

PROFILES SHOWING CONFIGURATION AND PROBABLE BOTTOM DEPOSITS AS INTERPRETED FROM FATHOMETER TRAVERSES ACROSS AND ALONG PARTS OF GASTINEAU CHANNEL, NEAR JUNEAU, ALASKA

by  
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The accompanying profiles were prepared and interpreted from fathometer records as part of a study being conducted by the Engineering Geology Branch of the U.S. Geological Survey of the sequence, distribution, and physical properties of geologic deposits that occur in the Juneau-Douglas urban area. Interpretations of the profiles resulting in evaluation of the nature of bottom deposits and speculation about the origin of slope features are preliminary, and may be modified as more information is obtained. Because of the construction activity in the Juneau-Douglas area, however, the release of these preliminary interpretations seems to be desirable, especially in light of what may be numerous sub-aqueous slides, slumps, and flows, as inferred in some of the profiles.

Assistance by individuals of the Water Resources Division, U.S. Geological Survey in Juneau under Vernon K. Derwick, Subdistrict Chief, is gratefully appreciated. They provided an 18-foot outboard cruiser and a portable graphic recording fathometer obtained from Anchorage. James McConaghy installed and operated the fathometer. Clark H. Benson and H. L. (Skip) White established transit stations which provided control for the placement of the traverses on the topographic base location map. Tidal heights, which were used to correct fathometer depths to Mean Lower Low Water, were obtained from a recording tide gauge at Juneau and furnished by William R. Rice, U.S. Weather Bureau, Environmental Science Services Administration, Department of Commerce, Juneau, Alaska.

The techniques used to obtain the fathometer records and to prepare the profiles are described in some detail so that the reader can evaluate the information shown. The fathometer traverses were not under rigorous spatial control, but the accuracy of the position of the gross details of the submarine topography is within 50 feet. The fathometer was placed in the cabin of the boat, and the transducer was firmly suspended over the free board along side of the boat so that it was submerged about 6 inches. The record obtained on the fathometer was checked for accuracy by comparing the depth shown on the fathometer chart against the depth at the same point as measured by a weighted cord lowered to the bottom.

After it was demonstrated that the fathometer was working properly, traverse lines were established between shore points marked by easily seen features such as navigation aids, beachhouses, and large prominent buildings on beaches. Transit stations were established at viewing angles as nearly perpendicular to each traverse as possible. The total transit angle between the ends of each traverse was separated into smaller increments of nearly equal amounts where possible; these increments were to be used to establish intersection points for the boat along the traverse line. The speed of the boat was held as nearly constant as possible, and the boat was held on course by steering toward the prominent landmark at the end of the traverse. The transit was positioned at a predetermined increment angle in front of the advancing boat. The moment that the boat intersected the crosshair in the transit, the persons on the boat

were notified by citizen-band transceivers, and a mark was placed on the continuously recording fathometer record. The transit was then turned to the next predetermined angle, and the procedure was repeated. These positions of control, or intersect points, are shown on the location map and profiles by the letters A, B, C, etc.

The position of the traverse was transferred from aerial photographs marked in the field to the location map by means of proportional dividers, and the length of the traverse and intersect point locations were plotted from the transit angles. Intersect positions along the traverse controlled the transfer of data from the fathometer record to the profiles. It was assumed that features appearing on the chart were accurately located with respect to the intersect positions, and these features were transferred to the profiles by relocating their positions relative to the adjacent intersect points. Slopes subsequently drawn through several of these points result in an uninterrupted slope having a smooth gradient, and suggest that such an assumption is valid.

Interpretations regarding the character of the bottom materials are based primarily on the width, density, and sharpness of the pattern recorded by the fathometer. In general, hard, firm, or dense materials will produce a relatively thin, sharp, and dense record, whereas soft or loose materials provide a light broad record having relatively indistinct boundaries. Bottom sampling equipment was not available, consequently the only supplemental information used in the construction of the profiles was the knowledge of the distribution of deposits along the shores of Gastineau Channel gained during field investigations made as part of the overall engineering geology study of the Juneau-Douglas area. Sandy clayey silt constitutes the tidal silts near shore along Gastineau Channel. A compact stony sandy silt, a glacio-marine deposit that closely resembles till, was probably deposited under sea water during glacial times, and now extends along the shores of Gastineau Channel on Douglas Island as well as on the mainland. These deposits are inferred to be recorded in the graphs obtained from the fathometer traverses. Nearer the center of the channel the bottom deposits are probably mud composed principally of silt-sized particles, as inferred from the soft reflection pattern recorded by the fathometer.

The meaning of much of the submarine topography is speculative. All profiles but one (5-5') have features interpreted as subaqueous slides, slumps, or flows. The configuration of the irregular and hummocky relief on the north-west side of the channel is believed to indicate gravity slides. This interpretation is supported by the knowledge that the underlying materials are either detritic silt, sand, and gravel, or the coarse heterogeneous rubble from the Alaska-Juneau mill dumped onto the side of the channel in a pile that probably had oversteepened slopes. Profile 1-1' shows that the upper part of the slope of the Snowslide Creek delta has a concave surface which grades downward into a series of hummocks and ridges not typical of stable slopes. I interpret this concave surface as being the

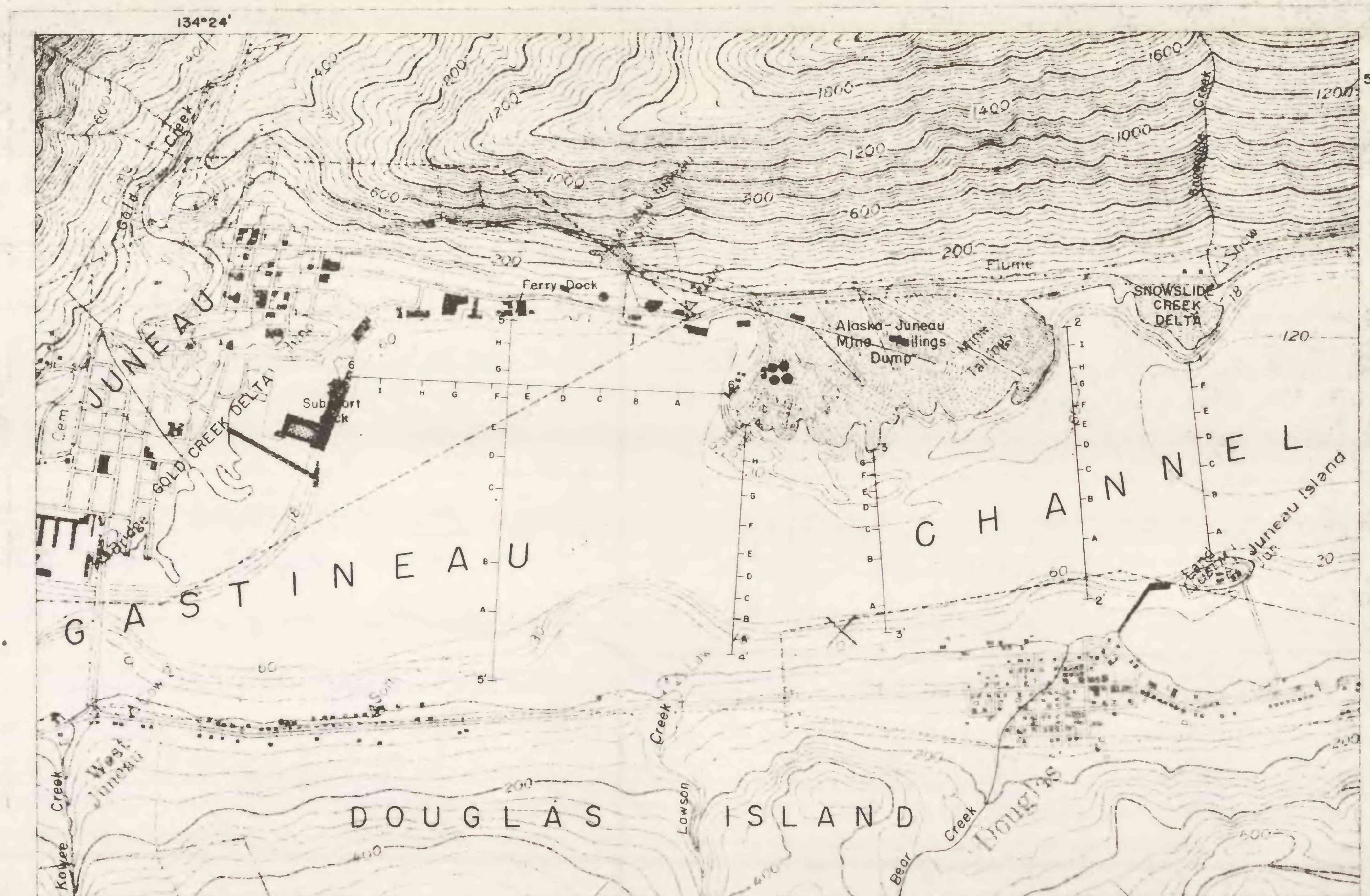
result of a portion of the delta having slumped from the deltaic face. It can be further speculated that the uneven terrain extending toward the center of the channel may represent slide debris. Surface configurations of other deltaic slopes, such as those at the southwest ends of profiles 2-2' and 4-4', do not indicate the presence of subaqueous slides. The number of deltas investigated is too small to permit conclusions as to why only Snowslide Creek delta has had apparent slide activity.

Offshore configurations of the Alaska-Juneau mine tailings dump, shown in profiles 2-2', 3-3', 4-4', and 6-6' are consistently erratic in shape. Although these irregularities might have been caused by mine tailings dumped from barges years ago, they are interpreted here as being the result of slides down the steep slopes of the tailings dump. The large mass of the mine tailings dump is composed of particles that range from sand-size through angular blocks as large as 8 inches. The subarctic surface of the tailings dump seems to be stable, as evidenced by the undisturbed radio tower and the fuel storage tanks, but if the speculations are correct, the slopes of the dump are less stable. The mounds shown near B, profile 4-4', and beneath B, profile 5-3', could therefore represent segments of mine tailings that moved from the slope of the dump.

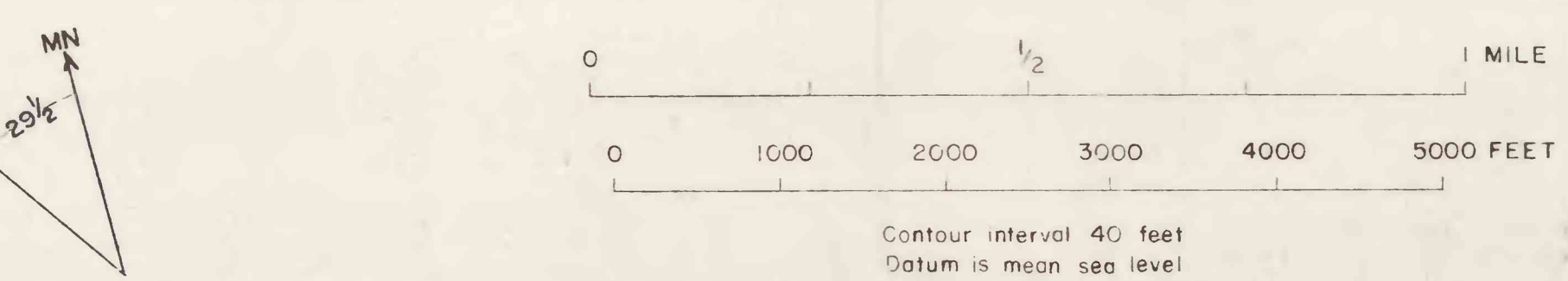
In addition, the accumulated weight of the mine dump must have compressed the bottom deposits, especially if they are near-shore, hummocky silty muds, and probably caused lateral displacement adjacent to the dump. Consequently, some of the lower mounds near the center of the channel on the profiles extending to the Alaska-Juneau tailings dump might be composed of ridges of displaced muds. Without bottom samples, the material composing these features and their origin are speculative.

Still another speculative feature is the sharply defined serrated surface of the bottom of the narrow channel, profile 5-3', between intersect positions A and C. The fathometer record shows an indistinct broad reflection, considered to be indicative of a soft bottom, but the serrated appearance of the floor suggests a more consolidated or firm material. One explanation of this apparent inconsistency might be that scouring action by currents during tidal ebb, which are common in this part of the channel during tidal fluctuations, conceivably eroded the bottom deposits in a selective manner, leaving the bottom with a series of ridges and grooves. Another explanation for these same features may be that this terrain represents partially eroded bottom deposits that were laterally displaced by the weight of the mine tailings dump.

In summary, the interpretations of the fathometer records and the speculations about their meanings must be regarded at best as educated guesses. It is hoped, however, that these speculations will attract the attention of interests planning to develop terrain adjacent to the areas of inferred subaqueous slides, such as Snowslide Creek delta and the Alaska-Juneau mine tailings dump, and may result in more intensive examinations by persons having specific sites in mind.



Part of Juneau and vicinity, U.S. Geological Survey topographic map, 1950. Coastal data and control by U.S. Coast and Geodetic Survey



LOCATION MAP SHOWING LINES OF TRAVERSE AND POINTS OF TRANSIT INTERSECTS, (A-I) USED FOR CONTROL AND POSITIONING OF BOAT ON LINE OF TRAVERSE