H11871

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Lidar
Project No. OPR-H328-KRL-08
Registry No. H11871

LOCALITY

State Florida
General Locality Approaches to Miami
Sub-Locality Biscayne Channel

2008

HYDROGRAPHER
MARK SINCLAIR

CHIEF OF PARTY
SCOTT RAMSAY

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTRY No.

HYDROGRAPHIC TITLE SHEET

H11871

State Florida

General Locality Approaches to Miami

Sub-Locality Biscayne Channel*

Scale 1:10,000 **Date of Survey** July 13 to August 26, 2008

Instructions dated March 25, 2008 **Project No.** OPR-H328-KRL-08

Vessel Tenix LADS Aircraft, call sign VH-LCL

Hydrographer M.J. Sinclair **Chief of Party** S.R. Ramsay

Surveyed by J.G. Guilford, W.T. Newsham, K.J. Oberhofer, B.A. Weidman, J.K. Young, D.J. Stubbing, C.N. Waite, V.X. Sicari, R.B. Touchstone.

Soundings by Laser Airborne Depth Sounder

Graphic record scaled by B.A. Weidman

Graphic record checked by S.R. Ramsay, J.G. Guilford **Automated Plot** N/A

Verification by *Atlantic Hydrographic Branch Personnel*

Soundings in ~~Meters~~ *Feet* at MLLW

REMARKS * The sub-locality was amended in accordance with email at Appendix V.

Requisition / Purchase Req. # NCNJ3000-8-37170

Contractor Tenix LADS, Incorporated, 925 Tommy Munro Dr., Suite J, Biloxi, MS 39532

Sub-Contractor John Oswald and Associates, 12001 Audubon Dr., Anchorage, AK 99516

Times All times are recorded in UTC.

Datum and Projection NAD83, UTM (N) Zone 17

Purpose The purpose of this survey is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

Acronyms A complete list of all acronyms used throughout this report is provided at *Appendix I of the Separates Report. ***Data appended to this report.***

Bold, Italic, Red notes in the Descriptive Report were made during office processing.

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DESCRIPTIVE REPORT TO ACCOMPANY

HYDROGRAPHIC SURVEY H11871

SCALE 1:10,000, SURVEYED IN 2008

TENIX LADS AIRCRAFT, VH-LCL

TENIX LADS, INC. (TLI)

MARK SINCLAIR, HYDROGRAPHER

PROJECT

Project Number: OPR-H328-KRL-08 **Original:** DG 133C-06-CQ-0066
Date of Instructions: March 25, 2008 *Concur* **Task Order:** T0004

Date of Supplemental Instructions:

- August 4, 2008 – Email from Dave Scharff (NOAA COTR) approving proposed modification to required survey area.
- January 29, 2009 – Email from Dave Scharff (NOAA COTR) approving sub-locality name change in Statement of Work Attachment #4B.

Registry Number: H11871
Sheet: D

A. AREA SURVEYED

Survey operations covered five registered sheets over the OPR-H328-KRL-08 project area, Approaches to Miami, FL (see Figure 1 and Figure 2).

A total of 2836 lineal nautical miles were illuminated in the process of flying 375 main scheme survey lines. An additional 1512 lineal nautical miles were illuminated flying 193 reflies and 252 lineal nautical miles flying 60 crosslines / investigations. The total seabed area surveyed across the project area, from the Mean High Water (MHW) line to geographical extents of the survey area, was approximately 63 square nautical miles. Refer to *Appendix III for further information.

Between July 13 and August 26, 2008, the LADS Mk II aircraft conducted 21 sorties in the vicinity of the Approaches to Miami, based out of Fort Lauderdale, FL. All survey flights were conducted between the hours of 22:30 and 06:00, due to the close proximity of the survey area to Miami International Airport. The specific dates of data acquisition for OPR-H328-KRL-08, hours flown and time on task were as follows:
Data appended to this report.

Date (UTC)	Sortie No.	Hours Flown	Time on Task
15-Jul-08	2	5:31	4:32
17-Jul-08	3	6:39	5:26
20-Jul-08	4	2:41	1:58
21-Jul-08	5	3:05	1:45
23-Jul-08	6	6:30	5:42
24-Jul-08	7	2:26	1:33
27-Jul-08	8	2:50	1:03
29-Jul-08	9	4:30	3:40
01-Aug-08	10	7:08	6:29
02-Aug-08	11	7:13	6:38
05-Aug-08	12	7:16	6:22
07-Aug-08	13	5:26	4:36
08-Aug-08	14	6:05	5:28
10-Aug-08	16	7:36	6:52
14-Aug-08	18	7:04	6:27
16-Aug-08	19	1:38	0:53
17-Aug-08	20	4:33	3:47
18-Aug-08	21	4:19	3:20
23-Aug-08	23	6:25	5:43
24-Aug-08	24	2:56	2:21
25-Aug-08	25	6:15	5:35

Table 1: Specific Dates of Data Acquisition

Environmental factors such as water clarity, tide, wind strength and direction and cloud base height influenced the area and duration of data acquisition on a daily basis. See Section B.2.3 for further details.

This Descriptive Report describes Sheet D, which covers Biscayne Channel (see Figure 2).

The sheet limits are as follows for Sheet D (coordinates are NAD83): ***Concur***

H11871 (D)	Latitude (N)	Longitude (W)
NW corner	25° 41' 11.37"	80° 13' 31.34"
SW corner	25° 37' 04.33"	80° 13' 32.94"
SE corner	25° 37' 01.65"	80° 05' 46.85"
NE corner	25° 41' 08.69"	80° 05' 44.99"

Figure 1 – General Locality of OPR-H328-KRL-08

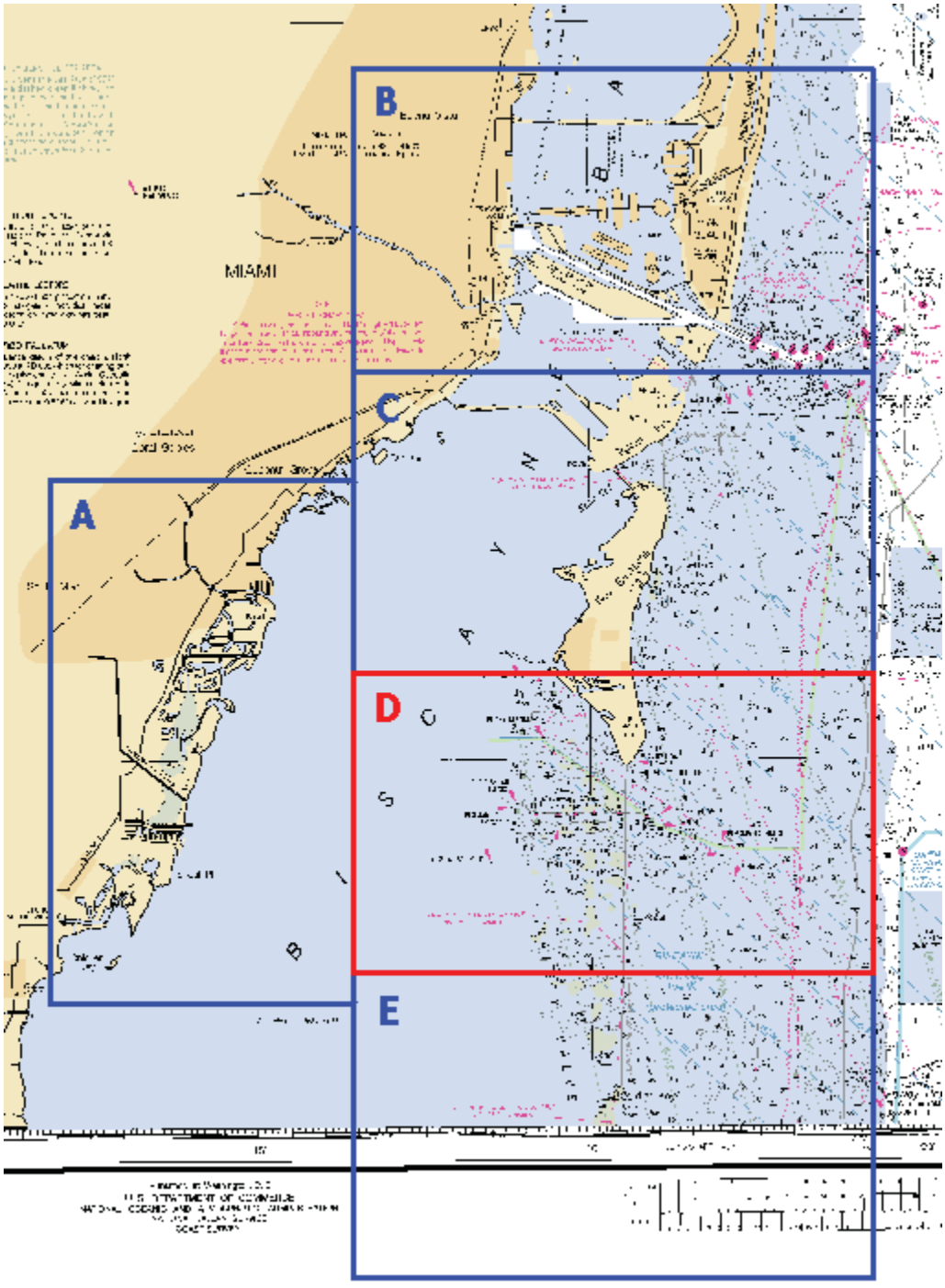


Figure 2 – Sub-Locality of H11871 (Sheet D)

B. DATA ACQUISITION AND PROCESSING *See also Evaluation Report*

Refer to the Data Acquisition and Processing Report for a detailed description of the equipment, processing, and quality control procedures used during LADS surveys. A general description and items specific to this survey are discussed in the following sections.

B.1 EQUIPMENT

Data collection was conducted using the LADS Mk II Airborne System (AS), data processing using the LADS Mk II Ground System (GS), and data visualization, quality control and final products using CARIS HIPS and SIPS 6.1 and CARIS BASE Editor 2.1.

B.1.1 Airborne System

The LADS Mk II AS platform consists of a De Havilland Dash 8-200 Series aircraft, which has a transit speed of 250kts at altitudes of up to 25,000ft, and an endurance of up to eight hours. Survey operations are conducted from heights between 1,200 and 2,200ft, at ground speeds of between 140 and 210kts. The aircraft is fitted with an Nd: YAG laser, which is eye safe in accordance with ANSI Z136.1-2000, American National Standard for Safe Use of Lasers. The laser operates at 900 Hertz from a stabilized platform to provide a number of different spot spacings across the seabed.

Green laser pulses are scanned beneath the aircraft in a rectilinear pattern. The pulses are reflected from the land, sea surface, within the water column and from the seabed. The height of the aircraft is determined by the infrared laser return, which is supplemented by the inertial height from the Attitude and Heading Reference System (AHRS) and a Global Positioning System (GPS) receiver. Real-time positioning is obtained by an Ashtech GG24 GPS receiver providing autonomous GPS, or is combined with WADGPS (Fugro Omnistar), to provide a differentially corrected position, when coverage is available. Ashtech Z12 GPS receivers are also provided as part of the AS and GS to log data on the aircraft and at a locally established GPS base station.

A digital camera installed on the LADS Mk II system platform allows high quality images to be captured in real-time. These images are georeferenced and can be overlaid with the processed survey data. The specifications for the Redlake MegaPlus II ES 2020 digital camera are provided in the *Data Acquisition and Processing Report.

B.1.2 Ground System

The LADS Mk II GS 'Frodo' was used to conduct data processing in the field. Frodo consists of a portable Compaq Alpha ES40 Series 3 processor server with 1 GB EEC RAM, 764 GB disk space, digital linear tape (DLT) drives and magazines, a digital audio tape (DAT) drive, a CD ROM drive, and is networked to up to 12 Compaq 1.5 GHz PCs and a HP 800ps Design Jet Plotter, printers and QC workstations. The GS supports survey planning, data processing, quality control and data export. The GS also includes a KGPS base station, which provides independent post-processed position and height data. Quality control checks and editing of the data were conducted on GS 'Katrina', at the TLI office in Biloxi, MS, upon completion of the data collection phase of the survey. ***Data Filed with Original Field Records***

B.2 QUALITY CONTROL

B.2.1 Quality Control Checks

The internal relative consistency of the survey data was checked with crossline depth comparisons, depth benchmark comparisons, dynamic position checks and by observing position confidence quality factors on the GS. System integrity was checked, in an absolute sense, with the local GPS base station site confirmation and the static position check.

B.2.1.1 Crosslines

No specific crosslines were planned due to many investigation / additional coverage lines being flown perpendicular to main scheme survey runs. Additionally, main scheme lines flown perpendicular to each other, were used in these comparisons. Below are the overall depth comparison results for the 448 crossline / main scheme line intersections. A complete summary is presented in the *Separates Report. ***Data Filed with Original Field Records***

Very few lines that qualify as crosslines were run over H11871. However, since the surveys within the project OPR-H328-KRL-08 junction and were acquired during the same relative time frame the crossline requirement for H11871 has been met adequately.

Total Number of Comparisons	Mean Depth Difference (m)	Mean Standard Deviation (m)
386500	-0.01 +/- 0.06	0.05 +/- 0.03

B.2.1.2 Depth Benchmarks

Six gridded depth benchmark areas were created from bathymetry collected over benchmark run 4.0, which was flown west of Fowey Rocks Lighthouse on July 23, 2008. Comparisons between the gridded benchmark areas and bathymetry collected on benchmark runs flown during each sortie were used to check the relative depth accuracy of the LADS Mk II system for the H11871 survey. Center coordinates for the benchmark areas are as follows:

		UTM (N) Zone 17	
Benchmark Name	**Nominal Depth**	**Easting**	**Northing**
BM_1	7m	589 776	2 835 064
BM_2	5m	590 426	2 831 735
BM_3	3m	590 662	2 830 568
BM_4	13m	590 955	2 829 053
BM_5	20m	591 100	2 828 298
BM_6	25m	591 169	2 827 951

Depth benchmark areas and benchmark flight lines were reduced to MLLW using Virginia Key verified tides, with time and range correctors as specified in Section C.2.

The LADS survey data is compared against the gridded benchmark surface in the GS, and statistics are generated which include the number of points compared, the mean depth difference (MDD) and the standard deviation (SD) between the data sets. The benchmark comparison function compares the data against the benchmark surface, and as this data is unedited, it may contain noise normally removed during the validation process. These noisy outliers are flagged as the shoalest and deepest differences.

A summary of the average of the MDD and SD for all depth benchmark area comparisons is presented below. Refer to the *Separates Report for detailed results of the depth benchmark comparison results. ***Data Filed with Original Field Records***

GS ID	BM Name	Nominal Depth	Mean MDD (m)	Mean SD (m)
1	BM_1	7m	0.04 +/- 0.07	0.06 +/- 0.01
2	BM_2	5m	0.00 +/- 0.06	0.03 +/- 0.01
3	BM_3	3m	-0.02 +/- 0.05	0.06 +/- 0.01
8	BM_4	13m	0.12 +/- 0.08	0.04 +/- 0.01
5	BM_5	20m	0.16 +/- 0.10	0.07 +/- 0.01
6	BM_6	25m	0.19 +/- 0.12	0.08 +/- 0.02

The depth benchmark comparison results and the crossline comparisons results are within expected tolerances and show that the LADS Mk II depth performance was within specifications throughout the survey period.

B.2.1.3 Positioning Checks

Two independent positioning systems were used during the survey. Real-time positions were determined using an Ashtech GG24 GPS receiver, differentially corrected in real-time by a Fugro Omnistar GPS receiver on the aircraft, termed Wide Area Differential GPS (WADGPS) mode. Post-processed KGPS positions were determined relative to a local GPS base station that was established by Coastal Planning and Engineering (CPE) on the top of a light pole at the Fort Lauderdale Executive Airport. The post-processed KGPS positions were applied to each sounding during processing and the KGPS height was used in the topographic datum filter.

Position checks were conducted prior to, during, and following data collection as follows:

a. Local GPS Base Station Site Confirmation. A 24-hour certification of the local GPS base station established was conducted on July 18-19, 2008. The results reveal that the local GPS base station is free from site specific problems such as multipath and obstructions. Details are provided in the *Horizontal and Vertical Control Report and scatter plots in the *Separates Report. ***Data Filed with Original Field Records***

b. Static Position Check. Prior to commencing data collection, the coordinates of the aircraft GPS antenna were determined relative to three marks, which were surveyed by CPE on the tarmac at the Fort Lauderdale Executive Airport. Data was logged by each LADS Mk

II positioning system while the aircraft was static, enabling the positions to be checked against the known GPS antenna point. The absolute accuracy of the post-processed KGPS solution during the static position check was 0.171m (95% confidence). The results and details of the static position check are enclosed in the *Horizontal and Vertical Control Report and *Separates Report. ***Data Filed with Original Field Records***

c. Dynamic Position Check. During each sortie, GPS data was logged on the aircraft and at the local GPS base station. This provided a check between the real-time and post-processed GPS positions. The mean difference between the real-time and post-processed positions was 0.901m, with an average SD of 0.096m. Details are provided in the *Horizontal and Vertical Control Report. ***Data Filed with Original Field Records***

d. Position Confidence. The position quality was also monitored on the GS by checking a post-processed position confidence (C3), which is determined from the AS platform error, GPS error, and residual errors between the actual GPS positions and aircraft position, as determined from the line of best fit. No position anomalies were detected.

The position checks were within the expected tolerances and demonstrated that the positioning systems were functioning correctly throughout the survey period.

B.2.2 Uncertainty Values

For this survey area, global horizontal and vertical uncertainties have been assigned based on the defined horizontal and vertical error budget, as stated in the *Horizontal and Vertical Control Report. The assigned horizontal uncertainty is 1.96m and the assigned vertical uncertainty is 0.39m. ***Data Filed with Original Field Records***

However, when the calculated grid node SD is greater than the assigned vertical uncertainty, the SD is used as the uncertainty value. This has occurred in areas of high relief, such as along the limit of a channel or dredged area. In some cases the SD may exceed IHO Order-1 limits. This could be attributed to the seabed gradient and a 3m grid resolution being used.

B.2.3 Environmental Factors

B.2.3.1 Sea Conditions - Sea State, Waves, Swell, White Water

Adverse sea conditions were not a significant issue during this project. Apart from the period when Tropical Storm “Fay” hit the Florida coast, between the August 18 and 20, 2008 (no flights were conducted during this time), seas were generally slight. In fact, the absence of a slight to moderate chop on the sea surface during many flights was more of a concern than large sea state and white water. On a number of occasions glassy seas made lidar data acquisition difficult, and in a few cases sorties were terminated prematurely due to the “mirror-like” sea surface.

B.2.3.2 Water Clarity

Water clarity varied significantly throughout the survey area. Poor conditions were typically driven by storm activity, high rainfall and tidal state. The worst period of water clarity was observed following landfall of Tropical Storm “Fay” on August 18, 2008. The first flight conducted following this major storm was on August 22, 2008 and water conditions were

generally unsuitable for lidar during this short flight (aborted prematurely for low cloud and poor water clarity). However, by the next evening water clarity had improved considerably. By the third flight following the tropical storm, conducted on August 24, water clarity conditions were generally back to normal.

Under good weather conditions, areas of poor water clarity were typically localized to Miami Main Channel, the channels north, west and south of Virginia Key and a wide area west of Key Biscayne. These regions generally exhibited improved water clarity during the flooding tide and coverage was maximized by flying these areas during optimal tide periods. The turbidity observed in some areas did not improve with tidal state, such as the small bay adjacent to Marine Stadium on Virginia Key and the inlets on the south end of Key Biscayne. The water clarity through most of Biscayne Bay, and east and south of Virginia Key and Key Biscayne was very good throughout the survey period.

Water clarity did not affect the maximum lidar depth achieved along the eastern edge of the survey area, as maximum depths were only ~15m within the geographical extents of the flight lines. It is worth noting that depths beyond 45m were typically observed on the benchmark line flown west of Fowey Rocks on each survey flight.

B.2.3.3 Sea Grass

Sea grass is present throughout much of Biscayne Bay. The automated gain control for the green receiver component of the LADS Mk II AS handled the transition from sandy to sea grass covered seabed very well. However, on occasion, returns from the sandy seabed were quite saturated and caused a false Bottom Object Detection (see B.2.4.3 for further details) that would have to be rejected by a surveyor during data cleaning. Typically, laser returns from sea grass areas were slightly more attenuated, but this only adversely affected data coverage in very shallow water (refer to B.2.4.2).

B.2.3.4 Topography

The LADS Mk II system can measure topographic heights up to 50m elevation, subject to the depth / topographic logging window selected. For this survey, a 20m topographic height logging window was selected. As a result, the coastline was surveyed and elevations up to 20m were measured. During the processing stage, a maximum height of ~3m above the sea surface was used to remove areas where trees, buildings or other cultural features exist in close proximity to the high waterline. In areas where the MHW line could not be determined due to trees, mangroves, buildings or other cultural features, the appropriate ‘gap’ tag was inserted in the GS. With the use of publicly available imagery (Florida Department of Environmental Protection) and exported tags, the MHW line has been interpolated in these areas and attributed to indicate an approximate location.

B.2.3.5 Buildings / Towers

For this survey the presence of tall buildings and towers was a significant issue. With all sorties being flown at night and the survey area being in close proximity to Miami International Airport, survey lines were flown at 2200ft to adhere to night operation lowest safe altitude guidelines.

B.2.3.6 Wind

Survey operations were conducted in wind strengths of up to 20kts during the survey. In general, the wind strength during sorties was between 0 and 15kts from the SE. In circumstances when wind speeds were forecast to be greater than 20kts, no flights were planned due to the possibility of dangerous levels of turbulence. On occasions where wind speeds at Fowey Rocks Lighthouse were reported at less than 5kts, sorties were cancelled due to the high likelihood of glassy seas throughout the survey area.

B.2.3.7 Cloud

Low cloud coverage, rain and thunderstorms were a significant factor during the survey. Low cloud coverage was often prevalent within the survey area, sometimes resulting in aborted lines and subsequent reflies, and premature termination of sorties. On many occasions a cloud base formed at 1800 – 2000ft in the early hours of each morning, and due to the limitations of the night operation lowest safe altitude guidelines, the aircraft could not descend to a lower survey altitude below the cloud base.

Poor weather was monitored using, and decisions on the flying program were based on:

- Real-time satellite imagery
- Radar data
- Weather buoy data
- On the ground personnel reports

B.2.4 Data Coverage and Object Detection

B.2.4.1 Nature of the Seabed

The nature of the seabed to the southeast and southwest of Key Biscayne is generally undulating with the occasional small seabed object. Directly south of Key Biscayne is an extremely shallow reef structure, extending from Cape Florida to the southern extent of H11871. Maximum depths within the extents of this sheet are in the order of 10m.

B.2.4.2 Data Coverage

The survey area was illuminated at 2.5x2.5m laser spot spacing, resulting in a 75m swath width. Mainlines of sounding were spaced at 60 / 70m, which provided the required 100% coverage. Initially the survey was planned with 70m line spacing, but after analyzing coverage from the first flights, it was determined that some small coverage gaps were apparent between successive lines, due aircraft heading-track differences (drift) of up to 10 degrees. These small gaps were filled by flying new runs between the original lines. All un-flown survey sub areas were regenerated with 60m line spacing to avoid further data "holidays" due to aircraft drift.

Full coverage within the very shallow regions of the project area was difficult to achieve primarily due to bathymetric lidar limitations in discriminating between "mixed" sea surface and seabed returns. The inaccurate data that is recorded in very shallow water is

automatically removed during data processing with the Secondary Exclusion Zone (SEZ) algorithm. This depth filter effectively removes erroneous data from the sea surface down to a depth of 0.5m. The SEZ gap is typically filled by flying 200% coverage lines, with each successive line at a significantly different tidal state (high tide, then low tide), or with additional very low or very high tide lines along the coast.

However, with a tide range in the order of just 0.7m at Virginia Key, the flight window limited to between 22:30 and 06:00 each night, and 100% lidar main line coverage across the project area, effective management of tides to fill the SEZ gaps in very shallow water proved extremely difficult. In fact, the limitations of the mixed sea surface / seabed return were further compounded by attenuated sea grass returns in Biscayne Bay and saturated glassy sea returns along most coastlines. This meant that in some areas, accurate detection of the seabed was not possible until the water depth was between 1 and 2m.

Once these unusually large shallow water gaps had been identified, the COTR was contacted in order to explain that lidar coverage in the shallow coastal areas of the project would be very limited. The option of not flying the most inshore main scheme survey lines was discussed and approved by the COTR. In lieu of flying these lines, where coverage would have been extremely poor, an expansion of the project area to the north, east and south was conducted. This modification meant that a greater area of seabed would be illuminated than that proposed in the Statement of Work. It also resulted in the requirement for a revised sheet layout and for an additional sheet to be created (H12008). See *Appendix V for further details. ***Data Appended to this Report.***

Apart from a few small turbidity gaps within the South Basin, and secondary exclusion zone gaps in the vicinity of Key Biscayne and on top of the reef structure South of Key Biscayne, full seabed coverage from the MHW Line to the limit of the survey area was achieved for H11871.

B.2.4.3 Object Detection

At the sea surface the footprint of the laser beam is approximately 2.5m in diameter. As the beam passes through the water column, it slowly diverges due to scattering. At 2.5x2.5m laser spot spacing, complete seabed illumination is achieved. However, there are areas within the survey area where object detection was not possible due to water clarity issues. When the noise within the water column due to turbidity reaches a level where discrimination of a small seabed object from the noise in the laser waveform becomes impossible, object detection capability cannot be claimed.

By considering the laser spot spacing, coverage achieved and the calculated Signal to Noise Ratio of the seabed laser return (measure of water clarity), a quantification of IHO Order 1A object detection specifications has been assigned to the survey area. Bathymetric coverage of each sheet has been attributed as “bottom object detection achieved” or “bottom object detection not achieved” using the following S-57 feature object and attributes:

	S-57 Feature Object	S-57 Attribute CATZOC value	S-57 Attribute CATQUA value
IHO Order 1A bottom object detection achieved	M_QUAL	3 (zone of confidence B)	1 (data quality A)
IHO Order 1A bottom object detection not achieved	M_QUAL	3 (zone of confidence B)	2 (data quality B)

A description of the Bottom Object Detection (BOD) algorithm used in data processing is presented in the *Data Acquisition and Processing Report.

B.3 CORRECTIONS TO SOUNDINGS

Refer to the *Data Acquisition and Processing Report for a description of corrections to soundings. There were no deviations from the corrections described therein.

B.4 DATA PROCESSING

B.4.1 Data Management

The database is identified as follows:

Database Name	Sub-Locality	Sheet
08_4FL	Biscayne Channel	D

A detailed table of survey line identifiers is presented in the *Data Acquisition and Processing Report.

B.4.2 Data Processing Sites

The data acquired during survey flights was processed at the operating site in Fort Lauderdale following each sortie. Final validation, checking, approving, reports and products were conducted at the office in Biloxi, MS. The quality control of the data was conducted using CARIS software in the Biloxi, MS office.

B.4.3 CARIS BASE Surface

One BASE Surface covers the extents of each sheet area. The "Shoal" layer of the BASE Surface is to be considered the official record of hydrography for the survey. A grid resolution of 3m was used for the BASE Surface. Grid resolution does not change relative to depth, as the laser pulse footprint stays relatively constant regardless of depth, and the laser spot spacing is constant irrespective of aircraft altitude. The 3m grid provides the largest amount of detail that can be supported by the lidar density.

Data Filed with Original Field Records

B.4.4 Tagging

During data processing on the GS, the operators have the ability to assign S-57 and user-defined tags to gaps and features in the data. This enables accurate delineation and attribution of unsurveyed polygons, cultural features, artificial shoreline and navigation aids for the S-57 feature file (US511871.000).

For this survey, the following tags were used:

Tag	Abbrv	Description
BCNSPP	BC	Beacon, special purpose / general
BOYSPP	BY	Buoy, special purpose / general
BRIDGE	BR	Bridge
BRKWTR	BW	Breakwater
JETTY	JE	Jetty
OBSTRN	OB	Obstruction
PILPNT	PL	Pile
PIPSOL	PI	Pipeline, submerged / on land
SNDWAV	SW	Sand waves
UWTROC	RK	Underwater / awash rock
GROYNE	GR	Groyne
DSTRUCT	HO	Dry structure / house on water
HULKES	HU	Permanently moored vessel
DMPGRD	DG	Dumping ground / spoil area
SEAWALL	SE	Seawall
BLDG	BLDG	Building
GAPBOAT	GB	Gap due to boat, boat wake and / or dragged nets
GAPTURBID	GT	Gap due to poor water clarity
GLASSYSEAS	GGS	Gap due to glassy seas
SEZ	SEZ	Gap due to the secondary exclusion zone (SEZ)
MANGROVE	GM	Gap due to mangroves
GAPTREE	GTR	Gap due to trees (not mangroves)

Detailed descriptions of the gaps in seabed coverage are presented in Section B.8 of the *Data Acquisition and Processing Report.

Data Filed with Original Field Records

B.4.5 Georeferenced Imagery

Due to nighttime operations, no digital imagery was available for the validating, checking, and approval stages of survey data cleaning. No georeferenced mosaics were produced for the survey area. However, publicly available imagery from the Florida Department of

Environmental Protection was used as a guide during product compilation. The imagery used can be downloaded from the following website:

- http://data.labins.org/2003/MappingData/DOQQ/doqq_04_utm_sid.cfm

Google Earth coupled with EarthNC was also used extensively during the data validation, checking and approval process, in lieu of the LADS digital imagery typically acquired during daylight operations.

B.4.6 Progress Sketches

Progress sketches were provided to NOAA on a monthly basis. The final progress sketch can be found at *Appendix III. ***Data appended to this Report.***

B.4.7 Deliverables Data Formats

Data is provided in the following formats:

- Digital S-57 feature file
- CARIS BASE Surface
- Lidar coverage and Lidar uncertainty images in geo .tif format
- Chart comparison file in CARIS .hob format
- CARIS compatible data – CAF Format – LADS soundings and waveforms, which can be imported into CARIS HIPS
- CARIS compatible data – HDCS Format – LADS soundings in CARIS HIPS native format
- Tidal data provided in ASCII, .xls and .csv formats

Refer to the *Data Acquisition and Processing Report for specific details.

Data Filed with Original Field Records

C. VERTICAL AND HORIZONTAL CONTROL *See also Evaluation Report*

Refer to the *Horizontal and Vertical Control Report for a detailed description of the horizontal and vertical control used during this survey. A summary of horizontal and vertical control used for the survey follows. ***Data Filed with Original Field Records***

C.1 VERTICAL CONTROL

Vertical control for this survey was based on MLLW at the National Water Level Observation Network (NWLON) station at Virginia Key, FL (8723214). *Concur*

Station details are as follows:

		NAD83	
Gauge	**Location**	**Latitude (N)**	**Longitude (W)**
8723214	Virginia Key, FL	25° 43.9'	80° 09.7'

C.2 ZONING

Tide zones that cover the extent of the survey were derived from tide zone coordinates supplied by NOAA. Each of these tide zones use time and range correctors relative to the Virginia Key tide station. These are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
FSE1	TA1	-48 minutes	x1.12	8723214
FSE2	TA2	-48 minutes	x1.12	8723214
FSE5	TA3	-30 minutes	x1.05	8723214
FSE6	TA4	-30 minutes	x1.07	8723214
FSE8	TA5	-18 minutes	x1.02	8723214
FSE9	TA6	-6 minutes	x1.00	8723214
FSE10	TA7	-18 minutes	x1.02	8723214
FSE11	TA8	-18 minutes	x1.00	8723214
FSE14	TA9	-6 minutes	x0.98	8723214
FSE16	TA10	+12 minutes	x0.98	8723214
FSE18	TA11	+24 minutes	x0.98	8723214
FSE18A	TA12	+36 minutes	x0.95	8723214
FSE20	TA13	+42 minutes	x0.98	8723214
FSE21	TA14	+36 minutes	x1.00	8723214
FSE21A	TA15	+42 minutes	x0.98	8723214
FSE22	TA16	+24 minutes	x1.00	8723214
FSE23	TA17	+12 minutes	x1.00	8723214
FSE24	TA18	+6 minutes	x1.00	8723214

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
FSE25	TA19	+24 minutes	x1.02	8723214
FSE26	TA20	+18 minutes	x1.02	8723214
FSE27	TA21	+6 minutes	x1.02	8723214
FSE28	TA22	-6 minutes	x1.05	8723214
FSE29	TA23	-18 minutes	x1.07	8723214
FSE34	TA24	+12 minutes	x1.07	8723214
SA227	TA25	-54 minutes	x1.22	8723214
SA228	TA26	-48 minutes	x1.20	8723214

For final tide application, the time and range correctors were applied to the smoothed tidal data provided by JOA. Soundings were then reduced to MLLW using these corrected tides. An analysis of depth benchmark and crossline comparisons, and overlaps of the mainlines of sounding concluded that final tide zoning was adequate.

The derived value for the difference between MLLW and MHW at the Virginia Key tide gauge is 0.66m. From the final zoning, a range factor of 0.95, 0.98, 0.98, 0.98, 1.00, 1.05, 1.12, 1.12, 1.07, 1.02, and 0.98 was applicable for Sheet D, resulting in a MHW value of 0.68m.

C.3 HORIZONTAL CONTROL

Data collection and processing were conducted on the AS and GS in World Geodetic System (WGS84) on Universal Transverse Mercator (Northern Hemisphere) projection UTM (N) in Zone 17, Central Meridian 81° W. This data was post-processed and all soundings are positioned relative to the North American Datum 1983 (NAD83). All units are in ~~meters~~ ***feet at MLLW***. ***Concur***

C.3.1 LADS Local GPS Base Station – Fort Lauderdale

Real-time positions were determined using an Ashtech GG24 GPS receiver, differentially corrected in real-time by a Fugro Omnistar GPS receiver on the aircraft (WADGPS mode). A local GPS base station was coordinated by Coastal Planning and Engineering (CPE) on the top of a light pole at the Fort Lauderdale Executive Airport on July 10, 2008, in order to post-process more accurate KGPS positions following survey flights.

The derived NAD83 coordinates for the local GPS base station are:

NAD83		UTM (N) Zone 17		
Latitude (N)	**Longitude (W)**	**Easting (m)**	**Northing (m)**	**Ellipsoidal Height (m)**
26° 11' 42.4877"	80° 10' 17.4843"	582776.318	2897558.340	-14.957

Post-processed KGPS positions were determined offline using data logged at the local GPS base station and on the aircraft. This data was processed with Waypoint GrafNav Software to calculate a KGPS position solution for the survey flights. The post-processed KGPS positions were imported into the GS and applied to all soundings. This provided increased sounding position accuracy from the real-time WADGPS.

D. RESULTS AND RECOMMENDATIONS *See also Evaluation Report*

The results for the H11871 survey are submitted separately to this Descriptive Report as the S-57 feature file, BASE Surface, CARIS .hob files, Chart Comparison Spreadsheet, etc. on the USB hard drive. Refer to Appendix II of the *Data Acquisition and Processing Report for a list of all the deliverable files from H11871. ***Data Filed with Original Field Records***

Below is a table listing the S-57 feature objects found in the S-57 feature file (US511871.000): ***Concur***

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Spatial Attribute	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Comments
Coastline	COALNE	L	The line where shore and water meet.	Quality of position (QUAPOS)	Category of Coasatine (CATCOA)				QUAPOS is used to identify interpolated coastline. CATCOA is used to identify where mangroves exist along the high water line.
Depth Contour	DEPCNT	L	A line connecting points of equal water depth.		Value of contour (VALDCO)				DEPCNT used to define the MLLW line.
Light	LIGHTS	P	A luminous or lighted aid to navigation.						Used to define a lighthouse.
Landmark	LNDMRK	P	A prominent object at a fixed location which can be used in determining a location or a direction.		Function (FUNCTN)				Used to define a lighthouse.
Offshore Platform	OFSPLF	P	A permanent offshore structure.		Category of offshore platform (CATOFP)				Used to define the offshore structures located within the reefs south of Key Biscayne.
Shoreline Construction	SLCONS	L	A fixed (not afloat) artificial structure between the water and the land, i.e. a man-made coastline.		Category of Shoreline Construction (CATSLC)				
Sounding	SOUNDG	P	A measured water depth or spot which has been reduced to a vertical datum.						Used for defining surveyed depths that differ significantly from the chart.

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Spatial Attribute	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Comments
Unsurveyed Areas	UNSARE	A	Unsurveyed area.		Information (INFORM)				Used to define gaps in data coverage. INFORM has been identified as SEZ, gap for turbidity, or gap for glassy seas , based on the GS tags.
Underwater/awash Rock	UWTROC	P	A concreted mass of stony material or coral which dries, is awash or is below the water surface.		Value of Sounding (VALSOU)	Water Level Effect (WATLEV)			Some of the Rocks may have been man made objects. Bottom objects were not investigated.
Meta Objects									
Coverage	M_COVR	A	A geographical area that describes the coverage and the extent of spatial objects.		Category of coverage (CATCOV)				M_COVR: CATCOV = 1 polygons define the extents of good LIDAR data coverage.
Quality of Data	M_QUAL	A	An area within which a uniform assessment of the quality of the data exists.		Category of zone of confidence in data (CATZOC)	Category of quality of data (CATQUA)			CATQUA=1 is used to identify areas where object detection is achieved, CATQUA=2 is used to identify areas where object detection is not achieved.

Table 2: S-57 Attribution for the S-57 feature file (US511871.000)

Recommendations for registry number H11871 are divided into 2 components:

1. Recommended charting action, primarily for MCD.
2. Recommended further boatwork to sufficiently junction with lidar seabed coverage and examine uncertain lidar features.

Recommendations for charting action for registry number H11871 are provided in Sections D.1.1 to D.1.6 below. The Chart Comparison Spreadsheet has historically been one of the sources for the lidar features for examination list. In order to provide just <u>one</u> list of features for examination to field units, the Chart Comparison Spreadsheet has had some minor adjustments for this survey (H11871_ChartComp.xls). All features that appear in the chart comparison, but have not accurately had least depth determined by lidar, appear in the features for examination file. Where the least depth has not been found by lidar, no recommended

charting action has been specified. The determination of least depth is at the discretion of the ships conducting junctioning / investigations and their results should be reported for charting action to MCD in due course.

Recommendations for ship junctioning are provided in Section D.2.1. There are eight features recommended for investigation for sheet H11871.

A summary of charting actions is provided in Section D.2.2.

D.1 CHART COMPARISON

H11871 LADS survey deliverables were compared to:

*ENC US5FL21M Edition 12 compiled from Raster Chart 11465 38th Edition, ENC issue date May 18, 2009, at scale 1:40,000. ***See Also the Evaluation Report***.

The chart was downloaded from the NOAA Office of Coast Survey – NOAA Electronic Navigational Charts download website on May 27, 2009.
(http://chartmaker.ncd.noaa.gov/mcd/ENC/download.htm)

D.1.1 Dangers to Navigation

No Dangers to Navigation (DTON) were submitted to Atlantic Hydrographic Branch (AHB) for Sheet H11871. ***Concur***

D.1.2 AWOIS

No AWOIS were assigned to this Task Order. ***Concur***

D.1.3 Aids to Navigation

Thirty-four (34) Aids to Navigation are charted within the survey area for H11871. Twenty-three (23) Aids to Navigation were detected by lidar and are presented in the following table: ***Recommend retaining ATON's as charted unless specified in the table below. Defer final disposition of ATON's to MCD Update Services Branch.***

No.	Navigation Aid Identifier	Charted Position		Surveyed Position		Lidar Hits	Diff. in Positions (m)	Comments
		NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)			
1	Cape Florida Channel Light 4	25° 41' 06.53"	80° 11' 01.29"	25° 41' 06.50"	80° 11' 01.33"	4	1	*Retain as charted*
2	bn 2 (Beacon, lateral - Cape Florida Channel)	25° 41' 04.23"	80° 10' 46.16"	25° 41' 04.24"	80° 10' 46.15"	1	1	*Retain as charted*
3	Cape Florida Channel Daybeacon 1	25° 40' 53.71"	80° 10' 31.97"	25° 40' 53.64"	80° 10' 31.94"	1	2	*Retain as charted*
4	Biscayne National Park Boundry Light B	25° 40' 16.31"	80° 12' 03.50"	25° 40' 16.27"	80° 12' -03.54"	6	2	*Retain as charted*
5	Biscayne Flats Daybeacon 1	25° 40' 22.00"	80° 11' 01.70"	25° 40' 22.03"	80° 11' 01.76"	2	2	*Retain as charted*
6	Biscayne National Park Boundry Light A	25° 40' 19.49"	80° 10' 44.46"	25° 40' 18.63"	80° 10' 44.20"	5	27	*Recommend revise charted position unless other data proves otherwise.*
7	Cape Florida Light (Private)	25° 39' 59.90"	80° 09' 21.10"	25° 39' 59.78"	80° 09' 21.51"	13	12	*Revise charted position*
8	Biscayne Flats Daybeacon 3	25° 39' 45.91"	80° 11' 01.09"	25° 39' 45.99"	80° 11' 01.18"	2	124	*Recommend revise charted position unless other data proves otherwise.*
9	Biscayne Channel Light	25° 38' 20.37"	80° 07' 52.64"	25° 38' 20.43"	80° 07' 52.98"	11	9	*Recommend revise charted position unless other data proves otherwise.*
10	Biscayne Channel Light 1	25° 38' 41.20"	80° 08' 02.40"	25° 38' 41.28"	80° 08' 02.45"	1	3	*Retain as charted*
11	Biscayne Channel Light 2	25° 38' 50.06"	80° 08' 04.24"	25° 38' 50.00"	80° 08' 04.18"	2	3	*Retain as charted*
12	bn 3 (Beacon, lateral - Biscayne Channel)	25° 39' 04.10"	80° 08' 39.90"	25° 39' 04.12"	80° 08' 39.94"	2	1	*Retain as charted*
13	Biscayne Channel Daybeacon 4	25° 39' 06.72"	80° 08' 36.95"	25° 39' 06.75"	80° 08' 36.92"	1	1	*Retain as charted*
14	bn 6 (Beacon, lateral - Biscayne Channel)	25° 39' 13.93"	80° 08' 58.64"	25° 39' 13.98"	80° 08' 58.68"	7	2	*Retain as charted*
15	bn 7 (Beacon, lateral - Biscayne Channel)	25° 39' 10.10"	80° 09' 06.10"	25° 39' 10.07"	80° 09' 06.03"	3	2	*Retain as charted*

No.	Navigation Aid Identifier	Charted Position		Surveyed Position		Lidar Hits	Diff. in Positions (m)	Comments
		NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)			
16	bn 8 (Beacon, lateral - Biscayne Channel)	25° 39' 12.93"	80° 09' 10.05"			0		Not detected by lidar. ***Retain as charted***
17	bn 10 (Beacon, lateral - Biscayne Channel)	25° 39' 16.48"	80° 09' 34.84"			0		Not detected by lidar. ***Retain as charted***
18	bn 11 (Beacon, lateral - Biscayne Channel)	25° 39' 10.68"	80° 09' 30.25"			0		Not detected by lidar. ***Retain as charted***
19	bn 12 (Beacon, lateral - Biscayne Channel)	25° 39' 16.19"	80° 09' 57.35"	25° 39' 16.24"	80° 09' 57.36"	3	2	***Retain as charted***
20	bn 13 (Beacon, lateral - Biscayne Channel)	25° 39' 09.26"	80° 09' 55.30"	25° 39' 09.30"	80° 09' 55.32"	2	1	***Retain as charted***
21	bn 14 (Beacon, lateral - Biscayne Channel)	25° 39' 15.70"	80° 10' 14.20"			0		Not detected by lidar. ***Retain as charted***
22	Biscayne Channel Light 15	25° 39' 07.20"	80° 10' 28.10"	25° 39' 07.20"	80° 10' 28.12"	5	0	
23	bn 16 (Beacon, lateral - Biscayne Channel)	25° 39' 14.85"	80° 10' 29.12"			0		Not detected by lidar. ***Retain as charted***
24	bn 17 (Beacon, lateral - Biscayne Channel)	25° 39' 09.46"	80° 10' 48.73"	25° 39' 09.45"	80° 10' 48.73"	1	0	***Retain as charted***
25	bn 18 (Beacon, lateral - Biscayne Channel)	25° 39' 15.42"	80° 10' 49.01"			0		Not detected by lidar. ***Retain as charted***
26	bn 19 (Beacon, lateral - Biscayne Channel)	25° 39' 17.60"	80° 11' 05.70"	25° 39' 17.80"	80° 11' 05.49"	4	9	***Recommend revise charted position unless other data proves otherwise.***
27	bn 20 (Beacon, lateral - Biscayne Channel)	25° 39' 23.59"	80° 11' 06.90"	25° 39' 23.69"	80° 11' 07.01"	7	4	***Retain as charted***
28	Biscayne Channel Light 21	25° 39' 20.30"	80° 11' 10.50"	25° 39' 20.38"	80° 11' 10.51"	7	3	***Retain as charted***
29	Beacon, special purpose/general	25° 38' 25.46"	80° 09' 41.37"			0		Not detected by lidar. ***Retain as charted***

No.	Navigation Aid Identifier	Charted Position		Surveyed Position		Lidar Hits	Diff. in Positions (m)	Comments
		NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)	NAD83 Latitude N (DMS)	NAD83 Longitude W (DMS)			
30	Miami Springs Shoal Buoy East (Private)	25° 38' 27.51"	80° 10' 48.36"			0		Not detected by lidar. ***Retain as charted***
31	Miami Springs Shoal Buoy South (Private)	25° 38' 28.48"	80° 10' 49.48"			0		Not detected by lidar. ***Retain as charted***
32	Miami Springs Shoal Buoy North (Private)	25° 38' 31.12"	80° 10' 57.36"			0		Not detected by lidar. ***Retain as charted***
33	Miami Springs Shoal Buoy West (Private)	25° 38' 31.12"	80° 10' 58.80"			0		Not detected by lidar. ***Retain as charted***
34	Saftey Valve Bank Light 1	25° 38' 36.38"	80° 11' 29.80"	25° 38' 37.01"	80° 11' 29.89"	3	20	***Recommend revise charted position unless other data proves otherwise.***

Table 3: H11871 Aids to Navigation

D.1.4 Charted Depths and Features

Registry number H11871 lies over part of NOAA charts 11465 and 11468, in the vicinity of Biscayne Channel. From the Source Diagrams, the area covered by H11871 was covered by NOS surveys between 1900 and 1939, presumably by lead line, and between 1990 and 1998, probably using an echo sounder. In both instances, partial bottom coverage was achieved. The chart in this area appears to be well surveyed, with the coastline being well portrayed.

The area surveyed is represented by the BASE Surface and S-57 feature file in considerably more detail than is currently shown on the chart. The following general recommendations are relevant:

a. Coastline. The charted coastline agrees well with the surveyed coastline. The surveyed coastline differs from the charted position by a maximum of 20m along one section of Key Biscayne. Numerous cultural features, differing types of artificial coastline, the presence of mangroves, along with the small tidal range made the delineation of the MHW line difficult in some areas. It is recommended that the coastline on the chart be amended to match the LADS surveyed and extrapolated MHW line. ***Concur. See also Evaluation Report***

b. Inshore Islets. No islets were surveyed within the extents of Sheet H11871. ***Concur.***

c. Rocks. The seafloor covering H11871 was generally undulating with some areas exhibiting many seabed objects. No drying rocks were identified for the area covered by this sheet. There are however, several shoals that are in the intertidal zone. Where a significant difference in depth existed between the chart and the BASE Surface, a sounding or rock was placed in the S-57 feature file and was referenced in the Chart Comparison Spreadsheet in Section D.1.6. Concur.

D.1.5 Detailed Chart Comparison

In addition to the general recommendations above, 16 specific differences between the chart and the LADS survey have been identified and are described in Section D.1.6. An expanded version of the spreadsheet is included digitally on the USB hard drive (H11871_ChartComp.xls). A CARIS .hob file containing just the chart comparison items has also been compiled and is provided as part of survey deliverables (H11871_ChartComp.hob). The attribution methodology for this file is presented below:

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Attribute 1	Attribute 2	Attribute 3	Attribute 4
Built-up Area	BUAARE	P	Used as a placeholder to store information relating to the chart comparison	OBJNAM (used for storing a unique chart comparison ID)	INFORM (used for storing the charting recommendation)	NINFOM (used for storing a reference to a Feature for Investigation)	PICREP (used for storing a link to GS screen captures)

The chart comparison was conducted by reviewing the chart and the LADS survey deliverable. For each item identified, screen dumps of the Local Area Display and Raw Waveform Display were extracted from the LADS Mk II GS.
These have been reviewed in order to make the following assessments:

a. Type of Feature
b. Least Depth Found
c. Charting Recommendation
d. Remarks

When the least depth has been adequately surveyed by lidar, the LDF Column is populated with a 'Y' for yes. The charting recommendation for a feature that has an adequately surveyed least depth will be either 'Insert' for a new feature, 'Replace' for an amendment to an existing charted feature or 'Remove' for a disproved charted feature.

When the least depth has NOT been found by lidar (populated with an 'N'), the chart comparison number has been used as the identifier within the S-57 feature file that contains the features for examination. If a chart comparison item had previously been identified as a feature for examination during data processing, a reference is made in the 'Remarks' column to the S-57 feature for examination item.

Each chart comparison was categorized as follows:

1. New shoal found
2. Charted shoal disproved / not found

The fields in the Chart Comparison Spreadsheet have been developed from experience learned and feedback received from previous lidar surveys in Alaska, witnessing survey operations aboard NOAA ship Rainier, from meetings at PHB and UNH and the 2007 NOAA Field Procedures Workshop. They have been designed for ease of use and to minimize double handling of data and transcription. Continued feedback is welcomed in order to develop these formats to achieve further efficiencies in data handling.

D.1.6 Chart Comparison Spreadsheet ***Concur with clarification. *See also Evaluation Report.***

			CHARTED			SURVEYED							
Sequence No	**Shoal No**	**Category**	**Charted Depth (meters)**	**NAD83 Latitude N (DMS)**	**NAD83 Longitude W (DMS)**	**Surveyed Depth (meters)**	**NAD83 Latitude N (DMS)**	**NAD83 Longitude W (DMS)**	**Type of Feature**	**Full Coverage**	**Least Depth Found**	**Charting Recommendation**	**Remarks** **All items covered by 2.5x2.5m laser spot spacing at 100% lidar coverage.**
1	D1	1				6.15	25° 40' 42.72"	80° 7' 6.6"	Rk	Y	N	Insert	Possible small object on seabed. Refer to FED1. ***Chart 20 ft shoal sounding***
2	D2	1				5.30	25° 40' 33.06"	80° 7' 26.54"	Rk	Y	Y	Insert	***Chart 17 ft shoal sounding***
3	D3	1				4.11	25° 40' 46.14"	80° 7' 48.36"	Rk	Y	N	Insert	Possible small object on seabed. Refer to FED2. ***Chart 13 ft shoal sounding***
4	D4	1				5.25	25° 39' 59.65"	80° 7' 30.3"	Rk	Y	Y	Insert	***Chart 17 ft shoal sounding***
5	D5	1				4.47	25° 39' 43.11"	80° 7' 53.57"	Rk	Y	Y	Insert	***Chart 14 ft shoal sounding***
6	D6	2	2.7	25° 39' 46.75"	80° 8' 23.33"	1.59	25° 39' 45.47"	80° 8' 22.17"	Shoal	Y	Y	Replace	***Chart 5 ft shoal sounding***
7	D7	1				4.64	25° 39' 48.91"	80° 9' 45.17"	Rk	Y	Y	Insert	***Chart 15 ft shoal sounding***
8	D8	1				-0.27	25° 39' 53.73"	80° 10' 16.54"	Intertidal Area	Y	Y	Insert	***Revise intertidal area***
9	D9	2	3.0	25° 39' 40.96"	80° 8' 34.86"	1.09	25° 39' 40.47"	80° 8' 35.76"	Shoal	Y	Y	Replace	***Chart 3 ft shoal sounding***
10	D10	1				4.56	25° 39' 30.21"	80° 7' 58.72"	Rk	Y	N	Insert	Possible small object on seabed. Refer to FED3. ***Update area with present survey data***
11	D11	1				6.31	25° 39' 32.51"	80° 7' 35.9"	Rk	Y	Y	Insert	***Chart 20 ft shoal sounding***

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED							
Sequence No	**Shoal No**	**Category**	**Charted Depth (meters)**	**NAD83 Latitude N (DMS)**	**NAD83 Longitude W (DMS)**	**Surveyed Depth (meters)**	**NAD83 Latitude N (DMS)**	**NAD83 Longitude W (DMS)**	**Type of Feature**	**Full Coverage**	**Least Depth Found**	**Charting Recommendation**	**Remarks** **All items covered by 2.5x2.5m laser spot spacing at 100% lidar coverage.**
12	D12	1				4.24	25° 39' 22.82"	80° 8' 2.57"	Rk	Y	N	Insert	Possible small object on seabed. Refer to FED4. ***Chart 14 ft shoal sounding***
13	D13	1				3.31	25° 39' 13.69"	80° 12' 5.18"	Rk	Y	Y	Insert	***Chart 11 ft shoal sounding***
14	D14	2	2.4	25° 37' 22.71"	80° 10' 56.83"	0.22	25° 37' 22.39"	80° 10' 53.15"	Shoal	Y	Y	Replace	***Chart intertidal areas****
15	D15	1				0.21	25° 40' 38.15"	80° 10' 31.22"	Shoal	Y	Y	Insert	***Chart intertidal area****
16	D16	2	1.2	25° 40' 2.31"	80° 10' 53.89"	0.15	25° 40' 4.26"	80° 10' 50.32"	Shoal	Y	Y	Replace	***Revise and chart intertidal areas****

Table 4: Chart Comparison Spreadsheet

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

D.2 ADDITIONAL RESULTS

D.2.1 Supplemental Information for Boatwork

For the H11871 survey, the supplemental information for further boatwork was compiled by defining the seaward limit of good lidar seabed coverage as a M_COVR, CATCOV=1 polygon. ***Concur.***

D.2.1.1 Seaward Limit of Lidar Coverage

The lidar coverage across H11871 is fairly consistent, with a few turbidity gaps and a number of small, very shallow water gaps due to the SEZ in the vicinity of Key Biscayne and the reef structure south of Key Biscayne. This is reflected by the extents of, and gaps within, the BASE Surface. ***Concur.***

In particular, the areas of poor lidar seabed coverage include:

- Within the South Basin, at position 25° 40’ 54” N, 80° 10’ 10” W, due to turbidity. ***Concur.***
- NNE of Cape Florida, at position 25° 40’ 25” N, 80° 09’ 10” W, due to the SEZ. ***Concur.***

When planning multibeam junctioning with lidar seabed coverage, the NALL and the following must be taken into consideration:

- Lidar derived MHW line, MLLW line.
- Shallow features detected by lidar.
- Features for examination.
- ‘Unsurveyed’ polygons due to poor water clarity, the SEZ, and glassy seas.

These are all provided in the S-57 feature file (US511871.000) for H11871.

The areas of good lidar seabed coverage include:

- E and S of Key Biscayne.
- Within Biscayne Bay.

The seaward limit of good lidar data coverage has been described by the S-57 feature object M_COVR in the S-57 feature file (US511871.000).

D.2.1.2 Lidar Features Requiring Further Investigation

A list of uncertain lidar soundings was collated during data processing and is presented in a ***CARIS *.hob file. ****This file did not exist in deliverables. An email was sent to Scott Ramsay on 10/28/09 regarding the submission of this data.*** Tagging in the GS was used to flag features for which the least depth has not been found. Typically this meant that there were less than 4 supporting soundings, within 0.5 – 1.0m of the depth, on the primary and

overlapping lines. These tags were then exported from the GS and compiled in CARIS BASE Editor. Features for examination have been captured within the H11871_Inv.hob as BUAARE feature objects. Where these features correlate with an item listed in the Chart Comparison Spreadsheet, a reference has been made in the H11871_Inv.hob file. The S-57 attribution methodology for lidar features requiring further investigation is presented below:

S-57 Object Class	S-57 Object Acronym	Geometry	Description	Attribute 1	Attribute 2	Attribute 3
Built-up Area	BUAARE	P	Used as a placeholder to store information relating to the item for further investigation	OBJNAM (used for storing a unique feature for investigation ID)	INFORM (used for storing a reference to a chart comparison, where applicable)	PICREP (used for storing a link to GS screen captures)

Refer to Section B.4.4 ***of this report*** for the descriptions of the GS tagging philosophy used for all lidar seabed coverage gaps and recommended features for investigation.

In circumstances where least depth has not been found over a significant feature, a recommendation for investigation by boat for 8 uncertain soundings has been made in the CARIS H11871_Inv.hob file. All features in the chart comparison that have not had least depth adequately surveyed also appear in this file.

D.2.1.3 Recommended Junctioning with Unsurveyed Lidar Areas

The 'unsurveyed' gaps in lidar seabed coverage are defined as polygons in the S-57 feature file. They were constructed utilizing the export of the operator assigned gap tags described in Section B.4.4. ***of this report.*** In the case of 'unsurveyed' areas for the SEZ and glassy seas, junctioning is not recommended for the obvious risks to surface vessels.

D.2.1.4 Comparison with prior Surveys

Comparison with prior surveys was not required under this Task Order. See Section D.1 ***of this report*** for comparison to the nautical charts.

D.2.2 Summary of Charting Actions and Investigations – H11871

D.2.2.1 Summary of Charting Actions – H11871

Total number of new significant islets recommended for insertion on chart: 0
Total number of new significant drying rocks recommended for insertion on chart: 0
Total number of new significant rocks awash recommended for insertion on chart: 0
Total number of new significant features recommended for insertion on chart: 12
Total number of charted features disproved by lidar (Remove): 0
Total number of charted features recommended for amendment by lidar (Replace): 4
Total number of chart comparison items requiring further investigation: 4

Total number of DTONs submitted to AHB during data acquisition: 0
Total number of DTONs submitted to AHB during data processing: 0
Total number of DTONs submitted to AHB for H11871: 0

D.2.2.2 Summary of Lidar Features Requiring Further Investigation – H11871

Total number of investigations recommended during data processing: 8
Total number of investigations recommended from chart comparison compilation: 0
Total number of recommended feature investigations: 8

E. APPROVAL SHEET

LETTER OF APPROVAL – OPR-H328-KRL-08

This report and the accompanying LADS survey deliverables are respectfully submitted.

Field operations contributing to the accomplishment of this survey were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and the accompanying LADS survey deliverables have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Report	Submission Date
Descriptive Report – H11871	June 1, 2009

Mark Sinclair
Hydrographer
Tenix LADS, Incorporated

Date: June 1, 2009

APPENDIX I – DANGERS TO NAVIGATION

No DTONs were submitted for H11871.

APPENDIX II – SURVEY FEATURE REPORT

No AWOIS were assigned to this task order.

APPENDIX III – FINAL PROGRESS SKETCH

FINAL PROGRESS SKETCH

July 13 – August 26, 2008

OPR-H328-KRL-08
Approaches to Miami, FL

Tenix LADS Inc.
Scott Ramsay, Project Manager

The Tenix LADS aircraft arrived in Fort Lauderdale on July 12, 2008, during a temporary suspension of operations in support of OPR-O190-KRL-08. The site mobilization was undertaken during the following day. The first survey flight was conducted in the OPR-H328-KRL-08 project area on July 14, 2008. A total of twenty-one survey flights were flown in the Approaches to Miami, FL project area during July and August. Operations were temporarily suspended on July 27, 2008, in order to conduct a sortie for Broward County. Demobilization of the site was conducted on August 26, 2008 and the aircraft departed Fort Lauderdale for Ketchikan, to complete OPR-O190-KRL-08 operations, on August 27, 2008.

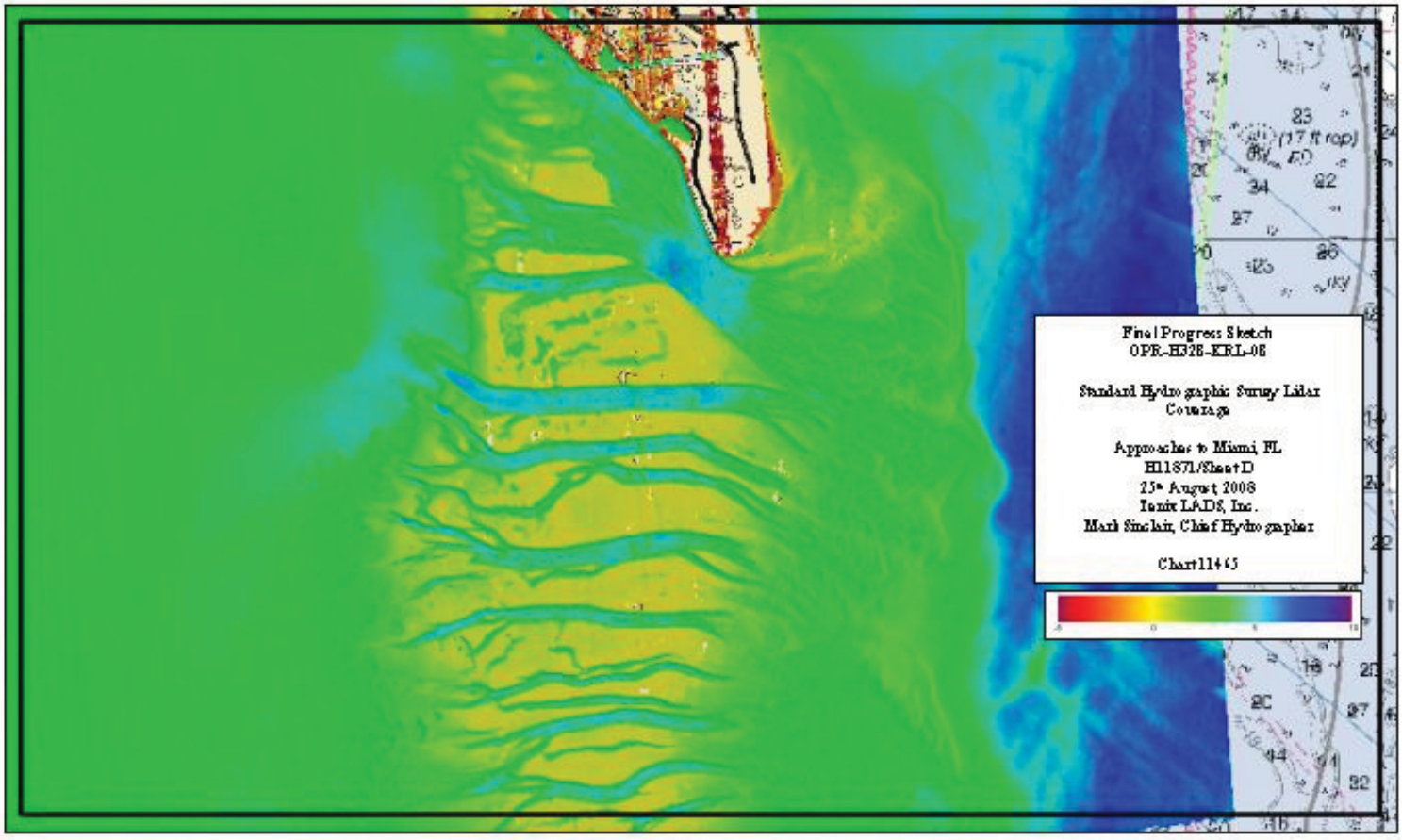
Of the 21 survey flights, 14 were deemed fully effective. The remaining sorties were aborted prematurely for adverse environmental conditions in the survey area, such as low cloud, glassy seas or poor water clarity, or due to system problems. Following some early aborts from the project area, when weather conditions were suitable to the North, the Broward County survey was completed. All flight and on task times reported below are calculated for the Approaches to Miami, FL project only.

The total area covered is 63 SNM, from the Mean High Water line to the limits of the survey area, at 2.5m laser spot spacing, 100% coverage.

OPR-H328-KRL-08	July	August	Total 2008	Total Budgeted	% Budgeted
Days on project	18	26	44	30	147%
Days mob / demob	1	1	2	2	100%
Survey flights	9	12	21	12	175%
No flight - weather	2	3	5	-	-
No flight – pilot hours	6	10	16	-	-
Linear nautical miles flown	1365	3235	4600	3828	120%
Area surveyed (NM^2)	20 *	43 *	63 *	55 **	115%
Aircraft flown hours	41:20	66:46	108:06	72:00	150%
Aircraft on task hours	32:08	58:02	90:10	57:30	157%
Hours lost to weather	1:06	0:00	1:06	-	-
Hours lost to system	2:11	0:22	2:33	-	-

Effective flights conducted	14	12	117%
Average time on task per effective flight	5:45	5:16	109%
Survey lines flown	628	506	124%

*Area surveyed value derived from CARIS BASE Surface at Aug 25, from MHWL to survey limits
** Total planned area sourced from OPR-H328-KRL-08 Statement of Work, Attachment #2



Progress Sketch OPR-H328-KRL-08: Lidar Coverage – H11871 at August 25, 2008

APPENDIX IV – TIDES AND WATER LEVELS

Abstract of Times of Hydrography

Start and End times refer to tidal applications requirement.

Time on Task indicates actual time of task in the survey area. All times and dates are in UTC.

08_4fl

Date	JD	Sortie	Start Time	End Time	Tide Duration	Time on Task
15-Jul-08	197	2	0200	1000	8:00	4:32
17-Jul-08	199	3	0200	1000	8:00	5:26
20-Jul-08	202	4	0200	0606	4:06	1:58
21-Jul-08	203	5	0200	0606	4:06	1:54
23-Jul-08	205	6	0200	1100	9:00	5:42
24-Jul-08	206	7	0200	1100	9:00	1:33
27-Jul-08	209	8	0100	1000	9:00	1:03
29-Jul-08	211	9	0100	1000	9:00	3:40
01-Aug-08	214	10	0100	1100	10:00	6:29
02-Aug-08	215	11	0100	1100	10:00	6:38
05-Aug-08	218	12	0100	1100	10:00	6:22
07-Aug-08	220	13	0100	1100	10:00	4:36
08-Aug-08	221	14	0100	1048	09:48	5:28
10-Aug-08	223	16	0100	1100	10:00	6:52
14-Aug-08	227	18	0100	1100	10:00	6:15
16-Aug-08	229	19	0100	1100	10:00	0:53
17-Aug-08	230	20	0100	1054	09:54	3:47
18-Aug-08	231	21	0100	1054	09:54	3:20
23-Aug-08	236	23	0100	0954	08:54	3:20
24-Aug-08	237	24	0100	0906	08:06	2:21
25-Aug-08	238	25	0100	1054	09:54	5:35

T I D A L D A T U M S

ELEVATIONS ON STATION DATUM
National Ocean Service (NOAA)

Station: 8723214 T.M.: 0 W
Name: VIRGINIA KEY, BISCAYNE BAY, FL Units: Meters
Status: Accepted Epoch: 1983-2001

Datum	Value	Description
MHHW	3.774	Mean Higher-High Water
MHW	3.752	Mean High Water
DTL	3.432	Mean Diurnal Tide Level
MTL	3.439	Mean Tide Level
MSL	3.431	Mean Sea Level
MLW	3.126	Mean Low Water
MLLW	3.090	Mean Lower-Low Water

APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

FW Proposed modification_to_OPR-H328-KRL-08.txt

From: RAMSAY Scott
Sent: Monday, August 04, 2008 4:11 PM
To: 'David.Scharff'
Cc: SINCLAIR Mark - LADS; GUILFORD James
Subject: RE: Proposed modification to OPR-H328-KRL-08

Dave,

Thanks for considering our recommendation.

Just so we are clear, I don't think it is necessary to completely remove sub area 3 & 4 - just the 15 most inshore lines of both sub areas. A lot of data has already been collected within sub area 3.

I think that we could achieve the Option 1 area you have suggested, and about 1/3 of the area in Option 3, with one new sub area totaling 40 lines and the coverage we have already acquired in the east of the area.

Please see the attached diagram demonstrating the original eastern survey extent (from the SOW), our current coverage with the Option 3 area and the recommended sub area for further collection within the Option 1 area.

I hope this works for NOAA and the OSI contract, and that we can devise a suitable modification to the SOW for the H328 project, that still gets us up to more than 55sqNM lidar coverage.

Regards,
Scott

-----Original Message-----
From: David.Scharff [mailto:David.Scharff@noaa.gov]
Sent: Monday, August 04, 2008 9:41 AM
To: RAMSAY Scott
Cc: SINCLAIR Mark - LADS; GUILFORD James
Subject: Re: Proposed modification to OPR-H328-KRL-08

Scott,

Attached are 3 optional coverage areas in order of priority. You may survey any part of the three areas indicated to replace sub areas 3-4. Please note that overlapping with OSI's assigned project is our lowest priority. Let me know what option you would be interested in pursuing.

FYI - I'm in training downtown all week if you need me I'll be checking my voice/email each morning or you can contact Crescent if you need help.

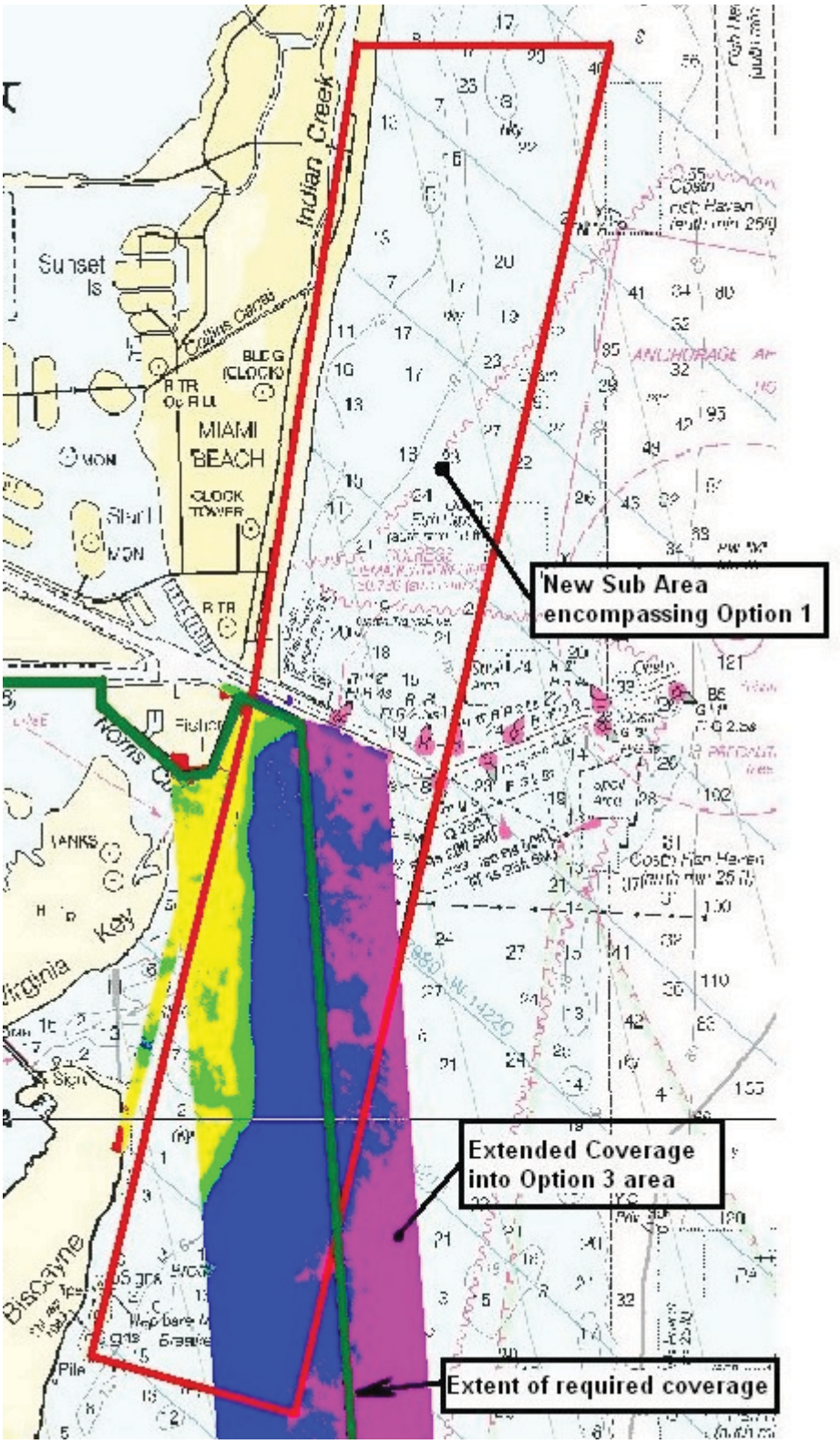
Regards,
Dave

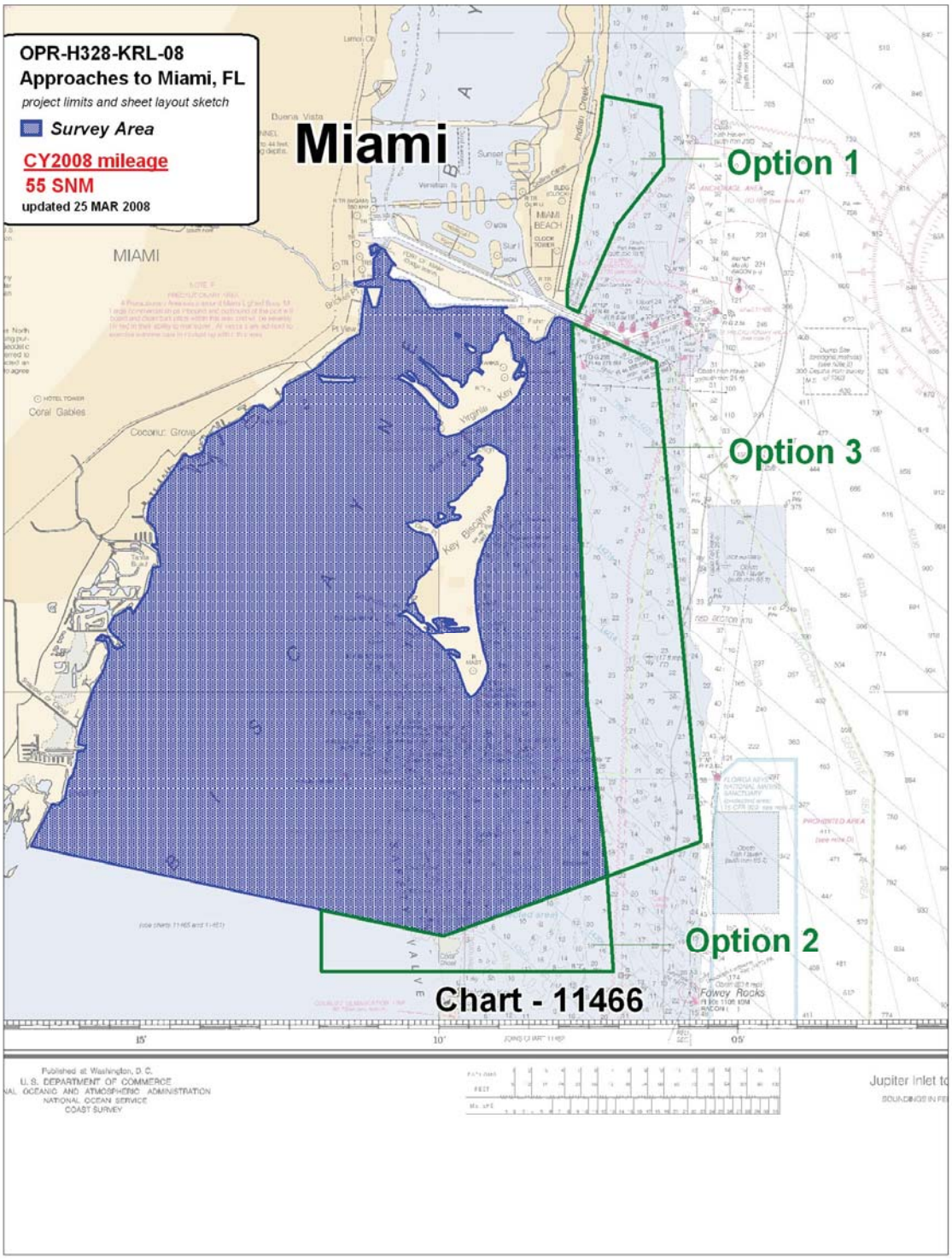
RAMSAY Scott wrote:
>
> Dave,
>
> Following our discussion this morning, attached is an image showing
> the contracted lidar survey sub areas 1-4 and proposed modification to
> areas (in black and dark green).
>
> As you are aware, we have limited capability in the very shallow,
> inshore areas of Biscayne Bay where seagrass is present (indicated as
> black on image in sub area 3 and 4). The coverage has been quite
> sparse throughout these regions, despite flying lines at the highest
> possible tide (tide range is only about 0.8m). At the Eastern edge of
> our area, which is the intended OSI junction line, we are still

Page 1

FW Proposed modification_to_OPR-H328-KRL-08.txt

> surveying 5-10m water depth. This is obviously not a very efficient
> depth for a multibeam platform to be operating in.
>
> I am proposing that lidar coverage across the Florida project area
> would be significantly improved if the "black" areas were removed from
> the required area (15 inshore lines from sub area 3 and 15 lines from
> sub area 4) and an additional 30 lines were planned to the East of the
> Eastern edge of sub area 1, indicated in dark green. This modification
> will actually improve the total SQNM coverage of lidar across the
> project area, as the offshore sub area 1 lines are significantly
> longer than those in sub area 3 and 4. I would propose that we still
> fly investigation lines down the middle of all the channels within sub
> area 3 and 4, as you mentioned this data was important to the survey.
>
> I have also attached coverage plots demonstrating the achieved lidar
> coverage up until July 30. We have had 2 very successful flights since
> this plot was produced, acquiring an additional 90 main scheme lines.
> We are currently about 50% through the required Florida data
> acquisition with the next flight programmed for Monday night.
>
> I look forward to your comments.
>
> Best Regards,
>
> Scott Ramsay
>
> Survey Manager
>
> Tenix LADS, Inc.
>


New Sub Area
encompassing Option 1
Extended Coverage
into Option 3 area
Extent of required coverage
Indian Creek
Sunset Is
MIAMI
BEACH
CLOCK
TOWER
Virginia Key
Biscayne


OPR-H328-KRL-08
Approaches to Miami, FL
project limits and sheet layout sketch
Survey Area
CY2008 mileage
55 SNM
updated 25 MAR 2008
Miami
Option 1
Option 3
Option 2
Chart - 11466
MIAMI
Coral Gables
Coconut Grove
Key Biscayne
Fowey Rocks
Published at Washington, D.C.
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
COAST SURVEY

Re Modification to SOW OPR-H328-KRL-08 Sub Locality Names.txt
From: David.Scharff [David.Scharff@noaa.gov]
Sent: Thursday, 29 January 2009 12:32 PM
To: RAMSAY Scott
Cc: Edward.Owens@noaa.gov; james.guilford@tenix.com; WEIDMAN Brett; NEWSHAM Wayne; BELL Rachel
Subject: Re: Modification to SOW OPR-H328-KRL-08 Sub Locality Names

Attachments: David_Scharff.vcf

Scott,

Thanks for the update. I have updated our system to reflect the new sub locality information you provided. Unfortunately registry number H11872 has already been assigned to a different project so we can't use it. The new number for sheet "*E*" will be *H12008*, please make the appropriate changes on your end.

Thanks,
Dave

RAMSAY Scott wrote:
>
> Dave,
>
> Based on the final lidar coverage for OPR-H328-KRL-08 I would propose
> the following sub-locality name modifications from the original SOW,
> for each of the registered sheets:
>
> H11868 (Sheet A) - 76x131cm, 1:10,000
>
> Sub locality: Dinner Key Channel to Shoal Point
>
> H11869 (Sheet B) - 76x131cm, 1:10,000
>
> Sub locality: Miami Beach to Fisher Island
>
> H11870 (Sheet C) - 76x131cm, 1:10,000
>
> Sub locality: Virginia Key to Key Biscayne
>
> H11871 (Sheet D) - 76x131cm, 1:10,000
>
> Sub locality: Biscayne Channel (remains the same)
>
> _Additional Sheet:_
>
> H11872 (Sheet E) - 76x131cm, 1:10,000
>
> Sub locality: Vicinity of Soldier Key
>
> Please let me know if these sub locality names are suitable for us to
> proceed with. For sheet layout and limits see the attached files.
>
> Regards,
> Scott Ramsay
> Survey Manager
> Tenix LADS, Inc.

Page 1

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT to ACCOMPANY
SURVEY H11871 (2008)

This Evaluation Report has been written to supplement and/or clarify the original Descriptive Report. Sections in this report refer to the corresponding sections of the Descriptive Report.

B. DATA ACQUISITION AND PROCESSING

B.1 DATA PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

CARIS HIPS/SIPS version 6.1 SP2, HF 7
CARIS Bathy Manager version 2.1.0.0 SP1, HF 1-10
CARIS S-57 Composer version 2.1 HF 4
DKART INSPECTOR, version 5.0 Build 732 SP1
CARIS HOM version 3.3 SP3 HF 8

B.2. QUALITY CONTROL

B.2.1. H-Cell

The AHB source depth grid for the survey's nautical chart update product was a 3m resolution shoal BASE surface derived from the field's original LIDAR 3m *.hns BASE surface. The survey scale soundings were created from the surface at single defined radius of one millimeter at chart scale of 1:40,000. A TIN was created from the survey scale soundings from which an interpolated surface was generated. The chart scale soundings were selected from the filtered interpolated surface using a single defined radius at the 40,000 chart scale. The chart scale selected soundings are a subset of the survey scale selected soundings. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portrayed the bathymetry within the common area.

Depth contours were created from a shifted interpolated TIN surface of 12m resolution. The depth contours are forwarded to MCD for reference only. The contours were utilized during chart scale sounding selection and quality assurance efforts at AHB. The depth contours are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The pre-compilation products or components (Stand Alone HOB files (SAHOB)) are detailed in the Compile Log attached at the end of this document. The SAHOB files included depth areas (DEPARE), depth contours (DEPCNT), sounding selections (SOUNDG), features (LNDMRK, LIGHTS, OFSPLF, SBDARE), US5FL21M_ENC Features (BOYSPP, OBSTRN, PILPNT, SBDARE, WEDKLP, WRECKS), Meta objects (M_QUAL, M_COVR), and cartographic Blue Notes ($CSYMB).

All of the components with the exception of the sounding selection and depth contours were inserted into one feature layer (including the Bluenotes, as dictated by Hydrographic Technical Directive 2008-8, and this layer was exported into S-57 format in order to create the H-Cell deliverable. Similarly, the sounding selection and depth contours were exported into S-57 format separately, and then both S-57 files were processed in CARIS HOM to convert the metric units to feet/fathoms and feet. The final products are two S-57 files, in Lat/Lon NAD-83, one that contains the chart soundings, all the features, Meta objects, and Bluenotes (H11871_CS.000), and one that contains the depth contours, and sounding selection (H11871_SS.000). Finally, quality assurance checks were made utilizing CARIS S-57 Composer version 2.1 validation checks.

Chart compilation was performed by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland.

H11871 CARIS H-Cell final deliverables include the following products:

H11871_CS.000	1:40,000 Scale	H11871 H-Cell with Chart Scale Selected Soundings
H11871_SS.000	1:10,000 Scale	H11871 Selected Soundings (Survey Scale)

B.2.2. Junctions

Survey H11871 (2008) junctions with survey H11870 (2008) to the north. There was excellent agreement between the present survey and survey H11870 with all soundings being within a 0-1 foot agreement.

Survey H11871 (2008) junctions with survey H12008 (2008) to the south. There was excellent agreement between the present survey and survey H12008 with all soundings being within a 0-1 foot agreement.

Survey H11871 (2008) junctions with survey H11868 (2008) to the west. There was excellent agreement between the present survey and survey H11868 with all soundings being within a 0-1 foot agreement.

Present survey depths are in harmony with the charted hydrography to the east with all depths being within a 0-2 foot agreement.

C. VERTICAL AND HORIZONTAL CONTROL

The OPR-H328-KRL-08 Horizontal and Vertical Control Report (HVCR) was submitted with survey H11871.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON

11465 (38th Edition, Nov./07)
Intracoastal Waterway Miami to Elliot Key
Corrected through NM 11/24/2007
Corrected through LNM 11/20/2007
Scale 1:40,000

ENC Comparison **US5FL21M**

Miami to Elliott Key
Edition 14
Application Date 2009-08-04
Issue Date 2009-08-04
Chart 11465

D.1.1 Hydrography

The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section "D" of the Descriptive Report. The following exceptions are noted:

D.1.6. Chart Comparison

a) The following underwater rocks were submitted by the field but were not discussed in the Descriptive Report. They were revised to shoal depths during office verification of the survey.

Feature Submitted	Latitude	Longitude	Depth (Meters)	Remarks
UWTROC	25-40-47.79480N	080-07-16.56552W	5.45	Chart 18 ft sounding
UWTROC	25-38-22.31592N	080-07-00.08544W	5.69	Chart 18 ft sounding
UWTROC	25-40-12.16092N	080-10-28.89480W	3.48	Update the area with present survey data
UWTROC	25-39-26.08164N	080-07-54.05124W	5.21	Update the area with present survey data
UWTROC	25-39-30.79188N	080-07-51.44412W	4.67	Chart 15 ft sounding
UWTROC	25-39-43.23060N	080-07-41.78748W	5.03	Chart 16 ft sounding
UWTROC	25-39-44.47620N	080-07-43.43772W	5.05	Update the area with present survey data
UWTROC	25-39-31.42332N	080-09-05.16744W	2.60	Update the area with present survey data
UWTROC	25-40-39.16956N	080-07-25.58892W	5.43	Update the area with present survey data
UWTROC	25-39-10.51056N	080-09-56.87640W	3.81	Chart 12 ft sounding
UWTROC	25-38-55.47696N	080-10-09.35436W	4.31	Update the area with present survey data
UWTROC	25-38-57.01524N	080-10-03.28224W	3.45	Chart 11 ft sounding
UWTROC	25-38-48.13944N	080-09-50.22648W	3.93	Chart 13 ft sounding
UWTROC	25-38-58.0229N	080-09-40.57128W	3.39	Chart 11 ft sounding

b) The following five accommodation platforms were positioned by the present survey. It is recommended that the associated charted Obstn (ruins) be deleted and the present survey platforms be added to the chart and ENC.

Charted Feature	Charted Latitude	Charted Longitude	Submitted Latitude (center)	Submitted Longitude (center)
Obstn (ruined)	25-39-18.1332N	080-10-28.9776W	25-39-16.3319N	080-10-28.5228N
Obstn (ruined)	25-39-16.2828N	080-10-05.7576W	25-39-17.4214N	080-10-06.1067N
Obstn (ruined)	25-39-06.9480N	080-10-08.5980W	25-39-07.4620N	080-10-07.2351N
Obstn (ruined)	25-39-06.6060N	080-10-14.1600W	25-39-07.1244N	080-10-13.8932W
Obstn (ruined)	25-39-03.1212N	080-10-53.4972W	25-39-02.4565N	080-10-53.9698N

c) The following two accommodation platforms were positioned by the present survey. These platforms were not shown on the chart or ENC. It is recommended that these platforms be added to the chart and ENC in the present survey location.

Submitted Feature	Submitted Latitude (center)	Submitted Longitude (center)
Offshore platform (area)	25-38-29.0698N	080-10-53.0674N
Offshore platform (area)	25-38-51.9706N	080-10-30.3838N

d) During the present survey, there was no collection of seabed area characteristics; therefore it is recommended that the sixteen characteristics charted within the present survey limits be retained as charted.

e) The following features were not disproved by the present survey and should be retained as charted.

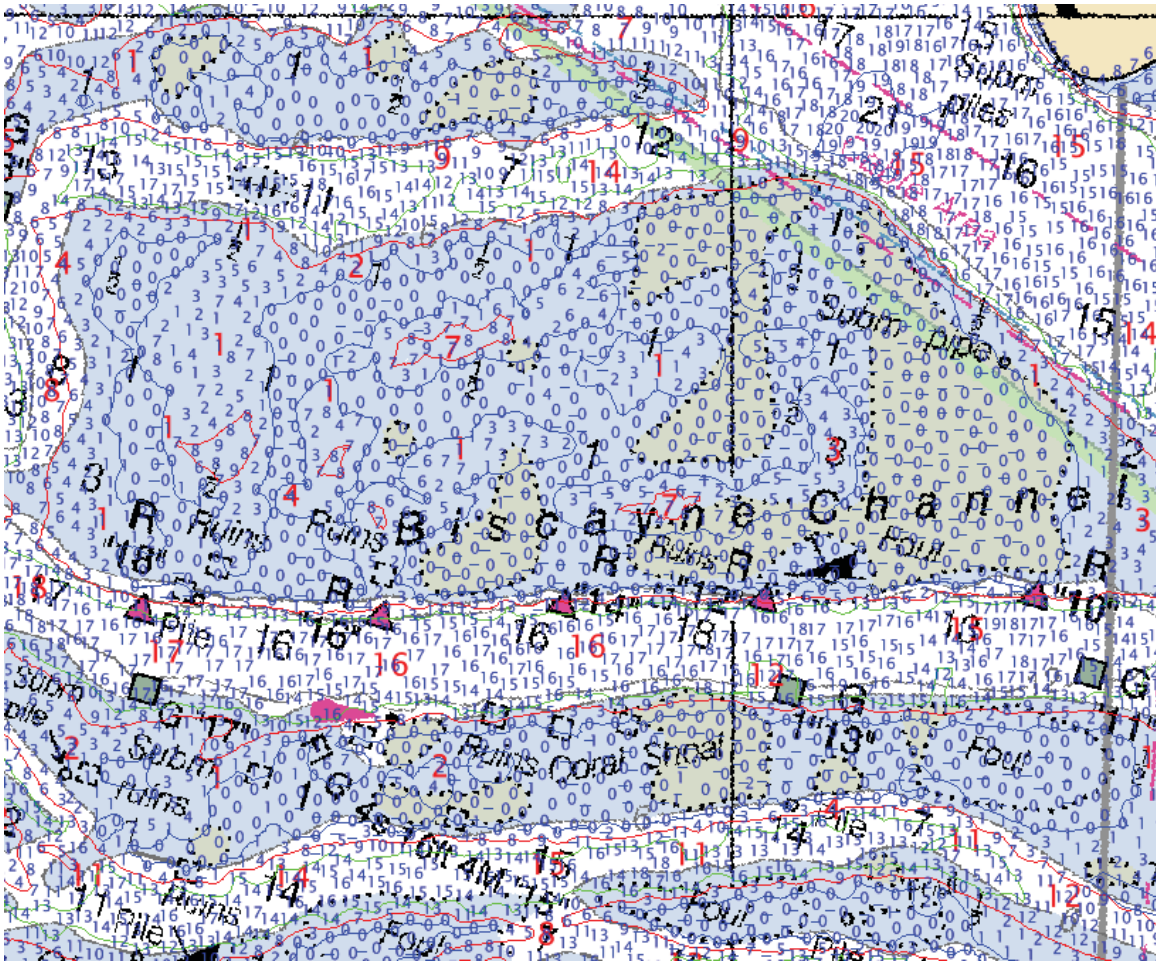
Charted Feature	Latitude	Longitude
Dangerous sunken wreck symbol (PA)	25-39-00.0000N	080-08-39.9984N
Visible wreck	25-39-17.9352N	080-09-51.8868N
Visible Wreck	25-38-48.3864N	080-10-44.7276N
Visible Wreck	25-41-09.0996N	080-10-48.5868N
Dangerous Wreck	25-38-48.6060N	080-10-39.3060N
Visible Wreck (PA)	25-38-59.5284N	080-13-00.5160N
Dangerous sunken wreck symbol	25-39-47.3004N	080-10-39.1620N
Visible Wreck (PA)	25-40-42.3120N	080-10-29.4240N
Weed/Kelp	25-30-34.0440N	080-08-44.8728N
Weed/Kelp	25-40-11.0496N	080-08-45.9492N
Weed/Kelp	25-39-05.5080N	080-07-32.6856N
Weed/Kelp	25-40-10.4304N	080-07-34.7412N
Pile	25-39-16.1136N	080-10-44.3604N
Pile	25-39-00.4788N	080-11-08.2104N
Pile	25-38-40.3404N	080-10-39.5688N
Pile	25-38-23.3448N	080-09-32.5836N
Pile	25-39-00.7416N	080-09-55.0044N
Pile	25-38-45.7368N	080-09-58.2516N
Pile	25-39-06.5520N	080-11-06.1116N
Pile	25-38-41.4636N	080-10-34.8924N
Pile	25-38-49.4520N	080-10-49.4040N
Pile	25-38-52.2132N	080-09-50.5332N
Pile	25-38-32.3988N	080-09-58.2012N
Obstn (foul area)	25-39-04.5866N	080-09-37.6662N
Obstn (foul area)	25-38-50.6496N	080-10-26.6504N
Obstn (foul area)	25-39-18.7719N	080-09-52.3286N

Charted Feature	Latitude	Longitude
Obstn (foul area)	25-38-52.9891N	080-10-01.4444N
Obstn (foul area)	25-38-51.5456N	080-09-45.5740N
Obstn symbol (Subm piles PA)	25-37-58.0260N	080-09-22.1400N
Obstn (ruins)	25-38-08.0880N	080-10-09.6528N
Obstn (Subm pile)	25-38-34.1628N	080-11-07.4976N
Obstn (subm piles)	25-38-43.3536N	080-10-25.2336N
Obstn (Piles)	25-38-43.4328N	080-10-30.9288N
Obstn (Subm pile)	25-38-43.4328N	080-10-23.7180N
Obstn (Piles)	25-38-44.1564N	080-10-29.8524N
Obstn (Subm pile)	25-38-44.7108N	080-10-24.0636N
1 ft Dangerous Obstn	25-38-45.2004N	080-10-47.2008N
Obstn (ruins)	25-38-55.8564N	080-10-45.1488W
Obstn (ruins)	25-38-59.8200N	080-10-22.9908W
Obstn (Subm ruins)	25-39-03.0276N	080-10-39.3204N
Obstn (Subm pile)	25-39-03.0672N	080-10-55.3908N
Obstn (Subm ruins)	25-39-05.9868N	080-10-30.6516N
Obstn (Subm ruins)	25-39-07.5816N	080-10-19.6248N
Obstn (ruins)	25-39-17.0100N	080-10-45.5124N
Obstn (ruins)	25-39-18.8604N	080-10-42.5856N
Obstn (Subm pipe)	25-39-33.9948N	080-09-37.3896N
10 ft Dangerous Obstn	25-40-53.2056N	080-11-04.00204N

f) The following features were disproved by the present survey and should be deleted from the chart. Delete the limits and the coral shoal label. Update the area with present survey data.

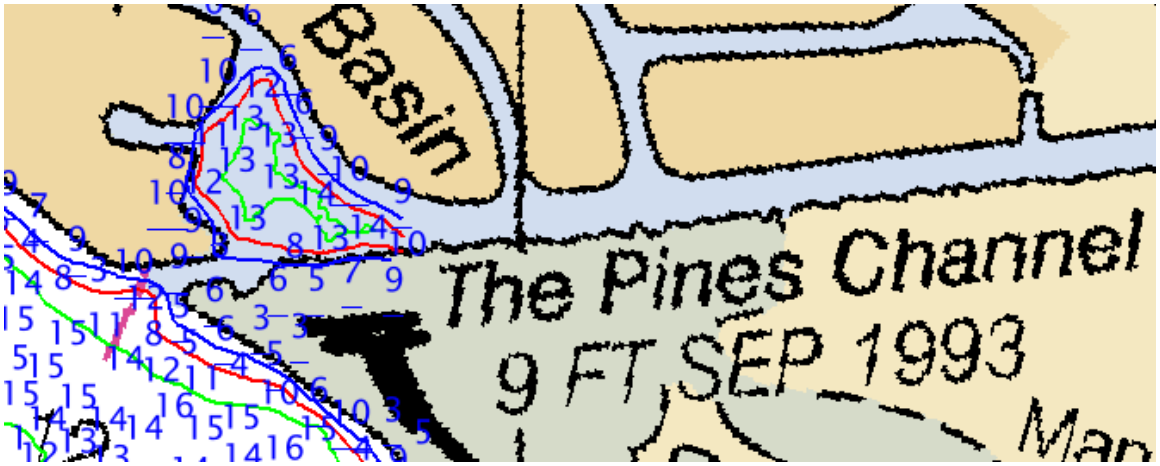
Charted Feature	Latitude (center)	Longitude (center)
Coral Shoal (area)	25-37-53.8518N	080-10-46.1453N
Coral Shoal (area)	25-38-15.1083N	080-10-28.4077N

g) This area has numerous charted intertidal areas. There have been dramatic changes in the intertidal areas, especially in the Biscayne Channel and the area labeled as a coral shoal to the south of the Channel. All the charted areas have changed drastically and there are many new intertidal areas throughout the survey area. It is recommended that the charted intertidal areas be deleted and new intertidal areas charted according to the present survey data.

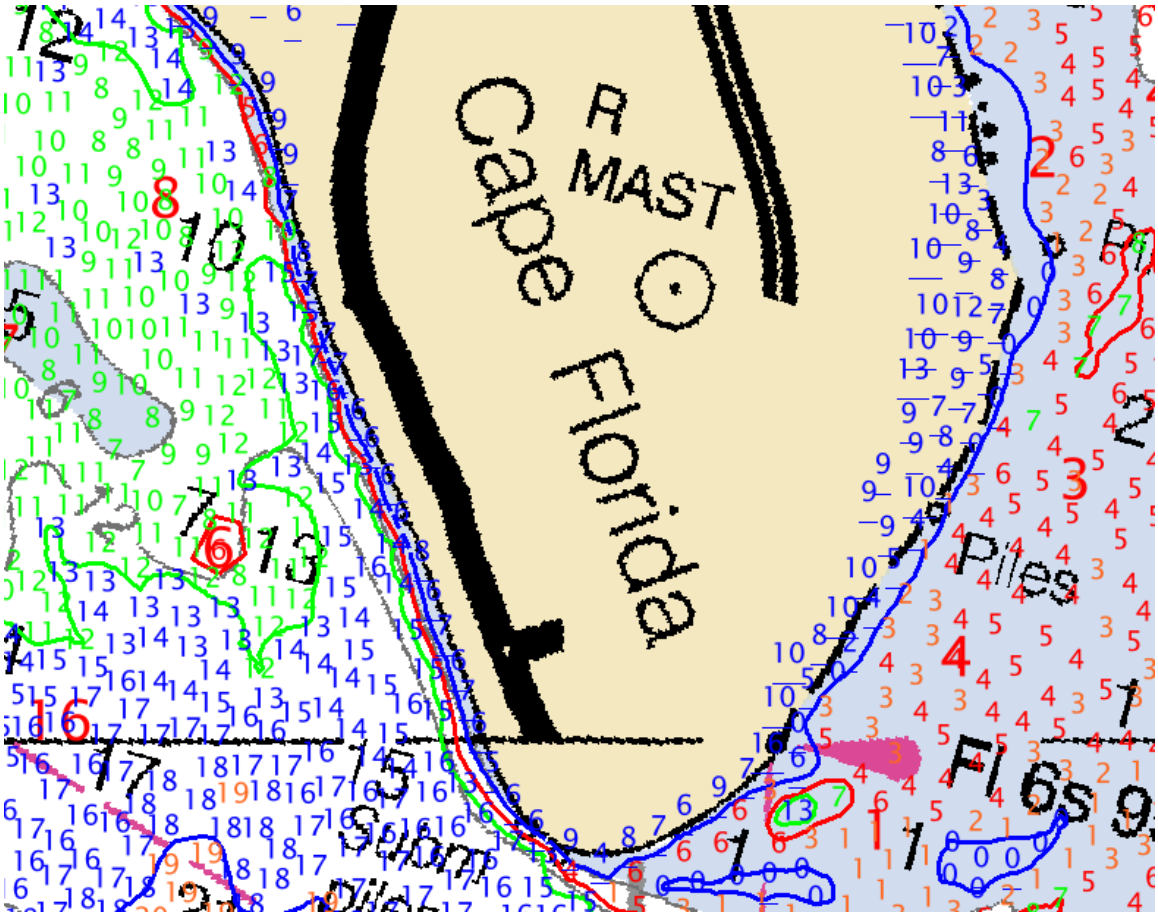


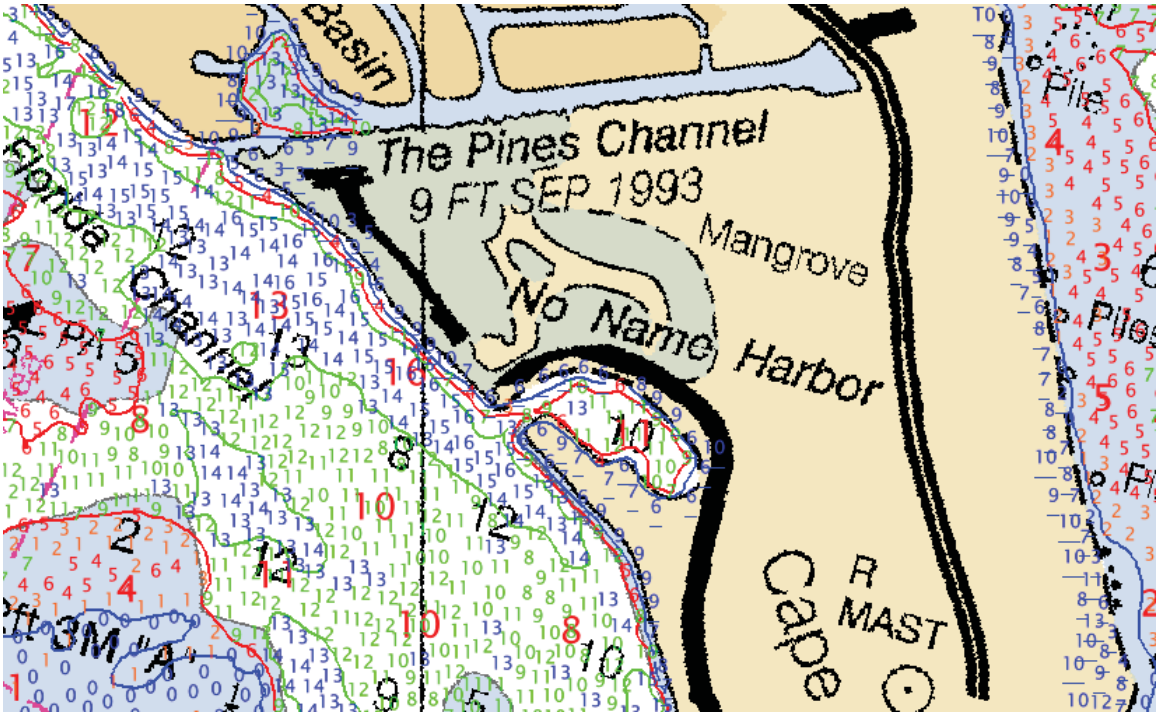
h) The Pines Channel -

H11871 bathymetry data in The Pines Channel has depths as shoal as 8.37 feet along the centerline in the vicinity of Latitude 25-40-54.8338N, Longitude 080-10-08.6473W. Recommend revise note of "9 FT SEP 1993" to "8 FT AUG 2008".



k) There are numerous depths above MHW on the present survey. These depths were used to help delineate the zero depth contour but they were not charted because this is a Lidar Survey and it was felt that they were usable only in the capacity of reference depths. These negative depths are located around the shoreline areas. The negative depths are included in the survey scale data set but they are not in the chart scale data set.





D.3. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. See Section D.1. of this report for a list of the Raster Charts and Electronic Navigation Charts (ENC) used for compiling the present survey:

D.4. ADEQUACY OF SURVEY

The present survey is adequate to supersede the charted bathymetry within the common area. Any features not specifically addressed either in the H-Cell BASE Cell File or the Blue Notes should be retained as charted. Refer to the Descriptive Report for further recommendations by the hydrographer.

This Document is for Office Process use only and is intended to supplement, not supersede or replace, information/recommendations in the Descriptive or Evaluation Reports

AHB COMPILATION LOG

General Survey Information	
REGISTRY No.	H11871
PROJECT No.	OPR-H328-KRL-08
FIELD UNIT	TENIX LADS, INCORPORATED
DATE OF SURVEY	13 JULY- 26 AUGUST 2008
LARGEST SCALE CHART	***11465, edition 14, 20090804, 1:40k***
ADDITIONAL CHARTS	***N/A***
SOUNDING UNITS	**feet**
COMPILER	Kolleen McKenzie/Deborah A. Bland

Source Grids	**File Name** H:\Compilation\H11871_H328-TENIX\AHB_H11871\
	E-SAR Final Products\GRIDS\H11871_3m_UNC_Final_shoal_Extract
Surfaces	**File Name** H:\Compilation\ H11871_H328-TENIX\AHB_H11871\COMPILE\Working
Combined	
Interpolated TIN	\Interpolated TIN**H11871_12m_InterpTIN.hns**
Shifted Interpolated TIN	\Shifted Surface\ **H11871_12m _InterpTIN_Shifted.hns**
Product Surface	\Product Surface**HXXXXX_Xm_Product_Surface.hns**
Final HOBs	**File Name** H:\Compilation\ H11871_H328-TENIX\AHB_H11871\COMPILE\Final_Hobs\
Survey Scale Soundings	**H11871_SS_Soundings_Grouped.hob**
Chart Scale Soundings	**H11871_CS_Soundings.hob**
Contour Layer	**H11871_Contours.hob and H11871_Zero_Contour.hob**
Feature Layer	**H11871_Features.hob**
Meta-Objects Layer	**H11871_MetaObjects_RRV.hob**
Blue Notes	**H11871_BlueNotes.hob**
ENC Retain Soundings	**US5FL21M_ENC_Retain.hob**

Meta-Objects Attribution	
Acronym	**Value**
M_COVR	
CATCOV	Available
SORDAT	20080826
SORIND	US,US,survy,H11871
M_QUAL	
CATZOC	zone of confidence U (data not assessed)
INFORM	H11871,OPR-H328-KRL-08,Tenix LADS Aircraft
POSACC	
SORDAT	20080826
SORIND	US,US,survy,H11871
SUREND	20080826
SURSTA	20080713
DEPARE	

DRVALV 1	0.00000
DRVALV2	30.8011
SORDAT	20080826
SORIND	US,US,survy,H11871
M_CSCL	
CSCALE	
SORDAT	
SORIND	

SPECIFICATIONS:

I. COMBINED SURFACE:
   a. Number of ESAR Final Grids: n/a
   b. Resolution of Combined (m): n/a

II. SURVEY SCALE SOUNDINGS (SS):
   a. Radius
   b. Shoal biased
   c. Use Single-Defined Radius (mm at Map Scale): ; Radius Value = 1
   d. Queried Depth of All Soundings
      i. Minimum: -16.43701
      ii. Maximum: 30.8720

III. INTERPOLATED TIN SURFACE:
   a. Resolution (m): 12
   b. Linear
   c. Shifted value: -0.229m (feet)

IV. CONTOURS:
   a. Use a Depth List: H11871_NOAA_depth_curves_list.txt
   b. Line Object: DEPCNT
   c. Value Attribute: VALDCO

V. FEATURES:
   a. Total Number of Features:11
   b. Number of Insignificant Features:

VI. CHART SURVEY SOUNDINGS (CS):
   a. Number of ENC CS Soundings:630
   b. Radius
   c. Shoal biased
   d. Use Single-Defined Radius: m on the ground
      i. Radius Value (m):
      ii. Or use a Sounding Space Range Table (if applicable): HXXXXX_SSR.txt
   e. Filter: Interpolated != 1
   f. Number Survey CS Soundings:593

VII. Notes:

APPROVAL SHEET
H11871

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with National Ocean Service and Office of Coast Survey requirements except where noted in the Descriptive Report and the Evaluation Report.

All final products have undergone a comprehensive reviews per the Hydrographic surveys Division Office Processing Manual and are verified to be accurate and complete except where noted.

_____

Kolleen McKenzie
Hydrographic Intern
Atlantic Hydrographic Branch

Deborah A. Bland
Digitally signed by Deborah A. Bland
DN: cn=Deborah A. Bland, o=Atlantic Hydrographic Branch, ou=NOAA/NOS, email=Deborah.A.Bland@NOAA.gov, c=US
Date: 2010.02.25 09:24:28 -05'00'

_____

Deborah A. Bland
Cartographer
Atlantic Hydrographic Branch

I have reviewed the H-Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet National Ocean Service requirements and standards for products in support of nautical charting except where noted.

Richard T. Brennan
I am approving this document
2010.02.28 21:01:50 -05'00'

Approved: _____

Richard T. Brennan
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

David Scharff
Digitally signed by David Scharff
DN: cn=David Scharff, o=OCS, ou=NOAA, email=david.scharff@noaa.gov, c=US
Reason: AWOIS and Surf Check complete
Date: 2010.03.02 09:48:41 -05'00'