Chapter 1 GENERAL CONSIDERATIONS

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1-17 DEFINITIONS

AASHTO	American Association of State Highway and Transportation Officials.
Acceleration Lane	A speed change lane, including tapered areas, to enable a vehicle entering a roadway to increase its speed to a rate at which it can safely merge with through traffic.
Access Point	The point of connection of a road network element, excluding a public road, to the road network.
ACP	Asphalt concrete pavement. May also mean the County's Annual Construction Program for Transportation.
ADA	Americans with Disabilities Act of 1991.
ADT	Average daily traffic. The total two-directional volume of traffic during a given time period (in whole days), greater than one day and less than one year, divided by the number of days in that time period.
Alley	Shall have the same meaning as defined in SCC 30.91A.150.
Alteration	A change to an existing facility in the public right-of-way that affects or could affect access, circulation, or use.
Applicant	Shall have the same meaning as defined in SCC 30.91A.220.
Appurtenance	Equipment and/or accessories that are part of an operating system or subsystem.
APWA	American Public Works Association.
ASTM	American Society for Testing and Materials.
ATB	Asphalt-treated base.
Arterial	Shall have the same meaning as defined in SCC 30.91A.270.
Auto Court	See **Shared Court**.
Auxiliary Lane	The roadway portion adjoining the traveled way for truck climbing, speed change or for other purposes supplementary to through traffic movement.
Backfill	Replacement of excavated material with suitable material compacted as specified.
Best Management Practices (drainage)	Shall have the same meaning as defined in SCC 30.91B.080.

Best Management Practices (critical areas)	Shall have the same meaning as defined in SCC 30.91A.090.
Best Management Practices (LID or low impact development)	Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of filtration, storage, evaporation, infiltration and transpiration. LID BMPs include, but are not limited to, bioretention, rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs and water re-use.
Best Management Practices (on-site stormwater management)	Those best management practices designed to meet Minimum Requirement 5 specified in SCC 30.63A.525 and described in Volume I of the Snohomish County Drainage Manual.
Bicycle or Bike	A vehicle propelled ~~solely~~ by human and/or electric power upon which a person may ride, having two tandem wheels, except scooters and similar devices. ~~"~~"Bicycle~~"~~" in this document may also be a three or four-wheeled, human and/or electric- powered vehicle, but not a tricycle for children. A bicycle is considered a "vehicle" under Washington State Law.
Bicycle Facilities	Improvements and provisions to accommodate bicycling.
Bicycle Lanes	That portion of a roadway, which has been designated by striping, signing, and/or pavement marking for use of bicycles.
Biofiltration	Process of reducing pollutant concentrations in water by filtering through biological materials.
Bioretention BMPs	Engineered stormwater facilities that ~~treat stormwater~~provide Runoff Treatment by passing ~~it~~the stormwater through a specified soil profile (Bioretention Soil Mix, or BSM), and typically either retain or detain the treated stormwater for ~~flow attenuation~~Flow Control. Bioretention facilities include a variety of plant material including trees, shrubs, grasses, and/or other herbaceous plants adapted to the local climate and soil moisture conditions. Bioretention is typically implemented as an LID practice, and as such is typically sited to receive stormwater runoff from a small contributing area.
Blended Transition	A connection with a grade of 5 percent or less between the level of the sidewalk or walkway and the level of the crosswalk.
Bollard	Shall have the same meaning as defined in SCC 30.91B.175.
Boring	Grade and alignment-controlled mechanical method of installing a pipe or casing under a road or stream without disturbing the surrounding medium.
Buffer	Shall have the same meaning as defined in SCC 30.91B.190.
Capacity	The maximum number of vehicles that have a reasonable expectation of passing over a given roadway, or section of roadway, in one direction during a given time period under prevailing roadway and traffic conditions.
Casing	A larger pipe enclosing a carrier for the purpose of providing structural or other protection to the carrier and/or to allow for carrier replacement without re-excavation, jacking or boring.

Catchbasin	A chamber or well, usually installed at the curb line of a road, for the transport of surface water to a sewer or subdrain, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.
CBU	Cluster box unit. A multiple mailbox delivery unit approved by the US Postal Service.
Channelization	The separation or regulation of conflicting traffic movements into definite paths of travel by the use of pavement markings, raised islands or other suitable means to facilitate the safe and orderly movement of both vehicles and pedestrians.
Clear Zone	The total roadside border area defined by the "Clear Zone Distance Table" found in Chapter 1600 of the WSDOT Design Manual, starting at the edge of traveled way and within the road right-of-way which is available for safe use by errant vehicles and where the placement or relocation of fixed objects is controlled.
CMP	Corrugated metal pipe.
Commercial Use	A use providing goods, merchandise or services for compensation.
Common plan of development or sale	Shall have the same meaning as defined in SCC 30.91C.185.
Compaction	Shall have the same meaning as defined in SCC 30.91C.210.
Conduit	Enclosed tubular runway for protecting wires or cables.
Construction Plans	Shall have the same meaning as defined in SCC 30.91C.280.
Control Zone	That roadside area defined by the "Control Zone Distance Table", found in Chapter 9 of the WSDOT Utilities Manual, within the road right-of-way in which placement of utility objects is controlled.
Controlled Density Fill	A mixture of Portland cement, fly ash, aggregates, water and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing and excavatable material that will result in a hardened, dense, non-settling fill.
Conveyance System	Shall have the same meaning as defined in SCC 30.91C.300.
County Council	The Snohomish County legislative authority.
County Engineer, County Road Engineer, The Engineer	The County Road Engineer for Snohomish County with authority and duties as designated in RCW 36.75 and RCW 36.80, or his/her authorized designee. Also referred to as "the Engineer" herein.
Cover	Depth to top of pipe conduit, casing or gallery below the grade of a road or ditch.
Critical Area	Shall have the same meaning as defined in SCC 30.91C.340.
Crosswalk	Per RCW 47.04.010: The portion of the roadway between the intersection area and a prolongation or connection of the farthest sidewalk line or, in the event there are no sidewalks, then between the intersection area and a line 10 feet therefrom, except as modified by a marked crosswalk.
CSTC	Crushed surfacing top course.
Cul-de-sac	A road closed at one end, where the closed end is a circular or near circular shape providing a permanent turnaround.
Curb Ramp	A perpendicular or parallel ramp and its landing that cuts through or is built up to the curb.
Deceleration Lane	A speed change lane, including tapered areas, to enable a turning vehicle to slow to a safe turning speed after it has left the main stream of faster moving traffic.

Design Speed	A selected speed used to determine the various geometric design features of the roadway.
Design Storm	Shall have the same meaning as defined in SCC 30.91D.160.
Detention	Shall have the same meaning as defined in SCC 30.91D.170.
Detention Facility	Shall have the same meaning as defined in SCC 30.91D.180.
Developer	Shall have the same meaning as defined in SCC 30.91D.190.
Deviation	A modification of these Standards approved by the County Engineer.
DHV	Design hour volume. Hourly traffic volume used for road design and capacity analysis, usually one or more peak hours during a 24-hour period.
Director	The Director of the Snohomish County Department of Public Works or his/her authorized representative.
Dispersion	Release of surface and stormwater runoff from a drainage facility such that the flow spreads over a wide area and is located so as not to allow flow to concentrate anywhere upstream of a drainage channel with erodible underlying granular soils.
DPW	Snohomish County Department of Public Works.
Drainage	Shall have the same meaning as defined in SCC 30.91D.350.
Drainage Facility	Shall have the same meaning as defined in SCC 30.91D.370.
Drainage Manual	Shall have the same meaning as defined in SCC 30.91D.400.
Drive Aisle	Shall have the same meaning as defined in SCC 30.91D.455.
Driveway	Shall have the same meaning as defined in SCC 30.91D.460.
Driveway, Shared	See **Shared Driveway**.
Easement	Shall have the same meaning as defined in SCC 30.91E.030.
EDDS	The Engineering Design and Development Standards of Snohomish County, adopted by the Snohomish County Department of Public Works pursuant to Title 13 SCC.
Edge of Traveled Way	The point in the road were the traveled way ends and a delineated bike or parking lane, shoulder, edge line or curb begins. Provided, that if there is no delineation or only the centerline is delineated, then it is the edge of pavement.
Effective Impervious Surface	Shall have the same meaning as defined in SCC 30.91E.070.
Encroachment	Occupancy of county right-of-way by non-roadway structures or other objects.
Emergency Vehicle Signal	A special adaptation of a conventional traffic signal specifically installed to allow for the safe movement of authorized emergency vehicles. When not providing for the movement of emergency vehicles the signal shall either flash continuously consistent with the requirements for a conventional traffic signal or display continuous green (allowed at non-intersection locations only). At no time shall the system simply be de-energized. LED displays are required.
Engineer	See County Engineer.
Facility	All or any portion of buildings, roads, structures, improvements, sidewalks, or walkways.
Fire Lane	Shall have the same meaning as defined in SCC 30.91F.300.

Fixed Object	An object, side slope, or water body or other constructed or natural feature that, when struck, can result in impact forces on a vehicle's occupants that may result in injury or place the occupants in a situation that has a high likelihood of injury.
Franchise	A document granted by the County authorizing the use of road rights-of-way by public or private entities, subject to specified conditions, in accordance with RCW 36.55, RCW 80.32 and Chapter 13.80 SCC.
Frontage Improvement	Road improvements that are constructed along a development's public road frontage. This definition does not include the construction or reconstruction of an access point when that is the only improvement being constructed.
Geometrics	The physical arrangement of the visible elements of a road such as alignment, grade, curvature, width, and side slopes.
Grade	Rate or percent of change in slope either ascending or descending from or along the roadway. Measured along the centerline of the roadway or access point.
Hard Surface	Shall have the same meaning as defined in SCC 30.91H.035.
Hazard	A side slope, an object, water, or a drainage device, which, if impacted, would apply unacceptable impact forces on the vehicle occupants, or place the occupants in a hazardous position. May be either natural or man-made.
HMA	Hot mix asphalt.
HOV Lane	A road or highway lane designated for the exclusive use of high occupancy vehicles and marked or signed accordingly.
Hyporheic Zone	Shall have the same meaning as defined in SCC 30.91H.280.
Impervious Surface	Shall have the same meaning as defined in SCC 30.91I.010.
Infill Development	The development of a parcel of land in a highly developed urban area.
Infiltration	Hydrologic process of stormwater runoff soaking into the subsoil, commonly referred to as percolation.
Intersection Sight Distance	Distance required for a driver of a vehicle traveling at or near the posted speed on the major road to reduce speed to avoid overtaking a vehicle which has entered the intersection from the minor road whether by right- or left-turning movements or crossings.
Island	A defined area between traffic lanes for control of vehicle movements and/or for pedestrian refuge.
Land Disturbing Activity	Shall have the same meaning as defined in SCC 30.91L.025.
Landing	Road or driveway approach area to any public or private road. Also, the level area at the back of the sidewalk ramp, typically 4 feet wide.
LID or Low Impact Development	Shall have the same meaning as defined in SCC 30.91L.215.
Maintenance	Those routine or emergency activities taken within the limits of a road network element to prevent a decline, lapse or cessation of existing features for which the activities apply and that involve no more than a de minimus expansion. Those routine or emergency activities may include, but are not limited to, resurfacing the road, controlling vegetation, cleaning drainage ditches, re-striping edge and/or center lines, or replacement of dysfunctional or damaged facilities like a utility pole, fire hydrant, signal or sign with a like or different type as long as the functioning characteristics of the original structure or equipment are substantially unchanged.

Manhole	Opening in an underground utility system into which workers or others may enter for the purpose of making installations, inspections, repairs, connections, cleaning, and testing.
Median	That portion of a divided roadway separating the traveled ways for traffic in opposite directions.
MPH	Miles per hour.
MUTCD	The Manual on Uniform Traffic Control Devices, published by the U.S. Department of Transportation.
New Construction	A new facility constructed where none existed before.
New Development	Shall have the same meaning as defined in SCC 30.91N.044.
New hard surface	Shall have the same meaning as defined in SCC 30.91N.045.
New impervious surface	Shall have the same meaning as defined in SCC 30.91N.046.
Non-Motorized Transportation	Any mode of transportation that utilizes a power source other than a motor.
On-site stormwater management BMPs	Shall have the same meaning as defined in SCC 30.91O.015.
Operating Speed	A speed used for design that is based on the 85th percentile of the distribution of observed speeds as determined by the Engineer.
P85 Speed or 85th Percentile Speed	The speed determined by a speed study, at or below which 85% of the drivers of a particular section of road will choose to drive and feel comfortable, based on the prevailing weather and traffic conditions.
Passing Sight Distance	The minimum sight distance required for the driver of one vehicle to pass another vehicle safely and comfortably.
Pavement	The combination of subbase, base course, and surfacing materials placed on a subgrade to support the traffic load and distribute it to the subgrade.
PC	Point of curvature. The point of change from a back tangent to a circular curve.
PCC	Portland cement concrete or point of compound curvature.
PDS	Snohomish County Department of Planning and Development Services.
Pedestrian	Person traveling on foot, in a wheelchair or similar device.
Pedestrian Facility	Infrastructure and equipment that create a walking environment, including sidewalks, curb ramps, traffic control devices, trails, walkways, crosswalks, paved shoulders, shared use paths and other design features intended to provide for pedestrian travel.
Permanent Road End	The physical termination of a roadway without potential for extension, based on the best available evidence at the time of evaluation. Typically a cul-de-sac.
Permeable Pavement	Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir.
Permit	A document or franchise authorized by the county.

Pervious Surface	Shall have the same meaning as defined in SCC 30.91P.188.
PI	Point of intersection. The point of intersection of a back tangent and a forward tangent.
Pipe	Structural tubular product designed, tested, and produced for the conveyance of specific liquids or gases under specific conditions.
Planter strip or planting strip	A planter strip is that portion of right-of-way between the curb line and the sidewalk, or between the sidewalk and the right-of-way line, used for the planting of trees, shrubs, groundcover or grass.
Plowing	Direct burial of utility lines by means of a plow type mechanism that breaks the ground, places the utility line at a predetermined depth, and closes the break.
Pollution-generating impervious surface (PGIS)	~~Pollution-generating impervious surface. Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are regularly subject to vehicular use, industrial activities (as further defined in the glossary of the Drainage Manual), or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall; metal roofs unless they are coated with an inert, non-leachable material such as baked-on enamel coating; or roofs that are subject to venting significant amounts of dusts, mists or fumes from manufacturing, commercial or other indoor activities.~~Shall have the same meaning as defined in SCC 30.91P.256.
Pollution-generating pervious surface (PGPS)	Shall have the same meaning as defined in SCC 30.91P.257.
Posted Speed	Maximum vehicle speed signed along a roadway or, if not posted, the regulatory speed required by Chapter 11.16 SCC
Primitive Road	An unmaintained or privately maintained county right of way that meets the requirements of RCW 36.75.300. Typically, a primitive road has a gravel or earth driving surface, and an average annual daily traffic of one hundred or fewer vehicles. A primitive road must be established by County Council ordinance.
Private Road	A road network element that is privately owned and maintained, located within a tract or easement, and designed to provide access from a public road to three or more lots.
Project	Shall have the same meaning as defined in SCC 30.91P.445.
Project Site	Shall have the same meaning as defined in SCC 30.91P.354.
PT	Point of tangency. The point of change from a circular curve to a forward tangent.
Public Road	Used interchangeably with road, roadway or street. Improvements in the right-of-way maintained by the county for the passage of vehicles that, where appropriate, may include pedestrian, equestrian and bicycle facilities. Limits include the outside edge of sidewalks, or curbs and gutters, planter strips, paths, walkways, or side ditches, including the associated shoulder and all slopes, ditches, channels, waterways, and other features necessary for proper drainage and structural stability within the right-of-way.
Radius Return Access Point	Intersection of an access point with a county road delineated by either pavement edges or curbs laid out at each edge in a curvilinear fashion between tangents formed by the edge of roadway (or curb face) and the edge of access point (driveway pavement or curb face).

Rain Garden	A non-engineered shallow landscaped depression, with compost-amended native soils and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile.
Reconstruction	Reconstruction (including Reconstructed) is where a continuous section of an existing road is rebuilt in its entirety to be in compliance with the EDDS. This definition does not include Frontage Improvements.
Record Drawings	An approved final revision of a design drawing or plan updated to include information from field inspectors showing the true condition or configuration of what has been built. The drawing or plan is designated "Record Drawing" by stamp or lettering on the drawing and the primary function is to document what was designed and what was actually built, including dimensions, elevations, location and calculations. Formerly known as "as-built" or "as-constructed" drawings.
Redevelopment	Shall have the same meaning as defined in SCC 30.91R.070.
Relocation	Planned change of location of an existing facility to a more advantageous place. Character or general physical nature of the facility will not change.
Replaced Hard Surface	Shall have the same meaning as defined in SCC 30.91R.1198.
Replaced impervious surface	Shall have the same meaning as defined in SCC 30.91R.119.
Replacement	Installation of a like element of a utility system or subsystem in the same, or nearly the same, physical location normally due to damage, wear or obsolescence of the element.
Restoration	All work necessary to replace, repair or otherwise restore the right-of-way and all features contained within the right-of-way to the same or equivalent condition as before.
Retention	Shall have the same meaning as defined in SCC 30.91R.160.
Retention Facility	Shall have the same meaning as defined in SCC 30.91R.170.
Right-of-Way (R/W)	Shall have the same meaning as defined in SCC 30.91R.200.
Road, Private	Shall have the same meaning as defined in SCC 30.91R.230.
Road, Public	Shall have the same meaning as defined in SCC 30.91R.220.
Road End	The physical termination of the traveled way.
Road Network	Shall have the same meaning as defined in SCC 30.91R.214.
Road Network Element	Shall have the same meaning as defined in SCC 30.91R.215.
Roadway	Portion of a public or private road network element improved, designed, or ordinarily used for vehicular travel, exclusive of the sidewalk or shoulder even though such sidewalk or shoulder is used by persons riding bicycles.
Rural Area	Shall have the same meaning as defined in SCC 30.91R.260.
SCC	Snohomish County Code.
Separate Turn Lane	An auxiliary lane for traffic in one direction, which has been physically, separated from the through traffic lane(s) by a traffic island or stripe. Frequently provided in one or more approaches to an intersection.
Shared Court	Shall have the same meaning as defined in SCC 30.91S.175.

Shared Driveway	Shall have the same meaning as defined in SCC 30.91D.465.
Shared Roadway	A roadway, without a painted bicycle lane, that does not prohibit bicycles.
Shared Use Path	A multi-use facility physically separated from the roadway, for bicyclists, pedestrians or other non-motorized users.
Shoulder	That portion of the roadway contiguous with the traveled way on the same level for accommodating bicycle and pedestrian travel, stopped vehicles, emergency use, and for lateral support of base and surface courses.
Sidewalk	A facility constructed between the curb line, in the lateral line of a roadway, and adjacent property set aside and intended for pedestrian use, or such portion of private property that parallels, and is in proximity to, a public roadway and dedicated for use by pedestrians. Sidewalks are typically constructed of concrete but may be asphalt or permeable pavement where feasible for stormwater infiltration.
Signed Shared Roadway	A roadway, designated by signing as a preferred route for bicycle use, with appropriate improvements such as widened shoulders.
Site	~~The area defined by the legal boundaries of a parcel or parcels of land that is (are) subject to new development or redevelopment, including contiguous improvements in the right-of-way. For road projects, the length of the project site and right-of-way boundaries define the site.~~ Shall have the same meaning as defined in SCC 30.91S.351.
Snohomish County Drainage Manual	See Drainage Manual.
Source control BMP	Shall have the same meaning as defined in SCC 30.91S.521.
Speed Change Lane	Separate lane to allow a vehicle entering or leaving a roadway to increase speed (acceleration lane), or decrease speed (deceleration lane) to a rate at which it can safely merge with, or diverge from, through traffic.
Stopping Sight Distance	Distance needed for a vehicle traveling at or near design speed to stop, prior to reaching a stationary object in its path.
Stormwater Facility	Shall have the same meaning as defined in SCC 30.91S.596. Same as "Drainage Facility."
Stream	Shall have the same meaning as defined in SCC 30.91S.640.
Street	Used interchangeably with "road," especially in urban areas. See "Public Road" definition.
Swale	A shallow drainage conveyance with relatively gentle side slopes, generally with flow depths less than one foot.
Temporary Road End	The physical termination of a roadway with potential for further extension typically ending in a temporary cul-de-sac or hammerhead turnaround.
Threshold discharge area	Shall have the same meaning as defined in SCC 30.91T.054B.
Traffic	Movement of motorized and non-motorized vehicles, persons, cargo, and equestrians through the transportation network comprised of streets, roads, sidewalks, walkways and shared use paths.
Traffic Control	Those activities necessary to safeguard the general public, as well as all workers, during the construction and maintenance of roadway and other facilities within the right-of-way.

Traffic Engineer Snohomish County Traffic Engineer.

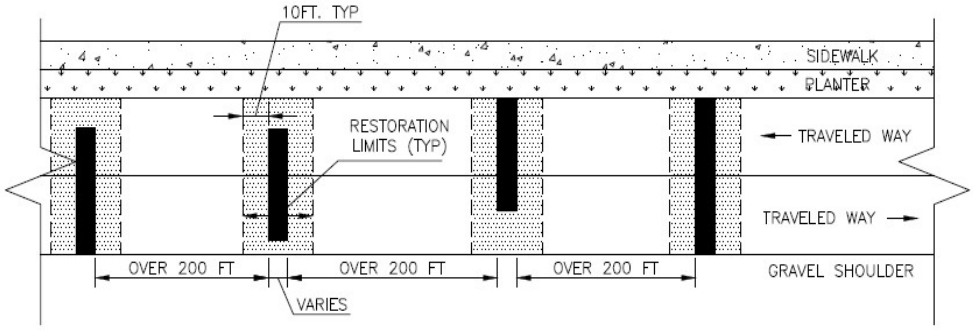
Trail Public way constructed primarily for, and open to, pedestrians, bicyclists and equestrians.

Trail Access Permit A permit issued pursuant to Chapter 13.60 SCC to allow access to a legal lot via county right-of-way where no county-maintained road exists.

Traveled Way That portion of the roadway intended for the movement of vehicles, exclusive of a delineated bicycle or parking lane, shoulder, edge line or curb.

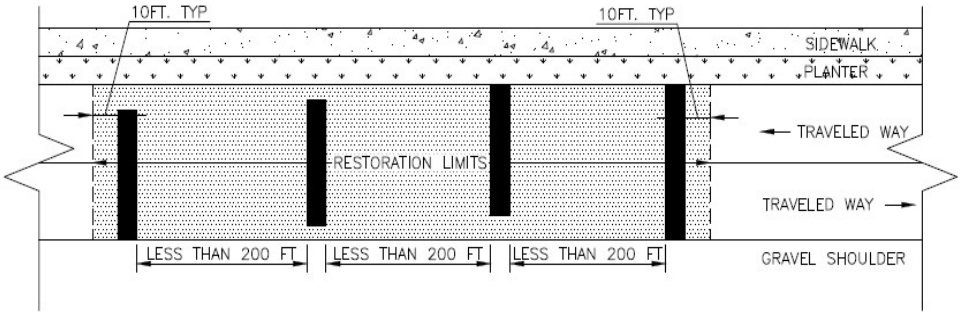
Trench, Lateral, Single A single lateral trench made by a single Utility Purveyor located within the paved portion of the roadway from curb to curb, shoulder to shoulder, or curb to shoulder and is located more than 200 feet from another lateral trench made by the same Utility Purveyor, Provided that single lateral trenches made by more than one Utility Purveyor that are associated with a private development project will be considered multiple lateral trenches for restoration purposes.

SINGLE LATERAL TRENCH



Trench, Lateral, Multiple Multiple lateral trenches are single lateral trenches made by a single Utility Purveyor located within the paved portion of the roadway from curb to curb, shoulder to shoulder, or curb to shoulder and are located closer than 200 feet to another lateral trench, Provided, that multiple lateral trenches associated with a private development project that are made by more than one Utility Purveyor will be considered together for restoration purposes.

MULTIPLE LATERAL TRENCHES



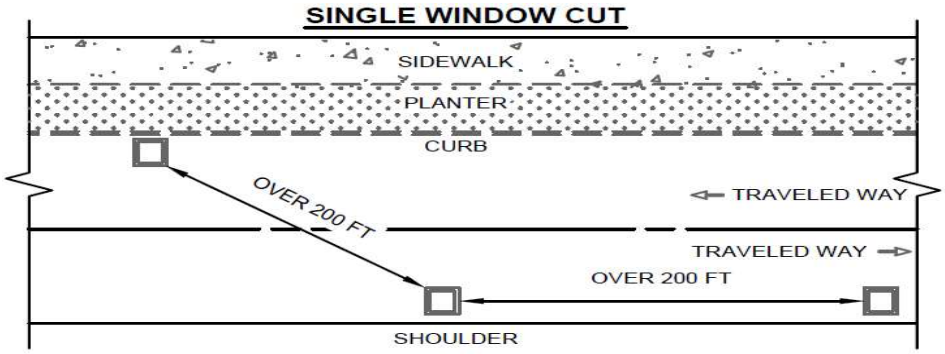
Trip A one-direction movement, which begins at an origin and ends at a destination.

Trip Distribution The calculation and assignment of trips from a land development proposal to the surrounding road network.

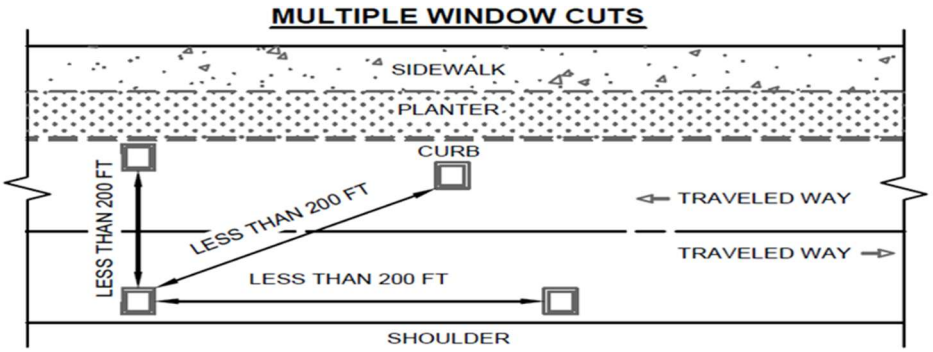
Trip End Each trip has two ends, the origin and the destination. Trip ends for a location are the summation of origins and destinations.

Trip Generation The number of trips created by a particular land use or activity.

Ultimate Buildout	The development potential based on established GMA land use designations, taking into account existing developments and assumptions about environmental constraints and other limiting features.
Unmaintained Road	A road within county right-of-way that is accessible to public travel but is not maintained by the County.
Unopened Right-of-Way	A county right-of-way that exists by dedication or deed, but for which no vehicular roadway meeting these Standards has been constructed by the County or other parties.
Urban Area	Those areas located within an urban growth area (UGA) officially adopted by the County Council pursuant to the State Growth Management Act, RCW 36.70A.
Urban Growth Areas (UGAs)	Shall have the same meaning as defined in SCC 30.91U.090.
Utility	Shall have the same meaning as defined in SCC 30.91U.110.
Vehicular use	Shall have the same meaning as defined in SCC 30.91V.016.
Walkway	An at grade pedestrian facility separated from the traveled way by a ditch, gravel shoulder or planter strip.
Wetlands	Shall have the same meaning as defined in SCC 30.91W.060.
Window Cut, Single	A single window cut is a cut made by a single Utility Purveyor and is located within the paved portion of the roadway (i.e. curb to curb, shoulder to shoulder, or curb to shoulder) that does not exceed 25 square feet in size, and is located more than 200 feet from another window cut or trench made by the same Utility Purveyor. PROVIDED, that single window cuts made by more than one Utility Purveyor that are associated with a private development project will be considered multiple window cuts for restoration purposes.



Window Cuts, Multiple	Multiple window cuts are window cuts of any size (excluding potholing) made by a single Utility Purveyor within the paved portion of the roadway (i.e. curb to curb, shoulder to shoulder, or curb to shoulder) and are located closer than 200 feet to another window cut or trench. PROVIDED, that multiple window cuts associated with a private development project that are made by more than one Utility Purveyor will be considered together for restoration purposes.



WSDOT Washington State Department of Transportation.

Chapter 11 LOW IMPACT DEVELOPMENT (LID)

11-01 INTRODUCTION

Low impact development (LID) means a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design. The goal of LID is to prevent measurable physical, chemical or biological degradation to streams, lakes, wetlands, and other natural aquatic systems from commercial, residential or industrial development sites. LID is the preferred and commonly-used approach to land development in Snohomish County. The Snohomish County Code and the Snohomish County Drainage Manual determine when the use of LID BMPs is mandatory. In recognition of the fact that LID BMPs work to manage stormwater pollution and runoff, Snohomish County encourages their use beyond what is required by the Drainage Manual.

A. LID Objectives

The primary stormwater management objective of LID is to approximate the pre-development (native) forested hydrologic condition (or prairie condition if historic data so indicate) over the full range of rainfall intensities and durations. On a practical level, this is accomplished by minimizing hard surfaces and land disturbance, maximizing retention of native vegetation and soils, and utilizing multiple small systems on a site to promote dispersion and infiltration of runoff as close to the source as possible.

B. Exemptions

1. Activities exempt from stormwater management requirements are described in Chapter 30.63A SCC (Part 200).

   Pavement maintenance activities include only targeted pavement repairs or maintenance. The limits of the exempt surfaces include only the area that must be disturbed to repair or maintain the pavement.

   Pavement maintenance activities do not:

   - change the characteristics of a roadway (e.g. changing a four-way intersection to a roundabout).
   - increase the traffic capacity of a roadway or parking area (e.g. include restriping to add lanes or parking spaces).
   - expand the area of coverage (i.e. add new hard surfaces).

   The following pavement maintenance ~~practices~~activities are exempt from all Minimum Requirements:

   - Pothole ~~and~~patching, square cut patching, or other targeted preservation work;
   - Overlaying (including grinding and overlaying, so long as base coarse is not exposed) existing asphalt or concrete pavement ~~with~~. Examples of overlay materials include bituminous surface treatment (BST or "chip seal"), asphalt, or concrete ~~without expanding the area of coverage~~;
   - Shoulder grading;

- Reshaping/regrading drainage systems (including adding curb/gutter and/or wedge curbs);
- Crack sealing; and
- ~~Resurfacing with in-kind material without expanding the road prism;~~
- ~~Pavement preservation activities that do not expand the road prism; and~~
- Vegetation maintenance associated with the road right-of-way.

~~1.~~2. The following are not pavement maintenance ~~practices are not categorically exempt~~ activities, and are not exempt:

- Removing and replacing ~~a paved surface to the base course or lower, or repairing the pavement base. If impervious surfaces are not expanded, Minimum Requirements (MRs) #1-#5 apply (refer to "Minimum Requirements" below)~~ pavement to base course or lower, or repairing the pavement base (except for pothole or square cut patching). These are considered replaced hard surfaces.
- Extending the pavement edge ~~without increasing the size of the road prism~~, or paving graveled shoulders. ~~(These are considered new impervious surfaces and are subject to the minimum requirements that are triggered when the thresholds identified for new development or redevelopment projects are met.)~~These are considered new hard surfaces.
- ~~Resurfacing by u~~Upgrading from dirt to gravel, ~~asphalt or concrete; upgrading from gravel to asphalt or concrete; or upgrading from~~ a bituminous surface treatment (~~"~~chip seal~~"~~), ~~to~~ asphalt, ~~or~~ concrete, or permeable pavement; upgrading from gravel to chip seal, asphalt, concrete, or permeable pavement; or upgrading from chip seal to asphalt, concrete, or permeable pavement. ~~(These are considered new impervious surfaces and are subject to the minimum requirements that are triggered when the thresholds identified for new development or redevelopment projects are met.)~~These are considered new hard surfaces.

3. Underground utility ~~projects that~~ activities include installing, maintaining, and/or upgrading an underground utility. The limits of the exempt surfaces include only the area disturbed by the trench work necessary for the underground utility work (including any over-excavating necessary for the utility trench).

   In order for an underground utility activity to be exempt, it cannot be part of, directly related to, or caused by a new development or redevelopment project.

   Underground utility activities must replace the ground surface with in-kind material or materials with similar runoff characteristics.

   Underground utility activities are ~~only~~ subject to only Minimum Requirement #2 (Construction Stormwater Pollution Prevention).

C. New Development and Redevelopment

Proposed activities that are not exempt are categorized as either "new development" or "redevelopment," as defined in EDDS Section 1-17. Projects that meet the definition of "redevelopment" shall not be considered "new development."

The drainage review thresholds for new development and redevelopment projects, and the applicable MRs, are described in Chapter 30.63A SCC (Part 300). Additional requirements for road-related redevelopment projects are specified in SCC 30.63A.310(5).

D. Minimum Requirements (MRs)

1. The MRs applicable to "new development" and "redevelopment" projects are described in Volume I, Chapter 2 of the Drainage Manual.

   i. MR #1: Preparation of Stormwater Site Plans
   ii. MR #2: Construction Stormwater Pollution Prevention Plan (SWPPP)
   iii. MR #3: Source Control of Pollution
   iv. MR #4: Preservation of Natural Drainage Systems and Outfalls
   v. MR #5: On-Site Stormwater Management
   vi. MR #6: Runoff Treatment
   vii. MR #7: Flow Control
   viii. MR #8: Wetlands Protection
   ix. MR #9: Operation and Maintenance

11-02 LID BEST MANAGEMENT PRACTICES (BMPs)

A. General

LID BMPs are distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of filtration, storage, evaporation, infiltration and transpiration. LID BMPs include, but are not limited to, rain gardens, bioretention, permeable pavement, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs and water re-use.

LID BMPs shall be designed and constructed in accordance with the Drainage Manual and these Standards, including the design criteria, limitations and infeasibility criteria identified for each BMP, as applicable. Additional technical guidance can be found in Low Impact Development: Technical Guidance Manual for Puget Sound (TGM), published by the WSU Extension and the Puget Sound Partnership (2012). In the event of conflict between the Drainage Manual and other design documents, the Drainage Manual shall take precedence. Subsections 11-02.G through J below discuss particular details of certain LID BMPs that are important due to conditions known to exist in Snohomish County.

B. BMP Feasibility

The BMP feasibility decision process is critical for determining how LID measures can be incorporated into the project design. BMP feasibility shall be evaluated using information developed from the site planning process of MR #1 and the design criteria, limitations and infeasibility criteria for each BMP.

C. BMP Selection

The BMP and facility selection process is detailed in Volume I, Chapter 4 of the Drainage Manual. BMPs are provided in Volumes II through V for MR #3 (Source Control), MR #5

(On-Site Stormwater Management), MR #6 (Runoff Treatment), MR #7 (Flow Control) and MR #8 (Wetlands Protection). Important design information for infiltration, flow control and treatment is provided in Volume III, Subchapter 3.3 (Infiltration Facilities for Flow Control and for Treatment).

D. Use of WSDOT Highway Runoff Manual

In accordance with SCC 30.63A.140, ~~T~~the Washington State Department of Transportation Highway Runoff Manual (HRM), as determined by the Washington State Department of Ecology to be equivalent to the 20~~12~~4 Stormwater Management Manual for Western Washington, may be used to meet the requirements of Chapters 30.63A and 30.63B SCC for public road construction projects as permitted by the County's applicable NPDES permit, subject to approval by the Engineer. ~~HRM equivalency is limited to its minimum design requirements and BMPs for public road projects only.~~

E. Future Technologies and BMPs

The use of new technologies and BMPs approved by DOE is described in Volume V, Chapter 12 of the Drainage Manual. Information on approved systems and technologies ~~is~~are provided on ~~the~~ DOE ~~"SW Treatment Technologies"~~ webpage~~s~~.

F. BMP Implementation

LID design typically requires the integration of multiple BMPs to meet the minimum requirements applicable for a given project. Implementation of LID BMPs shall comply with the following requirements unless approved otherwise by the Engineer:

1. SWPPP Elements 11 and 13 require protection from siltation and compaction for BMPs installed for infiltration or on-site stormwater management, as described below and in Volume II, Chapter 3 of the Drainage Manual:
   i. Install and maintain erosion and sediment control BMPs on portions of the site that drain to BMP areas.
   ii. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Removal of sediment and replacement with soils meeting the design specification may be necessary.
   iii. Clean permeable pavement that is fouled with sediment, or that no longer passes the initial infiltration test, according to the maintenance procedures in Volume V, Chapter 4 of the Drainage Manual.
   iv. Keep construction equipment and foot traffic off existing soil where infiltration or on-site stormwater management BMPs will be located to prevent compaction and retain the infiltration rate of the soil.
2. The Engineer is responsible for regulating use of the public right-of-way per RCW 36.75. To ensure that public priority is maintained, the right-of-way shall not be used for placement of stormwater facilities serving private property per EDDS Section 5-02.
3. LID BMPs may be installed in the right-of-way for treatment or flow control of stormwater runoff from public roads as approved by the Engineer.
4. BMP plantings in the right-of-way must be low-growing species and mowable by County maintenance equipment, unless otherwise approved by the Engineer. No plantings that require individual maintenance will be approved in the right-of-way. A recommended

list of seed mixes for filter strips and bioretention facilities is provided in Appendix B of these Standards.

G. Full Dispersion (Drainage Manual Volume V, BMP T5.30)

Full dispersion, where feasible, may reduce a development's total effective impervious surface and eliminate the requirement for runoff treatment or flow control facilities. The BMP describes particular requirements for dispersion from roof downspouts, driveways, and roadways. It also contains a subsection, "Minimum Design Requirements for Public Road Projects," that details the dispersion requirements for public road projects that are not part of residential, commercial or industrial site development. Full dispersion for roadways will likely be implemented only for roads outside urban growth areas where adjacent land is available for this purpose.

H. Rain Gardens (Drainage Manual Volume V, BMP T5.14A)

1. General: Rain gardens are generally appropriate for small projects where multiple, small infiltration facilities can be installed on a site instead of a larger system. They do not qualify for compliance with the LID Performance Standard or for meeting MR #5 (On-Site Stormwater Management) for larger projects that are subject to MRs #1-#9.
    i. Rain gardens are not considered "engineered facilities," but technical expertise is still required for proper design, such as an overflow system to prevent ponding and to convey overflow to an appropriate downstream location.
    ii. Rain gardens shall not be located in the public right-of-way due to their special maintenance requirements.
2. Infeasibility Criteria: The infeasibility criteria for BMP T5.14A are listed in BMP T7.30 (Bioretention Cells, Swales and Planter Boxes) in the Drainage Manual, Volume V. Two criteria that require careful evaluation are:
    i. Where a minimum vertical separation of one foot to the seasonal high water table, bedrock or other impervious layer would not be achieved below a rain garden serving a drainage area that is: (1) less than 5,000 square feet of pollution-generating impervious surface, and (2) less than 10,000 square feet of impervious surface; and (3) less than 3/4 acre of pervious surface.
    ii. Where infiltration would threaten adjacent facilities, such as underground utilities, structures or basements, or roads, parking lots, etc.
3. Design and Construction: Guidance for specifications and construction can be found in the "Rain Garden Handbook for Western Washington," published by the WSU Extension Office of Pierce County. These guidelines are intended to assist the construction of these non-engineered facilities outside the public right-of-way. The "Rain Garden Handbook" is not an adopted construction standard document for the County.

I. Bioretention (Drainage Manual Volume V, BMPs T5.14B & T7.30)

1. General: Bioretention systems are shallow landscaped depressions that are considered "engineered" facilities in that soil mixes and plants are selected to remove pollutants and to reduce runoff quantities and flow rates. These systems may be constructed as cells, swales or planters and planter boxes as described in BMP T7.30. Additional information is provided in BMP T5.14B and in Section 5-12 of these Standards. Bioretention systems

are not conveyance systems even though an underdrain may be required depending on soil conditions and infiltration.

Certain patented treatment systems that use specific, high rate media for treatment have been approved by the Department of Ecology (DOE). Such systems are not considered LID BMPs and are not options for meeting MR #5, although they may be used for MR #6 where appropriate. Information on approved systems and technologies may be found on the DOE "SW Treatment Technologies" webpage.

2. Infeasibility Criteria: The infeasibility criteria are provided in BMP T7.30. Similar to rain gardens, two criteria that require careful evaluation are the minimum vertical separation to groundwater and the potential infiltration threat to adjacent facilities. The minimum vertical separation to the seasonal high water table, bedrock or other impervious layer is one foot or three feet, depending on the size of the drainage area, as described in BMP T7.30.

3. Design and Construction:

   i. Key elements of the design process include determination of the subgrade infiltration rate and the bioretention soil mix infiltration rate that may include use of new high performance bioretention soil mixes (HPBSM), as described in BMP T7.30.

   ii. Bioretention soil depth: Must be a minimum of 18 inches to provide water quality treatment and an adequate growth environment for plants.

   iii. Geosynthetic material: Should not be installed between the bioretention soil mix and the subgrade because downward migration of soil fines may clog the material and reduce infiltration.

   iv. Underdrain: Design information is provided in BMP T7.30; additional guidance may be found in the TGM. Note that the minimum pipe diameter is 4 inches, the minimum slope is 0.5 percent, and the minimum orifice diameter for flow control is 0.5 inches to reduce clogging.

   v. Check dams and weirs: May be required to reduce flow velocity and erosion, or to increase detention time and infiltration on sloped sites.

   vi. Excavation: Excavation equipment must not operate in the bioretention area to prevent soil compaction. Refer to BMP T7.30 for detailed information on soil excavation and placement.

   vii. Fencing: EDDS 5-10.J.2 requires that fencing be installed around open systems when the maximum design water depth is greater than 3 feet or the sideslopes are steeper than 3H:1V.

   viii. Plantings in bioretention systems in the right-of-way must be low-growing species that can be mowed by County maintenance equipment, unless approved otherwise by the Engineer. No plantings that require individual maintenance will be approved in the right-of-way. A recommended list of seed mixes is provided in Appendix B Vegetative Seed Mixes for Use in Public Right-of-Way.

   ix. No fixed obstructions: No fixed part of any bioretention system located in the public right-of-way may extend more than 4 inches above the surface of the floor or sideslopes of the facility, unless approved by the Engineer. This is to prevent snagging of vehicles that may leave the adjacent road surface.

4. Restoration: In the event a bioretention facility is damaged by other construction, maintenance activities or motor vehicles, the party responsible shall restore the facility to an equivalent or better condition, as determined by the Engineer.

J. Permeable Pavement Drainage Manual Volume V, BMP T5.15)

See Standard Drawings 11-010, 11-020 and 11-030

1. General:

i. The four general categories of permeable pavement systems are described below. Typical cross-sections for porous asphalt and pervious concrete are provided in Standard Drawings 11-010 and 11-020.

a) Porous hot or warm-mix asphalt pavement

A flexible pavement similar to standard asphalt that uses a bituminous binder to adhere aggregate together. The fine material (sand or finer) is reduced or eliminated so that voids form between the aggregate and allow water to infiltrate.

b) Pervious Portland cement concrete

A rigid pavement similar to conventional concrete that uses a cementitious material to bind the aggregate. The fine aggregate (sand) is reduced or eliminated so that voids form between the aggregate and allow water to infiltrate.

c) Permeable interlocking concrete pavements (PICP) and aggregate pavers

PICPs are solid, pre-cast, Portland cement concrete modular units. Joints between the units are filled with permeable aggregate and installed on an open-graded aggregate bedding course. Aggregate (or pervious) pavers are modular pre-cast units of similar-sized aggregates bound together with Portland cement concrete, high-strength epoxy or other adhesives. Similar to PICPs, the joints or openings in the units are filled with open-graded aggregate and placed on an open-graded aggregate bedding course. Aggregate pavers are intended for pedestrian use only.

d) Grid systems (concrete or plastic)

Pre-cast concrete or plastic units are filled with topsoil and grass or permeable aggregate. The grid sections are connected together and pinned into a dense-graded base, or are eventually held in place by the grass root structure and the aggregate. Both types can be installed on an open-graded aggregate base as well as a dense-graded aggregate base.

b. Permeable pavement type selection must be appropriate for the intended use. Pervious concrete is the preferred permeable pavement for facilities that are subject to motor vehicle loads and tire shear forces. Permeable interlocking concrete pavements, aggregate pavers and concrete or plastic grid systems are not approved for road surfaces in the public right-of-way and are not recommended for private road network elements that carry significant traffic volumes or truck traffic.

c. Permeable pavement may be damaged by differential settlement. Permeable pavement shall not be used for bicycle, pedestrian or parking facilities adjacent to impervious pavement unless the design provides appropriate measures, such as a concrete separation barrier, to provide lateral support and to mitigate the structural strength differences of the pavements. In addition, the design shall ensure that

infiltration through a permeable pavement surface does not compromise the adjacent impervious pavement structure.

d. Permeable pavement systems shall be installed by contractors qualified either by certification by an appropriate trade organization, such as the National Ready-Mix Concrete Association, or by previous experience (at least three permeable pavement projects within the past five years).

2. Infeasibility Criteria: Among the infeasibility criteria listed in BMP T5.15, the following require careful evaluation:

   i. Where infiltrating and ponding water below the new permeable pavement would threaten (1) adjacent impervious pavements, (2) existing below-grade basements, or (3) the safety or reliability of pre-existing underground utilities, underground storage tanks or road subgrades.

   ii. Where the native soils below a pollution-generating permeable pavement (e.g. a road or parking lot) do not meet the soil suitability criteria for providing treatment. Refer to Site Suitability Criteria 6 (SSC-6), "Soil Physical and Chemical Suitability for Treatment," in Volume III, Section 3.3.7 of the Drainage Manual.

   iii. Where seasonal high groundwater or an underlying impermeable/low permeable layer would create saturated conditions within one foot of the bottom of the lowest gravel base course.

   iv. Where roads carry more than very low traffic volumes or areas have more than very low truck traffic. Roads with a projected average daily traffic volume of 400 vehicles or less are very low volume roads (AASHTO, 2001 and US Department of Transportation, 2013). Areas with very low truck traffic volumes are roads and other areas not subject to through truck traffic but may receive up to weekly use by utility trucks (e.g., garbage, recycling), daily school bus use, and multiple daily use by pick-up trucks, mail/parcel delivery trucks and maintenance vehicles. This infeasibility criterion does not apply to sidewalks or other non-motorized vehicle surfaces associated with the road.

   v. Where the site cannot reasonably be designed to have a porous asphalt surface at less than 5 percent slope, or a pervious concrete surface at less than 10 percent slope, or a permeable interlocking concrete pavement surface (where appropriate) at less than 12 percent slope. The upper slope limit for grid systems can range from 6 to 12 percent; contact the manufacturer for a maximum slope recommendation for the proposed use.

3. Design:

   i. Permeable pavement systems must be engineered to meet the requirements of the intended use, using appropriate materials with the necessary structure and strength, while infiltrating stormwater consistent with site conditions and design parameters. Permeable pavement specifications are evolving as project experience is gained in the Puget Sound region. Certain specifications are recommended below, but designers should consult sources such as the WSDOT Standard Specifications, the TGM and regional specifications developed by the City of Tacoma, for additional guidance.

ii. The wearing layer for all permeable pavement surface types shall have a minimum initial infiltration rate of 20 inches per hour. Significantly higher initial infiltration rates are desirable to improve long-term performance.

iii. Road projects proposing to use permeable pavement should be designed with adequate drainage conveyance facilities as if the road surface was impermeable. Road design should balance the storage capacity of the base materials and the infiltration rate of the surrounding native materials so that infiltrated water does not compromise the structural integrity of the road prism. Roads with base courses that extend below the surrounding grade should have a designed drainage flow path to move water away from the road prism and into the roadside drainage facilities. Note that if the design requires use of a perforated storm drain to collect and transport infiltrated water from under the road surface, the design will be less effective and the flow reduction benefit reduced. See Subsection 4.~~g~~vii below for "Underdrains."

iv. Permeable pavements used for pedestrian facilities and accessible routes of travel must have surfaces that comply with ADA (Americans with Disabilities Act) standards. ADA-compliant pedestrian facilities must include detectable warning surfaces to distinguish pedestrian areas from vehicular areas for the visually impaired. If the surface of a permeable pavement facility is rough enough to obscure the detectable warning surface, then a section of conventional asphalt or concrete shall be installed around the warning strip to highlight the transition.

4. Pavement Structure and Specifications:

The cross-sectional elements of permeable pavements are described in subsections a. through g. below and shown in Standard Drawings 11-010 and 11-020. References below to "subject to vehicle loading," apply to roads and other driving surfaces, pedestrian facilities located adjacent to curbs or vehicle travel lanes, and to separated pedestrian facilities that allow or require maintenance vehicle access.

i. Top Course or Wearing Layer:

a) Porous Asphalt: A flexible surface similar to conventional asphalt but fines smaller than a No. 30 sieve are reduced. Void ratios in the range of 16%–25% are typical. Asphalt binder shall be PG 70-22ER, polymer modified or higher grade, with a total weight between 6% and 7%. Recycled asphalt pavement shall not be used in porous asphalt. For additional materials required for porous asphalt construction that are not described in this section, refer to WSDOT Standard Specifications 5-04.2.

Aggregate for the porous asphalt top course shall consist of clean and washed, crushed stone with at least 90% fracture on two faces on the No. 4 sieve. The following is a recommended gradation for the Puget Sound region:

SIEVE SIZE	PERCENT PASSING
3/4-inch square	100
1/2-inch square	90-100
3/8-inch square	55-90
US No. 4	10-40
US No. 8	0-20

US No. 40	0-13
US No. 200	0-5

Recommended minimum layer depth: 6 inches for sections subject to vehicle loading; 4 inches for pedestrian facilities or other sections not subject to vehicle loading.

b) Pervious Concrete: A rigid surface using round or crushed aggregate typically, with Portland cement and admixtures to increase workability and strength. Void ratios of 15% – 20% are typical. Specifications shall conform to ACI 522.1, "Specification for Pervious Concrete Pavement," published by the American Concrete Institute. Quality control and testing procedures, including test panels, shall conform to ACI 522.1 and guidance provided in the TGM.

Aggregate for the pervious concrete top course is recommended to be clean and washed, 1/4-inch to 5/8-inch round or crushed aggregate conforming to the AASHTO No. 8 gradation:

SIEVE SIZE	PERCENT PASSING
1/2-inch square	99-100
3/8-inch square	85-100
US No. 4	10-30
US No. 8	0-10
US No. 16	0-5

Recommended minimum layer depth: 6 to 12-inches for surfaces subject to vehicle loading; 6 to 9-inches for parking lots; 4-inches for pedestrian facilities or other sections not subject to vehicle loading.

For pervious concrete, transverse control (contraction) joints shall be installed at 15-foot maximum intervals. The joints shall extend to a depth of 1/4 thickness of the pervious concrete layer. Expansion joints shall not be used except where the pavement abuts other slabs or structures.

c) Permeable Interlocking Concrete Pavement and Aggregate Pavers: A flexible surface capable of high vehicle loads but at low speed. Voids of 12% are typical. Pavement joints should be filled with No. 8, 89 or 9 stone.

d) Grid/Lattice Systems: A flexible surface composed of concrete or plastic grids filled with a minimum of 2 inches of sand, gravel, or soil and planted with grass. Capable of high vehicle loads but at low speed and infrequent use to minimize grass damage.

ii. Choker Course:

a) Porous Asphalt: An optional layer, 1 to 2 inches in depth, of clean and washed, crushed rock meeting the gradation shown above for the top course/wearing layer.

This layer serves to more evenly distribute loads to the base layer, particularly if larger diameter rock is used for the base.

b) Pervious concrete: A choker course is generally not recommended.

iii. Aggregate Base Layer (Reservoir Course):

a) Porous asphalt: Two gradation options for the aggregate base layer recommended for the region are:

Permeable ballast:

SIEVE SIZE	PERCENT PASSING
2 - 1/2-inch	100
2-inch	90-100
1 - 1/2-inch	35-70
1 inch	0-15
1/2-inch	0-5
US No. 100	0-3
% Fracture	95

Crushed surfacing choker course:

SIEVE SIZE	PERCENT PASSING
1 - 1/2-inch	100
1 inch	95-100
1/2-inch	25-60
US No. 4	0-10
US No. 8	0-5
% Fracture	95

Recommended minimum layer depth: 12-inches for sections subject to vehicle loading; 6-inches for pedestrian facilities or other sections not subject to vehicle loading.

b) Pervious concrete: The permeable ballast specification above is recommended for use with pervious concrete. Crushed surfacing choker course should not be used for pervious concrete installations.

Recommended minimum layer depth: 6 inches.

c) Aggregate specifications for permeable interlocking concrete pavement and concrete or plastic grid systems may be found in the TGM, section 6.3.2.

d) The aggregate base layer shall be clean and washed, crushed rock meeting the specifications above for the respective pavement types. Round rock shall not be

used where the perimeter of the base layer is not confined, such as for a sidewalk placed above grade.

e) The base layer shall be designed with sufficient depth to meet flow control requirements, taking infiltration into account. If the infiltration rate and the base layer's storage do not meet flow control requirements, then an underdrain system per subsection 4.vii may be required.

f) Where a permeable pavement system is installed on a grade, or where the system may create a conveyance channel for intercepted groundwater, then measures such as berms and checkdams shall be installed in the base or reservoir course to retard horizontal flow through the layer and promote infiltration. The distance between the berms or checkdams will vary depending on slope, flow control requirements and other site design considerations. Refer to Standard Drawing 11-030.

g) Where the facility grade may cause infiltrated runoff to overtop an internal berm, measures such as plastic cell separation joints shall be installed above each berm as necessary to control horizontal flow through the surface layer. Refer to Standard Drawing 11-030.

iv. Separation or Bottom Filter Layer:

A layer of sand or washed, crushed stone (0.5 inch or smaller) graded flat may be installed to promote infiltration across the surface, stabilize the base layer, protect underlying soil from compaction, and serve as a transition between the base layer and any underlying geosynthetic layer, if installed.

v. Geosynthetic Layer:

A layer of geosynthetic material above the subgrade is not typically necessary because it may create a clogging surface. However, a geosynthetic layer may be appropriate where soil characteristics, such as fine-grained clay or silt, indicate that upward movement of soil particles is possible and could cause void spaces to clog. Geosynthetic material may also be advisable on sloped surfaces to address subsurface scour and on the sides of excavations to prevent erosion of adjacent soil into the aggregate base. Specifications for geosynthetics are provided in the WSDOT Standard Specifications, Section 9-33 (use "Permanent Erosion Control, High Survivability, Non-woven, Class B" fabric).

vi. Subgrade:

a) Compact the subgrade to the minimum necessary for structural stability. Two guidelines used to specify subgrade compaction are "firm and unyielding" (qualitative) and 90%-92% Standard Proctor (quantitative). Construction practices must ensure that subgrade compaction from heavy equipment or truck traffic does not occur.

b) To prevent compaction when installing the aggregate base: (1) dump the aggregate base onto the subgrade from the edge of the installation and then push the aggregate onto the subgrade, and (2) dump subsequent loads of aggregate from the top of the aggregate base as the installation progresses.

vii. Underdrains:

An underdrain or overflow system may be required to convey high-volume runoff and prevent saturation of the pavement. The underdrain shall discharge to an approved bioretention or dispersion system, detention facility or conveyance system.

The recommended specifications for underdrains are:

a) Use thick-walled plastic pipe, slotted, with a minimum diameter of 6 inches;

b) Install at a depth that provides adequate cover for vehicle loads; and

c) For flow control, the minimum orifice diameter is 0.5 inch to reduce clogging.

Note that if an underdrain is placed at or near the bottom of the aggregate base layer in a permeable pavement design, the permeable pavement is no longer considered an LID BMP and cannot be used to satisfy MR #5 (On-Site Stormwater Management). However, a design utilizing an underdrain that is elevated within the aggregate base layer to protect the pavement wearing course from saturation is considered an LID BMP and can be used to satisfy MR #5. Further guidance on modeling permeable pavement with underdrains is provided in Volume III, Appendix III-C of the Drainage Manual.

viii. Acceptance Testing:

a) Driveways can be tested by pouring water on the surface and observing how much infiltrates and how much runs off. If more than a small amount runs off, additional testing is necessary before accepting construction.

b) Acceptance testing of permeable pavement other than driveways shall conform to ASTM C1701 for porous asphalt and ACI 522 for pervious concrete.

ix. Restoration:

Any cut or damage to permeable pavement shall be restored with the same permeable pavement, to an equivalent or better condition as determined by the Engineer. Paving over permeable pavement with conventional asphalt, concrete or other impermeable material invalidates prior stormwater design assumptions, creates the potential for runoff to exceed a conveyance or infiltration system, and shall not be allowed unless approved by the Engineer. Permeable pavement shall be restored in accordance with manufacturer's specifications by contractors qualified either by previous experience (at least three permeable pavement projects within the past five years) or certification by an appropriate trade organization. The pavement restoration plan shall be approved by the Engineer.

11-03 MAINTENANCE STANDARDS

Maintenance standards for stormwater facilities shall comply with the respective BMPs and with Chapter 4.6 ("Maintenance Standards for Drainage Facilities") in Volume V of the Drainage Manual.

In addition, to minimize stormwater contamination, maintenance of privately-owned road network elements should be performed in accordance with BMP 4.30 in Volume IV of the Drainage Manual.