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**GEOPHYSICAL SETTING**

## THE GEOPHYSICAL SETTING

The City and Borough of Juneau, Alaska is situated in the circum-Pacific Seismic Belt called the "Ring of Fire", on the border between the Boundary Range and the Alexander Archipelago Physiographic Divisions of Southeastern Alaska. To the east, the Boundary Ranges are characterized by deep, steep-walled, U-shaped valleys, many of which are filled with water, forming fjords. The mountains are massive, giving an impression of great bulk, and are bordered largely by cliffs that plunge several thousand feet to tidewater. Geologically, the Boundary Ranges are underlain by the massive granitic Coast Range batholith and a thick sequence of highly metamorphosed, youthfully weathered, sedimentary rock - mostly schist, phyllite and graywacke. To the west, across the Gastineau Channel, lies the Coastal Foothills Division. This division is characterized by blocks of high mountains and generally flat-floored valleys. It is underlain by mostly the same highly metamorphosed, youthfully weathered sedimentary rock, resulting from intrusion of the Coast Range batholith. The active Fairweather-Queen Charlotte Islands Fault lies near enough to affect the Juneau area.

Since the Pleistocene glaciers which covered the Juneau region began to recede, the earth's crust, which was depressed under the great weight of ice, has been rebounding - rising upward. Both the depressing process and the on-going rebounding have created a complex system of small regular cracks in the rock material. The existence of these joints plays an important role in the geomorphic development of the Juneau region.

Climate also plays an important role. Juneau's climate is governed by both cold polar air masses and warm, moist maritime air masses. These combine with orographic phenomenon to produce a high average annual precipitation that is distributed fairly evenly throughout the year. Deep snow accumulations build at higher elevations, and high run-off from lower elevations is normal. During the winter months many freeze-thaw cycles occur. The complex system of joints in the bedrock permits ample infiltration of moisture which, during the frequent freeze-thaw cycles, wedges blocks and plates of bedrock material apart. These accumulate on the slopes as debris.

The short period since the beginning of the soil forming processes, the dominance of mechanical weathering and the steepness of the slopes has resulted in the formation of only a thin mantle of coarse-grained soil. On the predominantly steep slopes, this soil is rapidly removed by landsliding and soil creep, thus retarding or precluding the natural development of soil-holding vegetation. The accumulated debris and lack of supporting vegetation are then affected by gravity and precipitation causing active mass wasting.

A similar combination of climate, geology and soil factors create a wintertime condition which directly affects the Juneau area. Precipitation in the form of snow accumulates on the steep slopes of the mountains behind the city. The poor soils inhibit the growth of vegetation, frost wedging of ice in bedrock joints contributes an unstable surface and rapidly changing extremes of temperature decrease the little on-slope storage capacity for snow accumulation. Frequent snow avalanches, ranging from very small and inconspicuous to large and destructive, are normal.

Seismic events, mass wasting and snow avalanches, all dynamic earth-shaping forces, expose portions of the urban and urbanizing areas of the City-Borough to extreme geophysical hazards.