

Landslide Mitigation Strategies



Photo courtesy of MNDNR

Prepared for:

mn DEPARTMENT OF
NATURAL RESOURCES



FEMA

Landslide Mitigation Strategies

Landslides are an unfortunate reality for Hennepin County, the metropolitan area and other regions in the State of Minnesota. In 2013, a deadly landslide occurred in St. Paul's Lilydale Regional Park. Heavy rains in the spring of 2014 were responsible for several landslides that closed roads, including the slide shown here on the West Bank at the University of Minnesota's Fairview Medical Center. This landslide closed West River Parkway for over a year and resulted in a \$6 million stabilization project.



Fairview Medical Center Slide in 2014. Photo courtesy of MNDNR

Landslides in Minnesota could potentially be more common over the next 100 years due to the impacts of climate change and development that does not take the hazard into account. Climate change in Minnesota is expected to result in an overall increase in

precipitation of 3-4 inches per year and an increase in the frequency and intensity of precipitation events.ⁱ These changes mean additional flooding, ground saturation, and runoff. In addition to steep slopes the most important factors contributing to landslides are extreme precipitation events, groundwater discharge (springs) and storm-water handling. Even though some of these contributors may be beyond our control, there are steps that communities can take to make their properties safer.



2014 Slide in St. Paul. Photo courtesy of MNDNR

Preparation of this landslide mitigation guidance was funded by the Federal Emergency Management Agency (FEMA). The document was reviewed by the Minnesota Department of Natural Resources (MNDNR), FEMA's Cooperating Technical Partner for this project. This guidance is intended to assist county and municipal officials ready to take action to reduce their exposure to landslide impacts. The sections below introduce several assessment, planning, and protection strategies that county officials may consider to mitigate landslide hazards. Example ordinances and codes have been provided to demonstrate potential land-use planning solutions for reducing risk related to landslides. Also included are education and outreach tools addressing slope stabilization that can be shared with affected homeowners.

Landslide Risk and Hazard Assessment

To enhance land-use planning and protection efforts, the first step is to create a GIS-based Landslide Risk Assessment. The assessment identifies areas of higher landslide risk. At a minimum it uses geographic data related to slopes, geology, and the location and extent of historic landslides. The location of springs and vegetation type may also be useful data to include. The assessment should be open to the public and participatory. Residents should be encouraged to share knowledge of landslide occurrences and areas of concern. Through participation in the assessment, they will become more knowledgeable about landslides and the types of activities that make landslides more likely to occur.

The resulting map can be used in conjunction with existing land development ordinances, including the Mississippi River Critical Area Overlay District and Shoreland Overlay District. Or it could be used to take the next step, the creation of a Hazard Assessment.

A Hazard Assessment includes economic and societal impacts of potential landslides. It should identify roads, utilities, and structures located in landslide hazard areas. Ideally it would include costs associated with repair and stabilization. It can be used to prioritize site-based assessments of critical facilities and infrastructure by qualified professional geologists or geotechnical engineers to determine if those facilities would benefit from relocation, prevention, or protection strategies.

The Landslide Risk Map and Hazard Assessment should be publicly available. In order to improve these products and promote education on the topic, communities and residents should be encouraged to share information about landslides. The USGS Landslide Hazards Program has a "Report a Landslide Tool" that is easy to use and the data will be archived by them and provided to the State of Minnesota. <http://landslides.usgs.gov/dysi/form.php>





Source: Minnesota Department of Natural Resources

Land-Use Planning

Several land-use planning and regulatory tools have been used to mitigate landslide hazards. For maximum effectiveness, the Landslide Risk and Hazard assessments should be incorporated into the comprehensive plan, which will enable and support additional regulatory approaches that could include the examples described below.

Several example codes and ordinances are included at the end of this document and provide a template for drafting new regulations.

Landslide Hazard Overlay Zone or Landslide Hazard Area Development Ordinance

Counties and municipalities can enact landslide-specific regulations in the form of an overlay zone or development ordinance. These types of regulation are a low-cost alternative to keep development and infrastructure away from sensitive slopes and prevent costly slope failures. County-level regulations can fill gaps left by municipality-specific versions and can reinforce local bluff protection ordinances in place to implement the Minnesota Department of Natural Resources' statewide Shoreland, Wild & Scenic Rivers, Lower St. Croix National Scenic & Recreational Riverway, and Mississippi River Critical Area programs.¹ New landslide-related regulations should build on existing policy and may include the following:

- Development restrictions and moratoriums;
- Minimum structure and impervious surface setbacks based on an assessment of risk—including permit reviews and approvals with geotechnical assessment;
- Vegetation standards (native plants with strong, deep root systems);
- Open space requirements that protect sensitive slopes;
- Real estate disclosure requirement;
- Storm water management and impervious surface restrictions;
- Landslide maintenance easements & deed restrictions; and
- Landslide hazard area building code with minimum foundation, grading, and drainage requirements



Pittsburgh, PA Landslide-Prone Overlay District

¹ http://dnr.state.mn.us/waters/watermgmt_section/critical_area/index.html

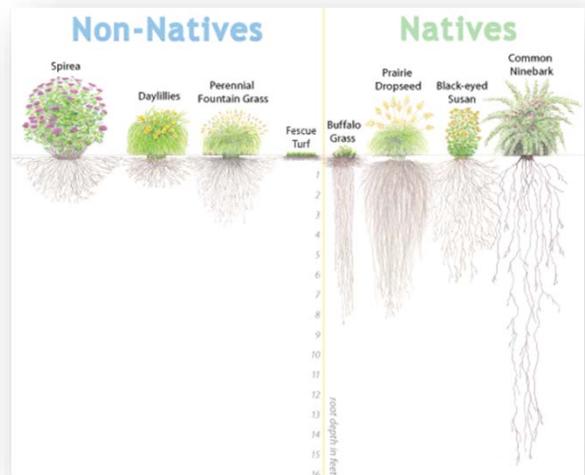
Transportation and Infrastructure Planning

Transportation systems, utilities, and other infrastructure are at risk from landslides. In many cases those projects have contributed to conditions that resulted in landslides. The Landslide Hazard Assessment can identify where existing infrastructure is at risk and areas that should be avoided in future projects. Transportation projects are managed by multiple entities, including municipalities, counties, townships, the Twin Cities Metropolitan Council and the Minnesota Department of Transportation. Through comprehensive plans, capital improvement plans, and regional transportation plans, policy and funding decisions can be crafted to mitigate landslide risk. This is accomplished through policies that restrict transportation and utility projects in landslide-prone areas. Additionally, projects that include landslide protection or that relocate at-risk structures can be included in capital improvement plans and long-range transportation plans.

Prevention and Protection Projects

Landslide prevention and protection are possible in some cases; however they are typically very expensive. Less expensive methods involve slope stabilization using native vegetation and drainage improvements. In many cases the most effective methods will involve relocation of utilities and critical facilities, realignment of roadways, and acquisition and demolition of high-risk structures. Some examples of stabilization techniques include:

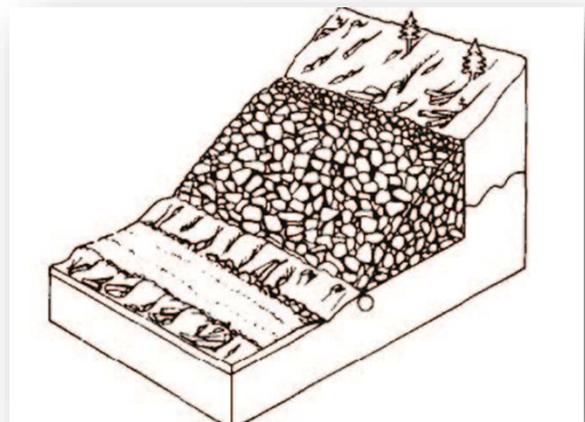
- Vegetation placement and management;
- Implementing drainage improvements (drainage pipes, ditches, berms, and catchment basins);
- Dewatering or installing impermeable membranes on existing slide areas to prevent oversaturation;
- Debris removal;
- Grading to lessen slope; and
- Constructing rock buttresses and retaining walls.



Source: Mid-America Regional Council
<http://marc.org/Environment/Water-Resources/Landscaping-and-Lawn-Care/Know-Your-Roots>



Retaining wall in St. Paul. Photo courtesy of MNDNR



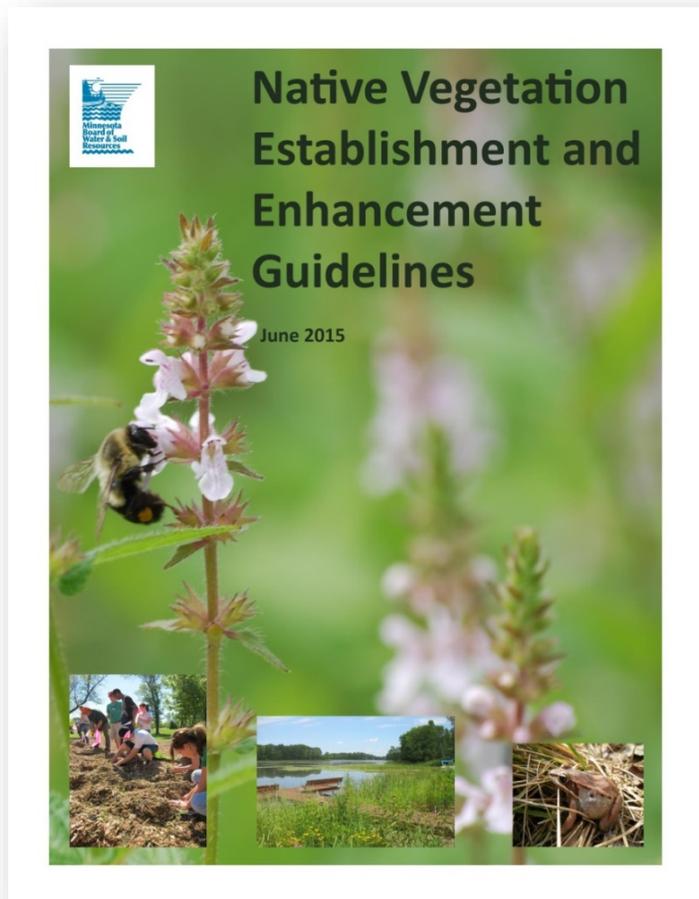
Rockfill Buttress

Source: USGS. The Landslide Handbook— A Guide to Understanding Landslides

Education & Outreach

Education and outreach efforts begin with public participation in the Landslide Risk Assessment. Private landowners and elected officials are the target audience for education and outreach efforts. Elected officials are key because they can enact regulatory changes and secure funding for landslide mitigation efforts. Private landowners are important because they often are not aware their property is at risk or do not know how to identify warning signs.

The completed Landslide Risk and Hazard assessments should be publicly available. Elected officials should be briefed on the results and mitigation strategies that require their assistance. Owners of properties in high-risk areas should be invited to special meetings in which the results of the risk assessment and appropriate mitigation strategies are discussed.



Minnesota already has several effective tools that offer information related to landslide mitigation, particularly for vegetation and drainage. The Minnesota Board of Water & Soil Resources issued the *Native Vegetation Establishment and Enhancement Guidelines* in June 2015. This document details methods for planting appropriate vegetation for a variety of situations, including streambank and ravine stabilization.

The Department of Natural Resources' *Restore Your Shore* program assists shoreland owners and professionals in implementing shoreland restoration and protection projects. The guidance offered in this program also applies to slope stabilization. *Restore Your Shore* also offers a good example for showcasing demonstration projects. Links to several publications and programs that can assist in education and outreach efforts are listed here:

Native Vegetation Establishment and Enhancement Guidelines, Minnesota Board of Water and Soil Resources

http://www.bwsr.state.mn.us/native_vegetation/seeding_guidelines.pdf

Restore Your Shore, Minnesota Department of Natural Resources

<http://www.dnr.state.mn.us/restoreyourshore/index.html>

Ravine Restoration Toolkit, Lake Michigan Watershed Ecosystem Partnership

<http://www.greatlakes.org/document.doc?id=1370>

Resources Guidelines for Restoring Natural Plant Communities along Trails and Waterways Chapter 4 – Riparian Environments, Minnesota Department of Natural Resources

http://files.dnr.state.mn.us/assistance/nrplanning/community/trails_plantcommunities/chapter4.pdf

Management of Bluffs and Slopes, Minnesota Department of Natural Resources.

http://files.dnr.state.mn.us/publications/waters/shoreland_rules_fact_sheet_bluff_management.pdf

Cost-Effective and Sustainable Road Slope Stabilization and Erosion Control, National Cooperative Highway Research Program

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_430.pdf

The Landslide Handbook - A Guide to Understanding Landslides, United States Geological Survey.

http://pubs.usgs.gov/circ/1325/pdf/C1325_508.pdf

Overview of Landslide Mitigation Techniques, Dr. J. David Rogers, PE, Missouri University of Science and Technology

http://dr-rogers.com/Puplications/hazard_mitigation_techniques/Rogers-Overview%20Landslide%20Mitigation.pdf



Photo courtesy of the MNDNR

Sample Ordinances and Codes

1. Minneapolis, Mississippi River Critical Area Overlay District	9
2. Minneapolis, Shoreland Overlay District.....	10
3. Olmsted County Decorah Edge Overlay District.....	14
4. Pittsburgh, Pennsylvania Landslide-Prone Overlay District	18
5. Salem, Oregon Landslide Hazards Ordinance.....	20
6. Cincinnati, Ohio Hillside Overlay Districts	25
7. Cincinnati, Ohio Excavation Or Filling Of Land Code.....	30

1. Minneapolis, Mississippi River Critical Area Overlay District

551.660. - Purpose.

The MR Mississippi River Critical Area Overlay District is established to prevent and mitigate damage to the Mississippi River, to preserve and enhance the Mississippi River's natural, aesthetic, cultural and historic value for public use, to protect and preserve the biological and ecological functions of the Mississippi River corridor, to comply with the requirements regarding the management of critical areas, and to protect the public health, safety and welfare.

551.670. - Established boundaries.

The boundaries of the MR Overlay District shall be the Mississippi River and the Mississippi River corridor as designated in Executive Order 79-19, and shown on the official zoning map. (2000-Or-048, § 8, 5-19-2000)

551.680. - Shoreland overlay district regulations to apply.

The regulations contained in the SH Shoreland Overlay District shall apply to that portion of the MR Overlay District located within three hundred (300) feet of the Mississippi River or the landward extent of the floodplain of the Mississippi River, whichever is greater, except as otherwise provided in this article. For the purposes of this section, the Mississippi River shall be considered a protected water.

551.690. - Shoreland overlay district variances to apply.

The variances to the SH Shoreland Overlay District regulations provided in Chapter 525, Administration and Enforcement, shall apply to the MR Overlay District.
(2000-Or-048, § 9, 5-19-2000)

551.700. - Development on bluffs or within forty (40) feet of the top of bluffs.

Development not otherwise governed by section 551.680 shall not be located on a bluff or within forty (40) feet of the top of a bluff, except where approved by a variance as provided in this article and Chapter 525, Administration and Enforcement, and shall be subject to the following additional conditions:

- (1) The foundation and underlying material shall be adequate for the slope condition and soil type.
- (2) The development shall present no danger of falling rock, mud, uprooted trees or other materials.
- (3) The view of the developed slope from the protected water shall be consistent with the natural appearance of the slope, with any historic areas, and with surrounding architectural features.

(2000-Or-048, § 10, 5-19-2000)

551.710. - Height of structures.

The maximum height of all structures within three hundred (300) feet of the Mississippi River or the landward extent of the floodplain of the Mississippi River, whichever is greater, and within one hundred (100) feet of the top of a bluff, shall be two and one-half (2.5) stories or thirty-five (35) feet, whichever is less. The height limitations shall not apply to the central riverfront between Plymouth Avenue North and I-35W, or the east bank from First Avenue Northeast to Central Avenue. The height limitations of principal structures may be increased by conditional use permit, as provided in Chapter 525, Administration and Enforcement. In addition to the conditional use standards contained in Chapter 525 and this article, the city planning commission shall consider, but not be limited to, the following factors when determining maximum height:

- (1) Access to light and air of surrounding properties.
- (2) Shadowing of residential properties or significant public spaces.
- (3) The scale and character of surrounding uses.
- (4) Preservation of views of landmark buildings, significant open spaces or water bodies.

551.720. - Off-premise advertising signs prohibited.

Off-premise advertising signs and billboards, including the sign face and structure, which may be viewed from the Mississippi River shall be prohibited, except a sign or billboard designated by the Heritage Preservation Commission or determined by the Heritage Preservation Commission to be a contributing feature in a historic district.

2. Minneapolis, Shoreland Overlay District

551.440. - Purpose.

The SH Shoreland Overlay District is established to preserve and enhance the environmental qualities of surface waters and the natural and economic values of shoreland areas within the city, to provide for the efficient and beneficial utilization of those waters and shoreland areas, to comply with the requirements of state law regarding the management of shoreland areas, and to protect the public health, safety and welfare.

551.450. - Established boundaries.

The boundaries of the SH Overlay District shall be all land located within the following distances from protected waters: (1) One thousand (1,000) feet from the ordinary highwater mark of a lake, pond, wetland or flowage; or (2) Three hundred (300) feet from a river or stream or the landward extent of the floodplain of such river or stream, whichever is greater.

(2000-Or-048, § 2, 5-19-2000)

551.460. - Definitions.

As used in this article, the following words and phrases shall mean:

Best management practices. Erosion and sediment control and water quality practices that are the most effective and practicable means of controlling, preventing and minimizing degradation of surface water.

Bluff. A steep outcropping, hill, cliff or embankment along a river or stream, with an average slope of eighteen (18) percent or greater measured over a horizontal distance of fifty (50) feet or more, and that rises at least twenty-five (25) feet above the ordinary high water mark of the protected water.

Clear cutting. The removal of an entire stand of trees, shrubs, bushes or similar vegetation.

Development. The erection, construction, reconstruction, relocation or enlargement of any structure except walkways, stairways, retaining walls, light poles, piers, docks and similar structures where accessory to a public park, unenclosed structures up to four hundred (400) square feet and not more than twenty (20) feet wide used for the storage of watercraft where accessory to a public park and if located at least ten (10) feet from the ordinary high water mark of any protected water, and stairways and seasonal docks not exceeding four (4) feet in width where accessory to any other use.

Ordinary highwater mark. A mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. The ordinary highwater mark commonly is that point where natural vegetation changes from predominantly aquatic to predominantly terrestrial.

Protected waters. The following lakes, ponds, wetlands, streams and rivers are protected waters: Brownie Lake, Cedar Lake, Lake of the Isles, Lake Calhoun, Lake Harriet, Lake Nokomis, Lake Hiawatha, Mother Lake, Legion Lake, Cemetery Lake, Diamond Lake, Grass Lake, Powderhorn Lake, Ryan Lake, Spring Lake, Taft Lake, Birch Pond, Bridal Veil Pond, Loring Pond, Webber Pond, wetlands mapped by the city engineer or classified by the United States Fish and Wildlife Service, Bassett Creek, Minnehaha Creek and Shingle Creek and the Mississippi River.

Steep slope. Land having an average slope of eighteen (18) percent or greater measured over a horizontal distance of fifty (50) feet or more. Steep slopes that are less than ten (10) feet in height shall not be considered a steep slope.

Surface water oriented uses. Land uses in which access to or use of a surface water feature is an integral component, such as boathouses, docks, marinas, observation platforms and water control structures including locks and dams.

Top of steep slope. The contour at which the slope ceases to be eighteen (18) percent or more.
(2000-Or-048, § 3, 5-19-2000)

551.470. - Location of development.

- (a) Location prohibited except as authorized by variance. Except as allowed in section (b) below or where approved by a variance as provided in this article and Chapter 525, Administration and Enforcement, development in the SH Overlay District shall be prohibited on steep slopes or within forty (40) feet of the top of a steep slope or bluff, and shall not be located within fifty (50) feet of the ordinary high water mark of any protected water. Development authorized by variance shall be subject to the following:

- (1) Development must currently exist on the steep slope or within forty (40) feet of the top of a steep slope within five hundred (500) feet of the proposed development.
 - (2) The foundation and underlying material shall be adequate for the slope condition and soil type.
 - (3) The development shall present no danger of falling rock, mud, uprooted trees or other materials.
 - (4) The view of the developed slope from the protected water shall be consistent with the natural appearance of the slope, with any historic areas, and with the surrounding physical context.
- (b) Location restricted except as authorized by conditional use permit. Conditional uses authorized in the primary zoning district are also authorized in the SH Overlay District and are subject to section (a) above. Notwithstanding section (a) above, the following uses may be allowed in all areas of the SH Overlay District by conditional use permit rather than variance as provided in this article and Chapter 525, Administration and Enforcement.
- (1) Public parks and surface water-oriented development on steep slopes or within forty (40) feet of the top of a steep slope, other than bluffs, or within fifty (50) feet of the ordinary high water mark of any protected water, where allowed by the primary zoning district, provided the development does not cause a hazard to water navigation.
 - (2) Electrical transmission services of under two hundred twenty (220) kilovolts, subject to the following conditions:
 - a. When routing transmission services, all of the following shall be avoided where practicable:
 1. Steep slopes, streams, rivers, valleys and open exposures of water, wetlands, wooded areas, ridge crests and open space recreation areas.
 2. Soils susceptible to erosion, which would create sedimentation and pollution problems, and areas of unstable soils which would be subject to extensive slippage.
 3. Areas with high water tables, especially if construction requires excavation.
 - b. The structural design of transmission services shall consider the following:
 1. Underground placement shall be preferred in order to minimize visual impact. If above ground placement is proposed, the applicant shall describe the economic, technological or land characteristics which make underground placement infeasible.
 2. If above ground placement is necessary, the appearance of any structures shall be made as compatible as practicable with the natural area with regard to height, width, materials used and color.
 3. The cleared portion of the right-of-way shall be kept to a minimum.
 4. Crossing points over protected waters shall be consolidated with other public facilities and rights-of-way so that the smallest area possible is devoted to crossing.
 - c. In the construction of transmission service, effective erosion and sedimentation control programs shall be conducted during all clearing, construction or reconstruction operations in order to prevent the degradation of surface waters and adjacent lands.
 - d. Right-of-way maintenance shall comply with the following:
 1. Natural vegetation of value to fish or wildlife, which does not pose a hazard to or restrict reasonable use of the utility, shall be allowed to grow in the right-of-way.
 2. Where vegetation has been removed, new vegetation consisting of native grasses, herbs, shrubs and low- growing trees shall be planted and maintained on the right-of-way.
 3. Chemical control of vegetation shall be avoided. Where such methods are necessary, chemicals used and the manner of their use shall be in accordance with rules, regulations and other requirements of all state and federal agencies with authority over the use, and best management practices shall be followed.

(2000-Or-048, § 4, 5-19-2000; 2008-Or-010, § 1, 2-1-08)

551.480. - Height of structures.

Except for structures subject to a more restrictive maximum height limitation in the primary zoning district, the maximum height of all structures within the SH Overlay District, except for single- and two-family dwellings, shall be two and one-half (2.5) stories or thirty-five (35) feet, whichever is less. The maximum height of single and two-family dwellings shall be two and one-half stories or twenty-eight (28) feet, whichever is less. The highest point of the roof of a single- or two-family dwelling with a gable, hip, or gambrel roof shall not exceed thirty-three (33) feet. The height limitation of accessory structures and single- and two-family dwellings may be increased by variance, as provided in Chapter 525, Administration and Enforcement. The height limitation of all other principal structures may be increased by conditional use

permit, as provided in Chapter 525, Administration and Enforcement. In addition to the conditional use standards contained in Chapter 525, the city planning commission shall consider, but not be limited to, the following factors when determining maximum height:

- (1) Access to light and air of surrounding properties.
- (2) Shadowing of residential properties or significant public spaces.
- (3) The scale and character of surrounding uses.
- (4) Preservation of views of landmark buildings, significant open spaces or water bodies.

(2008-Or-010, § 2, 2-1-08; 2014-Or-063, § 1, 8-29-2014, eff. 10-1-2014)

551.490. - Conditional uses and variances.

(a) Evaluation criteria. In addition to the conditional use and variance standards contained in Chapter 525, Administration and Enforcement, the city planning commission and board of adjustment shall consider the following:

- (1) The prevention of soil erosion or other possible pollution of public waters, both during and after construction.
- (2) Limiting the visibility of structures and other development from protected waters.
- (3) The suitability of the protected water to safely accommodate the types, uses and numbers of watercraft that the development may generate.

(2000-Or-048, § 5, 5-19-2000; 2007-Or-089, § 1, 10-19-07; 2008-Or-010, § 3, 2-1-08)

551.500. - Development on slopes between twelve (12) and eighteen (18) percent.

Development on slopes between twelve (12) and eighteen (18) percent, other than bluffs, where allowed by the primary zoning district, provided the development is not located within fifty (50) feet of the ordinary high water mark of any protected water, may be allowed in the SH Overlay District subject to the regulations of this article, Chapter 535, Regulations of General Applicability, and the following conditions:

- (1) The foundation and underlying material shall be adequate for the slope condition and soil type.
- (2) The development shall present no danger of falling rock, mud, uprooted trees or other materials.
- (3) The view of the developed slope from the protected water shall be consistent with the natural appearance of the slope, with any historic areas, and with surrounding architectural features.

(2000-Or-048, § 6, 5-19-2000)

551.510. - Grading and filling.

Grading or filling involving more than ten (10) cubic yards where the slope of the land is toward a protected water shall be prohibited within the SH Overlay District except where authorized by an erosion control plan approved by the city engineer and the zoning administrator, subject to the following conditions:

- (1) The smallest amount of bare ground shall be exposed for as short a time as feasible.
- (2) Temporary ground cover, such as mulch, shall be used and permanent ground cover, such as turf grass, native grasses or other perennial flowering plants, vines, shrubs or trees shall be established.
- (3) Best management practices to prevent erosion and trap sediment shall be employed to ensure that soil loss levels do not degrade the protected water.
- (4) Fill shall be stabilized to accepted engineering standards.
- (5) Any work which will change or diminish the course, current or cross-section of a protected water shall be prohibited except where approved by the commissioner of natural resources.
- (6) The top of a riverbank or lake bank shall not be moved closer to the protected water.
- (7) Such grading or filling shall comply with the provisions of Chapter 52, Erosion and Sediment Control for Land Disturbance Activities, of the Minneapolis Code of Ordinances.

551.520. - Removal of vegetation.

Removal of vegetation on steep slopes or bluffs or within forty (40) feet of the top of steep slopes or bluffs, or within fifty (50) feet of the ordinary high water mark of any protected water, shall be prohibited within the SH Overlay District except as authorized by the zoning administrator subject to the following conditions:

- (1) Clear cutting of vegetation shall be prohibited, except as necessary for an approved development and subject to the requirements of this article and Chapter 535, Regulations of General Applicability. This provision shall not prevent the removal of noxious weeds or dead or diseased vegetation.

- (2) Selective removal of vegetation shall be allowed, subject to the requirements of this article and Chapter 535, Regulations of General Applicability, provided sufficient vegetative cover remains to screen parking areas, dwellings and other structures when viewed from the protected water and provided a continuous natural cover is maintained.
 - (3) Vegetation shall be restored to the extent feasible after any construction project is completed to retard surface runoff and soil erosion and to provide screening. Restoration shall be completed as soon as feasible, but in no case later than the beginning of the next growing season following the completion of a project.
 - (4) Best management practices to prevent erosion and trap sediment shall be employed to ensure that soil loss levels do not degrade the protected water.
- (2000-Or-048, § 7, 5-19-2000)

551.530. - Stormwater management.

All development shall comply with all applicable regulations governing stormwater management, and shall employ best management practices to minimize off-site stormwater runoff, maximize overland flow and flow distances over surfaces covered with vegetation, increase on-site filtration, replicate predevelopment hydrologic conditions as nearly as possible, minimize off-site discharge of pollutants to ground and surface water, and encourage natural filtration function.

3. Olmsted County Decorah Edge Overlay District

Section 9.20 Decorah Edge Overlay District

9.21 Intent and Application

Intent: The intent of the Decorah Edge Overlay Zone (DEOZ) regulations is to guide development in the vicinity of the Decorah Edge in order to protect discharge, interflow, and infiltration and recharge processes taking place in the vicinity of the Decorah Edge; to protect water quality and quantity recharging the aquifers relied on for potable water supply; to prevent extraordinary public expenditure for remediation of damage to public infrastructure; and to protect the environmental quality of Decorah Edge wetlands and related natural habitats; all of which promote the public health, safety and general welfare.

The regulations of this district are superimposed upon other existing zoning districts, superseding the regulations of those other districts only to the extent that developments must meet the additional standards of this chapter as well as those of the underlying district in order to comply with this ordinance.

Application: The Decorah Edge Overlay Zone applies to unplatted lands zoned to accommodate commercial or industrial development or residential development at a density greater than four lots per quarter quarter section within the Decorah Edge as defined and mapped in accordance with the Olmsted County Wetland Conservation Ordinance. The Decorah Edge Overlay Zone does not apply to the development of residential or agricultural uses on existing lots of record in existence at the time of enactment of these provisions.

9.22 Definitions Related to This Chapter

1. Decorah Edge - For the purposes of this ordinance the Decorah Edge is the area so identified in the Olmsted County Wetland Conservation Ordinance, as updated.
2. Edge Support Area - The term "Edge Support Area" shall include any area so identified in the Olmsted County Wetland Conservation Ordinance.
3. Hydric Soil - A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA NRCS "Hydric Soils – Introduction," available at <http://soils.usda.gov/use/hydric/intro.html>, accessed September 26, 2005). Hydric soils that occur in areas having hydrophytic vegetation and wetland hydrology are wetland soils.
4. Wetland - An area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances supports a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
5. Groundwater supported slope wetland - A wetland that is saturated predominantly by ground water, including wetlands in the vicinity of springs or seeps. Such wetlands may be associated with highly organic peat-like soils such as Haverhill (474B) and Palms (528B) soils.
6. Managed Open Space - An area identified by easement or other mechanism that guarantees that the area will not be intentionally disturbed and that provides, at a minimum, for access by a public agency or a qualified land trust for purposes of monitoring the condition of and maintaining the site.

9.23 Development Standard

Within the DEOZ, development shall be carried out in such a way as to minimize the loss of wetlands and Edge Support Areas, maintain the potential for attenuation of groundwater pollutants including nitrate, maintain or enhance the quantity and quality of infiltration into the St.Peter, Prairie du Chien and Jordan aquifers, and protect groundwater discharge, interflow, and recharge characteristics.

9.24 Metes and Bounds Subdivisions

Except within the A-1, A-2, and A-3 Districts, creation of a lot by metes and bounds shall require a site plan showing that the buildable area, sewage treatment facilities, and runoff from impervious surfaces will not

affect wetlands and Edge Support Areas as defined in the Olmsted County Wetland Conservation Ordinance, unless approved under the Wetland Conservation Ordinance.

9.25 General Development Plan

Except as provided below, all commercial and industrial development and all platted residential development in the DEOZ shall take place in accordance with an approved general development plan meeting the development standard of Section 9.23. The following are exempt from this requirement:

1. lots included in a plat recorded as of the effective date of this ordinance amendment;
2. lots included in a preliminary plat approved within two years prior to the effective date of this ordinance; or
3. lots included in a preliminary plat approved within two years after the effective date of this ordinance that are located in a general development plan that was approved prior to the effective date of this ordinance.
4. If within a general development plan for future platted residential development that was approved prior to the effective date of this ordinance and that does not meet the requirements of this Section, there remains an area that has not received approval of a preliminary plat within two years of the effective date of this ordinance, the general development plan for the remaining area must be revised to meet these requirements prior to or concurrent with consideration of a preliminary plat. Cambridge Hills, Boulder Ridge, Mayo Woodlands, and Hunter Point General Development Plans are exempt from the requirements of Section 9.23.

9.26 R-1/DE Development

Within the R-1/DE District, a conservation design development which provides for an overall gross density of up to one dwelling per 3.5 acres; a gross density for the area covered by buildable lots, sewage treatment and stormwater runoff control facilities, and roads of up to one lot per 1.5 acres; and a minimum single family home lot size of 30,000 square feet may be accommodated in parcels or combinations of parcels any part of which are located in the DEOZ. Such conservation design development is the preferred style of development for development in the DEOZ. A general development plan for such development shall meet the following standards in addition to standards applying in the underlying R-1 Zone:

1. Avoidance of the Decorah Edge by roads, drains, pipelines, tiles, the building footprints of structures, other impervious surfaces, and sewage treatment systems to the maximum extent feasible, except where insufficient land area outside the Decorah Edge is included in the general development plan to accommodate the allowed density.
2. Complete avoidance of disturbance to groundwater supported slope wetlands and Edge Support Areas, except where provided for under the exemption and no-loss determination provisions or through the appeal process of the Olmsted County Wetland Conservation Ordinance.
3. Inclusion of wetlands in managed open space, to the maximum extent feasible, but in no case less than 75% of wetland areas. Wetland areas included as managed open space may provide for management through a conservation easement provided to the County prior to platting or through other mechanisms providing a similar level of protection and management oversight.
4. Provision for vegetative management of wetlands and Edge Support Areas, which shall include at a minimum, protection of such areas from disturbance, and which, at the discretion of the platting authority, may provide for posting or fencing of such areas, sustainable timber harvesting, restoration of native plant communities, or other vegetation management activities consistent with minimal disturbance and long term maintenance of natural vegetation. Vegetative management activities shall be documented in a vegetation management plan subject to the approval of the platting authority. The intent of this section is to maintain or augment nutrient uptake by deep-rooted vegetation.
5. Provision for storm water management and discharge/interflow/recharge management plans that provide for protection of offsite properties from damage related to drainage and for maintaining pre-development discharge, interflow, and recharge characteristics.
6. Financial arrangements, deed restrictions, or other arrangements sufficient to provide for installation of sewage pretreatment, management of vegetation, and management and maintenance of multi-party sewage treatment and storm water management facilities in perpetuity.
7. Density Bonus: Density of development up to an overall gross density of one dwelling per 2.5 acres and a minimum single family home lot size of 14,000 square feet may be accommodated provided

- A. roads, treatment facilities, drains, pipelines, tiles, the building footprints of structures, and driveways and other impervious surfaces avoid the Decorah Edge area to the maximum extent feasible; and
- B. all wetland areas and Edge Support Areas are maintained in managed open space; and
- C. other areas of the original site in native vegetation, and other areas of the site on slopes over 18%, are maintained in managed open space to the maximum extent feasible, but in no case less than 50% of such areas; and
- D. pretreatment or other nitrate reduction sewage treatment systems are installed resulting in a nitrate impact on groundwater equivalent to an overall 3.5-acre density of development.

9.27 R-A/DE Development

Within the R-A/DE District, a development which provides for a density of up to an overall gross density of one dwelling per five acres; a gross density for the area covered by buildable lots, sewage treatment and stormwater runoff control facilities, and roads of 2.5 acres per lot; and a minimum single family home lot size of 80,000 square feet may be accommodated in parcels any part of which are located in the DEOZ. A general development plan for such development shall meet the following standards in addition to standards applying in the underlying RA District:

1. Avoidance of the Decorah Edge by roads, drains, pipelines, tiles, the building footprints of structures, other impervious surfaces, and sewage treatment systems to the maximum extent feasible, except where insufficient land area outside the Decorah Edge is included in the general development plan to accommodate the allowed density.
2. Complete avoidance of disturbance to wetlands and Edge Support Areas, except where provided for under the exemption and no-loss determination provisions or through the appeal process of the Olmsted County Wetland Conservation Ordinance.
3. Inclusion in managed open space of wetlands, to the maximum extent feasible, but in no case less than 75% of wetland areas. Wetland areas included as managed open space may provide for management through a conservation easement provided to the County prior to platting or through other mechanisms providing a similar level of protection and management oversight.
4. Provision for vegetative management of wetlands and Edge Support Areas, which shall include at a minimum, protection of such areas from disturbance, and which, at the discretion of the platting authority, may provide for posting or fencing of such areas, sustainable timber harvesting, restoration of native plant communities, or other vegetation management activities consistent with minimal disturbance and long term maintenance of natural vegetation. Vegetative management activities shall be documented in a vegetation management plan subject to the approval of the platting authority. The intent of this section is to maintain or augment nutrient uptake by deep-rooted vegetation.
5. Provision for stormwater management and discharge / interflow / recharge management plans that provide for protection of offsite properties from damage related to storm water runoff and that provide for maintaining pre- development discharge, interflow, and recharge characteristics.
6. Financial arrangements, deed restrictions, or other arrangements sufficient to provide for installation of sewage pretreatment, management of vegetation, and management and maintenance of multi-party sewage treatment and storm water management facilities in perpetuity.
7. Pasture management plans that guarantee sustainable pasture management and which protect wetlands and woodlands in the Decorah Edge portions of the site from grazing and from runoff from grazed areas.

9.28 Conventional Development

If it is determined at the time of wetland delineation that portions of the areas mapped as Decorah Edge do not include wetlands or Edge Support Areas, a general development plan may proceed under conventional zoning and subdivision approaches for such portions of parcels. The area of parcels developed conventionally shall not be considered in the density calculations permitted under Sections 9.25 or 9.26 related to the development of other parcels included in the general development plan that contain wetlands or Edge Support Areas. For the purposes of this section, a portion of a parcel may be considered for conventional development when all of the following circumstances are met:

1. a reasonable use remains for any residual portions of the original parcel; and
2. all portions of the original parcel are included in the GDP; and

3. the portion of the parcel to be developed conventionally is contiguous; and
4. the portion of the parcel to be developed conventionally is at least 15 acres in area.

The determination that a reasonable use remains for residual portions of the original parcel shall reflect such attributes of the residual portions as contiguity, compactness, topography, developable area, and natural constraints on development for areas intended for development. Conservation easements or other means of preserving natural resource or open space uses of residual parcels may be considered to provide for reasonable use.

4. Pittsburgh, Pennsylvania Landslide-Prone Overlay District

906.04. - LS-O, Landslide-Prone Overlay District.

906.04.A Purpose

The LS-O, Landslide-Prone Overlay District regulations require subsurface investigations by a registered professional and approval of construction plans by the Chief of the Bureau of Building Inspection prior to issuance of a Certificate of Occupancy for any development in the LS-O District. The purpose of these regulations is to reduce the risk of damage or hazards of life that may occur as a result of construction and land operations on lands susceptible to movement or sliding of earth.

906.04.A.1 Warning and Disclaimer

The mapped delineations of land that may be subject to sliding or subsidence do not necessarily include all land that is subject to those hazards. While it is the purpose of the regulations contained in this section to afford reasonable protection against damages caused by construction on or use of hazard-prone land, neither the mapped delineations nor any regulations contained in this section shall create any liability on the part of the City, its officers or employees for damages that may occur.

906.04.B Effect of District Regulations

Within the LS-O District, land may be used and structures may be erected, altered or enlarged for any use that is allowed in the underlying zoning district, in accordance with the site development standards of the underlying zoning district and all other applicable requirements. The following requirements shall also apply with the LS-O District.

906.04.B.1 Compliance with Hillside Development Standards

Every new or changed use of land and every structure hereafter erected or enlarged within the LS-O District shall comply with the Hillside Development Standards of the Subdivision Regulations.

(a) An applicant for approval of a Certificate of Occupancy in the LS-O District shall submit a development plan for the site, which shall include a site plan, building plan and such other information as determined by the Zoning Administrator to be necessary to evaluate the proposed development for compliance with the Hillside Development Standards of the Subdivision Regulations.

(b) The Zoning Administrator shall not approve an application for a Certificate of Occupancy in the LS-O District unless the development plan for the subject property complies with the Hillside Development Standards of the Subdivision Regulations.

906.04.B.2 Review by the Zoning Administrator

No Certificate of Occupancy application shall be approved for zoning for any structure or for any use of land requiring excavation, fill or removal of vegetation until the applicant has submitted evidence, acceptable to the Zoning Administrator, that the proposed construction or development shall not contribute to or create conditions of increased susceptibility to landslides, soil erosion or any other movement of earth. Such evidence shall be based on field investigation performed by a registered professional as defined in the Land Operations Ordinance or a geotechnical consultant with appropriate professional insurance certification and the appropriate academic credentials and professional association.

906.04.B.3 Review by the Chief of the Bureau of Building Inspection

No building permit or land operations permit application shall be approved for any structure or for any use of land requiring excavation, fill or removal of vegetation in a Landslide-Prone District until construction plans and land operations plans for the site in question have been approved by the Chief of the Bureau of Building Inspection, based on findings and recommendations of the site investigation required under Sec. 906.03.B.2. In the implementation of this requirement, the Chief of the Bureau of Building Inspection may require that construction and land plans be prepared or approved by a registered professional as defined in the Land Operations Ordinance or a geotechnical consultant with appropriate professional insurance certification and the appropriate academic credentials and professional association.

5. Salem, Oregon Landslide Hazards Ordinance

Chapter 810 page 1 5/2014

CHAPTER 810 LANDSLIDE HAZARDS

- 810.001. Purpose
- 810.005. Applicability
- 810.010. Definitions
- 810.015. Map Adoption
- 810.020. Landslide Hazard Construction Permit
- 810.025. Landslide Hazard Risk Assessment
- 810.030. Standards for Geological Assessments and Geotechnical Reports
- 810.035. Certification of Compliance

810.001. Purpose. The purpose of this Chapter is to implement the Geologic Hazards policy of the Scenic and Historic Areas, Natural Resources, and Hazards section of the Salem Area Comprehensive Plan and to promote the public health, safety and welfare by:

- (a) Assessing the risk that proposed uses or activities will adversely affect the stability and slide susceptibility of an area;
- (b) Establishing standards and requirements for the use and development of land within landslide hazard areas; and
- (c) Mitigating risk within landslide hazard areas. (Ord No. 31-13)

810.005. Applicability. This chapter applies to all areas of land designated as Moderate Landslide Hazard Risk or High Landslide Hazard Risk pursuant to this Chapter. (Ord No. 31-13)

810.010. Definitions. Unless the context otherwise specifically requires, as used in this Chapter, the following mean:

- (a) Certified Engineering Geologist: Any Registered Geologist who is certified in the specialty of Engineering Geology under provisions of ORS 672.505 to 672.705.
- (b) Geological assessment: An assessment prepared and stamped by a Certified Engineering Geologist, detailing the surface and subsurface conditions of the site and delineating the areas of a property that might be subject to specified geologic hazards.
- (c) Geotechnical Engineer: A Professional Engineer, registered in the State of Oregon as provided by ORS 672.002 to 672.325, who by training, education and experience is qualified in the practice of geotechnical or soils engineering practices.
- (d) Geotechnical report: A report prepared and stamped by a Certified Engineering Geologist and Geotechnical Engineer, evaluating the site conditions and mitigation measures necessary to reduce the risks associated with development in geologically hazardous areas.
- (e) Graduated response tables: Those tables under SRC 810.025 that are used to determine the total landslide hazard risk and required level of site investigation for regulated activities under this Chapter.
- (f) Landslide: The down slope movement of soil, rocks, or other surface matter on a site. Landslides may include, but are not limited to, slumps, mudflows, earthflows, debris flows, and rockfalls.
- (g) Landslide Hazard Susceptibility Map: Cumulatively, the Oregon Department of Geology and Mineral Industries (DOGAMI) Interpretive Map Series IMS-5, IMS-6, IMS-17, IMS-18, and IMS-22 maps, together with the slope contour map.
- (h) Mitigation measure: An action designed to reduce project-induced geologically hazardous area impacts.
- (i) Tree: Any living, woody plant, which grows to 15 feet or more in height, having a trunk which is 10 inches or more dbh.
- (j) Tree removal: To cut down a tree or remove all or 30% or more of the crown, trunk, or root system of a tree; or to damage a tree so as to cause the tree to decline or die. "Removal" includes, but is not limited to, topping, damage inflicted upon a root system by application of toxic substances, operation of equipment and vehicles, storage of materials, change of natural grade due to

unapproved excavation or filling, or unapproved alteration of natural physical conditions. "Removal" does not include normal trimming or pruning of trees. (Ord No. 31-13)

810.015. Map Adoption. Areas subject to this Chapter shall be shown on Landslide Hazard Susceptibility Maps, which shall be adopted by administrative rule by the Director pursuant to SRC Chapter 20J. The Landslide Hazard Susceptibility Maps shall indicate the general location of areas of low, moderate, and high susceptibility to landslides, areas of known slide hazards, and slope contours. These maps shall be based on the best available information. (Ord No. 31-13)

810.020. Landslide Hazard Construction Permit.

(a) Applicability.

(1) Except as provided in paragraph (2) of this subsection, no person shall engage in any of the following activities in areas designated as moderate or high total landslide hazard risk without first obtaining a landslide hazard construction permit.

(A) Excavation or fill, as independent activity, exceeding 2 feet in depth or 25 cubic yards of volume;

(B) Installation or construction of any structure greater than 500 square feet in area;

(C) Alteration, enlargement, reconstruction, or relocation of a structure greater than 500 square feet in area that requires any modification to the foundation;

(D) Land division, planned unit development, or manufactured dwelling park; or

(E) Tree removal, as an independent activity, on regulated slopes greater than 60%.

(2) **Exemptions.** A landslide hazard construction permit is not required for the following:

(A) Excavation and fill exceeding 2 feet in depth or 25 cubic yards of volume within a public right-of-way or public utility easement.

(B) Activities otherwise identified in paragraph (1) of this subsection which must be undertaken immediately to prevent an imminent threat to public health or safety, or prevent imminent danger to public or private property; provided, however:

(i) The person undertaking such emergency activity shall notify the Director within one working day following the commencement of the activity.

(ii) If the Director determines that the activity, or any part thereof, is beyond the scope of allowed emergency activity, enforcement action may be taken.

(b) **Procedure Type.** A landslide hazard construction permit is processed as a Type I procedure under SRC Chapter 300.

(c) **Submittal Requirements.** In lieu of the application submittal requirements under SRC Chapter 300, an application for a landslide hazard construction permit shall include the following:

(1) A completed application form.

(2) A geological assessment, geotechnical report, or both, as applicable.

(d) **Criteria.** A landslide hazard construction permit shall be granted if:

(1) The geological assessment, geotechnical report, or both, as applicable, meets the standards of this chapter; and

(2) The geological assessment, geotechnical report, or both, as applicable:

(A) Indicates the development can proceed without a risk of landslide hazard; or

(B) Sets forth mitigation measures that will reduce or eliminate the risk of landslide hazard.

(e) The Director may, at the City's expense, elect to have an independent Certified Engineering Geologist or Geotechnical Engineer, selected from a list of prequalified consultants, review the report or its conclusions.

(f) Conclusions and recommendations set forth in an approved geological assessment or geotechnical report shall be incorporated as conditions of approval of the landslide hazard construction permit. The landslide hazard construction permit shall be incorporated into any land use approval connected with the regulated activity. (Ord No. 31-13)

810.025. Landslide Hazard Risk Assessment.

(a) **Graduated Response Tables.** The Graduated Response Tables set forth in this subsection are used to determine the total landslide hazard risk and required level of site investigation for regulated activities under this Chapter. To determine the total landslide hazard risk, follow the steps set forth in this

subsection. Where any portion of a proposed activity is identified under multiple landslide susceptibility ratings, the highest rating shall apply.

- (1) **Step One: Earthquake Induced Landslide Susceptibility.** Select one assigned point value from Table 810-1A and proceed to step two.

**TABLE 810-1A
EARTHQUAKE-INDUCED LANDSLIDE SUSCEPTIBILITY RATINGS**

Table 810-1A: Earthquake-Induced Landslide Susceptibility Ratings	
Physiographic and Geologic Categories	Assigned Point Value
Property identified under Very Low or Low Categories on IMS-17 or IMS-18.	0 Points
Property identified under a Moderate Category on IMS-17 or IMS-18.	2 Points
Property identified under a High Category on IMS-17 or IMS-18.	3 Points
<u>References:</u> Interpretive Map Series (IMS-17), Interpretive Map Series (IMS-18)	

- (2) **Step Two: Water-Induced Landslide Susceptibility.** Select one assigned point value from Table 810-1B and proceed to step 3.

**TABLE 810-1B
WATER-INDUCED LANDSLIDE SUSCEPTIBILITY RATINGS**

Table 810-1B: Water-Induced Landslide Susceptibility Ratings	
Physiographic and Geologic Categories	Assigned Point Value
Property identified under Category 1 on IMS-5 and IMS-6 Reports.	0 Points
Property identified under Categories 2 or 3 on IMS-5 or IMS-6 Reports.	2 Points
Property outside the boundaries of IMS-5, IMS-6, IMS-17, IMS-18, and IMS-22 and between 15% - 25 % slopes, including 25%.	2 Points
Property identified under Categories 4, 5a, 5b, or 6 on IMS-5 or IMS-6 Reports.	3 Points
Property identified in IMS-22 Report.	3 Points
Property outside the boundaries of IMS-5, IMS-6, IMS-17, IMS-18, and IMS-22 and over 25% slopes.	3 Points
<u>References:</u> Interpretive Map Series (IMS-5), Interpretive Map Series (IMS-6), Interpretive Map Series (IMS-17), Interpretive Map Series (IMS-18), Interpretive Map Series (IMS-22) and Slope Contour Map	

- (3) **Step Three: Activity Susceptibility Ratings.** Select one assigned point value from Table 810-1C and proceed to step four.

**TABLE 810-1C
ACTIVITY SUSCEPTIBILITY RATINGS**

Table 810-1C: Activity Ratings		Assigned Point Value
Type of Activity		
Excavation or fill, as an independent activity, exceeding 2 feet in depth or 25 cubic yards of volume.		3 Points
Installation or construction of any structure greater than 500 square feet in area.	Single Family, Duplex, or Manufactured Dwelling Building Permit	1 Point
	Multiple Family Building Permit	2 Points
	Schools, Hospital, or Public Building Permit	3 Points
	Commercial or Industrial Building Permit	3 Points
Alteration, enlargement, reconstruction, or relocation of a structure greater than 500 square feet in area that requires any modification to the foundation.	Single Family, Duplex, or Manufactured Dwelling Building Permit	1 Point
	Multiple Family Building Permit	2 Points
	Schools, Hospital, or Public Building Permit	3 Points
	Commercial or Industrial Building Permit	3 Points
Installation or construction of any structure greater than 500 square feet, not otherwise identified in table.		1 Point
Land division, planned unit development, or manufactured dwelling park.	Partition	2 Points
	Subdivision, Planned Unit Development, Manufactured Dwelling Park	3 Points
Tree removal, as an independent activity, on regulated slopes greater than 60% .		3 Points

- (4) **Step Four: Cumulative Score.** Add the sub-totals from Tables 810-1A, 810-1B, and 810-1C. Proceed to step five.

**TABLE 810-1D
CUMULATIVE SCORE**

Table 810-1D: Cumulative Score			
Step 1. Earthquake-Induced Landslide Susceptibility Rating	Step 2. Water-Induced Landslide Susceptibility Rating	Step 3. Activity Susceptibility Rating	Step 4. Cumulative Score
Points:_____	Points:_____	Points :_____	Total Points:_____

- (5) **Step Five: Total Landslide Risk.** Determine the total landslide hazard risk from Table 810-1E. If the total landslide hazard risk meets or exceeds the thresholds for moderate or high landslide hazard risk set forth in Table 810-1E, a geological assessment, geotechnical report, or both, as applicable, shall be provided by the applicant, and the action specified therein undertaken or insured before any regulated activity may be permitted or approved.

**TABLE 810-1E
TOTAL LANDSLIDE HAZARD RISK**

Table 810-1E: Total Landslide Hazard Risk		
Cumulative Score (From Table 810-1D)	Landslide Hazard Risk	Requirement
4 or fewer points	Category A - Low	No Requirements
5 - 8 points	Category B - Moderate	Geologic Assessment/ Geotechnical Report
9 or more points	Category C - High	Geotechnical Report

- (b) After determining the total landslide hazard risk under subsection (a) of this section, the following shall be required:
- (1) **Low Landslide Hazard Risk.** If application of Table 810-1E indicates a Low Landslide Hazard Risk, all regulated activities may proceed without further investigation, permitting, or approval required by this Chapter.
 - (2) **Moderate Landslide Hazard Risk.** If application of Table 810-1E indicates a Moderate Landslide Hazard Risk, a geological assessment shall be submitted for all regulated activities. If the geological assessment indicates that mitigation measures are necessary to safely undertake the regulated activity, a geotechnical report prepared by a Certified Engineering Geologist and Geotechnical Engineer shall be submitted.
 - (3) **High Landslide Hazard Risk.** If application of Table 810-1E indicates a High Landslide Hazard Risk, a geotechnical report prepared by a Certified Engineering Geologist and Geotechnical Engineer shall be submitted for all regulated activities. (Ord No. 31-13)

810.030. Standards for Geological Assessments and Geotechnical Reports. Geological assessments and geotechnical reports required under this Chapter shall include the information required by this section.

- (a) **Geological Assessment.** A geological assessment shall include information and data regarding the nature, distribution of underlying geology, and the physical and chemical properties of existing soils; an opinion as to stability of the site; and conclusions regarding the effect of geologic conditions on the proposed development. The geological assessment shall bear the stamp of a Certified Engineering Geologist.
- (b) **Geotechnical Report.** A geotechnical report shall include a comprehensive description of the site topography and geology; an opinion as to the adequacy of the proposed development from an engineering standpoint; an opinion as to the extent that instability on adjacent properties may adversely affect the project; a description of the field investigation and findings; conclusions regarding the effect of geologic conditions on the proposed development; and specific requirements for plan modification, corrective grading, and special techniques and systems to facilitate a safe and stable development. The report shall provide other recommendations, as necessary, commensurate with the project grading and development. The geotechnical report shall bear the stamp of a Certified Engineering Geologist and Geotechnical Engineer. (Ord No. 31-13)

810.035. Certification of Compliance. No regulated activity requiring a geotechnical report shall receive final approval or be permitted for properties located in areas of High Landslide Hazard Risk until the Director receives a written statement by a Geotechnical Engineer that all measures contained in the geotechnical report are completed, in place, and operable. (Ord No. 31-13)

6. Cincinnati, Ohio Hillside Overlay Districts

Chapter 1433 - HILLSIDE OVERLAY DISTRICTS

§ 1433-01. - Specific Purposes.

The purpose of the Hillside Overlay District regulations is to establish standards to assist in the development of land and structures in existing hillside areas and procedures for the review of proposed development, so that development will be compatible with the natural environment and respect the quality of the urban environment in those locations where the hillsides are of significant public value. These regulations are intended to prevent damage to the City's hillsides by minimizing:

- (a) Blighting influences caused by the application of conventional land use regulations to lots in areas having sensitive environmental qualities.
- (b) Unstable land.
- (c) Significant damage to or destruction of hillsides or valleys.
- (d) Significant damage to the economic value and efficiency of operation of existing properties or new developments due to the interdependence of their visual and functional relationships.
- (e) Soil erosion and stream siltation.
- (f) Destruction of mature trees and existing vegetation.

In hillside areas, the existence of a 20 percent slope, in combination with the KOPE geologic formation, is evidence of a condition of natural critical stability and development under conventional regulations may precipitate landslides or excessive soil erosion. The additional regulations embodied in the Hillside District are needed to respect the contours and views of the hills for all equally, not for the sole benefit of a few individuals.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03. - Definitions.

For purposes of this chapter, words and phrases defined below have the meanings ascribed to them; additional definitions are in Chapter 1401, Definitions.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-B. - Brow.

"Brow" means a brow of the hill that is the separator between the hilltop that is level or gently sloping and the hillside that is steeply sloped.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-C. - Cincinnati Hillside Development Guidelines.

"Cincinnati Hillside Development Guidelines" means the guidelines prepared in 1975 by the Cincinnati Institute for the City Planning Commission which are adopted as an appendix to this chapter. These guidelines are for the evaluation of proposed projects within adopted Hillside Overlay Districts.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-C2. - Colluvium.

"Colluvium" means soil material, rock fragments or both, moved by creep, slide or local wash deposited on or at the base of hillside slopes.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-H. - Hillside Study.

"Hillside Study" means the report prepared by the City Planning Commission in 1969 for general public distribution; this study identified the 23 critical hillsides within the City of Cincinnati, their natural characteristics and general suitability for development.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-I. - 1980 Inventory of Hamilton County Soils.

"1980 Inventory of Hamilton County Soils" means the report prepared by the Ohio Department of Natural Resources Division of Lands and Soil in conjunction with the Soil Conservation Service of the U.S. Department of Agriculture. This study may be used to evaluate the impact and feasibility of development.
(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-K. - KOPE Formation.

"KOPE formation" means the shale bedrock that is overlaid by colluvium soils. (See § 1433-03-C2). The colluvium forms a deposit that is thin on the steeper, higher slopes and gradually becomes thicker near the bottom of the hill. Landslides may occur in the colluvium, because the colluvium is derived from the weathering of bedrock.
(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-L. - Landslide Indicia.

"Landslide Indicia" means geographical contour information included in the Cincinnati Area Geographic Information System (CAGIS) that illustrates both the degree of slope (See § 1433-03-S) as well as irregularities, the presence of which indicate existing or potential landslides. Primary examples of irregularities include:

- (a) A significant variation in the degree of slope within a given hillside, and
- (b) Very closely spaced contours, particularly near the bottom of a slope.

Either of these characteristics may indicate existing or dormant landslides. These characteristics, when combined with the soil type provide a basis for identifying hillsides where site-specific geotechnical investigations are needed.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-L1. - Landslide Susceptible Soils.

"Landslide Susceptible Soils" means a soil of any of the following types when found on slopes of 20 percent or steeper. (See 1980 Inventory of Hamilton County Soils and Landslide Susceptibility Study and Map).

- (a) Bonnell Silt Loam
- (b) Casco Loam
- (c) Eden Silty Clay Loam
- (d) Hennepin Silt Loam
- (e) Markland Silty Clay Loam
- (f) Miamian-Hennepen Silt Loam
- (g) Pate Silty Clay Loam
- (h) Switzerland Silt Loam

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-L2. - Landslide Susceptibility Study and Map.

"Landslide Susceptibility Study and Map" means the study and map prepared in 1980 by the consulting firm of Sowers and Dalrymple for the Department of Transportation and Engineering. This map, which divides the City of Cincinnati into four categories of landslide susceptibility, is also used to determine the need for further geotechnical investigation. Low, moderate, moderately high and high landslide susceptibility categories are used in the determination of HS overlay district boundaries.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-03-S. - Slope.

Slope means the inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a rise of 20 feet in 100 feet of horizontal distance.

Slope(s)	difference between contour elevation (rise)	× 100
----------	--	-------

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-05. - HS Zoning Map Designator.

A Hillside Overlay District is shown on the zoning map by a HS designator applied to the base district designation. This designation is based upon a moderately high or high landslide susceptibility pursuant to the landslide susceptibility study and map: Any real property either whole or in part within said moderately high or high susceptibility areas should be classified as being within a HS District.
(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-07. - Applicability.

Except as otherwise provided in this chapter, all regulations of the underlying zone districts and other applicable overlay districts apply to and control property in an HS District; provided, however, that in the case of conflict between the provisions of an underlying zoning district and the HS District, the provisions of the HS District govern.
(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-09. - Criteria for Establishment of an HS District.

Council may establish HS Districts to include at least 50 percent of its area within one or more of the 23 hillside areas listed in the Hillside Study. The area with a HS overlay district must contain four of the following seven characteristics:

- (a) Slopes of 20 percent or greater;
- (b) Existence of KOPE geologic formations;
- (c) A minimum of one acre of contiguous land area;
- (d) Prominent hillsides that are readily visible from a public thoroughfare located in a valley below a hillside;
- (e) Hillsides that provide views of a major stream or valley;
- (f) Hillsides functioning as community separators or community boundaries as identified in a community plan accepted and approved by the City Planning Commission; and
- (g) Hillsides that support a substantial natural wooded cover.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-11. - Exempt Permits.

The following are exempt from the provisions of this chapter:

- (a) Permits for roof, gutter and chimney repair or replacement, plumbing, heating, air conditioning, elevators, fire alarms and extinguishing equipment and all other mechanical and electrical equipment.
- (b) Permits necessary for compliance with retroactive provisions of the Cincinnati Building Code.
- (c) Permits necessary for compliance with a lawful order of the Director of Buildings and Inspections, including deficiencies listed in Certificates of Inspection.
- (d) Permits necessary to ensure the immediate public health or safety.
- (e) Building permits for interior alterations and repairs, demolition or wrecking, driveways, fences and signs.
- (f) Permits for construction of public utilities in the public right-of-way.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-13. - Applications Subject to Review.

The Zoning Administrator has the duty to review the following permits in an established HS District for compliance with the base requirements of this district.

- (a) *New Buildings*. Permits for construction of new primary buildings and accessory structures larger than 600 square feet in area or 15 feet in height.
- (b) *Alterations to Residential Buildings*. Permits for alterations, additions and repairs to the exterior of residential buildings that result in an increase of dwelling units or exceeds the maximum building envelope.
- (c) *Alterations to Non-Residential Buildings*. Permits for alterations, additions and repairs to the exterior of all non-residential buildings in which the estimated improvement costs exceed \$5,000;
- (d) *Excavation and Fill Permits*. Permits for excavation and fill.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004; Emer. Ord. No. 141-2015, § 44, eff. July 1, 2015)

§ 1433-15. - Application Requirements.

In addition to the requirements for applications established in Chapter 1441, Application Procedures, Fees, Permits and Certificates, applications for development in the HS District that are not exempt under § 1433-11 must include:

- (a) A development plan, accompanied by a property survey, showing existing vegetation and proposed development, and where applicable, streets, drives, parking areas, walkways, heights of structure(s), location of structures, elevation and setback of proposed buildings, drainage, existing contours and proposed grading and new landscaping plans, proposed uses and square footage of uses and recreational facilities;
- (b) A preliminary geotechnical evaluation;
- (c) A determination of the maximum building envelope;
- (d) Average slope/grade of the property; and
- (e) Graphic illustrations demonstrating that the proposed improvement or new structure has not exceeded the maximum building envelope.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-17. - Determination of Maximum Building Envelope.

Each applicant must establish a maximum building volume area to determine the size of a structure that can be built on the site by calculating the following in accordance with the rules of measurement set forth in Chapter 1400:

- (a) *HS Rear Yard Setback.* Average rear yard setback of abutting structures on both sides; or the required rear yard setback of the underlying district if no abutting structure(s) exists.
- (b) *HS Side Yard Setback.* Average side yard setback of abutting structures on both sides; or the required least width side yard setback of the underlying district if no abutting structure(s) exists.
- (c) *HS Front Yard Setback.* Average front yard setback of abutting structures on both sides; or the required front yard setback of the underlying district if no abutting structure(s) exists.
- (d) *HS Height of Front.* Maximum height of the front of the structure; either the maximum height of the underlying zoning district or the average height of the front of abutting structures having the same street frontage as measured from the finished grade of the front of each abutting structure, whichever is greater.
- (e) *HS Height of Rear.* Maximum height of the rear of the structure; either the maximum height of the underlying zoning district or the average height of the rear of abutting structures having the same street frontage as measured from the average grade, whichever is greater.

The maximum building envelope is the solid defined by vertical planes constructed at the HS rear, side and front yard setbacks and the plane between the HS height of front and the HS height of rear.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004; a. Ord. No. 158-2008, § 1, eff. June 7, 2008)

§ 1433-19. - Base Development Requirements.

An application subject to review must comply with the following requirements:

- (a) *Maximum Building Envelope.* A new building or a building alteration, addition or repair must be contained within the maximum building envelope.
- (b) *Height Versus Width.* Buildings proposed on top of the hillside must be taller than wider to accentuate the vertical dimension.
- (c) *Stepping.* Buildings proposed below or above the brow of the hill must be staggered or stepped in depth and width to match topography and slope.
- (d) *Maximum Retaining Wall Height.* Retaining walls may not exceed eight feet in height.
- (e) *Rooftop Utilities.* Rooftop utilities and mechanical equipment should be avoided. If rooftop utilities and mechanical equipment are necessary, screening and sound control must be provided to integrate them into the rooftop.
- (f) *Landscaping of Pervious Surfaces.* All pervious surfaces remaining after completion of construction must be landscaped in trees, shrubs, grass or other ground covers to promote hillside stability and reduce excessive water runoff.
- (g) Excavation and fills should not exceed eight feet in cumulative height. Excavation and/or fill of any height or cumulative amount that is not tied to a specific development is expressly prohibited. Regardless of height, documentation must be provided to show the excavation and/or fill is necessary

to support a specific development and a staff review is required to determine conformance with all requirements of this chapter.

(h) The preliminary geotechnical evaluation should address relative hillside stability.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004; a. Ord. No. 412-2008, § 1, eff. Jan. 4, 2009)

§ 1433-21. - Approval.

(a) If the Zoning Administrator determines the application conforms to the requirements of § 1433-19 and the requirements of this chapter and all other requirements of the Cincinnati Zoning Code, the Zoning Administrator has the duty to approve a building permit for the proposed work. The Zoning Administrator has the duty to notify all owners of property abutting the subject property and the community organization recognized by the Council as representing the area that includes the subject property.

(b) If the Zoning Administrator determines the application does not conform to the requirements of § 1433-19, a hearing and decision by the Zoning Hearing Examiner is required, pursuant to Chapter 1443, Zoning Hearing Examiner Procedures, prior to the issuance of a building permit.

(c) The Zoning Hearing Examiner may approve, approve with conditions or disapprove an application for development in the HS District based on written findings in accordance with § 1433-23, Hillside Development Standards.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004; Emer. Ord. No. 141-2015, § 45, eff. July 1, 2015)

§ 1433-23. - Hillside Development Standards.

In addition to the Base Development Requirements of § 1433-19, the Zoning Hearing Examiner must consider the following standards to ensure harmonious relationships with adjacent buildings and the hillside environment:

(a) Avoid cuts in the hillside if they would leave cliff-like vertical slopes and excessively high retaining walls.

(b) Design buildings to fit into the hillside rather than altering the hillside to fit the buildings.

(c) Hillside development should be designed to minimize excavation required for foundations, parking and access drives.

(d) Cluster new development to retain surrounding tree cover and minimize alterations to the existing topography.

(e) Maintain a clear sense of the hillside brow by locating buildings back from the brow of the hill.

(f) Site buildings so as to respect views from public viewing places within the HS District identified in a community plan or other documentation approved by the City Planning Commission.

(g) Where applicable, consider the guidelines contained in the "Cincinnati Hillside Development Guidelines" report to evaluate development applications.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

§ 1433-25. - Appeal.

Any party with standing may, pursuant to Chapter 1449, Zoning Board of Appeals, appeal to the Zoning Board of Appeals within 30 days after the decision of the Zoning Hearing Examiner.

(Ordained by Ord. No. 15-2004, eff. Feb. 13, 2004)

7. Cincinnati, Ohio Excavation Or Filling Of Land Code

Chapter 1113 - EXCAVATION OR FILLING OF LAND

Sec. 1113-01. - Purpose.

The purpose of this Chapter is to safeguard life, limb, property and the public welfare, and the preservation of the natural environment and the stability of hillsides by regulating excavating and filling of land.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996)

Sec. 1113-03. - Prohibition of Certain Excavations, Fills, or Grades.

1113-03.1 *Operational Plan*: An excavation and fill permit shall not be issued for an excavation or fill comprising the movement of more than 1,000 cubic yards of material or disturbing one acre or more (whichever is more restrictive), unless the permit application is accompanied by an operational plan determined by the Cincinnati Stormwater Management Utility as sufficient to ensure that the operations are not offensive or objectionable due to erosion, siltation, dust or construction site pollutants. The operational plan must include:

- (1) A narrative description of the site that includes:
 - (a) Total area of the site;
 - (b) Area of the site that is expected to be disturbed;
 - (c) A calculation of the area-weighted runoff coefficients for each catchment tributary to an erosion prevention and sediment control best management practice, post-construction stormwater control best management practice, stormwater conveyance facility, and stormwater detention facility under both pre-construction and post-construction site conditions;
 - (d) An estimate of the impervious area and percent imperviousness of the site at the beginning and at the conclusion of the project;
 - (e) Existing data describing the soils throughout the site, including the soil series, soil association, and hydrologic soil group;
 - (f) Geotechnical data such as infiltration, extended conveyance, media filtration, or other best management practice to support the design of each proposed erosion prevention and sediment control best management practice and post-construction stormwater control best management practice, whose effectiveness depends upon site-specific data about the porosity, infiltration characteristics, depth to groundwater, depth to bedrock, and any impermeable layers;
 - (g) Existing data, if available, describing the quality of any stormwater discharge from the site;
 - (h) The name and/or location of the immediate receiving water resource and the first subsequent named water resource and the extent and description of wetlands or other special aquatic sites at or near the site which will be disturbed or which will receive discharges from disturbed areas of the site;
 - (i) The location and description of any stormwater discharges associated with asphalt and concrete plants on or contiguous with the project site and dedicated to the project, and the best management practices to address pollutants in these stormwater discharges;
 - (j) The location of structures on adjoining properties;
 - (k) The hours of operation of work activities on site;
 - (l) The anticipated duration of the project; and
 - (m) The intended use of the property after completion of construction on the site.
- (2) A map or series of maps that, in addition to the survey plat requirements of § 1101-19.4, includes and/or delineates:
 - (a) The entire site on a single 24" × 36" (architectural D-size drawing) plan sheet;
 - (b) A scale of at least 1-inch equals 50-feet;
 - (c) Identification of the phase of construction, if applicable, in relation to the overall construction;
 - (d) A north arrow;
 - (e) Elevation datum;
 - (f) Date of preparation or revision;
 - (g) Ingress and egress from the site including access drives and the connection to the public right of way;
 - (h) Limits of excavation and fill on the site for each phase of construction;

- (i) Soils types for the site, including the location and extent of visibly evident existing excavations or fills, slope instability, erosion and water seepage or wet conditions, unstable or highly erodible soils, or other areas with potentially serious existing or future erosion problems;
 - (j) Existing and proposed two-foot (2') contours, unless site conditions require more detailed topography to depict site drainage conditions;
 - (k) Drainage patterns;
 - (l) Erosion prevention and sediment control best management practices within, entering, and exiting the site during each phase of construction, including any existing and/or constructed combined and separate stormwater drainage conveyance and drainage inlet facilities within the site, beyond the site, and/or within the larger common plan of development if utilized during construction;
 - (m) Drainage watersheds at the site expected before, during, and after major excavation and fill activities;
 - (n) Location and approximate depth of existing and proposed utilities including appurtenances, structures and outfalls;
 - (o) Water resource locations including known springs, wetlands, streams, lakes, water wells, and Stream Corridor Protection Overlay District and/or other setbacks on or within 200 feet of the site, including the boundaries of wetlands or streams and any first subsequent named receiving water resource(s) intending to be filled or relocated under an approval from the Army Corps of Engineers and/or Ohio EPA;
 - (p) Existing and proposed locations of buildings, roads, and parking facilities;
 - (q) In-stream activities including stream crossings;
 - (r) Existing and proposed property boundaries, including bearings, distances, and survey monument information, and subdivision lot numbers;
 - (s) Existing or proposed easements or other restrictions placed on the use of the property and the responsible party under such easement or restriction;
 - (t) Areas vulnerable to erosion and sediment damage;
 - (u) Areas that do not drain to erosion prevention and sediment control best management practice structures;
 - (v) Locations where soil is to be stockpiled; and
 - (w) Location and size of permanent stormwater control best management practices and other stormwater facilities, drawn to scale.
- (3) A narrative that describes how stormwater discharges from the site will be controlled during construction that includes:
- (a) A description of the overall erosion prevention and sediment control plan that highlights specific areas of concern;
 - (b) A maintenance and inspection plan for erosion prevention and sediment control best management practices;
 - (c) An implementation schedule that describes the sequence of major construction operations (i.e., grubbing, excavating, grading, utilities and infrastructure installation) and the implementation of erosion prevention and sediment control best management practices to be employed during each operation of the sequence;
 - (d) Standards and specifications for the installation and maintenance of all temporary erosion prevention and sediment control best management practices;
 - (e) Temporary stabilization requirements and timelines for specific areas of the site;
 - (f) Standards and specifications for all vegetative practices including seeding, mulching, and fertilizing rates;
 - (g) Standards and specifications for any turf re-enforcement matting or other stabilization practices;
 - (h) Procedures for the stabilization of areas receiving stockpiled soils immediately after stockpiling is completed;
 - (i) Schedule indicating the anticipated starting and completion times of the development sequence, including clearing land, grubbing, stripping, rough grading and construction, final grading and vegetative establishment, and maintenance including the time of exposure of each area prior to the completion of erosion prevention and sediment control best management practices;

- (j) Inspection and maintenance guidelines for each erosion prevention and sediment control best management practice;
 - (k) Calculations for proposed stormwater runoff flows, volumes, and timing into and through all temporary erosion prevention and sediment control best management practices that shall include the underlying assumptions and hydrologic and hydraulic methods and parameters, under pre- and post-development land use conditions, for flood control, water resource protection, and water quality, which calculations shall demonstrate that the runoff from upper watershed areas have been considered in the calculations and indicate that no adverse impacts are conveyed downstream of the proposed project; and
 - (l) An investigation of immediate downstream conditions that addresses anticipated temporary impacts on the downstream water resource and floodplain morphology, hydrology, and water quality.
- (4) A narrative that describes how the quantity and quality of stormwater discharges from the site and/or into a water resource will be controlled after completion of construction that includes:
- (a) Standards and specifications for the installation and maintenance of all permanent stormwater control best management practices including vegetation, amended soil composition, structural materials, and rationale for the selection of each practice;
 - (b) Operations and maintenance requirements for all permanent stormwater control best management practices during and after construction;
 - (c) Permanent stabilization requirements and timelines for specific areas of the site;
 - (d) Calculations for proposed stormwater runoff flows, volumes, and timing into and through all stormwater control best management practices that shall include the underlying assumptions and hydrologic and hydraulic methods and parameters, under pre- and post-development land use conditions, for flood control, water resource protection, and water quality, which calculations shall demonstrate that the runoff from upper watershed areas have been considered in the calculations and indicate that no adverse impacts are conveyed downstream of the proposed project;
 - (e) An investigation of immediate downstream conditions that addresses anticipated permanent impacts on the downstream water resource and floodplain morphology, hydrology, and water quality;
 - (f) Soil and subsurface conditions, including tests of infiltration rates for native and amended soils underlying post construction stormwater control best management practices, and borings or equivalent data indicating seasonal high groundwater levels, top of bedrock elevations, and perched groundwater elevations;
 - (g) Installation of permanent stormwater control best management practices off-site may be considered if it is shown that installation of these structures are not feasible on the site and a maintenance agreement for off-site structures in a form acceptable to the city solicitor is recorded.
- (5) A narrative that describes how non-sediment pollutants will be controlled during construction that includes:
- (a) The type, location, and dimensions of structural and non-structural non-sediment pollution best management practices incorporated into the site and the rationale for their selection; and
 - (b) An inspection and maintenance plan for the non-sediment pollution best management practices used on the site.
- (6) Drawings that include:
- (a) Each permanent stormwater control best management practice providing sufficient dimensions, construction details, design calculations, volumes and sizes of contributing drainage areas, and elevations;
 - (b) For subdivided developments where a centralized erosion prevention and sediment control best management practice capable of controlling multiple individual lots is not provided, a detail drawing of a typical individual lot showing standard individual lot erosion prevention and sediment control best management practices.
- (7) An inspection and maintenance plan for each permanent stormwater control best management practice in a form acceptable to the city solicitor that must be recorded that includes:
- (a) The parties who:
 - (i) Own the permanent stormwater control best management practice;

- (ii) Are responsible for inspecting and maintaining the permanent stormwater control best management practice;
 - (iii) Own property contributing stormwater to the permanent stormwater control best management practice; and
 - (iv) Are required to install the permanent stormwater control best management practice.
- (b) A schedule for the regular inspection and maintenance of the permanent stormwater control best management practice.
 - (c) A requirement that if the party listed in the plan as responsible for inspecting and maintaining the permanent stormwater control best management practice fails to do so, each property owner contributing stormwater to and/or required to install the permanent stormwater control best management practice shall be proportionally responsible for such inspection and maintenance.
 - (d) The legal description for each property served by the permanent stormwater control best management practice.
 - (e) The legal description for the property on which a permanent stormwater control best management practice is located.
 - (f) A description of the funding for the long-term maintenance and inspection of the permanent stormwater control best management practice.
 - (g) A requirement that reports of all inspections of and maintenance operations on the stormwater control best management practice must be filed with the utility engineer within thirty days after such inspection or maintenance.
 - (h) A prohibition on alteration of the stormwater control best management practice without prior written approval from the utility engineer.

An operational plan is also required for an excavation or fill comprising the movement of less than 1,000 cubic yards of material or on less than one acre if the work area borders one or more work areas under separate excavation and fill permit and the total amount of material being moved in all contiguous areas is more than 1,000 cubic yards or the contiguous areas comprise more than one acre and the areas have some common ownership or the work in all areas is under common control.

1113-03.2 *Certification of Excavation and Fill Quantities and Operational Plan Compliance*: Every six months after the issuance of an excavation and fill permit and on completion of operations, the holder of permit for an excavation or fill comprising the movement of more than 1,000 cubic yards of material must file with the Director a certification prepared by a registered surveyor, registered architect or professional engineer of the quantities of materials placed or removed since the issuance of the permit and that the work has been conducted in accordance with the operational plan.

1113-03.3 *Revocation of Excavation and Fill Permits*: The Director may revoke an excavation and fill permit if the holder of the permit has failed to comply with the operational plan or if the Director determines that the operations have become offensive or objectionable due to erosion, siltation or dust.

1113-03.4 *Excavations and Fills in Residential Districts*: If the proposed work is wholly or partially within a residential zone district, work must be completed within one year from the date of permit issuance. The Director may extend the time for completion of the work if the Director determines after conducting a public hearing that the operations have been conducted in compliance with the permit and have not been offensive or objectionable due to erosion, siltation or dust. The Director has the duty to notify the owner or occupant of the subject property, any owner or occupant of property abutting the subject property and any community or neighborhood association or organization whose boundaries include or abut the subject property, recognized by the council as representing the area. Notice must be sent by ordinary U.S. Mail at least ten days in advance of the date set for the public hearing.

1113-03.5 *Slope*: An excavation and fill permit may not be issued for an excavation or fill to be made with a face steeper in slope than three horizontal to one vertical.

Exception: The director of buildings and inspections may permit an excavation or fill to be made with steeper face if an applicant demonstrates satisfactorily by means of appropriate soil exploration and analysis

and the written opinion of the geotechnical engineer that the materials are capable of standing on a steeper slope without creating any of the hazards described in §§ 1101-17.1.1 and 1101-63.5 CBC.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996; a. Ord. No. 343-2001, eff. Nov. 23, 2001; a. Ord. No. 058-2012, § 1, eff. March 29, 2012)

Sec. 1113-05. - Setbacks of Tops and Toes of Slopes.

The tops and toes of excavation and fill slopes shall be set back from property boundaries and structures as far as necessary for the safety of adjacent properties and adequacy of foundation support and to prevent damage as a result of water runoff.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996)

Sec. 1113-07. - Protection Against Erosion.

All excavations and fills shall be performed so as to minimize soil erosion and sedimentation.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996)

Sec. 1113-09. - Relocation of Sewers and Drainage Courses.

If, in the opinion of the director of sewers or director of public works, it is necessary to adjust, relocate, add to, or otherwise modify the existing sewer system or drainage course serving the area affected by an excavation or fill operation area or protecting the existing sewer system or drainage course from damage, a permit shall be issued in accordance with this Chapter only if the applicant for the permit obtains a permit to provide, relocate, or modify the sewer system or drainage course for the affected area pursuant to the regulations under Chapter 719, Sewers, of the Cincinnati Municipal Code, and the current rules and regulations of the metropolitan sewer district of Greater Cincinnati and the department of public works at the expense of the applicant and such easements as may be necessary shall be granted.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996)

Sec. 1113-11. - Protection of Existing Sewers.

In places where existing sewerage is adequate, but in the opinion of the director of sewers or director of public works is of doubtful strength to carry additional loading, the director of buildings and inspections shall issue a permit in accordance with this Chapter only if the applicant for the permit provided written approval from the director of sewers and the director of public works.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996)

Sec. 1113-13. - Performance Bond.

When in the opinion of the Director of Buildings and Inspections, the termination before completion of a proposed excavation or fill operation would create an actual or potential hazard to the public, the Director of Buildings and Inspections prior to issuing the permit shall require a bond in an amount sufficient to cover the estimated cost of restoration of any affected land or to cover the cost of performance of the operations under such permit, whichever is greater.

(Ordained by Ord. No. 67-1996, eff. Apr. 5, 1996)

References

2014 National Climate Assessment. U.S. Global Change Research Program

<http://nca2014.globalchange.gov/report/regions/midwest>

Kockelman, W. J. (1986). Some techniques for reducing landslide hazards. Bulletin of the Association of Engineering Geologists. v. 23, no. 1, pp. 29-52

Wold, R. J. & Jochim, C. L. (1989). Landslide Loss Reduction: A Guide for State and Local Government Planning. Federal Emergency Management Agency.

http://www.fema.gov/media-library-data/20130726-1440-20490-1637/fema_182.pdf

Mitigation Ideas: Possible Mitigation Measures by Hazard Type, FEMA Region 5

http://emergencymanagement.wi.gov/mitigation/docs/mitigation_ideas.pdf

Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. (2013). Federal Emergency Management Agency

http://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf

Landslide Mitigation Action Plan. (2014). Washington State Department of Transportation

<http://www.wsdot.wa.gov/NR/rdonlyres/8B3B653E-5C50-4E2B-977E-AE5AB36751B7/0/LandslideMitigationActionPlan.pdf>

La Crosse County, Wisconsin, Multi-Hazards Mitigation Plan 2015-2019

<http://www.alertlacrosse.org/docs/La%20Crosse%20Cnty%20HMP%202015-2019.pdf>

State of California Hazard Mitigation Plan. (2013). California Emergency Management Agency

http://hazardmitigation.calema.ca.gov/docs/SHMP_Final_2013.pdf

Fact Sheet 2004-3072 - Landslide Types and Processes (2004). United States Geological Survey

<http://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf>
