### 2.3.5 Green Street Typical Details

#### Table of Contents

<table>
<thead>
<tr>
<th>SWALES</th>
<th>CURB INLETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW-300 – Plan View</td>
<td>SW-330 – Concrete Inlet with Wingwalls</td>
</tr>
<tr>
<td>SW-301 – Section View</td>
<td>SW-331 – Concrete Inlet</td>
</tr>
<tr>
<td>SW-302 – (Removed)</td>
<td>SW-332 – Metal Inlet</td>
</tr>
<tr>
<td>SW-303 – Landscape Planting Templates</td>
<td>SW-333 – Inlet &amp; Outlet for Curb Extensions</td>
</tr>
<tr>
<td>SW-304 – Meter &amp; Hydrant Locations</td>
<td>SW-334 – Modified Metal Inlet Assembly</td>
</tr>
<tr>
<td>PLANTERS</td>
<td>SW-335A – Channel &amp; Grate Details</td>
</tr>
<tr>
<td>SW-310 – Plan View without Parking</td>
<td>SW-335B – Inlet, Channel &amp; Grate Details (Step-Out)</td>
</tr>
<tr>
<td>SW-311A – Plan View with Parking (2.5’ Step-out)</td>
<td>SW-336 – Grate &amp; Frame Details</td>
</tr>
<tr>
<td>SW-311B – Plan View with Parking (1’ Step-out)</td>
<td>CHECK DAMS</td>
</tr>
<tr>
<td>SW-312A – Section Views</td>
<td>SW-340 – (Removed)</td>
</tr>
<tr>
<td>SW-312B – Section View (2.5’ Step-out)</td>
<td>SW-341 – Wooden Check Dam for Swales</td>
</tr>
<tr>
<td>SW-313 – Planter Wall Details</td>
<td>SW-342 – Wooden Check Dam for Planters</td>
</tr>
<tr>
<td>SW-314 – (Removed)</td>
<td>SW-343 – Concrete Check Dam for Planters</td>
</tr>
<tr>
<td>SW-315 – Landscape Planting Templates</td>
<td>OVEm RFLOW INLETS</td>
</tr>
<tr>
<td>SW-316A – Meter &amp; Hydrant Locations</td>
<td>SW-350 – Beehive Inlet Grate</td>
</tr>
<tr>
<td>SW-316B – Meter &amp; Hydrant Locations</td>
<td>SW-351 – Overflow Drain</td>
</tr>
<tr>
<td>CURB EXTENSIONS</td>
<td>ADDITIONAL DETAILS</td>
</tr>
<tr>
<td>SW-320 – In-Street Plan View</td>
<td>SW-360 – Liner Attachment &amp; Pipe Boot Details</td>
</tr>
<tr>
<td>SW-321 – In-Planting-Strip Plan View</td>
<td>SW-361 – Tree Well Detail Without Rock Storage</td>
</tr>
<tr>
<td>SW-322 – Section Views</td>
<td>SW-362 – Tree Well Detail With Rock Storage</td>
</tr>
<tr>
<td>SW-323 – Landscape Planting Templates</td>
<td>SW-363 – Herbaceous Plants, Groundcovers &amp; Shrubs</td>
</tr>
<tr>
<td>SW-324 – Meter &amp; Hydrant Locations</td>
<td>SW-364 – Facility Overflow Configurations</td>
</tr>
</tbody>
</table>

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -

Table of Contents

Bureau of Environmental Services

TOC

7-1-2016
DESIGNER INFORMATION:
1. Adopt this plan view example to your engineered design. Maximize surface storage.
2. Provide beginning and ending stations for each facility. Provide stationing and/or dimensions and elevations at each inlet, outlet and check dam.
3. Sidewalk elevation must be set above check dam and inlet elevations to allow overflow to drain to street before sidewalk.
4. Proposed utility lines to be located out of facility.
5. Slopes 3:1. See swale sections on SW–301, unless otherwise specified.
6. Longitudinal slope of swale matches the road.
7. Area and Depth of facility are based upon engineering calculations and right-of-way constraints. See chapter 2 of the City of Portland Stormwater Management Manual (SWMM).

RELATED DETAILS AND RESOURCES:
10. Special requirements for water lines, meters, and fire hydrants. (see SW–304)
11. Swale Planting Template. (see SW–303)
13. Stormwater facility construction and blended soil requirements see City of Portland Standard Construction Specifications, sections 00415 and 01040.14(e).

IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate utilities and survey existing conditions prior to beginning design work and include information on design drawings.

The Portland Bureau of Transportation (PBOT), Portland Water Bureau (PWB), and Bureau of Environmental Services (BES) are responsible for the review and approval of Stormwater Swales in the public right of way. Stormwater facilities in Wellhead Protection Areas may require special containment measures as required by City Code 21.35.

For more information contact:
PBOT (503) 823–7884 BES (503) 823–7761
PWB (503) 823–7368 Urban Forestry (503) 823–4489
SECTION A-A
SWALE

DESIGNER INFORMATION:

1. Show liner and perf-pipe in the Section view if they are required

2. Typical facility width is 8' from back of curb to sidewalk

CONSTRUCTION NOTE:

In facilities that are unlined, fracture and loosen soil to a depth of 12" below grade before installing blended soil or aggregate. Do not till.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Section View
Swale

Bureau of Environmental Services

SW-301
7-1-2016
INSTRUCTIONS
1. Choose a template and alter it to design. These are examples of approved planting templates. Other planting plans may be approved.

2. Plant lists and on-center spacing requirements are found in Section 2.4.1 of the City of Portland Stormwater Management Manual.

3. Planting legend required. State plant species, spacing, and quantities per Zone A and Zone B and per facility. Include the square footage of Zone A and B.

4. Planting Plans shall include labels for each plant group identifying the plant species and quantity in the group.

5. See detail SW–363 for plant spacing.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -

Landscape Planting Templates
Swales

Bureau of Environmental Services

NUMBER

SW–303

7–1–2016
STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -

Meter & Hydrant Locations

Swales

Bureau of Environmental Services

NUMBER

SW–304

7-1-2016
PLAN VIEW

1. Adopt this plan view example to your engineered design. Maximize surface storage.
2. Provide beginning and ending stations for each facility. Provide stationing and/or dimensions and elevations at each inlet, outlet, check dam, planter corner and sidewalk notches.
3. Sidewalk elevation must be set above check dam and inlet elevations to allow overflow to drain to street before sidewalk.
4. Proposed utility lines to be located out of facility.
5. Longitudinal slope of planter matches the road, unless otherwise specified.
6. Area and Depth of facility are based upon engineering calculations and right-of-way constraints. See Chapter 2 of the City of Portland Stormwater Management Manual (SWMM).
7. Minimum interior planter width is 3ft. A minimum of 4 feet is required for planters with street trees.
8. If less than 18” between splash pad and planter wall, extend pad to wall.
9. Place one notch at low point of sidewalk. Space additional notches approximately 6ft apart.

RELATED DETAILS AND RESOURCES:
10. Inlet details SW–331 and SW–332
11. Check Dam details SW–342 and SW–343
12. Special requirements for water lines, meters, and fire hydrants (see SW–316B)
13. Planter Planting Template (see SW–315)
14. Curb and Gutter per PBOT standard drawing P–540
15. Stormwater facility construction and blended soil requirements see City of Portland Standard Construction Specifications, sections 00415 and 01040.14(d)
16. Planter wall detail (see SW–313)

IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate utilities and survey existing conditions prior to beginning design work and include information on design drawings.

The Portland Bureau of Transportation (PBOT), Portland Water Bureau (PWB), and Bureau of Environmental Services (BES) are responsible for the review and approval of Stormwater Swales in the public right of way. Stormwater facilities in Wetland Protection Areas may require special containment measures as required by City Code 21.35.

For more information contact:
PBOT (503) 823–7884 BES (503) 823–7761
PWB (503) 823–7368 Urban Forestry (503) 823–4489

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Plan View without Parking
Planers

Bureau of Environmental Services

SW–310
7–1–2016
DESIGNER INFORMATION:
1. Adapt this plan view example to your engineered design. Maximize surface storage.
2. Provide beginning and ending stations for each facility. Provide stationing and/or dimensions and elevations at each inlet, outlet, check dam, planter corner and sidewalk notches.
3. Sidewalk elevation must be set above check dam and inlet elevations to allow overflow to drain to street before sidewalk.
4. Proposed utility lines to be located out of facility.
5. Longitudinal slope of planter matches the road, unless otherwise specified.
6. Area and Depth of facility are based upon engineering calculations and right-of-way constraints. See Chapter 2 of the City of Portland Stormwater Management Manual (SWMM).
7. Minimum interior planter width is 3 feet. A minimum of 4 feet is required for planters with street trees.
8. May use concrete or pavers per City Standards.
9. Place one notch at low point of sidewalk. Space additional notches approximately 6ft. apart.

RELATED DETAILS AND RESOURCES:
10. Metal Inlet details SW-335A and SW-336
11. Check Dam details SW-342 and SW-343
12. Special requirements for water lines, meters, and fire hydrants (see SW-316A)
13. Planter Planting Template (see SW-315)
14. Curb and Gutter per PBOT standard drawing P-540
15. Stormwater facility construction and blended soil requirements see City of Portland Standard Construction Specifications, sections 00415 and 01040.14(d)
16. Planter wall detail (see SW-313)

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For more information contact:
PBOT (503) 823-7884 BES (503) 823-7761
PWB (503) 823-7368 Urban Forestry (503) 823-4489
DESIGNER INFORMATION:
1. Adopt this plan view example to your engineered design. Maximize surface storage.
2. Provide beginning and ending stations for each facility. Provide stationing and/or dimensions and elevations at each inlet, outlet, check dam, notch and wall corner.
3. Sidewalk elevation must be set above check dam and inlet elevations to allow overflow to drain to street before sidewalk.
4. Existing utility lines must be sleeved or relocated. Proposed utility lines to be located out of facility.
5. Slope 3:1. See section on SW-312A.
6. Longitudinal slope of planter matches the road, unless otherwise specified.
7. Area and Depth of facility are based upon engineering calculations and right-of-way constraints. See Chapter 2 of the City of Portland Stormwater Management Manual (SWMM).
8. Place one notch at low point of sidewalk. Space additional notches approximately 6ft. apart.

RELATED DETAILS AND RESOURCES:
9. Inlet and grate details SW-332, SW-335B and SW-336
10. Check Dam details SW-342 and SW-343
11. Special requirements for water lines, meters, and fire hydrants (see SW-316B)
12. Planting Template (see SW-315)
13. Curb and Gutter per PBOT standard drawing P-540.
14. Stormwater facility construction and blended soil requirements see City of Portland Standard Construction Specifications, sections 00415 and 01040.14(d)
15. Planter Wall Detail (See SW-313)

IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate utilities and survey existing conditions prior to beginning design work and include information on design drawings.

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For more information contact:
PBOT (503) 823-7884  BES  (503) 823-7761
PWB (503) 823-7368  Urban Forestry (503) 823-4489

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Plan View with Parking (1’ Step-Out), Planters

Bureau of Environmental Services

SW-311B
7-1-2016
SECTION A-A
PLANter WITH PARKING (2.5' STEP-OUT)

DESIGNER INFORMATION
1. Show liner and perf-pipe in the Section view if they are required.
2. Maximize 9" of surface storage.
3. Typical facility width is 8' from back of curb to sidewalk.
4. Top of curb and top of sidewalk at approximately same elevation, unless stormwater facility retrofit.

CONSTRUCTION NOTE
In facilities that are unlined, fracture and loosen soil to a depth of 12" below grade before installing blended soil or aggregate. Do not till.

DRAWING NOT TO SCALE

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets
Section View (2.5’ Step-out) Planters

Bureau of Environmental Services

SW-312B
7-1-2016
DESIGNER INFORMATION

1. Special design considerations or structural review may be required for longer planter wall spans. Steel reinforcement or additional concrete check dams may be needed for stability.

2. Specify one of the above planter wall options based on site conditions.

3. Maintain 1:6 batter for walls and 4" minimum from top of wall to top of sidewalk.

4. If a liner is used, See SW-360.

CONSTRUCTION NOTE

Finish all exposed concrete surfaces. See Specs.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Planter Wall Details
Planters

Bureau of Environmental Services

NUMBER
SW-313
7-1-2016
INSTRUCTIONS

1. Choose a template and alter it to design. These are examples of approved planting templates. Other planting plans may be approved.

2. Plant lists and on-center spacing requirements are found in Section 2.4.1 of the City of Portland Stormwater Management Manual.

3. Planting legend required. State plant species, spacing, and quantities per Zone A and Zone B and per facility. Include the square footage of Zone A and B.

4. Planting Plans shall include labels for each plant group identifying the plant species and quantity in the group.

5. See detail SW–363 for plant spacing.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets –
Landscape Planting Templates
Planters

Bureau of Environmental Services

NUMBER

SW–315
7–1–2016
1. Refer to Fire Hydrant Assembly Standard Drawing P-700. Center of hydrants must have min 5 ft clearance to the outside edge of stormwater facility.

2. Standard meter location is Option A. Option B or C can be used only if a minimum of 3' is available between the back of sidewalk and the Right-of-Way line. Option D and E can only be used for an existing service and when other options are infeasible, where a minimum of 1' is available between the back of sidewalk and the Right-of-Way line, and it requires a Design Exception from PBOT to be obtained by the project owner. In addition, for Option D, 3' minimum parking egress area is required for placement of 1' or smaller water meter, and 5' minimum for placement of 1.5" and 2" water meter.

3. Refer to 1" Service Assembly Standard Drawing P-780. For larger services or other appurtenances, contact PWB development services at (503) 823-7366. Water service line must be 2 ft min. from bottom of stormwater facility blended soil.

4. Maintain 2 ft skin-to-skin separation distance between the face of gutter pan and the water main. If water main is < 2 ft from face of gutter pan, the water main must be relocated unless otherwise approved by PWB. Verification of water main depth is required prior to PWB approval.

5. Cross-section views are not required on construction plans.

--- DRAWING NOT TO SCALE ---

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -

Meter & Hydrant Locations

Planters

Bureau of Environmental Services

SW-316A

7-1-2016
1. Refer to Fire Hydrant Assembly Standard Drawing P-700. Center of hydrants must have min 5 ft clearance to the outside edge of stormwater facility.

2. Standard meter location is Option A. Option B or C can be used only if a minimum of 3' is available between back of sidewalk and the Right-of-Way line. Option D can only be used for an existing service when other options are infeasible, where a minimum of 1’ is available between the back of sidewalk and the Right-of-Way line, and it requires a Design Exception from PBOT, to be obtained by the project owner.

3. Refer to 1” Service Assembly Standard Drawing P-780. For larger services or other appurtenances, contact PWB development services at (503) 823-7368. Water service line must be 2 ft min. from bottom of stormwater facility blended soil.

4. Maintain 2 ft skin-to-skin separation distance between the face of gutter pan and the water main. If water main is < 2 ft from face of gutter pan, the water main must be relocated unless otherwise approved by PWB. Verification of water main depth is required prior to PWB approval.

5. Cross-section views are not required on construction plans.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets – Meter & Hydrant Locations
Planter with 1’ Step-out

Bureau of Environmental Services

SW-316B

7-1-2016
DESIGNER INFORMATION:
1. Adapt this plan view example to your engineered design. Maximize surface storage.
2. Provide beginning and ending stations for each facility. Provide stationing and/or dimensions and elevations at each inlet, outlet, check dam, planter corner and sidewalk notches.
3. Sidewalk elevation must be set above check dam and inlet elevations to allow overflow to drain to street before sidewalk.
4. Proposed utility lines to be located out of facility.
5. Longitudinal slope of planter matches the road.
6. Area and Depth of facility are based upon engineering calculations and right-of-way constraints. See Chapter 2 of the City of Portland Stormwater Management Manual (SWMM).
7. Additional inlets in facilities over 25 feet in length per BES or site-specific requirements.

RELATED DETAILS AND RESOURCES:
8. Inlet and outlet details SW–331, SW–332, SW–333 and SW–334
9. Check Dam details SW–342 and SW–343
10. Special requirements for water lines, meters, and fire hydrants (see SW–316)
11. Planter Planting Template (see SW–323)
12. Thickened Curb and Gutter (see PBOT standard drawing P–540)
13. Stormwater facility construction and blended soil requirements see City of Portland Standard Construction Specifications, sections 00415 and 01040.14(d)
14. Planter wall detail (see SW–313)
15. Pavement markings see PBOT standard drawing P–434

IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate utilities and survey existing conditions prior to beginning design work and include information on design drawings.

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For more information contact:
PBOT (503) 823–7884
BES (503) 823–7761
PWB (503) 823–7368
Urban Forestry (503) 823–4489
DESIGNER INFORMATION:

1. Adapt this plan view example to your engineered design. Maximize surface storage.

2. Provide beginning and ending stations for each facility. Provide stationing and/or dimensions and elevations at each inlet, outlet, check dam, planter corner and sidewalk notches.

3. Sidewalk elevation must be set above check dam and inlet elevations to allow overflow to drain to street before sidewalk.

4. Existing utility lines must be sleeved or relocated. Proposed utility lines to be located out of facility.

5. Longitudinal slope of planter matches the road.

6. Area and depth of facility are based upon engineering calculations and right-of-way constraints. See Chapter 2 of the City of Portland Stormwater Management Manual (SWMM).

7. Additional inlets in facilities over 25 feet in length per BES or site-specific requirements.

RELATED DETAILS AND RESOURCES:

8. Inlet and outlet details SW–331, SW–332, SW–333 and SW–334

9. Check Dam details SW–342 and SW–343

10. Special requirements for water lines, meters, and fire hydrants (see SW–324)

11. Planter Planting Template (see SW–323)

12. Thickened Curb and Gutter per PBOT standard drawing P–540

13. Stormwater facility construction and blended soil requirements see City of Portland Standard Construction Specifications, sections 00415 and 01040.14(d)

14. Planter wall detail (see SW–313)

15. Pavement Markings (see PBOT standard drawing P–434)

16. 4" Sidewalk–Drainage Notch (see SW–322). Place one notch at the low point of the sidewalk and place additional notched approximately 6' apart.

IMPORTANT: Utility conflicts and existing conditions can create major design variables. Locate utilities and survey existing conditions prior to beginning design work and include information on design drawings.

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For more information contact:
PBOT (503) 823–7884  BES (503) 823–7761
PWB (503) 823–7368  Urban Forestry (503) 823–4489

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

– Green Streets –
In–Planting–Strip Plan View
Curb Extensions

Bureau of Environmental Services

7–1–2016
CONSTRUCTION NOTE
In facilities that are unlined, fracture and loosen soil to a depth of 12" below grade before installing behind soil or aggregate. Do not till.

FOR PLANTER WALL OPTIONS SEE SHEET SW-313

SIDEWALK DRAINAGE NOTCH TO BE 1" LOWER THAN SIDEWALK, SLOPED TO FACILITY

1:1 BEVEL
NO PARKING
3" MIN.

6" BENCH FOR CURB CONSTRUCTION

1-6" MIN. DEPTH STORMWATER FACILITY BLENDED SOIL

1-1/2" - 3/4" OPEN GRADED ROUND AGGREGATE (WHEN REQUIRED)

3" OF 3/4"-No.4 OPEN GRADED AGGREGATE (WHEN REQUIRED)

EXISTING SUBGRADE
SECTION B-B
(WITH PLANTER WALL)

FOR PLAN VIEW SEE SW-321

CONSTRUCTION NOTE
In facilities that are unlined, fracture and loosen soil to a depth of 12" below grade before installing behind soil or aggregate. Do not till.

NOTES:
1. See SW-330 and SW-332 for inlet.

2. Show liner and perforated pipe in section, if required.

3. Maximum 10" of surface storage.

CONSTRUCTION NOTE
In facilities that are unlined, fracture and loosen soil to a depth of 12" below grade before installing behind soil or aggregate. Do not till.

- DRAWING NOT TO SCALE -
INSTRUCTIONS

1. Choose a template and alter it to design. These are examples of approved planting templates. Other planting plans may be approved.

2. Plant lists and on-center spacing requirements are found in Section 2.4.1 of the City of Portland Stormwater Management Manual.

3. Planting legend required. State plant species, spacing, and quantities per Zone A and Zone B and per facility. Include the square footage of Zone A and B.

4. Planting Plans shall include labels for each plant group identifying the plant species and quantity in the group.

5. See detail SW-364 for plant spacing.

- DRAWING NOT TO SCALE -
DESIGNER INFORMATION
1. Refer to Fire Hydrant Assembly Standard Drawing P-700. Center of hydrants must have min 5 ft clearance to the outside edge of stormwater facility.
2. Standard meter location is Option A, if Furnishing Zone is a minimum of 3' wide. Option B or C can be used only if a minimum of 3" is available between the back of sidewalk and the Right-of-Way line. Option D can only be used for an existing service when other options are infeasible, where a minimum of 1" is available between the back of sidewalk and the Right-of-Way line, and it requires a Design Exception from PDOT to be obtained by Project Engineer.
3. Refer to "Service Assembly Standard Drawing P-780." For larger services or other appurtenances, contact PBW development services at (503) 823-7365. Water service line must be 2 ft min from bottom of stormwater facility imported soil blend.
4. Maintain 2 ft skin-to-skin separation distance between the face of gutter pan and the water main. If water main is < 2 ft from face of gutter pan, the water main must be relocated unless otherwise approved by PBW. Verification of water main depth is required prior to PBW approval.
5. Cross-section views are not required on construction plans.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets
Meter & Hydrant Locations
Curb Extensions

Bureau of Environmental Services

NUMBER SW-324
7-1-2016
DESIGNER INFORMATION
1. For use with stormwater facilities with side slopes.


3. Metal Inlet assembly, [SW–332] required on high traffic streets.

4. Inlets on slopes greater than 5% may require 2 foot wide throat.

DRAWING NOT TO SCALE

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets
Concrete Inlet with Wingwalls
Curb Inlets

Bureau of Environmental Services

SW–330
7–1–2016
**CONSTRUCTION NOTES**

1. Concrete splash pad elevation shall be level with soil inside planter.

2. Splash pad shall be six inches wider than inlet opening on both sides.

**DESIGNER INFORMATION**

1. For use with planters. If planter inlet is adjacent to planter wall, then include wall in detail.

2. Refer to [Standard Drawing P-540. Match gutter pan of adjacent curb and gutter.](#)

3. Metal inlet assembly, [SW-332], required on high traffic streets.

4. Inlets on slopes greater than 5% may require 2 foot wide throat.

5. If there is a drop from inlet to splash pad, Metal Inlet Assembly, [SW-332] is required.

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**STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS**

- **Green Streets**
  - Concrete Inlet
  - Curb Inlets

**NUMBER**

- **SW-331**

**Bureau of Environmental Services**

7-1-2016
CONSTRUCTION NOTES:
1. Headed concrete anchors shall meet the requirements of ASTM A-108.
2. HSS 6 x 2 x 1/8 tube shall meet the requirements of ASTM A-500 Grade B.
3. End Plates shall meet the requirements of ASTM A-36.
4. Entire assembly shall be Hot-Dip Galvanized in accordance with ASTM A-123.

DESIGNER INFORMATION:
1. Refer to Standard Drawing p-540. Match gutter of adjacent curb and gutter.
2. Metal inlet width can be modified to 2' if site conditions require a 2' interior inlet width.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

---

- Green Streets -

Metal Inlet
Curb Inlets

Bureau of Environmental Services

SW-332
7-1-2016
THICKENED CURB AND GUTTER
PER STANDARD DRAWING P-540

DETAIL A - INLET PLAN

DETAIL B - INLET PERSPECTIVE

DETAIL C - OUTLET PLAN

DETAIL D - OUTLET NOTCH

DESIGNER INFORMATION:
1. Additional concrete inlets, [SW-331], can be added if necessary
   (preferably immediately downstream of each check dam to minimize
   potential backflow).
2. Sawcut beyond facility and transition existing curb to new curb and
   gutter at 1' per foot as necessary.
3. Inlet may be modified to maximize flow entry to stormwater facility.
4. Modify inlet and outlet design as needed for site.
5. Ensure outlet notch elevation is 2' below lowest inlets and sidewalk
   notches.
6. Concrete splash pad required at all inlets.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets -
Inlet & Outlet for Curb Extensions
Curb Inlets

SW-333
7-1-2016

Bureau of Environmental Services
STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Modified Metal Inlet Assembly
Curb Inlets

DESIGNER INFORMATION:
1. Splash pad is required at all inlets.
2. Refer to Standard Drawing P-540, Match gutter pan of adjacent curb and gutter.
3. Design vertical wheel load is 85kips (1/2 of tandem axle weight specified in FHWA-HOP-06-105).

CONSTRUCTION NOTES:
1. Heeded concrete anchors shall meet the requirements of ASTM A-108.
2. HSS 6 x 2 x 1/4 Tube Channel shall meet the requirements of ASTM A-500 Grade B.
3. End Plates shall meet the requirements of ASTM A-36.
4. Entire assembly shall be Hot-Dip Galvanized in accordance with ASTM A-123.
DESIGNER NOTES:
1. Inlet channel slope may vary where appropriate. Steeper slopes are better for keeping inlet free of debris.

CONSTRUCTION NOTES:
1. 4" thick concrete splash pad elevation shall be level with soil inside planter.
2. Concrete splash pad shall be 6" wider than channel opening on both sides.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Channel & Grate Details
Curb Inlets

Bureau of Environmental Services

NUMBER
SW–335A
7-1-2016
CONSTRUCTION NOTES:

DESIGNER INFORMATION:
1. If inlet used with swale stormwater facility, modify plan and isometric views

DRAWING NOT TO SCALE

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets

Inlet, Channel & Grate Details (Step-Out)

Curb Inlets

Bureau of Environmental Services

SW-335B

7-1-2016
FRAME AND GRATE ATTACHMENT DETAIL

TRENCH GRATE

CONSTRUCTION NOTES:
1. Cast iron, natural finish.
2. No opening greater than 3/8".
3. Protect threaded holes in frame from clogging during frame installation.
4. Grate to be rated for H-20 loading, with a non-slip surface having a static coefficient of friction between 0.60 and 1.0 per ASTM C1020. Grates on inclines greater than 4% shall have a coefficient of 0.80 to 1.0.
5. Grate to be ADA compliant.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Grate & Frame Details
Check Dams

Bureau of Environmental Services

SW-336
7-1-2016
**ANGLE BRACKET DETAIL**

**DESIGNER INFORMATION**
1. Provide elevations and stationing and/or dimensioning for check dams, where applicable.
2. Ensure that check dam elevations do not cause stormwater to overflow to sidewalk or back in roadway.

**CONSTRUCTION NOTES**
1. Concrete to be 3000 psi.
2. Lumber to be a naturally rot-resistant wood (e.g. cedar). Manufactured products can be used with approval. No chemically treated wood will be allowed. Boards shall be free from holes or loose knots and cut to fit width of facility without gaps.
3. All fasteners and bracket to be stainless steel or aluminum.
4. Top of bracket to be no higher than top of check dam.
5. Minimum 5/16" dia. bolts, 3 bolts/bracket into concrete and 4 bolts/bracket into wood (2 bolts into each board).
6. Use clear silicone caulk or other approved product between check dam boards and along brackets as watertight seal.

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**STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS**

- **Green Streets** -
  Wood Check Dam for Swales
  Check Dams

**NUMBER**

SW–341

Bureau of Environmental Services

7-1-2016
DESIGNER INFORMATION
1. Provide elevations and stationing and/or dimensioning for check dams.
2. Top of checkdam (tcd) elevation to be whichever is lowest: 1" below the elevation of the upstream inlet elevation of the facility; 2" below the elevation of the sidewalk adjacent to the check dam; or 2" below the elevation of the top of curb (toc) adjacent to the check dam.
3. Ensure that check dam elevations do not cause stormwater to overflow to sidewalk.
4. Provide 1" curb–side step-out if planter is adjacent to parking, modify detail as needed.

CONSTRUCTION NOTES
1. Lumber to be a naturally rot-resistant wood (e.g. cedar). Manufactured products can be used with approval. No chemically treated wood will be allowed.
2. All fasteners to be stainless steel or aluminum.
3. 4"x 4"x 18" angle bracket, minimum 3/16" thick, stainless steel, or aluminum.
4. Top of bracket to be no higher than top of check dam.
5. Minimum 5/16" dia. bolts, 3 bolts into concrete, 2 bolts into each board.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets –
Wood Check Dam for Planters
Check Dams

Bureau of Environmental Services

NUMBER
SW–342
7–1–2016
DESIGNER INFORMATION
1. Provide elevations and stationing and/or dimensioning for check dams.
2. Top of check dam (tcd) elevation to be whichever is lowest: 1” below the elevation of the upstream inlet elevation of the facility; 2” below the elevation of the sidewalk adjacent to the check dam; or 2” below the elevation of the top of curb (toc) adjacent to the check dam.
3. Ensure that check dam elevations do not cause stormwater to overflow to sidewalk.
4. Provide 1” curb-side step-out if planter is adjacent to parking, modify detail as needed.

CONSTRUCTION NOTE
1. Concrete to be 3,000 psi.
2. Embed #4 rebar 3” into curb and planter wall.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS
– Green Streets –
Concrete Check Dam for Planters
Check Dams

Bureau of Environmental Services

NUMBER
SW–343
7–1–2016
**BEEHIVE GRATE**

**CONSTRUCTION NOTES**
1. Secure grate in place with 54" of wire rope. Loop ends of wire rope around U-bolt and grate. Crimp each end of wire rope with ferrule.

2. Drill 2" deep holes into pipe and epoxy #4 rebar U-bolt (2" x 4") in holes.

3. Grate to be cast iron, ASTM A48 CL30.

4. Beehive rim elevation to be 1" lower than sidewalk notches, top of planter wall, top of slope, outlet 'notch or upstream notch, whichever is lowest.

5. Wire rope between 1/8"-3/16" diameter, stainless steel, 7 strands of 19 wires.

**DESIGNER INFORMATION**
1. If connecting to a combination sewer manhole installation of a "swing-check type backwater valve" or approved equal is required to prevent odor emissions.

2. Size inlet based on calculated flows & manufacturers recommendations.

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**STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS**

**Green Streets**
**Beehive Inlet Grate**
**Overflow Inlets**

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**Bureau of Environmental Services**

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**NUMBER**

SW-350

7-1-2016
STORMWATER FACILITY BLENDED SOIL
(SEE DESIGNER INFORMATION NOTE 2)

\( \frac{3}{4}'' \) No.4 OPEN GRADED AGGREGATE
(SEE DESIGNER INFORMATION NOTE 2)

1-1/2"-3/4" CLEAN, OPEN WASHED CRUSHED AGGREGATE
(SEE DESIGNER INFORMATION NOTE 2)

SPECIFY ELEVATION

8" GALVANIZED IRON PIPE

ZURN Z100 15" DIA ROOF DRAIN WITH
8" GIP THREADED OUTLET OR APPROVED EQUAL

8" FERNCO STRONG BACK COUPLER

8" SCH. 40 PVC PERFORATED PIPE TO
EXTEND 6" BELOW DRAIN ROCK
(SEE CONSTRUCTION NOTE 1)

6"

12"

2'

EXISTING SUBGRADE

EXCAVATE 12" BELOW ROCK TRENCH (24"
DIA). FILL WITH 3000 PSI COMMERCIAL
GRADE CONCRETE.

DESIGNER INFORMATION
1. Show overflow drain in swale, planter or curb extension section. Separate swale, planter or curb extension section views may not be needed.

2. Dimension stormwater facility blended soil and rock layers per your design.

CONSTRUCTION NOTE
1. Perforate 8" Schedule 40 PVC with \( \frac{1}{8}'' \) holes, 90 degrees around pipe, rows 2" apart. Offset holes in rows by 45°.

DRAWING NOT TO SCALE

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

Green Streets
Overflow Drain
Overflow Inlets

Bureau of Environmental Services

NUMBER
SW-351

7-1-2016
CONSTRUCTION NOTES
1. Adhere liner to concrete w/sealant recommended by liner manufacture.
2. Secure liner to concrete with 2" aluminum flat bar, placed as directed (curb side or entire facility).
3. Attach flat bar with concrete hit anchors, 24" o.c.
4. Trim excess liner to the top of the flat bar.
5. On clean concrete surface, add silicone sealer to top 1/2" of liner.
6. Start attaching liner in the middle of the facility first. Working toward the ends to minimize wrinkles, corners should be cut to fit without wrinkles.

LINER ATTACHMENT

NEW Curb, CHECK DAM OR PLANTER WALL

TOP OF SOIL

2" x 1/8" ALUMINUM FLAT BAR

2" x 1/4" CONCRETE HIT ANCHOR AT 24" O.C.

DESIGNER INFORMATION
1. Liner materials to be HDPE. Liner to extend from top of blended soil to the bottom of excavation.
2. 3" of concrete is required on all sides of attachment. Adjust sidewalk depth as necessary.
3. Liner required when face of new curb is less than 2' from OD of adjacent water main.
4. Liner required on neighborhood collectors and higher street classifications.
5. Liner may be required on local streets with transit routes, higher traffic volumes, or when a facility is adjacent to travel lane at the discretion of the City Engineer.
6. In the Columbia South Shore Well Field Wellhead Protection Area or areas with contaminated soils the facility must be completely lined with a 40 mil liner unless facility’s bottom and sides are monolithic concrete.
7. Liners may be required near basements or other underground structures.
8. Trees allowed in lined facilities only at the discretion of City of Portland staff.

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Liner Attachment & Pipe Boot Detail
Additional Details

- DRAWING NOT TO SCALE -

Bureau of Environmental Services

NUMBER

SW–360

7–1–2016
DESIGNER INFORMATION:
1. Refer to Standard Drawing P-581 for tree planting instructions.
2. Distance between trees varies: 20ft–30ft on center per Urban Forestry requirements.
3. Stormwater facility construction and blended soil requirements, see City of Portland Standard Construction Specifications sections 00415 and 01040.14(d).
4. All proposed tree species must be approved by Urban Forestry (503–823–8733).
5. Include Tree Well and Street Tree views on plans.
6. Include liner and call-out if used, see Swale Section SW–301.
7. Trees shall be centered in the planting zone/tree well.
8. Planting zone/tree well shall be located to align with street trees in adjacent planting strip, unless otherwise shown on plan and approved by BES and Urban Forestry.

CONSTRUCTION NOTES:
1. Contact Urban Forestry for tree installation assistance and permitting at (503) 823–8733.
2. To the maximum extent possible set root ball on "pedestal" of native/undisturbed soil to avoid settling.
3. Set trunk flare two inches above the finished soil surface.
4. Remove all twine, wire, root bags, burlap, and all other nursery materials from tree prior to backfilling.

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STORMWATER FACILITY BLENDED SOIL
STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Tree Well Detail
Without Rock Storage

Bureau of Environmental Services

NUMBER
SW–361
7–1–2016
1. Refer to Standard Drawing P-581 for tree planting instructions.

2. Distance between trees varies: 20ft–30ft on center per Urban Forestry requirements.

3. Stormwater facility construction and blended soil requirements, see City of Portland Standard Construction Specifications sections 00415 and 01040.14(d).

4. All proposed tree species must be approved by Urban Forestry (503–823–8733).

5. Include Tree Well and Street Tree views on plans.

6. Include liner and call–out if used, see Swale Section SW–301.

7. Trees shall be centered in the planting zone/tree well.

8. Planting zone/tree well shall be located to align new tree trunk with street trees in adjacent planting strip, unless otherwise shown on plan and approved by BES and Urban Forestry.

9. Tree well required when tree is located over rock storage.

CONSTRUCTION NOTES:

1. Contact Urban Forestry for tree installation assistance and permitting at (503) 823–8733.

2. Set trunk flare two inches above soil surface.

3. Remove all twine, wire, root bags, burlap, and all other nursery materials from tree prior to backfilling.

IMPORTANT: Location of trees must meet clearance requirements established by the City of Portland. Utility conflicts and existing conditions can effect tree placement. Locate utilities prior to installing trees.

For specific clearance requirements contact:
PBOT (503) 823–7884
PWB (503) 823–7368
BES (503) 823–7761
Urban Forestry (503) 823–8733

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Green Streets -
Tree Well Detail
With Rock Storage

Bureau of Environmental Services

NUMBER

SW–362
7–1–2016
HERBACEOUS AND GROUNDCOVER SPACING

**DESIGNER INSTRUCTIONS**
1. All plants shall be planted at equal triangular spacing on center (O.C.) per spacing specified on the planting legend.

2. Plants shall be located set back from facility edges as follows:
   a. Herbaceous plants and groundcovers: 12" from center of plant to face of facility wall, back of curb or sidewalk edge.
   b. Shrubs: 18" from center of plant to face of facility wall, back of curb or sidewalk edge.

3. Interior plant spacing may be slightly adjusted to achieve desired edge setbacks.
INfiltration
Stormwater Hierarchy Category 1

Hybrid
Stormwater Hierarchy Category 2
Overflow directed to drain rock.

Partial Infiltration
Stormwater Hierarchy Category 3 or 4
Overflow and underdrain required. Set underdrain within drain rock.

Lined
Stormwater Hierarchy Category 3 or 4
Overflow and underdrain required. Set underdrain at base of drain rock liner.

Note: Hybrid facilities must be registered as a UIC designed under the presumptive approach.

-Drawing Not to Scale-

Stormwater Management Manual Typical Details

- Green Streets -
Facility Overflow Configurations

Bureau of Environmental Services

SW-364
7-1-2016