H11261

NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC/LIDAR

Field No. OPR-P182-KRL-04

Registry No. H11261

LOCALITY

State ALASKA

General Locality Southwest Alaska Peninsula

Sublocality Herring Lagoon

2004

CHIEF OF PARTY

Mark Sinclair Darren Stephenson

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DATE

HYDROGRAPHIC TITLE SHEET

NOAA FORM 77-28U.S. DEPARTMENT OF COMMERCE (11-72) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION **HYDROGRAPHIC TITLE SHEET**	REGISTRY NO. **H11261**
INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office	FIELD No. **N/A**

State: Alaska

General Locality: Southwest Alaska Peninsula

Sub-Locality: Herring Lagoon

Scale: 1:10,000 **Date of Survey:** May 25 to Sept. 04, 2004

Instructions dated: August 15, 2003 **Project No:** OPR-P182-KRL-04

Vessel: Tenix LADS Aircraft, VH – LCL

Hydrographer: M.J. Sinclair **Chief of Party:** D.J. Stephenson

Surveyed by: L.R. Chamberlain, W.T. Newsham, M.S. Hawkins, T.M. Farrow, J.K. Young, J.G. Guilford, S.P. Mumme, C.O. Johnson, S.R. Ramsay, N.E. Hewitt

Soundings taken by echo sounder, hand lead, pole: Laser Airborne Depth Sounder

Graphic record scaled by: L.R. Chamberlain and T.M. Farrow

Graphic records checked by: S.R. Ramsay

Protracted by: N/A **Automated plot:** HP Design Jet 800PS

Verification by: K. Sampadian, G. Nelson

Soundings in: Fathoms at MLLW

REMARKS: Contract # NC-NJ3000-4-00010 01.

Contractor: Tenix LADS, Incorporated, 2548 Beach Blvd, Suite 200, Biloxi, MS, 39531.

Sub contractor: John Oswald and Associates, 12001 Audubon Dr, Anchorage, AK 99516.

Times: All times are recorded in UTC.

Purpose: The purpose of this survey is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

Projection is UTM Zone 4.

DESCRIPTIVE REPORT TO ACCOMPANY

HYDROGRAPHIC SURVEY H11261

SCALE 1:10,000, SURVEYED IN 2004

TENIX LADS AIRCRAFT, VH-LCL

TENIX LADS, INC. (TLI)

MARK SINCLAIR, HYDROGRAPHER

PROJECT
Project Number: OPR-P182-KRL-04 **Original:** DG 133C-03-CQ-0011
Date of Instructions: August 15, 2003 **Task Order:** T0005

Date of Supplemental Instructions: May 7, 2003 email regarding meeting with PHB, NOAA, November 24, 2004 e-mail regarding SOW revision and April 8, 2005 email regarding the change of sub-locality name.

Sheet Number: AS
Registry Number: H11261

PURPOSE[1]

To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

A. AREA SURVEYED

The LADS Mk II aircraft operated out of Sand Point Airport from May 25 to September 04, 2004. During this period thirty-one survey sorties were flown under Task Order 5 OPR-P182-KRL-04 to Mitrofania Island and vicinity, Alaska. Survey operations covered seven smooth sheets. This Descriptive Report describes Sheet AS, which covers north of Fishhook Bay to south of Herring Lagoon.

The sub-locality name has been changed from 'Cape Itki to Herring Lagoon' as set out in the Statement of Work to 'Herring Lagoon' following approval from NOAA Pacific Hydrographic Branch (see Appendix V – Supplemental Survey Records and Correspondence). This was changed because the sheet limits have been adjusted to include additional lidar data collected in the north towards Fishhook Bay and also because the survey data from Cape Itki is included in survey H11260. Sheet AS has been reoriented from landscape to portrait in order to include the additional lidar data collected around Fishhook Bay (see Figure 1 and 2).

Environmental factors such as wind strength and direction, cloud cover, high ground and water clarity influenced the area of data acquisition on a daily basis. See section B.2 Quality.

The planned and actual linear miles sounded for the areas are provided at Appendix III. The amended sheet limits for Sheet AS are presented below:

Sheet AS	Latitude (NAD 83)	Longitude (NAD 83)
NW corner	56°.03211419 N	158°.69032183 W
SE corner	55°.92213420 N	158°.56958499 W

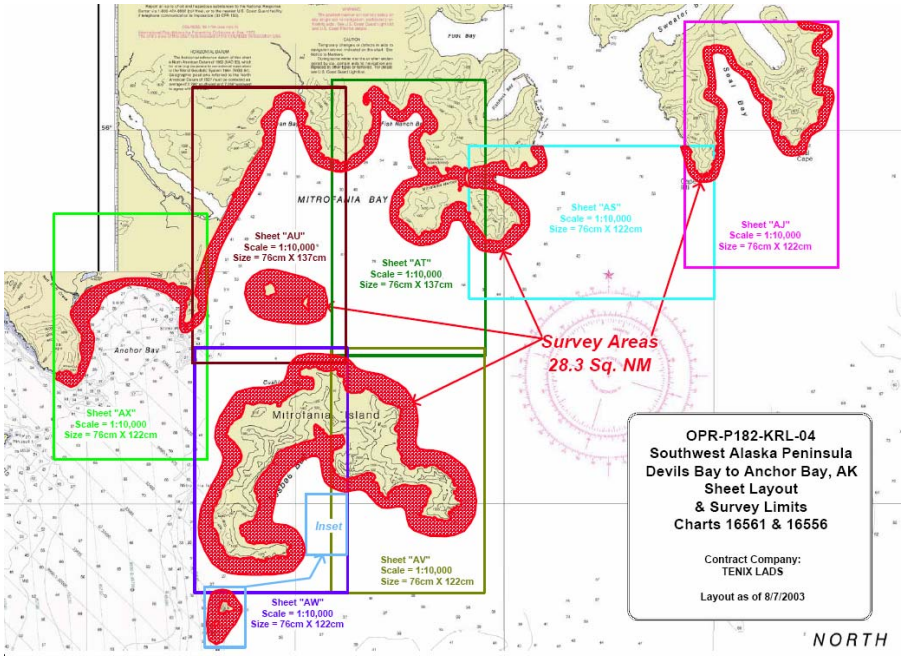


Figure 1 - Survey Area for Task Order 5 with Sheet Limits as Described in Statement of Work

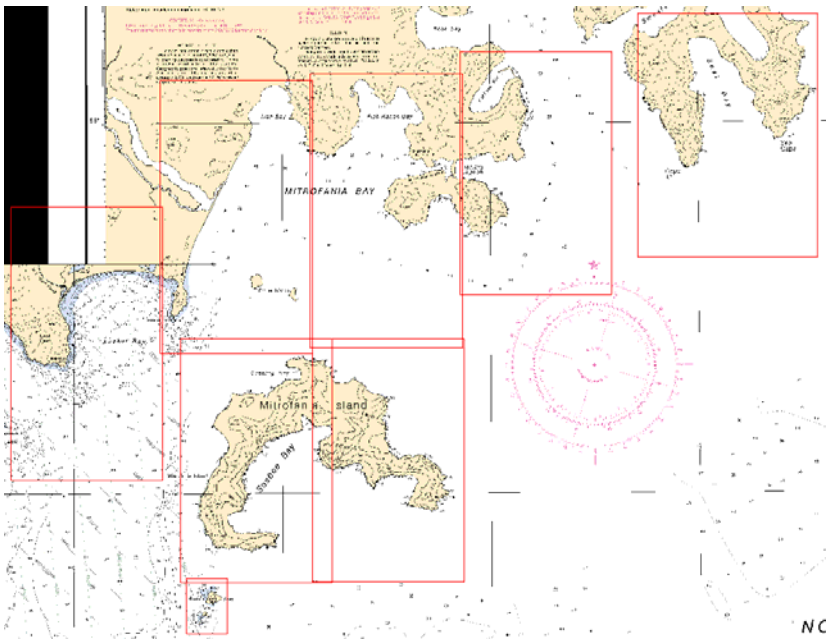


Figure 2 – Actual Limits of Rendered Smooth Sheets Under Task Order 5

B. ACQUISITION AND PROCESSING

Refer to the Data Acquisition and Processing Report for a detailed description of the equipment, processing and quality control procedures. A general description and items specific to this survey are discussed in the following sections.

B.1 EQUIPMENT

Data collection was conducted using the LADS Mk II Airborne System, data processing using the LADS Mk II Ground System and data visualization, quality control and final products using Caris HIPS 5.3, GMT/VTK, Terramodel and MicroStation version 8.

B.1.1 Airborne System

The LADS Mk II Airborne System (AS) consists of a Dash 8-200 series aircraft which has a transit speed of 250 knots at altitudes of up to 25,000 feet and an endurance of up to eight hours. Survey operations are conducted from heights between 1,200 and 2,200 feet at ground speeds between 140 and 175 knots. The aircraft is fitted with a Nd: YAG laser which is eye safe in accordance with ANSI Z136.1-2000, American National Standard for Safe Use of Lasers. The laser operates at 900 Hertz from a stabilized platform to provide 5x5 or 4x4 meter laser spot spacing in the main line sounding mode of operation. These two modes of data capture resolution require an over ground aircraft speed of 175 and 140 knots respectively. The electro-mechanical scanner also provides examination modes of sounding with laser spot spacings of 3x3 and 2x2 meters and swath widths of 100 and 50 meters respectively.

Green laser pulses are scanned beneath the aircraft in a rectilinear pattern. The pulses are reflected from the land, sea surface, within the water column and from the seabed. The green returned laser energy is captured by the green receiver and then digitized and logged onto digital linear tape. An infra-red beam is also directed vertically beneath the aircraft. The height of the aircraft is determined by the infra-red laser return, which is supplemented by the inertial height from the Attitude and Heading Reference System and GPS height. The LADS Mk II system can operate by day and night. The depth penetration of the system may be improved at night by removing the daylight filter from the receiving optics. Survey operations may be restricted at night by elevations in or near the survey area, which may invoke civil aviation lowest safe altitude rules. Real-time positioning is obtained by either an Ashtech GG24 GPS receiver combined with Wide Area DGPS provided by Thales GeoSolutions or an Ashtech GG24 GPS receiver providing autonomous GPS. Ashtech Z12 GPS receivers are also provided as part of the Airborne System and Ground Systems to log KGPS data on the aircraft and at a locally established GPS base station.

B.1.2 Ground System

The LADS Mk II Ground System (GS) ‘Gandalf’ was used to conduct data processing in the field. Gandalf consists of a portable Compaq Alpha ES40 Series 3 processor server with 1 GB EEC RAM, 764 GB disk space, digital linear tape (DLT) drives and magazines, digital audio tape (DAT) drive, CD ROM drive and is networked to up to 12 Compaq 1.5 GHz PCs

and a HP 800ps Design Jet Plotter, printers and QC workstations. Gandalf is transported in the LADS Mk II aircraft to the deployment site.

Quality control checks and editing of the data were conducted on Ground System 'Forrest', comprising a Compaq Alpha ES40 Series 3 processor server with 1 GB EEC RAM, 764 GB disk space, digital linear tape (DLT) drives and magazines, digital audio tape (DAT) drive, CD ROM drive and is networked to up to 12 Compaq 1.5 GHz PCs and a HP 800ps Design Jet Plotter, printers and QC workstations.

The GS supports survey planning, data processing, quality control and data export. The GS component also includes a KGPS base station, which provides independent post-processed position and height data. A comprehensive description of the GS is provided in the Data Acquisition and Processing Report.

B.2 QUALITY

B.2.1 Data Density

The survey area was sounded at 4x4 meter laser spot spacing with main lines of sounding spaced at 80 meters, which provided the required 200% coverage.

At the sea surface the footprint of the laser beam is approximately 2.5 meters in diameter. As the beam passes through the water column it slowly diverges due to scattering. It should be noted that at 4x4 meter laser spot spacing there is a gap of between 1 to 1.5 meters between the illuminated area of adjacent soundings at the sea surface. There is a possibility that small objects in shallow water along the coastline may fall between consecutive 4x4 meter soundings and not be detected.

B.2.2 Water Clarity

The water clarity in the survey area was generally good for laser survey. The maximum lidar depths measured during the survey exceeded 30 meters, although 20 meters was the generally achieved depth.

B.2.3 Data Management

Due to the size and complexity of the survey area the project was split into two databases to ease the management of data acquisition and processing. The databases are identified as follows:

Database Name	General Locality	Sheets
mitro 1	Anchor Bay, Long Beach, Mitrofania Bay, Herring Lagoon, and Brothers Island	AX, AU, AT, AS
mitro 2	Mitrofania Island, Spitz Island, and Seal Bay	AW, AV, AJ

Sheet AS was flown in the mitro 1 database.

A third database, 'mitro 3', was created in order to undertake reconnaissance activities only.

A detailed table of databases and line numbers is presented in the Data Acquisition and Processing Report.

B.2.4 Data Acquisition

Survey operations were planned when suitable weather conditions prevailed. The first survey sortie was flown on May 26, 2004. Survey sorties were conducted when there was minimal low cloud in the survey area and this generally occurred if the wind was below 20 knots from the west to the north. In general the aircraft departed at 1400 hours local time. The final survey sortie was conducted on September 2, 2004.

B.2.5 Sea Conditions - Sea State, Waves, Swell, White Water

The sea state ranged from 1 to 4 throughout the survey and was generally between states 2 and 3. This did not affect data quality except where significant white water occurred around rocks in exposed areas. White water creates saturated surface pulses; where this occurred the soundings have been edited to No Bottom At (NBA) 0 meters.

Calm seas were experienced on occasions in Herring Lagoon. Under such calm conditions the sea may become glassy which degrades the sea surface model. Long period swell was observed to be not significant during the survey however an allowance has been made in the assessment of accuracy.

B.2.6 Kelp

Kelp is one of the factors that increase the complexity of a particular survey area. It is one of the reasons why 200% coverage is recommended in these areas. Kelp reduces the survey coverage achieved by lidar. Kelp also increases the amount of data processing which is required and the amount of boatwork which is recommended in section D.1.3 additional boatwork inside lidar area D.1.4. chart comparison spreadsheet. Large areas of kelp exist in the survey area.

Kelp areas can be recognized in the data by the following indications:

- Mid water column pulses, frequently with low amplitude and poorly defined leading edges.
- Returns from the seabed are highly attenuated.
- Soundings in shallow water are very sparse.
- Soundings do not correlate with overlapping data from adjacent lines.

The effect of kelp is to limit the penetration of the laser. This reduces the laser coverage of the seabed in kelp areas. Data processing takes much longer in these areas, as more points need to be assessed and reviewed by the surveyors validating, checking, conducting quality control and approving the data.

Kelp areas appear as gaps in the data on the coverage plot. In such areas of partial coverage kelp symbols have been inserted on the smooth sheet.

Rocks detected by the system in kelp areas may be difficult to discriminate as rock or kelp returns. When it is doubtful whether the return is from rock or kelp, a recommendation for additional boatwork is given in section D.1.4 chart comparison spreadsheet.

B.2.7 Nature of the Seabed

In general, the seabed was very rugged in the survey area. The coastline was very complex and frequently rose steeply out of the sea. Rocky, kelp covered ridges were common. The complexity increased the time required for operators to validate and check the data.

In more gentle sloping areas such as Herring Lagoon, very good data was collected.

B.2.8 Topography

The LADS Mk II system can measure topographic heights up to 50 meters elevation, subject to the depth / topographic logging window selected. For this survey, a 20 meter topographic height logging window was selected. As a result, the coastline was surveyed and elevations up to 20 meters were measured. Above 20 meters elevation, no coverage has been achieved. On the smooth sheet the height of islets is shown in ( ) and provided in feet above MHW. Maximum heights up to approximately 80 feet are shown as a result of the 20 meter topographic logging window.

B.2.9 Datums

Upon the completion of each flight the GPS data logged on the aircraft and at the base station was processed to determine the post-processed KGPS position and height of the aircraft. This data is used in the calculation of the sea surface datum.

B.2.10 Wind

Survey operations were conducted in wind strengths of up to 20 knots during the survey. In general the wind strength during the time of survey was around 10 knots from the west to northeast. Certain wind directions caused high levels of turbulence, where the wind was coming off high ground. The wind direction also influenced the formation of low cloud and sea fog. Turbulence, low cloud and sea fog influenced the choice of survey area during sortie operations.

B.2.11 Cloud

Low cloud was a significant factor. The wind direction affected the cloud base in the survey area. For example, in southerly or easterly conditions a low cloud base was experienced. The effects of low cloud were managed as follows:

a. Use of limited weather forecasts for the survey area. The weather conditions were interpolated by looking at conditions at Sand Point and Chignik. Two internet sites proved to be invaluable for forecasting the weather. An aviation site, http://adds.aviationweather.gov/, provided METAR data, actual wind speed and direction, cloud base and satellite cloud data. The observations were updated every 20 minutes. A NOAA weather site, http://pafc.arh.noaa.gov/, provided aviation and general weather.
b. Diversion to the alternate survey area in Task Order 6 during prolonged poor conditions on the Alaska Peninsula.

B.2.12 Effects of High Ground

For this survey the maximum operating height of the LADS Mk II system was extended to 2,200 feet. All survey operations were conducted at 2,200 feet. Some areas of the chart had no topographic elevations shown which resulted in lines being re-orientated to acquire data close to high ground. The proximity of high ground caused severe turbulence under certain conditions.

B.2.13 Receiver Gain

Changes in gain levels in the Airborne System automatically accommodate for changes in the sea surface, water column and seabed conditions. In some areas, after long over land passages, low gain levels were initially set on passing back over the water. Where this has been identified in the data these lines were reflown from the opposite direction to improve the coverage.

B.2.14 Raw Laser Waveforms

The raw laser waveform returns from the areas which were covered with kelp are considerably attenuated. In order to detect the seabed in such areas, the threshold in the GS was lowered to detect pulses with low signal-to-noise ratios. This enabled the seabed to be detected but also resulted in increased data validation times. In some areas of kelp the seabed was completely obscured and either no signal was detected (NBD - No Bottom Determined) or noise was detected by the system, in which case an appropriate NBA (No Bottom At) depth was assigned by the hydrographic survey operators during data validation.

B.2.15 Data Processing

The data was processed at the operating site in Sand Point on the return from each sortie. Final validation and checking were conducted at this site and Biloxi, MS. The quality control of the data was done independently in Adelaide, South Australia and the final approval was conducted in Biloxi, MS.

B.2.16 Progress Sketches

Progress sketches were provided to NOAA on a bi-weekly basis, copies of which can be found in Appendix III.

B.3 DATA FORMATS

Data is provided in the following formats:

- Hard copy preliminary smooth sheet. Depths in decimal fathoms and heights in feet.
- Digital preliminary smooth sheet. Produced in MicroStation version 8 and saved as MicroStation version 7 .dgn file. Note contour B-splines have been re-parameterized for compatibility with MicroStation 95 used by NOAA.
- Edited data set. An ASCII file of 3 meter clashed data, which is a subset of all accepted data. Depths are in meters.
- Preliminary smooth sheet data. An ASCII file of all soundings on the smooth sheet. Depths are in meters.
- Caris compatible data. LADS soundings and waveforms, which can be imported into Caris HIPS.
- Coverage plots and sun illuminated images. Provided in GEOTIFF format.
- Tidal Data provided in ASCII, xls and CSV formats.

Refer to the Data Acquisition and Processing Report for specific details.

B.4 BENCHMARKS

Depth benchmark areas from the 2003 lidar survey in the Shumagin Islands and Vicinity (H11147 A – I & L – N) were used to check the performance of the LADS Mk II system for the H11261 survey. Five benchmarks were used; two are in Popof Strait and three lie on a line south of Korovin Island. These benchmarks were surveyed to check the LADS Mk II system accuracy.

Center coordinates for the benchmark areas are as follows:

Sand Point Benchmark Line

Benchmark Name	Nominal Depth	Easting (WGS 84)	Northing (WGS 84)
BM_5	14 m	404 100	6 135 080
BM_6	5 m	403 087	6 133 148

Korovin Benchmark Line

Benchmark Name	Nominal Depth	Easting (WGS 84)	Northing (WGS 84)
BM_7	4 m	420 620	6 141 390
BM_8	12 m	420 330	6 140 920
BM_9	18 m	420 090	6 140 363

Table 1 – Benchmarks

Either one or both benchmark lines were flown during each sortie. The total number of benchmarks compared during the survey was 125. The tidal model in use for the comparison of benchmarks was the same as the tidal model used to reduce the benchmarks during the 2003 survey. Benchmark comparisons were conducted after the application of tides. Comparison summaries are provided in the Separates.

The LADS data is compared against the gridded benchmark surface in the GS and statistics are generated which include the number of points compared, the mean depth difference (MDD) and the standard deviation (SD) between the data sets. The benchmark comparison function compares the data against the benchmark surface, and as this data is unedited it may contain noise normally removed during the validation process which is flagged as the shoalest and deepest differences.

B.4.1 Mean Depth Differences (MDD) and Standard Deviation (SD)

The benchmarks were flown independently of the database being surveyed at the time. The averages of the mean depth differences and standard deviation for each benchmark run are as follows:

Sand Point Benchmarks

GS ID	BM Name	Nominal Depth	MDD	SD
1	BM_5	14 m	0.02 +/- 0.06	0.14 +/- 0.02
2	BM_6	5 m	-0.20 +/- 0.17	0.26 +/- 0.09

Korovin Benchmarks

GS ID	BM Name	Nominal Depth	Average MDD	SD
4	BM_7	4 m	0.05 +/- 0.06	0.14 +/- 0.03
5	BM_8	12 m	0.22 +/- 0.08	0.15 +/- 0.02
6	BM_9	18 m	0.20 +/- 0.06	0.17 +/- 0.01

Table 2 – Benchmark Results

These results are within expected tolerances and show that the LADS Mk II depth performance was within specifications. These results indicate that the LADS Mk II system operated correctly during the survey.

B.5 CROSSLINES

Crosslines were planned after the majority of main lines had been completed. Areas were selected where the seabed was reasonably flat. This minimizes the apparent differences in depths due to minor positional differences in steeper areas of seabed.

Fifteen crosslines were sounded at 4x4 meter laser spot spacing throughout the survey area as follows:

Line 933.0.1	6 crossline intersections.	Western side of the bay south of Mitrofania Harbor and Herring Lagoon.
Line 904.0.1	7 crossline intersections.	Eastern side of the bay south of Mitrofania Harbor and Herring Lagoon.
Line 804.0.1	3 crossline intersections.	Headland southeast of Ivan Bay.
Line 981.0.1	2 crossline intersections.	Southern part of Long Beach.
Line 982.0.1	10 crossline intersections.	Western side of Anchor Bay.
Line 1657.0.1	2 crossline intersections.	Western coast of Seal Bay.
Line 2120.0.1	5 crossline intersections.	Bay on the southeast coast of Mitrofania Island.
Line 2119.0.1	4 crossline intersections.	Bay on the southeast coast of Mitrofania Island.
Line 2108.0.1	3 crossline intersections.	Bay on the southeast coast of Mitrofania Island.

Line 1722.0.1	2 crossline intersections.	Bay on the north coast of Mitrofania Is.
Line 2602.0.1	4 crossline intersections.	South coast of Sosbee Bay.
Line 2702.1.2	3 crossline intersections.	Southwest coast of Mitrofania Island.
Line 2607.0.1	2 crossline intersections.	West coast of Mitrofania Island.
Line 1809.1.1	2 crossline intersections.	West coast of Mitrofania Island.
Line 2208.0.2	3 crossline intersections.	North coast of Mitrofania Island.

For sheet AS one crossline was flown, line 904.0.1.

B.5.1 Mean Depth Differences (MDD) and Standard Deviation (SD)

The averages of the mean depth differences and standard deviation for each crossline are as follows:

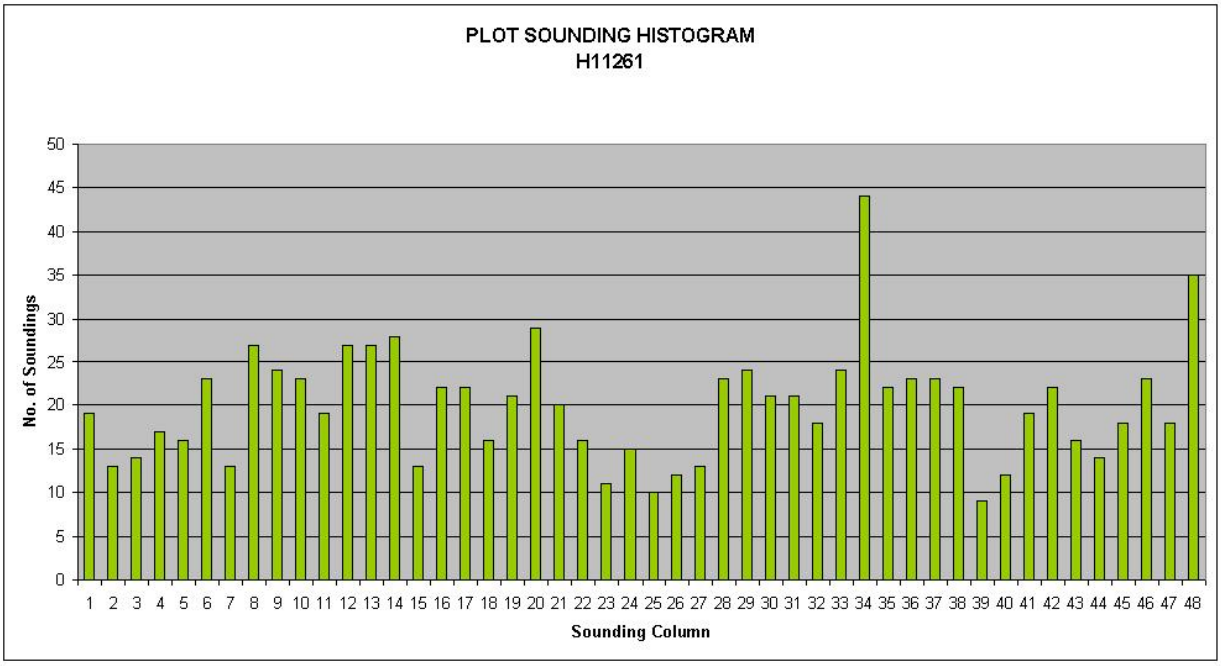
Run No.	Comparisons	Mean Confidence	*Average MDD*	*Average SD*
933.0.1	9547	5.9	0.11 +/- 0.13	0.34 +/- 0.28
904.0.1	15455	5.4	0.10 +/- 0.15	0.15 +/- 0.06
804.0.1	4593	5.4	0.01 +/- 0.08	0.21 +/- 0.01
981.0.1	2211	5.1	-0.33 +/- 0.02	0.13 +/- 0.03
982.0.1	17177	5.2	-0.10 +/- 0.10	0.13 +/- 0.05
2120.0.1	8919	7.1	0.20 +/- 0.02	0.12 +/- 0.02
2119.0.1	9134	6.8	-0.17 +/- 0.06	0.17 +/- 0.01
2108.0.1	2357	0.5	0.03 +/- 0.06	0.37 +/- 0.05
1722.0.1	2483	6.1	0.28 +/- 0.05	0.21 +/- 0.01
2602.0.1	7787	4.6	-0.03 +/- 0.04	0.19 +/- 0.05
2702.1.2	801	5.5	-0.01 +/- 0.16	0.56 +/- 0.21
2607.0.1	12761	4.0	-0.10 +/- 0.03	0.37 +/- 0.27
1809.1.1	3639	3.4	-0.03 +/- 0.05	0.27 +/- 0.00
2208.0.2	2285	0.6	-0.16 +/- 0.05	0.29 +/- 0.11
1657.0.1	1265	3.5	-0.05 +/- 0.07	0.23 +/- 0.02

Table 3 – Crossline Comparison Results

Crossline comparison details are provided in Appendix V of the Separates. The results of 2702.1.2 do not appear to be consistent with IHO Order-1 depth accuracy. However, this is due to the steep seabed gradient in this area.

B.6 ANALYSIS OF RESULTS

A sounding histogram has been produced of the column and occurrence of each sounding shown on the smooth sheet. The graph shows that there is no evident scan angle bias in the data.



Graph 1 – Sounding Histogram of Smooth Sheet H11261

B.7 POSITION CHECKS

Two independent positioning systems were used during the survey. Real-time positions were determined by autonomous GPS. A post-processed KGPS position was also determined relative to a local GPS base station that was established on the rooftop of the Popof Pizza Building at the processing facility in Sand Point. The post-processed KGPS position and height were applied to each sounding during post-processing.

Position checks were conducted prior to, during and following data collection as follows:

a. DGPS Site Confirmation. A 24-hour certification was conducted of the local GPS base station established at the survey office site.

b. Static Position Check. Prior to commencing data collection the coordinates of the aircraft GPS antenna were determined relative to three marks which were surveyed on the tarmac at Sand Point Airport. Data was then logged by each LADS Mk II positioning system enabling the positions to be checked against the known surveyed points. The accuracy of the KGPS solution during the static position check was 0.089 meters (95% confidence). The results and details of the static position check are enclosed in the Vertical and Horizontal Control Report.

c. Dynamic Position Check. During each sortie GPS data was logged on the aircraft and at the local GPS base station. This provided a check between the real-time GPS and post-processed positions. The mean difference between the real-time and post-processed position for each database was 2.401 meters (mitro1) and 2.321 meters (mitro2), with an average standard deviation of 0.211 meters (mitro1) and 0.201 meters (mitro2). Details are provided in the Vertical and Horizontal Control Report.

d. Navigation Position Check. Navigation checks were also conducted over the local GPS base station on the roof of the processing facility. This enabled the known position of the structure to be checked against the image on the downward looking video. This provided a gross error check of position. The mean error was 0.96 meters with a standard deviation of 3.49 meters. Details are provided in the Separates.

e. Position Confidence. The position quality was also monitored by checking a post-processed position confidence (C3), which is determined from the AS platform error, GPS error and residual errors between the actual GPS positions and aircraft position as determined from the line of best fit. No position anomalies were detected.

The position checks were within the expected tolerances and showed that the positioning systems were functioning correctly.

B.8 CORRECTIONS TO SOUNDINGS

Refer to the Data Acquisition and Processing Report for a description of corrections to soundings, which demonstrates that corrections to the soundings were being applied correctly.

There were no deviations from the corrections described therein.

C. VERTICAL AND HORIZONTAL CONTROL

Refer to the Vertical and Horizontal Control Report for a detailed description of the vertical and horizontal control used during this survey. A summary of vertical and horizontal control for the survey follows.

C.1 VERTICAL CONTROL

Vertical control for the survey was based on the Mean Lower Low Water tidal datum (MLLW). The operating National Water Level Observation Network (NWLON) station at Sand Point, AK (9459450) established vertical control for the LADS depth benchmark areas and for datum determination at the subordinate station installed at Cushing Bay, Mitrofania Island. The Mitrofania Island tide station served as vertical control for the survey areas around Mitrofania Island and Anchor Bay to Seal Bay.

Station details are as follows:

		WGS84	
Gauge	**Location**	**Latitude**	**Longitude**
9459450	Sand Point City Dock	55° 20.2' N	160° 30.1' W
9459016	Cushing Bay, Mitrofania Island	55° 53.3' N	158° 49.2' W

Table 4 – Sand Point and Cushing Bay Tide Gauge

C.2 ZONING

NOAA initially supplied tide zones that cover the extent of the survey, with time and range correctors relative to the Sand Point tide station. These were superseded by preliminary zones calculated prior to survey operations by John Oswald and Associates, LLC in Anchorage, AK. The preliminary zones were established by a 30-day comparison of simultaneous observations between Sand Point and Mitrofania Island. Analysis of crosslines and overlaps of the main lines of sounding concluded that preliminary tide zoning was adequate and therefore the preliminary tide zoning correctors have been considered to be the final zoning correctors.

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
M1	1	+0 minutes	x0.96	9459016
M2	2	+0 minutes	x1.00	9459016
M3	3	+0 minutes	x1.04	9459016
M4	4	+0 minutes	x1.08	9459016
SWA204A	5	+0 minutes	x1.00	9459450
SWA193A	6	+0 minutes	x1.02	9459450

Table 5 – Tide Zones

An analysis of simultaneous tides at Sand Point and Mitrofania Island for the period May 1, 2004 to Aug 30, 2004 enabled John Oswald and Associates to compute final datum for the Mitrofania Island tide station. Full details of this analysis can be found in the Mitrofania Island Tide Station Report prepared by John Oswald and Associates dated November 5, 2004. This report has been supplied digitally with the H11260 AJ Report CD in the tides directory in PDF format and sent to CO-OPS.

The derived value at the Mitrofania tide gauge for the difference between MLLW and MHW is 2.121 meters. From the tide zoning a range factor of 1.04 was used for Sheet AS to determine a MHW value of 2.206 meters or 1.206 fathoms.

The verified tides were supplied by John Oswald and Associates. The verified tide data was checked against predicted tides to ensure there were no meteorological effects at the tide gauge. The corrected gauge data was smoothed using a fifth order polynomial of five hours length and then supplied to Tenix LADS, Inc. for the application of tides.

For final processing, tidal correctors were applied to the verified tidal data delivered by John Oswald and Associates. The time and height correctors listed above were used for processing the data for tides.

C.3 HORIZONTAL CONTROL

Data collection and processing were conducted on the Airborne and Ground Systems in World Geodetic System (WGS 84) on Universal Transverse Mercator (Northern Hemisphere) projection UTM (N) in Zone 4, Central Meridian 159° West. All units are in meters. This data was post-processed and all soundings are relative to the North American Datum 1983 (NAD 83).

C.3.1 LADS Local GPS Base Station – Sand Point

Real-time positions were determined using an Ashtech GG24 GPS receiver. A local GPS base station was coordinated by John Oswald and Associates on the roof of the Popof Pizza Building at the processing facility, Sand Point, AK on March 28 - 29, 2004.

The derived NAD83 coordinates for the local GPS base station, are:

NAD 83		**UTM (N) Zone 4**		
Latitude (N)	Longitude (W)	Easting (m)	Northing (m)	Ellipsoidal Height (m)
55°20’42.544”	160°28’53.447”	406 048.735	6 134 199.851	72.980

Table 6 – GPS Base Station

Post-processed KGPS positions were determined off-line using data logged at the local GPS base station and on the aircraft. This data was processed through Ashtech PNAV software to calculate both a DGPS and KGPS position solution. The KGPS positions were then imported into the GS and applied to all soundings. This provided increased sounding position accuracy and horizontal redundancy.

The local GPS base station site was checked for obstructions and multipath over a 24 hour period on May 27 and 28, 2004. The results outlined in the Vertical and Horizontal Control Report reveal that the local GPS base station site is free from site specific problems such as multipath and obstructions.

On May 27, static position checks of the LADS MkII positioning systems were undertaken using a three-point control network established at the Sand Point Airport. The results outlined in the Vertical and Horizontal Control Report revealed no gross errors and that all positioning systems functioned correctly.

During each sortie, GPS data was logged both on the aircraft and at the local GPS base station, which enabled a post-processed KGPS position solution to be determined. These positions were then compared to the position determined by the real-time positioning system. This dynamic positioning check provided quality control of the positioning systems and the positional differences were within tolerance for the survey. These differences are tabulated in the Vertical and Horizontal Control Report.

Navigation position checks were conducted over the local GPS base station during each sortie when suitable weather conditions prevailed. Following each sortie the logged aircraft position was processed against the downward looking video record to determine the difference in position at the time of overflight. This provided a gross error check on the aircraft positioning.

The tabulated results are presented in the Vertical and Horizontal Control Report and revealed that the positioning systems functioned to within expectations.

D. RESULTS AND RECOMMENDATIONS

Recommendations for charting action are provided in D.1.

During the checking and approval of the data, seventeen additional features were identified which require investigation. This is provided in section D.2.

No Aids to Navigation were detected during the survey. This is normally provided in D.3.

The recommended overlap for boatwork is provided in D.4.

In the vicinity of steep coastline some contours on the smooth sheet appear unsupported by the smooth sheet soundings. Particularly around the MLLW depth curve, additional soundings were added from the 3m clashed dataset. These additional soundings were either placed on the appropriated level if room allowed on the smooth sheet or on the Excess level, numbered 63 and not displayed. These are provided in an additional file found with smooth sheet plot scale clashed data.

D.1 CHART COMPARISON - SMOOTH SHEET H11261 AS

H11261 was compared to:

- Preliminary Chart 16561 1st Edition January 2001, at scale 1:80,000. Nil corrections.

Recommendations for charting action are described in section D.1.1 charted depths and features and in the chart comparison spreadsheet under section D.1.4.

D.1.1 Charted Depths and Features

The chart in this area is generally unsurveyed with only the coastline and a number of rocks and islets along the coast portrayed. The area surveyed is represented on the smooth sheet in considerably more detail than is currently shown on the chart. In particular, the position of the coastline, islets and rocks are more accurately portrayed on the smooth sheet. The following general recommendations are relevant:

a. Coastline. The charted coastline is highly generalized. The surveyed coastline differs from the charted position by up to 75 meters throughout the smooth sheet. It is recommended that the coastline on the chart be amended to match the smooth sheet.

b. Inshore Islets. A large number of islets have been surveyed close to the coastline. Many of these are not shown on the chart, as the charted coastline is highly generalized. It is recommended that the chart be amended to match the smooth sheet. Where significant these islets are detailed in the chart comparison spreadsheet D.1.4. It should be noted that new islets are drawn on the smooth sheet in red if they do not currently appear on the chart.

c. Rocks. A number of rocks and drying rocks have been surveyed along the coastline that are not shown on the chart due to the unsurveyed nature of the area. It is recommended that the chart be amended to match the smooth sheet. Where significant, these rocks are detailed in the chart comparison spreadsheet D.1.4.

d. Foul Areas. Charted foul areas, particularly along the north coast of Herring Lagoon and the coastline to the northeast of Herring Lagoon, are described in greater detail by the rocks, drying rocks, kelp and islets represented on the smooth sheet.

In addition to the general recommendations above, some 55 significant differences between the chart and the smooth sheet have also been identified. Specific recommendations for these differences are described in the chart comparison spreadsheet. An expanded version of the spreadsheet is included digitally on the survey report CD. The digital .xls version contains information that may be useful for planning of boat sounding and easy to download into other survey packages and has the file name Sheet AS_V1_ChartComp.xls.

The chart comparison was conducted by reviewing the chart, the lidar coverage plot and the lidar smooth sheet. For each item identified, screen dumps of the Local Area Display and Raw Waveform Display were extracted from the LADS Mk II Ground System. These have been reviewed in order to make the following assessments:

a. Type of Feature
b. Kelp Area
c. Further Examination Recommended
d. Charting Recommendation
e. Remarks

Each chart comparison was categorized as follows:

1. New shoal found
2. Charted shoal disproved / not found

The fields in the chart comparison spreadsheet have been developed from experience learned and feedback received from previous lidar surveys in Alaska, witnessing survey operations in NOAA ship Rainier and from meetings at PHB and UNH. They have been designed for ease of use and to minimize double handling of data and transcription. Continued feedback is welcomed in order to develop these formats in order to achieve further efficiencies in data handling.

D.1.2 AWOIS

No AWOIS were assigned to this Task Order.

D.1.3 Additional Boatwork Inside Lidar Area

A number of significant soundings have been reviewed that were uncertain. For example, some isolated rocks in kelp were detected that were difficult to correctly classify as either rock or kelp. Rocks were also detected in areas that were permanently covered with white water. In circumstances where it was difficult to correctly classify a particular sounding, a recommendation for investigation by boat for 28 uncertain soundings has been made in the chart comparison spreadsheet. An expanded version of the spreadsheet is included digitally on the survey report CD. The digital .xls version contains information that may be useful for planning of boat sounding and is readily downloaded into other survey packages.

D.1.4 Chart Comparison Spreadsheet

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (degrees)	**NAD 83 Longitude W** (degrees)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet)	**NAD 83 Latitude N** (degrees)	**NAD 83 Longitude W** (degrees)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks** **All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
1	AS3	1				-7.22	-17	55° 57' 17.3250"	158° 41' 08.3131"	Islet	Y	N	Insert	Note: Islet 20m NW, -1.2 drying rock 80m W, -0.3 drying rock 50m S.
2	AS5	1				-6.65	-15	55° 57' 00.1327"	158° 40' 51.1498"	Islet	Y	N	Insert	Note: Many islets and drying rocks in vicinity.
3	AS6	1	Islet (*4*)	55° 56' 58"	158° 40' 44"	-2.82	-1.6	55° 56' 57.5245"	158° 40' 45.0243"	Drying Rk	Y	N	Replace	Note: Islets and drying rocks inshore.
4	AS8	1				-2.84	-1.6	55° 57' 01.8165"	158° 40' 36.2266"	Drying Rk	Y	N	Insert	Note: Islets and drying rocks inshore.
5	AS9	1				-0.44	-0.3	55° 57' 01.5745"	158° 40' 32.0070"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Islets and drying rocks inshore.
6	AS10	1				-4.75	-9	55° 57' 02.4013"	158° 40' 29.1611"	Islet	Y	N	Insert	Note: Many islets and drying rocks in vicinity.
7	AS11	1				-3.95	-6	55° 57' 01.8602"	158° 40' 24.2220"	Islet	Y	N	Insert	Note: Islets and drying rocks to W.
8	AS12	2	Islet (*125*)	55° 57' 01"	158° 40' 20"					Coast	Y	N	Replace	Charted islet is a headland. Replace with MHW line.
9	AS13	1				-1.81	-1.0	55° 57' 06.6592"	158° 40' 00.5742"	Drying Rk	Y	N	Insert	Note: Drying rocks and islet to N.
10	AS14	1				7.94	4.3	55° 57' 06.9478"	158° 39' 48.5343"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 5.5 Rk 55m SE.
11	AS15	1				12.39	6.7	55° 57' 10.6271"	158° 39' 19.6668"	Bank	Y	Y	N/A	
12	AS16	1				-2.52	-1.4	55° 57' 12.1882"	158° 39' 53.0874"	Drying Rk	Y	N	Insert	Note: Many islets and drying rocks along coastline.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
13	AS17	1				-2.02	-1.1	55° 57' 20.2239"	158° 39' 40.0732"	Drying Rk	Y	N	Insert	Note: Islets and drying rocks to NE.
14	AS18	1				-1.34	-0.8	55° 57' 26.1644"	158° 39' 26.3471"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Islets inshore to W.
15	AS19	1	Kelp			4.56	2.5	55° 57' 45.1734"	158° 39' 12.5033"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Many islets and drying rocks inshore along coastline.
16	AS20	1	Kelp			-2.65	-1.5	55° 57' 49.3886"	158° 39' 18.1129"	Drying Rk	Y	N	Insert	Note: Many islets and drying rocks along coastline.
17	AS21	1				-0.12	-0.1	55° 57' 59.8750"	158° 39' 36.2868"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.
18	AS22	1	Drying Rk (4)	55° 58' 05"	158° 39' 37"						Y	Y	N/A	Kelp area. Not visible on downward looking video, or detected by system.
19	AS23	1				-1.94	-1.1	55° 58' 05.3355"	158° 39' 50.7648"	Drying Rk	Y	N	Insert	
20	AS25	1				-2.45	-1.4	55° 58' 17.7499"	158° 40' 10.2456"	Drying Rk	Y	N	Insert	Note: Many islets inshore.
21	AS26	1				-1.47	-0.8	55° 58' 24.8569"	158° 40' 24.1196"	Drying Rk	Y	N	Insert	
22	AS27	1				-12.68	-35	55° 58' 26.3548"	158° 40' 29.4297"	Islet	Y	N	Insert	
23	AS28	1	Drying Rk	55° 58' 29"	158° 40' 49"						Y	Y	N/A	Kelp area. Not visible on downward looking video, or detected by system.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
24	AS29	1	Drying Rk	55° 58' 29"	158° 40' 54"	-11.45	-31	55° 58' 28.3269"	158° 40' 55.7564"	Island	Y	Y	Insert	Charted drying rock may be in kelp area to N of surveyed islands. Note: Islet 20m SE.
25	AS30	1	Islet	55° 58' 30"	158° 41' 06"	-1.14	-0.6	55° 58' 29.1868"	158° 41' 07.3569"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -1.5 drying rock 10m S.
26	AS31	2	Drying Rk	55° 58' 31"	158° 41' 16"	-4.16	-7	55° 58' 29.5564"	158° 41' 11.8198"	Islet	Y	N	Replace	
27	AS32	1	Foul			-0.22	-0.1	55° 59' 00.6940"	158° 41' 17.3726"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Islets and drying rocks along coastline.
28	AS33	1	Foul			-2.22	-1.2	55° 59' 01.7415"	158° 41' 03.1416"	Drying Rk	Y	N	Insert	Note: Islet 25m NE.
29	AS34	1				-7.54	-18	55° 59' 02.8751"	158° 40' 55.8815"	Islet	Y	N	Insert	
30	AS35	1				-3.70	-5	55° 59' 04.5540"	158° 40' 46.5938"	Islet	Y	N	Insert	
31	AS36	1				-1.40	-0.8	55° 58' 56.3910"	158° 39' 26.9945"	Drying Rk	Y	N	Insert	Note: Islets to N.
32	AS37	1				-2.80	-1.5	55° 59' 00.2430"	158° 39' 10.6834"	Drying Rk	Y	N	Insert	
33	AS38	1				-4.36	-7	55° 59' 04.6569"	158° 39' 10.1984"	Islet	Y	N	Insert	Note: Drying rocks to NE.
34	AS39	1				-2.66	-1.5	55° 58' 58.8643"	158° 38' 47.3560"	Drying Rk	Y	N	Insert	Note: Many islets and drying rocks along coastline.
35	AS40	1	Foul			6.88	3.7	55° 59' 03.4359"	158° 38' 23.9552"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 6.1 70m SSE.
36	AS41	1	Foul			-3.71	-5	55° 59' 05.5746"	158° 38' 19.9064"	Islet	Y	N	Insert	Note: Many islets and drying rocks to N.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms/ whole feet)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
37	AS42	1				-3.42	-4	55° 59' 09.9501"	158° 38' 19.5367"	Islet	Y	N	Insert	Note: Many islets and drying rocks in vicinity.
38	AS44	2	Drying Rk	55° 59' 24"	158° 38' 31"						Y	Y	N/A	Area of thick kelp. Not visible in downward looking video. Not detected by system.
39	AS45	1				-4.62	-8	55° 59' 36.4291"	158° 38' 37.2178"	Islet	Y	N	Insert	Note: Islet 10m SW. Many islets and drying rocks in vicinity.
40	AS46	1				2.83	1.5	55° 59' 44.6391"	158° 38' 30.4233"	Rock	Y	Y	N/A	Possible Rk in kelp.
41	AS47	1				0.85	0.4	55° 59' 54.0025"	158° 38' 24.7460"	Rock	Y	Y	N/A	Possible Rk in kelp. Note: Islets and drying rocks inshore.
42	AS48	1				-0.59	-0.3	56° 00' 07.7126"	158° 38' 16.0003"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.
43	AS49	1				-0.79	-0.5	56° 00' 21.6578"	158° 38' 11.1075"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Many islets and drying rocks in vicinity.
44	AS50	1				-2.15	-1.2	56° 00' 24.5455"	158° 38' 11.7094"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Many islets and drying rocks in vicinity.
45	AS51	1				-4.17	-7	56° 00' 27.495"	158° 38' 15.6951"	Islet	N	N	Insert	Note: Many islets and drying rocks in vicinity.
46	AS53	1				-1.06	-0.6	56° 01' 04.5727"	158° 38' 23.3188"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Many islets and drying rocks in vicinity.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

			CHARTED			SURVEYED								
Sequence No	**Shoal No**	**Category**	**Charted Depth** (fms)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Surveyed Depth** (meters)	**Surveyed Depth** (decimal fms / whole feet)	**NAD 83 Latitude N** (DMS)	**NAD 83 Longitude W** (DMS)	**Type of Feature**	**Kelp Area**	**Further Examination Recommended**	**Charting Recommendation**	**Remarks All items covered by 4x4m laser spot spacing at 200% lidar coverage.**
47	AS54	1				-0.37	-0.2	56° 01' 12.2441"	158° 38' 29.1443"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: 3 islets to NW.
48	AS55	2	Drying Rk	55° 59' 15"	158° 38' 21"						Y	Y	N/A	Area of thick kelp. Not visible in downward looking video. Not detected by system.
49	AS56	1				3.54	1.9	55° 59' 47.3338"	158° 38' 28.0223"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 4.5 Rk 70m E.
50	AS57	1				3.07	1.7	56° 00' 03.7595"	158° 38' 18.5569"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 2.9 Rk 75m S.
51	AS58	1				1.13	0.6	56° 00' 13.0420"	158° 38' 15.5373"	Bank	Y	Y	N/A	Note: 0.5 Rk 80m NNE, 1.2 Rk 100m NE.
52	AS59	2	Drying Rk	56° 00' 42"	158° 38' 26"						Y	Y	N/A	Area of thick kelp. Not visible in downward looking video. Not detected by system.
53	AS60	2	Drying Rk	56° 00' 47"	158° 38' 28"						Y	Y	N/A	Area of thick kelp. Not visible in downward looking video. Not detected by system.
54	AS61	1				0.82	0.4	56° 00' 52.4124"	158° 38' 27.1168"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -1.2 drying rock 85m WSW.
55	AS62	2	Drying Rk	55° 58' 59"	158° 39' 21"						Y	Y	N/A	No drying rock visible in downward looking video or detected by system at charted position.

Shoal Categories
1-New Shoal Found
2-Charted Shoal Disproved / Not Found

D.2 FEATURES REQUIRING INVESTIGATION

During approval of the data 17 significant features were identified for further investigation and are presented in the following table. The full spreadsheet is also provided in Excel format with the digital data (SheetAS_V1_Features_Inv.xls). None of these areas correlate with a feature listed in the chart comparison spreadsheet. The kelp areas are described under three general sections:

1. Few detections, shoaler soundings may exist – a kelp area adjacent to the coastline within good or patchy lidar coverage with some detections by the system, but not necessarily the shoalest.
2. No detection by system, visible on video, deep water – off lying kelp area in deep water observed on the downward looking video.
3. No detection by system, visible on video, shallow water – kelp area adjacent to the coastline observed on the video, within good or patchy lidar coverage, with no detections by the system.

All reported features are considered significant for further investigation and potentially hazardous when conducting survey work by boat.

Sequence No	Feature No	Latitude (N)	Longitude (W)	Dimension (m)	Kelp Area Description	Significance
1	FAS1	55° 57’ 01.2”	158° 40’ 02.5”	15 X 15	No detection by system, visible on video, shallow water	100m SE of SE coast, roughly 2500m SE of Herring Lagoon
2	FAS2	55° 57’ 02.1”	158° 41’ 04.4”	15 X 15	Few detections, shoaler soundings may exist	200m SW of SW coast in unnamed bay S of Herring Lagoon
3	FAS3	55° 57’ 02.2”	158° 40’ 01.0”	15 X 15	No detection by system, visible on video, shallow water	120m SE of SE coast, roughly 2500m SE of Herring Lagoon
4	FAS4	55° 57’ 09.5”	158° 39’ 17.6”	35 X 15	No detection by system, visible on video, shallow water	550m ESE of SE coast, roughly 2500-3000m SE of Herring Lagoon
5	FAS5	55° 57’ 12.0”	158° 39’ 41.4”	50 X 100	Few detections, shoaler soundings may exist	300m ESE of SE coast, roughly 2500m SE of Herring Lagoon
6	FAS6	55° 57’ 14.4”	158° 39’ 21.0”	25 X 25	No detection by system, visible on video, deep water	400m ESE of SE coast, roughly 2500m SE of Herring Lagoon
7	FAS7	55° 57’ 16.4”	158° 39’ 27.6”	20 X 20	Few detections, shoaler soundings may exist	300m ESE of SE coast, roughly 2500m SE of Herring Lagoon
8	FAS8	55° 57’ 32.3”	158° 39’ 06.7”	25 X 25	No detection by system, visible on video, shallow water	150m E of E coast, roughly 2500m SE of Herring Lagoon
9	FAS9	55° 58’ 56.8”	158° 41’ 22.8”	15 X 15	No detection by system, visible on video, shallow water	150m SE of NW coast of Herring Lagoon
10	FAS10	55° 59’ 01.0”	158° 39’ 01.3”	40 X 40	No detection by system, visible on video, shallow water	150m W of SE coast in unnamed bay near NE Herring Lagoon

11	FAS11	55° 59’ 35.1”	158° 38’ 31.2”	25 X 25	No detection by system, visible on video, shallow water	160m E of E coast, 850m NE of Herring Lagoon Bay
12	FAS12	55° 59’ 31.4”	158° 38’ 34.0”	40 X 40	Few detections, shoaler soundings may exist	200m E of E coast, 1300m NE of Herring Lagoon Bay
13	FAS13	56° 00’ 27.0”	158° 38’ 07.1”	50 X 50	Few detections, shoaler soundings may exist	160m E of E coast, 1650m E of Fishhook Bay
14	FAS14	55° 59’ 55.7”	158° 38’ 11.0”	40 X 40	Few detections, shoaler soundings may exist	250m E of E coast, 2000m SE of Fishhook Bay
15	FAS15	55° 59’ 47.2”	158° 38’ 21.3”	25 X 25	No detection by system, visible on video, shallow water	240m E of E coast, 1600m NE of Herring Lagoon Bay
16	FAS16	55° 57’ 14.1”	158° 39’ 23.5”	35 X 35	No detection by system, visible on video, deep water	300m E of SE coast, 2500m+ SE of Herring Lagoon Bay
17	FAS17	55° 57’ 07.4”	158° 39’ 25.2”	50 X 50	No detection by system, visible on video, shallow water	600m E of SE coast, roughly 3000m SE of Herring Lagoon Bay

Table 7 – Features Requiring Investigation

D.3 AIDS TO NAVIGATION AIDS

No Aids to Navigation were seen or detected in the survey area for Sheet AS.

D.4 RECOMMENDED OVERLAP WITH LIDAR DATA

The coastline represented on the smooth sheet is generally steep with numerous rocks and islets close inshore. Good data was obtained in the small bays and some of the more exposed areas down to 15 fathoms. Heavy kelp and the very steep nature of seabed resulted in sparse data in a number of areas along the coast. The following recommended overlap by surface vessel is described below. A polygon is also included in the MicroStation file to illustrate the following recommendation and should be consulted when reading these recommendations. This polygon is provided as a .dgn file (SheetAS_V1_Overlap.pzip) and is provided with the digital data in MicroStation version 7 format.

- Note: all positions quoted are in NAD 83.
- Along the coast, to the south of Herring Lagoon, from the western edge of the sheet around to the south east coast of Herring Lagoon, 55° 58’ 22.6” N 158° 40’ 11.9” W, the coastline is extremely rugged with patchy coverage. In some locations depths beyond 12 fathoms exist. However, there are many gaps inshore and boatwork is generally recommended up to the 5 fathom isobath or limit of kelp areas, whichever is encountered first in this very complex area.
- Along the southeast coast and across Herring Lagoon, from 55° 58’ 22.6” N 158° 40’ 11.9” W to 55° 58’ 59.0” N 158° 40’ 56.2” W good coverage exists to 13 fathoms. Gaps

along the coastline are due to extensive kelp beds. Boatwork is generally recommended up to the 10 fathom isobath.

- On the north coast of Herring Lagoon, from 55° 59’ 01.9” N 158° 40’ 56.2” W across the incomplete lidar coverage gap and around to 55° 58’ 57.1” N 158° 39’ 27.1” W sparse coverage exists. In some locations 15 fathoms has been achieved, but in many areas there is little or no coverage due to kelp. Boatwork is generally recommended to the 5 fathom isobath or the seaward limit of kelp. Within the incomplete area no coverage was achieved inside the 3 fathom isobath.
- On the north coast of Herring Lagoon, from 55° 58’ 57.1” N 158° 39’ 27.1” W to 55° 59’ 21.2” N 158° 38’ 34.1” W sparse coverage exists. Boatwork is generally recommended to the 3 fathom isobath or limit of kelp throughout this area.
- Along the coast southeast of Fishhook Bay, from 55° 59’ 22.6” N 158° 38’ 30.5” W to the end of lidar coverage at the entrance to Fishhook Bay, 56° 01’ 29.8” N 158° 38’ 45.9” W , good patchy data exists beyond 10 fathoms in places. Gaps in coverage due to kelp exist both offshore and inshore of the overlap line. Boatwork along this complex coastline is generally recommended up to the 3 fathom isobath or limit of kelp areas.

D.5 INCOMPLETE LIDAR COVERAGE

One gap on the smooth sheet is due to incomplete lidar coverage. This gap is located on the north coast of Herring Lagoon. The incomplete lidar coverage is due to the proximity of high ground to the survey area. Survey lines were re-oriented to achieve maximum coverage. However, the undertaking of lines to cover this gap would have contravened regulations for safe flying operations. The gap extends from 55° 59’ 09” N 158° 40’ 14” W to 55° 59’ 07” N 158° 39’ 54” W. The gap is approximately 350 meters along the coast and 150 meters shorewards. No coverage was achieved inshore of the 3 fathom isobath. The incomplete coverage can be readily identified on the smooth sheet and lidar coverage plot.

E. APPROVAL SHEETS

LETTER OF APPROVAL – OPR-P182-KRL-04

This report and the accompanying smooth sheets are respectfully submitted.

Field operations contributing to the accomplishment of this survey were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and the accompanying smooth sheets have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Report	Submission Date
Descriptive Report – H11261	April 15 , 2005

D. J. Stuart

FOR Mark Sinclair
Hydrographer
Tenix LADS Incorporated

Date April 15, 2005.

[1] The LIDAR survey referenced in this Descriptive Report has been applied to the multibeam survey it junctions with. No stand-alone LIDAR information was compiled to either an HCell or an Hdrawing. For information concerning the compilation of LIDAR features and soundings see the Descriptive Report for multibeam survey H11476. LIDAR does not meet IHO object detection requirements. LIDAR was not used to supersede shoaler charted soundings or to disprove charted features.

The Data Acquisition and Processing Report and Horizontal and Vertical Control Report have been filed with the project records.

APPENDIX I – DANGERS TO NAVIGATION

Nil.

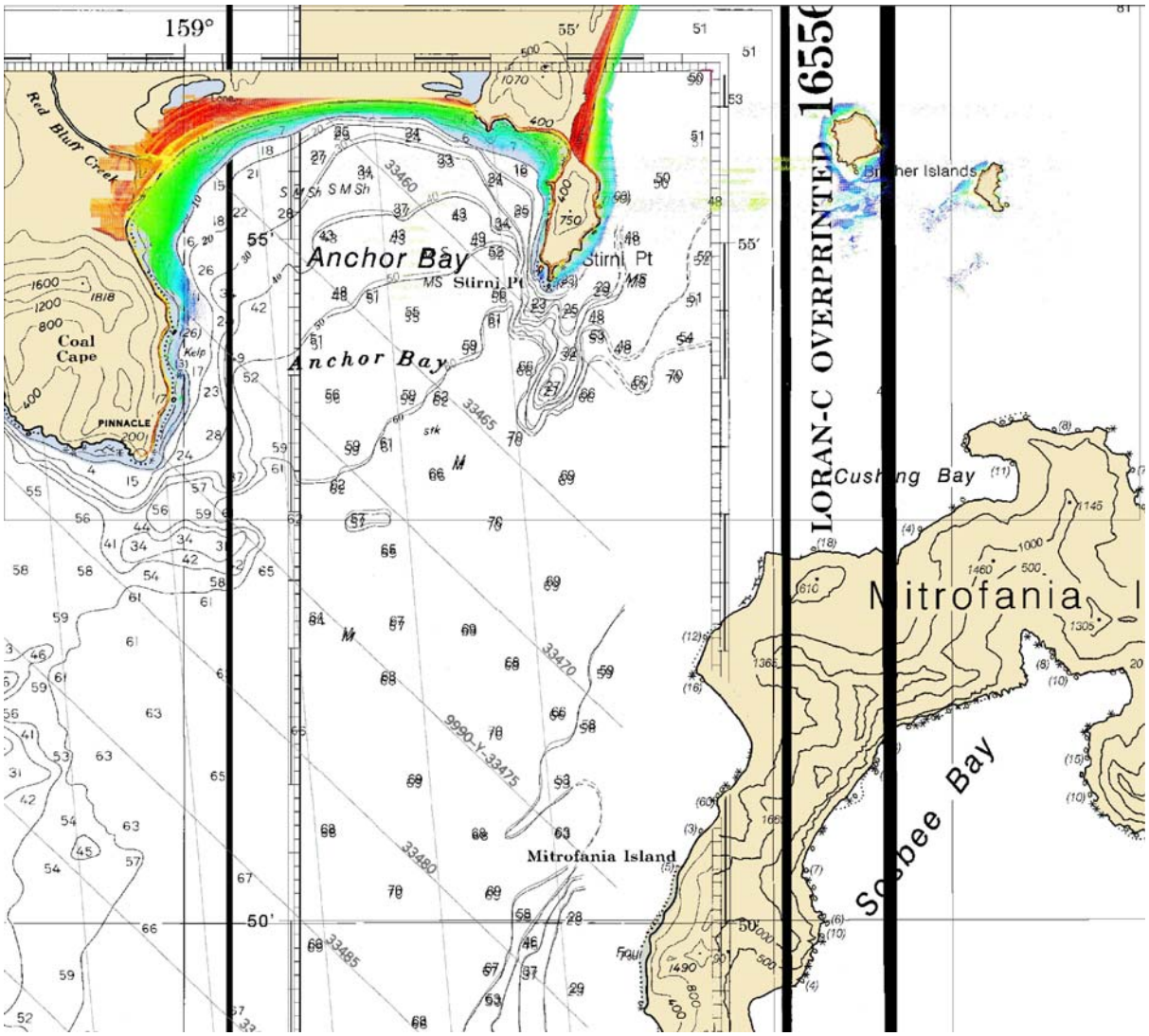
APPENDIX III – PROGRESS SHEET

Status upon completion of data acquisition for Task Order 5

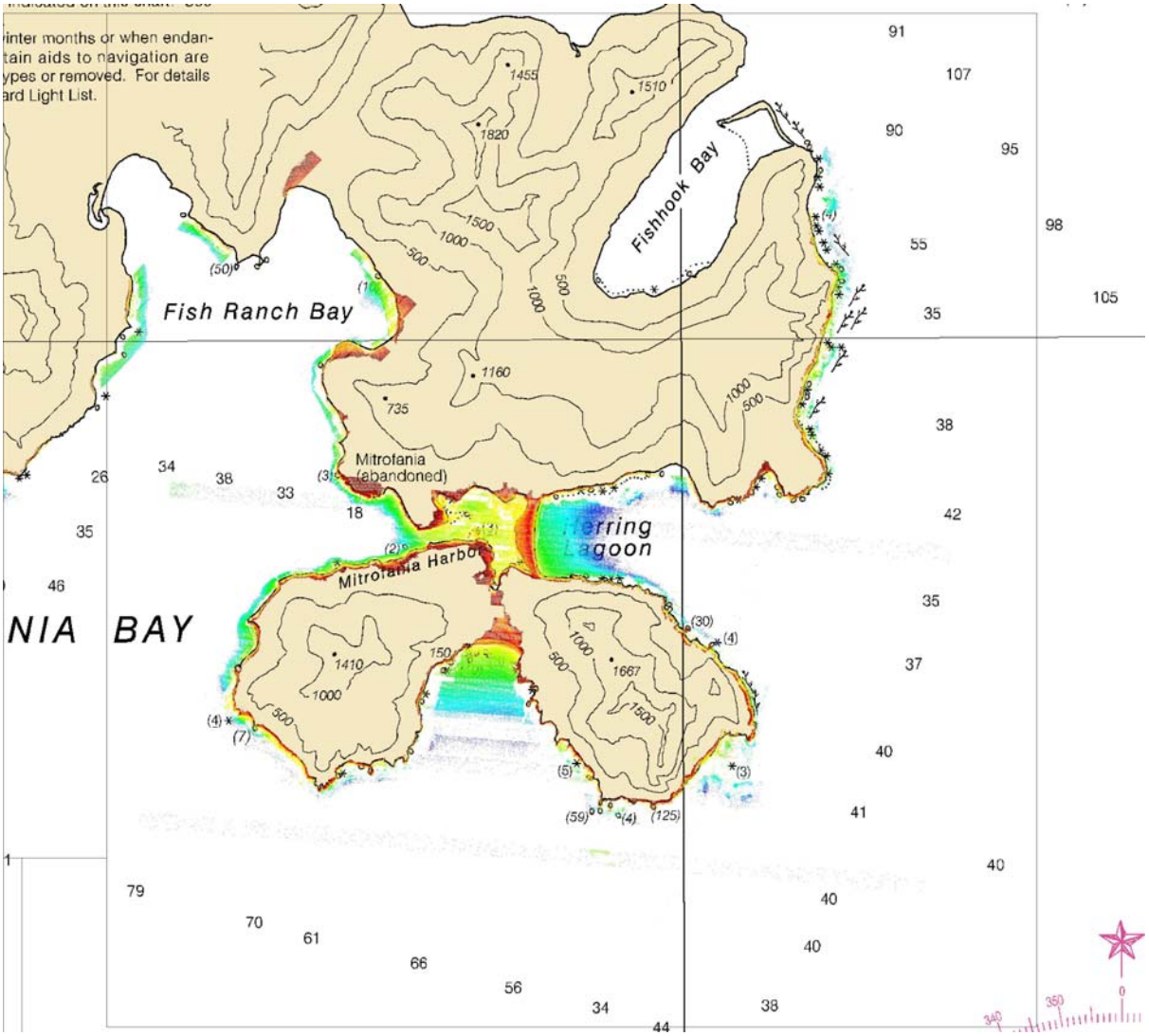
	May	June	July	August	September	Total	Total Planned	% Complete
Days on project	6	21	24	21	4	76		
Line – nm - flown	100	679	1776	745.1	30.1	3330.2	2382.5	139.8
Aircraft flown hours	14.3	23.2	55.4	37.9	2.2	133.0		
Aircraft on task hours	11.0	14.4	41.3	25.4	1.3	93.4		
Days with flight	3	6	12	9	1	31	23	134.7
Days deployed to TO6		9	7	11	0	27		
No flight due to weather	3	13	11	11	1	39		
No flight due to system	0	2	1	0	0	3		
Hours lost to weather	4	9	12	12	0	37		
Hours lost to system	4	4	0	0	0	8		

Note: Two of the sorties were shortened as no better data was being collected to improve the coverage.

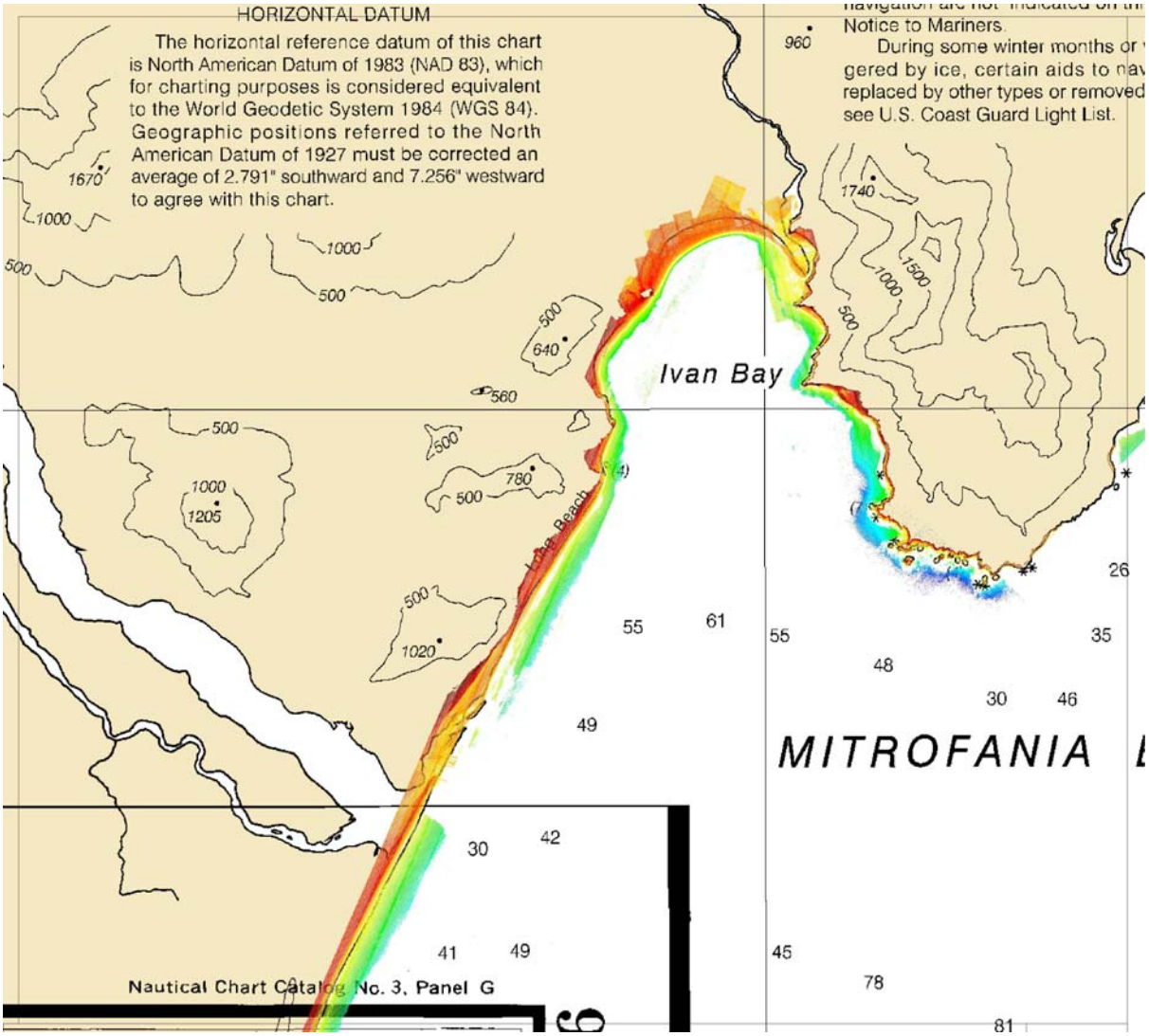
FINAL PROGRESS SKETCH - ANCHOR BAY



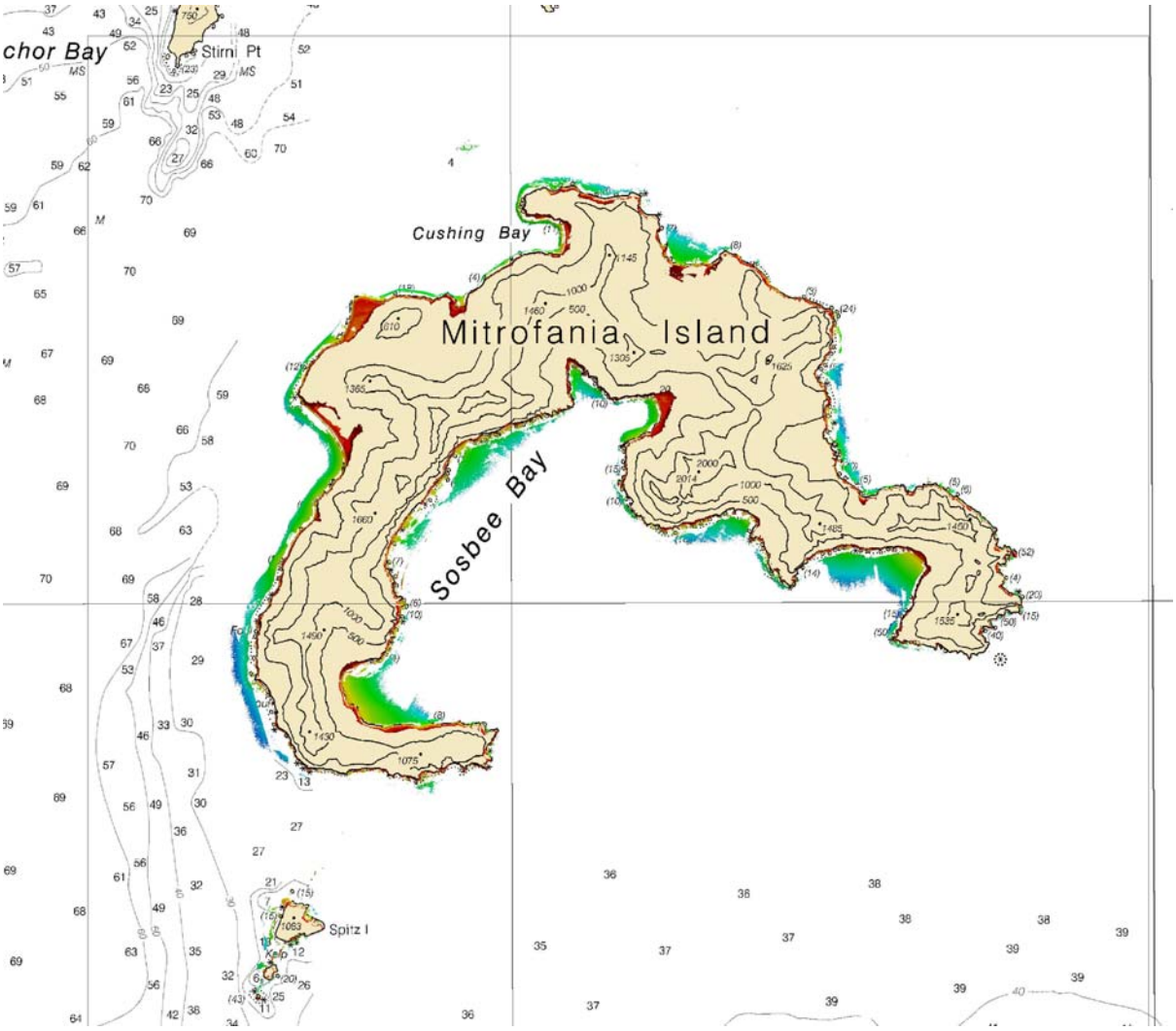
FINAL PROGRESS SKETCH - FISH RANCH BAY



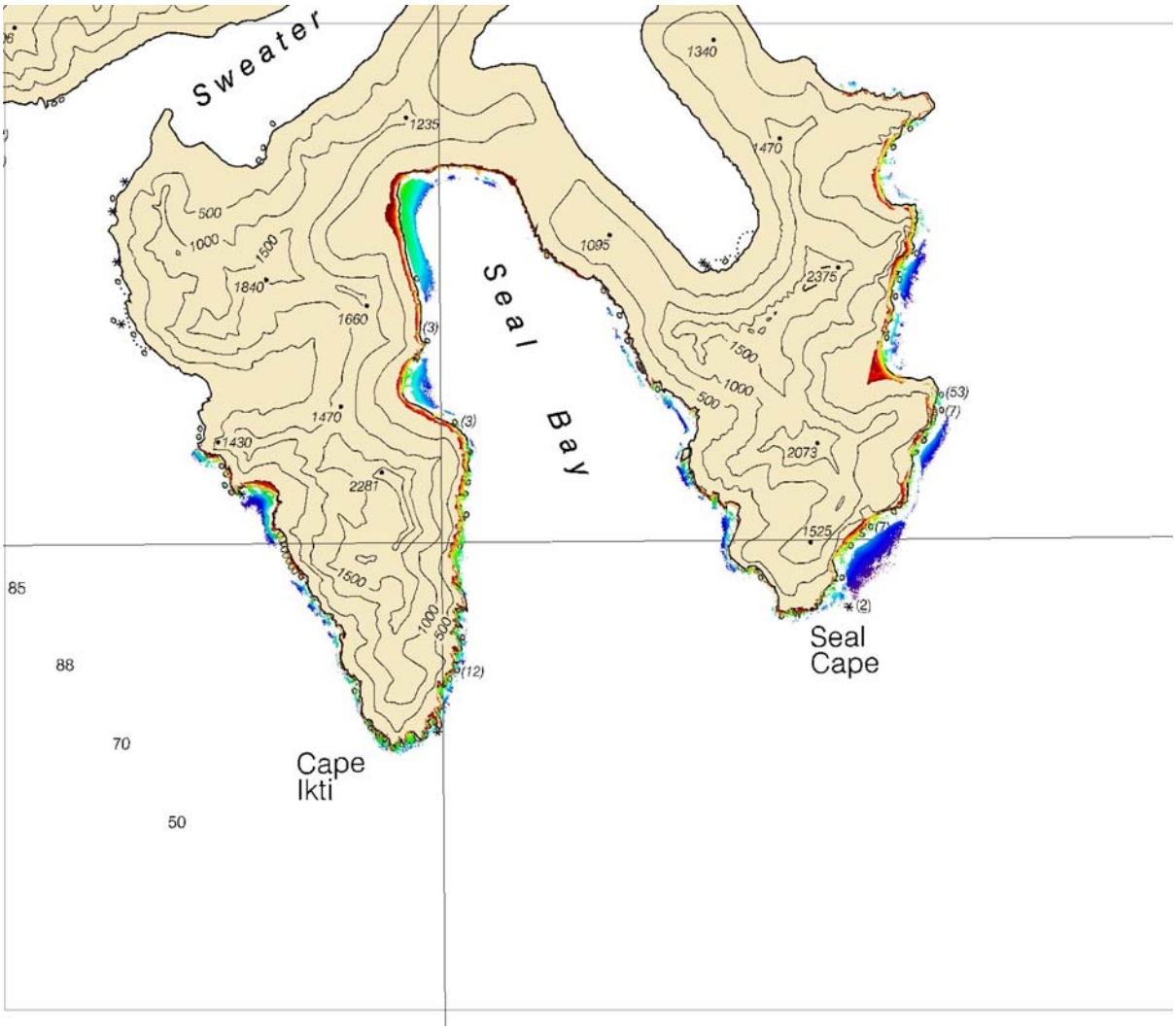
FINAL PROGRESS SKETCH - LONG BEACH



FINAL PROGRESS SKETCH - MITROFANIA ISLAND



FINAL PROGRESS SKETCH - SEAL BAY



APPENDIX IV – TIDES AND WATER LEVELS

Abstract of Times of Hydrography

Start and End times refer to tidal applications requirement.

Time on Task indicates actual time of task in the survey area. All times and dates are in UTC.

04_4mitro1

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
May-26-04	147	1	23:00	04:00	01:42
Jun-27-04	179	2	23:00	02:30	00:05
Jul-04-04	186	3	23:00	06:00	03:22
Jul-06-04	188	4	17:30	00:30	03:04
Jul-07-04	189	5	17:00	03:00	05:28
Jul-08-04	190	6	23:00	07:30	04:23
#Jul-18-04	200	8	23:30	08:00	05:30
Aug-02-04	215	9	23:30	06:00	02:43
Aug-04-04	217	11	18:00	01:00	03:20
Aug-06-04	219	12	17:30	24:00	04:48
Aug-07-04	220	13	18:00	01:00	03:30
Aug-15-04	228	14	20:00	04:30	03:05
*Aug-20-04	233	15	19:30	00:30	01:07
Sep-2-04	246	17	18:00	22:00	01:17

04_4mitro2

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
May-29-04	150	1	22:30	04:30	03:31
May-30-04	151	2	21:00	05:30	05:45
Jun-04-04	156	3	23:30	05:30	2:29
Jun-05-04	157	4	16:00	18:30	00:16
Jun-12-04	164	5	23:00	05:30	03:19
Jun-13-04	165	6	23:00	04:30	03:29
Jun-26-04	178	8	20:30	05:30	04:53
Jul-04-04	186	10	23:00	06:00	03:22
Jul-05-04	187	11	18:00	02:30	04:30
Jul-06-04	188	12	17:30	05:00	03:04
Jul-10-04	192	14	20:30	05:30	04:33
#Jul-18-04	200	16	23:30	08:00	05:30
Jul-20-04	202	17	23:30	07:00	03:58

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
Jul-23-04	205	18	20:00	05:30	03:23
Jul-28-04	210	19	22:30	03:30	00:19
Jul-29-04	211	20	22:00	07:00	04:52
Aug-07-04	220	21	23:00	05:00	01:40
Aug-15-04	228	22	21:00	04:30	03:05
*Aug-20-04	233	23	19:30	00:30	01:07
*Aug-31-04	244	25	21:45	02:27	00:10

04_4mitro3

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
#Jul-18-04	200	8	23:30	08:00	05:30
Aug-19-04	232	12	18:00	22:00	00:57

Note:

* denotes that 04_4mitro1 and 04_4mitro2 were both flown in the same sortie.

\# denotes that 04_4mitro1, 04_4mitro2 and 04_4mitro3 were all flown in the same sortie.

04_4mitro3 was a database created for reconnaissance only.

Tide Station Report (From JOA Mitrofania

Tide Station Report
Mitrofania Island
945-9016

Position:	*Latitude (NAD 83)* 55° 53' 22"	*Longitude (NAD83)* 158° 49' 11"	*Time Meridian* 0° (UTC)
Owner:	*Tidelands* State of Alaska		*Uplands* USFWS Alaska National Maritime Refuge
Type of Station:	Tertiary		
Density Observations:	Yes		
Project Type:	Hydrographic		
Established:	4/20/04		
Removed:	9/804		
Tide Observer:	John Oswald & Associates, LLC (JOA) 2000 East Dowling Rd., Suite 10 Anchorage, Alaska 99507 Phone: (907) 561-0136 Fax: (907) 561-0143		
Project Manager:	John Oswald, PLS, CHS		
Prime Contractor:	Tenix LADS Inc. (ATTN: Darren Stephenson)		
NOS Project No:	OPR-P182-KRL-04		
NOS Contract No:	DG 133C-03-CQ-0011		
JOA WO No:	24		
Tide House and Platform:	Tide gauges were housed in a 4' X 4' X 8' plywood box covered with a camouflage tarp located approximately 15 m above the beach in grass. The orifices for gauge 1 and 2 are attached to separate sheet pile anchors, weighing about 250 lbs each, in 7.5 m of water. The orifice for tide gauge 3 has an approximately 400 lb I-beam as an anchor and is located in approximately 9.5 m of water. The anchors were set offshore using the F/V Captain "G". The tubing from each orifice to the respective tide gauge is approximately 110 m in length.		
Tide staff:	None. Spirit leveling was observed between a nearby tidal bench mark and the water. The survey rod was outfitted with a stilling well to dampen wave action.		
Tide Gauge:	Three tide gauges were installed at this site. Each gauge is a Design Analysis Associates H350XL/H355 digital bubbler. Each system is powered by a 12vdc battery and solar cells for recharging. Data was transmitted via GOES telemetry for each gauge using Signal Engineering radios and Yagi antennas.		

Tide Gauge	Date	Tide Gauge S/N
1	4/20/04	1043
2	4/20/04	1042
3	4/20/04	1038

Primary Benchmark:	9016 E 2004	
Initial leveling:	4/22/04	9016 A 2004, 9016 B 2004, 9016 C 2004, 9016 D 2004, 9016 E 2004
Close-out leveling:	9/8/04	
Existing tidal bench marks:	0	
New tidal bench marks:	5	
JOA Field Book:	2004.02	

Tide Station Location

Tide Station Location
Mitrofania Island
945-9016

Position:	*Latitude (NAD 83)* 55° 53' 22"	*Longitude (NAD83)* 158° 49' 11"	*Time Meridian* 0° (UTC)
Owner:	*Tidelands* State of Alaska		*Uplands* USFWS Alaska National Maritime Refuge
Established:	4/20/04		
Removed:	9/804		
Tide Observer:	John Oswald & Associates, LLC (JOA) 2000 East Dowling Rd., Suite 10 Anchorage, Alaska 99507 Phone: (907) 561-0136 Fax: (907) 561-0143		
Project Manager:	John Oswald, PLS, CHS		
Prime Contractor:	Tenix LADS Inc. (ATTN: Darren Stephenson)		
NGS Project No:	OPR-P182-KRL-04		
NGS Contract No:	DG 133C-03-CQ-0011		
JOA WO No:	24		
Location:	To reach the bench marks from the harbor in Sand Point, AK, proceed NE 20.5 km (11 nm) to the north point of Korovin Island, then proceed ENE 46 km (25 nm) to the SE point of Kupreanof Point, then proceed NE 60 km (32 nm) to a west facing cove on the north side of Mitrofania Island. The benchmarks are located in the NE corner of the cove. The tide gauge orifices are located approximately 110 m offshore.		
GPS Tie:	Primary benchmark 9016 E 2004 was observed multiple times at a minimum of six hours each. Observations were processed and adjusted using NGS Pages NT and NGS Adjust. Methodology and results were documented in a comprehensive report (Fall 2004).		
Existing tidal bench marks:	0		
New tidal bench marks:	5		
Primary Bench Mark:	9016 E 2004		

-----Original Message-----
From: Erik Oppegard [mailto:eoppegard@acsalaska.net]
Sent: Tuesday, November 30, 2004 10:17 AM
To: STEPHENSON Darren
Cc: joswald@gci.net
Subject: RE: Some questions

Hello Darren

Attached is the preliminary datum computation for Mitrofania Island. The MLLW value, 6.480m, at the end of the tabulation was used to reduce the water level observations to MLLW during the field survey. The initial tides that were provided to Tenix were smoothed.

For the final datum computations, two methods were used, the NOAA method of Simultaneous Comparisons (Tide by Tide) and Monthly Means. For the preliminary Simultaneous Comparison, a 30 day computation was performed, but on a non-even calendar month (4/25 - 5/24). The final submitted Simultaneous Comparisons were made on even calendar months (5/1 - 5/30, 6/1 - 6/30 & etc) as a check to the monthly means computations which are made on the even calendar month.

Yes, the value of 6.504m was in fact the mean of the 4 monthly means and that the 2.121 is the MLLW to MHW difference at the gauge.

I had spoken with Tom a few weeks ago concerning the Monthly Mean computation. He had meaned the monthly values but did not correct for monthly values at the control station (Sand Point) nor adjusted to the 19 year epoch. These corrections are all found on the worksheet that says, "Tides: Comparison of Monthly Means". Column A in each box on that worksheet are the values found on the worksheets that say, "Tabulation of High and Lows". Column B in each box are the accepted NOS values for Sand Point for that month (these are 1 month epochs). At the bottom of each box, is "Accepted (B)" which is the accepted NOS value for the 19 year epoch (1983-2001). Column C in each box sets up the proportion or difference for each value. The equations are all listed on the forms. This method derives MLLW through determining the Mean Tide Level (MTL) and the Mean Range (MN) of the tide. So, if he was averaging the MLLW values on each individual monthly worksheet and not getting the same result as the final tabulation, this is why. This is the NOS CO-OPS preferred method of datum computation. If he is still confused, he is welcome to call me at the office, 907-561-0136.

Smoothing was applied to all tides (preliminary and final) using a 5th order polynomial of 5 hour length.

I noticed that the email address you have for me is incorrect. It should be: eoppegard@acsalaska.net, or more officially: erik@joasurveys.com. Both get routed to the same location so either one will be fine.

I hope this answers your questions. If you have any more, feel free to email or call.

Regards

Erik Oppegard
John Oswald & Associates
2000 E Dowling Road Suite 10
Anchorage, AK 99507
907-317-7805

John Oswald and Associates – Mitrofania1 – SimComp Preliminary (PDF).

-----Original Message-----
From: John Oswald [mailto:joswald@gci.net]
Sent: Saturday, May 29, 2004 12:33 PM
To: STEPHENSON Darren
Cc: Erik Oppegard (JOA)
Subject: Revised Tidal Zoning

Darren

Here is the revised tidal zoning we developed for Mitrofania Island. There is a jpg showing the zones. Note we made a zones that work directly off of the Mitrofania tide gauge. We are now posting those Mitrofania MLLW files on our ftp for your use.

The text file is in the zoning format that NOAA/CO-OPS provides (is used by their Map Info programs). It uses the primary gauge as Mitrofania and the secondary gauge as Sand Point. It should be obvious about the data format, but could be easily transformed to UTMs and input in your mapping/processing software. Note: I have never seen this data format defined by NOAA, in and official sense.

Zoning methodology:

Erik Oppegard developed, and I reviewed, this new zoning based on the actual tidal datum at Mitrofania for the month long series we just collected. That determines a different range ratio and time offset than NOAA used. Also we looked the tidal datums we computed at Chankliut Island in support of your work there in 2000. This zoning fits that as well. In addition the zone "jumps" of these new cells are based on the differences in the preliminary zoning provided by NOAA on Aug 15, 2003 in the SOW.

I would recommend you use this new zoning and gauge data from the local gauge at Mitrofania.

When we conclude the gauging at Mitrofania, we will compute a final datum using the longest series possible, adjust the zoning factors (if needed), and provide you with a single continuous file of 6 minute data at MLLW.

Currently we will provide the Mitrofania data at MLLW, based on the first month simultaneous datum computation relative to Sand Point). This data is "smoothed" using a fifth order polynomial. Do you need MHW values at Mitrofania?

If you have and questions please contact me or Erik Oppegard.

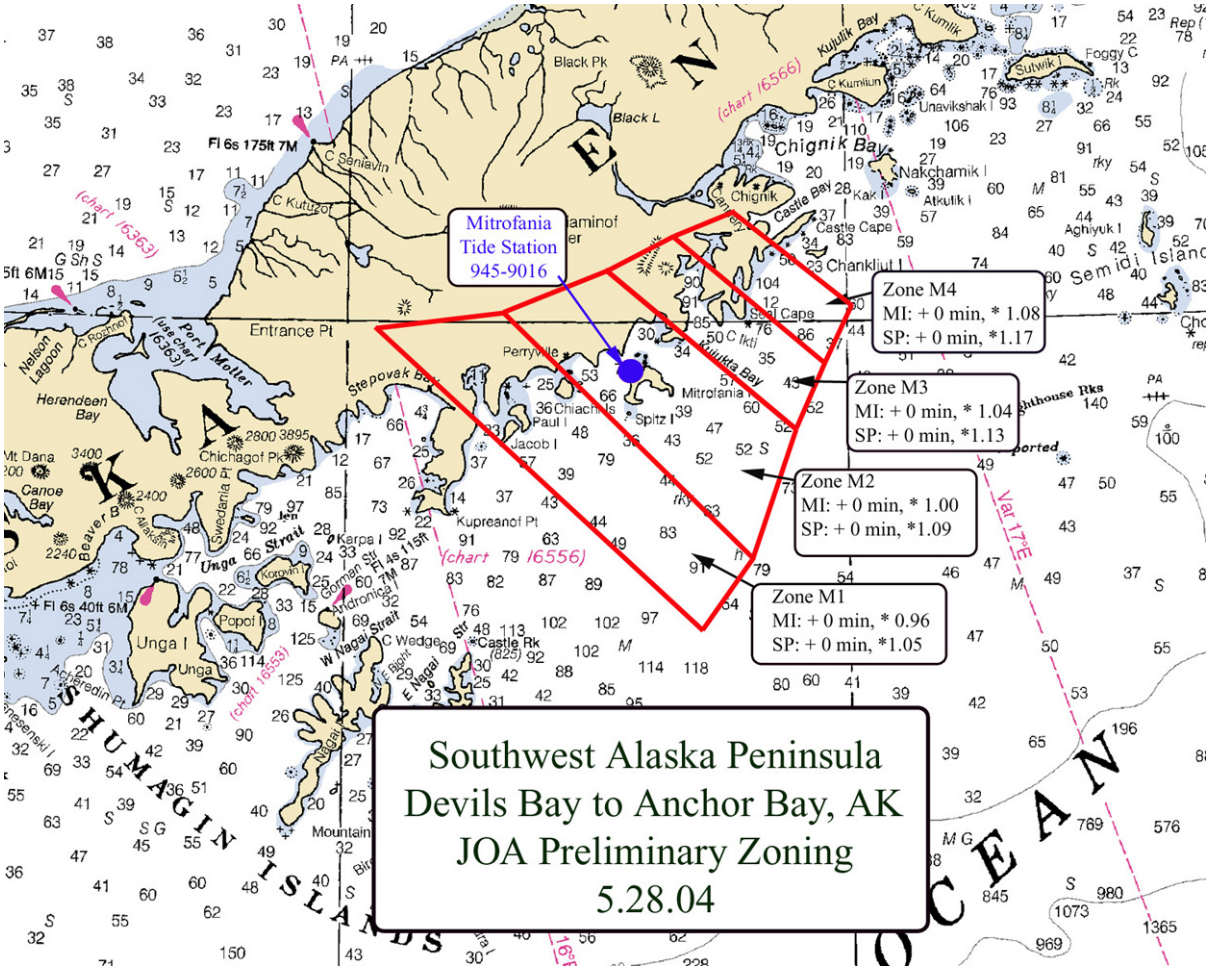
BTW: Our next staff observation and field maintenance trip is planned for

about June 9th.

Did your get the GPS report CD,Bonine and Dramamine pills on ACE today?

Regards:

John O.



```
 Mitrofania Island Zones, 4 Zones
 REVISED FROM NOAA ZONING dtd Aug 15, 2003
 MAPINFO FORMAT; NAD 83
 May 5, 2004 Zoned by JOA
 NOAA Project OPR-P182-KRL-04
 PROJECT NAME: SW ALASKA PENINSULA Devils Bay to Anchor Bay
 GAUGE AT: Mitrofania IS = 945-9016
 GAUGE AT: Sand Point = 945-9450

M1,0,0,0,0,0,0,0,9459016,0,0.960,9459450,0,1.050,**VV EO&JO, 5
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-158.27000  55.72500
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-159.34167  55.98333
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-158.70833  56.15000
-158.96667  56.07500
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-158.05000  56.00000
-158.50000  56.20500
-158.70833  56.15000
```

APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

-----Original Message-----
From: Kim Sampadian [mailto:Kim.Sampadian@noaa.gov]
Sent: Friday, April 08, 2005 2:36 AM
To: STEPHENSON Darren
Cc: michael.riddle@noaa.gov; David Scharff (E-mail)
Subject: Re: Re submit of smoothsheets for H11260 and H11265

Darren,

It is ok to change the sub locality to Herring Lagoon for H11261 (Sheet AS).

Kim

STEPHENSON Darren wrote:

>Kim
>
>Please find attached the transmittal note of the smoothsheets and corresponding digital data which are being re submitted.
> <<transmittal_04_4mitroAJ-AW_Issue2.xls>>
>For H11261 we have shortened the sheet limits to the east as this has already been covered by H11260. Having done this does the sub locality of Cape Itki to Herring Lagoon be renamed as Cape Itki has been covered by H11260. Maybe the sub locality should be Herring Lagoon.
>
>Sorry for the late notice about this.
>
>kind regards
>
>Darren Stephenson
>Survey Manager
>Tenix LADS Inc.

-----Original Message-----
From: Edward J Van Den Ameele [mailto:Edward.J.Vandenameele@noaa.gov]
Sent: Tuesday, May 20, 2003 1:10 AM
To: 'John K Longenecker'; 'Gary Nelson'
Cc: 'John Lowell'
Subject: RE: PHB_visit_7_May_03

See my two comments below; I'm sure John and Gary will have additional comments
-EJ

-----Original Message-----
From: John K Longenecker [mailto:John.K.Longenecker@noaa.gov]
Sent: Monday, May 19, 2003 7:55 AM
To: Gary Nelson
Cc: John Lowell; Edward J Van Den Ameele
Subject: PHB_visit_7_May_03

Could you please review and comment or give concurrence to the following statements or assumptions from the recent meeting at PHB? I will compile the response to Mark. Thanks.

John

Lidar Anywhere Task Order 1 OPR–P183-KR-03

Attendees:

Gary Nelson
Bob Mihailov
Bruce Olmstead
John Lowell
John Longenecker
Edward J Van den Ameele
Mark Sinclair

A meeting was held at Pacific Hydro Branch on 7 May, 2003 at the request of Tenix LADS Inc. The purpose of the meeting was to outline the TLI LADS Mk II survey plan and clarify items in the Statement of Work for Lidar Survey Services.

Summary of items raised:

- The SOW states certain versions of software are to be used. It is acceptable for delivered data to be compatible with the latest versions of Caris and Microstation.

- The requirements for reporting were discussed. 1 HVCR and 1 DAPR are to be provided per Task Order, however each smoothsheet is to have a separate DR which will facilitate standard archiving practices.

- Soundings in kelp were discussed. Sparse soundings in kelp are to be retained in the data set as they provide useful data, even if the coverage in these areas is incomplete. EJ: I believe it was also decided to delineate and denote the extents of kelp areas on the smooth sheet (i.e. with dashed line and "kelp" annotation)

- Automatically generated contours on smooth sheets which are close to gaps in the data, due to kelp or white water, may be placed in the wrong position if they are interpolated form the nearest soundings. In such cases, contours are to be manually edited to reflect the best estimate of the true position of the feature. EJ: This discussion mainly was in reference to the MLLW and MHW lines; and incorrect interpolation of the shoreline from irregularly spaced soundings.

- The requirement to bin the final data set was discussed. A 3 meter clash may be used for the sounding data set in lieu of the 5 meter bin.

- The depiction of drying soundings on the smoothsheet was discussed. Drying soundings shall be at the same density as depths. The datum and units stated in the SOW are to be used.

- 2D Microstation seed files shall be provided to PHB. It was noted that AHB specifies 3D seed files.

- The importance of the correct production of smoothsheets was discussed. Gary Nelson offered to review early drafts and provide feedback. He will also provide an example of a smoothsheet and microstation files.

- EJ advised that for the 2001 survey work, the list of doubtful soundings provided in the DR was very helpful. Such a list shall be provided in the event that doubtful depths are retained in the dataset.

- More information on the interpretation of raw laser waveforms was requested. MJS will plan to visit PHB on his next trip to Alaska and provide a presentation on waveform interpretation.

Prepared by Mark Sinclair
Project Director
Tenix LADS Inc
14 May 03

-----Original Message-----
From: Mark T Lathrop [mailto:Mark.T.Lathrop@noaa.gov]
Sent: Wednesday, November 24, 2004 7:47 AM
To: STEPHENSON Darren
Cc: Kim Sampadian; Linda D Brainard
Subject: SOW revision

Darren,

SOW Reference 6.2 (Sounding Units) in Attachment #6, OPR-P182-KRL-04 should state the following:

Sounding plotted on the Preliminary Smooth Sheet shall be in fathoms and tenths at MLLW in depths less than or equal to 20.9 fm. In depths greater than 20.9 fm, soundings shall be rounded to the nearest fathom. Heights aove MHW shall be in feet.

Thanks for catching the error.

Mark

APPROVAL SHEET
H11261

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, and verification of charted data. The survey records and digital data comply with NOS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area. (See endnote 1)

Gary C. Nelson
for Kim Sampadian
2009.04.30 08:58:05 -07'00'

Gary C. Nelson ***for***
Kimberly Sampadian, Physical Scientist
Pacific Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. The survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Descriptive Report.

Gary C. Nelson
2009.04.30 08:58:39
-07'00'

Gary C. Nelson
Acting Chief, Pacific Hydrographic Branch

Digitally signed by David Scharff
DN: cn=David Scharff, o=OCS,
ou=NOAA,
email=david.scharff@noaa.gov, c=US
Reason: AWOIS and Surf Check
complete
Date: 2009.05.11 12:34:20 -04'00'