GUIDANCE DOCUMENT

Topsoil Management Plan for Construction Sites

IowaStormwater.org

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Topsoil Management Plan

Introduction

This document provides guidance for cities, counties, builders, and developers to comply with the topsoil requirements of NPDES General Permit No. 2 (GP2).

GP2 states: "The permittee(s) shall minimize soil compaction and, unless infeasible, preserve topsoil." It further clarifies that preserving topsoil means that "topsoil from any areas of the site where the surface of the ground for the permitted construction activities is disturbed shall remain within the area covered by the applicable General Permit No. 2 authorization."

Topsoil is the uppermost layer of soil, typically characterized by darker color, higher organic matter content, loose structure with low clay content, and a more diverse microbial community than underlying layers. It provides nutrients to support plant, grass, and tree growth, soaks up rainwater to sustain plants, reduces stormwater runoff, and is critical for recharging groundwater.

The purpose of this plan is to ensure that topsoil is accurately assessed before construction, properly managed during development, and adequately replaced post-construction to meet regulatory requirements. As topsoil management can be a non-structural stormwater best management practice (BMP), the Topsoil Management Plan should be included as part of the broader Stormwater Pollution Prevention Plan (SWPPP) and/or attached as a reference or appendix to the SWPPP narrative.

It's important to note areas that will remain undisturbed during construction. These areas will not require topsoil replacement since it wasn't removed in the first place. These undisturbed areas should be noted on the site assessment and included in the site map.

Local Codes and Ordinances: Before proceeding with any topsoil management activities, consult local codes and ordinances for any additional guidelines or requirements specific to your area. Local regulations may provide more requirements than outlined in this general plan or offer incentives for additional practices.

Topsoil Assessment Procedure

Optional: This assessment should be conducted by a qualified professional (edit to add description of qualifications required here.)

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Site Evaluation and Planning

Before beginning any soil sampling, conduct a preliminary site evaluation to identify:

- Identify areas of distinctly different topsoil characteristics using NRCS Web Soil Survey (details given below)
- The amount of area in top slope, side slope, and downslope positions (the depth of topsoil will be different at each of these locations)
- Areas that are expected to be disturbed during construction

- Locations of planned buildings and other permanent structures
- Areas that will remain undisturbed

Use this information to create a sampling plan that will accurately represent the site's topsoil conditions.

How to use NRCS Web Soil Survey

The NRCS Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/) can provide valuable preliminary information about the soils on your site. To use this resource:

1. Navigate to the website and click "Start WSS"
2. Enter your site address or use the mapping tools to locate your area of interest
3. Use the "AOI" tool to draw a boundary around your site
4. Click on the "Soil Map" tab to view soil types present
5. Click on the "Soil Data Explorer" tab to access more detailed information about soil properties

This information can help guide your sampling plan, but it should not replace on-site assessment and sampling. The soil survey will be less useful in ultra-urban areas that have had significant soil disturbance over time.

Soil Sample Site Selection and Frequency Guidelines

For the purposes of this plan, "sample" refers to a shallow soil assessment, typically to a depth of 24 inches or until a clear change in soil characteristics is observed. This can be done using a handheld soil auger, probe, spade, or excavator. To get more accurate results, it may be necessary to pre-wet areas if the soil is very dry. The assessment should use common engineering or soil science evaluation methods for soil color, texture, and structure to identify the topsoil layer.

To ensure an accurate representation of the site's topsoil depth:

1. Conduct a minimum of 5 samples per site.
2. For sites larger than 10 acres, add one additional sample per 2 acres.
3. Ensure sample locations are well-distributed across the site to capture any significant variations in topography or vegetation.
4. Include samples from areas with distinctly different topsoil characteristics.
5. Sample from top slopes, side slopes, and downslope areas to account for topographical variations in topsoil depth.

For example:

- A 5-acre site would have a minimum of 5 samples.
- A 20-acre site would have 10 samples (5 + 5 additional for the extra 10 acres).
- A 50-acre site would have 25 samples (5 + 20 additional for the extra 40 acres).

When selecting sample locations, prioritize areas that represent different landscape positions and soil characteristics. This approach will provide a more comprehensive understanding of topsoil distribution across the site.

Soil Sample Procedure

The goal of this sampling procedure is to determine the depth of the topsoil layer at various locations across the site. These samples do not need to be sent to a lab for analysis; rather, they are used for on-site visual and tactile assessment.

At each selected location:

1. Clear the surface of vegetation and debris.
2. Use a soil auger, probe, spade, or excavator to extract soil to a depth of at least 24 inches or until a clear change in soil characteristics is observed.
3. Identify the topsoil layer based on:
    a. Color: Typically darker than underlying layers due to higher organic matter content
    b. Texture: Topsoil should be soft and crumble easily between your fingers with a slightly gritty texture; if unsure, perform a soil ribbon test (see procedure below).
    c. Structure: The topsoil should be loose and not sticky or clumpy
    d. Root presence: Typically contains more roots than deeper layers
4. Measure and record the depth of the topsoil layer.
5. Record GPS coordinates or mark the location on a site map for future reference.
6. Take photographs of some representative soils from each landscape position.

Soil Ribbon Test Procedure for Identifying Topsoil

1. Take a handful of the soil you're testing.
2. Moisten the soil with water until it's moist enough to roll into a ball, but not saturated.
3. Squeeze the soil between your thumb and forefinger, attempting to form a ribbon.
4. Measure the length of the ribbon before it breaks:
    a. Less than 1 inch: Sandy soils
    b. 1-2 inches: Loamy soils
    c. More than 2 inches: Clay soils
5. For topsoil, you typically expect a ribbon less than 2 inches, indicating a loamy or sandy loam texture. The longer the ribbon, the more clay is present.

Documentation

To accurately document the topsoil assessment and address variability across the site, prepare the following:

Map

Create a detailed site map that includes:

- Sample locations with measured topsoil depths
- Areas that are expected to be disturbed during construction

- Areas that will remain undisturbed
- Topographic contours (if already part of the SWPPP, reference can be made to that map)
- Drainage patterns (if already part of the SWPPP, reference can be made to that map)

Narrative

Provide a written description that includes:

- Methodology used for soil sample (option selected, equipment used, etc.)
- General trends in topsoil depth related to topography
- Description of soil characteristics observed (color, texture, structure)
- Any limitations encountered during the assessment process

Data Table

Create a table listing:

- Sample location identifiers (corresponding to map)
- GPS coordinates or other location references
- Measured topsoil depth at each location
- Brief description of soil characteristics at each location

Photographs

Include photographs of:

- Representative soil profiles from various parts of the site
- Any unique or notable soil features encountered

Calculating Average Topsoil Depth

To calculate the average topsoil depth for the site:

1. Sum the topsoil depths measured at all sample locations.
2. Divide the sum by the total number of samples.

This simple arithmetic mean provides a straightforward representation of the site's average topsoil depth. However, if there are significant variations across the site, consider the following:

- If distinct zones with different topsoil depths are identified, calculate separate averages for each zone.
- Use the site map and narrative to provide context for the calculated average and explain any notable variations.

Stripping and Stockpiling Best Practices

Topsoil Stripping

- Strip topsoil only from areas that will be disturbed by excavation, filling, road building, or compaction by equipment.
- Protect areas to remain undisturbed, using methods such as snow fence delineation.
- Remove topsoil to its full depth, as identified in the site assessment.
- Avoid stripping wet topsoil to prevent compaction and loss of soil structure.
- Minimize equipment traffic on areas before topsoil removal to prevent compaction.

Topsoil Stockpiling

- Locate stockpiles in flat, well-drained areas, away from waterways or areas prone to flooding.
- Keep stockpile heights to a maximum of 10-15 feet to minimize compaction.
- Install silt fences or other sediment barriers around the base of the stockpile. Place the fences and barriers far enough away from the edge of the stockpile to leave space for water to pond and room for equipment to move.
- Establish temporary vegetative cover using seed and mulch, following GP2 requirements for 14-day stabilization.
- Clearly mark stockpile areas to prevent disturbance or contamination.

Replacement Guidelines

Calculating Replacement Depth

- The calculated average depth should be replaced across areas that will be revegetated.
- Excluding areas under buildings and structures, all other topsoil must remain on site, in accordance with GP2 requirements.
- If it is infeasible to preserve all topsoil on-site, document the reason it is considered to be infeasible and quantify the approximate volume of topsoil that is expected to be removed from the site.

Topsoil Redistribution

- Rip or scarify compacted subsoil before replacing topsoil to promote proper drainage and root penetration.
- Replace topsoil in lifts of 6-8 inches in a loose yet firm manner.
- The final topsoil depth in revegetated areas can be greater than the original average depth, but it must not be less.
- Avoid over-compaction of replaced topsoil; aim for a soil density similar to undisturbed topsoil in the area.
- Grade the final topsoil layer to blend with surrounding topography and ensure proper drainage.

- Immediately stabilize with seed and provide erosion control (straw mulch or an erosion control blanket).

Verification Procedure for Topsoil Replacement

To ensure proper topsoil replacement:

1. Conduct verification measurements at a frequency of one point per acre, with a minimum of 5 points per site.
2. Distribute verification points randomly across the site.
3. At each point, use a soil probe or small excavation to measure the depth of replaced topsoil.
4. If any point is more than 1 inch shallower than the required depth, conduct additional verification points in that area to determine the extent of the deficiency.
5. Address any areas with insufficient topsoil depth by adding and properly incorporating additional topsoil.
6. If excess topsoil is to be removed from the site, document the approximate volume removed from the site and where the soil material was transported.

Soil Quality Restoration

Soil Quality Restoration (SQR) is a practice that can enhance the performance of replaced topsoil and potentially reduce the size of downstream stormwater management practices. SQR reduces compaction, increases pore space, improves organic matter content, and re-establishes populations of soil dwelling organisms.

Key benefits of SQR include:

- Improved soil structure and infiltration
- Increased water-holding capacity, resulting in less runoff
- Enhanced nutrient cycling
- Reduced erosion
- Reduced pollutant transport
- Potential to reduce the size and cost of downstream stormwater practices

Basic implementation steps for SQR:

- Deep tillage of compacted soils
- Incorporation of organic matter (typically topsoil or compost)
- Establishment of appropriate vegetation

While not required, implementing SQR can improve overall site performance and potentially allow for reductions in the size of other stormwater management practices. **Consult the Iowa Stormwater Management Manual (ISWMM) for detailed guidance on SQR and with the local jurisdiction for specific guidance and potential incentives.**

If SQR methods are to be implemented, include relevant information within the Topsoil Management Plan.

Final Vegetative Cover

Select cool and warm season seed and sod species as desired, keeping in mind seeding windows and placement seasons designated in SUDAS. Erosion and sediment control practices will be needed throughout the project including the establishment phase.

https://www.iowasudas.org/manuals/specifications-manual/#division-9-site-work-and-landscaping

References

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