RECONNAISSANCE OF UGASHIK BEACH SANDS, BRISTOL BAY, ALASKA

by Arthur L. Kimball

* open-file report

UNITED STATES DEPARTMENT OF THE INTERIOR

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BUREAU OF MINES

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RECONNAISSANCE OF UGASHIK BEACH SANDS, BRISTOL BAY, ALASKA

by

Arthur L. Kimball[1/]

ABSTRACT

The Bureau of Mines briefly examined a segment of the east shore of Bristol Bay north of Ugashik in 1969 to estimate the amount of gold present. The examination included sampling, magnetometer reconnaissance, and a study of the black sands. Bristol Bay and the lowlands east of the bay are underlain by glacial deposits transported from the Aleutian Range during Pleistocene glaciation. The beaches contain many varieties of igneous and sedimentary rocks. Of 125 samples taken, 36 contained no gold, 79 contained a trace of gold (.0001-.0005 oz./ton) or more, and 10 samples ranged in value from .001 to .007 oz. gold/ton. The maximum value was from a surface grab sample of black sands. A magnetometer of moderate resolution revealed no anomalous readings clearly caused by black sand concentrations.

Gold, when found, was nearly always associated with black sands. A veneer of black sands less than 1/2 inch thick covers wide sections of the upper beach. Thicker deposits are present, but usually cover less than an acre, and rarely exceed 6 inches in thickness, although one 14-inch layer was measured. The best gold pan (six colors) taken

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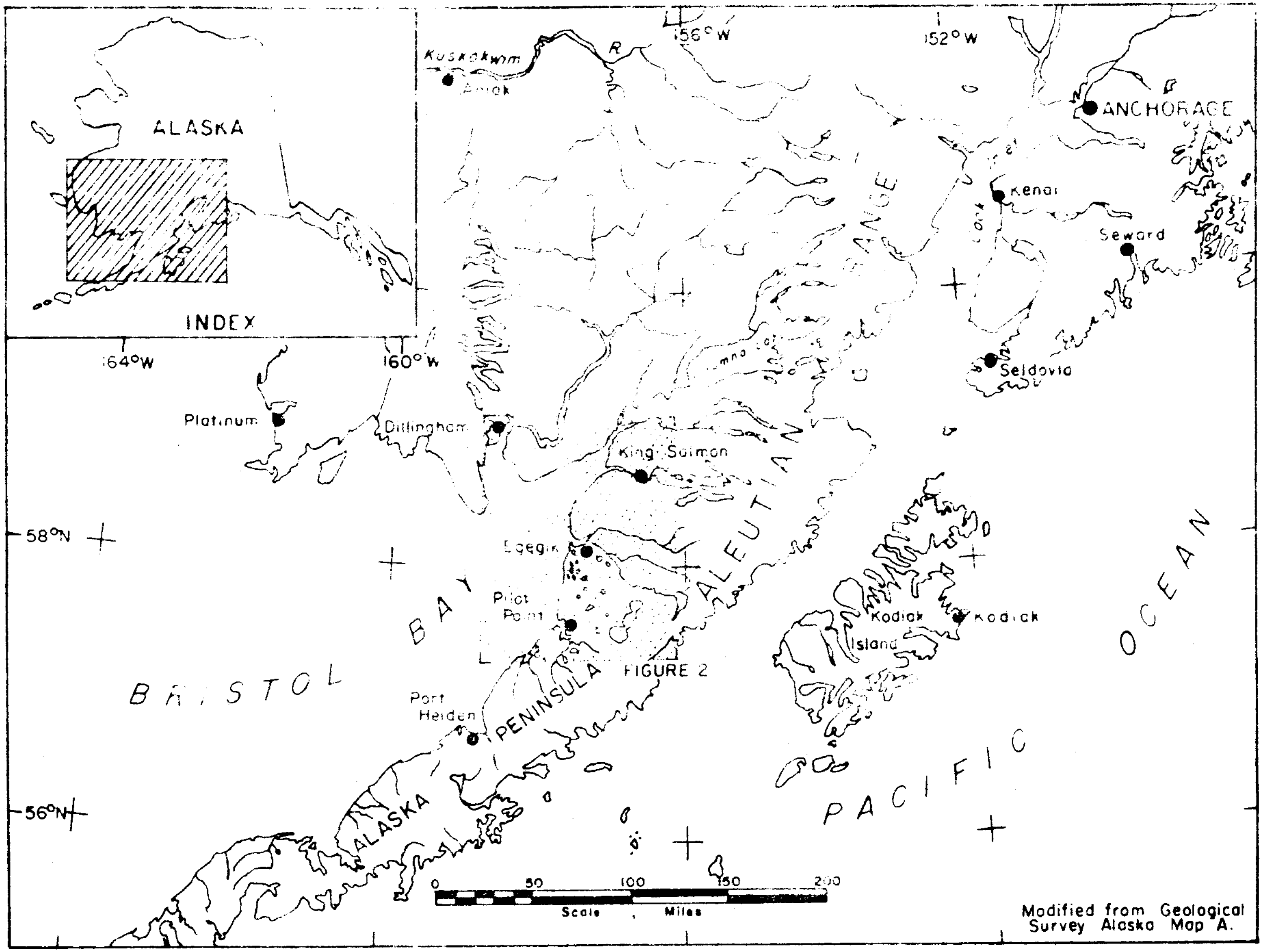

FIGURE 1.- Index map, Southwestern Alaska

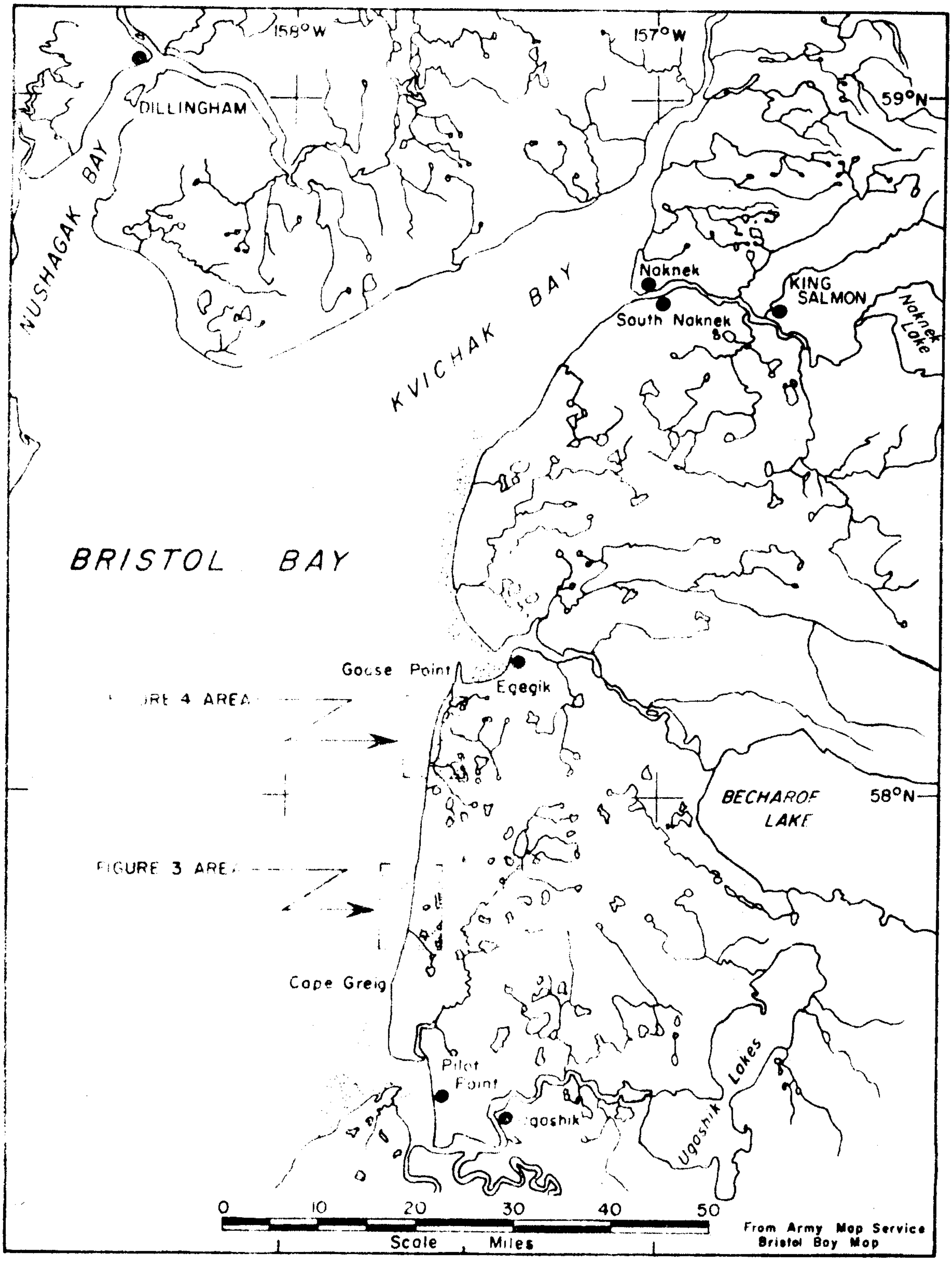

FIGURE 2 Location Map - Ugashik Beach Sands Area

was from a 3-inch black-sand layer. Two 60-pound bulk samples from this layer assayed .001 and .002 oz. gold per ton. Zircon, Ilmenite, and magnetite determined petrographically, averaged 0.75, 11, and 23 percent respectively. Hypersthene was the dominant black mineral. These samples represent only the black sands, not the beach material as a whole.

INTRODUCTION AND SUMMARY

Beach deposits reported to contain gold on the east shore of Bristol Bay (figs. 1 and 2) were investigated by the Bureau of Mines in late June and early July 1969, to determine whether gold is present in commercial quantities. A composite of a group of samples that were given to the University of Alaska by locators of placer claims between Egegik and Cape Greig assayed 0.19 oz. gold per ton (4)[2/]. Assays of another group of owner samples analyzed by the Bureau of Mines range in value from nil to .007 oz. gold per ton. Lacking details as to what these sample assemblages represented, the Bureau of Mines investigated 13 miles of beach taking 20 groups of shallow vertical sand cores from 1 to 4 feet in length via seamless steel tube. Strictly of reconnaissance nature, most samples were taken in profiles crossing the upper beach where black sands concentrate. Observations, description of work, background, and sample analyses given in appropriate report sections are summarized below.

Beach gold when mined has normally come from black sands and associated heavy mineral concentrations. Gold in Nome beach placer deposits was reportedly produced from black sands and garnet sands layers (8). Panning of Bristol Bay sands by the Bureau of Mines also defined black sands as the primary target. Extremely fine gold responding

2/ Underlined numbers in parentheses refer to items in the bibliography at the end of this report.

differently than black sands to factors controlling beach deposition may deposit elsewhere in such an environment. However, such gold would not be amenable to economic recovery by present mining technology and was not considered in this investigation.

Most black sands are concentrated near the top of the beach investigated, in lenses paralleling and just seaward of the berm. Though some lenses are several hundreds of feet long, tonnage is small for most are narrow, rarely blanket an acre and are seldom more than a few inches thick. One 14-inch thickness was measured. Buried layers of black sands cored had thicknesses similar to those at the surface and were generally thickest in the same part of the beach profile. The modern beach is forming over peat in much of the southern section (fig. 3). Here some beach deposits were cored to a peat base on both sides of the berm, but were too thick to be completely penetrated in the berm area. A sharp base indicator was not recognized elsewhere in this section or along the northern section (fig. 4) where the beach is backed by regressive sands in an abandoned beach ridge succession. Ground magnetometer work indicated that shallowly buried black sands deposits similar to, but thicker than those seen at the surface, probably do not exist.

Assays of 10 samples range from .001 to .007 oz. gold per ton, 79 samples a trace (.0001 to .0005 oz. gold per ton) and 36 nil (<.0001 oz. gold per ton), see Table 1. The 10 samples with the highest assays (Table 5) were taken near the top of the beach and probably are representative of the small quantities of more highly concentrated deposits found along this beach. Five are cores, assaying .001 oz. gold

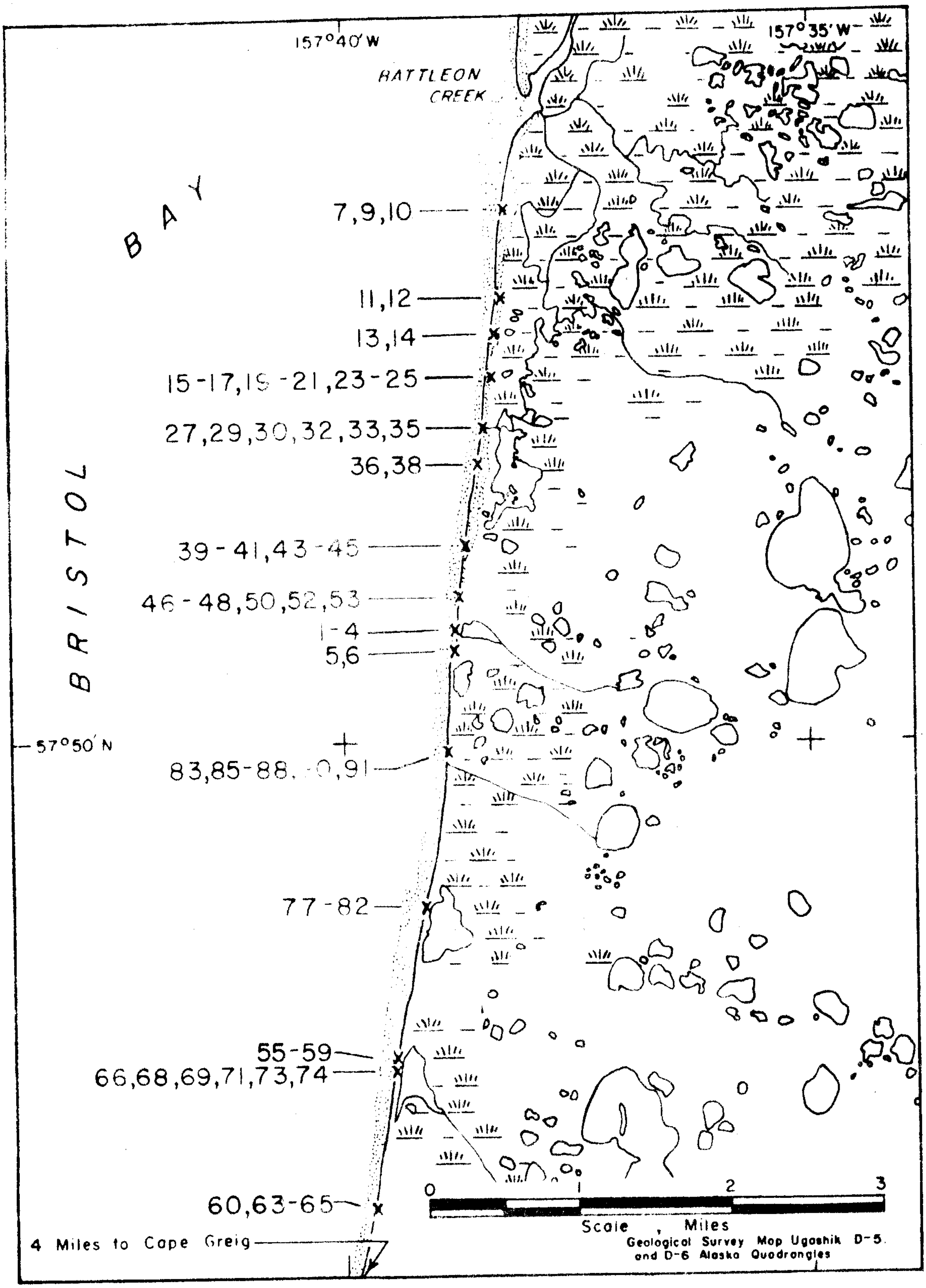

FIGURE 3.- South-Sample Location Map

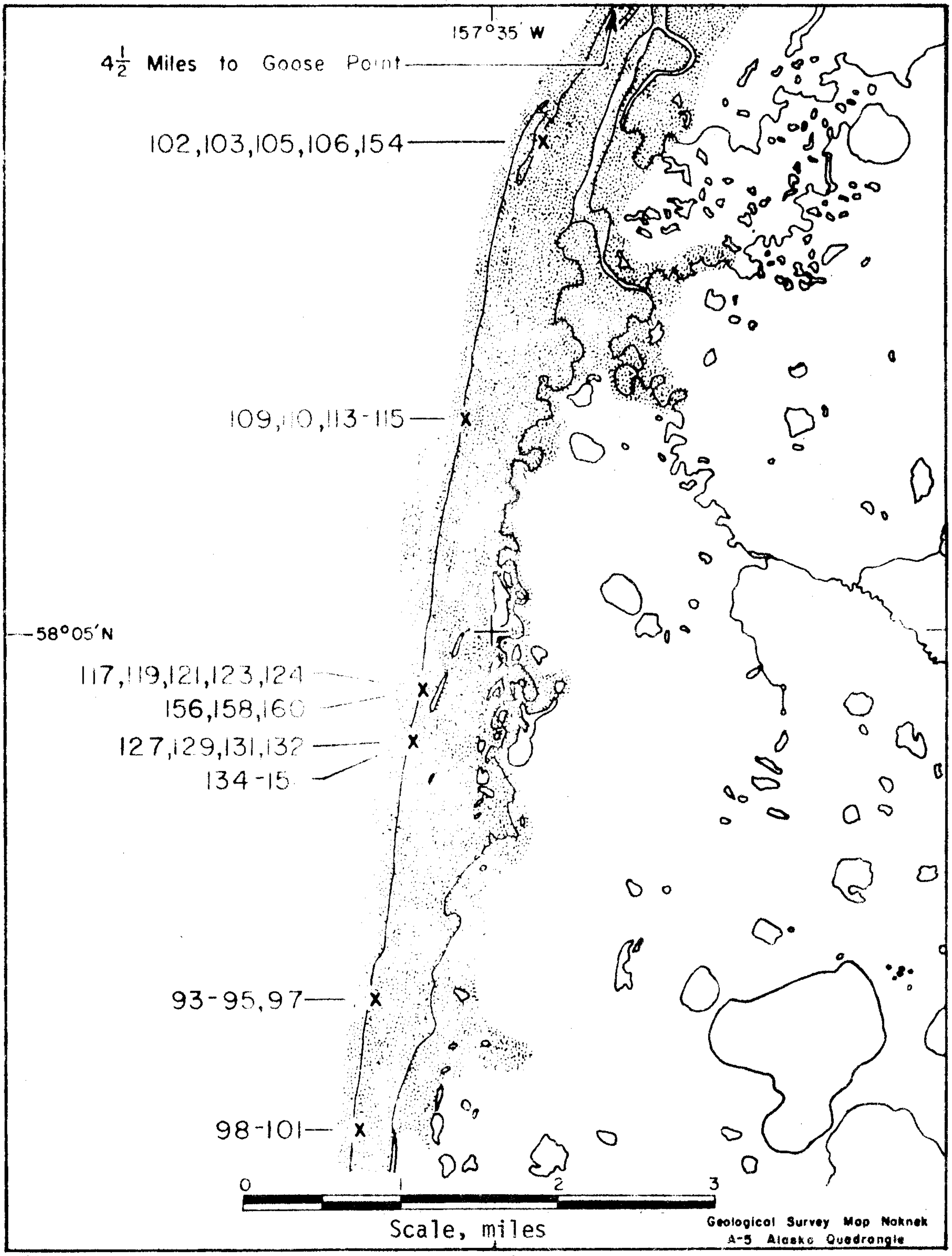

FIGURE 4.- North-Sample Location Map

per-ton each, of sections 17 to 26 inches thick containing moderate proportions of black sands. Two others are 60-pound bulk samples selected from 3 inches of particularly concentrated black sands 2 feet below the beach surface and assay .002 and .001 oz. gold per ton. A few colors were panned from this layer. The remaining three are grab samples from surface black sands and assay .002, .003, and .007 oz. gold per ton. The highest value was obtained from a 50 x 600 foot lens 1 to 6 inches thick from which cores gave much lower values. The 125 samples as a whole may not assess over all beach material, but probably tend to represent higher grade material and finer particle sizes. This is because profile sites were often selected where larger black sands concentrations were found, and because some reaches contained considerable material too large to core.

Nearly all gold value is in 20 x 35 mesh and minus 65 mesh particles, principally in the minus 65 mesh (Table 4).

Although garnet, ilmenite and magnetite are abundant in the two 60-pound bulk samples of concentrated black sands, hypersthene is the dominant accessory mineral. Moderate amounts of augite and epidote, and traces of hematite and zircon are also present. Average magnetite, ilmenite, and zircon content of the two samples is approximately 23, 11.5, and .75 percent (Table 6). Quartz, feldspar, and rock fragments composed of two or more minerals dominate the lower density fraction of these samples.

ACKNOWLEDGMENTS

Claim owners were very cooperative and furnished much valuable information and assistance throughout the investigations.

Information on the general geology was freely drawn from technical publications, including those of the U.S. Geological Survey in addition to the references cited; whereas, local details result from observations made by the Bureau of Mines during the 1969 reconnaissance.

LOCATION AND ACCESS

The beach investigated faces west on Bristol Bay from the base of the Alaska Peninsula, 200 miles west of Kodiak and 350 miles southwest of Anchorage. Lying between Egegik and Ugashik Bays, it consists of two sampled sections, 6 and 7 miles long respectively, separated by a 10-mile gap. The resulting 23-mile span is centered near 57°57' N. latitude and 157°37' W. longitude and extends from a position 10 miles southwest of Egegik (1960 population 150) southward to within 4 miles of Cape Greig. Pilot Point (1960 population 61) is 12 miles beyond in Ugashik Bay.

Most local travel is by air. King Salmon (1960 population 227), 50 miles northeast of the sample area, is the local hub of air transport. Small chartered fixed wing aircraft operating from King Salmon and South Naknek served the Bureau of Mines investigation. Landings can be made on most exposed sand or gravel beaches at low tide during good weather.

PHYSICAL FEATURES AND CLIMATE

The Ugashik-Egegik beach, nearly straight for 40 miles, in places a thousand feet wide at low tide, is the transient boundary between the Nushagak-Bristol Bay lowland and the shallow seas of Bristol Bay.

Thirty miles to the east, Becharof and Ugashik Lakes, glacially scoured and dammed during Pleistocene time, drain via the Egegik and Ugashik Rivers westward into Bristol Bay, respectively north and south of the sample area. Pleistocene morainal and outwash deposits mantling this area are partly overlain by silt, sand, and peat; and locally some littoral reworking of the drift is probable. Smaller drainages are poorly defined and streams sluggish; and the hundreds of lakes are probably glacial, except where related to stream meanders or where dammed by beach deposition in present or former strandline positions. Some lakes are deep and some very shallow, the latter clearly distinguishable from the air during wind roil. A triangulation point named "Dago" on the 405-foot high morainal hill 10 miles east of the seacoast is the maximum topographic elevation within 25 miles of the sampled section. This hill is almost certainly part of an arcuate recessional moraine paralleling the morainal dam at the western end of Becharof Lake.

Glacial deposits and salt marsh back the beach in the southern portions, but give way to parallel abandoned beach ridges farther north. Moss and low grass vegetate well-drained areas, but willows and tussock grass dominate where drainage is poor.

The climate of Bristol Bay is transitional between continental and maritime. Long term records have been kept at Naknek, 50 miles north of the sample area, and at Port Heiden, 100 miles southwest. Naknek records show an annual precipitation of 23 inches. The average January, July, and annual temperatures are 14.3°, 54.9°, and 34.5° F. respectively. Temperature extremes of -40° and +88° F. are reported. Port Heiden records show 20 percent less precipitation and less extreme temperatures, with a slightly higher annual average. Coastal ice often covers much of the sea north of Ugashik Bay between November and April or May. Average time of breakup on the Egegik and Ugashik Rivers is reported as late April.

HISTORY

Though early-day gold seekers doubtless prospected this beach as they did others, records do not show gold or other minerals as having been produced here. Claims were staked in 1967 and 1968 for heavy mineral content of the sands.

Brief discussions of heavy minerals in these sands resulting from former investigations are included in references (2) and (4) listed in the bibliography at the end of this report.

PROPERTY AND OWNERSHIP

All of the beach property visited was covered by placer claims whose owners were cooperative and sanctioned the Bureau work there. No effort was made to plot or trace out claim boundaries except to avoid trespass.

GEOLOGY

General Geology

Geologically, the main features near the investigated area are the sea, the coastal plain, and the transient boundary between them, the beach. The plain or Bristol Bay lowland is characterized by low hills, swampy depressions, sluggish streams, and numerous lakes. Most of the lowland is mantled with glacial drift, which reportedly floors much of Bristol Bay as well (5). The drift was probably transported during Pleistocene glaciation from the Aleutian Range whose crest is more than 50 miles east.

All deposits seen in the sample area are unconsolidated silts, sands, and gravels. They include the beach now forming, a succession of beach ridges now abandoned, varying amounts of silt and sand deposited by wind as blankets and small dunes, muddy silts of tidal estuaries and sluggish streams, and sand and gravel exposures in low sea-cliffs that appear to be stratified drift probably resulting from glacio-fluvial deposition on the outwash plain of receding Pleistocene glaciers. Some of the latter are possibly older beach deposits formed during a period of higher sea level. Some fairly level surfaces about 25 feet above sea level in the southern part of the area are possibly elevated marine terraces, though no abandoned beach ridges were seen there. Burk (3) notes that history of recent uplift isn't yet clear, but that elevated marine terraces were seen on the Pacific side of the Alaska Peninsula and are reported by earlier investigators in the Meshik Valley east of Port Heiden.

Thickness of drift underlying the lowland is uncertain; however, a log from an exploratory well drilled in 1966 by Great Basins Petroleum Co., a few miles southwest of Ugashik, indicates that sand and gravel extend to considerably more than 200 feet in depth. An earlier report by the U.S. Geological Survey (9) indicates that the lowland is underlain by several hundred feet of outwash and morainal deposits.

The beach gold evidently came from outwash and morainal deposits which were seen to contain a large proportion of mafic igneous rocks. Hawkes and Webb (6) give average gold content of mafic igneous rocks as 0.035 p.p.m. (slightly less than 4 cents/ton with gold worth $38.00/ ounce). More than 90 percent of the Bureau of Mines reconnaissance samples had lower values.

The Beach

Description

The south sample section (fig. 3) is characterized by new beach below low sea-cliffs of stratified drift, alternating with beach overtaking peat marsh. Minor advance and retreat may accompany the present landward migration of the shoreline indicated here. The newly forming beaches in this area essentially rest on drift or peat.

Counterclockwise shoreline adjustment is occurring in the north sample section (fig. 4). New beach construction obliquely truncating abandoned ridges in this section's southern part indicates shoreward advance of the sea. Farther north new beach deposits appear to be building seaward.

Low hills of drift dominate topography behind the beach in the southern sample area. Peat marsh fills the topographic depressions. Marsh becomes progressively more dominant northward and backs the abandoned beach ridge succession of the north sample section. Here, ridge crests 150-250 feet apart mark former prolonged seaward migration of the shoreline. The width of this series in some places is several thousand feet. Seas flood marshes behind the beach occasionally during storms or when maximum tides accompany strong and prolonged onshore winds.

Storm overwash terraces and deltas in some places extend 500 feet landward from the beach top, or berm crest, into the peat marsh. Peat is sporadically exposed in the swash zone between high and low tide. Some sample holes encountered peat on either side of the berm crest at predicted depth. The elevation of peat exposures in the swash zone ranges from marsh level, above normal high tide, to exposures more than 20 feet lower near lowest tide levels. Peat has formed in drift deposit depressions dammed by construction of the present beach and thins toward the edges of these depressions. Otherwise the thickness of peat was not determined except at one locality in the upper swash zone, where hand augering showed peat to be 12 feet thick or more.

Most sea cliffs, or beach scarps, are less than 20-feet high in areas visited. Much higher cliffs appear in the distance near Cape Greig. Geomorphic evidence indicates at least their upper parts are comprised of glacial deposits.

Beach Materials

Beach detritus ranged in size from silt through large boulders (21-inches across, maximum seen) and in composition through a wide variety of igneous rocks and some dark sediments. Intermediate to mafic fine-grained igneous rock appeared to dominate the larger material. The boulders are commonly displayed near the top of the beach as are black sands, where wave energy is greatest (7).

Fine materials of beach deposition are dominantly quartz and feldspar. Dark fines are dominantly hypersthene with lesser garnet, augite, amphibole, epidote, magnetite, and ilmenite. Magnetite, ilmenite, and zircon content is minor except where black sands are most highly concentrated. Such concentrations are sporadically distributed.

Wind as well as water is an important local classifying agent. Microridges of black sands between boulders commonly parallel strong offshore winds. Some layers of cobbles and pebbles are well classified as to size and are devoid of all fines. Low dunes top some berms and adjacent drift, and a thin mantle of wind blown sand and silt is widespread.

Beach Thickness

The thickness of the sampled beach was not measured except where the beach blankets peat, however, some inferences can be made. The beach when migrating landward is progressively being destroyed and rebuilt, and thickness should be similar whether measured from a base composed of ancient beach, glacial outwash, or peat. The beach building seaward and the genetically similar abandoned beach ridge succession, are much thicker. The sum of tide range, berm height above high tide, and depth below low tide to which detritus is disturbed by wave action is indicative of thickness, particularly where several parallel beach ridges have similar berm heights, and an extended period of relatively constant sea level is probable. Maximum tidal range is more than 20 feet, and berm height is several feet above high tide. The depth below low water to which materials are disturbed by waves is debatable, though several tens of feet is reasonable along open beaches (1).

Black Sands

Surface deposits of black sands are local and commonly form near the top of the beach in layers elongated parallel with the berm. Thicknesses range from veneer to more than a foot, although layers more than 6 inches thick are rare. Veneer is widespread in some sections. Buried layers of black sands in shovel pits and tube cores were no thicker than those at the surface and were thickest in the same part of the beach profile.

The two largest concentrations of black sands found were near the top of the beach, had black sand exposed at or near the surface, and were located where there is little or no obstruction to winds from land or sea. Both were 6 inches or more thick and covered areas of somewhat less than an acre.

Petrographic study of the black sands shows hypersthene is the dominant dark mineral, with garnet, epidote, augite, amphibole, magnetite, and ilmenite in lesser amounts. Minor zircon and sometimes traces of gold were found. Magnetite and ilmenite content of two samples of the most concentrated black sands that could be found, averaged 23 and 11 percent respectively. Zircon content of these two samples averaged 0.75 percent. The quantity of such concentrated black sands is small. Results of magnetite, ilmenite and zircon determinations made petrographically on eight samples, including the two above, are given in Table 6.

BUREAU OF MINES WORK

Sampling

A few samples were obtained from glacial outwash deposits exposed in beach scarps (wave cut cliffs) and from abandoned beach ridges; however, most came from zones of the beach now forming. These zones include the swash zone between high and low tide, the berm crest or highest part of the beach, and the backshore inland of the berm, with its east sloping terrace or delta deposits resulting from storm overwash in sections backed by salt marsh. The berm crest zone, where the best concentrations of black sands and nearly all pannable gold were found, received the most attention. Owner samples reportedly came from this zone.

All samples were of unconsolidated materials from the surface or shallow depths. Most were collected in a tube, driven vertically, and represent measured thicknesses. Channel samples of a few shovel pit walls and beach scarps, and grab samples of black sands comprise the remainder.

The tube sampler used is adapted from a commercial model designed to be mechanically pressed into soil for obtaining undisturbed core, and was modified by addition of a suitable anvil for hand-drive operation for maximum mobility by foot travel.

The sampler consists of a seamless steel tube with a 1/16-inch wall and a 3-inch outside diameter. The bottom is outside beveled to a cutting edge flush with the inside wall. A small anvil used during hammer drive was exchanged for an air-tight cork before pulling the tube with sample. Tubes of 2-, 3-, and 4 1/2-foot lengths were used.

Hole depths averaged 2 to 2 1/2 feet with a maximum of 4 feet. Difficulty experienced in driving and pulling the sampler increased rapidly with depth, so that the practical limit of hole depth was 3 1/2 or 4 feet under the best conditions. Most shallow holes were shallow because of detritus too large or too hard-packed for tube penetration. The latter condition usually prevailed at less than one foot below the wave-pounded surface of the lower active beach.

Little difficulty was experienced in retaining the samples while pulling the tube. Virtually all material entering the tube was retained through friction against the inside tube wall from hammer jar compaction. Many light hammer blows drove the tube more easily than fewer heavy ones. Pebble layers with too few interstitial fines for good compaction were usually lost, as were sands that were too dry. No difficulty was experienced in recovering samples from below the water table.

Though the apparent core settlement or compaction due to driving action could be measured from the open top of the tube while in place before pulling, some unknown portion of this undoubtedly occurred beneath the tube's lower end. So the core obtained was less, by some small undetermined amount, than that theoretically present in an undisturbed column of similar core diameter and hole depth.

Magnetometer Surveys

A few ground magnetometer profiles were run across known black sand concentrations and elsewhere. No anomalous data were obtained. A Sharpe A-3 magnetometer having a sensitivity of 25 gammas per-scale division in the gamma range encountered, was used.

Sample Preparation and Analysis

Laboratory preparation of beach sands samples for assay consisted of the following: Each sample was screened to four size fractions; +20; 20 x 35; 35 x 65; and minus 65 mesh. A pan concentrate was made from each fraction, with magnetic material returned to pan tails. The panning water of each sample was filtered. The filtration product, obtained by burning the filter paper, was added to the minus 65 mesh concentrate of that sample. Three to 10 grams of each concentrate were used in making atomic absorption determinations after digestion in aqua regia. Assays of the four fractions were weight combined to give the total sample assay.

TABLE 1. - Sample data and analyses

Sample number	Assay gold oz./ton	Figure number	Hole depth inches	Sample type	Sample location	Remarks
1 A[1]	Nil[2]	3	(48	Tube	Top of beach	
1 B	Nil	3	(	do.	do.	
2 A	Nil	3	(37	do.	100 ft. W	
2 B	Trace[3]	3	(	do.	do.	
3	Trace	3	12 1/2	do.	200 ft. W	
4	Trace	3	30	do.	300 ft. W	
5 A	Trace	3	(38	Tube	Scarp base	
5 B	0.001[4]	3	(	do.	do.	
6	Trace	3	48	Channel	Scarp face	Beach scarp,drift
7	Nil	3	18 1/4	Tube	Top of beach	
9	Nil	3	20 1/2	do.	25 ft. W	
10	Trace	3	--	Grab	45 ft. W	B[5]
11	Trace	3	--	Grab	45 ft. W	B
12	Nil	3	25	Tube	55 ft. W	B
13	Trace	3	16	Tube	Top of beach	
14	Trace	3	--	Grab	50 ft. W	B
15	Nil	3	44	Tube	380 ft. E	
16 A	Nil	3	(40	do.	190 ft. E	
16 B	Nil	3	(	do.	do.	
17 A	Trace	3	(36	do.	Top of beach	
17 B	Trace	3	(	do.	do.	
19	Nil	3	7	do.	100 ft. W.	B 3 core composite
20	Trace	3	32 1/2	do.	75 ft. W	B Same patch
21	0.007	3	--	Grab	do.	B do.
23	Trace	3	28	Tube	55 ft. W	B 6" concentrate over 6" clean pea gravel
24	Trace	3	34	do.	30 ft. W	B
25	Trace	3	--	Grab	do.	
27	Trace	3	25 1/2	Tube	200 ft. E	
29	Trace	3	30 1/2	do.	do.	
30	Nil	3	37 1/2	do.	Top of beach	
32	Trace	3	29 3/4	do.	55 ft. W	B
33	Nil	3	14	do.	100 ft. W	
35 A	0.001	3	(33 1/2	Tube	Top of beach	100's of sample 30
35 B	Trace	3	(	do	do	do.

Footnotes at end of table.

TABLE 1. - Sample data and analyses--continued

Sample number	Assay gold oz./ton	Figure number	Hole depth inches	Sample type	Sample location	Remarks
36	Trace	3	29	Tube	125 ft. E	
38	Trace	3	41 1/2	do.	Top of beach	
39	Trace	3	38 1/2	Tube	100 ft. E	
40	Trace	3	22	do.	Top of beach	
41	Trace	3	34	do.	do.	
43	Trace	3	7	do.	70 ft. W	3 core composite
44	Trace	3	18 1/2	do.	135 ft. W	
45	Trace	3	12	do.	315 ft. W	
46	Trace	3	24 3/4	do.	Scarp base	
47	Nil	3	60	Channel	Scarp face	Beach scarp, drift
48	Nil	3	29 3/4	Tube	30 ft. W	
50	Trace	3	18	do.	90 ft. W	
52	Trace	3	20	do.	215 ft. W	
53	Trace	3	25 1/2	do.	do.	
55	Trace	3	30	do.	60 ft. E	
56	Nil	3	28 1/2	do.	Top of beach	
57	Nil	3	29 3/4	do.	do.	
58	Trace	3	23 1/2	do.	do.	
59	Trace	3	27 3/4	do.	65 ft. W	
60	Trace	3	20	Tube	Scarp base	
63	Trace	3	27	do.	35 ft. W	
64	Trace	3	14	do.	145 ft. W	2 core composite
65	Trace	3	21 1/2	do.	do.	
66	Nil	3	27	Tube	Top of beach	
68	Nil	3	25	do.	30 ft. E	
69	Nil	3	25 3/4	do.	55 ft. E	
71	Trace	3	26	do.	30 ft. W	
73	Trace	3	10	do.	65 ft. W	2 core composite
74	Trace	3	28 1/2	do.	315 ft. W	
77	Trace	3	22	Tube	20 ft. W	B
78	Trace	3	18	do.	40 ft. W	
79	Trace	3	23 1/2	do.	Top of beach	
80	0.001	3	24 1/2	do.	30 ft. E	
81	0.002	3	--	Grab	100 ft. E	B Wind concentrated
82	Trace	3	--	do.	20 ft. W	B Good panning

TABLE 1. - Sample data and analyses--continued

Sample number	Assay gold oz./ton	Figure number	Hole depth inches	Sample type	Sample location	Remarks
83	Nil	3	27	Tube	Top of beach	
85	Trace	3	27 3/4	do.	do.	
86	Nil	3	29 1/2	do.	60 ft. E	
87	Nil	3	29 1/2	do.	do.	
88	Trace	3	17 1/2	do.	65 ft. W	
90	Nil	3	16 1/2	do.	do.	
91	Trace	3	22 3/4	do.	250 ft. W	
93	Nil	4	26 1/4	Tube	Top of beach	Truncated beach ridge
94	0.001	4	24 1/4	do.	20 ft. W	B 4" thick, 5' wide
95	0.003	4	--	Grab	do.	B do. do.
97	0.001	4	26	Tube	30 ft. W	
98	Trace	4	26 1/2	do.	Top of beach	
99	Trace	4	30	do.	20 ft. E	
100	Trace	4	25	do.	60 ft. E	
101	Trace	4	22	do.	35 ft. W	
102	Trace	4	23 3/4	do.	65 ft. E	B 12" thick ±
103[6/]	Trace	4	24 1/2	do.	Top of beach	B 14" thick ±
105	Trace	4	8 1/2	do.	40 ft. E	B 2 core composite
106	Trace	4	--	Grab	do.	B
109	Trace	4	27 1/2	Tube	Top of beach	
110	Trace	4	29 1/2	do.	20 ft. E	
113	Trace	4	28 1/2	do.	20 ft. W	
114	Trace	4	27 3/4	do.	65 ft. W	B thin
115	Trace	4	12 1/2	do.	135 ft. W	B 1/2" wind blown
117	Trace	4	20 1/4	Tube	40 ft. W	
119	Trace	4	24	do.	30 ft. W	
121	Nil	4	13 1/4	do.	65 ft. W	
123	Nil	4	37	do.	Top of beach	
124	Trace	4	35	do.	35 ft. E	
127	Trace	4	14	Tube	110 ft. W	
129	Trace	4	17	do.	40 ft. W	
131	Nil	4	24	do.	20 ft. W	
132	Trace	4	40 3/4	do.	Top of beach	
134	Nil	4	12	do.	200 ft. W	
135	Trace	4	18	Channel	280 ft. W	Shovel pit
136	Nil	4	24	do.	340 ft. W	do.
137	Trace	4	22	do.	400 ft. W	do.
138	Trace	4	5	do.	500 ft. W	do.
139	Trace	4	34 1/2	Tube	870 ft. E	Old beach ridge

Footnotes at end of table.

TABLE 1. - Sample data and analyses--continued

Sample number	Assay gold oz./ton	Figure number	Hole depth inches	Sample type	Sample location	Remarks
140	Nil	4	35	Tube	890 ft. E	
141	Nil	4	35 1/4	do.	965 ft. E	
142	Nil	4	32	do.	850 ft. E	
143	Nil	4	35	do.	800 ft. E	
144	Trace	4	37	do.	730 ft. E	
145	Trace	4	35	do.	625 ft. E	
146	Nil	4	35	do.	540 ft. E	
147	Nil	4	36 3/4	do.	465 ft. E	
148	Trace	4	35	do.	390 ft. E	
149	Trace	4	20	do.	300 ft. E	
150	Trace	4	37	do.	190 ft. E	
151	Trace	4	33 1/2	do.	100 ft. E	
152	Nil	4	39	do.	40 ft. E	
154 7/	Trace	4	53	Auger	Top of beach	B composite grab 24 1/2" to 53"
156	0.002	4	--	Bulk	20 ft. W	B
158	0.001	4	--	do.	do.	B
160 8/	Trace	4	30	Channel	do.	B Large pit-channel

1/ A= top half (approximate).
B= bottom half (approximate).
2/ Nil= < 0.0001 oz./ton.
3/ Trace= 0.0001 to 0.0005 oz./ton.
4/ See Table 5 for screen size distribution data for samples assaying more than a trace of gold.
5/ B= Black sands at, or almost at, surface.
6/ See sample 154 and Table 2.
7/ See Table 2 for hole log.
8/ See Table 3 for sample log.

TABLE 2. - Log of Samples 103[1/] and 154[2/]

Sample number	Depth from surface (inches)	Remarks
103 (tube)	0-14	Dominantly black sand layers, minor brown sands.
	14-24 1/2	Brown sand, very minor black sand.
154 (auger)	24 1/2-36	Brown sand, very minor black sand.
	36-39	Black sand.
	39-53	Brown sand and pebbles, very minor black sand.
	53	Auger stopped by large cobbles.

1/ Sample 103 - tube sample.
2/ Sample 154 - composite of a grab from each auger head lode.

TABLE 3. - Log of sample 160[1/]

Depth from surface (inches)	Remarks
0-2	Brown sand, dry.
2-4	Concentrated black sand.
4-14	Brown sand.
14-15	Black sand.
15-19	Brown sand.
19-27	Banded black sand.
27-30	Brown sand.
30	Top pebble layer.

1/ Sample 160 - 60 lb. vertical channel from shovel pit wall.

TABLE 4. - Percent Value-Screen Size Distribution By Sample Group

(Percent[1] of total gold value in each group)

Sample group	Screen size			
	+20	20 x 35	35 x 65	-65[2]
Samples assaying .001 or more (.001 to .007) oz. gold per ton (10 samples)	0	42	5	53
Samples assaying trace or more (.0001 to .007) oz. gold per ton (89 samples)	1	33	5	61

1/ Approximate.
2/ Each fraction was laboratory panned with panning water decanted through filter paper the burned residue of which was added to the -65 mesh fraction before assay.

TABLE 5. - Gold and sample weight-screen size data

Sample number 1/	Screen Size +20 gold mg	+20 sample g	20 x 35 gold mg	20 x 35 sample g	35 x 65 gold mg	35 x 65 sample g	-65 2/ gold mg	-65 2/ sample g	Total Sample gold mg	Total Sample sample g	Total Sample gold oz./ton	Remarks
5 B	Nil	460.5	Tr.	510	.085	1,363	.001	359.5	.086	2,639	.001	Tube sample.
21	Tr.	5.0	1.175	25.2	Tr.	4,309	.15	935.5	1.325	5,275	.007	Surface, black sands, grab sample.
35 A	Nil	79	Nil	519	Nil	2,215	.10	467	.10	3,280	.001	Tube sample.
80	Tr.	269.2	Nil	1,613	Nil	1,855	.126	318.8	.126	4,056	.001	Tube sample.
81	Nil	241	Nil	1,265	Tr.	2,000	.205	397	.205	3,903	.002	Surface, black sands, wind concentrated.
94	Nil	6	Nil	1,652	Nil	2,610	.169	661	.169	4,929	.001	4" thick black sands layer, tube sample.
95	Nil	1.1	.005	97.6	.052	2,800	.346	551	.403	3,450	.003	4" thick black sands layer, surface grab.
97	Tr.	548	.001	1,178	Tr.	2,640	.103	350	.104	4,716	.001	Tube sample.
156	Nil	45.9	Nil	655.0	Tr.	3,154	.228	516.5	.228	4,371	.002	Bulk, black sands.
158	Tr.	39.4	.001	484.8	Tr.	3,382	.090	478.3	.091	4,384	.001	Bulk, black sands.

1/ Samples assaying more than trace amounts of gold.

2/ Each fraction was laboratory panned with panning water decanted through filter paper the ignition residue of which was added to the -65 mesh before assay.

TABLE 6. - Magnetite, Ilmenite, and Zircon Determinations

Sample Number	Assay Gold oz./ton	Minerals - percent			Hole Depth Inches	Fig. No.	Sample Location	Remarks
		Magnetite	Ilmenite	Zircon				
20	Trace	2.	0.15	0.02	32 1/2	3	75 ft. W	Black sands: 1 1/2 in. layer at surface, minor subsurface.
48	Nil	0.8	.04	.02	29 3/4	3	30 ft. W	Brown sands.
103	Trace	14.	3.	.08	24 1/2	4	Top of beach	Log in table 2.
132	Trace	2.	.4	<.01	40 3/4	4	Top of beach	Brown sands.
138	Trace	.02	.02	Trace	5	4	500 ft. W	Hard-packed sand and cobbles at low tide.
156	.002	24.4	13.	.8	Bulk	4	20 ft. W	(Black sands of maximum
158	.001	21.5	10.	.7	Bulk	4	20 ft. W	(concentration seen. 3" (layer.
160	Trace	9.4	5.	.4	30	4	20 ft. W	Log in table 3.

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