

## **B. Landslide/Tectonic Subsidence**

### **1. Landslide:**

Landslides, historically, have been one of the most damaging geologic processes occurring in Weber County. Most active landslides, and most older slides, have been mapped and are shown on the Sensitive Lands Overlay District maps. These designations serve as an indication of unstable ground. The maps designate areas of landslides and slopes which are potentially unstable under static (non-earthquake) conditions, and are especially vulnerable under conditions of high to abnormally high precipitation. Landslides can damage structures, roads, railroads and power lines. Furthermore, landslides may rupture canals, aqueducts, sewers and water mains, all of which can add water to the slide plane and promote further movement. Flooding may also be caused.

Many methods have been developed for reducing landslide hazards. Proper planning and avoidance is the least expensive measure, if landslide-prone areas are identified early in the planning and development process. Care in site grading with proper compaction of fills and engineering of cut slopes is a necessary follow-up to good land use planning. Where avoidance is not feasible, various engineering techniques are available to stabilize slopes, including de-watering (draining), retaining structures, piles, bridging, weighting or buttressing slopes with compacted earth fills and drainage diversion. Since every landslide and unstable slope has differing characteristics, any development proposed within a designated landslide hazard area, as delineated on the Sensitive Lands Overlay District maps, shall require the submittal, review and approval by the Planning Commission, of specific site studies, including grading plans, cut/fill, and plans produced by a qualified engineering geologist and a Utah licensed Geotechnical Engineer. The site specific study shall address slope stability (including natural or proposed cut slopes), evaluate slope-failure potential, effects of development and recommendations for mitigative measures. Slope stability analysis shall include potential for movement under static, development-induced and earthquake-induced conditions as well as likely ground water conditions.

### **2. Tectonic Subsidence**

Tectonic subsidence, also called seismic tilting, is the warping, lowering and tilting of a valley floor that accompanies surface-faulting earthquakes on normal (dip slip) faults such as the Wasatch fault zone. Inundation along the shores of lakes and reservoirs and the ponding of water in areas with a shallow water table may be caused by tectonic subsidence. Certain structures which require gentle gradients or horizontal floors, particularly wastewater treatment facilities and sewer lines may be adversely affected.

Because subsidence may occur over large areas (tens of square miles), it is generally not practical to avoid the use of potentially affected land except in narrow areas of hazard due to lake shoreline flooding. For gravity-flow structures such as wastewater treatment facilities that are within areas of possible subsidence, it is advisable to consider the tolerance of such structures to slight changes in gradient. Some structures may have to be leveled after a large-magnitude earthquake. Critical facilities which contain dangerous substances should have safety features to protect the structure, its occupants and the environment from both tilting and flooding.

Flooding problems along lakes from tectonic subsidence shall be reduced using standard techniques such as raising structures above expected flood levels and dikes can be built. Development adjacent to lakes or reservoirs shall be prohibited within 3 feet of elevation above projected lake levels to protect against natural rises from wet periods, storm waves and earthquake induced seiching, as well as hazards associated with tectonic subsidence.

Rises in the water table accompanying tectonic subsidence may cause water to pond, flood basements and disrupt buried facilities in areas of shallow ground water adjacent to the fault on the down dropped side.

The principal application of the identified tectonic subsidence areas is to make the public aware of the hazard and to indicate those areas where further study may be necessary. Site specific Tectonic Subsidence Studies are recommended only for critical facilities in areas of potential lake-margin and ponded shallow ground water flooding. However, certain vulnerable facilities such as high cost wastewater treatment plants and hazardous waste facilities should also consider potential tilting.