H11209

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-O167-KR-03

Registry No. H11209

LOCALITY

State ALASKA

General Locality Chatham and Sumner Straits

Sublocality Spanish Islands and Decision Passage

2003

CHIEF OF PARTY

Mark Sinclair Darren Stephenson

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION **HYDROGRAPHIC TITLE SHEET**	REGISTRY NO. **H11209**
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 NUMBER. **N/A**

State:	Alaska		
General Locality:	Chatham and Sumner Straits		
Sublocality:	Spanish Islands and Decision Passage		
Scale:	1:10,000	**Date of Survey:**	May 15 to June 27, 2003
Instructions dated:	March 18, 2003	**Project No:**	OPR-O167-KR-03
Vessel:	Tenix LADS Aircraft, VH - LCL		
Hydrographer:	M.J. Sinclair	**Chief of Party:**	D.J. Stephenson
Surveyed by:	G.K. Stringfellow, H.E. Parker, M.S. Hawkins		
Soundings taken by echo sounder, hand lead, pole:	Laser Airborne Depth Sounder		
Graphic record scaled by:	N/A		
Graphic records checked by:	N/A		
Protracted by:	N/A	**Automated plot by:**	HP Design Jet 800ps
Verification by:	G. Nelson		
Soundings in:	Fathoms at MLLW		

REMARKS: Contract No. DG133C-03-CQ-0011
Contractor: Tenix LADS Incorporated, 2548 Beach Blvd, Biloxi, MS, 39531
Subcontractor: John Oswald and Associates, 12001 Audubon Dr., Anchorage, AK, 99516
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.

All times are recorded in UTC

Projection is UTM Zone 8

DESCRIPTIVE REPORT TO ACCOMPANY HYDROGRAPHIC SURVEY H11209 SCALE 1:10,000, SURVEYED IN 2003 TENIX LADS AIRCRAFT, VH-LCL TENIX LADS INC. (TLI) MARK SINCLAIR, HYDROGRAPHER

PROJECT
Project Number: OPR-O167-KR-03
Date of Instructions: March 18, 2003 **Original:** DG 133C-03-CQ-0011
Task Order: T0002
Date of Supplemental Instructions: May 7, 2003 email regarding meeting with PHB, NOAA
Sheet Number: Area "2"
Registry Number: H11209

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 Sitka Airport from May 15 to May 19, June 7 to June 9 and June 22 to June 27, 2003. During this period seven survey sorties were flown under Task Order 2 OPR-O167-KR-03 to the Spanish Islands and Decision Passage, AK, which is illustrated as Area 2 in the Statement of Work (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 day by day 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:

NW corner	56°.04061851	-134°.22754036
SE corner	55°.90364836	-134°.08560492

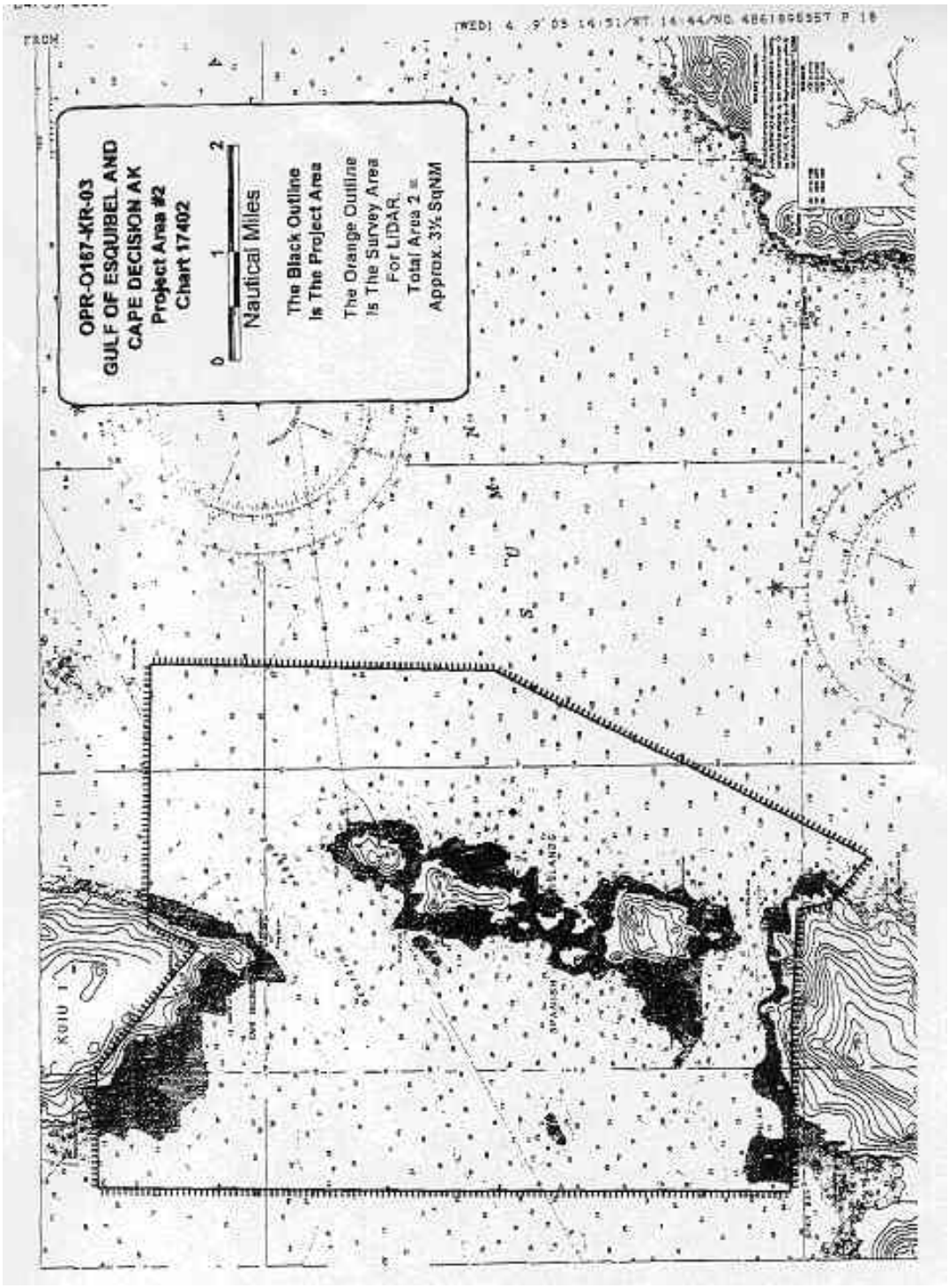


Figure 1 - Survey Area for Task Order 2

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 to provide 5x5 or 4x4 meter laser spot spacing in the main line sounding mode of operation. These modes require an aircraft speed of 175 or 140 knots over the ground. 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 stand-alone 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 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 Frodo, 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 80 meter line spacing 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, there were times when the water clarity was poor. The maximum lidar depths measured during the survey exceeded 20 meters, although 15 meters was the generally achieved depth.

Secchi disk observations in the area were taken on May 10, 2003, which indicated that depths of at least 15 meters should be achieved due to the water clarity at the time. There are strong tidal streams running throughout the Spanish Islands, which would have contributed to degrading the water clarity in certain areas.

B.2.3 Data Management

The survey area was managed in one database referred to as ‘Sitka’. A detailed table of the line numbers is presented in the Data Acquisition and Processing Report.

B.2.4 Data Acquisition

Survey operations were planned as a forward deployment from Cold Bay when suitable weather conditions prevailed in the Sitka area. The first survey deployment took place from May 15 - 19; the first sortie was flown on May 17 and the second on May 18. This first deployment took place during spring tides.

The first sortie commenced at low tide and continued through the flood tide and was completed approaching high tide when the water had risen 3 meters. Due to the poor depth penetration during this sortie the next sortie was flown at high tide when slack water occurred. No improvement in depth penetration was noticed.

The second deployment to Sitka was conducted during the neap tides during moderate tidal stream through the Spanish Islands. This was for the period June 7 – 9 during which time three survey sorties were conducted. The first sortie was flown just before high water where 1 meter of flood occurred; the data quality showed slight improvement from the previous deployment. The same environmental conditions occurred the next day. The final flight was conducted at low tide however due to the presence of low cloud on the headlands the sortie was cut short.

The third deployment to Sitka was once again conducted during the neap tidal cycle from June 22 – 27. This deployment was hampered by low cloud. Additional lines were planned to further the investigation of the shoal on the western side of the Spanish Islands; additional lines were also planned around the headland north of Decision Passage. The first sortie was flown on June 23 at low tide and no improvement of data quality occurred. The second sortie was flown on June 26 at low tide and similar results were obtained.

The limited coverage achieved on all three forward deployments was a result of the thick beds of kelp throughout the survey area.

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

The sea state ranged from 1 to 3 throughout the survey. Generally sea state 3 was found on the seaward side of the Spanish Islands and state 1 on the lee side. 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 the sheltered areas in the lee of the islands or headlands. Under such calm conditions the sea may become glassy which degrades the sea surface model.

Long period swell created some datum errors in a number of areas; where this occurred this data has been deleted as these areas were covered by other lines.

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.1.1.1 Charted Depths and Features and D.1.1.3 Additional Boatwork inside Lidar Area.

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. Where the kelp is very thick, such areas have been delineated on the smooth sheet by a dashed line and the annotation 'Foul with Kelp' is inserted.

Rocks detected in kelp by the system may be difficult to assess as returns from rock or kelp. When it is doubtful whether the return is from rock or kelp, a recommendation for additional boatwork is given in section D.1.1.3 Additional Boatwork inside Lidar Area.

In the case where a doubtful return is of charting significance, a recommendation for additional boatwork is given in section D.1.1.1 Charted Depths and Features.

B.2.7 Nature of the Seabed

In general, the seabed was very rugged in the survey areas. 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.

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 around the Spanish Islands 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 ( ), converted to feet above MHW. Maximum heights up to 63 or 64 feet are shown, as a result of the 20 meter topographic logging window.

B.2.9 Datums

On completion of each flight the GPS data logged on the aircraft and at the base station was processed to determine the 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 25 knots during the survey. In general the wind strength during the time of survey was around 10 knots from the west to northeast. The direction of the wind influenced the area for survey operations to be conducted due to high levels of turbulence under conditions where the wind was coming off high ground. The wind direction also influenced the formation of low cloud.

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. Limited weather forecasts were available for the survey area and the actual weather was confirmed by contacting the control tower at Sitka Airport prior to departure for each survey sortie.
b. 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.

On one occasion survey operations were conducted at 1,800 feet to fly over clouds forming on the headlands.

B.2.12 Effects of High Ground

At the time of the survey, the maximum operating height of the LADS MkII system was 1,800 feet. This has subsequently extended to 2,200 feet to improve operations in the vicinity of high ground. During the survey of Decision Passage, the proximity of high ground influenced the planned direction of survey lines and also caused significant turbulence under certain conditions. For example, when a westerly wind was present the eastern side of the headlands was particularly turbulent.

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 operator 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 copied and some limited processing was done at the operating site in Sitka after each sortie, however the majority of the processing was conducted at the operating site in Cold Bay on return from each forward deployment. Initial validation of the data was conducted at the Cold Bay site. Final validation, checking and approval by hydrographic surveyors was then conducted at either the Tenix LADS depot in Biloxi, MS or Adelaide, South Australia.

B.2.16 Progress Sketches

Progress sketches were provided to NOAA upon completion of each forward deployment.

B.2.17 Final Data

Final data for Task Order 2 was dispatched on May 14, 2004.

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 subset of all accepted data. Depths are in meters.
- Preliminary smooth sheet data. An ASCII file of all sounding on the smooth sheet. Depths are in meters.
- Caris compatible data. LADS sounding and waveforms which can be imported into Caris HIPS.
- Coverage plots and sun illuminated images. Provided in GEOTIFF format.

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

B.4 BENCHMARKS

One depth benchmark area was created from the LADS data, which lies along a line to the south of Kruzof Island to the west of Sitka. Center coordinates of the benchmark are as follows:

Benchmark Name	Nominal Depth	Easting (WGS 84)	Northing (WGS 84)
BM_3	9 m	459 200	6 318 725

The benchmark was established from data collected during sortie 2 on May 17 and was over flown on sorties 3, 4 and 5. The tidal model in use for the comparison of benchmarks was directly from the data obtained from the Sitka tide station. 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 all the data against the benchmark surface; 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 averages of the Mean Depth Differences and Standard Deviation for each benchmark run are as follows:

GS ID	BM Name	Nominal Depth	MDD	SD
3	BM_3	9 m	0.14 +/- 0.09	0.12 +/- 0.01

These results are good even though the benchmark area was slightly turbid during sorties 4 and 5 and show the depth difference means and the standard deviation of the benchmark are very consistent. These results indicate that the LADS Mk II system operated correctly.

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.

Two crosslines were planned over the best data available, however when the lines were flown the water quality was very poor and no meaningful data was collected. A sub area of lines was run in an east/west direction across the Spanish Islands to try and collect data over a charted rock to the west of the Spanish Islands. Six of these lines were used as crosslines against the main lines of sounding. Cross tie comparison statistics were conducted, however the existence of kelp reduced the number of comparisons which could be conducted.

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*
311.0.1	4076	4.8	-0.05 +/- 0.07	0.30 +/- 0.12
310.0.1	1150	4.	0.16 +/- 0.12	0.19 +/- 0.02
303.0.1	733	5.2	0.11 +/- 0.07	0.24 +/- 0.01
301.0.1	1029	1.3	-0.16 +/- 0.14	0.29 +/- 0.01
308.0.1	1031	1.25	0.33 +/- 0.22	0.28 +/- 0.04
309.0.1	2076	4.0	0.11 +/- 0.04	0.21 +/- 0.09

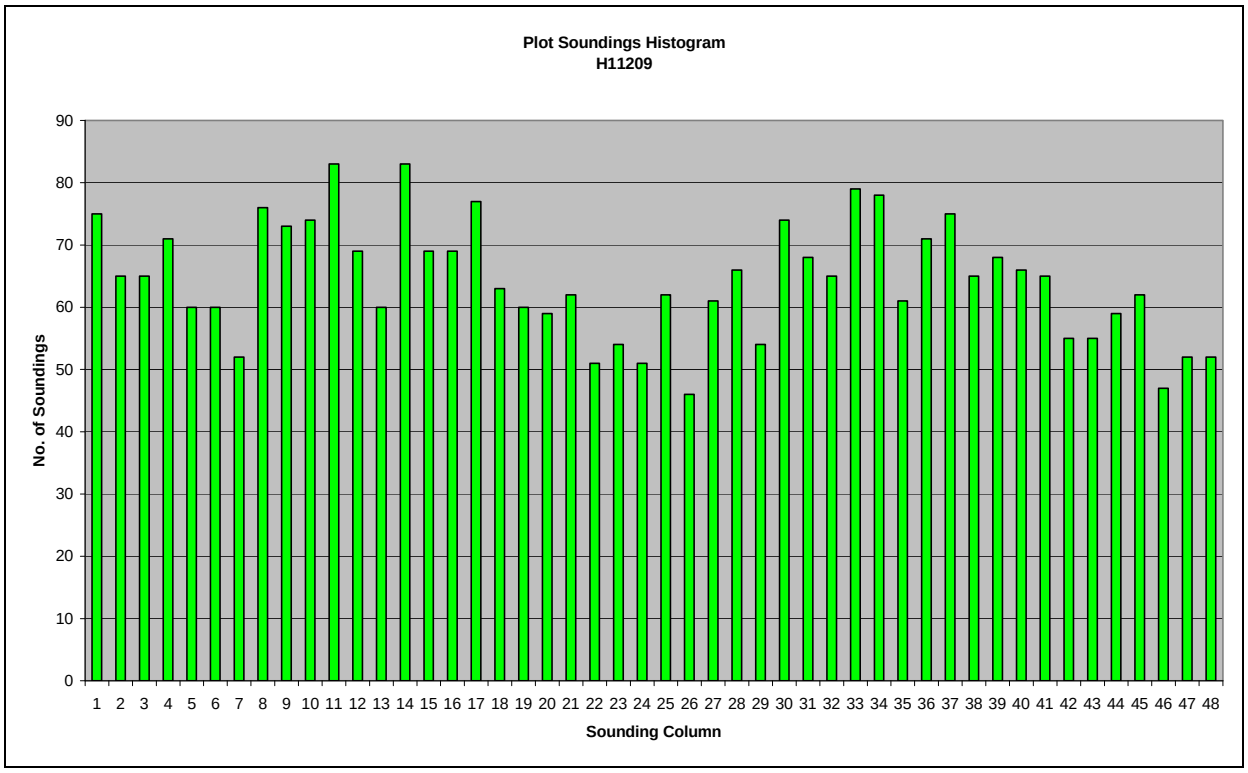
Table 1 – Crossline Comparison Results

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

These 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 H11209

B.7 POSITION CHECKS

Two independent positioning systems were used during the survey. Real-time positions were determined by stand-alone GPS. A KGPS position was also determined relative to a local GPS base station which was established on the rooftop of the Butler building at Sitka Airport. The KGPS position and height were applied to soundings 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 Sitka 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 (PNAV C/A code + carrier phase) during the static position check was 0.115 meters (95% confidence). The results and details of the static position check are enclosed in 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 ranged from 1.634 to 3.204 meters, with the mean standard deviation from 0.192 to 0.366 meters. Details are provided in the Vertical and Horizontal Control Report.
d. 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 as expected.

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) from the NOAA station at Sitka (9451600).

Station details are as follows:

			WGS84	
Gauge	**Location**	**GS No.**	**Latitude**	**Longitude**
9451600	Sitka Sound Seafood Dock	TS8	57° 03.1' N	135° 20.5' W

Table 2 – Sitka Tide Gauge

C.2 ZONING

Tide zones that cover the extent of the survey were supplied by NOAA with time and range correctors relative to the Sitka tide station. These are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
SA220	TA4	-6 minutes	x1.06	9451600
SA221	TA5	-12 minutes	x1.13	9451600
SA224	TA6	-12 minutes	x1.11	9451600
SA226	TA7	-12 minutes	x1.09	9451600
SA230	TA3	-6 minutes	x1.14	9451600
SA231	TA2	-6 minutes	x1.12	9451600
SA232	TA1	-6 minutes	x1.09	9451600
SEA200	TA8	0 minutes	x1.01	9451600

Table 3 – Tide Zones

Prior to the commencement of the survey, a tidal zoning analysis of the areas was conducted by surveying company 'John Oswald and Associates, LLC' in Anchorage, Alaska. The result of this analysis concluded that the zoning provided by NOAA should be adequate to meet the accuracy specifications for soundings and the datum jump between tide areas should be below 0.070 meters with the majority of the differences in the 2 – 3 centimeter range. A complete copy of this analysis can be found in the Vertical and Horizontal Report.

The verified tides supplied by NOAA were independently checked by John Oswald and Associates. Once the data was checked a fifth degree polynomial was applied to the tidal data and this data was then supplied to Tenix LADS Inc. for the application of tides.

For final processing, tidal correctors were applied to the 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 8, Central Meridian 135° 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 – Sitka

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 Butler building at Sitka Airport, Sitka, Alaska on May 11, 2003.

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

NAD 83		UTM (N)		
Latitude (N)	Longitude (W)	Easting (m)	Northing (m)	Ellipsoidal Height (m)
57°02’45.02153”	135°21’20.53002”	478 418.443	6 322 544.771	13.209

Table 4 – GPS Base Station

GPS 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 Coarse Acquisition (C/A) code + carrier phase smoothed position solution. The C/A code + carrier phase smoothed positions were then imported into the GS and were applied to all soundings. This provided increased sounding position accuracy and horizontal redundancy.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON - SMOOTH SHEET H11209

D.1.1 Chart H11209

H11209 was compared to:

- Chart 17402 10th Edition August 2002, at scale 1:40,000. Nil corrections.

Recommendations for charting action are described in section D.1.1.1 Charted Depths and Features and in the table at Enclosure 1.

Note: Charted depths are in Fathoms and Feet and in format 2_4. Surveyed depths are in decimal Fathoms and in format 2^4. For comparison, fathom and feet conversion is in brackets in format $[2_2]$.

D.1.1.1 Charted Depths and Features

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, islands, 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 100 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. 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. Islets and Rocks. A large number of drying rocks and islets have been surveyed. A number of the surveyed drying rocks (features with a height below 2.3 feet above MHW) are shown on the chart as islets; a number of surveyed islets (features with a height above 2.3 feet above MHW) are shown on the chart as rocks. Where significant, these differences are described in the Chart Comparison spreadsheet at Enclosure 1.

In addition to the general recommendations above, some 83 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 at Enclosure 1. This data is also provided digitally as an Excel file (.xls).

D.1.1.2 AWOIS

No AWOIS were assigned to this task order.

D.1.1.3 Additional Boatwork inside Lidar Area

During the approval of the data a number of soundings have been reviewed which were uncertain. For example, some isolated rocks in kelp were detected which were difficult to correctly classify as either rock or kelp; rocks were also detected in areas which were permanently covered with white water. In circumstances where it was difficult to correctly classify a particular sounding a recommendation for investigation by boat has been made. Details of these soundings are provided in the Additional Boatwork inside Lidar Area spreadsheet at Enclosure 2. This data is also provided digitally as an Excel file (.xls).

D.1.2 Recommended Overlap with Lidar Data

Around the Spanish Islands a large number of islets and rocks were surveyed. Coverage was significantly reduced due to the existence of kelp. It is recommended that additional boatwork is required around the islands from offshore up to the 5 fathom isobath. In areas where the 5 fathom isobath is not shown on the smooth sheet, it is recommended the overlap be extended up to the 3 fathom isobath.

D.1.3 Navigational Aids

The following navigation aids were detected by lidar and are described as follows:

1. 1020 Cape Decision Lighthouse

   - Charted Position is 56°00’05”, 134°08’10” NAD83 (553 883E, 6 206 575N)
   - Twenty Five positions were detected by LADS. The mean being adopted for the position of the lighthouse.

Twenty-Five Positions		
	553 883.3 E	6 206 575.1 N
	553 893.5 E	6 206 579.3 N
	553 882.5 E	6 206 579.8 N
	553 878.1 E	6 206 585.9 N
	553 892.3 E	6 206 583.9 N
	553 890.9 E	6 206 580.2 N
	553 888.0 E	6 206 573.1 N
	553 888.6 E	6 206 577.9 N
	553 878.5 E	6 206 580.1 N
	553 879.6 E	6 206 577.3 N
	553 879.8 E	6 206 583.8 N
	553 892.6 E	6 206 574.1 N
	553 883.9 E	6 206 583.4 N
	553 890.2 E	6 206 587.8 N
	553 882.5 E	6 206 571.4 N
	553 881.4 E	6 206 587.2 N
	553 894.8 E	6 206 583.0 N
	553 885.6 E	6 206 577.1 N

	553 885.3 E	6 206 587.0 N
	553 879.3 E	6 206 572.6 N
	553 886.9 E	6 206 580.7 N
	553 888.6 E	6 206 584.2 N
	553 886.2 E	6 206 570.5 N
	553 896.5 E	6 206 574.5 N
	553 894.3 E	6 206 587.2 N
Adopted Mean Position	**553 886.5 E**	**6 206 579.9 N**

- The adopted position lies 6m from the charted position on a bearing of 039°.

2. 23445 Spanish Islands Light

- Charted Position is 55°59’13”, 134°06’17” NAD83 (555 857E, 6 204 974N)
- Two positions were detected by LADS at 555 828E, 6204982N and 555827E, 6204978N. These are 4m apart.
- The adopted position is the mean of the two detections above, being:

555 827 E, 6 204 980 N

- This lies 31m from the charted position on a bearing of 281°.

ENCLOSURE 1 TO SECTION D

H11209 – Chart Comparison Spreadsheet.

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
1	1	1^{1}	1.99	56 01'57.86" 134 11'22.79"	550496 6210020	Kelp	56 01'58" 134 11'18"	4	132.0.1	24	14	43	Possible 1^{1} $[1_{1}]$Rk surveyed at 4x4 meter laser spacing at 200% coverage. Area of very sparse data due to kelp.	Yes
2	1	0^{5}	0.88	56 01'55.50" 134 10'59.60"	550898 6209951	Kelp	56 01'56" 134 10'60"	5	135.0.1	87	15	41	Surveyed 0^{5} $[0_{3}]$Rk on edge of surveyed area. Surveyed at 4x4 meter laser spot spacing at 100% coverage. Area of very sparse data due to kelp.	Yes
3	2	0^{6}	1.11	56 01'08.27" 134 10'31.06"	551409 6208497	Kelp	56 01'10" 134 10'30"	4	119.0.2	76	5	2	Recommend chart 0^{6} $[0_{4}]$Rk surveyed at 4x4 meter laser spot spacing at 200% coverage. Area of very sparse data due to kelp. Numerous other rocks in vicinity. Chart annotated 'Bares at LW' 50 metres north.	No
4	1	1^{9}	3.55	56 01'12.21" 134 09'57.41"	551990 6208626	Kelp	56 01'13" 134 09'56"	5	125.0.1	67	10	35	Possible 1^{9} $[1_{5}]$Rk in kelp. Surveyed at 4x4 meter laser spot spacing at 200% coverage. Area of very sparse data due to kelp.	Yes
5	3					$4^{3}/_{4}$	56 00'37" 134 10'16"						Charted $4^{3}/_{4}$ fathom sounding not found.	Yes
6	1	0^{3}	0.66	56 00'58.68" 134 09'42.24"	552258 6208211	Kelp	56 00'59" 134 09'45"	5	120.0.1	41	7	45	Possible 0^{6} $[0_{4}]$Rk in kelp. Surveyed at 4x4 meter laser spot spacing at 200% coverage. Sparse data due to kelp.	Yes
7	1	0^{7}	1.39	56 00'43.15" 134 09'25.89"	552547 6207734	Kelp	56 00'43" 134 09'26"	5	118.0.1	45	11	3	Surveyed 0^{7} $[0_{4}]$Rk at 4x4 meter laser spot spacing at 200% coverage. Area of sparse data due to kelp.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
8	1	$(\underline{0}^4)$*	-0.77	56 00'44.52" 134 09'07.97"	552857 6207780	Kelp	56 00' 44" 134 09' 09"	5	118.0.1	49	6	46	Surveyed $(\underline{0}^4)$ $[\underline{0}_2]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
9	1	0^3	0.5	56 00'36.03" 134 08'54.22"	553098 6207521	Kelp	56 00'36" 134 08'53"	5	118.0.1	53	7	10	Surveyed 0^3 $[0_2]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
10	1	0^6	1.18	56 00'09.75" 134 08'30.18"	553525 6206714	Kelp	56 00'04" 134 08'20"	4	111.0.1	40	18	37	Surveyed 0^6 $[0_4]$Rk southwest of Cape Decision. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
11	3					7	55 59'53" 134 08'29"						Charted 7 fathom sounding not found.	Yes
12	3	7^1	13	56 00'09.53" 134 07'45.86"	554292 6206716	*	56 00'10" 134 07'45"	4	115.0.1	30	1	42	Recommend replace charted * with surveyed 7^1 $[7_1]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage.	No
13	1	1^6	2.96	56 00'35.86" 134 07'28.99"	554574 6207534	Kelp	56 00'36" 134 07'29"	4	124.0.2	77	16	43	Recommend chart 1^6 $[1_4]$ Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
14	1	3^4	6.25	56 00'39.11" 134 07'18.50"	554755 6207637	10	56 00'40" 134 07'19"	4	128.0.2	83	10	1	Isolated 3^4 $[3_2]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Currently charted as 10 fathom contour.	Yes
15	1	1^7	3.19	56 00'55.64" 134 07'17.98"	554757 6208148	Kelp	56 00'56" 134 07'19"	4	132.0.1	84	15	41	Recommend chart 1^7 $[1_4]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
16	1	2^5	4.53	56 00'59.20" 134 07'13.94"	554826 6208259	$5^1/_4$	55 00'59" 134 07'11"	5	135.0.1	29	5	36	Possible 2^5 $[2_3]$Rk on edge of surveyed area. Surveyed at 4x4 meter laser spot spacing at 100% coverage. Area of very sparse data due to kelp. Currently charted as $5\ ^1/_4$ fathoms.	Yes
17	1	$(\underline{0}^2)$*	-0.42	55 59'10.91" 134 06'36.55"	555516 6204919	Islet	55 59'10" 134 06'37"	4	214.0.2	31	16	26	Possible (0^2) $[0_1]$*. Surveyed at 4x4 meter spot spacing at 200% coverage. Area of sparse data due to kelp. Note surveyed rocks and islets differ from chart in this vicinity.	Yes
18	2	$(\underline{1}^4)$*	-2.53	55 59'12.47" 134 06'31.70"	555600 6204969	Islet	55 59'13" 134 06'31"	2	216.0.1	115	16	48	Recommend chart $(\underline{1}^4)$ $[\underline{1}_2]$* in lieu of islet. Surveyed at 4x4 meter laser spot spacing at 200% coverage. Area of sparse data due to kelp.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
19	2	$(\underline{0}^{7})$*	-1.27	55 59'16.90" 134 06'16.09"	555869 6205109	Rk	55 59'19" 134 06'17"	4	218.0.2	27	9	11	Recommend move charted rock to surveyed position. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
20	2	2^{8}	5.21	55 58'51.84" 134 05'56.74"	556214 6204339	$1^{3}/_{4}$	55 58'52" 134 05'57"	4	226.0.2	33	12	2	Surveyed 2^{8} $[2_{5}]$ Rk in kelp. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
21	2,3	$(\underline{0}^{1})$*	-0.12	55 58'38.81" 134 06'11.16"	555969 6203933	Rk Awash	55 58'39" 134 06'11"	2	225.0.1	41	9	1	Surveyd $(\underline{0}^{1})$ $[\underline{0}_{1}]$. Charted as Rk Awash. Note charted * 150meters ENE not detected. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
22	3	3	5.53	55 58'40.91" 134 06'35.52"	555546 6203992	Rk	55 58'40" 134 06'36"	2	219.0.1	45	12	19	Surveyed 3 [3]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted * not found.	Yes
23	3	7^{8}	14.33	55 58'17.76" 134 06'20.83"	555810 6203280	$2^{3}/_{4}$	55'58'18" 134 06'20"	4	224.0.2	49	17	45	Surveyed 7^{8} $[7_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted $2^{3}/_{4}$ not found.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
24	1	0^{7}	1.4	55 58'12.74" 134 06'35.08"	555565 6203121	Kelp	55 58'13" 134 06'36"	4	222.0.2	53	6	43	Surveyed 1^{4} [1_{2}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
25	3	2^{5}	4.67	55 58'04.97" 134 06'35.15"	555567 6202881	1	55 58'03" 134 06'37"	2	225.0.1	57	3	4	Surveyed 2^{5} [2_{3}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted 1fm not detected.	Yes
26	3	13^{1}	23.95	55 57'50.96" 134 06'22.09"	555799 6202451	Rk	55 57'50" 134 06'21"	4	303.0.1	36	6	21	Charted Rk not detected. Recommend delete.	No
27	1	5^{8}	10.74	55 57'42.58" 134 06'48.81"	555339 6202186	"Breakers"	55 57'42" 134 06'49"	4	305.0.1	42	12	30	Recommend Chart 5^{8} [5_{5}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
28	3	7^{2}	13.26	55 57'31.75" 134 06'46.64"	555381 6201852	$3^{3}/_{4}$	55 57'31" 134 06'46"	3	226.0.2	69	13	36	Surveyed 7^{2} [7_{1}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted $3^{3}/_{4}$ fm not found.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
29	2	1^5	2.78	55 57'34.50" 134 06'58.80"	555169 6201934	2	55 57'32" 134 06'58"	2	307.0.1	43	14	47	Recommend replace charted 2 with surveyed 1^5 $[1_3]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
30	2	1^5	2.71	55 57'32.60" 134 07'17.76"	554841 6201871	Rk	55 57'33" 134 07'18"	2	221.0.1	75	1	10	Two charted Rks. Surveyed 1^5 $[1_3]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
31	2	5^2	9.62	55 56'59.59" 134 07'47.56"	554337 6200844	$6^1/_2$	55 56'58" 134 07'44"	2	218.0.1	54	16	1	Surveyed 5^2 $[5_1]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Replace charted $6^1/_2$ with surveyed 5^2 Rk.	No
32	1	$(\underline{1}^8)$*	-3.29	55 57'09.98" 134 08'20.42"	553763 6201158			4	212.0.2	87	16	5	Recommend chart $(\underline{1}^8)$ $[1_5]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
33	2	0^1	0.31	55 57'17.44" 134 08'14.26"	553867 6201390	*	55 57'17" 134 08'16"	2	212.0.1	60	4	42	Surveyed 0^1 $[0_1]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Recommend move charted islet and Rk to match smoothsheet.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
34	2	$(\underline{1}^{7})$*	-3.14	55 57'19.39" 134 08'01.31"	554091 6201453	Rk	55 57'17" 134 08'02"	2	313.0.1	57	8	9	Recommend chart $(\underline{1}^{7})$ $[1_4]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of white water and sparse data due to kelp.	No
35	1	2^2	4.09	55 57'36.53" 134 07'46.91"	554334 6201986			2	307.0.1	55	8	5	Possible 2^2 $[2_1]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
36	3	3	5.55	55 57'43.82" 134 07'44.90"	554366 6202212	Rk	55 57'44" 134 07'44"	2	214.0.1	74	1	40	Surveyed 3 [3]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted Rks not detected. White water 50 meters east	Yes
37	3	6^3	11.58	55 58'06.67" 134 07'35.33"	554523 6202920	Rk	55 58'07" 134 07'34"	2	212.0.1	83	5	29	Surveyed 6^3 $[6_3]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted Rks not detected.	Yes
38	1	1^2	2.33	55 58'15.53" 134 07'27.92"	554648 6203196			4	212.0.2	57	4	23	Surveyed 1^2 $[1_1]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
39	1	0^{7}	1.24	55 58'24.76" 134 07'35.27"	554517 6203480			5	209.0.2	51	10	28	Recommend chart 0^{7} [0_{4}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
40	1	($\underline{0}^{2}$)*	-0.4	55 58'26.57" 134 07'33.46"	554548 6203536	Kelp	55 58'26" 134 07'37"	2	210.0.1	91	17	39	Surveyed ($\underline{0}^{2}$) [0_{1}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
41	2	($\underline{1}^{8}$)*	-3.3	55 58'29.77" 134 07'28.64"	554630 6203636	Islet	55 58'30" 134 07'30"	2	210.0.1	93	11	29	Surveyed ($\underline{1}^{8}$) [1_{5}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Recommend replace charted islet with surveyed Rk.	No
42	1	(13)	-6.99	55 58'35.98" 134 07'25.45"	554683 6203829			5	209.0.2	46	10	34	Recommend chart (13) Islet. Surveyed at 4x4 meter laser spot spacing with 200% coverage.	No
43	2	($\underline{1}^{4}$)*	-2.44	55 58'46.91" 134 07'36.22"	554492 6204164	Rk	55 58'46" 134 07'37"	2	206.0.1	99	10	30	Surveyed (1^{4}) [1_{2}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of white water and sparse data due to kelp. Rk charted 100 meters SSE not detected.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
44	1	0^{8}	1.57	55 58'43.10" 134 07'26.79"	554657 6204048	Kelp	55 58'43" 134 07'26"	5	209.0.2	44	4	7	Surveyed 0^{8} [0_{5}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
45	1	1	1.87	55 58'41.62" 134 07'20.23"	554771 6204004	Kelp	55 58'42" 134 07'20"	4	210.0.2	47	4	17	Surveyed 1 [1]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
46	2	0^{5}	0.94	55 58'43.60" 134 06'48.61"	555318 6204072	Rk Awash	55 58'44" 134 06'50"	4	216.0.2	43	6	18	Surveyed 0^{5} [0_{3}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Recommend move charted Rk to surveyed position.	No
47	1	1^{8}	3.38	55 56'51.73" 134 07'33.64"	554582 6200604			4	222.0.2	92	8	47	Recommend chart 1^{8} [1_{5}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
48	3	8^{2}	15.02	55 57'00.43" 134 07'18.22"	554846 6200876	$3^{1}/_{2}$	55 57'00" 134 07'18"	4	226.0.2	85	8	3	Surveyed 8^{2} [8_{1}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted $3^{1}/_{2}$ fathoms not found	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
49	3	3	5.54	55 56'47.06" 134 07'02.68"	555120 6200467	$1^1/_2$	55 56'48" 134 07'04"	2	231.0.1	71	17	3	Surveyed 3 [3]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted $1^1/_2$ fathoms not found.	Yes
50	1	(0)*	-0.04	55 56'24.60" 134 07'05.45"	555081 6199771			2	233.0.1	76	13	18	Surveyed (0) [0]Rk ledge close inshore. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Note islet on chart was surveyed as part of coast.	No
51	1	4	7.3	55 56'14.18" 134 07'07.27"	555054 6199449			5	235.0.2	71	2	1	Recommend chart 4 [4]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
52	2	2^7	5.04	55 56'11.25" 134 07'09.22"	555021 6199358	$3^1/_4$	55 56'13" 134 07'09"	5	235.0.2	72	8	2	Recommend replace charted $3^1/_4$ with surveyed 2^7 $[2_7]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
53	2,3	(1^4)*	-2.53	55 56'03.90" 134 07'15.03"	554923 6199130	Islet & Drying Rk	55 56'04" 134 07'16"	4	233.0.2	86	7	41	Surveyed (1^4) $[1_2]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Recommend move charted Rk and delete charted islet.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
54	2	8^{5}	15.62	55 55'58.33" 134 07'20.73"	554826 6198956	$2^{1}/_{2}$	55 55'58" 134 07' 22"	4	233.0.2	89	3	34	Surveyed 8^{5} [8_{3}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted $2^{1}/_{2}$ fathom not detected.	Yes
55	2	6^{3}	11.51	55 55'58.99" 134 07'28.30"	554695 6198975	$3^{1}/_{2}$	55 55'58" 134 07'29"	4	233.0.2	89	15	1	Surveyed 6^{3} [6_{2}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted $3^{1}/_{2}$ fathoms not detected.	Yes
56	1	3^{8}	7.03	55 55'55.34" 134 07'36.00"	554563 6198860	Foul	55 55'55" 134 07'36"	2	231.0.1	95	10	22	Recommend chart 3^{8} [3_{5}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
57	1	3	5.56	55 55'41.32" 134 07'32.15"	554635 6198427			4	233.0.2	96	17	38	Recommend chart [3]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
58	2	3^{3}	6	55 56'13.13" 134 08'32.86"	553569 6199398	$4^{1}/_{4}$	55 56'13" 134 08'33"	2	218.0.1	32	12	48	Recommend replace charted $4^{1}/_{4}$ fathom with surveyed 3^{2} [3_{1}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
59	1	0^{6}	1.22	55 56'03.73" 134 09'22.23"	552716 6199097	Kelp	55 56'04" 134 09'23"	4	208.0.2	121	9	31	Surveyed 0^{6} $[0_{4}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
60	1	$(\underline{0}^{1})$*	-0.17	55 56'11.51" 134 09'18.80"	552773 6199338			3	209.0.1	116	16	2	Possible $(\underline{0}^{1})$ $[0_{1}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
61	1	0^{1}	0.2	55 56'21.45" 134 09'06.33"	552985 6199648			4	210.0.2	112	5	2	Surveyed 0^{2} $[0_{1}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Note $(\underline{1}_{9})$* 50 meters NE.	Yes
62	2	$(\underline{1}^{9})$*	-3.43	55 56'26.47" 134 09'06.92"	552973 6199803	Islet	55 56'26" 134 09' 06"	5	209.0.2	103	14	6	Surveyed $(\underline{1}^{9})$ $[1_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Recommend replace charted islet with drying Rk.	No
63	1	0^{8}	1.5	55 56'28.10" 134 09'00.89"	553077 6199854	Kelp	55 56'28" 134 09'02"	2	208.0.1	36	10	4	Possible (0^{8}) $[0_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of white water and sparse data due to kelp.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
64	1	2	3.62	55 56'28.64" 134 08'44.58"	553360 6199875	Kelp	55 56'29" 134 08'45"	4	212.0.2.	106	5	29	Surveyed 2 [2]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
65	1	0^5	1.04	55 56'31.72" 134 08'38.05"	553472 6199971			2	214.0.1	40	8	43	Possible (0^5) [0_3]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of white water and sparse data due to kelp. Numerous rocks close S.	Yes
66	3					Rk	55 56'38" 134 08'37"						Charted Rk not detected.	Yes
67	2	($\underline{1}^2$)*	-2.17	55 56'46.61" 134 08'18.77"	553801 6200436	Islet	55 56'47" 134 08'18"	2	214.0.1	48	1	8	Recommend replace charted islet with surveyed ($\underline{1}^2$) [1_1]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage.	No
68	1	($\underline{1}^9$)*	-3.41	55 54'28.54" 134 07'21.23"	554853 6196180			2	400.0.1	105	8	21	Recommend chart ($\underline{1}^9$)* close N of islet. Surveyed at 4x4 meter laser spot spacing with 200% coverage.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
69	2	(1)*	-1.71	55 54'58.88" 134 06'59.61"	555217 6197123	Rk	55 54'57" 134 07'01"	18	411.0.2	113	4	42	Surveyed (1) [1]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Recommend move charted Rk to surveyed position.	No
70	3	3^{7}	6.87	55 55'17.16" 134 07'34.05"	554611 6197680	Rk in Foul Area	55 55'16" 134 07'36"	2	419.0.1	102	8	10	Surveyed 3^{7} [3_{4}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp. Charted Rk not detected.	Yes
71	2	(0^{3})*	-0.54	55 55'18.91" 134 07'41.18"	554487 6197733	Rk in Foul Area	55 55'18" 134 07'42"	3	420.0.1	44	11	48	Surveyed (0^{3}) [0_{2}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Recommend move charted Rk to surveyed position.	No
72	3					Islet	55 55'11" 134 08'42"						Charted islet not detected	Yes
73	2	(1^{8})*	-3.24	55 55'23.62" 134 08'57.29"	553164 6197862	Islet in Foul Area	55 55'24" 134 08'57"	3	420.0.1	62	16	42	Surveyed (1^{7}) [1_{4}]Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage.	No

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
74	1	3^{9}	7.2	55 55'19.66" 134 10'11.64"	551875 6197724	Foul Area		5	415.0.2	63	11	48	Recommend chart 3^{9} $[3_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
75	1	1^{6}	3.06	55 55'16.60" 134 10'14.51"	551826 6197629	Kelp in Foul Area	55 55'17" 134 10'14"	6	414.0.1	82	9	6	Surveyed 1^{6} $[1_{4}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
76	1	$(\underline{0}^{7})$*	-1.29	55 55'04.30" 134 10'51.13"	551195 6197241	Kelp in Foul Area	55 55'04" 134 10'52"	2	410.0.1	91	10	36	Recommend chart $(\underline{0}^{7})$ $[0_{4}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
77	1	0^{6}	1.08	55 55'03.67" 134 10'55.99"	551111 6197220	Kelp in Foul Area	55 55'04" 134 10'56"	5	410.0.2	89	18	46	Recommend chart 0^{6} $[0_{4}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	No
78	1	0^{5}	0.90	55 55'07.22" 134 11'25.10"	550604 6197324	Foul Area		5	410.0.2	96	14	28	Surveyed 0^{5} $[0_{3}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

CHART COMPARSION

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

				SURVEYED		CHARTED								
Shoal No	**Category**	**Surveyed Depth** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms/ft)	**Latitude N Longitude W NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**	**Recommend further investigation by boat**
79	1	0^{9}	1.65	55 55'30.33" 134 11'38.76"	550359 6198036	Kelp in Foul Area	55 55'31" 134 11'36"	5	419.0.2	43	3	13	Surveyed 0^{9} $[0_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
80	1	3^{2}	5.84	55 55'32.43" 134 11'38.70"	550359 6198101	Kelp in Foul Area	55 55'33" 134 11'39"	5	419.0.2	43	2	29	Surveyed 3^{2} $[3_{1}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
81	1	4^{9}	9.01	55 55'10.98" 134 11'51.53"	550144 6197435	$6^{1}/_{2}$	55 55'10" 134 11'51"	5	410.0.2	103	2	9	Surveyed 4^{9} $[4_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
82	1	1^{3}	2.38	55 54'47.74" 134 11'22.33"	550659 6196723	Kelp in Foul Area	55 54'48" 134 11'22"	6	403.0.1	48	8	14	Surveyed 1^{3} $[1_{2}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes
83	1	4^{8}	8.83	55 54'46.86" 134 12'56.18"	549030 6196677	Kelp	55 54'47" 134 12'55"	6	401.0.1	27	5	10	Surveyed 4^{8} $[4_{5}]$Rk. Surveyed at 4x4 meter laser spot spacing with 200% coverage. Area of sparse data due to kelp.	Yes

Shoal Categories:

1. New Shoal Found
2. Charted Shoal Relocated
3. Charted Shoal Not Found/Disproved

ENCLOSURE 2 TO SECTION D

H11209 – Features Requiring Investigation Spreadsheet.

Features Requiring Investigation

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

			SURVEYED		CHARTED							
Shoal No	**Depth on Smooth Sheet** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms)	**Latitude N LongitudeW NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**
1	1^3	2.43	56 00'47.01" 134 09'47.06"	552179 6207849	*	56 00' 47" 134 09'50"	4	117.0.2	63	9	34	Possible Rk in white water close east of charted Rk
2	2^3	4.33	56 00'18.71" 134 08'41.51"	553325 6206988	*	56 00' 21" 134 08'40"	5	112.0.1	53	1	32	Possible Rk in kelp close south of charted Rk
3	58	20.72	56 00'05.22" 134 08'09.25"	553889 6206578			5	110.0.1	59	4	36	Possible helipad near lighthouse
4	0^7	1.28	55 59'59.05" 134 08'14.13"	553807 6206386	$^1/_2$	55 59'59" 134 08'16"	4	109.0.1	33	18	46	Possible rk in kelp close to charted $^1/_2$ fathom
5	2^5	4.66	56 01'06.56" 134 10'22.04"	551566 6208446			5	120.0.1	31	13	29	Possible Rk in kelp close south of chart annotation : 'Bares at LW'
6	2	3.78	56 01'12.37" 134 10'24.52"	551521 6208625	Kelp		4	121.0.2	74	6	1	Possible Rk in kelp close north of chart annotation: 'Bares at LW'
7		NBA 0	56 01'16.65" 134 10'31.41"	551400 6208756			4	122.0.1	31	9	46	Possible shoal in white water close to Feature Requiring Investigation No. 9
8		NBA 0	56 01'07.88" 134 10'02.09"	551911 6208491	*	56 01'08" 134 10' 04"	4	122.0.1	39	3	36	Possible shoal in white water close east of charted Rk
9		NBA 0	56 01'16.56" 134 10'32.40"	551387 6208752			2	123.0.1	78	18	26	Possible shoal in white water close to Feature Requiring Investigation No. 7
10	1^1	1.99	56 01'57.88" 134 11'22.76"	550496 6210020	Kelp		4	132.0.1	24	14	43	See Chart Comparison No. 1
11	1^6	2.93	56 01'57.28" 134 11'01.40"	550866 6210006	Kelp		5	135.0.1	88	10	32	Possible shoal in kelp close north of Chart Comparison No. 2
12	0^9	1.65	55 55'30.33" 134 11'38.75"	550359 6198036	Foul		5	419.0.2	43	3	13	See Chart Comparison No. 79
13	3^2	5.84	55 55'32.44" 134 11'38.70"	550359 6198101	Kelp/ Foul		5	419.0.2	43	2	29	See Chart Comparison No. 80

Features Requiring Investigation

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

			SURVEYED		CHARTED							
Shoal No	**Depth on Smooth Sheet** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms)	**Latitude N LongitudeW NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**
14	3	5.44	55 58'32.57" 134 07'53.90"	554191 6203717	$2^{3}/_{4}$	55 58'33" 134 07'54"	2	204.0.1	92	10	19	Possible shoal in kelp close to charted shoal
15		NBA 0	55 58'44.04" 134 07'33.45"	554541 6204076	*	55 58'44" 134 07'35"	2	206.0.1	98	11	10	Possible shoal in white water close to charted Rk
16		NBA 0	55 56'07.81" 134 09'20.81"	552739 6199223			2	208.0.1	26	16	25	Possible shoal in white water
17		NBA 0	55 58'31.86" 134 07'31.53"	554579 6203700			2	208.0.1	93	12	7	Possible shoal in white water close west of Chart Comparison No. 41 and north of charted islet
18	0^{6}	1.22	55 56'03.74" 134 09'22.23"	552716 6199097	Kelp		4	208.0.2	121	9	31	See Chart Comparison No. 59
19	1	1.87	55 58'41.62" 134 07'20.23"	554771 6204004	Kelp		4	210.0.2	47	4	17	See Chart Comparison No. 45
20		NBA 0	55 58'02.44" 134 07'34.10"	554546 6202790	Foul		2	212.0.1	81	12	12	Possible shoal in white water
21	2^{1}	3.80	55 56'07.90" 134 08'56.61"	553159 6199231	Foul		2	212.0.1	28	7	8	Possible Rk in kelp in foul area
22	2	3.62	55 56'28.65" 134 08'44.57"	553360 6199875	Kelp		4	212.0.2	106	5	29	See Chart Comparsion No. 64
23		NBA 0	55 56'26.99" 134 08'34.63"	553533 6199826			2	214.0.1	38	13	15	Possible shoal in white water
24	0^{4}	0.76	55 56'28.86" 134 08'37.76"	553478 6199883	*	55 56'30" 134 08'36"	2	214.0.1	39	5	33	Possible Rk in kelp close north east of charted Rk and south of Chart Comparsion No.65
25	$(\underline{0}^{2})$	-0.32	55 57'41.10" 134 07'44.27"	554378 6202128	*	55 57'40" 134 07'47"	2	214.0.1	72	18	31	Possible Rk in kelp - close south of Chart Comparsion No. 36
26		NBA 0	55 57'43.55" 134 07'42.08"	554415 6202204	*	55 57'44" 134 07'44"	2	214.0.1	74	3	28	Possible shoal in white water - near charted Rk
27	$(\underline{1}^{9})$*	-3.46	55 59'07.03" 134 06'42.96"	555407 6204798	*	55 59'06" 134 06'45"	4	214.0.2	34	1	11	Possible Rk in kelp

Features Requiring Investigation

Survey :H11209 - Chatham and Sumner Straits **Locality: Spanish Islands and Decision Passage**

			SURVEYED		CHARTED							
Shoal No	**Depth on Smooth Sheet** (decimal fathoms)	**Surveyed Depth** (meters)	**Latitude N Longitude W NAD 83**	**Eastings Northings UTM N-8**	**Charted Depth** (fms)	**Latitude N LongitudeW NAD 83**	**Sortie No**	**Run No**	**Frame**	**Row**	**Column**	**Remarks**
28	0^{9}	1.74	55 58'59.32" 134 06'44.98"	555375 6204559	*	55 59'00" 134 06'43"	3	214.0.2	37	5	27	Possible Rk in kelp
29		-0.7	55 56'21.72" 134 08'34.69"	553534 6199663	*	55 56'22" 134 08'36"	2	216.0.1	36	8	41	Possible Rk in kelp close south of charted Rk
30	0^{9}	1.68	55 56'18.19" 134 08'39.09"	553459 6199553	*	55 56' 19" 134 08'42"	4	216.0.2	110	8	2	Possible Rk in kelp close east of charted Rk
31		NBA 0	55 56'16.41" 134 08'24.67"	553710 6199501			2	218.0.1	34	11	24	Possible Rk in white water. Area of sparse data in kelp. Close north of charted islet
32	0^{7}	1.4	55 58'12.73" 134 06'35.09"	555565 6203121	Kelp		4	222.0.2	53	6	43	See Chart Comparsion No. 24
33		4.99	55 58'03.73" 134 06'34.78"	555574 6202843	1	55 58'03" 134 06'37"	4	224.0.2	56	15	30	Possible Rk in kelp. Close south of 2^{5} in Chart Comparsion No. 25
34	1^{2}	2.25	55 57'55.47" 134 06'37.45"	555531 6202587	Foul		4	226.0.2	59	9	2	Possible Rk in kelp
35	0^{8}	1.42	55 55'40.53" 134 07'56.19"	554218 6198398	Foul		4	228.0.2	115	7	44	Possible Rk in kelp
36	1^{3}	2.33	55 56'47.02" 134 07'13.26"	554937 6200463			4	228.0.2	84	11	22	Possible shoal in kelp
37		-0.45	55 56'06.07" 134 07'12.46"	554967 6199197	Foul		4	233.0.2	85	5	45	Possible Rk in kelp - doubtful - deleted; from dataset

E. APPROVAL SHEETS

LETTER OF APPROVAL – OPR-O167-KR-03 AREA 2

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**
Data Acquisition and Processing	May 14, 2004
Vertical and Horizontal Control	May 14, 2004

Mark Sinclair
Hydrographer
Tenix LADS Incorporated

Date 14 May 2004

[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 Reports for multibeam surveys H11362 and H11363. 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.

Danger to Navigation Report

Hydrographic Survey Registry Number: **H11209**

Survey Title: State: Alaska Locality: Chatham and Sumner Straits Sub-locality: Spanish Islands and Decision Passage

Project Number: OPR-O167-KR-03

Survey Dates: May - June 2003

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
17402	**1:40,000**	**10th**	**8/01/2002**

DANGERS:

Feature	Depth (fms)	Latitude (N)	Longitude (W)
Rock*	1	56° 01' 57.9"	134° 11' 22.8"
Rock	1/2	56° 01' 08.3"	134° 10' 31.1"
Rock	1 1/2	56° 01' 03.3"	134° 10' 27.1"
Rock	4 1/4	56° 00' 04.6"	134° 07' 56.4"
Rock	4 1/2	56° 00' 20.0"	134° 07' 31.1"
Rock	3 1/4	56° 00' 39.1"	134° 07' 18.5"
Rock	1/2	55° 58' 24.8"	134° 07' 35.3"
Rock	5 1/4	55° 56' 59.6"	134° 07' 47.6"
Rock *	3/4	55° 55' 30.3"	134° 11' 38.8"
Rock	1/2	55° 55' 07.2"	134° 11' 25.1"
Rock	4 3/4	55° 55' 11.0"	134° 11' 51.5"
Rock	4 3/4	55° 54' 46.9"	134° 12' 56.2"

All features listed were found using LIDAR.
Items listed with "* ": The hydrographer recommends that these items be further investigated by boat. PHB recommends charting these items with a "reported" notation.

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

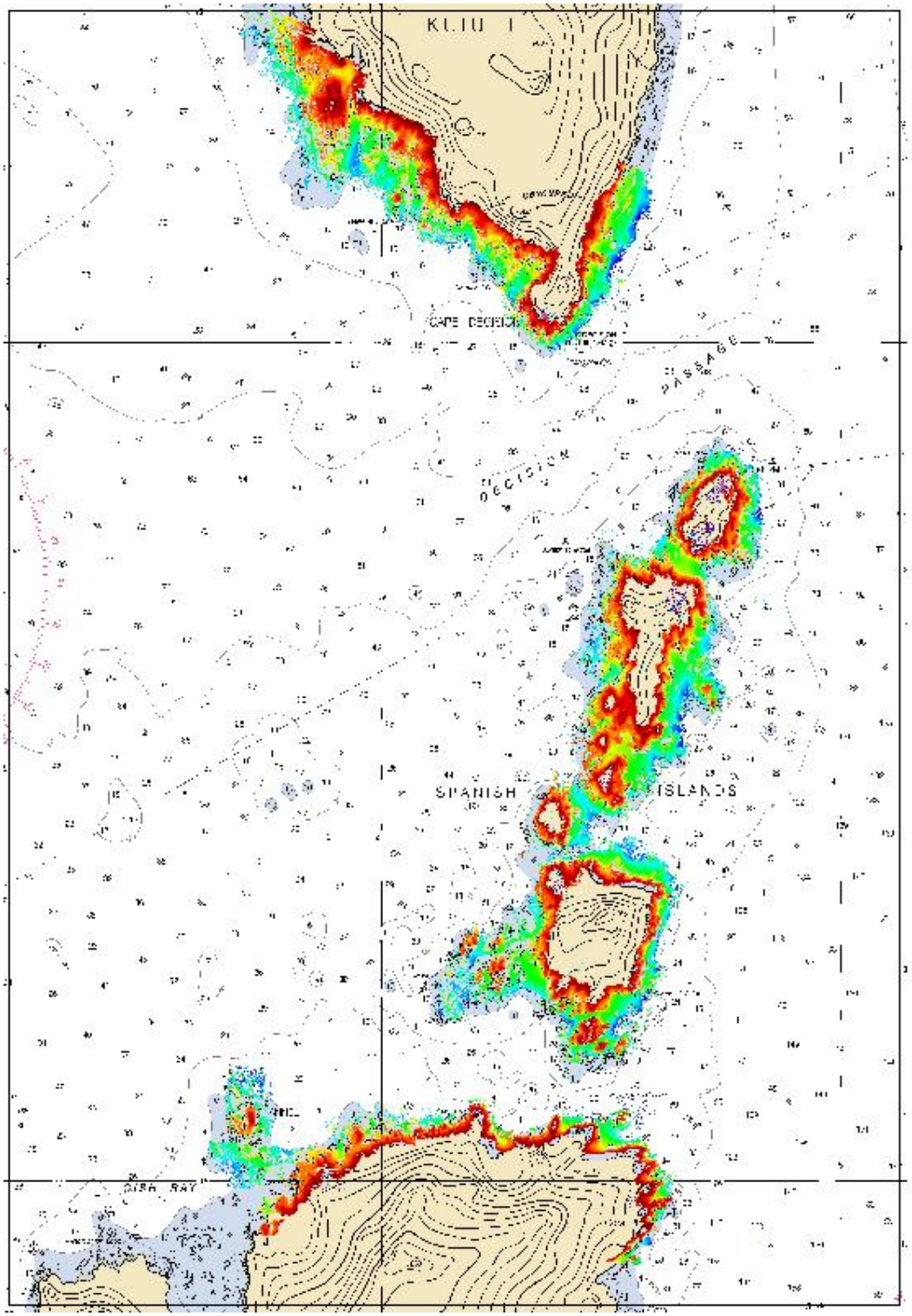
APPENDIX III – PROGRESS SHEET

Status upon completion of data acquisition for Task Order 2.

Line Nautical Miles Flown	May	June	Total	% Complete
Cape Decision	250	630	400	157
Aircraft flown hours	13.4	14.5	27.9	
Aircraft on task hours	11.45	11.75	23.8	
Days with flight	2	5	7	140
Hours lost to weather	0	0		
Hours lost to system	6	0		

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

FINAL PROGRESS SKETCH



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.

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
May-17-03	137	2	16:00	21:00	4:05
May-18-03	138	3	22:00	24:00	2:30
Jun-07-03	158	4	00:00	04:00	3:07
Jun-08-03	159	5	01:00	05:00	4:05
Jun-09-03	160	6	19:00	21:00	0:21
Jun-23-03	174	18	22:00	03:00	3:45
Jun-26-03	177	19	21:00	24:00	1:45

Summary of Tidal Zone Analysis Compiled By John Oswald and Associates, LLC
For a hydrographic survey, the zoning provided by NOAA should be adequate to meet the accuracy specifications for soundings. The datum jump should be below 0.070 meters with the majority of differences in the 2 – 3 cm category.

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 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

APPROVAL SHEET
H11209

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
2009.04.30
07:52:27 -07'00'

Gary C. Nelson
Cartographic Team Leader
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
07:52:43 -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 12:28:39 -04'00'