UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ALASKAN GEOLOGY BRANCH
TECHNICAL DATA FILE

REPORT ON THE BEACH DYNAMICS, GEOLOGY AND
OIL SPILL SUSCEPTIBILITY OF THE GULF OF ALASKA
COASTLINE IN GLACIER BAY NATIONAL MONUMENT--
SEA OTTER CREEK TO ICY POINT

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OPEN-FILE REPORT
78-284

This report is preliminary
and has not been edited or
reviewed for conformity
with Geological Survey
standards and nomenclature.

Menlo Park, California
March 1978

INTRODUCTION

Observations of the Gulf of Alaska coastline in Glacier Bay National Monument were conducted between June 1975 and July 1977 to: (1) characterize the beach environment, and (2) assess the effects of an oil spill (fig. 1). These included overflights in June 1975, June 1976, July 1976, January 1977, May 1977, and July 1977 when photographic observations were made from small fixed-wing aircraft and field observations in June 1975, July 1976, January 1977, and July 1977. Field observations consisted of measuring beach morphology, sediment distribution, and vegetation type, and characterization of beach dynamics between Fairweather Glacier and La Perouse Glacier.

Ninety sediment samples were collected and analyzed for grain size in the Menlo Park USGS sediment laboratory. Beach morphology at selected sites was determined by profiling from the limit of storm deposited debris (mostly wood) to the surf zone. In 1976, 30 profiles were made, ten of which were revisited in 1977. In all 55 profiles were measured.

A qualitative estimate of the effects of an oil spill for the Monument coastline between Sea Otter Creek and Icy Point as well as each of the profile stations has been made based on field observations and a susceptibility scheme by Hayes and Owens (Hayes et al., 1976; Owens, 1977).

ACKNOWLEDGMENTS

The following have greatly helped in the collection of field data during the three periods of beach observation by serving as field assistants: Daniel Bishop, Terry Bruns, John Cudnohufsky, John Hampson, Nancy Hardin, Lee Kmith, Greg Streveler and Richard Weissbrod. Laboratory analyses of beach sediments were performed by John Hampson, Steve Kittelson, Bill Levy and Jorge Rodriguez.

GEOLOGY OF THE COASTAL AREA,
GLACIER BAY NATIONAL MONUMENT

The Coastal and Fairweather provinces, two of five geologically distinct provinces in Glacier Bay National Monument (MacKevett et al., 1971) comprise almost one-third of the area of the monument (fig. 2).

The Coastal province extends northwest from Icy Point to the northern boundary of the monument, a distance of approximately 75 km. The eastern boundary of the Coastal province is the long, narrow, northwest-trending valley that is the surface expression of the Fairweather fault. A terraced lowland rises gently from the coastline to the 600 to 1,000 m high Coast Range. This belt of low mountains increases in elevation and width to the northwest. Lituya Bay, a T-shaped inlet from the Pacific Ocean, divides the Coastal province. The upper end of the bay, a fjord-like pass through the Coast Range, ends in the Fairweather fault trench and is bounded to the north by Lituya Glacier and to the south by North Crillon Glacier.

The Fairweather province lies east of the Fairweather fault, extends east to the Brady Glacier, and spans over 100 km from Cape Spencer, at the southeast end of the province, northwest to the northern boundary of the monument. The land surface northeast of the Fairweather fault trench rises steeply into the rugged mountainous area of the Fairweather province. The precipitous peaks of the Fairweather Range commonly rise to elevations over 3,000 m, and culminate to the northwest at the 4,600 m Mount Fairweather.

Valley glaciers originating in the Fairweather Range descend east to the Brady Glacier and other glaciers in the Geikie province and west to the Coastal province. Here they flow through parts of the Fairweather fault trench and form broad piedmont lobes that flow through the Coast Range onto the terraced lowland.

Figure 1. Map of Alaska showing the location of Glacier Bay National Monument.

FIGURE 2.—Index map showing Glacier Bay National Monument, Alaska, and geologic provinces within the monument.

Geology of the Coastal and Fairweather Provinces

Stratigraphy

The bedrock stratigraphic section in the Coastal and Fairweather provinces ranges in age from early Mesozoic to middle or late Pleistocene. The oldest rocks are in a Mesozoic volcanic unit of unknown thickness. Earlier described as the "slate-greenstone group" (Mertie, 1931), this unit crops out in a belt along the southwest side of the Fairweather fault. This belt extends from beyond the northwest boundary of the Coastal province to within 12 km of the southeastern end of the province and is approximately 2 to 8 km wide. The volcanic unit also crops out on the peninsula west of Taylor Bay (Rossman, 1963b).

The Mesozoic volcanic sequence is composed primarily of dark gray to black, slaty argillite interbedded with greenstone derived from flows, volcanic breccias, tuffs, and volcanic graywackes (Miller, 1961). Some intrusive greenstone may be present. Minor amounts of limestone, dolomite, and chert also occur in the bedded sequence. Much of the rock has been intensely deformed and mildly to moderately metamorphosed. Based on lithologic similarities to rocks on strike to the southeast on Yakobi and Chichagof Islands, this unit is believed to be of early to mid-Mesozoic age (Kennedy and Walton, 1946; Rossman, 1963a).

On the northeast side of the Fairweather fault, in fault contact with the volcanic unit, is a group of highly metamorphosed Mesozoic rocks. This group occupies a 6 to 18 km wide belt extending northwest beyond the Glacier Bay National Monument boundary and southeast to the Torch Bay and Graves Harbor area. These are predominantly amphibole and biotite schists and are believed to be the metamorphic equivalents of the volcanic unit. The amphibole schist is typically dark green or gray in outcrop. The biotite schist varies in outcrop from a light gray to a stained, rusty red appearance. Both rock types are medium- to fine-grained and are believed to be of Mesozoic age on the basis of similarities to rocks on Chichagof Island (Rossman, 1963a).

A sequence of Tertiary strata unconformably overlies the Mesozoic volcanic unit in the Coastal province. This sequence has been divided into three distinct units by Miller (1961) and Plafker (1967). The Tertiary Cenotaph Volcanics unit (Formation "B" of Miller, 1961) consists of about 380 m (1,250 ft.) of unfossiliferous green, red, and purple andesite breccia, tuff, and flows interbedded with green and red tuffaceous siltstone, glauconitic sandstone, green pebble-cobble conglomerate, and minor coal. The type section is designated along the south shore of Cenotaph Island in Lituya Bay (Plafker, 1967).

The Tertiary Topsy Formation (Formation "A" of Miller, 1961) is a sparsely fossiliferous marine unit which intertongues with, and in part unconformably overlies, the Cenotaph Volcanics Formation. It consists of approximately 365 m (1,200 ft.) of gray, hard, calcareous siltstone and sandstone. The type locality is designated along upper Topsy Creek, 11 km southeast of the mouth of Lituya Bay (Plafker, 1967).

The Tertiary-Quaternary Yakataga Formation was geographically extended by Plafker in 1967 to include lithogenetically equivalent rocks in the Lituya district (Formation "C" of Miller, 1961). At least 2,050 m (10,000 ft.) of the Yakataga Formation are exposed in nearly continuous outcrops near the Crillon River and in an area just south of Fairweather Glacier. Comprising most of this thickness are interbedded light olive-gray to dark-gray siltstone and light-gray to greenish-gray sandstone. Interbedded with the siltstone and sandstone in the upper 2,400 m (8,000 ft.) is a gray to greenish-gray conglomeratic sandy mudstone (Miller, 1961). Marine invertebrate fossils, chiefly mollusks, have been found throughout the Yakataga Formation (Plafker and Addicott, 1976).

The Cenotaph Volcanics Formation unconformably overlies the Mesozoic volcanic unit; the base of the Topsy Formation is not exposed. The Yakataga Formation unconformably overlies the Mesozoic volcanic unit in the area just

south of Fairweather Glacier. In the southeastern part of the Lituya district the Yakataga Formation appears to conformably overlie the Topsy and Cenotaph Formations. Based on fossil evidence, the age of the Yakataga Formation is believed to range from early Miocene to Holocene. The Topsy and Cenotaph Volcanics Formations are tentatively assigned a post-early Oligocene to pre-middle Miocene age (Plafker, 1967; Plafker and Addicott, 1976).

Most of the Quaternary deposits occur in the Coastal province and are primarily Pleistocene and Holocene morainal debris and beach sands. Other surficial deposits include lagoonal and tidal-estuary deposits, stream alluvium, and talus.

Comparison of onshore samples of the Yakataga Formation with the Holocene sediment collected in cores and grabs from the offshore shows a distinctive similarity in mineralogy of clay fraction, gross physical appearance and likely mode of deposition. Clay mineral assemblages are identical, with similar percentage ranges for each clay mineral present. The samples contain predominantly chlorite, illite, and kaolinite with minor montmorillonite. The Chugach, St. Elias, and Fairweather Mountains are the major source areas for these sediments, which enter the gulf mainly as rock flour and are distributed by surface currents from east to west (Molnia and Fuller, 1977).

Sediment samples from Lituya Bay are very similar to those from offshore and further exemplify the uniformity of non-terrestrial deposition in the region.

Intrusives

Three large, layered gabbroic plutons occur in a northwest-trending zone in the Fairweather province. Several smaller bodies of compositionally similar gabbroic rock occur in a southeastward extension of this zone on western Chichagof Island. All of these stocks are of approximately the same age, probably post-early Cretaceous, and are believed to be genetically related (Rossman, 1963a).

The largest of the plutons in the Fairweather province is the Crillon-La Perouse pluton, located in the Mount Crillon and Mount La Perouse area. Elliptical in plan, it is about 27 km long and 11 to 13 km wide; its long axis trends northwest. The total exposed thickness is almost 9,750 m (32,000 ft.) and it is probable that "many more thousands of feet of layered rock exist below the lowest layers exposed" (Rossman, 1963a).

The northernmost pluton underlies an area along the southwest flank of Mount Fairweather. The extreme northwestern end of the Fairweather pluton extends just beyond the boundary of the monument. The pluton is almost 10 km long and 6 km wide, with the long axis trending northwest.

The Astrolabe-De Langle pluton, the southernmost of the three, makes up the southern part of Mount De Langle and the Astrolabe Peninsula. Most of the pluton is concealed by the sea. The exposed stock is about 8 km long and 3 km wide, and up to 600 m (2,000 ft.) thick. The known outline of the Astrolabe-De Langle pluton suggests an elliptical shape similar to the other two plutons in the Fairweather province (Rossman, 1963a).

The rocks of all three plutons are mostly gabbroic. The primary rock-forming minerals are virtually unaltered plagioclase, clinopyroxene, orthopyroxene, and olivine. Accessory constituents include ilmenite, magnetite, sulfides, spinel-group minerals, hornblende, chromite, and traces of rutile, apatite, and graphite. Ilmenite is common in the Crillon-La Perouse pluton and magnetite and ilmenite make up as much as 10 to 15 percent of some layers in the Astrolabe-De Langle and Fairweather plutons. Some ultramafic rocks occur, mainly in the northern part of the Fairweather pluton and in the Crillon-La Perouse pluton near Brady Glacier. These are primarily pyroxenite, wehrnite, and dunite, and contain concentrations of up to 15 percent sulfides and a few percent of chromite (Rossman, 1963a; Plafker and MacKevett, 1970).

Well-developed layering is present in all three plutons. These layers are commonly 5 cm to 1.5 m thick and are formed by variations in texture and mineral proportions. These variations were produced during fractional crystallization and crystal settling in the magma chamber.

Layering in both the Crillon-La Perouse and Astrolabe-De Langle plutons seems to form northwest-striking, gently to moderately dipping synclinal basins (Rossman, 1963a). Layering in the Fairweather pluton along the southwest flank of Mount Fairweather appears to dip moderately to the northeast. The northeastern contact of the pluton is concealed beneath snow and ice (Plafker and MacKevett, 1970). Thus, the overall pattern of layering in the Fairweather pluton is not known, but may be inferred to be similar to those in the other two plutons.

The host rocks for these plutons are the Mesozoic amphibole and biotite schists, which have been thoroughly recrystallized in the contact areas. The minerals in the recrystallized rocks include almandine garnet, andalusite, staurolite, hornblende, biotite, kyanite, magnetite, ilmenite, and sulfides (Rossman, 1963a).

A similar gabbroic pluton on Chichagof Island intrudes a graywacke unit of probable early Cretaceous age. Rossman (1963a) thus believes that the plutons in the Fairweather province were intruded sometime during or after the early Cretaceous.

Several small bodies of Cretaceous or younger diorite and quartz diorite occur northeast of Palma Bay. Quartz diorite crops out northeast of Graves Harbor near Taylor Bay. Diorite also occurs just southwest of the Fairweather fault near the head of Lituya Bay and in several areas in the eastern part of the Fairweather province. Both the quartz diorite and diorite are fairly widespread in southeastern Alaska, and may be genetically related in some areas. In general, the quartz diorite appears to be intrusive and the diorite seems to be mainly metamorphic (Rossman, 1963a).

Regional Structure

A northwest trend is characteristic of most structural features in the Coastal and Fairweather provinces. Outcrop patterns, faults, and the strike of bedded rocks generally follow this northwest trend.

The bedding in the Mesozoic schists generally strikes northwest. Close to the Fairweather fault, the bedding dips steeply to the northeast, except towards the southeast near Palma Bay, where it dips steeply to the southwest (Miller, 1961; Rossman, 1963a). Near Brady Glacier, north of Mount De Langle, the schists form an anticline and syncline which strike approximately northwest (Rossman, 1963a).

Rossman (1963a) believed that emplacement of the layered gabbro caused the overlying schists to be pushed up and subsequently eroded. The dioritic stocks, however, do not appear to have significantly displaced or structurally deformed the bedded rocks which they intrude. These stocks seem to have been formed partly by magmatic intrusion and partly by recrystallization of the adjacent bedded rocks.

The Astrolabe-De Langle pluton is offset by several right-lateral faults which trend northeast, normal to the regional trend. These faults show strong strike-slip displacement (Rossman, 1963a).

The Tertiary strata are generally gently to moderately folded, except in some areas, where they are overturned. A northwest-trending syncline occurs in these strata just southeast of Fairweather Glacier. In the area between Lituya Bay and Crillon Lake, Tertiary strata form a syncline and an anticline with northwest-trending axes. The anticline is displaced vertically near its axis by a thrust fault. This fault extends approximately 8 km southeast from an area near the mouth of Lituya Bay, where it is concealed by glacial debris. The northeast side of the fault is the upper plate.

Another northwest-trending thrust fault displaces the offshore Tertiary strata from Lituya Bay southeast to just beyond Icy Point, a distance of approximately 40 km. The upper plate is the northeast side (Plafker, 1967). The Tertiary beds onshore on the upper plate dip steeply to the southwest, and are overturned for several kilometers near Icy Point and between Topsy Creek and the Crillon River.

The Cenotaph Volcanics Formation and the overlying Yakataga Formation form a homoclinal sequence on Cenotaph Island. The strike of these beds is N 50° to 60° W and the dip varies from 20° to 30° SW on the south side of the island to 50° to 60° SW on the north end (Mertie, 1931; Miller, 1961).

Little is known of the structure of the Mesozoic volcanic unit. Northwest of Lituya Bay and for several kilometers southeast of the bay and on Middle Dome near La Perouse Glacier, the rocks of this unit are moderately folded and strike to the northwest. In an area just west of Crillon Lake, however, these rocks strike to the west and dip steeply to the north (Miller, 1961).

The most prominent structural feature of the region is the Fairweather fault, which separates the Coastal and Fairweather provinces. Onshore, this northwest-trending, strike-slip fault extends for about 280 km from Icy Point to the upper Seward Glacier area, north of Yakutat Bay (Plafker and others, 1977). The fault trench, readily visible on land, extends for most of this distance and is filled with glacial ice and water. This trench is one to two kilometers wide for most of its 70 km onshore length in Glacier Bay National Monument.

The Fairweather fault lies in an arcuate network of faults that trend parallel to the coastal mountain ranges of southeastern Alaska, and is tectonically as active as the San Andreas fault in California (Page, 1969b).

To the northwest, the Fairweather fault joins a series of east to southeast-trending thrust faults, including the Coal Glacier fault and the Chugach-Saint

Elias fault. To the southeast, the Fairweather fault runs offshore and apparently joins the Queen Charlotte transform fault and the Peril Strait fault (Plafker and others, 1977).

Tectonics and Related Phenomena

The most recent major movement along the Fairweather fault occurred during the July 10, 1958 earthquake (Richter magnitude 7.9). Movement probably occurred along much or all of the onshore length of the fault. The maximum observed displacement, measured just east of the north end of Crillon Lake, was 6.5 m dextral slip and 1 m dip slip, with the southwestern side up (Tocher, 1960b). The fault plane is vertical or dips steeply to the northeast. The epicenter was located at 58° 20' N, 136° 55' W, just offshore from Astrolabe Point (Stauder, 1960).

The 1958 earthquake caused moderate property damage at Yakutat, 210 km to the northwest and was readily felt within 650 km of the epicenter (Davis and Sanders, 1960). The macroseismic area was estimated to be at least 10^6 square kilometers. The most distant point at which the earthquake was reportedly felt was in Seattle, Washington (Brazee and Jordan, 1958). It was the largest shock "on or near United States territory since the Aleutian Islands shock of March 9, 1957, and the largest with extensive fault breakage on land in the United States since the California earthquake of April 18, 1906" (Tocher, 1960a).

A well-defined sequence of aftershocks was triggered by the 1958 earthquake, of which over 200 were recorded (Brazee and Jordan, 1958). Microearthquake activity recorded near Crillon Lake in 1968 was at least equal to and possibly greater than that reported for active sites on the Denali and San Andreas faults. It is not known, however, if all of the observed seismicity near Crillon Lake can be attributed to aftershock activity of the 1958 earthquake (Page, 1969a).

Phenomena related to the 1958 earthquake included rock, soil, snow, and ice avalanches, earth lurches, rockslides, earth flows, earth slumps, sandblows,

and minor fissuring. Because the region near the Fairweather fault is sparsely settled, only five persons were killed. A beach on Khantaak Island, near Yakutat, plunged into Monti Bay, carrying three persons with it. The other two were lost when their fishing vessel was sunk by a cataclysmic wave in Lituya Bay.

The most spectacular event related to the 1958 earthquake was the generation of this cataclysmic wave by a rockslide at the head of Lituya Bay. About 30 million cubic meters of rock, loosened by the earthquake, plunged into Gilbert Inlet, the northern arm of the bay, from elevations up to 900 m on the steep northeast wall (Miller, 1960a). This caused a surge of water to sweep over the opposite wall of the inlet, reaching a maximum altitude of 520 m, and generated a gravity wave that traveled towards the mouth of the bay. Moving at a speed probably between 155 and 210 km per hour, this wave sank two of the three fishing boats that had been anchored in the outer part of the bay, killing two persons. Vegetation along the shores was destroyed over a total area of more than 10 square kilometers. The area of destruction on the north and south shores along a 1.6 km distance midway between the head and mouth of the bay averaged 360 m in width and reached an average altitude of 33 m. The maximum horizontal distance of the trimline from the high-tide shoreline in the bay was about 1,080 m near Fish Lake, north of the west end of the bay (Miller, 1960b).

At least four giant waves similar to the one in 1958 are believed to have occurred since 1853 in Lituya Bay. These were also probably caused by rockslides or avalanches from the steep slopes along the head of Lituya Bay but only one or two were likely to have been earthquake-triggered. The dates of occurrence and the maximum altitudes of the trimlines of these waves are given by Miller (1960a) as: October 27, 1936--about 147 m; 1899(?)--about 60 m; 1874(?)--about 24 m; and 1853 or 1854--about 120 m.

The relatively frequent occurrence of these giant waves in Lituya Bay,

as compared to other seemingly similar bays may be due to a combination of the following factors: (a) presence of an active fault under water at the head of the bay; (b) presence of recently glaciated, steep slopes on highly fractured and sheared rocks along the fault zone; (c) presence of deep water immediately below the steep slopes in and near the fault zone; and (d) heavy rainfall and frequent freezing and thawing (Miller, 1960b). Miller (1960b), as does the author, believes that these waves should be taken into account in any future use of Lituya Bay since they are likely to reoccur.

The 1958 earthquake in the Lituya Bay area is the only historic earthquake known to have caused movement on the Fairweather fault. A series of earthquakes occurred in the Yakutat Bay area in 1899 and 1900 causing local uplifts of as much as 14 m. These earthquakes were felt throughout a large area in southern Alaska and adjacent Canada, and may have involved some movement on the northern part of the Fairweather fault. They also may have triggered a cataclysmic wave in Lituya Bay believed to have occurred during 1899. A considerable amount of drift timber and muddy water was reported in the ocean between Cape Fairweather and Yakutat 2 days after the largest of the earthquake shocks, but no reports were received concerning the Lituya Bay area (Tarr and Martin, 1912).

Rates of movement along the Fairweather fault have been estimated from offset moraines and drainages. Dextral displacements with maximum offset of about 55 m were measured on three streams flowing on glacial till and bedrock near Crillon Lake. A dextral offset of at least 50 m was measured on a lateral moraine of Finger Glacier. Radiocarbon-dated wood from lateral moraines at these localities indicates that the average slip rate during the last millenium has been at least 4.8 cm/year and probably as much as 5.8 cm/year (Plafker and others, 1977).

A similar rate of approximately 4 cm/year for dextral slip on the Fairweather fault for the last millenium was obtained by Page (1969b) from measurements along a fault scarp on the northeastern shore of Crillon Lake. He assumed a constant ratio of 6:1 or 7:1 strike-slip to dip-slip motion, such as that observed for the 1958 earthquake. Also assumed was that formation of the 6 m high scarp occurred during the last 1,000 years, before which time the area was believed to have been glaciated.

Total late Cenozoic dextral displacement along the Fairweather fault is believed to be on the order of 5.5 km, based on the offset of major valleys that drain across the trace of the fault. These glacial valleys probably started forming during the Miocene, when uplift of the Saint Elias Mountains is believed to have begun. The fit across the fault of almost all of these glacial drainages is improved with removal of about 5.5 km of dextral displacement. Theoretically, Lituya Bay would have originally been connected to North and South Crillon Glaciers (Plafker and others, 1977).

The estimated rates of 4.0 to 5.8 cm/year for recent dextral displacement on the Fairweather fault are very close to estimated rates of 5 (Page, 1969b) to 5.4 cm/year (Plafker and others, 1977) displacement along the Pacific and North American crustal plates in the region of the fault. This suggests that most or all of the relative motion between the Pacific and North American plates in the region presently occurs along the Fairweather fault (Plafker and others, 1977). The rates of movement between the plates probably have been nearly constant since at least the early Pliocene (Page, 1969b). Since total late Cenozoic displacement of 5.5 km on the Fairweather fault would require less than 10,000 years at the displacement rates estimated from the late Holocene offsets, the Fairweather fault may have been a major transform boundary between the Pacific and North American plates only since the late Pleistocene. Before that time,

relative motion between the plates probably occurred along one or more offshore faults (Plafker and others, 1977).

Marine Terraces

A series of raised marine terraces occurs along most of the length of the coastal province. These terraces are well developed and best defined south of Lituya Bay and north of Crillon River. Northwest of Lituya Bay and southeast of Crillon River, these terraces are not as well developed and are more obscured by erosion and overlying sediments.

Four distinct terraces have been recognized in the area between Lituya Bay and the Crillon River which parallel the coast and increase in both average width and age with mean height. The elevations and maximum widths of these four terraces were given by Derksen (1974, 1975b): (a) 13 m, 150 m; (b) 30.5 m, 250 m; (c) 85 to 100 m, 1.6 km; and (d) 170 to 245 m, 2.3 km. A fifth terrace, 400 to 510 m above sea level and up to 600 m wide, was also recognized by Derksen (1974). However, this terrace is not well developed or preserved and is limited areally. According to Hudson (oral commun., 1977), the relation of the fifth terrace to the others is not well understood; it may not be of marine origin.

The older terraces are generally more deformed due to differential tectonic uplift, and thus have greater variations in elevation. Terrace elevations generally reach a maximum between La Perouse Glacier and the Crillon River area and diminish gradually to the northwest and southeast (Hudson, oral commun., 1977).

Derksen (1974, 1975b) believes that the young 13 m terrace formed during Neoglacial isostatic depression of the entire Glacier Bay region, which climaxed about 1750 A.D. (~225 yrs. B.P.), and that the terrace reached its present elevation with recovery of the area. The 30.5 m terrace developed about 11,000 B.P. in response to eustatically rising sea level following the recession of late

Wisconsin ice. Similarly, the three higher terraces were cut by rising sea level during former interglacial periods. According to Derksen (1974, 1975b), these hypotheses for terrace formation require a relatively slow rate of tectonic uplift in the area. "Correlation between modern terrace elevations and dated marine transgressions in the Bering Sea area indicate the rate of tectonic uplift near Steelhead Creek averages 0.1 cm/year over the past 175,000 years" (Derksen, 1975b).

Hudson and others (1976) believe that diastrophism was responsible in large part for the development of the raised terraces. They note that in the Lituya Bay area and in two other areas where marine terrace sequences occur, Middleton Island and between Cape Yakataga and Icy Bay, documented historical earthquakes have always been accompanied by vertical displacements. "The existence of the terraces alone indicates that uplift over the short term is somewhat spasmodic" (Hudson and others, 1976). On the basis of radiocarbon dating of peat accumulations and wood on the terraces in the Lituya Bay area, Hudson and others (1976) determined the average rate of uplift to be approximately .9 cm/year. Also, this rate appears to have been relatively constant for the past several thousand years. Figure 3 shows a plot of their data.

The area immediately adjacent to Lituya Bay represents an apparent anomaly in the uplift regime of the coastal province. Several levels of buried forest just a few meters above the high tide line at two points on the north and south shores of Lituya Bay give radiometric ages of about 9,000 and about 6,000 years, respectively (Goldthwait and others, 1963). Thus, uplift, at rates indicated by radiometric dating of nearby raised terraces, has not occurred at these points on the shores of Lituya Bay.

Another series of raised marine terraces occurs to the southeast in the region between Icy Point and Cape Spencer, but has not been studied or described

Figure 3. Preliminary results of radiocarbon dating of marine terrace sequences between Cape Yakataga and Icy Bay (□), in the vicinity of Lituya Bay (Δ), and on Middleton Island (O). Figure from Plafker, Hudson, and Rubin (1976).

in as much detail as the sequence southeast of Lituya Bay. The best developed, most extensive, and highest of these terraces, at an elevation of about 36 m, is found at Icy Point, around the mouths of Dixon Harbor, Torch Bay, and Graves Harbor, and extends around Cape Spencer into Taylor Bay. Segments of marine terraces occur at elevations of about 13.5 m on both sides of Boussole Head, east of Palma Bay, at elevations of about 10.5 m and 16.5 m in Dixon Harbor, and at elevations of about 7.5 m and 13.5 to 16.5 m around the mouth of Torch Bay (Derksen, 1975a).

The 36 m terrace and the terraces at about 13.5 m may correlate with the 30.5 m and the 13 m terraces, respectively, in the Lituya Bay area. If so, Derksen (1975a) asserts that the occurrence of terraces at similar elevations on both sides of the Fairweather fault indicates that the development of these surfaces was primarily due to post-Wisconsin sea level rise and post-Neoglacial isostatic uplift, rather than tectonism. Plate 1 shows the location of the marine terraces between Sea Otter Creek and Icy Point.

Glaciation

Major valleys in the Coastal and Fairweather provinces probably contained glaciers extending to or near tidewater as early as the late Miocene, during much of the Pliocene, and throughout much or all of Quaternary time (Plafker and others, 1977). The glacial regimes of the area during the last few centuries are fairly well known from field observations and more recently from air photo interpretations. Some Holocene advances have been documented based on radio-carbon dating and field relations of moraine systems. Pleistocene and earlier regimes are not as well documented due to obliteration of drift by glacial re-advances and interglacial marine transgressions and weathering of remaining drift.

During the late Pleistocene, North Crillon and Lituya Glaciers merged to

form a large piedmont glacier that covered the immediate Lituya Bay area and discharged directly onto the present continental shelf, although the relationship with the sea level of that time is not clear. Huge boulders are strewn along 11 km of the modern coast, from Whale Creek to 1 km northwest of Portage Creek. Low moraines and outwash in the woods along this distance of coastline are believed to record the earliest and greatest spread of Wisconsin drift from North Crillon and Lituya Glaciers (Goldthwait and others, 1963). A later stand of Wisconsin ice is represented by the low end moraine forming La Chaussee Spit and Harbor Point at the mouth of Lituya Bay. A third, late Wisconsin stand is recorded by immense lateral moraines beginning near the head of Lituya Bay and extending through the "Paps" east of the Bay mouth. These lateral moraines are believed to be a composite of late Wisconsin and Little Ice Age deposition and are part of a prominent lateral-end moraine system attributed to Little Ice Age advances. This bulbous, nearly continuous, moraine system enlarges laterally from about 3 km along the pass through the steep walls near the head of Lituya Bay, where the highest drift is at an elevation of about 400 m, to about 8 km near the southwestern end of the bay (Goldthwait and others, 1963). As the northern arm of the moraine system is strikingly regular and resembles a large railroad grade, it is known as Solomon's Railroad. The southern arm is less regular.

Outcrops of forest buried in alluvial and lacustrine sediments on the shores of Lituya Bay give radiocarbon dates between about 3000 and 9000 years B.P. Underlying these levels of buried forest are Wisconsin outwash gravels and till. North Crillon and Lituya Glaciers probably retreated from their late Wisconsin stand about 9000 to 10,000 years B.P., and fluctuated about or behind their current relative termini positions during Hypsithermal time. Radiocarbon dating of logs, buried in glacial outwash gravels and overlain by till on east Cenotaph

Island and on the south shore of Lituya Bay, indicates that the beginning of the first Little Ice Age advance of North Crillon and Lituya Glaciers into Lituya Bay occurred at least 1800 years ago. By about 1000 years B.P. the advancing ice had reached its seaward limit, topping Solomon's Railroad and extending seaward to the Paps, near the mouth of the bay. The ice field probably remained extensive until about 400 to 600 years ago when the South Crillon Glacier reached its maximum stand as indicated by radiocarbon dating of morainal wood. Also, forest composition and tree size within Solomon's Railroad Moraine suggest forest growth for only a few centuries (Goldthwait and others, 1963). The forest growing outside of the moraine is noticeably more mature.

A prominent continuous moraine system on the slopes above Crillon Lake and blocking its extension south records the maximum Little Ice Age stand, and probably the maximum extent ever of South Crillon Glacier. No glacial drift has been observed beyond this limit (Goldthwait and others, 1963).

The moraine system of Finger Glacier is comparable to that of South Crillon Glacier; it extends across the terraced coastal lowland from the Fairweather Range to within a few kilometers of the present coastline. However, the modern terminus of Finger Glacier is only 1 to 2 km from its maximum Holocene stand, whereas the modern terminus of South Crillon is about 10 km from its maximum Holocene stand.

Based on radiocarbon dating and field relations of lateral moraines of South Crillon and Finger Glaciers, Plafker and others (1977) believe there were three general advances of these two glaciers during the Holocene: (1) about 1000 years B.P., (2) about 2600 years B.P., and (3) about 6000 years B.P. The youngest of these advances coincides generally with the Little Ice Age advances in the Crillon Glacier system as determined by Goldthwait and others (1963). Any advances into Lituya Bay by North Crillon and Lituya Glaciers concurrent

with the two earlier Holocene advances of South Crillon and Finger Glaciers have not been documented.

In 1786 the positions of Lituya and North and South Crillon Glaciers were mapped by La Perouse (map reproduced in Klotz, 1899). North and South Crillon Glaciers had retreated enough to have separate termini in the southern arm of Lituya Bay. Similarly, Lituya Glacier and the southern arm of Desolation Glacier had separate termini in the northern arm of Lituya Bay. By 1893, Lituya Glacier had united with the southern extension of Desolation Glacier and advanced about 4.8 km into the northern arm of Lituya Bay and North Crillon Glacier had merged with South Crillon Glacier and advanced about 4 km into the southern arm of the bay (Klotz, 1899). Lituya Glacier advanced about .8 km between 1895 and 1906 (Wright and Wright, 1908), and by 1961 had gained an additional .5 km (Miller, 1964). North Crillon Glacier has advanced more than 1 km since 1894. South Crillon Glacier advanced into Crillon Lake at an average rate of 10 m/year between 1924 and 1961 (Goldthwait and others, 1963).

Cascade Glacier, the medium-sized cirque glacier at the head of Lituya Bay, was observed at or near tidewater level by La Perouse in 1786. By 1907, the terminus had receded to an elevation of about 300 m (Miller, 1964). In 1934 it had advanced to reach tidewater, and was observed at this position again in 1943 (Kennedy, 1943, unpublished report in files of Alaska Technical Data Unit, U.S. Geological Survey). Thus, while nearby Lituya and North Crillon Glaciers were expanding, Cascade Glacier underwent a period of shrinkage before its recent expansion. This contrasting behavior is probably a function of a lower *névé* elevation and of the different geometries the glaciers have in their relationships to sea level. Cascade's *névé* elevation is much lower, lying between 900 m and 1,200 m (Miller, 1964). The 1977 position of Cascade Glacier is at tidewater.

La Perouse Glacier is the only North American tidewater glacier calving bergs directly into open ocean. It currently deposits coarse clasts from the Crillon-La Perouse pluton at the shoreline, where they are dispersed toward the northwest by prevailing ocean currents. The presence of pebble and cobble horizons in the Yakataga Formation of the Lituya Bay region suggests that glaciers of this region have been calving icebergs into the ocean since at least early Pliocene time (Plafker and others, 1977).

As mapped by Miller (1961), La Perouse Glacier at its maximum Holocene stand was about 6 km wide, only about 1 km wider than at present. A forest trimline within the outermost trimline was established during an advance culminating in 1895. Since then, La Perouse Glacier has oscillated within about 100 m of the trimline (Miller, 1964).

La Perouse, who was a rather astute observer, made no mention of a 1786 marine terminus for the glacier which now bears his name. Perhaps La Perouse Glacier had receded back from its present shoreline position, and resembled many of the other valley glaciers in the area or perhaps La Perouse did not make any detailed observations south of the terminal moraine at Lituya Bay mouth. The smaller, unnamed piedmont glacier west of La Perouse Glacier on the east side of Middle Dome is presently about 1 km from its maximum Holocene stand, which is about 3 km from the present shoreline (Miller, 1961).

The Fairweather Glacier was about 2.5 km wider in the coastal lowlands during earlier Holocene time than at present. Two different Holocene stages are recorded by lateral moraines north of the glacier in the Coastal province, but there is only one prominent Holocene moraine south of the glacier (Miller, 1961). The lateral moraines north of the glacier trend directly toward the ocean, indicating that the Fairweather Glacier was an open coast tidewater glacier for a period of time during the Holocene, most likely during the Little

Ice Age. Comparison of 1895 and 1961 topographic maps indicate as much as 5 km of retreat of Fairweather Glacier during the intervening 68 years. However, the reliability of the 1893 map must be questioned. In 1786 when La Perouse first explored this area he named this glacier (Fairweather), the Grand Plateau Glacier (La Perouse, 1793).

No evidence of glaciation has been found in the areas between the positions believed to be occupied by the Pleistocene and Holocene piedmont glaciers in the Coastal province (Miller, 1961; Goldthwait and others, 1963). These driftless areas "constituted important refugia for plants and animals all through late Pleistocene time. The age of forests is limited only by Pleistocene interglacial higher sea levels" (Goldthwait and others, 1963).

The 300 km² Brady Glacier, the largest glacier in Glacier Bay National Monument, lies in the Fairweather and Geikie provinces. Most of this piedmont glacier flows southward and terminates in outwash above tidewater in Taylor Bay. During the Pleistocene, probably as recently as late Wisconsin, Brady Glacier covered most of the southeastern end of the Fairweather province. The upper parts of De Langle Mountain, Astrolabe Peninsula, and Horn Mountain projected above the ice as nunataks. "Ice flowed down Palma, Boussole, and Dixon Valleys to probably coalesce into a broad piedmont lobe stretching from Icy Point to Cape Spencer on the coastal lowlands exposed by eustatically lowered sea level" (Derksen, 1975a). A lateral moraine on the southwest flank of De Langle Mountain indicates that late Wisconsin glaciation in the area reached an elevation of at least 615 m (Derksen, 1975a).

An extensive Neoglacial advance of the Brady Glacier deposited moraines in Palma Valley, upper Boussole Valley, and near the mouth of the Dixon River. Radiocarbon dating indicates that this advance probably occurred between 1740 and 1440 years B.P. A period of recession followed this advance, and the ice

was probably near present margins. Expansion of the Brady Glacier during the Little Ice Age may have started as early as 650 to 600 years B.P. and reached a maximum in 1876, more than a century after ice in nearby Glacier Bay reached its Little Ice Age maximum (Derksen, 1975a). The Brady Glacier is currently slightly smaller than its Little Ice Age maximum and is essentially in equilibrium (Bengston, 1962).

Mineral Resources

The mineral resources in the Coastal and Fairweather provinces have been described and summarized by MacKevett and others (1971) in a reconnaissance study of the mineral resources in Glacier Bay National Monument. Information on mineral deposits from previous investigations was complemented by field studies and geochemical sampling.

The three layered gabbroic plutons in the Fairweather province contain large amounts of low grade concentrations of ilmenite and magnetite. Smaller amounts of sulfides, chromite, and platinum have also been reported. Mineralization in these plutons has been described by Kennedy and Walton (1946), Rossman (1963a), and Plafker and MacKevett (1970).

A nickel-copper prospect in the easternmost part of the Crillon-La Perouse pluton, located in two small nunataks in Brady Glacier, has recently been explored by diamond drilling and may be economically significant (MacKevett and others, 1971).

"The little-explored and prospected layered intrusive rocks of the Fairweather Range are potentially important because they contain known resources and are favorable hosts for a variety of mineral deposits. However, they occur largely in remote and rugged terraine where prospecting, exploration, and mining are difficult and costly" (MacKevett and others, 1971).

The beaches along the entire length of the Coastal province contain con-

centrations of heavy minerals derived primarily from the layered intrusives in the Fairweather province. These irregularly distributed placer deposits consist of beach sands containing 5 to 40 percent heavy minerals and occur in the modern bare beaches and in older, vegetated, beaches (Rossman, 1957). Concentrations of over 95 percent heavy minerals in the modern beaches have been observed by the author. The placers range in size from a few meters wide and a few meters long to over 100 m wide and over 3 km long. The thicknesses of the placers are not known (Rossman, 1957). Those of primary economic interest are the concentrations of ilmenite, magnetite, gold, and platinum.

The beach deposits have been studied by Mertie (1931), Rossman (1957), Thomas and Berryhill (1962), and Cook (1969). According to MacKevett and others (1971), these deposits "could be worked under favorable economic conditions for gold, and they also constitute a potential resource of titanium, and possibly iron."

The placers were mined sporadically for gold by Russians before 1867 when Alaska was purchased by the United States, and since 1894 by Americans. The best year of mining reported was 1896, due to particularly heavy and frequent storm activity. During 1896, between 150 and 200 men were mining along the beach. Gold valued at about \$75,000 (1931 prices approximately \$20/oz.) was recovered from these deposits between 1894 and 1917. No substantial production has been recorded since 1917. Auriferous sands occur from 3 to 26 km northwest and 6 to 15 km southeast of Lituya Bay. The best pay sands were found between 11 and 14 km southeast of the bay. The beach sands on the raised terraces have been mined to a small extent, but little is known of the results (Mertie, 1931). The beach deposits between Lituya Bay and Fairweather Glacier are covered by 160 standard placer claims, the deposits between Lituya Bay and La Perouse Glaciers are held with 14 placer claims (Thomas and Berryhill, 1962).

COMPARISON OF 1893 AND 1961 TOPOGRAPHY--
CAPE FAIRWEATHER TO LITUYA BAY

The most striking differences between the 1893 topographic map (fig. 4) and the 1961 map (fig. 5) are the morphology of the shoreline near Cape Fairweather and the drainage pattern between Justice Creek and Portage Creek. The maps also show a shoreline difference at Eagle (Portage) Creek mouth which confirms the ongoing erosion near the creek outlet.

The morphology of the Cape Fairweather area on the 1893 map indicates a straight coastline projecting over 4.5 km further out to sea than the 1961 topographic map. In addition, a lake over 1.5 km in length is shown in an area which is part of the continental shelf on the 1961 map. The water depth in 1961 is about 10 m. The large meltwater lake at the terminus of Fairweather Glacier is not shown at all. Two hypotheses are presented here to explain the Cape Fairweather morphology differences: (1) The accuracy of the 1893 map is so poor that the lake shown is actually the terminus meltwater lake, but it is mislocated by over 3.5 km, while the differences in shoreline position are the result of inaccurate plotting of data and the shorelines are actually similar. (2) The differences are the result of the retreat of Fairweather Glacier during the 68 year period between maps, and consequently represent actual changes in shoreline morphology. Similar changes in morphology have been observed at Icy Bay and at Sitkagi Bluffs in front of Malaspina Glacier (Molnia, 1977a, b). The reliability of the map between Justice Creek and Lituya Bay mouth is very high and tends to strengthen the second alternative.

The drainage between Justice Creek and Portage Creek on the 1893 map has only one outlet, Portage Creek. In 1917, the situation was the same (Mertie, 1931). However, by 1961, Justice, Echo, and Portage Creeks all had separate outlets. This situation can be explained by the following hypothesis. Prior to 1893 a major storm or storms, an earthquake related uplift, or river mouth

Figure 4. Tracing of the 1893 Alaskan-British Boundary Commission topographic map of the area between Fairweather Glacier and Lituya Bay. Note the ponding of drainage and the sole outlet at Portage Creek.

Figure 5. Tracing of the 1961 U.S.G.S. topographic map, Mt. Fairweather Quadrangle, between Fairweather Glacier and Lituya Bay. Note the changes in drainage of the position of Fairweather Glacier as compared to 1893.

spit growth ponded all of the major drainages between Fairweather Glacier and Lituya Bay behind a large beach front ridge. In the case of storms the diverting deposit would be a series of coalescing wash-over fans, with an earthquake, the case would be an uplifted beach ridge or offshore bar. Subsequent erosion (post 1917) and perhaps a few large meltwater floods would be required to breach the ponding barrier. This would have to be completed by 1929 as air photography in the collection of Bradford Washburn shows discrete stream mouths. The major system of tributaries which drains through Justice Creek still shows this parallel to beach ponding. The western tributaries are offset as much as 5 km to the east before they drain into the gulf. Justice Creek mouth is presently offset over a kilometer to the west, the modern direction of longshore transport. I doubt that the eastward offset of the streams (1893-1940's) is the result of longshore transport as (1) the modern direction is 180° out of phase, and (2) there is no evidence of a counter current in the nearshore.

The shoreline at Portage (Eagle) Creek mouth has receded (been eroded) 200 to 300 m during the 68 years between maps. This distance corresponds very well with the observed 3 to 4 m of retreat between the summers of 1976 and 1977. Based on field observations this stretch of coastline appears to be the most actively retreating between Cape Fairweather and Icy Point.

DESCRIPTION OF THE BEACH ENVIRONMENT

A total of 55 separate beach profiles were measured and 98 sediment samples collected and analyzed. In addition, many pages of field notes and observations were recorded. Rather than bombarding the reader with volumes of data, a graphic (Plate 1) and tabular (Table 1) synthesis of the data has been made to aid in simplification of presentation. However, a written description with selected profiles is also presented. Data on grain size of the beach material is presented in a later section on sedimentology. The summary table (Table 1) also lists the

Plate I is an oversized, folded map which accompanies the text. It is separate from the page-sized text.

Table 1. Summary of major data.

<u>Station</u>	<u>Elev. of Storm Evidence (m)</u>	<u>Elev. of Lowest Vegetation (m)</u>	<u>h - high tide berm l - low tide berm s - storm berm</u>	<u>Cusps Period/Height</u>	<u>Bedforms</u>	<u>Erosional Scarp Height (m)</u>	<u>Oil Spill Suscep- tibility Rating</u>
76-1	8.3	6.2	s, h, l,	-	Sand waves	-	AF
76-2	>10.0	>12.0	-	-	-	-	E
76-3	>9.6	>10.0	-	-	-	-	E
76-4	>7.8	-	-	-	-	3.8	AF
76-5	>11.3	-	-	-	-	4.2	AG
76-6	>8.0	-	s, h	-	-	5.2	ACE
76-7	>6.8	-	-	1 set	Imbricated cobbles	-	CE
S77-5	15.5	-	-	-	-	4.0	AE
S77-6	12.0	7.4	-	2 sets	-	5.7	ACE
S77-7	12.5	12.5	-	2 sets	-	6.2	AEF
76-8	>9.2	-	l present	-	-	2.8	AF
76-9	11.7	-	-	-	-	5.0	AG
S77-4	11.7	7.2	-	1 set	-	5.0	AG
76-10	>8.6	7.0	Washover fan	-	-	6.5	ACF

Tf a 1 continued

S77-3	>9.4	9.0	Washover Fan	-	-	5.0	ACF
J77-10	>7.8	7.0	Washover Fan	-	-	4.0	ACF
76-11	8.0	7.3	1 present	-	-	-	ACF
S77-2	8.0	7.3	1 present	-	Wind-rippled sand	-	ACF
J77-11	8.0	7.3	1 present	-	-	-	ACF
76-12	>7.9	7.6	2 present	-	-	-	AF
S77-8	>8.8	6.8	5	1 set	-	-	AEF
J77-31	>8.8	6.3	5	1 set	-	-	AEF
76-13	>10.0	6.6	5, 1 other	-	Sand waves; ripples	1.0	ACF
S77-9	>10.0	6.6	2 present	-	-	1.0	ACF
J77-13	>10.0	6.6	S, 1 other	-	-	1.0	ACF
76-14	>8.0	5.5	1 present	1 set	-	-	AEF
S77-10	>8.0	5.5	1 present	1 set	Wind-rippled sand	-	AEF
J77-14	>8.0	5.5	-	-	-	-	AEF
76-15	>6.2	6.1	5	1 set	-	-	AE

Table 1 continued

S77-1	>7.6	6.1	5	-	-	-	AE
J77-15A	>8.5	7.4	5	-	-	-	AE
76-16	>8.5	8.5	-	-	-	1.0	AE
S77-11	>8.5	8.5	- -	-	-	1.0	AE
J77-16	>8.5	8.5	-	-	-	1.0	AE
76-17	>7.3	5.6* 4.1**	-	-	-	-	AE
76-18	11.4	11.3	-	-	-	-	E
							ACG
76-19	>8.5	-	h	1 set, 49 m, 60 cm	-	1.8	ACG
S77-12	>8.5	5.7	s, h; ridge and runnel	-	-	-	ACG
S77-13	>10.4	7.2	1 present; ridge and runnel	-	Wind-rippled sand	-	AF
76-20	> 6.8	6.8	1 present; ridge and runnel	-	Wind--and water- rippled sand	-	AF
S77-14	>10.2	6.0	Berm at cusp crests	1 set	-	1.0	ACEF
76-21	>8.7	7.0	-	-	-	-	ABF
S77-18	>8.8	6.2	-	1 set	-	-	ABF
S77-17	>10.0	8.3	-	-	-	.9*** 1.3****	AB

T le 1 continued

76-22	6.7	4.7	-	1 set, 50-60 m period				AB
76-33	8.4	6.0	2 berms at cusp crests	3 sets, 70 m, 30 m and 25 m periods	Imbricated pebbles	-		ABE
S77-15	10.0	8.7	1 present; small ridge and runnel	-	Wind- and water- rippled sand	1.1		AF
S77-16	9.2	5.6	1 present	1 set		.5		AEF
76-24	9.4	9.0	1 present	1 set, 20 m, 15 cm	Wind- and water- rippled sand	2.0		AF
76-25	8.1	7.2	2 berms at cusp crests	1 set, 20 m period	-	-		AEF
76-26	6.8	5.3	-	-	-	-		AEF
76-27	6.7	6.5	Multiple berms	2 sets, 10 m, 30 cm	-	-		ACEF
76-28	6.2	5.6	1 present	2 sets, 34 m, 20 cm and 10 m, 5 cm	-	-		AF
76-29	7.5	6.7	Multiple berms	1 set, 80 m, 20 cm	Sand waves; wind- and water-rippled sand	-		AEF
76-30	5.8	-	-	-	-	-		EF

* Ocean beach

** Bay Beach

*** in soft sediment

**** in Yakataga Formation

oil spill susceptibility of each of the 55 profile localities. Maximum height of storm evidence at each location is also noted. Profiles are shown in Appendix I.

Sea Otter Creek area to Fairweather Glacier Neoglacial Moraine

The beach between Sea Otter Creek and the western coastal limit of the Neoglacial Fairweather Glacier moraine was examined by small plane fly-overs and with aerial photography. No ground level field observations were made. This coastal segment appears to be a combination of cobble and sand beaches with widths that vary from about 30 m to 250 m. 1948, 1958, and 1975 aerial photography all show westward stream mouth offset of 1.2 to 1.4 km to the mouth of Sea Otter Creek. Beginning at Sea Otter Creek and continuing to the west for about the next 15 km is a low elevation uplifted beach ridge system fronted by a generally sandy beach. Two large unnamed streams drain this coastal segment and both show westward stream mouth offset of up to 4 km.

Fairweather Glacier to La Perouse Glacier

Profile 76-1, located in the large cove west of the coastal limit of the Fairweather moraine is characteristic of the segment of coastline to the west. It is a broad sandy beach with sand waves in the intertidal area and cobbles in the upper back-beach zone. The profile measures over 170 m in length and shows a gentle fore-beach and much steeper back-beach. As with most profile locations, the upper portion of the back-beach is vegetated and storm deposited debris extends to the upper limit of the profile.

Profiles 76-2 and 76-3 are characteristic of the rocky moraine near Fairweather Glacier. They are steep, unvegetated and composed of boulders and cobbles.

Profiles 76-4, 76-5, and 76-6 are located in what is probably an eroding uplifted outwash or beach plain between Fairweather Slough and Moraine. Each

is characterized by scarps over 4 m in height at the upper end of the beach. All are generally sandy with some cobbles. The length of the beach segment below the scarp increases to the east.

Profile 76-7 is located at the eastern edge of Fairweather Slough and consists of cobbles and pebbles. It is unvegetated, broad and probably completely washed over during severe storms.

Profile S77-5 represents one of the highest energy environments of the entire Outer Coast. Evidence of storm deposition was found 15 m above mean sea level. It is an unvegetated cobble and boulder beach with good cusp development.

Profiles S77-6, S77-7, 76-8, S77-4, and 76-9 are located east of Fairweather Slough and west of Justice Creek. All show upper scarps and roughly the same slope for their lower segments. S77-4 and 76-9 measured at the same location one year apart show minor erosion of the upper beach below the scarp and little change in the lower beach.

Profiles 76-10, 77-10, and S77-3 are located near each other at the mouth of Justice Creek. The scarp behind the Creek appears to have been eroded back about 4 m between observations. The vegetation on the plain above the scarp was observed draped over the scarp indicating undercutting. Washover fans had sealed off the stream mouth at both summer observations. Storm debris is deposited on top of the scarp at an elevation of at least 8 m above mean sea level.

Profiles 76-11, 77-11 and S77-2 all located at the east end of Justice Creek, show a significant net erosion between 1976 and 1977. The 1977 summer beach has recovered from winter erosion but is not at all like the 1976 beach.

East of Justice Creek the back-beach meadow broadens but storm debris is found at the forest edge at elevations of over 8 m. Profiles 76-12, 77-31, and S77-8 are characteristic of this stretch of coastline.

Profiles 76-13, 77-13, and S77-9 are all located just west of Echo Creek. The upper beach shows very little change during the period of observation. The lower beach shows a significant net accumulation of sand between observations. The summer 1977 beach is about 2 m thicker than 1976.

Profiles 76-14, 77-14, and S77-10 are all located at the placer mining camp east of Echo Creek. The two summer profiles are similar but 77-14, the winter profile, is much steeper and shorter. Grain size did not appear to change during winter.

Profiles S77-1, 76-15, and 77-15A are characteristic of the coastal segment between the placer mining camp and the eroding coastline west of Portage Creek. Each profile has a relatively flat vegetated upper beach meadow and a steep beach face. The composition of the beach face is coarse sand and cobbles. Profile S77-1 has a sand flat in the foreshore.

Profiles 76-16, 77-16, and S77-11 are all located east of Portage Creek and show very little change during observation. Just west of Portage Creek mouth an area of significant active erosion and shoreline retreat exists. This area is characterized by erosion of up to 2 to 4 m/year and extends for over 1.5 km to the west. The erosional scarp is capped by washover sand deposits. During winter 1977 and summer 1977, observations indicated large quantities of washover sand and storm surge water passed through the forest area above the beach.

Profiles 76-17 and 76-18 are located in the bay mouth moraine. Profile 76-17 extends from Lituya Bay to the Gulf of Alaska across La Chaussee Spit. The entire spit area appears to be washed over during severe storms. Vegetation was restricted to a small area above 3 m in elevation on the bay side of the spit.

Profiles 76-19, S77-12, S77-13, 76-20, and S77-14 are characteristic of

the sandy beach between the bay mouth moraine and the Yakataga outcrop to the east. Typical of these areas are ridge and runnel topography and small eroding scarps at the back of the beach. Significant deposition in the back-beach area can be seen on profiles 76-19 and S77-12. A large washover supplied fore-beach exists at 76-20.

Profiles 76-21, S77-18, S77-17, and 76-22 are characterized by Yakataga Formation outcrops in the foreshore. From west to east the character of the back-beach sediment changes from sand to gravel and sand sized Yakataga fragments and finally to nothing between the vegetated meadow or forest and the Yakataga outcrop. Much of the Yakataga outcrop has tidal pools eroded into the rocky outcrop.

Between the Yakataga outcrop and Crillon Stream, the beach broadens and becomes sandy. Cusps are often present and garnet sand lag deposits are frequently found on the back-beach. Profiles 76-23, S77-15, S77-16, and 76-24 are typical of this segment.

Profiles 76-25 and 76-26 near Dagelet River are shorter and steeper than those to the east. The beaches are coarser and have well developed cusps. In both instances, storm deposited debris extends to the upper limit of the profile.

Profile 76-27 is located in "the Cusp", a semi-circular indentation in the shoreline east of Dagelet River. This indentation may represent a weakness in the underlying bedrock, perhaps a small fault branching off the nearby Fairweather system. The profile shows almost 200 m of beach with a stream passing through its middle. Storm debris extends almost 180 m inland from the shoreline. The fore-beach is a large washover deposit reaching a height of over 5 m above mean sea level. The stream in the cusp was ponded when observed by a small washover deposit.

Profiles 76-28 and 76-29 are located between the Cusp and La Perouse Glacier

where the beach broadens to a maximum width of about a kilometer. Profile 76-28 extends from an uplifted marine terrace (elevation 50 m above sea level) to the shoreline, a distance of over 400 m. Storm debris extended over 290 m inland. Profile 76-29, 309 m in length, had storm debris over 200 m inland. Both beaches are low angle, broad and sandy.

Profile 76-30 in front of La Perouse Glacier was made on a beach underlain by ice. A small push moraine is located against the toe of the glacier and the beach draped upon this ice. The profile runs through sand and gravel but to the east the beach coarsens.

East of La Perouse Glacier the beach is generally sand and gravel. Cobbles are found at stream mouths. About 850 m east of Finger Glacier the beach changes character to rocky outcrop with sandy pocket beaches behind. The rocky outcrop continues east to Icy Point.

SUSCEPTIBILITY TO OIL

Hayes et al. (1976) and Owens (1977) discuss the impact of oil on different types of beach environments. In order to provide a basis for assessing which coastal segments would show the greatest vulnerability to spilled oil, I have adopted an environmental vulnerability scale slightly modified from that of Hayes. Vulnerability or susceptibility is here defined to mean the retainability of the oil in the environment. The longer the retention the higher the rating. Biological damage is not considered in this classification other than to signal out rocky tidal pools as a sheltered micro-environment.

Two major factors which complicate the situation and increase the vulnerability to damage for the entire Glacier Bay National Monument, Gulf of Alaska coastal segment are: (1) the tremendous quantity of storm deposited wood and debris, mostly complete trees with root systems, which have accumulated at the upper limits of the back-beach along the entire coastal segment, and (2) the

vegetated meadows behind most active beach segments but below the limits of storm deposits. The trees and other wooden debris could act as depositional sites for floating oil and hence greatly increase the duration for oil residence and oil related damage. Regardless of the character of the beach, the presence of the beach meadows and the wood and logs on the upper beach provides depositional sites which could later leak oil down the beach or at least provide a very difficult clean-up problem.

All of the coastal environments considered by Hayes et al. (1976) do not occur in the coastal section of the Monument, while others not mentioned are present. However, in order to show the relative susceptibility of the environments which do occur, all of Hayes 10 beach categories plus one additional category constructed by the author are included in the following susceptibility scheme. The coastal environments are presented in order of increased susceptibility to oil spills. Those environments which do occur in the coastal segment of the Monument are shown by asterisks. Plate 1, the environmental map of the coastal segment, shows the susceptibility of each profile location using a modified version of this scheme. The higher the number, the greater the susceptibility. Hayes' classification is designed for a much larger area and much less intense study of the beach components. Where we have over 55 observational stations and almost 100 samples, he may have 3 profiles and 6 samples. Hence, when applying Hayes' classifications to such an intensely studied area, the classification breaks down. All of the micro-variations in susceptibility from our detailed field studies are shown on Plate 1 and Table 1. However as a general statement, the entire coastal segment would fit into Hayes' highest 2 risk categories.

1. Straight, rocky headlands:

These are areas of maximum wave energy where waves reflect off rocky scarps

readily dispersing the oil. No section of the coastline between Icy Point and Sea Otter Creek falls into this type.

*2. Eroding wave-cut platforms:

Generally, these areas are swept clean by wave erosion. However, in the Monument where bedrock is Yakataga, the platforms have numerous depressions which serve as centers for biological communities. These tidal pools are very vulnerable to oil accumulation and because of the high productivity, may suffer severe biological damage. In essence, the tidal pools are a miniature sheltered rocky headland and I therefore rate them as having a susceptibility of 8.

3. Flat, fine-grained sandy beaches:

These beaches are generally flat and hard-packed. Oil that reaches these beaches does not penetrate the fine sand. Clean-up is easy and involves only scraping the upper layer of sand. Unfortunately, this type beach does not occur in the monument.

*4. Steeper, medium- to coarse-grained sandy beaches:

Rates of burial of oil can be high (50 to 100 cm in a few days) and depth of penetration would be only a few centimeters on these beaches. Removal of oil is a major problem and involves destruction of the beach. Beach erosion releases oil at later times after burial. Burial often prevents degradation of oil and hence the natural beach cycle assures long-term pollution of the environment. This type beach is common in the Monument.

*5. Impermeable muddy tidal flats:

These do not occur in the area of the outer Coast. Small areas of muddy flats occur in Lituya Bay near both North Crillon and Lituya Glaciers.

*6. Mixed sand and gravel beaches:

Oil on these beaches may penetrate several centimeters and be rapidly buried. The longevity of oil on this type beach is high, especially on berm

top areas and low-tide terraces. This type beach is common in the Monument.

*7. Gravel beaches:

Very large amounts of penetration and high rates of burial are typical of this type of beach. Clean-up is nearly impossible. This type of beach is very abundant in the entire coastal area. Such beaches exist at Lituya Bay Mouth, near Fairweather Glacier, between Echo and Portage Creeks and west of Justice Creek and near Fairweather Slough.

*8. Sheltered rocky headlands:

Hayes et al. (1976) report that oil tends to stick to rough rocky surfaces and remain for extended periods of time. This type of environment, especially in the Icy Point area, is common. I have added the small tidal pools and ponds of the Yakataga outcrop areas to this category since they are a smaller analog of the larger sheltered headlands.

*9. Protected estuarine tidal flats:

None exists in the area of study, but certain reaches of streams such as Justice Creek, Echo Creek, and Fairweather Slough have protected reaches where oil could be very long lasting.

10. Protected estuarine salt marshes:

None exist in the study area.

*11. Vegetated beach meadows and forests:

Behind almost every active beach segment there are areas of vegetated beach meadows and forests, many of which show recent evidence of storm surge deposition. Oil deposited during higher water conditions could have a devastating effect on the vegetation, and might impact bird habitats and small mammal ecology.

OIL SPILL SUSCEPTIBILITY RATINGS

- A Vegetated Beach Meadows and Forests
- B Rocky Platforms with Tidal Pools
- C Sloughs, Backwater Channels and Ponds
- D Sheltered Rocky Headlands
- E Gravel Beaches
- F Mixed Sand and Gravel Beaches
- G Medium-Coarse Sandy Beaches
- H Flat Fine-Grained Sandy Beaches
- I Eroding, Wave Cut Platforms - (No Tidal Pools)

The above sequence shows a relative rating of the susceptibility of various beach environments found in the coastal section of the Monument. Vegetated beach meadows and forests have the highest susceptibility while eroding wave cut platforms without tidal pools have the lowest. This sequence differs from that of Hayes et al. (1976) by the inclusion of environments not found in his study area but present on the Outer Coast, and by the elimination of low energy environments which do not occur here. Multiple component beaches such as a gravel beach with an upper vegetated beach meadow would have a susceptibility designated as AE. This indicates the complexity of the beach segment and informs the user of the different types of problems that will be encountered at that beach segment. The reason that the higher level vegetated beach meadows and forests are included in this classification, is that at almost all of the profile stations where vegetation was present, the height of the maximum observable storm evidence was greater than the lowest abundant vegetation. Hence, if a spill were to occur during a storm, perhaps the most probable time of occurrence, then storm conditions and possible storm surge could easily deposit oil well

above the limit of the modern active beach. Maximum observed heights of storm surge deposits were over 12 m above mean low water. Spray carried by wind could easily deposit oil in the forest or on the supratidal meadows even if spills occurred during lower tidal conditions.

SEDIMENTOLOGY OF GLACIER BAY NATIONAL MONUMENT BEACH SAMPLES

Analyses of 95 sediment samples were made. With few exceptions the samples were either coarse sand or coarse sand and gravel mixtures. Complete size analyses for all samples analyzed appear at the end of this section. Generally, grain size changed only slightly or not at all at stations where samples were collected during different seasons. Table II summarizes the major sediment data, while Appendix II presents detailed grain size information.

Mineralogically most samples appear to contain quartz, feldspar, lithics and chlorite. However, no detailed study of mineralogic components was made.

The major sources of sediment in the study area are Fairweather Slough, Crillon River, Dagelet River, and the streams which drain La Perouse Glacier. Lituya Bay acts as a sediment sink with only minor quantities of suspended fines entering the Gulf. Crillon Lake acts as a setting basin for much of the coarse material from South Crillon Glacier; hence, Crillon River carries most of its load in suspension. West of Crillon River the sediment covering Yakataga outcrop becomes sparse and the beach segment from about 2 km west of Crillon River to about 2 km west of Steelhead Creek can be characterized as sediment starved.

The bay mouth moraine complex and the beach to the west of the bay is also sediment starved. Much of the sand now making up the beach between Portage and Justice Creeks may be relict from the Neoglacial advance of the Lituya and Crillon Glacier system which filled the bay as recently as 400-500 years B.P. Estimates of the suspended sediment load of Fairweather Slough are as high as 4 g/l of suspended solids.

TABLE II

Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN (ϕ)	SORTING
76-1	31.8	68.2	0	0	-0.5	-1.2	1.3
76-2	.2	99.8	0	0	0.5	0.4	0.3
76-3	4.4	95.6	0	0	0.4	0.4	.6
76-4	41.6	58.4	0	0	-0.9	-0.9	.7
76-5	0	100	0	0	1.4	1.4	.4
76-6	0	100	0	0	1.0	1.0	.9
76-7	1.5	98.5	0	0	0.6	0.6	.5
76-8	57.4	42.6	0	0	-1.1	-1.1	.7
76-9	12.3	87.6	0	0.1	0.6	0.5	1.2
76-10	66.6	33.4	0	0	-1.6	-1.6	1.2
S77-8	0.6	99.4	0	0	1.0	1.0	0.4
S77-9	61.4	38.6	0	0	-1.1	-1.1	1.1
S77-10	0	100	0	0	1.6	1.6	0.3
76-11	0.2	99.8	0	0	1.0	1.0	0.5
76-12	2.8	97.1	0	0.1	1.3	1.3	0.6
76-13	29.9	70.1	0	0	1.4	0.6	1.8
76-14	0	99.7	0.1	0.2	2.0	2.0	0.5
76-15	0	100	0	0	1.6	1.7	0.6
76-16	0	100	0	0	1.8	1.8	0.7
S77-6	26.8	73.2	0	0	0.6	0.2	1.4
S77-7	100	0	0	0	-4.2	-4.1	1.4
76-17	0	100	0	0	1.1	1.1	0.8
76-18	0	100	0	0	2.2	2.3	0.4
76-19	100	0	0	0	-2.6	-2.6	0.5

TABLE II (cont)
Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN (ϕ)	SORTING
76-20	23.8	76.2	0	0	0.8	-0.5	1.6
S77-4	3.9	96.1	0	0	0.5	0.6	0.9
S77-5	46.2	53.8	0	0	-0.9	-0.2	1.4
76-21	0	100	0	0	1.4	1.4	0.6
76-22	30.9	69.1	0	0	-0.7	-0.8	1.0
76-23	66.3	33.7	0	0	-1.1	-1.0	0.3
J77-6	0	100	0	0	1.0	1.0	0.6
J77-5	65.3	34.7	0	0	-1.3	-1.1	0.7
S77-1	0	100	0	0	1.4	1.4	0.6
S77-2	6.8	92.1	0.2	0.9	1.2	1.2	1.0
S77-3	50.1	49.9	0	0	-1.0	-0.9	0.5
76-24	0	97.7	2.0	0.3	1.1	1.1	0.7
76-25	25.2	74.8	0	0	-0.1	-0.4	0.9
76-26	39.6	60.4	0	0	-0.9	-0.9	0.3
76-27A	0	100	0	0	1.5	1.5	0.6
76-28	0	100	0	0	1.1	1.1	0.5
76-29	0	100	0	0	1.0	1.1	0.6
76-30	28.4	71.6	0	0	-0.2	-1.1	1.6
76-31	12.6	87.4	0	0	0.3	0.5	1.3
J77-3	1.9	98.1	0	0	0.8	0.7	0.9
J77-4	7.5	92.5	0	0	0.9	0.7	0.9
S77-13	0	100	0	0	1.9	1.9	0.5
S77-14	74.8	25.2	0	0	-5.1	-3.2	2.8
S77-11	1.6	98.4	0	0.1	1.0	1.0	0.7

TABLE II (cont)

Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN (ϕ)	SORTING
S77-12	68.2	31.8	0	0	-2.1	-2.8	2.2
76-32	0	99.8	0.1	0.1	2.1	2.1	0.5
76-33	0	100	0	0	2.0	2.0	0.5
76-34	0	100	0	0	2.3	2.3	0.4
J77-2	0	100	0	0	1.8	1.8	0.5
J77-1	0.1	99.9	0	0	1.4	1.5	0.5
S77-15	0	100	0	0	1.8	1.8	0.5
76-35	63.0	37.0	0	0	-1.3	-1.6	1.2
76-36	66.2	33.8	0	0	-1.2	-1.3	0.6
76-37	0	100	0	0	1.5	1.5	0.7
76-38	1.4	98.6	0	0	1.0	0.8	0.8
76-39	0	100	0	0	1.7	1.8	0.4
S77-17	0.9	99.1	0	0	0.5	0.5	0.6
S77-18	4.5	95.3	0	0.1	1.2	1.2	0.7
S77-19	0.2	99.2	0.1	0.5	1.6	1.6	0.5
S77-20	1.0	99.0	0	0	1.1	1.1	0.5
76-40	0	100	0	0	1.7	1.7	0.5
76-41	0	100	0	0	2.0	2.0	0.4
76-42	5.3	94.7	0	0	1.1	1.1	0.7
76-43	15.5	84.5	0	0	-0.3	-0.3	0.6
76-44	2.6	97.4	0	0	0.4	0.4	0.7
76-46	97.6	2.3	0.1	0	-2.2	-2.3	0.6
S77-25	3.1	96.7	0	0.1	0.0	0.0	0.5
76-48	0	99.8	0.1	0.1	2.1	2.1	0.6

TABLE II (cont)
Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN ϕ	SORTING
76-49	2.2	92.1	5.0	0.8	0.3	0.5	1.3
76-50	3.9	96.1	0	0	0.2	0.3	0.8
S77-21	0	100	0	0	2.2	2.3	0.4
S77-22	8.7	91.3	0	0	0.5	0.6	1.1
S77-23	0.2	99.7	0	0.1	1.1	1.0	0.9
S77-24	82.9	17.1	0	0	-2.0	-3.0	2.0
76-51	0	87.4	11.1	1.5	2.0	2.1	1.0
76-52	0	100	0	0	2.3	2.3	0.4
76-53	0	99.9	0	0.1	2.1	2.1	0.3
76-54	48.3	51.7	0	0	1.2	-0.2	2.7
76-55	0	100	0	0	1.8	1.8	0.4
76-56	5.9	94.1	0	0	0.4	0.4	0.7
76-57	0	100	0	0	1.9	1.9	0.5
76-58	99.7	0.3	0	0	-2.2	-2.4	0.8
76-60	0.7	99.3	0	0	1.0	1.1	0.5
76-61	1.9	98.1	0	0	0.9	0.9	0.6
76-62	0	100	0	0	0.4	0.5	0.8
76-63	0	100	0	0	1.4	1.4	0.5
76-64	0	100	0	0	1.6	1.5	0.6
76-65	10.0	90.0	0	0	0.9	0.8	1.3
76-66	0.2	99.8	0	0	0.8	0.9	0.9
76-67	0	99.4	0.3	0.3	1.9	1.9	0.6

SUMMARY

The Gulf of Alaska coastal area of Glacier Bay National Monument is characterized by coarse sand and gravel beaches backed by vegetated supratidal meadows and forests. No fine-grained beaches exist anywhere in the studied area. In addition to the coarse sediment beaches, the area east of Lituya Bay has stretches where sediment cover is very thin and bedrock outcrops at the beach surface. West of Lituya Bay no bedrock outcrops occur.

The beaches in the Monument are broad and generally have low slopes. Exceptions to this are beaches on glacial moraine. Many beaches are over 100 m in width. Some in the eastern end of the study area are 200 m or more in width.

Many beaches have vegetation only at their upper ends and most have storm deposited debris at their uppermost ends. Storm deposited debris was found at elevations of as much as 15 m above mean sea level, and distances over 290 m from shore.

Because of the presence of relatively flat, heavily vegetated supratidal meadows at the upper end of most beach areas, the susceptibility to damage from spilled oil is very high. If an oil spill were to occur during a period of storm surge, oil would be deposited not only on the active sediment areas of the beaches but also on the heavily vegetated supratidal beach meadows and forests.

Many of the beaches studied showed evidence of erosion in the upper part of the beach. Scarps, many over 3 m in height are found behind about one-half of the areas profiled. Two areas, Justice Creek and the area west of Portage (Eagle) Creek, are undergoing rapid scarp retreat. During the period of study, it appears that both areas had between 3 to 4 m of retreat.

EXPLANATION OF THE ENVIRONMENTAL GEOLOGIC MAP--GULF OF ALASKA COASTAL AREA OF GLACIER BAY NATIONAL MONUMENT (Plate 1)

The environmental geologic map depicts glacial moraines, marine terraces, and scarp heights and locations by a series of symbols on the shoreward side

of the coastline. Offshore a series of four bands are used to depict the location of beach profile stations and samples (Band 1), special details about specific areas of the beach (Band 2), grain size (Band 3), and oil spill susceptibility (Band 4).

Details depicted in Band 2 include location of cusps, heavy mineral deposits, areas of active erosion, ice-cored beaches, storm debris, eskers, areas subject to glacial lake breakout, areas of onshore ice cored moraine, areas of washover deposits and fans, and the direction and amount of stream offset.

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APPENDIX I

Beach Profiles (1976 and 1977) showing location
of sediment samples

Point to Boulder Beach

Profile 76-3

No Samples

Profile 76-4

Profile 76-5

Profile 76-6

Profile 76-7

no vegetation

Fairweather Slough

Sample
76-9

V.E = 3X

Sample 76-10

Gulf of Alaska

profile length = 111m

mean sea level

6
4
2
0

upper
limit

storm
debris

lower
limit

corals

25 JULY 77
STNS 77-5
12:50 LOCAL

VE. = 3X

Profile S 77-5
No Samples

← 69 m = profile length

mean sea level

16

14

12

10

8

6

m

4

2

0

Profile S 77-7

Sample S 77-9

Top of Cap
Gravel
Gravel and Sand

Gravel
Gravel and Sand

Gravel and Sand

mean sea level

← profile length = 90m →

limit of vegetation

12.5

S 77-7
2 July 1973
from 20:41

corals

V.e = 3X

12
10
8
6
4
2
0

Profile #76-8

These 2 profiles are located on the east bank of the first unnamed stream W of Justice Creek. ~ 1/2 the distance between Fairweather Slough and Justice

Profiles 577-4 76-9

These three profile are located near each other at the mouth of Justice Creek.

These profiles are separated to show relative change. They are not plotted on the same axes

V.E. = 3X

These 3 profiles are all located at the eastern end of Justice Creek. The N. side of all three profile starts at waters edge (~2.5 m above mean sea level).

Profile 76-12

Not plotted on the same axes

Winter 1977

Summer 1977

actual elev. ~ 9m.

0.6

0.4

m

0.2

0

6

12

18m

These two profiles are located at R. Weirwood's transect marker W of Echo Creek.

Samples

S77-11 S77-12
on profile S77-A

77-31

S77-8

These three profiles are located at the W. side of Echo Creek.

These profiles are plotted on the same axes

These three profiles are located at the placer mining camp east of Echo Creek.

These profiles are not plotted on the same axes

Profile S77-1

No Samples

forest edge

storm debris

limit of
vegetation

sand flat

V.E = 3X

S 77-1
11551 m
24 July 77

mean sea level

201 m

8
6
4 m
2

ROAD AT EDGE OF FOREST
LEAVE PATH

Profile 76-15

Sample
76-35

WOODPILE logs pebbles pebbles & sand

COBBLE LIPS

V.E. = 3X

← 99m →

mean sea level

Profile 77-15A

No Samples

ASWD. LOGS
EDGE OF BEIRM
END OF VEGETATION
LARGE CURVES

20 JANUARY 77
STN. 15A
1122 LOCAL

m

VE=3X

WATER SURFACE

M.S./

← 45 m →

These three profiles are located at the cobble beach east of Portage Creek Mouth.

These profiles are not plotted on the same axes.

Profile 76-17
 Bay Mouth Moraine
 LaChaussee Spit

No Samples

Both profiles at E end of Lituya Bay Mouth Moraine

V.E. = 3X

Profile S 77-13

for more words
if there are

1. 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350

820978

sample

176-40

WATER RIFLES!

DATE 11/11/11
TO 11/11/11

Page 10

Sample 76-41

Sample 176-42

sample

for deposit

sample

44

SECRET

$$V.E. = 3X$$
mean sea level

6-159 m.d.

44-38861-100

Profile S 77-14

No Samples

limit of
vegetation
↓

V.E. = 3X

Profile Length
← 165m →

mean sea level

-8
-6
-4 m
-2
0

Profile 76-21

Profile S 77-18

Profile S77-17

No Samples

Profile 76-22

storm debris limit

limit of vegetation

Sample 76-47

OUTCROP OF VENTRIER

VE = 3X

4 m

2-2

117 m

mean sea level

IN 10 cm of water

PEAKS OF LIGHTHOUSE

Sample 76-48

Station 22
Elev Time 1253
7-9-76

$$v.e. = 3X$$

Profile S77-15

Profile S77-16

young trees

V.E. = 3X

8
6 m
4
2

Profile 76-24

storm debris
limit of vegetation

sample 76-51

sample

76-52

sample

76-53

sample

76-54

V.E. = 3X

sea level

177m = length of profile.

V.E. = 3X

Profile
76-25

Sample 55

20m to top
TOP OF DUNE

± M TROUGH

Limit of vegetation

supercrust

← SAND
IN TROUGH

Sample
76-55

75m

Length of profile = 75m

Sea level

Station 25

END TIME 1750

7-19-76

Log leveling
corrects

8
7.5
7
6
5
4
3
2.5

M

V.e. = 3X

Profile 76-26

Limit of
vegetation

STORM TOSSED TREES
& COBBLES

COBBLES, SAND, & PEGGLES

Sample
76-56

11 13 cm WATER

mean sea level ← 66m →

STATION 210
END TIME 2226
4-19-76

Profile 76-27

V.E. = 3x

Profile 76-28

Profile 76-29

V.E. = 3x

V.E. = 3X

Profile 76-30

SAMPLE 67

PUSH MOORING

76-30

STATION 30

END TIME 2019

7-20-74

APPENDIX II

Analyses of grain size data for beach samples

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 1 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0, WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE 8.0000- 0.3540MM MEIHOD SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM
-3.0000	8.0000	16.086	16.086
-2.4854	5.6000	0.0	16.086
-2.0000	4.0000	0.0	16.086
-1.5008	2.8300	2.818	18.904
-1.0000	2.0000	12.859	31.762
-0.4854	1.4000	20.389	52.152
0.0	1.0000	22.643	74.795
0.5002	0.7070	20.594	95.389
1.0000	0.5000	4.303	99.693
1.4982	0.3540	0.307	100.000

Profile 76-1

Sample 76-1

SIZE CLASS RATIOS:

GRAVEL=	31.762PCT	GRAVEL/SAND=	0.465
SAND =	68.238PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 2

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.1770MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	0.234	0.234
-0.4854	1.4000	1.639	1.874
0.0	1.0000	12.178	14.052
0.5002	0.7070	40.749	54.801
1.0000	0.5000	39.110	93.911
1.4982	0.3540	5.621	99.532
2.0000	0.2500	0.234	99.766
2.4982	0.1770	0.234	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.234PCT	GRAVEL/SAND=	0.002
SAND =	99.766PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-1

Sample 76-2

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 3 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11, FN=0, WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE 2.8300- 0.0880MM METHOD SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.5008	2.8300	2.128	2.128
-1.0000	2.0000	2.270	4.397
-0.4854	1.4000	4.255	8.652
0.0	1.0000	16.596	25.248
0.5002	0.7070	36.454	61.702
1.0000	0.5000	27.518	89.220
1.4982	0.3540	6.099	95.319
2.0000	0.2500	1.844	97.163
2.4982	0.1770	1.844	99.007
3.0000	0.1250	0.851	99.858
3.5063	0.0880	0.142	100.000

SIZE CLASS RATIOS:

GRAVEL =	4.397PCT	GRAVEL/SAND =	0.046
SAND =	95.603PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-1

Sample 76-3

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 4

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
4.0000- 0.1770MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	6.025	6.025
-1.4854	2.8000	13.054	19.079
-1.0000	2.0000	22.510	41.590
-0.4854	1.4000	32.385	73.975
0.0	1.0000	17.406	91.381
0.5002	0.7070	6.276	97.657
1.0000	0.5000	1.841	99.498
1.4982	0.3540	0.335	99.833
2.0000	0.2500	0.084	99.916
2.4982	0.1770	0.084	100.000

SIZE CLASS RATIOS:

GRAVEL=	41.590PCT	GRAVEL/SAND=	0.712
SAND =	58.410PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-4

Sample 76-4

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 5 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0, WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 1.0000- 0.0880MM
METHOD: SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.375	0.375
0.5002	0.7070	2.064	2.439
1.0000	0.5000	9.756	12.195
1.4982	0.3540	43.527	55.722
2.0000	0.2500	34.522	90.244
2.4982	0.1770	8.068	98.311
3.0000	0.1250	1.501	99.812
3.5063	0.0880	0.188	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=
SAND =	100.000	PCT	SAND/SILT =
SILT =	0.0	PCT	SILT/CLAY =
CLAY =	0.0	PCT	SAND/CLAY =
MUD =	0.0	PCT	SAND/MUD =
			GRAVEL/MUD =

Sample 76-5
Garnet sand
at E End of
Fairweather Moraine
Cobbles

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 6

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
1.4000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

<u>PHI</u>	<u>MM</u>	<u>PERCENT</u>	<u>CUM PERCENT</u>
-0.4854	1.4000	2.439	2.439
0.0	1.0000	7.622	10.061
0.5002	0.7070	18.598	28.659
1.0000	0.5000	21.341	50.000
1.4982	0.3540	20.427	70.427
2.0000	0.2500	15.244	85.671
2.4982	0.1770	9.146	94.817
3.0000	0.1250	3.963	98.781
3.5063	0.0880	0.915	99.695
3.9885	0.0630	0.305	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-5

Sample 76-6

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 7

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9, FN=0; WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 ; PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	1.512	1.512
-0.4854	1.4000	2.647	4.159
0.0	1.0000	8.696	12.854
0.5002	0.7070	26.276	39.130
1.0000	0.5000	36.106	75.236
1.4982	0.3540	22.684	97.921
2.4982	0.1770	1.512	99.433
3.0000	0.1250	0.378	99.811
3.5063	0.0880	0.189	100.000

SIZE CLASS RATIOS:

GRAVEL =	1.512PCT	GRAVEL/SAND =	0.015
SAND =	98.488PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-6

Sample 76-7

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 8

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
4.0000- 0.1770MM SIEVES

PARTICLE SIZE DISTRIBUTION:

<u>PHI</u>	<u>MM</u>	<u>PERCENT</u>	<u>CUM PERCENT</u>
-2.0000	4.0000	11.282	11.282
-1.4854	2.8000	14.825	26.107
-1.0000	2.0000	31.282	57.389
-0.4854	1.4000	22.284	79.674
0.0	1.0000	11.748	91.422
0.5002	0.7070	5.781	97.203
1.0000	0.5000	2.238	99.441
1.4982	0.3540	0.466	99.907
2.0000	0.2500	0.047	99.953
2.4982	0.1770	0.047	100.000

SIZE CLASS RATIOS:

GRAVEL=	57.389PCT	GRAVEL/SAND=	1.347
SAND =	42.611PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-7

Sample 76-8

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 9

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.005;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	12.253	12.253
-0.4854	1.4000	8.399	20.652
0.0	1.0000	11.067	31.719
0.5002	0.7070	14.229	45.949
1.0000	0.5000	17.984	63.933
1.5023	0.3530	16.008	79.941
2.0000	0.2500	9.289	89.229
2.4982	0.1770	5.336	94.565
3.0000	0.1250	3.360	97.925
3.5063	0.0880	1.383	99.308
3.9885	0.0630	0.593	99.901
13.2877	0.0001	0.099	100.000

SIZE CLASS RATIOS:

GRAVEL=	12.253PCT	GRAVEL/SAND=	0.140
SAND =	87.648PCT	SAND/SILT =	2062.522
SILT =	0.042PCT	SILT/CLAY =	0.757
CLAY =	0.056PCT	SAND/CLAY =	1561.327
MUD =	0.099PCT	SAND/MUD =	888.633
		GRAVEL/MUD =	124.228

Profile 76-7

Sample 76-9

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 10

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
8.0000- 0.2500MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	14.348	14.348
-2.0000	4.0000	26.238	40.586
-1.5008	2.8300	11.673	52.259
-1.0000	2.0000	14.348	66.607
-0.4854	1.4000	12.143	78.750
0.0	1.0000	12.902	91.652
0.5002	0.7070	6.975	98.627
1.0000	0.5000	1.265	99.892
1.4982	0.3540	0.072	99.964
2.0000	0.2500	0.036	100.000

SIZE CLASS RATIOS:

GRAVEL=	66.606PCT	GRAVEL/SAND=	1.995
SAND =	33.394PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-7

Sample 76-10

SEDIMENT SIZE ANALYSIS--GLACIER DAY BEACH SAMPLES - SUMMER 1977

CRUISE STATION S77-3
 TYPE, NUMBER
 SAMPLE TOTAL SAMPLE SAMPLE
 LENGTH CENTER LENGTH METHODS
 . M . CM . CM 1

#F:SV=11,ST= 0,H=C;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE-- METHOD-----
 2.8284- 0.0625MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES-- RSA---- HYDROPHLOMEIER-- PAN----- INITIAL-----
 12.2500 12.2500 (G)

PARTICLE SIZE DISTRIBUTION:

PHI---	WE---	PERCENT	CUM
-1.0000	2.0000	0.571	0.571
-0.5000	1.4142	0.898	1.469
0.0000	1.0000	2.449	3.918
0.5000	0.7071	9.143	13.061
1.0000	0.5000	35.102	48.163
1.5000	0.3536	39.347	87.510
2.0000	0.2500	10.041	97.551
2.5000	0.1768	1.714	99.265
3.0000	0.1250	0.571	99.837
3.5000	0.0884	0.082	99.918
4.0000	0.0625	0.082	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.571PCT	GRAVEL/SAND=	0.006
SAND =	99.429PCT	SAND/SILT =	99999.999
SILT =	0.000PCT	SILT/CLAY =	0.000
CLAY =	0.000PCT	SAND/CLAY =	0.000
MUD =	0.000PCT	SAND/MUD =	99999.999
		GRAVEL/MUD =	99999.999

Sample S77-8

Profile S77-7

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	SAMPLE METHODS
S77-9				M	CM	CM	1

#F:SV=13,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

-----SIZE-RANGE-----
 5.6569- 0.0625MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA	HYDROPHOTOMETER	BAN	TOTAL
19.3900				19.3900 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	20.371	20.371
-1.5000	2.8284	2.630	23.002
-1.0000	2.0000	38.370	61.372
-0.5000	1.4142	10.315	71.686
0.0000	1.0000	11.552	83.239
0.5000	0.7071	7.220	90.459
1.0000	0.5000	4.126	94.585
1.5000	0.3536	2.837	97.421
2.0000	0.2500	1.547	98.969
2.5000	0.1768	0.774	99.742
3.0000	0.1250	0.155	99.897
3.5000	0.0884	0.052	99.948
4.0000	0.0625	0.052	100.000

SIZE CLASS RATIOS:

GRAVEL	GRAVEL=	61.372PCT	GRAVEL/SAND=	1.589
SAND	=	38.628PCT	SAND/SILT =	0.000
SILT	=	0.000PCT	SILT/CLAY =	0.000
CLAY	=	0.000PCT	SAND/CLAY =	0.000
MUD	=	0.000PCT	SAND/MUD =	0.000
			GRAVEL/MUD =	0.000

Profile S77-7
 Sample S77-9

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
	S77-10			M	CM	CM	1

#F:SV= 8,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE-RANGE---
 1.4142- 0.0884MM
 ---METHOD-----
 SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	WTA	HYDROWEIGHT	PAN	TOTAL
11.5400				11.5400 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	W	PERCENT	CUM PERCENT
0.0000	1.0000	0.260	0.260
0.5000	0.7071	0.520	0.780
1.0000	0.5000	2.060	2.860
1.5000	0.3536	31.023	33.882
2.0000	0.2500	54.593	88.475
2.5000	0.1768	10.225	98.700
3.0000	0.1250	1.213	99.913
3.5000	0.0884	0.087	100.000

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD	GRAVEL/SAND	SAND/SILT	SILT/CLAY	SAND/CLAY	SAND/MUD	GRAVEL/MUD
0.000PCT	100.000PCT	0.000PCT	0.000PCT	0.000PCT	0.000	0.000	0.000	0.000	0.000	0.000

Sample S 77-10
 Garnet Sand bag
 collected 100 m N. of
 Stream S(E) of
 Farweather Slough

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 11 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
2.0000- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	0.200	0.200
-0.4854	1.4000	0.898	1.098
0.0	1.0000	4.391	5.489
0.5002	0.7070	14.970	20.459
1.0000	0.5000	33.333	53.792
1.4982	0.3540	33.333	87.126
2.0000	0.2500	8.583	95.709
2.4982	0.1770	2.994	98.703
3.0000	0.1250	0.898	99.601
3.5063	0.0880	0.399	100.000

Profile 76-8
Sample 76-11

SIZE CLASS RATIOS:

GRAVEL=	0.200PCT	GRAVEL/SAND=	0.002
SAND =	99.800PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 12 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.005;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S)

SIZE RANGE	METHOD
2.0000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	2.757	2.757
-0.4854	1.4000	1.060	3.818
0.0	1.0000	1.485	5.302
0.5002	0.7070	5.408	10.711
1.0000	0.5000	18.452	29.162
1.4982	0.3540	37.328	66.490
2.0000	0.2500	23.754	90.244
2.4982	0.1770	7.423	97.667
3.0000	0.1250	1.485	99.152
3.5063	0.0880	0.530	99.682
3.9885	0.0630	0.212	99.894
13.2877	0.0001	0.106	100.000

SIZE CLASS RATIOS:

GRAVEL=	2.757PCT	GRAVEL/SAND=	0.028
SAND =	97.137PCT	SAND/SILT =	2129.797
SILT =	0.046PCT	SILT/CLAY =	0.756
CLAY =	0.060PCT	SAND/CLAY =	1610.413
MUD =	0.106PCT	SAND/MUD =	917.021
		GRAVEL/MUD =	25.029

Profile 76-8

Sample 76-12

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 13

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=13,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.005;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
4.0000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	14.708	14.708
-1.5008	2.8300	8.340	23.048
-1.0000	2.0000	6.823	29.871
-0.4854	1.4000	1.668	31.539
0.0	1.0000	0.910	32.449
0.5002	0.7070	1.668	34.117
1.0000	0.5000	6.368	40.485
1.4982	0.3540	15.011	55.497
2.0000	0.2500	18.347	73.844
2.4982	0.1770	15.921	89.765
3.0000	0.1250	8.795	98.559
3.5063	0.0880	1.061	99.621
3.9885	0.0630	0.303	99.924
13.2877	0.0001	0.076	100.000

Profile 76-8

Sample 76-13

SIZE CLASS RATIOS:

GRAVEL=	29.871PCT	GRAVEL/SAND=	0.426
SAND =	70.053PCT	SAND/SILT =	2148.341
SILT =	0.033PCT	SILT/CLAY =	0.756
CLAY =	0.043PCT	SAND/CLAY =	1623.410
MUD =	0.076PCT	SAND/MUD =	924.674
		GRAVEL/MUD =	394.286

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 14 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9, FN=0, WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0, PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.280	0.280
0.5002	0.7070	0.280	0.560
1.0000	0.5000	1.961	2.521
1.4982	0.3540	13.445	15.966
2.0000	0.2500	34.174	50.140
2.4982	0.1770	34.174	84.314
3.0000	0.1250	14.006	98.319
3.5063	0.0880	0.840	99.160
3.9885	0.0630	0.560	99.720
13.2877	0.0001	0.280	100.000

SIZE CLASS RATIOS:

GRAVEL	0.0 PCT	GRAVEL/SAND	0.0
SAND	99.720PCT	SAND/SILT	827.667
SILT	0.120PCT	SILT/CLAY	0.756
CLAY	0.159PCT	SAND/CLAY	625.983
MUD	0.280PCT	SAND/MUD	356.417
		GRAVEL/MUD	0.0

Profile 76-9

Sample 76-14

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 15

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 :PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.962	0.962
0.5002	0.7070	1.442	2.404
1.0000	0.5000	11.538	13.942
1.4982	0.3540	27.404	41.346
2.0000	0.2500	27.404	68.750
2.4982	0.1770	20.913	89.663
3.0000	0.1250	9.135	98.798
3.5063	0.0880	1.202	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-9
Sample 76-15

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 16

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7, FN=0; WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 ; PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
0.7070- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.5002	0.7070	1.630	1.630
1.0000	0.5000	10.326	11.957
1.4982	0.3540	25.000	36.957
2.0000	0.2500	24.185	61.141
2.4982	0.1770	23.370	84.511
3.0000	0.1250	14.130	98.641
3.5063	0.0880	1.359	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-9
Sample 76-16

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE, NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-6			M	CM	CM	1

#F:SV=13,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE--
5.6569- 0.0625MM
SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	WEIGHT	PERCENT	CUM
14.2300	14.2300	100.00	14.2300

PARTICLE SIZE DISTRIBUTION:

PHI	WE	PERCENT	CUM
-2.0000	4.0000	12.720	12.720
-1.5000	2.8284	0.000	12.720
-1.0000	2.0000	14.055	26.774
-0.5000	1.4142	2.108	28.883
0.0000	1.0000	5.271	34.153
0.5000	0.7071	14.055	48.208
1.0000	0.5000	18.482	66.690
1.5000	0.3536	15.882	82.572
2.0000	0.2500	10.892	93.465
2.5000	0.1768	5.200	98.665
3.0000	0.1250	1.124	99.789
3.5000	0.0884	0.141	99.930
4.0000	0.0625	0.070	100.000

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD
26.774PCT	73.226PCT	-0.000PCT	0.000PCT	-0.000PCT
GRAVEL/SAND=	SAND/SILT=	SILT/CLAY=	SAND/CLAY=	SAND/MUD=
0.366	*****	0.000	0.000	*****

Sample S77-6
Profile S77-4

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	SAMPLE METHODS
S77-7				M	CM	CM	1

#F:SV=14,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0010; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE--
 64.0011- 0.0625MM SIEVES
 0.0625- 0.0001MM PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	HYDROPHOIMETER	PAN	TOTAL
71.1350	0.0010	0.0010	71.1360 (G)

PARTICLE SIZE DISTRIBUTION:

PERCENT	PERCENT	CUM
16.0002	55.024	55.024
4.0000	36.274	91.298
2.8284	8.298	99.597
2.0000	0.360	99.956
1.4142	0.014	99.970
1.0000	0.003	99.973
0.7071	0.003	99.976
0.5000	0.006	99.982
0.3536	0.001	99.983
0.2500	0.003	99.986
0.1768	0.001	99.987
0.1250	0.006	99.993
0.0884	0.001	99.994
0.0625	0.003	99.997
0.0001	0.001	99.999

SIZE CLASS RATIOS:

GRAVEL	99.956PCT	GRAVEL/SAND	2451.970
SAND	0.041PCT	SAND/SILT	67.317
SILT	0.001PCT	SILT/CLAY	0.274
CLAY	0.002PCT	SAND/CLAY	18.465
MUD	0.003PCT	SAND/MUD	14.490
		GRAVEL/MUD	35529.459

Profile S 77-4
 Sample S 77-7

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 17

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	1.010	1.010
0.0	1.0000	6.397	7.407
0.5002	0.7070	13.468	20.875
1.0000	0.5000	23.906	44.781
1.4982	0.3540	24.242	69.024
2.0000	0.2500	17.508	86.532
2.4982	0.1770	10.101	96.633
3.0000	0.1250	2.357	98.990
3.5063	0.0880	0.673	99.663
3.9885	0.0630	0.337	100.000

Profile 76-10
Sample 76-17

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	100.000PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 18

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
1.0000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

<u>PHI</u>	<u>MM</u>	<u>PERCENT</u>	<u>CUM</u> <u>PERCENT</u>
0.0	1.0000	0.217	0.217
0.5002	0.7070	0.217	0.433
1.0000	0.5000	1.300	1.733
1.4982	0.3540	5.634	7.367
2.0000	0.2500	23.835	31.203
2.4982	0.1770	39.220	70.423
3.0000	0.1250	26.219	96.641
3.5063	0.0880	3.250	99.892
3.9885	0.0630	0.108	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-10

Sample 76-18

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 19 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 3, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE 8.0000- 2.8300MM METHOD SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	18.780	18.780
-2.0000	4.0000	81.103	99.883
-1.5008	2.8300	0.117	100.000

SIZE CLASS RATIOS:

GRAVEL= 100.000PCT	GRAVEL/SAND= 0.0
SAND = 0.0 PCT	SAND/SILT = 0.0
SILT = 0.0 PCT	SILT/CLAY = 0.0
CLAY = 0.0 PCT	SAND/CLAY = 0.0
MUD = 0.0 PCT	SAND/MUD = 0.0
	GRAVEL/MUD = 0.0

Profile 76-10
Sample 76-19

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 20

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=12,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
4.0000- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	6.003	6.003
-1.5008	2.8300	7.547	13.551
-1.0000	2.0000	10.292	23.842
-0.4854	1.4000	4.803	28.645
0.0	1.0000	7.376	36.021
0.5002	0.7070	9.091	45.111
1.0000	0.5000	9.091	54.202
1.4982	0.3540	10.292	64.494
2.0000	0.2500	12.521	77.015
2.4982	0.1770	14.237	91.252
3.0000	0.1250	8.062	99.314
3.5063	0.0880	0.686	100.000

Profile 76-10

Sample 76-20

SIZE CLASS RATIOS:

GRAVEL=	23.842PCT	GRAVEL/SAND=	0.313
SAND =	76.158PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE, NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-4			M	CM	CM	1

#F:SV=10,ST= 0,H=0:WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE RANGE---
 2.8284- 0.0834MM
 ---METHOD---
 SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	PSA	HYDROPHONE	PAN	LOIAL
9.1300				9.1300 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	PERCENT	CUM PERCENT
-1.0000	2.0000	3.943
-0.5000	1.4142	9.200
0.0000	1.0000	16.101
0.5000	0.7071	19.496
1.0000	0.5000	18.182
1.5000	0.3536	16.210
2.0000	0.2500	10.186
2.5000	0.1768	5.038
3.0000	0.1250	1.424
3.5000	0.0884	0.219
		100.000

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD
3.943PCT	96.057PCT	0.000PCT	0.000PCT	0.000PCT
GRAVEL/SAND =	SAND/SILT =	SILT/CLAY =	SAND/CLAY =	SAND/MUD =
0.041	0.000	0.000	0.000	0.000
				GRAVEL/MUD =
				0.000

Profile S77-3
 Sample S77-4

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-5				M	CM	CM	1

#F:SV=13,ST= 0,H=C;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
5.6569- 0.0625MM	SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA	HYDROPHOTOMETER	PAN	TOTAL
16.4300				18.4300 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	W	PERCENT	CUM PERCENT
-2.0000	4.0000	4.829	4.829
-1.5000	2.8284	4.829	9.658
-1.0000	2.0000	36.571	46.229
-0.5000	1.4142	13.022	59.251
0.0000	1.0000	9.224	68.475
0.5000	0.7071	5.606	74.281
1.0000	0.5000	4.449	78.730
1.5000	0.3536	5.100	83.831
2.0000	0.2500	5.860	89.691
2.5000	0.1768	5.969	95.659
3.0000	0.1250	3.690	99.349
3.5000	0.0884	0.543	99.891
4.0000	0.0625	0.109	100.000

SIZE CLASS RATIOS:

GRAVEL	GRAVEL	SAND	SAND	SILT	SILT	CLAY	CLAY	MUD	MUD
46.229PCT	GRAVEL/SAND	0.860							
53.771PCT	SAND/SILT	*****							
-0.000PCT	SILT/CLAY	=	0.000						
0.000PCT	SAND/CLAY	=	0.000						
-0.000PCT	SAND/MUD	*****							
	GRAVEL/MUD	*****							

Profile 577-3
Sample 577-5

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 21

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	0.223	0.223
0.0	1.0000	0.668	0.891
0.5002	0.7070	5.791	6.682
1.0000	0.5000	20.713	27.394
1.4982	0.3540	30.067	57.461
2.0000	0.2500	22.494	79.955
2.4982	0.1770	14.031	93.987
3.0000	0.1250	5.345	99.332
3.5063	0.0880	0.445	99.777
3.9885	0.0630	0.223	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-11

Sample 76-21

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 22 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=12,FN=0,WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 8.0000- 0.1250MM METHOD: SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	10.984	10.984
-2.0000	4.0000	3.071	14.055
-1.5008	2.8300	2.874	16.929
-1.0000	2.0000	13.937	30.866
-0.4854	1.4000	36.772	67.638
0.0	1.0000	20.315	87.953
0.5002	0.7070	6.299	94.252
1.0000	0.5000	3.110	97.362
1.4982	0.3540	1.654	99.016
2.0000	0.2500	0.630	99.646
2.4982	0.1770	0.276	99.921
3.0000	0.1250	0.079	100.000

SIZE CLASS RATIOS:

GRAVEL=	30.866PCT	GRAVEL/SAND=	0.446
SAND =	69.134PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-11
Sample 76-22

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 23

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.8300- 0.1250MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.5008	2.8300	5.976	5.976
-1.0000	2.0000	60.313	66.289
-0.4854	1.4000	29.421	95.710
0.0	1.0000	3.463	99.173
0.5002	0.7070	0.337	99.510
1.0000	0.5000	0.123	99.632
1.4982	0.3540	0.123	99.755
2.0000	0.2500	0.153	99.908
2.4982	0.1770	0.061	99.970
3.0000	0.1250	0.031	100.000

SIZE CLASS RATIOS:

GRAVEL=	66.288PCT	GRAVEL/SAND=	1.966
SAND =	33.712PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-11
Sample 76-23

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1977

SAMPLE NO. 77-6 GLACIER BAY 77

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9.FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 1.4000- 0.0880MM
METHOD: SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM
-0.4854	1.4000	0.312	0.312
0.0	1.0000	2.804	3.115
0.5002	0.7070	17.290	20.405
1.0000	0.5000	30.530	50.935
1.4982	0.3540	26.324	77.259
2.0000	0.2500	15.109	92.368
2.4982	0.1770	6.386	98.754
3.0000	0.1250	1.090	99.844
3.5063	0.0880	0.156	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile J 77-11
Sample J 77-6

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1977

SAMPLE NO. 77-5 GLACIER BAY 77

DATA SPECIFICATION INPUT:

#OF FRC:CS=12, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
4.0000- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM. PERCENT
-2.0000	4.0000	7.756	7.756
-1.5008	2.8300	28.273	36.029
-1.0000	2.0000	29.263	65.292
-0.4854	1.4000	12.871	78.163
0.0	1.0000	12.871	91.034
0.5002	0.7070	6.106	97.140
1.0000	0.5000	1.980	99.120
1.4982	0.3540	0.440	99.560
2.0000	0.2500	0.220	99.780
2.4982	0.1770	0.110	99.890
3.0000	0.1250	0.055	99.945
3.5063	0.0880	0.055	100.000

SIZE CLASS RATIOS:

GRAVEL=	65.292PCT	GRAVEL/SAND=	1.881
SAND =	34.708PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile J 77-11

Sample J 77-5

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE/NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-1			M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE-- METHOD-----
 2.0000- 0.0625MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES--	RSA----	HYDROPHOTOMETER--	PAN-----	TOTAL----
15.4700				13.4700 (G)

PARTICLE SIZE DISTRIBUTION:

PHI----	MM----	PERCENT	CUM
-0.5000	1.4142	0.520	0.520
0.0000	1.0000	1.336	1.856
0.5000	0.7071	6.162	8.018
1.0000	0.5000	18.560	26.578
1.5000	0.3536	28.879	55.457
2.0000	0.2500	25.093	80.549
2.5000	0.1768	13.734	94.284
3.0000	0.1250	4.306	98.589
3.5000	0.0884	0.742	99.332
4.0000	0.0625	0.668	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.000PCT	GRAVEL/SAND=
SAND =	100.000PCT	SAND/SILT =
SILT =	0.000PCT	SILT/CLAY =
CLAY =	0.000PCT	SAND/CLAY =
MUD =	0.000PCT	SAND/MUD =
		GRAVEL/MUD =

Profile S77-2
 Sample S77-1

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE/NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-2			M	CM	CM	1

#F:SV=12,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,h/P= 0.0800; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE	METHOD
4.0000- 0.0625MM	SIEVES
0.0625- 0.0001MM	PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	BSA----	HYDROPHOICMEIER-	PAN----	TOTAL----
14.5200	0.0800	0.0800	0.0800	14.6000 (G)

PARTICLE SIZE DISTRIBUTION:

PHI----	PERCENT	CUM PERCENT
-1.5000	2.8284	1.438
-1.0000	2.0000	5.411
-0.5000	1.4142	5.000
0.0000	1.0000	1.849
0.5000	0.7071	12.466
1.0000	0.5000	16.575
1.5000	0.3536	22.123
2.0000	0.2500	17.329
2.5000	0.1768	10.753
3.0000	0.1250	4.384
3.5000	0.0884	0.890
4.0000	0.0625	0.685
13.2800	0.0001	0.548

SIZE CLASS RATIOS:

GRAVEL=	6.849PCT	GRAVEL/SAND=	0.074
SAND =	92.055PCT	SAND/SILT =	389.760
SILT =	0.236PCT	SILT/CLAY =	0.275
CLAY =	0.860PCT	SAND/CLAY =	107.077
MUD =	1.096PCT	SAND/MUD =	84.000
		GRAVEL/MUD =	6.250

Profile S77-2
Sample S77-2

SEDIMENT SIZE ANALYSIS--GLACIER DAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	SAMPLE METHODS
S77-3				M	CM	CM	1

#F:SV=11,ST= 0,H=0;WT:SV= C.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE RANGE---
 2.8284- 0.0625MM
 ---METHOD-----
 SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RS	HYDROPHOIMETER	PAN	TOTAL
9.5200				9.5200 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM
-1.0000	2.0000	50.105	50.105
-0.5000	1.4142	32.353	82.458
0.0000	1.0000	10.399	92.857
0.5000	0.7071	2.626	95.483
1.0000	0.5000	1.366	96.849
1.5000	0.3536	0.735	97.584
2.0000	0.2500	0.735	98.319
2.5000	0.1768	0.735	99.055
3.0000	0.1250	0.630	99.685
3.5000	0.0884	0.105	99.790
4.0000	0.0625	0.210	100.000

SIZE CLASS RATIOS:

GRAVEL	50.10SPCT	GRAVEL/SAND	1.004
SAND	49.895PCT	SAND/SILT	99999.999
SILT	0.000PCT	SILT/CLAY	0.000
CLAY	0.000PCT	SAND/CLAY	0.000
MUD	0.000PCT	SAND/MUD	99999.999
		GRAVEL/MUD	99999.999

Profile S77-2
 Sample S77-3

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 24

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=9; WTS:CS= 0.0 ,FN= 0.125, PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0630MM	SIEVES
0.0442- 0.0001MM	HYDROPHOTOMETER

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	1.123	1.123
0.0	1.0000	2.619	3.742
0.5002	0.7070	11.974	15.716
1.0000	0.5000	27.877	43.592
1.4982	0.3540	29.373	72.965
2.0000	0.2500	15.903	88.868
2.4982	0.1770	6.922	95.790
3.0000	0.1250	1.684	97.474
3.5063	0.0880	0.187	97.661
3.9885	0.0630	0.0	97.661
4.4998	0.0442	0.112	97.774
5.0023	0.0312	0.426	98.200
5.4998	0.0221	0.231	98.431
6.0023	0.0156	0.338	98.769
6.5063	0.0110	0.273	99.042
7.0023	0.0078	0.239	99.281
7.5063	0.0055	0.211	99.492
8.0023	0.0039	0.208	99.700
13.2877	0.0001	0.300	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	97.664PCT	SAND/SILT =	47.999
SILT =	2.035PCT	SILT/CLAY =	6.750
CLAY =	0.301PCT	SAND/CLAY =	324.010
MUD =	2.336PCT	SAND/MUD =	41.806
		GRAVEL/MUD =	0.0

Profile 76-12
Sample 76-24

134

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 25 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
4.0000- 0.1770MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	8.035	8.035
-1.5008	2.8300	8.294	16.328
-1.0000	2.0000	8.855	25.184
-0.4854	1.4000	10.367	35.551
0.0	1.0000	21.598	57.149
0.5002	0.7070	27.214	84.363
1.0000	0.5000	13.132	97.495
1.4982	0.3540	1.901	99.395
2.0000	0.2500	0.432	99.827
2.4982	0.1770	0.173	100.000

SIZE CLASS RATIOS:

GRAVEL=	25.184PCT	GRAVEL/SAND=	0.337
SAND =	74.816PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-12
Sample 76-25

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 26

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 6, FN=0; WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 ; PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.8000- 0.5000MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.4854	2.8000	3.974	3.974
-1.0000	2.0000	35.628	39.603
-0.4854	1.4000	55.926	95.529
0.0	1.0000	3.974	99.503
0.5002	0.7070	0.426	99.929
1.0000	0.5000	0.071	100.000

SIZE CLASS RATIOS:

GRAVEL=	39.602PCT	GRAVEL/SAND=	0.656
SAND =	60.398PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-12

Sample 76-26

136

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 27A

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	0.351	0.351
0.0	1.0000	2.339	2.690
0.5002	0.7070	4.912	7.602
1.0000	0.5000	14.269	21.871
1.4982	0.3540	30.877	52.749
2.0000	0.2500	29.006	81.754
2.4982	0.1770	14.620	96.374
3.0000	0.1250	3.275	99.649
3.5063	0.0880	0.234	99.883
3.9885	0.0630	0.117	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	100.000PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-13

Sample 76-27A

137

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 28

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7, FN=0; WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 1.0000- 0.1250MM
 METHOD: SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	1.902	1.902
0.5002	0.7070	8.424	10.326
1.0000	0.5000	27.717	38.043
1.4982	0.3540	37.772	75.815
2.0000	0.2500	18.750	94.565
2.4982	0.1770	5.163	99.728
3.0000	0.1250	0.272	100.000

SIZE CLASS RATIOS:

GRAVEL	=	0.0	PCT	GRAVEL/SAND	=	0.0
SAND	=	100.000	PCT	SAND/SILT	=	0.0
SILT	=	0.0	PCT	SILT/CLAY	=	0.0
CLAY	=	0.0	PCT	SAND/CLAY	=	0.0
MUD	=	0.0	PCT	SAND/MUD	=	0.0
				GRAVEL/MUD	=	0.0

Profile 76-13
 Sample 76-28

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 29

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	0.102	0.102
0.0	1.0000	1.628	1.729
0.5002	0.7070	12.614	14.344
1.0000	0.5000	32.553	46.897
1.4982	0.3540	29.908	76.806
2.0000	0.2500	13.428	90.234
2.4982	0.1770	7.121	97.355
3.0000	0.1250	2.442	99.797
3.5063	0.0880	0.203	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-13
Sample 76-29

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 30 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE 8.0000- 0.1770MM METHOD SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	21.639	21.639
-2.0000	4.0000	3.060	24.699
-1.5008	2.8300	1.676	26.375
-1.0000	2.0000	2.004	28.379
-0.4854	1.4000	12.969	41.348
0.0	1.0000	16.976	58.324
0.5002	0.7070	33.297	91.621
1.0000	0.5000	6.995	98.616
1.4982	0.3540	1.020	99.636
2.0000	0.2500	0.291	99.927
2.4982	0.1770	0.073	100.000

SIZE CLASS RATIOS:

GRAVEL=	28.379PCT	GRAVEL/SAND=	0.396
SAND =	71.621PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-13
Sample 76-30

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 31

GLACIER BAY 76

DATA SPECIFICATION INPUT:
#OF FRC:CS=13,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 :PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
4.0000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	3.224	3.224
-1.5008	2.8300	3.224	6.447
-1.0000	2.0000	6.184	12.632
-0.4854	1.4000	12.303	24.934
0.0	1.0000	13.487	38.421
0.5002	0.7070	17.237	55.658
1.0000	0.5000	14.276	69.934
1.4982	0.3540	8.684	78.618
2.0000	0.2500	7.566	86.184
2.4982	0.1770	9.276	95.460
3.0000	0.1250	4.145	99.605
3.5063	0.0880	0.329	99.934
3.9885	0.0630	0.066	100.000

SIZE CLASS RATIOS:

GRAVEL=	12.632PCT	GRAVEL/SAND=	0.145
SAND =	87.368PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-13
Sample 76-31

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1977

SAMPLE NO. 77-3

GLACIER BAY 77

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	1.897	1.897
-0.4854	1.4000	8.641	10.537
0.0	1.0000	15.174	25.711
0.5002	0.7070	13.488	39.199
1.0000	0.5000	17.914	57.113
1.4982	0.3540	21.918	79.031
2.0000	0.2500	14.542	93.572
2.4982	0.1770	5.269	98.841
3.0000	0.1250	0.843	99.684
3.5063	0.0880	0.316	100.000

SIZE CLASS RATIOS:

GRAVEL=	1.897PCT	GRAVEL/SAND=	0.019
SAND =	98.103PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile J 77-13
Sample J 77-3

142

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1977

SAMPLE NO. 77-4 GLACIER BAY 77

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
2.0000- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM. PERCENT
-1.0000	2.0000	7.468	7.468
-0.4854	1.4000	4.434	11.902
0.0	1.0000	7.701	19.603
0.5002	0.7070	12.835	32.439
1.0000	0.5000	25.671	58.110
1.4982	0.3540	27.305	85.414
2.0000	0.2500	10.969	96.383
2.4982	0.1770	3.034	99.417
3.0000	0.1250	0.467	99.883
3.5063	0.0880	0.117	100.000

SIZE CLASS RATIOS:

GRAVEL=	7.468PCT	GRAVEL/SAND=	0.081
SAND =	92.532PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile J 77-13
Sample J 77-4

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
	S77-13			M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE RANGE--- WEIHOLD
2.0000- 0.0625MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA	HYDROPHOTOMETER	PAN	TAIL
13.0000				13.0000 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	FW	PERCENT	CUM
-0.5000	1.4142	0.231	0.231
0.0000	1.0000	0.231	0.462
0.5000	0.7071	1.077	1.538
1.0000	0.5000	4.462	6.000
1.5000	0.3536	16.769	22.769
2.0000	0.2500	33.385	56.154
2.5000	0.1768	30.769	86.923
3.0000	0.1250	12.533	99.462
3.5000	0.0884	0.462	99.923
4.0000	0.0625	0.077	100.000

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD
0.000PCT	100.000PCT	-0.000PCT	0.000PCT	-0.000PCT
GRAVEL/SAND=	SAND/SILT=	SILT/CLAY=	SAND/CLAY=	SAND/MUD=
0.000	*****	0.000	0.000	*****
				GRAVEL/MUD=
				0.000

Profile S77-9

Sample S77-13

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE, NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
	S77-14		M	CM	CM	1

#F:SV=14,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0020; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
64.0011- 0.0625MM	SIEVES
0.0625- 0.0001MM	PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	BSA	HYDROPHOTOMETER	PAN	TOTAL
139.7520		0.0020	0.0020	139.7540 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-4.0000	16.0002	55.440	55.440
-2.0000	4.0000	8.229	63.669
-1.5000	2.8284	5.574	69.243
-1.0000	2.0000	5.510	74.753
-0.5000	1.4142	3.478	78.230
0.0000	1.0000	2.461	80.692
0.5000	0.7071	1.975	82.667
1.0000	0.5000	1.975	84.642
1.5000	0.3536	3.148	87.790
2.0000	0.2500	4.937	92.727
2.5000	0.1768	4.508	97.235
3.0000	0.1250	2.576	99.811
3.5000	0.0884	0.172	99.983
4.0000	0.0625	0.014	99.997
13.2800	0.0001	0.001	99.999

SIZE CLASS RATIOS:

GRAVEL	74.753PCT	GRAVEL/SAND
SAND	25.244PCT	SAND/SILT = 40912.869
SILT	0.001PCT	SILT/CLAY = 0.275
CLAY	0.002PCT	SAND/CLAY = 11235.410
MUD	0.003PCT	SAND/MUD = 8814.727
		GRAVEL/MUD = 26101.888

Profile S77-9
Sample S77-14

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-11				M	CM	CM	1

#F:SV=11,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0030; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE-RANGE---
 2.8284- 0.0625MM SIEVES
 0.0625- 0.0001MM PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

---SIEVES--- --ESA--- HYDROPHOTOMETER- --PAN--- --TOTAL---
 8.9318 0.0030 0.0030 8.9343 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	1.567	1.567
-0.5000	1.4142	2.238	3.805
0.0000	1.0000	5.988	9.793
0.5000	0.7071	12.647	22.440
1.0000	0.5000	24.287	46.727
1.5000	0.3536	29.212	75.939
2.0000	0.2500	17.908	93.847
2.5000	0.1768	5.148	98.995
3.0000	0.1250	0.895	99.890
3.5000	0.0884	0.032	99.923
4.0000	0.0625	0.010	99.933
13.2300	0.0001	0.034	99.966

SIZE CLASS RATIOS:

GRAVEL	1.567PCT	GRAVEL/SAND	0.016
SAND	98.366PCT	SAND/SILT	6796.532
SILT	0.014PCT	SILT/CLAY	0.275
CLAY	0.053PCT	SAND/CLAY	1867.201
MUD	0.067PCT	SAND/MUD	1464.783
		GRAVEL/MUD	23.333

Profile S 77-8
 Sample S 77-11

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMNER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-12				M	CM	CM	1

#F:SV=14,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 64.0011- 0.0625MM
 METHOD: SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA	HYDROPHOTOMETER	PAN	TOTAL
131.3600				131.3600 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-4.0000	16.0002	36.914	36.914
-2.0000	4.0000	13.619	50.533
-1.5000	2.8284	7.247	57.780
-1.0000	2.0000	10.467	68.248
-0.5000	1.4142	17.167	85.414
0.0000	1.0000	9.219	94.633
0.5000	0.7071	2.474	97.107
1.0000	0.5000	1.401	98.508
1.5000	0.3536	1.066	99.574
2.0000	0.2500	0.274	99.848
2.5000	0.1768	0.084	99.931
3.0000	0.1250	0.046	99.977
3.5000	0.0884	0.015	99.992
4.0000	0.0625	0.008	100.000

SIZE CLASS RATIOS:

GRAVEL	68.248PCT	GRAVEL/SAND	2.149
SAND	= 31.752PCT	SAND/SILT	*****
SILT	= -0.000PCT	SILT/CLAY	= 0.000
CLAY	= 0.000PCT	SAND/CLAY	= 0.000
MUD	= -0.000PCT	SAND/MUD	*****
		GRAVEL/MUD	*****

Profile S 77-8
 Sample S 77-12

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 32

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.010;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.415	0.415
0.5002	0.7070	0.727	1.142
1.0000	0.5000	3.115	4.258
1.4982	0.3540	10.800	15.057
2.0000	0.2500	26.376	41.433
2.4982	0.1770	35.929	77.362
3.0000	0.1250	19.938	97.300
3.5063	0.0880	2.077	99.377
3.9885	0.0630	0.415	99.792
13.2877	0.0001	0.208	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	99.793PCT	SAND/SILT =	1116.995
SILT =	0.089PCT	SILT/CLAY =	0.757
CLAY =	0.118PCT	SAND/CLAY =	845.071
MUD =	0.207PCT	SAND/MUD =	481.095
		GRAVEL/MUD =	0.0

Profile 76-14
Sample 76-32

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 33

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.237	0.237
0.5002	0.7070	0.949	1.186
1.0000	0.5000	2.610	3.796
1.4982	0.3540	14.947	18.743
2.0000	0.2500	28.351	47.094
2.4982	0.1770	33.215	80.308
3.0000	0.1250	17.556	97.865
3.5063	0.0880	2.135	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	100.000PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-14
Sample 76-33

b4

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 34 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
 0.5000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
1.0000	0.5000	0.493	0.493
1.4982	0.3540	5.425	5.919
2.0000	0.2500	20.469	26.387
2.4982	0.1770	40.197	66.584
3.0000	0.1250	30.333	96.917
3.5063	0.0880	2.959	99.877
3.9885	0.0630	0.123	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-14
 Sample 76-34

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1977

SAMPLE NO. 77-2 GLACIER BAY 77

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9, FN=0; WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE 1.0000- 0.0630MM METHOD SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM. PERCENT
0.0	1.0000	0.109	0.109
0.5002	0.7070	0.869	0.977
1.0000	0.5000	5.646	6.623
1.4982	0.3540	24.756	31.379
2.0000	0.2500	34.745	66.124
2.4982	0.1770	26.059	92.182
3.0000	0.1250	7.166	99.349
3.5063	0.0880	0.434	99.783
3.9885	0.0630	0.217	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile J 77-14
Sample J 77-2

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1977

SAMPLE NO. 77-1 GLACIER BAY 77

DATA SPECIFICATION INPUT:

#OF FRC:CS=11,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
2.0000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	0.103	0.103
-0.4854	1.4000	0.0	0.103
0.0	1.0000	0.826	0.929
0.5002	0.7070	4.334	5.263
1.0000	0.5000	16.305	21.569
1.4982	0.3540	35.913	57.482
2.0000	0.2500	27.245	84.727
2.4982	0.1770	12.384	97.110
3.0000	0.1250	2.270	99.381
3.5063	0.0880	0.413	99.794
3.9885	0.0630	0.206	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.103PCT	GRAVEL/SAND=	0.001
SAND =	99.897PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile J 77-14
Sample J 77-1

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-15				M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE-RANGE---
 2.0000- 0.0025MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	WGT	HYDROPHOTOMETER	RAN	IQIAL
12.5800				12.5800 (G)

PARTICLE SIZE DISTRIBUTION:

PERCENT	PERCENT	CUM
0.5000	0.238	0.238
0.5000	0.318	0.556
0.5000	0.238	0.795
1.0000	2.941	3.736
1.5000	22.576	26.312
2.0000	36.804	63.116
2.5000	23.847	86.963
3.0000	11.685	98.649
3.5000	1.033	99.682
4.0000	0.318	100.000

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD
0.000PCT	100.000PCT	0.000PCT	0.000PCT	0.000PCT
GRAVEL/SAND	SAND/SILT	SILT/CLAY	SAND/CLAY	SAND/MUD
0.000	0.000	0.000	0.000	0.000
GRAVEL/MUD				
0.000				

Profile S77-10
 Sample S77-15

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 35 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0, WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
8.0000- 0.2500MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	17.239	17.239
-2.0000	4.0000	14.515	31.754
-1.5008	2.8300	10.075	41.828
-1.0000	2.0000	21.194	63.022
-0.4854	1.4000	22.052	85.075
0.0	1.0000	10.784	95.858
0.5002	0.7070	3.246	99.105
1.0000	0.5000	0.784	99.888
1.4982	0.3540	0.075	99.963
2.0000	0.2500	0.037	100.000

SIZE CLASS RATIOS:

GRAVEL=	63.022PCT	GRAVEL/SAND=	1.704
SAND =	36.978PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-15
Sample 76-35

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 36

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 6, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
4.0000- 0.7070MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	13.423	13.423
-1.5008	2.8300	20.929	34.353
-1.0000	2.0000	31.851	66.203
-0.4854	1.4000	26.886	93.090
0.0	1.0000	6.791	99.881
0.5002	0.7070	0.119	100.000

SIZE CLASS RATIOS:

GRAVEL =	66.203PCT	GRAVEL/SAND =	1.959
SAND =	33.797PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-16
Sample 76-36

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 37

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	2.111	2.111
0.5002	0.7070	7.652	9.763
1.0000	0.5000	14.248	24.011
1.4982	0.3540	23.219	47.230
2.0000	0.2500	32.718	79.947
2.4982	0.1770	17.150	97.098
3.0000	0.1250	2.639	99.736
3.5063	0.0880	0.264	100.000

Profile 76-19
Sample 76-37

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 38

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9,FN=0,WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE 2.0000- 0.1250MM
METHOD SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	1.423	1.423
-0.4854	1.4000	6.504	7.927
0.0	1.0000	10.366	18.293
0.5002	0.7070	9.756	28.049
1.0000	0.5000	21.748	49.797
1.4982	0.3540	31.098	80.894
2.0000	0.2500	15.244	96.138
2.4982	0.1770	3.659	99.797
3.0000	0.1250	0.203	100.000

SIZE CLASS RATIOS:

GRAVEL=	1.423PCT	GRAVEL/SAND=	0.014
SAND =	98.577PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-19
Sample 76-38

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 39

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
0.7070- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.5002	0.7070	0.248	0.248
1.0000	0.5000	4.467	4.715
1.4982	0.3540	28.784	33.499
2.0000	0.2500	44.665	78.164
2.4982	0.1770	19.355	97.519
3.0000	0.1250	2.233	99.752
3.5063	0.0880	0.248	100.000

Profile 76-19
Sample 76-39

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

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SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	SAMPLE METHODS
S77-17				M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE-- --METHOD-----
 2.8284- 0.0884MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES--	RSA----	HYDROPHOTOMETER	PAN-----	TOTAL----
12.4200				12.4200 (G)

PARTICLE SIZE DISTRIBUTION:

PHI----	MM----	PERCENT	CUM PERCENT
-1.0000	2.0000	0.886	0.886
-0.5000	1.4142	3.784	4.670
0.0000	1.0000	14.251	18.921
0.5000	0.7071	33.333	52.254
1.0000	0.5000	24.638	76.892
1.5000	0.3536	14.815	91.707
2.0000	0.2500	6.522	98.229
2.5000	0.1768	1.369	99.597
3.0000	0.1250	0.242	99.839
3.5000	0.0884	0.161	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.886PCT	GRAVEL/SAND=
SAND =	99.114PCT	SAND/SILT =
SILT =	0.000PCT	SILT/CLAY =
CLAY =	0.000PCT	SAND/CLAY =
MUD =	0.000PCT	SAND/MUD =
		GRAVEL/MUD =

Profile 577-12
 Sample 577-17

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE, NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-18						

#F:SV=12,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0100; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
5.65-9- 0.0625MM	SIEVES
0.0625- 0.0001MM	PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA	HYDROPHOTOMETER	PAN	TOTAL
10.7400		0.0100	0.0100	10.7500 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-2.0000	4.0000	2.140	2.140
-1.5000	2.8284	1.674	3.814
-0.5000	1.4142	1.395	5.209
0.0000	1.0000	2.977	8.186
0.5000	0.7071	5.483	13.674
1.0000	0.5000	21.395	35.070
1.5000	0.3536	35.256	70.326
2.0000	0.2500	20.186	90.512
2.5000	0.1768	7.907	98.419
3.0000	0.1250	1.209	99.628
3.5000	0.0884	0.093	99.721
4.0000	0.0625	0.093	99.814
13.2500	0.0001	0.093	99.907

SIZE CLASS RATIOS:

GRAVEL	4.512PCT	GRAVEL/SAND	0.047
SAND	95.302PCT	SAND/SILT	2376.837
SILT	0.040PCT	SILT/CLAY	0.275
CLAY	0.146PCT	SAND/CLAY	652.982
MUD	0.186PCT	SAND/MUD	512.252
		GRAVEL/MUD	24.350

Profile S77-12
Sample S77-18

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE STATION S77-19
 SAMPLE TYPE, NUMBER
 TOTAL LENGTH M
 SAMPLE CENTER CM
 SAMPLE LENGTH CM
 METHODS 1

#F:SV=11,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0400; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE--
 2.8284- 0.0625MM SIEVES
 0.0625- 0.0001MM PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES-- 12.5800
 RSA---- HYDROPHOIMEIER-- 0.0400
 PAN---- 0.0400
 TOTAL---- 12.6200 (G)

PARTICLE SIZE DISTRIBUTION:

PHI---	WE---	PERCENT	CUM
-1.0000	2.0000	0.158	0.158
-0.5000	1.4142	0.158	0.317
0.0000	1.0000	0.634	0.951
0.5000	0.7071	1.426	2.377
1.0000	0.5000	7.052	9.429
1.5000	0.3536	30.269	39.699
2.0000	0.2500	39.144	78.843
2.5000	0.1768	15.769	94.612
3.0000	0.1250	4.120	98.732
3.5000	0.0884	0.396	99.128
4.0000	0.0625	0.238	99.366
13.2800	0.0001	0.317	99.683

SIZE CLASS RATIOS:

GRAVEL=	0.158PCT	GRAVEL/SAND=	0.002
SAND =	99.208PCT	SAND/SILT =	726.160
SILT =	0.137PCT	SILT/CLAY =	0.275
CLAY =	0.497PCT	SAND/CLAY =	199.495
MUD =	0.634PCT	SAND/MUD =	156.500
		GRAVEL/MUD =	0.250

Profile S77-13
 Sample S77-19

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-20				M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00, FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE-RANGE--- WEIHQD
2.8284- 0.0884MM SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RS4	HYDROPHOTOMETER	PAN	TOTAL
9.8400				9.8400 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	1.016	1.016
-0.5000	1.4142	0.915	1.931
0.0000	1.0000	2.439	4.370
0.5000	0.7071	9.248	13.618
1.0000	0.5000	30.894	44.512
1.5000	0.3536	34.146	78.659
2.0000	0.2500	17.581	96.240
2.5000	0.1768	3.354	99.593
3.0000	0.1250	0.305	99.898
3.5000	0.0884	0.102	100.000

SIZE CLASS RATIOS:

GRAVEL	1.016PCT	GRAVEL/SAND
SAND	98.984PCT	SAND/SILT = 0.010
SILT	0.000PCT	SILT/CLAY = 0.000
CLAY	0.000PCT	SAND/CLAY = 0.000
MUD	0.000PCT	SAND/MUD = 0.000
		GRAVEL/MUD = 0.000

Profile S77-13
Sample S77-20

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 40

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
0.7070- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

<u>PHI</u>	<u>MM</u>	<u>PERCENT</u>	<u>CUM PERCENT</u>
0.5002	0.7070	0.632	0.632
1.0000	0.5000	7.376	8.008
1.4982	0.3540	26.133	34.141
2.0000	0.2500	36.670	70.811
2.4982	0.1770	23.815	94.626
3.0000	0.1250	5.058	99.684
3.5063	0.0880	0.211	99.895
3.9885	0.0630	0.105	100.000

Profile 76-20
Sample 76-40

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 41

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
0.5000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

<u>PHI</u>	<u>MM</u>	<u>PERCENT</u>	<u>CUM PERCENT</u>
1.0000	0.5000	0.917	0.917
1.4982	0.3540	12.844	13.761
2.0000	0.2500	38.349	52.110
2.4982	0.1770	38.349	90.459
3.0000	0.1250	8.991	99.450
3.5063	0.0880	0.367	99.817
3.9885	0.0630	0.183	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-20
Sample 76-41

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 42 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
2.0000- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	5.280	5.280
-0.4854	1.4000	0.422	5.702
0.0	1.0000	0.422	6.125
0.5002	0.7070	1.901	8.025
1.0000	0.5000	23.654	31.679
1.4982	0.3540	48.363	80.042
2.0000	0.2500	14.995	95.037
2.4982	0.1770	4.224	99.261
3.0000	0.1250	0.634	99.894
3.5063	0.0880	0.106	100.000

SIZE CLASS RATIOS:

GRAVEL=	5.280PCT	GRAVEL/SAND=	0.056
SAND =	94.720PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-20
Sample 76-42

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 43

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7, FN=0, WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 2.0000- 0.2500MM METHOD: SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	15.521	15.521
-0.4854	1.4000	20.422	35.943
0.0	1.0000	33.628	69.571
0.5002	0.7070	21.239	90.810
1.0000	0.5000	7.624	98.434
1.4982	0.3540	1.498	99.932
2.0000	0.2500	0.068	100.000

SIZE CLASS RATIOS:

GRAVEL=	15.521PCT	GRAVEL/SAND=	0.184
SAND =	84.479PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-20
Sample 76-43

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 44

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	2.570	2.570
-0.4854	1.4000	7.243	9.813
0.0	1.0000	19.860	29.673
0.5002	0.7070	25.234	54.907
1.0000	0.5000	21.495	76.402
1.4982	0.3540	14.486	90.888
2.0000	0.2500	6.308	97.196
2.4982	0.1770	2.103	99.299
3.0000	0.1250	0.467	99.766
3.5063	0.0880	0.234	100.000

SIZE CLASS RATIOS:

GRAVEL=	2.570PCT	GRAVEL/SAND=	0.026
SAND =	97.430PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-20
Sample 76-44

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 46

GLACIER BAY 76

DATA SPECIFICATION INPUT:
#OF FRC:CS=14,FN=9;WTS:CS= 0.0 ,FN= 0.160,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
8.0000- 0.0630MM	SIEVES
0.0442- 0.0001MM	HYDROPHOTOMETER

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	15.501	15.501
-2.0000	4.0000	57.821	73.322
-1.5008	2.8300	18.935	92.257
-1.0000	2.0000	5.345	97.602
-0.4854	1.4000	1.301	98.903
0.0	1.0000	0.366	99.268
0.5002	0.7070	0.152	99.421
1.0000	0.5000	0.086	99.507
1.4982	0.3540	0.056	99.563
2.0000	0.2500	0.030	99.594
2.4982	0.1770	0.030	99.624
3.0000	0.1250	0.036	99.660
3.5063	0.0880	0.036	99.695
3.9885	0.0630	0.224	99.919
4.4998	0.0442	0.003	99.921
5.0023	0.0312	0.033	99.954
5.4998	0.0221	0.015	99.969
6.0023	0.0156	0.002	99.970
6.5063	0.0110	0.009	99.979
7.0023	0.0078	0.005	99.985
7.5063	0.0055	0.003	99.988
8.0023	0.0039	0.004	99.992
13.2877	0.0001	0.007	100.000

SIZE CLASS RATIOS:

GRAVEL=	97.602PCT	GRAVEL/SAND=	42.129
SAND =	2.317PCT	SAND/SILT =	31.415
SILT =	0.074PCT	SILT/CLAY =	9.724
CLAY =	0.008PCT	SAND/CLAY =	305.491

Profile 76-21
Sample 76-46

Sample 76-45 collected at this profile location was not analyzed as it consisted of Yakutaga fragments which broke down in size during analysis. The majority of grains were pea gravel size or coarse sand size

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SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-25				M	CM	CM	1

#F:SV= 8,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0110; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.8284- 0.1768MM	SIEVES
0.1768- 0.0001MM	PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RS4	HYDROQUICKMEIER	PAN	TOTAL
12.0829		0.0110	0.0110	12.0959 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	3.142	3.142
-0.5000	1.4142	13.726	16.868
0.0000	1.0000	33.488	50.356
0.5000	0.7071	33.571	83.927
1.0000	0.5000	13.478	97.404
1.5000	0.3536	2.315	99.720
2.0000	0.2500	0.083	99.802
2.5000	0.1768	0.016	99.818
13.2800	0.0001	0.091	99.909

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD	GRAVEL/SAND	SAND/SILT	SILT/CLAY	SAND/CLAY	SAND/MUD	GRAVEL/MUD
3.142PCT	96.689PCT	0.034PCT	0.136PCT	0.169PCT	0.032	2864.885	0.249	713.550	571.266	18.564

Profile S77-18
Sample S77-25

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 48 GLACIER BAY 76

DATA SPECIFICATION INPUT:
 #OF FRC:CS= 9, FN=0, WTS:CS= 0.0 , FN= 0.0 , PAN= 0.010, PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.211	0.211
0.5002	0.7070	0.423	0.634
1.0000	0.5000	3.805	4.440
1.4982	0.3540	12.474	16.913
2.0000	0.2500	28.541	45.455
2.4982	0.1770	30.655	76.110
3.0000	0.1250	18.816	94.926
3.5063	0.0880	3.805	98.732
3.9885	0.0630	1.057	99.789
13.2877	0.0001	0.211	100.000

SIZE CLASS RATIOS:

GRAVEL= 0.0	PCT	GRAVEL/SAND= 0.0
SAND = 99.789PCT		SAND/SILT = 1097.460
SILT = 0.091PCT		SILT/CLAY = 0.756
CLAY = 0.120PCT		SAND/CLAY = 830.130
MUD = 0.211PCT		SAND/MUD = 472.629
		GRAVEL/MUD = 0.0

Profile 76-22
 Sample 76-48

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 49

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11,FN=9,WTS:CS= 0.0 ,FN= 0.400,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 2.0000- 0.0630MM SIEVES
0.0442- 0.0001MM HYDROPHOTOMETER

PARTICLE SIZE DISIRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	2.168	2.168
-0.4854	1.4000	14.306	16.474
0.0	1.0000	20.087	36.561
0.5002	0.7070	18.931	55.491
1.0000	0.5000	13.584	69.075
1.4982	0.3540	13.006	82.081
2.0000	0.2500	7.514	89.595
2.4982	0.1770	2.890	92.486
3.0000	0.1250	0.867	93.353
3.5063	0.0880	0.578	93.931
3.9885	0.0630	0.289	94.220
4.4998	0.0442	1.103	95.322
5.0023	0.0312	0.349	95.671
5.4998	0.0221	0.341	96.012
6.0023	0.0156	0.420	96.432
6.5063	0.0110	0.761	97.193
7.0023	0.0078	0.781	97.975
7.5063	0.0055	0.648	98.623
8.0023	0.0039	0.610	99.234
13.2877	0.0001	0.766	100.000

SIZE CLASS RATIOS:

GRAVEL= 2.168PCT GRAVEL/SAND= 0.024
SAND = 92.077PCT SAND/SILT = 18.465
SILT = 4.986PCT SILT/CLAY = 6.484
CLAY = 0.769PCT SAND/CLAY = 119.727
MUD = 5.756PCT SAND/MUD = 15.998
GRAVEL/MUD = 0.377

Profile 76-23
Sample 76-49

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 50

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	3.855	3.855
-0.4854	1.4000	9.398	13.253
0.0	1.0000	25.783	39.036
0.5002	0.7070	23.614	62.651
1.0000	0.5000	16.145	78.795
1.4982	0.3540	11.325	90.121
2.0000	0.2500	6.265	96.386
2.4982	0.1770	2.410	98.795
3.0000	0.1250	0.723	99.518
3.5063	0.0880	0.241	99.759
3.9885	0.0630	0.241	100.000

SIZE CLASS RATIOS:

GRAVEL=	3.855PCT	GRAVEL/SAND=	0.040
SAND =	96.145PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-23
Sample 76-50

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-21				M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0000; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE RANGE---
2.0000- 0.0625MM
---METHOD---
SIEVES

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA	HYDROPIQUEMETER	PAN	TOTAL
12.9100				12.9100 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.5000	1.4142	0.310	0.310
0.0000	1.0000	0.232	0.542
0.5000	0.7071	0.232	0.775
1.0000	0.5000	0.620	1.394
1.5000	0.3536	5.190	6.584
2.0000	0.2500	25.252	31.836
2.5000	0.1768	42.525	74.361
3.0000	0.1250	22.851	97.211
3.5000	0.0884	2.324	99.535
4.0000	0.0625	0.465	100.000

SIZE CLASS RATIOS:

GRAVEL	0.000PCT	GRAVEL/SAND	0.000
SAND	100.000PCT	SAND/SILT	*****
SILT	-0.000PCT	SILT/CLAY	0.000
CLAY	0.000PCT	SAND/CLAY	0.000
MUD	-0.000PCT	SAND/MUD	*****
		GRAVEL/MUD	0.000

Profile 577-15
Sample 577-21

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE, NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-22			M	CM	CM	1

#F:SV=13,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0010; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE RANGE---
 5.6569- 0.0625MM SIEVES
 0.0625- 0.0001MM PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	WGT	HYDROPHORIC WGT	WGT	TOTAL
44.3710	0.0010	0.0010	0.0010	44.3720 (G)

PARTICLE SIZE DISTRIBUTION:

PHI	PERCENT	CUM PERCENT
-2.0000	3.403	3.403
-1.5000	1.848	5.251
-1.0000	3.426	8.677
-0.5000	9.646	18.322
0.0000	15.505	33.828
0.5000	16.903	50.730
1.0000	13.094	63.824
1.5000	12.395	76.219
2.0000	14.469	90.688
2.5000	7.212	97.900
3.0000	1.938	99.838
3.5000	0.135	99.973
4.0000	0.023	99.995
13.2800	0.001	99.998

SIZE CLASS RATIOS:

GRAVEL	SAND	SILT	CLAY	MUD
8.677PCT	91.319PCT	0.001PCT	0.004PCT	0.005PCT
GRAVEL/SAND= 0.095	SAND/SILT = 93969.337	SILT/CLAY = 0.275	SAND/CLAY = 25823.828	SAND/MUD = 20256.982
			GRAVEL/MUD = 1924.713	

Profile S77-15
 Sample S77-22

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	SAMPLE METHODS
S77-23				M	CM	CM	1

#F:SV=10,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0040; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE-RANGE--WEIHDR-----
 2.8284- 0.0625MM SIEVES
 0.0625- 0.0001MM PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	RSA----	HYDROPHOICIFIER-	PAN----	TOTAL----
8.7302		0.0040	0.0040	8.7342 (6)

PARTICLE SIZE DISTRIBUTION:

PHI----	NR--	PERCENT	CUM PERCENT
-1.0000	2.0000	0.229	0.229
-0.5000	1.4142	5.038	5.267
0.0000	1.0000	18.777	24.043
1.0000	0.5000	20.494	44.538
1.5000	0.3536	23.700	68.238
2.0000	0.2500	20.723	88.961
2.5000	0.1768	9.274	98.235
3.0000	0.1250	1.603	99.837
3.5000	0.0884	0.057	99.895
4.0000	0.0625	0.014	99.908
13.2800	0.0001	0.046	99.954

SIZE CLASS RATIOS:

GRAVEL=	0.229PCT	GRAVEL/SAND=	0.002
SAND =	99.679PCT	SAND/SILT =	5049.589
SILT =	0.020PCT	SILT/CLAY =	0.275
CLAY =	0.072PCT	SAND/CLAY =	1387.312
MUD =	0.092PCT	SAND/MUD =	1088.312
		GRAVEL/MUD =	2.500

Profile 577-16
 Sample 577-23

SEDIMENT SIZE ANALYSIS--GLACIER BAY BEACH SAMPLES - SUMMER 1977

CRUISE	STATION	SAMPLE TYPE	SAMPLE NUMBER	TOTAL LENGTH	SAMPLE CENTER	SAMPLE LENGTH	METHODS
S77-24				M	CM	CM	1

#F:SV=14,ST= 0,H=0;WT:SV= 0.0000,ST= 0.0000,H/P= 0.0060; PHI LIM:CS= 0.00,FN= 0.00

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

---SIZE-RANGE---
 64.0011- 0.0625MM SIEVES
 0.0625- 0.0001MM PAN

UNEDITED SAMPLE WEIGHTS IN GRAMS:

SIEVES	SSA----	HYDROPHOIMETER-	PAN----	TOTAL----
234.6060		0.0060	0.0060	234.6120 (G)

PARTICLE SIZE DISTRIBUTION:

PHI---	UC---	PERCENT	CUM PERCENT
-4.0000	16.0002	38.314	38.314
-2.0000	4.0000	11.862	50.176
-1.5000	2.8284	13.836	64.012
-1.0000	2.0000	18.899	82.911
-0.5000	1.4142	12.212	95.123
0.0000	1.0000	3.414	98.537
0.5000	0.7071	0.443	98.980
1.0000	0.5000	0.149	99.130
1.5000	0.3536	0.153	99.283
2.0000	0.2500	0.213	99.496
2.5000	0.1768	0.213	99.709
3.0000	0.1250	0.175	99.884
3.5000	0.0884	0.068	99.952
4.0000	0.0625	0.043	99.995
13.2800	0.0001	0.003	99.997

SIZE CLASS RATIOS:

GRAVEL=	82.911PCT	GRAVEL/SAND=	4.853
SAND=	17.084PCT	SAND/SILT =	15495.998
SILT =	0.001PCT	SILT/CLAY =	0.275
CLAY =	0.004PCT	SAND/CLAY =	4255.969
MUD =	0.005PCT	SAND/MUD =	3338.933
		GRAVEL/MUD =	16204.820

Profile S77-16
 Sample S77-24

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 51

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9,FN=9;WTS:CS= 0.0 ,FN= 0.750,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0630MM	SIEVES
0.0442- 0.0001MM	HYDROPHOTOMETER

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.169	0.169
0.5002	0.7070	0.847	1.017
1.0000	0.5000	3.898	4.915
1.4982	0.3540	13.559	18.475
2.0000	0.2500	27.797	46.271
2.4982	0.1770	27.119	73.390
3.0000	0.1250	12.034	85.424
3.5063	0.0880	1.525	86.949
3.9885	0.0630	0.339	87.288
4.4998	0.0442	3.989	91.277
5.0023	0.0312	2.204	93.482
5.4998	0.0221	1.064	94.546
6.0023	0.0156	1.396	95.942
6.5063	0.0110	0.517	96.459
7.0023	0.0078	0.693	97.152
7.5063	0.0055	0.580	97.732
8.0023	0.0039	0.789	98.521
13.2877	0.0001	1.479	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	87.378PCT	SAND/SILT =	7.844
SILT =	11.139PCT	SILT/CLAY =	7.511
CLAY =	1.483PCT	SAND/CLAY =	58.921
MUD =	12.622PCT	SAND/MUD =	6.923
		GRAVEL/MUD =	0.0

Profile 76-24
Sample 76-51

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 52 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7, FN=0; WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 ; PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
0.5000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
1.0000	0.5000	0.229	0.229
1.4982	0.3540	1.376	1.606
2.0000	0.2500	19.037	20.642
2.4982	0.1770	53.440	74.083
3.0000	0.1250	23.624	97.706
3.5063	0.0880	2.064	99.771
3.9885	0.0630	0.229	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-24
Sample 76-52

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 53

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.005;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
0.5000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
1.0000	0.5000	0.227	0.227
1.4982	0.3540	2.270	2.497
2.0000	0.2500	30.647	33.144
2.4982	0.1770	62.429	95.573
3.0000	0.1250	2.043	97.616
3.5063	0.0880	2.043	99.660
3.9885	0.0630	0.227	99.887
13.2877	0.0001	0.114	100.000

Profile 76-24
Sample 76-53

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	99.887PCT	SAND/SILT =	2046.318
SILT =	0.049PCT	SILT/CLAY =	0.756
CLAY =	0.065PCT	SAND/CLAY =	1547.924
MUD =	0.113PCT	SAND/MUD =	881.283
		GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 54 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=13,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
8.0000-- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	47.739	47.739
-1.5008	2.8300	0.421	48.160
-1.0000	2.0000	0.158	48.318
-0.4854	1.4000	0.053	48.370
0.0	1.0000	0.158	48.528
0.5002	0.7070	0.158	48.686
1.0000	0.5000	0.736	49.422
1.4982	0.3540	3.891	53.312
2.0000	0.2500	14.458	67.771
2.4982	0.1770	21.504	89.274
3.0000	0.1250	9.884	99.159
3.5063	0.0880	0.789	99.947
3.9885	0.0630	0.053	100.000

SIZE CLASS RATIOS:

GRAVEL=	48.318PCT	GRAVEL/SAND=	0.935
SAND =	51.682PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-24
Sample 76-54

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 55 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 8, FN=0, WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
1.0000- 0.0880MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	0.195	0.195
0.5002	0.7070	0.585	0.780
1.0000	0.5000	4.483	5.263
1.4982	0.3540	19.298	24.561
2.0000	0.2500	42.495	67.057
2.4982	0.1770	28.070	95.127
3.0000	0.1250	4.678	99.805
3.5063	0.0880	0.195	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-25
Sample 76-55

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 56 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9, FN=0, WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE: 2.0000- 0.1250MM
 METHOD: SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	PERCENT	CUM
-1.0000	2.0000	5.865	5.865	5.865
-0.4854	1.4000	6.452	12.317	12.317
0.0	1.0000	16.422	28.739	28.739
0.5002	0.7070	28.446	57.185	57.185
1.0000	0.5000	27.566	84.751	84.751
1.4982	0.3540	12.610	97.361	97.361
2.0000	0.2500	1.760	99.120	99.120
2.4982	0.1770	0.587	99.707	99.707
3.0000	0.1250	0.293	100.000	100.000

SIZE CLASS RATIOS:

GRAVEL=	5.865PCT	GRAVEL/SAND=	0.062
SAND =	94.135PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-26
 Sample 76-56

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 57

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 7,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
0.7070- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.5002	0.7070	0.513	0.513
1.0000	0.5000	2.821	3.333
1.4982	0.3540	17.436	20.769
2.0000	0.2500	37.949	58.718
2.4982	0.1770	32.564	91.282
3.0000	0.1250	8.462	99.744
3.5063	0.0880	0.256	100.000

Profile 76-27
Sample 76-57

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 58 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=12,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
8.0000- 0.1250MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-3.0000	8.0000	23.066	23.066
-2.0000	4.0000	36.094	59.160
-1.5008	2.8300	28.967	88.127
-1.0000	2.0000	11.577	99.703
-0.4854	1.4000	0.255	99.959
0.0	1.0000	0.013	99.972
0.5002	0.7070	0.003	99.975
1.0000	0.5000	0.007	99.982
1.4982	0.3540	0.003	99.985
2.0000	0.2500	0.010	99.995
2.4982	0.1770	0.003	99.999
3.0000	0.1250	0.002	100.001

SIZE CLASS RATIOS:

GRAVEL=	99.703PCT	GRAVEL/SAND=	335.686
SAND =	0.297PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-27
Sample 76-58

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 60 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10, FN=0, WTS:CS= 0.0 , FN= 0.0 , PAN= 0.0 , PHI LIM:CS= 0.0 , FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE METHOD
2.0000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	PERCENT	CUM
-1.0000	2.0000	0.733	0.733	0.733
-0.4854	1.4000	0.733	1.465	1.465
0.0	1.0000	1.954	3.419	3.419
0.5002	0.7070	8.547	11.966	11.966
1.0000	0.5000	33.455	45.421	45.421
1.4982	0.3540	36.142	81.563	81.563
2.0000	0.2500	15.629	97.192	97.192
2.4982	0.1770	2.442	99.634	99.634
3.5063	0.0880	0.244	99.878	99.878
3.9885	0.0630	0.122	100.000	100.000

Profile 76-28
Sample 76-60

SIZE CLASS RATIOS:

GRAVEL=	0.733PCT	GRAVEL/SAND=	0.007
SAND =	99.267PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 61

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	1.875	1.875
-0.4854	1.4000	0.833	2.708
0.0	1.0000	4.792	7.500
0.5002	0.7070	17.917	25.417
1.0000	0.5000	33.021	58.438
1.4982	0.3540	25.313	83.750
2.0000	0.2500	11.042	94.792
2.4982	0.1770	3.958	98.750
3.0000	0.1250	1.042	99.792
3.5063	0.0880	0.208	100.000

SIZE CLASS RATIOS:

GRAVEL=	1.875PCT	GRAVEL/SAND=	0.019
SAND =	98.125PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-28
Sample 76-61

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 62 GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10.FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ,PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE MEIHOD
1.4000- 0.0630MM SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	9.836	9.836
0.0	1.0000	25.137	34.973
0.5002	0.7070	20.492	55.465
1.0000	0.5000	16.667	72.131
1.4982	0.3540	13.934	86.066
2.0000	0.2500	8.197	94.262
2.4982	0.1770	4.098	98.361
3.0000	0.1250	1.093	99.454
3.5063	0.0880	0.273	99.727
3.9885	0.0630	0.273	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-28
Sample 76-62

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 63

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9, FN=0; WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ; PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.0000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
0.0	1.0000	1.458	1.458
0.5002	0.7070	4.167	5.625
1.0000	0.5000	16.250	21.875
1.4982	0.3540	37.292	59.167
2.0000	0.2500	29.375	88.542
2.4982	0.1770	8.958	97.500
3.0000	0.1250	1.667	99.167
3.5063	0.0880	0.625	99.792
3.9885	0.0630	0.208	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

Profile 76-28
Sample 76-63

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 64

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS= 9,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	1.636	1.636
0.0	1.0000	1.168	2.804
0.5002	0.7070	2.103	4.907
1.0000	0.5000	13.785	18.692
1.4982	0.3540	27.804	46.495
2.0000	0.2500	27.804	74.299
2.4982	0.1770	18.224	92.523
3.0000	0.1250	5.374	97.897
3.5063	0.0880	2.103	100.000

Profile 76-29
Sample 76-64

SIZE CLASS RATIOS:

GRAVEL=	0.0	PCT	GRAVEL/SAND=	0.0
SAND =	100.000	PCT	SAND/SILT =	0.0
SILT =	0.0	PCT	SILT/CLAY =	0.0
CLAY =	0.0	PCT	SAND/CLAY =	0.0
MUD =	0.0	PCT	SAND/MUD =	0.0
			GRAVEL/MUD =	0.0

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 65

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=11,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0630MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	10.037	10.037
-0.4854	1.4000	9.854	19.891
0.0	1.0000	12.226	32.117
0.5002	0.7070	10.766	42.883
1.0000	0.5000	9.124	52.007
1.4982	0.3540	10.401	62.409
2.0000	0.2500	15.511	77.920
2.4982	0.1770	15.328	93.248
3.0000	0.1250	6.022	99.270
3.5063	0.0880	0.547	99.818
3.9885	0.0630	0.182	100.000

Profile 76-29
Sample 76-65

SIZE CLASS RATIOS:

GRAVEL=	10.037PCT	GRAVEL/SAND=	0.112
SAND =	89.963PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

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SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 66

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.0 ;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
2.0000- 0.0880MM	SIEVES

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-1.0000	2.0000	0.216	0.216
-0.4854	1.4000	2.165	2.381
0.0	1.0000	12.121	14.502
0.5002	0.7070	23.810	38.312
1.0000	0.5000	21.429	59.740
1.4982	0.3540	14.502	74.242
2.0000	0.2500	12.771	87.013
2.4982	0.1770	9.091	96.104
3.0000	0.1250	3.247	99.351
3.5063	0.0880	0.649	100.000

SIZE CLASS RATIOS:

GRAVEL=	0.216PCT	GRAVEL/SAND=	0.002
SAND =	99.784PCT	SAND/SILT =	0.0
SILT =	0.0 PCT	SILT/CLAY =	0.0
CLAY =	0.0 PCT	SAND/CLAY =	0.0
MUD =	0.0 PCT	SAND/MUD =	0.0
		GRAVEL/MUD =	0.0

Profile 76-29
Sample 76-66

SEDIMENT SIZE ANALYSIS: GLACIER BAY BEACH SAMPLES--1976

SAMPLE NO. 67

GLACIER BAY 76

DATA SPECIFICATION INPUT:

#OF FRC:CS=10,FN=0;WTS:CS= 0.0 ,FN= 0.0 ,PAN= 0.030;PHI LIM:CS= 0.0 ,FN= 0.0

SAMPLE ANALYZED BY THE FOLLOWING METHOD(S):

SIZE RANGE	METHOD
1.4000- 0.0630MM	SIEVES
0.0630- 0.0001MM	PAN

PARTICLE SIZE DISTRIBUTION:

PHI	MM	PERCENT	CUM PERCENT
-0.4854	1.4000	0.393	0.393
0.0	1.0000	0.786	1.179
0.5002	0.7070	2.750	3.929
1.0000	0.5000	6.090	10.020
1.4982	0.3540	17.485	27.505
2.0000	0.2500	31.238	58.743
2.4982	0.1770	26.326	85.069
3.0000	0.1250	11.002	96.071
3.5063	0.0880	2.750	98.821
3.9885	0.0630	0.589	99.411
13.2877	0.0001	0.589	100.000

Profile 76-30
Sample 76-67

SIZE CLASS RATIOS:

GRAVEL=	0.0 PCT	GRAVEL/SAND=	0.0
SAND =	99.411PCT	SAND/SILT =	392.117
SILT =	0.254PCT	SILT/CLAY =	0.756
CLAY =	0.335PCT	SAND/CLAY =	296.595
MUD =	0.589PCT	SAND/MUD =	168.866
		GRAVEL/MUD =	0.0

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TABLE II
Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN (ϕ)	SORTING
76-1	31.8	68.2	0	0	-0.5	-1.2	1.3
76-2	.2	99.8	0	0	0.5	0.4	0.3
76-3	4.4	95.6	0	0	0.4	0.4	.6
76-4	41.6	58.4	0	0	-0.9	-0.9	.7
76-5	0	100	0	0	1.4	1.4	.4
76-6	0	100	0	0	1.0	1.0	.9
76-7	1.5	98.5	0	0	0.6	0.6	.5
76-8	57.4	42.6	0	0	-1.1	-1.1	.7
76-9	12.3	87.6	0	0.1	0.6	0.5	1.2
76-10	66.6	33.4	0	0	-1.6	-1.6	1.2
S77-8	0.6	99.4	0	0	1.0	1.0	0.4
S77-9	61.4	38.6	0	0	-1.1	-1.1	1.1
S77-10	0	100	0	0	1.6	1.6	0.3
76-11	0.2	99.8	0	0	1.0	1.0	0.5
76-12	2.8	97.1	0	0.1	1.3	1.3	0.6
76-13	29.9	70.1	0	0	1.4	0.6	1.8
76-14	0	99.7	0.1	0.2	2.0	2.0	0.5
76-15	0	100	0	0	1.6	1.7	0.6
76-16	0	100	0	0	1.8	1.8	0.7
S77-6	26.8	73.2	0	0	0.6	0.2	1.4
S77-7	100	0	0	0	-4.2	-4.1	1.4
76-17	0	100	0	0	1.1	1.1	0.8
76-18	0	100	0	0	2.2	2.3	0.4
76-19	100	0	0	0	-2.6	-2.6	0.5

TABLE II (cont)

Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN (ϕ)	SORTING
76-20	23.8	76.2	0	0	0.8	-0.5	1.6
S77-4	3.9	96.1	0	0	0.5	0.6	0.9
S77-5	46.2	53.8	0	0	-0.9	-0.2	1.4
76-21	0	100	0	0	1.4	1.4	0.6
76-22	30.9	69.1	0	0	-0.7	-0.8	1.0
76-23	66.3	33.7	0	0	-1.1	-1.0	0.3
J77-6	0	100	0	0	1.0	1.0	0.6
J77-5	65.3	34.7	0	0	-1.3	-1.1	0.7
S77-1	0	100	0	0	1.4	1.4	0.6
S77-2	6.8	92.1	0.2	0.9	1.2	1.2	1.0
S77-3	50.1	49.9	0	0	-1.0	-0.9	0.5
76-24	0	97.7	2.0	0.3	1.1	1.1	0.7
76-25	25.2	74.8	0	0	-0.1	-0.4	0.9
76-26	39.6	60.4	0	0	-0.9	-0.9	0.3
76-27A	0	100	0	0	1.5	1.5	0.6
76-28	0	100	0	0	1.1	1.1	0.5
76-29	0	100	0	0	1.0	1.1	0.6
76-30	28.4	71.6	0	0	-0.2	-1.1	1.6
76-31	12.6	87.4	0	0	0.3	0.5	1.3
J77-3	1.9	98.1	0	0	0.8	0.7	0.9
J77-4	7.5	92.5	0	0	0.9	0.7	0.9
S77-13	0	100	0	0	1.9	1.9	0.5
S77-14	74.8	25.2	0	0	-5.1	-3.2	2.8
S77-11	1.6	98.4	0	0.1	1.0	1.0	0.7

TABLE II (cont)
Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN (ϕ)	SORTING
S77-12	68.2	31.8	0	0	-2.1	-2.8	2.2
76-32	0	99.8	0.1	0.1	2.1	2.1	0.5
76-33	0	100	0	0	2.0	2.0	0.5
76-34	0	100	0	0	2.3	2.3	0.4
J77-2	0	100	0	0	1.8	1.8	0.5
J77-1	0.1	99.9	0	0	1.4	1.5	0.5
S77-15	0	100	0	0	1.8	1.8	0.5
76-35	63.0	37.0	0	0	-1.3	-1.6	1.2
76-36	66.2	33.8	0	0	-1.2	-1.3	0.6
76-37	0	100	0	0	1.5	1.5	0.7
76-38	1.4	98.6	0	0	1.0	0.8	0.8
76-39	0	100	0	0	1.7	1.8	0.4
S77-17	0.9	99.1	0	0	0.5	0.5	0.6
S77-18	4.5	95.3	0	0.1	1.2	1.2	0.7
S77-19	0.2	99.2	0.1	0.5	1.6	1.6	0.5
S77-20	1.0	99.0	0	0	1.1	1.1	0.5
76-40	0	100	0	0	1.7	1.7	0.5
76-41	0	100	0	0	2.0	2.0	0.4
76-42	5.3	94.7	0	0	1.1	1.1	0.7
76-43	15.5	84.5	0	0	-0.3	-0.3	0.6
76-44	2.6	97.4	0	0	0.4	0.4	0.7
76-46	97.6	2.3	0.1	0	-2.2	-2.3	0.6
S77-25	3.1	96.7	0	0.1	0.0	0.0	0.5
76-48	0	99.8	0.1	0.1	2.1	2.1	0.6

TABLE II (cont)

Major Sediment Data

SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	MEDIAN (ϕ)	MEAN ϕ	SORTING
76-49	2.2	92.1	5.0	0.8	0.3	0.5	1.3
76-50	3.9	96.1	0	0	0.2	0.3	0.8
S77-21	0	100	0	0	2.2	2.3	0.4
S77-22	8.7	91.3	0	0	0.5	0.6	1.1
S77-23	0.2	99.7	0	0.1	1.1	1.0	0.9
S77-24	82.9	17.1	0	0	-2.0	-3.0	2.0
76-51	0	87.4	11.1	1.5	2.0	2.1	1.0
76-52	0	100	0	0	2.3	2.3	0.4
76-53	0	99.9	0	0.1	2.1	2.1	0.3
76-54	48.3	51.7	0	0	1.2	-0.2	2.7
76-55	0	100	0	0	1.8	1.8	0.4
76 56	5.9	94.1	0	0	0.4	0.4	0.7
76-57	0	100	0	0	1.9	1.9	0.5
76-58	99.7	0.3	0	0	-2.2	-2.4	0.8
76-60	0.7	99.3	0	0	1.0	1.1	0.5
76-61	1.9	98.1	0	0	0.9	0.9	0.6
76-62	0	100	0	0	0.4	0.5	0.8
76-63	0	100	0	0	1.4	1.4	0.5
76-64	0	100	0	0	1.6	1.5	0.6
76-65	10.0	90.0	0	0	0.9	0.8	1.3
76-66	0.2	99.8	0	0	0.8	0.9	0.9
76-67	0	99.4	0.3	0.3	1.9	1.9	0.6