Module 4 - Topsoil
It is formed from the weathering of rocks and the subsequent addition of organic material from decaying plants and animals.

Source: https://www.onlinesoil.co.uk/knowledge-base/general-info/what-is-topsoil
Upland Topsoil

Soil Composition

- Water: 25%
- Mineral: 45%
- Air: 25%
- Organic Matter: 5%


Life in the Soil – YouTube
Per COR400000 – Unless Infeasible, topsoil shall be preserved for those areas of a site that will utilize vegetative final stabilization.
Importance of Upland Topsoil Sampling

Create conditions ideal for vegetation establishment saving cost, increasing success, minimizing erosion, reducing impacts to water quality, and maintenance by:

- Determining existing upland soil fertility
- Salvaging, protecting and reusing existing topsoil if feasible
- Providing tailored soil amendments for upland areas as needed based on topsoil laboratory sample result
Topsoil does NOT need to be sampled if topsoil salvaging is infeasible. Factors that may affect the ability to salvage onsite:

- Known soil contamination or extremely poor soils with pH > 8.8 or salinity > 12 mmhos/cm
- Soils with large cobbles (> 6 inches) covering 20% or more of the site.
- Noxious weed infestation
- Inability to store onsite or nearby

From the NEPA Manual Chapter 9.5

Topsoil Management – When salvaging topsoil from on-site construction locations, the potential for the spreading of noxious weeds shall be considered. Topsoil should never be salvaged if contaminated by noxious weeds or seeds. Importing topsoil onto the project site should not be allowed unless it is certified weed free.
Regional contact for revegetation questions. Also, provided on additional agenda items for CDOT Pre-construction Environmental agenda on LA website.

- Region 1 - Susie Hagie (Susie.Hagie@state.co.us) 303-757-9932
- Region 2 - Troy Rice (troy.rice@state.co.us) 719-648-3462
- Region 3 - Jen Klaetsch (jennifer.klaetsch@state.co.us) 970-683-6223
- Region 4 - Nick Schipanski (nicholaus.schipanski@state.co.us) 970-350-2127
- Region 5 - Danielle Wilkinson (danielle.wilkinson@state.co.us) 970-382-1425

The Permanent Stabilization Subject Matter Expert (PSSME) can also be delegated to a consultant.

The decision on who the PSSME should be made during the design phase.
Topsoil Sampling

- Performed by the SWMP Designer or designee (can be done with other field work). *Note: May want to review soil reports prior to field work.*

- Goal - Complete and have results before FOR for DBB Projects

- Collected within the LDA

- Recorded sample locations

*If results cannot be obtained before FOR, provide draft quantities that can be revised prior to AD – DO NOT LEAVE BLANK*
Revegetation Units

- Prior to or during the FIR discuss revegetation units with the Regional Environmental Staff (RES).
- If topsoil from different project locations will be combined into one stockpile, then only one composite sample is required.
- If the project has work areas separated by large distances, then each work area should be identified as a revegetation unit and will require separate composite samples.
Revegetation Units
Topsoil Sampling Timing

- If feasible, topsoil sampling should be during FIR process; however, soil should not be frozen or overly moist.
- Topsoil sampling should occur no later than FOR and ideally results need to be prior to FOR to properly account for pay items for engineering cost estimates.
Topsoil Sampling Recap

- Six (6) topsoil sample pits for each revegetation unit (or area that will be stockpiled together)
- A sample is collected from each pit and mixed as a composite sample for that unit (LABEL and Date SAMPLES!!)
- Samples should be hand delivered and or shipped overnight. Samples should be sent the same day as collected if possible and kept cool.
Document general existing plant species, weeds and other factors within LOCs that might influence vegetation establishment and observe if there is trash present.
Testing Facilities:

- CSU Testing Lab – Sample Form (written directions on sample form)
- Weld Laboratories – Sample Form
- Results typically 1-2 weeks
- Results entered into the Soil Amendment Calculator (Module 3) to determine quantities

Add example results
Topsoil Categories and Pay Items

- Topsoil (Onsite) – if topsoil may be salvaged onsite and reused - **PREFERRED**

- Topsoil (Offsite) – new method of importing if topsoil may not be salvaged. Must meet requirements of Table 207-2 in SSP 207

- Topsoil (Wetland) - if wetland topsoil meets requirements and is salvaged onsite and reused

- Seeding Media – produced topsoil from sub-soil, overburden, or material generated from rock. Must meet requirements of Table 207-1 in SSP 207 and will likely require maximum amount of soil amendments
Consult with the Regional Wetland Biologist regarding topsoil management strategies, amendments and seeding for wetlands and associated wetland buffers.
Seeding Media

- Also known as engineered soil

- Engineered soil is a manufactured soil consisting of specified ratios of sand, silt, clay, and organic amendments such as compost and designed for a specific application.

- SSP 207 – Seeding Media is a new method of amending onsite subsoil as a seeding media

https://www.calrecycle.ca.gov/organics/compostmulch/toolbox/engineeredsoil
# Topsoil Properties - Seeding Media

## Table 207-1

<table>
<thead>
<tr>
<th>Property</th>
<th>Range</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH (s.u.)</td>
<td>5.6 – 7.5</td>
<td>ASA Mono. #9, Part 2, Method 10-3.2 or TMECC 04.11-A</td>
</tr>
<tr>
<td>Soil Electrical Conductivity (EC)</td>
<td>&lt; 5.0</td>
<td>ASA Mono. #9, Part 2, Method 10-3.3</td>
</tr>
<tr>
<td>Soil SAR (s.u.)</td>
<td>0 - 10</td>
<td>ASA Mono. #9, Part 2, Method 10-3.4</td>
</tr>
<tr>
<td>Rock Content (%)</td>
<td>≤ 25</td>
<td>USDA NRCS Rock Fragment Modifier Usage</td>
</tr>
<tr>
<td>Trace Contaminants (Arsenic, Cadmium, Copper, Mercury, Selenium, Zinc, Nickel, and Lead)</td>
<td>Meets US EPA, 40 CFR 503 Regulations</td>
<td>TMECC 04.06 or EPA6020/ASA (American Society of Agronomy)</td>
</tr>
<tr>
<td>Rock Content (%) greater than 3” diameter</td>
<td>≤ 25</td>
<td>USDA NRCS Rock Fragment Modifier Usage</td>
</tr>
<tr>
<td>USDA Soil Texture</td>
<td>No more than 70% clay, silt, and sand by percentage volume of topsoil.</td>
<td>ASA Monograph #9, Part 1, Method 15-4 or ASA 1 43-5</td>
</tr>
<tr>
<td>All Particle Sizes</td>
<td>&lt; 6 Inches</td>
<td></td>
</tr>
<tr>
<td>Physical contaminants (man-made inerts) (%)</td>
<td>&lt; 1</td>
<td>TMECC 03.08-C</td>
</tr>
<tr>
<td>C:N ratio</td>
<td>&lt; 20</td>
<td>TMECC 05.02-A</td>
</tr>
<tr>
<td>* Fines % when manufacturing material from rock</td>
<td>≥25% material passing through #4 sieve</td>
<td>ASTM D6913</td>
</tr>
</tbody>
</table>

Amendments to the base imported material shall have the quantities of material verified onsite prior to incorporation into parent material, either at the stockpiles or after placement of parent material. Topsoil amended at the stockpiles shall be distributed to the site within seven days. * Substitute this requirement for USDA Soil Texture requirement when project are approved to use material manufactured from native rock material on site.
Table 207-2
TOPSOIL (OFFSITE) PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Range</th>
<th>Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH (s.u.)</td>
<td>5.6 – 7.5</td>
<td>ASA Mono. #9, Part 2, Method 10-3.2 or TMECC 04.11-A</td>
</tr>
<tr>
<td>Salt by Electrical Conductivity (EC)</td>
<td>&lt; 2.0</td>
<td>ASA Mono. #9, Part 2, Method 10-3.3</td>
</tr>
<tr>
<td>(mmhos/cm or ds/m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil SAR (s.u.)</td>
<td>0 – 10</td>
<td>ASA Mono. #9, Part 2, Method 10-3.4</td>
</tr>
<tr>
<td>Soil OM (%)</td>
<td>3 – 5</td>
<td>Methods of Soil Analysis, Part 3, Method 34</td>
</tr>
<tr>
<td>Soil N (NO₃-n, ppm)</td>
<td>≥ 20.0</td>
<td>Methods of Soil Analysis, Part 3, Chemical Methods, Ch. 38 Nitrogen – Inorganic Forms</td>
</tr>
<tr>
<td>Soil P (ppm)</td>
<td>≥ 13.0</td>
<td>ASA Mono. #9, Part 2, Method 24-5.4 or others as required based on soil pH</td>
</tr>
<tr>
<td>Soil K (ppm)</td>
<td>≥ 80</td>
<td>ASA Mono. #9, Part 2, Method 13-3.5</td>
</tr>
<tr>
<td>Rock Content (%) greater than 3” diameter</td>
<td>≤ 25</td>
<td>USDA NRCS Rock Fragment Modifier Usage</td>
</tr>
<tr>
<td>Bioassay (seedling emergence and relative vigor)</td>
<td>&gt; 80% of control</td>
<td>TMECC 05-05-A or Approved Germination Test</td>
</tr>
<tr>
<td>Soil Texture</td>
<td></td>
<td>ASA Mono. #9, Part 1, Method 15-4</td>
</tr>
<tr>
<td>Physical contaminants (man-made inerts) (%)</td>
<td>&lt; 1</td>
<td>TMECC 03-08-C</td>
</tr>
<tr>
<td>Trace Contaminants (Arsenic, Cadmium, Copper, Mercury, Selenium, Zinc, Nickel, and Lead)</td>
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<tr>
<td>All Particle Sizes</td>
<td>&lt; 6 Inches</td>
<td></td>
</tr>
<tr>
<td>C:N ratio</td>
<td>&lt;20</td>
<td>TMECC 05-02-A</td>
</tr>
</tbody>
</table>
Topsoil Management Strategy

1. The initial SWMP represents control measures that shall be installed prior to start of construction (any disturbance of existing vegetation).

2. Once disturbance of existing vegetation starts the SWMP Administrator for construction shall outline the area with area of disturbance line and use the interim SWMP to represent current installed control measures.

3. Control measures are not drawn to scale and locations are approximate.

4. Vegetative transplants were done by the SWMP Administrator for design prior to the start of construction.

5. Wetlands were delineated by the Region 2 Wetland Biologist and any questions should be directed to XXX XXX at XXX XXX-XXXX.

6. Erosion logs shall be flared upward.

Print Date: 11/22/2020
File Name: RS12 SWMP INITIAL SHEET tags
Check: Susan 12/08
Print: Susan 12/08
Rev: 000
Change: Unit Information
Unit Leader: MSG

As Constructed

STORMWATER MANAGEMENT PLAN
SITE MAP - INITIAL

Colorado Department of Transportation
1440 Quail Dove Loop, Suite A
Colorado Springs, CO 80968
Phone: 719-227-5205
FAX: 719-227-5298

Region 2

MSA

No. Revision:
Revision:
Designers:
Detailers:
Sheet Subsets:

3/24/200
12/1/09
04/05/06
9/9/06
Sheet Number: 50

Revised:

Sheet:

SSWMP
1821
8 of 20
A typical detail may be used to depict topsoil control measures. However, it is imperative that the SWMP Designer evaluates the details to ensure it meets the project needs.

*SWMP Designers should evaluate CMs when in the field!*
Topsoil Management on Permanent Stabilization Site Maps

**Permanant Stormwater Management Plan (SWMP) Notes:**

1. The permanent stormwater management plan maps specify the soil conditions, seeding and mulch requirements for the areas once salvaged topsoil is placed and grades approved. The requirements of the plans are based on decisions through the project development process and specific site conditions identified.

2. Once an area has been permanently stabilized, the SWMP administrator for construction shall identify the area on the plans and sheet when the work was completed.

3. Control measures shown were from either the initial or internal SWMP sheets and might vary based on review with the CDOT regional water pollution control manager and the engineer.

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**Legend:**

- **Subgrade Soil Preparation (Pay Item 237-00704):**
  - YES: Place 6 inch depth (rural) topsoil as shown on plans (207-00700)
  - NO: Place 12 inch dept (wetland) topsoil as shown on plans (207-00703)

- **Topsoil Management Requirement:**
  - YES: Compost (mechanically applied) (212-00701)
  - NO: Biologic soil amendments (212-00702)

- **Soil Amendments:**
  - Compost: (212-00701)
  - Humate: (212-00703)
  - Mycorrhizae: (212-00704)

- **Seeding Method:**
  - Native (212-00706)
  - Hybrid (212-00710)

- **Attached Mulch/Permanant Seed Cover:**
  - Mulching (straw) (213-00004)
  - Tackifier (213-00061)

- **Use Requirement of Adjacent Area:**
  - Area (Square Feet / Acres): 996,433 ft² / 22.65 Acres

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**Printed Date:** 11/14/2020

**File Name:** 1E02 - SWMP Permanent Site Map

**Sheet Revisions:**

- Date: Comments: Initials

**Project No./Code:** STA 0012-004

**Region 2**

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**Stormwater Management Plan (SWMP) Permanent Stabilization:**

**Colorado Department of Transportation**

1480 Southlake Loop, Suite A
Colorado Springs, CO 80906
Phone: 719-227-3156
Fax: 719-227-3796

**As Constructed:**

- No Revisions:
- Revisions:
- Approval:
- Sheet Number: 58
Earthwork Quantities

Changes that will affect quantities:

• 6 inches of topsoil salvage and redistribution (PREFERRED)

• Potential offsite topsoil or additional soil amendments

• Salvaging topsoil is a separate pay item and NO longer part of clearing and grubbing
Salvaged topsoil placement deeper than 6 inches is allowed with approval if additional suitable material is on-site.

Permanent Stabilization Subject Matter Expert should be consulted on topsoil strategies and pay item quantities.
Prior to the placement of topsoil or seeding media, the subgrade must be ripped to a minimum of 14 inches to de-compact the soil.

The Contractor must submit a method statement for subgrade soil preparation.

Pay Item and Pay Unit

<table>
<thead>
<tr>
<th>Pay Item Code</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>207-00704</td>
<td>Subgrade Soil Preparation</td>
<td>SY</td>
</tr>
</tbody>
</table>
Subgrade Preparation and Pay Item

• Design team should decide if subgrade preparation should be incorporated into the project.

• Projects with the following conditions may NOT include subgrade preparation:
  • No mass grading is occurring
  • Where disturbed areas that will be seeded or have sod are less than 5 ft wide
  • Rocky soils (> 6 inches)
  • Existing utilities
  • High moisture subsoils (wetlands and riparian zones)
  • Cut slopes embankments steeper than 2.5:1
  • Only for disturbed areas that will be seeded (not in areas with pavement, aggregate base course, shouldering or recycled asphalt)
Subgrade Preparation and Pay Item

- Site conditions that would benefit from using subgrade preparation item:
  - Abandoned roads, haul roads, batch plants, and on-site staging areas
  - Bioretention areas
  - Fill slopes that do not have rocky soils (> 6 inches for more than 20% of the soil)
Questions?