SECTION I: GREEN STORMWATER INFRASTRUCTURE (GSI)

The City of Seattle's Stormwater Code requires that single-family residential projects implement Green Stormwater Infrastructure (GSI) to the maximum extent feasible. GSI is a stormwater Best Management Practice (BMP) that utilizes infiltration, dispersion, evaporation, transpiration, and/or detention. The intent of GSI is to help mitigate the impacts of development. GSI provides a function in addition to stormwater management such as water reuse, open space or providing green space and/or wildlife habitat in the City. The goal is to encourage a smaller building footprint and to effectively manage stormwater runoff as close to the point of origin as possible. To meet submittal requirement for a single-family residential projects, fill out the Pre-Sized Worksheet below. Refer to Director's Rule – *Requirements for Green Stormwater Infrastructure for Single Family Residential and Parcel-Based Projects* for further information, Credits and Sizing Factors.

The interactive GSI calculator is located at:

http://www.seattle.gov/dpd/cms/groups/pan/@pan/@forms/documents/web_informational/dpdp018515.xls

SECTION II: GSI WORKSHEET

City of Seattle GSI to MEF Requirement Calculator (2012-05-01)

Building Permit No. → | Project Type →
Project Address → | Project Area → ____ sf
New plus Replaced Impervious Area → ____ sf
Area Requiring Mitigation → ____ sf

Runoff Reduction Methods		Facility Size		Credit		Area Mitigated
Retained Trees						
Existing Evergreen	# Trees	Total Canopy Area of Trees ____ sf	x	20% Canopy (or min 100 sf/tree) =		
Existing Deciduous	# Trees	Total Canopy Area of Trees ____ sf	x	10% Canopy (or min 50 sf/tree) =		
New Trees						
New Evergreen	# Trees		x	50 sf/tree =		
New Deciduous	# Trees		x	20 sf/tree =		
				Total Area Mitigated by Trees	=	____ sf
Dispersion [1]						
Downspout or Sheet Flow Dispersion		Dispersed Impervious Area ____ sf	x	100.0%	=	____ sf

Infiltration and Reuse Facilities		Facility Size		Sizing Factor		Area Mitigated
Infiltrating Facilities						
Bioretention Cell (without Underdrain)						
1 Contributing Area ____ sf		Bioretention Bottom Area ____ sf	=	Select Project Type	=	____ sf
Ponding Depth ____ in						
Design Infiltration Rate ____ in/hr						
2 Contributing Area ____ sf		Bioretention Bottom Area ____ sf	=	Select Project Type	=	____ sf
Ponding Depth ____ in						
Design Infiltration Rate ____ in/hr						
3 Contributing Area ____ sf		Bioretention Bottom Area ____ sf	=	Select Project Type	=	____ sf
Ponding Depth ____ in						
Design Infiltration Rate ____ in/hr						
Detention Cistern to Bioretention Cell (BC) (without Underdrain) [2]						
Contributing Area ____ sf		Bioretention Bottom Area ____ sf	=	Select Project Type	=	____ sf
Number Cisterns						
BC Ponding Depth ____ in						
BC Design Infilt Rate ____ in/hr						
Permeable Pavement Facility (may receive run-on) [3]						
Contributing Area ____ sf		Permeable Pavement Area ____ sf	=	Select Depth	=	____ sf
Ponding Depth [4] ____ in				Plus Permeable Pavement Facility Area	=	____ sf
Design Infiltration Rate ____ in/hr						
Reuse Facilities [1]						
Rainwater Harvesting		Applicant must provide documentation of area mitigated by rainwater harvesting				____ sf

Impervious Surface Reduction Methods		Facility Size		Credit		Area Mitigated
Alternative Pavement Surfaces						
Permeable Pavement Surface (Subgrade Slope ≤2%)		Permeable Pavement Area ____ sf	x	100.0%	=	____ sf
Permeable Pavement Surface (Subgrade Slope >2-5%)		Permeable Pavement Area ____ sf	x	95.0%	=	____ sf
Alternative Roof Surfaces [1]						
Green Roof (Single/Multi-Course / 4" Growth Medium)		Green Roof Area ____ sf	x	55.0%	=	____ sf
Green Roof (Multi-Course / 8" Growth Medium)		Green Roof Area ____ sf	x	84.0%	=	____ sf
Partial Infiltration [1]						
Bioretention Cell with Detention (without Underdrain)						
Contributing Area ____ sf		Bioretention Bottom Area ____ sf		Select Project Type	=	____ sf
Ponding Depth ____ in						
Design Infiltration Rate ____ in/hr						

Non-Infiltrating Facilities		Facility Size		Credit		Area Mitigated
Non Infiltrating Facilities						
Bioretention Planter (with underdrain)						
Contributing Area ____ sf		Bioretention Bottom Area ____ sf	=	Select Project Type	=	____ sf
Ponding Depth ____ in						
Detention Cistern with Harvesting Capacity [5,6]						
Contributing Area ____ sf		Min Cistern Area ____ sf		Select Project Type	=	____ sf
		Min Live Cistern Volume ____ gal				

Total Area Mitigated → 0 sf
Area Requiring Mitigation → ____ sf
% Impervious Area Mitigated → ____ %
GSI to MEF Target Achieved? → ____

Notes:
GSI - Green Stormwater Infrastructure; sf - square feet; in - inch; eqn - equation; BC - bioretention cell; min - minimum; ft - feet; in/hr - inch per hour; gal - gallons; infilt - infiltration
1. Single family residential projects and trail/sidewalk projects are not required to evaluate this BMP.
2. Each above ground cistern must have 6.68 sf minimum bottom area, a 0.25 inch orifice and a minimum of 3 feet of live storage above the orifice. If using two cisterns they must be connected and have only one orifice. Flow from cistern orifice must be routed to bioretention cell.
3. The area contributing runoff to a facility shall be no larger than 3 times the permeable pavement facility area corresponding to a minimum sizing factor of 33.3%).
4. Average subsurface ponding depth in aggregate storage reservoir.
5. Cistern must be above ground. Cistern area must be rounded up to next commercially available product. Cistern need not have more than 3 feet of live storage volume above orifice.
6. Water collected using the detention cistern may be used for non-potable uses only (e.g., irrigation). For additional uses of harvested water consider the "Rainwater Harvesting" BMP.
This calculator does not provide conveyance flow calculations.
Applicant is responsible to ensure system overflow conveyance is provided per Section 4.2.5 of the Stormwater Manual Volume 3.

SECTION III: GSI PLANTINGS

Complete the following calculator to determine the minimum number of plantings required for:

	Facility Size Area			Multi-plication Factor		Total Number of Plants (round up)*
Bioretention Cell(s)						
Small Trees (if used)	Bottom & Sides	____ sf	x	0.012	=	____ ea
Shrubs	Bottom & Sides	____ sf	x	0.028	=	____ ea
Groundcover/Herbaceous Plants	Bottom & Sides	____ sf	x	0.084	=	____ ea
Bioretention Planter(s)						
Small Trees (if used)	Bottom	____ sf	x	0.012	=	____ ea
Shrubs	Bottom	____ sf	x	0.028	=	____ ea
Groundcover/Herbaceous Plants	Bottom	____ sf	x	0.084	=	____ ea
Green Roofs						
Groundcover/Succulent Plants	Footprint	____ sf	x	0.088	=	____ sf

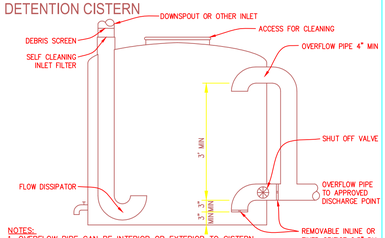
Planting General Notes:
- For a list of approved plants, see the Seattle Green Factor plant list: http://www.seattle.gov/dpd/Permits/GreenFactor/GreenFactorTools/default.asp
- Plans shall specify that vegetation coverage of selected plants will achieve 90-percent coverage within 2 years or additional plantings shall be provided until this coverage requirement is met.
- Plants shall be sited according to sun, soil, wind and moisture requirements
- At a minimum, provisions must be made for supplemental irrigation during the first two growing seasons following installation.

Bioretention Cells and Planters Notes:
- Provide a minimum of three different species of shrubs and herbaceous plants.

Green Roofs Notes:
- Appropriate plants include succulents, grasses, herbs, and wildflowers that are adapted to harsh conditions. Plants can be installed as pre-grown mats, individual plugs, cuttings, or spread as seeds.
- A Landscape Management Plan shall be developed and implemented.

SECTION IV: GSI STANDARD DETAILS

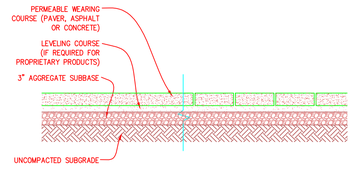
DETENTION CISTERN



NOTES:
1. OVERFLOW PIPE CAN BE INTERIOR OR EXTERIOR TO CISTERN.
2. MAXIMUM OF TWO CISTERNS CAN BE USED.
3. MINIMUM SIZE OF CISTERN SHALL BE 300 GALLONS.

SYMBOL: DC

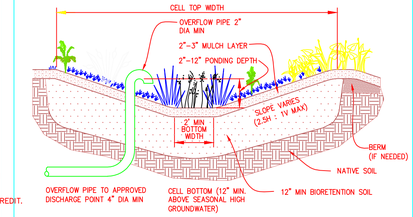
PERMEABLE PAVEMENT SURFACE



NOTES:
1. PERMEABLE PAVEMENT SURFACE AREA DIMENSIONS AND PAVEMENT SLOPE MUST BE SHOWN ON DRAINAGE CONTROL PLAN.
2. AGGREGATE SUBBASE SHALL BE TYPE 22-5/8"-3/4" CLEAR, CRUSHED GRAVEL.
3. PERMEABLE PAVEMENT SURFACE MUST BE LESS THAN 5% SLOPE TO RECEIVE FLOW CONTROL CREDIT.

SYMBOL: PPS

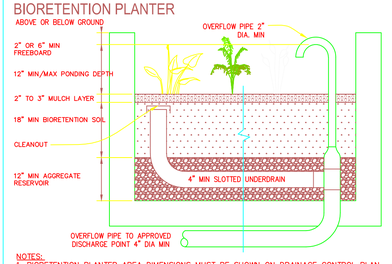
BIORETENTION CELL
WITH SLOPED SIDES



NOTES:
1. BOTTOM AND TOP CELL DIMENSIONS MUST BE SHOWN ON DRAINAGE CONTROL PLAN.
2. PONDING DEPTH SHALL BE NOTED ON PRE-SIZED CALCULATOR.
3. BOTTOM CELL WIDTH SHALL BE A MINIMUM WIDTH OF 2 FEET.

SYMBOL: BC

BIORETENTION PLANTER



NOTES:
1. BIORETENTION PLANTER AREA DIMENSIONS MUST BE SHOWN ON DRAINAGE CONTROL PLAN.
2. AGGREGATE RESERVOIR SHALL BE TYPE 22-5/8" - 3/4" CLEAR CRUSHED GRAVEL.
3. PLANTER SHALL BE A MINIMUM WIDTH OF 2 FEET.
4. SLOTTED DRAIN PIPE SHALL RUN THE LENGTH OF THE PLANTER.
5. MINIMUM FREEBOARD SHALL BE 2 INCHES FOR DRAINAGE AREAS LESS THAN 1,000 SF AND 6 INCHES FOR CONTRIBUTING DRAINAGE AREAS GREATER THAN 1,000 SF. IFREEBOARD SHALL BE NOTED ON PRE-SIZED CALCULATOR.

SYMBOL: BP

SECTION V: DRAINAGE CONTROL PLAN REQUIREMENTS

General requirements:
- Address and permit number of project.
- North arrow.
- Identification of the drawing's scale (min. 1" = 10').
- Property lines and dimensions.
- Identification of adjacent streets (by name), alleys or other adjacent public property.
- Curbs and sidewalks and street trees: type, location, dimensions.
- Street and alley improvement type (asphalt, concrete, gravel, etc.).
- Creeks, streams or any ECA areas, per CAM 103B, if they exist on the site.
- Location and dimensions of all driveways, parking areas, and other paved areas (existing and proposed).
- General location, size and shape of any structures presently on the site and of those proposed for construction; including buildings, retaining walls, patios, decks, porches, rockeries and driveways (existing and proposed).
- Specific location, size and shape of any structures presently on the site and those proposed for construction, including buildings, retaining walls, patios, decks, porches, rockeries and driveways (existing and proposed).
- Show specific location, size and species of all trees at least 6 inches in diameter measured 4 ½ feet above the ground.
- Areas not to be disturbed by construction must be indicated.
- Ground elevations and contour lines with labeled contour intervals on sloping sites or where earth grading is proposed.
- Identify top and bottom of slopes and show dimensions from slope top/bottom tot he building(s).
- Identify drainage ditches, natural watercourses, and culverts (near shorelines).
- Sewer mains (sanitary only [pss] and/or combined sewers [psi]).
- Storm drains [psd] and catch basins.
- Water mains, fire hydrants and water meters.
- Power poles, street lights, signal and transit poles, bus zones, street signs, etc. adjacent to the subject property.
- All other elements between the pavement edge and the property line (such as side sewer, electrical ducts and vaults, electrical conduits, mandholes, ditches culverts, etc.).
- On-site green stormwater infrastructure facilities. See below for further instructions.

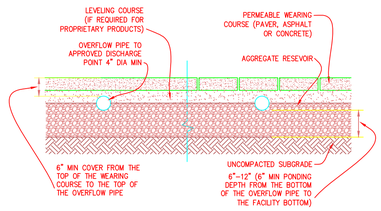
Green stormwater infrastructure requirements:
- Identify contributing areas to each GSI facility.
- Bioretention Cells and Planters: Locations of top and bottom of cell, square footage of bottom area.
- Trees: Locations of newly planted and existing trees used for reduction credit.
- Permeable pavement: Location, type of pavement, slope, and total square footage.
- Impervious pavement: Location and total square footage.
- Green Roofs: Locations and square footage.
- Cisterns: Locations, contributing roof areas, discharge locations and use.

Standard Drainage features:
- Pump systems (wet wells), pump sizes, maintenance holes (MHs), cleanouts, downspouts, catch basins, and area drains.
- Footing drain connections to on-site basins.

Sanitary Sidesewer features:
- Show the new sidesewer from the strucuture to its point of connection with an existing sidesewer or the public main sewer in the street, whichever is applicable.

· An increase in living units using an existing sidesewer will require the evaluation and certification of the existing sidesewer prior to drainage plan approval. See Directors Rule 4-2011V.M.

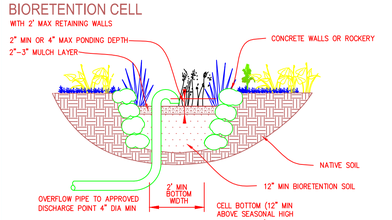
PERMEABLE PAVEMENT FACILITY



NOTES:
1. PERMEABLE PAVEMENT SURFACE FACILITY DIMENSIONS AND PAVEMENT SLOPE MUST BE SHOWN ON DRAINAGE CONTROL PLAN.
2. AGGREGATE RESERVOIR SHALL BE TYPE 22-5/8"-3/4" CLEAR, CRUSHED GRAVEL.
3. PERMEABLE PAVEMENT FACILITY MUST BE LESS THAN 5% SLOPE TO RECEIVE FLOW CONTROL CREDIT.

SYMBOL: PPF

BIORETENTION CELL
WITH 2' MAX RETAINING WALLS



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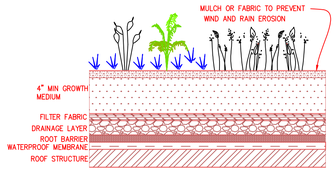
3. BOTTOM CELL WIDTH SHALL BE A MINIMUM WIDTH OF 2 FEET.

SYMBOL: BC

GREEN ROOF



- SINGLE COURSE: 4" GROWTH MEDIUM
- MULTI COURSE: 4" GROWTH MEDIUM
- MULTI COURSE: 8" GROWTH MEDIUM

SYMBOL: GR

SECTION VI: GSI AFFIRMATION

Affirmative statement for Green Stormwater Infrastructure to the Maximum Extent Feasible:

I, _____, certify that Green Stormwater Infrastructure has been implemented to the Maximum Extent Feasible for this project.

Owner/Owner's Rep Signature:_____

Date: _____

DRAINAGE CONTROL PLAN

CHECK SCALE USED: ☐ ONE SQUARE = ONE FOOT (1"=5') ☐ ONE SQUARE = TWO FEET (1"=10') ☐ ONE SQUARE = FOUR FEET (1"=20')

NORTH ARROW

June 2012

STANDARD DRAINAGE CONTROL PLAN - Small Projects

Applicant Plan Sheet

CITY OF SEATTLE DPD DEPARTMENT OF PLANNING AND DEVELOPMENT

Project Number:

Address:

SHEET

DRAINAGE STANDARD PLAN