

## CHAPTER 18.62

### CRITICAL AREAS – GEOLOGICALLY HAZARDOUS AREAS

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**18.62.010: Designation of Geologically Hazardous Areas:** Geologically hazardous areas include areas susceptible to erosion, sliding, earthquake, or other geological events. They pose a threat to the health and safety of citizens when incompatible development is sited in areas of significant hazard. Such incompatible development may not only place itself at risk, but also may increase the hazard to surrounding development and use. Areas susceptible to one or more of the following types of hazards shall be designated as a geologically hazardous area (See WAC 365-190-080(4)(a)):

- (1) Erosion hazard;
- (2) Landslide hazard;
- (3) Seismic hazard;
- (4) Extreme slope hazard;
- (5) Other geological events including mass wasting, debris flows, rock falls, and differential settlement. (Ord. 5206 Sec. 5, 2007)

**18.62.020: Designation of Specific Hazard Areas:**

(1) Erosion hazard areas. Erosion hazard areas are those areas identified by the U.S. Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS) as having a "moderate to severe," "severe," or "very severe" rill and inter-rill erosion hazard (See WAC 365-190-080(4)(c)). Rill erosion tends to occur on slopes, particularly steep slopes with easily-erodible soils or poor vegetation. Erosion hazard areas also include those areas with slope greater than fifteen percent (15%).

(2) Landslide hazard areas. Landslide hazard areas are areas potentially subject to landslides based on a combination of geologic, topographic, and hydrologic factors. They include areas susceptible because of any combination of bedrock, soil, slope (gradient), slope aspect, structure, hydrology, or other factors. Example of these may include, but are not limited to the following:

- (a) Areas of historic failures, such as (See WAC 365-190-070(4)(d)(i)):

- (i) Those areas delineated by the USDA-NRCS as having a "severe" limitation for building site development for factors other than slope for one or more types of building development;
  - (ii) Those areas mapped by the Department of Ecology (Coastal Zone Atlas) or the Department of Natural Resources (slope stability mapping) as unstable ("U" or class 3), unstable old slides ("UOS" or class 4), or unstable recent slides ("URS" or class 5); or
  - (iii) Areas designated as quaternary slumps, earthflows, mudflows, lahars, or landslides on maps published by the U.S. Geological Survey or Department of Natural Resources;
- (b) Areas with all three of the following characteristics (See WAC 365-190-080(4)(d)(ii)):
- (i) Slopes steeper than fifteen percent (15%); and
  - (ii) Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and
  - (iii) Springs or ground water seepage;
- (c) Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials (See WAC 365-190-080(4)(d)(iv));
- (d) Slopes having gradients steeper than eighty percent (80%) subject to rock fall during seismic shaking (See WAC 365-190-080(4)(d)(v));
- (e) Areas potentially unstable because of rapid stream incision, stream bank erosion, and undercutting by wave action (See WAC 365-190-080(4)(d)(vi));
- (f) Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding (See WAC 365-190-080(4)(d)(vii)); and
- (g) Any area with a slope of forty percent (40%) or steeper and with a vertical relief of ten (10) 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 (10) feet of vertical relief (See WAC 365-190-080(4)(d)(ix)).
- (3) Seismic hazard areas. Seismic hazard areas are areas subject to severe risk of damage as a result of earthquake induced ground shaking, slope failure, settlement, soil liquefaction, lateral spreading, or surface faulting. One indicator of potential for future earthquake damage is a record of earthquake damage in the past. Ground shaking is the primary cause of earthquake damage in Washington. The strength of ground shaking is primarily affected by (See WAC 365-180-080(4)(e)):
- (a) The magnitude of an earthquake;
  - (b) The distance from the source of an earthquake;
  - (c) The type of thickness of geologic materials at the surface; and
  - (d) The type of subsurface geologic structure.
- Settlement and soil liquefaction conditions occur in areas underlain by cohesionless, loose, or soft-saturated soils of low density, typically in association with a shallow ground water table.
- (4) Extreme slope hazard areas. Extreme slope hazard areas have severe erosion potential and a high probability of slope failure and landslide occurrence.

(5) Other hazard areas. Geologically hazardous areas shall also include areas determined by the Planning Director to be susceptible to other geological events including mass wasting, debris flows, rock falls, and differential settlement. (Ord. 5206 Sec. 5, 2007)

**18.62.030: Classification of Geologically Hazardous Areas:** The level of risk for each geologic hazard type is described in this section. Documentation of specific areas in which a known or suspected risk exists for each of the following hazard areas is provided in the City Critical Areas Map (see Exhibit 4: Geologically Hazardous Areas). The provisions of this Title apply only to those areas for which a known or suspected risk exists.

Classification	Documentation and Data Sources
Known or Suspected Risk	Documentation or projection of the hazard by a qualified professional exists.
Low or No Risk	Documentation exists by a qualified professional regarding low hazard risk or lack of hazard.
Risk Unknown	Documentation, data, or projection of the hazard risk by a qualified professional are not available or sufficient to determine the presence or absence of a geologic hazard.

- (1) Erosion hazard areas – Known or suspected risk in steep areas.
- (2) Landslide hazard areas – Known or suspected risk in areas with slope > 15%.
- (3) Seismic hazard areas – Low or no risk
- (4) Extreme slope hazard areas – Known or suspected risk in areas with slope > 40%.
- (5) Other hazard areas - Other geologically hazardous areas may be designated by the City if documentation thereof is available. (Ord. 5206 Sec. 5, 2007)

**18.62.040: Mapping of Geologically Hazardous Areas:**

(1) The approximate location and extent of geologically hazardous areas containing known or suspected risk are shown on the adopted Critical Areas Map (Exhibit 4: or latest version of this map). The hazard areas outlined on this map are based on the following data:

- (a) USGS 10-meter Digital Elevation Model (slope);
- (b) USDA Soil Survey of Benton County Area, Washington;
- (c) Additional data as determined necessary by the City.
- (2) This map is to be used as a guide for the City, project applicants and/or property owners, and may be updated as new information becomes available. It is a reference and does not provide a final critical area designation. (Ord. 5206 Sec. 5, 2007)

**18.62.050: Activities Allowed in Geologically Hazardous Areas:** The following activities are allowed in geologically hazardous areas pursuant to Section 18.58.110, and do not require submission of a critical area report provided that the activity will not increase the risk of the hazard:

(1) Erosion and landslide hazard areas. Except as otherwise provided for in this Title, only those activities approved and permitted consistent with the critical area report in accordance with this Title shall be allowed in erosion or landslide hazard areas.

(2) Extreme slope hazard areas. Installation of fences may be allowed within an extreme slope hazard area.

(3) Other hazard areas. The following activities may be allowed within other geologically hazardous areas:

- (a) Construction of new buildings with less than 3,500 square feet of floor area or roof area, whichever is greater, and which are not residential structures or used as places of employment or public assembly;
- (b) Additions to existing residences that are 250 square feet or less; and
- (c) Installation of fences. (Ord. 5206 Sec. 5, 2007)

**18.62.060: Critical Area Report – Additional Requirements for Geologically Hazardous Areas:**

(1) Prepared by a qualified professional. A critical areas report for a geologically hazardous area shall be prepared by a geotechnical engineer or geologist, licensed in the state of Washington, with experience analyzing geologic, hydrologic, and ground water flow systems; or by a geologist who earns his or her livelihood from the field of geology and/or geotechnical analysis, with experience analyzing geologic, hydrologic and ground water flow systems, who has experience preparing reports for the relevant type of hazard. Preparation of these reports by a state of Washington registered geologist is preferred.

(2) Area addressed in critical area report. The following areas shall be addressed in a critical area report for geologically hazardous areas:

- (a) The project area of the proposed activity; and
- (b) All geologically hazardous areas within two hundred (200) feet of the project area or that have potential to be affected by the proposal.

(3) Geotechnical assessment. A critical area report for a geologically hazardous area shall contain an assessment of geological hazards including the following site and proposal-related information at a minimum:

- (a) Site and construction plans. The report shall include a copy of the site plans for the proposal showing:
  - (i) The type and extent of geologic hazard areas, and any other critical areas, and buffers on, adjacent to, within two hundred (200) feet of, or that are likely to impact the proposal;
  - (ii) Proposed development, including the location of existing and proposed structures, fill, storage of materials, and drainage facilities, with dimensions indicating distances to the floodplain;
  - (iii) The topography, in two-foot contours, of the project area and all hazard areas addressed in the report; and
  - (iv) Clearing limits.
- (b) Assessment of geological characteristics. The report shall include an assessment of the geologic characteristics and engineering properties of the

soils, sediments, and/or rock of the project area and potentially affected adjacent properties, and a review of the site history regarding landslides, erosion, and prior grading. Soils analysis shall be accomplished in accordance with accepted taxonomic classification systems in use in the region. The assessment shall include, but not be limited to:

- (i) A description of the surface and subsurface geology, hydrology, soils, and vegetation found in the project area and in all hazard areas addressed in the report;
  - (ii) A detailed overview of the field investigations, published data and references; data and conclusions from past assessments of the site; and site specific measurements, test, investigations, or studies that support the identification of geologically hazardous areas; and
  - (iii) A description of the vulnerability of the site to seismic and other geologic events.
- (c) Analysis of proposal. The report shall contain a geotechnical analysis including a detailed description of the project, its relationship to the geologic hazard(s), and its potential impact upon the hazard area, the subject property and affected adjacent properties; and
- (d) Minimum buffer and building setback. The report shall make a recommendation for the minimum no-disturbance buffer and minimum building setback from any geologic hazard based upon the geotechnical analysis.

(4) Incorporation of previous study. Where a valid geotechnical report has been prepared within the last five (5) years for a specific site, and where the proposed land use activity and surrounding site conditions are unchanged, said report may be incorporated into the required critical area report. The applicant shall submit a geotechnical assessment detailing any changed environmental conditions associated with the site.

(5) Mitigation of long-term impacts. When hazard mitigation is required, the mitigation plan shall specifically address how the activity maintains or reduces the pre-existing level of risk to the site and adjacent properties on a long-term basis (equal to or exceeding the projected lifespan of the activity or occupation). Proposed mitigation techniques shall be considered to provide long-term hazard reduction only if they do not require regular maintenance or other actions to maintain their function. Mitigation may also be required to avoid any increase in risk above the pre-existing conditions following abandonment of the activity. (Ord. 5206 Sec. 5, 2007)

**18.62.070: Critical Area Report – Additional Requirements for Specific Hazards:**

In addition to the general critical area report requirements of Section 18.58.140, critical area reports for geologically hazardous areas must meet the requirements of this Section. Critical area reports for two or more types of critical areas must meet the report requirements for each relevant type of critical area.

(1) Erosion, landslide and extreme slope hazard areas. In addition to the basic critical area report requirements, a critical area report for an erosion hazard or landslide hazard area shall include the following information at a minimum:

- (a) Site plan. The report shall include a copy of the site plan for the proposal showing:

- (i) The height of slope, slope gradient, and cross section of the project area;
- (ii) The location of springs, seeps, or other surface expressions of ground water on or within two hundred (200) feet of the project area or that have potential to be affected by the proposal (a distance of two hundred feet is suggested so that geological features that might affect the proposal are included in the critical area report. It may be necessary to include features further than two hundred feet from the project area in some instances, such as a series of related geological features that extend more than two hundred feet); and
- (iii) The location and description of surface water runoff.
- (b) Geotechnical analysis. The geotechnical analysis shall specifically include:
  - (i) A description of the extent and type of vegetative cover;
  - (ii) An estimate of load capacity including surface and ground water conditions, public and private sewage disposal systems, fills and excavations and all structural development;
  - (iii) An estimate of slope stability and the effect construction and placement of structures will have on the slope over the estimated life of the structure;
  - (iv) An estimate of the bluff retreat rate that recognizes and reflects potential catastrophic events such as seismic activity or a one hundred year storm event;
  - (v) Consideration of the run-out hazard of landslide debris and/or the impacts of landslide run-out on down slope properties.
  - (vi) A study of slope stability including an analysis of proposed angles of cut and fill and site grading;
  - (vii) Recommendations for building limitations, structural foundations, and an estimate of foundation settlement;
  - (viii) An analysis of proposed surface and subsurface drainage, and the vulnerability of the site to erosion;
- (c) Erosion and sediment control plan. For any development proposal on a site containing an erosion hazard area, an erosion and sediment control plan shall be required. The erosion and sediment control plan shall be prepared in compliance with requirements set forth in the City's Construction Standards;
- (d) Drainage plan. The report shall include a drainage plan for the collection, transport, treatment, discharge and/or recycle of water. The drainage plan should consider on-site septic system disposal volumes where the additional volume will affect the erosion or landslide hazard area.
- (e) Mitigation plans. Hazard and environmental mitigation plans for erosion and landslide hazard areas shall include the location and methods of drainage, surface water management, locations and methods of erosion control, a vegetation management and/or replanting plan and/or other means for maintaining long-term soil stability.
- (f) Monitoring surface waters. If the Planning Director determines that there is a significant risk of damage to downstream receiving waters due to potential erosion from the site, based on the size of the project, the proximity to the receiving waters, or the sensitivity of the receiving waters, the critical area

report shall include a plan to monitor the surface water discharge from the site. The monitoring plan shall include a recommended schedule for submitting monitoring reports to the City.

(2) Other geologically hazardous areas. In addition to the basic report requirements, the Planning Director may require additional information to be included in the critical area report when determined to be necessary to the review the proposed activity and the subject hazard. Additional information that may be required, includes, but is not limited to:

- (a) Site plan. The site plan shall show all hazard areas located within two hundred (200) feet of the project area or that have potential to be affected by the proposal; and
- (b) Geotechnical analysis. The geotechnical analysis shall include a complete discussion of the potential impacts of the hazard on the project area and of the proposal on the hazard. (Ord. 5206 Sec. 5, 2007)

**18.62.080: Performance Standards – General Requirements:**

(1) Alterations of geologically hazardous areas or associated buffers may only occur for activities that:

- (a) Will not increase the threat of the geological hazard to adjacent properties beyond pre-development conditions;
- (b) Will not adversely impact other critical areas;
- (c) Are designed so that the hazard to the project is eliminated or mitigated to a level equal to or less than pre-development conditions; and
- (d) Are determined to be safe as designed and under anticipated conditions by a qualified engineer or geologist, licensed in the state of Washington.

(2) Critical facilities shall not be sited within geologically hazardous areas unless there is no other practical alternative.

(3) In addition to the provisions of this Title, alterations of geologically hazardous areas or associated buffers must conform to City Construction Standards and building codes. (Ord. 5206 Sec. 5, 2007)

**18.62.090: Performance Standards – Specific Hazards:**

(1) Erosion and landslide hazard areas. Activities on sites containing erosion or landslide hazards shall meet the following requirements:

- (a) Buffer required. A buffer shall be established from all edges of erosion or landslide hazard areas. The size of the buffer shall be determined by the Planning Director to eliminate or minimize the risk of property damage, death or injury resulting from erosion and landslides caused in whole or part by the development, based upon review of and concurrence with a critical area report prepared by a qualified professional.
  - (i) Minimum buffer. The minimum buffer shall be equal to the height of the slope or fifty (50) feet, whichever is greater.
  - (ii) Buffer reduction. The buffer may be reduced to a minimum of ten (10) feet when a qualified professional demonstrates to the Planning Director's satisfaction that the reduction will adequately protect the proposed development, adjacent developments and uses and the subject critical area

- (iii) Increased buffer. The buffer may be increased where the Planning Director determines a larger buffer is necessary to prevent risk of damage to proposed and existing development;
- (b) Alterations. Alterations of an erosion or landslide hazard area and/or buffer may only occur for activities for which a geotechnical analysis is submitted and determines that:
  - (i) The development will not increase surface water discharge or sedimentation to adjacent properties beyond pre-development conditions;
  - (ii) The development will not decrease slope stability on adjacent properties; and
  - (iii) Such alterations will not adversely impact other critical areas.
- (c) Construction Standards. Development within an erosion or landslide hazard area and/or buffer shall be designed to meet the following basic requirements unless it can be demonstrated that an alternative design that deviates from one or more of these standards provides greater long-term slope stability while meeting all other provisions of this Title. The requirement for long-term slope stability shall exclude designs that require regular and periodic maintenance to maintain their level of function. In addition to those requirements outlined in Section 18.62.080, the basic development Construction Standards within geologically hazardous areas are:
  - (i) The proposed development shall not decrease the factor of safety for landslide occurrences below the limits of 1.5 for static conditions and 1.2 for dynamic conditions. Analysis of dynamic conditions shall be based on a minimum horizontal acceleration as established by the current version of the Uniform Building Code.
  - (ii) Structures and improvements shall be clustered to avoid geologically hazardous areas and other critical areas;
  - (iii) Structures and improvements shall minimize alterations to the natural contour of the slope and foundations shall be tiered where possible to conform to existing topography;
  - (iv) Structures and improvements shall be located to preserve the most critical portion of the site and its natural landforms and vegetation;
  - (v) The proposed development shall not result in greater risk or a need for increased buffers on neighboring properties;
  - (vi) The use of retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes;
  - (vii) Development shall be designed to minimize impervious lot coverage.
- (d) Vegetation shall be retained. Unless otherwise provided or as part of an approved alteration, removal of vegetation from an erosion or landslide hazard area or related buffer shall be prohibited;
- (e) Utility lines and pipes. Utility lines and pipes shall be permitted in erosion and landslide hazard areas only when the applicant demonstrates that no other practical alternative is available. The line or pipe shall be located above ground and properly anchored and/or designed so that it will continue to function in the event of an underlying slide. Stormwater conveyance shall be allowed only through a high-density polyethylene pipe with fuse-welded

- joints, or similar product that is technically equal or superior.
- (f) Point discharges. Point discharges from surface water facilities and roof drains onto or upstream from an erosion or landslide hazard area shall be prohibited except as follows:
    - (i) Conveyed via continuous storm pipe downslope to a point where there are no erosion hazards areas downstream from the discharge;
    - (ii) Discharged at flow durations matching predeveloped conditions, with adequate energy dissipation, into existing channels that previously conveyed stormwater runoff in the predeveloped state; or
    - (iii) Dispersed discharge upslope of the steep slope onto a low-gradient undisturbed buffer demonstrated to be adequate to infiltrate all surface and stormwater runoff, and where it can be demonstrated that such discharge will not increase the saturation of the slope;
  - (g) Subdivisions. The division of land in erosion and landslide hazard areas and associated buffers is subject to the following:
    - (i) Land that is located wholly within an erosion or landslide hazard area or its buffer may not be subdivided. Land that is located partially within an erosion or landslide hazard area or its buffer may be divided provided that each resulting lot has sufficient buildable area outside of, and will not affect, the erosion or landslide hazard or its buffer.
    - (ii) Access roads and utilities may be permitted within the erosion or landslide hazard area and associated buffers if the City determines that no other feasible alternative exists.
  - (h) Prohibited development. On-site sewage disposal systems, including drain fields, shall be prohibited within erosion and landslide hazard areas and related buffers.
- (2) Extreme slope hazard areas. Activities on sites containing extreme slope hazards shall be considered unbuildable. This includes, but is not limited to, construction of buildings, sewage disposal systems and roads. Construction of facilities shall not be permitted in extreme slope hazard areas unless under an exception provided consistent with Section 18.58.120 of this Title. If an exception is granted, the provisions of Sections 18.62.080 and 18.62.090(1) must be satisfied.
- (3) Other hazard areas. Activities on sites containing or adjacent to seismic or other geologically hazardous areas, shall meet the standards of Section 18.62.080. (Ord. 5206 Sec. 5, 2007)