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Diag. Cht. No. 8554-2

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

(HYDROGRAPHIC)

Type of Survey HYDROGRAPHIC

Field No. RA-40-1-77

Office No. H-9708

LOCALITY

State ALASKA

General Locality COOK INLET

Locality OFFSHORE ANCHOR POINT TO CAPE NINILCHIK

1977

CHIEF OF PARTY
J.P. Randall

LIBRARY & ARCHIVES

DATE August 4, 1978

☆ U.S. GOV. PRINTING OFFICE: 1976—660-441

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NOAA FORM 77-28 (11-72)

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

REGISTER NO.

H-9708

HYDROGRAPHIC TITLE SHEET

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.

RA-40-1-77

State: Alaska

General locality: Cook Inlet

Locality: Offshore Anchor Point to Cape Ninilchik

Scale: 1:40,000 Date of survey: 26 July to 12 August 1977

Instructions dated: 1 April 1977 Project No.: OPR-429-RA-77

Vessel: NOAA Ship RAINIER (2120) - Launch No. RA-3 for bottom samples

Chief of party: CAPT J.P. Randall

Surveyed by: LCDR L. Lapine, LTJG S. Ramsey, ENS J. Barnett

Soundings taken by echo sounder, ~~hand lead, pole~~: Ross Fineline Fathometer

Graphic record scaled by: RAINIER Personnel

Graphic record checked by: RAINIER Personnel

Positions verified ~~Plotted~~ by: Donald E. Zimmer Automated plot by: PMC Xynetics Plotter

Soundings Verification by: Donald E. Zimmer

Soundings in fathoms ~~and tenths~~ at ~~MLW~~ MLLW

REMARKS: Time meridian for this survey is GMT (000°W).

Applied to charts 12/18/78 CMB

KWW 3/9/92

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—665-661/1222 REGION NO. 6

DESCRIPTIVE REPORT
To Accompany Hydrographic Survey
H-9708, RA-40-1-77

A. PROJECT INSTRUCTIONS

Project instructions for OPR-429-RA-77 (hydrographic survey operations in Lower Cook Inlet, Alaska) were received by RAINIER personnel on 1 April 1977. A memo entitled "Change Number 1: Supplement to Instructions" was received by RAINIER personnel on 17 May 1977 and stated that a presurvey review of the project area had been assembled and forwarded to the ship. The presurvey review, dated 6 May 1977, arrived at the ship in late June. Two more memos, "Change Number 2: Amendment to Instructions" and "Change Number 3: Supplement to Instructions", were received by RAINIER personnel on 20 July 1977; these memos concerned project tide gaging requirements. Copies of the project instructions, presurvey review, and change memos are attached to this report as separates.

B. SURVEY AREA, SCALE, DATES, AND REGISTRY NUMBER

The portion of Lower Cook Inlet which was surveyed during OPR-429-RA-77 was bounded on the north and south by 60°01.5'N and 59°40.0'N respectively and on the east and west by a series of lines that approximately delineated corresponding twenty fathom curves. The area was surveyed at a scale of 1:40,000. Hydrographic survey operations were begun on 26 July 1977 (JD 207) and were completed on 12 August 1977 (JD 224). Upon completion, the survey was assigned registry number H-9708.

C. SOUNDING VESSEL

All depth soundings obtained during this survey were taken by NOAA Ship RAINIER (Electronic Data Processing Number 2120) using a conventional echo sounder system (see below).

D. SOUNDING EQUIPMENT AND CORRECTIONS TO ECHO SOUNDINGS

All echo soundings obtained during this survey were taken with a Ross Fineline Fathometer system which included the following components: a 100 kHz transducer, a Ross Model 4000 Transceiver - S/N 1041, a Ross Model 5000 Analog Recorder - S/N 1042, a Ross Model 6000 Digitizer - S/N 1042, and a Digital Electronics Corporation Hydroplot Controler - S/N 04.

Several possible error sources are present in the Ross echo sounding system including: sound velocity, vessel draft, dynamic settlement and squat, and instrument errors. Field corrections for each of these error sources are discussed below.

Sound Velocity Corrections - Velocity corrections for echo soundings are derived from analysis of seawater samples obtained during Nansen Casts. (See H.O. 607, Instruction Manual for Obtaining Oceanographic Data, Third Edition, U.S. Naval Oceanographic Office, 1968.) Two Nansen casts were performed during OPR-429-RA-77, and the details of each are presented in Table 1.

TABLE 1

Nansen Cast Data, OPR-429-RA-77

Cast No.	Location	Time and Date	Applicable Surveys
1	Lat. 59°36.2'N Long. 151°25.5'W	0045 GMT 21 July 1977	H-9708
2	Lat. 59°55.2'N Long. 152°19.0'W	2320 GMT 11 August 1977	H-9708

The first cast was taken at Coal Point Pier in Homer, Alaska and was used in calculation of TRA for the ship. (See Transducer and Draft Corrections.) The second cast was taken at the completion of the project and was used for both sounding velocity corrections and to confirm the final TRA correction.

Samples from the casts were analyzed for salinity using standard laboratory procedures. (See H.O. 607.) A Bisset/Berman Model 6210 salinometer, S/N 1040, was used for the analysis and standardization was performed with Copenhagen standard seawater. The instrument was last calibrated in April 1977 by the Northwest Regional Calibration Center, Bellevue, Washington. Calibration data is attached with separates.

Data from each Nansen Cast and its salinity measurements were input to computer program RK 530 - Layer Corrections for Velocity and run on RAINIER's PDP 8/e digital computer, S/N 1015. Output from this program was used to plot a graph of "Actual Depth Minus Velocity Correction Values versus Velocity Correction". (See Provisional Hydrographic Manual, Fourth Edition.) Preliminary correctors were applied to smooth field hydrographic sheets. Final correctors were calculated at the completion of the survey and submitted to PMC with other data.

Ship's Draft Corrections - Prior to the beginning of OPR-429-RA-77, RAINIER's draft was measured by the following procedure. With the ship moored at Coal Point Pier, Homer, Alaska, lead line measurements

were taken from the "bottom" to the handrail of the fantail at the following locations: on the port and starboard sides adjacent to the after draft marks and on the centerline of the stern. Measurements were also taken from handrails on the port and starboard sides of the fantail to the water surface. The mean water surface was subtracted from the mean lead line distance to obtain a mean depth at the stern. (The depth at the stern was required for draft corrections because the echo sounder transducer is mounted on the aft portion of the ship's skeg.)

While lead line depths were being taken, the fathometer and digitizer in the ship's plotting room were monitored. Preliminary sound velocity corrections were applied to the observed digitized depth, and the resultant depth was subtracted from the lead line depth, yielding a draft value of 2.6 fathoms. This procedure was repeated at completion of survey H-9708 and an identical draft value was computed.

Settlement and Squat Corrections - The ship has no appreciable settlement or squat. The maximum on line speed attained during the survey was 13.0 knots. This was running at 190 rpms and 12 feet of pitch.

Sounding Instrument Corrections - The fathometer system aboard RAINIER records soundings in two modes. The first is a digital mode in which depth is intermittantly sampled and recorded on teletype printout and on punch tape. The second is an analog mode in which depth is continuously sampled and recorded on fathograms. Digital data is used for basic compilation of field sheets with corrections and supplemental information taken from the analog record. The major error sources associated with each sounding system and field methods used to compensate for these errors are discussed below.

A "blanking" function is utilized in the digitizer system to prevent the logging of soundings from above a preset depth, i.e., spurious returns from fish, seaweed, etc. During survey operations, the "blanking" depth was set to a value slightly shoaler than the shoalest bottom depth expected in the immediate area and was adjusted as the depth changed. When bottom depths shoaler than the blanking depth were encountered, the digitizer system would record the blanking value rather than the actual depth. In these cases, corresponding analog depths were substituted for missed digital soundings during field scanning operations.

During hydrographic operations, the analog recorder initial trace may occasionally wander from the zero axis of the strip chart paper, causing an initial error. This trace was frequently monitored during survey operations and adjusted when necessary to prevent initial errors. When these errors did occur, analog depths were corrected during the check scanning which occurred prior to incorporation of these values with digital data.

Phase errors are caused by improper internal adjustment of the analog recorder and are manifested by differences between recorded analog and digital depths. The presence of phase error is determined by introducing an electronically simulated "exact" depth into the analog system and comparing the resultant analog trace with the "exact" value.

During hydrographic operations, phase error of the analog system was frequently monitored and the analog recorder was adjusted so as to have no phase error at the mean sounding depth. Consequently, no phase error corrections were applied to any echo soundings obtained in this survey.

At times when the analog trace was blurred by heavy seas and/or swells, depth was scaled by assuming the "bottom" to be located one-third of a trace width from the top of the trace. This method of averaging is similar in theory to the conservative method used for rounding off depths, and, like the round-off method, yields depth values that are shoaler or more conservative than the apparent depths.

Although the echo sounder transducer is located near the ship's propellers, no noticeable effect from propeller turbulance was noted on the analog trace.

In areas of rugged bottom relief or in extremely deep water, a survey vessel may be required to reduce speed in order to maintain an analog trace. However, the gradually sloping bottom and relatively shallow depths of Cook Inlet (maximum survey depth of 58 fathoms) did not necessitate slowing of RAINIER to maintain a clear trace.

Data and Computations - All echo sounding data and computations are included as separates at the end of this report. A table of contents for this information is provided at the beginning of the separates package.

E. HYDROGRAPHIC SHEETS

Hydrographic field sheets (including smooth field sheets) were compiled using the PDP 8/e Hydroplot systems of RAINIER (EDP Number 2120) and launch RA-3 (EDP Number 2123). Table 2 presents the serial numbers of the various components of both systems.

TABLE 2
Hydroplot Systems Used for Compilation of Field Sheets

Component	S/N RAINIER (2120)	S/N RA-3 (2123)
PDP 8/e Digital Computer	1015	1006
DEC High Speed Reader	15150	6564
Houston Complot Plotter	5848-18	6166-23
Teletype Corp. ASR-33 Teletypes (2)	326742, 321393	568903, 542640

A modified Transverse Mercator Project was used to develop the geographic position grid for plotting of hydrographic data. A list of parameters used to define the projection is attached to this report as a separate.

Soundings plotted on RAINIER's smooth sheets have been corrected for the following: tides (using predicted values), ship's draft (using the final computed value), and non-standard sound velocities (using preliminary computed values). No discernable distortion of mylar sheets was observed during smooth field plotting of hydrographic data.

All field hydrographic sheets and associated survey data will be submitted to Pacific Marine Center for verification and processing.

F. CONTROL STATIONS

Basic horizontal control for this survey was provided by existing triangulation stations and offsets from these stations. The following stations were recovered for this survey: ANCHOR POINT LIGHT 1976, LEE 1968, ANCHOR POINT 1908, STARISKY 1964, NINILCHIK 1908, DEEP 1964, KALGIN 1944, and NORTH KALGIN 1908. Offsets were made from ANCHOR POINT 1908, STARISKY 1964, NINILCHIK 1908, DEEP 1964, and KALGIN 1944.

Survey Methods and Equipment - Third Order Class I methods were used for all horizontal angle and distance measurements (see Classification, Standards of Accuracy, and General Specifications of Geodetic Control Surveys, NOAA-NOS, February 1974 and Specifications to Support Classification, Standards of Accuracy, and General Specifications of Geodetic Control Surveys, NOAA-NOS, July 1975). All angle measurements were made with a Wild T-2 Theodolite, S/N 68648, which was inspected and adjusted for correction of collimation errors prior to the survey (in April 1977 by the ship's force and Mr. Bob Melby, PMC Photogrammetric Party). Distance measurements were made with one hundred foot (thirty meter) Lufkin Chrome-Clad steel tapes or standard three hundred foot steel tapes.

Geodetic Data and Computations - Published geographic positions were utilized for stations ANCHOR POINT 1908, STARISKY 1964, NINILCHIK 1908, DEEP 1964, KALGIN 1944, and NORTH KALGIN 1908. Unadjusted field positions were used for ANCHOR POINT LIGHT and LEE. An outdated (1968) geographic position of ANCHOR POINT LIGHT was used for field plotting of hydrographic data. The "new" (1976) and outdated positions of ANCHOR POINT LIGHT are both listed on the form Unadjusted Field Geographic Positions.

Geographic positions of offset points were in all cases determined from the positions of existing triangulation stations via short traverse computations. Computer program RK 407 - Geodetic Inverse/ Direct Computations and RAINIER's PDP 8/e digital computer, S/N 1015, were used for position computations.

Starting azimuths for position computations were obtained from published geodetic data or were computed from the geographic positions of the occupied and observed initial stations using computer program RK 407 and RAINIER's PDP 8/e computer. Horizontal angles were observed from the initial station to the offset point; these angles were abstracted and the mean angle was added to the starting azimuth value to obtain an azimuth for position computations.

Distances from existing stations to offsets were taped horizontally. Consequently, these distances were not reduced to geodetic distances but were used directly in position computations.

Elevations of offset points at ANCHOR POINT 1908, NINILCHIK 1908, and DEEP 1964 were assumed to be equal to the published elevations of the corresponding triangulation stations. The elevation of the offset from station KALGIN 1944 was scaled from a USGS topographic map.

Data and Computations - All geodetic data, computations, and triangulation station recovery notes are attached to this report as separates.

G. HYDROGRAPHIC POSITION CONTROL

Hydrographic positioning for this survey was provided by the Teledyne Hastings-Raydist system of electronic range-range control. Briefly, the system included two fixed shore stations and one mobile station installed on RAINIER (EDP No. 2120). The Raydist system operated on a basic carrier frequency of 3296.400 kHz.

Raydist System Characteristics - The Raydist system utilizes the phase comparison principle to obtain positioning information. Thus, the signal transmitted by each fixed station can be visualized as forming a series of equally spaced concentric arcs or lanes which are centered on the station; the width of a lane is equal to one-half wavelength of the Raydist signal or about forty-five meters. The characteristics of a phase comparison system are such that the position in a lane may be determined at any time, but the number of whole lanes (or wavelengths) between the fixed and mobile stations cannot be detected. Thus, the exact number of lanes must be manually input to the system at some particular time and whole lanes are mechanically counted as they are traversed. However, if the signal from a shore station is temporarily lost or if a spurious signal is received by the mobile unit, the lane count may be lost. When a loss of lane count occurs, the system must be recalibrated.

Raydist Shore Stations - The shore stations were designated Red and Green Raydist.

Red Raydist was installed at an offset point of the same name which was established from triangulation station KALGIN 1944. The Raydist station included the following components: a Teledyne Hastings-Raydist

Model AA-60A Side Band Station - S/N 232, an antenna (including tower and ground plane), and a power supply. The antenna tower consisted of a base plate and insulator, four ten foot triangular structural aluminum sections, and a thirty-five foot whip antenna. The ground plane consisted of sixteen wires radiating outward from the tower base and spaced about 24° apart; the average length of the ground radials was about fifty feet. The power supply for the station was a propane fueled Teledyne Telan Thermo-Electric Generator. The station was set on a grassy hilltop which is elevated about seventy meters above MSL.

Green Raydist was installed on an offset point of the same name which was established from station NINILCHIK 1908. This station utilized the same basic components as Red Raydist with the following exceptions: Teledyne Hastings-Raydist Model AA-60A Side Band Station - S/N 233 and three ten foot aluminum tower sections were used for Green Raydist. The station was located in a flat, grassy field near a cliff that fell away to Cook Inlet about eighty meters below.

The shore stations were located so that the intersection angle of the Red and Green signals was never less than 30° or greater than 150° when received by the ship inside the survey limits.

Raydist Mobile Station - During this survey, RAINIER was equipped with the following mobile station components: a thirty-five foot whip antenna, a Teledyne Hastings-Raydist Model TA-96B Continuous Wave Transmitter - S/N 166, a Teledyne Hastings-Raydist Model ZA-75C-1 Navigator - S/N 114, a Teledyne Hastings-Raydist Model GA-50B Position Indicator - S/N 117, a Gould Model 11-6402-03 Strip Chart Record, a Hazlow Navigation Interface - S/N 17, and a Digital Electronics Corporation Hydroplot Controller - S/N 04. The antenna was mounted atop RAINIER's foremast, and electronic gear was installed in the ship's plotting room.

Visual Calibration - Visual calibrations of the Raydist system were performed at least once every twenty-four hours (under normal conditions), whenever the lane count was lost or suspected, and at completion of the project. Calibration checks were accomplished by means of three-point sextant fixes and check fixes using computer program RK 561 - H/R Geodetic Calibration and RAINIER's PDP 8/e digital computer - S/N 1015. The following signals were used for sextant calibration: station ANCHOR POINT LIGHT, a visual signal at station LEE, a visual signal at TP2 which was the offset from station ANCHOR POINT 1908, the Starisky Microwave Tower, a visual Signal at station NINILCHIK 1908, and a visual signal at TP1 which was an offset point from station DEEP 1964. Procedures and specifications prescribed in the Provisional Hydrographic Manual, Fourth Edition, were adhered to for all calibrations.

The calibration signals mentioned above were located on the shore east of the survey area in such a way that visual calibration could be performed nearly anywhere on the eastern side of the survey area (provided visibility was reasonably good). Good agreement was obtained between northerly and southerly calibrations, indicating that calibration correctors were probably valid throughout the survey area.

Supplemental Electronic Positioning Control - The Motorola Mini-Ranger III system, another electronic range-range positioning system, was used to verify the Raydist system position data. Each Mini-Ranger shore station consisted of the following: a Motorola Mini-Ranger Reference Station Model 01P04853F001 Transponder mounted on a standard survey tripod, a Motorola Mini-Ranger High Gain Antenna, and a supply of standard twelve volt automotive batteries. Mini-Ranger Code 4 Transponder - S/N 777 was located at offset point TP2 near station ANCHOR POINT 1908 and Mini-Ranger Code 3 Transponder - S/N 776 was located at offset point TP1 near station DEEP 1964.

The mobile station installed on RAINIER included the following components: a Motorola Mini-Ranger Model 01P04854F001 Receiver/ Transmitter Assembly - S/N 727, a Motorola Mini-Ranger Omnidirectional Antenna, a Motorola Mini-Ranger Model 01P04855F001 Range Console - S/N 715, and the Digital Electronics Corporation Hydroplot Controller - S/N 04.

Mini-Ranger rates were used to check Raydist data by the following procedure. Mini-Ranger and Raydist rates were simultaneously sampled and recorded. Mini-Ranger rates were then input to program RK 300 and RAINIER's PDP 8/e computer, and the corresponding Raydist rates were computed. Computed and received Raydist rates were then compared as a check on the Raydist lane count.

Raydist System Performance - Overall performance of the Raydist system was excellant. The Red Raydist side band station was retuned twice after initial tuning and the Green Raydist did not require retuning. Thermal-electric generators proved to be adequate and dependable power supplies. No major problems were encountered with the mobile station.

On three separate occasions, loss of lane count occurred. In each case, the ship was experiencing dense rain squalls, leading RAINIER personnel to conclude that atmospheric conditions, rather than system malfunctions, were the cause of the failures. Each case of lost lane count is discussed below:

Julian Day 220 - After 081749 GMT, both Raydist signals became very erratic and an obvious loss of lane count occurred. Monitoring of Red Raydist indicated that the station's signal was only intermittantly being received. Hydrography was discontinued

until a visual calibration was performed to verify the partial lane value and to determine the change in whole lane count.

Julian Day 222 - After 111358 GMT, both Raydist signals became erratic and an obvious loss of lane count occurred. Hydrography was discontinued and a series of Mini-Ranger fixes were obtained. Raydist rates were calculated from Mini-Ranger data as described above, and computed rates were used to reset the Raydist lane counts. Hydrography was then continued.

After 154407 of the same Julian Day, Raydist signals again became erratic and a loss of lane count occurred. Hydrography was suspended until a visual calibration could be made.

H. SHORELINE

No shoreline was contained within the limits of this survey.

I. CROSSLINES

A total of 96.4 nautical miles of crossline was run during this survey, which corresponds to 7.2 percent of the total main scheme and development mileage. Good to excellent agreement was obtained at main scheme - crossline intersections; depths agree exactly at sixty-seven percent of main scheme - crossline intersections, differed by one fathom or less at ninety-seven percent of the intersections, differed by two fathoms or less at ninety-nine percent of the intersections, and differed by four fathoms or less at all intersections. At those intersections where significant depth differences (two to four fathoms) were recorded, the bottom was typically characterized by steeply sloping terrain.

J. JUNCTIONS

This survey has no contemporary junctioning surveys.

K. COMPARISON WITH PRIOR SURVEYS

This survey was preceded by two other hydrographic surveys including: survey H-3206 done in 1910 at a scale of 1:120,000 and survey H-3355 done in 1911 at a scale of 1:100,000. Survey H-3206 included the portion of the present survey lying east of a line defined by the following geographic positions: 59°40.0'N, 152°29.5'W and 60°01.5'N, 152°17.0'W. In general, the prior surveys did a reasonably good job of defining the more inshore portions of the present survey area (less than thirty fathoms). However, several significant discrepancies were discovered between the past and present surveys in deeper waters which extend northerly and southerly through the approximate center of the present survey area.

Two primary methods were employed to compare the prior and present surveys, including: direct comparison of soundings from past and present surveys, and comparison of prior and present depth curve positions at specific latitudes. Presurvey review items are discussed individually.

Comparison of Survey H-3206 and Present Survey - Forty-four H-3206 soundings were transferred to present survey sheets and compared with new sounding data. Of this total, nine percent of the compared soundings agreed completely, forty-eight percent differed by one fathom or less, fifty-three percent differed by two fathoms or less, sixty-six percent differed by three fathoms or less, and seventy-three percent differed by five fathoms or less. The remaining prior survey soundings differed by six to thirteen fathoms from the corresponding present survey depths. In ninety percent of the comparisons for which differences were encountered between past and present soundings, the present sounding was "deeper" than the prior survey sounding.

Depth curve comparisons were made by transferring H-3206 curve positions to present survey sheets at two minute increments of latitude from 59°40' to 60°00' North Latitude. Comparisons were made of the twenty, thirty, forty, and fifty fathom curves where possible. Fair agreement was obtained between the continuous inshore twenty and thirty fathom curves of the two surveys. The twenty fathom curve of the present survey varied from seven hundred meters west to one hundred meters east of the previous survey's twenty fathom curve and generally lay west at an average distance of two hundred meters from the "old" twenty fathom curve. The thirty fathom curve from the present survey varied from one thousand meters west to three hundred meters east of the prior survey thirty fathom curve and averaged three hundred meters of westerly displacement.

The agreement of depth curves lying to the west of the above-mentioned thirty fathom curve was varied. Meaningful comparisons at and below 59°54'N were not possible due to extreme differences in bottom contour configuration. The most extreme example is a thirty-nine fathom "shoal" that coplots with a fifty-seven fathom deep from the 1910 survey; both features were located on or near 152°26'W between 59°40' and 59°42'N. At 59°56'N and above, comparisons of "offshore" depth produced results similar to those obtained in the comparisons of the twenty and thirty fathom curves.

Comparison of Survey H-3355 and Present Survey - Twenty-one H-3355 soundings were compared with corresponding present survey soundings. Of this total, twenty-four percent of the compared soundings agreed exactly, forty-eight percent differed by one fathom or less, sixty-seven percent differed by two fathoms or less, seventy-six percent differed by three fathoms or less, and eighty-one percent differed by four fathoms or less. The remaining prior soundings differed from present values by six to eighteen fathoms. In

ninety percent of those comparisons for which differences were encountered between prior and present survey depths, the present survey sounding was "shoaler" than the prior survey sounding; this phenomena was a complete reversal from that discovered when comparing the present survey with survey H-3206.

Depth curve comparisons were made at two minute increments of latitude from 59°42' to 60°00'N. Comparisons were made of the twenty, thirty, and forty fathom curves, and fair agreement was obtained from comparison of the continuous inshore curves corresponding to these depths. The present survey's twenty fathom curve varied from three hundred to two thousand five hundred meters east of the prior survey twenty fathom curve and averaged one thousand three hundred meters of easterly displacement from the "old" twenty fathom curve. The present survey's thirty fathom curve ranged from one thousand six hundred meters east to four hundred meters west from the prior survey curve and averaged six hundred meters of eastward displacement. Finally, the new inshore forty fathom curve varied in position from two thousand nine hundred meters east to three hundred meters west of the "old" curve, and averaged five hundred meters of easterly displacement.

Several comparisons were made of depth curves lying east of the forty fathom curve mentioned above. Good comparisons were made at 59°58' and 60°00' North Latitude. However, a H-3355 offshore forty fathom curve at 59°42' North Latitude was not detected by the present survey.

Conclusions on Comparisons of Prior and Present Surveys - In general, the prior surveys did a reasonably good job of defining the more "inshore" portions of the present survey area (above thirty fathom depths on the eastern side and above forty fathom depths on the western side). Also, prior survey data compares well with present findings in the north-central portion of the survey area. Discrepancies which were noted between past and present surveys are probably due to one or a combination of the factors listed below:

1. Changing of the bottom due to erosion and deposition.
2. Vertical displacement and slumping of the bottom due to earthquakes.
3. Inferior sounding methods used in prior surveys.
4. Inaccurate reduction of tidal data in prior surveys.
5. Weak positioning control in prior surveys, compounded by rough seas, strong currents, and inclement weather.
6. Errors in transferring sounding and depth curve positions from prior survey sheets to present survey sheets.

Presurvey Review Items - During this survey, four unnumbered presurvey review items were investigated. In all cases, the investigations were performed to verify or disprove indications of shoaling that were either unsupported or inadequately developed by prior surveys. Presurvey review items are discussed individually below. (See Section 6(VII) Verifiers Report)

An investigation was performed in the vicinity of an alleged fifteen fathom sounding located at 59°42'00'N, 152°09'W. The area was extensively developed with two hundred meter line spacings. The bottom appeared to be quite flat, with a least depth of seventeen fathoms being recorded several times in the area. RAINIER personnel believe, however, that in light of this item's position on the edge of the survey area and because of the large depth discrepancies discovered elsewhere (see comparisons of present survey with H-3206 and H-3355), that a fifteen fathom (or shoaler) depth may exist somewhere adjacent to the presurvey review item but outside the area surveyed by RAINIER. Therefore, the fifteen fathom sounding should be retained until further survey work is accomplished east of the present survey limits and adjacent to the alleged location of this sounding.

Do not concur See Q.C. Critique ✓

Another investigation was carried out to develop the bottom adjacent to an alleged thirteen fathom sounding at 59°46'N, 152°09'W. The area was developed with two hundred meter line spacings, and the bottom was found to be quite flat and regular. A least depth of sixteen fathoms was encountered numerous times. However, RAINIER personnel recommend that the thirteen fathom depth be retained for the same reasons that were given in the discussion of the previous item.

Do not concur See QC Critique

A third investigation was conducted adjacent to an alleged twenty-nine fathom sounding in vicinity of 59°50'N, 152°20'W. The area was developed with two hundred meter line spacings and the bottom was found to be somewhat irregular with least depths of thirty-seven fathoms. In light of the results of this investigation, RAINIER personnel recommend that the twenty-nine fathom depth be replaced with a more representative value. See Section 6 (VI) Verifiers Report

concur 7/15 ✓

The final investigation developed the bottom adjacent to an alleged twenty-seven fathom depth at 59°56'N, 152°14'W. Two hundred meter line spacings were employed for this development. The bottom was found to be somewhat irregular with a least depth of twenty-~~seven~~ eight fathoms; this depth was recorded slightly north and west of the location of the previous twenty-seven fathom depth. Consequently, RAINIER personnel recommend that the new position of the twenty-~~seven~~ eight fathom depth be used in lieu of the previous position.

concur 7/15

See Section 6 VI Verifiers Report

Three additional unnumbered presurvey review items adjacent to the northwestern survey limit were not investigated. These items are ✓

shoal indications of ten fathoms depth or less which were inadequately developed by prior surveys. RAINIER personnel decided against investigating these items because the depths were such that the items could not be adequately developed at the scale of this survey (1:40,000).

L. COMPARISON WITH THE CHART

The area which was surveyed during this project is charted on NOAA-NOS Chart 16640, Cook Inlet - Southern Part, Fifteenth Edition, November 1976. This charting was based on data from surveys H-3206 and H-3355 which were discussed in the previous section. No specific dangers to navigation were plotted on the chart within the survey limits and no significant dangers to navigation were discovered during this survey.

M. ADEQUACY OF THE SURVEY

RAINIER personnel believe that the present survey is complete and adequate to supersede hydrographic surveys H-3206 and H-3355 for the following reasons:

1. Modern sounding equipment was utilized as opposed to the lead lines and highly suspect Bassnett tubes employed during the prior surveys.

2. A network of eight continuously recording tide gages was installed for this survey so as to accurately and thoroughly monitor the tidal fluctuations of Cook Inlet.

3. Modern electronic hydrographic position control was used for this project as opposed to the relatively crude navigation methods utilized for the prior surveys.

4. A much more dense and systematic pattern of soundings was obtained during this survey than during the prior surveys.

5. Good to excellent agreement of depths at main scheme - crossline junctions indicates that the internal accuracy of the present survey is quite good.

N. AIDS TO NAVIGATION

No fixed or floating aids to navigation were located within the limits of this survey.

O. STATISTICS

Table 3 below documents statistics for this survey.

TABLE 3

Survey Statistics

Lineal Miles of Hydrography Including Main Scheme, Development, and Crosslines	1429.5 n.m.
Area of Hydrography	283.5 $n.m.^2$
Total Number of Hydrographic Positions	3074
Total Number of Bottom Samples	35
Number of Tide Stations	8

P. MISCELLANEOUS

No particularly significant phenomena, other than those mentioned elsewhere in this report, were observed during this survey.

Q. RECOMMENDATIONS

RAINIER personnel recommend that this survey supersede surveys H-3206 and H-3355 for charting purposes. No other recommendations are made.

R. AUTOMATED DATA PROCESSING

Table 4 lists all computer programs utilized during this project for automated data acquisition and/or processing.

TABLE 4

Computer Programs Used for Data Acquisition/Processing

Number	Title	Version Date
RK 111	Range-Range Real Time Hydroplot	01/30/76
RK 201	Grid, Signal, and Lattice Plot	04/18/75
RK 211	Range-Range Non-Real Time Plot	01/15/76
RK 300	Utility Computations	02/05/76
RK 330	Reformat and Data Check	05/04/76
PM 360	Electronic Corrector Abstract	02/02/76
RK 407	Geodetic Inverse/Direct Computation	10/23/75
AM 500	Predicted Tide Generator	11/10/72
RK 530	Layer Corrections for Velocity	05/10/76
RK 561	H/R Geodetic Calibration	02/19/75
AM 602	Elinore (Extended Line Oriented Editor)	05/20/75

Data acquisition and processing procedures were accomplished as outlined in the Provisional Hydrographic Manual, Fourth Edition, with one exception. The Motorola Mini-Ranger navigation system

was used to check, and in one case reset, the Raydist system lane count (see Section G). This computation was performed using program RK-300 and RAINIER's PDP 8/e digital computer, S/N 1015.

S. REFERENCES TO REPORTS

No additional reports were compiled for this survey. All data, computations, and supplemental information is attached to this report in the form of separates.

Respectfully submitted,

Steven M Miller

Steven M. Miller
ENS, NOAA

FIELD TIDE NOTE
H-9707, H-9708
OPR 429

KENAI RIVER, ALASKA
LOWER COOK INLET, ALASKA

Seldovia, Alaska predicted tides were used for field tide reduction of soundings for H-9707 and H-9708. PROGRAM AM 500, PREDICTED TIDE GENERATOR (version 10 November 1972) was used to convert predicted tides to GMT tide correctors. All tidal observations were performed on GMT (000°W). Due to the number of tide stations and the distance between then, observations were performed as operational requirements and budget limitations for helicopter usage would allow. Time errors were noted and distributed equally over the period when they occurred.

Eight tide stations were established to monitor the tide within the project limits of H-9707 and H-9708:

Station	Location	Dates
T1, Coal Point, 945-5558	LAT 59° 36.2'N LON 151° 25.5'W	7/22/77 to 8/13/77 21 days
T2, Anchor Point, 945-5606	LAT 59° 46.2'N LON 151° 51.8'W	7/18/77 to 8/18/77 31 days
T3, Ninilchik Harbor, 945-5653	LAT 60° 03.1'N LON 151° 41.1'W	7/20/77 to 8/13/77 23 days
T4, Kenai River, 945-5737	LAT 60° 31.1'N LON 151° 12.4'W	7/16/77 to 8/12/77 27 days
T5, Kenai River, 945-5742	LAT 60° 32.7'N LON 151° 13.1'W	7/17/77 to 8/18/77 32 days
T6, Redoubt Point, 945-6094	LAT 60° 16.7'N LON 152° 25.0'W	7/28/77 to 8/14/77 17 days
T7, Snug Harbor, 945-6173	LAT 60° 06.2'N LON 152° 34.3'W	7/22/77 to 8/11/77 20 days
T8, Chinitna Bay, 945-6301	LAT 59° 50.3'N LON 153° 00.0'W	7/21/77 to 8/12/77 21 days

T1, Coal Point, 945-5558

The T1 gage was a Fisher Porter ADR, SN 7404A0407M1. On the ADR tape 0.0 feet equalled 0.373 feet on the fixed tide staff. Metric instal-

lation levels to 3 benchmarks were run on 22 July 1977 and removal levels to 3 benchmarks were run on 13 August 1977 with the levels indicating that the tide staff did not move. Twelve minute staff/gage comparison observations were accomplished on 23 July 1977 from well before to well after high and low tide stages. A tide observer was contracted for this station.

On 29 July 1977 the timer and the float cable for the ADR gage were replaced and the gage reinstalled which resulted in a shift in the datum such that the gage then read 19.943 feet higher than the fixed tide staff. This was because the original staff/gage datum settings were unknown to the field party.

T2, Anchor Point, 945-5606

The T2 gage was a Bristol Bubbler, SN 67A 10294. On the marigram 0.0 feet equalled 18.004 feet on the tide staff. As a method of obtaining staff/gage comparison observations, a reference mark was established on the beach and levels were run to the water's edge. Metric installation levels to 5 benchmarks were run on 10 August 1977 with the levels indicating that the reference mark did not move. Twelve minute staff/gage comparison observations were accomplished on 22 July 1977 from well before to well after high and low tide stages.

It was necessary to splice and rebury the broken bubbler tubing on 21 July 1977. The T2 gage failed to record 3 high tides during its operation because the high tide surpassed the gage recording high point.

T3, Ninilchik Harbor, 945-5653

The T3 gage was a Bristol Bubbler, SN 64A 11030. On the marigram 0.0 feet equalled 17.985 feet on the tide staff. As a method of obtaining staff/gage comparisons, a reference mark was established on the beach and levels were run to the water's edge. Metric installation levels were run to 3 benchmarks on 20 July 1977 and metric removal levels were run to 3 benchmarks on 13 August 1977 with the levels indicating that the reference mark did not move. Twelve minute staff/gage comparison observations were accomplished on 22 July 1977 from well before to well after high and low tide stages.

The T3 gage failed to record 6 low tides because the water level fell below the orifice.

T4, Kenai River, 945-5737

The T4 gage was a Bristol Bubbler, SN 73A 235. On the marigram 0.0 feet equalled 4.078 feet on the tide staff. As a method of obtaining

staff/gage comparisons, a reference mark was established and an inverse tape was used to measure the distance to the water's surface. Metric installation levels were run to 3 temporary benchmarks on 16 July 1977 and metric removal levels were run to 3 temporary benchmarks on 12 August 1977 with the levels indicating that the reference mark did not move. Twelve minute staff/gage comparison observations were accomplished on 20 July 1977 from well before to well after high and low tide stages.

The time for T4 was reset on 10 August 1977 because the gage was 6 minutes fast.

T5, Kenai River, 945-5742

The T5 gage was a Fisher Porter, SN 7404A0407M15. On the ADR tape 0.0 feet equalled 0.826 feet on the tide staff. As a method of obtaining staff/gage comparisons, a reference mark was established and an inverse tape was used to measure the distance to the water's surface. Metric installation levels were run to 5 benchmarks on 18 July 1977 and metric removal levels were run to 5 benchmarks on 19 August 1977 with the levels indicating that the reference mark did not move. The 5 newly installed benchmarks were connected with 5 historic benchmarks that were in the area. Twelve minute staff/gage comparison observations were accomplished on 20 July 1977 from well before to well after high and low tide stages.

Although the gage was established over the deepest water available, the gage did go dry at 24.160 feet at low tide for each day of operation because the water level fell below the float well orifice. Heavy flooding of the Kenai River caused the float takeup wire to become entangled and resulted in a loss of data for the final 2 days of operation. As per the revised project instructions, this gage was left installed for the EPA marsh study.

T6, Redoubt Point, 945-6094

The T6 gage was a Bristol Bubbler, SN 64A 11021. On the marigram 0.0 feet equalled 32.910 feet on the tide staff. As a method of obtaining staff/gage comparisons, a reference mark was established on the beach and levels were run to the water's edge. Metric installation levels were run to 3 benchmarks on 23 July 1977 and metric removal levels were run to 3 benchmarks on 11 August 1977 with the levels indicating that the reference mark did not move. Twelve minute staff/gage comparison observations were accomplished on 23 July 1977 for a time period which operational time limitations would allow.

The time on T6 was reset on 3 August 1977. The T6 gage failed to record 10 low tides because the water level fell below the orifice.

T7, Snug Harbor, 945-6173

The T7 gage was a Bristol Bubbler, SN 64A 11028. On the marigram 0.0 feet equalled 22.729 feet on the tide staff. As a method of obtaining staff/gage comparisons, a reference mark was established and an inverse tape was used to measure the distance to the water's surface. Metric installation levels were run to 3 benchmarks on 23 July 1977 and metric removal levels were run to 3 benchmarks on 11 August 1977 with the levels indicating that the reference mark did not move. Twelve minute staff/gage comparison observations were accomplished on 23 July 1977 from well before to well after high and low tide stages. A tide observer was contracted for this station.

On 31 July 1977 T7 became soaked due to a heavy storm; no extra protective actions were deemed necessary for the gage after this because the storm was abnormally heavy. As a result of a paper jam on 8 August 1977, the time was incorrectly reset to 0000Z instead of 1600Z which resulted in all following times for the gage being off by 8 hours. T7 failed to record 1 low tide because the water level fell below the orifice.

T8, Chinitna Bay, 945-6357

The T8 gage was a Bristol Bubbler, SN 67A 16201. On the marigram 0.0 feet equalled 5.525 feet on the upper fixed tide staff and 2.800 feet on the fixed lower tide staff. The tide staff was divided in two sections so that it could be more securely fastened. Metric installation levels were run to 3 benchmarks on 21 July 1977 and metric removal levels were run to 3 benchmarks on 12 August 1977 with levels indicating that the fixed upper tide staff did not move. Due to the height of the tide at the time of the gage removal, the fixed lower tide staff was not included in the removal levels. Twelve minute staff/gage comparison observations were accomplished on 23 July 1977 from well before to well after high and low tide stages.

The T8 gage failed to record 3 low tides because the water level fell below the orifice. Time was reset on 24 July 1977 because the gage was 3 minutes fast; on 28 July 1977 because the gage was 4.5 minutes fast; on 4 August 1977 because the clock had not been switched on; and on 9 August 1977 because the gage was 4 minutes fast.

H-9707 Gage Comparisons

The predicted tides and T4 are referenced to T5 with a positive time indicating a later occurrence and a negative time indicating an earlier occurrence.

	Kenai River, T4			Predicted Tides		
Date	High	Low	Range	High	Low	Range
7/20/77	0	*	*	-24 min	*	*
7/25/77	0	*	*	-12 min	*	*
8/03/77	24 min	*	*	-12 min	*	*
8/10/77	15 min	*	*	- 6 min	*	*

(*) The low tides and tidal ranges could not be compared since T5 failed to record low tides. The T4 gage can be related to the predicted tides from its comparisons to T5. The tidal cycle occurred earlier for T5 because T4 was further inland.

H-9708 Gage Comparisons

The predicted tides and T1, T2, T3, T6, and T8 are referenced to T7 with a positive time indicating a later occurrence and a negative time indicating an earlier occurrence. A plus or minus sign in the range column indicates a greater or lesser range respectfully.

	Coal Point, T1			Anchor Point, T2		
Date	High	Low	Range	High	Low	Range
7/25/77	-75 min	-81 min	+2.13 ft	-30 min	-75 min	+2.9 ft
8/06/77	gage not operating			-30 min	-45 min	+2.9 ft
8/10/77	-52 min	-75 min	+2.39 ft	-15 min	-45 min	+2.5 ft

	Ninilchik Harbor, T3			Redoubt Point, T6		
Date	High	Low	Range	High	Low	Range
7/25/77	-15 min	-15 min	+2.8 ft	T6 not installed yet		
8/06/77	0.0	0.0	+2.3 ft	+30 min	+75 min	+0.3 ft
8/10/77	-30 min	0.0	+2.7 ft	+45 min	+45 min	+0.3 ft

	Chinitna Bay, T8			Predicted Tides		
Date	High	Low	Range	High	Low	Range
7/25/77	-45 min	-45 min	-1.4 ft	-14 min	-12 min	0.0
8/06/77	-45 min	-45 min	-1.0 ft	-10 min	-11 min	+0.4 ft
8/10/77	-30 min	-45 min	-0.6 ft	+7 min	-2 min	-0.2 ft

By keeping the appropriate algebraic sign for the times of highs, times of lows, and the tidal ranges for each gage and by subtracting this information from the data for predicted tide comparison with T7, a relation of each gage to predicted tides can be obtained.

It is evident, from the tidal data, that the tides on the Kenai Peninsula side of Cook Inlet occur with a greater range and that the tidal range increases as you progress further into Cook Inlet. The exception to this is the tidal range for Coal Point and this is a result of the geographical position of the Coal Point tide station.

Recommended Zoning

Unless Rockville smooth tides display significantly different tide comparisons, zoning for H-9707 and H-9708 is recommended using SDCOM (Sounding Compute, version number and date unknown). SDCOM is a PMC computer program which samples tides from each part of the survey to derive a sounding corrector.

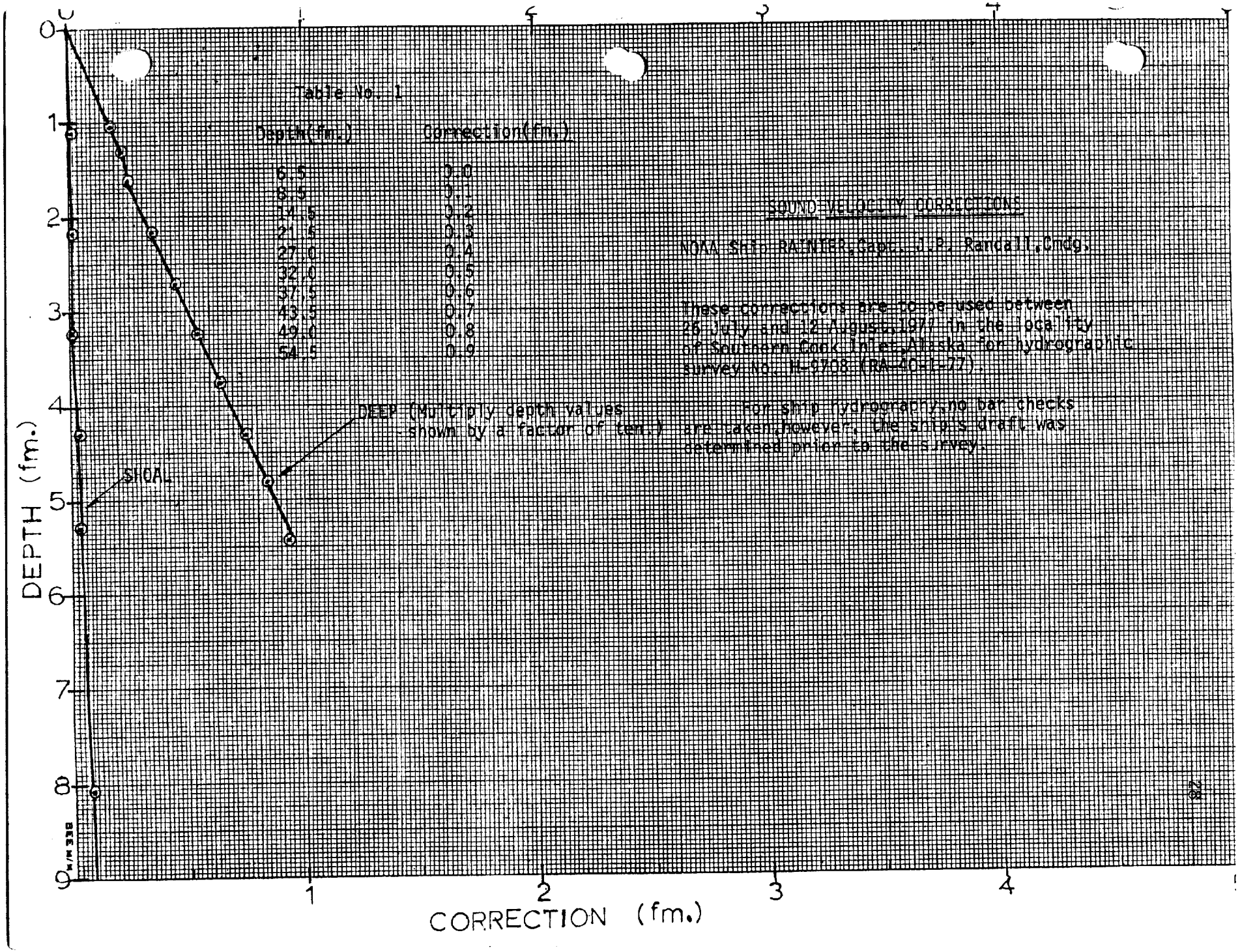


Table No. 1
Depth(fm.)
Correction(fm.)
6.5
8.5
14.5
21.5
27.0
32.0
37.5
43.5
49.0
54.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
SOUND VELOCITY CORRECTIONS
NOAA SHIP RAINIER, Capt. J.P. Randall, Cmdg.
These corrections are to be used between 26 July and 12 August, 1977 in the locality of Southern Cook Inlet, Alaska for hydrographic survey No. H-9708 (RA-40-1-77)
For ship hydrography, no bar checks are taken, however, the ship's draft was determined prior to the survey.
DEEP (Multiply depth values shown by a factor of ten.)
SHOAL
DEPTH (fm.)
CORRECTION (fm.)
0
1
2
3
4
5
6
7
8
9
1
2
3
4

CORRECTIONS TO ECHO SOUNDINGS

RA-40-1-77, COAL PT. PIER

VESSEL = 2120

DATE = 26 JULY 1977

TIME = 1150 LOCAL

LATITUDE = 059/36/12.00

LONGITUDE = 151/25/30.00

TYPE OF OBSERVATION = NANSEN CAST

CAST-DEPTH (SURFACE) (M)	TEMP (DEG C)	SALINITY (0/00)	SND VEL (M/SEC)
0000.0	12.70	24.71	1487.13
0005.0	08.72	31.21	1480.85
0010.0	08.57	31.15	1480.27

MID-DEPTH (M)	SND VEL (M/SEC)	LAYER THICKNESS (M)
0001.00	1485.87	0002.00
0003.00	1483.36	0002.00
0005.00	1480.85	0002.00
0007.00	1480.61	0002.00
0009.00	1480.38	0002.00

ACTUAL DEPTH (SURFACE) MINUS VELOCITY COPCTION (FM)	VELOCITY CORRECTION (FM)
0001.09	0000.00
0002.19	0000.00
0003.27	0000.01
0004.35	0000.02
0005.43	0000.03

CORRECTIONS TO ECHO SOUNDINGS

RA-40-1-77

VESSEL = 2120

DATE = 11 AUGUST 1977

TIME = 2320 GMT

LATITUDE = 059/55/12.00

LONGITUDE = 152/19/00.00

TYPE OF OBSERVATION = NANSEN CAST

CAST-DEPTH (SURFACE) (M)	TEMP (DEG C)	SALINITY (O/OO)	SND VEL (M/SEC)
0000.0	11.85	28.41	1488.69
0010.0	11.42	29.78	1488.96
0020.0	11.24	30.16	1488.96
0030.0	10.97	30.68	1488.81
0038.7	10.88	30.91	1488.91
0048.8	10.87	30.95	1489.09
0066.8	10.86	30.98	1489.38
0088.7	10.86	30.99	1489.76

MID-DEPTH (M)	SND VEL (M/SEC)	LAYER THICKNESS (M)
0001.00	1488.71	0002.00
0003.00	1488.77	0002.00
0005.00	1488.82	0002.00
0007.00	1488.88	0002.00
0009.00	1488.93	0002.00
0012.50	1489.00	0005.00
0017.50	1489.01	0005.00
0022.50	1488.92	0005.00
0027.50	1488.85	0005.00
0035.00	1488.86	0010.00
0045.00	1489.02	0010.00
0055.00	1489.20	0010.00
0065.00	1489.35	0010.00
0075.00	1489.51	0010.00
0085.00	1489.69	0010.00
0095.00	1489.87	0010.00

ACTUAL DEPTH (SURFACE) MINUS VELOCITY CORRECTION (FM)	VELOCITY CORRECTION (FM)
0001.09	0000.00
0002.19	0000.00
0003.27	0000.01
0004.34	0000.03
0005.42	0000.05
0008.10	0000.10
0010.79	0000.15
0013.47	0000.20
0016.16	0000.24
0021.53	0000.34
0026.90	0000.44
0032.27	0000.54
0037.64	0000.63
0043.01	0000.73
0048.38	0000.83
0053.75	0000.93

TC/TI TAPE LISTING
RA-40-1-77(H-9708)

FATHOMETER - ROSS S/N 1042
LAUNCH - 2120(SHIP RAINIER)

053448 0 0026 0001 207 000000 000000
055706 0 0026 0001 208 000000 000000
181720 0 0026 0001 216 000000 000000
000008 0 0026 0001 217 000000 000000
000003 0 0026 0001 218 000000 000000
000821 0 0026 0001 219 000000 000000
000009 0 0026 0001 220 000000 000000
000025 0 0026 0001 221 000000 000000
000241 0 0026 0001 222 000000 000000
000000 0 0026 0001 223 000000 000000
222939 0 0026

TC/TI TAPE LISTING
RA-40-1-77(H-9708)

LAUNCH - 2120(SHIP RAINIER)
FOR BOTTOM SAMPLES ONLY

000355 0 0026 0001 224 000000 000000
114918 0 0026

MASTER STATION LIST
OPR-429, SOUTHERN COOK INLET

RA-40-1-77(H-4708)

FINAL VERSION

```
101 1  60 21 27100 152 04 00010  250 0031 329640
/RED RAYDIST STATION

102 1  60 00 33348 151 42 48460  250 0054 329640
/GREEN RAYDIST STATION

103 1  59 48 48058 151 49 42447  250 0063 000000
/TP 2 (ANCHOR POINT ECC)  M/R  CODE 3

104 1  60 01 13057 151 42 24922  250 0041 000000
/TP 1 (DEEP ECC)  M/R  CODE 4

200 1  59 52 53664 151 47 02441  139 0000 000000
/STARSKY MICROWAVE TOWER

201 1  60 00 33292 151 42 49781  139 0000 000000
/NINILCHIK 1908

202 1  59 46 11148 151 51 53411  139 0000 000000
/ANCHOR POINT LIGHT

203 1  59 47 46433 151 50 49857  139 0000 000000
/LEE

204 1  60 03 03042 151 39 47040  139 0000 000000
/NINILCHIK CHURCH CUPOLA 1909
```

ASCII SIGNAL TAPE LISTING
RA-40-1-77(H-9708)

FINAL VERSION

101	1	60	21	27100	152	04	00010	250	0031	329640
102	1	60	00	33348	151	42	48460	250	0054	329640
103	1	59	48	48058	151	49	42447	250	0063	000000
104	1	60	01	13057	151	42	24922	250	0041	000000
200	1	59	52	53664	151	47	02441	139	0000	000000
201	1	60	00	33292	151	42	49781	139	0000	000000
202	1	59	46	11148	151	51	53411	139	0000	000000
203	1	59	47	46433	151	50	49857	139	0000	000000
204	1	60	03	03042	151	39	47040	139	0000	000000

ASCII SIGNAL TAPE LISTING
RA-40-1-77(H-9708)

101	1	60	21	27100	152	04	00010	250	0059	329640
102	1	60	00	33348	151	42	48460	250	0076	329640
103	1	59	48	48058	151	49	42447	250	0067	000000
104	1	60	01	13057	151	42	24922	250	0046	000000
200	1	59	52	53664	151	47	02441	139	0000	000000
201	1	60	00	33292	151	42	49781	139	0000	000000
202	1	59	46	11294	151	51	53330	139	0000	000000
203	1	59	47	46433	151	50	49857	139	0000	000000
204	1	60	03	03042	151	39	47040	139	0000	000000

ABOVE SIGNALS WERE USED FOR SMOOTH FIELD SHEET PLOTTING.

APPROVAL SHEET

DESCRIPTIVE REPORT TO ACCOMPANY
HYDROGRAPHIC SURVEY

H-9708

RA-40-1-77

OPR-429-RA-77

In producing this sheet, standard procedures were observed in accordance with the Hydrographic Manual, PMC OPORDER, and the Instruction Manual for Automated Hydrographic Surveys. The data was examined daily during the execution of the survey.

The boatsheet and the accompanying records have been examined by me and are considered complete and adequate for charting purposes and are approved.

James P. Randall
CAPT, NOAA

U.S. DEPARTMENT OF COMMERCE

rch 15, 1978 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL OCEAN SURVEY

TIDE NOTE FOR HYDROGRAPHIC SHEET

Processing Division: Pacific Marine Center:

Hourly heights are approved for Form 362

Tide Station Used (NOAA Form 77-12): 945-5606 Anchor Point
945-6173 Snug Harbor

Period: July 26 - August 11, 1977

HYDROGRAPHIC SHEET: H-9708

OPR: 429

Locality: Lower Cook Inlet, Alaska

Plane of reference (mean lower low water): 4.4 ft. - Anchor Point
3.9 ft. - Snug Harbor

Height of Mean High Water above Plane of Reference is
See below

Remarks: Recommended zoning: See attached sheet.

Height of MHW above MLLW is
18.6 ft. at Ninilchik
17.7 ft. at Anchor Point
14.9 ft. at Snug Harbor
13.7 ft. at Chinitna Bay

BS Chief, Tides Branch

March 15, 1978

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

TIDE NOTE FOR HYDROGRAPHIC SHEET

Recommended zoning for H-9708:

I. West of 152°20' apply range ratio x1.08 to Snug Harbor and the following time corrections.

   A. North of 59°56': -15 minutes
   B. 59°48' to 59°56': -30 minutes
   C. South of 59°48': -45 minutes

II. East of 152°20' apply range ratio x0.94 to Anchor Point and the following time corrections.

   A. North of 59°56': +30 minutes
   B. 59°48' to 59°56': +15 minutes
   C. South of 59°48': none

NOAA FORM 76-155
(11-72)

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

SURVEY NUMBER

H-9708

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO. 16640	B ON PREVIOUS SURVEY NO.	C ON U.S. QUADRANGLE MAPS	D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F P.O. GUIDE OR MAP	G RAND MCNALLY ATLAS	H	K U.S. LIGHT LIST	
COOK INLET	X									1
OFFSHORE ANCHOR } TITLE										2
PT. TO CAPE } TITLE										3
NINILCHIK } TITLE										4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
					APPROVED					17
					Chas. E. Harrington					18
					CHIEF GEOGRAPHER – C3x8					19
					13 Oct 1978					20
										21
										22
										23
										24
										25

APPROVAL SHEET

FOR

SURVEY H- 9708

A. All revisions and additions made on the smooth sheet during verification have been entered in the magnetic tape records for this survey. A new final position print-out has been made. A new final sounding print-out has been made.

B. The verified smooth sheet has been inspected, is complete, and meets the requirements of the Hydrographic Manual. Exceptions are listed in the verifier's report.

Date: 7/11/74

Signed: [signature]

Title: Chief, Verification Branch

NOAA FORM 77-27 (5-77) | U. S. DEPARTMENT OF COMMERCE NOAA | HYDROGRAPHIC SURVEY NUMBER

HYDROGRAPHIC SURVEY STATISTICS

H-9708

RECORDS ACCOMPANYING SURVEY: To be completed when survey is registered.

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	BOAT SHEETS & PRELIMINARY OVERLAYS	4
DESCRIPTIVE REPORT	1	SMOOTH OVERLAYS: POS. ARC, EXCESS	3

DESCRIPTION	DEPTH RECORDS	HORIZ. CONT. RECORDS	PRINTOUTS	TAPE ROLLS	PUNCHED CARDS	ABSTRACTS/ SOURCE DOCUMENTS
ENVELOPES						
CAHIERS	2 with printouts					
VOLUMES						
BOXES			1-Smooth			1-Sawtooth rec.

T-SHEET PRINTS *(List)*

SPECIAL REPORTS *(List)*

OFFICE PROCESSING ACTIVITIES
The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS: PRE-VERIFICATION	AMOUNTS: VERIFICATION	AMOUNTS: TOTALS
POSITIONS ON SHEET			3051
POSITIONS CHECKED		3051	
POSITIONS REVISED		0	
SOUNDINGS REVISED		505	
SOUNDINGS ERRONEOUSLY SPACED		0	
SIGNALS (CONTROL) ERRONEOUSLY PLOTTED		0	
	TIME — HOURS		
CRITIQUE OF FIELD DATA PACKAGE (PRE-VERIFICATION)	4		
VERIFICATION OF CONTROL		6	
VERIFICATION OF POSITIONS		13	
VERIFICATION OF SOUNDINGS		60	
COMPILATION OF SMOOTH SHEET		34	
APPLICATION OF TOPOGRAPHY		0	
APPLICATION OF PHOTOBATHYMETRY		0	
JUNCTIONS		1	
COMPARISON WITH PRIOR SURVEYS & CHARTS		4	
VERIFIER'S REPORT		4	
OTHER		4	
TOTALS	4	126	130

Pre-Verification by James S. Green	*Beginning Date* 12/21/77	*Ending Date* 12/21/77
Verification by Donald E. Zimmer	*Beginning Date* 1/23/78	*Ending Date* 5/24/78
Verification Check by A.E. Eichelberger, J.S. Green	*Time (Hours)* 33	*Date* 6/19/78
Marine Center Inspection by HIT	*Time (Hours)* 16	*Date* 7/17/78
Quality Control Inspection by F.P. Saulsbury	*Time (Hours)* 38 hrs	*Date* 10/10/78
Requirements Evaluation by D.J. Hill	*Time (Hours)* 4	*Date* 11/13/78

Cursory: Bonynes 10/13/78 1 hr

REGISTRY NO. H-9708(1977)

The Computer and Excess Sounding Cards for this survey have not been corrected to reflect the changes made to the Computer Card and Excess Card Printouts at this time of the review.

When the cards have been updated to reflect the final results of the survey, the following shall be completed:

CARDS CORRECTED

DATE_____ TIME REQUIRED_____ INITIALS_____

REMARKS:

REGISTRY NO. _____

The magnetic tape containing the data for this survey has not been corrected to reflect the changes made during evaluation and review.

When the magnetic tape has been updated to reflect the final results of the survey, the following shall be completed:

MAGNETIC TAPE CORRECTED

DATE_____ TIME REQUIRED_____ INITIALS_____

REMARKS:

PACIFIC MARINE CENTER
VERIFIER'S REPORT

REGISTRY NO: H-9708 FIELD NO: RA-40-1-77

Alaska, Cook Inlet, Offshore Anchor Point to Cape Ninilchik

SURVEYED: July 26 - August 12, 1977

SCALE: 1:40,000 PROJECT NO: OPR-429

SOUNDINGS: Ross Model 5000
Fineline Fathometer

CONTROL: Range-Range Raydist

Chief of Party.....CAPT J.P. Randall
Surveyed by.....LCDR L. Lapine, LTJG S. Ramsey, ENS J. Barnett
Automated plot by.....PMC Xynetics Plotter
Verified by.....Donald E. Zimmer
May 24, 1978

I. INTRODUCTION

This is a basic hydrographic survey conducted by the NOAA Ship RAINIER from July 26 thru August 12, 1977. The area surveyed is in Cook Inlet, Offshore Anchor Point to Cape Ninilchik.

No unusual problems were encountered in the verification of this survey.

The signal list from the field was revised to include only aids to navigation, landmarks, signals used for calibration and signals used to control hydrography on H-9708.

Project parameters used to prepare the boatsheets have been revised to center the hydrography on the smooth sheet. Parameters used by PMC are appended in the smooth printout.

Predicted tides from Seldovia, Alaska, were used to reduce soundings on the field sheet. Observed tides from the Snug Harbor gage and Anchor Point gage approved by the Tide and Current Division, Rockville, were used to reduce the sounding on the smooth sheet.

II. CONTROL AND SHORELINE

Horizontal control is adequately described in Sections F and G of the Descriptive Report.

There is no shoreline within the survey area.

III. HYDROGRAPHY

Crosslines are in excellent agreement throughout the entire survey with no difference being greater than 1 fathom.

Standard depth curves are adequately drawn and conform to the Hydrographic Manual. do not concur

Basic hydrography is adequate to delineate the bottom configuration and determine least depths. There were no major difficulties encountered in the verification of the main scheme hydrography.

There were 35 bottom samples taken on this survey. none of which indicate rocky bottom

IV. CONDITION OF SURVEY

All of the graphic records, overlays, smooth field sheets and reports are adequate and conform to the requirements of the Provisional Hydrographic Manual.

V. JUNCTIONS

There are no contemporary junction surveys within the limits of H-9708 at this time.

VI. COMPARISON WITH PRIOR SURVEYS

H-3206 (1910) 1:120,000
H-3355 (1911) 1:100,000

H-3206 (1910) and H-3355 (1911) soundings and depth curves agree reasonably well considering the vintage and sounding method used by hydrographers in 1910 and 1911. Soundings inshore of the 30 fathom curve agree to within 3 fathoms, but soundings further offshore do not compare well. These differences being attributed to bottom erosion, slumping caused by earthquakes and less accurate tidal data. With the addition of the four PSR items listed below, recommend H-9708 supersede H-3206 and H-3355 in all areas of common hydrography.

There are four (4) dashed circled presurvey review items with H-9708:

A 15-fathom sounding located at 59°42'17"N and 152°08'30"W. ✓

A 13-fathom sounding located at 59°46'35"N and 152°08'25"W. ✓

A 29-fathom sounding located at 59°50'33"N and 152°19'25"W. ✓

these are to be soundings and should be disregarded

A 27-fathom sounding located at 59°55'43"N and 152°14'00"W. ✓

None of these 4 dashed pre-survey review items were developed sufficiently to disprove their existence. The ship's line spacing of 200 meters is considered insufficient to invalidate these soundings. They have been transferred to the smooth sheet from H-3206. do not concur See Q.C. Critique

Recommend the 13 and 15 fathom presurvey review items be further investigated on the contemporary survey junctioning to the east.

Three additional unnumbered presurvey review items charted from H-3355 (1911) adjacent to the northwestern survey limits were not investigated during this survey as they fall westward of the limits of hydrography. concur ✓

VII. COMPARISON WITH CHART

Chart 16640 (C&GS 8554) 15th Edition, Nov. 27, 1976 1:200,000

A. Hydrography

H-3206 1:120,000 (1910), and H-3355 1:100,000 (1911) were determined as the charting sources, hence discrepancies have been disposed of in Section VI, "Comparison with Prior Surveys". It is recommended that H-9708 supersede charted hydrography of the common area of coverage.

B. Controlling Depths

There are no controlling depths charted in H-9708 survey area.

C. Aids to Navigation

There are no aids to navigation in the survey area.

VIII. COMPLIANCE WITH PROJECT INSTRUCTIONS

This survey adequately complies with Project Instructions, OPR-429-RA-77, August 24, 1977 Change No. 1: "Supplement to Instructions", dated September 16, 1977; Change No. 2: Supplement to Instructions, dated Dec. 16, 1977.

IX. ADDITIONAL FIELD WORK

This survey is considered an excellent basic survey, adequate to supersede charted hydrography. No additional field work is recommended, except development of two (2) presurvey review items. Refer to Section VI of this report. do not concur on addtnal devel.

Respectfully submitted,
Donald E Zimmer
Donald E. Zimmer
Cartographic Technician
May 24, 1978

Examined and approved,
James S. Green
Chief, Verification Branch

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Pacific Marine Center, 1801 Fairview Ave. E.
Seattle, WA 98102

DATE: 21 July 1978

TO : Eugene A. Taylor
Director, PMC

FROM: Glen R. Schaefer
Chief, Processing Division

SUBJ: PMC Hydrographic Inspection Team Report for Survey H-9708

This survey is a basic hydrographic survey Offshore Anchor Point to Cape Ninilchik, Cook Inlet, Alaska. This survey was conducted by NOAA Ship RAINIER in 1977 in accordance with Project Instructions OPR-429-RA-77 dated 1 April 1977 and Change Nos. 1 thru 3 dated 17 May 1977, 20 July 1977 and 20 July 1977, respectively.

#1 It is recommended that Project Instructions for future surveys to be conducted adjacent to H-9708 include instructions for resolution of the following: (1) two PSR items, a 15-fathom sounding at Latitude 59°42'17"N, Longitude 152°08'30"W and a 13-fathom sounding at Latitude 59°46'37"N, Longitude 152°08'25"W (2) the two holidays in less than 20 fathoms at Latitude 59°55'N Longitude 152°03'W and Latitude 60°00'30"N and Longitude 152°21'40"W.

#1, do not concur
#2- Closer devel. may find shoaler depths
JPS

The HIT Team concurs with the verifier that the two PSR items, a 29-fathom sounding at Latitude 59°50'33"N, Longitude 152°19'25"W and a 27-fathom sounding located at Latitude 59°55'43"N, Longitude 152°14'00"W, were not disproved. (No additional work is recommended. concur JPS)

do not concur
See Q.C. Critique
JPS

The inspection team finds H-9708 to be a very good basic survey adequate to supersede common areas of prior surveys and charted hydrography. Administrative approval is recommended.

Glen R. Schaefer

David B. MacFarland, Jr.

James W. Steensland

Stanley H. Otsubo

ADMINISTRATIVE APPROVAL

H-9708

The smooth sheet and reports of this survey have been examined and the survey is adequate for charting and to supersede common areas of prior surveys.

E. A. Taylor

Eugene A. Taylor, RADM
Director
Pacific Marine Center

24 JULY 1978
Date

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville, Md. 20852

C352/FPS

October 10, 1978

TO: A. J. Patrick
Chief, Marine Surveys Division

THRU: Chief, Quality Control Branch

FROM: F. P. Saulsbury
Quality Evaluator

SUBJECT: Quality Control Report for H-9708 (1977), Alaska, Cook Inlet, Offshore Anchor Point to Cape Ninilchik

A quality control inspection of H-9708 was accomplished to monitor the survey for obvious deficiencies with respect to data acquisition, delineation of the bottom, determination of least depths, navigational hazards, junctions, sounding line crossings, shoreline transfer, smooth plotting, decisions and actions taken by the verifier, and the cartographic presentation of data. In general, it was found to conform to the National Ocean Survey's standards and requirements except as stated in the Verifier's Report, the HIT Report, and as follows:

1. Some supplemental depth curves were added to emphasize sand ridges or rises. Some curves were revised to show a representative delineation of bottom configuration.

While the delineation of the bottom is adequate for nautical charting, in several areas of 30 fathoms and greater, development is inadequate for bathymetric mapping. A sandy bottom of ridge and swale topography trending in a northeast-southwest direction occupies much of the survey area.

2. No junctions were made since hydrography on junctional surveys is incomplete.

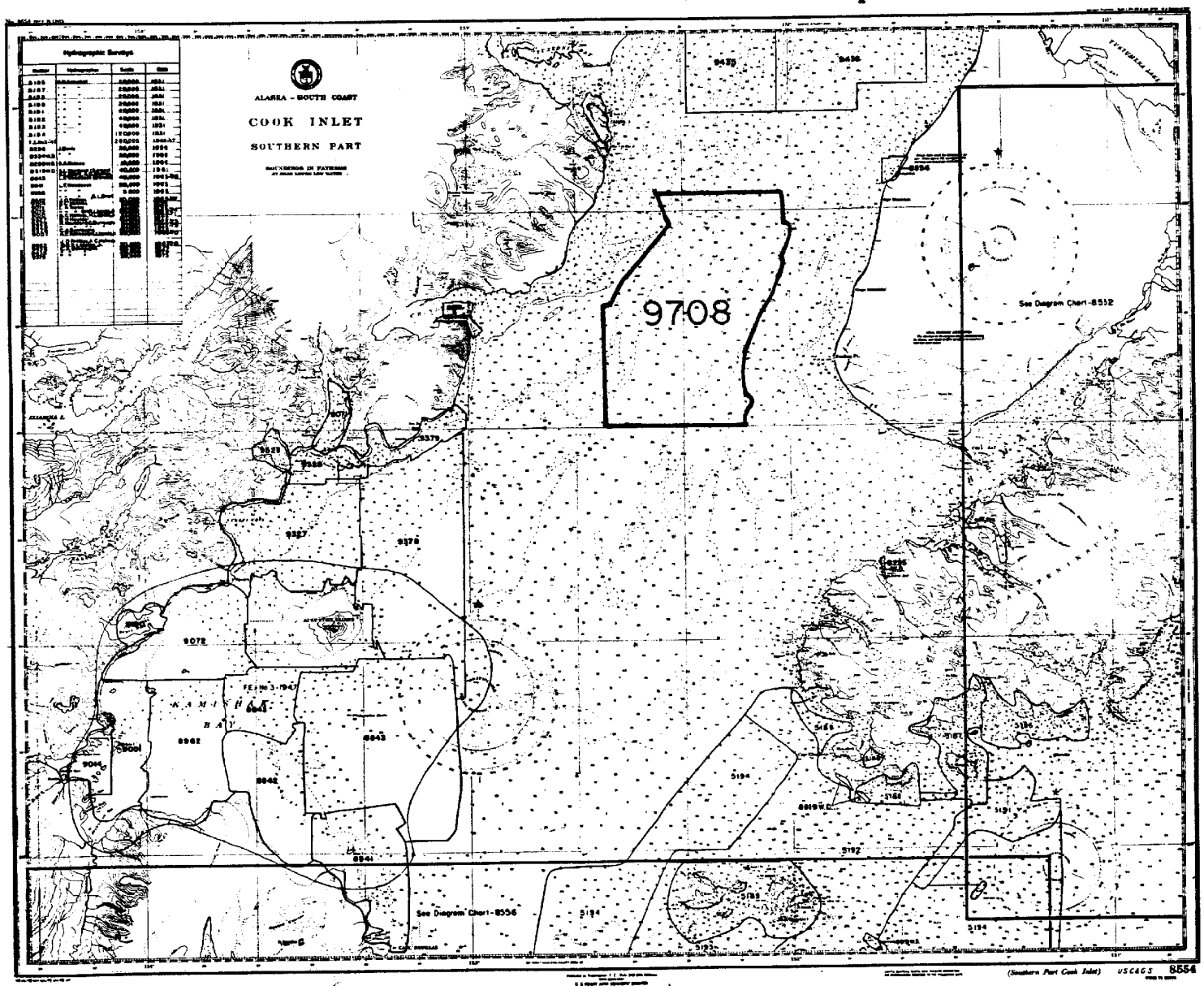
3. The four Presurvey Review dashed circle items, shoal soundings of 15, 13, 29, and 27 fathoms, addressed in the Verifier's Report on pages 2 and 3, item VI, and in the HIT Report are considered discredited by present depths. This section of Cook Inlet is covered with unconsolidated sediments. No rock outcrops exist in the area. A comparison with the prior surveys reveals a relatively unstable bottom. In addition, the soundings are pressure tube soundings which in the past have been found often to be erratic and unreliable.

The four charted shoal soundings, from H-3206 (1910), originally brought forward to the present survey during verification were deleted during quality control inspection.

4. The navigation system antenna on the Ship RAINIER is 32.2 meters from the Ross fathometer transducer. A correction for this distance was not considered by the hydrographer. However, at the scale of the present survey an .8 mm shift in sounding placement is insignificant. The largest scale chart affected by this survey is 1:80,000.

No correction was applied during quality control inspection.

cc:
C35
C351



8554No.2 (2sheets)

8554No.2 (2sheets)

(3-75-63) 155-5352

NAUTICAL CHART DIVISION

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-9708

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS QC
16640	3/30/79	Rector	~~Full~~ Part ~~Before~~ After Verification Review Inspection Signed Via
			Drawing No. 19 Exam, No corr at proof stage
531	7/27/79	Owen Steinbel	Full ~~Part~~ ~~Before~~ After Verification Review Inspection Signed Via
			Drawing No. 16
16013	3/13/80	J. Bailey	~~Full Part Before~~ After Verification Review QC Inspection Signed Via
			Drawing No. 25 Exam thru 16640 • no corr.
16661	8-24-84	Roy A. Diamond	Full [redacted] After Verification Review Inspection Signed Via
			Drawing No. 1
16640	10-29-85	J.M. O'Connor	Full ~~Part Before~~ After Verification Review Inspection Signed Via
			Drawing No. 22 Applied thru cht 16661
16013	3/11/91	ALMACEN	Full ~~Part Before~~ After Verification Review Inspection Signed Via
			Drawing No. Fully applied sndgs. from 55 thru 16640.
500	4/16/91	ALMACEN	Full Part Before After Verification Review Inspection Signed Via
			Drawing No. Applied 33, 34, 42 & 53 meters sndgs. from 55 thru 16013.
			Full Part Before After Verification Review Inspection Signed Via
			Drawing No.
			Full Part Before After Verification Review Inspection Signed Via
			Drawing No.
			Full Part Before After Verification Review Inspection Signed Via
			Drawing No.

FORM C&GS-8352 SUPERSEDES ALL EDITIONS OF FORM C&GS-975.

USCOMM-DC 8558-P63