Seattle Department of Construction and Inspections
sdci
Tip 531
Seattle Permits
— part of a multi-departmental City of Seattle series on getting a permit

Green Stormwater Infrastructure on Private Property: Post Construction Soil Management

November 30, 2009

This Tip is designed to help applicants meet the City of Seattle Stormwater Code Green Stormwater Infrastructure (GSI) requirements for Post Construction Soil Quality and Depth. Obtain a copy of the Construction Stormwater Control Plan/Post Construction Soil Management (CSC/PCSM) Plan at the SDCI drainage desk.

This Tip covers:

- What is healthy soil and why does it matter?
- What are the Post Construction Soil Management requirements?
- What are the Post Construction Soil Management options?
- How are custom amendment rates calculated?
- How are the Post Construction Soil Requirements documented on the CSC/PCSM Plan sheet?
- What inspections are required for GSI Post Construction Soil Management?
- How are inspections scheduled?
- Where can material suppliers and installers be found?
- What other resources and contacts are available?

What is healthy soil and why does it matter?

Naturally occurring soil (undisturbed), soil organisms, and vegetation provide important stormwater management functions, including water infiltration and storage, and nutrient, sediment, and pollutant removal.

These functions are largely lost when native soils and vegetation are stripped and replaced with minimal soil and sod. Not only are these important stormwater management functions lost, but these landscapes become pollution-generating surfaces due to compaction, increased use of pesticides and fertilizers, concentration of pet wastes, and pollutants from adjacent roads and driveways.

While restoring a minimum soil quality and depth is not the same as preserving naturally occurring soil and vegetation, it does improve onsite stormwater management and water quality.

Amending construction-disturbed soils with compost re-establishes a healthy soil ecosystem, which provides increased treatment of pollutants and sediments. It also supports healthy plant growth, minimizing the need for fertilizers and pesticides, thus reducing pollution through prevention.

What are the Post Construction Soil Management requirements?

In the City of Seattle, all new construction sites subject to clearing, grading, or compaction that have not been covered by impervious surface, incorporated into a drainage facility, or engineered as structural fill or slope shall, at project completion, meet post construction soil quality and depth requirements. Only the areas of the sites where existing vegetation and/or soil are disturbed or compacted must be restored.

A minimum 8-inch depth of compost amended soil or imported topsoil shall be placed in all areas of the project site that have been disturbed during construction. Before the soil is placed, the subsoil must be scarified (loosened) at least 4 inches deep, with some incorporation of the amended soil into the existing subsoil shall be achieved to avoid stratified layers. Both planting and turf

beds must pass a 12-inch probe test during the site final inspection.

Once amended, soil areas must be protected from re-compaction, and planting beds must be covered with 2-4 inches of mulch.

Compost amendment requirements differ for turf and planting beds:

- Turf areas require 1.75 inches of compost mixed into the upper 8 inches of soil (or 8 inches of imported topsoil containing 20-25 percent compost by volume).
- Planting Beds require 3 inches of compost mixed into the upper 8 inches of soil (or 8 inches of imported topsoil containing 35-40 percent compost by volume).

These compost amendment rates are pre-approved to meet Seattle's code requirements for "Organic Matter" (O.M.) levels: 5 percent O.M. in turf (equals 20-25 percent compost amendment); and 10 percent O.M. in planting beds (equals 35-40 percent compost amendment). "Organic Matter" is measured in a soil laboratory by the Loss-On-Ignition test*, but using the pre-approved amendment rates above eliminates the need for these tests.

**Acceptable test methods for determining loss-on-ignition soil organic matter (O.M.) include the most current version of ASTM D2974 "Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils," and TMECC 05.07A "Loss-On-Ignition Organic Matter Method".*

Topsoil for turf areas (see Figure 1 on page 3):

- 8-inch minimum depth of organic-amended soil.
- 1.75 inches of compost amendment, or 20-25 percent compost by volume in a topsoil mix (equals 5 percent O.M. by loss-on-ignition test).
- pH of 6.0 to 8.0 or match the original undisturbed soil.
- 4 inches of scarified subsoil, for a finished un-compacted depth of 12 inches.

Topsoil for planting beds (see Figure 2 on page 3):

- 8-inch minimum depth of organic-amended soil.
- 3 inches of compost amendment, or 35-40 percent compost by volume in a topsoil mix (equals 10 percent O.M. by loss-on-ignition test).
- pH of 6.0 to 8.0 or match the original undisturbed soil.
- 4 inches of scarified subsoil, for a finished un-compacted depth of 12 inches.

NOTE: All planting beds, regardless of soil amendment option, must be covered with a minimum of two inches of mulch. Mulch shall be kept 1-2 inches away from the trunks of all trees.

What are the Post Construction Soil Management options?

On the plansheet assign one of the following three options to all areas that will not be covered by impervious surface:

- **Non-disturbed Area (ND)**
  Areas covered by vegetation that will not be subject to land disturbing activity or compaction (clearing, grading, storage, stockpiling, vehicles, etc.) do not require soil amendment if they are fenced and continuously protected throughout the construction process.
- **Disturbed Area Option 1 (D-1) - AMEND**
  Amend existing topsoil to meet Post Construction Soil requirements. Amend existing soil in place or stockpile topsoil, amend and place back. There are two methods for amending the existing soil in place:
  - Mix a pre-approved rate of compost (1.75 inches in turf areas, or 3 inches in planting beds) into the existing soil to an 8 inch depth. The subsoil shall to be scarified prior to tilling in the compost to provide 12 inches of un-compacted soil depth. Compost must meet the definition of "Composted Materials" in WAC 173-350 section 220. This code is available at the Washington State Department of Ecology's website: **https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Organic-materials/Managing-organics-compost.**
  - Add a custom-calculated amendment rate of compost to meet the organic matter requirement, based on tests of the soil and amendment. The compost must conform to the WAC 173-350 standards. The completed area must have 12 inches of un-compacted soil depth. (See "How Are Custom Amendment Rates Calculated?" below).

Figure 1 - Cross Section of Turf Soil Amendment

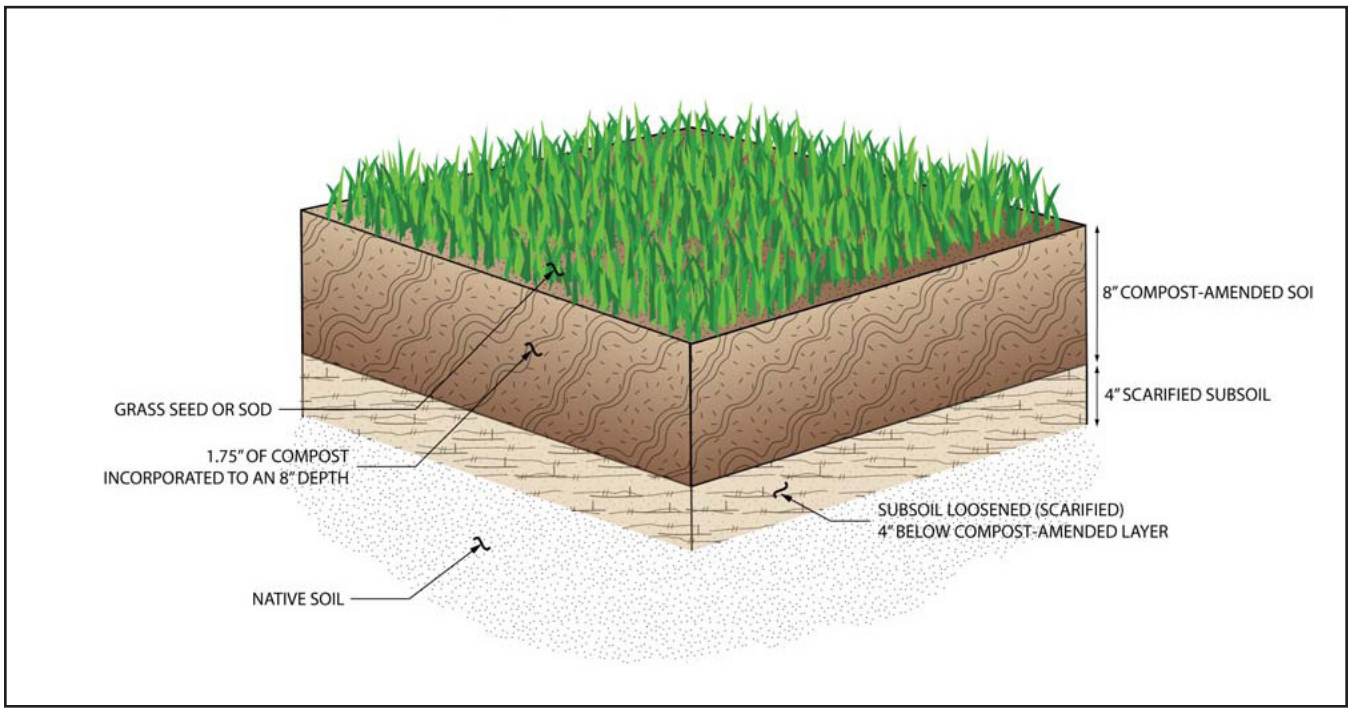
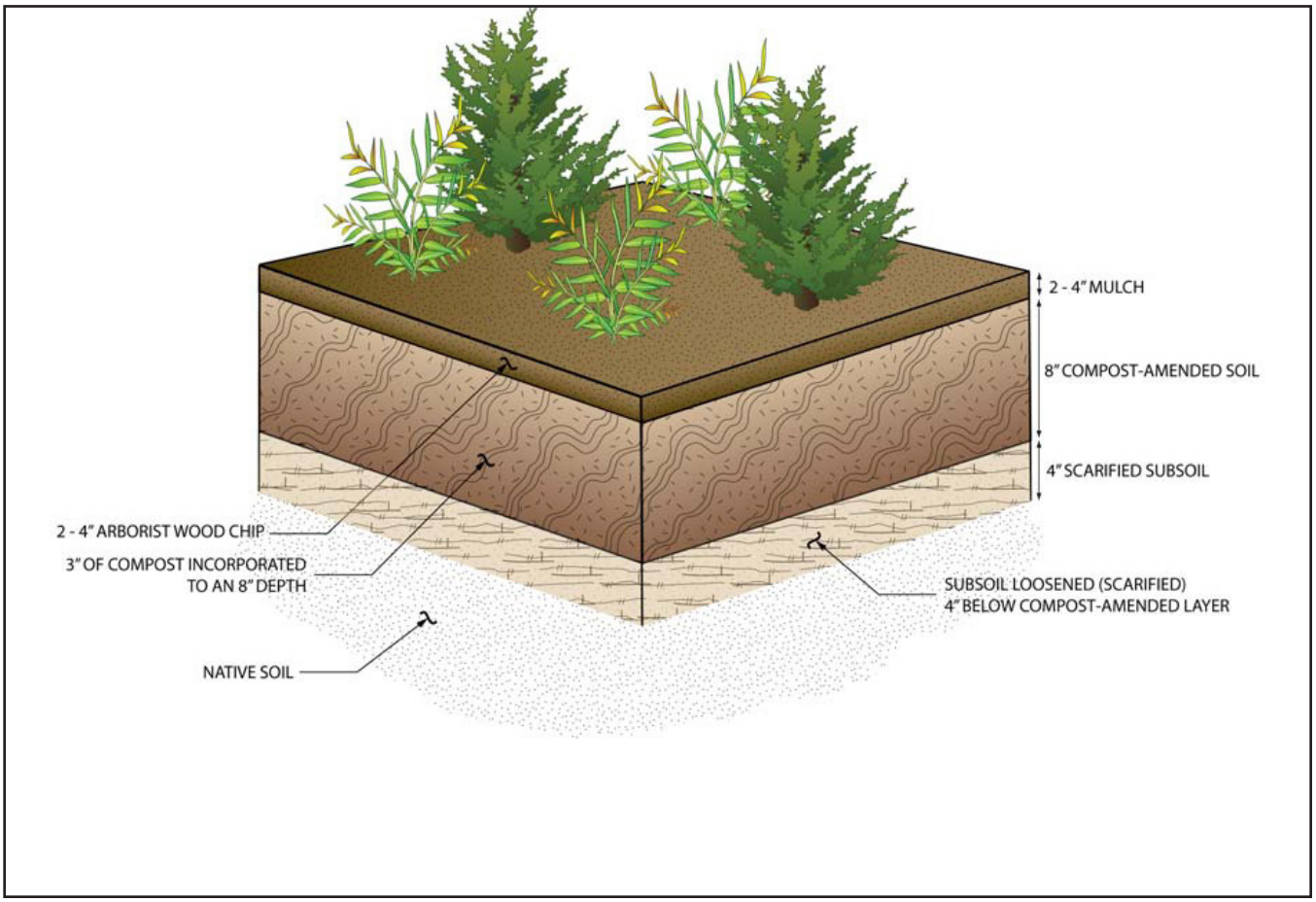


Figure 2 - Cross Section of Planting Bed Soil Amendment



- **Disturbed Area Option 2 (D-2) - IMPORT**
  Import a topsoil mix that meets the organic content and depth requirements. Where the existing soil is too rocky, compacted or poorly drained to amend effectively, 8 inches of topsoil can be imported and placed on the surface. Organic matter requirements in topsoil for planting beds and turf areas differ:

  - For turf areas: a soil mix including 20 25 percent compost by volume (or topsoil with a lab test showing 5 percent organic matter by loss-on-ignition test).
  - For planting beds: a soil mix including 35-40 percent compost by volume (or topsoil with a lab test showing 10 percent organic matter by loss-on-ignition test).

Note: the subsoil must be scarified four inches prior to placing the topsoil to provide the required 12 inches of un-compacted soil depth. (At project completion, a 3/8-inch diameter probe must penetrate 12 inches driven only by the inspector's weight.)

Note: Where tree roots limit the depth of incorporation of amendments, those root areas are exempted from this requirement only if they are fenced and protected from stripping of soil, grading, or compaction to the maximum extent practical. See Tip 534, *Tree Planting and Retention for Flow Control Credit*, for more information on tree protection requirements and best practices to protect trees.

Areas assigned to each of these soil management options will be shown on the CSC/Post Construction Soil Management Plan sheet, as described below.

How are custom amendment rates calculated?

Most applicants will find it easier to amend at the pre-approved rates described above (turf areas: 1.75 inches of compost, or 20-25 percent compost by volume; planting beds: 3 inches of compost or 35-40 percent compost by volume).

On larger sites with higher quality existing soil (higher initial organic matter), it may be cost-effective to calculate a custom amendment rate to meet the organic matter (O.M., determined by laboratory loss-on-ignition test*) requirements:

- 5 percent O.M. for turf areas
- 10 percent O.M. for planting beds

Calculating a custom amendment rate requires laboratory tests of soil bulk density and organic matter, and compost bulk density and organic matter.*

The WA Department of Ecology-approved method for calculating custom amendment rates is described on pages 18-19 of the guide, Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington. That guide also includes a list of soil laboratories and permitted composting facilities in Washington. The guide is available on two websites: **www.buildingsoil.org** (for builders) and **www.soils-forsalmon.org** (with more resources for designers). These websites also have a spreadsheet that will do the custom amendment calculations, and other resources.

** Acceptable test methods for determining loss-on-ignition soil organic matter (O.M.) include the most current version of ASTM D2974 "Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils," and TMECC 05.07A "Loss-On-Ignition Organic Matter Method."*

How are the Post Construction Soil Requirements documented on the CSC/ PCSM Plan sheet?

Represent to scale on the CSC/PCSM Plan Sheet located at **www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/stormwater-code** or on an attached copy of the site plan in the plan set:

- Lot dimensions - including property lines, street names and curb cuts.
- Impervious surface areas - building footprint, driveways, patios, walkways, etc. Include permeable pavement areas, such as porous concrete and paver systems.
- Retaining walls - show existing and proposed rockeries and retaining walls.
- Soil management areas - for all areas not covered by impervious surface, choose one of the three soil management options and note if they are turf or planting beds. These areas shall be labeled one of the following: ND (Non-disturbed), D1Turf, D1Planting Bed, D2Turf, or D2Planting Bed (D1 indicates amending existing soil, D2 indicates importing an amended soil, as described under "Options" above). Delineate each soil management area with a dark, clear line and note the square footage of each area.

- Construction stormwater control (CSC) measures - also known as Temporary Erosion and Sedimentation Control (TESC) - show CSC measures that will be used to contain the site during construction. Use the standard detail symbols shown on the CSC/PCSM Plan Sheet.

Complete the Soil Management Plan Worksheet on the CSC/PCSM Plan Sheet at **www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/stormwater-code**. Show the square footage of each Soil Management Area, and do the calculations to show how much compost, amended topsoil, and mulch will be brought onto the site. The Seattle DCI site inspector must see delivery tickets equaling those totals, and inspect the soil, before the project can pass final inspection.

Access to Information

Links to electronic versions of SDCI Tip, Director's Rules, and the Seattle Municipal Code are available on our website at **www.seattle.gov/sdci**. Paper copies of these documents, as well as additional regulations mentioned in this Tip, are available from our Public Resource Center, located on the 20th floor of the Seattle Municipal Tower at 700 Fifth Ave. in downtown Seattle, (206) 684-8467.

What inspections are required for GSI post construction soil management?

First Disturbance Inspection

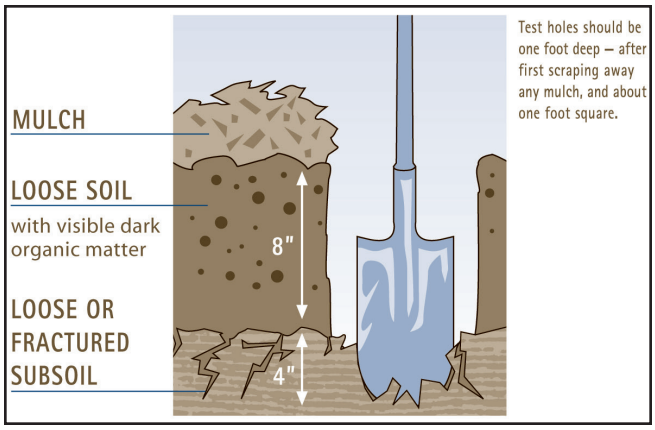
DO NOT BEGIN EARTH DISTURBANCE PRIOR TO THIS INSPECTION

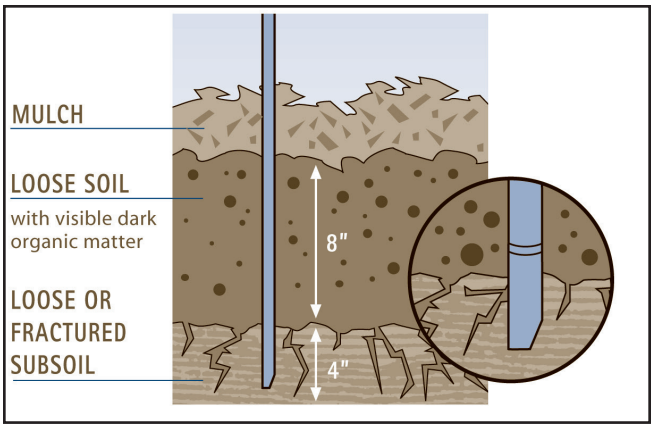
Builder Requirements:	Inspector Requirements:	Notes:
Have the approved plan set onsite	Review approved plan set	If the approved set of plans are not on site, the inspection cannot be conducted and must be rescheduled
Have knowledge of the impervious materials, areas and quantities	Review allowed impervious surfaces per plan	Changes to the approved square footage will require resizing the stormwater management plan and plan revision submittals may be required
Carefully read the CSC\Post Construction Soil Management Plan Sheet from the approved plan set, and sign onsite with the Site Inspector	Review the CSC/ Post Construction Soil Management Plan Sheet from the approved plan set and sign onsite with the Owner or Owner's Representative	Sign the Site Management agreement on the CSC/Post Construction Soil Management Plan Sheet onsite during the first disturbance inspection with the Site Inspector
Verify the property pins are in place and visible at lot corners	Discuss setback of GSI facilities	
Have a construction sequencing, staging and GSI protection plan prepared	Discuss GSI protection strategy	
Determine Non-disturbed (ND) areas to be protected from construction impacts	Verify ND areas and square footage on CSC/PCSM plan sheet	
Identify Soil Management Options D1 or D2 for planting beds and turf areas	Discuss Post Construction Soil Management Plan, verify D1, D2 square feet	D1 is amending existing soil on-site with compost. D2 is importing a compost-amended topsoil mix
Areas identified as Non-disturbed (ND)on the plan set must be protected throughout construction with sturdy fencing	Review areas to be identified as non-disturbed and protected throughout construction	If any Non-disturbed Area is impacted during construction, then it shall be amended and inspected as required for Disturbed Areas
Install approved TESC measures including tree protection prior to start of work	Review TESC requirements and expectations	No tracking/dirt/debris allowed in ROW. Use dust control at all times

Site Final Inspection

The final site inspection shall occur prior to the building permit final approval.

Builder Requirements:	Inspector Requirements:	Notes
Have the approved plan set onsite	Evaluate permanent erosion control	This inspection cannot be conducted without the approved plan set
Know the impervious square footage per plan	Measure required impervious surface	
Show how Non-disturbed areas have been protected throughout construction	Verify Non-disturbed areas remained protected throughout construction	No storage, vehicle traffic, clearing, grading, or other impacts are allowed on Non-disturbed areas
Provide original delivery tags of compost, topsoil and mulch showing supplier, quantity, type of material, and delivery location	Verify compost, topsoil, and mulch came from an approved supplier. Make sure that total quantities meet or exceed the required amount shown on the approved CSC/Post Construction Soil Plan Sheet	
Based on the approved CSC/Post Construction Soil Management Plan Sheet, ensure that the site has been properly amended and planting beds/turf areas are planted Be prepared to dig holes (one cubic foot in size) where the Inspector designates, to verify mulch, topsoil/compost and scarified subgrade	Choose locations of test holes to be dug in both planting beds and turf areas. Verify profile of mulch, topsoil/compost and scarified subgrade Test several locations with a “rod penetrometer” probe to verify 12 inches of probe penetration. The probe should be driven easily solely by the weight of the Inspector to a depth of 12 inches below the mulch layer	The test holes and 12-inch probe test should verify 8 inches of topsoil/compost soil mix, and 4 inches of scarified (loosened) subgrade There shall be a minimum of 2 inches and maximum of 4 inches of mulch on top of the topsoil/compost mix in planting beds. Mulch shall be kept 1-2 inches away from the trunks of all trees
Follow the CSC/PCSM Plan in the approved plan set and provide scaled redline of any changes made to this approved plan set	Ensure the CSC/PCSM Plan has been followed and that any and all changes were approved and properly documented on the plan sheet	
Schedule additional inspections as needed	Assess the need for additional inspections	





If a project has Geotechnical Special inspections, the SDCI Site Final inspection cannot replace any Geotechnical Special inspection requirements.

How are inspections scheduled?

Call 684-8900 or go online to **https://cosaccela.seattle.gov/portal/.**

For the:

- First Ground Disturbance Inspection: Enter the *building* permit number and select First Disturbance Inspection.
- Site Final Inspection: Enter the *building* permit number and select Site Final Inspection

Where can material suppliers and installers be found?

"Compost" and "Topsoil" headings in phone directories list local suppliers. The Washington Department of Ecology (**https://ecology.wa.gov/**) also maintains a list of permitted composting facilities on its website.

That list is also available in the Building Soil guide, along with other resources, available at **www.buildingsoil.org** or **www.soilsforsalmon.org**.

Soil amendment or amended topsoil installation can be done by landscape contractors, other contractors with the appropriate equipment and experience, or by a property owner. Ask contractors for references on similar jobs.

What other resources are available?

- DR 17-2009 the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual, Vol III
- The City of Seattle Stormwater Code, SMC 22.800
- The City of Seattle Grading Code, 22.170
- SDCI Stormwater Code website: **www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/stormwater-code**
- Practical information on soil management can be found on two websites: **www.buildingsoil.org** (for builders) and **www.soilsforsalmon.org** (with more information for designers)
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- Washington Department of Ecology permitted compost facilities: **https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Organic-materials/Managing-organics-compost.**

Key Contacts:

- SDCI Drainage Desk:
  sidesewerinfo@seattle.gov
  206-684-5362
- Inspection Requests:
  https://cosaccela.seattle.gov/portal/
  206-684-8900
- Inspection Cancellations:
  206-684-8860