H13491

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13491

LOCALITY

State(s):	Washington
General Locality:	Puget Sound
Sub-locality:	Dyes Inlet

2021

CHIEF OF PARTY
Patrick Faha

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13491**

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:	**Dyes Inlet**
Scale:	**10000**
Dates of Survey:	**05/05/2021 to 06/22/2021**
Instructions Dated:	**04/28/2021**
Project Number:	**S-N906-NRTSE-21**
Field Unit:	**NOAA Navigation Response Team - Seattle**
Chief of Party:	**Patrick Faha**
Soundings by:	**Multibeam Echo Sounder 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 10N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13491

Project: S-N906-NRTSE-21

Locality: Puget Sound

Sublocality: Dyes Inlet

Scale: 1:10000

May 2021 - June 2021

NOAA Navigation Response Team - Seattle

Chief of Party: Patrick Faha

A. Area Surveyed

The survey area is located in Dyes Inlet within the sub locality of Puget Sound

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
47° 38' 40.74" N 122° 42' 31.15" W	47° 33' 56.71" N 122° 36' 55.14" W

Table 1: Survey Limits

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the April 2021 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) with the exceptions noted in this report (Figure 1). In all areas where the 3.5 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in close proximity to environmental or man made features.

The southern section of Ostrich Bay on the southern portion of the assigned survey area was not surveyed due to active remediation efforts by the US Navy for unexploded ordinance in the area (Figure 2). See Appendix II Supplemental Survey Records and Correspondence for more information.

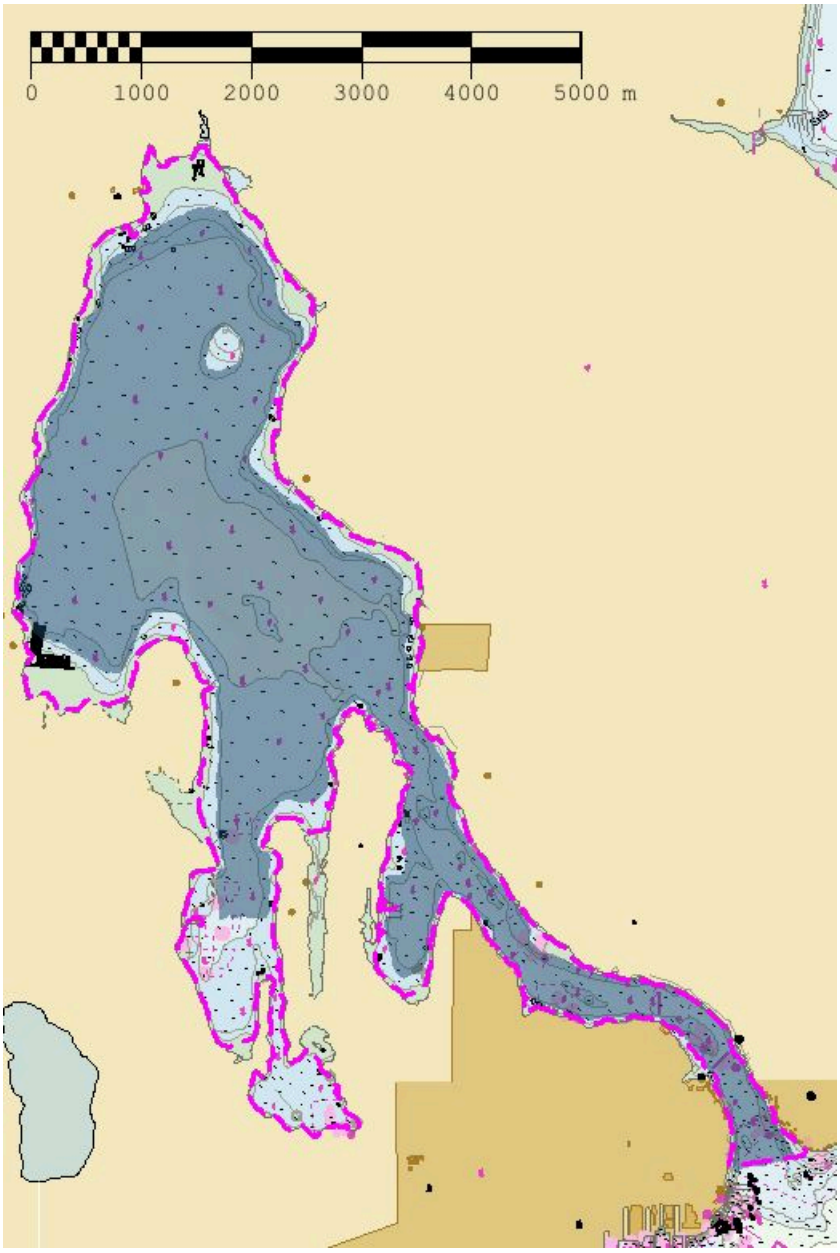


Figure 1: Assigned sheet limits (Pink), surveyed area (blue) on ENC US5WA14M and US5WA21M.

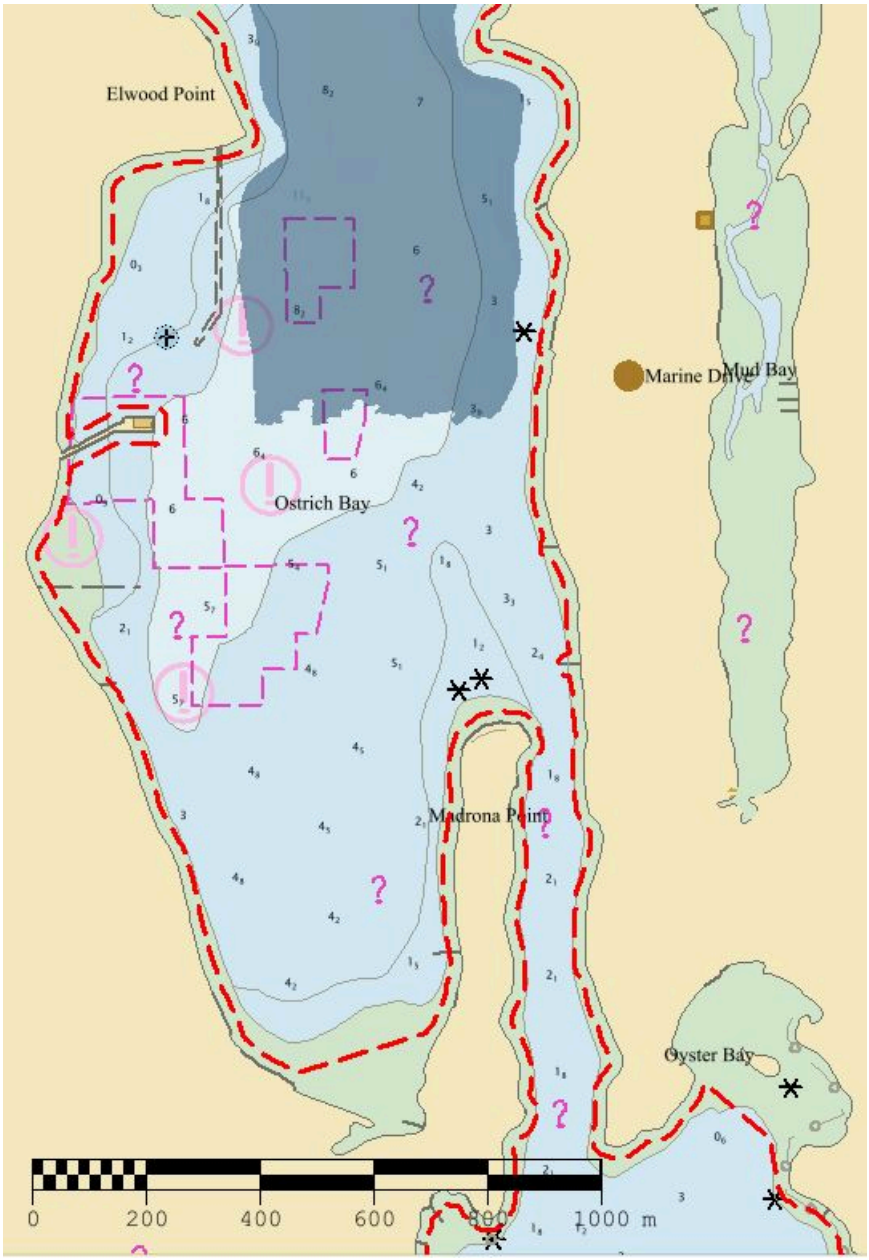


Figure 2: Survey limit (blue) in Ostrich Bay limited due to active remediation in and around charted caution areas in pink.

A.2 Survey Purpose

The Regional Navigation Manager has requested a contemporary hydrographic survey in Dyes Inlet to update the nautical chart. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13491 meets multibeam echo sounder (MBES) coverage requirements for object detection, as required by the HSSD with the exceptions noted in this report. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11). Additional compliance statistics can be found in the Standards and Compliance located in Appendix II of this report.

The surface was analyzed using the HydrOffice QC Tools Grid QA feature (Figure 3-4). Density requirements for H13491 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. The few nodes that did not meet density requirements are due to sparse data in the outer beams, especially near steep sand waves, slopes and rocky areas where acoustic shadowing occurred, and at the edges of the survey limits.

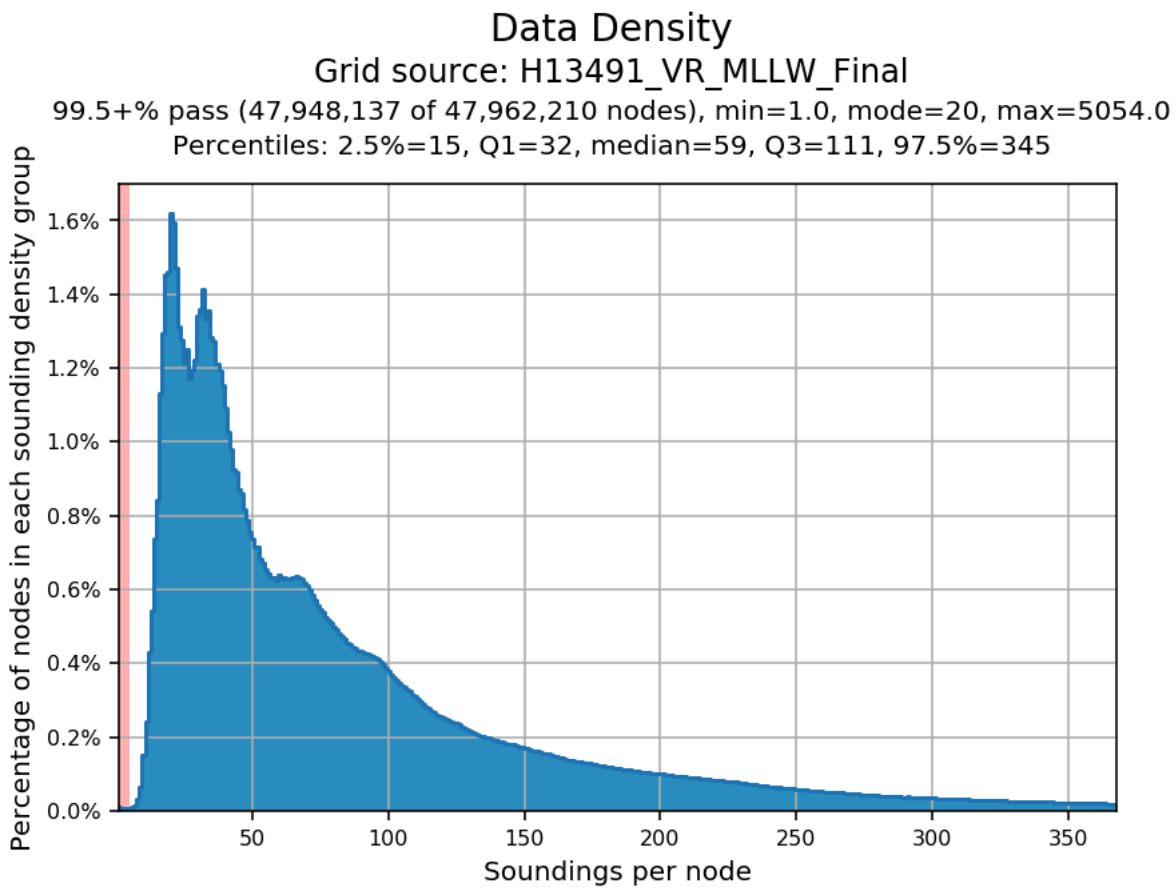


Figure 3: Pydro derived histogram plot showing HSSD object detection compliance for H13491 MBES within the finalized CUBE surface.

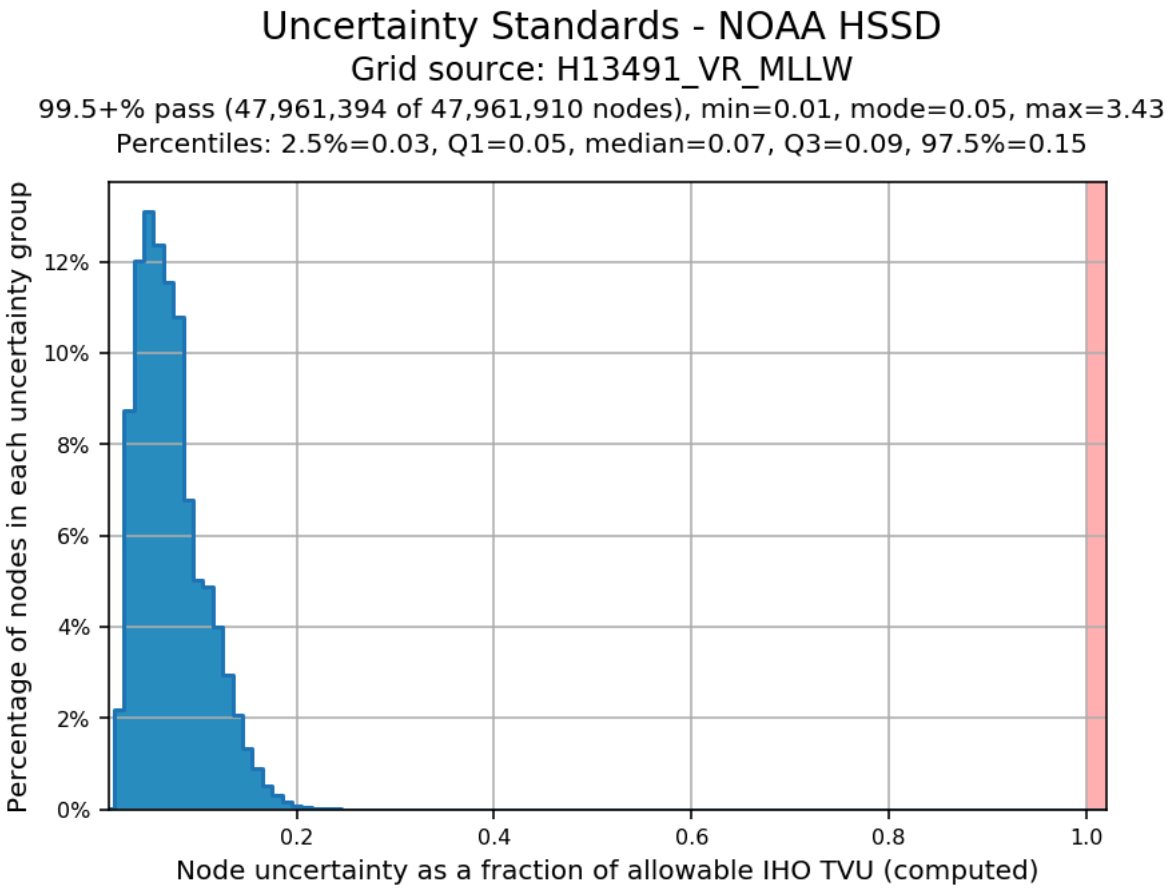


Figure 4: Uncertainty distribution for H13491

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

The entirety of H13491 was acquired in accordance with the Object Detection MBES coverage standard, meeting the requirements listed above and in the HSSD with the exceptions noted in this report. Data is adequate to supersede charted. (Figure 5)

The Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry. In areas where the 3.5 m depth contour was not met, it was due to the risks of maneuvering the survey vessel in close proximity to the shoreline and obstructions. (Figure 6)

Holidays:
H13491 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Seventy-six holidays have been identified via HydrOffice QC Tools Holiday Finder tool using 'Object Detection' settings. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer.

A number of flagged holidays occurred around the bridge supports of the two bridges crossing Port Washington Narrows (Figure 7).

Additional holidays exist due to the propensity for fish balls and mooring lines through out the survey. Fish balls were noted near the bottom and were distributed throughout the survey but were most abundant in the mud flats on the north part of Dyes inlet (Figures 8-9). Efforts were made to recollect data over such areas when possible however a large percentage of the fish balls in particular were not identified and removed from the data until after the boat had left the survey grounds.

Holidays are also present in the near shore areas, inshore or just offshore of the 3.5m depth contour. Gaps in coverage present at the inshore limits of H13491 were not met due to the proximity of the shoreline and safety concerns. Particularity where rocky areas, kelp and near shore features such as mooring balls made it too dangerous to acquire additional bathymetry (Figure 10). Reasonable attempts were made to cover all gaps in coverage that resulted from lack of coverage when it was safe and prudent to do so. Features were added or updated accordingly in the Final Feature File (FFF) where applicable (all mooring balls within the survey area are private and likely seasonal and as such were not included in the FFF).

Holidays were also flagged along the southern edges of the survey in Ostrich Bay and the entrance to Port Washington Narrows. Data collection in Ostrich Bay was suspended due to active remediation of unexploded ordinance by the US Navy (Section A.1) . The Navy anticipates surveying the bay post remediation work and data from such survey work should supersede data from this survey where possible. The data gaps at the entrance to the Port Washington Narrows fall outside the survey bounds and within the junction area for project S-N907-NRTSE-21 conducted post H13491. (Figure 11).

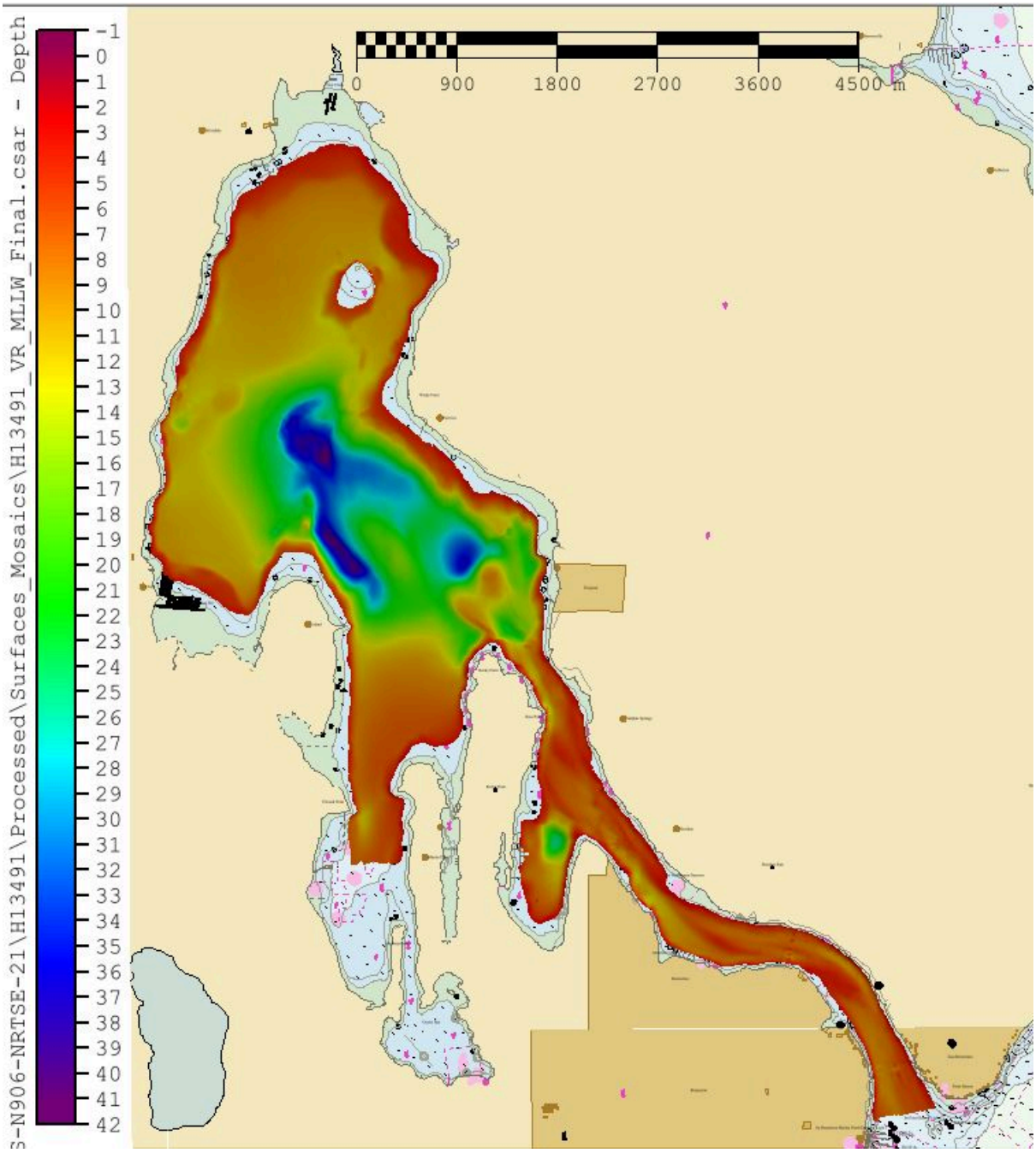


Figure 5: H13491 survey coverage on ENC US5WA14M and US5WA21M.

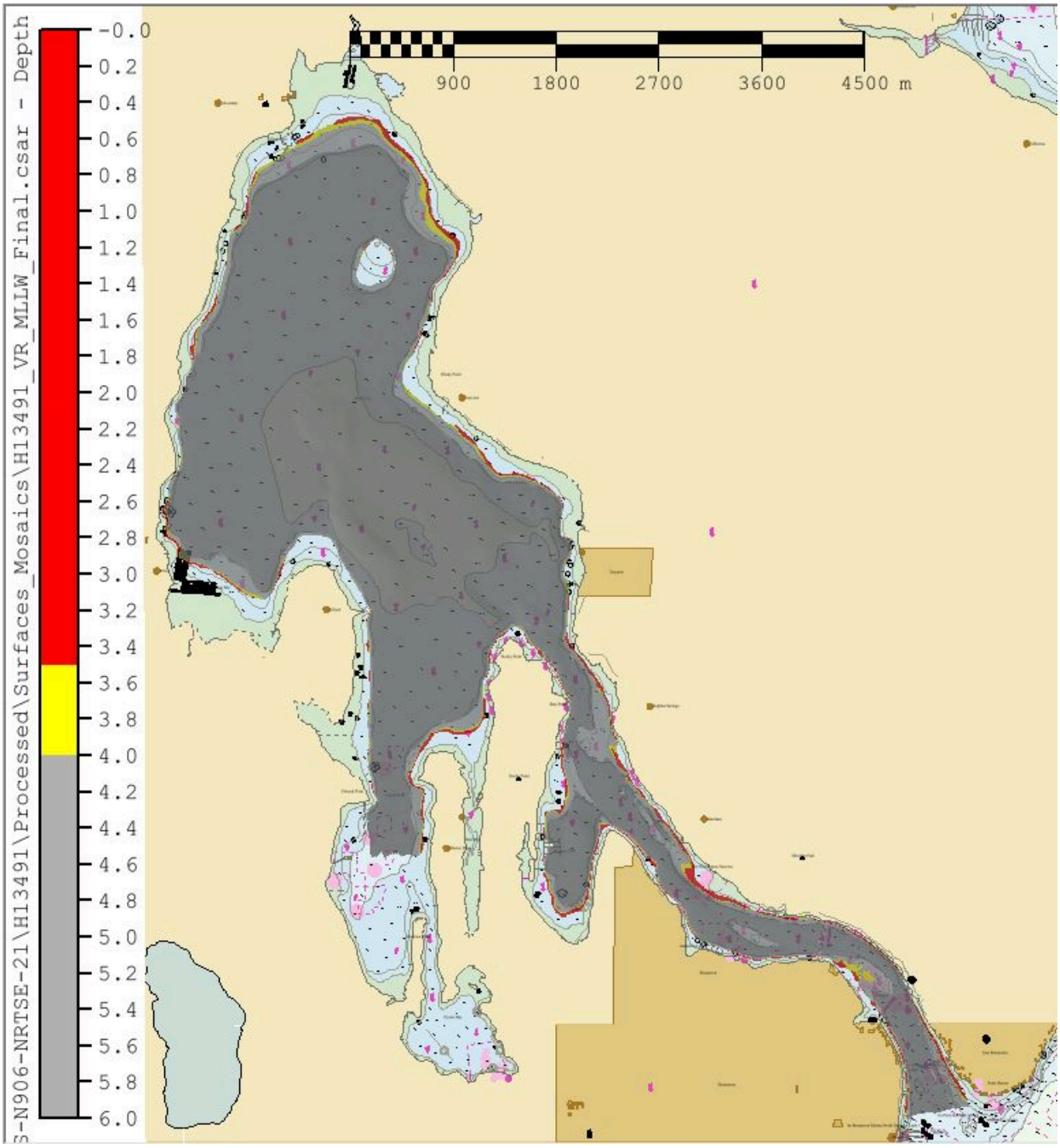


Figure 6: H13491 survey coverage, inshore of 3.5m in red on ENC US5WA14M and US5WA21M.

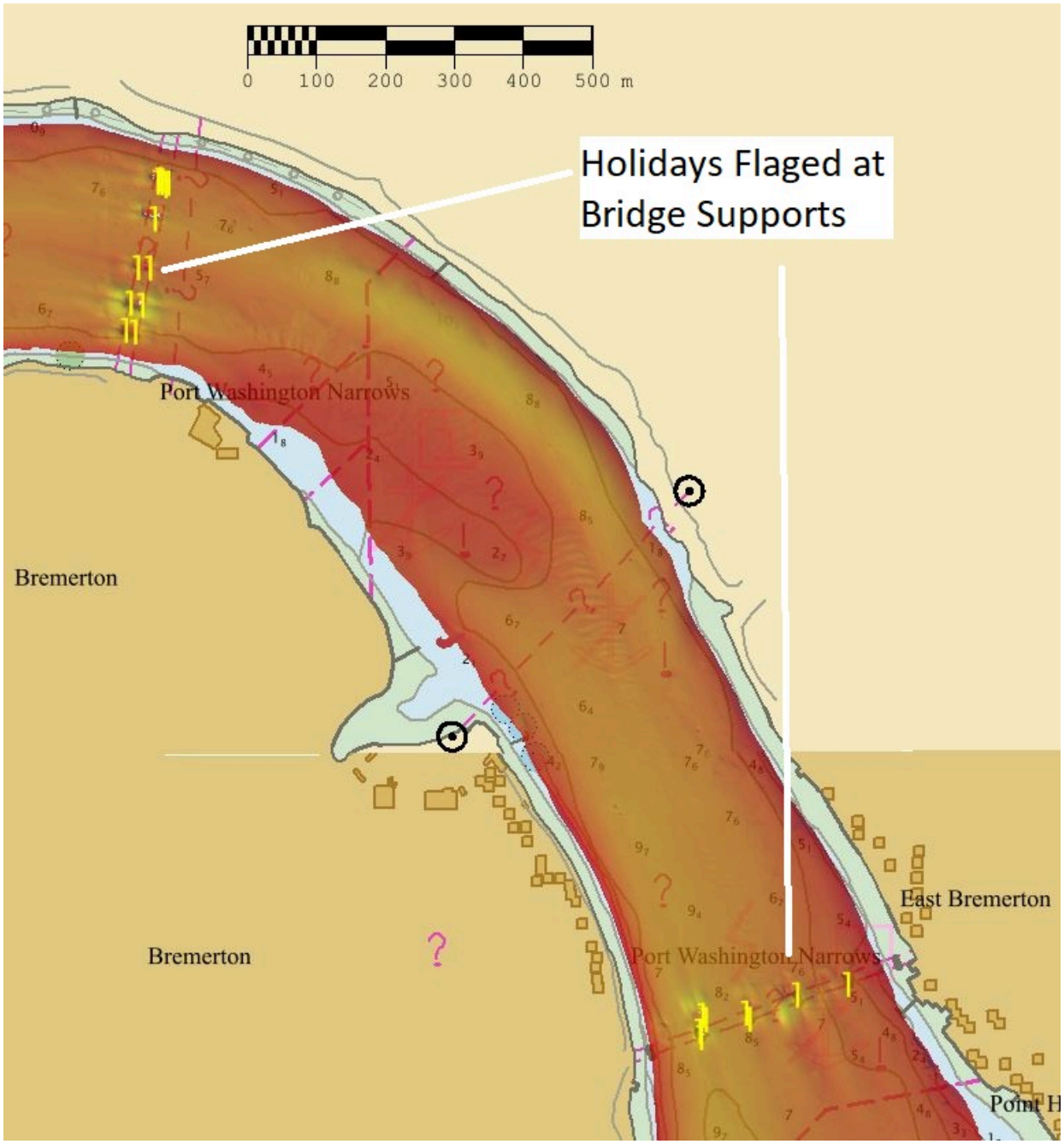


Figure 7: Holidays in yellow flagged on bridge supports

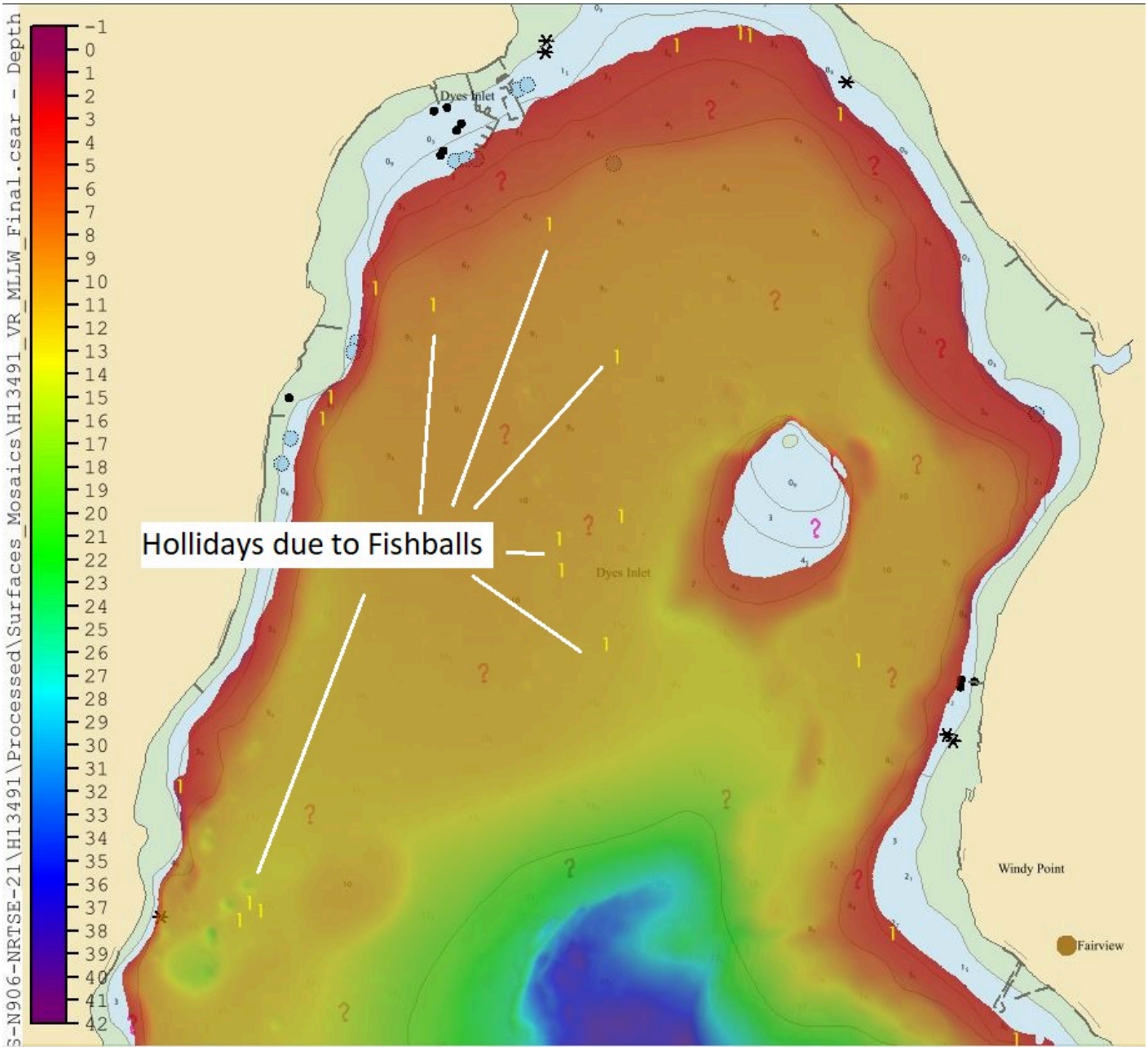


Figure 8: Example of some of the holidays identified in yellow where fish balls were cleaned from processed data.

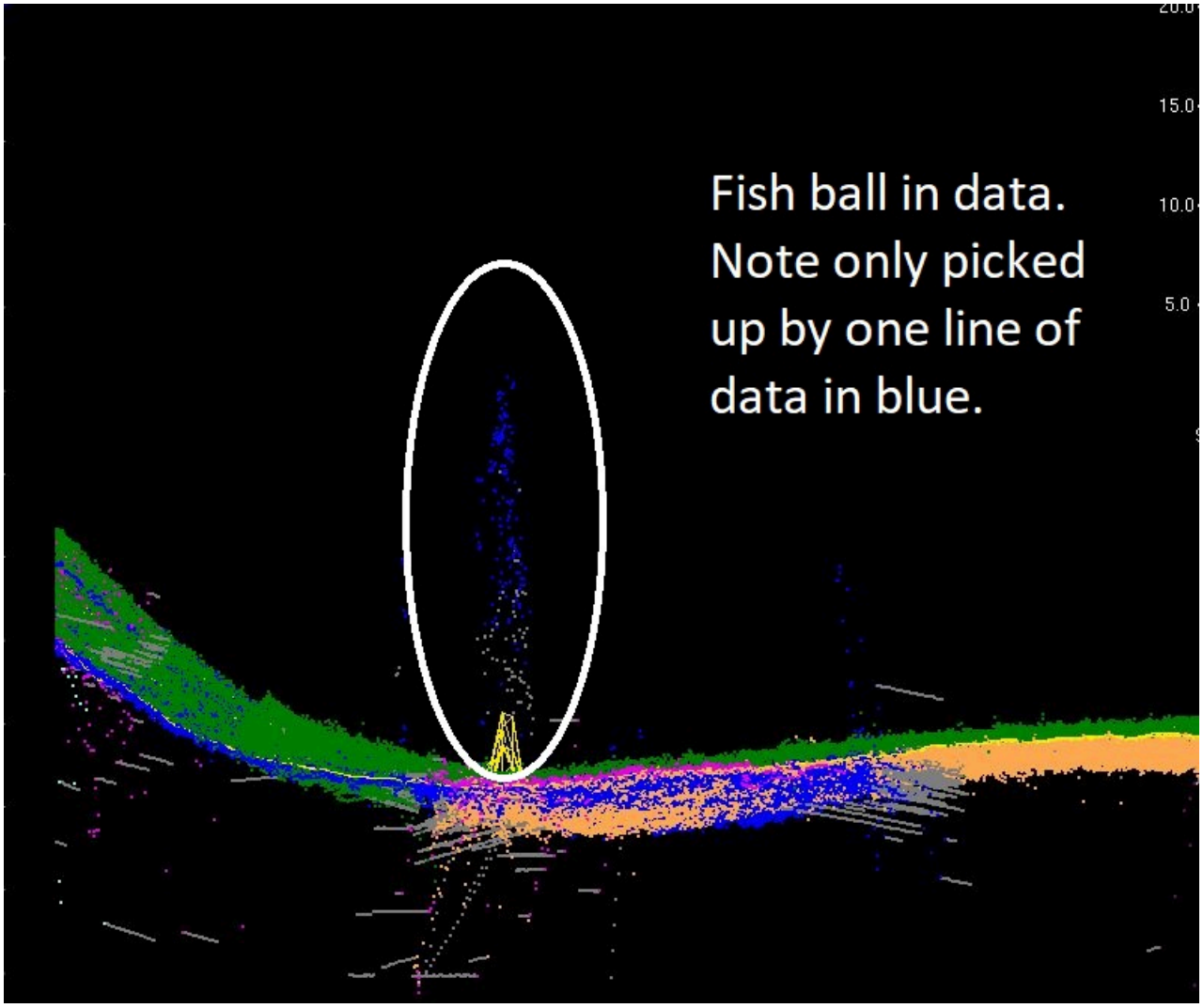


Figure 9: Example of fish ball in data from H13491

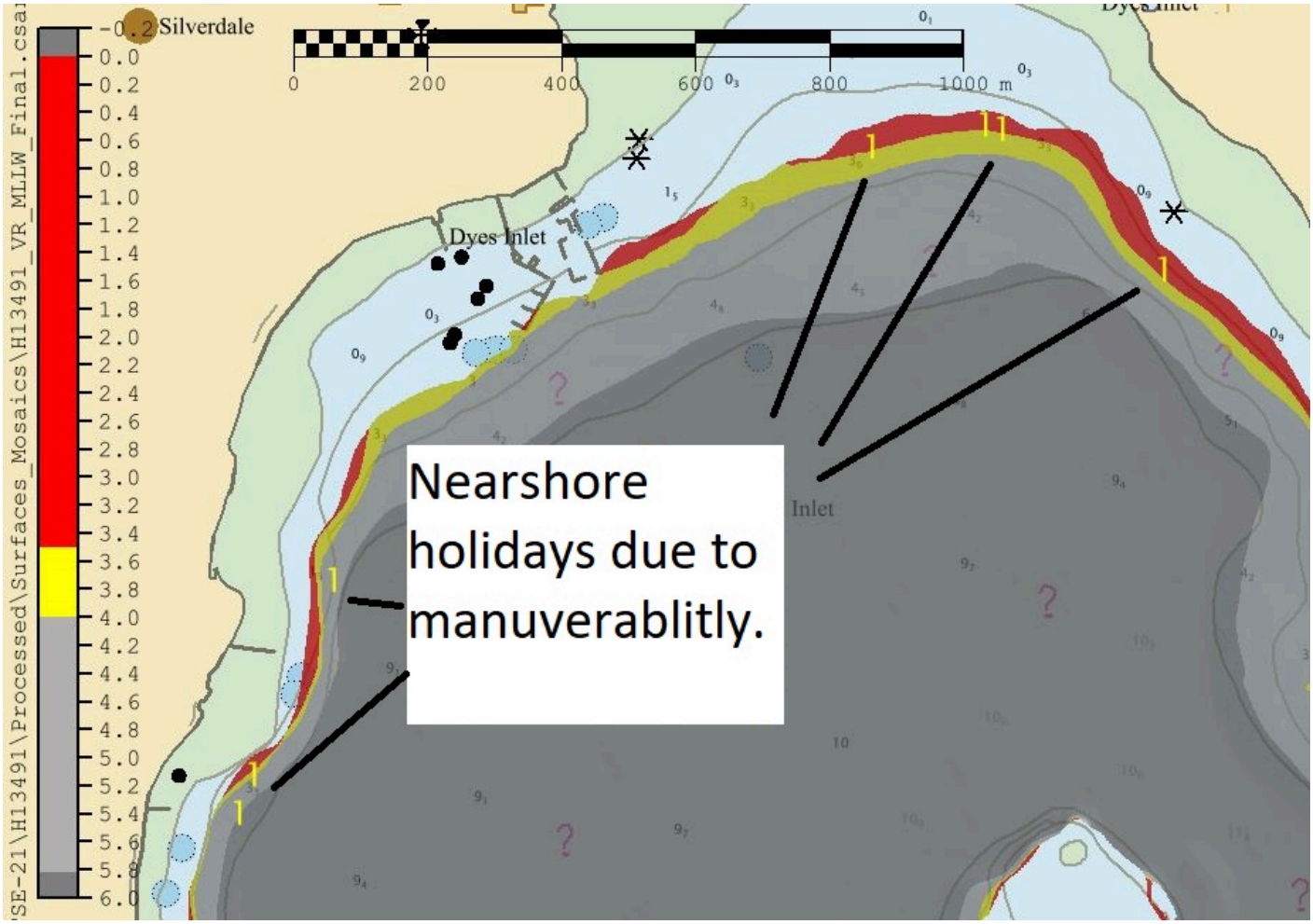


Figure 10: Example of some of the holidays in yellow caused by near shore maneuverability and presence of mooring balls.

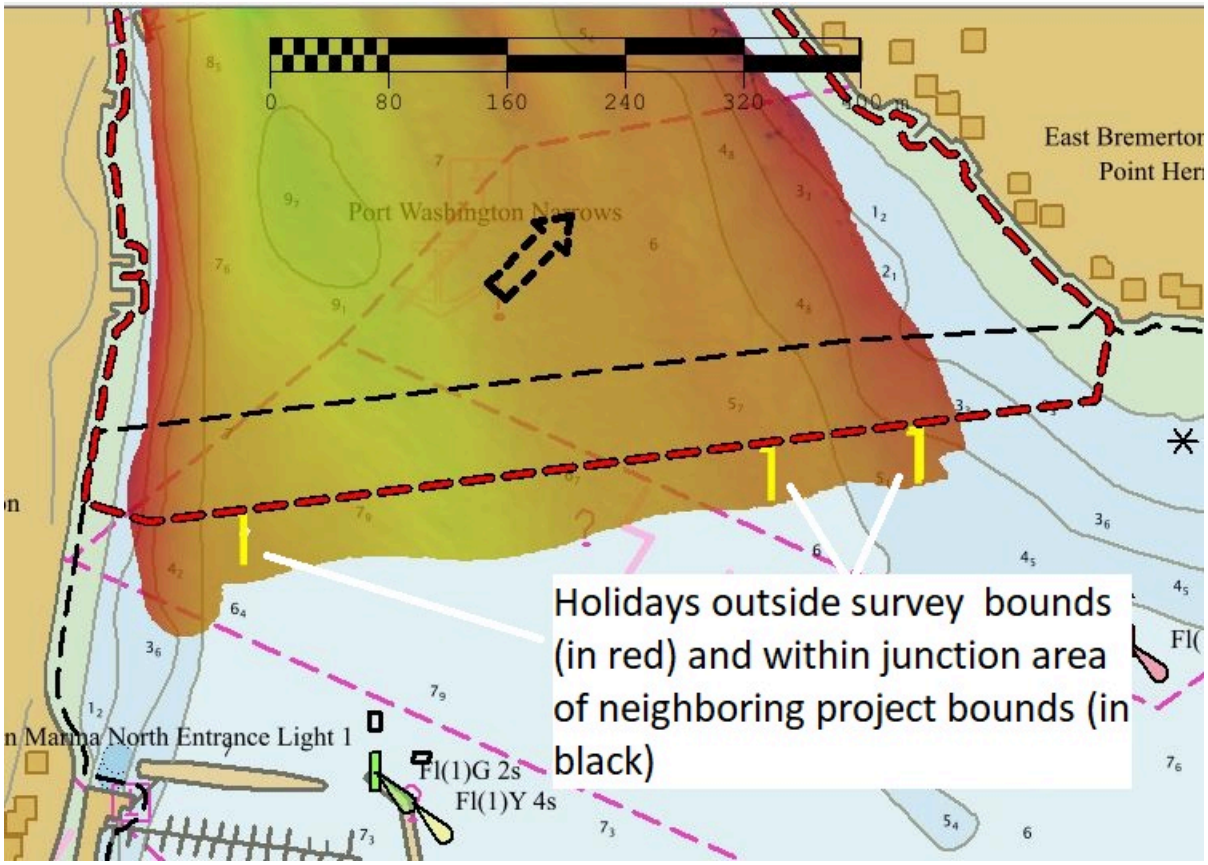


Figure 11: Holidays in yellow along survey bounds.

A.6 Survey Statistics

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

	HULL ID	*NRT3_S3006*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	296.9	307.7
	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	10.8	0.0
	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			3.9034

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/05/2022	125
05/10/2022	130

Survey Dates	Day of the Year
05/11/2022	131
05/12/2022	132
05/20/2021	140
05/21/2021	141
05/25/2021	145
05/26/2021	146
06/02/2021	153
06/03/2021	154
06/04/2021	155
06/09/2021	160
06/11/2021	162
06/22/2021	173

Table 4: Dates of Hydrography

This survey was collected from 05/05/2021 to 06/22/2021 with NRT-Seattle team members. Data collection on 6/22/2021, DN173 crossed over UTC midnight. Data collected after UTC midnight on 6/22/2021 has time stamp of 6/23/2021, DN 174 in Caris.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the S-N906-NRTSE-21 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	***NRT3_S3006***
LOA	10.5 meters
Draft	1.2 meters

Table 5: Vessels Used

Figure 12: S3006

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040C	MBES
AML Oceanographic	MicroX SV	Sound Speed System
YSI	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on S3006. The vessel is equipped with POS MV v5 system for positioning and attitude, Kongsberg EM 2040C for MBES, AML Oceanographic MicroX SVS surface sound speed sensor, and YSI CastAway-CTD casts.

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD (Figure 13) . A Variable Resolution (VR) surface was created of only mainscheme lines, and a second VR surface was created of only crosslines. A difference surface was generated in Pydro tool's Scribble by subtracting the crossline only surface from the mainscheme surface (mainscheme- crosslines= difference surface), from which statistics were derived. Statistics show the mean difference between the depths derived from mainscheme data and crossline data was 0.04 meters and 95% of nodes falling within 0.13 meters (Figure 14).

For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards (Figure 15). In total, 99.5% of the depth differences between H13491 mainscheme and crossline data were within allowable NOAA uncertainties (Figure 16). The largest differences exhibited are in areas where the geologic structure of the seafloor is dynamic.

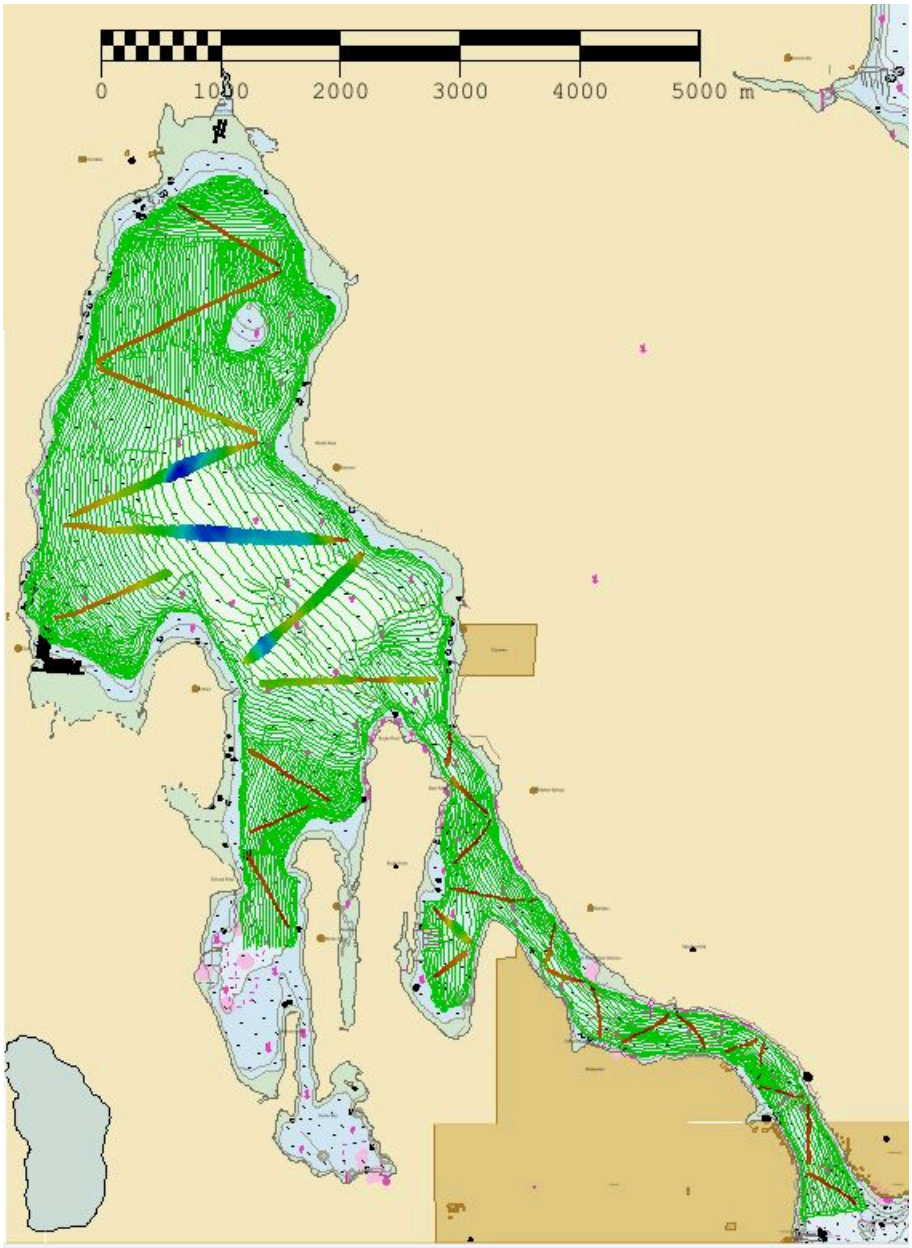
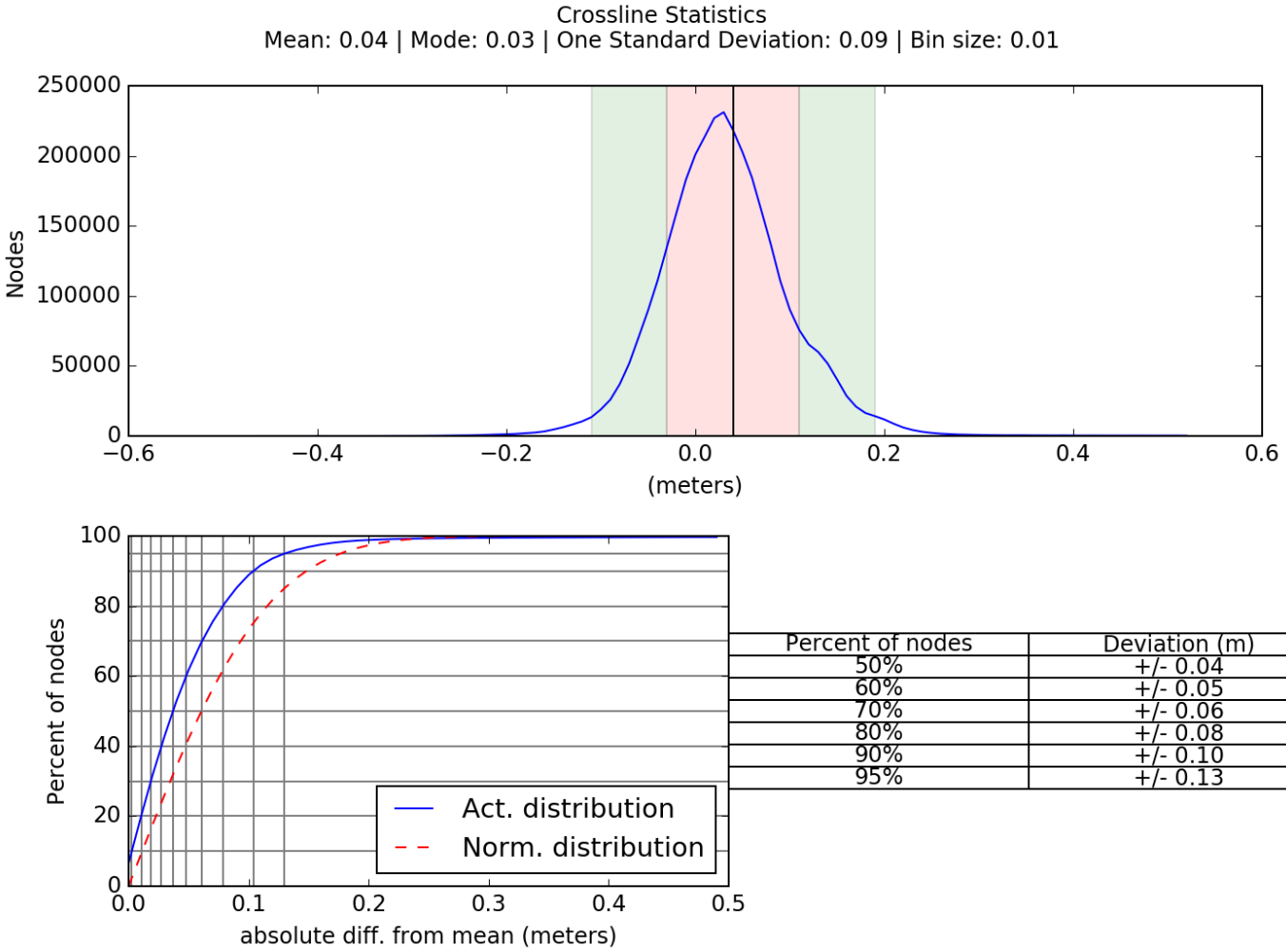


Figure 13: H13491 Crosslines



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.10
95%	+/- 0.13

Figure 14: The statistics and distribution summary plot of the difference between H13491 mainscheme and crossline data.

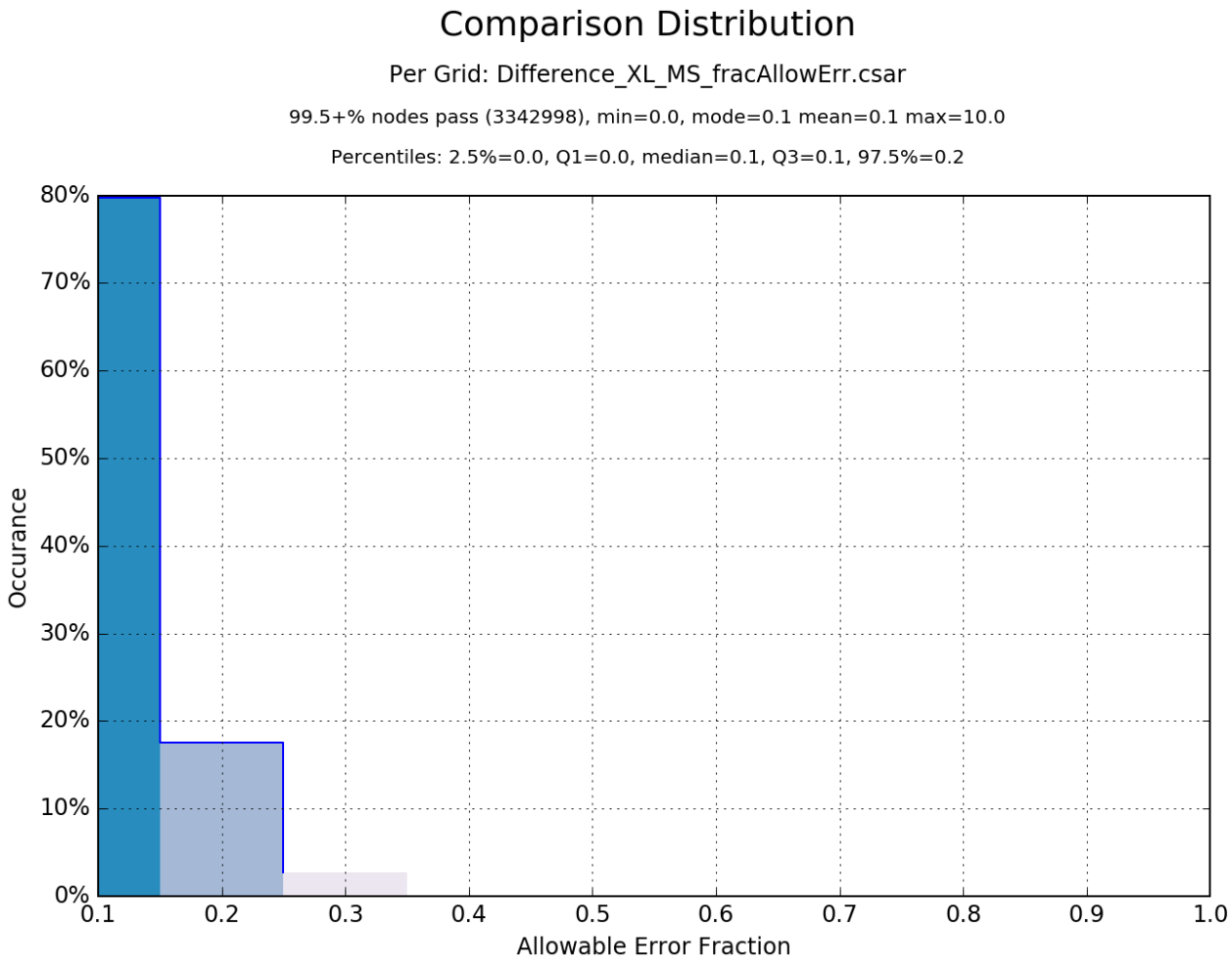


Figure 15: Histogram plot utilizing the magnitude of the Allowable Error Fraction to show the indication of what percentage of the total number of comparisons pass the TVU max test for H13491

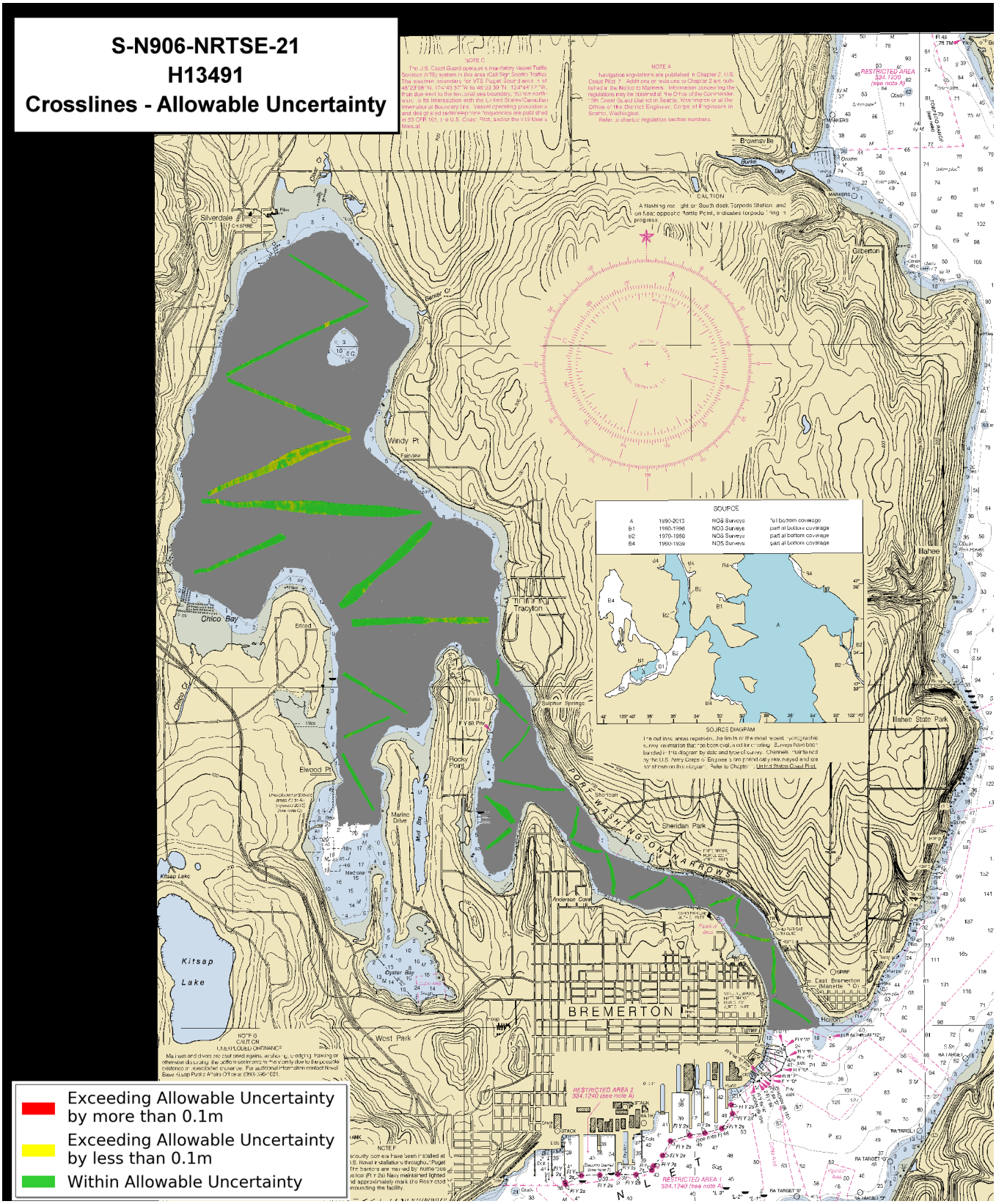


Figure 16: Depth differences between H13491 mainscheme and crossline data as compared to NOAA allowable uncertainty standards for the associated depths.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.095 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3006	4.0 meters/second	N/A	N/A	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for H13491 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. The uncertainty for the VDatum model was provided to the field unit.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, VDatum, and real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13491. Real-time uncertainties from the Kongsberg 2040C MBES sonars were incorporated and applied during post processing. Uncertainties associated with vessel roll, gyro, and navigation were applied real-time. H13491 utilized kinematic (RTK) positioning service. The recorded delayed heave Applanix files included an estimate of the heave uncertainty and were applied during post processing. All of the aforementioned uncertainties were applied in CARIS. H13491 is an ellipsoidally referenced survey (ERS) and the tidal component was accomplished via separation model.

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13491 (Figure 17).

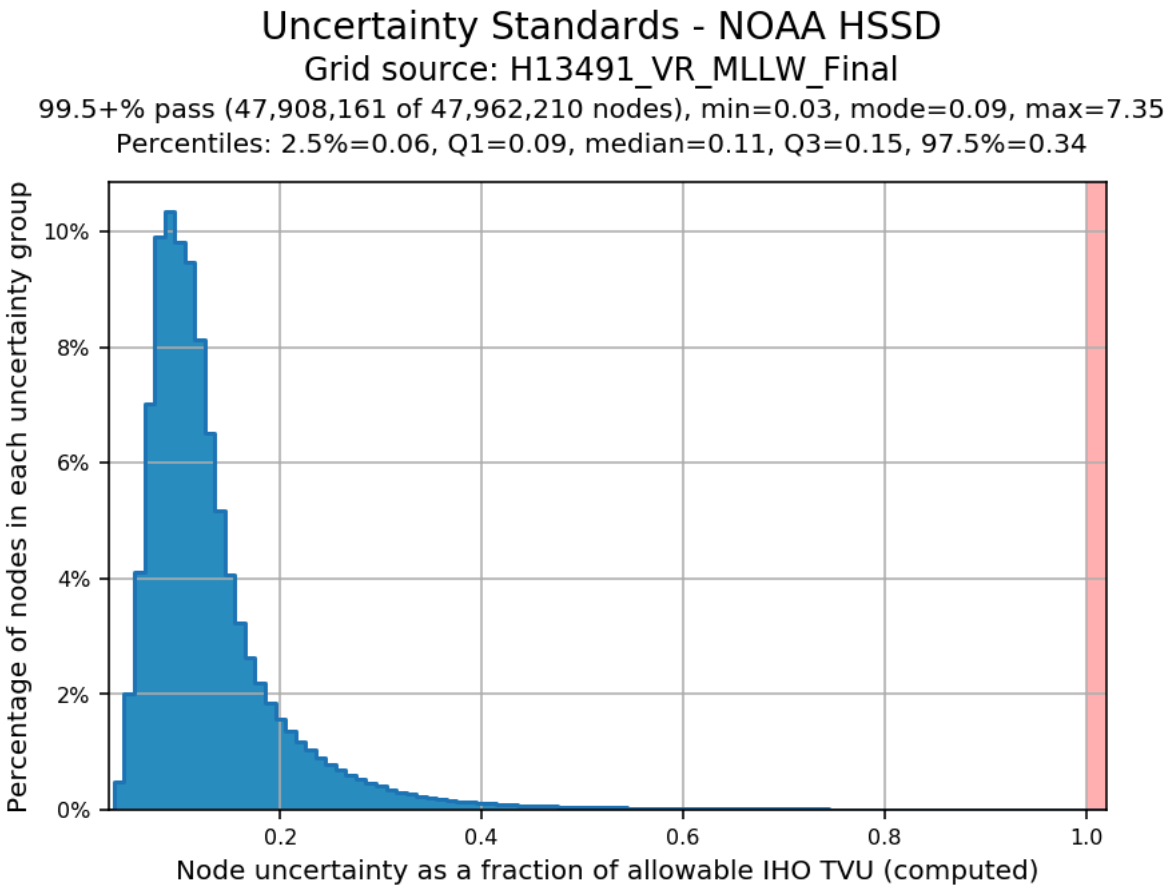


Figure 17: H13491 Node Uncertainty as a fraction of Allowable

B.2.3 Junctions

H13491 junctions with contemporary survey H13530 from S-N907-NRTSE-21, Approaches to Bremerton. H13530 was conducted after H13491 and is still in processing stage. A junction comparison between H13491 and H13530 will be conducted and included in the DR for H13530.

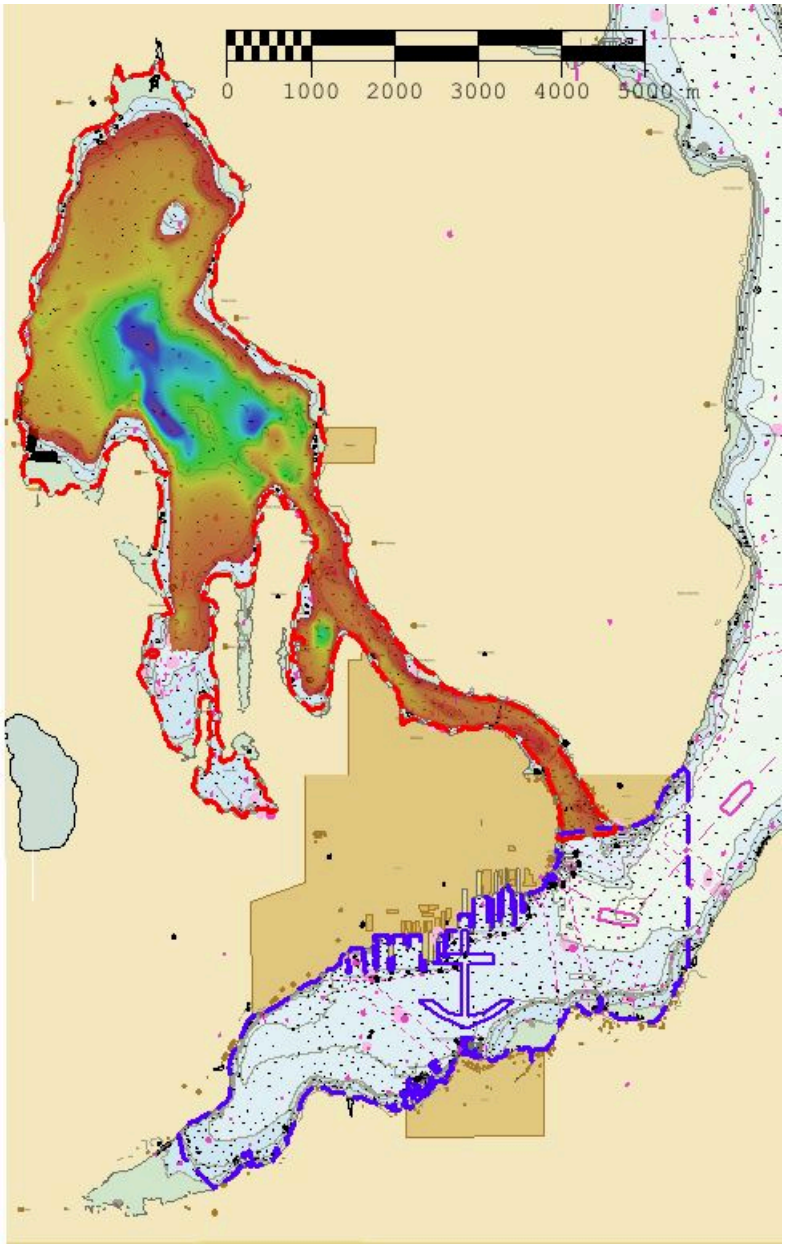


Figure 18: Survey area for junction survey H13530 in blue, south of H13491.

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

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

B.2.5 Equipment Effectiveness

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

B.2.6 Factors Affecting Soundings

Sand waves

Sand waves were present, particularly running down the middle of Port Washington Narrows. Currents within Port Washington Narrows can run up to 4 knots. The sand waves located between the Manette and the 303 bridges in particular have heights up 1.5m (figure 19). Data collected over these areas line up well when collected within close proximity to each other but when data collection spanned many days, offsets are visible in the data. SNDWAV areas were created and included in the FFF to distinguish these areas (See section D.2.8 of this report).

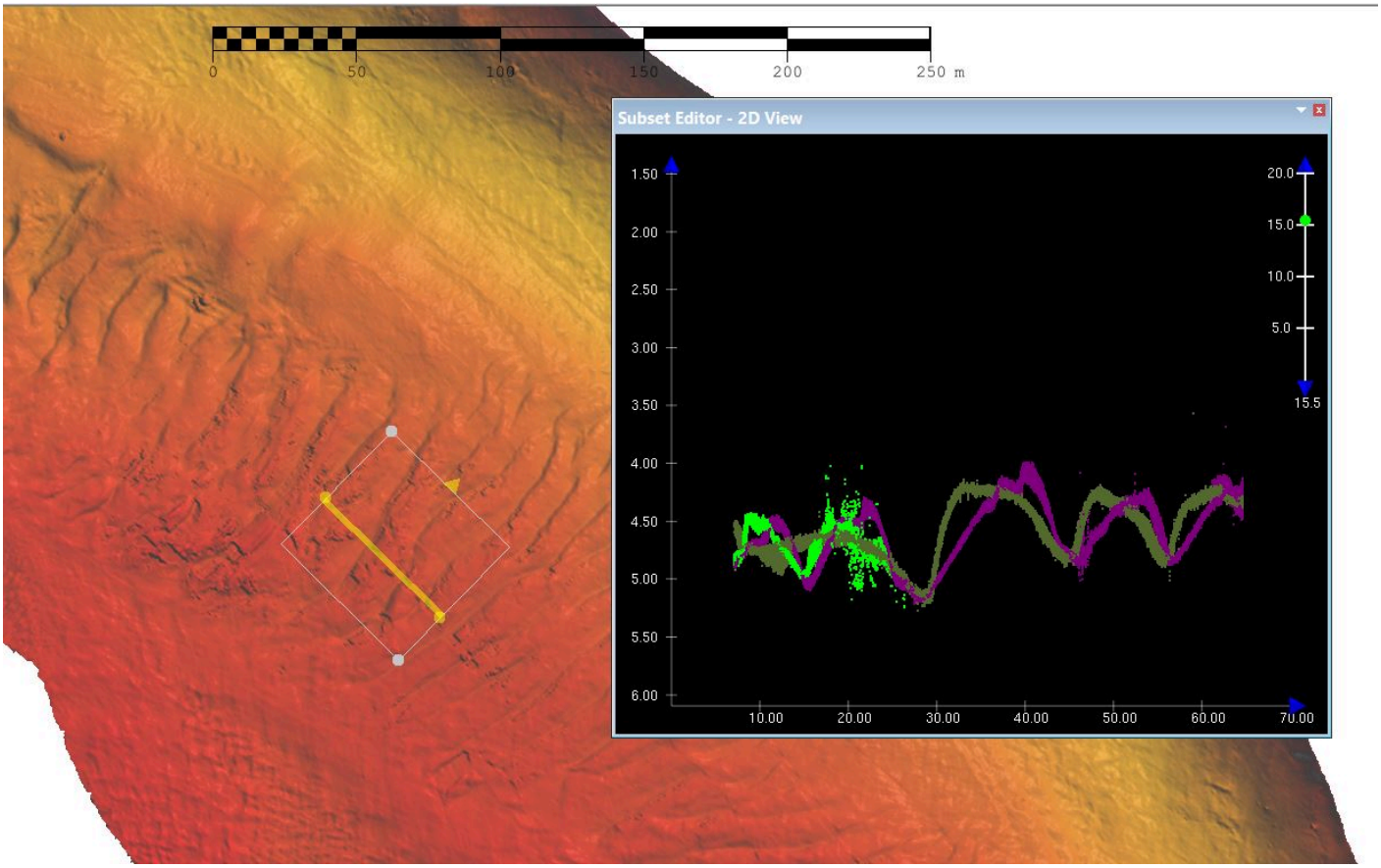


Figure 19: Sand waves in Port Washington Narrow show in subset editor. Lines colored by day showing the migration of waves over time.

Vegitation

Sea grasses were present in few areas and at times, indistinguishable from the seafloor (Figure 20). In areas where they were distinguishable, the soundings on the vegetation were rejected to enable more accurate representation of the true seafloor. Where vegetation was indistinguishable, all soundings were retained and WDKELP areas were added to the FFF (Figure 21).

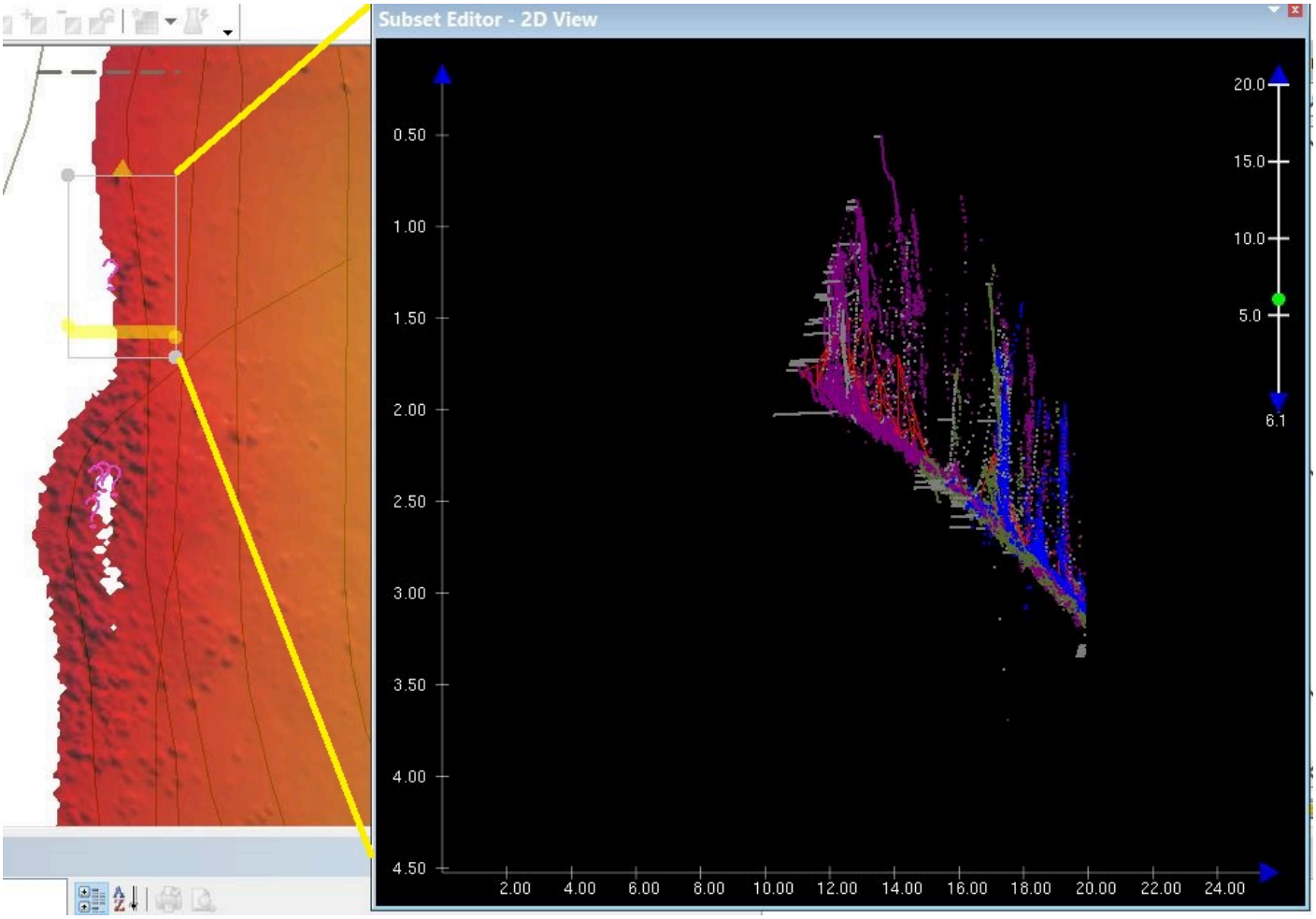


Figure 20: Vegetation visible on along the shore shown in subset editor. Lines colored individually.

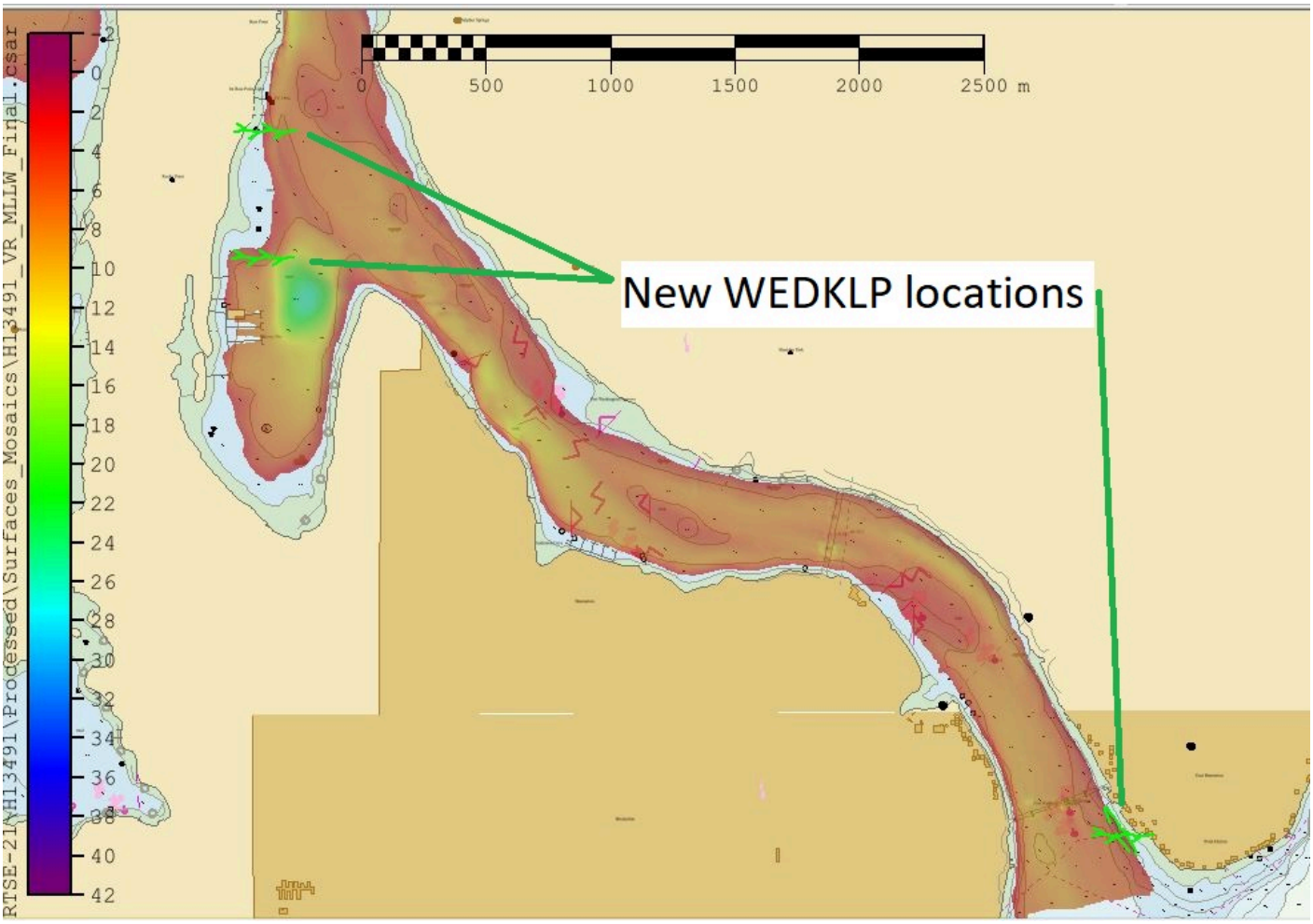


Figure 21: New areas of vegetation included in the FFF in Green.

Fish balls

As noted in section A.4, Survey Coverage of this report, fish balls were present throughout the survey area but most notably with Dyes Inlet and along the mud flats. Fish balls were cleaned out from the data which in some cases resulting in object detection holidays. See figures 8-9 above.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Minimum every four hours

Casts were conducted at a minimum of one every four hours in the deepest water nearest to the active survey area during launch acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column, when there was a change in surface sound speed

greater than four meters per second, and over varying depths (Figure 22). SVP casts were applied to the MBES lines in CARIS using the “nearest in distance within time of 4 hours” method. All sound speed methods were used as detailed in the DAPR.

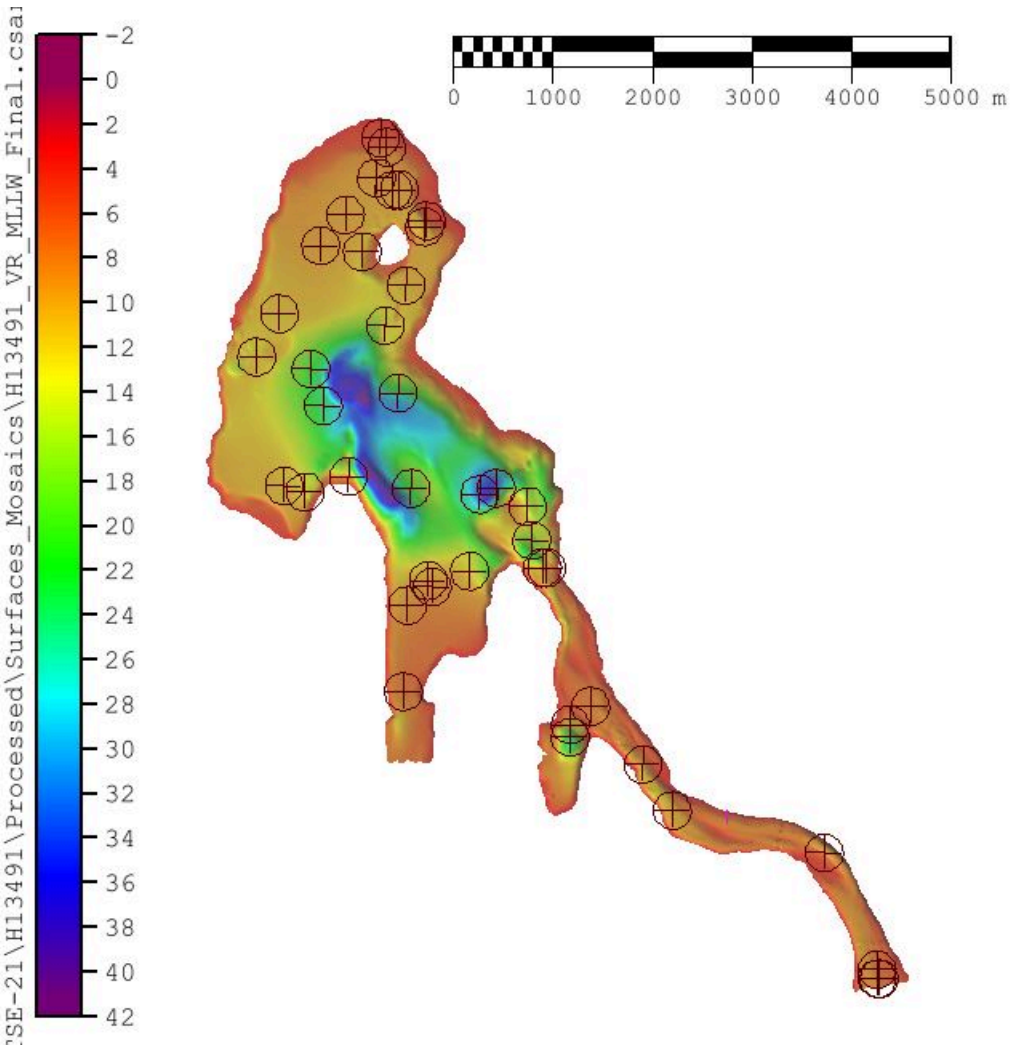


Figure 22: H13491 Sound speed cast locations

B.2.8 Coverage Equipment and Methods

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

B.2.9 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature and the results are shown in Figure 23 below. Density requirements for H13491 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. The few nodes that did not meet

density requirements are due to sparse data in the outer beams, especially near steep slopes and rocky areas where acoustic shadowing occurred, and at the edges of the survey limits.

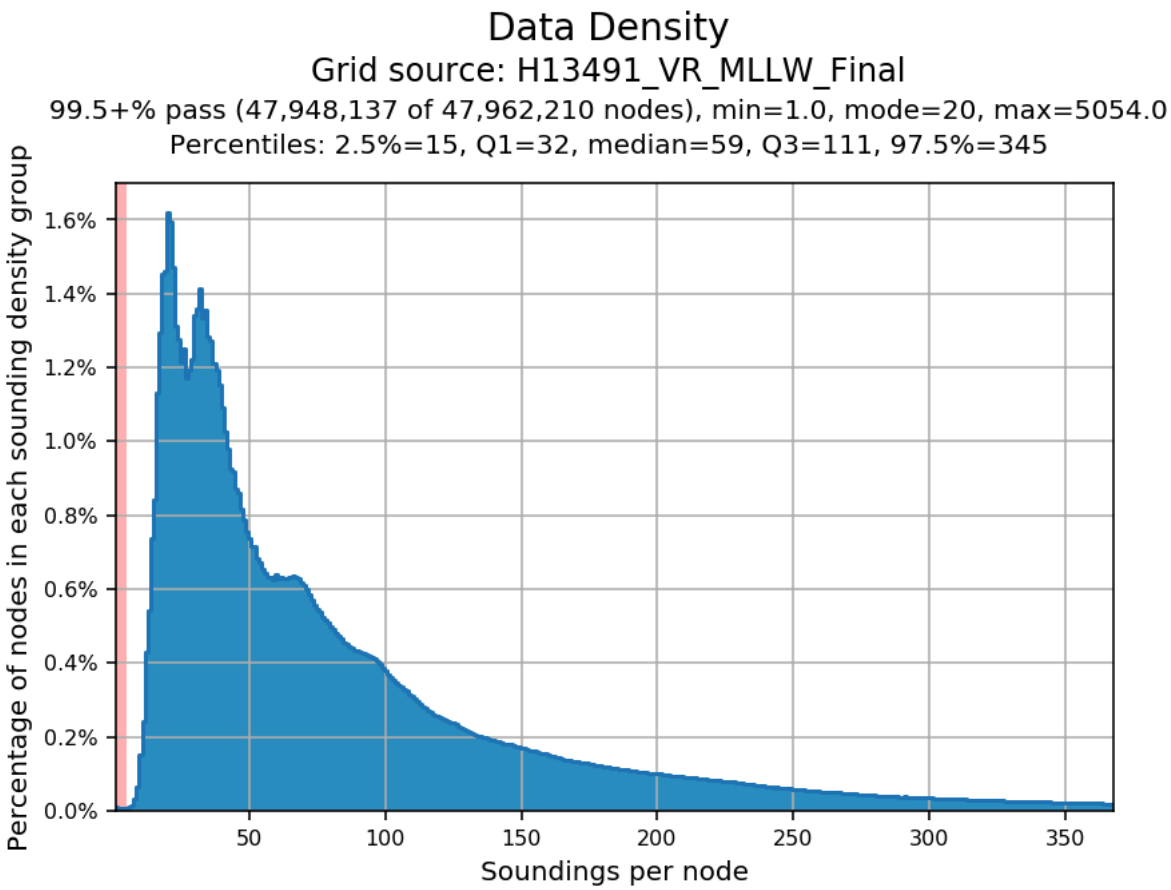


Figure 23: Data Density distribution for H13491

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 is logged as .all file for delivery to NOAA's Pacific Hydrographic Branch. NOAA's Navigation Response Branch field units are waived from producing backscatter mosaics for the 2021 field season. All equipment and survey methods were used as detailed in the DAPR.

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	11.3.23

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Extended Attribute Files Version 2021.

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
H13491_VR_MLLW	CARIS VR Surface (CUBE)	VR meters	-0.6 meters - 41.2 meters	NOAA_VR	Object Detection
H13491_VR_MLLW_Final	CARIS VR Surface (CUBE)	VR meters	0.0 meters - 41.2 meters	NOAA_VR	Object Detection

Table 10: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13491. The surfaces have been reviewed where noisy data, or 'fliers' are incorporated into the gridded

solutions 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 Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed. Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the steep slopes and dynamic nature of the seafloor. The finalized surface retained 190 'fliers' after iterative cleaning. These remaining 'fliers' fall within one of the areas of vegetation (Section B.2.5, Figures 20-21), correlate to designated soundings on obstructions, or are edge fliers along areas extensively cleaned where every effort has been made to remove obvious spurious soundings.

H13413 contains 29 designated soundings in accordance with HSSD Section 5.2.1.2.3. One designated sounding represents a DTONs (see Section D.1.6) . All designated soundings were selected to accurately represent the seafloor The majority of designated soundings (11) are on shoal points. The remaining designated sounding (18) are were selected over submerged addressed features included in the FFF.

The surface names were updated during branch review to include sounding type (MB): H13491_MB_VR_MLLW & H13491_MB_VR_MLLW_Final.

C. Vertical and Horizontal Control

Per Section 5.2.2.1.3 of the 2020 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13491

C.1 Vertical Control

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

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	S-N906_Limits_100m_NAD83-MLLW_geoid12b.csar

Table 11: 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 10.

The following PPK methods were used for horizontal control:

- RTX

RTK

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSpacMMS 8.4 software to produce SBETs for post-processing horizontal correction. All of H13491 meets HSSD horizontal accuracy requirements.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13491 and ENC US5WA14M and US5WA21M using CARIS HIPS and SIPS sounding and contour layers derived from the finalized VR surface. The contours and soundings were overlaid on the charts to assess differences between the surveyed soundings and charted depths. All data from H13491 should supersede charted data. In general, surveyed soundings agree with the majority of charted depths. A full discussion of the disagreements follows below.

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
US5WA14M	1:25000	32	09/29/2021	09/29/2021
US5WA21M	1:10000	15	10/15/2021	10/15/2021

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

One DTON was submitted for H13491. The DTON has been applied to the latest edition of the ENC.

D.1.3 Charted Features

Charted features exist and are addressed in the Final Feature File.

A large number of submerged and/or ruined piles exist throughout the survey area. Every effort was made to disprove features with multibeam but many remanded inshore of the NALL. Shoreline was run at times of negative low tide and the presence or lack of many of the piles inshore of the NALL were noted and attributed accordingly in the FFF. In particular, Chico Bay on the SW corner of Dyes Inlet has a large number of charted ruined piles, none of which we visible at low tide or in available aerial photography and are recommended to be removed (Figure 25).

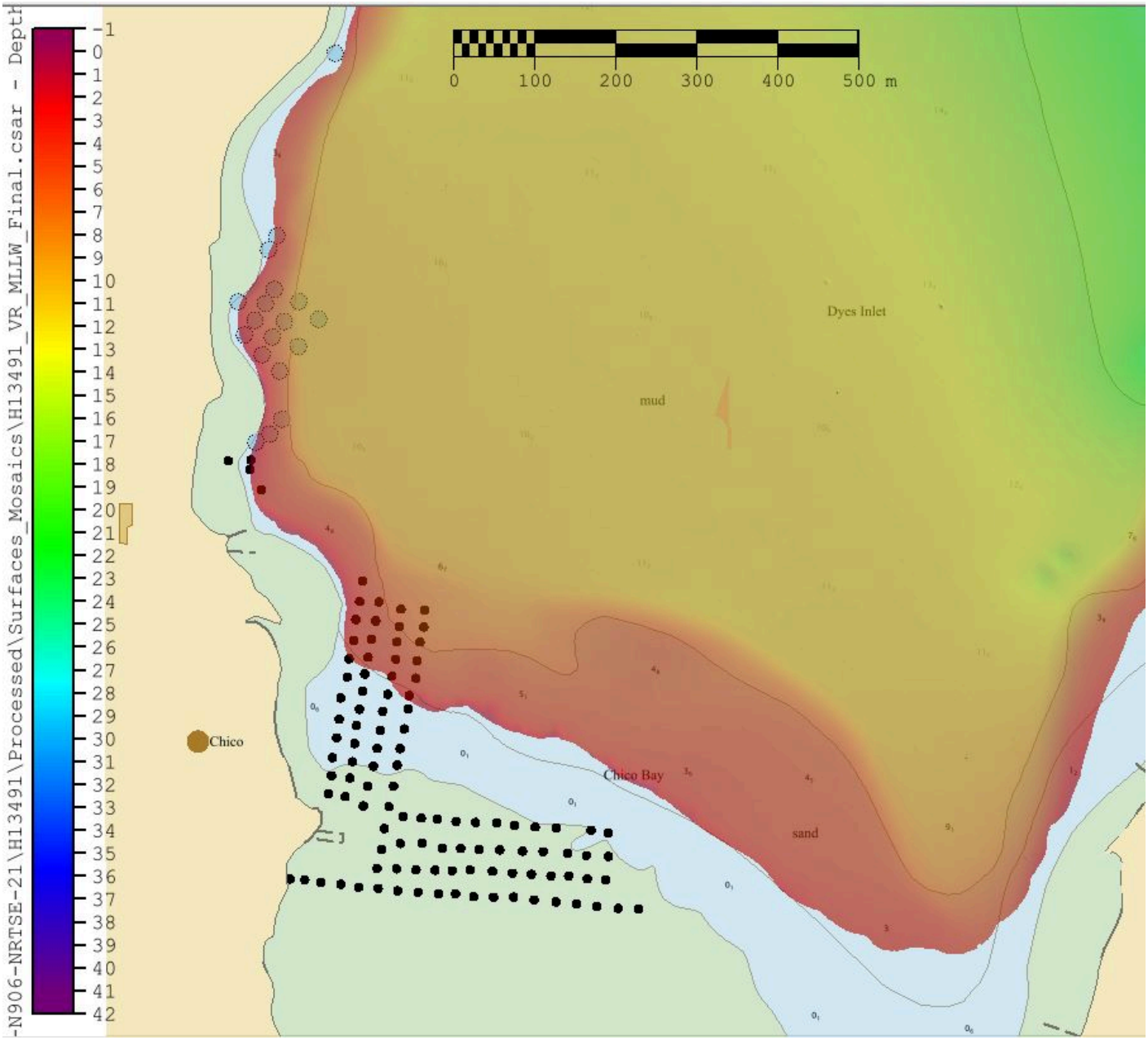


Figure 24: Charted ruins along the west and south shore of Chico Bay in the SW of Dyes Inlet.

D.1.4 Uncharted Features

Survey H13491 has 29 new features that are addressed in the H13491 Final Feature File.

D.1.5 Channels

No channels exist for this survey. There are no designated anchorages,safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits. Caution Areas exist within Ostrich Bay for unexploded ordinance (Section A.1).

D.2 Additional Results

D.2.1 Aids to Navigation

Only Private Aids to navigation (ATONs) exist for this survey, but were not investigated.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Eight bottom samples were acquired in accordance with the Project Instructions for survey H13491. All bottom samples were entered in the H13491FFF. See Figure 26 for a graphical overview of sample locations.

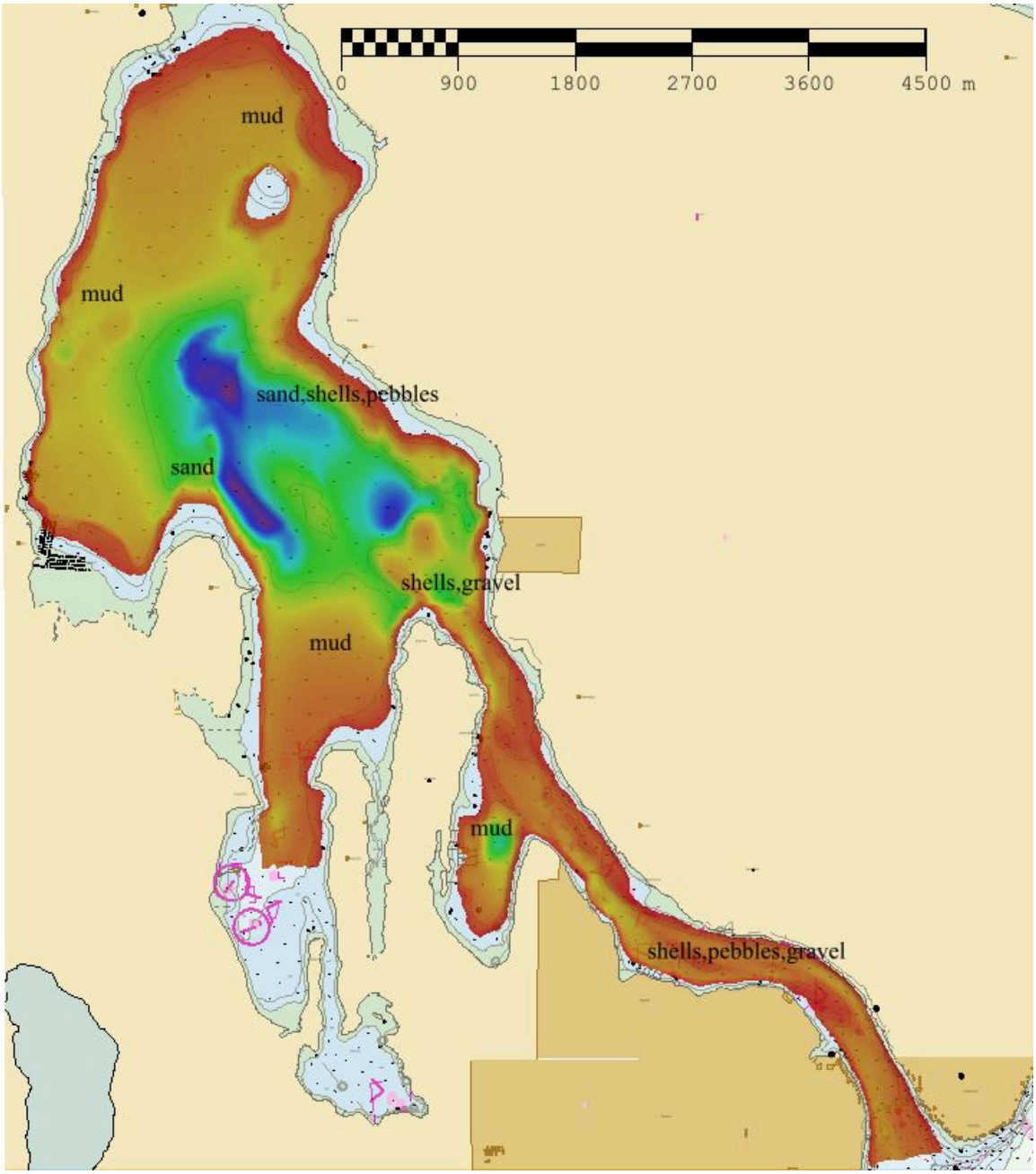


Figure 25: Bottom samples taken shown in black.

D.2.4 Overhead Features

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

D.2.5 Submarine Features

Multiple submarine cable areas exist within Port Washington Narrows. No exposed cables were noted in the multibeam within the charted areas (Figure 27).

A new pipeline was noted in the bathymetry near a charted pipeline (Figure 28). Pipeline reports have been submitted to the Bureau of Safety and Environmental Enforcement and NDB per HSSD 1.7.1 and 1.7.3. The reports are included in Appendix II Supplemental Survey Records and Correspondence, and the pipeline has been included in the FFF.

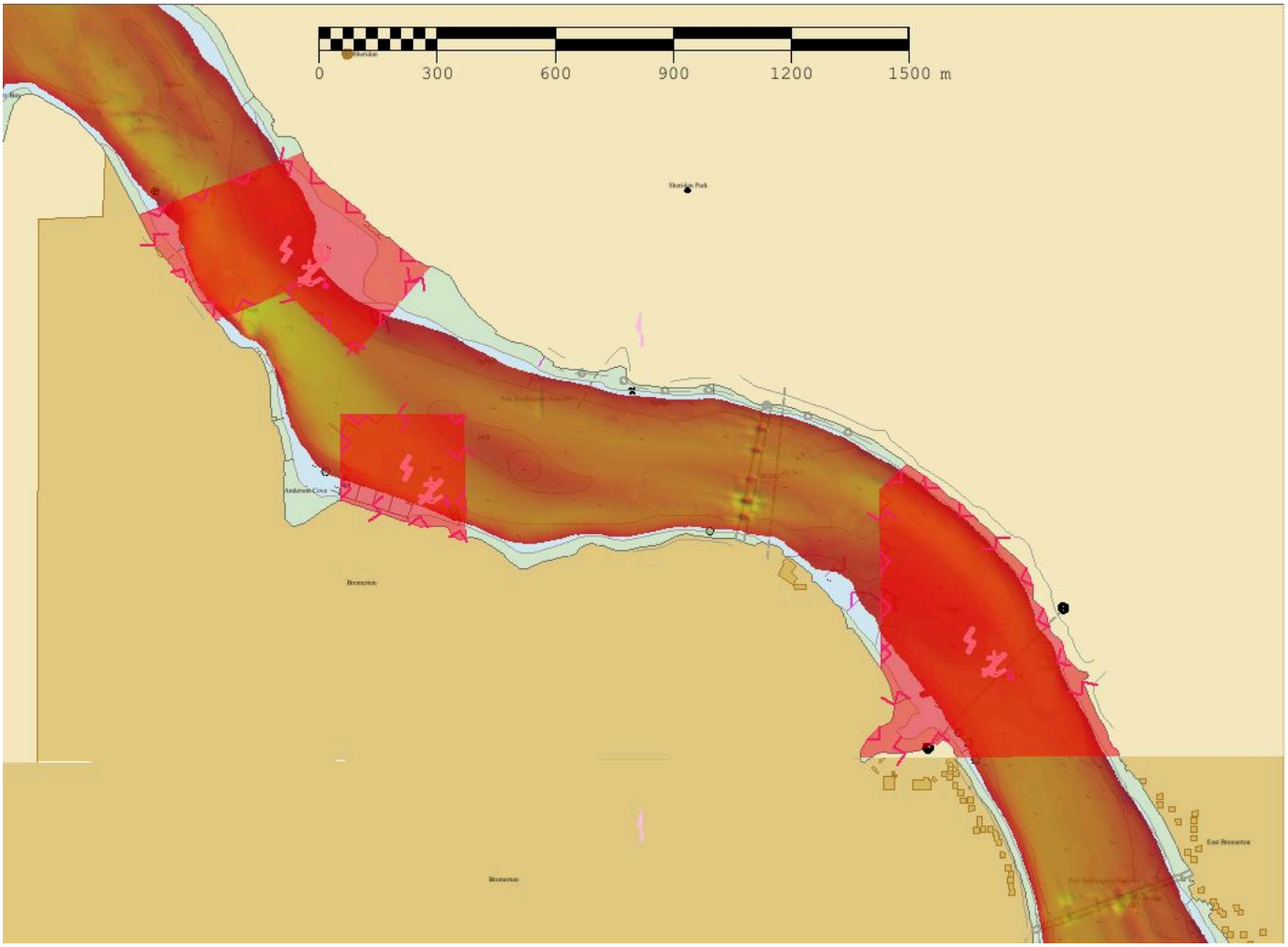


Figure 26: Location of cable areas in red along Port Washington Narrows.

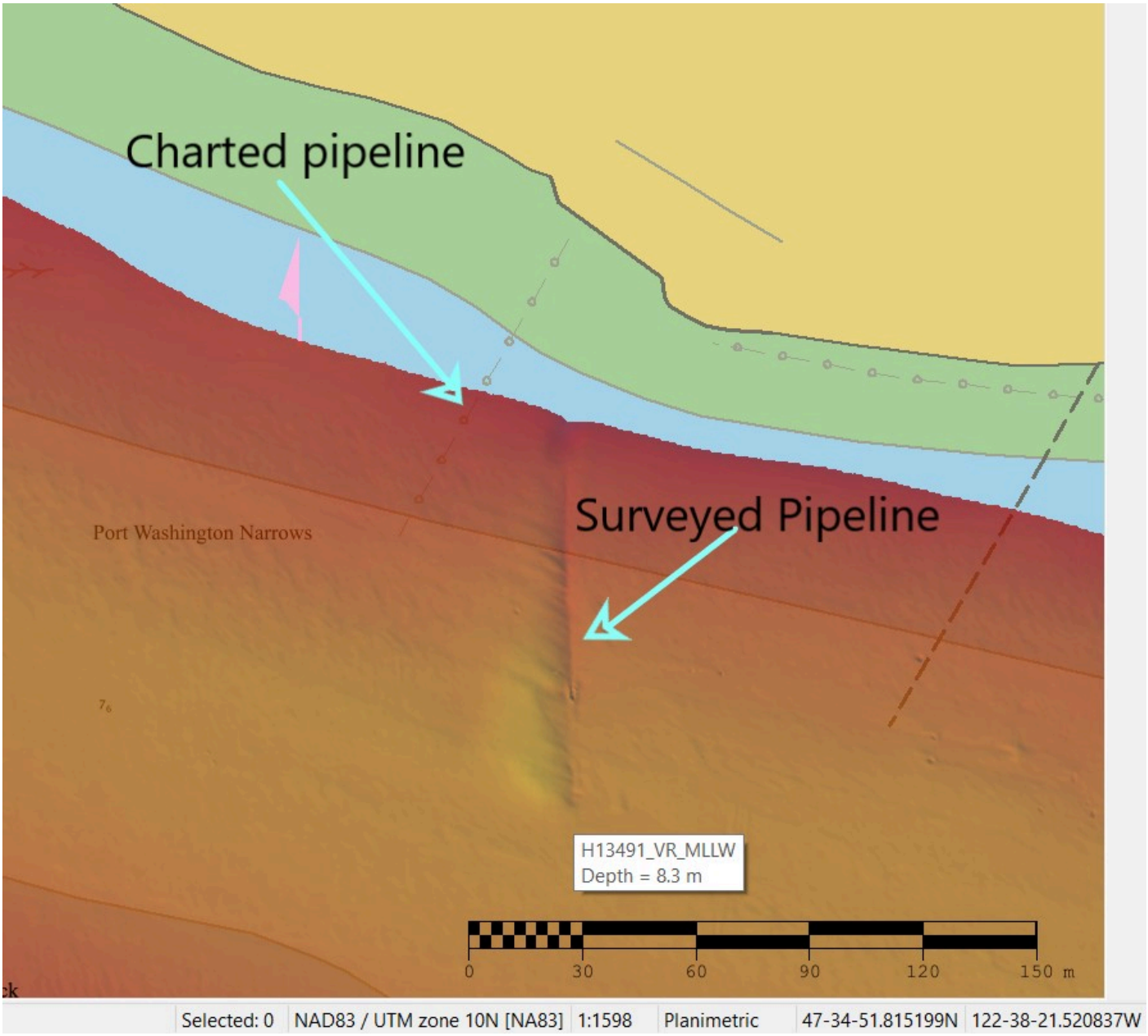


Figure 27: New pipeline visible in multibeam near existing charted pipeline.

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

As noted in section B.2.6 of this report, tidal currents within Port Washington Narrows can be in excess of 4knots at times. Large and small sand waves and other geologic features created by the current are present; primarily down the center of the channel but also where the narrows empty into Dyes Inlet. Sand wave areas were created and included in the FF to distinguish the largest and most changeable of the areas. See figures 29 and 30.

A large isolated and charted shoal exist in the north east reaches of Dyes Inlet (Figure 31). At extreme low tide, flats were visible.

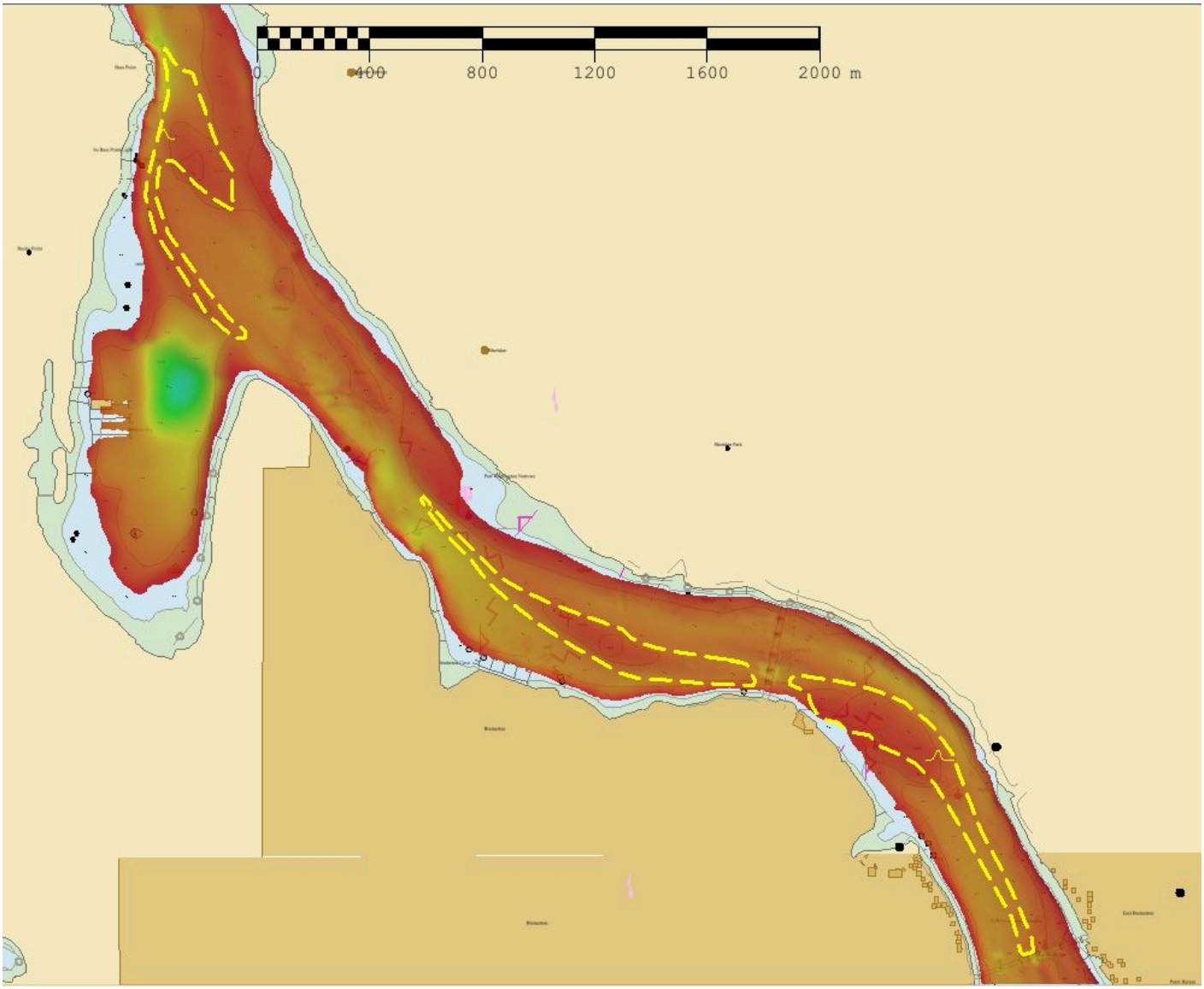


Figure 28: Large sand wave areas included in the FFF shown in yellow within Port Washington Narrows.

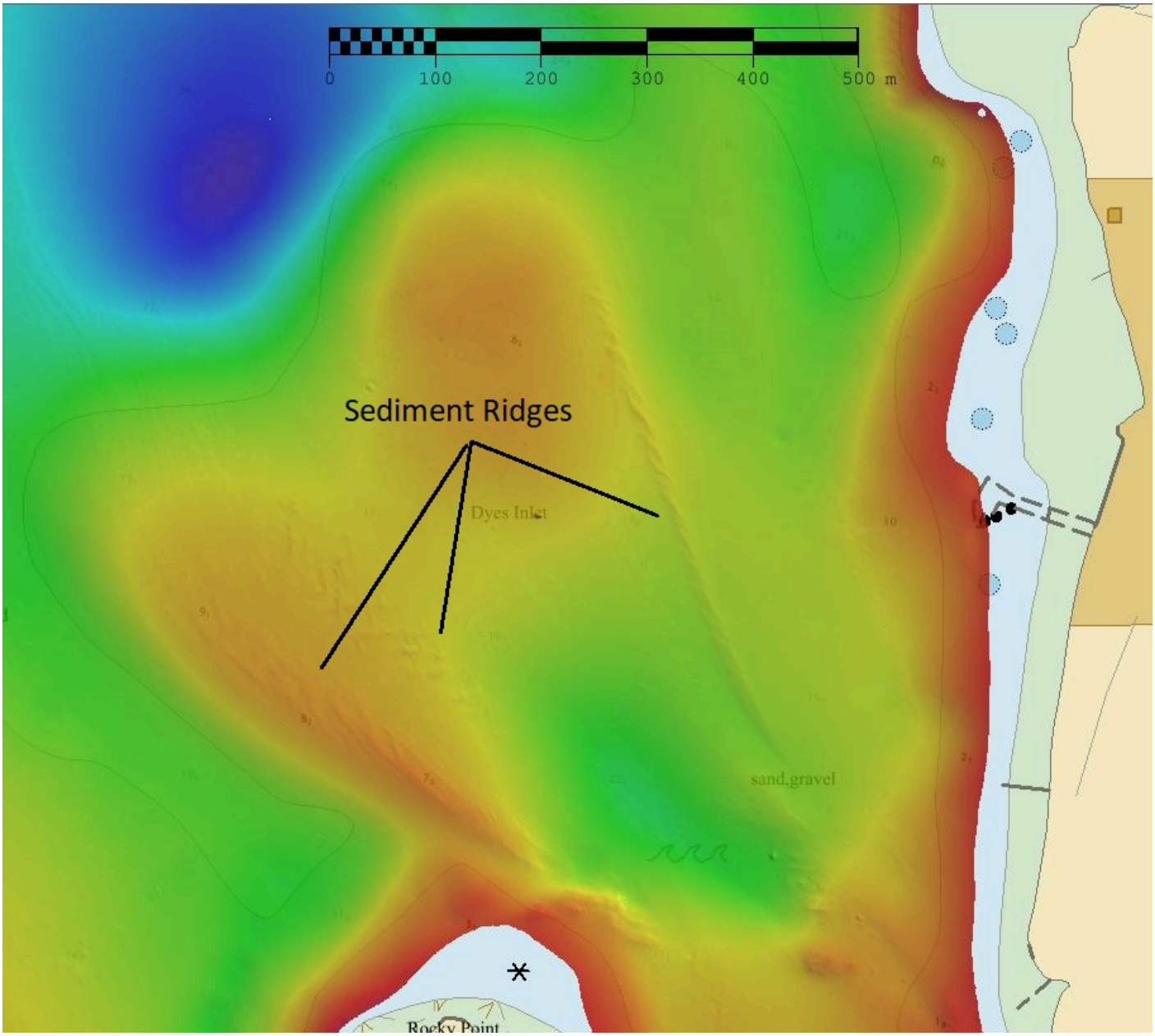


Figure 29: Narrow sediment ridges visible in Dyes Inlet where extreme tidal current empty in and out from Port Washington Narrows to the south-east of the graphic.

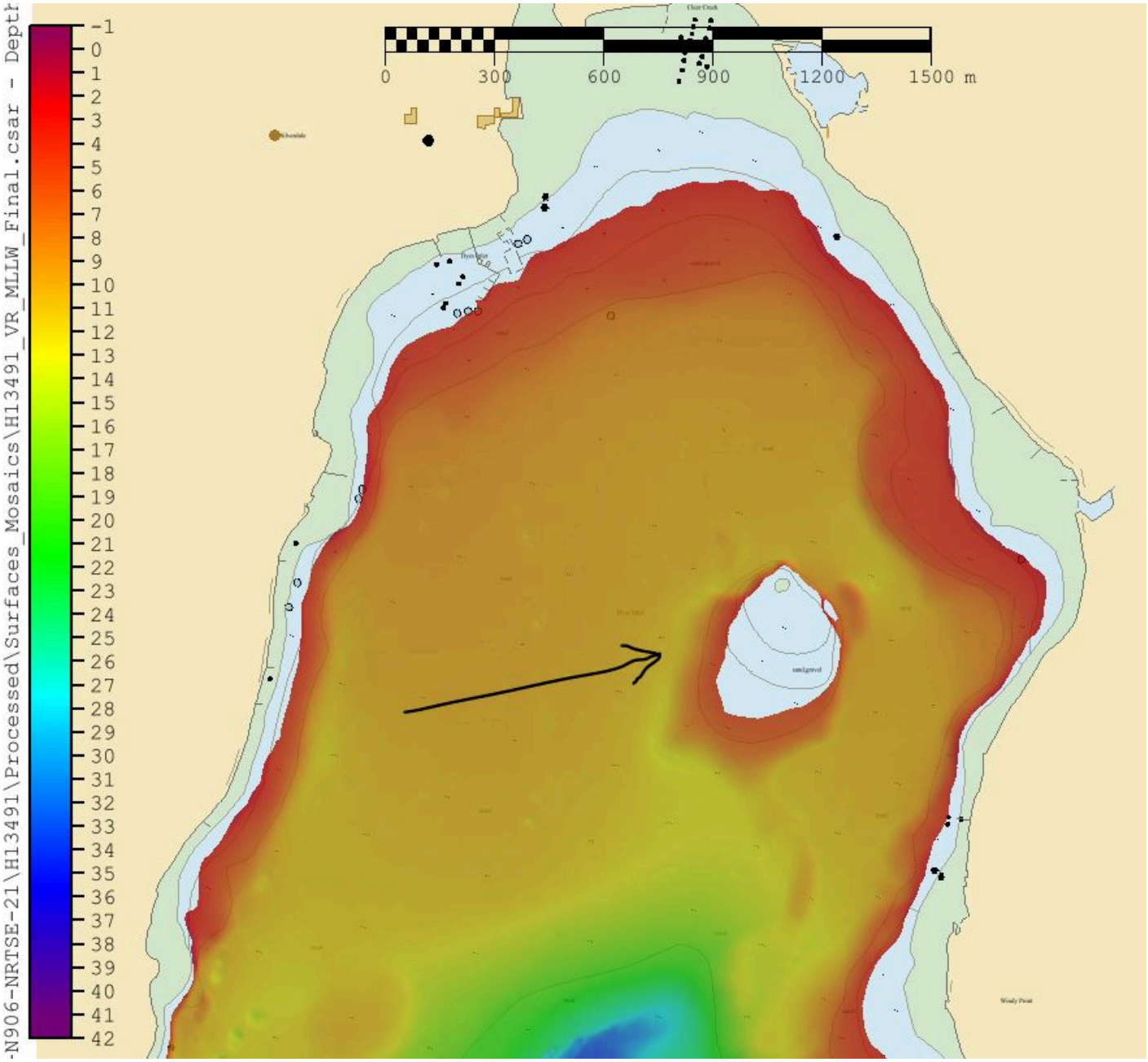


Figure 30: Charted shoal in Dyes Inlet

D.2.9 Construction and Dredging

As notes in section A.1, active remediation efforts are underway in the southern section of Ostrich Bay by the US Navy for unexploded ordinance in the area (Figure 2). The Navy anticipates conducting post remediation surveys of the area and it is recommended that any such surveys be used to update the charts where applicable. See Appendix II Supplemental Survey Records and Correspondence for additional information.

D.2.10 New Survey Recommendations

See Section D.2.9 above

D.2.11 ENC Scale Recommendations

No new ENC scales 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
Patrick Faha	Chief of Party	11/09/2021	FAHA.PATRICK.THOMAS.1549418305 Digitally signed by FAHA.PATRICK.THOMAS.1549418305 Date: 2022.07.11 10:51:02 -07'00'
Annemieke Raymond	Physical Science Tech	11/09/2021	RAYMOND.ANNEMIEKE.SMITH.1365883048 Digitally signed by RAYMOND.ANNEMIEKE.SMITH.1365883048 Date: 2022.07.11 11:11:20 -07'00'

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	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