H13339

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13339

LOCALITY

State(s):	Hawaii
General Locality:	Hawaiian Islands and Vicinity
Sub-locality:	Hilo Harbor

2019

CHIEF OF PARTY
Benjamin K. Evans, CAPT/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13339**

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):	**Hawaii**
General Locality:	**Hawaiian Islands and Vicinity**
Sub-Locality:	**Hilo Harbor**
Scale:	**5000**
Dates of Survey:	**09/21/2019 to 09/22/2019**
Instructions Dated:	**06/28/2019**
Project Number:	**OPR-T383-RA-19**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Benjamin K. Evans, CAPT/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
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 5N, 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 H13339

Project: OPR-T383-RA-19

Locality: Hawaiian Islands and Vicinity

Sublocality: Hilo Harbor

Scale: 1:5000

September 2019 - September 2019

NOAA Ship *Rainier*

Chief of Party: Benjamin K. Evans, CAPT/NOAA

A. Area Surveyed

This survey area is referred to as H13339, "Hilo Harbor" (sheet 12) as described in correspondence with the Project Manager. The survey encompasses approximately 1.1 square nautical miles within Hilo Harbor on the east side of the "Big Island" of Hawai'i.

Survey H13339 was originally part of H13321, a survey not included in original Project Instructions but added to investigate the lava flows on the east side of the Big Island. Hilo Harbor was added to survey H13321 as a "weather alternative" should conditions on the offshore lava flows prove unworkable. Subsequent to RAINIER completing both the offshore lava flow area and the inner portion of Hilo Harbor, the ship requested a split of survey H13321 to separate Hilo Harbor from the geographically separate Puna Coast lava flows.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
19° 44' 39.26" N 155° 5' 23.92" W	19° 43' 20.85" N 155° 3' 12.05" W

Table 1: Survey Limits

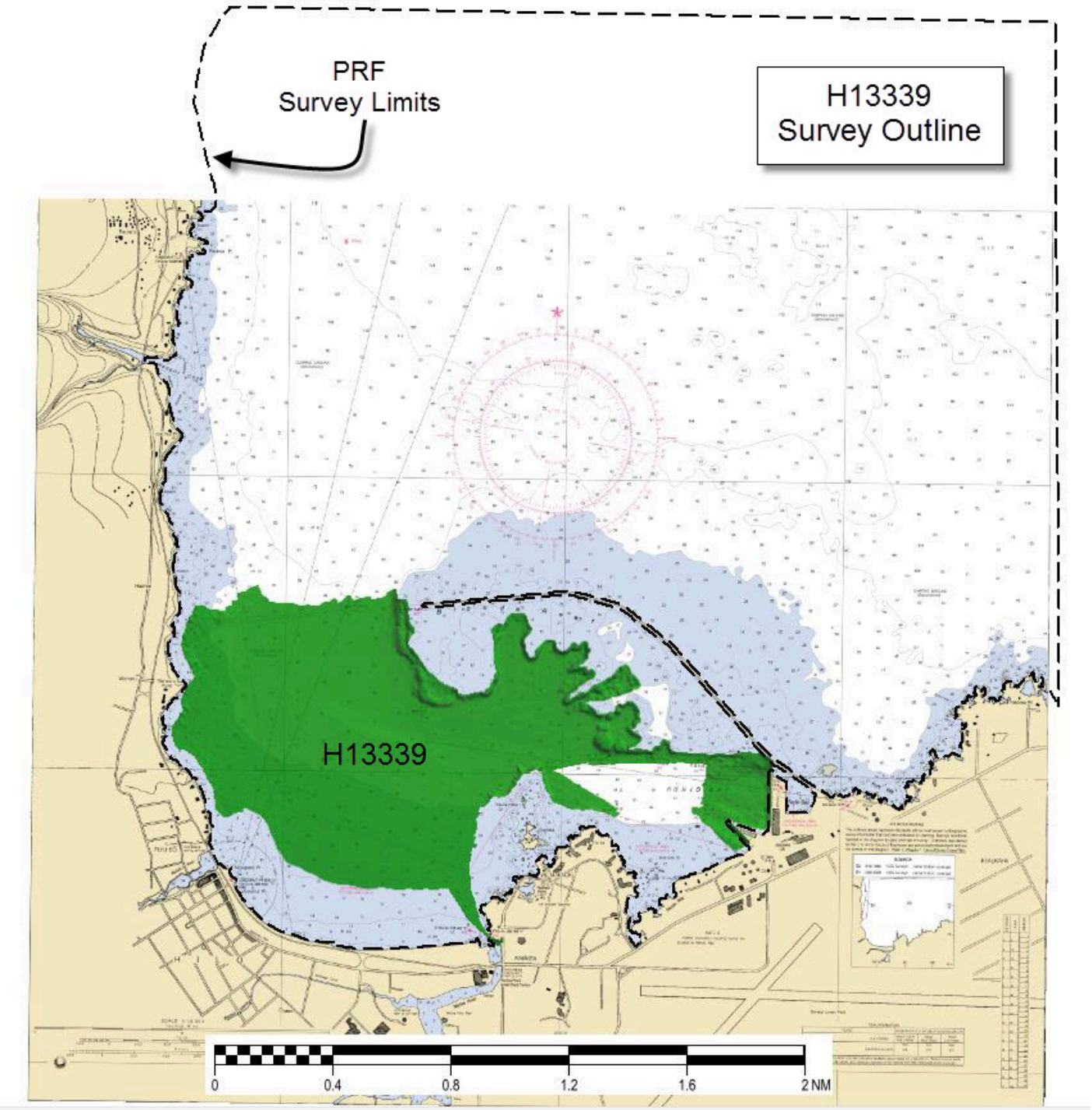


Figure 1: H13339 survey outline and PRF survey limits (Chart 19324) .

The Project Manager stated that when preparing this opportunistic survey, "I have made the additional area very large to include areas in which the ship could survey, if Rainier chooses" (Figure 1). However, no

attempt was made to acquire MBES data outside the Hilo Harbor Breakwater. Refer to appendix II for further information.

A.2 Survey Purpose

H13339 was conducted opportunistically when a short amount of time became available at the conclusion of the originally assigned project. It responded to interest by the Hawai'i Department of Transportation in obtaining contemporary survey data for Hilo Harbor. Acquisition of H13339 data allowed survey operations to continue when unfavorable conditions prevailed offshore. Refer to appendix II for further information.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools (v3.1.4) Grid QA was used to analyze H13339 multibeam echosounder (MBES) data density. The submitted H13339 finalized variable-resolution (VR) surface met HSSD density and object detection requirements as shown in the histograms below.

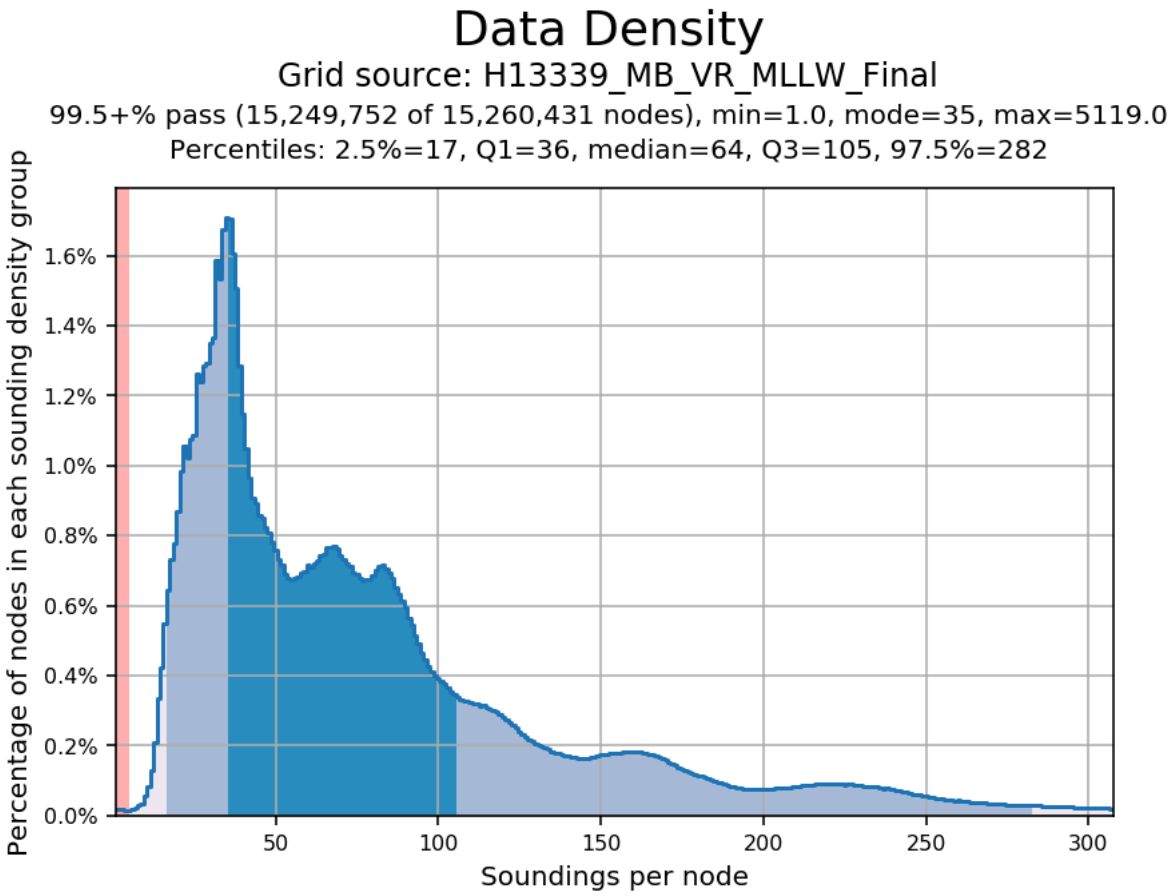


Figure 2: Pydro derived plot showing HSSD density compliance of H13339 finalized variable-resolution MBES data.

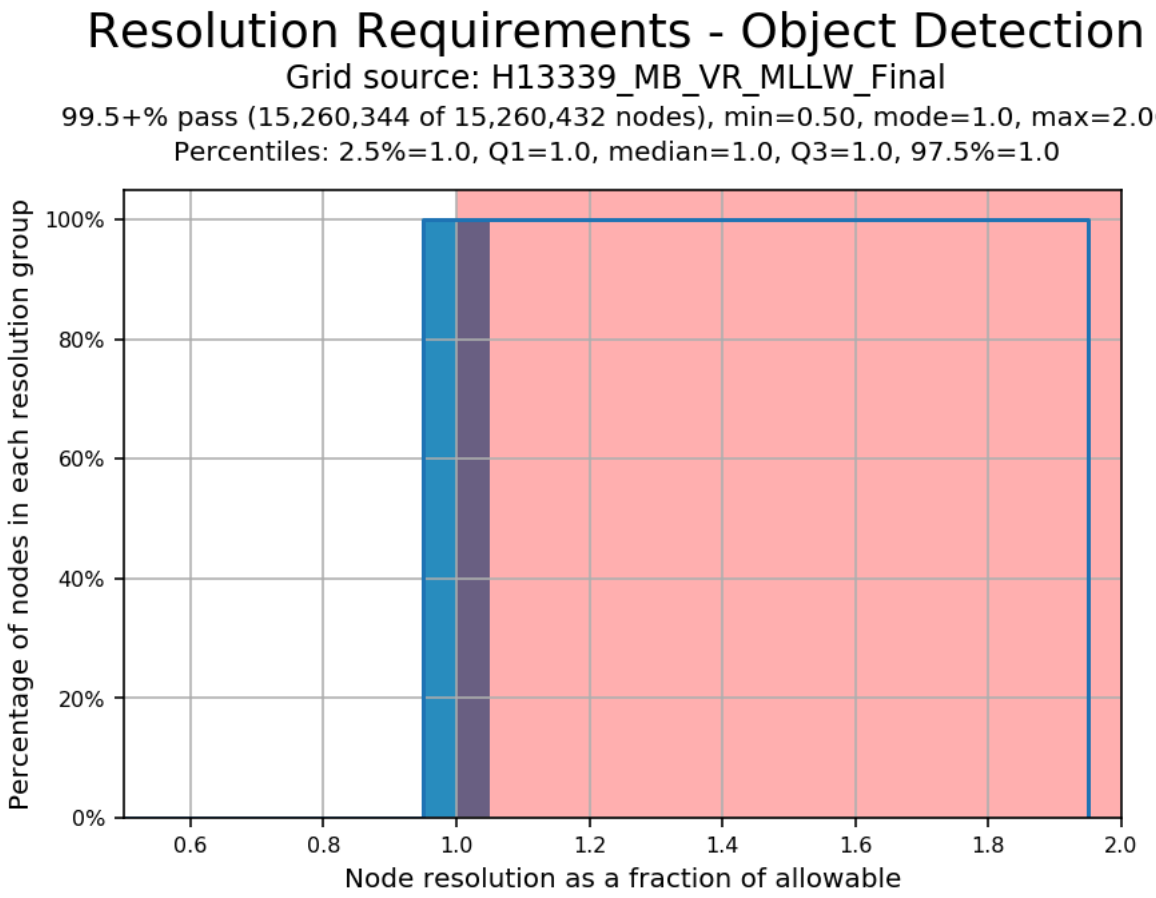


Figure 3: Pydro derived plot showing HSSD object detection compliance of H13339 finalized variable-resolution MBES data.

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	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

Object detection multibeam echosounder coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL) except as noted below. The NALL is defined as the most seaward of the following: the surveyed 3.5-meter depth contour, the line defined by the distance seaward from the observed MHW line which is equivalent to 0.8 millimeters at chart scale, or the inshore limit of safe navigation. Areas where H13339 survey coverage reached neither 3.5 meters water depth nor the appropriate distance from the observed MHW line, were due either to encountering unsafe conditions or to time constraints.

According to the OPR-T383-RA-19 Project Manager, an area within Hilo Harbor had recently been dredged / surveyed by the USACE and therefore was not to be a priority. This area was outlined in images provided by the Hawai'i Department of Transportation (Figure 5) and was therefore excluded from H13339 survey operations. Refer to appendix II for further information.

Pydro Find Holidays program (v4) identified 71 coverage gaps ("holidays") in the finalized H13339 variable-resolution, object detection surface. All but seven of those holidays occurred in 300 kHz lines using the following settings: auto pulse length and yaw stabilization enabled (Figure 6). Virtually all the holidays measure approximately 1-meter wide and most appear at a near consistent location across the swath, near beam numbers 100 and 300. The EM 2040 sonar transmit fan is divided into three angular sectors; the holidays seem to occur at the boundary of these sectors when yaw stabilization is enabled (Figure 7). The majority of H13339 was acquired using the EM 2040 set to 400 kHz, short pulse and yaw stabilization disabled; very few holidays occurred in those lines. All H13339 holidays were examined in subset mode to ensure that no navigationally significant features were omitted from the delivered data set.

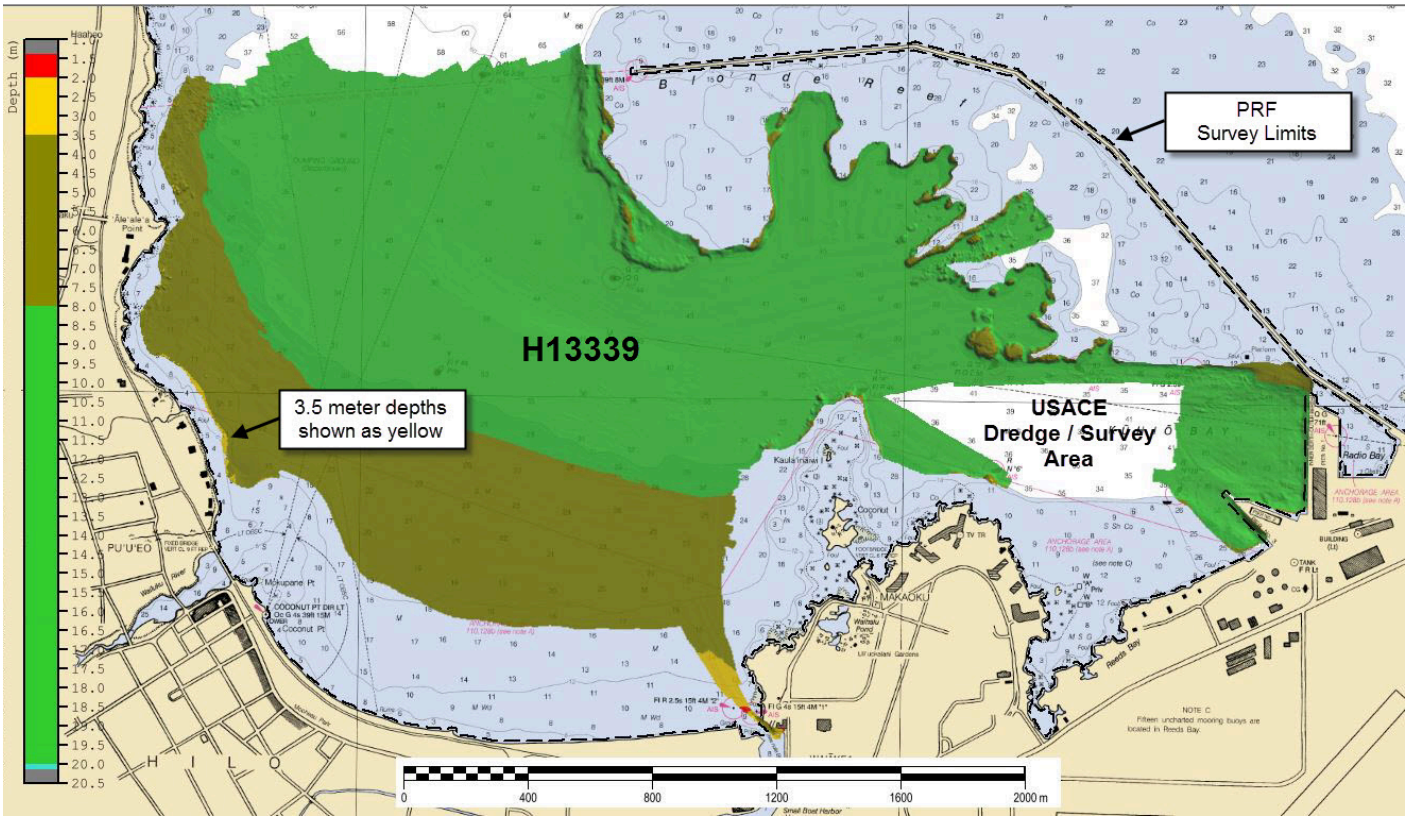


Figure 4: H13339 survey extents.

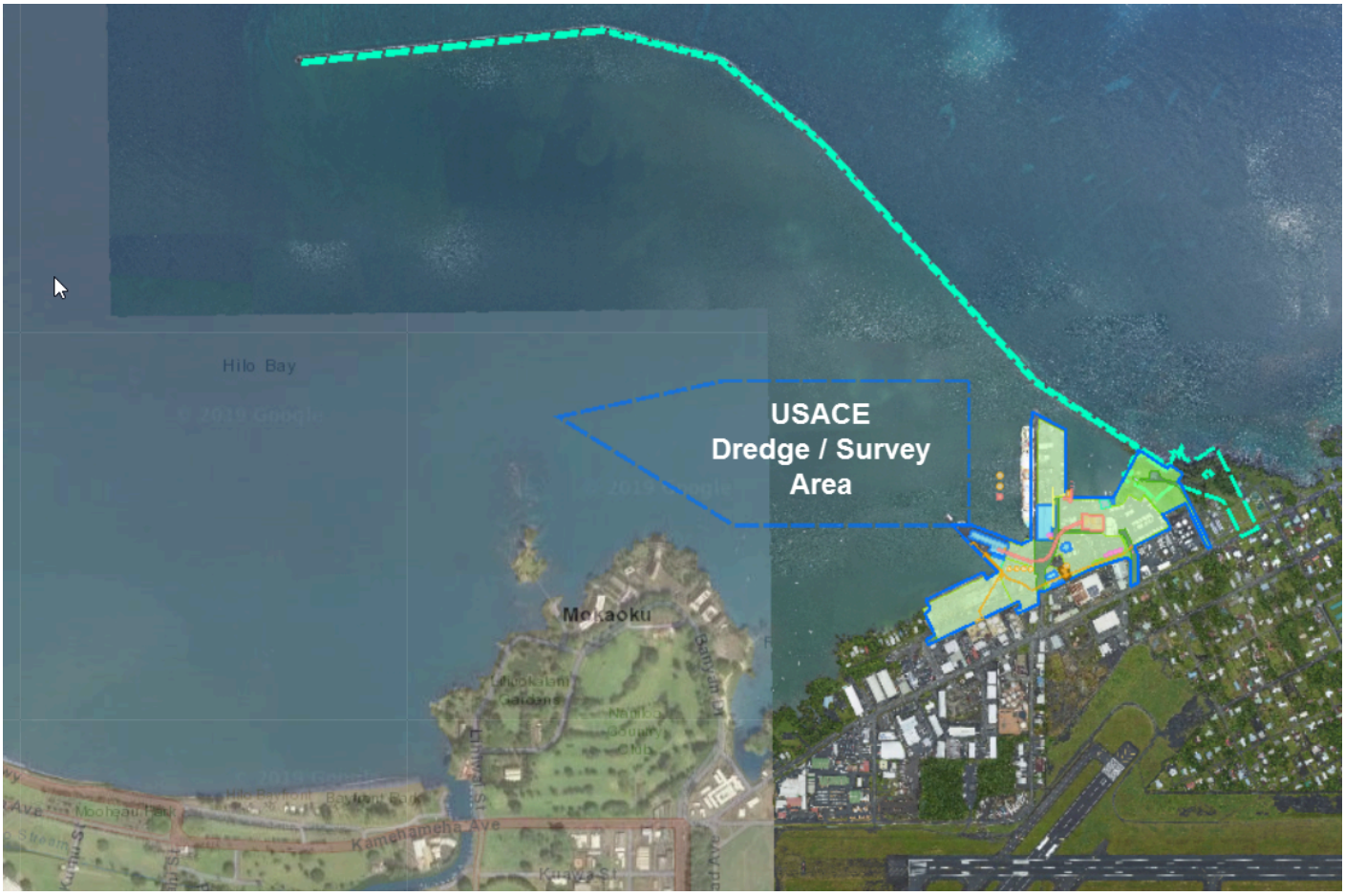


Figure 5: Hawai'i DOT provided image of USACE dredge / survey area inside Hilo Harbor.

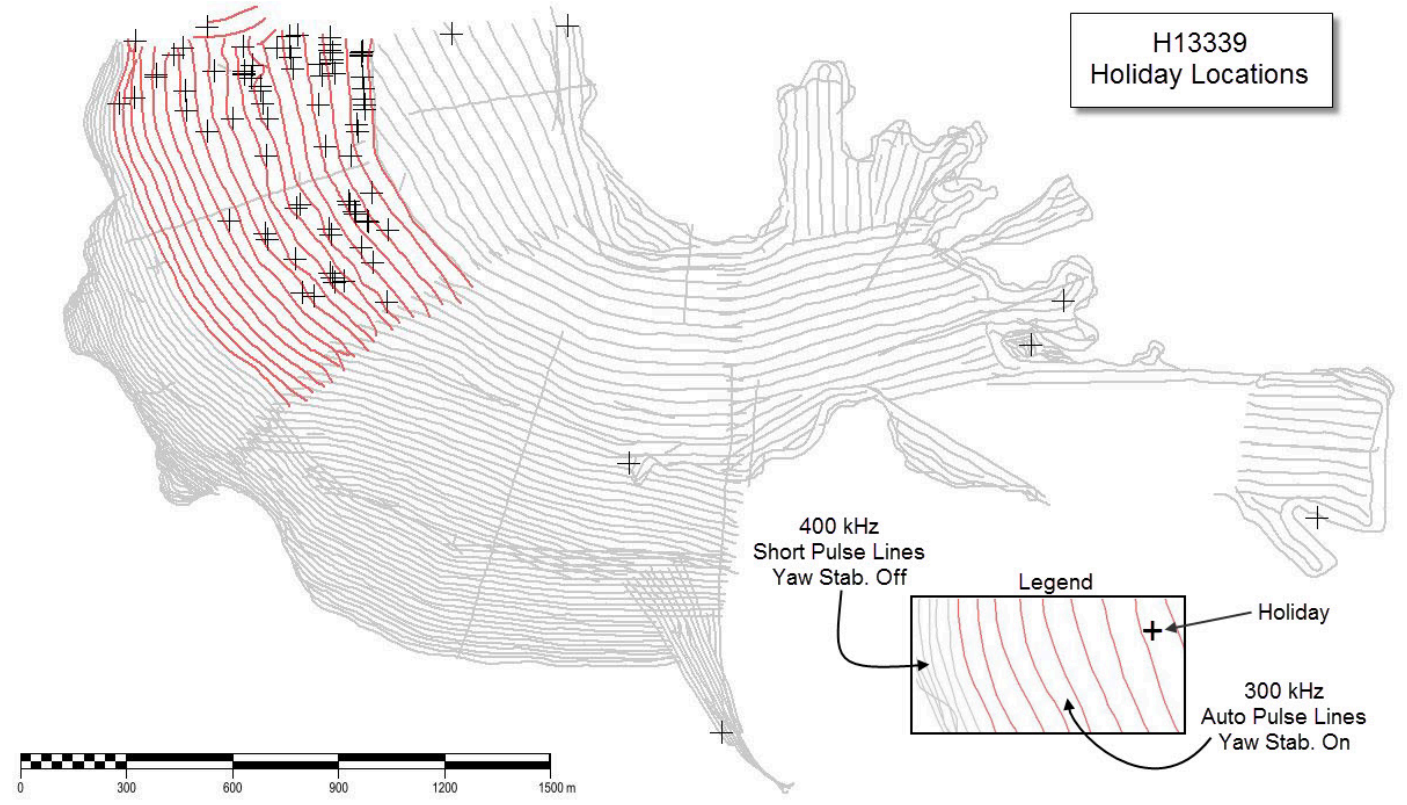


Figure 6: H13339 holiday locations. Note most holidays coincide with EM 2040 lines acquired using 300 kHz, yaw stabilization enabled.

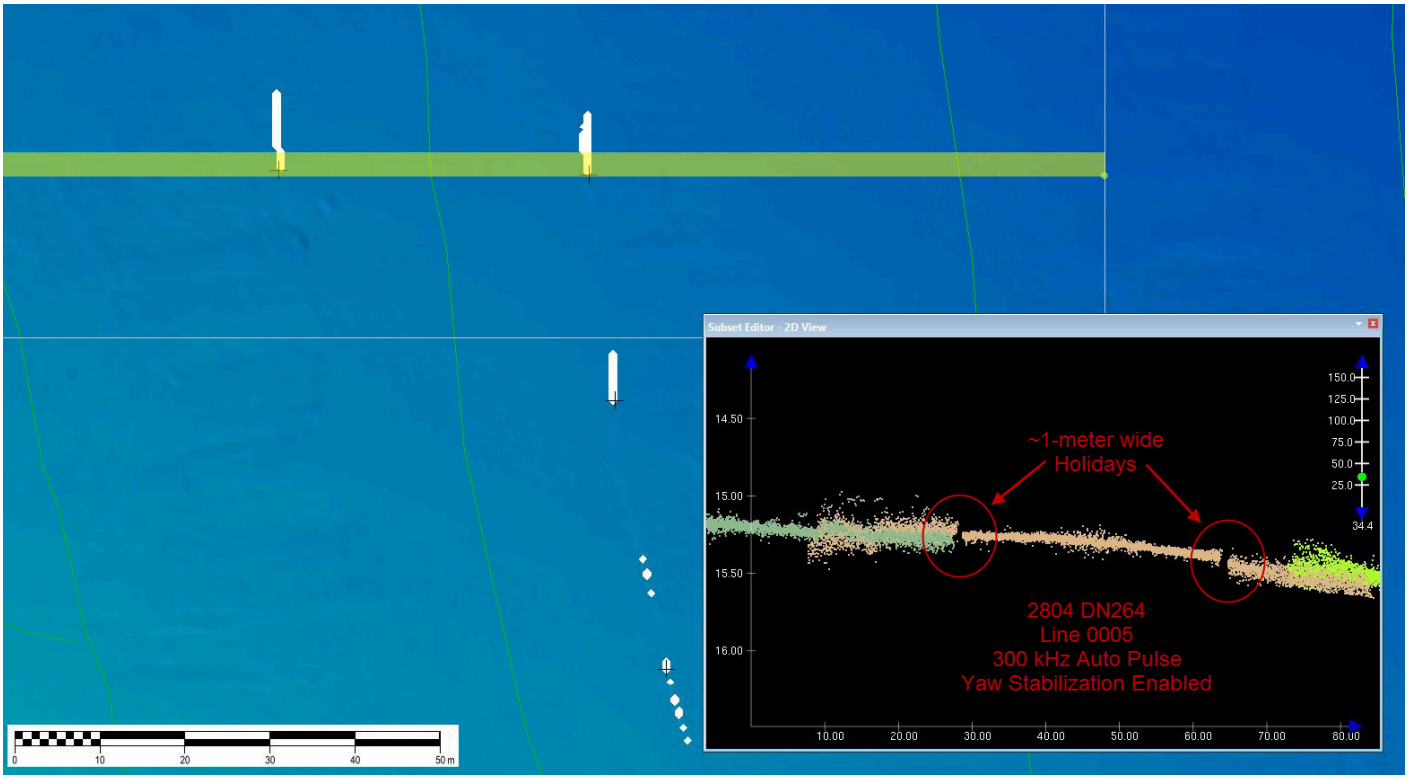


Figure 7: Example of typical H13339 holiday.

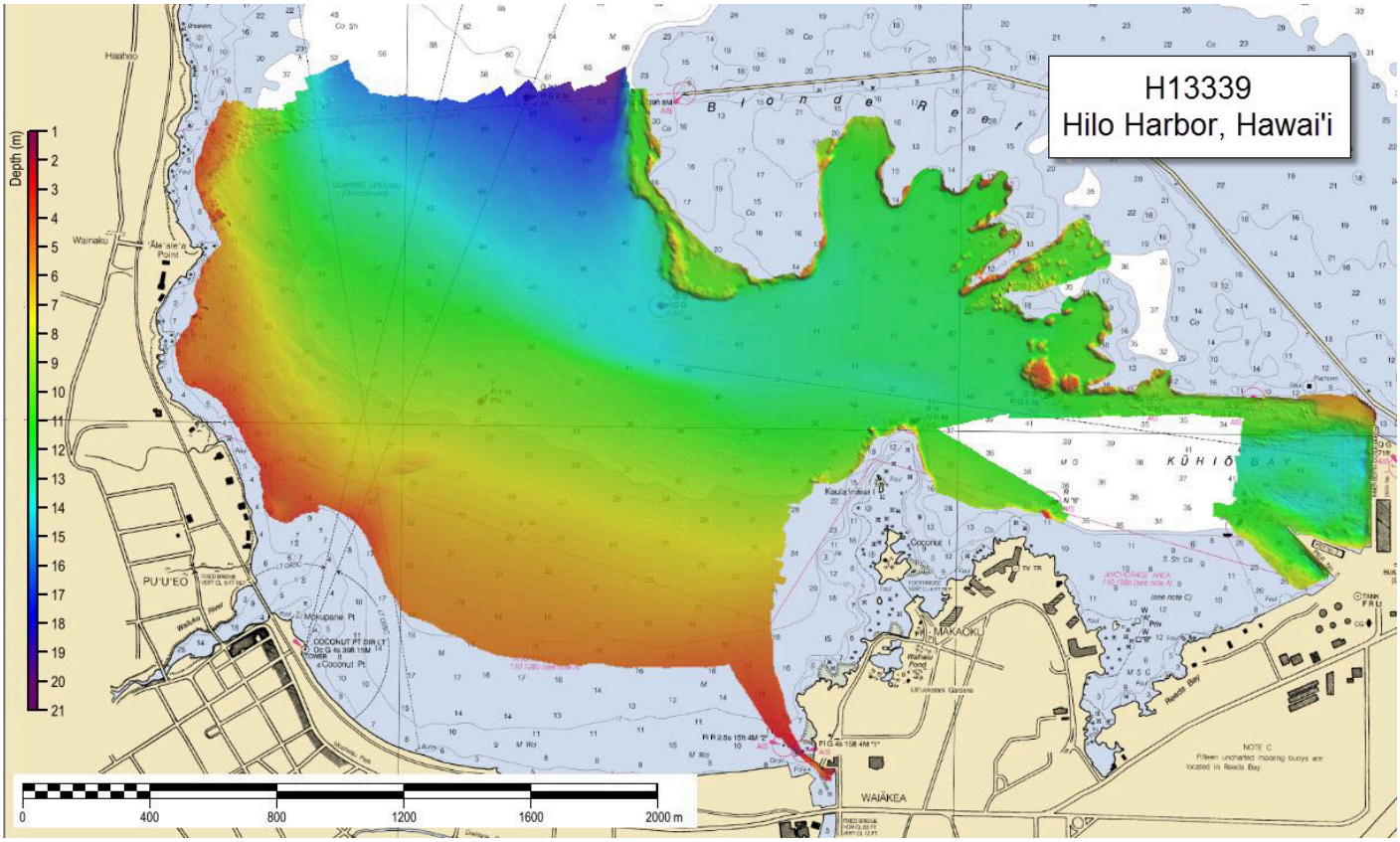


Figure 8: H13339 survey coverage (Chart 19324).

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*2804*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	30.10	25.49	40.11	96.39
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0
	SBES/MBES Crosslines	0.69	0.81	1.51	3.01
	Lidar Crosslines	0	0	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					1.14

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/21/2019	264
09/22/2019	265

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 comprehensive description of data acquisition and processing systems, survey vessels, quality control procedures and processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in this report.

B.1.1 Vessels

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

Hull ID	***2801***	***2803***	***2804***
LOA	8.8 meters	8.8 meters	8.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

Figure 9: NOAA Ship RAINIER survey launch 2804 (RA-6).

All H13339 survey data were acquired by NOAA Ship RAINIER survey launches 2801, 2803 and 2804. The vessels acquired depth soundings, backscatter imagery, sound speed profiles and conducted limited shoreline feature verification.

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

RAINIER launches 2801, 2803 and 2804 acquired three nautical miles of MBES crosslines across all depth ranges, water masses and boat days that were safe and operationally practical. Time constraints prevented crossline operations from achieving the percentage required by HSSD, however the Hydrographer deems them adequate for verifying and evaluating the internal consistency of H13339 sonar data. Crossline analysis was performed using the Compare Grids function within Pydro Explorer on Caris variable-resolution surfaces of H13339 mainscheme only and crossline only data. 99.5+% of grid nodes met allowable uncertainties; see Pydro generated histograms below.

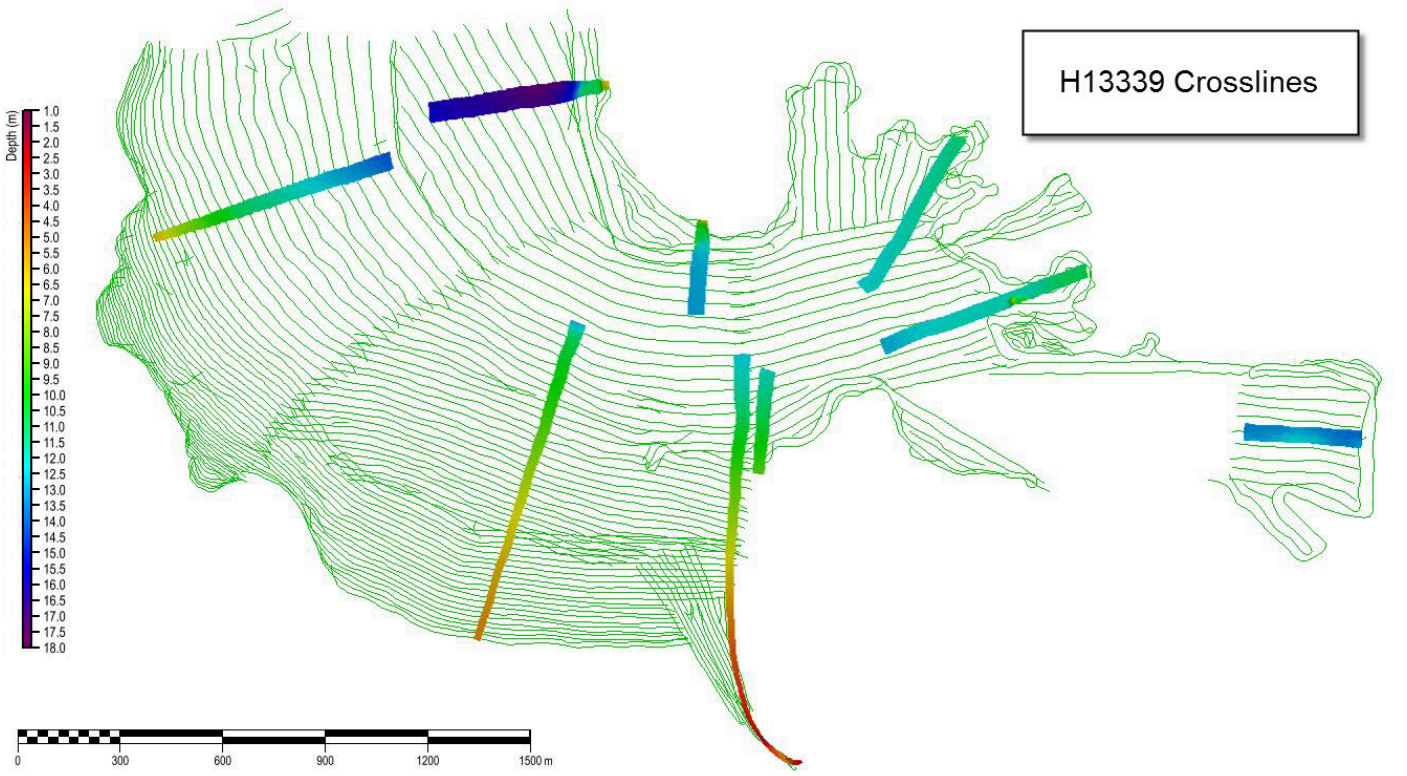


Figure 10: H13339 Crossline surface overlaid on mainscheme tracklines.

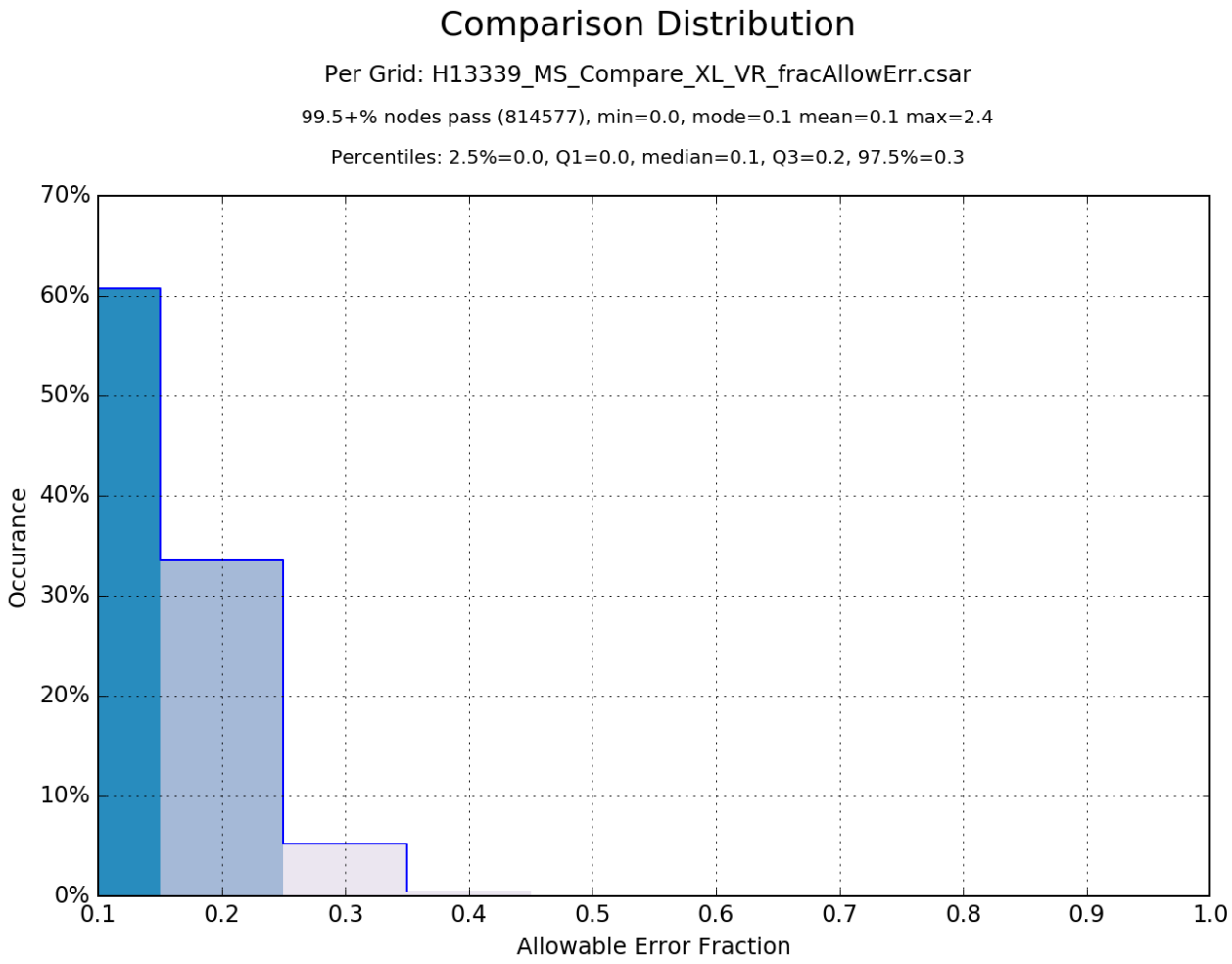
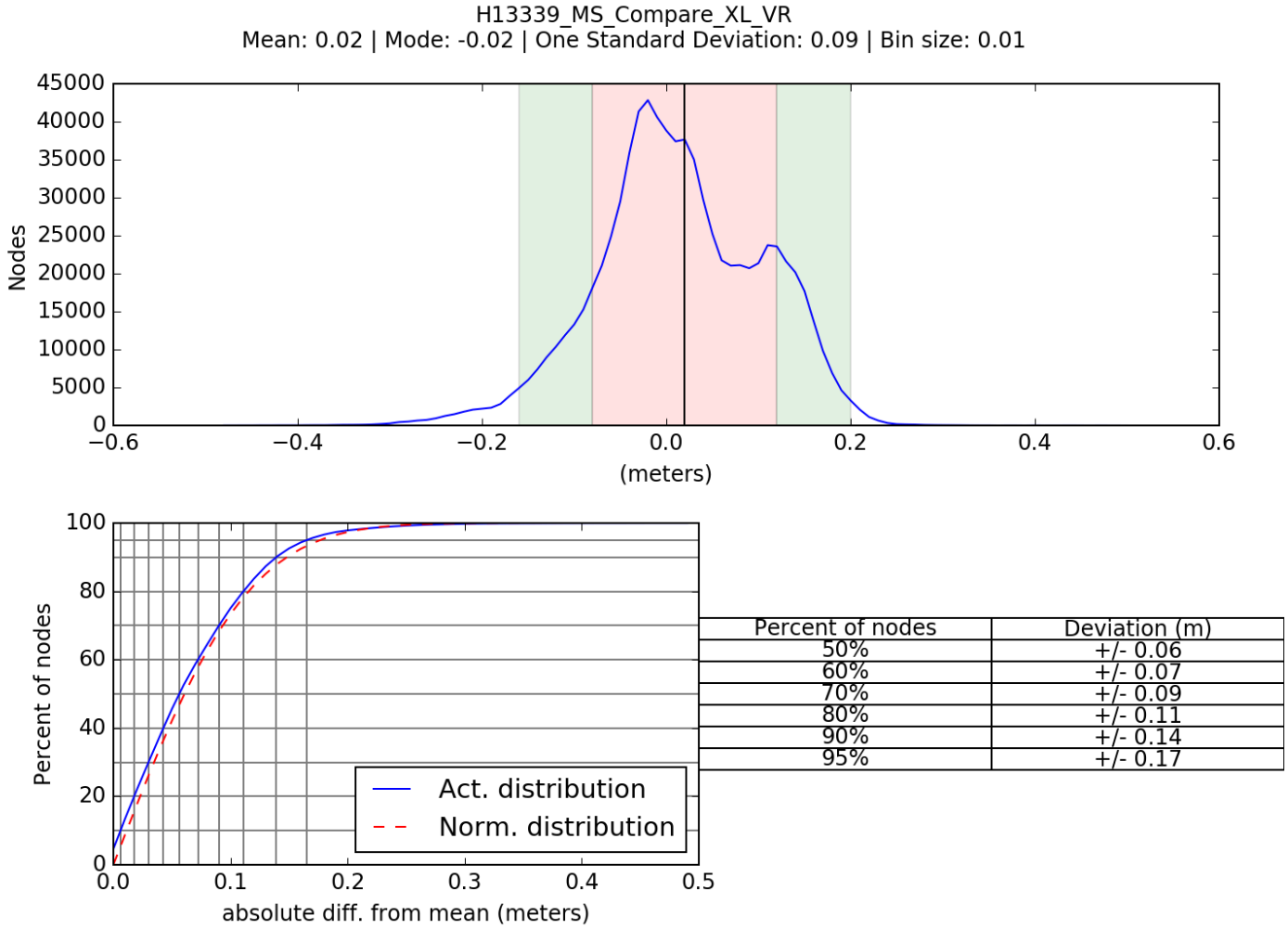


Figure 11: Pydro derived plot showing node percentage pass value of H13339 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.07
70%	+/- 0.09
80%	+/- 0.11
90%	+/- 0.14
95%	+/- 0.17

Figure 12: Pydro derived plot showing absolute difference statistics of H13339 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0 meters	0.10 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
2801, 2803, 2804	3 meters/second	N/A meters/second	N/A meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13339 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. The uncertainty value of 0.10 meters was provided through communication with NOAA's Coast Survey Development Lab (see Appendix II).

In addition to the usual a priori estimates, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time (HVF) values were used for navigation and attitude. Applanix TrueHeave (POS) files, which record estimates associated with vessel position and attitude were applied in Caris HIPS using SBET and RMS files generated using POSPac MMS software.

Uncertainty values of the submitted finalized grid was calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA within Pydro QC Tools 3 was used to analyze H13339 Total Vertical Uncertainty (TVU) compliance; a histogram plot of the results is shown below.

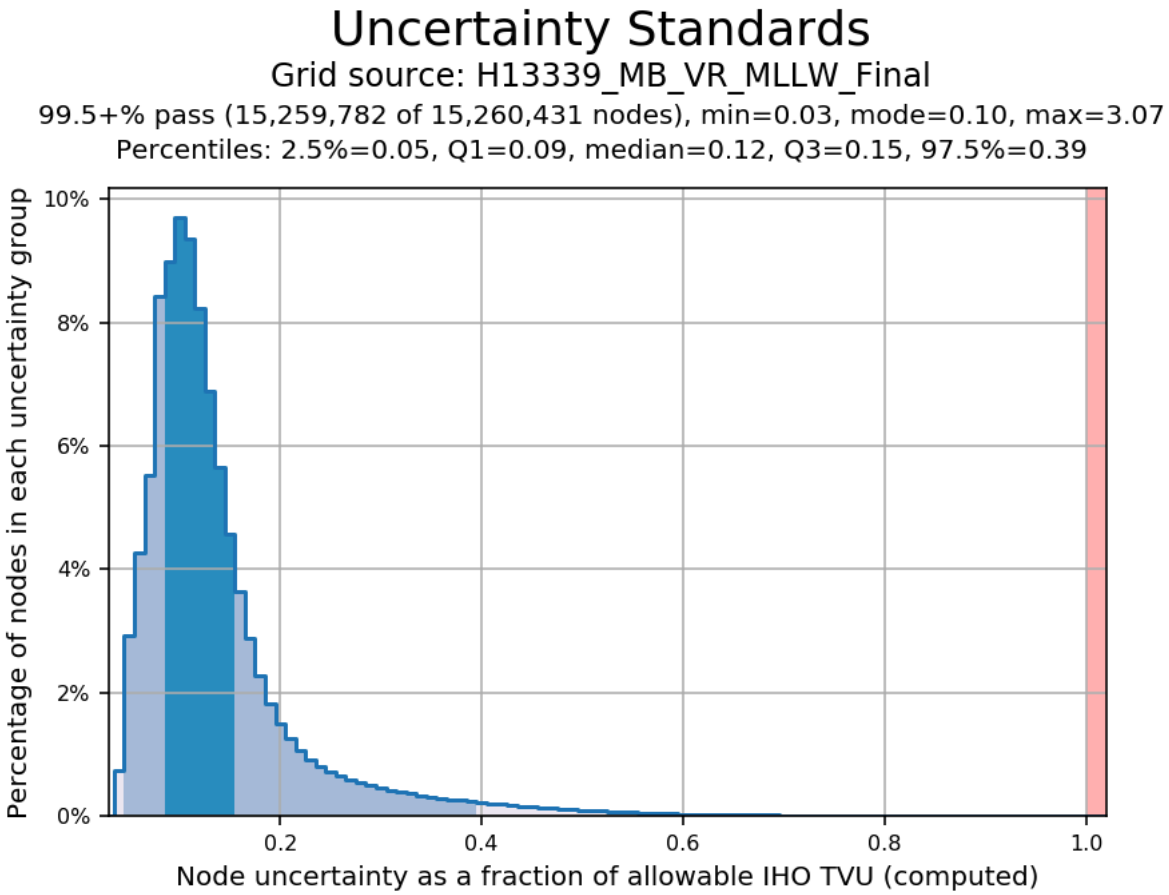


Figure 13: Pydro derived plot showing TVU compliance of H13339 finalized multi-resolution MBES data.

B.2.3 Junctions

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

Transmit Fan Sector Gaps

Numerous small coverage gaps were identified in EM 2040 data; they measure approximately 1-meter wide and appear to occur where sonar transmitter sectors meet. See section A.4, Survey Coverage, for additional information.

B.2.6 Factors Affecting Soundings

Mid Water Column Interference

Apparent marine vegetation was observed in some H13339 MBES data that interfered with optimal bottom detection (Figure 14). In some cases, it was possible to discern the underlaying seafloor from the apparent vegetation; in these instances, seafloor soundings were retained and vegetation soundings rejected. When unable to clearly distinguish between the two, no soundings were rejected.

In areas where apparent dredging has taken place, an additional issue was seen that affected accurate bottom detection (Figure 15). The source of the interference is unknown; it may be caused by disturbed seafloor sediment, or marine life. The material does not appear solid nor permanent in nature. Soundings associated with this phenomenon were not rejected because of uncertainty in determining the actual seafloor location.

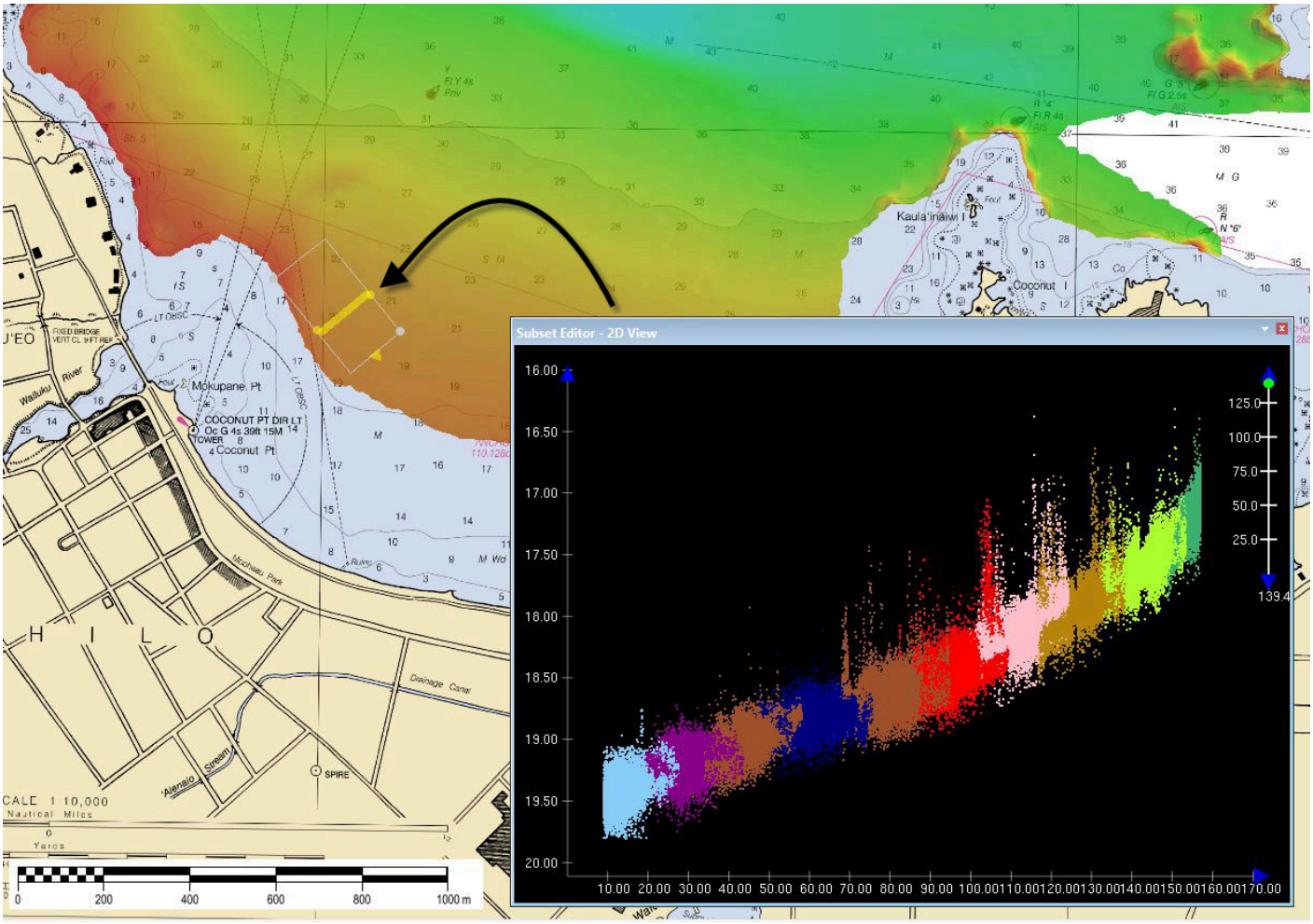


Figure 14: Subset view of apparent marine vegetation inhibiting optimal seafloor detection.

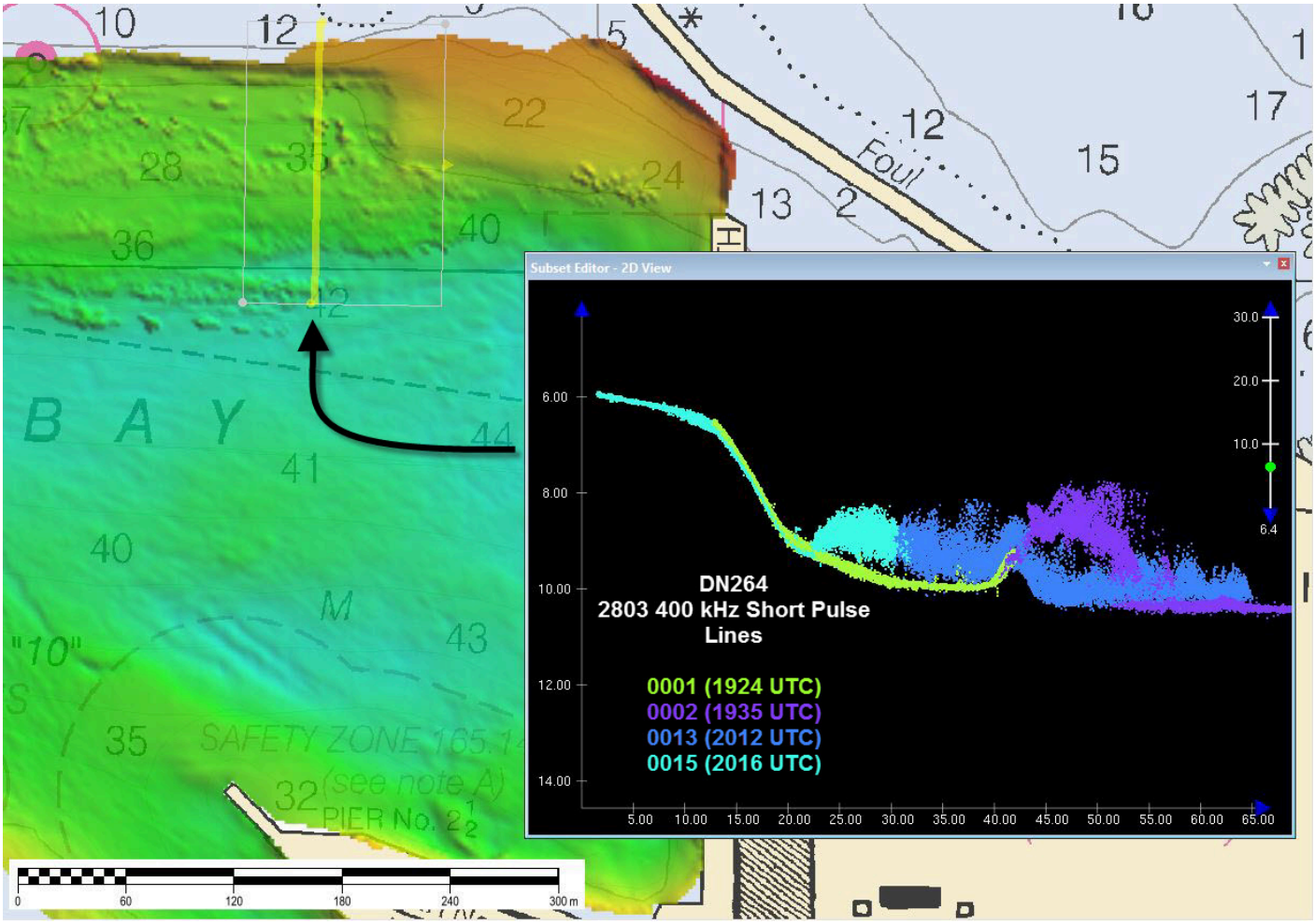


Figure 15: Unknown interference associated with apparent dredging activities.

Vertical Offset

A vertical offset of up to 0.20 meters exists between some H13339 MBES lines (Figure 16). It is unclear if the cause of the offset is due to inaccuracies in vertical control processes or to other factors such as suboptimal sound velocity correction. However, submitted H13339 data meet HSSD standards.

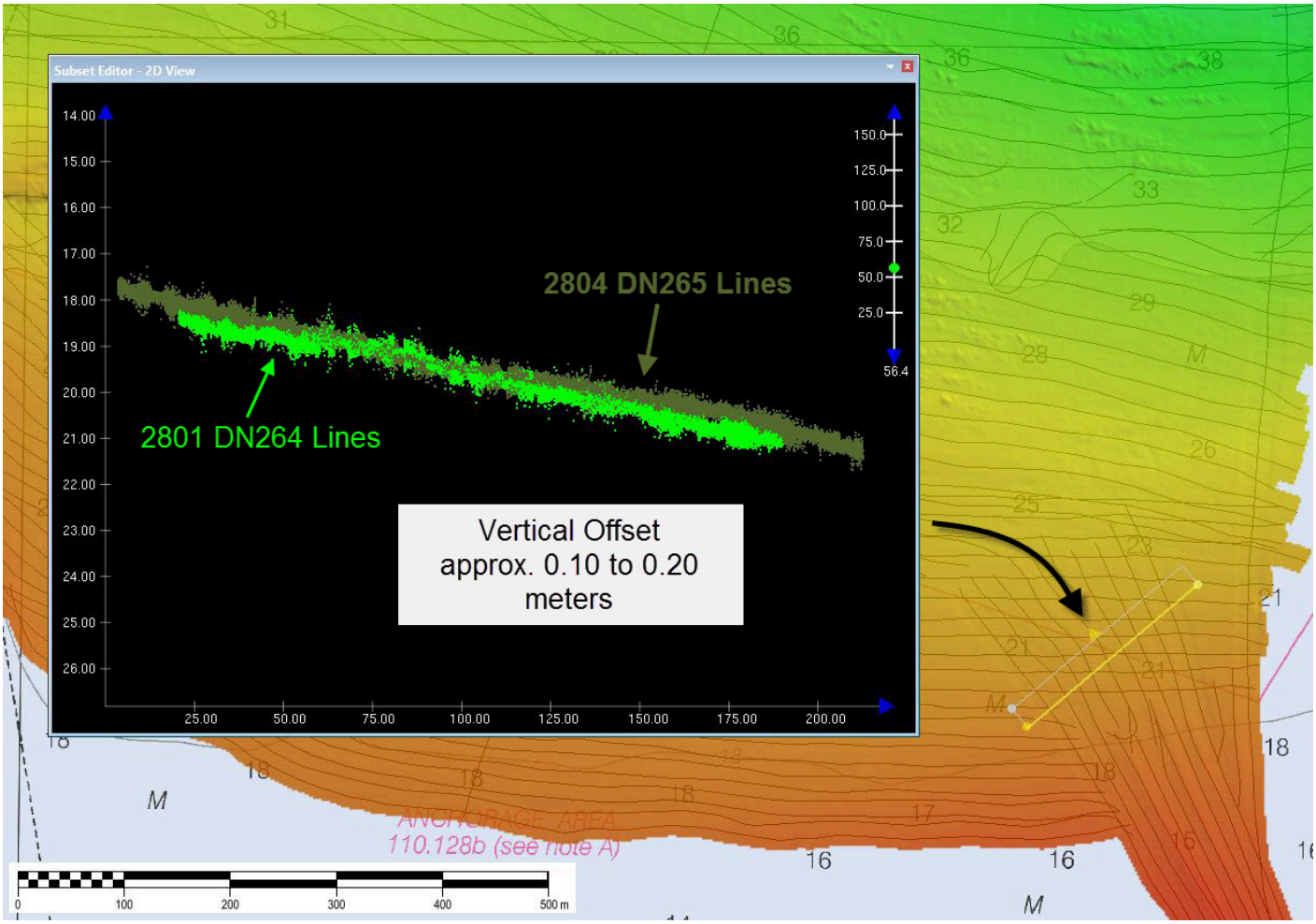


Figure 16: Example of vertical offset seen between some H13339 MBES data.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Eighteen sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes to surface sound speed were observed, or when operating in a new area. Sound speed profiles were acquired using Sea-Bird Scientific SBE 19plus profilers. All casts were concatenated into a master file and applied to H13339 MBES data using the "Nearest distance within Time" (4 hours) profile selection method.

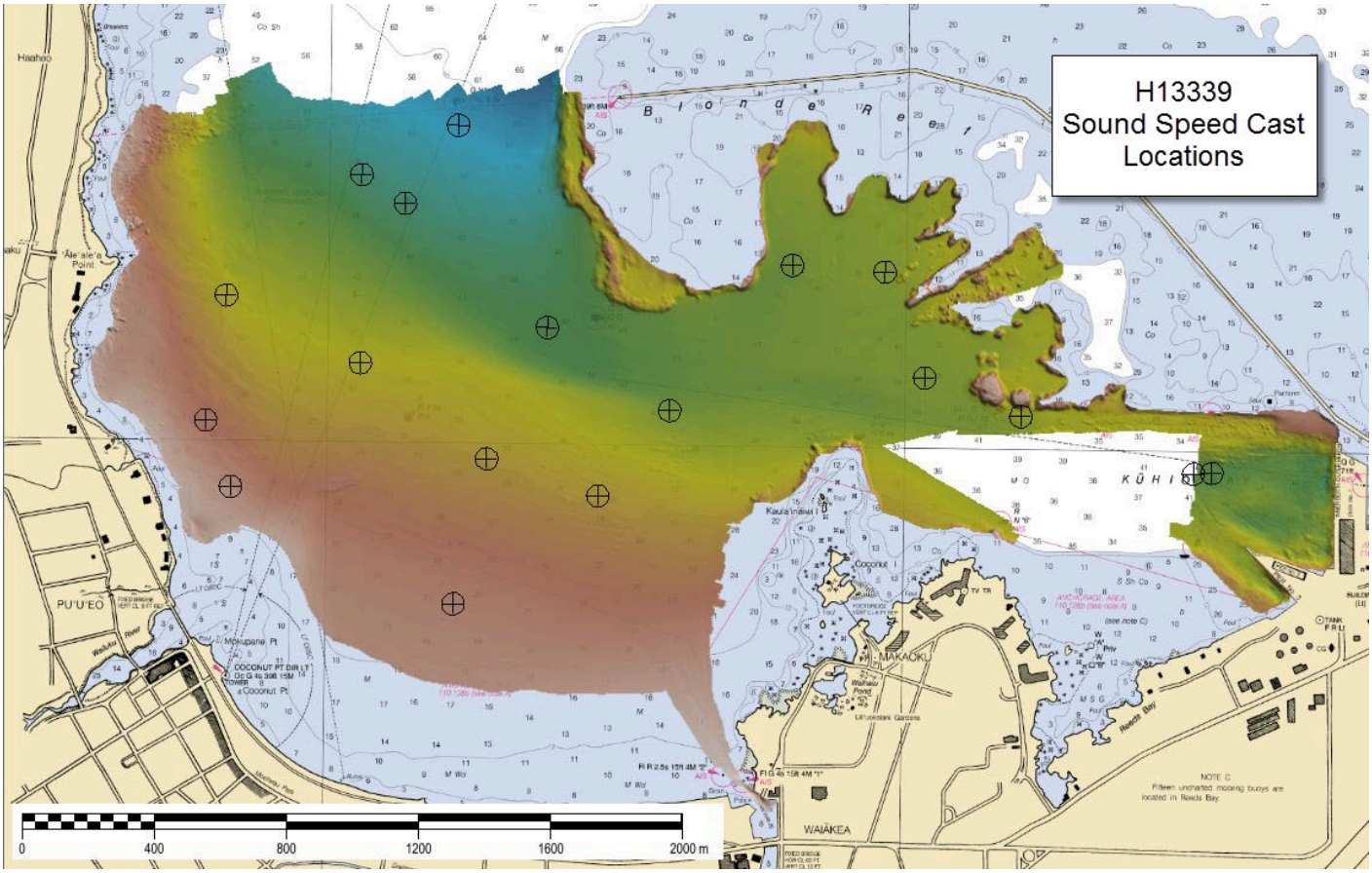


Figure 17: H13339 sound speed cast locations.

B.2.8 Coverage Equipment and Methods

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

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

Raw backscatter data was acquired as .ALL files logged during MBES operations and subsequently processed by RAINIER personnel. The .GSF files created during processing and one backscatter mosaic per vessel per frequency has been delivered with this report. Backscatter processing procedures are described in the DAPR.

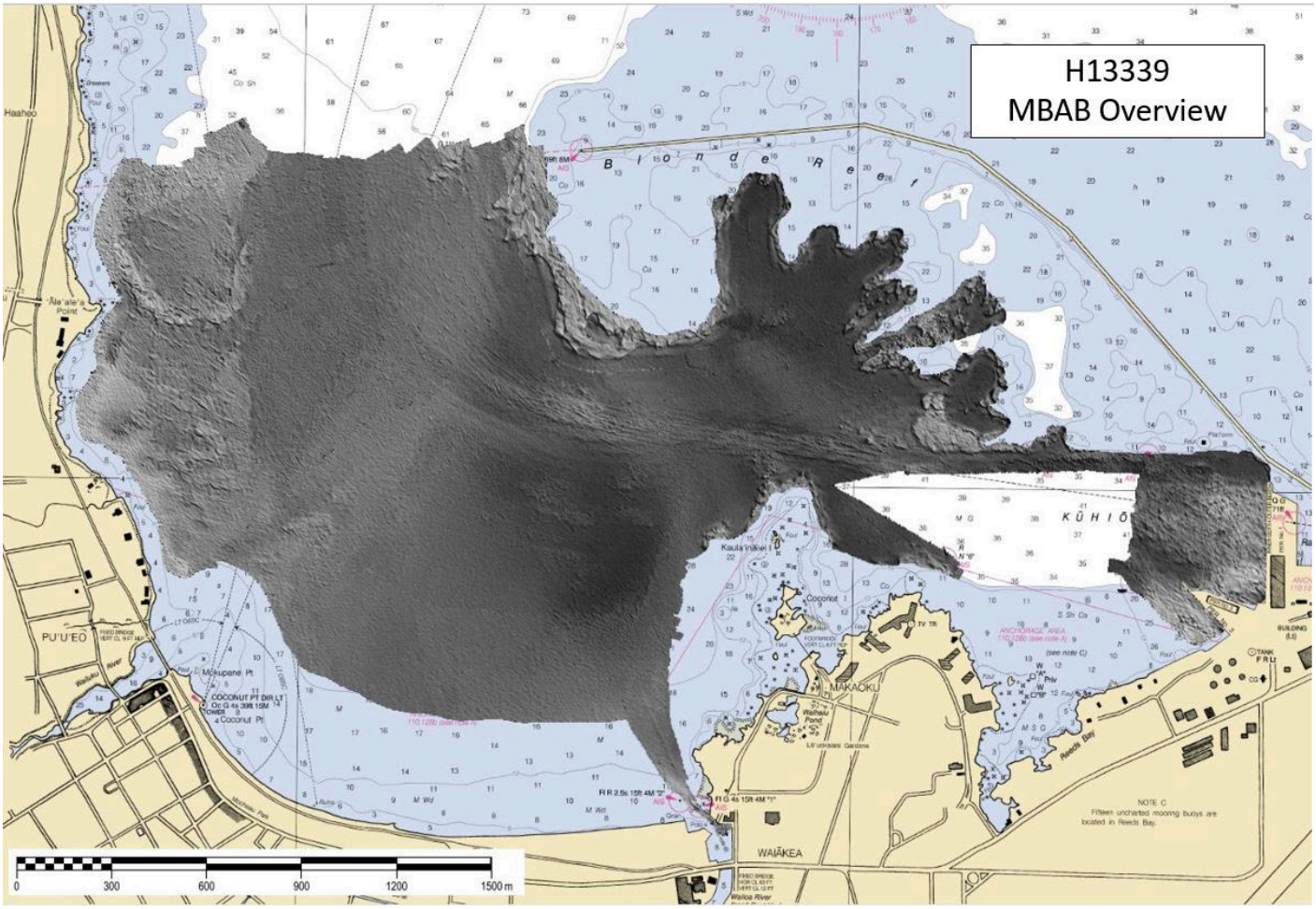


Figure 18: Overview of H13339 multibeam acoustic backscatter mosaics (Chart 19324).

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	11.1.3

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus Geocoder Tool Box (FMGT)	7.8.1

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
H13339_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.32 meters - 20.17 meters	NOAA_VR	Object Detection
H13339_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.32 meters - 20.17 meters	NOAA_VR	Object Detection

Table 11: Submitted Surfaces

Submitted H13339 surfaces were generated using NOAA recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids. No soundings were designated for this survey.

Pydro QC Tools v.3.1.2 Flier finder v8 program with default settings was used to identify sounding fliers in H13339 submitted surfaces. One potential flier was identified; it is located in an apparent dredged area of abnormal seafloor characteristics. Due to the uncertain nature of the seafloor in this area, no soundings were rejected. Flier finder was also used with the "Noisy Edges" option enabled; the results indicated that 662 edge fliers were present. A thorough cleaning of the data was conducted, the program re-ran and 577

fliers were identified. The Hydrographer believes these fliers to be "false positives" and that no additional cleaning is warranted.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey is included in the 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 ERTDM	OPR-T383-RA-19_ERTDM_NAD83(2011)_MLLW_Extended2.csar

Table 12: ERS method and SEP file

All submitted H13339 MBES data, except as noted below, were reduced to MLLW using Ellipsoid Referenced Tidal Datum Model (ERTDM) processing methods.

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 5.

The following PPK methods were used for horizontal control:

- Single Base
- RTX

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS (v8.2.1) software during post-processing horizontal correction for most MBES data. Single Base processing methods were also used to address small vertical or horizontal offsets observed in some PP-RTX

processed data. Single Base processing was used for the following data: 2801 DN264 lines 0002-0051, 2803 DN264 lines 0001-0066.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
Mauna Loa	MLO1

Table 13: CORS Base Stations

WAAS

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

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 Non-Loading SBET

A single crossline (XL_0033_20190922_210347_2803_400S_265) did not load SBET data, therefore ERS processing was not possible for this line. For crossline to mainscheme analysis, this crossline was reduced to MLLW using verified tide data from NWLON gauge 1617760 (Hilo Bay) but no TCARI or Zone Definition files. Soundings from the crossline did not contribute to the submitted VR surfaces.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H13339 survey data and Electronic Navigational Chart (ENC) US5HA12M using CUBE surfaces, selected soundings and contours created in Caris.

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
US5HA12M	1:10000	12	08/25/2017	06/04/2019

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

H13339 data identified a 5-foot shoal near a charted 9-foot depth at the entrance to the Wailoa River Small Boat Harbor. Chart 19324 includes Note B (April 2009) which warns "Shoaling has been reported within the Wailoa Small Boat Harbor. Mariners are advised to exercise caution when transiting the area."

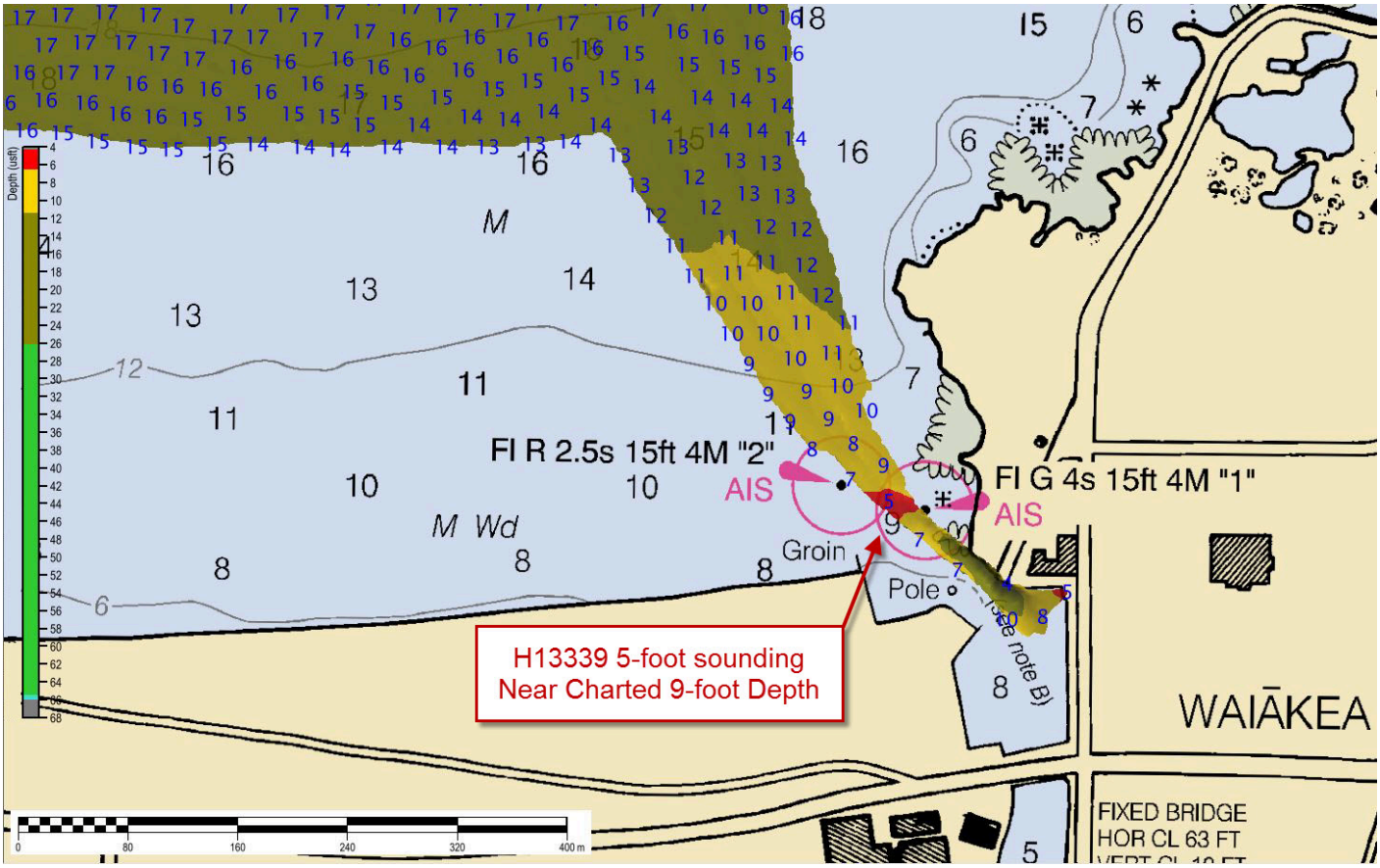


Figure 19: Uncharted shoal near entrance to Wailoa River Small Boat Harbor. H13339 VR surface and selected soundings (blue) overlaid on Chart 19324.

D.1.3 Charted Features

No features charted as PA, ED, PD, or Rep are located within the H13339 survey area.

D.1.4 Uncharted Features

No new features with navigational significance were identified in the H13339 survey area.

D.1.5 Channels

Dredging activities have been reported within the H13339 survey area, however no regularly maintained channels or controlled depths are charted. Three anchorage areas are charted within Hilo Harbor, however H13339 coverage was limited to just one of these, the area between Mokupane Point and the outlet of the Wailoa River. In this area, survey soundings and charted depths agreed to approximately one foot.

D.2 Additional Results

D.2.1 Aids to Navigation

Numerous Aids to Navigation (ATON) are located within the H13339 survey area. Many were observed in the field and appear to be serving their intended purpose; see H13339 Final Feature File for additional information.

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

Two fixed bridges and two foot bridges, all with charted vertical clearances, are located inside Hilo Harbor. The spans were inshore of safe navigation and therefore not addressed.

D.2.5 Submarine Features

There are no submarine cables, pipelines or tunnels charted within the H13339 survey area.

D.2.6 Platforms

One platform is charted in Hilo Harbor approximately 180 meters east of the G "9" buoy; the feature was not addressed during shoreline verification.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals are located in Hilo Harbor.

D.2.8 Abnormal Seafloor or Environmental Conditions

See "Mid Water Column Interference" in section B.2.6, Factors Affecting Soundings.

D.2.9 Construction and Dredging

The Hawai'i Department of Transportation reported that an area inside Hilo Harbor had recently been dredged and surveyed by USACE. The graphic below was provided by the Hawai'i DOT which stated that the area outlined was not a priority for NOAA survey operations.

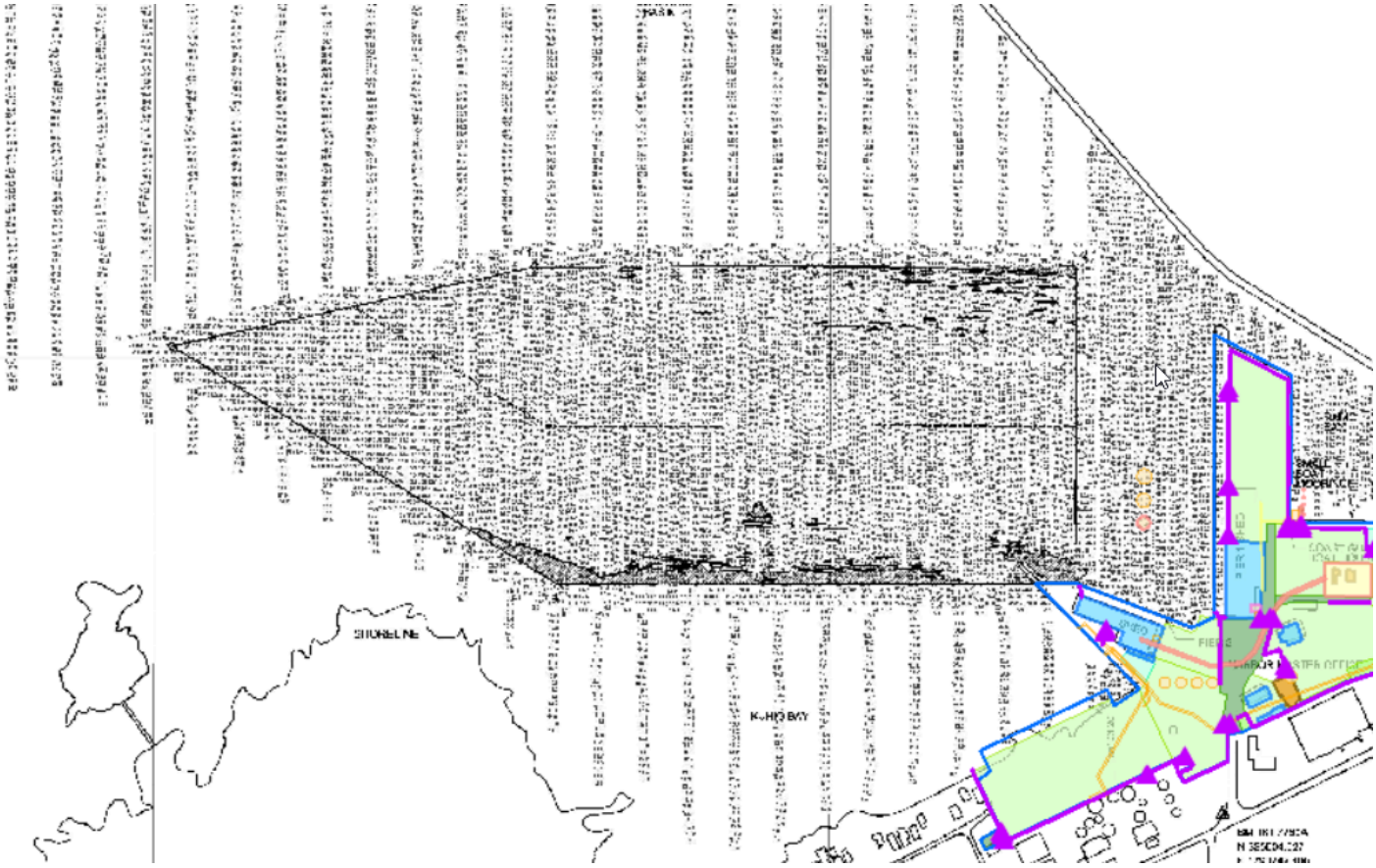


Figure 20: Hawai'i DOT provided image of USACE dredge / survey area inside Hilo Harbor.

D.2.10 New Survey Recommendations

No new surveys or further investigations are recommended for this area.

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.

Approver Name	Approver Title	Approval Date	Signature
Samuel F. Greenaway, CDR/NOAA	Commanding Officer	01/24/2020	GREENAWAY.SAMUEL.F.1275635347 Digitally signed by GREENAWAY.SAMUEL.F.1275635347 Date: 2020.01.24 12:03:17 -08'00'
Hadley A. Owen, LT/NOAA	Field Operations Officer	01/24/2020	Digitally signed by OWEN.HADLEY.ANNE.1410967070 Date: 2020.01.24 12:26:27 -08'00'
James B. Jacobson	Chief Survey Technician	01/24/2020	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2020.01.24 12:29:35 -08'00'
B.D. Jackson	Senior Survey Technician	01/24/2020	B Jackson

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