F00776

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	F00776

LOCALITY

State(s):	Alaska
General Locality:	Resurrection Bay, Alaska
Sub-locality:	JAG Shipyard, Seward, Alaska

2019

CHIEF OF PARTY
Benjamin K. Evans, CAPT/NOAA

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

F00776

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):	**Alaska**
General Locality:	**Resurrection Bay, Alaska**
Sub-Locality:	**JAG Shipyard, Seward, Alaska**
Scale:	**10000**
Dates of Survey:	**05/27/2019 to 06/05/2019**
Instructions Dated:	**05/28/2019**
Project Number:	**OPR-P136-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 6N, 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 F00776

Project: OPR-P136-RA-19

Locality: Resurrection Bay, Alaska

Sublocality: JAG Shipyard, Seward, Alaska

Scale: 1:10000

May 2019 - June 2019

NOAA Ship *Rainier*

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

A. Area Surveyed

This survey area is referred to as F00776, "JAG Shipyard and Vicinity". The survey area encompasses 2.94 square nautical miles of northeastern Resurrection Bay and the Seward Shipyard.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
60° 5' 53.7" N 149° 25' 3.2" W	60° 4' 8.9" N 149° 20' 34.75" W

Table 1: Survey Limits

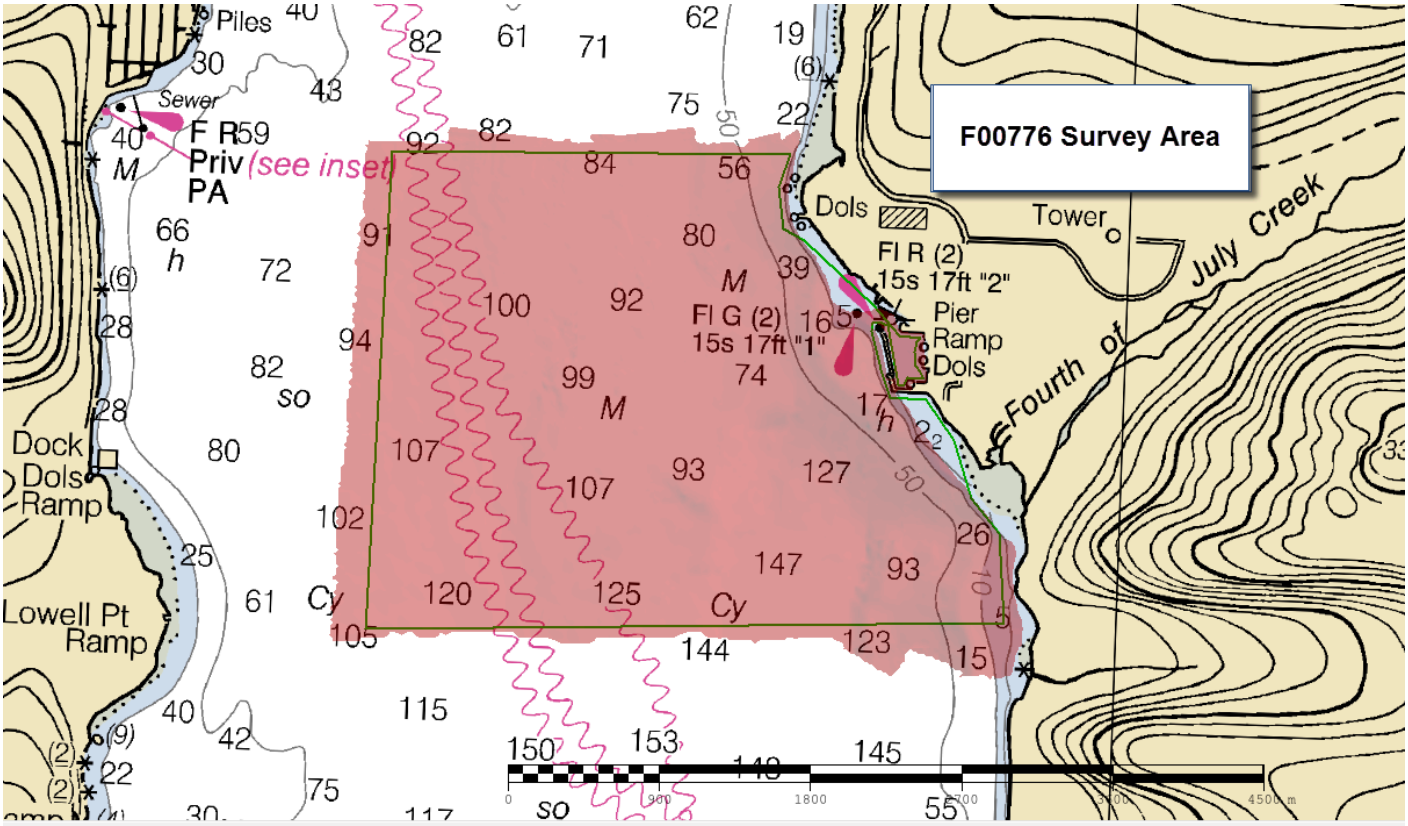


Figure 1: F00776 survey area (Chart 16682).

Data were acquired within the survey limits as described above and to specifications as determined by the HSSD, unless otherwise noted in this report.

No sheet limits were assigned for this survey. NOAA Ship RAINIER initially surveyed the Seward Marine Industrial Center basin to ensure safe transit to the JAG Shipyard pier for emergency repairs. After consultation with the Alaska Navigation Manager, this area was expanded to include the adjacent area of Resurrection Bay to support a planned large scale ENC.

A.2 Survey Purpose

Major recent changes to the Seward Marine Industrial Center (JAG Alaska, Inc. Shipyard) located in Resurrection Bay near Seward, Alaska, including a new breakwater structure and accompanying channel markers, necessitate the need for updated hydrographic survey data of the area. Contemporary data are required to support a new large-scale inset to National Ocean Service (NOS) charting products of the shipyard facility and its approach.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Multibeam data for this survey were acquired and processed using object detection settings. Sonar frequency and pulse length were adjusted to correspond with changing water depths. Pydro QC Tools Grid QA V5 was used to analyze F00776 multibeam echosounder (MBES) data density. The offshore portion was analyzed using complete coverage settings whereas the basin and inshore portion of the survey area was analyzed using object detection settings. The submitted F00776 finalized variable-resolution (VR) surface met the density requirement as well as the object resolution requirement. See section A.4 Survey Coverage section for more information.

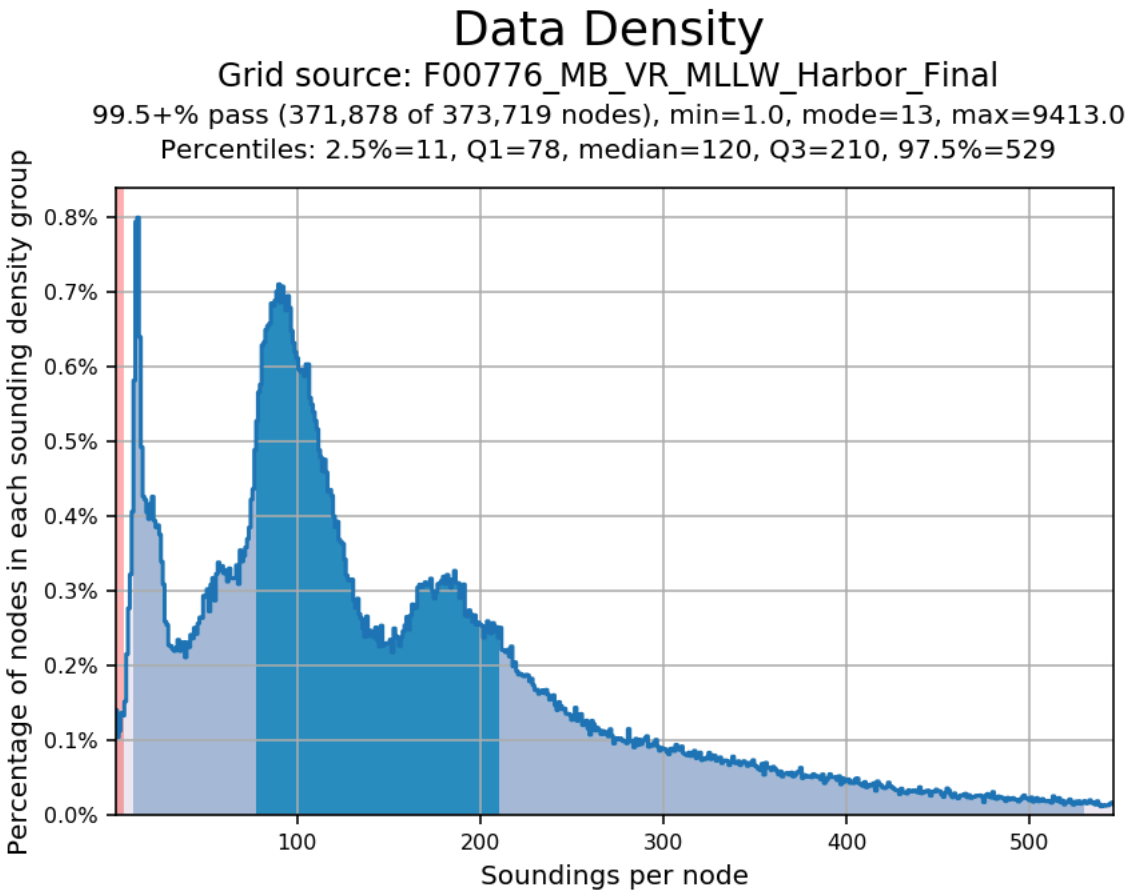


Figure 2: Pydro derived plot showing HSSD data density compliance of harbor area F00776 finalized variable-resolution MBES data.

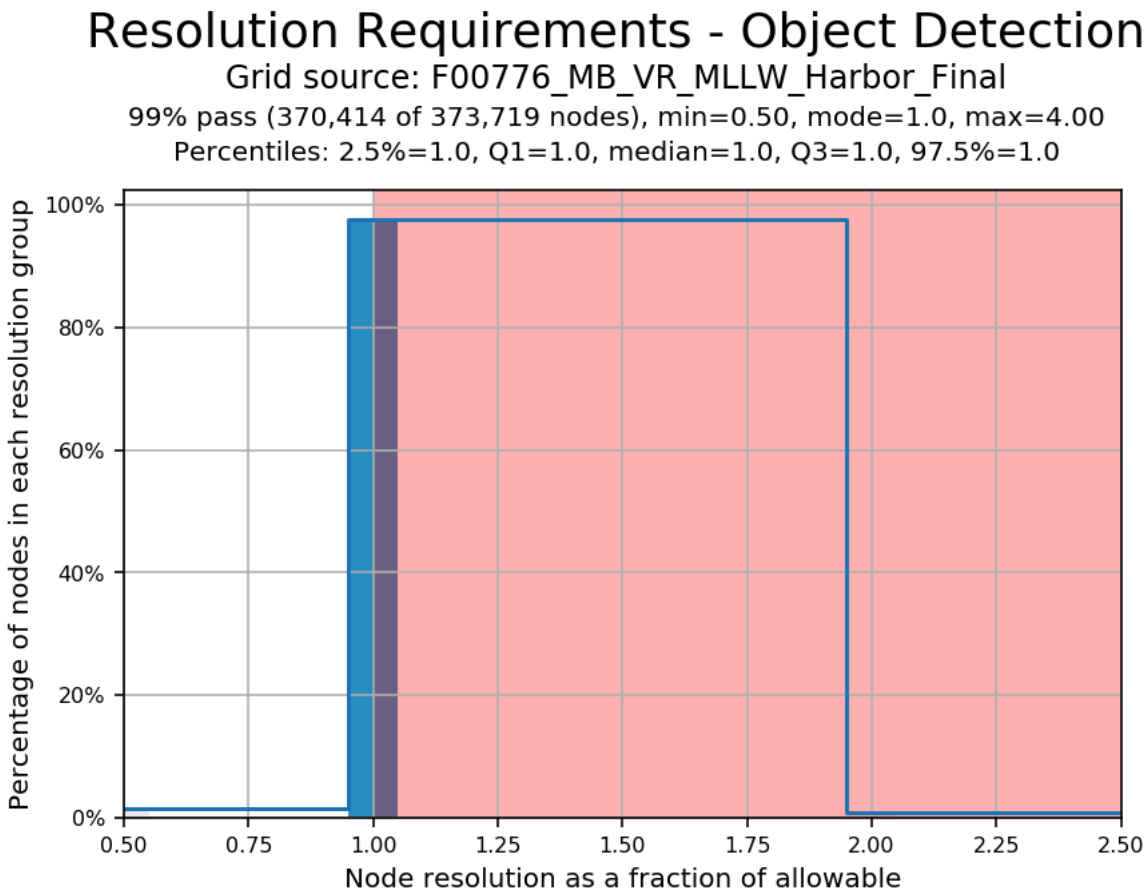


Figure 3: Pydro derived plot showing HSSD data coverage compliance of harbor area F00776 finalized variable-resolution MBES data.

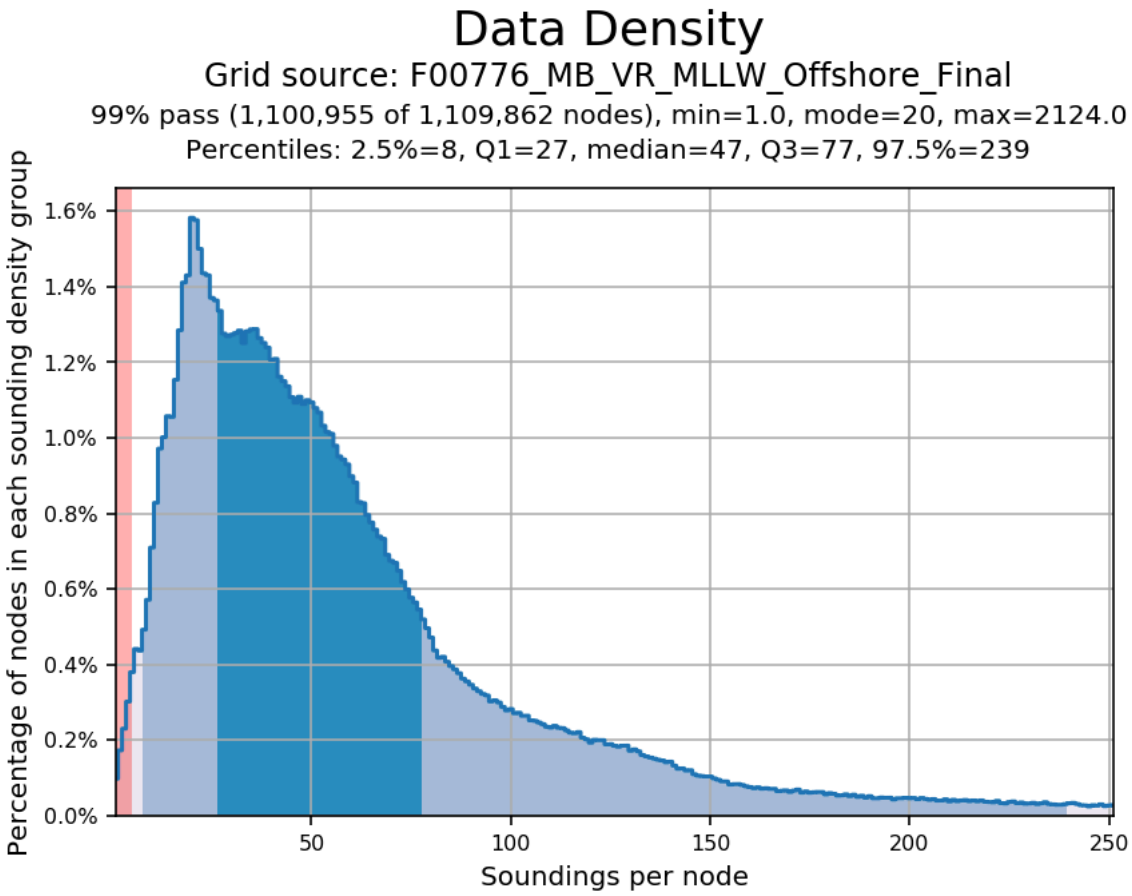


Figure 4: Pydro derived plot showing HSSD data density compliance of offshore area F00776 finalized variable-resolution MBES data.

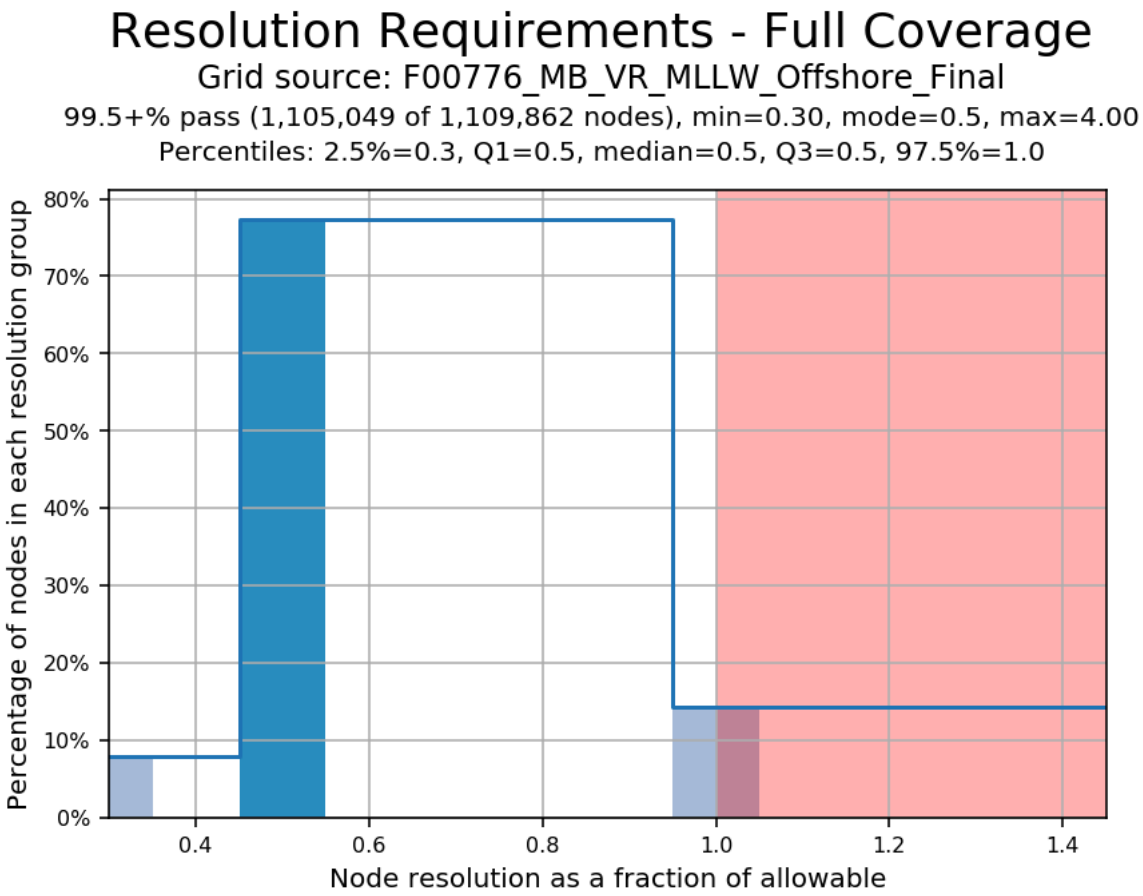


Figure 5: Pydro derived plot showing HSSD data coverage compliance of offshore area F00776 finalized variable-resolution MBES data.

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 in survey area	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

This survey is intended to produce an inset to the adjoining chart 16682. The shipyard harbor data were acquired and processed with object detection settings, whereas the data outside of the harbor were acquired and processed with complete coverage settings. Complete multibeam echosounder (MBES) coverage was acquired to the inshore limit of hydrography or the Navigable Area Limit Line (NALL) with the exception of the areas depicted in the figure 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 observed MHW line which is equivalent to 0.8 millimeters at chart scale, or the inshore limit of safe navigation.

The Pydro "Detect Holidays" program was used to scan for holidays. Three holidays were detected using the "object detection" setting. No holidays were detected when using the "complete coverage" setting. One of the holidays appears to be due to lack of overlap during data acquisition and the remaining 2 holidays appear to be the result of outer beam density issues due to a relatively sharp course change made by the acquiring vessel during acquisition. Total coverage as well as these holidays are depicted in the images below.

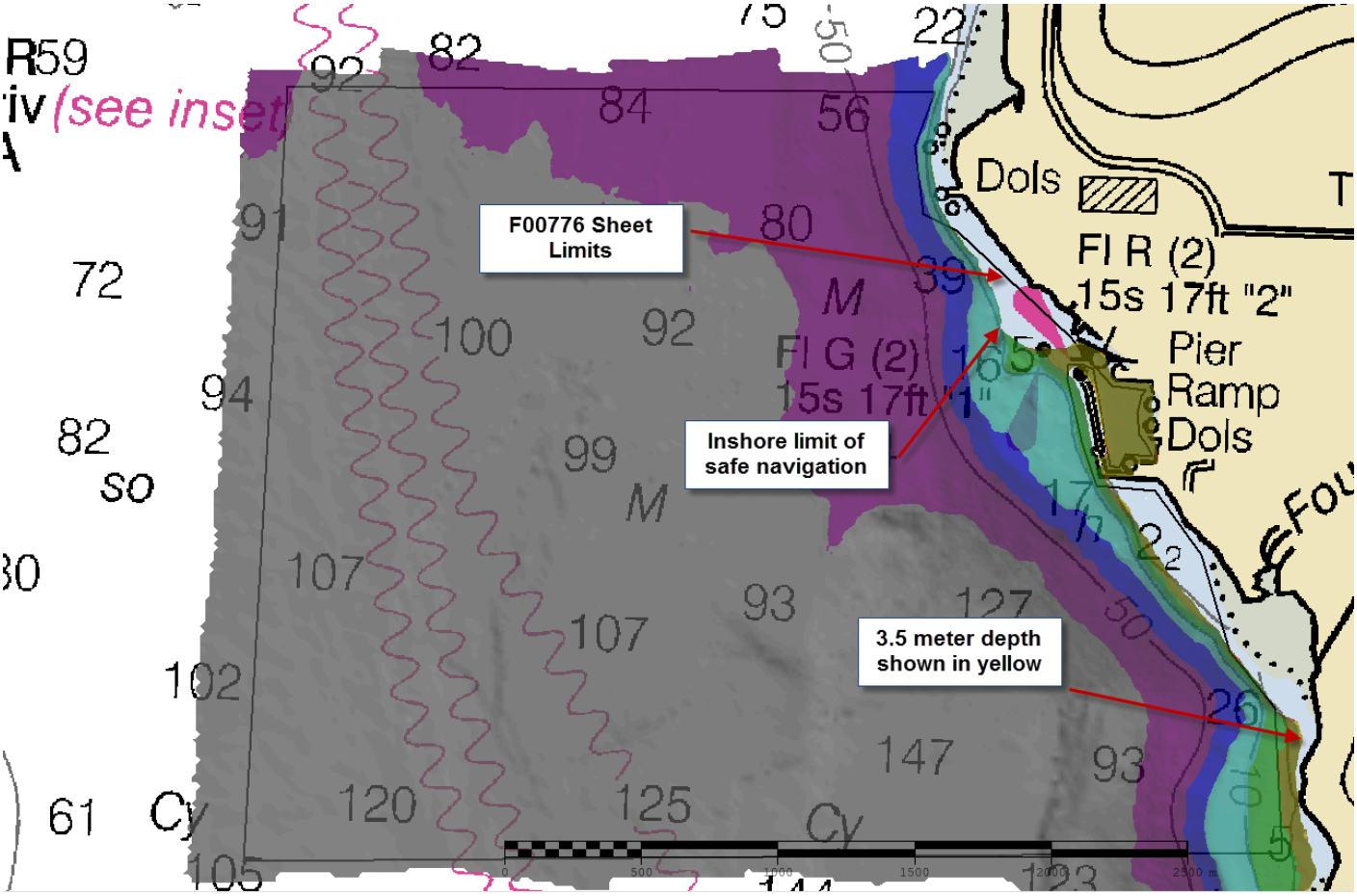


Figure 6: F00776 coverage and NALL determination (Chart 16682).

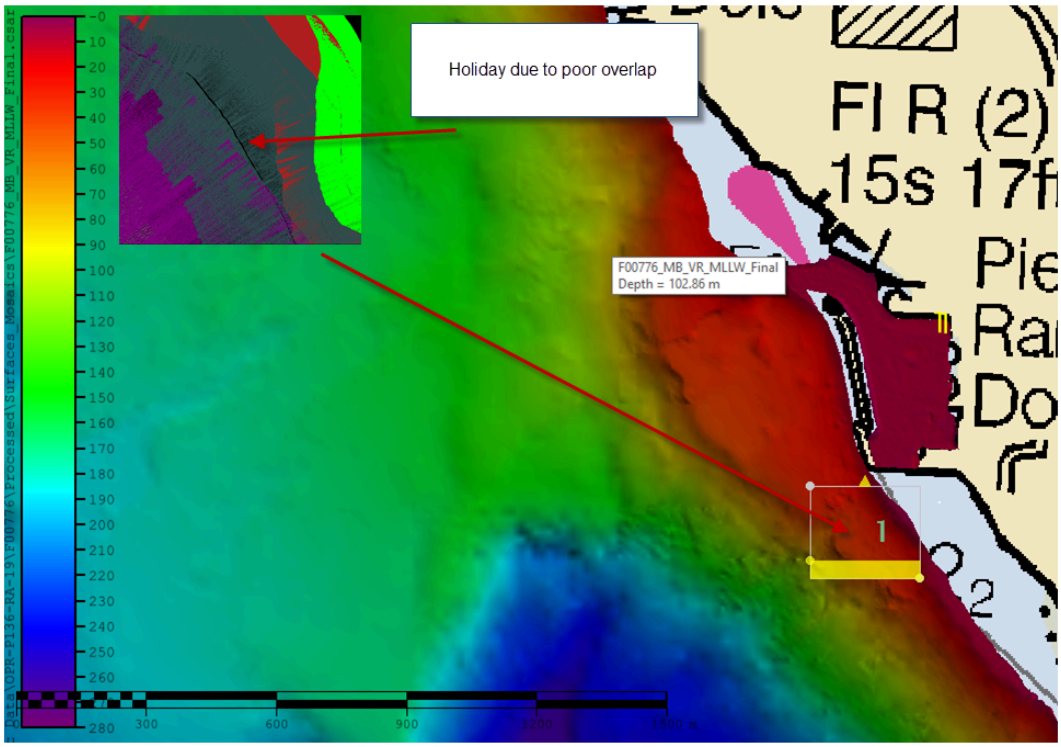


Figure 7: F00776 holiday due to poor data acquisition overlap.

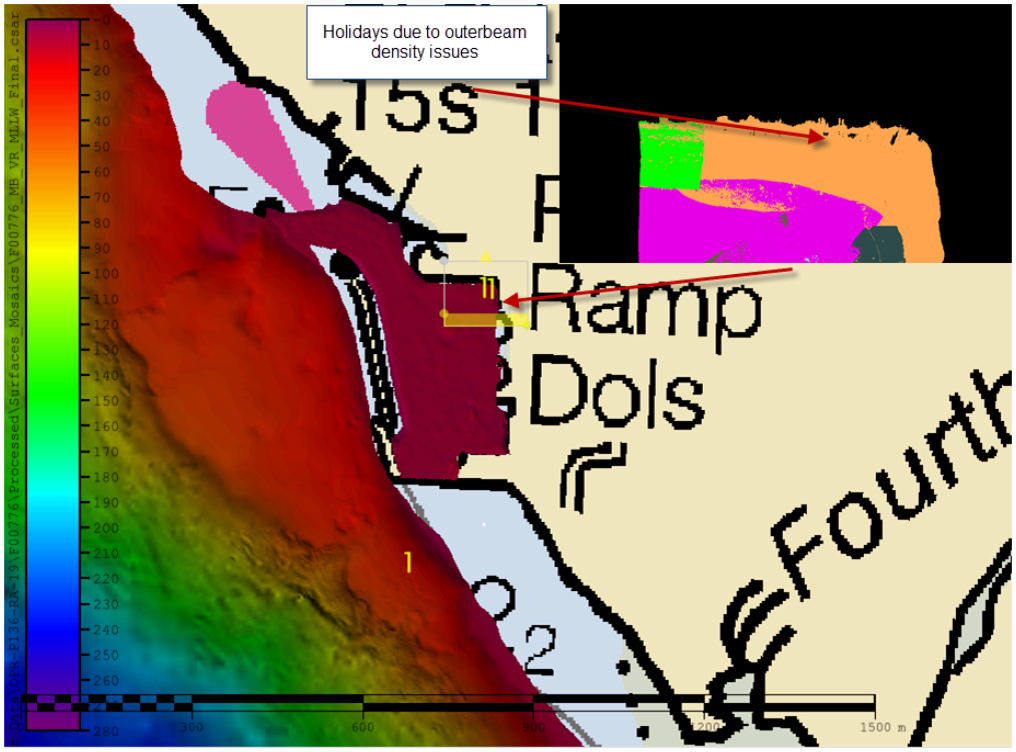


Figure 8: F00776 holidays due to low outer beam density.

SAR: A single Object Detection VR surface was created and archived during office review.

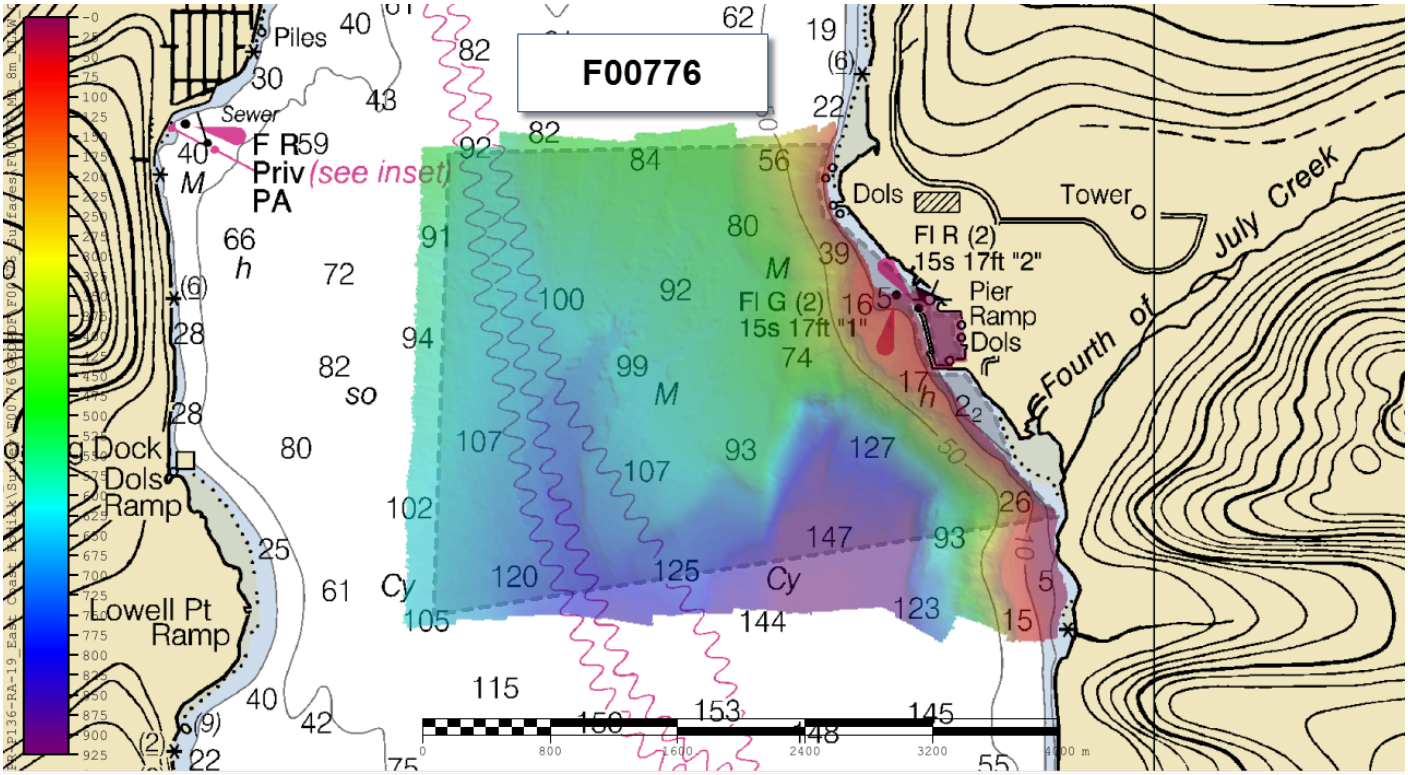


Figure 9: F00776 survey coverage (Chart 16682).

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*2701*	*Total*
LNM	**SBES Mainscheme**	0	0	5.33	5.33
	MBES Mainscheme	14.52	10.89	0	25.41
	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	0	0	0
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					0
Number Maritime Boundary Points Investigated					0
Number of DPs					3
Number of Items Investigated by Dive Ops					0
Total SNM					2.94

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/27/2019	147
05/30/2019	150

Survey Dates	Day of the Year
05/31/2019	151
06/03/2019	154
06/05/2019	156

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	*2801*	*2803*	*2701*
LOA	8.8 meters	8.8 meters	7.6 meters
Draft	1.1 meters	1.1 meters	0.47 meters

Table 5: Vessels Used

Figure 10: Survey launch 2803 (RA-3).

Figure 11: Shoreline verification boat 2701 (RA-2).

All MBES data for F00776 were acquired by NOAA Ship RAINIER survey launches 2801 and 2803. The vessels acquired depth soundings, backscatter imagery, and sound speed profiles. Shoreline feature verification was conducted by Rainier jet boat 2701. This vessel also acquired SBES data, which were used for reconaissance in order to establish an inshore boundary of MBES acquisition. Subsequent MBES coverage superceded these data for NALL determination. The SBES data are included with this survey, but due to the low quality of the data, it was not incorporated into any other products being delivered

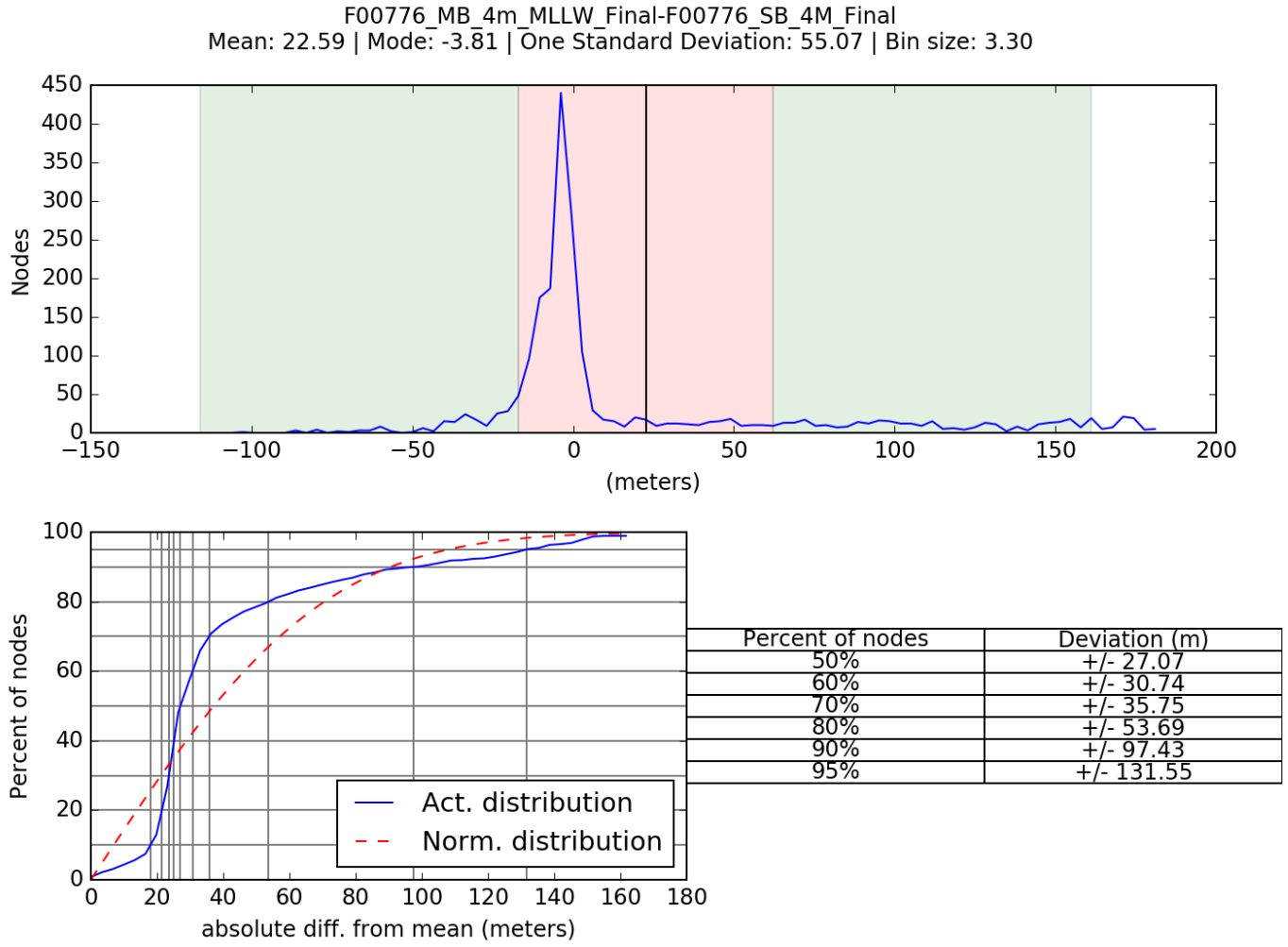
with this report. A comparison was made with the Pydro Explorer "Compare Grids" function using a 4m SBES finalized surface and a 4m MBES finalized surface. The results are shown in the figures below. The computed statistics indicated the average difference in depth between F00776 MBES and SBES was 22.59 meters with a standard deviation of 55.07 meters.

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
Teledyne Odom Hydrographic	Echotrac CV200	SBES
Velodyne LiDAR	VLP-16	Lidar System

Table 6: Major Systems Used



Percent of nodes	Deviation (m)
50%	+/- 27.07
60%	+/- 30.74
70%	+/- 35.75
80%	+/- 53.69
90%	+/- 97.43
95%	+/- 131.55

Figure 12: Pydro derived plot showing F00776 MBES/SBES surface comparison statistics.

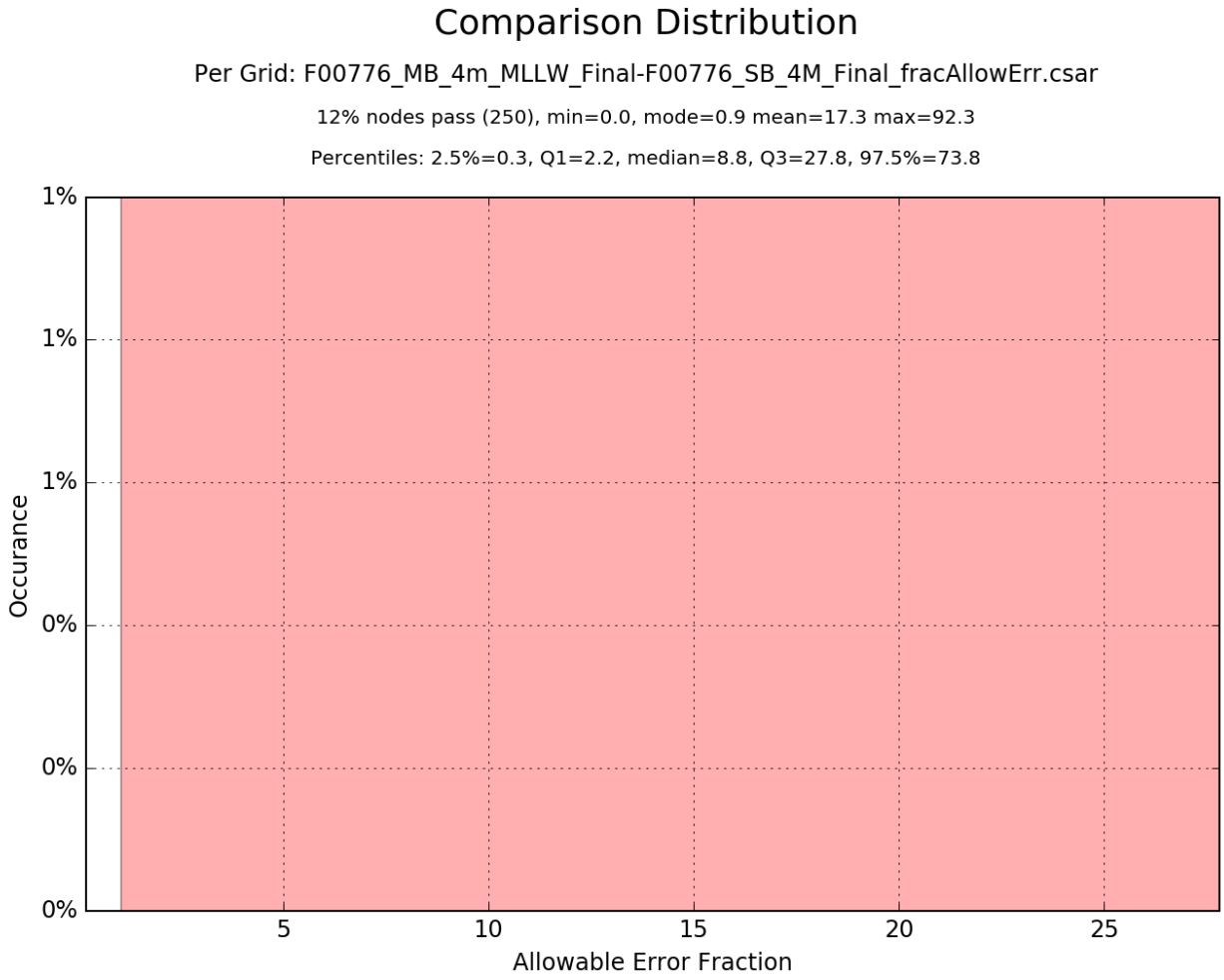


Figure 13: Pydro derived plot showing F00776 MBES/SBES surface comparison statistics.

B.2 Quality Control

B.2.1 Crosslines

No crosslines were acquired for this survey.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0 meters	0.0335 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
2801	3 meters/second	N/A meters/second	0.05 meters/second
2803	3 meters/second	N/A meters/second	0.05 meters/second
2701	3 meters/second	N/A meters/second	N/A meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey F00776 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 Elipsoidally Referenced Tidal Datum Model (ERTDM) uncertainty value entered for tide zoning TPU calculation was 0.0335 meters; it was determined using an MS Excel ERTDM calculator based on a method for estimating ERDTM SEP uncertainty developed by Jack Riley using the 1km ERZT SEP. (See Supplemental Survey Records & Correspondence for more info).

In addition to the usual a priori estimates of uncertainty, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Kongsberg MBES sonars were recorded and applied in post-processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were applied during post-processing. Finally, the post-processed uncertainties associated with vessel roll, pitch, yaw and position 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 V5 was used to analyze F00776 TVU compliance, a histogram plot of the results is shown below.

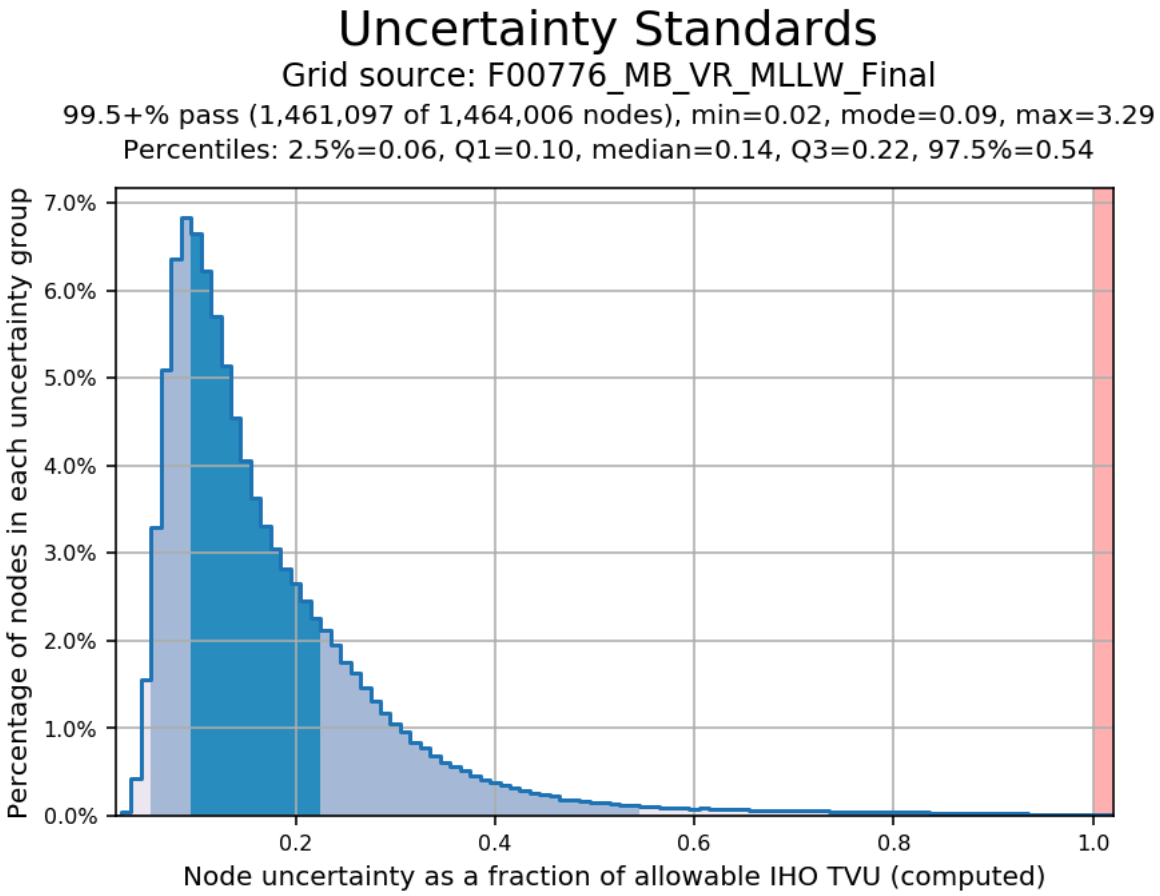


Figure 14: Pydro derived plot showing TVU compliance of F00776 finalized variable-resolution MBES grid data.

B.2.3 Junctions

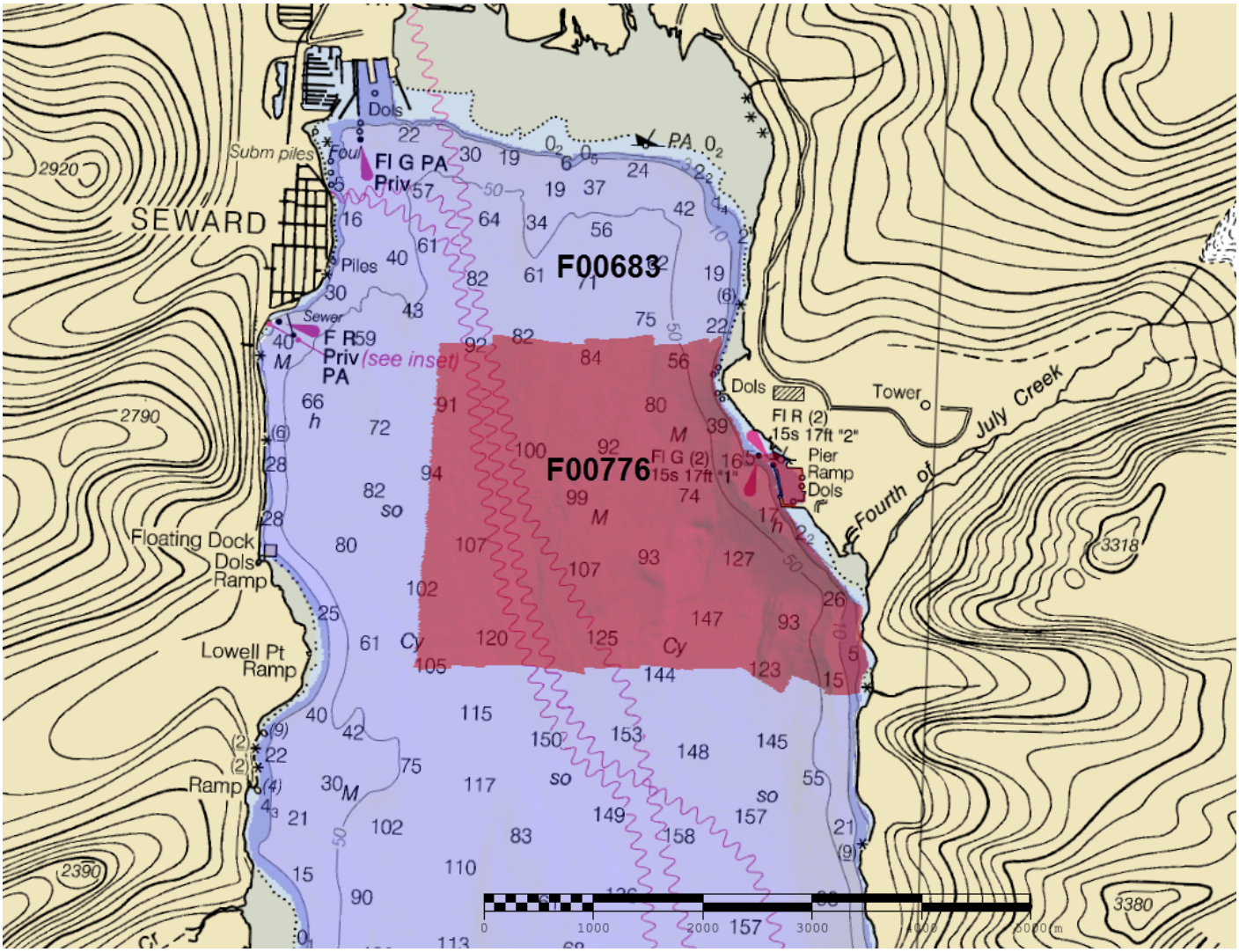


Figure 15: F00776 / F00683 junction.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
F00683	1:5000	2016	NOAA Ship RAINIER	W

Table 9: Junctioning Surveys

F00683

The junction with survey F00683 encompassed 2.94 square nautical miles and is situated completely within prior F00683 coverage with the exception of prior coverage which existed where the new breakwater is now situated. A comparison was made with the Pydro Explorer "Compare Grids" function using two Caris

single-resolution surfaces from F00776 (8m and 16m) as well as two single-resolution BAG surfaces of corresponding resolutions from survey F00683. These two resolutions were chosen as they were the best representation of the overall survey junction. The results are shown in the figures below. Additionally, the Compare Grids function creates a difference surface, from which statistics were derived. The computed statistics indicated the average difference in depth between F00776 and F00683 was 0.18 meters with a standard deviation of 0.84 meters for the 8 meter surface and 0.08 meters with a standard deviation of 0.97 meters for the 16 meter surface.

Localized areas of disagreement, include the shoreward side of the new breakwater, the northeastern portion of coverage, and the delta at the mouth of Fourth of July Creek. These areas of non-compliance are illustrated in the image below.

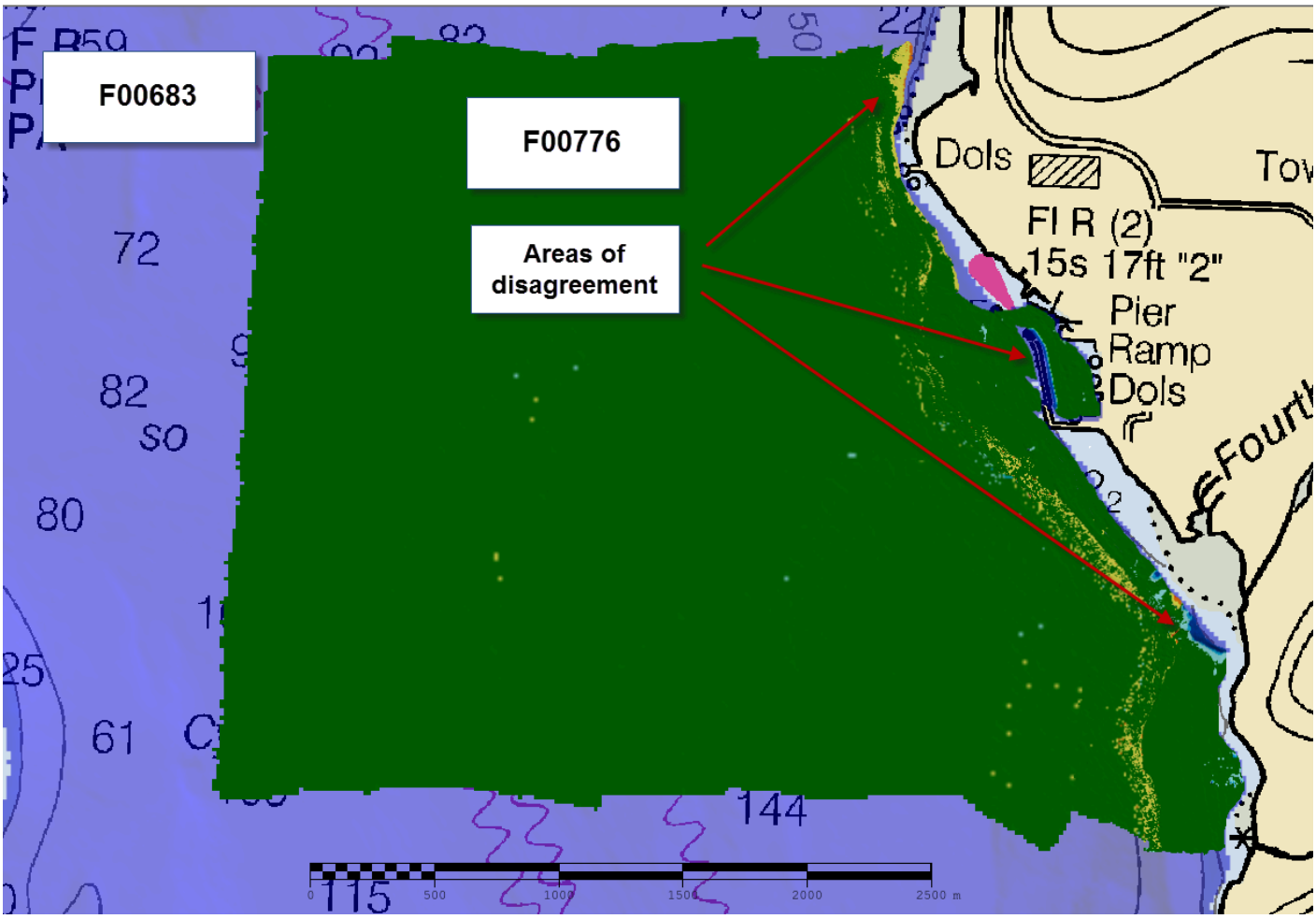
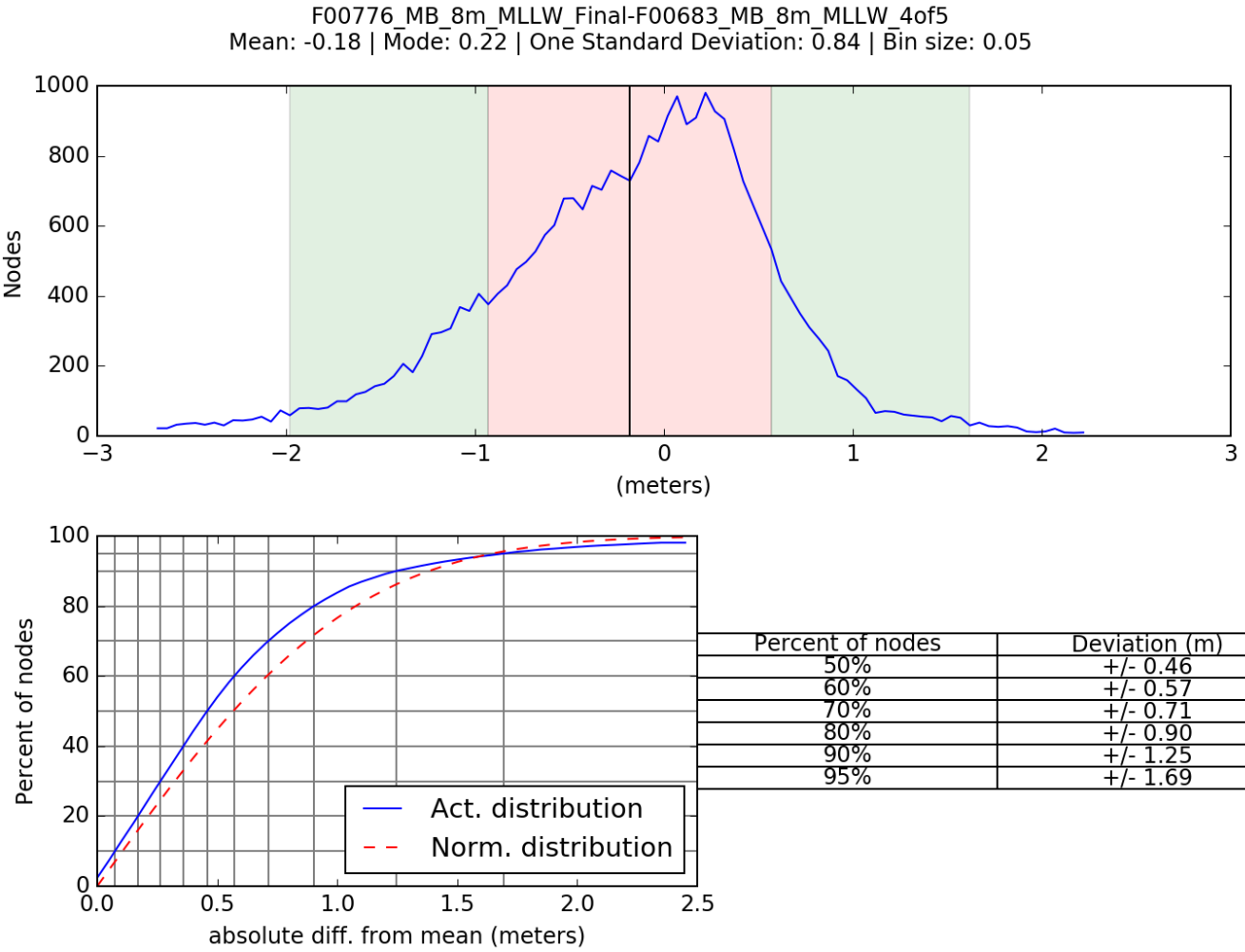


Figure 16: F00776 junction area. Failed - low and failed - high nodes are shown in cool blue/ hot red, yellow, and orange; those nodes meeting uncertainty standards are shown in green.



Percent of nodes	Deviation (m)
50%	+/- 0.46
60%	+/- 0.57
70%	+/- 0.71
80%	+/- 0.90
90%	+/- 1.25
95%	+/- 1.69

Figure 17: Pydro derived plot showing F00776/F00683 8m surface comparison statistics.

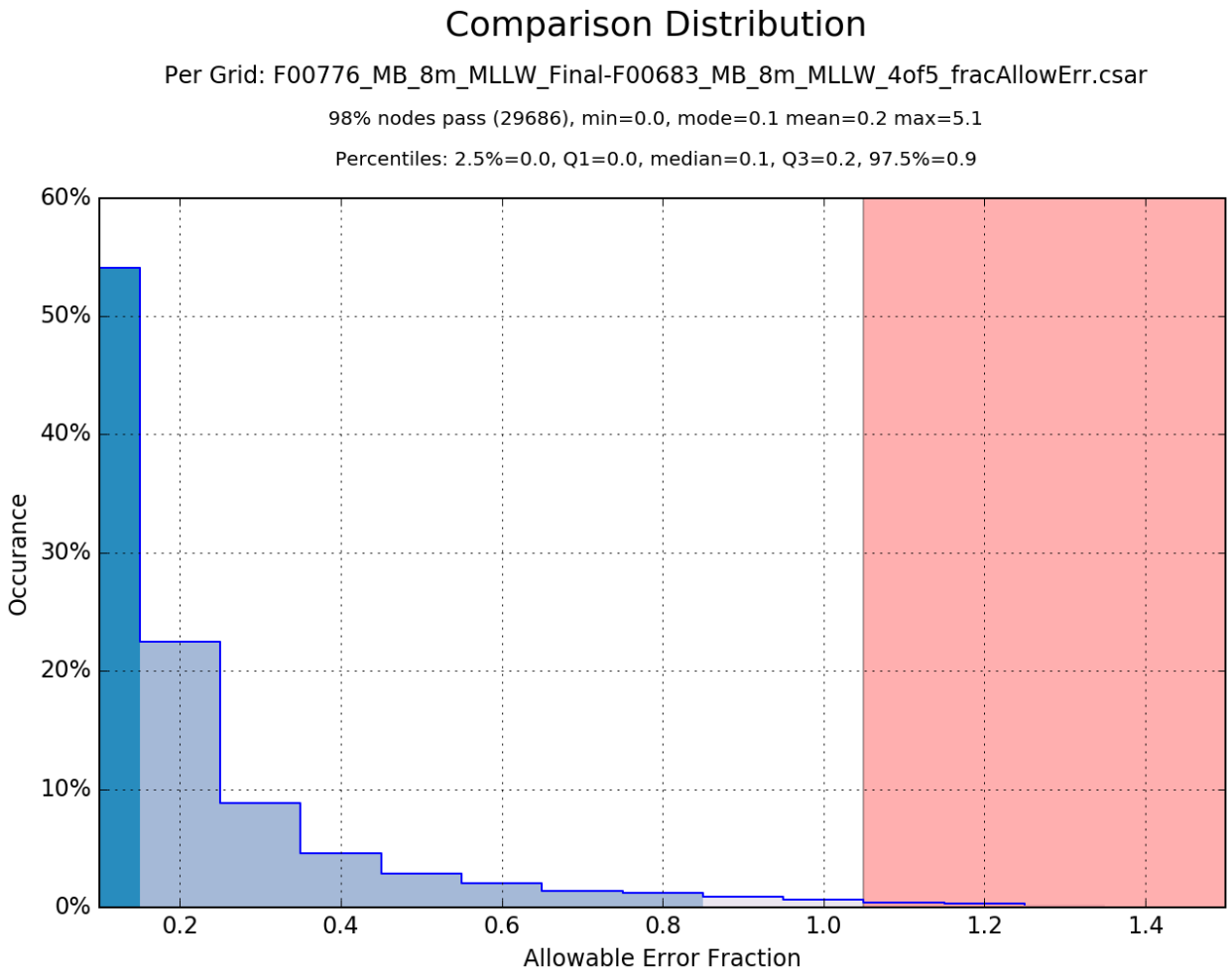
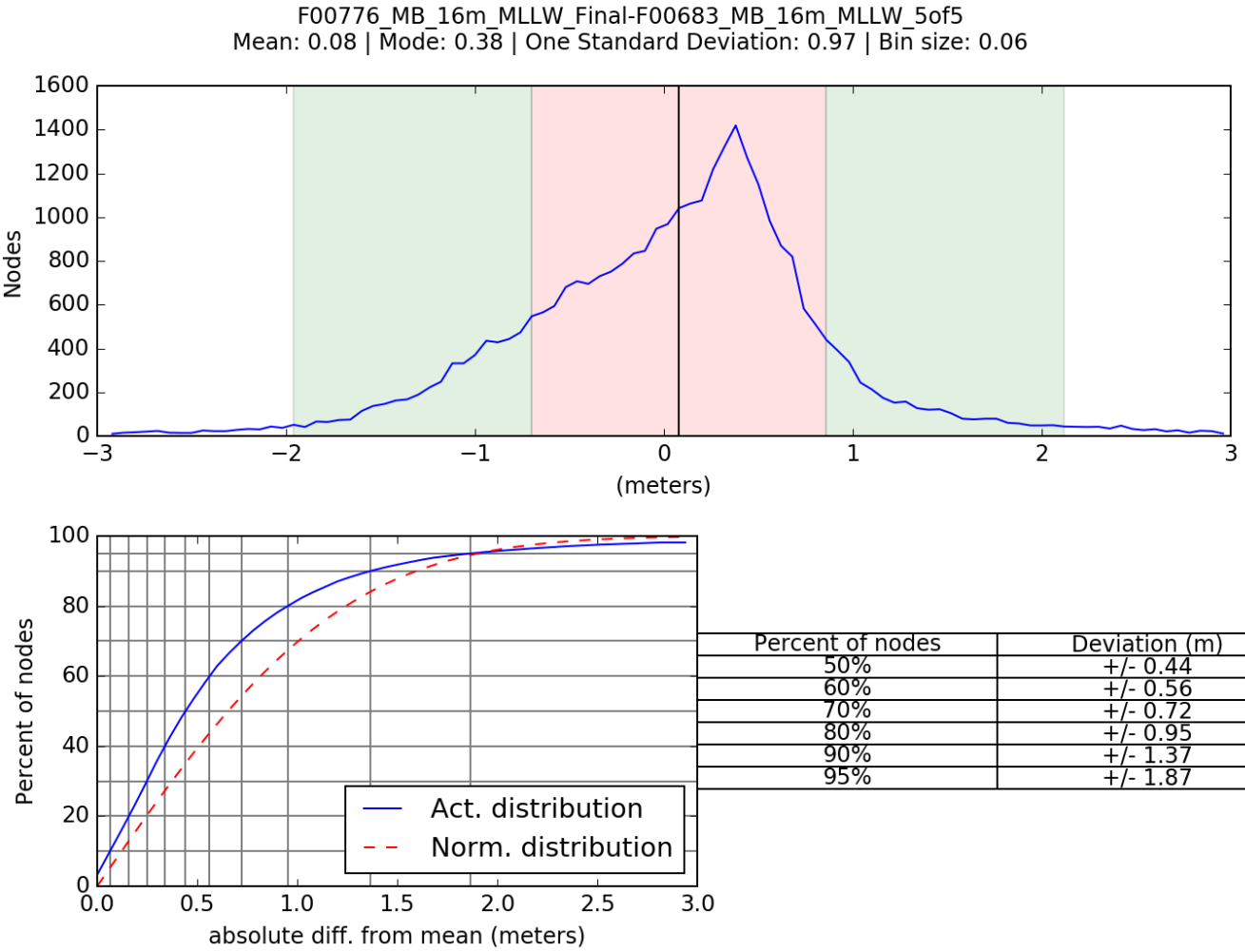


Figure 18: Pydro derived plot showing F00776/F00683 8m surface comparison statistics.



Percent of nodes	Deviation (m)
50%	+/- 0.44
60%	+/- 0.56
70%	+/- 0.72
80%	+/- 0.95
90%	+/- 1.37
95%	+/- 1.87

Figure 19: Pydro derived plot showing F00776/F00683 16m surface comparison statistics.

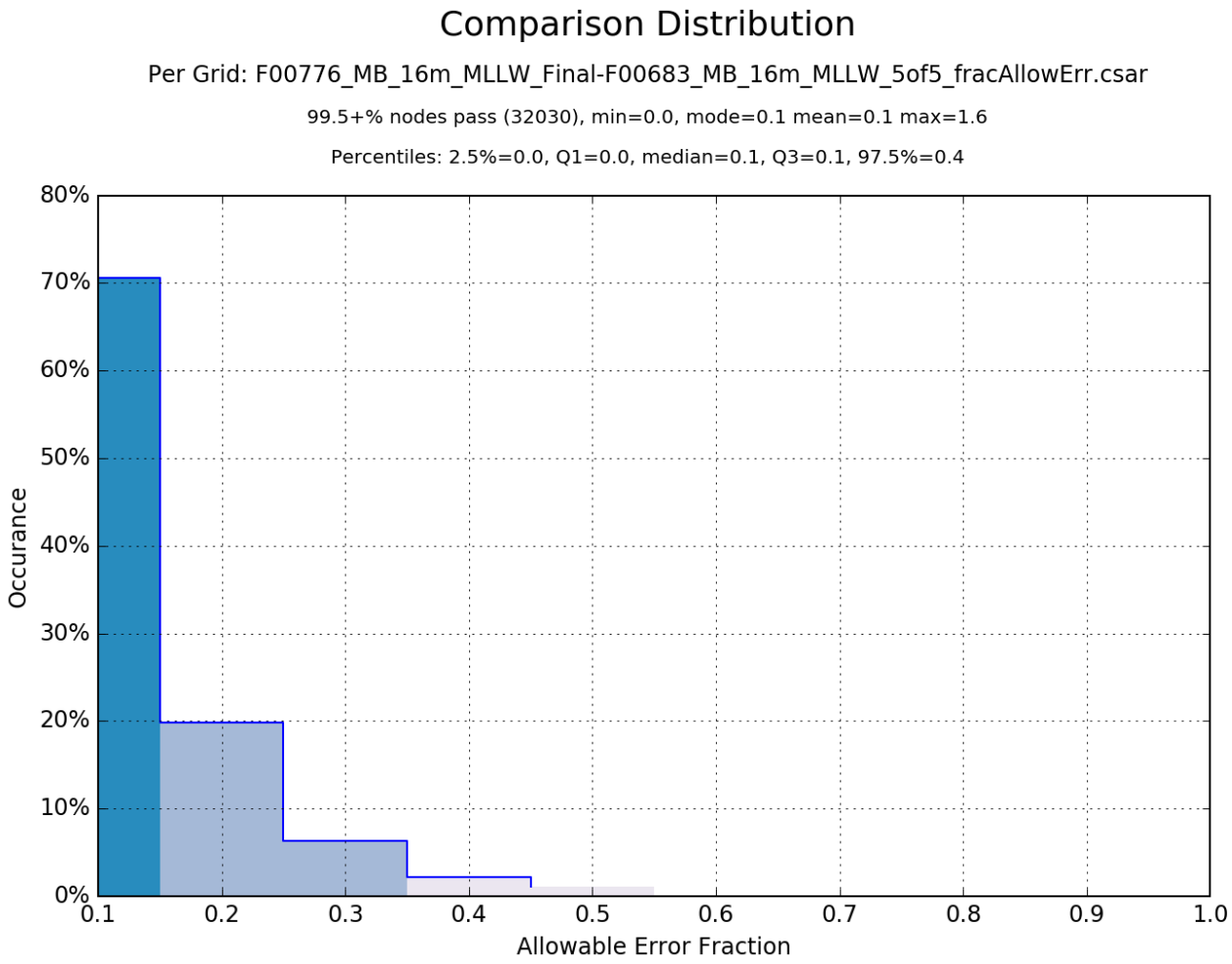


Figure 20: Pydro derived plot showing F00776/F00683 16m surface comparison statistics.

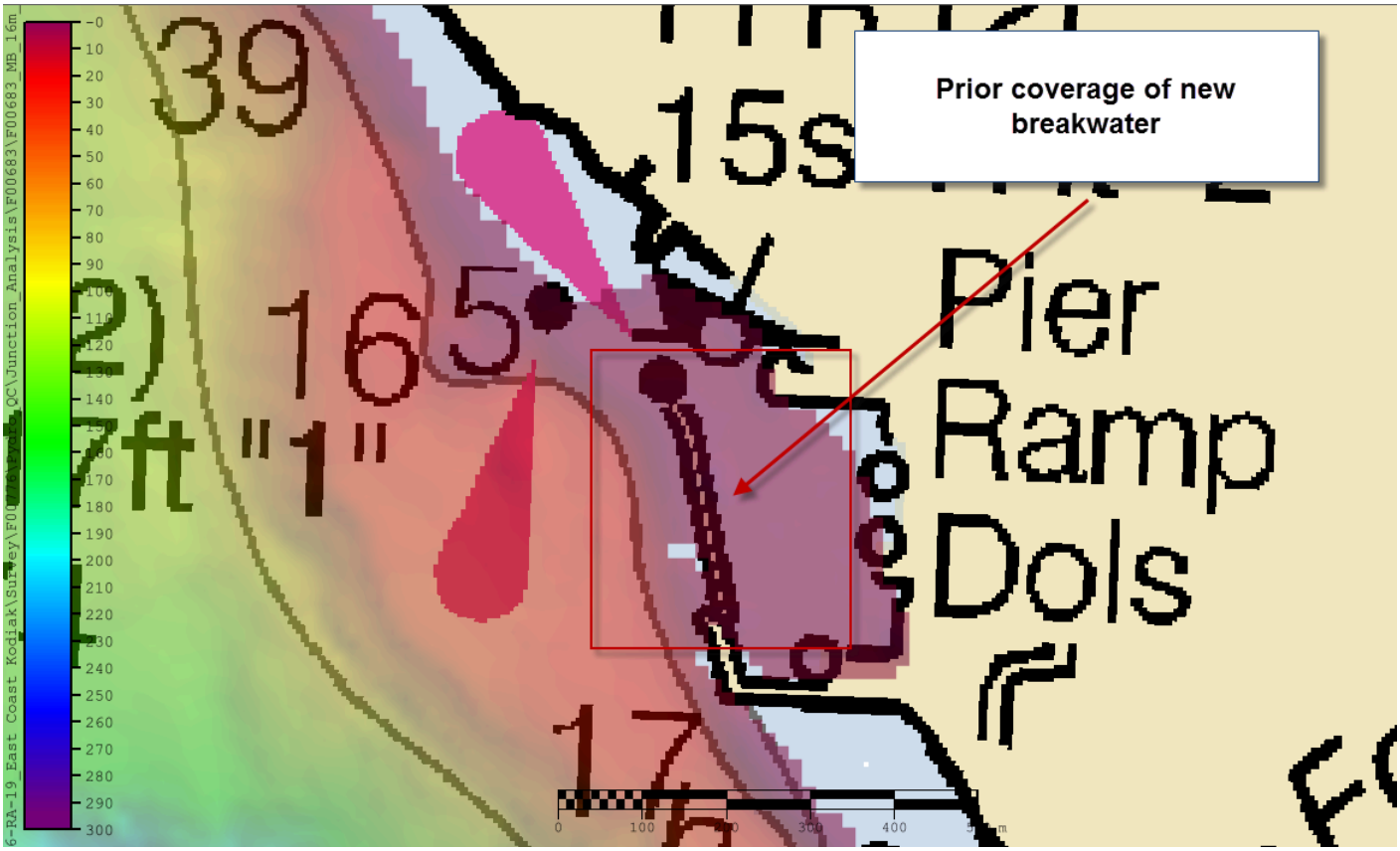


Figure 21: F00683 coverage of new breakwater.

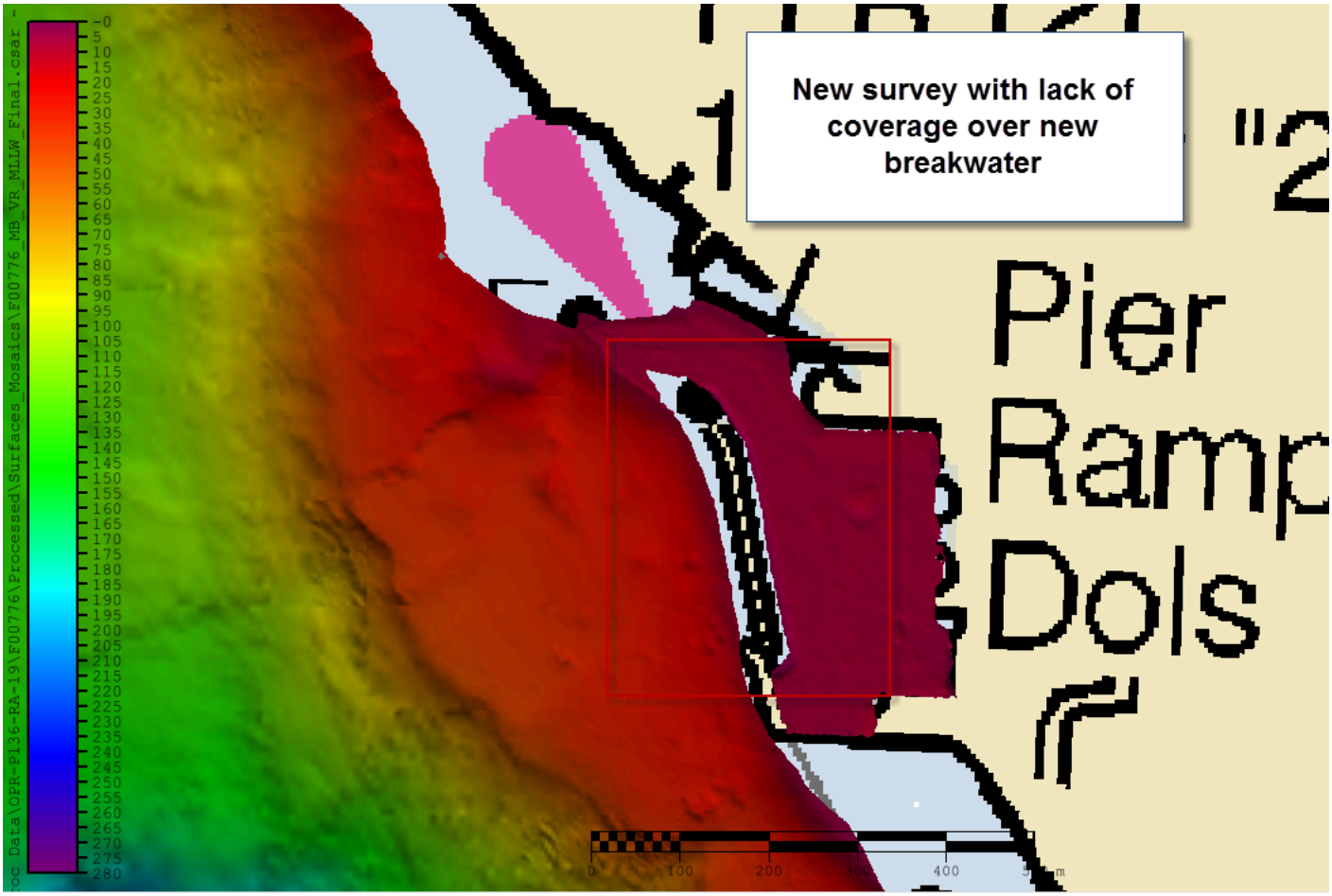


Figure 22: F00776 new coverage showing lack of coverage over new breakwater.

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

SBES Deficiency

See section B.1 for discussion covering SBES deficiency.

B.2.6 Factors Affecting Soundings

Suboptimal Sound Speed Correction

Significant fresh water inflow and water column variations, especially related to temperature and salinity differences, were sometimes encountered during the survey. Despite the best efforts of the Hydrographers to conduct sufficient sound speed casts, sound speed correction was suboptimal. This was evidenced by the appearance of systematic artifacts in the survey grid and by the characteristic "smiles" or "frowns" of the data when viewed in subset editor. To address this issue, the Hydrographer rejected outer-beam soundings obviously in error in an attempt to produce a surface that best represented the sea floor.

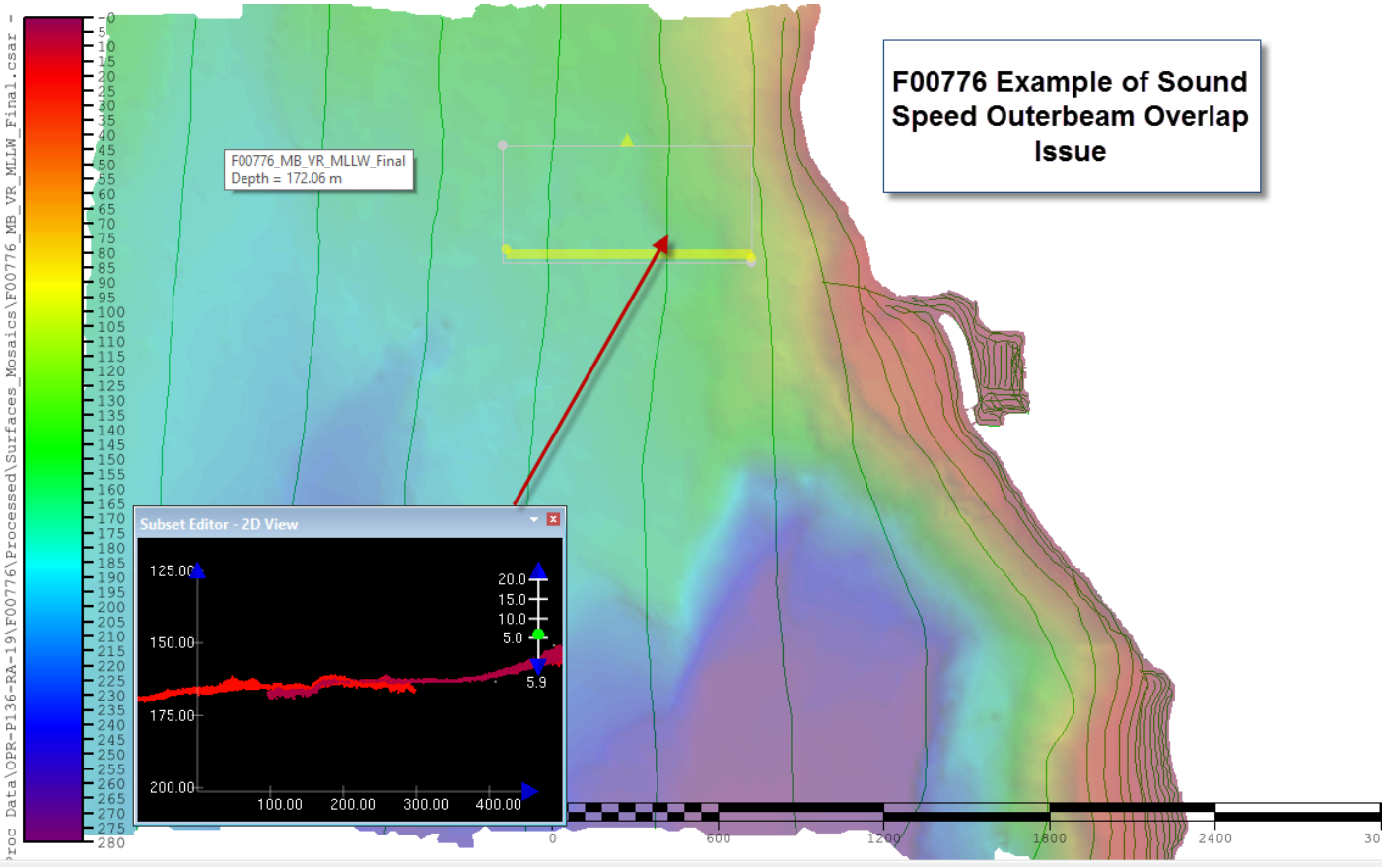


Figure 23: Subset view of MBES lines showing disagreement between overlapping outer-beams.

Survey Line Vertical Offset

Vertical offsets within multibeam coverage of approximately 0.5 meters exist in shallow portions of the survey area. After a thorough review of the survey methods used, no cause(s) could be found to explain this issue.

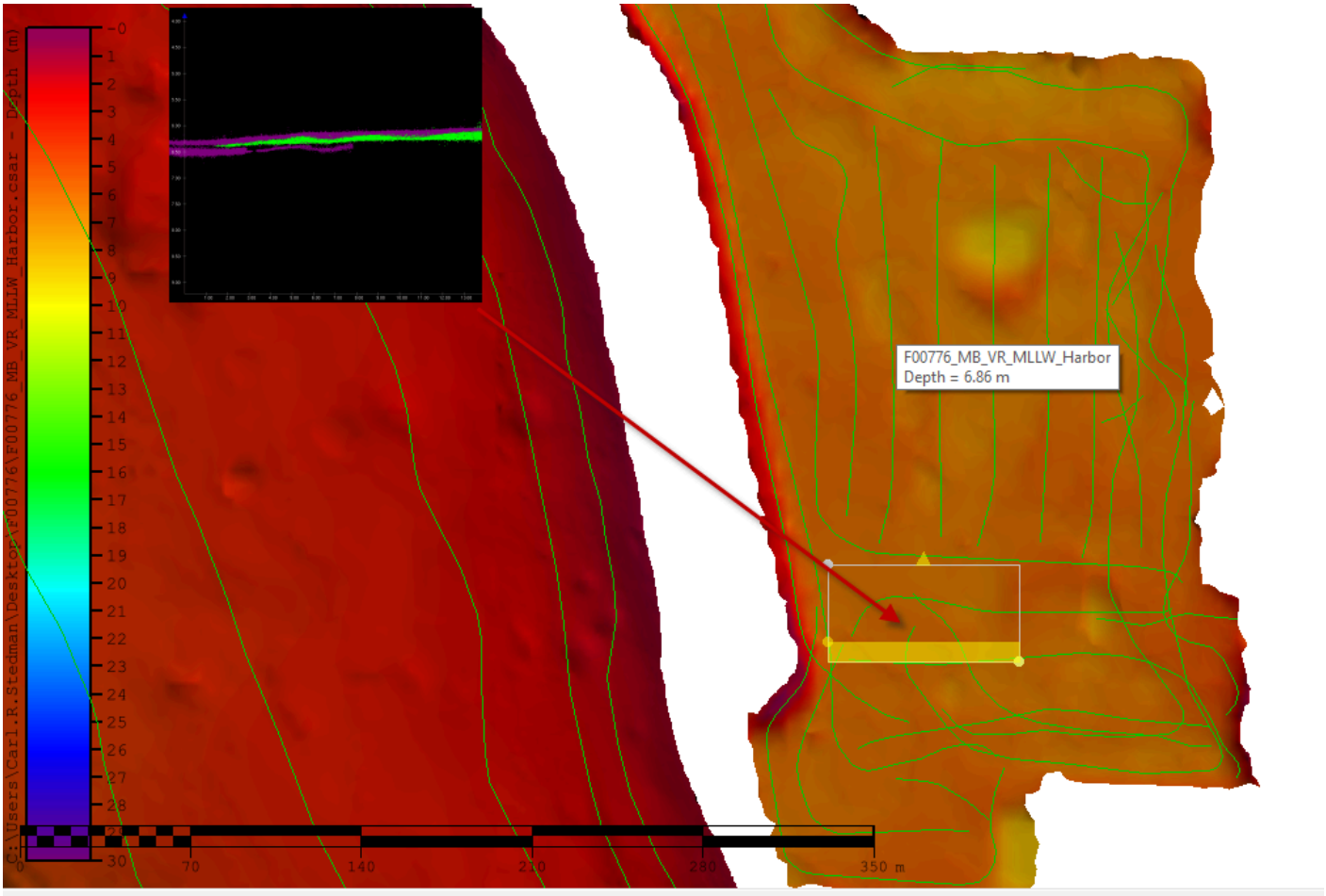


Figure 24: Example of vertical offset issue.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Thirteen 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 using the "Nearest in distance within time (4 hours)" profile selection method.

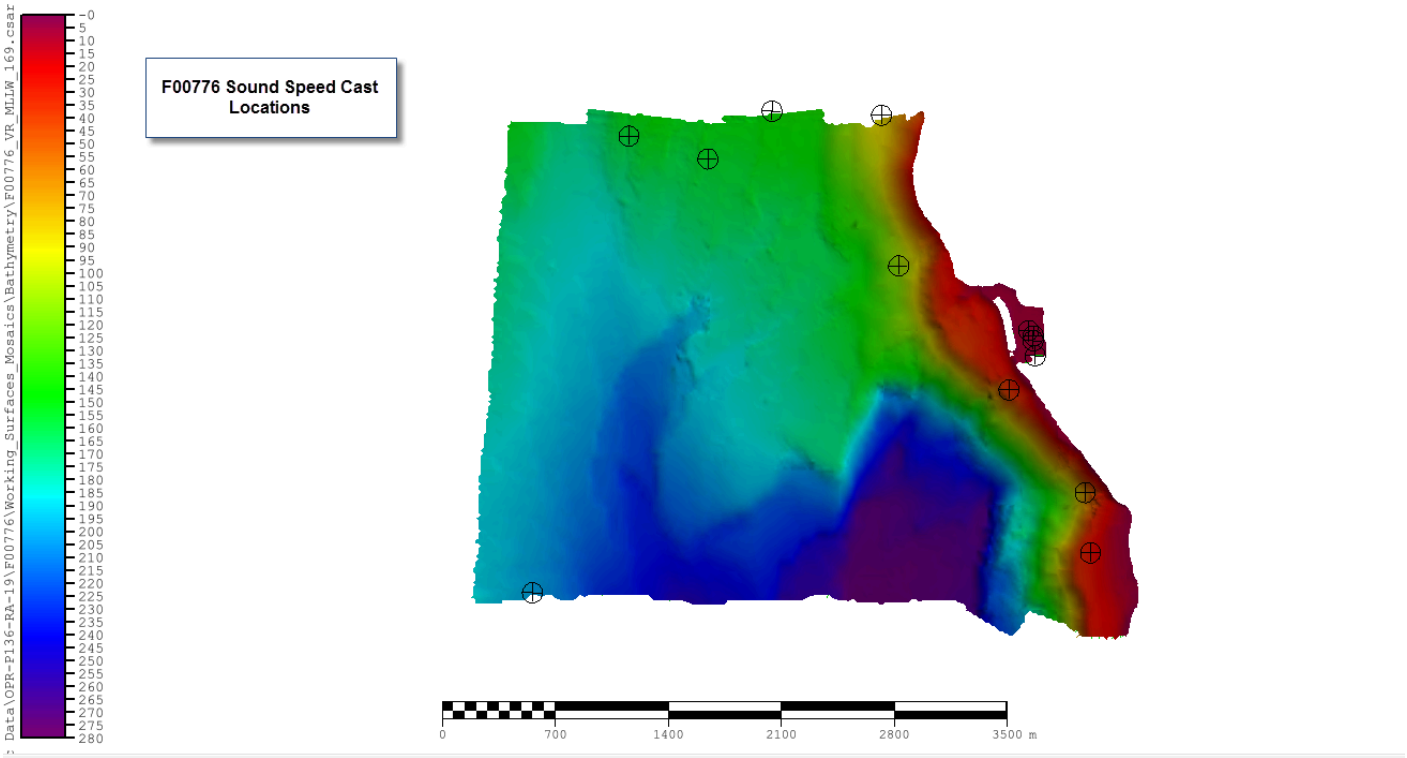


Figure 25: F00776 sound speed cast locations.

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 were acquired as .all files logged during MBES operations and subsequently processed by personnel aboard RAINIER. The .GSF files created during processing and one backscatter mosaic per vessel per frequency have been delivered with this report. Backscatter processing procedures utilized followed those detailed in the DAPR.

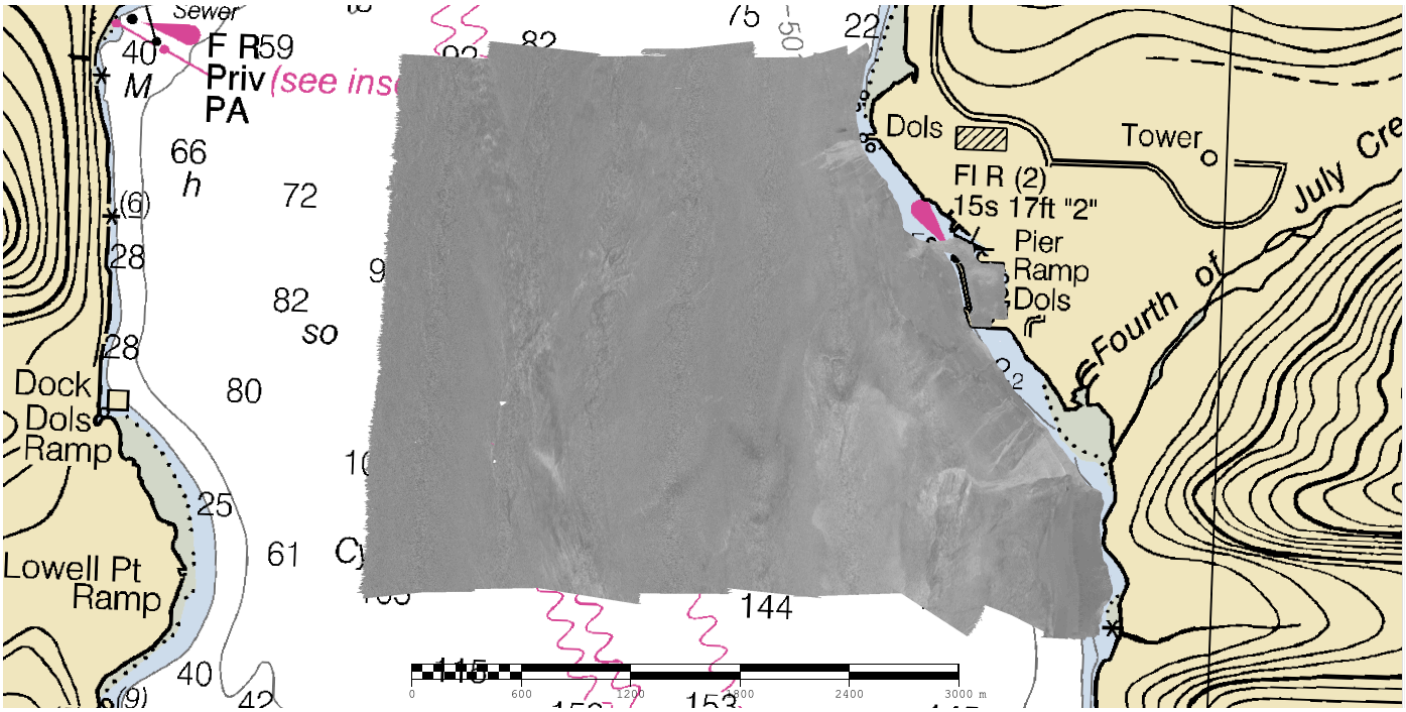


Figure 26: Overview of F00776 backscatter mosaics (Chart 16682).

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

Table 10: 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 11: 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
F00776_MB_VR_CC_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.11 meters - 278.51 meters	NOAA_VR	Complete MBES
F00776_MB_VR_OD_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	0.22 meters - 72.18 meters	NOAA_VR	Object Detection
F00776_MB_VR_OD_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	0.22 meters - 72.18 meters	NOAA_VR	Object Detection
F00776_MB_VR_CC_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.11 meters - 278.51 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids as specified in HSSD 2019.

Pydro QC Tools "Detect Fliers" program with object detection settings was used to identify fliers in the data; obvious noise was rejected. Upon completion of multiple iterations of this process, Detect Fliers was run again, resulting in no fliers remaining. Results from Pydro QC tools are included in the Separates section of this report.

No soundings were designated for this survey.

SAR: The surfaces were replaced in review with a single VR surface created using the Object Detection criteria for the Ranges gridding algorithm. The field unit showed the two submitted surface passed required densities in the relevant areas, so delivering a single surface downstream keeps things simplified later. The new single surface has a depth range of 0.2m to 276.4m and follows standard naming conventions.

SAR: One designated sounding was added to the data to represent the least depth on an OBSTRN found in review.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying 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	Seward_Shipyard_ERDTM_NAD83-MLLW.csar

Table 13: ERS method and SEP file

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 6.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 SBET Processing Method

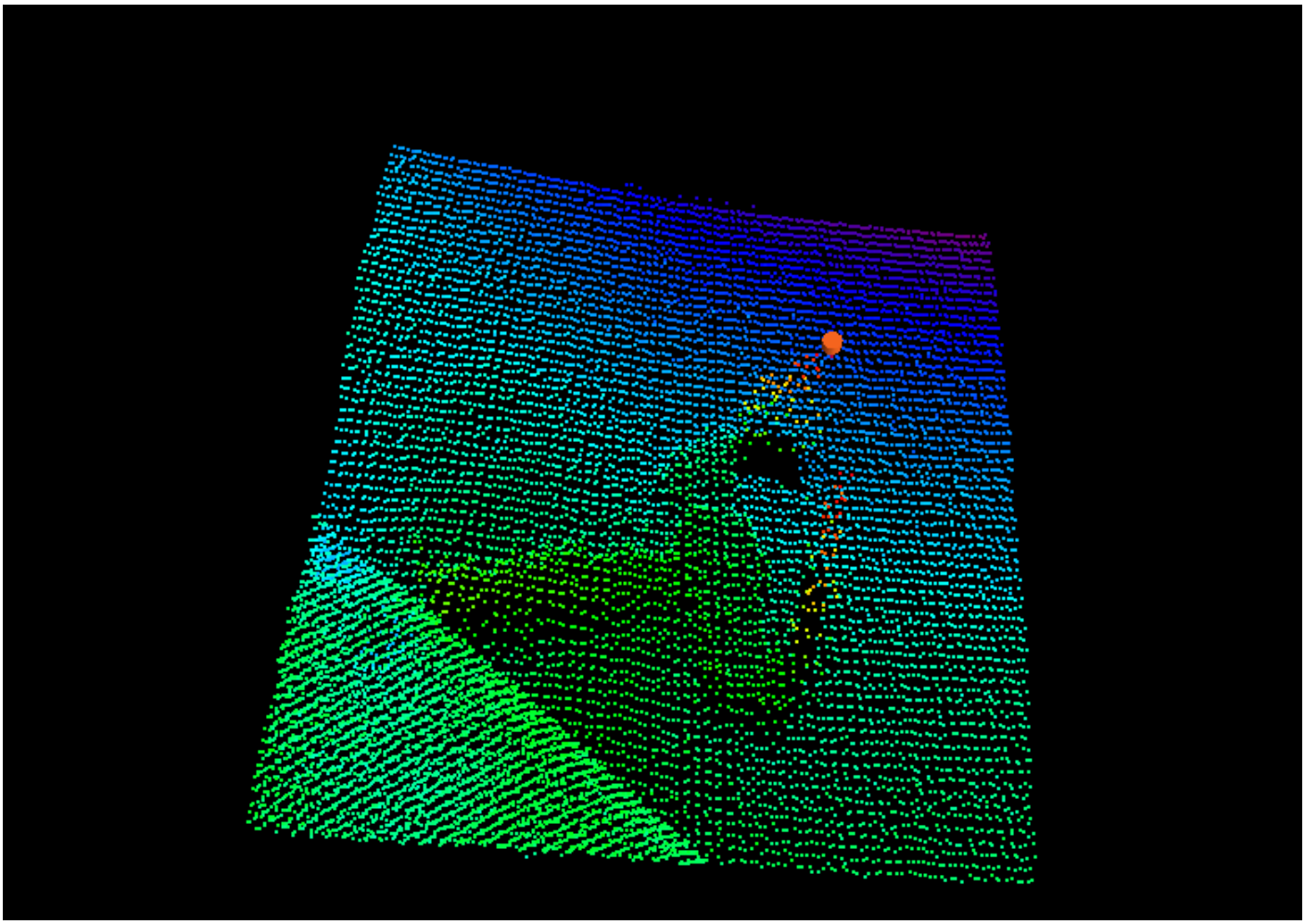
Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.2.1 software to produce SBETs for post-processing horizontal correction.

D. Results and Recommendations

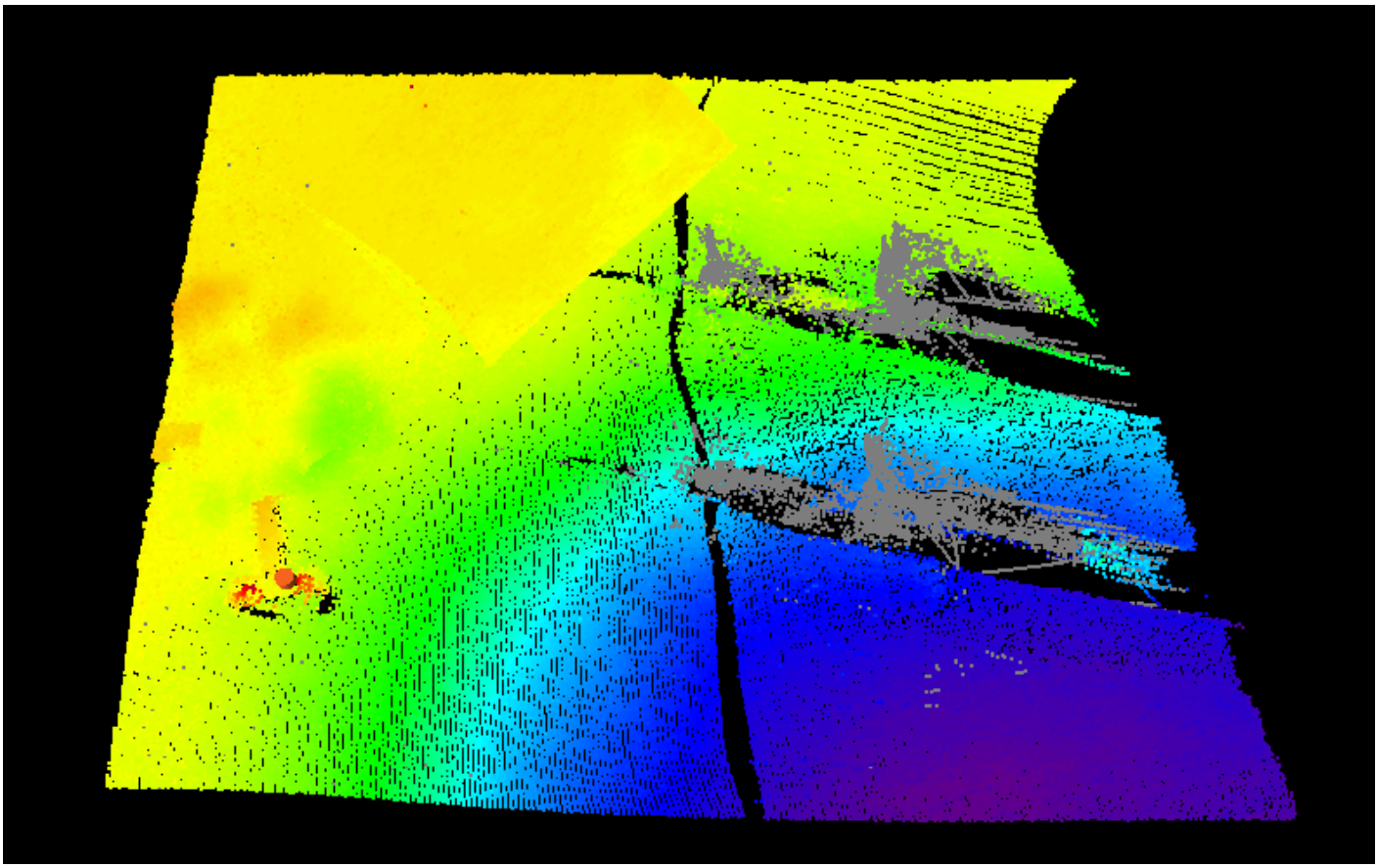
D.1 Chart Comparison

A comparison was made between F00776 survey data and Electronic Navigation Charts (ENC) US4AK2GM and US4AK2FM using CUBE surfaces, selected soundings, and contours created in Caris. Both charts were required to gain coverage of the entire survey area.

A potentially significant change can be found in the southern extent of the surveyed shipyard. Survey MBES found an OBSTRN feature, standing 4m proud of the sea floor, to a least depth of 4.2m within the proximity of the JAG Alaska dry dock.



MBES of OBSTRN



MBES of OBSTRN and surroundings, with Charted MORFAC dolphin in grey

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
US4AK2GM	1:81436	11	05/14/2018	04/01/2019
US4AK2FM	1:81847	19	09/14/2018	04/01/2019

Table 14: 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

See Final Feature File for more information.

D.1.4 Uncharted Features

See section D.2.1 for further information.

D.1.5 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

Two new green channel markers at the entrance to JAG Shipyard were positioned during shoreline investigation and were added to the Final Feature File. These channel markers are listed in the 2019 U.S. Coast Guard Light List Volume VI and are listed as private aids. All aids to navigation were on station and serving their intended purposes.

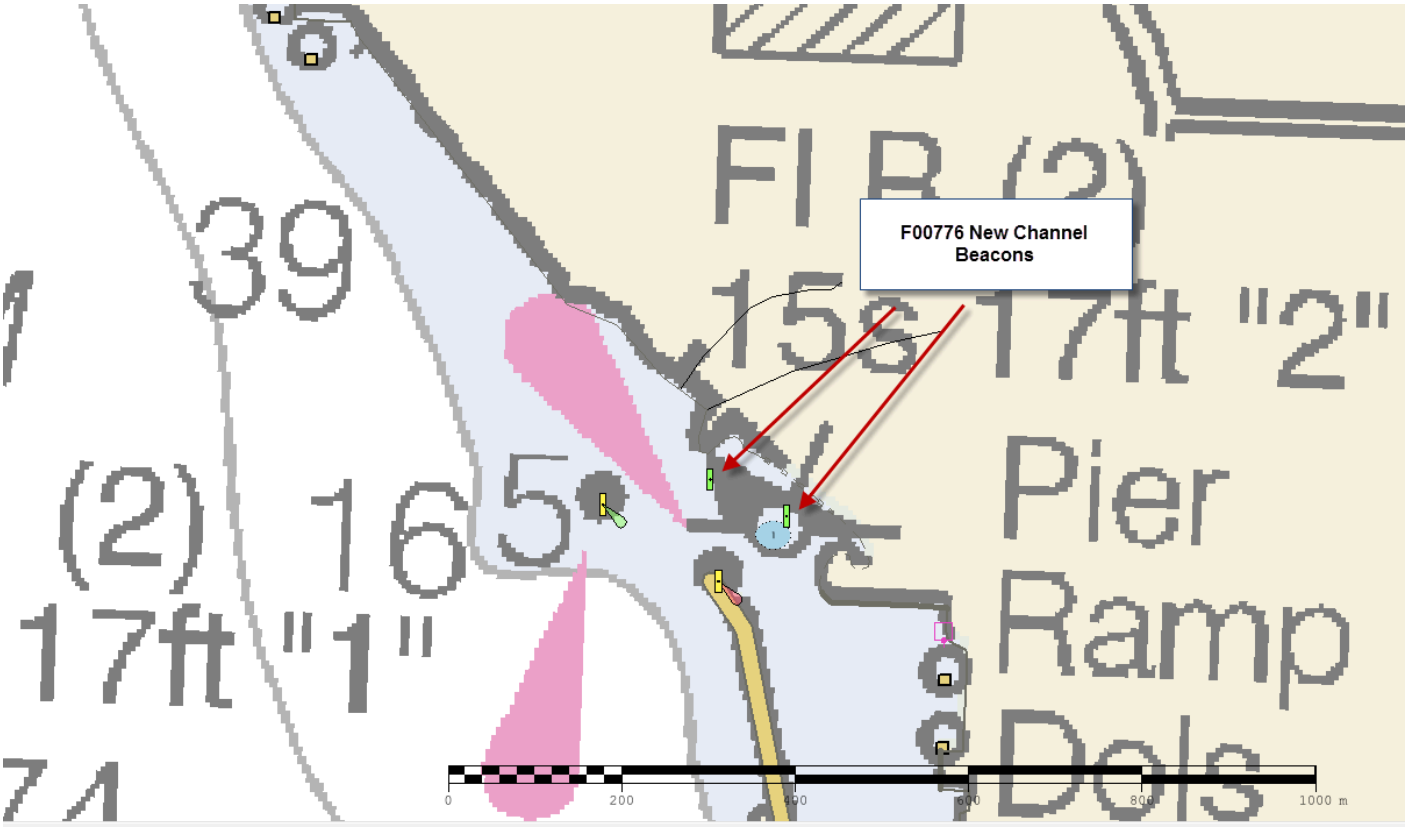


Figure 27: New channel beacons added to Final Feature File (Chart 16682).

A third new ATON (square, green day beacon) was submitted, and unlike the two already mentioned, was not found on the Light List.

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

No overhead features exist for this survey.

D.2.5 Submarine Features

Three submarine cables exist within the survey area. These cables were not seen in the MBES data.

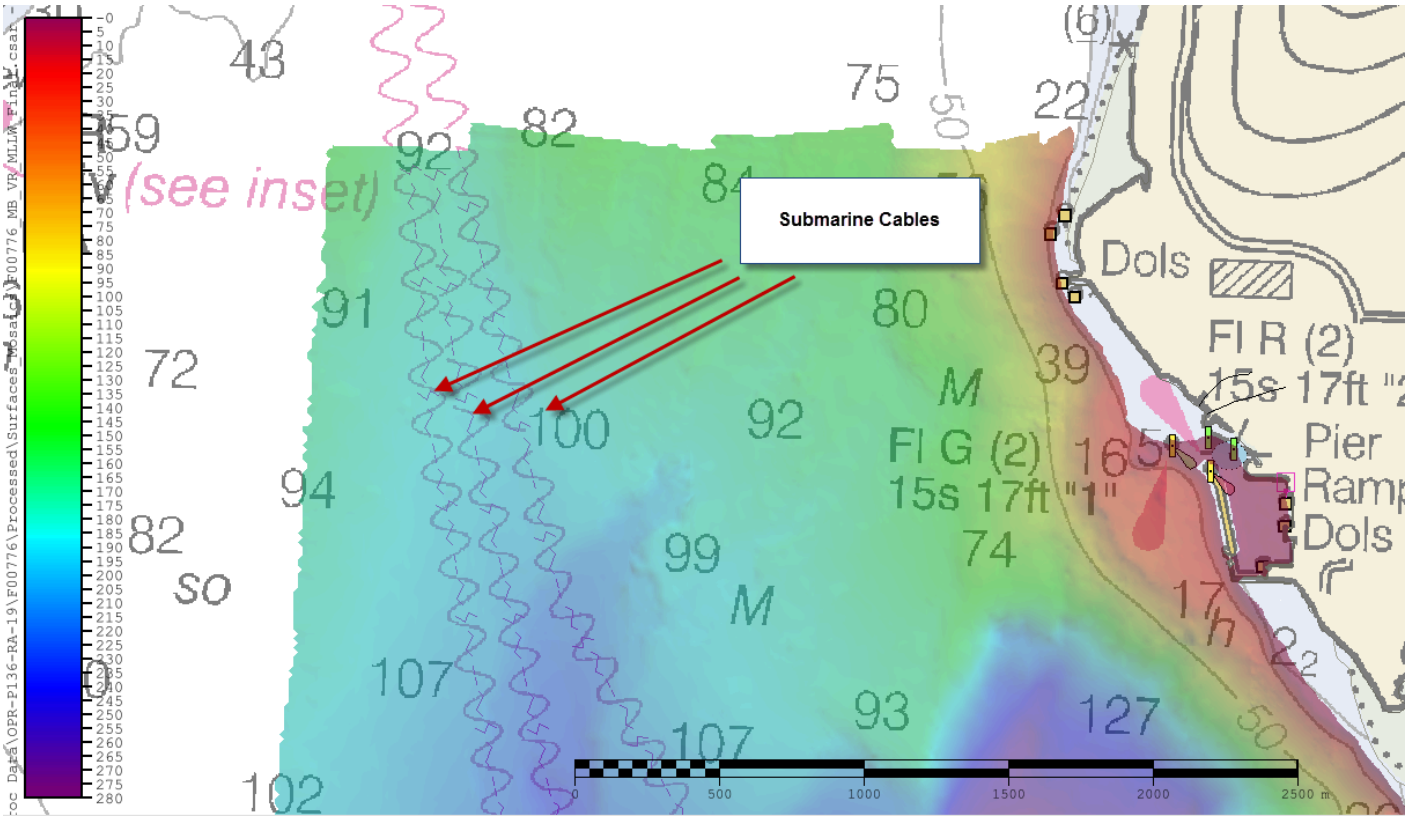


Figure 28: Depiction of submarine cables within the F00776 survey area.

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

No present or planned construction or dredging exist within the survey limits.

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

This project is recommended to be used to create an inset adjoining chart 16882.

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
Benjamin K. Evans, CAPT/NOAA	Chief of Party	10/07/2019	Digitally signed by EVANS.BENJAMIN.K.1237217094 Date: 2019.10.10 15:45:30 -07'00'
Hadley A. Owen, LT/NOAA	Field Operations Officer	10/07/2019	Digitally signed by OWEN.HADLEY.ANNE.1410967070 Date: 2019.10.08 07:43:30 -07'00'
James B. Jacobson	Chief Survey Technician	10/07/2019	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2019.10.07 13:30:55 -07'00'
Carl R. Stedman	Sheet Manager	10/07/2019	

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

APPROVAL PAGE

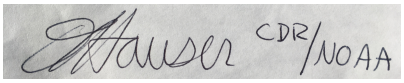
F00776

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 NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- GeoPDF of survey products

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



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Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch