

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: F00744

**LOCALITY**

State(s): Oregon

General Locality: Columbia River, WA and OR

Sub-locality: Willamette River

**2018**

CHIEF OF PARTY  
LTJG Michelle Levano

LIBRARY & ARCHIVES

Date:

**F00744**

**HYDROGRAPHIC TITLE SHEET**

**F00744**

**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): **Oregon**

General Locality: **Columbia River, WA and OR**

Sub-Locality: **Willamette River**

Scale: **2500**

Dates of Survey: **08/10/2018 to 08/11/2018**

Instructions Dated: **07/26/2018**

Project Number: **S-N918-NRT3-18**

Field Unit: **Navigation Response Team 3**

Chief of Party: **LTJG Michelle Levano**

Soundings by: **Multibeam Echo Sounder**

Imagery by:

Verification by: **Pacific Hydrographic Branch**

Soundings Acquired in: **meters at Columbia River Datum**

**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. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via [http:// www.ncei.noaa.gov/](http://www.ncei.noaa.gov/).*



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## Descriptive Report to Accompany Survey F00744

Project: S-N918-NRT3-18

Locality: Columbia River, WA and OR

Sublocality: Willamette River

Scale: 1:2500

August 2018 - August 2018

**Navigation Response Team 3**

Chief of Party: LTJG Michelle Levano

### A. Area Surveyed

This hydrographic survey was acquired in accordance with the requirements defined in the Project Instruction S-N918-NRT3-18 (figure 1). F00744 survey area was done at the request of the Columbia River Pilots to update nautical charts on the Willamette River as part of the initiative to update the anchorages on the Columbia River (figure 2).

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
45° 36' 42.88" N 122° 47' 6.24" W	45° 33' 42.49" N 122° 42' 24.95" W

*Table 1: Survey Limits*

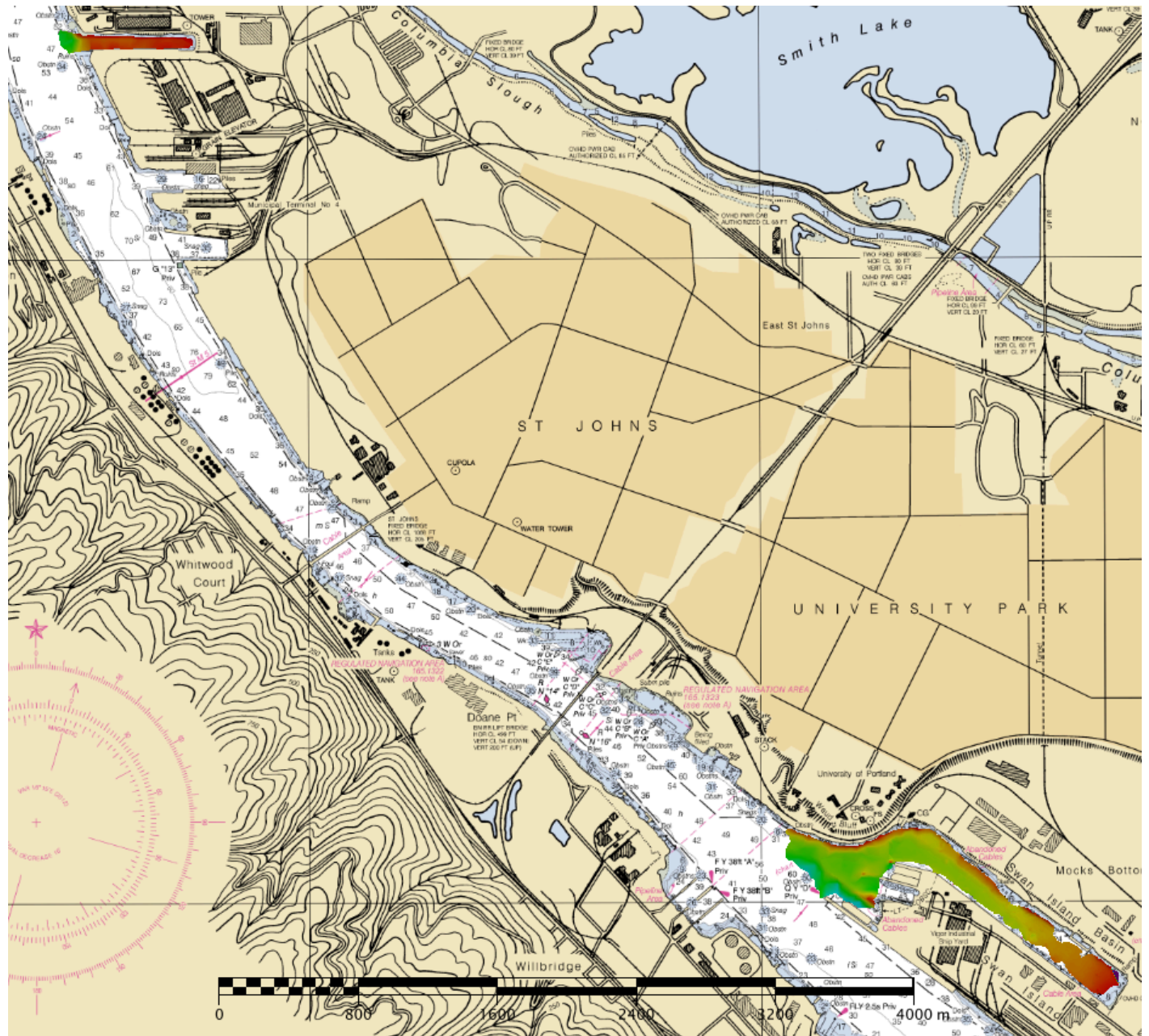


Figure 1: Overview of areas surveyed (Chart 18526).



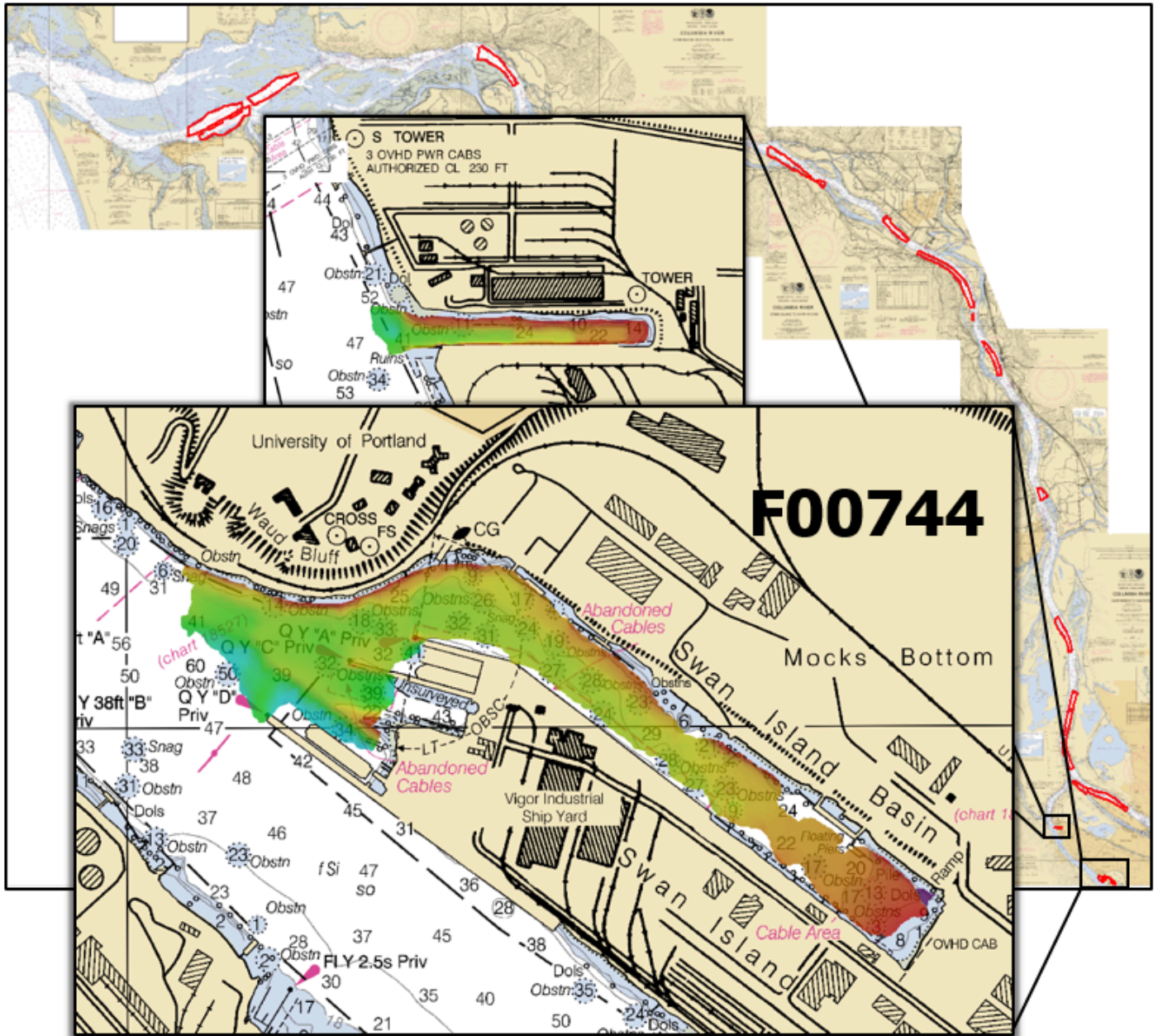


Figure 2: Relative location of F00744 in the Columbia and Willamette rivers. Red areas are the sheet limits to other assigned areas in the S-N918-NRT3-18 project.

Data were acquired within survey limits in accordance with the requirements in the Project Instructions and the HSSD.

## **A.2 Survey Purpose**

The Columbia River Steamship Operators' Association, Inc. (CRSOA) and the Columbia River Pilots (COLRIP) request that NOAA's Office of Coast Survey collect multibeam bathymetric data of the Columbia River anchorages. This Willamette River survey includes International Terminal and Swan Island Basin at the request of the Columbia River Pilots. Swan Island Basin serves Swan Island Shipyard and Dry dock, United States Coast Guard Station- Portland, and various marine services.

## **A.3 Survey Quality**

The entire survey is adequate to supersede previous data.

The Finalized Variable Resolution was analyzed within Pydro Explorer's QA Tools to assess multibeam echosounder (MBES) data density. The finalized surface met the HSSD data density requirements with 99.5+% of nodes passing (figure 3).

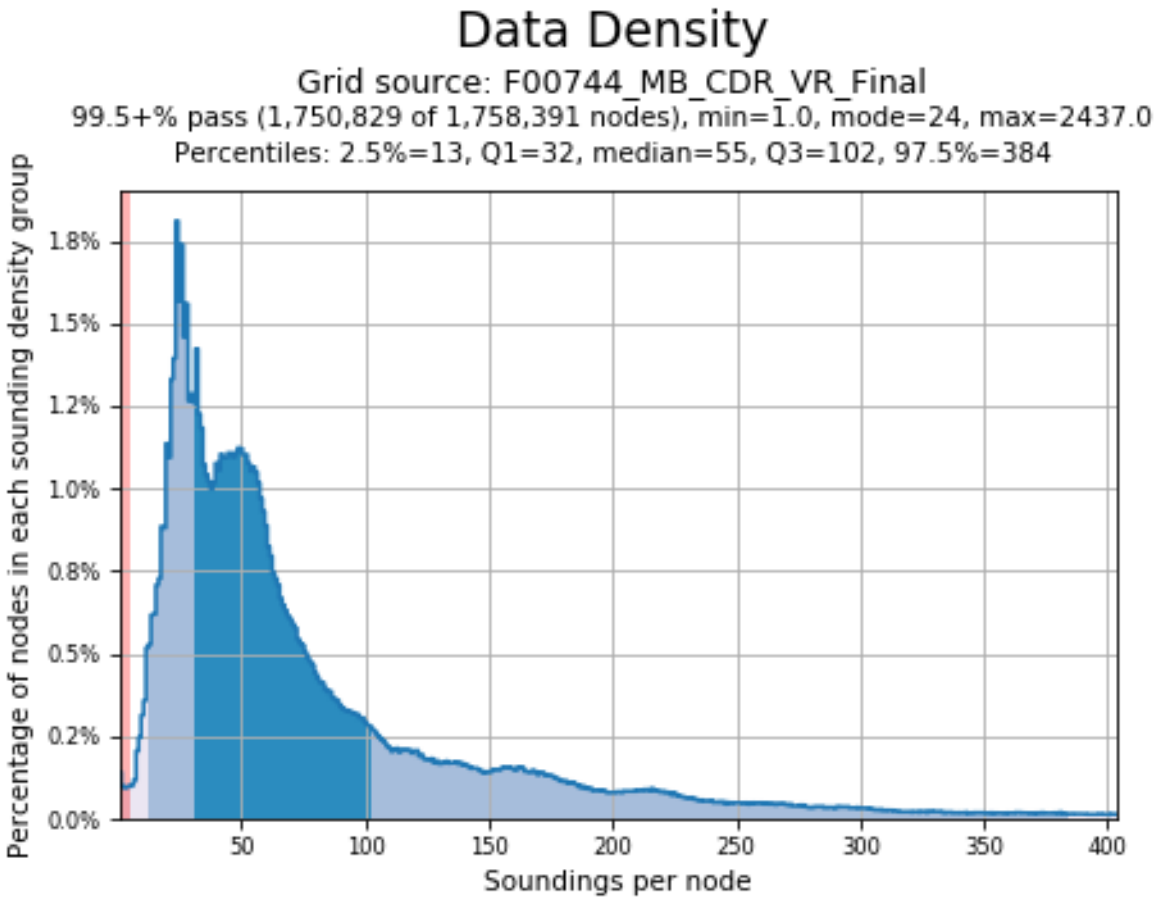


Figure 3: Pydro derived histogram plot showing HSSD object detection compliance of F00744 MBES within the finalized CUBE surface.

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

Table 2: Survey Coverage

Complete multibeam coverage was achieved within the limits of hydrography as defined in the project instructions with some exceptions. The following are some examples of areas that do not meet the coverage requirement.

Within the Swan Island Basin there were numerous vessels, ruins, and barges that prevented coverage to the NALL (figures 4-7). All efforts were made to collect as much data as safely possible.



There are several areas where the 12 foot contour or sheet limits are not met due to the proximity of the shoreline and safety concerns. Additionally, there were some locations where coverage falls inshore of the NALL due to the location of pier faces and safe water.

There are some holidays in F00744 (figures 10-12). The majority are due to surrounding pier pilings, dry docks, shallow depths, or on the boundaries of the survey limits. There are 10 holidays in the middle of the sheet that do not fall under these categories.



*Figure 4: Various examples of vessels, ruins, and barges blocking the shoreline in the southeastern portion of Swan Island Basin.*





*Figure 5: Various examples of vessels, ruins, and barges blocking the shoreline in the southwestern portion of Swan Island Basin.*





*Figure 6: Various examples of vessels, ruins, and barges blocking the shoreline in the middle of the survey area on the eastern shore of Swan Island Basin.*





*Figure 7: Various examples of vessels, ruins, and barges blocking the shoreline in the middle of the survey area on the western shore of Swan Island Basin.*

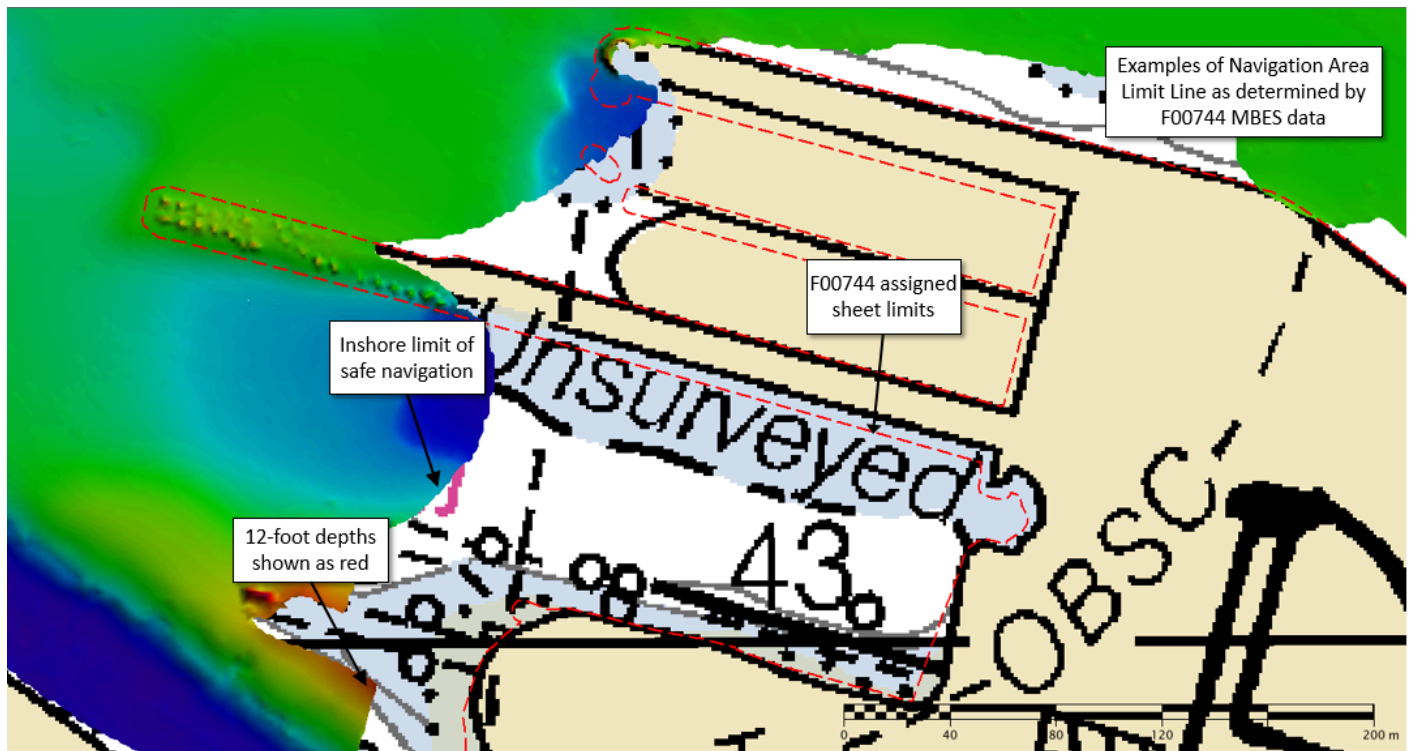


Figure 8: Examples of NALL determination.

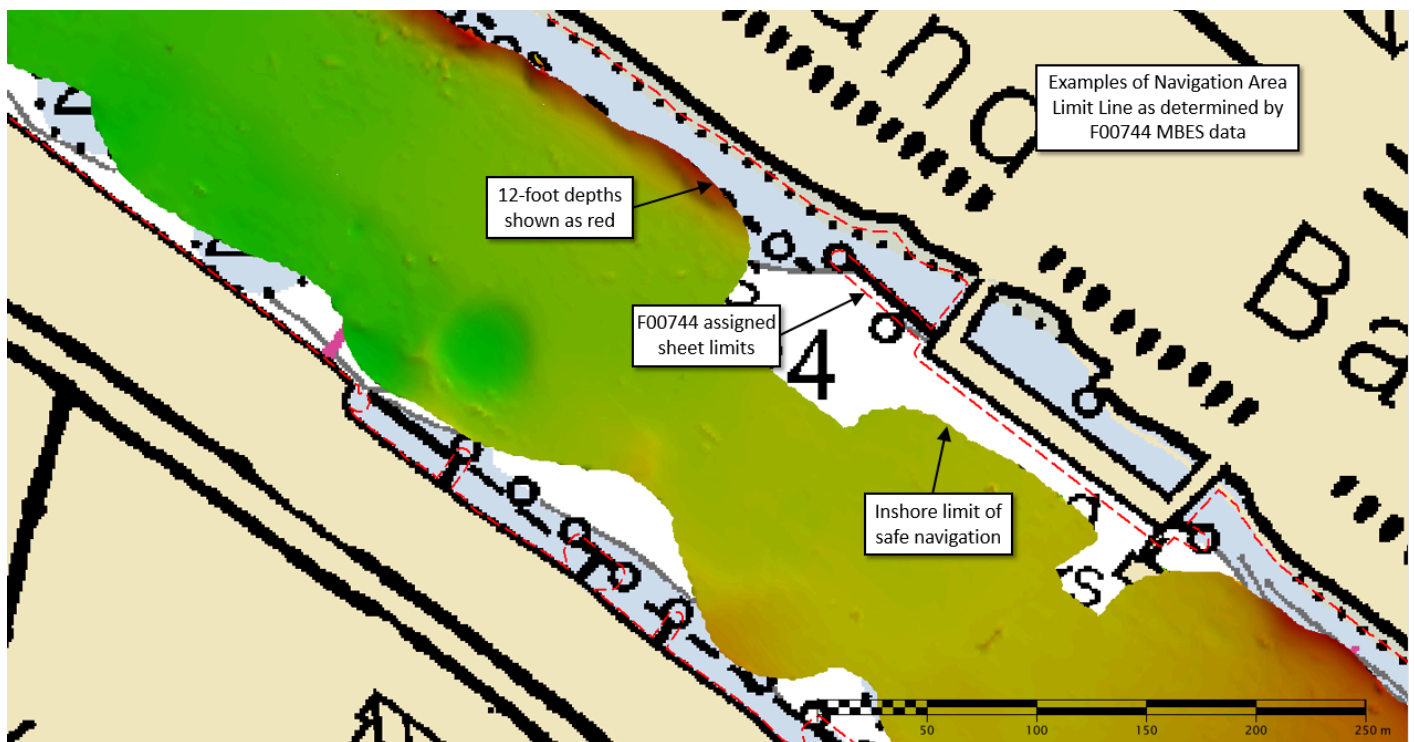
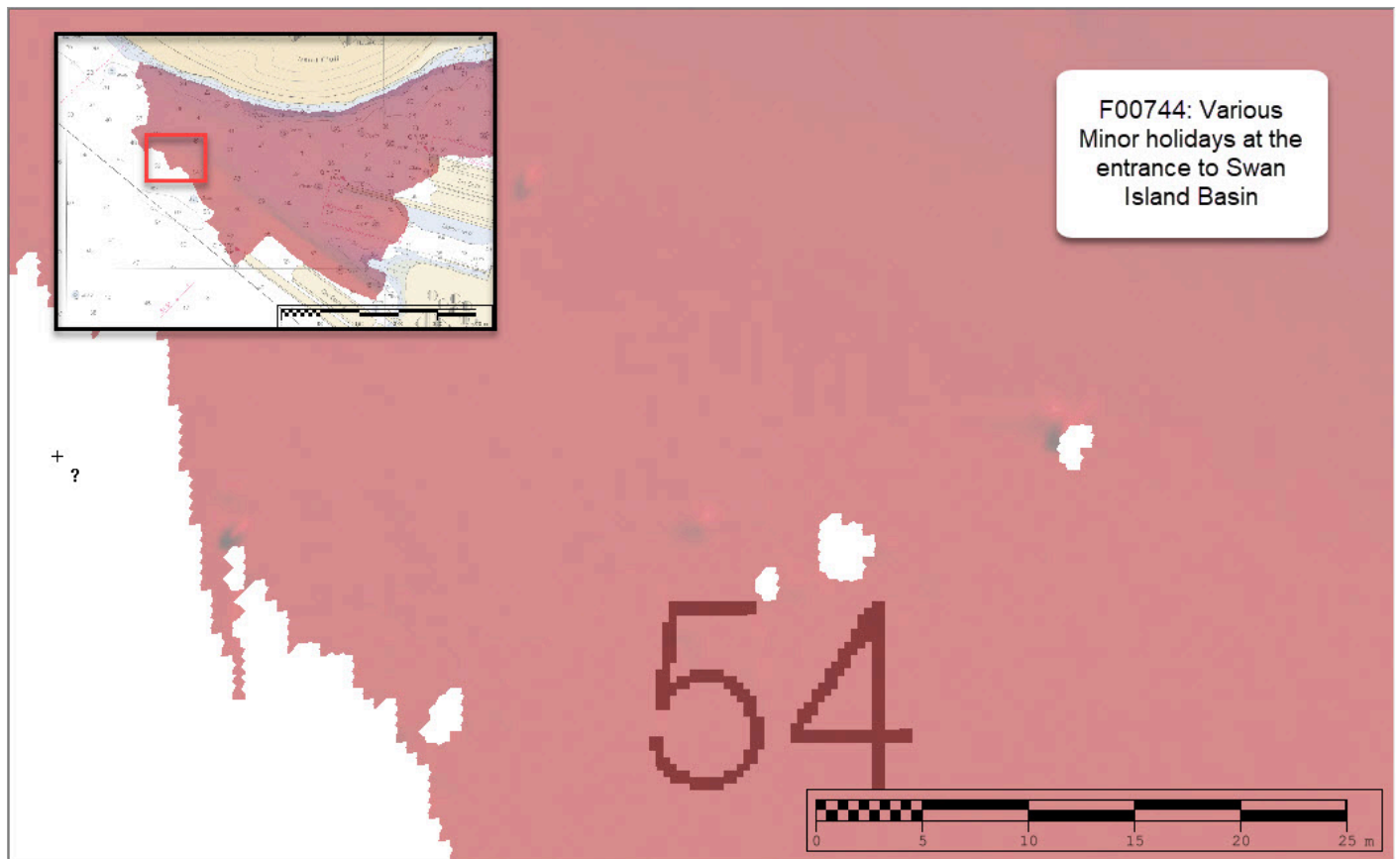


Figure 9: Examples of NALL determination.



*Figure 10: An example of several small holidays on survey limit outskirts due to operator error as discussed in section A.4.*





*Figure 11: Holidays due to pier pilings in the Swan Island Basin. MBES data on pilings supporting an active pier were rejected from the data.*



Figure 12: Additional holiday examples at the southern end of the Swan Island basin due to shallow operating areas.

## A.6 Survey Statistics

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



	<b>HULL ID</b>	<i>S3006</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0	0
	<b>MBES Mainscheme</b>	11.92	11.92
	<b>Lidar Mainscheme</b>	0	0
	<b>SSS Mainscheme</b>	0	0
	<b>SBES/SSS Mainscheme</b>	0	0
	<b>MBES/SSS Mainscheme</b>	0	0
	<b>SBES/MBES Crosslines</b>	0.997	0.9973
	<b>Lidar Crosslines</b>	0	0
<b>Number of Bottom Samples</b>			1
<b>Number Maritime Boundary Points Investigated</b>			0
<b>Number of DPs</b>			0
<b>Number of Items Investigated by Dive Ops</b>			0
<b>Total SNM</b>			0.14

*Table 3: Hydrographic Survey Statistics*

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

<b>Survey Dates</b>	<b>Day of the Year</b>
08/10/2018	222
08/11/2018	223

*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:

<b>Hull ID</b>	<i>S3006</i>
<b>LOA</b>	34 feet
<b>Draft</b>	4 feet

*Table 5: Vessels Used**Figure 13: NRT3 S3006*

All data for survey F00744 was acquired by S3006. The vessel acquired multibeam depth soundings, sound speed profiles, and bottom samples.

### B.1.2 Equipment

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
Kongsberg Maritime	EM 2040C	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SVS	Sound Speed System
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor

*Table 6: Major Systems Used*

## B.2 Quality Control

### B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 8.36% of mainscheme acquisition.

Multibeam crosslines were collected by S3006 across a variety of depth ranges, and water masses. Due to area constraints, crosslines were not collected over all depth ranges on F00744 (figure 13). International terminal was too narrow of an area to safely collect crossline data; crosslines were only collected in the Swan Island Basin with good distribution and there is no indication of any comparison issues.

A Variable Resolution (VR) surface was created using only mainscheme lines, and a second VR surface was created of only crosslines. A difference surface was generated in Pydro tool's Compare Grids program from which statistics were derived. For F00744 respective depths, the difference surface was compared to IHO allowable Total Vertical Uncertainty (TVU) standards (figure 15). In total, 99.5% of the total number of nodes pass the TVUmax test between F00744 mainscheme and crossline data (figure 16 & 17). The analysis was performed on F00744 MBES data reduced to Columbia River Datum (CRD) using Ellipsoidally Referenced Survey (ERS) methods.

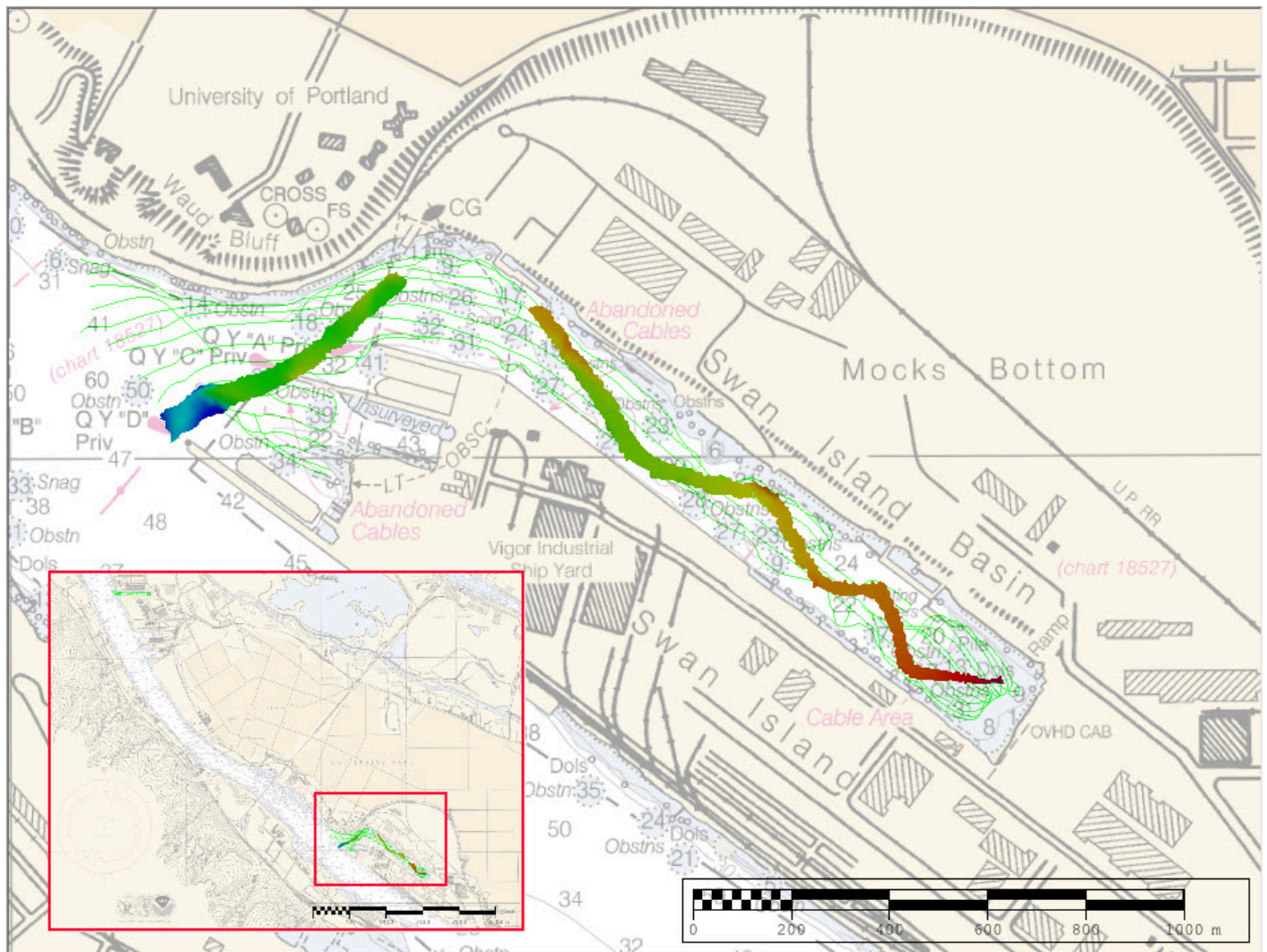


Figure 14: F00744 crossline surface overlaid on mainscheme tracklines, demonstrating adequate temporal geographic distribution with respect to area limitations and safety concerns.



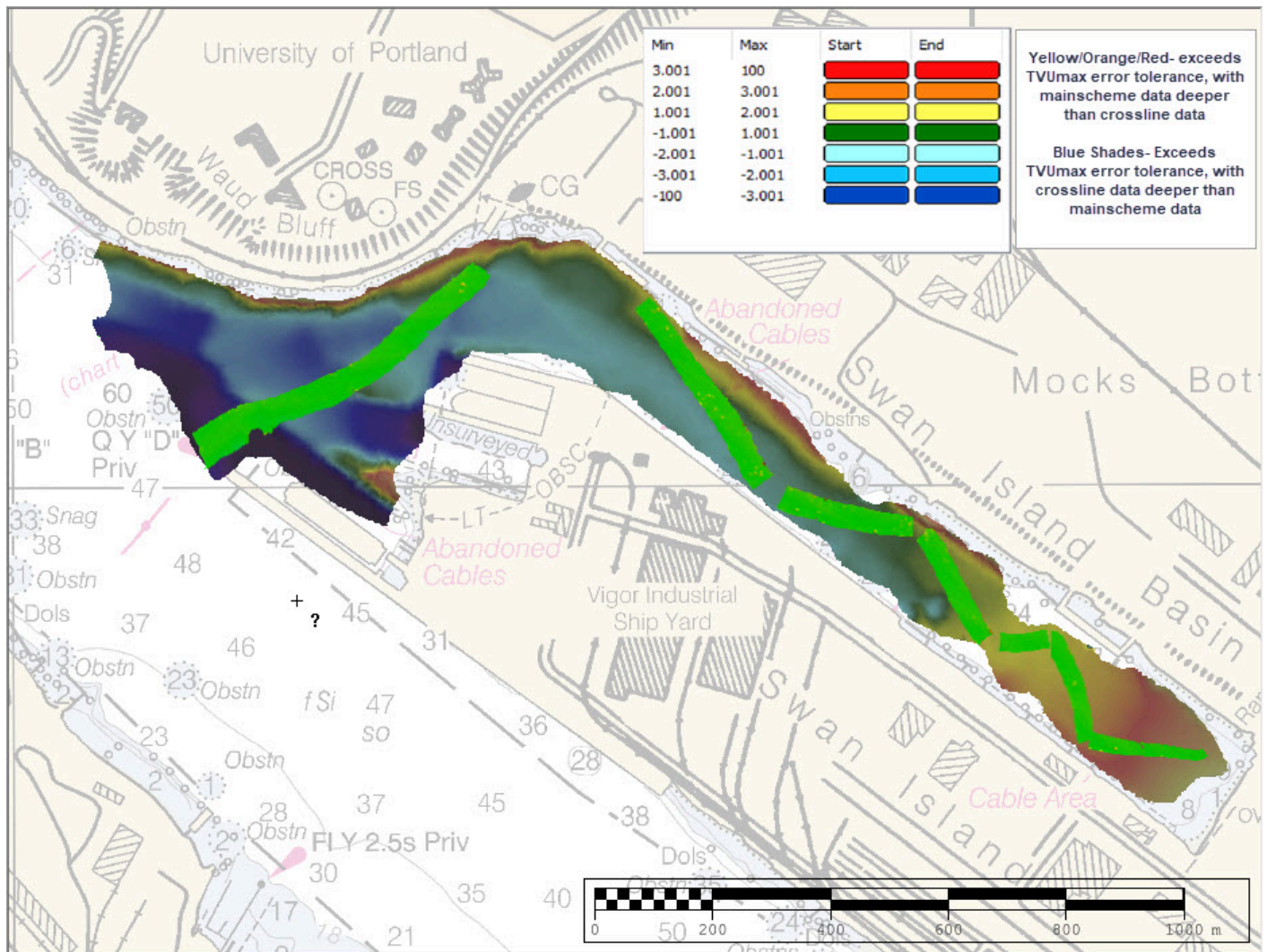


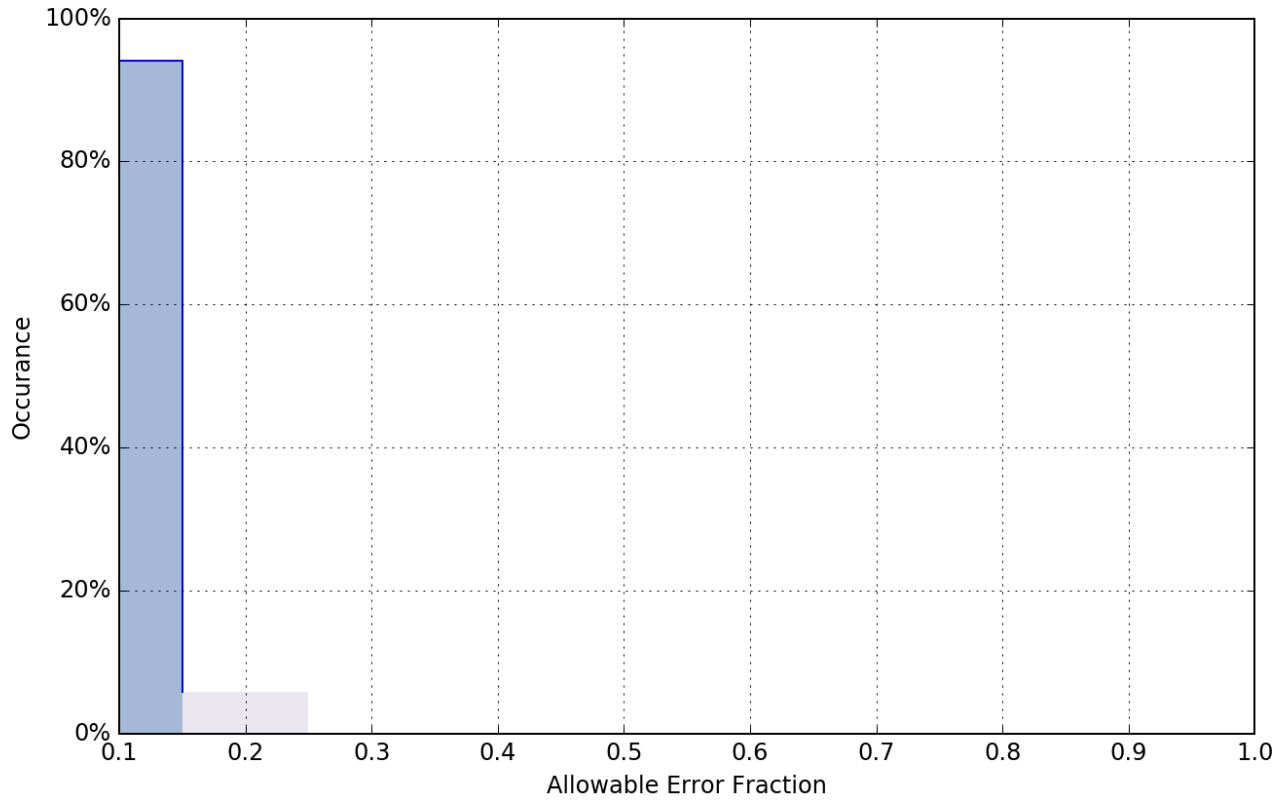
Figure 15: F00744 crossline TVU allowance overlaid on mainscheme MBES data. Positive values represent areas where mainscheme data is deeper than crossline data. Negative values represent areas where crossline data is deeper than mainscheme data.

## Comparison Distribution

Per Grid: F00744\_MS\_MB\_CDR\_VR-F00744\_XL\_MB\_CDR\_VR\_fracAllowErr.csar

99.5+% nodes pass (268643), min=0.0, mode=0.1 mean=0.0 max=2.2

Percentiles: 2.5%=0.0, Q1=0.0, median=0.0, Q3=0.1, 97.5%=0.1



*Figure 16: Histogram plot utilizing the magnitude (absolute value) of the Allowable Error Fraction to show the indication of what percentage of the total number of comparisons pass the TVUmax test.*

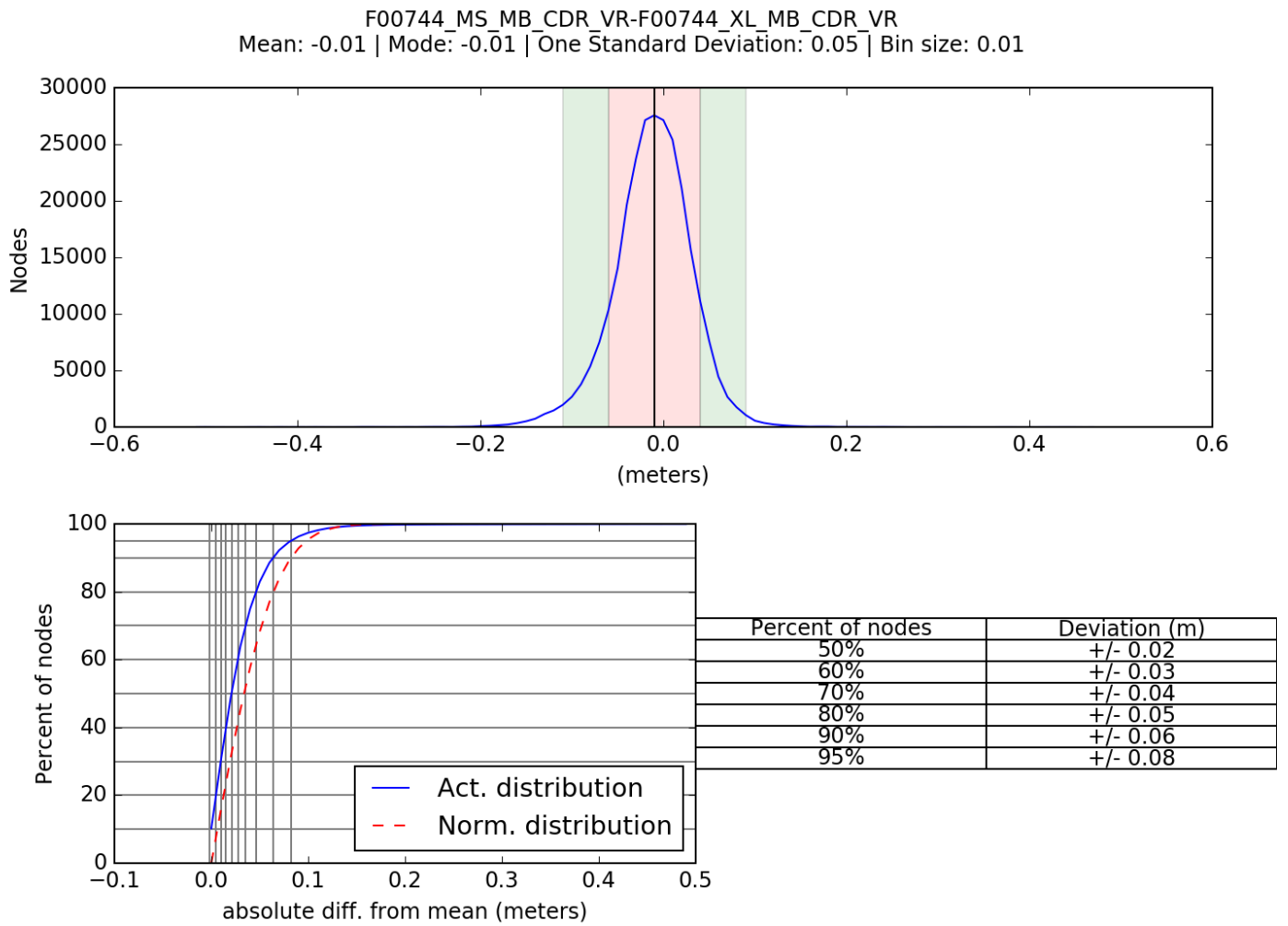


Figure 17: The statistic and distribution summary plot of the difference between F00744 mainscheme and crossline data.

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.12 meters

Table 7: Survey Specific Tide TPU Values.

<b>Hull ID</b>	<b>Measured - CTD</b>	<b>Measured - MVP</b>	<b>Surface</b>
S3006	1.0 meters/second	N/A meters/second	0.15 meters/second

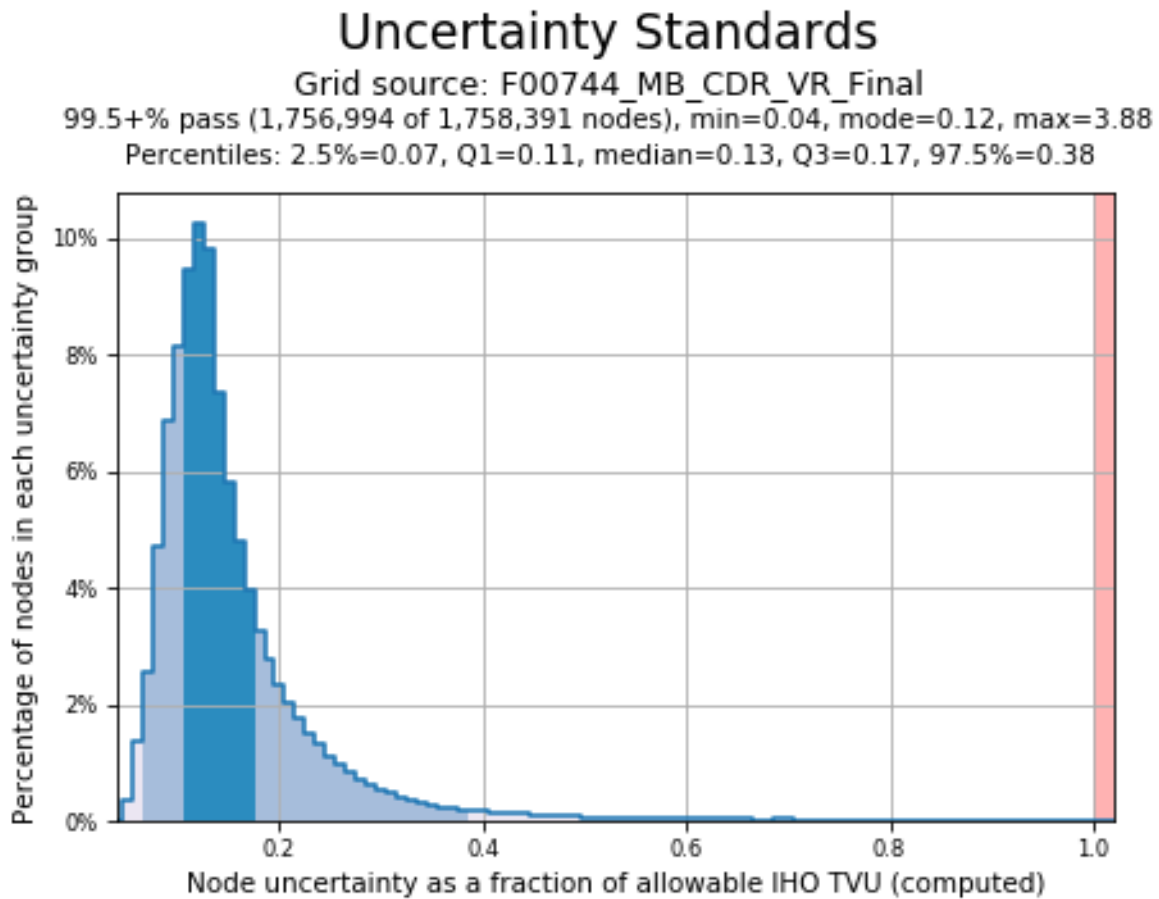
*Table 8: Survey Specific Sound Speed TPU Values.*

The uncertainty statistics (figure 18) were calculated using Pydro Explorer's Finalized CSAR QA tool.

Total Propagated Uncertainty (TPU) values for F00744 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. A visual inspection of the Uncertainty layer revealed the areas of higher uncertainty occurred in the outer beams of survey lines and over the many snags on the sea floor located within F00744.

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 the survey. Real-time uncertainties from the Kongsberg MBES sonars were incorporated and applied during post processing. Uncertainties associated with vessel roll, gyro, and navigation were applied real-time. F00744 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. F00744 is an ellipsoidally referenced survey (ERS) and the tidal component was accomplished via separation model. Additional information about RTK and the separation model are located in section C.1 and C.2 of this document.





*Figure 18: Pydro derived histogram plot showing HSSD uncertainty standards compliance of F00744 finalized VR surface*

### B.2.3 Junctions

There are no contemporary surveys that junction with this survey.

### B.2.4 Sonar QC Checks

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

**B.2.5 Equipment Effectiveness**

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

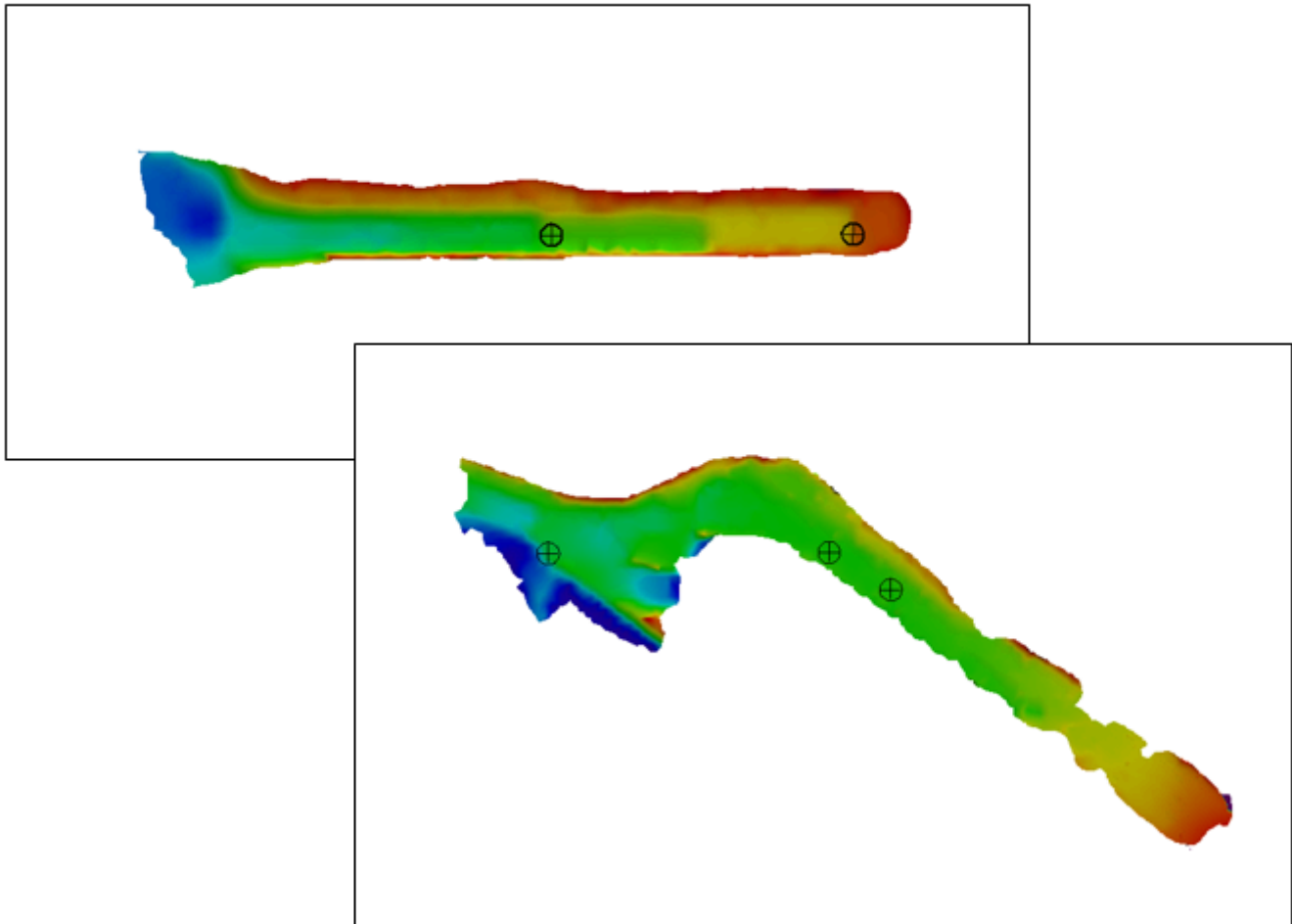
**B.2.6 Factors Affecting Soundings**

There were no other factors that affected corrections to soundings.

**B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: SVP casts were taken at least once every four hours in the deepest water nearest to the active survey area and when there was a change in sound speed values over varying depths (figure 19). The SVP casts were applied to the MBES lines in CARIS using the "nearest in distance within time of 4 hours" method.

## ⊕ Sound Speed Cast Locations



*Figure 19: F00744 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

Backscatter was not acquired for this survey.

### 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/SIPS	10.3.3

*Table 9: Primary bathymetric data processing software*

The following Feature Object Catalog was used: NOAA Profile V\_5\_7.

#### 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
F00744_MB_CDR_VR	CARIS VR Surface (CUBE)	Variable Resolution	1.2 meters - 18.4 meters	NOAA_VR	Object Detection
F00744_MB_CDR_VR_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.2 meters - 18.4 meters	NOAA_VR	Object Detection

*Table 10: Submitted Surfaces*

The survey was carried out to meet the Object Detection MBES Coverage requirements as defined by section 5.2.2 of the Hydrographic Survey Specifications and Deliverables (2018 ed.)

QC Tools in PydroExplorer were used to analyze the surfaces for fliers. There were 12 fliers, and upon review were found to be false positives or on the edge of the sheet. There is a new S-57 obstruction feature, that comes up as a flier. The top of the obstruction has been designated and added to the Final Feature File (FFF) (Figure 20 & 21).

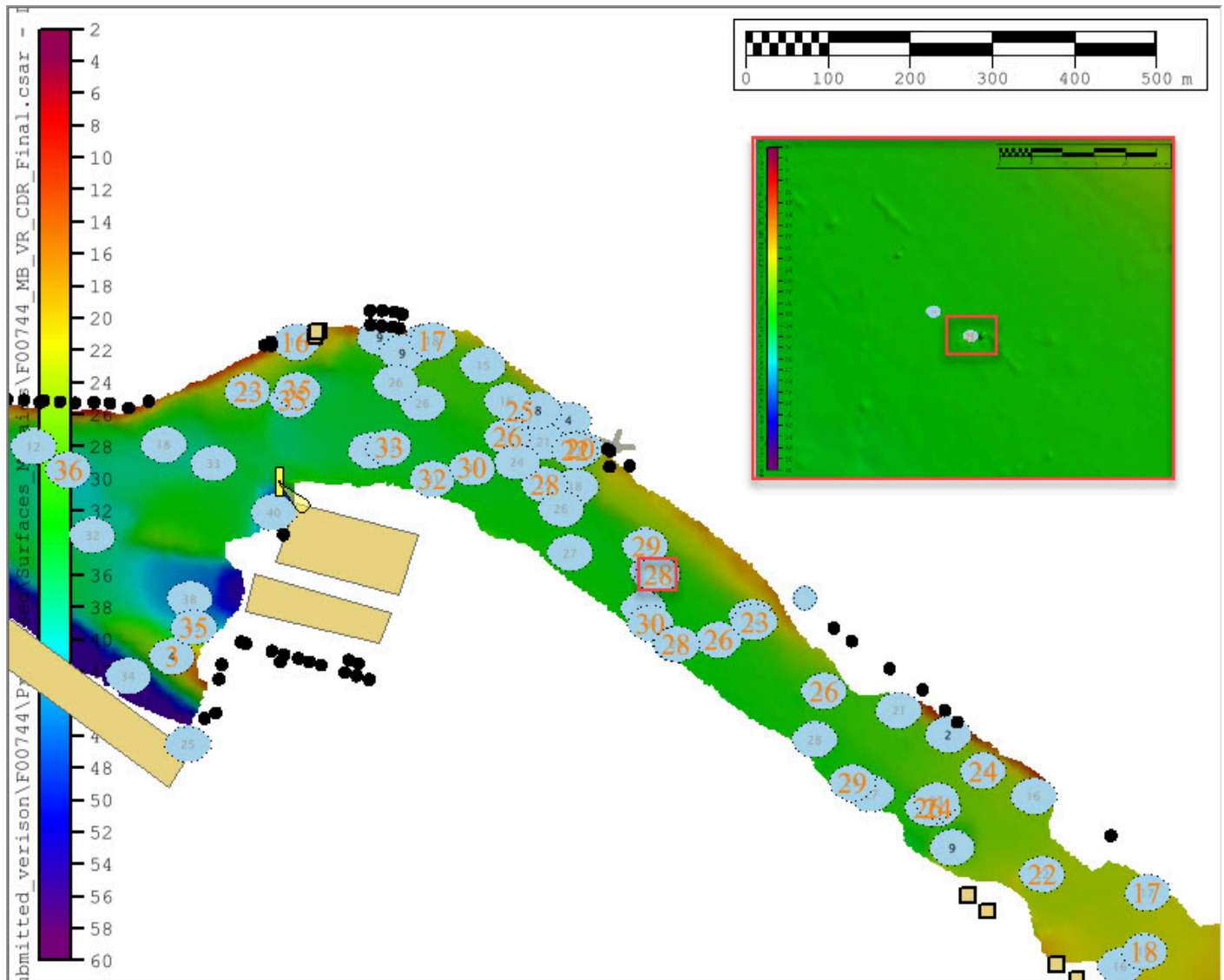
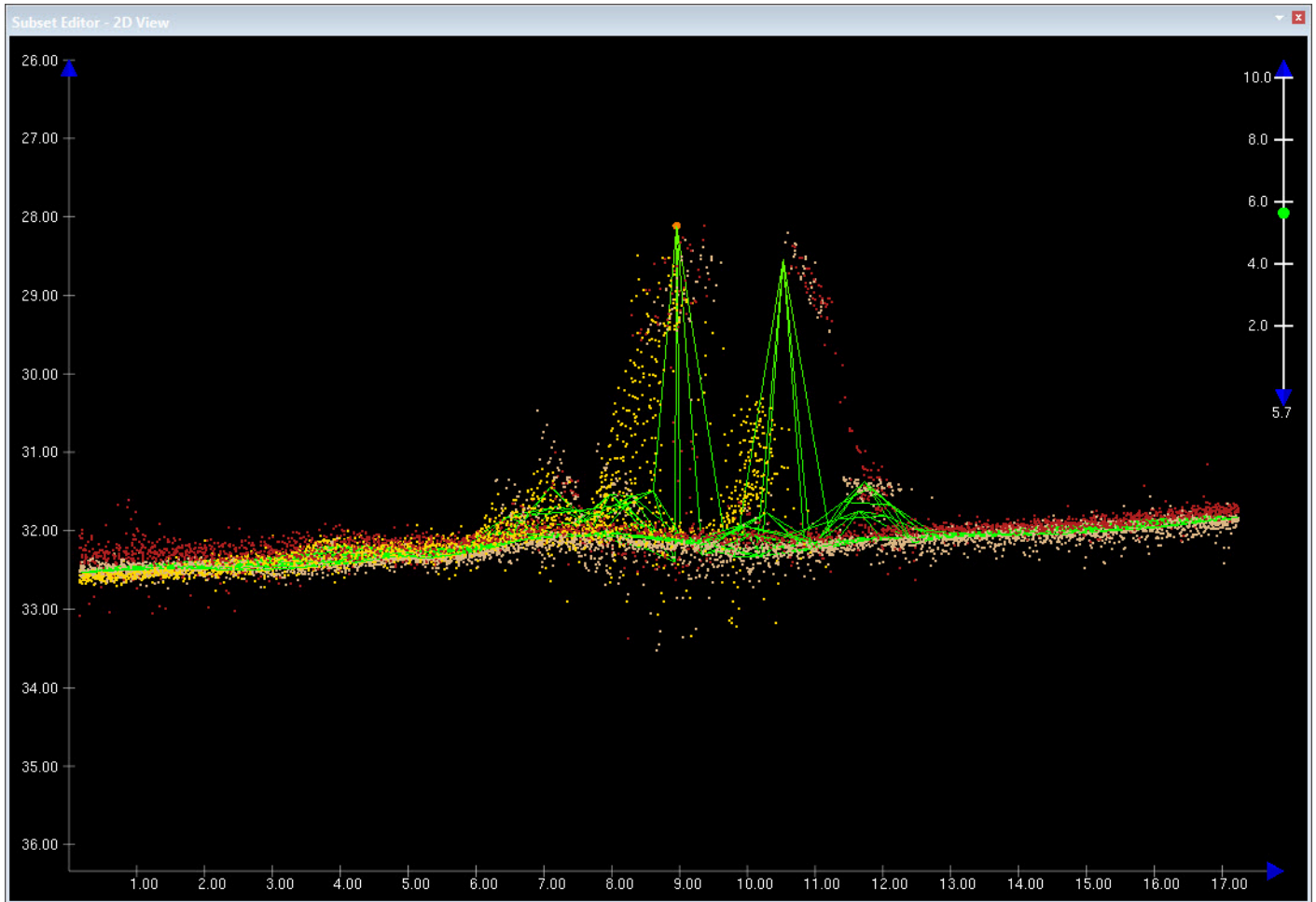


Figure 20: Location of new obstruction that is flagged by QC Tools as a flier.



*Figure 21: 2-D view of the new obstruction.*

*The submitted VR surfaces were renamed with the proper name. It was misspelled as word CDR rather than CRD (Columbia River Datum) for the vertical datum in the VR surface for example: F00744\_MB\_CDR\_VR\_Final instead F00744\_MB\_CRD\_VR\_Final.*

## C. Vertical and Horizontal Control

Field installed tide of GPS stations were not utilized for this survey; there is no HVCR report included with submission of F00744.

## C.1 Vertical Control

The vertical datum for this project is Columbia River Datum.

### ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	NAD83-mllwCRD_Geoid09.csar

*Table 11: ERS method and SEP file*

Sounding elevations relative to the ellipsoid were collected through Ellipsoidal Referenced Survey (ERS) with post-processing of the daily logged POSpac data to create a statistical best estimate of trajectory (SBET) file, as detailed in the DAPR, All of F00744 meets HSSD vertical accuracy requirements.

## C.2 Horizontal Control

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

The projection used for this project is Universal Transverse Mercator (UTM) Zone 10.

### RTK

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSpac MMS 8.3 software to produce SBETs for post-processing horizontal correction. All of F00744 meets HSSD horizontal accuracy requirements.

## C.3 Additional Horizontal or Vertical Control Issues

### C.3.1 Vessel motion artifacts

Throughout the mainscheme data there are slight vessel motion artifacts that are meet specification (Figure 22).

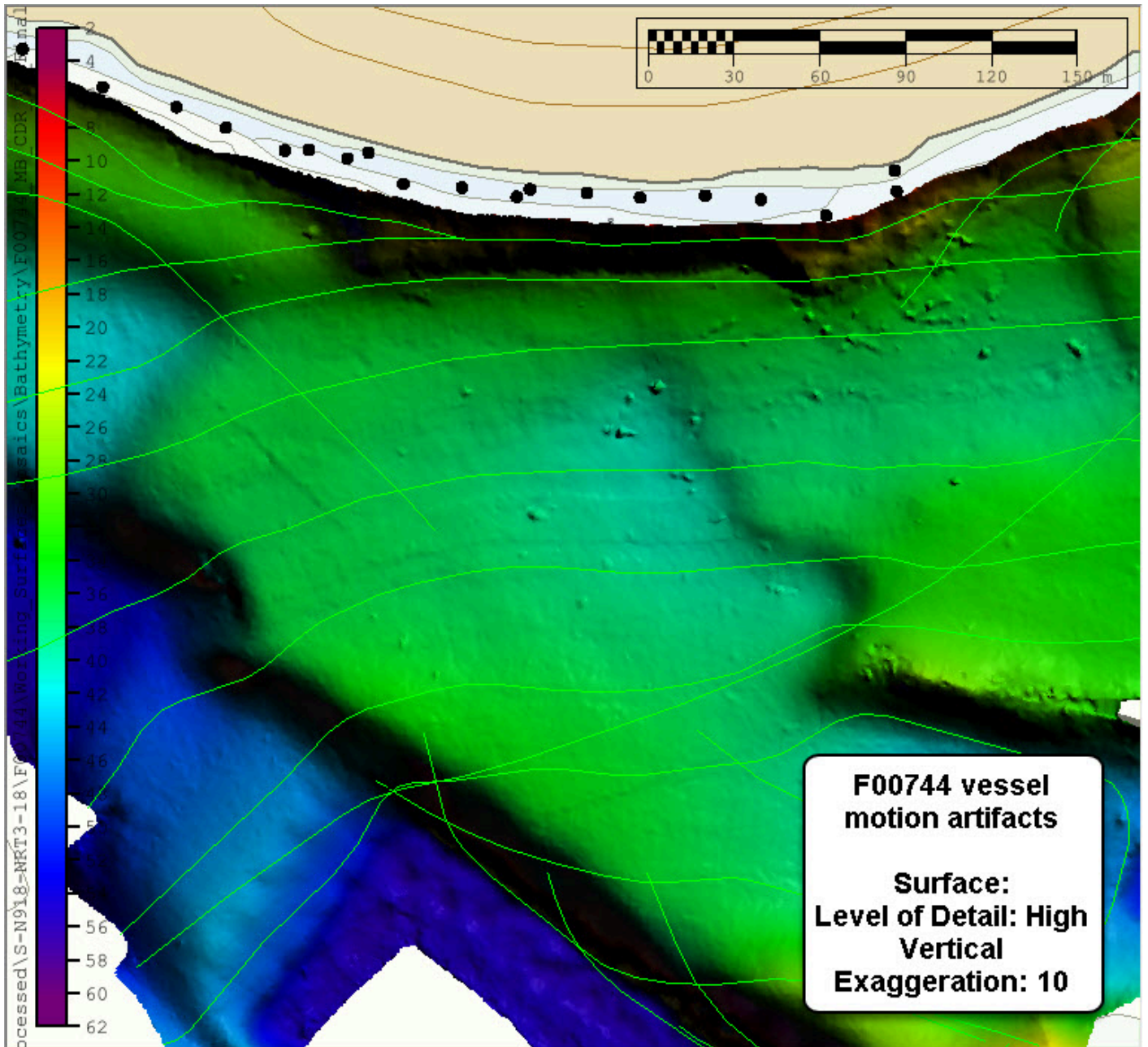


Figure 22: Vessel motion artifacts are present within F00744 and meet specification.



## D. Results and Recommendations

### D.1 Chart Comparison

The chart comparison was made using a CARIS sounding and contour layer derived from the finalized VR surface. The contours and sounders were overlaid on the chart and compared for general agreement and to identify areas of significant change.

#### D.1.1 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?
US5OR16M	1:5000	21	11/09/2018	06/05/2018	NO
US5OR15M	1:20000	59	11/09/2018	10/12/2018	NO

*Table 12: Largest Scale ENC's*

#### US5OR16M

ENC US5OR16M is a harbor chart of the Swan Island Basin, and the southern portion of F00744. Contoured depths of ENS US5OR16M that apply to F00744 are 5.9, 11.8, 17.7, 29.9, and 59.7 feet.

The contours derived from F00744 show discrepancies primarily between the charted and surveyed 5.9, 11.8, and 29.9 ft contours in shoal areas.

Soundings derived from F00744 generally agreed with those charted on ENC US5OR16M within 1-2 ft (figure 23 & 24).

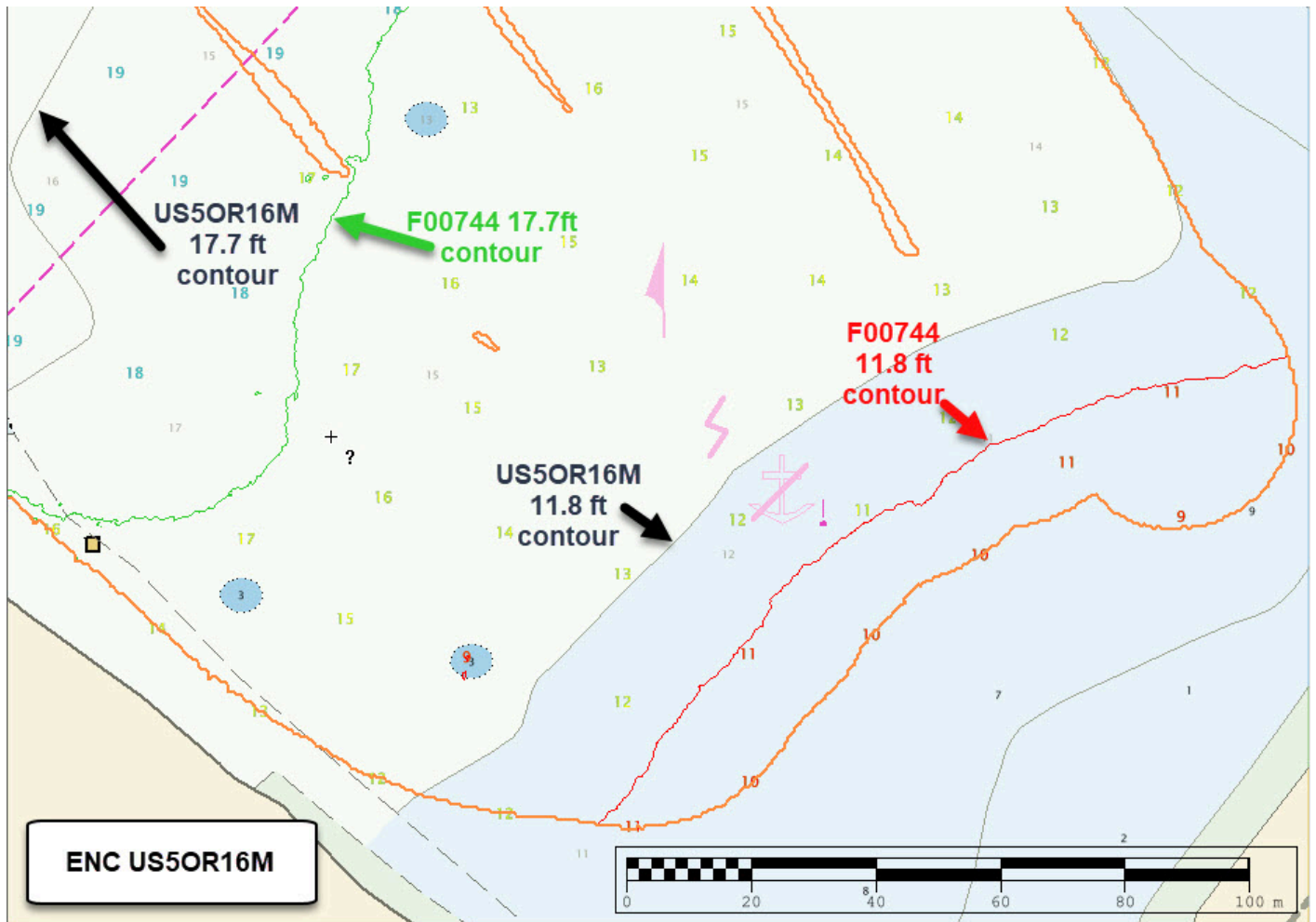


Figure 23: F00744 11.8 ft (in red) and 17.7 ft (in green) overlaid on ENC US5OR16M showing slight discrepancies between survey data and ENC charted data.

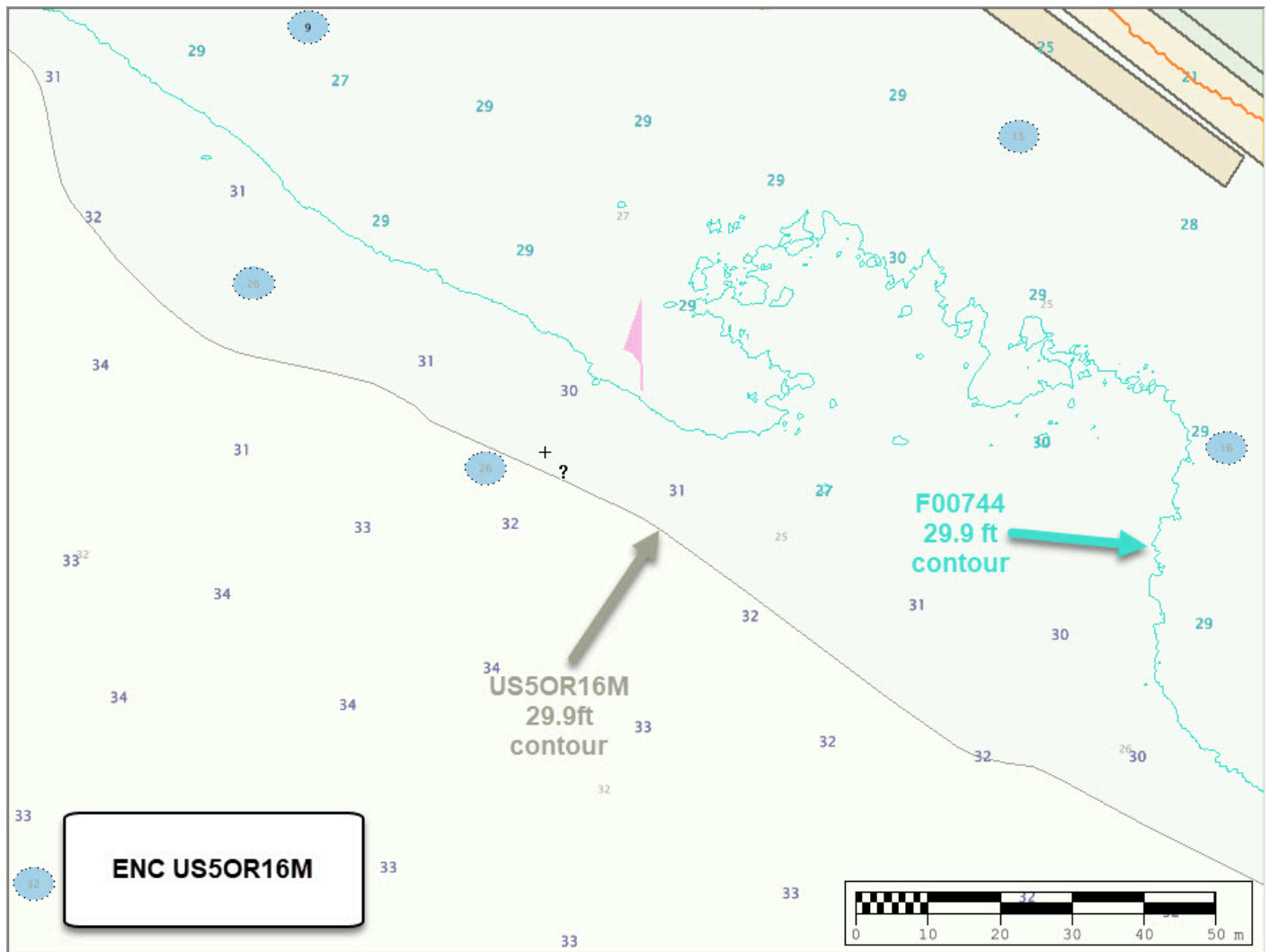


Figure 24: F00744 29.9 ft (in turquoise) overlaid on ENC US5OR16M showing about a 63 ft discrepancy.

### US5OR15M

ENC US5OR15M provides an overview the Columbia River and Willamette Rivers excluding the Swan Island Basin area charted on ENC USOR16M. Contoured depths of ENC US5OR15M that apply to F00744 are 5.9, 11.8, 17.7, 29.9 and 59.7 feet.

The charted 29.9 ft contour stops at the entrance to the International terminal. Derived contours from F00744 place the 29.9 ft contour beyond the middle of the pier face (figure 25).

Soundings derived from F00744 agreed with those charted on ENC US5OR15M.

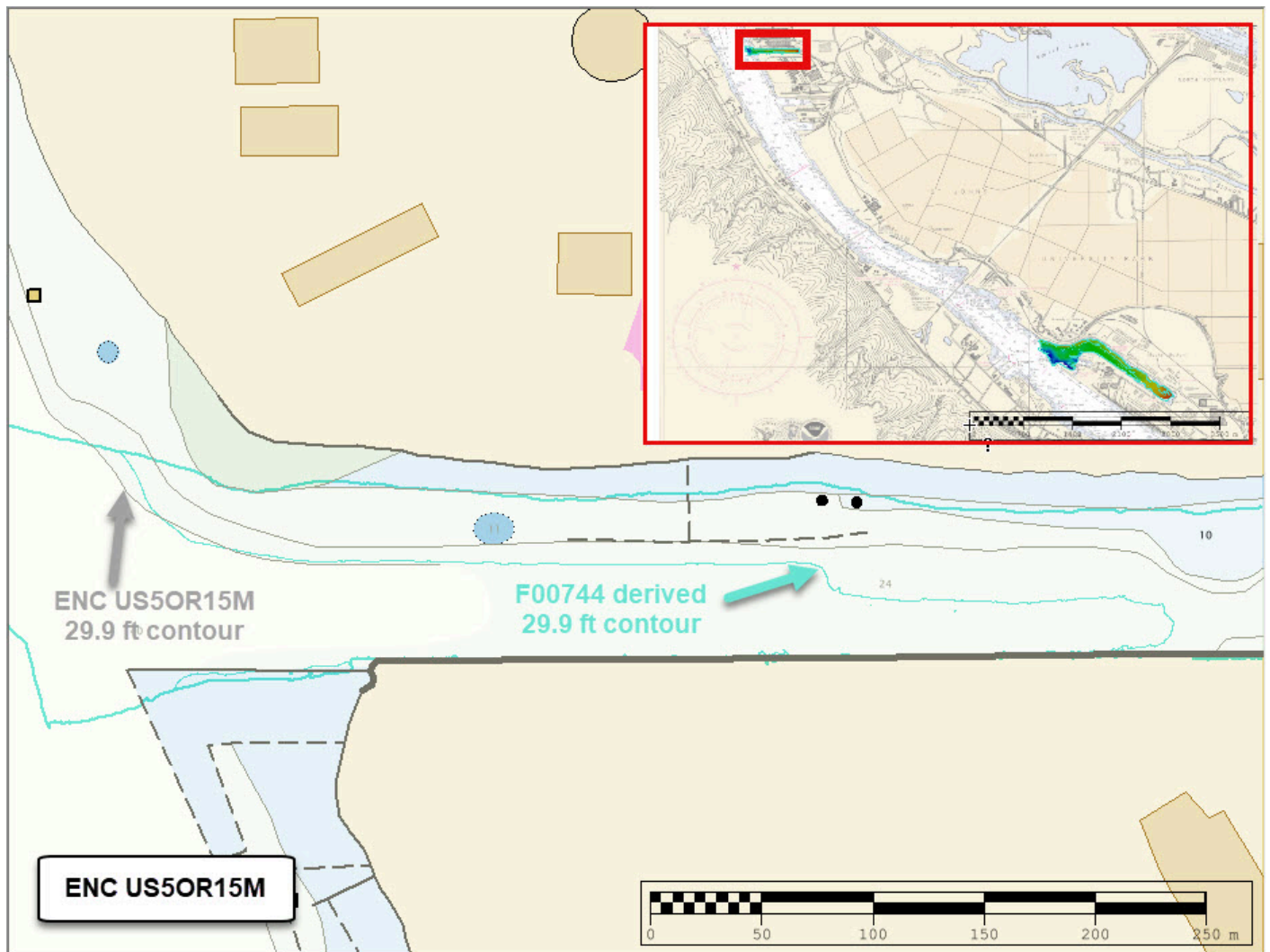


Figure 25: F00744 derived 29.9 ft contour (in turquoise) overlaid on ENC US5OR15M showing discrepancy between survey data and ENC charted data.

### D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

### D.1.3 Charted Features

No charted features with the label PA, ED, PD, or REP exist for this survey.

#### **D.1.4 Uncharted Features**

Swan Island Basin is home to Vigor- Swan Island Shipyard. There are numerous new features that were found and positioned that are detailed in the Final Feature file; including dry dock positions.

#### **D.1.5 Shoal and Hazardous Features**

No shoals or potentially hazardous features exist for this survey.

#### **D.1.6 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.1.7 Bottom Samples**

One bottom sample was conducted in the assigned location. There is no drop camera image submitted with this bottom sample. Refer to the results included in the F00744 Final Feature File submitted with this report.

### **D.2 Additional Results**

#### **D.2.1 Shoreline**

Limited shoreline verification was conducted in the accordance with applicable section of NOAA HSSD and FPM using the Project Reference File (PRF) and Composite Source File (CSF) provided with the project instructions. Please refer to the DAPR for details on shoreline collection and verification.

Feature Scan within QC Tools was used to verify features had correct attributions on "Field" mode. There were several pilings, dolphins, and one wreck that were unable to be investigated due to visual obstruction by vessels and barges.

#### **D.2.2 Aids to Navigation**

Two private lights exist on the northern end of west and east piers at Swan Island shipyard. For both lights, the structure was observed but the light characteristic was not due to daylight. There are no images of these structures due to hydrographer oversight.

**D.2.3 Overhead Features**

No overhead features exist for this survey.

**D.2.4 Submarine Features**

No submarine features exist for this survey.

**D.2.5 Platforms**

No platforms exist for this survey.

**D.2.6 Ferry Routes and Terminals**

No ferry routes or terminals exist for this survey.

**D.2.7 Abnormal Seafloor and/or Environmental Conditions**

The southern portion of this survey area includes Swan Island shipyard and many other working maritime trades. Obstructions, scours, and seafloor abnormalities to this survey area will constantly be changing due to the nature of the shipyard and maritime work in the surrounding area.

**D.2.8 Construction and Dredging**

Present and/or planned construction or dredging exists within the survey limits, but was not investigated. Construction was ongoing due to the shipyard located at the northern end of the Swan Island Basin. This included installation of oil booms and what appeared to be a drivable ramp connecting the pier and the floating dry docks.

**D.2.9 New Survey Recommendation**

Due to the nature of the work conducted in the Swan Island basin, seafloor obstructions will constantly be changing. Future surveys can provide a more detailed shoreline review, and allow for the NALL to be achieved due to potential vessel and barge moment in the southern end Swan Island Basin. For future surveys, the team would allow multiple days for this sheet for possible vessel movement to collect to the NALL.

**D.2.10 Inset Recommendation**

Suggest a inset for the International Terminal if there is adequate data to do so. This survey was conducted at the request of the Columbia River pilots. The pier is utilized for cargo, bulk, gravel and some construction goods are exported through this facility.




## 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
LTJG Michelle Levano, NOAA	Chief of Party	03/08/2019	 <small>Digitally signed by LEVANO,MICHELLE.MARIE.1516645888 Date: 2019.03.08 16:10:24 -08'00'</small>
PST Timothy Wilkinson	Hydrographer	03/08/2019	<small>WILKINSON,TIMOTHY.DAVID.13 83074440</small> <small>Digitally signed by WILKINSON,TIMOTHY.DAVID.1383074440 Date: 2019.03.11 09:34:23 -07'00'</small>

## F. Table of Acronyms

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

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

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

APPROVAL PAGE

**F00744**

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)
- Processed survey data and records
- Bottom samples
- 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.

Approved: \_\_\_\_\_

**Commander Olivia Hauser, NOAA**  
Chief, Pacific Hydrographic Branch