Bedford Institute of Oceanography

Cruise Report
86302

COASTAL STUDIES IN THE WESTERN ARCTIC ARCHIPELAGO (MELVILLE, MACKENZIE KING, LOUGHEED AND NEARBY ISLANDS)

Geological Survey of Canada
Open File 1409

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1986

ABSTRACT

Coastal studies in the northwestern Arctic Archipelago during the summer of 1986 were divided into two components. Phase 1, on Sabine Peninsula, northern Melville Island, was concerned with Holocene delta sedimentation, facies characteristics in river-mouth settings, prodelta slope stability, and rates of fluvial sediment supply to the coast. Delta terrace sequences were surveyed and sampled along the lower reaches of three of the largest rivers in the area, with observations extending up to about 30 m asl near Invincible Point, 27 m asl near Drake Point, and 20 m asl near Chads Point. A preliminary assessment of the relative sea level history in the area suggests that the deposits examined may provide information on delta sedimentation processes back to 8-9 ka BP. Phase 2, based on Lougheed Island, was intended to ground-truth coastal mapping carried out in 1980 and based exclusively on airphotos, to extend the information base by examining type coastal settings on Lougheed Island, and to extend and improve oblique aerial video coverage of the coast in this region. Low-level video imagery was obtained for the entire coast of Lougheed and nearby small islands and for much of the east and north coast of Mackenzie King Island. The ground-truth survey program encompassed 11 sites on Lougheed Island and 2 on Mackenzie King.

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Responsible agency Atlantic Geoscience Centre

Geological Survey of Canada [GSC] project 820043
Polar Continental Shelf Project [PCSP] program 74-77
Northwest Territories Scientific Research Licence 6087

Area of operations (Fig. 1)

Northwest Queen Elizabeth Islands, District of Franklin:

phase 1: Sabine Peninsula, Melville Island;
phase 2: eastern Mackenzie King Island, Lougheed Island, and adjoining small islands of the Findlay Group.

Dates

phase 1: 18 July to 29 July 1986
phase 2: 30 July to 7 August 1986

Objectives

(1) To survey Holocene delta terraces on Sabine Peninsula, Melville Island (Fig. 1), to estimate rates of Holocene fluvial sediment input to Byam Martin Channel and Hecla and Griper Bay, and to describe the nature of coastal facies development in this low-energy emergent setting.

(2) To extend the information base for coastal environments of the northwest Arctic Archipelago by examining type settings on Lougheed Island; and also to ground-truth earlier coastal maps produced for this area (Woodward-Clyde Consultants, 1980).

(3) To extend and improve aerial video coverage of coastlines in the northwest Arctic Islands, providing a reference source for environmental and management planning and for scientific research.

Personnel

D.L. Forbes	(GSC/AGC)	coastal geologist
R.B. Taylor	(GSC/AGC)	coastal geologist
D. Frobel	(GSC/AGC)	video & geological technician
R. Wiebe	(Quasar)	helicopter pilot
E. Neil	(Quasar)	helicopter pilot

Transport

air:
DeHavilland-Canada Twin-Otter CG-NDO on large tyres
(Bradley Air Services Ltd, Carp, Ontario)
Bell Helicopter 206L CG-BPO on floats
(Quasar Aviation Ltd, Abbotsford, British Columbia)

ground:
3 Honda-110 all-terrain cycles [ATCs]

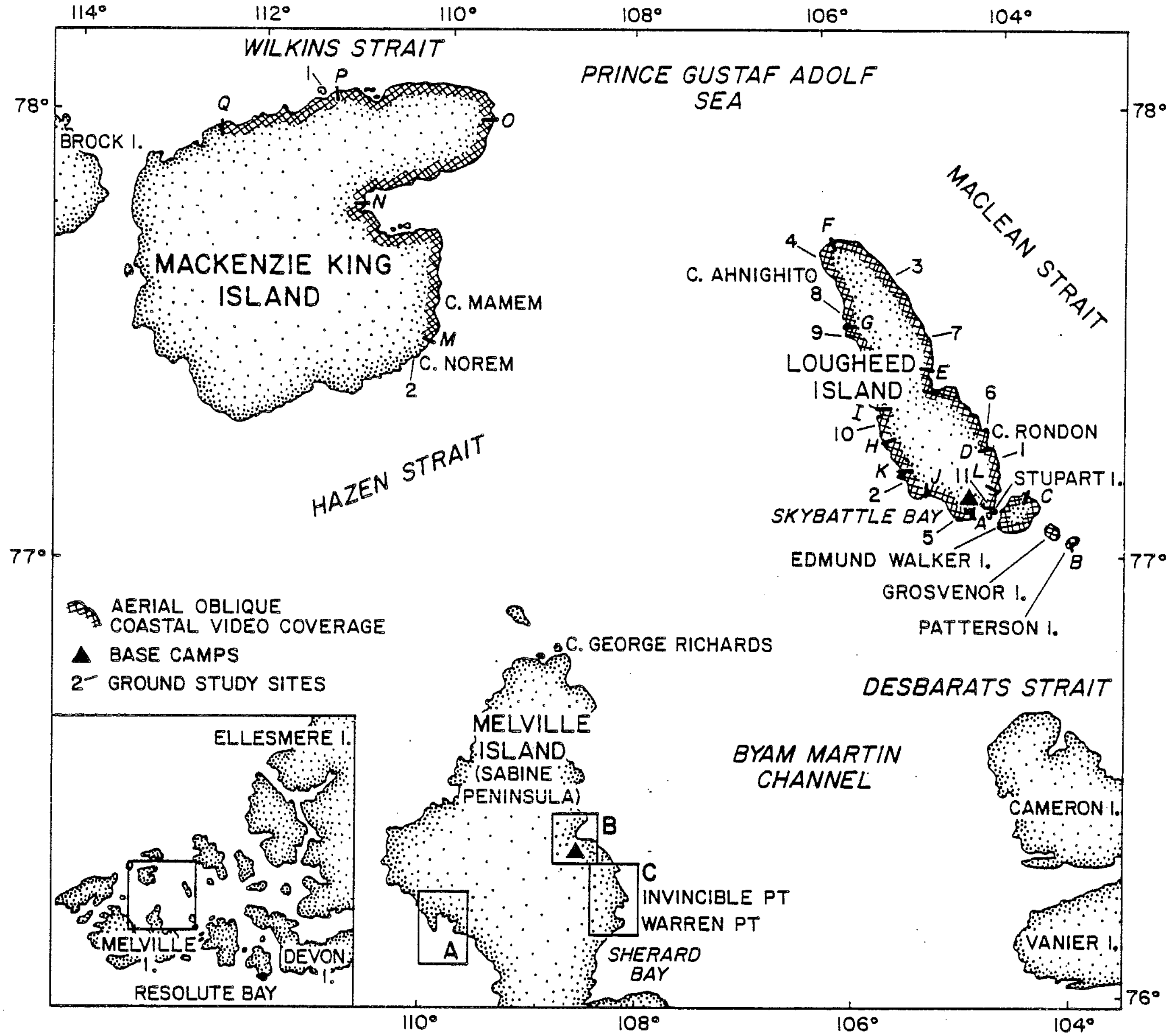

Figure 1. Location map showing study areas on Melville Island (Sabine Peninsula), Lougheed, Stupart, Edmund Walker, Grosvenor, and Patterson Islands (Findlay Group), and Mackenzie King Island, northwest Arctic Archipelago, with extent of coastal video coverage (and locations referred to in Appendix 3), groundtruth sites on Mackenzie King and Lougheed Islands, and locations of Figs 2-4 (boxes A-C respectively) on Melville Island.

SUMMARY OF OPERATIONS

Phase 1 [Forbes and Taylor]

The Polar Continental Shelf Project [PCSP] base at Resolute Bay (Cornwallis Island) provided logistical support for the field operations. Forbes and Taylor flew from Halifax-Dartmouth to Montreal on the evening of July 17 (Air Canada flight 637) and arrived at Resolute from Montreal (Nordair flight 503) the following day, July 18. Air freight shipments to Resolute had been seriously backlogged for some time and it became apparent that some equipment, notably survey gear and all-terrain cycles, had not yet arrived. Personnel at PCSP offered to provide substitute vehicles and the Resolute Airport Manager (Transport Canada) agreed to lend survey equipment. With this assistance, we were ready to leave Resolute by the evening of July 19.

Late the next day, July 20, we departed Resolute at 2030 CDT in a PCSP-chartered Twin-Otter (CG-NDO) and flew first to Chads Point on the west coast of Sabine Peninsula (Figs 1 and 2), intending to put down on the prominent delta immediately east of the point. Although Forbes with pilot Patrick Doyle had landed at the site in 1971 in a Piper Super-Cub (CF-LXQ), the Twin-Otter pilot was unwilling to land there. After searching for other possible landing sites in the area, we agreed to an alternate site near Drake Point on the east coast of Sabine Peninsula (Figs 1 and 3). We landed at an abandoned rough strip 9 km south-southwest of Drake Point at 2330 CDT. The following 4 hours and a good part of the day, July 21, were spent establishing camp at this location (76°23'N, 108°35'W) in light drizzle and snow showers. After establishing camp and radio contact with PCSP, we set out in the evening (1900-2130) to reconnoitre part of the route south to the major study site at Invincible Point (Figs 1 and 4).

July 22 0700: Weather observations and radio contact with PCSP. 0920-1130: Overland by ATC to raised delta deposits of river draining to Invincible Point (Fig. 4). 1130-1850: Surveyed long profile of terraces on north bank of 'Invincible River' [informal name] from present delta front to 30-m terrace 7.4 km upstream (Fig. 4, Appendix 1); work slow due to restricted visibility in snow showers. 1850-2020: Returned overland to camp. 2100: Weather observations and radio contact with PCSP.

July 23 0700: Weather observations and radio contact with PCSP and Lougheed Island. 1000-1300: Set out to do altimeter survey of alluvial terrace elevations on south bank of 'Drake River' [informal name], the large river immediately north of camp (Fig. 3). One ATC developed engine trouble and the remainder of the morning was devoted to repairs. 1300-1630: Examined high terrace (section 1) at 42 m asl, with veneer of sediment containing (presumed-Holocene) mollusc shells (sample 8607001). 1630-1900: Stopped at lower terrace exposure (section 2), approximately 9-22 m asl, where brown alluvial pebbly silt and sand conformably overlie black marine mud exposed at the base of the section. Samples of sediment and organic material were collected from the mud (8607002-8607003) and from the lower 3 m of silt

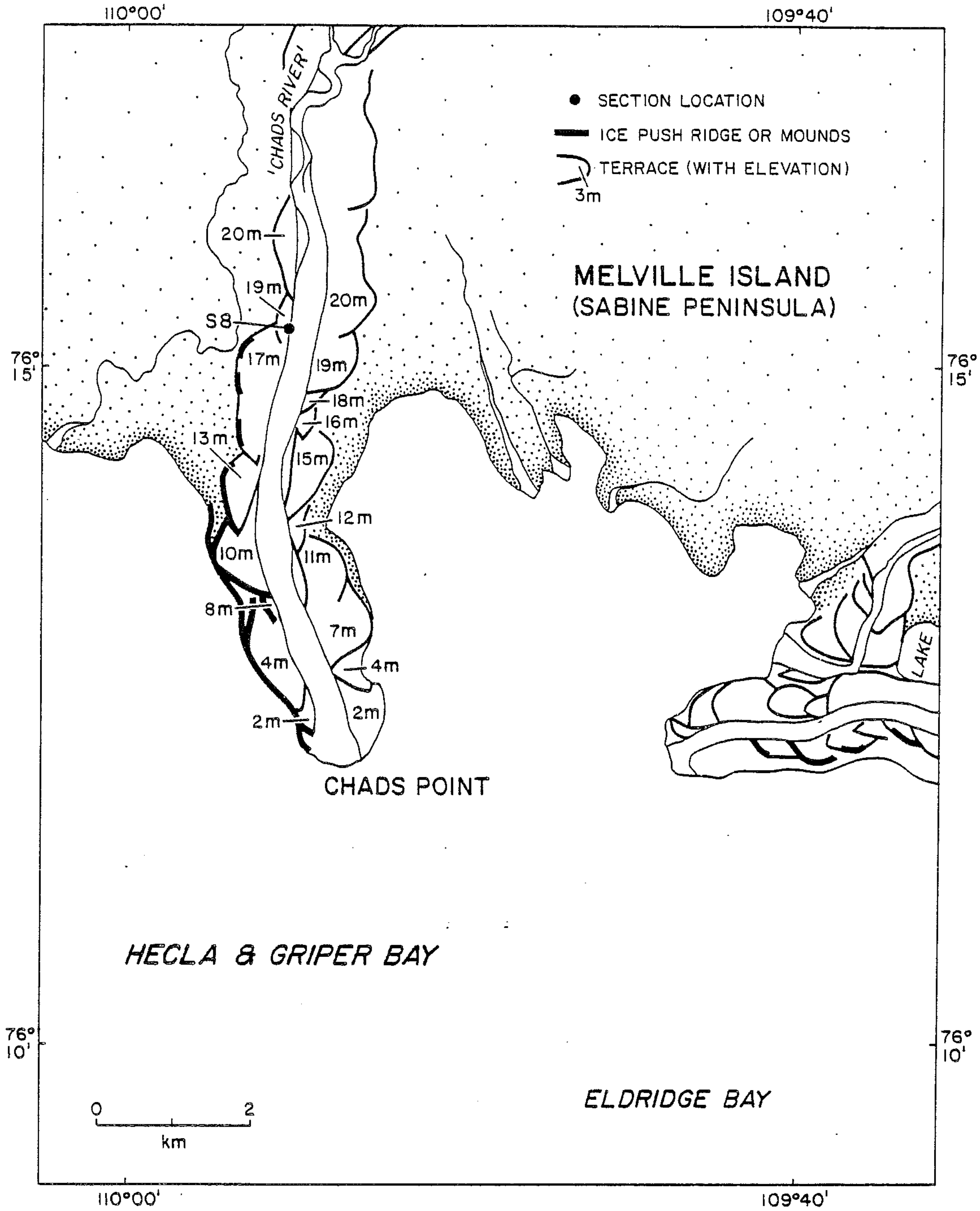

Figure 2. Chads Point and adjacent deltas on the west coast of Sabine Peninsula, on Hecla and Griper Bay (see Fig. 1, box A, for location). Note distribution of ice-push features defining west- and south-facing margins of lower terraces, location of section 8 on west bank of 'Chads River', and terrace elevations determined by altimeter survey of Chads Point delta.

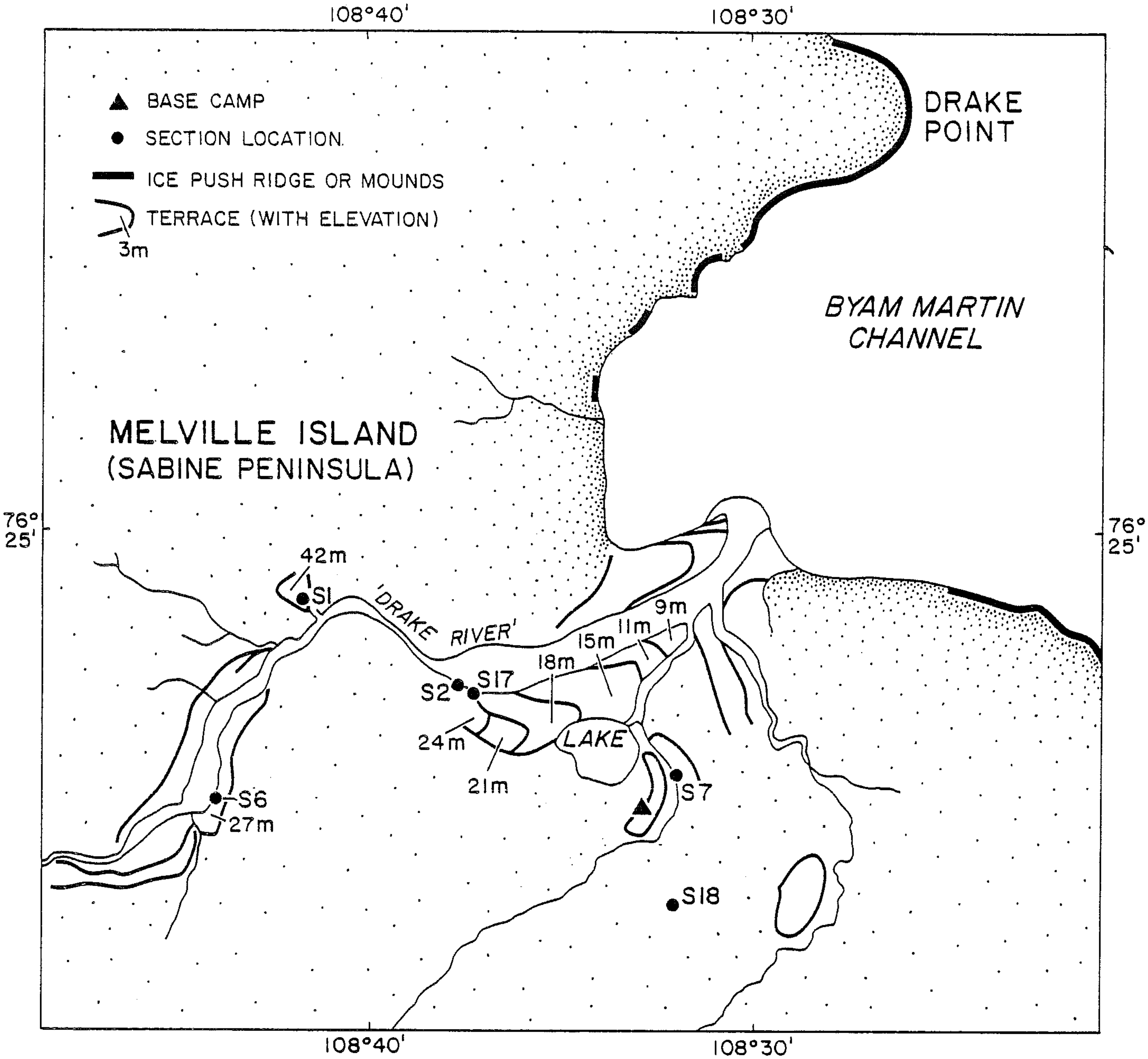

Figure 3. Terraces on 'Drake River' and tributaries draining into bay south of Drake Point, on the east coast of Sabine Peninsula (see Fig. 1, box B, for location). Note absence of ice-push features on delta terraces at this embayed site, locations of sections (s1, s2, s6, s7, s17, s18) referred to in the text, terrace elevations determined by altimeter surveys, and location of base camp

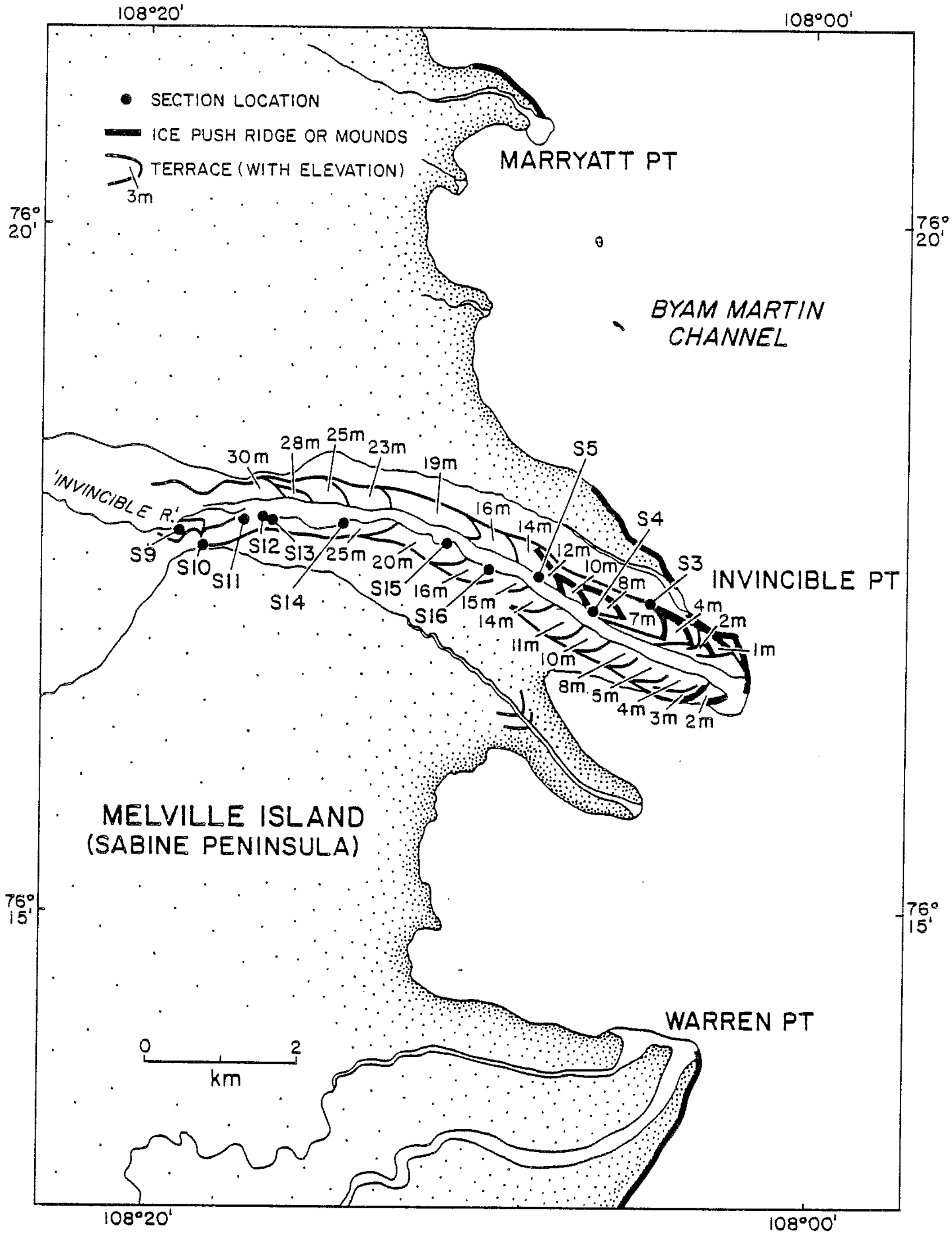

Figure 4. Deltas at Marryatt Point, Invincible Point, and Warren Point, on Byam Martin Channel, east coast of Sabine Peninsula (see Fig. 1, box C, for location). Note ice-push features defining northern margins of lower terraces at Invincible Point, and along exposed modern coast at Marryatt, Invincible, and Warren Points. Map also shows elevations of 'Invincible River' terraces up to 30 m asl and locations of sections (s3-s5 and s9-s16) referred to in the text.

and sand (8607004-8607010) (see Appendix 2). 1900: Weather observations and radio contact with PCSP.

July 24 0700: Weather observations and radio contact with PCSP. 0940-1050: Overland to Invincible Point. 1050-1745: Altimeter survey of north-bank terraces, for comparison with level survey of July 22. Study of ice-push ridge forming terrace margin (section 3) and of two other left-bank sections (4 and 5) exposing large-scale delta foreset beds of sand and gravel overlying prodelta sands and muds. Sample 8607011 collected from section 3 and samples 8607012-8607014 from section 5. 1745-1845: Returned overland to camp. 1900: Weather observations and radio contact with PCSP.

July 25 0700: Weather observations and radio contact with PCSP. 0945-1340: Altimeter survey of south-bank terraces along lower 5 km of 'Drake River' (Fig. 3) from delta front to 24 m asl. 1340-1500: Examined terrace exposure (section 6) approximately 7 km upstream from river mouth (27 m asl) and collected two samples of plant fragments (8607015-8607016). Returned to camp 1525 CDT. 1530-1840: Study of section 7 (7-16 m asl) in raised delta terrace along small tributary stream immediately east of camp. Section exposes normal fault with 0.18 m offset in delta foreset silts and sands. Samples of mud, sand, and plant fragments (8607017-8607019). 1900: Weather observations and radio contact with PCSP.

July 26 0700: Weather observations and radio contact with PCSP. 0940-1100: Overland to Invincible Point. 1100-1805: Surveyed long profile of terraces on south bank from present delta front to 26-m terrace 5.9 km upstream (Fig. 4, Appendix 1). 1805-1910: Returned overland to camp. 1910: Weather observations and radio contact with PCSP. 1945: Radio contact with Lougheed Island.

July 27 0700: Weather observations and radio contact with Lougheed Island and PCSP. 1200: Helicopter CG-BPO arrived at Drake Point camp from Lougheed Island with Gary Sonnichsen (AGC) and pilot Bob Wiebe. 1200-1225: Flight across Sabine Peninsula to Chads Point on Hecla and Griper Bay (Figs 1 and 2). 1226: Put down on sea ice off Chads Point delta front to zero altimeter. 1227-1315: Altimeter survey of terraces on both banks of 'Chads River' [informal name], finishing with closing observation on sea ice off delta front again. 1315-1445: Additional altimeter observation on lowermost terrace, followed by quick overflight of delta complex before landing at exposure (section 8) in west-bank terrace 19 m asl. Section shows large-scale delta foreset beds in sand and gravel overlying prodelta sands and muds. Foreset unit includes faulted (and rotated?) block. Sediment samples 8607020-8607022. 1445-1530: Despite thick fog envelopping the site shortly before take-off, we escaped to the south along the coast of Hecla and Griper Bay, then east across the peninsula to pick up the coast of Byam Martin Channel just south of Warren Point. Although the ceiling was low, we flew the coast from Warren Point to the mouth of 'Drake River', taking 35-mm aerial oblique photos. 1530-1850: Radio stand-by while CG-BPO was refuelling and slinging boat across Byam Martin Channel to site off Cape George Richards (north end of Sabine Peninsula). 1850: Helicopter CG-BPO departed Drake Point camp for Lougheed Island. 1900: Weather observations and radio contact with PCSP.

July 28 0700: Weather observations and radio contact with PCSP. 0940-1050: Overland to Invincible Point. 1050-1930: Working sections 9 to 16 in south-bank terraces of 'Invincible River': exposures of shell-bearing Holocene black mud over Cretaceous? sediments at upper section, giving way downstream to prodelta muds overlain by delta foreset deposits. Samples 8607023-8607024 (section 9), 8607025 (section 11), 8607026-8607027 (section 12), 8607028 (section 14), and 8607029 (section 15) (see Appendix 2). 1930-2115: Returned overland to camp.

July 29 0700: Weather observations and radio contact with PCSP. 0915-1330: Working terrace exposures on south bank of 'Drake River' near camp (sections 17 and 2; Fig. 3). Wood fragment (sample 8607030) collected from foreset sands in section 17. Additional samples (8607031-8607034) of mollusc shells, wood fragments, and plant debris collected from section 2. 1355-1545: Examined small deposit (section 18) of brown sand 1 km south of camp at 77 m asl (Fig. 3), thinking it might be a high post-glacial beach terrace. Sand is planar laminated, includes rare mud beds, and shows large fold structure with variable dips to southwest; may be pre-Wisconsinan or older. Samples 8607035-8607037 of wood fragments, sand, and mud. 1600: Radio contact with PCSP; arrangements for camp move later in evening. 1600-2030: Broke camp in preparation for move to Lougheed Island. 2030: Bradley Twin-Otter CG-NDO landed at Drake Point camp. Moved to Lougheed Island, ending phase 1.

Phase 2 [Taylor, Forbes, Frobel]

The second phase of operations was conducted from a base camp located on southern Lougheed Island. The camp was managed by G. Sonnichsen (AGC) as part of GSC project 820050 (Geology of Arctic Island Channels). Frobel arrived at the Lougheed Island camp from Resolute on the evening of July 29, having flown north from Montreal earlier in the day. Our coastal work during phase 2 included two components:

(1) ground surveys and sediment sampling; and
(2) aerial oblique video imagery and photography.

July 30 A clear, sunny day with light winds, ideal for aerial photography. Unfortunately, the helicopter was only available on an opportunity basis and was initially dedicated to project 820050. While waiting for the helicopter we carried out maintenance on the ATCs, erected the office tent and organized field equipment. The aircraft became available late in the afternoon. At 1730 CDT, we set out to fly coastal video surveys of Lougheed and Mackenzie King Islands, beginning near camp on the south coast of Lougheed Island (Fig. 1). The flight proceeded counter-clockwise, breaking off to continue coverage around Edmund Walker, Grosvenor, Patterson and Stupart Islands. The video was flown at an altitude of 125-155 m, at a speed of 40-50 knots, roughly 1 km offshore (Appendix 3). Shortage of fuel and the need to check on a boat crew working at sea off southern Lougheed Island caused us to interrupt the taping just south of Cape Rondon (Fig. 1). The survey resumed at 2323 CDT and continued north along the east coast of Lougheed Island.

July 31 After landing for fuel near Cape Ahnighito at 0036 CDT, we continued the video survey southward along the west coast of the island to Skybattle Bay. At this point (0205 CDT), fog and drizzle forced us to postpone completion of the Lougheed Island coastal video. On the other hand, the visibility to the northwest was excellent and, although there was some concern about the amount of lighting, an airphoto/video survey of Mackenzie King Island appeared feasible. It was important to take this rare opportunity because flying conditions over Mackenzie King Island are commonly limited by extensive fog during the summer months.

After refuelling at Skybattle Bay, we crossed to Mackenzie King Island, making landfall near Cape Mamem at 0309, and landed at the fuel cache near Cape Norem at 0324 CDT. Video coverage of the Mackenzie King coast began at 0351 CDT between Capes Norem and Mamem (Fig. 1). Four 20-minute video tapes were completed (Appendix 3) before fog, snow showers, and fuel requirements stopped the flight at 78"00'N, 112"25'W on the north (Wilkins Strait) coast of the island. One brief ground stop was made at a small island off the north coast (stop 1; sample 8608001) before returning to the fuel cache near Cape Norem. Weather conditions had deteriorated dramatically and, except for a brief beach stop near Cape Norem (stop 2; sample 8608002), the survey of Mackenzie King Island had to be terminated. We returned across Prince Gustaf Adolf Sea in snow, rain, and fog, landing at base camp on Lougheed Island at 0730 CDT.

August 1 Fog and drizzle blanketed Lougheed Island. Ground surveys were begun at the southeast corner of the island using the ATCs for transportation overland to the coast. Beach profile site 1 was established at a representative location on this low sandflat coast. Measurements of the beach profile and thaw layer thickness were completed (Appendix 4), along with observations of selected sediment facies, including ice-push and raised beach deposits. Sediment samples (8608003-8608005) were obtained and a 0.4-m long core (sample 8608006) was collected from the swale between the present beach and the first raised beach ridge.

August 2 Travelled overland by ATC to site 2, north of Skybattle Bay (Fig. 1). This site was chosen to represent the wide intertidal shores of southwest Lougheed Island. Surveying, sediment sampling and coring (samples 8608007-8608010), and measurements of thaw layer thickness were completed. Additional observations were made along the long peninsula north of Skybattle Bay where ice push dominates the south shore but is prevented from reaching the north shore by an extensive intertidal flat and shallow offshore platform. Here and elsewhere along the inner embayed shore of southwestern Lougheed Island, there is little evidence of reworking by littoral processes, a situation in sharp contrast to conditions on the southeast coast of the island.

August 3 Rain and fog limited the activities of project 820050, so the helicopter was made available for coastal surveys of Lougheed

Island. Field checks were made of features not easily identified on air photos and to ground-truth coastal mapping completed by Woodward-Clyde Consultants (1980). Five brief stops were made around the island (sites 6-10) to get a feel for ground conditions. Shore features were photographed and sediment samples (8608011-8608014, 8608022-8608025) were collected. Detailed surveys similar to those at profile sites 1 and 2 were also completed at sites 3 and 4 (Fig. 1; Appendix 4; samples 8608015-8608021, Appendix 2). Returned to base camp to complete field notes at 1430 CDT. Heavy rain turned to snow by early evening and winds shifted from the south to the northwest at roughly 2030 CDT.

August 4 All activities were suspended because of a blizzard with winds reaching 45-50 knots. Snow filled the floors of the river valleys and drifted against all positive relief features.

August 5 ATCs were used to travel to the ice-pushed southwest shore of the island. A fifth profile location was established (site 5) with a detailed shore profile (Appendix 4) and sediment sampling (8608026-8608028, Appendix 2). This site is representative of much of southeastern Skybattle Bay and the shores adjacent to site 7.

In the afternoon, we examined features on the extensive delta plain immediately southeast of base camp (site 11). Attention was focussed on the numerous small raised beach ridges which are so prominent on the air photos. Several pits were excavated (samples 8608029-8608034, Appendix 2) to facilitate a comparison of sediment facies within the modern and raised beach ridges.

Mechanical problems with the ATCs and very thixotropic ground conditions across the delta plain, resulting from the large amount of precipitation that had fallen over the last few days, made travel very difficult or nearly impossible. In addition, many of the streams had inflated discharge due to storm run-off, raising water levels almost to the limit for ATC crossings.

August 6 The day began with a short flight between Skybattle Bay and Stupart Island (0000-0040 CDT) to complete the aerial video coverage of Lougheed Island. Visibility and lighting were excellent; however strong northerly winds hampered aircraft handling in small embayments. Later in the morning, equipment and samples were packed up in preparation for the evacuation to Resolute Bay at 1300 CDT. Additional packing and labelling of gear was completed in Resolute Bay during the evening.

August 7 0240 CDT: Departed south via Cambridge Bay and Yellowknife on Pacific Western Airlines flight 582, connecting in Edmonton with Canadian Pacific Airlines flight 90 to Toronto and arriving in Halifax-Dartmouth late in the evening.

SCIENTIFIC HIGHLIGHTS

Phase 1

Altimeter surveys of terrace elevations on both banks of 'Chads River', the south bank of 'Drake River', and a small tributary to 'Drake River', together with altimeter and level surveys of terraces on both banks of 'Invincible River', provide a basis for interpretation of Holocene fluvial sediment supply to Byam Martin Channel and Hecla and Griper Bay. This interpretation will require further evaluation of facies characteristics and development of a terrace chronology, both directly (using organic material sampled within the terraces) and indirectly (through an improved understanding of Holocene relative sea level [RSL] changes in the study area).

The delta sequences examined on Sabine Peninsula display an unusual and distinctive morphology, prograding rapidly seaward with almost no channel bifurcations or avulsions. The deltas at the mouths of 'Chads River' and 'Invincible River', like many others in the area, project seaward as long, narrow, finger-like deposits (Figs 2 and 4), with the modern braided channel confined between terraced banks exposing sections of prodelta muds overlain by large-scale foreset beds. In contrast, the 'Drake River' delta (Fig. 3), prograding into a broad embayment south of Drake Point, does not extend beyond the present coastline but nevertheless displays the same general facies sequence in river bank sections.

Our expectation before going into the field had been that basal muds in all of the deltas would contain abundant shell fauna. This was based on experience in Sherard Bay in 1971 and 1972 (Barnett and Forbes, 1973; Barnett, 1973), when a large variety of molluscs, together with echinoid and algal fragments, were collected from marine muds in several sections throughout the eastern part of the valley. However, despite extensive searches during the 1986 season, we found very little shell material and only one site, in the 'Drake River' valley, where an abundant molluscan fauna was clearly preserved *in situ*. We have concluded that this site and those sampled in Sherard Bay in the early 1970s may have developed in somewhat protected marginal bay environments. We propose that exposed prodelta sites may provide much less hospitable habitat, in part perhaps because of high sedimentation rates and/or severe ice scour. Terrace margins at Chads Point and Invincible Point are defined by well developed ice-push levees (Figs 2 and 4), features that are largely absent from the embayed delta terraces at the mouth of 'Drake River' (Fig. 3) and in Sherard Bay (Fig. 1).

Holocene relative sea level changes on Melville Island have attracted the interest of several investigators over the years. Henoch (1964), Barnett (1973), McLaren and Barnett (1978), and Hodgson *et al*. (1984) have presented interpretations based on samples collected over a wide area in the eastern and central part of the island. There is evidence, however, to suggest that significant variations in sea level history may occur within this region. Hodgson *et al*. (1984)

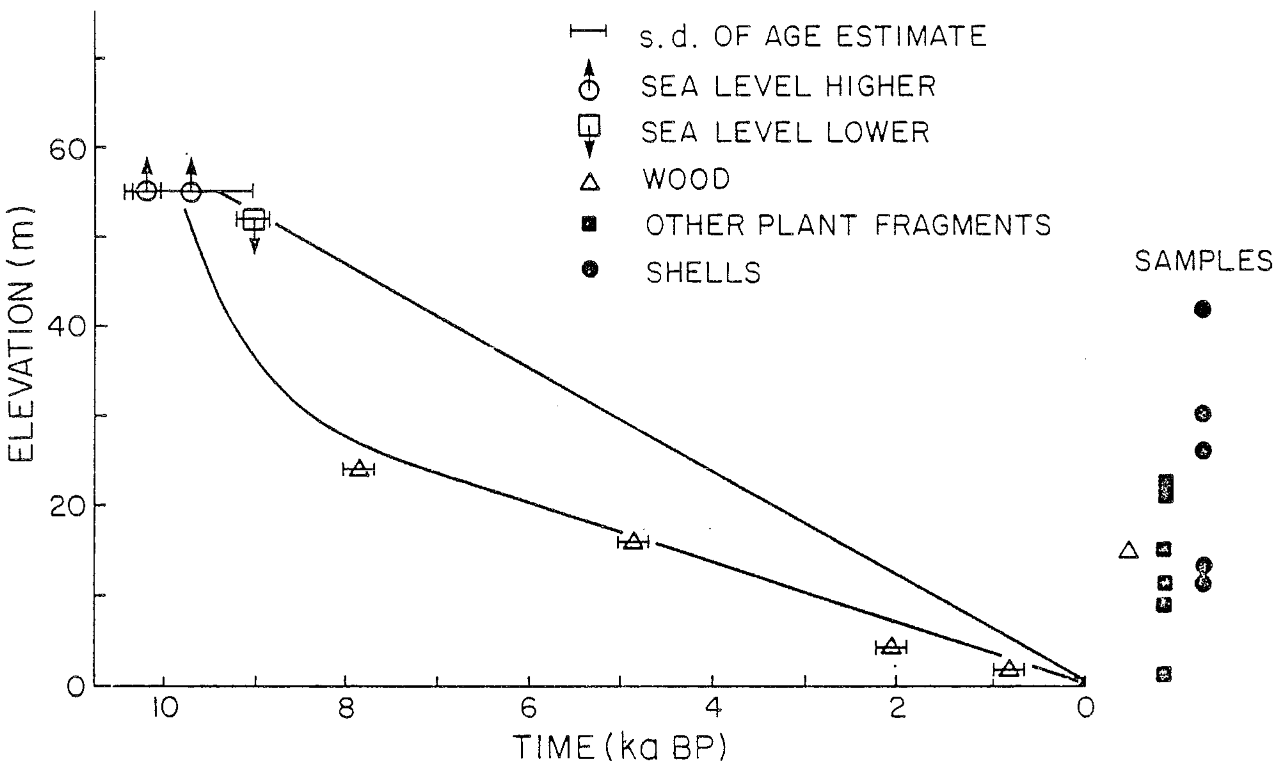

Figure 5. Data pertaining to Holocene relative sea level history on Sabine Peninsula. Dated samples after Barnett (1973) and McLaren and Barnett (1978). Elevations are in metres above present mean sea level. The lines show two extreme sea level histories compatible with the existing data. The actual trend is likely to have approximated the lower curve. Elevations of samples (as yet undated) collected during the 1986 field season are shown at right.

have reported a 61-m difference in the elevation of the Holocene marine limit over a distance of less than 200 km between Winter Harbour (on the central south coast) and Towson Point (the eastern extremity of the island). In the present study, we restrict our attention to samples collected over a smaller area, on or very close to Sabine Peninsula. This leaves us with just 7 published dates (Barnett, 1973; McLaren and Barnett, 1978). Figure 5 shows the available data for the Sabine Peninsula region, with two extreme sea level curves that delimit a rather broad range of possible sea level histories. Our preliminary interpretation is that relative sea level may have followed close to the lower curve, which is defined on the basis of driftwood sample data. The figure also shows the elevations and types of organic samples collected in 1986. We expect that radiocarbon dates on these samples will add considerable detail to the RSL picture available at present.

If we accept the lower curve of Figure 5 as a preliminary relative sea level model, then the data on terrace levels collected during this study should cover the history of delta sedimentation back to approximately 8-9 ka BP. Higher terraces are present along many of the rivers in the study area, indicating an ongoing pattern of fluvial sedimentation initiated at an earlier date. However, the higher terraces are more severely dissected than the lower features, and reasonable estimates of terrace volume can only be obtained at elevations of 30 m asl or less.

Phase 2

Detailed aerial video imagery obtained during this program covered the coast of the Findlay Island chain, including Lougheed, Edmund Walker, Grosvenor, and Patterson Islands, and 180 km of eastern and northern Mackenzie King Island (Fig. 1). The imagery provides a continuous record of the shoreline morphology and sediment composition, and indirectly an insight into processes affecting these shores. The hooked plan form of some coastal islands in Wilkins Strait resembles the arcuate gravel berms observed on the Polynia Islands in Ballantyne Strait (Hudson *et al*., 1981). This morphology emphasizes the role of sea ice in controlling coastal plan form. Several of the river mouths on northern Mackenzie King Island exhibit an estuarine character, which may signify a cessation of coastal emergence or a slight rise in relative sea level. If these observations prove correct, they have significant implications for the interpretation of Quaternary history in the northwest Arctic Islands.

From ground and aerial surveys of the Findlay Islands (Lougheed and nearby small islands), it is concluded that all parts of the shore are affected by ice push. Coastal deposits include varying proportions of sand and mud, with occasional pebble and cobble size material. Thixotropic conditions are common, particularly in the intertidal zone and within the numerous stream channels which cross much of the backshore zone. Many parts of the coast are dominated by ridged sea ice or shore ice piles, up to 20 m high. Anchor ice is common, especially adjacent to the larger river deltas of the sandflat coast.

In earlier work, based exclusively on airphoto interpretation (Woodward-Clyde Consultants, 1980; Owens et al., 1981), five coastal types were defined. On the basis of 1986 field work, we have re-evaluated this analysis and now distinguish four types, as follows: sandflat, mudflat, deltaic, and scarred. Our field observations suggest that the shores with the greatest proportion of muds are associated with areas of underlying Christopher Formation shales (Balkwill et al., 1982). The following brief comments describe the major characteristics of the four coastal types.

1 - Sandflat coast On southeast Lougheed Island (site 1), this coastal type exhibits a low-angle backshore and raised-beach sequence, with discontinuous low beach ridges, dissected by rill wash and numerous subparallel streams. The raised beach ridges that are best preserved are topped by a variable thickness of severely distorted ice-push deposits. Compacted muds in the ice-push units act as a protective cap on the ridges, helping to preserve them against erosion by rillwash and aeolian processes. Wind-blown deposits are best preserved along stream banks and in polygon troughs. Between the beach ridges, the sediments are characterized by alternate light and dark sand units. The lighter units appear to be associated with the development of small swash-bar structures; the origin of the darker units remains unclear at present. Swash-deposited sediments are preserved in the modern beach as thin orange-red or grey units; in the raised beach ridges, these swash deposits are often very colourful and distorted by weathering and cryogenic processes. Muds are introduced to the beach environment from the intertidal zone by ice push and from the interior by rill and stream erosion of extensive older marine pelite deposits (Hodgson, 1981) and weathered underlying shaly bedrock.

2 - Mudflat coast Along the west coast of Lougheed Island (site 2), and to some extent on the north coast, the inherent gradual slope of the coastal terrain has produced a very low-angle shoreline with a vegetated backshore surface and extensive shoals and intertidal flats offshore. This contrasts with the sandflat shoreline, which is much more distinct and steeper, allowing sea ice to penetrate closer inshore. On the mudflat coast, sea ice ridging occurs tens to hundreds of metres offshore, producing shoals and 'barrier' ridges that protect the inner shore from direct ice impact. The shore is virtually featureless, with active and relict (raised) beaches marked by subtle ridges with relief of less than 0.5 m. Depressions between the ridges are partially filled by colluvial deposits. Very small waves, developed in the narrow shore leads, produce thinly laminated muds with millimetre-thick sand units. The sediment surface in the intertidal zone is often covered by a thin algal mat. Numerous pebble and cobble clasts, presumably ice-rafted, occur within shoreface muds preserved beneath the beach. Thin slabs of rock incorporated in surficial sediments at some sites on the west coast of the island suggest that bedrock may outcrop only a short distance offshore.

3 - Deltaic coast Large segments of the Lougheed Island coast are dominated by extensive braided-channel delta deposits (Woodward-

Clyde Consultants, 1980; Hodgson, 1981). In some areas, numerous sub-parallel consequent streams have produced a coalesced deltaic apron on which minor wave reworking develops features that are essentially indistinguishable from those of the non-deltaic sandflat coast. More pronounced delta features have formed at the mouths of larger rivers. At these sites, wide braided channels feed sediment onto relatively steep prodelta slopes. Ice-push disturbance of the channel-mouth deposits is a common occurrence. Where deltas protrude offshore, the more exposed flanks may be reworked into ice-push ridges that sometimes define the margins of delta terraces. On the whole, however, the deltas on Lougheed Island display much less pronounced terrace development than was observed on Sabine Peninsula.

4 - Scarred coast This type (sites 3 and 5) is distinguished by a subdued hummocky morphology with low to moderate backshore slopes, often dissected by small streams. The hummocks are older weathered ice-push deposits that are characterized by a surface of dessicated mud and scattered lag gravel. On northeast Lougheed Island (site 3), the zone of well-preserved older ice-push hummocks extends to approximately 8.0 m asl; at sites examined on southern Lougheed Island (site 5), it is found up to 5-6 m asl. Between the raised hummocks, the hollows are covered by a thin sandy veneer of beach sediment, which is better developed in sand-rich areas (such as the Isachsen Formation exposures at the north end of the island - see Balkwill et al., 1982) and along parts of the coast where a greater extent of open water develops. The modern shore is characterized by nearly continuous sharp-crested ridges and craters produced by sea ice ride-up and ridging onshore. Between the ice-push scarred headlands (generally less than 2.5 m high), short pocket beaches occur, with small sand berms and transverse bars. The ice-pushed backshore deposits consist of distorted black muds with thin sandy inclusions. When saturated, these muds are very thixotropic and prone to disturbance, but when dry they become very hard. Thaw depths are highly variable beneath the newly developed ice-pushed ridges and craters and sea ice is often still present beneath the surface sediment.

ACKNOWLEDGEMENTS

We thank Gary Sonnichsen for logistical and moral support throughout the field program and for technical assistance at Chads Point. We wish to express our appreciation also to the other residents of the 1986 Lougheed Island camp, for their assistance and companionship during phase 2 of this program. Polar Continental Shelf Project provided invaluable logistical, communications, and aircraft support. In particular, we thank Barry Hough, all other members of the PCSP Resolute Base staff, and the Bradley and Quasar air and maintenance crews for their support and concern. We also wish to thank John Goodman (Resolute Airport Manager, Transport Canada) for his generous assistance. John Shaw and Gary Sonnichsen kindly reviewed the draft of this report. We are grateful to Doug Hodgson for advice and discussion of the Quaternary geology of the area, and to J.G. Fyles and D.M. Barnett for introducing us to the deltas of Sabine Peninsula.

REFERENCES

Balkwill, H.R., Hopkins, W.S., Jr, and Wall, J.H., 1982, Geology of Lougheed Island and nearby small islands, District of Franklin (parts of 69C, 79D); Geological Survey of Canada, Memoir 395, 22 p and Map 1490A.

Barnett, D.M., 1973, Radiocarbon dates from eastern Melville Island; in Report of Activities, Geological Survey of Canada, Paper 73-1B, p. 137-140.

Barnett, D.M., and Forbes, D.L., 1973, Surficial geology and geomorphology of Melville Island; in Report of Activities, Geological Survey of Canada, Paper 73-1A, p. 189-192.

Henoch, W.E.S., 1964, Postglacial marine submergence and emergence of Melville Island, Northwest Territories; Geographical Bulletin, 22, p. 105-126.

Hodgson, D.A., 1981, Surficial geology, Lougheed Island, northwest Arctic Archipelago; in Current Research, Geological Survey of Canada, Paper 81-1C, p. 27-34.

Hodgson, D.A., Vincent, J.-S., and Fyles, J.G., 1984, Quaternary geology of central Melville Island, Northwest Territories; Geological Survey of Canada, Paper 83-16, 25 p.

Hudson, R.D., Pilkington, G.R., and Metge, M., 1981, Extreme ice features along the n.w. edge of the Canadian Arctic Archipelago; in Dionne, J.-C. (ed.), Proceedings, Workshop on Ice Action on Shores (Rimouski, May 1981), Associate Committee for Research on Shoreline Erosion and Sedimentation, National Research Council Canada, Ottawa, p. 15-34.

McLaren, P., and Barnett, D.M., 1978, Holocene emergence of the south and east coasts of Melville Island, Queen Elizabeth Islands, Northwest Territories, Canada; Arctic, 31, p. 415-427.

Owens, E.H., Taylor, R.B., Miles, M.J., and Forbes, D.L., 1981, Coastal geology mapping: an example from the Sverdrup Lowland, District of Franklin; in Current Research, Geological Survey of Canada, Paper 81-1B, p. 39-48.

Woodward-Clyde Consultants, 1980, Coastal geology maps, central Sverdrup Basin, Northwest Territories; Geological Survey of Canada, Open File 549.

APPENDIX 1

(A) Terrace elevations at Chads Point (Fig. 2)
altimeter survey 1986/07/27

location	time (CDT)	altimeter	adjusted elevation* (m)
sea ice	1226	3.305	0.0
t-1	1229	3.324	2.0
t-2	1231	3.339	3.5
t-3	1234	3.384	8.2
t-4	1238	3.401	10.1
t-7	1241	3.425	12.6
t-10	1244	3.468	17.0
t-10	1246	3.468	17.1
t-12	1248	3.485	18.9
t-13	1250	3.499	20.4
t-13	1253	3.495	20.1
t-12	1255	3.487	19.4
t-11	1259	3.473	18.2
t-9	1301	3.442	15.1?
t-8	1302	3.441	15.1
t-6	1305	3.406	11.7
t-5	1307	3.400	11.2
t-3	1309	3.353	6.6
t-2	1311	3.325	3.8
sea ice	1315	3.285	0.0
t-1	1316	3.302	1.7

*assuming linear adjustment

(B) Terrace elevations near Drake Point (Fig. 3)
altimeter survey 1986/07/25

location	time (CDT)	altimeter	adjusted elevation** (m)
camp	0945	4.552	29.1
sea level	1028	4.261	0.0
t-5	1100	4.355	9.4
t-6	1054	4.375	11.4
t-7	1107	4.410	14.9
t-8	1116	4.444	18.3
t-9	1159	4.482	21.4
t-10	1151	4.505	23.8
t-8	1213	4.455	18.4
t-5	1223	4.361	9.0
t-12	1445	4.545	27.4
camp	1525	4.562	29.1

** assuming rapid 1-m adjustment between 1115 and 1215 CDT

APPENDIX 1 (continued)

(C) Terrace elevations at Invincible Point (Fig. 4)

north bank (^^ denotes ice-push ridge)

location	level survey 1986/07/22 distance (m)	elevation (m)	altimeter survey 1986/07/24 altimeter	time (CDT)
sea level	0	0.0	3.745	1240
t-1	107	0.5		
t-2	177	0.8		
	223	0.8		
	341	0.9		
	477	1.0		
	558	1.1		
t-3	586	2.1		
	717	2.3		
	847	2.3		
	892	3.9		
t-4	910	5.1 ^^	3.808	1233
	928	4.2		
	970	4.3		
	1111	4.2		
	1225	4.1		
	1353	4.5		
	1386	5.5		
t-5	1469	6.5		
	1544	6.9 ^^		
	1603	6.1		
	1707	6.1		
	1833	6.2		
	2006	6.2		
	2187	6.3		
	2255	6.4		
	2359	7.4		
t-6	2385	8.1	3.858	1257
	2557	8.8		
t-7	2628	10.4	3.881	1304
	2724	10.5		
	2983	10.7		
	3034	10.7		
t-8	3075	12.3		
	3215	12.4	3.885	1134
	3339	12.3		
	3464	12.7		
	3583	13.2	3.938	1430
	3717	14.3		
	3808	14.8		
t-9	3839	15.7		
	3999	15.6		
	4128	16.2		
	4259	16.3		
	4353	16.9		

Terrace elevations at Invincible Point (continued)

north bank (^^ denotes ice-push ridge)

location		level survey 1986/07/22 distance (m)	level survey 1986/07/22 elevation (m)	altimeter survey 1986/07/24 altimeter	altimeter survey 1986/07/24 time (CDT)
		4385	17.6		
t-10		4515	18.5		
		4635	18.9		
		4775	19.3		
		4893	20.2		
		5088	20.4		
		5228	20.8		
		5414	21.7		
t-11		5551	22.2		
		5681	22.7		
		5770	23.7		
		5901	24.1		
t-12		6043	25.0		
	>SH	6241	25.7	4.015	1102
	>SH			4.083	1728
		6554	27.4		
t-13		6940	28.1		
		7205	28.6		
		7243	28.8		
t-14	>97	7276	29.7	4.043	1054
	>97			4.135	1745
		7395	30.2		

south bank (^^ denotes ice-push ridge)

location	level survey 1986/07/26 distance (m)	level survey 1986/07/26 elevation (m)	altimeter survey 1986/07/28 altimeter	altimeter survey 1986/07/28 time (CDT)
sea level		0.0		
t-1	0	0.5		
	23	1.6		
t-2	67	2.0 ^^		
	141	1.9		
	223	2.1		
	290	2.0		
	340	2.4		
t-3	390	3.6		
t-4	458	3.7		
	554	4.4		
	647	4.3		
	728	4.4		
t-5	861	5.4		
	879	5.3		
	916	5.7		

APPENDIX 1 (continued)

Terrace elevations at Invincible Point (continued)

south bank (^^ denotes ice-push ridge)

location	level survey 1986/07/26 distance (m)	level survey 1986/07/26 elevation (m)	altimeter survey 1986/07/28 altimeter	altimeter survey 1986/07/28 time (CDT)
	954	5.5		
	1016	6.0		
	1078	6.1		
	1302	6.4		
	1367	6.9		
t-6	1409	7.8		
	1506	8.1		
	1629	8.4		
	1764	8.4		
	1838	8.8		
	1871	9.3		
t-7	1933	10.1		
	2024	10.4		
	2113	10.2		
	2205	10.2		
	2290	10.2		
t-8	2334	11.0		
	2446	11.2		
	2549	11.6		
	2666	11.6		
	2761	11.8		
	2837	12.2		
t-9	2917	12.9		
	3006	13.5		
	3079	13.9		
	3148	14.1		
t-10	3213	14.8		
	3316	15.2		
	3410	15.6		
	3531	15.4		
	3641	15.8		
t-11	3745	16.6		
	3845	17.2		
	3979	18.0		
	4062	18.4		
	4152	19.0		
	4232	19.4		
t-12	4307	20.0		
	4383	20.4		
	4470	20.5		
	4588	20.8		
	4687	21.0		
	4798	21.3		
	4887	22.0		
	4984	22.4		

<u>Terrace elevations at Invincible Point</u> (continued)

<u>south bank</u> (^^ denotes ice-push ridge)

location	level survey 1986/07/26 distance (m)	level survey 1986/07/26 elevation (m)	altimeter survey 1986/07/28 altimeter	altimeter survey 1986/07/28 time (CDT)
	5083	22.8		
	5170	23.2		
t-13	5250	23.5		
	5365	24.1		
	5465	24.3		
	5567	24.3		
	5674	24.8		
t-14	5773	25.8		
	5858	26.7		
>SH		26.3		
s14		25.8	3.109	1450
t-14 s13			3.144	1440
[s12]			3.083	1422
[s12]			3.095	1330
>97		29.7	3.155	1336
s11			3.122	1303
s10			3.198	1250
s 9			3.180	1120

[Note: Terraces are numbered sequentially from the modern river mouth (t-0) upward and backward in time: thus t-1 is the first terrace above the active channel, t-5 is the fifth, &c; >SH is a common point (seismic shot-hole LN2671-SP136) on the north bank; >97 is another temporary bench mark on the north bank used for altimeter survey control; s 9, s10, s11, s12, s13, s14 are exposed sections (see Fig. 4 for locations; [ ] denotes position below the terrace surface.]

APPENDIX 2

Sample inventory

sample number**	lat. (degrees)	long.	elev. (m)	type	site*	feature	material
Melville Island							
7001	76.410	108.700	42	grab	1	terrace	shells
7002	76.400	108.639	11	section	2	delta	mud
7003	76.400	108.639	11	section	2	delta	shells
7004	76.400	108.639	11	section	2	delta	plants
7005	76.400	108.639	11	section	2	delta	plants
7006	76.400	108.639	13	section	2	delta	shells
7007	76.400	108.639	13	section	2	delta	mud-sand-pebble
7008	76.400	108.639	13	section	2	delta	shells
7009	76.400	108.639	13	section	2	delta	shells
7010	76.400	108.639	14	section	2	delta	mud-sand
7011	76.285	108.085	9	section	3	ice-push	mud-sand-pebble
7012	76.291	108.130	1	section	5	delta	mud
7013	76.291	108.130	1	section	5	delta	plants
7014	76.291	108.130	8	section	5	delta	sand
7015	76.398	108.715	22	section	6	delta	plants
7016	76.398	108.715	22	section	6	delta	plants
7017	76.392	108.527	9	section	7	delta	mud
7018	76.392	108.527	9	section	7	delta	sand
7019	76.392	108.527	9	section	7	delta	plants
7020	76.257	109.918	8	section	8	delta	mud
7021	76.257	109.918	10	section	8	delta	sand-pebble
7022	76.257	109.918	11	section	8	delta	sand-pebble
7023	76.295	108.319	30	grab	9	terrace	shells
7024	76.295	108.319	20	grab	9	terrace	shell
7025	76.296	108.291	26	grab	11	terrace	shells
7026	76.297	108.283	23	section	12	delta	mud
7027	76.297	108.283	27	section	12	delta	sand
7028	76.297	108.240	21	section	14	delta	plants
7029	76.294	108.181	15	section	15	delta	plants
7030	76.398	108.629	15	section	17	delta	wood
7031	76.400	108.639	11	section	2	delta	shell
7032	76.400	108.639	11	section	2	delta	shells+plants
7033	76.400	108.639	11	section	2	delta	shells+plants
7034	76.400	108.639	11	section	2	delta	plants
7035	76.375	108.527	77	section	18	terrace	wood
7036	76.375	108.527	77	section	18	terrace	sand
7037	76.375	108.527	77	section	18	terrace	mud
Mackenzie King Island							
8001	78.087	111.440	~5	grab	1	ice-push	gravel
8002	77.494	110.370	0	grab	2	beach	mud-sand

APPENDIX 2 (continued)

sample number**	lat. (degrees)	long.	elev. (m)	type	site*	feature	material
Lougheed Island							
8003	77.247	104.367	0	section	1	beach	sand
8004	77.247	104.367	1	section	1	beach	
8005	77.247	104.367	1	section	1	ice-push	mud
8006	77.247	104.367	1	core	1	beach	
8007	77.217	105.283	0	section	2	beach	
8008	77.217	105.283	0	section	2	beach	
8009	77.217	105.283	0	core	2	beach	
8010	77.217	105.283	1	section	2	beach	mud-sand
8011	77.320	104.450	1	section	6	beach	
8012	77.320	104.450	0	grab	6	beach	sand-pebble
8013	77.528	104.967	1	section	7	beach	mud-sand-pebble
8014	77.528	104.967	2	section	7	beach	mud
8015	77.678	105.350	1	section	3	beach	mud-sand-pebble
8016	77.678	105.350	0	section	3	beach	sand
8017	77.678	105.350	0	section	3	beach	
8018	77.678	105.350	0	section	3	beach	
8019	77.725	106.100	0	grab	4	beach	sand
8020	77.725	106.100	0	grab	4	beach	sand
8021	77.725	106.100	2	section	4	beach	mud
8022	77.583	105.867	0	grab	8	beach	mud-sand
8023	77.547	105.850	2	grab	9	beach	sand
8024	77.367	105.533	0	grab	10	beach	sand-pebble
8025	77.367	105.533	0	grab	10	beach	mud
8026	77.367	105.533	0	grab	10	platform	sandstone
8027	77.113	104.783	3	core	5	ice-push	mud
8028	77.113	104.783	0	section	5	beach	mud
8029	77.113	104.783	6	grab	5	ice-push	mud
8030	77.142	104.475	~3	section	11	bch rdge	
8031	77.142	104.475	~3	section	11	bch rdge	
8032	77.142	104.475	~3	section	11	bch rdge	
8033	77.147	104.467	~3	section	11	bch rdge	sand
8034	77.147	104.467	~5	section	11	bch rdge	clay
8035	77.147	104.467	~5	section	11	bch rdge	sand

* See Figures 2-4 for site (section) locations on Melville Island; Figure 1 for site locations on Lougheed and Mackenzie King Islands.

**Sample numbers given above omit the leading digits '860'.

APPENDIX 3

Video tape summary (see Figure 1 for locations)

field tape number	start time (CDT)	location	stop time (CDT)	location
1986/07/30	Lougheed Island and nearby small islands			
1	1730	A	1749	B
2	1750	B	1810	C
3	1815	C	1843	D
4	2353	D	0009	E
1986/07/31	Lougheed Island			
5	0010	E	0031	F
6	0058	F	0119	G
7	0120	G	0141	H
8	0146	I	0205	J
1986/07/31	Mackenzie King Island			
9	0351	M	0413	N
10	1414	N	0435	O
11	0436	O	0457	P
12	0510	P	0525	Q
1986/08/06	Lougheed Island			
13	0000	K	0022	L

APPENDIX 4

Beach profiles

Site 1
1986/08/01

dist. (m)	elev. (m)	slope*		sediment type**		thaw depth (m)
.00	.92	.00	bm1	s		.50
3.00	.95	-.01		s		
6.00	1.05	-.03		sp		
8.00	1.16	-.06		sp		.39
11.00	1.11	.02		s		
13.00	1.05	.03		s		
16.00	1.00	.02		s		.40
19.00	1.04	-.01		s		
20.20	1.08	-.03		s		
22.20	1.16	-.04		sp		
25.20	1.05	.04		s		.42
26.80	1.07	-.01		s		
27.80	1.24	-.17		sp		
29.20	1.15	.06		sp	8005	.42
29.85	1.04	.17	bm2	sp		
30.85	.91	.13		s		
33.85	.86	.02		s		
36.85	.84	.01		s		
39.85	.77	.02		s		
42.85	.78	.00		s	8004/8006	.46
45.85	.73	.02		s		
48.85	.74	.00		s		
51.85	.67	.02		s		
54.85	.58	.03		s		.48
57.85	.65	-.02		s		
60.85	.67	-.01		s		
62.35	.68	-.01		s		
65.35	.65	.01		s		.48
66.25	.62	.03		s		
66.65	.63	-.02		s		
67.65	.57	.06		s		
70.65	.55	.01		s		
72.65	.53	.01		s		.48
73.35	.65	-.17		s		
74.55	.49	.13		s		
76.05	.32	.11		s		.50
77.45	.19	.09		s	8003	
79.55	.00	.09	wl	s		.42
81.35	-.18	.10		s		
83.35	-.35	.09		s		.15
86.35	-.49	.05		im		
89.35	-.64	.05		im		
92.35	-.69	.02		m		
93.85	-.68	-.01		m		
96.85	-.83	.05		m		

Site 2
1986/08/02

dist. (m)	elev. (m)	slope*		sediment type**		thaw depth (m)
.00	.71	.00	bm1	oms		.28
3.00	.68	.01		oms		
6.00	.61	.02		oms		
9.00	.61	.00		oms		.48
12.00	.60	.00		ms		.82
15.00	.55	.02		ms		.63
18.00	.50	.02		m		
21.00	.47	.01		m		.69
24.00	.42	.02				
27.00	.33	.03				.72
30.00	.39	-.02		ms		
31.20	.39	.00	bm2			.78
34.20	.37	.01		msp		.92
37.20	.35	.01		msp		.92
40.20	.30	.02		ms	8009	.48
43.20	.26	.01		ms		.58
45.20	.21	.03		msp		
48.20	.09	.04			8007/8008	
51.20	.00	.03		m		.62
52.70	.00	.00	wl	m		.26

Site 3
1986/08/03

dist. (m)	elev. (m)	slope*		sediment type**		thaw depth (m)
-37.50	3.23	.00		oms		
-34.50	3.45	-.07		oms		
-31.50	3.52	-.02		mp		
-28.50	3.47	.02				
-25.50	3.30	.06				.62
-22.50	2.89	.14		m		
-19.50	2.52	.12		om		
-16.50	2.29	.08				
-13.50	2.18	.04		om		
-10.50	2.16	.01		ms		
-7.50	2.14	.01				
-4.50	2.15	.00		ms		
-1.60	2.11	.01		ms		
.00	1.86	.16	bm1	ms		.66
1.10	1.97	-.10		msp		
4.10	1.95	.01				
7.10	1.84	.04				
7.80	1.67	.24				
9.20	1.61	.04				
12.20	1.28	.11		ms		
12.20	1.28	I				
13.60	1.36	-.06				
14.90	1.27	.07				
17.30	1.14	.05	bm2	s		.67
20.30	.99	.05		s	8015	
21.70	.90	.06		s		.73
24.20	.55	.14		s		.71
24.95	.49	.08		s	8018	.75
25.25	.39	.33		s		
26.50	.35	.03		s		
26.80	.28	.23		sp	8016	
29.10	.16	.05				
29.90	.12	.05		s		
30.20	.16	-.13		s	8017	.92
30.45	.12	.16		s		
31.05	.06	.10				
31.55	.06	.00				
32.35	.00	.07	wl			.69
33.45	-.10	.09		s		
36.45	-.29	.06		m		
39.45	-.40	.04		m		
42.45	-.56	.05		m		
45.45	-.78	.07		m		

Site 4
1986/08/03

dist. (m)	elev. (m)	slope*		sediment type**		thaw depth (m)
-7.10	.13	.00		ms		
-4.10	.31	-.06		oms		
-1.10	.71	-.13		oms		
.00	.84	-.12	bm1	oms		.44
3.00	.97	-.04		om		
6.00	1.12	-.05		om		
9.00	1.31	-.06				
11.80	1.68	-.13				
14.80	1.91	-.08		m		.37
17.80	2.01	-.03				
19.40	2.16	-.09		m		
20.40	1.96	.20				
22.90	2.04	-.03	bm2			.53
25.90	1.95	.03		m		
28.40	2.00	-.02				
31.40	2.05	-.02				
34.40	1.89	.05		msc	8021	.51
37.40	1.73	.05		ms		
40.25	1.60	.05				
41.50	1.32	.22		ms		
42.50	.83	.49		ms		
43.10	.42	.68		ms		
43.25	.21	1.40		ms		
43.65	.09	.30		s		
43.95	.03	.20		s	8019/8020	
44.25	.00	.10	wl	s/m		.52
45.95	-.17	.10		m		

Site 5
1986/08/03

dist. (m)	elev. (m)	slope*		sediment type**		thaw depth (m)
-3.00	5.88	.00		msp		
.00	5.88	.00	bm1	msp	8029	.59
3.00	5.88	.00				
6.00	5.63	.08		oms		.51
9.00	5.40	.08				
12.00	4.98	.14		ms		
15.00	4.56	.14				
18.00	3.86	.23		ms		.52
21.00	3.72	.05		om		
24.00	3.55	.06		om		
27.00	3.50	.02		om		
30.00	3.32	.06				.41
33.00	3.08	.08				
36.00	3.02	.02		m		
39.60	3.09	-.02	bm2	m		.92
43.20	2.75	.09		m		
44.40	2.08	.56		m		.85
45.40	2.49	-.41		m		
47.40	2.72	-.12		om		.46
50.70	2.61	.03		m		
51.30	2.91	-.50		ms		.67
53.40	2.79	.06				
55.50	2.88	-.04		m		
56.50	2.03	.85		m		
56.90	2.40	-.92				
58.40	2.05	.23		m		
60.00	2.51	-.29		im		.53
61.70	2.48	.02		m		.37
63.00	2.68	-.15		m	8027	.73
64.30	1.42	.97		m		.32
65.60	1.43	-.01		m		
66.10	1.68	-.50		m		.92
68.10	1.41	.14		m		.86
70.10	.92	.25				
72.30	.71	.10		m		.74
74.60	.48	.10				
77.60	.42	.02				
79.60	.27	.08		m		.78
82.10	.20	.03		m		
83.90	.05	.08		m	8028	.48
85.90	.00	.03	wl	m		.41

* Slope positive seaward.
** Sediment types: i (ice); o (organics); m (mud); s (sand); p (pebbles); c (cobbles).