SOIL HAZARD MAP OF GREATER VICTORIA FOR ASSESSING THE EARTHQUAKE HAZARD DUE TO LATERAL GROUND SHAKING

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Southwest British Columbia is located in the most seismically active region of Canada. However, the strength of ground shaking during an earthquake varies considerably due to local geological conditions, and is generally greater at sites located on deposits of soft soil than at sites located on bedrock. For example, during the 1989 Loma Prieta Earthquake, ground shaking in San Francisco was commonly two to three times stronger on soft soil sites than on bedrock sites nearby.

The objective this map is to delineate the different soil types in Greater Victoria for use in determining the earthquake hazard due to lateral ground shaking. **The map is intended to be used for planning purposes, such as land use planning, emergency response planning, and prioritization of seismic retrofit candidates. It is not intended to replace site-specific investigations where these are normally required. Furthermore, other earthquake hazards, such as liquefaction, landslides and tsunamis have not been considered in the preparation of this map.** ***Appropriate use of this map requires careful reading and understanding of the accompanying report and the following text.***

For more details on the preparation of this map, including references and acknowledgments, the reader is referred to the accompanying report.

Geological Mapping

This map is based mainly on the Relative Amplification of Ground Motion Hazard Map of Greater Victoria published by the British Columbia Geological Survey (http://www.em.gov.bc.ca/Mining/Geolsurv/Surficial/hazards/default.htm). Locally, some minor changes have been made to the geological boundaries on the basis of more recent investigations by the author.

Definition of Soil Types

The soil types are defined here primarily by assigning NEHRP site classes to the various geological map units shown on the source map. These site classes, which are being incorporated into the current national building code, are defined fundamentally on the basis of the average shear-wave velocity in the upper 30 metres (V_{30}). However, other criteria can be used where shear-wave velocity data are lacking (Table 1). In general, the intensity of ground shaking increases from site class A to E.

Table 1. NEHRP Site Classes

Site Class	General Description	Definition (V_{s30}=average shear-wave velocity in upper 30 m, m/sec; N_{30}=average N in the upper 30 m)
A	Hard rock	V_{s30}>1500
B	Rock	760<V_{s30}<1500
C	Very dense soil and soft rock	360<V_{s30}<760; or N_{30} >50; or >3 m of soil over bedrock, where V_{s30}>760 m/sec
D	Stiff soils	180<V_{s30}<360; 15<N_{30}<50
E	Soft soils, or soil profile with >3 m soft silt and clay	V_{s30}< 180; or N_{30}<15; or >3 m silt and clay with plasticity index >20, moisture content >40%, and undrained shear strength <25 kPa)

Site classes were assigned to the geological map units on the basis of a shear-wave velocity model of the Quaternary deposits of the Victoria area that was initially developed for the original earthquake hazard mapping project and was updated with more recent shear-wave velocity data. This model permits the estimation of the V_{s30} at sites where shear-wave data are not available, but where the stratigraphy is known.

Limitations of this map

This map is intended for regional planning purposes only, such as prioritizing seismic retrofits and land use and emergency response planning, and should not replace site-specific evaluations where normally required.

The map on which this map is based was based on the interpretation of borehole records, which are unevenly distributed throughout the area. In areas where borehole data are scarce, subsurface conditions had to be *inferred* from topographic and geomorphic evidence. Furthermore geological boundaries are generally gradational and geological materials are variable, so that deposits of a particular deposit may locally have unusual properties. For these reasons, geological boundaries are *approximate*, areas assigned to one site class may enclose smaller occurrences of other site classes, and the mapping is subject to revision as more borehole data become available. **Consequently, the hazard *at a specific site* could be either higher or lower than that indicated by these maps.**

This map does not address man-made alterations to ground conditions, whether the changes lower or increase the hazard at a site. Furthermore, the map does not consider the effect of fill on the shear-wave velocity profile, except in those areas where fill is identified on the source map. However, other areas of fill occur present, and new areas of fill will be developed in the future.

The stability of dams under earthquake shaking, and hazards due to the failures of dams or other man-made structures have not been addressed.

This map shows the distribution of soil classes, which largely reflect the variation in the ground-shaking hazard in an earthquake. However, a low hazard indicated on the map does not mean freedom from earthquake hazards, because all areas could be subjected to significant ground shaking during an earthquake. Furthermore, the map does not address the variation in the ground-shaking hazard due to topography, or due to resonance or subsurface structure.

The map does not address other earthquake hazards, such as liquefaction, landslides, tsunamis, land subsidence and ground rupture.

Site Class

- AB
- C
- D
- DE
- E

0 0.25 0.5 1 1.5 2
Kilometres

Map layout prepared by:
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