Harding-Lawson Associates Maps
Geotechnical Hazards Assessment Study
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Seismically Induced Ground Failure Maps of Anchorage

Background for the User:

The map shows the relative potential for ground failure across the Municipality of Anchorage caused during or as the result of an earthquake, such as land sliding, land spreading, surface cracking, and liquefaction. The relative potential for such earthquake-induced ground failure is rated on a scale of one (lowest susceptibility) to five (very high susceptibility). These criteria were developed by consideration of observed and expected seismic response for the various combinations of soil, geologic, and topographic conditions existing across the Municipality. In general, the susceptibility for earthquake-induced ground failure is least in areas of exposed bedrock; moderate in areas underlain by dense, coarse-grained, unconsolidated sediments (such as glacial till); and greatest in areas which are underlain by saturated, fine-grained, unconsolidated deposits.

The boundaries of these five ground failure zones as drawn on the original maps (circa 1979, https://www.muni.org/Departments/OCPD/Planning/Publications/Pages/GeotechHazStudy.aspx) were based heavily on the types, magnitude, and extent of ground failure that actually occurred in Anchorage during the 1964 Great Alaska Earthquake but also considered the geologic mapping available at that time, and interpretation of historic, pre-1964 ground failures interpreted from aerial photographs and/or reported in literature. It is important to understand that the authors of this original map did not perform any new field explorations or numeric analysis. Further, the 1979 report which accompanied the original maps clearly points out the major data gaps which existed at that time, as well as the need for future updates to the maps with new information as available.

The map reflects the relative potential for earthquake-induced ground failure qualitatively; e.g. the potential for and/or magnitude of ground failure in Zone 1 is very low versus Zone 5 where the potential for and/or magnitude of ground failure is very high. Further, it is important to understand that there is no absolute type or quantitative magnitude (e.g. specific dimension of movement) of ground failure associated with any single hazard zone; although Zone 5 generally delineates the areas that experienced significant and destructive translational ground failures during the 1964 and pre-1964 earthquakes, and Zone 4 generally delineates the lateral extent of notable ground spreading observed behind Zone 5.

These maps were and still are intended for general land use and development planning—the map is not a substitute for engineering. The map is also referenced in Chapter 18 of the local amendments to the building code. As stated in the 1979 report, the map should be updated as new information becomes available and that property owners and developers should have the opportunity to demonstrate, through on-site investigations, whether or not the level of risk described on the map actually exists on individual sites.

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For reference, the definitions of the zones as provided on the original maps are listed below:

Zone 1: LOWEST GROUND FAILURE SUSCEPTIBILITY. Includes exposed bedrock, thin alluvium and colluvium over bedrock, generally coarse and fine-grained glacial deposits overlying bedrock in upland areas. May experience minor ground cracking and acceleration of normal mass wasting processes in unconsolidated material such as rock falls and snow avalanches.

Zone 2: MODERATELY LOW GROUND FAILURE SUSCEPTIBILITY. Mixed coarse and fine-grained glacial deposits in lowland areas, thick deposits of channel, terrace, flood plain, and fan alluvium. The thickness of alluvium in the upland areas is variable, and some areas are rated as 1. May have very low susceptibility; may experience minor ground cracking, localized settlement due to consolidation, and perhaps liquefaction or lurching of localized saturated zones of fine-grained material.

Zone 3: MODERATE GROUND FAILURE SUSCEPTIBILITY. Fine-grained surficial and subsurface deposits, including the Bootlegger Cove Clay, and other silt, clay, and peat deposits. Where coarser material (alluvium of fill) overlies these deposits, the seismic-related ground failure susceptibility is controlled by the fine-grained material. May experience ground cracking and horizontal ground movement due to landspreading or lurching, and subsidence due to consolidation.

Zone 4: HIGH GROUND FAILURE SUSCEPTIBILITY. Fine-grained, surficial and subsurface deposits within the vicinity of steep slopes. Includes areas above and below the slope, the width of which is approximately 10 times the slope height in the slide area. Highly susceptible to all types of seismically-induced ground failure, including liquefaction, translational sliding, lurching, landspreading, cracking and subsidence.

Zone 5: VERY HIGH GROUND FAILURE SUSCEPTIBILITY. Areas of previous seismically-induced landslides. Includes the zone of tension cracks above the headward scarp, and the toe bulge or pressure ridge areas. Although portions of these previous slides may remain relatively undisturbed from strong shaking, these slides will be the more likely site of future seismically-induced sliding.