H13438

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13438

LOCALITY

State(s):	Alaska
General Locality:	Bristol Bay
Sub-locality:	Egegik Bay

2021

CHIEF OF PARTY
Andrew Orthmann

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13438**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Alaska**
General Locality:	**Bristol Bay**
Sub-Locality:	**Egegik Bay**
Scale:	**40000**
Dates of Survey:	**08/01/2021 to 09/17/2021**
Instructions Dated:	**08/16/2021**
Project Number:	**OPR-R340-KR-21**
Field Unit:	**Terrasond**
Chief of Party:	**Andrew Orthmann**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM4N, 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 H13438

Project: OPR-R340-KR-21

Locality: Bristol Bay

Sublocality: Egegik Bay

Scale: 1:40000

August 2021 - September 2021

Terrasond

Chief of Party: Andrew Orthmann

A. Area Surveyed

The survey area is located in Bristol Bay, Alaska. A number of rivers flow into the bay and host the world's largest salmon runs. Seasonal fishing activity, including in the nearby Egegik fishing district, is the major driver of the economic activity in the area.

The region is relatively remote. None of the area communities are accessible by road. Travel and resupply is done by air or water. The closest communities to the survey area are Pilot Point (pop. 101, 2019) and Egegik (pop. 58, 2019). Dillingham (pop. 2,215, 2019), about 70 NM to the north, is the hub of the region with direct daily flights to and from Anchorage.

Vessel traffic consists mostly of barges that service the local communities and fishing vessel activities, especially during the busy summer fishing season. Fishing activity usually begins in June, peaks in July, and is largely over by August. The Egegik fishing district can have as many as 800 fishing boats laying nets and working in close proximity to each other at the height of the season. This project was timed to take place late in the summer season when fishing activities had diminished.

Tides have a large range here, usually four to five meters between high and low each day. As a result tidal currents are also strong, frequently in the range of 2-3 knots outside of the bay, but can reach 4 knots or more inside the bay on ebb tides when river current combines with the outgoing tide.

The large tide range allows relatively deep drafted vessels to navigate to and from Egegik at mid to high tides. Vessels with drafts from 8-10' were occasionally observed navigating inside the bay during survey operations, but only with significant tide. At high tide nearly all shoals are covered.

As a result of the strong currents, the seafloor is extremely dynamic and continuously shifting, with sandwaves obvious almost everywhere. Inside Egegik Bay is especially dynamic, with significant bottom change frequently observed on lines run just days apart. The location of channels and shoals inside the bay is dramatically different than what is currently charted.

Bathymetric data collection was carried out from August through September of 2021 under project OPR-R340-KR-21, with final processing and reporting carried out from October through December, 2021. Work was completed concurrently with five other nearby sheets, and done in accordance with the Hydrographic Survey Project Instructions (original dated 2/22/21, updated 8/16/21), Statement of Work (2/24/21), and the Hydrographic Surveys Specifications and Deliverables (HSSD, May 2020 edition).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
58° 17' 17.34" N 157° 40' 38.1" W	58° 4' 42.53" N 157° 20' 40.75" W

Table 1: Survey Limits

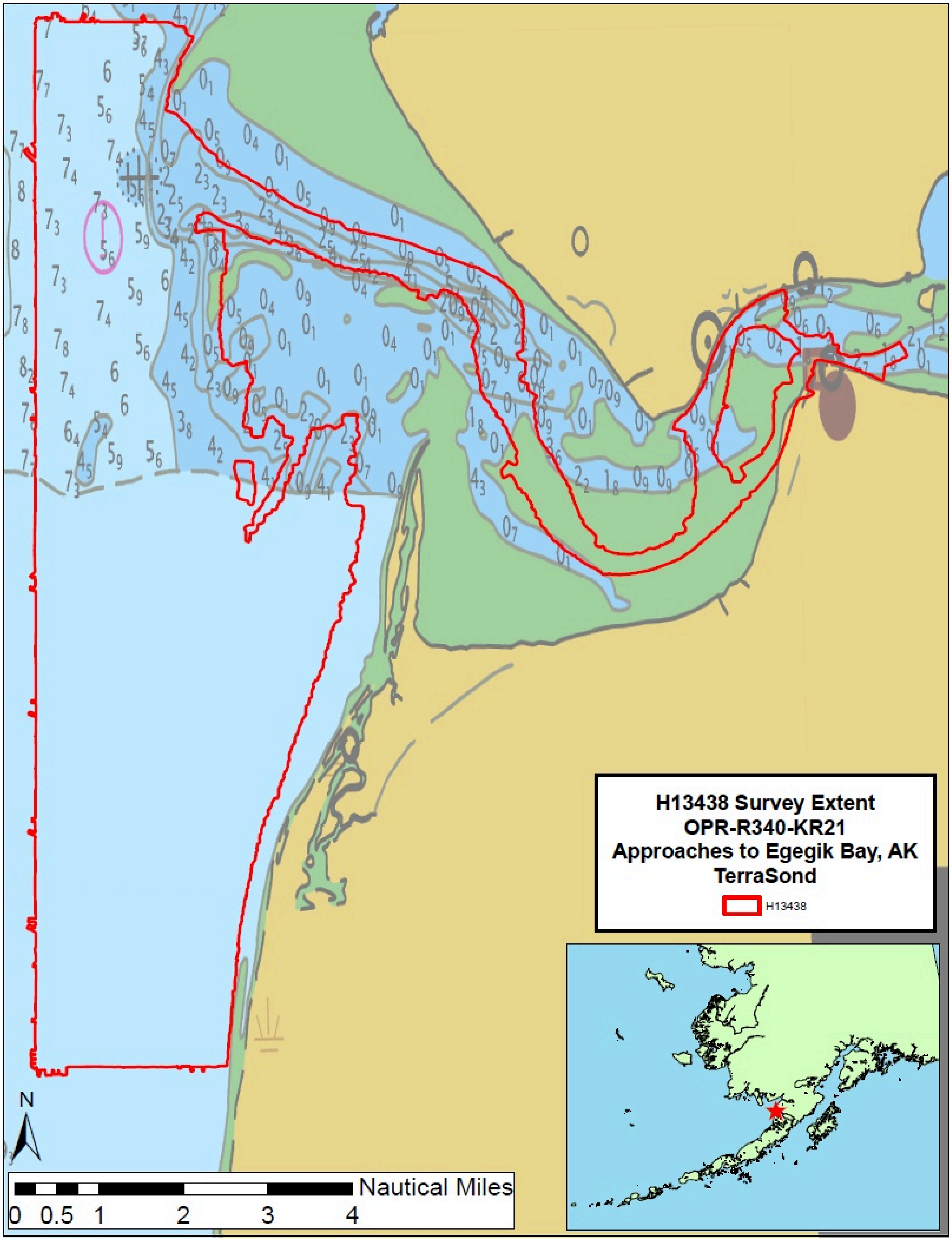

Figure 1: Image showing overview of survey extents.

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

A.2 Survey Purpose

The purpose of this survey is described as follows in the Project Instructions document:

The Approaches to Egegik Bay project located in Bristol Bay, Southwest Alaska, will provide contemporary surveys to update National Ocean Service (NOS) nautical charting products and services. The survey will provide modern bathymetry to update historic charted data, survey uncharted waters, and address concerns of navigational risk due to shoal formation.

Direct user feedback from the Western Alaska Tanker Lightering Best Practices Committee via the Alaska Maritime Prevention & Response Network, identified areas that support Ship-to- Ship transfers of oil products, commonly referred to as "lightering." Together with the Automatic Identification Systems (AIS) traffic patterns feeding the Hydrographic Health model, the lightering areas helped to define the 749 square nautical mile survey extents. Areas to be surveyed include uncharted waters and historic data from 1914 to the 1940s.

This work will directly support the maritime services available to the remote native coastal community of Egegik (Igyagiiq) located within the mouth of the Egegik River.

Additionally, this project will provide support for other NOAA Hydrographic surveys and regional tidal products by installing two temporary water level measuring stations in the vicinities of Egegik and Pilot Point.

Modern charting products reduce the risk to navigation, increasing maritime safety and supporting the regions maritime infrastructure and commerce. Remote harbors and lightering sites are are essential to the maritime infrastructure of Alaska's communities. This project will provide that critical data for the updating of National Ocean Service (NOS) nautical charting products.

Figure 2: A barge on anchor inside Egegik Bay.

Figure 3: A fishing tender anchored south of Egegik, waiting on higher tides to navigate.

Figure 4: Egegik waterfront, looking north.

Figure 5: Egegik waterfront, looking south.

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
Inshore limit to 8 meters water depth in Sheet 1	Set Line Spacing MBES with concurrent backscatter perpendicular to contours (Refer to HSSD Section 5.2.2.4, Option A)
Greater than 8 meters water depth in Sheet 1	Complete Coverage (Refer to HSSD Section 5.2.2.3, Option A)

Table 2: Survey Coverage

LNM Requirements:

The project required 5,726 LNM of survey data to be acquired project-wide. This consisted of the originally assigned 5,429 and an additional 297 authorized by the Government on 9/8/21 (see correspondence included with project deliverables).

6,007 LNM were acquired project-wide, exceeding the requirement by 281 LNM. The excess of 4.9% was collected to compensate for inefficiencies incidental to data collection such as crossline mileage that exceeded requirements, data acquired on run-ins or run-outs including on turns in shallow water in order to scout depths between lines, and excess overlap (if any). LNM quantities do not include transit or calibration data, or mileage that does not meet HSSD specifications.

Inshore Limit:

The inshore limit was defined in the Project Instructions as follows: "The inshore limit is the Navigable Area Limit Line (Refer to HSSD 1.3.2), except for those areas <8m in Sheet H13438 that define the Egegik Channel survey, where the inshore limit is defined as the inshore limit of safe navigation for the vessel, as determined by the Chief of Party in consultation with his or her field personnel. If kelp, rocks, breakers, or other hazards make it unsafe to approach the coast to the sheet limits, the NALL shall be defined as the shoreward boundary of the area in which it is safe to survey. The coverage requirements are as follows below, unless otherwise authorized by the COR and CO. If alternate coverage requirements are provided by the COR and CO during the lifecycle of the contract, include the correspondence with the applicable deliverables."

For this survey, outside of the bay, 3.5 m water depth defined the NALL and was reached on all lines along the coast.

Inside the bay, the limit of safe navigation served as the NALL. A reconnaissance was undertaken inside the bay on JD215 and JD216, the results of which were communicated with the COR with recommendations for survey, including depth limits, extents, and line patterns. The plan was approved by NOAA and is included with the survey correspondence. Due to the fact that much of the bay was shoaler than 3.5 m, and given the extensive tide range of the area, it was decided that soundings shoaler than 3.5 m could be achieved safely and would be valuable for the mariners that navigate the area. The plan called for 1 m depths in the west part of the bay, 0 m depths in the south portion of the bay, and -0.5 m depths in the east (upper) part of the bay. During operations inside the bay the field crew generally achieved these target depths, but in some cases turned away early for safety reasons, usually because of excessive current in proximity to shoals.

Set Line Spacing:

Set Line Spacing was required in areas areas of depths less than 8 meters. 100 m spacing was achieved in these areas.

Inside the bay, per the survey plan discussed above, a zig-zag / diagonal pattern was undertaken to acquire survey lines bank to bank in an as operationally efficient and safely as possible. This resulted in up to 200 m spacing at turns (normally at the bank or shallow limit), but 100 m spacing at points inside the pattern. The planned pattern was achieved overall, except in rare instances where safety issues prevented additional passes near the shallow ends of the lines.

In addition, inside the bay, "channel" lines, or lines paralleling the depth contour, were collected whenever the survey vessel was working inside the bay. These were generally offset about 100 m from previous channel lines in order to provide denser data within the channel, and also served as crosslines in many cases.

Note that "recon" lines, which were any lines collected by the Sealegs vessel inside the bay on JD215 and JD216, are included in the coverage for the project. They do not conform to Set Line Spacing standards outside the channel since they were completed for reconnaissance purposes only, but are included in the survey coverage because they add value to the outdated and uncharted areas, and are integrated into the mainscheme survey where they intersect.

Complete Coverage:

Complete Coverage was achieved in all areas deeper than 8 m. Exceptions are some isolated "deep spots" inside the bay, where it was agreed Complete Coverage would not be required and where Set Line Spacing would suffice (see correspondence).

Note that in some cases along the 8 m contour, where Complete Coverage transitions to Set Line Spacing, small pockets of water deeper than 8 m exist inside Set Spaced Lines that were not developed further. These were normally not developed when the seaward extend of the 8 m had already been defined, and the pockets were due to areas between crests of transitory sandwave features.

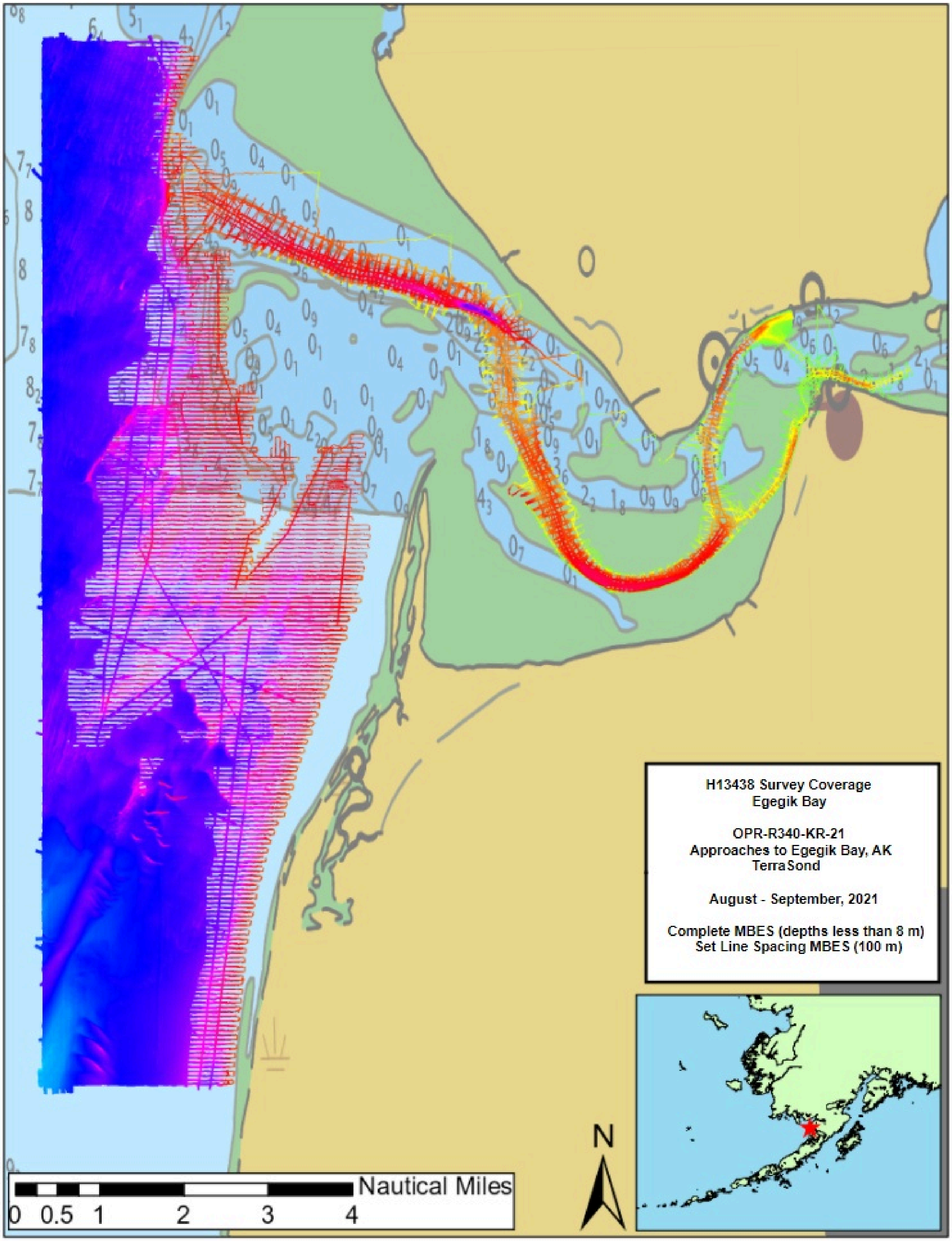

Figure 6: Image showing overview of survey coverage.

A.6 Survey Statistics

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

	HULL ID	*Qualifier 105*	*Sealegs*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	881.1	494.4	1375.5
	Lidar Mainscheme	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0
	SBES/MBES Crosslines	86.2	29.9	116.1
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				3
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				38.6

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/01/2021	213
08/02/2021	214
08/03/2021	215
08/04/2021	216
08/05/2021	217
08/07/2021	219
08/08/2021	220
08/09/2021	221
08/10/2021	222
08/11/2021	223
08/12/2021	224
08/13/2021	225
08/16/2021	228
08/17/2021	229
08/18/2021	230
08/21/2021	233
08/22/2021	234
08/23/2021	235
08/24/2021	236
08/28/2021	240
08/30/2021	242
08/31/2021	243
09/01/2021	244
09/02/2021	245
09/03/2021	246
09/04/2021	247
09/16/2021	259
09/17/2021	260

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***Qualifier 105***	***Sealegs***
LOA	32.0 meters	5.5 meters
Draft	1.8 meters	0.5 meters

Table 5: Vessels Used

Figure 7: RV Qualifier 105 (Q105)

Figure 8: Sealegs skiff

The Qualifier 105 (Q105) is a 105' aluminum-hull vessel owned and operated by Support Vessels of Alaska (SVA). 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 tide buoys, conduct sound speed casts, conduct feature investigations, and deploy/support the Sealegs vessel.

The Sealegs is a 5.5 m RHIB-style skiff owned and operated by SVA. It was deployed via deck crane from the Q105 when conditions were favorable, and used to collect multibeam data in the shoalest portions of the survey area that were not readily accessible by the larger vessel.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Teledyne RESON	SeaBat T20-P	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne Oceanscience	rapidCAST	Sound Speed System
Valeport	SWiFT SVP	Sound Speed System
AML Oceanographic	MicroX SV	Sound Speed System
AML Oceanographic	SV-Xchange	Sound Speed System

Table 6: Major Systems Used

The survey vessels were configured for MBES data collection with similar survey equipment and software. Both vessels utilized Reson Seabat MBES systems (T-50 on the Q105, T-20 on the Sealegs), with surface sound speed measurements provided by AML Oceanographic Micro-X sensors. Both vessels used Applanix POSMVs (Wavemaster II) with submersible IP-68 rated IMUs for attitude and position measurements. Sound speed profiles were collected using a Valeport SWiFT sensor (deployed while underway using a Teledyne Oceanscience RapidCast system) on the Q105, while the Sealegs utilized a AML Oceanographic Minos-X (with P- and SV-Xchange sensors) deployed by hand. QPS QINSy software, running on Microsoft Windows 10-based PCs, was used for multibeam data logging and vessel navigation.

B.2 Quality Control

B.2.1 Crosslines

Crossline LNM totaled 8.4% of mainscheme.

Since this sheet had a combination of Set Line Spacing and Complete Coverage, the higher standard of 8% of mainscheme (for Set Line Spacing) was used as the target for crossline totals.

Effort was made to ensure crosslines (XLs) had good temporal and geographic distribution, were angled to enable nadir-to-nadir comparisons, and that the required minimum percent of mainscheme LNM was achieved. Additionally, crosslines from each vessel was acquired over the other vessel's mainscheme where possible.

Crosslines were often collected while transiting across the survey area to reach a different survey priority such as bottom sample locations or infills, often leading to crosslines that were diagonal to the direction of mainscheme lines.

The crossline analysis was conducted using CARIS HIPS “Line QC Report” process. Each crossline (with all associated file segments) was selected and run separately through the process, which calculated the depth difference between each accepted crossline sounding and a "QC" BASE (CUBE-type) surface’s depth layer created from the mainscheme data. The QC surface was created with the same parameters and resolution used for the final surface, with the important distinction that the QC surface 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.

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 could be counted as a QC failure in this process.

Note: Prior to this survey, the location of the 8 m contour and therefore areas requiring Complete MBES was generally unknown. Therefore initial operations focused on collecting widely spaced Set Line Spacing lines perpendicular to shore. As the general location of the 8 m contour became better known, areas deeper than 8 m were filled in to achieve Complete MBES. This resulted in a fair number of Set Spaced mainscheme lines that intersect Complete MBES areas and made good crosslines. These were often selected to run through the QC report process.

Similarly, "channel"or "recon" lines run inside the bay were sometimes selected as crosslines due to their large number of crossings on the bank-to-bank mainscheme lines run there.

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

Note that lines with with "XL" in the filename were acquired as dedicated crosslines, while lines without "XL" were mainscheme that were used in the QC report process due to their large number of crossings. Only the portion of the mainscheme line with crossings was counted towards achieving crossline requirements. The portion counted towards achieving crossline requirements is noted next to the line name below, where applicable.

0118-Q105-213-A1EW22840_-_0001 -- 100.0% pass (735m used as XL)
0354-Q105-219-A1XL00001_-_0001 -- 100.0% pass
0360-Q105-220-A1XL00003_-_0001 -- 100.0% pass
1990-Q105-259-A_XL11_-_0001 -- 100.0% pass
1996-Q105-259-A_XL13_-_0001 -- 100.0% pass
2005-Q105-259-A_XL17_-_0001 -- 100.0% pass
1100-SLG-259-A1XL -- 100.0% pass
1106-SLG-259-A1XL2_-_0001 -- 100.0% pass
1111-SLG-259-A1XL4 -- 100.0% pass

1113-SLG-259-A1XL5_-_0001 -- 100.0% pass
1118-SLG-259-A1XL6_-_0001 -- 100.0% pass
1119-SLG-259-A1XL7_-_0001 -- 100.0% pass
1122-SLG-259-A1XL8 -- 100.0% pass
1139-SLG-259-A1X_12_-_0001 -- 100.0% pass
1143-SLG-260-A1XL13_-_0001 -- 100.0% pass
1146-SLG-260-A1XL14_-_0001 -- 100.0% pass
1149-SLG-260-A1XL15_-_0001 -- 100.0% pass
0345-Q105-219-A1EW07700_-_0001 -- 100.0% pass (735m used as XL.)
0400-Q105-221-A1NS00400_-_0001 -- 100.0% pass (1471m used as XL)
1152-SLG-260-A1XL16_-_0001 -- 100.0% pass
2002-Q105-259-A_XL15_-_0001 -- 100.0% pass
0684-Q105-228-A1EW07600_-_0001 -- 100.0% pass (395m used as XL)
1103-SLG-259-A1XL2 -- 100.0% pass
0682-Q105-228-A1EW07500_-_0001 -- 100.0% pass (375m used as XL)
2044-Q105-260-A_XL_-_0001 -- 100.0% pass
0364-Q105-220-A1XL00005 -- 100.0% pass
2065-Q105-260-A_XL -- 100.0% pass
2036-Q105-260-A_Xllong -- 100.0% pass
2059-Q105-260-A_XL_SetSpacing_-_0001 -- 100.0% pass
2008-Q105-259-A_XL18_-_0001 -- 100.0% pass
2063-Q105-260-A_XL -- 100.0% pass
1159-SLG-260-A1XL17 -- 100.0% pass
1134-SLG-259-A1XL10_-_0001 -- 100.0% pass
0363-Q105-220-A1EW19700 -- 100.0% pass (4019m used as XL)
0399-Q105-221-A01XL_-_0001 -- 100.0% pass
0679-Q105-228-A1EW07100_-_0001 -- 100.0% pass (390m used as XL)
2064-Q105-260-A_XL -- 100.0% pass
1110-SLG-259-A1XL3 -- 100.0% pass
2058-Q105-260-A_XL -- 100.0% pass
2062-Q105-260-A_XL_SetSpacing -- 100.0% pass
2038-Q105-260-A_SetSpacing_XL2 -- 100.0% pass
1046-Q105-240-A1NS03200_-_0001 -- 100.0% pass (575m used as XL)
0674-Q105-228-A1EW06800_-_0001 -- 100.0% pass (1896m used as XL)
0346-Q105-219-A1EW08700_-_0001 -- 100.0% pass (1633m used as XL)
2060-Q105-260-A_XL -- 100.0% pass
2037-Q105-260-A_SetSpacing_XL -- 100.0% pass
2057-Q105-260-A_XL -- 100.0% pass
0353-Q105-219-A1EW09700_-_0001 -- 100.0% pass (685m used as XL)
0112-Q105-213-A1EW22800_-_0001 -- 100.0% pass (370m counted as XL)
0355-Q105-219-A1XL00002_-_0001 -- 100.0% pass
0479-Q105-223-A1NS00400_-_0002 -- 100.0% pass (915m used as XL)
2061-Q105-260-A_XL_-_0001 -- 100.0% pass
0044-JD216-Sla_MBE -- 100.0% pass (2982m used as XL)
2056-Q105-260-A_XL_SetSpacing -- 100.0% pass
1130-SLG-259-A1XL9_-_0001 -- 100.0% pass

0261-Q105-216-A1EW04900_-_0001 -- 100.0% pass (400m used as XL)
0357-Q105-220-A1EW14900_-_0001 -- 100.0% pass (770m used as XL)
2039-Q105-260-A_XL -- 100.0% pass
0365-Q105-220-A1EW21900_-_0001 -- 100.0% pass (500m used as XL)
0362-Q105-220-A1XL00004 -- 100.0% pass
2040-Q105-260-A_XL_-_0001 -- 100.0% pass
0182-Q105-215-A1EW00800_-_0001 -- 100.0% pass (340m used as XL)
0191-Q105-215-A1_Boundary_Line_-_0001 -- 100.0% pass (625m used as XL)
0361-Q105-220-A1EW17500 -- 100.0% pass (3823m used as XL)
0582-Q105-225-A1NS02700_-_0001 -- 99.9% pass (340m used as XL)
1128-SLG-259-A1XL8_-_0001 -- 99.9% pass
0155-Q105-215-A1_Recon -- 99.9% pass (3946m used as XL)
1136-SLG-259-A1XL11_-_0001 -- 99.9% pass
0116-Q105-213-A1EW22700_-_0001 -- 99.8% pass (732m used as XL)
0568-Q105-225-A1NS02100_-_0001 -- 99.8% pass (340m used as XL)
0358-Q105-220-A1XL00003_-_0001 -- 99.8% pass
2010-Q105-259-A_XL19 -- 99.7% pass
0374-SLG-230-Centerline -- 99.7% pass (9692m used as XL)
0113-Q105-213-A1EW22700_-_0001 -- 99.5% pass (450m used as XL)
0380-Q105-220-A1EW22700_-_0001 -- 99.4% pass
0439-SLG-234-S-1_(100.00) -- 99.4% pass (16788m used as XL)
0194-Q105-215-A1EW03900_-_0001 -- 99.2% pass (650m used as XL)
1999-Q105-259-A_XL14_-_0001 -- 99.1% pass
0117-Q105-213-A1EW22800_-_0001 -- 97.8% pass (740m used as XL)
0115-Q105-213-A1EW22600 -- 94.3% pass (1374m used as XL)

Results: Agreement between them mainscheme surface and crossline soundings is excellent. At least 95% of crossline soundings compare to the mainscheme surface within IHO Order 1a for all but one crosslines.

One crossline (0115-Q105-213-A1EW22600 - a mainscheme with 1374 m used as XL) -- had a marginal failure at 94.3% passing when compared to a 4 m resolution mainscheme surface. The crossline was re-run through the process but using a 1 m mainscheme surface due to large numbers of sandwaves and found to pass at 96.4% when comparing to a finer resolution grid that better captured the variable seafloor. Final data is within specifications.

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 ERTDM	0.15 meters	0.0 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
Qualifier 105	0 meters/second	1.6 meters/second	0 meters/second	0.025 meters/second
Sealegs	0 meters/second	6.5 meters/second	0 meters/second	0.025 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The uncertainty layer of the final surface(s) was examined in CARIS HIPS, and also analyzed in Pydro QC Tools V3.5.14 Grid QA v6.

Uncertainty of the final grid cells range from 0.31 to 1.071 m for the 1 m resolution surface, and between 0.31 to 0.838 m for the 4 m resolution surface. Greater than 99.5% of grid cells have TVU falling within the allowable range by depth. The larger values were observed to be in areas of variable seafloor, usually around sandwave features, where many soundings of different depths contribute to the value of the grid cell, resulting in a higher standard deviation for the grid cell. All final grid cells are within specifications.

B.2.3 Junctions

During field operations, effort was made to ensure sufficient overlap was achieved between lines run in adjacent survey sheets in order to complete junction analysis.

The "Gridded Surface Comparison V19.4" utility within Pydro was used to compare survey junctions. The utility differences the surfaces from the two surveys and generates statistics that include the percentage of grid cells that compare to within allowable TVU for the depth. 4 m resolution CUBE surfaces were used for all comparisons.

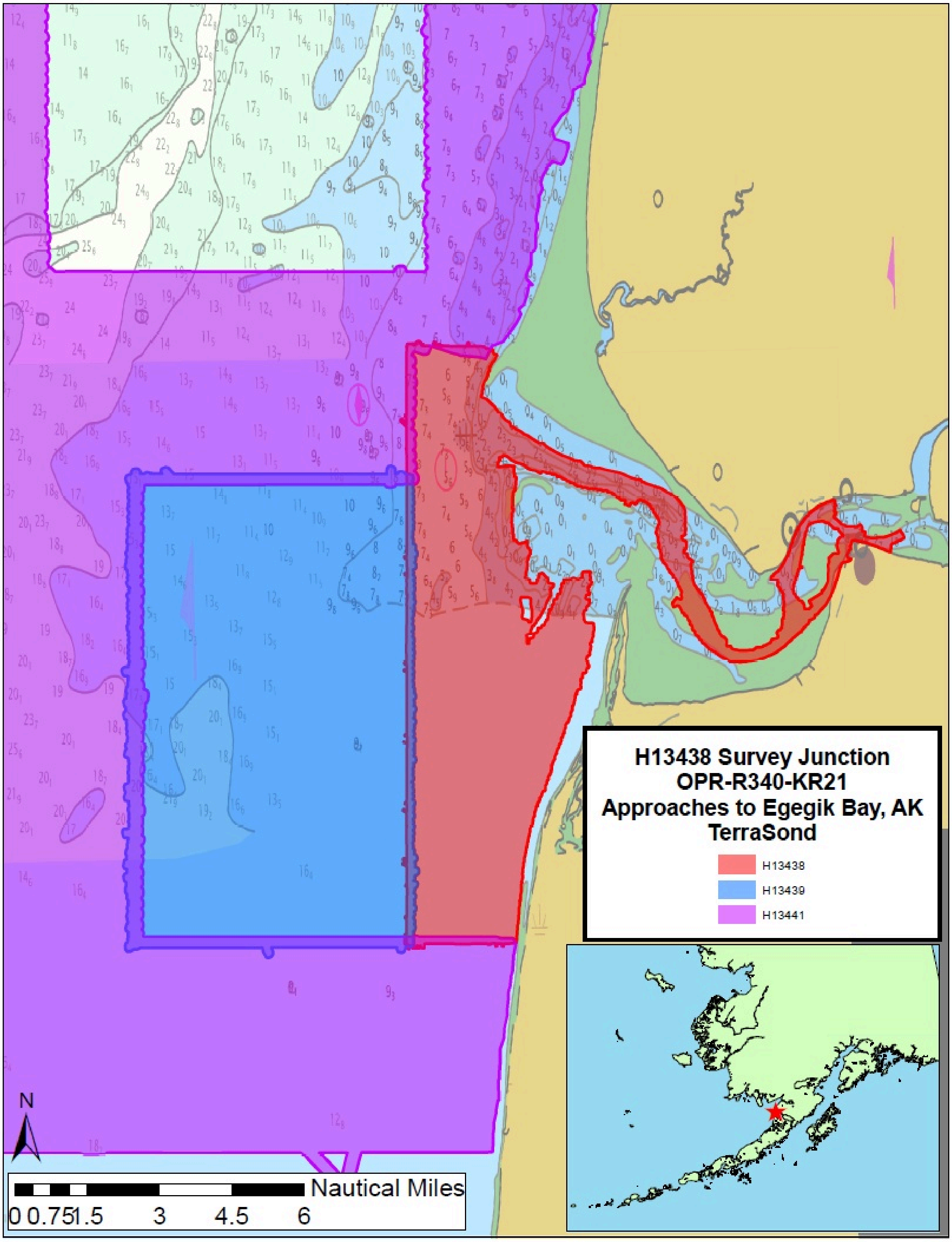

Figure 9: Image showing an overview of junctions with this survey.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13439	1:40000	2021	TerraSond	W
H13441	1:40000	2021	TerraSond	W

Table 9: Junctioning Surveys

H13439

Significant overlap was achieved between the two surveys. The area of overlap was largely between the Complete Coverage area of H13438 and the run-ins and run-outs of the set-spaced mainscheme lines of H13439.

Agreement between the two survey is excellent. The mean difference is 0.01 m with a standard deviation of 0.11 m. 100% of grid cells agree within the allowable TVU for their depth.

H13441

Significant overlap was achieved between the two surveys. The area of overlap was largely between the Complete Coverage area of H13438 and the run-ins and run-outs of a portion of the set-spaced mainscheme lines of H13441. In addition, substantial overlap was achieved along the south and north sides of H13438 where this sheet also junctioned.

Agreement between the two survey is excellent. The mean difference is 0.02 m with a standard deviation of 0.09 m. 100% of grid cells agree within the allowable TVU for their depth.

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

Data Blowouts

During rough weather conditions, especially with following seas, air bubbles would occasionally be forced under the multibeam sonar head and result in temporary loss of bottom tracking or "blowouts", sometimes causing small along-track gaps. These were examined and only reran when the gap at nadir exceeded three nodes alongtrack (12 m horizontal distance) for mainscheme lines. These were not normally reran where the occurred on crosslines since there was ample crossline LNM for QC purposes. Final data is within specifications.

B.2.6 Factors Affecting Soundings

Sound Speed Error

Sound speed error, which is characterized by a general upward or downward across-track cupping of sounding data that increases in magnitude towards the outer beams, is evident sporadically in the dataset. This is an area of transition between the Egegik River and Bristol Bay and therefore had a large amount of freshwater influence. Sound speed profiles returned wide ranging results of approximately 1465 m/s near Egegik to 1495 m/s outside the bay.

Profiles were taken frequently, at least every two hours, and whenever changing areas (especially from outside the bay to inside the bay, in the case of the Sealegs vessel), but some residual error remains. In processing, beam filters were applied to reject outer beams that exhibited the most error in Set Line spacing areas, and manual edits were applied in other cases. Effect on the final surfaces is relatively minor, usually to 0.20 m or better. Final data is within specifications.

Bottom Change

Bottom change was observed over the course of the survey, especially between lines that were run days to weeks apart. There is evidence of extreme amounts of sediment transport throughout the survey area, especially inside the bay where currents are very strong, with sandwaves visible in most areas.

When bottom change was observed between lines, no attempts were made to edit or otherwise "choose" a seafloor except in cases where bottom tracking issues were simultaneously observed (decribed in next section).

The following images are representative of some of the largest instances of bottom change observed. However, the issue is widespread and bottom change is suspect wherever sandwaves are observed, and especially along the river "cut bank"--an area at the south bend in the river channel (approximately centered on 58-10-30.7 N, 157-27-17.9 W) where the river current is strongest and is rapidly eroding the south side of the channel.

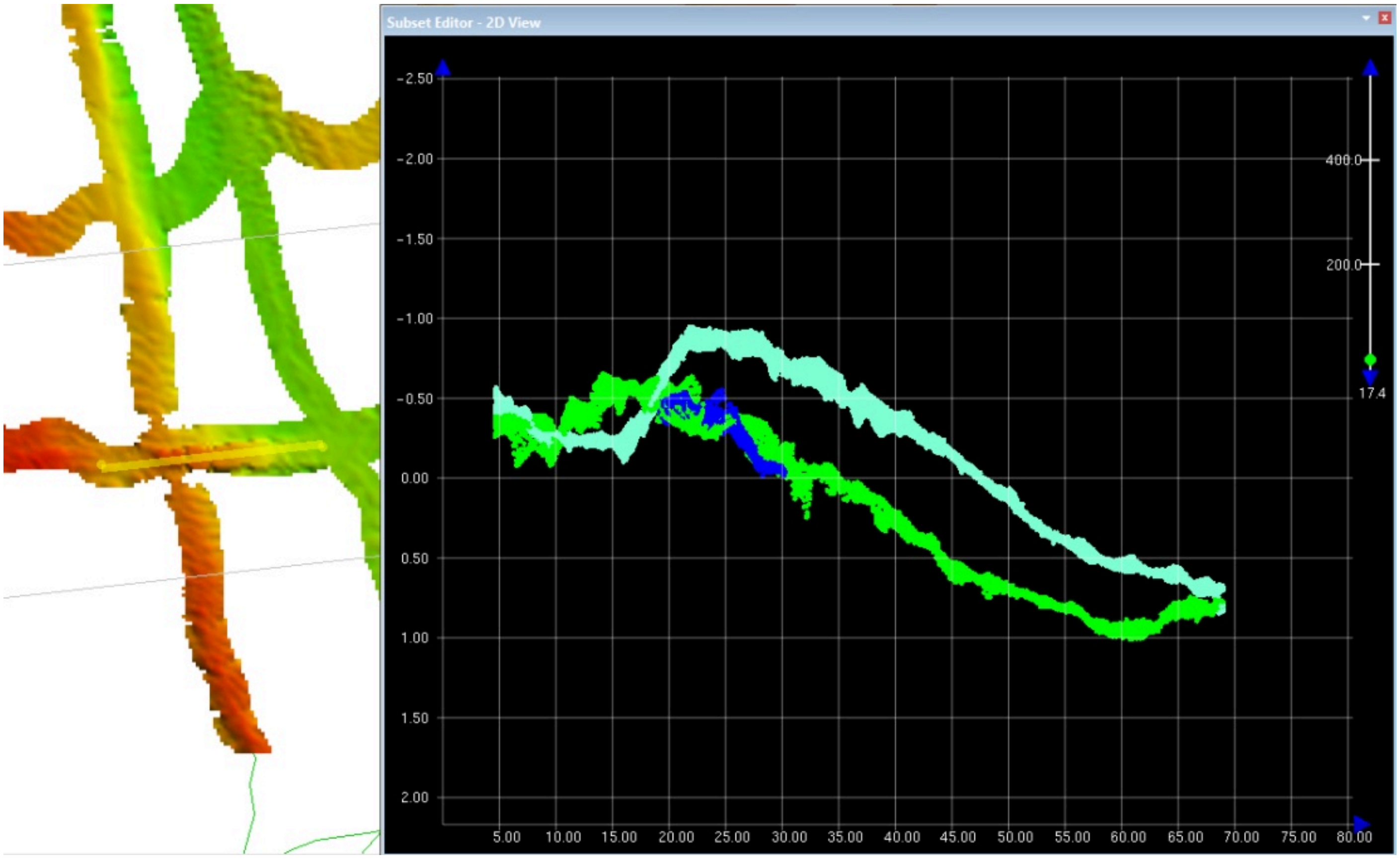

Figure 10: Example of bottom change shown in CARIS HIPS subset mode. Cyan line run on JD215 has up to 0.75 m of difference from lines run on JD234 (green) and JD235 (blue). Location: 58-12-42 N, 157-23-11.6 W

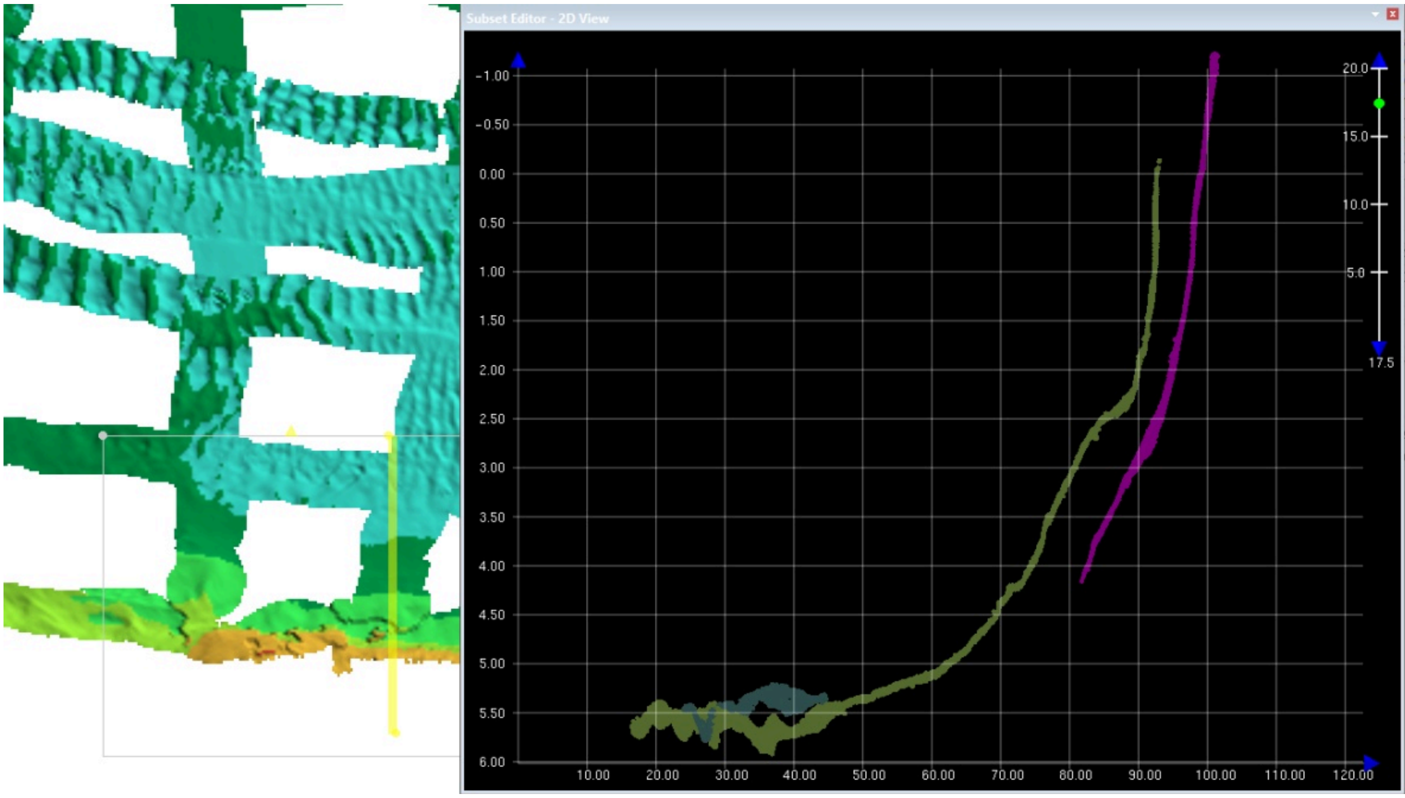

Figure 11: Example of bottom change shown in CARIS HIPS subset mode. Green line run on JD230 has up to 2.3 m of vertical change from purple line, run on JD242. It agrees better with dark green line run closer in time on JD233 but still exhibits 0.5 m of change there. This is in the area of the cut bank where current is very strong and is eroding the river edge, migrating the channel southward (to the right in this image). Location: 58-10-30.7 N, 157-27-17.9 W.

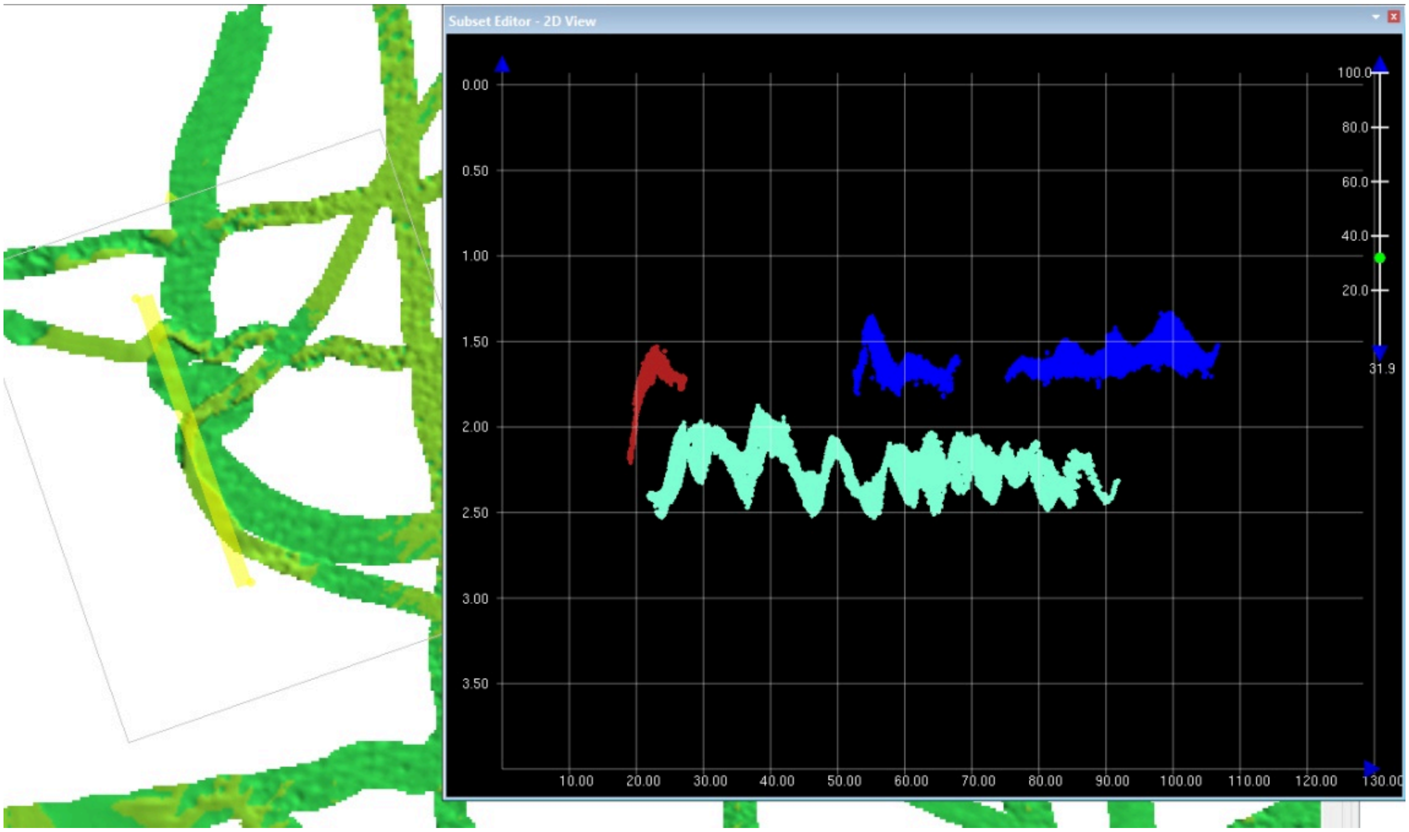

Figure 12: Example of bottom change shown in CARIS HIPS subset mode. Cyan line run on JD242 shows up to 1.0 m of change from lines run on JD215 (blue) and JD229 (red). Location: 58-12-48.5 N, 157-30-03.9 W.

Loss of Bottom Tracking

In some areas in the upper part of the bay, especially in the immediate vicinity of Egegik, the Reson T20 MBES on the Sealegs experienced significant difficulty tracking the seafloor. When this occurred it appeared to intermittently track two (and sometimes three) bottoms -- likely a softer "fluff" layer with the outer beams, which would transition towards nadir which would often penetrate and track harder bottom underneath, creating a "wing" artifact in the data. The difference between the two layers could range from 0.20 to 1.5 meters, causing significant tracking issues in places.

The issue ranged from complete loss of bottom tracking, where the sounder was entirely tracking the shoaler fluff layer, to partial loss of bottom tracking, where the nadir was still able to track the harder layer underneath while outer beams tracked the shoaler layer. Often tracking would transition between the two states, and finally to good (full swath) bottom tracking when harder bottom was again reached.

In acquisition, a number of settings were attempted on the T20 in order to tune it to track the correct bottom, which was assumed to be the deeper layer. This included frequency changes from the default 400 kHz to as low as 200 kHz, increasing and decreasing power, pulsewidth, and gain. This had limited success as the fluff layer appeared to be inconsistent, and settings that worked in one part of the line would cease to work a short distance down line, with large amounts of noise at all times. The issue persisted despite returning to the areas to collect more lines on multiple days.

In addition, the harder, deeper layer itself showed change during subsequent visits in this very dynamic riverine area, resulting in a different bottom being tracked on each deployment to the area.

The tracking issue occurred only in the deeper parts of the affected areas, usually the center of the channels. This indicated soft material was likely settling into the low areas of the river. It is possible that fish waste discharge from the cannery operations in nearby Egegik, for which the fish processing season was still in progress but winding down for the season at the time of survey operations, was the source of the material since this issue was not experienced to any significant degree elsewhere in the project area.

In processing, soundings where the sounder was suspected to be tracking the incorrect layer by a significant degree were manually rejected. This had the end result of opening along-track gaps of greater than 3-nodes (12 m) on some lines, interspersed with low density / isolated nodes. However, due to additional lines collected through the areas and manual salvage of nadir data where it appeared to be tracking the correct bottom, enough bottom tracking was maintained to obtain sufficient depths in the area for the purpose of charting the channels to Egegik.

The figures below show the areas most affected and examples from CARIS HIPS subset mode.

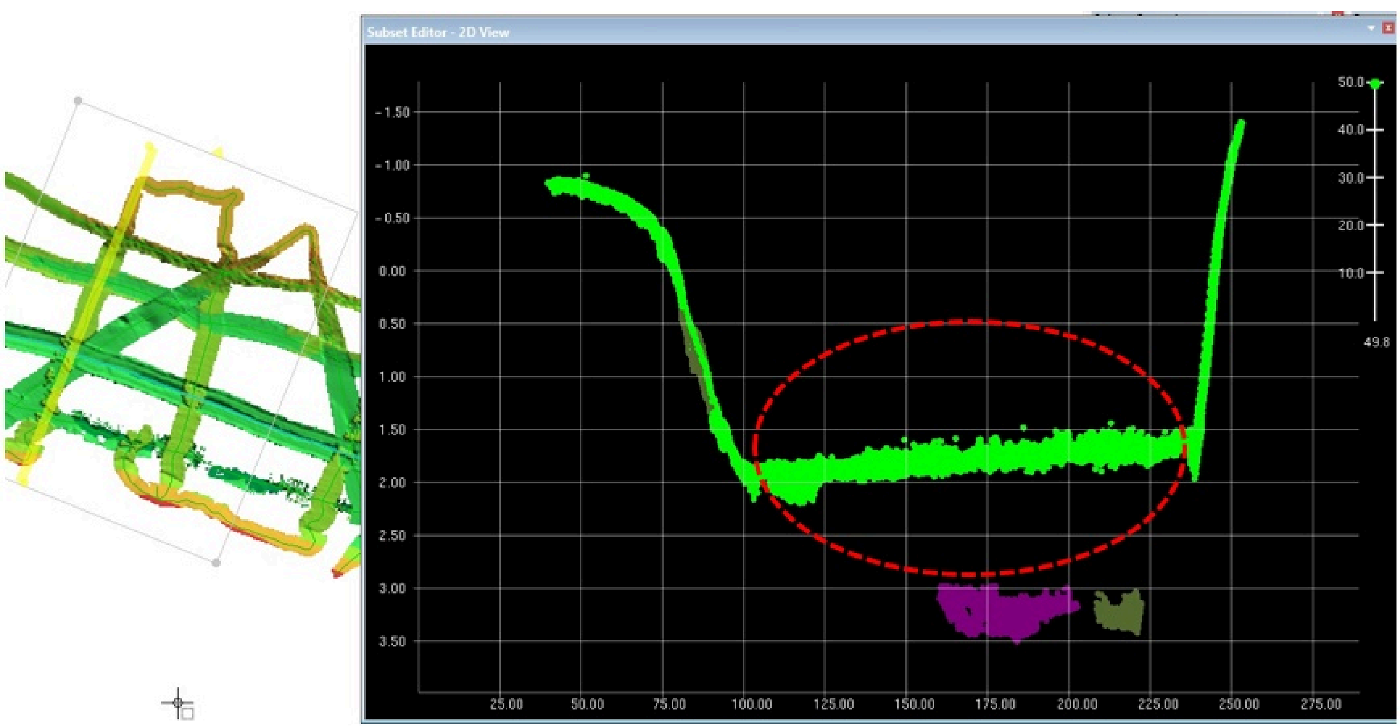

Figure 13: Example of complete loss of bottom tracking issue near Egegik (prior to editing): Green line in the circled region is tracking a softer layer by up to 1.5 m shoaler, while the purple and dark green line are tracking harder bottom. These and similar soundings where true bottom were not being tracked were manually rejected in processing.

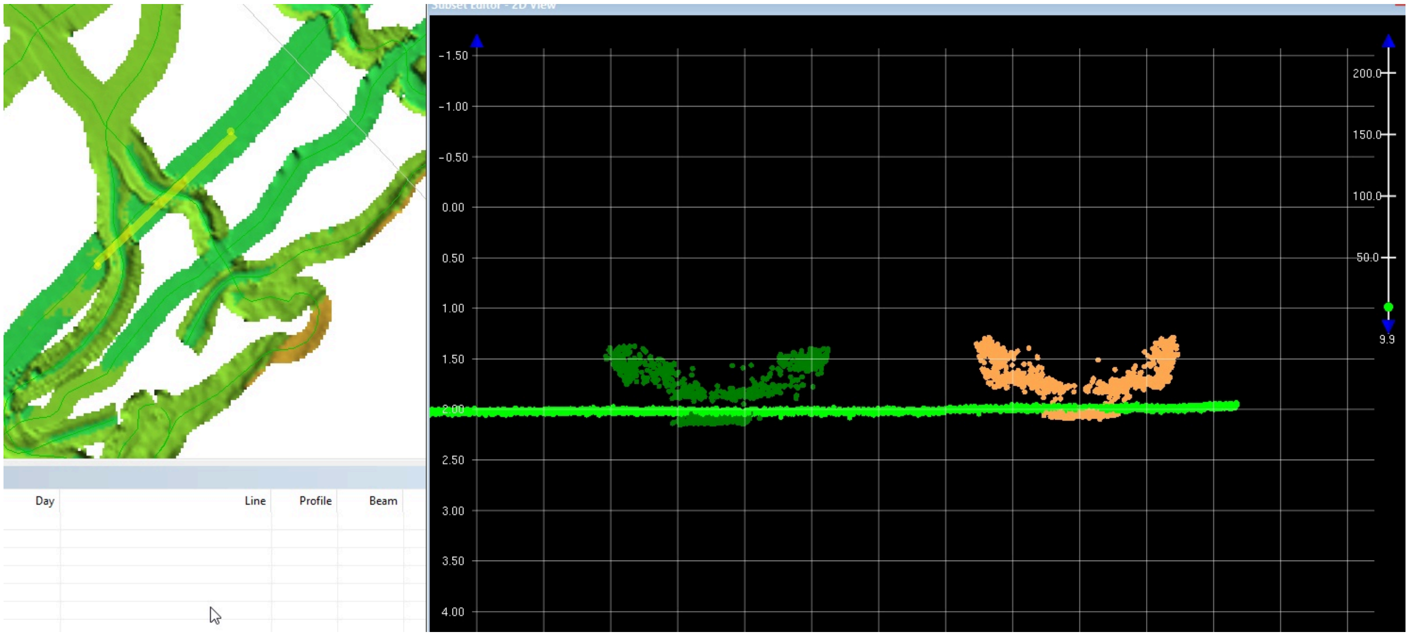

Figure 14: A similar issue, shown prior to editing, of partial bottom tracking: The dark green and orange lines are tracking correctly at nadir, but their outer beams are tracking a shoaler seafloor. Outer beams ("wings") were manually rejected, leaving only nadir and near-nadir data, in this and similar cases.

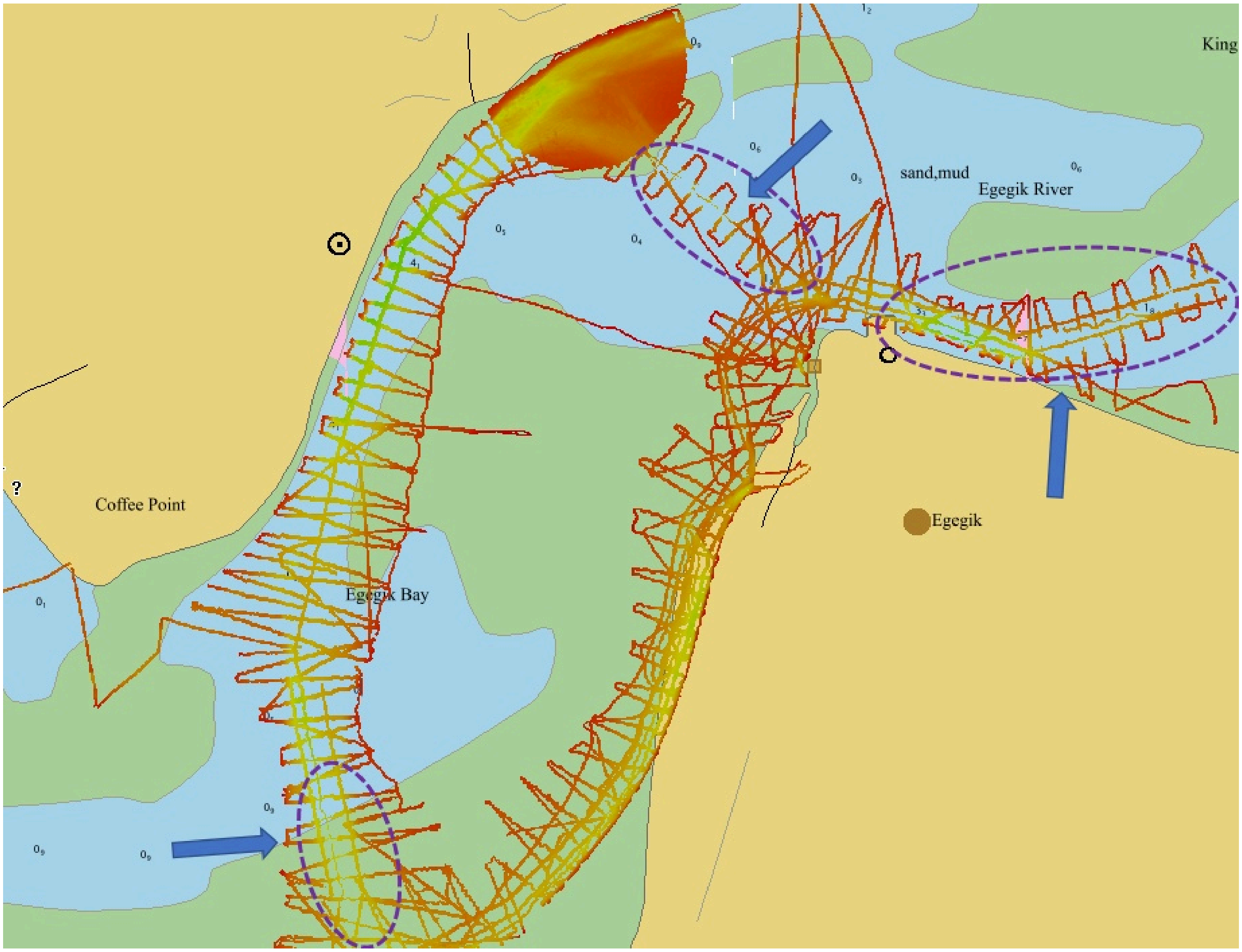

Figure 15: The entire upper river area shown in the diagram was intermittently affected by the bottom tracking issue. However, the areas circled were most affected.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 2 hours

Sound speed profiles or "casts" were acquired aboard the Q105 while underway with a Teledyne Oceanscience RapidCAST system, which utilized a Valeport SWiFT sound speed profiler. The Sealegs used a manually-deployed AML Oceanographic Minos-X (with P- and SV- Xchange sensors).

Surface sound speed at the sonar head was monitored continuously and a new cast was collected when the surface speed varied from the previous profile's speed at the same depth by greater than 2 m/s, leading to a cast interval of 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 normally favored to ensure that changes across the full water column were measured. The cast data was used to correct the sounding data using the "nearest in distance within time" (set to 3 hours) within CARIS HIPS.

B.2.8 Coverage Equipment and Methods

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

B.2.9 GPS Vertical Busts

Although vertical agreement between overlapping lines is generally very good, normally within 0.10 m or better, vertical busts attributable to GPS positioning error are apparent sporadically in the data set. On rare occasions these reach approximately 0.20 m in this area. Any that approached or exceeded IHO Order 1a for their depth were investigated and addressed in processing. All crosslines pass within IHO Order 1a, and final surfaces are within allowable TVU for the depth.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

Sound Speed Correction Exception:

One line file needed to have sound speed corrections applied as nearest in distance within 4 hours instead of the normal 3 hours. This was file 0665-Q105-228-A1NS00500_-_0001. There is no significant adverse affect on the line's data as a result.

Lines Extending Outside ERTDM Model:

Some lines inside the bay had small sections extending outside of the NOAA-provided NAD83 to MLLW separation model. The COR was consulted and it was determined that the best course of action was to apply a fixed NAD83 to MLLW separation value to these lines. The following lines had 12.422 m applied as a fixed separation offset and did not use the separation model.

Note 12.422 was used because it was representative of the separation values closest to the area of concern. The lines intersected other model grid cells ranging from 12.418 to 12.427, therefore a maximum error of 0.005 m was introduced, which is well within specifications.

0451-SLG-234-Channel-neg6-65_-_0001
0451-SLG-234-Channel-neg6-65_-_0002
0452-SLG-234-Channel-pos6-55_-_0001
0461-SLG-234-Channel-pos6-55_-_0001
0462-SLG-234-Channel-pos6-55_-_0001
0463-SLG-234-Channel-pos6-55_-_0001
0464-SLG-234-Channel-pos6-55_-_0001
0479-SLG-235-Centerline_-_0001
0484-SLG-235-S-2_(200.00)_-_0002
0488-SLG-235-S-2_(200.00)_-_0001
0493-SLG-235-S-1_(100.00)_-_0001
0007_JD215_Sla_MBE_-_0001
0008_JD215_Sl_MBE_-_0001
0008_JD215_Sla_MBE_-_0001

Post-Processing Exception:

While troubleshooting vertical busts from GPS error, a number of lines were loaded with Applanix Smart Base (ASB) SBETs instead of the default PP-RTX SBETs. ASB was kept as the final position source on any lines ASB SBETs were loaded into, unless PP-RTX showed better results, in which case it was reverted to PP-RTX. ASB almost always resulted in improvements to vertical matchup where GPS vertical error was an issue.

This was primarily done on all Sealegs lines run in the upper part of the river (Egegik vicinity) while troubleshooting busts there. This improved matchup in that area slightly, and remaining busts in the upper river are from bottom change or bottom tracking issues.

On the Q105, all lines on JDs 216, 229, 230, 235, 243 through 245, and most of JD260 utilized ASB.

Refer to the processing logs for individual lines that utilize ASB. Final positioning is within specifications.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter data was acquired but not processed for this survey. 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 Extended Attribute Files V2021.

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
H13438_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	-2.797 meters - 9.09 meters	NOAA_4m	MBES Set Line Spacing
H13438_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	-1.834 meters - 13.662 meters	NOAA_1m	Complete MBES

Table 10: Submitted Surfaces

The final depth information for this survey was submitted as a set of CARIS BASE surfaces (CSAR format) which best represented the seafloor at the time of the 2021 survey. The surfaces were created from fully processed data with all final corrections applied.

The surfaces were created using NOAA CUBE parameters and resolutions by depth range in conformance with the 2020 HSSD. The surface was finalized, and designated soundings were applied where applicable.

Horizontal projection was selected as UTM Zone 4 North, NAD83(2011).

Note that the surface were finalized with a minimum depth of -3.0 m. This was done because the HSSD specification of 0 meters would have clipped much of the useful negative sounding data that was acquired inside the bay. Refer to correspondence in Appendix II for discussion.

Final surfaces were clipped by coverage type. Refer to the following section for more discussion.

Non-finalized versions of the CSAR surfaces were also included with the survey deliverables. These do not have the "_Final" designation in the filename.

An S-57 (.000) Final Feature File (FFF) was submitted with the survey deliverables as well. The FFF contains data not readily represented by the final surface, including bottom samples and shoreline verification results (if any). Each object is encoded with mandatory S-57 attributes and NOAA Extended Attributes (V2021).

B.5.3 Surface Clipping

Upon arrival on the survey area, the location of the 8 m contour was relatively unknown. A number of set spaced lines were therefore run first, perpendicular to shore, in order to determine the general location of the 8 m. After its location was determined, areas between set spaced lines were filled with Complete MBES in areas deeper than 8 m.

This resulted in a large number of set spaced lines that extended into the Complete MBES area and therefore span coverage types and surface resolutions (1 m for Complete Coverage, 4 m for Set Line Spacing).

Final surfaces were clipped in CARIS BASE editor in the following method:

1. A 1 m resolution surface was made for the entire survey area. It was finalized as described earlier in this report. The file names are H13438_MB_1m_MLLW for the non-finalized version, and H13438_MB_1m_MLLW_F for the finalized version.

2. Similarly, a 4 m resolution surface was made for the entire survey area. It was finalized as described earlier in this report. The file names are H13438_MB_4m_MLLW for the non-finalized version, and H13438_MB_1m_MLLW_F for the finalized version.

3. In CARIS HIPS, using the surfaces created above as reference, a Coverage Area polygon object (cvrage) was defined that was inclusive of areas meeting Complete MBES standards. This was generally slightly shoaler than the 8 m contour, and included two feature development areas that extended shoaler than 8 m. This object is saved to the file "H13438_CompleteMBES_Area.hob".

4. Similarly, a Coverage Area polygon object was defined that was inclusive of areas meeting Set Line Spacing standards. This polygon was extended to overlap the Complete Coverage area slightly. This object was saved to the file "H13438_SetLineSpacing_Area.hob".

5. In CARIS BASE Editor, the "_F" (finalized but non-clipped) surfaces were clipped using the Coverage Area polygons. These clipped versions were saved as the "_Final" surfaces that represent the final surface deliverables.

All surfaces and HOB files used for clipping are included with the survey deliverables in the "Surfaces_Mosaics" directory. Clipping of the surfaces was authorized by the NOAA COR prior to survey submission. Correspondence is included in Appendix II.

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 Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via ERTDM	OPR-R340-KR-21_Egegik_ERTDM21_NAD83-MLLW_.csar

Table 11: ERS method and SEP file

All soundings were reduced to MLLW using the ERTDM NAD83 to MLLW separation model grid file provided by NOAA using ERS methodology.

Two tide stations, at Egegik and Dago Creek Mouth (Pilot Point) were installed as part of the overall project but were not used for reduction of soundings. A GNSS Buoy was also deployed as an ERTDM validation site. All gauge data and validation results have been separately provided to NOAA CO-OPS. Reports (with accompanying data packages) that have been submitted directly to CO-OPS are itemized in Section E of this report.

Note: During analysis of the GNSS Buoy data, which was installed as a check on the ERTDM model in an offshore portion of the project area, a discrepancy was observed. The NAD83 to MLLW separation was computed to be 11.790 m from the buoy data, while the ERTDM model had a separation value of 12.472 m at the buoy location, a difference of 0.682 m. Conversely, the NAD83 to MLLW separation values computed at the two project tide stations (Egegik and Dago Creek Mouth) agreed with the ERTDM model to 0.111 m and 0.079 m, respectively, which is within the uncertainty stated for the ERTDM model in the Work Instructions (0.15 m). This suggests the possibility of error in the tide model that exceeds specifications offshore. The discrepancy was brought to the COR's attention (see tides correspondence) but was unresolved at the time of this submittal. The result of higher than actual separation values applied to the GNSS altitude data would be a deep bias to final soundings; therefore further investigation is recommended.

H13438 was conducted in 2021. At the time, the field was provided a preliminary ERTDM SEP Model for the field party to reduce their sounding elevations from ellipsoidal heights to depths referenced to MLLW. As part of their survey operations, the field party set up a series of tide buoys to help improve ellipsoidal-to MLLW datum reduction modeling in the area. In early 2023, HSTB provided updated SEP models to the hydrographic branches, based on the tide data collected by the buoys. The hydrographic branch used two vertical shifts to transform submitted data depths. The first shift used the original 2021 SEP Model to

return gridded depths to the ellipsoidally referenced elevations. The second shift used the improved 2023 SEP to reduce grid depths back to MLLW. The hydrographic branch did not re-process the individual soundings that generate the grids. All HDCS data remains referenced to MLLW, based on the original SEP model. Sounding depths of original HDCS sounding data vary from the grids approved for charting anywhere between +/- 0.25m.

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 4.

The following PPK methods were used for horizontal control:

- Smart Base
- RTX

PPP

Post-processing of all navigation data for final positions was done in Applanix POSPac MMS (v8.5 or v8.7) software. Trimble PP-RTX was used as the processing methodology within POSPac. Note in some cases Applanix Smart Base (ASB) was used as the processing methodology in POSPac and applied to final data. This was discussed earlier in this report.

RTK

Real-time positions were primarily RTK. Hemisphere SmartLink antennas on each vessel were set to receive the subscription-based Atlas H-10 service, which output RTCM corrections to each vessel's POSMV, allowing them to operate in RTK mode. This assisted with real-time positioning, especially helping to ensure depth requirements were met. However, all real-time positions were replaced in post-processing with PPK corrections, as described previously.

WAAS

The Wide Area Augmentation System (WAAS) was used incidentally for real-time positions when there were issues receiving RTK corrections. However, all real-time positions were replaced in post-processing with PPK corrections, as described previously.

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 report compilation were used.

The chart comparison was accomplished by overlaying the final surface(s) with shoal-biased soundings and the final feature file (FFF) 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. ENC metadata and non-specific geographic area objects on the ENC(s) that overlap the survey area were not investigated.

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

Soundings outside the bay generally agree with survey soundings to within 1 to 2 meters, with survey soundings showing deeper in most cases.

There is widespread discrepancy with the charts inside the bay. This includes a migration of the main channel up to 2 kilometers further south than charted.

The figures below show charted soundings overlaid on shoal-biased survey soundings.

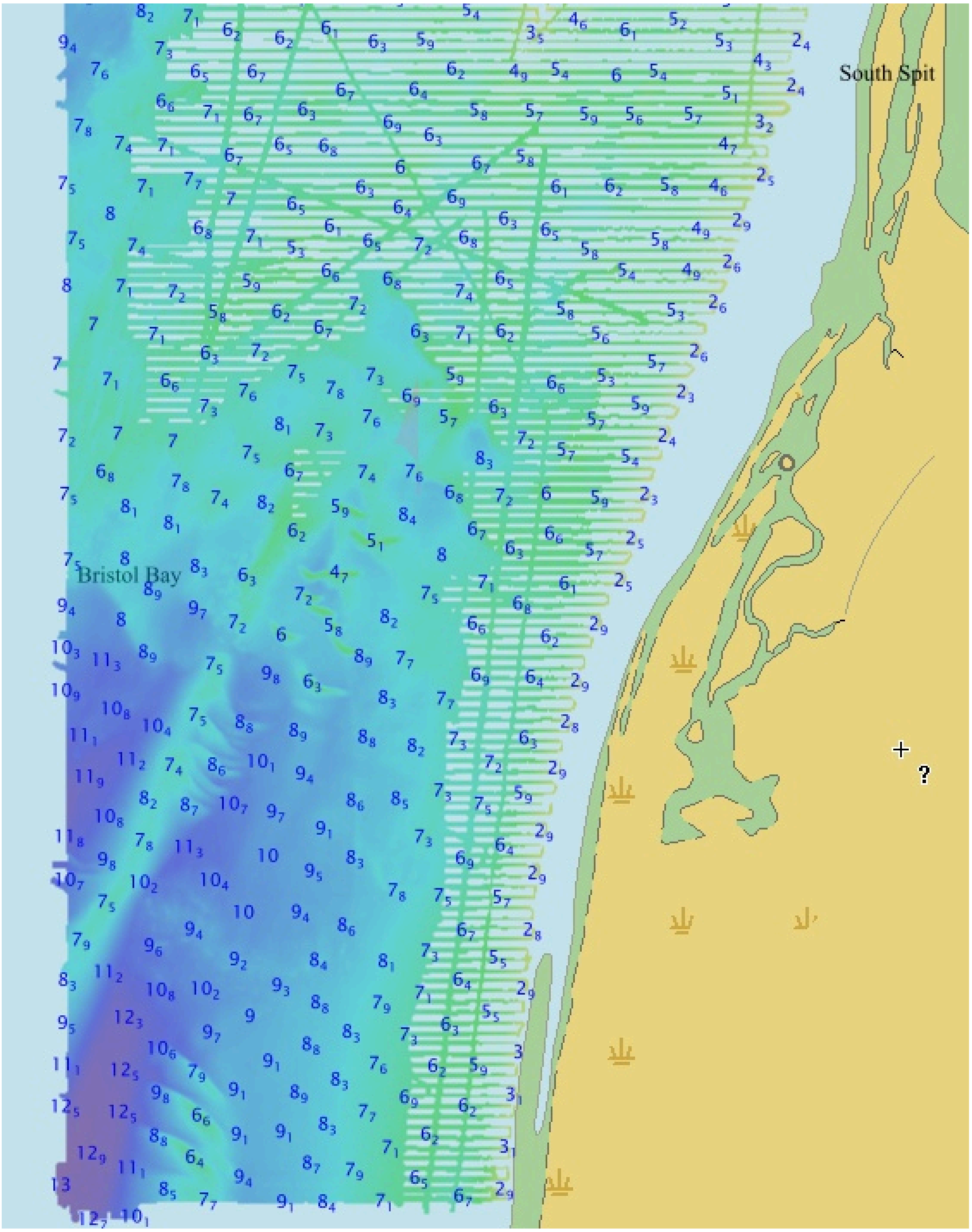

Figure 16: South part of this survey, outside the bay. Soundings from this survey (blue) overlaid on US4AK52M (soundings in black). All soundings in meters. This area was uncharted and there were no soundings to compare.

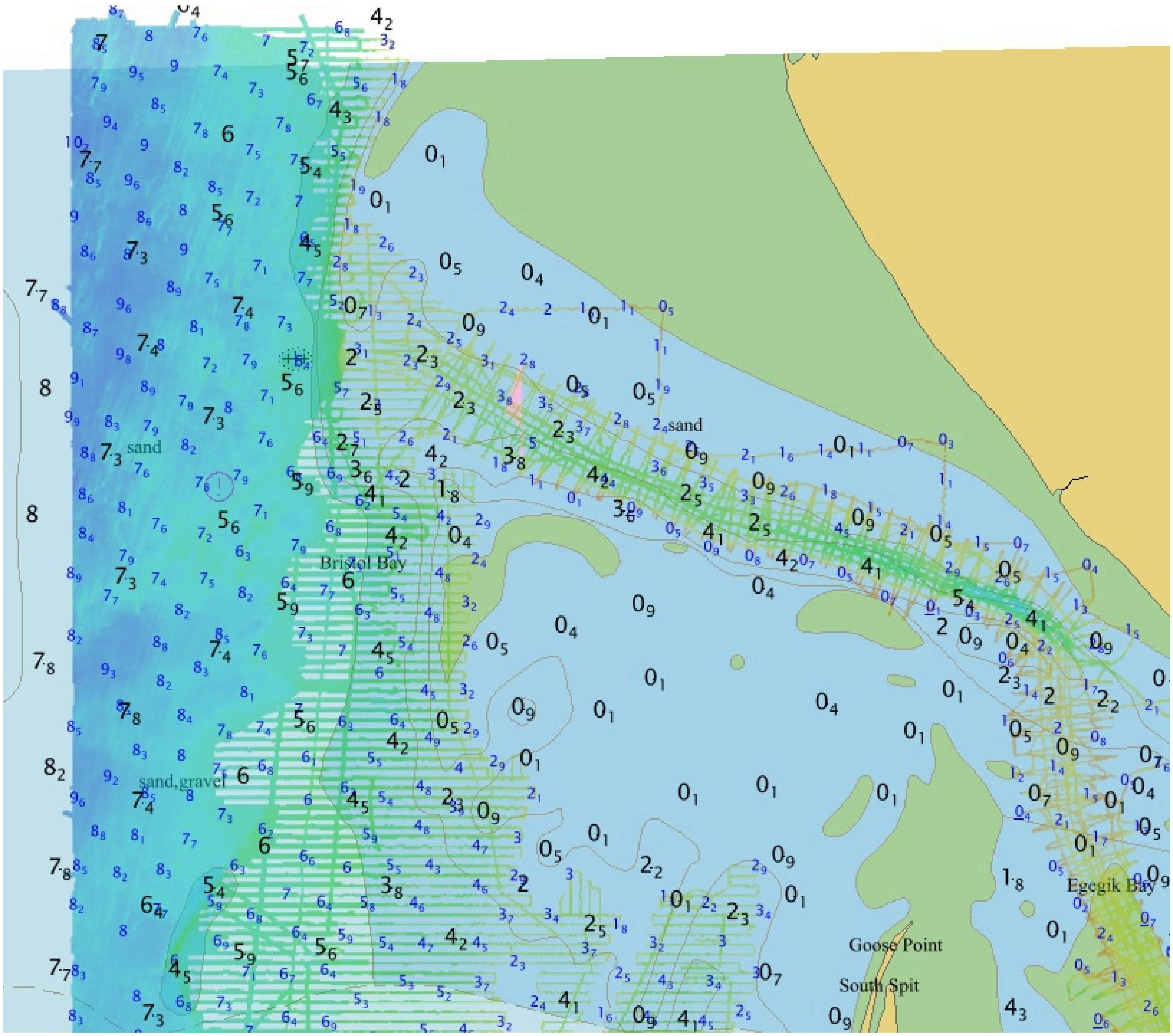

Figure 17: Soundings from this survey (blue) overlaid on US4AK52M (soundings in black) in the NW part of this survey. All soundings in meters. Most soundings agree to within 1-2 m, with soundings from this survey normally deeper.

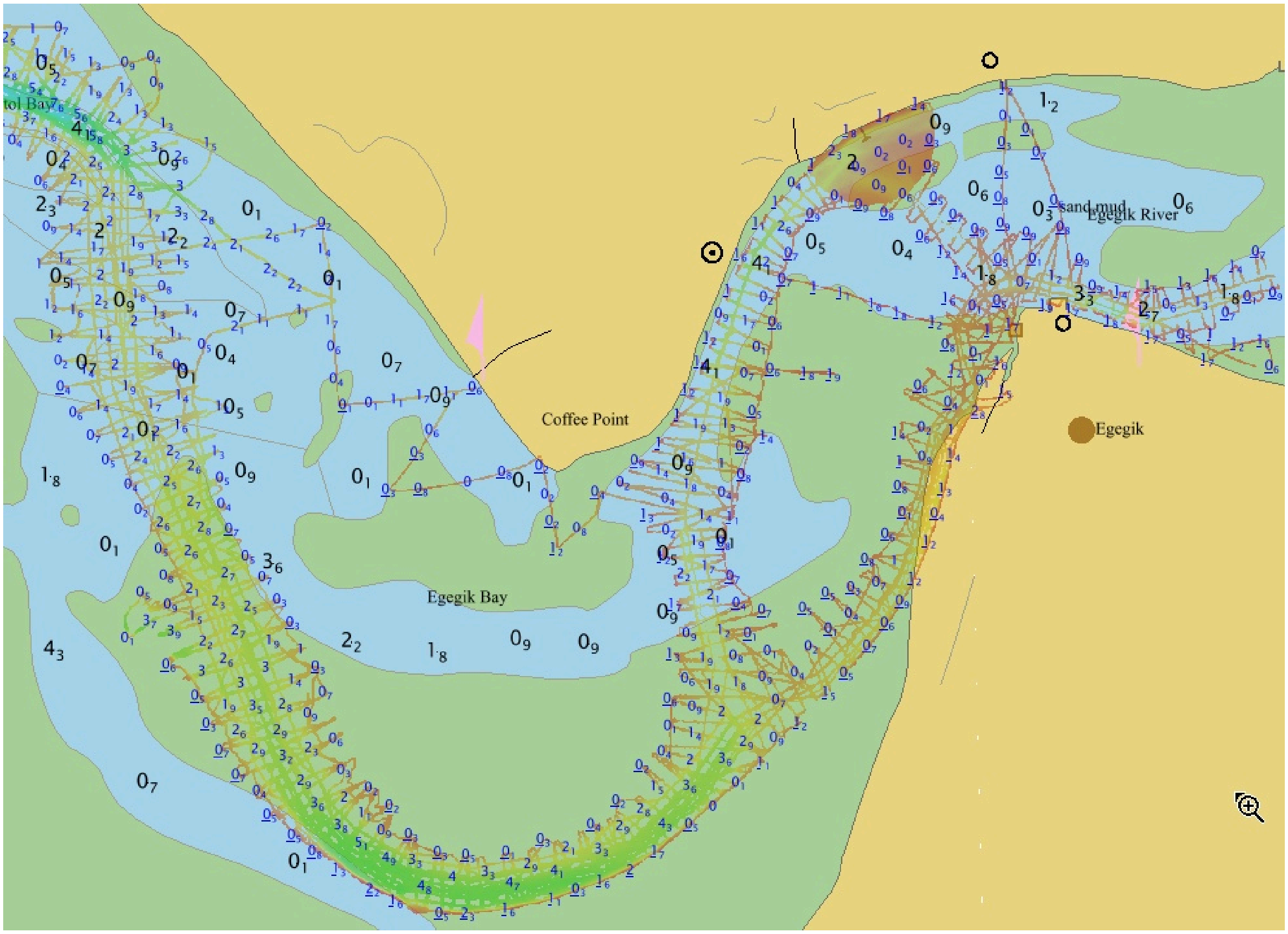

Figure 18: Soundings from this survey (blue) overlaid on US4AK52M and US4AK51M (soundings in black) inside the bay. All soundings in meters. There is widespread disagreement between the chart and this survey due to the shifts in the river channel.

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
US4AK52M	1:100000	4	12/27/2017	12/27/2017
US4AK51M	1:100000	5	05/08/2019	05/08/2019

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Shoals or potentially hazardous features exist for this survey and were investigated.

1. A charted wreck on US4AK52M was inside the survey area and was assigned for investigation. The area received Complete MBES coverage, and remains of a wreck with significant scour were found to the SE of the charted position. A least depth of 5.405 m was designated on the wreck in the dataset, which is about 1.3 m proud of the seafloor. Refer to the FFF for additional information, position, and recommendations. An image of the wreck is shown below.

2. The entrance to the bay, the bar--or relatively shallow area over which vessels must transit to enter the bay--appears to largely remain as charted, albeit this survey found depths slightly deeper through most of the bar area. An image of the area is shown below.

3. Most of the shoals inside the bay have shifted position. The river has generally migrated southward, depositing new shoals and removing previously charted shoals. See the previous figure showing survey data plotted on the chart inside the bay.

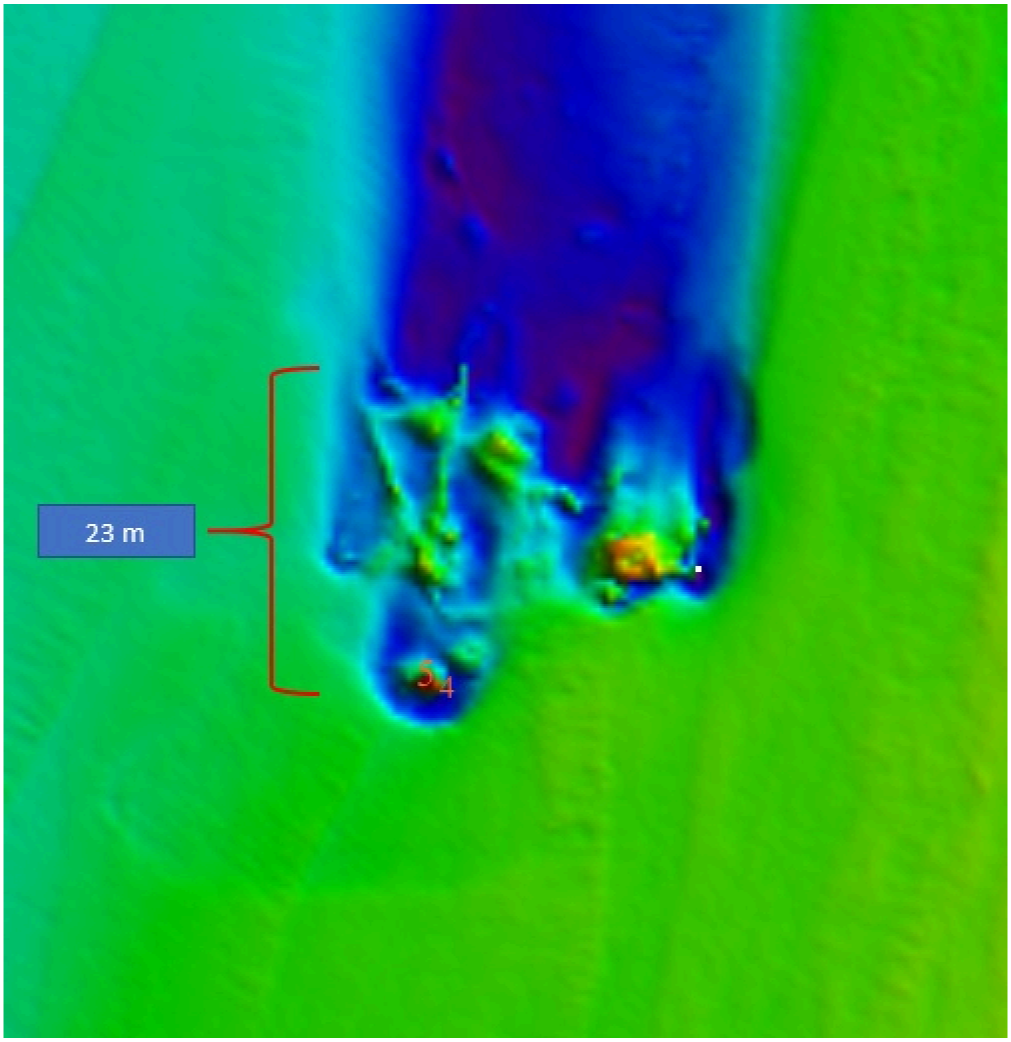

Figure 19: Wreck remains developed with Complete MBES coverage. Gridded at 0.5 m for this image.

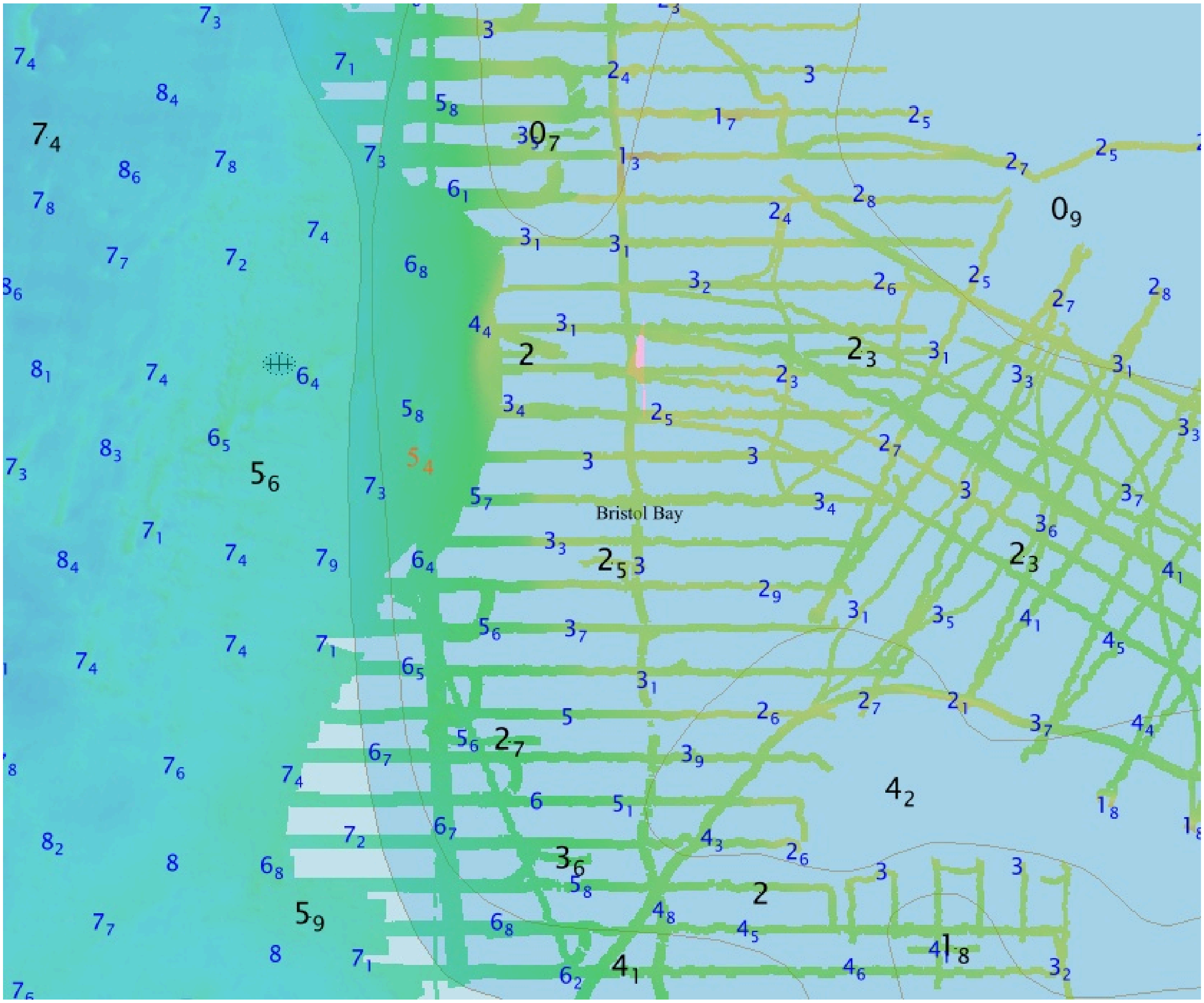

Figure 20: Soundings from this survey (blue) overlaid with soundings from US4AK52M (black) at the bar or entrance to the bay. Soundings in meters.

D.1.3 Charted Features

Charted features existed and were assigned for investigation. These consisted of the charted wreck discussed previously in this report, and a pier/jetty feature in the upper bay, north of Egegik.

The pier/jetty feature was not observed. Therefore a Complete MBES disproval was undertaken with a 500 m search radius. Note the NALL was considered by survey operations to be -0.5 m in this area, therefore the area was extremely shallow, with parts dry at MLLW. The feature is recommended for removal. See the FFF for additional details.

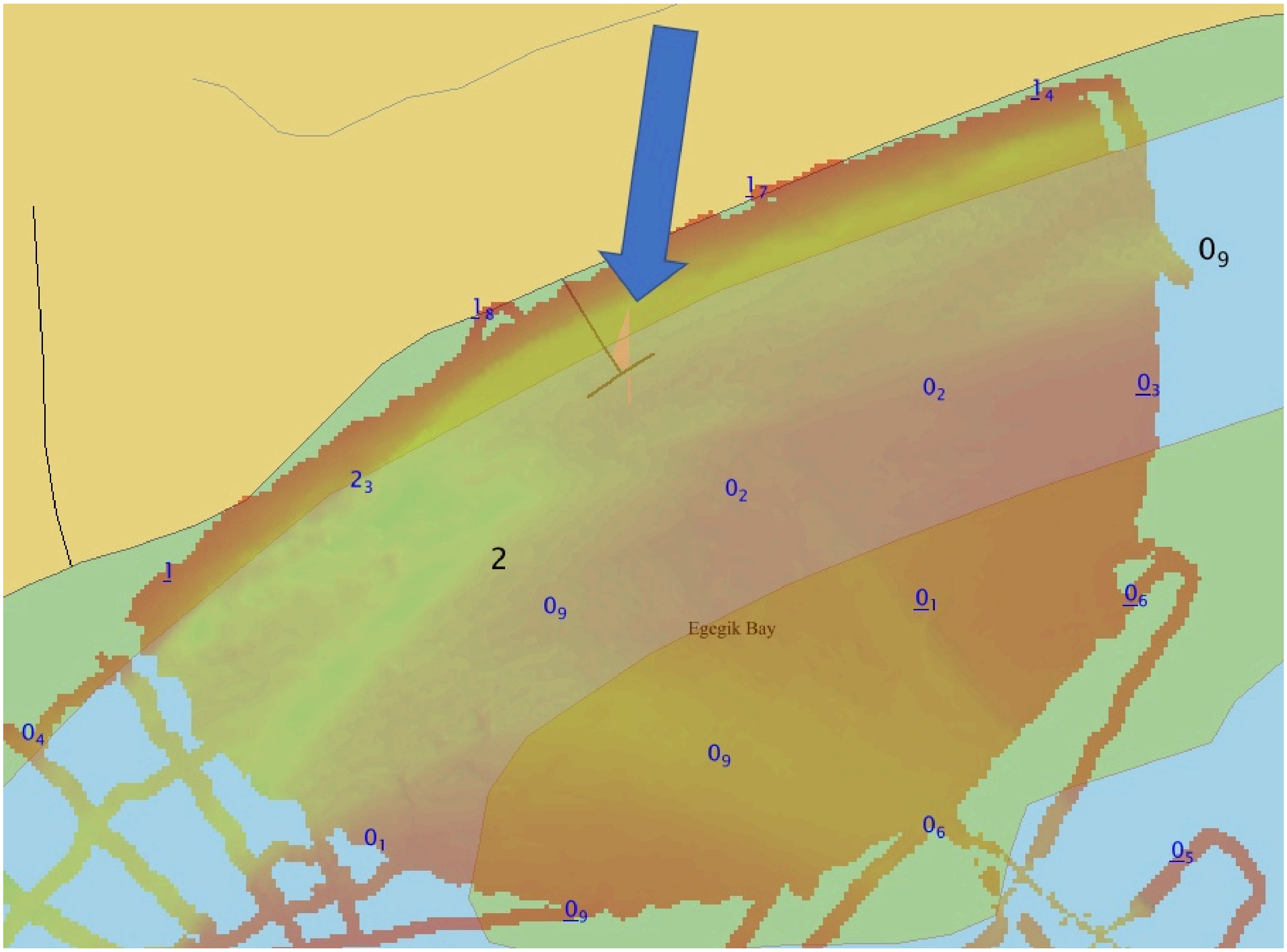

Figure 21: Pier/jetty feature on US4AK52M. It was disproved by a Complete MBES search with a 500 m radius.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

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

D.2 Additional Results

D.2.1 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Three bottom samples were assigned in the PRF for this survey. Samples were successfully obtained at two of the assigned locations.

One assigned sample at 58-13-22.9 N, 157-22-07.4 W, in the upper bay north of Egegik, was in an area too shallow to reach. An alternate sample was therefore obtained in a more meaningful location near the channel about 900 m to the SE, keeping a total of three samples sheet-wide.

All samples returned sand as primary constituents. Mud, gravel, and pebbles were common minor constituents. Refer to the FFF for results.

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 routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey that have not already been discussed in this report.

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

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 2020 NOS Hydrographic Surveys Specifications and Deliverables, 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
Tide Station Recon Reports (Egegik and Pilot Point)	2021-06-21
9464874 Egegik Tide Station Install Report	2021-09-10
9464512 Dago Creek Tide Station Install Report	2021-09-11
Survey Outline Submittal	2021-10-15
Final Progress Report	2021-10-15
9464874 Egegik Tide Station One Day Removal Report	2021-11-06
9464512 Dago Creek Tide Station One Day Removal Report	2021-11-08
NCEI Sound Speed Data Submittal	2021-11-19
MMO Logsheets and Training Observer Log Submittal	2021-11-23
Coast Pilot Review Report	2021-12-06
9464874 Egegik Tide Station Removal / Tides Package	2021-12-12
9464512 Dago Creek Tide Station Removal / Tides Package	2021-12-14
9999778 Offshore Egegik GNSS Buoy Removal / Tides Package	2021-12-17

Approver Name	Approver Title	Approval Date	Signature
Andrew Orthmann, C.H.	Charting Program Manager	01/08/2022	Andrew Orthmann Digitally signed by Andrew Orthmann Date: 2022.01.08 20:19:12 -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	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