DESIGN GUIDE NO. 4

POST CONTRUCTION SOIL QUALITY AND DEPTH (BMP LID.02)
2009 DRAINAGE DESIGN AND EROSION CONTROL MANUAL

T. Pat Allen, P.E., Senior Engineer, Drainage Manual
Thurston County Water Resources Division
Resource Stewardship Department
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Purpose

The purpose of this design guide is to summarize in one location the requirements for Post-Construction Soil Quality and Depth (BMP LID.02) using the 2009 Drainage Design and Erosion Control Manual for Thurston County (DDECM). Post Construction Soil Quality and Depth requirements and applications are found in several locations within the DDECM including:

- Volume I, Section 2.4.6, *Minimum Requirement #5: Onsite Stormwater Management*
- Volume I, Section 4.2, *Step-by-Step BMP Selection Process*
- Volume I, Appendix C, *Engineer's Construction Inspection Report Form*
- Volume II, Section 3.1.8, *BMP C120: Temporary and Permanent Seeding*
- Volume V, Chapter 2, *Low Impact Development*
- Volume V, Section 2.1.2, *LID.02 Post-Construction Soil Quality and Depth*
- Volume V, Section 2.1.3, *LID.03 Reduce Effective Impervious Area of Roads, Shared Accesses, Alleys, Sidewalks, Driveways, and Parking Areas.*
- Volume V, Section 2.2.3, *LID.06 Sheet Flow Dispersion*
- Volume V, Section 2.2.4, *LID.07 Concentrated Flow Dispersion*
- Volume V, Section 2.2.8, *LID.11 Full Dispersion*
- Volume V, Section 2.2.10, *LID.13 Rural Road Engineered Dispersion*
- Volume V, Appendix C, Table C-8, *Maintenance Checklist for Compost Amended Soil for Post-Construction Soil Quality and Depth (BMP LID.02) and Compost-Amended Vegetated Filter Strip (BMP BF.06)*

In addition to references in the 2009 DDECM, this BMP makes extensive reference to the document "*Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington.*" This design guide incorporates applicable elements of that document. The document can be downloaded at www.soilsforsalmon.org or www.buildingsoil.org.

Applicability

Minimum Requirement #5, *Onsite Stormwater Management*, requires projects to employ onsite stormwater management BMPs to infiltrate, disperse, and retain stormwater runoff onsite to the maximum extent feasible. All projects required to comply with Minimum Requirement #5 shall implement BMP LID.02 to restore soil quality and depth to all new lawn and landscape areas or areas to be restored to native vegetation.

Minimum Requirement #5 and BMP LID.02 is required for projects that:

1. Create 2,000 square feet or more of impervious surface; or.

2. Have 7,000 square feet or more of land disturbing activity.

Projects that propose to manage all site stormwater through BMP LID.11, *Full Dispersion*, are not required to implement BMP.02.

Redevelopment projects that meet criteria requiring retrofitting the existing site to current stormwater standards would be required to implement BMP LID.02 for all existing and newly created lawn or landscape areas to the maximum extent practicable.

Benefits of BMP LID.02

Naturally occurring, undisturbed soil and vegetation provides important stormwater functions that are largely lost when development removes the native soil and vegetation and replaces it with minimal topsoil and sod or landscaping. Implementation of BMP LID.02 reestablishes a minimum soil quality and depth in an attempt to restore the beneficial functions lost during development.

Special Requirements

In designated Well Head Protection Areas of a public water system with over 1,000 connections, compost used shall be comprised entirely of vegetative materials only. No biosolids or animal manure components shall be contained within the compost.

On poorly draining sites being considered for turf establishment consider alternatives to planting a lawn or reduce the ratio of compost to be incorporated into the soil to a ratio of no more than 30 percent by volume.

In some instances, steep slopes on a project site, even if not disturbed by the project may have sparse native soils and vegetation (e.g. an area previously under heavy tree canopy but now exposed due to removal of adjacent trees). In this case the area should be amended by planting deep rooting vegetation and soil amendments applied with a pit application at least twice as wide as the root ball of the vegetation being planted, using a 50/50 mix of compost and soil.

The objective of this BMP is to restore soil quality to all non-impervious disturbed areas of a project site. Some areas may not be suitable for soil amendment such as engineered structural fill or slopes, stormwater facilities, etc. and the recommendations of the civil or geotechnical engineer should be followed for surface treatment of those areas.

Design Process

Prepare a Soil Management Plan (SMP) for the project (see Submittal Requirements) using the following steps:

1. Review site Landscape Plans and Grading Plans and identify areas to receive which type of soil treatment option (1 through 4).

    i. **Option 1**: Leave undisturbed native vegetation and soil and protect from compaction during construction.
    ii. **Option 2:** Amend existing site topsoil or subsoil at "pre-approved" default rates, or at custom rates based on tests of the soil and amendment.
    iii. **Option 3:** Stockpile existing topsoil during grading and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements.
    iv. **Option 4:** Import topsoil mix of sufficient organic content and depth to meet requirements.

    Note: For small projects submitting abbreviated drainage plans it is recommended that "pre-approved" default amendment rates and/or imported top soil mix be used to simplify the compliance with this BMP and avoid costly soils testing and hiring of a soils professional.

2. **Step 2**: Evaluate existing and anticipated post-construction soil conditions for the project and factor this in to the selection of amendment options.

    a. Identify compaction of subgrade. Dig down 12 inches below finished grade and use a shovel or penetrometer to determine compaction.
    b. Assess condition of native areas that are to remain undisturbed and whether any amendment to soils or enhanced plantings should be provided.
    c. Assess soil conditions in each area to be cut, filled or otherwise disturbed and establish scarification and amendment recommendations for each area.

3. **Step 3:** Select Amendment Options
    a. Identify where each amendment option will be applied and outline these areas on the SMP site plan (or Abbreviated Drainage Plan) and on the SMP form.
    b. Assign each area an identifying number or letter on the SMP site plan and SMP form.

4. **Step 4:** Identify sources for compost, topsoils, and other organic materials for amendment and mulch. Obtain test results for materials and provide with SMP.

5. **Step 5:** Calculate Amendment, Topsoil and Mulch Volumes on SMP Form.

6. **Step 6:** Complete Soil Management Site Plan by delineating what soil treatment will be provided for each area identified on the plans. Assign unique identifier. Specifications for soil amendment can be shown on the face of the plan or a separate specification sheet can be provided.

7. **Step 7:** Complete Soil Management Plan Form, fill in appropriate information for each area (using same area identifier as provided on the SMP Site Plan). Attach soil test results, product test results, etc.

8. **Step 8:** If applicable, prepare specifications for soil management. An example specification in APWA or CSI format is provided in the "Soils for Salmon" reference document at www.soilsforsalmon.org or www.buildingsoil.org.

Design Elements

Soil Quality

Areas subject to post-construction soil quality requirements shall use soils that are amended to meet the following requirements:

- Minimum organic matter content of 10 percent dry weight for planting beds and 5 percent for turf areas.
- pH from 6.0 to 8.0 or matching the pH of the original undisturbed soils.
- A minimum topsoil layer depth of 8 inches except where tree roots limit the depth of incorporation of amendments.
- Subsoils below the topsoil layer scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers.
- Planting beds shall be mulched with 2 inches of organic material.

Soil Amendment Rates

Site soils may be amended using a "default" amendment rate or a calculated custom rate as determined by a qualified professional. A custom rate might be considered where existing site soils can be easily amended to meet specifications. The default amendment rate is more appropriate for small projects or where site soils are generally unsuitable for cost-

effective amendment to meet standards. This section will not address custom rate calculations and if this method is considered, a soils professional should be retained to analyze soils and propose custom amendment rates.

The default amendment rate for soils depends on whether the area will be landscaped or whether lawn/turf will be installed and whether existing site topsoil will be amended in place or stockpiled topsoil will be replaced prior to amendment. If the default amendment methods described below are used with materials meeting specifications described below then it is presumed that the soil quality targets described above will be met. Each of these four scenarios are described as follows:

1. **Existing in place soils amended for planting beds (landscaping):**

    - Scarify or rototill subgrade to 8 inches depth except within the dripline of trees to be retained.
    - Place 3 inches of compost and rototill into 5 inches of soil.
    - Rake area smooth and remove large rocks (>2 inches in diameter).
    - Plant landscaping plants as required.
    - Mulch planting bed with 2 inches of organic mulch except immediately around plants.

2. **Existing in place soils amended for lawn/turf.**

    - Scarify or rototill subgrade to 8 inches depth except within the dripline of trees to be retained.
    - Place 1.75 inches of compost and rototill into 6.25 inches of soil.
    - Water or roll to compact to approximately 85% of maximum dry density.
    - Rake to level and remove surface woody debris and rocks greater than 1 inch in diameter.
    - Seed or sod per recommendations of seed/sod provider.

3. **Stockpiled soils replaced and amended for planting beds (landscaping)**

    - Stockpile and cover existing topsoil removed during grading with a weed barrier material that sheds moisture yet allows air transmission. This will prevent the destruction of soil organisms essential to functioning topsoil.
    - If sufficient volume of stockpiled topsoil exists to provide for a settled depth of 8 inches (approximately 9.5 inches loose) after replacement and the existing topsoil can be verified to meet soil quality criteria (may require testing), then compost amendment is not required.
    - If replaced topsoil plus compost will amount to less than 12 inches scarify or rototill subgrade to depth needed to achieve 12 inches of loosened soil after topsoil and amendment are placed. Do not scarify within the dripline of trees to be retained.

      For example: if there is only enough stockpiled topsoil to place 3-inches and an additional 3-inches of compost is placed, then the subgrade should be

scarified to a depth of 6-inches prior to replacement of topsoil and compost amendment.

- Replace stockpiled topsoil and spread uniformly over the ground surface scarified as described above.
- Place 3 inches of compost and rototill into 5 inches of soil.
- Rake beds to smooth and remove surface rocks larger than 2 inches in diameter.
- Plant landscaping plants as required.
- Mulch planting bed with 2 inches of organic mulch except immediately around plants.

4. Stockpiled soils replaced and amended for lawn/turf.

- Stockpile and cover existing topsoil removed during grading with a weed barrier material that sheds moisture yet allows air transmission. This will prevent the destruction of soil organisms essential to functioning topsoil.
- If sufficient volume of stockpiled topsoil exists to provide for a settled depth of 8 inches (approximately 9.5 inches loose) after replacement and the existing topsoil can be verified to meet soil quality criteria (may require testing), then compost amendment is not required.
- If replaced topsoil plus compost will amount to less than 12 inches scarify or rototill subgrade to depth needed to achieve 12 inches of loosened soil after topsoil and amendment are placed. Do not scarify within the dripline of trees to be retained.

  For example: if there is only enough stockpiled topsoil to place 3-inches and an additional 1.75-inches of compost is placed, then the subgrade should be scarified to a depth of 7.25 inches prior to replacement of topsoil and compost amendment.
- Replace stockpiled topsoil and spread uniformly over the ground surface scarified as described above. .
- Place 1.75 inches of compost and rototill into 6.25 inches of soil.
- Water or roll to compact soil to approximately 85% of maximum dry density.
- Rake to level and remove surface woody debris and rocks greater than 1 inch in diameter.
- Seed or sod per recommendations of seed/sod provider.

Importing Topsoil

As an alternative to compost amendment of soils an applicant may choose to import topsoil for installation in landscape and lawn/turf areas. Topsoil shall meet the requirements provided in the "materials" section of this design guide and installation shall be in accordance with the following procedures:

1. Imported Topsoil For Planting Beds (landscape areas)

- Scarify or till subgrade in two directions to a depth of 6-inches. The entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.

- Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil.

- Place a second lift of 3 inches of topsoil mix on the surface.

- Rake beds to smooth and remove surface rocks over 2 inches in diameter.

- Plant landscaping plants as required.

- Mulch planting bed with 2 inches of organic mulch except immediately around plants.

2. Imported Topsoil for Lawn/Turf Areas

- Scarify or till subgrade in two directions to a depth of 6-inches. The entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.

- Place 3 inches of topsoil mix on surface and till into 2 inches of soil.

- Place a second lift of 3 inches of topsoil mix on surface.

- Water or roll to compact soil to approximately 85% of maximum dry density.

- Rake to level and remove surface rocks or debris greater than 1 inch in diameter.

- Seed or sod per recommendations of seed/sod provider.

Materials

Your landscaper should be able to locate a source of materials that meet the following requirements. The source of materials should be identified and testing data should be obtained certifying the material meets standards. Include test data in SMP.

1. Compost

- Compost shall meet the definition of "composted materials" in WAC 173-350-220.

- Compost must have an organic matter content of 35% to 65% as determined by "loss on ignition" test method and a carbon to nitrogen ratio below 25:1 (35:1 if used in landscape area).

- Carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

- Compost shall meet the contaminant standards of Grade A Compost.

- The following potential sources for compost meeting the above specifications include*:

    - Silver Springs Organics Composting, Tenino (360) 446-0197
    - Pierce County Recycling, Composting & Disposal in Puyallup (253) 847-7555.
    - Purdy Compost Facility, Gig Harbor, (253) 857-2075

- Sequalitchew Creek Earthworks, Fort Lewis, (253) 966-3275
- North Mason Fiber Co., Belfair, (360) 275-0228.

*Thurston County does not endorse any of the companies listed and the list is provided as a resource only. Compost from many of these facilities is sold and mixed into topsoil products through numerous retail outlets – check with topsoil and nursery vendors also. Information provided by WA Department of Ecology, current April 2008. An updated, current list of Permitted Composting Facilities throughout Washington is available at the Ecology Website: www.ecy.wa.gov/programs/swfa/compost/

2. Mulch

- Mulch for planting beds shall be organic mulch or stockpiled forest duff. Mulch may be compost, fine ground freshwater bark, composted sawdust, wood chips, or equivalent.

3. Imported Topsoil

- Imported topsoil mix for planting beds shall contain a minimum of 10% organic matter (typically around 40% compost) with the soil portion consisting of sand or sandy loam as defined by the USDA with little or no clay.

- Imported topsoil mix for turf areas shall contain a minimum of 5% organic matter (typically around 25% compost) with the soil portion consisting of sand or sandy loam as defined by the USDA with little or no clay.

Maintenance

A maintenance checklist is provided in Appendix V of the DDECM for inclusion in the Maintenance Plan prepared for the project (if required). General maintenance considerations include:

- Soil quality and depth should be established toward the end of construction and once established, should be protected from compaction, such as from large machinery use, and from erosion.

- Soil should be planted and mulched as soon as possible after installation to avoid erosion.

- Plant debris or its equivalent should be left on the soil surface to replenish organic matter.

- Propert implementation of this BMP should reduce the use of irrigation, fertilizers, herbicides and pesticides.

Submittal Information

For projects submitting a full Drainage Design and Erosion Control Report a site specific Soil Management Plan (SMP) shall be prepared and submitted with other project documentation. The SMP includes:

- 11x17 or larger scale drawing identifying area where native soil and vegetation will be retained undisturbed and which soil treatments will be applied in landscape areas.

- A completed SMP form identifying treatments and products to be used to meet the soil depth and organic content requirements of each area.

- Computations of compost or topsoil volumes to be imported (and/or soil to be stockpiled) to meet "pre-approved" amendment rates; or calculations by a qualified

professional to meet organic content requirements if custom calculated rates are used.

- Copies of laboratory analyses for compost and topsoil products to be used documenting organic matter content and carbon to nitrogen ratios. These should be available from the compost/soil provider or from the qualified professional for custom rate calculations.

- If applicant proposes to use stockpiled topsoils from on-site without amendment submit testing to indicate that existing topsoil meets organic content requirements.

- If a Maintenance Plan is required for the project include maintenance checklist from Appendix V-C of the DDECM.

- The As-Built submittal for the project shall include any deviations from the approved Soil Management Plan and copies of original delivery tickets for all soil and mulch products.

Abbreviated Drainage Plan Submittals

For those projects allowed to submit an Abbreviated Drainage Plan or Engineered Abbreviated Drainage Plan and for which the default amendment rates or imported topsoil is proposed for all lawn or landscape areas, the following shall be submitted with the Abbreviated Drainage Plan to meet the requirements of this BMP:

- Identify on the Abbreviated Drainage Plan Plot Plan areas where native soil and vegetation will be retained and areas for which soil amendment will be applied.

- Determine which method of soil restoration will be provided for each area and note this on the face of the Plot Plan. (See Section: "Soil Amendment Rates" and "Importing Topsoil").

- Attach the applicable soil default application rate or imported topsoil restoration method description to the Plot Plan and reference it for each area of soils restoration.

- Identify sources of compost, topsoil and mulch and provide documentation that the materials meet the material specifications. If you hire a landscaper, they should be able to provide this for you.

- The Soil Management Plan Form and Site Plan is not required to be completed if the above information is provided as part of the Abbreviated Drainage Plan submittal. Attachment B is a condensed reference guide that can be used in preparing the Abbreviated Drainage Plan.

POST-CONSTRUCTION SOIL QUALITY AND DEPTH

Applicant Use	REVIEW CHECKLIST	Staff Use Only
	APPLICABILITY & SPECIAL REQUIREMENTS	
	If project is a redevelopment that is required to retrofit to current stormwater standards verify that existing landscape and lawn areas are proposed for soil amendment.	
	If project is within a Well Head Protection area for a public water system with over 1,000 connections compost shall be comprised entirely of vegetative materials. No animal manure or biosolids components shall be contained in the compost.	
	If poorly draining areas are proposed for turf establishment, confirm that compost amendment is no more than 30% by volume. (Note: Standard amendment rate is 40% by volume).	
	Are soil restoration requirements for engineered slopes or structural fill areas provided and in conformance with geotechnical or civil engineer recommendations?	
	DESIGN ELEMENTS	
	Are all areas of the project where soils have been disturbed identified in the Soil Management Plan with recommendations for soil restoration (Options 1 through 4).	
	Are construction notes provided in construction drawings indicating the method and procedure for post construction soil quality and depth restoration.	
	Have sources for topsoil, compost and mulch been identified and supporting documentation of testing been submitted with the application.	
	For custom soil amendment has a soils professional performed testing and provide recommendations and has this information been submitted with the Soils Management Plan.	
	If existing topsoil is to be stockpiled has the stockpile area been shown on the plans and a suitable weed barrier cover provided that sheds moisture yet allows air transmission.	
	If use of topsoil from onsite is proposed without amendment, has soil testing been performed and results submitted documenting adequate organic content (10% for landscape areas & 5% for lawn/turf areas). Is adequate volume available for 8" final depth.	
	MATERIALS	
	Is source of compost identified and information provided certifying that compost material meets definition of "composted materials" in WAC 173-350-220, has organic matter content of 35% to 65% and a carbon to nitrogen ratio below 25:1.	
	Has the type and source of mulch been provided? Is mulch either stockpiled forest duff, compost, fine ground freshwater bark, composted sawdust, wood chips or an equivalent?	
	If imported topsoil is to be used has the applicant identified the source of topsoil and provided documentation that topsoil meets organic content requirements (5% for lawn areas, 10% for landscape areas) with soil components consisting of sand or sandy loam with little or no clay.	
	SUBMITTAL REQUIREMENTS	
	Has a Soil Management Plan been prepared and submitted?	
	Is a Soil Management Site Plan provided showing all areas for post-construction soil restoration and area designations? For an Abbreviated Drainage Plan this information can be shown on the Abbreviated Drainage Plan Plot Plan.	
	Has a Soil Management Plan Form been completed with areas identified and corresponding to areas shown on the Soil Management Plan Site Plan. For an Abbreviated Drainage Plan using only default amendment rates or imported topsoil the form is not required and the applicable amendment method description should be attached to the Abbreviated Drainage Plan Plot Plan with reference to the areas identified on the Plot plan to which each method applies.	
	If custom calculated amendment rates are proposed has testing data been provided with the Soil Management Plan.	
	Has the Soil Management Site plan been included in the Construction drawings for the project or has the information been incorporated into the construction drawings with notes and details consistent with the Soils Management Plan?	
	Do project specifications (either incorporated into the construction drawings or as a separate contract document) include soils restoration requirements.	
	If a Maintenance Plan is required has the appropriate checklist been included for Post-Construction Soils Quality and Depth BMP LID.02	
	Delivery tickets for topsoil, mulch, and compost shall be provided to the County as part of the final project inspection and as-built submittals.	

ATTACHMENTS

A. SOIL MANAGEMENT PLAN FORM & INSTRUCTIONS
B. ABBREVIATED DRAINAGE PLAN ATTACHMENT
C. FIELD GUIDE TO VERIFYING SOIL QUALITY AND DEPTH
D. FIELD VERIFICATION FORM

ATTACHMENT A
SOIL MANAGEMENT PLAN FORM & INSTRUCTIONS

Soil Management Plan for BMP LID.02

PROJECT INFORMATION **Page # ____ of ____ pages**
Complete all information on page 1; only site address and permit number on additional pages.

Site Address / Lot No.:_____	
Permit Type:	**Permit Number:**
Permit Holder:	**Phone:**
Mailing Address:_____	
Contact Person:	**Phone:**
Plan Prepared By:	

ATTACHMENTS REQUIRED (*Check off required items that are attached to this plan*)

___ **Site Plan showing, to scale:**	___ Areas of undisturbed native vegetation (no amendment required) ___ New planting beds and turf areas (amendment required) ___ Type of soil improvement proposed for each area
___ **Soil test results (required if proposing custom amendment rates)**	
___ **Product test results for proposed amendments**	

AREA #_____ (*should match Area # on Site Plan*)

PLANTING TYPE ___ Turf ___ Planting Beds	___ Undisturbed native vegetation ___ Other: _____	
SQUARE FOOTAGE OF THIS AREA: _____ square feet		
SCARIFICATION ___ Subsoil will be scarified	___ inches (depth) of scarification needed to achieve finished total 12" loosened depth.	
PRE-APPROVED AMENDMENT METHOD: ___ Topsoil import ___ Amend with compost ___ Stockpile and amend (____ cu. yds. stockpiled)	____inches of compost or imported topsoil applied X 3.1 (*conversion factor, inches to cubic yards*) _____= cu. yards per 1,000 sq. ft. X ___ ,000s sq.ft. in this area ____ = cubic yards of amendment → → → → → (*needed to cover this area to designated depth*)	PRODUCT:_____ _____ QUANTITY:_____CU. YDS.
CUSTOM AMENDMENT ___ Topsoil import ___ Topsoil & compost lift ___ Amend ___ Stockpile and amend (____ cu. yds. stockpiled)	**Attach test results and calculations.** ____ inches organic matter or topsoil import X 3.1 _____= cu. yards / 1,000 sq. ft. X ___ ,000s sq.ft. in this area ____ = cubic yards of amendment → → → → →	PRODUCT:_____ _____ QUANTITY:_____CU. YDS.
MULCH	___ ,000 sq.ft. X 6.2 (*conversion, to give 2 inch mulch depth*) ____ = cubic yards of mulch → → → → → →	PRODUCT:_____ QUANTITY:_____CU. YDS.

TOTAL AMENDMENT/TOPSOIL/MULCH FOR ALL AREAS (*complete on page 1 only, totaling all areas/pages in this Plan*)

- ❑ **Product #1:**_____ ❑ **Quantity: _____cu. yds.**
- ❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants) **____ "stable"** (yes/no)
- ❑ **Product #2:**_____ ❑ **Quantity: _____cu. yds.**
- ❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants) **____ "stable"** (yes/no)
- ❑ **Product #3:**_____ ❑ **Quantity: _____cu. yds.**
- ❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants) **____ "stable"** (yes/no)

Date:	**Inspector:**	**Approved:**	**Revisions Required:**
Date:	**Inspector:**	**Approved:**	**Revisions Required:**

INSTRUCTIONS FOR COMPLETING SOIL MANAGEMENT PLAN FORM

The numbers correspond to the numbers shown on the Soil Management Plan Form from on the following page.

1. Page _ of _ pages: Indicate page number and total number of pages. More than one page may be required if there is more than one area requiring soil amendment. Attach a separate page for each additional area requiring soil amendment.

PROJECT INFORMATION

Complete all information for page 1 and only site address and permit number for additional pages.

2. Site Address/Lot No.: Provide site address and assessor's parcel number(s). If no address indicate nearest street and cross-street.
3. Permit Type: Provide permit type, i.e. building permit, short plat, etc.
4. Permit Number: Provide Thurston County project number as assigned by the County.
5. Permit Holder: Provide name of applicant, if a company provide company name.
6. Phone: Provide project applicant's business phone number.
7. Mailing Address: Provide mailing address of applicants business.
8. Contact Person: Provide individual's name that represents applicant for this project.
9. Phone: Provide phone number for contact person.
10. Plan Prepared By: Provide name of person preparing plan. May be different from Applicant or Contact person. If different, also provide phone number.

ATTACHMENTS REQUIRED

Only Required to be completed for the first page. Leave blank for additional pages.

11. Site Plan: Provide site plan showing information requested.
12. Soil Test Results: Provide results of testing of existing soils, only required if proposing custom amendment rates.
13. Product Test Results: Provide test results for compost and topsoil showing that materials meet specification requirements.

AREA SOIL AMENDMENT DATA

14. Area #: Provide area number corresponding to areas on site plan. Attach additional sheets for each additional area.
15. Planting Type: Check what type of plantings will occur in area.
16. Square Footage of This Area: Calculate square footage of area and enter here.
17. Scarification: Check if scarification is required and indicate depth of scarification.
18. Pre-Approved Amendment Method: Check if this area will use pre-approved amendment rates.
19. Provide inches of compost or topsoil and calculate cubic yards required.
20. Product & Quantity: State what product is used, i.e. compost or topsoil and cubic yards calculated from block 19.
21. Custom Amendment: If custom amendment is used check type. Either the pre-approved or custom amendment block should be completed, not both.
22. Provide inches of compost or imported topsoil and calculate cubic yards required.
23. Product & Quantity: State what product is used, i.e. compost or topsoil and cubic yards calculated from block 22.
24. Mulch: No mulch required for turf/grass, if area is a landscape planting bed complete this block.
25. Enter square feet of area to be mulched and calculate cubic yards required.
26. Product & Quantity: State product used and cubic yards calculated from block 25.

TOTAL AMENDMENT/TOPSOIL/MULCH FOR ALL AREAS

Complete on page 1 only, totaling all areas/pages in the Plan. If more than 3 products are proposed Indicate total on 2nd page and indicate so on Page 1.

27. Indicate product (compost, topsoil, mulch), quantity for all areas, and test results. C:N ratio and "stable" is only applicable for compost, for topsoil or mulch indicate "n/a" for not applicable.
28. Repeat step 27 for each additional product.
29. Repair step 27 for each additional product.
30. For County Use – Leave Blank.

Soil Management Plan for BMP LID.02

PROJECT INFORMATION [1] **Page # ____ of ____ pages**
Complete all information on page 1; only site address and permit number on additional pages.

Site Address / Lot No.: [2] _____

Permit Type: [3] **Permit Number:** [4]
Permit Holder: [5] **Phone:** [6]
Mailing Address: [7] _____
Contact Person: [8] **Phone:** [9]
Plan Prepared By: [10]

ATTACHMENTS REQUIRED (*Check off required items that are attached to this plan*)

___ **Site Plan showing, to scale:** [11]
___ Areas of undisturbed native vegetation (no amendment required)
___ New planting beds and turf areas (amendment required)
___ Type of soil improvement proposed for each area

[12] **Soil test results (required if proposing custom amendment rates)**
[13] **Product test results for proposed amendments**

AREA # [14] (*should match Area # on Site Plan*)

PLANTING TYPE [15] ___ Turf ___ Undisturbed native vegetation
___ Planting Beds ___ Other: _____

SQUARE FOOTAGE OF THIS AREA: [16] ___ square feet

SCARIFICATION [17] ___ Subsoil will be scarified	___ inches (depth) of scarification needed to achieve finished total 12" loosened depth.	
PRE-APPROVED [18] **AMENDMENT METHOD:** ___ Topsoil import ___ Amend with compost ___ Stockpile and amend (____ cu. yds. stockpiled)	[19] ___ inches of compost or imported topsoil applied X 3.1 (*conversion factor, inches to cubic yards*) _____= cu. yards per 1,000 sq. ft. X ___ ,000s sq.ft. in this area ____ = cubic yards of amendment → → → → → (*needed to cover this area to designated depth*)	PRODUCT:_____ [20] _____ QUANTITY:_____CU. YDS.
CUSTOM AMENDMENT [21] ___ Topsoil import ___ Topsoil & compost lift ___ Amend ___ Stockpile and amend (____ cu. yds. stockpiled)	**Attach test results and calculations.** [22] ___ inches organic matter or topsoil import X 3.1 _____= cu. yards / 1,000 sq. ft. X ___ ,000s sq.ft. in this area ____ = cubic yards of amendment → → → → →	PRODUCT:_____ [23] _____ QUANTITY:_____CU. YDS.
MULCH [24]	[25] ___ ,000 sq.ft. X 6.2 (*conversion, to give 2 inch mulch depth*) ____ = cubic yards of mulch → → → → → →	PRODUCT:_____ [26] QUANTITY:_____CU. YDS.

TOTAL AMENDMENT/TOPSOIL/MULCH FOR ALL AREAS (*complete on page 1 only, totaling all areas/pages in this Plan*)

[27]
❑ **Product #1:**_____ ❑ **Quantity: _____cu. yds.**
❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants) ____ **"stable"** (yes/no)

[28]
❑ **Product #2:**_____ ❑ **Quantity: _____cu. yds.**
❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants) ____ **"stable"** (yes/no)

[29]
❑ **Product #3:**_____ ❑ **Quantity: _____cu. yds.**
❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants) ____ **"stable"** (yes/no)

Date: [30]	**Inspector:**	**Approved:**	**Revisions Required:**
Date:	**Inspector:**	**Approved:**	**Revisions Required:**

ATTACHMENT B
ABBREVIATED DRAINAGE PLAN ATTACHMENT

POST-CONSTRUCTION SOIL QUALITY AND DEPTH COMPLIANCE GUIDE FOR PROJECTS SUBMITTING ABBREVIATED DRAINAGE PLANS

References:
1. Thurston County 2009 Drainage Design and Erosion Control Manual, Volume I, Section 2.4.6
2. Thurston County 2009 Drainage Design and Erosion Control Manual, Volume V, Section 2.1.2
3. Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington (www.soilsforsalmon.org). .

Projects required to comply with Minimum Requirement #5, On-Site Stormwater Management, per the 2009 Thurston County Drainage Design and Erosion Control Manual and eligible to submit an Abbreviated Drainage Plan or Engineered Abbreviated Drainage Plan can use this Guide to comply with the requirement for restoring Post-Construction Soil Quality and Depth (BMP LID.02).

1. Identify on the plot plan those areas that will be landscaped and those areas that will be lawn/turf. Use a letter or number designator for each area.
2. Calculate the area in square feet for each area.
3. Select a soil amendment method for each area based on the following alternatives:
   A. Compost amendment of in-place soils for landscape areas
   B. Compost amendment of in-place soils for lawn/turf areas.
   C. Compost amendment of replaced stockpiled topsoil for landscape areas.
   D. Compost amendment of replaced stockpiled topsoil for lawn/turf areas.
   E. Imported Topsoil for Landscape Areas
   F. Imported Topsoil for Lawn/Turf Areas
   G. Replacement of stockpiled topsoil without compost amendment. (testing of soil stockpile required to ensure it meets organic content requirements).

4. Indicate on the plot plan which area will receive which type of soil amendment (A–G). Add a note on your plot plan such as:
   Soil Amendment
   Area 1: Method A
   Area 2: Method C
   See attached soil amendment method descriptions

5. Calculate the quantity of each product required (mulch, imported topsoil, compost) and indicate the quantities on the plot plan. Use the following formula:

   Cubic Yards = "inches placed" x 0.0031 x "Area in SF"
   For example: if you place 2" of mulch on 1500 square feet of area, then:
   Cubic Yards Mulch = 2" x 0.0031 x 1500 sf = 9.3 cubic yards

6. Identify the supplier you will use for compost and imported topsoil and obtain a test report for each indicating that the product meets the following specifications:

   Compost: --C:N less than 25:1 (except less than 35:1 for Native Plants)
   --Organic Content: 35% to 65%
   --Meets definition of "composted materials" per WAC 173-350-220
   --Meets contaminant standards of Grade A Compost

   Topsoil: --Minimum of 10% organic matter for landscape planting beds
   --Minimum of 5% organic matter for lawn/turf areas.
   --Soil portion consists of sand or sandy loam as defined by USDA with little or no clay.

7. Mulch shall be organic mulch such as compost, fine ground freshwater bark, composted sawdust, wood chips, stockpiled forest duff or equivalent.
8. Include the test reports with your Abbreviated Drainage Plan submittal.
9. Attach this document (which describes amendment methods) to your Plan.

PRE-APPROVED "DEFAULT" SOIL AMENDMENT METHODS

Compost Amendment of In-Place Soils

METHOD A: Compost Amendment of In-Place Soils for Landscape Areas

- Scarify or till subgrade to 8" depth except within the dripline of trees to be retained.
- Place 3" of compost and rototill into 5" of soil.
- Rake area smooth and remove large rocks (>2" in diameter).
- Plant landscaping plants as required.
- Mulch planting bed with 2" of organic mulch.

METHOD B: Compost Amendment of In-Place Soils for Lawn/Turf Areas.

- Scarify or till subgrade to 8" depth except within the dripline of trees to be retained.
- Place 1.75" of compost and rototill into 6.25" of soil.
- Water or roll to compact.
- Rake level and remove debris and rocks greater than 1" in diameter.
- Seed or sod per recommendations of seed/sod provider.

Compost Amendment of Replaced Stockpiled Topsoil

METHOD C: Compost Amendment of Replaced Stockpiled Topsoil for Landscape Areas

- Remove, stockpile and cover existing topsoil with a weed barrier material that sheds moisture yet allows air transmission.
- If replaced topsoil plus compost will amount to less than 12" scarify or rototill subgrade to depth needed to achieve 12" of loosened soil after topsoil and amendment are placed, 4" minimum. Do not scarify within the dripline of trees to be retained.

  For example: if there is only enough stockpiled topsoil to place 3" and an additional 3" of compost is placed, then the subgrade should be scarified to a depth of 6" (12" total depth) prior to replacement of topsoil and compost.

- Replace topsoil and spread uniformly over surface scarified as described above.
- Place 3 inches of compost and rototill into 5" of soil.
- Rake beds to smooth and remove surface rocks larger than 2" in diameter.
- Plant landscaping plants as required.
- Mulch planting bed with 2" of organic mulch.

METHOD D: Compost Amendment of Replaced Stockpiled Topsoil for Lawn/Turf Areas.

- Remove, stockpile and cover existing topsoil with a weed barrier material that sheds moisture yet allows air transmission.
- If replaced topsoil plus compost will amount to less than 12" scarify or rototill subgrade to depth needed to achieve 12" of loosened soil after topsoil and amendment are placed, 4" minimum. Do not scarify within the dripline of trees.

  For example: if there is only enough stockpiled topsoil to place 3" and an additional 1.75" of compost is placed, then the subgrade should be scarified to a depth of 7.25" (12" total depth) prior to replacement of topsoil and compost amendment.

- Replace topsoil and spread uniformly over surface scarified as described above.
- Place 1.75" of compost and rototill into 6.25" of soil.
- Water or roll to compact soil.
- Rake level and remove woody debris and rocks greater than 1" in diameter.
- Seed or sod per recommendations of seed/sod provider.

Imported Topsoil – No Amendment

As an alternative to compost amendment of soils an applicant may choose to import topsoil for installation in landscape and lawn/turf areas. Installation shall be in accordance with the following procedures:

METHOD E: Imported Topsoil For Landscape Areas

- Scarify or till subgrade in two directions to a depth of 6". The entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees.
- Place 3" of imported topsoil mix on surface and till into 2" of soil.
- Place a second lift of 3" of topsoil mix on the surface.
- Rake beds to smooth and remove surface rocks over 2" in diameter.
- Plant landscaping plants as required.
- Mulch planting bed with 2" of organic mulch.

METHOD F: Imported Topsoil for Lawn/Turf Areas

- Scarify or till subgrade in two directions to a depth of 6". The entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees.
- Place 3" of topsoil mix on surface and till into 2" of soil.
- Place a second lift of 3" of topsoil mix on surface.
- Water or roll to compact soil.
- Rake to level and remove surface rocks or debris greater than 1 inch in diameter.
- Seed or sod per recommendations of seed/sod provider.

Stockpiled Topsoil Replacement – Without Amendment

METHOD G: Replacement of Stockpiled Topsoil Without Compost Amendment
If sufficient volume of stockpiled topsoil exists to provide for a settled depth of 8 inches (approximately 9.5 inches loose) after replacement and the existing topsoil can be verified to meet soil quality criteria (see below), then compost amendment is not required and the following procedure should be followed:

- Remove, stockpile and cover existing topsoil with a weed barrier material that sheds moisture yet allows air transmission.
- Test stockpiled topsoil to ensure minimum organic content (10% for landscape beds, 5% for lawn/turf areas). Otherwise, compost amendment is required.
- Scarify or till subgrade 4" minimum except within the dripline of trees to be retained.
- Place 3" of topsoil on scarified surface and till into 2" of soil.
- Place remainder of topsoil on surface.
- Rake bed smooth and remove surface rocks over 2" diameter for landscape beds and rocks and woody debris over 1" for lawn/turf areas.
- For lawn/turf areas water or roll to compact.
- Plant lawn/turf or landscape plants.
- For landscape areas mulch planting bed with 2" of organic mulch.

ATTACHMENT C
FIELD GUIDE TO VERIFYING SOIL QUALITY AND DEPTH
(EXCERPT FROM "SOILS FOR SALMON" REFERENCE)

FIELD GUIDE TO VERIFYING SOIL QUALITY AND DEPTH IN NEW LANDSCAPES

This guide is provided to help professional inspectors verify implementation of soil improvements to fulfill BMP T5.13 "Post Construction Soil Quality and Depth" in the Washington Department of Ecology's Stormwater Management Manual Western Washington.

The main conditions to be confirmed are:

1. Provision of eight inches of topsoil containing 10% organic matter in planting beds, or 5% in turf areas.
2. Scarification of compacted subsoil four inches below the topsoil layer (for a total uncompacted depth of 12 inches).
3. Placement of two inches of mulch on all planting beds.

Site Inspection Supplies

- A copy of the approved Soil Management Plan (SMP) for the site, with site drawing.
- A sturdy shovel
- Tape measure or 12" ruler
- 3/8 inch diameter 3-4 foot stainless steel "rod penetrometer" with a 1/8" bevel cut into the tip at 30 degrees from the side, and a 90 degree bend at top to form a handle (*see illustration, next page*).
- Field Verification Form to record results

The following steps may be completed at multiple visits as a project progresses or in one final project approval inspection, depending on local practices:

STEP 1: Compare site conditions with approved Soil Management Plan (SMP).

The SMP approved with the site permit describes soil treatments approved for each area. Make sure site conditions match these details in the SMP:

- Site location and permit holder.
- Turf and planting areas match approved drawings.
- Areas to remain as undisturbed native soil and vegetation have been fenced off during construction to prevent soil compaction or damage to plants.

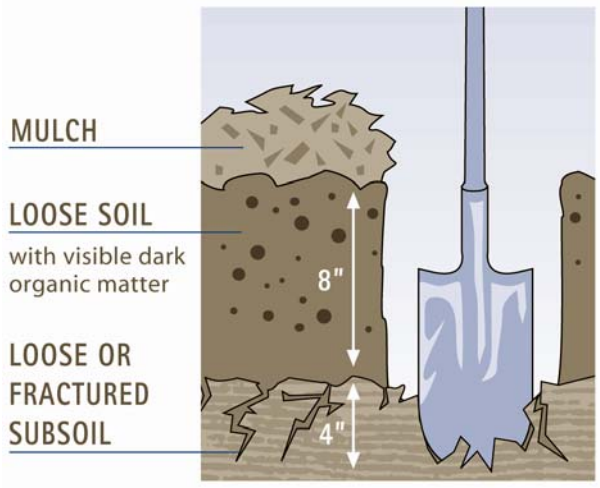
STEP 2: Inspect delivery tickets for compost, topsoil and mulches.

Permitee must provide original delivery tickets for all soil and mulch products. Compare delivery tickets with the SMP to match the following information:

- Delivery location.
- Total quantities for each soil product and mulch.
- Product descriptions and sources.
  If materials other than those listed in the SMP were delivered, laboratory test results must be provided to confirm that they are equivalent to approved products.

STEP 3: Verify depth of amended soil and scarification.

Use a shovel to dig at least one test hole per acre for turf and one per acre for planting beds to verify eight inch topsoil depth (below mulch layer), incorporation of amendments, and four inches of uncompacted subsoil.



Test holes should be about one foot deep (after first scraping away any mulch) and about one foot square.

Eight Inch Depth of Amended Soil. The top eight inches of soil should be easy to dig using a garden spade driven solely by your weight. The soil should be darker than the unamended soil below, and particles of added organic

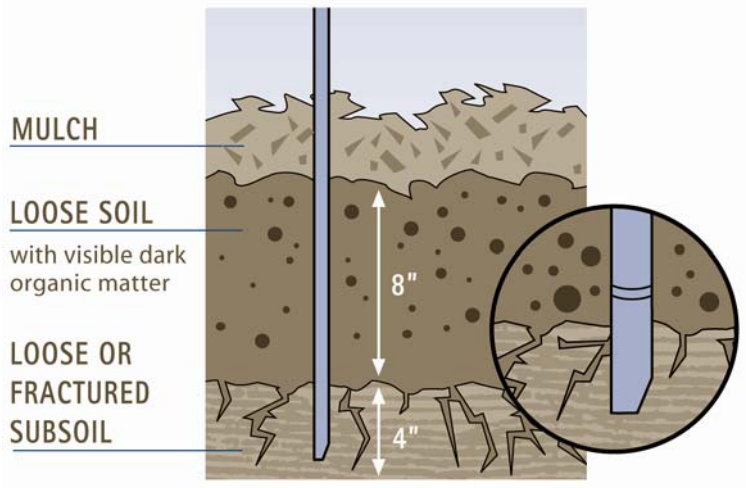
matter are likely to be visible. Clay soil that been saturated and then dried may require jumping on the shovel step to penetrate, but the soil should yield easily when moist. Soil that requires vigorous chipping with the shovel to penetrate probably does not meet the specification.

Four Inch Depth of Scarified Subsoil. The next four-inch depth of soil should be loose enough to penetrate with the shovel. It may be rocky, and the loosened depth may vary due to the pattern of scarifying equipment – but some sections of subsoil in a one foot square hole should be loose four inches deep into the subsoil (that is, to a total 12 inch depth from the soil surface).

STEP 4: Check soil depth in several spots.

Use a simple "rod penetrometer" (illustration below) to confirm that the soil is uncompacted twelve inches deep at ten locations per acre – with a minimum of ten on smaller sites. To locate test spots, imagine a line dividing the site (or each acre) in half lengthwise, then divide each half into five nearly equal sections. Conduct tests near the middle of each section. Additional test locations are encouraged.

The rod penetrometer should enter the soil twelve inches deep, driven solely by the inspector's weight. Irregular scarification or rocks in the lower layer may require probing a few spots at each location to reach the full depth.



A rod penetrometer is a 4 foot long, 3/8 inch or 10 mm diameter stainless steel rod with a 90 degree bend 5 inches form the top to make a handle, and a 30 degree bevel cut 1/8 inch or 3 mm into the side of the tip.

STEP 5: Check mulch depth.

Use a shovel to scrape away and reveal surface mulch thickness. A two inch layer of organic material (mulch) such as composted sawdust, wood chips, or ground bark should be distinguished from the underlying soil on all planting beds.

FINAL STEP: Record results on "Field Verification Form" or similar document *(see sample form on next page)*.

What should be attached to the Soil Management Plan?

- Scale drawings showing layout of turf and planting beds, and identifying where soil treatments described in the SMP will be applied.
- Copies of compost and topsoil test results demonstrating that products contain adequate organic matter, and meet carbon to nitrogen ratio and stability standards.
- Where custom calculated amendment rates are used, include laboratory analyses of the soil and organic matter sources plus calculations by a qualified professional showing that the organic matter requirement will be achieved.

What If A Site Does Not Meet the Soil Management Plan Requirements?

If inspection indicates that an installation does not fulfill the approved SMP, the permit holder or their agent should be notified of what steps are needed to comply. When results are unclear or disputed, an independent consultant should conduct sampling for analytical testing of organic matter as described in the project specifications.
Qualified consultants include: Certified Soil Scientists, Crop Advisors or Agronomists; or Licensed Landscape Architects, Civil Engineers or Geologists.

ATTACHMENT D
FIELD VERIFICATION FORM
(EXCERPT FROM "SOILS FOR SALMON" REFERENCE)

Model FIELD VERIFICATION FORM for BMP T5.13

(available as MS Word file at www.SoilsforSalmon.org)

PROJECT INFORMATION **Page # ____ of ____ pages**

Complete all information on page 1, only site address and permit number on additional pages.

Site Address: _____	
Permit Type:	**Permit Number:**
Permit Holder:	**Phone:**
Mailing Address: _____	
Customer Representative At Inspection:	**Phone:**
Plan Prepared By:	

VISIT RECORD

Date:	**Inspector:**	**Items Approved: __ Fencing off undisturbed areas __ Soil preparation __ Mulch __ Other:**
Date:	**Inspector:**	**Items Approved: __ Fencing off undisturbed areas __ Soil preparation __ Mulch __ Other:**
Date:	**Inspector:**	**Items Approved: __ Fencing off undisturbed areas __ Soil preparation __ Mulch __ Other:**

DELIVERY TICKETS FOR AMENDMENT, TOPSOIL & MULCH.

(*Check if tickets match Soil Management Plan (SMP). Total volumes for all areas should be on page 1 of the SMP*).

❑ **Product #1:** _____ ❑ **Test Results: ___ % organic matter ____C:N ratio <25:1 ____ "stable"** (Y/N) ❑ **Quantity: _____ cu. yds.** (except mulch, or <35:1 for native plants)	**Comments:**
❑ **Product #2:** _____ ❑ **Test Results: ___ % organic matter ____C:N ratio <25:1 ____ "stable"** (Y/N) ❑ **Quantity: _____ cu. yds.** (except mulch, or <35:1 for native plants)	
❑ **Product #3:** _____ ❑ **Test Results: ___ % organic matter ____C:N ratio <25:1 ____ "stable"** (Y/N) ❑ **Quantity: _____ cu. yds.** (except mulch, or <35:1 for native plants)	

AREA #___ (*refer to Areas mapped on Site Plan and described on Soil Management Plan*)

PLANTING TYPE ___ Undisturbed vegetation ___ Turf ___ Planting Beds ___ Other: _____ **Square footage:_____**	**Test Holes** **Number Test Holes Required:____** (minimum 1 hole/acre) **Soil Amended 8 Inches Deep? Y / N** **Amendment Matches Soil Mgmt. Plan? Y / N** ❑ Topsoil Product ? ❑ Amendment Visible ? **Subsoil Loose/Scarified 12 Inches Deep? Y / N**	**Rod Test** **Number Rod Tests Required:____** (minimum 10 tests/acre) **Rod penetrates 12 inches deep in all areas? Y / N**
(*If Planting Bed, Mulch is Required After Planting*) **Mulch Product:** _____ **Mulch two inches deep? Y / N**	**Comments:**	

AREA #___

PLANTING TYPE ___ Undisturbed vegetation ___ Turf ___ Planting Beds ___ Other: _____ **Square footage:_____**	**Test Holes** **Number Test Holes Required:____** (minimum 1 hole/acre) **Soil Amended 8 Inches Deep? Y / N** **Amendment Matches Soil Mgmt. Plan? Y / N** ❑ Topsoil Product ? ❑ Amendment Visible ? **Subsoil Loose/Scarified 12 Inches Deep? Y / N**	**Rod Test** **Number Rod Tests Required:____** (minimum 10 tests/acre) **Rod penetrates 12 inches deep in all areas? Y / N**
(*If Planting Bed, Mulch is Required After Planting*) **Mulch Product:** _____ **Mulch two inches deep? Y / N**	**Comments:**	

Add additional sheets for additional Areas