

H12564

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: H12564

LOCALITY

State(s): Washington

General Locality: Puget Sound

Sub-locality: Pilot Point to Apple Cove Point

2013

CHIEF OF PARTY
CDR James M. Crocker, NOAA

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

H12564

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): **Washington**

General Locality: **Puget Sound**

Sub-Locality: **Pilot Point to Apple Cove Point**

Scale: **10000**

Dates of Survey: **05/15/2013 to 05/30/2013**

Instructions Dated: **04/18/2013**

Project Number: **OPR-N395-FA-13**

Field Unit: **NOAA Ship *Fairweather***

Chief of Party: **CDR James M. Crocker, 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:

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. Notes in red were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or nonsequential. All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via <http://www.ngdc.noaa.gov/>.

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Descriptive Report to Accompany Survey H12564

Project: OPR-N395-FA-13

Locality: Puget Sound

Sublocality: Pilot Point to Apple Cove Point

Scale: 1:10000

May 2013 - May 2013

NOAA Ship *Fairweather*

Chief of Party: CDR James M. Crocker, NOAA

A. Area Surveyed

The survey area is located in Central Puget Sound, WA, Pilot Cove Point to Apple Cove Point.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
47° 54' 8.4" N 122° 32' 53.4" W	47° 45' 57.6" N 122° 32' 53.4" W

Table 1: Survey Limits

Due to time constraints, the in-shore limit requirements of the survey were not met. See Survey Coverage section for more information.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. The project addresses NHSP priority area 3.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Near Appletree Cove, Kingston, in the southwest corner of the survey area, a nearshore swath was not surveyed due to time constraints (see Figure 2). This swath is approximately 300m at its widest. Additionally, crosslines were not run due to time constraints. This issue is addressed further in Section B.2.2.

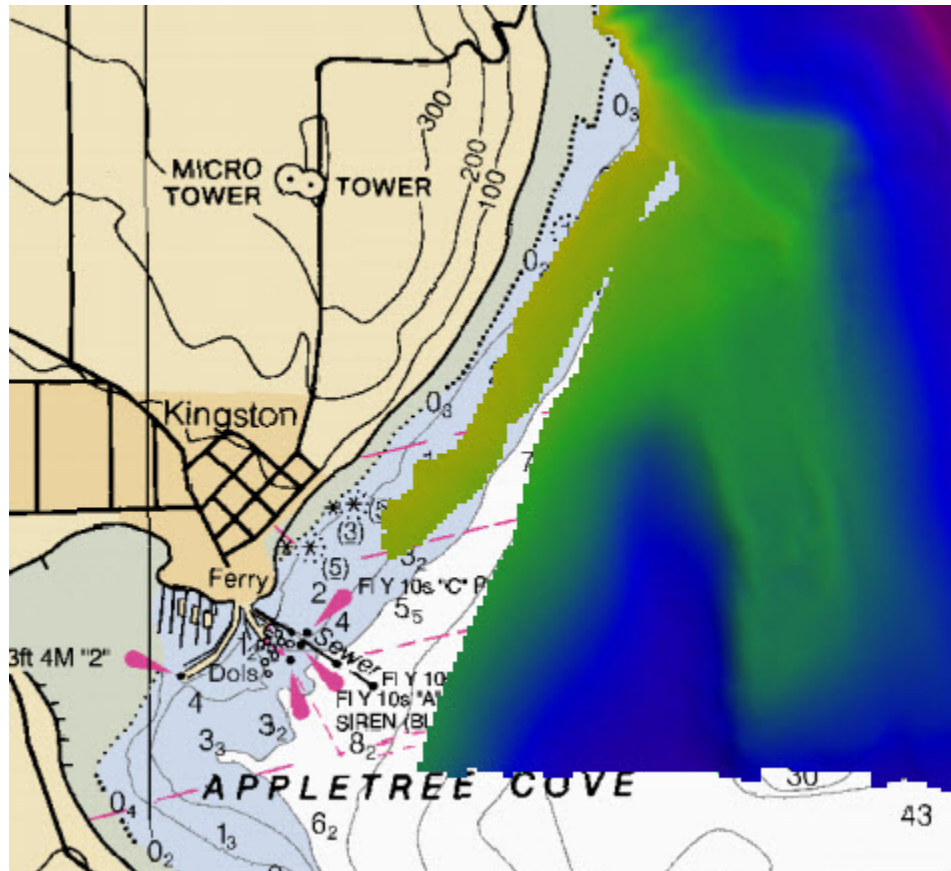


Figure 2: H12564 Appletree Cove Coverage Gap

A.5 Survey Statistics

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

	HULL ID	<i>2808</i>	<i>2805</i>	<i>Total</i>
LNM	SBES Mainscheme	0.00	0.00	0
	MBES Mainscheme	86.84	48.63	135.47
	Lidar Mainscheme	0.00	0.00	0
	SSS Mainscheme	0.00	0.00	0
	SBES/SSS Mainscheme	0.00	0.00	0
	MBES/SSS Mainscheme	0.00	0.00	0
	SBES/MBES Crosslines	0.00	0.00	0
	Lidar Crosslines	0.00	0.00	0
Number of Bottom Samples			0	
Number of AWOIS Items Investigated			1	
Number Maritime Boundary Points Investigated			0	
Number of DPs			0	
Number of Items Investigated by Dive Ops			0	
Total SNM			12.41	

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/15/2013	135
05/17/2013	137
05/22/2013	142
05/28/2013	148
05/29/2013	149
05/30/2013	150

Table 3: 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	2808	2805
LOA	8.64 meters	8.64 meters
Draft	1.12 meters	1.12 meters

Table 4: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
RESON	7125	MBES
Applanix	POS MV V4	Positioning and Attitude System
Sea Bird	SBE 19 Plus	Conductivity, Temperature, and Depth Sensor
RESON	SVP71	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 0% of mainscheme acquisition.

Cross lines were not collected due to time constraints. However, the hydrographer believes that overlap was sufficient to positively identify any systemic data errors.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0 meters	0.097 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
2805	2 meters/second		0.5 meters/second
2808	2 meters/second		0.5 meters/second

Table 7: Survey Specific Sound Speed TPU Values

B.2.3 Junctions

The areas of overlap between the sheets are reviewed in CARIS Subset Editor for sounding consistency to assess surface agreement. The junction agreement is generally within the total allowable vertical uncertainty in their common areas and depths for all surfaces. Data overlap between all surveys was achieved. See Figure 3 for planned areas of overlap. Surface differencing in CARIS HIPS and SIPS was used to assess junction and surface agreement between all sheets for sounding consistency. Differences in junctions are believed to be caused by abrupt slope changes and/or excessively coarse resolutions of a surface.

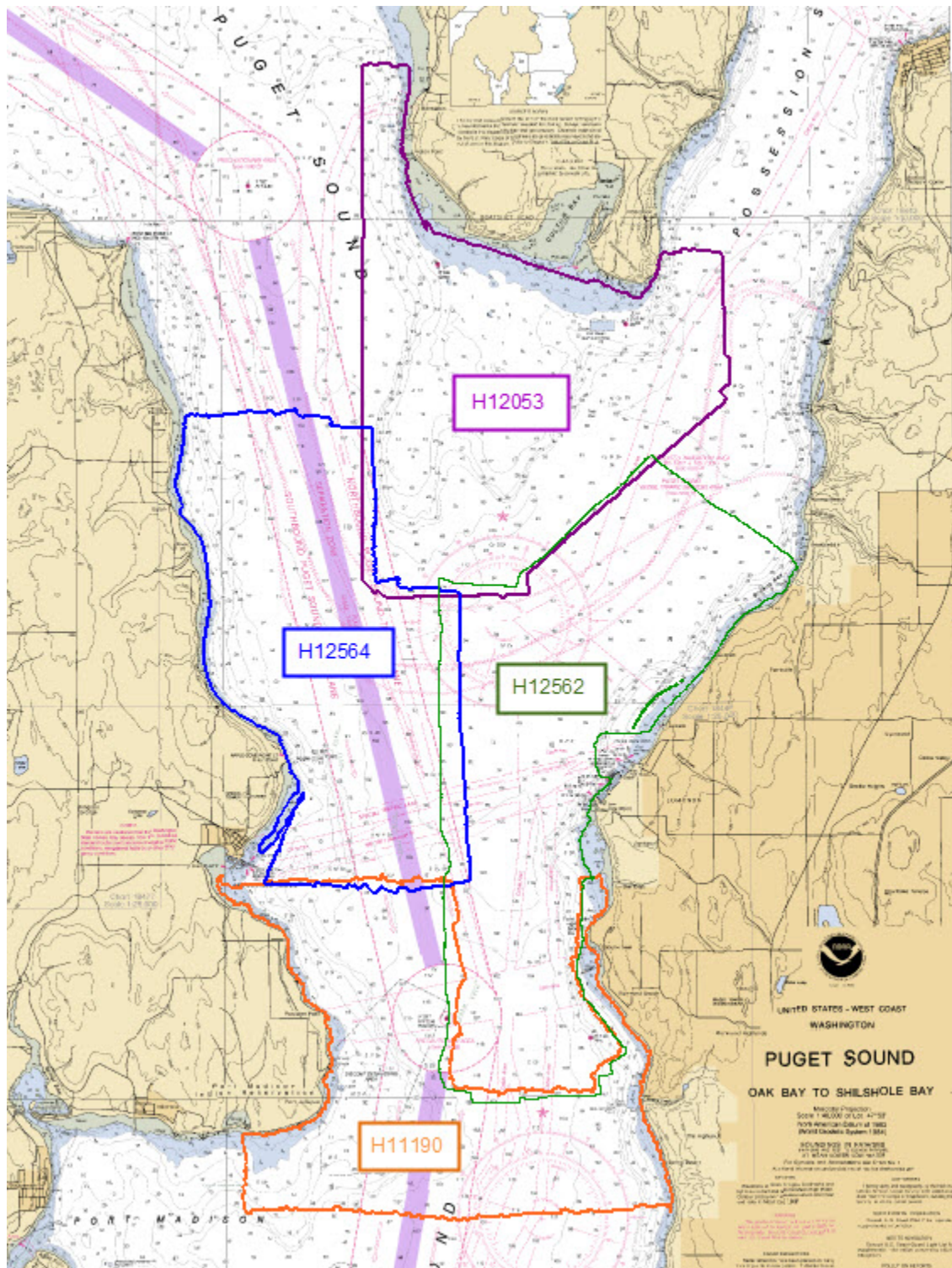


Figure 3: Junctions between H11190, H12053, H12562, and H12564

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12053	1:10000	2009	Williamson & Associates, Inc.	NE
H11190	1:10000	2002	NOAA Ship RAINIER	S
H12562	1:10000	2013	NOAA Ship FAIRWEATHER	E

Table 8: Junctioning Surveys

H12053

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the H12564 16-meter combined surface and the H12053 8-meter combined surface. See Figure 4 for an area image of the survey junction. Figure 5 is a statistical representation of the survey junction. The largest differences in junctions between these two surfaces appear in areas of steepest slope, as in the northern half of the eastern edge. There, measurements of variances were, at their most extreme, between 2.6 and 2.9 meters. In general throughout the junction of H12564 and H12053, some 50% of the nodes in the junction were +/- 0.5 meters (see Figure 5).

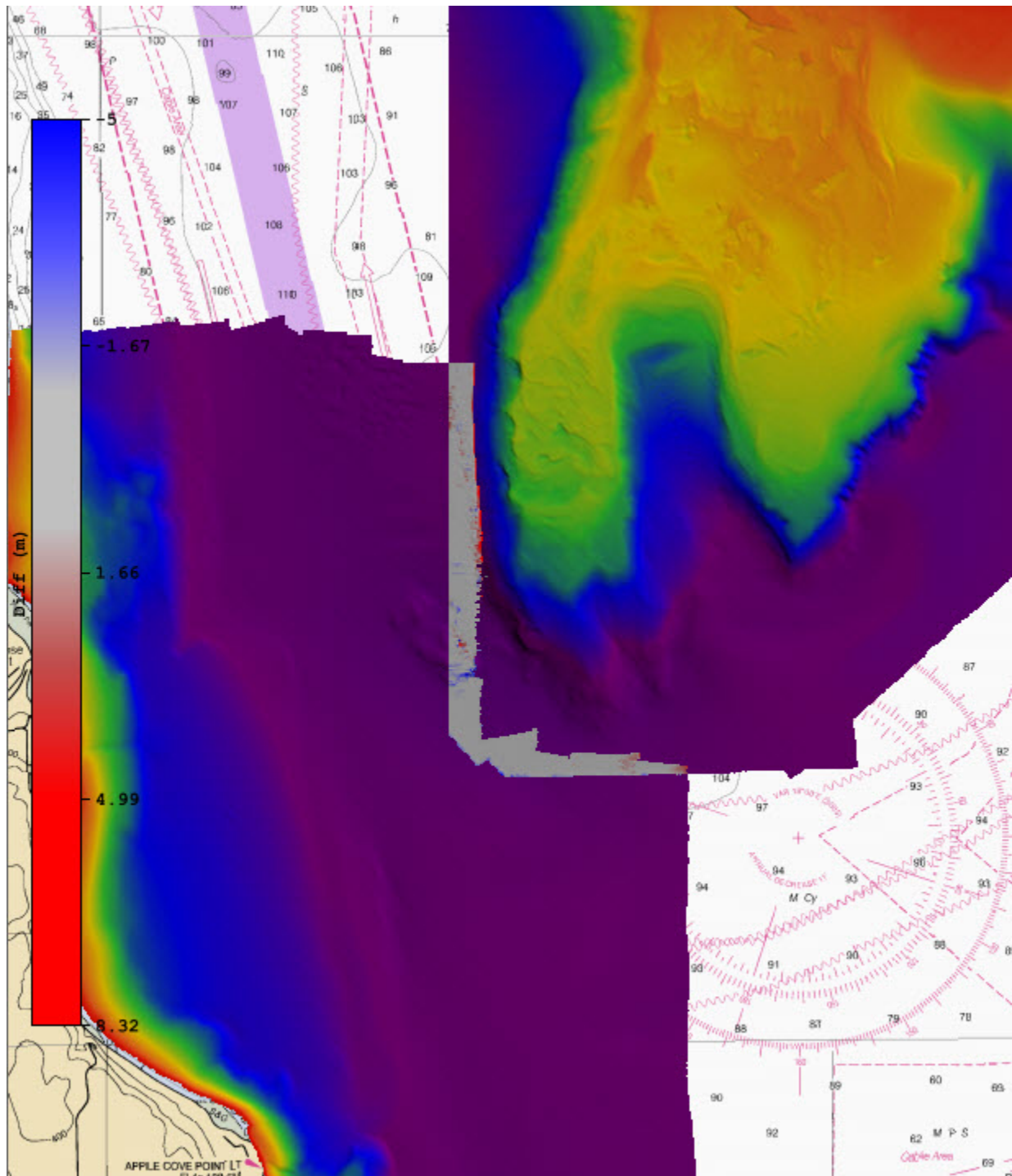


Figure 4: H12053 Survey Junction

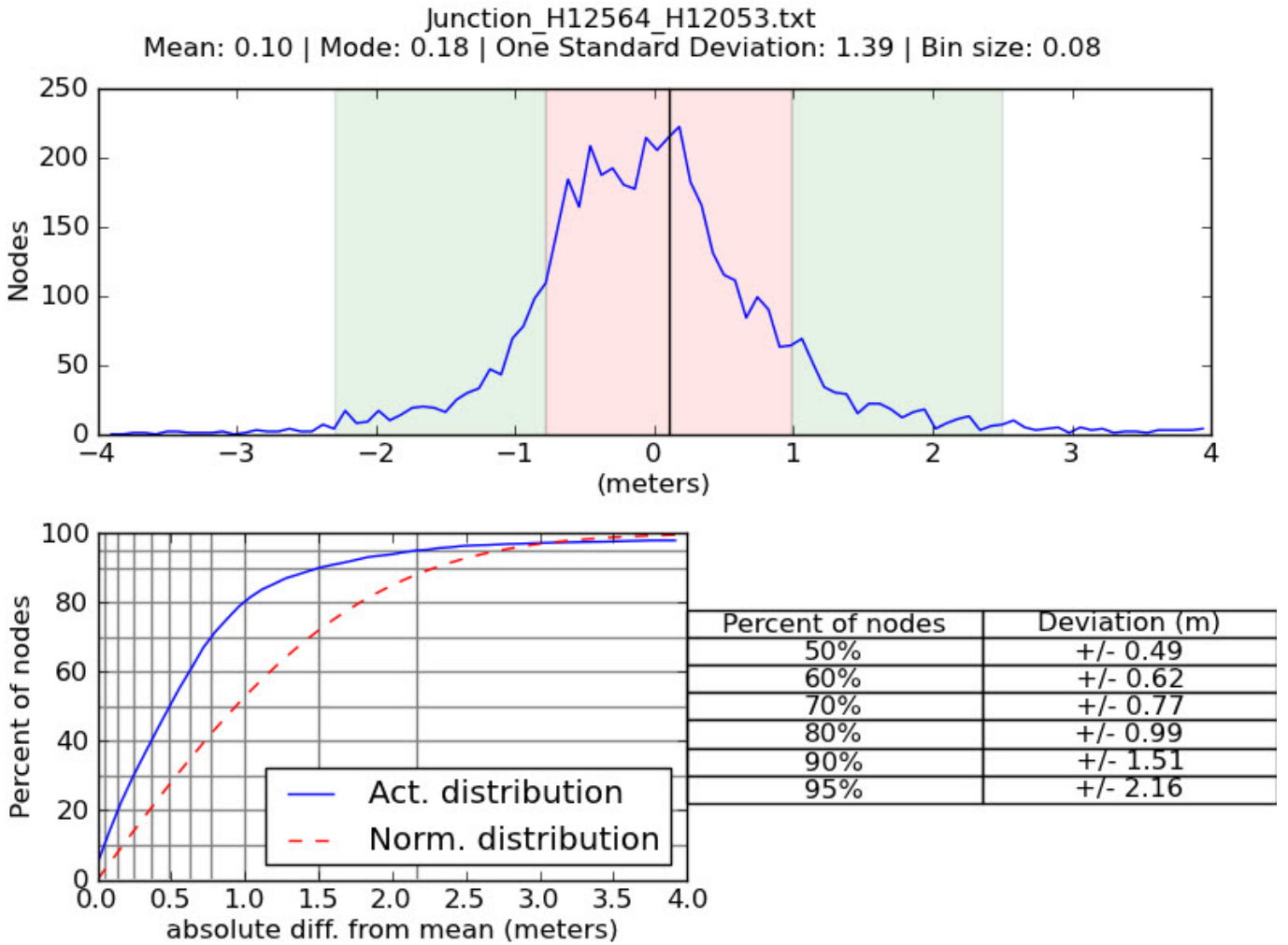


Figure 5: H12053 Junction Statistics

H11190

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the H12564 16-meter combined surface and the H11190 60-meter combined surface. This surface was created using a TIN surface from a point cloud. The surface had average node spacing of 45m, with a standard deviation of 16m. See Figure 6 for an image of the survey junction. In the area with the most extreme range of differences in measurements, values were generally between 2.6 and 10.9 meters. Values as high as 20 meters exist for that area (see Figure 7). Figure 8 is a statistical representation of the survey junction, showing that fifty percent of the nodes between the two surveys were within 1.29 meters.

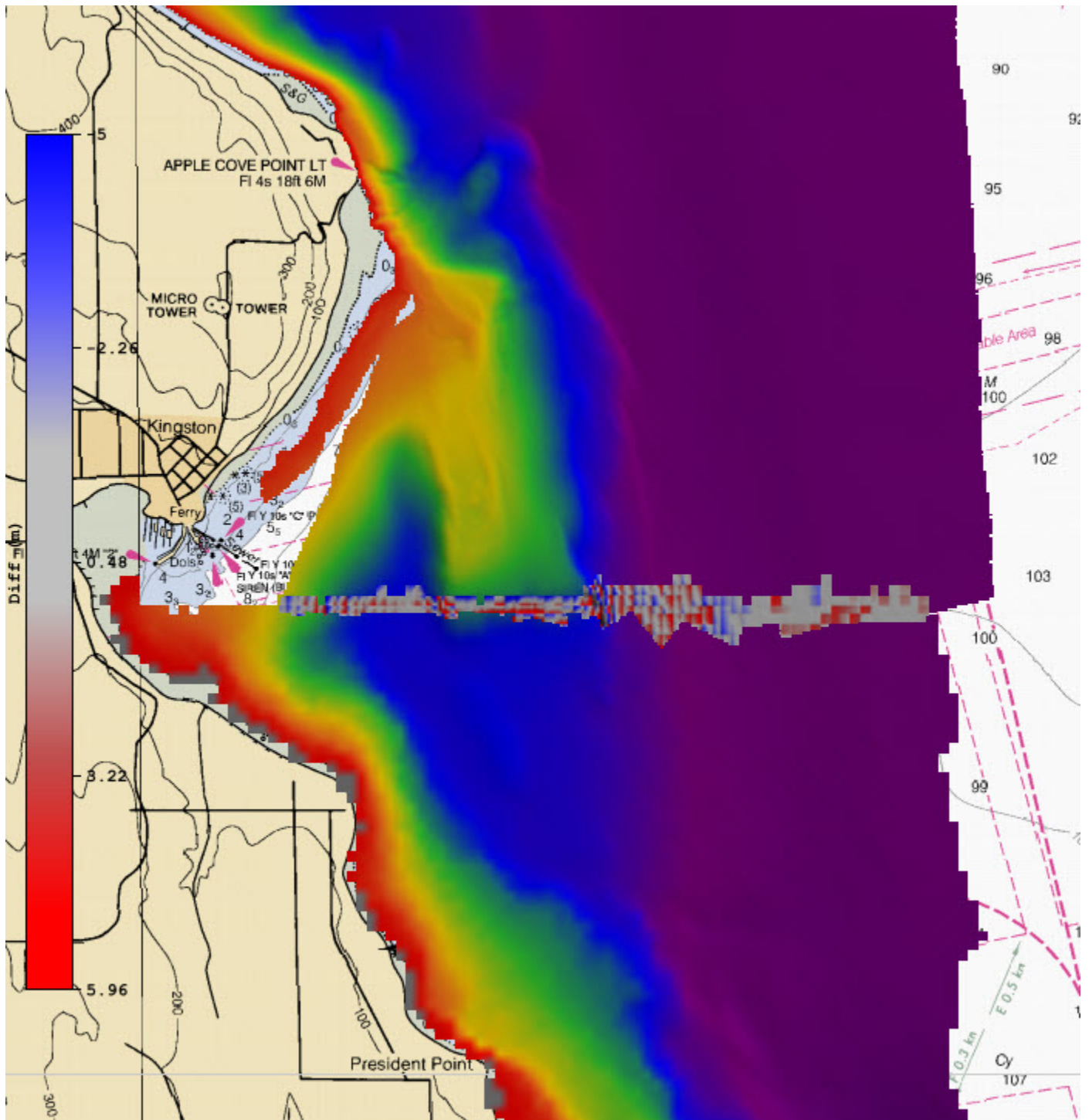


Figure 6: H11190 Survey Junction

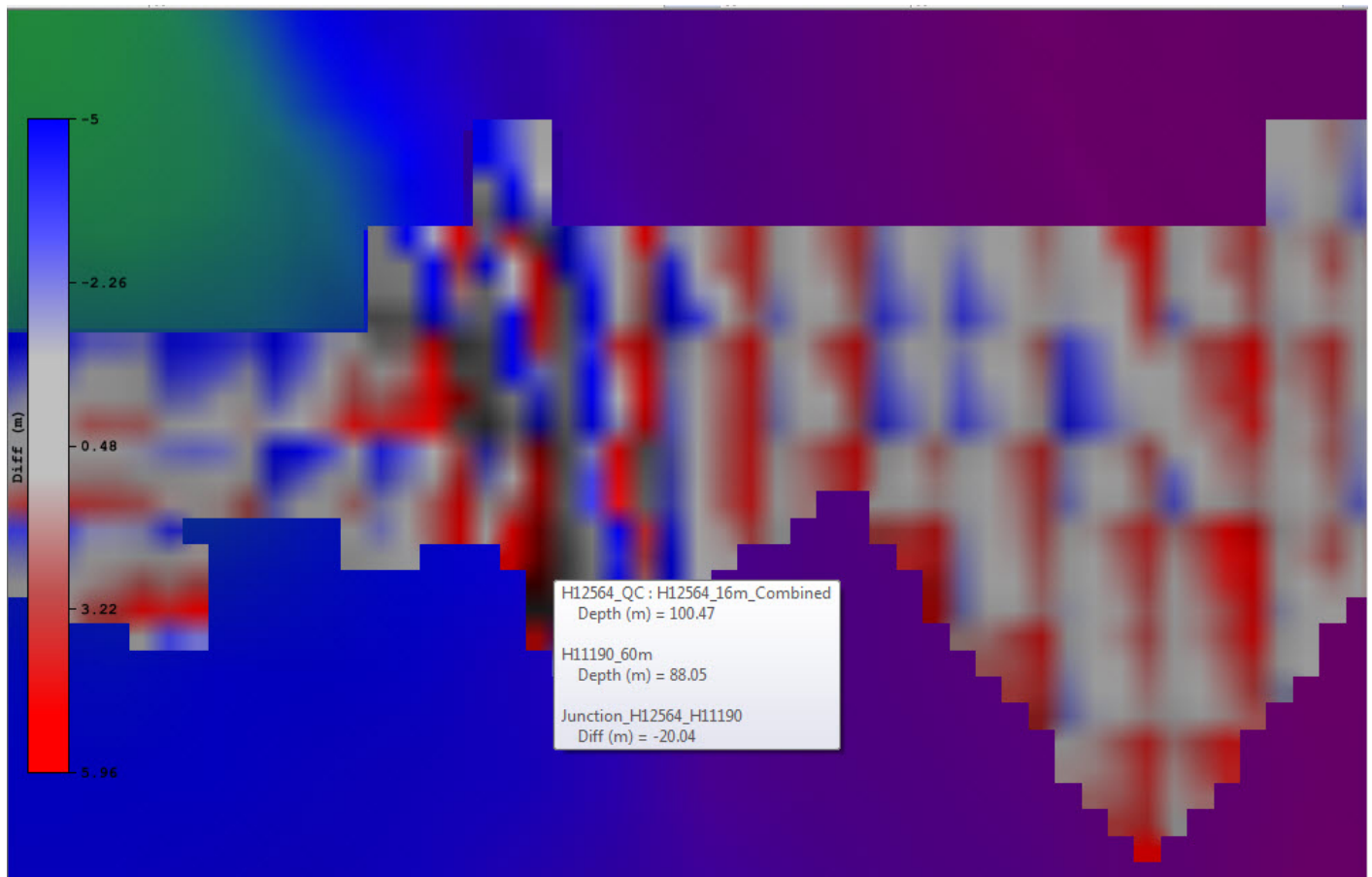


Figure 7: H11190 Survey Junction. Detail of most extreme range of differencing. H11190 had a coarse surface resolution of 60-meters for the combined surface. While most soundings within the junction were within +/- 5m of each other, in this area, the resolution, combined with the steep slope, led to differences between soundings in each surveys of up to 20m.

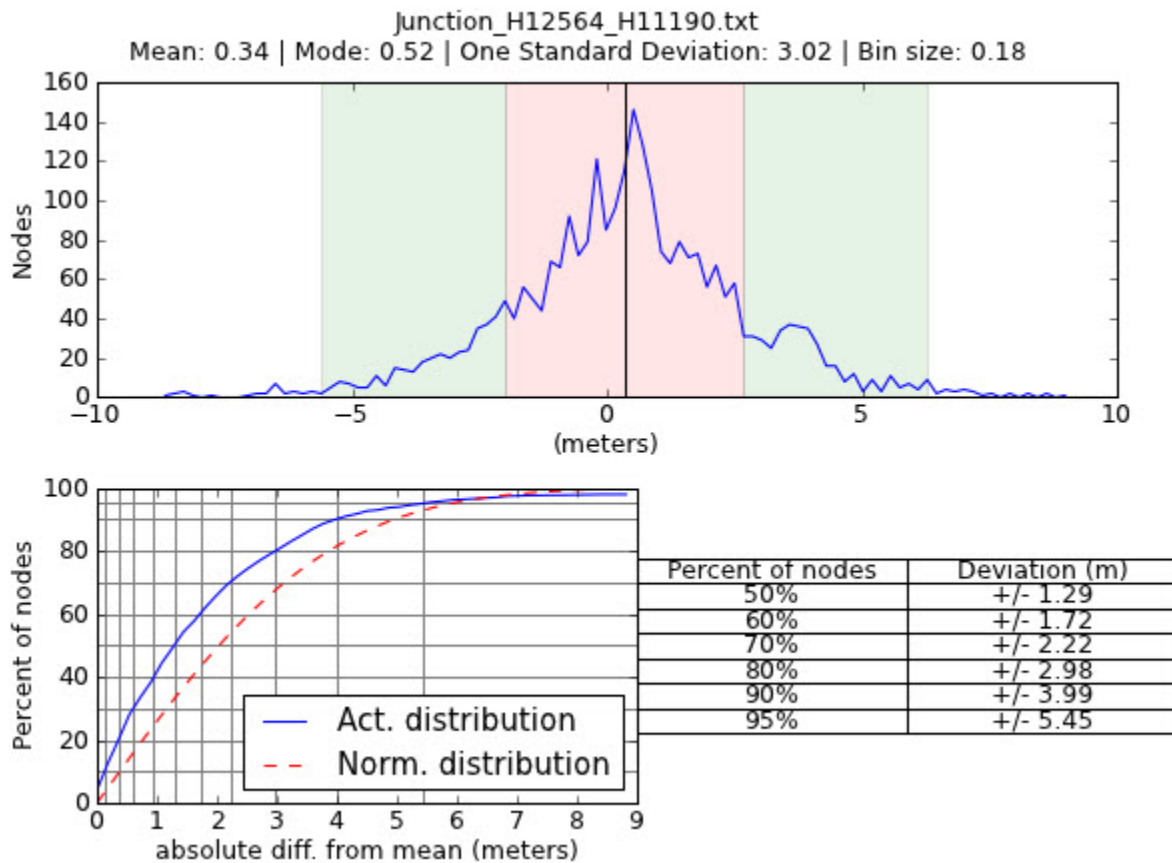


Figure 8: H11190 Junction Statistics

H12562

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the H12564 16-meter combined surface and the H12562 16-meter combined surface. This junction showed relatively low differencing values - not quite 80% of the nodes agreed to +/- 1 meter. See Figure 9 for an image of the survey junction. Figure 10 is a statistical representation of the survey junction.

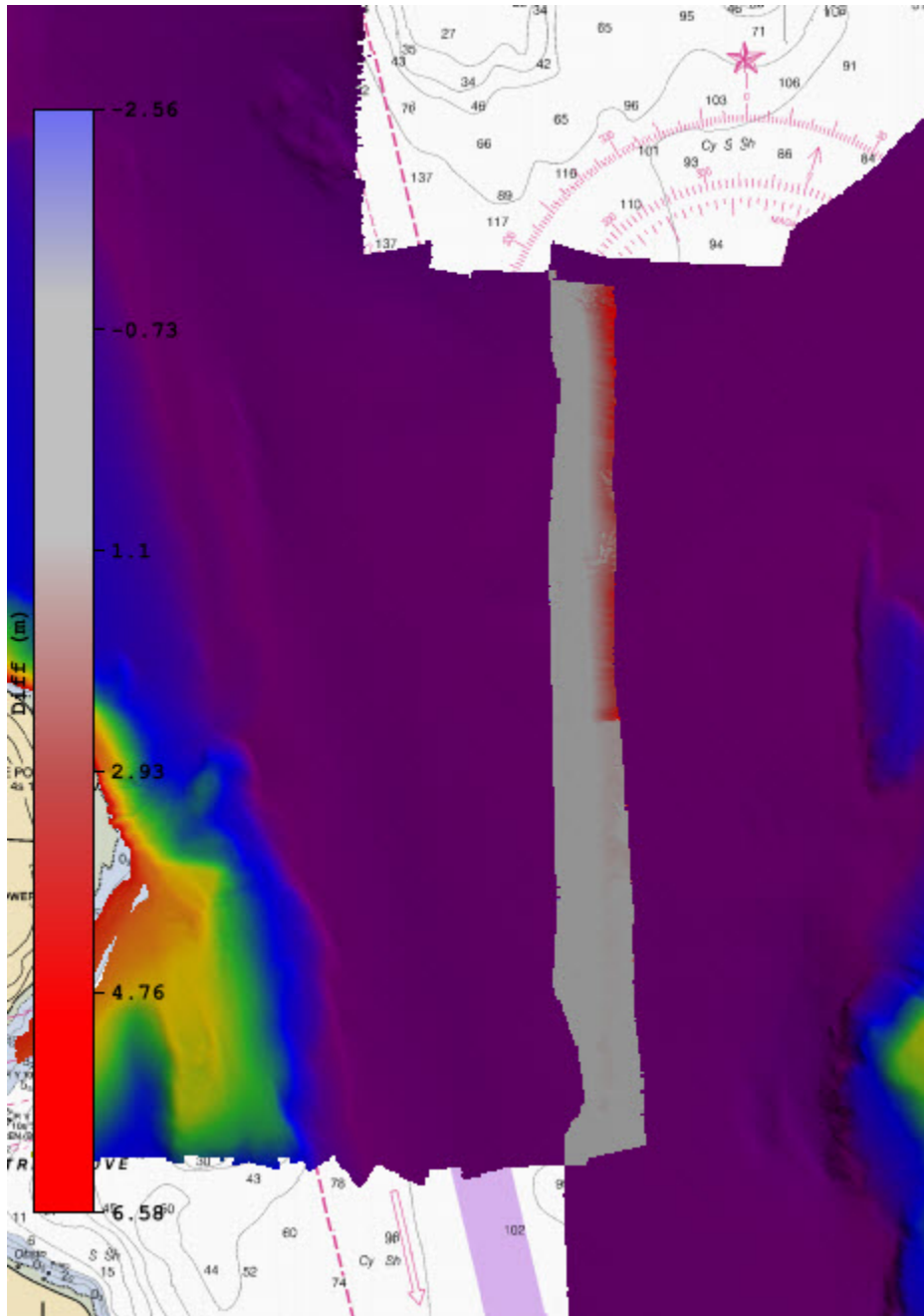


Figure 9: H12562 Survey Junction.

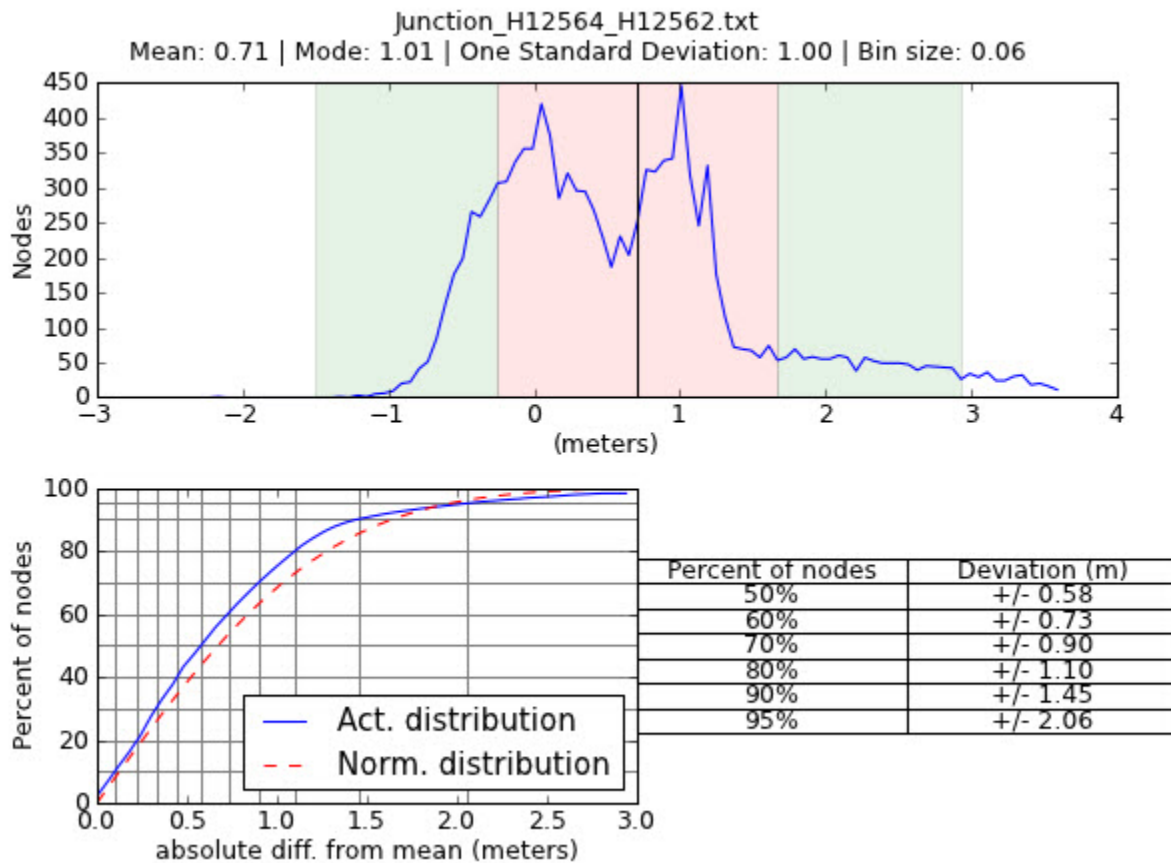


Figure 10: H12562 Junction Statistics

Project Instructions list OPR-N326-FA-12 H12420 and OPR-N326-RA-01 F00483 as junctions as well. H12420 does not junction with this survey and F00483 is not a contemporary survey for comparison.

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

Shoreline Vegetation

Vegetation is present along the shoreline. An example is provided for the area north of Appletree Cove, in the southwest corner of the survey. The vegetation data was not removed as it is difficult to differentiate between rocks and vegetation. All soundings should supersede the chart. See Figure 11 below for an overview of the vegetated area, and Figure 12 for a Subset Editor view of the same area. The 1-meter finalized surface is loaded in the Subset Editor image.

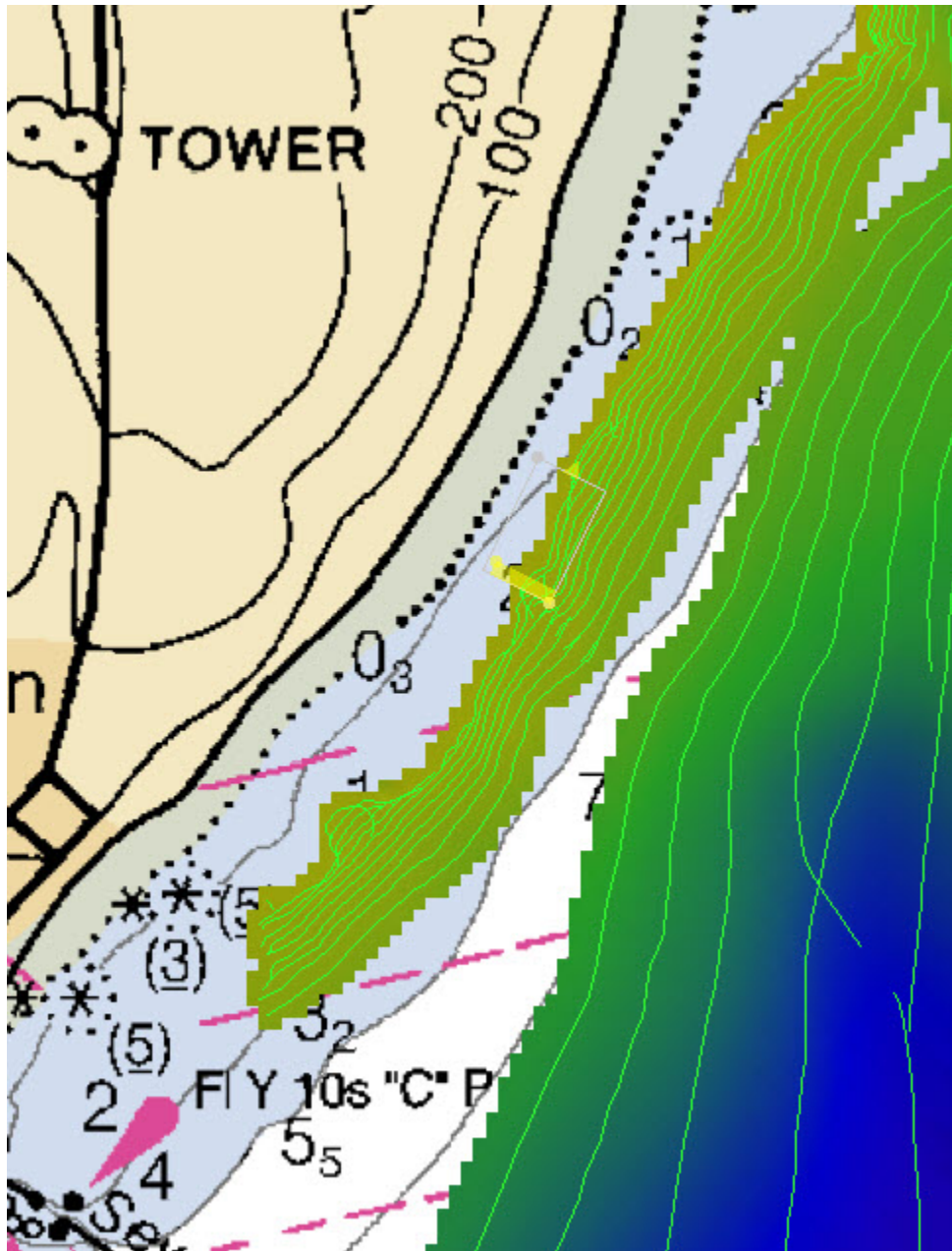


Figure 11: Shoreline Vegetation, Area View

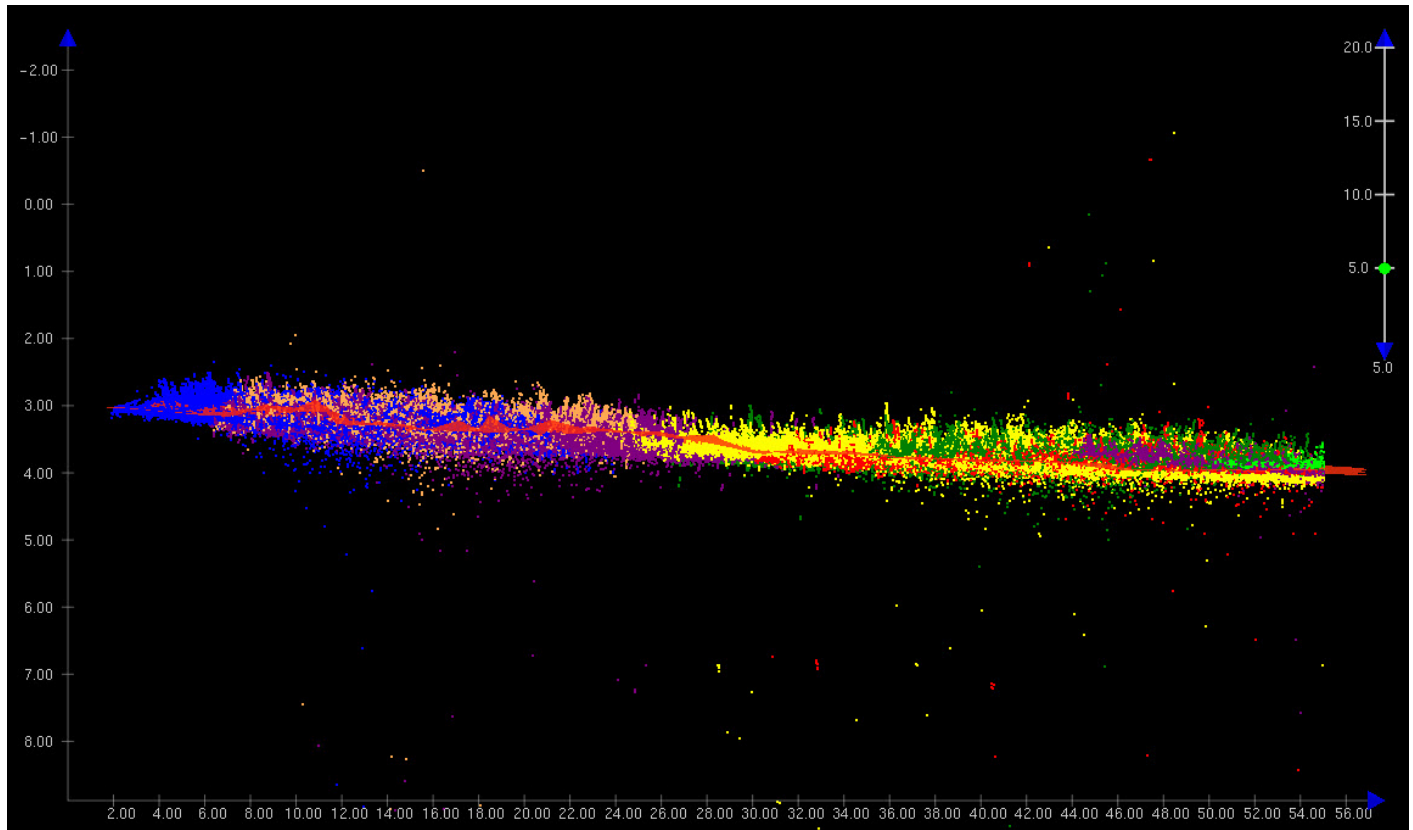


Figure 12: Shoreline Vegetation, Subset Editor, with 1-meter finalized surface loaded.

Sound Speed Artifacts

As demonstrated in Figures 13 and 14, sound speed artifacts appeared in data acquired in a nearshore area south of Apple Cove Point. The nearest sound speed cast was obtained at the extreme eastern extent of the point, while the data to which it was applied was located south-east of the point. The sound speed artifacts indicate that the water column density gradients were significantly different, possibly due to currents affected by the land mass.

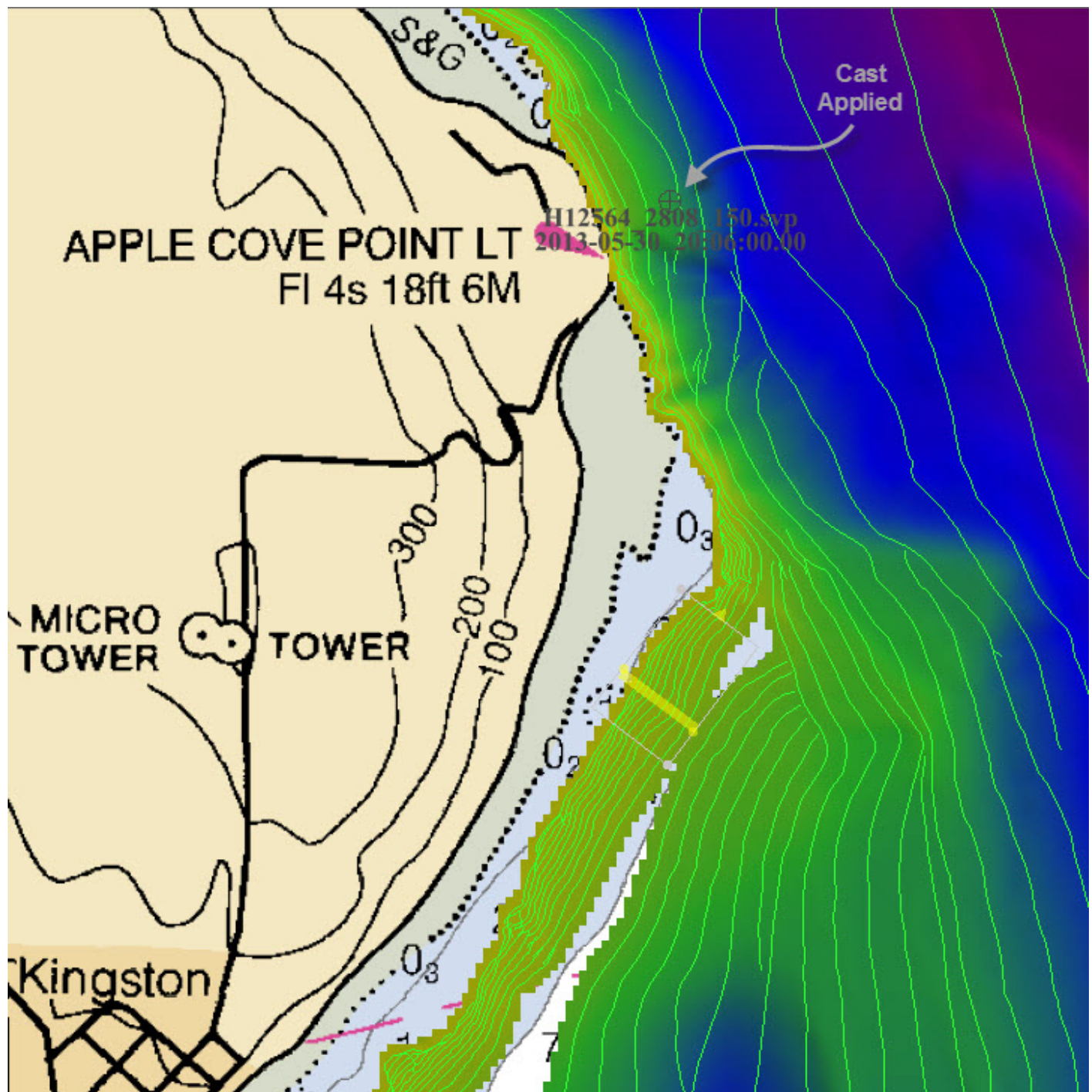


Figure 13: Location of acquisition lines containing sound speed issues and location of cast which was applied.

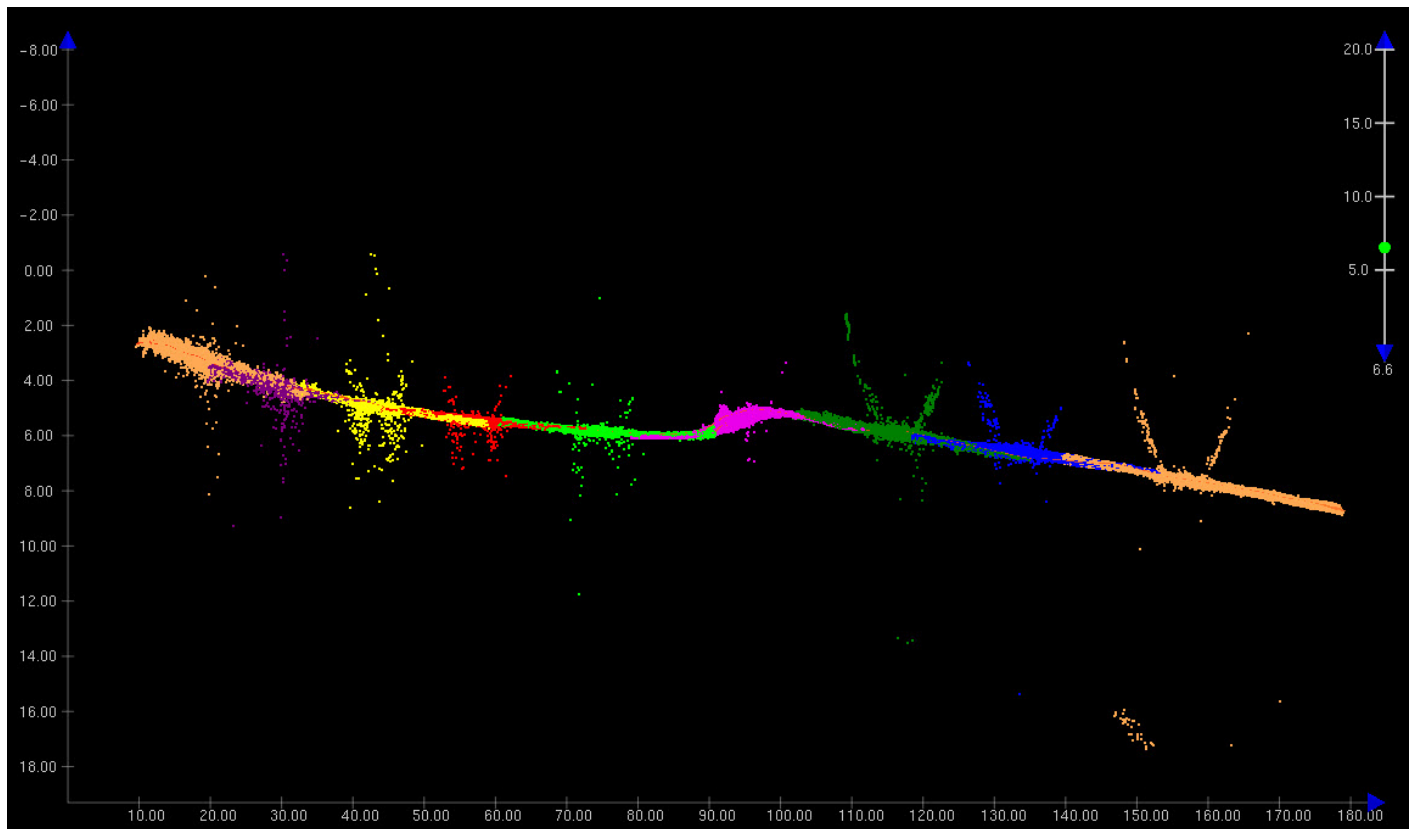


Figure 14: Sound speed artifacts as seen in Subset Editor

These are not sound speed artifacts, they are the result of side lobe interference (from sub-optimal sonar tuning, environmental noise, vessel traffic, etc.). The SSP correctors can be evaluated by the excellent agreement where lines overlap.

Tidal Offset

The depicted area has been highlighted as the hydrographer believes them to be at the borderline of within IHO standard, and may draw additional review.

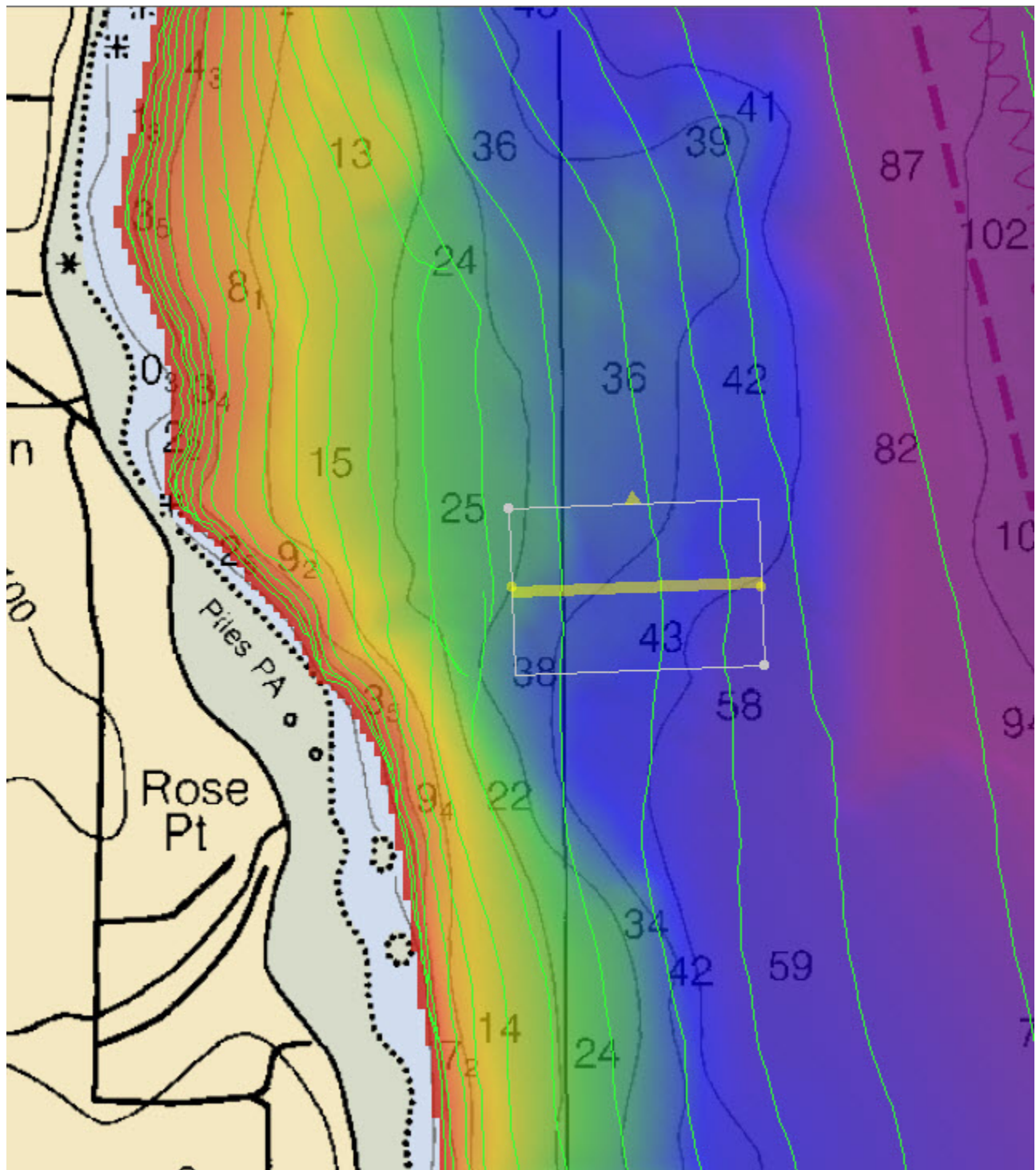


Figure 15: Overview of area of interest, NE of Rose Point. (47/51.5N 122/30W)

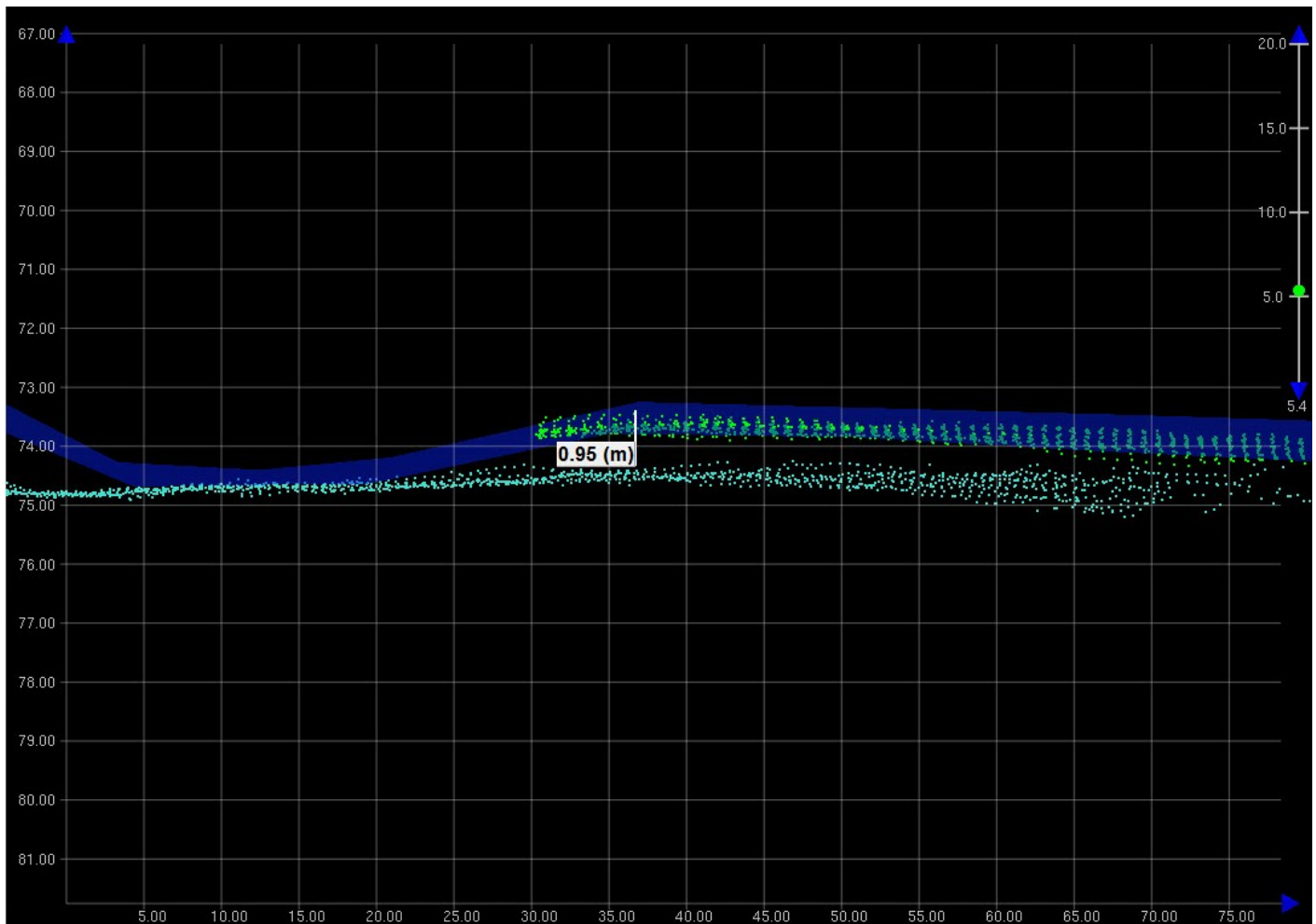
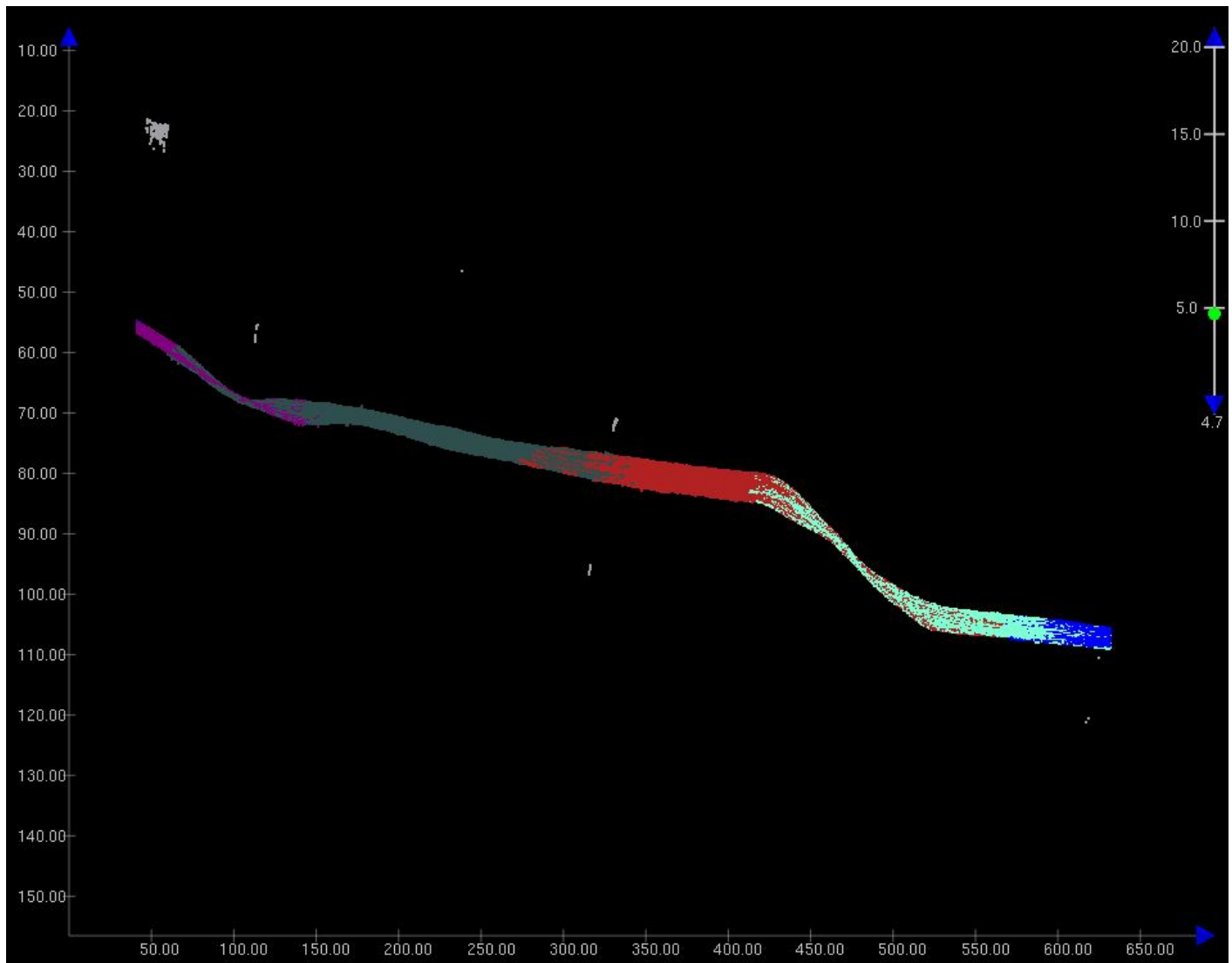


Figure 16: Subset Editor view of area of interest, NE of Rose Point. IHO Acceptable Total Vertical Uncertainty is 1.096 at 75m. 16-meter finalized surface loaded in Subset Editor.

A subset at this location reveals no such discrepancy between overlapping bathymetric data. Discrepancy cannot be explained, but there is no such error in the surface of the data.



Reviewer found no TVU issue in subset editor

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: CTD casts were conducted every 3 to 4 hours during launch data acquisition, as discussed in the Corrections to Echo Soundings section of the DAPR.

B.2.8 Coverage Equipment and Methods

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

B.2.9 IHO Uncertainty

All data meet the data accuracy specifications as stated in the NOS Hydrographic Specifications and Deliverables (HSSD) dated April 2013. See Standards Compliance Review in Appendix V.

Appendix V does not exist. The correct Appendices is "II Supplemental_Survey_Records_&_Correspondence".

B.2.10 Density

Density requirements for H12564 were achieved with at least 99% of finalized surface nodes containing five or more soundings. See Standards Compliance Review in Appendix V.

Appendix V does not exist. The correct Appendices is "II Supplemental_Survey_Records_&_Correspondence".

B.2.11 Holiday Assessment

Complete multibeam coverage was obtained within the limits of H12564 except for the holiday noted below. The least depths of all navigationally significant features are represented by H12564. Time constraints led to a northwest/southwest holiday in the southwest corner of the fieldsheet. It runs from approximately 47/48/29.7N, 122/28/38.2W to 47/47/21.4N, 122/29/23.8W. It is approximately 670m north/south in width at its greatest extent, along the western border (See Figure 15). Coverage continues shoreward of the holiday to the NALL.

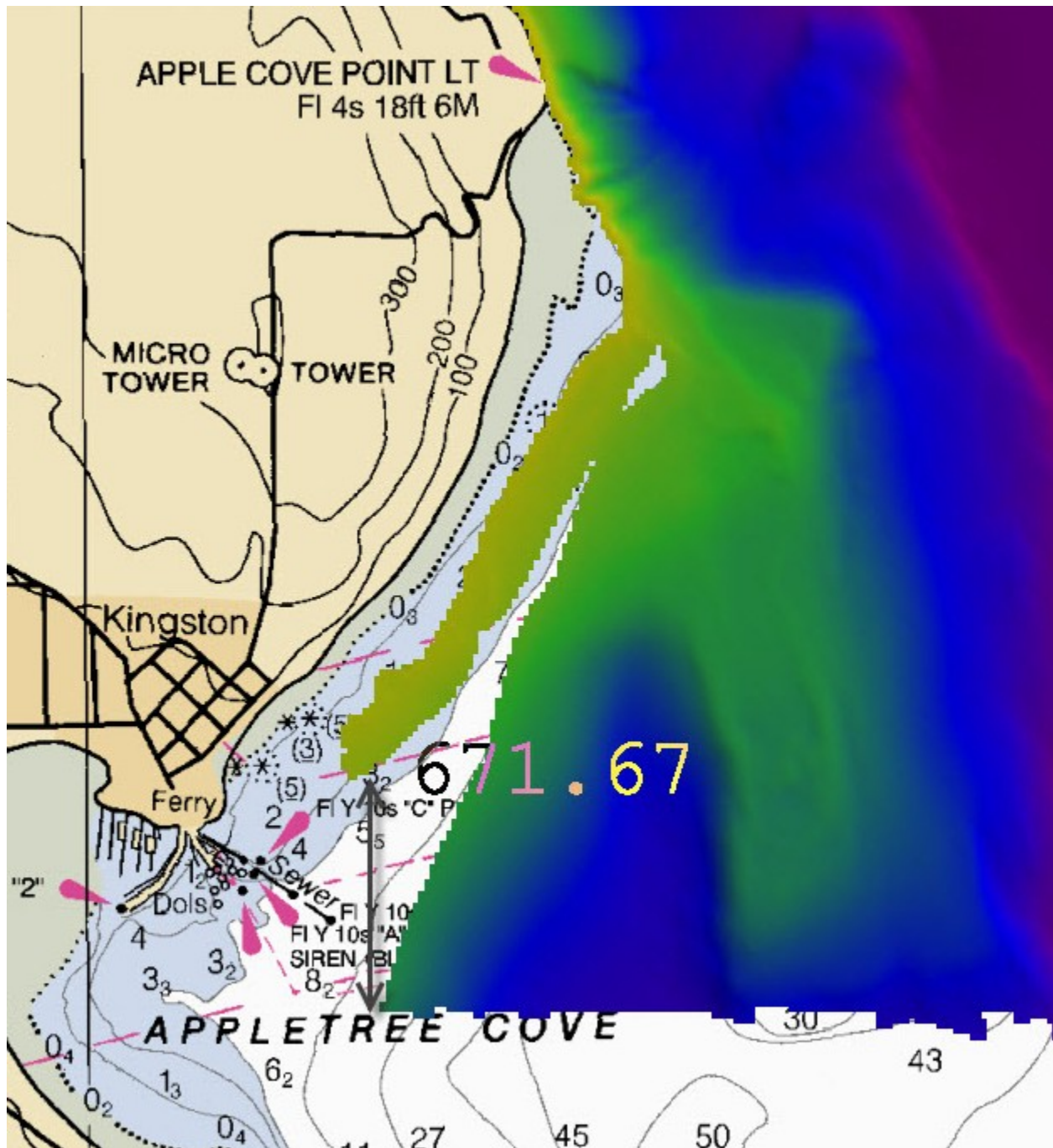
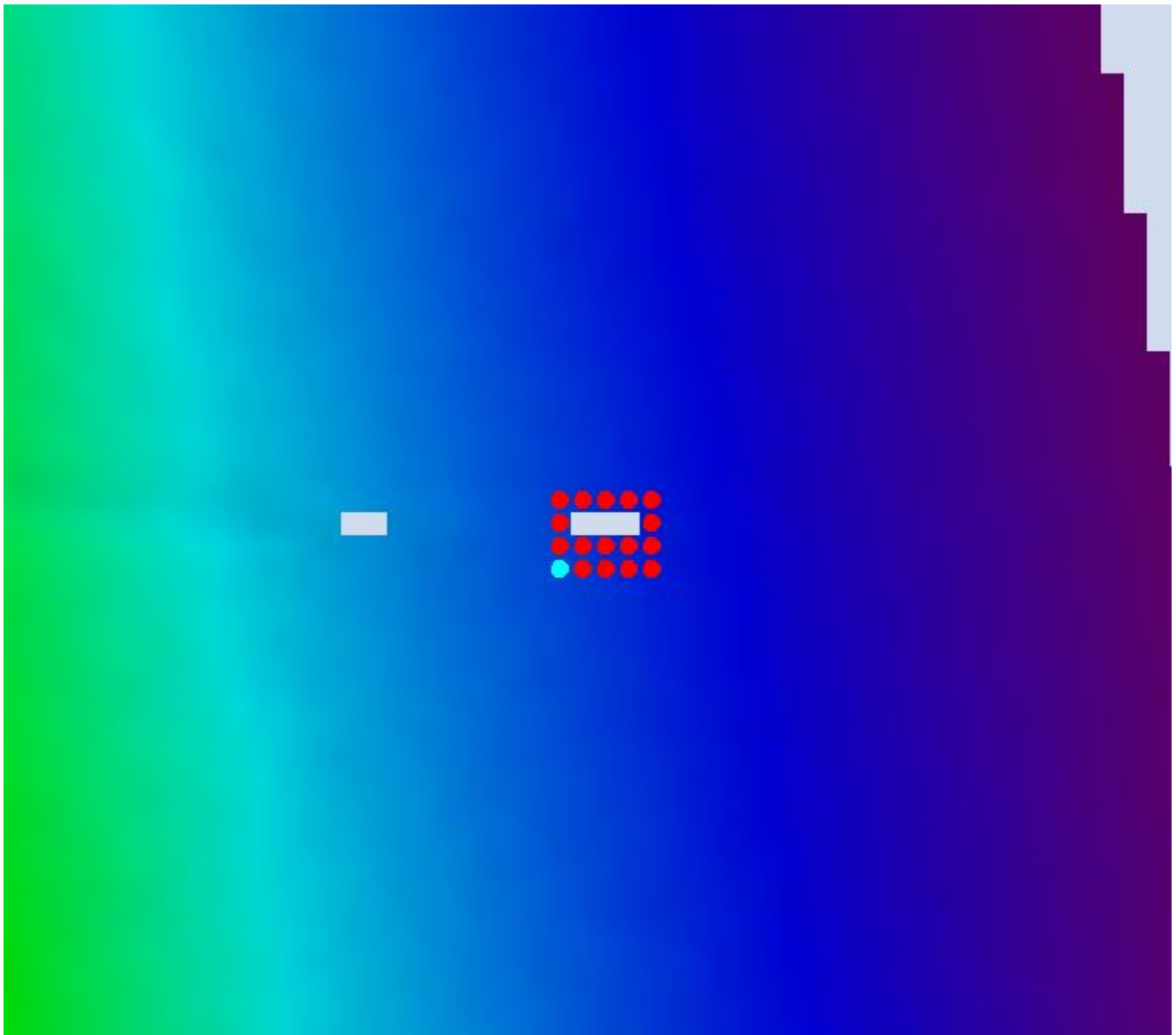
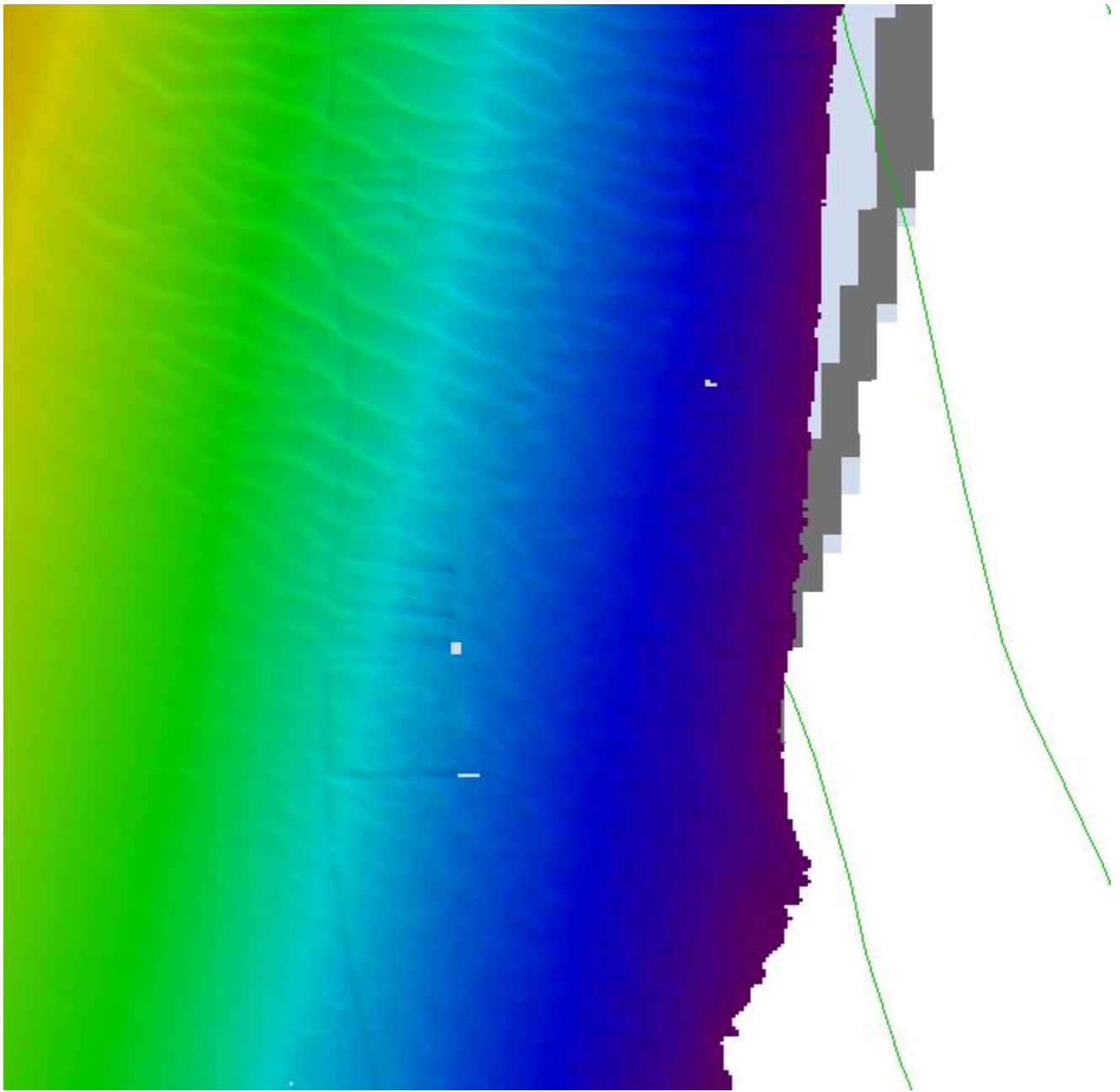


Figure 17: Holiday between NALL and deeper coverage.

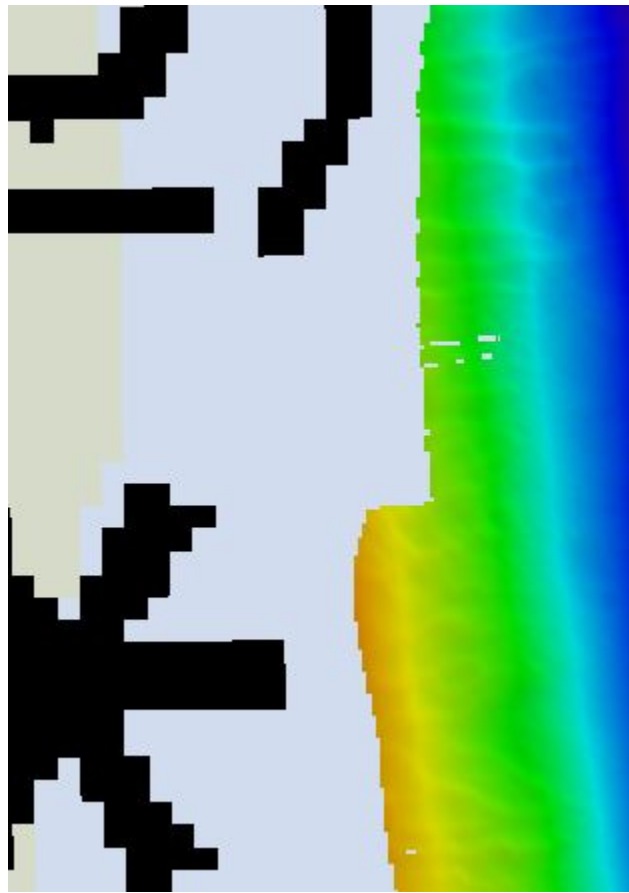
The holiday is located in the Southwest corner of the fieldsheet but runs from the southwest toward the northeast. As defined in the HSSD section 5.2.2.4, there are a few additional small holidays that exist that are greater than 3 adjoining nodes. Based on the surrounding data, none of the holidays present a threat to safe navigation. Charted soundings and contours within holiday on chart 18446 will be retained.



17b



17c



17d

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

Backscatter was logged to 7k files and submitted to NGC for file backup and to the Pacific Hydrographic Branch for processing. Backscatter was not processed by the field unit due to time constraints.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAA Profile V_5_3

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
H12564_MB_1m_MLLW	CUBE	1 meters	-	NOAA_1m	Complete MBES
H12564_MB_2m_MLLW	CUBE	2 meters	-	NOAA_2m	Complete MBES
H12564_MB_4m_MLLW	CUBE	4 meters	-	NOAA_4m	Complete MBES
H12564_MB_8m_MLLW	CUBE	8 meters	-	NOAA_8m	Complete MBES
H12564_MB_16m_MLLW	CUBE	16 meters	-	NOAA_16m	Complete MBES
H12564_MB_1m_MLLW_Final	CUBE	1 meters	0 meters - 20 meters	NOAA_1m	Complete MBES
H12564_MB_2m_MLLW_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12564_MB_4m_MLLW_Final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12564_MB_8m_MLLW_Final	CUBE	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES
H12564_MB_16m_MLLW_Final	CUBE	16 meters	144 meters - 320 meters	NOAA_16m	Complete MBES
H12564_MB_16m_MLLW_Combined	CUBE	16 meters	0 meters - 320 meters	NOAA_16m	Complete MBES

Table 9: Submitted Surfaces

The NOAA CUBE parameters mandated in HSSD were used for the creation of all CUBE BASE surfaces in Survey H12564. The surfaces have been reviewed where noisy data, or 'fliers,' are incorporated into the gridded solution, causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable vertical uncertainty at that depth, the noisy data have been rejected and the surface recomputed.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound velocity application is noted in the H12564 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

B.5.4 Critical Soundings

Designation of soundings followed procedures as outlined in section 5.2.1.2 of the HSSD. Survey H12564 requires 15 designated soundings. No soundings were designated as Dangers to Navigation. All designated soundings are required to accurately represent the seafloor. All soundings flagged as outstanding require additional interpretation.

C. Vertical and Horizontal Control

No additional Horizontal or Vertical Control Report is submitted with H12564.

C.1 Vertical Control

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

Standard Vertical Control Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Port Townsend, WA	9444900
Seattle, WA	9447130

Table 10: NWLON Tide Stations

There was no Water Level file associated with this survey.

File Name	Status
N395FA2013.tc	Final

Table 11: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 08/10/2013. The final tide note was received on 08/23/2013.

Preliminary zoning is accepted as the final zoning for OPR-N395-FA-2013, survey H12564.

Tide file is appended to this report.

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

The VDatum separation file was applied in accordance with the FPM. VDatum was used for the vertical transformation of ellipsoid-referenced data to MLLW and is applied for data submission. All soundings were merged in CARIS HIPS and SIPS using the Apply GPS Tide function, and TPU was computed with the new VDatum uncertainty value. See correspondence in Appendix V for additional information on VDatum use and approval.

Appendix V does not exist. The correct Appendices is "II Supplemental_Survey_Records_&_Correspondence".

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is UTM-10N.

The following PPK methods were used for horizontal control:

Smart Base

Vessel kinematic data were post-processed using Applanix POSPac processing software and SmartBase Post Processed Kinematic methods as described in the DAPR. Smooth Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS (exceptions are previously noted). All data from H12564 can be referenced to the ellipsoid. For further details regarding the processing and quality control checks performed, see the H12564 POSPac Processing Logs spreadsheet located in the SBET folder with the GNSS data.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
P437	P437
LKCP	LKCP
P424	P424
SEAT	AF9674
P426	P426
KTBW	KTBW
SSHO	DJ9210
CHCM	DI8467
SMAI	DL2071

Table 12: CORS Base Stations

The following DGPS Stations were used for horizontal control:

DGPS Stations
Whidbey Island, WA - 302 kHz (100 BPS)

Table 13: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

D.1.1 Raster Charts

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

Chart	Scale	Edition	Edition Date	LNМ Date	NM Date
18441	1:80000	47	06/2011	06/21/2011	06/25/2011
18446	1:25000	18	03/2011	03/08/2011	03/19/2011
18473	1:40000	8	09/2005	09/13/2005	09/24/2013

Table 14: Largest Scale Raster Charts

18441

Comparison of H12564 survey with chart 18441 (1:80,000) follow the trends as discussed below for the larger scale charts 18473 (1:40,000) and 18446 (1:25,000). Both chart 18441 and chart 18473 cover the entire extent of the survey area for H12564.

The trends between the two scale charts do agree however the conclusions the field makes below are incorrect due to them displaying the survey soundings in the incorrect units for comparison.

18446

Chart 18446 covers the southern half of H12564. Soundings generally trend within 5 feet of charted depths on chart 18446.

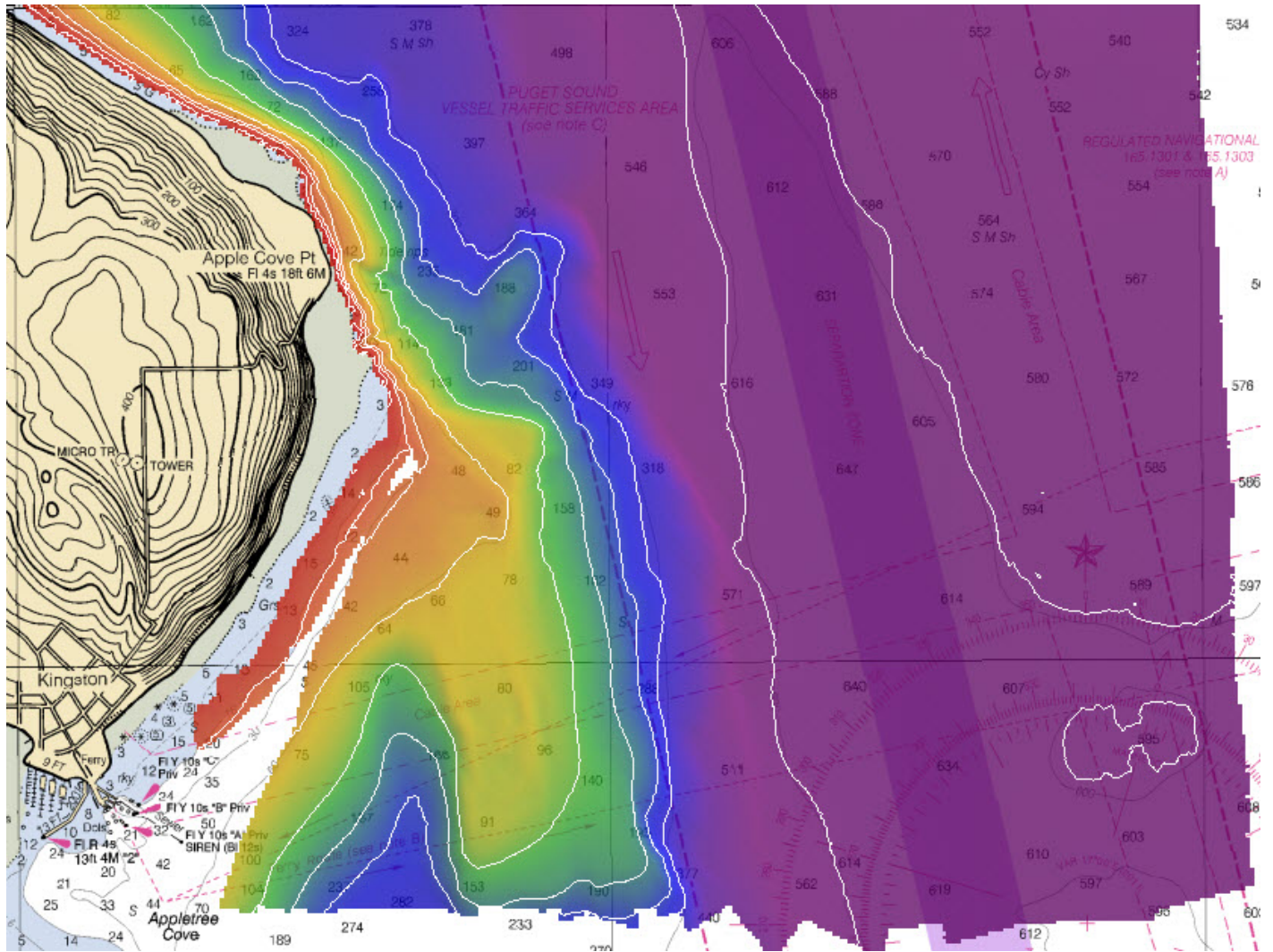


Figure 18: Overview, contour comparison with chart 18446.

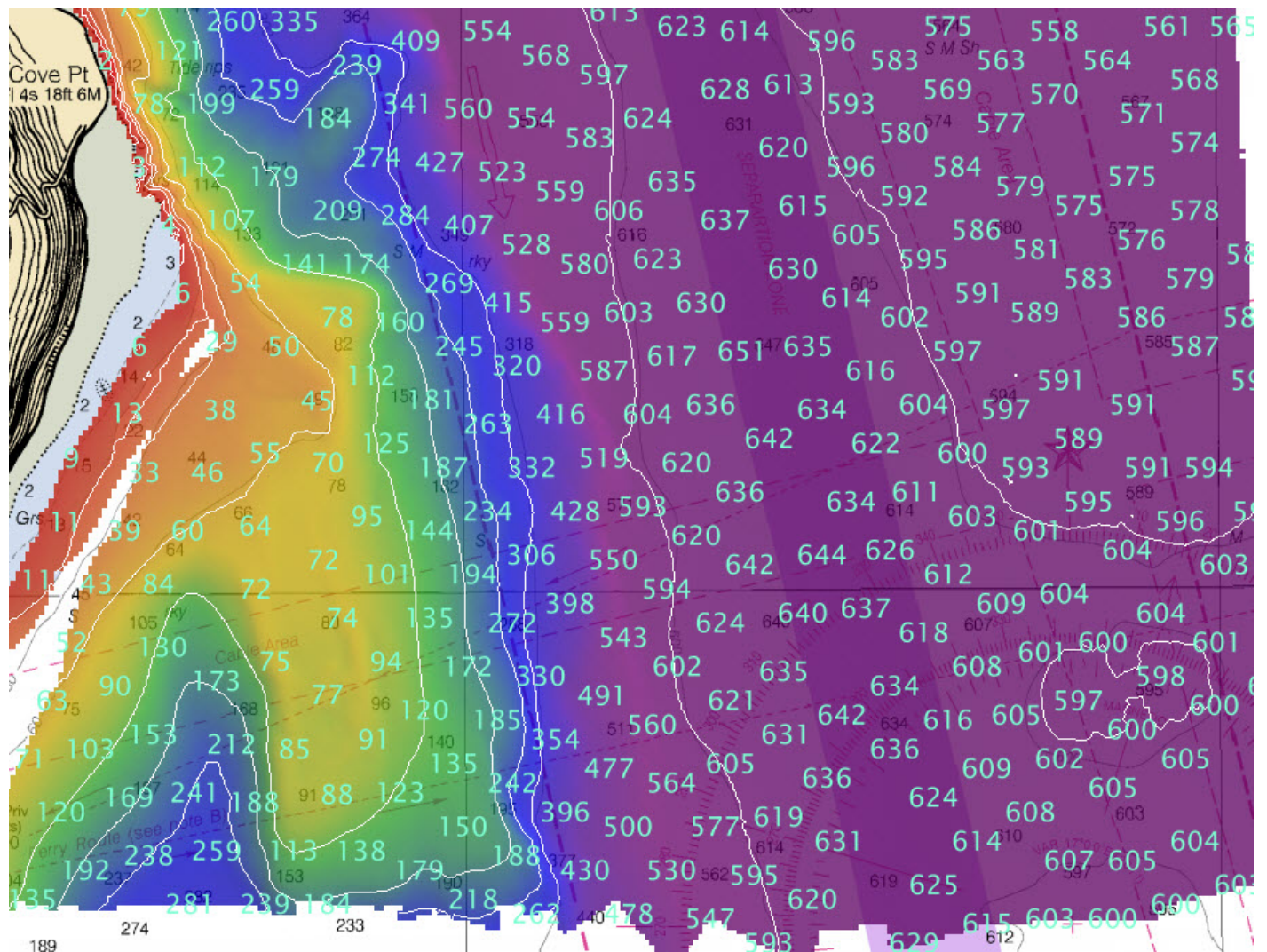


Figure 19: Apple Cove Point and east, soundings comparison with chart 18446. Soundings in feet.

18473

Soundings from H12564 appear to be between 8 and 20+ fathoms deeper than charted depths for chart 18473, throughout the extent of the survey. However, surveyed contour lines generally follow the trends of the charted contours.

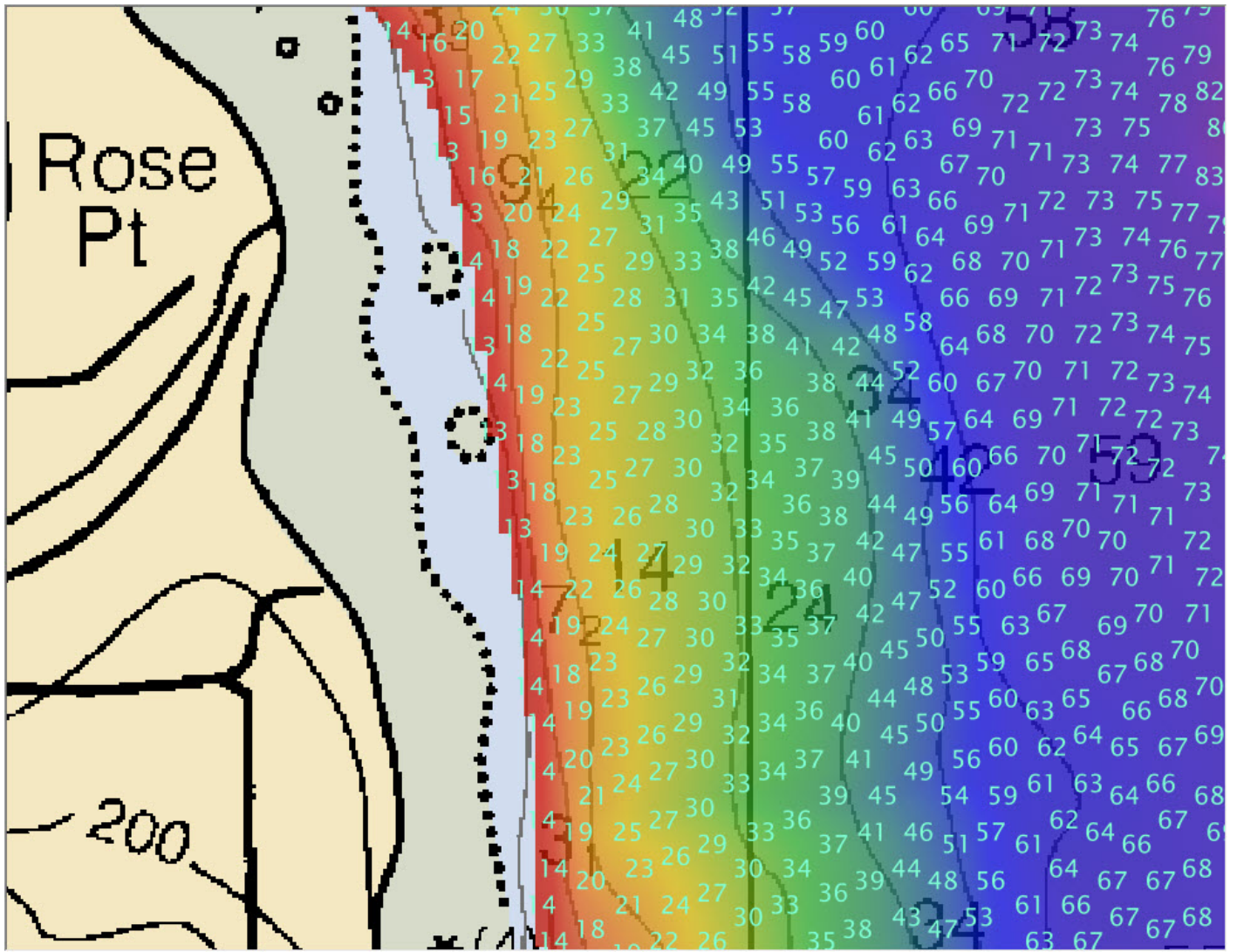


Figure 20: Example of discrepancy between charted depths and surveyed soundings near the region of Rose Point on chart 18473. Surveyed soundings are primarily between 10 and 15 fathoms deeper than charted soundings.

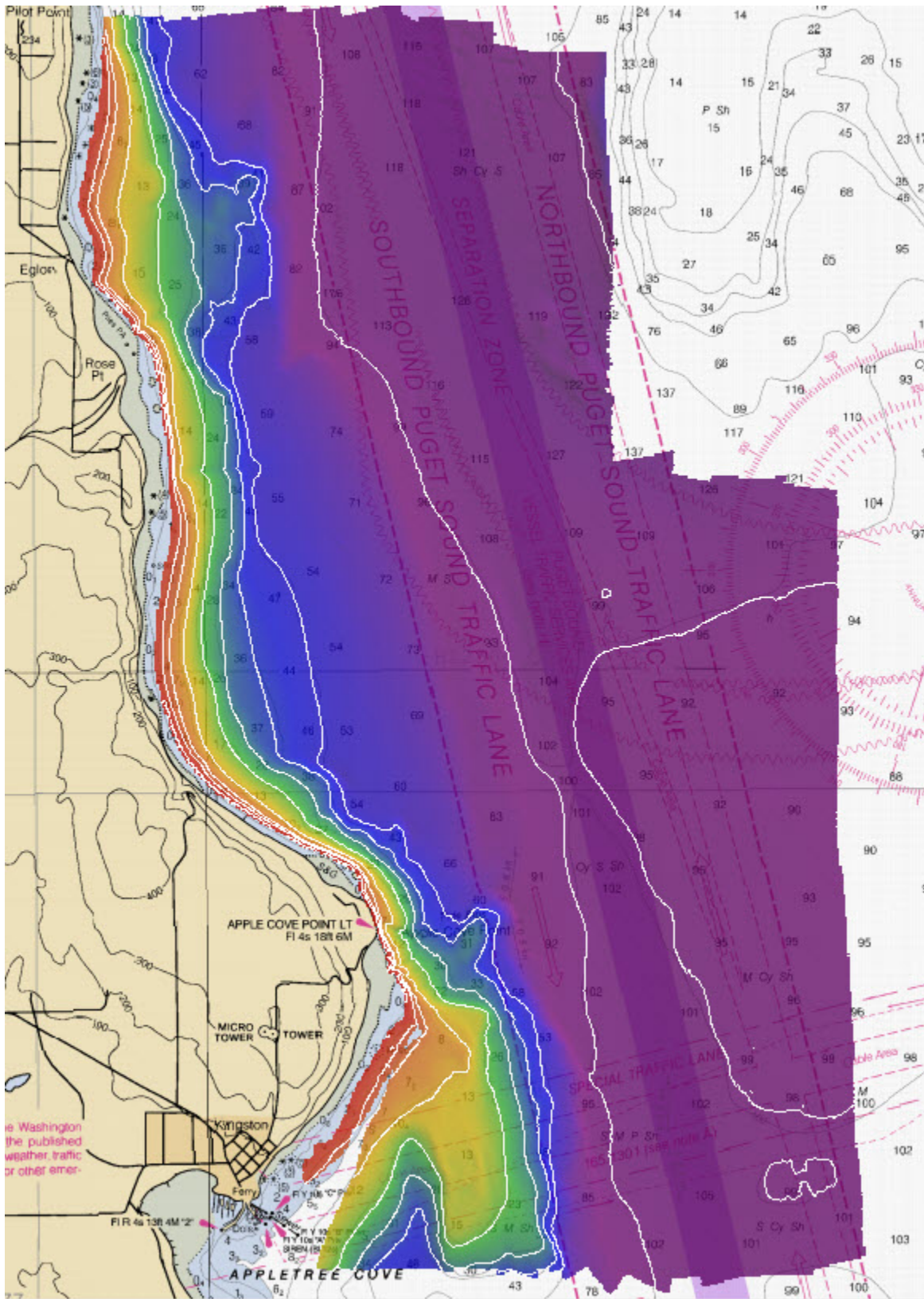


Figure 21: H12564 Contours overlaid on chart 18473.

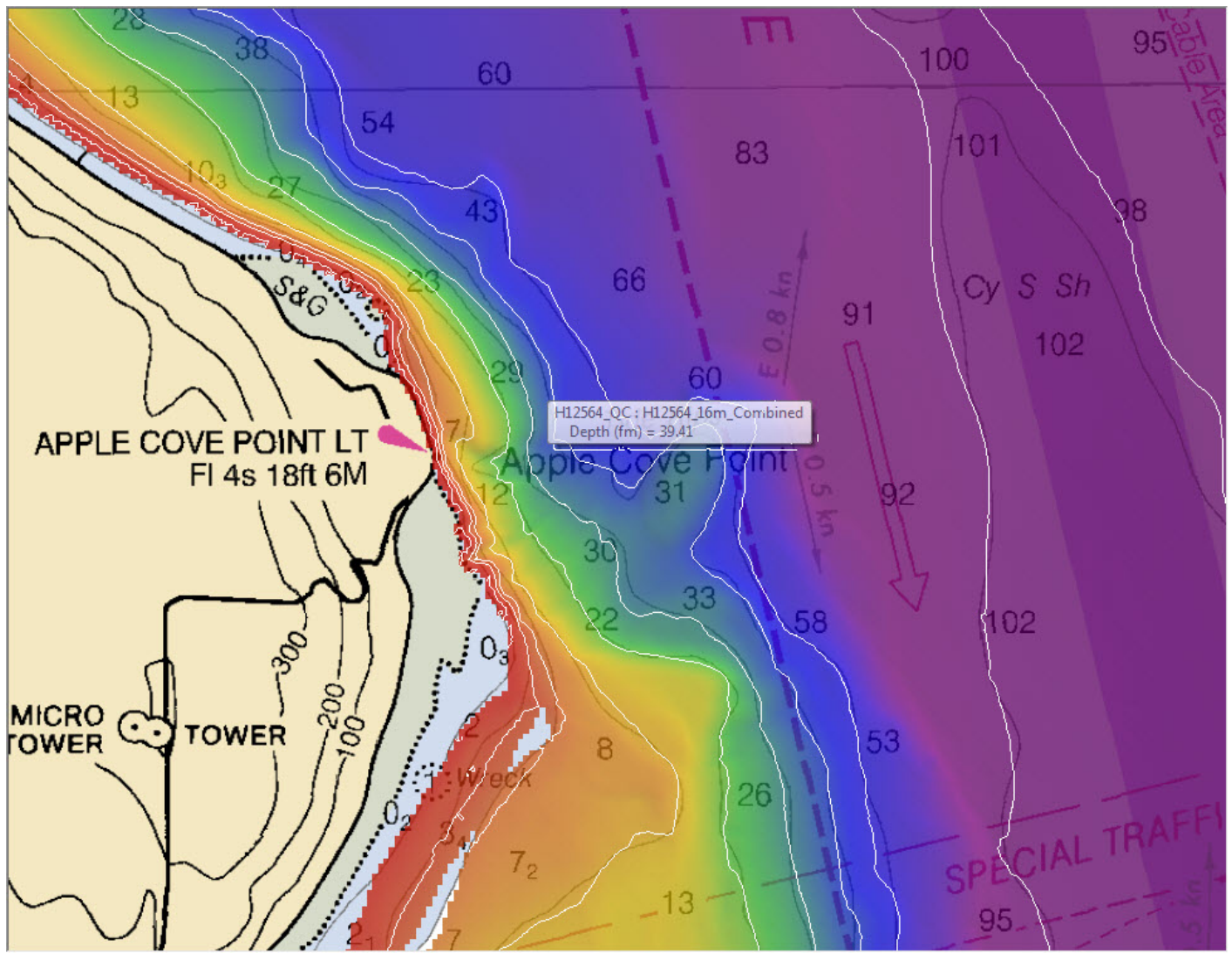


Figure 22: Detail of contours, Apple Cove Point, overlaid on chart 18473.

The field appears to have made conclusions by comparing the chart with survey soundings displayed in incorrect units. When displayed in fathoms the charts match soundings within 1-2 fathoms.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5WA17M	1:40000	16	09/29/2012	01/04/2013	NO
US4WA11M	1:80000	17	07/27/2011	03/26/2013	NO

Table 15: Largest Scale ENC's

US5WA17M

Soundings from survey H12564 generally agreed within 1 to 2 fathoms on chart US5WA17M, with newly surveyed soundings trending slightly deeper than originally charted soundings. Contours generated in CARIS HIPS closely approximated the charted contours.

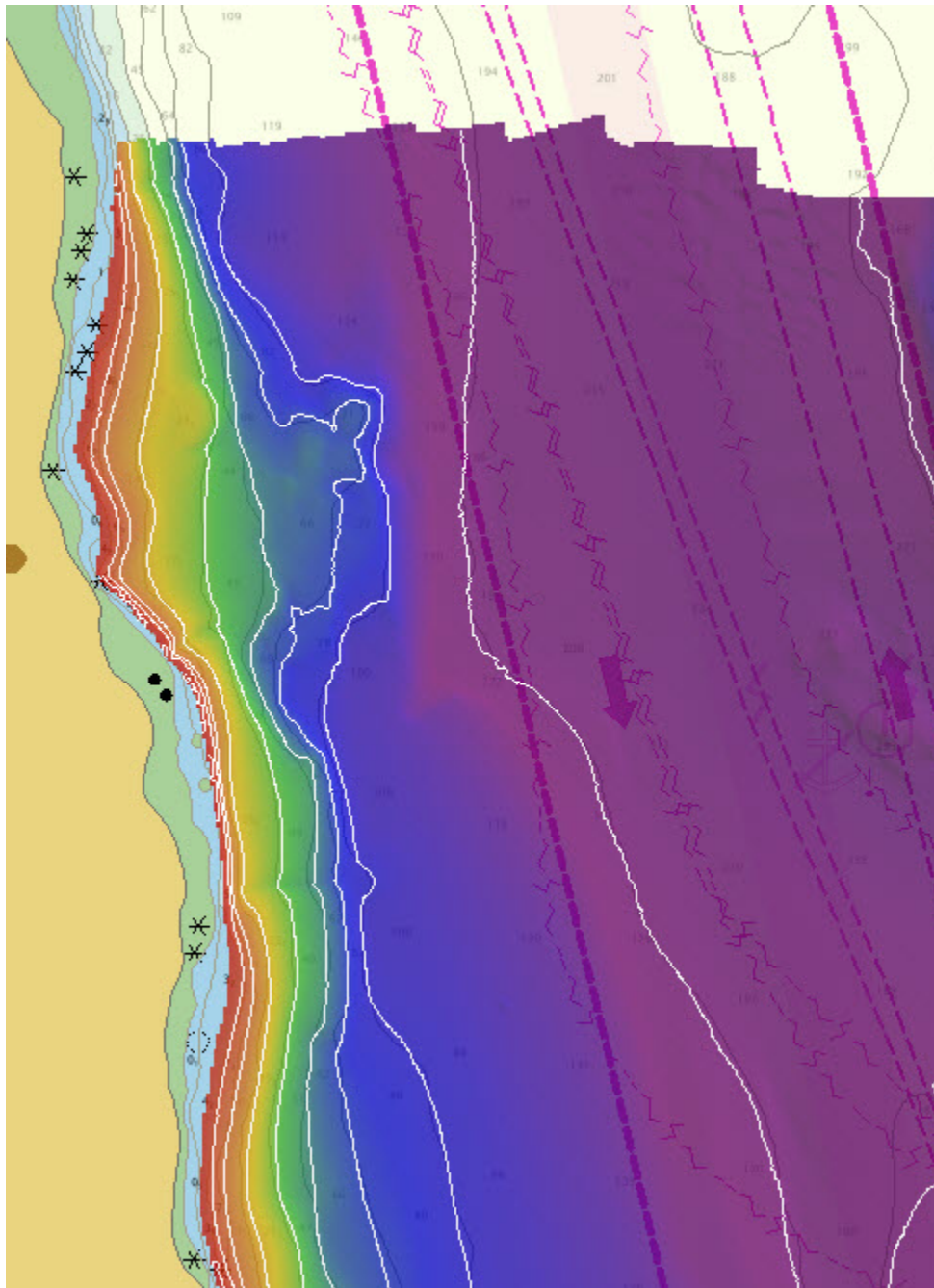


Figure 23: Contour comparison, H12564 with US5WA17M

US4WA11M

Soundings from survey H12564 generally agreed within 1 to 2 fathoms on chart US5WA11M. Contours generated in CARIS HIPS closely approximated the charted contours, with the most noticeable deviations located along the shoreline.

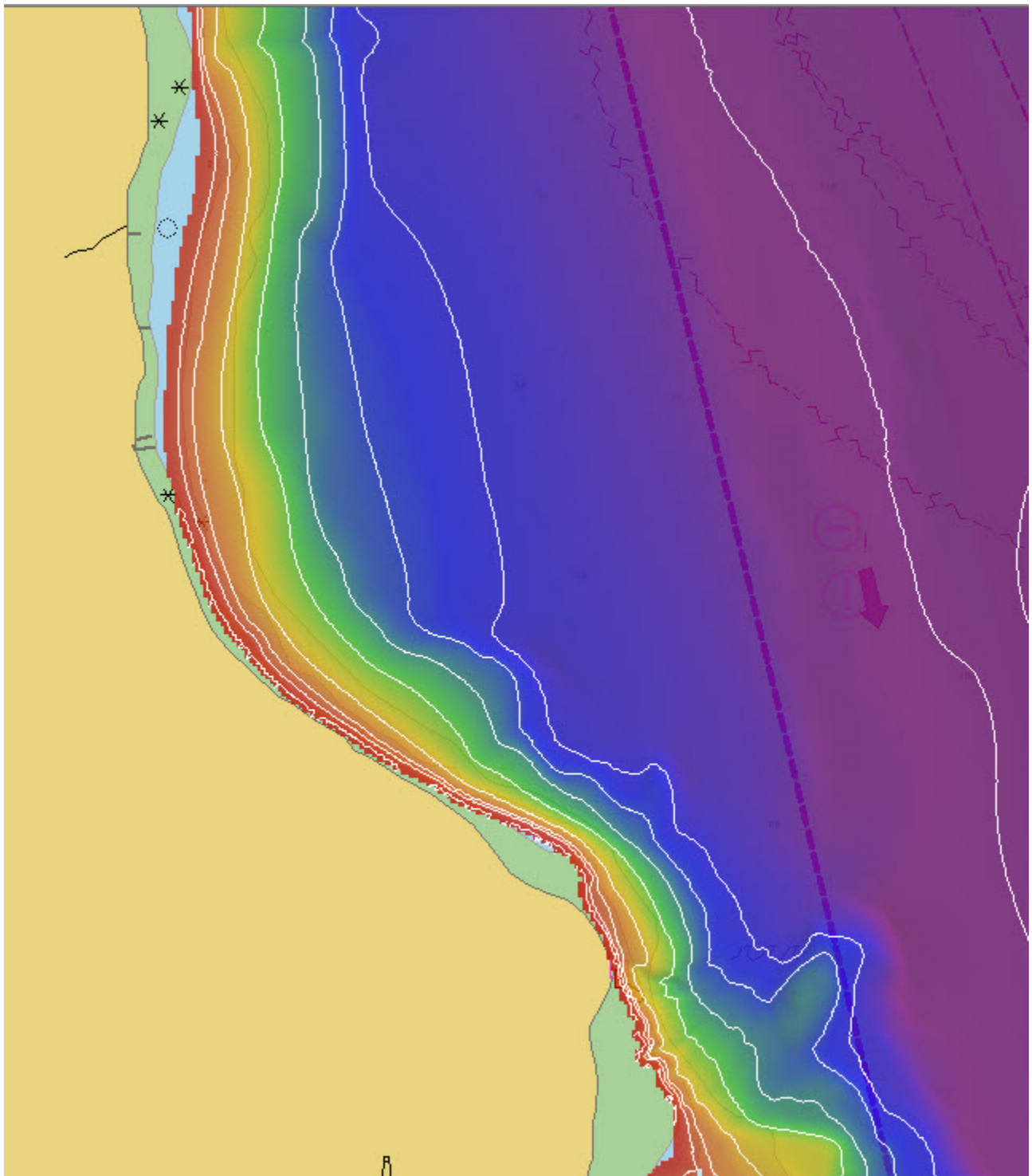


Figure 24: Contour comparison, H12564 with US5WA11M

D.1.3 AWOIS Items

AWOIS items exist for this survey, but were not addressed.

AWOIS item # 54109 is within the limits of this survey. Since the AWOIS was not addressed the feature should be retained. AWOIS item # 54109 represents two piles PA charted on 18473 at 47/51/20.9N 122/30/26.1W and 47/51/23.5N 122/30/28.9W.

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

Charted features exist for this survey, but were not investigated due to time constraints. See Final Feature File for details.

D.1.6 Uncharted Features

No uncharted features exist for this survey.

D.1.7 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.8 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.9 Channels

Channels, designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, and/or channel and range lines exist within the survey limits, but were not investigated.

D.1.10 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Due to time constraints, traditional or limited shoreline verification were not conducted as stated in the DAPR. See attribution in "H12564_Final_Feature_File" for any investigation details.

"as stated in the DAPR" should read "as required by the Project Instructions".

D.2.2 Prior Surveys

Prior survey comparisons exist for this survey, but were not investigated.

D.2.3 Aids to Navigation

Aids to navigation (ATONs) exist for this survey and were verified to be fulfilling their intended purpose, but were not further investigated.



Figure 25: ATON: Apple Cove Point Light

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

Charted cable areas exist within the survey and will be retained.

D.2.6 Ferry Routes and Terminals

Ferry routes and/or terminals exist for this survey, but were not investigated.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

No significant features 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 Recommendation

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

D.2.11 Inset Recommendation

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 and Specifications Deliverables Manual, Field Procedures Manual, Standing and 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	2013-11-15
Coast Pilot Report	2013-11-15

Approver Name	Approver Title	Approval Date	Signature
CDR James M. Crocker	Chief of Party	11/15/2013	 <small>Digitally signed by CDR James M Crocker, NOAA DN: cn=CDR James M Crocker, NOAA, ou=NOAA Ship Fairweather, ou=Commanding Officer, email=james.m.crocker@noaa.gov, c=US Date: 2013.11.15 14:11:42 -0800'</small>
LT Timothy M. Smith	Field Operations Officer	11/15/2013	 <small>Digitally signed by Tim Smith DN: cn=Tim Smith, cn=NOAA, ou=NOAA Ship Fairweather, email=timothy.m.smith@noaa.gov, c=US Date: 2013.11.15 14:51:15 -0800'</small>
HCST Tami M. Beduhn	Chief Survey Technician	11/15/2013	 Tami Beduhn 2013.11.15 12:54:40 -08'00'
ENS Hadley A. Owen	Sheet Manager	11/15/2013	 ENS Hadley Owen 2013.11.15 13:00:09 -08'00'

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	Continually 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
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
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
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	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	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
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPE	Total Propagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positioning System timing message
ZDF	Zone Definition File



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : August 19, 2013

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N395-FA-2013
HYDROGRAPHIC SHEET: H12564

LOCALITY: Pilot Point to Apple Cove Point, Central Puget Sound
TIME PERIOD: May 15 - May 30, 2013

TIDE STATION USED: 9444900 Port Townsend, WA
Lat. 48° 6.7' N Long. 122° 45.5' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.389 meters

TIDE STATION USED: 9447130 Seattle, WA
Lat. 47° 36.2' N Long. 122° 20.4' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.199 meters

REMARKS: RECOMMENDED GRID

Please use the TCARI grid "N395FA2013.tc" as the final grid for project OPR-N395-FA-2013, H12564, during the time period between May 15 and May 30, 2013.

Refer to attachments for grid 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).

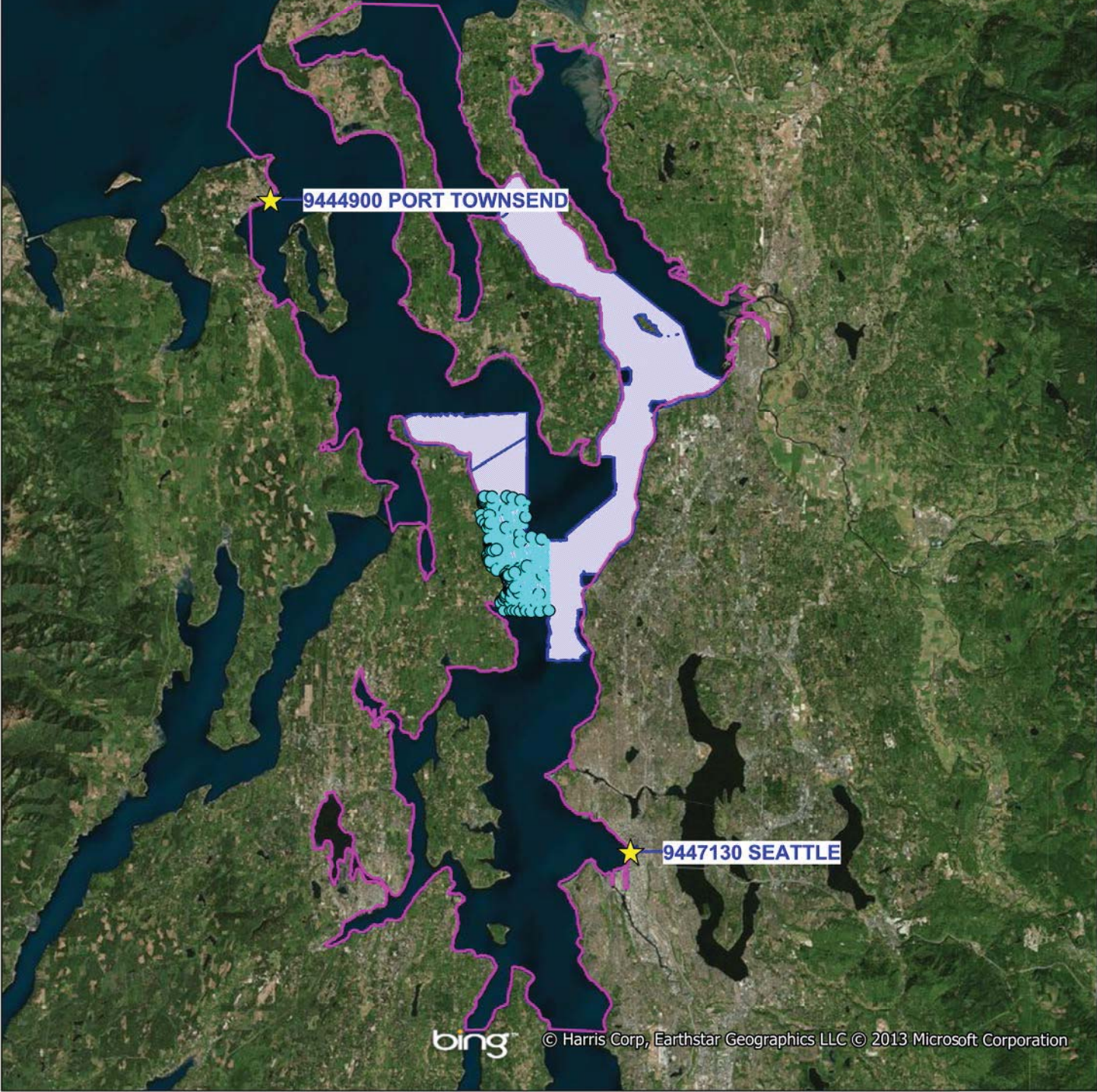
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THOMAS.13658
60250

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ou=DoD, ou=PKI, ou=OTHER,
cn=HOVIS.GERALD.THOMAS.1365860
250
Date: 2013.08.23 09:56:54 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH



**Preliminary as Final TCARI Grid for OPR-N395-FA-2013, H12564
Pilot Point to Apple Cove Point, Central Puget Sound, WA**



APPROVAL PAGE

H12564

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

- H12564_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12564_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved: _____

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: _____

CDR, Benjamin K. Evans, NOAA
Chief, Pacific Hydrographic Branch