

H11435

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-P183-KRL-05

Registry No. H11435

LOCALITY

State Alaska

General Locality Southwest Alaska Peninsula, Shumagin Islands

Sublocality Cape Devine and Scotland Point

2005

CHIEF OF PARTY

..... Mark Sinclair Darren Stephenson

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DATE

HYDROGRAPHIC TITLE SHEET

NOAA FORM 77-28 U.S. DEPARTMENT OF COMMERCE (11-72) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION HYDROGRAPHIC TITLE SHEET	REGISTRY NO. H11435
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
<p>State: <u>Alaska</u></p> <p>General Locality: <u>Southwest Alaska Peninsula Shumagin Islands</u></p> <p>Sub-Locality: <u>Cape Devine and Scotland Point</u></p> <p>Scale: <u>1:10,000</u> Date of Survey: <u>April 29 to August 12, 2005</u></p> <p>Instructions dated: <u>April 18, 2005</u> Project No: <u>OPR-P183-KRL-05</u></p> <p>Vessel: <u>Tenix LADS Aircraft, VH – LCL</u></p> <p>Hydrographer: <u>M.J. Sinclair</u> Chief of Party: <u>D.J. Stephenson</u></p> <p>Surveyed by: <u>S.R. Ramsay, M.S. Hawkins, T.M. Farrow, J.K. Young, B.C. McWilliam, S.G. Denton, A.P. Reed and J. Weick</u></p> <p>Soundings taken by echo sounder, hand lead, pole: <u>Laser Airborne Depth Sounder</u></p> <p>Graphic record scaled by: <u>V. Sicari and L.R. Chamberlain</u></p> <p>Graphic records checked by: <u>S.R. Ramsay and J.G. Guilford</u></p> <p>Protracted by: <u>N/A</u> Automated plot: <u>HP Design Jet 800PS</u></p> <p>Verification by: <u>K. Sampadian, K. Reser</u></p> <p>Soundings in: <u>Fathoms at MLLW</u></p>	
<p>REMARKS: <u>Contract # NC-NJ3000-4-00010 01.</u></p> <p><u>Contractor: Tenix LADS Incorporated, 925 Tommy Munro Drive, Suite J, Biloxi, MS 39532.</u></p> <p><u>Sub contractor: John Oswald and Associates, 12001 Audubon Dr, Anchorage, AK 99516.</u></p> <p><u>Times: All times are recorded in UTC.</u></p> <p><u>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.</u></p> <p><u>Projection is UTM Zone 4.</u></p>	

DESCRIPTIVE REPORT TO ACCOMPANY**HYDROGRAPHIC SURVEY H11435****SCALE 1:10,000, SURVEYED IN 2005****TENIX LADS AIRCRAFT, VH-LCL****TENIX LADS, INC. (TLI)****MARK SINCLAIR, HYDROGRAPHER****PROJECT****Project Number:** OPR-P183-KRL-05**Original:** DG 133C-03-CQ-0011**Date of Instructions:** April 18, 2005**Task Order:** T0007

Date of Supplemental Instructions: May 7, 2003 email regarding meeting with PHB, NOAA and November 24, 2004 e-mail regarding SOW revision.

Sheet Number: AF**Registry Number:** H11435**PURPOSE¹**

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 April 29 to August 12, 2005. During this period twenty-four survey sorties were flown under Task Order 7 OPR-P183-KRL-05 Southwest Alaska Peninsula Shumagin Islands, AK. Survey operations covered six smooth sheets. This Descriptive Report describes Sheet AF, which covers Cape Devine and Scotland Point area Northwest of Nagai Island (see Figure 1).

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 sheet limits are as follows for Sheet AF:

	Latitude (NAD 83)	Longitude (NAD 83)
NW corner	55°.47052784	160°.23571268
SE corner	55°.36092263	160°.11562790

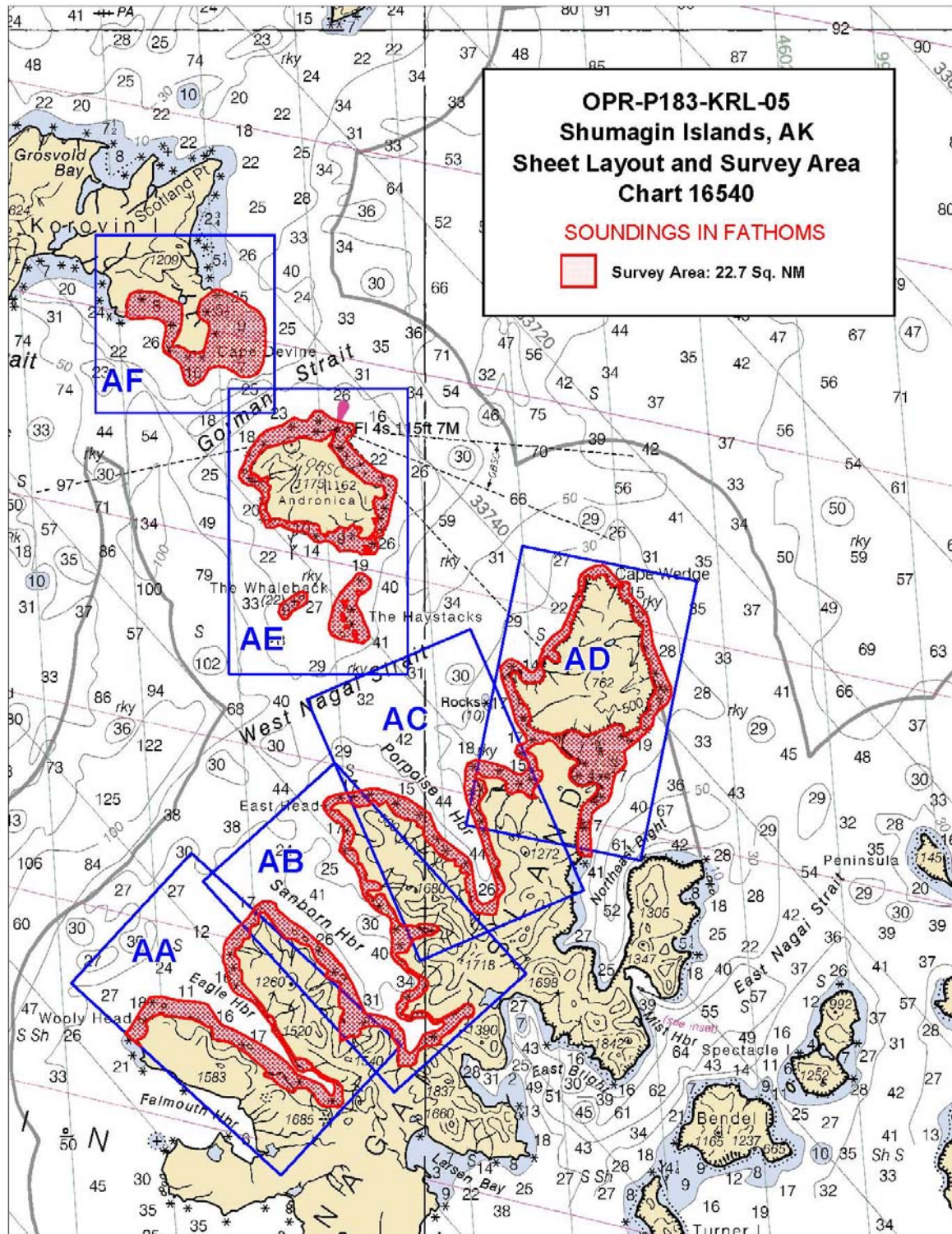


Figure 1 - Survey Area for Task Order 7 OPR-P183-KRL-05

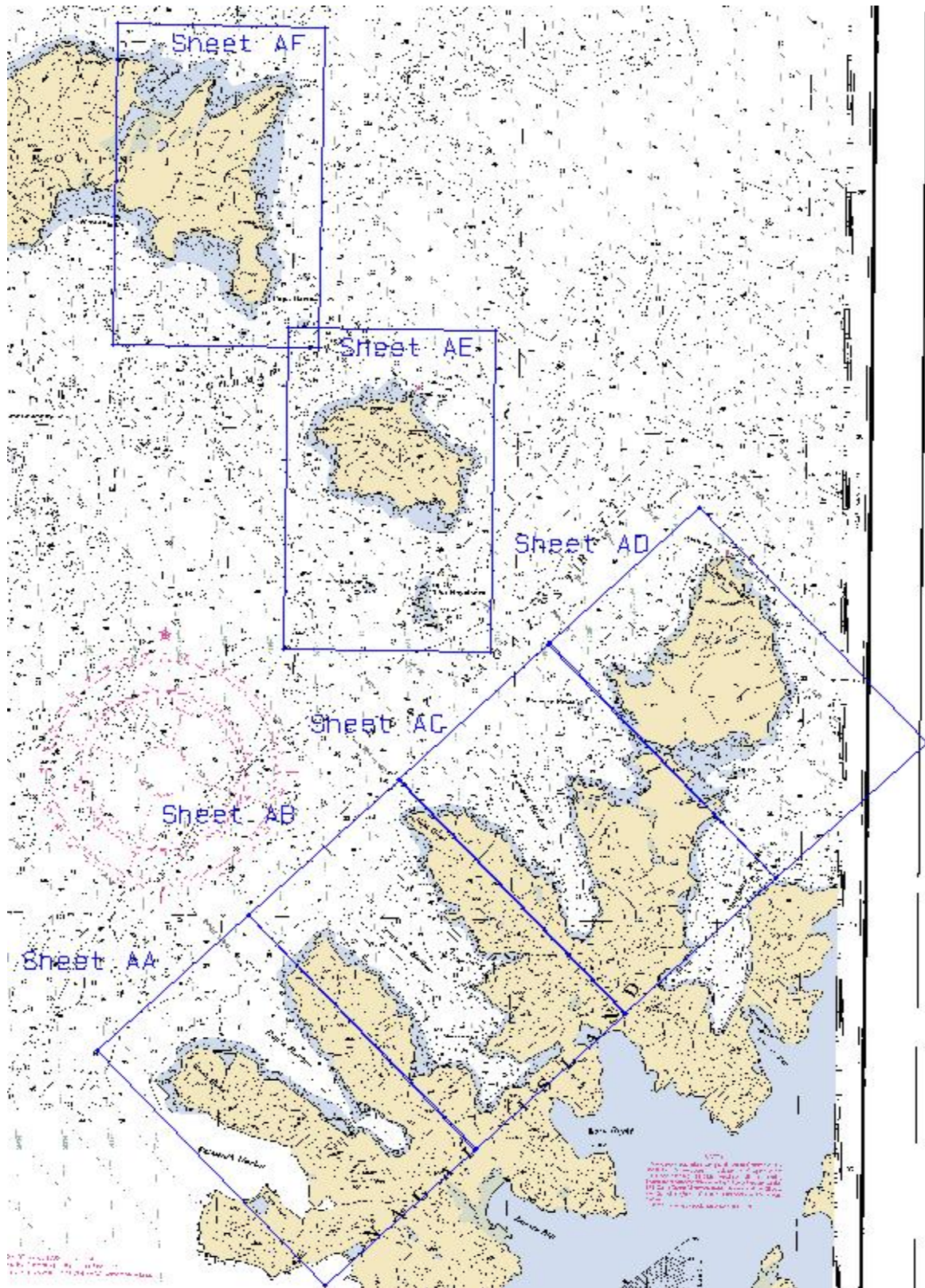


Figure 2 – Amended Sheet limits for Task Order 7 OPR-P183-KRL-05

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.

A prototype Digital Imagery capture system was installed at the commencement of this survey which allowed digital images from the downward looking video to be captured.

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 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) 'Forrest' was used to conduct data processing in the field. Forrest 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. Forrest was transported to the deployment site. Quality control checks and editing of the data were also conducted on Ground System Forrest. GS 'Forrest' was destroyed by hurricane Katrina August 29, 2005 and was replaced by GS 'Katrina'.

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, however, it did vary from poor to excellent and this required close management and extra lines to be planned. The maximum lidar depths measured during the survey exceeded 35 meters, although 20-25 meters was the generally achieved depth.

B.2.3 Data Management

The database is identified as follows:

Database Name	General Locality	Sheets
Nagai	Shumagin Islands	AF

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 April 29, 2005. 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 August 2, 2005.

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

The sea state ranged from 1 to 3 throughout the survey and was generally state 2. 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 and the area reflowed on a calm day.

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

B.2.6 Kelp

Kelp is one of the factors that increases 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 and 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

The seabed around Caped Devine is relatively flat with rock outcrops extending offshore from headlands resulting in a more undulating seabed.

Relatively flat and gentle sloping seabeds exists in the bays.

The seabed around Scotland Point is quite complex and undulating.

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. A westerly wind on Korovin Island 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. Being located in Sand Point allowed close monitoring of the current weather conditions as the survey area was only 45 km north east of Sand Point. 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 southeast Alaska under project OPR-O112-KRL-05 occurred during prolonged poor conditions on the Alaska Peninsula.

B.2.12 Effects of High Ground

The majority of survey operations were conducted at 1,800 feet, as high ground was not a significant issue. The proximity of high ground on the Alaska Peninsula and Korovin Island 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 reflowed 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.
- Accepted mission runs plot.
- Coverage plots and sun illuminated images. Provided in GEOTIFF format.
- Tidal Data provided in ASCII, xls and CSV formats.
- Digital georeferenced image in JPEG, TIFF and ECW 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 H11435 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 (NAD 83)	Northing (NAD 83)
BM_1	14.5 m	404 100	6 135 080
BM_2	5 m	403 087	6 133 148

Korovin Benchmark Line

Benchmark Name	Nominal Depth	Easting (NAD 83)	Northing (NAD 83)
BM_3	4 m	420 620	6 141 390
BM_4	12 m	420 330	6 140 920
BM_5	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 58. 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:

N. Popov Straight Benchmarks

GS ID	BM Name	Nominal Depth	MDD	SD
1	BM_1	14.5 m	0.05 +/- 0.06	0.14 +/- 0.02
2	BM_2	5 m	0.07 +/- 0.04	0.11 +/- 0.01

Korovin Benchmarks

GS ID	BM Name	Nominal Depth	Average MDD	SD
3	BM_3	4 m	-0.05 +/- 0.02	0.25 +/- 0.03
5	BM_4	12 m	0.17 +/- 0.10	0.16 +/- 0.02
5	BM_5	18 m	0.20 +/- 0.07	0.18 +/- 0.04

Table 2 – Benchmark Results

These results are within expected tolerances and show that the LADS Mk II depth performance was within specifications. These results compare well with the 2003 and 2004 surveys and indicate that the LADS Mk II system operated correctly during the survey.

B.5 CROSSLINES

Two crosslines were planned to cover where the seabed was reasonably flat. The crossline areas identified to conduct crossline comparisons were selected based on data coverage, nature of the seabed and angle of intersection. This minimizes the apparent differences in depths due to minor positional differences in steeper areas of seabed.

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

Line 1011.0.1	49 crossline intersections.	To the west of Cape Devine heading NW into bay.
Line 1012.0.1	35 crossline intersections.	Along the east coast of Korovin Island Between Cape Devine and Scotland Point.

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	<i>Average MDD</i>	<i>Average SD</i>
1011.0.1	96489	4.7	0.03 +/- 0.10	0.27 +/- 0.25
1012.0.1	1367945	4.6	0.01 +/- 0.12	0.24 +/- 0.16

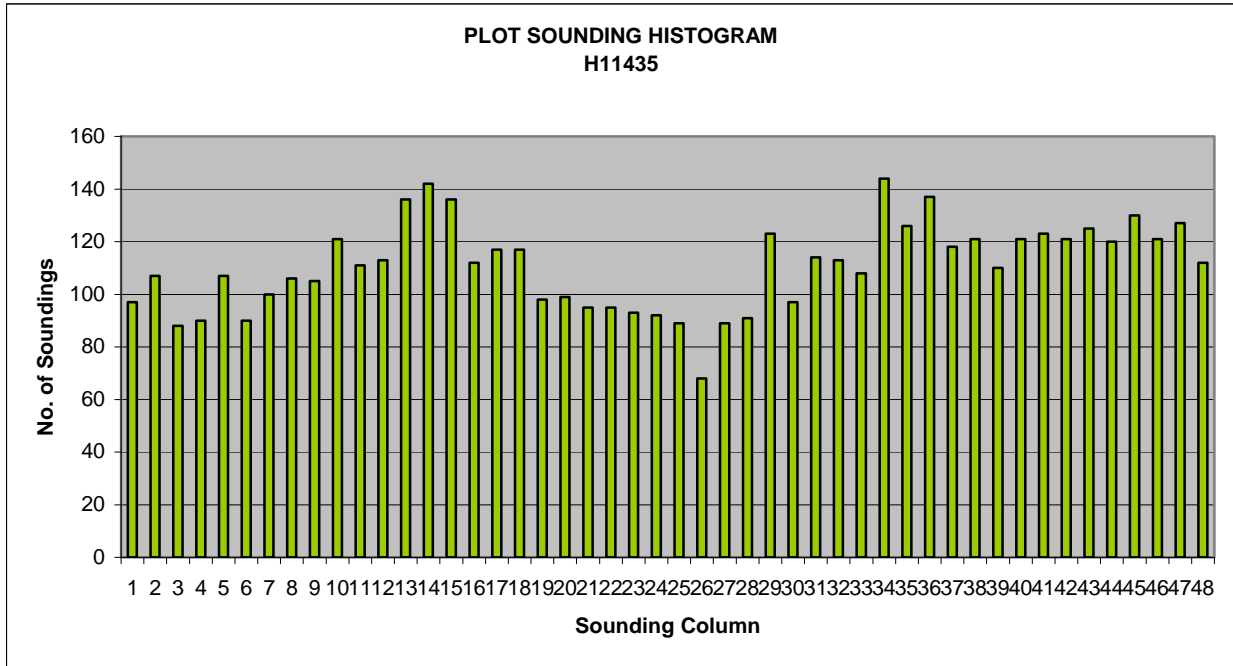
Table 3 – Crossline Comparison Results

Crossline comparison details are provided in Appendix V of the Separates.

All depth comparison results are consistent with IHO Order-1 depth accuracy.

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 H11435

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 positions 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 processing facility on the roof at the Popof Pizza building at Sand Point.
- 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 0.179 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 was 2.333 meters, with an average standard deviation of 0.272 meters. 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 1.79 meters with a standard deviation of 7.23 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.

Station details are as follows:

Gauge	Location	WGS84	
		Latitude	Longitude
9459450	Sand Point City Dock	55° 20.2' N	160° 30.1' W

Table 4 – Sand Point 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 are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
SWA193A	1	+0 minutes	x1.02	9459450
SWA204A	2	+0 minutes	x1.00	9459450
SWA193	3	-6 minutes	x1.02	9459450
SWA204	4	+0 minutes	x0.98	9459450

Table 5 – Tide Zones

An analysis of crosslines and overlaps of the mainlines of soundings concluded that the preliminary tide zoning was adequate and therefore the preliminary tide zoning correctors have been considered to be the final tide zoning correctors for the survey.

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, the time and amplitude correctors were applied to the tidal data delivered by JOA. Soundings were then reduced to MLLW using these corrected 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 post processed 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 April 30 and May 1, 2005. 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 April 28, 2005 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 for smooth sheet H11435 is provided in sections D.1.1 to D.1.7 below.

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 a 15m clashed dataset. The 15m clashed dataset was imported into Microstation Layers “15m_DPT” and “15m_DRY”. Where an additional sounding was deemed necessary for the smooth sheet, one would be selected from either the 15m_DPT or 15m_DRY Microstation Layer and placed on the “ADD_DPT” or “ADD_DRY” Microstation Layer respectively. The “ADD_DPT” and “ADD_DRY” Microstation Layers were created in order to track soundings that were added to the smooth sheet from the 15m clash dataset. These are provided in an additional file found with the smooth sheet plot scale clashed data.

D.1 CHART COMPARISON - SMOOTH SHEET H11435 AF

H11435 was compared to:

Preliminary Chart 16553 5th Edition September 2005, at scale 1:80,000. Corrected through NM Sept. 24, 2005. Corrected through LNM Sept. 13, 2005.

This chart was downloaded from the NOAA Office of Coast Survey – NOAA Raster Navigational Charts download website (<http://chartmaker.ncd.noaa.gov/mcd/Raster/Index.htm>) on April 10, 2006.

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 40 meters throughout the smooth sheet. The main differences occur along the rugged coastlines at Scotland Point and Cape Devine. 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.

In addition to the general recommendations above, some 95 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 H11435_V1_ChartComp.xls.

The chart comparison was conducted by reviewing the chart, the lidar coverage plot, the digital orthophoto mosaic 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 45 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

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
1	AF1	1				-3.56	(5)	55° 23' 19.786"	160° 12' 23.9757"	Islet	Y	N	Insert	Note: Charted drying rock 60m SSW confirmed in downward looking video and many drying rocks to NNE visible in downward looking video, not in dataset (out of survey area).
2	AF2	2	Drying Rk	55° 23' 21"	160° 12' 16"	-13.82	(39)	55° 23' 20.7099"	160° 12' 15.2163"	Islet	Y	N	Replace	Note: cov 1 ft drying rock 35m N.
3	AF3	1				-16.18	(47)	55° 23' 22.6143"	160° 12' 12.3289"	Islet	Y	N	Insert	Note: Islet 35m SSE, -6 drying rock 65m NNW.
4	AF4	2	Drying Rk	55° 23' 27"	160° 12' 1"	-8.10	(20)	55° 23' 27.8397"	160° 12' 4.4238"	Islet	Y	N	Replace	
5	AF5	1				-0.34	-1	55° 23' 50.9571"	160° 11' 52.7985"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.
6	AF6	1				-0.80	-3	55° 23' 54.7822"	160° 11' 46.2992"	Drying Rk	Y	N	Insert	Note: Charted islet 50m N confirmed, charted drying rock 130m SE surveyed as drying shelf.
7	AF7	1				3.25	1.8	55° 23' 40.6966"	160° 11' 30.3468"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 1.8 Rk 100m NNE.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
8	AF8	1				-0.92	-3	55° 23' 53.3336"	160° 11' 17.9151"	Drying Rk	Y	N	Insert	
9	AF9	1				3.19	1.7	55° 23' 47.0016"	160° 10' 57.1792"	Rk	Y	Y	N/A	Possible Rk in kelp.
10	AF10	1				-0.93	-3	55° 23' 27.4807"	160° 9' 51.4668"	Drying Rk	Y	N	Insert	Note: 1.3 Rk 250m SSW.
11	AF11	2	Drying Rk	55° 23' 8"	160° 10' 4"	-3.57	(5)	55° 23' 8.2941"	160° 10' 1.8067"	Islet	Y	N	Replace	Note: Charted islet 100m NNW confirmed, charted -3 drying rock 180m NW confirmed, -7 drying rock 105m ESE, 6.5 Rk 255m W.
12	AF12	1				-1.58	-5	55° 23' 0.4077"	160° 10' 4.6195"	Drying Rk	Y	N	Insert	
13	AF13	1				-2.07	-7	55° 22' 52.2443"	160° 10' 8.2557"	Drying Rk	Y	N	Insert	
14	AF14	2	Drying Rk	55° 22' 46"	160° 10' 13"	-3.45	(5)	55° 22' 45.2594"	160° 10' 11.251"	Islet	Y	N	Replace	
15	AF15	2	7	55° 22' 34"	160° 9' 58"	10.38	5.7	55° 22' 35.8347"	160° 9' 57.4602"	Rk	N	Y	N/A	Possible fish strike.
16	AF16	1				-1.66	-6	55° 22' 41.9669"	160° 9' 44.5238"	Drying Rk	N	N	Insert	

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
17	AF17	1				-1.27	-4	55° 22' 37.5241"	160° 9' 36.2461"	Drying Rk	Y	N	Insert	Note: -0 drying rock 35m WNW, 2 other drying rocks in immediate vicinity observed in downward looking video unable to be displayed due to smoothsheet scale.
18	AF18	1				-0.03	-0	55° 22' 32.9668"	160° 9' 32.8131"	Drying Rk	Y	N	Insert	Note: Charted -2 drying rock 90m E confirmed, numerous drying rocks in vicinity, some drying rocks visible in downward looking video possibly not detected by lidar.
19	AF19	1				5.82	3.2	55° 22' 32.7151"	160° 9' 44.1093"	Rk	Y	Y	N/A	Possible Rk in kelp.
20	AF20	1				0.90	0.5	55° 22' 24.1805"	160° 9' 35.0774"	Rk	Y	N	Insert	Note: Charted -1 drying rock 80m NW confirmed.
21	AF21	1				2.11	1.1	55° 22' 30.3147"	160° 9' 21.9177"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 9.3 Rk 155m S.
22	AF22	1				-0.13	-1	55° 22' 33.1367"	160° 9' 9.6753"	Drying Rk	Y	N	Insert	Note: cov 1 ft drying rock 35m E.
23	AF23	1				-0.47	-2.0	55° 22' 34.2065"	160° 8' 53.2859"	Drying Rk	Y	N	Insert	Note: -2 drying rock 35m NW.
24	AF24	1				12.78	7.0	55° 22' 32.5029"	160° 8' 47.9894"	Rk	Y	Y	N/A	Possible Rk in kelp.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
25	AF25	2	DryingRk	55° 22' 38"	160° 8' 56"	-4.44	(8)	55° 22' 37.2465"	160° 8' 56.145"	Islet	Y	N	Replace	
26	AF26	1				0.97	0.5	55° 22' 39.4888"	160° 8' 44.7288"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted -3 drying rock 85m SW confirmed, charted -6 drying rock 65m W confirmed, -1 drying rock 95m WNW, -0 drying rock 95m NW, 7.6 Rk 90m SSE, 7.5 Rk 75m ENE.
27	AF27	1				14.24	7.8	55° 22' 44.6538"	160° 8' 33.8965"	Rk	N	N	Insert	
28	AF28	1				2.87	1.5	55° 22' 47.7891"	160° 8' 40.2235"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 3.8 Rk 75m NNE.
29	AF29	1				23.53	12.8	55° 22' 51.5438"	160° 7' 21.5562"	Rk	N	N	Insert	Note: 11.7 Rk 390m W, 9.9 Rk 470m NNW.
30	AF30	1				23.11	12.6	55° 22' 42.9211"	160° 7' 9.5165"	Rk	N	N	Insert	Note: 12.6 Rk 65m NE.
31	AF31	1				15.42	8.4	55° 22' 11.932"	160° 7' 26.4466"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 7.8 Rk 170m WSW, 8.3 Rk 135m SW.
32	AF32	2	Islet	55° 23' 20"	160° 12' 5"	-4.52	(8)	55° 23' 19.0767"	160° 12' 4.2264"	Islet	Y	N	Inserted	See Danger to Navigation Report Item 1.
33	AF33	1				-0.68	-2	55° 22' 54.7361"	160° 8' 39.6444"	Drying Rk	Y	N	Insert	Note: Charted -0 drying rock 60m E confirmed, -2 drying rock 30m S, -9 drying rock 140m WSW.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
34	AF34	1				-0.44	-2	55° 22' 58.7249"	160° 8' 35.6826"	Drying Rk	Y	N	Insert	Note: Charted -0 drying rock 50m ENE confirmed, -2 drying rock 100m W, 2.8 Rk 65m ESE.
35	AF35	1				0.84	0.4	55° 23' 0.1778"	160° 8' 30.2252"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: cov 1 ft drying rock 120m NW.
36	AF36	1				11.46	6.2	55° 23' 0.1913"	160° 8' 24.7155"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 6.2 Rk 50m SSW.
37	AF37	1				9.03	4.9	55° 23' 4.5726"	160° 8' 27.3207"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 0.7 Rk 100m WNW, 0.5 Rk 130m NW, 6.8 Rk 95m NE.
38	AF38	1				13.68	7.5	55° 23' 10.5799"	160° 8' 22.0375"	Rk	N	N	Insert	
39	AF39	1				2.61	1.4	55° 23' 13.3534"	160° 8' 32.5349"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -2 drying rock 160m SW, 0.6 Rk 55m NW.
40	AF40	1				11.26	6.1	55° 23' 18.0867"	160° 8' 20.0347"	Rk	N	N	Insert	Note: 7.6 Rk 120m NNE, 8.2 Rk 90m E.
41	AF41	1				15.70	8.6	55° 23' 24.5625"	160° 8' 14.8619"	Rk	N	N	Insert	Note: 5.2 Rk 145m WNW, 10.7 Rk 215m N.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
42	AF42	1				0.30	cov 1 ft	55° 23' 18.1983"	160° 8' 39.7019"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted cov 1 ft drying rock 140m E confirmed, -1 drying rock 50m SSW, -3 drying rock 105m W. Possible drying rock observed in downward looking video not detected by lidar 30m E.
43	AF43	1				-0.97	-3	55° 23' 24.8439"	160° 8' 56.8639"	Drying Rk	N	N	Insert	Note: Charted -3 drying rock 50m ENE confirmed, -1 drying rock 55m SSE.
44	AF44	1				0.59	cov 2 ft	55° 23' 37.8514"	160° 9' 3.4418"	Drying Rk	N	N	Insert	
45	AF45	1				5.57	3.0	55° 23' 45.1217"	160° 8' 47.3196"	Rk	Y	Y	N/A	Possible Rk in kelp.
46	AF46	1				-0.35	-1	55° 23' 50.958"	160° 8' 49.5429"	Drying Rk	Y	N	Insert	
47	AF47	1				17.31	9.4	55° 23' 41.6059"	160° 8' 9.6847"	Rk	N	Y	N/A	Note: 11.3 Rk 120m W. See Danger to Navigation Report. Item 2
48	AF48	1				9.52	5.2	55° 23' 55.659"	160° 8' 29.9319"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 4.2 Rk 95m NNW, 7.7 Rk 140m SSW, 11.5 Rk 110m NE.
49	AF49	2	DryingRk	55° 23' 59"	160° 8' 42"	-4.13	(7)	55° 23' 58.1435"	160° 8' 41.7717"	Islet	Y	N	Replace	Note: Many drying rocks in vicinity.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
50	AF50	1				11.26	6.1	55° 24' 1.4767"	160° 8' 28.5592"	Rk	N	N	Insert	Note: 7.5 Rk 55m N, 7.0 Rk 60m SW, 11.3 Rk 130m ENE, 6.7 Rk 120m NW.
51	AF51	1				0.36	cov 1 ft	55° 24' 7.5428"	160° 8' 39.1324"	Drying Rk	Y	Y	N/A	Possible Rk in kelp. Shoaler depth likely exists. Note: 2 islets 50m to S.
52	AF52	2	Islet	55° 24' 8"	160° 8' 45"						N	N	Remove	Not detected by lidar, not observed in downward looking video.
53	AF53	1				3.76	2.0	55° 24' 11.983"	160° 8' 42.4013"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 0.7 Rk 90m WSW.
54	AF54	1				15.94	8.7	55° 24' 13.0361"	160° 8' 32.8839"	Rk	N	N	Insert	
55	AF55	1				3.24	1.7	55° 24' 12.7166"	160° 8' 51.8557"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted pinnacle 65m NW surveyed as 2 separate islets, islet 80m W.
56	AF56	1				-0.67	-2	55° 24' 16.5264"	160° 8' 54.3194"	Drying Rk	Y	N	Insert	
57	AF57	1				-1.91	-6	55° 24' 20.5991"	160° 8' 58.3583"	Drying Rk	N	N	Insert	Note: -6 drying rock 50m W. See Danger to Navigation Report. Item 3
58	AF58	1				-3.11	(4)	55° 24' 23.613"	160° 8' 59.3027"	Islet	Y	N	Insert	Note: -9 drying rock 35m E, 5.4 Rk 90m E.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
59	AF59	2	9 ₂	55° 24' 22"	160° 8' 25"	15.17	8.3	55° 24' 22.2585"	160° 8' 23.426"	Rk	N	N	Replace	All items covered by 4x4m laser spot spacing at 200% lidar coverage.
60	AF60	1				8.45	4.6	55° 24' 31.2276"	160° 8' 56.606"	Rk	N	Y	N/A	Possible fish strike.
61	AF61	1				-1.31	-4	55° 24' 36.8816"	160° 9' 9.7902"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -4 drying rock 170m S confirmed.
62	AF62	1				1.42	0.7	55° 24' 40.8009"	160° 9' 3.0993"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -1 drying rock 80m WNW, 1.4 Rk 85m S, 3.7 Rk 105m NE.
63	AF63	1				-1.19	-4	55° 24' 46.21"	160° 8' 59.8163"	Drying Rk	Y	N	Insert	Note: Charted -4 drying rock 70m WNW confirmed.
64	AF64	1				-0.41	-2	55° 24' 49.7776"	160° 9' 1.561"	Drying Rk	Y	N	Insert	Note: Charted islet 130m WSW confirmed, -5 drying rock 45m W, -2 drying rock 70m NW.
65	AF65	1				8.93	4.9	55° 24' 52.4023"	160° 8' 49.5478"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 4.9 Rk 40m NNE, 5.1 Rk 65m S.
66	AF66	1				10.13	5.5	55° 24' 54.7435"	160° 8' 42.0996"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 6.6 Rk 165m SE, 7.9 Rk 145m ENE.
67	AF67	1				10.40	5.7	55° 24' 33.1087"	160° 8' 17.7608"	Rk	N	N	Insert	Note: 5.8 Rk 105m WNW, 5.9 Rk 105m SW.
68	AF68	1				6.15	3.3	55° 25' 4.5454"	160° 8' 55.4258"	Rk	Y	Y	N/A	Possible Rk in kelp.
69	AF69	1				-1.49	-5	55° 25' 14.2579"	160° 9' 25.0675"	Drying Rk	N	Y	N/A	Possible breaking wave.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
70	AF70	1				-0.54	-2	55° 25' 28.748"	160° 9' 18.1394"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.
71	AF71	1				11.81	6.4	55° 25' 16.6179"	160° 8' 1.1405"	Rk	N	Y	N/A	Sparse lidar coverage in deep water. See Danger to Navigation Report. Item 4
72	AF72	2	16	55° 25' 33"	160° 7' 53"	12.88	7.0	55° 25' 30.881"	160° 7' 53.9613"	Rk	N	Y	N/A	Sparse lidar coverage in deep water. See Danger to Navigation Report. Item 5
73	AF73	1				5.96	3.2	55° 25' 43.6512"	160° 8' 48.2942"	Rk	N	Y	N/A	Possible fish strike.
74	AF74	1				-0.46	-2	55° 25' 44.5601"	160° 9' 7.1283"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp.
75	AF75	1				0.73	cov 2 ft	55° 25' 54.7252"	160° 8' 56.0463"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: -2 drying rock 70m NW.
76	AF76	1				0.25	cov 1 ft	55° 25' 59.6468"	160° 8' 50.2643"	Drying Rk	Y	N	Insert	Note: Charted -2 drying rock 35m W confirmed.
77	AF77	1				-6.02	(13)	55° 26' 0.3933"	160° 8' 56.2625"	Islet	Y	N	Insert	Note: Islet 40m W, -8 drying rock 35m E.
78	AF78	1				-0.36	-1	55° 26' 8.1591"	160° 8' 52.128"	Drying Rk	Y	N	Insert	Note: Charted -6 drying rock 30m W confirmed, islet 75m W.
79	AF79	2	Drying Rk	55° 26' 14"	160° 8' 44"	-3.97	(7)	55° 26' 13.8446"	160° 8' 44.6625"	Islet	Y	N	Replace	Note: Charted -4 drying rock 85m SW confirmed, 2 additional drying rocks 110m SW.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
80	AF80	2	Drying Rk	55° 26' 17"	160° 8' 39"						Y	Y	N/A	Possible Rk in kelp. 2 possible drying rocks observed in downward looking video not detected by lidar.
81	AF81	1				2.81	1.5	55° 26' 19.0572"	160° 8' 32.0848"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted islet 50m WSW confirmed.
82	AF82	1				-0.59	-2	55° 26' 22.5865"	160° 8' 34.4968"	Drying Rk	Y	N	Insert	Note: Charted islet 65m NE confirmed.
83	AF83	1				1.36	0.7	55° 26' 37.1463"	160° 8' 17.4953"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted -4 drying rock 215m SW confirmed, charted -1 drying rock 140m WNW confirmed, 4.8 Rk 105m E. See Danger to Navigation Report. Item 6
84	AF84	1				12.53	6.8	55° 26' 44.4008"	160° 8' 7.3249"	Rk	Y	Y	N/A	Possible Rk in kelp.
85	AF85	1				-3.05	(4)	55° 26' 49.133"	160° 8' 15.7256"	Islet	Y	N	Insert	Note: Charted -6 drying rock 110m E confirmed.
86	AF86	1				8.31	4.5	55° 26' 50.6396"	160° 7' 58.8116"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted -1 drying rock 130m W confirmed, -0 drying rock 160m WNW, 8.3 Rk 95m SE.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
87	AF87	1				2.28	1.2	55° 27' 5.7487"	160° 8' 7.25"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 1.3 Rk 50m SW, 9.0 Rk 205m N.
88	AF88	1				-3.15	(4)	55° 27' 1.5235"	160° 8' 13.983"	Islet	Y	N	Insert	Note: Charted (59) pinnacle 130m SE confirmed, charted -6 drying rock 220m ESE confirmed, charted cov 1 ft drying rock 75m NNE confirmed, -0 drying rock 75m E.
89	AF89	1				-1.19	-4	55° 27' 3.3888"	160° 8' 18.1365"	Drying Rk	Y	N	Insert	Note: -5 drying rock 130m W.
90	AF90	1				6.25	3.4	55° 27' 7.1483"	160° 8' 29.0011"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: 6.0 Rk 120m NW.
91	AF91	1				16.45	9.0	55° 27' 14.1516"	160° 8' 26.8115"	Rk	N	Y	N/A	Sparse lidar coverage in deep water.
92	AF92	1				1.59	0.8	55° 27' 4.8656"	160° 8' 35.7047"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: -1 drying rock 80m SW.
93	AF93	1				-1.67	-6	55° 27' 0.0717"	160° 8' 44.3853"	Drying Rk	Y	N	Insert	
94	AF94	1				10.51	5.7	55° 27' 8.5628"	160° 8' 51.8028"	Rk	Y	Y	N/A	Possible Rk in kelp. Note: Charted -5 drying rock 75m SSE confirmed, 7.1 Rk 75m NE, 8.2 Rk 185m WSW confirmed.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

Sequence No	Shoal No	Category	CHARTED			SURVEYED				Type of Feature	Kelp Area	Further Examination Recommended	Charting Recommendation	Remarks
			Charted Depth (fms)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)	Surveyed Depth (meters)	Surveyed Depth (decimal fms / whole feet / (feet) above MHW)	NAD 83 Latitude N (DMS)	NAD 83 Longitude W (DMS)					
95	AF95	1				0.40	cov 1 ft	55° 26' 59.7336"	160° 8' 59.6221"	Drying Rk	Y	Y	N/A	Possible drying rock in kelp. Note: Charted -3 drying rock 60m E confirmed, 4 drying rocks to WSW at edge of survey area.

Shoal Categories

1-New Shoal Found

2-Charted Shoal Disproved / Not Found

D.1.5 Features Requiring Investigation

During the validation, checking and approving stages of the data processing a spreadsheet of the features was compiled. The list from this spreadsheet was then compared to the chart comparisons and DtoNs reported and their significance evaluated. Some 78 additional soundings 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 (H11435_V1_Features_Inv.xls). Where these areas correlate with a feature listed in the chart comparison spreadsheet, a reference has been made to the shoal number. The kelp areas are described under five general sections:

1. Kelp area observed in video, no detection by system – deep water.
2. Kelp area observed in video, no detection by system within data coverage.
3. Kelp area, some detections, least depth found.
4. Kelp area, some detections, least depth NOT found.
5. No evidence of kelp but poor coverage – least depth NOT found.

All reported features are considered significant for further investigation during boat work and are reported as possible hazards when conducting survey work by boat.

During the approval of the smooth sheet a number of possible small objects were identified on the seabed and these possible features have been assigned the text “Rk” in the category column. These possible features may or may not be kelp related but analysis of the waveform indicates the possibility of a small object. During the production of the smooth sheet the digital mosaic was reviewed against the surveyed charted drying features and where a possible drying rock has been identified on the digital mosaic a “DR” text has been put in the category column. For this smooth sheet features FAF70 – FAF78 fall into this category as possible drying rocks as seen on the digital mosaic.

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
1	FAF1	4	55° 23' 09.51"	160° 08' 31.12"	100x100	120m E of Cape Devine
2	FAF2	4	55° 23' 04.66"	160° 08' 30.35"	50x50	120m E of Cape Devine Note: AF37 seaward
3	FAF3	4	55° 23' 07.44"	160° 08' 30.60"	30x50	120m E of Cape Devine
4	FAF4	4	55° 23' 01.13"	160° 08' 34.00"	30x50	120m E of Cape Devine
5	FAF5	3	55° 24' 16.71"	160° 08' 54.49"	50x50	100m E of Korovin I. See AF56

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
6	FAF6	4	55° 24' 10.53"	160° 08' 47.38"	30x20	130m E of Korovin I.
7	FAF7	4	55° 24' 07.57"	160° 08' 39.10"	50x50	50m E of Korovin I. See AF51
8	FAF8	2	55° 23' 45.82"	160° 10' 46.09"	25x10	250m S of Korovin I. at the head of the bay
9	FAF9	4	55° 22' 57.93"	160° 10' 10.00"	30x30	100m offshore in the east of the bay
10	FAF10	4	55° 27' 02.56"	160° 08' 52.02"	100x80	120m NW of Scotland Point
11	FAF11	4	55° 24' 51.42"	160° 08' 55.04"	35x35	300m E of Korovin I.
12	FAF12	4	55° 23' 41.76"	160° 11' 27.57"	160x75	420m S of Korovin I. In bay Note: AF7 and other features S
13	FAF13	4	55° 22' 59.85"	160° 08' 29.59"	55x55	200m E of Cape Devine Note AF35
14	FAF14	4	55° 23' 58.24"	160° 08' 33.09"	60x80	150m W of Korovin I.
15	FAF15	4	55° 22' 23.92"	160° 09' 37.24"	50x35	300m S of Cape Devine
16	FAF16	4	55° 27' 06.57"	160° 08' 42.06"	30x30	200m N of Scotland Point
17	FAF17	4	55° 27' 03.10"	160° 08' 43.16"	100x100	100m N of Scotland Point
18	FAF18	3	55° 27' 06.50"	160° 08' 53.22"	60x80	200m N of Scotland Point
19	FAF19	4	55° 27' 04.33"	160° 08' 15.53"	100x150	100m NW of Scotland Point
20	FAF20	4	55° 24' 41.35"	160° 08' 58.96"	50x150	200m E of Korovin I.
21	FAF21	4	55° 22' 31.08"	160° 09' 35.80"	150x200	200m S of Cape Devine
22	FAF22	4	55° 22' 29.03"	160° 09' 26.99"	150x150	200m S of Cape Devine
23	FAF23	4	55° 23' 35.31"	160° 08' 59.77"	10x50	150m E of Korovin I.
24	FAF24	4	55° 23' 45.36"	160° 08' 47.61"	30x20	200m E of Korovin I. See AF45
25	FAF25	4	55° 22' 25.95"	160° 09' 37.41"	50x50	350m S of Cape Devine
26	FAF26	4	55° 23' 17.81"	160° 12' 21.81"	20x20	250m S of Korovin I. at W extent of survey area Note AF1 50m NW
27	FAF27	4	55° 22' 42.77"	160° 08' 42.96"	50x100	150m E of Cape Devine
28	FAF28	3	55° 23' 18.43"	160° 08' 32.17"	30x30	200m E of Cape Devine
29	FAF29	3	55° 27' 06.35"	160° 09' 02.04"	25x25	280m NW of Scotland Point at W extent of survey area

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
30	FAF30	5	55° 27' 14.15"	160° 08' 26.80"	25x25	400m N of Scotland Point See AF91
31	FAF31	4	55° 27' 07.72"	160° 08' 50.86"	40x40	200m N of Scotland Point
32	FAF32		55° 27' 04.71"	160° 09' 01.02"	20x20	230m NW of Scotland Point at W extent of survey area
33	FAF33	5	55° 27' 12.24"	160° 08' 09.78"	25x25	350m NW of Scotland Point
34	FAF34	4	55° 23' 06.79"	160° 10' 00.26"	30x30	50m E of Korovin I. See AF56
35	FAF35	4	55° 27' 04.94"	160° 08' 33.36"	70x70	100m N of Scotland Point In vicinity of AF92
36	FAF36	4	55° 27' 08.53"	160° 08' 26.47"	25x25	200m NW of Scotland Point
37	FAF37	4	55° 27' 07.03"	160° 08' 23.69"	50x100	150m NW of Scotland Point
38	FAF38	4	55° 25' 59.01"	160° 08' 49.78"	30x10	150m E of Korovin I. In vicinity of AF76
39	FAF39	4	55° 26' 00.78"	160° 08' 51.08"	70x100	150m E of Korovin I. In vicinity of AF76
40	FAF40	4	55° 24' 27.59"	160° 09' 03.05"	50x120	150m E of Korovin I.
41	FAF41	4	55° 23' 27.02"	160° 08' 53.73"	40x40	150m E of Korovin I.
42	FAF42	4	55° 24' 12.53"	160° 08' 51.92"	30x15	100m E of Korovin I., 30m SE of islet See AF55
43	FAF43	4	55° 22' 36.01"	160° 08' 50.32"	50x80	150m SE of Cape Devine
44	FAF44	4	55° 24' 09.06"	160° 08' 44.00"	10x10	70m E of Korovin I. In vicinity of kelp and other features
45	FAF45	Rk	55° 23' 27.22"	160° 10' 12.62"	N/A	400m offshore Korovin I. in bay
46	FAF46	Rk	55° 23' 09.90"	160° 10' 16.25"	N/A	180m offshore in the east of the bay
47	FAF47	Rk	55° 25' 33.52"	160° 09' 08.30"	N/A	130m E of Korovin I.
48	FAF48	Rk	55° 22' 35.84"	160° 09' 57.46"	N/A	300m S of Cape DevineSee AF15
49	FAF49	Rk	55° 25' 43.98"	160° 08' 49.07"	N/A	350m E of Korovin I.
50	FAF50	Rk	55° 25' 43.65"	160° 08' 48.29"	N/A	350m E of Korovin I. See AF73
51	FAF51	Rk	55° 25' 04.55"	160° 08' 55.42"	N/A	500m E of Korovin I. See AF68

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
52	FAF52	Rk	55° 25' 41.54"	160° 08' 47.13"	N/A	350m E of Korovin I.
53	FAF53	4	55° 27' 05.75"	160° 08' 07.25"	50x50	200m NW of Scotland Point See AF87
54	FAF54	4	55° 24' 10.07"	160° 08' 45.59"	10x10	130m E of Korovin I.
55	FAF55	5	55° 26' 51.44"	160° 07' 56.77"	N/A	330m E of Scotland Point, 130m E of drying rocks Note: AF 86 30m S
56	FAF56	5	55° 26' 48.73"	160° 07' 54.39"	10x10	400m E of Scotland Point, 200m E of drying rocks
57	FAF57	5	55° 24' 31.29"	160° 08' 22.85"	N/A	700m E of Korovin I.
58	FAF58	5	55° 25' 16.62"	160° 08' 01.14"	N/A	1500m E of Korovin I. See AF71
59	FAF59	5	55° 24' 22.82"	160° 08' 20.71"	N/A	600m E of Korovin I. In vicinity of AF59
60	FAF60	5	55° 25' 30.88"	160° 07' 53.96"	N/A	1500m E of Korovin I. See AF72
61	FAF61	4	55° 23' 19.09"	160° 08' 36.85"	50x80	150m E of Cape Devine
62	FAF62	4	55° 23' 25.82"	160° 08' 22.75"	20x20	500m off the E coast of Korovin I.
63	FAF63		55° 24' 56.53"	160° 08' 00.12"	N/A	1250m E of Korovin I.
64	FAF64	Rk	55° 23' 17.32"	160° 09' 56.56"	10x10	100m offshore in the east of the bay
65	FAF65	4	55° 23' 38.55"	160° 11' 31.95"	20x20	500m S of Korovin I. In bay Note: AF7 50m NNE
66	FAF66	4	55° 23' 40.70"	160° 11' 30.35"	50x50	450m S of Korovin I. In bay See AF7
67	FAF67	Rk	55° 23' 12.41"	160° 08' 28.96"	N/A	180m E of Cape Devine Note: AF39 50m NW
68	FAF68	Rk	55° 23' 15.64"	160° 08' 31.19"	N/A	200m E of Cape Devine
69	FAF69	4	55° 22' 32.72"	160° 09' 44.11"	10x10	220m S of Cape Devine, 30m W of large kelp are See AF19
70	FAF70	DR	55° 26' 37.49"	160° 08' 24.09"	N/A	50m E of Scotland Point.
71	FAF71	DR	55° 26' 30.19"	160° 08' 26.27"	N/A	50m E of Scotland Point.
72	FAF72	DR	55° 23' 23.37"	160° 12' 21.64"	N/A	100m S of Korovin I. At W extent of survey area, in kelp

Sequence No.	Feature No.	Kelp Description Category	NAD 83 Latitude (N) (deg min sec.dd)	NAD 83 Longitude (W) (deg min sec.dd)	Dimension (m)	Significance and Chart Comparison Relationship
73	FAF73	DR	55° 22' 33.28"	160° 09' 25.64"	N/A	50m S of Cape Devine
74	FAF74	DR	55° 22' 32.79"	160° 09' 36.70"	N/A	150m S of Cape Devine
75	FAF75	DR	55° 22' 35.01"	160° 09' 30.63"	N/A	50m S of Cape Devine
76	FAF76	DR	55° 22' 34.83"	160° 09' 32.73"	N/A	50m S of Cape Devine
77	FAF77	DR	55° 22' 42.51"	160° 09' 51.36"	N/A	50m S of Cape Devine
78	FAF78	DR	55° 22' 43.30"	160° 10' 00.70"	N/A	50m S of Cape Devine

D.1.6 Aids To Navigation

No Aids to Navigation were seen or detected in the survey area for H11435.

D.1.7 Recommended Overlap With Lidar Data

The smooth sheet H11435 consists of the east coast of Korovin Island starting in the north to the west of Scotland Point at 55° 27.15 N, 160° 09.1' W heading east around Scotland Point then south along the east coast of Korovin Island to Cape Devine. The smooth sheet goes around Cape Devine into a bay and continues west to approximately 55° 23.35 N, 160° 12.2' W. Around Scotland Point the coast is quite rugged consisting of many islets, drying rocks and kelp leading to sparse data close inshore. In general good coverage to 10 fathoms exists in this area with sparse data to 12 fathoms. Along the east coast of Korovin Island good coverage exists in the relatively gentle sloping bay to 11 fathoms with sparse data to 13 fathoms. Around Cape Devine a rugged coastline exists with many islets, drying rocks and kelp inshore. In general good data exists to 11 fathoms with sparse data to 13 fathoms. An expansive shallow bank with good coverage exists to the south of Cape Devine. West of Cape Devine is a gentle sloping bay where good coverage exists to 10 fathoms and sparse data to 13 fathoms. In the NW head of the bay heavy kelp exist resulting in sparse coverage. Islets, drying rocks and kelp exist at the southwestern extent of the survey area. The 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 the following notes. This polygon is provided as a .dgn file (H11435_v1_Overlap.pzip) and is provided with the digital data in MicroStation version 7 format.

Note: all positions quoted are in NAD 83.

The recommended overlap by surface vessels for smooth sheet H11435 is to seaward of the poly-lines /polygons described as follows:

- a) Poly-line H11435_1

This poly-line covers from Scotland Point to west of Cape Devine. Good coverage exists in the shallow bays and more sheltered areas. In general good coverage exists to 10 fathoms with sparse coverage to 13 fathoms. The recommended overlap is depicted by the poly-line. In addition, local areas of sparse coverage exists as follows:

- Kelp area at 55° 27.15' N, 160° 09.1' W
- Around 5ft drying rock and kelp at 55° 27.1' N, 160° 08.85' W
- Kelp area at 55° 27.2' N, 160° 08.6' W
- Kelp area at 55° 27.1' N, 160° 08.4' W
- Kelp area at 55° 27.1' N, 160° 08.2' W
- Around 1.2Rk and kelp at 55° 27.1' N, 160° 08.1' W
- Kelp area at 55° 27.0' N, 160° 08.1' W
- Kelp area at 55° 26.85' N, 160° 08.0' W
- Kelp area and drying rocks at 55° 26.85' N, 160° 08.15' W
- Kelp area at 55° 26.7' N, 160° 08.2' W
- Kelp area at 55° 26.6' N, 160° 08.25' W
- Kelp area close to coast at 55° 26.45' N, 160° 08.4' W
- Kelp area at 55° 26.3' N, 160° 08.5' W
- Kelp area at 55° 26.2' N, 160° 08.7' W
- Around drying rocks and kelp at 55° 26.0' N, 160° 08.8' W
- Kelp area close to coast at 55° 25.0' N, 160° 09.3' W
- Kelp area at 55° 26.3' N, 160° 08.5' W
- Deep area at 55° 24.5' N, 160° 08.6' W
- Kelp area at 55° 23.95' N, 160° 08.5' W
- Around 3.0Rk and kelp at 55° 23.75' N, 160° 08.8' W
- Within the MLLW line and the 5 fm contour from 55° 23.2' N, 160° 08.5' W and 55° 22.6' N, 160° 09.7' W along the SE coast of Cape Devine
- Around 1ft drying rock and kelp at 55° 22.4' N, 160° 09.6' W
- Kelp area at 55° 22.7' N, 160° 10.1' W
- Within the MLLW line and the 5 fm contour from a headland at 55° 22.75' N, 160° 10.2' W and a headland at 55° 23.2' N, 160° 10.2' W along the W coast of Cape Devine
- Kelp area at 55° 23.8' N, 160° 11.1' W
- Kelp area at 55° 23.8' N, 160° 11.35' W
- Kelp area at 55° 23.75' N, 160° 11.55' W
- Around 1.8Rk and kelp at 55° 23.7' N, 160° 11.5' W
- Around islets, drying rocks and kelp south of headland at the western extent of the survey area at 55° 23.35' N, 160° 12.2' W

Shoal data also exists seaward of the poly-line in the following locations:

- At 55° 22.15' N, 160° 07.55' W
- At 55° 22.8' N, 160° 07.4' W
- At 55° 24.35' N, 160° 08.4' W
- At 55° 25.3' N, 160° 08.0' W
- At 55° 25.5' N, 160° 07.9' W

E. APPROVAL SHEETS**LETTER OF APPROVAL – OPR-P183-KRL-05**

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 – H11435

May 18, 2006



For
Mark Sinclair
Hydrographer
Tenix LADS Incorporated

Date May 18, 2006

¹ The LIDAR survey referenced in this Descriptive Report has been applied to the multibeam surveys 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 surveys H11580 and H11581. 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 –
DTONS Submitted to PHB during data acquisition****1.1.1. Danger to Navigation Report****Hydrographic Survey Registry Number: H11435****Survey Title:** **State:** Alaska **Locality:** Shumagin Islands **Sub-locality:** Cape Devine and Scotland Point**Project Number: OPR-P183-KRL-05****Survey Dates: May - August 2005**

Depths are in meters and reduced to Mean Lower Low Water using preliminary tides. Positions are based on the NAD83 horizontal datum.

CHARTS AFFECTED:

Chart	Scale	Edition	Date
16553	1:80,000	4th	03/05/04

DANGERS:

No.	Feature	Depth (m)	Latitude (N)	Longitude (W)	Remarks
1	Islet	-4.2	55° 23' 19.14"	160° 12' 04.46"	

COMMENTS: Preliminary tides have been applied to date from the Sand Point tide gauge. Final tides will be applied at a later date.

The shoals was found using LIDAR.

Questions concerning this report should be directed to the Darren Stephenson in the Tenix LADS Inc. office in Biloxi MS. At (228) 594 6800

DTONS Submitted to PHB during final data processing

1.1.2. Danger to Navigation Report

Hydrographic Survey Registry Number: H11435

State: Alaska

Locality: Shumagin Islands

Sublocality: Cape Devine and Scotland Point

Project Number: OPR-P183-KRL-05

Survey Dates: April - August 2005

Depths are in decimal fathoms and reduced to Mean Lower Low Water using final verified tides. Drying heights are in whole feet above MHW. Positions are based on the NAD83 horizontal datum.

Charts Affected

Number	Version	Date	Scale
16553	5 th Ed.	09/01/05	1:80,000
16540	12 th Ed.	01/01/05	1:300,000

The following items were found during hydrographic survey operations:

No.	Feature	Depth	Latitude (N)	Longitude (W)	Remarks
2	Rk on shoal	9.4	55° 23' 41.60"	160° 08' 09.71"	Recommend further investigation by boat
3	Drying Rk	-6	55° 24' 20.59"	160° 08' 58.36"	
4	Rk in sparse coverage	6.4	55° 25' 16.60"	160° 08' 01.11"	Recommend further investigation by boat
5	Rk in sparse coverage	7.0	55° 25' 30.87"	160° 07' 53.96"	Recommend further investigation by boat
6	Rk in kelp	0.7	55° 26' 37.13"	160° 08' 17.48"	Recommend further investigation by boat

COMMENTS: Final verified tides have been applied from the Sand Point tide gauge. The shoals were found using LIDAR.

Questions concerning this report should be directed to the Survey Manager, Darren Stephenson, in the Tenix LADS, Inc., Biloxi, MS office at 228 594 6800.

DTONS Submitted to MCD during final data processing**1.1.3. Danger to Navigation Report****Hydrographic Survey Registry Number: H11435****Survey Title: State: Alaska****Locality: Shumagin Islands****Sub-locality: Cape Devine & Scotland Point****Project Number: OPR-P183-KRL-05****Survey Dates: APR-AUG 2005**

Depths are reduced to Mean Lower Low Water using verified tides. Positions are based on the NAD83 horizontal datum.

CHARTS AFFECTED:

Chart	Scale	Edition	Date
16553	1:80,000	5th	09/01/05
16540	1:300,000	12th	01/01/05

DANGERS:

Feature	Depth(ft or fms)	Latitude (N)	Longitude (W)
Rock	9 fms 2 ft	55/23/41.6	160/08/09.6
Rock	8 fms 2 ft	55/24/22.3	160/08/24.0
Rock	6 fms 2 ft	55/25/16.6	160/08/02.4
Rock	7 fms 0 ft	55/25/30.7	160/07/55.2
Rock	0 fms 4 ft	55/26/37.3	160/08/16.8

COMMENTS: All features were found using LIDAR. It is recommended that the following statement be charted: "During the recent survey of the Cape Devine and Scotland Point area, numerous uncharted rocks were located within the 10 fm contour. Please be advised that these rocks are not necessary reflected on the current chart."

Submitted by TENIX/LADS (LIDAR) reviewed by PHB

Submit Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch at (206) 526-6835

APPENDIX II – LIST OF GEOGRAPHIC NAMES

Geographical names were not checked during the survey, and no amendments are proposed.

APPENDIX III – PROGRESS SKETCH

FINAL PROGRESS SKETCH

13 August 2005

1.1. OPR-P183-KRL-05 & OPR-P184-KRL-05

Shumagin and Pavlof Islands, AK

Tenix LADS Inc.

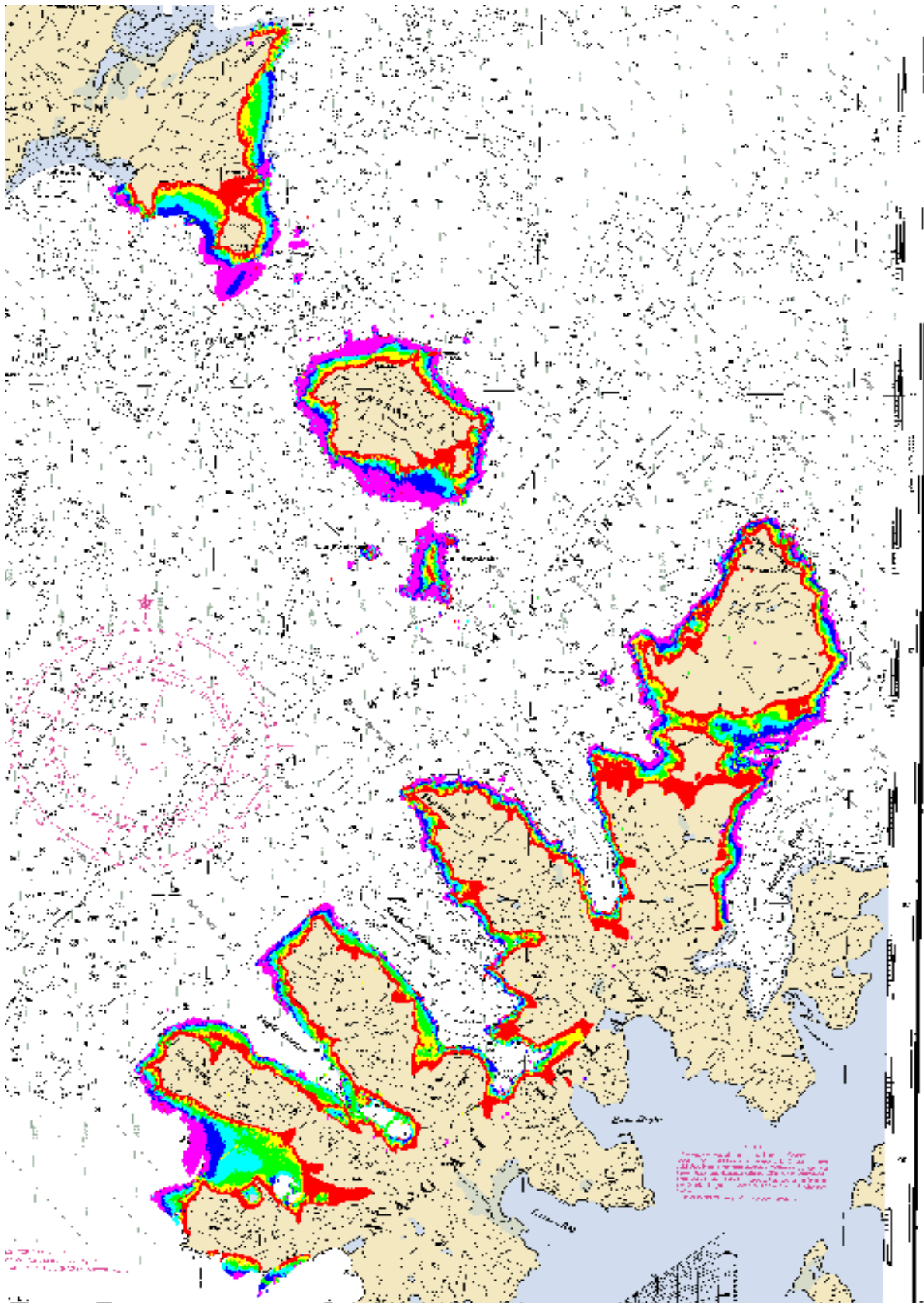
Darren Stephenson, Lead Hydrographer

Deployed to the field on April 28, 2005 for survey commencement on April 29, 2005.

This is the status numerically at August 13, 2005 and the chartlet is of July 15, 2005.

Both projects OPR-P183-KRL-05 and OPR-P184-KRL-05 have been combined for ease of reporting.

	April	May	June	July	August	Total	Total Planned	% Complete
Days on project	2	23	26	23	10	84		
Line – nm - flown	250	2907.3	2326.96	2482.0	1370.8	9337.1	6025.5	154.9
Aircraft flown hours	3.2	56.23	51.52	67.65	29.6	208.2		
Aircraft on task hours	2.2	40.61	35.05	43.14	22.9	143.9		
Days with flight	1	9	10	12	5	37	32	115.6
Transit to Sand Point		1	0	0	0	1		
No flight due to weather	1	11	16	11	5	44		
No flight due to water quality		0	0	0	0	0		
No flight due to system		2	0	0	0	2		
Hours lost to weather		3	4	4	0	11		
Hours lost to system		7	4	8	0	19		



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.

05_5Nagai

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
April-29-05	119	5	19:00	00:54	05:54
May-13-05	133	7	01:00	06:54	05:54
May-14-05	134	8	00:00	06:54	06:54
May-16-05	136	9	00:00	00:00	Sortie Not Processed
May-19-05	139	11	20:00	03:54	07:54
May-21-05	141	12	22:00	23:48	01:48
May-22-05	142	13	03:00	05:24	02:24
May-23-05	143	14	21:00	00:48	03:48
May-24-05	144	15	18:30	22:24	03:54
June-03-05	154	16	21:00	23:48	02:48
June-12-05	163	18	21:00	04:54	07:54
June-13-05	164	19	19:30	23:48	04:18
June-16-05	167	20	21:30	04:48	07:18
June-19-05	170	21	18:42	03:00	08:18
June-27-05	178	23	22:30	04:24	05:54
June-28-05	179	24	19:00	02:24	07:24
June-29-05	180	25	21:00	05:24	08:24
July-02-05	183	27	14:00	16:24	02:24
July-07-05	188	30	19:30	04:30	09:00
July-12-05	193	31	22:00	04:54	06:54
July-13-05	194	32	19:00	02:24	07:24
July-14-05	195	33	00:00	00:00	Sortie Not Processed
July-27-05	208	37	22:00	04:54	06:54
July-30-05	211	38	19:00	01:00	06:00
Aug-02-05	214	40	14:00	21:24	07:24
Aug-04-05	216	42	14:00	21:54	07:54
Aug-05-05	217	43	16:00	20:00	04:00

T I D A L D A T U M S

Tidal datums at SAND POINT, POPOF ISLAND based on:

LENGTH OF SERIES: 19 Years
 TIME PERIOD: January 1983 - December 2001
 TIDAL EPOCH: 1983-2001
 CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (12/31/1986) = 3.531
 MEAN HIGHER HIGH WATER (MHHW) = 2.204
 MEAN HIGH WATER (MHW) = 1.988
 MEAN TIDE LEVEL (MTL) = 1.197
 MEAN SEA LEVEL (MSL) = 1.181
 MEAN LOW WATER (MLW) = 0.406
 MEAN LOWER LOW WATER (MLLW) = 0.000
 LOWEST OBSERVED WATER LEVEL (11/15/1993) = -1.120

Bench Mark Elevation Information In METERS above:

Stamping or Designation	MLLW	MHW
9450 R 1991	4.593	2.605
9450 S 1991	4.582	2.594
9450 T 1991	3.836	1.848
9450 U 1991	4.397	2.409
945 9450 SHEET PILE BOLT	4.006	2.018
9450 V 1992	4.180	2.192
9450 W 1992	3.553	1.565
9450 X 1992	3.731	1.743
9450 Y 1997	4.559	2.571
1293-1 1984	3.585	1.598

APPENDIX V – SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

-----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 from 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 bin 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

APPENDIX VI – AWOIS

No AWOIS were assigned to this task order.

APPROVAL SHEET
H11435

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, S-57 classification and attribution of soundings and features, cartographic characterization, and verification or disproof of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

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