F00792

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey:	Natural Disaster Response
Registry Number:	F00792

LOCALITY

State(s):	Georgia
General Locality:	Brunswick, GA
Sub-locality:	Brunswick

2019

CHIEF OF PARTY
LT John Kidd

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**F00792**

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(s):	**Georgia**
General Locality:	**Brunswick, GA**
Sub-Locality:	**Brunswick**
Scale:	**10000**
Dates of Survey:	**09/06/2019 to 09/07/2019**
Instructions Dated:	**09/05/2019**
Project Number:	**S-G931-NRT1-19**
Field Unit:	**NOAA Navigation Response Team - Stennis**
Chief of Party:	**LT John Kidd**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Side Scan Sonar**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 17N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey F00792

Project: S-G931-NRT1-19

Locality: Brunswick, GA

Sublocality: Brunswick

Scale: 1:10000

September 2019 - September 2019

NOAA Navigation Response Team - Stennis

Chief of Party: LT John Kidd

A. Area Surveyed

This hydrographic survey was designed and acquired in accordance with the requirements defined in the Project Instructions S-G931-NRT1-19. The F00792 survey area includes the channels leading into the Port of Brunswick.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
31° 10' 4.8" N 81° 33' 18" W	31° 5' 34.8" N 81° 23' 6" W

Table 1: Survey Limits

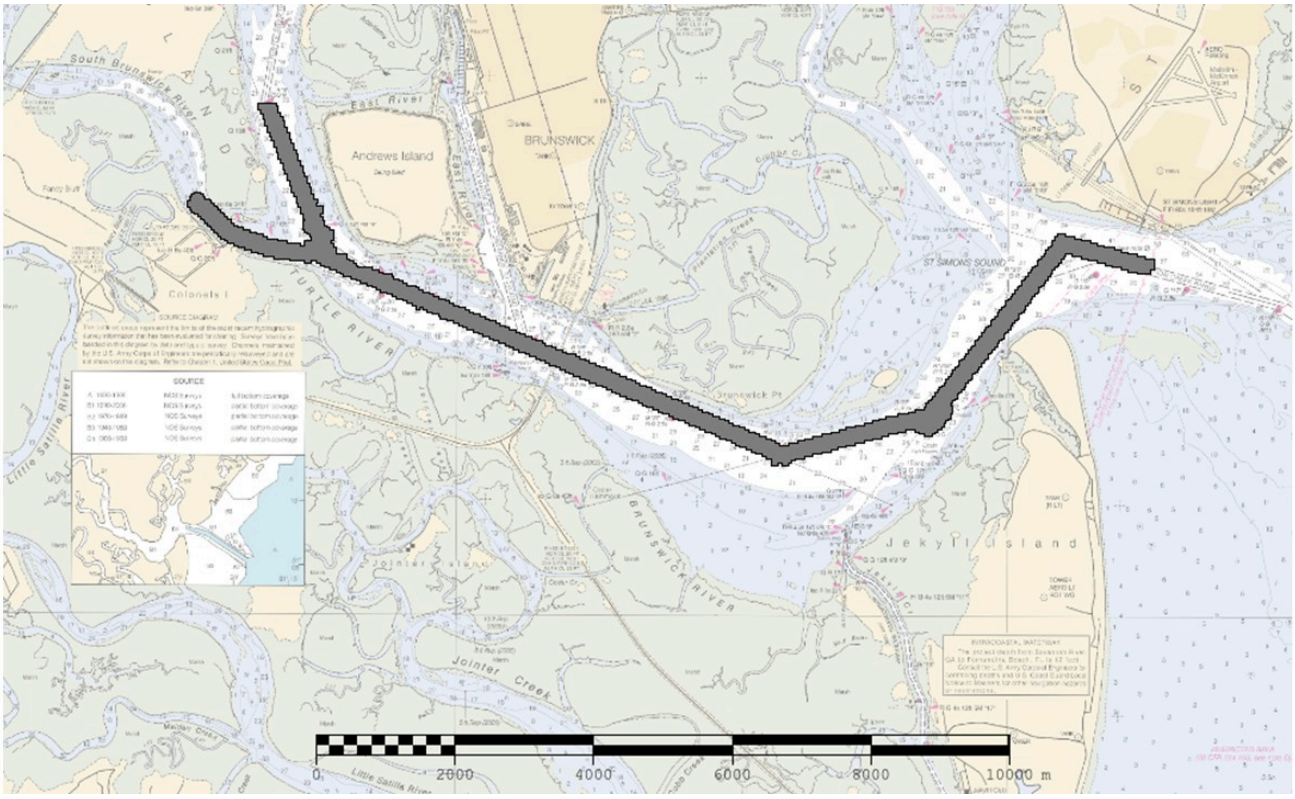


Figure 1: Survey outline

The Port of Brunswick is located on the Atlantic Coast in southern Georgia. The ship channel is 15NM from the sea buoy to the deep water piers. It is the second busiest RO/RO port in the United States, and the busiest on the East Coast.

The survey limits and methods (i.e., sensors used) were ultimately defined by the Team Lead in consult with the NRB Chief and NOAA Navigation Manager. Data was acquired to the survey limits in accordance with the requirements of the Project Instructions and the National Ocean Service (NOS) March 2019 Hydrographic Surveys Specifications and Deliverables (HSSD).

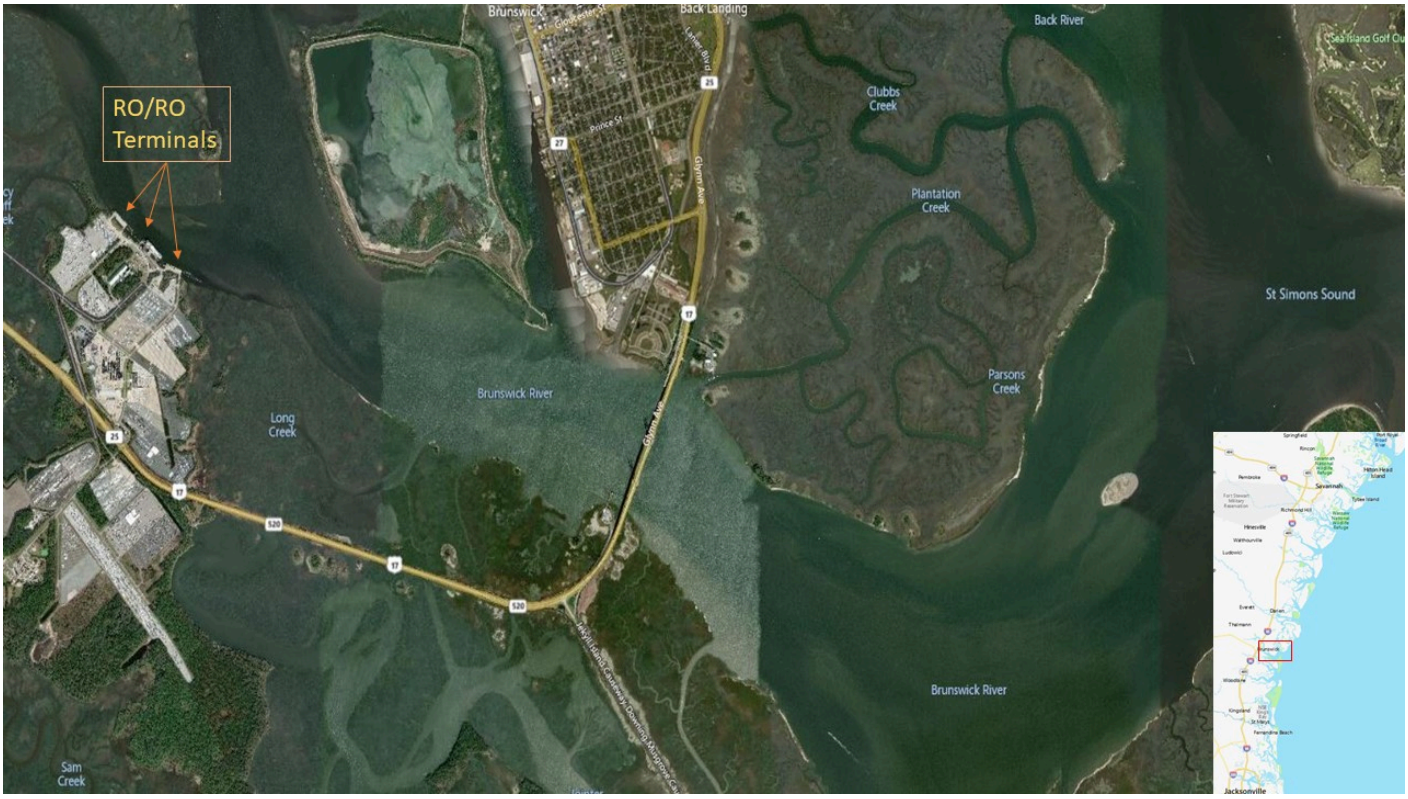


Figure 2: Survey location

A.2 Survey Purpose

The purpose of this survey is to respond to a USCG request for hydrographic survey to reopen the channels in Brunswick Georgia, after Hurricane Dorian moved through.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired for F00792 met the coverage requirements for object detection, as required by the HSSD. This includes crosslines (see Section B.2), NOAA allowable uncertainty and density requirements (Section B.2).

The surface was analyzed using the HydrOffice QC Tools Grid QA feature. Density requirements for F00792 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

Survey coverage was in accordance with the requirements listed above and in the HSSD.

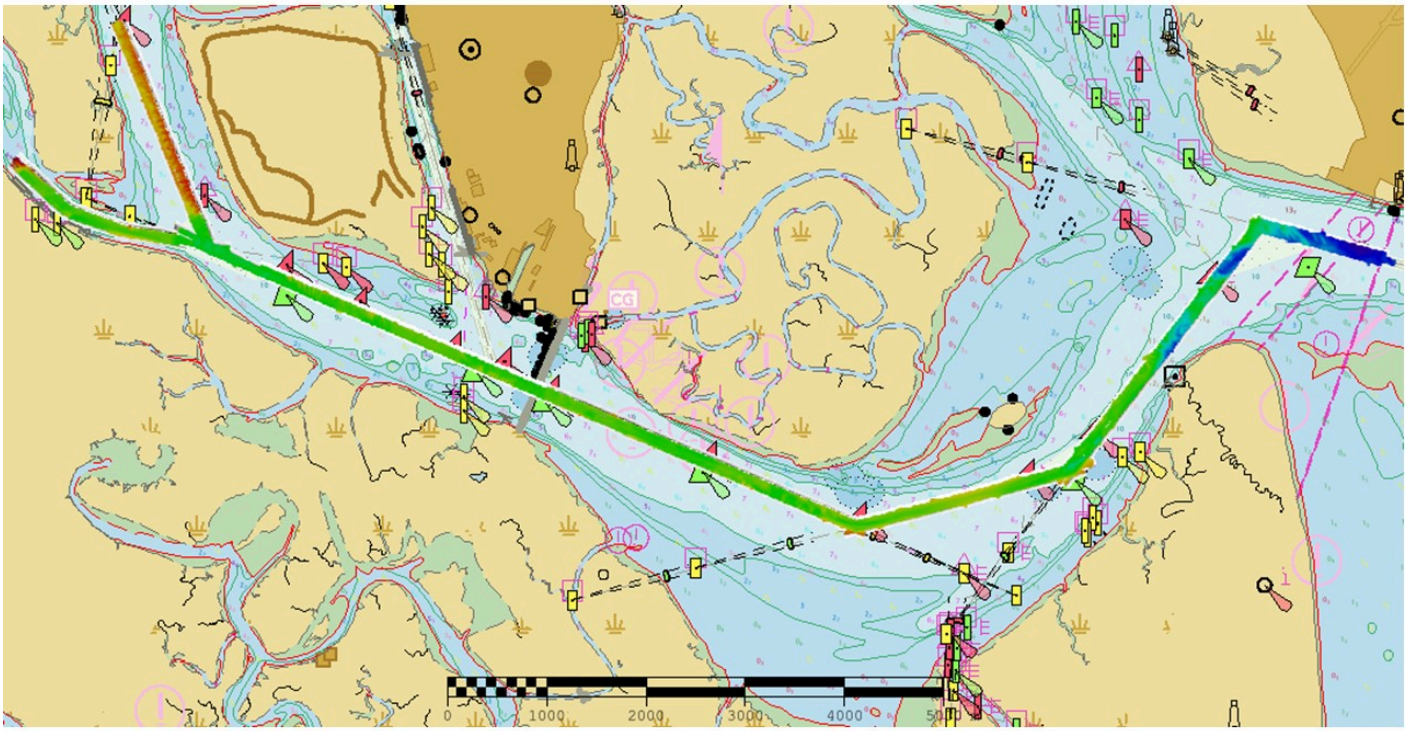


Figure 3: 200% side scan coverage with concurrent multibeam bathymetry.

A.6 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*S3005*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	0	0
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	34.9	34.9
	SBES/MBES Crosslines	5.1	5.1
	Lidar Crosslines	0	0
Number of Bottom Samples			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			1.84

Table 3: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Day of the Year
09/06/2019	249
09/07/2019	250

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***S3005***
LOA	31 feet
Draft	1.5 feet

Table 5: Vessels Used

Figure 4: NRT S3005

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040C	MBES
EdgeTech	4125	SSS
YSI	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MicroX SV	Sound Speed System
Applanix	POS MV 320 v4	Positioning and Attitude System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected by S3005 and are spatially distributed across the survey area. Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. A depth surface was created in Caris of only mainscheme lines, and a second depth surface was created of only crosslines. A difference surface was generated and compared with the Pydro Explorer's Compare Grids tool. The mainshceme only, crossline only, and difference surface are included in the submission of this survey as Digital Data.

In total, 99.5% of the total number of nodes pass the TVUmax test between F00792 mainscheme and crossline data. For F00792 respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. Statistics show the mean difference between the depths derived from mainscheme data and crossline data was less than -0.03 meters.

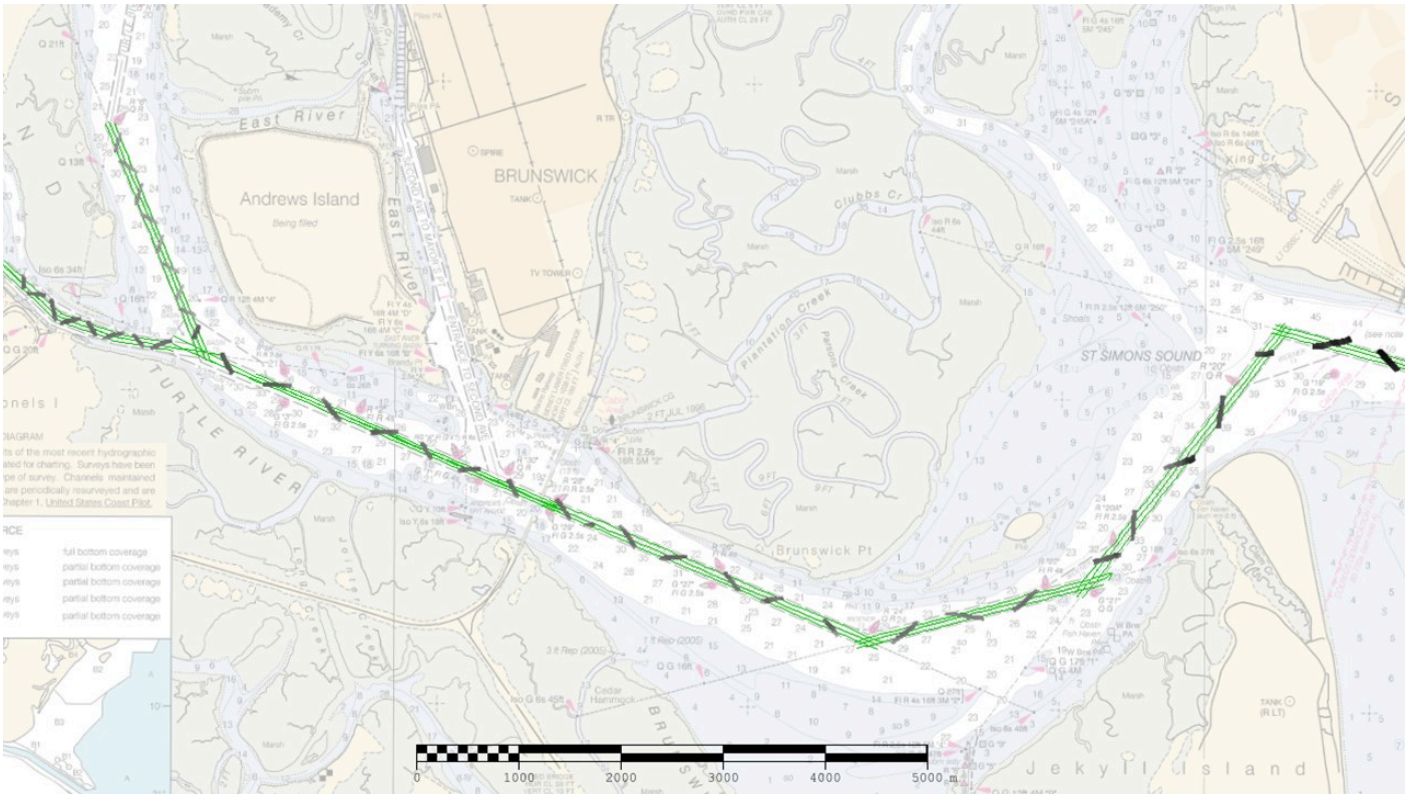


Figure 5: F00792 Crosslines surface overlaid on mainscheme lines.

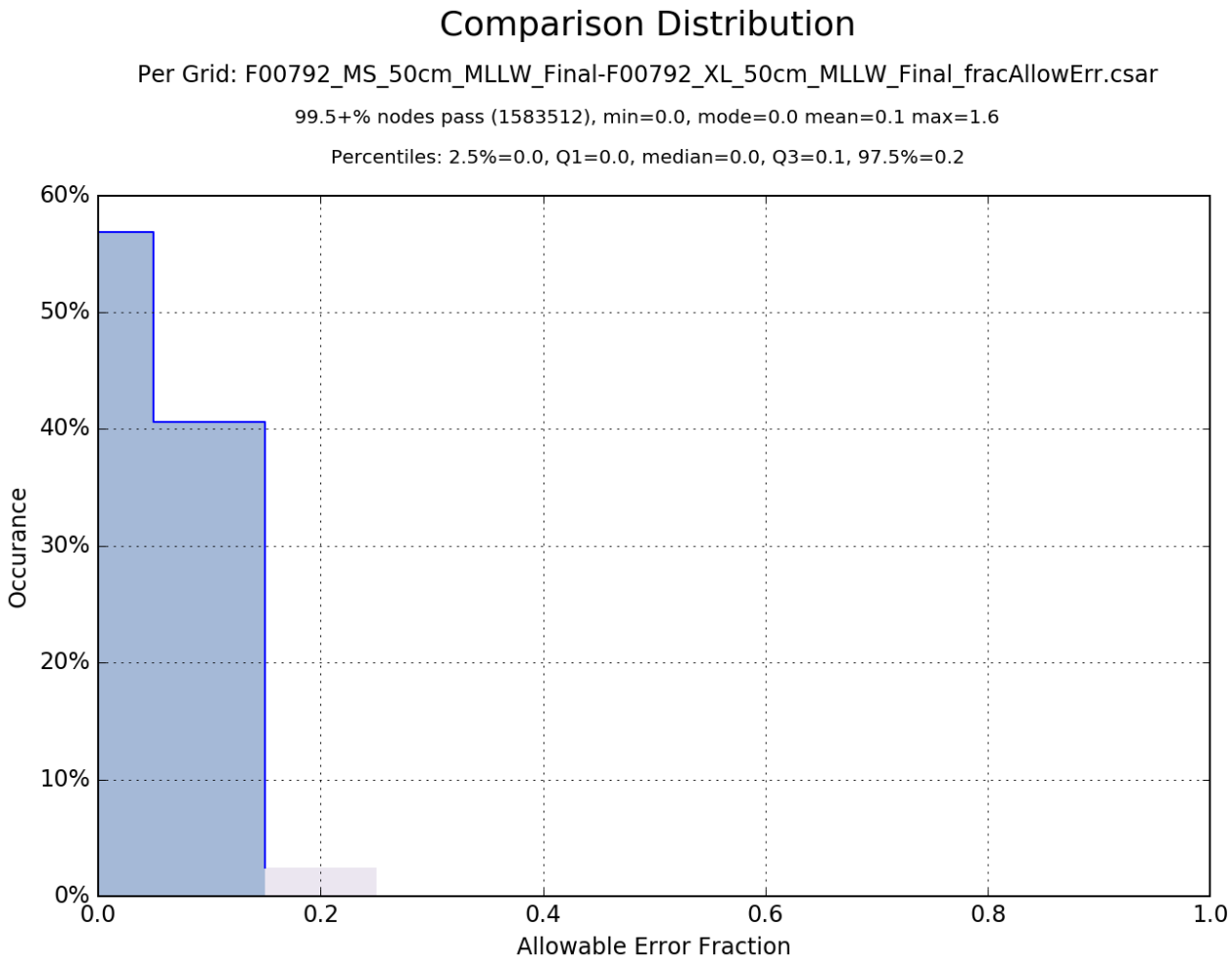
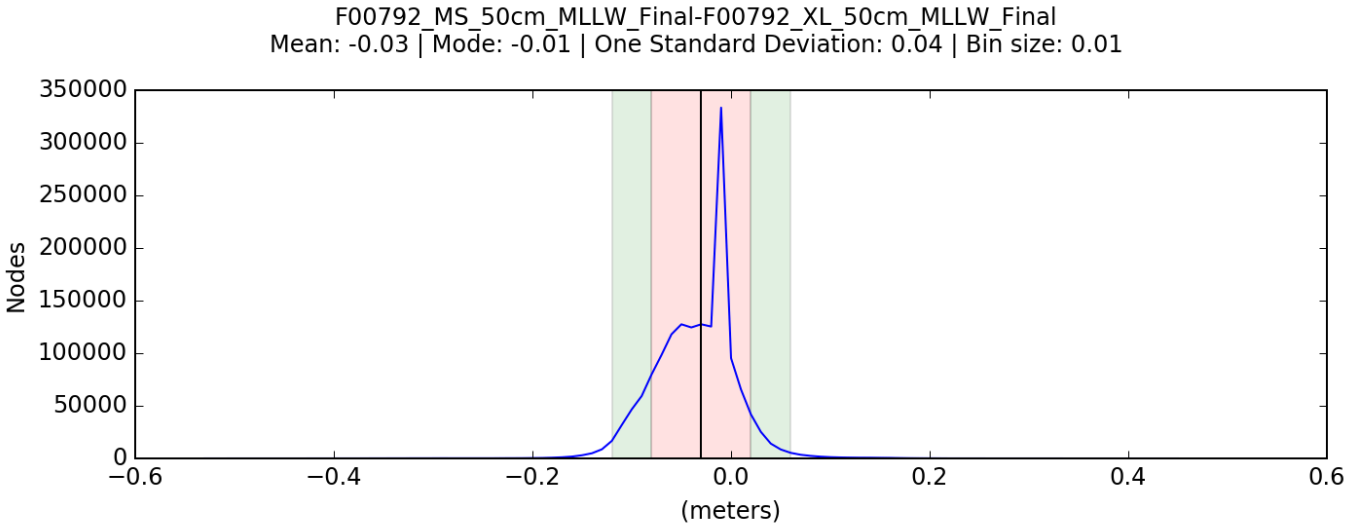
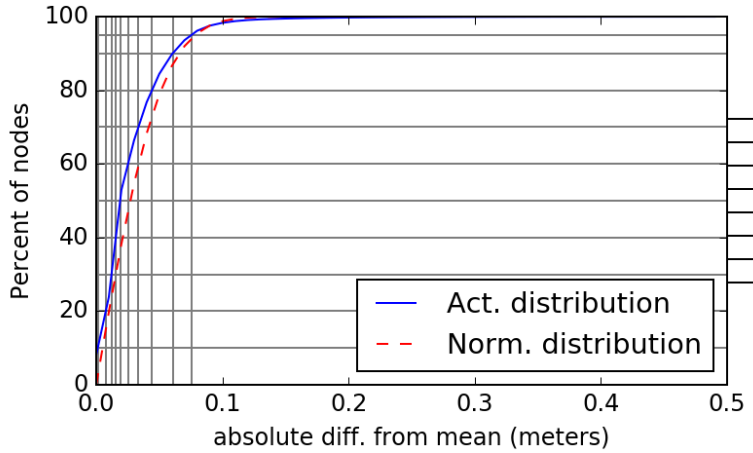


Figure 6: Pydro derived histogram showing percentage-pass value of F00972 complete coverage mainscheme to crossline data.





Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.03
70%	+/- 0.03
80%	+/- 0.04
90%	+/- 0.06
95%	+/- 0.08

Figure 7: Pydro derived plot showing absolute difference statistics of F00792 complete coverage mainscheme to crossline data.

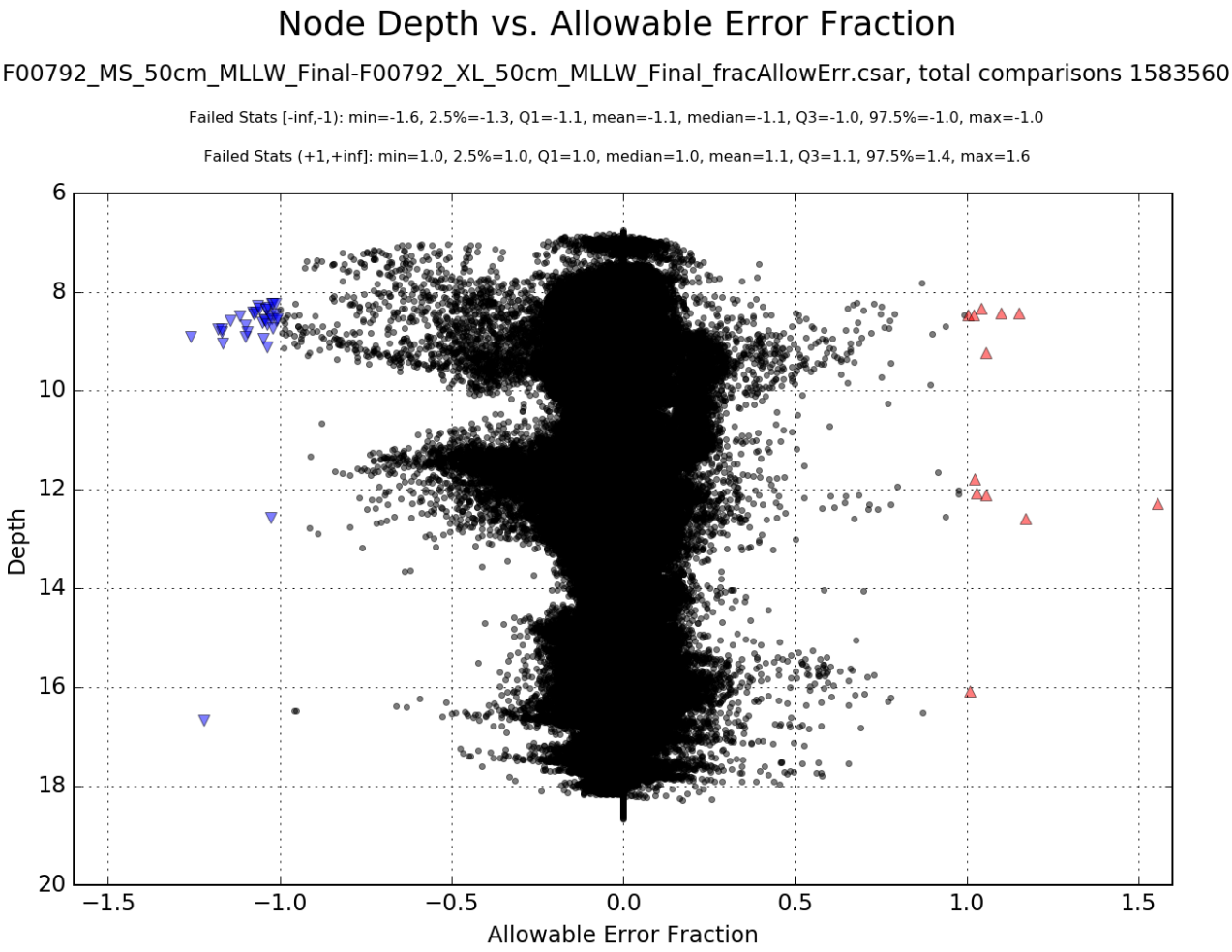


Figure 8: Pydro derived depth dependent plot of the Allowable Error Fraction, with values between and including +/- 1 representing passing comparisons.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	17 centimeters	N/A

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3005	2 meters/second	N/A	N/A	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The uncertainty statistics were calculated using Pydro Explorer's QC Tool's Finalized CSAR QA application. Total Propagated Uncertainty (TPU) values for F00792 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties.

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for F00792.

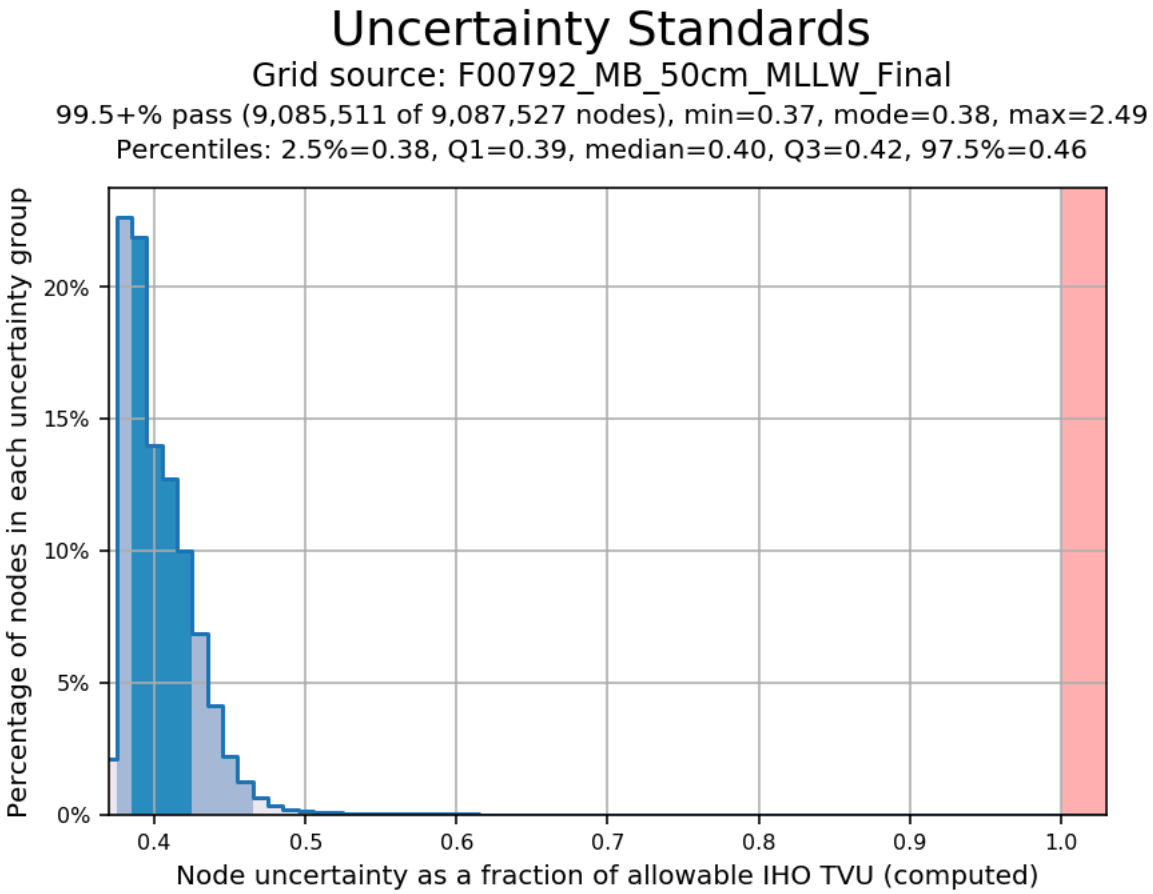


Figure 9: Pydro derived plot showing TVU compliance of F00792 complete coverage finalized variable-resolution MBES data.

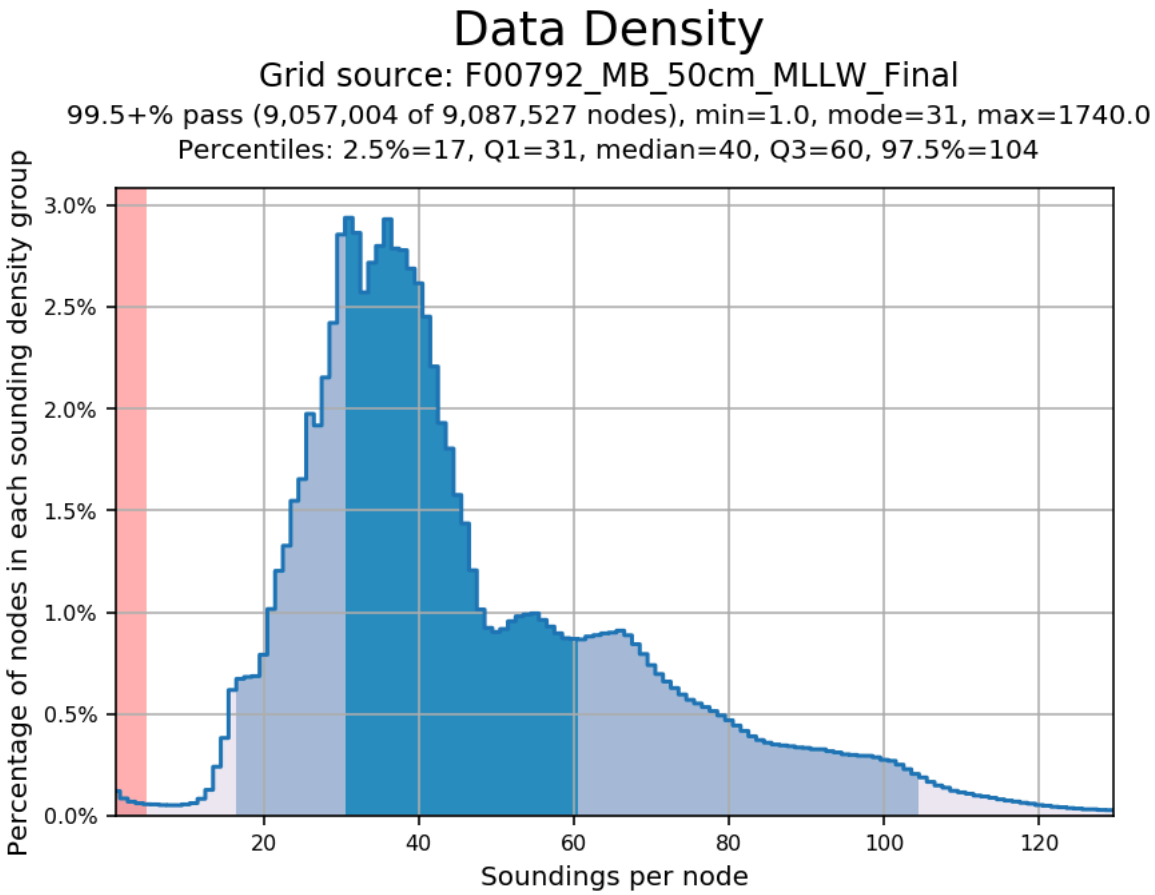


Figure 10: Pydro derived plot showing percent of nodes in compliance with HSSD density standards. Percentages of nodes less than 5 soundings per node fall in the red shaded region of the plot and together must be less than 5% of all nodes in order to "pass".

The TPU values applied to a number of lines differ from reported above. Some lines have a tidal uncertainty of 0.1 meters/second and a SSP value of 0.2 meters/second applied to the data. In one instance (line 0000_20190906_162446) the measured sound speed that was applied was 4 meters/second.

B.2.3 Junctions

There are no junctions required for this survey.

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound Speed Cast Frequency: Sound Velocity Profiles (SVP) casts were taken at least once every four hours in the deepest water nearest to the active survey area and when there was a change in sound speed values over varying depths.

The SVP casts were applied to the MBES lines in CARIS using the "nearest in distance within time of 4 hours" method.

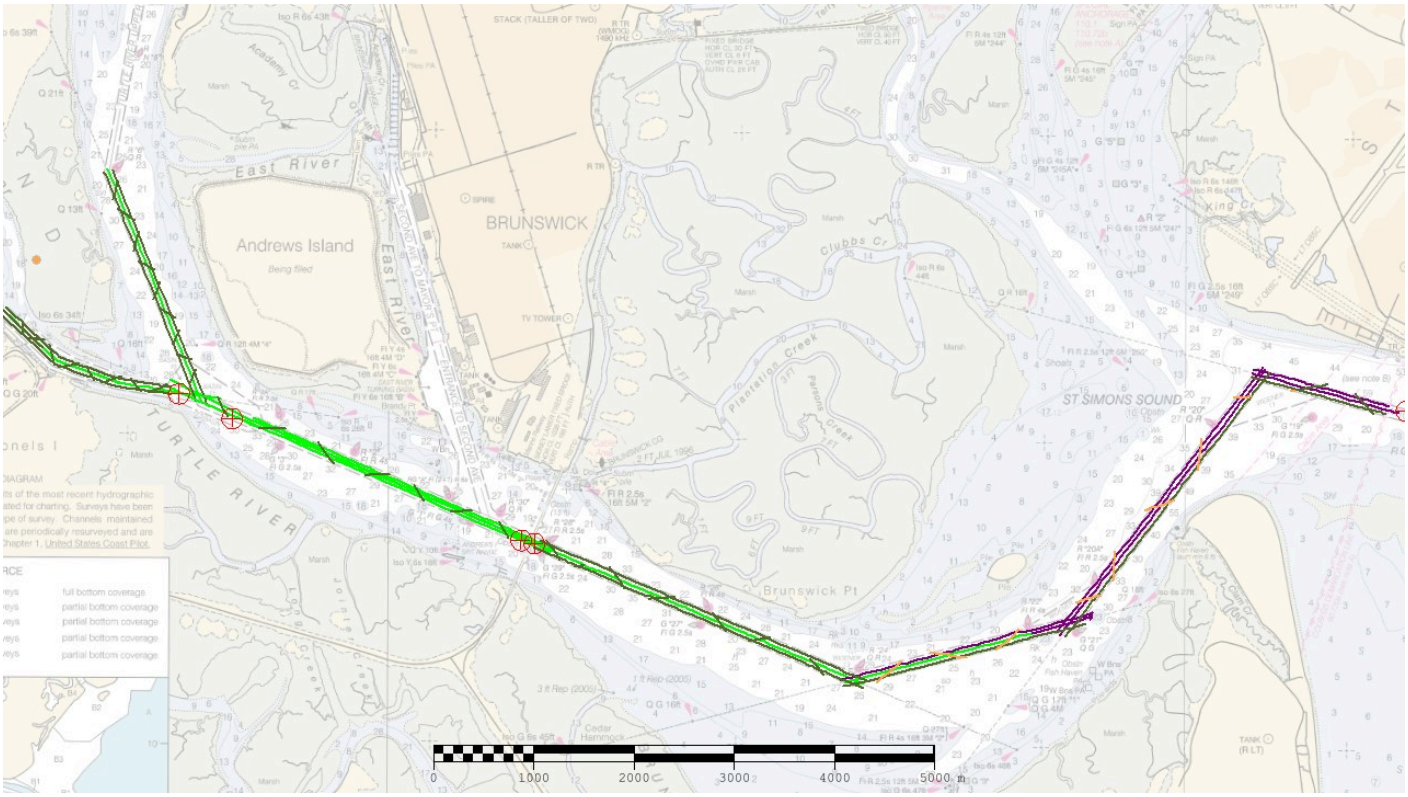


Figure 11: F00792 sound speed cast locations with lines coloured by SV Profile used.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Detect Fliers

Pydro QC Tools Flier Finder v8 was used to find fliers in the finalized variable resolution surface.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR. Raw backscatter data is logged as .all file for delivery to NOAA's Pacific Hydrographic Branch. NOAA's Navigation Response Branch field units are waived from producing backscatter mosaics for the 2019 field season.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.1.4

Table 9: Primary bathymetric data processing software

The following software program was the primary program used for imagery data processing:

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.1.4

Table 10: Primary imagery data processing software

The following Feature Object Catalog was used: **NOAA Profile Version 2019**

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
F00792_MS_50cm_MLLW_Final	CARIS Raster Surface (CUBE)	0.5 meters	5.6 meters - 18.7 meters	NOAA_0.5m	Object Detection
F00792_SSSAB_50cm_400kHz_1of2	SSS Mosaic	0.5 meters	0 meters - 0 meters	N/A	100% SSS
F00792_SSSAB_50cm_400kHz_2of2	SSS Mosaic	0.5 meters	0 meters - 0 meters	N/A	200% SSS

Table 11: Submitted Surfaces

The survey was carried out to meet the Object Detection MBES Coverage requirements as defined by Section 5.2.2 of the 2019 Hydrographic Survey Specifications and Deliverables.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying 2019 DAPR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	s-g931_limits_NAD83-MLLW

Table 12: ERS method and SEP file

Sounding elevations relative to the ellipsoid were collected through Ellipsoidal Referenced Survey (ERS) with post-processing of the daily logged POSPac data to create a statistical best estimate of trajectory (SBET) file, as detailed in the DAPR, All of F00792 meets HSSD vertical accuracy requirements.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 17.

The following PPK methods were used for horizontal control:

- RTX

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.4 software to produce SBETs for post-processing horizontal correction. All of F00792 meets HSSD horizontal accuracy requirements.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

D. Results and Recommendations

D.1 Chart Comparison

F00792 survey data was compared to Electronic Navigation Chart (ENC) US5GA13M using the CA Tools from Pydro Explorer. Throughout the survey, multibeam generally agreed with their charted depths. See images and discussions below for more information.

D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US5GA13M	1:40000	49	09/27/2018	08/22/2019

Table 13: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

Charted features exist for this survey, but were not investigated.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

The survey revealed channel depths and soundings consistently deeper then the posted controlling depths reported in the ENC, RNC, and Coast Pilot.

D.2 Additional Results

D.2.1 Aids to Navigation

Aids to Navigation were visually verified during daylight hours and appeared able to serve their intended use.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

No bottom samples were required for this survey.

D.2.4 Overhead Features

Overhead features exist for this survey, but were not investigated.

D.2.5 Submarine Features

Submarine features exist for this survey, but were not investigated.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor and/or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

It was reported to the Team Lead that portions of the channel had been recently dredged and is evident in the bathymetry.

D.2.10 New Survey Recommendations

Currently there is a NOAA survey for the Brunswick Channel being conducted by Navigational Response Team 2.

D.2.11 ENC Scale Recommendations

No new insets are recommended for this area.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2020-01-08

Approver Name	Approver Title	Approval Date	Signature
John Kidd, LT /NOAA	Chief of Party	12/30/2019	
Collin Walker, LTJG/NOAA	Sheet Manager	12/30/2019	

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continuously Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERTDM	Ellipsoidally Referenced Tidal Datum Model
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File