

**Cover Sheet (NOAA Form 76-35A)**

NOAA FORM 76-35A
U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE
Horizontal & Vertical Control Report
<i>Type of Survey</i> <u>HYDROGRAPHIC</u>
<i>Field No</i> <u>S-J977-KR-FU</u>
<i>Registry No.</i> <u>H11621 & H11622</u>
LOCALITY
<i>State</i> <u>ALABAMA</u>
<i>General Locality</i> <u>MISSISSIPPI SOUND</u>
<i>Sublocality</i> <u>GRAND BAY TO PETIT BOIS PASS AND DAUPHIN ISLAND</u>
<div style="text-align: center;">_____ 2006 _____</div>
CHIEF OF PARTY <u>DEAN MOYLES</u>
LIBRARY & ARCHIVES DATE

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**Title Sheet (NOAA Form 77-28)**

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTER NO.
HYDROGRAPHIC TITLE SHEET		H11621 & H11622
INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office		FIELD NO.
<p>State <u>ALABAMA</u></p> <p>General Locality <u>MISSISSIPPI SOUND</u></p> <p>Locality <u>GRAND BAY TO PETIT BOIS PASS AND DAUPHIN ISLAND</u></p> <p>Scale <u>1:10000</u> Date of Survey <u>09/19/06 – 12/15/06</u></p> <p>Instructions dated <u>July 21, 2006</u> Project No. <u>S-J977-KR-FU</u></p> <p>Vessel <u>R/V LOCATOR (CF-4540-NB) and R/V C.B. #3 (LA-5204-EU)</u></p> <p>Chief of party <u>DEAN MOYLES</u></p> <p>Surveyed by <u>, REYNOLDS, GILL, MOUNT, STOCK, FARLEY, BRIGGS, POECKERT, ET AL</u></p> <p>Soundings taken by echo sounder, hand lead, pole <u>ODOM DF3200 (LOCATOR - HULL MOUNT) and ODOM DF3200 (C.B. #3 - POLE MOUNT)</u></p> <p>Graphic record scaled by <u>FUGRO PELAGOS, INC. PERSONNEL</u></p> <p>Graphic record checked by <u>FUGRO PELAGOS, INC. PERSONNEL</u></p> <p>Protracted by <u>N/A</u> Automated plot by <u>N/A</u></p> <p>Verification by _____</p> <p>Soundings in _____ <u>METERS</u> at <u>MLLW</u></p>		
REMARKS: The purpose of this work is to provide NOAA with modern debris mapping survey in the area of Mississippi Sound from Grand Bay to Petit Bois Pass including the waters surrounding Dauphin Island.		
ALL TIMES ARE RECORDED IN UTC.		
FUGRO PELAGOS INC. 3738 RUFFIN ROAD SAN DIEGO, CA 92123		



A-Vertical Control

All sounding data were initially reduced to mean lower low water (MLLW) using unverified tidal data from one tide station located on Dauphin Island, AL. Tidal Stations were owned and operated by the NOAA's National Ocean Service through the National Water Level Observation Program.

Table 1 - Tide Gauges

Gauge	Model	Gauge Type	Location	Latitude	Longitude	Operational
8735180	AquaTrak	Acoustic	Dauphin Island, AL	30° 15.0'N	88° 04.5' W	N/A
8741533	AquaTrak	Acoustic	Pascagoula NOAA Lab, MS	30° 21.5'N	88° 34.0' W	N/A

Table 2 - Final Tide Zones

Zone	Primary			
	Site	Number	Time	Range Ratio
CGM40	Dauphin Island, AL	8735180	-60	1.09
CGM40A	Dauphin Island, AL	8735180	-72	1.09
CGM41	Dauphin Island, AL	8735180	-54	1.05
CGM42	Dauphin Island, AL	8735180	-42	1.05
CGM42A	Dauphin Island, AL	8735180	-36	1.01
CGM43	Dauphin Island, AL	8735180	-24	1.01
CGM44	Dauphin Island, AL	8735180	-18	1.01
CGM44A	Dauphin Island, AL	8735180	-12	0.97
CGM45	Dauphin Island, AL	8735180	0	0.97
CGM46A	Dauphin Island, AL	8735180	6	1.01
CGM55	Dauphin Island, AL	8735180	12	1.09
CGM56	Dauphin Island, AL	8735180	0	1.09
CGM57	Dauphin Island, AL	8735180	-6	1.09
CGM58	Dauphin Island, AL	8735180	0	1.13
CGM59	Dauphin Island, AL	8735180	36	1.00
CGM59A	Dauphin Island, AL	8735180	-12	1.13
CGM60	Pascagoula NOAA Lab, MS	8741533	30	1.03
CGM61	Pascagoula NOAA Lab, MS	8741533	18	1.03
CGM62	Pascagoula NOAA Lab, MS	8741533	12	1.03
CGM514	Pascagoula NOAA Lab, MS	8741533	0	1.03
CGM574	Pascagoula NOAA Lab, MS	8741533	-6	1.03



Predicted tidal data for a month long period, UTC (Central Daylight Time to UTC was +5 hours), was assembled from the National Water Level Observation Program accessed through the NOAA tides and currents website (<http://tidesandcurrents.noaa.gov/>). A cumulative file for the gauge was updated monthly by appending the new data.

On January 12, 2007, verified tide data was acquired from the National Water Level Observation Program accessed through the NOAA tides and currents website (<http://tidesandcurrents.noaa.gov/>). A tidal zoning file was developed and provided by NOAA. From January 15, 2007 to January 16, 2007, all sounding data were re-merged using CARIS HIPS and SIPS tide routine. The Dauphin Island, AL, 873-5180 and the Pascagoula NOAA Lab, 874-1533, tidal stations verified tides were used in final processing. Verified tidal data were used for the final Navigation Base Surfaces and S-57 Feature files.

On January 26, 2007 while conducting random Quality Control Reports unusual conditions regarding tidal information were noted and reported to Crescent Moegling of the Hydrographic Surveys Division. During field operations it is common practice to conduct cross lines after a survey block is complete or near its completion to ensure the proper percentage ratio to main scheme lines. Once the cross lines are completed for a block, random reports are generated to ensure a 95% confidence interval, but in the case of H11621 the majority of cross lines were not conducted until the end of the project, therefore field operations were concluded when the problem was noticed.

Fugro Pelagos Inc. (FPI) sent graphics illustrating the tidal busts along with additional graphics of the data reduced via Post Processing Kinematics (PPK) to provide evidence the busts were a result erroneous tidal data. On March 3, 2007 FPI received a revised tidal zoning scheme which was used to re-apply the verified tidal data. After review, the new tidal zoning was found to have little or no improvement on the sounding data. On March 15, 2007 CO-OPS concluded that the tidal busts were a result of meteorological events and that nothing could be done to correct the error. It was then decided by NOAA that the original tide and zoning information, found in the Scope of Work dated June 2006, was to be used for all final sounding data. Refer to Table 2 below which outlines the survey days affected by the erroneous tidal data.


Table 3 Survey Days affect by Erroneous Tidal Data

Survey #	Julian Day	Date (dd/mm/yyyy)	Vessel	Comments
H11622	2006-290	17/10/2006	Locator	
H11622	2006-298	25/10/2006	CB-3/Locator	
H11621	2006-311	7/11/2006	Locator	Collected after the storm, may still be in spec
H11621	2006-312	8/11/2006	Locator	Collected after the storm, may still be in spec
H11622	2006-322	18/11/2006	Locator	Tielines
H11621/H11622	2006-323	19/11/2006	CB-3/Locator	Locator Tielines
H11621/H11622	2006-324	20/11/2006	CB-3/Locator	
H11621	2006-325	21/11/2006	Locator	
H11621/H11622	2006-326	22/11/2006	CB-3/Locator	H11622 it was only in-fills done by the Locator
H11621	2006-327	23/11/2006	CB-3/Locator	
H11621	2006-328	24/11/2006	CB-3/Locator	
H11621	2006-329	25/11/2006	CB-3/Locator	
H11621/H11622	2006-330	26/11/2006	Locator	
H11621	2006-331	27/11/2006	Locator	Collected after the storm, may still be in spec
H11621	2006-335	1/12/2006	CB-3	
H11621	2006-336	2/12/2006	Locator	
H11621	2006-337	3/12/2006	CB-3/Locator	Collected after the storm, may still be in spec
H11621	2006-339	5/12/2006	CB-3/Locator	
H11621	2006-340	6/12/2006	CB-3/Locator	
H11621/H11622	2006-341	7/12/2006	CB-3/Locator	
H11621/H11622	2006-343	9/12/2006	CB-3/Locator	
H11621/H11622	2006-344	10/12/2006	CB-3/Locator	

Refer to Appendix A for a more detailed description and Tidal Data.





B-Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83). All raw positions were originally collected in WGS84 and transformed to NAD83 during the real time DGPS corrections from USCG stations.

It was necessary to acquire dual frequency GPS data at a known location on the ground so that a KGPS solution could be used for squat settlement calculations. Fugro Pelagos, Inc. established one local control point: station "FPI1" which was located on Dauphin Island AL. Refer to the Appendix II for Horizontal Control results and procedures.

Vessel position was determined in real time using a Trimble Zephyr L1/L2 GPS antenna, which was connected to a Trimble BD950 L1/L2 GPS card residing in the POS MV. The POS MV was setup to accept USCG differential corrections, which were output from a CSI MBX-3S Coast Guard beacon receiver. A secondary backup system, utilizing output from a CSI DGPS-Max OmniStar receiver, was used only in times of complete loss of USCG beacons. OmniStar produces DGPS correction service through satellite broadcasts and produces a multi-site solution based on a world wide array of reference stations. Note: since the pseudorange corrections received by the POS MV are based on the NAD 83 position of the reference station antenna position, all final positions are NAD 83.

Table 4 - DGPS Stations

Station	ID	Latitude	Longitude	Freq.	Tx. Rate	Rx. No.	Wt.
Mobile Point, USCG	813	30°13.7 N	88°01.4' W	300	100BPS	1	1
OmniStar-Eastern US	MSV-E	n/a	n/a	1530. 3590	1200 baud		

Positioning system confidence checks were conducted on a daily basis using the POS MV controller software. The controller software has numerous real time displays that were monitored throughout the survey to ensure the positional accuracies specified in the NOS Hydrographic Surveys Specifications and Deliverables (version June 2006) were achieved. These include, but are not limited to the following: GPS Status, Position Accuracy, Receiver Status (which included HDOP) and Satellite Status. During periods of high HDOP and/or low number of available satellites survey operations were suspended.



C-Approval Sheet

Approval Sheet

For

H11621 & H 11622

Standard field surveying and processing procedures were followed in producing this survey in accordance with the following documents:

S-J977-KR-FU statement of work and hydrographic manual;
Fugro Pelagos, Inc. Acquisition Procedures (2006- NOAAAcquisitionProcedures);
Fugro Pelagos, Inc. Processing Procedures (2006-NOAAProcessingProcedures);

The data were reviewed daily during acquisition and processing.

This report has been reviewed and approved. All records are forwarded for final review and processing to the Chief, Pacific Hydrographic Branch.

Approved and forwarded,

A handwritten signature in cursive script, reading "Dean Moyles".

Dean Moyles,
Lead Hydrographer
Fugro Pelagos, Inc. Survey Party



Appendix I -Tides and Water Levels

Tide Station: 873-5180

Dauphin Island, AL

Latitude: 30° 15.0' N

Mean Range: 1.17 ft.

Longitude: 88° 4.5' W

Diurnal Range: 1.20 ft.

Established: Mar 30 1966

Present Installation: Aug 8 1995

NOAA Chart #: 11376

Time Meridian: 90

Jan 22 2007 19:42

ELEVATIONS ON STATION DATUM
National Ocean Service (NOAA)

Station: 8735180

T.M.: 0 W

Name: DAUPHIN ISLAND, MOBILE BAY, AL

Units: Feet

Status: Accepted

Epoch: 1983-2001

Datum	Value	Description
-----	-----	-----
MHHW	4.08	Mean Higher-High Water
MHW	4.06	Mean High Water
DTL	3.48	Mean Diurnal Tide Level
MTL	3.47	Mean Tide Level
MSL	3.44	Mean Sea Level
MLW	2.89	Mean Low Water
MLLW	2.88	Mean Lower-Low Water
GT	1.20	Great Diurnal Range
MN	1.17	Mean Range of Tide
DHQ	0.02	Mean Diurnal High Water Inequality
DLQ	0.01	Mean Diurnal Low Water Inequality
HWI		Greenwich High Water Interval (in Hours)
LWI		Greenwich Low Water Interval (in Hours)
NAVD	3.11	North American Vertical Datum
Maximum	7.44	Highest Water Level on Station Datum
Max Date	19850902	Date Of Highest Water Level
Max Time	03:24	Time Of Highest Water Level
Minimum	0.80	Lowest Water Level on Station Datum
Min Date	19770119	Date Of Lowest Water Level
Min Time	00:00	Time Of Lowest Water Level

Location:

To reach the tidal bench marks from the Dauphin Island Post Office, proceed 0.3 km (0.2 mi) south on Lockland Street to its intersection with Bienville Boulevard, then 4.0 km (2.5 mi) east on Bienville Boulevard to Fort Gaines at the east end of the island. The bench marks are near Fort Gaines and the Dauphin Island Sea Lab complex. The tide gage is atop a 7.6 m (25 ft) high tower on the SE side of a large fishing pier north of the fort.

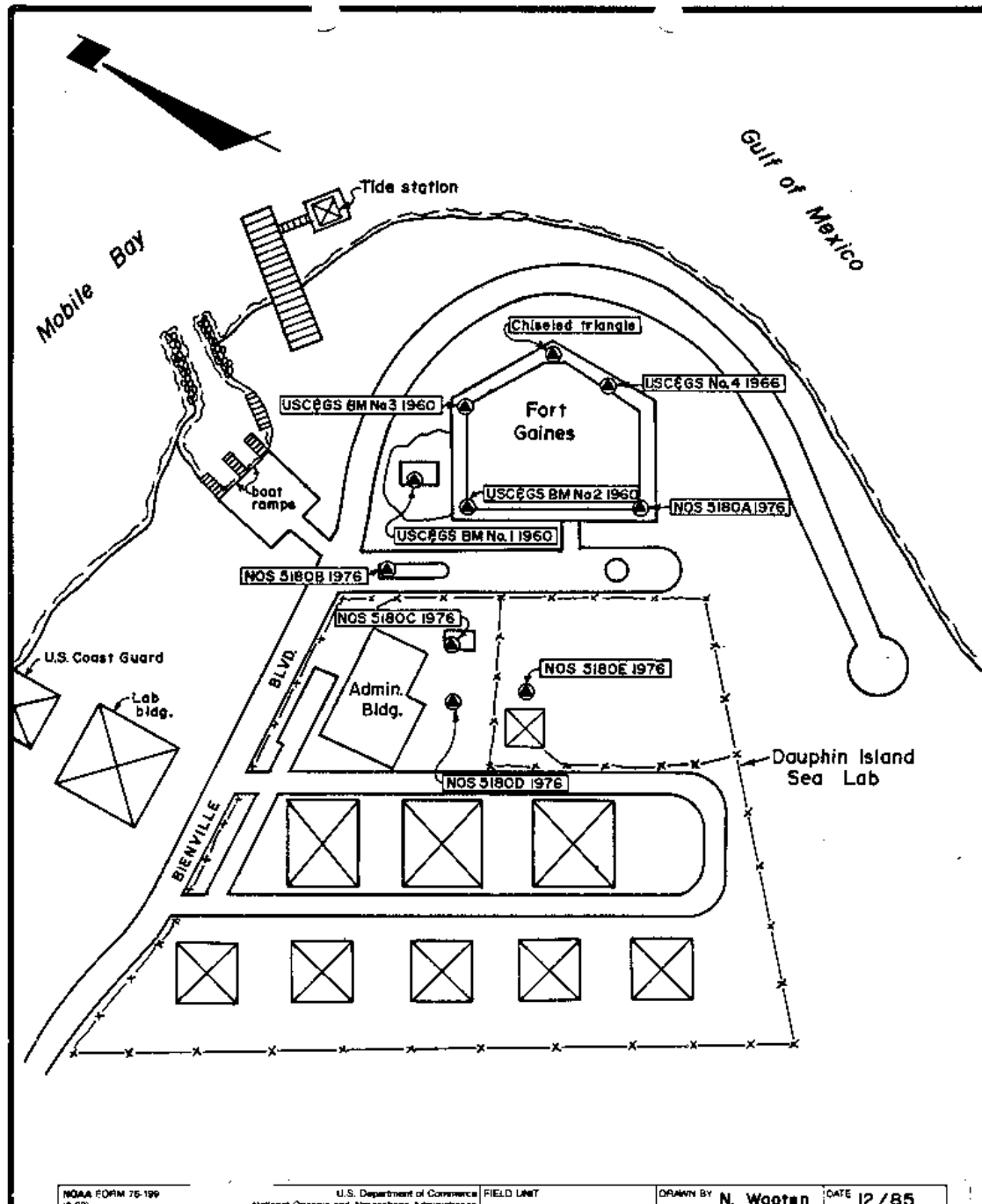


Figure 2 – Tide Station 873-5180 – Dauphin Island, AL

Tide Station 874-1533**Latitude:** 30° 21.5' N

Mean Range: 1.38 ft.

Longitude: 88° 34.0' W

Diurnal Range: 1.58 ft.

Established: Sep 13 2005**Present Installation:** Sep 9 2005**Time Meridian:** 90

Jan 22 2007 19:41

**ELEVATIONS ON STATION DATUM
National Ocean Service (NOAA)****Station:** 8741533**T.M.:** 0 W**Name:** PASCAGOULA NOAA LAB, PASCAGOULA RIVER, MS**Units:** Meters**Status:** Accepted**Epoch:** 1983-2001

Datum	Value	Description
-----	-----	-----
MHHW	7.142	Mean Higher-High Water
MHW	7.110	Mean High Water
DTL	6.902	Mean Diurnal Tide Level
MTL	6.900	Mean Tide Level
MSL	6.898	Mean Sea Level
MLW	6.690	Mean Low Water
MLLW	6.662	Mean Lower-Low Water
GT	0.481	Great Diurnal Range
MN	0.420	Mean Range of Tide
DHQ	0.032	Mean Diurnal High Water Inequality
DLQ	0.028	Mean Diurnal Low Water Inequality
HWI		Greenwich High Water Interval (in Hours)
LWI		Greenwich Low Water Interval (in Hours)
NAVD		North American Vertical Datum
Maximum		Highest Water Level on Station Datum
Max Date		Date Of Highest Water Level
Max Time		Time Of Highest Water Level
Minimum		Lowest Water Level on Station Datum
Min Date		Date Of Lowest Water Level
Min Time		Time Of Lowest Water Level

Note: All information provided by NOAA's Center for Operational Oceanographic Products and Services at <http://tidesandcurrents.noaa.gov>.

Appendix II –Horizontal Control

A control point, FPI1, was established for the purpose of collecting KGPS data in the process of developing squat settlement curves.

Location

The survey was performed in the vicinity of Dauphin Island, AL. A control point, FPI1, was established at 2204 Cadillac Avenue, Dauphin Island, AL for the collection of base station data. The control point consisted of a rebar stake installed by Fugro Pelagos, Inc. employees.



Figure 3 – FPI1 Control Point – Dauphin Island, AL

Equipment

One Thales Navigation Z-Max Surveying System with a L1/L2 frequency antenna was used in PPK logging. The Z-Max system was affixed to the top of a fiberglass tripod with an optical tribrach. Antenna measurements were conducted from the top of the rebar to the Z-Max measuring plate.



Processing

Base station data were collected for 10 hour sessions. Processing was done using the NGS online processing site, OPUS. OPUS provides precise positioning with respect to the three nearest CORS stations and the logged data set. Four OPUS solutions were averaged to determine the final position of FPI1.

Table 5 FPI1 Average OPUS Results

GEODETIC				GRID / VERTICAL DATUM				
Datum	Lat	Long	E Height	Projection	East	North	Vert Datum	Height
NAD83	30 15 13.26715	88 08 47.81332	-26.6615	UTM-16N	389690.366	3347452.443	NAVD88	1.1165

OPUS Solutions for FPI1 Base Station

[OPUS solution FPI12642.06O 000026461.msg](#)

[OPUS solution FPI12674.06O 000026458.msg](#)

[OPUS solution FPI12701.06O 000026455.msg](#)

[OPUS solution FPI12731.06O 000026484.msg](#)

Appendix III –KGPS Processing Summary

The following reports (generated by the Applanix POSPac POSGPS software after post-processing the GPS data) outline the estimated positional accuracies of the post-processed dual-frequency GPS data for each vessel on every Julian day that dual-frequency GPS data was available.

Forward / Reverse Separation RMS values are the average differences between the forward and reverse solutions, and serve as a check on the repeatability of the solution. Note that for this project, the KGPS data output from POSGPS and applied to the survey lines in CARIS are a combined forward and reverse solution.

The position standard deviation percentages are the percent of the number of positions for that day that fall within the specified standard deviation range.

Average baseline refers to the average distance from the base station on Dauphin Island to the survey vessel. This can have an effect on positioning accuracy: the further the vessel is from the base station, the less ionospheric-induced positioning error can be corrected.

Quality Percentages refers to the percent of positions that are given a corresponding quality tag by POSGPS. The following table describes these quality tags.

Table 6 Quality Tags

Quality	Meaning	Estimated Accuracy
1	Fixed Integer	0.00 – 0.15m
2	Converged Float or Noisy Fixed Integer	0.05 – 0.40m
3	Converging Float	0.20 – 1.00 m
4	Converging Float	0.50 – 2.00 m
5	DGPS	1.00 – 5.00 m
6	DGPS	2.00 – 10.00 m

Table 7 Results for the Locator

Julian Day/Time	Fwd/Rev Separation RMS Values(meters)			Position Standard Deviation Percentages (%)					Quality Percentages (%)						Average Baseline (km)
	East	North	Height	<0.10m	0.10-0.30m	0.30-1.00m	1.00-5.00m	>5.00m	Q1	Q2	Q3	Q4	Q5	Q6	
284/1208	0.012	0.019	0.054	96.0	3.9	0.1	0.0	0.0	99.8	0.1	0.1	0.1	0.0	0.0	4.37

Table 8 Results for the C.B. #3

Julian Day/Time	Fwd/Rev Separation RMS Values(meters)			Position Standard Deviation Percentages (%)					Quality Percentages (%)						Average Baseline (km)
	East	North	Height	<0.10m	0.10-0.30m	0.30-1.00m	1.00-5.00m	>5.00m	Q1	Q2	Q3	Q4	Q5	Q6	
308/1213	0.013	0.012	0.033	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	2.995