Field and Design Procedures for Bioretention, Permeable Pavement, Rain Gardens, and Downspout Infiltration Systems Checklist

This checklist reflects most, but not necessarily all of the items that will be reviewed by the Development Review. It is intended to be used as an aid by us to provide a consistent review of development work in Thurston County. All items may not be applicable in the review of each project and all items of concern to this office may not be covered on this checklist.

Y	N	
		BIORETENTION FIELD AND DESIGN PROCEDURES
		Soils Report meeting the requirements in the "Soils Report" section. For projects subject to CR #1 through #5, the Advanced Abbreviated Plan Soils Report is provided. For projects subject to CR #1 through #10, the Drainage Control Plan Soils Report is provided.
		Infiltration Rate
		Test hole or test pit explorations are conducted during mid to late in the wet season (December 1 through April 30).
		Infiltration testing is performed at the anticipated elevation of the top of the native soil beneath the bioretention area.
		Small bioretention cells (bioretention areas receiving water from one or two individual lots or < 0.25 acre of pavement or other impervious surface): A small-scale PIT, or other method outlined in Appendix III-A,[1] is performed at each potential bioretention site.
		Large bioretention cells (bioretention areas receiving water from several lots or 0.25 acre or more of pavement or other impervious surface): A small-scale PIT, or other method outlined in Appendix III-A,[1] is performed every 5,000 square feet of bioretention area, OR one large-scale PIT[1] is performed.
		Bioretention swales or long, narrow bioretention areas (i.e., one following the road right-of-way): A small-scale PIT, or other method outlined in Appendix III-A,[1] is performed every 200 lineal feet and within each length of road with varying subsurface characteristics.[2]
		If deemed necessary by a qualified professional engineer, a safety factor is applied to the measured Ksat of the subgrade soils (not the imported bioretention soil mix) to estimate its design (long-term) infiltration rate.
		Depth to Groundwater
		A soil log or over excavation of the PIT reveals that there is at least 3 feet of vertical clearance from the lowest elevation of the bioretention soil (or any underlying gravel layer) to the seasonal high groundwater elevation or other impermeable layer if the area tributary to the facility meets or exceeds any of the following thresholds: • 5,000 square feet of pollution-generating impervious surface (PGIS) • 10,000 square feet of impervious area • 0.75 acres of lawn and landscape

Y	N	
		A soil log or over excavation of the PIT reveals that there is at least 1 foot of vertical clearance from the from seasonal high groundwater or other impermeable layer for bioretention systems with a contributing area less than the above threshold.
		Infiltration Receptor Characterization Applies to bioretention areas with drainage areas exceeding one acre.
		If a single bioretention area serves a drainage area exceeding one acre, infiltration receptor analysis and performance testing may be necessary. Additional Soils Report requirements apply to projects that require Infiltration Receptor Characterization. Refer to "Soils Report" section below.
		A minimum of three groundwater monitoring wells per infiltration facility are installed, or the highest groundwater level is known to be at least 50 feet below the proposed base of the bioretention facility.
		Seasonal groundwater levels are monitored at the site during at least one wet season (December 1 through April 30) and observations are normalized to historic groundwater records in the region.
		PERMEABLE PAVEMENT **FIELD AND DESIGN PROCEDURES**
		Soils Report meeting the requirements in the "Soils Report" section. For projects subject to CR #1 through #5, the Advanced Abbreviated Plan Soils Report is provided. For projects subject to CR #1 through #10, the Drainage Control Plan Soils Report is provided.
		Infiltration Rate
		Test hole or test pit explorations are conducted during mid to late in the wet season (December 1 through April 30).
		Infiltration testing is performed in the soil profile at the estimated bottom elevation of base materials for the permeable pavement. If no base materials (e.g., a pervious concrete sidewalk), the testing is performed at the estimated bottom elevation of the pavement.
		Projects subject to Minimum Requirements #1 - #5: A small-scale PIT, or other method outlined in Appendix III-A,[1] is performed for every 5,000 square feet of permeable pavement, but not less than one test per site.
		Projects subject to Minimum Requirements #1 - #10: • On commercial property: a small-scale PIT, or other method outlined in Appendix III-A,[1] is performed for every 5,000 square feet of permeable pavement, but not less than one test per site. • On residential developments: a small-scale PIT, or other method outlined in Appendix III-A,[1] is performed at every proposed lot, every 200 feet of roadway, and within each length of road with significant differences in subsurface characteristics.[2]
		If deemed necessary by a qualified professional engineer, a safety factor is applied to the measured Ksat of the subgrade soils to estimate its design (long-term) infiltration rate.

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		Where permeable pavements are used for pollution-generating hard surfaces (primarily roads, driveways, and parking lots), the subgrade meets the soil suitability criteria for treatment (refer to Volume V, Section 6.3), or a treatment layer is provided. Note: Permeable pavement driveways that are less than 5,000 square feet in area do not trigger this requirement .
		Depth to Groundwater
		A soil log or over excavation of the PIT reveals that there is at least 1 foot between the bottom of the lowest gravel base course or treatment layer and the seasonal high groundwater or an underlying impermeable/low permeable layer.
		RAIN GARDEN FIELD AND DESIGN PROCEDURES
		Soils Report meeting the Advanced Abbreviated Plan Soils Report in the "Soils Report" section.
		Infiltration Rate
		Test hole or test pit explorations are conducted during mid to late in the wet season (December 1 through April 30).
		A small-scale PIT, or other method outlined in Appendix III-A, is performed at each potential rain garden site.
		Infiltration testing is performed at the anticipated elevation of the top of the native soil beneath the rain garden area.
		Depth to Groundwater
		A soil log or over excavation of the PIT reveals that there is at least 1 foot between the bottom of the lowest elevation of the rain garden soil (or any underlying gravel layer) and the seasonal high groundwater or an underlying impermeable/low permeable layer.
		DOWNSPOUT INFILTRATION SYSTEMS FIELD AND DESIGN PROCEDURES (SWM Volume III, Section 3.9.3)
		Soils Report meeting the requirements in the "Soils Report" section. For projects subject to CR #1 through #5, the Advanced Abbreviated Plan Soils Report is provided. For projects subject to CR #1 through #10, the Drainage Control Plan Soils Report is provided.
		Individual lot or site tests consist of at least one soil log at the location of the infiltration system.
		Soil logs extend a minimum of 4 feet in depth (from proposed grade).
		Soils in the location of the proposed infiltration system are not silty clay loam, clay loam, clay, or any other soil having a percolation rate slower than 1 inch per hour.
		For sites that do not use the sizing tables presented in Table 3.5, the site infiltration rates are determined using the procedures outlined in Appendix III-A.
		Depth to Groundwater

Y	N	
		Site-specific test indicates there is 12 inches or more of permeable soil from the proposed bottom (final grade) of the infiltration system to the seasonal high groundwater table or other impermeable layer.
		ADVANCED ABBREIVATED PLAN SOILS REPORT
		The Soils Report is prepared by one of the following: • A professional soil scientist certified by the Soil Science Society of America (or an equivalent national program) • A licensed onsite sewage designer • A suitably trained person working under the supervision of a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington.
		Soil surveys, soil test pits, soil borings, or soil grain analyses sufficient to identify underlying soils on the site.
		The results of saturated hydraulic conductivity (Ksat) testing to assess infiltration capability and the feasibility of rain gardens, bioretention, and permeable pavement.
		The results of testing for a hydraulic restriction layer (groundwater, soil layer with less than 0.3 in/hr Ksat, bedrock, etc.) under possible sites for a rain garden, bioretention area, or permeable pavement. Testing with a monitoring well or an excavated pit must extend to a depth at least 1 foot below the estimated bottom elevation of a rain garden/bioretention excavation and at least 1 foot below the subgrade surface of a permeable pavement. This analysis should be performed in the winter season (December 1 through April 30). Site historic information and evidence of high groundwater in the soils can also be used.
		If onsite infiltration may result in shallow lateral flow (interflow), the conveyance and possible locations where that interflow may re-emerge shall be assessed by a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington
		For downspout infiltration systems, the Soils Report identifies the limits of any outwash type soils (i.e., those meeting USDA soil texture classes ranging from coarse sand and cobbles to medium sand) versus other soil types and includes an inventory of topsoil depth. Any evidence of high groundwater level, such as mottling, is noted.
		For bioretention, the Soils Report includes a detailed description of the condition of the upper soil structure, including the pathway the discharged stormwater will take.
		DRAINAGE CONTROL PLAN SOILS REPORT
		The Soils Report is prepared and stamped by a professional engineer with geotechnical expertise, a licensed geologist, a hydrogeologist, or an engineering geologist registered in the State of Washington.
		Figure showing the following: • Topography within 500 feet of the proposed facility • Locations of any water supply wells within 500 feet of the proposed facility

Y	N	
		• Locations of groundwater protection areas, aquifer recharge areas, and 1-, 5-, and 10-year times of travel zones for wellhead protection areas • Locations of test pits or test holes.
		Results of soils tests, at a minimum, include: • Detailed soil logs • Visual grain size analysis • Grain-size distribution (required if using the grain size analysis method to estimate infiltration rates) • Percent clay content (include type of clay, if known) • Color/ mottling • Variations and nature of stratification
		Soils Report includes a description of local site geology, including soil or rock units likely to be encountered at soil sampling depths.
		Soils Report includes the seasonal high groundwater elevation.
		Soils Report includes detailed documentation of the design infiltration rate determination.
		Soils Report states whether location is suitable for infiltration and recommends a design infiltration rate.
		If infiltration for treatment is proposed, the report includes the results of the soil suitability testing per Volume V, Chapter 6.
		For downspout infiltration systems, the Soils Report identifies the limits of any outwash type soils (i.e., those meeting USDA soil texture classes ranging from coarse sand and cobbles to medium sand) versus other soil types and includes an inventory of topsoil depth.
		For bioretention, the Soils Report includes a detailed description of the condition of the upper soil structure, including the pathway the discharged stormwater will take.
		Additional Soils Report Requirements for Infiltration Receptor Analysis (when required)
		Depth to groundwater and to bedrock/impermeable layers are addressed.
		Seasonal variation of groundwater table based on well water levels and observed mottling of soils is addressed.
		Existing groundwater flow direction and gradient is addressed.
		Volumetric water holding capacity of the infiltration receptor soils is addressed.
		The horizontal hydraulic conductivity of the saturated zone is assessed to determine the aquifer's ability to laterally transport the infiltrated water.
		Approximation of the lateral extent of infiltration receptor is provided.
		The impact of the infiltration rate and proposed added volume from the project site on local groundwater mounding, flow direction, and water table determined by hydrogeologic methods is provided.
		If required by the county, a groundwater mounding analysis is conducted using an approved approach.

Y	N	
		Site suitability for infiltration is stated and a design infiltration rate is recommended. Note that the maximum allowable design infiltration rate is 30 inches per hour.