

**ORDINANCE NUMBER 136 - 01**  
**AMENDMENTS TO THE MASON COUNTY RESOURCE ORDINANCE**

AN ORDINANCE amending the Mason County Resource Ordinance, Ordinance 77-93, regulations which apply to Geologically Hazardous Areas. This is Section 17.01.100 Landslide Hazard Areas, under the authority of Chapters 36.70 and 36.70A RCW.

WHEREAS, the Board of County Commissioners held a public hearing on December 11, 2001, to consider the recommendations of the Planning Commission, the Mason County Department of Community Development, and citizens on the proposed amendments;

WHEREAS, the Mason County Planning Commission formulated its recommendations after a public hearing on November 19, 2001, and approved findings of fact;

WHEREAS, these hearings were duly advertised public hearings;


WHEREAS, these amendments are intended to comply with the Orders of the Western Washington Growth Management Hearings Board, Case No. 95-02-0073;

WHEREAS, the Mason County Board of County Commissioners has approved findings of fact to support its decision as ATTACHMENT A;

NOW, THEREFORE, BE IT HEREBY ORDAINED, that the Board of County Commissioners of Mason County hereby approves and ADOPTS the amendments to the Mason County Resource Ordinance, as amended, as described by ATTACHMENT B.

DATED this 11th day of December, 2001.

Board of County Commissioners  
Mason County, Washington

  
\_\_\_\_\_  
Herb Baze, Chair

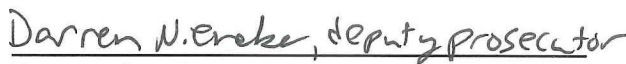
  
\_\_\_\_\_  
Wesley E. Johnson, Commissioner

  
\_\_\_\_\_  
Robert Holter, Commissioner

ATTEST:

  
\_\_\_\_\_  
Clerk of the Board

APPROVED AS TO FORM:

  
\_\_\_\_\_  
Darren N. Erbe, deputy prosecutor  
Prosecuting Attorney

**Mason County Planning Commission  
November 19, 2001**

**FINDINGS OF FACT**

**1. PROPOSED ACTION**

Under consideration is a proposal to amend the Mason County Resource Ordinance Sec. 17.01.100 Landslide Hazard Areas, intended to designate, protect, and guide development in these areas in Mason County. These changes are proposed to update the county regulations and to address the concerns of the Western Washington Growth Management Hearings Board (Hearings Board) in case #95-2-0073 addressed in their Findings and Order, dated July 13, 2001.

**2. PUBLIC PARTICIPATION**

A Mason County Planning Commission public hearing was scheduled for November 19, 2001 and comments were received from the commission members and the public. In addition, public participation was provided through the SEPA review process to agencies and interested parties in October and November 2001, other written public comment by the Washington Department of Natural Resources (DNR), and public testimony at the hearing.

**3. ENVIRONMENTAL REVIEW**

A determination of non-significance (DNS) was issued by Mason County on October 29, 2001; no agency comments were received in response to this threshold determination and environmental checklist. After review of the comments received and consideration of the changes proposed since that issuance, it was determined by the Department of Community Development that no significant adverse impacts are expected from this action.

**4. GROWTH MANAGEMENT HEARINGS BOARD COMPLIANCE - DISCUSSION**

The previous Order of the Growth Management Hearings Board (GMHB), Case #95-2-0073, dated July 13, 2001, expressed concern over the use of Best Available Science (BAS) and public participation in establishing development review standards for landslide hazard areas. The discussion of these issues was presented in the staff report for the November 19, 2001 public hearing and is summarized below:

*1. Triggering distance for geological assessment or geotechnical report.*

The draft landslide hazard areas ordinance text, in the Section E Geotechnical Report, now includes the triggering distance from the edge of buffer revised from 200 feet to 250 feet, which same distance recommended by Mason County's geotechnical consultant in the 2000 drafts of this ordinance. The DNR geologist, who was part of an interagency review group, supported this proposed triggering distance revision to minimize such hazards and also suggested other ordinance text revisions to improve the clarity and to include additional geological information submitted to Mason County.

*2. Public participation.*

Public input was noted in the text above.

*3. Compliance with Other Resource Ordinance Sections and the Shoreline Master Program.*

The current Resource Ordinance Sec. 17.01.100, Landslide Hazard Areas, has direct references to resource protection in shoreline areas, as emphasized in Sec. 17.01.110, Fish and Wildlife Conservation Areas. In the sub-sections regarding proposed development (Sec. 17.01.100.E.7) and bank protection and bulkhead projects (Sec. 17.01.100.D.7), a proposal must meet fish and

and bank protection and bulkhead projects (Sec. 17.01.100.D.7), a proposal must meet fish and wildlife habitat conservation area regulations and complete a habitat management plan as part of the development review (as noted in Sec. 17.01.110.G.1.e bank stabilization).

**5. GROWTH MANAGEMENT HEARINGS BOARD COMPLIANCE - FINDINGS**

A. Mason County finds that these amendments and the provisions of this Section 17.01.100 of the Resource Ordinance are an important part of the implementation of GMA and county goals for environmental protection, specifically for landslide hazard areas.

B. Mason County finds that the proposed landslide hazard areas ordinance classifies landslide hazard areas of the county and regulates proposed development in these geologically hazardous areas to protect the conditions and values of those critical areas.

C. Mason County finds that the proposed landslide hazard area ordinance standards work together with other resource standards, including fish and wildlife habitat conservation areas and the Shoreline Master Program, to provide adequate protection of values, functions, and conditions of these geologically hazardous areas.

D. Mason County finds that the designation of landslide hazard areas provides a level of protection from geologic hazards that supports the goals of the Growth Management Act and incorporates Best Available Science in the development of the ordinance regulations.

E. Mason County finds that all of the issues stated in the Growth Management Hearings Board Findings and Order of July 13, 2001 have been addressed in the revisions made and the public review of the Mason County Resource Ordinance Sec. 17.01.100 Landslide Hazard Areas.

**6. CONCLUSIONS**

The Mason County Board of Commissioners finds that the ordinance revisions for the proposed changes to the Mason County Resource Ordinance Sec. 17.01.100 are consistent with the goals of the Mason County Comprehensive Plan and the goals of the Growth Management Act.

The Mason County Board of Commissioners approves these revisions and hereby adopts this Findings of Fact for the proposed changes to the Mason County Resource Ordinance Sec. 17.01.100 Landslide Hazard Areas.

  
Chair, Mason County Board of Commissioners



12/11/01  
Date

The purpose of the Landslide Hazard Section is to identify areas that present potential dangers to public health and safety, to prevent the acceleration of natural geological hazards, to address off site environmental impacts, and to minimize the risk to the property owner or adjacent property owners from development activities.

Except for the exceptions listed below, development in or near landslide hazard areas requires a permit and the professional preparation of a geotechnical report or geological assessment to determine under what conditions the development may proceed at a reasonable risk. All development applications are reviewed to determine if they are likely to be in or near a landslide hazard area.

- Landslide hazard areas are described in A.
- The designation of landslide hazard areas is done in B.
- Activities exempt from these requirements are described in C.1. and others are listed in section 17.01.130 of the Resource Ordinance.
- Activities requiring permits are described in C.2.
- Standard requirements for certain activities are contained in D.
- When a geotechnical report or geological assessment is required is determined in E 1 and 2.
- The standards for a geotechnical report and geological assessment are contained in E. 3, 4, 5, and 6.
- The general review standard for approval of a permit is in E.7.
- Notice of the risks inherent in development in a landslide hazard area is required for the applicant and future property owners in F.

#### A. CLASSIFICATION

1. The following shall be classified as Landslide Hazard Areas:
  - a. Areas with any indications of earth movement such as debris slides, earthflows, slumps and rock falls (see figure F.100).
  - b. Areas with artificial oversteepened or unengineered slopes, i.e. cuts or fills.
  - c. Areas with slopes containing soft or potentially liquefiable soils.
  - d. Areas oversteepened or otherwise unstable as a result of stream incision, stream bank erosion, and undercutting by wave action.
  - e. Slopes greater than 15% (8.5 degrees) and having the following:
    - i. Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock (e.g. sand overlying clay); and
    - ii. Springs or groundwater seepage.
  - f. Any area with a slope of forty percent or steeper and with a vertical relief of ten or more feet except areas composed of consolidated rock. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least ten feet of vertical relief.
2. The following information may be used as a guide by the County to indicate areas that have a higher likelihood of meeting the classification criteria above:
  - a. The areas identified on the Mason County Soil Survey Map as having slopes greater than 15%.
  - b. The areas identified on the Coastal Zone Atlas, Volume 9, of Mason County, Washington as:

- I. Unstable - "U"
- ii. Unstable Old Slides - "UOS"
- iii. Unstable Recent Slides - "URS"
- iv. Intermediate Slopes - "I"
- v. Modified Slopes - "M"
- c. The areas identified as Class 2, 3, 4, or 5 of the maps: of "Relative Slope Stability of the Southern Hood Canal Area, Washington", by M. Smith and R.J. Carson, Washington State Department of Natural Resources, Division of Earth Resources, 1977 and "The Geological Map of North Central Mason County, Washington", by R.J. Carson, 1976, U.S. Geologic Survey OFR 76-2.

B. DESIGNATION

- 1. Lands of Mason County classified as Landslide Hazard Areas are hereby designated, under RCW 36.70A.060 and RCW 36.70A.170, as critical areas requiring immediate protection from incompatible land uses.
- 2. Upon an application for development on either mapped or unmapped lands, the Director shall determine if a hazard exists on a particular site based on:
  - a. Information supplied by the applicant in the form of a geotechnical report or geological assessment,
  - b. Actual physical observation of the site,
  - c. Existing County Hazard Area maps, or
  - d. Other means determined to be appropriate.

If the presence of a hazard is determined, the boundaries of the hazard and associated buffers shall then be delineated (top, both sides, and toe) on a geologic map of the site.

C. LAND USES

- 1. Exempt Uses
  - a. The growing and harvesting of timber, forest products and associated management activities in accordance with the Washington Forest Practices Act of 1974, as amended, and regulations adopted pursuant thereto; including, but not limited to, road construction and maintenance; aerial operations; applications of fertilizers and pesticides; helispots; and other uses specific to growing and harvesting timber forest products and management activities, except those Forest Practices designated as "Class IV -General Forest Practices" under the authority of the "Washington State Forest Practices Act Rules and Regulations", WAC 222-16-030;
  - b. Those activities and uses conducted pursuant to the Washington State Surface Mining Act, RCW 78.44 and its Rules and Regulations, where State law specifically exempts local authority;
  - c. Existing and ongoing agriculture, aquaculture, floriculture, horticulture, general farming, dairy operating under best management practices (BMP) of the Washington State Department of Ecology's Storm Water, Water Quality, Hazardous Waste, Wetland, and Solid Waste Program and BMP from the Departments of Health, Agriculture, Transportation, and State Conservation District Office.

2. Permit Required Uses

Permits are required for all new construction, grading, land clearing, and other uses subject to Section 17.01.050, and any Class IV Conversion Permit pursuant to the State Forest Practices Act which involves conversion to a Permit Required Use, and are within a Landslide Hazard Area or its buffer. Permit Required Use may require a Geotechnical Report, see Section 17.01.100.E.

D. DEVELOPMENT STANDARDS

Any land use on Landslide Hazard Areas or their buffers shall conform to the following standards:

1. Grading

- a. No grading shall be performed in landslide hazard areas prior to obtaining a grading permit subject to approval, by the Director, based on recommendations contained in the geotechnical report with slope stability, drainage, erosion control and grading recommendations.
- b. Clearing during grading shall be limited to the area of the approved development.
- c. No fill, dead vegetation (slash/stumps), or other foreign material shall be placed within a Landslide Hazard Area; with the exception of engineered compacted fill for construction of buttresses for landslide stabilization which shall be in accordance with recommendations specified in a Geotechnical Report.

2. Land Clearing

- a. Within this section, "Land Clearing" is defined as the cutting or harvesting of trees or the removing or cutting of vegetation so as to expose the soil and which is not otherwise exempt from this section.
- b. Land Clearing in Landslide Hazard Areas or their buffers is permitted when it is consistent with the recommendation and plans contained in the Geotechnical Report and development approval.
- c. If there is no Geotechnical Report for the site, land clearing is not permitted: however removal of danger trees, selected removal for viewing purposes of trees less than 6 inches dbh (diameter at breast height) and trimming or pruning of existing trees and vegetation is allowed with the qualifications cited herein. Danger trees shall be identified with the recommendation of a member of the Association of Consulting Foresters of America, an arborist certified by the International Society of Arboriculture, or with the recommendation of a person qualified to prepare a geotechnical report if removing trees for slope stabilization purposes. Removal of trees less than 6 inches dbh shall be limited to less than 2 percent of the total number of trees of that size or larger in the hazard area. Removal of multiple trees in a concentrated area, i.e. within a distance of 25 feet of each other, shall be accompanied by replacement by deep rooting native shrubs or other vegetation that serve similar moisture and erosion protective functions to that provided by the removed trees. Trimming and pruning shall be accomplished in accordance with pruning standards of the

International Society of Arboriculture, as published in "ANSI A300-95" or subsequent updated versions in order to minimize the potential for long term damage to the trees.

- d. Removal of selected trees and ground cover is allowed without a permit for the purpose of surveying and geotechnical exploration activities that do not involve grading, provided that re-vegetation of the disturbed areas occurs immediately afterward.
- e. Land clearing for which a permit has been obtained shall not be allowed during the wet season, i.e. from November 1 through May 1, unless special provisions for wet season erosion and landslide protection have been addressed in the Geotechnical Report and approved by the Director.

### 3. Drainage

- a. Surface drainage, including downspouts and runoff from paved or unpaved surfaces up slope, shall not be directed onto or within 50 feet above or onto the face of a Landslide Hazard Area or its associated buffer. If drainage must be discharged from the top of a Landslide Hazard Area to below its toe, it shall be collected above the top and directed to below the toe by tight line drain and provided with an energy dissipating device at the toe.
- b. Stormwater retention and detention systems, including percolation systems utilizing buried pipe or french drain, are prohibited unless a licensed civil engineer certifies appropriate mitigation measures.
- c. Erosion shall be controlled as provided in the Mason County Stormwater Management Ordinance and any geotechnical report or geological assessment prepared for the site.

### 4. Sewage Collection/Treatment Systems

Sewage collection and treatment systems shall be located outside of the Landslide Hazard Areas and associated buffers, unless an approved geotechnical report specifies appropriate mitigation measures. See Section 17.01.100.E.

### 5. Subdivision Design and Lot Size

For the purpose of determining lot sizes under Title 16 of the Mason County Code, and other county regulatory requirements, the Director shall review available information and required Geotechnical Reports or Geological Assessments under Section 17.01.100.E, and make a decision on a case-by-case basis based on the reports. To avoid impacts to anadromous fisheries and fish habitat, land divisions, (short plats, subdivisions, and large lot divisions) shall not be approved unless:

- a. No improvements or construction shall be within fish and wildlife habitat conservation areas, wetlands, or their buffers, provided that necessary water or wetland crossings or encroachments approved pursuant to other sections of the Mason County Resource Ordinance or other county regulations may be permitted for roads and utilities.
- b. All lots must have designated building areas on which structures may be safely located without the requirement for bulkheading, bank protection or other structures that encroach on fish and wildlife habitat conservation areas,

wetlands, or their buffers. Future buildings are to be limited to such designated areas.

The number, size, or configuration of lots may be changed as a condition of approval to meet this requirement.

6. Buffers

- a. A 50 foot (15.25 meter) buffer of vegetation is required around the Landslide Hazard Area.
- b. Upon finding substantial evidence that the proposed development is to be located near or within a hazardous area, the Director may require a Geotechnical Report or Geological Assessment pursuant to Section 17.01.100.E. Based on the results of the Geotechnical Report or Geological Assessment, the Director may increase the buffer.
- c. An application may be made to reduce the buffer for the purpose of constructing a single family residence on a lot existing or vested by December 6, 1996. Notice of application for the reduction of the buffer shall be made as provided in Section 15.07.010 of the Mason County Development Code (which specifies how notice is sent to adjacent property owners and posted on the site). The Director shall approve such a reduction only on finding that the approval is conditioned as necessary to be consistent with the recommendations contained within the Geotechnical Report or Geological Assessment (described in Sections 17.01.100.E.) and on finding that impacts to anadromous fish or their habitat or to fish and wildlife habitat conservations areas shall be avoided or mitigated as detailed in an approved Habitat Management Plan (described in Section 17.01.110.)

7. Bulkheads and Bank Protection

Bulkheads and bank protections, along with related fill, constructed for landslide stabilization measures approved under the Shoreline Master Program or the Fish and Wildlife Habitat Conservation Area regulations, shall be consistent with recommendations specified in a Geotechnical Report.

8. Residential Densities and Floor Area Ratios

The landslide hazard area and its buffer shall be counted in calculating the number of dwelling units (determined by the size of the site and residential density allowed) or the area of non-residential building (determined by the size of the site and the floor area ratio allowed) that may be built on the site; provided that:

- a. the development is outside of the landslide hazard area or its buffer, and
- b. the development is able to comply with all county regulations without encroaching on the landslide hazard area or its buffer.

Clustering of residential development away from landslide hazard area and its buffer may receive a density bonus if performed meeting the design requirements contained in Chapter 16.22, Mason County Code.



E. GEOTECHNICAL REPORT

1. Applicability

Every application for development within a Landslide Hazard Area or its buffer or within 250 feet of the buffer shall meet the standards of Section 17.01.100.D and shall require either a Geological Assessment or a Geotechnical Report, or both, in accordance with the following guidance:

- Category a. Areas with slopes greater than 40 percent (21.8 degrees) will require an Geotechnical Report.
- Category b. Areas with any visible signs of earth movement such as debris slides, earthflows, slumps and rockfalls, or areas within 200 feet of previously mapped or recorded landslides will require a Geotechnical Report.
- Category c. Areas within 100 feet of oversteepened or otherwise potentially unstable slopes as a result of stream incision, stream bank erosion, and undercutting by wave action will require an Geotechnical Report.
- Category d. Areas with slopes between 15 percent (8.5 degrees) and 40 percent (21.8 degrees) will require a Geological Assessment, and may further require a Geotechnical Report upon analysis of the following factors by the Director:
  - (1) Lot size and use;
  - (2) Overall height of slope and maximum planned cut or fill (requires a grading plan);
  - (3) Soil types and history of sliding in the vicinity (from the Geological Assessment);
  - (4) Groundwater conditions, including depth to water and quantity of surface seepage (from the Geological Assessment);
  - (5) Approximate depth to hard or dense competent soil, e.g. glacial till or outwash sand (from the Geological Assessment);
  - (6) Impervious surfaces and drainage schemes (requires development/grading plan);
  - (7) Wastewater treatment (requires on-site sewage disposal system approval from Mason County Department of Health);
  - (8) Potential off-site impacts, including adjacent properties, roadways, etc. (requires environmental statement dependant on scope of project).

2. Waiver of Geotechnical Report

The Director may waive the requirement for the Geotechnical Report for Category c and d sites upon a written finding in the Geological Assessment that the potential for landslide activity is low and that the proposed development would not cause significant adverse impacts, or that there is adequate geological information available on the area proposed for development to determine the impacts of the proposed development and appropriate mitigating measures.

3. Qualifications of Preparer

The Geologic Assessment shall be prepared at the discretion of the Director by either a licensed civil engineer with specialized knowledge of geotechnical/geological engineering or a practicing engineering geologist with special knowledge of the local conditions. The preparer shall have at least three years of experience in landslide

assessment and shall submit a statement of qualifications with the assessment or report, unless they have been previously determined to be qualified by Mason County. The Geotechnical Report shall be prepared at the discretion of the Director by a licensed civil engineer with specialized knowledge of geotechnical/geological engineering. The Geotechnical Report may also be prepared by a practicing engineering geologist with special knowledge of the local conditions, provided the work is performed under the supervision of a licensed civil engineer who will stamp the report and attest to the competency of the engineering geologist to perform landslide evaluations in accordance with the prevailing standard of practice.

4. Content of the Geological Assessment

A Geological Assessment shall include but not be limited to the following:

- (1) A discussion of geologic conditions in the general vicinity of the proposed development, with geologic unit designation consistent with terminology used in the Coastal Zone Atlas (Washington Department of Natural Resources, 1980) or in applicable U.S. Geologic Survey maps (e.g. Geological Map of North Central Mason County, by R.J. Carson, 1976, U.S. Geologic Survey OFR 76-2). Use of Soil Conservation Service soil layer terminology is considered inappropriate for this assessment.
- (2) A discussion of the ground water conditions at the site, including the depth to water and the quantity of surface seepage.
- (3) The approximate depth to hard or dense competent soil, e.g. glacial till or outwash sand.
- (4) A discussion of any geomorphic expression of past slope instability (presence of hummocky ground or ground cracks, terraced topography indicative of landslide block movement, bowed or arched trees indicating downslope movement, etc.).
- (5) A discussion of the history of landslide activity in the vicinity, as available in the Coastal Zone Atlas, the map of "Relative Slope Stability of the Southern Hood Canal Area, Washington" by M. Smith and R.J. Carson, 1977; and the landslide records on file with the Mason County Department of Community Development.
- (6) An opinion on the potential for landslide activity at the site in light of the proposed development.
- (7) A recommendation by the preparer whether a Geotechnical Report should be required to further evaluate site conditions and the proposed development of the subject property.

5. Content of a Geotechnical Report

A Geotechnical Report shall include but not be limited to the following:

- (1) A discussion of general geologic conditions, specific soil types, ground water conditions and history of landslide activity in the vicinity as required for the Geologic Assessment described above.
- (2) A site plan which identifies the important development and geologic features.
- (3) Locations and logs of exploratory holes or probes.
- (4) A minimum of one cross section at a scale which adequately depicts the subsurface profile, and which incorporates the details of proposed grade changes.
- (5) A description and results of slope stability analyses performed for both static and seismic loading conditions.

- (6) Appropriate restrictions on placement of drainage features, septic drain fields and compacted fills and footings, including recommended setbacks from shoreline bluffs and the tops of other slopes on the property.
- (7) A detailed clearing and grading plan which specifically identifies vegetation to be removed, a schedule for vegetation removal and replanting, and the method of vegetation removal.
- (8) A detailed temporary erosion control plan which identifies the specific mitigating measures to be implemented during construction to protect the slope from erosion, landslides and harmful construction methods.
- (9) An analysis of both on-site and off-site impacts of the proposed development.
- (10) Specifications of final development conditions such as, vegetative management, drainage, erosion control, and buffer widths.

6. Applicable Standards

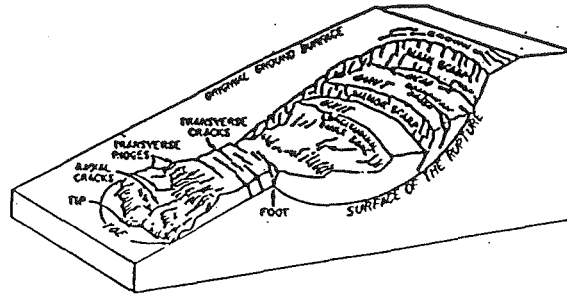
Geological Assessments and Geotechnical Reports shall be prepared using terminology, descriptions, evaluation methods and mitigation approaches that reflect the current standard of care for practitioners in the field of geologic hazards. The standard of care shall be considered to be represented by , but not limited to, Turner, A.K. and Schuster, R.L. (1996; "Landslides, Investigation and Mitigation", Transportation Research Board Special Report 247, National Academy Press, Washington DC.) for classification, analysis and conceptual mitigation of landslides; Washington Department of Ecology (1993; "Slope Stabilization and Erosion Control Using Vegetation, A Manual of Practice For Coastal Property Owners", Publication No. 93-30, Olympia, WA; and "Vegetation Management: A Guide For Puget Sound Bluff Property Owners", Publication No. 93-31, Olympia, WA) for vegetation management and its use in slope stabilization and erosion protection; and Washington Department of Ecology (1995; "Surface Water and Groundwater on Coastal Bluffs", Publication No. 95-107, Olympia, WA) for water and drainage management and its use in slope stabilization and erosion protection.

7. Administrative Determination

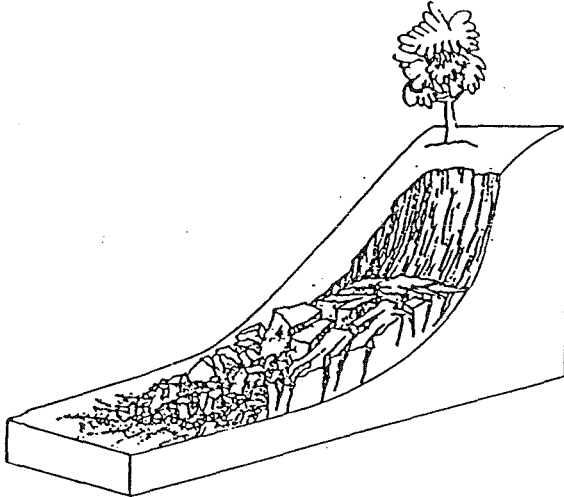
Any area in which the Geotechnical report or geological assessment indicates the presence of landslide hazards shall not be subjected to development unless the report demonstrates conclusively that the hazards can be overcome, and that the development meets all standards in Section 17.01.100.D. Hazards must be overcome in such a manner as to prevent harm to property and public health and safety, and to assure no significant adverse environmental impact. Impacts to anadromous fish or their habitat or to fish and wildlife habitat conservations areas shall be avoided or mitigated as detailed in an approved Habitat Management Plan, as described in Section 17.01.110. The Director may submit either the Geologic Assessment or the Geotechnical Report to an outside agency with geotechnical expertise or to a geotechnical consultant for third party peer review prior to issuing a ruling on the project.

F. APPLICANT HOLD HARMLESS STATEMENT

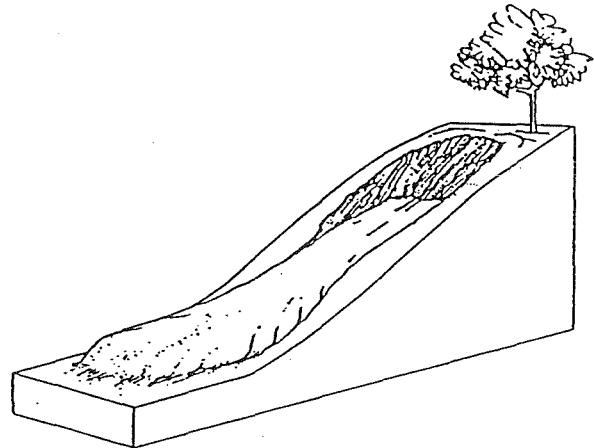
The property owner shall be required to acknowledge in writing the risks inherent in developing in a geologic hazard area, to accept the responsibility of any adverse affects which may occur to the subject property or other properties as a result of the development, and to agree to convey the knowledge of this risk to persons purchasing the site by filing the notice on the property title.



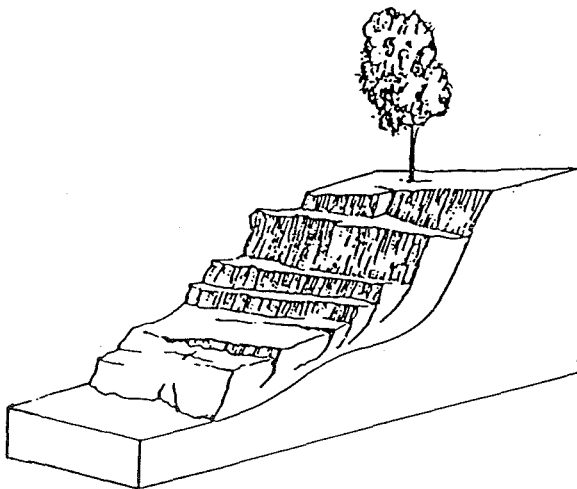
Nomenclature of parts of a landslide (from Eckel, 1958):



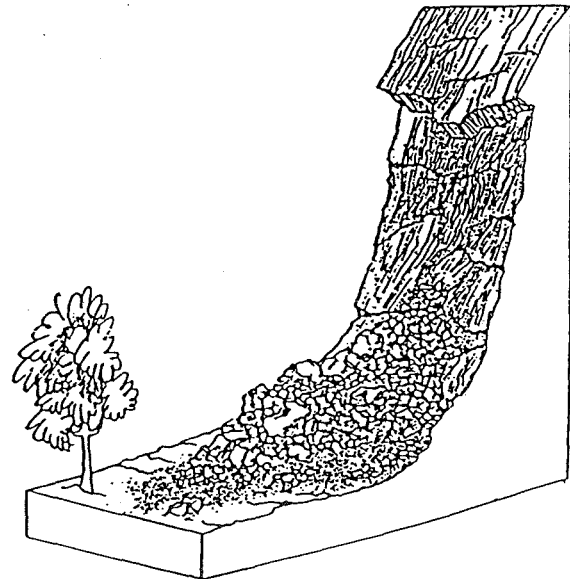
Debris slide: incoherent or broken masses of rock and other debris that move downslope by sliding on a surface that underlies the deposit.



Earthflow: colluvial materials that move downslope in a manner similar to a viscous fluid.



Slump: coherent or intact masses that move downslope by rotational slip on surfaces that underlie as well as penetrate the landslide deposit.



Rockfall: rock that has moved primarily by falling through the air.