H13116

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13116

LOCALITY

State(s):	Alaska
General Locality:	Southwestern Alaskan Peninsula
Sub-locality:	Ikatan Bay

2018

CHIEF OF PARTY
Andrew Orthmann

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**H13116**

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:	**Alaska**
General Locality:	**Southwestern Alaskan Peninsula**
Sub-Locality:	**Ikatan Bay**
Scale:	1: **40,000**
Dates of Survey:	**06/13/2018 to 07/23/2018**
Instructions Dated:	**04/24/2018**
Project Number:	**OPR-P377-KR-18**
Field Unit:	**Terrasond, Ltd.**
Chief of Party:	**Andrew Orthmann**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder**
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. 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/.

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Descriptive Report to Accompany Survey H13116

Project: OPR-P377-KR-18

Locality: Southwestern Alaskan Peninsula

Sublocality: Ikatan Bay

Scale: 1:40000

June 2018 - July 2018

Terrasond, Ltd.

Chief of Party: Andrew Orthmann

A. Area Surveyed

The survey area is located in the Aleutian Island region of southwest Alaska. The closest community is False Pass, population 35 (2010), located on Unimak Island approximately 6 NM to the NW from the west side of the survey area.

The area is centered on Ikatan Bay, which is the southern approach to False Pass. False Pass is the first navigable pass between the Pacific Ocean and the Bering Sea encountered by vessels transiting down the Alaska Peninsula. False Pass is navigable by relatively shallow drafted vessels. Deep drafted vessels use Unimak Passage, approximately 65 NM to the southwest.

Field work was carried out in June and July of 2018 under project OPR-P377-KR-18, with final processing and reporting carried out from August through December, 2018. Four additional survey areas located to the southwest were surveyed concurrently during this project. Work was done in accordance with the Hydrographic Survey Project Instructions (dated April 24th, 2018) and the NOS Hydrographic Surveys Specifications and Deliverables (HSSD), April 2017 edition.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
54° 52' 51.06" N 163° 20' 27.85" W	54° 40' 3.75" N 162° 56' 13.4" W

Table 1: Survey Limits

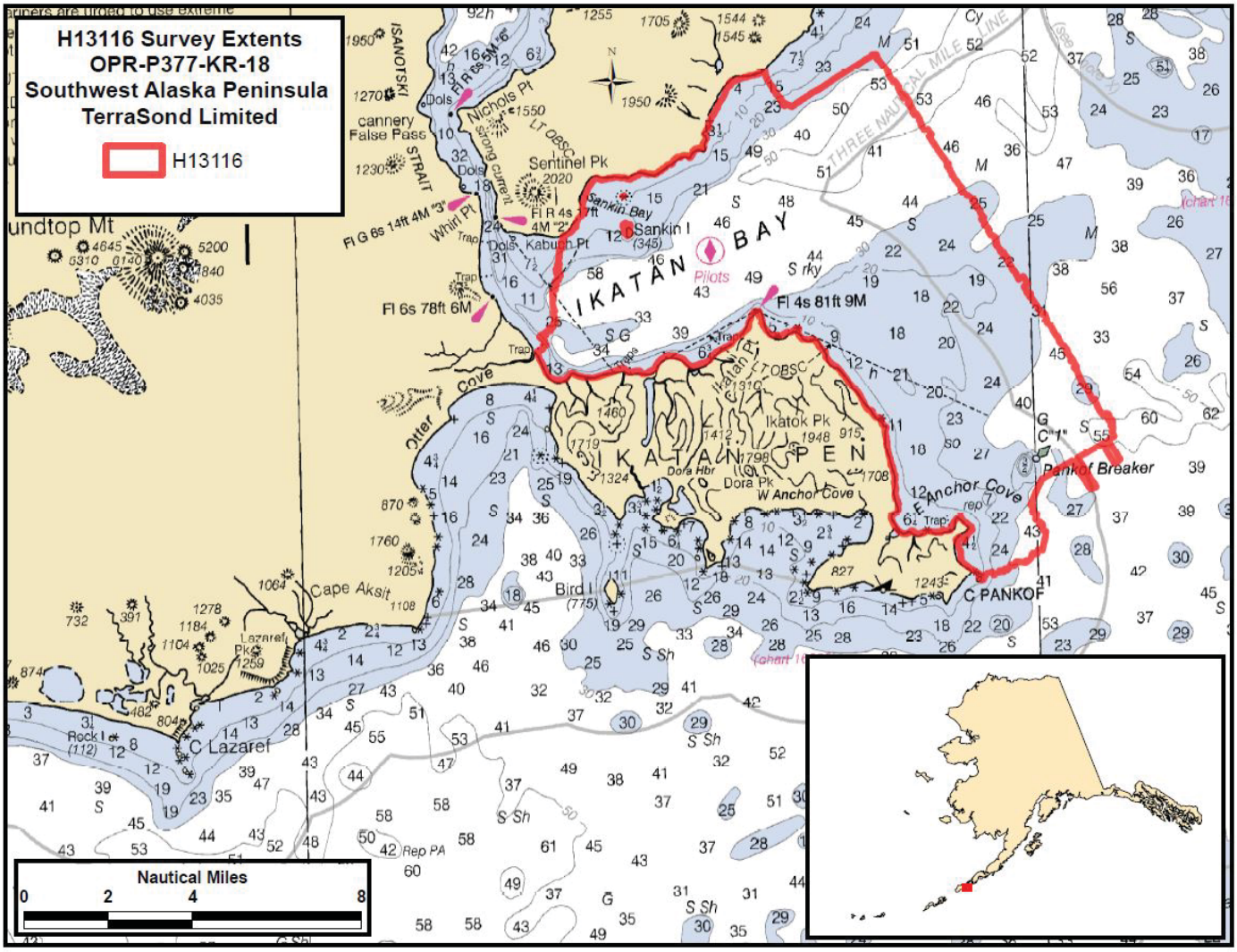


Figure 1: Survey extents

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service nautical charting products to support an increase in vessel traffic in Unimak Passage and False Pass. Unimak Passage and False Pass are the gateways to the Bering Strait utilized by cargo, fishing, and trans-Pacific vessels delivering goods to the Aleutian Islands, western Alaska, and the Arctic. This passage and area is specifically utilized by the fishing fleet in Bristol Bay and the Bering Sea and this area was specifically requested by the Alaska Marine Pilots, Alaska Fisheries Development Foundation, the 17th District of the United States Coast Guard, and the Alaska Marine Highway. This project was last surveyed using partial bottom coverage

techniques in the 1930's. 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.

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	Complete Coverage (Refer to HSSD Section 5.2.2.3) Acquire backscatter data during all multibeam data acquisition (Refer to HSSD Section 6.2)
All waters in survey area	LNM no less than 5715 LNM. Report significant shoaling via weekly progress report. COR may adjust survey prioritization based on observed shoaling.

Table 2: Survey Coverage

Total project-wide LNM acquired for project OPR-P377-KR-18 totaled 5,738, which exceeded the required 5,715.

This survey area included a portion of the "H13116_ext" area described in the Project Instructions (PI). The PI called for at least 5,715 LNM to be collected project-wide, with excess to be utilized in the "H13116_ext" area. During operations, once it became clear that the assigned areas would require less than 5,715 LNM to complete, the "H13116_ext" add-on to this survey sheet began to be surveyed. Per communications with the project COR (see included correspondence), the deeper area on the north part of the "_ext" area was favored first, followed by the shoal to the south including Pankof Breaker.

Although the majority of the "_ext" area was surveyed, there was insufficient LNM to complete the entire area. This left the near-shore north and far southern sections unsurveyed. Boundaries of the completed work were squared-off and all features within the surveyed extents fully addressed.

The NALL was achieved in nearshore areas. The NALL for this survey was generally the 3.5 m depth contour, though in many areas excessive rocks, kelp (or both) made it not possible to achieve 3.5 m depth without excessive risk to equipment or personnel. In these areas the limit of safe navigation served as the NALL.

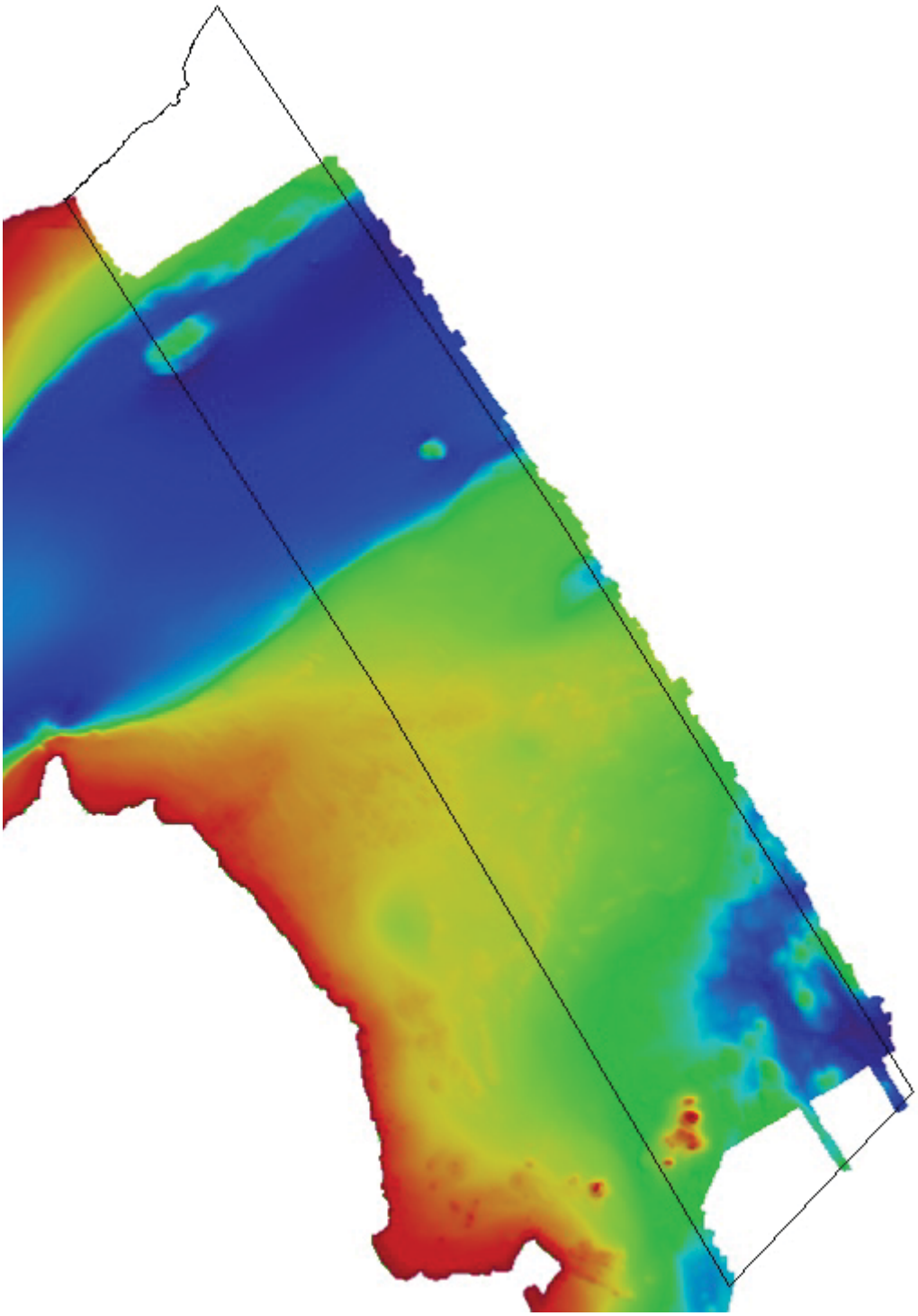


Figure 2: Image showing the work completed in the "H13116_ext" area. There was sufficient LNM to survey the majority of the area, leaving only the near-shore north and southern sections unsurveyed.

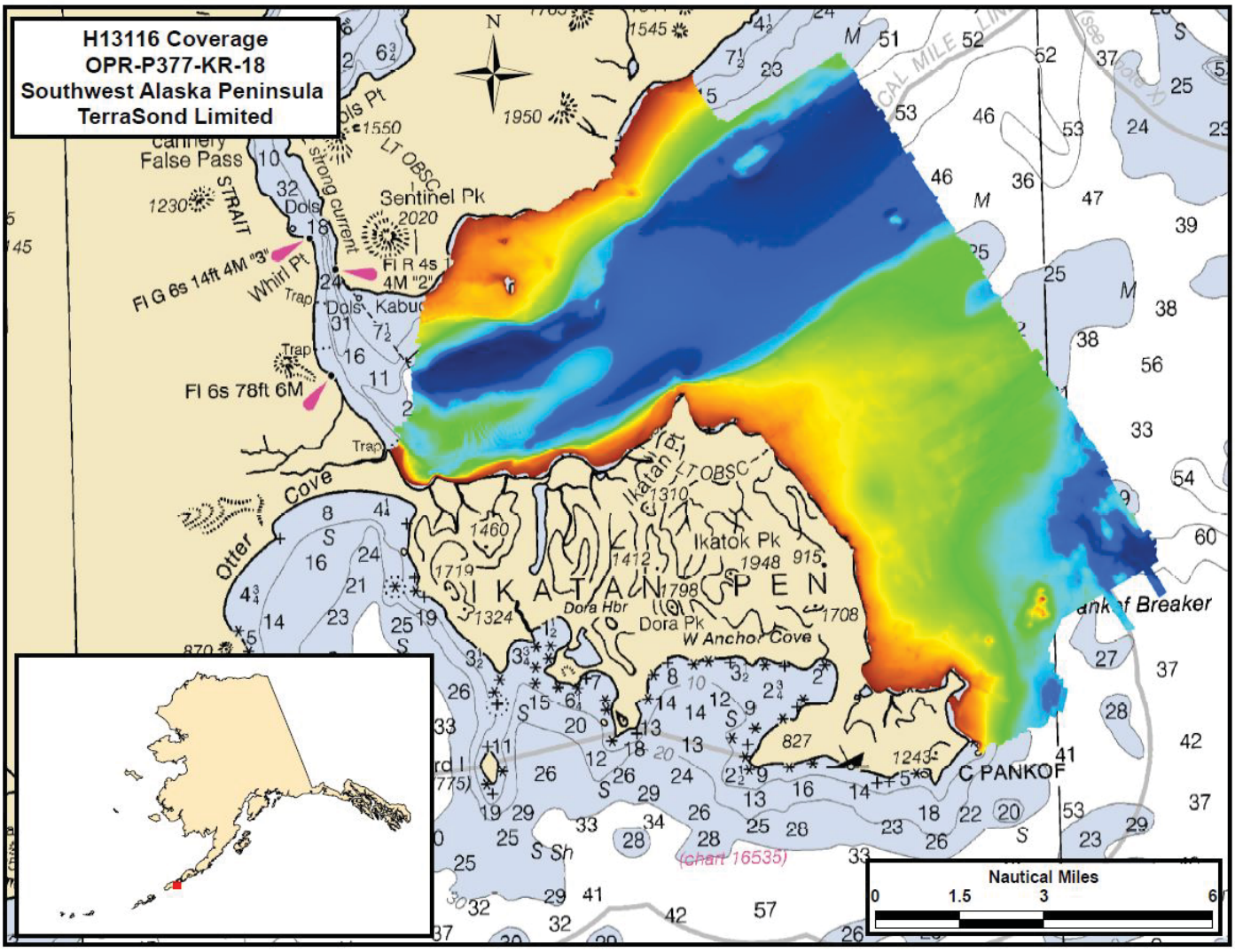


Figure 3: Survey coverage graphic

A.6 Survey Statistics

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

	HULL ID	*ASV-CW5*	*Qualifier 105*	*Total*
LNM	**SBES Mainscheme**	0	0	0
	MBES Mainscheme	737.8	641.5	1379.3
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/SSS Mainscheme	0	0	0
	MBES/SSS Mainscheme	0	0	0
	SBES/MBES Crosslines	50.0	65.7	115.7
	Lidar Crosslines	0	0	0
Number of Bottom Samples				7
Number Maritime Boundary Points Investigated				1
Number of DPs				271
Number of Items Investigated by Dive Ops				0
Total SNM				77.9

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/13/2018	164

Survey Dates	Day of the Year
06/14/2018	165
06/18/2018	169
06/26/2018	177
06/27/2018	178
06/28/2018	179
06/29/2018	180
06/30/2018	181
07/03/2018	184
07/04/2018	185
07/07/2018	188
07/08/2018	189
07/09/2018	190
07/10/2018	191
07/11/2018	192
07/13/2018	194
07/14/2018	195
07/22/2018	203
07/23/2018	204

Table 4: Dates of Hydrography

Effort and statistics include all work completed in H13116 as well as the extended ("_ext") area.

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	*ASV-CW5*	*Qualifier 105*
LOA	5.5 meters	32 meters
Draft	0.5 meters	1.8 meters

Table 5: Vessels Used

Figure 4: Survey vessels used on this project - ASV-CW5 (foreground), Q105 (background)

The Qualifier 105 (Q105) is a 32 m aluminum-hull vessel owned and operated by Support Vessels of Alaska. The Q105 acquired multibeam data and provided housing and facilities for on-site data processing. The vessel was also used to collect bottom samples, deploy/recover BMPG tide gauges, conduct sound speed casts, and deploy/recover the ASV-CW5 vessel.

The ASV-CW5 (C-Worker 5) is a 5.5 m aluminum-hull Autonomous Surface Vessel (ASV) owned and operated by ASV Global. The ASV was operated in an unmanned but monitored mode, collecting multibeam data in close proximity to the Q105.

B.1.2 Equipment

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

Manufacturer	Model	Type
Sea-Bird Scientific	SBE 26 plus	Tide Guage, Submerged
Trimble	5700	Base Station
Teledyne Oceanscience	Rapidcast	Sound Speed Deployment System
Valeport	RapidSV	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Applanix	POS MV 320 v4	Positioning and Attitude System
Teledyne RESON	Seabat T50	MBES

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 8.39% of mainscheme acquisition.

Effort was made to ensure crosslines had good temporal and geographic distribution, were angled to enable nadir-to-nadir comparisons, and that the required percent of mainscheme LNM was achieved. Crosslines were conducted with both vessels to ensure there was ample overlap for inter-vessel comparisons, with each vessel crossing the other's mainscheme lines. Since the two vessels worked in close proximity and normally ran parallel lines, crosslines were usually collected in sets when both vessels were in simultaneous operation. These lines were often collected when transiting across the survey area to reach a different survey priority.

The crossline analysis was conducted using CARIS HIPS “Line QC Report” process. Each crossline was selected individually and run through the process, which calculated the depth difference between each accepted crossline sounding and a "QC" BASE (CUBE-type, 4 m resolution) surface’s depth layer created from the mainscheme data. QC surfaces were created with the same parameters used for 4 m surfaces as the final surfaces, with the important distinction that the QC surfaces did not include crosslines so as to not bias the results. Differences in depth were grouped by beam number and statistics were computed, including the percentage of soundings with differences from the QC surface falling within IHO Order 1a. Note for

simplicity IHO Order 1a was used for all comparisons even though the looser IHO Order 2 standard was allowable for depths greater than 100 m.

When at least 95% of the sounding differences exceed IHO Order 1a, the crossline was considered to “pass,” but when less than 95% of the soundings compare within IHO Order 1, the crossline was considered to “fail.” A 5% (or less) failure rate was considered acceptable since this approach compares soundings to a surface (instead of a surface to a surface), allowing for the possibility that noisy crossline soundings that don't adversely affect the final surface(s) could be counted as a QC failure in this process.

Lines used as crosslines and their % of soundings passing IHO Order 1a, sorted from highest passing to lowest, are listed below.

0971-179-ASV-CW5-E2-Nearshore -- 100.0% pass
2381-204-ASV-CW5-XLE9-North_750 -- 100.0% pass
0774-194-Q105-E9-EXT-XL-2 -- 100.0% pass
0925-203-Q105-E-XL -- 100.0% pass
0931-203-Q105-E-XL2 -- 100.0% pass
1906-191-ASV-CW5-E5-XL_7 -- 100.0% pass
1907-191-ASV-CW5-E5-XL_5 -- 100.0% pass
0354-178-Q105-E4-XL -- 100.0% pass
2372-203-ASV-CW5-E-XL -- 100.0% pass
0937-204-Q105-E-Ext_Border -- 100.0% pass
0665-191-Q105-E5-XL_8 -- 100.0% pass
0930-203-Q105-E-XL -- 100.0% pass
0353-178-Q105-E3-XL -- 100.0% pass
0889-178-ASV-CW5-E2-339_3_XL -- 100.0% pass
2378-203-ASV-CW5-E-Nearshore_XL -- 100.0% pass
1756-189-ASV-CW5-E6-XL -- 100.0% pass
0666-191-Q105-E5-XL_6 -- 100.0% pass
0134-165-Q105-E-XL -- 100.0% pass
0374-178-Q105-E4-XL1 -- 100.0% pass
0890-178-ASV-CW5-E3-840_XL -- 100.0% pass
0212-165-ASV-CW5-E5-570 -- 100.0% pass
0132-164-Q105-E4-XL1 -- 100.0% pass
0213-165-ASV-CW5-E5-570 -- 100.0% pass
0748-194-Q105-E-E-EXT-XL -- 100.0% pass
0750-194-Q105-E7-XL1 -- 99.9% pass
2362-203-ASV-CW5-E-XL -- 99.9% pass
0598-189-Q105-E-NorthXL -- 99.9% pass
0375-178-Q105-E4-XL -- 99.9% pass
2366-203-ASV-CW5-E-XL -- 99.9% pass
0209-164-ASV-CW5-E2-570 -- 99.9% pass
0800-195-Q105-E9-EXT-XL -- 99.9% pass
0924-203-Q105-E-XL_South -- 99.9% pass
0911-178-ASV-CW5-E4-XL -- 99.8% pass
0917-178-ASV-CW5-E4-XL-2 -- 99.8% pass

1909-191-ASV-CW5-E5-XL_1 -- 99.7% pass
0667-191-Q105-E5-XL_4 -- 99.7% pass
1908-191-ASV-CW5-E5-XL_3 -- 99.7% pass
0751-194-Q105-E7-XL3 -- 99.7% pass
0668-191-Q105-E5-XL_2 -- 99.6% pass
1791-190-ASV-CW5-E4-XL -- 99.5% pass
0587-189-Q105-E3-5-XL -- 99.3% pass
2383-204-ASV-CW5-XLE9-North_165 -- 99.3% pass
0135-165-Q105-E-XL2 -- 99.2% pass

Results: Agreement between the mainscheme surface and crosslines soundings is excellent. At least 95% of crossline soundings compare to the mainscheme surface within IHO Order 1a -- the worst-comparing crossline had 99.2% of soundings comparing to within IHO Order 1a.

Refer to Separate II: Digital Data for the detailed Crossline QC Reports.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via PMVD	0.098 meters	0 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
ASV-CW5	0 meters/second	2 meters/second	0.025 meters/second
Qualifier 105	0 meters/second	2 meters/second	0.025 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Real-time (dynamic) error estimates were computed and loaded for the majority of the survey data. This replaced the static error estimates for attitude and navigation during final TPU computation. Exceptions, if they exist, are listed in Section B.3 of this report. Refer to the DAPR for more information on derivation of the values used for TPU estimates.

The BASE surfaces were finalized in CARIS HIPS so that the uncertainty value for each grid cell is the greater of either standard deviation or uncertainty. The uncertainty layer of each final surface was then

examined for areas of uncertainty that exceeded allowable TVU for the depth (Order 1a for depths less than 100 m, and Order 2 for depths 100 m and deeper). Uncertainty for the surfaces ranges from 0.20 to 1.77 m.

Greater than 99.5% of grid cells have uncertainty values within allowable TVU. Highest uncertainties were found in areas of varying bottom topography such as slopes and near bottom features where high standard deviations are caused by the wide depth ranges of soundings contributing to each grid cell, outer edges of multibeam swathes without adjacent line overlap, and areas with unrejected noisy soundings. Despite elevated TPU values for these grid cells, the data is within specifications.

B.2.3 Junctions

This survey junctions with one Current and one Prior survey. NOAA's "Gridded Surface Comparison V18.4" utility was used to complete the junction comparisons.

The utility differences the surfaces from the junctioning surveys and generates statistics, including the percentage of grid cells that compare to within allowable TVU.

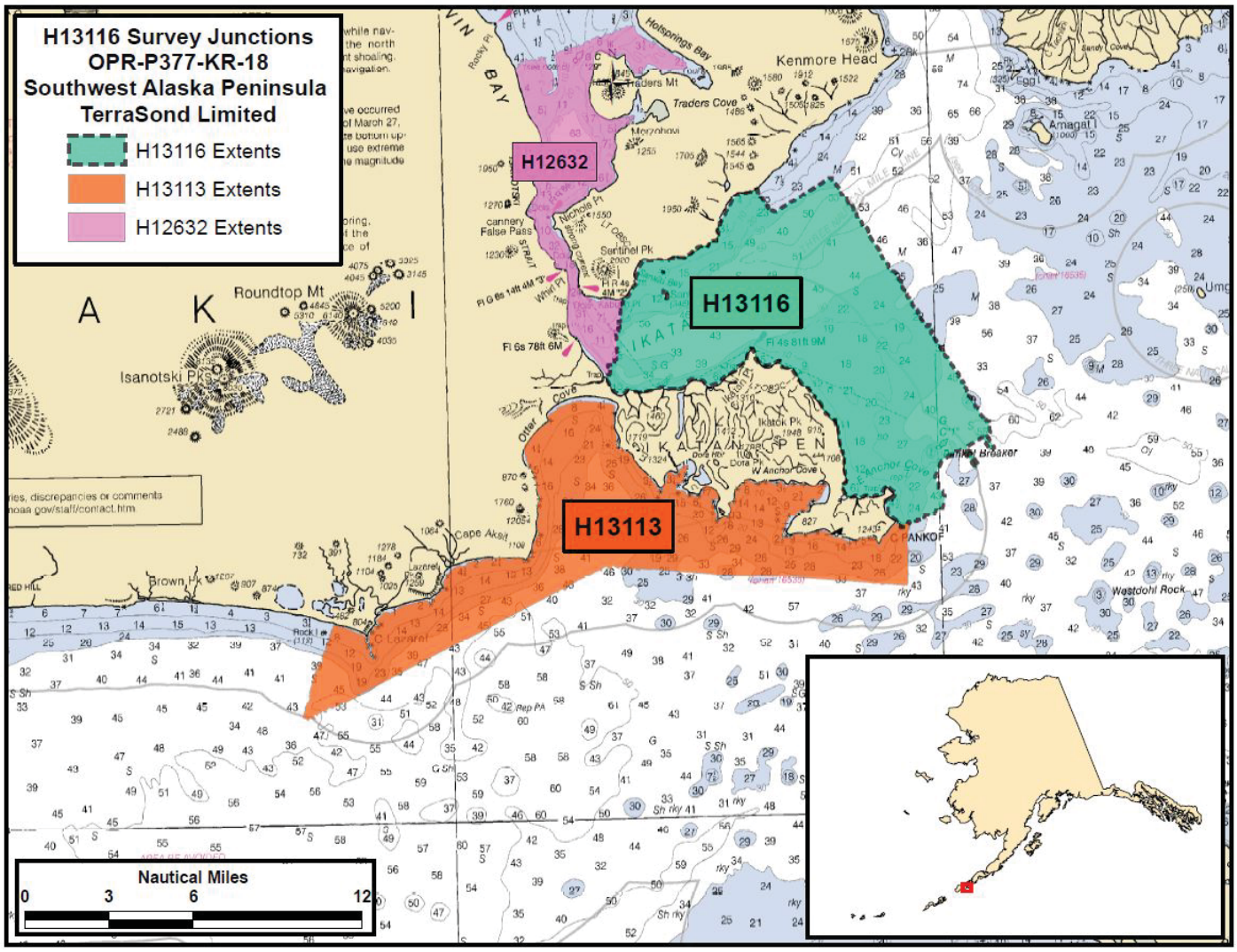


Figure 5: Image showing junctions with this survey

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13113	1:40000	2018	Terrasond, Ltd.	SE
H12632	1:40000	2014	Terrasond, Ltd.	W

Table 9: Junctioning Surveys

H13113

4m CUBE surfaces from each survey was used for this comparison.

Agreement is excellent. The mean difference between the two surveys in their overlapping area is 0.04 m, with a standard deviation of 0.40 m. Over 97 % of grid cells compare to within the allowable TVU.

H12632

The 4 m BAG surface "H12632_MBVB_4m_MLLW_Combined" was downloaded from NGDC to use for the comparison (from https://www.ngdc.noaa.gov/nos/H12001-H14000/H12632.html.) It was compared to a 4 m CUBE surface from this survey.

Agreement is excellent. The mean difference between the 2014 and 2018 surveys in their overlapping area is 0.05 m, with a standard deviation of 0.32 m. Over 99 % of grid cells compare to within the allowable TVU.

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

Q105 Roll Alignment

It became evident during operations that a roll bias was periodically present in data collected on the Q105 vessel. This was determined to correlate to deployment and retrieval of the hydraulic multibeam arm, which was not on the same physical mount as the motion sensor IMU on this vessel. Exact cause is unknown but small fluctuations in hydraulic pressure in the arm actuator are suspected. Effect on pitch and yaw, if any, was not discernible. The issue was addressed in processing by systematically examining lines exhibiting trouble and determining new roll alignment values--which was possible due to significant overlap with adjacent survey lines--and applying them via the HVF. There may be remnants of this error remaining periodically in the Q105 data set but the effect on final surfaces is minor and well within specifications. Additional discussion is available in the DAPR.

B.2.6 Factors Affecting Soundings

Sound Speed Error

Mild to moderate sound speed error is evident periodically throughout the data set. This is observed as a general downward or upward cupping ("frowning" or "smiling") of the seafloor profiles. The issue was addressed in the field through a relatively high cast frequency and tightening of line spacing. In processing filters were used to remove outer beam soundings most subject to the error, and areas showing excessive

"frowning" or "smiling" received additional manual data editing to reject soundings that adversely affected the final surfaces. The effect on final surfaces is relatively minor, generally less than 0.30 m, and within specifications.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 2

Sound speed profiles or casts were acquired aboard the Q105 while underway with an Teledyne Oceanscience RapidCAST system, which utilized a Valeport RapidSV sound speed profiler. The interval between subsequent casts was approximately 2 hours.

Casts were taken as deep as possible. On survey lines with significant differences in depth, the deeper portion of the line was favored to ensure changes across the full water column were measured.

The cast data was used to correct the sounding data for both vessels, using the "nearest in distance within 4 hours" option within CARIS HIPS.

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

* Applanix SmartBase (ASB) or Singlebase (SB) was used instead of PP-RTX for the post-processing method on the following lines to address minor positioning issues.

Vessel ASV-CW5: Lines with prefix 212-213 (JD165) used ASB. 1378-1379 used SB, 1778-1779 ASB, 821, 892, 902 used ASB. All JD178 used ASB. ASB height and navigation only on all JD188 through JD191 lines, also line 1297 from JD184. Line 1748 from JD189 used PPRTX navigation only.
Vessel Q105: All lines from JD190 and JD191 used ASB

* Static error values were used instead of real-time (SMRMSG) error values for the following lines

Vessel ASV-CW5: Lines 2372-2376 and all ASV lines on JD178

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

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 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
H13116_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	0 meters - 20 meters	NOAA_1m	Complete MBES
H13116_MB_2m_MLLW_Final	CARIS Raster Surface (CUBE)	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H13116_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H13116_MB_8m_MLLW_Final	CARIS Raster Surface (CUBE)	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES

Table 10: Submitted Surfaces

The final depth information for this survey was submitted as CARIS BASE surfaces (CSAR format) which best represented the seafloor at the time of the 2018 survey. The surfaces were created from fully processed data with all final corrections applied.

Surfaces were created using NOAA CUBE parameters and resolutions by depth range in conformance with the 2017 HSSD. Surfaces were finalized, and designated soundings were applied where applicable. Horizontal projection was selected as UTM Zone 3 North, NAD83.

Non-finalized versions of the CSAR surfaces are also included which do not have a depth cutoff applied. These do not have the "_Final" designation in the filename.

An S-57 (.000) file was submitted with the survey deliverables as well. The final feature file (FFF) contains meta-data and other data not readily represented by the final surfaces, including bottom samples and shoreline verification results, if applicable. Each object is encoded with mandatory S-57 attributes and NOAA Extended Attributes (V#5.7).

A georeferenced multibeam backscatter mosaic (Geotif format in NAD83 UTM Zone 3N, 1 m resolution) was also produced and is provided with the survey deliverables. Note that backscatter processing and mosaic generation was not a requirement of this survey and the mosaic is provided for interest only. The mosaic may have flaws or holidays which could be addressed through further processing. However, it is of sufficient quality to show the relative changes in seafloor type across the survey area.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

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

ERS Methods Used:

ERS via Poor Mans VDATUM

Ellipsoid to Chart Datum Separation File:

OPR-P377-KR-18_NSPMVD_EPSG6332_NAD83-MLLW_Revised.csar

All soundings were reduced to MLLW using the NSPMVD grid provided by NOAA using ERS methodology. Discrete tide zones were provided but used only for preliminary corrections in the field, as well as comparisons. See HVCR for additional information.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983.

The projection used for this project is Projected UTM 3.

The following PPK methods were used for horizontal control:

Smart Base
Single Base

CORS station geometry allowed for Applanix SmartBase (ASB) processing on this project, with AB06 (False Pass) used as the the primary control station. However, ASB was only used on lines that experienced issues with PP-RTX. Singlebase (using AB06) was also used in select cases. Lines using ASB (or SB) are itemized in the Data Acquisition and Processing section of this report.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
AB06	False Pass

Table 11: CORS Base Stations

The Trimble PP-RTX subscription-based correction service within POSPac was used for final positioning for the majority of lines. Results were good overall, usually at 0.10 m or better vertically. In a few cases PPRTX altitudes were replaced with ASB or SB-processed altitudes to address minor positioning issues, as described earlier.

WAAS was used for real-time positioning only.

D. Results and Recommendations

D.1 Chart Comparison

The chart comparison was performed by examining the best-scale Electronic Navigational Charts (ENCs) that intersect the survey area. The latest edition(s) available at the time of the review were used.

The chart comparison was accomplished by overlaying the finalized BASE surfaces with shoal-biased soundings, and final feature file on the charts in CARIS HIPS. The general agreement between charted soundings and survey soundings was then examined and a more detailed comparison was undertaken for any shoals or other dangerous features. In areas where a large scale chart overlapped with a small scale chart, only the larger scale chart was examined.

When comparing to survey data, chart scale was taken into account so that 1 mm at chart scale was considered to be the valid radius for charted soundings and features.

Results are shown in the following sections. It is recommended that in all cases of disagreement this survey should supersede charted data.

USCG Notice to Mariners (NM) and USCG Local Notice to Mariners (LNM) were checked for updates affecting the area. No updates affecting the survey area issued subsequent to the date of the Hydrographic Survey Project Instructions and before the end of the survey were found except LNMs which were a product of this survey.

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	Preliminary?
US4AK5CM	1:80660	7	07/06/2018	07/06/2018	NO

Table 12: Largest Scale ENCs

US4AK5CM

General agreement is good. Most charted soundings agree to this survey within 1-2 meters, with best agreement in flatter areas. No overall deepening or shoaling trends are apparent.

Significant discrepancies appear to be largely due to misrepresented seafloor topology on steep slopes where a small amount of horizontal positioning variance can cause a large discrepancy in depth, or in areas where the survey technology used to produce the soundings on the chart did not fully capture the least depths of the area. An example is included in the images below.

Notable sounding discrepancies not clearly due to misrepresented seafloor topology include:

1. Depths in the vicinity of charted 74.9 m sounding at 54-50-01.689 N, 163-05-56.116 W found to be considerably deeper at 91 to 92 m.

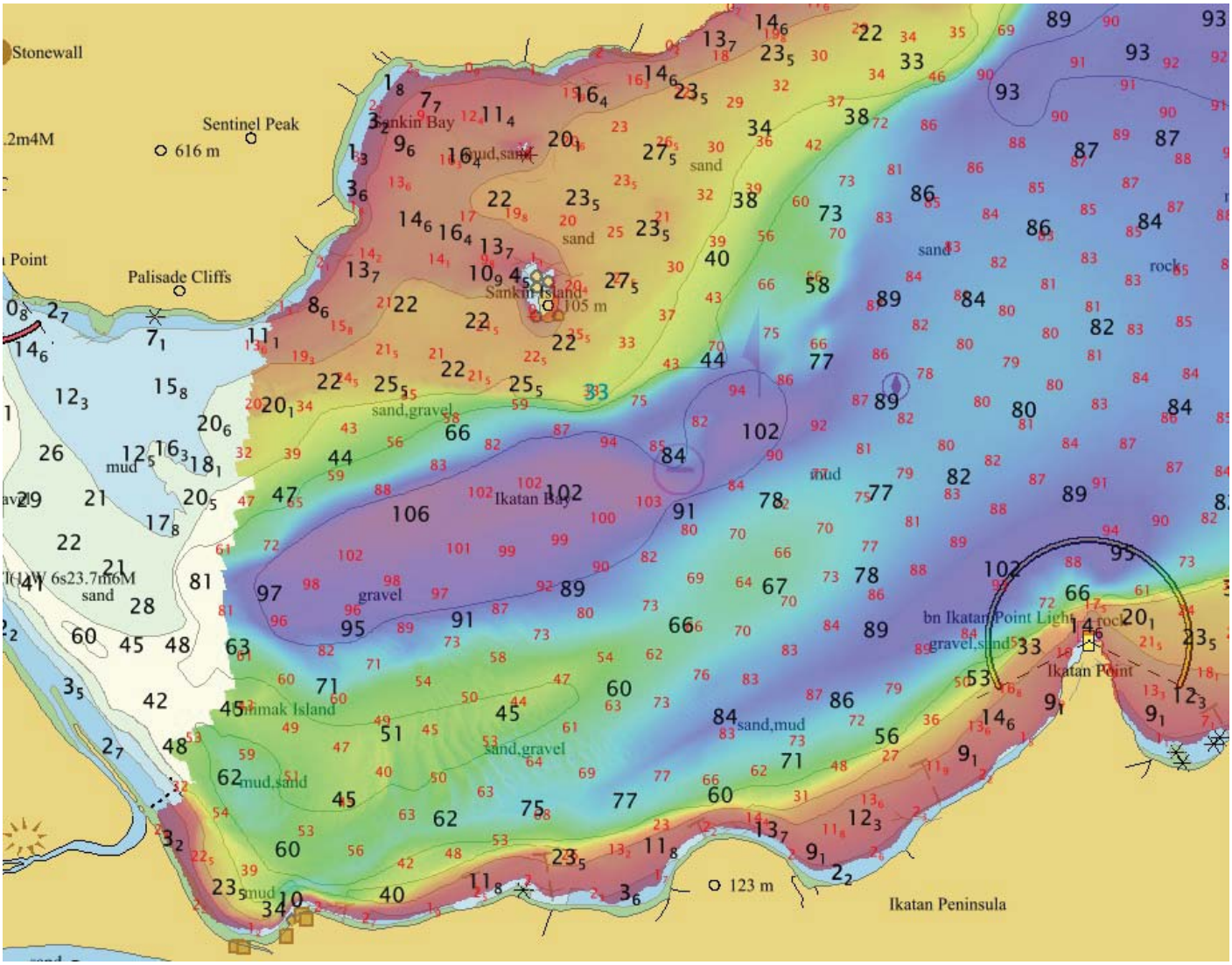


Figure 6: Soundings from this survey (red) shown on chart US4AK5CM (black). West part of the survey area. Soundings in meters.

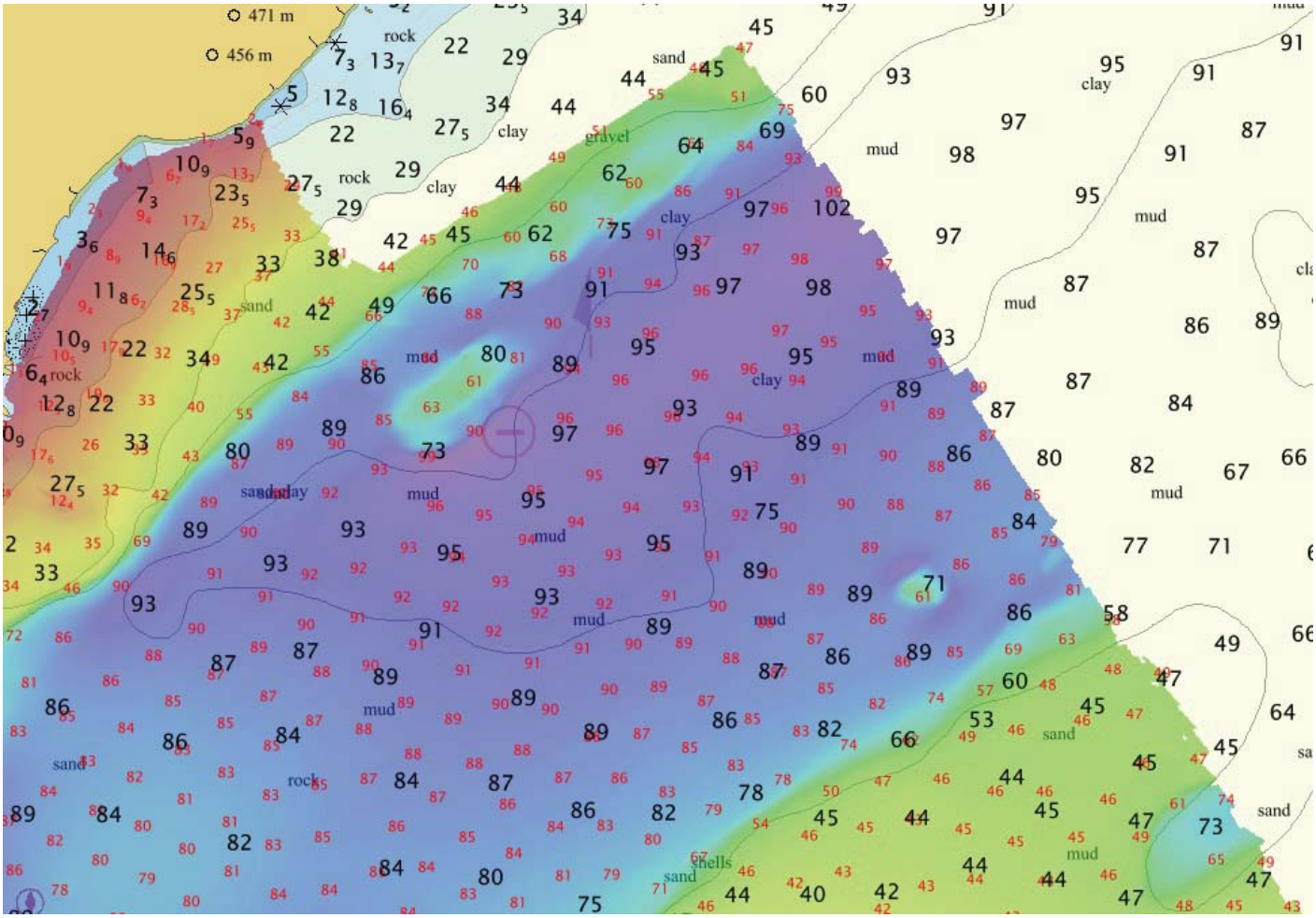


Figure 7: Soundings from this survey (red) shown on chart US4AK5CM (black). North part of the survey area. Soundings in meters.

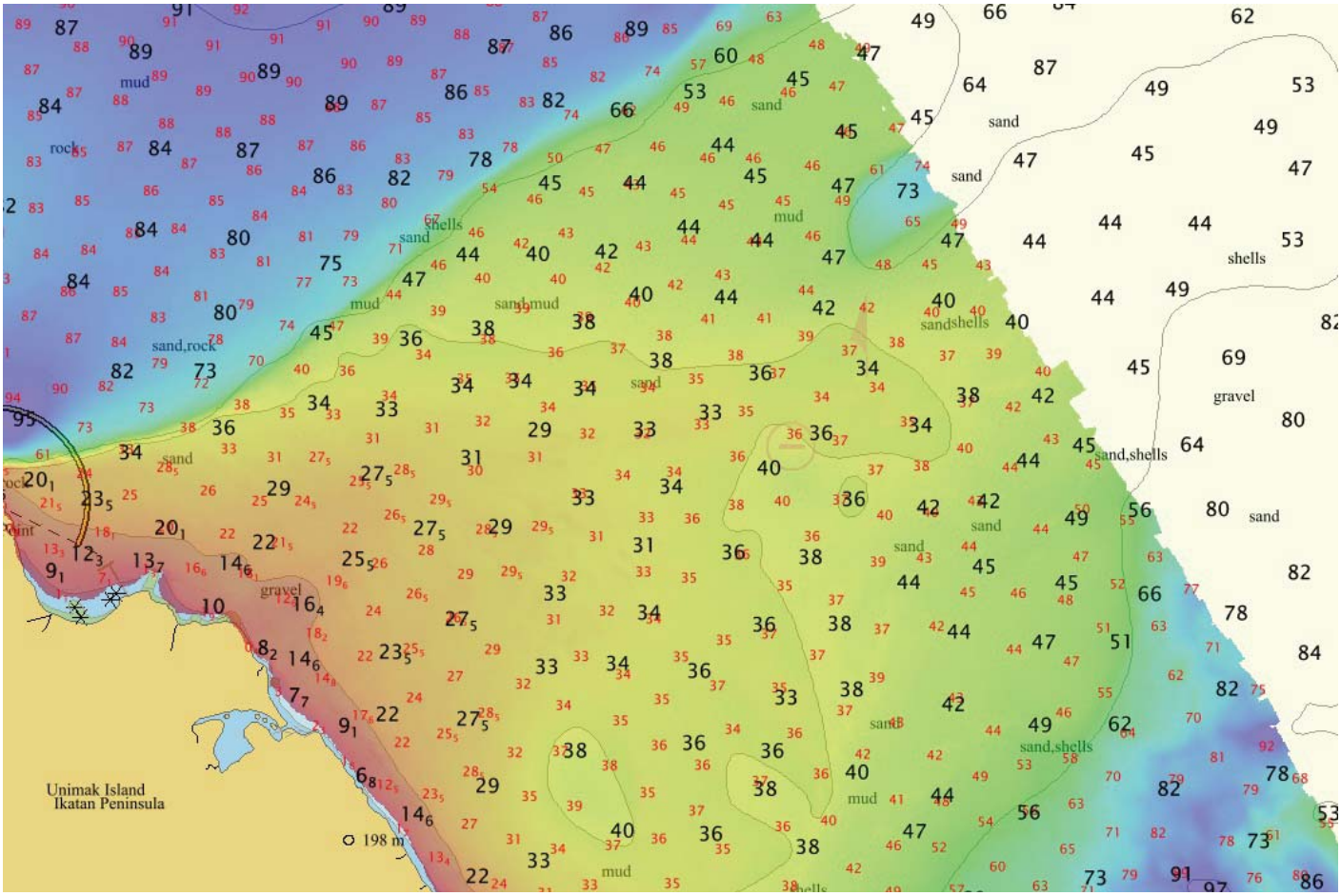


Figure 8: Soundings from this survey (red) shown on chart US4AK5CM (black). East part of the survey area. Soundings in meters.

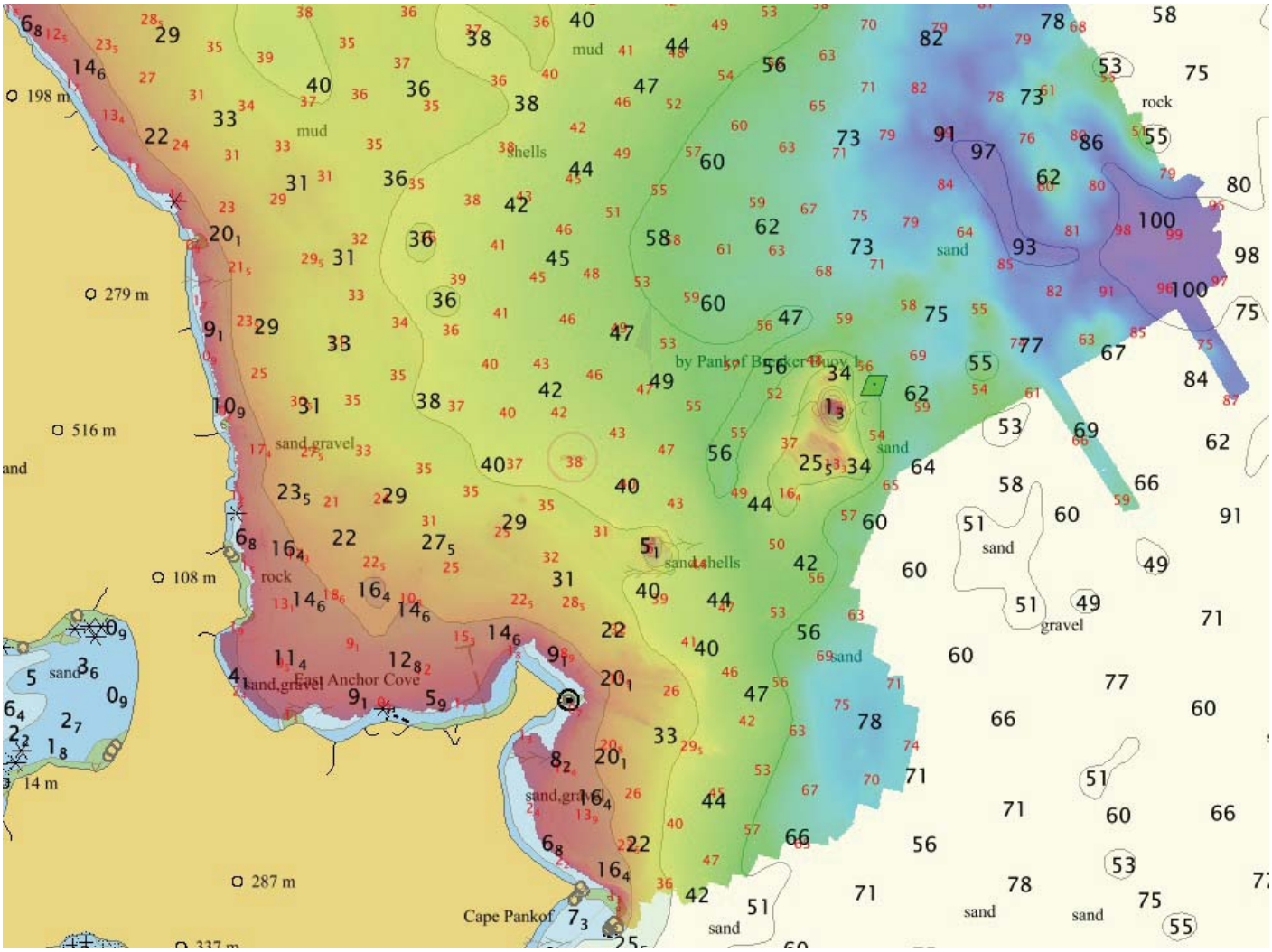


Figure 9: Soundings from this survey (red) shown on chart US4AK5CM (black). South part of the survey area. Soundings in meters.

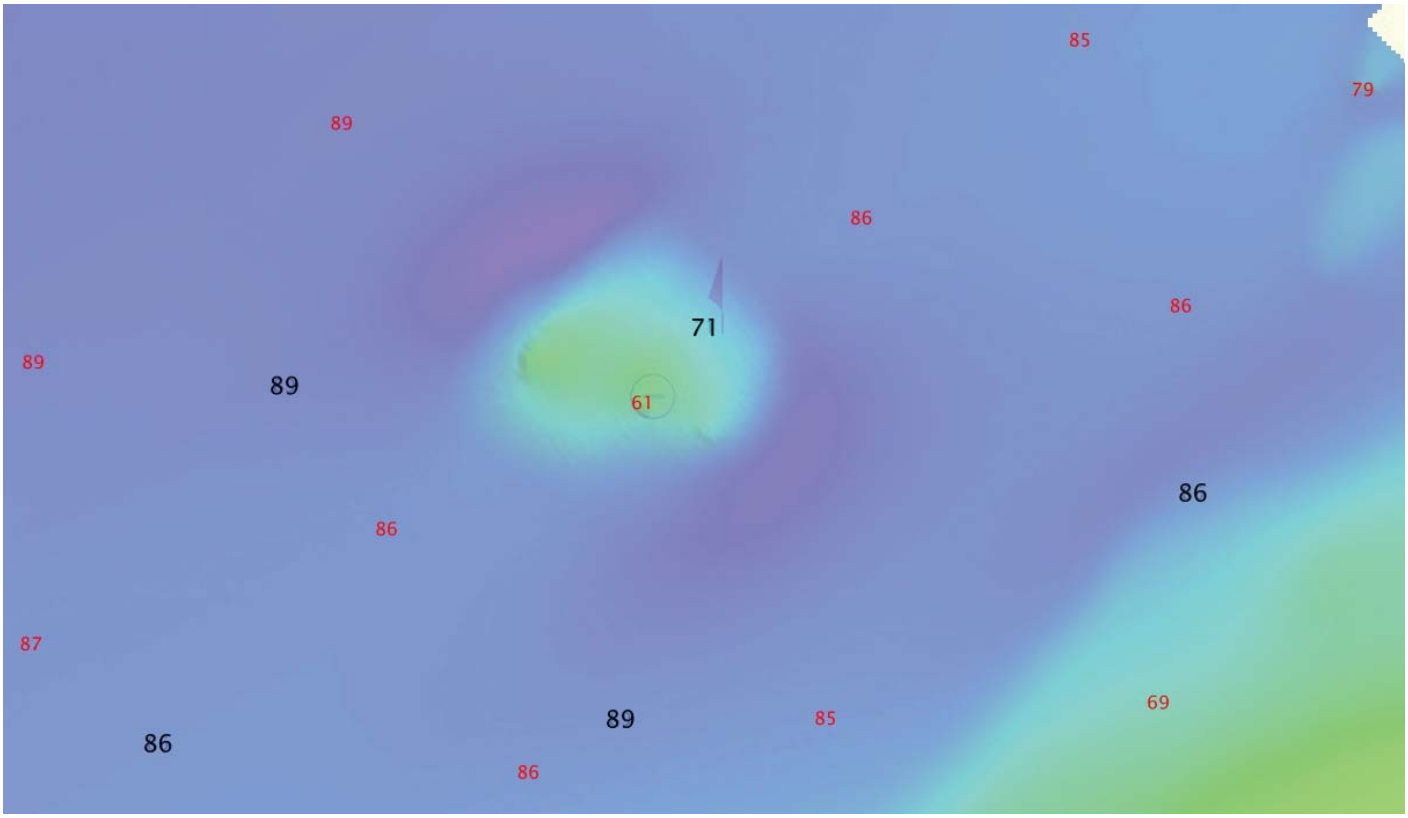


Figure 10: A common example if a discrepancy on this survey. Soundings from this survey (red) shown on chart US4AK5CM (black). The charted 71 m sounding is relatively accurate but does not capture the nearby 61 m rise in the seafloor found on this survey.

D.1.2 Maritime Boundary Points

The position of assigned MBP at 54-43-57.139 N, 163-06-13.465 W appears to refer to an islet approximately 53 m NNW. The islet (and likely actual MBP) is located at 54-43-58.602 N, 163-06-14.294 W with an elevation of 2.26 m MHW.

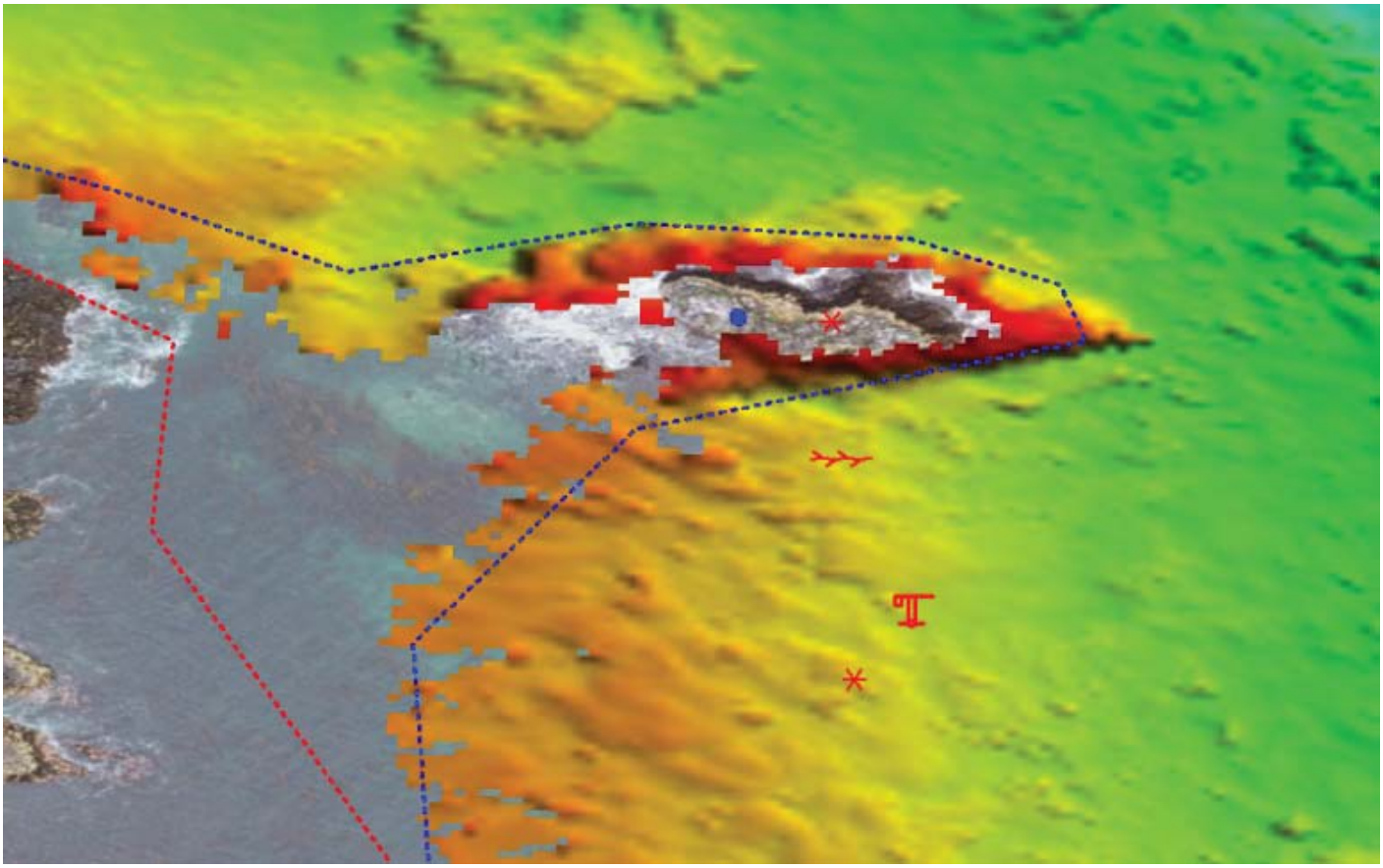


Figure 11: MBP (crane S57 item) shown with MBES coverage and UAS imagery. MBP location is 53 m SSE of the likely actual point, an islet found by this survey (blue feature) to be 2.26 m above MHW.

D.1.3 Charted Features

No charted features exist for this survey that contain the label PA, ED, PD, or Rep. Note that a "Rep" sounding existed prior to chart updates from this survey in the vicinity of East Anchor Cove but was addressed during submission of a DTON report, discussed separately in this report.

D.1.4 Uncharted Features

New features (such as kelp, rocks, reefs, ledges, and foul areas) were commonly identified in the near-shore zone during limited shoreline verification and are portrayed in the FFF. Other significant uncharted features including DTONs are discussed elsewhere in this report.

The following orthometric imagery was used:

File Name	Source	Source Image Date
Mission 39-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/09/2018
Mission 40_B-std-ORTHO-NAD83UTM3N	TerraSond UAS	07/09/2018
Mission 40-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/09/2018
Mission 41-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/10/2018
Mission 42-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/10/2018
Mission 25-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	06/28/2018
Mission 26-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	06/28/2018
Mission 27-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	06/28/2018
Mission 28-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	06/29/2018
Mission 23-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	06/26/2018
Mission 24-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	06/26/2018
Mission 44-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/13/2018
Mission 45-MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/13/2018
Mission 51 [obl] -MLLW-ORTHO-NAD83UTM3N	TerraSond UAS	07/22/2018
2018-Mission51	TerraSond UAS	07/22/2018

Table 13: Orthometric Imagery

D.1.5 Shoal and Hazardous Features

Eight fish trap and associated obstruction line features extending from the shore outwards were assigned for investigation along the north coast of the Ikatan Peninsula (with one additional in East Anchor Cove). All

but one were investigated from MHW to their seaward extents using drone imagery to MLLW, and complete multibeam coverage from 3.5 m to their seaward extents, and no trace of these or associated obstructions to navigation could be found. With the exception of the westernmost fish trap, which was outside the survey area, these are considered to be disproved and are recommended for removal from the chart. Note that although the western-most trap did not receive MBES coverage during this survey, it was previously disproved with MBES coverage and skiff investigation during survey H12632 in 2014 and recommended for removal from the chart at that time.

A DTON was submitted during this survey on 6/29/18 (H13116_DTON_062918) for a 5.12 m sounding found where the chart indicated a reported 12.8 m sounding and a nearby charted 32.9 m sounding at 54-42-03.9 N, 163-02-01.4 W at the approach to East Anchor Cove. This DTON is adequately reflected on the latest edition chart. Note that after application of final correctors the final position of this sounding is 54-42-03.879 N, 163-02-01.302 W with a final depth of 5.362 m. This updated position and depth is shown in the FFF.

Potentially hazardous soundings were found on seafloor rises south of Pankof Breaker. These were not issued as DTONs considering the proximity to the charted Pankof Breaker danger and draft of vessels commonly transiting this area. This included a 16.4 m sounding at 54-42-19.471 N, 163-00-44.035 W which is between charted 43.8 and 25.6 m soundings, as well as a 13.3 m sounding at 54-52-28.117 N, 163-00-18.8 W which is between charted 25.6 and 34.7 m soundings.

The rock forming Pankof Breaker is adequately charted for both position and depth, though a slightly updated position and least depth are provided for this rock in the FFF.

A potentially hazardous sounding was found on a seafloor rise on the north side of the survey area as well. This was also not issued as a DTON considering the proximity to shore and the draft of vessels commonly transiting this area. This survey found a 12.4 m sounding at 54-50-10.693 N, 163-12-35.949 W near a charted 27.4 m sounding at 54-50-15.987 N, 163-12-32.777 W.

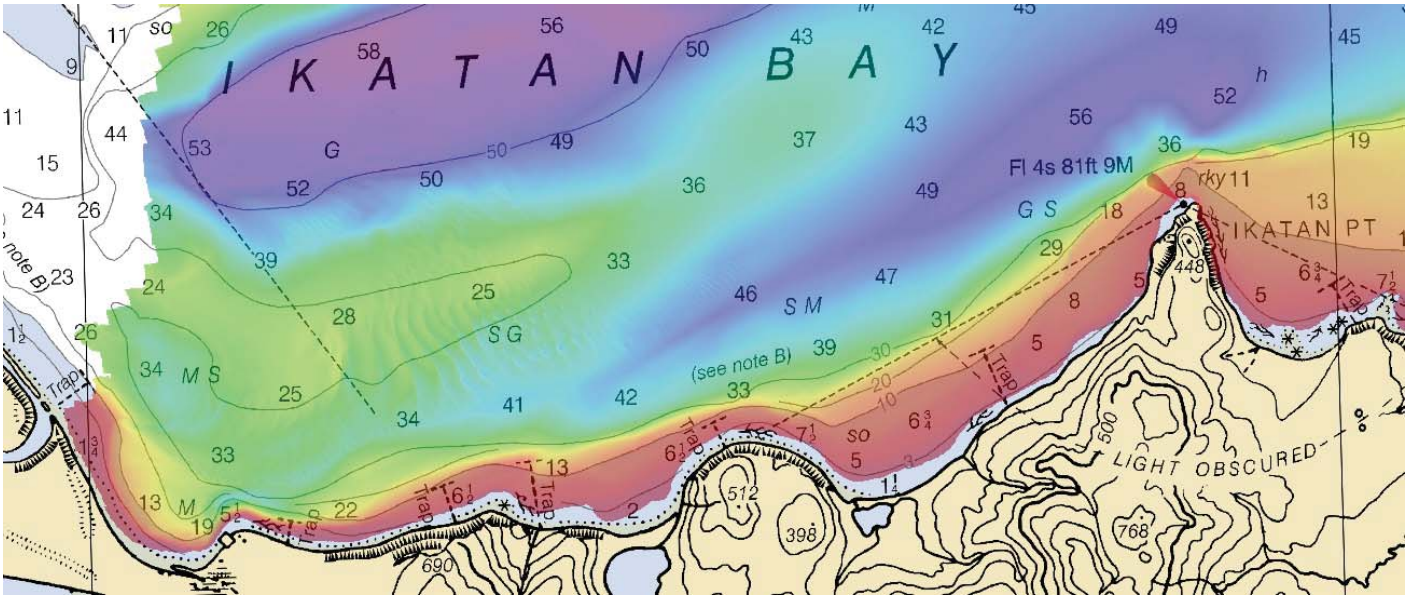


Figure 12: Fish traps along north coast of Ikatan Peninsula shown on chart 16535. No trace of these could be found by this survey. Only the western trap shown here, which was outside the survey extents and did not receive MBES coverage, is recommended to be retained on the chart.

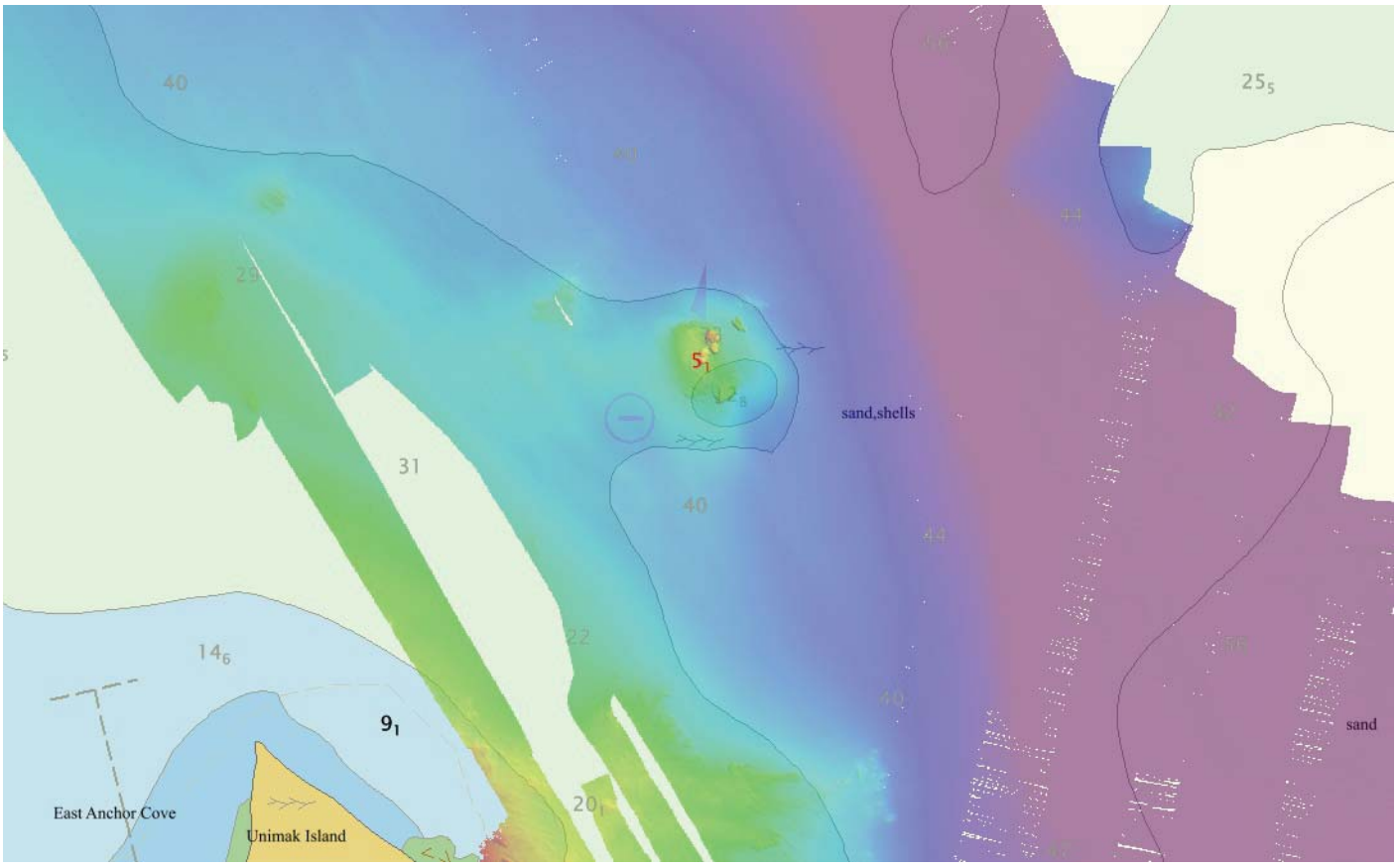


Figure 13: DTON image issued during this survey for the area near East Anchor Cove: 5.1 m sounding found near reported 12.8 m sounding and charted 32.9 m sounding. Final corrections adjusted this to 5.3 m.

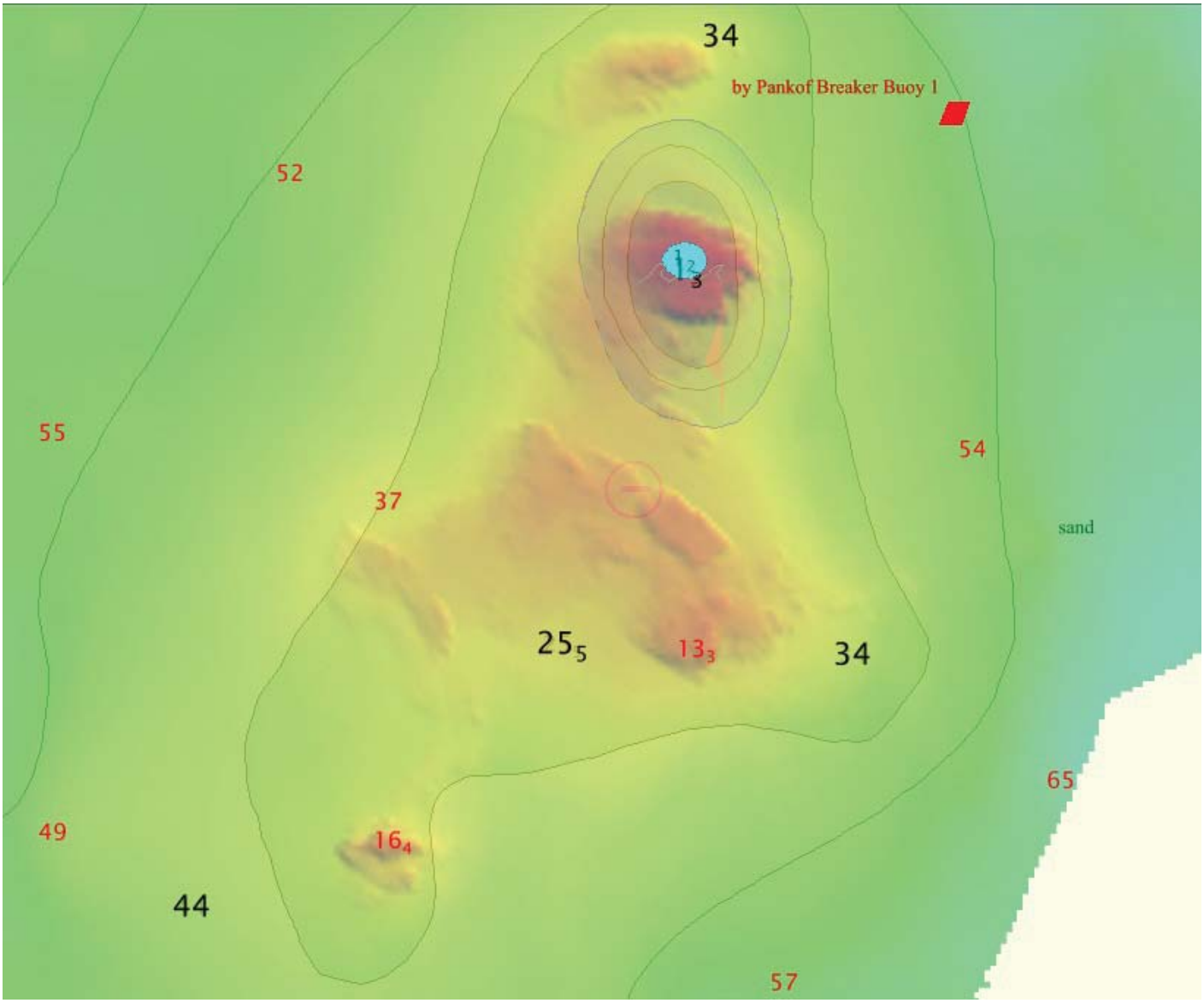


Figure 14: Shoaler than charted soundings on seafloor features south of Pankof Breaker. Soundings from this survey (red) overlaid on soundings from US4AK5CM (black). Note 16.4 m and 13.3 m survey soundings. Also note updated depth (1.2 m) and position of the rock forming Pankof Breaker (blue).

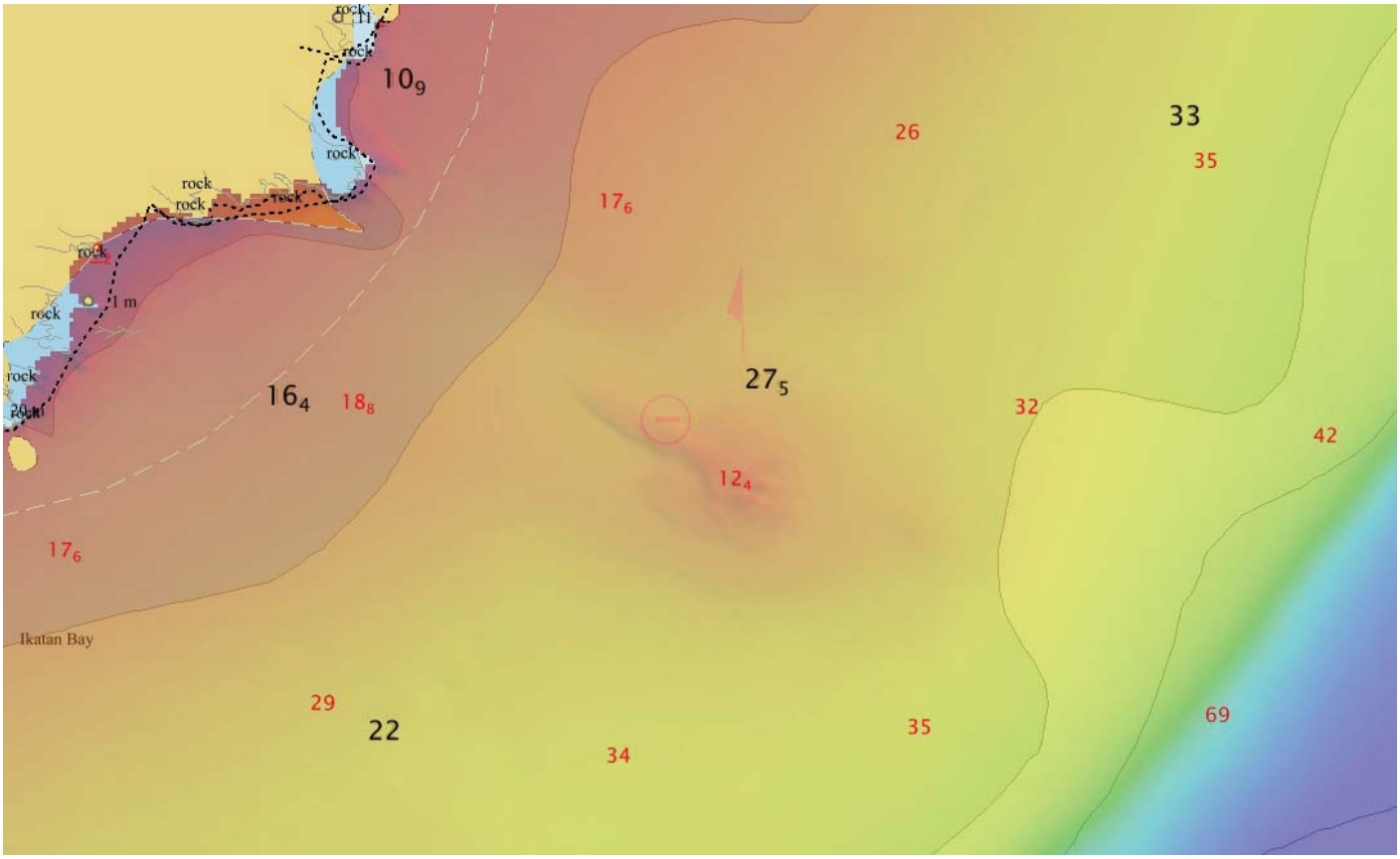


Figure 15: Shoaler than charted sounding on seafloor feature from this survey (red) overlaid on soundings from US4AK5CM (black). Note 12.4 m sounding with 27.5 m sounding nearby

D.1.6 Channels

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

A charted pilot boarding area exists but was not observed to be in use.

D.1.7 Bottom Samples

Seven bottom samples locations were assigned that fell within the extents of this sheet. Samples were successfully obtained at all locations.

Samples ranged from gravel to sand and mud, with broken shells a common secondary constituent in some of the samples.

Bottom samples are included in the FFF. Photos of the sample, if available, are included in the accompanying "multimedia" folder.

D.2 Additional Results

D.2.1 Shoreline

Limited shoreline verification was assigned and accomplished for this project.

A Composite Source File (CSF) and Project Reference File (PRF) were provided with the Work Instructions. Assigned features were extracted from the CSF and PRF and systematically investigated. The primary method of investigation was through low altitude inspection using a UAS (unmanned aerial system) at low tide. Structure from Motion (SfM) software was used to build orthophotomosaics and tide-corrected DEM point clouds of approximately 5 cm resolution over assigned feature locations and the surrounding area within the search radius (80 m, or 1 mm at chart scale). These were then correlated with the assigned features and attributed accordingly in CARIS HIPS to assemble the Final Feature File (FFF) submitted with the survey deliverables.

The majority of features were verified to exist within 80 m of their source location. However, most required modification to their positions or extents. Features originating from the chart showed the greatest discrepancy from this survey, but usually were still within 80 m. GC-sourced features agreed to this survey better, often to within 5 m.

Conflicting features (pairs of features), sourced from GC and the chart, were common in the CSF. These were deconflicted, usually resulting in one revised (new) feature.

Refer to the FFF for investigation results including recommendations. Refer to the DAPR for details on shoreline verification acquisition, processing, and quality control. Refer to the Multimedia directory submitted with the survey deliverables for orthophotomosaics and DEM TIF images (projected as NAD83 UTM Zone 3). Orthomosaics with their dates of acquisition are itemized previously in this report.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey. Prior and Current junction comparison results are discussed previously in this report.

D.2.3 Aids to Navigation

One ATON existed in the survey area and was investigated. No uncharted ATONS were observed.

At the time of this survey, Ikatan Point Light was found to be on station, functional, and serving its intended purpose. The position was checked by UAS inspection and found to agree to within 5 m of the charted and USCG Light List position.

Figure 16: Ikatan Point Light ATON during this survey

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry terminals exist in this survey area.

The Alaska Marine Highway System (AMHS) ferry M/V Tustumena transits this area approximately every two weeks during the summer months to provide ferry service to the community of False Pass.

D.2.8 Abnormal Seafloor and/or Environmental Conditions

Large sand waves are evident on the seafloor in the SW portion of the survey area inside of Ikatan Bay. The largest are up to 10 m in height. Currents can be strong in this area as water is funneled towards Isantoski Strait and False Pass to the NW, resulting in seafloor sediment transport. The sandwave area is included in the FFF.

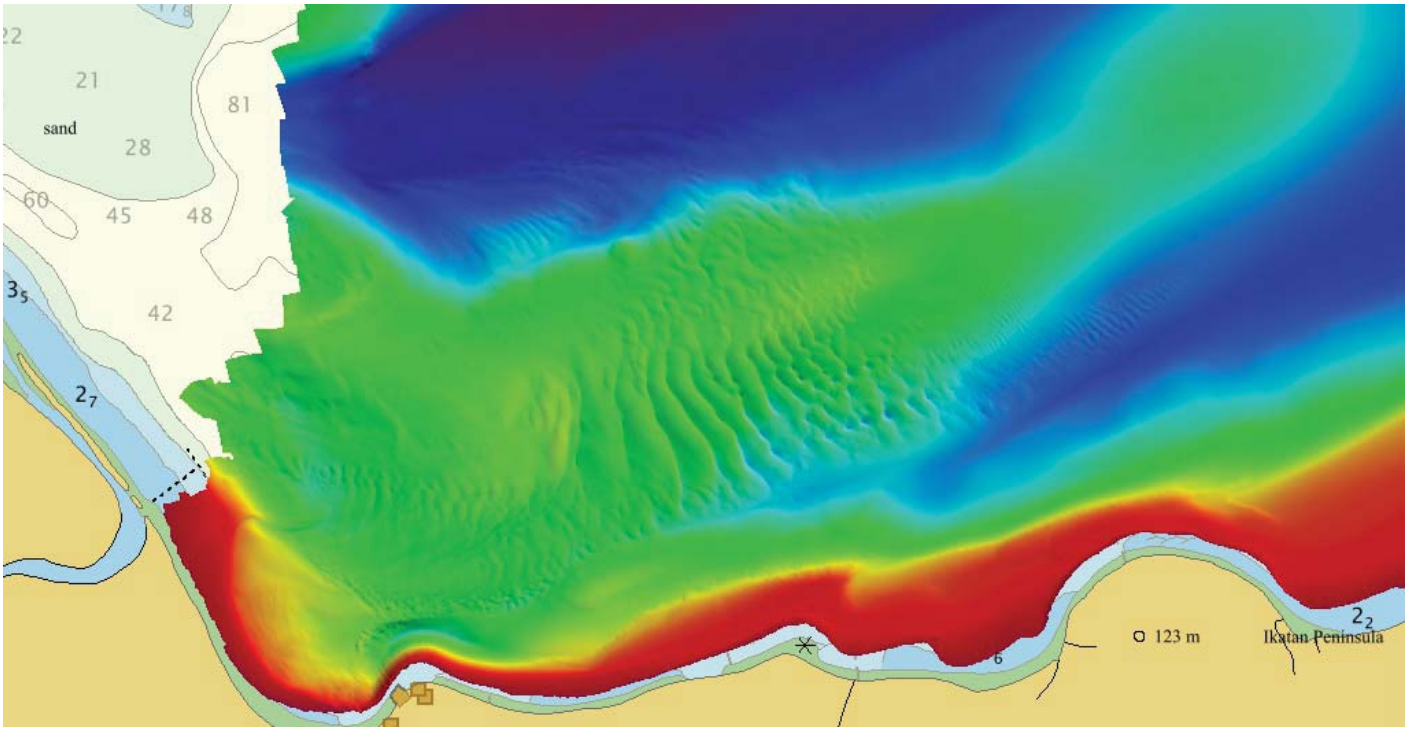


Figure 17: Area of sandwaves evident on the seafloor in the SW part of the survey area. The largest sandwaves near the center of the image are up to 10 m high.

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

Field operations contributing to the completion of this survey were conducted under my direct supervision with frequent personal checks of progress, integrity, and adequacy.

This report, digital data, and all other accompanying records are approved. All records are respectfully submitted for final review and acceptance.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables document as well as the Hydrographic Survey Project Instructions and Statement of Work. This data is adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies--if any--noted in the Descriptive Report.

Report Name	Report Date Sent
Marine Mammal Observers Training Logsheet and Observation Logs	2018-08-28
NCEI Sound Speed Data Submission	2018-11-07
Coast Pilot Review Report	2018-12-17

Approver Name	Approver Title	Approval Date	Signature
Andrew Orthmann, C.H.	TerraSond Charting Program Manager	12/29/2018	Andrew Orthmann Digitally signed by Andrew Orthmann Date: 2018.12.29 18:32:58 -09'00'

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 Staiton
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	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
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
SSSAB	Side Scan Sonar Acoustic Backscatter
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 Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

APPROVAL PAGE

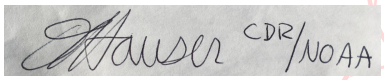
H13116

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

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



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Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch