FINAL FIELD REPORT
ARCTIC SURVEYS
NARES STRAIT
PROJECT FILE NUMBER 6600-76-1
MARCH-APRIL, 1975

J.H. WILSON

FINAL FIELD REPORT

ARCTIC SURVEYS

NARES STRAIT

PROJECT FILE NUMBER 6600-76-1

MARCH - APRIL, 1975

J.H. WILSON
HYDROGRAPHER-IN-CHARGE

TABLE OF CONTENTS

SUMMARY

The 1975 hydrographic survey of Nares Strait was the culmination of the survey which was started in 1972 by Mr. G.E. Wade and party. Mr. Wade established horizontal control along the Greenland coast of Nares Strait and we used this control in conjunction with established topographic control and our own 1975 established control, to accurately position bathymetric data over Nares Strait.

Nares Strait was spot sounded from the north end of Smith Sound to the north end of Hall Basin, with the utilization of three 206B helicopters.

The survey was carried out from a parcoll tent camp located on the ice in John Richardson Bay with logistic support being supplied by the Polar Continental Shelf Project in Resolute.

Established horizontal control points were recovered in preparation for future bathymetric surveys along the following prospective pipeline crossing areas: Peel Sound, Franklin Strait, Byam Channel, Austin Channel and Belcher Channel. The control along Belcher Channel will be used for our regular spring hydrographic survey in 1976.

PERSONNEL

J. Wilson	Hydrographer-in-Charge	March 7 - May 1
A. Welmers	Hydrographer	March 7 - April 12
C. Gorski	Hydrographer	March 4 - May 1
D. Lock	Hydrographer (term)	March 7 - April 25
P. Schrimger	Hydrographer (term)	March 7 - April 25
R. Coons	Electronic Technician	March 7 - April 25
J. McGirr	Gas Engineer	March 4 - April 25
R. Smith	Cook	March 7 - April 29
J. Kreke	Helicopter Pilot and Engineer	March 7 - April 28
J. Pearson	Helicopter Pilot	March 7 - April 9
B. Dowell	Helicopter Pilot	March 7 - April 20
P. Love	Helicopter Pilot	April 9 - April 28
D. Ormson	Helicopter Engineer	March 7 - April 9
Z. Dreja	Helicopter Engineer	March 7 - April 9
G. Wyatt	Helicopter Engineer	April 9 - April 28
T. Smith	Helicopter Engineer	April 9 - April 28

VISITORS

E. Thompson	Hydrographer	April 22 - May 1
D. Pugh	Hydrographer	April 9 - April 19

MAJOR EQUIPMENT

Aircraft

3 206B helicopters
1 Twin Otter - periodically
1 DC-3 freighter - periodically

Electronic and Survey Equipment

4 9040 echo sounders - metric
1 Raytheon sounder - metric
2 Motorola R.P.S. chains
2 Motorola Mini-Ranger chains
2 Wild T-2 theodolites
1 Wild T-1 theodolite
1 Wild T-3 theodolite
1 N.A.-2 level
1 CH-25 radio-transceiver
1 Spillsbury Tindall SBX-11
1 Pye VHF radio-transceiver
6 PT-400 radio-transceivers
1 Spillsbury Tindall radio beacon
1 Aanderaa tide gauge

Camping Equipment

4 parcoll tents (3 - 6 section, 1 - 4 section)
2 longhouse tents
1 Igloo tent
1 5 k.w. lister generator
miscellaneous arctic field equipment

CHRONOLOGY OF EVENTS

March 4	Advance party to Resolute, N.W.T.
March 7	Remainder of party to Resolute, N.W.T.
March 8	Campsite reconnaissance.
March 9 - 10	Horizontal control recovery in Peel Sound and Franklin Strait.
March 10 - 20	Establishing camp in John Richardson Bay.
March 14	Horizontal control recovery in Belcher Channel and Northern Penny Strait.
March 20	Commenced sounding in Nares Strait.
March 23	Submersible tide gauge installed at entrance to John Richardson Bay.
April 9	Helicopter crew change.
April 20	Sounding completed in Nares Strait.
April 21	Tide gauge retrieved.
April 21 - 29	Camp dismantled and returned to Resolute. Equipment inventory, storage and shipment south.
April 24	Horizontal control recovery in Byam Channel and Austin Channel.
April 26	Sounding in Bay in northeast corner of Belcher Channel.
May 1	All staff returned home.

NARRATIVE

PLANNING AND PREPARATIONS

As in past years, Marine Sciences received aircraft support and logistical support from the Polar Continental Shelf Project. They allotted us 1050 helicopter hours on three 206B aircraft, 85 hours on a Twin Otter, a DC-3 freighter aircraft whenever required for camp and fuel transportation, all fuel required for aircraft and camp, miscellaneous camping equipment, wages for a cook and a labourer and logistal support from the Polar Shelf base in Resolute.

This year, P.C.S.P. contracted a new three year rotor-wing contract with Klondike Helicopters of Calgary, Alberta. Klondike did not have 206B helicopters with the ambulance option, thus our R.P.S. instrument racks, which were designed for ambulance machines last year, had to be modified. A meeting was held in Calgary with Klondike personnel and they were very helpful in the design and fabrication of new racks. They had new drawings made up with the required modifications, had the existing racks modified, constructed one new set for the third helicopter, and obtained M.O.T. approval for the modifications. All the racks were completed and in Resolute in time for the survey.

The Danish were invited to participate in the survey, but they stated that they did not have the funds to do so.

Existing 1:250,000 topographic maps were blown up to survey scale for shoreline, by Headquarters in Ottawa.

Control data for Nares Strait and the proposed pipeline crossing areas were obtained from our Nautical Geodesy Section in Ottawa.

Field sheet base plots for the sounding area were drawn up on our Gerber plotter in Burlington.

Two term hydrographers were hired on to participate in the survey.

SURVEY OPERATIONS

Logistics

Helicopters, helicopter crew and Marine Sciences personnel were all in Resolute by March 7th.

The following day, a reconnaissance flight was made over the John Richardson Bay area and a campsite was chosen on the ice in the Bay (Latitude 80-06.5N, Longitude 71-28.0W).

The camp was established in nine days. Seven DC-3 trips were required to move the equipment into John Richardson Bay with each trip requiring approximately 7.2 hours flying time.

While the camp was being erected, temperatures went below -60^{o}F. A Herman Nelson heater was used for heat while setting up the parcolls. Once part of a tent was erected, the heater made the cold a bit more bearable.

All required electronic hydrographic equipment was installed in two helicopters while in Resolute. Klondike helicopters are owned by Kenting, who have an aircraft hanger in Resolute, thus our technician was able to do the installations in the comfort of a heated hanger. Motorola Mini-Ranger with an omni-directional antenna was installed in one machine and Motorola R.P.S. with a radome antenna was installed in the second helicopter. Edo 9040 sounders were installed in both machines. An Edo was also installed in the third helicopter later at John Richardson Bay. All electronic equipment was tried out in the Resolute area with good results.

In conjunction with the camp setup, one helicopter was used out of Resolute to recover horizontal control in the following proposed pipeline crossing areas: Peel Sound, Franklin Strait, Northern Penny Strait and Belcher Channel. Fuel caches were established in these areas with the Twin Otter.

The Nares Strait sounding area, stretching from the north end of Smith Sound to the north end of Hall Basin, was completely surveyed from the John Richardson Bay camp.

A DC-3 freighter aircraft made a trip to camp from Resolute nearly every second day with five hundred to five hundred and fifty gallons of bulk fuel per trip.

P.C.S.P. had an established fuel cache of over 200 turbo drums in Alexander Fiord from which we fuelled when working in the southern quarter of our area. Fuel out of this cache was also hauled by Twin Otter to other cache sites over our survey area. Fuel caches were established at Cape Field, Cape Louis Napolean, Allman Bay, Bert Bay, Carl Ritter Bay, Cape Defosse and Cape Lieber. All the turbo fuel in the cache at Alexander Fiord was used up.

We had three fires in the camp this season:

1) the top was burned out of the generator longhouse tent. Oil dripped down onto the stove from an oil can which was being heated so that the oil would pour out of the can,

2) the plywood sauna washhut burned to the ice. The propane lead in the hose sprung a leak and that was the end of the bathing facilities,

3) the generator longhouse tent burned to the ice. The fire originated in a shorted out battery charger. After receiving replacement battery chargers, one of these shorted out and was tossed outside before any damage was done.

The major equipment lost in these fires were the five kilowatt generator, two longhouse tents (only one frame), tools and batteries. Thanks to Mr. F. Alt of the Polar Continental Shelf Project, we hurridly received replacements from his stores, so that the survey carried on without loss of time.

Our fresh water supply was ice, hauled from an iceberg, by skidoo and sled from approximately a mile away. The cook supplemented this supply with snow melted on the stove.

Meteorlogical observations were recorded twice daily and radioed into Resolute.

By April 22nd, the camp had been dismantled and all personnel had returned to Resolute, but due to bad weather, one load of camping equipment was left behind. This gear was picked up a week later.

While waiting the week to get the remaining equipment out of John Richardson Bay, Army Survey control points were recovered along the proposed pipeline crossing areas in Byam and Austin Channels. Lodging and fuel were obtained at the Pan Arctic Camp at Rae Point on Melville Island.

A small bay on the southeast corner of Cornwall Island was photo sounded by one helicopter out of Resolute. After the helicopter left Resolute, the weather closed in and the hydrographer and pilot spent two uncomfortable days and nights sitting in the helicopter fifty miles out of Resolute.

In Resolute, an inventory was made of all field equipment. The camping equipment was stored in a P.C.S.P. shed and the survey gear was shipped back to Burlington.

All personnel had returned home by May 1st.

Bathymetry

Nares Strait was spot sounded from Latitude 78-45N to Latitude 81-40N. Hall Basin, Kennedy Channel and the Canadian side of Kane Basin were sounded on a three kilometre grid. The smaller fiords along the Canadian side were sounded at one and a half kilometre line spacing with one kilometre and less between soundings along the lines. The Danish side of Kane Basin was not done but both sides of the border in Kennedy Channel and Hall Basin were surveyed.

Due to open water, we were unable to sound an area of approximately 375 sq. kilometres at the south end of Kane Basin, east of Pine Island and as a result there is a gap between the Smith Sound Survey in 1962 and our work this year.

Soundings in the main channel areas were controlled by range-range and range-bearing positioning. Range-bearing was done in some small areas along the cliffs where some of the range-range stations could not be received. Soundings in the small fiords were controlled by photo fixed lines with timed intervals along the lines or by one range and timed intervals shore to shore.

Soundings were done on the existing Hans Island Field Sheet #3698 in order to close the spacing into a three kilometre grid.

All soundings were done with 115.2 KHz crystals in the sounders which gave us an assumed propagation speed for sound in water of 1440 metres/ second. The sounders were checked through the ice with a bar down to sixty metres. Each day before leaving the camp site, the sounders were checked at the same location on the ice in front of the camp, to ensure they were operating and that they were operating correctly. This procedure saved many flying hours, i.e., if there was a problem with a sounder, it was discovered at the camp and not an hour's flying time away.

No distinct shoals were discovered over the whole area. The main channel, i.e. Kane Basin, Kennedy Channel and Hall Basin, proved to be quite deep with depths of plus 150 metres.

Flagler Bay, which is located on the south side of the Bache Peninsula, was found to be very shallow with depths between ten and twenty metres over 3/4 of its area. This is an oddity because this Bay is between Princess Marie Bay and Hayes Fiord, which both proved to be fairly deep. It is interesting to note that there is a valley running from the head of Flagler Bay to the head of Irene Bay in Bay Fiord which we surveyed in 1974. This route of approximately 40 miles long, was traversed by Sverdrup's party in 1898. This would be one route that a pipeline or rail could be run across Ellesmere Island without going over mountains and glaciers. The line would have to be carried onto one of the nearby deeper fiords or bays as a large ship could not get to the head of Flagler Bay.

On this Nares Strait survey, a total of 2974 soundings were completed with a utilization of 819.8 hours on the three helicopters, including time done on equipment trials and flying time, Resolute to camp and return.

The small protected bay on the S.E. corner of Cornwall Island was photo sounded because someone expressed interest in running a pipeline to this bay and coming into the bay with ships. As the surrounding low flat topography indicated, there was little water in this harbour - less than ten metres. On a few of the soundings a graph was not received, thus the ice was probably frozen to the bottom. Fourteen soundings were done with the utilization of 8.3 hours on one helicopter.

Control

Very little additional control was required for the Nares Strait survey. On the Canadian side there were existing Army Survey stations and on the Greenland side there were C.H.S. stations which had been established by Mr. G.E. Wade in 1972 in preparation for this bathymetric survey.

Ten new stations were established by traversing and one was trilaterated. Eight of these were permanently marked.

In preparation for future bathymetric surveys of proposed pipeline crossing areas, this year we recovered the existing Army Survey horizontal control points in a few of the most likely crossing areas: Peel Sound, Franklin Strait, Byam Channel, Austin Channel, Northern Penny Strait and Belcher Channel. The control in Northern Penny Strait and Belcher Channel was also recovered in preparation for our 1976 hydrographic survey of these areas.

The base of operations for this control recovery was Resolute. As mentioned previously, fuel caches were established in each area by Twin Otter.

In each of the above areas, it was found that there is enough existing horizontal control points to chart the areas using line of sight positioning systems. See Appendix #V for map showing stations recovered in these pipeline crossing areas.

At each station, additions were made to the existing station descriptions, if necessary, and it was noted whether or not the station location was suitable for a remote navigation station.

Ice conditions at each crossing were noted and photographed.

For details on pipeline crossing project, see "INTERIM TECHNICAL REPORT, BATHYMETRIC MAPPING ICP-1". Investigators - A.J. Kerr and J.H. Wilson.

Thirty-eight decimal three (38.3) helicopter hours were used on this project and seven decimal one (7.1) hours of Twin Otter time were used for fuel caching.

Fifty-seven (57) horizontal control stations were recovered.

Tide Gauge Installation

A submersible Aanderaa tide gauge was established and retrieved successfully at the mouth of John Richardson Bay, Latitude 80-11.05N and Longitude 70-22.50W.

The gauge was located in forty three (43) feet of water below the ice surface and approximately three feet above the bottom. It was held upright and off the bottom by two eleven inch diameter styrofoam buoys above it, and held submersed by a one-hundred and fifteen pound weight sitting on the bottom. Two 3/8" stainless steel cables stretched to the surface. A one inch pipe was frozen into the ice and the two cables went through the pipe. The pipe protected the cables from being cut with the ice auger when the gauge was retrieved.

The gauge was lowered to the bottom by hand and pulled out by helicopter. The instrument was in the water for thirty days. A recording was made every fifteen minutes. The maximum range of tide recorded over the period was 5.0 metres and the minimum range was 1.2 metres.

The gauge worked perfectly, but we did not know this until the tapes were edited in Dartmouth, Nova Scotia. The one drawback with this instrument is that you do not receive real time data and thus you do not know if it is recording or not until it is brought to the surface.

Electronic Equipment

(a) Navigation Systems

This season, we had two Motorola R.P.S. chains and two Motorola Mini-Ranger chains. We received the second Mini-Ranger consul on April 3rd.

R.P.S. with a radome antenna was installed on one machine and Mini-Ranger with an omni antenna was used on the second helicopter. The spare sets were used as replacements when the helicopters came in with navigation equipment problems, which was quite often. The spare set would be installed and the machine would be back out working with little delay. The technician could then repair the malfunctioning set in the comfort of a parcoll.

The Mini-Rangers, when operating properly, were workable out to a range of sixty-five (65) kilometres. The signal was often received at seventy-five (75) kilometres when the helicopter was flying out to the work area. There did not appear to be any difference in the working range, whether the long horns or the short horns were used on the transponders, but a range test was not carried out.

R.P.S. was workable out to ninety-eight (98) kilometres. Very few problems were experienced with the R.P.S.

The modified instrument racks for these positioning systems proved out successfully.

(b) *Sounders*

We had four metric 9040 Edo sounders with 15.2 KHz crystals on the survey, with one installed in each of the three helicopters. A lot of maintenance was required to keep three sounders operating at one time.

A couple of transducers failed again this year, and were replaced by ones sent up from Burlington. They either break down in the cold or possibly have been set down on the ice with a jar causing them to malfunction. We had the same problem on the 1974 survey.

A Raytheon sounder was set up in the office in order to check the rise and fall of the tide against that recorded by the Aanderaa tide gauge. This did not prove too successful as the styluses would break after a short time (maximum running time of 2 hours). It was a brand new sounder and our technician was unable to repair it.

(c) *Radio Beacon*

P.C.S.P. purchased a Spillsbury Tindall LWX-100 radio beacon for our survey. The maximum range that the helicopters were able to pick up the signal was ten miles, but even with this low range it proved useful in guiding a helicopter into camp, from across the Bay, in very low visibility conditions. Without the beacon, the helicopter crew might have spent an uncomfortable night in the cold waiting for the weather to clear.

The instruction manual called for the antenna to be mounted fifty (50') feet in the air, but the material was not available to get it up more than twenty feet (20') to twenty-five feet (25'). The technician has talked to different authorities on returning south and has concluded that a different type of antenna should be tried.

Shorelining

As mentioned previously, 1:250,000 topographic maps were blown up to survey scale before leaving for the field. In the field, fixes were taken along the shoreline with the range-range systems as the sounding progressed. The shoreline on the topo plots on the Canadian side was fairly accurate and the maximum shift required at scale 1:100,000 was 1.5 mm south. The Greenland shoreline along Kennedy Channel and Hall Basin was off by approximately 2.5 cm to the east at 1:200,000 or 5,000 metres. Range-range fixes were taken frequently along this coast in conjunction with the positions being pricked on photos. The Greenland shoreline on the field sheet should be within 2 mm at scale of being correct.

Data Processing

All the soundings were reduced and inked on work sheets in the field office.

The final field sheets were done on the Gerber plotter in our Burlington office.

The photo sounding positions and depths were digitized from the worksheets instead of being picked off by hand as they were last year. This saved a lot of time and frustration.

Shoreline and names will be put on the sheets manually.

APPROXIMATE SURVEY COSTS

Costs for hydrographic navigation and survey equipment are not included.

* - Polar Continental Shelf Project Expenditures

1. Nares Strait

206 B helicopters - $321.90/hour with fuel for 819.8 hrs.	=	$263,893 *
Twin Otter - $434/hr. with fuel for 85 hrs.	=	$ 36,890 *
- $434/hr. with fuel for 12.0 hrs.	=	$ 5,208
DC-3 - $460/hr. with fuel for 233.8 hrs.	=	$107,548 *
Diesel fuel + regular gas - 40 drums @ $2.00/gallon	=	$ 3,600 *
Headquarters expenditures + field account	=	$ 20,000
Salaries - Marine Sciences	=	$ 22,500
P.C.S.P.	=	$ 13,000 *
TOTAL COST		$472,639

TOTAL SOUNDINGS COMPLETED = 2974

COST/SOUNDING = $159

2. Control Recovery in Peel Sound, Franklin Strait, Byam Channel, Austin Channel, Belcher Channel and Northern Penny Strait

206 B helicopter - 38.3 hours	=	$ 12,329 *
Twin Otter - 7.1 hours	=	$ 3,081
87 man hours @ $8.70/hour	=	$ 756
Accommodation + fuel at Rae Point	=	$ 865
TOTAL COST		$ 17,031

STATIONS RECOVERED = 57

COST/STATION = $299

3. Belcher Channel - Sounding at N.E. corner

206 B helicopter for 8.3 hrs.	=	$ 2,672 *

Polar Continental Shelf Project Expenditures	=	$439,932
Marine Sciences Expenditures	=	$ 52,410
TOTAL 1975 ARCTIC SURVEYS COST = 1 + 2	=	$492,342

RECOMMENDATIONS AND COMMENTS

On the 1976 Belcher Channel Survey, the third helicopter could be outfitted with Mini-Ranger as there will be very little photo sounding or control to do with this machine. Considering the ranges involved on this survey, all three helicopters could use Mini-Ranger systems. A fourth set should be available to exchange quickly with a malfunctioning system on one of the machines. Down time would be cut to a minimum, i.e., the technician could make the necessary repairs while the helicopter is back out sounding.

It would be beneficial to purchase a radome for the Mini-Ranger, and try it out this coming season in preparation for future long range surveys. Motorola are advertising one hundred and eighty (180) kilometre range with this system and if this is proven to be correct, most areas in the Arctic Islands including Viscount Melville Sound could be surveyed with this range-range system if the remote stations are high enough.

The Pye VHF radio proved very successful this season for short range communications with the helicopters.

It would be much more efficient if the technician assigned to Arctic Surveys spend two seasons with the party.

A couple of spare transducers should be taken north as they have caused problems the last two seasons.

The LWX-100 radio beacon should be field tested in the Burlington area and a new antenna purchased if necessary. This beacon is a very important piece of equipment when aircraft are involved in surveys in the Arctic.

A cook's helper is needed if the Arctic survey party is going to be maintained at the same size or larger. The labourer position for Arctic surveys could be filled and the incumbent could help the cook plus help with the general labour such as loading and unloading aircraft, etc.

It is advisable to purchase new gas canisters for the fire extinguishers at the beginning of each season. The old ones can be depleted with no indication of their state. If you try them out, you puncture the gas canister in doing so. It would be ideal to have fire extinguishers with gauges indicating what condition they are in.

A new generator will be required for the 1976 survey season. It would be advantageous to purchase a light weight 8 to 10 Kw machine as our old 5 Kw (supplied by P.C.S.P.) did not have the required power output to supply the helicopter heaters plus the camp. It looks as though the survey camps in the future will be larger and thus a more powerful generator will definitely be required.

This year, we had a movie once a week. These movies were good for morale in that they gave us something to look forward to. The P.C.S.P., aircraft companies and exploration companies in the Arctic have video tape televisions. If we had one of these sets, we would save money in the long run and camp life would be much more enjoyable. We would be able to exchange tapes with the other companies and thus have a great variety of entertainment.

The Aanderaa tide gauge trial was a success so as a result this type of gauge will probably be used on our future Arctic Surveys. I would like to see these gauges modified so that a signal can be picked up on the surface informing us whether it is working or not and better yet, if they can be set up so that we receive real time data when required.

Many days this season, radio communications between the helicopters and camp were very poor and Mr. F. Alt of P.C.S.P. relayed messages back and forth on the radio in Resolute. I wish to thank him and his men for all their assistance rendered our party.

APPENDIX I

- STATISTICS -

[illegible]

YEAR 1975 FROM MARCH 4 TO APRIL 30

Establishment ARCTIC SURVEY PARTY

H.I.C. J.H. WILSON

	Project Number	Project Number	Project Number	Project Number
Project Name NARES STRAIT and horizontal control recovery in Austin and Byam Channels, Peel Sound, Franklin Strait, and Belcher Channel.	6600-76-1			
Project Name				
Resources :				
Number of Hydrographers *	4/175			
Number of Scientists *	NIL			
Number of Electronic Technicians *	1/50			
No. of Student Assistants and Casuals *	2/95	(term hydrographers)		
No. of Support personnel (Ship's Crew etc.) *	7/361			
Total Personnel *	14/681			
Number of Ships				
Number of Launches				
Number of Land Vehicles				
Number (and type) of Aircraft	see below			
Number of Minor Support Staff				
Other (specify)				
206 B HELICOPTERS	3			
TWIN OTTER (PERIODICALLY)	1			
DC-3 AIRCRAFT (PERIODICALLY)	1			

* Should provide two figures separated by a slash. The first figure being the average number on strength and the second being the man days, e.g.-number of Hydrographers:5/100 (an average of 5 hydrographers ... 100 man days on the project).

[illegible]	Project Number	Project Number	Project Number	Project Number
H.I.C.				
Time:				
Total operational days.	58			
Days actual field work.	35			
Days lost (weather)	3			
Days lost (Sat. Sun. Holidays)	NIL			
Days lost (Equipment failure) ELECTRONIC	4			
Days lost in Transit	3			
Days lost in port for Supplies, Bunker, etc.	NIL			
Days lost, other causes SETTING UP CAMP-DECAMPING & EQUIPMENT INVENTORY AND PACKING	13			
Total Man days in period (staff)	270			
Total Man days worked (staff)	270			
Man days:- (staff)				
(a) Sounding	115			
(b) Shoal Examinations	NIL			
(c) Wharf surveys	NIL			
(d) Oceanography	NIL			
(e) Geophysics	NIL			
(f) Tides & water levels	2			
(g) Collecting bottom samples	NIL			
(h) Horizontal Control	22			
(i) Shorelining & Low Watering	2			
(j) Data processing & office admin.	63 1/2			
(k) Sailing directions	1/2			
(l) Place Names	NIL			
(m) Current observations	NIL			
(n) Photo-Ident.	1			
(o) Others (specify) ESTABLISHING CAMP, DECAMPING, EQUIPMENT INVENTORY, AND PACKING	64			

FIELD REPORT STATISTICS:- MONTHLY ... PROJECT ... FINAL FIELD ...

YEAR FROM TO

Establishment ______ H.I.C. ______	Project Number	Project Number	Project Number	Project Number	To
Sounding (Linear Nautical Miles/KM):					
Ship Sounding	N/A				
Launch Sounding	N/A				
Other (specify)	N/A				
Total sounding SPOT SOUNDINGS	2988				
Reconnaissance (Track) sounding	N/A				
Area sounded (XXXX^2) (Km^2)	18,225				
Shoals Examined:					
Shoal Examinations (Ship)	N/A				
Shoal Examinations (Launch)	N/A				
Shoal Examinations (Sweep)	N/A				
Shoal Examinations (other) specify	N/A				
Shoal Examinations (Total)	N/A				
Navigational Aids:					
Shore Aids Positioned (including ranges)	N/A				
Floating Aids Positioned	N/A				
Navigational Ranges Sounded	N/A				
Navigational Ranges Drifted	N/A				
Sector Ranges Positioned	N/A				
Navigational Aids Established	N/A				

FIELD REPORT STATISTICS:- MONTHLY ... PROJECT ... FINAL FIELD ...

YEAR FROM TO

Establishment ______ H.I.C. ______	Project Number	Project Number	Project Number	Project Number	To
Shore Control:					
Signals built	10				
Signals re-built	2				
Towers built	N/A				
Number of Stations occupied	13				
Number of Stations re-occupied	2				
Number of stations permanently marked	7				
Distance Traversed (N.M.) (K.M.)	209				
Number of Elevations Measured	17				
Number of Heights Measured	0				
Number of Stations Photo Ident.	8				
Other (specify)					
NUMBER OF STATIONS RECOVERED	85				
Calibrations:					
No. of Calibration Stations:					
[illegible]					
[illegible] RPS MOTOROLA, MINI-RANGER MOTOROLA	19				
No. of E/c's marked and referenced	7				

FIELD REPORT STATISTICS:- MONTHLY ... PROJECT ... FINAL FIELD ...

YEAR FROM TO

Establishment H.I.C.	Project Number	Project Number	Project Number	Project Number	To
Tide and Current Data:					
Recording gauges established	1				
Recording gauges recovered	1				
Staff gauges established	N/A				
Bench Marks Recovered	N/A				
Bench Marks Established	3				
Bench Marks Levelled	3				
Distance Levelled XXXXXX (KM)	1				
No. of Current Meters Set Out	N/A				
No. of Current Meters recovered	N/A				
No. of hours of Current Measurements (Other than with Moored Meters)	N/A				
Oceanography.					
No. of Oceanographic stations	N/A				
Gravity Profiles-survey (N.M.) (KM)	N/A				
Gravity Profiles-track, (N.M.) (KM)	N/A				
Magnetic Profile-survey (N.M.) (KM)	N/A				
Magnetic Profile-track, (N.M.) (KM)	N/A				
Seismic Profile-survey (N.M.) (KM)	N/A				
Seismic Profile-track (N.M.) (KM)	N/A				
Number of Water Samples	N/A				

FIELD REPORT STATISTICS: MONTHLY ... PROJECT ... FINAL FIELD ...

YEAR FROM TO

Establishment H.I.C.	Project Number	Project Number	Project Number	Project Number	Tot.
Bottom Samples:					
Number of bottom samples (Grab)	N/A				
No. of bottom samples (underway)	N/A				
No. of bottom samples (Armed Lead)	N/A				
No. of Cores	N/A				
No. of Samples retained	N/A				
Miscellaneous:					
No. of Dangers to Navigation, rocks ruins, pilings, etc., fixed.	N/A				
Shoreline checked [illegible]	71 fixes	along area	shoreline		
Wharves surveyed	N/A				
No. of Reference buoys streamed	N/A				
No. of Reference buoys recovered	N/A				
No. of Shore Stations Established:					
[illegible] RPS AND MINI-RANGER, MOTOROLA	36				
Helicopter flying hours 206 B	866.4				
TWIN OTTER FLYING HOURS	103				
DC-3 FLYING HOURS	233.8				

FIELD REPORT STATISTICS: MONTHLY ... PROJECT ... FINAL FIELD ...

YEAR FROM TO

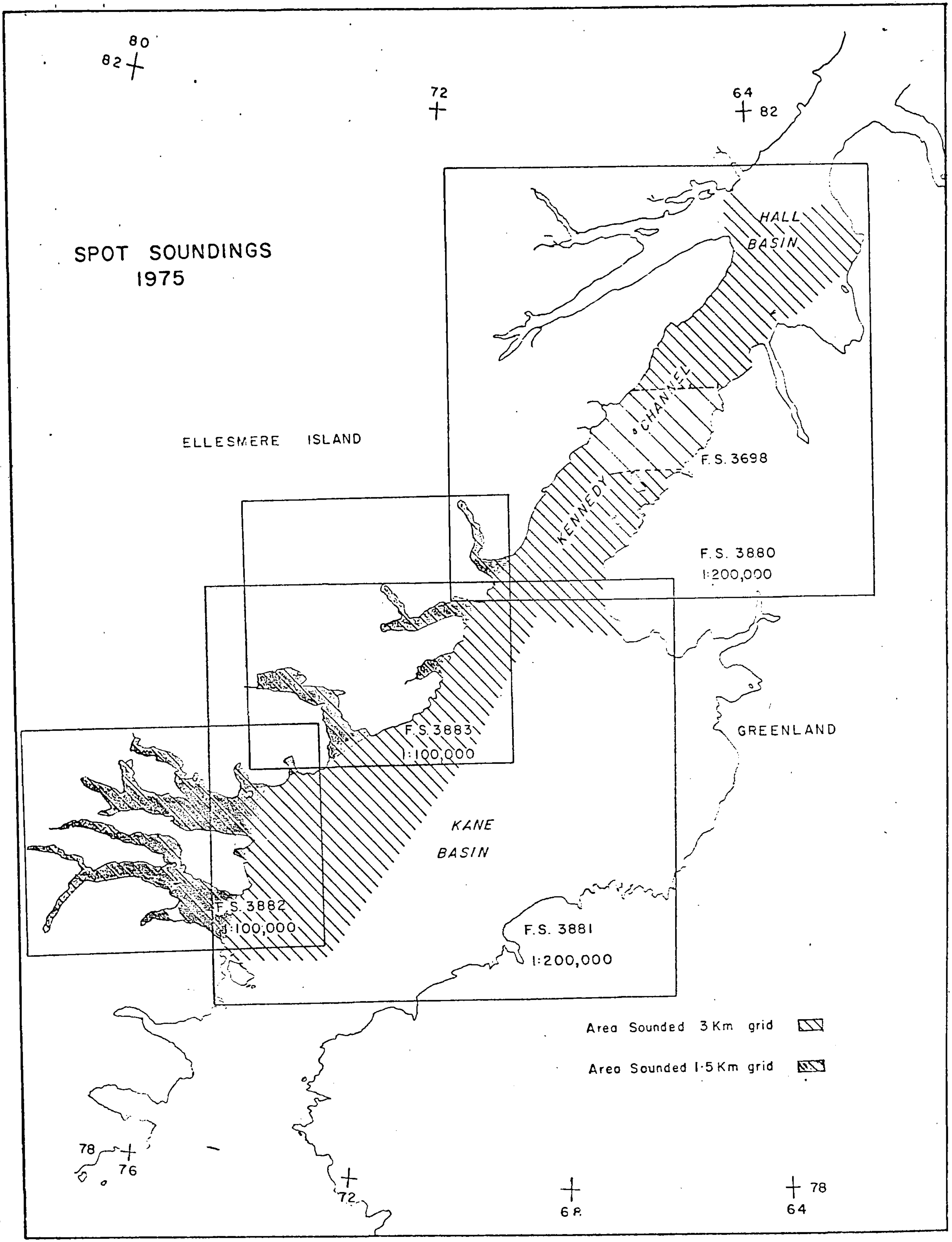
Establishment:

H.I.C..

	Project Number	Project Number	Project Number	Project Number	To[illegible]
Data submitted from the field: (Include file numbers:)					
FIELD SHEETS:					
KENNEDY CHANNEL - HALL BASIN	3880				
KANE BASIN	3881				
PRINCESS MARY BAY - BUCHANAN BAY	3882				
RAWLINGS BAY, JOHN RICHARDSON BAY, SCORESBY BAY, DOBBIN BAY	3883				
SOUNDING NOTES	70623				
OBSERVATION NOTES	70624				
COMPUTATION NOTES	70625				
MISCELLANEOUS NOTES	70626				

APPENDIX II

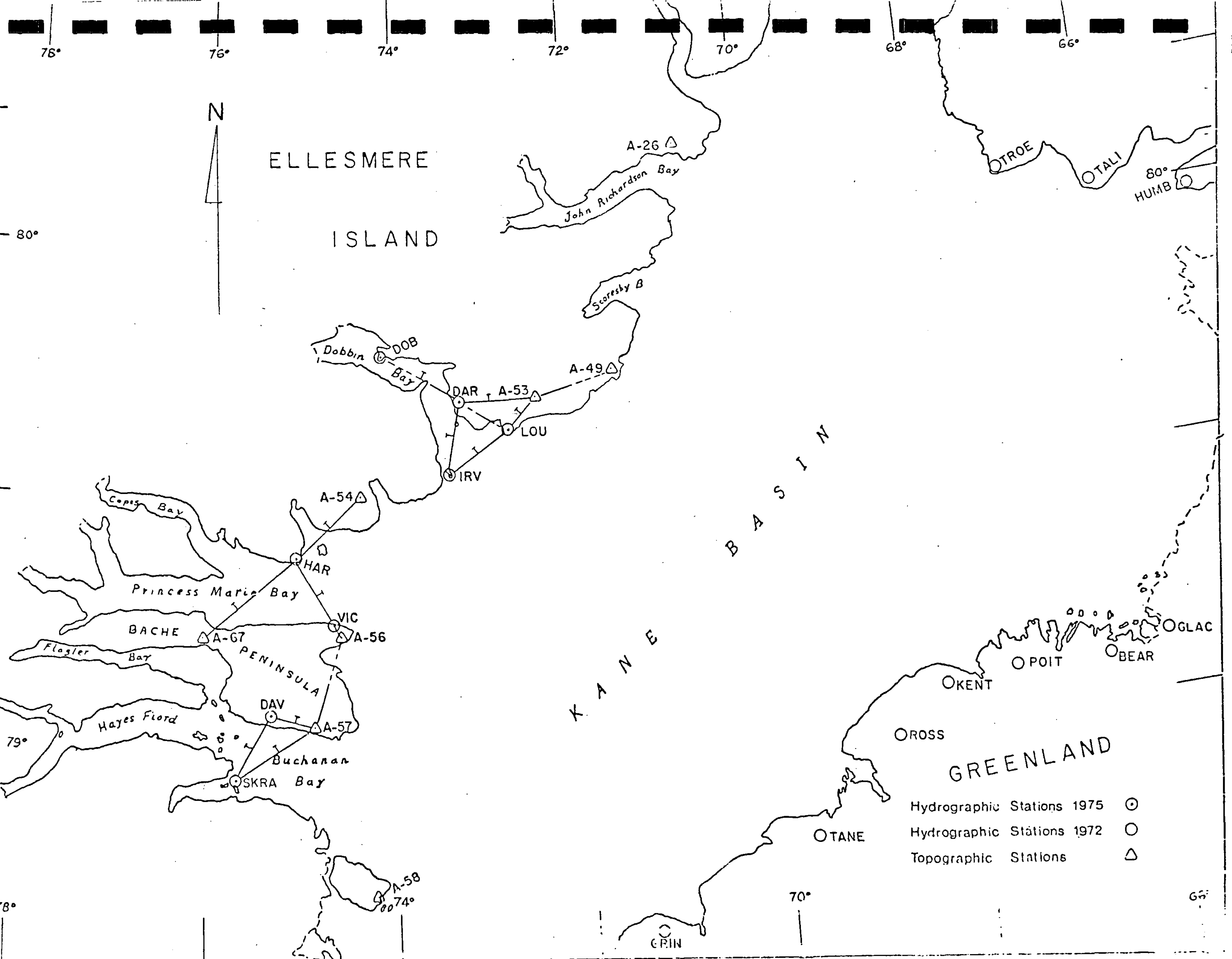
- FIELD SHEET LAYOUT AND AREA SOUNDED -



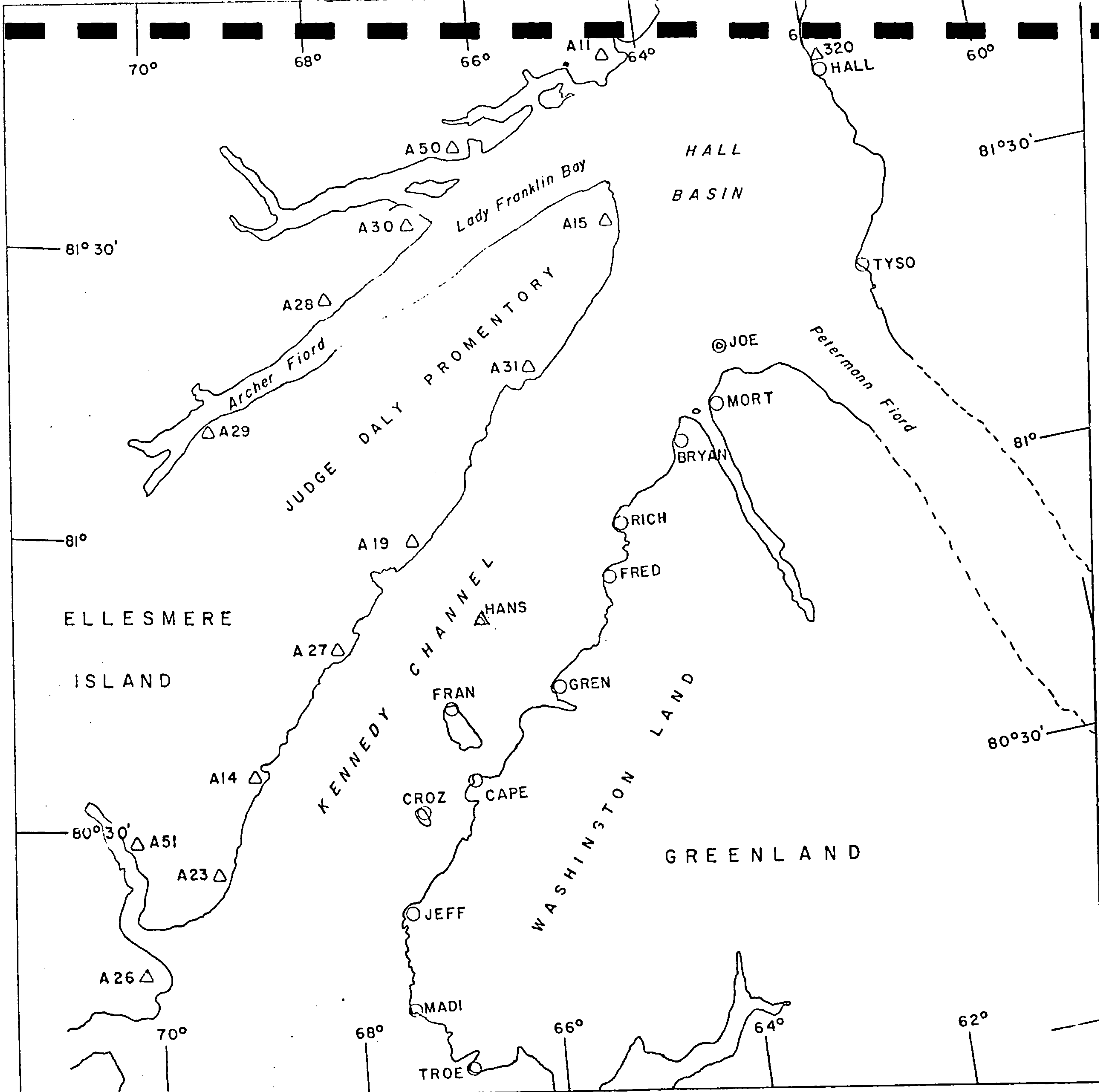
SPOT SOUNDINGS
1975
ELLESMERE ISLAND
GREENLAND
HALL BASIN
KENNEDY CHANNEL
KANE BASIN
F.S. 3698
F.S. 3880
1:200,000
F.S. 3883
1:100,000
F.S. 3882
1:100,000
F.S. 3881
1:200,000
Area Sounded 3 Km grid
Area Sounded 1·5 Km grid
80
82
72
64
82
78
76
72
68
64
78

APPENDIX III

- HORIZONTAL CONTROL -



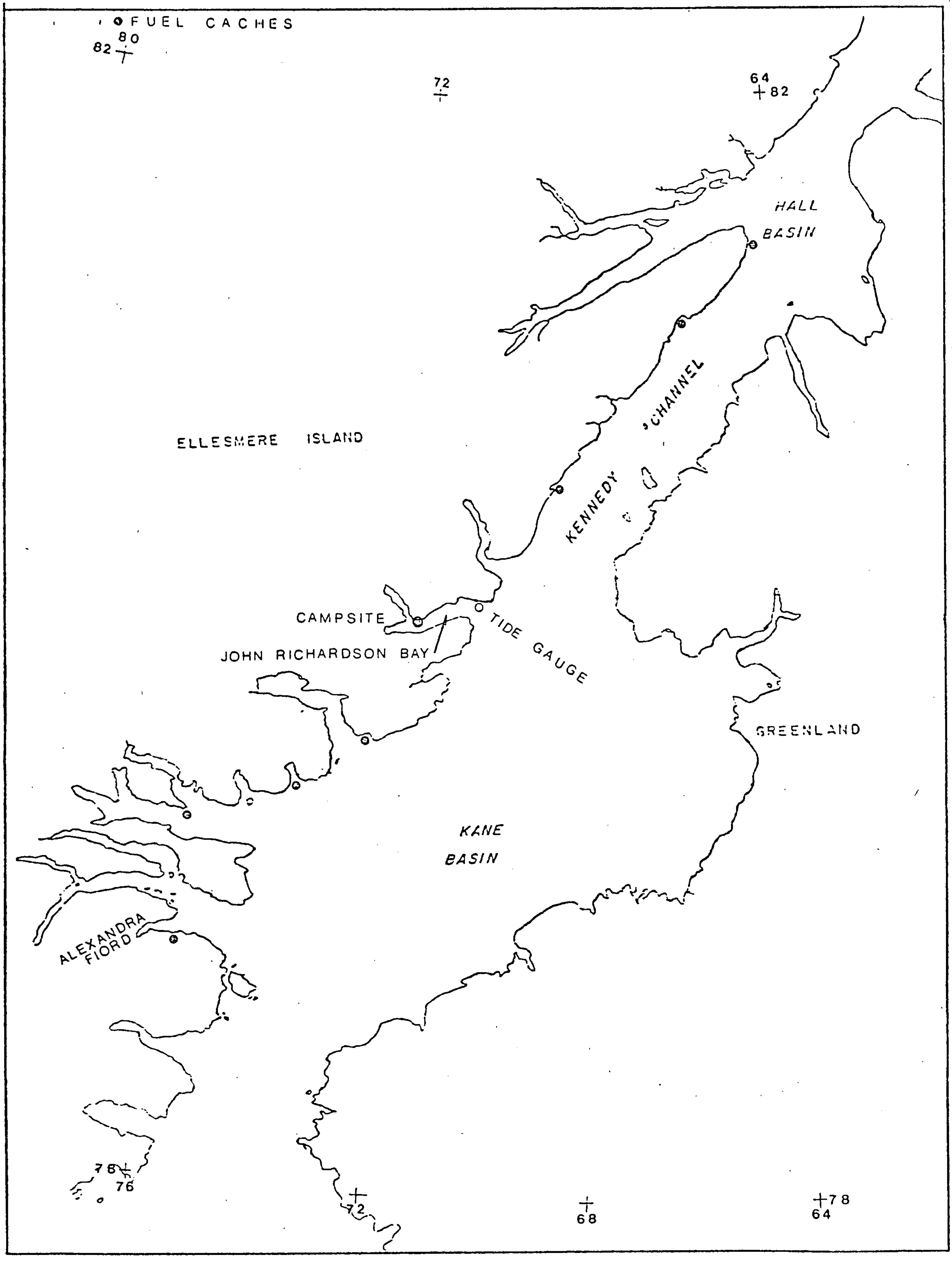
78°
76°
74°
72°
70°
68°
66°
80°
79°
N
ELLESMERE
ISLAND
A-26
John Richardson Bay
TROE
TALI
80°
HUMB
Scoresby B
Dobbin
DOB
Bay
DAR
A-53
A-49
LOU
IRV
A-54
Copes Bay
HAR
Princess Marie Bay
VIC
BACHE
A-67
A-56
Flagler Bay
PENINSULA
DAV
A-57
Hayes Fiord
Buchanan
SKRA
Bay
A-58
74°
KANE BASIN
GLAC
BEAR
POIT
KENT
ROSS
GREENLAND
TANE
70°
GRIN
Hydrographic Stations 1975
Hydrographic Stations 1972
Topographic Stations



70°
68°
66°
A11
64°
320
HALL
60°
A50
HALL
BASIN
81°30'
Lady Franklin Bay
A30
A15
81° 30'
TYSO
A28
JUDGE DALY PROMENTORY
JOE
Petermann Fiord
Archer Fiord
A31
MORT
A29
BRYAN
81°
RICH
81°
A19
FRED
KENNEDY CHANNEL
HANS
ELLESMERE
ISLAND
A27
GREN
FRAN
WASHINGTON LAND
80°30'
A14
CAPE
CROZ
80°30'
A51
GREENLAND
A23
JEFF
A26
MADI
70°
68°
66°
64°
62°
TROE

APPENDIX IV

- CAMPSITE, FUEL CACHES, AND TIDE GAUGE LOCATIONS -



FUEL CACHES
80
82
72
64
82
HALL
BASIN
KENNEDY CHANNEL
ELLESMERE ISLAND
CAMPSITE
TIDE GAUGE
JOHN RICHARDSON BAY
GREENLAND
KANE
BASIN
ALEXANDRA
FIORD
78
76
72
68
78
64

APPENDIX V

- HORIZONTAL CONTROL RECOVERED ON PROPOSED PIPELINE CROSSINGS -

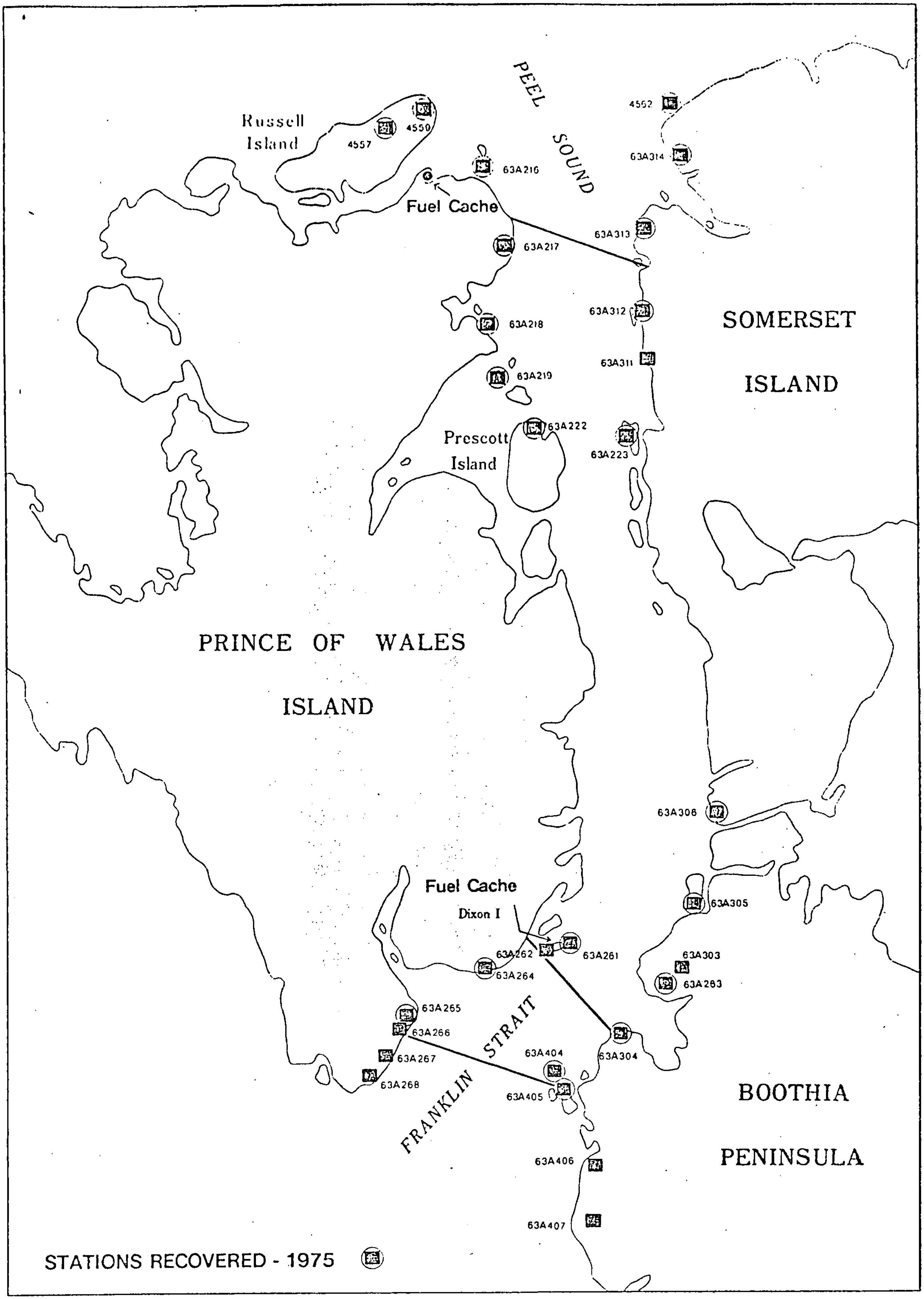


Figure 4. Geodetic Control (Peel Sound and Franklin Strait)

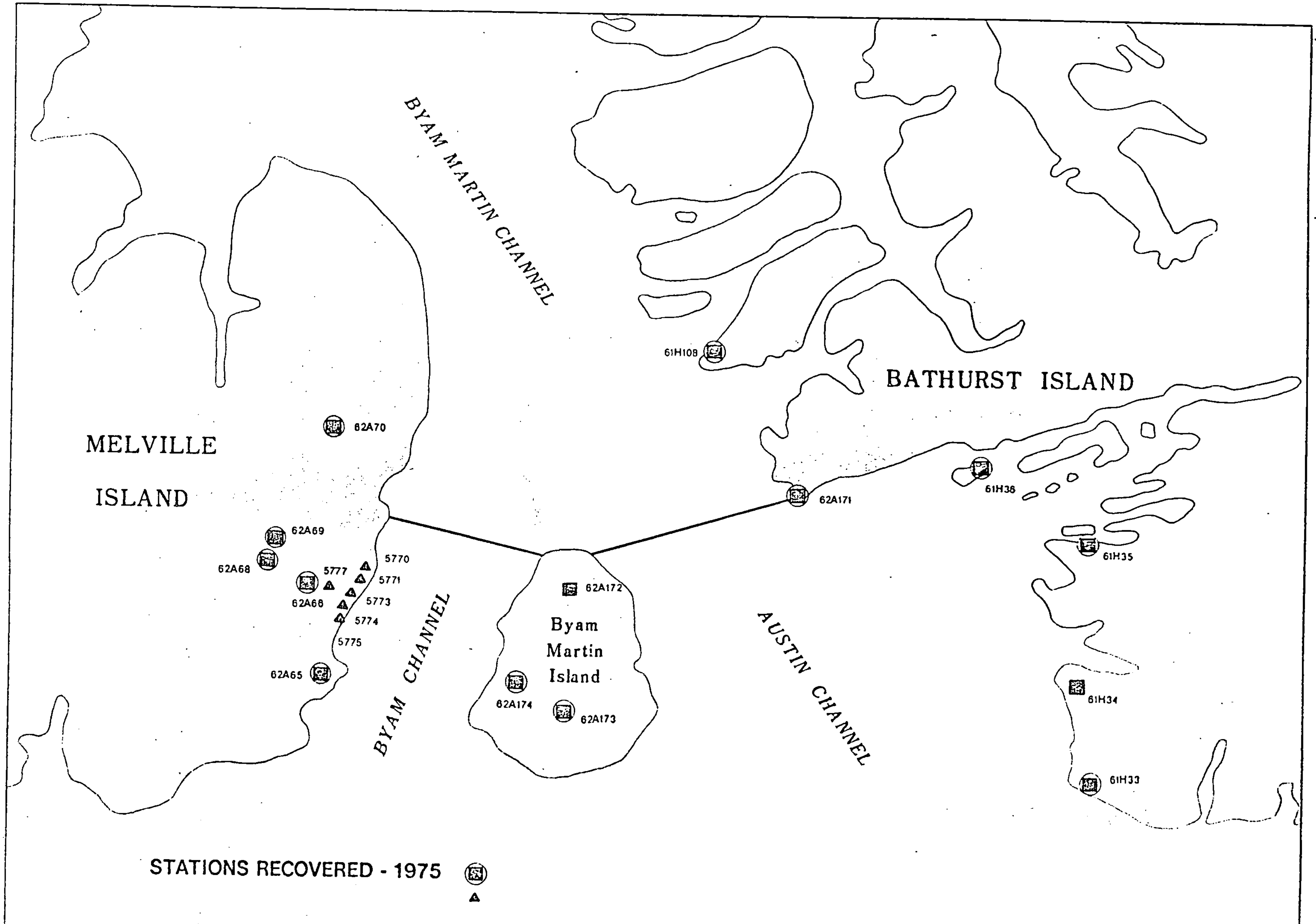


Figure 5. Geodetic Control (Byam and Austin Channels)

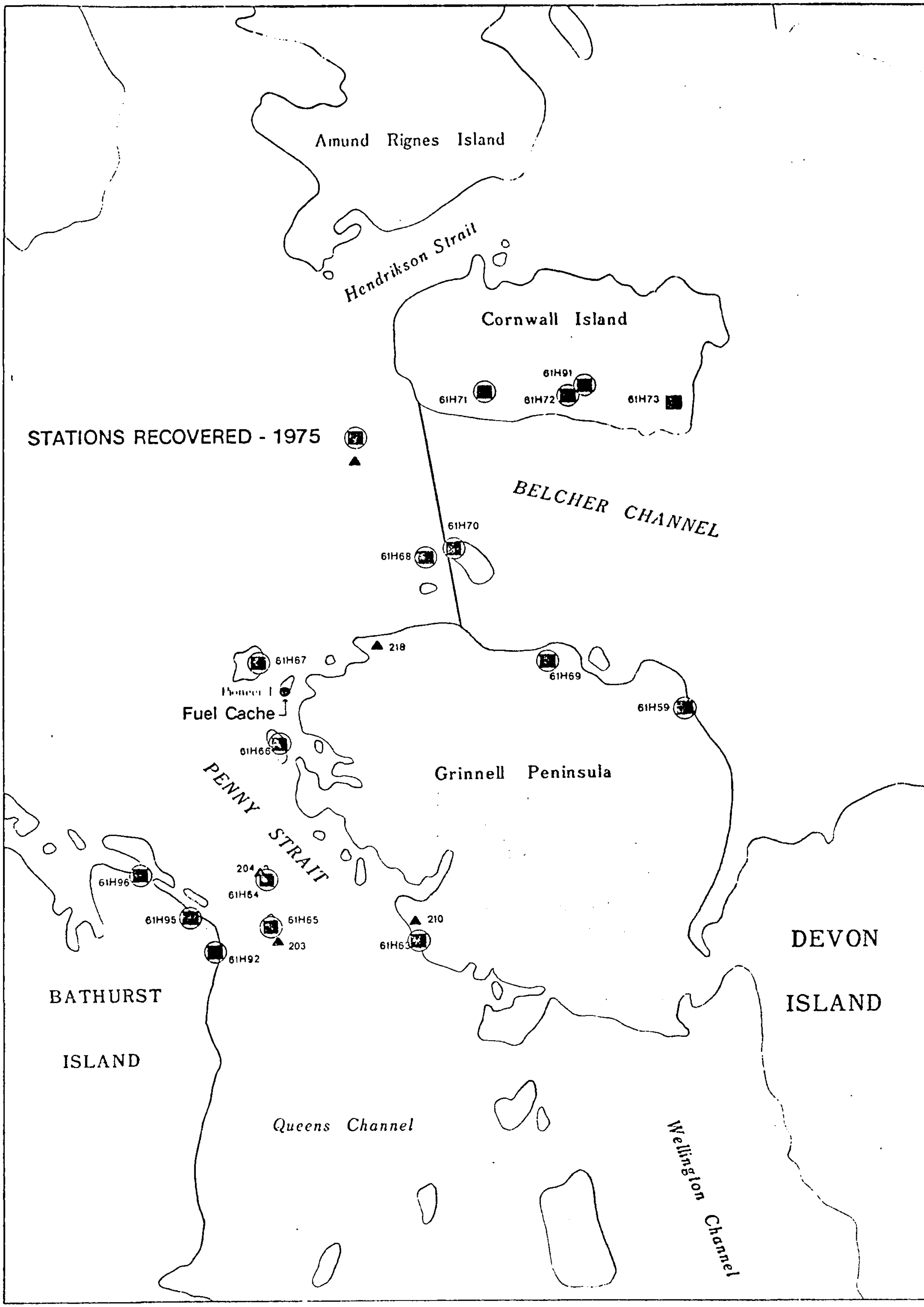
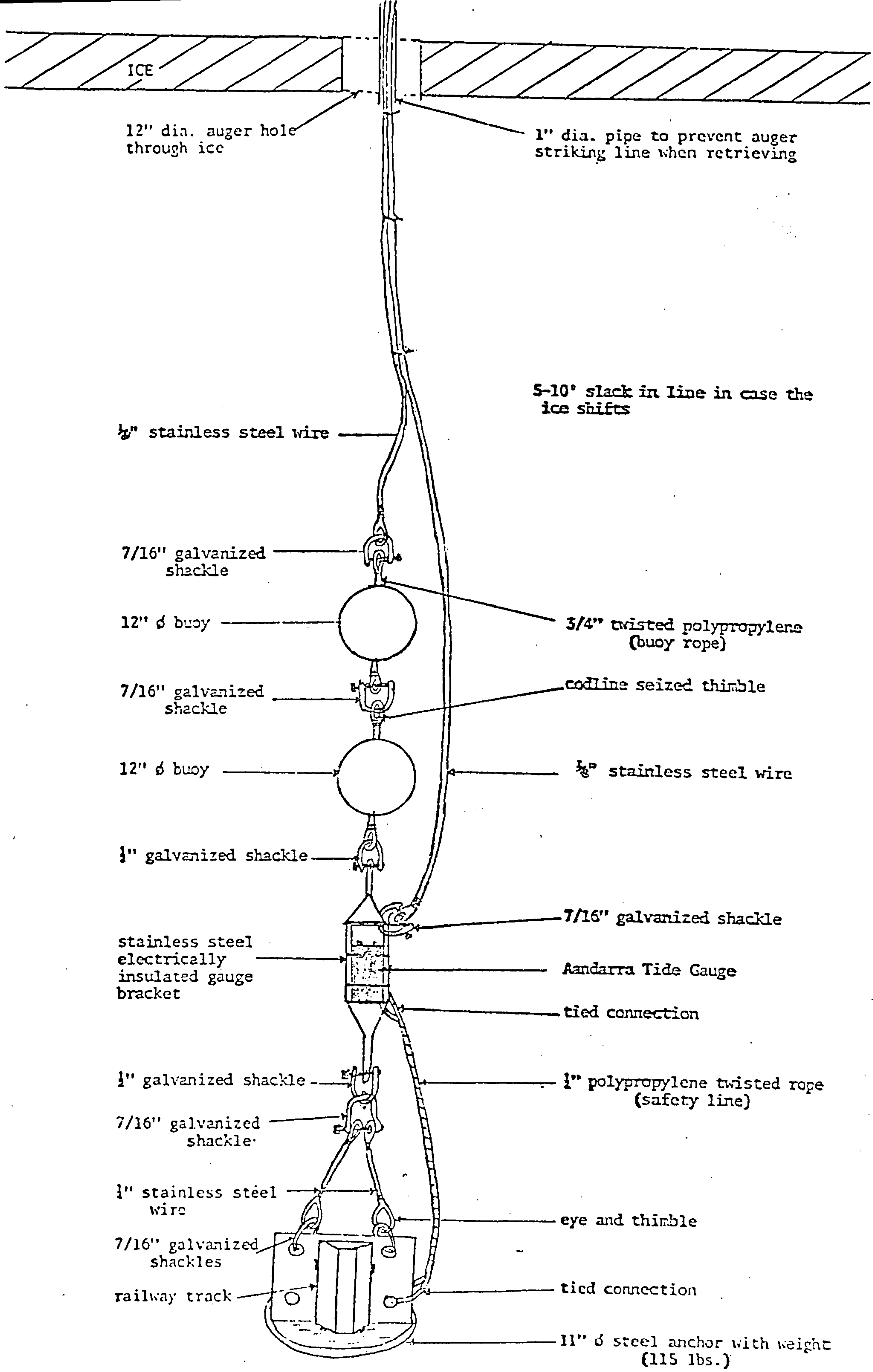


Figure 6. Geodetic Control (Belcher Channel)

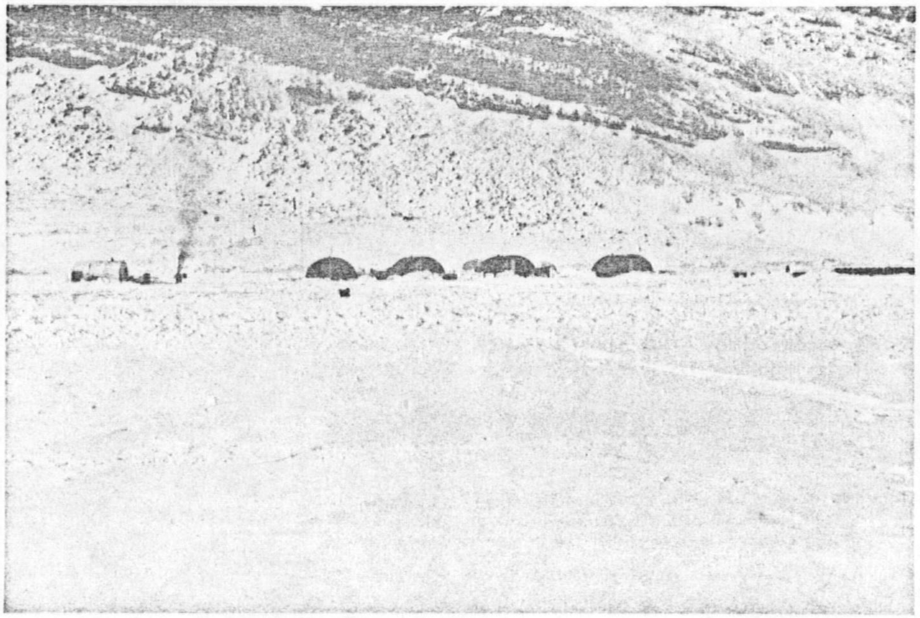
APPENDIX VI

- TIDE GAUGE INSTALLATION -

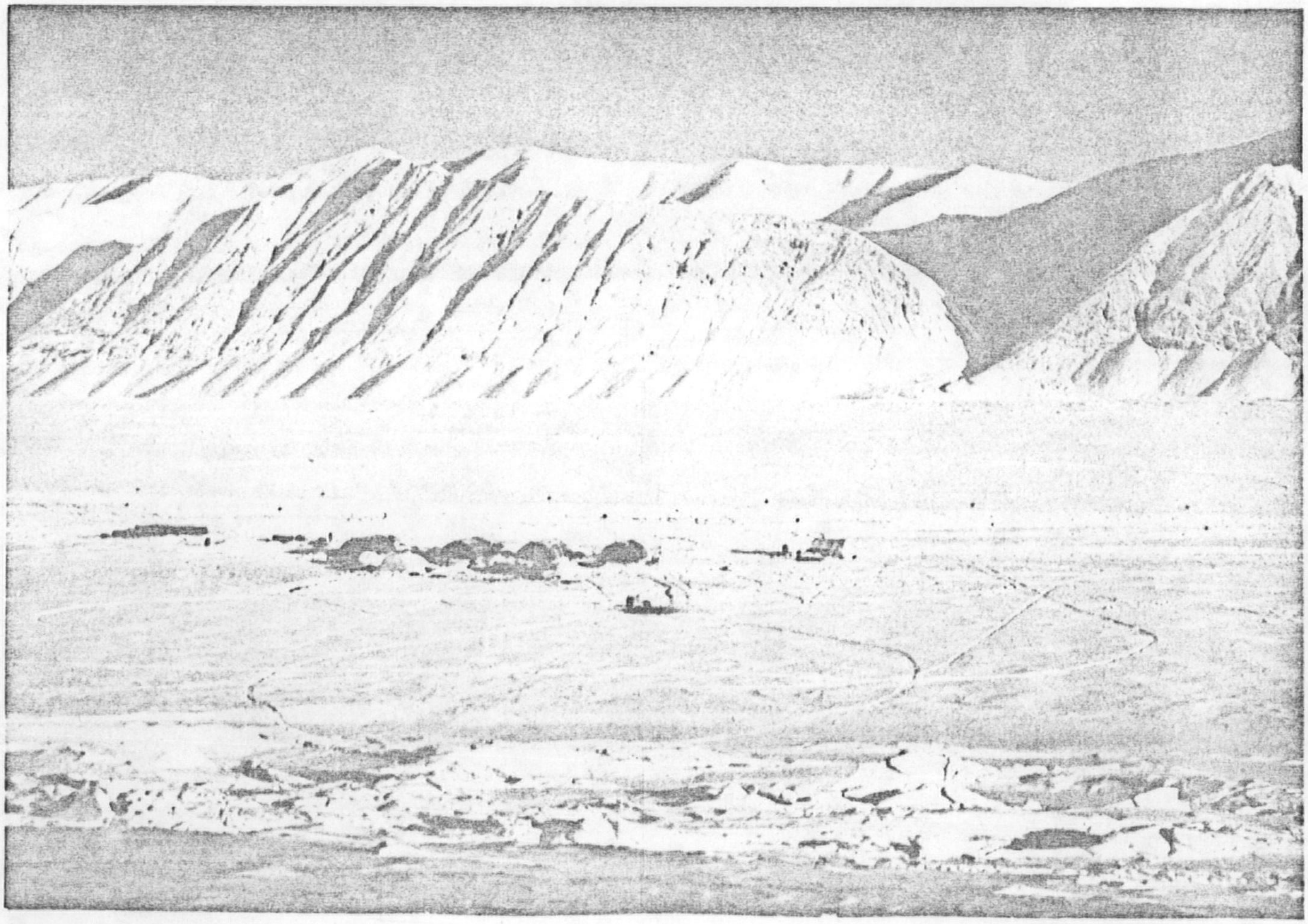

ICE
12" dia. auger hole through ice
1" dia. pipe to prevent auger striking line when retrieving
5-10' slack in line in case the ice shifts
⅛" stainless steel wire
7/16" galvanized shackle
12" ø buoy
3/4" twisted polypropylene (buoy rope)
7/16" galvanized shackle
codline seized thimble
12" ø buoy
⅛" stainless steel wire
½" galvanized shackle
7/16" galvanized shackle
stainless steel electrically insulated gauge bracket
Aandarra Tide Gauge
tied connection
½" galvanized shackle
½" polypropylene twisted rope (safety line)
7/16" galvanized shackle
½" stainless steel wire
eye and thimble
7/16" galvanized shackles
railway track
tied connection
11" ø steel anchor with weight (115 lbs.)

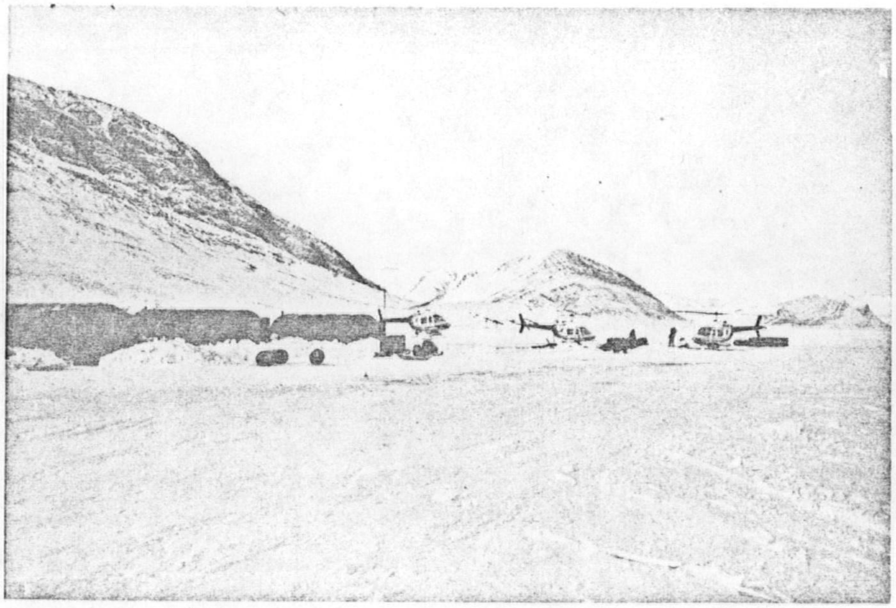
APPENDIX VII

- PHOTOGRAPHS -

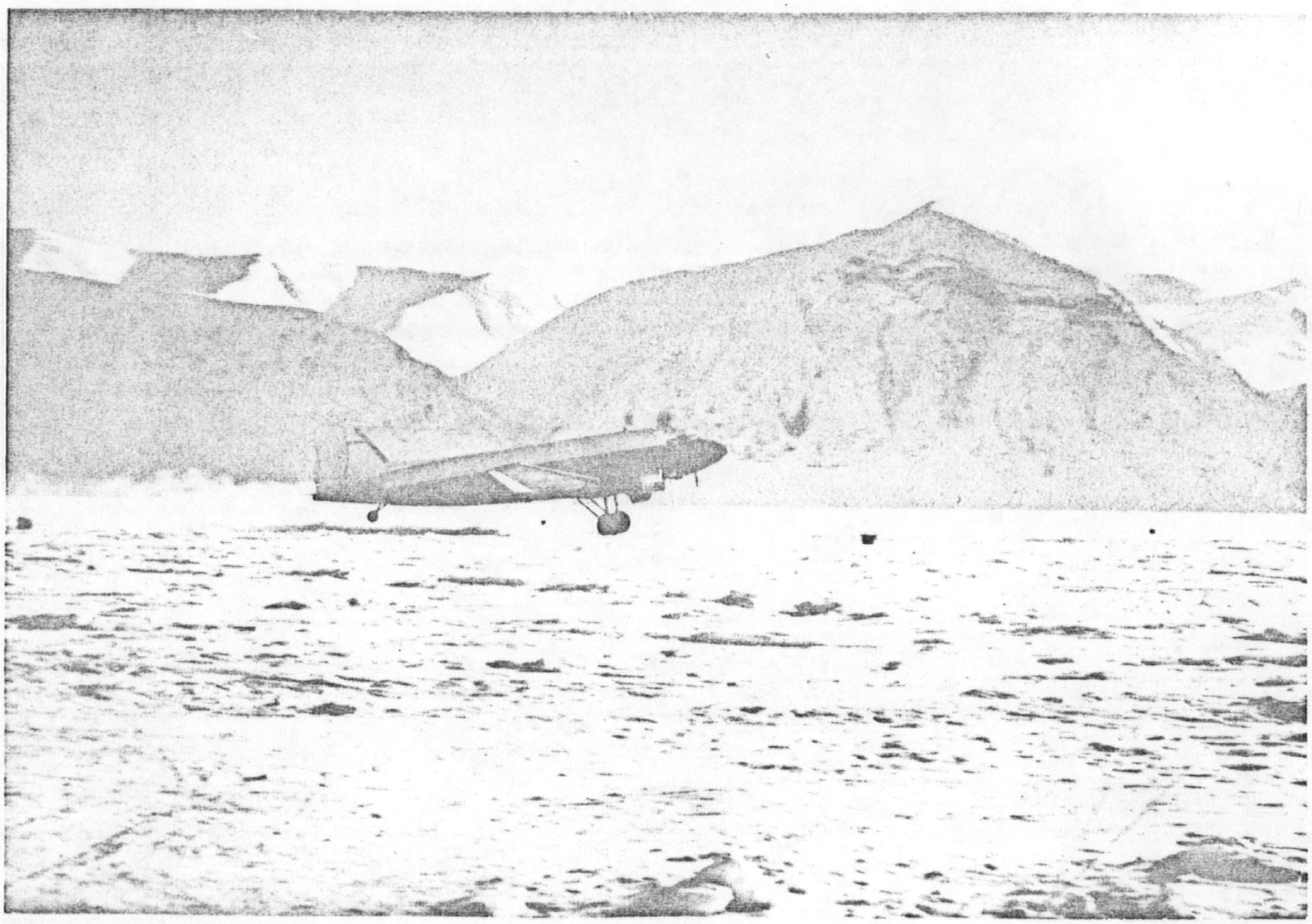


JOHN RICHARDSON BAY CAMP



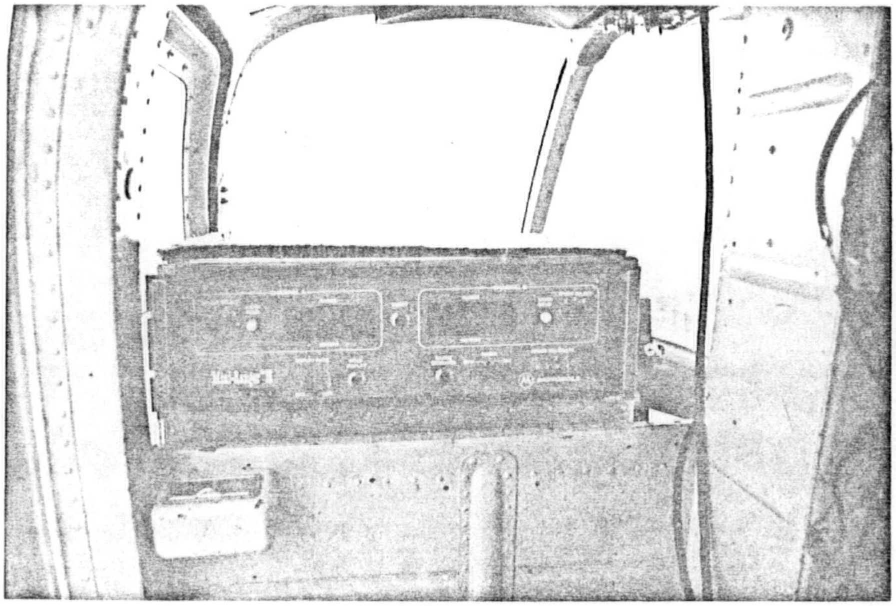


206 B HELICOPTERS

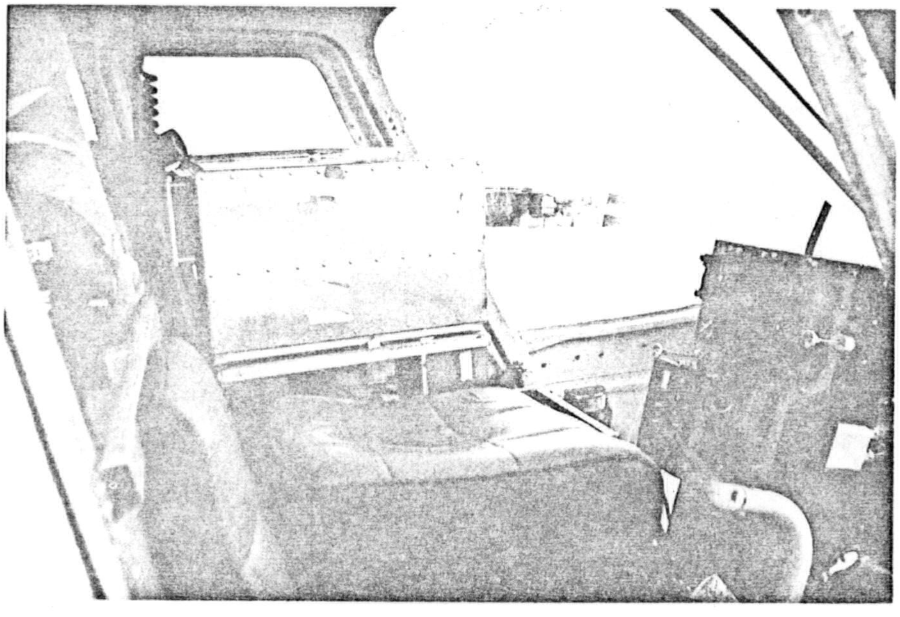


D.C.-3 AIRCRAFT

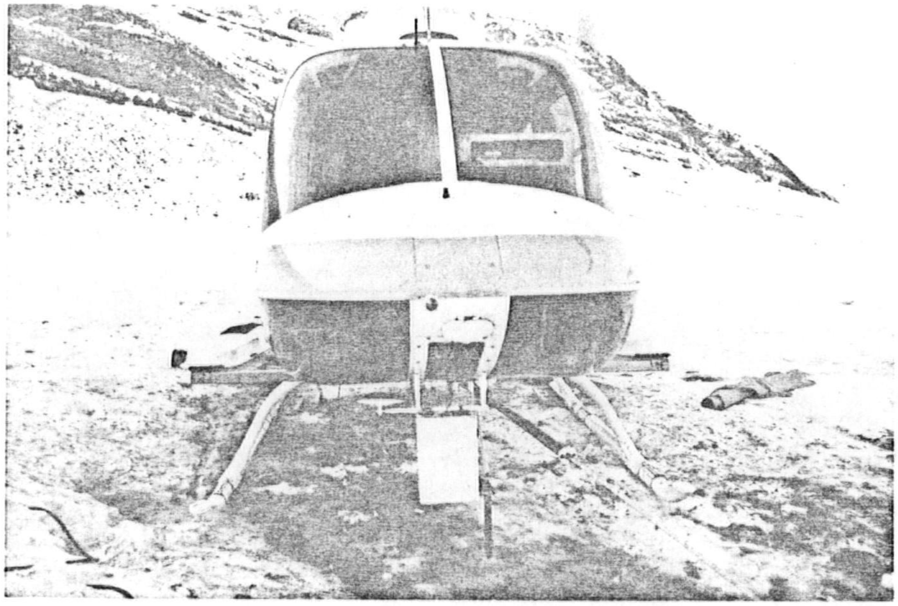
MINI-RANGER SETUP IN 206B HELICOPTER



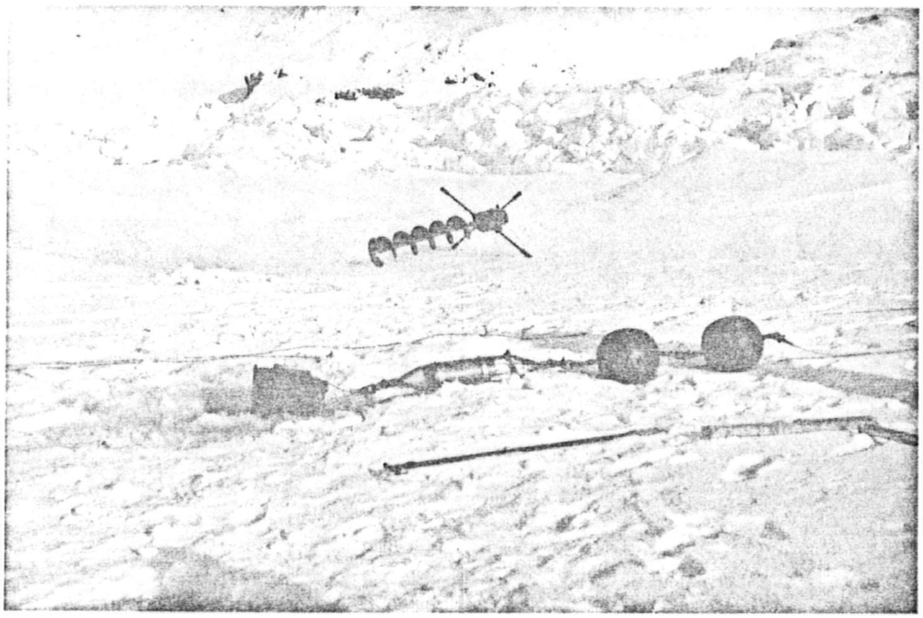
MINI-RANGER CONSUL (LOOKING FROM BACK SEAT)



MINI-RANGER CONSUL HOUSING (LOOKING FROM PILOT'S SEAT)



MINI-RANGER ANTENNA ON 206B



AANDERAA TIDE GAUGE

APPENDIX VII

- WEATHER OBSERVATIONS -

[redacted] WEATHER REPORTS

Ceiling Classification's

A	Aircraft
E	Estimated
P	Precipitation
W	Indefinite

[redacted]

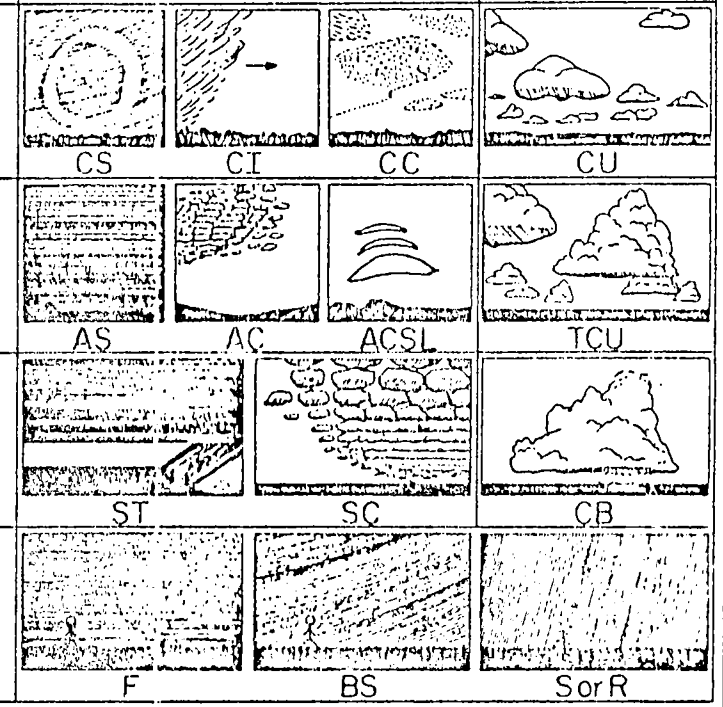
°C	°F	°C	°F
-60	-76	-15	05
-55	-67	-10	14
-50	-58	-05	23
-45	-49	00	32
-40	-40	05	41
-35	-31	10	50
-30	-22	15	59
-25	-13	20	68
-20	-04	25	77

Wind Speed

m/sec	knots	mph
00	00	00
03	04	05
05	10	09
08	15	13
10	20	17
13	25	22
15	30	26
18	35	30
20	40	35

Clouds and Obscuring Phenomena

Standard Height Range	Layer Cloud: Stratoform		Layer Cloud: Cumuloform	Vertically Developed Cloud
40,000 to 20,000 feet	CS	CI	CC	CU
20,000 to 6,500 feet	AS	AC	ACSL	TCU
6,500 to 0 feet	ST		SC	CB
Surface Based	F		BS	S or R



CS-cirostratus, CI-cirus, CC-cirocumulus, CU-cumulus
AS-altostratus, AC-altocumulus, ACSL-lenticular altocumulus
NS-nimbostratus, SC-stratocumulus, SF-stratusfractus, TCU-towering cumulus
ST-stratus, BS-blowing snow, CF-cumulusfractus
F-fog, S-snow, R-rain, CB-cumulonimbus

[redacted]

CIG	Ceiling
CLR	Clear
DFTG	Drifting
DMLY	Dimly
F PTCH	Fog Patch
F BNK	Fog Bank
FROIN	Frost Indicator
INTMT	Intermittent
INVDG	Invading
LFTG	Lifting
LWR	Lower
MOVG	Moving
OCNL	Occasion
PIREP	Pilot Report
QUAD	Quadrant
SNW	Snow
VRBL	Variable
VSBY	Visibility

Sky Symbol

○	Clear
⦶	Scattered
◍	Broken
⊕	Overcast
–X	Partially Obscured
X	Obscured

Weather and Obstruction To Vision

L	Drizzle
ZL	Freezing Drizzle
R	Rain
ZR	Freezing Rain
RW	Rain Showers
S	Snow
SW	Snow Showers
SP	Snow Pellets
SG	Snow Grains

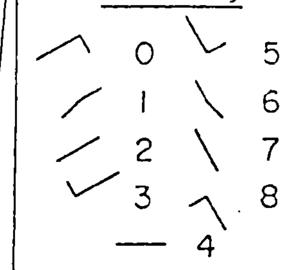
very light	light	moderate	heavy
--	-		+

F	Fog
IF	Ice Fog
IC	Ice Crystals
BS	Blowing Snow

Wind Direction

N	= 36
NNE	= 02
NE	= 04
ENE	= 07
E	= 09
ESE	= 11
SE	= 13
SSE	= 16
S	= 18
SSW	= 20
SW	= 22
WSW	= 25
W	= 27
WNW	= 29
NW	= 32
NNW	= 34

Tendency



Date (LST) 27	Hour (LST) 28	Hour (GMT) 30	Sky Condition and/or Ceiling (100's ft.) 31	Visibility (miles) 32	Weather and Obstructions To Vision 33	Sea-level Pressure (mb) 34	Dry Bulb Temperature (°F) 35	Dew Point Temperature (°F) 36	Wind Dir. 00 to 36 37A	Wind Speed (mph) 38	Wind Character 39	Altimeter Setting (in) 40	Clouds and/or Obscuring Phenomena Type, Amount 41	Remarks 42	Max Temperature (°F)	Min Temperature (°F)	Precipitation (1/100's in.)	Tendency 43
0 1	0 8	1 3	O	15+	IC	0 1 4	- 1 0	- 1 2	0 0	0 0		0 0 8		F BNK W OVR BAY	- 0 1	- 0 5		
0 9	0 8	1 3	E 5 ⊕	10	S--	9 9 2	0 7	0 5	3 6	1 0		9 8 8	ST 10	CIG LWR W	1 0	0 6	0 2	
0 9	1 9	0 0	5 ⦶ A10 ◍ 100 ⊕	45		9 9 8	0 8	0 5	0 9	1 5	G 20	9 9 2	ST3 SC4 AC3	DFTG SNW, SUN DMLY VSBL				6 0 2
1 5	0 8	1 3	-X E 150 ⊕	1V	F	9 8 9	2 0	2 0	1 8	2 0	E		F4 AS3	VSBY VRBL 1/2-3	2 5	1 5		

AVIATION WEATHER REPORTS

STATION ________ MONTH ________ YEAR ________ LOCAL TIME ________

Date (LST) 27	Hour (LST) 28	Hour (GMT) 30	Sky Condition and/or Ceiling (100's ft.) 31	Visibility (miles) 32	Weather and Obstructions To Vision 33	Sea-level Pressure (mb) 34	Dry Bulb Temperature (°F) 35	Dew Point Temperature (°F) 36	Wind Dir. 00 to 36 37A	Wind Speed (mph) 38	Wind Character 39	Altimeter Setting (in.) 40	Clouds and/or Obscuring Phenomena Type, Amount 41	Remarks 42	Max Temperature (°F)	Min Temperature (°F)	Precipitation (1/100's in.)	Tendency 43
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]	[illegible]				Time = +6 Zulu				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]		Time = +5 Zulu				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]			[illegible]		IF to the West				

[illegible]

AVIATION WEATHER REPORTS

STATION________ MONTH [illegible] YEAR [illegible] LOCAL TIME [illegible]

Date (LST) 27	Hour (LST) 28	Hour (GMT) 30	Sky Condition and/or Ceiling (100's ft.) 31	Visibility (miles) 32	Weather and Obstructions To Vision 33	Sea-level Pressure (mb) 34	Dry Bulb Temperature (°F) 35	Dew Point Temperature (°F) 36	Wind Dir. 00 to 36 37A	Wind Speed (mph) 38	Wind Character 39	Altimeter Setting (in.) 40	Clouds and/or Obscuring Phenomena Type, Amount 41	Remarks 42	Max Temperature (°F)	Min Temperature (°F)	Precipitation (1/100's in.)	Tendency 43
[illegible]	[illegible]	[illegible]	X	1/4		31	-2[illegible]		[illegible]			[illegible]	1F					
[illegible]	[illegible]	13	X	1/2		[illegible]	-21			[illegible]		34	[illegible] 1F					
[illegible]	[illegible]	[illegible]	X	2		38	-2[illegible]		[illegible]	3		40	[illegible] 1F					
[illegible]	[illegible]	3	-X	4		3[illegible]	[illegible]		[illegible]			43	[illegible]					
[illegible]	[illegible]	[illegible]	O	+15		30	-23			0		[illegible]						
31	[illegible]	10	O	+15		[illegible]	-2[illegible]		[illegible]6	3		34		CAVU				
3[illegible]	08	13	O	+15		29	-33		[illegible]	3		23		CAVU				
3[illegible]	[illegible]	[illegible]	O	+15		[illegible]	-40			0		98[illegible]						

[redacted]

AVIATION WEATHER REPORTS

STATION [illegible] MONTH [illegible] YEAR [illegible] LOCAL TIME [illegible]

Date (LST) 27	Hour (LST) 28	Hour (GMT) 30	Sky Condition and/or Ceiling (100's ft.) 31	Visibility (miles) 32	Weather and Obstructions To Vision 33	Sea-level Pressure (mb) 34	Dry Bulb Temperature (°F) 35	Dew Point Temperature (°F) 36	Wind Dir. 00 to 36 37A	Wind Speed (mph) 38	Wind Character 39	Altimeter Setting (in.) 40	Clouds and/or Obscuring Phenomena Type, Amount 41	Remarks 42	Max Temperature (°F)	Min Temperature (°F)	Precipitation (1/100's in.)	Tendency
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]		[illegible]						
		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]							[illegible]				
			[illegible]	[illegible]		[illegible]	[illegible]					[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]					[illegible]						
[illegible]		[illegible]		[illegible]		[illegible]	[illegible]					[illegible]		[illegible]				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]						
[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]		[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
				[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
				[illegible]		[illegible]	[illegible]			[illegible]		[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]					[illegible]						
[illegible]			[illegible]	[illegible]		[illegible]	[illegible]					[illegible]						
			[illegible]			[illegible]						[illegible]						
	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]					[illegible]						
		[illegible]	[illegible]	[illegible]		[illegible]						[illegible]						
	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]					[illegible]						
			[illegible]			[illegible]												
	[illegible]	[illegible]		[illegible]		[illegible]						[illegible]						
			[illegible]	[illegible]		[illegible]	[illegible]											
	[illegible]		[illegible]	[illegible]								[illegible]						
			[illegible]	[illegible]														
				[illegible]														
				[illegible]		[illegible]												

John Richardson [illegible]

AVIATION WEATHER REPORTS

STATION ______ MONTH ______ YEAR ______ LOCAL TIME +5 Z[illegible]

Date (LST) 27	Hour (LST) 28	Hour (GMT) 30	Sky Condition and/or Ceiling (100's ft.) 31	Visibility (miles) 32	Weather and Obstructions To Vision 33	Sea-level Pressure (mb) 34	Dry Bulb Temperature (°F) 35	Dew Point Temperature (°F) 36	Wind Dir. 00 to 36 37A	Wind Speed (mph) 38	Wind Character 39	Altimeter Setting (in.) 40	Clouds and/or Obscuring Phenomena Type, Amount 41	Remarks 42	Max Temperature (°F)	Min Temperature (°F)	Precipitation (1/100's in.)	Tendency 43
[illegible]	[illegible]	[illegible]	C	+15		[illegible]	-21			0		[illegible]		CAVU				
[illegible]	[illegible]	[illegible]	C	+15		[illegible]	-22					[illegible]		CAVU				
	[illegible]	[illegible]	OS 4 12000 4/10	+15		[illegible]	-26			10		[illegible]		CAVU				
	[illegible]		C	+15		[illegible]	-26					[illegible]		CAVU				
[illegible]	[illegible]			+15		[illegible]	[illegible]					[illegible]		CAVU				
[illegible]	[illegible]		C	+15		18	-2[illegible]			0		[illegible]		CAVU				
[illegible]	[illegible]			+15		[illegible]	[illegible]			[illegible]		[illegible]		CAVU				
[illegible]	[illegible]		C	+15		20	-26			[illegible]		[illegible]		CAVU				
	[illegible]		OS 4 2/10 12,000	+15		[illegible]	[illegible]			[illegible]		[illegible]		CAVU				
[illegible]	[illegible]		C	+15		16	-23			[illegible]		[illegible]		CAVU				
[illegible]	[illegible]		C	+15		16	-2[illegible]			[illegible]		[illegible]		CAVU				
[illegible]			C	+15		1[illegible]	[illegible]			[illegible]		[illegible]		CAVU				
[illegible]			C	+15		[illegible]	[illegible]			[illegible]		[illegible]						