

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: H12639

LOCALITY

State: USVI

Sub-locality: Lang Bank, St Croix

2014

CHIEF OF PARTY
Timothy Battista

LIBRARY & ARCHIVES

DATE: April 2014

HYDROGRAPHIC TITLE SHEET

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State: **USVI**

General Locality: **Caribbean Sea**

Sub-Locality: **Lang Bank, St. Croix**

Scale: **1:40,000** Date of Survey: **March 15 to April 2, 2014**

Instructions Dated: **21 February 2014** Project Number: **M-I907-NF-14**

Vessel: **NOAA Ship *Nancy Foster***

Chief of Party: **Timothy Battista**

Surveyed by: **CCMA Biogeography Branch**

Soundings by: **Reson 7125 SV2**

Graphic record scaled by: **N/A**

Graphic record checked by: **N/A**

Protracted by: **N/A**

Automated Plot: **N/A**

Verification by:

Soundings in: **Meters at MLLW**

Remarks:

- 1) All Times are in UTC.
- 2) This is a Coral Reef Mapping Project and Hydrographic Survey.

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via <http://www.ngdc.noaa.gov/>.

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ACRONYMS AND ABBREVIATIONS

AtoN	Aid to Navigation
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DN	Day Number
DtoN	Danger to Navigation
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSSD	Hydrographic Surveys Specifications and Deliverables
IHO	International Hydrographic Organization
MBES	Multibeam
MLLW	Mean Lower Low Water
NAD83	North American Datum of 1983
QC	Quality Control
RNC	Raster Navigational Chart
SSS	Side Scan Sonar
TPU	Total Propagated Uncertainty
UTM	Universal Transverse Mercator
RNC	Raster Navigation Chart
ENC	Electronic Navigation Chart

Descriptive Report to Accompany Hydrographic Survey H12639

Project M-I907-NF-14

Locality: Caribbean Sea

Sub-locality: Lang Bank, St. Croix, USVI

Scale 1:40,000

March 2014 – April 2014

NOAA Ship Nancy Foster

Chief Scientist: Tim Battista

Lead Hydrographer: Mike Stecher

A. AREA SURVEYED

The Center for Coastal Monitoring and Assessment (CCMA) conducted hydrographic survey operations in the Caribbean Sea, Lang Bank St Croix, US Virgin Islands. Survey H12639 was conducted in accordance with the Hydrographic Survey Project Instructions (February 21, 2014) for M-I907-NF-14.

A1. SURVEY LIMITS

The extents of the H12639 survey limits are listed in Table 1.

Table 1. H12639 Survey Limits

Northeast Limit	Southwest Limit
17.81 N	17.80 N
64.55 W	64.43 W

A2. SURVEY PURPOSE

The project is being conducted in support of the National Center for Coastal Ocean Science (NCCOS) to provide shallow water bathymetric data of critical benthic habitats in selected areas off of the coast of St. Croix, USVI. Bathymetric data from the project was collected with multibeam echosounder and will be utilized by the Office of Coast Survey (OCS) to update the nautical charts in the surveyed area.

A3. SURVEY QUALITY

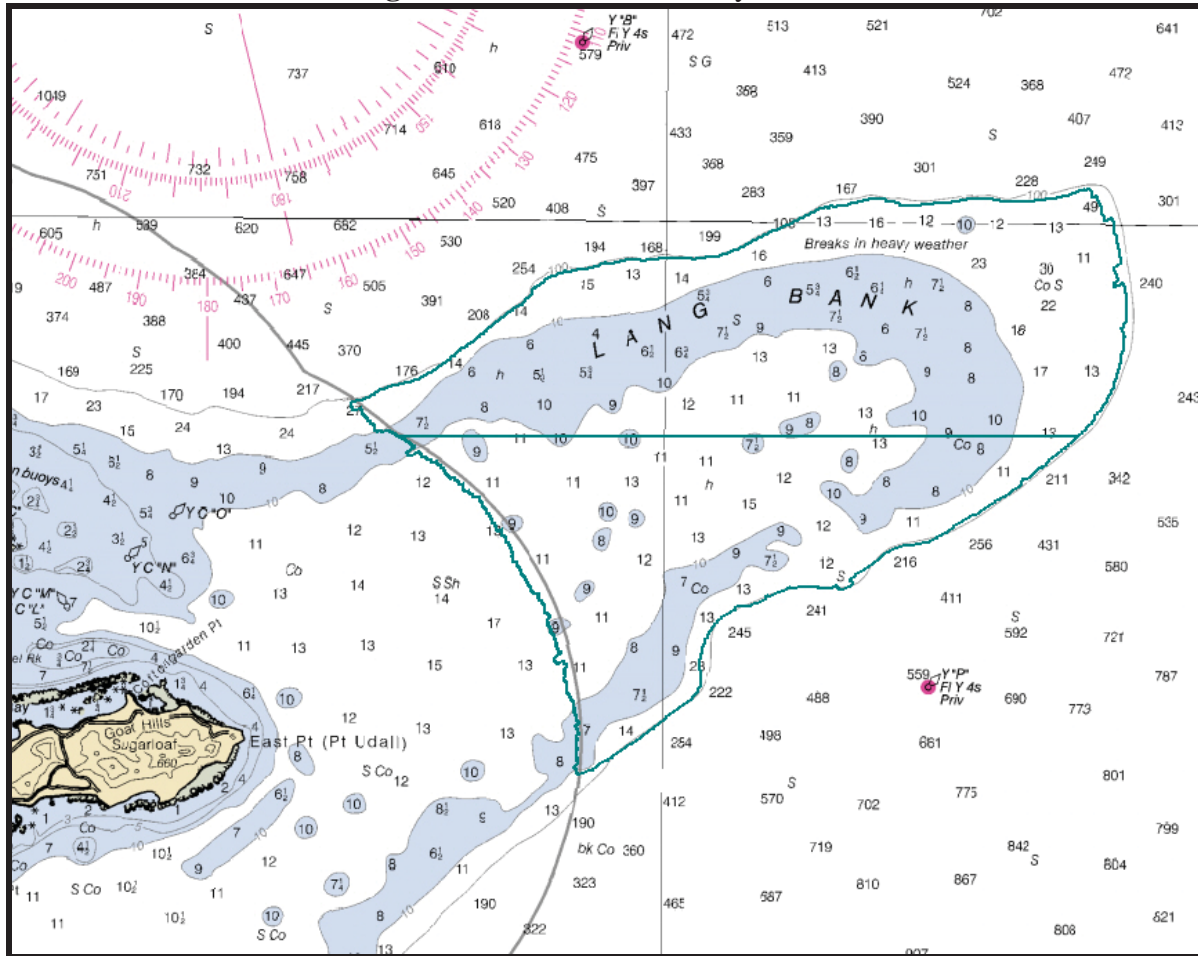
The entire survey is adequate to supersede previous surveys.

A4. SURVEY COVERAGE

As per the Project Instructions, this survey was conducted using the complete coverage multibeam specification as defined in the Hydrographic Survey Specifications and Deliverables April 2014 (HSSD). While conducting the survey, bathymetric coverage was monitored by creating CUBE surfaces with 1-meter, 2-meter, 4-meter and 8-meter resolutions as per HSSD. Sounding densities generally meet the five soundings per node criteria, except in areas where multibeam data were shadowed by features of significant height and from ping drop outs from the Reson 7125-SV2. A fill plan was created for all holidays greater than the required

specifications. Due to a balance between coverage and time allotment some minor holidays do exist in between survey transects.

Figure 1. H12639 Survey Outline



A5. SURVEY STATISTICS

Detailed survey statistics for H12639 are provided in Table 2.

Table 2. H12639 Hydrographic Survey Statistics

Survey Statistics	MBES
MBES main scheme (nm)	595.0
Crosslines (MBES nm)	31.7
Additional full coverage MBES (nm)	0
Additional full coverage MBES crosslines (nm)	0
Number of item investigations that required additional survey effort	0
Number of bottom samples	0
Total number of square nautical miles	18.58

Data acquisition was conducted from March 15, 2014 (DN 074) to April 2, 2014 (DN 092). Table 3 lists specific dates of survey and patch test data acquisition. Patch test data was used to determine system biases in support of the survey are also included with the digital deliverable.

Table 3. H12639 Days of Acquisition

Dates of Acquisition	
March	15-23, 30-31
April	1-2
Dates of Patch Test Acquisition	
March	21

A6. SHORELINE

Shoreline investigation was not required for M-I907-NF-14.

A7. BOTTOM SAMPLES

Bottom Samples were not required for M-I907-NF-14.

B. DATA ACQUISITION AND PROCESSING


B1. EQUIPMENT AND VESSELS

The M-I907-NF-14 *Data Acquisition and Processing Report* (DAPR) submitted under separate cover, details equipment and vessel information as well as data acquisition and processing procedures used during this survey. There were no vessel or equipment configurations used during data acquisition that deviated from those described in the DAPR.

B1.a Vessels

The vessel used during this survey is listed in Table 4.

Table 4. Vessel Specifications

NOAA Ship Nancy Foster	
	
Hull Number	R352
Builder	McDermott, Inc
Year Built	1990
Weight	1190 long tons
Length Overall	187'
Beam	40'
Draft, Maximum	11.2'
Cruising Speed	10.5 knots
Max Survey Speed	7 knots

B1.b Equipment

Equipment systems used during data acquisition are listed in Table 5.

Table 5. Equipment Used

Type	Manufacturer	Model
Multibeam Echosounder	Reson	7125-SV2
Surface Sound Speed	Reson	SVP-71
Primary Sound Speed Profiler	Sippican	XBT Deep Blue
Secondary Sound Speed Profiler	Sea-Bird	SEACAT SBE-19Plus CTD Profiler
Positioning & Attitude	Applanix	POS/MV 320 v4
Positioning & Attitude	Trimble	DSM132

B2. QUALITY CONTROL

Survey data show decent internal consistency. As shown in Appendix II of the M-I907-NF-14 DAPR, the lead line check difference was 0.10 meters. Results from the crossline analysis, final CUBE surface uncertainties and the Total Vertical Uncertainties (TVU QC) indicate decent internal consistency of the multibeam data.

B2.a Crosslines

A total of 31.7 nautical miles of crosslines, or 5.3% of all survey lines, were run for analysis of survey accuracy. Crosslines were run in a direction of less than 45 degrees to main scheme lines across most of the surveyed area, providing a good representation for analysis of consistency. All crosslines were used for crossline comparisons.

Crossline analysis was performed using the CARIS Hydrographic Information Processing System (HIPS) Quality Control (QC) Report tool, which compares crossline data to a gridded surface and reports results by beam number. Crosslines were compared to a 2-meter CUBE surface encompassing mainscheme data for the entire survey area. The QC Report plots and tabular data are included in Separate II Digital Data. The results of the analysis meet the requirements as stated in the 2014 Hydrographic Surveys Specifications and Deliverables (HSSD).

B2.b Uncertainty

Survey specific uncertainty parameters for tide and sound speed are included in Table 6. Additional discussion of these parameters is included in the M-I907-NF-14 DAPR.

Table 6. TPU Values for Tide and Sound Speed

Total Propagated Uncertainty Computation in CARIS HIPS*		
<i>Tide Values</i>	Uncertainty* (m)	Day Number Range
Tide Value Measured	0.025	all
Tide Value Zoning	0.05	all
<i>Sound Speed Values</i>	Uncertainty* (m/s)	
Sound Speed Measured (SN 5510)	4.0	all
Surface Sound Speed	0.500	all

During surface finalization in HIPS, the "greater of the two" option was selected, where the calculated uncertainty from total propagated uncertainty (TPU) is compared to the standard deviation (StdDev) of the soundings influencing the node, and where the greater value is assigned as the final uncertainty of the node. The uncertainty of the finalized surface increased for nodes where the StdDev of the node was greater than the total propagated uncertainty. The resulting calculated uncertainty values of all nodes in the 2m finalized surfaces range from 0.45 meters to 5.54 meters with the larger values resulting from the steep drop offs along the reef shelf or along coral heads. The maximum uncertainty value is associated with a high standard deviation in the depth surface caused by gridding data over an irregular seafloor.

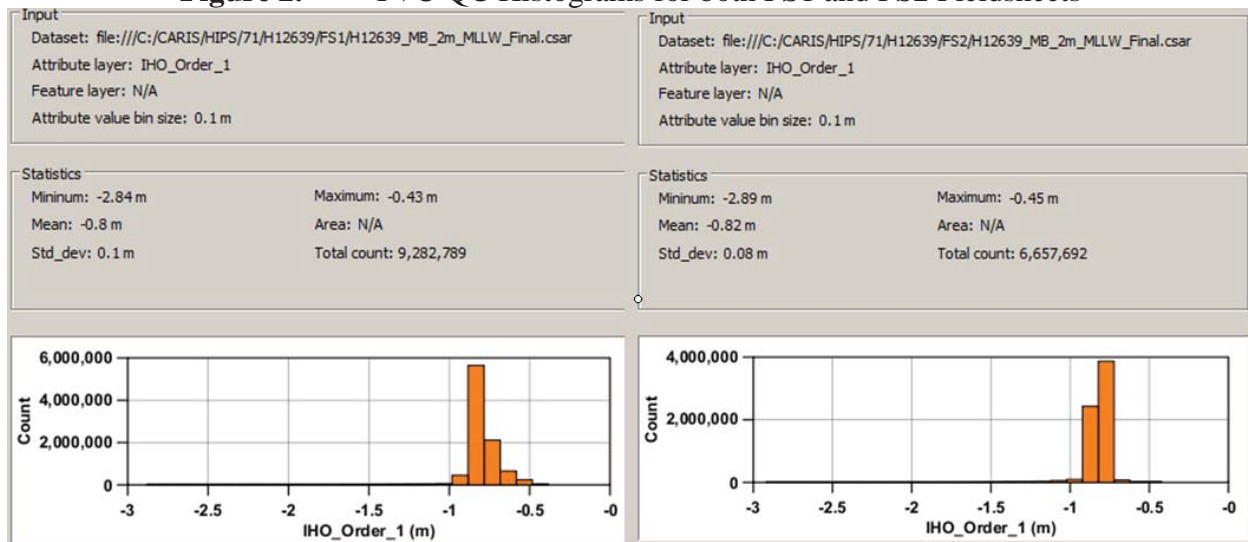
To determine if surface grid nodes met International Hydrographic Organization (IHO) Order 1 specifications a Total Vertical Uncertainty Quality Check (TVU QC) was performed. This

routine is used to identify nodes in the 2m finalized CUBE surfaces that have estimated uncertainties that exceed the NOAA specifications. The NOAA uncertainty standards are based on IHO S-44 standards for hydrographic surveys. Specifically, the TVU QC layer compares the estimated uncertainty of the depth estimate to the allowable uncertainty of the depth estimate node by node.

This routine uses the ratio method which visualizes the ratio of the uncertainty at a node to the maximum allowed IHO uncertainty for each node via a computed layer in CARIS. The TVU QC layer scales with depth and demonstrates what fraction of the total allowable error budget is consumed by the estimated uncertainty. The TVU QC layers are labeled as IHO_Order_1 and reside as child layers within the finalized 2m CUBE surfaces for FS1 and FS2 (fieldsheet). The TVU QC layers were reviewed with filters set to -1 to -100, and areas that had these values were further examined by the MBE data processor.

As shown in Table 7, the results from the TVU QC method show that both fieldsheets have met and exceeded IHO Order 1 specifications.

Figure 2. TVU QC Histograms for both FS1 and FS2 Fieldsheets



B2.c Junctions

No Junctioning surveys were provided for this project.

B2.d Sonar QC Checks

Sonar System quality control checks were conducted as detailed in the quality control section of the M-I907-NF-14 DAPR.

B2.e Equipment Effectiveness

The Nancy Foster’s Reson 7125-SV2 system has historically had issues with dropped pings, system crashes and issues that seem to reflect sound velocity and/or positioning issues. All resources have been consulted about these continuing issues including Reson, Applanix, HSTP, Chief Survey Tech, Chief Electronic Tech and others to no avail. Although the system does

collect data to IHO specification it should be noted that there are areas of lower confidence due to poor system performance.

B2.f Factors Affecting Soundings

Two lines of HDCS data did not take the Trueheave corrections appropriately. The lines affected are line number 008_0000 from DN075, and 028_1043 from DN080. When Trueheave was applied it seemed to introduce a timing error in the heave application. The real time heave was used instead of Trueheave for the two mentioned files.

B2.g Sound Speed Methods

Hand launched Sippican XBT's was the primary sound velocity acquisition device. The XBT's were deployed at no more than 5 hour increments during survey while underway and actions were taken to try and distribute the casts evenly throughout out the survey area. Occasional SVP casts were performed with an SBE19Plus for comparison purposes (DN71 and DN085). Additional discussion of sound speed methods can be found in the M-I907-NF-14 DAPR.

B2.h Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the M-I907-NF-14 DAPR

Survey speeds were maintained to meet or exceed along track coverage requirements throughout the survey. A fill plan was created for all holidays greater than the required specifications. Due to a balance between coverage and time allotment some minor holidays do exist in between survey transects.

B3. ECHO SOUNDING CORRECTIONS

B3.a Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the M-I907-NF-14 DAPR.

B3.b Calibrations

No additional calibration tests were conducted beyond those discussed in the M-I907-NF-14 DAPR.

B4. BACKSCATTER

Multibeam backscatter was logged in Hypack .7K format and was processed and evaluated with a combination of Fledermaus FMGT and the Hypack implementation of Geocoder. The backscatter data was used in combination with the bathymetry to create Principal Component Analysis surfaces in GIS to delineate areas of change. This information was used to plan ROV transects to characterize benthic habitats in the surveyed regions.

B5. DATA PROCESSING

B5.a Software Updates

There was a combination of Caris HIPs 7.1.2 and 8.1.8. used to convert and process the data for this sheet. The *Nancy Foster's* main processing machine had both versions loaded. The majority of the data was pre-processed with 7.1.2 and all final data and analysis was performed with 8.1.8

B5.b Surfaces

Bathymetric grids were created relative to Mean Lower Low Water (MLLW) in CUBE format using complete coverage resolution requirements as described in the HSSD and using the CUBEParams_NOAA.xml file. The survey area was split into two fieldsheets, FS1 and FS2 with identically named CUBE surfaces. BAGs were exported from Caris with the identical name as the surface from which they were derived from.

Finalized CUBE surfaces are delivered with and without depth thresholds. Cube surfaces appended with “Final” are not depth thresholded. Depth thresholds were applied as defined in the HSSD and are appended with the “Depth_TH” description. The NCCOS and CCMA groups prefer not to have depth thresholded surfaces for seafloor classification reasons.

Thorough analysis determined that the 1m resolution CUBE surface is an accurate representation of the seafloor in the shallow regions and the surface honors the shoalest reliable soundings within 1/2 of the allowable TVU, therefore no designated sounding were used on this survey sheet. Table 7 lists the finalized CUBE surfaces submitted with this survey.

Table 7. H12639 Multibeam Surfaces (FS1 and FS2)

Surface Name	Resolution
H12639_MB_1m_MLLW_Final (Depth_TH)	1.0m
H12639_MB_2m_MLLW_Final (Depth_TH)	2.0m
H12639_MB_4m_MLLW_Final (Depth_TH)	4.0m
H12639_MB_8m_MLLW_Final (Depth_TH)	8.0m

C. VERTICAL AND HORIZONTAL CONTROL

No HorCon or VertCon operations were performed for this survey. A summary of horizontal and vertical control for this survey follows.

C1. VERTICAL CONTROL

The vertical datum for this project is MLLW. Additional information related to tides and tide correctors is included in Tables 9, 10 and 11.

Table 8. Tide Stations

Station Name	Station ID
Christiansted, USVI	9751364
Lime tree Bay	9751401

Table 9. HIPS Water Level Files

File Name	Status
9751364.tid	Verified

Table 10. HIPS Zoning Files

File Name	Status
I907NF2014CORP.zdf	Final Zoning

C2. HORIZONTAL CONTROL

The horizontal datum for this project is North American Datum of 1983 (NAD83) projected in Universal Transverse Mercator (UTM) Zone 20. All of the real-time navigation data were collected in Differential GPS (DGPS) mode. DGPS corrections were received from the U.S. Coast Guard (USCG) beacon located at Isabel, Puerto Rico (295 kHz) or from Omnistar when the vessel was out of range of the Isabel station.

D. RESULTS AND RECOMMENDATIONS

D1. CHART COMPARISON

The chart comparison was performed by comparing a H12639 shoal biased selected sounding layer generated in Caris to the affected RNC and ENC charts listed in the Project Instructions. A 160-meter selected sounding surface of the entire survey area was generated from the finalized 2-meter CUBE depth surface. The chart comparison was conducted by visually reviewing the resultant surface and charted soundings.

D1.a Raster Charts

The raster chart comparison was performed by comparing RNCs covering the survey area to H12639 using visual comparison techniques. The RNCs are listed in Table 11.

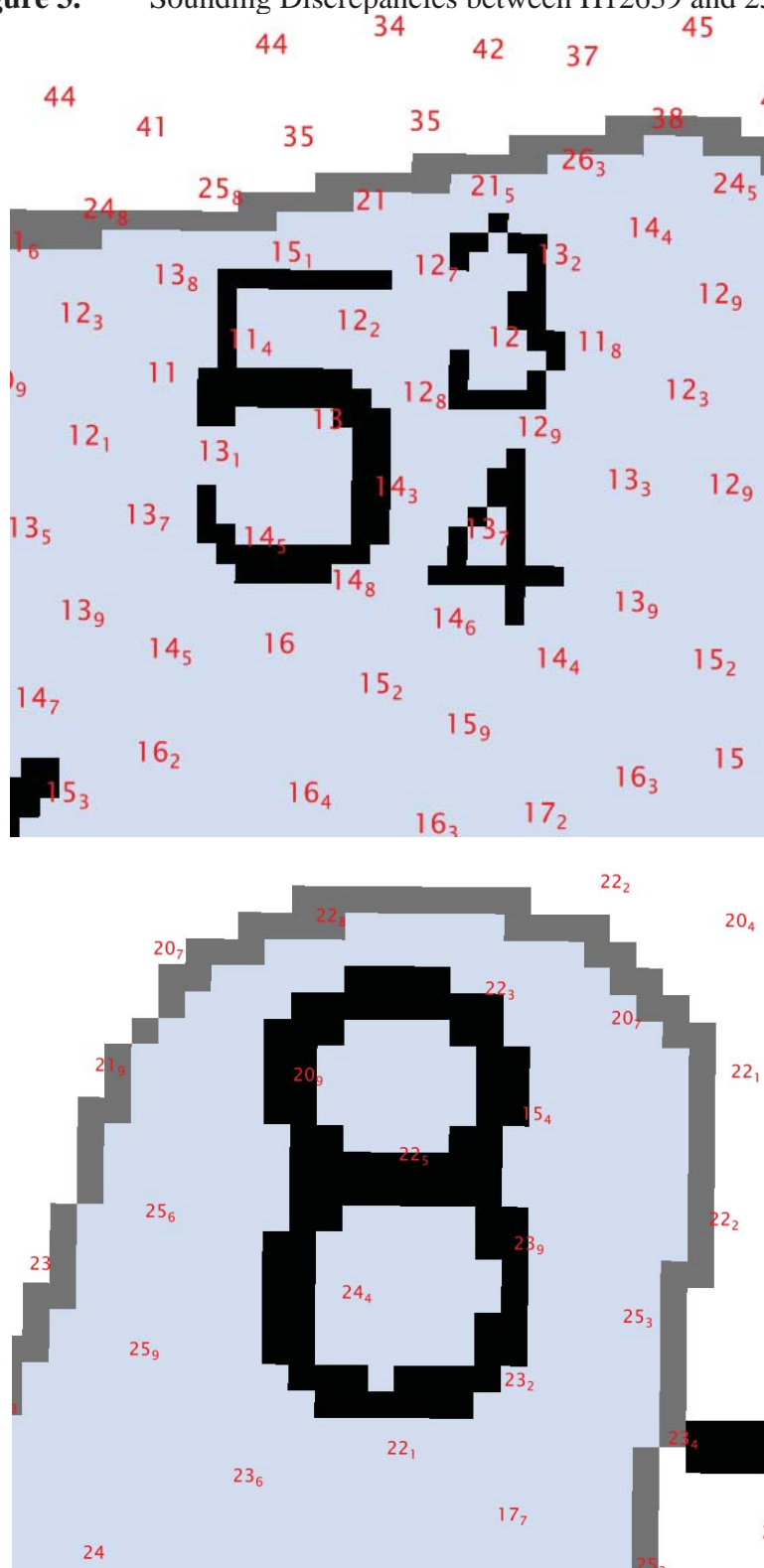
Table 11. RNCs Compared to H12639

Chart	Scale	Edition Number	Edition Date	LNM Date	NM Date
25644	1:20,000	15	01/2014	12/31/2013	01/04/2014
25641	1:100,000	29	09/2013	09/24/2013	09/28/2013
25640	1:326856	45	01/2013	01/21/2014	01/25/2014

25640

Surveyed soundings generally compare to within a few meters with the exception of a several areas where previously surveyed soundings appear to be shoaler. Figure 3 provides examples of multiple discrepancies where RNC soundings were shoaler or mis-charted than the current surveyed soundings.

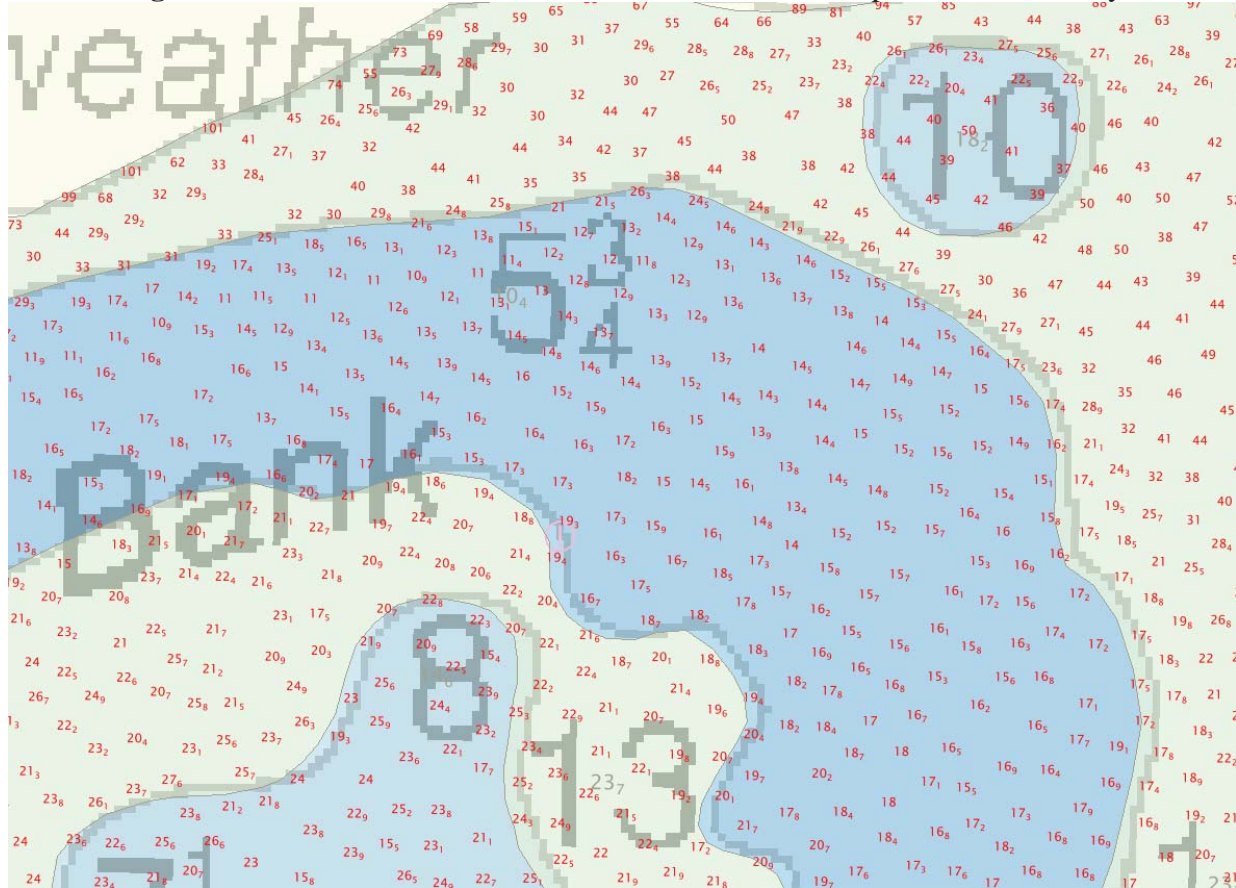
Figure 3. Sounding Discrepancies between H12639 and 25640



Red soundings from the current survey in meters, charted soundings are in fathoms

An ENC to RNC comparison reveals that the same sounding information was used to derive both types of charts and the inconsistencies noted previously are also evident in both charts as shown in Figure 5.

Figure 5. RNC 25640 to ENC US3PR10M chart comparison and overlay



US5PR13M

This ENC did not have coverage within the H12639 survey limits.

US4PR11M

This ENC did not have coverage within the H12639 survey limits.

D1.c AWOIS Items

There were no AWOIS investigations required for this project.

D1.d Charted Features

No charted features were located within the H12639 survey area.

D1.e Uncharted Features

No uncharted features were located within the H12639 survey area.

D1.f Dangers to Navigation

No Dangers to Navigation (Dtons) were reported for this survey.

D1.g Shoal and Hazardous Features

No shoals or potentially hazardous features were located within the H12639 survey area.

D1.h Channels

The H12639 survey area does not contain any anchorage areas, maintained navigation channels or channel lines.

D1.i Bottom Samples

There was no bottom sample requirement for this survey.

D2. ADDITIONAL RESULTS

D2.a Shoreline

Shoreline investigation was not assigned for this project.

D2.b Prior Surveys

Aside from previously discussed charted comparisons, no comparisons with prior surveys were conducted.

D2.c Aids to Navigation

No Aids to Navigation (Atons) were charted or located within the H12639 survey area.

D2.d Overhead Features

There were no overhead bridges, cables, or other structures which would impact overhead clearance in the survey area.

D2.e Submarine Features

The H12639 survey area contained no submarine features.

D2.f Ferry Routes and Terminals

There were no ferry routes or terminals within the survey area.

D2.g Platforms

There were no platforms within the survey area.

D2.h Significant Features

No additional information of scientific or practical value was observed during the survey other than the benthic habitat characterization maps created by the scientific party. No anomalous tidal or environmental conditions were observed during the survey that impacted the quality of the survey.

D2.i Construction and Dredging

There were no construction or dredging activities observed during survey operations.

D3. NEW SURVEY RECOMMENDATIONS

No recommendations for further charting in the Lang Bank region are suggested by the hydrographer.

D3.a Inset Recommendations

No inset recommendations are requested at this time for the surveyed area.

E. APPROVAL SHEET

As Lead Hydrographer, I have ensured that standard field surveying and processing procedures were followed in producing this examination in accordance with the Office of Coast Survey Hydrographic Surveys Division's Field Procedures Manual, and the Hydrographic Surveys Specifications and Deliverables. Field operations for this basic hydrographic survey were conducted under my daily supervision with frequent checks of progress and adequacy.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to N/CS33, Atlantic Hydrographic Branch.

The Data Acquisition and Processing Report for M-I907-NF-14 is submitted separately and contains additional information relevant to this survey.

Michael Stecher
NOAA Contractor
Lead Hydrographer
CCMA Biogeography Branch

Mike
Stecher

Digitally signed by Mike Stecher
DN: cn=Mike Stecher, o,
ou=Solmar Hydro Inc,
email=mike@solmarhydro.com,
c=US
Date: 2014.10.30 11:54:51
-07'00'

APPENDIX I
TIDES AND WATER LEVELS

WATER LEVEL INSTRUCTIONS
M-I907-NF-2014 USVI Essential Fish Habitat Mapping
(01/30/2014 LH)

1.0. TIDES AND WATER LEVELS

1.1. Specifications

Tidal data acquisition, data processing, tidal datum computation and final tidal zoning shall be performed utilizing sound engineering and oceanographic practices as specified in National Ocean Service (NOS) Hydrographic Surveys Specifications and Deliverables (HSSD), dated April, 2013, and OCS Field Procedures Manual (FPM), dated May, 2013. Specifically reference Chapter 4 of the HSSD and Sections 1.5.8, 1.5.9, 2.4.3, and 3.4.2 of the FPM.

1.2. Vertical Datums

The tidal datums for this project are referenced to Chart Datum, Mean Lower Low Water (MLLW) and Mean High Water (MHW). Soundings are referenced to MLLW and heights of overhead obstructions (bridges and cables) are referenced to MHW.

1.2.1. Water Level Data Acquisition Monitoring

The Commanding Officer (or Team Leader) and the Center for Operational Oceanographic Products and Services (CO-OPS) are jointly responsible for ensuring that valid water level data are collected during periods of hydrography. The Commanding Officer (or Team Leader) is required to monitor the pertinent water level data via the CO-OPS Web site at <http://tidesandcurrents.noaa.gov/hydro.shtml>, or through regular communications with CO-OPS/Oceanographic Division (OD) personnel before and during operations. During traditional non duty hours, the Commanding Officer/Team Leader may contact the Continuous Operational Real-Time Monitoring System (CORMS) watch stander who is available 24 hours/day - 7 days/week for assistance in assessing the status of applicable water level station operation. The CORMS watch stander may be contacted either by phone at 301-713-2540 or by Email: CORMS@noaa.gov. Problems or concerns regarding the acquisition of valid water level data identified by the Commanding Officer/Team Leader shall be communicated with CO-OPS/OD (nos.coops.hpt@noaa.gov) to coordinate the appropriate course of action to be taken such as gauge repair and/or developing contingency plans for hydrographic survey operations. In addition, CO-OPS is required to coordinate with the Commanding Officer (or Team Leader) before interrupting the acquisition of water level data for the NWLON stations mentioned above for any reason during periods of hydrography.

1.2.2. The Hydro Hot List (HHL)

Please contact CO-OPS' Hydrographic Planning Team (HPT) at nos.coops.hpt@noaa.gov and CO-OPS' Operational Engineering Team (OET) at nos.coops.oetteam@noaa.gov at least three business days before survey operations begin, and within 1 business day after survey operations are completed so that the appropriate CO-OPS National Water Level Observation Network (NWLON) control water level station(s), as well as any required subordinate station(s), is/are added to or removed from the CO-OPS Hydro Hotlist (HHL) (<http://tidesandcurrents.noaa.gov/hydro>). Include start and end survey dates, full project number (e.g. OPR-H355-TJ-10), and control and subordinate station numbers. The notification must be

sent to both teams as OET is responsible for configuring the station in the CO-OPS data base and HPT manages the addition and removal of stations from the HHL.

Station	Station ID	Control or Subordinate	Type (e.g. NWLON, PORTS [®] , etc)	Comment
Christiansted	9751364	Control	NWLON	
Lime Tree Bay	9751401	Control	NWLON	

Table 1: All stations that need to be added to the HHL in support of M-I907-NF-2014

It is important to know that the addition of a water level station to the HHL ensures the station is monitored by CORMS and any problems are reported daily. However, platforms should view the HHL each morning of active survey operations and click on the “Plot” to double check that there are no problems with the required stations on that day. If a platform notices problems with data on their survey day of operation, please contact HPT at nos.coops.hpt@noaa.gov, CORMS at CORMS@noaa.gov, and their respective headquarters point of contact at HSD or NSD. Stations on the HHL are given priority for maintenance should a station cease normal operation during scheduled times of hydrography. CO-OPS will notify a field unit within 1 business day if a HHL water level station ceases operation during scheduled times of hydrography. This is in addition to the daily CORMS report that CORMS sends to NOAA field units, if the field unit's e-mail address is added to the CORM's daily e-mail list. To be added to the CORMS daily HHL report, the platform should contact CO-OPS’ Data Monitoring and Analysis Team (DMAT) at nos.co-ops.dmat@noaa.gov and request to be added.

If the stations are listed on HHL, then weekly priority processing will occur and, for those water level stations, verified 6-minute water level data will be made available every week on Monday or Tuesday. If Monday happens to be a federal holiday, then the 6-minute verified water level data will be made available on the following Tuesday or Wednesday.

1.3. Tide Reducer Stations

1.3.1. CO-OPS Long Term Water Level Station Operation and Maintenance

The NWLON stations Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401), will provide water level reducers for this project. Therefore it is critical that they remain in operation during the survey. See Sections 1.1. and 1.2. concerning responsibilities.

No leveling is required at Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401), by NOAA’s Nancy Foster personnel.

CO-OPS/FOD is responsible for the operation and maintenance of all NWLON primary control stations. If a problem is identified at an NWLON primary control station, FOD shall make all reasonable efforts to repair the malfunctioning station. However, CO-OPS may request assistance from the NOAA ship or NRT personnel in the actual repair of the water level station to facilitate a rapid repair. CO-OPS/FOD and the Commanding Officer (or Team Leader) shall maintain the required communications until the repairs to the water level station have been completed.

1.3.2. Subordinate Station Requirements

No subordinate water level stations are required for this project, however, supplemental and/or back-up water level stations may be necessary depending on the complexity of the hydrodynamics and/or the severity of the environmental conditions of the project area. The installation and continuous operation of water level measurement systems (tide gauges) at subordinate station locations is left to the discretion of the Commanding Officer (or Team Leader), subject to the approval of CO-OPS. If the Commanding Officer (or Team Leader) decides to install additional water level stations, then a 30-day minimum of continuous data acquisition is required. For all subordinate stations, data must be collected throughout the entire survey period for which they are applicable, and not less than 30 continuous days. This is necessary to facilitate the computation of an accurate datum reference as per NOS standards.

1.3.3. Tide Component Error Estimation

The estimated tidal error contribution to the total survey error budget in the vicinity of USVI Essential Fish Habitat Mapping is 0.10 meters at the 95% confidence level, and includes the estimated gauge measurement error, tidal datum computation error, and tidal zoning error. It should be noted that the tidal error component can be significantly greater than stated if a substantial meteorological event or condition should occur during time of hydrography.

1.3.4. GOES Satellite Enabled Subordinate Stations

This section is not applicable for this project.

1.3.5. Benchmark Recovery and GPS Requirements

This section is not applicable for this project.

1.3.6. This section is not applicable for this project.

1.4. Discrete Tidal Zoning

1.4.1. The water level stations at Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401) are the reference stations for preliminary tides for hydrography in USVI Essential Fish Habitat Mapping. The time and height correctors listed below for applicable zones should be applied to the preliminary data at Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401) during the acquisition and preliminary processing phases of this project. **Preliminary data may be retrieved in one month increments over the Internet from the CO-OPS SOAP web services at <http://opendap.co-ops.nos.noaa.gov/axis/text.html>.** The Commanding Officer (or Team Leader) must notify CO-OPS/ED personnel immediately of any problems concerning the preliminary tides. Preliminary data are six-minute time series data relative to MLLW in metric units on Greenwich Mean Time. For the time corrections, a negative (-) time correction indicates that the time of tide in that zone is earlier than (before) the preliminary tides at the reference station. A positive (+) time correction indicates that the time of tide in that zone is later than (after) the predicted tides at the reference station. For height corrections, the water level heights **relative to MLLW** at the reference station are multiplied by the range ratio to estimate the water level heights relative to MLLW in the applicable zone.

<u>Zone</u>	<u>Time Corrector(mins)</u>	<u>Range Ratio</u>	<u>Predicted Reference Station</u>
SCI1	+6	x0.99	9751401
SCI2	0	x0.99	9751401
SCI5	+24	x0.96	9751364
SCI7	+24	x0.96	9751364
SCI8	+24	x0.96	9751364
SCI9	+24	x0.96	9751364
SCI6	+24	x0.96	9751364

1.4.2. Polygon nodes and water level corrections referencing Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401) are provided in CARIS® format denoted by a *.zdf extension file name.

NOTE: The tide corrector values referenced to Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401) are provided in the zoning file “I907NF2014CORP” for this project and are in the fourth set of correctors designated as TS4. Longitude and latitude coordinates are in decimal degrees. Negative (-) longitude is a MapInfo® representation of West longitude.

“Preliminary” data for the control water level station, Christiansted, VI (9751364) and Lime Tree Bay, VI (9751401), are available in near real-time and verified data will be available on a weekly basis for the previous week. **These water level data may be obtained from the CO-OPS SOAP web services at <http://opendap.co-ops.nos.noaa.gov/axis/text.html>.**

1.4.3 Zoning Diagram(s)

Zoning diagrams, created in MapInfo® and Adobe PDF, are provided in digital format to assist with the zoning in section 1.4.1.

1.4.4 Final Zoning

Upon completion of project M-I907-NF-2014, submit a Pydro generated request for final tides, with times of hydrography abstract and mid/mif tracklines attached. Forward this request to Final.Tides@noaa.gov . Provide the project number, as well as a sheet number, in the subject line of the email.

CO-OPS will review the times of hydrography, final tracklines, and six-minute water level data from all applicable water level gauges. After review, CO-OPS will send a notice indicating that the tidal zoning scheme sent with the project instructions has been approved for final zoning. If there are any discrepancies, CO-OPS will make the appropriate adjustments and forward a revised tidal zoning scheme to the field group and project manager for final processing.

1.5 Fetchtides

Preliminary and verified six minute water level time series data may be retrieved from the CO-OPS database via the Fetchtides application. Fetchtides provides a mechanism to store imported data locally and combines multiple days of data into one CARIS readable tide (.tid) file. Fetchtides is available for download at Hydrosoft Online (<https://inside.nos.noaa.gov/hydrosoft/hydrosoftware.html>). For more information, please see the Fetchtides User Manual in the FPM chapter 3 appendix.

1.6 Water Level Records

This section is not applicable for this project.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : April 14th, 2014

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: M-I907-NF-2014
HYDROGRAPHIC SHEET: H12639

LOCALITY: Lang Bank, St Croix, Virgin Islands
TIME PERIOD: March 15th - April 2nd, 2014

TIDE STATION USED: 975-1364 Christiansted, St Croix
Lat. 17° 45.0'N Long. 64° 42.3' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.220 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project M-I907-NF-2014, H12639, during the time period between March 15th - April 2nd, 2014.

Please use the zoning file I907NF2014 submitted with the project instructions for M-I907-NF-2014. Zones SCI7, SCI8, and SCI9 are the applicable zones for H12639.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

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DN: cn=U.S. Government, ou=DoD, ou=PKI,
ou=OTHER, cn=HOVIS.GERALD.THOMAS.1365860250
Date: 2014.04.14 11:03:15 -0400

CHIEF, PRODUCTS AND SERVICES BRANCH



**GORDA TO ST THOMAS
AND ST CROIX**

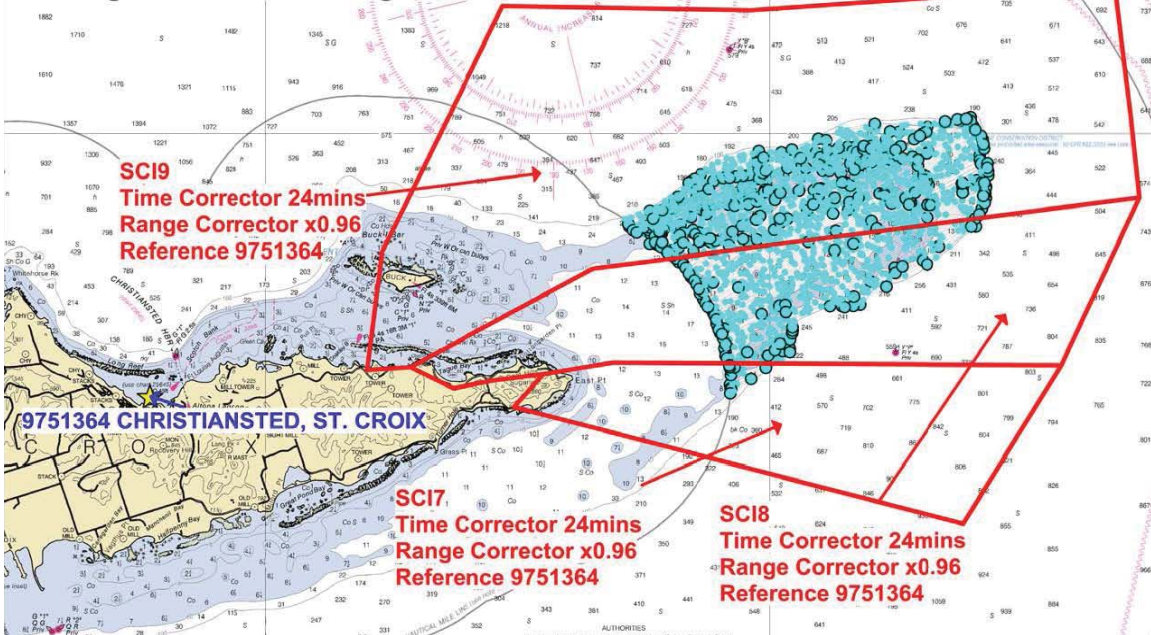
Mercator Projection
Scale 1:100,000 at Lat. 18°04'
North American Datum of 1983
(World Geodetic System 1984)

if information can be obtained at nauticalcharts.noaa.gov.

**SOUNDINGS IN FATHOMS
AT MEAN LOWEST LOW WATER**

TIDAL INFORMATION			
Height referred to datum of soundings (M.L.L.W.)			
SLATS (M)	Mean High Water	Mean Low Water	Lowest Low Water
Feet	Feet	Feet	Feet
20K (L)	0.8	-0.8	-1.0

**Preliminary as Final Zoning for M-I907-NF-2014, H12639
Lang Bank, St Croix, Virgin Islands**



AUTHORITIES
Hydrography and topography by the National Ocean Service, Coast Survey, with additional data from the Corps of Engineers, Geographical Survey, and U.S. Coast Guard.

ABBREVIATIONS (This complete list of symbols and abbreviations, see Chart No. 1)
Aids to Navigation (lights are white unless otherwise indicated):
 A green
 B black
 C red
 D white
 E yellow
 F red
 G green
 H white
 I blue
 J purple
 K orange
 L pink
 M brown
 N grey
 O yellow
 P black
 Q red
 R white
 S blue
 T green
 U yellow
 V red
 W white
 X black
 Y yellow
 Z white

CAUTION
Improved channels shown by broken lines are subject to shoaling, particularly at the edges.

SUPPLEMENTAL INFORMATION
Consult U.S. Coast Pilot 5 for important supplemental information.

AIDS TO NAVIGATION
Consult U.S. Coast Guard Light List for supplemental information concerning aids to navigation.

CAUTION
Temporary changes or defects in aids to navigation are not indicated on this chart. See Local Notice to Mariners.

CAUTION
See the National Imagery and Mapping Agency List of Lights and Fog Signals for information not included in the U.S. Coast Guard Light List.

NOTE 6
CALL 9751364

POLLUTION REPORTS
Report all spills of oil and hazardous substances to the National Response Center via 1-800-424-8802 toll free, or to the nearest U.S. Coast Guard facility if telephone communication is impossible (33 CFR 152).

HORIZONTAL DATUM
The horizontal reference datum of this chart is North American Datum of 1983 (NAD 83), which, for charting purposes is considered equivalent to the World Geodetic System 1984 (WGS 84). Geographic positions referred to the Survey No. Datum must be corrected an average of 7' 13" southward and 1.488' eastward to agree with this datum.

NOAA WEATHER RADIO BROADCASTS
The NOAA Weather Radio station listed below provides continuous weather broadcasts. The reception range is typically 20 to 40 nautical miles from the antenna site, but can be as much as 100 nautical miles for stations at high elevations.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Ship NANCY FOSTER (MOA-NF)
439 West York St
Norfolk, VA 23510-1145

April 02, 2014

MEMORANDUM FOR: Gerald Hovis, Chief, Products and Services Branch, N/OPS3

FROM: M Stecher, NOAA Ship NANCY FOSTER (MOA-NF)

SUBJECT: Request for Approved Tides/Water Levels

Please provide the following data:

1. Tide Note
2. Final zoning in MapInfo and .MIX format
3. Six Minute Water Level data (Co-ops web site)

Transmit data to the following:

NOAA Ship NANCY FOSTER (MOA-NF)
439 West York St
Norfolk, VA 23510-1145

solmarhydro@gamil.com

These data are required for the processing of the following hydrographic survey:

Project No.: M-I907-NF-14 USVI
Registry No.: H12639
State: Virgin Islands
Locality: St Croix
Sublocality: Lang Bank

Attachments containing:

- 1) an Abstract of Times of Hydrography,
- 2) digital MID MIF files of the track lines from Pydro

cc: MOA-NF



Year_DOY	Min Time	Max Time
2014_074	15:55:34	23:55:29
2014_075	00:00:25	23:27:59
2014_076	00:36:29	23:57:46
2014_077	00:04:14	23:43:28
2014_078	00:08:12	11:44:07
2014_079	02:05:51	11:21:49
2014_080	00:28:38	11:35:49
2014_081	09:09:15	23:59:42
2014_082	00:03:16	05:22:14
2014_089	22:57:06	23:57:50
2014_090	00:14:16	23:54:19
2014_091	00:07:18	23:56:06
2014_092	00:08:57	04:42:34

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS
AND CORRESPONDENCE

No additional supplemental survey records or correspondence related to this survey are being submitted

APPROVAL PAGE

H12639

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NGDC for archive

- H12639_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12639_GeoImage.pdf

The survey evaluation and verification has been conducted according to current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: _____

Lieutenant Commander Matthew Jaskoski, NOAA
Chief, Atlantic Hydrographic Branch