F00847

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: F00847

LOCALITY

State(s): Alaska

General Locality: Bering Sea

Sub-locality: Kuskokwim to Etolin

2022

CHIEF OF PARTY
Andrew Orthmann

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**F00847**

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:	**Bering Sea**
Sub-Locality:	**Kuskokwim to Etolin**
Scale:	**80000**
Dates of Survey:	**06/15/2022 to 08/19/2022**
Instructions Dated:	**02/08/2022**
Project Number:	**OPR-R302-KR-22**
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 UTM 3N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey F00847

Project: OPR-R302-KR-22

Locality: Bering Sea

Sublocality: Kuskokwim to Etolin

Scale: 1:80000

June 2022 - August 2022

Terrasond

Chief of Party: Andrew Orthmann

A. Area Surveyed

The survey area is between Nunivak Island and Kuskokwim Bay, Alaska, in the Bering Sea.

The remote region is located in the Arctic. The area experiences pack ice for a large portion of the year, from approximately November through April, normally opening to navigation in late May or early June.

The area experiences frequent inclement weather due to its location in the Bering Sea, and has high exposure in all directions.

Field work for hydrographic data collection was carried out from June through August of 2022 under project OPR-R302-KR-22, with final processing and reporting occurring from September through December, 2022. Work was completed concurrently with five other sheets in the Nunivak Island region in accordance with the Hydrographic Survey Project Instructions (dated February 8th, 2022), accompanying Scope of Work, and the NOAA Hydrographic Surveys Specifications and Deliverables (HSSD, 2022 edition).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
60° 2' 13.15" N 165° 38' 50.45" W	59° 18' 3.74" N 163° 41' 11.33" W

Table 1: Survey Limits

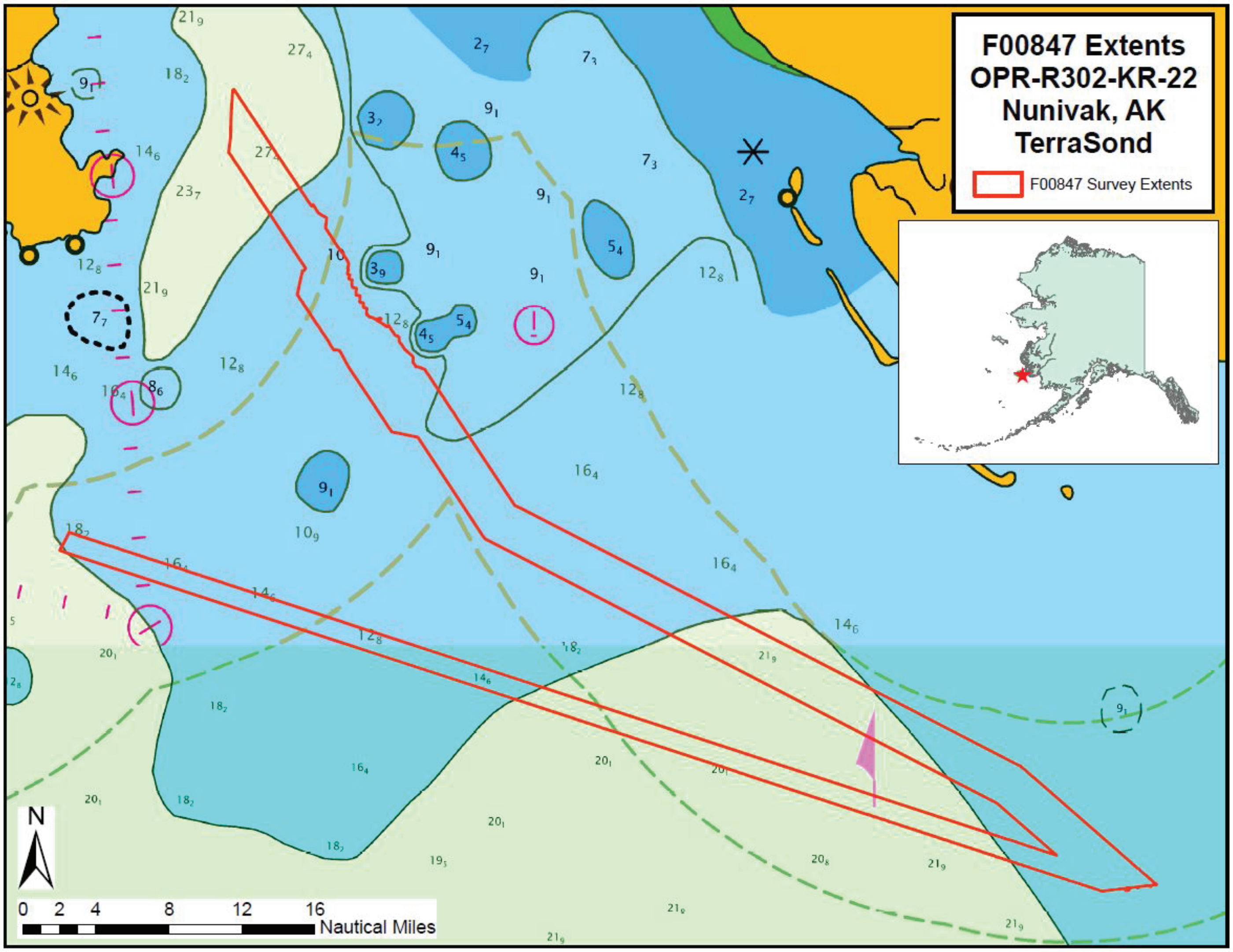

Figure 1: Image showing an overview of survey extents.

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:

The Nunivak project will provide contemporary surveys to update National Ocean Service (NOS) nautical charting products and services in waters that have not been surveyed since before Alaska was declared a state. The 1500 square nautical miles of targeted areas are important to the strategic maritime infrastructure of Alaska both on a local scale and on a regional scale.

Nunivak Island is strategically important to Alaska, as it can be used by regional traffic, supply tanks, and USCG PARS corridor to seek protection from weather. The survey vintage of these charts are 1902 and 1953. Old and sparse data elevate the potential risk for grounding. The survey will provide updated bathymetry and feature data that will be used to create larger scale charts for strategic waters in the area, reducing the risk to navigation for vessels transiting the area.

The project will support the remote coastal community Mekoryuk by providing the base data to update nautical products for nearby waters, including Nash Harbor. These products can improve the safety of subsistence fishing, marine transportation, and shipment of goods to the city. Shipments include the transportation of fuel, which need to be transported to smaller vessels in lightering areas. Survey areas have been prioritized to focus on vessel lightering areas identified by the Western Alaska Tanker Lightering Best Practices Committee, as part of the Alaska Maritime Prevention Response Network.

The lightering areas, traffic patterns, and regional requests were used to delineate and prioritize the Nunivak project. Data will supersede all prior survey data providing modern hydrographic survey data for this area and updating the local charting products.

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 a minimum of 7,300 LNM. Transit mileage, system calibration mileage and data which do not meet HSSD specifications shall not count towards the completion of the LNM requirement. Notify the COR/Project Manager upon nearing completion of LNM requirement. The final survey area shall be squared off and ensure the full investigation of any features within the surveyed extent.
All waters in survey area	Set Line Spacing system of MBES with concurrent backscatter (Refer to HSSD Section 5.2.2.4 Option A).
F00847	Up to 600 LNM delineating the path along and seaward of the 10-meter contour. Sounding lines shall be acquired with spacing adequate to collect data at an interval of at least 480 meters. The purpose of this sheet is to acquire data during the transit to the primary survey area. Crosslines are waived. Junction analysis will be completed for any concurrent surveys.

Table 2: Survey Coverage

Coverage requirements were met. Additional clarification on specific requirements are provided below.

LNM Requirements:

The project required 7,797 LNM of multibeam data to be collected project-wide. This consisted of the originally assigned 7,300 and an additional 497 tasked by the Government on August 16, 2022. Correspondence is included with the project deliverables.

8,050 LNM was actually acquired project-wide, exceeding requirements by 253 LNM. The excess of approximately 3.2% 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 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 data that does not meet HSSD specifications.

645 LNM was acquired in this survey area, which exceeded the 600 LNM maximum specified in the Project Instructions. The 45 additional LNM were acquired during final passes through the survey area instead of alternatively ceasing to log data while transiting through the relatively uncharted area. These are included in the excess LNM described above.

Depth Priorities:

The Project Instructions specified the priority of delineating the path along and seaward of the 10 meter contour. During pre-project discussions, it was noted that locating the 10 m contour was important for charting purposes. The 10 meter contour was intersected near the northern extent of this survey where it was initially developed with a zig-zag line pattern of regular crossings. Subsequent survey lines were acquired west and seaward of the 10-meter contour there. All other survey data was deeper than 10 m.

Line Spacing:

Following collection of initial lines at the minimum 480 m spacing, it was agreed with NOAA that remaining LNM would be collected at 960 m spacing in the majority of the survey area due to its flat to very gradual sloping nature. An exception was in the northern part of the survey area where the 10 m contour was intersected -- due to increased seafloor variability spacing was kept at 480 m there. These spacings were achieved. See survey correspondence for details.

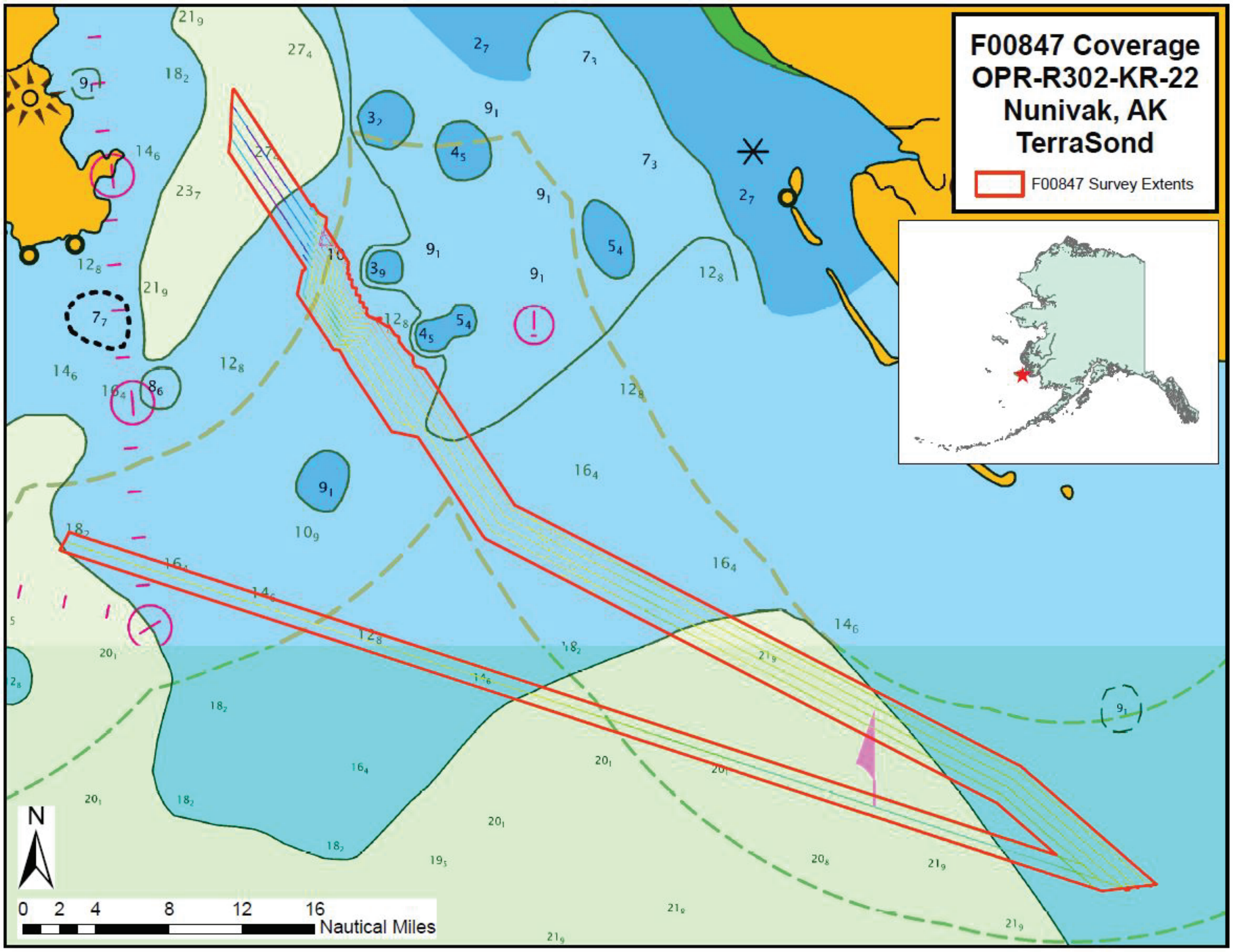

Figure 2: Image showing an overview of survey coverage.

A.6 Survey Statistics

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

	HULL ID	*Qualifier 105*	*ASV-CW5*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	382.8	262.0	644.8
	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	0.0	0.0	0.0
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				0
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				227.0

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/15/2022	166

Survey Dates	Day of the Year
06/16/2022	167
06/29/2022	180
06/30/2022	181
07/10/2022	191
07/11/2022	192
07/14/2022	195
07/24/2022	205
07/25/2022	206
07/27/2022	208
07/28/2022	209
08/08/2022	220
08/09/2022	221
08/10/2022	222
08/18/2022	230
08/19/2022	231

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*	*ASV-CW5*
LOA	32.0 meters	5.5 meters
Draft	1.8 meters	0.6 meters

Table 5: Vessels Used

Figure 3: ASV-CW5 (foreground) and Qualifier 105 (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 tide buoys, conduct sound speed casts, and deploy/recover the ASV-CW5 vessel.

The ASV-CW5 (ASV) is a 5.5 m aluminum-hull Autonomous Surface Vessel (ASV), C-Worker 5 model, owned and operated by L3-Harris ASV. The ASV was operated in an uncrewed but monitored mode, collecting multibeam data in close proximity to the Q105, as well as in areas too shallow for the Q105.

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 T50-R	MBES Backscatter
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne Oceanscience	rapidCAST	Sound Speed System
Valeport	SWiFT SVP	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 nearly identical survey equipment and software. Both vessels utilized Reson Seabat T50-R MBES systems, with surface sound speed measurements provided by AML Oceanographic Micro-X sensors. Both vessels used Applanix POSMVs (integrated into the T50-R MBES systems) 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. 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

Crosslines were waived for this sheet.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0.13 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	1.2 meters/second	0 meters/second	0.025 meters/second
ASV-CW5	0 meters/second	1.2 meters/second	0 meters/second	0.025 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The uncertainty layer of the final surface was examined in CARIS HIPS, as well as analyzed in Pydro QC Tools V3.7.0 Grid QA v6.

Uncertainty of the final grid cells range from 0.291 to 0.724 m. 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, where many soundings of different depths contribute to the value a grid cell, resulting in a overall higher standard deviation for the grid cell. Despite the higher uncertainty computed for a small number of grid cells, depths for all final grid cells are within specifications.

B.2.3 Junctions

Per the Project Instructions, junction analysis was required only for concurrent surveys. This survey did not junction with any concurrent surveys.

However, this survey did have overlap with modern surveys, completed in 2016 and 2019. Therefore a comparison was undertaken with those surveys.

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 surfaces were used for all comparisons unless noted otherwise.

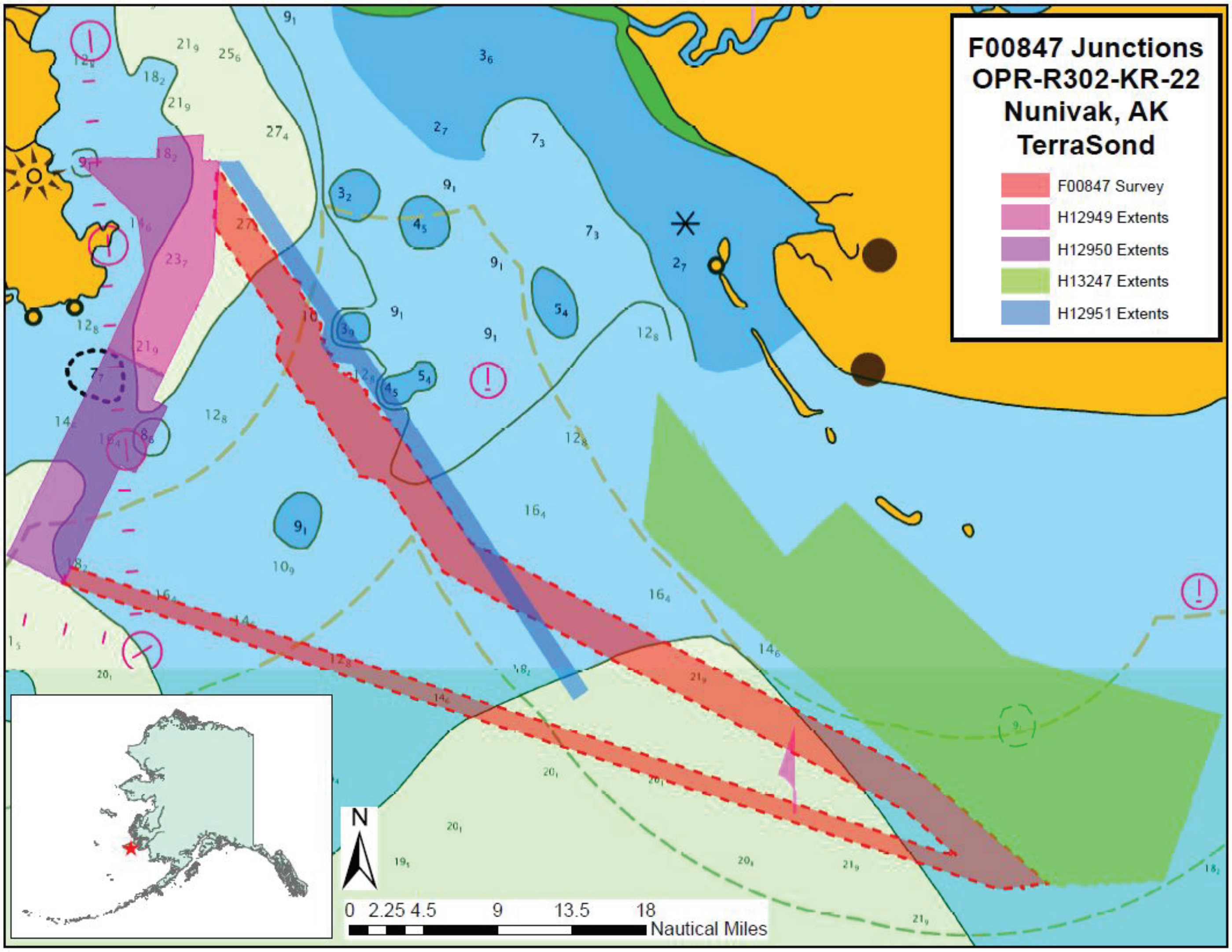

Figure 4: Overview of junctions with this survey.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12949	1:40000	2016	TerraSond	NW
H12950	1:40000	2016	TerraSond	W
H12951	1:40000	2016	TerraSond	NE
H13247	1:40000	2019	TerraSond	E

Table 9: Junctioning Surveys

H12949

The 4 m BAG surface was downloaded from NOAA NCEI for H12949 and used for this comparison.

Agreement between the two surveys is very good. The mean difference is 0.13 m, with a standard deviation of 0.10. F00847 is slightly deeper on average. 100% of grid cells agree to within allowable TVU for the depth.

H12950

The 2 m BAG surface was downloaded from NOAA NCEI for H12950 and used for this comparison. A 4 m surface was not available at NCEI for this sheet.

Agreement between the two surveys is very good. The mean difference is 0.12 m, with a standard deviation of 0.06. F00847 is slightly deeper on average. 100% of grid cells agree to within allowable TVU for the depth.

H12951

The 2 m BAG surface was downloaded from NOAA NCEI for H12951 and used for this comparison.

Agreement between the two surveys is acceptable. The mean difference is 0.29 m, with a standard deviation of 0.16. F00847 is slightly deeper on average. Greater than 99.5% of grid cells agree to within allowable TVU for the depth.

H13247

The 4 m BAG surface was downloaded from NOAA NCEI for H13247 and used for this comparison.

Agreement between the two surveys is acceptable. The mean difference is 0.31 m, with a standard deviation of 0.13. F00847 is slightly deeper on average. Greater than 99.5% of grid cells agree to within allowable TVU for the 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

<u>Data Blowouts</u>

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

B.2.6 Factors Affecting Soundings

<u>Sound Speed Error</u>

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.

Profiles were taken frequently, at least every two hours, and whenever changing areas, but some residual error remains. In processing, beam filters were applied to reject outer beams greater than 65 degrees from nadir in order to reject soundings most subject to sound speed error.

The effect on the final surfaces is relatively minor, usually to 0.20 m or less. Final data is within specifications.

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. Note that the ASV-CW5 was not equipped to collect sound speed profiles -- Q105 sound speed profiles were used to correct all ASV sounding data, which was possible because the vessels always worked in close proximity to each other (usually within 2 kilometers).

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 2 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

Delayed Heave Exceptions:

The following line files did not have delayed heave available. This was usually due to a PC crash or similar issue causing POSMV file logging to stop earlier than planned. Real-time heave was used instead. There is no adverse affect on the final data as a result.

0008-166-Q105-T0100480_-_0010
0008-166-Q105-T0100480_-_0011
0007-166-Q105-T0100000_-_0002

Post-Processing Exceptions:

A number of line files were loaded with SBETs that were created using Applanix Smart Base (ASB) post-processing methodology instead of PP-RTX. This was done in order to address vertical busts from GPS error and improve matchup. Data is within specifications following application of the ASB SBETs. Affected line files are listed below.

0007-166-Q105-T0100000 (All segments)
0203-180-Q105-T0102260 (All segments)

0374-180-ASV-T0101780 (All segments)
0375-180-ASV-T0101340 (All Segments)
0460-195-Q105-SHEET_T01 (All Segments)
0629-206-Q105-T0143680 (All Segments)
0630-208-Q105-T0146560 (All Segments)
0729-195-ASV-T0100000 (All Segments)
0852-220-Q105-T0100960 (All Segments)
0853-221-Q105-T0147040 (All Segments)
0854-222-Q105-T01_FMGT_Infill_01_-_0001
0951-208-ASV-T0144160 (All Segments)
0952-208-ASV-T01_0003_-_0001
0953-208-ASV-T01_0004_-_0001
0954-208-ASV-T01_0007_-_0001
0955-208-ASV-T01_0008_-_0001
0956-208-ASV-T01_0009_-_0001
0957-208-ASV-T01_0013_-_0001
0958-208-ASV-T01_0015_-_0001
0959-208-ASV-T01_0016_-_0001
0960-208-ASV-T01_0018_-_0001
0961-208-ASV-T0144160 (All Segments)

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 Extended Attribute Files V2022_1.

The most current version of NOAA's Extended Attribute Files available at the start of survey operations was utilized for this project.

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
F00847_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	7.833 meters - 29.933 meters	NOAA_4m	MBES Set Line Spacing
F00847_MBAB_2m_400kHz_1of1	MB Backscatter Mosaic	2 meters	0.0 meters - 80.0 meters	N/A	MBES Set Line Spacing

Table 10: Submitted Surfaces

The final depth information for this survey was submitted as a single 4 m resolution CARIS BASE surface (CSAR format) which best represents the seafloor at the time of the 2022 survey. The surface was created from fully processed data with all final corrections applied.

The surface was created using NOAA CUBE parameters and resolutions in conformance with the 2022 HSSD. The surface was finalized, and designated soundings were applied where applicable.

Horizontal projection was selected as UTM Zone 3 North, NAD83(2011).

A non-finalized versions of the CSAR surface is also included with the survey deliverables for reference. This does not have the "_Final" designation in the filename.

Multibeam Acoustic Backscatter (MBAB) surface(s), produced with QPS Fledermaus Geocoder Toolbox (FMGT), is also provided. MBAB data for both vessels, acquired using 400 kHz, is combined in the mosaic.

Note that no FFF was submitted with this survey. Feature investigations and bottom samples were not required, and there were no charted features requiring inclusion in a feature file.

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-R302-KR-22_Sheets08232022_ERTDM2021_NAD83(2011)-MLLW

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. The uncertainty stated for the model in the Project Instructions is 0.13 m.

F00847 was conducted in 2022. 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 2022 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 +/- 0.11m.

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 3.

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 (v8.7) software. Trimble PP-RTX was used as the primary processing methodology within POSPac, with any exceptions noted previously.

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 WGS84-based 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 relative to chart datum were met. However, all real-time positions were replaced in post-processing with PPK corrections, unless otherwise noted in this report.

WAAS

The Wide Area Augmentation System (WAAS) was used incidentally for real-time positions as a backup 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 finalized BASE 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. Results are shown in the following sections. It is recommended that in all cases of disagreement this survey should supersede charted data.

ENC metadata and non-specific geographic area objects on the ENCs that overlap the survey area were not investigated.

Charted soundings that overlap this survey are relatively sparse. Most that overlap have generally good agreement, to 1 m or better.

The following images show general sounding agreement with the charts.

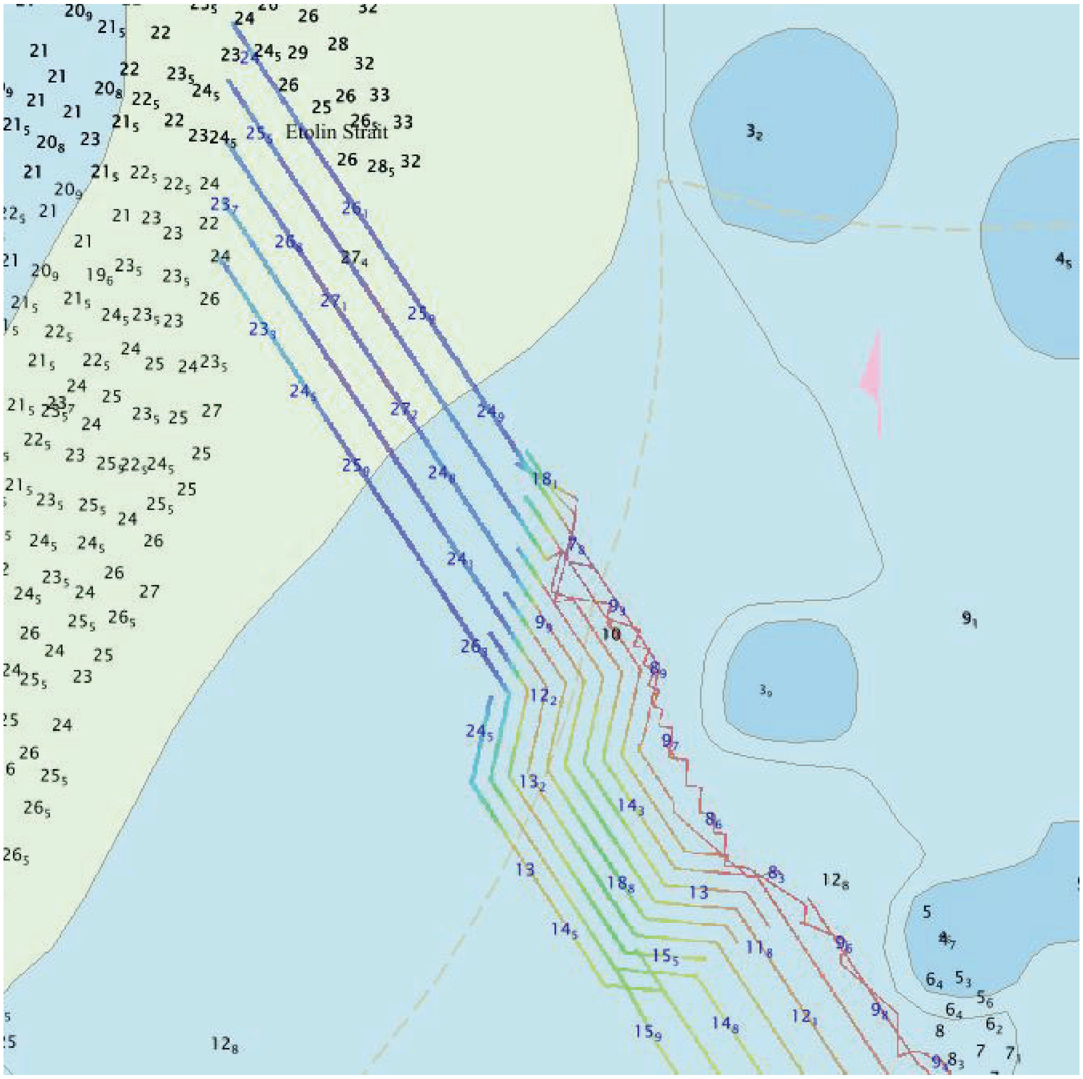

Figure 5: North part of the survey area: Soundings from this survey (blue) overlaid with existing charted soundings (black). Soundings in meters.

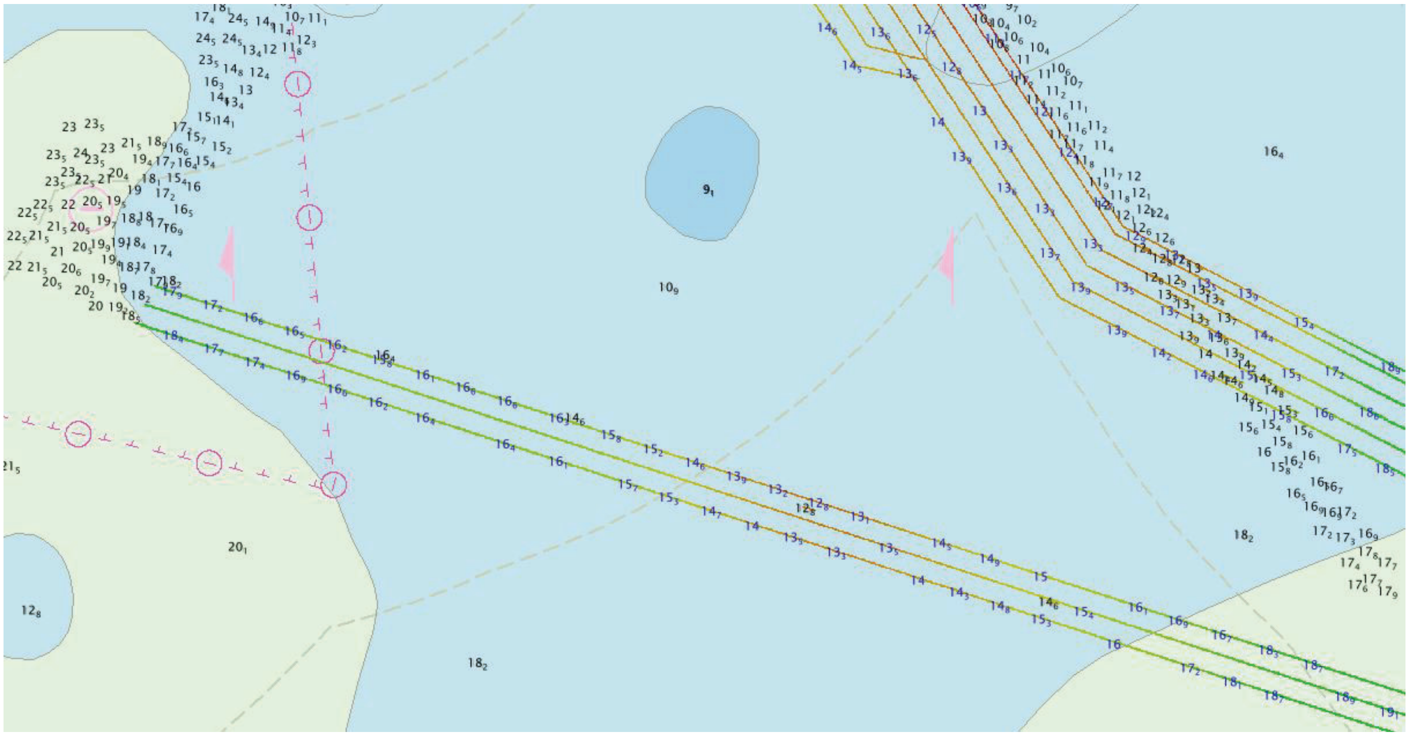

Figure 6: West part of the survey area: Soundings from this survey (blue) overlaid with existing charted soundings (black). Soundings in meters.

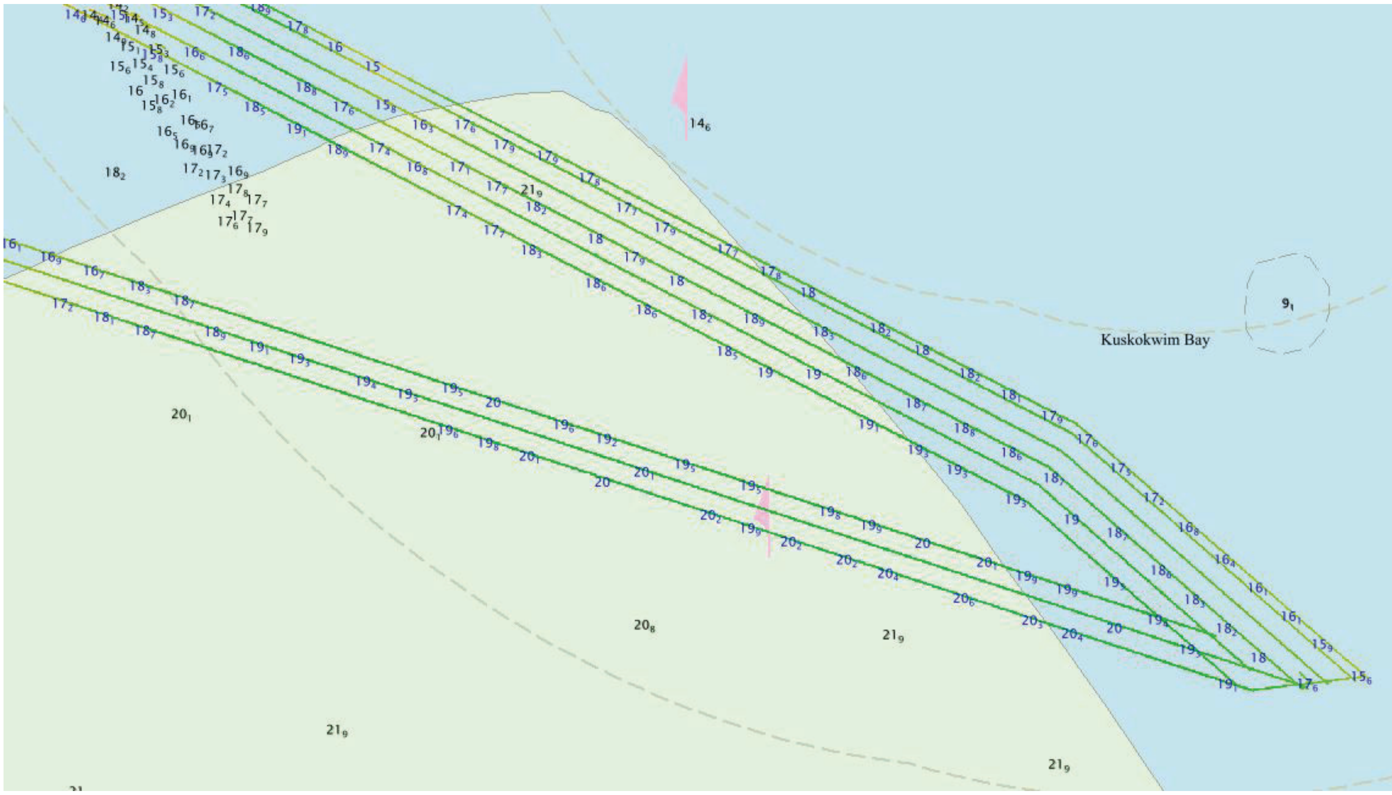

Figure 7: East part of the survey area: Soundings from this survey (blue) overlaid with existing charted soundings (black). Soundings in meters.

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
US2AK95M	1:1534076	11	02/07/2022	02/07/2022
US4AK6AN	1:80000	2	09/03/2021	09/03/2021
US4AK6BO	1:80000	2	02/28/2022	02/28/2022
US4AK6AP	1:80000	2	09/03/2021	09/03/2021
US4AK6BP	1:80000	1	10/17/2018	06/15/2021
US4AK6AO	1:80000	2	09/03/2021	09/03/2021
US4AK6CO	1:80000	2	02/28/2022	02/28/2022

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey. No DTONs were submitted for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

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

D.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

No bottom samples were required for 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 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.

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 NOS Hydrographic Surveys Specifications and Deliverables, Hydrographic Survey Project Instructions, and Statement of Work. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies,if any, noted in the Descriptive Report.

Report Name	Report Date Sent
GNSS Tide Buoy Reports	2022-11-30
Coast Pilot Review Report	2022-11-26
MMO Logsheets and Training Observer Logs	2022-11-26
NCEI Sound Speed Data Submittal	2022-10-07
Final Progress Report	2022-09-27
Survey Outline Submittal	2022-09-15

Approver Name	Approver Title	Approval Date	Signature
Andrew Orthmann	Charting Program Manager	12/29/2022	Andrew Orthmann Digitally signed by Andrew Orthmann Date: 2022.12.29 19:33:37 -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