bench mark is set flush in the top of a concrete foundation an irregular concrete pad, 72.6 feet (22.1 m) SE of the SE corner of a concrete swimming pool, 44 feet (13 m) west of the west shoreline of the Intracoastal Waterway, 42 feet (13 m) west of a wooden dock, 31 feet (9 m) south of a large oak tree south of the swimming pool, and at ground level.

NOTE: The swimming pool has been filled with dirt and is now used as a planter.

BENCHMARK STAMPING: 0305 B 1978 This Bench Mark Was Recovered AS Described On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument, 0.3 mile (0.5 km) west of bench mark 0305 A 1978, 552 feet (168 m) south of bench mark 0305 C 1978, 34 feet (10 m) south of the dirt drive leading to the gage, 32 feet (10 m) east of the centerline of the dirt road, 1 foot (0.3 m) north of a witness post, and at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

Page 2 of 3

FLORIDA 872-0305

OAK LANDING, INTRACOASTAL WATERWAY

BENCHMARK STAMPING: 0305 C 1978 This Bench Mark Description Changed On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument, 0.2 mile (0.3 km) SE of bench mark 0305 D 1978, 25 feet (8 m) west of the centerline of the dirt road, 2 feet (1 m) east of a witness post, and at ground level.

The bench mark is set flush in the top of a concrete monument, 0.2 mile (0.3 km) SE of bench mark 0305 D 1978, <u>76 feet south of the extended center line of the private</u> drive at number 5031 Dixie Landing Road, 44.5 southwest of the southwest corner of a 3 foot by 12 foot (1 m by 3.6 m) concrete pad located on the east side of Dixie Landing Road, 25 feet (8 m) west of the centerline of the dirt road, 2 feet (1 m) east of a witness post, and at ground level.

BENCHMARK STAMPING: 0305 D 1978 This Bench Mark Was Recovered AS Described On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in top of a concrete monument, 0.2 mile (0.3 km) south of bench mark 0305 E 1978, 60 feet (18 m) SW of the intersection of San Pablo Road and the dirt road leading easterly, 57 feet (17 m) west of the centerline of San Pablo Road, 2.4 feet (0.7 m) east of the fence line, 1 foot (0.3 m) east of a witness post, and 0.1 foot (0.3 m) below the level of San Pablo Road.

BENCHMARK STAMPING: 0305 E 1978 This Bench Mark Was Recovered AS Described On 01/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument, 55 feet (17 m) east of the centerline of San Pablo Road, 17.6 feet (5.4 m) west of a concrete utility pole, 1 foot (0.3 m) west of a witness post, and at ground level.

The bench mark is set flush in the top of a concrete monument, 55 feet (17 m) east of the centerline of San Pablo Road, 17.6 feet (5.4 m) west of a concrete utility pole, <u>5.8 feet (1.8 m) northwest of an electrcal box</u>, 1 foot (0.3 m) west of a witness post, and at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 01/27/93

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FLORIDA 872-0305

OAK LANDING, INTRACOASTAL WATERWAY

TIDAL DATUMS ARE BASED ON THE FOLLOWING:

LENGTH OF SERIES	æ	2 MONTHS
TIME PERIOD	E	SEPTEMBER, NOVEMBER 1978
TIDAL EPOCH		1960-1978
CONTROL TIDE STATION	E	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	5.87 FEET
MEAN HIGHER HIGH WATER (MHHW)	Ħ	4.43 FEET
MEAN HIGH WATER (MHW)	=	4.23 FEET
MEAN TIDE LEVEL (MTL)	=	2.20 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	1.90' FEET
MEAN LOW WATER (MLW)	=	0.16 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (09/01/78)	=	-0.40 FEET

Bench mark elevation information:

	ELEVATION IN FEET	ABOVE:
BENCHMARK STAMPING	MLLW	MHW
0305 A 1978	10.78	6.55
0305 B 1978 0305 C 1978	13.58	9.35 9.19
0305 D 1978	15.21	10.98
0305 E 1978	15.73	11.50

The estimated highest water level to the nearest half-foot is 7.00 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PUBLICATION DATE: 02/05/87

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FLORIDA 872-0305

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

OAK LANDING, INTRACOASTAL WATERWAY

LATITUDE: 30°15.2'N LONGITUDE: 081°25.8'W NOAA CHART: 11488 USGS QUAD: JACKSONVILLE BEACH

To reach the tidal bench marks from the intersection of U.S. Highway 90 (Beach Boulevard) and U.S. Highway AlA in Jacksonville Beach, proceed 2.75 miles (4.43 km) west along U.S. Highway 90 to the intersection with San Pablo Road, then 2.3 miles (3.7 km) south along San Pablo Road to its intersection with a dirt road, proceed east along the dirt road for 0.4 mile (0.6 km) to the dirt drive leading to the residence #4933. The bench marks are located along San Pablo Road and in the vicinity of residence #4933. The tide gage and staff were located at the east end of the dock behind the residence #4933.

BENCHMARK STAMPING: 0305 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set flush in the top of a concrete foundation, 72.6 feet (22.1 m) SE of the SE corner of a concrete swimming pool, 44 feet (13 m) west of the west shoreline of the Intracoastal Waterway, 42 feet (13 m) west of a wooden dock, 31 feet (9 m) south of a large oak tree south of the swimming pool, and at ground level.

BENCHMARK STAMPING: 0305 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument, 0.3 mile (0.5 km) west of bench mark 0305 A 1978, 552 feet (168 m) south of bench mark 0305 C 1978, 34 feet (10 m) south of the dirt drive leading to the gage, 32 feet (10 m) east of the centerline of the dirt road, 1 foot (0.3 m) north of a witness post, and at ground level.

BENCHMARK STAMPING: 0305 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument, 0.2 mile (0.3 km) SE of bench mark 0305 D 1978, 25 feet (8 m) west of the centerline of the dirt road, 2 feet (1 m) east of a witness post, and at ground level.

FLORIDA 872-0305

OAK LANDING, INTRACOASTAL WATERWAY

BENCHMARK STAMPING: 0305 D 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in top of a concrete monument, 0.2 mile (0.3 km) south of bench mark 0305 E 1978, 60 feet (18 m) SW of the intersection of San Pablo Road and the dirt road leading easterly, 57 feet (17 m) west of the centerline of San Pablo Road, 2.4 feet (0.7 m) east of the fence line, 1 foot (0.3 m) east of a witness post, and 0.1 foot (0.3 m) below the level of San Pablo Road.

BENCHMARK STAMPING: 0305 E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument, 55 feet (17 m) east of the centerline of San Pablo Road, 17.6 feet (5.4 m) west of a concrete utility pole, 1 foot (0.3 m) west of a witness post, and at ground level.

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PUBLICATION DATE: 02/05/87

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FLORIDA 872-0305

OAK LANDING, INTRACOASTAL WATERWAY

Tidal datums at OAK LANDING, INTRACOASTAL WATERWAY are based on the following:

LENGTH OF SERIES $= 2 M$	NONTHS
TIME PERIOD = SEP	PTEMBER, NOVEMBER 1978
TIDAL EPOCH = 196	50-1978
CONTROL TIDE STATION = MAY	(PORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	5.87	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.43	FEET
MEAN HIGH WATER (MHW)	=	4.23	FEET
MEAN TIDE LEVEL (MTL)	= `	2.20	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	Ξ		FEET
MEAN LOW WATER (MLW)	=	0.16	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (09/01/78)	=	-0.40	FEET

Bench mark elevation information:

ELEVATION IN FE MLLW	ET ABOVE: MHW
10.78	6.55
13.58	9.35
13.42	9.19
15.21	10.98
15.73	11.50
	ELEVATION IN FE MLLW 10.78 13.58 13.42 15.21 15.73

The estimated highest water level to the nearest half-foot is 7.00 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet below mean lower low

water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source	<u> </u>	NOAA/NOS	Jacksonville Electric Authority	FDEP/ BSM
b.	Туре		Horizontal/ Vertical	Horizontal/ Vertical	Mean High Water Files
c.	Cost		None	None	None
d.	Availability	<u> </u>	Silver Springs Maryland	Jacksonville	Tallahassee
e.	Format		ASCII	Arc Info	Hard copy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

Description/Bank_	River Mile <u>Location</u>	Description/Bound	River <u>Mile</u>
Mayport Basin	0.5 L	Dame Point Fulton Cutoff/Begin	7.0
Fort George Inlet	0.8 L	Clapboard Creek	7.9* L
Shad Creek	2.0 L	Browns Creek	9.4* L
Pablo Creek	3.3 R	Nichols Creek	10.4*
Chicopit Bay	4.0 R	San Carlos	10.4*
Intercoastal Waterway	4.1 R	Shipyard Creek	7.1 R
Sisters Creek	4.5 L	Back'River	7.6 L
Hannah Mills Creek	5.4 L	Unnamed Mill Cove Access	9.1 R
St. John Creek	6.2 R		

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

*Dame Point Fulton Cut-off - Alternative Stationing

R-1.90

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LOWER ST. JOHNS RIVER EXISTING WATER LEVEL

SCALE 1 + 100.000 1" . 1.6 MILES (APPROX.)

1.0 ML

MEASUREMENT NETWORK

REACH ONE



R-1.91

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach One an experienced two person reconnaissance crew would require approximately 5 days to perform the task at an estimated cost of \$2,000.

In this reach the strength of existing survey control network for horizontal is fair, vertical is good. Reconnaissance surveys are expected to recover 55-60 existing survey control points, therefore no additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately eleven days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach One.

LOCATION	EXISTING		a	RECO	MMEND	ED	
Reach/Node/Side	A (872) (V)	ы) (Н)	(V)	U (V)	(H)	r (Tid	al)
1 / A / B _.	0 a	a	0	0	0	0	0
1 / B / B	0220 a 0232	a	0	0	0	1 1	0 0
1 / C / B	0 a	a	0	0	0	0	0
1 / D / B	0198 a 0221	a	0	0	0	1 1	0 1
1 / E / B	0203 a	a	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>
		Total	0	0	0	5	2

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

- A. Tide Station Number
- B. Control Point Analysis (n) none, (p) poor, (m) marginal,(a) adequate
- C. River crossing, monumentation, documentation
- D. NAVD 1988 ties, monumentation, documentation (miles)
- E. GPS point and azimuth mark to be set, observed, adjusted
- F. GPS point and azimuth mark to be set at tide station
- G. Additional bench mark(s) to be set, leveled, documented R-1.92

COST ESTIMATE

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

ŘEACH ONE									
Cost/unit	(Nu A	mber B	of C	tasks D	to E	be	perf F	orme G	ed) Total
\$2,000/pair	6								\$12,000
\$ 500/mark		2							1,000
\$2,000/crossi	ng		0						0
\$1,000/mile				0					0
\$2,000/pair					0				0
\$2,000/pair							5		10,000
\$ 500/mark								2	1,000
									Total \$24,000

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Vicinity Tide Station; GPS point/azimuth mark Vicinity Tide Station; set additional tidal bench mark Β.

River crossing - vertical control NAVD 1988 tie - vertical control С.

D.

Ε.

F.

GPS point/azimuth mark - horizontal control Main Stem Tide Station; GPS point/azimuth mark Main Stem Tide Station; set additional tidal bench mark G.

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LOWER ST. JOHNS RIVER EXISTING HORIZONTAL CONTROL SURVEY NETWORK INVENTORY



- 1 . 1.6 MILES (APPROX.)
- . A CONTROL POINT-TRIANGULATION (NOS)

 - CONTROL POINT-GPS (NOS)
 - CONTROL POINT-GPS (GEONEX / SJRWMD)
 - RIVER MILE
 - ST. JOHNS RIVER (MAIN STEM)

REACH ONE MILE 0.0 TO 10.0



LOWER ST. JOHNS RIVER EXISTING VERTICAL CONTROL SURVEY NETWORK INVENTORY

SCALE 1 · 100,000 1" • 16 MILES (APPROX.)

LO MIL

* CONTROL POINT (NOS or FDEP)



RIVER MILE



ST. JOHNS RIVER (MAIN STEM)

REACH ONE MILE 0.0 TO 10.0

REACH TWO

RIVER MILE 10.1 TO RIVER MILE 20.0





USGS Quad Sheets:	LOWER ST. JOHNS RIVER
Eastport,	MAIN STEM
Trout River	REACH TWO ABSTRACT
	MILE 10.1 TO MILE 20.0

Task'1: Readily Available Tidal Data:

HISTORIC NOTE

Senate Ex. Doc. No. 61, February 14, 1890, provides Corps of Engineers condition report: "Jacksonville (River Mile 20.0*) to Dame's Point (River Mile 10.0): Total distance, 12.25 miles; average channel width between 15 feet contours, 1,250 feet: minimum channel width, 500 feet; minimum mid channel depth, 20 feet" Additionally; House Document No. 493, January 29, 1912, states ". . . the range of tide varies from 1.6 feet at Trout Creek (River Mile 15+/-) to about 0.9 foot at Jacksonville (River Mile 23 +/-).

William T. Rossell, Colonel, Corps of Engineers, Senior Member of the Board of Engineers for Rivers and Harbors, see House of Representatives Document 281, December 12, 1911, discussed the General Governments' decisions to make Jacksonville a seaport and the cost incurred to date:

"--- about \$4,000,000 in creating a channel 24 feet in depth to that city, situated 27.5 miles inland from the ocean and by the act of June 25, 1910 has adopted an enlarged project which provides for a depth of 30 feet at an additional cost of \$2,852,000, which with the cost of rock excavation within the harbor proper in order that deep draft vessels could better approach the wharves, makes the total expenditures made and contemplated approximately \$7,000,000"

Thus ending the bid by local parties to make Palatka a future seaport.

*modern river mileage system added for location purposes

MAIN STEM REACH TWO Continued

•				•
Station No. Name	River Mile Location	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y
872 0244 Mill Cove	10.5 Right Bank	872 0220 Mayport	6	9/77 1/78
872 0219 Dame Point	11.0 Left Bank	872 0220 Mayport	5	9/77 1/78
872 0222 Chaseville	14.8 Right Bank	872 0220 Mayport	1.6	11/58 12/58
872 0215 Jacksonville Navy Fuel Depot	15.1 Left Bank	872 0220 Mayport	4	9/77 12/77
872 0225 Phoenix Park	16.1 Left Bank	872 0220 Mayport	5	9/77 1/78
872 0242 Long Branch	18.2 Left Bank	872 0220 Mayport	168	1954 1. /

EXISTING	NOAA/NOS	TIDE	STATIONS

Station No.	Elevat	ion (Feet, N	Mean Range	Tidal Bench		
	MHW	MTL	MLW	(Feet)	Marks Fd/Reqd.	
872 0244	2.05	-	; _	-	8/0	
872 0219	2.03	0.44	-1.16	3.19	3/2	
872 0222	-	-	-	2.30	0/0	
872 0215	1.86	0.55	-0.77	2.63	5/0	
872 0225	1.83	0.56	-0.71	2.54	5/0	
872 0242	1.78	0.74	-0.30	2.08	7/0	

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MAIN STEM REACH TWO Continued

STRENGTH OF EXISTING SURVEY CONTROL NETWORK Type/Order Control Stations/ Mile Weak Strong Horizontal 2.1 Portical 2.1 Vertical 3.9 1st/2nd 5.1

MISCELLANEOUS

The current range of tide at Trout River (River Mile 15.5) is 2.54 feet and at Jacksonville (River Mile 23.2) is 1.51 feet a difference of 0.9 feet and 0.6 feet respectively from values published in the above referenced Corps report. NOS letter of July 5, 1977 to U.S. COE agrees with an annual sea level increase of 0.007 feet at Mayport. Using this analysis the 1850 sea level was 1.00 foot lower than in 1993.

The U.S. Army Corps of Engineers Dredge Depot is located at River Mile <u>18.3</u>. Dames Point Expressway State Highway 9A crosses the St. John River at River Mile 10.4.

A copy of each Main Stem (1)<u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

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PRELIMINARY DATE 05/28/93

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FLORIDA 872 0244

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

MILL COVE, ST. JOHNS RIVER

LATITUDE: 30°22.2'N LONGITUDE: 81°33.5'W NOAA CHART: 11488 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of Monument Road and Fort Caroline Road proceed 5.0 miles (8.0 km) west along Fort Caroline Road to a dirt drive leading north, then 0.2 mile (0.3 km) along the drive to the residence at 8831 Fort Caroline Road. The bench marks are located along Fort Caroline Road. The tide gage and staff were located on the dock behind the residence at 8831 Fort Caroline Road.

BENCH MARK STAMPING: NO 4 1952 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Pipe

The bench mark is set in top of a 8-inch tile pipe filled with concrete on south shore of Mill Cove at the north end of Saye Drive (0.1 mile (0.2 km) west of Fort Caroline Road from the intersection of Fort Caroline and Merrill Roads), 92.5 feet (28.2 m) ENE of the NE corner of Saye's house, 29 feet (9 m) east of centerline of a path, 10 feet (3 m) NE of the NE side of a 2-foot (1 m) diameter oak tree, 4 feet (1 m) west of a wire fence, and 0.2 foot (0.1 m) above ground.

BENCH MARK STAMPING: 1 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the bridge curb on the NE edge of the bridge which is 0.5 mile (0.8 km) east on Fort Caroline Road from the intersection of Merrill Road and Fort Caroline Road, 1 foot (0.3 m) from the east end of the curb, and 0.5 foot (0.2 m) above road level.

The bench mark is set in the bridge curb on the NE edge of the bridge <u>over Ginhouse</u> <u>Creek</u> which is 0.5 mile (0.8 km) east on Fort Caroline Road from the intersection of Merrill Road and Fort Caroline Road, 1 foot (0.3 m) from the east end of the curb, and 0.5 foot (0.2 m) above road level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

BENCH MARK STAMPING: 2 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the bridge curb on the SW end of the bridge which is 0.5 mile (0.8 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the west end of the curb and 0.5 foot (0.2 m) above road level.

The bench mark is set in the bridge curb on the SW end of the bridge <u>over Ginhouse</u> <u>creek</u> which is 0.5 mile (0.8 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the west end of the curb and 0.5 foot (0.2 m) above road level.

BENCH MARK STAMPING: 3 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the bridge curb on the NE end of the bridge which is 0.15 mile (0.24 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the east end of the curb, and 0.5 foot (0.2 m) above road level.

The bench mark is set in the <u>northwest</u> bridge curb on the NE end of the bridge <u>over</u> <u>Ginhouse Creek</u> which is 0.15 mile (0.24 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the east end of the curb, and 0.5 foot (0.2 m) above road level.

BENCH MARK STAMPING: 4 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the bridge curb on the SW end of the bridge which is 0.15 mile (0.24 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the west end of the curb, and 0.5 foot (0.2 m) above road level.

The bench mark is set in the <u>southeast</u> bridge curb on the SW end of the bridge <u>over</u> <u>Ginhouse Creek</u> which is 0.15 mile (0.24 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the west end of the curb, and 0.5 foot (0.2 m) above road level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

BENCH MARK STAMPING: 0244 D 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Shallow Set Metal Rod

The bench mark is set atop a metal rod encased in concrete, 105.5 feet (32.2 m) NE of the NE corner of a frame house at 8331 Fort Caroline Road, 60.5 feet (18.4 m) east of a 4.5 foot (1.4 m) diameter live oak, 6.5 feet (2.0 m) west of a metal frame fence running north and south, 1.5 feet (0.5 m) west of a witness post and 0.2 foot (0.1 m) above ground level. 918

The bench mark is set atop a metal rod encased in concrete, 105.5 feet (32.2 m) NE of the NE corner of a frame house at 8331 Fort Caroline Road, 60.5 feet (18.4 m) east of a 4.5 foot (1.4 m) diameter live oak, 6.5 feet (2.0 m) west of a metal frame chain link fence running north and south, 1.5 feet (0.5 m) west of a witness post and 0.2 foot (0.1 m) above ground level. 918

BENCH MARK STAMPING: 0224 E 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at 8331 Fort Caroline Road, 67 feet (20 m) north of the centerline of Fort Caroline Road, 7.5 feet (2.3 m) north of an old asphalt road leading east of Fort Caroline Road, and 1 foot (0.3 m) south of a witness post. The bench marks is 2 feet (1 m) below the centerline of Fort Caroline Road, crimped to a copper-clad steel rod driven 16 feet (5 m) to refusal and encased in a 4-inch PVC pipe and concrete kickblock.

The bench mark is 0.5 miles (0.8 k) northwest along Fort Caroline Road from the Dames Point bridge overpass at 8331 8335 Fort Caroline Road, 67 feet (20 m) north of the centerline of Fort Caroline Road, 7.5 feet (2.3 m) north of an old asphalt road leading east of Fort Caroline Road, 7.4 south-southwest of a wooden poer pole, and 1 foot (0.3 m) south of a witness post. The bench marks is 2 feet (1 m) below the centerline of Fort Caroline Road, crimped to a copper-clad steel rod driven 16 feet (5 m) to refusal, encased in a 4-inch PVC pipe and concrete kickblock and 0.1 ft (0.07 m) below the level of the ground.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

BENCH MARK STAMPING: 0244 F 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Rod

The bench mark is about 4.15 mile (6.68 km) west 0.35 miles southeast along Fort Caroline Road from the Dames Point bridge overpass the intersection of Merrill and Fort Caroline roads, 24.5 feet (7.5 m) SW of the centerline of Fort Caroline Road, 24 feet (7 m) NE of the corner of a chain link fence, 3.5 feet (1.1 m) ENE of power pole #20, 10.3 ft (3.14 m) east -northeast of concrete power pole number F65T, 1 foot (0.3 m) ENE of a witness post southwest of a metal, witness sign, 1.0 ft (0.3 m) northeast of a carsonite witness post and 0.1 ft (0.3 m) below the level of the ground. The bench marks is level with the ground, crimped to a copper-clad steel rod driven 16 feet (5 m) to refusal, and encased in a 4-inch PVC pipe and a concrete kickblock.

BENCH MARK STAMPING: G.M.C. 1 1977 FL CLB This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in top of a concrete monument 2.1 miles (3.4 km) SW along Fort Caroline Road from the intersection of Monument and Fort Caroline Roads, 300 feet (91 m) SW of a Seven-Eleven convenience store, 25.5 feet (7.8 m) NW of centerline of Fort Caroline Road, 16 feet 95 m) south of 1.2 foot (0.4 m) diameter cabbage palm, 7.5 feet (2.3 m) east of a 2 foot (1 m) diameter live oak, and 1.5 feet (0.5 m) SE of a witness post, and 1 foot (0.3 m) below the centerline of Fort Caroline Road.

The bench mark is set in top of a concrete monument 2.1 miles (3.4 km) SW along Fort Caroline Road from the intersection of Monument and Fort Caroline Roads, <u>near the "Y"</u> <u>intersection of Fort Caroline Road and McCormick Road</u>, 300 feet (91 m) SW of a Seven-Eleven convenience store, 25.5 feet (7.8 m) NW of centerline of Fort Caroline Road, 16 feet 95 m) south of 1.2 foot (0.4 m) diameter cabbage palm, 7.5 feet (2.3 m) east of a 2 foot (1 m) diameter live oak, and 1.5 feet (0.5 m) SE of a witness post <u>1.0 foot (0.3 m) south-southeast of a carsonite witness post</u>, and 1 foot (0.3 m) below the centerline of Fort Caroline Road.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

Tidal datums at Mill Cove, St. Johns River are based on the following:

LENGTH OF SERIES	×	6 MONTHS
TIME PERIOD	=	SEPTEMBER 1977-MARCH 1978
TIDAL EPOCH	=	1960-1 978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean high water (MHW) are as follows:

HIGHEST OBSERVED WATER LEVEL (03/09/78)	. =	1.05	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.14	FEET
MEAN HIGH WATER (MHW)	=	0.00	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-2.04	FEET

*NGVD reference based on adjustment of 8/77 and NOS levels of 1977.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

<u>MHW</u>

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NO 4 1952	22.17
1 1977	3.94
2 1977	3.97
3 1977	8.23
4 1977 .	7.12
0244 D 1977	8.33
0244 E 1977	19.52
0244 F 1977	31.71
G.M.C. 1 1977 FL CLB	30.49

NOTE: The datums were computed by the NOS Direct Method due to flat low waters.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 11/23/87

FLORIDA 872 0244

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

MILL COVE, ST. JOHNS RIVER

LATITUDE: 30°22.2'N LONGITUDE: 81°33.5'W NOAA CHART: 11488 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of Monument Road and Fort Caroline Road proceed 5.0 miles (8.0 km) west along Fort Caroline Road to a dirt drive leading north, then 0.2 mile (0.3 km) along the drive to the residence at 8831 Fort Caroline Road. The bench marks are located along Fort Caroline Road. The tide gage and staff were located on the dock behind the residence at 8831 Fort Caroline Road.

BENCH MARK STAMPING: NO 4 1952

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Pipe

The bench mark is set in top of a 8-inch tile pipe filled with concrete on south shore of Mill Cove at the north end of Saye Drive (0.1 mile (0.2 km) west of Fort Caroline Road from the intersection of Fort Caroline and Merrill Roads), 92.5 feet (28.2 m) ENE of the NE corner of Saye's house, 29 feet (9 m) east of centerline of a path, 10 feet (3 m) NE of the NE side of a 2-foot (1 m) diameter oak tree, 4 feet (1 m) west of a wire fence, and 0.2 foot (0.1 m) above ground.

BENCH MARK STAMPING: 1 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the bridge curb on the NE edge of the bridge which is 0.5 mile (0.8 km) east on Fort Caroline Road from the intersection of Merrill Road and Fort Caroline Road, 1 foot (0.3 m) from the east end of the curb, and 0.5 foot (0.2 m) above road level.

PUBLICATION DATE: 11/23/87

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

BENCH MARK STAMPING: 2 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the bridge curb on the SW end of the bridge which is 0.5 mile (0.8 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the west end of the curb and 0.5 foot (0.2 m) above road level.

BENCH MARK STAMPING: 3 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the bridge curb on the NE end of the bridge which is 0.15 mile (0.24 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the east end of the curb, and 0.5 foot (0.2 m) above road level.

BENCH MARK STAMPING: 4 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: City of Jacksonville Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the bridge curb on the SW end of the bridge which is 0.15 mile (0.24 km) east on Fort Caroline Road from the intersection of Merrill and Fort Caroline Roads, 1 foot (0.3 m) from the west end of the curb, and 0.5 foot (0.2 m) above road level.

BENCH MARK STAMPING: 0244 D 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Shallow Set Metal Rod

The bench mark is set atop a metal rod encased in concrete, 105.5 feet (32.2 m) NE of the NE corner of a frame house at 8331 Fort Caroline Road, 60.5 feet (18.4 m) east of a 4.5 foot (1.4 m) diameter live oak, 6.5 feet (2.0 m) west of a metal frame fence running north and south, 1.5 feet (0.5 m) west of a witness post and 0.2 foot (0.1 m) above ground level. 918

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

BENCH MARK STAMPING: 0224 E 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at 8331 Fort Caroline Road, 67 feet (20 m) north of the centerline of Fort Caroline Road, 7.5 feet (2.3 m) north of an old asphalt road leading east of Fort Caroline Road, and 1 foot (0.3 m) south of a witness post. The bench marks is 2 feet (1 m) below the centerline of Fort Caroline Road, crimped to a copper-clad steel rod driven 16 feet (5 m) to refusal and encased in a 4-inch PVC pipe and concrete kickblock.

BENCH MARK STAMPING: 0244 F 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Rod

The bench mark is about 4.15 mile (6.68 km) west along Fort Caroline Road from the intersection of Merrill and Fort Caroline roads, 24.5 feet (7.5 m) SW of the centerline of Fort Caroline Road, 24 feet (7 m) NE of the corner of a chain link fence, 3.5 feet (1.1 m) ENE of power pole #20, and 1 foot (0.3 m) ENE of a witness post. The bench marks is level with the ground, crimped to a copper-clad steel rod driven 16 feet (5 m) to refusal, and encased in a 4-inch PVC pipe and a concrete kickblock.

BENCH MARK STAMPING: G.M.C. 1 1977 FL CLB

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in top of a concrete monument 2.1 miles (3.4 km) SW along Fort Caroline Road from the intersection of Monument and Fort Caroline Roads, 300 feet (91 m) SW of a Seven-Eleven convenience store, 25.5 feet (7.8 m) NW of centerline of Fort Caroline Road, 16 feet 95 m) south of 1.2 foot (0.4 m) diameter cabbage palm, 7.5 feet (2.3 m) east of a 2 foot (1 m) diameter live oak, and 1.5 feet (0.5 m) SE of a witness post, and 1 foot (0.3 m) below the centerline of Fort Caroline Road.

PUBLICATION DATE: 11/23/87

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FLORIDA 872 0244

MILL COVE, ST. JOHNS RIVER

Tidal datums at Mill Cove, St. Johns River are based on the following:

LENGTH OF SERIES	= 6 MONTHS
TIME PERIOD	= SEPTEMBER 1977-MARCH 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= MAYPORT (872 0220)

Elevations of tidal datums referred to mean high water (MHW) are as follows:

HIGHEST OBSERVED WATER LEVEL (03/09/78)	=	1.05	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	0.14	FEET	
MEAN HIGH WATER (MHW)	=	0.00	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	=	-2.04	FEET	•

*NGVD reference based on adjustment of 8/77 and NOS levels of 1977.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	<u>MHW</u>
NO 4 1952 2 1 1977 2 2 1977 3 3 1977 4 4 1977 0 0244 D 1977 0 0244 E 1977 1 0244 F 1977 3 0244 F 1977 3	22.17 3.94 3.97 8.23 7.12 8.33 19.52 31.71

NOTE: The datums were computed by the NOS Direct Method due to flat low waters.

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PRELIMINARY DATE: 05/12/93

FLORIDA 872 0219

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPINGNATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

DAME POINT, ST. JOHNS RIVER

LATITUDE: 30°23.5'N LONGITUDE: 81°33.9'W NOAA CHART: 11488 USGS QUAD: EASTPORT

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Heckscher Drive (County Road 105) in Jacksonville, proceed east on Heckscher Drive for 4.68 miles (7.53 km) (over the Dunn Creek bridge) to August Drive, then SE along August Drive for 1.6 miles (2.6 km) to the residence at 9050 August Drive. The bench marks are located on the bridge, along Heckscher Drive, Dame Point Road, and August Drive. The tide gage and staff were located on a dock at 9050 August Drive.

BENCH MARK STAMPING: H 325 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida SRD Bench Mark SETTING CLASSIFICATION: Concrete Sidewalk

The bench mark is set in the top of the east end of the north concrete sidewalk of the County Road 105 bridge over Dunn Creek, 17.8 feet (5.4 m) north of the centerline of the highway, 0.8 foot (0.2 m) west of the east end of the sidewalk, 0.3 foot (0.1 m) south of the south face of the north concrete guardrail of the bridge, and 1 foot (0.3 m) above the highway level.

BENCH MARK STAMPING: J 325 1970 This Bench Mark Was Searched For And Not Found On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument along County Road 105, about 0.6 mile (1.0 km) east of the east end of the County Road 105 bridge over Dunn Creek,93 feet (28 m) south of the SE corner of Heckscher Drive Baptist Church, 56 feet (17 m) west of the centerline of the entrance drive to the church, 43 feet (13 m) north of the centerline of the highway, 9.5 feet (2.9 m) of the west end of a 12-inch pipe culvert under the driveway, and 0.2 foot (0.1 m) above the ground.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0219

DAME POINT, ST. JOHNS RIVER

BENCH MARK STAMPING: 0219 D This Bench Mark Description Changed On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at the intersection of Dame Point Road and August Drive about 1.6 miles (2.6 km) south of Heckscher Drive (County Road 105), 76.6 feet (23.3 m) east of a cabbage palm, 56.1 feet (17.1 m) NW of power pole #30, and 34.5 feet (10.5 m) west of the centerline of Dame Point Road. The bench mark is 1 foot (0.3 m) below Dame Point Road level, crimped to a copper-clad steel rod driven 28 feet (9 m) to refusal and encased by a concrete kickblock.

The bench mark is at the intersection of Dame Point Road and August Drive about 1.6 miles (2.6 km) south of Heckscher Drive (County Road 105), 76.6 feet (23.3 m) east of a cabbage palm, 56.1 feet (17.1 m) NW of power pole #30, 51.1 feet (15.6 m) NNW of concrete power pole number 80 T, and 34.5 feet (10.5 m) 33.5 feet (10.2 m) west of the centerline of Dame Point Road, 28.2 feet (8.6 m) N of the center line of August Drive, 1 foot (0.3 m) W of a carsonite witness post and 1.5 (0.5 m)feet below the level of the ground The bench mark is 1 foot (0.3 m) below Dame Point Road level, crimped to a copper-clad steel rod driven 28 feet (9 m) to refusal and encased by a concrete kickblock.

BENCH MARK STAMPING: 0219 E This Bench Mark Was Searched For And Not Found On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at the intersection of New Berlin Road and Dame Point Road about 0.9 mile (1.4 km) SE of Heckscher Drive (County Road 105), 195 feet (59 m) south of the intersection, 37 feet (11 m) NE of the northernmost rail at the intersection of a railroad and Dame Point Road, 23 feet (7 m) east of the centerline of Dame Point Road, and 2 feet (1 m) west of a witness post. The bench marks is 2 feet (1 m) below Dame Point Road, crimped to a copper-clad stainless steel rod driven 48 feet (15 m) to refusal and encased by a concrete kickblock.

BENCH MARK STAMPING: 0219 F 1977 This Bench Mark Description Changed On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at 9050 August Drive, 0.1 mile (0.2 km) NW of the intersection of August Drive and Dame Point Road, 57.5 feet (17.5 m) NW of power pole #9044, 30 feet (9 m) SW of the centerline of August Drive, 3 feet (1 m) NE of a witness sign, and about level with August Drive.

The bench mark is set in the top of a concrete monument at 9050 August Drive, 0.1 mile (0.2 km) NW of the intersection of August Drive and Dame Point Road, $\frac{57.5}{59.8}$ feet (19.2 m) NW of power pole $\frac{\#9044}{100}$ number 9064, 30 feet (9 m) SW of the centerline of August Drive, 3 feet (1 m) NE of a witness sign, and about level with August Drive.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/12/93

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FLORIDA 872 0219

DAME POINT, ST. JOHNS RIVER

Tidal datums at Dame Point, St. Johns River are based on the following:

LENGTH OF SERIES	÷	5 MONTHS
TIME PERIOD	z	SEPTEMBER 1977-JANUARY 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	4.34 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	3.44 FEET
MEAN HIGH WATER (MHW)	=	3.29 FEET
MEAN TIDE LEVEL (MTL)	=	1.70 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	1.25 FEET
MEAN LOW WATER (MLW)	=	0.10 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (01/10/78)	=	-1.22 FEET

*NGVD is based on elevations published in Quad 300813, 7/73 and NOS leveling of 1978.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	MHW
J 325 1970	8.08	4.79
0219 F 1977 ·	8.43	5.14
0219 D	11.17	7.88
0219 E	5.83	2.54
Н 325	11.36	8.07

The estimated highest water level to the nearest half-foot is 6.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).


PUBLICATION DATE: 11/30/87

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FLORIDA 872 0219

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

DAME POINT, ST. JOHNS RIVER

LATITUDE: 30°23.5'N LONGITUDE: 81°33.9'W NOAA CHART: 11488 USGS QUAD: EASTPORT

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Heckscher Drive (County Road 105) in Jacksonville, proceed east on Heckscher Drive for 4.68 miles (7.53 km) (over the Dunn Creek bridge) to August Drive, then SE along August Drive for 1.6 miles (2.6 km) to the residence at 9050 August Drive. The bench marks are located on the bridge, along Heckscher Drive, Dame Point Road, and August Drive. The tide gage and staff were located on a dock at 9050 August Drive.

BENCH MARK STAMPING: H 325

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida SRD Bench Mark SETTING CLASSIFICATION: Concrete Sidewalk

The bench mark is set in the top of the east end of the north concrete sidewalk of the County Road 105 bridge over Dunn Creek, 17.8 feet (5.4 m) north of the centerline of the highway, 0.8 foot (0.2 m) west of the east end of the sidewalk, 0.3 foot (0.1 m) south of the south face of the north concrete guardrail of the bridge, and 1 foot (0.3 m) above the highway level.

BENCH MARK STAMPING: J 325 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument along County Road 105, about 0.6 mile (1.0 km) east of the east end of the County Road 105 bridge over Dunn Creek,93 feet (28 m) south of the SE corner of Heckscher Drive Baptist Church, 56 feet (17 m) west of the centerline of the entrance drive to the church, 43 feet (13 m) north of the centerline of the highway, 9.5 feet (2.9 m) of the west end of a 12-inch pipe culvert under the driveway, and 0.2 foot (0.1 m) above the ground.

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FLORIDA 872 0219

DAME POINT, ST. JOHNS RIVER

BENCH MARK STAMPING: 0219 D

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at the intersection of Dame Point Road and August Drive about 1.6 miles (2.6 km) south of Heckscher Drive (County Road 105), 76.6 feet (23.3 m) east of a cabbage palm, 56.1 feet (17.1 m) NW of power pole #30, and 34.5 feet (10.5 m) west of the centerline of Dame Point Road. The bench mark is 1 foot (0.3 m) below Dame Point Road level, crimped to a copper-clad steel rod driven 28 feet (9 m) to refusal and encased by a concrete kickblock.

BENCH MARK STAMPING: 0219 E

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is at the intersection of New Berlin Road and Dame Point Road about 0.9 mile (1.4 km) SE of Heckscher Drive (County Road 105), 195 feet (59 m) south of the intersection, 37 feet (11 m) NE of the northernmost rail at the intersection of a railroad and Dame Point Road, 23 feet (7 m) east of the centerline of Dame Point Road, and 2 feet (1 m) west of a witness post. The bench marks is 2 feet (1 m) below Dame Point Road, crimped to a copper-clad stainless steel rod driven 48 feet (15 m) to refusal and encased by a concrete kickblock.

BENCH MARK STAMPING: 0219 F 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at 9050 August Drive, 0.1 mile (0.2 km) NW of the intersection of August Drive and Dame Point Road, 57.5 feet (17.5 m) NW of power pole #9044, 30 feet (9 m) SW of the centerline of August Drive, 3 feet (1 m) NE of a witness sign, and about level with August Drive.

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PUBLICATION DATE: 11/30/87

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FLORIDA 872 0219

DAME POINT, ST. JOHNS RIVER

Tidal datums at Dame Point, St. Johns River are based on the following:

LENGTH OF SERIES	= 5 MONTHS
TIME PERIOD	= SEPTEMBER 1977-JANUARY 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	4.34	FEET
MEAN HIGHER HIGH WATER (MHHW)	#	3.44	FEET
MEAN HIGH WATER (MHW)	Ξ	3.29	FEET
MEAN TIDE LEVEL (MTL)	=	1.70	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	1.25	FEET
MEAN LOW WATER (MLW)	=	0.10	FEET
MEAN LOWER LOW WATER (MLLW)	Ħ	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/10/78)	=	-1.22	FEET

*NGVD is based on elevations published in Quad 300813, 7/73 and NOS leveling of 1978.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	<u>MHW</u>
J 325 1970	8.08	4.79
0219 F 1977 ·	8.43	5.14
0219 D	11.17	7.88
0219 E	5.83	2.54
Н 325	11.36	8.07

The estimated highest water level to the nearest half-foot is 6.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 05/17/93 Not Published By NOS Page 1 of 3

FLORIDA 872-0222

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

CHASEVILLE, ST. JOHN'S RIVER

LATITUDE: 30°23.4'N LONGITUDE: 081°36.8'W NOAA: USGS QUAD:

BENCHMARK STAMPING: BENCHMARK 6 (1909) This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: IRON PIPE AGENCY/DISK TYPE: PIPE CAP SETTING CLASSIFICATION: CONCRETE FILLED TERRA COTTA PIPE

BENCH MARK 6 (1909) is an iron cap, stamped "VI," on top of 2-inch galvanized-iron pipe set in concrete filled 4-inch terra cotta pipe, 19.5 feet southwest of southwest corner of house occupied by Julius Summerlin and projecting 6 inches above ground. Elevation: 7.63 feet above mean low water.

BENCHMARK STAMPING: BENCHMARK 1 (1933) This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Standard Disk SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 1 (1933) is a standard disk, stamped "CHASEVILLE 1 1933," set in top of concrete post projecting 2 inches above ground, 550 feet northwest of house occupied by Julius Summerlin and 49 feet northeast of center line of trail to river shore. Elevation: 8.37 feet above mean low water.

BENCHMARK STAMPING: BENCH MARK 3 (1933) This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 3 (1933) is a standard disk, stamped "Chaseville 3 1933," set in top of concrete post projecting 6 inches above ground about 500 feet northwest of northwest corner of house occupied by Julius Summerlim. It is 65 feet northeast of center line of trail leading to river shore and 2 feet south of 18-inch diameter oak tree. Elevation: 9.92 feet above mean low water.

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PRELIMINARY DATE: 05/17/93 Not Published By NOS

FLORIDA 872-0222

CHASEVILLE, ST. JOHN'S RIVER

BENCHMARK STAMPING: BENCH MARK 1 This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: Concrete Breakwater

BENCH MARK 1 (1958) is a standard disk, stamped "NO 1 1958," set in west end of concrete breakwater on south side of St. John's River, about 240 feet east of George Ferbers east property line. Elevation: 5.70 feet above mean low water.

> BENCHMARK STAMPING: BENCH MARK 2 This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: Concrete Breakwater

BENCH MARK 2 (1958), is a standard disk, stamped "NO 2 1958," set in top of east end of concrete breakwater, 195 feet east of Bench Mark 1 (1958). Elevation: 6.02 feet above mean low water.

> BENCHMARK STAMPING: BENCH MARK 3 This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STNADARD DISK SETTING CLASSIFICATION: Chimney Base

BENCH MARK 3 (1958) is a standard disk, stamped "NO 3 1958," set in chimney base at southwest corner of small house and 450 southwest of Bench Mark 2 (1958). Elevation: 6.96 feet above mean low water.

BENCHMARK STAMPING: BENCH MARK 4 This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 4 (1959), is a standard disk, stamped "NO 4 1959," set in top of concrete post projecting 6 inches above ground on south edge of right-of-way about 4 miles norht along University Boulevard from intersection of Florida Highway No. 10 and the boulevard. It is 33 feet south of center line of University Boulevard, 90.5 feet southeast of junction of center lines of University Boulevard and dirt road leading to property of Dr. F.A. Johnson and 124.5 feet southwest of junction of center lines of University Boulevard and dirt road leading to property of Alberto Fields. Elevation: 11.37 feet above mean low water.

PRELIMINARY DATE: 05/19/93 Not Published By NOS

Page 3 of 3

FLORIDA 872-0222

CHASEVILLE, ST. JOHN'S RIVER

Mean low water at Chaseville, St. Johns River is based on 49 high waters and 49 low waters, November 13 - December 8, 1958 reduced to mean values. Elevations of other tide planes referred to this datum are as follows:

HIGHEST OBSERVED WATER LEVEL	=	5.00	FEET
MEAN HIGH WATER (MHW)	=	2.30	FEET
MEAN TIDE LEVEL (MTL)	=	1.15	FEET
MEAN LOW WATER (MLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL	`	2.50	FEET

The estimated highest water level to the nearest half-foot is 5.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 2.5 feet below mean lower low water.

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PRELIMINARY DATE: 05/12/93

FLORIDA 872 0215

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

JACKSONVILLE NAVY FUEL DEPOT, ST. JOHNS RIVER

LATITUDE: 30°24.0'N LONGITUDE: 81°37.6'W NOAA CHART: 11491 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Heckscher Drive, proceed 0.67 miles (1.1 km) east on Heckscher Drive to the paved drive leading south into the Navy Fuel Depot, follow the driveway to the large concrete fuel loading pier which is on the north shore of St. Johns River. The tide gage and staff were located on a platform in the St. Johns River.

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Heckscher Drive, proceed 0.67 0.7 miles (1.1 km) east on Heckscher Drive to the <u>Sommers road</u>, which is the paved drive leading south into the Navy Fuel Depot, follow the driveway to the large concrete fuel loading pier which is on the north shore of St. Johns River. The tide gage and staff were located on a platform in the St. Johns River.

BENCH MARK STAMPING: BM OIL 3 1945

This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USACOE Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set on the top of a concrete monument 150 feet (46 m) NE of the north end of Pier 1, 42 feet (13 m) south of the centerline of the street, 16.6 feet (5.1 m) north of the SW corner of Building 30, and 1.9 feet (0.6 m) west of the west face of Building 30.

BENCH MARK STAMPING: NO 2 1958 This Bench Mark Description Changed On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Wall

The bench mark is set on the top of the east end of the north concrete lead wall, 165 feet (50 m) NE of the north end of Pier 1, 73 feet (22 m) north of and directly across the street from Bench Mark OIL 3 1945, 24 feet (7 m) north of the centerline of an east-west street, and 23 feet (7 m) east of the centerline of the street leading north, opposite Building 30.

The bench mark is set on the top of the east end of the north concrete $\frac{1}{2}$ wall; <u>headwall for a culvert</u>, 165 feet (50 m) NE of the north end of Pier 1, 73 feet (22 m) north of and directly across the street from Bench Mark OIL 3 1945, 24 feet (7 m) north of the centerline of an east-west street, and 23 feet (7 m) east of the centerline of the street leading north, opposite Building 30.

Page 2 of 3

PRELIMINARY DATE: 05/12/93

FLORIDA 872 0215

JACKSONVILLE NAVY FUEL DEPOT, ST. JOHNS RIVER

BENCH MARK STAMPING: NO 3 1958 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Base of Building

The bench mark is set on the top of the west end of the concrete base of the foundation of Building 92, 48 feet (15 m) north of the center of a large steel gate for the entrance to Pier 2, 20 feet (6 m) north of the centerline of a black-topped street, and 0.9 foot (0.3 m) SE of the SW corner of Building 92.

BENCH MARK STAMPING: 0215 D 1977 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Slab

The bench mark is set in a concrete slab supporting the Guard House, 47 feet (14 m) NW of the front door of the Administration Building, 23.5 feet (7.1 m) east of the SW corner of the entrance gate, and 13.9 feet (4.2 m) south of the centerline of Sommers Road.

BENCH MARK STAMPING: B 325 1970 This Bench Mark Description Changed On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument near the NW corner of a high steel fence around a power sub-station at the junction of Sommers Road leading south, 108.8 feet (33.2 m) west of the west rail of a spur track, 56 feet (17 m) east of the centerline of Sommers Road, 1.9 feet (0.6 m) east of the NW corner fence post, and 1 foot (0.3 m) north of the fence line.

The bench mark is set in the top of a concrete monument near the NW corner of a high steel fence around a power sub-station at the junction of Sommers Road leading south, and Heckscher Drive, 108.8 feet (33.2 m) west of the west rail of a spur track, $\underline{94}$ feet (29 m) south of the centerline of Heckscher Drive 56 feet (17 m) east of the centerline of Sommers Road, 2 feet (0.6 m) west of a metal witness post, and 1.9 feet (0.6 m) east of the NW corner fence post, and 1 foot (0.3 m) north of the fence line.

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PRELIMINARY DATE: 05/12/93

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FLORIDA 872 0215

JACKSONVILLE NAVY FUEL DEPOT, ST. JOHNS RIVER

Tidal datums at Jacksonville Navy Fuel Deport, St. Johns River are based on the following:

LENGTH OF SERIES	÷	5 MONTHS
TIME PERIOD	=	SEPTEMBER-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	¥	3.77 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.83 FEET
MEAN HIGH WATER (MHW)	×	2.71 FEET
MEAN TIDE LEVEL (MTL)	=	1.40 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	0.84 FEET
MEAN LOW WATER (MLW)	Ħ	0.08 FEET
MEAN LOWER LOW WATER (MLLW)	Ħ	0.00 FEET
LOWEST OBSERVED WATER LEVEL (01/09/78)	=	-1.01 FEET

*NGVD is based on elevations published in Quad 300813, February 1973 and NOS leveling of March 1978.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW		<u>MHW</u>
BM OIL 3 1945	6.08		3.37
NO 2 1958	6.04		3.33
NO 3 1958	6.69		3.98
0215 D 1977	8.56		5.85
B 235 1970	7.29	;	4.58

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



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PUBLICATION DATE: 01/25/88

FLORIDA 872 0215

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

JACKSONVILLE NAVY FUEL DEPOT, ST. JOHNS RIVER

LATITUDE: 30°24.0'N LONGITUDE: 81°37.6'W NOAA CHART: 11491 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Heckscher Drive, proceed 0.67 miles (1.1 km) east on Heckscher Drive to the paved drive leading south into the Navy Fuel Depot, follow the driveway to the large concrete fuel loading pier which is on the north shore of St. Johns River. The tide gage and staff were located on a platform in the St. Johns River.

BENCH MARK STAMPING: BM OIL 3 1945

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USACOE Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set on the top of a concrete monument 150 feet (46 m) NE of the north end of Pier 1, 42 feet (13 m) south of the centerline of the street, 16.6 feet (5.1 m) north of the SW corner of Building 30, and 1.9 feet (0.6 m) west of the west face of Building 30.

BENCH MARK STAMPING: NO 2 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Wall

The bench mark is set on the top of the east end of the north concrete lead wall, 165 feet (50 m) NE of the north end of Pier 1, 73 feet (22 m) north of and directly across the street from Bench Mark OIL 3 1945, 24 feet (7 m) north of the centerline of an east-west street, and 23 feet (7 m) east of the centerline of the street leading north, opposite Building 30.

PUBLICATION DATE: 01/25/88

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FLORIDA 872 0215

JACKSONVILLE NAVY FUEL DEPOT, ST. JOHNS RIVER

BENCH MARK STAMPING: NO 3 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Base of Building

The bench mark is set on the top of the west end of the concrete base of the foundation of Building 92, 48 feet (15 m) north of the center of a large steel gate for the entrance to Pier 2, 20 feet (6 m) north of the centerline of a black-topped street, and 0.9 foot (0.3 m) SE of the SW corner of Building 92.

BENCH MARK STAMPING: 0215 D 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Slab

The bench mark is set in a concrete slab supporting the Guard House, 47 feet (14 m) NW of the front door of the Administration Building, 23.5 feet (7.1 m) east of the SW corner of the entrance gate, and 13.9 feet (4.2 m) south of the centerline of Sommers Road.

BENCH MARK STAMPING: B 325 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument near the NW corner of a high steel fence around a power sub-station at the junction of Sommers Road leading south, 108.8 feet (33.2 m) west of the west rail of a spur track, 56 feet (17 m) east of the centerline of Sommers Road, 1.9 feet (0.6 m) east of the NW corner fence post, and 1 foot (0.3 m) north of the fence line.

PUBLICATION DATE: 01/25/88

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FLORIDA 872 0215

JACKSONVILLE NAVY FUEL DEPOT, ST. JOHNS RIVER

Tidal datums at Jacksonville Navy Fuel Deport, St. Johns River are based on the following:

=	5 MONTHS
=	SEPTEMBER-DECEMBER 1977
=	1960-1978
=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	3.77	FEET	
MEAN HIGHER HIGH WATER (MHHW)	æ	2.83	FEET	
MEAN HIGH WATER (MHW)	=	2.71	FEET	
MEAN TIDE LEVEL (MTL)	=	1.40	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	=	0.84	FEET	
MEAN LOW WATER (MLW)	=	0.08	FEET	
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (01/09/78)	=	-1.01	FEET	

*NGVD is based on elevations published in Quad 300813, February 1973 and NOS leveling of March 1978.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	MHW
BM OIL 3 1945	6.08	3.37
NO 2 1958	6.04	3.33
NO 3 1958	6.69	3.98
0215 D 1977	8.56	5.85
B 235 1970	7.29 :	4.58

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 05/26/93

FLORIDA 872 0225

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PHOENIX PARK, ST. JOHNS RIVER

LATITUDE: 30°23.0'N LONGITUDE: 81°38.2'W NOAA CHART: 11488 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Lawton Avenue in Jacksonville, proceed east on Lawnton Avenue 0.5 mile (0.8 km) to Buffalo Avenue, then south on Buffalo Avenue 0.1 mile (0.2 km) to Virginia Street, then east on Virginia Street 0.2 mile (0.3 km) to Evergreen Avenue, then south on Evergreen Avenue 0.1 mile (0.2 km) to a drive leading east into the U.S. Coast Guard Training Facility. The bench marks are on the Coast Guard property and along U.S. Highway 17. The tide gage and staff were located on the dock and piling of the Coast Guard property.

BENCH MARK STAMPING: 0225 A This Bench Mark Description Changed On 05/26/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is in the bottom step of the Administration Building of the Coast Guard facility, 52 feet (16 m) ENE of a lamppost at the east end of a circular driveway, 25 feet (8 m) NW of the SW corner of the Administration Building, 9.5 feet (2.9 m) SE of the SE corner of the infirmary, and 0.7 foot (0.2 m) above sidewalk level.

The bench mark is in the bottom step of the Administration Building of the Coast Guard facility, 52 feet (16 m) ENE of a lamppost at the east end of a circular driveway, 25 feet (8 m) NW of the SW corner of the Administration Building, 9.5 feet (2.9 m) 89.5 feet (27.3 M) SE of the SE corner of the infirmary, and 0.7 foot (0.2 m) above sidewalk level.

BENCH MARK STAMPING: 0225 B This Bench Mark Was Recovered AS Described On 05/26/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is in the top of the concrete steps of the Storeroom of the Coast Guard facility, 47 feet (14 m) NW of the NW corner of the power station, 23 feet (7 m) NNW of the centerline of the entrance driveway, 3 feet (1 m) west of the SE corner of the Storeroom steps, and 3 feet (1 m) above driveway level.

PRELIMINARY DATE: 05/26/93

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FLORIDA 872 0225

PHOENIX PARK, ST. JOHNS RIVER

BENCH MARK STAMPING: 0225 C This Bench Mark Was Recovered AS Described On 05/26/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is inside a hurricane fence for a warehouse at 6935 Evergreen Avenue near the entrance to the Coast Guard facility, 54.5 feet (16.6 m) south of a 3-foot (1 m) diameter oak tree, 32.5 feet (9.9 m) east of the centerline of Evergreen Avenue, 23.5 feet (7.2 m) north of the centerline of the entrance driveway, and 1.5 feet (0.5 m) west of a witness post. The bench mark is at ground level, crimped to a copper-clad steel rod driven 42 feet (13 m), encased in a PVC pipe projecting 1 foot (0.3 m) above ground level and a concrete kickblock.

> BENCH MARK STAMPING: R 142 1954 This Bench Mark Description Changed On 05/26/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set in the top of the SE corner of the east end of the bridge seat of the north abutment of the railroad bridge over Trout River, 6.6 miles (10.6 km) north along Seaboard Air Line Railway from the station at Jacksonville, 5.1 miles (8.2 km) south along the railway from the school at Oceanway, 0.1 mile (0.2 km) north of milepost #629, 4.5 feet (1.4 m) east of the east rail, and 4 feet (1 m) below track level.

The bench mark is set in the top of the SE corner of the <u>northeast</u> east end of the bridge seat of the north abutment of the railroad bridge over Trout River, 6.6 miles (10.6 km) north along Seaboard Air Line Railway from the station at Jacksonville, 5.1 miles (8.2 km) south along the railway from the school at Oceanway, 0.1 mile (0.2 km) north of milepost #629, <u>100 feet SW of a carsonite witness post</u>, 4.5 feet (1.4 m) east of the east rail, and 4 feet (1 m) below track level.

BENCH MARK STAMPING: V2 V2 17.457 This Bench Mark Was Recovered AS Described On 05/26/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument in a fenced yard at 7508 Oakwood Street, at the intersection of 65th Street and the Seaboard Air Line Railway, 65 feet (20 m) WNW of the center of the intersection of 65th and Oakwood Streets, 60 feet (18 m) west of the centerline of Oakwood Street, 44 feet (13 m) east of the east rail of the track, 33.5 feet (10.2 m) north of the centerline of 65th Street, 1.5 feet (0.5 m) south of a witness post, 0.5 foot (0.2 m) above ground level, and 4 feet (1 m) above track level.

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FLORIDA 872 0225

PHOENIX PARK, ST. JOHNS RIVER

Tidal datums at Phoenix Park, St. Johns River are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	SEPTEMBER 1977-JANUARY 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	Ŧ	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	3.71	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	2.75	FEET	
MEAN HIGH WATER (MHW)	=	2.63	FEET	
MEAN TIDE LEVEL (MTL)	Ŧ	1.36	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	=	0.80	FEET	
MEAN LOW WATER (MLW)	Ħ	0.09	FEET	
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (01/28/78)	=	-1.58	FEET	

Bench mark elevation information:

BENCH MARK STAMPING	MLLW	ELEVATION IN FEET ABOVE: <u>MHW</u>
0225 A	8.26	5.63
0225 B	11.00	8.37
0225 C	12.15	9.52
R 142 1954	7.98	5.35
V2 V2 17.457	17.97	15.34

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PUBLICATION DATE: 06/09/87

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FLORIDA 872-0225

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PHOENIX PARK, ST. JOHNS RIVER

LATITUDE: 30°23.0'N LONGITUDE: 081°38.2'W NOAA CHART: 11488 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of U.S. Highway 17 (Main Street) and Lawton Avenue in Jacksonville, proceed east on Lawton Avenue 0.5 mile (0.8 km) to Buffalo Avenue, then south on Buffalo Avenue 0.1 mile (0.2 km) to Virginia Street, then east on Virginia Street 0.2 mile (0.3 km) to Evergreen Avenue, then south on Evergreen Avenue 0.1 mile (0.2 km) to a drive leading east into the U.S. Coast Guard Training Facility. The bench marks are on the Coast Guard property and along and along U.S. Highway 17. The tide gage and staff were located on the dock and piling of the Coast Guard property.

BENCHMARK STAMPING: 0225 C

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is inside a hurricane fence for a warehouse at 6935 Evergreen Avenue near the entrance to the Coast Guard facility, 54.5 feet (16.6 m) south of a 3-foot (1 m) diameter oak tree, 32.5 feet (9.9 m) east of the centerline of Evergreen Avenue, 23.5 (7.2 m) north of the centerline of the entrance driveway, and 1.5 feet (0.5 m) west of a witness post. The bench mark is at ground level, crimped to a copper-clad steel rod driven 42 feet (13 m), encased in a PVC pipe projecting 1 foot (0.3 m) above ground level and a concrete kickblock.

BENCHMARK STAMPING: R 142 1954

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set in the top of the SE corner of the east end of the bridge seat of the north abutment of the railroad bridge over Trout River, 6.6 miles (10.6 km) north along Seaboard Air Line Railway from the station at Jacksonville 5.1 miles (8.2 km) south along the railway from the school at Oceanway, 0.1 mile (0.2 km) north of milepost #269, 4.5 feet (1.4 m) east of the east rail, and 4 feet (1 m) below track level.

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PUBLICATION DATE: 06/09/87

FLORIDA 872-0225

PHOENIX PARK, ST. JOHNS RIVER

BENCHMARK STAMPING: V2 V2 17.457

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument in a fenced yard at 7508 Oakwood Street, at the intersection of 65th Street and the Seaboard Air Line Railway, 65 feet (20 m) WNW of the center of the intersection of 65th and Oakwood Streets, 60 feet (18 m) west of the centerline of Oakwood Street, 44 feet (13 m) east of the east rail of the track, 33.5 feet (10.2 m) north of the centerline of 65th Street, 1.5 feet (0.5 m) south of witness post, 0.5 foot (0.2 m) above ground level, and 4 feet (1 m) above track level.

BENCHMARK STAMPING: 0225 A

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is in the bottom step of the Administration Building of the Coast Guard facility, 52 feet (16 m) ENE of a lamp post at the east end of a circular driveway, 25 feet (8 m) NW of the SW corner of the Administration Building, 9.5 feet (2.9 m) SE of the SE corner of the infirmary, and 0.7 foot (0.2 m) above sidewalk level.

BENCHMARK STAMPING: 0225 B

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Step

The bench mark is in the top of the concrete steps of the storeroom of the Coast Guard facility, 47 feet (14 m) NW of the NW corner of the power station, 23 feet (7 m) NNW of the centerline of the entrance driveway, 3 feet (1 m) west of the SE corner of the storeroom steps, and 3 feet (1 m) above driveway level.

PUBLICATION DATE: 06/09/87

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FLORIDA 872-0225

PHOENIX PARK, ST. JOHNS RIVER

Tidal datums at PHOENIX PARK, ST. JOHNS RIVER are based on the following:

= 5 MONTHS
= SEPTEMBER 1977-JANUARY 1978
= 1960-1978
= MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	3.71 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.75 FEET
MEAN HIGH WATER (MHW)	=	2.63 FEET
MEAN TIDE LEVEL (MTL)	=	1.36 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	' FEET
MEAN LOW WATER (MLW)	=	0.09 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (01/28/78)	=	-1.58 FEET

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEE MLLW	T ABOVE: MHW
<u> </u>		
0225 C	12.15	9.52
R 142 1954	7.98	5.35
V2 V2 17.457	17.97	15.34
0225 A	8.26	5.63
0225 B	11.00	8.37

The estimated highest water level to the nearest half-foot is 5.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet below mean lower low

water. Estimates are based on observed extreme water levels at Mayport (872 0220).

Page 1 of 4

PRELIMINARY DATE: 05/13/93

FLORIDA 872 0242

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

LONG BRANCH, ST. JOHNS RIVER

LATITUDE: 30°21.6'N LONGITUDE: 81°37.2'W NOAA CHART: 11488 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of U.S. Highway 17 and U.S. Highway Alt. 1, proceed east on U.S. Highway Alt. 1 (21st Street) to Talleyrand Avenue, then south on Talleyrand Avenue to the entrance of the U.S. Army Corp of Engineers Depot grounds. The bench marks are on the depot grounds. The tide gage and staff were on the concrete bulkhead on the north side of the boat basin.

BENCH MARK STAMPING: NO 4 1928 This Bench Mark Description Changed On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Tank Foundation

The bench mark is set in the top of the east corner of the concrete foundation of the SE leg of a water tank at the SW angle of the intersection of Talleyrand Avenue and East 18th Street, just south of Fire Station #11.

The bench mark is set in the top of the east corner of the concrete foundation of the SE leg of for a water tank at the SW angle of the intersection of Talleyrand Avenue and East 18th Street, just south of Fire Station #11. NOTE: The water tank is now gone, the foundation for the tank is still present.

> BENCH MARK STAMPING: D 142 1954 This Bench Mark Description Changed On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Building Wall

The bench mark is set vertically in the north face of the NW corner of Public School #8, at the SE corner of East 17th Street and Franklin Street, 1 foot (0.3 m) east of the corner of the building, and 2 feet (1 m) above ground level.

The bench mark is set vertically in the north face of the NW corner of Public School #8 (J. Allen Axon Elementary), at the SE corner of East 17th Street and Franklin Street, 1 foot (0.3 m) east of the corner of the building, and 2 feet (1 m) above ground level.

PRELIMINARY DATE: 05/13/93

Page 2 of 4

FLORIDA 872 0242

LONG BRANCH, ST. JOHNS RIVER

BENCH MARK STAMPING: STJO 175 1971 JAX FLA This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Dock

The bench mark is set in a concrete dock, 228 feet (69 m) east of the west corner of a chain link fence, 15.1 feet (4.6 m) east of a large metal cleat on the edge of the shipping dock, and 7.4 feet (2.3 m) south of the north corner of the docking pier.

BENCH MARK STAMPING: STJO 204 RPS 1973 JAX FLA This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead

The bench mark is set in a concrete bulkhead in the NE corner of the boat slip, 56.7 feet (17.3 m) SE of the NW corner of a chain link fence, 34 feet (10 m) SW of the NW end of the boat slip, and 5.3 feet (1.6 m) south of a chain link fence.

BENCH MARK STAMPING: STJO 205 RPS 1973 JAX FLA This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead

The bench mark is set in a concrete bulkhead at the SE corner of the boat slip, 69.5 feet (21.2 m) SE of a flagpole, 10.5 feet (3.2 m) SE of the NE corner of a chain link fence, and 0.7 foot (0.2 m) north of the southernmost tip of the west side of the boat slip.

BENCH MARK STAMPING: STJO 213 1973 JAX FLA This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Apron

The bench mark is set in a concrete apron along the waterfront, 106.3 feet (32.4 m) NE of the SE corner of the main warehouse, 48.3 feet (14.7 m) NE of a flagpole, and 4.5 feet (1.4 m) south of the north corner of a chain link fence.

PRELIMINARY DATE: 05/13/93

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FLORIDA 872 0242

LONG BRANCH, ST. JOHNS RIVER

BENCH MARK STAMPING: STJO 214 1973 JAX FLA This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Apron

The bench mark is set in a concrete apron along the waterfront, 87 feet (27 m) east of a flagpole, 88 feet (27 m) SE of the SE corner of the main warehouse, and 5.3 feet (1.6 m) NW of the SE corner of a chain link fence.

BENCH MARK STAMPING: STJO 215 1973 JAX FLA This Bench Mark Was Recovered AS Described On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Apron

The bench mark is set in a concrete apron, 89.8 feet (27.4 m) SE of the NE corner of the main warehouse, 88 feet (27 m) east of a flagpole, and 4.9 feet (1.5 m) west of the east corner of a chain link fence.

BENCH MARK STAMPING: STJO 218 1973 JAX FLA This Bench Mark Was Searched For And Not Found On 05/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Asphalt Concrete Pavement

The bench mark is set in the asphalt concrete pavement, 1232 feet (276 m) SE of the centerline of Tallyrand Avenue, 249 feet (76 m) west of the SW corner of the main warehouse, and 3.2 feet (1.0 m) WSW of the SW corner of a chain link fence.

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PRELIMINARY DATE: 05/13/93

Page 4 of 4

FLORIDA 872 0242

LONG BRANCH, ST. JOHNS RIVER

Tidal datums at Long Branch, St. Johns River are based on the following:

= 14 YEARS
= 1954 - 1967
= 1960 - 1978
= MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (09/10/64)	=	5.6	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.27	FEET
MEAN HIGH WATER (MHW)	=	2.16	FEET
MEAN TIDE LEVEL (MTL)	=	1.12	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	0.39	FEET
MEAN LOW WATER (MLW)	=	0.08	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/02/57)	×	-1.6	FEET

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*NGVD is based on elevations published in Quad 300813, 2/1973 and NOS leveling of 1977.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK_STAMPING	MLLW	<u>MHW</u>
NO 4 1928	12.06	9.90
D 142 1954	21.38	19.22
STJO 175 1971 JAX FLA	7.31	5.15
STJO 204 RPS 1973 JAX FLA	4.90	2.74
STJO 205 RPS 1973 JAX FLA	4.80 :	2.64
STJO 213 1973 JAX FLA	7.08	4.92
STJO 214 1973 JAX FLA	7.96	5.80
STJO 215 1973 JAX FLA	7.95	5.79
STJO 218 1973 JAX FLA	7.50	5.34

The estimated highest water level to the nearest half-foot is 5.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 07/20/89

Page 1 of 4

FLORIDA 872 0242

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

LONG BRANCH, ST. JOHNS RIVER

LATITUDE: 30°21.6'N LONGITUDE: 81°37.2'W NOAA CHART: 11488 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of U.S. Highway 17 and U.S. Highway Alt. 1, proceed east on U.S. Highway Alt. 1 (21st Street) to Talleyrand Avenue, then south on Talleyrand Avenue to the entrance of the U.S. Army Depot grounds. The bench marks are on the depot grounds. The tide gage and staff were on the concrete bulkhead on the north side of the boat basin.

BENCH MARK STAMPING: NO 4 1928

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Tank Foundation

The bench mark is set in the top of the east corner of the concrete foundation of the SE leg of a water tank at the SW angle of the intersection of Talleyrand Avenue and East 18th Street, just south of Fire Station #11.

BENCH MARK STAMPING: D 142 1954

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Building Wall

The bench mark is set vertically in the north face of the NW corner of Public School #8, at the SE corner of East 17th Street and Franklin Street, 1 foot (0.3 m) east of the corner of the building, and 2 feet (1 m) above ground level.

BENCH MARK STAMPING: STJO 175 1971 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Dock

The bench mark is set in a concrete dock, 228 feet (69 m) east of the west corner of a chain link fence, 15.1 feet (4.6 m) east of a large metal cleat on the edge of the shipping dock, and 7.4 feet (2.3 m) south of the north corner of the docking pier.

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FLORIDA 872 0242

LONG BRANCH, ST. JOHNS RIVER

BENCH MARK STAMPING: STJO 204 RPS 1973 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead

The bench mark is set in a concrete bulkhead in the NE corner of the boat slip, 56.7 feet (17.3 m) SE of the NW corner of a chain link fence, 34 feet (10 m) SW of the NW end of the boat slip, and 5.3 feet (1.6 m) south of a chain link fence.

BENCH MARK STAMPING: STJO 205 RPS 1973 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead

The bench mark is set in a concrete bulkhead at the SE corner of the boat slip, 69.5 feet (21.2 m) SE of a flagpole, 10.5 feet (3.2 m) SE of the NE corner of a chain link fence, and 0.7 foot (0.2 m) north of the southernmost tip of the west side of the boat slip.

BENCH MARK STAMPING: STJO 213 1973 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Apron

The bench mark is set in a concrete apron along the waterfront, 106.3 feet (32.4 m) NE of the SE corner of the main warehouse, 48.3 feet (14.7 m) NE of a flagpole, and 4.5 feet (1.4 m) south of the north corner of a chain link fence.

BENCH MARK STAMPING: STJO 214 1973 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Apron

The bench mark is set in a concrete apron along the waterfront, 87 feet (27 m) east of a flagpole, 88 feet (27 m) SE of the SE corner of the main warehouse, and 5.3 feet (1.6 m) NW of the SE corner of a chain link fence.

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FLORIDA 872 0242

LONG BRANCH, ST. JOHNS RIVER

BENCH MARK STAMPING: STJO 215 1973 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Concrete Apron

The bench mark is set in a concrete apron, 89.8 feet (27.4 m) SE of the NE corner of the main warehouse, 88 feet (27 m) east of a flagpole, and 4.9 feet (1.5 m) west of the east corner of a chain link fence.

BENCH MARK STAMPING: STJO 218 1973 JAX FLA

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Bench Mark SETTING CLASSIFICATION: Asphalt Concrete Pavement

The bench mark is set in the asphalt concrete pavement, 1232 feet (276 m) SE of the centerline of Tallyrand Avenue, 249 feet (76 m) west of the SW corner of the main warehouse, and 3.2 feet (1.0 m) WSW of the SW corner of a chain link fence.

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FLORIDA 872 0242

LONG BRANCH, ST. JOHNS RIVER

Tidal datums at Long Branch, St. Johns River are based on the following:

=	14 YEARS
=	1954 - 1967
=	1960 - 1978
=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (09/10/64)	=	5.6	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.27	FEET
MEAN HIGH WATER (MHW)	=	2.16	FEET
MEAN TIDE LEVEL (MTL)	=	1.12	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	0.39	FEET
MEAN LOW WATER (MLW)	=	0.08	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/02/57)	=	-1.6	FEET

*NGVD is based on elevations published in Quad 300813, 2/1973 and NOS leveling of 1977.

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	MHW
NO 4 1928	12.06	9.90
D 142 1954	21.38	19.22
STJO 175 1971 JAX FLA	7.31	5.15
STJO 204 RPS 1973 JAX FLA	4.90	2.74
STJO 205 RPS 1973 JAX FLA	4.80	2.64
STJO 213 1973 JAX FLA	7.08	4.92
STJO 214 1973 JAX FLA	7.96	5.80
STJO 215 1973 JAX FLA	7.95	5.79
STJO 218 1973 JAX FLA	7.50	5.34

The estimated highest water level to the nearest half-foot is 5.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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LOWER ST. JOHNS RIVER VICINITY REACH TWO ABSTRACT MILE 10.1 TO MILE 20.0

EXISTING NOAA/NOS TIDE STATIONS

Station No. Name	River Mile Location	Dístance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y
872 0189 Cedar Hts., Broward R.	14.6	3.0 miles/ Left	872 0220 Mayport	3	10/77 12/77
872 0202 Trout River	15.7	4.5 miles/ Left	Unknown	N/A	N/A
872 0213 Trout River, Sherwood Forest	15.9	6.6 miles/ Left	872 0220 Mayport	4	9/78 12/78
872 0217 Moncrief Creek	15.9	2.0 miles/ Left	872 0220 Mayport	3	10/78 12/78
872 0216 Ribault River, Lake Forest	16.1	3.2 miles/ Left	872 0220 Mayport	2	6/78 7/78

Station No.	Elevation (Feet, NGVD 1929)			Mean Range	Tidal Bench	
	MHW	MTL	MLW	(Feet)	Fd/Req'd.	
872 0189	1.96	0.45	1.07	3.03	5/0	
872 0202	N/A	N/A	N/A	2.50	0/0	
872 0213	1.92	0.59	-0.73	2.65	3/2	
872 0217	1.84	0.56	-0.72	2.56	5/0	
872 0216	2.06	0.74	-0.58	2.64	5/0	

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A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:

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PRELIMINARY DATE: 05/20/93

FLORIDA 872 0189

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

CEDAR HEIGHTS, BROWARD RIVER

LATITUDE: 30°26.2'N LONGITUDE: 81°38.5'W NOAA CHART: 11488 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of Heckscher Drive and U.S. Highway 17 in Jacksonville, proceed north 2.1 miles (3.4 km) along U.S. Highway 17 to the bridge over Broward River. The bench marks are located along U.S. Highway 17. The tide gage and staff were located on a catwalk, 18 feet (5 m) east of the north end of the bridge.

BENCH MARK STAMPING: 0189 A This Bench Mark Was Recovered AS Described On 05/20/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge

The bench mark is set on a curb inside the guard rail on the NW corner of the northbound U.S. Highway 17 (North Main Street) bridge over Broward River. The bench mark is 0.2 foot (0.1 m) above highway level.

BENCH MARK STAMPING: 0189 B This Bench Mark Was Recovered AS Described On 05/20/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge

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The bench mark is set on a curb inside the guard rail on the SE corner of the northbound U.S. Highway 17 bridge over Broward River. The bench mark is 0.2 foot (0.1 m) above highway level.

Page 2 of 4

FLORIDA 872 0189

CEDAR HEIGHTS, BROWARD RIVER

BENCH MARK STAMPING: 0189 C 1977 This Bench Mark Description Changed On 05/20/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is near Oceanway, set in the headwall of a box culvert, 258 feet (79 m) south of the Interstate 295 overpass, 68 feet (21 m) east of the centerline of the northbound lane of U.S. Highway 17, 52.5 feet (16.0 m) east of a storm sewer located at the north point of a triangular median, and 3 feet (0.9 m) SE of a witness post. The bench mark is 3 feet (1 m) below highway level.

The bench mark is near Oceanway, set in the headwall of a box culvert, 258 feet (79 m) south of the Interstate 295 overpass, 68 feet (21 m) east of the centerline of the northbound lane of U.S. Highway 17, 52.5 feet (16.0 m) east of a storm sewer located at the north point of a triangular median, and 3 feet (0.9 m) SE of a witness post, and 0.3 ft (0.9 m) west of a carsonite witness post. The bench mark is 3 feet (1 m) below highway level. the mark has been defaced and the stamping is illegible.

BENCH MARK STAMPING: 10 JWM 1948 32 This Bench Mark Description Changed On 05/20/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Culvert

The bench mark is in Oceanway, set in the top of the south end of the west headwall of a culvert under U.S. Highway 17, 51 feet (16 m) east of the east rail of the railroad tracks, 41 feet (12 m) NW of the center of the junction of U.S. Highway 17 and Alabama Avenue, and 28 feet (9 m) west of the centerline of the highway. The bench mark is 4 feet (1 m) below track level.

The bench mark is in Oceanway, set in the top of the south end of the west headwall of a culvert under U.S. Highway 17, 51 feet (16 m) east of the east rail of the railroad tracks, 41 feet (12 m) NW of the center of the junction of U.S. Highway 17 and Alabama Avenue, and 28 feet (9 m) west of the centerline of the highway, 3 ft (1.0 m) west of the south end of a 10 ft (3.0 m) guardrail, and 0.3 ft (0.9 m) east of a carsonite witness post. The bench mark is 4 feet (1 m) below track level.

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Page 3 of 4

PRELIMINARY DATE: 05/20/93

BENCH MARK STAMPING: W 142 1954 This Bench Mark Description Changed On 05/20/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post, 0.15 mile (0.24 km) south of the intersection of U.S. Highway 17 and Eastport Road at a private road crossing, 80 feet (24 m) SW and across track from a switch stand at the south end of a siding, 46.5 feet (14.2 m) west of the west rail, 30 feet (9 m) north of the centerline of the private road west, 28 feet (9 m) SSW of a utility pole, and 10 feet (3 m) south of a metal witness post. The bench mark is 1 foot (0.3 m) below track level, and the concrete post is 0.2 foot (0.1 m) below ground level.

The bench mark is set in the top of a concrete post, 0.15 mile (0.24 km) south of the intersection of U.S. Highway 17 and Eastport Road at a private road crossing, which is the entrance to Nutri Turf Inc., at 11650 North Main Street, 80 feet (24 m) SW and across track from a switch stand at the south end of a siding, 46.5 feet (14.2 m) west of the west rail, 30 feet (9 m) north of the centerline of the private road west, 28 feet (9 m) SSW of a utility pole, and 10 feet (3 m) south of a metal witness post. The bench mark is 1 foot (0.3 m) below track level, and the concrete post is 0.2 foot (0.1 m) below ground level.

PRELIMINARY DATE: 05/20/93

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FLORIDA 872 0189

CEDAR HEIGHTS, BROWARD RIVER

Tidal datums at Cedar Heights, Broward River are based on the following:

LENGTH OF SERIES	=	3 MONTHS
TIME PERIOD	×	OCTOBER 1977-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	4.19	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	3.24	FEET
MEAN HIGH WATER (MHW)	=	3.13	FEET
MEAN TIDE LEVEL (MTL)	=	1.62	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	1.16	FEET
MEAN LOW WATER (MLW)	=	0.10	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/78)	=	-1.02	FEET

*NGVD is based on elevations published in Quad 300813, January 1973 and NOS leveling of August 11, 1977.

Bench mark elevation information:

BENCH MARK STAMPING	ELEVATION IN FEET MLLW	ABOVE : <u>MHW</u>
0189 A	13.95	10.82
0189 B ·	13.64	10.51
0189 C 1977	32.71	29.58
10 JWM 1948 32	33.06	29.93
W 142 1954	20.96	17.83

The estimated highest water level to the nearest half-foot is 6.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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FLORIDA 872 0189

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

CEDAR HEIGHTS, BROWARD RIVER

LATITUDE: 30°26.2'N LONGITUDE: 81°38.5'W NOAA CHART: 11488 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of Heckscher Drive and U.S. Highway 17 in Jacksonville, proceed north 2.1 miles (3.4 km) along U.S. Highway 17 to the bridge over Broward River. The bench marks are located along U.S. Highway 17. The tide gage and staff were located on a catwalk, 18 feet (5 m) east of the north end of the bridge.

BENCH MARK STAMPING: 0189 A

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge

The bench mark is set on a curb inside the guard rail on the NW corner of the northbound U.S. Highway 17 (North Main Street) bridge over Broward River. The bench mark is 0.2 foot (0.1 m) above highway level.

BENCH MARK STAMPING: 0189 B

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge

The bench mark is set on a curb inside the guard rail on the SE corner of the northbound U.S. Highway 17 bridge over Broward River. The bench mark is 0.2 foot (0.1 m) above highway level.
Page 2 of 3

FLORIDA 872 0189

CEDAR HEIGHTS, BROWARD RIVER

BENCH MARK STAMPING: 0189 C 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is near Oceanway, set in the headwall of a box culvert, 258 feet (79 m) south of the Interstate 295 overpass, 68 feet (21 m) east of the centerline of the northbound lane of U.S. Highway 17, 52.5 feet (16.0 m) east of a storm sewer located at the north point of a triangular median, and 3 feet (0.9 m) SE of a witness post. The bench mark is 3 feet (1 m) below highway level.

BENCH MARK STAMPING: 10 JWM 1948 32

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Culvert

The bench mark is in Oceanway, set in the top of the south end of the west headwall of a culvert under U.S. Highway 17, 51 feet (16 m) east of the east rail of the railroad tracks, 41 feet (12 m) NW of the center of the junction of U.S. Highway 17 and Alabama Avenue, and 28 feet (9 m) west of the centerline of the highway. The bench mark is 4 feet (1 m) below track level.

BENCH MARK STAMPING: W 142 1954

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post, 0.15 mile (0.24 km) south of the intersection of U.S. Highway 17 and Eastport Road at a private road crossing, 80 feet (24 m) SW and across track from a switch stand at the south end of a siding, 46.5 feet (14.2 m) west of the west rail, 30 feet (9 m) north of the centerline of the private road west, 28 feet (9 m) SSW of a utility pole, and 10 feet (3 m) south of a metal witness post. The bench mark is 1 foot (0.3 m) below track level, and the concrete post is 0.2 foot (0.1 m) below ground level.

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Page 3 of 3

FLORIDA 872 0189

CEDAR HEIGHTS, BROWARD RIVER

Tidal datums at Cedar Heights, Broward River are based on the following:

LENGTH OF SERIES	=	3 MONTHS
TIME PERIOD	=	OCTOBER 1977-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	4.19	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	3.24	FEET
MEAN HIGH WATER (MHW)	=	3.13	FEET
MEAN TIDE LEVEL (MTL)	=	1.62	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	1.16	FEET
MEAN LOW WATER (MLW)	=	0.10	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/78)	=	-1.02	FEET

*NGVD is based on elevations published in Quad 300813, January 1973 and NOS leveling of August 11, 1977.

Bench mark elevation information:

BENCH MARK STAMPING	ELEVATION IN FI <u>MLLW</u>	LET ABOVE: <u>MHW</u>
0189 A	13.95	10.82
0189 в ·	13.64	10.51
0189 C 1977	32.71	29.58
10 JWM 1948 32	33.06	29.93
W 142 1954	20.96	17.83

The estimated highest water level to the nearest half-foot is 6.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 05/13/93 NOT PUBLISHED BY NOS

FLORIDA 872-0202

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

TROUT RIVER, ST. JOHN'S RIVER

LATITUDE: 30°25.0'N LONGITUDE: 081°41.8'W NOAA CHART: 300813 USGS QUAD: TROUT RIVER

BENCHMARK STAMPING: NO 1 1939 This Bench Mark Was Searched For And Not Found On 02/02/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 1 (1939) is a standard disk, stamped "NO 1 1939," set in top of 6-inch square concrete post flush with ground, on south side of Trout River, 151 feet south of south end of bridge on Lem Turner Road, 15 feet west of center line of north-and - south road, 38 feet southeast of southeast corner of stucco house, 3 feet east of southeast fence post, and 16.1/2 feet north of second telephone pole south of bridge. Elevation: 14.21 feet above mean low water.

BENCHMARK STAMPING: NO 2 1939 This Bench Mark Was Searched For And Not Found On 02/02/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 2 (1939) is a standard disk, stamped "NO 2 1939," set in top of 9 inch diameter concrete post, flush with ground, on south side of Trout River, 73 feet south of south abutment of Lem Turner Road Bridge, 42 feet east of center line of bridge, on property belonging to Mrs. E.W. Dayman, 31 feet south of small store, 8 feet northwest of northwest corner of cottage, and 8 inches north of wire fence. Elevation: 11.75 feet above mean low water.

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PRELIMINARY DATE: 05/13/93 NOT PUBLISHED BY NOS Page 2 of 2

FLORIDA 872-0202

TROUT RIVER, ST. JOHN'S RIVER, FL

MEAN HIGH WATER (MHW)	=	2.5	FEET
MEAN TIDE LEVEL (MTL)	=	1.25	FEET
MEAN LOW WATER (MLW)	=	0	FEET
LOWEST OBSERVED WATER LEVEL (03/10/78) = -	2.50	FEET

The estimated highest water level to the nearest half-foot is 5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 2.5 feet below mean lower low water.

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Page 1 of 3

PRELIMINARY DATE: 02/15/93

FLORIDA 872 0213

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

SHERWOOD FOREST, TROUT RIVER

LATITUDE: 30°25.2'N LONGITUDE: 81°43.7'W

NOAA CHART: USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of Edgewood Avenue and Lem Turner Road in Jacksonville, proceed north along Lem Turner Road for 2.0 miles (3.2 km), then west on Trout River Boulevard for 2.0 miles (3.2 km) to 5339 Trout River Boulevard. The bench marks are located along Trout River Boulevard and Sibbald Avenue. The tide gage and staff were located on a private dock behind the residence at 5339 Trout River Boulevard.

BENCH MARK STAMPING: 0213 A 1978 This Bench Mark Was Searched For And Not Found On 02/15/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 365 feet (lll m) north of Trout River Boulevard, 120 feet (37 m) north of a tin shed behind the residence at 5339 Trout River Boulevard, 65 feet (20 m) south of the south shoreline of the Trout River, and 59 feet (18 m) SW of a dock.

The property owner reported that the bench mark had been buried by fill dirt.

BENCH MARK STAMPING: 0213 B 1978 This Bench Mark Was Searched For And Not Found On 02/15/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 196 feet (60 m) west of the Wayside Church of God, 76 feet (23 m) south of a large cedar tree, 44 feet (13 m) SW of the intersection of Trout River Boulevard and Sibbald Road, 37.5 feet (11.4 m) south of the centerline of Trout River Boulevard, 26.6 feet (8.1 m) west of the centerline of Sibbald Road, and 1 foot (0.3 m) east of a witness post.

The mark is believed destroyed by road construction in the area.

PRELIMINARY DATE: 02/15/93

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FLORIDA 872 0213

SHERWOOD FOREST, TROUT RIVER

BENCH MARK STAMPING: 0213 C 1978 This Bench Mark Description Changed On 02/15/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Abutment Guardrail

The bench mark is set in a 1×2 foot $(0.3 \times 1 \text{ m})$ concrete port on the SE corner of the Trout River Boulevard bridge over Nine Mile Creek, 20.4 feet (6.2 m) south of the centerline of Trout River Boulevard; 6 feet (2 m) west of a witness post, and 1.3 feet (0.4 m) south of the bridge railing.

The bench mark is set in a 1 x 2 foot $(0.3 \times 1 \text{ m})$ concrete port <u>gruadrail</u> on the SE corner of the Trout River Boulevard bridge over Nine Mile Creek, 20.4 feet (6.2 m) south of the centerline of Trout River Boulevard, 6 feet (2 m) west of a witness post, 1.3 feet (0.4 m) south of the bridge railing, <u>and 3 feet (1.0 m)</u> above the road.

BENCH MARK STAMPING: 0213 D 1978 This Bench Mark Was Recovered AS Described On 02/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concert headwall, 96 feet (29 m) north of the intersection of Sibbald Road and Gilchrist Road, 40 feet (12 m) east of the centerline of the south bound lane of Sibbald Road, 20 feet (6 m) west of the centerline of the north bound lane of Sibbald Road, and 2.5 feet (0.8 m) south of a witness post.

BENCH MARK STAMPING: 0213 E 1978 This Bench Mark Description Changed On 02/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 0.4 mile (0.6 km) south of the intersection of Gilchrist Road and New Kings Road (U.S. Highway 1), 61 feet (19 m) west of the median of New Kings Road, 58 feet (18 m) NW of the centerline of a the NW drive of the Thoni Service Station, 30 feet (9 m) NE of a chain link fence, and 3 feet (1 m) south of a witness post.

The bench mark is set in a concrete headwall, 0.4 mile (0.6 km) south of the intersection of Gilchrist Road and New Kings Road (U.S. Highway 1), 61 feet (19 m) west of the median of New Kings Road, 58 feet (18 m) NW of the centerline of a the NW drive of the Thoni White and Son's Service Station, 30 feet (9 m) NE of a chain link fence, and 3 feet (1 m) south of a witness post.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 02/15/93

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FLORIDA 872 0213

SHERWOOD FOREST, TROUT RIVER

Tidal datums at Sherwood Forest, Trout River are based on the following:

=	4 MONTHS
=	SEPTEMBER-DECEMBER 1978
=	1960-1978
E	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	4.07	FEET
MEAN HIGHER HIGH WATER (MHHW)	,	2.88	FEET
MEAN HIGH WATER (MHW)	Ħ	2.75	FEET
MEAN TIDE LEVEL (MTL)	=	1.43	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	0.83	FEET
MEAN LOW WATER (MLW)	=	0.10	FEET
MEAN LOWER LOW WATER (MLLW)	Ħ	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/27/78)	=	-1.30	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0213 A 1978	6.13	3.38
0213 B 1978	7.15	4.40
0213 C 1978	12.96	10.21
0213 D 1978	10.60	7.85
0213 E 1978	22.01	19.26

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



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PUBLICATION DATE: 01/25/88

FLORIDA 872-0213

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

SHERWOOD FOREST, TROUT RIVER

LATITUDE: 30°25.2'N LONGITUDE: 081°43.7'W NOAA CHART: 00000 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of Edgewood Avenue and Lem Turner Road in Jacksonville, proceed north along Lem Turner Road for 2.0 miles (3.2 km), then west on Trout River Boulevard for 2.0 miles (3.2 km) to 5339 Trout River Boulevard. The bench marks are located along Trout River Boulevard and Sibbald Avenue. The tide gage and staff were located on a private dock behind the residence at 5339 Trout River Boulevard.

BENCHMARK STAMPING: 0213 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 365 feet (111 m) north of Trout River Boulevard, 120 feet (37 m) north of a tin shed behind the residence at 5339 Trout River Boulevard, 65 feet (20 m) south of the south shoreline of the Trout River, and 59 feet (18 m) SW of a dock.

BENCHMARK STAMPING: 0213 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 196 feet (60 m) west of the Wayside Church of God, 76 feet (23 m) south of a large cedar tree, 44 feet (13 m) SW of the intersection of Trout River Boulevard and Sibbald Road, 37.5 feet (11.4 m) south of the centerline of Trout River Boulevard, 26.6 feet (8.1 m) west of the centerline of Sibbald Road, and 1 foot (0.3 m) east of a witness post.

BENCHMARK STAMPING: 0213 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Abutment

The bench mark is set in a 1 x 2-foot $(0.3 \times 1 \text{ m})$ concrete post on the SE corner of the Trout River Boulevard bridge over Nine Mile Creek, 20.4 feet (6.2 m) south of the centerline of Trout River Boulevard, 6 feet (2 m) west of a witness post, and 1.3 feet (0.4 m) south of the bridge railing.

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FLORIDA 872-0213

SHERWOOD FOREST, TROUT RIVER

BENCHMARK STAMPING: 0213 D 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 96 feet (29 m) north of the intersection of Sibbald Road and Gilchrist Road, 40 feet (12 m) east of the centerline of the southbound lane of Sibbald Road, 20 feet (6 m) west of the centerline of the northbound lane of Sibbald Road, and 2.5 feet (0.8 m) south of a witness post.

BENCHMARK STAMPING: 0213 E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 0.4 mile (0.6 km) south of the intersection of Gilchrist Road and New Kings Road (U.S. Highway 1), 61 feet (19 m) west of the median of New Kings Road, 58 feet (18 m) NW of the centerline of the NW drive of the Thoni Service Station, 30 feet (9 m) NE of a chain link fence, and 3 feet (1 m) south of a witness post.

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FLORIDA 872-0213

SHERWOOD FOREST, TROUT RIVER

Tidal datums at SHERWOOD FOREST, TROUT RIVER are based on the following:

LENGTH OF SERIES	=	4 MONTHS	
TIME PERIOD	×	SEPTEMBER-DECEMBER	1978
TIDAL EPOCH	æ	1960-1978	
CONTROL TIDE STATION	=	MAYPORT (872 0220)	

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	4.07	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.88	FEET
MEAN HIGH WATER (MHW)	=	2.75	FEET
MEAN TIDE LEVEL (MTL)	=	1.43	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=		FEET
MEAN LOW WATER (MLW)	=	0.10	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/27/78)	=	-1.30	FEET

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEET MLLW	ABOVE: MHW
<u> </u>		
0213 A 1978	6.13	3.38
0213 B 1978	7.15	4.40
0213 C 1978	12.96	10.21
0213 D 1978	10.60	7.85
0213 E 1978	22.01	19.26

The estimated highest water level to the nearest half-foot is 5.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet below mean lower low

water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 04/28/93

FLORIDA 872 0217

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

LATITUDE: 30°23.5'N LONGITUDE: 81°39.7'W NOAA CHART: 11491 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of US #17 and Florida #111 (Edgewood Avenue), proceed 1.1 miles (1.8 km) NW on Edgewood Avenue to the NW end of the bridge over Moncrief Creek. Bench marks are on the bridge and in the vicinity of the north bank on Moncrief Creek. The gauge was located 46 feet (14 m) SSE of the north bank of Moncrief Creek at the end of a series of four catwalks over an abandoned steel bridge foundation. Tide staff was 16 feet (5 m) NW of the tide gauge.

BENCH MARK STAMPING: 0217 A This Bench Mark Description Changed On 04/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The primary bench mark is 106 feet (32 m) SE of the centerline of Merle Drive, 26 feet (8 m) NE of the centerline of the westbound lane of Edgewood Avenue, 5 feet (2 m) SW of a wooden power pole, and 1 foot (0.3 m) SW of a witness sign. The bench mark is at road level, crimped to a copper-clad steel rod driven 33 feet (10 m) and encased in a concrete kickblock.

The primary bench mark is 106 feet (32 m) SE of the centerline of Merle Drive, 26 feet (8 m) NE of the centerline of the westbound lane of Edgewood Avenue, 5 feet (2 m) SW of a wooden power pole, and 1 foot (0.3 m) SW of a witness sign., 22 feet (6.7 m) NW of a concrete power pole and 0.8 feet (0.2 m) SW of a carsonite witness post. The bench mark is at road level, crimped to a copper-clad steel rod driven 33 feet (10 m) and encased in a concrete kickblock.

BENCH MARK STAMPING: 195 72 A31 This Bench Mark Was Recovered AS Described On 04/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in top of a round concrete post in the median of Interstate 95 at the north end of the bridge over Edgewood Avenue, 21.9 feet (6.7 m) east of the centerline of the southbound lane of Interstate 95, 6.2 feet (1.9 m) NE of a concrete guardrail, 3.0 feet (0.9 m) east of a metal guardrail, 2.1 feet (0.6 m) SW of a witness sign, and 0.1 foot (0.03 m) below ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 04/28/93

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FLORIDA 872 0217

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

BENCH MARK STAMPING: 195 72 A31 RM1 BENCH MARK STAMPING: 195 72 A31 RM NO 1 This Bench Mark Was Recovered AS Described On 04/28/93 Except The Stamping Has Been Misreported

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Guardrail

The bench mark is set in top of the concrete guardrail at the NW corner of the northbound bridge of Interstate 95 over Edgewood Avenue and 16.6 feet (5.1 m) west of the centerline of the northbound lane of Interstate 95.

BENCH MARK STAMPING: 195 72 A31 RM2 BENCH MARK STAMPING: 195 72 A31 RM NO 2 This Bench Mark Was Recovered AS Described On 04/28/93 Except The Stamping Has Been Misreported

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Guardrail

The bench mark is set in top of the concrete guardrail at the NE corner of the southbound bridge of Interstate 95 over Edgewood Avenue and 17.6 feet (5.4 m) east of the centerline of the southbound lane of Interstate 95.

BENCH MARK STAMPING: 195 G7 This Bench Mark Was Recovered AS Described On 04/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the concrete curb at the NW corner of Edgewood Avenue Bridge over Moncrief Creek, 18.7 feet (5.7 m) SW of the centerline of Edgewood Avenue's eastbound lane, 6.0 (1.8 m) feet SE of the NW end of the concrete curb, and 4.0 feet (1.2 m) SW of the edge of the curb.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 04/28/93

Page 3 of 4

FLORIDA 872 0217

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

BENCH MARK STAMPING: 195 H7 This Bench Mark Was Recovered AS Described On 04/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the concrete curb at the SE corner of the Edgewood Avenue Bridge over Moncrief Creek, 19.0 (5.8 m) feet NE of the westbound lane of Edgewood Avenue, 6.0 feet (1.8 m) NW of the SE end of the concrete curb, and 4.0 feet (1.2 m) NE of the edge of the curb.

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PRELIMINARY DATE: 04/28/93

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FLORIDA 872 0217

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

Tidal datums at Moncrief Creek Entrance, St. Johns River are based on the following:

LENGTH OF SERIES	=	3 MONTHS
TIME PERIOD	=	OCTOBER-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	3.77	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.76	FEET
MEAN HIGH WATER (MHW)	=	2.65	FEET
MEAN TIDE LEVEL (MTL)	=	1.37	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	0.81	FEET
MEAN LOW WATER (MLW)	=	0.09	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/26/77)	=	-0.73	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0217 A	8.50	5.85
I95 72 A31	34.64	31.99
195 72 A31 RM1	36.47	33.82
I95 72 A31 RM2	36.49	33.84
195 G7	12.78	10.13
195 H7	20.93	18.28

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport, FL (872-0220).



PUBLICATION DATE: 03/11/93

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FLORIDA 872 0217

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

LATITUDE: 30°23.5'N LONGITUDE: 81°39.7'W NOAA CHART: 11491 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of US #17 and Florida #111 (Edgewood Avenue), proceed 1.1 miles (1.8 km) NW on Edgewood Avenue to the NW end of the bridge over Moncrief Creek. Bench marks are on the bridge and in the vicinity of the north bank on Moncrief Creek. The gauge was located 46 feet (14 m) SSE of the north bank of Moncrief Creek at the end of a series of four catwalks over an abandoned steel bridge foundation. Tide staff was 16 feet (5 m) NW of the tide gauge.

BENCH MARK STAMPING: 0217 A

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The primary bench mark is 106 feet (32 m) SE of the centerline of Merle Drive, 26 feet (8 m) NE of the centerline of the westbound lane of Edgewood Avenue, 5 feet (2 m) SW of a wooden power pole, and 1 foot (0.3 m) SW of a witness sign. The bench mark is at road level, crimped to a copper-clad steel rod driven 33 feet (10 m) and encased in a concrete kickblock.

BENCH MARK STAMPING: 195 72 A31

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in top of a round concrete post in the median of Interstate 95 at the north end of the bridge over Edgewood Avenue, 21.9 feet (6.7 m) east of the centerline of the southbound lane of Interstate 95, 6.2 feet (1.9 m) NE of a concrete guardrail, 3.0 feet (0.9 m) east of a metal guardrail, 2.1 feet (0.6 m) SW of a witness sign, and 0.1 foot (0.03 m) below ground level.

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PUBLICATION DATE: 03/11/93

FLORIDA 872 0217

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

BENCH MARK STAMPING: 195 72 A31 RM1

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Guardrail

The bench mark is set in top of the concrete guardrail at the NW corner of the northbound bridge of Interstate 95 over Edgewood Avenue and 16.6 feet (5.1 m) west of the centerline of the northbound lane of Interstate 95.

BENCH MARK STAMPING: 195 72 A31 RM2

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Guardrail

The bench mark is set in top of the concrete guardrail at the NE corner of the southbound bridge of Interstate 95 over Edgewood Avenue and 17.6 feet (5.4 m) east of the centerline of the southbound lane of Interstate 95.

BENCH MARK STAMPING: 195 G7

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Curb

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The bench mark is set in the concrete curb at the NW corner of Edgewood Avenue Bridge over Moncrief Creek, 18.7 feet (5.7 m) SW of the centerline of Edgewood Avenue's eastbound lane, 6.0 (1.8 m) feet SE of the NW end of the concrete curb, and 4.0 feet (1.2 m) SW of the edge of the curb.

PUBLICATION DATE: 03/11/93

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FLORIDA 872 0217

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

BENCH MARK STAMPING: 195 H7

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Curb

The bench mark is set in the concrete curb at the SE corner of the Edgewood Avenue Bridge over Moncrief Creek, 19.0 (5.8 m) feet NE of the westbound lane of Edgewood Avenue, 6.0 feet (1.8 m) NW of the SE end of the concrete curb, and 4.0 feet (1.2 m) NE of the edge of the curb.

PUBLICATION DATE: 03/11/93

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FLORIDA 872 0217

MONCRIEF CREEK ENTRANCE, ST. JOHNS RIVER

Tidal datums at Moncrief Creek Entrance, St. Johns River are based on the following:

LENGTH OF SERIES	=	3 MONTHS
TIME PERIOD	=	OCTOBER-DECEMBER 1977
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/02/77)	=	3.77	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.76	FEET
MEAN HIGH WATER (MHW)	=	2.65	FEET
MEAN TIDE LEVEL (MTL)	=	1.37	FEET
MEAN LOW WATER (MLW)	=	0.09	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/26/77)	=	-0.73	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHW</u>
0217 A	8.50	5.85
195 72 A31	34.64	31.99
I95 72 A31 RM1	36.47	33.82
195 72 A31 RM2	36.49	33.84
195 G7	12.78	10.13
195 H7	20.93	18.28

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport, FL (872-0220).

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PRELIMINARY DATE: 05/12/93

Page 1 of 3

FLORIDA 872 0216

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

RIBAULT RIVER, LAKE FOREST

LATITUDE: 30°23.9'N LONGITUDE: 81°41.9'W NOAA CHART: 11488 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of Edgewood Avenue and Lem Turner Road in Jacksonville, proceed 0.34 mile (0.55 km) north on Lem Turner Road to Ribault Scenic Drive, then proceed 1.0 mile (1.6 km) NW on Ribault Scenic Drive to 2600 Ribault Scenic Drive. The bench marks are along Ribault Scenic Drive. The tide gage and staff were located on a concrete dock, 100 feet (30 m) north of the NW corner of the 2600 Ribault Scenic Drive property.

BENCH MARK STAMPING: 0216 A 1978 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Seawall

The bench mark is near a concrete dock and boat launch, 94 feet (29 m) NW of a concrete carport on the property at 2600 Ribault Scenic Drive, 68 feet (21 m) east of the concrete dock, 19 feet (6 m) west of the boat launch, and 8 feet (2 m) NW of a large pine tree. The bench mark is set in a concrete seawall at ground level.

BENCH MARK STAMPING: 0216 B 1978 This Bench Mark Was Found Destroyed On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Abutment

The bench mark is west of Restlawn Cemetery on Ribault Scenic Drive at the east end of a highway bridge, 360 feet (110 m) west of the cemetery entrance, and 13.4 feet (4.1 m) south of the centerline of the street. The bench mark is set in the SE corner of the bridge abutment 1 foot (0.3 m) below highway level.

The bench mark is west of Restlawn Cemetery on Ribault Scenic Drive at the east end of a highway bridge, 360 feet (110 m) west of the cemetery entrance, and 13.4 feet (4.1 m) south of the centerline of the street. The bench mark is set in the SE corner of the bridge abutment 1 foot (0.3 m) below highway level. This benchmark was destroyed when the bridge was replaced in 1986

PRELIMINARY DATE: 05/12/93

Page 2 of 3

FLORIDA 872 0216

RIBAULT RIVER, LAKE FOREST

BENCH MARK STAMPING: 0216 C 1978 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is near Restlawn Cemetery and Restlawn Drive, 67 feet (20 m) SE of the SE corner of the house at 2603 Ribault Scenic Drive, 33 feet (10 m) north of the centerline of Ribault Scenic Drive, and 2 feet (0.6 m) north of a concrete block wall. The bench mark is set in the top of a concrete post 0.1 foot (0.03 m) above ground level.

BENCH MARK STAMPING: 0216 D 1978 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is at the NE corner of Restlawn Cemetery, 73 feet (22 m) south of Bench Mark 0216 C 1978, 43 feet (13 m) SW of the intersection of Ribault Scenic Drive and Restlawn Drive, 9.5 feet (2.9 m) south of a utility pole, and 2.3 feet (0.7 m) north of the NE corner of the cemetery. The bench mark is set in the top of a concrete post at ground level.

BENCH MARK STAMPING: 0216 E 1978 This Bench Mark Was Recovered AS Described On 05/12/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is on the north side of Ribault Scenic Drive and east of the cemetery, 110 feet (34 m) north of the house at 2340 Ribault Scenic Drive, 23 feet (7 m) north of the centerline of the street, and 4 feet (1 m) east of a utility pole. The bench mark is set in the top of a concrete post at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/12/93

FLORIDA 872 0216

RIBAULT RIVER, LAKE FOREST

Tidal datums at Ribault River, Lake Forest are based on the following:

LENGTH OF SERIES	Ħ	2 MONTHS
TIME PERIOD	z	JUNE-JULY 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (07/19/78)	=	3.50	FEET	
MEAN HIGHER HIGH WATER (MHHW)	.=	2.82	FEET	
MEAN HIGH WATER (MHW)	=	2.73	FEET	
MEAN TIDE LEVEL (MTL)	=	1.41	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	×	0.67	FEET	•
MEAN LOW WATER (MLW)	=	0.09	FEET	
MEAN LOWER LOW WATER (MLLW)	Ħ	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (05/22/78)	=	-0.92	FEET	

Bench mark elevation information:

BENCH MARK STAMPING	ELEVATION IN F <u>MLLW</u>	EET ABOVE: <u>MHW</u>
0216 A 1978	3.84	1.11
0216 B 1978	6.49	3.76
0216 C 1978	7.18	4.45
0216 D 1978	8.71	5.98
0216 E 1978	5.33	2.60

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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Page 1 of 3

872 0216

DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

RIBAULT RIVER, LAKE FOREST

LATITUDE: 30°23.9'N LONGITUDE: 81°41.9'W NOAA CHART: 11488 USGS QUAD: TROUT RIVER

To reach the tidal bench marks from the intersection of Edgewood Avenue and Lem Turner Road in Jacksonville, proceed 0.34 mile (0.55 km) north on Lem Turner Road to Ribault Scenic Drive, then proceed 1.0 mile (1.6 km) NW on Ribault Scenic Drive to 2600 Ribault Scenic Drive. The bench marks are along Ribault Scenic Drive. The tide gage and staff were located on a concrete dock, 100 feet (30 m) north of the NW corner of the 2600 Ribault Scenic Drive property.

BENCH MARK STAMPING: 0216 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Seawall

The bench mark is near a concrete dock and boat launch, 94 feet (29 m) NW of a concrete carport on the property at 2600 Ribault Scenic Drive, 68 feet (21 m) east of the concrete dock, 19 feet (6 m) west of the boat launch, and 8 feet (2 m) NW of a large pine tree. The bench mark is set in a concrete seawall at ground level.

BENCH MARK STAMPING: 0216 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Abutment

The bench mark is west of Restlawn Cemetery on Ribault Scenic Drive at the east end of a highway bridge, 360 feet (110 m) west of the cemetery entrance, and 13.4 feet (4.1 m) south of the centerline of the street. The bench mark is set in the SE corner of the bridge abutment 1 foot (0.3 m) below highway level.

Page 2 of 3

FLORIDA 872 0216

RIBAULT RIVER, LAKE FOREST

BENCH MARK STAMPING: 0216 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is near Restlawn Cemetery and Restlawn Drive, 67 feet (20 m) SE of the SE corner of the house at 2603 Ribault Scenic Drive, 33 feet (10 m) north of the centerline of Ribault Scenic Drive, and 2 feet (0.6 m) north of a concrete block wall. The bench mark is set in the top of a concrete post 0.1 foot (0.03 m) above ground level.

BENCH MARK STAMPING: 0216 D 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is at the NE corner of Restlawn Cemetery, 73 feet (22 m) south of Bench Mark 0216 C 1978, 43 feet (13 m) SW of the intersection of Ribault Scenic Drive and Restlawn Drive, 9.5 feet (2.9 m) south of a utility pole, and 2.3 feet (0.7 m) north of the NE corner of the cemetery. The bench mark is set in the top of a concrete post at ground level.

BENCH MARK STAMPING: 0216 E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is on the north side of Ribault Scenic Drive and east of the cemetery, 110 feet (34 m) north of the house at 2340 Ribault Scenic Drive, 23 feet (7 m) north of the centerline of the street, and 4 feet (1 m) east of a utility pole. The bench mark is set in the top of a concrete post at ground level.

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Page 3 of 3

FLORIDA 872 0216

RIBAULT RIVER, LAKE FOREST

Tidal datums at Ribault River, Lake Forest are based on the following:

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LENGTH OF SERIES	=	2 MONTHS
TIME PERIOD	=	JUNE-JULY 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (07/19/78)	=	3.50	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.82	FEET
MEAN HIGH WATER (MHW)	=	2.73	FEET
MEAN TIDE LEVEL (MTL)	=	1.41	FEET
MEAN LOW WATER (MLW)	×	0.09	FEET
MEAN LOWER LOW WATER (MLLW)	Ξ	0.00	FEET
LOWEST OBSERVED WATER LEVEL (05/22/78)	=	-0.92	FEET

Bench mark elevation information:

BENCH MARK STAMPING	ELEVATION IN FEE [.] <u>Mllw</u>	r above: <u>Mhw</u>
0216 A 1978	3.84	1.11
0216 B 1978	6.49	3.76
0216 C 1978	7.18	4.45
0216 D 1978	8.71	5.98
0216 E 1978	5.33	2.60

The estimated highest water level to the nearest half-foot is 5.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source	<u> </u>	NOAA/NOS	Jacksonville Electric Authority	FDEP/ BSM
b.	Туре		Horizontal/	Horizontal/	Mean High
			Vertical	Water Fi	les
c.	Cost	<u> </u>	None	None	None
d.	Availability		Silver Springs Maryland	Jacksonville	Tallahassee
e.	Format		ASCII	Arc Info	Hard copy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

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The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

Description/Bank_	River Mile Location	Description/Bank	River <u>Mile</u>
Dame Point Fulton Cutoff/End	10.4	Drummond Creek	14.3 L
Dunn Creek	12.6 L	Trout River	15.8 L
Broward River	13.3 L	Long Branch	16.8 L
Unnamed Connect to Mill Cove	14.0 R	Deer Creek	19.2 L

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.



1" - 1.6 MILES (APPROX.)



NOS TIDE STATION



FDEP APPROVED MEAN HIGH WATER SURVEY

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RIVER MILE



REACH TWO MILE 10.1 TO 20.0

R-2.73

407 Task 4: RECOMMENDED WATER LEVEL NETWORK

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Two an experienced two person reconnaissance crew would require approximately 6 days to perform the task at an estimated cost of \$2,500.

In this reach the strength of existing survey control network for horizontal is moderate and vertical is excellent. Reconnaissance surveys are expected to recover more than 70 existing survey control points, therefore only a few additional geodetic control points and a river crossing vertical tie is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately 13-15 days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Two.

	LOCATION	EXIS	RECOMMENDED					
	Reach/Node/Side	A (872)	(V) (H)	(V)	(V)	(H)	r (Tid	al)
	2 / A / B	0244 0219	a a	0	0	0	1 1	0 2
	2 / B /· R	0	n ā	0	0	0	0	С
	2 / C / B	0242	a a	0	0	0	1	0
	2 / D / B	0	n a	l	3	0	0	0
	2 / E / L	0203	a a	0	0	0	0	0
	2 / F / L	0222* 0215	a a	0	0	0	0 . 1	0 0
	2 / G / L	0225 0202*	a a	<u>0</u>	<u>0</u>	<u>0</u>	1 <u>0</u>	0 <u>0</u>
A	. Tide Station Nu	umber* No	Total published	1 tidal	3 valu	0 es	5	2

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

Control Point monumentation (n) none, (p) poor, В. (m) marginal, (a) adequate

River crossing, monumentation, documentation С.

NAVD 1988 ties, monumentation, documentation (miles) D.

GPS point and azimuth mark to be set, observed, adjusted Ε.

GPS point and azimuth mark to be set at tide station F.

G. Additional bench mark(s) to be set, leveled, documented

COST ESTIMATE

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The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

REACH TWO			_	_		_	_		
Cost/unit	(Nun A	nber B	of C	tasks D	to E	be	perfo F	G	Total
¢2.000/maim	Λ								÷
\$2,000/pair	4								\$ 8,000
\$ 500/mark		2							1,000
\$2,000/crossin	ng		1						2,000
\$1,000/mile				3					3,000
\$2,000/pair				•	0				0
\$2,000/pair							5		10,000
\$ 500/mark								2	1,000
								Total	25,000

A. Vicinity Tide Station; GPS point/azimuth mark

B. Vicinity Tide Station; set additional tidal bench mark

C. River crossing - vertical control

D. NAVD 1988 tie - vertical control

E. GPS point/azimuth mark - horizontal control

F. Main Stem Tide Station; GPS point/azimuth mark

G. Main Stem Tide Station; set additional tidal bench mark

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ADDITIONAL VERTICAL CONTROL POINT(S) IN NODE RECOMMENDED. RIVER CROSSING VERTICAL TIE RECOMMENDED SCALE 1 - 100.000

1" - 1.6 MILES (APPROX.)

CONTROL POINT (NOS OR FDEP)



RIVER MILE

ST. JOHNS RIVER (MAIN STEM)

REACH TWO MILE 10.1 TO 20.0

REACH THREE

411

RIVER MILE 20.1 TO RIVER MILE 30.0



	- GENERAL -
10	RIVER MILE STATION
	ST. JOHNS RIVER - MAIN STEM
	CONTROL SURVEY NETWORK ZONE
9	MEAN HIGH WATER SURVEY (FDEP)
*	NOS TIDE STATION

- HOI	RIZONTAL CONTROL POINTS
\bigtriangleup	1ST ORDER TRIANGULATION (NOS)
\bigtriangleup	2ND ORDER TRIANGULATION (NOS)
\triangle	SRD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
÷	2ND ORDER GPS (JEA)
+	B ORDER HARN, GPS (NOS)
0	2ND ORDER GPS (SJRWMD)

- VE	RTICAL CONTROL POINTS -
*	1ST ORDER - CLASS I
*	1ST ORDER - CLASS II
*	2ND ORDER - CLASS O
*	2ND ORDER - CLASS I



Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

Corps of Engineers reports of 1908 use Jacksonville (River Mile 25*) as a dividing line when referencing navigational attributes of the river eg: Jacksonville to the ocean (approximately 30 miles) or Jacksonville to Palatka (approximately 55 miles). According to House of Representatives Document No. 1111, December 9, 1908 "The present ruling depth from the ocean to Jacksonville is 20 feet. In the future when the 24 foot channel is available the condition as regards traffic to Palatka will become more and more unfavorable and I do not think that the depth of 13 feet provided by the present project will be of much benefit to this portion of the river."

Another Corps report documents the need to excavate large quantities of rock at Jacksonville to accomplish the 24-foot channel depth; House Document No. 663 March 28, 1906:

"The total quantity of material to be removed in order to secure the proposed depth from the present channel to the pierhead lines on the left bank, between the railway bridge (River Mile 23.4) and the mouth of Hogans Creek (River Mile 22.3), is 165,000 cubic yards. From soundings and borings taken in this tract during the past year, it appears that about 112,000 cubic yards of this material is rock, and about 53,000 cubic yards soft material. The surface of the rock is very uneven, with ridges, pockets, and holes, and the rock appears to be quite hard and tough."

The following table gives distances and average depth of the channel, by sections: (House of Representatives, Document No. 281 letter from the Secretary of War, December 12, 1911.)

(1993 River	Mile Loc (From)	cation)* (To)	Miles	Average depth
Buckey Bluff to Christopher Point	(33.0)	(29.0)	3	20
Christopher Point to deep water (24 feet or over) in Jacksonville Harbor	(29.0)	(25.0)	4	14

The above information was derived from Coast and Geodetic Survey Charts Nos. 455b, 455c, 455d.

* modern river mileage system added for location purposes
MAIN STEM REACH THREE ABSTRACT (Continued)

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		·			
Station No. Name	River Mile Location/ Bank	Control Station No. Name	Length of Series (Months)	Da from M/Y	te to M/Y
872 0268 Jacksonville, Acosta Bridge	23.2 Left Bank	872 0220 Mayport	10	5/77	2/78
872 0296 Ortega River Entrance	26.1 Left Bank	872 0220 Mayport	6	8/78	1/79

EXISTING NOAA/NOS TIDE STATION(S)

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Station No.	Elevat	Elevation (Feet, NGVD 1929)		Mean Range	Tidal Bench	
	MHW	MTL	MLW	(Feet)	Marks Fd/Req'd.	
872 0268	1.50	0.74	-0.01	1.51	1/4	
872 0296	1.39	0.84	0.28	1.11	5/0	

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STRENGTH OF EXISTING SURVEY CONTROL NETWORK



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MAIN STEM REACH THREE Continued

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MISCELLANEOUS

Hart Bridge (Alternate U.S. Highway 1) crosses the St. Johns River at River Mile 21.0. Other bridges crossing the river in the reach are Main Street Bridge (US Highway 17) River Mile 23.0; Acousta Bridge (new structure under construction) River Mile 23.35 and Florida East Coast Railroad River Mile 23.38 and finally the Fuller Warren Bridge (Interstate Route I-95) at River Mile 23.9.

A copy of each Main Stem (1)<u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

Page 1 of 3

PRELIMINARY DATE: 05/27/93

FLORIDA 872 0268

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER

LATITUDE: 30°19.5'N LONGITUDE: 81°39.9'W NOAA CHART: 11488 USGS QUAD: JACKSONVILLE

To reach the tidal bench marks from the north end of the Acosta Bridge in Jacksonville, proceed NE to Water Street, then east on Water Street to the Seaboard Coast Line Railroad building. The bench marks are located in the area along the railroad. The tide gage and staff were located on a concrete headwall SW of the railroad building.

BENCH MARK STAMPING: NO 2 1934 This Bench Mark Was Searched For And Not Found On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the SE corner of the concrete base of the fourth pier south of the north end of the bridge in the west row of piers, 61 feet (19 m) west of the SW corner of the Monticello Drug Company building, and 3 feet (1 m) above ground level. NOTE: The old bridge, bulkheads and piers were demolished for the construction of a new bridge, the mark is presumed destroyed.

> BENCH MARK STAMPING: NO 1 1958 This Bench Mark Was Searched For And Not Found On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the SE corner of a concrete base of a bridge pillar, 159 feet (48 m) NE of Bench Mark NO 2 1934, 5.7 feet (1.7 m) north of the NW corner of the Monticello Drug Company building, and 2.1 feet (0.6 m) above ground level. NOTE: The old bridge, bulkheads and piers were demolished for the construction of a new bridge, the mark is presumed destroyed.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

Page 2 of 3

FLORIDA 872 0268

JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER

BENCH MARK STAMPING: NO 3 1958 This Bench Mark Was Searched For And Not Found On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the NW corner of the concrete base of the seventh pier south of the north end of the bridge, 111 feet (34 m) south of Bench Mark NO 2 1934, 58.8 feet (17.9 m) east of easterly railroad track (Atlantic Coast), and 4.2 feet (1.3 m) above ground level. NOTE: The old bridge, bulkheads and piers were demolished for the construction of a new bridge, the mark is presumed destroyed.

> BENCH MARK STAMPING: 0268 A 1978 This Bench Mark Was Recovered AS Described On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sea Wall

The bench mark is set in a concrete sea wall adjacent to the railroad building at the NW end of the Acosta Bridge over the St. Johns River, 300 feet (91 m) SW of the SW corner of the railroad building, and 4 feet (1 m) east of the westernmost pair of large iron cleats in the concrete sea wall.

BENCH MARK STAMPING: 0268 B 1978 This Bench Mark Was Searched For And Not Found On 05/27/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Storm Drain

The bench mark is set in a concrete storm drain in the parking lot of the Seaboard Coast Line railroad building, 430 feet (131 m) NW of Bench Mark 0268 A 1978, 48 feet (15 m) NE of a fence line along the west side of the parking lot, and 33 feet (10 m) north of parking space #530.

NOTE: The portion of the parking lot in the general location of the Bench Mark was was removed and now is under a new bridge. The mark is presumed destroyed.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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Page 3 of 3

FLORIDA 872 0268

JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER

Tidal datums at Jacksonville, Acosta Bridge, St. Johns River are based on the following:

=	10 MONTHS
=	MAY 1978 - FEBRUARY 1979
=	1960-1978
=	MAYPORT (872 0220)
	= = =

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	, =	2.75	FEET
MEAN HIGHER HIGH WATER (MHHW)	*	1.68	FEET
MEAN HIGH WATER (MHW)	æ	1.60	FEET
MEAN TIDE LEVEL (MTL)	-	0.84	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	E	0.10	FEET
MEAN LOW WATER (MLW)	=	0.09	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.55	FEET

Bench mark elevation information:

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ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
NO 2 1934	12.38	10.78
NO 1 1958	12.47	10.87
NO 3 1958	12.45	10.85
0268 A 1978	6.28	4.68
0268 B 1978	7.18	5.58

The estimated highest water level to the nearest half-foot is 4.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

<u>CAUTION:</u> The reliability of the elevations at this station may be reduced due to only one set of levels.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 06/16/88

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FLORIDA 872-0268

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER

LATITUDE: 30°19.5'N LONGITUDE: 081°39.9'W NOAA CHART: 11488 USGS QUAD: JACKSONVILLE

NOTICE:

These data do not meet all of the criteria and standards for official tidal bench mark publication. However, tidal datum and bench mark elevations are issued for surveying and other public use, as appropriate, with precaution. The reliability of the elevations at this station may be reduced due to only one set of levels.

To reach the tidal bench marks from the north end of the Acosta Bridge in Jacksonville, proceed NE to Water Street, then east on Water Street to the Seaboard Coastline Railroad building. The bench marks are located in the area along the railroad. The tide gage and staff were located on a concrete headwall SW of the railroad building.

BENCHMARK STAMPING: NO 2 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the SE corner of the concrete base of the fourth pier south of the north end of the bridge in the west row of piers, 61 feet (19 m) west of the SW corner of the Monticello Drug Company building, and 3 feet (1 m) above ground level.

BENCHMARK STAMPING: NO 1 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the SE corner of a concrete base of a bridge pillar, 159 feet (48 m) NE of bench mark NO 2 1934, 5.7 feet (1.7 m) north of the NW corner of the Monticello Drug Company building, and 2.1 feet (0.6 m) above ground level.

PUBLICATION DATE: 06/16/88

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FLORIDA 872-0268

JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER

BENCHMARK STAMPING: NO 3 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the NW corner of the concrete base of the seventh pier south of the north end of the bridge, 111 feet (34 m) south of bench mark NO 2 1934, 58.8 feet (17.9 m) east of the easterly railroad track (Atlantic Coast), and 4.2 feet (1.3 m) above ground level.

BENCHMARK STAMPING: 0268 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Seawall

The bench mark is set in a concrete seawall adjacent to the railroad building at the NW end of the Acosta Bridge over the St. Johns River, 300 feet (91 m) SW of the SW corner of the railroad building, and 4 feet (1 m) east of the westernmost pair of large iron cleats in the concrete seawall.

BENCHMARK STAMPING: 0268 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Storm Drain

The bench mark is set in a concrete storm drain in the parking lot of the Seaboard Coastline Railroad building, 430 feet (131 m) NW of bench mark 0268 A 1978, 48 feet (15 m) NE of a fence line along the west side of the parking lot, and 33 feet (10 m) north of parking space #530.

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PUBLICATION DATE: 06/16/88

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FLORIDA 872-0268

JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER

Tidal datums at JACKSONVILLE, ACOSTA BRIDGE, ST. JOHNS RIVER are based on the following:

LENGTH OF SERIES	æ	10 MONTHS
TIME PERIOD	=	MAY 1978 - FEBRUARY 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	2.75	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.68	FEET
MEAN HIGH WATER (MHW)	=	1.60	FEET
MEAN TIDE LEVEL (MTL)	=	0.84	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=		FEET
MEAN LOW WATER (MLW)	=	0.09	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.55	FEET

Bench mark elevation information:

BENCHMARK STAMPING .	ELEVATION IN FEET MLLW	ABOVE: MHW
NO 2 1934	12.38	10.78
NO 1 1958	12.47	10.87
NO 3 1958	12.45	10.85
0268 A 1978	6.28	4.68
0268 B 1978	7.18	5.58

The estimated highest water level to the nearest half-foot is 4.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet below mean lower low

water. Estimates are based on observed extreme water levels at Mayport (872 0220).

FLORIDA 872 0296

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

ORTEGA RIVER ENTRANCE

LATITUDE: 30°16.7' LONGITUDE: 81°42.3'W NOAA CHART: 11492 USGS QUAD: JACKSONVILLE

To reach the tidal bench marks from the intersection of Interstate Highway I-295 and U.S. Highway 17, proceed 4.3 miles (6.9 km) north of U.S. Highway 17 to its intersection with State Highway C-211 (Ortega River Boulevard and Grand Avenue), then 1.9 miles (3.1 km) NW on Highway C-211 to the dirt drive leading to the residence of the Van Dorens. The bench marks are along Highway C-211 (Grand Avenue). The tide gage and staff were located on a pier owned by the Van Dorens.

BENCH MARK STAMPING: NO 1 1939 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead Seawall

The bench mark is set in the top of a concrete bulkhead on the south shore of the Ortega River along State Highway C-211, 340 feet (104 m) SE of the SE end of the highway bridge over the Ortega River, and 40.4 feet (12.3 m) SW of the centerline of the highway.

The bench mark is set in the top of a concrete <u>bulkhead</u> <u>seawall along the causeway</u> on the south shore of the Ortega River along State Highway C-211, $\frac{340-\text{feet}}{104-\text{m}}$, $\frac{365}{\text{feet}}$ (111.2 m) SE of the SE end of the highway bridge over the Ortega River, 40.4 feet (12.3 m) SW of the centerline of the highway, and 9.4 feet (2.8 m) NW of the center of the last concrete pillar.

BENCH MARK STAMPING: NO 2 1939 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead Seawall

The bench mark is set in the top of a concrete bulkhead on the south shore of the Ortega River along State Highway C-211, 205 feet (62 m) SE of the SE end of the highway bridge, and 135 feet (41 m) NW of Bench Mark NO 1 1939.

The bench mark is set in the top of a concrete-bulkhead seawall of the causeway on the south shore of the Ortega River along State Highway C-211, 205 feet (62 m) SE of the SE end of the highway bridge, and 135 feet (41 m) NW of Bench Mark NO 1 1939.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0296

ORTEGA RIVER ENTRANCE

BENCH MARK STAMPING: 0296 A 1978 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is in the traffic island across from the dirt drive leading to the Van Doren residence at 2711 Grand Avenue, 210 feet (64 m) SSE of the north end of the first traffic island south of the bridge over Ortega River, 21.0 feet (6.4 m) SSW of the centerline of the northbound lane of Grand Avenue, and 20.5 feet (6.2 m) NNE of the centerline of the southbound lane of Grand Avenue. The bench mark is at ground level, crimped to the top of a copper-clad steel rod driven 40 feet (12 m) to refusal, and encased in a PVC pipe and concrete kickblock.

The bench mark is in the traffic island across from the dirt drive leading to the Van Doren residence at 2711 Grand Avenue, 210 feet (64 m) SSE first traffic island SE of the Ortega River bridge, 157 feet (47.9 m) SE of the north end of the first traffic island south of the bridge over Ortega River, 21.0 feet (6.4 m) SSW of the centerline of the northbound lane of Grand Avenue, and 20.5 feet (6.2 m) NNE of the centerline of the southbound lane of Grand Avenue, and 15.9 feet SE of a wooden light pole in the median. The bench mark is at ground level, crimped to the top of a copper-clad steel rod driven 40 feet (12 m) to refusal, and encased in a PVC pipe and concrete kickblock.

> BENCH MARK STAMPING: 0296 B 1978 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 84 feet (26 m) SE of the intersection of Grand Avenue and McGirts Boulevard, 54 feet (16 m) SE of the intersection of Grand Avenue and El Dorado Avenue, and 51 feet (16 m) SE of the north end of the second traffic island of Grand Avenue south of the bridge. The bench mark is 0.5 foot (0.2 m) below ground level, crimped to a copper-clad steel rod riven 42 feet (13 m) to refusal, and encased in a PVC pipe and concrete kickblock.

The bench mark is 84 feet (26 m) SE of the intersection of Grand Avenue and McGirts Boulevard, <u>62.5 feet WSW of the northern most corner of a low stucco wall</u>, 54 feet (16 m) SE <u>E</u> of the intersection of Grand Avenue and El Dorado Avenue, and 51 feet (16 m) SE of the north <u>47.5 feet SE of the NW</u> end of the second traffic island of Grand Avenue south of the bridge <u>and 46.8 ft E of an old metal light pole</u>. The bench mark is 0.5 foot (0.2 m) below ground level, crimped to a copper-clad steel rod riven 42 feet (13 m) to refusal, and encased in a PVC pipe and concrete kickblock.

> BENCH MARK STAMPING: 0296 C RESET 3 1978 RLB GWH This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set flush in the top of a concrete post, 43.0 feet (13.1 m) SE of the SE corner of the Ortega River bridge, 31.5 feet (9.6 m) SW of the centerline of Ortega Boulevard, 10.5 feet (3.2 m) NW of a concrete seawall, and at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0296

ORTEGA RIVER ENTRANCE

Tidal datums at Ortega River Entrance are based on the following:

LENGTH OF SERIES	=	6 MONTHS
TIME PERIOD	=	AUGUST 1978 - JANUARY 1979
TIDAL EPOCH	#	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/4/78)	=	2.33 FI	EET
MEAN HIGHER HIGH WATER (MHHW)	=	1.26 F	EET
MEAN HIGH WATER (MHW)	=	1.18 FI	EET
MEAN TIDE LEVEL (MTL)	Ξ	0.63 FI	CET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.21 FI	EET
MEAN LOW WATER (MLW)	=	0.07 FI	ET
MEAN LOWER LOW WATER (MLLW)	=	0.00 F	EET
LOWEST OBSERVED WATER LEVEL (1/26/79)	×	-1.42 FI	EET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
NO 1 1939	7.14	5.96
NO 2 1939	7.04	5.86
0296 A 1978	11.90	10.72
0296 B 1978	17.62	16.44
0296 C RESET 3 1978 RLB GWH	7.52	6.34

The estimated highest water level to the nearest half-foot is 4.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport, FL (873 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 07/19/85

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872 0296

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

ORTEGA RIVER ENTRANCE

LATITUDE: 30°16.7' LONGITUDE: 81°42.3'W NOAA CHART: 11492 USGS QUAD: JACKSONVILLE

To reach the tidal bench marks from the intersection of Interstate Highway I-295 and U.S. Highway 17, proceed 4.3 miles (6.9 km) north of U.S. Highway 17 to its intersection with State Highway C-211 (Ortega River Boulevard and Grand Avenue), then 1.9 miles (3.1 km) NW on Highway C-211 to the dirt drive leading to the residence of the Van Dorens. The bench marks are along Highway C-211 (Grand Avenue). The tide gage and staff were located on a pier owned by the Van Dorens.

BENCH MARK STAMPING: NO 1 1939

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead

The bench mark is set in the top of a concrete bulkhead on the south shore of the Ortega River along State Highway C-211, 340 feet (104 m) SE of the SE end of the highway bridge over the Ortega River, and 40.4 feet (12.3 m) SW of the centerline of the highway.

BENCH MARK STAMPING: NO 2 1939

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead

The bench mark is set in the top of a concrete bulkhead on the south shore of the Ortega River along State Highway C-211, 205 feet (62 m) SE of the SE end of the highway bridge, and 135 feet (41 m) NW of Bench Mark NO 1 1939.

PUBLICATION DATE: 07/19/85

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FLORIDA 872 0296

ORTEGA RIVER ENTRANCE

BENCH MARK STAMPING: 0296 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is in the traffic island across from the dirt drive leading to the Van Doren residence at 2711 Grand Avenue, 210 feet (64 m) SSE of the north end of the first traffic island south of the bridge over Ortega River, 21.0 feet (6.4 m) SSW of the centerline of the northbound lane of Grand Avenue, and 20.5 feet (6.2 m) NNE of the centerline of the southbound lane of Grand Avenue. The bench mark is at ground level, crimped to the top of a copper-clad steel rod driven 40 feet (12 m) to refusal, and encased in a PVC pipe and concrete kickblock.

BENCH MARK STAMPING: 0296 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 84 feet (26 m) SE of the intersection of Grand Avenue and McGirts Boulevard, 54 feet (16 m) SE of the intersection of Grand Avenue and El Dorado Avenue, and 51 feet (16 m) SE of the north end of the second traffic island of Grand Avenue south of the bridge. The bench mark is 0.5 foot (0.2 m) below ground level, crimped to a copper-clad steel rod riven 42 feet (13 m) to refusal, and encased in a PVC pipe and concrete kickblock.

BENCH MARK STAMPING: 0296 C RESET 3 1978 RLB GWH

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set flush in the top of a concrete post, 43.0 feet (13.1 m) SE of the SE corner of the Ortega River bridge, 31.5 feet (9.6 m) SW of the centerline of Ortega Boulevard, 10.5 feet (3.2 m) NW of a concrete seawall, and at ground level.

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PUBLICATION DATE: 07/19/85

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FLORIDA 872 0296

ORTEGA RIVER ENTRANCE

Tidal datums at Ortega River Entrance are based on the following:

LENGTH OF SERIES	=	6 MONTHS
TIME PERIOD	=	AUGUST 1978 - JANUARY 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/4/78)	=	2.33	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.26	FEET
MEAN HIGH WATER (MHW)	Ξ	1.18	FEET
MEAN TIDE LEVEL (MTL)	=	0.63	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (1/26/79)	=	-1.42	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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6
36
2
4
14

The estimated highest water level to the nearest half-foot is 4.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport, FL (873 0220).

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LOWER ST. JOHNS RIVER VICINITY REACH TWO ABSTRACT MILE 20.1 TO MILE 30.0

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from M/Y	20 M/Y
872 0274 Little Pottsburg Creek	21.6	0.9 mile/ Right	872 0220 Mayport	6	7/78 12	2/78
Station No.	E	levation (Fee	t, NGVD 1929)	Mear (F	Range	Tidal Bench Marks
	МНИ	N MTL	MLW	v (*		Fd/Req'd.
872 0274	1.7	9 0.76	(-)0.	26 2	.05	5/0

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:

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R-3.16

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PRELIMINARY DATE: 05/14/93

FLORIDA 872 0274 COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

LITTLE POTTSBURG CREEK

LATITUDE: 30°18.6'N LONGITUDE: 81°36.6'W NOAA CHART: 11491 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of University Boulevard and Atlantic Boulevard in Jacksonville, proceed 0.6 mile (1.0 km) west along Atlantic Boulevard to the concrete bridge over Little Pottsburg Creek. The tide gauge was located 50 feet (15 m) west of the apparent high water line on the east shore of Little Pottsburg Creek, and on the second set of concrete bridge supports on the north side of the bridge. The tide staff was 1 foot (0.3 m) west of the gauge.

BENCH MARK STAMPING: 0274 A 1978 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Abutment

The primary bench mark is set in the eastern end of the concrete bridge abutment over Little Pottsburg Creek, 28 feet (9 m) north of the centerline of the west bound lane of Atlantic Boulevard, 6.8 feet (2.1 m) west of a utility pole, and 1.0 foot (0.3 m) south of the NE corner of the bridge.

The primary bench mark is set in the <u>side walk</u> eastern end of the concrete bridge abutment over Little Pottsburg Creek, 28 feet (9 m) north of the centerline of the west bound lane of Atlantic Boulevard, 6.8 feet (2.1 m) west of a utility pole, and 1.0 foot (0.3 m) south of the NE corner of the bridge.

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FLORIDA 872 0274

LITTLE POTTSBURG CREEK

BENCH MARK STAMPING: 0274 B 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Steps

The bench mark is set in the first row of steps leading to Saint Pauls Church, 50 feet (15 m) SE of the back of the sidewalk, 43.8 feet (13.4 m) SE of the church wall closest to Atlantic Boulevard, 32 feet (10 m) SE of the centerline of the east bound lane of Atlantic Boulevard, and 2.0 feet (0.6 m) SE of the concrete retaining wall.

BENCH MARK STAMPING: NO 1 1939 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post level with the ground along the NE shore of Little Pottsburg Creek near Campbell Road, 72.5 feet (22.1 m) SE of the east corner of a boat shed, 60.5 feet (18.4 m) SW of the south corner of S.F. Hall's residence, 11 feet (3 m) SW of the centerline of the road leading to the creek, and 2 feet (0.6 m) SW of a power line pole.

The bench mark is set in the top of a concrete post level with the ground along the NE shore of Little Pottsburg Creek near <u>the east end of</u> Campbell Road, <u>98.3 feet (29.9</u> m) <u>SE of a power pole with a transformer</u>, <u>72.5 feet (22.1 m) SE of the east corner ef a boat shed</u>, <u>60.5 feet (18.4 m)</u> <u>81.8 feet (24.9 m)</u> SW of the south corner of 5.F. Hall's residence the house at number 1117 Campbell Road, <u>27.6 feet NW of the NW corner of a wooden dock</u>, 11 feet (3 m) SW of the centerline of the road leading to the creek <u>Campbell residence</u>, and 2 feet (0.6 m) SW of a power line pole., and 2.9 feet NNE of a 22 inch longleaf pine tree.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0274

LITTLE POTTSBURG CREEK

BENCH MARK STAMPING: NO 2 1939 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the concrete foundation of the NE brick pillar along the NE shore of Little Pottsburg Creek at the SE entrance to R.C. Campbell property, 127.5 feet (38.9 m) NE of Bench Mark NO.1 1939, 37.5 feet (11.4 m) SW of Bench Mark NO. 3 1939, and 6 feet (2 m) NE of the centerline of the road at Cattle Guard.

The bench mark is set in the concrete foundation of the NE brick pillar along the NE shore of Little Pottsburg Creek at the SE entrance to <u>the residence at 1100 Campbell</u> <u>Road</u> R.C. Campbell property, 127.5 feet (38.9 m) NE of Bench Mark NO.1 1939, 37.5 feet (11.4 m) SW of Bench Mark NO. 3 1939, and 6 feet (2 m) NE of the centerline of the road at Cattle Guard.

BENCH MARK STAMPING: NO 3 1939 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post level with the ground along the NE shore of Little Pottsburg Creek, 37.5 feet (11.4 m) NE of Bench Mark NO 2 1939, 14 feet (4 m) SW of the centerline of the sand road, and 3 feet (1 m) SE of the corner fence post.

The bench mark is set in the top of a concrete post level with the ground along the NE shore of Little Pottsburg Creek, 37.5 feet (11.4 m) NE of Bench Mark NO 2 1939, 14 feet (4 m) SW of the centerline of the sand-road, driveway to the house at 1101 Campbell Road, 11 feet (3.3 m) SW of the SW corner of the western most one of two concrete pillars flanking a gate, and 3 feet (1 m) 3.5 feet (1.06 m) SE of the corner fence post of a wooden fence.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0274

LITTLE POTTSBURG CREEK

Tidal datums at Little Pottsburg Creek are based on the following:

LENGTH OF SERIES	=	6 MONTHS	
TIME PERIOD	듁	JULY-DECEMBER	1978
TIDAL EPOCH	#	1960-1978	
CONTROL TIDE STATION		MAYPORT (872	0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)) =	3.42 FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.23 FEET
MEAN HIGH WATER (MHW)	` =	2.15 FEET
MEAN TIDE LEVEL (MTL)	=	1.12 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	0.36 FEET
MEAN LOW WATER (MLW)	E	0.10 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (12/10/78)	=	-1.08 FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0274 A 1978	14.63	12.48
0274 B 1978	21.37	19.22
NO 1 1939	5.64	3.49
NO 2 1939	7.83	5.68
NO 3 1939	8.56	6.41

The estimated highest water level to the nearest half-foot is 5.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport, FL (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES



PUBLICATION DATE: 03/11/93

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FLORIDA 872 0274

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

LITTLE POTTSBURG CREEK

LATITUDE: 30°18.6'N LONGITUDE: 81°36.6'W NOAA CHART: 11491 USGS QUAD: ARLINGTON

To reach the tidal bench marks from the intersection of University Boulevard and Atlantic Boulevard in Jacksonville, proceed 0.6 mile (1.0 km) west along Atlantic Boulevard to the concrete bridge over Little Pottsburg Creek. The tide gauge was located 50 feet (15 m) west of the apparent high water line on the east shore of Little Pottsburg Creek, and on the second set of concrete bridge supports on the north side of the bridge. The tide staff was 1 foot (0.3 m) west of the gauge.

BENCH MARK STAMPING: 0274 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Abutment

The primary bench mark is set in the eastern end of the concrete bridge abutment over Little Pottsburg Creek, 28 feet (9 m) north of the centerline of the west bound lane of Atlantic Boulevard, 6.8 feet (2.1 m) west of a utility pole, and 1.0 foot (0.3 m) south of the NE corner of the bridge.

BENCH MARK STAMPING: 0274 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Steps

The bench mark is set in the first row of steps leading to Saint Pauls Church, 50 feet (15 m) SE of the back of the sidewalk, 43.8 feet (13.4 m) SE of the church wall closest to Atlantic Boulevard, 32 feet (10 m) SE of the centerline of the east bound lane of Atlantic Boulevard, and 2.0 feet (0.6 m) SE of the concrete retaining wall.

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FLORIDA 872 0274

LITTLE POTTSBURG CREEK

BENCH MARK STAMPING: NO 1 1939

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post level with the ground along the NE shore of Little Pottsburg Creek near Campbell Road, 72.5 feet (22.1 m) SE of the east corner of a boat shed, 60.5 feet (18.4 m) SW of the south corner of S.F. Hall's residence, 11 feet (3 m) SW of the centerline of the road leading to the creek, and 2 feet (0.6 m) SW of a power line pole.

BENCH MARK STAMPING: NO 2 1939

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the concrete foundation of the NE brick pillar along the NE shore of Little Pottsburg Creek at the SE entrance to R.C. Campbell property, 127.5 feet (38.9 m) NE of Bench Mark NO.1 1939, 37.5 feet (11.4 m) SW of Bench Mark NO. 3 1939, and 6 feet (2 m) NE of the centerline of the road at Cattle Guard.

BENCH MARK STAMPING: NO 3 1939

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post level with the ground along the NE shore of Little Pottsburg Creek, 37.5 feet (11.4 m) NE of Bench Mark NO 2 1939, 14 feet (4 m) SW of the centerline of the sand road, and 3 feet (1 m) SE of the corner fence post.

PUBLICATION DATE: 03/11/93

Page 3 of 3

FLORIDA 872 0274

LITTLE POTTSBURG CREEK

Tidal datums at Little Pottsburg Creek are based on the following:

LENGTH OF SERIES	=	6 MONTHS	
TIME PERIOD	=	JULY-DECEMBER	1978
TIDAL EPOCH	=	1960-1978	
CONTROL TIDE STATION	=	MAYPORT (872	0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	3.42	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	2.23	FEET
MEAN HIGH WATER (MHW)	=	2.15	FEET
MEAN TIDE LEVEL (MTL)	=	1.12	FEET
MEAN LOW WATER (MLW)	=	0.10	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (12/10/78)	=	-1.08	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0274 A 1978	14.63	12.48
0274 B 1978	21.37	19.22
NO 1 1939	5.64	3.49
NO 2 1939	7.83	5.68
NO 3 1939	8.56	6.41

The estimated highest water level to the nearest half-foot is 5.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport, FL (872 0220).

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Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source		NOAA/NOS	Jacksonville Electric Authority	FDEP/ BSM
b.	Туре	<u> </u>	Horizontal/	Horizontal/	Mean High Water Files
c.	Cost		None	None	None
đ.	Availability		Silver Springs	Jacksonville	Tallahassee
e.	Format		ASCII	Arc Info	Hard copy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

• NOS Tide Stations

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- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

r tion	Description/Bank	River Mile <u>Location</u>
.2 R	Ortega River	25.7 R
.0 R	Unnamed Creek	25.8 R
.3 L	Unnamed Creek	26.1 L
.4 L	Yacht Basin	28.2 L
.7 R	New Rose Creek	28.3 R
.9 L	Cristopher Creek	28.9 R
.9 L	Unnamed Creek	29.6 R
.6 R	Unnamed Creek	30.0 R
	er e ation 1.2 R 2.0 R 2.3 L 3.4 L 4.7 R 4.9 L 4.9 L 5.6 R	er e ation Description/Bank 1.2 R Ortega River 2.0 R Unnamed Creek 2.3 L Unnamed Creek 3.4 L Yacht Basin 4.7 R New Rose Creek 4.9 L Cristopher Creek 4.9 L Unnamed Creek 5.6 R Unnamed Creek

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

R-3.24



SCALE 1 . 100.000 1" - 1.6 MILES (APPROX.)

LOWER ST. JOHNS RIVER

EXISTING WATER LEVEL MEASUREMENT NETWORK

REACH THREE MILE 20.1 TO 30.0 类 NOS TIDE STATION \bullet FDEP APPROVED MEAN HIGH WATER SURVEY

RIVER MILE

ST. JOHNS RIVER (MAIN STEM)

R-3.25

441 Task 4: RECOMMENDED WATER LEVEL NETWORK

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Three an experienced two person reconnaissance crew would require approximately 6 days to perform the task at an estimated cost of \$2,500.

In this reach the strength of existing survey control network for horizontal is moderate, vertical is good. Reconnaissance surveys area expected to recover 70-72 existing survey control points, therefore no additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately seven field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Three.

HORIZONTAL/VERTICAL CONTROL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH THREE

LOCATION		EXISTI	NG	C	<u>R</u>	ECOMM	ENDED	G	
Reach/Node/Side	(872)	(V)	(H)	(V)	(V)	(H)	(Tid	la1)	
3 / A / R	0274	а	a	0	0	0	1	- 0	
3 / B / R	0	a	a	0	0	0	0	0	
3 / C / R	0	a	a	0	0	0	0	0	
3 / D / L	0	а	a	0	0	0	0	0	
3 / E / L	0268*	а	a	0	0	0	1	4	
3 / F / L	0	a	a	0	0	0	0	0	
3 / G / L	0296	а	a	0	0	0	1	0	
3 / H / L	0	a	a	<u>0</u>	<u>0</u>	Q	<u>0</u>	<u>0</u>	
			Total	0	0	O	3	4	

A. Tide Station Number *reoccupation recommended

B. Control Point Analysis (n) none, (p) poor (m) marginal,(a) adequate

C. River crossing, monumentation, documentation

D. NAVD 1988 ties, monumentation, documentation (miles)

E. GPS point and azimuth mark to be set, observed, adjusted

F. GPS point and azimuth mark to be set at tide station

G. Additional bench mark(s) to be set, leveled, documented

COST ESTIMATE

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

REACH THREE	2									
Cost/unit	A	В	С	D	E	F	G	Н	Total	
\$2,000/pair	2								\$ 4,000	-
\$ 500/mark		0							0	
\$2,000/cross:	ing		0						0	
\$1,000/mile				0					0	
\$2,000/pair					0				0	
\$2,000/pair						2			6,000	
\$ 500/mark							4		2,000	
\$5,000/statio	on							1	5,000	
								Total	\$17,000	

- Vicinity Tide Station; GPS point/azimuth mark Α.
- Vicinity Tide Station; set additional tidal bench mark в.
- River crossing vertical control NAVD 1988 tie vertical control С.
- D.
- Ε. GPS point/azimuth mark - horizontal control
- Main Stem Tide Station; GPS point/azimuth mark F.
- Main Stem Tide Station; set additional tidal bench mark G.

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Н. Tide Station Reoccupation 442



SCALE 1 - 100,000 1" - 1.6 MILES (APPROX.)

LOWER ST. JOHNS RIVER EXISTING HORIZONTAL CONTROL SURVEY NETWORK INVENTORY

REACH THREE MILE 20.1 TO 30.0

- CONTROL POINT-TRIANGULATION (NOS)
- CONTROL POINT-GPS (GEONEX / JEA)
- CONTROL POINT-GPS (NOS)
- CONTROL POINT-GPS (GEONEX / SJRWMD)
- RIVER MILE

ST. JOHNS RIVER (MAIN STEM)



R-3.29

REACH FOUR

RIVER MILE 30.1 TO RIVER MILE 40.0



	- GENERAL -
10	RIVER MILE STATION
	ST. JOHNS RIVER - MAIN STEM
	CONTROL SURVEY NETWORK ZONE
•	MEAN HIGH WATER SURVEY (FDEP)
*	NOS TIDE STATION

- HO	RIZONTAL CONTROL POINTS
\bigtriangleup	1ST ORDER TRIANGULATION (NOS)
\bigtriangleup	2ND ORDER TRIANGULATION (NOS)
\triangle	SRD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
÷	2ND ORDER GPS (JEA)
+	B ORDER HARN, GPS (NOS)
0	2ND ORDER GPS (SJRWMD)





USGS Quads: Orange Park Fleming Island LOWER ST. JOHNS RIVER MAIN STEM REACH FOUR ABSTRACT MILE 30.1 TO MILE 40.0

Duval County Clay County St. Johns County

Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

On October 26, 1911, William Bixby, Chief of Engineers, U.S. Army recommended against the efforts by local parties to have the St. Johns River increased in depth between Jacksonville and Palatka (House of Representatives, Document No. 281). The reach currently being improved to 200 feet wide and 13 feet depth, local parties supported increasing the depth to 16 feet mainly for the lumber industry. Bixby noted the 16 feet depth would only provide temporary relief. He stated:

"A depth of 20 feet would care for the lumber shipments but would not be enough for an expected phosphate trade; and that a depth of 24 feet is necessary to make Palatka a port of any consequence." He also considered the district officers' question of the routes for the trans-Florida canals and other transportation questions in Florida. it was concluded "--- the greater depth of 24 feet is too large and too costly a work for the United States to undertake at this time, ---"

The following table gives distances and average depth of the channel, by sections: (House of Representatives, Document No. 281 Letter from the Secretary of War, December 12, 1911.)

(1993 River	Mile Lo (From)	cation)* (To)	Miles	Average Depth
Hibernia to Ragged Point	(42.0)	(38.6)	4	16
Ragged Point to Orange Park	(38.6)	(35.6)	3	21
Orange Park to Buckey Bluff	(35.6)	(32.0)	3	14
Buckey Bluff to Christopher Point	(32.0)	(29.0)	3	20

The above information was derived from Coast and Geodetic Survey Charts Nos. 455b, 455c, 455d.

* modern river mileage system added for location purposes

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MAIN STEM REACH FOUR ABSTRACT Continued EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Control Station No/ Name		Length of Series (Months)	Date from to M,Y M,Y	
872 0333 Piney Point	30.2 Left Bank	872 0220 Mayport		2	10/78 11/78	
872 0339 Goodbys Creek	31.2 Right Bank	N/A		N/A	N/A	
872 0377 Mandarin	34.9 Right Bank	Unknown		0.5	1/34 1/34	
872 0374 Orange Park Moose Haven	35.2 Left Bank	872 0496 Green Cove Springs		4	6/78 7/78 9/78 10/78	
Station No.	Elevati	on (Feet, N	Mean	Tidal Bench		
Name Left/Right	MHW	MTL	MLW	Range (Feet)	Marks Fd/Reg'd.	
872 0333	1.23	0.79	0.35	0.88	4/1	
872 0339	N/A	N/A	N/A	N/A	0/0 (
872 0374	N/A	N/A	N/A	0.60	0/0	

STRENGTH OF EXISTING SURVEY CONTROL NETWORK

0.29

0.74

6/0



0.66

1.03

872 0377

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MISCELLANEOUS

It is noted the NGVD 1929 elevation of Mean High Water has progressively decreased at each tide station located between the mouth of the St. Johns River (River Mile 0.0) and Orange Park (River Mile 35.2) and (River Mile)

A copy of each Main Stem (1)<u>NOS Published Tidal Bench Mark Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

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R-4.02

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PRELIMINARY DATE: 05/28/93

FLORIDA 872 0333

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PINEY POINT, ST. JOHNS RIVER

LATITUDE: 30°13.7'N LONGITUDE: 81°39.8'W NOAA CHART: 11491 USGS QUAD: ORANGE PARK

To reach the tidal bench marks from the intersection of Interstate 295 and US Highway 17 in Orange Park, proceed 2.3 miles (3.7 km) north along US Highway 17 to the entrance (Yorktown Avenue) of the Naval Air Station, then 1.3 miles (2.1 km) east along Yorktown Avenue to the intersection with Hoyt Street, which leads to the air field, proceed 0.15 mile (0.24 km) north along Hoyt Street to the intersection with Albermarle Avenue, then 0.8 mile (1.3 km) east along Albermarle to the pier. The bench marks are near the railroad tracks and the buildings near the pier. The tide gauge and staff were located on the pier.

BENCH MARK STAMPING: 1 1958 Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: .Concrete Retaining Wall

The primary bench mark is set flush in the concrete retaining wall on the southern edge of pier 139, 320 feet (98 m) west of the east end of the pier, and 0.8 foot (0.2 m) north of the south edge of the pier.

BENCH MARK STAMPING: 2 1958 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sidewalk

The bench mark is set in the top of a concrete sidewalk, 500 feet (152 m) west of the breakwater, 250 feet (76 m) north of the north side of Building 121, (boat house at the end of pier 139), and 15 feet (5 m) SW of the SW corner of Building 151 D.

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FLORIDA 872 0333

PINEY POINT, ST. JOHNS RIVER

BENCH MARK STAMPING: 3 1958 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Breakwater

The bench mark is set flush in the top of the breakwater, 135 feet (41 m) south of the south end of Building 121, and 0.5 foot (0.2 m) west of the east edge of the breakwater.

BENCH MARK STAMPING: 2 14 1977 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post projecting 0.1 foot (0.03 m) above ground level, 25.5 feet (7.8 m) NW of the intersection of Hoyt Street and Albermarle Avenue, 22.2 feet (6.8 m) south of the south rail of railroad tracks, 1.8 feet (0.5 m) NE of the corner of a metal fence, and 1 foot (0.3 m) east of a witness post.

The bench mark is set in the top of a concrete post projecting 0.1 foot (0.03 m) above ground level, 25.5 feet (7.8 m) NW of the intersection of Hoyt Ajax Street and Albermarle Avenue, 22.2 feet (6.8 m) south of the south rail of railroad tracks, 1.8 feet (0.5 m) NE of the corner of a metal fence, and 1 foot (0.3 m) east of a witness post.

BENCH MARK STAMPING: MULBERRY CAMERA 1381 GSS 1963 This Bench Mark Was Added On 01/01/63

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: U. S. Air Force SETTING CLASSIFICATION: Concrete Pad

The bench mark is set in the top of an 11 X 18 foot (3 X 5 m) concrete pad, near triangulation station YORK 1964, 63 feet (19 m) north of the centerline of the drive, 43 feet (13 m) west of a powerline pole, 5 feet (1.5 m) east of the west edge of the pad, 4 feet (1.2 m) north of the south edge of the pad, and 0.6 feet (0.18 m) above the level of the ground.

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FLORIDA 872 0333

PINEY POINT, ST. JOHNS RIVER

BENCH MARK STAMPING: (no stamping) This Bench Mark Was Added

MONUMENTATION: Iron Pipe AGENCY/DISK TYPE: U. S. Navy SETTING CLASSIFICATION: Tile Pipe Filled With Concrete

The bench mark is an iron pipe set in the center of a tile pipe filled with concrete. Located 0.3 mile (0.48 k) east of the main gate at the intersection of Yorktown avenue and Childs Street, 56.5 feet (17.2 m) north of the centerline of Yorktown Avenue, 28.3 feet (8.6 m) east of the centerline of Childs Street, and 1.0 feet (0.3 m) below the level of the ground.

BENCH MARK STAMPING: YORK 1964 This Bench Mark Was Added On 01/01/64

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete monument

The bench mark is set in the top of a concrete monument, 0.5 mile (0.8 k) south along Allagany Road from its intersection with Yorktown Avenue, 264 feet (80.5 m) east along a drive from Allegany Road, 73 ft (22.5 m) north of the centerline of the drive, 121 feet (36.9 m) west of a powerline pole, and flush with the ground.

> BENCH MARK STAMPING: YORK 1964 AZ MK This Bench Mark Was Added On 01/01/64

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete monument

The bench mark is set in the top of a concerte monument, 0.6 mile (0.96 k) south of the entrance to the Naval Air Station, 82 feet (25 m) east of the east rail of a spur track, 63 feet (19.2 m) east of a fence, 27 feet (8.2 m) south of the centerlin of a drive, 3.0 feet (1.0 m) east of a north/south drive, 7 feet (2.1 m) north of a metal witness post, and flush with the ground.

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FLORIDA 872 0333

PINEY POINT, ST. JOHNS RIVER

Tidal datums at Piney Point, St. Johns River are based on the following:

LENGTH OF SERIES	=	2 MONTHS
TIME PERIOD	E	OCTOBER-NOVEMBER 1978
TIDAL EPOCH	z	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	×	2.19	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.00	FEET
MEAN HIGH WATER (MHW)	=	0.95	FEET
MEAN TIDE LEVEL (MTL)	æ	0.51	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.28	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	Ŧ	-1.38	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
1 1958	8.51	7.56
2 1958	9.33	8.38
3 1958	4.99	4.04
2 14 1977	16.37	15.42
MULBERRY CAMERA 1381 GSS 1963	23.32	22.37
NO STAMPING	18.41	17.46
YORK 1964	22.13	21.18
YORK 1964 AZ MK	15.74	14.79

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



PUBLICATION DATE: 03/11/93

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FLORIDA 872 0333

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PINEY POINT, ST. JOHNS RIVER

LATITUDE: 30°13.7'N LONGITUDE: 81°39.8'W NOAA CHART: 11491 USGS QUAD: ORANGE PARK

To reach the tidal bench marks from the intersection of Interstate 295 and US Highway 17 in Orange Park, proceed 2.3 miles (3.7 km) north along US Highway 17 to the entrance (Yorktown Avenue) of the Naval Air Station, then 1.3 miles (2.1 km) east along Yorktown Avenue to the intersection with Hoyt Street, which leads to the air field, proceed 0.15 mile (0.24 km) north along Hoyt Street to the intersection with Albermarle Avenue, then 0.8 mile (1.3 km) east along Albermarle to the pier. The bench marks are near the railroad tracks and the buildings near the pier. The tide gauge and staff were located on the pier.

BENCH MARK STAMPING: 1 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Retaining Wall

The primary bench mark is set flush in the concrete retaining wall on the southern edge of pier 139, 320 feet (98 m) west of the east end of the pier, and 0.8 foot (0.2 m) north of the south edge of the pier.

BENCH MARK STAMPING: 2 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sidewalk

The bench mark is set in the top of a concrete sidewalk, 500 feet (152 m) west of the breakwater, 250 feet (76 m) north of the north side of Building 121, (boat house at the end of pier 139), and 15 feet (5 m) SW of the SW corner of Building 151 D.

Page 2 of 3

FLORIDA 872 0333

PINEY POINT, ST. JOHNS RIVER

BENCH MARK STAMPING: 3 1958

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Breakwater

The bench mark is set flush in the top of the breakwater, 135 feet (41 m) south of the south end of Building 121, and 0.5 foot (0.2 m) west of the east edge of the breakwater.

BENCH MARK STAMPING: 2 14 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post projecting 0.1 foot (0.03 m) above ground level, 25.5 feet (7.8 m) NW of the intersection of Hoyt Street and Albermarle Avenue, 22.2 feet (6.8 m) south of the south rail of railroad tracks, 1.8 feet (0.5 m) NE of the corner of a metal fence, and 1 foot (0.3 m) east of a witness post.

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PUBLICATION DATE: 03/11/93

FLORIDA 872 0333

PINEY POINT, ST. JOHNS RIVER

Tidal datums at Piney Point, St. Johns River are based on the following:

LENGTH OF SERIES	=	2 MONTHS
TIME PERIOD	=	OCTOBER-NOVEMBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	2.19	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.00	FEET
MEAN HIGH WATER (MHW)	=	0.95	FEET
MEAN TIDE LEVEL (MTL)	=	0.51	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.38	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
1 1958	8.51	7.56
2 1958	9.33	8.38
3 1958	4.99	4.04
2 14 1977	16.37	15.42

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Page 1 of 1

PRELIMINARY DATE: 06/17/93 Not Published By NOS

FLORIDA 872-0339

COUNTY: QUAD INDEX NUMBER:

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

GOODBYS CREEK, ST. JOHNS RIVER LATITUDE: 30°13.0'N LONGITUDE: 081°37.1'W NOAA CHART: USGS QUAD:

Staff installed for hydro work in 1977, FLDNR has no data on this station.

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Page 1 of 1

PRELIMINARY DATE: 05/24/93 Not Published By NOS

FLORIDA 872-0377

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

MANDARIN, ST. JOHN'S RIVER

LATITUDE: 30°09.8'N LONGITUDE: 081°40.0'W NOAA CHART: USGS QUAD:

BENCHMARK STAMPING: BENCH MARK 3 (1934) This Bench Mark Was Searched For And Not Found On 06/06/82 This Bench Mark Was Searched For And Not Found On 03/13/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: STANDARD DISK SETTING CLASSIFICATION: CONCRETE POST

BENCH MARK 3 (1934) is a standard disk, stamped "NO 3 1934," set in top of concrete post flush with ground, in northeast corner of lawn of C.E. Hillyer, about .5 mile west of the post office. It is 135 feet northeast of northeast corner of house, 70 feet north of northeast corner of wooden building, 100 feet south of northeast corner of concrete sea wall, 15 feet south of large forked oak tree and 1.5 feet west of fence. Elevation: 7.48 feet above mean low water.

Mean low water at Mandrin is based on 13 highwaters and 13 low waters, January 19-25, 1934, reduced to mean values. Elevations of other tide planes referred to this datum are as follows:

. MEAN	HIGH WATER	(MHW)	=	0.60	FEET
MEAN	TIDE LEVEL	(MTL)	=	0.30	FEET
MEAN	LOW WATER	(MLW)	=	0.00	FEET

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 2.5 feet below mean lower low water.

Page 1 of 3

PRELIMINARY DATE: 05/14/93

FLORIDA 872 0374

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

ORANGE PARK, MOOSE HAVEN, ST. JOHNS RIVER

LATITUDE: 30°10.1'N LONGITUDE: 81°41.7'W NOAA CHART: 11492 USGS QUAD: ORANGE PARK

To reach the tidal bench marks from the intersection of Interstate Highway 395 and U.S. Highway 17 in Orange Park, proceed SSE on U.S. Highway 17 for 2.8 miles (4.5 km) to Kingsley Avenue, then east on Kingsley Avenue for 0.3 mile (0.5 km) to River Road, then north on River Road for 0.15 mile (0.24 km) to the concrete fishing pier at Moose Haven. The bench marks are located in Moose Haven, along River Road and Kingsley Avenue. The tide gage and staff were located on the fishing pier, 350 feet (107 m) east of the west bank of the St. Johns River.

BENCH MARK STAMPING: 0374 A 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in a concrete foundation NNW of the concrete fishing pier, 52.9 feet (16.1 m) north of the north edge of the sidewalk leading east to the fishing pier, 37.8 feet (11.5 m) east of the centerline of River Road, 23.5 feet (7.2 m) NE of a 3 foot (1 m) diameter live oak tree, and 3 feet (1 m) above ground level.

BENCH MARK STAMPING: 0374 B 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument north of the concrete fishing pier, 90.5 feet (27.6 m) NNE of the centerline of the intersection of River Road and Stiles Avenue, 17 feet (5.2 m) west of the top of the west bank of St. Johns River, 16.1 feet (4.9 m) east of the centerline of River Road, 2.8 feet (0.9 m) east of a utility line brace pole, and level with the ground.

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PRELIMINARY DATE: 05/14/93

FLORIDA 872 0347

ORANGE PARK, MOOSE HAVEN, ST JOHNS RIVER

BENCH MARK STAMPING: 0374 C 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the top of the north edge of a concrete cistern foundation north of the concrete fishing pier, 39.9 feet (12.2 m) NE of the centerline of the intersection of River Road and Blake Avenue, 38.5 feet (11.7 m) west of the top of the west bank of St. Johns River, 21 feet (6 m) east of the centerline of River Road, and 17 feet (5 m) NNE of the northernmost of nine triangular concrete posts.

> BENCH MARK STAMPING: 0374 D 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument north of the concrete fishing pier, 30.5 feet (9.3 m) NW of the centerline of the intersection of River Road and Campbell Avenue, 24.7 feet (7.5 m) west of the centerline of River Road, 18.1 feet (5.5 m) north of the centerline of Campbell Avenue, 3 feet (1 m) NNE of a 1.1 foot (0.3 m) square concrete utility pole, and 2 feet (1 m) north of a witness post.

BENCH MARK STAMPING: 0374 E 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sewer Grating

The bench mark is set flush in the SW corner of a sewer pipe grating west of the intersection of Kingsley Avenue and Doctors Lake Drive, 77 feet (23 m) east of the Seaboard Coast Line Railroad, 45 feet (14 m) south of the centerline of Kingsley Avenue, 26 feet (8 m) west of the centerline of Doctors Lake Drive, and 0.8 foot (0.2 m) north of water pipe.

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FLORIDA 872 0374

ORANGE PARK, MOOSE HAVEN, ST. JOHNS RIVER

Tidal datums at Orange Park, Moose Haven, St. Johns River are based on the following:

LENGTH OF SERIES	=	4 MONTHS
TIME PERIOD	=	JUNE, JULY, SEPTEMBER, OCTOBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78) MEAN HIGHER HIGH WATER (MHHW)	=	1.98 0.87	FEET FEET
MEAN HIGH WATER (MHW)	z	0.82	FEET
MEAN TIDE LEVEL (MTL)	=	0.45	FEET
1929 (NGVD)	-	-0.21	FEET
MEAN LOW WATER (MLW)	=	0.08	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
DOMEST OBSERVED MATER DEVED (07/23/10)	-	-0.47	LPET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHM</u>
0374 A 1978	12.87	12.05
0374 B 1978	8.57	7.75
0374 C 1978	11.82	11.00
0374 D 1978	13.12	12.30
0374 E 1978	17.07	16.25

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

<u>CAUTION</u>: The reliability of the elevations at this station may be reduced due to installation levels only, no closing levels.

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ISSUE DATE: 12/09/87

Page 1 of 4

FLORIDA 872 0374

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

ORANGE PARK, MOOSE HAVEN, ST. JOHNS RIVER

NOTICE:

These data do not meet all of the criteria and standards for official tidal bench mark publication. However, tidal datum and bench mark elevations are issued for surveying and other public use, as appropriate, with precaution. Before using this bench mark information, please read the explanatory note of caution at the bottom of the last page.

DO NOT DETACH FROM DATA SHEET

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ISSUE DATE: 12/09/87

FLORIDA 872 0374

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

ORANGE PARK, MOOSE HAVEN, ST. JOHNS RIVER

LATITUDE: 30°10.1'N LONGITUDE: 81°41.7'W NOAA CHART: 11492 USGS QUAD: ORANGE PARK

To reach the tidal bench marks from the intersection of Interstate Highway 395 and U.S. Highway 17 in Orange Park, proceed SSE on U.S. Highway 17 for 2.8 miles (4.5 km) to Kingsley Avenue, then east on Kingsley Avenue for 0.3 mile (0.5 km) to River Road, then north on River Road for 0.15 mile (0.24 km) to the concrete fishing pier at Moose Haven. The bench marks are located in Moose Haven, along River Road and Kingsley Avenue. The tide gage and staff were located on the fishing pier, 350 feet (107 m) east of the west bank of the St. Johns River.

BENCH MARK STAMPING: 0374 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in a concrete foundation NNW of the concrete fishing pier, 52.9 feet (16.1 m) north of the north edge of the sidewalk leading east to the fishing pier, 37.8 feet (11.5 m) east of the centerline of River Road, 23.5 feet (7.2 m) NE of a 3 foot (1 m) diameter live oak tree, and 3 feet (1 m) above ground level.

BENCH MARK STAMPING: 0374 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument north of the concrete fishing pier, 90.5 feet (27.6 m) NNE of the centerline of the intersection of River Road and Stiles Avenue, 17 feet (5.2 m) west of the top of the west bank of St. Johns River, 16.1 feet (4.9 m) east of the centerline of River Road, 2.8 feet (0.9 m) east of a utility line brace pole, and level with the ground.

ISSUE DATE: 12/09/87

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FLORIDA 872 0347

ORANGE PARK, MOOSE HAVEN, ST JOHNS RIVER

BENCH MARK STAMPING: 0374 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

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The bench mark is set in the top of the north edge of a concrete cistern foundation north of the concrete fishing pier, 39.9 feet (12.2 m) NE of the centerline of the intersection of River Road and Blake Avenue, 38.5 feet (11.7 m) west of the top of the west bank of St. Johns River, 21 feet (6 m) east of the centerline of River Road, and 17 feet (5 m) NNE of the northernmost of nine triangular concrete posts.

BENCH MARK STAMPING: 0374 D 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a concrete monument north of the concrete fishing pier, 30.5 feet (9.3 m) NW of the centerline of the intersection of River Road and Campbell Avenue, 24.7 feet (7.5 m) west of the centerline of River Road, 18.1 feet (5.5 m) north of the centerline of Campbell Avenue, 3 feet (1 m) NNE of a 1.1 foot (0.3 m) square concrete utility pole, and 2 feet (1 m) north of a witness post.

BENCH MARK STAMPING: 0374 E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Sewer Grating

The bench mark is set flush in the SW corner of a sewer pipe grating west of the intersection of Kingsley Avenue and Doctors Lake Drive, 77 feet (23 m) east of the Seaboard Coast Line Railroad, 45 feet (14 m) south of the centerline of Kingsley Avenue, 26 feet (8 m) west of the centerline of Doctors Lake Drive, and 0.8 foot (0.2 m) north of water pipe.

ISSUE DATE: 12/09/87

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FLORIDA 872 0374

ORANGE PARK, MOOSE HAVEN, ST. JOHNS RIVER

Tidal datums at Orange Park, Moose Haven, St. Johns River are based on the following:

LENGTH OF SERIES	= 4 MONTHS
TIME PERIOD	= JUNE, JULY, SEPTEMBER, OCTOBER 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	1.98	FEET
MEAN HIGHER HIGH WATER (MHHW)	• =	0.87	FEET
MEAN HIGH WATER (MHW)	=	0.82	FEET
MEAN TIDE LEVEL (MTL)	=	0.45	FEET
MEAN LOW WATER (MLW)	=	0.08	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (07/29/78)	=	-0.49	FEET

Bench mark elevation information:

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ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0374 A 1978	12.87	12.05
0374 B 1978	8.57	7.75
0374 C 1978	11.82	11.00
0374 D 1978	13.12	12.30
0374 E 1978	17.07	16.25

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

<u>CAUTION</u>: The reliability of the elevations at this station may be reduced due to installation levels only, no closing levels.

LOWER ST. JOHNS RIVER VICINITY REACH FOUR ABSTRACT MILE 30.1 TO MILE 40.0

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No/ Name	Length of Series (Mos.)	Da from M,Y	te to M,Y
872 0409 Julington Creek	38.2	2.9 miles/ Right	872 0496 Green Cove Springs	6	5/78	10/78
872 0406 Doctors Lake, Peoria	39.9	5.5 miles/ Left	872 0496 Green Cove Springs	5	6/78	10/78
872 0398 Palm Valley	40.0	17.6 miles/ Right	872 0220 Mayport	2	6/78	10/78

Station No.	on No. Elevation (Feet, NGVD 1929)		ion No.		Mean	Tidal Bench
Name		мнพ	MTL	MLW	(Feet)	Marks Fd/Req'à.
872 0409		1.16	0.81	0.45	0.71	5/0
872 0406		1.22	0.83	0.44	0.78	5/0
872 0398		2.53	0.14	-2.26	4.79	5/0

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary Tidal</u> <u>Bench Mark Descriptions with Elevation Sheet</u> dated May or June 199: follows:

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PRELIMINARY DATE: 05/14/93

FLORIDA 872 0409

COUNTY: DUVAL QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

JULINGTON CREEK

LATITUDE: 30°08.1'N LONGITUDE: 81°37.8'W NOAA CHART: 11491 USGS QUAD: ORANGE PARK

To reach the tidal bench marks from the intersection of Interstate 295 and State Road 13 proceed 3.4 miles (5.4 km) south along State Road 13 to Reitman Marina. The bench marks are located in the vicinity of State Road 13 and the concrete bridge over Julington Creek. The tide gage and staff were located on the marina dock.

BENCH MARK STAMPING: 0409 A 1978 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set atop a concrete post, 113 feet (34 m) SE of a double utility pole, 93 feet (28 m) south of Julington Creek Seafood Restaurant sign, and 12 feet (4 m) NW of the entrance to Reitman Marina.

The bench mark is set atop a concrete post, 113 feet (34 m) SE of a <u>double</u> utility pole, 93 feet (28 m) south of Julington Creek Scafood Restaurant sign, <u>200 feet south of Julington Creek Marina sign</u>, and 12 feet (4 m) NW of the entrance to Reitman Marina.

BENCH MARK STAMPING: 0409 C 1978 This Bench Mark Was Searched For And Not Found On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 180 feet (55 m) south of the intersection of Westberry Road and State Road 13, 30 feet (9 m) NE of the flagpole in front of the Ace Hardware store, 21 feet (6 m) west of the centerline of State Road 13, and 4 feet (1 m) north of a witness post.

The culvert and concrete headwall have been removed and replaced. The mark is presumed destroyed.

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FLORIDA 872 0409

JULINGTON CREEK

BENCH MARK STAMPING: 0409 E 1982 This Bench Mark Was Searched For And Not Found On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in the concrete headwall, 139.0 feet (42.4 m) north of the centerline of Julington Creek Road, 58.5 feet (17.8 m) west of the center of the double doors to American Federal Savings and Loan, 28.0 feet (8.5 m) east of the centerline of State Road 13, and 3.5 feet (1.1 m) south of the north end of the culvert headwall.

The culvert and concrete headwall have been removed and replaced. The mark is presumed destroyed.

BENCH MARK STAMPING: JC 3 1978 C.L.B. This Bench Mark Was Searched For And Not Found On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 345 feet (105 m) south of the intersection of State Road 13 and Marbon Road, 130.5 feet (39.8 m) SE of a utility pole, and 21 feet (6 m) east of the centerline of State Road 13.

The culvert and concrete headwall have been removed and replaced. The mark is presumed destroyed.

BENCH MARK STAMPING: NO STAMPING 1 This Bench Mark Was Searched For And Not Found On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDOT Bench Mark SETTING CLASSIFICATION: Concrete Guardrail

The bench mark is set in the top of the concrete guardrail at the NW bridge corner, 19 feet (6 m) SW of the centerline of the highway.

The bridge guardrail has been removed and replaced, the mark is presumed destroyed.

BENCH MARK STAMPING: 0409 G 1987 This Bench Mark Was Added On 12/16/87

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Walk Way

The bench mark is set in the NE walk way of the State Road 13 bridge over Julington Creek, 16.5 feet (5.03 m) east-northeast of the centerline of the road, 13.1 feet (4.0 m) south-southeast of of the northeast corner of the concrete guardrail.

FLORIDA 872 0409

JULINGTON CREEK

BENCH MARK STAMPING: 0409 H 1987 This Bench Mark Was Added On 12/16/87

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Box Drain

The bench mark is set at the intersection of State Road 13 and Julington Creek Road, 74.5 feet (22.7 m) east of the east face of the of the east curb of State Road 13, 16.6 feet (5.06 m) north of the center line of Julington Creek Road, 66.9 ft (20.4 M) south-southeast of of the southeast corner of the American Federal Bank Building.

BENCH MARK STAMPING: 0409 K 1987

This Bench Mark Was Added On 12/16/87

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Pad For Electric Box

The bench mark is set at the First Federal Bank on State Road 13, 61.5 feet (18.7 m)south southeast of of the southeast corner of the bank building, 17.3 feet (5.3 m) west of the west curb of State Road 13, and 0.6 feet (0.2 m) southwest of the northeast corner of a 6 foot by 8 foot concrete pad for electric box number 12230.

BENCH MARK STAMPING: JC 1 1978 CLB This Bench Mark Was Added On 01/01/87

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Vertical Control Mark SETTING CLASSIFICATION: Concrete Steps

The bench mark is set located 0.8 mile (1.2 k) south of Interstate 295 along State Road 13, in the steps of Manderin Baptist Church. The mark is 10.0 feet (3.0 m) north of the southeast corner of the church, 1.0 foot (0.3 m) east of the east wall of the church.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0409

JULINGTON CREEK

Tidal datums at Julington Creek are based on the following:

LENGTH OF SERIES	=	6 MONTHS
TIME PERIOD	z	MAY-OCTOBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	2.07	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.83	FEET
MEAN HIGH WATER (MHW)	=	0.78	FEET
MEAN TIDE LEVEL (MTL)	=	0.43	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.38	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (07/30/78)	=	-0.67	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH_MARK_STAMPING	MLLW	MHW
0409 A 1978	4.47	3.69
0409 C 1978	15.97	15.19
0409 E 1982	10.41	9.63
JC 3 1978 C.L.B.	20.08	19.30
NO STAMPING 1	14.19	13.41
Q409 G 1987	9.61	8.83
0409 H 1987	10.71	9.39
0409 K 1987	22.78	22.00
JC 1 1978 CLB	19.86	19.08

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



PUBLICATION DATE: 06/26/85

FLORIDA 872 0409

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

JULINGTON CREEK

LATITUDE: 30°08.1'N LONGITUDE: 81°37.8'W NOAA CHART: 11491 USGS QUAD: ORANGE PARK

To reach the tidal bench marks from the intersection of Interstate 295 and State Road 13 proceed 3.4 miles (5.4 km) south along State Road 13 to Reitman Marina. The bench marks are located in the vicinity of State Road 13 and the concrete bridge over Julington Creek. The tide gage and staff were located on the marina dock.

BENCH MARK STAMPING: 0409 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set atop a concrete post, 113 feet (34 m) SE of a double utility pole, 93 feet (28 m) south of Julington Creek Seafood Restaurant sign, and 12 feet (4 m) NW of the entrance to Reitman Marina.

BENCH MARK STAMPING: 0409 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 180 feet (55 m) south of the intersection of Westberry Road and State Road 13, 30 feet (9 m) NE of the flagpole in front of the Ace Hardware store, 21 feet (6 m) west of the centerline of State Road 13, and 4 feet (1 m) north of a witness post.

Page 2 of 3

FLORIDA 872 0409

JULINGTON CREEK

BENCH MARK STAMPING: 0409 E 1982

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in the concrete headwall, 139.0 feet (42.4 m) north of the centerline of Julington Creek Road, 58.5 feet (17.8 m) west of the center of the double doors to American Federal Savings and Loan, 28.0 feet (8.5 m) east of the centerline of State Road 13, and 3.5 feet (1.1 m) south of the north end of the culvert headwall.

BENCH MARK STAMPING: JC 3 1978 C.L.B.

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is set in a concrete headwall, 345 feet (105 m) south of the intersection of State Road 13 and Marbon Road, 130.5 feet (39.8 m) SE of a utility pole, and 21 feet (6 m) east of the centerline of State Road 13.

BENCH MARK STAMPING: NO STAMPING 1

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDOT Bench Mark SETTING CLASSIFICATION: Concrete Guardrail

The bench mark is set in the top of the concrete guardrail at the NW bridge corner, 19 feet (6 m) SW of the centerline of the highway.

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PUBLICATION DATE: 06/26/85

Page 3 of 3

FLORIDA 872 0409

JULINGTON CREEK

Tidal datums at Julington Creek are based on the following:

LENGTH OF SERIES	æ	6 MONTHS
TIME PERIOD	=	MAY-OCTOBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	2.07	FEET
HIGHEST OBSERVED WATER DEVEL (11/04/10)		2.07	
MEAN HIGHER HIGH WATER (MHHW)	=	0.83	FEET
MEAN HIGH WATER (MHW)	=	0.78	FEET
MEAN TIDE LEVEL (MTL)	=	0.43	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (07/30/78)	=	-0.67	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

MLLW	MHW
4.47	3.69
15.97	15.19
10.41	9.63
20.08	19.30
14.19	13.41
	<u>MLLW</u> 4.47 15.97 10.41 20.08 14.19

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PRELIMINARY DATE: 05/14/93

FLORIDA 872 0406

COUNTY: CLAY QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PEORIA POINT, DOCTORS LAKE

LATITUDE: 30°07.2'N LONGITUDE: 81°45.5'W NOAA CHART: 11491 USGS QUAD: MIDDLEBURG

To reach the tidal bench marks from the intersection of US Highway 17 and State Highway 224 in Orange Park, proceed 0.5 mile (0.8 km) west along State Highway 224 to Doctor's Lake Road, travel 4.4 miles (7.1 km) SW on Doctor's Lake Road to Cedar Road, then 0.1 mile (0.16 km) on Cedar Road, then 0.1 mile (0.16 km) on Cedar Road to Holly Road, then travel 0.2 mile (0.3 km) east on Holly Road to Magnolia Road, then south on Magnolia Road to 4221 Magnolia Road. The bench marks are located along Magnolia and Holly Roads. The tide gauge and staff were located on the property at 4221 Magnolia Road.

BENCH MARK STAMPING: 0406 A 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post on the east side of Magnolia Road, 21 feet (6 m) east of the centerline of Magnolia Road, 7 feet (2 m) north of twin oaks, 1.3 feet (0.4 m) south of a telephone pole, and 1 foot (0.3 m) south of a witness post. The bench mark is at road level.

BENCH MARK STAMPING: 0406 B 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post, 57 feet (17 m) south of the Lshaped dock at the rear of 4221 Magnolia Road, 20 feet (6 m) east of a large magnolia tree, and 7 feet (2 m) west of the shoreline of a break wall. The bench mark is level with the ground.

Page 2 of 3

FLORIDA 872 0406

PEORIA POINT, DOCTORS LAKE

BENCH MARK STAMPING: 0406 C 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-cald Steel Rod

The primary bench mark is located in the median at the intersection of Magnolia Road at Holly Road, 49 feet (15 m) SE of a telephone pole, and 46 feet (14 m) south of a driveway. The bench mark is crimped to the top of a copper-coated steel rod driven 32 ffet (10 m), encased in a PVC pipe and concrete kickblock, and at ground level.

BENCH MARK STAMPING: 0406 D 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is located in the center of a small median, 58 feet (18 m) south of the intersection of Doctors Lake Road and Cedar Road, 54 feet (16 m) NW of the NW corner of a brown block house at 4055 Cedar Road, 42.5 feet (13.0 m) SE of a large pine tree, and 18.7 feet (5.7 m) NNE of a small oak tree at the south end of the median. The bench Mark is crimped to a copper-coated steel rod driven 32 feet (10 m), and encased in a PVC pipe and concrete kickblock, and at ground level.

BENCH MARK STAMPING: 0406 RESET E 1978 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post, 0.35 mile (0.56 km) north of the median at Doctors Lake Road and Cedar Road, 50 feet (15 m) SE of the railroad tracks, 48 feet (15 m) NW of the centerline of Doctors Lake Road, 5.3 feet (1.6 m) south of the Hide-A-Way Mobile Home Village sign, 4.5 feet (1.4 m) NW of a large hickory tree, and 1 foot (0.3 m) south of a witness post. The bench mark is 2 feet (0.6 m) above road level.

Page 3 of 3

FLORIDA 872 0406

PEORIA POINT, DOCTORS LAKE

Tidal datums at Peoria Point, Doctors Lake are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	JUNE-OCTOBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	#	2.12	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.91	FEET
MEAN HIGH WATER (MHW)	=	0.85	FEET
MEAN TIDE LEVEL (MTL)	×	0.46	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.37	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (06/04/78)	=	-0.79	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0406 A 1978	10.42	9.57
0406 B 1978	4.08	. 3.23
0406 C 1978	13.04	[′] 12.19
0406 D 1978	22.10	21.25
0406 RESET E 1978	18.75	17.90

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The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



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PUBLICATION DATE: 03/11/93

Page 1 of 3

FLORIDA 972 0406

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PEORIA POINT, DOCTORS LAKE

LATITUDE: 30°07.2'N LONGITUDE: 81°45.5'W NOAA CHART: 11491 USGS QUAD: MIDDLEBURG

To reach the tidal bench marks from the intersection of US Highway 17 and State Highway 224 in Orange Park, proceed 0.5 mile (0.8 km) west along State Highway 224 to Doctor's Lake Road, travel 4.4 miles (7.1 km) SW on Doctor's Lake Road to Cedar Road, then 0.1 mile (0.16 km) on Cedar Road, then 0.1 mile (0.16 km) on Cedar Road to Holly Road, then travel 0.2 mile (0.3 km) east on Holly Road to Magnolia Road, then south on Magnolia Road to 4221 Magnolia Road. The bench marks are located along Magnolia and Holly Roads. The tide gauge and staff were located on the property at 4221 Magnolia Road.

BENCH MARK STAMPING: 0406 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post on the east side of Magnolia Road, 21 feet (6 m) east of the centerline of Magnolia Road, 7 feet (2 m) north of twin oaks, 1.3 feet (0.4 m) south of a telephone pole, and 1 foot (0.3 m) south of a witness post. The bench mark is at road level.

BENCH MARK STAMPING: 0406 B 1978

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MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post, 57 feet (17 m) south of the Lshaped dock at the rear of 4221 Magnolia Road, 20 feet (6 m) east of a large magnolia tree, and 7 feet (2 m) west of the shoreline of a break wall. The bench mark is level with the ground.

Page 2 of 3

FLORIDA 872 0406

PEORIA POINT, DOCTORS LAKE

BENCH MARK STAMPING: 0406 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-cald Steel Rod

The primary bench mark is located in the median at the intersection of Magnolia Road at Holly Road, 49 feet (15 m) SE of a telephone pole, and 46 feet (14 m) south of a driveway. The bench mark is crimped to the top of a copper-coated steel rod driven 32 ffet (10 m), encased in a PVC pipe and concrete kickblock, and at ground level.

BENCH MARK STAMPING: 0406 D 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is located in the center of a small median, 58 feet (18 m) south of the intersection of Doctors Lake Road and Cedar Road, 54 feet (16 m) NW of the NW corner of a brown block house at 4055 Cedar Road, 42.5 feet (13.0 m) SE of a large pine tree, and 18.7 feet (5.7 m) NNE of a small oak tree at the south end of the median. The bench Mark is crimped to a copper-coated steel rod driven 32 feet (10 m), and encased in a PVC pipe and concrete kickblock, and at ground level.

BENCH MARK STAMPING: 0406 RESET E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set in the top of a concrete post, 0.35 mile (0.56 km) north of the median at Doctors Lake Road and Cedar Road, 50 feet (15 m) SE of the railroad tracks, 48 feet (15 m) NW of the centerline of Doctors Lake Road, 5.3 feet (1.6 m) south of the Hide-A-Way Mobile Home Village sign, 4.5 feet (1.4 m) NW of a large hickory tree, and 1 foot (0.3 m) south of a witness post. The bench mark is 2 feet (0.6 m) above road level.

PUBLICATION DATE: 03/11/93

Page 3 of 3

FLORIDA 872 0406

PEORIA POINT, DOCTORS LAKE

Tidal datums at Peoria Point, Doctors Lake are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	JUNE-OCTOBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	2.12	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.91	FEET
MEAN HIGH WATER (MHW)	=	0.85	FEET
MEAN TIDE LEVEL (MTL)	=	0.46	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (06/04/78)	=	-0.79	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
0406 A 1978	10.42	9.57
0406 B 1978	4.08	3.23
0406 C 1978	13.04	12.19
0406 D 1978	22.10	21.25
0406 RESET E 1978	18.75	17.90

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Page 1 of 3

FLORIDA 872 0398

COUNTY: ST JOHNS QUAD INDEX NUMBER: 300812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PALM VALLEY

LATITUDE: 30°08.0'N LONGITUDE: 081°23.2'W NOAA CHART: 11488 USGS QUAD: PALM VALLEY

To reach the tidal bench marks from the intersection of U.S. Highway 1 and the southern city limits line of Bayard, proceed 5 miles (8.0 km) south along U.S. Highway 1 to the intersection of County Road C 210, then 5.6 miles (9.0 km) northeast along County Road C 210 to the east end of the highway bridge over the Intracoastal Waterway. The tide gage was located north of the northeast corner of the Palm Valley Fish Company and store, and 15 feet (4.6 m) south of a concrete boat ramp. The bench marks are located in the vicinity of the highway bridge over the Intracoastal Waterway.

BENCHMARK STAMPING: 0398 C 1978 This Bench Mark Was Recovered AS Described On 06/08/93

MONUMENTATION: Survey disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is located on the top of a concrete headwall on the west side of State Road S 210 A, 35 feet (11 m) west of the intersection of County Road C 210 and State Road S 210 A, 31 feet (9 m) south of a telephone pole, 24 feet (7 m) north of the centerline of County Road C 210, and 1 foot (0.3 m) north of a witness post.

> BENCHMARK STAMPING: 0398 D 1978 This Bench Mark Was Recovered AS Described On 06/08/93

MONUMENTATION: Survey disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-Clad Steel Rod

The bench mark is located on the south side of County Road C 210, 0.25 mile (0.40 km) west of the Palm Valley Bridge, 32 feet (10 m) south of the centerline of County Road C 210, 13.7 feet (4.2 m) north of a 14-inch diameter palm tree, 10.4 feet (3.2 m) west of a utility pole, and 1 foot (0.3 m) north of a witness post. The bench mark is crimped to the top of a copper-clad steel rod driven 48 feet (15 m) encased in a PVC pipe surrounded by concrete and flush with the ground.

Page 2 of 3

PRELIMINARY DATE: 06/08/93

FLORIDA 872-0398

PALM VALLEY

BENCHMARK STAMPING: IWSJ 210 1969 JAX FLA This Bench Mark Was Recovered AS Described On 06/08/93

MONUMENTATION: Survey disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Concrete Bridge Walkway

The bench mark is located in the concrete walkway at the eastern end of the highway bridge over the Intracostal Waterway, in the NE corner of the east parapet on the north side of the draw span, and 0.1 mile (0.2 km) north of Bench Mark 0398 C 1978

BENCHMARK STAMPING: IWSJ 217 1969 JAX FLA This Bench Mark Was Recovered AS Described On 06/08/93

MONUMENTATION: Survey disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Concrete Bridge Walkway

The bench mark is located in the concrete walkway at the western end of the highway bridge over the Intracoastal Waterway, in the SE corner of the east parapet on the south side of the draw span.

BENCHMARK STAMPING: 0398 E 1978 This Bench Mark Was Recovered AS Described On 06/08/93

MONUMENTATION: Survey disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-Clad Steel Rod

The bench mark is located on the south side of County Road C 210, 0.28 mile (0.45 km) west of bench mark 0398 D 1978, 71.7 feet (21.9 m) NW of a barbed-wire fence, 64.1 feet (19.6 m) NE of the centerline of a private drive, 31.3 feet (9.6 m) SE of the centerline of County Road C 210, 8.5 feet (2.6 m) east of a utility pole, and 1 foot (0.3 m) NW of a witness post. The bench mark is crimped to the top of a copper-clad steel rod driven 40 feet (12 m), encased in a PVC pipe surrounded by concrete, and 1 foot (0.3 m) below the highway surface.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 06/08/93

Page 3 of 3

FLORIDA 872-0398

PALM VALLEY

Tidal datums at PALM VALLEY are based on the following:

LENGTH OF SERIES	=	2 MONTHS
TIME PERIOD	=	JULY AND SEPTEMBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	6.63	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	5.15	FEET
MEAN HIGH WATER (MHW)	=	4.94	FEET
MEAN TIDE LEVEL (MTL)	=	2.55	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	2.42	FEET
MEAN LOW WATER (MLW)	=	0.15	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (06/18/78)	=	-0.48	FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1979.

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEE: MLLW	r above: <u>Mhw</u>
0398 C 1978	7.46	2.52
0398 D 1978	6.00	1.06
IWSJ 210 1969 JAX FLA	18.93	13.99
IWSJ 217 1969 JAX FLA	18.93	13.99
0398 E 1978	6.82	1.88

The estimated highest water level to the nearest half-foot is 8.00 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Page 1 of 3

PUBLICATION DATE: 06/11/85

FLORIDA 872-0398

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PALM VALLEY

LATITUDE: 30°08.0'N LONGITUDE: 081°23.2'W NOAA CHART: 11488 USGS QUAD: PALM VALLEY

To reach the tidal bench marks from the intersection of U.S. Highway 1 and the southern city limits line of Bayard, proceed 5 miles (8.0 km) south along U.S. Highway 1 to the intersection of County Road C 210, then 5.6 miles (9.0 km) northeast along County Road C 210 to the east end of the highway bridge over the Intracoastal Waterway. The tide gage was located north of the northeast corner of the Palm Valley Fish Company and store, and 15 feet (4.6 m) south of a concrete boat ramp. The bench marks are located in the vicinity of the highway bridge over the Intracoastal Waterway.

BENCHMARK STAMPING: 0398 C 1978

MONUMENTATION: Survey disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Headwall

The bench mark is located on the top of a concrete headwall on the west side of State Road S 210 A, 35 feet (11 m) west of the intersection of County Road C 210 and State Road S 210 A, 31 feet (9 m) south of a telephone pole, 24 feet (7 m) north of the centerline of County Road C 210, and 1 foot (0.3 m) north of a witness post.

BENCHMARK STAMPING: 0398 D 1978

MONUMENTATION: Survey disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-Clad Steel Rod

The bench mark is located on the south side of County Road C 210, 0.25 mile (0.40 km) west of the Palm Valley Bridge, 32 feet (10 m) south of the centerline of County Road C 210, 13.7 feet (4.2 m) north of a 14-inch diameter palm tree, 10.4 feet (3.2 m) west of a utility pole, and 1 foot (0.3 m) north of a witness post. The bench mark is crimped to the top of a copper-clad steel rod driven 48 feet (15 m) encased in a PVC pipe surrounded by concrete and flush with the ground.

Page 2 of 3

PUBLICATION DATE: 06/11/85

FLORIDA 872-0398

PALM VALLEY

BENCHMARK STAMPING: IWSJ 210 1969 JAX FLA

MONUMENTATION: Survey disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Concrete Bridge Walkway

The bench mark is located in the concrete walkway at the eastern end of the highway bridge over the Intracostal Waterway, in the NE corner of the east parapet on the north side of the draw span, and 0.1 mile (0.2 km) north of Bench Mark 0398 C 1978

BENCHMARK STAMPING: IWSJ 217 1969 JAX FLA

MONUMENTATION: Survey disk AGENCY/DISK TYPE: USE Bench Mark SETTING CLASSIFICATION: Concrete Bridge Walkway

The bench mark is located in the concrete walkway at the western end of the highway bridge over the Intracoastal Waterway, in the SE corner of the east parapet on the south side of the draw span.

BENCHMARK STAMPING: 0398 E 1978

MONUMENTATION: Survey disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-Clad Steel Rod

The bench mark is located on the south side of County Road C 210, 0.28 mile (0.45 km) west of bench mark 0398 D 1978, 71.7 feet (21.9 m) NW of a barbed-wire fence, 64.1 feet (19.6 m) NE of the centerline of a private drive, 31.3 feet (9.6 m) SE of the centerline of County Road C 210, 8.5 feet (2.6 m) east of a utility pole, and 1 foot (0.3 m) NW of a witness post. The bench mark is crimped to the top of a copper-clad steel rod driven 40 feet (12 m), encased in a PVC pipe surrounded by concrete, and 1 foot (0.3 m) below the highway surface.

PUBLICATION DATE: 06/11/85

Page 3 of 3

FLORIDA 872-0398

PALM VALLEY

Tidal datums at PALM VALLEY are based on the following:

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LENGTH OF SERIES	=	2 MONTHS
TIME PERIOD	=	JULY AND SEPTEMBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	6.63	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	5.15	FEET
MEAN HIGH WATER (MHW)	=	4.94	FEET
MEAN TIDE LEVEL (MTL)	=	2.55	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	2.42	FEET
MEAN LOW WATER (MLW)	≈	0.15	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (06/18/78)	=	-0.48	FEET

*NGVD is based on elevations published in Quad 300812, February, 1973 and NOS leveling of 1979.

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN MLLW	FEET ABOVE: MHW
0398 C 1978	7.46	2.52
0398 D 1978	6.00	1.06
IWSJ 210 1969 JAX FLA	18.93	13.99
IWSJ 217 1969 JAX FLA	18.93	13.99
0398 E 1978	6.82	1.88

The estimated highest water level to the nearest half-foot is 8.00 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source	 NOAA/NOS	Jacksonville Electric Authority	FDEP/ BSM	SJRWMD Horizontal/
b.	Туре	 Horizontal/ Vertical	Horizontal/ Vertical	Mean High Water Files	Vertical (
c.	Cost	 None	None	None	None
d.	Availability	 Silver Springs Maryland	Jacksonville	Tallahassee	Palatka
e.	Format	 ASCII	Arc Info	Hard Copy	Arc Info

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

	River Mile		River Mile	
Description/Bank	Location	<u>Description/Bank</u>	<u>Location</u>	ſ
Goodsby Creek	31.0 R	2 unnamed Creeks	34.2 L	l
Mulberry Cove .	31.6 L	Unnamed Slough Mandarin	35.1 R	
Casa Linda Lake	31.7 L	Johnson Slough	35.7 L	
Creek		Doctors Inlet	36.0 L	
Unnamed Creek	32.0 R	Unnamed Slough	36.6 R	
Plummers Cove	32.3	Mandarin Pt.		
Unnamed Creek	32.4 R	Unnamed Creek	38.0 R	
Deep Bottom Creek	33.1 R	Moccasin Slough	38.1 L	
Unnamed Creek	33.2 L	Peters Branch	39.3 L	
Unnamed Creek	33.4 L	Cunningham Cr.	39.8 R	
Unnamed Creek	33.5 R	Mill Creek	39.9 R	
Unnamed Creek	34.0 R			
near County Dock				

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

R-4.39



LOWER ST. JOHNS RIVER EXISTING WATER LEVEL MEASUREMENT NETWORK

REACH FOUR MILE 30.1 TO 40.0 NOS TIDE STATION
FDEP APPROVED MEAN HIGH WATER SURVEY
RIVER MILE
ST. JOHNS RIVER

MAIN STEM

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Four an experienced two person reconnaissance crew would require approximately 7 days to perform the task at an estimated cost of \$3,000.

In this reach the strength of existing survey control network for both horizontal and vertical is good. Reconnaissance surveys area expected to recover 80-85 existing survey control points, therefore only a few miles of additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately seven field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Four.

LOCATI	ON	E	XISTIN	<u> </u>		<u>RE</u>		NDED		
Reach/Node	e/Side	A (872)	B (V)	(H)	C (V)	D (V)	E (H)	F (Tida)	G 1)	1
4 / A /	R	0	a	a	0	0	0	0	0	ĺ
4 / B /	/ R	0	a	a	0	0	0	0	0	
4 / C /	/ R	0	a	a	0	0	0	0	0	
4 / D /	/ R	0377*	n	a	0	5	0	0	0	
4 / E /	/ R	0409	a	a	0	0	0	1	0	
4 / F /	R	0	n	a	, 0	3	0	0	0	
4/G,	/ L	0333	a	a	0	0	0	1	1	
4 / H ,	/ L	0	a	a	0	0	0	0	0	
4 / I ,	/ L	0374	а	a	0	0	0	1	0	
4 / J ,	/ 1, • •	0	a	a	0	0	D	0	0	
4 / K /	/ L	0	n	a	<u>0</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>0</u>	
				Total	0	11	0	3	1	

HORIZONTAL/VERTICAL CONTROL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH FOUR

A. Tide Station Number * No published tidal values

B. Control Point Analysis (n) none (p) poor (m) marginal (a) adequate

C. River crossing, monumentation, documentation

D. NAVD 1988 ties, monumentation, documentation (miles)

E. GPS point and azimuth mark to be set, observed, adjusted

F. GPS point and azimuth mark to be set at tide station

G. Additional bench mark(s) to be set, leveled, documented

COST ESTIMATE

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

REACH FOUR							
Cost/unit	(Numb A B	ber of 3 C	tasks D	to be E	perform F G	ed) Total	
 \$2.000/pair	2			-		¢ 6 000	_
\$2,000/pair	2					Ş 6,000	
\$ 500/mark	()				0	
\$2,000/crossi	ng	0				0	
\$1,000/mile			11			11,000	
\$2,000/pair				0		0	
\$2,000/pair					3	6,000	
\$ 500/mark					1	500	
						Total \$23,500	

Α.

Vicinity Tide Station; GPS point/azimuth mark Vicinity Tide Station; set additional tidal bench mark River crossing - vertical control NAVD 1988 tie - vertical control Β.

C.

D.

Ε.

F.

GPS point/azimuth mark - horizontal control Main Stem Tide Station; GPS point/azimuth mark Main Stem.Tide Station; set additional tidal bench mark G.

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R-4.42





REACH FIVE

RIVER MILE 40.1 TO RIVER MILE 50.0



WWEALTH BLVD., MAIL STATION 105 , FLORIDA 32308 427	JACKSONVILLE JACKSONVILLE PAPATKA PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PUTNAN PAPATKA PUTNAN PU	
3900 COMMON TALLAHASSEE, (904) 488-24		
PREPARED BY: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING	LOWER ST. JOHNS RIVER REACH MAP WATER QUALITY MANAGEMENT FEASIBILITY STUDY PHASE 1 – VERTICAL/HORIZONTAL CONTOL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH FIVE - RIVER MILE 40.1 TO RIVER MILE 50.0	

USGS Quad Sheets: Fleming Island Green Cove Springs

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LOWER ST. JOHNS RIVER VICINITY REACH FIVE ABSTRACT MILE 40.1 TO MILE 50.0

Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

(House of Representatives, Document No. 281, to the 62nd Congress 2D, Session) The preliminary examination survey dated May 20, 1911, by George R. Spalding, Captain, Corps of Engineers revealed a current inventory of river characteristics between Palatka (River Mile 78) and Jacksonville Harbor (River Mile 25+/-).

The following table gives distances and average depth of the channel, by sections: (House of Representatives, Document No. 281 Letter from the Secretary of War, December 12, 1911.)

(1993 River	Mile Lo (From)	cation)* (To)	Miles	Average depth
Hogarths Landing to	(50.1)	(42.0)	9	15
Hibernia to Ragged Point	(42.0)	(38.6)	4	16

The above information was derived from Coast and Geodetic Survey Charts Nos. 455b, 455c, 455d.

*modern river mileage system added for location purposes

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Control Station No/ Name	Length of Series (Months)	Date from to M/Y M/Y
872 0496 Green Cove Springs	47.1 Left Bank	872 0220 Mayport	12	2/74 1/75

Station No.	Elevat	ion (Feet, N	GVD 1929)	Mean Range	Tidal Bench	
Name	MHW	MTL	MLW	(Feet)	Marks Fd/Reg'd.	
872 0496	1.06	0.69	0.32	0.74	5/0	

MAIN STEM REACH FIVE Continued

STRENG	TH OF EXISTING SURVEY CONTROL METWOR	KK (
Type/Order	Control Stations/ Mile	!
	Weak	Strong
Horizontal B/1st/2nd	4.1	
Vertical 1st/2nd	1.0 0	5

EXTORATIO OTDUEN CONTROL NE

MISCELLANEOUS

At Green Cove Springs River Mile 49.2 (Green Cove Springs) S.R. 16 crosses the St. Johns River (Shands Bridge).

The Mean Range has progressively decreased in value at each tide station located between the mouth of St. Johns River (River Mile 0.0) and Green Cove Springs (River Mile 47.1).

The Mean Range progressively increases in value at each tide station located between Green Cove Springs (River Mile 47.1) and Palatka (River Mile 78.6)

A copy of each Main Stem (1) NOS Published Tidal Bench Mark Descriptions with Elevation Sheet and (2) FDEP_Preliminary Tidal Bench Mark Descriptions with Elevation Sheet dated May/June 1993 follows:

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Page 1 of 3

PRELIMINARY DATE: 05/18/93

FLORIDA 872 0496

COUNTY: CLAY QUAD INDEX NUMBER: 290814

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

GREEN COVE SPRINGS, ST. JOHNS RIVER

LATITUDE: 29°59.4'N LONGITUDE: 81°39.8'W NOAA CHART: 11492 USGS QUAD: GREEN COVE SPRINGS

To reach the tidal bench marks from the intersection of U.S. Highway 17 and Florida Highway 16, proceed south on Florida Highway 16 for 1.1 miles (1.8 km), then north along the paved road into the fenced area of Reynolds Industrial Park. The bench marks are located along State Highway 16 and the road leading from the highway to Pier 1 in the Industrial Park along the St. Johns River. The tide gage and staff were located on the south side of Pier 1.

> BENCH MARK STAMPING: WHITE 2 NO 3 1934-1960 This Bench Mark Was Searched For And Not Found On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: 'Concrete Monument

The bench mark is set flush in the top of a 0.7-foot (0.2 m) concrete monument flush with the ground, on the north side of Florida State Highway 16, 17 feet (5 m) west of the centerline of the road, 4 feet (1 m) NW of the west gate corner post on the west entrance to the piers, 3 feet (1 m) north of a 6-foot (2 m) high hurricane fence, and 1 foot (0.3 m) east of a witness post.

BENCH MARK STAMPING: USC&GS G 123 1945 This Bench Mark Was Recovered AS Described On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Culvert

The bench mark is set flush in the top center of a 1-foot (0.3 m) thick concrete culvert, the north of two culverts between a divided highway in a grass strip, 220 feet (67 m) west of the grass strip at the main gate road to the entrance of the Reynolds property on the south side of Florida Route 16, and the east road entrance to the piers on the north side of the highway, 25 feet (8 m) south of the centerline of the north lane, 0.8 foot (0.2 m) west of the east end of the culvert, and 3 feet (1 m) below the centerline of the north lane.

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FLORIDA 872 0496

GREEN COVE SPRINGS, ST. JOHNS RIVER

BENCH MARK STAMPING: ST TH 300 1956 JACKSONVILLE This Bench Mark Was Searched For And Not Found On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead Cap

The bench mark is set flush in the top of a 2-foot (0.6 m) wide concrete bulkhead cap, 0.7 foot (0.2 m) above the road and pier deck, at the SE intersection of the wharf and Pier 2 on the Reynolds property, 0.5 foot (0.2 m) east of the east side of the beginning of the pier, and 0.2 foot (0.06 m) south of the edge of the bulkhead.

NOTE: A brass stem was found at the described location, no disk was located. The mark is presumed destroyed.

BENCH MARK STAMPING: 1 1973 This Bench Mark Was Recovered AS Described On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead Cap

The bench mark is set flush in the top of the 2-foot (0.6 m) wide concrete bulkhead cap at the SE intersection of the wharf and pier at Pier 1, 0.8 foot (0.2 m) south of the edge of the bulkhead, 0.8 foot (0.2 m) east of the east side of the beginning of the pier, and 0.5 foot (0.2 m) above the road and pier deck.

BENCH MARK STAMPING: 2 1973 This Bench Mark Was Recovered AS Described On 05/18/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Culvert

The bench mark is set flush in the top of a 1-foot (0.3 m) thick concrete culvert on State Route 16, north of one of two bench marks in the center grass strip between the divided highway, 400 feet (122 m) east of the west road entrance to Reynolds Piers, 25 feet (8 m) south of the centerline of the north lane, 20 feet (6 m) east from where the highway divides, 0.5 foot (0.2 m) east of the west end of the culvert, and 1 foot (0.3 m) below the highway.

PRELIMINARY DATE: 05/18/93

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FLORIDA 872 0496

GREEN COVE SPRINGS, ST. JOHNS RIVER

Tidal datums at Green Cove Springs, St. Johns River are based on the following:

LENGTH OF SERIES	=	12 MONTHS	
TIME PERIOD	=	FEBRUARY 1974-JANUARY 19	75
TIDAL EPOCH	=	1960-1978	
CONTROL TIDE STATION	=	MAYPORT (872 0220)	

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/07/74)	=	2.79	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.86	FEET
MEAN HIGH WATER (MHW)	=	0.81	FEET
MEAN TIDE LEVEL (MTL)	=	0.44	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	×	-0.25	FEET
LOWEST OBSERVED WATER LEVEL (04/01/79)	=	-1.69	FEET

*NGVD reference based on adjustment of 1976 and NOS levels of 1979.

Bench mark elevation information:

BENCH MARK STAMPING	ELEVATION IN <u>Mllw</u>	FEET ABOVE: <u>MHW</u>
WHITE 2 NO 3 1934-1960	8.43	7.62
USC&GS G 123 1945	8.87	8.06
ST TH 300 1956 JACKSONVILLE	8.40	7.59
1 1973	8.37	7.56
2 1973	11.52	10.71

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



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PUBLICATION DATE: 08/06/87

FLORIDA 872 0496

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

GREEN COVE SPRINGS, ST. JOHNS RIVER

LATITUDE: 29°59.4'N LONGITUDE: 81°39.8'W NOAA CHART: 11492 USGS QUAD: GREEN COVE SPRINGS

To reach the tidal bench marks from the intersection of U.S. Highway 17 and Florida Highway 16, proceed south on Florida Highway 16 for 1.1 miles (1.8 km), then north along the paved road into the fenced area of Reynolds Industrial Park. The bench marks are located along State Highway 16 and the road leading from the highway to Pier 1 in the Industrial Park along the St. Johns River. The tide gage and staff were located on the south side of Pier 1.

BENCH MARK STAMPING: WHITE 2 NO 3 1934-1960

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 0.7-foot (0.2 m) concrete monument flush with the ground, on the north side of Florida State Highway 16, 17 feet (5 m) west of the centerline of the road, 4 feet (1 m) NW of the west gate corner post on the west entrance to the piers, 3 feet (1 m) north of a 6-foot (2 m) high hurricane fence, and 1 foot (0.3 m) east of a witness post.

BENCH MARK STAMPING: USC&GS G 123 1945

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Culvert

The bench mark is set flush in the top center of a 1-foot (0.3 m) thick concrete culvert, the north of two culverts between a divided highway in a grass strip, 220 feet (67 m) west of the grass strip at the main gate road to the entrance of the Reynolds property on the south side of Florida Route 16, and the east road entrance to the piers on the north side of the highway, 25 feet (8 m) south of the centerline of the north lane, 0.8 foot (0.2 m) west of the east end of the culvert, and 3 feet (1 m) below the centerline of the north lane.

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FLORIDA 872 0496

GREEN COVE SPRINGS, ST. JOHNS RIVER

BENCH MARK STAMPING: ST TH 300 1956 JACKSONVILLE

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: COE Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead Cap

The bench mark is set flush in the top of a 2-foot (0.6 m) wide concrete bulkhead cap, 0.7 foot (0.2 m) above the road and pier deck, at the SE intersection of the wharf and Pier 2 on the Reynolds property, 0.5 foot (0.2 m) east of the east side of the beginning of the pier, and 0.2 foot (0.06 m) south of the edge of the bulkhead.

BENCH MARK STAMPING: 1 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bulkhead Cap

The bench mark is set flush in the top of the 2-foot (0.6 m) wide concrete bulkhead cap at the SE intersection of the wharf and pier at Pier 1, 0.8 foot (0.2 m) south of the edge of the bulkhead, 0.8 foot (0.2 m) east of the east side of the beginning of the pier, and 0.5 foot (0.2 m) above the road and pier deck.

BENCH MARK STAMPING: 2 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Culvert

The bench mark is set flush in the top of a 1-foot (0.3 m) thick concrete culvert on State Route 16, north of one of two bench marks in the center grass strip between the divided highway, 400 feet (122 m) east of the west road entrance to Reynolds Piers, 25 feet (8 m) south of the centerline of the north lane, 20 feet (6 m) east from where the highway divides, 0.5 foot (0.2 m) east of the west end of the culvert, and 1 foot (0.3 m) below the highway.

PUBLICATION DATE: 08/06/87

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FLORIDA 872 0496

GREEN COVE SPRINGS, ST. JOHNS RIVER

Tidal datums at Green Cove Springs, St. Johns River are based on the following:

LENGTH OF SERIES	=	12 MONTHS
TIME PERIOD	=	FEBRUARY 1974-JANUARY 1975
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/07/74)	=	2.79	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	0.86	FEET	
MEAN HIGH WATER (MHW)	=	0.81	FEET	
MEAN TIDE LEVEL (MTL)	=	0.44	FEET	
MEAN LOW WATER (MLW)	=	0.07	FEET	
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	=	-0.25	FEET	
LOWEST OBSERVED WATER LEVEL (04/01/79)	=	-1.69	FEET	

*NGVD reference based on adjustment of 1976 and NOS levels of 1979.

Bench mark elevation information:

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BENCH MARK STAMPING	ELEVATION <u>MLLW</u>	IN FEET	ABOVE: <u>MHW</u>
WHITE 2 NO 3 1934-1960	8.43		7.62
USC&GS G 123 1945	8.87		8.06
ST TH 300 1956 JACKSONVILLE	8.40		7.59
1 1973	8.37		7.56
2 1973	11.52		10.71

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

LOWER ST. JOHNS RIVER VICINITY REACH FIVE ABSTRACT MILE 40.1 TO MILE 50.0

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No/ Name	Length of Series (Months)	Date from to M/Y M/Y
872 0411 Catfish Point Doctors Lake	40.4	5.9 miles Left	N/A	N/A	N/A N/A
872 0421 Swimming Pen Creek	40.5	5.9 miles Left	N/A	N/A	N/A N/A
872 0434 Black Creek	41.8	4.5 miles Left	872 0496 Green Cove Springs	3	8/78 10/78

Station No.	Elevat	Elevation (Feet, NGVD 1929)		Mean Range	Tidal Be	
Name	iame MHW		MTL MLW		Marks Fd/Regd.	
872 0411	· N/A	N/A	N/A	N/A	0/0	
872 0421	N/A	N/A	N/A	N/A	0/?	
872 0434	1.25	0.84	0.43	0.82	3/2	

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:

Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source		NOAA/NOS	SJRWMD	FDEP/ BSM	Union Camp
b.	Туре		Horizontal/ Vertical	Horizóntal/ Vertical	Mean High Water Files	Horizontal/ Vertical
c.	Cost	<u> </u>	None	None	None	Known
d.	Availability		Silver Springs Maryland	Jacksonville	Tallahassee	Green Cove Springs
e.	Format		ASCII	Arc Info	Hard copy	Unknown

PRELIMINARY DATE: 06/17/93 Not Published By NOS

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FLORIDA 872-0411

COUNTY: QUAD INDEX NUMBER:

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

CATFISH POINT, DOCTORS LAKE FLORIDA

LATITUDE: 30°06.9'N LONGITUDE: 081°44.9'W NOAA CHART: USGS QUAD:

Staff installed in 1977 for hydro work, FLDNR has no data on this station.

Page 1 of 1

FLORIDA 872-0421

COUNTY: QUAD INDEX NUMBER:

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

SWIMMING PEN CREEK, FLORIDA

LATITUDE: 30°06.0'N LONGITUDE: 081°44.8'W NOAA CHART: USGS QUAD:

Staff and three TBM's were installed in 1977 for hydro work, FLDNR has no data on this station.

Page 1 of 4

PRELIMINARY DATE: 05/28/93

FLORIDA 872 0434

COUNTY: CLAY QUAD INDEX NUMBER: 300813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

LATITUDE: 30°04.8'N LONGITUDE: 081°45.7'W NOAA CHART: 11492 USGS QUAD: MIDDLEBURG

To reach the tidal station from the intersection of U.S. Route 17 and Kingsley Avenue in Orange Park, proceed south on U.S. Route 17 for 4.5 miles (7.2 km) to its intersection with Florida State Route 220, go west on Florida State Route 220 for 3.8 miles (6.1 km) to Sleepy Hollow Road, drive south on Sleepy Hollow Road which becomes a dirt road after 0.4 mile (0.6 km) until it intersects another dirt road after 1.2 miles (1.9 km), then go south 0.2 mile (0.3 km) on this dirt road (which is east of the main dirt road) until it reaches Black Creek. The bench marks are along the roads leading to the river from Florida State Route 220. The tide gage and staff were 130 ft (40 m) east of the Seaboard Coastline Railroad Bridge which crosses over Black Creek.

To reach the tidal station from the intersection of U.S. Route 17 and Kingsley Avenue in Orange Park, proceed south on U.S. Route 17 for 4.5 miles (7.2 km) to its intersection with Florida State Route County Road 220, go west on Florida State Route County Road 220 for 3.8 miles (6.1 km) 3.5 mi (5.6 k) to Sleepy Hollow Road, drive south on Sleepy Hollow Road which becomes a dirt road after 0.4 mile (0.6 km) until it intersects another dirt road after 1.2 miles (1.9 km), then go south 0.2 mile (0.3 km) on this dirt road (which is east of the main dirt road) until it reaches Black Greek. for 1.25 miles (2.0 k) to a trail road on the left that parallels the railroad tracks, then go south 0.2 mi (0.3k) on this trail road until it reaches Black Creek. The bench marks are along the roads leading to the river from Florida State Route County Road 220. The tide gage and staff were 130 ft (40 m) east of the Seaboard Coastline Railroad Bridge which crosses over Black Creek.

> BENCHMARK STAMPING: 0434 C 1978 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 125 feet (38 m) west of the west rail of the railroad tracks, 47 feet (14 m) west of the dirt road leading to the gage site, 18 feet (5 m) SE of the fifth telephone pole north of the gage site, and 1 foot (0.3 m) east of a witness post. The bench mark is crimped to the top of a copper-clad steel rod driven 32 feet (10 m) about level with the ground.

The area surrounding the location of the mark has been incorporated into the land fill and it appears that the mark has been destroyed.

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PRELIMINARY DATE: 05/28/93

Page 2 of 4

FLORIDA 872-0434

SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

BENCHMARK STAMPING: 0434 D 1978 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is 528 feet (161 m) NW of bench mark 0434 C 1978, 200 feet (61 m) west of the railroad tracks, 88 feet (27 m) NW of a telephone pole, 22 feet (7 m) west of the centerline of Sleepy Hollow Road, and 1 foot (0.3 m) east of a witness post in a concrete post.

The area surrounding the location of the mark has been incorporated into the land fill and it appears that the mark has been destroyed.

BENCHMARK STAMPING: 0434 E 1978 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 0.5 mile (0.8 km) north of bench mark 0434 D 1978, 22 feet (7 m) east of the centerline of Sleepy Hollow Road, 5 feet (2 m) east of a witness post, and 4.5 feet (1 m) east of a telephone pole. The bench mark is crimped to the top of a copper-clad steel rod driven to a depth of 32 feet (10 m) about level with the road.

The bench mark is 0.5 mile (0.8 km) north of bench mark 0434 D 1978, 22 feet (7 m) east of the centerline of Sleepy Hollow Road, 5 feet (2 m) east of a witness post, and 4.5 feet (1 m) east of a telephone pole with a witness sign attached. The bench mark is crimped to the top of a copper-clad steel rod driven to a depth of 32 feet (10 m) about level with the road.

PRELIMINARY DATE: 05/28/93

Page 3 of 4

FLORIDA 872-0434

SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

BENCHMARK STAMPING: 0434 A 1978 This Bench Mark Was Recovered AS Described On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Footing

The bench mark is set in a concrete bridge footing, 120 feet (37 m) west of the railroad bridge, 31 feet (9 m) SW of the centerline of the dirt road leading to the gage site, 17 feet (5 m) NE of a cypress tree, and 8 feet (2 m) north of the north shoreline of Black Creek.

BENCHMARK STAMPING: 0434 B 1978 This Bench Mark Was Searched For And Not Found On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set on a concrete post 12 feet (4 m) above the dirt road, 264 feet (80 m) south of the intersection of Sleepy Hollow Road and the secondary dirt road, 100 feet (30 m) west of the railroad tracks, 30 feet (9 m) NW of the fourth telephone pole from the north bank of the creek, 29 feet (9 m) east of the centerline of the dirt road, and 1 foot (0.3 m) east of a witness post.

The area surrounding the location of the mark has been incorporated into the land fill and it appears that the mark has been destroyed.

Page 4 of 4

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FLORIDA 872-0434

SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

Tidal datums at SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK are based on the following:

LENGTH OF SERIES	= 3 MONTHS
TIME PERIOD	= AUGUST-OCTOBER 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (06/16/78)	*	2.33	FEET
MEAN HIGHER HIGH WATER (MHHW)		0.92	FEET
MEAN HIGH WATER (MHW)	=	0.87	FEET
MEAN TIDE LEVEL (MTL)	=	0.46	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.38	FEET
MEAN LOW WATER (MLW)	=	0.05	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (07/31/78)	=	-0.76	FEET

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEET <u>MLLW</u>	ABOVE: <u>MHW</u>
0434 C 1978	15.99	15.12
0434 D 1978	14.80	13.93
0434 E 1978	15.81	14.94
0434 A 1978	6.13	5.26
0434 B 1978	16.97 [']	16.10

The estimated highest water level to the nearest half-foot is 3.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).



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PUBLICATION DATE: 07/01/85

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FLORIDA 872-0434

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

LATITUDE: 30°04.8'N LONGITUDE: 081°45.7'W NOAA CHART: 11492 USGS QUAD: MIDDLEBURG

To reach the tidal station from the intersection of U.S. Route 17 and Kingsley Avenue in Orange Park, proceed south on U.S. Route 17 for 4.5 miles (7.2 km) to its intersection with Florida State Route 220, go west on Florida State Route 220 for 3.8 miles (6.1 km) to Sleepy Hollow Road, drive south on Sleepy Hollow Road which becomes a dirt road after 0.4 mile (0.6 km) until it intersects another dirt road after 1.2 miles (1.9 km), then go south 0.2 mile (0.3 km) on this dirt road (which is east of the main dirt road) until it reaches Black Creek. The bench marks are along the roads leading to the river from Florida State Route 220. The tide gage and staff were 130 ft (40 m) east of the Seaboard Coastline Railroad Bridge which crosses over Black Creek.

BENCHMARK STAMPING: 0434 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 125 feet (38 m) west of the west rail of the railroad tracks, 47 feet (14 m) west of the dirt road leading to the gage site, 18 feet (5 m) SE of the fifth telephone pole north of the gage site, and 1 foot (0.3 m) east of a witness post. The bench mark is crimped to the top of a copper-clad steel rod driven 32 feet (10 m) about level with the ground.

BENCHMARK STAMPING: 0434 D 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is 528 feet (161 m) NW of bench mark 0434 C 1978, 200 feet (61 m) west of the railroad tracks, 88 feet (27 m) NW of a telephone pole, 22 feet (7 m) west of the centerline of Sleepy Hollow Road, and 1 foot (0.3 m) east of a witness post in a concrete post.

PUBLICATION DATE: 07/01/85

Page 2 of 3

FLORIDA 872-0434

SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

BENCHMARK STAMPING: 0434 E 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Copper-clad Steel Rod

The bench mark is 0.5 mile (0.8 km) north of bench mark 0434 D 1978, 22 feet (7 m) east of the centerline of Sleepy Hollow Road, 5 feet (2 m) east of a witness post, and 4.5 feet (1 m) east of a telephone pole. The bench mark is crimped to the top of a copper-clad steel rod driven to a depth of 32 feet (10 m) about level with the road.

BENCHMARK STAMPING: 0434 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Footing

The bench mark is set in a concrete bridge footing, 120 feet (37 m) west of the railroad bridge, 31 feet (9 m) SW of the centerline of the dirt road leading to the gage site, 17 feet (5 m) NE of a cypress tree, and 8 feet (2 m) north of the north shoreline of Black Creek.

BENCHMARK STAMPING: 0434 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set on a concrete post 12 feet (4 m) above the dirt road, 264 feet (80 m) south of the intersection of Sleepy Hollow Road and the secondary dirt road, 100 feet (30 m) west of the railroad tracks, 30 feet (9 m) NW of the fourth telephone pole from the north bank of the creek, 29 feet (9 m) east of the centerline of the dirt road, and 1 foot (0.3 m) east of a witness post.

PUBLICATION DATE: 07/01/85

Page 3 of 3

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FLORIDA 872-0434

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SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK

Tidal datums at SEABOARD COASTLINE RAILROAD BRIDGE, BLACK CREEK are based on the following:

LENGTH OF SERIES	= 3 MONTHS
TIME PERIOD	= AUGUST-OCTOBER 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (06/16/78)	=	2.33	FEET
MEAN HIGHER HIGH WATER (MHHW)	Ŧ	0.92	FEET
MEAN HIGH WATER (MHW)	Ŧ	0.87	FEET
MEAN TIDE LEVEL (MTL)	=	0.46	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=		FEET
MEAN LOW WATER (MLW)	=	0.05	FEET
MEAN LOWER LOW WATER (MLLW)	æ	0.00	FEET
LOWEST OBSERVED WATER LEVEL (07/31/78)	=	-0.76	FEET

Bench mark elevation information:

ELEVATION IN FER	r Above: Mhw	
15.99	15.12	
14.80	13.93	
15.81	14.94	
6.13	5.26	
16.97	16.10	
	ELEVATION IN FEE MLLW 15.99 14.80 15.81 6.13 16.97	

The estimated highest water level to the nearest half-foot is 3.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet below mean lower low

water. Estimates are based on observed extreme water levels at Mayport (872 0220).

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

	River Mile		River Mile
Description/Bank	Location	Description/Bank	<u>Location</u>
Unnamed Creek	40.5 R	Unnamed Creek	44.8 L
Unnamed Creek	40.6 L	Unnamed Creek	45.2 L
Unnamed Creek	40.9 R	Unnamed Creek (Magnolia Springs)	45.3 L
Unnamed Creek	41.3 L	Governors Creek	45.6 L
Unnamed Creek	41.5 R	Hallowes Cove	45.7 R
Unnamed Creek (St. Lukes Ch.)	41.7 L	2 Unnamed Creek	46.2 R
Unnamed Creek	42.7 L	Unnamed Creek @ Green Cove Springs	47.0 L
Kentucky Branch	42.9 R	Orange Grove Branch	47.2 L
Unnamed Creek	43.6 R	Unnamed Creek	47.5 R
Black Creek	43.8 L	Red Bay -	48.2 L
Unnamed Creek	44.0 R	Unnamed Creek	48.8 L

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

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LOWER ST. JOHNS RIVER

EXISTING WATER LEVEL MEASUREMENT NETWORK 0 25 5 10 MLE

1" + 1.6 MILES (APPROX.)

 NOS TIDE STATION
FDEP APPROVED MEAN HIGH WATER SURVEY
RIVER MILE

> ST. JOHNS RIVER (MAIN STEM)

REACH FIVE MILE 40.1 TO 50.0 Task 4: RECOMMENDED WATER LEVEL NETWORK

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Five an experienced two person reconnaissance crew would require approximately 4 days to perform the task at an estimated cost of \$1,600.

In this reach the strength of existing survey control network for horizontal is good, vertical is poor. Reconnaissance surveys are expected to recover 40 existing survey control points, therefore no additional geodetic control however a river crossing vertical tie is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately seven field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Five.

HORIZONTAL/VERTICAL CONTROL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH FIVE

LOCATION Reach/Node/Side	A (872)	<u>EXI</u> 1 (V)	STING B (H)	с (V)	RECOMMENDED C D E F G (V) (V) (H) (Tidal)				
	•								
5 / A / R	0	n	a	0	2.2	0	0	o	
5 / B / R	o	n	a	0	2.2	0	o	0	
5 / C / R	o	n	a	0	2.2	0	o	0	
5 / D / R	o	n	a	0	2.2	0	0	0	
5 / E / R	0	n	a :	0	2.2	0	0	0	
5 / F / L	o	n	a	1	2.2	0	0	0	
5 / G / L	0	n	a	0	2.4	0	0	0	
5 / H / L	0	n	a	0	2.4	0	0	0	
5 / I / L	0496	a	a	<u>0</u>	_0_	<u>0</u>	1	<u>0</u>	
			Total	1	18.2	0	1	0	

A. Tide Station Number

- B. Control Point Analysis (n) none, (p) poor, (m) marginal, (a) adequate
- C. River crossing, monumentation, documentation
- D. NAVD 1988 ties, monumentation, documentation (miles)
- E. GPS point and azimuth mark to be set, observed, adjusted
- F. GPS point and azimuth mark to be set at tide station
- G. Additional bench mark(s) to be set, leveled, documented

COST ESTIMATE

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

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REACH FIVE	4		-	_				
Cost/unit	(Nur A	nber B	of C	tasks D	to be E	pe F	rform G	ed) Total
\$2,000/pair	3							\$ 6,000
\$ 500/mark		2						1,000
\$2,000/crossin	ng		1					2,000
\$1,000/mile				18.2				18,200
\$2,000/pair					0			0
\$2,000/pair						1		2,000
\$ 500/mark							0	0
								Total \$29,200

Vicinity Tide Station; GPS point/azimuth mark Α.

Vicinity Tide Station; set additional tidal bench mark Β.

C.

D.

River crossing - vertical control NAVD 1988 tie - vertical control GPS point/azimuth mark - horizontal control Ε.

Main Stem Tide Station; GPS point/azimuth mark F.

Main Stem Tide Station; set additional tidal bench mark G.


LOWER ST. JOHNS RIVER

EXISTING HORIZONTAL CONTROL SURVEY NETWORK INVENTORY 0 _25 _5 _1.0 MILE SCALE 1 - 100,000 1" - 1.6 MILES (APPROX.)

- CONTROL POINT-TRIANGULATION (NOS
- CONTROL POINT-GPS (GEONEX / JEA)

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- CONTROL POINT-GPS (NOS)
- CONTROL POINT-GPS (GEONEX / SJRWMD)

ST. JOHNS RIVER

REACH FIVE MILE 40.1 TO 50.0



LOWER ST. JOHNS RIVER

EXISTING VERTICAL CONTROL SURVEY NETWORK INVENTORY

ADDITIONAL VERTICAL CONTROL POINT(S) IN NODE RECOMMENDED. RIVER CROSSING VERTICAL TIE RECOMMENDED

REACH FIVE MILE 40.1 TO 50.0 0 .25 .5 1.0 MHLE SCALE 1 - 100,000

1" - 1.6 MILES (APPROX.)

CONTROL POINT (NOS OR FDEP)

F₁₀

RIVER MILE

ST. JOHNS RIVER (MAIN STEM)

R-5.24

REACH SIX

RIVER MILE 50.1 TO RIVER MILE 60.0



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	- GENERAL -
10	RIVER MILE STATION
	ST. JOHNS RIVER - MAIN STEM
	CONTROL SURVEY NETWORK ZONE
•	MEAN HIGH WATER SURVEY (FDEP)
*	NOS TIDE STATION
- HO	RIZONTAL CONTROL POINTS -
\triangle	1ST ORDER TRIANGULATION (NOS)
\bigtriangleup	2ND ORDER TRIANGULATION (NOS)
\bigtriangleup	SRD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
¢	2ND ORDER GPS (JEA)
+	B ORDER HARN, GPS (NOS)
٥	2ND ORDER GPS (SJRWMD)

- VI	ERTICAL CONTROL POINTS
*	1ST ORDER - CLASS I
*	1ST ORDER - CLASS II
*	2ND ORDER - CLASS O
*	2ND ORDER - CLASS I
0	3RD ORDER (SJRWMD)

MONWEALTH BLVD., MAIL STATION 105 LEE, FLORIDA 32308 -2427	JACKSONVILLE JACKSONVILLE PACATKA POTNAL POTNAL PUTNAL FLAGLER CEORGE REACH LOCATION	
PREPARED BY: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING (904) 488- (904) 488-	LOWER ST. JOHNS RIVER REACH MAP WATER QUALITY MANAGEMENT FEASIBILITY STUDY PHASE 1 – VERTICAL/HORIZONTAL CONTOL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH SIX – RIVER MILE 50.1 TO RIVER MILE 60.0	

Picolta Riverdale

USGS Quad Sheets: LOWER ST. JOHNS RIVER Clay County MAIN STEM REACH SIX ABSTRACT MILE 50.1 TO MILE 60.0

St. Johns County

Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

House of Representatives Document 281 letter from Secretary of War dated December 12, 1911, states before improvement there existed a well defined channel 13 feet deep, one-half mile wide from Jacksonville (River Mile 25+\-) to Tocoi Shoal (River Mile $60+\-)$ near the southern Clay County boundary. The ruling depth from Tocoi Palatka (River Mile 78) was 9 feet. Tonnage movement at Palatka by years is provided below:

Freight traffic - The tonnage movement by years is given in the reports of the Chief of Engineers as follows:

Tons. 1903 _____ 269,610 1898 _____ 25,866 1899 _____122,074 1906 _____ 559,838 1900 _____171,500 1907 _____ 273,070 1901 _____ 67,500 1908 _____ 347,764 1902 _____ 137,950 1909 _____ 379,864

Detailed estimated traffic for 1909 is as follows:

Articles	Amount in custo- mary units.	Amount in short tons.	Valuation.	Average haul or distance freight was carried.	Rate per ton-mile.
				Miles	Canta
Dud)ding merenia)	1 15 000		63.80 DOC	MILES.	Cente.
	13.000	2 000	3180,000	60	5.0
Crossie	53 000	2,000	44 665	60	
Ertilizer eache	27 500	2 750	110,000	6C	
Fich harrals	4 800	1,150	4 720	60	
	514,000	25 200	1 156 500	60	
	314,000	25,700	1,130,300	60	2.0
neybaier.	55 137 000	35,200	1 646 280	60	303
	55.137.000	110.2/4	1,546,260	60	1.7
Machinely	3,700	3.700	5,700,000	60	
Merchandibe and groceries,	3,413,200	167, 333	6.717,400	60	5.0
Neva: stores	30,866	1,2/2	66,040	61	
Dranges	265,000	11,160	446,400	60	•••••
Fruits	16,750	/50	22,500	60	• • • • • • • • • • • • • •
PeatLONS	3,600	3,600	10,800	60	5.0
Shingles	14,446	3,130	71,990	60	1.7
vegetablesCrates	50,000	1,500	185,000	60	•••••
Tota]		379,864	14,907,895		

These figures were furnished by the Board of Trade of Palatka.

527

Tons.

MAIN STEM REACH SIX Continued

المارية المنص الماجيجين ماليا متحجين والمالي

الالهاج الارد متدانيان بالمعاولات جنبيج والمستام يعينها

The following table gives distances and average depth of the channel, by sections: (House of Representatives, Document No. 281 Letter from the Secretary of War, December 12, 1911.)

(199	3 River Mile Lo (From)	cation)* (To)	Miles	Average depth
Tocoi Cut	(61.6)	(58.1)	3	13
Tocoi Cut to Hogarths Landi	ng (29.0)	(25.0)	8	18

The Above information was derived from Coast and Geodetic Survey charts Nos. 455b, 455c, 455d.

*modern river mileage system added for location purposes

Station No. Name	River Mile Location	Control Station No/ Name	Length of Series (Months)	Da from M/Y	te to M/Y
872 0499 Trout Creek	51.5 Right Bank	N/A	N/A	N/A	N/A
872 0596 East Tocoi	59.8 Right Bank	872 0496 Green Cove Springs	3	9/78	11/78

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	Eleva	tion (Feet, 1	NGVD 1929)	Mean Range	Tidal Bench
	MHW	MTL	MLW (Feet)	Marks Fd/Req'd	
872 0499	N/A	N/A	N/A	N/A	0/0
872 0596	1.13	.68	0.23	0.90	5/0

R-6.02

MAIN STEM REACH SIX Continued

na yang san dalam yan in 529 kana ana ing kang sangan ang bagas dang sanan san dalam s

المريح فجراد الرادا حجورة والمحاص فستحصص والوريا مارا الدراسي والا



STRENGTH OF EXISTING SURVEY CONTROL NETWORK

MISCELLANEOUS

Many photo control points near the river (both horizontal and vertical) were surveyed by Geonex, Inc. for a SJRWMD project along Julington Creek.

A copy of each Main Stem (1)<u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

Page 1 of 1

PRELIMINARY DATE: 05/28/93 Not Published By NOS

FLORIDA 872-0499

COUNTY: QUAD INDEX NUMBER:

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

TROUT CREEK, ST. JOHNS RIVER FLORIDA

LATITUDE: 00°00.0'N LONGITUDE: 000°00.0'W NOAA CHART: USGS QUAD:

Staff and three TBM's were installed in 1977 for hydro work, FLDNR has no data on this station.

FLORIDA 872 0596

COUNTY: ST.JOHNS OUAD INDEX NUMBER: 290814

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

EAST TOCOI, ST. JOHNS RIVER

LATITUDE: 29°51.5'N LONGITUDE: 81°33.2'W NOAA CHART: 11492 USGS QUAD: RIVERDALE

To reach the tidal bench marks from the intersection of U.S. Highway 1 and State Road C-214 (Tocoi Road) in St. Augustine, proceed west on State Road C-214 for 15.6 miles (25.1 km) to State Road 13, proceed NE on State Road 13 for 0.9 mile (1.4 km) to the Tocoi Fish Camp on the west side of the highway. The bench marks are along State Roads 13 and C-214. The tide gauge and staff were at the NW corner of the southernmost dock at the fish camp.

BENCH MARK STAMPING: NO 1 1934 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1.0-foot (0.3 m) square concrete monument, south of the intersection of State Roads 13 and C-214, 51 feet (15 m) east of the centerline of State Road 13, 49 feet (15 m) south of the centerline of State Road C-214, 39.5 feet (12.0 m) NW of the north corner of an abandoned concrete block building, 9 feet (3 m) east of a former gasoline sign, and at ground level.

The bench mark is set flush in the top of a 1.0-foot (0.3 m) square concrete monument, south of the intersection of State Roads 13 and C-214, 51 feet (15 m) east of the centerline of State Road 13, 49 feet (15 m) south of the centerline of State Road C-214, 39.5 feet (12.0 m) NW of the north corner of an abandoned concrete block building a concrete block house, 9 feet (3 m) east of a former gasoline sign, 5 feet (1.5 m) east of th NW corner of a chain link fence, and at ground level.

Page 2 of 4

FLORIDA 872 0596

EAST TOCOI, ST. JOHNS RIVER

BENCH MARK STAMPING: NO 3 1934 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1.0-foot (0.3 m) square concrete monument, north of the intersection of State Roads 13 and C-214, 288 feet (88 m) north of the centerline of State Road C-214, 163 feet (50 m) north of the north end of the east headwall of a culvert under the highway, 47 feet (14 m) east of the centerline of State Road 13, 1.5 feet (0.5 m) west of a fence, and at ground level.

The bench mark is set flush in the top of a 1.0-foot (0.3 m) square concrete monument, north of the intersection of State Roads 13 and C-214, $\frac{288 \text{ feet } (88 \text{ m})}{388 \text{ feet } (118 \text{ m})}$ north of the centerline of State Road C-214, 163 feet (50 m) morth NNE of the north end of the east headwall of a culvert under the highway, 47 feet (14 m) east of the centerline of State Road 13, $\frac{1.5 \text{ feet } (0.5 \text{ m})}{4 \text{ most} \text{ of a fence } 1 \text{ foot } (0.3 \text{ m})}$ west of a carsonite witness post, and at ground level.

BENCH MARK STAMPING: 0596 A 1978 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Pad

The primary bench mark is set flush in a 4 x 6-foot $(1 \times 2 m)$ concrete pad at the entrance to the Tocoi Fish Camp store, 1900 feet (579 m) north of Bench Mark 0596 B 1978, 45 feet (13 m) west of the centerline of State Road 13, and 9.2 feet (2.8 m) east of the camp store.

The primary bench mark is set flush in a 4 x 6-foot $(1 \times 2 \text{ m})$ concrete pad at the entrance to the Tocoi Fish Camp store, 1900 feet (579 m) north of Bench Mark 0596 B 1978, 45 feet (13 m) west of the centerline of State Road 13, and 9.2 feet (2.8 m) east of the camp store. A wooden ramp has been built over the bench mark. One board may be removed to allow access to the mark.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

Page 3 of 4

FLORIDA 872 0596

EAST TOCOI, ST. JOHNS RIVER

BENCH MARK STAMPING: 0596 B 1978 Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 1300 feet (396 m) north of Bench Mark 0596 C 1978, 75.5 feet (23.0 m) north of a 3-foot (1 m) diameter oak tree, 42.2 feet (12.9 m) west of the centerline of State Road 13, 42.2 feet (12.9 m) south of the centerline of a dirt road leading west to the K.D. Shannon residence, and 1.6 feet (0.5 m) east of a witness post.

BENCH MARK STAMPING: 0596 C 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Highway Culvert

The bench mark is set flush in the north end of a highway culvert, 1320 feet (402 m)NNE of Bench Mark NO 3 1934, 65 feet (20 m) east of St. Johns River, 23 feet (7 m)east of the centerline of State Road 13, and 2.3 feet (0.7 m) south of a witness post.

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Page 4 of 4

FLORIDA 872 0596

EAST TOCOI, ST. JOHNS RIVER

Tidal datums at East Tocoi, St. Johns River are based on the following:

LENGTH OF SERIES	= 3 MONTHS
TIME PERIOD	= SEPTEMBER - NOVEMBER 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78) = 2.34 FEET = MEAN HIGHER HIGH WATER (MHHW) 1.02 FEET = 0.97 FEET MEAN HIGH WATER (MHW) MEAN TIDE LEVEL (MTL) = 0.52 FEET *NATIONAL GEODETIC VERTICAL DATUM-= -0.16 FEET 1929 (NGVD) = 0.07 FEET MEAN LOW WATER (MLW) MEAN LOWER LOW WATER (MLLW) = 0.00 FEET LOWEST OBSERVED WATER LEVEL (01/26/79) = -1.12 FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW
NO 1 1934	9.82	8.85
NO 3 1934	10.57	9.60
0596 A 1978	5.71	4.74
0596 B 1978	10.53	9.56
0596 C 1978	11.33	10.36

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 07/23/92

Page 1 of 3

FLORIDA 872 0596

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

EAST TOCOI, ST. JOHNS RIVER

LATITUDE: 29°51.5'N LONGITUDE: 81°33.2'W NOAA CHART: 11492 USGS QUAD: RIVERDALE

To reach the tidal bench marks from the intersection of U.S. Highway 1 and State Road C-214 (Tocoi Road) in St. Augustine, proceed west on State Road C-214 for 15.6 miles (25.1 km) to State Road 13, proceed NE on State Road 13 for 0.9 mile (1.4 km) to the Tocoi Fish Camp on the west side of the highway. The bench marks are along State Roads 13 and C-214. The tide gauge and staff were at the NW corner of the southernmost dock at the fish camp.

BENCH MARK STAMPING: NO 1 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1.0-foot (0.3 m) square concrete monument, south of the intersection of State Roads 13 and C-214, 51 feet (15 m) east of the centerline of State Road 13, 49 feet (15 m) south of the centerline of State Road C-214, 39.5 feet (12.0 m) NW of the north corner of an abandoned concrete block building, 9 feet (3 m) east of a former gasoline sign, and at ground level.

BENCH MARK STAMPING: NO 3 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1.0-foot (0.3 m) square concrete monument, north of the intersection of State Roads 13 and C-214, 288 feet (88 m) north of the centerline of State Road C-214, 163 feet (50 m) north of the north end of the east headwall of a culvert under the highway, 47 feet (14 m) east of the centerline of State Road 13, 1.5 feet (0.5 m) west of a fence, and at ground level.

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Page 2 of 3

FLORIDA 872 0596

EAST TOCOI, ST. JOHNS RIVER

BENCH MARK STAMPING: 0596 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Pad

The primary bench mark is set flush in a 4 x 6-foot $(1 \times 2 \text{ m})$ concrete pad at the entrance to the Tocoi Fish Camp store, 1900 feet (579 m) north of Bench Mark 0596 B 1978, 45 feet (13 m) west of the centerline of State Road 13, and 9.2 feet (2.8 m) east of the camp store.

BENCH MARK STAMPING: 0596 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 1300 feet (396 m) north of Bench Mark 0596 C 1978, 75.5 feet (23.0 m) north of a 3-foot (1 m) diameter oak tree, 42.2 feet (12.9 m) west of the centerline of State Road 13, 42.2 feet (12.9 m) south of the centerline of a dirt road leading west to the K.D. Shannon residence, and 1.6 feet (0.5 m) east of a witness post.

BENCH MARK STAMPING: 0596 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Highway Culvert

The bench mark is set flush in the north end of a highway culvert, 1320 feet (402 m)NNE of Bench Mark NO 3 1934, 65 feet (20 m) east of St. Johns River, 23 feet (7 m)east of the centerline of State Road 13, and 2.3 feet (0.7 m) south of a witness post.

Page 3 of 3

FLORIDA 872 0596

EAST TOCOI, ST. JOHNS RIVER

Tidal datums at East Tocoi, St. Johns River are based on the following:

LENGTH OF SERIES	= 3 MONTHS
TIME PERIOD	= SEPTEMBER - NOVEMBER 1978
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	2.34	FEET
MEAN HIGHER HIGH WATER (MHHW)	*	1.02	FEET
MEAN HIGH WATER (MHW)	=	0.97	FEET
MEAN TIDE LEVEL (MTL)	=	0.52	FEET
MEAN LOW WATER (MLW)	Ħ	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.12	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	<u>MHW</u>
NO 1 1934	9.82	8.85
NO 3 1934	10.57	9.60
0596 A 1978	5.71	4.74
0596 B 1978	10.53	9.56
0596 C 1978	11.33	10.36

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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ser and the set of 539° and a series of the second s LOWER ST. JOHNS RIVER VICINITY REACH SIX ABSTRACT MILE 50.1 TO MILE 60.0

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EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No/ Name	Length of Series (Months)	Date from to M/Y M/Y
(None)	N/A	N/A	N/A	N/A	N/A

Station No.	Elevat	ion (Feet, NO	Mean Range	Tidal Bench	
	мнพ	MTL	MLW	(Feet)	Marks Fd/Reg'd.
(None)	N/A	N/A	N/A	N/A	N/A

Task 2: ADDITIONAL DATA AND INFORMATION:

•••

a.	Source		NOAA/NOS	SJRWMD	FDEP/ BSM
b.	Туре		Horizontal/ Vertical	Horizontal/ Vertical	Mean High Water Files
c.	Cost		None	None	None
d.	Availability		Silver Springs Maryland	Palatka	Tallahassee
e.	Format	<u></u>	ASCII	Arc Info	Hard copy

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Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

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- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

	River Mile		River Mile
Description/Bank_	Location	<u>Description/Bank</u>	<u>Location</u>
Little Florence	50.3 R	Palmo Cove	51.7 R
Unnamed Creek	50.5 R	Six mile Creek	51.9 R
Unnamed Creek	50.6 R	Sulphur Spring Creek	52.5 L
Florence Cove	51.0 R	Puerto Rico Cove	53.1 L
Trout Creek Cove	51.5 R	Cole Cove	53.3 R
Unnamed Creek	53.3 R	Solano Cove	57.9 R
Unnamed Creek	53.7 R	Unnamed Creek	59.2 R
Clarkes Creek	56.0 L	Unnamed Creek	59.5 L
Unnamed Creek Unnamed Creek	56.8 R 57.9 R	Tocoi Creek	59.7 R

Specific recommendations and cost estimates to upgrade survey measuremetns in the reach are itemized on the next two pages.

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R-6.13



LOWER ST. JOHNS RIVER

EXISTING WATER LEVEL MEASUREMENT NETWORK

REACH SIX MILE 50.1 TO 60.0 e f

FDEP APPROVED MEAN HIGH WATER SURVEY

10 RIVER MILE

ST. JOHNS RIVER (MAIN STEM)

R-6.14

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Six an experienced two person reconnaissance crew would require approximately 2 days to perform the task at an estimated cost of \$1,000.

In this reach the strength of existing survey control network for horizontal is good, vertical is poor. Reconnaissance surveys are expected to recover 18-20 existing survey control points, therefore substantial additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately twelve to fourteen field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Six.

HORIZONTAL/VERTICAL CONTROL SURVEY NETWORK AND WATER LEVEL MEASUREMENT STATIONS REACH SIX

	R	Ieac	.ocz h/N	TIC	<u>N</u> /Side		A (872)	<u>EXI</u> (V)	(STING B (H)		с (V)	D (V)	<u>RE(</u> E (H)	COMME F (Tid	NDED G Hal)		
	6	7	A /	R			0499*	'n	a		o	1.9	0	0	о		
	6	1	в /	R	•		o	n	a		0	1.9	٥	0	o		
	6	1	с /	R			0	a	a		0	1.9	0	0	0		
	6	1	D /	R			0	a	a		o	1.9	0	1	0		
	6	1	E /	R			0596	n	m		, 0	1.9	0	0	0		
	6	1	F /	L			0	n	a		0	2.1	0	0	0		
	6	1	G /	L			0	n	a		0	2.1	0	0	0		
	6	1	н /	L			0	n	m		0	2.1	1	0	o		
	6	1	I /	L			0	n	m		0	2.1	0	0	0		
	6	1	J /	L			0	P	a		<u>o</u>	<u>2.1</u>	<u>0</u>	<u>o</u>	<u>o</u>		
A. B. D. F. G.	T C (R N G G A	id on a) iv AVI PS PS dd:	e f ac er po po it:	Sta ol lec 198 oir oir	Ation Point Quate cossin 38 tie nt and nt and nal be	Nu A ng, es, i a i a enc	mber nalys monu zimut zimut h man	*No sis umen umen ch m ch m ck(s	pub: (n) r tatic tatic ark f ark f) to	Total Lished none, on, do on, do to be to be be se	(p) (p) ocume set, set set	20.0 al v poor ntat ntat obs at t evel	3 valu c, (tion tion serv tide led,	1 (m) (m) red, est	o marg ile: adj atio	ginal s) juste on ented	, d

jan 1997 - Santa Santa 1997 - Santa Santa

COST ESTIMATE

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The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

REACH SIX											
Cost/unit	A	в	С	D	Е	F	G		Tota	al	
\$2,000/pair	0								\$	0	
\$ 500/mark	•	0								0	
\$2,000/cross	ing		0							0	
\$1,000/mile				20.0					20	,000	
\$2,000/pair					3				6	,000	
\$2,000/pair						1			2	,000	
\$ 500/mark							0			0	
								Total	\$28	. 0 00	

Vicinity Tide Station; GPS point/azimuth mark Α.

Vicinity Tide Station; set additional tidal bench mark в.

С.

D.

River crossing - vertical control NAVD 1988 tie - vertical control GPS point/azimuth mark - horizontal control Ε.

F.

Main Stem Tide Station; GPS point/azimuth mark Main Stem Tide Station; set additional tidal bench mark G.

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R-6.16



LOWER ST. JOHNS RIVER

EXISTING HORIZONTAL CONTROL SURVEY NETWORK INVENTORY



REACH SIX MILE 50.1 TO 60.0

- CONTROL POINT-TRIANGULATION (NOS)
- CONTROL POINT-GPS (GEONEX / JEA)
- CONTROL POINT-GPS (NOS)
- CONTROL POINT-GPS (GEONEX / SJRWMD)
- RIVER MILE
 - ST. JOHNS RIVER (MAIN STEM)





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RIVER MILE 60.1 TO RIVER MILE 70.0



6

	- GENERAL -
10	RIVER MILE STATION
	ST. JOHNS RIVER - MAIN STEM
	CONTROL SURVEY NETWORK ZONE
•	MEAN HIGH WATER SURVEY (FDEP)
*	NOS TIDE STATION

-	HORIZONTAL CONTROL POINTS
\triangle	1ST ORDER TRIANGULATION (NOS)
\triangle	2ND ORDER TRIANGULATION (NOS)
Δ	3RD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
¢	2ND ORDER GPS (JEA)
+	B ORDER HARN, GPS (NOS)
0	2ND ORDER GPS (SJRWMD)

- VERTICAL CONTROL POINTS
* 1ST ORDER - CLASS I

* 1ST ORDER - CLASS I

* 2ND ORDER - CLASS 0

* 2ND ORDER - CLASS I



USGS Quad Sheets: Riverdale, Hastings

******* 549

LOWER ST. JOHNS RIVER MAIN STEM REACH SEVEN ABSTRACT MILE 60.1 TO MILE 70.0

Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

In 1908, boats were normally built to conform with river conditions of the area. Boats using the St. Johns River from Jacksonville to Sanford are listed below: (House of Representatives Document IV, December 9, 1908)

- two large side-wheel passenger boats, Jacksonville to Sanford
- one propeller boat, Jacksonville to Green Cove Springs
- one propeller boat, Jacksonville to Cresent City
- one propeller boat Palatka (River Mile 78) to Drayton Island (River Mile 108)
- one propeller boat Palatka to Green Cove Springs (River Mile 47)

In addition there are probably 50 tugs of various tonnage and 400 barges engaged in the transportation of lumber, naval stores, brick, etc, but without regular sailing dates.

The following table shows the counties dependent upon commerce in St. Johns River, With their population in 1900. It is estimated that this population has increased by about 10 per cent:

Duval	39,733
Clay	3,635
St. Johns	9,165
Putnam	11,641
Marion	24,403
Volusia	10,003
Lake	7,467
Orange	
Brevard	5,158
Total	122,579

Much of the country dependent upon the river is well adapted to agriculture and there is a great deal of valuable timber and turpentine land.

MAIN STEM REACH SEVEN Continued

The following table gives distances and average depth of the channel, by sections: (House of Representatives, Document No. 281 Letter from The Secretary of War, December 12, 1911.)

	(1993 River Mile (From)	Location) (To)	Miles	Average depth
Orange Mills Flats Cu	it (69.1)	(66.6)	2.5	13
Orange Mills Flats to Raccy Point	(66.6)	(64.4)	2.5	16
Raccy Point Cut	(64.4)	(63.1)	1.25	13
Raccy Point to Tocoi	(63.1)	(61.6)	1.50	17.5
Tocoi Cut	(61.6)	(58.1)	3.50	13

The above information was derived from Coast and Geodetic Survey Chart Nos. 455b, 455c, 455d.

* modern river mileage system added for location purposes

.

Station No. Name	River Mile Location	Control Station No/ Name	Length of Series (Months)	Date from to M,Y M,(
872 0589 Lane Landing	60.1 Right Bank	N/A	N/A	N/A N/A
872 0653 Palmetto Bluff	66.5 Left Bank	872 0496 Green Cove Springs	5	9/78 3/79

EXISTING NOAA/NOS TIDE STATION(S)

Station No.	Elevat	ion (Feet, NG)	VD 1929)	Mean Range	Tidal Bench Marks Fd/Req'd.	
Name	MHW	MTL	MLW	(Feet)		
872 0589	N/A	N/A ·	N/A	N/A	0/0	
872 0653	1.18	0.66	0.14	1.04	7/0	

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MAIN STEM REACH SEVEN continued

STRENGTH OF EXISTING SURVEY CONTROL NETWORK



MISCELLANEOUS

Putnam County boundary left side at River Mile 60.5 and Putnam County boundary right side at River Mile 66.0 leaving center of St. Johns River along Deep Creek.

A copy of each Main Stem (1)<u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993.follows:

R-7.03

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Page 1 of 1

PRELIMINARY DATE: 05/28/93 Not Published By NOS

FLORIDA 872-0589

COUNTY: ST JOHNS QUAD INDEX NUMBER:

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

LANE LANDING, ST JOHNS RIVER

LATITUDE: 00°00.0'N LONGITUDE: 000°00.0#'W NOAA CHART: USGS QUAD:

A bubbler gage was installed in 1977 for hydro work, no bench mark were installed, FLDNR has no data on this station.

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Page 1 of 4

PRELIMINARY DATE 05/17/93

FLORIDA 872 0653

COUNTY: ST. JOHNS QUAD INDEX NUMBER: 290814

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS

TIDAL BENCH MARKS

PALMETTO BLUFF, ST. JOHNS RIVER

LATITUDE: 29°45.8'N LONGITUDE: 81°33.7'W NOAA CHART: 11492 USGS QUAD: RIVERDALE

To reach the tidal bench marks from the intersection of State Road 209 and the Seaboard Coastline Railroad in Bostwick, proceed east on State Road 209 for 2.75 miles (4.43 km) to Cedar Creek Road, then north on Cedar Creek Road for 0.15 mile (0.24 km) to the dirt road leading east to the residence of Mr. Brice E. Bell. The bench marks are in area around residence, and in the vicinity of the intersection of Palmetto Bluff Road and Cedar Creek Road. The gage and staff were located on a private dock in rear of the Bell residence.

To reach the tidal bench marks from the intersection of State Road 209 and the Seaboard Coastline Railroad in Bostwick, proceed east on State Road 209 for $\frac{2.75 \text{ miles}}{(4.43 \text{ km})}$ $\frac{4.95 \text{ miles } (7.9 \text{ k})}{4.95 \text{ miles } (7.9 \text{ k})}$ to Cedar Creek Road, then north on Cedar Creek Road for 0.15 mile (0.24 km) to the dirt road leading east to the residence of Mr. Brice E. Bell. The bench marks are in area around residence, and in the vicinity of the intersection of Palmetto Bluff Road and Cedar Creek Road. The gage and staff were located on a private dock in rear of the Bell residence.

BENCH MARK STAMPING: NO 1 1934 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at the east end of Palmetto Bluff Road, 172 feet (52 m) south of Bench Mark NO 2 1934 Reset 1962, 102.5 feet (31.2 m) south of an Artesian well on the NW side of the circular end of the road, 4 feet (1 m) west of the top of the river bank, and 0.4 foot (0.1 m) above ground level.

The bench mark is set in the top of a concrete monument at the east end of Palmetto Bluff Road, 172 feet (52 m) south of Bench Mark NO-2 1934 Reset 1962, 102.5 feet (31.2 m) south of an Artesian well on the NW side of the circular end of the road, 28 .8 feet (8.5 m) east of the NE corner of a dilapidated shed, 4 feet (1 m) west of the top of the river bank, and 0.4 foot (0.1 m) above ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

Page 2 of 4

FLORIDA 872 0653

PALMETTO BLUFF, ST. JOHNS RIVER

BENCH MARK STAMPING: NO 3 1934 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument near the east end of Palmetto Bluff Road, 274.5 feet (82.7 m) SE of Bench Mark NO 2 1934 Reset 1962, 67 feet (20 m) SE of power pole with a transformer, 40 feet (12 m) NE of the centerline of Palmetto Bluff Road, 4.5 feet (1.4 m) NE of a fence, and 0.5 foot (0.2 m) above ground level.

The bench mark is set in a concrete monument near the east end of Palmetto Bluff Road, 274.5 feet (82.7 m) SE of Bench Mark NO 2 1934 Reset 1962, 67 feet (20 m) SE of power pole with a transformer, 40 feet (12 m) NE north of the centerline of Palmetto Bluff Road, 4-5 <u>4.7</u> feet (1.4 m) NE of a fence, and 0.5 foot (0.2 m) above ground level.

BENCH MARK STAMPING: NO 2 1934 RESET 1962 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in top of a concrete monument, 76.5 feet (23.3 m) north of Bench Mark NO 4 1962, 70 feet (21 m) east of the centerline of the intersection of Palmetto Bluff Road and Cedar Creek Road, and 0.3 foot (0.1 m) above ground level.

The bench mark is set in top of a concrete monument, 76.5 feet (23.3 m) north of and across the road from Bench Mark NO 4 1962, 70 feet (21 m) east NE of the centerline of the intersection of Palmetto Bluff Road and Cedar Creek Road, and 0.3 foot (0.1 m) above ground level.

BENCH MARK STAMPING: NO 4 1962 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in to of a concrete monument at the NW corner of a fence, 35.3 feet (10.8 m) SW of the centerline of Palmetto Bluff Road, and at ground level.

The bench mark is set at the intersection of Cedar Point Road and Palmetto Road, in to of a concrete monument at the NW corner of a fence, 35.3 feet (10.8 m) SW of the centerline of Palmetto Bluff Road, and at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872 0653

PALMETTO BLUFF, ST. JOHNS RIVER

BENCH MARK STAMPING: 0653 A 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 600 feet (183 m) north of Bench Mark NO 2 1934 Reset 1962, 30.5 feet (9.3 m) east of the centerline of Cedar Creek Road, 24 feet (7 m) north of the centerline of the dirt road leading east of the Brice E. Bell residence, and 1.6 feet (0.5 m) west of a power pole with a witness post at the NW corner of the fence line surrounding the Bell residence, and 0.2 feet (0.1 m) below ground level.

BENCH MARK STAMPING: 0652 B This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 69 feet (21 m) ENE of the intersection of Palmetto Bluff Road and Cedar Creek Road, 32 feet (10 m) north of the ceterline of Palmetto Bluff Road, 19 feet (6 m) SE of Bench Mark NO 2 1934 Rest 1962, and 1.4 feet (0.4 m) above ground level.

BENCH MARK STAMPING: Y Y2 0653 C 66 66 PALMETTO This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 70 feet (21 m) SE of the intersection of Palmetto Bluff Road and Cedar Creek Road, 54.3 feet (16.6 m) SE of the Centerline of Cedar Creek Road, 34 feet (10 m) east of the largest oak tree in the area, 31.6 feet (9.6 m) SW of the centerline of Palmetto Bluff Road, 2.4 feet (0.7 m) NE of Bench Mark NO 4 1962, 1 foot (0.3 m) north of a fence corner, and 0.2 foot (0.1 m) above ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

FLORIDA 872 0653

PALMETTO BLUFF, ST. JOHNS RIVER

Tidal datums at Palmetto Bluff, St. Johns River are based on the following:

LENGTH OF SERIES	æ	5 MONTHS
TIME PERIOD	=	SEPTEMBER 1978-MARCH 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/3/78)	Ŧ	2.48	FEET
MEAN HIGHER HIGH WATER (MHHW)	×	1.18	FEET
MEAN HIGH WATER (MHW)	=	1.11	FEET
MEAN TIDE LEVEL (MTL)	=	0.59	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.07	FEET
MEAN LOW WATER (MLW)	×	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (1/26/79)	=	-1.14	FEET

Bench mark elevation information:

1.10

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ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	MHW	
NO 1 1934	6.92	5.81	
NO 3 1934	6.76	5.65	
NO 2 1934 RESET 1962	8.16	7.05	
NO 4 1962	7.94	6.83	
0653 A 1978	5.86	4.75	
0653 B	8.52	7.41	
Y Y2 0653 C 66 66 PALMETTO	8.16	7.05	

The estimated highest water level to the nearest half-foot is 4.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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Page 4 of 4



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Page 1 of 4

PUBLICATION DATE: 03/24/88

FLORIDA 872 0653

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PALMETTO BLUFF, ST. JOHNS RIVER

LATITUDE: 29°45.8'N LONGITUDE: 81°33.7'W NOAA CHART: 11492 USGS QUAD: RIVERDALE

To reach the tidal bench marks from the intersection of State Road 209 and the Seaboard Coastline Railroad in Bostwick, proceed east on State Road 209 for 2.75 miles (4.43 km) to Cedar Creek Road, then north on Cedar Creek Road for 0.15 mile (0.24 km) to the dirt road leading east to the residence of Mr. Brice E. Bell. The bench marks are in area around residence, and in the vicinity of the intersection of Palmetto Bluff Road and Cedar Creek Road. The gage and staff were located on a private dock in rear of the Bell residence.

BENCH MARK STAMPING: NO 1 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at the east end of Palmetto Bluff Road, 172 feet (52 m) south of Bench Mark NO 2 1934 Reset 1962, 102.5 feet (31.2 m) south of an Artesian well on the NW side of the circular end of the road, 4 feet (1 m) west of the top of the river bank, and 0.4 foot (0.1 m) above ground level.

BENCH MARK STAMPING: NO 3 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument near the east end of Palmetto Bluff Road, 274.5 feet (82.7 m) SE of Bench Mark NO 2 1934 Reset 1962, 67 feet (20 m) SE of power pole with a transformer, 40 feet (12 m) NE of the centerline of Palmetto Bluff Road, 4.5 feet (1.4 m) NE of a fence, and 0.5 foot (0.2 m) above ground level.

PUBLICATION DATE: 03/24/88

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FLORIDA 872 0653

PALMETTO BLUFF, ST. JOHNS RIVER

BENCH MARK STAMPING: NO 2 1934 RESET 1962

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in top of a concrete monument, 76.5 feet (23.3 m) north of Bench Mark NO 4 1962, 70 feet (21 m) east of the centerline of the intersection of Palmetto Bluff Road and Cedar Creek Road, and 0.3 foot (0.1 m) above ground level. BENCH MARK STAMPING: NO 4 1962

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in to of a concrete monument at the NW corner of a fence, 35.3 feet (10.8 m) SW of the centerline of Palmetto Bluff Road, and at ground level.

BENCH MARK STAMPING: 0653 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 600 feet (183 m) north of Bench Mark NO 2 1934 Reset 1962, 30.5 feet (9.3 m) east of the centerline of Cedar Creek Road, 24 feet (7 m) north of the centerline of the dirt road leading east of the Brice E. Bell residence, and 1.6 feet (0.5 m) west of a power pole with a witness post at the NW corner of the fence line surrounding the Bell residence, and 0.2 feet (0.1 m) below ground level.

BENCH MARK STAMPING: 0652 B

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MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 69 feet (21 m) ENE of the intersection of Palmetto Bluff Road and Cedar Creek Road, 32 feet (10 m) north of the ceterline of Palmetto Bluff Road, 19 feet (6 m) SE of Bench Mark NO 2 1934 Rest 1962, and 1.4 feet (0.4 m) above ground level.
PUBLICATION DATE: 03/24/88

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FLORIDA 872 0653

PALMETTO BLUFF, ST. JOHNS RIVER

BENCH MARK STAMPING: Y Y2 0653 C 66 66 PALMETTO

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 70 feet (21 m) SE of the intersection of Palmetto Bluff Road and Cedar Creek Road, 54.3 feet (16.6 m) SE of the Centerline of Cedar Creek Road, 34 feet (10 m) east of the largest oak tree in the area, 31.6 feet (9.6 m) SW of the centerline of Palmetto Bluff Road, 2.4 feet (0.7 m) NE of Bench Mark NO 4 1962, 1 foot (0.3 m) north of a fence corner, and 0.2 foot (0.1 m) above ground level.

PUBLICATION DATE: 03/24/88

Page 4 of 4

FLORIDA 872 0653

PALMETTO BLUFF, ST. JOHNS RIVER

Tidal datums at Palmetto Bluff, St. Johns River are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	SEPTEMBER 1978-MARCH 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/3/78)	=	2.48	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.18	FEET
MEAN HIGH WATER (MHW)	=	1.11	FEET
MEAN TIDE LEVEL (MTL)	=	0.59	FEET
MEAN LOW WATER (MLW)	=	0.07	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (1/26/79)	=	-1.14	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	MHW
NO 1 1934	6.92	5.81
NO 3 1934	6.76	5.65
NO 2 1934 RESET 1962	8.16	7.05
NO 4 1962	7.94	6.83
0653 A 1978	5.86	4.75
0653 в .	8.52	7.41
Y Y2 0653 C 66 66 PALMETTO	8.16	7.05

The estimated highest water level to the nearest half-foot is 4.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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LOWER ST. JOHNS RIVER VICINITY REACH SEVEN ABSTRACT MILE 60.1 TO MILE 70.0

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name (Offset Distance)	River Mile Location	Distance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from ito M/Y M/Y
872 0554 Vilano Beach Inside, Tolomato River	62.0	17.8	872 0220	5	7/78 12/78

Station No.	Elevat	ion (Feet, N	GVD 1929)	Mean Range	Tidal Bench
Name Left/Right	MHW	MTL	MLW	(Feet)	Marks Fd/Req'd.
872 0554	2.55	0.31	-1.93	4.48	6/0

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:

562

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Page 1 of 3

PRELIMINARY DATE: 06/09/93

FLORIDA 872 0554

COUNTY: ST JOHNS QUAD INDEX NUMBER: 290811

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

VILANO BEACH INSIDE, TOLOMATO RIVER

LATITUDE: 29°55.0'N LONGITUDE: 081°18.0'W NOAA CHART: 11488 USGS QUAD: ST. AUGUSTINE

To reach the tidal bench marks from the intersection of Florida Highway 5A (Marco Avenue) and Florida Highway AlA in St. Augustine, proceed 1.3 miles (2.1 km) east on Florida Highway AlA to the east end of the AlA bridge over the Tolomato River, thence to the Riverside Fish Camp on the north side of the highway. The bench marks are located along Highway AlA. The tide gage and staff were located on the Fish Camp Pier.

BENCHMARK STAMPING: 7879 A 39 RM NO 1 This Bench Mark Description Changed On 06/09/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Setback Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.25 mile (0.4 km) north of triangulation station VILANO 1933 1962, across Highway A1A from a realtor's office, 122 feet (37 m) north of Cedar Avenue, 29 feet (9 m) west of the centerline of Florida Highway A1A, 0.2 foot (0.06 m) north of a witness post, and at ground level.

The bench mark is set in the top of a concrete monument, 0.25 mile (0.4 km) north of triangulation station VILANO 1933 1962, across Highway AlA from a realtor's office, 122 feet (37 m) north of Cedar Avenue, 29 feet (9 m) west of the centerline of Florida Highway AlA, 0.2 foot (0.06 m) north of a witness post, and at 0.5 feet (0.15 m) below ground level.

BENCHMARK STAMPING: 7879 A 39 RM NO 2 This Bench Mark Was Searched For And Not Found On 06/09/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Setback Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in a concrete monument, 100 feet (30 m) north of bench mark 7879 A 39 RM NO 1, 81 feet (25 m) south of Oak Avenue, 29 feet (9 m) west of the centerline of Florida Highway AlA, 0.2 foot (0.06 m) south of a witness post, and 0.3 foot (0.1 m) below ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 06/09/93

Page 2 of 3

FLORIDA 872-0554

VILANO BEACH INSIDE, TOLOMATO RIVER

BENCHMARK STAMPING: M 322 1970 This Bench Mark Was Recovered AS Described On 06/09/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set on the top of the north end of the east abutment of the large highway bridge over the Intracoastal Waterways, and 16 feet (5 m) north of the centerline of the highway.

BENCHMARK STAMPING: VILANO 1933 1962 This Bench Mark Description Changed On 06/09/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in top of a concrete monument, 42 feet (13 m) south of the centerline of a paved street leading east, 32 feet (10 m) east of the extended centerline of Highway AlA leading north, and 1.7 feet (0.5 m) north of a metal witness post, and 0.2 foot (0.1 m) above ground level.

The bench mark is set in the top of a concrete monument, 0.4 mile east of the bridge, 42 feet (13 m) south of the centerline of a paved street leading east, 32 feet (10 m) east of the extended centerline of Highway AlA leading north, 1.7 feet (0.5 m) north of a metal witness post, and 0.2 foot (0.1 m) above ground level.

BENCHMARK STAMPING: VILANO 1933 NO 1 1977 This Bench Mark Was Recovered AS Described On 06/09/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 205 feet (62 m) west of the centerline of a paved road leading south, 38.5 feet (11.7 m) south of the centerline of the paved road to the beach, 3 feet (1 m) north of the north edge of a concrete sidewalk, 1 foot (0.3 m) north of a metal witness, and 0.3 foot (0.1 m) above ground level.

BENCHMARK STAMPING: VILANO 1933 NO 4 1977 This Bench Mark Was Recovered AS Described On 06/09/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 83 feet (25 m) east of the centerline of proposed State Highway AlA, 46 feet (14 m) north of the centerline of the road to the beach, 11.5 feet (3.5 m) east of a utility line brace pole, 2.5 feet (0.8 m) south of the south edge of a concrete sidewalk, 1.5 feet (0.5 m) east of a metal witness post, and at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 06/09/93

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FLORIDA 872-0554

VILANO BEACH INSIDE, TOLOMATO RIVER

TIDAL DATUMS ARE BASED ON THE FOLLOWING:

...

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	JULY-DECEMBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	Ξ	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	×	7.20	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	4.98	FEET
MEAN HIGH WATER (MHW)	=	4.66	FEET
MEAN TIDE LEVEL (MTL)	=	2.42	FEET
*NATIONAL GEODETIC VERTICAL DATUM-		,	
1929 (NGVD)	=	2.11	FEET
MEAN LOW WATER (MLW)	Ħ	0.18	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (08/18/78)	=	-1.41	FEET

Bench mark elevation information:

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BENCHMARK STAMPING	ELEVATION IN FEET MLLW	ABOVE: <u>MHW</u>
7879 a 39 rm no 1	10.15	5.49
7879 A 39 RM NO 2	11.92	7.26
M 322 1970	11.65	6.99
VILANO 1933 1962 ·	11.65	6.99
VILANO 1933 NO 1 1977	11.00	6.34
VILANO 1933 NO 4 1977	11.04	6.38

The estimated highest water level to the nearest half-foot is 7.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 10/21/86

FLORIDA 872-0554

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

VILANO BEACH INSIDE, TOLOMATO RIVER

LATITUDE: 29°55.0'N LONGITUDE: 081°18.0'W NOAA CHART: 11488 USGS QUAD: ST. AUGUSTINE

To reach the tidal bench marks from the intersection of Florida Highway 5A (Marco Avenue) and Florida Highway AlA in St. Augustine, proceed 1.3 miles (2.1 km) east on Florida Highway AlA to the east end of the AlA bridge over the Tolomato River, thence to the Riverside Fish Camp on the north side of the highway. The bench marks are located along Highway AlA. The tide gage and staff were located on the Fish Camp Pier.

BENCHMARK STAMPING: VILANO 1933 1962

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in top of a concrete monument, 42 feet (13 m) south of the centerline of a paved street leading east, 32 feet (10 m) east of the extended centerline of Highway AlA leading north, and 1.7 feet (0.5 m) north of a metal witness post, and 0.2 foot (0.1 m) above ground level.

BENCHMARK STAMPING: VILANO 1933 NO 1 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 205 feet (62 m) west of the centerline of a paved road leading south, 38.5 feet (11.7 m) south of the centerline of the paved road to the beach, 3 feet (1 m) north of the north edge of a concrete sidewalk, 1 foot (0.3 m) north of a metal witness, and 0.3 foot (0.1 m) above ground level.

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Page 2 of 3

PUBLICATION DATE: 10/21/86

FLORIDA 872-0554

VILANO BEACH INSIDE, TOLOMATO RIVER

BENCHMARK STAMPING: VILANO 1933 NO 4 1977

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NGS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 83 feet (25 m) east of the centerline of proposed State Highway AlA, 46 feet (14 m) north of the centerline of the road to the beach, 11.5 feet (3.5 m) east of a utility line brace pole, 2.5 feet (0.8 m) south of the south edge of a concrete sidewalk, 1.5 feet (0.5 m) east of a metal witness post, and at ground level.

BENCHMARK STAMPING: 7879 A 39 RM NO 1

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Setback Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 0.25 mile (0.4 km) north of triangulation station VILANO 1933 1962, across Highway AlA from a realtor's office, 122 feet (37 m) north of Cedar Avenue, 29 feet (9 m) west of the centerline of Florida Highway AlA, 0.2 foot (0.06 m) north of a witness post, and at ground level.

BENCHMARK STAMPING: 7879 A 39 RM NO 2

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Setback Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument, 100 feet (30 m) north of Bench Mark 7879 A 39 RM NO 1, 81 feet (25 m) south of Oak Avenue, 29 feet (9 m) west of the centerline of Florida Highway AlA, 0.2 foot (0.06 m) south of a witness post, and 0.3 foot (0.1 m) below ground level.

BENCHMARK STAMPING: M 322 1970

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Bridge Abutment

The bench mark is set on the top of the north end of the east abutment of the large highway bridge over the Intracoastal Waterways, and 16 feet (5 m) north the centerline of the highway, and 1 foot (0.3 m) above highway level.

Page 3 of 3

FLORIDA 872-0554

VILANO BEACH INSIDE, TOLOMATO RIVER

Tidal datums at VILANO BEACH INSIDE, TOLOMATO RIVER are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	JULY-DECEMBER 1978
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Lower Low Water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	7.20 FEET
MEAN HIGHER HIGH WATER (MHHW)	÷	4.98 FEET
MEAN HIGH WATER (MHW)	=	4.66 FEET
MEAN TIDE LEVEL (MTL)	æ	2.42 FEET
*NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	=	2.11 FEET
MEAN LOW WATER (MLW)	=	0.18 FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00 FEET
LOWEST OBSERVED WATER LEVEL (08/18/78)	=	-1.41 FEET

*NGVD is based on elevations published in Quad 290811, February, 1973 and NOS leveling of 1979.

Bench mark elevation information:

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BENCHMARK STAMPING	ELEVATION IN FEE Mllw	T ABOVE: MHW
7879 A 39 RM NO 2	11.92	7.26
VILANO 1933 NO 1 1977	11.00	6.34
VILANO 1933 NO 4 1977	11.04	6.38
7879 A 39 RM NO 1	10.15	5.49
м 322 1970	11.65	6.99
. VILANO 1933 1962	11.65	6.99

The estimated highest water level to the nearest half-foot is 7.50 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.00 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source	<u> </u>	NOAA/NOS	FDEP/BSM
b.	Туре		Horizontal/	Mean High Water Files
	-		Vertical	Mater Files
с.	Cost		None	None
d.	Availability		Silver Springs Marvland	Tallahassee
e.	Format		ASCII	Hardcopy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

Description/Bank	River Mile Location	Description/Bank	River Mile <u>Location</u>
Paines Branch	61.3 R	Moccasin Branch	65.6 R
Unnamed Creek	61.9 L	Deep Creek	66.2 R
Unnamed Creek	62.0 R	Dredged Canal	66.3 L
Cedar Creek	62.4 L	Dredged Canal	67.0 L
Elbow Branch	63.6 L	Unnamed Creek	68.1 R
Unnamed Creek	64.5 R	Mason Branch	68.3 L
Unnamed Creek @ Deadman Point	64.5 L	Unnamed Creek	69.1 R
McCullough Creek	64.9 R	Unnamed Creek	69.8 R

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

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1" - 1.6 MILES (APPROX.)

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LOWER ST. JOHNS RIVER

EXISTING WATER LEVEL
MEASUREMENT NETWORK* NOS TIDE STATIONPFDEP APPROVED MEAN
HIGH WATER SURVEYPFDEP APPROVED MEAN
HIGH WATER SURVEYREACH SEVEN
MILE 60.1 TO 70.0RIVER MILEST. JOHNS RIVER
(MAIN STEM)ST. JOHNS RIVER
(MAIN STEM)

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Seven an experienced two person reconnaissance crew would require approximately 3 days to perform the task at an estimated cost of \$1,300.

In this reach the strength of existing survey control network for both horizontal and vertical is poor. Reconnaissance surveys area expected to recover 25 existing survey control points, therefore substantial additional geodetic control and a river crossing vertical tie is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately sixteen days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Seven.

	LOCATION	A (872)	EXI	STING B		C (V)	D	RE(E	COMMEN F			(
U	Reach/Node/Side	(8/2)	(9)	(H)		(V)	(v)	(H)	(114	a1)	لنا	
	7 / A / R	0559*	n	p		0	2.3	1	0	0		
	7 / B / R .	o	n	a		0	2.3	ο	0	0		
	7 / C / R	0	n	q		D	2.3	ı	o	0		
	7 / D / R	0	n	n		o	2.3	ı	o	0		
	7 / E / R	0	a	a		'n	2.3	0	o	0		
	7 / F / L	0	n	m		0	2.0	0	0	0		
	7 /G/L	0	n	P		0	2.0	1	o	0		
	7 / H / L	0653	a	a		o	2.0	o	1	0		
	7 / I / L	0	n	a		<u>o</u>	2.0	ō	<u>o</u>	<u>o</u>		
A.	Tide Station 1	Number*	No	r publi	rotal shed	ı tid	19.5 al v	₄ ralu	ı .es	0		
Β.	Control Point (a) adequate	Analys	is,	(n) n	one	(p)	poor	. (π	i) ma	arginal		
C.	River crossing	g, monu	nen	tation	, doo	cume	ntat	ion	L			
D.	NAVD 1988 ties	s, monui	nen	tation	, doo	cume	ntat	ion	(m:	iles)		
Ε.	GPS point and	azimut	h m	ark to	be s	set,	obs	erv	red,	adjust	ed	
F.	GPS point and	azimut	h ma	ark to	be s	set	at t	ide	sta	ation		

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

G. Additional bench mark(s) to be set, leveled, documented

572

R-7.22

COST ESTIMATE

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

11	REACH SEVEN	(Number	c of	tasks	to 1	be	perform	ned)
	Cost/unit	A B	С	D	E		F G	Total
	\$2,000/pair	1						\$ 2,000
	\$ 500/mark	0						0
	\$2,000/crossir	ŋg	1					2,000
	\$1,000/mile			19.5				19,500
	\$2,000/pair				4			8,000
	\$2,000/pair						1	2,000
	\$ 500/mark						0	0
								Total \$33,500

Α.

Vicinity Tide Station; GPS point/azimuth mark Vicinity Tide Station; set additional tidal bench mark в.

River crossing - vertical control NAVD 1988 tie - vertical control С.

D.

Ε.

F.

GPS point/azimuth mark - horizontal control Main Stem Tide Station; GPS point/azimuth mark Main Stem Tide Station; set additional tidal bench mark G.

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R-7.23



1" - 1.6 MILES (APPROX.)

LOWER ST. JOHNS RIVER EXISTING HORIZONTAL CONTROL

SURVEY NETWORK INVENTORY

ADDITIONAL HORIZONTAL CONTROL POINT(S) IN NODE RECOMMENDED.

REACH SEVEN MILE 60.1 TO 70.0

- CONTROL POINT-TRIANGULATION (NOS)
- CONTROL POINT-GPS Ŷ (GEONEX / JEA)
 - CONTROL POINT-GPS (NOS)
- 0 CONTROL POINT-GPS (GEONEX / SJRWMD) **F**₁₀
 - RIVER MILE

ST. JOHNS RIVER (MAIN STEM)



R-7.25

REACH EIGHT

2 10

RIVER MILE 70.1 TO RIVER MILE 80.0



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	GENERAL -
10	RIVER MILE STATION
	ST. JOHNS RIVER - MAIN STEM
	CONTROL SURVEY NETWORK ZONE
9	MEAN HIGH WATER SURVEY (FDEP)
*	NOS TIDE STATION

OFNEDAL

- HOI	RIZONTAL CONTROL POINTS -
\bigtriangleup	1ST ORDER TRIANGULATION (NOS)
\bigtriangleup	2ND ORDER TRIANGULATION (NOS)
\triangle	3RD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
ф.	2ND ORDER GPS (JEA)
+	B ORDER HARN, GPS (NOS)
0	2ND ORDER GPS (SJRWMD)

- VE	ERTICAL CONTROL POINTS
*	1ST ORDER - CLASS I
*	1ST ORDER - CLASS II
*	2ND ORDER - CLASS O
*	2ND ORDER - CLASS I



Hastings, Palatka

USGS Quad Sheets: LOWER ST. JOHNS RIVER MAIN STEM REACH EIGHT ABSTRACT MILE 70.0 TO MILE 80.0

Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

As one nears Palatka, going upstream, on the St. Johns River it is noticed the rivers' nominal width suddenly decreases to less than one mile. It is interesting to note the physical dimensions of an ocean steamer proposed for river travel between Jacksonville and Sanford as described in a preliminary examination by the US Engineer Office (House of Representatives, Ex. Doc. No. 240) dated February 7, 1891.

(1) "From Jacksonville to Sanford, to obtain an estimate of the cost of deepening the channel so as to secure navigation for ocean steamers, and to report separately the cost of opening the channel in the vicinity of Orange Mills." (River Mile 67+/-)*

A steamer 350 feet long, 45 feet beam, and drawing 10 feet of water is assumed to be the type of boat for which the estimate for channel improvement is desired. Such a boat requires a channel 100 feet wide in a perfectly straight reach. She can not be handled safely in an ordinary curved channel less than 200 feet wide. The least radius in which she can turn on the open sea would vary from 500 to 1,000 feet; 1,500 feet is assumed as the least radius of a curve which she can make in a confined channel. To form a channel from Jacksonville to Sanford having a navigable depth of 10 feet, a minimum width of 200 feet, and with no curves of less than 1,500 feet radius, 1,362,000 cubic yards of sand silt must be removed from straight reaches and 30 bends must be straightened by dredging 3,469,000 cubic yards in addition. Taking the cost of dredging at 30 cents per cubic yard, which, as it must include clearing the land of trees and roots, is not excessive, and adding 15 per cent for contingencies, the total cost of this work would be \$1,460,000. Each foot of depth required in addition would add to this cost proportionably.

Ten feet can now be carried to Palatka and for 14 miles beyond, as far as Little Lake George.

The following table gives distances and average depth of the channel, by sections: (House of Representatives, Document No. 281 Letter from the Secretary of War, December 12, 1911.)

	(1993 River Mile (From)	Location) * (To)	Miles	Average depth
Palatka to Forresters Point	(76.6)	(74.6)	2	13
Forresters Point Cut	(74.6)	(72.6)	2	13
Forresters Point to Orange Mills Flats	(72.6)	69.1)	3.25	18.5

The above information was derived from Coast and Geodetic Survey Charts Nos. 455b, 455c, 455d.

*modern river mileage system added for location purposes R-8.01

MAIN STEM REACH EIGHT Continued

EXISTING NOAA/NOS TIDE STATION(S)

Station No.	River Mile Location	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y
872 0774 Palatka	78.6 Left Bank	872 0496 Green Cove Springs	4	8/78 3/79

Station No.	Elevati	lon (Feet, N	Mean Range	Tidal Bench		
Name	мнพ	MTL	MLW	(Feet)	Marks Fd/Req'd.	
872 0774	1.19	0.65	0.10	1.09	5/0	

STRENGTH OF EXISTING SURVEY CONTROL NETWORK



MISCELLANEOUS

At River Mile 78.4 (Palatka) US Route 17 crosses the St. Johns River.

A copy of each Main Stem (1)<u>NOS</u> <u>Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary Tidal</u> <u>Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

R-8.02

580

Page 1 of 3

PRELIMINARY DATE: 05/17/93

FLORIDA 872 0774

COUNTY: PUTNAM QUAD INDEX NUMBER: 290814

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

PALATKA, ST. JOHNS RIVER

LATITUDE: 29°38.6'N LONGITUDE: 81°37.9'W NOAA CHART: 11492 USGS QUAD: PALATKA

To reach the tidal bench marks from the Post Office at the intersection of Reid and Second Streets in Palatka, proceed NW on Reid Street to 3rd Street, turn left and proceed SW on 3rd Street to River Street, continue SW on River Street to Boathouse Marina. The bench marks are in the area between Reid Street and the marina. The tide gage and staff were on the Boathouse Marina pier.

To reach the tidal bench marks from the Post Office <u>City Hall</u> at the intersection of Reid and Second Streets in Palatka, proceed NW on Reid Street to 3rd Street, turn left and proceed SW on 3rd Street to River Street, continue SW on River Street to Boathouse Marina. The bench marks are in the area between Reid Street and the marina. The tide gage and staff were on the Boathouse Marina pier.

BENCH MARK STAMPING: PRIM TRAV STA NO 6 1911 18.822 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USGS Traverse Station SETTING CLASSIFICATION: Iron Pipe

The bench mark is riveted on top of a 3-1/2-inch diameter iron pipe in the SW corner of City Park, in the triangle of grass bordered by St Johns Avenue, a parking lot, and a sidewalk along the west side of the courthouse, 136.5 feet (41.6 m) SW of the SW corner of the south wing of the courthouse, 22.5 feet (6.9 m) north of the north curb of St Johns Avenue, and 0.5 foot (0.2 m) above ground level.

BENCH MARK STAMPING: NO 5 1934 This Bench Mark Description Changed On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The primary bench mark is set flush in the concrete porch of the Post Office, in the SE corner of the main entrance on the west side (2nd Street), 28 feet (8 m) east of the east curb of 2nd Street, 21 feet (6 m) south of the center of the entrance, and 2.5 feet (0.8 m) above street level.

The primary bench mark is set flush in the concrete porch of the Post Office City Hall, in the SE corner of the main entrance on the west side (2nd Street), 28 feet (8 m) east of the east curb of 2nd Street, 21 feet (6 m) south of the center of the entrance, and 2.5 feet (0.8 m) above street level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 05/17/93

Page 2 of 3

FLORIDA 872 0774

PALATKA, ST. JOHNS RIVER

BENCH MARK STAMPING: D 31 RESET 1968 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Steps

The bench mark is set in the SE corner of the front steps to the public library building north of U.S. Highway 17, between 2nd and 3rd Streets.

. BENCH MARK STAMPING: 8 1973 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set flush in the top of a 6-foot (2 m) diameter concrete sewer cover at City Park, midway between the driveways of the two parking areas off River Street, 40 feet (12 m) SE of the intersection of the centerlines of River and Laurel Streets, 25 feet (8 m) east of the centerline of River Street, 2 feet (1 m) south of the center of the 2-foot (1 m) round steel manhole cover, and 0.3 foot (0.1 m) above ground level.

> BENCH MARK STAMPING: BH 0774 G This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the top of the end rail at the west end of the U.S. Highway 17 bridge over St. Johns River, 28.0 feet (8.5 m) south of the centerline of the southbound lane, 5.8 feet (1.8 m) east of the west end of the rail, 0.6 foot (0.2 m) west of the bridge abutment, and 3 feet (1 m) above the level of the pavement.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 05/17/93

Page 3 of 3

FLORIDA 872 0774

PALATKA, ST. JOHNS RIVER

Tidal datums at Palatka, St. Johns River are based on the following:

LENGTH OF SERIES	=	4 MONTHS
TIME PERIOD	=	AUGUST 1978-MARCH 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	Ħ	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	2.59	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.22	FEET
MEAN HIGH WATER (MHW)	=	1.17	FEET
MEAN TIDE LEVEL (MTL)	=	0.63	FEET
MEAN LOW WATER (MLW)	=	0.08	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.02	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.11	FEET

*NGVD reference based on adjustment of 1976 and NOS levels of 1985.

Bench mark elevation information:

	ELEVATION IN	FEET ABOVE:
BENCH MARK STAMPING	MLLW	MHW
PRIM TRAV STA NO 6 1911 18.822 NO 5 1934	18.79 15.97	17.62 14.80
D 31 RESET 1968 8 1973	15.64 7.69	14.47 6.52
BH 0774 G	13.97	12.80

The estimated highest water level to the nearest half-foot is 4.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PUBLICATION DATE: 04/08/91

FLORIDA 872 0774

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

PALATKA, ST. JOHNS RIVER

LATITUDE: 29°38.6'N LONGITUDE: 81°37.9'W NOAA CHART: 11492 USGS QUAD: PALATKA

To reach the tidal bench marks from the Post Office at the intersection of Reid and Second Streets in Palatka, proceed NW on Reid Street to 3rd Street, turn left and proceed SW on 3rd Street to River Street, continue SW on River Street to Boathouse Marina. The bench marks are in the area between Reid Street and the marina. The tide gage and staff were on the Boathouse Marina pier.

BENCH MARK STAMPING: PRIM TRAV STA NO 6 1911 18.822

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USGS Traverse Station SETTING CLASSIFICATION: Iron Pipe

The bench mark is riveted on top of a 3-1/2-inch diameter iron pipe in the SW corner of City Park, in the triangle of grass bordered by St Johns Avenue, a parking lot, and a sidewalk along the west side of the courthouse, 136.5 feet (41.6 m) SW of the SW corner of the south wing of the courthouse, 22.5 feet (6.9 m) north of the north curb of St Johns Avenue, and 0.5 foot (0.2 m) above ground level.

BENCH MARK STAMPING: NO 5 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The primary bench mark is set flush in the concrete porch of the Post Office, in the SE corner of the main entrance on the west side (2nd Street), 28 feet (8 m) east of the east curb of 2nd Street, 21 feet (6 m) south of the center of the entrance, and 2.5 feet (0.8 m) above street level.

PUBLICATION DATE: 04/08/91

Page 2 of 3

FLORIDA 872 0774

PALATKA, ST. JOHNS RIVER

BENCH MARK STAMPING: D 31 RESET 1968

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Steps

The bench mark is set in the SE corner of the front steps to the public library building north of U.S. Highway 17, between 2nd and 3rd Streets.

BENCH MARK STAMPING: 8 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set flush in the top of a 6-foot (2 m) diameter concrete sewer cover at City Park, midway between the driveways of the two parking areas off River Street, 40 feet (12 m) SE of the intersection of the centerlines of River and Laurel Streets, 25 feet (8 m) east of the centerline of River Street, 2 feet (1 m) south of the center of the 2-foot (1 m) round steel manhole cover, and 0.3 foot (0.1 m) above ground level.

BENCH MARK STAMPING: BH 0774 G

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Florida DOT Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the top of the end rail at the west end of the U.S. Highway 17 bridge over St. Johns River, 28.0 feet (8.5 m) south of the centerline of the southbound lane, 5.8 feet (1.8 m) east of the west end of the rail, 0.6 foot (0.2 m) west of the bridge abutment, and 3 feet (1 m) above the level of the pavement.

PUBLICATION DATE: 04/08/91

Page 3 of 3

FLORIDA 872 0774

PALATKA, ST. JOHNS RIVER

Tidal datums at Palatka, St. Johns River are based on the following:

LENGTH OF SERIES	=	4 MONTHS
TIME PERIOD	=	AUGUST 1978-MARCH 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	2.59	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.22	FEET
MEAN HIGH WATER (MHW)	=	1.17	FEET
MEAN TIDE LEVEL (MTL)	Ŧ	0.63	FEET
MEAN LOW WATER (MLW)	=	0.08	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.02	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.11	FEET

*NGVD reference based on adjustment of 1976 and NOS levels of 1985.

Bench mark elevation information:

	ELEVATION IN FE	ET ABOVE:
BENCH MARK STAMPING	MLLW	MHW
PRIM TRAV STA NO 6 1911 18.822 NO 5 1934	18.79 15.97	17.62 14.80
D 31 RESET 1968 8 1973	15.64 7.69	14.47
BH 0774 G	13.97	12.80

The estimated highest water level to the nearest half-foot is 4.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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LOWER ST. JOHNS RIVER 588 VICINITY REACH EIGHT ABSTRACT MILE 70.1 TO MILE 80.0

and the state

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/	Y
None	N/A	N/A	N/A	N/A		

Station No.	Elevat	ion (Feet, N	Mean Range	Tidal Bench	
	мнพ	MTL	MLW	(Feet)	Marks Fd/Req'd.
None	N/A	N/A	N/A	N/A	N/A

Task 2: ADDITIONAL DATA AND INFORMATION:

. . **. .**

a.	Source		NOAA/NOS Pacific	FDEP/BSM	(
b.	Туре	<u> </u>	Horizonal/ Vertical	Mean High Water Files	3
c.	Cost		None	None	
d.	Availability		Silver Springs Maryland	Tallahassee	
e.	Format		ASCII	Arc Info	Hardcopy

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589 Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

Description/Bank_	River Mile Location	Description/Bank	River Mile <u>Location</u>
Dog Branch	70.9 R	Unnamed Creek/	73 9 I.
Dredged Canal	71.0 L	Rice Creek/	74.7 L
Dredged Creek	71.1 R	Cow Creek/	76.1 R
Fish Creek	71.9 L	Unnamed Creek	78.9 L
		from Ravine Garder	ı
		State Park/	
Warner Cove	72.6	Unnamed Creek	73.7 L
Unnamed Creek	73.5 L	Unnamed Creek/	79.9 L

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.



REACH EIGHT MILE 70.1 TO 80.0 NOS TIDE STATION
FDEP APPROVED MEAN HIGH WATER SURVEY
RIVER MILE
ST. JOHNS RIVER (MAIN STEM)

R-8.11

591 Task 4: RECOMMENDED WATER LEVEL NETWORK

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Eight an experienced tow person reconnaissance crew would require approximately 4 days at an estimated cost of \$1,800.

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In this reach the strength of existing survey control network for horizontal is poor and vertical is fair. Reconnaissance surveys area expected to recover 35-40 existing survey control points, therefore only a few miles of additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately three field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Eight.

LOCATION	EX	ISTI	NG	_	RECO	MMENI	DED	
Reach/Node/Side	A (872)	(V)	B (H)	C (V)	D (V)	E (H)	F (Tid	G lal)
8 / A / B.	Ο.	a	a	0	0	0	0	0
8 / B / B	0	n	a	0	4.7	0	0	0
8 / C / -B	0	а	a	0	0	0	0	0
8 / D / B	0	р	a	: 0	1.3	0	0	0
8 / E / B	0774	a	a	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>
			Total	0	6.0	0	1	0

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

- A. Tide Station Number
- B. Monumentation (n) none, (p) poor, (m) marginal, (a) adequate C. River crossing, monumentation, documentation
- D. NAVD 1988 ties, monumentation, documentation (miles)
- E. GPS point and azimuth mark to be set, observed, adjusted
- F. GPS point and azimuth mark to be set at tide station
- G. Additional bench mark(s) to be set, leveled, documented

COST ESTIMATE

Actor at

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

الهيها بالحادي بتنصحوا المحجم

ممرية المصلح المجار الارد الجار محرف مصرو مرتمين فيطاو فالم

RÉACH EIGHT	(-			-	•	
Cost/unit	(Number A B	OÍ C	D	to be E	perform F G	ed) Tota:	1
\$2,000/pair	0					\$. 0
\$ 500/mark	0						0
\$2,000/crossin	ng	0					0
\$1,000/mile			6.0			6,0	000
\$2,000/pair				0		2,0	000
\$2,000/pair					1		0
\$ 500/mark					0		0
						Total \$24,0	000

Α. Vicinity Tide Station; GPS point/azimuth mark

Vicinity Tide Station; set additional tidal bench mark Β.

River crossing - vertical control NAVD 1988 tie - vertical control С.

D.

الله التي المراجع الم المراجع الم

GPS point/azimuth mark - horizontal control Ε.

F.-

Main Stem Tide Station; GPS point/azimuth mark Main Stem Tide Station; set additional tidal bench mark G.

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R-8.13



REACH EIGHT MILE 70.1 TO 80.0

- CONTROL POINT-TRIANGULATION (NOS)
- CONTROL POINT-GPS (GEONEX / JEA)
- CONTROL POINT-GPS (NOS)
 - CONTROL POINT-GPS (GEONEX / SJRWMD)
 - RIVER MILE

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ST. JOHNS RIVER (MAIN STEM)



REACH NINE

RIVER MILE 80.1 TO RIVER MILE 90.0



	- GENERAL -
10	RIVER MILE STATION
	ST. JOHNS RIVER - MAIN STEM
	CONTROL SURVEY NETWORK ZONE
•	MEAN HIGH WATER SURVEY (FDEP)
*	NOS TIDE STATION

- HOI	RIZONTAL CONTROL POINTS -
\bigtriangleup	1ST ORDER TRIANGULATION (NOS)
\bigtriangleup	2ND ORDER TRIANGULATION (NOS)
\triangle	SRD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
ф.	2ND ORDER GPS (JEA)
•	B ORDER HARN, GPS (NOS)
0	2ND ORDER GPS (SJRWMD)

- VI	ERTICAL CONTROL POINTS -
*	1ST ORDER - CLASS I
*	1ST ORDER - CLASS II
*	2ND ORDER - CLASS O
*	2ND ORDER - CLASS I


Hastings, San Mateo

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597 USGS Quad Sheets: LOWER ST. JOHNS RIVER Putnam County MAIN STEM **REACH NINE ABSTRACT** MILE 80.1 TO MILE 90.0

Task 1: Readily Available Tidal Data:

HISTORIC NOTE

Major Francis R. Shunk, U.S. Army Corps of Engineers documents interesting facts concerning railroading versus boating competition and related freight rates in North Florida. Preliminary Examination of the St. Johns River dated June 3, 1907. (House of Representatives Document No. 1111 December 9, 1908) revealed the following analysis:

Before the days of the railroads the St. Johns River was the main highway of commerce in Florida. There were several competing lines of boats, but the amount of freight to be carried was as great as the boats could handle, so that freight rates were relatively high. When the railroad was built to Sanford, about 1886, most of the boats went out of business, and after a period of fluctuation a single regular line was left, with rates considerably lower than they had been. There has been no change to speak of for twenty years. It is, therefore, a fact that the only considerable reduction in freight rates in this part of the world was due to the building of a railroad. However, the existence of the waterway has had an effect on railroad rates, which from the beginning have been lower than they otherwise probably would have been. Railroad rates in this State are regulated by a commission, acting under authority of the State government, which commission fixes maximum charges. The rates from Jacksonville to Sanford have always been less than the maximum, and this, in my opinion, is undoubtedly due to the fact that there is a waterway in parallel.

Station No. Name	River Mile Location	Control Station No. Name		Length of Series (Months)	D from M/Y	ate to M/Y
872 0767 Buffalo Bluff	89.2 Left Bank	872 0220 Mayport		5	11/7	8 4/79
Station No.	Elevation (Feet, NGVD 1929) Me		Mean Ra	Mean Range Ti		
	MHW	MTL	MLW			Fd/Req'd.
872 0767	1.33	0.87	0.40	0.93	3	5/0

EXISTING NOAA/NOS TIDE STATION(S)

REACH NINE ABSTRACT Continued



STRENGTH OF EXISTING SURVEY CONTROL NETWORK

MISCELLANEOUS

The Seaboard Coast Line Railroad crosses the St. Johns River at Buffalo Bluff (River Mile 89.2).

A copy of each Main Stem (1)<u>NOS</u> <u>Published</u> <u>Tidal</u> <u>Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP</u> <u>Preliminary</u> <u>Tidal</u> <u>Bench Mark</u> <u>Descriptions</u> with <u>Elevation</u> <u>Sheet</u> dated May/June 1993 follows: Ĺ

PRELIMINARY DATE: 05/17/93

FLORIDA 872 0767

COUNTY: PUTNAM QUAD INDEX NUMBER: 290814

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

BUFFALO BLUFF, ST JOHNS RIVER

LATITUDE: 29°35.7'N LONGITUDE: 81°40.9'W NOAA CHART: 11492 USGS QUAD: <u>PALATKA SATSUMA</u>

To reach the tidal bench marks from the junction of County Road C-309 and U.S. Highway 17 in Satsuma, proceed north on U.S. Highway 17 for 0.95 mile (1.53 km) to County Road C-309B (Buffalo Bluff Road), then NW on County Road C-309B for 2.0 miles (3.2 km) to a private driveway leading NE across the railroad tracks, cross the tracks and continue NE on the track road parallel to the railroad tracks for 0.6 mile (1.0 km) to the railroad bridge. The bench marks are on the railroad bridge and nearby. The tide gage and staff were below the bridge span.

BENCH MARK STAMPING: 0767 A 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Wingwall

The bench mark is set flush in the concrete wingwall at the SW corner of the bridge, 143.6 feet (43.8 m) NW of the NW corner of the bridge tender's residence, 20 feet (6.1 m) NW of the south shoreline, 18 feet (5 m) SW of the centerline of the railroad tracks, and 8.9 feet (2.7 m) west of the handrail along the west side of the bridge.

BENCH MARK STAMPING: 0767 B 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Pier Foundation

The bench mark is set flush in the SW corner of the concrete pier foundation at the south end of the bridge drawspan, 275 feet (84 m) north of Bench Mark 0767 A 1978, 38 feet (12 m) west of the drawbridge control house at the center of the bridge, 5.0 feet (1.5 m) north of the south edge of the pier foundation, and 4.8 feet (1.5 m) below the level of the railroad tracks.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

Page 2 of 3

PRELIMINARY DATE: 05/17/93

FLORIDA 872 0767

BUFFALO BLUFF, ST JOHNS RIVER

BENCH MARK STAMPING: 0767 C 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Wingwall

The bench mark is set flush in the concrete wingwall at the NW corner of the bridge, 610 feet (186 m) NNW of Bench Mark 0767 B 1978, 25 feet (8 m) south of a telephone box at the NW corner of the bridge, 11.5 feet (3.5 m) west of the centerline of the railroad tracks, and level with the bridge surface.

BENCH MARK STAMPING: 0767 D 1978 This Bench Mark Added On 01/01/78 This Bench Mark Was Recovered AS Described On 01/01/85 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set flush in the concrete foundation of the southern drawbridge signal 145 feet (44.2 m) south of the southern end of the concrete railroad bridge, 11.5 feet (3.4 m) west of the bridge tenders residence, and 1.8 feet (0.6 m) southwest of the signal support frame.

BENCH MARK STAMPING: 0767 E 1978 This Bench Mark Added On 01/01/78 This Bench Mark Was Recovered AS Described On 01/01/85 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set flush in a 3 X 3 X 1.5 foot (1 X 1 X 0.5 m) concrete base for the train signal light on the north end of the railroad bridge, 331 feet (100.9 m)north of the north end of the bridge and bench mark 0767 C 1978, 11.5 feet (3.5 m)west of the centerline of the railroad tracks, 8.7 feet (2.6 m) north of the track relay switch enclosed in a grey metal house.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 05/17/93

Page 3 of 3

FLORIDA 872 0767

BUFFALO BLUFF, ST JOHNS RIVER

Tidal datums at Buffalo Bluff, St Johns River are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	NOVEMBER 1978-APRIL 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/31/78) MEAN HIGHER HIGH WATER (MHHW) MEAN HIGH WATER (MHW) MEAN TIDE LEVEL (MTL) *NATIONAL GEODETIC VERTICAL DATUM-	2.20 1.03 0.99 0.52	FEET FEET FEET FEET	
1929 (NGVD) MEAN LOW WATER (MLW) MEAN LOWER LOW WATER (MLLW) LOWEST OBSERVED WATER LEVEL (01/26/79)	 -0.34 0.06 0.00 -1.16	FEET FEET FEET FEET	

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

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BENCH MARK STAMPING	MLLW	MHW
0767 A 1978	11.01	10.02
0767 в 1978	5.79	4.80
0767 C 1978	10.79	9.80
0767 D 1978	11.19	10.26
0767 E 1978	10.34	9.41

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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PUBLICATION DATE: 11/20/90

FLORIDA 872 0767

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

BUFFALO BLUFF, ST JOHNS RIVER

LATITUDE: 29°35.7'N LONGITUDE: 81°40.9'W NOAA CHART: 11492 USGS QUAD: PALATKA

To reach the tidal bench marks from the junction of County Road C-309 and U.S. Highway 17 in Satsuma, proceed north on U.S. Highway 17 for 0.95 mile (1.53 km) to County Road C-309B (Buffalo Bluff Road), then NW on County Road C-309B for 2.0 miles (3.2 km) to a private driveway leading NE across the railroad tracks, cross the tracks and continue NE on the track road parallel to the railroad tracks for 0.6 mile (1.0 km) to the railroad bridge. The bench marks are on the railroad bridge and nearby. The tide gage and staff were below the bridge span.

BENCH MARK STAMPING: 0767 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Wingwall

The bench mark is set flush in the concrete wingwall at the SW corner of the bridge, 143.6 feet (43.8 m) NW of the NW corner of the bridge tender's residence, 20 feet (6.1 m) NW of the south shoreline, 18 feet (5 m) SW of the centerline of the railroad tracks, and 8.9 feet (2.7 m) west of the handrail along the west side of the bridge.

BENCH MARK STAMPING: 0767 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Bridge Pier Foundation

The bench mark is set flush in the SW corner of the concrete pier foundation at the south end of the bridge drawspan, 275 feet (84 m) north of Bench Mark 0767 A 1978, 38 feet (12 m) west of the drawbridge control house at the center of the bridge, 5.0 feet (1.5 m) north of the south edge of the pier foundation, and 4.8 feet (1.5 m) below the level of the railroad tracks.

Page 2 of 3

PUBLICATION DATE: 11/20/90

FLORIDA 872 0767

BUFFALO BLUFF, ST JOHNS RIVER

BENCH MARK STAMPING: 0767 C 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Wingwall

The bench mark is set flush in the concrete wingwall at the NW corner of the bridge, 610 feet (186 m) NNW of Bench Mark 0767 B 1978, 25 feet (8 m) south of a telephone box at the NW corner of the bridge, 11.5 feet (3.5 m) west of the centerline of the railroad tracks, and level with the bridge surface.

PUBLICATION DATE: 11/20/90

Page 3 of 3

FLORIDA 872 0767

BUFFALO BLUFF, ST JOHNS RIVER

Tidal datums at Buffalo Bluff, St Johns River are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	NOVEMBER 1978-APRIL 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/31/78)	=	2.20	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	1.03	FEET
MEAN HIGH WATER (MHW)	Ξ	0.99	FEET
MEAN TIDE LEVEL (MTL)	=	0.52	FEET
MEAN LOW WATER (MLW)	=	0.06	FEET
MEAN LOWER LOW WATER (MLLW)	Ħ	0.00	FEET
LOWEST OBSERVED WATER LEVEL (01/26/79)	=	-1.16	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

:

BENCH MARK STAMPING	MLLW	MHW
0767 A 1978 0767 B 1978	11.01	10.02
0767 C 1978	10.79	9.80

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

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LOWER ST. JOHNS RIVER VICINITY REACH NINE ABSTRACT MILE 80.1 TO MILE 90.0

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y
872 0782 Sutherlands Still, Dunns Creek	84.8	1.6 miles/ Right	872 0496 Green Cove Springs	4	10/78 3/79
Station No. Name	Eleva	tion (Feet, 1929)	NGVD	Mean Range	Tidal Bench
	МНЖ	MTL	MLW	(Feet)	Marks Fd/Req'd.
872 0782	1.16	0.77	0.37	0.79	5/0

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary Tidal</u> <u>Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:

PRELIMINARY DATE: 05/14/93

FLORIDA 872 0782

COUNTY: PUTNAM QUAD INDEX NUMBER: 290814

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

SUTHERLANDS STILL, DUNNS CREEK

LATITUDE: <u>29°34.4'N</u> LONGITUDE: <u>81°36.2'W</u> LATITUDE: <u>29°34.3'N</u> LONGITUDE: <u>81°36.4'W</u> NOAA CHART: 11492 USGS QUAD: SAN MATEO

To reach the tidal bench marks from the intersection of FL 100 and US 17, proceed 1.75 miles (2.82 km) southwest along U.S. 17 to its intersection with Horse Landing Road, then 1.9 miles (3.1 km) south southwest along Horse Landing Road to Fishermans Road (dirt road) and continue west for 0.55 mile (0.88 km) to Paradise Point Road, and then 0.35 mile (0.56 km) to Paradise Circle. The station was located on the north shore of Dunns Creek, on the southeast corner of the wooden dock, behind the mobile home residence of Mrs. Peck, and 240 feet (73 m) south of the southeast corner of Mrs. Peck's residence.

BENCH MARK STAMPING: 0782 A 1978 C.L.B. This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The primary bench mark is set in the top of a concrete monument, 84 feet (25.6 m) north of centerline of a driveway, 64.7 feet (19.7 m) east of the northeast corner of the Peck residence, 24 feet (7.3 m) west of centerline of Paradise Circle, 2.8 feet (0.8 m) east of utility pole, 2 feet (0.6 m) east from a witness post, and 1 foot (0.3 m) below ground level.

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Page 2 of 4

FLORIDA 872 0782

SUTHERLANDS STILL, DUNNS CREEK

BENCH MARK STAMPING: 0782 B 1978 C.L.B. This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the top of a concrete monument at curve in Paradise Point Road, 0.15 mile (0.24 km) south of Fishermans Road, 29 feet (8.8 m) southeast of the centerline of the Paradise Point Road, 6.8 feet (2.1 m) west of a guy support wire, 3.0 feet (0.9 m) east of a utility pole, 1.0 foot (0.3 m) north of a witness post, and at ground level.

The bench mark is set in the top of a concrete monument at curve in Paradise Point Road, $0.15 \text{ mile } (0.24 \text{ km}) \quad 0.12 \text{ mi} \quad (0.19 \text{ k})$ south of Fishermans Road, 29 feet (8.8 m) southeast of the centerline of the Paradise Point Road, 6.8 feet (2.1 m) west of a guy support wire, the anchor for a guy wire support, 3.0 feet (0.9 m) east of a utility pole, 1.0 foot (0.3 m) north of a witness post, and at ground level.

BENCH MARK STAMPING: 0782 C 1978 C.L.B. This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 34.8 feet (10.6 m) south of the centerline of Fishermans Road, 20.8 (6.3 m) west of the centerline of a private road at the end of Horse Landing Road, 5.4 feet (1.6 m) north of a fence line, 3.4 feet (1.0 m) southeast of a utility pole, 1.0 feet (0.3 m) north of a witness post, and 0.2 foot (0.1 m) below ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 05/14/93

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FLORIDA 872 0782

SUTHERLANDS STILL, DUNNS CREEK

BENCH MARK STAMPING: STILL 1935 This Bench Mark Description Changed On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a square concrete monument , 100 feet (30.5 m) north of a gas pump near the river bank, 97 feet (29.6 m) east northeast of northeast corner of a swimming pool, 24 feet (7.3 m) southeast of the southwest corner of the white house, 19 feet (5.8 m) southwest of the southeast corner of the white house, and 0.2 foot (0.1 m) above ground level.

The bench mark is set in the top of a square concrete monument, 0.1 mi (0.16 k) south along a private drive from bench mark 0782 C 1978 BSM, 100 feet (30.5 m) north of a gas pump near the river bank, 97 feet (29.6 m) east northeast of northeast corner of a swimming pool, 24 feet (7.3 m) southeast of the southwest corner of the white house, 19 feet (5.8 m) southwest of the southeast corner of the white house, and 0.2 foot (0.1 m) above ground level.

BENCH MARK STAMPING: STILL NO 2 1935 This Bench Mark Was Recovered AS Described On 05/14/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a square concrete monument on the east side of the driveway, 57 feet (17.4 m) north northeast of the northeast corner of the white house, 15 feet (4.6 m) north of the north wall of the metal garage building, 10.5 feet (3.2 m) east of a brick outdoor fireplace, and 0.7 foot (0.2 m) above ground level.

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Page 4 of 4

PRELIMINARY DATE: 05/14/93

FLORIDA 872 0782

SUTHERLANDS STILL, DUNNS CREEK

Tidal datums at Sutherlands Still, Dunns Creek are based on the following:

LENGTH OF SERIES	=	4 MONTHS
TIME PERIOD	**	OCTOBER 1978-MARCH 1979
TIDAL EPOCH	Ŧ	1960-1978
CONTROL TIDE STATION		GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	2.10	FEET
MEAN HIGHER HIGH WATER (MHHW)	*	0.91	FEET
MEAN HIGH WATER (MHW)	=	0.81	FEET
MEAN TIDE LEVEL (MTL)	=	0.42	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	_ =	-0.35	FEET
MEAN LOW WATER (MLW)	=	0.02	FEET
MEAN LOWER LOW WATER (MLLW)	Ŧ	0.00	FEET
LOWEST OBSERVED WATER LEVEL (04/09/79)	Ξ	-1.12	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

:

BENCH MARK STAMPING	MLLW	<u>MHW</u>
0782 A 1978 C.L.B.	1.89	1.08
0782 B 1978 C.L.B.	4.84	4.03
0782 C 1978 C.L.B.	10.12	9.31
STILL 1935	8.14	7.33
STILL NO 2 1935	9.61	8.80

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES



PUBLICATION DATE: 03/12/93

Page 1 of 3

FLORIDA 872 0782

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

SUTHERLANDS STILL, DUNNS CREEK

LATITUDE: 29°34.4'N LONGITUDE: 81°36.2'W NOAA CHART: 11492 USGS QUAD: SAN MATEO

To reach the tidal bench marks from the intersection of FL 100 and US 17, proceed 1.75 miles (2.82 km) southwest along U.S. 17 to its intersection with Horse Landing Road, then 1.9 miles (3.1 km) south southwest along Horse Landing Road to Fishermans Road (dirt road) and continue west for 0.55 mile (0.88 km) to Paradise Point Road, and then 0.35 mile (0.56 km) to Paradise Circle. The station was located on the north shore of Dunns Creek, on the southeast corner of the wooden dock, behind the mobile home residence of Mrs. Peck, and 240 feet (73 m) south of the southeast corner of Mrs. Peck's residence. The bench marks are in the vicinity.

BENCH MARK STAMPING: 0782 A 1978 C.L.B.

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The primary bench mark is set in the top of a concrete monument, 84 feet (25.6 m) north of centerline of a driveway, 64.7 feet (19.7 m) east of the northeast corner of the Peck residence, 24 feet (7.3 m) west of centerline of Paradise Circle, 2.8 feet (0.8 m) east of utility pole, 2 feet (0.6 m) east from a witness post, and 1 foot (0.3 m) below ground level.

BENCH MARK STAMPING: 0782 B 1978 C.L.B.

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the top of a concrete monument at curve in Paradise Point Road, 0.15 mile (0.24 km) south of Fishermans Road, 29 feet (8.8 m) southeast of the centerline of the Paradise Point Road, 6.8 feet (2.1 m) west of a guy support wire, 3.0 feet (0.9 m) east of a utility pole, 1.0 foot (0.3 m) north of a witness post, and at ground level.

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FLORIDA 872 0782

SUTHERLANDS STILL, DUNNS CREEK

BENCH MARK STAMPING: 0782 C 1978 C.L.B.

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: FLDNR Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument, 34.8 feet (10.6 m) south of the centerline of Fishermans Road, 20.8 (6.3 m) west of the centerline of a private road at the end of Horse Landing Road, 5.4 feet (1.6 m) north of a fence line, 3.4 feet (1.0 m) southeast of a utility pole, 1.0 feet (0.3 m) north of a witness post, and 0.2 foot (0.1 m) below ground level.

BENCH MARK STAMPING: STILL 1935

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a square concrete monument , 100 feet (30.5 m) north of a gas pump near the river bank, 97 feet (29.6 m) east northeast of northeast corner of a swimming pool, 24 feet (7.3 m) southeast of the southwest corner of the white house, 19 feet (5.8 m) southwest of the southeast corner of the white house, and 0.2 foot (0.1 m) above ground level.

BENCH MARK STAMPING: STILL NO 2 1935

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a square concrete monument on the east side of the driveway, 57 feet (17.4 m) north northeast of the northeast corner of the white house, 15 feet (4.6 m) north of the north wall of the metal garage building, 10.5 feet (3.2 m) east of a brick outdoor fireplace, and 0.7 foot (0.2 m) above ground level.

Page 3 of 3

FLORIDA 872 0782

SUTHERLANDS STILL, DUNNS CREEK

Tidal datums at Sutherlands Still, Dunns Creek are based on the following:

LENGTH OF SERIES	=	4 MONTHS
TIME PERIOD	=	OCTOBER 1978-MARCH 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/03/78)	=	2.10	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.91	FEET
MEAN HIGH WATER (MHW)	₽	0.81	FEET
MEAN TIDE LEVEL (MTL)	=	0.42	FEET
MEAN LOW WATER (MLW)	=	0.02	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (04/09/79)	=	-1.12	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

:

BENCH MARK STAMPING	MLLW	MHW
0782 A 1978 C.L.B.	1.89	1.08
0782 B 1978 C.L.B.	4.84	4.03
0782 C 1978 C.L.B.	10.12	9.31
STILL 1935	8.14	7.33
STILL NO 2 1935	9.61	8.80

The estimated highest water level to the nearest half-foot is 3.5 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

Task 2: ADDITIONAL DATA AND INFORMATION:

a.	Source		NOAA/NOS	FDEP/BSM
b.	Туре	<u> </u>	Horizontal/ Vertical	Mean High Water Files
c.	Cost		None	None
d.	Availability		Silver Springs Maryland	Tallahassee
e.	Format		ASCII	Hard copy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

Description/Bank	River Mile Location	Description/Bank	River Mile <u>Location</u>
Mill Branch	80.8 R	Dredged Channel	84.9 R
Bray Creek	82.3 R	Dredged Channel	85.0 R
Unnamed Creek	83.3 R	Unnamed Creek	85.2 R
Unnamed Creek	83.2 R	Dunns Creek	85.7 R
Unnamed Creek	83.4 R	Polly Creek	85.9 R
Unnamed Creek	83.4 L	Polly Creek	86.6 R
Unnamed Creek	83.6 L	Murphy Creek	88.6 R
Dredged Creek	84.1 R	Barrentine Creek	89.8 R
Dredged Channel	84.1 R		

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

R-9.17



LOWER ST. JOHNS RIVER

EXISTING WATER LEVEL MEASUREMENT NETWORK

0 .25 .5 1.0 MILE SCALE 1 • 100.000

1" - 1.6 MILES (APPROX.)







ST. JOHNS RIVER (MAIN STEM)

617 Task 4: RECOMMENDED WATER LEVEL NETWORK

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network'. In Reach Nine an experienced two person reconnaissance crew would require approximately 2 days to perform the task at an estimated cost of \$1,000.

In this reach the strength of existing survey control network for both horizontal and vertical is poor. Reconnaissance surveys are expected to recover 18-20 existing survey control points, therefore some additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately eleven field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Nine.

LOCATION	EX	ISTI	NG		RECO	MMENI	DED	
Reach/Node/S	ide (872)	(V)	B (H)	С (V)	D (V)	E (H)	F (Tid	G al)
9 / A	. 0	a	a	0	0	0	0	0
9 / B	0	m	a	0	1	0	0	0
9 / C	0782	m	p	0	0	1	1	0
9 / D	0	n	р	; 0	1.5	1	0	0
9 / E	0767	a	р	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>0</u>
			Total	0	2.5	3	2	0

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

A. Tide Station Number

B. Control Point Analysis, (n) none, (p) poor, (m) marginal, (a) adequate

- C. River crossing, monumentation, documentation
- D. NAVD 1988 ties, monumentation, documentation (miles)
- E. GPS point and azimuth mark to be set, observed, adjusted
- F. GPS point and azimuth mark to be set at tide station
- G. Additional bench mark(s) to be set, leveled, documented

R-9.19

COST ESTIMATE 618

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

REACH NINE	4.5.5		-				-				
Cost/unit	(Nur A	B	OÍ C	tasks D	to E	be	perfo F	G G	d)	Total	
\$2,000/pair	1									\$ 2,000	
\$ 500/mark		0								0	
\$2,000/crossin	ıg		0							0	
\$1,000/mile				2.5						2,500	
\$2,000/pair					3					6,000	
\$2,000/pair							2			4,000	
\$ 500/mark								0		0	
								,	Total	\$14,000	

Α.

Vicinity Tide Station; GPS point/azimuth mark Vicinity Tide Station; set additional tidal bench mark Β.

C.

River crossing - vertical control NAVD 1988 tie - vertical control D.

GPS point/azimuth mark - horizontal control Ε.

Main Stem Tide Station; GPS point/azimuth mark F.

Main Stem Tide Station; set additional tidal bench mark G.

R-9.20



REACH NINE MILE 80.1 TO 90.0

P₁₀ RIVER MILE

> ST. JOHNS RIVER (MAIN STEM)



REACH TEN

RIVER MILE 90.1 TO RIVER MILE 100.0



- GENERAL -¹⁰ RIVER MILE STATION ST. JOHNS RIVER - MAIN STEM CONTROL SURVEY NETWORK ZONE MEAN HIGH WATER SURVEY (FDEP) X NOS TIDE STATION

- HORIZONTAL CONTROL POINTS -

\triangle	1ST ORDER TRIANGULATION (NOS)
\bigtriangleup	2ND ORDER TRIANGULATION (NOS)
\triangle	SRD ORDER TRIANGULATION (NOS)
¢	1ST ORDER GPS (NOS / JEA)
÷	2ND ORDER GPS (JEA)
+	B ORDER HARN, GPS (NOS)
0	2ND ORDER GPS (SJRWMD)

- VERTICAL CONTROL POINTS -

- * 1ST ORDER CLASS I
- * 1ST ORDER CLASS II
- * 2ND ORDER CLASS O
- 2ND ORDER CLASS I



Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

Many books could be written abut the U.S. Army Corps of Engineers' studies to build a trans Florida Barge Canal to link the Atlantic Ocean and Gulf of Mexico. During the mid to late 1800s numerous routes were surveyed by the Corps providing many early horizontal and vertical control survey networks including topographic mapping and lake levels of the period - The Cross Florida Barge Canal (River Mile 92.0) eastern terminus ties into the St. Johns River at a point seven miles north of Welaka, Florida.

Station No. Name	River Mile Location	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y	
872 0832 Welatka	98.4 Right Bank	872 0496 Green Cove Springs	5	9/78	3/79

EXISTING NOAA/NOS TIDE STATION(S)

Station No.	Elevat	ion (Feet,	Mean Range	Tidal Bench		
	мнพ	MTL	: MLW	(Feet)	Marks Fd/Req'd.	
872 0832	1.08	0.90	0.73	0.35	7/0	

MAIN STEM REACH TEN ABSTRACT Continued

والريبية والمعرفية ومتهمة المحافظ محافظ مطاب المحار المحار المحار المحاف المحاف متحاصل مارك المحافظ المحافظ

STRENGTH OF EXISTING SURVEY CONTROL NETWORK



MISCELLANEOUS

The Cross Florida Barge Canal intersects the left bank at River Mile 92.0.

A copy of each Main Stem (1) NOS Published Tidal Bench Mark Descriptions with Elevation Sheet and (2) FDEP Preliminary Tidal Bench Mark Descriptions with Elevation Sheet dated May/June 1993 follows:

الدرامج والجرومي الوجيج والجرو

R-10.02

Page 1 of 3

PRELIMINARY DATE: 05/17/93

FLORIDA 872 0832

COUNTY: PUTNAM QUAD INDEX NUMBER: 290813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

WELAKA, ST. JOHNS RIVER

LATITUDE: 29°28.6'N LONGITUDE: 81°40.5'W NOAA CHART: 11495 USGS QUAD: WELAKA

To reach the tidal bench marks from the intersection of State Road 308B (Oak Street) and State Road 309 in Welaka, proceed west on State Road 308B for 0.15 mile (0.24 km) to Front Street, then south on Front Street for 0.3 mile (0.5 km) to the dirt road leading west to the Greene residence, the house just to the north of Trail Boss Campgrounds. The bench marks are along Front and Elm Streets. The tide gage and staff were on the west end of the northernmost finger dock behind the Greene residence.

BENCH MARK STAMPING: N 19 1933 22.903 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at the intersection of Front and Elm Streets, across from Welaka Civic Hall, 30 feet (9 m) north of the centerline of Elm Street, 29 feet (9 m) east of the centerline of Front Street, 2 feet (1 m) east of a flagpole at the SW corner of a concrete block building, and 0.1 foot (0.03 m) above ground level.

BENCH MARK STAMPING: NO 1 1934 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument at the intersection of Front and Palmetto Streets, 41.2 feet (12.6 m) east of the centerline of Front Street, 18.6 feet (5.7 m) north of the centerline of Palmetto Street, 0.5 foot (0.2 m) NW of power pole #3-3724-1203-0-6, and 0.3 foot (0.1 m) above ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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Page 2 of 3

FLORIDA 872 0832

WELAKA, ST. JOHNS RIVER

BENCH MARK STAMPING: WELAKA 1935 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a square concrete monument in an open area near the river, 265 feet (81 m) south of the post office, 150 feet (46 m) east of the river, 132 feet (40 m) west of the centerline of a paved street, 49 feet (15 m) SSE of the SW corner of an old garage, 14 feet (4 m) north of a yard fence, 1 foot (0.3 m) east of a metal witness post, and 0.2 foot (0.1 m) above ground level.

BENCH MARK STAMPING: WELAKA 1935 NO 4 1968 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument in the SE corner of an open area, 150 feet (46 m) east of the river, 30 feet (9 m) west of the centerline of a paved street, 2.2 feet (0.7 m) north of the fence corner with a 3 x 3-inch square concrete property corner stake, and at ground level.

BENCH MARK STAMPING: 0832 A 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The primary bench mark is set flush in the top of a 4-foot (1 m) deep bell- shaped concrete monument, 76.3 feet (23.3 m) NW of the office at Trail Boss Campgrounds, 54.8 feet (16.7 m) west of the SW corner of the Greene residence, 47.9 feet (14.6 m) SE of the beginning of the ladder which leads down to the dock, 0.5 foot (0.2 m) west of the property marker at the SW corner of Greene's property, and at ground level.

BENCH MARK STAMPING: 0832 B 1978 This Bench Mark Was Recovered AS Described On 05/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 4-foot (1 m) deep bell-shaped concrete monument, 0.15 mile (0.24 km) south of the intersection of Front and Oak Streets, 72.6 feet (22.1 m) SW of a culvert on the east side of Front Street, 26.4 feet (8.0 m) west of the centerline of Front Street, 18.2 feet (5.5 m) south of the centerline of the dirt road leading west into Wolfe's Fishing Camp, 1 foot (0.3 m) SW of power pole #3-3723-1676-0-1 with witness sign, and at ground level.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 05/17/93

Page 3 of 3

FLORIDA 872 0832

WELAKA, ST. JOHNS RIVER

Tidal datums at Welaka, St. Johns River are based on the following:

LENGTH OF SERIES	≈ 5 months
TIME PERIOD	= SEPTEMBER 1978-MARCH 1979
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	-	1.53	FEET	
MEAN HIGHER HIGH WATER (MHHW)	=	0.42	FEET	
MEAN HIGH WATER (MHW)	=	0.39	FEET	
MEAN TIDE LEVEL (MTL)	**	0.22	FEET	
*NATIONAL GEODETIC VERTICAL DATUM-				
1929 (NGVD)	¥	-0.69	FEET	
MEAN LOW WATER (MLW)	Ħ	0.04	FEET	
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET	
LOWEST OBSERVED WATER LEVEL (04/10/79)	=	-0.97	FEET	

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHM</u>
N 19 1933 22.903	22.22	21.83
NO 1 1934	22.52	22.13
WELAKA 1935	22.15	21.76
WELAKA 1935 NO 4 1968	23.14	22.75
0832 A 1978 ·	17.16	16.77
0832 B 1978	17.27	16.88

The estimated highest water level to the nearest half-foot is 3.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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Page 1 of 3

PUBLICATION DATE: 04/04/91

FLORIDA 872 0832

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

WELAKA, ST. JOHNS RIVER

LATITUDE: 29°28.6'N LONGITUDE: 81°40.5'W NOAA CHART: 11495 USGS QUAD: WELAKA

To reach the tidal bench marks from the intersection of State Road 308B (Oak Street) and State Road 309 in Welaka, proceed west on State Road 308B for 0.15 mile (0.24 km) to Front Street, then south on Front Street for 0.3 mile (0.5 km) to the dirt road leading west to the Greene residence, the house just to the north of Trail Boss Campgrounds. The bench marks are along Front and Elm Streets. The tide gage and staff were on the west end of the northernmost finger dock behind the Greene residence.

BENCH MARK STAMPING: N 19 1933 22.903

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at the intersection of Front and Elm Streets, across from Welaka Civic Hall, 30 feet (9 m) north of the centerline of Elm Street, 29 feet (9 m) east of the centerline of Front Street, 2 feet (1 m) east of a flagpole at the SW corner of a concrete block building, and 0.1 foot (0.03 m) above ground level.

BENCH MARK STAMPING: NO 1 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument at the intersection of Front and Palmetto Streets, 41.2 feet (12.6 m) east of the centerline of Front Street, 18.6 feet (5.7 m) north of the centerline of Palmetto Street, 0.5 foot (0.2 m) NW of power pole #3-3724-1203-0-6, and 0.3 foot (0.1 m) above ground level.

Page 2 of 3

PUBLICATION DATE: 04/04/91

FLORIDA 872 0832

WELAKA, ST. JOHNS RIVER

BENCH MARK STAMPING: WELAKA 1935

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Triangulation Station SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a square concrete monument in an open area near the river, 265 feet (81 m) south of the post office, 150 feet (46 m) east of the river, 132 feet (40 m) west of the centerline of a paved street, 49 feet (15 m) SSE of the SW corner of an old garage, 14 feet (4 m) north of a yard fence, 1 foot (0.3 m) east of a metal witness post, and 0.2 foot (0.1 m) above ground level.

BENCH MARK STAMPING: WELAKA 1935 NO 4 1968

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Reference Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in a concrete monument in the SE corner of an open area, 150 feet (46 m) east of the river, 30 feet (9 m) west of the centerline of a paved street, 2.2 feet (0.7 m) north of the fence corner with a 3 x 3-inch square concrete property corner stake, and at ground level.

BENCH MARK STAMPING: 0832 A 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The primary bench mark is set flush in the top of a 4-foot (1 m) deep bell- shaped concrete monument, 76.3 feet (23.3 m) NW of the office at Trail Boss Campgrounds, 54.8 feet (16.7 m) west of the SW corner of the Greene residence, 47.9 feet (14.6 m) SE of the beginning of the ladder which leads down to the dock, 0.5 foot (0.2 m) west of the property marker at the SW corner of Greene's property, and at ground level.

BENCH MARK STAMPING: 0832 B 1978

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 4-foot (1 m) deep bell-shaped concrete monument, 0.15 mile (0.24 km) south of the intersection of Front and Oak Streets, 72.6 feet (22.1 m) SW of a culvert on the east side of Front Street, 26.4 feet (8.0 m) west of the centerline of Front Street, 18.2 feet (5.5 m) south of the centerline of the dirt road leading west into Wolfe's Fishing Camp, 1 foot (0.3 m) SW of power pole #3-3723-1676-0-1 with witness sign, and at ground level.

Page 3 of 3

FLORIDA 872 0832

WELAKA, ST. JOHNS RIVER

Tidal datums at Welaka, St. Johns River are based on the following:

LENGTH OF SERIES	=	5 MONTHS
TIME PERIOD	=	SEPTEMBER 1978-MARCH 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	GREEN COVE SPRINGS (872 0496)

Elevations of tidal datums referred to mean lower low water (MLLW) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/04/78)	=	1.53	FEET
MEAN HIGHER HIGH WATER (MHHW)	=	0.42	FEET
MEAN HIGH WATER (MHW)	=	0.39	FEET
MEAN TIDE LEVEL (MTL)	Ŧ	0.22	FEET
MEAN LOW WATER (MLW)	=	0.04	FEET
MEAN LOWER LOW WATER (MLLW)	=	0.00	FEET
LOWEST OBSERVED WATER LEVEL (04/10/79)	=	-0.97	FEET

Bench mark elevation information:

ELEVATION IN FEET ABOVE:

BENCH MARK STAMPING	MLLW	<u>MHW</u>
N 19 1933 22.903	22.22	21.83
NO 1 1934	22.52	22.13
WELAKA 1935	22.15	21.76
WELAKA 1935 NO 4 1968	23.14	22.75
0832 A 1978	17.16	16.77
0832 B 1978 .	17.27	16.88

The estimated highest water level to the nearest half-foot is 3.0 feet above mean lower low water. The estimated lowest water level to the nearest half-foot is 3.0 feet <u>below</u> mean lower low water. Estimates are based on observed extreme water levels at Mayport (872 0220).

LOWER ST. JOHNS RIVER VICINITY REACH TEN ABSTRACT MILE 90.1 TO MILE 100.0

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Distance from Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from to M/Y { M/Y
872 0841 Shell Bluff, Cresent Lake	98.5	11.7 miles/ Right	N/A	0.6 0.4	7/35 8/35 1/37 2/37

Station No.	Elevation (Feet, NGVD 1929)	Mean Range	Tidal
	Mean Water Level		Marks Fd/Req'd.
872 0841	N/A	None*	0/5

* Mean Water Level datum published by NOS

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:
Page 1 of 1

PRELIMINARY DATE: 05/28/93 Not Published By NOS

FLORIDA 872-0841

COUNTY: FLAGLER QUAD INDEX NUMBER: 290812

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

SHELL BLUFF, CRESCENT LAKE

LATITUDE: 29°29.5'N LONGITUDE: 081°29.3'W NOAA CHART: USGS QUAD: LAKE WOODRUFF

BENCHMARK STAMPING: DA 20 This Bench Mark Was Found Destroyed On 01/01/82

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Standard Disk SETTING CLASSIFICATION: Concrete Post

BENCH MARK DA 20 is a standard disk, stamped "DA20", 2.1 miles east along State Road No. 28 from concrete bridge over Salt Branch. Bridge is 8 miles southeast on State Road No. 28 from intersection of this highway with U. S. Highway N. 17 at San Mateo. Turn north on sand road to intersection with another sand road. Bench mark is 28.5 feet east of center line of north-south road, 34.5 feet north of center line of eastwest road, and 20.0 feet west of 10 inch blazed pine tree. Elevation 18.40 feet above low-water datum; 17.90 feet above mean water level.

Mean water level at Shell Bluff is based on hourly heights of water for a period of 17 days, July 20 - August 5, 1935, and 12 days, January 22 - February 2, 1937.

Low water datum is taken as a plane one-half foot below mean water level.

Task 2: ADDITIONAL DATA AND INFORMATION:

a. Source ____ NOAA/NOS

b. Type _____ Horizontal/ Mean High Water Files
c. Cost _____ None None
d. Availability _____ Silver Springs Tallahassee Maryland

e. Format ____ ASCII Hard copy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

FDEP/BSM

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

Description/Bank_	River Mile Location	Description/Bank	River Mile <u>Location</u>
Stokes Island Cross Florida Barge Canal	91.1 L 92.0 L	Welatka Springs Dredged Channel	97.3 R 97.5 R
Trout Creek Unnamed Creek Unnamed Creek Acosta Creek	92.3 R 93.8 L 94.9 R 96.7 R	Unnamed Creek Oklawaha River Oklawaha River Bear Creek	99.0 L 99.8 L 99.8 L 99.8 L 99.9 L

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

R-10.11

634



LOWER ST. JOHNS RIVER

EXISTING WATER LEVEL MEASUREMENT NETWORK

REACH TEN MILE 90.1 TO 100.0



ST. JOHNS RIVER (MAIN STEM) Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is highly recommended as the first step to a high quality Water Level Network. In Reach Ten an experienced two person reconnaissance crew would require approximately 5 days at an estimated cost of \$1,000.

In this reach the strength of existing survey control network for horizontal is poor and vertical is poor. Reconnaissance surveys area expected to recover 12-15 existing survey control points, therefore extensive additional geodetic control and a river crossing vertical tie is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately sixteen field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Ten.

LOCATION	EX	ISTI	NG		RECO	MMENI	DED	
Reach/Node/Side	A (872)	(V)	B (H)	C (V)	D (V)	E (H)	F (Tid	G al)
10 / A / B	0	n	n	0	4.4	1	0	0
10 / B / B	0	n	p	0	4.1	1	0	0
10 / C / B	0	a	р	0	3.0	1	0	0
10 / D / B	0	a	n	0	1.5	1	0	0
10 / E / B	0832	а	p	<u>1</u>	<u>1.3</u>	<u>1</u>	<u>1</u>	<u>0</u>
			Total	1	14.3	5	1	0

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

- A. Tide Station Number
- B. Control Point Analysis (n) none, (p) poor, (m) marginal, (a) adequate
- C. River crossing, monumentation, documentation
- D. NAVD 1988 ties, monumentation, documentation (miles)
- E. GPS point and azimuth mark to be set, observed, adjusted
- F. GPS point and azimuth mark to be set at tide station
- G. Additional bench mark(s) to be set, leveled, documented

R-10.13

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637 COST ESTIMATE

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

	REACH TEN										
1	Cost/unit	(Nut A	nber B	of C	tasks D	to be E	perf F	ormed G	.)	Total	
	\$2,000/pair	0								\$	0
	\$ 500/mark		0								0
	\$2,000/crossin	ng		1						2,0	00
	\$1,000/mile				14.3					14,3	00
	\$2,000/pair					5				10,0	00
	\$2,000/pair						1			2,0	00
	\$ 500/mark							0			0
								Т	otal	\$28,3	00

Α.

Vicinity Tide Station; GPS point/azimuth mark Vicinity Tide Station; set additional tidal bench mark Β.

River crossing - vertical control NAVD 1988 tie - vertical control C.

D.

Ε.

F.

GPS point/azimuth mark - horizontal control Main Stem Tide Station; GPS point/azimuth mark Main Stem Tide Station; set additional tidal bench mark G.



LOWER ST. JOHNS RIVER

EXISTING HORIZONTAL CONTROL SURVEY NETWORK INVENTORY

ADDITIONAL HORIZONTAL CONTROL POINT(S) IN NODE RECOMMENDED.

REACH TEN MILE 90.1 TO 100.0

- CONTROL POINT-TRIANGULATION (NOS)
- CONTROL POINT-GPS (GEONEX / JEA)
- CONTROL POINT-GPS (NOS)
- CONTROL POINT-GPS (GEONEX / SJRWMD)
- 10 RIVER MILE

ST. JOHNS RIVER (MAIN STEM)



REACH ELEVEN

RIVER MILE 100.1 TO RIVER MILE 110.0





543 USGS Quad Sheets: LOWER ST. JOHNS RIVER Putnam County Welatka, MAIN STEM REACH ELEVEN ABSTRACT Welatka, S.E. MILE 100.1 TO MILE 110.0

Task 1: READILY AVAILABLE TIDAL DATA:

HISTORIC NOTE

In January 1891 Captain W. M. Black, U.S. Army Corps of Engineers wrote in an examination report about navigation problems at Volusia Bar by river steamers of the day "The largest of these, the City of Jacksonville is 160.5 feet long, 32.5 feet beam and 7.7 feet depth and has a gross tonnage of 460 tons. She is ordinarily loaded to draft of 5 feet. In her trips between Jacksonville and Sanford she frequently delayed at Volusia Bar (at south end of Lake George) -- " He also discussed channel deepening and placement of jetties also the need to purchase a dredge boat to keep the river cleared of snags, its bars removed and its worst bends straightened. He opined dredging from time to time will always be required here. As early as 1879 and again in 1884 recommendations similar to those of Captain Black were proposed by his predecessors.

EXISTING NOAA/NOS TIDE STATION(S)

Station No. Name	River Mile Location	Control Station No. Name	Length of Series (Months)	Dat from M/Y	te to M/Y
872 0877 Georgetown	107.7 Right Bank	872 0220 Mayport	4	11/74	3/76

Station No. Elevation (Feet, NGVD 1929)		Mean	Tidal Bench
	Mean Water Level	Range (Feet)	Marks Fd/Regʻd.
872 0877	0.69	None	5/0

* Mean Water Level datum published by NOS

** STRENGTH OF EXISTING SURVEY CONTROL NETWORK

644



MISCELLANEOUS

River Mile 103.4 is the approximate location of the ferry near Fruitland, Florida.

A copy of each Main Stem (1)<u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> and (2) <u>FDEP Preliminary</u> <u>Tidal Bench Mark Descriptions with Elevation Sheet</u> dated May/June 1993 follows:

Page 1 of 4

PRELIMINARY DATE: 05/28/93

FLORIDA 872 0877

COUNTY: PUTNAM QUAD INDEX NUMBER: 290813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

GEORGETOWN, ST. JOHNS RIVER

LATITUDE: 29°23.1'N LONGITUDE: 081°38.2'W NOAA CHART: 11495 USGS QUAD: WELAKA

To reach the tidal bench marks from the post office in Georgetown, proceed ESE on S 309 to the entrance to the Pine Cove Fishing Resort. The bench marks are located on the property of the Pine Cove Fishing Resort and near the post office. The tide gage and staff were located on a pier on the Pine Cove Fishing Resort property.

To reach the tidal bench marks from the junction of County Road C-309 and the Georgetown Cutoff Road in Georgetown, proceed ESE on C-309 to the entrance to the Pine Cove Fishing Resort. The bench marks are located on the property of the resort and near the old post office. The tide gage and staff were located on a pier on the resort property.

BENCHMARK STAMPING: 6 1973 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Face of Post Office Building

The bench mark is set vertically 1.5 feet (0.5 m) above the ground in the front east face of the old post office building near the SE corner, 110 feet (33.5 m) NW of the black top road intersection with S 309, and 0.3 foot (0.1m) north of the SE corner.

The bench mark is set vertically in the east wall of the old post office (now a quift shop), 1.5-feet (0.5 m) above the ground in the front east face of the old post office building near the SE corner, 110 feet (33.5 m) NW of the intersection of Georgetown Cutoff Road and County road C-309 the black top road intersection with S 309, 0.3 foot (0.1m) north of the SE corner, and 1.5 feet above the level of the ground.

ASSEMBLED. BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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FLORIDA 872-0877

GEORGETOWN, ST. JOHNS RIVER

BENCHMARK STAMPING: 7 1973 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.2 foot (0.1 m) above the ground on the SE corner of the Pine Cove Fishing Resort property, 90 feet (17.4 m) east of the pier, 60 feet (18.3 m) SE of the SE corner of an office building, and 10 feet (3.0 m) west of a 2 foot (0.6 m) diameter hickory tree at the edge of a shallow ditch near the east property line.

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.2 foot (0.1 m) above the ground on the SE corner of the Pine Cove Fishing Resort property, 90 feet (17.4 m) east of the pier, 60 feet (18.3 m) SE of the SE corner of an office building, 10 feet (3.0 m) west NW of a 2 foot (0.6 m) diameter hickory cypress tree at the edge of a shallow ditch near the east property line, 1.0 foot (0.3 m) N of a carsonite witness post, and 0.1 feet (0.03 m) below the ground level.

BENCHMARK STAMPING: 8 1973 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.3 foot (0.1 m) above the ground on the Pine Cove Fishing Resort property, 400 feet (121.9 m) north of the river bank, 70 feet (21.3 m) north of the porch on the north side of a small house, 55 feet (16.8 m) SW and across the dirt road from the SW corner of a metal shed, 17 feet (5.2 m) SW of the main dirt road, and 5 feet (1.5 m) NE of a 4 foot (1.2 m) diameter forked oak tree.

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.3 foot (0.1 m) above the ground on the Pine Cove Fishing Resort property, 400 feet (121.9 m) north of the river bank, 70 feet (21.3 m) north of the porch on the north side of a small house, 121 feet N of the N corner of a vacant building that once was a restrant, 55 feet (16.8 m) SW and across the dirt road from the SW corner of the foundation of a metal shed, 17 feet (5.2 m) 5.5 feet (1.7 m) SW of the main dirt road, 5 feet (1.5 m) NE of a 4 foot (1.2 m) diameter forked oak tree, and 1 foot (0.3 m) ESE of a carsonite witness post.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 05/28/93

Page 3 of 4

FLORIDA 872-0877

GEORGETOWN, ST. JOHNS RIVER

BENCHMARK STAMPING: 9 1973 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.3 foot (0.1 m) above the ground on the south side of S 309 between the entrance to the Pine Cove Fishing Resort and the entrance road to the Drayton Island Ferry, 0.15 mile (0.2 km) SE of the post office, 30 feet (9.1 m) south of the centerline of S 309, and 4 feet (1.2 m) east of a powerline pole.

BENCHMARK STAMPING: NO 3 1934 This Bench Mark Description Changed On 05/28/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set on the top of a concrete post 0.3 foot (0.1 m) above the ground in front of a dwelling house and 40 feet (12.2 m) NW of the centerline of the dead end road leading south from the old post office to the river. Note: The dwelling has burned down.

The bench mark is set on the top of a concrete post 0.3 foot (0.1 m) above the ground in front of a dwelling house and 40 feet (12.2 m) NW of the centerline of the dead end road leading south from the old post office to the river. Note: The dwelling has burned down. 30.0 feet (9.1 m) NW of the centerline of Georgetown Cutoff Road, 27.0 feet (8.2 m) NE of a power pole with a transformer, 7.0 feet (2.1 m) S of of a 1.6 foot (0.5 m) diameter pine tree, 1.0 foot (0.3 m) SE of a witness post, about 475 feet (144.8 m) NE of the St Johns River and 0.3 foot 0.1 m) above the ground.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

Page 4 of 4

FLORIDA 872-0877

GEORGETOWN, ST. JOHNS RIVER

Tidal datums at GEORGETOWN, ST. JOHNS RIVER are based on the following:

LENGTH OF SERIES	= 4 MONTHS
TIME PERIOD	= NOVEMBER 1974 - MARCH 1976
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Water Level (MWL) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/07/74)	=	2.40 FEET
MEAN WATER LEVEL (MWL)	=	0.00 FEET
* NATIONAL GEODETIC VERTICAL DATUM-		
1929 (NGVD)	×	-0.69 FEET
LOWEST OBSERVED WATER LEVEL (03/22/76)	=	-0.93 FEET

Bench mark elevation information:

BENCHMARK STAMPING		ELEVATION	IN	FEET	ABOVE :
6 1973		23.14			
7 1973		3.11			
8 1973		13.41			
9 1973		22.91			
NO 3 1934	•	13.25			

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES



Page 1 of 3

PUBLICATION DATE: 09/09/82

FLORIDA 872-0877

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

GEORGETOWN, ST. JOHNS RIVER

LATITUDE: 29°23.1'N LONGITUDE: 081°38.2'W NOAA CHART: 11495 USGS QUAD: WELAKA

To reach the tidal bench marks from the post office in Georgetown, proceed ESE on S 309 to the entrance to the Pine Cove Fishing Resort. The bench marks are located on the property of the Pine Cove Fishing Resort and near the post office. The tide gage and staff were located on a pier on the Pine Cove Fishing Resort property.

BENCHMARK STAMPING: 6 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Face of Post Office Building

The bench mark is set vertically 1.5 feet (0.5 m) above the ground in the front east face of the old post office building near the SE corner, 110 feet (33.5 m) NW of the black top road intersection with S 309, and 0.3 foot (0.1m) north of the SE corner.

BENCHMARK STAMPING: 7 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.2 foot (0.1 m) above the ground on the SE corner of the Pine Cove Fishing Resort property, 90 feet (17.4 m) east of the pier, 60 feet (18.3 m) SE of the SE corner of an office building, and 10 feet (3.0 m) west of a 2 foot (0.6 m) diameter hickory tree at the edge of a shallow ditch near the east property line.

BENCHMARK STAMPING: 8 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.3 foot (0.1 m) above the ground on the Pine Cove Fishing Resort property, 400 feet (121.9 m) north of the river bank, 70 feet (21.3 m) north of the porch on the north side of a small house, 55 feet (16.8 m) SW and across the dirt road from the SW corner of a metal shed, 17 feet (5.2 m) SW of the main dirt road, and 5 feet (1.5 m) NE of a 4 foot (1.2 m) diameter 3 forked oak tree.

Page 2 of 3

PUBLICATION DATE: 09/09/82

FLORIDA 872-0877

GEORGETOWN, ST. JOHNS RIVER

BENCHMARK STAMPING: 9 1973

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set flush in the top of a 1 foot (0.3 m) square concrete monument 0.3 foot (0.1 m) above the ground on the south side of S 309 between the entrance to the Pine Cove Fishing Resort and the entrance road to the Drayton Island Ferry, 0.15 mile (0.2 km) SE of the post office, 30 feet (9.1 m) south of the centerline of S 309, and 4 feet (1.2 m) east of a powerline pole.

BENCHMARK STAMPING: NO 3 1934

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USC&GS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Post

The bench mark is set on the top of a concrete post 0.3 foot (0.1 m) above the ground in front of a dwelling house and 40 feet (12.2 m) NW of the centerline of the dead end road leading south from the old post office to the river. Note: The dwelling has burned down.

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PUBLICATION DATE: 09/09/82

FLORIDA 872-0877 GEORGETOWN, ST. JOHNS RIVER

Tidal datums at GEORGETOWN, ST. JOHNS RIVER are based on the following:

LENGTH OF SERIES	= 4 MONTHS
TIME PERIOD	= NOVEMBER 1974 - MARCH 1976
TIDAL EPOCH	= 1960-1978
CONTROL TIDE STATION	= MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Water Level (MWL) are as follows:

HIGHEST OBSERVED WATER LEVEL (10/07/74)=2.40 FEETMEAN WATER LEVEL (MWL)=0.00 FEET*NATIONAL GEODETIC VERTICAL DATUM-=FEET1929 (NGVD)=FEETLOWEST OBSERVED WATER LEVEL (03/22/76)=-0.93 FEET

Bench mark elevation information:

	ELEVATION IN FEET ABOVE:
BENCHMARK STAMPING	MWL
6 1973	23.14
7 1973	3.11
8 1973	13.41
9 1973 ·	22.91
NO 3 1934	13.25

653 VICINITY REACH ELEVEN ABSTRACT Mile 100.1 to Mile 110.0

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EXISTING NOAA/NOS TIDE STATION

Station No. Name	River Mile Location	Distance From Main Stem/Side	Control Station No. Name	Length of Series (Months)	Date from to M/Y M/Y
872 0855 Cresent City Cresent Lake	104.5 Right Bank	8.8 miles/ Right	872 0220 Mayport	1	11/74 3/76

Station No. Elevation (Feet, NGVD 1929)		Mean	Tidal Bench
	Mean Water Level	Range (Feet)	Marks Fd/Req'd.
872 0855	0.12	None*	3/2

* Mean water level datum published by NOS

A copy of each Vicinity (1) <u>NOS Published Tidal Bench Mark</u> <u>Descriptions with Elevation Sheet</u> (2) <u>FDEP Preliminary Tidal</u> <u>Bench Mark Descriptions with Elevation Sheet</u> dated May or June 1993 follows:

Page 1 of 3

PRELIMINARY DATE: 06/08/93

FLORIDA 872 0855

COUNTY: PUTNAM QUAD INDEX NUMBER: 290813

FLORIDA DEPARTMENT OF NATURAL RESOURCES DIVISION OF STATE LANDS BUREAU OF SURVEY AND MAPPING

TIDAL BENCH MARKS

CRESCENT CITY, CRESCENT LAKE

LATITUDE: 29°25.8'N LONGITUDE: 081°30.3'W NOAA CHART: 11492 USGS QUAD: CRESCENT CITY

> BENCHMARK STAMPING: 5A AMC 1979 This Bench Mark Description Changed On 06/08/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at the SE corner of the intersection of Central Avenue and North Park Street, 13.8 feet (4.2 m) NE of the NE corner of a building, 4.8 feet (1.5 m) SE of a utility pole, 3.0 feet (0.9 m) north of the edge of a sidewalk, 3.0 feet (0.9 m) west of the edge of a sidewalk, and level with the ground.

The bench mark is set in the top of a concrete monument at the SE corner of the intersection of Central Avenue and North Park Street, 13.8 feet (4.2 m) NE of the NE corner of a building, 4.8 feet (1.5 m) SE of a utility pole, 3.0 feet (0.9 m) north of the edge of a sidewalk, 3.0 feet (0.9 m) west of the edge of a sidewalk, and level with the ground.

BENCHMARK STAMPING: 6A AMC 1979 This Bench Mark Was Searched For And Not Found On 06/08/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Pavement

The bench mark is set in the concrete pavement at the east end of Central Avenue, 121.2 feet (36.9 m) east of the SE corner of a building, 94.5 feet (28.8 m) west of the inshore edge of the wooden T-shaped pier, 25 feet (8 m) south of the north wharf wall, 7.5 feet (2.3 m) north of a light pole, and level with the ground.

A pier and boat ramp have been constructed at the end of Central Avenue. The mark is believed destroyed.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

PRELIMINARY DATE: 06/08/93

Page 2 of 3

FLORIDA 872-0855

CRESCENT CITY, CRESCENT LAKE

BENCHMARK STAMPING: NO 3 1937 This Bench Mark Was Recovered AS Described On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Standard Disk SETTING CLASSIFICATION: Concrete Post

The bench mark is located 35 yards (32.0 m) SW of the intersection of Lake Street and Cypress Avenue, under the Cresent City water tank, in line with and halfway between the two southern most legs of the water tank.

This mark was published in the 1964 tide station report for 872 0855, and was not included in the report Issued on 07/22/89. Our files indicate the this mark was not tied to the NGVD network. The mark is in good condition.

BENCHMARK STAMPING: NO 1 1934 This Bench Mark Was Recovered AS Described On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: USED Standard Disk SETTING CLASSIFICATION: Granite Block

The bench mark is set the SE Granite support column at the SW corner of the building, formerly the Peoples Bank of Cresent City, at the corner of Central Avenue and Prospect Street.

This mark was published in the 1964 tide station report for 872 0855, and was not included in the report Issued on 07/22/89. Our files indicate the this mark was not tied to the NGVD network. The mark is in good condition.

BENCHMARK STAMPING: NO 4'1952 This Bench Mark Description Changed On 06/17/93

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: Standard Disk SETTING CLASSIFICATION: Concrete Base

The bench mark is located at the Cresent city water works, in the concrete base of an old water wheel, on the south side of the main brick building, 100 feet (30.5 m) east of the water tank.

The bench mark is located at the Cresent city water works, in the concrete base of an old water wheel <u>the water wheel has been removed</u>, on the south side of the main brick building, 100 feet (30.5 m) east of the water tank. <u>This mark was published in</u> the 1964 tide station report for 872 0855, and was not included in the report Issued on 07/22/89. Our files indicate the this mark was not tied to the NGVD network. The mark is in good condition.

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

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PRELIMINARY DATE: 06/08/93

FLORIDA 872-0855

CRESCENT CITY, CRESCENT LAKE

Tidal datums at CRESCENT CITY, CRESCENT LAKE are based on the following:

LENGTH OF SERIES = 2	27 DAYS
TIME PERIOD = N	NOVEMBER 3 - 29, 1979
TIDAL EPOCH =]	1960–1978
CONTROL TIDE STATION = N	AYPORT (872 0220)

Elevations of tidal datums referred to Mean Water Level (MWL) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/07/79)	=	0.82	FEET
MEAN WATER LEVEL (MWL)	=	0.00	FEET
*NATIONAL GEODETIC VERTICAL DATUM-			
1929 (NGVD)	=	-0.12	FEET
LOWEST OBSERVED WATER LEVEL (11/28/79)) =	-0.55	FEET

Bench mark elevation information:

	ELEVATION IN FEET ABOVE:						
BENCHMARK STAMPING	MWL						
5A AMC 1979	30.70						
6A AMC 1979	3.24						

ASSEMBLED BY: BUREAU OF SURVEY AND MAPPING, FLA DEPT OF NATURAL RESOURCES

R-11.13

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PUBLICATION DATE: 07/22/89

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FLORIDA 872-0855

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

TIDAL BENCH MARKS

CRESCENT CITY, CRESCENT LAKE

LATITUDE: 29°25.8'N LONGITUDE: 081°30.3'W NOAA CHART: 11492 USGS QUAD: CRESCENT CITY

NOTICE:

These data do not meet all of the criteria and standards for official tidal bench mark publication as the reliability of the elevations at this station may be reduced due to not having the minimum number of bench marks required for stability verification. However, tidal datum and bench mark elevations are issued for surveying and other public use, as appropriate, with precaution.

To reach the tidal bench marks from the intersection of Prospect Street and Central Avenue in Crescent City, proceed east on central avenue for 1000 feet (305 m) to a ramp and a T-shaped pier with mooring slips. The bench marks are along Central Avenue and in the vicinity of the water tower at Crescent City Boat Works. The tide gage and staff were at the south end of the T-shaped pier.

BENCHMARK STAMPING: 5A AMC 1979

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Monument

The bench mark is set in the top of a concrete monument at the SE corner of the intersection of Central Avenue and North Park Street, 13.8 feet (4.2 m) NE of the NE corner of a building, 4.8 feet (1.5 m) SE of a utility pole, 3.0 feet (0.9 m) north of the edge of a sidewalk, 3.0 feet (0.9 m) west of the edge of a sidewalk, and level with the ground.

BENCHMARK STAMPING: 6A AMC 1979

MONUMENTATION: Survey Disk AGENCY/DISK TYPE: NOS Tidal Bench Mark SETTING CLASSIFICATION: Concrete Pavement

The bench mark is set in the concrete pavement at the east end of Central Avenue, 121.2 feet (36.9 m) east of the SE corner of a building, 94.5 feet (28.8 m) west of the inshore edge of the wooden T-shaped pier, 25 feet (8 m) south of the north wharf wall, 7.5 feet (2.3 m) north of a light pole, and level with the ground.

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FLORIDA 872-0855

CRESCENT CITY, CRESCENT LAKE

Tidal datums at CRESCENT CITY, CRESCENT LAKE are based on the following:

LENGTH OF SERIES	=	27 DAYS
TIME PERIOD	=	NOVEMBER 3 - 29, 1979
TIDAL EPOCH	=	1960-1978
CONTROL TIDE STATION	=	MAYPORT (872 0220)

Elevations of tidal datums referred to Mean Water Level (MWL) are as follows:

HIGHEST OBSERVED WATER LEVEL (11/07/79) =0.82 FEETMEAN WATER LEVEL (MWL) =0.00 FEET*NATIONAL GEODETIC VERTICAL DATUM-1929 (NGVD) =LOWEST OBSERVED WATER LEVEL (11/28/79) =-0.55 FEET

Bench mark elevation information:

BENCHMARK STAMPING	ELEVATION IN FEET ABOVE: MWL
5A AMC 1979	30.70
6A AMC 1979	3.24

Task 2: ADDITIONAL DATA AND INFORMATION: 660

a.	Source		NOAA/NOS	FDEP/BSM
b.	Туре		Horizontal/	Mean High Water Files
c.	Çost		None	None
d.	Availability	<u> </u>	Silver Springs Maryland	Tallahassee
e.	Format		ASCII	Hard copy

Task 3: RIVER MILE INDEX; TRIBUTARY INVENTORY Task 5: ADDITIONAL TIDAL DATA

The reach map accompanying this section titled EXISTING WATER LEVEL MEASUREMENT NETWORK indicates location of:

- NOS Tide Stations
- FDEP Approved Mean High Water Surveys
- Tributaries

The following list identifies each tributary or noted shoreline feature along the main stem and appropriate river mile location.

	River Mile		River Mile		
Description/Bank_	Location	Description/Bank	<u>Location</u>		
Mud Creek Cove	100.5 R	Unnamed Creek	105.5 R		
Mud Creek	100.6 R	Dredged Canal (x3)	105.7 R		
Buzzard Roost Cove	101.5 R	Smith Cove	105.8 R		
Croaker Hole Cove	102.0 L	Dredged Canal	105.9 R		
Little Lake George (exit)	102.1	Dredged Canal	106.0 R		
Beecher Rum	104.0 R	Mudd Cove	106.4 L		
Fruitland Cove	104.0 L	Unnamed Creek	107.5		
Dredged Canal (x4) Unnamed Creek	104.5 R 105.1 R	Drayton Island	108.0 L		

Specific recommendations and cost estimates to upgrade survey measurements in the reach are itemized on the next two pages.

R-11.16



LOWER ST. JOHNS RIVER EXISTING WATER LEVEL MEASUREMENT NETWORK



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R-11.17

Scheduling and General Recommendations

Reconnaissance of existing horizontal and vertical control points is recommended as the first step to a high quality Water Level Network. In Reach Eleven an experienced two person reconnaissance crew would require approximately 3 days to perform the task at an estimated cost of \$1,400.

In this reach the strength of existing survey control network for both horizontal and vertical is poor. Reconnaissance surveys are expected to recover 15-17 existing survey control points, therefore moderate additional geodetic control is recommended. The overall time requirement for upgrading monumentation (excluding reconnaissance work) is anticipated to require approximately seven field days.

The following tables provide specific recommendations of work to be accomplished in each node within the reach. Please refer to EXISTING CONTROL SURVEY NETWORK INVENTORY Reach Maps at the end of River Reach Eleven.

LOCATION	EX	ISTI	<u>NG</u>	RECOMMENDED					
Reach/Node/Side	A (872)	(V)	B (H)	C (V)	D (V)	E (H)	F (Tid	G al)	Ú
11 / A / B _.	0	a	р	0	0	1	0	0	
11 / B / B	0	a	a	0	0	0	0	0	
11 / C / B	0	m	a	0	0	0	0	0	
11 / D / B	0877	a	р	: 0	0	0	1	0	
11 / E / B	0	n	р	<u>0</u>	<u>1</u>	1	<u>0</u>	<u>0</u>	
			Total	0	1	2	1	0	

Horizontal/Vertical Control Survey Network and Water Level Measurement Stations

A. Tide Station Number

B. Control Point Analysis (n) none, (p) poor, (m) marginal (a) adequate

- C. River crossing, monumentation, documentation
- D. NAVD 1988 ties, monumentation, documentation (miles)
- E. GPS point and azimuth mark to be set, observed, adjusted
- F. GPS point and azimuth mark to be set at tide station
- G. Additional bench mark(s) to be set, leveled, documented

R-11.18



LOWER ST. JOHNS RIVER EXISTING HORIZONTAL CONTROL SURVEY NETWORK INVENTORY



REACH ELEVEN MILE 100.1 TO 110.0

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- ▲ CONTROL POINT-TRIANGULATION (NOS)
- CONTROL POINT-GPS (GEONEX / JEA)
- CONTROL POINT-GPS
- CONTROL POINT-GPS (GEONEX / SJRWMD)
- RIVER MILE

ST. JOHNS RIVER (MAIN STEM) 【11月19日11月19日,19月1日,1月19日,1月19日,1月19日,1月19日,1月19日,1月19日1日,1月19日日,1月19日,1月19日,1月19日,1月19日,1月19日,1月19日,1月19日,1月19日

The estimated cost to achieve the RECOMMENDED WATER LEVEL NETWORK is itemized below:

REACH ELEVEN	ৰ										-	
Cost/unit	(Nun A	nber B	of C	tasks D	to E	be	perfo F	orme G	d)	То	tal	
\$2.000/pair	1									ć	2 000	
\$ 500 (mark	T	2								Ş	2,000	
\$ 500/mark	.~	2	0						·		1,000	
\$2,000/CIOSSI	19		U									
\$1,000/mile				Ţ	-						1,000	
\$2,000/pair					2						4,000	
\$2,000/pair							1				2,000	
\$ 500/mark								С		_	0	
									Total	\$1	0,000	

Α.

Vicinity Tide Station; GPS point/azimuth mark Vicinity Tide Station; set additional tidal bench mark в.

River crossing - vertical control С.

NAVD 1988 tie - vertical control D.

COST ESTIMATE

Ε.

F.

GPS point/azimuth mark - horizontal control Main Stem Tide Station; GPS point/azimuth mark Main Stem Tide Station; set additional tidal bench mark G.

R-11.19



LOWER ST. JOHNS RIVER EXISTING VERTICAL CONTROL SURVEY NETWORK INVENTORY







RIVER MILE

ST. JOHNS RIVER

REACH ELEVEN MILE 100.1 TO 110.0