# TOTO OF SACRALITY

## **CITY OF SAUSALITO**

#### DISASTER PREPAREDNESS - EMERGENCY OPERATIONS PROGRAM

"Preparing and Protecting our Community"

## **Disaster Preparedness: Landslide**

Landslides occur in all U.S. states and territories. In a landslide, masses of rock, earth, or debris move down a slope. Landslides may be small or large, slow or rapid. They are activated by:

- storms,
- earthquakes,
- volcanic eruptions,
- fires.
- alternate freezing or thawing,
- and steepening of slopes by erosion or human modification.

Debris and mud flows are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." They can flow rapidly, striking with little or no warning at avalanche speeds. They also can travel several miles from their source, growing in size as they pick up trees, boulders, cars, and other materials.

Landslide problems can be caused by land mismanagement, particularly in mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Land-use zoning, professional inspections, and proper design can minimize many landslide, mudflow, and debris flow problems.

#### Before a Landslide or Debris Flow

Protect yourself from the effects of a landslide or debris flow:

- Do not build near steep slopes, close to mountain edges, near drainage ways, or natural erosion valleys.
- Get a ground assessment of your property.
- Contact local officials, state geological surveys or departments of natural resources, and university departments of geology. Landslides occur where they have before, and in identifiable hazard locations. Ask for information on landslides in your area, specific information on areas vulnerable to landslides, and request a professional referral for a very detailed site analysis of your property, and corrective measures you can take, if necessary.
- If you are at risk from a landslide talk to your insurance agent. Debris flow may be covered by flood insurance policies from the National Flood Insurance Program (NFIP).



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- Minimize home hazards:
  - 1. Have flexible pipe fittings installed to avoid gas or water leaks, as flexible fittings are more resistant to breakage (only the gas company or professionals should install gas fittings).
  - 2. Plant ground cover on slopes and build retaining walls.
  - 3. In mudflow areas, build channels or deflection walls to direct the flow around buildings.
  - 4. Remember: If you build walls to divert debris flow and the flow lands on a neighbor's property, you may be liable for damages.

#### **Recognize Landslide Warning Signs**

- Changes occur in your landscape such as patterns of storm-water drainage on slopes (especially the places where runoff water converges) land movement, small slides, flows, or progressively leaning trees.
- Doors or windows stick or jam for the first time.
- New cracks appear in plaster, tile, brick, or foundations.
- Outside walls, walks, or stairs begin pulling away from the building.
- Slowly developing, widening cracks appear on the ground or on paved areas such as streets or driveways.
- Underground utility lines break.
- Bulging ground appears at the base of a slope.
- Water breaks through the ground surface in new locations.
- Fences, retaining walls, utility poles, or trees tilt or move.
- A faint rumbling sound that increases in volume is noticeable as the landslide nears.
- The ground slopes downward in one direction and may begin shifting in that direction under your feet.
- Unusual sounds, such as trees cracking or boulders knocking together, might indicate moving debris.
- Collapsed pavement, mud, fallen rocks, and other indications of possible debris flow can be seen when driving (embankments along roadsides are particularly susceptible to landslides).

### **During a Landslide or Debris Flow**

#### What you should do if a landslide or debris flow occurs

• Stay alert and awake. Many debris-flow fatalities occur when people are sleeping. Listen to a NOAA Weather Radio or portable, battery-powered radio or television for warnings of intense rainfall. Be aware that intense, short bursts of rain may be particularly dangerous, especially after longer periods of heavy rainfall and damp weather.



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- If you are in areas susceptible to landslides and debris flows, consider leaving if it is safe to do so. Remember that driving during an intense storm can be hazardous. If you remain at home, move to a second story if possible. Staying out of the path of a landslide or debris flow saves lives.
- Listen for any unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together. A trickle of flowing or falling mud or debris may precede larger landslides. Moving debris can flow quickly and sometimes without warning.
- If you are near a stream or channel, be alert for any sudden increase or decrease in water flow and for a change from clear to muddy water. Such changes may indicate landslide activity upstream, so be prepared to move quickly. Don't delay! Save yourself, not your belongings.
- **Be especially alert when driving.** Embankments along roadsides are particularly susceptible to landslides. Watch the road for collapsed pavement, mud, fallen rocks, and other indications of possible debris flows.

#### What to Do if You Suspect Imminent Landslide Danger

- Contact your local fire, police, or public works department. Local officials are the best persons able to assess potential danger.
- **Inform affected neighbors.** Your neighbors may not be aware of potential hazards. Advising them of a potential threat may help save lives. Help neighbors who may need assistance to evacuate.
- **Evacuate.** Getting out of the path of a landslide or debris flow is your best protection.
- Curl into a tight ball and protect your head if escape is not possible.

#### After a Landslide or Debris Flow

#### Guidelines for the period following a landslide:

- Stay away from the slide area. There may be danger of additional slides.
- Listen to local radio or television stations for the latest emergency information.
- Watch for flooding, which may occur after a landslide or debris flow. Floods sometimes follow landslides and debris flows because they may both be started by the same event.
- Check for injured and trapped persons near the slide, without entering the direct slide area. Direct rescuers to their locations.
- Help a neighbor who may require special assistance infants, elderly people, and people with disabilities. Elderly people and people with disabilities may require additional assistance. People who care for them or who have large families may need additional assistance in emergency situations.
- Look for and report broken utility lines and damaged roadways and railways to appropriate authorities. Reporting potential hazards will get the utilities turned off as quickly as possible, preventing further hazard and injury.



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- Check the building foundation, chimney, and surrounding land for damage. Damage to foundations, chimneys, or surrounding land may help you assess the safety of the area.
- **Replant damaged ground as soon as possible** since erosion caused by loss of ground cover can lead to flash flooding and additional landslides in the near future.
- Seek advice from a geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk. A professional will be able to advise you of the best ways to prevent or reduce landslide risk, without creating further hazard.