FINAL REPORT

DOCUMENTATION OF SUMMER NOGAP ACTIVITIES

July 22 - August 25, 1990

Prepared for: Geological Survey of Canada
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HGR Project No.: 90-6

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Preface

This report describes field work undertaken as part of the Northern Oil and Gas Action Program funded through Indian and Northern Affairs Canada. The primary objective of the program is to provide government regulatory agencies with information required to plan and control resource development in the Canadian Beaufort Sea. The role of the Geological Survey of Canada is to provide adequate understanding of the distribution of physical and geotechnical properties of geological materials and processes which occur in the nearshore and coastal regions.

The location of this study was chosen in consultation with other government agencies and with industry in order to focus on areas which are most likely to see development first. In addition, specific sites were chosen so that a more generic understanding of the processes acting in the area can be achieved. Permission to use data from cliff retreat sites in the area has been given by Gulf Canada Resources.

The field work described herein was performed under the direction of a contract geologist and has been reviewed by personnel of the Atlantic Geoscience Centre. The report is part of an ongoing series of Open File releases which are based solely or in part on NOGAP funded research. A second Open File is being released which describes the summer 1990 field work undertaken under NOGAP along the Tuktoyaktuk Peninsula.

Please note that this release includes 128 colour slides some of which are referred to in the text. These slides can be reproduced at an additional cost when requested.

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EXECUTIVE SUMMARY

A field program was carried out between July 22 and August 25, 1991, with the objective of surveying the coastline of the area between North Head and the Reindeer Islands in the Canadian Beaufort Sea region. The study focused on the embayment between North Head and Reindeer Island, informally named Pipeline Harbour. During the month-long program, beach profiles were measured at 20 sites that were considered representative of the different sub-environments of the shoreline, with three profiles being re-measured to evaluate short term changes. A video monitoring station was established at one site to observe wave activity and sediment transport processes. A range of beach types were observed from barred dissipative beaches on the exposed northern coastlines to broad sand/mud flats in the inner harbour. Two major spit systems, Wolfe Spit, to the east of North Head, and the Pullen Island spit were surveyed in detail. This report documents the measured profiles and contains descriptions of each site.

A sounding and sidescan sonar survey was attempted in the nearshore portion of the study area, using Zodiac inflatable boats. A bathymetric map was compiled for the area seaward of the embayment entrance. Various features were observed on the sidescan records, including sedimentary bedforms and outcropping lake bed strata.

Previously established cliff retreat sites on Pelly and Hooper Islands were re-measured and estimates of average retreat rates between 1.15 and 2.93 m/a were obtained for the period 1971 to 1990. New retreat rate sites were established on Pullen Island.

ACKNOWLEDGEMENTS

We would like to thank the other members of the field party, Philip Giles, Don Locke (AGC) and Kirby Fraser (DFO), for efficient and cheerful assistance under sometimes frustrating conditions. We also appreciate the background support of programme coordinators Arnaud Héquette, Don Gillespie and Don Forbes (AGC). John Schemel and Steve Robinson (TSD) shared the camp at times and were both helpful and good company. The vital logistic support of the Polar Continental Shelf Project, in particular the help given by Claude Brunet and Charlie Beaton, was greatly appreciated. We would also like to thank Gary White of the Inuvik Research Centre (Science Institute of the Northwest Territories) for additional support. The sidescan sonar equipment was loaned by Terrain Sciences Division.

The preparation of this report was funded by the Northern Oil and Gas Action Program (NOGAP). Thanks to Steve Solomon for his patience as Scientific Authority.

1.0 INTRODUCTION

In the summer of 1990, a field programme to investigate the coastal geology of the area between North Head and Reindeer Islands (Figure 1), in the Canadian Beaufort Sea, was carried out by personnel from the Geological Survey of Canada and Hill Geoscience Research. The section of the coast included in the survey area is considered to be the most likely location for the landfall of an oil pipeline serving Gulf's Amauligak discovery (Gillie, 1988).

This report was commissioned to document the field activities and preliminary results of the survey programme. It is based on field notes and preliminary data analysis. The survey was carried out at a reconnaissance level due to the size of the area and to logistic constraints. Although aiming to be comprehensive in documenting all the observations and data collected during the survey, the report does not include detailed interpretations. Nevertheless, where the data provoked interesting questions, some preliminary interpretations are presented.

1.1 Objectives of the Field Program

The principal objective of the survey, as presented to Hill Geoscience Research at a meeting on July 16, 1990, was to obtain data from emergent coastal environments and the offshore seabed that facilitate the development of a coastal sediment budget. The study area was loosely defined as extending from North Head, northward to Pullen Island and eastward to the entrance of Hansen Harbour and including the network of islands and embayments in the estuary between them (informally named and referred to here as Pipeline Harbour; Fig. 2). Within this general objective, several specific tasks were detailed:

(i) to establish a video camera monitoring station at a beach site near the entrance to Pipeline Harbour;

(ii) to measure beach profiles along Wolfe Spit and Reindeer Islands (Fig. 2);

(iii) to conduct bathymetric, seismic and sidescan surveys and collect grab samples in the area between Pipeline Harbour and Pullen Island;

(iv) to document sedimentation within Pipeline Harbour, with regard to erosion of the small islands within the estuary and the accumulation of Mackenzie-derived fine-grained sediments;

(v) to resurvey cliff retreat sites on Hooper, Pelly and Garry Islands and re-establish a site on Pullen Island.

1.2 Field Camp

The programme was carried out from a field camp located on the south shore of Hansen Harbour (Fig. 2). This site was selected for its deep water anchorage, suitable for the M/V J. Ross

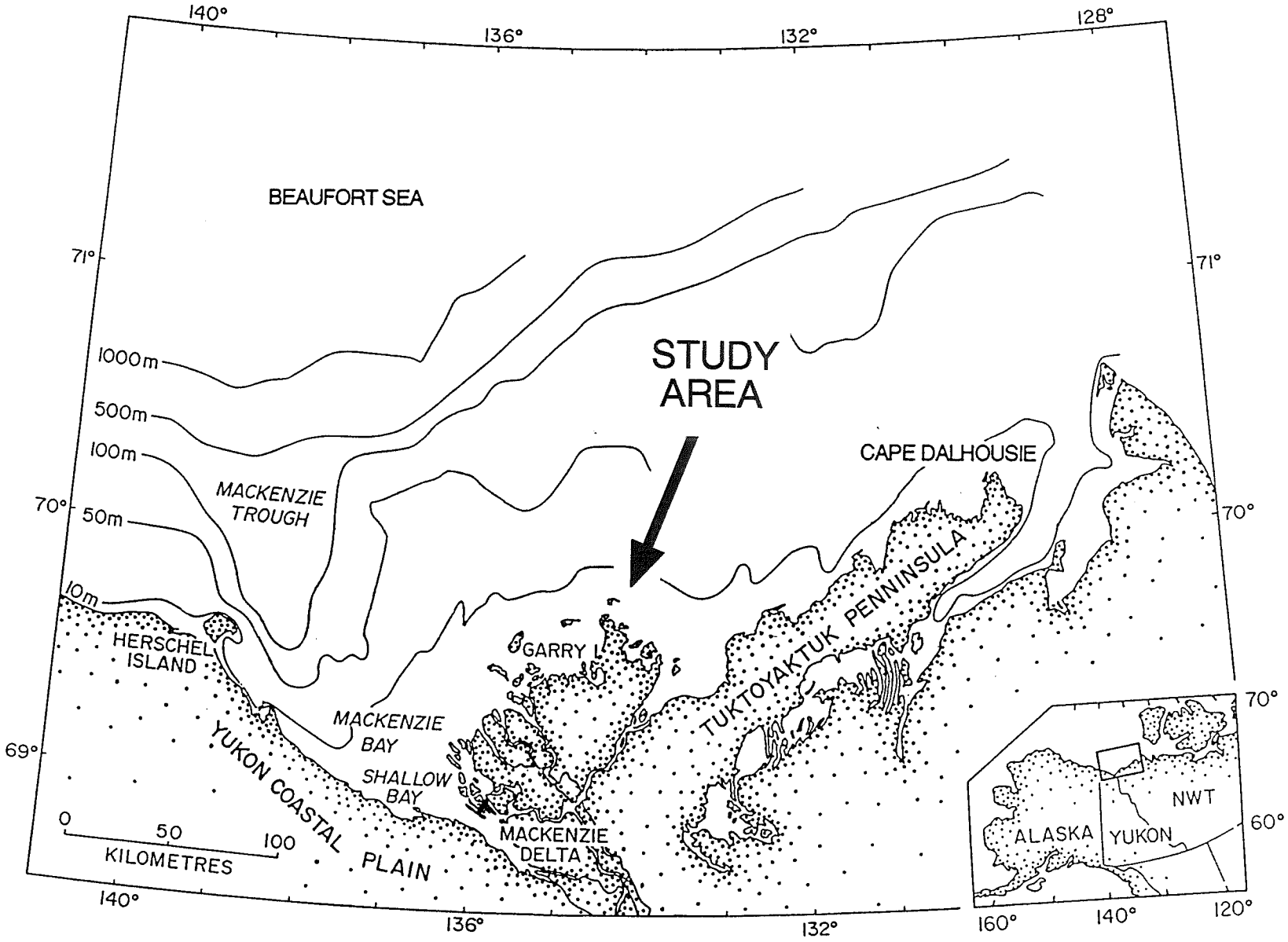

Figure 1. Location of the study area

Mackay and its accessibility to both freshwater and the NOGAP drilling site (Fig. 2). The site was originally occupied by the AGC survey crew, the drilling party and members of the Terrain Sciences field party. The camp was later reduced in size, leaving only the AGC party.

The site proved to be good from all aspects except access to the field area. The trip to Pipeline Harbour by Zodiac took between 0.5 hour and 1 hour, depending on the water level and wave conditions. However, due to the ubiquitous presence of mudbanks in much of Pipeline Harbour and the absence of standing water on the accessible islands, there do not appear to be any better options for camp sites.

1.3 Personnel

Dave Frobel	Atlantic Geoscience Centre	Marine Technician
Philip Giles	Atlantic Geoscience Centre	Student Assistant
Phil Hill	Hill Geoscience Research	Contractor
Don Locke	Atlantic Geoscience Centre	Electronics Technician
Kirby Fraser	Bedford Institute of Oceanography	Coxswain

1.4 Field Methods

1.4.1 Vessels

The original plan was to mobilize the M/V J. Ross Mackay, a 40-ft vessel owned by the GSC. The"Mackay"" was to be used as a means of transport for the field party to beach survey sites, and as a survey vessel for the bathymetric, seismic and sidescan portions of the field work. Due to the numerous mechanical problems experienced by the "Mackay"", it was never available for these functions and alternative means of transportation and surveying had to be found. The only remaining option was to use inflatable Zodiacs. Although fast and capable of performing the transportation role, the Zodiacs were considered to be safe for operations in the offshore only under calm conditions. Both safety and survey quality deteriorated rapidly as the wind and waves increased. There was therefore a limit to the amount of offshore survey work that could be completed without the "Mackay".

Nevertheless , echo sounding, sidescan sonar surveys and grab sampling were successfully carried out from the Zodiacs. When sounding and sampling only were planned, a single Zodiac was used. When sidescan sonar was to be carried out, a second zodiac, containing the sidescan deck unit, was towed behind the first, with the sidescan fish towed in turn behind it. The equipment layout for these operations is shown in Figure 3.

In the very shallow water between Pipeline Harbour and Hansen Harbour, there was a problem of navigation with the outboard motors becoming grounded frequently. At low water, passage was almost impossible, even with the short shaft motor. This gave rise to a considerable

loss of time on several days and highlights again the problems caused by the loss of the "Mackay". The larger vessel could have been used to go around Reindeer Islands at times when the water level was low and the wind sufficient to prevent passage of the Zodiacs on the open sea. It is strongly recommended that all Zodiacs in future be equipped with short shaft outboard motors.

1.4.2 Positioning

Two systems were used for positioning of the vessels and survey profiles. A Geodimeter 1404 infra-red electronic total station survey instrument was used for short range positioning, particularly beach and nearshore profiles. The Geodimeter system provides accurate distance, horizontal angle and vertical angle for each position of a range pole-mounted prism. Data were stored during the day in the portable memory (Geodat 124) and transferred to a Macintosh computer each evening for calculations of positions and elevations. The system performed well throughout the programme, except on days with poor visibility.

For offshore work, a Miniranger microwave navigation system was used. Four microwave transmitters were set up at the start of the survey in order to provide maximum coverage for the study area and to minimize the need for repositioning during the survey (Fig. 2). It was necessary to reposition one of the transmittters (station MR2 moved to MR2A) to facilitate survey work inside Pipeline Harbour. Station MR1 on Pullen Island was accurately positioned with respect to existing benchmarks and features on the island. The remaining stations were positioned with respect to the Pullen Island benchmarks. The coordinates of the miniranger stations are given in Table 1.

Table 1 Coordinates of Miniranger Stations

Station	**Northing**	**Easting**
MR1	7740855	523395
MR2A	7732402	527889
MR3	7729120	531969
MR4	7732942	526200

The miniranger receiver was mounted on a mast, secured by guy lines to the Zodiac (Fig. 4). Underway positioning was maintained by noting ranges from the digital read-out on the Miniranger console and marking the sounder and sidescan records simultaneously. As the sidescan recorder was located in a second Zodiac (Fig.3), the fix was announced by the navigator using a walkie-talkie system. The Miniranger system worked well throughout the program although the batteries at each transmitter had to be changed every 4-5 days. Because the receiver

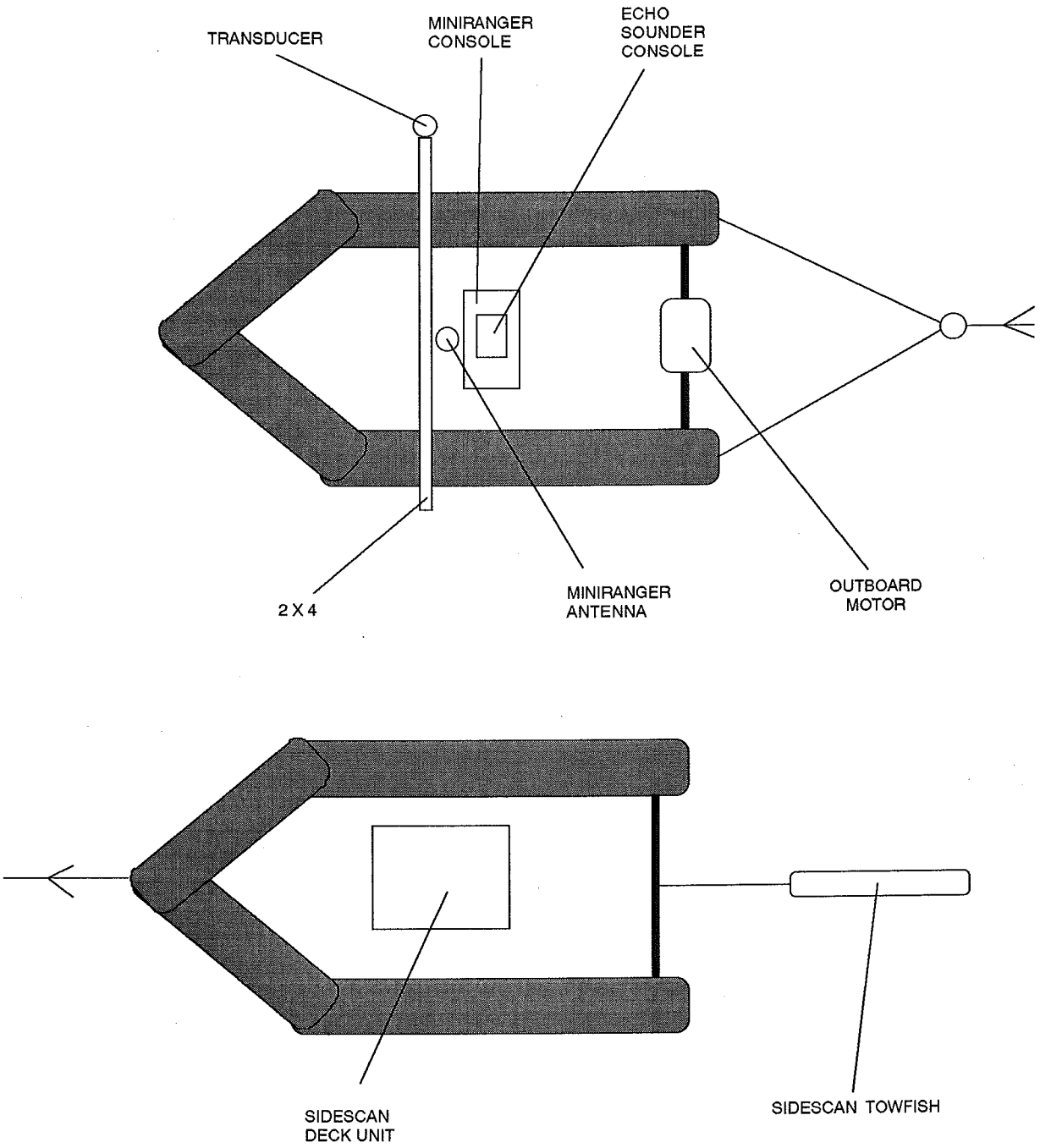

Figure 3. Equipment configuration in the Zodiacs (not to scale).

Figure 4. Photo of sounding Zodiac.

could only display two ranges at a time, there are unavoidable inaccuracies involved in obtaining the third range reading. The error involved is estimated to be approximately 5 metres.

1.4.3 Beach and Nearshore Profiles

As described above, the beach and nearshore profiles were measured using the Geodimeter system. For each profile, a line perpendicular to the shoreline was established using steel or wooden markers and orange flagging. The backshore portions of the surveys were measured from a point above the bluff or in the lagoon behind the beach and extended in the foreshore to approximately 1 metre water depth (wading depth). The nearshore portions of the surveys were carried out along the extension of the same profiles using a Zodiac with the Geodimeter prism mounted on the mast. The presence of a current and wind drift caused problems with steering a straight line. Inevitably, the profile line was less than perfectly straight.

1.4.4 Depth Sounding

The depth sounder was a Raytheon 719B system with a side-mounted transducer. The transducer was mounted on a wooden boom within 1 metre of the Miniranger receiver and Geodimeter prism. An inventory of sounding rolls is provided in Table 2.

1.4.5 Sidescan Sonar

The EG&G portable sidescan system was borrowed from Terrain Sciences Division to facilitate sidescan work from the Zodiacs. The sidescan fish was towed from the stern of the second Zodiac after removal of the outboard motor. This configuration was quite workable, although it required care during turns to avoid snagging the tow rope in the propellor of the first Zodiac. An inventory of sidescan profiles is included in Table 2. The largest problem in the operation was the extremely shallow water in which the profiling took place. It was difficult to keep the fish properly streamed on the very short tow line that was necessary in such shallow water. Furthermore, the fish was directly in the wake of the second Zodiac most of the time. Trials showed that the wake problem could be eliminated at slow speeds and that adequate data could be obtained once a stable tow position had been found. However, once the fish became destabilized, it was difficult to find the correct position again. Record quality is therefore variable and sections with only one useable channel are common. In future, if Zodiac operations are considered, a possible improvement would be to hang or mount the sidescan fish on a surface-towed catamaran.

1.4.6 Grab Sampling

A small grab sampler was used to take samples from the Zodiacs. Samples were bagged

Table 2. Acoustic Record Inventory

Sounder

Roll No.	Day	Start Fix	End Fix	Notes
1	August 5	1	35	Underway sounding.
2	August 9	40	423	Underway sounding.
3	August 11	1	54	Underway sounding.
4	August 11	55	121	Underway sounding.
	August 12	90-10	90-36	Grab sample stations.
5	August 17	1	18	90-3 Nearshore profile
	August 17	1	10	90-2 Nearshore profile.
	August 17	90-47	90-55	Grab sample stations.

Sidescan

Roll No.	Day	Start Fix	End Fix	Notes
1	August 5	1	29	
2	August 5	30	35	
	August 11	1	72	
3	August 11	73	121	

and labelled using a marker pen on board the boat, then double-bagged and labelled with a plastic label-maker back at the camp site. An inventory of grab samples is included in Table 5 (see section 5.3).

1.4.7 Cliff Retreat Measurements

Previously established cliff retreat sites were revisited in the principal study area (Gillie, 1988) and on Pelly and Hooper Islands (Forbes and Frobel, 1985; Gillie, 1987). The Gillie (1988) sites were originally established for Gulf Canada Ltd. and were remeasured using the Geodimeter surveying system described above and included both vertical and horizontal positions. The sites on Pelly and Hooper Islands were measured with a tape measure only and therefore only include horizontal positions with respect to the established benchmark. The wooden dowel markers were found to be in poor condition and several were not found. Distances to the cliff edge were measured using a steel tape measure. Markers that were likely to be lost within a few years were repositioned and the setback duly recorded. Eight new cliff retreat survey lines were established at the northwest corner of Pullen Island.

1.4.8 Video Monitoring

A video camera system was supplied by U. Lobsiger for monitoring a beach site. This consisted of two portable camcorders and an electronic timer, mounted in a weather proof case. The selected site was on the western end of Reindeer Island near MR2 (Fig. 2). The cameras were attached to an aluminium ladder and positioned on top of a small frost-heave mound, approximately 5 metres above sea-level (Fig. 5). The RCA camera was oriented offshore at a bearing of 328° (magnetic), and the Minolta camera pointed alongshore at a bearing of 039° (magnetic). A 2-metre long plastic pipe, painted with 0.5 metre intervals was positioned on the beach in the RCA camera's field of view. Because of its length, the pole had to be placed in a 0.5 metre-deep hole, before it could be driven deeper into the sand. Consequently, attempts to position this marker in the breaker zone (for estimation of wave height) proved to be impossible.

The cameras were initially set to start at 13.00 hrs on August 3. They were programmed to operate for 2.5 minutes every three hours, subject to adequate light conditions monitored by a photo-sensitive cell. Times of tape changes and a tape inventory are shown in Table 3.

1.5 Data Analysis Methods

1.5.1 Water Levels

Water level measurements were made in Hansen Harbour, near the camp site, over the period of the field programme. A graduated piece of 2 by 4, driven into the harbour bottom was used as a tide board and measurements were made on an opportunity basis, and were thus

Figure 5. Photo of site 90-2 showing location of video cameras on knoll overlooking the beach.

Table 3. Inventory of Video Tapes from the Beach Monitoring Site (90-2).

Tape No.	Start	End	Direction
1	13.00 hrs, August 4	14.50 hrs, August 9	Offshore[1]
2	13.00 hrs, August 4	14.50 hrs, August 9	Alongshore[2]
3	14.50 hrs, August 9	10.30 hrs, August 15	Offshore
4	14.50 hrs, August 9	10.30 hrs, August 15	Alongshore
5	10.30 hrs, August 15	14.15 hrs, August 17	Offshore
6	10.30 hrs, August 15	14.15 hrs, August 17	Alongshore

[1] Offshore camera oriented towards 328° magnetic.

[2] Alongshore camera oriented towards 039° magnetic.

irregular. Because these measurements provided only relative water levels, they were compared to tide gauge data from Tuktoyaktuk (see Section 3.2 and Figure 9). Means of both data sets over the study period were calculated in order to adjust the Hansen Harbour measurements to the same datum as the Tuktoyaktuk measurements. The mean of the Tuktoyaktuk data from July 29 to August 20 was 0.34 $\pm$ 0.01 metres (n = 528) above chart datum. For comparison, the Lowest Normal Tide defined by CHS, is 0.3 metres below Mean Water level. The mean of the Hansen Harbour data was 1.35 $\pm$ 0.02 metres (n = 42) with respect to the arbitrary datum. The local measurements were therefore adjusted to the chart datum by subtracting the difference of 1.01 metres between the two means.

1.6 Numbering and Notation System

All sites visited in the study area, whether measured profiles, descriptive investigations or offshore sampling stations, were given separate identification numbers, designated sequentially, from 90-1 to 90-62. For example, the first 7 sites visited were measured beach profiles 90-1 through 90-7; site 90-8 was a descriptive investigation only; site 90-9 was a measured profile; then samples 90-10 through 90-36 were grab samples.....and so on. Where samples were taken along measured beach profiles, the samples were given an additional number, as in 90-42-1, 90-42-2 etc. Cores were given the letter C before the final number e.g. 90-45-C1. Sites measured by Gillie in 1988 were identified by the prefix GIL e.g. GIL-L etc. Miniranger transmitters were numbered MR1 through MR4. Cliff retreat sites outside the study area were identified by their number in the AGC database and by the dowel number e.g. 5381-53.

1.7 Summary of Field Operations

A complete copy of P.R.Hill's field notes is included as Appendix 2.

July 22

Frobel and Giles to Edmonton.

July 23

Frobel and Giles to Tuk.

July 25

Helicopter to camp site.

July 26

Drillers to drill site.

July 27

Drilling completed.

July 28

Drillers leave. M/V Mackay with Dyke camp, Nixon's camp arrived.

July 29

Locke arrived Tuk. Frobel and Giles surveyed profiles 90-2 and 90-3.

July 30

Frobel and Giles surveyed profile 90-1. Hill arrived in Tuk. Examined shoreline of the hamlet.

July 31

Frobel and Giles set up MR1 and surveyed cliff retreat sites on Pullen Island. Locke, Hill, Héquette began mobilizing M/V J. Ross Mackay in Tuk. Hill and Héquette shopped for groceries, then surveyed Tuk shoreline by schoolhouse. Checked out video cameras.

August 1

Frobel and Giles set up MR2 and MR3, surveyed profile GIL-L. Hill photographed shore protection under construction at Tuk. Mackay mobilization continued. Evening test cruise. All systems working, but problems with clutch on way back in.

August 2

Frobel and Giles surveyed profiles GIL-B, GIL-E, GIL-F and GIL-K. In Tuk overnight, Nahidik hit Mackay at dock side. Problems continued with transmission. Decision made to take boat back to Inuvik for repairs. Hill, Locke, Héquette and Fraser demobilized Mackay.

August 3

Hill by helicopter to field camp. Took aerial photos of coastline from Hansen Harbour to North Head. Weather windy and raining.

August 4

Established water level rod on beach near camp. Helicopter arrrived with Locke and equipment. Set up video cameras at beach site 90-2. Beach profiles 90-1, 90-2, 90-3 resurveyed.

August 5

Sounding and sidescan survey seaward of Reindeer Island. Survey terminated in mid-afternoon due to deteriorating weather.

August 6

Attempted to reach Wolfe Spit, but Zodiac got stuck on mudbank due to very low water level. Surveyed inner harbour sites 90-4, 90-5, 90-6. At higher water, set up MR4 at site GIL-E.

August 7

Water level again very low. Surveyed Reindeer Island sites, 90-7, 90-9. Investigated site 90-8.

August 8

Frobel assisted Schemel and Robinson with cliff recession survey on North Head. Hill, Locke and Giles moved MR2 to MR2A and replaced batteries. Then to MR1 on Pullen Island to replace batteries.

August 9

Sounder survey, Pipeline Harbour, SE end of Wolfe Spit and tidal channel of inner harbour.

August 10

Foggy. Helicopter arrived c. 14.00 hrs with fuel and to take out Locke. Returned with Fraser c. 20.00 hrs.

August 11

Sounder and sidescan survey of outer Pipeline Harbour and offshore beach site 90-2.

August 12

Frobel and Giles cross-calibrated MR stations and conducted Wolfe Spit survey including profile 90-39. Hill and Fraser took grab samples in Pipeline Harbour entrance. Noted very strong current under flat calm conditions.

August 13

Surveyed Wolfe Spit, profiles 90-38, 90-40 and 90-41.

August 14

Surveyed middle harbour beach sites 90-42, 90-43. Investigated site 90-44.

August 15

MR2A tripod found tipped over. Reset and re-oriented, replaced batteries. Replaced tapes and battery at camera site. Resurveyed profile 90-2. Investigated thaw-flow slide. Investigated site 90-45 on south side of MR2 island. Attempted to reach site 90-3, but too rough.

August 16

Resurveyed beach profile 90-3. Returned to site 90-45 and surveyed profile. Took series of core samples (90-45-C1 through 90-45-C5).

August 17

Ran nearshore sounding line at 90-3, 90-2. Collected grab samples 90-46 through 90-55. Dismantled video camera station, MR2A and MR4.

August 18

Hill and Frobel to Pullen Island by helicopter. Walked and mapped inner spit at high water mark and water line. Attempted beach profile 90-60 but fog came down. Helicopter grounded for 2 hours, then flew to PCSP, because camp fogged in. Packed miscellaneous field equipment for shipment.

August 19

Hill and Frobel returned to Pullen Island. Surveyed profiles 90-61 and 90-62. Walked and mapped outer spit. Flew to Hooper Island and measured cliff retreat sites 5381, 5382, 5383 and 5384. Flew to Pelly Island and measured cliff retreat site 5370. Took aerial photos of major thaw flow slides along western shore of Pelly Island, accretional landforms off Hooper Island. Giles and Fraser to Inuvik by float plane.

August 20

Packing camp.

August 21

Fuel slung to PCSP. Continued to pack camp.

August 22

Giles returned to camp by float plane. Return loads taken to Inuvik. Large crates would not fit. Began helicopter sling of camp.

August 23

Continue helicopter sling of camp. Hill, Frobel and Giles to Tuk. Labelled and weighed crates for shipping.

August 24

Hill, Frobel and Giles to Edmonton.

August 25

Hill, Frobel and Giles to Halifax.

2.0 COASTAL MORPHOLOGY OF THE STUDY AREA

In this section of the report, an overview of the main morphological components of the study area is presented, including general observations made during the field program.

2.1 Cliffs and Bluffs

Cliffs in the study area vary in height from less than 2 metres to greater than 30 metres. On North Head, the cliffs consist of massive grey sandy diamict up to 10 m thick (Wolfe, 1989). This diamicton may be correlative with the Toker Point Till, or represent glacimarine sediments of early Wisconsinan age (S.R. Dallimore, cited in Wolfe, 1989). On Reindeer Island and the small islands of Pipeline Harbour, the cliffs consist of well-sorted Kittigazuit Sand (Rampton, 1988) showing large-scale cross-bedding. In places, a thin veneer of sandy diamict, with rounded gravel clasts up to cobble size, overlies the Kittigazuit Sand. These sandy cliffs commonly have a rounded cliff-top profile, reflecting the thermokarst topography ubiquitous throughout the area. Where bedding is exposed, there is no evidence for deformation resulting from the thermokarst development[1]. Typically, cliff faces in the Kittigazuit Sand are steep or near-vertical. Observations during this study suggest that eolian processes are important in both eroding and moving sand along the cliff face and adjacent beach. Wind-blown sand aprons were present at the base of many cliffs. Low relief (< 1 metre) dunes were also observed along cliff tops, stabilized by a specialized variety of low shrubs (e.g. at site 90-7).

Retrogressive thaw flow slides are common in the Kittigazuit Formation cliffs. Several old and inactive slides and one active slide were observed in the study area. The active slide occurred on Reindeer Island, just west of site 90-2 (Fig. 2). Typically the slides were narrow, but deeply incised into the cliff face, forming a steep-walled gorge. The flow formed a steep fan that covered the beach and extended below the water line (Fig. 6). A small scarp had been cut at the water line and the sediment deposited by the flow slide was noticeably soft and high in water content compared to the surrounding beach sand.

The higher cliffs on the northwest side of Pullen Island (and also Garry and Pelly Islands) consist of dark grey, ice-rich diamict. These cliffs were not examined in any detail because access to them was difficult as a result of extensive thaw flow sliding along the cliff face. Thaw flow sliding was so pervasive along these cliff sections that the failures were amalgamated to form a broadly retreating front (Fig. 7).

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[1] The rounded profile may reflect a primary morphology enhanced by thermokarst processes. Rampton (1988) notes that hills and lakes in this area are strongly oriented with long axes trending NE-SW. Possible origins include aeolian or sub-glacial processes.

Figure 6. Flow slide near Site 90-2.

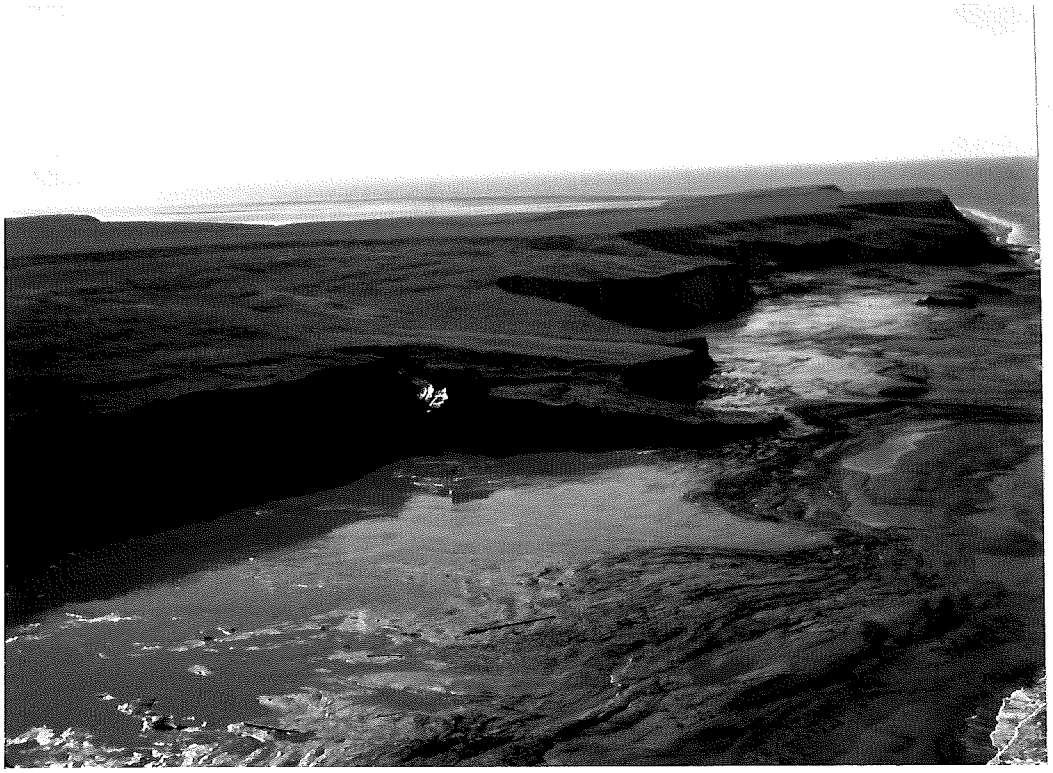


Figure 7. Flow slides on the northern shore of Hooper Island.

2.2 Thermokarst Lake Coasts

Where thermokarst lakes have been breached, three types of coastal morphology are observed in the study area. **Coastal embayments** have formed where the bottom of the former lakes were lower than sea-level. The large embayments of Pipeline Harbour and Hansen Harbour (Fig. 2) probably formed by the drowning of a lake-dominated coastline, with the thermokarst basins becoming flooded and the areas of higher ground forming the numerous headlands and islands of the present day. Some of the smaller embayments exposed along northern coastlines have been closed off by **barrier beaches.** A good example of this is the barrier at site 90-8 (Fig. 2), where a lake has been closed by a 300 metre barrier beach. The third kind of morphology associated with thermokarst lakes formed when the bottom of the lake was higher than sea-level so that the lake drained, forming a **perched thermokarst basin.** An example of this morphology is found at site 90-1 (Fig. 2). Here, a pocket beach formed in front of the basin and because the basin floor is very close to sea level, the perched basin has been flooded during high water levels, probably under storm surge conditions. Extensive driftwood deposits have been left in the basin by this process.

2.3 Embayments

Pipeline Harbour and Hansen Harbour form a connected system of complex embayments (Fig. 2). The term **embayment** is preferred to estuary because there is no significant fresh water source, although there is minor input from streams draining small thermokarst lakes. Thus, estuarine circulation is unlikely to be important. Large areas of the embayment system are characterised by very shallow water (less than 1 metre). During the course of the study, a **channel** was mapped in Pipeline Harbour. The channel extends into the inner harbour between sites 90-43 and 90-45 and meanders around sites 90-42 and 90-44, gradually narrowing and apparently dying out inside of site 90-44 (Fig. 2). At its deepest point, the channel is more than 3 metres deep. Where it meanders, the channel takes an asymmetrical profile, with a very steep wall on the inside of the meander (Fig. 8). Between site 90-44 and site 90-6, there is an area of very shallow water, with no obvious channel. Water depths increase slightly at the head of Hansen Harbour, but because no attempts were made to find or map channels in the southern end of the system, the exact morphology of this area is not known.

The morphology of **sub-tidal mud accumulations** in the embayments is not well known. It is apparent from surveying most beaches and supratidal flats within the embayment that the sandy beach sediment passes rapidly into soft and relatively thick (at least 10's of centimetres) mud within a few metres offshore. Experience wading in these areas suggest that there is a microtography and possible changes in grain size and strength over distances less than 1 metre.

Spits or promontories (e.g. site 90-6, 90-42) and more extensive **supratidal flats**

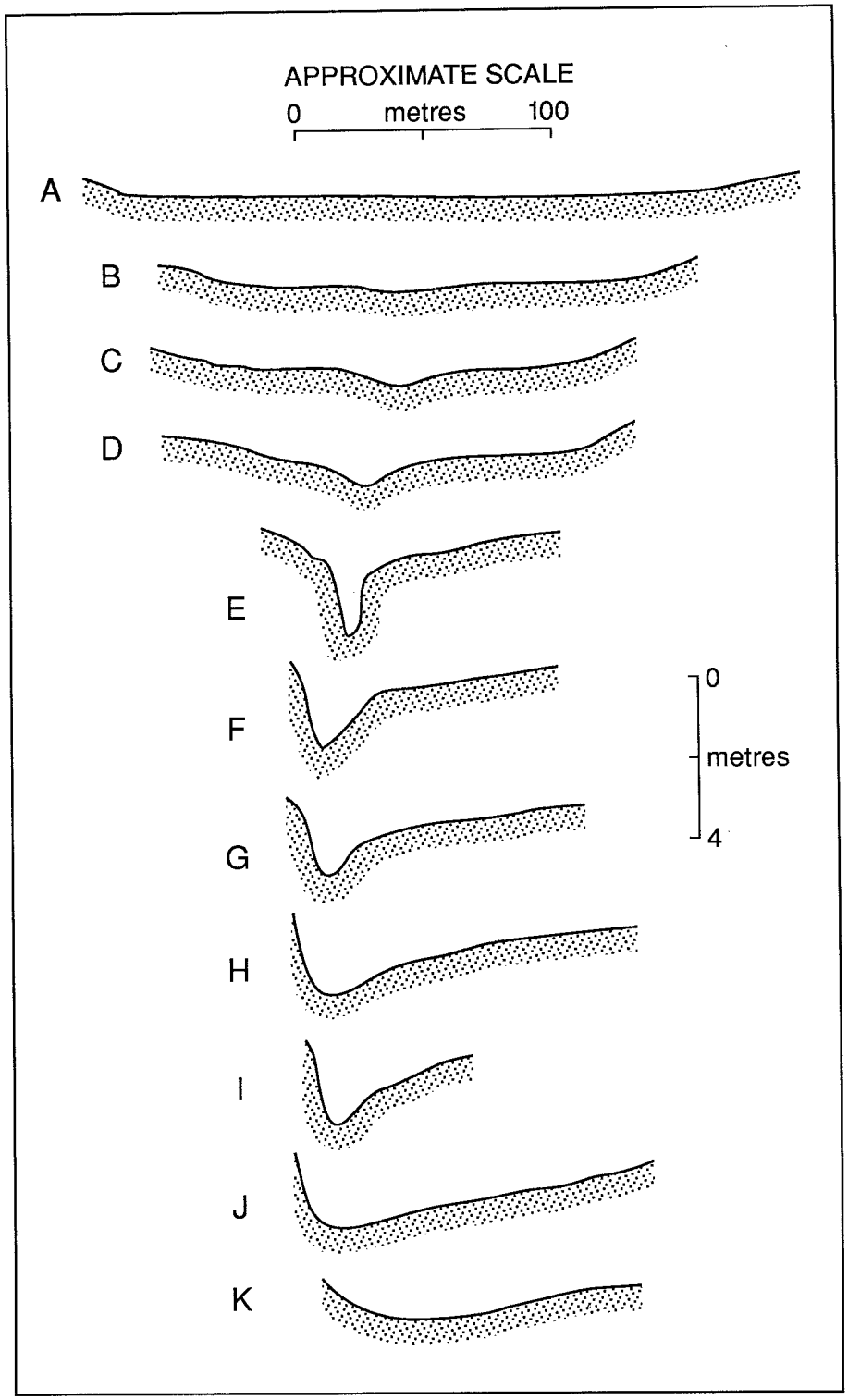


Figure 8. Consecutive echo sounder profiles along the channel showing morphological changes. Horizontal scale approximately constant but may vary according to boat speed. See Figure 2 for locations of profiles

(e.g. sites 90-4, 90-44, 90-45; Fig. 2) are present along the margins of several islands and peninsulas in the area. Both features occur as extensions of headlands or islands and are distinguished principally on their plan form. The two spits also have distinguishable storm ridges and/or berms, whereas the flats do not, although they may have an accumulation of coarser debris against the adjacent bluff. The morphologies are, however, transitional rather than distinct: the distal portions of the spit at site 90-42 shows many characteristics of the supratidal flats although still essentially linear in form. There is no storm ridge or berm and the surface is partially muddy. The surface of the other flats may be muddy or sandy, commonly with the lower flat being sandier, as a result of minor wave reworking. Very low relief supratidal and subtidal, shore parallel bars are present at the outer edges of the flats also as a result of wave action.

2.4 Spits of the Open Coast.

Large complex spits have built out from Pullen Island and North Head (Wolfe Spit) and a smaller one is present at the eastern end of Reindeer Island (Fig. 2). Detailed descriptions of these features can be found in sections 4.1, 4.3 and 4.4 respectively.

3.0 ENVIRONMENTAL OBSERVATIONS

3.1 Wind

Wind speed and direction data for the study period at Tuktoyaktuk were obtained from the Atmospheric Environment Service of Environment Canada (Fig. 9). The time series shows several periods with winds above 20 km/hr. The significant events were as follows:

(i) August 2 to 4 (Days 214 - 216), with winds from the northwest, reaching mean speeds of 41 km/hr, gusting to 44 km/hr;

(ii) August 6 to 7 (Days 218 - 219), with winds from the east and east-northeast, reaching mean speeds of 32 km/hr;

(iii) August 14 to 16 (Days 226 - 228), with winds from the east, reaching mean speeds of 35 km/hr, gusting to 39 km/hr.

None of these events could be described as extreme storm events, compared to typical fall storms in the Beaufort Sea when winds over 40 km/hr are common (Fissel and Birch, 1984). However, for operations, based on Zodiac boats, these wind events were sufficient to cause difficulties.

3.2 Water Levels

The water level measurements from Tuktoyaktuk and Hansen Harbour are shown in Figure 9. A detailed examination of the two data sets indicates that they are closely correlated. There is no discernably consistent phase lag or difference in amplitude between them, except for the period between August 14 and 16 (days 226 and 228), when the Hansen Harbour levels were as much as 0.14 metres higher than those at Tuktoyaktuk.

Extreme water levels (positive and negative storm surges) were strongly associated with the wind events described in section 3.1. Figure 10 shows how extreme water levels (outside 1 standard deviation of the mean) from Tuktoyaktuk vary with wind direction. The data clearly show that high water levels are associated with winds from the northwest quadrant and low water levels with winds from the east. During the northwesterly storm of August 2 -4, the peak water level reached 1.17 m above chart datum. During both the easterly storms, water levels below chart datum were recorded. A differential set-up between Tuktoyaktuk Harbour and Hansen Harbour may have caused the observed difference between the water level records noted above for August 14 to 16.

3.3 Waves

There were no direct measurements of waves attempted, but a review of the photographs taken during the field program provide some information concerning wave approach during

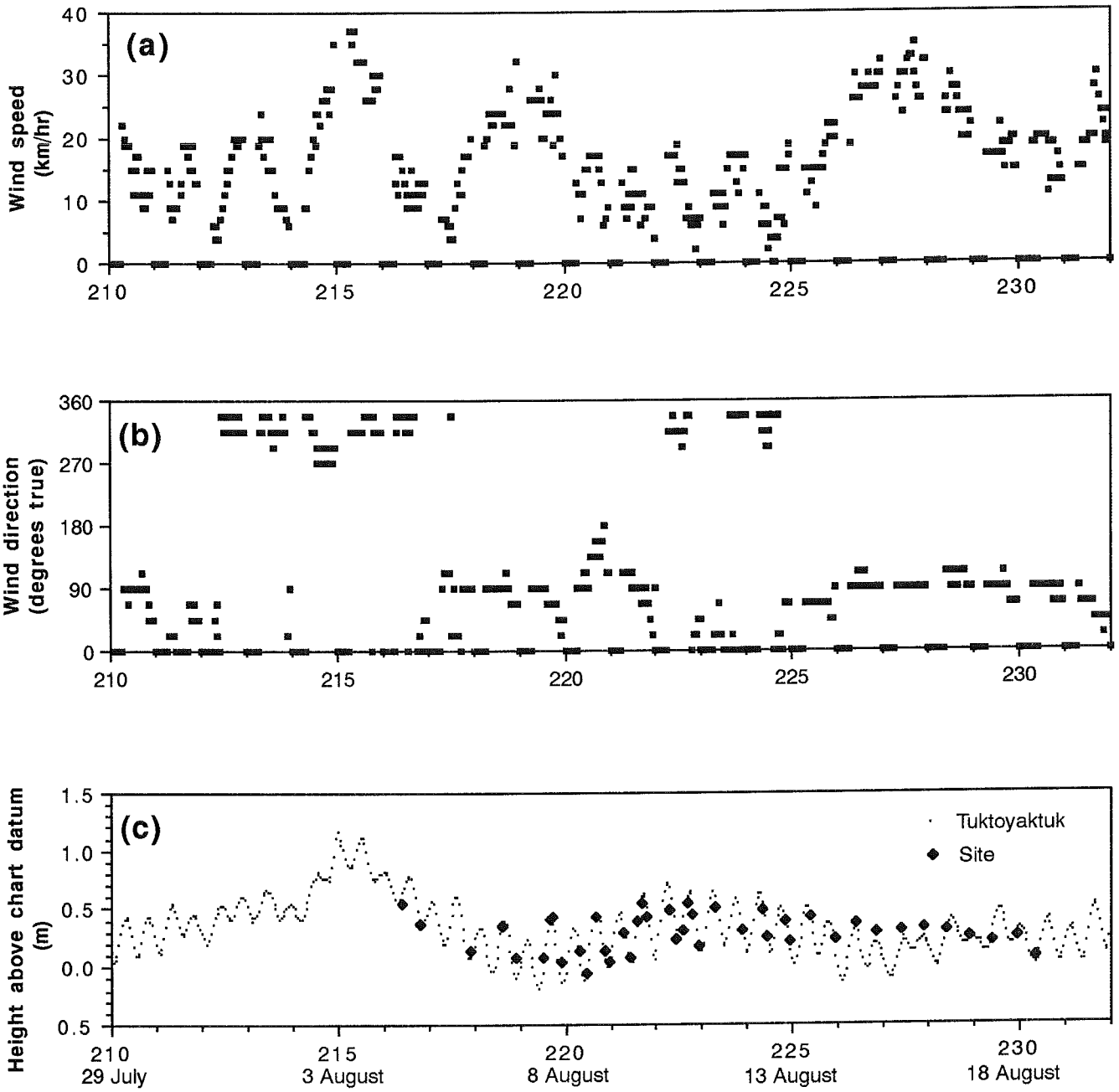


Figure 9. Plots of (a) wind speed, (b) wind direction, and (c) water level measured during the study period.

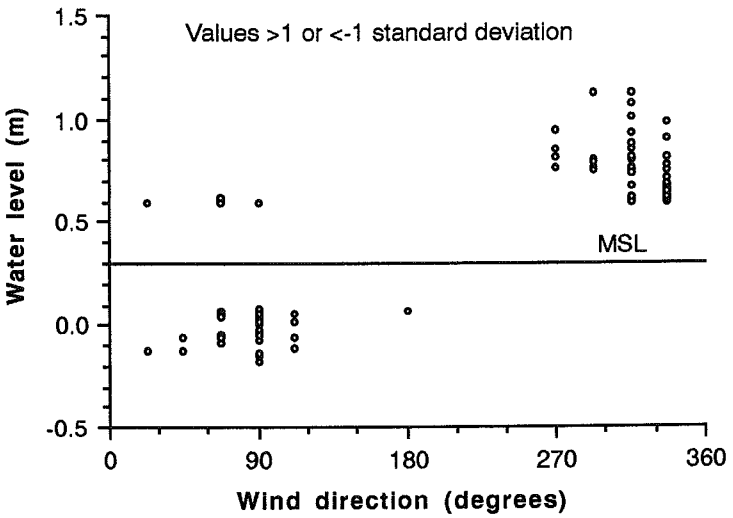


Figure 10. Plot of extreme water levels by direction. Data from Tuktoyaktuk, 29 July to 20 August 1991.

northwesterly winds. On August 3, a series of photographs were taken from the helicopter, during the relatively strong northwesterly wind event of that day. At North Head and Wolfe Spit (Fig. 2), wave crests were oriented roughly normal to the wind direction, with wave trains therefore heading through the passage between Pullen Island and North Head (slides 14-17). Along the eastern shore of MR2 island and Reindeer Island, the waves were weakly refracted and approached the shore from approximately the north (slides 10, 11). In the bight of Reindeer Island, a set of local, shorter wavelength waves from the west to northwest direction interfered with the dominant waves from the north. Unfortunately, no equivalent information on wave approach could be determined for easterly wind conditions.

3.4 Currents

No current measurements were made in this study. However two observations suggest that there may be significant current circulation in the area:

(i) The presence of a tidal channel within Pipeline Harbour has been noted. Regardless of whether or not the channel is primarily controlled by lateral progradation of adjacent spits and sand flats, the fact that such a deep feature has been maintained in an embayment that is largely infilled with sediment suggests that there must be some circulation or flushing through the embayment on a regular basis. On the other hand, although the channel was used on a daily basis and at various stages of the tide for passage to the field area, strong currents were not noticed.

(ii) On the morning of August 12, almost five days after the last major storm (an easterly) and under calm conditions and glassy seas at low tide, a strong current was noted outside the entrance to Pipeline Harbour (sites 20 - 30; see Fig. 34 for location). The current was directed towards the southeast and was strong enough to require anchoring the Zodiac in order to obtain a Geodimeter fix and take a sample. The speed was estimated at 0.5 m/s. The origin of this current is uncertain as it does not appear to be related to a wind event.

4.0 BEACH MORPHOLOGY AND SEDIMENTATION

The following brief description of each site is based on field observations, aerial photograph interpretation and measured profile data. The measured profiles are presented here at the scales most appropriate for showing features described in the text. In Appendix 3, all the beach profiles are presented at the same scale for comparison.

4.1 Pullen Island (Sites 90-61, 90-62)

Pullen Island consists of several areas of tundra upland with elevations up to 40 metres, surrounded by extensive supratidal and intertidal sand flats (Fig. 11). The largest upland area forms the northwest corner of the island and is characterized by northwest facing cliffs which are rapidly eroding by retrogressive thaw flow slide processes. To the east of this area, the north side of the island is formed by a linear beach that truncates older recurved spit deposits. At the eastern end of this beach, two recurved spits have formed, one older spit (A) extending almost 3 km to the southeast, and a younger spit (B), which has grown seaward of A, forming a new recurve. To the south of the main upland area, a southward extending spit, backed by extensive intertidal flats, is disrupted by a single large washover channel. Some of the intertidal flats are anchored by small upland remnants.

Due to poor weather and difficulties reaching the island, an extensive survey of the area was not possible. Most of the time was spent surveying spits A and B from their point of convergence. In the time available, the following tasks were completed:

(i) The areal extent of spits A and B were mapped, by walking the perimeter with the Geodimeter reflector. Measurements were taken at the water line and at the most pronounced high water line. The results of this survey are shown on Figure 2 and in Appendix 3.

(ii) Profile 90-61 was measured on the spit just west of where spits A and B converge (Figs. 11, 12).

(iii) Profile 90-62 was measured in the middle of spit B (Figs. 11, 12).

(iv) Miscellaneous observations of morphology were recorded.

Spit A had a broad, rounded profile with a flat, wind-ablated surface of sand and gravel. It had slightly higher elevation than spit B. The foreshore of the older spit was relatively steep in its middle section, with a slope of 0.100 at profile 90-61 (Table 4), but where it was sheltered from storm waves by spit B, it consisted of low-relief oblique bars and troughs (slide 109). The shoreface is characterised by several shore parallel bars, two of which can be seen on the measured profile (Fig. 12a). Much of the subtidal embayment between the two spits was draped with mud. At the very end of spit A, two bars were present on the shoreface, one parallel to the spit, and the

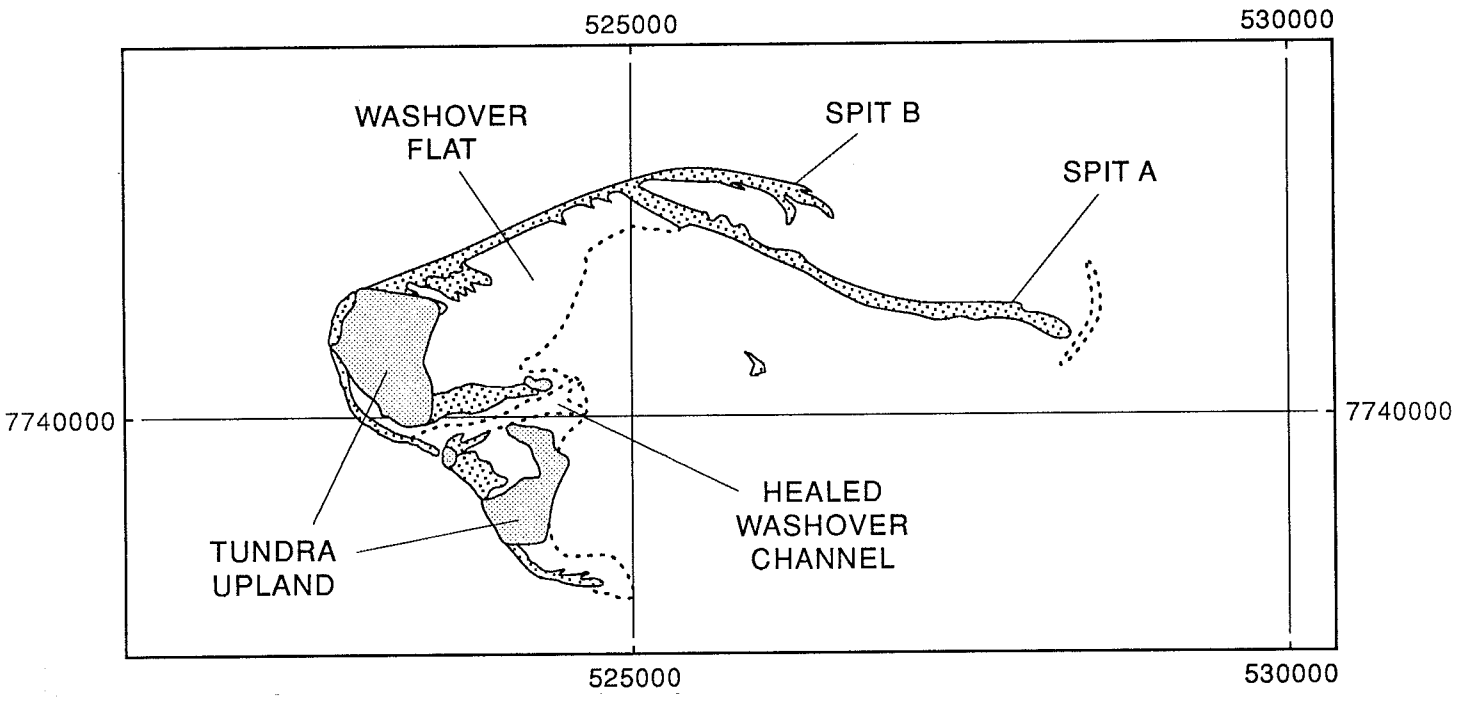


Figure 11. Morphology of Pullen Island from 1985 air photograph. UTM grid in metres.

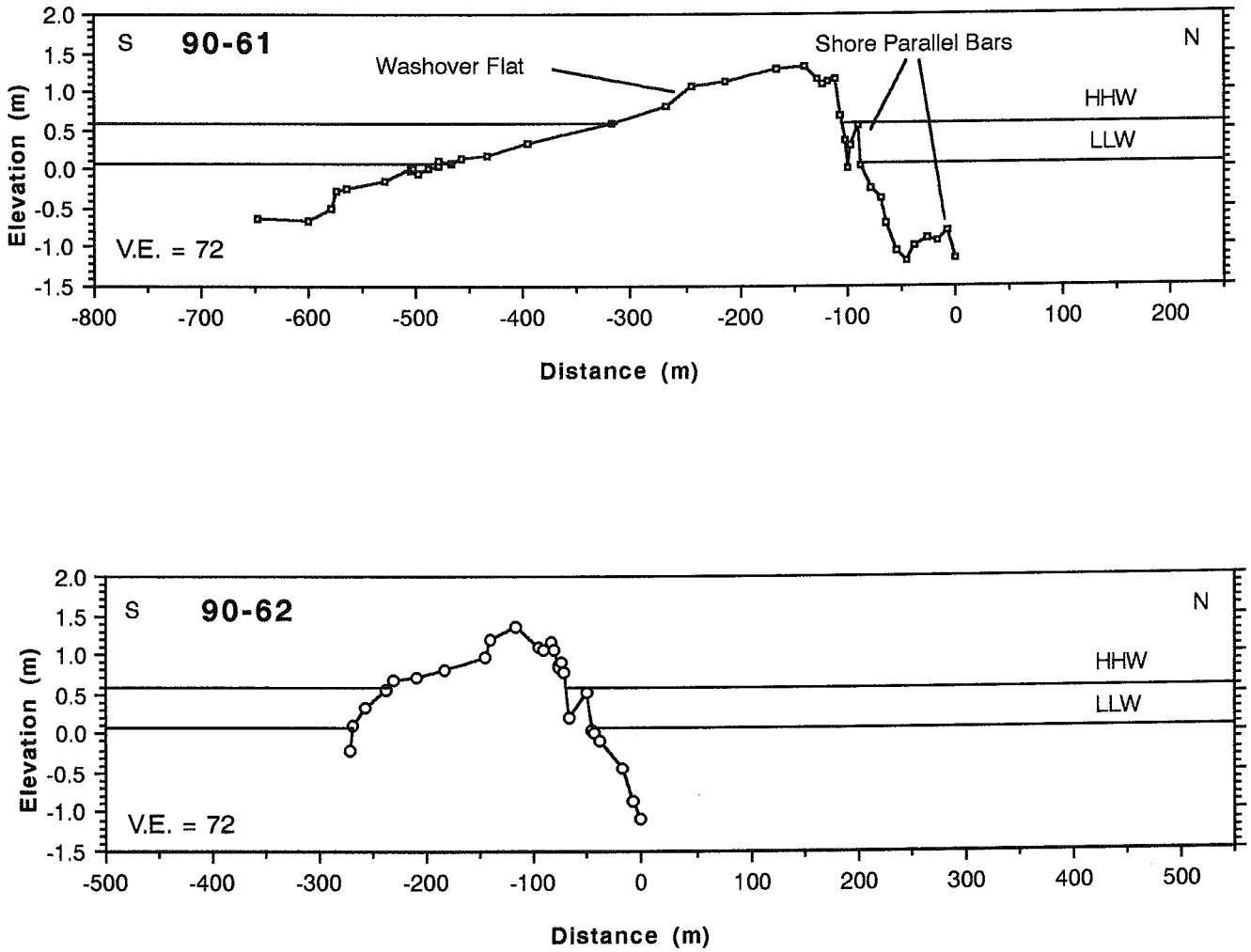


Figure 12. Beach profiles 90-61 and 90-62, Pullen Island.

Table 4. Summary of beach morphology for the sites measured during the study.

Site	Geographical Name	Sediment Type	Foreshore slope[1]	Beach width[2] (m)	Crest elevation[3] (m)
90-1	North Head	Gravel and sand	0.070	46	2.01
90-2	MR2 Island north side	Sand with minor gravel	0.050	60	1.58
90-3	Hansen Harbour spit	Sand with minor gravel	0.009	124	1.23
90-4	Inner Harbour	Gravel, sand and mud	0.006	145	1.25
90-5	Inner Harbour	Gravel, sand and mud	0.167	11	1.34
90-6	Inner Harbour (spit)	Gravel, sand and mud	0.056	23	0.65
90-7	Reindeer Island	Gravel, sand and mud	0.013	45	1.20
90-9	Reindeer Island	Sand with minor gravel	0.012	71	1.65
90-38	Wolfe Spit Spit 1	Sand with gravel storm ridge	-	609	2.02
90-38	Wolfe Spit Outer bar	Sand	0.008	170	0.88
90-39	Wolfe Spit Spit 2	Sand with mud	-	620	1.18

[1]Foreshore slope is given as tan ß, measured between positions of higher high water (+0.6 m) and lower low water (+0.1 m) for large tides. Elevations above chart datum.

[2]Beach width measured from base of bluff to intersection of beach profile with lowest normal tide elevation (chart datum). On spits, the width is taken as the distance between lowest normal tide elevation on either side of the spit.

[3]Elevations above chart datum.

Table 4 (Cont'd)

Site	Geographical Name	Sediment Type	Foreshore slope	Beach width (m)	Crest elevation (m)
90-39	Wolfe Spit Intertidal platform	Sand and mud	-	196	0.63
90-39	Wolfe Spit Outer bar	Sand	0.008	155	0.97
90-40	Wolfe Spit Intertidal platform	Sand	-	411	0.37
90-41	Wolfe Spit Intertidal platform	Sand	-	348	0.51
90-42	Middle Harbour spit	Sand	0.004	255	1.35
90-43	Middle Harbour island	Sand and gravel	0.017	50	1.43
90-45	MR2 island south side	Mud and sand	0.003	343	0.87
90-61	Pullen Island	Sand	0.100 (0.029)[4]	420	1.32
90-62	Pullen Island	Sand	0.021	227	1.35

[4]Shoreface on Pullen Island spit has barred morphology. The higher slope was measured on the beach face , whereas the lower slope is the average slope to LLW on the first bar.

other oriented obliquely to the first and forming a crescent around the end of the spit (Fig. 11, slide 111). The backshore side of the older spit consists of an extensive washover flat, 400 metres wide in the vicinity of profile 90-61, sloping gently down to below low water level. The backshore shoreline was characterized by a series of oblique intertidal bars (slide 110).

Spit B had similar characteristics, having a rounded profile with a wind-ablated surface at its proximal end. The distal end of spit B was completely intertidal, consisting of welded bars and troughs (slides 109, 110).

A brief visit to the northwestern side of the island revealed that the beach proximal to cliffs of the main upland area was relatively gravel rich (slide 59). Peat beds were observed outcropping along the foreshore in this region (slide 59).

4.2 North Head (Site 90-1)

This site consists of a small pocket beach, formed in a drained thermokarst lake surrounded by low bluffs of sandy diamict (Fig. 13, slides 29-31). The eastern bluff showed small scale slumping along much of the shoreline. The bluffs were fringed with a narrow (3 to 4 metres wide) gravel and sand beach. The western bluffs were similar in lithology, but slumped material extended across the beach to the water line. The pocket beach showed a distinctive gravel storm ridge with small log debris. The storm ridge was breached in places by low relief washover channels. The drained lake bottom forms an amphitheatre-like backshore area filled with large log debris, sand and gravel. The elevation of the highest log debris at this site was 2.33 m above chart datum. This elevation is similar to the maximum storm surge elevations measured in the vicinity of Kugmallit Bay by Harper et al. (1988). The presence of polystyrene and compressed foam objects within the log debris suggest that the log debris was probably emplaced during the large storm surge of 1970 (Harper et al., 1988).

Two beach profiles were measured at site 1 (Fig. 13c) on July 30 and August 4 (Days 211 and 216), the latter immediately following the period of strong northwesterly winds (Fig. 9). By comparison with other sites, the beach is relatively narrow and the foreshore relatively steep ($\tan \beta = 0.07$). A low-relief bar is present on the shoreface in both profiles. Both the foreshore and the shoreface bar show a slight accretion in the August 4 (Day 216) profile.

4.3 Wolfe Spit (Sites 90-38, 90-39, 90-40, 90-41)

Wolfe Spit was studied in detail by Wolfe (1989) and informally named after him. Four beach profiles were measured across the spit during the present study (Figs. 14, 15). The spit has a complex morphology which results from a four stage development (Fig. 14):

(i) a recurved sand and gravel spit prograded from North Head and extended over 1 km

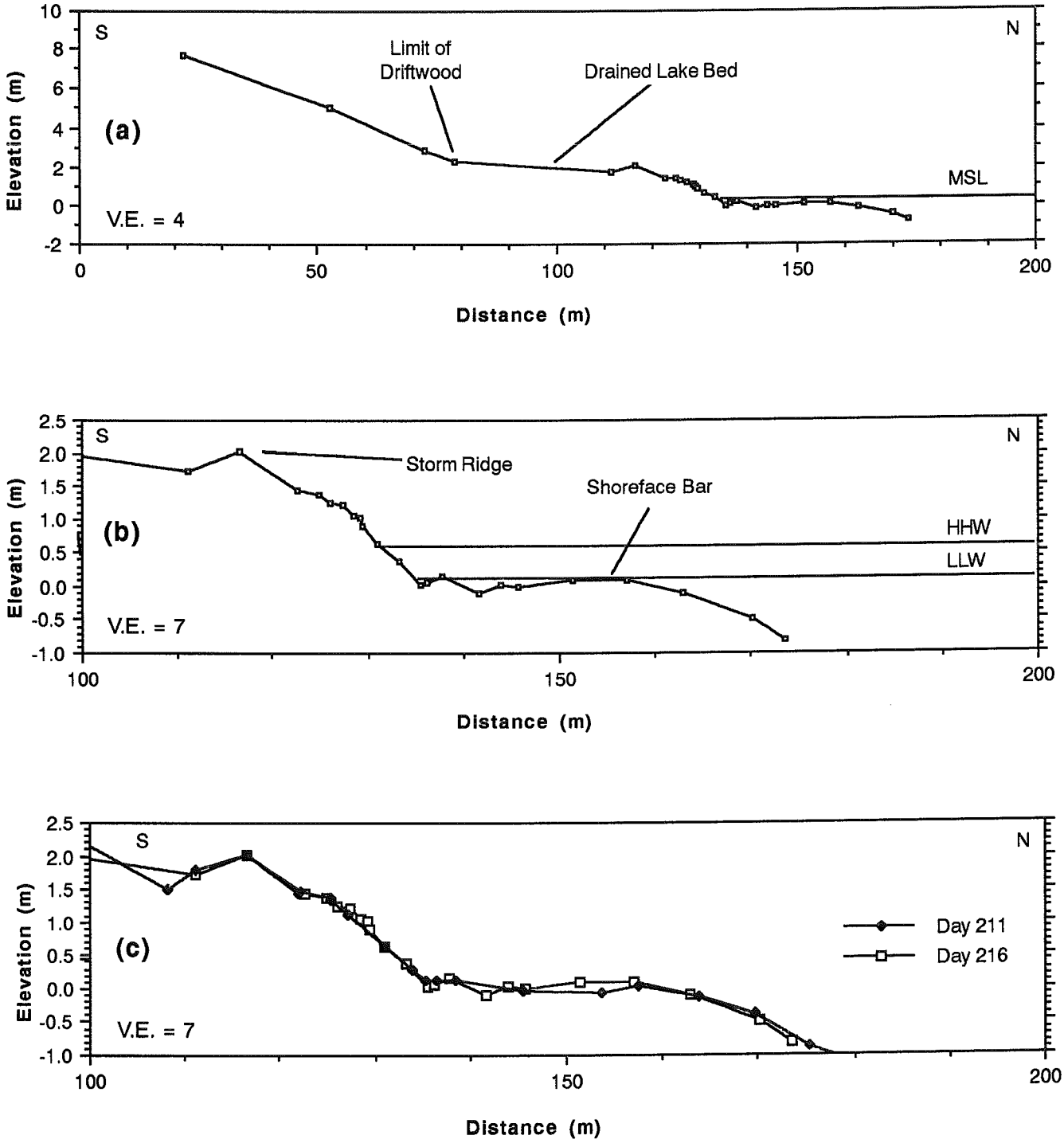


Figure 13. Beach profiles at site 90-1, North Head; (a) full profile showing drained lake backshore; (b) beach profile, August 4; (c) comparison of profiles measured on July 30 (Day 211) and August 4 (Day 216).

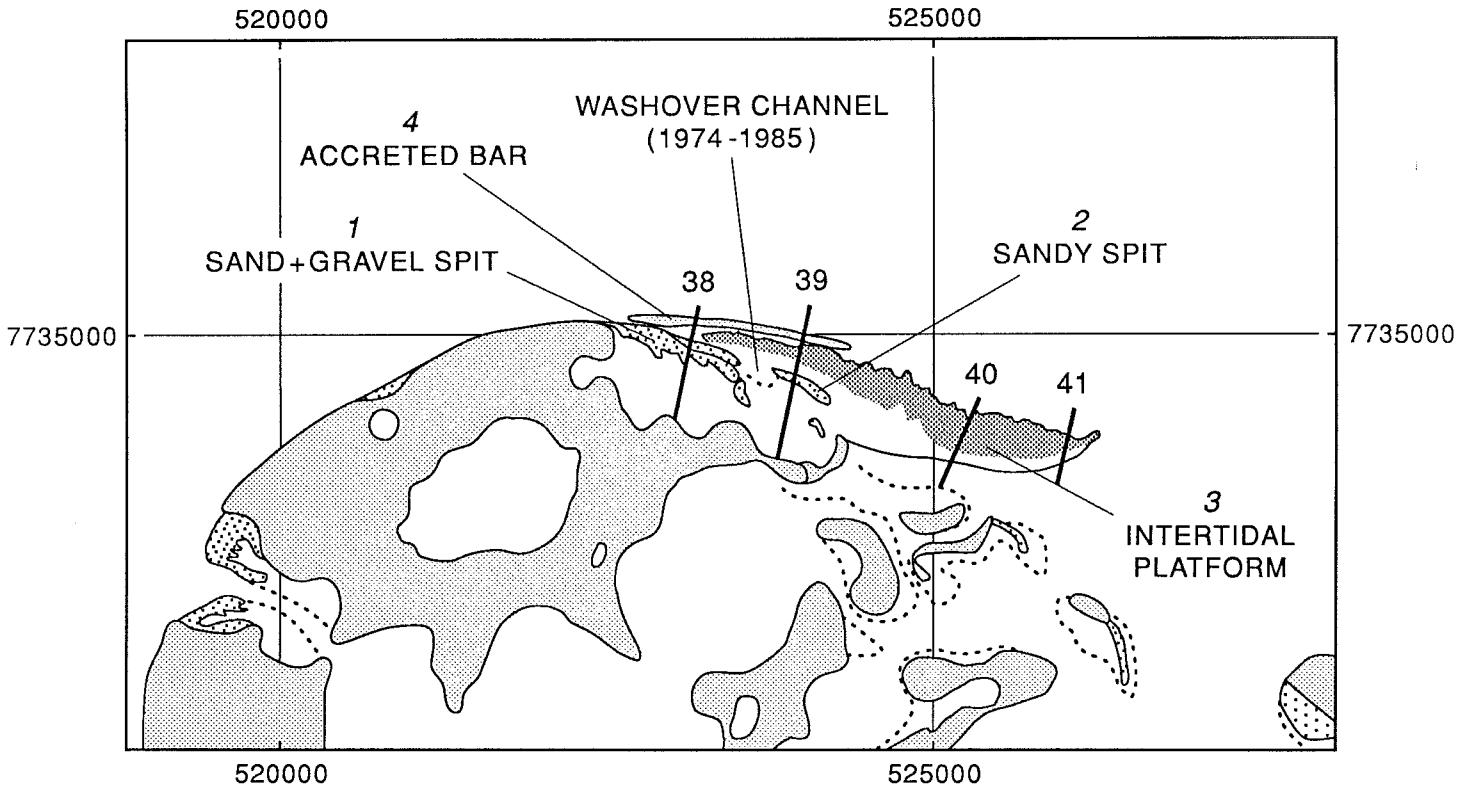


Figure 14. Morphology of Wolfe Spit from 1985 air photograph. UTM grid in metres.

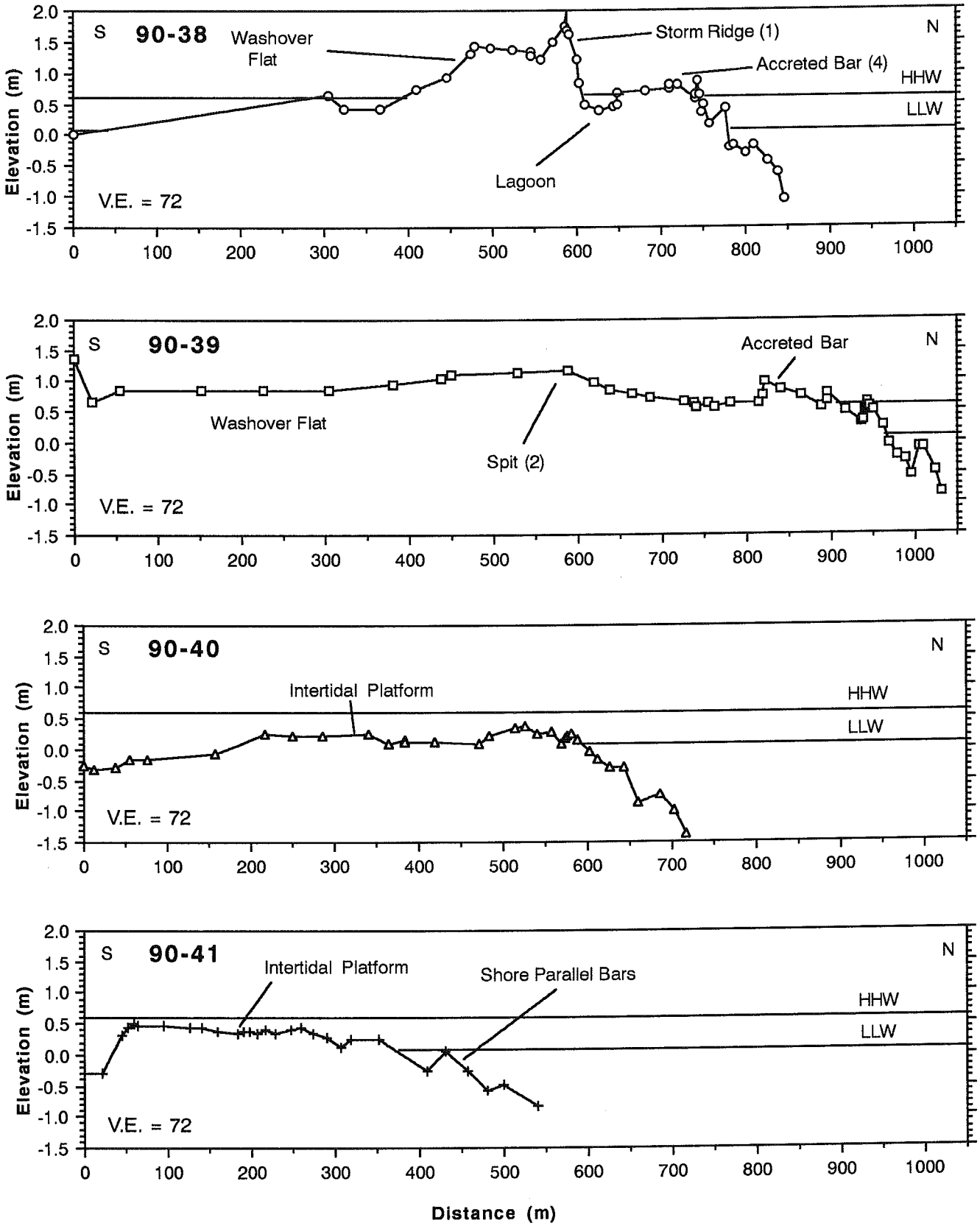


Figure 15. Beach profiles 90-38, 90-39, 90-40, 90-41, Wolfe Spit.

eastward. Although this is the oldest spit to have developed, aerial observations on August 3 indicated that , during raised water levels associated with storm surges, the sand and gravel beach is still active (slides 16, 17).

(ii) a sandy spit developed just seaward of the earlier spit and prograded eastward almost 1 km beyond it. This spit was breached by a broad washover channel between 1974 and 1985

(iii) sand accreted seaward of the earlier two spits as a series of oblique bars, forming a broad platform that presently extends over 4 km eastward. In its proximal region its elevation is just above HHW, but east of profile 90-39, it is completely intertidal;

(iv) between 1974 and 1985, a narrow sandy bar accreted seaward of the proximal end of the spit. It presently extends approximately 2 km from North Head.

Profile 90-38 (Fig. 15a) was measured at the proximal end of the spit, traversing the oldest spit and the accreted bar (1 and 4 respectively, Fig. 14a). The older spit consists of a 2 metre high sand and gravel storm ridge (slide 62), covered by large amounts of log debris (slide 63). Behind the ridge, a partially vegetated and wind-ablated washover flat extends for approximately 100m (slide 63) before descending steeply into a the muddy lagoon fringe. The whole sand and gravel spit at profile 38 is less than 200 metres wide. The accreted bar is separated from the storm ridge by a 30 metre wide lagoon (slide 64). The margins of the lagoon showed a mud drape and the centre of the lagoon had a very soft bottom suggesting several centimetres of mud accumulation. This is also reflected in the flaser lithologies observed in a pit dug in the margin of the lagoon. The bar has a much lower profile than the old sand and gravel spit, with its crest barely above the higher high water line (Fig. 15a). During the overflight on August 3, the bar was almost entirely submerged except for a small section (slide 15). It forms a continuous berm and oblique foreshore bars are welded to it.

Profile 90-39 (Fig. 15b) was measured across the younger spit (2), the intertidal platform (3) and the accreted bar (4) at approximately the broadest part of the constructional landform (Fig. 14) near the washover channel cutting through spit 2. The profile has a crest elevation of 1.18 metres at site 39, and although it was exposed during the overflight on August 3, it may have been largely submerged during the peak water level of the August 2-4 storm. Behind the spit crest a broad 600 m wide washover flat (slide 67) extends southward to the low bluffs of Richards Island. The washover flat is very sparsely vegetated except at the base of the bluff. Much of the flat has a wind-ablated mud veneer, and pits within this area show thin interbeds of sand and clay within 20

cm of the surface, going down into more massive sand with traces of gravel (slides 68, 69). On the crest of the spit, the clay is less abundant. In a pit dug approximately 50 m behind the spit crest, a 15 cm thick massive sand with pebbles overlies sand with silt flasers (slide 70). The massive sand probably represents recent washover deposits.

In the vicinity of profile 90-39, the intertidal platform forms a low area just at HHW between spit 2 and the outer bar. This area is presently accumulating mud as shown by a surface veneer and by the interbedded mud and sand lithologies exposed in a pit (slide 73). The outer bar again consists of a low berm with a maximum elevation of 0.97 metres (Table 4) and a series of low-angle oblique foreshore bars accreted to it. The landward side of the bar is steep (slide 71, Fig. 15b) and characterized by numerous small washover fans (slide 74). During the elevated water level of August 2-4, the outer bar was entirely submerged (slides 16 and 17).

Profiles 90-40 and 90-41 (Fig. 15c, d) were measured across the intertidal platform (Fig. 14). Traversing from profile 90-39 to 90-40, the average elevation of the platform decreases and the continuous berm disappears so that the platform consists entirely of oblique bars and troughs (slides 75,76). The bars consist of very fine sand with rare flasers. Greater mud accumulation occurs on the landward side of the platform.

The very end of the intertidal platform is marked by a lunate bar or recurve (slide 77). Offshore, beyond the extent of the measured profiles, a series of shore-parallel bars is present on the shoreface and marked by distinct breaker line (slides 16, 17). This bar extends from off the bluffs of North Head, along the entire length of the spit and appears to connect with the lunate bar at the distal end of the spit.

4.4 Reindeer Island (Site 90-3, 90-7, 90-8 and 90-9)

These sites are all located along the northeastern-facing shore of Reindeer Island (Fig. 2). Profile 90-3 was measured three times, on July 29, August 4 and August 16. Profiles were also measured at sites 90-7 and 90-9, but not at 90-8.

Site 90-3 was located on the spit at the southeastern end of the island (Fig. 2). The spit is supplied with sediment from low cliffs of Kittigazuit Sand (slide 32). The proximal end of the spit had a megacusp morphology with shoreface bars welded to the megacusps. The backshore side of the spit in this area mimicked the megacusp morphology indicating more rapid rates of retreat in the embayments. The surface of the spit here showed much evidence of aeolian reworking in the form of spit-parallel scour patterns and lineations on August 4, and little evidence of washover from the previous day's high water.

The middle part of the spit, in contrast, while lacking the megacusp morphology, shows numerous spit-normal scour patterns, lineations and driftwood debris indicating recent washover (slide 33). The backshore side of the spit in the middle section is characterized by transverse bars

welded to a smaller scale cusp morphology along the backshore berm (slide 35). Profile 90-3 was located on this part of the spit (Fig. 16). The profile in Figure 16a shows the narrow spit and barred shoreface. No significant changes of the profile occurred during the period of the field program (Fig. 16b)

The distal end of the spit is recurved into the mouth of Hansen Harbour (slide 33). The surface of the distal part of the spit is characterized by small scale frost-heave polygons (slide 36). The preservation of these features suggests that the distal part of the spit was not overwashed during the previous days' high water. A lunate shoreface bar is present around the distal end of the spit (slide 34).

A nearshore sounding profile was run at site 90-3 (Fig. 16c). It can be seen that the profile flattens markedly at approximately 3 metres water depth. The deepest bar occurs approximately 700 metres off the beach and has a crest elevation of -0.9 metres.

Site 90-7 is located further along the coast of Reindeer Island, close to MR3 (Fig. 2). The area between sites 90-3 and 90-7 consists of a broad gravelly washover flat behind a barrier beach. The gravel extends 30 to 40 metres from the beach, before passing into sand. Driftwood is scattered over the washover flat. On the north side, a small area of vegetated dunes is present on the washover flat, while on the south side, a small lagoon is trapped by the barrier beach.

The measured profile at site 90-7 is shown in Figure 17a. The 9 metre high bluff consists of cross-bedded Kittigazuit Sand with large rounded cobbles. The top of the cliff is characterized by small scale aeolian dunes, which are vegetated by a few species of specialized plants. A low storm ridge is present at the base of the cliff, indicating that waves break directly on the cliff during storm surges. The foreshore is covered by poorly sorted cobbles, gravel and sand, which forms a thin (lag?) veneer over brown sand, possibly Kittigazuit sand. Samples were taken from the cliff and beach in an attempt to distinguish between the Kittigazuit Sand and the reworked beach sand. The shoreface is characterized by numerous small bars. The inner ones were exposed at low tide and can be seen to be complex and oblique (slide 55). Pits dug in the trough behind the first bar revealed gravel within 10 cm of the surface, overlying grey clay. These observations suggest that the shoreface erosion surface is shallow. The grey clay could be Unit D sediment underlying the Kittigazuit (Unit C) sand (Blasco et al. 1990). Beyond the extent of the measured profile, a large, continuous, shore-parallel bar is present.

Site 90-8 is located immediately seaward of a barrier-enclosed thermokarst lagoon (Fig. 2). The notable feature of this site is the presence of outcropping beds of peat (slide 56), that extend for several hundred metres along the shore in front of the lagoon and the adjacent coast. The peat consists of soft fibrous organics, interbedded with layers of woody twigs and mud. This material was most likely deposited within the lagoon before it was breached by the sea. The outcrops further illustrate the shallow nature of the shoreface erosion surface.

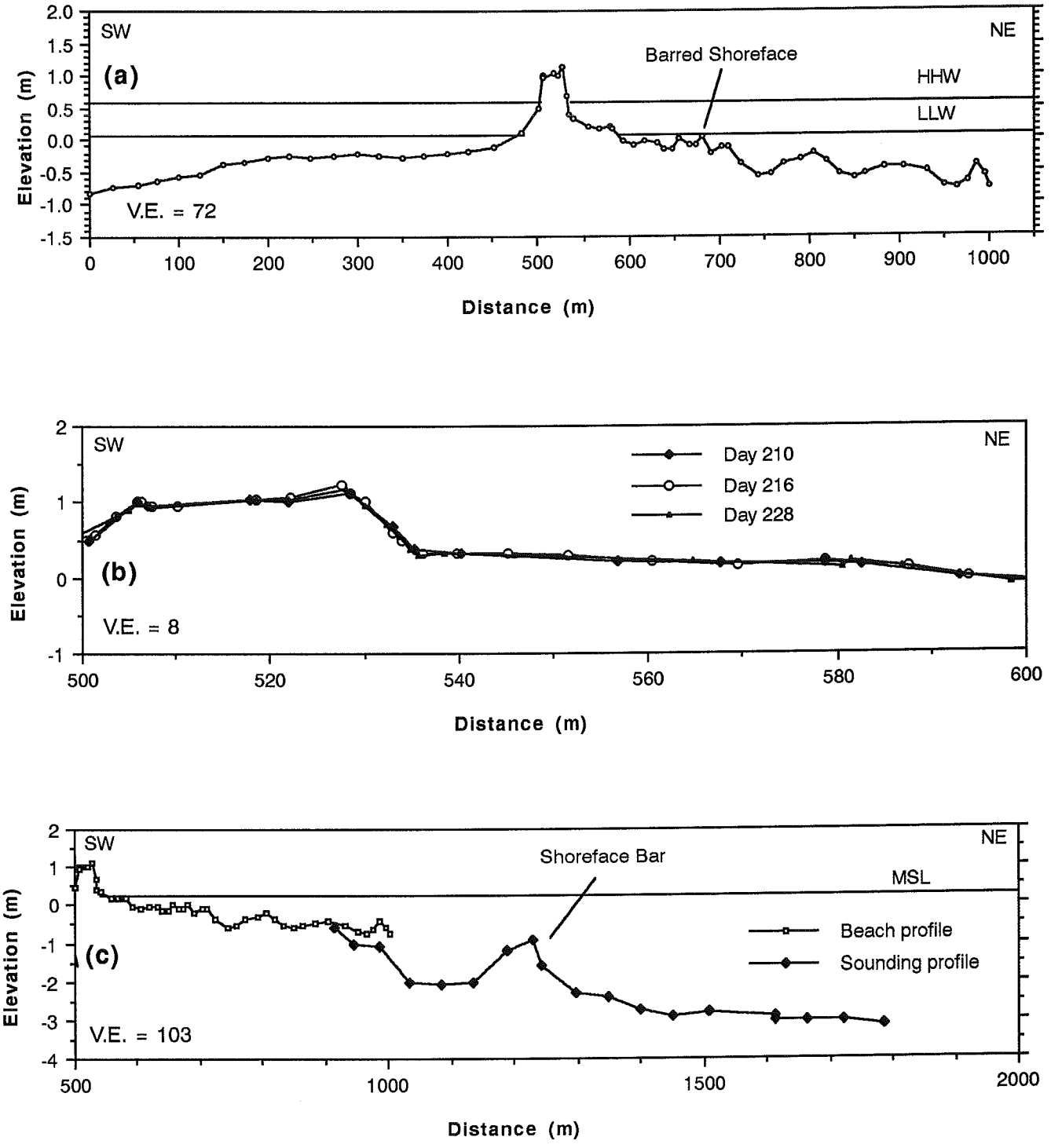


Figure 16. Beach profile 90-3, Reindeer Island: (a) Day 210 showing complete profile; (b) details of spit and shoreface for the three repeated surveys; (c) profile with nearshore sounding survey appended.

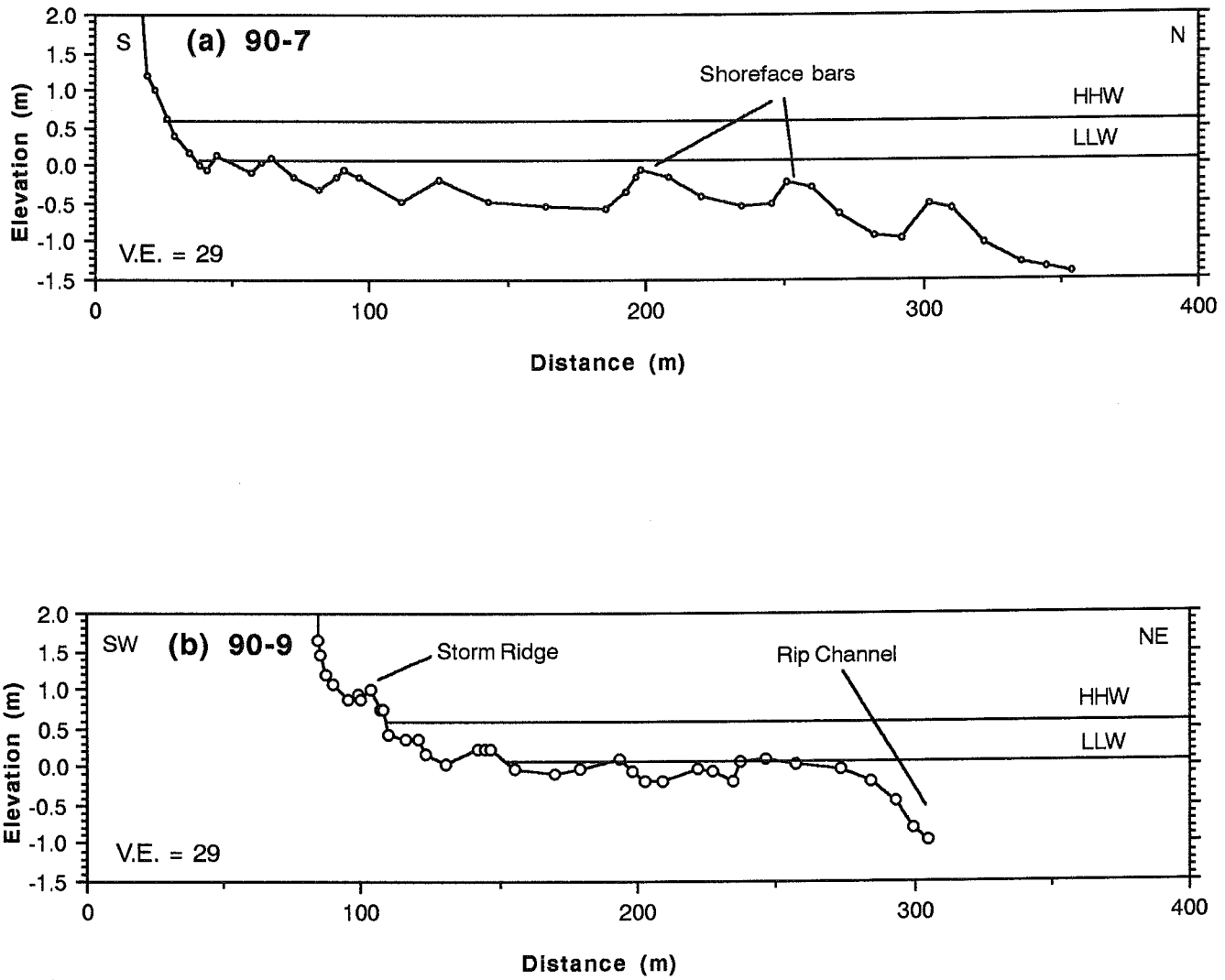


Figure 17. Beach profiles 90-7 and 90-9, Reindeer Island.

Profile 90-9 is located approximately 60 metres northwest of a small stream draining the large thermokarst lake at the northern end of the island (Figs. 2, 17b). This profile was positioned directly in front of an oblique rip-channel in the offshore bar (slide 57). This explains the steep seaward end of the profile (Fig. 17b). The bluff here was low and slumped, consisting of brown sandy silt with deformed laminations of lighter and darker, more clay-rich silt and brown oxidised sand. The beach consists of fine to medium sand. A small storm ridge is present along the base of the bluff. The lower backshore shows desiccation cracks and dry run-off rills. The foreshore is characterized by longshore bars. A pit in the foreshore exposed gravel at approximately 55 cm suggesting that the shoreface erosion surface is deeper here than further south.

4.5 Outer Harbour (Sites 90-2 and 90-45)

The two sites representative of the outer harbour (sites 2 and 45) are located at the eastern side of the harbour on MR2 island. Profile 90-2 was measured three times during the program, on July 29, August 4 and August 15 (Fig. 18). Descriptions of the beach are based on the visits of August 4 and 15. Profile 45 was measured once on August 16 (Fig. 19).

Site 90-2 is located on the north-facing side of the island and consists of a small pocket beach between two broad headlands (slide 23). The headlands are characterized by 15 metre high vertical cliffs of Kittigazuit Sand, showing sub-horizontal bedding and low-angle cross-stratification. During the study, a retrogressive thaw flow slide was active on the western headland and had formed a small fan across the beach (slides 22, 26, 87). Between the headlands, the cliff descends to a low bluff, 2 to 3 metres high. The bluff face is covered by low dunes with rippled surfaces indicating transport parallel to the bluff. Considerable accumulation was noted around survey markers both between July 29 and August 4, and between August 4 and 15.

The beach profile showed little change over the duration of the study (Fig. 18c). A gravel storm ridge, with small driftwood debris and partially covered by windblown sand, was present along most of the base of the cliff. In the middle section of the beach (in the vicinity of profile 90-2), the storm ridge is absent except for a thin veneer of gravel at the base of the cliff, suggesting that during storms, waves break directly on the bluff at this location.

Between the storm ridge and the berm, the backshore was partly covered by a mud drape approximately 1 mm thick (slide 21). On the landward margin of the berm, the drape was observed only in the troughs of small ripples, as incipient flasers (slide 24). The drape was probably deposited from pooled water left during the recent period of high water (August 2 to 4). On August 15, during a period of strong easterly winds, the backshore showed considerable evidence of wind ablation.

The berm itself, with an elevation of 1.15 m (probably related to the August 2-4 storm surge) was sandy with black heavy mineral streaks and scattered driftwood debris. The upper

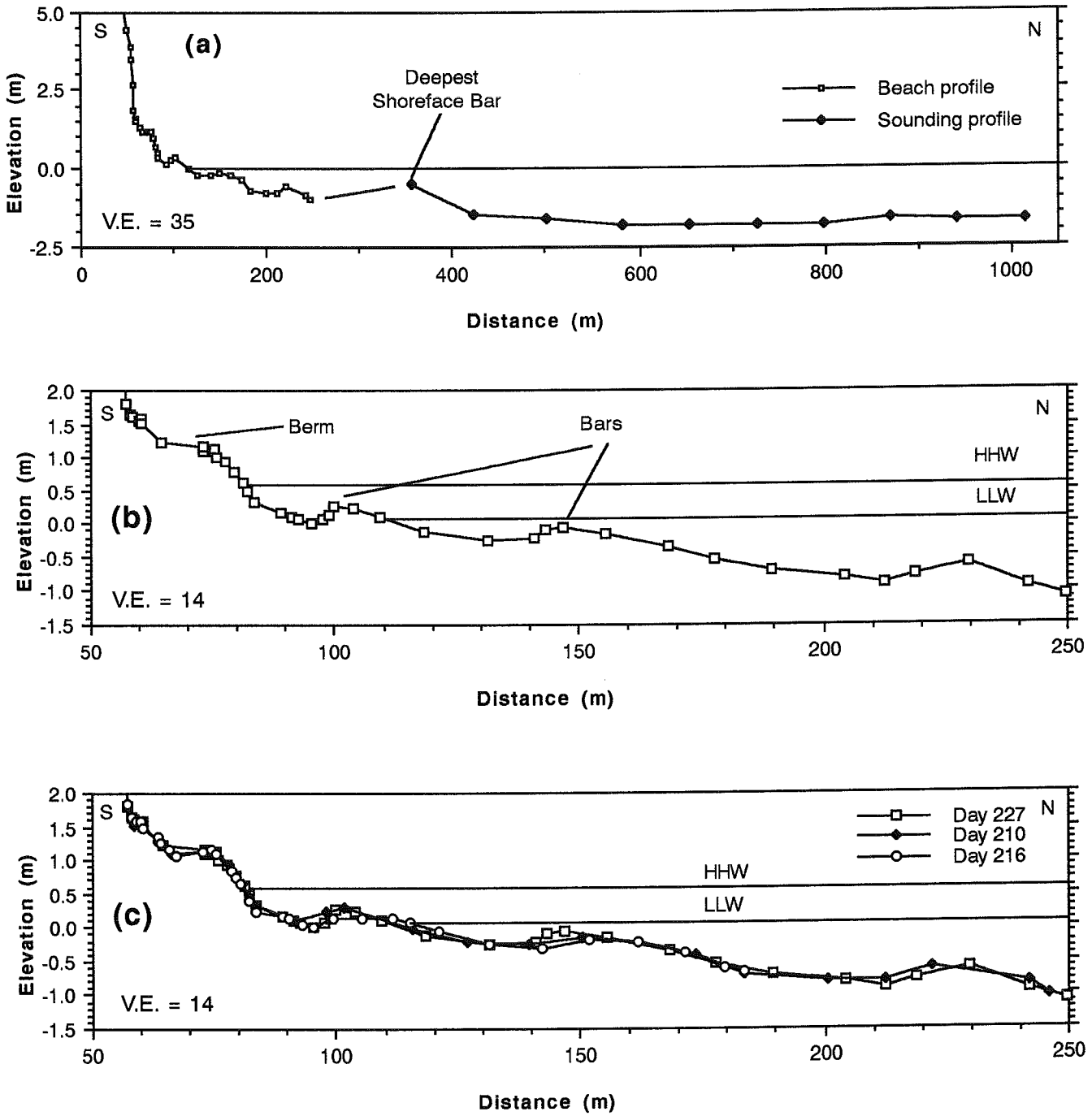


Figure 18. Beach profiles 90-2, Outer Harbour: (a) Day 227, showing complete profile including nearshore soundings; (b) detail of Day 227 profile, showing bars; (c) repeat surveys.

foreshore was covered with gravel and showed a small-scale cusp morphology (slide 25). The foreshore slope was 0.05.

The shoreface at site 90-2 was characterized by a series of shore parallel sand bars (Fig. 18a). From nearshore soundings at this site, the deepest bar occurs approximately 300 metres offshore and has a crest elevation of -0.5 m (Fig. 18a).

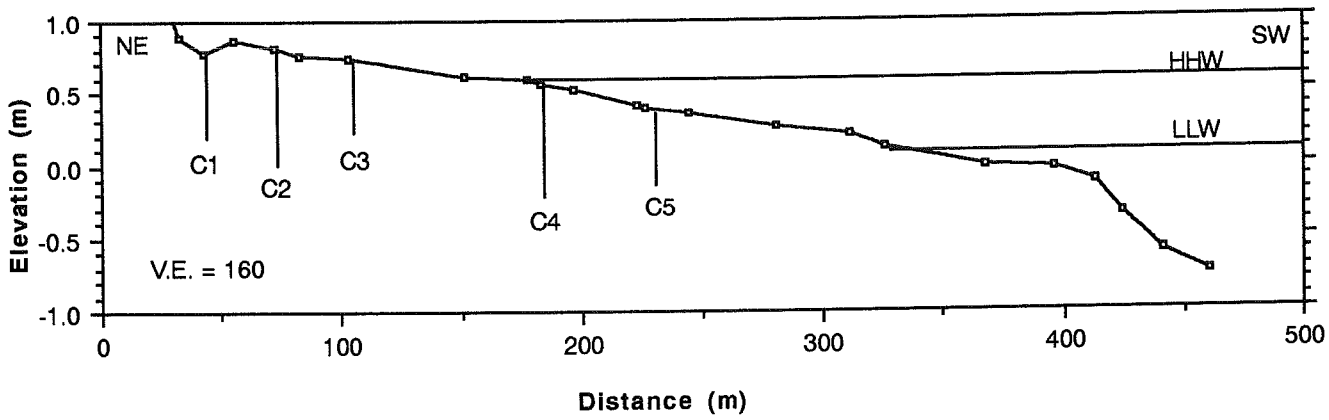
Site 90-45 is located on the southwest facing corner of the island and consists of a broad sand flat. Air photo analysis suggests that the flat may have initially been constructed as a small southward-prograding recurved spit. The northwestern (most proximal) part of the flat is partially vegetated and characterized by small stabilized aeolian dunes (slide 89). In the vicinity of the measured profile, the vegetated area forms a narrow fringe to the bluffs with low hummocky dunes (slide 90). The bluffs themselves consist of Kittigazuit Sand. A narrow fringing storm beach of gravel and sand is present at the base of the cliffs. Beyond the base of the cliffs, the profile (Fig. 19) has a very low relief with a foreshore slope less than 0.003 (Table 4). The exaggerated profile of Figure 19 shows two distinct knickpoints. Based on their position with respect to the normal tide range, they appear to be related to the levels of wave run-up at high and low tides. Seaward of the lowest normal tide level, the shoreface profile steepens markedly to 0.013.

A series of five cores were collected from the supratidal flat (Fig. 19). Core 90-45-C1 was taken in the upper vegetated flat. The top 14 cm of this core consists of very thin beds of grey and brown silty clay, interbedded with sand lenses and thin beds of fibrous peat (slide 94). These are underlain by a thin sand bed and a sequence of bioturbated silty clay. At 21 cm, there is a thin layer of gravel at the surface of a thick sequence of cross-bedded and laminated brown sand. A possible interpretation of this sequence is that the gravel represents a thin lag deposit overlying brown sand of the Kittigazuit Formation. The thin sequence above the gravel would then represent transgression and accretion of the supratidal flat.

Core 90-45-2 was taken from the upper flat, just below the vegetated zone, in an area characterized by small linear wave ripples draped by a thin veneer of dry mud. The core contains a complex sequence of thin rusty-brown sand beds and ripple lenses, with clay and silt interbeds (slides 95,96). Down-core, the sand beds become thicker and show normal grading from well-sorted sandy bases to silty sand. Several thin peat beds are present in the lower section of the core.

Core 90-45-C3 was taken in the middle supratidal flat in an area with a similar rippled surface, but with a more recently deposited wet mud drape. This core contains a sequence of thin well-sorted sand beds up to 10 cm thick, with very thin mud interbeds and flasers (slides 97, 98). A small wood fragment is present at 28 cm. Several thin peat lenses occur just below the wood and appear to be reworked.

Core 90-45-C4 was taken at the boundary between the supratidal flat and the upper intertidal flat, just below higher high water. The surface of the flat in the vicinity of this core is



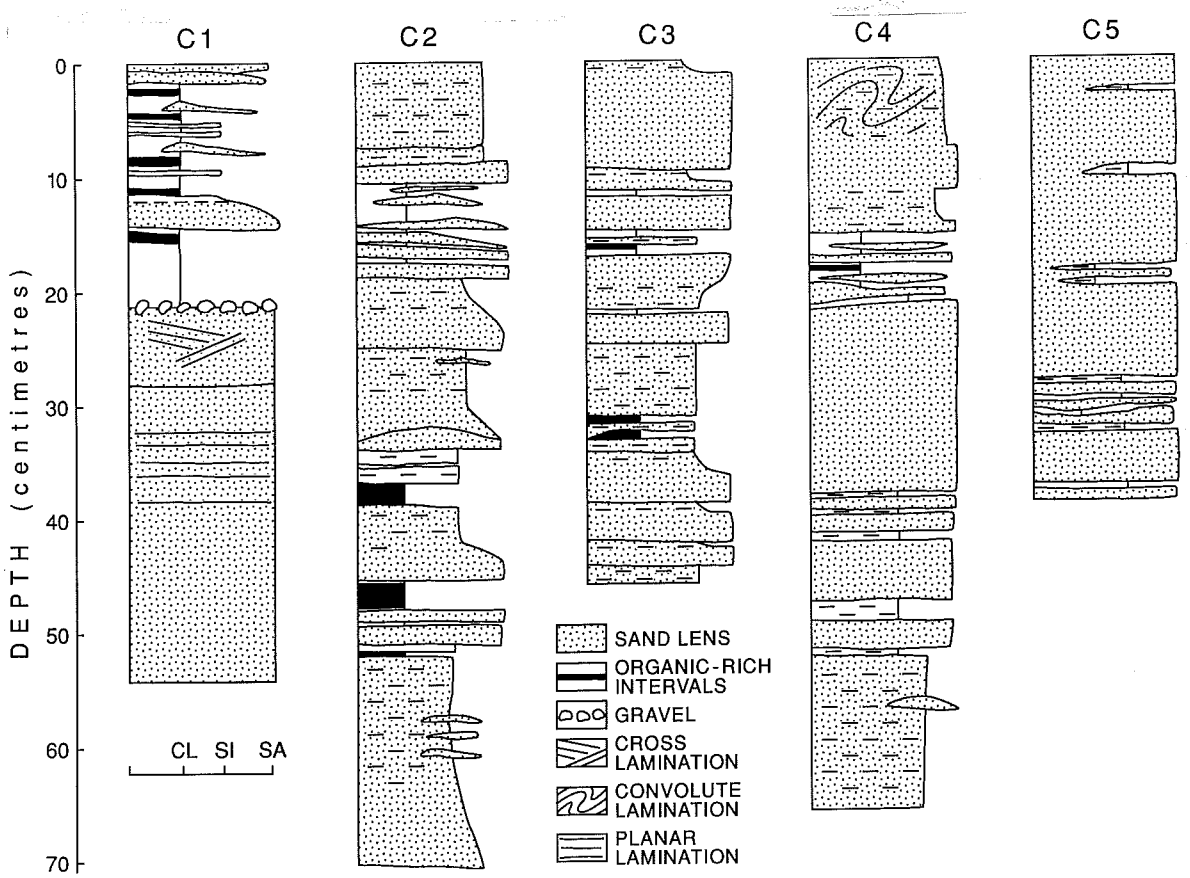


Figure 19. Beach profile 90-45, Outer Harbour.

relatively smooth and sandy, showing gentle undulations with fine organic accumulations in the depressions. The core is characterized by thicker beds of well-sorted sand (up to 16 cm thick) with minor intervals of mud interbeds, sand lenses and mud flasers (slide 99).

Core 90-45-C5 was collected from the middle intertidal flat, where the surface was smooth and sandy. The section here was easily fluidised by the core removal process, but a reasonably undisturbed core was obtained. The upper 30 cm of the core consists of thick sand with a few thin flasers. Below this sand, the sand beds are thinner, with thin mud interbeds.

4.6 Middle Harbour (Sites 90-42, 90-43 and 90-44)

Sites 90-42 and 90-43 were located on an un-named island in the middle harbour, site 90-43 on the northern coast, exposed to the harbour entrance, and site 90-42 on a spit extending from the eastern side of the island (Fig. 2). The island consists of Kittigazuit Sand that forms vertical cliffs 10-20 metres high on the exposed northern side. Large scale sets of trough cross-bedding, 2-5 metres thick are exposed in the cliff (slide 78). The Kittigazuit Sand is overlain by a thin (< 1 metre) gravelly diamict.

A beach profile was measured at site 90-43 and is shown in Figure 20a. The beach here has a slope of 0.017, which is intermediate between the steeper exposed beach slopes of MR2 island and North Head, and the sand flat slopes of 90-45 (Table 4). Beneath the bluffs at this site, a small sand and gravel debris apron is present at the base of the slope. This apron appears to have formed by subaerial cliff fall, modified by aeolian processes. No storm ridge is present, indicating that storm waves probably break directly on the cliff face during periods of elevated water level. A weak berm is present on the upper foreshore and is constructed from sand and gravel, with scattered small boulders (slide 86) overlying brown sand similar to the Kittigazuit Sand. The lower foreshore is sandy, with a wave-rippled surface. A low-relief cuspate knick occurs at the low water line (Fig. 20a). Just below low water, a small shoreface bar is present. The profile flattens approximately 100 metres beyond the bar and the bottom becomes softer indicating mud deposition.

At the eastern end of the island, a few hundred metres to the east of profile 90-43, a spit-like promontory has developed. Profile 90-42 was measured across it and is shown in Figure 20b. The proximal part of this spit however is largely erosional rather than accretional. Beds of Kittigazuit sand crop out at the surface of the 1.35 metre-high platform. The outcropping beds form a large scale trough in plan view (slide 80), indicating a paleo-flow towards the east. The erosional nature of this feature is also apparent from the measured profile (Fig. 20b), which shows a broad foreshore in front of a sharp break in slope and a steep backshore.

The backshore side of the feature slopes steeply down to the embayment behind. Within 5 to 10 metres of the shoreline, the bottom becomes soft and muddy. A narrow intertidal region has

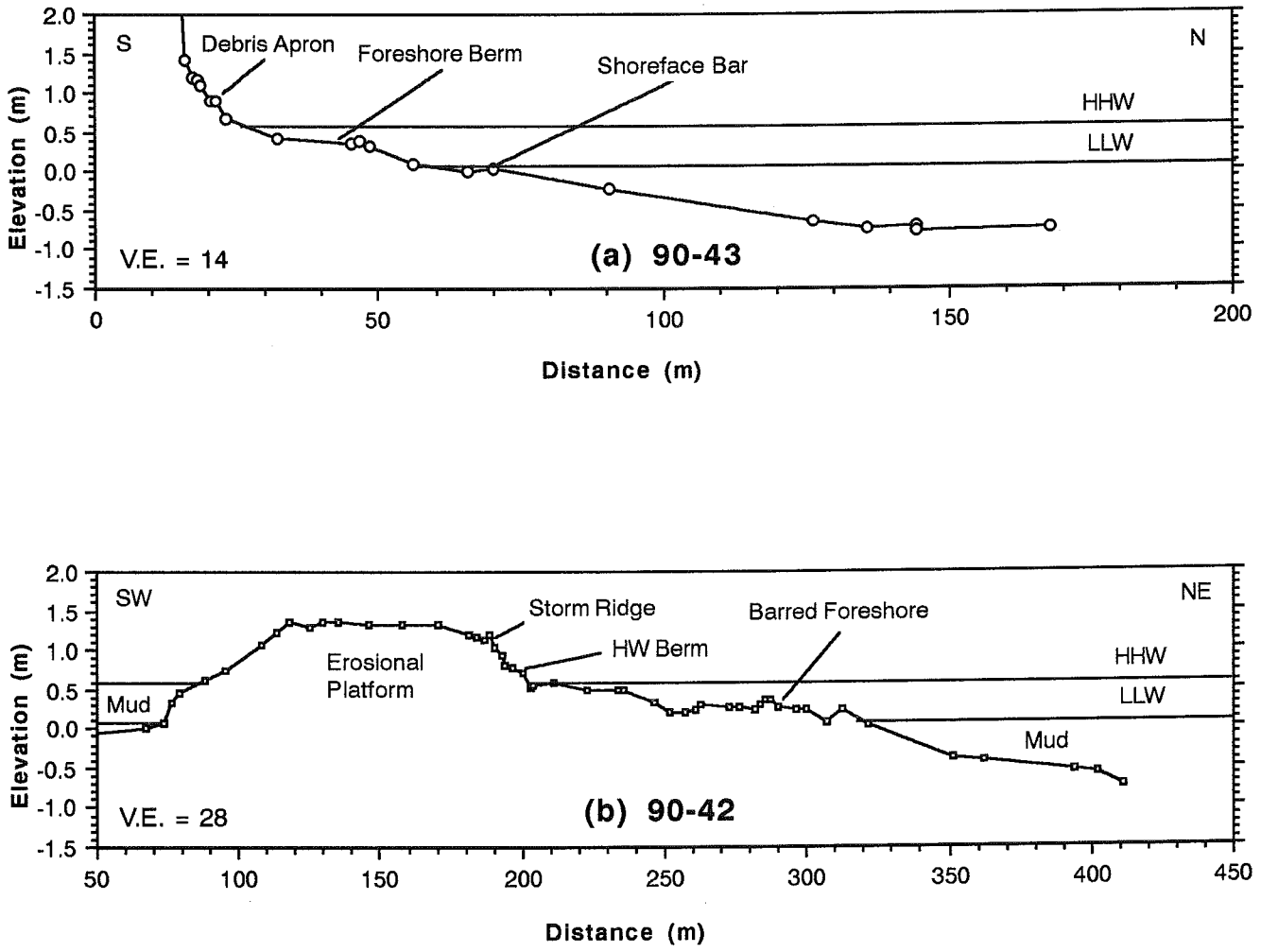


Figure 20. Beach profiles 90-43, 90-42, Middle Harbour.

a thin veneer of mud at the surface, but a pit shows the veneer to be very thin and overlying brown sand (slide 81) with flaser lenses of organic rich mud and a sulphurous smell. The top of the feature is extensively wind blown, has a hard crust and is partly covered by a thin veneer of aeolian sand (slide 83). Some gravel, with associated comet marks, and small logs are scattered over the surface. A pit in the crest of the erosional platform shows a thin unit of ripple cross-laminated overlying brown sand with thin grey flaser beds (slide 82). The brown sand in both cases is probably Kittigazuit Sand.

The seaward facing part of the backshore is sandy and shows a small storm ridge covered by small log debris. Patches of gravel are also distributed across this area. A pit in the high water berm shows well-sorted fine sand with parallel and low-angle cross lamination (slide 84). The top of the sequence is characterized by ripple cross-lamination. At 25 cm below the surface, thin cross-laminated gravel beds are present. Below the berm, the sandy foreshore is characterized by a series of oblique bars.

The erosional platform extends only half way along the promontory and the distal end has a lower elevation, being almost entirely intertidal. It consists of a broad sand flat with ubiquitous ripples and scattered log debris. A pit in this area shows approximately 15 cm of fine sand with mud flasers, overlying a 1 cm thick (cryogenically?) deformed mud bed (slide 85). This in turn overlies a massive brown sand that again could be Kittigazuit Formation.

It is difficult at present to distinguish between in situ Kittigazuit Formation and the reworked beach sand derived from it (although samples from both were collected for future analysis). However, it appears that the promontory at the eastern end of this island is an erosional remnant of a ridge that previously separated thermokarst lakes before they were breached during the transgression. The most distal part of the promontory may be accretional, although the possible presence of Kittigazuit Sand within 20 cm of the sand flat surface suggests that this area may also be largely erosional.

Site 90-44 is located south of the site 90-42 promontory on the opposite side of the channel (Fig. 2). The site consists of a broad sandy flat, marginal to a large island, and is the location of a thermistor probe emplaced by L. Dyke. No profiles were measured at this site. The 10 metre high bluff consists of Kittigazuit Sand overlain by a 20 to 30 cm thick bed of rounded gravel. The bluff is fronted by a gravelly storm ridge and the low relief sand flat. At its widest point, the flat slopes very steeply down into the channel below low water level at almost 45°. On its sheltered side, the sand flat passes laterally into an intertidal mud flat.

4.7 Inner Harbour (Sites 90-4, 90-5 and 90-6)

These sites were visited during a period of low water, which provided an opportunity to view the surface of an intertidal mud flat. The three sites are located on the northern side of a

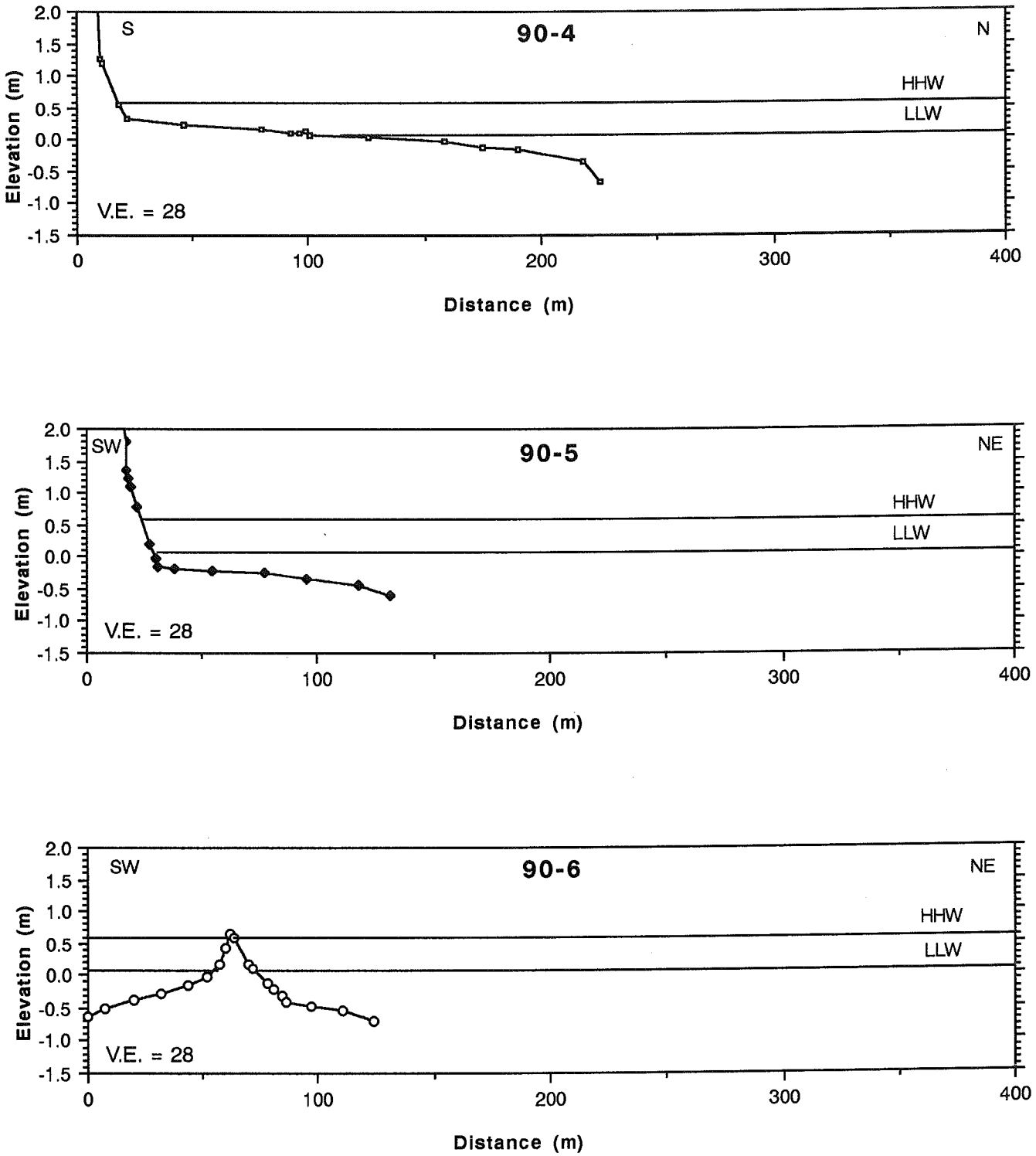


Figure 21. Beach profiles 90-4, 90-5, 90-6, Inner Harbour.

narrow isthmus extending from the main Richards Island (Fig. 2). This isthmus is sheltered from offshore waves by the island of profile 90-42 and 90-43.

Profile 90-4 (Fig. 21a) was measured across the intertidal mudflat, which forms a convex-seaward area on the northern side of the isthmus, in front of cliffs of brown Kittigazuit Sand overlain by a thin bed of diamict. In front of the cliffs, a poorly-sorted gravel and sand beach is present (slide 39). Gravel clasts are generally less than 5 cm in diameter, but cobbles up to 30 cm occur. The gravel beach passes laterally into the mud flat, which can be divided into upper intertidal and lower intertidal sections.

The upper intertidal flat extends only about 10 metres horizontally. Its surface consists of wave-rippled very fine sand and silt, and is covered by numerous worm trails and concentrations of organic matter (slide 40). The latter occur in two forms: as clumps of partially buried peat and in low relief bedforms of particulate organic material. The clumps range in size from a few centimetres to tens of centimetres in diameter and up to 10 cm of exposed thickness. The particulate organic material is concentrated in ripple troughs and in isolated linguoid ripples up to 30 cm across (slide 41). These features are superimposed on the linear wave ripples. A pit in the upper intertidal flat shows 5 cm of muddy very fine sand overlying a 1 cm thick bed of grey clay, which in turn overlies sand similar to the surface unit.

The upper and lower intertidal flat sections are separated by a very low relief scarp (slide 42). The lower intertidal flat has a more irregular surface morphology, consisting of low-relief pits and mounds. The mounds have relief typically up to 5 cm high and tens of centimetres across, whereas the intervening pits are generally narrower. The surface is muddy and thixotropic and in pits can be seen to consist of thinly-bedded very fine sand, silt and grey clay (slide 44). Numerous small scale scarps bounding amphitheatre-shaped depressions are also present on this part of the mud flat (slide 45). The scarps have relief of 3 to 5 centimetres and may be several metres across. These features have the characteristics of small liquefaction collapse depressions, but sections through them show no obvious deformation. An alternative explanation is that they may be formed by wave erosion. The subtidal portion of this section consists of soft mud in irregular mounds.

Profile 90-5 was measured to the east of 90-4, across a narrow fringing gravelly beach (slide 46, Fig. 21b). The bluffs here are low and partially vegetated. The beach is uniform with no well-defined storm ridge or berm. It passes offshore below the low water line into mud. The lower foreshore was very soft, suggesting it is underlain by partially liquefied sand and silt. A pit in this area of the beach shows approximately 20 cm of sand and gravel overlying a thin bed of grey clay, in turn overlying brown sand (slide 47). Further eastward along the beach, just below a collapsed section of the cliff, a thin lag gravel overlies soft brown silty sand directly. Once again, the brown sand may be Kittigazuit Sand underlying a thin reworked veneer of beach sand and gravel. The soft nature of the sand may have resulted from water release during summer thaw.

Site 90-6 was measured across a low, narrow spit of sand and gravel (Fig. 21c). The spit surface lies just above the high water line. The sand here was firm and pits in the foreshore show beach sand and gravel down to at least 20 cm. This observations suggest that the spit is primarily an accretional feature, in contrast to the promontory at site 90-42.

5.0 OFFSHORE SURVEY

5.1 Bathymetry

Conducting a systematic sounding survey from the Zodiac was problematic. Attempts were made to steer the boat using landmarks to sight on and attempting to compensate for wind and current drift. Although the sounding lines were rarely straight, the coverage obtained was reasonable in the area of the entrance to Pipeline Harbour (Fig. 22). Original positioning information is included as Appendix 4.

The soundings were corrected to chart datum, using the measured tide at Tuktoyaktuk. After correction, crossover soundings were checked, both within the same day's data (August 9) and between the data from August 9 and August 11. The crossover depths generally corresponded within $\pm$ 0.3 m, except for a few points over steep slopes (e.g. bedforms). One line running north - south across the area (Aug. 9, fixes 251 to 278), for unexplained reasons, appeared to be consistently in error compared to other lines it crossed, and was therefore deleted from the bathymetric compilation.

The contoured bathymetry is shown in Figure 23. It should be noted that this map does not resolve the complex bar topography close to MR2 island and Wolfe Spit, nor details of smaller scale topography such as sand waves. However, the map shows clearly the broad embayment of Pipeline Harbour and a pronounced shoal outside the mouth of the harbour.

5.2 Sidescan Sonar Survey

As described in section 1.4.5, the sidescan survey was difficult from the Zodiacs. Efforts were concentrated on obtaining records off MR2 island and across the shoal off the entrance to Pipeline Harbour. One long regional line was also obtained from the mouth of Hansen Harbour to Wolfe Spit. The results of the sidescan survey are presented on two figures, the first showing bottom types (Fig. 24) and the second showing smaller scale features (Fig. 25).

Five different bottom types were recognized:

(1) Moderate reflectance seafloor that is predominantly smooth and featurless except for degraded ice scours and ice grounding pits (Fig. 26). Rippled seafloor is observed in some of the ice grounding pits. This bottom type is found only off the eastern end of Reindeer Island and Hansen Harbour. The degraded nature of the ice scours suggest a relatively mobile, perhaps sandy seabed.

(2) Higher reflectance seafloor, characteristically patchy with numerous low relief depressions and/or sand patches (Fig. 27). This bottom type appears to be dominated by

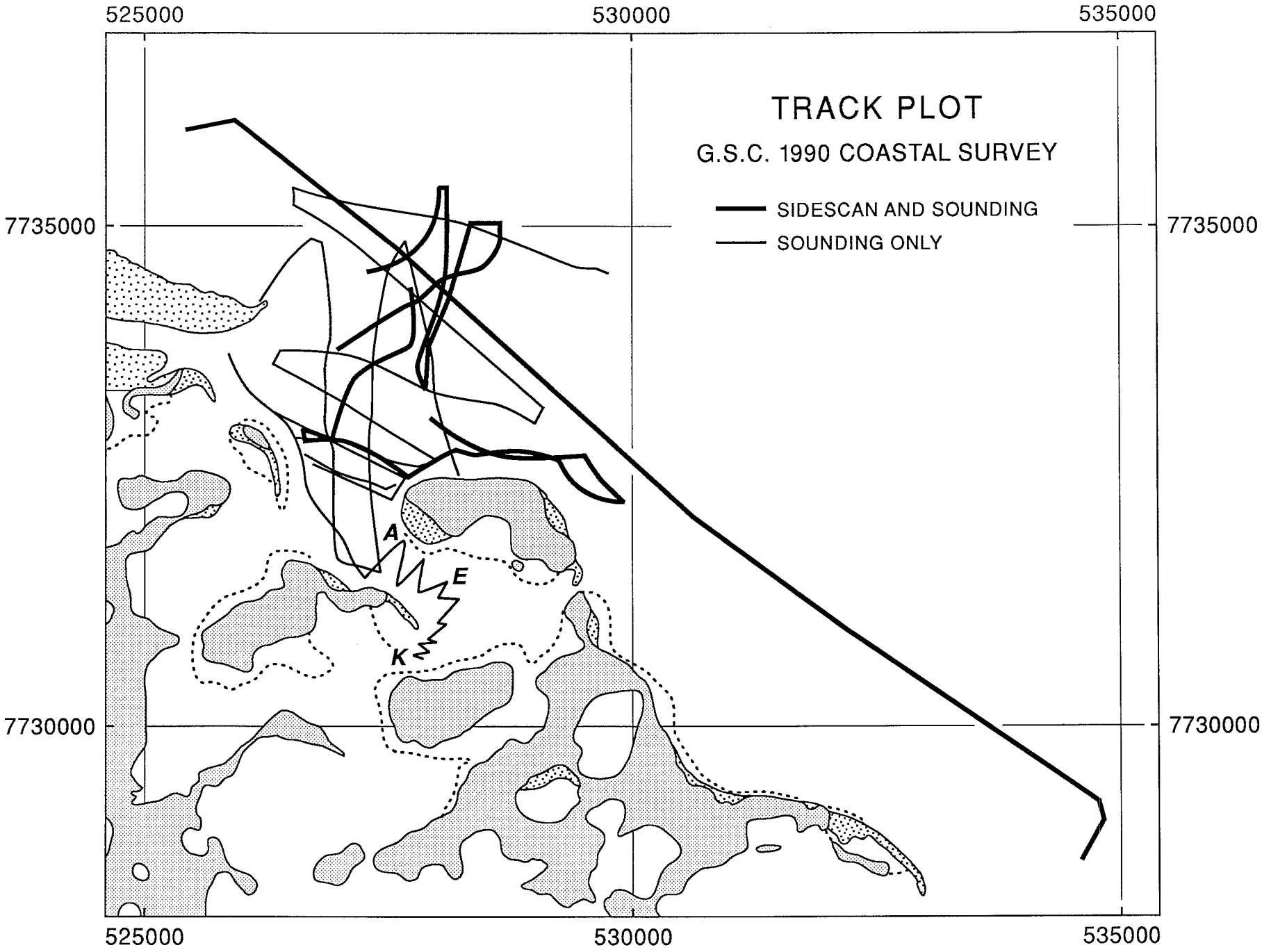


Figure 22. Track plot of bathymetry and sidescan sonar survey lines. Detailed positioning shown in Appendix 4. UTM grid in metres.

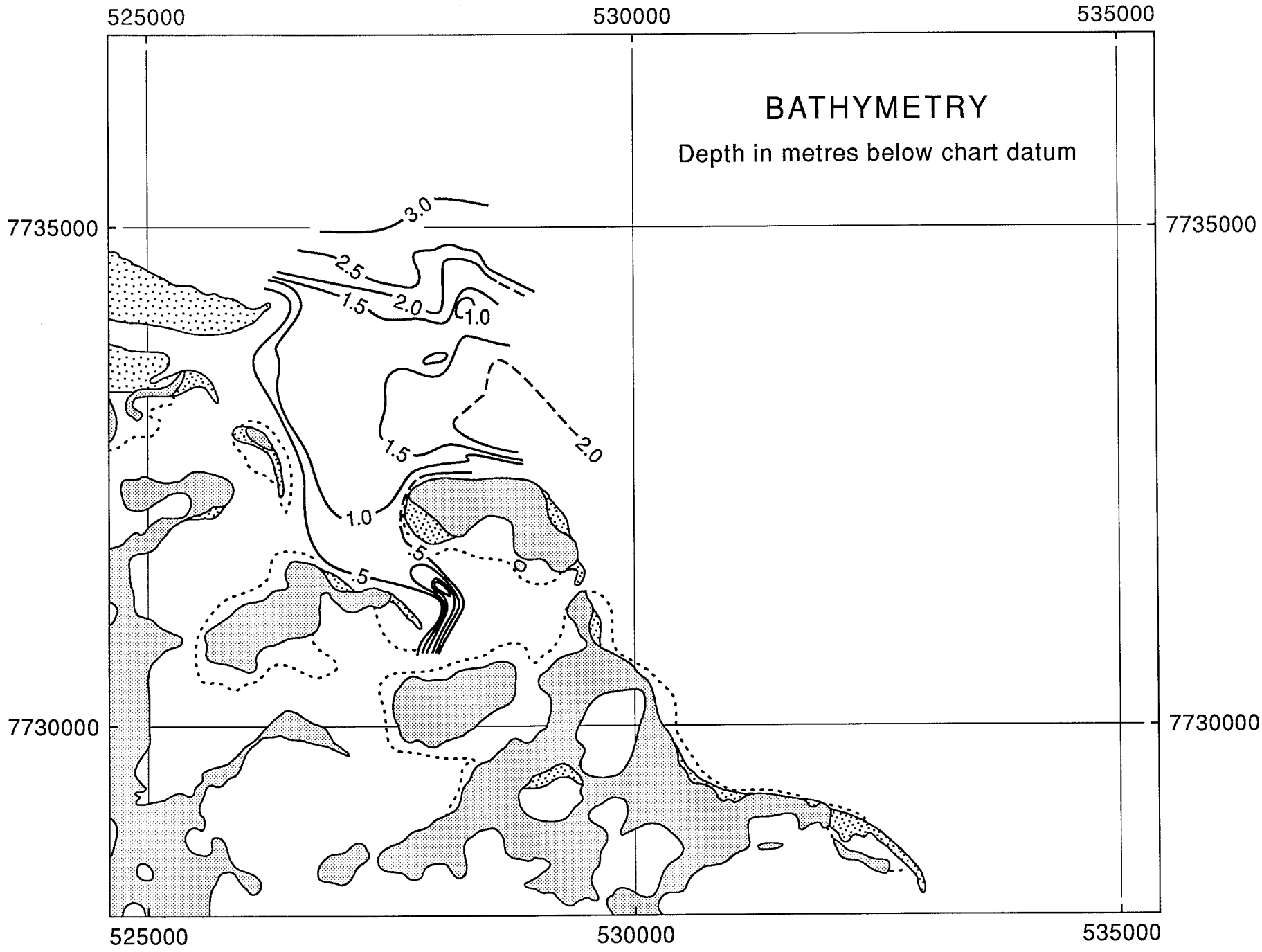


Figure 23. Bathymetry of the study area based on 1990 soundings. UTM grid in metres.

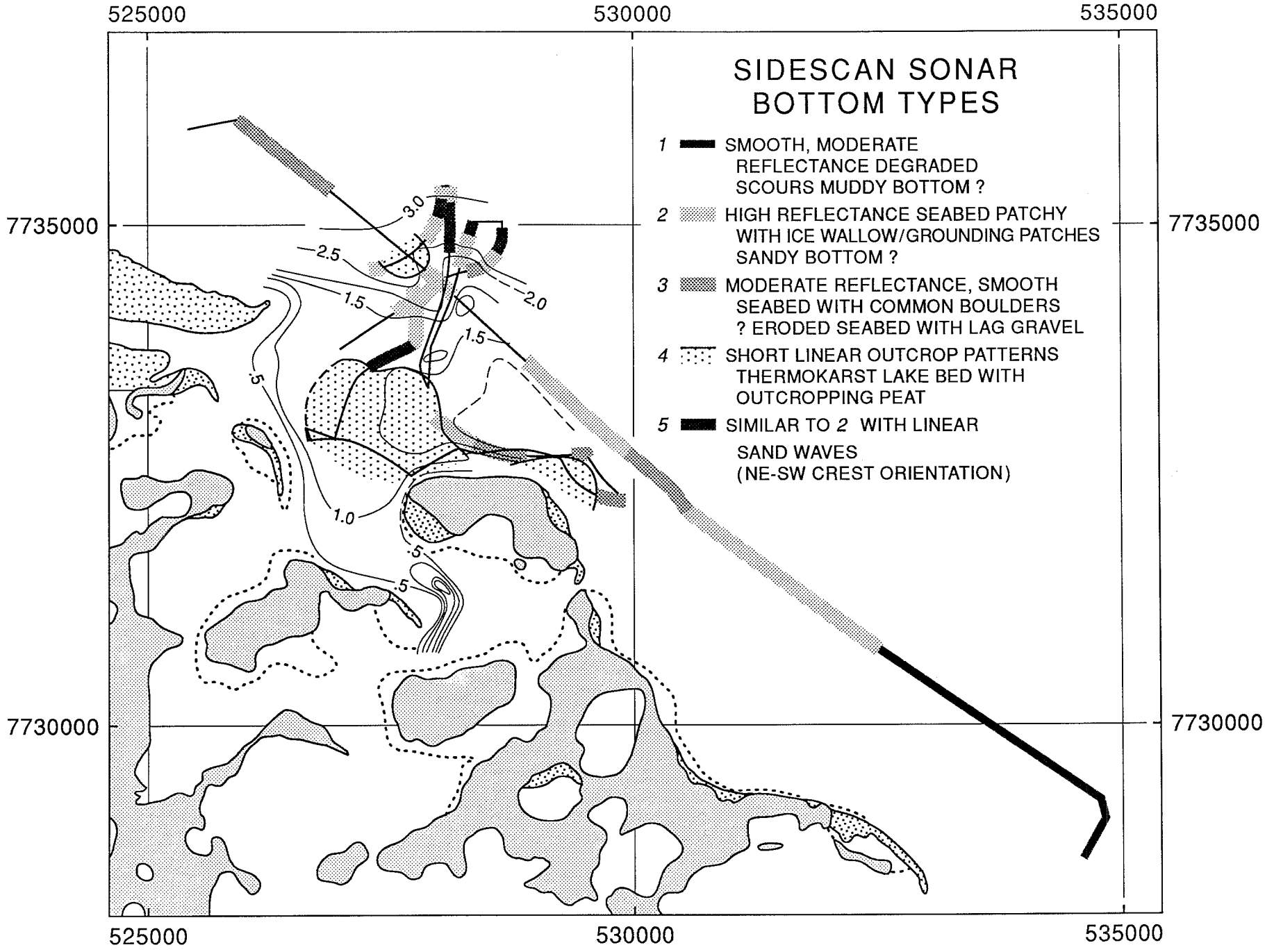


Figure 24. Map of bottom types observed on sidescan sonar records. UTM grid in metres.

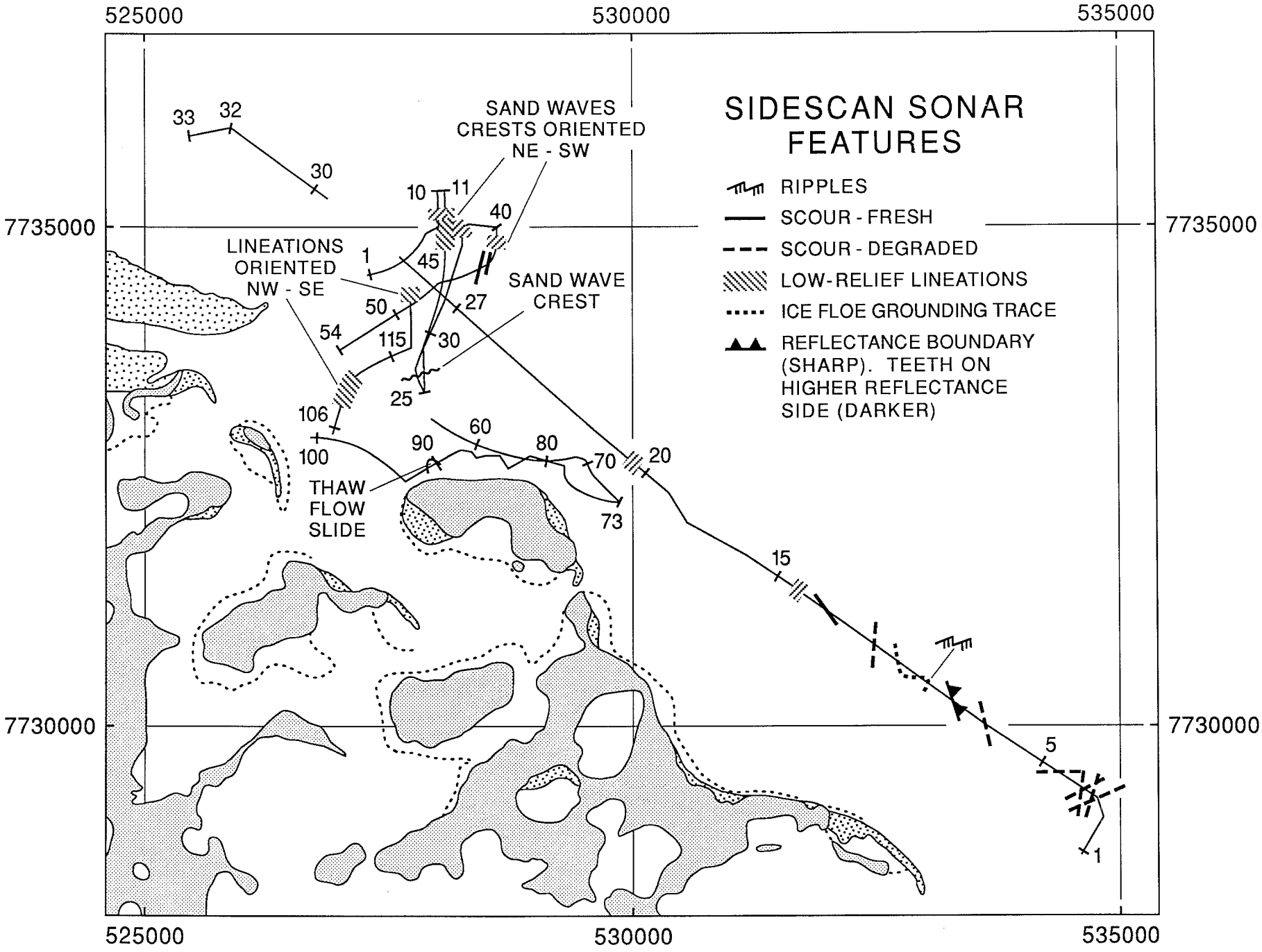
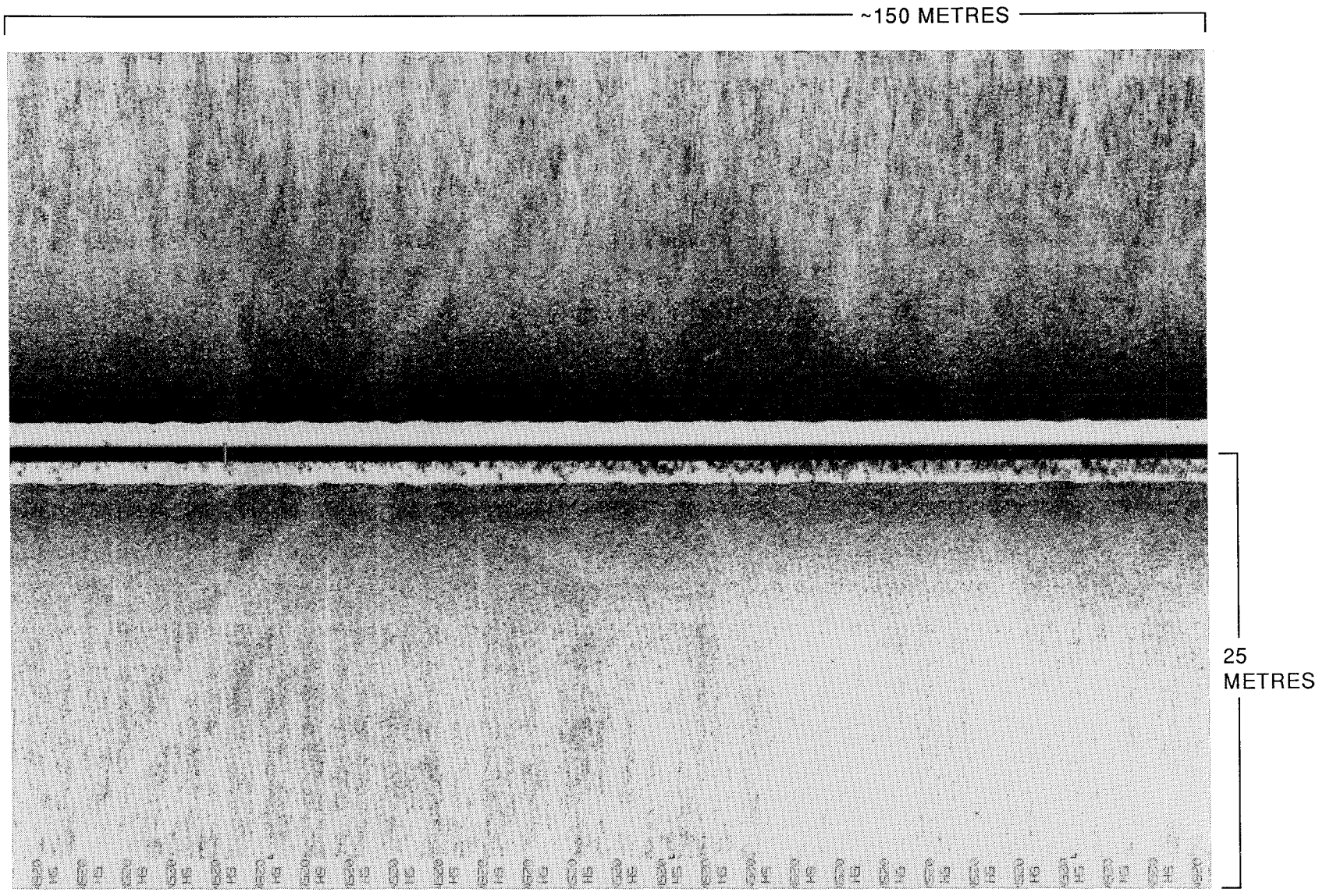


Figure 25. Map of small scale features observed on sidescan sonar records. UTM grid in metres.

Figure 26. (Following page) Example of type 1 seafloor. Note presence of degraded ice scours.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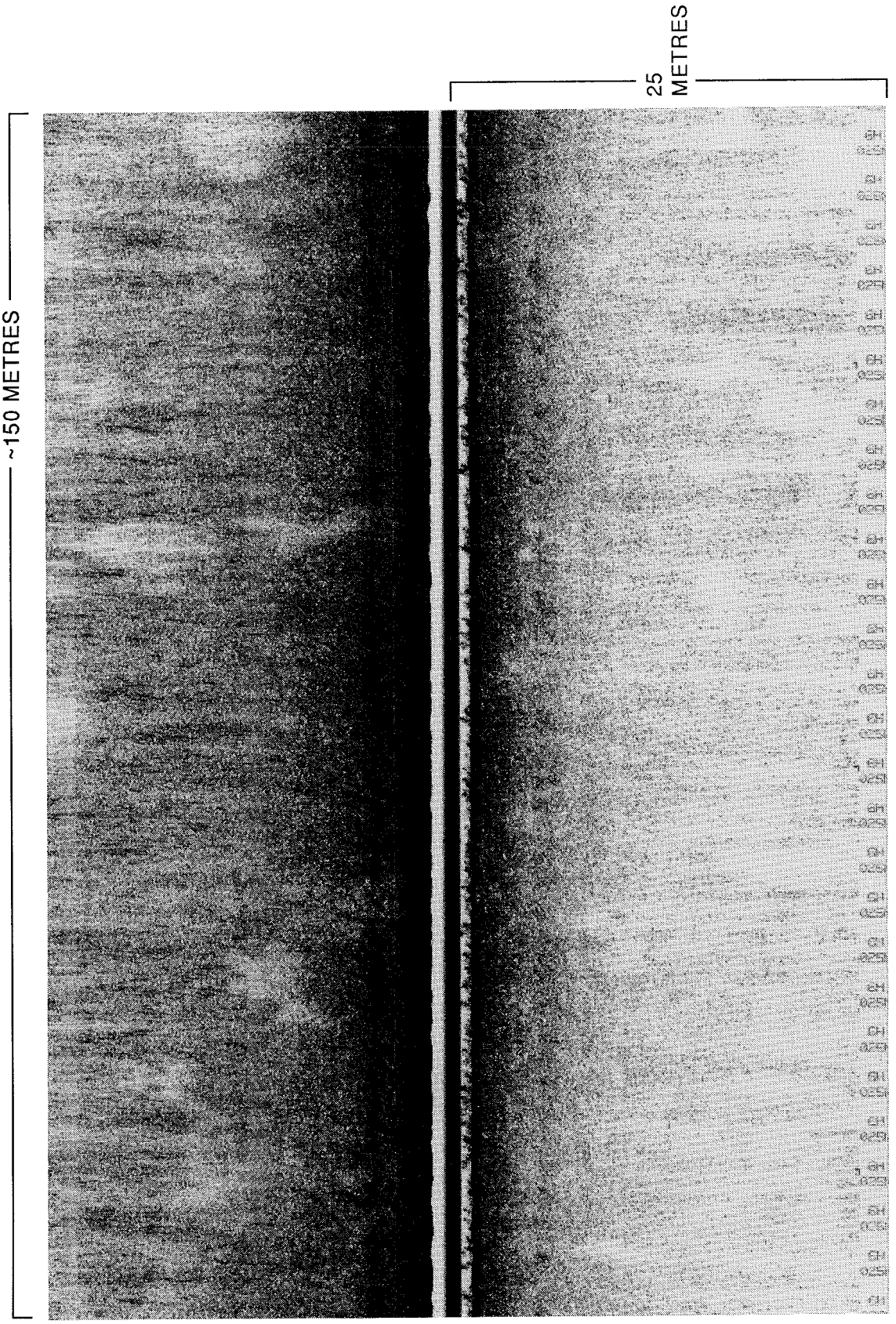
25
METRES

Figure 27. (Following page) Example of type 2 seafloor. Note presence of low relief ice grounding patches.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grounding ice features, although the low relief suggests active sediment transport and infill of scour relief.

(3) Moderate to low reflectance, smooth seabed characterized by numerous scattered point reflectors (Fig. 28). The point reflectors are probably boulders and pieces of eroded tundra, similar to that observed on many of the beaches. Two interpretations of these features are possible: they may be either lag material on an erosive surface, or ice-rafted.

(4) Moderate to low reflectance with distinctive high reflectance outcropping pattern (Fig. 29). The outcrops consist of short, linear or arcuate ridges, generally oriented in parallel to each other. This outcrop pattern is interpreted to represent transgressed thaw lake deposits, similar to that seen on beaches in front of present-day thaw lakes (slide 56).

(5) Moderate reflectance seabed with low relief linear bedforms (Fig. 30). These bedforms were observed on the northern edge of the shoal off Pipeline Harbour but were barely visible on the sounding records. They had a maximum relief of approximately 20 centimetres and a maximum wavelength in the order of 1.5 to 2.0 metres. The crests of the bedforms were oriented NE-SW and, from bedform asymmetry, appeared to be migrating towards the southeast.

A sixth type of sidescan pattern was observed (Fig. 31), but is thought to be an artefact. It occurs only in very shallow water areas and consists of a regular wave-like pattern and reduced lateral range. The pattern is probably related directly to the wake or motion of the boat.

The relatively sparse coverage of the sidescan data prevents detailed interpretation. The most distinctive features are the areas of outcropping beds, which appear to define former thaw lakes. The largest area occurs in the entrance to Pipeline Harbour supporting the interpretation that the embayment was formed by the drowning of a thaw lake. The sidescan data does not reveal much about the origin of the shoal off Pipeline Harbour. Elsewhere, the impression is of an erosional seabed with a thin veneer of sand, but seismic reflection data would be required to confirm this interpretation.

The distribution of smaller scale features (Fig. 25) shows that most observed ice scours are degraded. A feature of note is the area of high reflectance irregular seabed observed off MR2 island (Fig. 32). This area occurs directly off a present-day thaw flow slide, but it seems unlikely that a slide deposit would extend over 1 km off the coast. It may however represent a former slide deposit preserved on the margin of the Pipeline Harbour thaw lake (Fig. 24).

Some very distinctive records (Fig. 33) were obtained in Hansen Harbour during start-up

Figure 28. (Following page) Example of type 3 seafloor. Note presence of point reflectors.

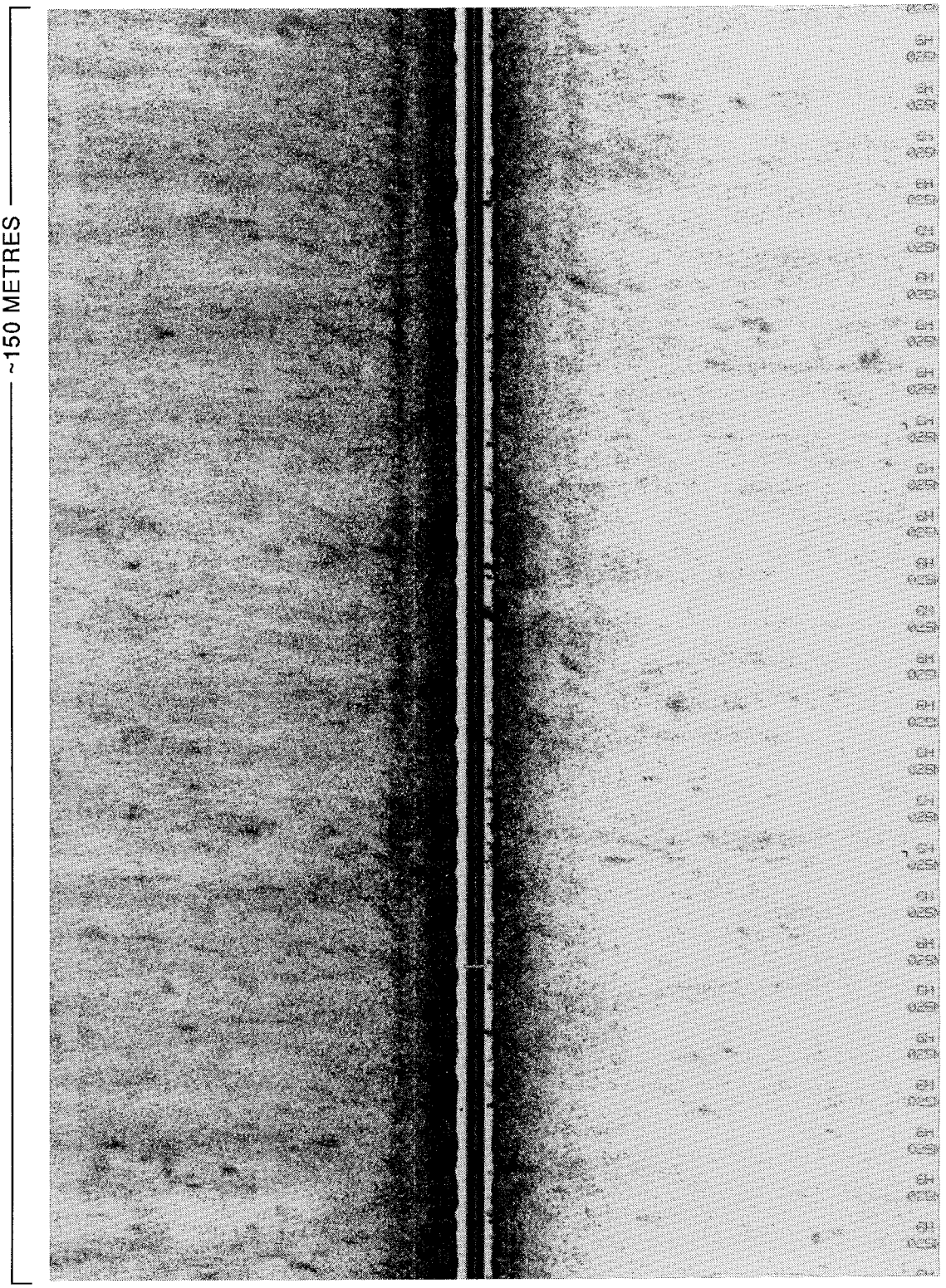
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Figure 29. (Following page) Example of type 4 seafloor. Note presence of outcrop patterns.

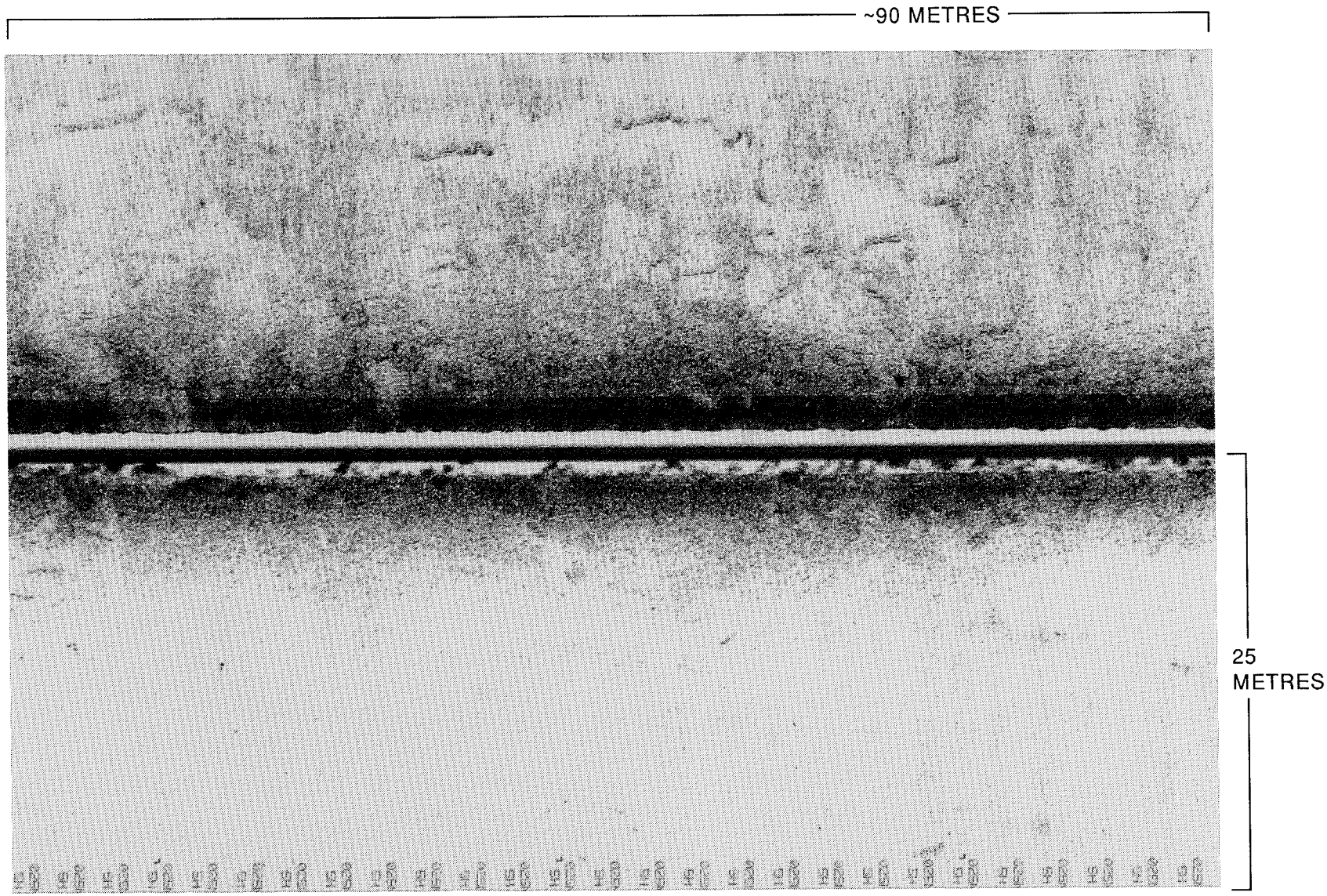
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Figure 30. (Following page) Example of type 5 seafloor. Note presence of low relief bedforms.

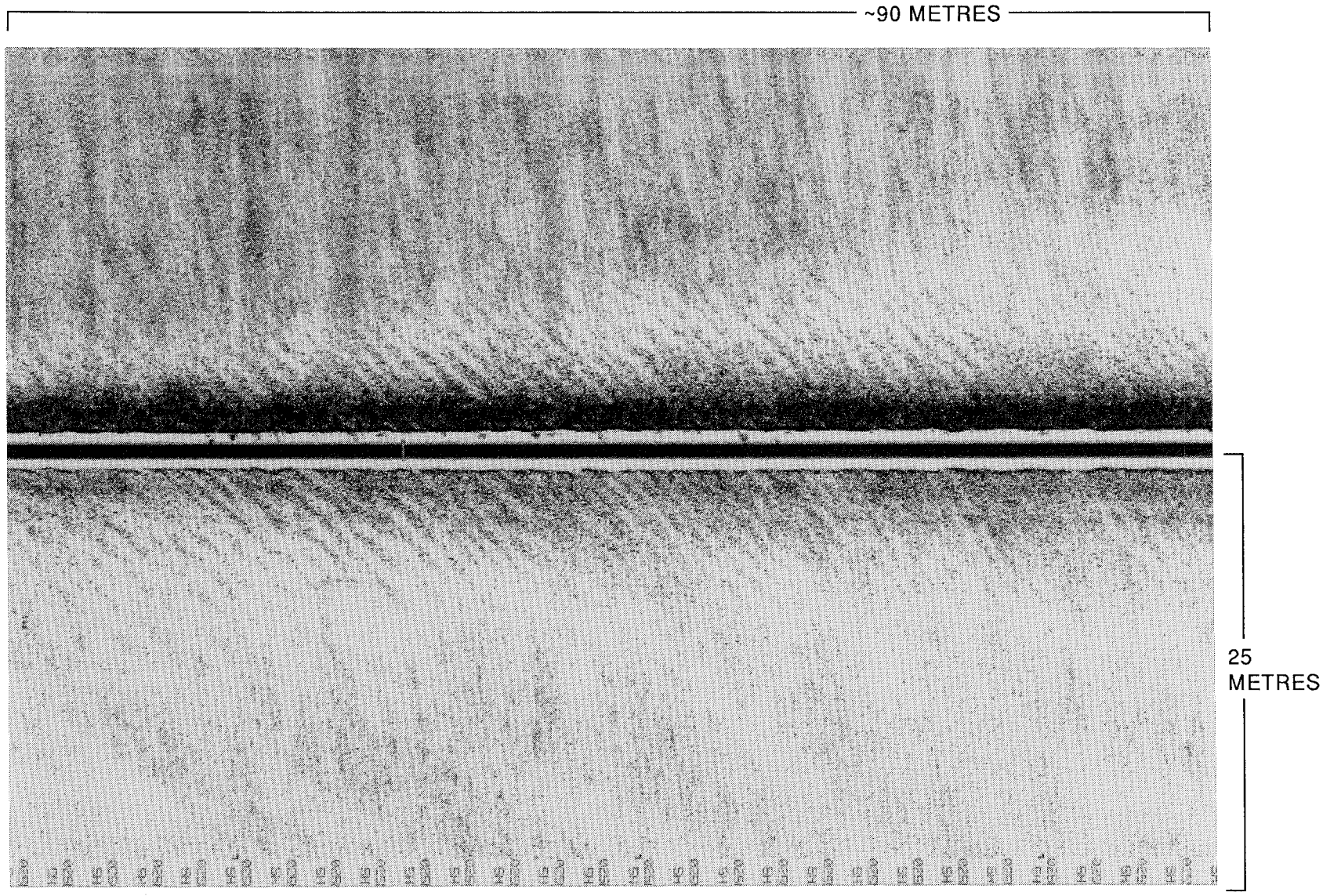
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Figure 31. (Following page) Example of shallow water artefact.

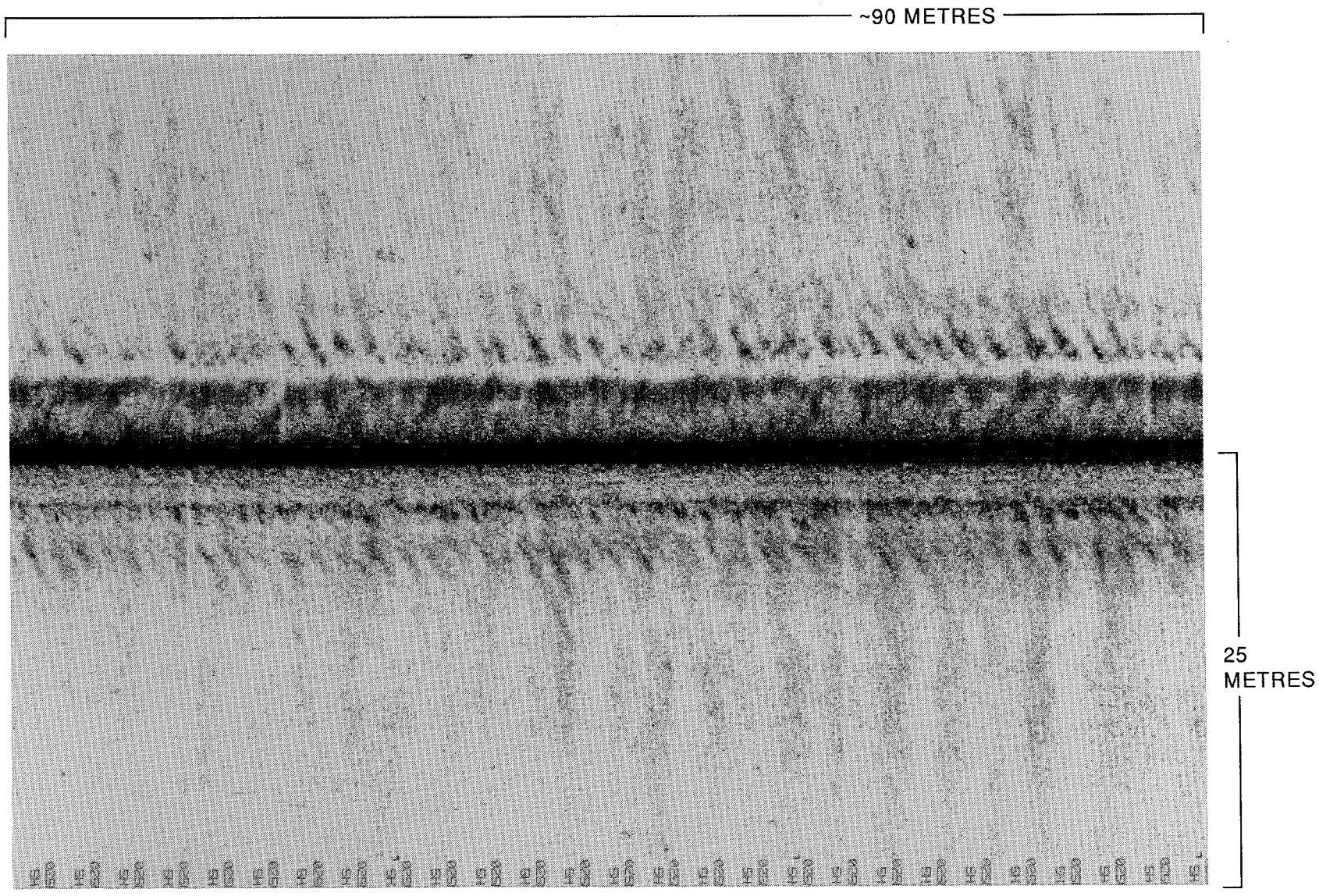
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Figure 32. (Following page) Possible thaw flow slide deposit off MR2 island.

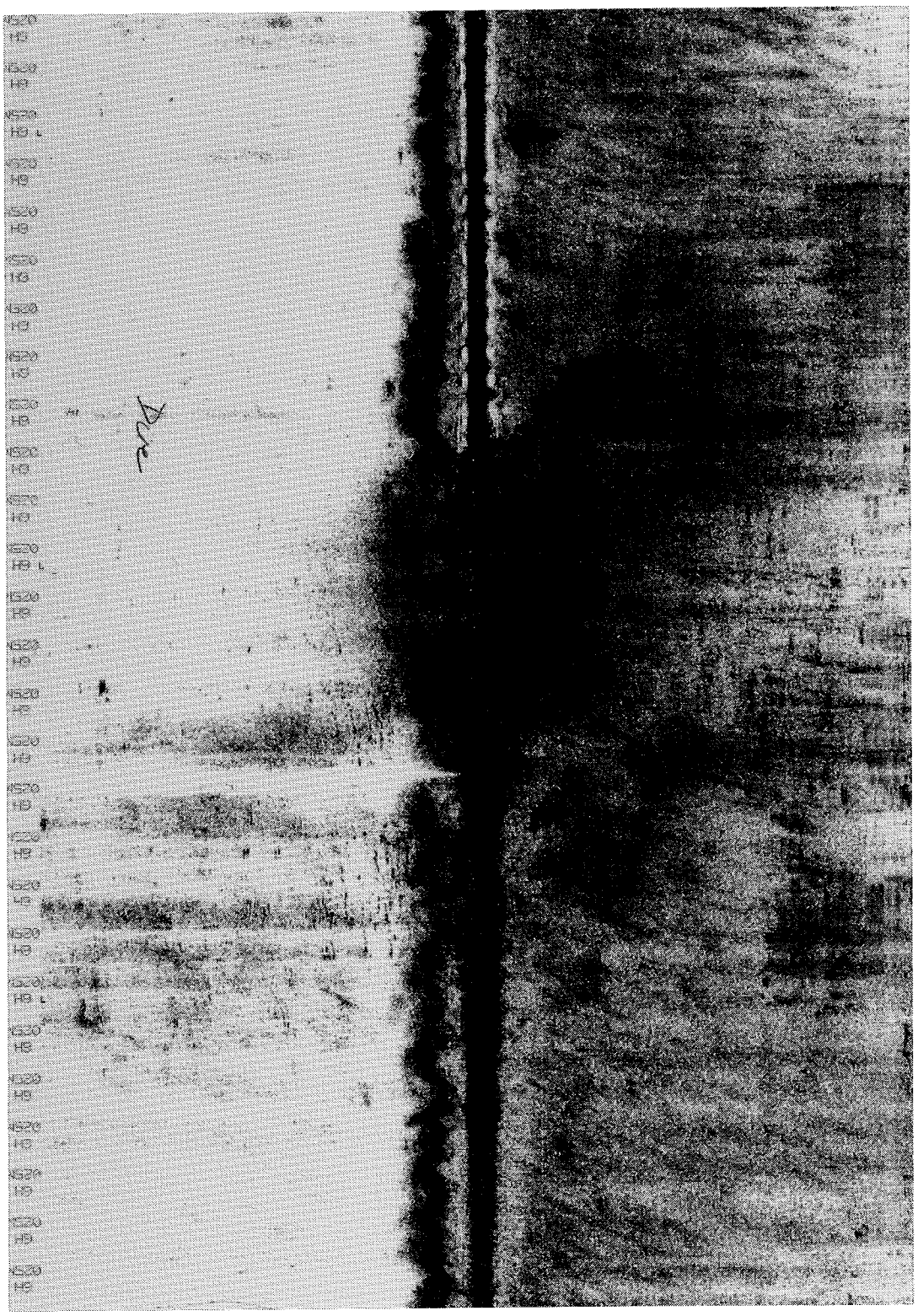
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Figure 33. (Following page) Example of Hansen Harbour seafloor. Note presence of sand patches migrating over highly scoured seabed.

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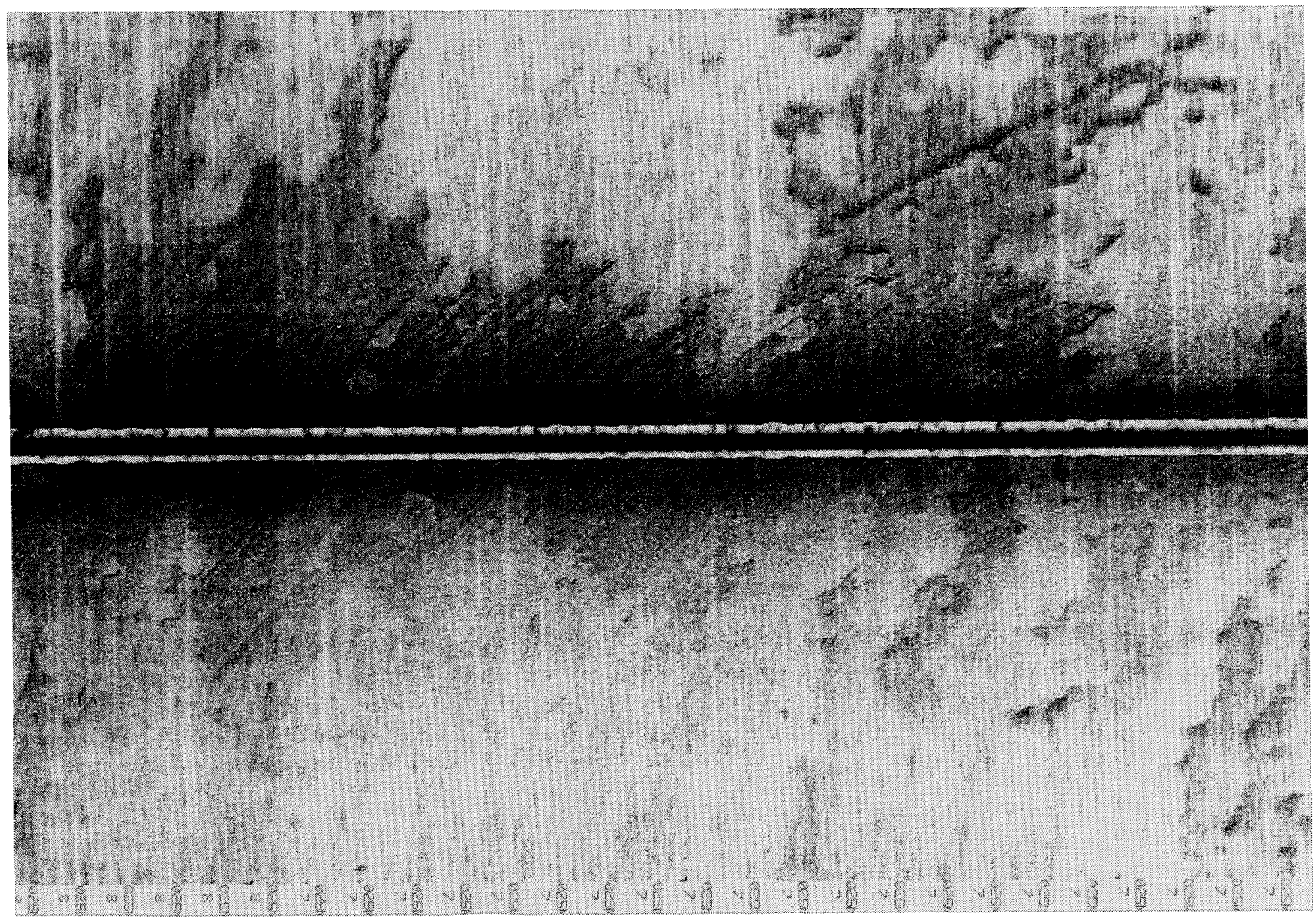

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trials, but were outside the range of the Miniranger navigation . The seafloor in this region consisted of sand (and possibly gravel) patches, which were obviously migrating over heavily scoured seabed.

5.3 Grab Samples

Grab samples were collected in the area off Pipeline Harbour and along nearshore profiles at sites 90-2 and 90-3. The locations and lithologies (as described by the author in the field and S. Solomon upon return of the samples to AGC) are listed in Table 5 and shown on Figure 34. No grain size analyses were available for this report. The four principal lithologies observed were:

(1) Stiff mud with a very thin veneer of very soft mud. These samples were located in the deeper water off Pipeline Harbour and were probably taken in an area of erosion.

(2) Soft mud, generally clay with a relatively high silt content.

(3) Very fine silty sand, with a significant mud content. This is the dominant lithology in the area in and around Pipeline Harbour.

(4) Well-sorted, fine to medium sand, located principally close to Wolfe Spit and on bars along nearshore profiles 90-2 and 90-3.

Table 5. Grab sample descriptions (by S. Solomon). For positions, see Figure 34.

90-10	Very fine muddy sand, with black heavy minerals. Grey green 5Y3/2. Calcareous.
90-11	Very fine muddy sand, with abundant silt. Mud is fluffy, organic rich. Green grey, 5Y4/4. Calcareous.
90-12	Very fine muddy sand, siltier than 11, with trace of black heavy minerals and scattered organic material. Grey green, 5Y3/2. Calcareous.
90-13	Very fine muddy sand, with trace of black heavy minerals, less organic material than 12. Grey green, 5Y3/2. Calcareous.
90-14	Sandy, muddy silt with filamentous organic detritus and trace of black heavy minerals. Mud is fluffy and flocculated with addition of HCl. Grey green, 5Y3/2. Calcareous. Scattered flakes of "mother-of-pearl" material, possibly shell fragments.
90-15	Sandy, muddy silt, with less organic material and slightly more clay than 14, giving more cohesion. Grey green, 5Y3/2. Calcareous.
90-16	Silty fine sand with a trace of clay, but cleaner than 15. 3-5% black heavy minerals and abundant feldspar. Very mature. Grey-green, 5Y5/3. Calcareous.
90-17	Fine to medium sand with silt. Well-sorted. Abundant non-quartz grains. Light grey-green, 5Y5/3. Calcareous, effervescence on discrete red-brown grains.
90-18	Fine to medium sand with silt. Muddier than 17 with abundant organic detritus. 5Y4/4. Calcareous.
90-19	Fine sand, well sorted, trace of silt, heavy minerals and carbonate grains, no organic material. Yellow-green, 2.5Y4/4.
90-20	Very small sample of sandy mud (from shipboard description).
90-22	Sand overlying mud (from shipboard description).
90-23	Clayey silt with abundant organic material, cohesive, plastic feel. 5Y4/4. Calcareous.
90-24	Very fine sand, very slightly muddy., but well-sorted, scattred organic material, heavy minerals and orange feldspar and/or Fe-stained grains. 2.5Y4/4.
90-25	Very fine sand, well sorted, very slightly silty. Trace of organic material, heavy minerals and Fe-stained grains. 2.5Y4/4. Calcareous.
90-26	Ditto.
90-27	Ditto.
90-28	Very fine sand. Well-sorted, no silt or organics. 2.5Y4/4. Calcareous.
90-29	Fine to medium sand, well-sorted, no organics. 2.5Y4/4. Calcareous.

90-30	Ditto.
90-31	Ditto.
90-32	Ditto.
90-33	Ditto.
90-34	Silty mud with trace of fine sand. Scattered organic detritus. Grey-green, 5Y4/4. Calcareous.
90-35	Ditto.
90-36	Silty mud with more clay than 35. Sticky and cohesive. Abundant organic detritus. Grey-green 5Y4/2. Calcareous.
90-46	Silty mud, sticky and cohesive. Scattered organic detritus. Grey green, 5Y4/2. Calcareous.
90-47	Ditto.
90-48	Fine to very fine, slightly muddy sand. Abundant black heavies and orange feldspar or Fe-stained grains. Trace organic detritus. 2.5Y4/4. Calcareous.
90-49	Fine to medium sand, well-sorted with sub-rounded to sub-angular heavies and orange grains. Trace of brick-red siltstone. 2.5Y4/4. Calcareous.
90-50	As 49, but slightly muddy.
90-51	Ditto.
90-52	Silty clay, sticky, with organic material. 5Y4/4. Calcareous.
90-53	Ditto, but siltier.
90-54	Ditto, stiff with a trace of sand.
90-55	Very fine to fine slightly silty sand. Well-sorted. Sub angular grains of black heavies, Fe-stained quartz, feldspar. 2.5Y4/4. Calcareous.

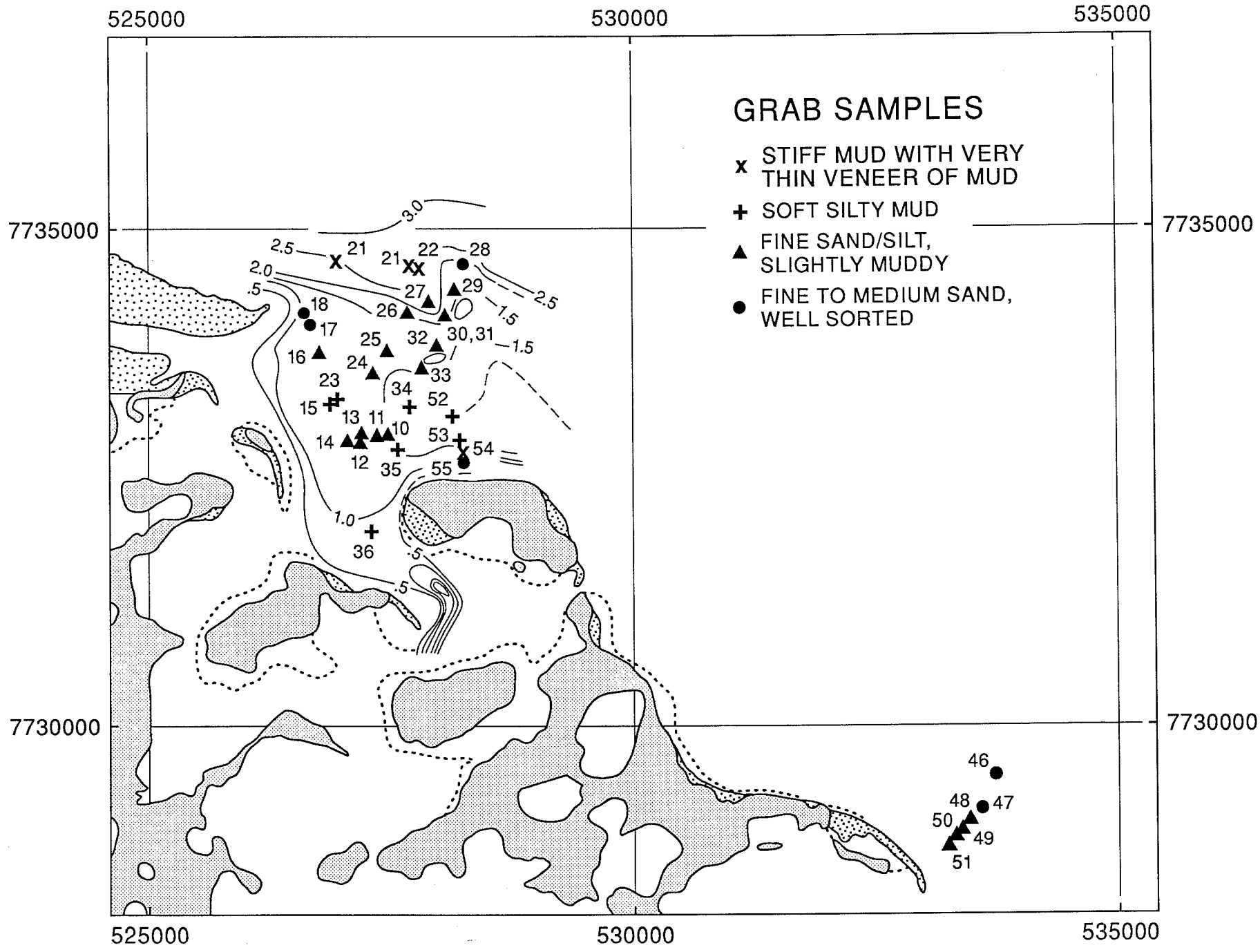

Figure 34. Map showing grab sample locations and lithologies. UTM grid in metres.

6.0 CLIFF RETREAT MEASUREMENTS

Two sets of cliff monitoring stations were revisited to determine retreat rates: (a) the sites established in the principal study area by Gillie (1988); and (b) those initially established on Hooper and Pelly Islands by H. Kerfoot and/or C.P. Lewis in 1971 and 1976 and remeasured in 1984 by Forbes and Frobel (1985) and in 1986 by Gillie (1987).

6.1 Resurvey of Gillie (1988) Sites

Five of the Gillie sites were resurveyed and the results are shown in Table 6 and Appendix 5. The location of the sites are shown on Figure 2 and descriptions of the site can be found in Gillie (1988). At sites GIL-B and GIL-F, the front markers could not be located and the survey line had to be re-established based on a compass bearing from the back benchmark. The inherent error involved can be seen in the fact that slight positive changes are recorded at these sites. Although it is reasonable to infer that relatively little erosion has occurred at these sites (as they both occur in relatively sheltered locations), the positive change is more likely to reflect survey error than true accretion.

The remaining three sites, GIL-E, GIL-K and GIL-L, are all at relatively exposed locations and show significant retreat at rates ranging from 0.40 to 1.45 metres per year. The highest rate of retreat occurred at site GIL-L on a section of the cliff where active thaw-flow slide activity was observed.

6.2 Pelly Island Sites

Considerable effort was expended searching for the survey markers on Pelly Island. Unfortunately only one numbered marker was found (#145 at GSC site 5370, see Table 7), but the distance measured to the cliff edge exceeded the previously measured value by 6 metres. An error was therefore made by either our field party or a previous one. A second unmarked dowel was found.

6.3 Hooper Island

Four sites (GSC sites 5381, 5382, 5383 and 5384) were located and re-surveyed. These sites are located along the seaward-facing cliffs of the island which were characterized by extensive thaw-flow slides (slides 120-123). Each site consisted originally of 13 to 16 dowel markers, but at all sites, some of these were not found. Only five and two markers were found at sites 5382 and 5384 respectively. The resulting data are presented as individual measurements (Table 7) and mean retreat rate values compared to previous measurements (Table 8). The retreat rates over the four years since they were previously surveyed range from 1.12 to 7.75 metres per year, with all

Table 6. Cliff retreat measurements at the Gillie (1988) sites.

Site	Distance to cliff edge (m) 1988	1990	Mean Retreat Rate (m/a)	Comments
GIL-B	37	37.8	-	Front benchmark missing, back benchmark had fallen and was replaced in its assumed hole. Profile measured using bearing from Gillie's notes. Rebar set at base of cliff (+48.6 m) as new front benchmark.
GIL-E	40	39.2	0.40	
GIL-F	26.3	27.1	-	New threaded rod placed at cliff edge.
GIL-K	50	48.1	0.95	
GIL-L	48	45.1	1.45	

Table 7. Cliff retreat measurements on the outer island sites.

Site	Site No.	Distance to cliff edge (m) 1986	1990	Mean Retreat Rate 1986-1990 (m/a)	Comments
Pelly Island	5370-145	13.6	19.29	-	Error
Hooper Island	5381-53	15.3	7.04	2.07	BM set back 10 m to 17.04 m.
	5381-55	13.8	7.31	1.62	
	5381-56	13.7	7.73	1.49	BM set back 10 m to 17.73 m.
	5381-57	13.1	6.61	1.62	BM set back 10 m to 16.61 m.
	5381-58	13.3	6.86	1.61	BM set back 10 m to 16.86 m.
	5381-59	14.0	8.08	1.48	BM set back 10 m to 18.08 m.
	5381-60	16.4	10.03	1.59	BM set back 10 m to 20.03 m.
	5381-61	16.0	11.50	1.12	BM set back 10 m to 21.50 m
	5381-63	14.3	8.30	1.50	BM set back 10 m to 18.30 m.
	5381-64	12.9	6.12	1.69	BM set back 10 m to 16.12 m.
	5381-65	13.0	6.49	1.63	BM set back 10 m to 16.49 m.
	5381-67	13.7	6.65	1.76	BM set back 10 m to 16.65 m.
	5382-68	17.8	7.92	2.47	
	5382-69	14.3	1.90	3.10	BM set back 10 m to 11.90 m.

Table 7 (Cont'd)

Site	Site No.	Distance to cliff edge (m) 1986	1990	Mean Retreat Rate 1986-1990 (m/a)	Comments
Hooper Island	5382-72	11.0	2.15	2.21	BM set back 10 m to 12.15 m.
	5382-74	10.6	1.84	2.19	BM set back 10 m to 11.84 m.
	5382-75	17.7	9.07	2.16	
	5383-83	?	2.74		BM set back 10 m to 12.74 m.
	5383-84	15.5	5.00	2.62	BM set back 10 m to 15.00 m. Tag missing, marked with marker pen.
	5383-85	15.1	6.90	2.05	Dowel broken - stick marks position.
	5383-86	18.3	8.58	2.43	BM set back 10 m to 18.58 m.
	5383-87	18.7	9.37	2.33	Tag missing.
	5383-88	15.1	5.89	2.30	BM set back 10 m to 15.89 m.
	5383-89	17.7	0.84	4.21	Flow slide. BM set back 20 m to 20.84 m.
	5383-90	15.6	3.52	3.02	BM set back 10 m to 13.52 m.
	5383-92	14.9	4.74	2.54	BM set back 10 m to 14.74 m.
	5383-93	13.6	4.14	2.36	BM set back 10 m to 14.14 m.
	5383-95	13.5	4.48	2.25	BM set back 10 m to 14.48 m.
	5384-98	Missing	6.27	-	BM set back 10 m to 16.27 m.

Table 7 (Cont'd)

Site	Site No.	Distance to cliff edge (m) 1986	1990	Mean Retreat Rate 1986-1990 (m/a)	Comments
Hooper Island	5384-101	21.7	12.60	2.27	
	5384-107(?)	15.4	7.65	7.75	
	5384-109	Missing	0.65	-	BM set back 23 m to 23.65 m. In front of broad slope failure.

Table 8. Mean Retreat Rates on Hooper Island, 1971 to 1990[1].

Site	Mean Retreat Rates				19-Year Mean
	1971-1976	1976-1984	1984-1986	1986-1990	1971-1990
5381	1.4 (±0.1)	0.9 (±0.0)	0.6 (±0.1)	1.60 (±0.06)	1.15
5382	1.5 (±0.1)	1.2 (±0.1)	1.8 (±0.2)	2.43 (±0.18)	1.59
5383	2.1 (±0.1)	1.5 (±0.1)	1.1 (±0.1)	2.61 (±0.20)	1.85
5384	2.7 (±0.4)	2.1 (±0.4)	2.7 (±0.9)	5.01 (±2.73)	2.93

1. Errors given as one standard error of the estimate of the mean.

survey lines showing net retreat (Table 7). In comparison to the previous measurements, the last four years have seen relatively rapid rates of retreat (Table 8), presumably as a result of increased thaw flow slide activity.

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APPENDIX 1

Field Notes

JOB.....

DATE 29/7/90 PAGE 1

14.30 To Lobsiger's to pick up video camera system.

16.45 Depart Halifax

21.30 Arrive Leduc Inn, Edmonton.

July 30

07.25 Departed Leduc Inn.

13.30 Arrived Inuvik
Flight to Tuk delayed till 17.30

18.00 Arrived Tuk.

20.00 Walked along coast of Tuk hamlet from ~~Sto~~ old schoolhouse.
Shoreline between old schoolhouse and next point to N has sandbag protection. Looks new in part.
Talked to resident on beach who thought that bags had been placed last summer. However, there

PARTY CHIEF.....

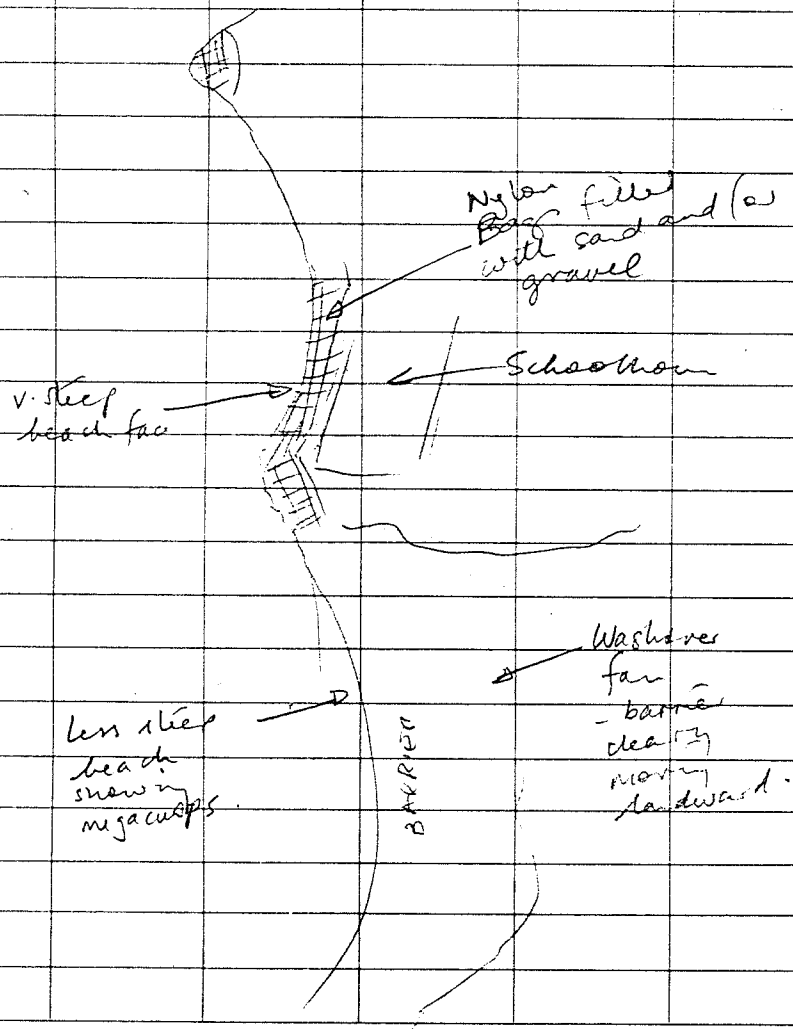
WEATHER.....

wade

JOB

DATE PAGE 2

was evidence that rock bags had been split, moved along beach.



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JOB

DATE PAGE 3

July 31

08.00 Mobilizing Madeira - setting up 3.5 kHz

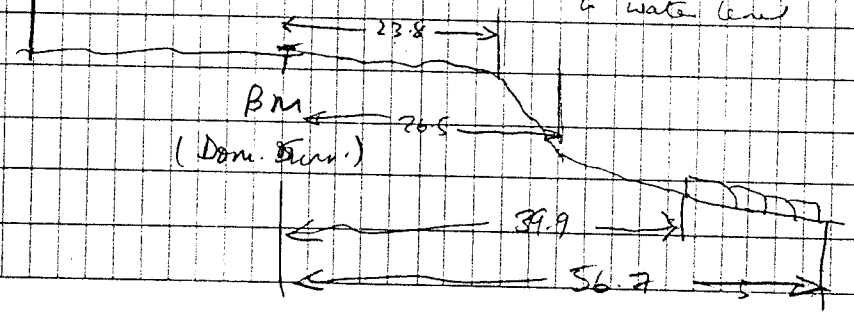
10.00 Grocery shopping with Armand.

13.00 Hardware store, Bay etc.

15.30 With Armand looking at coastal erosion problem in...

TUKTOYAKTUK HAMLET

Site 5012 from benchmark 23.80 m
Profile L3 to edge of bluff.
26.50 m
to base of scarp, top of beach
39.90 m
to edge of bags (shore protection)
56.7 m
to water line



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WEATHER

A1-2

JOB

DATE PAGE 4

Profile 2 Photos ① · ②

BM: Iron pipe, previously red - ~~no mark~~ measured approx perpend. to beach crest.

↳ Sm mark SW corner of lagoon.
+ Photo 1-1 ; 1-2

Thead. height 152cm

	Lower	Middle (cm)	Upper	D (m)	Ht (above datum)
①		-145		3.2	124.5
②		-1.70		11.2	229.5
③	20.5	-29.5	39	18.5	240
④	12	-22.5	33.4	21.4	247
⑤	124.7	-140.5	156.5	31.8	129
⑥	201	-219.5	238	37.0	50

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WEATHER

JOB

DATE PAGE 5

Inner limit of wavetover, limit of marsh

Halfway between thead. and lagoon crest

Driftwood

Crest

Water level (time = 16:25) MDST
15.25 MST
- tide - 0.5 m

PARTY CHIEF

WEATHER

A1-3

JOB.....

DATE..... PAGE 6

July 31 (cont'd)

18.00 Checked out video cameras - both working OK on time, but noticed that Minolta goes to PAUSE when switched on after being interrupted during a rewind cycle.

Don & Ian SEISTEC put together, now wiring up to power supply etc.

21.00 End day.

August 1

08.00 Packed away equipment into red crate in Bay 6. Made markers for video cameras from PVC pipe - painted 0.5 m divisions in day-glow orange.

10.30 Down to boat to finish preparation.

PARTY CHIEF.....

WEATHER.....

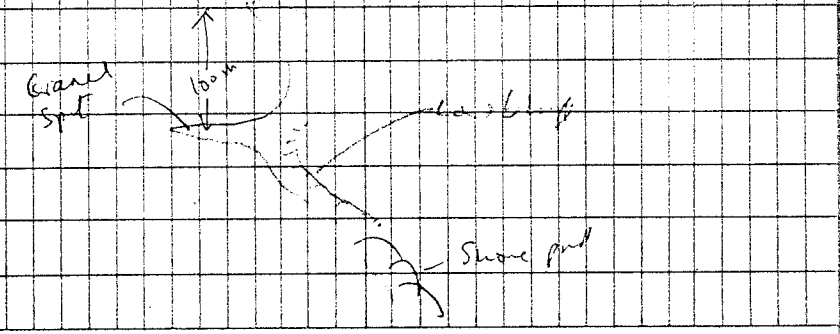
wade

JOB.....

DATE..... PAGE 7

13 45 N. end of town
- work crew actively filling nylon bags for shore protection
- Just N of (3) view S of shore protection at north end of peninsula

At very end of the peninsula, small bluff of consolidated [illegible] (4)
- [illegible] rock face, ~50 - 80 cm high
- [illegible] around peninsula



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WEATHER.....

wade

JOB.....

DATE..... PAGE 6

Talked to workers, path down bags reinforced to the hamlet
- placed bags at N end this year + new school
- have put shore protection in over last 2 years
- obvious steepening of shoreface in front of bags - very little beach left
- Pits 1-4 (5) southward from newest groynes
- shows new construction near shore protection

15.00 Return to boat. Still minor things to fix. Winch to secure, but essentially ready to go.

16.30 Heading out to test gear. Seistec deployed in harbour. Sidescan outside harbour entrance

20.00 Heading back in. All system working, but seistec records

JOB.....

DATE.....PAGE 9

EQUIPMENT LIST:

IKB Seistec Catamaran + Hydrophon system
Huntec booner (on IKB catamaran),
Geopulse power supply
Geopulse 5210 A receiver
EPC 1600 recorder.

~~Raz~~ RTT 1000 3.5/7.5 kHz profiler
EPC 1600 Recorder.

Klein 531 T sidescan system.

Van Veen Grab Sampler

Industrial Instrument RS5-3 salinometer

JOB.....

DATE..... PAGE ..10.....

disappointing in shallow water. Did not get into main Kuymallit Channel to assess performance in soft sediments. Resolving hard reflectors within 5-10 ms below seabed, but seabed reflector lost in transmit pulse. Also pervasive system ringing at mod to high gains, means record quality is best when TVG is not used.

21.15 Tied up at Coastguard Dock.

Problems with one engine

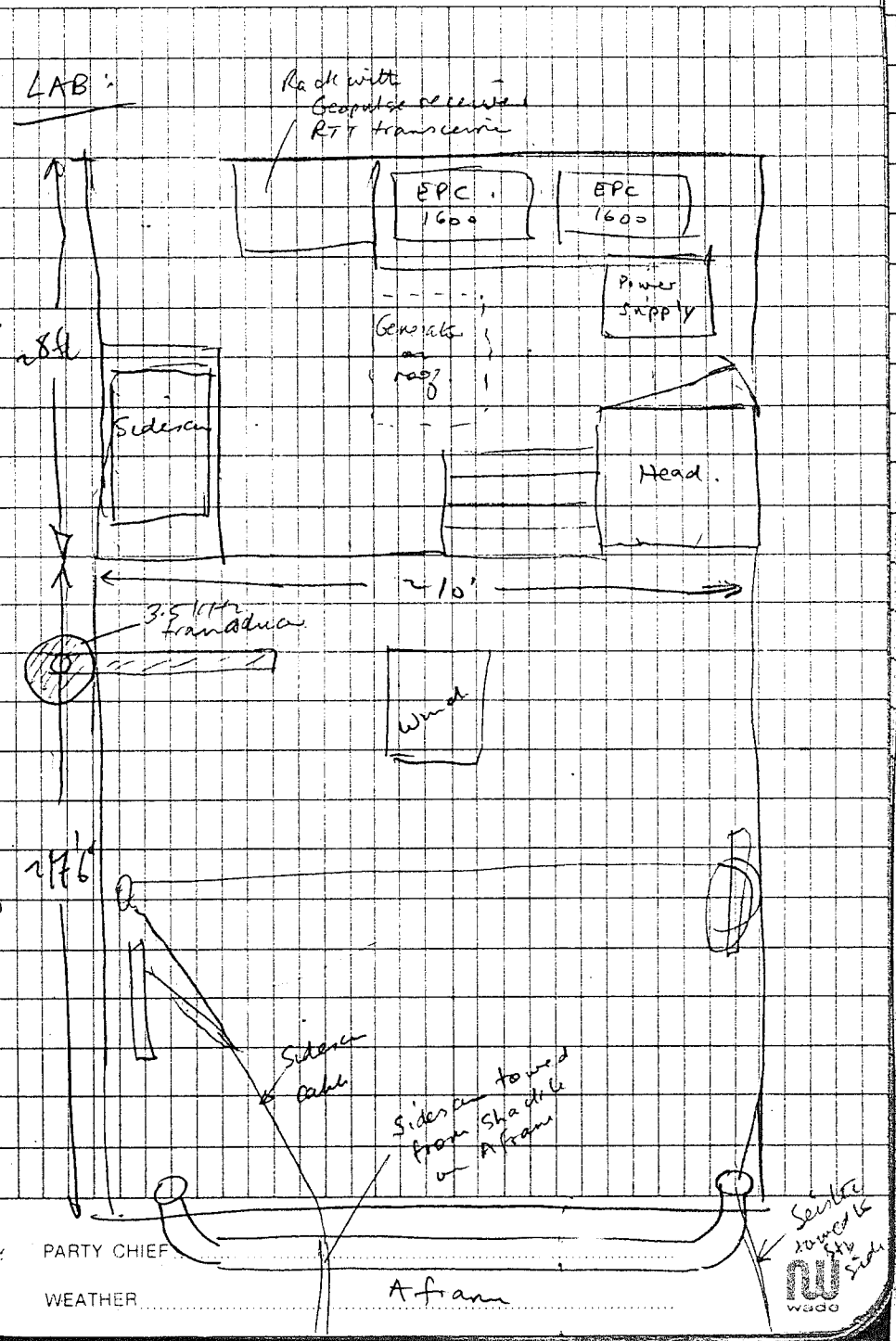
- suddenly revs up
- ? loose nut on prop.
- ? bad fuel ?
- ? low temp ?

PARTY CHIEF.....

WEATHER.....

JOB.....

DATE..... PAGE ..11.....



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WEATHER.....

JOB.....
DATE..... PAGE 12

August 2

Overnight — Armand + Kirby went down to check on engine problems. Nahwiik came into dock and hit the J.R. Mackay on the stern. No major damage, but guard rail bent.

08 00 Down to Mackay. Kirby looked at outboard + noticed cable not connected. Hooked it up + then went out to test. Still no transmission on port engine

12·30 Talked to Ron Good - problem likely to be in clutch which was replaced in 1979. Likely burnt out when churning mud. Will need to get boat out of water, to open it up and see. Gave names of possible suppliers / repairs — nearest

PARTY CHIEF.....
WEATHER.....

JOB.....
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in Edmonton.

15 00 Checking various options - No crane at NT. — Armand + Kirby checking with Beaufill.

Could operate from Zodiacs with EG.G sidescan from Larry Dyke.

J.R. Mackay likely to take minimum 4-5 days, more likely longer. Geophys. gear has to be back by 10th for Noble Hughes.

Armand called Don Forbes who is checking with Blasco Wrecking any delay to schedule is possible.

17.00 Decision made to take boat back to Inuvik for repair by R. Angus Inc. mechanic. Don and I to go to the camp tomorrow. Armand to go with Kirby up river.

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WEATHER.....

A1-6

JOB

DATE PAGE 14

18.00 Demobbing boat. Most eqpt left on Coastguard dock under tarp. Video camera etc brought back to PCSP for transport to camp.

21.30 Finish demobbing boat. Back at PCSP.

August 3

08.30 Helicopter to camp on Richards Island.
Took series of photos, marked on photocopied map.
1-6 (6) Spit on N. side of Hansen Hbr
1-7 (7) "
1-8 (8) "
1-9 (9) Beach along Reindeer Islands
1-10 (10) "
1-11 (11) Northern end of Reindeer Is.
1-12 (12) View of pipeline harbour
1-13 (13) Shoals, coast N of pipeline hbr
1-14 (14) View along N Head spit

PARTY CHIEF

WEATHER

JOB

DATE PAGE 15

1-15 (15) View of N. Head spit
1-16 (16) "
1-17 (17) "
1-18 (18) View of N end of Reindeer Islands - potential video camera site.

Weather windy + 15-20 knots cold, overcast
- conditions poor for work with Zodiac.

15.00 Still weathered in - rain - wind seems to be going down

18.00 No helicopter returned. Worked on producing field map, identifying key environments, including Gillie survey sites.

18.45 Started cooking mega-stew.

20.30 Supper, not bad considering - Still windy, but rain stopped.

22.00 Bed

PARTY CHIEF

WEATHER

A1-7

JOB.....

DATE..... PAGE 16

August 4

Established water level rod on beach

Water level - 70cm - 09.30 hrs.

(considerably higher last night.

Waiting for helicopter - first load arrived 09.00 - sling.

Weather - heavy overcast, light rain at times - wind light breeze

Preparing to install video cameras at beach site 2. Also plan to resurvey after last night's storm, each beach site.

12.50 Set up video camera at beach site 2. All appears to be working. Bearing 328.4° mag.

RCA looking offshore with Orange & White pole on beach just as present water line.

Minolta looking along beach.

038.9° Magnetic

Photo 1-19, (19) 1-20 (20) of set-up.

13.00 Reset to restart.

Photo 1-21 (21) Beach at location of profile.

PARTY CHIEF .....

WEATHER.....

wade

JOB.....

DATE..... PAGE 17

Western end of beach - headland - 15m high

- Small ground-ice slump at camera next to beach - massive ice showing, slide forming low bluff, 3m high, fringed by gravelly beach - less than 2m wide. Cobbles up to 30cm (chalky grey) (light grey)

Photo 1-22 (22). Ground ice slump + bottom wall of slump - 3m high + depth > 20m.

Photo 1-23 (23) looking east along pocket beach

Beach has gravel storm ridge with driftwood just below bluffs of sand, patchy wrack below. Below storm ridge is small sand ridge - top of active beach face, probably formed during yesterday's storm - shows black heavy mineral streaks + much driftwood.

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WEATHER.....

wade

A1-8

JOB.....

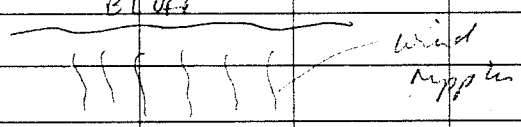
DATE..... PAGE 18

Between two ridges, in centre part of beach, significant mud drape has been left, presumably due to muddy water being ponded behind swash bar.

- drape is only ~ 1 mm thick & underlain by fine to med. sand.
- on seaward margin / landward side of swash bar, small v. low angle ripples are evident with mud drape filling in troughs as flaser

Photo 1-24 (24)

Prob. note substantial accum. at back of beach in vicinity of the profile — stake in windblown sand; with ripples having along beach (E-W) transport direction. ie long axis perpend. to beach

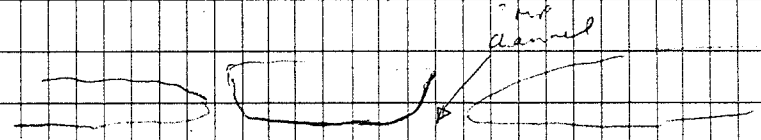


JOB.....

DATE..... PAGE 19

Note at time of profile highest storm ridge not present except for small area of gravel at base of cliffs - indicate waves break directly on bluff at this location during severe storms.

Western end of beach — swash bar morphology:
(now on lower beach)



Present waterline characterised by low gravelly ridge ~ 10 cm high — upper shoreface predominantly gravel. Photo 1-25 (25)
with small (1m across) cusps.

Just below cliffs of northern headland is large timber piles in beach - remains of previous building?

A1-9

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WEATHER.....

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WEATHER.....

JOB

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Northern headland high (~ m) vertical cliffs of Kittegazuit Sand - from N, bedding is almost horizontal with low angle x-strat visible. Small flow slide crosses beach in form of a steep angled fan.

Photo 1-26 (26)

15.10 Beach Site 90-1 North Head.

Photos 1-27 (27), 1-28 (28) - small herd of caribou.

Small pocket beach in probable former thermokarst lake.

- gravel/sand beach fronting flat arcuate-shaped area of low elevation
- large amount of log debris around margins of basin defining storm surge limit
- log debris at highest end contains polystyrene and compressed foam, suggesting recent formation.
- Photo 1-29 (29) - float lying backshore with log debris.

Lower Beach shows low relief gravel berm characterized by flat pebble showing mod. developed imbrication (dipping seaward)

Photo 1-30 (30)

Western bluff, relatively low elevation (3-5 m)

- sandy clay with occasional well-rounded gravel clasts and pattern of sand veins near top.
- otherwise massive
- small-scale slumping along most of bluff.
- narrow (3-4 m) gravel + sand beach fronting bluff.

Upper Beach - storm berm with smaller log debris lying & interjected in

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WEATHER

A1-10

JOB.....

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places by area of washover

Photo 1-30 (31) looking east along beach, washover area to right

Western bluffs - similar to E, but higher (5-10 m)

- similar lithology, overlain by brown sand.
- cliff face largely slumped
- with much of slump material directly attacked by waves
- further along, narrow fringing beach

From notes that last time, he dug a pit, discovered driftwood - 20 cm down - took sample.

17.00 Stopped at camp to pick up miscellaneous, recon. for position check at site 3.

JOB.....

DATE..... PAGE 23

17 30 Beach Site 90-3

Spit at mouth of Hansen River.

Predom. sand spit, narrowed at southern end.

- visible from considerable distance
- has relief of ~ 1.5 m

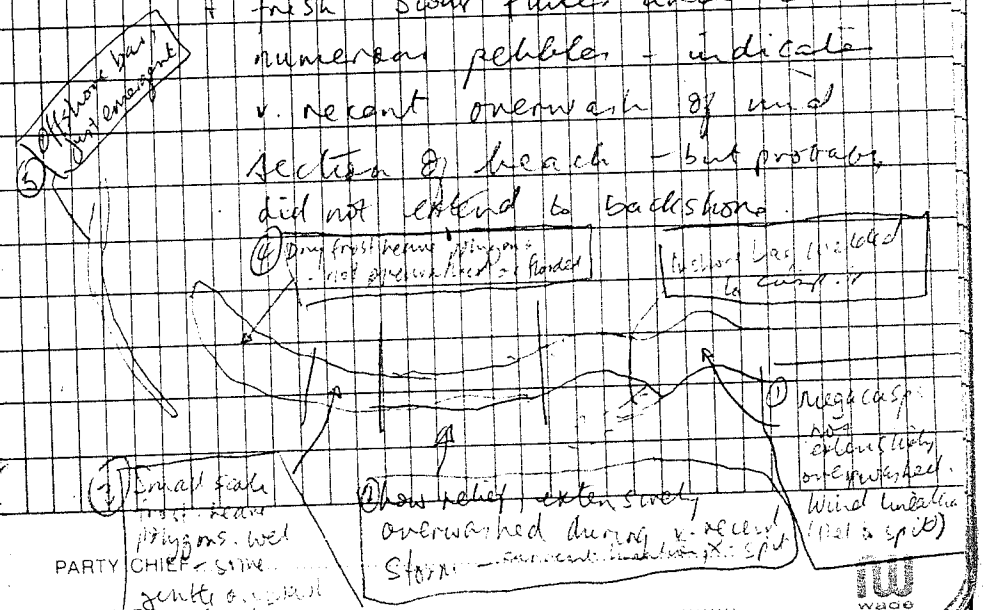
Proximal end has mega cusp morphology

Photo 1-32 (32) - looking north

Photo 1-33 (33) - looking south.

Spit surface scattered with driftwood + fresh scour flute, around numerous pebbles - indicate v. recent overwash of mud

Section of beach - but protrudes, did not extend to backshore.



PARTY CHIEF - SJW

WEATHER - gentle onshore breeze

PARTY CHIEF.....

WEATHER.....

wade

wade

A1-11

JOB

DATE PAGE 24

Photo 1-34 (34) End of spit with offshore bar visible

Photo 1-35 (35) Backshore, showing cusps and transverse bars. Water level to top of cusps during yesterday's storm.

Photo 1-36 (36) Frost heave polygons.

Summary: numbers refer to sketch

(1) Proximal beach - shows megacusp morphology with welded offshore bar at first (most southern cusp). Backshore mimics cusp morphology indicating more rapid washover in embayment. Evidence of wind-blown, spit parallel slow patterns and lineation suggest little washover during yesterday's storm.

(2) Middle zone - shows extensive washover as indicated by slow pattern + lineations, perpend. to spit

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WEATHER

JOB

DATE PAGE 25

Washover ended only as far as backshore berm. Backshore clearly reworked by waves from embayment - cusp morphology evident on backshore with shore normal transverse bars welded to the cusps.

(3) Zone of wet frost-heave polygons - may have suffered some flooding, but overwash too weak to erode polygons. Polygon ~ 10 cm diameter

(4) Distal end of spit - dry frost heave polygons. Apparently not overwashed during yesterday's storm.

(5) Offshore bars at distal end of spit - emergent.

Mini range Check

Station		
	1	15578
	2	5725
	3	1096

PARTY CHIEF

WEATHER

A1-12

JOB

DATE PAGE 26

19.30 Return to camp.

.48 Water level: - 87 cm

August 5

07.25 Arnaud at IRL

Mackay Out of water this morning
= possibly fixed by Monday
- If so Ar. will go back & Tow
- if not someone will have to fly to Inuvik + accompany Kirby
- send after ~~cook~~ radio check tonight

Deadline for Mackay
27th in Inuvik
Close camp on 20th

Water level >-102 cm (off the scale
est ± 2 cm 07.39

Weather - light rain / sunshine showers

09.00 Decided to attempt Sidescan Survey offshore by weather

PARTY CHIEF

WEATHER

JOB

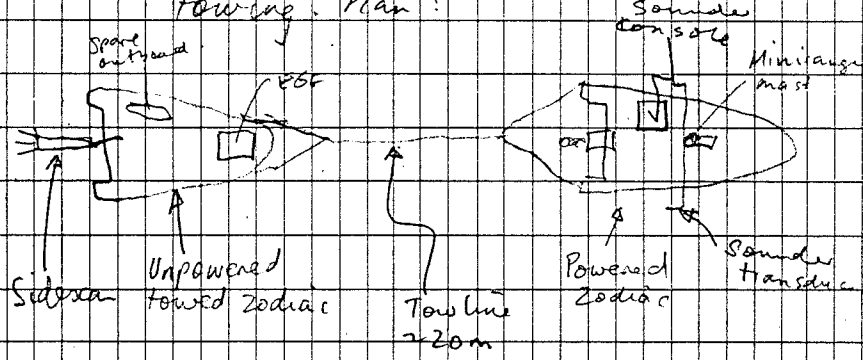
DATE PAGE 27

along coast using two zodiacs
- one ahead with navigator
- second behind (towed) with sidescan
- necessary to use two due to weight of eqpt + personnel

09.30 Weather now calm, partly overcast with sunny intervals
- rain still looks likely

09.50 Water level back on scale: -101 cm

10.30 Test cruise to check on towing. Plan:



Seems to work OK.
Return to camp to load electronics.

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WEATHER

A1-13

JOB

DATE PAGE 28

12.30 Leaving for survey
Photos 2-1 (37)
2-2 (38)

13 25 At harbour entrance - sidescan working & keep slow speed.
Sand patches over scoured bottom - Sand ribbons
Heading 349°
- ribbons oriented approx E-W -

13.54 Start survey, fix 1

15.00 Crossed Shoal to N of pipeline harbour entrance - some small & ?large scale bedforms oriented ⊥ to record.
Fix 26-27.

15.25 ~ 5.5 km from Pulken
Wind + waves coming up.
Turning to run line back towards Pulken harbour entrance

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15.30 Host mini range taken - one transponder station
- Weather getting worse

15.45 Abandoned survey - too much risk of water damage to equipment.

17.30 Arrived at camp, unloaded gear. Return from offshore into harbour proved hazardous with towed zodiac configuration - as first zodiac is difficult to steer and second is uncontrolled + tends to swing back and forth according to motion of tow and waves. Surveying in flat calm was quite successful, but as waves came up > 0.3 m, surveying has to be terminated. Need to be careful not to be caught out, but waves come up very quickly with wind to level of discomfort

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Navigation is set up for and works offshore but not in Hansen Hbr. For some reason did not work when we turned back towards the SE.

K.2. Water level −92 cm.

19.00 Arnaud
- need parts etc for boat
- radar + sounder blew in thunder

21.45 Plotted today's survey - line looks good in terms of location. Fixes with only two Miniranger signals along the baseline give poor positioning beyond fix 24.

Discussed plan for tomorrow with Dave + Don. If weather v. good — will attempt more sidescanning. If windy, will relocate Miniranger 2 and set up fourth inside pipeline harbour.

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Then survey N. Head spit to establish present extent and extent of offshore bar.

22.00 Water level beyond 102 cm
+ estimate 105 + 110.
Wind NE 15+20.
Clear sky.

AUG 6

09.20 Aboout to leave for Wolfe Spit.
Water level << 102 cm
- will have to move gauge.
Weather - Stiff breeze + 15 kn
- clear + sunny

10.30 Long shaft Zodiac stuck on mudbank. Returned to shore + left Frodo there with gun + zodiac. Colin + I take short shaft to Miniranger 2 site.

11.30 Decided to [illegible] through is impossible. Decided to survey mudflat and

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Beach.

Site 90-4 - marked by two orange painted cairns with survey pin in one. Extensive intertidal mudflat at end of headland.

Cliffs of brown medium sand (Kitkatgazuit ?) overlain by thin diamict and peat.

Beach - gravel lag overlying massive silty fine sand. Gravel up to 30 cm cobble size, but predominantly < 5 cm.

Photo 2-3 (39)

Mud flat

Upper part - 10 m horiz. consist of fine sand, rippled at surface, extensive worm trails. Microtopography - some relief but less than next zone seaward. Concentrations of organic particles

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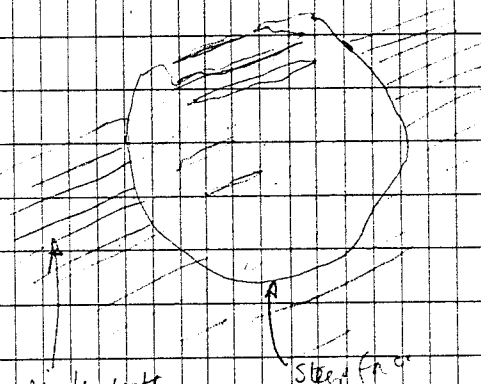
in ripple troughs and in lee of ripples.

Pit in upper mud flat consists of 5 cm muddy fine sand, overlying 1 cm dark grey clay, overlying sand similar to surface.

Photo 2-4 (40) - ripples on mudflat

2-5 (41) - lunguroid organic material

Lunguroid organic ripple consist of horseshoe shaped accumulation 30 cm across with steep seaward face - up to 5 cm - have migrated over ripples



- Section through shows fine muddy sand with grey mud flasers / thin beds

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Below upper flat, sharp break down onto middle flat — ~~subtle~~ elevation difference of a few cm perhaps (v. slight) but shows up clearly as zone of different micro-topography.

Photo 2-6 — along line of break. (42)

Note both upper + middle mudflat show cross-cutting sets of wave ripple, fine scale, wavelength 2-3 cm.

Middle mudflat

- characterised by more irregular micro-topography
- irregular mounds + pits
- mounds up to 5 cm high, 5's to 10's of cms across. Pits are finally broadly scale

Photo 2-7 (43)

Mud soft + thixotropic - consists of thinly bedded fine sand + silt, with grey clay layer — easily ingressed by boots.

Photo 2-8 (44) section showing thin bed 1-5 cm thick.

Much of the complex micro-topog. appears to be degraded ripples.

Note: all mudflat + beach is scattered with peaty clumps a few to 10's of cm across - up to 10 cm thick - some partially buried + contributed to microtopog.

Also on middle mudflat, small scale scarps with bay/hummock shape — irregular headwall clearly eroded - 3-5 cm high headwall

- could be just wave attack, but possibly also ingress of collapse structures?

Photo 2-9 (45)

Approx X-section

headwall — more ~~pitted~~ disturbed

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- other characteristics suggestive of liquefaction - partly exposed on seaward side.
- disturbed zone appears to be roughly equivalent diameter of pit in dense deposit is limited area.

- definitely visible at wall's edge now, but could still be result of liquefaction.

- but section through feature shows no disruption of bedding below scarp, no convolution ∴ unlikely to be liquefaction

Site 90-5 - marked by two orange painted cairns, one near base of bluff with Survey pin.

Narrow fringing beach.

Bluff is relatively steep and

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reactivated - no recent sign of inundation. Photo 2-10 (46)

Beach consists of fine gravel with ~~some~~ common cobbles and common driftwood - beach is uniform with only a very minor storm driftwood line, no obvious storm ridge or berm. Passes quickly offshore to mudflats. Part of these transitional is often soft, liquefied silt underlying beach.

↳ pit in berm. Beach shows beach sand & gravel - 2cm thick, overlies a grey clay and brown sand - possibly Kitkatla silt. Photo 2-11 (47) shows close pit - trowel points to grey clay - surface granules appear to be discontinuous.

Further southward along beach, thin ground fog directly overlies silty sand -

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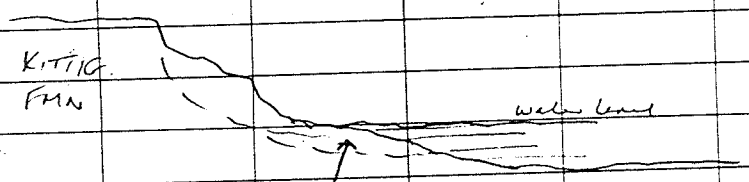
- in it again be Kittiga just →
I worked Kitti & reworked
Mackenzie sand.
- site just beneath a collapsed
section of the cliff - probably a
thaw flow slide. - some exposed
on beach
- this brings in a possible mechanism
for beach deposition.



slumped, liquified Kittig. beneath beach lag and interbedded with Mack. silt ~~gravel~~ sand?

- seems to be proven by pit further along the beach where a dk grey sandy clay material underlies beach sand & gravel - Photo 2 ~~[illegible]~~ 12 (48)
— v. similar to material in cliff just above beach.

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Site 90-6 — marked by two orange [illegible]

Spit at [illegible]
- low gravelly feature
- more solid to walk on dry pt.
beyond tundra remnants ; ds wdf
but soft sandy muddy sand - spit
gravel ; sand [illegible]
to 20 cm !)
- this adds further support to the
hypothesis suggested above.
- probably works for low energy
section of coast.

Site 90-E-G14

17.00 Setting up Miniranger stakes for
surveying in pipeline harbour
(49) to (52)

17.35 Photos 2-13 to 2-16

Photo mosaic from island looking
at site I around to site J
Site E has high cliffy and sandy beach
with offshore bar system
Nearshore bars exposed at low tide in
photo. Offshore bar is

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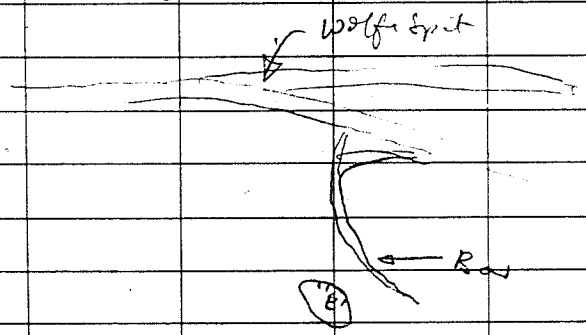
...moved, ~~with~~ a breaker line.

Geodimeter battery dead, so minirange station surveyed in to site E by tape & angle.



Don moved tide gauge ~~to~~ at 14.00 hrs because it had been exposed.

14.00 hrs stake at 90 cm

Minimoved + replaced at 70 cm

20.00 Returned to camp – decided against moving minirange as tide was going down again.

22.13 Water level 97 cm.

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AUGUST 7

08.45 Winds still strong from E/NE. Water level also v. low (probably low tide combined with -ve. storm surge). Impossible to get through shoals on way to pipeline hbr. Therefore determined to work on Reindeer Islands area and Lo. System approach from Hansen Harbour side.

09.05 Water level > 100 cm. - stake and [illegible] again.

10.05 Arrived on shore near MR3.

Site 90-7

Located at MR3, marked by threaded iron rods, orange painted, 1 on cliff top, one on beach.

Area between main Reindeer Island (MR2) and smaller island (90-3) consists

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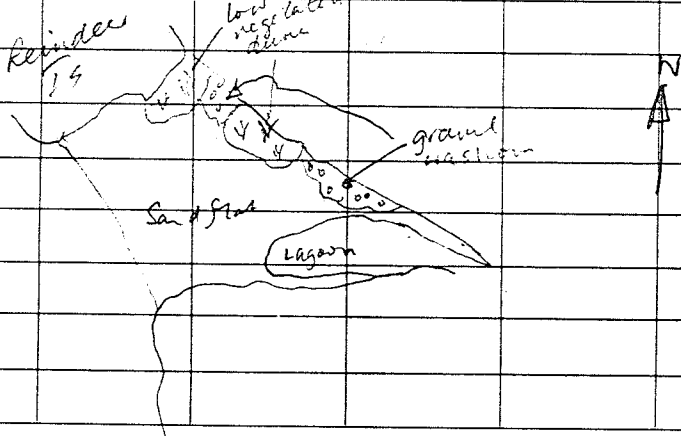
a broad sandy washover. On N side is a small area of partially vegetated dunes. On S side, small lagoon trapped by barrier that extends beyond 90-3 island.

Photo 2-17 (53) View of above from MR3 (now 90-7).

Vegetated dunes mid section of the flat on shoreward side.
- dunes are very low, 1m or less - stabilized by vegetation.
~~S~~ - Low bluffs on seaward side.



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Gravel washover extends 80-90m from beach across flat
- also large driftwood in this area.
- remaining flat is predom sand with smaller driftwood.
- surface of whole area relatively windblown

Photo 2-18 (54) - view NW along ground washover

Photo 2-19 (55) - view NE along survey line

Beach consists of low elevation storm ridge at base of cliffs passing down into poorly gravel upper beachface - poorly sorted with cobbles up to 40cm
- lower part of gravel area is fine grained in mud matrix

Beyond gravelly beach is extensive bar system inside a main continuous sidewashover bar.

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Inner bars are complex, slightly oblique.

Nearshore bar was not reached by survey.

Cliff consists of complexly x-bedded Kittiga suit sand with occasional large rounded cobbles. Peat at top has fallen and forms a small apron at the base of the cliff.

Wind erosion of cliff may be significant here - at top of cliff is v. small scale dune stabilized by specialized plants.

Presence of storm berm at base of cliff suggests cliff undercutting is important during high water levels.

Inner bars characterized by rippled fronts, flat planed surface and rippled back-bar region.

- small areas of gravel lag exposed

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Thickness of reworked sed. on beach in bar and clear bar pit in gravelly beach face shows thin gravel lag overlying sand very similar to Kittiga suit Sand.

Samples taken:

90-7-1 Cliff sample - Kitti Sand

90-7-2 Storm ridge at base of cliff

90-7-3 Sand below gravel lag on gravel beach face

Distribution suggests erosional beach face with gravel lag overlying in situ Kitti Fmn.

Pit in bar suggests bar thickness at least 30 cm - no gravel encountered

Pit: Sample 90-7-4 Bar sand

Pit in trough beyond first bar reveals gravel within 10 cm and grey clay with gravel (could be Unit 3!)

Sample 90-7-5 Grey clay

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Site 90-5 (no beach profile)

Peat beds outcropping along beach, ~~seaward~~ seaward of barrier enclosing lake. ✓

Photo 2-20.

(56)

Outcropping peat extends for several hundred metres along the shore in front of the two lagoon and shoreline between

- peat consists of soft fibrous material + layers of wood twigs + fragments, with some mud layers.

Site 90-9 Beach profile located c. 60 m NW of small stream, draining tiny unnamed lake. Marked by orange-painted threaded iron rods, one on cliff edge, two on beach.

Located opposite gap in offshore breaker line + between bars.

Photo 2-21 Along line of profile.

(57)

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Cliff consists of low (4-5 m) slumping bluff of fine sandy silt + [illegible] and deformed laminae of fine clayey silt, brown stained layers + lighter grey layers.

Beach - upper beach consists of fine to medium sand, forming apron/storm ridge directly along bluff + wave-formed breaks in the cliff face during storm surge.

- upper beach is sandy gravel and shows evidence of water draining from cliff.
- rusty bolts, iron day
- gravel layer at 35 cm (no gravel on beach surface)
- berm of fine to medium sand small driftwood above berm behind berm
- lower, inner (under tidal) shore face is low bars, with rippled surface + abundant worm trails
- pit in lower beach but not gravel at 55 cm

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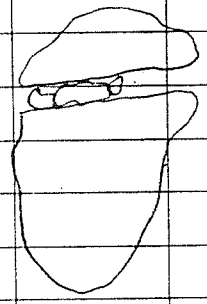
(58)

1... 2-22 Frost cracking of beach
c... c... - cobble 20cm in diam
cracked in situ - both halves there,
with small pebbles (presumably
loaded in) inside crack



16.40 Return to camp
Water level moved again
@ 12.00 from 96 to 86 cm

16.00 54 cm.
16.45 51 cm.

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9.0 Call to Don Gillespie
Need 2 parts for Marlin,
N. Jersey or 5th place
Alternator for diesel
Starter
Fuel from Tuktoyaktuk
2.06

21.56 Water level 90 cm

Options for tomorrow
Wolfe Spit
Sounding / sampling inside
Core Hilbe sampling on mud flats

AUG 8
[illegible] Start. No [illegible]
07.20 Wake [illegible] Start. Wind light sunny
Tide going down - again will
encounter problems inside
on mudbanks.
10.30 PG-1 attempted to head
out to entrance of Kanaryk Kit.
to check wave conditions outside.
Short shaft motor stopped soon

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21:15 parting returned to camp
to D.C. to fix Took long-shaft
out to hbr entrance. Waves 2 ft
- no problem getting around
Reindeer Islands to field site.

Dave F to go with John Sutherland
; Steve Robinson to resurvey North
Head cliff recession site. PG, DL
and to go more MR2 to site L-GIL
and sounder survey hbr.

10.45 Wales level 100 cm

11.30 Left camp for site MR2

12.40 Arrived site 90-2, checked
video cameras - appear to have
advanced tape - in both.

13.00 Watched cameras come on
- all appears to be working OK
- times in sync.

14.35 Mini ranger is moved to site L GIL

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erected along [illegible] hauling...

Set up mini ranger and [illegible]
beach - batteries dead (from
mini ranger) ~~Hardy~~ station)

16.15 Returned to camp B, new batteries

16.18 Wales level 5.2 m

17.00 Still in MR1. Heading [illegible]
Pullen Is to replace batteries

18.10 Batteries replaced
Photo 2 2.3 (59) Boat on trapping run
NW side of Pullen Is.

Photo 2-24 (60) Split NS sand of Pullen
- extension northward from

Photo 2-25 (61) Extension sand spit
S side of Pullen Is.

20.00 Arrive back at camp.

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A1-25

20.. Water level 81 cm
Wind : v. light
Warm & sunny — bugs.
22 51 Water level 91 cm.

Thursday Aug 9

07.00 Sked — helicopter for Don tomorrow p.m.
07.20 Water level 66 cm
V. light winds, high cirrus cloud.
09.15 Underway to pipeline hbr for sounder survey. Have to stop for gas at drill site. Only ½ barrel left. Drive to have remaining barrel flown in from Tuk when replacing Don.
09.50 Leaving drill site
11.00 Arrived at harbour entrance & some difficulty due to

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low water.

Receiving three minirange stations but soundings did not fit for seconds.

11.20 Start survey
Use MK2 · MK4 first
MK1 slightly late.

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FIX	MR1	MR2A	MR4	TIME (MDST)	
40	9551	433	1501	11.21	
41	9581	496	1414	11.22	
42	9508	579	1309	11.23	
43	9316	675	1191	11.24	
44	9275	780	1067	11.25	
45	9127	894	945	11.26	
46	9063	970	865	11.27	
47	8977	1076	769	11.28	
48	8897	1194	636	11.29	Turn.
49	8783	1285	511	11.30	
50	8876	1164	630	11.31	
51	8955	1053	734	11.32	
52	1055	915	879	11.33	
53	9135	805	992	11.34	
54	9205	691	1103	11.35	
55	9275	595	1200	11.36	
56	9329	521	1281	11.37	
57	9426	389	1420	11.38	~~Turn.~~
58	9426	319	1474	11.39	~~Turn.~~
59	9371	251	1523	11.40	Turn.
60	9208	375	1395	11.41	
61	9213	470	1300	11.42	

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FIX	MR1	MR2A	MR4	TIME (MDST)
62	9136	590	1180	11.43
63	9040	705	1065	11.44
64	8957	821	948	11.45
65	8870	945	825	11.46
66	8784	1060	712	11.47
67	8670	1210	561	11.48
68	8615	1295	478	11.49
69	8540	1386	389	11.50
70	8420	1530	260	11.51
71	8310	1635	230	11.52
72	8371	1566	290	11.53
73	8431	1484	355	11.54
74	8505	1372	445	11.55
75	8581	1274	535	11.56
76	8650	1172	630	11.57
77	8748	1050	744	11.58
78	8813	925	866	11.59
79	8906	834	953	12.00
80	8991	700	1090	12.01
81	9085	570	1218	12.02
82	9167	460	1339	12.03
83	9235	369	1439	12.04
84	9305	281	1535	12.05

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FIX	MR	MR2A	MR1	TIME	
85	9[illegible]	192	1648	12.06	TURN
86	9402	115	1745	12.07	
87	9[illegible]0	250	1824	12.08	TURN
88	7295	215	1734	12.09	
89	9194	349	1624	12.10	
90	9105	430	1519	12.11	
91	1021	513	1410	12.12	
92	8887	645	1218	12.13	
93	8803	745	1219	12.14	
94	8693	865	1114	12.15	
95	8595	980	1016	12.16	
96	8471	1129	904	12.17	
97	8372	1237	835	12.18	
98	8284	1345	775	12.19	
99	8194	1445	720	12.20	
100	8095	1571	679	12.21	
101	8002	1682	656	12.22	
102	7905	1800	645	12.23	
103	7840	1875	655	12.24	~~TURN~~
104	7775	1974	679	12.25	TURN
105	7695	2005	825	12.26	
106	7760	1920	846	12.27	
107	7805	1834	910	1228	

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FIX	MR1	MR2A	MR2	TIME
108		1745	965	12.29
109		1695	1005	12.30
110		1615	1086	12.31
111		1550	1140	12.32
112		1479	1200	12.33
113		1417	1240	12.34
114		1303	1335	12.35
115		1220	1418	12.36
116		1155	1470	12.37
117		1095	1536	12.38
118		1035	1597	12.39
119		972	1686	12.40
120		920	1773	12.41
121		901	1864	12.42
122		900	1955	12.43
123		944	2085	12.44
124		974	2170	12.45
125		1004	2266	12.46
126		1029	2351	12.47
127		1095	2454	12.48
128		1150	2573	12.49
129		1174	2635	12.50
130		1214	2708	12.51

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IV	MR1	MR2A	MRV	TIME	
131		1280	2815	12.52	TURN
132		1432	2921	12.54	
133	9455	1410	2850	12.55	
134	9320	1385	2763	12.56	
135	9230	1374	2704	12.57	
136	9121	1375	2635	12.58	
137	1017	1370	2561	12.59	
138	8903	1384	2498	13.00	
139	8779	1420	2438	13.01	
140	8687	1435	2379	13.02	
141	8589	1459	2315	13.03	
142	8501	1493	2270	13.04	
143	8371	1560	2214	13.05	
144	8282	1625	2183	13.06	
145	8183	1665	2151	13.07	
146	8080	1725	2125	13.08	
147	7990	1785	2101	13.09	
148	7925	1825	2078	13.10	
149	7803	1915	2055	13.11	
150	7715	1979	2045	13.12	
151	7640	2080	2049	13.13	
152	7520	2140	2050	13.14	
153	7420	2220	2047	13.15	

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FIX	MR1	MR2A	MRV	TIME	
154	7306	2310	2056	13.16	
155	7204	2395	2065	13.17	
156	7115	2475	2074	13.18	
157	7008	2574	2109	13.19	
158	6911	2646	2115	13.20	
159	6816	2735	2135	13.21	
160	6705	2840	2179	13.22	
161	6614	2920	2205	13.23	
162	6520	3015	2248	13.24	
163	6434	3100	2270	13.25	Turn
164	6341	3185	2340	13.26	
165		3250	2435	13.27	Turn
166	6426	3164	2426	13.28	
167	6525	3085	2405	13.29	
168	6603	3015	2410	13.30	
169	6702	2954	2418	13.31	
170		2887	2436	13.32	
171	6888	2830	2469	13.33	
172	6940	2799	2490	13.34	
173	7020	2769	2541	13.35	
174	7120	2735	2600	13.36	
175	7175	2710	2641	13.37	
176	7255	2691	2679	13.38	

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	MR1	MR2A	MR4	TIME	
177	7350	2670	2741	13.39	
178	7443	2654	2805	13.40	
179	7565	2629	2880	13.41	
180	7665	2627	2945	13.42	
181	7785	2599	2995	13.43	
182	7870	2585	3054	13.44	
183	7980	2576	3113	13.45	
184		2566	3177	13.46	
185	8215	2569	3249	13.47	
186	8340	2591	3334	1348	
187		2580	3404	1349	
188	8576	2598	3481	1350	
189	8689	2625	3561	1351	
190	8760	2665	3646	1352	
191	8855	2725	3743	1353	
192	8994	2780	3851	1254	EOL.

End survey. Heading to head Sti 90 - ? for lunch

14.50 Replaced tape in both video cameras. Both have advanced to more than ½ way - Accum to—

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have worked!

15.15. Resume sounder survey.

Fix	MR1	MR2A	MR4	TIME
193	9587	347	2058	15.21
194	9513	368	2029	15.22
195	9407	399	1988	15.23
196	9305	454	1931	15.24
197	9180	531	1874	15.25
198	9039	655	1838	15.26
199	8970	727	1825	15.27
200	8864	829	1821	15.28
201	8754	940	1819	15.29
202	8670	1040	1841	15.30
203	8590	1140	1875	15.31
204	8515	1220	1890	15.32
205	8417	1321	1918	15.33
206	8314	1426	1949	15.34
207	8169	1575	1979	15.35
208	8066	1681	2016	15.36
209	7958	1787	2053	15.37
210	7863	1889	2090	15.38
211	7750	1995	2138	15.39

PARTY CHIEF ....

WEATHER ....

wade

A1-30

JOB

DATE PAGE 62

FIX	MR1	MR2A	MR4	TIME	
212		2090	2181	15.40	
213	7545	2216	2251	15.41	
214		2345	2334	15.42	
215	7361	2423	2393	15.43	TURN
216	7410	2364	2294	15.44	
217	7460	2269	2170	15.45	
218	7504	2198	2057	15.46	
219	9585	2100	1987	15.47	
220	7676	1965	1854	15.48	
221	7730	1900	1799	15.49	
222	7809	1809	1715	15.50	
223	7891	1710	1629	15.51	
224	7975	1616	1554	15.52	
225	8082	1495	1455	15.53	
226	8142	1433	1406	15.54	
227	8236	1330	1345	15.55	
228	8310	1260	1296	15.56	
229	8372	1193	1260	15.57	
230	8449	1119	1223	15.58	
231	8532	1035	1185	15.59	
232	8621	955	1155	16.00	
233	8739	855	1124	16.01	
234	8862	761	1110	16.02	

PARTY CHIEF

WEATHER

JOB

DATE PAGE 63

FIX	MR1	MR2A	MR4	TIME	
235	8983	695	1105	16.03	
236	9039	663	1119	16.04	
237	9145	620	1152	16.05	
238		590	1192	16.06	
239	9341	575	1248	16.07	
240	9474	584	1330	16.08	
241	9569	610	1393	16.09	
242	9652	640	1455	16.10	
243	9745	685	1521	16.11	
244	9843	749	1600	16.12	
245	9950	823	1690	16.13	
246	10050	904	1771	16.14	
247	10151	975	1869	16.15	Turn
248	10040	1021	1764	16.16	
249	9966	1060	1671	16.17	
250	9882	1122	1570	16.18	
251	9826	1170	1495	16.19	Turn
252	9712	1129	1397	16.20	
253	9605	1080	1297	16.21	
254	9504	1035	1209	16.22	
255	9370	990	1095	16.23	
256	9282	979	1020	16.24	
257	9185	955	956	16.25	

PARTY CHIEF

WEATHER

JOB

DATE PAGE 64

Fx	MR1	MR2A	MR4	TIME	
258	9090	953	892	16.26	
259	8998	960	842	16.27	
260	8900	986	789	16.28	
261	8791	1035	740	16.29	
262	8685	1094	694	16.30	
263	8515	1209	653	16.31	
264	8459	1245	659	16.32	
265	8356	1308	698	16.33	
266	8242	1385	755	16.34	
267	8155	1453	810	16.35	
268	8040	1546	874	16.36	
269	7968	1603	939	16.37	
270	7850	1700	1067	16.38	
271	7760	1776	1165	16.39	
272	7685	1847	1239	16.40	
273	7570	1953	1345	16.41	
274	7437	2077	1468	16.42	
275	7301	2209	1594	16.43	
276	7190	2334	1704	16.44	
277	7101	2423	1785	16.45	
278	6900	2627	1958	16.46	Turn
279	6840	2704	1971	16.47	
280	6875	2682	1897	16.48	

PARTY CHIEF

WEATHER

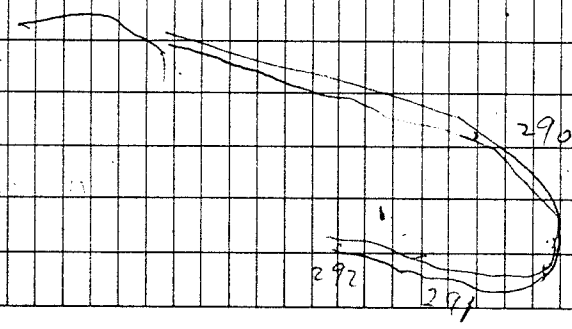
JOB

DATE PAGE 65

Fx	MR1	MR2A	MR4	TIME
281	6904	2654	1810	16.49
282	6943	2620	1719	16.50
283	6985	2590	1631	16.51
284	7035	2555	1546	16.52
285	7101	2515	1450	16.53
286	130	2476	1375	16.54
287	7260	2412	1203	16.56

Ran into bar in front of spit.
Definite offshore extension of spit.
- 20m

288	7560	2094	975	
289	7450	2149	1124	
290	7278	2295	1314	
291	7486	2359	903	
292	7380	2579	995	17.25



PARTY CHIEF

WEATHER

JOB

DATE PAGE 66

Fix	MR1	MR2A	MR4	TIME	
300	7549	2406	835	17.33	
301	7585	2380	800	17.34	
302	7660	2310	719	17.35	
303	7750	2240	639	17.36	
304	7805	2190	579	17.37	
305	7884	2120	500	17.38	
306	7960	2055	424	17.39	A/C
307	8041	1964	347	17.40	
308	8129	1865	280	17.41	
309	8170	1801	249	17.42	
310	8245	1725	230	17.43	
311	8308	1642	245	17.44	
312	8390	1550	294	17.45	
313	8487	1471	314	17.46	
314	8570	1470	354	17.47	
315	8632	1392	380	17.48	
316	8732	1335	449	17.49	
317	8905	1265	582	17.51	
318	8963	1244	635	17.52	
319	9074	1239	725	17.53	A/C
320	9158	1206	805	17.54	
321	9235	1150	901	17.55	

PARTY CHIEF

WEATHER

JOB

DATE PAGE 67

Fix	MR1	MR2A	MR4	TIME	
322	9313	1130	967	17.56	
323	9364	1111	1020	17.57	
324	9435	1075	1099	17.58	
325	9501	1043	1169	17.59	
326	9590	1020	1259	18.00	
327	9691	1005	1368	18.01	
328	9771	1025	1440	18.02	
329	9850	1050	1516	18.03	
330	9925	1070	1595	18.04	
331	10005	1084	1671	18.05	
332	10081	1103	1754	18.06	
333		1115	1809	18.07	A/C
334	10101	1025	1816	18.08	
335	10069	933	1809	18.09	
336	10034	850	1779	18.10	
337	10011	780	1500	18.11	
338	9988	712	1810	18.12	
339	9967	630	1824	18.13	
340	9966	600	1840	18.14	A/C
341	10031	649	1583	18.15	
342	10105	744	1926	18.16	
343	10148	795	1946	18.17	
344	10221	898	1974	18.18	

PARTY CHIEF

WEATHER:

JOB

DATE PAGE 68

FIX	MR1	MR2A	MR4	TIME	
345	10285	970	2040	18.19	
346	10336	1029	2081	18.20	A/c
347	10331	991	2103	18.21	
348	10315	959	2104	18.22	
349	10282	890	2104	18.23	
350	10241	810	2100	18.24	
351		759	2108	18.25	
352	10221	740	2115	18.26	A/c
353	10301	825	2157	18.27	
354	10329	870	2175	18.27	
355	10390	940	2207	18.28	
356	10443	1003	2240	18.29	
357	10497	1062	2285	18.30	A/c
358	10518	1055	2344	18.31	
359	10522	1038	2365	18.32	
360	10519	1000	2404	18.33	
361	10520	985	2430	18.34	A/c
362	10552	1021	2441	18.35	
363	10588	1071	2451	18.36	
364	10609	1111	2455	18.37	
365		1130	2459	18.38	A/c
366	10637	1140	2485	18.38	
367	10670	1147	2535	18.39	#

PARTY CHIEF

WEATHER

JOB

DATE PAGE 69

FIX	MR1	MR2A	MR4	TIME	
368	10708	1169	2590	18.40	
369	10732	1188	2629	18.41	A/c
370	10780	1246	2645	18.42	
371	10803	1285	2644	18.43	
372	10825	1315	2646	18.44	
373	10830	1339	2639	18.45	
374	10833	1365	2630	18.46	
375		1370	2624	18.47	A/c
376	10923	1415	2728	18.48	A/c
377	10924	1431	2720	18.49	
378		1435	2710	18.49	
379		1450	2705	18.50	
380		1455	2703	18.50	
381		1464	2700	18.51	
382		1470	2701	18.51	
383		1478	2704	18.52	
384		1486	2696	18.52	
385		1495	2695	18.53	
386		1504	2689	18.53	
387		1506	2685	18.53	A/c
388		1525	2700	18.54	
389		1538	2723	18.54	
390		1550	2745	18.55	

PARTY CHIEF

WEATHER

JOB.....

DATE..... PAGE 70

Ex	MR1	MR2A	MR4	TIME	
391		1569	2772	5.54.	
392		1575	2787	18.54	A/c.
393		1570	2775	18.55	
394		1560	2754	"	
395		1555	2740	18.56	
396		1545	2718	18.56	
397		1535	2695	1857	A/c
398		1560	2718	1857	
399		1584	2750	1858	
400		1600	2775	1858	
401		1610	2791	1858	A/c
402		1604	2779	1859	
403		1590	2757	"	
404		1580	2736	"	
405		1571	2718	"	
406		1554	2691	19.00	A/c → DO
407		1592	2733	19.00	
408		1620	2781	"	
409		1652	2781	"	
410		1689	2833	19.01	A/c
411		1639	2769	19.02	
412		1614	2729	19.02	
413		1583	2675	19.03	

PARTY CHIEF.....

WEATHER.....

wade

JOB.....

DATE..... PAGE 71

Fix	MR1	MR2A	MR4	TIME
414		1576	2665	19.04
415		1621	2716	19.05
416		1650	2758	19.05
417		1681	2794	19.06
418		1715	2794	19.06
419		1746	2794	19.06
420	11081	1724		19.07
421	11062	1705		19.08
422	11047	1686		19.08
423	11047	1671		19.09

Not receiving MR1 or MR4.

19.55 Return to camp.

Water level checking day (KF)

10.00	87 cm
14.30	55 cm
16.30	41 cm
18.30	51 cm

22.37 Water level 82 cm

PARTY CHIEF.....

WEATHER.....

wade

A1-35

JOB

DATE PAGE 72

FRIDAY AUGUST 10

06.45 Light breeze, fog.

07.00 School - no traffic.

07.20 Water level 46 cm

Inuvik Air Charter.
(Shell Lake)

12 loaves of bread
Message out. Laces. Milk - Rope (on Mackay)
Call Don Forbes
Helicopter time.

2 survival suits on Mackay?
Kirby - bring ow...
Don - buy hard on second.

09.30 Called IRL, talked to Gary W.
- Don G has left.
- Kirby coming via FCSL
- asked for bread, milk

PARTY CHIEF

WEATHER

JOB

DATE PAGE 73

10.17 Water level 71 cm.

11.00 Still fog patches, occasional clear sky. Wind has died to near zero. Fog in Inuvik also

12.00 Weather - improved visibility
2 helicopter trips - one to sling fuel. Stand for Kirby.
Due between 13.00 + 16.00.
Will wait for Kirby, for 2nd stand
~~Fog~~

14.07 Water level 64 cm
14.10 Helicopter arrived with fuel and to take Don 4.
16.51 Water level 41 cm
18.51 Water level 50 cm.

19.00 Don Cotterill
One or two lines NW of Pullen Is
off N. Head - looking for depressions.
Will look into helicopter time to work on Pullen Island.

PARTY CHIEF

WEATHER

A1-36

JOB.....

DATE.....PAGE 74

Ebb tidal bar: in MR ranges:

MR4	MR2A
2300	1900
1500	950

~20.00 Kirby arrived by helicopter

21.57 Water level 77cm

SATURDAY AUGUST 11

07.00 Sched.

Helicopter hours 228 hrs used.

07.20 Water level 44 cm.

09.30 Heading out for sidescan work
- overcast, some fog beginning to form
- winds v. light.

11.15 Sidescan, Sounder + minirange up + running.

Kirby + Dave in front - Zodiac

PG + me in rear with sidescan.

Making fixes info for underway plotting

PARTY CHIEF.....

WEATHER.....

wade

JOB.....

DATE.....PAGE 2557 2785 75

2A

16	2250	2550
17	1100	2450
18	1740	2330
19	1820	2230
20	1690	2110
21	1590	2010
22	1385	1870
23	1250	1770
24	1110	1710
25	980	1740
26	1095	1760
28	1310	1850
29	1410	1810
30	1525	2000
31	1640	2110
32	1750	2210
33	1890	2330
34	2010	2430
35	2100	2550
24	2610	2930
31	2670	3050
40	2680	3170
41	2515	3070
42	2380	2945

PARTY CHIEF.....

WEATHER.....

wade

A1-37

JOB

DATE MR 2 A MRV PAGE 76

46		2180	2675		
45		2135	2560		
[illegible]		2000	[illegible]		
[illegible]		2000	[illegible]		
48		1895	2150		
49		1800	1990		
50		1755	1830		
51		1700	1530		
52		1670	1500		
53		1620	1335		
LINES	OFF SITE 90-2		(CAMERA BEACH)		
55		670	1750		
56		620	1840	2.1m	
57		600	1930		
58		607	2040		
59		630	2140		
60		680	2250		
61		750	2350		
62		835	2460		
63		930	2570		
64		1030	2685		
65		1140	2810		
66		1240	2920		
67		1320	3030		

PARTY CHIEF

WEATHER

wade

JOB

DATE PAGE 77

68	1450	3140
69	1580	3250
~~70~~	EJR	

LINE shows some ~~[illegible]~~ [illegible] oblique to profile. Some possible outcropping peat beds opposite breached lake.

15.50 2nd line off site 90-2 (changed paper in sidescan record.

Fix 77 - 78 peat beds outcropping

84	870	2550
85	775	2400
86	600	2270
	600	2180
	200	2050
89	780	1940

Just before fix 89, boundary seems to correspond to transition from low bluffs to high, i.e. beginning cliff of Kitty[illegible].

PARTY CHIEF

WEATHER

JOB.....

DATE..... PAGE 78

Below	90 - 91	- large Contact corresponds to mudflow on cliff opposite	
92	167	1610	
	275	1500	
97	820	990	
98	945	865	
99	1070	730	
98 - 99	Outcropping beds along harbour entrance - characteristic of thermokarst lakes?		
101	1310	~~480~~	
102	1160	610	
104	1070	700	
105	1070	720	
106	1100	740	
107	1120	800	
108	1155	865	
109	1220	955	
110	1220	1025	
109 - 110	hummocky ripples.		

PARTY CHIEF.....

WEATHER.....

JOB.....

DATE..... PAGE 79

114	1280	1100
	1320	1210
113	1320	1330
115	1330	1540
116	1350	1650
117	1400	1760
	1510	1870
119		
120	1725	1955
121	1845	2030
	1970	2110

18.30 Returned to camp

19.00 Sched - Aaul [illegible] [illegible]

20.40 Water level 64 cm [illegible]

SUNDAY AUG. 12

07.00 Sched. - no traffic

07.30 Water level 46 cm.

Weather - overcast, cool

- v. light breeze from NW.

10.00 Water level 70 cm

leaving for

PARTY CHIEF.....

WEATHER.....

A1-39

JOB

DATE PAGE 80

10.00 Leaving for pipeline harbour.
DF + PG to cross calibrate
MR stations + survey buoy
Spit
PH + KF to sample in harbour
entrance

11.00 At entrance - only receiving
MR 2A + 1 → batteries at MR4
are dead.

	1	2A
MR	8923	693

Sampling

#	MR1	MR2A	DEPTH(m)	TIME	COMMENTS.
90-10	8928	660	1.5	11.10	Silty sand.
11	8889	724	1.4	11.20	Fine sand
12	8850	815	1.3	11.28	Fine sand with clay l.
13	8819	845	1.2	11.35	Fine sand.
14	8823	933	0.8	11.45	Fine sand with mud & organic debris
15	8340	1310	0.8	12.00	Fine sand.
16	7905	1710	1.0	12.10	Fine sand.
17	7574	2029	1.5	12.20	Fine to med. sand.
18	7453	2150	12	12.25	30 m off Spit Fine to med sand

PARTY CHIEF

WEATHER

wade

JOB 4 1375 / 7360

DATE PAGE 81

#	MR1	MR2A	MR4	DEPTH	TIME	COMMENTS
19	7220	2346		1.2	12.40	Fine brn sd
	Minimeter / Head. cross check					
19A	7360	2215	1375			
20	7105	2464	1893	2.7	13.15	(Three trees standing) Mud
	Note V. strong current ... 1 Knot (0.5 m/s) towards SE - in flat calm weather.					
21	7577	2195	2221			No sample
22	7625		2235	2.7	13.25	Sand over mud
	13.30 Break for lunch - sunny + flat calm.					
	14.45 Resume					

#	MR1	MR2A	MR4	DEPTH	TIME	COMMENTS
23		1299	779	1.5	15.25	Silty mud
24		1240	1252	1.5	15.40	Fine sand
25		1433	1509	1.7	15.55	Fine sand
26		1750	1906	2.4	16.10	Fine sd.
27		1838	2140	2.5	16.15	"
28		2259	2678	2.1	16.25	Fine to med sd
29		1976	2430	1.8	16.45	Fine sand

PARTY CHIEF

WEATHER

wade

A1-40

JOB.....

DATE..... PAGE 82

#	MRZA	MRK	DEPTH	TIME	COMMENTS
30	1719	2243	1.6	16.55	Oly trough of Sand over Fine sd.
31	1683	2202	1.4	17.05	Crest of sd wave Fine Sd.
32	1397	1972	1.5	17.15	Fine sd
33	1195	1755	1.6	17.25	Fine sd
34	824	1551	1.8	17.35	Fine muddy sandy sd / mud. → anchor sample taken - muddy
35	503	1378	1.6	17.45	V. fine sd, silty.
36	720	1486	1.7	17.55	Silty clay
18.50	Arrive back at ramp				
19.05	School . no traffic				
19.28	Water level 55 cm				
22.50	Water level 70 cm				

MONDAY AUGUST 13

07.00	School — no traffic.				
08.35	Water level 52 cm				
	Sunny + clear				
	Wind - mod breeze from NE				
10.00	Wolfe Spit — Dan setting up survey gear with Kirby				

PARTY CHIEF.....

WEATHER.....

JOB.....

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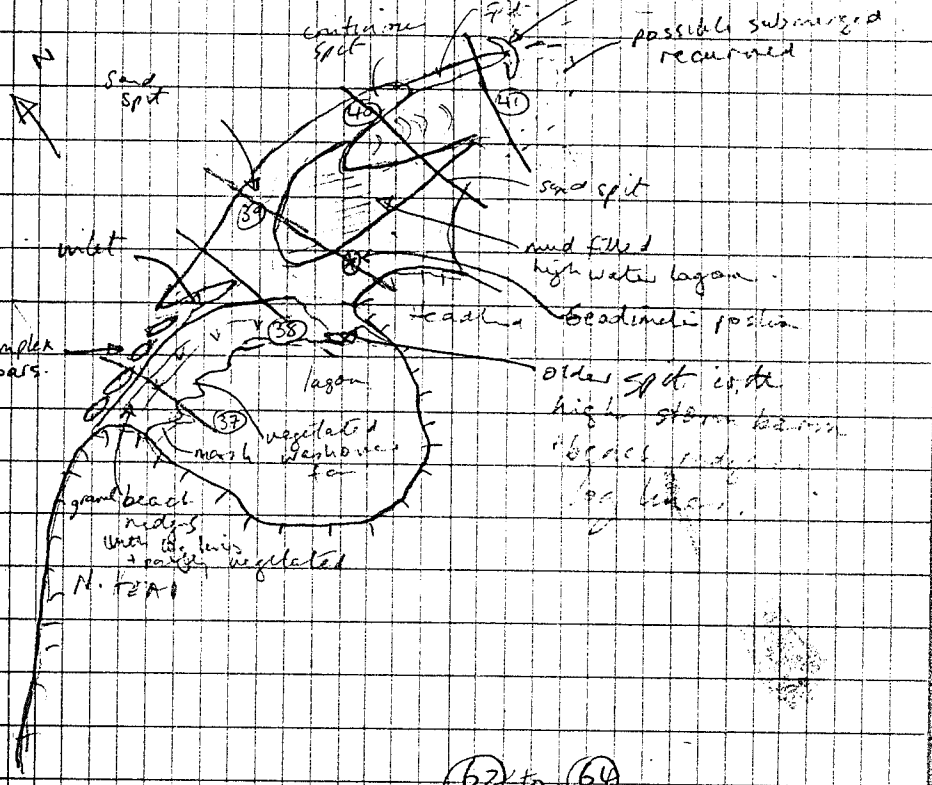
From N. Head, looking east (foreshortened) (modified by walking survey)



Complex : Photos 2-26 to 2-28 - profile 38 (62) to (64)

Proximal end of spit consists of a shallow older recurved spit with prominent storm ridge & several ridges at most proximal end. Storm ridges show large amount of log debris.

PARTY CHIEF.....

WEATHER.....

A1-41

JOB.....

DATE..... PAGE 84

- backed by extensive washover plain
- with partial vegetation.
- beachface mixed sand + gravel

In vicinity of profile 38, sand spit has prograded seaward of the gravelly relict spit - flat, lower profile, separated from old spit by small lagoon - presume sandspit drowned only by highest storm surges

- margins of lagoon draped by mud, centre of lagoon not muddy.
- all lagoon characterised by clumps of peat

very characteristic of many beaches in the area.

Washover flat - mud substrate to gravelly pavement with sparse vegetation, going down behind into muddy lagoon fringe

- pit in muddy part shows sand with mud flasers
- Photo 2-29. → in profile 36, normal to beach.

(65)

PARTY CHIEF.....

WEATHER.....

wade

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At lagoon margin just of gravelly spit beachface mixed sand + gravel

In mud overlie gravelly sand - estimate at least 10 cm mud in centre of lagoon.

Sand spit - near 38, in places mud covered ripple marks troughs. - complex linguoid ripple - sand flaser laminated.

of sandspit.

Beach face consists of complex braided topography with no distinct berm, rather complex flotsam line, meandering around bars + embayments.

(66) Photo 2-30 →

- seaward are oblique bars

Nearshore bar apparent at time of breaking.

Profile 39

Geodomain located on sandy spit that extends beyond recurved

PARTY CHIEF.....

WEATHER.....

wade

A1-42

JOB.....

DATE..... PAGE 86

portion of old gravelly spit previously excised - separated from main spit by extensive mud-filled trough - not filled with water today

- Photo 2-32 (67) - general view of profile location looking E.

Behind inner spit - extensive sand + mud flat

- ~~[illegible]~~
- dried surface with polygonal mud cracks, v. sparse, v. small
- pit shows thin interbeds of sand and clay (pajama-striped facies)
- sand brown, ~~[illegible]~~

Photo 2-33 (68) 3 cm thick. Clay-grey in hue generally - 1 cm.

- sandier with some granules within 20 cm of surface
- flat is v. sparsely vegetated except for back edge near bluffs or islands
- ~~[illegible]~~ locally reworked to

PARTY CHIEF.....

WEATHER.....

wade

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growth on partially buried clumps of tundra peat.

Photo 2-33 (69) Pit further towards spit - thicker mud cap of thin (1 cm) brown sand texture.

- Moving up onto old spit - less clay beds - get flasser sands with silty ~~[illegible]~~ flasers

Photo 2-34 (70) - spit surface down from geodimeter

- 15 cm thick sand, massive with gradational overlying flaser sand with silt flasers

- prograding spit crest washover, underlying beach, washover flat

Old spit surface sandy + vegetated ablated

Between old spit + present active spit is mud-filled trough

- flat ~~[illegible]~~ backside margin - 1 cm of mud

PARTY CHIEF.....

WEATHER.....

wade

A1-43

JOB

DATE PAGE 88

covers predom. sandy bed with
- thin wispy lams of silt.
Photo 2-35 (71)
2-36 (72)

- surface covered by small scale linear ripples.

- centre of trough more muddy
- thin interbeds of sand/c mud (silty) - Photo 2-37 (73)

- standing water on part of trough.

New spit - sharp backspit margin showing numerous small washover fans. - Photo 2-38 (74)
Spit surface completely rippled + wind deflated.

- further out spit - broad high washover low surface ~20 cm high.

PARTY CHIEF

WEATHER

wade

JOB

DATE PAGE 89

- right at head - low angle bedding
- ~~Photo before walk~~ bar
- giving complex beam, low elevation
- trough largely water - full + connected to sea at high tide
Photo 3-1 (75) View E & W, N. Head in distance.

Distal end of spit - breaks up into series of elongate bars
- part reworked by Geodimeter

Photo 3-2 (76) Distal end of spit showing broad character.
- PG + KF for scale.

- some appear to be of remnant of previous spit position
- muddy low areas between

- sand at seaward end of spit fine grained + bachelor area - silty
- structureless except for occasional

PARTY CHIEF

WEATHER

wade

A1-44

JOB

DATE PAGE 90

flames.

- sand v. wet (v. low lying) so cannot dig trench pits.

Profile #1

Distal spit - to summarise consists of a low lying sand flat with complex barred morphology - appears to be series of accreted bars or ridges with troughs between.

- much of surface is draped with mud and sand appears to be fine-grained silty

- stratification generally seems to be absent or perhaps difficult to see in the wet sand.

- occasional fine (silty) flames

- there seems to be fine cam even on the 'headland' of spit which consists of a set of oblique bars.

- ~~[illegible]~~

- Shoreface consists of a series of bars marked

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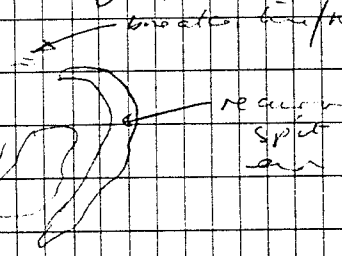
by distinctive surface.

- bars on seaward side do appear to be more sandy (less mud accumulated on the surface during ebb).

(77)

Photo 3-3 - End of WSW spit

- low northward receding end of end which merges with main bar in foreground of main spit



20.00 Arrived back at camp after rocky + wet ride home. Fog that had rolled in during latter part of survey now cleared

- sunny
- windy.

21.17 Water flood tide

PARTY CHIEF

WEATHER

A1-45

JOB.....

DATE..... PAGE 92

TUESDAY AUGUST 14

07.00 Sched. No traffic.

08.52 Wake Lud 5.7 cm.
Strong E wind.

10.35 Arrived at beach site 42+43
- small island of Killig Sao
- objective: to survey beach and transect to mud bank.

Bluffs ~ 30 m high
- Killig Fm
- Large scale trough x-bedding
- trough sets 2 - 5 m thick
dipping both S & W + E.
Photos 3-[78], [79], 3-5
- overlain by thin (< 1 m) diamict with rounded clasts.

Spit extends from island
- but proximal part has
ridge & swale pattern - looks like

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large-scale troughs ± 20 m across
- must be Killig. Fm outcrop
- illustrates nature of x-bedding in well large scale trough

(80)
Photo 3-61

- also indicates spit is not totally accretionary but is actually an eroded island platform.
- not clear if the crescentic accretionary boundary is built from multiple sets of parallel 200 m.
Spit is broad, extensive across
[illegible] with [illegible] channel

PARTY CHIEF.....

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A1-46

JOB

DATE PAGE 94

meander positive - channel forced around by longshore accretion of spit.

Profile 42

Backshore side of spit

- rapidly passes into ~~soft~~ mud offshore - within 5-10m.
+ backshore of spit is gently sloping flat surface - extensively windblown, mud covered + partly covered by windblown sand.
- pit consists of predom fine (silty) sand with flaser lenses of mud + dk laminae
- thin continuous bed (5mm) of clay near surface
- hard to make out but it appears to be ripple X-lam.
- black (dk) laminae + lenses consist of organic rich clay with fibrous particles and sulphurous smell.

Photo 3-7 (81) — Sample 90-42-2

Top of spit - extensively

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WEATHER

wadc

JOB

DATE PAGE 95

windblown + eroded - previous ripple pattern degraded
- hard crust over much of the surface (Kotey ?).
- some gravel present on surface with some marks behind on down-wind side.
- occasional log present + overturned barge.
- pit in spit crest - ripple X-lam fine sand with ~~thin~~ thin ~~continuous~~ grey flaser beds

Photo 3-8 (82) — Sample 90-42-3

3-9 (83)

Foreshore:

- Storm ridge with small log debris - low elevation and high water berm.
- extensive low angle foreset bedding (intertidal) composed of alternating [illegible]
- [illegible]
- small amount of fine gravel

PARTY CHIEF

WEATHER

wadc

A1-47

JOB.....

DATE..... PAGE 96

distributed in patches on ~~sand~~ upper foreshore

- pit in storm berm - parallel clean sand - well sorted
- low angle x-bedding
- thin ripple x-lam
- thin ground beds 1 - 2 cm
- 25 cm down

Photo 3-10 (84) Sample 90-42-4

- upper intertidal region - fine silty sand with thin ground beds - 20 cm apart - thin ground clasts elsewhere - Sample 90-42-5
- intertidal sand flat is extensively rippled with patches of ground in upper mid region.

- lower foreshore consists of fine silty sand with oblique ~~sh~~ ~~re~~ bar Sample 90-42-6
- sand at least 50 cm thick

PARTY CHIEF .....

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Wade

JOB.....

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& trough
- sand extends to mid-tide
- bars offshore for in 100 m
- soft & muddy between bars and beyond

Distal end of spit
- storm berm extends only ~ ¼ way along spit
- remaining area consists of broad flat of rippled sand with log debris
- presumably subjected during HHW / storm surge
- partially mud-covered.

- pit shows spit to consist of fine sand with thin clay beds & flasers - partly deformed (cryogenic) and/or convolute.

Photo 3-11 (85) 9r

Sample 90-42-1

Cliff Sample - Killey Spit.

Sample 90-42-7

PARTY CHIEF .....

WEATHER .....

Wade

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Profile 90-43

- ~~from~~ beneath bluffs is small debris apron, largely unmodified by wind.
- steeper upper foreshore ~~slope~~
- no storm berm, waves must break directly on cliff during high water storms
- middle foreshore - gravel and small boulders - underlain by brown sand, similar to Kitting.
- lower shoreface, gently sloping bead with ripples
- small aspate water line
- one small bar in nearshore
- soft Mud ~ 30m off
- clumps of peaty material

(46 to -12)

Site 90-44

Next channel meander from 90-43 - site barrier bluffs
- Lake in
- channel in
- and steeply sloped dip of sand flat

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WEATHER .....

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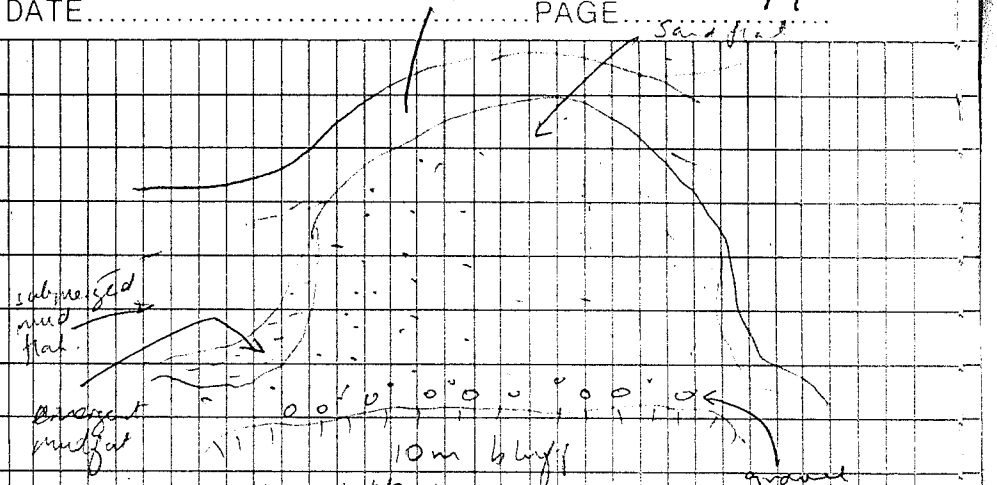

Diamict/P. Kitting

Sand flat - thick sand beds with thin beds of clay

Emerg. mud flat - thicker mud interbeds

Upper shoreface - boulder ground

Origin of sand flat?
- may be erosional remnant of island

Cliff - Kitting Fm
- 20 - 30 cm thick [illegible]

PARTY CHIEF .....

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A1-49

JOB.....

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19.00 Sched
- Don Locke reports radar on J.K. Mackay is fixed + operational
Don Gillespie called - parts have arrived in Inuvik - will be assembled tomorrow - then line cut off.

19.35 Water level 65 cm.

WEDNESDAY AUG 15

07.00 Sched - no traffic.

09.00 Water level 63 cm
Clear + windy (10-15 knots from E).

10.15 Arrive at MR3A Tripod has been knocked down by wind. Changed batteries and reset for working in front of Wolfe Spit + N. Head.

10.30 Arrived at video camera site. Both tapes have advanced

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bad battery and running 10.5 V.
Replaced batteries.

DF + PG - resurveying profile 90-2

W of beach site and landward edge Sand fan extending from gully across beach
Photo 3-13 (87)
Sand is V. soft
- water still draining on surface
- form of fan failure
- believe I saw frost features from the boat when running the video camera line on Aug 11
- noted rough topography there
- gravelly debris spread across fan head and into nearshore.

Photo 1-14 (88) Beach sed 2
NB Wind deflector in foreground

PARTY CHIEF .....

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- impressed by amount of longshore transport on foreshore. backshore by wind.
- low bluffs behind beach in places covered by low dunes.
- Substantial ablation of ~~the~~ dried mud surface in lows behind berm.

Site 90-45

West side of island from MR2. [illegible] and mud

- Scarps of ~~the~~ subtle mass across flat w/ mud drapes + [illegible] Above sand a low [illegible] elevation by a few cm extend significantly on feel harder ~~soft~~ patches

- Backshore vegetation - clumps & continuous areas of brown plants - Photo 3-16 (90)

- sand on N side west of low

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vegetated dunes - Photo 3-15 (89)
+ some eroded [illegible] dunes formed by grass growth.

13.15 Returned to camp for lunch
Wind still strong

14.30 Set out for beach site 90-3
Wind coming straight down Hansen Harbour making passage very rough. Returned to camp.

Photos 3-17, 3-18 (91) (92) of the camp

19.00 Sched. No traffic.

20.50 Water level 61 cm.

THURSDAY AUGUST 16

07.00 Sched - no traffic
Radiophone - poor Xmission + reception.
+ no copy with operator.

08.55 Water level 63 cm.
weather - still blowing hard from E.

PARTY CHIEF.....

WEATHER.....

A1-51

JOB.....

DATE..... PAGE 104

09.05 Attempted radiophone again - no luck.

09.40 Arrive beach site 3 - Spit at entrance to Hansen Hb. Bear seen on adjacent island - tracks seen on spit.

Photo 3-19 (93) - Beach profiles from E.

Appears to be little change since last visit. No signs of fresh washover - storm polygons still well-preserved, with only modification by the wind.

DF + PG resurveyed beach profile.

11.30 Returned to camp for lunch - did not pick up miniranger due to presence of bear.

12.00 Contacted Don Franke re. arrangements for Kirby to get

PARTY CHIEF .....

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to Inuvik. Boat should be ready to go into water by 4 pm tomorrow. Suggested get Cessna floatplane in on Sat. morning (18) for Kirby + Philip to take them back to Inuvik. Should then get here for 20th. Also, helicopter for 18 + 19 for Pete and Dave to do island work. Don agreed plan was sensible - need to check on accommodation arrangements + status of helicopter on Monday with Base G. at Inuvik time.

13.30 Returned to Site 90-45 - established survey line 1 to cliff line, across supratidal flat - will survey cores position along line.

As previously described, water saturated flat has algae + bacterial mat covering bare, wet sediment surface - contrasting to dense tundra vegetation with greater soil accumulation.

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WEATHER .....

A1-52

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- arranged to sample variety of features:

Core 90-45-1

Depth ground surface to core tube top 35.5 cm
Depth top of core 40.0 cm
Length of core liner 93 cm
Core length 53 cm (radial length 57.5 cm)

In area with low grassy hummocks just below upper shoreface gravel + sand beach.

- bare area on flat with numerous cracks
- small scale linear ripple "ghosts" present
- rarely flooded
- assorted debris - logs, boulders etc present.

- pit shows thin interbeds of grey and brown silty clay, with beds of thin fibrous peat
- silty clay beds 1-2 cm thick + appear bioturbated.
- sed. is dry and crumbly
- sand partings but thicker sand (7-10 cm) at 20-25 cm down

PARTY CHIEF .....

WEATHER .....

JOB.....

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tephra, 2-5 cm thick, well graded. ~~Lower~~ ~~tephra unit~~

- peat is black, forms layer of approx 1 cm thick
- organic, proto-tufaceous small.

Photo 3-20 (94)

Core 90-45-2

Tube 113.5
Ground to tube 22.5
Core to tube 45.5

Area presently covered by mud just below vegetated upper shoreface.

- small linear wave ripples draped in mud characteristic surface.
- Mud surface is patchy with some irregular wind-ablated patches
- could be preserved footprints

- pit contains complex interlayering of brown sand - as thin beds and lenses - clean, oxidised - forms amalgamated beds up to 10 cm thick, lenses as thin as 0.5 cm.
- some clear ripples within amalgamated units.
- interlayered with grey and black clay

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A1-53

- generally thin bedded and/or laminated

- look[illegible] similar to fa[illegible] 5.0. i[illegible] on Kingalik — Submerged banks?

Photo ~~3-1~~ 3-21 (95), 3-22 (96)

Core 90-45-3 — Core tube 148 cm
Core surface to tube top 100 cm
Ground to core top 97 cm

Middle Supratidal flat
- surface mud covered with small wave ripples ~2.5 cm wavelength, draped with mud.
- similar to previous site but more sticky mud (more recently deposited) and soft surface.

- pit contains interbedded sand and mud with sand beds up to 10 cm — cross L (dune form) with fine gravel component brown stained, sand lenses and ripples in.
- interbedded with grey & black clay

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as thin flaser... and lenticular, up to 5 cm thick.
Photo 3-23 (97), 3-24 (98)

Core 90-45-4 — Core tube 100 cm
Ground to top 24 cm
Core top to tube top 27.5 cm

Marginal to muddy sand flat
- surface is smooth, gently undulating with fine organic detritus in depressions & ripple troughs.
~30 cm from high water mark.

- pit shows sequence of thin sand beds, 5-10 cm thick with thin silty layers & rare organic laminae
- some X-lam in sand — not as oxidised looking as previous site
- sand predominately [illegible] bed 1-2 cm thick only
- cyclic organic clay layers ~1-2 cm ~30 cm apart.
Photo 3-25 (99)

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A1-54

JOB.....

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Core 90-45-5 Tube length 120.5 cm;
Ground to tube top 39.0 cm
Core top to tube top 45.5 cm.
- outer Sandy bar still on supratidal flat
- v. fluid, sand; some grey organic Mud laminae visible in pit wall, but predom sand which fluidised very quickly ∴ no photog.

17.50 Return to camp.

19.00 Sched / Call to Ottokpie
- all demob plans approved
- Charter Cessna will pick up Kirby & Phil @ 1pm Saturday for transport to Inuvik
- Mackay to be put in the ~~boat~~ water asap. & return by Monday.
- Mr. & Dave to get helicopter on Sat for trip to Pullen and on Sunday for

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Garry, Kelly & Hooper Islands
- will stay in Tuk Saturday night & arrange shipment of freight from Tuk.

20.00 Packed up helicopter unit ready for plan to Inuvik if weight allowable.

21.05 Water level 70 cm.

FRIDAY AUGUST 17

07.00 Sched N. Traffic.
08.50 Water level 73 cm.
Weather - Sunny & clear
- light breeze from NE
Heading out to main navigation channel thence at beach gradient to Site 1.
Prof.

11.25 Complete Sounder line at site 90-3.
13.00 Complete grab-sampling
Heading to beach site 2.

PARTY CHIEF.....

WEATHER.....

A1-55

JOB.....

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14.15	Dismantled camera station and MR2a. Heading out for nearshore soundg line.		
16.00	Completed sounding line + grab samples. Too late to go to N. Head and wind + waves coming up.		
16.30	Pick up MR4		
17.30	Back at camp.		
19.00	Sched. No traffic. Dan Collingwood – arrangements for key in Inuvik for P + K.		
22.15	Water level	70 cm.	
SATURDAY AUGUST 18			
07.00	Sched. Helicopter due to leave at 08.00.		
08.20	Water level	86 cm.	

PARTY CHIEF.....

WEATHER.....

193.2

JOB.....

DATE..... PAGE 113

08.35 Helicopter to Pullen I5.
- some fog between Pullen + pipeline base.
- hazy on island.

08.50 Land Pullen I5
Backsiding from previous station.

10.05 Site 60 – at intersection of two spits.

Older spit has slightly higher vegetation + larger tone on image
- in places small (1m across) rounded domes vegetated by small light green shrubs + grass accumulations
- area between 2 spits is rimmed by supratidal mud mounds or is part of back shore + platform right on spit before main diversion
- surface of spit is medium sand with fine gravel (wind ablated) lag.

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WEATHER.....

A1-56

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- younger spit has lower profile
- driftwood from set-up pt site 60

12.10 Mapped on spit - HW line & water line to geodetic survey point c 2/3 way along spit (new large pile of logs/debris)
- spit has flat wind blown gravelly surface
- on S side, series of shingle sandy bars
- N side, relatively steep shoreface beyond younger spit
- last series of shingle bars with mud filled trough to landward.

12.30 Attempted beach profile survey just west of set-up point. Fog beginning to drift in. Impossible to sight with Geodimeter

13.30 Moved to S end of island with hope of seeing N. Head to make it back

PARTY CHIEF.....

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JOB.....

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16.00 Arrived PCSP.

20.00 Tour of Arktos

21.00 Packed gear away for shipment by Bill.

SUNDAY AUGUST 19

08.25 Departing PCSP for Pullen Is.

09.10 Arrive Pullen
Starting Profile 61 & 62.

11.50 Completed Profile 61 + 62

61 - island side of spit
61 - on new spit - ½ way along.

Lagoon between is steep sided (on new spit side) & contains thick mud accumulation

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A1-57

JOB

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New spit has ablated sand & gravel surface until this end. Now it breaks into 2 areas of numerous interlocked & sub-parallel welded bars. Rest of the unit is flat.

12.15 Heading out to define the ends of the two spits.

13.00 Work on Pullen complete - heading to Hooper Island (100) - (111) shots of Pullen's.

14.00 Cliff measurments Hooper Island

Dowel No.	Dist to cliff edge (m)	Bearing (magnetic)	Additional Distance moved back (m)	Comments
SITE 5384				
109	0.65	312°	23.0	In front of broad slope feature - sand cliff - no visible ice.
107 ??	7.65	317°	0	Label difficult to read
101	12.60	328°	0	Thaw flow slide between 101 + ?107
98	6.27	316.5°	10.0	
Site 5383				
95	4.48	311°	10.0	
93	4.14	305°	10.0	
92	4.74	309°	10.0	

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	Dowel No	Dist to cliff edge (m)	Bearing ° Mag	Distance moved back (m)	Comments
	90	3.52	311°	10	Edge of flow slide
	89	0.84	317°	20	Flow slide
	88	5.89	312°	10	
(87)	No number.	9.37	312°	0	
	86	8.58	303°	10	
	85	6.90	314°	0	Broken at ice/land top - ice/rock slope - stick north position
(84)	No number.	5.00	309	10	No material with metal tag
	83	2.74	309	10	
	82	not found			
Site 5382		- note v. large flow slides to W.			
	68	7.92	302°	0	
	69	1.90	296	10	
	No number.	2.91	296°	0	
	72	2.15	296°	10	
	73	—	—	—	Broken + moved from original position
	74	1.84	285°	10	
	75	9.07	310°	0	
	76-81	not found			
	Photo 3-36 (112)	From slide.			
Site 5381					
	53	7.06	290°	10	
	54	—	—	—	Broken + moved from original pos.

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Dowel No.	Distance from cliff (m)	Direction °mag	Distance set back	
55	7.31	290°	10	
56	7.73	293°	10	
57	6.61	286°	10	
58	6.86	290°	10	
59	8.08	287°	10	
60	10.03	288	10	
61	11.50	299	10	
62	NOT FOUND			
63	8.30	293	10	
64	6.12	294	10	At tag mashed up.
65	6.49	291	10	
66				
67	6.65	295	10	Broken.

16.20 Finished on Hoopers Island - waiting for helicopter to return.

Photos 113 4-1 to 4-5 117

Spit on NE Kelly Island

Photos 115, 119 4-6 Barrie NW Kelly - note v. small inlet & flood tidal delta

PARTY CHIEF.....

WEATHER.....

wade

JOB.....

DATE..... PAGE 119

Dowel No.	Dist. to cliff (m)	Direction (°mag)	Dist moved back	Comm.
145	19.29	267°	0	
Unnumbered 27.6 m at 336° mag from #145	13.32	269°	0	

and in vicinity of #145 also

In opposite direction large flow slide with overhanging head wall & massive Beach consists of coarse gravelly debris/ mud flows & fossil shell bearing beds attached by ice.

- lithology is black & grey mudstone overlying muddy sand (Laurel)

Photos 123 4-6 to 4-10

17.15 leaving Kelly

Photos 125 4-11 to 4-18 - more of Kelly Coastal landforms.

Photos 4-14 to 4-15 - large sand bar off S end of Hoopers Is.

- completely separated from Hoopers mainland and tundra islands.

PARTY CHIEF.....

WEATHER.....

wade

A1-59

17.30 Return to camp -

19.00 Sched - PCSP no traffic
Kirby - Mackay has blown head gasket soon after putting it in the water
Gillespie - resolved that best demob plan is to use Cessna 206 as much as possible - Then sling the rest to Tuk.

MONDAY AUGUST 20

Demob all day 08.00 – 22.30.
Inuvik Air Charter can come in at 15.00 hrs tomorrow.
Decided to sling fuel to PCSP - arranged with Claude on evening Sched

TUESDAY AUGUST 21

Fuel slung in two loads.
Float plane delayed in Ramlabuk rescheduled for 21.00 hrs. with

PARTY CHIEF.....
WEATHER.....

have to do remaining load on Weds A.M.

17.00 Packing more or less complete with exception of sleeping, shelter and talking tents

PARTY CHIEF.....
WEATHER.....

A1-60

JOB

DATE PAGE

PCSP

1. Helicopter time — Sat 18 → Pullen for the day
   2 persons + 50 lb.
   ← Stop at PCSP ~~overnight~~ elect. 50 lb on return
   Sun 19 → Hoops, Kelly, Garry, T.
   – all day 2 persons

2. ~~Call Gary White~~
   ~~– Kirby, Phil arrive Sat pm~~
   ~~– as accomod. for~~
   ~~– how get Key~~

3. Demob camp with Mackay
   – no helicopter needs anticipated if above time OK
   – workers items Mackay cannot take. – if not sent go ~22nd.

   23rd helicopter → Inuvik

PARTY CHIEF

WEATHER

JOB WATER LEVEL MEASUREMENTS

DATE PAGE

	DAY	TIME	LEVEL	REL. HT.
(222)	10	07.20	46	154
	10	10.17	71	129
	10	14.07	64	136
	10	16.51	41	159
	10	18.51	50	150
	10	21.57	77	123
(223)	11	07.20	44	156
	11	20.40	64	136
(224)	12	07.30	46	154
	12	16.00	70	130
	12	19.28	55	145
	12	22.50	74	126
(225)	13	08.35	52	148
	13	22.17	72	128
(226)	14	08.52	57	143
	14	19.35	65	135
(227)	15	09.00	63	137
	15	20.50	61	139
(228)	16	08.58	63	137
	16	21.05	70	130
(229)	17	08.50	73	127
	17	22.15	70	130
(230)	18	08.20	86	114

PARTY CHIEF

WEATHER

A1-61

JOB WATER LEVEL MEASUREMENTS.

DATE PAGE

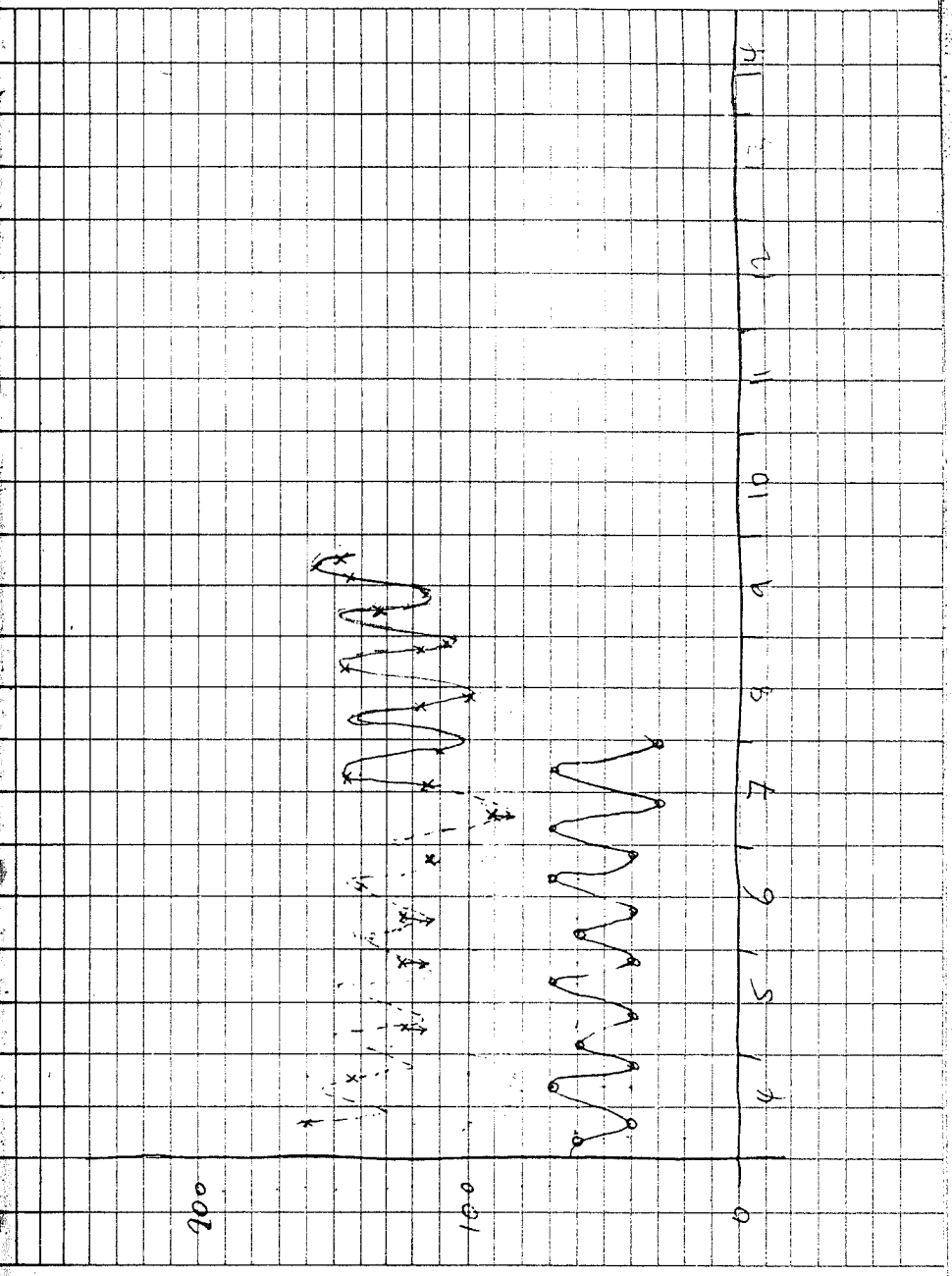
		TIME	READING	ADJUSTMENT	RELATIVE H (120 - READING)
(216)	U	09 30	70	30	160
	L	17.45	87	30	143
(217)	S	07.30	< 102	30	< 122
	S	22 00	90	30	120
(218)	6	09.30	< 122	30	< 122
	6	14.00	70	10	140
	6	22 17	97	10	113
(219)	7	09.55	< 100	10	< 110
	7	13.00	86	0	110
	7	16.00	54	0	140
	7	16.45	51	0	109
	7	21.56	90	0	110
(220)	8	07.20	81	0	119
	8	12.55	120	0	100
	8	16.18	52	0	148
	8	18.00	91	0	119
	S	22.00	91	0	109
(221)	1	09.10	66	0	134
	9	10.00	87	0	113
	9	14.30	55	0	145
	9	16-30	61	0	159
		18-30	51	0	159

PARTY CHIEF

WEATHER

JOB

DATE PAGE



PARTY CHIEF

WEATHER

A1-62

APPENDIX 2

Slides

SLIDES

Note: All slides are annotated with the prefix BEAU90-

1. Tuktoyaktuk hamlet, AGC monitoring site 5012, profile L2. View from south with gravel barrier and marsh and Hequette at survey benchmark. Abandoned schoolhouse in background. July 31, 1990.

2. Same as 1.

3. Tuktoyaktuk hamlet. Gravel beach north of schoolhouse, looking south, showing nylon bag shore protection (unfinished). August 1, 1990.

4. Tuktoyaktuk hamlet. Gravel beach north of schoolhouse, looking south, showing eroded low bluff and log debris storm line. August 1, 1990.

5. Tuktoyaktuk hamlet. View southward from near end of peninsula, showing new home construction behind shore protection. August 1, 1990.

6. Aerial view from helicopter. Spit on north side of Hansen Harbour from the south. Nearshore bar visible. August 3, 1990.

7. Aerial view from helicopter. Spit on north side of Hansen Harbour from the east. Multiple nearshore bars visible. August 3, 1990.

8. Aerial view from helicopter. Spit on north side of Hansen Harbour from the northeast. Multiple nearshore bars visible. August 3, 1990.

9. Aerial view from helicopter. Beach along Reindeer Island from the southeast. Barrier enclosing thermokarst lake. August 3, 1990.

10. Aerial view from helicopter. Beach along Reindeer Island from the southeast. Thaw flow slide in foreground. August 3, 1990.

11. Aerial view from helicopter. Northern end of Reindeer Island from the southeast. Nearshore bar visisble. August 3, 1990.

12. Aerial view from helicopter. Pipeline Harbour from the southeast with view of island, sites 90-42, 90-43, in centre. August 3, 1990.

13. Aerial view from helicopter. Pipeline Harbour from the southeast, with GIL-E island in centre left. August 3, 1990.

14. Aerial view from helicopter. Wolfe Spit (in distance left) from the southeast, with extensive offshore bar system visible. August 3, 1990.

15. Same as 14, close up August 3, 1990.

16. Aerial view from helicopter. Wolfe Spit and North Head, from northeast. Nearshore bar sytem visible extending in front of North Head. August 3, 1990.

17. Aerial view from helicopter. Wolfe Spit and nearshore bar system from the northwest. Pipeline harbour in background. August 3, 1990.

18. Aerial view from helicopter. MR2 island from the southeast, showing barrier enclosing thermokarst lake. August 3, 1990.

19. Beach site 90-2 from the west, showing location of video cameras on knoll. Log debris on beach and bar in foreshore. August 4, 1990.

20. Same as 19.

21. Beach site 90-2 from the bluff, showing close-up of survey line. August 4, 1990.

22. West of beach site 90-2, showing ground ice slump, including ice in headwall. August 4, 1990.

23. Beach site 90-2 from thewest, showing pocket beach character. August 4, 1990.

24. Beach site 90-2. Close-up of mud drape filling troughs of small-scale ripples in small trough behind foreshore bar. August 4, 1990.

25. Western end of beach site 90-2, showing low gravel storm ridge on lower foreshore. August 4, 1990.

26. Headland east of beach site 90-2, showing small thaw flow slide across beach. August 4, 1990.

27. Caribou, North Head. August 4, 1990.

28. Caribou, North Head. August 4, 1990.

29. Beach site 90-1 from the storm ridge, showing log accumulation in the backshore drained thermokarst lake. August 4, 1990.

30. Beach site 90-1. Berm showing seaward-dipping pebble imbrication. August 4, 1990.

31. Beach site 90-1 from the west, showing logs and washover debris on backshore. August 4, 1990.

32. Beach site 90-3 from the south. Sandy spit with washover debris on surface. August 4, 1990.

33. Beach site 90-3 from the north, showing recurved southern end in the distance. August 4, 1990.

34. Beach site 90-3 from the north, looking across Hansen Harbour. Distal recurved end shows nearshore bar in distance. August 4, 1990.

35. Beach site 90-3 from the south. Backshore of the spit, showing cusps and transverse bars. Swash line for previous day's storm visible to right of picture. August 4, 1990.

36. Beach site 90-3. Small frost heave polygons marked by pebbles on distal end of spit. August 4, 1990.

37. Zodiacs prepared for sidescan survey, at campsite. Zodiac in background contains miniranger navigation system and echo sounder, with transducer suspended on wooden boom. Zodiac in foreground, containing sidescan display unit, was towed behind, with sidescan fish deployed from the transum. Outboard motor was carried in case of emergencies. August 5, 1990.

38. Closer view of first zodiac with navigation antenna and sounder transducer deployed. August 5, 1990.

39. Site 90-4 from the south, showing profile. Thin gravel lag on upper foreshore, mud flat on lower foreshore and shoreface. August 6, 1990.

40. Site 90-4. Upper mudflat showing linear ripples and trails. Fine organic debris in some ripple troughs. August 6, 1990.

41. Site 90-4. Distinctive (horseshoe-shaped) linguoid ripples of particulate organic debris on upper mudflat. Steep seaward face to right of picture. August 6, 1990.

42. Site 90-4. Low relief scarp marking boundary between upper mudflat with regular ripples and middle mudflat with irregular microtopography. Seaward to the right. August 6, 1990.

43 Site 90-4. Irregular microtography of middle mud flat. Seaward tio the right. August 6, 1990.

44. Site 90-4. Shovel section of middle mudflat showing thin sand beds with very thin, grey clay interbeds. August 6, 1990.

45. Site 90-4. Small scale amphitheatre-shaped scarp, with erosional headwall and irregular topography in centre. Seaward to the left. August 6, 1990.

46. Site 90-5 from the south. Fine gravel beach with dritwood debris storm line apparent. August 6, 1990.

47. Site 90-5. Pit in lower foreshore showing 20 cm thick beach sand and gravel, overlying grey clay and brown (possibly Kittigazuit) sand. Trowel points to grey clay. August 6, 1990.

48. Site 90-5. Pit in lower foreshore further along beach to the south, showing beach sand and gravel overlying grey clay and brown (possibly Kittigazuit) sand. August 6, 1990.

49. View from site GIL-E. Part 1 of panorama, looking towards the southeast and MR2 island in distance. Irregular, oblique shoreface bars in foreground and linear nearshore bar in mid-range. August 6, 1990.

50. View from site GIL-E. Part 2 of panorama, looking towards the south-southeast and GIL-K island in distance. Series of oblique shoreface bars and linear nearshore bar in mid-range. August 6, 1990.

51 View from site GIL-E. Part 3 of panorama, looking towards the south along spit. August 6, 1990.

52. View from site GIL-E. Part 4 of panorama, looking towards the south and GIL-K island in the distance. August 6, 1990.

53. View from site 90-7 (MR3), looking towards the east. Large sand flat between main island of Reindeer Islands and smaller island. Small vegetated dunes in foreground, on western side of sand flat. August 7, 1990.

54. East of site 90-7, on sand flat shown in 53. looking towards the northwest. Gravel washover fan on seaward side of flat. August 7, 1990.

55. Site 90-7. View northeastward along surveyed line. Red flagging survey marker in gravel foreshore, centre. Peat at base of cliff; poorly sorted gravel foreshore; sandy lower foreshore/upper shoreface, shore-parallel bars; and nearshore bar in distance. August 7, 1990.

56. Site 90-8, looking towards the west. Peat beds outcropping on foreshore of barrier enclosing thermokarst lake. August 7, 1990.

57. Site 90-9, looking towards the northeast along the survey line. Line was located off an oblique rip-current channel separating the outer nearshore bar, seen in the distance. Base of storm ridge just visible in foreground. Shoreface bars in middle distance. August 7, 1990.

58. Site 90-9. Close-up of frost-shattered cobble on beach. Note smaller pebbles washed into crack. August 7, 1990.

59. Pullen Island. Peat outcropping on beach along northwest side of the island. August 8, 1990.

60. View from Pullen island, MR1. Looking east along sand flat and spit forming eastern part of the island. August 8, 1990.

61. View from Pullen island, MR1. Looking south along sand flat connecting small tundra islands. August 8, 1990.

62. Wolfe Spit, site 90-38, looking towards the northwest. Older gravel spit with prominent storm ridge and log debris. Younger sand spit visible to right of picture. August 13, 1990.

63. Wolfe Spit, site 90-38, looking west across gravel storm ridge to sparsely vegetated washover flats behind. August 13, 1990.

64. Wolfe Spit, site 90-38, looking towards the north, across foreshore of gravel spit to younger sand spit behind lagoon. August 13, 1990.

65. Wolfe Spit, site 90-38. Pit in muddy part of washover flat at margin of lagoon. Wind-ablated surface. Rippled sand with mud flasers. August 13, 1990.

66. Wolfe Spit, site 90-38. Pit in rippled, mud-draped bar of younger spit . Section is predominantly sand, but thin mud flasers are visible. August 13, 1990.

67. Wolfe Spit, profile 90-39. General view of survey benchmark, looking east along spit. August 13 1990.

68. Wolfe Spit, profile 90-39. Pit in washover flat behind inner spit. Thin interbeds of sand and clay (pyjama facies) overlying thicker sand with gravel. August 13 1990.

69. Wolfe Spit, profile 90-39. Pit in washover flat closer to inner spit crest. Thicker mud with thin sand lenses. August 13 1990.

70. Wolfe Spit, profile 90-39. Pit on inner spit crest, 50 m from benchmark. 15 cm thick massive sand, with pebbles, overlying sand with silt flasers. August 13 1990.

71 Wolfe Spit, profile 90-39. View towards west from foreshore along survey line. Outer spit crest in foreground. Oblique shoreface bar system visible in background. August 13 1990.

72. Wolfe Spit, profile 90-39. Pit in mud-filled trough in backshore of outer spit. Rippled, mud-draped surface. Sand with thin mud flasers visible in pit wall. August 13 1990.

73. Wolfe Spit, profile 90-39. Pit in muddy trough between oblique bars. Thin interbeds of sand and mud visible in pit wall. August 13 1990.

74. Wolfe Spit. View eastward along spit showing sharp backshore margin with low relief washover fans. Spit surface to the left is extensively rippled, with linear, linguoid and complex forms. August 13 1990.

75. Wolfe Spit, east of site 90-39, looking towards the west, with North Head in the distance. Oblique foreshore bar. August 13, 1990.

76. Wolfe Spit, east of site 90-40, distal end looking towards the east, with MR2 island in the distance. Spit consists of series of bars. Shoreface bars in distance left. Kirby Fraser and Philip Giles. August 13, 1990.

77. Wolfe Spit, east of site 90-41, looking towards the north. End of spit showing recurved foreshore bar which merges offshore with prominent shoreface bar which fronts most of the spit. August 13, 1990.

78. Site 90-43. Cliffs of Kittigazuit Sand. August 14, 1990.

79. Not included - under exposed.

80. Proximal spit between sites 90-42 and 90-43, looking west. Outcropping beds of Kittigazuit Sand in backshore, showing broad troughs, indicating flow approximately southeastwards. August 14, 1990.

81. Profile 90-42. Pit in backshore of spit, showing fine sand with thin flasers of silt and grey clay. August 14, 1990.

82. Profile 90-42. Pit in spit crest, showing ripple cross-lamination in fine sand and grey flaser beds. August 14, 1990.

83. Profile 90-42. View looking northwest along spit crest, showing position of pit in 82. August 14, 1990.

84. Profile 90-42. Pit in storm berm showing parallel laminated sand, with low angle cross-bedding and ripple cross-bedding near surface. Gravel in cross-beds at 25 cm. August 14, 1990.

85. Southeast of profile 90-42. Pit on mud-covered, distal end of spit, showing thin mud veneer over fine sand with deformed clay beds and flasers. August 14, 1990.

86. Beach between profiles 90-42 and 90-43, looking towards the east. Upper foreshore is sandy with some gravel, boulders and peat clumps. Lower foreshore is rippled fine sand. August 14, 1990.

87. West of profile 90-2, looking towards the west. Alluvial fan extending from gully of retrogressive thaw flow slide. August 15, 1990.

88. Beach profile 90-2, looking towards the west. Wind ablation in foreground and low shore-parallel dunes on beach and along bluff, resulting from strong easterly winds. August 15, 1990.

89. Site 90-45 looking towards the northwest. Low vegetated dunes on upper sand flat. August 15, 1990.

90. Site 90-45 looking towards the southeast. Brown vegetation on upper flat. August 15, 1990.

91. View of camp site looking north across Hansen Harbour. August 15, 1990.

92. Same as 91.

93. Beach site 90-3, looking towards the northwest. Washover debris. August 16, 1990.

94. Site 90-45. Pit in upper, vegetated supratidal flat in location of core 90-45-1. Thin interbeds of grey and brown silty clay, with beds of thin fibrous peat, and sand partings. August 16, 1990.

95. Site 90-45. Pit in upper supratidal flat , just below vegetated area, in location of core 90-45-2. Complex interlayering of brown, oxidised sand beds and lenses, grey clay and black clay. August 16, 1990.

96. Same as 95.

97. Site 90-45. Pit in muddy middle supratidal flat. Interbedded oxidised, cross-laminated brown sand and grey mud, with sand beds up to 10 cm, clay as thin flasers and beds up to 5 cm thick. August 16, 1990.

98. Same as 97.

99. Site 90-45. Pit in sandier middle supratidal flat.. Thin 5 - 10 cm sand beds, less oxidised than sand on upper flat, with thin silt and grey clay beds. August 16, 1990.

100 to 111. Aerial views of Pullen Island from helicopter. August 19, 1990.

112. Flow slides along northern shore of Hooper Island. View towards the southwest. August 19, 1990.

113. Aerial view of northeastern Pelly Island with spit - barrier island complex in background, looking towards the east.

114. Aerial view of proximal spit and large washover fan, northeast Pelly Island, looking towards the east.

115. Aerial view of distal spit and western end of barrier island, showing inlet, northeast Pelly Island, looking towards the west.

116. Same as 115, looking towards the southwest.

117. Same as 116, showing more of barrier island.

118. Aerial view of barier beach enclosing thermokarst lake, northwest Pelly Island, looking towards the west.

119. Closer view of 118 showing small inlet and amalgamated flood tidal deltas/washover fans, looking towards the northeast.

120. Flow slides along northwest shore of Pelly Island, from cliff edge, looking towards the northeast.

121. Same as 120, looking towards the southwest. Note mudflows to water line and flow lines on flow surface.

122. Same as 122, looking straight down from cliff. Flow lines very clear.

123. Same as 120, showing massive ice in headwall of cliff.

124. Aerial view of large natural sand island south of Hooper Island, looking towards the southeast.

125. Same as 124 from closer up.

126. Aerial view across Richards Island looking northeastwards towards the campsite and Hansen Harbour in far distance.

127. Same as 126 from closer up, campsite visible.

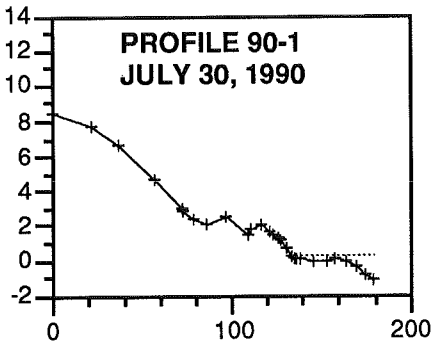
128. same as 126 from closer up still, with campsite and Hansen Harbour clearly visible.

APPENDIX 3

Cliff and Beach Profiles with Data Listings

BEACH and CLIFF PROFILES

All profiles are plotted at the same scale with distances and elevations in metres. The vertical exaggeration for the plots is 10:1 unless indicated otherwise. Elevations were calculated using water levels from tidal records at Tuktoyaktuk. The dotted horizontal line on the graphs is water level at the time the survey. The tables accommpanying the plots give the distance along the profile line, the elevation at each survey point, a descrption of each point, grid coordinates, and general information about the profile. All bearings are magnetic.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6
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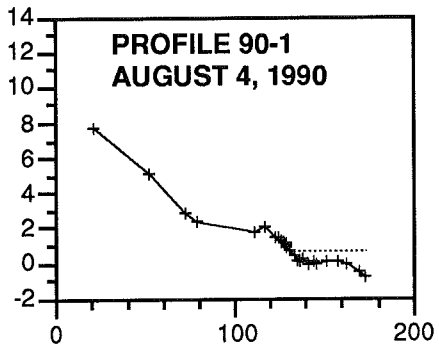
0
100
200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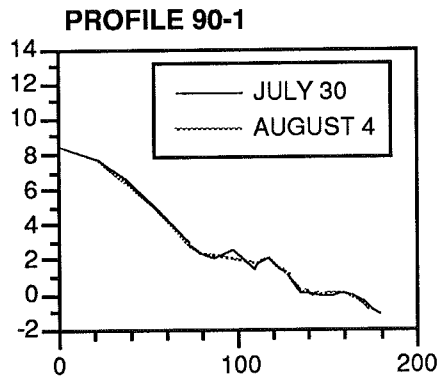
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JULY 30
AUGUST 4
14
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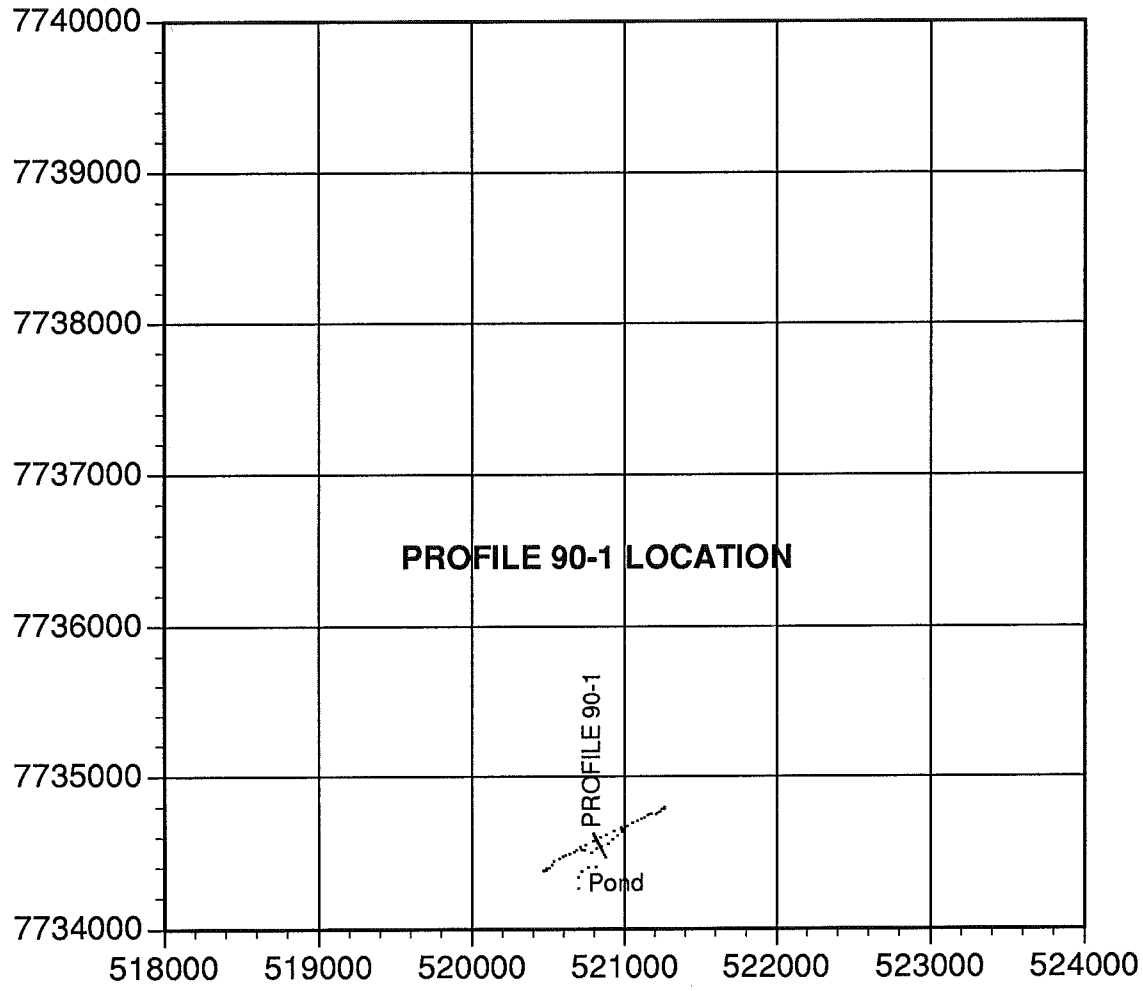
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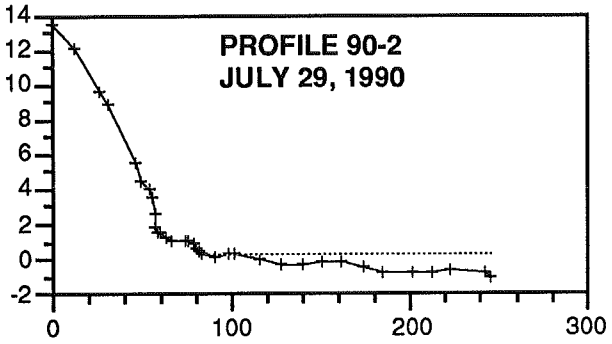
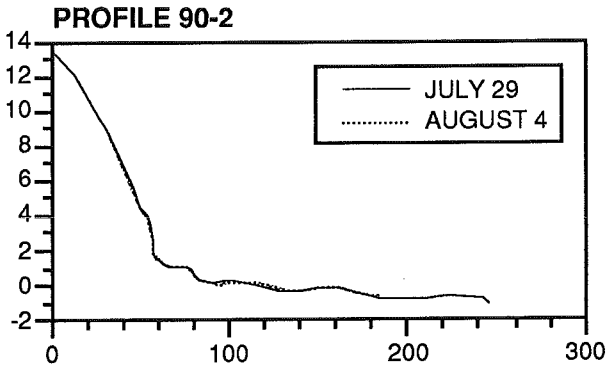
PROFILE 90-1 LOCATION
PROFILE 90-1
Pond

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-1, JULY 30, 1990	RIDGE TOP	0.00	8.50	520874.89	7734465.06
PROFILE BEARING 304.4° M	BM1	21.68	7.68	520865.01	7734484.35
BM1 = METAL ROD, HT. = 0.742	VEGETATED SLOPE	37.74	6.56	520857.82	7734498.71
NORTH HEAD BM 4=METAL ROD	VEGETATED SLOPE	56.76	4.58	520849.08	7734515.60
WITH CAP, HT= 0.62	WOOD STAKE	72.03	3.03	520842.07	7734529.18
BM 2 = METAL ROD, HT. = 0.58	NORTH HEAD BM4	72.39	2.88	520841.94	7734529.52
WOOD STAKE, HT. = 0.40	DRIFTWOOD	78.93	2.32	520839.13	7734535.43
WATER LEVEL AT TUK = 0.29	DRIFTWOOD	86.22	2.09	520835.44	7734541.73
	DRIFTWOOD	96.05	2.46	520831.04	7734550.51
	DRIFTWOOD	108.20	1.50	520825.48	7734561.32
	PEBBLE,COBBLE,SAND,WASHOVER	111.19	1.78	520824.12	7734563.99
	BM2	116.45	2.01	520821.80	7734568.70
	SAND,PEBBLE,COBBLE	122.01	1.45	520819.26	7734573.65
	SAND,PEBBLE,COBBLE	122.15	1.46	520819.21	7734573.78
	SAND,PEBBLE,COBBLE	125.27	1.36	520817.78	7734576.55
	SAND,PEBBLE,COBBLE	125.28	1.36	520817.79	7734576.57
	BEACH FACE	127.19	1.12	520816.87	7734578.25
	BEACH FACE	131.03	0.65	520815.10	7734581.65
	WATER LEVEL	133.88	0.29	520813.88	7734584.23
	SAND	135.37	0.11	520813.19	7734585.55
	PEBBLE	136.53	0.12	520812.75	7734586.63
	PEBBLE	138.48	0.12	520811.75	7734588.31
	SAND	145.36	-0.05	520808.66	7734594.46
	SAND	153.61	-0.07	520804.94	7734601.82
	SAND	157.46	0.03	520803.14	7734605.22
	SAND	163.77	-0.13	520800.26	7734610.84
	SAND	169.74	-0.40	520797.32	7734616.04
	SAND	175.25	-0.86	520794.97	7734621.03
	SAND	179.04	-1.08	520793.13	7734624.35

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-1, AUGUST 4,1990	BM1	21.68	7.69	520316.61	7735878.53
PROFILE BEARING 304.4° M	VEGETATED SLOPE	52.51	5.06	520316.78	7735909.37
BM1 = METAL ROD, HT. = 0.74	NORTH HEAD BM4	72.40	2.87	520316.68	7735929.25
NORTH HEAD BM 4=METAL ROD	EDGE DRIFTWOOD	78.83	2.33	520316.79	7735935.69
WITH CAP, HT= 0.64	DRIFTWOOD,SAND,GRAVEL	111.15	1.74	520316.95	7735968.01
BM 2 = METAL ROD, HT. = 0.57	BM2	116.46	2.03	520316.70	7735973.32
WATER LEVEL AT TUK = 0.76	BEACH,SAND,PEBBLE	122.55	1.43	520316.66	7735979.41
	BEACH,SAND,PEBBLE	124.93	1.38	520316.75	7735981.78
	BEACH,SAND,PEBBLE	126.00	1.25	520316.72	7735982.86
	BEACH,SAND,PEBBLE	127.34	1.22	520316.67	7735984.20
	BEACH,SAND,PEBBLE	128.54	1.07	520316.67	7735985.40
	BEACH,SAND,PEBBLE	129.17	1.02	520316.66	7735986.03
	BEACH,SAND,PEBBLE	129.30	0.89	520316.64	7735986.16
	WATER LEVEL	130.99	0.64	520316.62	7735987.85
	SAND,PEBBLE	133.23	0.39	520316.67	7735990.09
	SAND	135.52	0.03	520316.60	7735992.38
	GRAVEL	136.13	0.05	520316.70	7735992.99
	GRAVEL	137.72	0.16	520316.61	7735994.57
	GRAVEL	141.71	-0.05	520316.61	7735998.57
	GRAVEL	143.80	0.03	520316.72	7736000.66
	SAND,GRAVEL	145.70	-0.03	520316.63	7736002.56
	SAND	151.43	0.09	520316.67	7736008.29
	SAND	157.12	0.09	520316.63	7736013.98
	SAND	163.00	-0.10	520316.73	7736019.86
	SAND	170.07	-0.54	520316.57	7736026.93
	SAND	173.46	-0.79	520316.79	7736030.32

JUL. 30	DESCRIPTION	DIST.	ELEV.	AUG. 4	DESCRIPTION	DIST.	ELEV.	ΔELEV
90-1	BM1	21.68	7.68	90-1	BM1	21.68	7.69	0.01
	VEG SLP	37.74	6.56			37.74	6.32	-0.24
		52.51	5.02		SLP	52.51	5.06	0.04
	VEG SLP	56.76	4.58			56.76	4.59	0.02
	WOOD STK	72.03	3.03			72.03	2.91	-0.11
	NHD BM4	72.39	2.88		NHD BM4	72.40	2.87	-0.01
	DRFTWOOD	78.93	2.32		EDG DRFTWOOI	78.83	2.33	0.02
	DRFTWOOD	86.22	2.09			86.22	2.20	0.11
	DRFTWOOD	96.05	2.46			96.05	2.02	-0.45
	DRFTWOOD	108.20	1.50			108.20	1.79	0.30
	PCS.WO	111.19	1.78		WD.SG	111.15	1.74	-0.05
	BM2	116.45	2.01		BM2	116.46	2.03	0.02
	SPC	122.01	1.45			122.01	1.48	0.03
	SPC	122.15	1.46			122.15	1.46	0.00
		122.55	1.45		BCH.SP	122.55	1.43	-0.02
		124.93	1.37		BCH.SP	124.93	1.38	0.00
	SPC	125.27	1.36			125.27	1.33	-0.03
	SPC	125.28	1.36			125.28	1.36	0.00
		126.00	1.27		BCH.SP	126.00	1.25	-0.02
	BCHFAC	127.19	1.12			127.19	1.22	0.10
		127.34	1.11		BCH.SP	127.34	1.22	0.11
		128.54	0.96		BCH.SP	128.54	1.07	0.11
		129.17	0.88		BCH.SP	129.17	1.02	0.14
		129.30	0.87		BCH.SP	129.30	0.89	0.03
		130.99	0.66		WLO1550	130.99	0.64	-0.02
	BCHFAC	131.03	0.65			131.03	0.64	-0.02
		133.23	0.37		SP	133.23	0.39	0.01
	WLO1408	133.88	0.29			133.88	0.28	-0.01
		135.52	0.09		S	135.52	0.03	-0.07
	S	135.37	0.11			135.37	0.02	-0.09
		136.13	0.12		GRAV	136.13	0.05	-0.07
	P	136.53	0.12			136.53	0.08	-0.04
		137.72	0.12		GRAV	137.72	0.16	0.04
	P	138.48	0.12			138.48	0.12	0.00
		141.71	0.04		GRAV	141.71	-0.05	-0.09
		143.80	-0.01		GRAV	143.80	0.03	0.04
	S	145.36	-0.05			145.36	-0.02	0.04
		145.70	-0.05		SG	145.70	-0.03	0.03
		151.43	-0.07		S	151.43	0.09	0.16
	S	153.61	-0.07			153.61	0.09	0.16
		157.12	0.02		S	157.12	0.09	0.07
	S	157.46	0.03			157.46	0.08	0.05
		163.00	-0.11		S	163.00	-0.10	0.01
	S	163.77	-0.13			163.77	-0.15	-0.02
	S	169.74	-0.40			169.74	-0.52	-0.13
		170.07	-0.42		S	170.07	-0.54	-0.12
		173.46	-0.71		S	173.46	-0.79	-0.08


PROFILE 90-2
JULY 29, 1990
14
12
10
8
6
4
2
0
-2
0
100
200
300


PROFILE 90-2
JULY 29
AUGUST 4
14
12
10
8
6
4
2
0
-2
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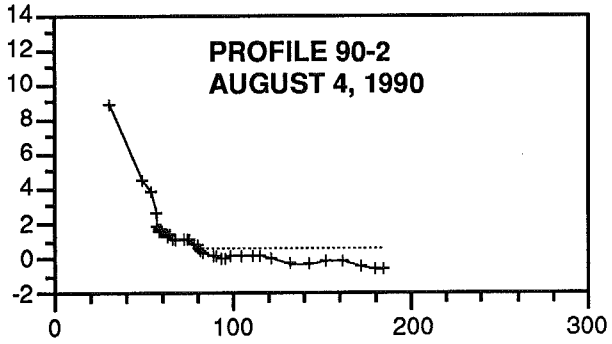
100
200
300


PROFILE 90-2
AUGUST 4, 1990
14
12
10
8
6
4
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-2
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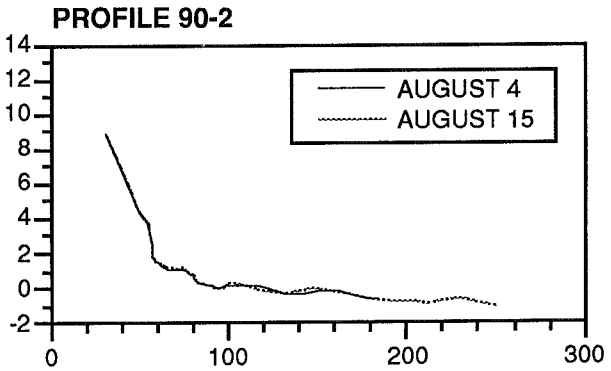
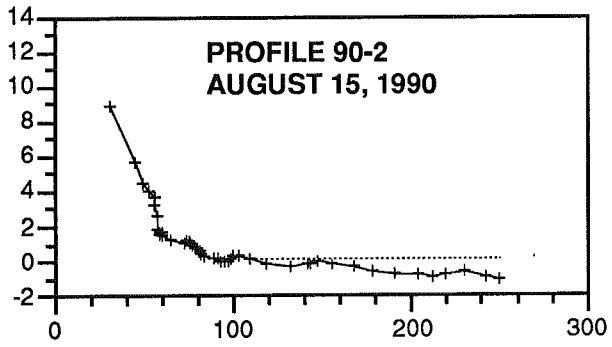
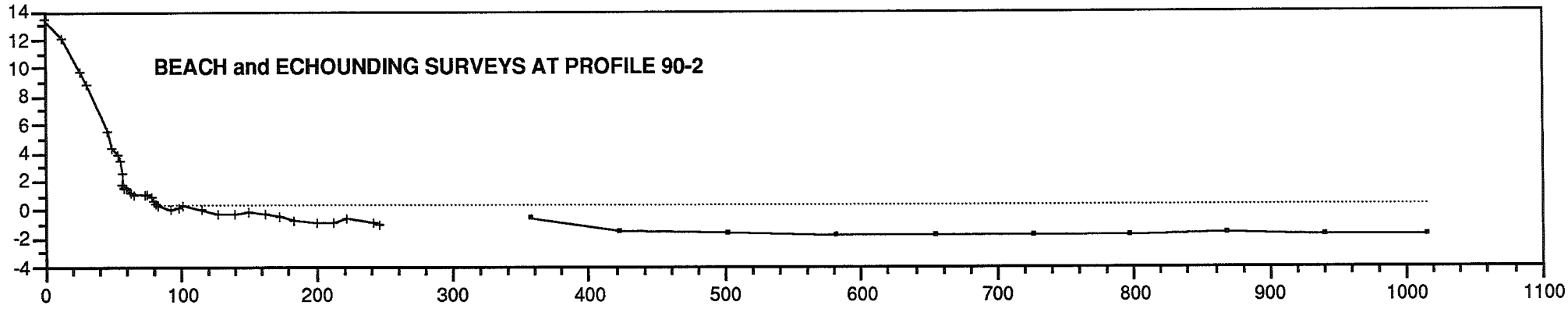

PROFILE 90-2
AUGUST 4
AUGUST 15
14
12
10
8
6
4
2
0
-2
0
100
200
300


PROFILE 90-2
AUGUST 15, 1990
14
12
10
8
6
4
2
0
-2
0
100
200
300


BEACH and ECHOUNDING SURVEYS AT PROFILE 90-2
14
12
10
8
6
4
2
0
-2
-4
0
100
200
300
400
500
600
700
800
900
1000
1100

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-2, JULY 29, 1990	VEGETATED SLOPE	0.00	13.42	528341.48	7732335.83
PROFILE BEARING 323.6°M	VEGETATED SLOPE	12.78	12.13	528339.10	7732348.61
BM1=METAL ROD, HT. = 0.51	VEGETATED SLOPE	25.86	9.72	528336.77	7732361.69
BM2=WOODEN PEG, HT. = 0.20	BM1	31.17	8.90	528335.73	7732367.01
BM3=METAL ROD, HT.= 0.40	VEGETATED SLOPE	45.93	5.51	528332.86	7732381.76
WATER LEVEL AT TUK =0.32	VEGETATED SLOPE	50.05	4.46	528332.09	7732385.88
	VEGETATED SLOPE	54.15	3.92	528331.37	7732389.98
	VEGETATED SLOPE,SAND	55.64	3.46	528331.21	7732391.47
	VEGETATED SLOPE,SAND	56.80	2.63	528331.01	7732392.63
	BASE SLOPE	57.22	1.81	528330.90	7732393.05
	BM2	58.71	1.53	528330.67	7732394.55
	PRODUNE	59.90	1.53	528330.41	7732395.73
	PRODUNE,SAND,VEG	60.10	1.58	528330.37	7732395.93
	PRODUNE,SAND,VEGETATION	60.33	1.49	528330.33	7732396.16
	SAND,PEBBLE	63.89	1.28	528329.70	7732399.72
	SAND,PEBBLE,DRIFTWOOD	66.27	1.12	528329.16	7732402.11
	AOELIAN SAND	73.68	1.13	528327.93	7732409.51
	BM3	75.33	1.13	528327.62	7732411.16
	HIGH WATER MARK	77.85	0.94	528327.18	7732413.68
	MID BEACH FACE,SAND	80.71	0.64	528326.61	7732416.55
	PEBBLE,SAND	82.27	0.47	528326.32	7732418.10
	WATER LEVEL	83.47	0.32	528326.12	7732419.31
	RUNNEL,SAND,PEBBLE	91.48	0.11	528324.67	7732427.31
	RIDGE	97.79	0.25	528323.39	7732433.62
	RIDGE,SAND	101.44	0.29	528322.78	7732437.28
	IN WATER	115.60	-0.01	528319.99	7732451.43
	IN WATER	127.03	-0.23	528317.87	7732462.86
	IN WATER	139.70	-0.24	528315.55	7732475.54
	IN WATER	150.53	-0.15	528313.26	7732486.36
	IN WATER	161.78	-0.21	528311.21	7732497.61
	IN WATER	173.48	-0.40	528309.22	7732509.32
	IN WATER	183.43	-0.69	528307.54	7732519.26
	IN WATER	200.55	-0.78	528303.40	7732536.39
	IN WATER	212.35	-0.81	528302.17	7732548.18
	IN WATER	222.06	-0.60	528300.68	7732557.89
	IN WATER	241.64	-0.83	528296.53	7732577.47
	IN WATER	246.05	-1.02	528295.05	7732581.88

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-2, AUG. 4,1990	BM1	31.17	8.89	528335.73	7732367.01
PROFILE BEARING 323.6°M	VEGETATED SLOPE	50.03	4.47	528332.18	7732385.53
BM1=METAL ROD, HT. = 0.59	VEGETATED SLOPE	54.67	3.83	528331.35	7732390.10
BM2=WOODEN PEG, HT. = 0.23	FACE OF SLOPE	56.88	2.62	528330.91	7732392.26
BM3=METAL ROD, HT.= 0.50	BASE OF SLOPE	57.27	1.85	528330.87	7732392.65
WATER LEVEL AT TUK=0.77	BACK BEACH	58.24	1.65	528330.71	7732393.61
	BM2	58.83	1.57	528330.61	7732394.19
	PRODUNE	59.91	1.54	528330.29	7732395.23
	PRODUNE	60.18	1.58	528330.24	7732395.49
	PRODUNE	60.54	1.48	528330.14	7732395.84
	PRODUNE	63.40	1.29	528329.73	7732398.67
	PRODUNE	63.73	1.35	528329.67	7732399.00
	PRODUNE	64.06	1.25	528329.58	7732399.31
	SAND,PEBBLE	65.82	1.15	528329.28	7732401.05
	HIGH WATER MARK	67.41	1.07	528328.90	7732402.60
	DRIFTWOOD	72.51	1.12	528328.12	7732407.64
	BERM TOP	74.45	1.15	528327.79	7732409.55
	BM3	75.43	1.10	528327.59	7732410.51
	BEACH FACE	78.69	0.84	528327.01	7732413.72
	BEACH FACE	79.54	0.73	528326.86	7732414.56
	WATER LEVEL	80.44	0.64	528326.59	7732415.42
	PEBBLE	82.18	0.41	528326.19	7732417.11
	SAND	83.44	0.25	528326.01	7732418.37
	SAND	88.82	0.18	528325.10	7732423.67
	SAND,PEBBLE	90.27	0.13	528324.69	7732425.06
	SAND,PEBBLE	93.19	0.03	528324.25	7732427.96
	SAND	95.34	-0.01	528323.70	7732430.03
	SAND	99.17	0.13	528323.16	7732433.83
	SAND	105.30	0.13	528321.71	7732439.80
	SAND	111.43	0.12	528320.53	7732445.82
	SAND	115.25	0.09	528319.92	7732449.59
	SAND	121.21	-0.05	528318.82	7732455.45
	SAND	131.44	-0.26	528316.90	7732465.50
	SAND	142.35	-0.31	528315.16	7732476.26
	SAND	151.98	-0.20	528312.90	7732485.64
	SAND	161.69	-0.20	528311.28	7732495.21
	SAND	171.21	-0.39	528309.43	7732504.56
	SAND	179.30	-0.61	528308.29	7732512.58
	SAND	183.60	-0.67	528307.38	7732516.77

INFORMATION	DESCRIPTION	ELEV.	DIST.	EASTING	NORTHING
PROFILE 90-2, AUG. 15,1990	BM1	8.956	31.17	528335.73	7732367.01
PROFILE BEARING 323.6°M	VEGETATED SLOPE	5.679	45.16	528332.82	7732380.72
BM1=METAL ROD, HT. = 0.52	VEGETATED SLOPE	4.508	50.13	528331.71	7732385.58
BM2=WOODEN PEG, HT. = 0.11	VEGETATED SLOPE	4.056	52.88	528331.69	7732388.35
BM3=METAL ROD, HT.= 0.41	VEGETATED SLOPE	3.780	55.01	528331.25	7732390.43
WATER LEVEL AT TUK=0.23	VEGETATED SLOPE	3.316	56.01	528331.07	7732391.41
	VEGETATED SLOPE	2.618	56.92	528330.95	7732392.32
	BASE OF SLOPE	1.871	57.24	528330.80	7732392.61
	EDGE AOELIAN SAND,PEBBLE	1.705	58.23	528330.66	7732393.60
	AOELIAN SAND BM2	1.684	58.73	528330.56	7732394.09
	PRODUNE	1.638	60.00	528330.37	7732395.34
	PRODUNE	1.661	60.20	528330.32	7732395.55
	PRODUNE	1.590	60.44	528330.17	7732395.76
	AOELIAN SAND	1.288	64.29	528329.62	7732399.58
	DRIFTWOOD	1.230	72.93	528327.97	7732408.06
	DRIFTWOOD	1.183	73.08	528327.98	7732408.22
	DRIFTWOOD	1.234	73.26	528327.98	7732408.40
	AOELIAN SAND	1.176	74.75	528327.64	7732409.86
	SAND	1.167	75.23	528327.54	7732410.32
	BM3	1.196	75.35	528327.50	7732410.43
	SAND	1.092	75.86	528327.46	7732410.95
	SAND,PEBBLE	1.004	77.43	528327.08	7732412.47
	SAND,PEBBLE	0.843	79.44	528326.72	7732414.45
	SAND	0.690	81.02	528326.37	7732415.99
	SAND	0.573	82.11	528326.24	7732417.08
	SAND	0.412	83.32	528326.02	7732418.27
	SAND,PEBBLE	0.253	88.97	528324.73	7732423.78
	WATER LEVEL RUNNEL	0.176	91.19	528324.43	7732425.98
	RUNNEL	0.143	92.70	528324.22	7732427.49
	RUNNEL,SAND	0.095	95.33	528323.66	7732430.05
	WATER LEVEL RUNNEL	0.151	97.30	528323.52	7732432.04
	SAND	0.223	98.85	528323.16	7732433.56
	RIDGE,SAND	0.346	99.59	528323.02	7732434.28
	TOP OF RIDGE	0.317	103.78	528322.34	7732438.41
	SWASH	0.179	109.39	528321.37	7732443.95
	SAND	-0.033	118.16	528319.72	7732452.57
	SAND	-0.173	131.40	528317.00	7732465.52
	SAND	-0.141	141.14	528315.22	7732475.11
	SAND BAR	-0.014	143.22	528315.17	7732477.23
	SAND BAR	0.016	146.89	528314.08	7732480.78
	SAND BAR	-0.089	155.39	528312.48	7732489.14
	SAND	-0.270	167.97	528309.82	7732501.39
	SAND	-0.457	177.40	528307.86	7732510.62
	SAND	-0.633	189.54	528304.20	7732522.24
	SAND	-0.736	204.09	528301.79	7732536.61
	SAND	-0.814	212.31	528299.79	7732544.59
	SAND	-0.695	218.89	528299.61	7732551.29
	SAND	-0.539	229.74	528298.52	7732562.17
	SAND	-0.860	242.03	528295.47	7732574.20
	SAND	-1.013	249.64	528294.17	7732581.70

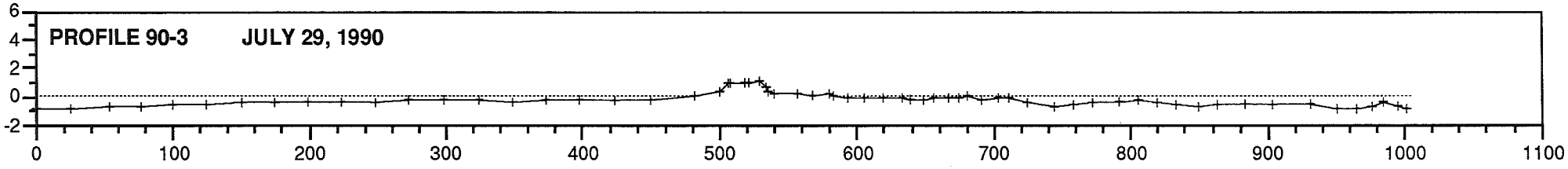
JUL. 29	DESCRIPTION	DIST.	ELEV.	AUG. 4	DESCRIPTION	DIST.	ELEV.	Δ ELEV.
90-2	BM1	31.17	8.90	90-2	BM1	31.17	8.89	0.00
	VEG SLOPE	45.93	5.51			45.93	5.43	-0.08
	VEG SLOPE	50.05	4.46		VEG SLOPE	50.03	4.47	0.02
	VEG SLOPE	54.15	3.92			54.15	3.90	-0.02
		54.67	3.76		VEG SLOPE	54.67	3.83	0.07
	VEG SLOPE,SAND	55.64	3.46			55.64	3.30	-0.17
	VEG SLOPE,SAND	56.80	2.63		FACE	56.88	2.62	-0.01
	BASE SLOPE	57.22	1.81		BASE SLOPE	57.27	1.85	0.04
		58.24	1.62		BACK BEACH	58.24	1.65	0.03
	BM2	58.71	1.53		BM2	58.83	1.57	0.04
	PRODUNE	59.90	1.53		PRODUNE	59.91	1.54	0.01
	PRODUNE,SAND,VEG	60.10	1.58		PRODUNE	60.18	1.58	0.00
	PRODUNE,SAND,VEG	60.33	1.49			60.33	1.54	0.05
		60.54	1.48		PRODUNE	60.54	1.48	0.01
		63.40	1.31		PRODUNE	63.40	1.29	-0.02
		63.73	1.29		PRODUNE	63.73	1.35	0.06
	SAND,PEBBLE	63.89	1.28			63.89	1.30	0.02
		64.06	1.27		PRODUNE	64.06	1.25	-0.02
		65.82	1.15		SAND,PEBBLE	65.82	1.15	0.00
	SAND,PEBBLE,DRIFTWOOD	66.27	1.12			66.27	1.13	0.01
		67.41	1.12		HWM	67.41	1.07	-0.05
		72.51	1.13		DRIFT WOOD	72.51	1.12	-0.01
	AOEL SAND	73.68	1.13			73.68	1.14	0.01
		74.45	1.13		BERM TOP	74.45	1.15	0.02
	BM3	75.33	1.13		BM3	75.43	1.10	-0.03
	HWM	77.85	0.94			77.85	0.90	-0.04
		78.69	0.85		BCH FACE	78.69	0.84	-0.02
		79.54	0.76		BCH FACE	79.54	0.73	-0.03
		80.44	0.67		WATER LEVEL	80.44	0.64	-0.03
	MID BCH FACE.SAND	80.71	0.64			80.71	0.60	-0.04
	PEBBLE,SAND	82.27	0.47		PEBBLE	82.18	0.41	-0.07
	WATER LEVEL	83.47	0.32		SAND	83.44	0.25	-0.07
		88.82	0.18		SAND	88.82	0.18	-0.01
		90.27	0.14		SAND,PEBBLE	90.27	0.13	-0.02
	RUNNEL,SAND,PEBBLE	91.48	0.11			91.48	0.09	-0.02
		93.19	0.15		SAND,PEBBLE	93.19	0.03	-0.12
		95.34	0.20		SAND	95.34	-0.01	-0.20
	WATER LEVEL RIDGE	97.79	0.25			97.79	0.08	-0.17
		99.17	0.26		SAND	99.17	0.13	-0.14
	RIDGE,SAND	101.44	0.29			101.44	0.13	-0.16
		105.30	0.21		SAND	105.30	0.13	-0.08
		111.43	0.08		SAND	111.43	0.12	0.05
		115.25	0.00		SAND	115.25	0.09	0.09
	IN WATER	115.60	-0.01			115.60	0.08	0.09
		121.21	-0.12		SAND	121.21	-0.05	0.07
	IN WATER	127.03	-0.23			127.03	-0.17	0.06
		131.44	-0.23		SAND	131.44	-0.26	-0.03

JUL. 29	DESCRIPTION	DIST.	ELEV.	AUG. 4	DESCRIPTION	DIST.	ELEV.	Δ ELEV.
	IN WATER	139.70	-0.24			139.70	-0.30	-0.06
		142.35	-0.22		SAND	142.35	-0.31	-0.09
	IN WATER	150.53	-0.15			150.53	-0.21	-0.06
		151.98	-0.16		SAND	151.98	-0.20	-0.04
	IN WATER	161.78	-0.21		SAND	161.69	-0.20	0.00
		171.21	-0.36		SAND	171.21	-0.39	-0.03
	IN WATER	173.48	-0.40			173.48	-0.45	-0.05
		179.30	-0.57		SAND	179.30	-0.61	-0.04
	IN WATER	183.43	-0.69			183.43	-0.67	0.02
		183.60	-0.69		SAND	183.60	-0.67	0.02

AUG. 4	DESCRIPTION	DIST.	ELEV.	AUG. 15	DESCRIPTION	DIST.	ELEV.	Δ ELEV
90-2	BM1	31.17	8.89	90-2	BM1	31.17	8.88	-0.01
		45.16	5.61		VEG SLOPE	45.16	5.61	-0.01
	VEG SLOPE	50.03	4.47			50.03	4.46	-0.01
		50.13	4.46		VEG SLOPE	50.13	4.44	-0.02
		52.88	4.08		VEG SLOPE	52.88	3.98	-0.09
	VEG SLOPE	54.67	3.83			54.67	3.75	-0.08
		55.01	3.64		VEG SLOPE	55.01	3.71	0.06
		56.01	3.10		VEG SLOPE	56.01	3.24	0.15
	FACE	56.88	2.62		VEG SLOPE	56.92	2.55	-0.07
	BASE SLOPE	57.27	1.85		VEG SLOPE BASE	57.24	1.80	-0.05
	BACK BCH	58.24	1.65		EDGE AOEL. SAND,PEBBLE	58.23	1.63	-0.02
	BM2	58.83	1.57		AOEL. SAND BM2	58.73	1.61	0.04
	PRODUNE	59.91	1.54		PRODUNE	60.00	1.57	0.02
	PRODUNE	60.18	1.58		PRODUNE	60.20	1.59	0.01
	PRODUNE	60.54	1.48		PRODUNE	60.44	1.52	0.03
	PRODUNE	63.40	1.29			63.40	1.29	-0.01
	PRODUNE	63.73	1.35			63.73	1.26	-0.09
	PRODUNE	64.06	1.25			64.06	1.23	-0.02
		64.29	1.24		AOEL. SAND	64.29	1.22	-0.02
	SAND,PEBBLE	65.82	1.15			65.82	1.21	0.06
	HWM	67.41	1.07			67.41	1.19	0.13
	DRIFT WOOD	72.51	1.12			72.51	1.16	0.04
		72.93	1.12		DRIFTWOOD HWM	72.93	1.16	0.03
		73.08	1.13		DRIFTWOOD HWM	73.08	1.11	-0.02
		73.26	1.13		DRIFTWOOD HWM	73.26	1.16	0.03
	BERM TOP	74.45	1.15			74.45	1.12	-0.04
		74.75	1.13		AOEL. SAND	74.75	1.10	-0.03
		75.23	1.11		SAND	75.23	1.09	-0.02
	BM3	75.43	1.10		BM3	75.35	1.12	0.02
		75.86	1.06		SAND	75.86	1.02	-0.05
		77.43	0.94		SAND,PEBBLE	77.43	0.93	-0.01
	BCH FACE	78.69	0.84			78.69	0.83	-0.01
		79.44	0.75		SAND,PEBBLE	79.44	0.77	0.02
	BCH FACE	79.54	0.73			79.54	0.76	0.03
	WATER LEVEL	80.44	0.64			80.44	0.67	0.03
		81.02	0.56		SAND	81.02	0.62	0.06
	PEBBLE	82.18	0.41		SAND	82.11	0.50	0.09
		83.32	0.27		SAND	83.32	0.34	0.07
	SAND	83.44	0.25			83.44	0.34	0.09
	SAND	88.82	0.18			88.82	0.18	0.01
		88.97	0.17		SAND,PEBBLE	88.97	0.18	0.01
	SAND,PEBBLE	90.27	0.13			90.27	0.14	0.01
		91.19	0.10		WL RUNNEL	91.19	0.10	0.01
		92.70	0.05		RUNNEL	92.70	0.07	0.02
	SAND,PEBBLE	93.19	0.03			93.19	0.06	0.03
	SAND	95.34	-0.01		RUNNEL.SAND	95.33	0.02	0.03
		97.30	0.06		RUNNEL WL	97.30	0.08	0.02

AUG. 4	DESCRIPTION	DIST.	ELEV.	AUG. 15	DESCRIPTION	DIST.	ELEV.	Δ ELEV
		98.85	0.12		SAND	98.85	0.15	0.04
	SAND	99.17	0.13			99.17	0.20	0.08
		99.59	0.13		RIDGE,SAND	99.59	0.27	0.15
		103.78	0.13		TOP RIDGE	103.78	0.24	0.12
	SAND	105.30	0.13			105.30	0.21	0.08
		109.39	0.13		SAWSH,SAND	109.39	0.11	-0.02
	SAND	111.43	0.12			111.43	0.06	-0.07
	SAND	115.25	0.09			115.25	-0.04	-0.12
		118.16	0.02		SAND	118.16	-0.11	-0.13
	SAND	121.21	-0.05			121.21	-0.14	-0.09
	SAND	131.44	-0.26		SAND	131.40	-0.25	0.01
		141.14	-0.30		SAND	141.14	-0.21	0.09
	SAND	142.35	-0.31			142.35	-0.14	0.17
		143.22	-0.30		SAND,BAR	143.22	-0.09	0.21
	SAND	151.98	-0.20		SAND,BAR	146.89	-0.06	0.14
		155.39	-0.20		SAND,BAR	155.39	-0.16	0.04
	SAND	161.69	-0.20			161.69	-0.25	-0.05
		167.97	-0.32		SAND	167.97	-0.34	-0.02
	SAND	171.21	-0.39			171.21	-0.41	-0.02
		177.40	-0.56		SAND	177.40	-0.53	0.03
	SAND	179.30	-0.61			179.30	-0.56	0.05
	SAND	183.60	-0.67			183.60	-0.62	0.05

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-2					
BEACH PROFILE	VEGETATED SLOPE	0.00	13.42	528341.48	7732335.83
	VEGETATED SLOPE	12.78	12.13	528339.10	7732348.61
	VEGETATED SLOPE	25.86	9.72	528336.77	7732361.69
	BM1	31.17	8.90	528335.73	7732367.01
	VEGETATED SLOPE	45.93	5.51	528332.86	7732381.76
	VEGETATED SLOPE	50.05	4.46	528332.09	7732385.88
	VEGETATED SLOPE	54.15	3.92	528331.37	7732389.98
	VEGETATED SLOPE,SAND	55.64	3.46	528331.21	7732391.47
	VEGETATED SLOPE,SAND	56.80	2.63	528331.01	7732392.63
	BASE SLOPE	57.22	1.81	528330.90	7732393.05
	BM2	58.71	1.53	528330.67	7732394.55
	PRODUNE	59.90	1.53	528330.41	7732395.73
	PRODUNE,SAND,VEG	60.10	1.58	528330.37	7732395.93
	PRODUNE,SAND,VEGETATION	60.33	1.49	528330.33	7732396.16
	SAND,PEBBLE	63.89	1.28	528329.70	7732399.72
	SAND,PEBBLE,DRIFTWOOD	66.27	1.12	528329.16	7732402.11
	AOELIAN SAND	73.68	1.13	528327.93	7732409.51
	BM3	75.33	1.13	528327.62	7732411.16
	HIGH WATER MARK	77.85	0.94	528327.18	7732413.68
	MID BEACH FACE,SAND	80.71	0.64	528326.61	7732416.55
	PEBBLE,SAND	82.27	0.47	528326.32	7732418.10
	WATER LEVEL	83.47	0.32	528326.12	7732419.31
	RUNNEL,SAND,PEBBLE	91.48	0.11	528324.67	7732427.31
	RIDGE	97.79	0.25	528323.39	7732433.62
	RIDGE,SAND	101.44	0.29	528322.78	7732437.28
	IN WATER	115.60	-0.01	528319.99	7732451.43
	IN WATER	127.03	-0.23	528317.87	7732462.86
	IN WATER	139.70	-0.24	528315.55	7732475.54
	IN WATER	150.53	-0.15	528313.26	7732486.36
	IN WATER	161.78	-0.21	528311.21	7732497.61
	IN WATER	173.48	-0.40	528309.22	7732509.32
	IN WATER	183.43	-0.69	528307.54	7732519.26
	IN WATER	200.55	-0.78	528303.40	7732536.39
	IN WATER	212.35	-0.81	528302.17	7732548.18
	IN WATER	222.06	-0.60	528300.68	7732557.89
	IN WATER	241.64	-0.83	528296.53	7732577.47
	IN WATER	246.05	-1.02	528295.05	7732581.88
ECHO SOUNDING	FIX 10	356.52	-0.5	528256.24	7732682.01
SURVEY	FIX 9	421.87	-1.5	528228.91	7732742.40
	FIX8	501.27	-1.6	528212.08	7732820.11
	FIX7	581.16	-1.8	528199.67	7732899.42
	FIX6	653.84	-1.8	528189.98	7732971.88
	FIX5	726.52	-1.8	528176.32	7733043.33
	FIX4	797.13	-1.8	528167.69	7733113.79
	FIX3	868.82	-1.6	528154.18	7733184.22
	FIX2	940.68	-1.7	528152.39	7733257.31
	FIX1	1014.33	-1.7	528152.25	7733332.36


PROFILE 90-3 JULY 29, 1990
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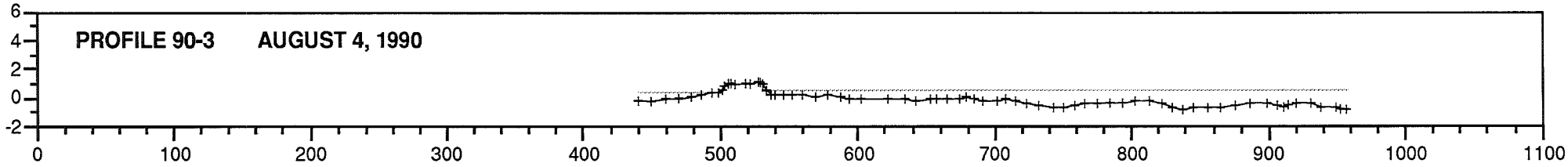
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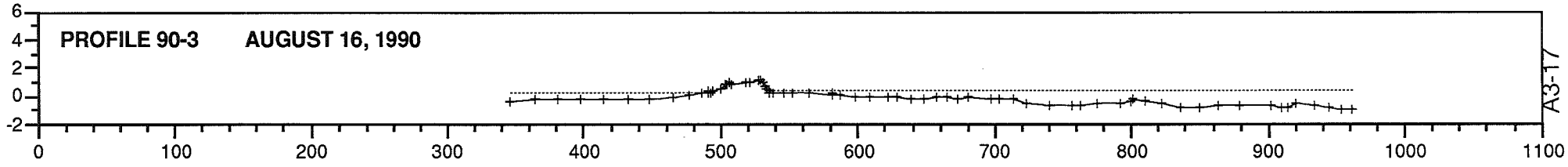
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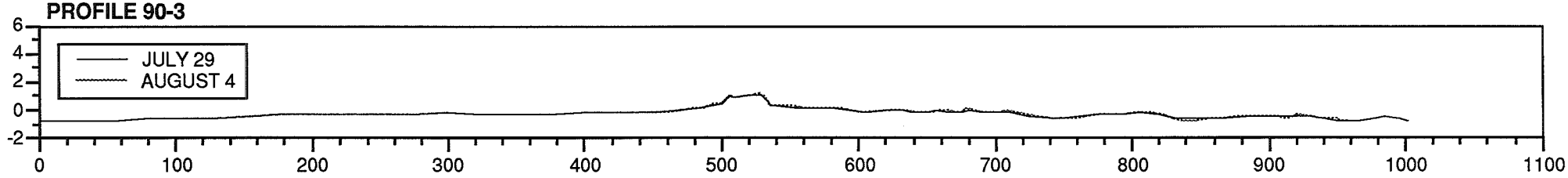
PROFILE 90-3
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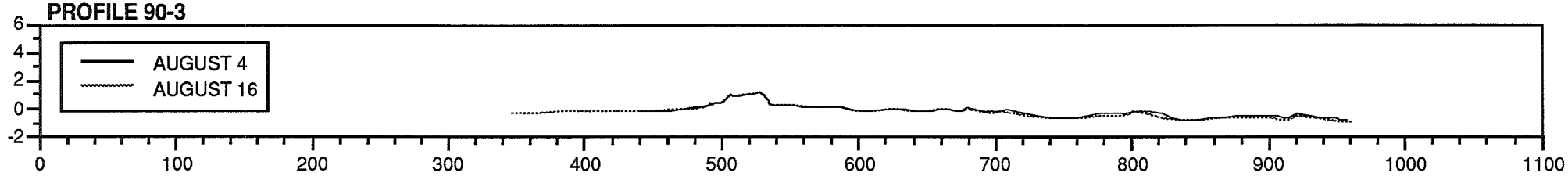
PROFILE 90-3
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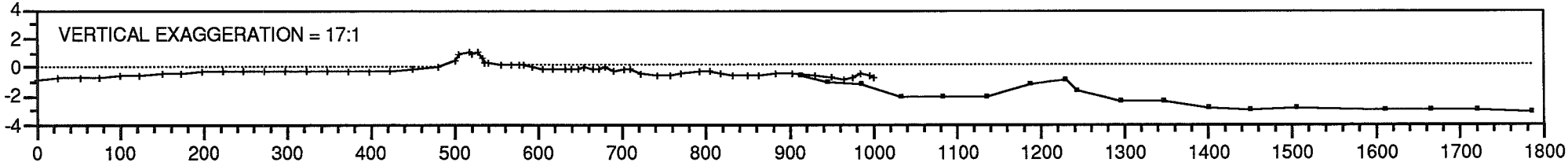
BEACH and ECHO SOUNDING SURVEYS AT PROFILE 90-3



INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-3, JULY 29,1990	IN LAGOON	0.00	-0.84	532451.73	7728138.49
PROFILE BEARING 011.7°M	IN LAGOON	25.31	-0.74	532470.54	7728155.43
BM1=METAL ROD, HT.=0.33	IN LAGOON	53.52	-0.69	532491.34	7728174.48
BM2=METAL ROD, HT.=0.40	IN LAGOON	76.80	-0.64	532508.95	7728189.70
BM3=METAL ROD, HT.=0.38	IN LAGOON	100.19	-0.56	532526.78	7728204.85
WATER LEVEL TUK=0.16	IN LAGOON	124.74	-0.54	532545.91	7728220.24
	IN LAGOON	150.00	-0.39	532565.11	7728236.64
	IN LAGOON	174.11	-0.36	532583.51	7728252.23
	IN LAGOON	198.86	-0.27	532601.84	7728268.86
	IN LAGOON	223.04	-0.26	532620.57	7728284.15
	IN LAGOON	247.48	-0.27	532639.31	7728299.84
	IN LAGOON	273.03	-0.24	532658.72	7728316.46
	IN LAGOON	299.06	-0.22	532678.83	7728332.99
	IN LAGOON	324.35	-0.25	532698.37	7728349.03
	IN LAGOON	349.38	-0.30	532717.81	7728364.80
	IN LAGOON	373.49	-0.23	532738.50	7728377.19
	IN LAGOON	398.79	-0.21	532759.79	7728390.86
	IN LAGOON	423.99	-0.17	532779.05	7728407.10
	IN LAGOON	450.93	-0.13	532799.57	7728424.57
	WATER LEVEL	481.74	0.10	532823.61	7728443.83
	SAND,HIGH WATER MARK	501.16	0.48	532838.53	7728456.26
	BM1,SAND	506.43	1.00	532842.54	7728459.68
	SWASH	507.67	0.97	532843.48	7728460.49
	BACK BEACH	518.56	1.03	532853.58	7728467.42
	BM2	522.61	1.02	532851.86	7728470.00
	BM3,SAND	529.10	1.13	532855.00	7728474.11
	BEACH FACE	533.55	0.67	532859.98	7728476.98
	BEACH FACE	535.82	0.38	532863.46	7728478.38
	BEACH FACE	540.76	0.33	532865.14	7728481.61
	BEACH FACE	557.42	0.21	532868.94	7728492.23
	BEACH FACE,SAND	568.28	0.18	532881.77	7728499.17
	BEACH FACE,SAND	579.40	0.19	532890.19	7728506.18
	WATER LEVEL	583.09	0.16	532898.83	7728508.45
	IN WATER	593.67	-0.01	532901.63	7728515.22
	IN WATER	606.32	-0.08	532909.85	7728523.20
	IN WATER	619.17	-0.03	532919.70	7728531.24
	IN WATER	633.47	-0.05	532929.52	7728540.47
	IN WATER	640.31	-0.14	532940.76	7728544.56
	IN WATER	649.54	-0.14	532945.75	7728550.76
	IN WATER	656.98	0.02	532953.37	7728554.77
	IN WATER	667.88	-0.09	532958.37	7728562.57
	IN WATER	674.66	-0.09	532967.32	7728566.08
	IN WATER	681.69	0.04	532971.97	7728571.16
	IN WATER	692.55	-0.20	532977.28	7728578.13
	IN WATER	703.77	-0.11	532985.61	7728585.32
	IN WATER	712.23	-0.11	532994.84	7728589.93
	IN WATER	725.19	-0.39	533001.07	7728598.48

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
	IN WATER	745.52	-0.58	533011.19	7728611.24
	IN WATER	759.13	-0.53	533026.70	7728620.14
	IN WATER	773.46	-0.37	533039.25	7728626.34
	IN WATER	793.70	-0.30	533048.73	7728640.77
	IN WATER	807.75	-0.22	533063.77	7728650.32
	IN WATER	821.35	-0.34	533076.20	7728656.75
	IN WATER	835.09	-0.55	533085.64	7728666.56
	IN WATER	852.74	-0.61	533094.74	7728679.51
	IN WATER	865.41	-0.54	533109.66	7728685.57
	IN WATER	886.11	-0.45	533119.98	7728697.71
	IN WATER	906.57	-0.44	533136.77	7728709.61
	IN WATER	933.80	-0.51	533152.30	7728727.19
	IN WATER	953.57	-0.72	533170.76	7728742.52
	IN WATER	968.65	-0.77	533186.38	7728750.72
	IN WATER	980.35	-0.65	533196.69	7728759.61
	IN WATER	988.39	-0.41	533205.51	7728764.81
	IN WATER	998.67	-0.58	533212.18	7728770.76
	IN WATER	1004.24	-0.76	533219.85	7728774.59

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-3, AUG. 4, 1990	IN LAGOON	440.43	-0.15	532791.93	7728418.05
PROFILE BEARING 011.7° M	IN LAGOON	450.22	-0.13	532799.66	7728424.09
BM1=METAL ROD, HT =0.32	IN LAGOON	459.73	-0.09	532806.91	7728430.23
BM2=METAL ROD, HT =0.37	IN LAGOON	468.90	-0.03	532814.06	7728435.98
BM3=METAL ROD, HT =0.39	IN LAGOON	478.95	0.09	532821.71	7728442.51
WATER LEVEL AT TUK=0.54	IN LAGOON	485.97	0.21	532827.09	7728447.00
	IN LAGOON	493.52	0.39	532832.87	7728451.86
	WATER LEVEL	498.08	0.48	532836.38	7728454.76
	SWASH LAG	501.42	0.58	532838.94	7728456.91
	MID LAG BEACH FACE	503.61	0.80	532840.67	7728458.27
	BM1	505.85	1.01	532842.37	7728459.73
	LAG BERM	506.23	1.02	532842.66	7728459.97
	SAND	507.47	0.96	532843.64	7728460.73
	SAND	510.22	0.96	532845.78	7728462.46
	SAND	518.49	1.03	532852.11	7728467.78
	SAND,BM2	522.07	1.06	532854.91	7728470.02
	BERM TOP	527.63	1.23	532859.18	7728473.57
	BM3	528.61	1.13	532859.93	7728474.20
	SAND, PEBBLE	529.99	1.01	532861.01	7728475.06
	SAND, PEBBLE	532.97	0.61	532863.29	7728476.99
	WATER LEVEL	533.92	0.49	532864.02	7728477.59
	SAND,PEBBLE	536.15	0.31	532865.76	7728478.98
	SAND	539.80	0.33	532868.62	7728481.25
	SAND	545.35	0.33	532872.90	7728484.79
	SAND	551.57	0.30	532877.73	7728488.71
	SAND	560.34	0.22	532884.46	7728494.32
	SAND	569.45	0.16	532891.61	7728499.98
	SAND	578.79	0.20	532898.69	7728506.08
	SAND	587.47	0.13	532905.14	7728511.89
	SAND	593.86	0.00	532910.55	7728515.37
	SAND	602.54	-0.09	532917.43	7728520.68
	SAND	622.55	0.00	532932.75	7728533.56
	SAND	633.93	-0.03	532941.59	7728540.72
	SAND	642.94	-0.15	532948.52	7728546.48
	SAND	653.39	-0.08	532956.12	7728553.69
	SAND	657.46	-0.02	532959.10	7728556.47
	SAND	665.38	-0.05	532965.06	7728561.69
	SAND	674.47	-0.09	532972.66	7728566.76
	SAND	679.36	0.10	532976.44	7728569.87
	SAND	684.96	0.02	532981.06	7728573.08
	SAND	690.52	-0.13	532985.74	7728576.13
	SAND	701.53	-0.14	532994.13	7728583.27
	SAND	707.15	-0.05	532998.59	7728586.69
	SAND	715.21	-0.17	533004.74	7728591.91
	SAND	723.73	-0.37	533011.56	7728597.01
	SAND	732.23	-0.47	533018.46	7728602.03
	SAND	742.97	-0.62	533026.81	7728608.78

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
	SAND	751.20	-0.61	533033.00	7728614.21
	SAND	758.59	-0.54	533039.76	7728617.62
	SAND	766.51	-0.40	533046.86	7728621.48
	SAND	774.88	-0.35	533054.17	7728625.76
	SAND	783.82	-0.28	533060.36	7728632.31
	SAND	793.17	-0.27	533067.10	7728638.83
	SAND	802.54	-0.19	533074.20	7728644.94
	SAND	812.80	-0.17	533082.22	7728651.34
	SAND	821.85	-0.38	533089.42	7728656.83
	SAND	829.99	-0.58	533095.79	7728661.91
	SAND	837.79	-0.72	533102.07	7728666.57
	SAND	845.14	-0.69	533108.45	7728670.37
	SAND	855.38	-0.66	533116.48	7728676.73
	SAND	864.95	-0.58	533124.35	7728682.23
	SAND	876.10	-0.44	533132.85	7728689.46
	SAND	887.35	-0.39	533141.54	7728696.58
	SAND	898.41	-0.39	533151.07	7728702.44
	SAND	906.73	-0.50	533156.89	7728708.44
	SAND	911.47	-0.60	533160.34	7728711.72
	SAND	914.73	-0.55	533163.07	7728713.52
	SAND	920.53	-0.27	533167.47	7728717.31
	SAND	931.35	-0.39	533176.51	7728723.36
	SAND	939.13	-0.61	533182.15	7728728.74
	SAND	949.40	-0.65	533190.43	7728734.84
	SAND	952.91	-0.73	533192.79	7728737.50
	SAND	956.74	-0.81	533195.88	7728739.77

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-3, AUG. 16, 1990	IN LAGOON	346.55	-0.266	532719.64	7728358.06
PROFILE BEARING 011.7° M	IN LAGOON	364.41	-0.247	532732.92	7728370.02
BM1=METAL ROD, HT =0.35	IN LAGOON	381.51	-0.211	532745.70	7728381.41
BM2=METAL ROD, HT =0.38	IN LAGOON	398.08	-0.193	532758.18	7728392.31
BM3=METAL ROD, HT =0.41	IN LAGOON	415.18	-0.204	532771.42	7728403.13
WATER LEVEL AT TUK=0.29	IN LAGOON	432.30	-0.177	532784.59	7728414.08
	IN LAGOON	448.16	-0.128	532797.75	7728423.05
	IN LAGOON	465.37	-0.075	532811.17	7728433.84
	IN LAGOON	476.57	0.055	532819.74	7728441.04
	IN LAGOON	485.81	0.214	532826.98	7728446.79
	WATER LEVEL	490.48	0.333	532830.71	7728449.60
	SAND	490.86	0.388	532830.90	7728449.97
	SWASH,SAND	491.85	0.333	532831.63	7728450.64
	SAND	494.59	0.424	532833.76	7728452.36
	SAND	499.41	0.532	532837.49	7728455.42
	SAND,PEBBLE,HIGH WATER MARK	503.62	0.805	532840.72	7728458.11
	SAND,PEBBLE	505.07	0.909	532841.77	7728459.12
	BM1	505.85	0.982	532842.35	7728459.65
	SAND,PEBBLE,BERM	505.96	0.991	532842.42	7728459.73
	SAND,PEBBLE,BERM	506.75	0.974	532843.03	7728460.24
	SAND,PEBBLE,BERM	507.45	0.934	532843.60	7728460.65
	SAND	518.63	1.023	532852.11	7728467.90
	BM2	522.03	1.041	532854.83	7728469.94
	TOP OF BEACH,SAND,PEBBLE	527.97	1.166	532859.39	7728473.75
	BM3	528.53	1.108	532859.80	7728474.12
	BEACH FACE	530.13	0.967	532861.04	7728475.15
	BEACH FACE	532.33	0.712	532862.69	7728476.59
	BEACH FACE	533.71	0.547	532863.78	7728477.45
	WATER LEVEL,SAND	534.95	0.369	532864.76	7728478.22
	SAND	535.85	0.281	532865.43	7728478.81
	SAND	538.51	0.308	532867.50	7728480.48
	SAND	546.01	0.291	532873.29	7728485.26
	SAND	552.33	0.264	532878.22	7728489.20
	SAND	564.71	0.215	532887.70	7728497.17
	SAND	580.49	0.139	532899.94	7728507.13
	SAND	581.56	0.212	532900.78	7728507.79
	SAND	586.94	0.116	532904.88	7728511.28
	SAND	598.42	-0.100	532913.69	7728518.64
	SAND	608.99	-0.077	532921.87	7728525.33
	SAND	622.12	-0.053	532931.92	7728533.78
	SAND	628.87	0.014	532937.14	7728538.06
	SAND	638.61	-0.134	532944.65	7728544.27
	SAND	647.89	-0.165	532951.89	7728550.07
	SAND	657.43	-0.007	532959.57	7728555.76
	SAND	664.35	-0.062	532965.29	7728559.70
	SAND	673.50	-0.173	532971.98	7728565.96
	SAND	679.90	-0.064	532976.95	7728569.99

	SAND	697.77	-0.234	532990.74	7728581.35
	SAND	703.47	-0.163	532994.86	7728585.33
	SAND	713.71	-0.230	533003.09	7728591.43
	SAND	723.64	-0.443	533010.35	7728598.24
	SAND	740.30	-0.647	533023.78	7728608.15
	SAND	757.29	-0.654	533036.71	7728619.17
	SAND	763.54	-0.590	533041.76	7728622.87
	SAND	775.54	-0.462	533050.74	7728630.84
	SAND	791.51	-0.412	533063.82	7728640.09
	SAND	798.93	-0.356	533069.58	7728644.75
	SAND	800.39	-0.205	533071.08	7728645.24
	SAND	810.05	-0.280	533078.11	7728651.89
	SAND	822.86	-0.543	533087.79	7728660.29
	SAND	836.32	-0.780	533097.36	7728669.83
	SAND	850.46	-0.804	533108.05	7728679.10
	SAND	863.67	-0.671	533117.84	7728687.99
	SAND	879.43	-0.574	533131.40	7728696.33
	SAND	902.39	-0.595	533149.56	7728710.39
	SAND	909.93	-0.749	533155.01	7728715.62
	SAND	913.54	-0.757	533157.49	7728718.30
	SAND	919.98	-0.451	533162.47	7728722.38
	SAND	934.22	-0.645	533173.77	7728731.06
	SAND	944.43	-0.773	533181.40	7728737.86
	SAND	953.70	-0.910	533188.30	7728744.05
	SAND	961.65	-0.893	533194.14	7728749.48

JULY 29	DESCRIPTION	DIST.	ELEV.	AUG. 4	DESCRIPTION	DIST.	ELEV.	ΔELEV
90-3	IN LAGOON	423.42	-0.17	90-3				
		440.43	-0.14		IN LAGOON	440.43	-0.15	-0.01
		450.22	-0.13		IN LAGOON	450.22	-0.13	-0.01
	IN LAGOON	450.37	-0.13			450.37	-0.13	-0.01
		459.73	-0.06		IN LAGOON	459.73	-0.09	-0.04
		468.90	0.01		IN LAGOON	468.90	-0.03	-0.04
		478.95	0.09		IN LAGOON	478.95	0.09	0.01
	WATER LEVEL,SAND	481.17	0.10			481.17	2.20	0.03
		485.97	0.20		IN LAGOON	485.97	0.21	0.01
		493.52	0.34		IN LAGOON	493.52	0.39	0.05
		498.08	0.43		WATER LEVEL	498.08	0.48	0.05
	SAND,HWM LAGOON	500.58	0.48			500.58	0.42	0.07
		501.42	0.56		SWASH LAGOON	501.42	0.58	0.01
		503.61	0.78		LAGOON MID BEACH FACE	503.61	0.80	0.02
	BM1,SAND	505.85	1.00		BM 1	505.85	1.01	0.01
		506.23	0.99		LAGOON BERM	506.23	1.02	0.03
		507.47	0.96		SAND	507.47	0.96	0.00
	SWASH	507.10	0.97			507.10	0.96	-0.01
		510.22	0.99		SAND	510.22	0.96	-0.03
	BACK BEACH	517.99	1.03			517.99	1.01	-0.01
		518.49	1.03		SAND	518.49	1.03	0.00
	BM 2	522.04	1.02		BM 2,SAND	522.07	1.06	0.05
		527.63	1.12		BERM TOP	527.63	1.23	0.12
	BM 3,SAND	528.52	1.13		BM 3	528.61	1.13	-0.01
		529.99	0.98		SAND,PEBBLE	529.99	1.01	0.03
	BEACH FACE	532.97	0.67		SAND,PEBBLE	532.97	0.61	-0.07
		533.92	0.55		WATER LEVEL	533.92	0.49	-0.06
	BEACH FACE	535.25	0.38			535.25	12.14	0.00
		536.15	0.37		SAND,PEBBLE	536.15	0.31	-0.06
		539.80	0.34		SAND	539.80	0.33	-0.01
	BEACH FACE	540.18	0.33			540.18	0.33	-0.01
		545.35	0.29		SAND	545.35	0.33	0.04
		551.57	0.25		SAND	551.57	0.30	0.05
	BEACH FACE	556.84	0.21			556.84	0.28	0.04
		560.34	0.20		SAND	560.34	0.22	0.02
	BEACH FACE,SAND	567.71	0.18			567.71	0.18	-0.01
		569.45	0.18		SAND	569.45	0.16	-0.02
	BEACH FACE,SAND	578.82	0.19		SAND	578.79	0.20	0.01
	WATER LEVEL	582.51	0.16			582.51	0.20	0.01
		587.47	0.08		SAND	587.47	0.13	0.05
	IN WATER	593.08	-0.01			593.08	0.04	0.03
		593.86	-0.01		SAND	593.86	0.00	0.02
		602.54	-0.06		SAND	602.54	-0.09	-0.02
	IN WATER	605.74	-0.08			605.74	0.07	0.08
	IN WATER	618.58	-0.03			618.58	-0.01	0.03
		622.55	-0.03		SAND	622.55	0.00	0.03
	IN WATER	632.88	-0.05			632.88	-0.20	0.02
		633.93	-0.07		SAND	633.93	-0.03	0.03
	IN WATER	639.71	-0.14			639.71	-0.04	0.03
		642.94	-0.14		SAND	642.94	-0.15	-0.01
	IN WATER	648.90	-0.14			648.90	-0.25	0.03
		653.39	-0.04		SAND	653.39	-0.08	-0.04
	IN WATER	656.28	0.02			656.28	-0.18	-0.06
		657.46	0.01		SAND	657.46	-0.02	-0.03
		665.38	-0.07		SAND	665.38	-0.05	0.03
	IN WATER	667.12	-0.09			667.12	0.03	0.09

JULY 29	DESCRIPTION	DIST.	ELEV.	AUG. 4	DESCRIPTION	DIST.	ELEV.	ΔELEV
	IN WATER	673.83	-0.09			673.83	0.02	0.09
		674.47	-0.08		SAND	674.47	-0.09	-0.01
		679.36	0.02		SAND	679.36	0.10	0.09
	IN WATER	680.76	0.04			680.76	-0.21	0.04
		684.96	-0.05		SAND	684.96	0.02	0.08
		690.52	-0.18		SAND	690.52	-0.13	0.05
	IN WATER	691.62	-0.20			691.62	-0.12	0.07
		701.53	-0.12		SAND	701.53	-0.14	-0.02
	IN WATER	702.84	-0.11			702.84	-0.13	-0.01
		707.15	-0.11		SAND	707.15	-0.05	0.06
	IN WATER	711.24	-0.11			711.24	-0.26	0.00
		715.21	-0.20		SAND	715.21	-0.17	0.03
		723.73	-0.38		SAND	723.73	-0.37	0.01
	IN WATER	724.19	-0.39			724.19	-0.33	0.02
		732.23	-0.47		SAND	732.23	-0.47	0.00
		742.97	-0.57		SAND	742.97	-0.62	-0.06
	IN WATER	744.52	-0.58			744.52	-0.57	-0.04
		751.20	-0.56		SAND	751.20	-0.61	-0.05
	IN WATER	758.13	-0.53			758.13	-0.54	-0.01
		758.59	-0.53		SAND	758.59	-0.54	-0.02
		766.51	-0.43		SAND	766.51	-0.40	0.03
	IN WATER	772.03	-0.37			772.03	-0.32	0.00
		774.88	-0.36		SAND	774.88	-0.35	0.01
		783.82	-0.33		SAND	783.82	-0.28	0.05
	IN WATER	792.16	-0.30			792.16	-0.27	0.03
		793.17	-0.29		SAND	793.17	-0.27	0.02
		802.54	-0.24		SAND	802.54	-0.19	0.05
	IN WATER	806.19	-0.22			806.19	-0.20	0.04
		812.80	-0.28		SAND	812.80	-0.17	0.11
	IN WATER	819.53	-0.34			819.53	-0.34	0.02
		821.85	-0.38		SAND	821.85	-0.38	0.00
		829.99	-0.50		SAND	829.99	-0.58	-0.07
	IN WATER	833.19	-0.55			833.19	-0.59	-0.08
		837.79	-0.57		SAND	837.79	-0.72	-0.15
		845.14	-0.59		SAND	845.14	-0.69	-0.10
	IN WATER	850.68	-0.61			850.68	-0.64	-0.06
		855.38	-0.59		SAND	855.38	-0.66	-0.08
	IN WATER	863.07	-0.54			863.07	-0.60	-0.06
		864.95	-0.54		SAND	864.95	-0.58	-0.05
		876.10	-0.48		SAND	876.10	-0.44	0.05
	IN WATER	883.72	-0.45			883.72	-0.45	0.04
		887.35	-0.44		SAND	887.35	-0.39	0.06
		898.41	-0.44		SAND	898.41	-0.39	0.05
	IN WATER	904.14	-0.44			904.14	-0.47	-0.03
		906.73	-0.44		SAND	906.73	-0.50	-0.05
		911.47	-0.46		SAND	911.47	-0.60	-0.15
		914.73	-0.46		SAND	914.73	-0.55	-0.09
		920.53	-0.48		SAND	920.53	-0.27	0.21
	IN WATER	931.36	-0.51		SAND	931.35	-0.39	0.12
		939.13	-0.60		SAND	939.13	-0.61	-0.02
		949.40	-0.71		SAND	949.40	-0.65	0.06
	IN WATER	950.26	-0.72			950.26	-0.66	0.05
		952.91	-0.73		SAND	952.91	-0.73	0.00
		956.74	-0.74		SAND	956.74	-0.81	-0.07

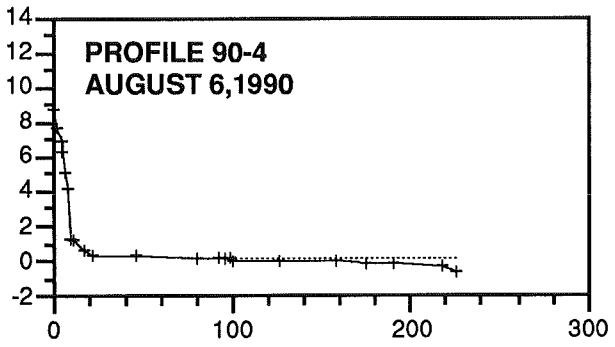
AUG. 4	DESCRIPTION	DIST.	ELEV.	AUG. 16	DESCRIPTION	DIST.	ELEV.	ΔELEV.
90-3				90-3	IN LAGOON	432.30	-0.18	
	IN LAGOON	440.43	-0.15			440.43	-0.15	0.00
		448.16	-0.14		IN LAGOON	448.16	-0.13	0.01
	IN LAGOON	450.22	-0.13			450.22	-0.12	0.01
	IN LAGOON	459.73	-0.09			459.73	-0.09	0.00
		465.37	-0.05		IN LAGOON	465.37	-0.08	-0.02
	IN LAGOON	468.90	-0.03			468.90	-0.03	0.00
		476.57	0.06		IN LAGOON	476.57	0.06	-0.01
	IN LAGOON	478.95	0.09			478.95	0.10	0.00
		485.81	0.20		IN LAGOON	485.81	0.21	0.01
	IN LAGOON	485.97	0.21			485.97	0.22	0.01
		490.48	0.32		WLL1007,SAND	490.48	0.33	0.02
		490.86	0.33		SAND	490.86	0.39	0.06
		491.85	0.35		SWASH,SAND	491.85	0.33	-0.02
	IN LAGOON	493.52	0.39			493.52	0.39	-0.01
		494.59	0.41		SAND	494.59	0.42	0.01
	WLL1752	498.08	0.48			498.08	0.50	0.02
		499.41	0.52		SAND	499.41	0.53	0.01
	SWASH LAGOON	501.42	0.58			501.42	0.66	0.09
	LAGOON MID BEACH FACE	503.61	0.80		HWM,SAND,PEBBLE	503.62	0.81	0.00
		505.07	0.94		SAND,PEBBLE	505.07	0.91	-0.03
	BM 1	505.85	1.01		BM 1	505.85	0.98	-0.03
		505.96	1.02		BERM,SAND,PEBBLE	505.96	0.99	-0.02
	LAGOON BERM	506.23	1.02			506.23	0.99	-0.04
		506.75	0.99		BERM,SAND,PEBBLE	506.75	0.97	-0.02
	SAND	507.47	0.96		BERM,SAND,PEBBLE	507.45	0.93	-0.02
	SAND	510.22	0.96			510.22	0.96	0.00
	SAND	518.49	1.03			518.49	1.02	0.00
		518.63	1.03		SAND	518.63	1.02	0.00
	BM 2,SAND	522.07	1.06		BM 2	522.03	1.04	-0.02
		527.97	1.24		TOP BEACH,SAND,PEBBLE	527.97	1.17	-0.08
	BERM TOP	527.63	1.23			527.63	1.20	-0.03
	BM 3	528.61	1.13		BM 3	528.53	1.11	-0.02
	SAND,PEBBLE	529.99	1.01			529.99	0.98	-0.03
		530.13	0.99		BEACH FACE	530.13	0.97	-0.02
		532.33	0.69		BEACH FACE	532.33	0.71	0.02
	SAND,PEBBLE	532.97	0.61		BEACH FACE	533.71	0.55	-0.06
	WLO1802	533.92	0.49			533.92	0.52	0.03
		534.95	0.41		WLO1021,SAND	534.95	0.37	-0.04
		535.85	0.33		SAND	535.85	0.28	-0.05
	SAND,PEBBLE	536.15	0.31			536.15	0.28	-0.03
		538.51	0.32		SAND	538.51	0.31	-0.01
	SAND	539.80	0.33			539.80	0.31	-0.02
	SAND	545.35	0.33			545.35	0.29	-0.04
		546.01	0.33		SAND	546.01	0.29	-0.04
	SAND	551.57	0.30			551.57	0.27	-0.03
		552.33	0.29		SAND	552.33	0.26	-0.03

AUG. 4	DESCRIPTION	DIST.	ELEV.	AUG. 16	DESCRIPTION	DIST.	ELEV.	ΔELEV.
	SAND	560.34	0.22			560.34	0.23	0.01
		564.71	0.19		SAND	564.71	0.22	0.02
	SAND	569.45	0.16			569.45	0.19	0.03
	SAND	578.79	0.20			578.79	0.15	-0.06
		580.49	0.19		SAND	580.49	0.14	-0.05
		581.56	0.18		SAND	581.56	0.21	0.03
		586.94	0.10		SAND	586.94	0.12	0.01
	SAND	587.47	0.13			587.47	0.11	-0.03
	SAND	593.86	0.00			593.86	-0.01	-0.02
		598.42	-0.04		SAND	598.42	-0.10	-0.06
	SAND	602.54	-0.09			602.54	-0.09	0.00
		608.99	-0.06		SAND	608.99	-0.08	-0.02
		622.12	0.00		SAND	622.12	-0.05	-0.05
	SAND	622.55	0.00			622.55	-0.05	-0.05
		628.87	-0.02		SAND	628.87	0.01	0.03
	SAND	633.93	-0.03			633.93	-0.06	-0.03
		638.61	-0.09		SAND	638.61	-0.13	-0.04
	SAND	642.94	-0.15			642.94	-0.15	0.00
		647.89	-0.12		SAND	647.89	-0.17	-0.05
	SAND	653.39	-0.08			653.39	-0.07	0.01
	SAND	657.46	-0.02		SAND	657.43	-0.01	0.01
		664.35	-0.04		SAND	664.35	-0.06	-0.02
	SAND	665.38	-0.05			665.38	-0.07	-0.03
		673.50	-0.08		SAND	673.50	-0.17	-0.09
	SAND	674.47	-0.09			674.47	-0.16	-0.07
	SAND	679.36	0.10			679.36	-0.07	-0.18
		679.90	0.10		SAND	679.90	-0.06	-0.16
	SAND	684.96	0.02			684.96	-0.11	-0.14
	SAND	690.52	-0.13			690.52	-0.17	-0.04
		697.77	-0.13		SAND	697.77	-0.23	-0.10
	SAND	701.53	-0.14			701.53	-0.19	-0.05
		703.47	-0.11		SAND	703.47	-0.16	-0.06
	SAND	707.15	-0.05			707.15	-0.19	-0.14
		713.71	-0.15		SAND	713.71	-0.23	-0.08
	SAND	715.21	-0.17			715.21	-0.26	-0.09
	SAND	723.73	-0.37		SAND	723.64	-0.44	-0.07
	SAND	732.23	-0.47			732.23	-0.55	-0.08
		740.30	-0.59		SAND	740.30	-0.65	-0.06
	SAND	742.97	-0.62			742.97	-0.65	-0.03
	SAND	751.20	-0.61			751.20	-0.65	-0.05
		757.29	-0.55		SAND	757.29	-0.65	-0.10
	SAND	758.59	-0.54			758.59	-0.64	-0.10
		763.54	-0.46		SAND	763.54	-0.59	-0.14
	SAND	766.51	-0.40			766.51	-0.56	-0.15
	SAND	774.88	-0.35			774.88	-0.47	-0.12
		775.54	-0.34		SAND	775.54	-0.46	-0.12
	SAND	783.82	-0.28			783.82	-0.44	-0.16

AUG. 4	DESCRIPTION	DIST.	ELEV.	AUG. 16	DESCRIPTION	DIST.	ELEV.	ΔELEV.
		791.51	-0.27		SAND	791.51	-0.41	-0.14
	SAND	793.17	-0.27			793.17	-0.40	-0.13
		798.93	-0.22		SAND	798.93	-0.36	-0.13
		800.39	-0.21		SAND	800.39	-0.21	0.01
	SAND	802.54	-0.19			802.54	-0.22	-0.03
		810.05	-0.18		SAND	810.05	-0.28	-0.10
	SAND	812.80	-0.17			812.80	-0.34	-0.17
	SAND	821.85	-0.38			821.85	-0.52	-0.14
		822.86	-0.40		SAND	822.86	-0.54	-0.14
	SAND	829.99	-0.58			829.99	-0.67	-0.09
		836.32	-0.69		SAND	836.32	-0.78	-0.09
	SAND	837.79	-0.72			837.79	-0.78	-0.07
	SAND	845.14	-0.69			845.14	-0.80	-0.11
		850.46	-0.68		SAND	850.46	-0.80	-0.13
	SAND	855.38	-0.66			855.38	-0.75	-0.09
		863.67	-0.60		SAND	863.67	-0.67	-0.08
	SAND	864.95	-0.58			864.95	-0.66	-0.08
	SAND	876.10	-0.44			876.10	-0.59	-0.16
		879.43	-0.42		SAND	879.43	-0.57	-0.15
	SAND	887.35	-0.39			887.35	-0.58	-0.20
	SAND	898.41	-0.39			898.41	-0.59	-0.20
		902.39	-0.44		SAND	902.39	-0.60	-0.15
	SAND	906.73	-0.50			906.73	-0.68	-0.19
		909.93	-0.57		SAND	909.93	-0.75	-0.18
	SAND	911.47	-0.60			911.47	-0.75	-0.15
		913.54	-0.57		SAND	913.54	-0.76	-0.19
	SAND	914.73	-0.55			914.73	-0.70	-0.15
		919.98	-0.29		SAND	919.98	-0.45	-0.16
	SAND	920.53	-0.27			920.53	-0.46	-0.19
	SAND	931.35	-0.39			931.35	-0.61	-0.22
		934.22	-0.47		SAND	934.22	-0.65	-0.17
	SAND	939.13	-0.61			939.13	-0.71	-0.09
		944.43	-0.63		SAND	944.43	-0.77	-0.14
	SAND	949.40	-0.65			949.40	-0.85	-0.19
	SAND	952.91	-0.73			952.91	-0.90	-0.17
		953.70	-0.74		SAND	953.70	-0.91	-0.17
	SAND	956.74	-0.81			956.74	-0.90	-0.10

INFORMATION	DESCRIPTION	DIST	ELEV	EASTING	NORTHING
SURVEYS AT PROFILE 90-3					
	IN LAGOON	0.00	-0.84	532451.73	7728138.49
	IN LAGOON	25.29	-0.74	532470.54	7728155.43
	IN LAGOON	53.46	-0.69	532491.34	7728174.48
	IN LAGOON	76.73	-0.64	532508.95	7728189.70
	IN LAGOON	100.12	-0.56	532526.78	7728204.85
	IN LAGOON	124.68	-0.54	532545.91	7728220.24
	IN LAGOON	149.93	-0.39	532565.11	7728236.64
	IN LAGOON	174.04	-0.36	532583.51	7728252.23
	IN LAGOON	198.76	-0.27	532601.84	7728268.86
	IN LAGOON	222.94	-0.26	532620.57	7728284.15
	IN LAGOON	247.38	-0.27	532639.31	7728299.84
	IN LAGOON	272.93	-0.24	532658.72	7728316.46
	IN LAGOON	298.96	-0.22	532678.83	7728332.99
	IN LAGOON	324.24	-0.25	532698.37	7728349.03
	IN LAGOON	349.27	-0.30	532717.81	7728364.80
	IN LAGOON	373.11	-0.23	532738.50	7728377.19
	IN LAGOON	398.22	-0.21	532759.79	7728390.86
	IN LAGOON	423.42	-0.17	532779.05	7728407.10
	IN LAGOON	450.37	-0.13	532799.57	7728424.57
	WATER LEVEL LAGOON	481.17	0.10	532823.61	7728443.83
	HIGH WATER MARK	500.58	0.48	532838.53	7728456.26
	BM1	505.85	1.00	532842.54	7728459.68
	SWASH	507.10	0.97	532843.48	7728460.49
	BACK BEACH	517.99	1.03	532853.58	7728467.42
	BM2	522.04	1.02	532851.86	7728470.00
	BM3	528.52	1.13	532855.00	7728474.11
	BEACH FACE	532.97	0.67	532859.98	7728476.98
	BEACH FACE	535.25	0.38	532863.46	7728478.38
	BEACH FACE	540.18	0.33	532865.14	7728481.61
	BEACH FACE	556.84	0.21	532868.94	7728492.23
	BEACH FACE	567.71	0.18	532881.77	7728499.17
	BEACH FACE	578.82	0.19	532890.19	7728506.18
	WATER LEVEL	582.51	0.16	532898.83	7728508.45
	IN WATER	593.08	-0.01	532901.63	7728515.22
	IN WATER	605.74	-0.08	532909.85	7728523.20
	IN WATER	618.58	-0.03	532919.70	7728531.24
	IN WATER	632.88	-0.05	532929.52	7728540.47
	IN WATER	639.71	-0.14	532940.76	7728544.56
	IN WATER	648.89	-0.14	532945.75	7728550.76
	IN WATER	656.27	0.02	532953.37	7728554.77
	IN WATER	667.12	-0.09	532958.37	7728562.57
	IN WATER	673.83	-0.09	532967.32	7728566.08
	IN WATER	680.76	0.04	532971.97	7728571.16
	IN WATER	691.62	-0.20	532977.28	7728578.13
	IN WATER	702.84	-0.11	532985.61	7728585.32
	IN WATER	711.24	-0.11	532994.84	7728589.93

INFORMATION	DESCRIPTION	DIST	ELEV	EASTING	NORTHING
	IN WATER	724.19	-0.39	533001.07	7728598.48
	IN WATER	744.52	-0.58	533011.19	7728611.24
	IN WATER	758.13	-0.53	533026.70	7728620.14
	IN WATER	772.03	-0.37	533039.25	7728626.34
	IN WATER	792.16	-0.30	533048.73	7728640.77
	IN WATER	806.19	-0.22	533063.77	7728650.32
	IN WATER	819.53	-0.34	533076.20	7728656.75
	IN WATER	833.19	-0.55	533085.64	7728666.56
	IN WATER	850.68	-0.61	533094.74	7728679.51
	IN WATER	863.07	-0.54	533109.66	7728685.57
	IN WATER	883.72	-0.45	533119.98	7728697.71
	IN WATER	904.14	-0.44	533136.77	7728709.61
	IN WATER	931.36	-0.51	533152.30	7728727.19
	IN WATER	950.26	-0.72	533170.76	7728742.52
	IN WATER	965.24	-0.77	533186.38	7728750.72
	IN WATER	976.76	-0.65	533196.69	7728759.61
	IN WATER	984.80	-0.41	533205.51	7728764.81
	IN WATER	995.05	-0.58	533212.18	7728770.76
	IN WATER	1000.61	-0.76	533219.85	7728774.59
ECHO SOUNDING SURVEY	FIX 18	914.52	-0.6	533138.85	7728742.00
	FIX 17	945.76	-1.0	533156.08	7728769.66
	FIX 16	986.67	-1.1	533175.00	7728809.60
	FIX 15	1033.72	-2.0	533198.91	7728852.85
	FIX 14	1083.66	-2.1	533225.76	7728896.90
	FIX 13	1135.75	-2.0	533257.91	7728938.49
	FIX 12	1188.78	-1.2	533291.49	7728979.91
calculated position	FIX 11.75	1230.09	-0.9	533320.57	7729009.26
	FIX 11	1243.86	-1.6	533330.26	7729019.05
	FIX 10	1296.02	-2.3	533368.56	7729054.52
	FIX 9	1348.07	-2.4	533406.16	7729090.53
	FIX 8	1400.74	-2.75	533447.33	7729123.82
	FIX 7	1451.89	-2.9	533485.29	7729158.17
	FIX 6	1506.23	-2.8	533530.16	7729190.02
	FIX 5	1611.64	-2.9	533610.43	7729258.67
	FIX 4	1611.64	-3.0	533610.43	7729258.67
	FIX 3	1665.72	-3.0	533656.72	7729288.55
	FIX 2	1721.62	-3.0	533700.23	7729323.91
	FIX 1	1785.35	-3.1	533753.21	7729360.64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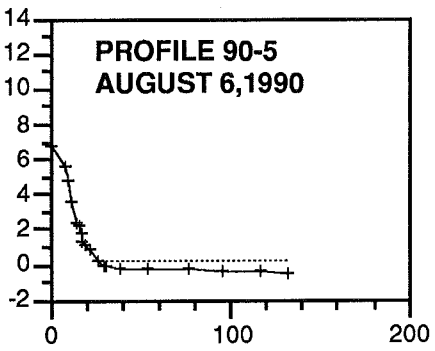
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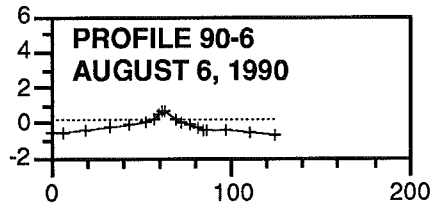
PROFILE 90-6
AUGUST 6, 1990
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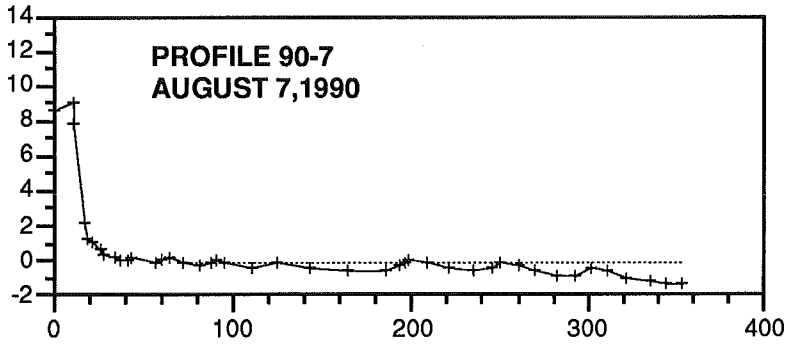
INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-4, AUG. 6, 1990	CLIFF TOP	0.00	8.75	526587.24	7730047.42
PROFILE BEARING 350.0°M	CLIFF EDGE	2.45	7.64	526588.54	7730049.50
LINE MARKERS ARE ROCK CAIRN	CLIFF EDGE	4.95	6.85	526589.79	7730051.66
WATER LEVEL AT TUK=0.11	CLIFF FACE	5.02	6.23	526589.91	7730051.67
	CLIFF FACE	5.99	5.06	526590.44	7730052.49
	CLIFF FACE	7.54	4.14	526591.14	7730053.87
	CLIFF BASE	10.34	1.25	526592.66	7730056.23
	PIN AND CAIRN,PEBBLE	11.24	1.19	526593.26	7730056.91
	CAIRN,PEBBLE,COBBLE	17.87	0.57	526596.67	7730062.60
	MUD,PEBBLE	21.31	0.33	526598.48	7730065.52
	MUD	45.81	0.24	526611.50	7730086.29
	MUD	79.99	0.16	526630.03	7730115.01
	MUD,WATER LEVEL	92.66	0.11	526636.61	7730125.83
	MUD	95.79	0.11	526638.08	7730128.61
	MUD	98.90	0.12	526639.63	7730131.30
	MUD	100.19	0.09	526640.64	7730132.20
	MUD	126.14	0.05	526654.12	7730154.38
	MUD	157.98	-0.03	526670.90	7730181.43
	MUD	174.32	-0.11	526679.87	7730195.09
	MUD	190.36	-0.14	526688.14	7730208.84
	MUD	218.31	-0.33	526703.70	7730232.08
	MUD	225.73	-0.67	526707.30	7730238.58

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-5, AUG. 6, 1990	CLIFF TOP VEGETATED	0.00	6.83	526899.43	7729874.41
PROFILE BEARING 017.5°M	CLIFF EDGE	8.19	5.64	526906.49	7729878.56
LINE MARKER IS A ROCK CAIRN	CLIFF FACE VEGETATED	9.52	4.77	526907.60	7729879.30
WATER LEVEL AT TUK=0.22	CLIFF FACE VEGETATED	10.85	3.59	526908.78	7729879.92
	CLIFF FACE VEGETATED	14.69	2.35	526911.96	7729882.08
	SCARP TOP	16.46	2.16	526913.49	7729882.97
	SCARP FACE	17.09	1.82	526914.04	7729883.28
	SCARP BASE	17.19	1.34	526914.08	7729883.41
	CAIRN	17.78	1.23	526914.59	7729883.72
	PEBBLE,COBBLE	19.10	1.09	526915.75	7729884.34
	HIGH WATER MARK	22.13	0.78	526918.39	7729885.84
	WATER LEVEL	27.19	0.20	526922.83	7729888.24
	MUD	29.77	-0.02	526925.06	7729889.56
	MUD	30.44	-0.14	526925.64	7729889.89
	MUD	38.31	-0.18	526932.44	7729893.84
	MUD	54.04	-0.22	526946.32	7729901.27
	MUD	76.50	-0.25	526966.12	7729911.87
	MUD	94.90	-0.34	526982.49	7729920.27
	MUD	117.32	-0.43	527002.45	7729930.51
	MUD	131.37	-0.60	527014.26	7729938.20

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-6, AUG. 6, 1990	IN WATER BEHIND SPIT	0.00	-0.62	527046.88	7729654.76
PROFILE BEARING 356.5°M	IN WATER BEHIND SPIT	7.03	-0.50	527049.63	7729661.32
LINE MARKER IS A ROCK CAIRN	IN WATER BEHIND SPIT	19.58	-0.39	527057.20	7729671.40
WATER LEVEL AT TUK =0.30	IN WATER BEHIND SPIT,MUD	31.94	-0.28	527063.51	7729682.03
	IN WATER BEHIND SPIT,MUD	43.85	-0.15	527069.54	7729692.30
	IN WATER BEHIND SPIT,MUD	51.90	-0.01	527073.75	7729699.17
	WATER LEVEL	57.39	0.16	527076.64	7729703.84
	BEACH FACE,PEBBLE	59.72	0.43	527077.85	7729705.83
	CAIRN,SAND,PEBBLE	61.23	0.65	527078.57	7729707.15
	SAND,PEBBLE	63.04	0.60	527079.54	7729708.69
	WATER LEVEL	69.99	0.18	527082.99	7729714.72
	CAIRN	71.82	0.10	527084.17	7729716.14
	MUD	77.44	-0.12	527087.09	7729720.94
	MUD	80.94	-0.21	527088.99	7729723.88
	MUD	84.27	-0.32	527090.70	7729726.74
	MUD	86.24	-0.40	527091.81	7729728.37
	MUD	96.39	-0.46	527097.17	7729736.99
	MUD	110.01	-0.52	527104.73	7729748.32
	MUD	124.06	-0.68	527112.28	7729760.17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AUGUST 7,1990
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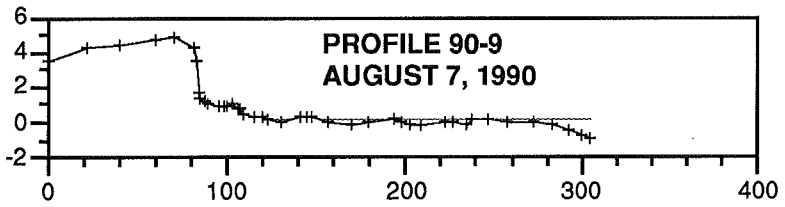
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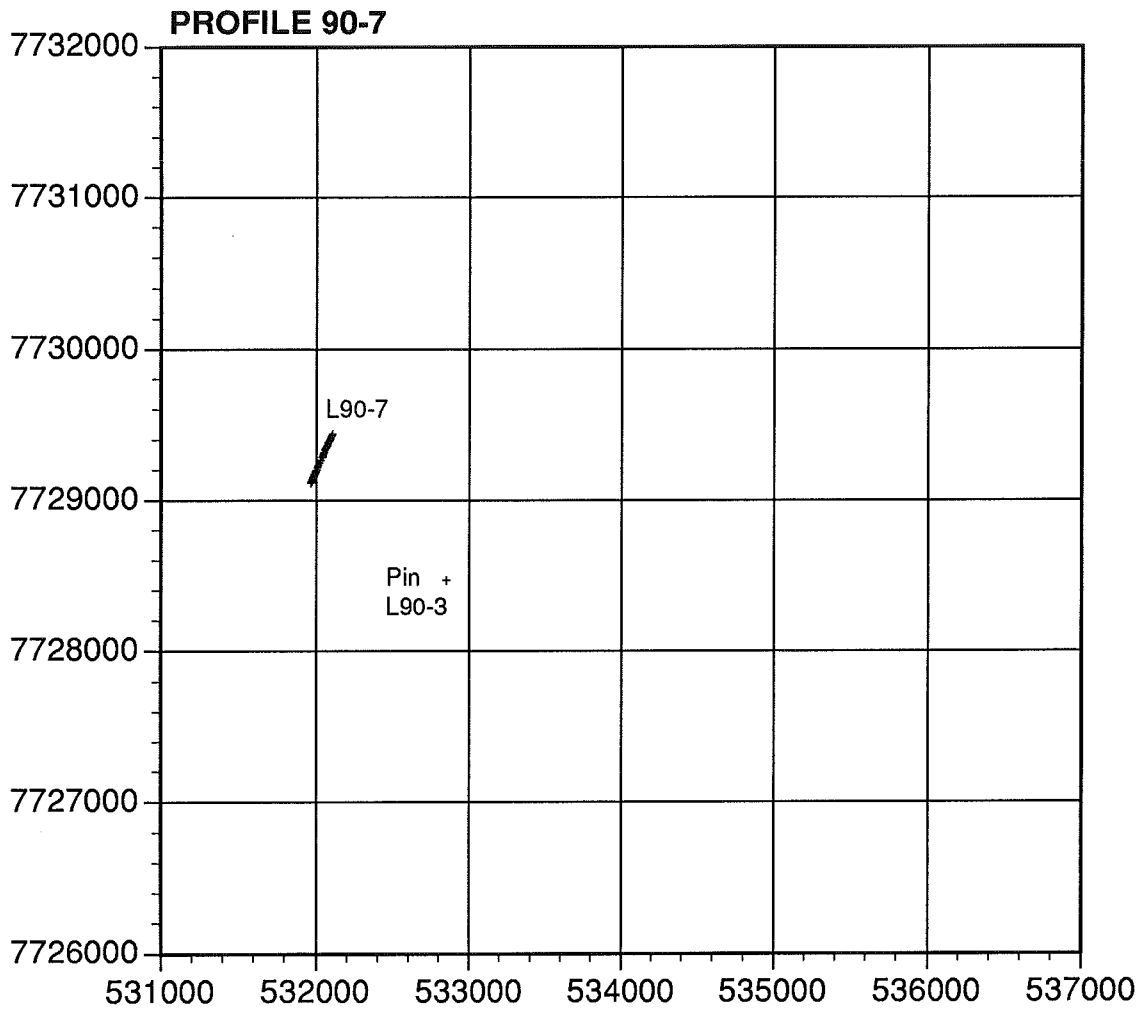
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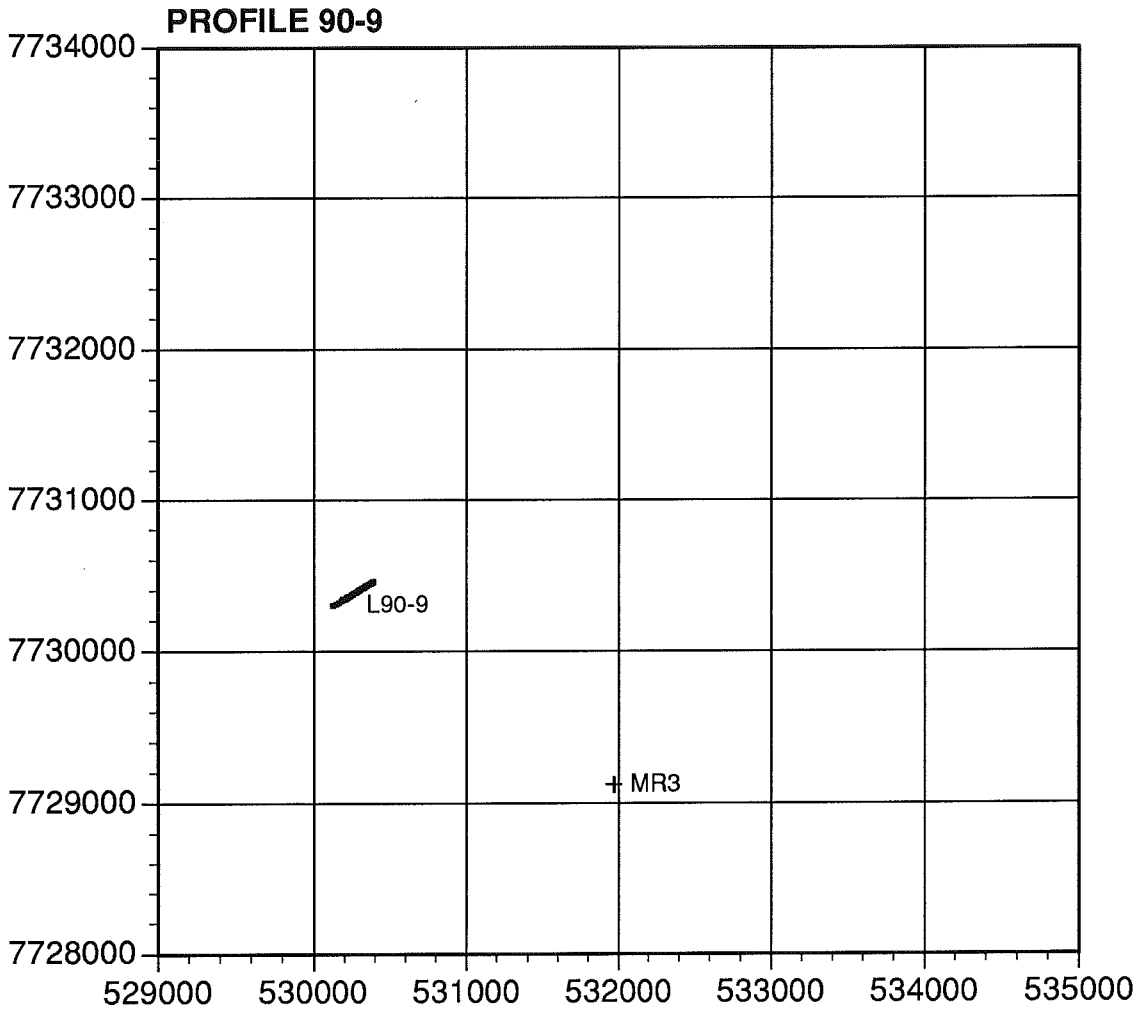
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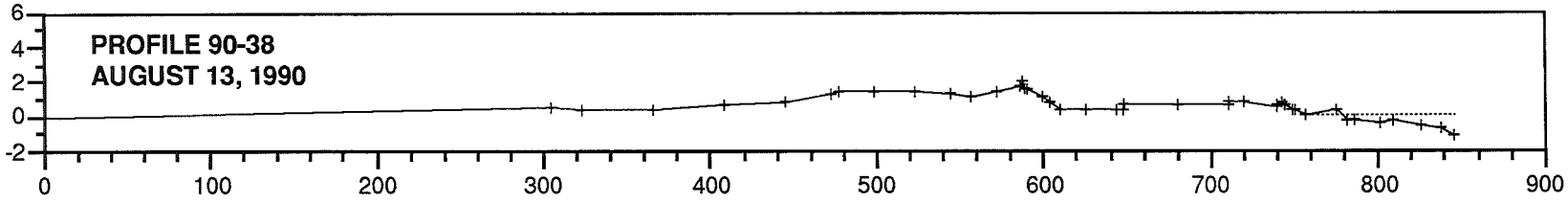
INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-7, AUG. 7, 1990	CLIFF TOP	0.00	8.63	531965.92	7729112.29
AT MINI RANGER 3 SITE	BM1	10.54	9.07	531969.93	7729122.03
PROFILE BEARING 350.5°M	CLIFF EDGE	11.10	9.00	531970.23	7729122.51
WATER LEVEL AT TUK=-0.16	CLIFF FACE	11.32	7.87	531970.16	7729122.72
	CLIFF FACE	17.37	2.17	531972.66	7729128.11
	CLIFF BASE,SAND	19.00	1.20	531973.30	7729129.70
	SAND	21.56	1.01	531974.40	7729132.02
	SAND,PEBBLE	25.93	0.61	531976.22	7729136.01
	SAND,COBBLE,PEBBLE	28.58	0.39	531977.27	7729138.45
	BM2	34.78	0.18	531979.24	7729144.36
	RUNNEL WATER LEVEL,COBBLE,PEBBLE,BOULDER	37.94	0.00	531980.43	7729147.29
	RUNNEL,SAND	41.16	-0.04	531981.76	7729150.21
	SAND	44.05	0.14	531982.93	7729152.85
	RUNNEL,SAND	57.36	-0.09	531988.02	7729165.16
	EDGE RUNNEL,SAND	60.75	0.04	531989.23	7729168.32
	RIDGE,SAND	64.24	0.10	531990.99	7729171.34
	RUNNEL WATER LEVEL	72.55	-0.16	531994.55	7729178.84
	RUNNEL,SAND	81.48	-0.31	531997.83	7729187.15
	RUNNEL,SAND,WATER LEVEL	87.98	-0.16	532000.62	7729193.02
	RIDGE	90.21	-0.05	532001.42	7729195.10
	WATER LEVEL	96.16	-0.16	532003.59	7729200.64
	SAND	111.45	-0.46	532009.28	7729214.84
	SAND	124.93	-0.18	532013.47	7729227.64
	SAND	143.26	-0.46	532021.44	7729244.15
	SAND	163.87	-0.55	532029.88	7729262.95
	SAND	185.78	-0.55	532037.81	7729283.39
	SAND	192.76	-0.36	532040.86	7729289.65
	SAND,WATER LEVEL	196.56	-0.17	532042.57	7729293.05
	SAND,WATER LEVEL	197.79	-0.05	532043.04	7729294.19
	SAND,WATER LEVEL	208.36	-0.15	532047.69	7729303.68
	SAND	220.34	-0.42	532051.66	7729314.98
	SAND	234.56	-0.54	532056.70	7729328.28
	SAND	244.86	-0.50	532061.20	7729337.54
	SAND	250.32	-0.22	532063.70	7729342.40
	SAND	260.01	-0.29	532067.63	7729351.25
	SAND	269.56	-0.62	532071.28	7729360.08
	SAND	282.22	-0.93	532075.10	7729372.16
	SAND	292.61	-0.96	532078.37	7729382.02
	SAND	302.14	-0.52	532082.85	7729390.42
	SAND	310.49	-0.58	532087.14	7729397.59
	SAND	322.22	-1.03	532091.93	7729408.29
	SAND	335.44	-1.26	532096.46	7729420.71
	SAND	344.63	-1.35	532101.42	7729428.45
	SAND	353.86	-1.39	532104.92	7729436.99

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-9, AUG. 7,1990	LAKE EDGE	0.00	3.55	530126.66	7730298.00
PROFILE BEARING 014.0°M	VEGETATION	21.46	4.27	530145.19	7730308.83
BM 1 HT=0.58	VEGETATION	40.16	4.36	530161.43	7730318.10
WATER LEVEL AT TUK=0.17	VEGETATION	59.98	4.75	530178.31	7730328.48
	VEGETATION	70.39	4.84	530187.04	7730343.03
	CLIFF EDGE	81.90	4.22	530196.96	7730339.99
	CLIFF FACE	82.97	3.58	530197.85	7730340.59
	CLIFF BASE	84.37	1.65	530199.07	7730341.26
	BEACH,SAND	85.02	1.44	530199.63	7730341.60
	BEACH,SAND,BM2	87.24	1.19	530201.49	7730342.82
	BEACH,SAND	89.84	1.08	530203.79	7730344.01
	BEACH,SAND	95.46	0.89	530208.67	7730346.80
	BEACH,SAND	98.66	0.93	530211.58	7730348.13
	RUNNEL	99.81	0.89	530212.66	7730348.52
	RIDGE	103.26	0.99	530215.53	7730350.44
	RIDGE	106.72	0.74	530218.01	7730352.85
	RIDGE	107.52	0.74	530218.67	7730353.29
	RUNNEL	109.73	0.44	530220.69	7730354.22
	BM3	115.61	0.37	530225.61	7730357.44
	BEACH FACE,SAND	120.46	0.36	530229.80	7730359.87
	WATER LEVEL	123.21	0.17	530232.12	7730361.36
	SAND	130.57	0.03	530238.37	7730365.24
	RIDGE	142.01	0.24	530248.17	7730371.15
	RIDGE	145.11	0.23	530250.82	7730372.75
	RIDGE	146.91	0.23	530252.38	7730373.65
	SAND	156.04	-0.04	530260.12	7730378.50
	SAND	169.87	-0.08	530271.98	7730385.61
	SAND	179.58	-0.01	530280.28	7730390.64
	SAND	193.65	0.11	530292.47	7730397.66
	SAND	198.02	-0.06	530295.88	7730400.40
	SAND	202.81	-0.19	530299.93	7730402.96
	SAND	208.98	-0.19	530305.17	7730406.23
	SAND	221.97	-0.02	530316.58	7730412.42
	SAND	227.29	-0.07	530321.06	7730415.29
	SAND	233.95	-0.17	530326.77	7730418.72
	SAND	237.21	0.09	530329.51	7730420.48
	SAND	246.56	0.10	530337.31	7730425.64
	SAND	256.88	0.03	530346.13	7730431.00
	SAND	272.94	-0.01	530359.77	7730439.48
	SAND	284.23	-0.20	530369.20	7730445.68
	SAND	293.11	-0.43	530376.73	7730450.39
	SAND	299.88	-0.80	530382.00	7730454.64
	SAND	305.23	-0.94	530386.64	7730457.32


PROFILE 90-38
AUGUST 13, 1990
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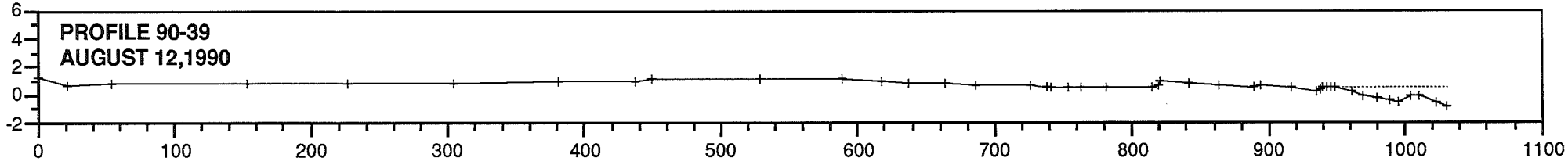
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AUGUST 12,1990
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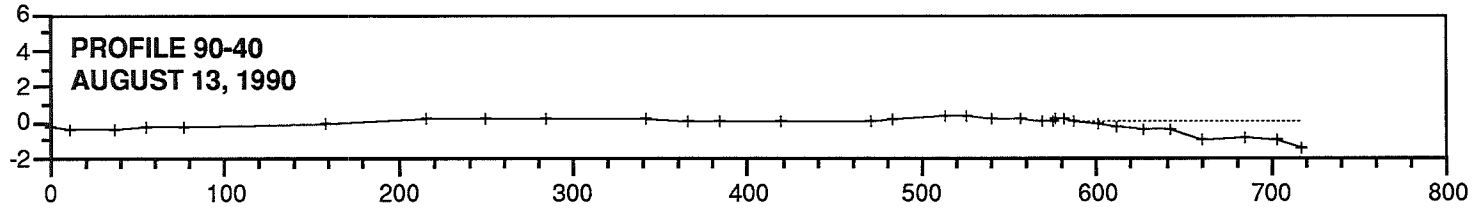
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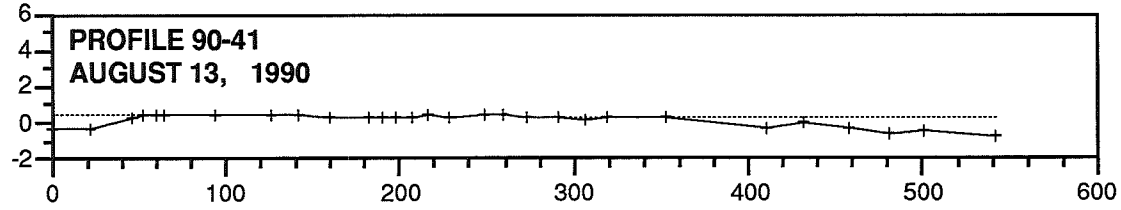
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AUGUST 13, 1990
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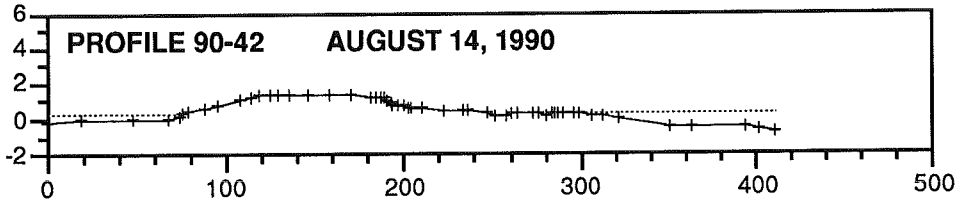
INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-38, AUG. 13, 1990	IN POND	0.00	0.01	523061.76	7734374.47
PROFILE BEARING 339.5°M	IN POND	305.17	0.63	523151.40	7734666.18
WATER LEVEL AT TUK=0.17	IN POND	322.85	0.42	523157.84	7734682.64
	IN POND	365.72	0.43	523173.63	7734722.50
	WATER LEVEL,MUD	408.71	0.73	523184.91	7734763.99
	MUD,SAND	444.70	0.93	523195.46	7734798.40
	SAND,PEBBLE,VEGETATION,BEACH	473.10	1.32	523203.60	7734825.60
	DRIFTWOOD	477.39	1.45	523205.63	7734829.39
	DRIFTWOOD	498.53	1.39	523212.00	7734849.54
	SAND,PEBBLE,COBBLE,VEGETATION	522.99	1.39	523218.65	7734873.08
	MUD,SAND	545.07	1.34	523225.41	7734894.10
	MUD,SAND	545.18	1.29	523225.49	7734894.02
	SAND,PEBBLE	556.22	1.22	523228.69	7734904.59
	SAND,PEBBLE,DRIFTWOOD	572.26	1.50	523233.04	7734920.03
	SAND,DRIFTWOOD	586.09	1.75	523237.69	7734933.06
	SAND,DRIFTWOOD	587.25	2.02	523238.00	7734934.17
	SAND,PEBBLE,DRIFTWOOD	588.60	1.68	523238.45	7734935.45
	SAND,PEBBLE	590.92	1.63	523239.17	7734937.65
	HIGH WATER MARK, SAND	599.54	1.20	523241.94	7734945.81
	MUD	603.31	0.84	523242.80	7734949.49
	MUD,LAGOON	609.36	0.48	523244.42	7734955.32
	MUD,LAGOON	625.06	0.39	523249.18	7734970.27
	EDGE LAGOON,MUD	643.80	0.47	523254.76	7734988.17
	BACK BEACH	647.91	0.48	523256.56	7734991.86
	SAND,MUD	648.23	0.66	523256.76	7734992.11
	SAND,MIDBEACH	680.27	0.71	523266.08	7735022.76
	BERM,SAND	710.19	0.73	523274.96	7735051.34
	SAND	710.33	0.79	523274.97	7735051.47
	SAND	719.82	0.82	523278.43	7735060.31
	BERM	740.06	0.58	523283.49	7735079.91
	BERM	740.61	0.65	523283.78	7735080.37
	BERM	743.06	0.88	523285.21	7735082.37
	BERM	744.14	0.64	523285.56	7735083.39
	SAND	744.70	0.64	523285.75	7735083.91
	SAND	748.79	0.37	523286.59	7735087.92
	SAND	750.32	0.47	523287.05	7735089.38
	WATER LEVEL,SAND	757.04	0.17	523289.50	7735095.64
	SAND	775.02	0.44	523293.99	7735113.05
	SAND	781.82	-0.20	523295.15	7735119.75
	SAND	785.05	-0.19	523296.57	7735122.65
	SAND	800.97	-0.31	523301.41	7735137.82
	SAND	809.44	-0.16	523304.49	7735145.70
	SAND	825.94	-0.42	523308.62	7735161.68
	SAND	837.32	-0.63	523310.90	7735172.83
	SAND	845.62	-1.07	523313.71	7735180.64

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-39, AUG. 12,1990	BASE VEGETATED SLOPE	0.00	1.37	523785.50	7734076.33
WATER LEVEL AT TUK=0.49	VEGETATION	21.22	0.65	523791.39	7734096.72
	VEGETATION	54.55	0.85	523800.14	7734128.88
	SAND	153.17	0.86	523826.09	7734224.02
	SAND	226.09	0.87	523845.68	7734294.26
	SAND	304.83	0.87	523866.33	7734370.25
	SAND	380.59	0.96	523886.73	7734443.21
	SAND	437.13	1.04	523901.40	7734497.82
	SAND	449.74	1.10	523904.78	7734509.96
	SAND	528.46	1.15	523925.94	7734585.78
	SAND	588.37	1.18	523941.88	7734643.53
	TRIPOD	618.14	0.98	523949.87	7734672.21
	SAND	636.99	0.86	523955.26	7734690.28
	SAND	664.35	0.79	523962.95	7734716.53
	MUD	686.75	0.74	523969.53	7734737.94
	MUD	726.24	0.65	523981.19	7734775.67
	MUD	738.83	0.63	523984.50	7734787.82
	MUD	741.00	0.56	523985.13	7734789.90
	MUD	753.88	0.63	523988.35	7734802.37
	MUD	762.39	0.58	523990.50	7734810.60
	MUD	781.42	0.64	523995.04	7734829.08
	MUD	814.63	0.62	524002.71	7734861.39
	MUD	819.68	0.75	524004.11	7734866.25
	SAND	820.96	0.97	524004.42	7734867.49
	SAND	841.66	0.85	524009.77	7734887.49
	SAND	863.92	0.75	524015.61	7734908.97
	SAND	889.16	0.58	524022.43	7734933.26
	SAND	894.80	0.67	524024.14	7734938.64
	SAND	894.96	0.78	524024.19	7734938.79
	SAND	917.23	0.51	524030.20	7734960.23
	IN RUNNEL	935.16	0.32	524034.86	7734977.55
	IN RUNNEL	938.40	0.35	524035.61	7734980.71
	RUNNEL WATER LEVEL	939.80	0.51	524036.05	7734982.03
	RUNNEL WATER LEVEL	942.59	0.55	524036.74	7734984.74
	RIDGE,SAND	942.68	0.63	524036.77	7734984.82
	BERM	946.36	0.57	524037.75	7734988.37
	BERM WATER LEVEL	949.00	0.49	524038.67	7734990.84
	SAND	961.03	0.24	524041.77	7735002.47
	SAND	969.61	-0.02	524044.51	7735010.60
	SAND	979.69	-0.23	524046.38	7735020.50
	SAND	989.18	-0.29	524049.39	7735029.50
	SAND	994.77	-0.54	524050.74	7735034.93
	SAND	1003.66	-0.10	524053.35	7735043.42
	SAND	1010.42	-0.10	524055.00	7735049.98
	SAND	1022.87	-0.48	524058.49	7735061.93
	SAND	1030.26	-0.83	524060.56	7735069.02

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-40, AUG.13, 1990	IN LAGOON	0.00	-0.25	525120.12	7733910.44
PROFILE BEARING 353.6°M	WATER LEVEL	11.71	-0.32	525123.93	7733921.51
WATER LEVEL AT TUK=0.15	WATER LEVEL	37.37	-0.28	525133.33	7733945.39
	WATER LEVEL	55.62	-0.18	525141.07	7733961.91
	WET MUD TO DRY MUD	76.44	-0.15	525150.58	7733980.44
	MUD	158.12	-0.08	525188.41	7734052.83
	MUD AND PUDDLES	216.05	0.24	525216.58	7734103.45
	HIGHER GROUND	249.07	0.23	525232.30	7734132.49
	START DRY MUD	284.63	0.23	525248.54	7734164.12
	DRY MUD	341.34	0.24	525275.63	7734213.94
	LOWER	365.48	0.08	525287.48	7734234.98
	HIGH,MUD	383.73	0.15	525296.27	7734250.97
	HIGH,MUD	383.87	0.13	525296.23	7734250.84
	SAND,TBM1	419.07	0.13	525312.42	7734282.10
	SAND	470.62	0.10	525336.92	7734327.45
	HIGH,SAND	483.73	0.22	525343.76	7734338.64
	LOW,SAND	514.47	0.35	525359.29	7734365.18
	HIGH,SAND	526.09	0.37	525365.30	7734375.12
	LOW	540.37	0.24	525371.74	7734387.86
	HIGH,SAND	556.08	0.29	525377.26	7734402.57
	LOW,SAND	568.28	0.08	525382.97	7734413.35
	SAND	574.91	0.18	525385.97	7734419.26
	HIGH	577.16	0.21	525387.06	7734421.23
	HIGH	581.51	0.24	525389.33	7734424.95
	WATER LEVEL,SAND	587.13	0.15	525391.97	7734429.90
	SAND,IN WATER	601.62	-0.04	525398.58	7734442.80
	SAND,IN WATER	611.34	-0.18	525403.45	7734451.21
	SAND,IN WATER	626.68	-0.28	525410.35	7734464.91
	SAND,IN WATER	642.87	-0.30	525416.02	7734480.08
	SAND,IN WATER	660.16	-0.87	525420.94	7734496.65
	SAND,IN WATER	684.64	-0.75	525431.04	7734518.95
	SAND,IN WATER	703.31	-0.99	525439.61	7734535.53
	SAND,IN WATER	716.57	-1.37	525446.04	7734547.13

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-41, AUG.13,1990	IN LAGOON	0.00	-0.28	525924.61	7733808.84
PROFILE BEARING 341.5°M	IN LAGOON	22.55	-0.28	525930.95	7733830.48
WATER LEVEL AT TUK=0.29	IN LAGOON	45.84	0.31	525937.36	7733852.87
	WATER LEVEL,SAND	52.18	0.45	525938.90	7733859.02
	HIGH,SAND	60.02	0.51	525940.97	7733866.58
	LOW,SAND	64.92	0.46	525942.56	7733871.21
	FLAT	94.59	0.47	525950.33	7733899.85
	FLAT	126.03	0.44	525959.24	7733930.01
	HIGH	140.88	0.43	525962.98	7733944.38
	LOWER	159.11	0.37	525968.33	7733961.81
	FLAT,SAND	183.22	0.35	525974.91	7733985.00
	FLAT,SAND	190.09	0.37	525977.07	7733991.52
	SAND	197.69	0.37	525978.96	7733998.88
	SAND	206.90	0.35	525981.46	7734007.75
	SAND	217.00	0.40	525984.14	7734017.48
	SAND	227.82	0.33	525987.14	7734027.88
	SAND	248.70	0.40	525992.77	7734047.99
	SAND	258.57	0.44	525995.62	7734057.44
	SAND	272.77	0.35	525999.62	7734071.07
	WATER LEVEL	290.86	0.29	526004.60	7734088.45
	SAND	306.95	0.13	526009.53	7734103.76
	SAND	319.24	0.26	526012.73	7734115.63
	SAND	352.73	0.24	526021.59	7734147.93
	SAND	410.70	-0.25	526037.98	7734203.53
	SAND	431.75	0.05	526043.19	7734223.93
	SAND	457.26	-0.25	526050.22	7734248.46
	SAND	481.25	-0.58	526054.34	7734272.08
	SAND	500.45	-0.47	526058.76	7734290.77
	SAND	541.44	-0.83	526062.09	7734331.63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AUGUST 14, 1990
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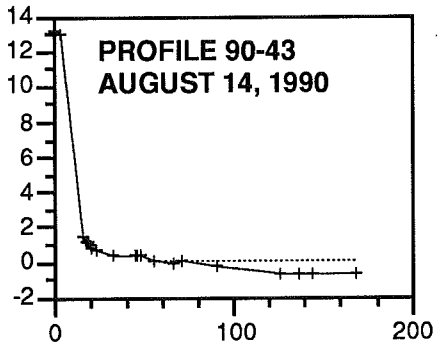
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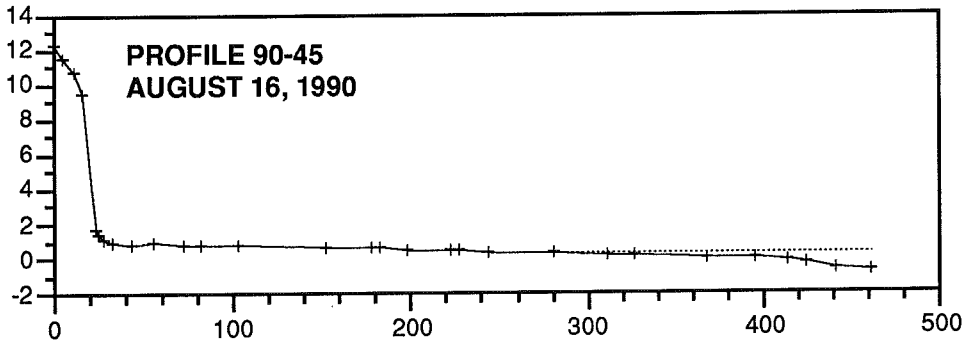
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AUGUST 16, 1990
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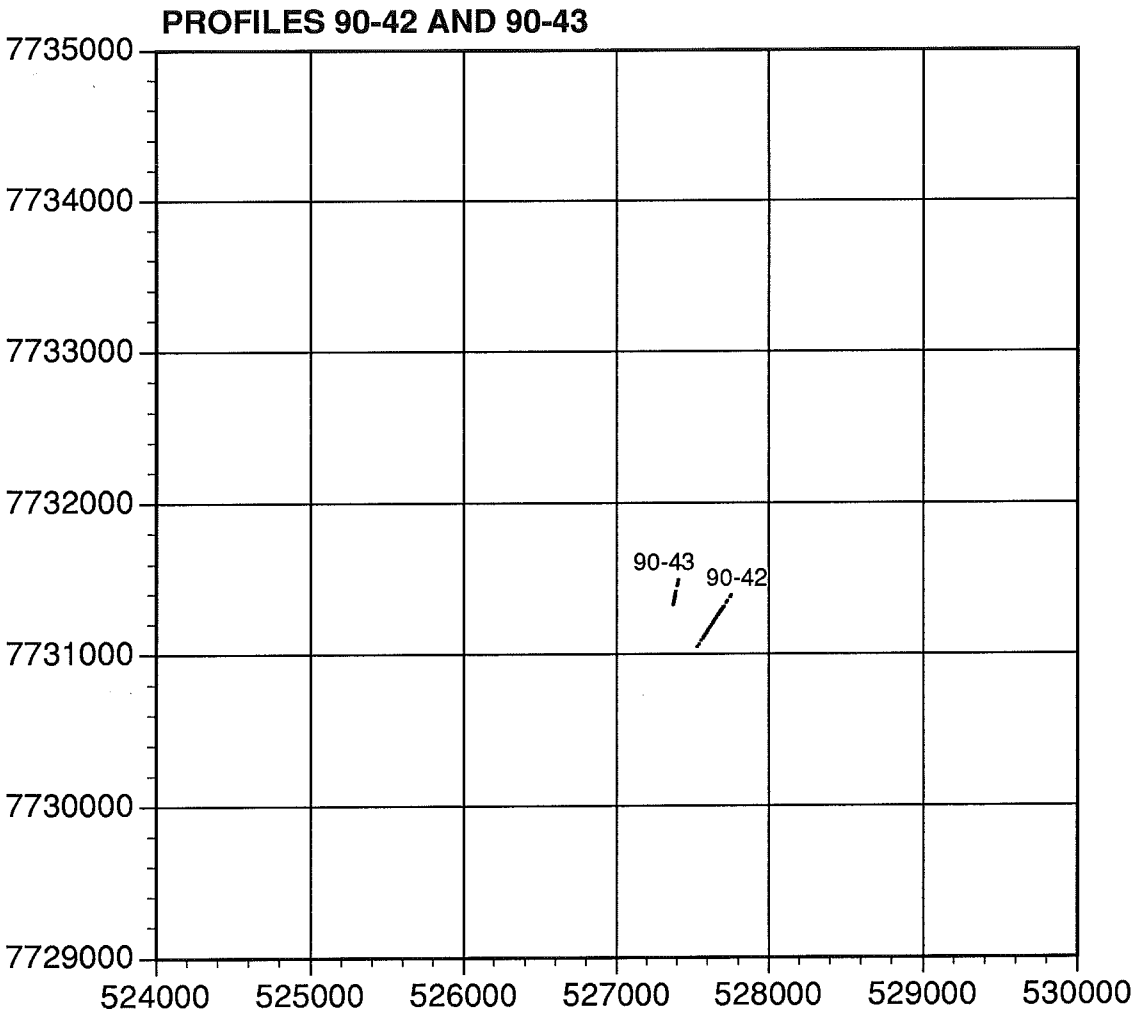
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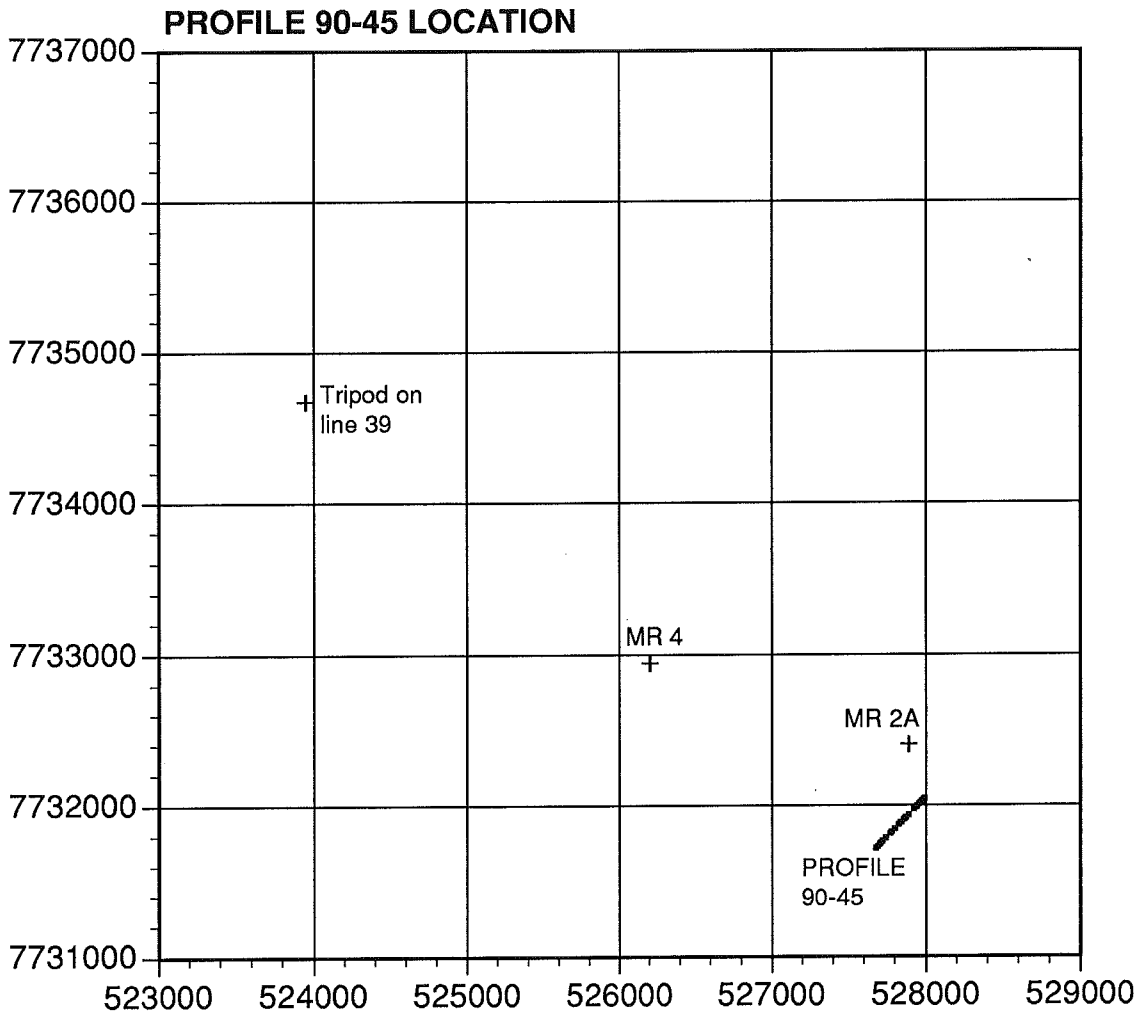
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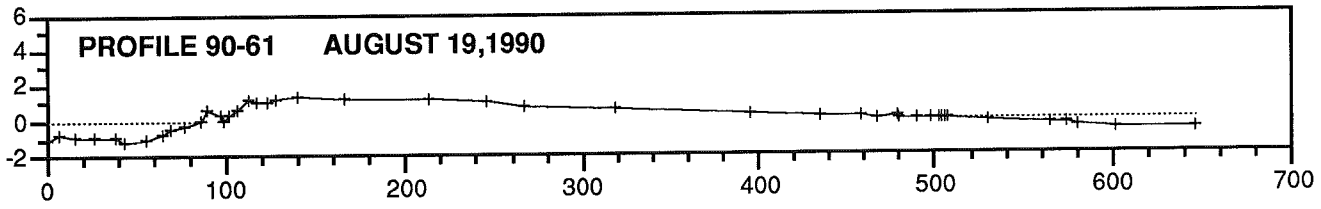
MR 4
MR 2A
PROFILE 90-45

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-42, AUG. 14,1990	IN LAGOON,MUD	0.00	-0.11	527530.89	7731048.22
PROFILE BEARING 355.8°M	IN LAGOON,MUD	18.58	-0.03	527541.96	7731063.14
WATER LEVEL AT TUK = 0.20	IN LAGOON,MUD	48.44	-0.05	527557.50	7731088.64
	IN LAGOON,MUD	67.17	0.01	527567.53	7731104.46
	IN LAGOON,SAND	73.64	0.09	527571.19	7731109.79
	WATER LEVEL,SAND	76.19	0.34	527572.23	7731112.12
	HIGH TIDE LINE,SAND	78.94	0.46	527573.69	7731114.45
	MID BEACH FACE	88.30	0.63	527578.87	7731122.25
	BEACH	95.69	0.76	527582.97	7731128.39
	SAND	108.28	1.08	527589.79	7731138.98
	SPIT TOP	113.58	1.24	527592.77	7731143.36
	GRAVEL LAG	117.68	1.34	527595.05	7731146.77
	SAND,PEBBLE	125.16	1.30	527599.11	7731153.05
	AEOLIAN SAND	129.26	1.35	527601.29	7731156.53
	AEOLIAN SAND	134.70	1.35	527604.15	7731161.16
	AEOLIAN SAND,PEBBLE	145.96	1.33	527610.63	7731170.37
	AEOLIAN SAND,PEBBLE	157.43	1.33	527616.93	7731179.95
	STORM BERM	170.43	1.31	527624.16	7731190.75
	BM2,SAND	181.45	1.21	527629.75	7731200.25
	SAND,DEBRIS	183.60	1.17	527630.94	7731202.04
	BERM	186.81	1.15	527632.67	7731204.75
	BERM	188.57	1.19	527633.61	7731206.23
	BERM,SAND,PEBBLE	190.67	1.03	527634.80	7731207.96
	BERM,SAND,PEBBLE	192.66	0.94	527635.77	7731209.70
	BERM BASE,SAND,PEBBLE	193.56	0.82	527636.32	7731210.42
	RIPPLED SAND	196.90	0.77	527638.13	7731213.22
	EDGE GRAVEL	199.80	0.73	527639.72	7731215.64
	EDGE GRAVEL,SAND	202.61	0.54	527641.27	7731217.99
	SAND RIPPLED,PEBBLE	203.94	0.56	527641.99	7731219.11
	FLAT SAND	210.63	0.57	527645.47	7731224.83
	FLAT SAND	222.84	0.49	527652.23	7731234.98
	FLAT SAND	233.65	0.50	527658.20	7731244.00
	OBLIQUE BAR	235.71	0.49	527659.29	7731245.75
	OBLIQUE BAR	246.25	0.33	527665.26	7731254.43
	WATER LEVEL	251.56	0.20	527668.18	7731258.87
	BAR TROUGH	256.99	0.20	527671.19	7731263.39
	WATER LEVEL,SAND	260.88	0.24	527673.13	7731266.76
	BAR	262.99	0.29	527674.14	7731268.61
	BAR,SAND	272.57	0.27	527680.15	7731276.07
	WATER LEVEL	276.67	0.27	527681.59	7731279.91
	TROUGH	281.24	0.22	527684.19	7731283.67
	WATER LEVEL	283.81	0.29	527685.66	7731285.77
	BAR	285.16	0.35	527686.71	7731286.62
	BAR	287.41	0.35	527687.74	7731288.63
	WATER LEVEL,SAND	290.07	0.28	527688.88	7731291.03
	TROUGH	296.03	0.24	527692.26	7731295.93
	SAND	299.45	0.25	527693.95	7731298.91

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
	TROUGH	306.81	0.08	527698.38	7731304.79
	SAND	312.09	0.22	527701.31	7731309.18
	SAND	321.46	0.04	527707.38	7731316.32
	SOFT	351.24	-0.38	527722.36	7731342.05
	HARD	362.49	-0.40	527728.31	7731351.60
	SOFT	394.23	-0.53	527745.51	7731378.28
	HARD	402.00	-0.58	527749.82	7731384.75
	SOFT	410.92	-0.72	527755.45	7731391.67

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-43, AUG.14, 1990	CLIFF TOP	0.00	13.14	527374.01	7731329.42
PROFILE BEARING 337.5°M	CLIFF EDGE	2.90	13.09	527374.78	7731332.21
WATER LEVEL TUK=.02	CLIFF BASE	15.94	1.43	527376.50	7731345.14
	BM1	17.23	1.20	527376.67	7731346.42
	HEAVY MINERALS	17.89	1.18	527376.88	7731347.04
	HEAVY MINERALS	18.40	1.09	527377.00	7731347.54
	SAND,PEBBLE	20.29	0.90	527377.40	7731349.39
	SAND,PEBBLE	21.10	0.90	527377.59	7731350.18
	SAND,PEBBLE	23.16	0.69	527377.89	7731352.21
	SAND FLAT	32.05	0.41	527379.69	7731360.92
	SAND FLAT	45.47	0.35	527382.43	7731374.06
	SAND FLAT	46.49	0.39	527382.58	7731375.06
	BM2	48.22	0.32	527382.81	7731376.78
	WATER LEVEL,SAND	56.17	0.12	527383.94	7731384.65
	IN WATER,SAND	65.65	0.00	527386.41	7731393.80
	BAR	70.18	0.04	527386.83	7731398.32
	SOFT	90.46	-0.22	527391.86	7731417.96
	SOFT	126.12	-0.63	527398.07	7731453.07
	HARD	135.67	-0.72	527400.76	7731462.24
	SOFT	144.49	-0.69	527403.77	7731470.52
	SOFT	144.50	-0.76	527403.78	7731470.53
	SOFT	168.05	-0.72	527405.78	7731494.00

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-45, AUG. 16,1990	CLIFF TOP VEGETATED	0.00	12.25	527994.61	7732046.66
PROFILE BEARING 190.0°M	CLIFF TOP VEGETATED	5.39	11.42	527990.54	7732043.09
WATER LEVEL AT TUK=0.35	EDGE CLIFF	11.98	10.80	527985.88	7732038.43
	CLIFF FACE	15.13	9.51	527984.04	7732035.84
	CLIFF BASE	23.59	1.72	527978.17	7732029.73
	TBM PIN	25.17	1.40	527977.02	7732028.66
	SAND,PEBBLE	28.52	1.10	527974.70	7732026.23
	EDGE PEBBLE	32.83	0.90	527971.70	7732023.14
	CORE 90.45.1.MUD	42.73	0.79	527964.83	7732016.02
	EDGE MUD	55.20	0.87	527956.18	7732007.03
	CORE 90.45.2.MUD	72.04	0.81	527944.47	7731994.93
	MUD	82.35	0.77	527937.27	7731987.54
	CORE 90.45.3.MUD	103.25	0.75	527922.71	7731972.56
	MUD	151.76	0.62	527889.00	7731937.67
	MUD	177.67	0.59	527870.92	7731919.11
	CORE 90.45.4.MUD	183.04	0.57	527867.21	7731915.22
	MUD	197.22	0.53	527857.35	7731905.04
	MUD	222.51	0.42	527839.72	7731886.91
	CORE 90.45.5.MUD	226.58	0.40	527836.88	7731883.99
	WATER LEVEL,MUD	244.00	0.35	527824.69	7731871.55
	MUD.IN WATER	280.81	0.27	527799.08	7731845.11
	MUD.IN WATER	311.40	0.21	527777.77	7731823.16
	MUD.IN WATER	325.94	0.11	527767.69	7731812.68
	MUD.IN WATER	367.48	-0.02	527738.79	7731782.84
	MUD.IN WATER	395.92	-0.02	527718.92	7731762.50
	MUD.IN WATER	413.12	-0.11	527707.09	7731750.02
	MUD.IN WATER	424.14	-0.33	527699.40	7731742.12
	MUD.IN WATER	440.66	-0.60	527688.01	7731730.15
	MUD.IN WATER	460.43	-0.74	527674.07	7731716.12


PROFILE 90-61 AUGUST 19,1990
6
4
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-2
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100
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400
500
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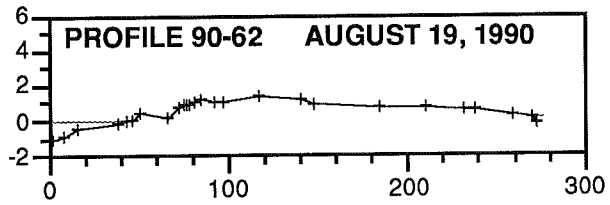
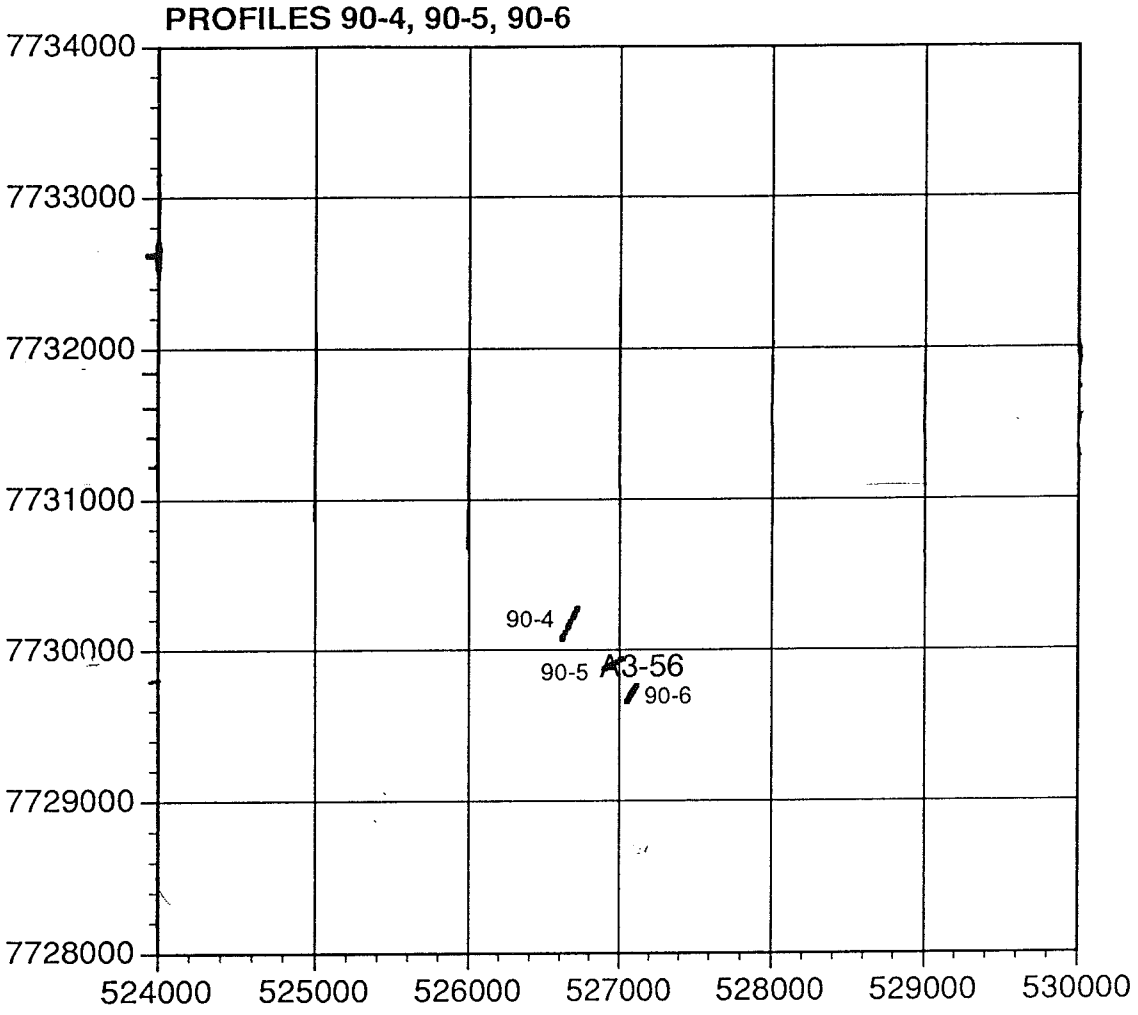

PROFILE 90-62 AUGUST 19, 1990
6
4
2
0
-2
0
100
200
300

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-61 AUG. 19, 1990	IN WATER	0.00	-1.14	525025.66	7741832.93
PROFILE BEARING 134.0°M	IN WATER	6.71	-0.80	525027.08	7741826.37
WATER LEVEL TUK=0.04	IN WATER	15.80	-0.94	525027.85	7741817.32
	IN WATER	26.01	-0.90	525028.72	7741807.14
	IN WATER	38.14	-0.99	525029.58	7741795.05
	IN WATER	43.95	-1.18	525030.75	7741789.35
	IN WATER	54.92	-1.05	525031.42	7741778.40
	IN WATER	64.32	-0.69	525032.85	7741769.11
	IN WATER	69.15	-0.39	525033.05	7741764.28
	IN WATER	77.38	-0.24	525033.82	7741756.09
	WATER LEVEL	86.48	0.04	525034.58	7741747.02
	BERM CREST	89.58	0.55	525035.27	7741744.00
	WATER LEVEL SMALL TROUGH	96.39	0.31	525036.02	7741737.23
	CENTRE OF TROUGH	98.58	0.01	525036.06	7741735.04
	EDGE TROUGH	101.16	0.35	525036.40	7741732.48
	BEACH FACE,SAND	105.72	0.67	525037.04	7741727.96
	CREST,GRAVEL,SAND,BM1	111.65	1.18	525037.42	7741722.05
	TROUGH,MUD	117.48	1.14	525038.47	7741716.31
	MUD,GRAVEL	122.47	1.09	525038.48	7741711.32
	EDGE MUD	128.30	1.18	525039.51	7741705.59
	SAND,GRAVEL	139.86	1.32	525040.22	7741694.05
	BM2,SAND,GRAVEL	165.98	1.29	525043.04	7741668.08
	SAND,GRAVEL	213.32	1.15	525047.98	7741621.00
	MUD,SAND,GRAVEL	244.72	1.07	525051.33	7741589.78
	BM3	267.36	0.81	525053.73	7741567.27
	MUD,SAND	318.46	0.60	525058.98	7741516.43
	MUD,SAND	395.43	0.33	525067.05	7741439.89
	HIGH WATER MARK,MUD,SAND	434.65	0.17	525070.97	7741400.87
	SMALL BAR	457.38	0.14	525073.18	7741378.25
	SMALL TROUGH,MUD	466.69	0.06	525074.35	7741369.01
	OBLIQUE BAR	479.39	0.11	525075.77	7741356.39
	CHANGE IN SLOPE	479.81	0.05	525075.59	7741356.77
	WATER LEVEL	489.94	0.01	525076.72	7741346.71
	TROUGH,MUD	497.49	-0.05	525077.46	7741339.20
	WATER LEVEL	502.05	0.01	525078.16	7741334.69
	BAR	503.70	0.04	525078.02	7741333.04
	WATER LEVEL	505.77	-0.01	525078.27	7741330.99
	WATER LEVEL	506.45	0.01	525077.99	7741331.60
	IN LAGOON	529.26	-0.14	525080.43	7741308.92
	IN LAGOON	565.42	-0.25	525084.26	7741272.97
	IN LAGOON	573.63	-0.27	525085.02	7741264.79
	IN LAGOON,MUD	580.26	-0.50	525085.85	7741258.21
	IN LAGOON,MUD	601.52	-0.66	525088.19	7741237.08
	IN LAGOON,MUD	646.89	-0.64	525092.69	7741191.93

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE 90-62, AUG. 19,1990	IN WATER	0.00	-1.08	526019.14	7741849.87
WATER LEVEL AT TUK=0.11	IN WATER	1.42	-1.10	526017.75	7741850.14
	IN WATER	8.03	-0.86	526016.94	7741843.57
	IN WATER	16.59	-0.43	526015.89	7741835.09
	IN WATER	38.18	-0.09	526013.73	7741813.60
	IN WATER	44.05	0.00	526013.20	7741807.76
	WATER LEVEL	46.52	0.03	526012.72	7741805.34
	BAR CREST,SAND	50.96	0.52	526012.31	7741800.91
	BASE BEACH,GRAVEL	66.52	0.22	526011.43	7741785.37
	HIGH WATER MARK,GRAVEL,SAND	73.05	0.76	526008.74	7741779.43
	GRAVEL,SAND	75.62	0.90	526008.24	7741776.90
	GRAVEL,SAND	76.43	0.85	526008.00	7741776.14
	GRAVEL,SAND	78.20	0.87	526009.71	7741775.66
	GRAVEL,SAND	80.96	1.06	526009.49	7741772.91
	BM,SAND,GRAVEL	84.14	1.18	526009.17	7741769.75
	SAND,GRAVEL	92.36	1.06	526007.98	7741761.61
	SAND,GRAVEL	97.27	1.12	526007.44	7741756.74
	SAND,GRAVEL	116.68	1.35	526005.62	7741737.41
	BM2,SAND,GRAVEL	140.19	1.21	526003.06	7741714.04
	MUD,SAND,GRAVEL	146.97	0.98	526002.15	7741707.32
	MUD,SAND,GRAVEL	183.50	0.80	525998.06	7741671.02
	MUD,SAND,GRAVEL	209.79	0.73	525995.50	7741644.86
	MUD,SAND,BM3	231.20	0.67	525993.07	7741623.59
	CHANGE SLOPE	238.20	0.55	525992.39	7741616.61
	AOELIAN SAND,MUD	258.72	0.32	525990.10	7741596.23
	WATER LEVEL	270.48	0.11	525988.63	7741584.55
	IN WATER,MUD	272.26	-0.21	525987.69	7741583.05

2


PROFILES 90-4, 90-5, 90-6
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7733000
7732000
7731000
7730000
7729000
7728000
524000
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527000
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530000
90-4
90-5
A3-56
90-6

APPENDIX 4

Offshore Positioning

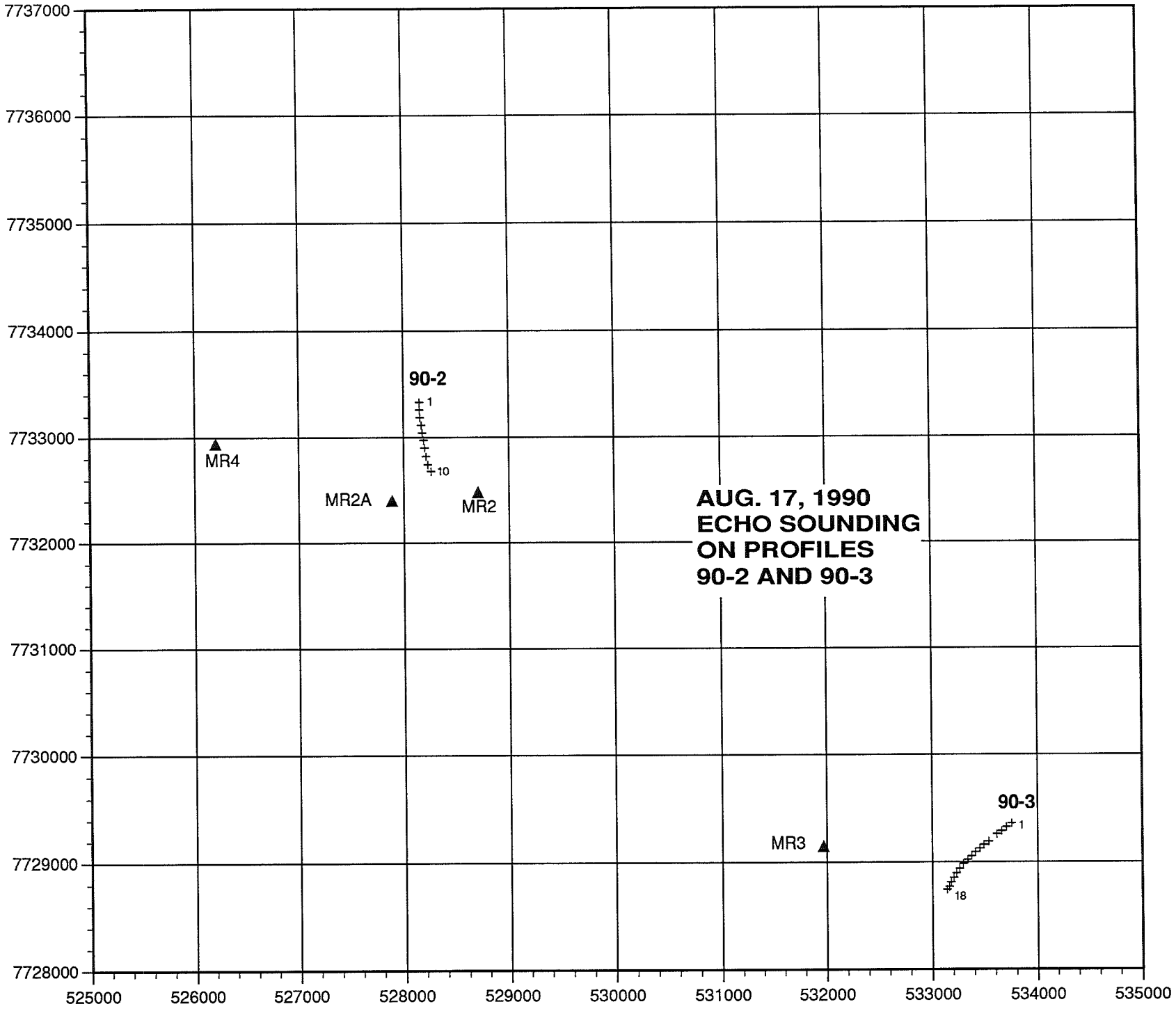
APPENDIX 4

Positioning Data and Plots

ECHO SOUNDING and SIDESCAN SURVEYS

Each echo sounding and sidescan survey is presented as a plot of fix numbers on a Universal Transverse Mercator grid that can be overlain on the map in figure 2. In some cases,on a separate page, the surveys are also plotted in more detail on an enlarged portion of this grid.

Accompanying the plots are tables that include grid coordinates for the fix positions, water depths and other survey information. All Mini-Ranger, survey instrument distances and water depths are in metres. The water depths have been corrected for tidal variation.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7732000
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7730000
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7728000
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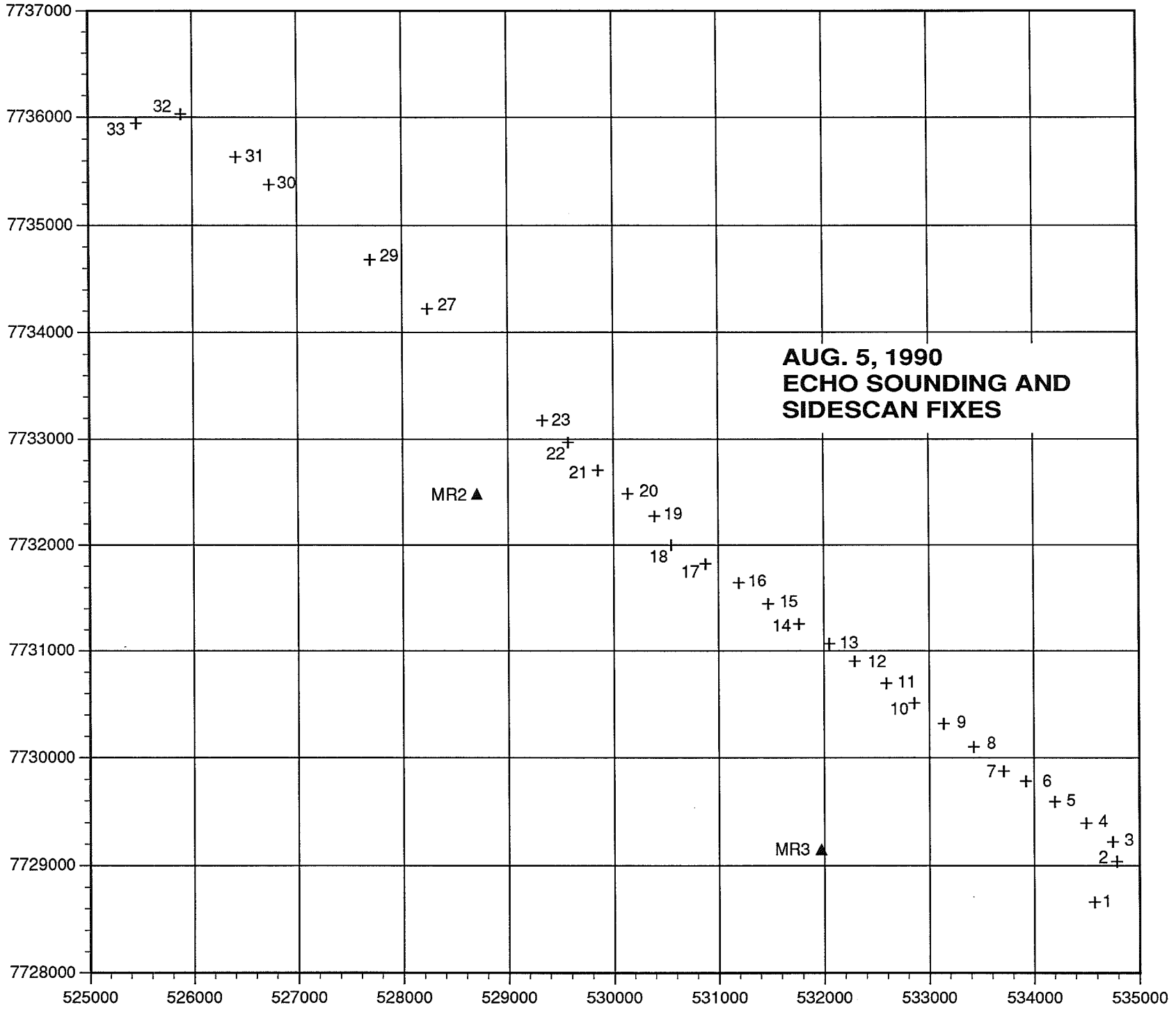
530000
531000
532000
533000
534000
535000
90-2
1
10
MR4
MR2A
MR2
AUG. 17, 1990
ECHO SOUNDING
ON PROFILES
90-2 AND 90-3
MR3
90-3
1
18

INFORMATION	FIX#	DEPTH	H DIST(bm1)	GRID BRG	EASTING	NORTHING
AUG. 17, 1990	10		315.785	345.4215	528256.241	7732682.012
ECHO SOUNDING	9		377.388	343.5590	528228.915	7732742.404
PROFILE 90-2	8		454.987	344.2314	528212.082	7732820.110
	7		533.857	345.2351	528199.671	7732899.422
	6		605.915	346.0820	528189.984	7732971.877
	5		677.289	346.3875	528176.324	7733043.330
	4		747.462	347.0084	528167.691	7733113.791
	3		817.861	347.1747	528154.178	7733184.225
	2		890.539	348.1193	528152.387	7733257.307
	1		965.377	349.0440	528152.251	7733332.359
INFORMATION	FIX#	DEPTH	H DIST(bm2)	GRID BRG	EASTING	NORTHING
AUG. 17, 1990	18		393.131	68.6348	533138.847	7728741.998
ECHO SOUNDING	17		424.783	66.1859	533156.076	7728769.657
PROFILE 90-3	16		466.615	62.8065	533175.004	7728809.599
	15		514.634	59.8382	533198.908	7728852.852
	14		565.428	57.3987	533225.760	7728896.903
	13		617.914	55.7815	533257.909	7728938.489
	12		671.220	54.4843	533291.492	7728979.913
	11		726.171	53.7548	533330.258	7729019.048
	10		778.078	53.3198	533368.560	7729054.518
	9		829.956	52.8804	533406.159	7729090.525
	8		882.228	52.7709	533447.328	7729123.815
	7		933.194	52.5037	533485.293	7729158.172
	6		987.051	52.6209	533530.155	7729190.024
	5		1040.166	52.3182	533610.427	7729258.673
	4		1092.097	52.3182	533610.427	7729258.673
	3		1145.763	52.5487	533656.718	7729288.549
	2		1201.490	52.4726	533700.232	7729323.909
	1		1264.916	52.6137	533753.210	7729360.636


AUG. 5, 1990
ECHO SOUNDING AND
SIDESCAN FIXES
MR2
MR3
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7736000
7735000
7734000
7733000
7732000
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7730000
7729000
7728000
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531000
532000
533000
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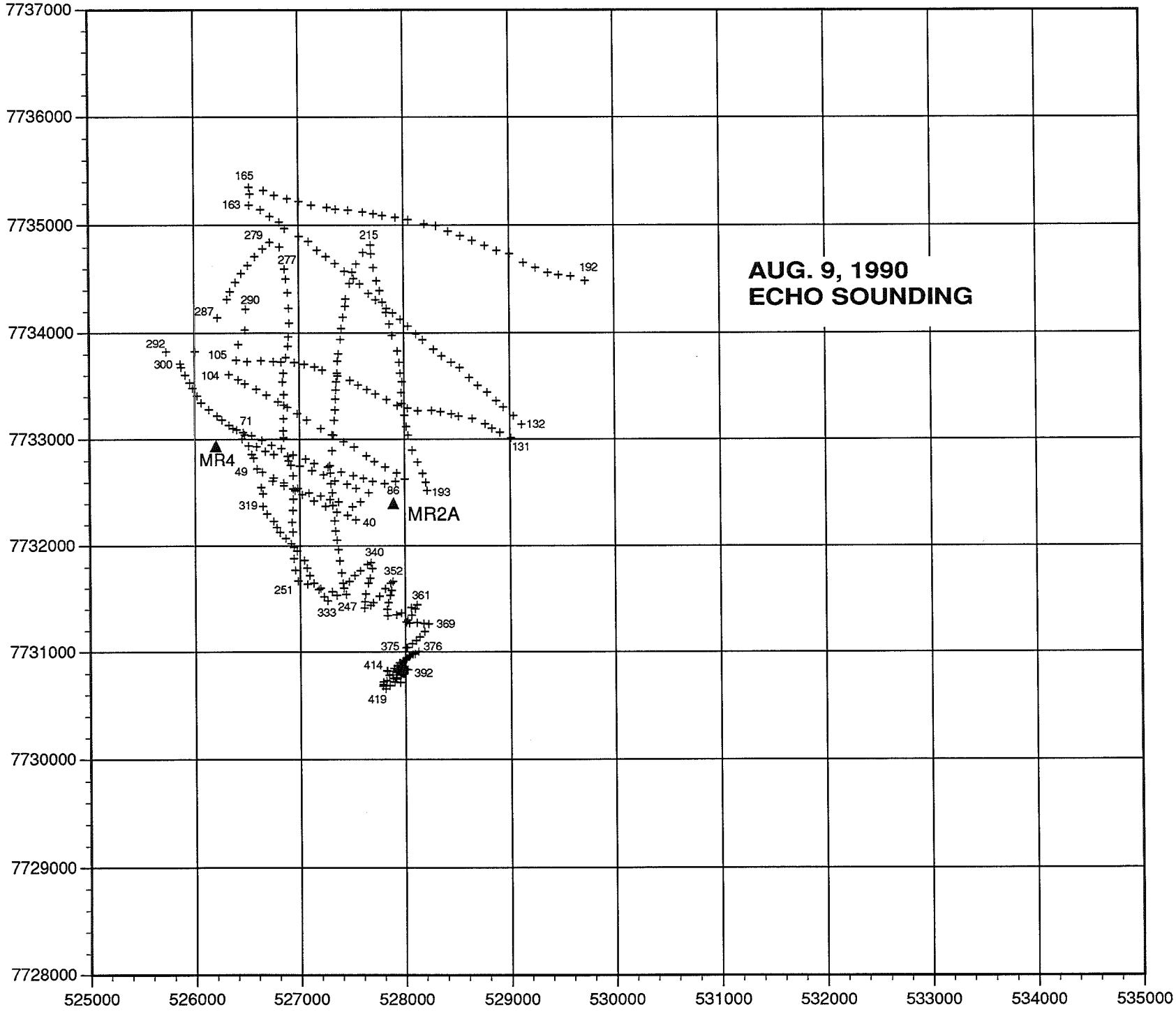
535000

INFORMATION	FIX#	TIME	MR1	MR2	MR3	DEPTH	NOTES	EASTING	NORTHING
AUG 5/90	1	1343		7008	2644	-2.7	BRG 353.2°MAG	534572	7728660
ECHO SOUNDING	2	1348		6995	2818	-2.8	START TURN	534785	7729035
AND	3	1350		6871	2779	-2.8	END TURN	534746	7729220
SIDESCAN	4	1353		6569	2541	-2.9	BRG 246°MAG	534495	7729391
	5	1356		6212	2280	-2.8		534198	7729594
	6	1359		5880	2063	-2.8		533922	7729782
	7	1402	15064	5539	1899	-2.7		533710	7729877
	8	1405	14703	5250	1754	-2.6		533422	7730101
	9	1408	14353	4905	1676	-2.5		533140	7730318
	10	1411	14023	4575	1650	-2.3		532860	7730508
	11	1414	13705	4279	1692	-2.2		532591	7730693
	12	1417	13350	3920	1809	-2.2		532290	7730900
	13	1420	13065	3625	1950	-2.1		532050	7731068
	14	1423	12739	3314	2143	-2.1		531767	7731254
	15	1426	12404	2985	2375	-2.1		531474	7731443
	16	1429	12069	2660	2640	-2.0		531193	7731644
	17	1432	11730	2351	2914	-2.0		530879	7731823
	18	1435	11385	2038	3210	-2.0		530552	7732001
	19	1438	11072	1690	3526	-2.0		530392	7732274
	20	1441	10699	1440	3830	-2.0		530140	7732485
	21	1444	10397	1176	4162	-2.0		529855	7732706
	22	1447	10012	998	4533	-2.0		529573	7732968
	23	1450	9694	934	4838	-2.0		529330	7733175
	24	1453	9346		5185	-2.0		?	?
	25	1456	8965		5545	-1.9		?	?
	26	1459	8621		5890	-1.4		?	?
	27	1502	8214		6319	-0.9		528240	7734222
	28	1505	7895		6629	-2.1		?	?
	29	1508	7524		7013	-2.4		527696	7734681
	30	1517	6418		8155	-2.7		526736	7735375
	31	1520	6037		8554	-2.9		526420	7735630
	32	1525	5435		9200	-3.1		525892	7736027
	33	1528	5331		9424	-3.0	TURN102° MAG	525469	7735944
	34	1531	5545			-2.9			
	35	1532	5614			-2.8			


AUG. 9, 1990
ECHO SOUNDING
MR4
MR2A
7737000
7736000
7735000
7734000
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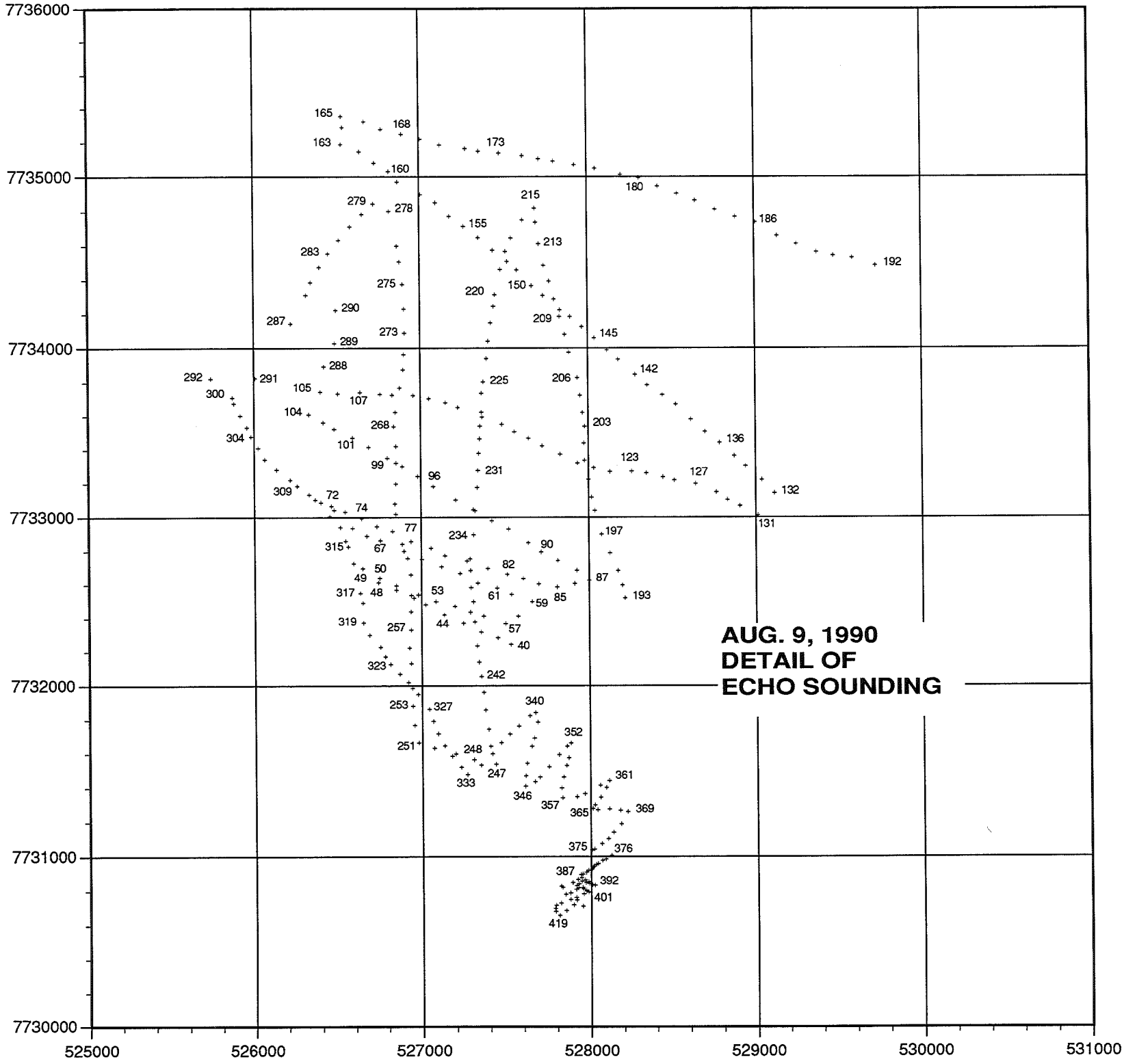
7736000
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AUG. 9, 1990
DETAIL OF
ECHO SOUNDING

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG 9/90	40	1121	9551	433	1501	-1.05		527528	7732245
ECHO SOUNDING	41	1122	9481	496	1414	-1.15		527452	7732286
	42	1123	9408	579	1309	-1.15		527350	7732319
	43	1124	9316	675	1191	-1.15		527245	7732371
	44	1125	9225	780	1069	-1.25		527133	7732421
	45	1126	9127	894	945	-1.35		527024	7732480
	46	1127	9063	970	865	-1.35		526954	7732520
	47	1128	8977	1076	749	-1.25		526849	7732569
	48	1129	8897	1194	636	-1.20		526743	7732612
	49	1130	8783	1285	511	-1.25	TURN	526647	7732696
	50	1131	8876	1164	630	-1.25		526751	7732638
	51	1132	8955	1053	739	-1.35		526851	7732594
	52	1133	9055	915	879	-1.35		526981	7732540
	53	1134	9135	805	992	-1.25		527087	7732499
	54	1135	9205	691	1103	-1.25		527197	7732472
	55	1136	9275	595	1200	-1.25		527287	7732436
	56	1137	9329	521	1281	-1.20		527366	7732413
	57	1138	9426	389	1420	-1.20	TURN	527498	7732369
	58	1139	9420	319	1474	-1.15		527575	7732413
	59	1140	9379	251	1523	-1.05	TURN	527657	7732500
	60	1141	9288	375	1395	-1.25		527535	7732541
	61	1142	9213	470	1300	-1.25		527448	7732581
	62	1143	9136	590	1180	-1.25		527332	7732611
	63	1144	9040	705	1065	-1.25		527228	7732668
	64	1145	8957	821	948	-1.25		527118	7732708
	65	1146	8870	945	825	-1.35		527002	7732751
	66	1147	8784	1060	712	-1.35		526897	7732799
	67	1148	8670	1210	561	-1.40		526755	7732862
	68	1149	8615	1295	478	-1.45		526674	7732888
	69	1150	8540	1386	389	-1.40		526588	7732934
	70	1151	8424	1530	260	-1.15		526452	7733005
	71	1152	8300	1635	230	<-0.95	TURN	526363	7733104
	72	1153	8371	1566	290	-1.35		526462	7733066
	73	1154	8431	1484	355	-1.45		526542	7733033
	74	1155	8505	1372	445	-1.45		526641	7732994
	75	1156	8584	1274	535	-1.45		526734	7732947
	76	1157	8650	1172	630	-1.45		526829	7732916
	77	1158	8748	1050	744	-1.40		526938	7732857
	78	1159	8833	925	866	-1.40		527056	7732816
	79	1200	8906	834	953	-1.35		527137	7732773
	80	1201	8991	700	1090	-1.40		527271	7732742
	81	1202	9085	570	1218	-1.45		527392	7732697
	82	1203	9167	460	1339	-1.45		527509	7732663
	83	1204	9235	369	1439	-1.45		527605	7732635
	84	1205	9305	281	1535	-1.45		527697	7732604
	85	1206	9373	192	1648	<-0.95	TURN	527808	7732586
	86	1207	9404	195	1745	-1.15		527912	7732607
	87	1208	9400	250	1827	-1.25	TURN	528000	7732626
	88	1209	9295	285	1743	-1.35		527924	7732685
	89	1210	9194	349	1624	-1.65		527812	7732742
	90	1211	9105	430	1519	-1.70		527712	7732794
	91	1212	9021	513	1440	-1.75		527637	7732849
	92	1213	8887	645	1318	-1.70		527518	7732930
	93	1214	8803	745	1219	-1.65		527419	7732980
	94	1215	8693	865	1114	-1.55		527310	7733044
	95	1216	8595	980	1016	-1.45		527204	7733103
	96	1217	8471	1129	904	-1.45		527072	7733181
	97	1218	8372	1237	835	-1.45		526980	7733241
	98	1219	8284	1345	775	-1.45		526888	7733300
	99	1220	8194	1445	725	-1.50		526799	7733351
	100	1221	8095	1571	679	-1.55		526688	7733415
	101	1222	8002	1682	656	-1.50		526590	7733470
	102	1223	7905	1800	645	-1.50		526481	7733523
	103	1224	7840	1875	655	-1.45		526415	7733561
	104	1225	7775	1974	679	<-0.95	TURN	526327	7733609

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG 9/90	105	1226	7695	2005	825	-1.35		526398	7733743
ECHO SOUNDING	106	1227	7760	1920	846	-1.55		526504	7733732
CONTINUED	107	1228	7805	1834	910	-1.65		526636	7733741
	108	1229		1745	965	-1.55		526757	7733730
	109	1230		1695	1005	-1.50		526830	7733726
	110	1231		1615	1086	-1.40		526957	7733721
	111	1232		1550	1140	-1.45		527048	7733704
	112	1233		1479	1200	-1.45		527146	7733681
	113	1234		1417	1240	-1.45		527218	7733650
	114	1235		1303	1335	-1.50		527365	7733595
	115	1236		1220	1418	-1.50		527481	7733552
	116	1237		1155	1470	-1.60		527557	7733508
	117	1238		1095	1536	-1.65		527643	7733469
	118	1239		1035	1597	-1.70		527723	7733424
	119	1240		972	1686	-1.70		527831	7733372
	120	1241		920	1773	-1.75		527932	7733321
	121	1242		901	1864	-1.85		528031	7733292
	122	1243		900	1955	-1.90		528128	7733270
	123	1244		944	2085	-1.95		528259	7733270
	124	1245		974	2170	-1.95		528347	7733262
	125	1246		1004	2266	-1.95		528447	7733236
	126	1247		1029	2331	-1.95		528515	7733219
	127	1248		1095	2454	-1.95		528641	7733198
	128	1249		1150	2573	-2.05		528765	7733147
	129	1250		1174	2635	-2.20		528830	7733103
	130	1251		1214	2708	-2.25		528906	7733065
	131	1252		1280	2815	-2.45	TURN	529015	7733011
	132	1254		1432	2921	-2.25		529114	7733143
	133	1255	9455	1410	2850	-2.25		529037	7733221
	134	1256	9320	1385	2765	-2.35		528942	7733302
	135	1257	9230	1374	2704	-2.25		528872	7733362
	136	1258	9121	1375	2635	-2.25		528787	7733443
	137	1259	9017	1370	2561	-2.20		528698	7733507
	138	1300	8903	1384	2498	-2.10		528616	7733580
	139	1301	8779	1420	2438	-1.90		528527	7733671
	140	1302	8687	1435	2379	-1.70		528447	7733724
	141	1303	8589	1459	2315	-1.70		528357	7733784
	142	1304	8501	1496	2270	-1.60		528283	7733845
	143	1305	8371	1560	2214	-1.40		528180	7733935
	144	1306	8282	1605	2183	-1.20		528115	7733991
	145	1307	8183	1665	2151	-1.60		528038	7734060
	146	1308	8080	1725	2125	-2.10		527966	7734125
	147	1309	7990	1785	2101	-2.40		527893	7734187
	148	1310	7925	1825	2078	-2.50		527834	7734226
	149	1311	7803	1915	2055	-2.65		527734	7734311
	150	1312	7715	1979	2045	-2.70		527666	7734368
	151	1313	7640	2080	2049	-2.80		527578	7734459
	152	1314	7520	2140	2050	-2.90		527521	7734510
	153	1315	7420	2220	2047	-2.90		527435	7734575
	154	1316	7306	2310	2056	-2.90		527348	7734648
	155	1317	7204	2395	2065	-2.95		527262	7734714
	156	1318	7115	2475	2074	-2.90		527176	7734772
	157	1319	7008	2574	2109	-2.95		527097	7734851
	158	1320	6911	2646	2115	-3.00		527008	7734897
	159	1321	6816	2765	2138	-3.05		526870	7734973
	160	1322	6705	2840	2179	-3.10		526817	7735032
	161	1323	6614	2920	2205	-3.15		526731	7735083
	162	1324	6520	3015	2248	-3.20		526641	7735147
	163	1325	6434	3100	2270	-3.25	TURN	526530	7735188
	164	1326	6341	3185	2370	-3.30		526541	7735288
	165	1327		3250	2435	-3.35	TURN	526531	7735355
	166	1328	6426	3164	2426	-3.25		526671	7735322
	167	1329	6525	3085	2405	-3.20		526773	7735278
	168	1330	6603	3015	2410	-3.10		526897	7735249
	169	1331	6702	2954	2418	-3.10		527008	7735222

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG 9/90	170	1332		2887	2426	-3.10		527124	7735186
ECHO SOUNDING	171	1333	6888	2830	2469	-3.05		527276	7735165
CONTINUED	172	1334	6940	2799	2490	-3.05		527353	7735149
	173	1335	7020	2769	2541	-3.05		527476	7735140
	174	1336	4120	2735	2600	-3.00		527616	7735123
	175	1337	7175	2710	2641	-3.00		527714	7735106
	176	1338	7255	2691	2679	-2.90		527800	7735092
	177	1339	7350	2670	2741	-2.40		527926	7735072
	178	1340	7443	2654	2805	-2.60		528050	7735051
	179	1341	7565	2629	2880	-2.70		528203	7735012
	180	1342	7665	2627	2945	-2.70		528312	7734995
	181	1343	7785	2599	2995	-2.80		528428	7734945
	182	1344	7870	2585	3054	-2.80		528542	7734903
	183	1345	7980	2576	3113	-2.80		528650	7734863
	184	1346		2566	3177	-2.85		528769	7734813
	185	1347	8215	2569	3249	-2.85		528887	7734769
	186	1348	8340	2591	3334	-2.80		529009	7734738
	187	1349		2580	3404	-2.80		529140	7734658
	188	1350	8576	2598	3481	-2.80		529255	7734612
	189	1351	8689	2625	3566	-2.80		529376	7734565
	190	1352	8760	2665	3646	-2.80		529476	7734543
	191	1353	8855	2725	3743	-2.80		529589	7734531
	192	1354	8994	2780	3851	-2.74	EOL	529728	7734487
	193	1521	9587	347	2058	-0.55		528215	7732521
	194	1522	9513	366	2029	-0.95		528200	7732596
	195	1523	9407	399	1988	-1.30		528171	7732684
	196	1524	9305	454	1931	-1.55		528125	7732790
	197	1525	9180	531	1874	-1.85		528074	7732900
	198	1526	9039	655	1838	-1.75		528036	7733040
	199	1527	8970	727	1825	-1.65		528017	7733118
	200	1528	8864	829	1821	-1.60		528000	7733224
	201	1529	8754	940	1819	-1.60		527976	7733338
	202	1530	8670	1040	1841	-1.55		527973	7733439
	203	1531	8590	1140	1875	-1.50		527978	7733539
	204	1532	8515	1220	1890	-1.25		527965	7733620
	205	1533	8417	1321	1918	-1.15		527953	7733721
	206	1534	8314	1426	1949	-1.15		527937	7733827
	207	1535	8169	1575	1979	-1.35		527887	7733977
	208	1536	8066	1681	2016	-1.95		527863	7734083
	209	1537	7958	1787	2053	-2.15		527832	7734188
	210	1538	7863	1889	2090	-2.45		527799	7734289
	211	1539	7750	1995	2138	-2.55		527770	7734393
	212	1540		2090	2181	-2.55		527740	7734487
	213	1541	7545	2216	2251	-2.55		527711	7734611
	214	1542		2345	2334	-2.60		527691	7734739
	215	1543	7361	2425	2393	-2.65	TURN	527686	7734818
	216	1544	7410	2364	2294	-2.65		527613	7734750
	217	1545	7460	2269	2170	-2.60		527546	7734645
	218	1546	7504	2198	2087	-2.60		527510	7734567
	219	1547	7585	2100	1987	-2.55		527481	7734462
	220	1548	7676	1965	1854	-2.00		527445	7734316
	221	1549	7730	1900	1799	-1.90		527438	7734248
	222	1550	7809	1809	1715	-1.70		527419	7734149
	223	1551	7891	1710	1629	-1.50		527403	7734041
	224	1552	7975	1616	1554	-1.50		527392	7733940
	225	1553	8082	1495	1455	-1.50		527372	7733805
	226	1554	8142	1433	1406	-1.40		527362	7733735
	227	1555	8236	1330	1345	-1.30		527361	7733623
	228	1556	8310	1260	1296	-1.30		527350	7733541
	229	1557	8372	1193	1260	-1.30		527347	7733465
	230	1558	8449	1119	1223	-1.25		527343	7733379
	231	1559	8532	1035	1185	-1.20		527337	7733278
	232	1600	8621	955	1155	-1.30		527331	7733177
	233	1601	8739	855	1124	-1.30		527320	7733040
	234	1602	8862	761	1110	-1.25		527309	7732895

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG 9/90	235	1603	8983	695	1105	-1.10		527289	7732753
ECHO SOUNDING	236	1604	9039	663	1119	-1.05		527289	7732685
CONTINUED	237	1605	9145	620	1152	-1.00		527294	7732583
	238	1606		590	1192	-1.00		527307	7732499
	239	1607	9341	575	1248	-1.00		527314	7732380
	240	1608	9474	584	1330	-1.00		527328	7732238
	241	1609	9569	610	1393	-1.00		527338	7732139
	242	1610	9652	640	1455	-0.90		527352	7732053
	243	1611	9745	685	1521	-0.90		527363	7731962
	244	1612	9843	749	1600	-0.80		527375	7731857
	245	1613	9950	823	1690	-0.85		527393	7731745
	246	1614	10050	900	1771	-0.80		527404	7731644
	247	1615	10151	975	1869	-0.80	TURN	527435	7731539
	248	1616	10040	1021	1764	-0.75		527303	7731566
	249	1617	9966	1060	1671	-0.80		527196	7731600
	250	1618	9882	1122	1570	-0.80		527070	7731635
	251	1619	9826	1170	1495	-0.60	TURN	526979	7731666
	252	1620	9712	1129	1397	-0.80		526955	7731767
	253	1621	9605	1080	1297	-0.90		526944	7731879
	254	1622	9504	1035	1209	-0.90		526941	7731987
	255	1623	9370	990	1095	-1.00		526936	7732132
	256	1624	9282	979	1020	-1.10		526926	7732225
	257	1625	9185	955	956	-1.10		526936	7732332
	258	1626	9090	953	892	-1.00		526936	7732439
	259	1627	8998	960	842	-1.00		526938	7732537
	260	1628	8900	986	789	-1.00		526937	7732661
	261	1629	8791	1035	740	-1.05		526917	7732758
	262	1630	8685	1094	694	-1.00		526887	7732841
	263	1631	8515	1209	653	-1.10		526849	7733019
	264	1632	8459	1245	659	-1.15		526845	7733080
	265	1633	8356	1308	698	-1.15		526850	7733197
	266	1634	8242	1385	755	-1.20		526853	7733322
	267	1635	8155	1453	810	-1.20		526853	7733421
	268	1636	8040	1546	874	-1.20		526840	7733538
	269	1637	7968	1603	939	-1.20		526849	7733622
	270	1638	7850	1700	1067	-1.15		526877	7733768
	271	1639	7760	1776	1165	-1.15		526898	7733876
	272	1640	7685	1847	1239	-1.15		526902	7733963
	273	1641	7570	1953	1348	-1.15		526907	7734090
	274	1642	7437	2077	1468	-1.10		526904	7734231
	275	1643	7301	2209	1594	-2.15		526897	7734376
	276	1644	7190	2334	1704	-2.40		526878	7734506
	277	1645	7101	2423	1785	-2.40		526866	7734599
	278	1646	6900	2627	1958	-2.60	TURN	526817	7734801
	279	1647	6840	2704	1971	-2.70		526724	7734842
	280	1648	6875	2682	1897	-2.60		526656	7734784
	281	1649	6904	2654	1810	-2.45		526582	7734712
	282	1650	6943	2620	1719	-2.40		526514	7734632
	283	1651	6985	2590	1631	-2.20		526448	7734554
	284	1652	7035	2555	1546	-1.80		526396	7734476
	285	1653	7101	2515	1450	-0.60		526342	7734385
	286	1654	7134	2476	1375	<-0.40		526314	7734313
	287	1656	7260	2412	1203	<-0.40		526222	7734145
	288	?	7560	2094	975		OFF SPIT	526418	7733893
	289	?	7450	2149	1124		OFF SPIT	526486	7734030
	290	?	7278	2295	1314		OFF SPIT	526493	7734223
	291	?	7486	2359	903		OFF SPIT	526007	7733824
	292	1725	7380	2579	995			525736	7733822
	300	1733	7549	2406	835	-0.40		525869	7733709
	301	1734	7585	2380	800	-0.45		525877	7733674
	302	1735	7660	2310	719	-0.50		525915	7733602
	303	1736	7750	2240	639	-0.50		525955	7733532
	304	1737	7805	2190	579	<-0.40		525982	7733478
	305	1738	7884	2120	500	<-0.40		526024	7733410
	306	1739	7960	2055	424	<-0.40	A/C	526062	7733343

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG 9/90	307	1740	8041	1964	347	-0.40		526133	7733283
ECHO SOUNDING	308	1741	8129	1865	280	-0.40		526214	7733222
CONTINUED	309	1742	8170	1809	249	<-0.40		526258	7733185
	310	1743	8245	1725	230	<-0.40		526327	7733134
	311	1744	8308	1642	245	-0.70		526397	7733088
	312	1745	8390	1550	294	-0.90		526477	7733042
	313	1746	8487	1476	314	-0.90		526514	7732940
	314	1747	8570	1420	354	-0.90		526544	7732859
	315	1748	8632	1392	380	-0.90		526561	7732824
	316	1749	8732	1335	449	-0.90		526594	7732726
	317	1751	8905	1265	584	-0.85		526632	7732549
	318	1752	8963	1244	635	-0.85		526648	7732492
	319	1753	9074	1239	725	<-0.40	A/C	526650	7732374
	320	1754	9158	1206	805	-0.40		526687	7732301
	321	1755	9235	1150	901	-0.80		526752	7732230
	322	1756	9313	1130	967	-0.70		526783	7732170
	323	1757	9364	1111	1020	-0.80		526812	7732126
	324	1758	9435	1075	1099	-1.00		526867	7732069
	325	1759	9501	1043	1169	-0.90		526918	7732020
	326	1800	9590	1020	1259	-0.90		526975	7731950
	327	1801	9691	1005	1368	-0.90		527041	7731863
	328	1802	9771	1025	1440	-0.90		527066	7731791
	329	1803	9850	1050	1516	-0.90		527093	7731717
	330	1804	9925	1070	1595	-0.80		527131	7731647
	331	1805	10005	1084	1671	-0.70		527176	7731586
	332	1806	10081	1103	1754	-0.50		527227	7731520
	333	1807		1115	1809	<-0.40	A/C	527264	7731479
	334	1808	10101	1025	1816	-0.65		527345	7731533
	335	1809	10069	933	1809	-0.60		527413	7731600
	336	1810	10034	850	1799	-0.70		527466	7731664
	337	1811	10011	780	1800	-0.70		527518	7731716
	338	1812	9988	712	1810	-0.70		527574	7731763
	339	1813	9967	630	1824	-0.60		527640	7731823
	340	1814	9966	600	1840	<-0.40	A/C	527675	7731842
	341	1815	10031	649	1883	-0.50		527686	7731785
	342	1816	10105	744	1926	-0.70		527665	7731692
	343	1817	10148	795	1946	-0.80		527650	7731644
	344	1818	10221	898	1994	-0.80		527622	7731544
	345	1819	10285	970	2040	-0.70		527614	7731472
	346	1820	10336	1029	2081	<-0.40	A/C	527610	7731412
	347	1821	10331	991	2103	-0.60		527668	7731436
	348	1822	10315	959	2104	-0.70		527696	7731463
	349	1823	10282	890	2104	-1.10		527753	7731522
	350	1824	10241	810	2100	-0.80		527812	7731596
	351	1825		759	2108	-0.50	A/C	527861	7731644
	352	1826	10221	740	2115	<-0.40		527884	7731662
	353	1827	10301	825	2157	-0.70		527870	7731577
	354	1828	10329	870	2175	-0.80		527857	7731533
	355	1829	10390	940	2207	-1.20		527838	7731463
	356	1830	10443	1003	2240	-0.60		527826	7731401
	357	1831	10497	1062	2285	<-0.40	A/C	527831	7731342
	358	1832	10518	1055	2344	<-0.40		527918	7731347
	359	1833	10522	1038	2365	-2.80		527964	7731367
	360	1834	10519	1000	2404	-0.70		528058	7731416
	361	1835	10520	985	2430	-0.40	A/C	528112	7731443
	362	1836	10552	1021	2441	-0.50		528094	7731402
	363	1837	10588	1071	2451	-0.85		528059	7731345
	364	1837	10609	1111	2455	-2.20		528024	7731299
	365	1838		1130	2459	<-0.40	A/C	528011	7731279
	366	1839	10637	1140	2485	-1.40		528040	7731272
	367	1840	10670	1147	2535	-0.70		528111	7731277
	368	1841	10708	1169	2590	-0.40		528177	7731269
	369	1842	10732	1188	2629	<-0.40	A/C	528222	7731262
	370	1843	10780	1246	2645	<-0.40		528182	7731191
	371	1844	10803	1285	2644	-0.40		528136	7731141

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG 9/90	372	1845	10825	1315	2646	-0.70		528104	7731105
ECHO SOUNDING	373	1846	10830	1339	2639	-1.20		528065	7731075
CONTINUED	374	1847	10838	1365	2630	-1.60		528020	7731043
	375	1848		1370	2624	-0.40	A/C	528004	7731037
	376	1849	10923	1415	2728	-0.40	A/C	528122	7731006
	377	1849	10924	1431	2720	-0.50		528089	7730985
	378	1850		1435	2710	-0.80		528067	7730978
	379	1850		1450	2705	-0.95		528041	7730960
	380	1851		1455	2703	-1.00		528031	7730954
	381	1851		1464	2700	-1.20		528015	7730943
	382	1852		1470	2701	-1.30		528010	7730937
	383	1852		1478	2704	-1.40		528005	7730929
	384	1853		1486	2696	-1.60		527982	7730919
	385	1853		1495	2695	-1.80		527969	7730909
	386	1853		1504	2689	-1.90		527948	7730899
	387	1853		1506	2685	<-0.40	A/C	527940	7730897
	388	1854		1525	2700	-1.90		527940	7730878
	389	1854		1538	2723	-1.30		527962	7730866
	390	1854		1550	2745	-0.95		527983	7730855
	391	1854		1569	2772	-0.40		528004	7730837
	392	1854		1575	2787	<-0.40	A/C	528021	7730833
	393	1855		1570	2775	-0.50		528007	7730836
	394	1855		1560	2754	-0.90		527985	7730845
	395	1856		1555	2740	-1.20		527968	7730849
	396	1856		1545	2718	-1.70		527945	7730858
	397	1857		1535	2695	-1.40	A/C	527920	7730867
	398	1857		1560	2718	-1.50		527926	7730842
	399	1858		1584	2750	-1.00		527948	7730819
	400	1858		1600	2775	-0.60		527969	7730804
	401	1858		1610	2791	-0.30	A/C	527983	7730795
	402	1859		1604	2779	-0.50		527970	7730800
	403	1859		1590	2757	-0.90		527952	7730813
	404	1859		1585	2736	-1.20		527924	7730817
	405	1859		1571	2718	-1.60		527912	7730831
	406	1900		1554	2691	-0.90	A/C	527890	7730848
	407	1900		1592	2733	-1.20		527910	7730810
	408	1901		1620	2781	-0.80		527953	7730783
	409	1901		1652	2781	-0.60	A/C	527911	7730750
	410	1901		1689	2833	-0.40		527950	7730714
	411	1902		1639	2769	-0.80		527909	7730763
	412	1902		1614	2729	-1.10		527876	7730788
	413	1903		1583	2675	-0.90		527829	7730820
	414	1904		1576	2665	<-0.40		527822	7730827
	415	1905		1621	2716	-1.10		527846	7730782
	416	1905		1650	2758	-0.80		527876	7730752
	417	1906		1681	2794	-0.70		527895	7730721
	418	1906		1715	2794	-0.45		527850	7730687
	419	1906		1746	2794	-0.40		527809	7730658
	420	1907	11081	1724		-0.50		527786	7730681
	421	1908	11062	1705		-0.80		527783	7730700
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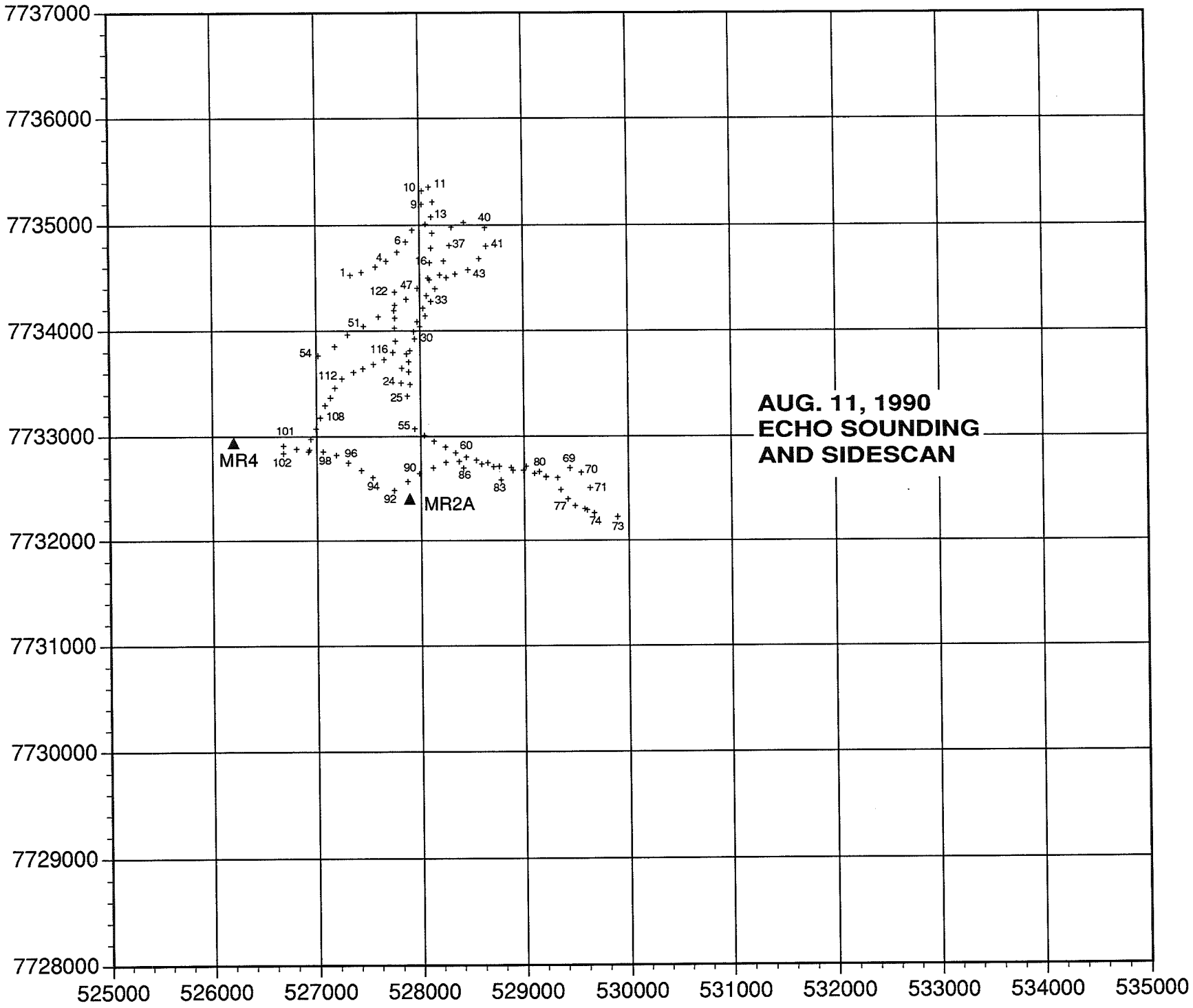
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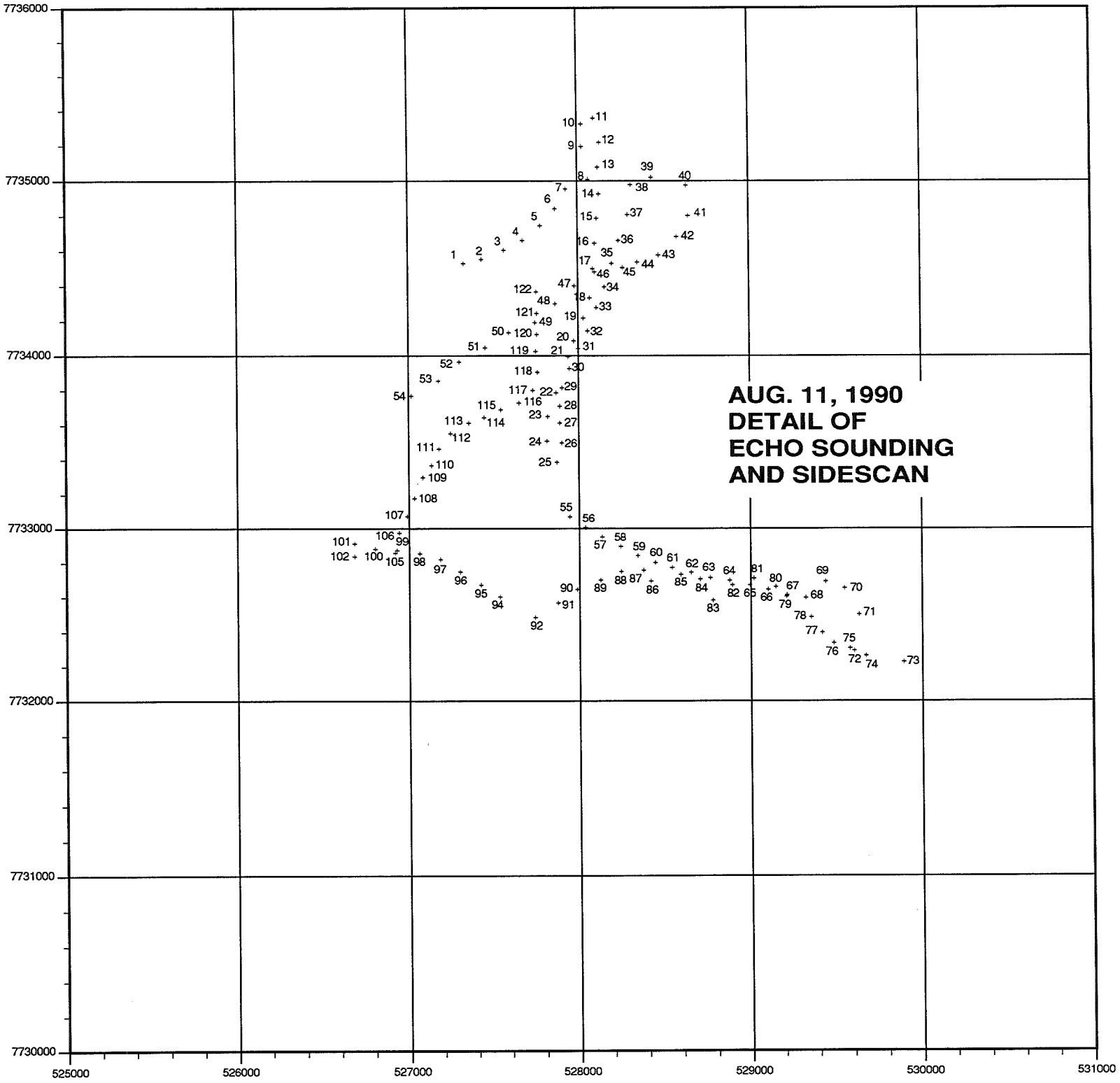
MR4
MR2A
AUG. 11, 1990
ECHO SOUNDING
AND SIDESCAN


AUG. 11, 1990
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AND SIDESCAN
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525000
526000
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528000
529000
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531000

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG. 11, 1990	1	1119		2200	1946	-2.6	BRG 027.0°M	527327	7734529
ECHO SOUNDING	2	1121		2199	2030	-2.6		527435	7734554
AND SIDESCAN	3	1123		2226	2153	-2.6		527568	7734605
	4	1125		2268	2266	-2.6		527678	7734660
	5	1127		2345	2398	-2.6		527782	7734745
	6	1129		2440	2528	-2.6		527868	7734842
	7	1131		2551	2654	-2.5		527933	7734953
	8	1133		2613	2782	-2.4		528062	7735009
	9	1135		2798	2901	-2.9		528026	7735197
	10	1137		2924	3001	-3.1	TURN	528028	7735323
	11	1139		2963	3072	-3.3	TURN	528099	7735358
	12	1141		2827	2985	-3.0	145°M	528131	7735219
	13	1143		2685	2871	-2.5		528120	7735077
	14	1145		2534	2764	-2.5		528126	7734925
	15	1147		2394	2657	-2.5		528114	7734785
	16	1149		2251	2550	-2.0		528100	7734643
	17	1151		2107	2446	-1.9		528086	7734500
	18	1153		1938	2329	-2.0		528070	7734332
	19	1155		1820	2232	-2.0		528033	7734216
	20	1157		1686	2110	-1.8		527974	7734086
	21	1158		1593	2033	-1.4	TURN	527940	7733994
	22	1201		1385	1871	-1.3		527870	7733787
	23	1203		1250	1768	-1.4		527820	7733650
	24	1205		1108	1709	-1.5		527813	7733507
	25	1207		986	1730	-1.7	TURN	527872	7733388
	26	1209		1096	1790	-1.6	BRG 320°M	527902	7733498
	27	1211		1212	1819	-1.7		527891	7733614
	28	1213		1309	1856	-1.5		527890	7733711
	29	1215		1413	1914	-1.3		527904	7733815
	30	1217		1524	2006	-1.3		527949	7733925
	31	1219		1642	2108	-1.2		528000	7734040
	32	1221		1749	2211	-1.6		528057	7734143
	33	1223		1888	2329	-1.7		528109	7734277
	34	1225		2011	2435	-1.9		528154	7734395
	35	1227		2149	2552	-1.8		528200	7734528
	36	1229		2285	2666	-2.2		528239	7734660
	37	1231		2440	2804	-2.7		528293	7734808
	38	1233		2610	2933	-2.6	TURN	528312	7734977
	39	1235		2674	3050	-2.5		528433	7735020
	40	1237		2680	3173	-2.5	BRG 210°M	528636	7734976
	41	1239		2516	3072	-2.9		528646	7734801
	42	1241		2381	2945	-2.8		528577	7734681
	43	1243		2250	2798	-2.6		528473	7734575
	44	1245		2183	2676	-1.9		528350	7734536
	45	1247		2136	2588	-1.8		528263	7734505
	46	1249		2090	2443	-1.9		528097	7734482
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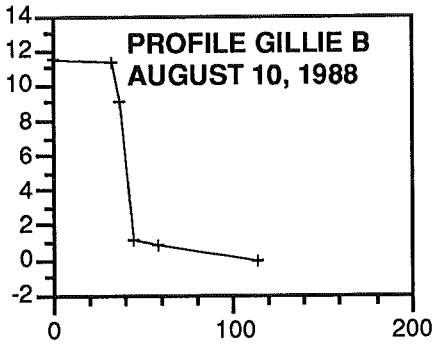
	51	1259		1701	1670	-1.8		527453	7734046
	52	1301		1670	1500	-1.6		527298	7733964
	53	1303		1619	1335	-1.5		527175	7733855
	54	1305		1619	1161	-1.4	EOL	527018	7733767
	55	1442	9001	671	1749	-1.9	PARALLEL	527945	7733071
	56	1444	9105	623	1837	-1.9	TO SHORE	528036	7733007
	57	1446	9200	601	1933	-2.0	BRG 065°M	528133	7732951
	58	1448	9305	607	2042	-2.0		528242	7732896
	59	1450	9408	631	2143	-2.0		528341	7732842

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG. 11, 1990	60	1452	9485	683	2247	-2.0		528443	7732801
ECHO SOUNDING	61	1454	9569	750	2347	-2.0		528541	7732772
AND SIDESCAN	62	1456	9651	835	2458	-2.0		528650	7732745
CONTINUED	63	1458	9731	927	2572	-1.9		528762	7732713
	64	1500	9815	1029	2685	-1.9		528874	7732698
	65	1502	9897	1139	2808	-2.0		528995	7732672
	66	1504	9985	1237	2917	-1.4		529102	7732644
	67	1506	10080	1340	3030	-1.8		529212	7732612
	68	1508	10159	1447	3141	-2.0		529322	7732598
	69	1510	10240	1577	3248	-2.2		529439	7732693
	70	1512	10313	1678	3360	-2.4		529548	7732654
	71	1514	10425	1747	3461	-2.2	TURN	529633	7732501
	72	1518	10577		3465	-1.7		529603	7732291
	73	1551	10802		3762	-2.0		529892	7732225
	74	1555	10641		3538	-1.9		529671	7732262
	75	1557	10553		3440	-1.8		529580	7732304
	76	1559	10474		3343	-1.3		529487	7732334
	77	1601	10384		3265	-1.2		529418	7732396
	78	1603	10274		3187	-1.4		529353	7732485
	79	1607	10094		3030	-1.5		529210	7732604
	80	1609	10011		2961	-1.4		529147	7732661
	81	1612	9897		2830	-2.1		529020	7732712
	82	1614	9857		2705	-1.6		528891	7732672
	83	1616	9848	907	2603	<-0.9		528778	7732581
	84	1618	9761	870	2515	-0.9		528704	7732706
	85	1621	9603	775	2400	-1.8		528591	7732730
	86	1624		604	2231	<-1.1		528418	7732694
	87	1626		603	2183	-1.8		528376	7732758
	88	1628		497	2053	-1.3		528244	7732749
	89	1630		379	1939	-1.4		528124	7732699
	90	1632		262	1813	-1.1		527989	7732644
	91	1634		164	1715	-0.8		527873	7732565
	92	1636		167	1609	<-1.1		527742	7732481
	93	1638		275	1497	-1.1		?	?
	94	1640		409	1375	-1.1	A/C	527533	7732603
	95	1642		541	1249	-1.1		527420	7732671
	96	1644		685	1114	-1.1		527297	7732747
	97	1646		822	989	-1.1		527182	7732821
	98	1648		945	864	-1.1		527060	7732856
	99	1650		1068	733	-1.1		526930	7732872
	100	1652		1186	607	-1.1		526804	7732882
	101	1654		1310	483	-1.2		526682	7732912
	102	1656		1281	495	-1.2	TURN	526684	7732837
	103	1658		1155	614	-1.2	035°M	?	?
	104	1700		1073	699	-1.2	A/C 000°M	?	?
	105	1702		1072	723	-1.2		526918	7732857
	106	1704		1106	743	-1.2		526943	7732975
	107	1706		1121	801	-1.2		526991	7733073
	108	1708		1155	865	-1.2		527033	7733177
	109	1710		1206	951	-1.2		527082	7733298
	110	1712		1229	1024	-1.2		527131	7733369
	111	1714		1278	1106	-1.3		527176	7733463
	112	1716		1319	1209	-1.3		527244	7733553
	113	1718		1324	1333	-1.3		527353	7733613
	114	1720		1320	1428	-1.3		527444	7733645
	115	1722		1332	1537	-1.5		527544	7733689
	116	1724		1348	1650	-1.5		527651	7733729
	117	1726		1406	1757	-1.4	A/C 350°M	527734	7733799
	118	1728		1507	1833	-1.4		527761	7733904

INFORMATION	FIX #	TIME	MR1	MR2A	MR4	DEPTH	NOTES	EASTING	NORTHING
AUG. 11, 1990	119	1730		1630	1893	-1.8		527752	7734026
ECHO SOUNDING	120	1732		1726	1955	-1.9		527759	7734123
AND SIDESCAN	121	1734		1845	2029	-2.2		527758	7734242
CONTINUED	122	1736		1968	2108	-2.4		527755	7734365

APPENDIX 5

Retreat Site Profiles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AUGUST 10, 1988
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-2
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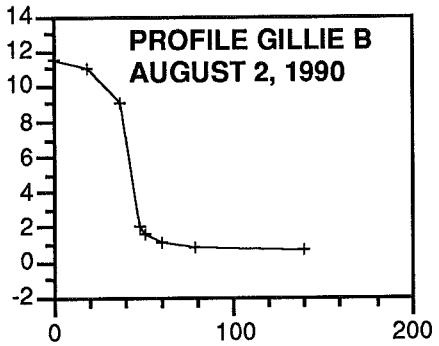
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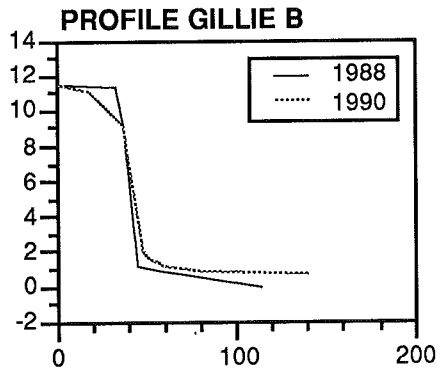
PROFILE GILLIE B
1988
1990
14
12
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4
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0
-2
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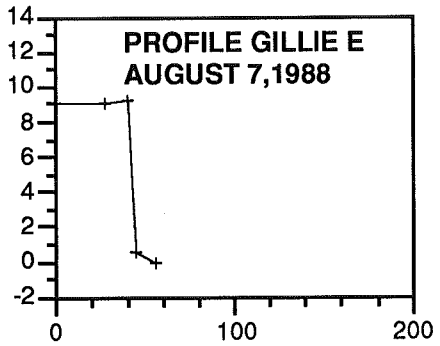
200

INFORMATION	DESCRIPTION	DIST.	ELEV.
PROFILE GILLIE B	BACK BM	0.0	11.5
AUG. 10,1988		33.0	11.4
MEASURED BY TAPE	CLIFF EDGE	37.0	9.0
	BEACH	45.0	1.2
	MUDFLATS	59.0	0.9
	WATER LEVEL	114.0	0.0

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE GILLIE B	BACK BM	0.00	11.50	524668.63	7732993.14
AUG. 2, 1990	NEW FRONT BM	19.39	11.00	524687.59	7732989.11
PROFILE BEARING 056°M	CLIFF EDGE	37.79	9.03	524705.67	7732985.67
RESET BACK BM - WOOD STAKE	CLIFF BASE	48.60	2.10	524716.42	7732986.66
IN SAME POSITION	HIGHER HIGH WATER MARK	51.37	1.55	524719.19	7732986.71
NEW FRONT METAL ROD	HIGHER WATER MARK	60.41	1.13	524728.22	7732986.42
	EDGE MUD,VEGETATION	77.78	0.82	524745.58	7732987.08
	WATER LEVEL	138.82	0.61	524806.62	7732986.29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AUGUST 7,1988
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10
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6
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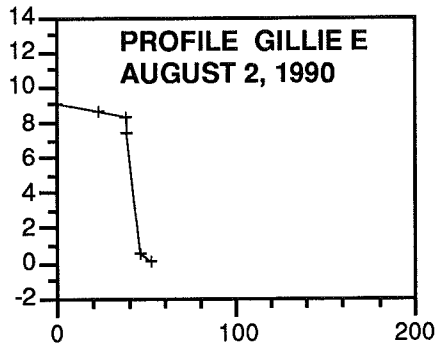
2
0
-2
0
100
200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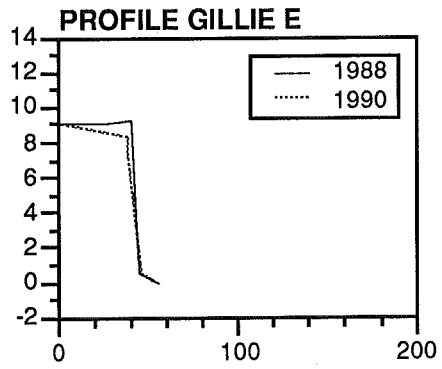
PROFILE GILLIE E
1988
1990
14
12
10
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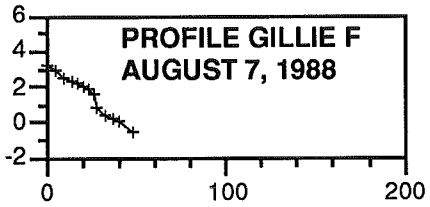
0
-2
0
100
200

INFORMATION	DESCRIPTION	DIST.	ELEV.
PROFILE GILLIE E	BACK BM	0	9.0
AUG. 7, 1988	FRONT STAKE	28	9.1
BY TAPE	CLIFF EDGE	40	9.2
	BASE OF CLIFF	45	0.5
	WATER LEVEL	55	0.0

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE GILLIE E	BACK BM	0.00	9.00	526184.99	7732883.69
AUG. 2, 1990	NEW WOOD BM	23.95	8.59	526197.98	7732903.81
PROFILE BEARING 357°M	CLIFF EDGE	39.18	8.27	526206.06	7732916.73
	UPPER CLIFF FACE	39.34	7.36	526206.17	7732916.84
	CLIFF BASE	46.99	0.50	526209.79	7732923.57
	WATER LEVEL	51.96	0.09	526212.13	7732927.96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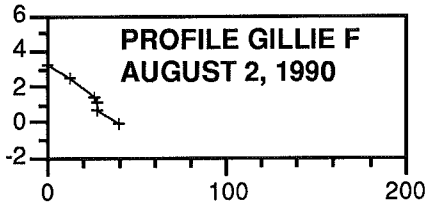
-2
0
100
200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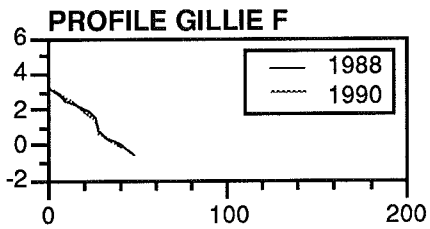
PROFILE GILLIE F
1988
1990
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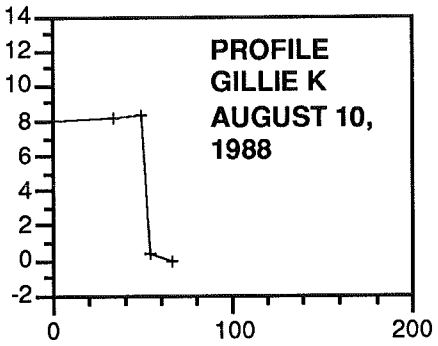
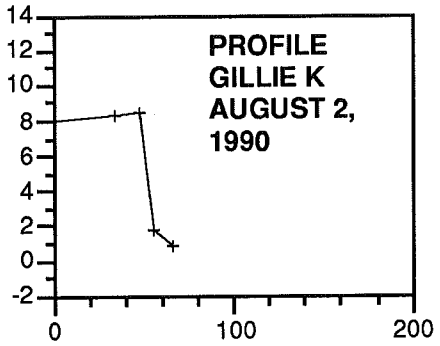
4
2
0
-2
0
100
200

INFORMATION	DESCRIPTION	DIST	ELEV	EASTING	NORTHING
PROFILE GILLIE F	BACK STAKE WOOD	0.000	3.260	525806.75	7732452.13
AUG. 2,1990	NEW METAL ROD	12.746	2.426	525815.32	7732461.57
PROFILE BEARING 006.0°M	CLIFF EDGE	27.055	1.418	525825.01	7732472.09
	CLIFF FACE	28.146	0.985	525825.70	7732472.94
	CLIFF BASE	28.241	0.650	525825.80	7732472.98
	WATER LEVEL	40.713	-0.157	525834.39	7732482.02

INFORMATION	DESCRIPTION	DIST	ELEV
PROFILE GILLIE F	BM HT=0.41M	0.0	3.26
AUG. 7,1988	TUNDRA,GRASS	5.0	2.87
SURVEY		10.0	2.50
INSTRUMENT	INSTRUMENT	15.0	2.25
		17.5	2.21
		20.0	2.01
	FRONT STAKE	23.1	1.82
	EDGE OF TUNDRA	26.3	1.61
	BASE OF CLIFF	28.4	0.86
		32.0	0.36
	INSTRUMENT	36.7	0.17
	WATER LEVEL	40.0	0.00
		47.5	-0.55


PROFILE
GILLIE K
AUGUST 10,
1988
14
12
10
8
6
4
2
0
-2
0
100
200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GILLIE K
AUGUST 2,
1990
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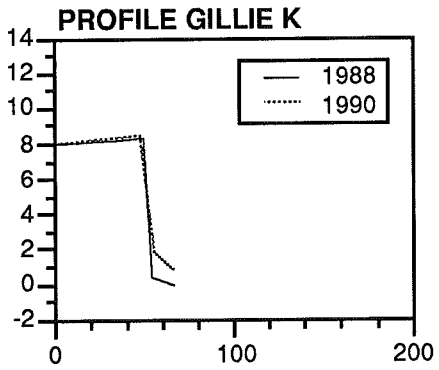
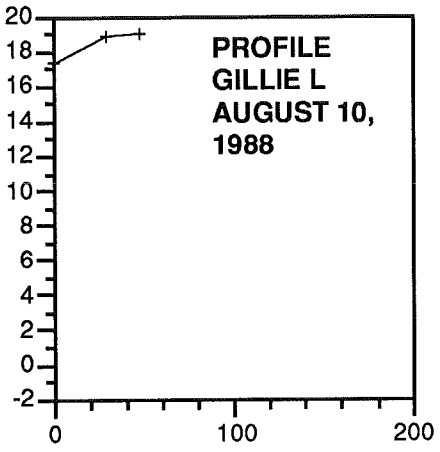
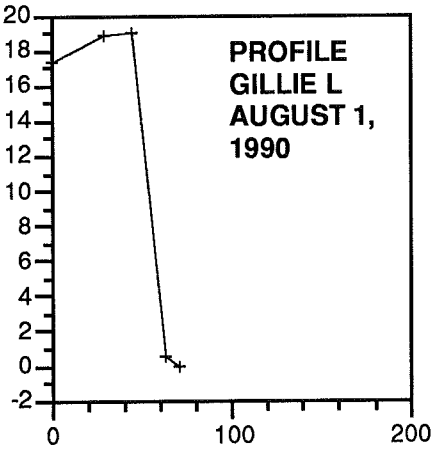
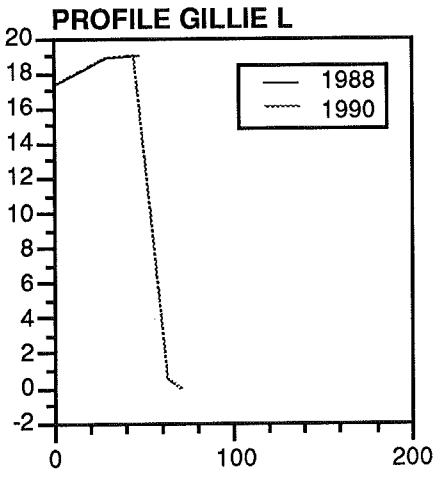

PROFILE GILLIE K
1988
1990
14
12
10
8
6
4
2
0
-2
0
100
200

INFORMATION	DESCRIPTION	DIST.	ELEV.
PROFILE GILLIE K	BACK BM	0	8.0
AUG. 10,1988	FRONT STAKE	34	8.2
BY TAPE	CLIFF EDGE	50	8.3
	BASE OF CLIFF	54	0.4
	WATER LEVEL	66	0.0

INFORMATION	DESCRIPTION	DIST.	ELEV.	EASTING	NORTHING
PROFILE GILLIE K	BACK BM	0.000	8.000	526670.90	7731632.82
AUG. 2,1990	FRONT BM	34.072	8.270	526672.74	7731666.84
PROFILE BEARING 331.7°M	CLIFF EDGE	48.121	8.516	526673.62	7731680.86
	CLIFF BASE	55.432	1.752	526672.76	7731688.12
	WATER LEVEL	66.287	0.871	526672.40	7731698.97


PROFILE
GILLIE L
AUGUST 10,
1988
20
18
16
14
12
10
8
6
4
2
0
-2
0
100
200


PROFILE
GILLIE L
AUGUST 1,
1990
20
18
16
14
12
10
8
6
4
2
0
-2
0
100
200


PROFILE GILLIE L
1988
1990
20
18
16
14
12
10
8
6
4
2
0
-2
0
100
200

INFORMATION	DESCRIPTION	DIST.	ELEV.
PROFILE GILLIE L	BACK BM	0.00	0.00
AUG. 10,1988	FRONT BM	29.50	0.00
MEASURED BY TAPE	CLIFF EDGE	48.20	0.00

INFORMATION	DESCRIPTION	DIST.	ELEV.
PROFILE GILLIE L	BACK BM	0.000	17.381
AUG. 1,1990	FRONT BM	29.485	18.803
PROFILE BEARING 314°M	CLIFF EDGE	45.062	19.090
	CLIFF BASE	63.212	0.606
	WATER LEVEL	70.787	0.000

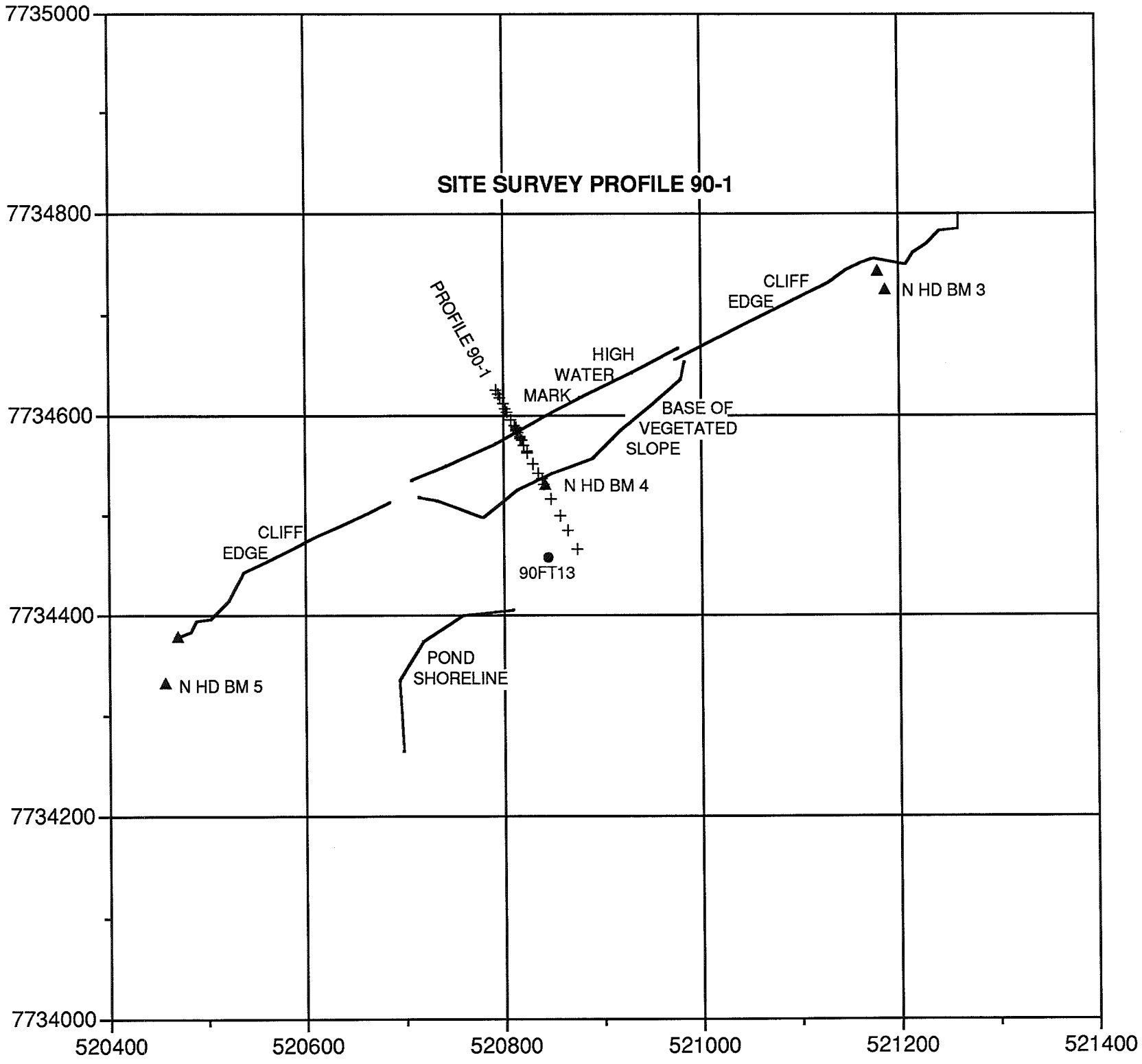
APPENDIX 6

Additional Site Surveys

SITE SURVEYS

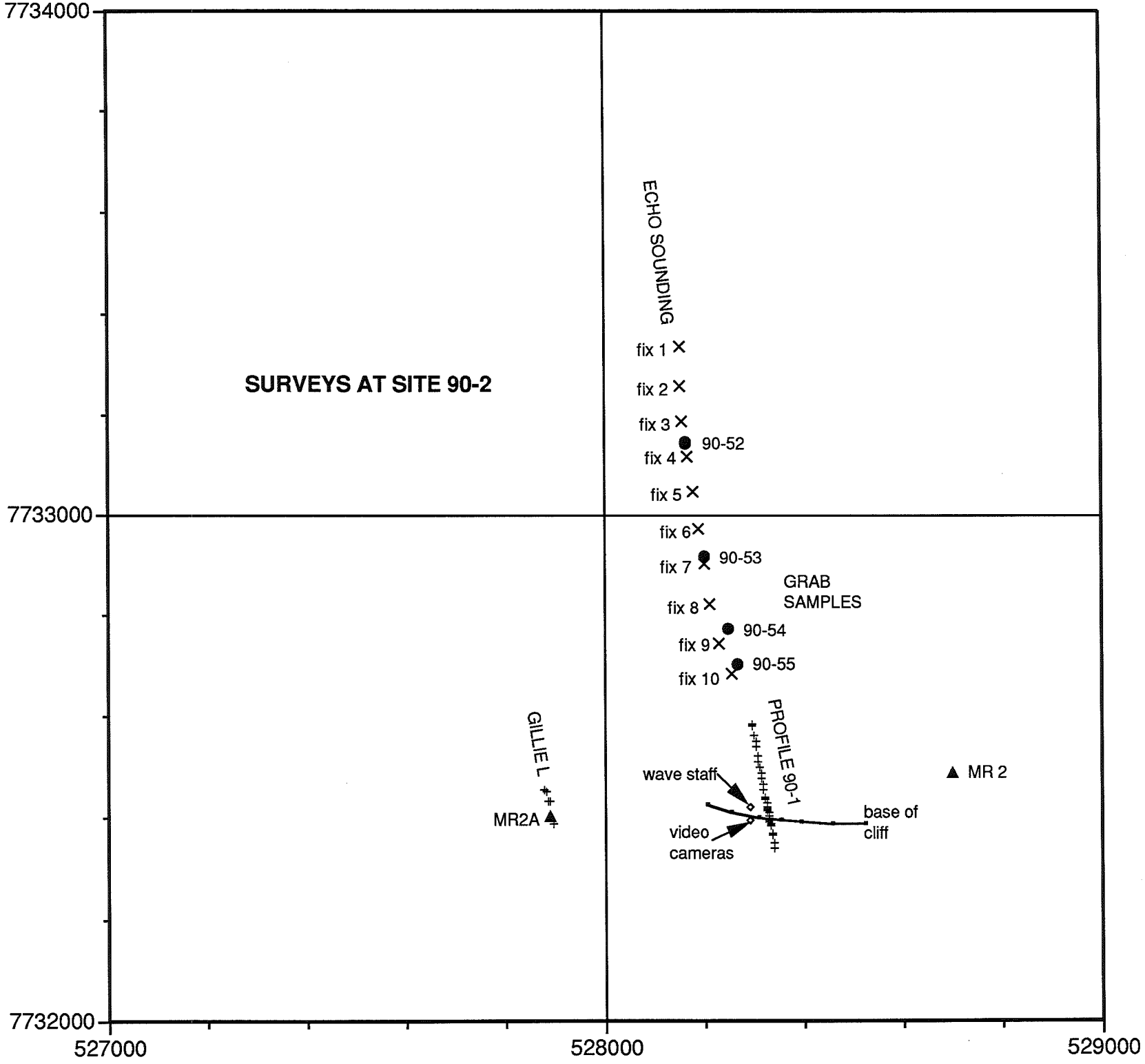
At a number of cliff or beach profile sites additional surveys were carried out to delineate morphologic features such as the cliff edge or spit extent and to tie in other bench marks, navigation stations and instrument locations etc.

These surveys are presented as plots on the UTM grid at various scales and are accompanied by tables of coordinates and elevations.


SITE SURVEY PROFILE 90-1
7735000
7734800
7734600
7734400
7734200
7734000
520400
520600
520800
521000
521200
521400
PROFILE 90-1
HIGH
WATER
MARK
CLIFF
EDGE
N HD BM 3
BASE OF
VEGETATED
SLOPE
N HD BM 4
90FT13
CLIFF
EDGE
N HD BM 5
POND
SHORELINE

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
SITE SURVEY PROFILE 90-1				
PROFILE 90-1 JULY 30	RIDGE TOP	8.50	520874.89	7734465.06
	BM1	7.68	520865.01	7734484.35
	VEG SLP	6.56	520857.82	7734498.71
	VEG SLP	4.58	520849.08	7734515.61
	WOOD STAKE	3.03	520842.07	7734529.18
	N HD BM4	2.88	520841.94	7734529.52
	DRIFTWOOD	2.32	520839.13	7734535.43
	DRIFTWOOD	2.09	520835.44	7734541.73
	DRIFTWOOD	2.46	520831.04	7734550.51
	DRIFTWOOD	1.50	520825.48	7734561.32
	PEBBLE	1.78	520824.12	7734563.99
	BM2	2.01	520821.80	7734568.70
	SAND	1.45	520819.26	7734573.65
	SAND	1.46	520819.21	7734573.78
	SAND	1.36	520817.78	7734576.55
	SAND	1.36	520817.79	7734576.57
	BEACH FACE	1.12	520816.87	7734578.25
	BEACH FACE	0.65	520815.10	7734581.65
	WATER LEVEL	0.29	520813.88	7734584.23
	SAND	0.11	520813.19	7734585.55
	PEBBLE	0.12	520812.75	7734586.63
	PEBBLE	0.12	520811.75	7734588.31
	SAND	-0.05	520808.66	7734594.46
	SAND	-0.07	520804.94	7734601.82
	SAND	0.03	520803.14	7734605.22
	SAND	-0.13	520800.26	7734610.84
	SAND	-0.40	520797.32	7734616.04
	SAND	-0.86	520794.97	7734621.03
	SAND	-1.08	520793.13	7734624.35
BASE OF VEGETATED SLOPE	BASE OF SLOPE	2.64	520716.09	7734516.67
	BASE OF SLOPE	2.50	520734.33	7734513.86
	BASE OF SLOPE	3.53	520779.65	7734496.44
	BASE OF SLOPE	2.24	520815.63	7734524.36
	BASE OF SLOPE	2.31	520850.38	7734540.29
	BASE OF SLOPE	2.39	520891.56	7734555.39
	BASE OF SLOPE	2.17	520919.44	7734584.11
	BASE OF SLOPE	2.53	520951.22	7734609.55
	BASE OF SLOPE	2.84	520979.52	7734634.91
	BASE OF SLOPE	2.86	520983.96	7734652.32
HIGH WATER MARK	HWM	0.64	520707.32	7734534.42
	HWM	0.53	520743.25	7734548.49
	HWM	0.63	520792.82	7734571.41
	HWM	0.56	520839.99	7734595.94
	HWM	0.54	520878.99	7734616.52
	HWM	0.55	520930.44	7734640.75
	HWM	0.57	520975.72	7734664.46

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
EDGE OF ERODING CLIFF	EDGE OF CLIFF	13.19	520466.90	7734375.63
	EDGE OF CLIFF	13.31	520470.29	7734380.42
	EDGE OF CLIFF	13.74	520483.79	7734382.30
	EDGE OF CLIFF	13.55	520488.88	7734392.82
	EDGE OF CLIFF	13.11	520504.44	7734395.20
	EDGE OF CLIFF	11.40	520523.67	7734413.60
	EDGE OF CLIFF	10.34	520537.42	7734441.66
	EDGE OF CLIFF	8.31	520573.12	7734457.08
	EDGE OF CLIFF	7.90	520594.29	7734468.90
	EDGE OF CLIFF	7.62	520612.90	7734478.80
	EDGE OF CLIFF	7.18	520635.35	7734487.74
	EDGE OF CLIFF	6.95	520666.76	7734501.93
	EDGE OF CLIFF	5.17	520685.51	7734511.99
	EDGE OF CLIFF	1.93	520974.72	7734654.25
	EDGE OF CLIFF	3.02	521001.35	7734666.39
	EDGE OF CLIFF	4.55	521019.75	7734675.69
	EDGE OF CLIFF	6.36	521052.99	7734693.21
	EDGE OF CLIFF	8.02	521083.83	7734708.61
	EDGE OF CLIFF	9.06	521109.23	7734721.03
	EDGE OF CLIFF	9.59	521130.57	7734730.04
	EDGE OF CLIFF	10.14	521148.45	7734743.85
	EDGE OF CLIFF	10.91	521164.03	7734750.31
	EDGE OF CLIFF	11.90	521174.21	7734753.82
	EDGE OF CLIFF	12.09	521176.93	7734754.13
	EDGE OF CLIFF	13.99	521207.35	7734749.27
	EDGE OF CLIFF	14.05	521214.86	7734758.91
	EDGE OF CLIFF	14.31	521229.86	7734768.49
	EDGE OF CLIFF	13.87	521242.41	7734782.30
	EDGE OF CLIFF	12.76	521261.24	7734798.63
	EDGE OF CLIFF	13.38	521262.04	7734784.54
SHORE OF POND	POND	3.51	520697.99	7734263.48
	POND	5.29	520695.74	7734334.49
	POND	5.26	520719.83	7734371.88
	POND	5.17	520759.45	7734399.10
	POND	5.20	520809.60	7734403.60
NORTH HEAD CLIFF RECESSION	N HD BM3	12.98	521186.53	7734724.94
BENCH MARKS	N HD BM4	2.90	520842.15	7734529.71
	N HD BM5	13.78	520457.47	7734332.38
MARK NIXON'S FROST TUBE	90FT13NIXON	7.70	520845.24	7734456.58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7733000
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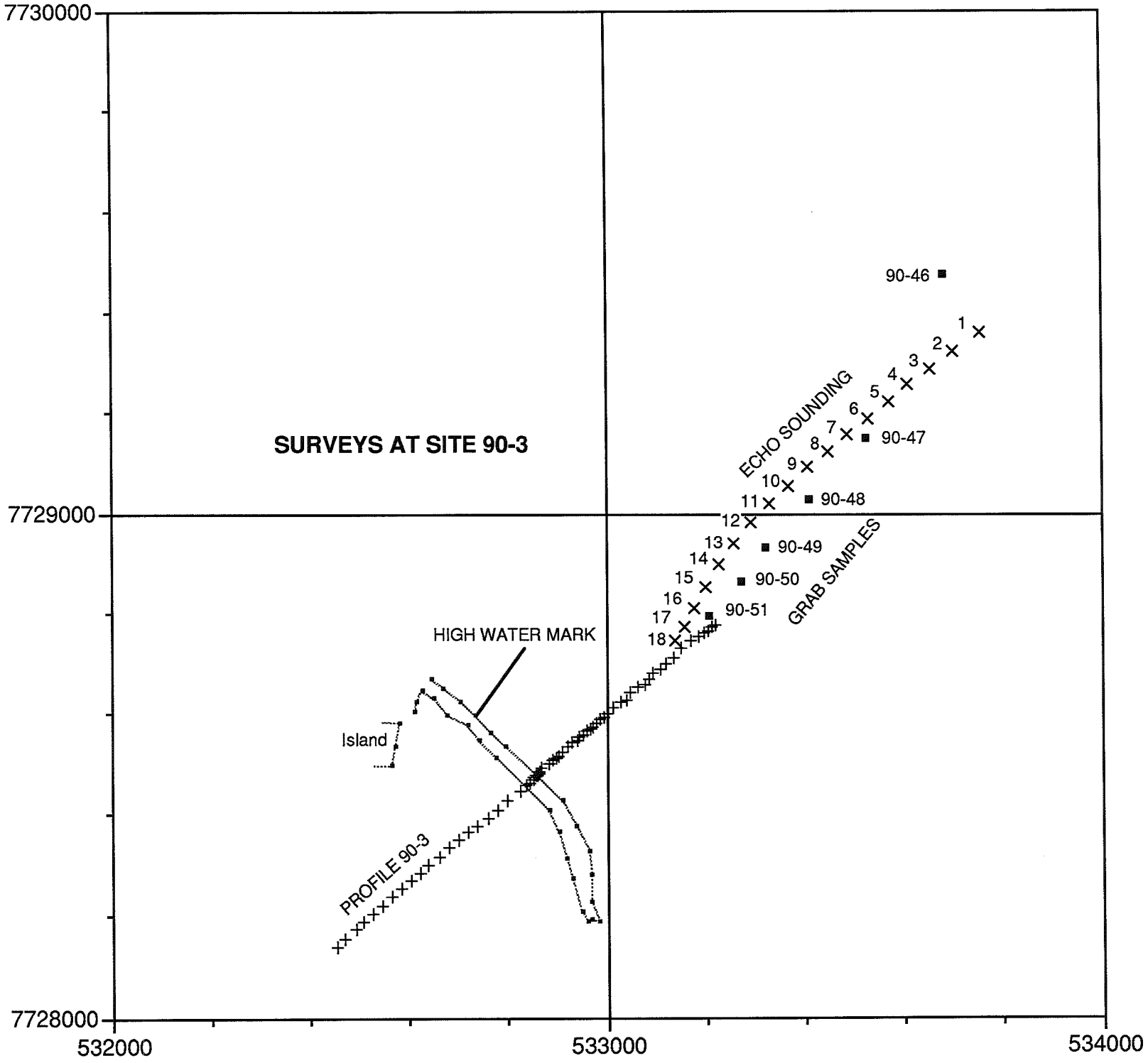
SURVEYS AT SITE 90-2
ECHO SOUNDING
fix 1
fix 2
fix 3
90-52
fix 4
fix 5
fix 6
fix 7
90-53
GRAB
SAMPLES
fix 8
90-54
fix 9
90-55
fix 10
PROFILE 90-1
GILLIE L
MR2A
wave staff
video
cameras
base of
cliff
MR 2

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
SURVEYS AT SITE 90-2				
PROFILE 90-1	VEG CLIFF	13.41	528341.48	7732335.83
	VEG CLIFF	12.12	528339.11	7732348.61
	VEG CLIFF	9.71	528336.77	7732361.69
	BM1	8.89	528335.73	7732367.01
	VEG CLIFF	5.51	528332.86	7732381.76
	VEG CLIFF	4.45	528332.09	7732385.89
	VEG CLIFF	3.92	528331.37	7732389.98
	VEG CLIFF	3.46	528331.21	7732391.47
	VEG CLIFF	2.62	528331.01	7732392.63
	BASE CLIFF	1.80	528330.90	7732393.05
	BM2	1.53	528330.67	7732394.55
	PRODUNE	1.53	528330.41	7732395.73
	PRODUNE	1.58	528330.38	7732395.94
	PRODUNE	1.49	528330.34	7732396.16
	SAND	1.28	528329.70	7732399.72
	DRIFTWOOD	1.11	528329.16	7732402.11
	SAND	1.13	528327.93	7732409.51
	BM3	1.13	528327.62	7732411.16
	HIGH WATER MARK	0.94	528327.18	7732413.68
	MID BEACH FACE	0.63	528326.61	7732416.55
	PEBBLE,SAND	0.47	528326.32	7732418.10
	WATER LEVEL	0.32	528326.12	7732419.31
	RUNNEL	0.11	528324.67	7732427.31
	RIDGE	0.25	528323.39	7732433.63
	RIDGE	0.28	528322.78	7732437.28
	IN WATER	-0.01	528319.99	7732451.43
	IN WATER	-0.23	528317.87	7732462.86
	IN WATER	-0.24	528315.55	7732475.54
	IN WATER	-0.15	528313.26	7732486.36
	IN WATER	-0.21	528311.21	7732497.61
	IN WATER	-0.40	528309.22	7732509.32
	IN WATER	-0.70	528307.54	7732519.26
	IN WATER	-0.78	528303.40	7732536.39
	IN WATER	-0.81	528302.17	7732548.18
	IN WATER	-0.61	528300.68	7732557.89
	IN WATER	-0.83	528296.53	7732577.47
	IN WATER	-1.02	528295.05	7732581.88
	VIDEO CAMERAS	8.49	528291.61	7732391.32
	WAVE POLE	0.75	528293.04	7732417.97
BASE OF CLIFF	CLIFF BASE	1.91	528208.39	7732422.24
	CLIFF BASE	2.12	528255.99	7732406.36
	CLIFF BASE	1.81	528310.77	7732396.14
	CLIFF BASE	1.61	528354.82	7732393.42
	CLIFF BASE	2.22	528396.52	7732388.64
	CLIFF BASE	2.16	528459.21	7732384.81
	CLIFF BASE	2.01	528524.53	7732384.08

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
BEACH HIGH WATER MARK	HWM	0.77	528522.23	7732399.62
	HWM	0.74	528452.41	7732412.19
	HWM	0.65	528396.94	7732414.76
	HWM	0.62	528337.33	7732416.48
	HWM	0.62	528295.00	7732419.62
	HWM	0.63	528257.01	7732425.92
	HWM	0.61	528206.33	7732435.36
PROFILE GILLIE L	BACK BM	17.73	527894.96	7732385.06
	FRONT BM	19.15	527888.53	7732429.93
	CLIFF EDGE	19.44	527886.83	7732429.51
	CLIFF BASE	0.95	527881.53	7732446.92
	WATER LEVEL	0.35	527878.86	7732453.40
MINI-RANGER STATIONS	MR2A	19.29	527888.90	7732402.00
	MR2	23.69	528700.00	7732485.00
ECHO SOUNDING SURVEY	FIX1		528152.25	7733332.36
	FIX2		528152.39	7733257.31
	FIX3		528154.18	7733184.23
	FIX4		528167.69	7733113.79
	FIX5		528176.32	7733043.33
	FIX6		528189.98	7732971.88
	FIX7		528199.67	7732899.42
	FIX8		528212.08	7732820.11
	FIX9		528228.92	7732742.40
	FIX10		528256.24	7732682.01
GRAB SAMPLES	G90.52		528161.99	7733142.61
	G90.52.1		528161.89	7733143.35
	G90.52.2		528161.97	7733143.14
	G90.53		528199.51	7732916.19
	G90.54		528249.00	7732770.22
	G90.55		528265.73	7732700.35


7730000
7729000
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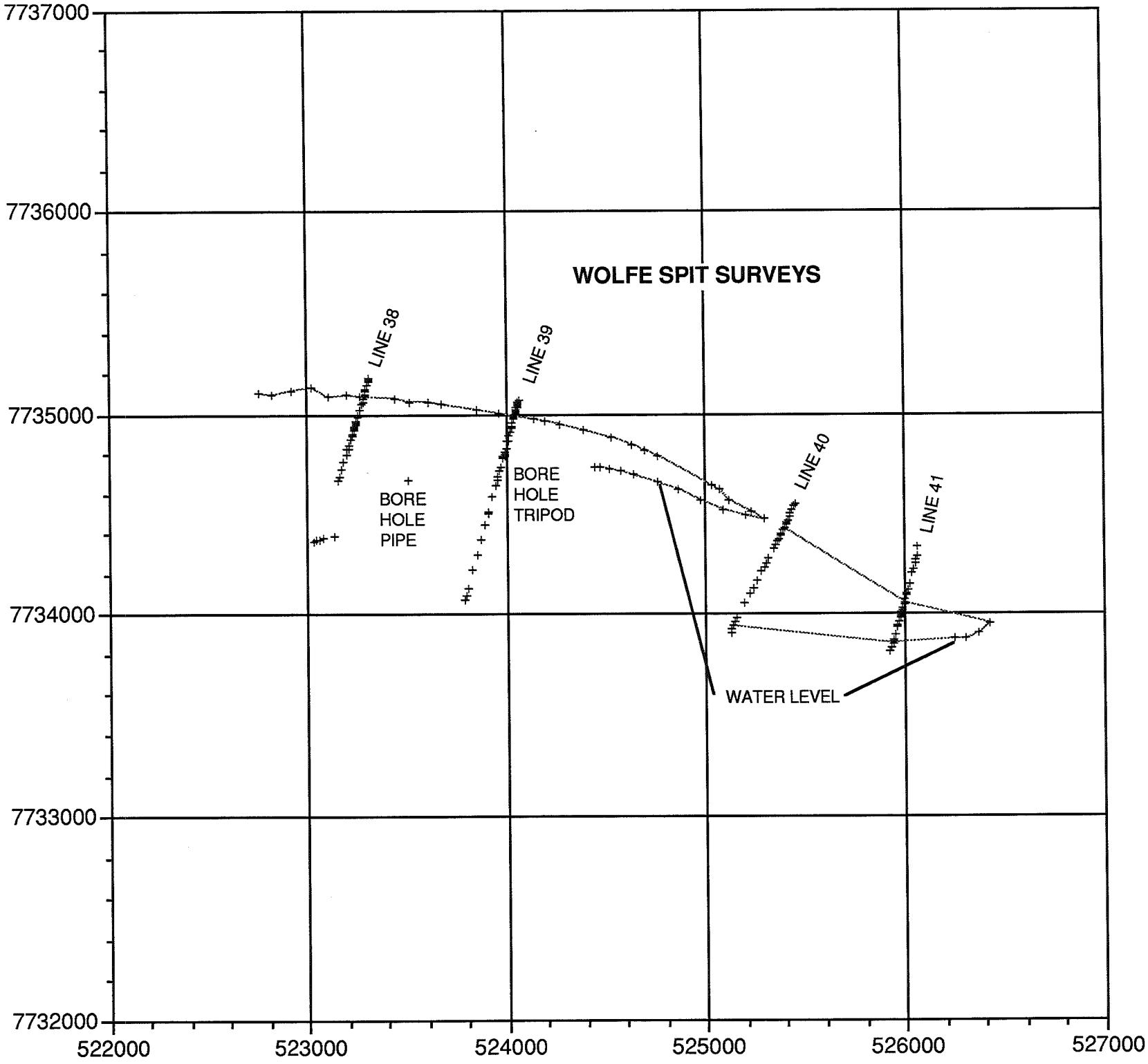
SURVEYS AT SITE 90-3
ECHO SOUNDING
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
90-46
90-47
90-48
90-49
90-50
90-51
GRAB SAMPLES
HIGH WATER MARK
Island
PROFILE 90-3

INFORMATION	DESCRIPTION	EASTING	NORTHING	ELEV
SURVEYS AT SITE 90-3				
ECHO SOUNDING FIX NO.'S	1	533753.21	7729360.64	
	2	533700.23	7729323.91	
	3	533656.72	7729288.55	
	4	533610.43	7729258.67	
	5	533571.67	7729223.88	
	6	533530.16	7729190.02	
	7	533485.29	7729158.17	
	8	533447.33	7729123.81	
	9	533406.16	7729090.53	
	10	533368.56	7729054.52	
	11	533330.26	7729019.05	
	12	533291.49	7728979.91	
	13	533257.91	7728938.49	
	14	533225.76	7728896.90	
	15	533198.91	7728852.85	
	16	533175.00	7728809.60	
	17	533156.08	7728769.66	
	18	533138.85	7728742.00	
GRAB SAMPLES	G90.46	533662.67	7729475.07	
	G90.47	533524.25	7729149.73	
	G90.48	533409.70	7729028.05	
	G90.49	533322.36	7728930.09	
	G90.50	533271.59	7728863.51	
	G90.51	533206.42	7728793.08	

INFORMATION	DESCRIPTION	EASTING	NORTHING	ELEV
SPIT SURVEY	ISLAND	532567.17	7728496.53	1.37
	ISLAND	532573.40	7728532.27	1.78
	ISLAND	532582.80	7728578.07	1.66
	CURVE OF SPIT	532613.08	7728600.48	0.33
	CURVE OF SPIT	532617.72	7728622.41	0.41
	HIGH WATER MARK	532628.87	7728643.48	0.34
	HIGH WATER MARK	532647.37	7728666.22	0.75
	HIGH WATER MARK	532669.85	7728648.74	0.79
	HIGH WATER MARK	532652.40	7728628.35	0.53
	HIGH WATER MARK	532676.81	7728595.83	0.55
	HIGH WATER MARK	532705.52	7728620.58	0.73
	HIGH WATER MARK	532734.99	7728593.76	0.72
	HIGH WATER MARK	532718.13	7728575.06	0.53
	HIGH WATER MARK	532744.54	7728542.86	0.44
	HIGH WATER MARK	532764.50	7728561.12	0.63
	HIGH WATER MARK	532797.26	7728533.20	0.71
	HIGH WATER MARK	532778.31	7728509.21	0.43
	HIGH WATER MARK	532838.55	7728456.34	0.48
	HIGH WATER MARK	532863.75	7728477.22	0.62
	HIGH WATER MARK	532912.09	7728423.98	0.54
	HIGH WATER MARK	532886.03	7728407.00	0.63
	HIGH WATER MARK	532902.44	7728364.19	0.63
	HIGH WATER MARK	532938.95	7728377.84	0.62
	HIGH WATER MARK	532964.10	7728326.59	0.45
	HIGH WATER MARK	532920.52	7728311.22	0.69
	HIGH WATER MARK	532930.62	7728273.44	0.67
	HIGH WATER MARK	532970.23	7728280.22	0.64
	HIGH WATER MARK	532969.86	7728228.29	0.67
	HIGH WATER MARK	532951.25	7728207.13	0.58
	HIGH WATER MARK	532962.71	7728189.63	0.56
	HIGH WATER MARK	532985.36	7728187.62	0.47
	HIGH WATER MARK	532967.43	7728193.12	0.55

INFORMATION	DESCRIPTION	EASTING	NORTHING	ELEV
PROFILE 90-3	IN LAGOON	532451.73	7728138.49	-0.84
	IN LAGOON	532470.54	7728155.43	-0.74
	IN LAGOON	532491.34	7728174.48	-0.69
	IN LAGOON	532508.95	7728189.70	-0.64
	IN LAGOON	532526.78	7728204.85	-0.56
	IN LAGOON	532545.91	7728220.24	-0.54
	IN LAGOON	532565.11	7728236.64	-0.39
	IN LAGOON	532583.51	7728252.23	-0.36
	IN LAGOON	532601.84	7728268.86	-0.27
	IN LAGOON	532620.57	7728284.15	-0.26
	IN LAGOON	532639.31	7728299.84	-0.27
	IN LAGOON	532658.72	7728316.46	-0.24
	IN LAGOON	532678.83	7728332.99	-0.22
	IN LAGOON	532698.37	7728349.03	-0.25
	IN LAGOON	532717.81	7728364.80	-0.30
	IN LAGOON	532738.50	7728377.19	-0.23
	IN LAGOON	532759.79	7728390.86	-0.21
	IN LAGOON	532779.05	7728407.10	-0.17
	IN LAGOON	532799.57	7728424.57	-0.13
	WATER LEVEL LAGOON	532823.61	7728443.83	0.10
	HIGH WATER LINE	532838.53	7728456.26	0.48
	BM1	532842.54	7728459.68	1.00
	SWASH	532843.48	7728460.49	0.97
	BACK BEACH	532853.58	7728467.42	1.03
	BM2	532851.86	7728470.00	1.02
	BM3	532855.00	7728474.11	1.13
	BEACH FACE	532859.98	7728476.98	0.67
	BEACH FACE	532863.46	7728478.38	0.38
	BEACH FACE	532865.14	7728481.61	0.33
	BEACH FACE	532868.94	7728492.23	0.21
	BEACH FACE	532881.77	7728499.17	0.18
	BEACH FACE	532890.19	7728506.18	0.19
	WATER LEVEL	532898.83	7728508.45	0.16
	IN WATER	532901.63	7728515.22	-0.01
	IN WATER	532909.85	7728523.20	-0.08
	IN WATER	532919.70	7728531.24	-0.03
	IN WATER	532929.52	7728540.47	-0.05
	IN WATER	532940.76	7728544.56	-0.14
	IN WATER	532945.75	7728550.76	-0.14
	IN WATER	532953.37	7728554.77	0.02
	IN WATER	532958.37	7728562.57	-0.09
	IN WATER	532967.32	7728566.08	-0.09
	IN WATER	532971.97	7728571.16	0.04
	IN WATER	532977.28	7728578.13	-0.20
	IN WATER	532985.61	7728585.32	-0.11
	IN WATER	532994.84	7728589.93	-0.11
	IN WATER	533001.07	7728598.48	-0.39
	IN WATER	533011.19	7728611.24	-0.58
	IN WATER	533026.70	7728620.14	-0.53
	IN WATER	533039.25	7728626.34	-0.37
	IN WATER	533048.73	7728640.77	-0.30
	IN WATER	533063.77	7728650.32	-0.22

INFORMATION	DESCRIPTION	EASTING	NORTHING	ELEV
	IN WATER	533076.20	7728656.75	-0.34
	IN WATER	533085.64	7728666.56	-0.55
	IN WATER	533094.74	7728679.51	-0.61
	IN WATER	533109.66	7728685.57	-0.54
	IN WATER	533119.98	7728697.71	-0.45
	IN WATER	533136.77	7728709.61	-0.44
	IN WATER	533152.30	7728727.19	-0.51
	IN WATER	533170.76	7728742.52	-0.72
	IN WATER	533186.38	7728750.72	-0.77
	IN WATER	533196.69	7728759.61	-0.65
	IN WATER	533205.51	7728764.81	-0.41
	IN WATER	533212.18	7728770.76	-0.58
	IN WATER	533219.85	7728774.59	-0.76


WOLFE SPIT SURVEYS
LINE 38
LINE 39
LINE 40
LINE 41
BORE HOLE PIPE
BORE HOLE TRIPOD
WATER LEVEL
7737000
7736000
7735000
7734000
7733000
7732000
522000
523000
524000
525000
526000
527000

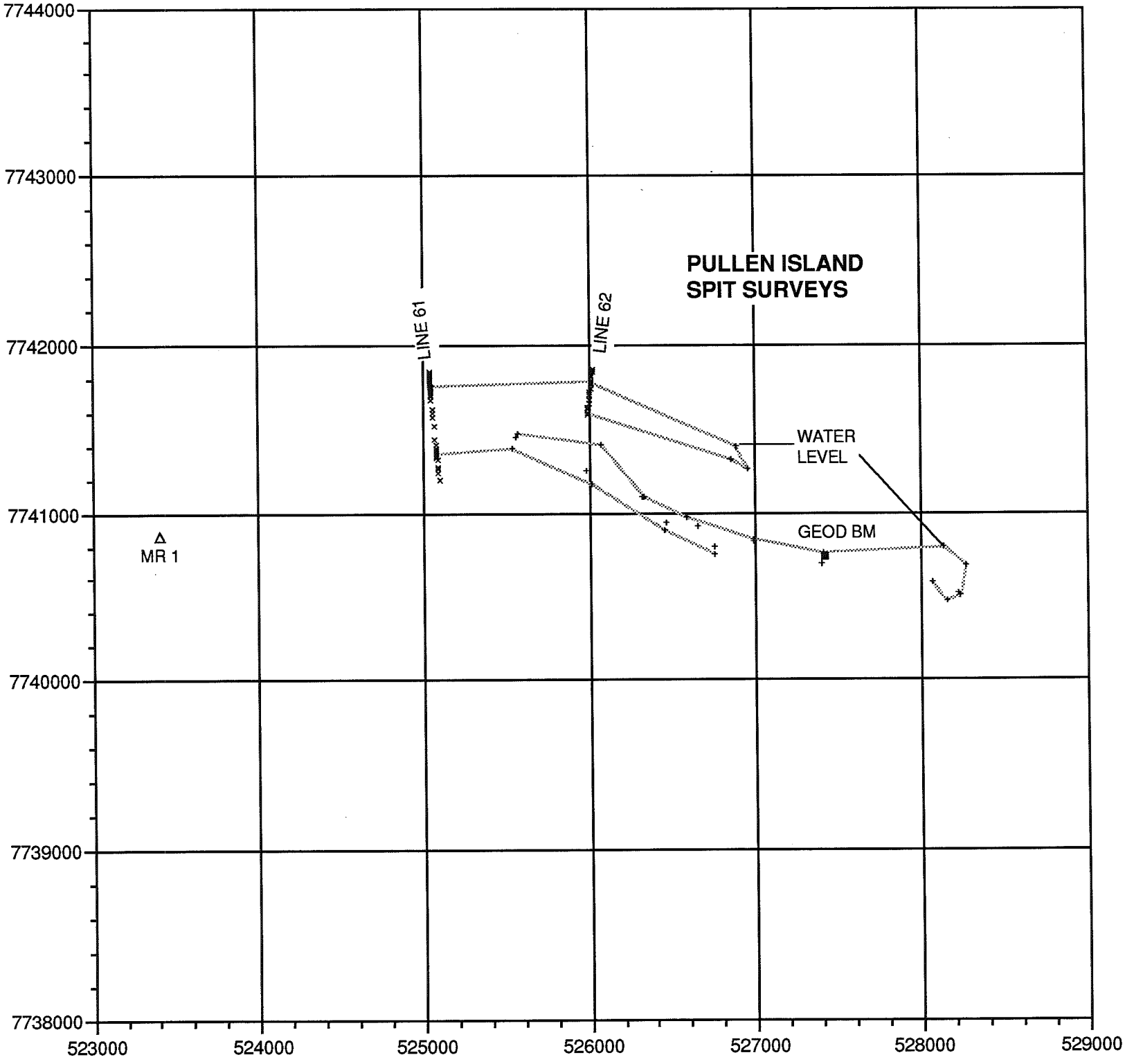
INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
WOLFE SPIT SURVEYS				
WATER LEVELS	WATER LEVEL	0.25	522750.80	7735109.10
	WATER LEVEL	0.29	522820.05	7735096.16
	WATER LEVEL	0.31	522921.88	7735111.57
	WATER LEVEL	0.35	523020.60	7735132.71
	WATER LEVEL	0.39	523109.09	7735087.29
	WATER LEVEL	0.42	523195.06	7735096.39
	WATER LEVEL	0.39	523268.89	7735090.49
	WATER LEVEL	0.35	523444.20	7735073.65
	WATER LEVEL	0.40	523512.46	7735062.77
	WATER LEVEL	0.41	523605.74	7735057.21
	WATER LEVEL	0.45	523674.89	7735049.01
	WATER LEVEL	0.48	523846.92	7735020.24
	WATER LEVEL	0.46	523960.56	7735002.49
	WATER LEVEL	0.45	524038.39	7734990.59
	WATER LEVEL	0.43	524133.83	7734971.61
	WATER LEVEL	0.44	524196.76	7734962.05
	WATER LEVEL	0.41	524272.16	7734947.10
	WATER LEVEL	0.39	524388.04	7734922.20
	WATER LEVEL	0.40	524531.58	7734878.29
	WATER LEVEL	0.25	524630.08	7734840.39
	WATER LEVEL	0.32	524691.57	7734814.94
	WATER LEVEL	0.35	524760.78	7734788.38
	WATER LEVEL	0.35	525027.71	7734643.85
	WATER LEVEL	0.29	525064.53	7734624.13
	WATER LEVEL	0.33	525115.08	7734569.26
	WATER LEVEL	0.29	525222.98	7734509.38
	WATER LEVEL	0.25	525200.40	7734490.39
	WATER LEVEL	0.38	525083.87	7734523.80
	WATER LEVEL	0.39	524975.46	7734563.80
	WATER LEVEL	0.44	524860.19	7734618.21
	WATER LEVEL	0.50	524757.35	7734659.49
	WATER LEVEL	0.55	524637.54	7734700.06
	WATER LEVEL	0.49	524577.55	7734716.13
	WATER LEVEL	0.46	524517.89	7734720.19
	WATER LEVEL	0.43	524471.24	7734729.20
	WATER LEVEL	0.45	524447.26	7734738.11
	END SPIT WL	-0.01	526246.99	7733881.12
	END OF SPIT WL	-0.01	526247.00	7733881.15
	END OF SPIT WL	0.15	526305.28	7733882.03
	END OF SPIT WL	0.14	526368.42	7733904.61
	END OF SPIT WL	0.13	526424.31	7733954.95
BORE HOLE PIPE	BORE HOLE	2.01	523504.32	7734665.47
SAND BARS	START SAND BARS	-0.13	525292.28	7734473.16

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
PROFILE 90-38	BASE OF SLOPE	1.42	523032.79	7734364.09
	WATER LEVEL POND	1.03	523042.11	7734368.20
	IN POND	0.01	523061.76	7734374.47
	IN POND	-0.10	523080.04	7734379.40
	IN POND	0.22	523130.55	7734394.03
	IN POND	0.63	523151.40	7734666.19
	IN POND	0.42	523157.84	7734682.64
	IN POND	0.43	523173.63	7734722.50
	WATER LEVEL POND	0.73	523184.92	7734763.99
	MUD	0.93	523195.46	7734798.40
	BEACH	1.31	523203.60	7734825.60
	DRIFTWOOD	1.45	523205.63	7734829.39
	DRIFTWOOD	1.39	523212.00	7734849.54
	SAND	1.38	523218.65	7734873.08
	MUD	1.34	523225.41	7734894.10
	MUD	1.29	523225.49	7734894.02
	SAND	1.22	523228.69	7734904.59
	DRIFTWOOD	1.50	523233.04	7734920.03
	DRIFTWOOD	1.75	523237.69	7734933.06
	DRIFTWOOD	2.02	523238.00	7734934.17
	DRIFTWOOD	1.68	523238.45	7734935.45
	SAND	1.63	523239.17	7734937.65
	HIGH WATER MARK	1.20	523241.94	7734945.81
	MUD	0.84	523242.80	7734949.49
	LAGOON	0.48	523244.42	7734955.32
	LAGOON	0.39	523249.18	7734970.28
	EDGE LAGOON	0.47	523254.76	7734988.17
	BACK BEACH	0.48	523256.56	7734991.86
	SAND	0.66	523256.76	7734992.11
	MID BEACH	0.70	523266.08	7735022.76
	BERM	0.73	523274.96	7735051.34
	SAND	0.79	523274.97	7735051.47
	SAND	0.82	523278.43	7735060.31
	BERM	0.58	523283.49	7735079.91
	BERM	0.65	523283.79	7735080.37
	BERM	0.88	523285.21	7735082.37
	BERM	0.64	523285.56	7735083.39
	SAND	0.64	523285.75	7735083.91
	SAND	0.37	523286.59	7735087.92
	SAND	0.47	523287.05	7735089.38
	WATER LEVEL	0.17	523289.50	7735095.64
	SAND	0.44	523293.99	7735113.05
	SAND	-0.20	523295.15	7735119.75
	SAND	-0.19	523296.57	7735122.65
	SAND	-0.31	523301.41	7735137.82
	SAND	-0.16	523304.49	7735145.70
	SAND	-0.42	523308.62	7735161.68
	SAND	-0.63	523310.90	7735172.83
	SAND	-1.07	523313.71	7735180.64

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
PROFILE 90-39	BASE VEG SLOPE	1.37	523785.50	7734076.33
	VEG	0.65	523791.39	7734096.72
	VEG	0.85	523800.14	7734128.88
	SAND	0.86	523826.09	7734224.02
	SAND	0.87	523845.68	7734294.26
	SAND	0.87	523866.33	7734370.25
	SAND	0.96	523886.73	7734443.21
	SAND	1.04	523901.40	7734497.82
	SAND	1.10	523904.78	7734509.96
	SAND	1.15	523925.94	7734585.78
	SAND	1.18	523941.88	7734643.53
	BOREHOLE TRIPOD	0.98	523949.87	7734672.21
	SAND	0.86	523955.26	7734690.28
	SAND	0.79	523962.95	7734716.53
	MUD	0.74	523969.53	7734737.94
	MUD	0.65	523981.19	7734775.67
	MUD	0.63	523984.50	7734787.82
	MUD	0.56	523985.13	7734789.90
	MUD	0.63	523988.35	7734802.37
	MUD	0.58	523990.50	7734810.60
	MUD	0.63	523995.04	7734829.08
	MUD	0.62	524002.71	7734861.39
	MUD	0.75	524004.11	7734866.25
	SAND	0.97	524004.42	7734867.49
	SAND	0.85	524009.77	7734887.49
	SAND	0.75	524015.61	7734908.97
	SAND	0.58	524022.43	7734933.26
	SAND	0.67	524024.14	7734938.64
	SAND	0.78	524024.19	7734938.79
	SAND	0.51	524030.20	7734960.23
	RUNNEL	0.32	524034.86	7734977.55
	RUNNEL	0.35	524035.61	7734980.71
	RUNNEL WATER LEVEL	0.51	524036.05	7734982.03
	RUNNEL WATER LEVEL	0.55	524036.74	7734984.74
	RIDGE	0.63	524036.77	7734984.82
	BERM	0.57	524037.75	7734988.37
	WATER LEVEL	0.49	524038.67	7734990.84
	SAND	0.24	524041.77	7735002.47
	SAND	-0.02	524044.51	7735010.60
	SAND	-0.23	524046.38	7735020.50
	SAND	-0.29	524049.39	7735029.50
	SAND	-0.54	524050.74	7735034.93
	SAND	-0.10	524053.35	7735043.42
	SAND	-0.10	524055.00	7735049.98
	SAND	-0.48	524058.49	7735061.93
	SAND	-0.83	524060.56	7735069.02

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
PROFILE 90-40	IN LAGOON	-0.25	525120.13	7733910.44
	WATER LEVEL LAGOON	-0.31	525123.93	7733921.51
	WATER LEVEL LAGOON	-0.28	525133.33	7733945.39
	WATER LEVEL LAGOON	-0.18	525141.07	7733961.91
	MUD	-0.15	525150.58	7733980.44
	MUD	-0.08	525188.41	7734052.83
	MUD	0.24	525216.58	7734103.45
	HIGHER	0.23	525232.30	7734132.49
	DRY MUD	0.23	525248.54	7734164.12
	DRY MUD	0.24	525275.64	7734213.94
	LOWER	0.08	525287.48	7734234.98
	MUD	0.15	525296.27	7734250.97
	MUD	0.13	525296.23	7734250.84
	SAND	0.13	525312.42	7734282.10
	SAND	0.10	525336.92	7734327.45
	SAND	0.22	525343.76	7734338.64
	SAND	0.35	525359.29	7734365.18
	SAND	0.37	525365.30	7734375.12
	LOWER	0.24	525371.74	7734387.86
	SAND	0.29	525377.26	7734402.57
	SAND	0.08	525382.97	7734413.35
	SAND	0.18	525385.97	7734419.26
	HIGHER	0.21	525387.06	7734421.23
	HIGHER	0.24	525389.33	7734424.95
	WATER LEVEL	0.15	525391.97	7734429.90
	SAND	-0.04	525398.58	7734442.80
	SAND	-0.18	525403.45	7734451.21
	SAND	-0.28	525410.35	7734464.91
	SAND	-0.30	525416.02	7734480.08
	SAND	-0.87	525420.95	7734496.65
	SAND	-0.75	525431.04	7734518.95
	SAND	-0.99	525439.61	7734535.53
	SAND	-1.37	525446.04	7734547.13

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
PROFILE 90-41	IN LAGOON	-0.28	525924.61	7733808.84
	IN LAGOON	-0.28	525930.95	7733830.48
	IN LAGOON	0.31	525937.36	7733852.87
	WATER LEVEL LAGOON	0.45	525938.90	7733859.02
	SAND	0.51	525940.97	7733866.58
	SAND	0.46	525942.56	7733871.21
	FLAT	0.47	525950.33	7733899.85
	FLAT	0.44	525959.24	7733930.01
	HIGHER	0.43	525962.98	7733944.38
	LOWER	0.37	525968.33	7733961.81
	SAND FLAT	0.35	525974.91	7733985.00
	SAND FLAT	0.37	525977.07	7733991.52
	SAND	0.37	525978.96	7733998.88
	SAND	0.35	525981.46	7734007.75
	SAND	0.40	525984.14	7734017.48
	SAND	0.33	525987.14	7734027.88
	SAND	0.39	525992.77	7734047.99
	SAND	0.44	525995.62	7734057.44
	SAND	0.35	525999.62	7734071.07
	WATER LEVEL	0.29	526004.61	7734088.45
	SAND	0.13	526009.53	7734103.76
	SAND	0.26	526012.73	7734115.63
	SAND	0.24	526021.59	7734147.93
	SAND	-0.25	526037.98	7734203.53
	SAND	0.05	526043.19	7734223.93
	SAND	-0.25	526050.22	7734248.46
	SAND	-0.58	526054.34	7734272.08
	SAND	-0.47	526058.76	7734290.77
	SAND	-0.83	526062.09	7734331.63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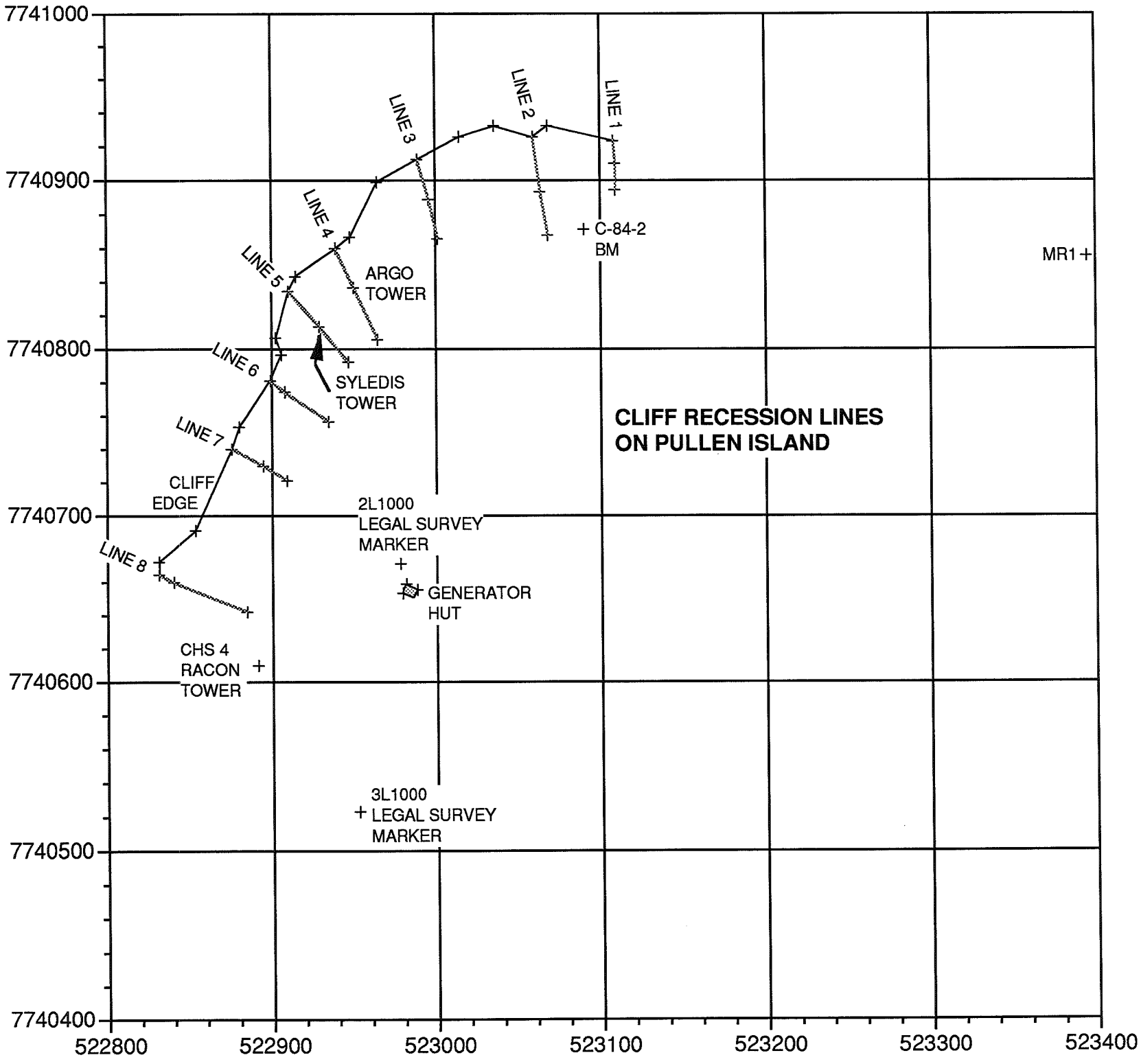
PULLEN ISLAND
SPIT SURVEYS
LINE 61
LINE 62
WATER
LEVEL
GEOD BM
MR 1

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
PULLEN ISLAND	MR1	13.6	523395.21	7740854.99
SPIT SURVEYS	WATER LEVEL SPIT END		526954.17	7741256.94
	WATER LEVEL SPIT END		526848.76	7741311.82
	WATER LEVEL SPIT END		526880.17	7741394.35
	WATER LEVEL SPIT END		528234.03	7740502.49
	TOP OF BERM		528224.87	7740509.02
	SOUTH CORNER WL		528159.51	7740470.86
	WATER LEVEL NECK		528064.53	7740575.00
	N SIDE NECK		528134.03	7740792.94
	N SIDE CORNER		528265.42	7740680.17
	WATER LEVEL TROUGH		526009.45	7741165.79
	WATER LEVEL TROUGH		525538.69	7741382.68
	HIGH WATER MARK		526463.44	7740939.66
	WATER LEVEL		526448.37	7740885.80
	HWM TURN OF SPIT		526748.29	7740786.09
	WATER LEVEL		526753.95	7740742.38
	HIGH WATER MARK		527400.39	7740693.21
	HIGH WATER MARK		527411.67	7740744.65
	WATER LEVEL		527411.39	7740756.56
	HWM		526981.55	7740819.96
	WATER LEVEL		526984.47	7740830.32
	HWM TRF		526644.67	7740913.60
	WATER LEVEL TROUGH		526578.60	7740965.91
	HIGH WATER MARK		526317.33	7741089.64
	WATER LEVEL		526321.06	7741095.25
	WLTRANSVERSE BAR		526069.63	7741405.42
	HIGH WATER MARK		525979.56	7741243.55
	HIGH WATER MARK		525558.58	7741446.52
	WATER LEVEL		525566.46	7741473.34
	GEOD BM 859042		527411.36	7740736.63
PROFILE 90-61	IN WATER	-1.1	525025.66	7741832.93
	IN WATER	-0.8	525027.08	7741826.37
	IN WATER	-0.9	525027.85	7741817.32
	IN WATER	-0.9	525028.72	7741807.14
	IN WATER	-1.0	525029.58	7741795.05
	IN WATER	-1.2	525030.75	7741789.35
	IN WATER	-1.0	525031.42	7741778.40
	IN WATER	-0.7	525032.85	7741769.11
	IN WATER	-0.4	525033.05	7741764.28
	IN WATER	-0.2	525033.82	7741756.09
	WATER LEVEL	0.0	525034.59	7741747.02
	BERM CREST	0.5	525035.27	7741744.00
	WL SMALL TROUGH	0.3	525036.02	7741737.23
	CENTRE OF TROUGH	0.0	525036.06	7741735.04
	EDGE TROUGH	0.3	525036.40	7741732.48
	BEACH FACE	0.7	525037.04	7741727.96
	CREST BM1	1.2	525037.42	7741722.05

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
	TROUGH	1.1	525038.47	7741716.31
	MUD	1.1	525038.49	7741711.32
	EDGE MUD	1.2	525039.51	7741705.59
	SAND	1.3	525040.22	7741694.05
	BM2	1.3	525043.04	7741668.08
	SAND	1.1	525047.98	7741621.00
	MUD	1.1	525051.33	7741589.78
	BM3	0.8	525053.73	7741567.27
	MUD	0.6	525058.98	7741516.43
	MUD	0.3	525067.05	7741439.89
	HIGH WATER MARK	0.2	525070.97	7741400.87
	SMALL BAR	0.1	525073.18	7741378.25
	SMALL TROUGH	0.1	525074.35	7741369.01
	OBLIQUE BAR	0.1	525075.77	7741356.39
	CHANGE OF SLOPE	0.0	525075.59	7741356.77
	WATER LEVEL	0.0	525076.72	7741346.71
	TROUGH	-0.1	525077.46	7741339.20
	WATER LEVEL LAGOON	0.0	525078.16	7741334.69
	BAR	0.0	525078.02	7741333.04
	WATER LEVEL LAGOON	0.0	525078.27	7741330.99
	WATER LEVEL LAGOON	0.0	525077.99	7741331.60
	IN LAGOON	-0.1	525080.43	7741308.93
	IN LAGOON	-0.2	525084.27	7741272.97
	IN LAGOON	-0.3	525085.02	7741264.79
	IN LAGOON	-0.5	525085.85	7741258.21
	IN LAGOON	-0.7	525088.19	7741237.09
	IN LAGOON	-0.6	525092.69	7741191.93
PROFILE 90-62	IN WATER	-1.1	526019.14	7741849.87
	IN WATER	-1.1	526017.75	7741850.14
	IN WATER	-0.9	526016.95	7741843.57
	IN WATER	-0.4	526015.89	7741835.09
	IN WATER	-0.1	526013.73	7741813.60
	IN WATER	0.0	526013.20	7741807.76
	WATER LEVEL	0.0	526012.72	7741805.34
	BAR CREST	0.5	526012.31	7741800.91
	BASE OF BEACH	0.2	526011.43	7741785.37
	HIGH WATER MARK	0.8	526008.74	7741779.43
	GRAVEL	0.9	526008.24	7741776.90
	GRAVEL	0.8	526008.00	7741776.14
	GRAVEL	0.9	526009.71	7741775.66
	GRAVEL	1.1	526009.49	7741772.91
	BM1	1.2	526009.17	7741769.75
	SAND	1.1	526007.98	7741761.61
	SAND	1.1	526007.44	7741756.74
	SAND	1.3	526005.62	7741737.41
	BM2	1.2	526003.06	7741714.04
	MUD	1.0	526002.15	7741707.32

INFORMATION	DESCRIPTION	ELEV	EASTING	NORTHING
	MUD	0.8	525998.06	7741671.02
	MUD	0.7	525995.50	7741644.86
	BM3	0.7	525993.07	7741623.59
	CHANGE IN SLOPE	0.5	525992.39	7741616.61
	AOELIAN SAND	0.3	525990.10	7741596.23
	WATER LEVEL	0.1	525988.63	7741584.56
	IN WATER	-0.2	525987.69	7741583.05


7741000
7740900
7740800
7740700
7740600
7740500
7740400
522800
522900
523000
523100
523200
523300
523400
LINE 1
LINE 2
LINE 3
LINE 4
LINE 5
LINE 6
LINE 7
LINE 8
+ C-84-2
BM
MR1 +
ARGO
TOWER
SYLEDIS
TOWER
CLIFF RECESSION LINES
ON PULLEN ISLAND
CLIFF
EDGE
2L1000
LEGAL SURVEY
MARKER
GENERATOR
HUT
CHS 4
RACON
TOWER
3L1000
+ LEGAL SURVEY
MARKER

INFORMATION	DESCRIPTION	ELEV.	EASTING	NORTHING
PULLEN ISLAND CLIFF SURVEY				
BENCH MARKS	CHS4	30.6	522891.34	7740609.32
elevations are based on a height of 17.3 m	C-84-2	17.3	523090.31	7740869.62
for BM C-84-2	2L1000	28.3	522978.19	7740670.13
	3L1000	23.4	522952.15	7740522.47
GENERATOR HUT	CRNR HUT	28.6	522979.35	7740652.91
	CRNR HUT	28.8	522981.96	7740657.67
	CRNR HUT	28.8	522987.88	7740654.48
MINI-RANGER STATION	MR1	13.6	523395.21	7740854.99
NAVIGATION TOWERS	SYLEDIS TWR	23.1	522929.25	7740811.98
	ARGO TWR	21.3	522950.43	7740835.26
EDGE OF ERODING CLIFF	CLIFF EDG	14.1	523067.80	7740930.92
	CLIFF EDG	14.8	523036.34	7740930.97
	CLIFF EDG	15.2	523014.96	7740924.79
	CLIFF EDG	18.0	522965.31	7740898.08
	CLIFF EDG	19.9	522947.97	7740865.93
	CLIFF EDG	22.2	522914.83	7740842.01
	CLIFF EDG	24.2	522902.81	7740806.12
	CLIFF EDG	24.4	522906.17	7740795.42
	CLIFF EDG	26.2	522880.15	7740752.84
	CLIFF EDG	26.9	522853.29	7740689.60
	CLIFF EDG	27.0	522831.97	7740671.09
CLIFF RECESSION LINES				
L1	L1BM1	16.4	523109.20	7740893.63
	L1BM2	15.5	523108.81	7740909.08
L2	L1CLIFF EDG	14.5	523108.51	7740921.98
	L2BM1	17.9	523068.34	7740866.41
	L2BM2	16.7	523064.27	7740892.48
L3	L2CLIFF EDG	14.7	523059.09	7740924.71
	L3BM1	19.1	523001.99	7740864.07
	L3BM2	17.8	522995.87	7740887.83
L4	L3CLIFF EDG	16.8	522989.79	7740911.66
	L4BM1	22.6	522964.32	7740804.86
	L4BM2ARGO	21.3	522950.43	7740835.26
L5	L4CLIFF EDG	20.7	522939.45	7740859.30
	L5BM1	23.6	522947.09	7740791.36
	L5BM2SYLTOWR	23.1	522929.25	7740811.98
L6	L5CLIFF EDG	22.8	522910.01	7740833.23
	L6BM1	25.1	522934.99	7740756.09
	L6BM2	24.9	522908.30	7740774.00
L7	L6CLIFF EDG	25.3	522899.17	7740780.16
	L7BM1	26.3	522909.85	7740720.25
	L7BM2	26.3	522894.89	7740728.52
L8	L7CLIFF EDG	26.4	522876.24	7740738.98
	L8BM1	29.4	522884.44	7740640.94
	L8BM2	27.5	522840.75	7740659.43
	L8CLIFF EDG	26.9	522831.02	7740663.68