

HILLSIDE DEVELOPMENT

7.00 DESIGN STANDARDS

7.01 PURPOSE

These standards are meant to provide a consistent policy under which certain physical aspects of street, storm, and sanitary sewer design and plan preparation shall be implemented, with an emphasis on those areas where the general lay of the existing land exceeds a slope of five percent. The standards listed in this Section 7.00 are intended to supplement the other Sections of this manual for the additional standards that will apply to Hillside Development work. Those other Sections shall also be referenced for any other design standards that are not addressed below.

Most of the elements contained in this document are Public Works oriented and most are related to the development or platting process. However, they shall apply to both public and private work designated herein.

These standards cannot provide for all situations and are not a substitute for competent work by design professionals. Engineers shall bring to each project the best of skills from their respective disciplines.

The standards are also not intended to limit any reasonable, innovative, or creative effort that could result in better quality and/or lower costs. Any proposed departure from the standards, however, shall be pointed out to the City for review and will be judged by the City on the likelihood that it will produce a comparable result which in every way will be adequate for the user and the City.

7.02 WATER SUPPLY AND DISTRIBUTION

All new water system facilities and modifications to water system facilities both inside and adjacent to the proposed development shall be placed in the street right-of-way at a location and depth of bury that meets the standards of the Springfield Utility Board. Where street right-of-way width is inadequate to accommodate the facilities, then the applicant shall provide public utility easements abutting the right-of-way.

7.03 SANITARY SEWER

7.03.1 Logical Phasing

Construction of sanitary and storm sewers shall be done in a logical phasing sequence that corresponds to the phasing of development. The sewers shall be planned, sized and extended to the boundaries of the development to serve future development areas in a logical and convenient manner.

7.03.2 Hillside Plan Submittals

Detailed plans for streets, sanitary, and storm systems shall be submitted with each phase of a development. The plans shall include existing and proposed contours of the site to enable an adequate review of the location and routing of these systems.

7.03.3 Geotechnical Engineering Representative

The project construction engineering team shall include a geotechnical engineering firm. The geotechnical engineering firm shall have a representative on-site to observe all trenching, excavation, cut, and fill operations during the development of the project.

7.03.4 Springfield Development Code

Sewer design shall comply with the Springfield Development Code Section 32.100 and any other special provisions for hillside development that are approved and required by the City Engineer.

7.03.5 Public vs. Private Sanitary Sewer

Unless otherwise approved, on a case-by-case basis, and at the sole discretion of the City Engineer, all publicly maintained sewer facilities shall be located within street right-of-ways, or in easements immediately adjacent to the right-of-way, or in paved driveway or private street areas. The conceptual sanitary sewer plan may include provisions for connecting up to four lots on private, shared, laterals in easements to eliminate the need for backyard sewers. In that case, a joint use, joint maintenance agreement shall be agreed to and recorded for the affected properties. In the event any public sanitary sewer manholes or mains are approved to be located in side-yard or rear-yard easements to connect to a downhill street, restrictions shall be placed on these properties to prevent the construction of fences, landscaping, and other private improvements to ensure that adequate access is maintained for system maintenance.

7.03.6 Sewer Extensions

Sewers shall be extended to the boundaries of the development area to allow extension into undeveloped areas. Sewers internal to the site shall be sized to accommodate any flows that can be anticipated in the future from off-site development areas.

7.03.7 Sewer Boundary Mapping

The developer shall provide mapping of the boundaries of internal and adjacent sewer basins, an analysis of the sewer tributary areas, both on-site and off-site, and the site system capacity to ensure that adequate capacity and appropriate connection points are provided. Construction of sanitary sewers shall be done in a logical sequence that corresponds to the phasing of the development.

7.03.8 Sewer Pump Stations

Neither temporary nor permanent public sewer pump stations shall be proposed when gravity sewer service is available to the development site. If the applicant anticipates the use of temporary private sewer pump stations, this issue shall be addressed at the time of submittal of the subdivision tentative application for the development in the context of the overall project phasing plan.

7.03.9 Hillside Design Considerations

Sewer design shall address specific problems and special design considerations for steep hillside development such as flow velocity, energy dissipation, turbulence in manholes and bends, and restraints on pipe movement.

7.03.10 Intercepted Groundwater Flow

Trench drainage measures, or other approved methods of intercepting groundwater flow in trench backfill, shall be incorporated into all trench sections with slopes exceeding ten percent and elsewhere when required by the City Engineer. The intercepted flow shall be directed into an approved storm water facility.

7.03.11 Curved Sewers

Curved sewers may be considered on a case-by-case basis, with approval at the sole discretion of the City Engineer. Any curved sewers shall be designed with a curve radius of not less than 150 percent of the manufacturer's recommended minimum radius for the given pipe size and material. Combination horizontal and vertical curves between manholes shall not be used. All curved sewers shall include tracer wires, tested for electrical continuity, wrapping the pipes and marking tape in the trench.

7.04 STORM DRAINAGE

7.04.1 Springfield Development Code

Storm drainage design shall comply with the Springfield Development Code Section 32.110 and any other special provisions for hillside development that are approved and required by the City Engineer.

7.04.2 Storm Sewer Laterals

The storm sewer system shall be constructed in a manner that provides a storm sewer lateral to every lot for conveyance of roof drains, building foundation drains, and private property surface and underground drainage. These storm laterals shall not be permitted to drain to the gutter.

7.04.3 Publicly Maintained Facilities

All publicly maintained drainage facilities shall be located within street right-of-ways, or in easements immediately adjacent to the right-of-way, or in paved driveway or private street areas.

7.04.4 Storm Sewer Extensions

Drainage lines shall be extended to the project boundaries to serve abutting, undeveloped properties. Storm drains internal to the site shall be sized to accommodate any flows that can be anticipated in the future from the full development of off-site development areas.

7.04.5 Site Drainage Analysis

For each development, or phase thereof, the developer shall provide an analysis of the drainage tributary areas both on-site and the site system capacity to ensure that adequate capacity is provided for the full development of those tributary areas. The developer shall also provide an analysis of the downstream system to the extent necessary to establish that capacity exists for the expected discharge at the required design storm event as defined in 4.03.1 Drainage Study.

7.04.6 Hillside Design Considerations

Storm drain design shall address potential problems and special design considerations for steep hillside development such as flow velocity, energy dissipation, turbulence in manholes and bends, restraints on pipe movement, and ex-filtration of water from pipes in the trench.

7.04.7 Trench Drainage Control

Trench drainage measures, or acceptable alternatives to control water flow in trench backfill, shall be incorporated into all trench sections with slopes exceeding ten percent, or as required by the City Engineer.

7.04.8 Curved Storm Sewer

Curved storm drains may be considered on a case by case basis, with approval at the sole discretion of the City Engineer. Any curved storm drains shall be designed with a curve radius of not less than 150 percent of the manufacturer's recommended minimum radius for the given pipe size and material. Combination horizontal and vertical curves between manholes shall not be used. All storm drains shall include tracer wires, tested for electrical continuity, and marking tape in the trench.

7.04.9 Drainage Impact to Wetlands

Design of the storm drainage system shall be done so that no net change in volume or flow rate is experienced in any wetlands on or adjacent to the site.

7.04.10 Hillside Pavement Distress Study

The project shall incorporate the standard drawings for development of hillside areas recommended in Appendix A in the *Hillside Pavement Distress Study*, 1994, by Dames and Moore. Deviations from these requirements may be considered on a case-by-case basis, at the sole discretion of the City Engineer, during the development of each phase.

7.04.11 Catch Basin Design

During the design of the project, the developer shall provide catch basin sizing calculations to show that adequate inlet capacity is provided to capture all of the water flowing in the street. Combination gutter/curb inlet basins shall be used in areas of Hillside development where slopes and velocities allow by-pass of more the 15 percent of the design flow (HEC 12 method of determination). Catch basin design shall include the following considerations: length of run on the street; velocity of flow in gutter bar; volume of flow in gutter bar; curb openings with depressed gutter bars up-slope of catch basins; and the control of flow past catch basins.

7.04.12 Drainage Approval

For each development proposal, the City Engineer shall review and approve drainage methods.

7.04.13 Water Flow at Curb Cuts

Driveway curb cuts and approaches shall be designed to prevent water flowing in the gutter from entering private properties with emphasis on the outside of curves on steep down slopes.

7.04.14 Agreement of Responsibilities

Prior to approval of the subdivision tentative plat for any development, the developer and the City shall enter into an agreement specifying responsibilities for the long-term access and maintenance of any storm drainage detention and water quality ponds.

7.04.15 Water Quality Best Management Practices

All proposed or required detention ponds shall include water quality measures. Best Management Practices shall be incorporated into the overall design of the master storm water

system sufficient to comply with Section 32.110(4), and the City's Design Standards, as determined by the City engineer and this Manual. In addition, all detention/retention facilities shall control ex-filtration/percolation to pre-development flow conditions.

7.04.16 Maintenance Vehicle Access

For all publicly maintained ponds, maintenance vehicle access shall be provided around the entire perimeter of each pond. For publicly maintained open drainage channels, access paths, a minimum of seven feet wide, and wider when the City Engineer determines that vehicle access is required to a channel, shall be provided along at least one side of every channel. See Sections 4.07 and 4.12 of this Manual for further information. Access shall also be provided and guaranteed for all storm drain manholes located outside of a street right-of-way.

7.04.17 Storm Water Discharge Restrictions

No discharge of storm water from public facilities shall be allowed onto private property, unless adequate easements and agreements are developed and recorded to accommodate that drainage. All lots tributary to such storm drains shall be restricted from development until a connection to a public system is provided or a privately owned and maintained storm water facility is approved and developed to City requirements.

7.04.18 Drainage Benches and Private Storm Systems

The design engineer shall incorporate drainage benches, private storm drain systems, and other features as may be recommended by the project geotechnical engineer and approved by the City Engineer, at the top of all cut slopes, and along the exposed face of all cut and fill slopes to reduce the potential of erosion on these slopes.

7.05 TRANSPORTATION

7.05.1 Temporary Dead End Streets

The length of a temporary dead end street (due to an approved phasing sequence within a development) shall not exceed 1000 feet. Temporary dead end streets which are greater in length than allowed by the City Development Code shall not be allowed without a plan and financial guarantee (bond) that the street will be completed through to another outlet point within three years. The temporary dead end street shall be constructed with appropriate turnarounds for emergency vehicles. In addition, temporary dead end streets shall be provided with a temporary, secondary emergency vehicle access until the completion of the street provides a permanent secondary access.

7.05.2 Right-of-Way Dedications

Right-of-way shall be dedicated as required to allow future street connection to abutting lands along the boundary of the site. These shall be public streets and shall be constructed in conjunction with the development.

7.05.3 Slope Easements

Slope easements shall be dedicated along streets as needed for operation and maintenance purposes proportionate to the angle of repose of slopes and as needed for slope stability and drainage considerations.

7.05.4 Local Street Right-of-Way

Right-of-ways shall be dedicated for local streets according to SDC Section 32.020, Table 32-1 of the Springfield Development Code.

7.05.5 Field Measured Cross Sections

Submittals of field measured cross sections, extending a minimum of 20 feet beyond fill and/or excavation limits, showing the proposed street and the existing ground elevations shall be submitted with each set of the construction plans for streets.

7.05.6 Details and Typical Cross Sections

Details and typical cross sections with slope control measures shall be submitted with each phase of development. The development application shall also indicate the location and under what conditions retaining walls will be constructed. A registered engineer shall design all retaining structures exceeding 30 inches in height.

7.05.7 Secondary Access

Secondary access to each phase of a development shall be provided for police and fire response.

7.05.8 Geometry

7.05.8.A Basic Geometry

Unless otherwise authorized by the City Engineer, standard basic engineering geometry shall be adhered to. For specific design standards, the engineer shall employ the latest edition of the AASHTO's *A Policy on Geometric Design of Highways and Streets*. The location, width and grade of streets shall be considered in their relation to existing and planned streets, to topographical conditions, and to the planned use of land to be served by the streets. Grades, tangents, curves and intersection angles shall be appropriate for the traffic to be carried, considering the terrain. Construction specifications and design standards for private streets shall be the same as for public streets.

7.05.8.B Combination Vertical and Horizontal Curves

Whenever a vertical curve, with an algebraic difference in grade of five percent or more, is combined with a horizontal curve, the engineer shall provide the City with numeric and graphical sight distance analyses. These analyses shall include the existing topographic features that are proposed to remain after development of the street, as well as any future features that may be expected or anticipated.

7.06 GROUNDWATER CONTROL

7.06.1 Embankment Restrictions

Construction of embankments shall not be allowed on top of soils with a plastic index greater than 30. Plans for embankments shall show construction details for maintaining drainage to eliminate shrink/swell problems evident in adjacent developments.

7.06.2 Persistent Flow Conditions

All persistent flow conditions, except for any identified open water component of the conceptual storm water plan, shall be directed into the piped storm system.

7.06.3 Longitudinal Drainage Systems

The developer shall include longitudinal drainage systems along the uphill side of all streets constructed on cut slopes for each phase of the development. These drains shall discharge to a piped drainage facility, not the street gutter.

7.06.4 Interception of Springs and Watercourses

Saturation of the street subgrade and of building pads shall be prevented. Therefore, the project storm drainage system shall be designed to intercept and remove from the street structural section and street subgrade the flows from all known springs and watercourses. In addition, the flow from all springs and watercourses encountered during street and utility construction and lot pad grading shall be intercepted and removed, with discharge into the project storm drain system. The applicant's design engineer shall include an anticipated flow volume and rate from springs and watercourses on the site and shall size all elements of the storm drainage system accordingly.

7.07 Tree and Understory Preservation

7.07.1 Tree or Understory Removal

No trees or understory shall be removed in any planned open space areas, parks, wetlands, drainage ways, or archaeological sites. Significant understory species shall be protected throughout the site to the greatest extent practicable. Invasive non-native plant species such as blackberries, ivy, and scotchbroom can be removed.

7.07.2 Analysis of Urban Forester

A tree or forestry consultant shall be employed to analyze the street design and proposed cutting plan for the right-of-ways for the development and determine what trees can be retained to serve as required street trees. The trees shall be depicted on the tentative subdivision plan and the final construction drawings for the public improvements. Appropriate measures to protect the trees during construction shall be specified on the construction drawings.

7.07.3 Forestry Consultant

The applicant shall employ a tree or forestry consultant approved by the City who demonstrates knowledge of soils and vegetation of the site and who has had previous experience with forested hillside construction of a similar scale. The consultant will prepare a vegetation and re-vegetation report for each phase of a development. The report shall include:

- A. A description of plant material and condition, pathology (if any), structural problems (if any), corrective measures and methods to improve the health and condition.
- B. Identification of patches to be retained after assessment of vigor, species, size, estimated size at maturity, and ability to support some forms of disturbance.
- C. Notation of individual specimen trees and their suitability for preservation.
- D. Evaluation of the impacts of constructing the public improvements addressing soil compaction, fill, paving, location of disturbance with respect to remaining vegetation, excavation methods/trenching, and measures to mitigate the impacts.
- E. Stipulate the health of trees intended to be removed and adjacent trees, and provide typical protection measures to preserve the adjacent trees and understory vegetation during removal.

- F. Evaluation of existing vegetation conditions on each proposed lot and assessment of the least impact for placement of buildings, decking, and outbuildings. Building envelopes shall be created pursuant to this analysis.
- G. The re-vegetation plan will consist of replacement trees suitable to the site and compatible with adjacent uses. Characteristics such as longevity, hardiness, and wind firmness will be considered. The re-vegetation plan must include a management section detailing planting methods. The replacement trees may be located anywhere within the development site, including proposed open space.

7.07.4 Retainage of Trees

The applicant shall retain trees in sufficiently large areas and dense stands to prevent windthrow. A stand of trees shall constitute an area not less than 2,000 square feet.

7.07.5 Oregon White Oaks

Any Oregon White Oaks on the site that are 12 inches in diameter at breast height (dbh) or larger shall be preserved. These trees shall be specifically identified on the tentative plans for the development, and the vegetation report shall specify critical root zone and detail measures to prevent damage to those trees.