BUREAU OF WATERSHED MANAGEMENT PROGRAM GUIDANCE

RUNOFF MANAGEMENT POLICY AND MANAGEMENT TEAM
Storm Water Management Program

Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
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Construction Site Soil Loss and Sediment Discharge Calculation Guidance

September 2017
EGAD Number: 3800-2017-03

This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

APPROVED:

Pam Biersach, Director
Bureau of Watershed Management

Sept 28, 2017
Date

1. STATEMENT OF PROBLEM BEING ADDRESSED

This Department guidance establishes a procedure to verify compliance with the 5 tons/acre/year sediment performance standard for construction sites (ss. NR 151.11 and 151.23, Wis. Adm. Code).

2. BACKGROUND

The ss. NR 151.11 and NR 151.23, Wis. Adm. Code, sediment performance standard for construction sites is applicable to construction sites that will disturb 1 acre or more of land and require coverage under the Department's construction site storm water discharge general permit. Subch. III of ch. NR 216, Wis. Adm. Code, identifies the erosion and sediment control plan requirements for sites that must obtain permit coverage.

The sediment performance standard for construction sites has been in effect since October 1, 2002. Initially, this performance standard required the design of erosion and sediment control plans to remove 80% of the average annual sediment load discharged from construction sites. As of January 1, 2013, the sediment performance standard was revised to require the design of erosion and sediment control plans to discharge no more than 5 tons per acre per year of sediment from construction sites (from initial land disturbance until final stabilization is achieved).

Previously, compliance with the sediment performance standard was assumed for all permitted construction sites with erosion and sediment control plans designed in accordance with the subch. III of ch. NR 216, Wis. Adm. Code. The procedure identified in this document is the guidance for establishing compliance with the sediment performance standard. Although alternative approaches to establishing compliance may be proposed, following the procedure identified in this guidance will minimize delays during the plan review and permitting process.

Effective January 1, 2016, applications for permit coverage must include documentation demonstrating compliance with the sediment performance standard. The documentation should be developed in accordance with Section 4.7.

NOTE: Sections NR 151.11 and 151.23, Wis. Adm. Code, identifies several prescriptive practices and measures that must be implemented regardless of compliance with the sediment performance standard.

3. DISCUSSION

The procedure described in this guidance document will require soil loss and sediment discharge calculations in most cases to evaluate the effectiveness of erosion and sediment control plans and verify compliance with the sediment performance standard. However, the results of soil loss and sediment discharge calculations will not supersede minimum regulatory erosion and sediment control plan requirements or other construction site performance standards. In addition, there are specific site conditions where soil loss and sediment discharge calculations are not appropriate to establish compliance with the sediment performance standard (see prescriptive compliance procedure in Section 4.1 and Table 1).

A spreadsheet-based calculator has been developed in conjunction with this guidance. It is suggested that this tool, or equivalent method (e.g., RUSLE2), is used to conduct the soil loss and sediment discharge calculations (see Soil Loss and Sediment Discharge Calculation Tool description in Section 4.4.1).

4. GUIDANCE

The following procedure should be used to verify compliance with the sediment performance standard for construction sites (see Appendix A for typical examples, Appendix B for spreadsheet tool supporting documentation and Appendix C for transportation project examples):

4.1 Identify areas where prescriptive measures are required for both existing and proposed grades.

There are areas at construction sites where soil loss and sediment discharge calculations will not be used to establish compliance with the sediment performance standard. These areas are either relatively small and don't represent the site as a whole (e.g., soil stockpiles, landscape berms) or difficult to accurately evaluate using the calculations (e.g., concentrated flow, steep slopes). For these areas, a "prescriptive compliance" procedure will be used rather than soil loss and sediment discharge calculations.

4.1.1 Specific areas where the prescriptive compliance procedure should be used are as follows:

- Soil stockpiles.
- Utility plow routes and trench excavations.
- Utility trench backfills provided that soil stabilization practices are implemented immediately after backfill.

- Areas of channel flow including temporary or permanent ditches/swales.

  NOTE: Channel side slope areas above the design storm event flow depth should be considered slopes

- Small areas that are not considered representative of the site provided that these areas are less than 10% of the total land disturbance area and are no larger than 1 acre.

- Discrete land disturbance areas less than 1 acre (e.g., electric transmission towers, bore pits, etc.).

- Side slopes of storm water management practices including permanent storm water ponds that will be used as sediment basins during site construction.

- Slopes steeper than 20%.

4.1.2 The prescriptive compliance procedure is as follows:

- Identify and delineate all prescriptive compliance areas on the erosion and sediment control plan.

- Verify that the erosion and sediment control practices proposed for the prescriptive compliance areas are appropriate. If necessary, modify the erosion and sediment control plan.

- Identify soil stabilization criteria that will apply to the prescriptive compliance areas and include this criteria on the erosion and sediment control plan (see Table 1).

Table 1 – Prescriptive Compliance Area Soil Stabilization

Prescriptive Compliance Areas	Bare Soil	Slope & Channel Management	Periods of Inactivity	Final Grade
Soil stockpiles that will exist for more than 7 days **Utility trench backfills** **Temporary ditches/swales that will exist for more than 7 days** **Permanent ditches/swales** **Small areas – Less than 1 acre and less than 1% of site** **Discrete areas – Less than 1 acre** **Storm water practice side slopes** **Slopes steeper than 20%**	<u>Areas that Do Not Drain to Sediment Basins or Traps</u> Limit the duration of soil exposure to no more than 30 days. <u>Areas that Drain to Sediment Basins or Traps</u> Limit the duration of soil exposure to no more than 90 days. However, use the duration from the soil loss and sediment discharge calculations for the other areas of the site if less than 90 days.	<u>General</u> Design and implement approved soil stabilization practices per DNR technical standards. Refer to WisDOT Slope & Channel Matrices for appropriate slope and slope length conditions. <u>Slopes Steeper than 20%</u> Provide stable diversion of off-site runoff around the slope. Provide slope interruption devices in accordance with Manufactured Perimeter Control & Slope Interruption Products Technical Standard 1071 or equivalent methods to reduce uninterrupted slope length.	<u>Planned Inactivity</u> Stabilize immediately if area will be left inactive for more than 14 days. <u>Unplanned Inactivity</u> Stabilize area immediately if period of inactivity reaches 14 days.	<u>Permanent Features</u> Stabilize area immediately after reaching final grade. <u>Temporary Features</u> Stabilize area immediately after establishment of temporary feature or reaching specified temporary grade.

4.2 Identify the project activities and schedule for each phase of construction.

In order to calculate soil loss and sediment discharge during the life of the project, information on the project construction sequence and schedule is needed to complete the calculations:

- On typical projects, the first two activities will be bare soil and are often the phases with the most discharge. The first bare soil activity would cover demolition and/or clearing, grubbing and topsoil stripping when the existing contours still characterize the topography. Erosion and sediment control for this phase should be designed to address existing grading and drainage. The second bare soil activity represents major grading operations and the implementation of proposed grading and drainage along with associated modifications to erosion and sediment controls.

- Experienced construction inspection staff and/or contractors may be helpful in identifying reasonable sequence, schedule and phasing assumptions.

- Soil loss calculations are highly sensitive to time of year due to seasonal variations in rainfall intensity. In addition, calculated soil loss increases as the duration of soil exposure increases. With these factors in mind, a conservative approach is recommended when selecting the start dates and/or duration of construction for the soil loss and sediment discharge calculations. Using a conservative approach will minimize the potential need to re-run the calculations if the construction schedule changes.

- Compliance with the sediment performance standard is calculated based on the duration of soil exposure and the time necessary to establish vegetation after seeding during the growing season and/or construct impervious surfaces. For seeding in the growing season, a minimum of 60 days after seeding should be assumed for establishment of the vegetation. If seeding will occur in the non-growing season, a vegetation establishment date of May 15th of the following spring should be assumed.

- If the entire disturbed area is proposed to be impervious surfaces, the end date for the soil loss and sediment discharge calculations occurs when bare soil is no longer exposed. This is also the case for sites where all pervious/landscape areas are considered prescriptive compliance areas. In these cases, seeding with the 60 day vegetation establishment period would not be used in the calculations.

- Compacted subbase gravel is considered an impervious (stabilized) surface for the purpose of the soil loss and sediment discharge calculations.

- The soil loss and sediment discharge calculations are conducted for periods of 12 months or less and can occur in more than one calendar year depending on the start of construction and what time of year seeding occurs.

- For construction durations that exceed 12 months, compliance must be evaluated to confirm that 5 tons/acre/year standard is not exceeded in any consecutive 12 month period. For example, if an 18 month construction project discharges 2 tons/acre in the first 6 months, 3 tons/acre in the second 6 months, and 3 tons/acre in the final 6 months, then the project is not in compliance, as the final 12 months discharges 6 tons/acre/year (see Appendix A – Example 4).

- If the construction start date is unknown, a start date of May 16th can be assumed so that soil exposure will occur during the time of year that generates the highest soil loss. May 16th is considered the default start date. If the default start date is used, the construction schedule can be developed using duration (e.g., 6 months maximum soil exposure) rather than specific start and end dates.

4.3 Determine the location(s) where soil loss and sediment discharge calculations will be conducted for both existing and proposed grades.

Soil loss and sediment discharge calculations need to be conducted in the area of the site (other than prescriptive compliance areas) where the combination of soil loss and sediment control practice removal efficiency produces the highest sediment discharge rate. This area is considered the "representative worst case" condition.

NOTE: Soil loss and sediment discharge calculations are not conducted in areas of the site identified as prescriptive compliance areas in Step 1.

4.3.1 Factors that should be considered when determining the representative worst case condition include the following:

- Soil loss increases as the duration of soil exposure increases.

- Soil loss is highest in the summer months (May to September).

- Soil loss is highest from silty soil textures.

- Soil loss increases more with slope steepness than slope length.

- Erosion and sediment control practices have different efficiencies (see Tables 2 and 3).

4.3.2 Typically, several potential slopes, combinations of practices and soil exposure durations will need to be evaluated in order to determine the representative worst case condition. If the representative worst case condition meets the sediment performance standard, it can be assumed that all other locations meet the standard and the construction schedule for the site can be developed based on the representative worst case condition.

NOTE: Additional guidance and examples for transportation projects are found in Appendix C.

4.3.3 It is not necessary to use a single representative worst case condition to represent the entire site. For sites with highly variable conditions and/or practices, it may be more appropriate to determine the representative worst case condition for each drainage area. In this case, area-specific construction schedules can be developed as long as the sediment performance standard is met in each area. Essentially, each area will be considered a separate compliance area. The results from individual areas should not be added and/or averaged to establish compliance.

4.3.4 Modification of the erosion and sediment control plan to include construction phasing, targeted area soil stabilization and/or high efficiency sediment control practices may be needed when the initial representative worst case condition is not consistent with the anticipated construction schedule for the overall site. For example, on a 7-acre site with 2 acres at 6% slope and 5 acres at 2% slope, the representative worst case condition is likely to be located in the 6% slope area. However, if the erosion and sediment control plan requires the contractor to complete grading and stabilization activities in the 6% slope area in a shorter period of time, the 2% slope area may become the representative worst case condition.

NOTE: Consultation with the administering authority (DNR and/or jurisdictional municipality) is recommended to discuss the approach that will be used to determine the representative worst case condition for large sites (greater than 10 acres) or complex projects.

4.4 Conduct soil loss and sediment discharge calculations based on the construction schedule from Section 4.2 and locations from Section 4.3.

4.4.1 Soil Loss and Sediment Discharge Calculation Tool:

A computer-based tool has been developed to assist in the calculation of soil loss and sediment discharge from construction sites. The DNR Soil Loss and Sediment Discharge Calculation Tool is an Excel spreadsheet application that is available for download from the Department's storm water program website (see http://dnr.wi.gov/topic/stormwater/). Supporting documentation is provided in Appendix B.

NOTE: The spreadsheet tool will automatically calculate both soil loss and sediment discharge. The sediment discharge includes an adjustment to account for sediment deposition and underestimation of soil loss for short, flat slope conditions. This adjustment is based on the difference between RUSLE2 soil loss (with sediment deposition) and USLE soil loss (without sediment deposition) for a series of sample calculations of varying slopes, lengths and soil types.

4.4.2 Soil Loss Calculation Input:

Soil loss calculations are conducted using the principles of the Universal Soil Loss Equation (USLE) to estimate soil loss during the compliance period(s). Soil loss calculations are only intended for sheet and rill erosion. Gully or channel erosion is not considered in soil loss calculations or this procedure (i.e., slopes only). The input variables for soil loss calculations include climate, soil texture, topography and soil cover:

4.4.2.1 Climate (Rainfall Factor - R):

Monthly climate data should be used that accurately represents the variability of rainfall-runoff erosivity for the proposed site location (i.e., county). This value will be automatically entered in the spreadsheet tool based on the county selected.

4.4.2.2 Soil Texture (Soil Erodibility Factor - K):

Soil texture should be selected based on the dominant texture that will be exposed to rainfall and runoff considering all phases of construction. This value will be automatically entered in the spreadsheet tool based on the soil type selected. Silt loam generates the highest soil loss and can be used as the default worst case soil texture.

4.4.2.3 Topography (Slope Length – L, Slope % - S):

Slope steepness (percent slope) and slope length should represent average overland flow conditions prior to concentrated flow areas or channels. For sites with substantial grade changes, more than one slope condition should be used to represent the transition from existing to proposed grades. Manufactured slope interruption products can be used to reduce effective slope lengths. In the case of multiple rows of silt fence or other slope interruption products, the maximum allowable spacing between rows should be used as the slope length. It's important to avoid using slope lengths (overland flow paths) that exceed sediment control practice limitations (e.g., 100 feet for silt fence) or where concentrated flow would be expected to occur.

4.4.2.4 Soil Cover (Land Cover Factor – C):

Areas where land disturbing construction activities will occur should be considered bare soil until soil stabilization practices are installed. Estimated erosion control efficiencies for soil stabilization practices are identified in Table 2. Soil stabilization practices must be designed and implemented per DNR technical standards.

Table 2- Estimated Erosion Control Efficiency for Soil Stabilization Practices[1]

Practice	Erosion Control Efficiency	DNR Technical Standard
Directional Tracking or Tillage	10%	1067
Land Applied Additive[2]	50%	1050
Seeding[3]	60%	1059
Mulch or Erosion Matting[4]	80%	1058, 1052
Mulch or Erosion Matting with Seeding	90%	1058, 1052, 1059
Sod	99%	NA
Impervious Surface[5]	100%	NA

[1] Permanent and temporary soil stabilization measures must be re-applied as necessary to maintain or restore effectiveness.
[2] Additive application with or without seeding is considered a temporary soil stabilization measure.
[3] A minimum period of 60 days shall be assumed for establishment of dense vegetative cover after seeding during the growing season.
[4] Mulching and erosion matting with or without seeding are considered temporary soil stabilization measures.
[5] Rooftops, sidewalks, driveways, gravel or paved parking lots and streets.

4.4.3 Sediment Discharge Calculation Input

Sediment discharge is calculated by applying the sediment removal efficiency for the sediment control practice to the calculated uncontrolled soil discharge after sediment deposition is considered (see Appendix B for more detail). Estimated sediment removal efficiencies for sediment control practices are identified in Table 3. Sediment control practices must be designed and implemented per DNR technical standards.

Table 3 – Estimated Sediment Removal Efficiency for Sediment Control Practices[6]

Practice	Sediment Removal Efficiency	DNR Technical Standard
Sediment Basin	80%	1064
Sediment Trap	80%	1063
Silt Fence	40%	1056
Straw Bale Barrier	40%	1055
Manufactured Perimeter Control	40%	1071
Vegetative Buffer	40%	1054
Inlet Protection	30%	1060
Ditch Check Sediment Trap	30%	1063, 1062

[6] Practices such as dewatering, tracking pads and dust control are not included in Table 3 or sediment discharge calculations because they are not directly associated with sediment removal during runoff events.

4.5 If necessary, modify the erosion and sediment control plan and re-calculate.

If the calculated sediment discharge from the site exceeds 5 tons/acre/year, the duration of soil exposure, soil stabilization practices and/or sediment control practices should be adjusted and the compliance verification procedure repeated until the sediment performance standard is met.

4.6 Update the erosion and sediment control plan.

The duration of soil disturbance and timing of soil stabilization have a significant impact on soil loss and sediment discharge from construction sites. As a result, the prescriptive compliance criteria and soil loss and sediment discharge calculations will have a direct influence on construction schedules. Construction schedules identified on erosion and sediment control plans must be consistent with prescriptive compliance area criteria and dates or durations used in the soil loss and sediment discharge calculations.

4.6.1 The following information must be included on erosion and sediment control drawings:

- Delineation of prescriptive compliance areas.
- Prescriptive compliance area soil stabilization criteria (Table 1 or equivalent).
- Construction schedule based on the input variables used in the soil loss and sediment discharge calculations (spreadsheet tool screenshots or equivalent).
- Identification of areas where area-specific restrictions apply, such as an area of 6% slope assumed to be stabilized with seed and erosion control mat within 2 weeks of disturbance so that a 2% slope area will control the sediment discharge.

4.7 Document the results of the soil loss and sediment discharge calculations.

The results of soil loss and sediment discharge calculations must be documented in a summary report and included with permit applications submitted to the administering authorities:

- The summary report should identify the input variables used in the calculations (e.g., a screenshot of the spreadsheet tool) and the locations where the input variables were measured or determined (e.g., a map that clearly identifies the slope and soil conditions and sediment control practices).

- If possible, all summary report elements can be included on the erosion and sediment control plan sheets and submitted in that format.

- For complex projects, the summary report should include all areas that were evaluated to establish the representative worst case condition and a narrative describing the approach that was used.

5. IMPLEMENTATION & RE-VERIFICATION

It's important to continue to evaluate compliance with the sediment performance standard during construction. Weather conditions and other factors can alter construction projects such that the soil loss and sediment discharge calculations and construction schedule no longer represent the actual site conditions. Deviations from the assumed conditions have the potential to increase the calculated sediment discharge above the 5 tons/acre/year standard and re-verification of compliance may be necessary.

5.1 Evaluate compliance during weekly erosion control inspections.

A review of site conditions should be conducted on a weekly basis by the erosion control inspector designated by the permittee. The inspector should compare actual site conditions with the assumed conditions (input variables) used in the soil loss and sediment discharge calculations to verify that the initial assumptions are still valid. The inspector should also note any deviations from the assumed conditions that have occurred or are likely to occur in the inspection reports.

5.2 Determine if re-verification of compliance is possible.

If deviations are noted in inspection reports, the permittee (or representative) should determine if re-verification is possible. For re-verification to be possible, the initial calculated sediment discharge must be less than 5 tons/acre/year or it must be possible to revise the erosion and sediment control plan to compensate for the deviations (e.g., implement temporary soil stabilization, upgrade to high efficiency sediment control practices). If re-verification is not possible, the permittee should contact the administering authorities (e.g., DNR, municipality) to discuss the appropriate course of action.

5.3 Conduct re-verification and revise the erosion and sediment control plan.

If re-verification is possible, modify the input variables to represent the actual site conditions and re-calculate the sediment discharge to document compliance (see Appendix A for a re-calculation example). The erosion and sediment erosion control plan should be revised to reflect changes to the construction schedule or practices.

5.4 Submit the re-verification and revised plans to the administering authority.

The permittee should submit the revised documents as required by the administering authority. For sites where the Department conducted a plan review during the permitting process, s. NR 216.50(2), Wis. Adm. Code, requires the permittee to notify the Department at least five working days prior to making erosion and sediment control plan modifications.

6. EXAMPLES

Examples of the compliance verification procedure are provided in Appendix A. In addition, soil loss and sediment discharge guidance webinar recordings with additional examples are available for download from the Department's storm water website (see http://dnr.wi.gov/topic/Stormwater/construction/practices.html).

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On behalf of the Storm Water Liaison Team

9/21/17
Date

APPROVED:

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9/21/17
Date

Runoff Management Policy Management Team approved on September 7, 2017.
Division Administrator approved on September 20, 2017.

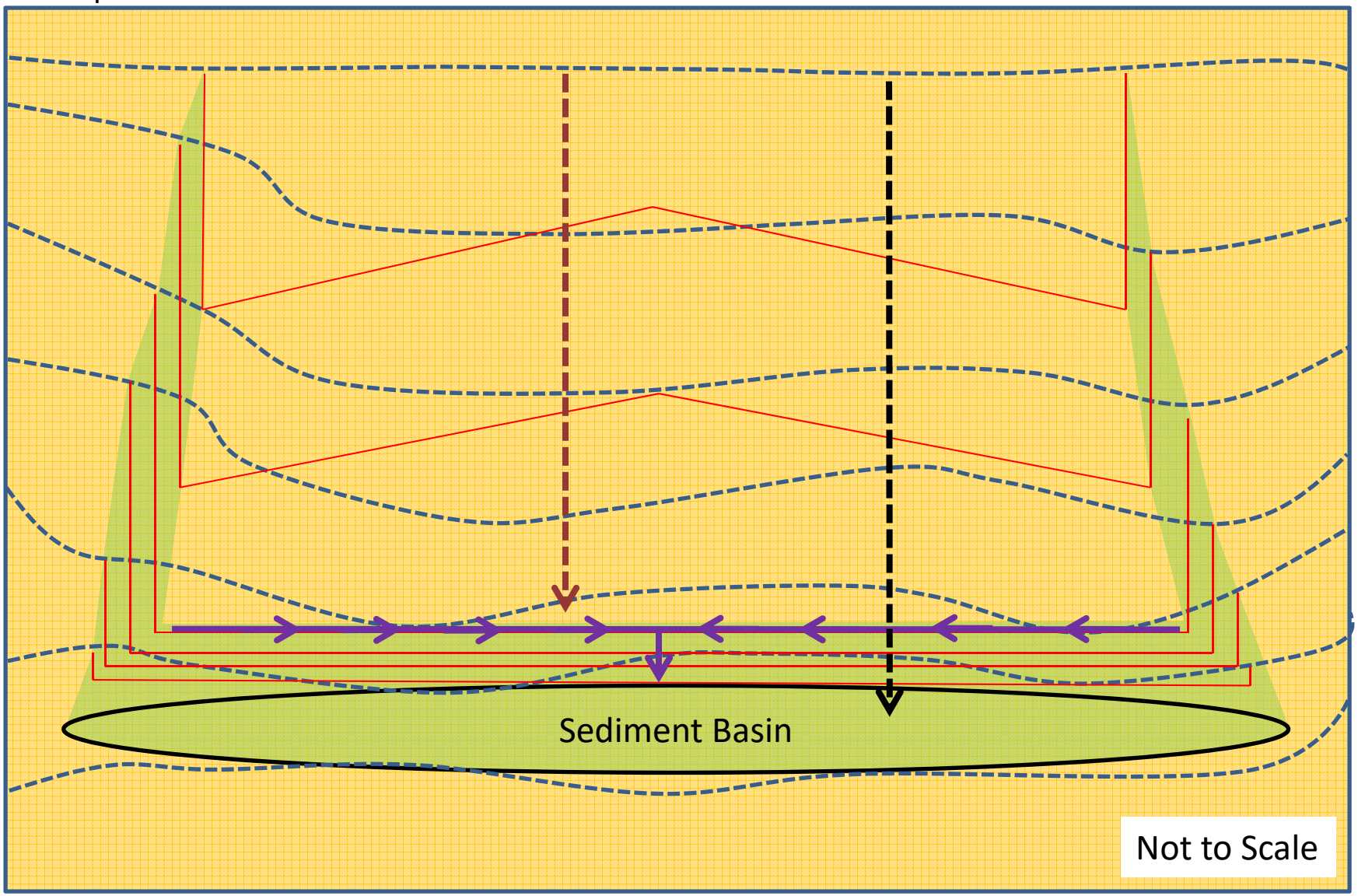
Appendix A

Examples

Example 1 – One Soil Type

Guidance Section	Description	Input/Output	
		Trial 1	Trial 2
4.1	Identify areas where the spreadsheet tool will not be used (prescriptive compliance areas)	Sediment basin, runoff diversion swales and slopes steeper than 20%	Sediment basin, runoff diversion swales and slopes steeper than 20%
4.2	Identify activities and durations	Initial Grade: 5/1/2017 to 6/1/2017 Final Grade: 6/1/2017 to 9/1/2017 Seed & Mulch: 9/1/2017 End: 11/1/2017	Initial Grade: 5/1/2017 to 6/1/2017 Final Grade: 6/1/2017 to 8/1/2017 Seed & Mulch: 8/1/2017 End: 10/1/2017
4.3	Identify representative worst case slope conditions	Initial Grade: 300 feet at 7% Final Grade: 250 feet at 4%	Initial Grade: 300 feet at 7% Final Grade: 250 feet at 4%
4.4	Enter construction activities, site conditions and sediment control practices in spreadsheet tool to calculate sediment discharge	County: Waukesha Activities: From Section 4.2 Soil Texture: Silt loam Slope Conditions: From Section 4.3 Sediment Control: Sediment basin	County: Waukesha Activities: From Section 4.2 Soil Texture: Silt loam Slope Conditions: From Section 4.3 Sediment Control: Sediment basin
4.5	Modify the input variables and re-calculate if sediment discharge is greater than 5.0 tons/acre	Modification and re-calculation is required (go to Trial 2)	Modification and re-calculation is not required (go to Section 4.6)
4.6	Update the erosion control plan	Prescriptive Compliance Areas: Show areas on plan and identify stabilization schedule (Table 1) Calculation Areas: Identify construction schedule based on spreadsheet tool input for Trial 2	
4.7	Document results	Develop summary report	

Example 1 – Sediment Basin



Runoff Diversions (Channel Flow)

Existing Contour

Final Contour

Silt Loam Soils

Prescriptive Compliance Area

Representative Worst Case Slope – Initial Grading

Representative Worst Case Slope – After Fill Slope Established

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 1

Project: Trial 1 - Sediment Basin

Date: 03/28/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/17	06/01/17	11.2%	130	Silt Loam	0.43	7.0%	300	1.43	1.00	9.0	0.936	Sediment Basin	1.7
Bare Ground	06/01/17	09/01/17	59.9%	130	Silt Loam	0.43	4.0%	250	0.58	1.00	19.3	1.046	Sediment Basin	4.0
Seed with Mulch or Er	09/01/17	11/01/17	16.6%	130	Silt Loam	0.43	4.0%	250	0.58	0.10	0.5	1.046	Sediment Basin	0.1
End	11/01/17	-----	-----	-----	-------	-----	4.0%	250	0.58	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	4.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	28.9		TOTAL	5.8
													% Reduction Required	14%

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 1

Project: Trial 2 - Sediment Basin

Date: 03/28/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/17	06/01/17	11.2%	130	Silt Loam	0.43	7.0%	300	1.43	1.00	9.0	0.936	Sediment Basin	1.7
Bare Ground	06/01/17	08/01/17	43.1%	130	Silt Loam	0.43	4.0%	250	0.58	1.00	13.9	1.046	Sediment Basin	2.9
Seed with Mulch or Er	08/01/17	10/01/17	27.6%	130	Silt Loam	0.43	4.0%	250	0.58	0.10	0.9	1.046	Sediment Basin	0.2
End	10/01/17	-----	-----	-----	-------	-----	4.0%	250	0.58	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	4.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	23.8		TOTAL	4.8
													% Reduction Required	NONE

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

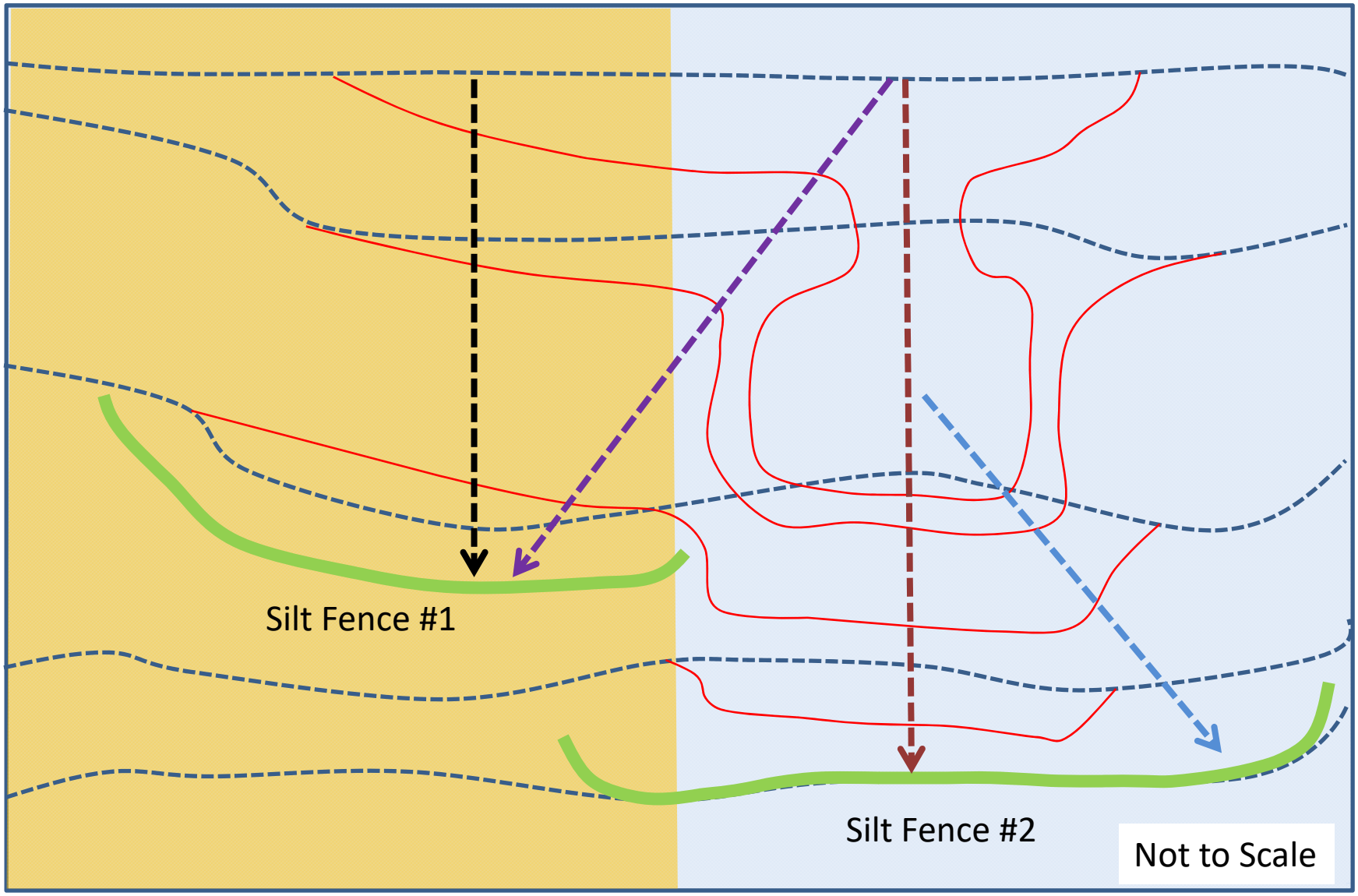
4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Example 2 – Two Soil Types

Guidance Section	Description	Input/Output	
		Silt Fence Area #1	Silt Fence Area #2
4.1	Identify areas where the spreadsheet tool will not be used (prescriptive compliance areas)	No prescriptive compliance areas	No prescriptive compliance areas
4.2	Identify activities and durations	Initial Grade: 5/1/2017 to 6/1/2017 Final Grade: 6/1/2017 to 8/10/2017 Seed & Mulch: 8/10/2017 End: 10/10/2017	Initial Grade: 5/1/2017 to 6/1/2017 Final Grade: 6/1/2017 to 7/10/2017 Seed & Mulch: 7/10/2017 End: 9/10/2017
4.3	Identify representative worst case slope conditions	Initial Grade: 40 feet at 3% Final Grade: 60 feet at 3%	Initial Grade: 60 feet at 3% Final Grade: 50 feet at 7%
4.4	Enter construction activities, site conditions and sediment control practices in spreadsheet tool to calculate sediment discharge	County: Waukesha Activities: From Section 4.2 Soil Texture: Silt loam Slope Conditions: From Section 4.3 Sediment Control: Silt fence	County: Waukesha Activities: From Section 4.2 Soil Texture: Clay Slope Conditions: From Section 4.3 Sediment Control: Silt fence
4.5	Modify the input variables and re-calculate if sediment discharge is greater than 5.0 tons/acre	Modification and re-calculation is not required	Modification and re-calculation is not required
4.6	Update the erosion control plan	Identify construction schedule based on spreadsheet tool input for Silt Area #2 (shortest bare soil duration) OR identify separate construction schedules for each area based on the spreadsheet tool input for each area	
4.7	Document results	Develop summary report	

Example 2



Silt Fence

Existing Contour

Final Contour

Silt Loam Soils

Clay Soils

Representative Worst Case Slope - Silt Fence #1 Initial

Representative Worst Case Slope - Silt Fence #1 Final

Representative Worst Case Slope - Silt Fence #2 Initial

Representative Worst Case Slope - Silt Fence #2 Final

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 2

Project: Silt Fence #1

Date: 03/29/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/17	06/01/17	11.2%	130	Silt Loam	0.43	3.0%	40	0.21	1.00	1.3	0.940	Silt Fence	0.7
Bare Ground	06/01/17	08/10/17	48.9%	130	Silt Loam	0.43	3.0%	60	0.24	1.00	6.6	0.971	Silt Fence	3.8
Seed with Mulch or Er	08/10/17	10/10/17	23.7%	130	Silt Loam	0.43	3.0%	60	0.24	0.10	0.3	0.971	Silt Fence	0.2
End	10/10/17	-----	-----	-----	-------	-----	3.0%	60	0.24	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	3.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	8.2		**TOTAL**	4.8
													% Reduction Required	NONE

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 2

Project: Silt Fence #2

Date: 03/29/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/17	06/01/17	11.2%	130	Clay	0.32	3.0%	60	0.24	1.00	1.1	1.016	Silt Fence	0.7
Bare Ground	06/01/17	07/10/17	27.7%	130	Clay	0.32	7.0%	50	0.58	1.00	6.7	0.882	Silt Fence	3.6
Seed with Mulch or Er	07/10/17	09/10/17	36.7%	130	Clay	0.32	7.0%	50	0.58	0.10	0.9	0.882	Silt Fence	0.5
End	09/10/17	-----	-----	-----	-------	-----	7.0%	50	0.58	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	7.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	8.8		TOTAL	4.7
													% Reduction Required	NONE

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

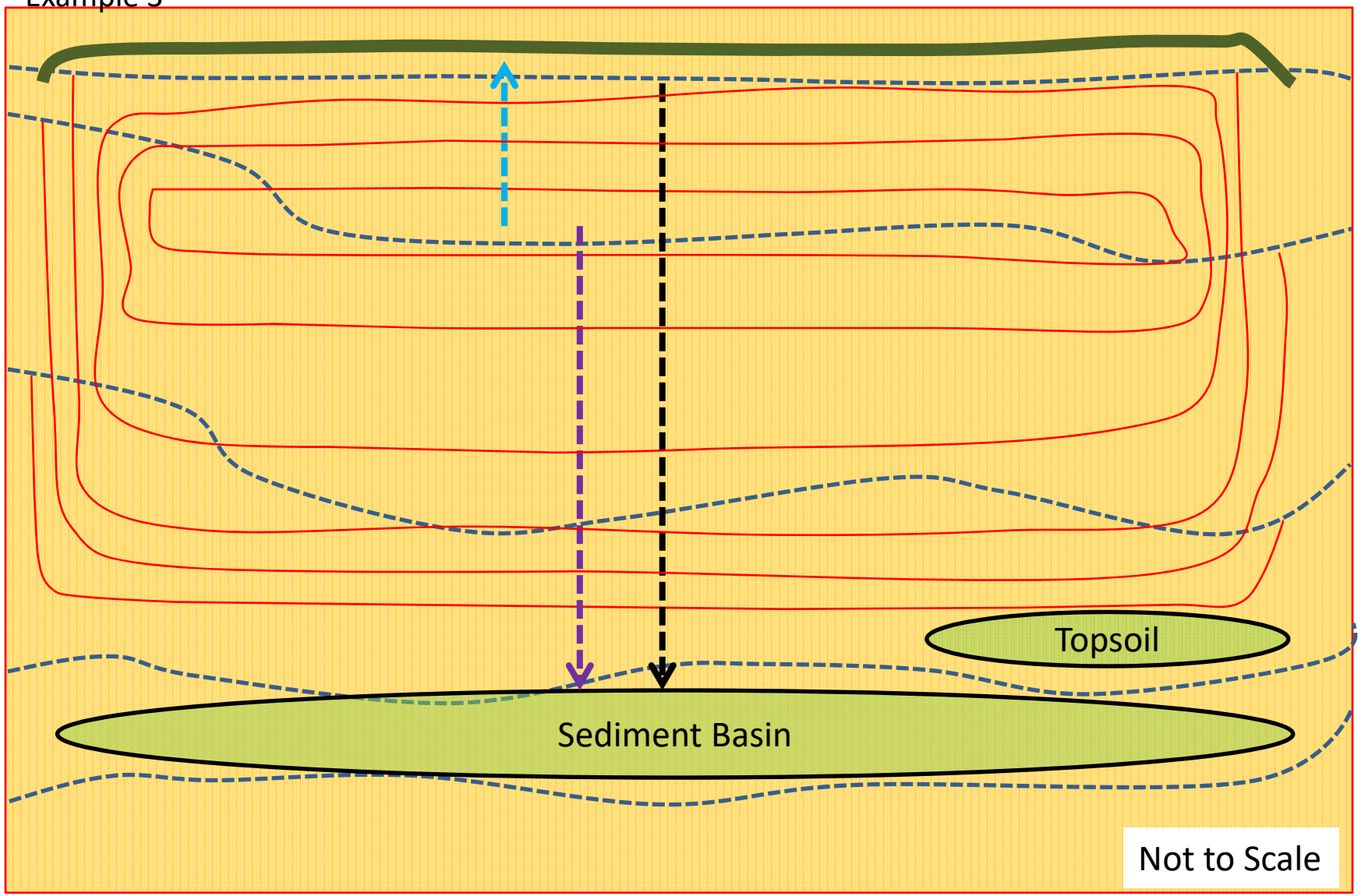
4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Example 3 – Two Sediment Control Practices & Seeding After Growing Season

Guidance Section	Description	Input/Output	
		Silt Fence Area	Sediment Basin Area
4.1	Identify areas where the spreadsheet tool will not be used (prescriptive compliance areas)	No prescriptive compliance areas	Sediment basin and topsoil stockpile
4.2	Identify activities and durations	Initial Grade: 5/16/2017 to 6/15/2017 Intermediate Grade: 6/15/2017 to 7/15/2017 Final Grade: 7/15/2017 to 10/15/2017 Seed & Mulch: 10/15/2017 End: 05/15/2018	Initial Grade: 5/16/2017 to 6/15/2017 Final Grade: 6/15/2017 to 10/15/2017 Seed & Mulch: 10/15/2017 End: 05/15/2018
4.3	Identify representative worst case slope conditions	Initial Grade: 50 feet at 2% Intermediate Grade: 50 feet at 3% Final Grade: 50 feet at 4.5%	Initial Grade: 200 feet at 2% Final Grade: 150 feet at 7%
4.4	Enter construction activities, site conditions and sediment control practices in spreadsheet tool to calculate sediment discharge	County: Waukesha Activities: From Section 4.2 Soil Texture: Silty clay Slope Conditions: From Section 4.3 Sediment Control: Silt fence	County: Waukesha Activities: From Section 4.2 Soil Texture: Silty clay Slope Conditions: From Section 4.3 Sediment Control: Sediment basin
4.5	Modify the input variables and re-calculate if sediment discharge is greater than 5.0 tons/acre	Modification and re-calculation is not required	Modification and re-calculation is not required
4.6	Update the erosion control plan	Prescriptive Compliance Areas: Show areas on plan and identify stabilization schedule (Table 1) Calculation Areas: Identify construction schedule based on spreadsheet tool input for the Silt Fence Area or Sediment Basin Area (bare soil duration is the same for both areas)	
4.7	Document results	Develop summary report	

Example 3



Silt Fence
Existing Contour
Final Contour
Silty Clay Soils
Prescriptive Compliance Area
Representative Worst Case Slope – Initial Grading
Representative Worst Case Slope – Sediment Basin Final
Representative Worst Case Slope – Silt Fence

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 3

Project: Silt Fence

Date: 03/29/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/16/17	06/15/17	14.0%	130	Silty Clay	0.28	2.0%	50	0.16	1.00	0.8	1.244	Silt Fence	0.6
Bare Ground	06/15/17	07/15/17	24.0%	130	Silty Clay	0.28	3.0%	50	0.22	1.00	2.0	1.034	Silt Fence	1.2
Bare Ground	07/15/17	10/15/17	41.5%	130	Silty Clay	0.28	4.5%	50	0.33	1.00	5.1	0.966	Silt Fence	2.9
Seed with Mulch or E r	10/15/17	05/15/18	19.8%	130	Silty Clay	0.28	4.5%	50	0.33	0.10	0.2	0.966	Silt Fence	0.1
End	05/15/18	-----	-----	-----	-------	-----	4.5%	0	-----	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	------	-----	0.000		0.0
										TOTAL	**8.1**		**TOTAL**	**4.9**
													% Reduction Required	**NONE**

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 3

Project: Sediment Basin

Date: 03/29/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/16/17	06/15/17	14.0%	130	Silty Clay	0.28	2.0%	200	0.25	1.00	1.3	1.060	Sediment Basin	0.3
Bare Ground	06/15/17	10/15/17	65.5%	130	Silty Clay	0.28	7.0%	150	1.01	1.00	24.1	0.758	Sediment Basin	3.7
Seed with Mulch or Er	10/15/17	05/15/18	19.8%	130	Silty Clay	0.28	7.0%	150	1.01	0.10	0.7	0.758	Sediment Basin	0.1
End	05/15/18	-----	-----	-----	-------	-----	7.0%	150	1.01	------	-----	0.000	Sediment Basin	0.0
		-----	-----	-----	-------	-----		0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----		0	-----	-----	-----	0.000		0.0
										TOTAL	**26.1**		**TOTAL**	**4.0**
													% Reduction Required	**NONE**

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

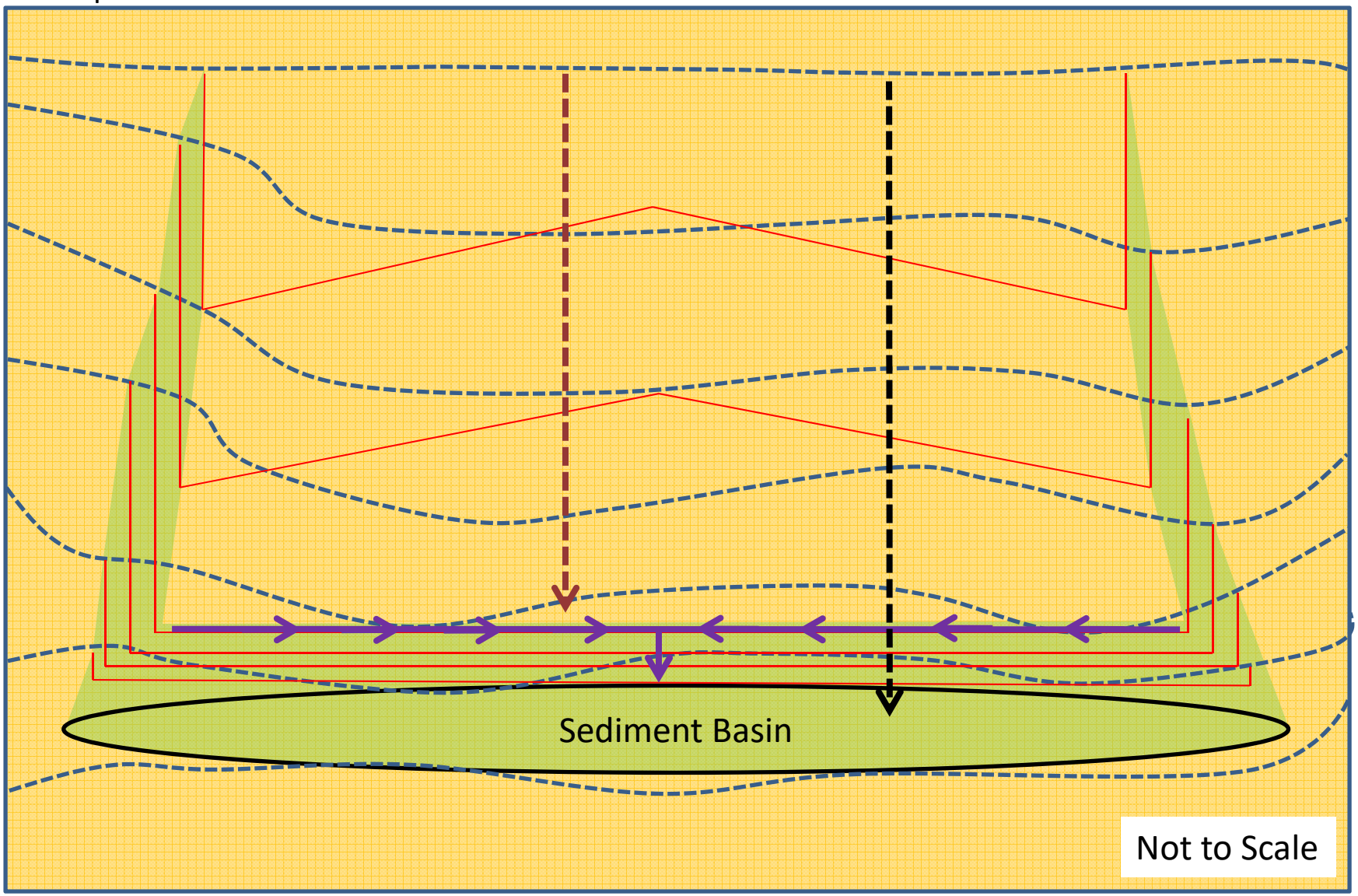
4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Example 4 – Construction > 12 Months

Guidance Section	Description	Input/Output	
		Year 1	Year 2
4.1	Identify areas where the spreadsheet tool will not be used (prescriptive compliance areas)	Sediment basin, runoff diversion swales and slopes steeper than 20%	Sediment basin, runoff diversion swales and slopes steeper than 20%
4.2	Identify activities and durations	Initial grade: 5/1/2017 to 7/1/2017 Final grade: 7/1/2017 to 4/30/2018 End: 04/30/2018 (Year 1)	12 Months Prior Year 2 End: 11/1/2017 Seed & Mulch: 08/30/2018 End: 10/30/2018 (Year 2)
4.3	Identify representative worst case slope conditions	Initial Grade: 300 feet at 4% Final Grade: 250 feet at 2%	Final Grade: 250 feet at 2%
4.4	Enter construction activities, site conditions and sediment control practices in spreadsheet tool to calculate sediment discharge	County: Waukesha Activities: From Section 4.2 Soil Texture: Silt loam Slope Conditions: From Section 4.3 Sediment Control: Sediment basin	County: Waukesha Activities: From Section 4.2 Soil Texture: Silt loam Slope Conditions: From Section 4.3 Sediment Control: Sediment basin
4.5	Modify the input variables and re-calculate if sediment discharge is greater than 5.0 tons/acre	Modification and re-calculation is not required	Modification and re-calculation is not required
4.6	Update the erosion control plan	Prescriptive Compliance Areas: Show areas on plan and identify stabilization schedule (Table 1) Calculation Areas: Identify construction schedule based on spreadsheet tool input for Year 1 and Year 2	
4.7	Document results	Develop summary report	

Example 4



Runoff Diversions (Channel Flow)

Existing Contour

Final Contour

Silt Loam Soils

Prescriptive Compliance Area

Representative Worst Case Slope – Initial Grading

Representative Worst Case Slope – After Fill Slope Established

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Example 4

Project: Sediment Basin

Date: 03/29/17

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/17	07/01/17	30.6%	130	Silt Loam	0.43	4.0%	300	0.62	1.00	10.6	1.062	Sediment Basin	2.3
Bare Ground	07/01/17	04/30/18	68.9%	130	Silt Loam	0.43	2.0%	250	0.26	1.00	10.2	1.130	Sediment Basin	2.3
End	04/30/18	-----	-----	-----	-------	-----	2.0%	250	0.26	------	-----	0.000	Sediment Basin	0.0
		-----	-----	-----	-------	-----	2.0%	250	0.26	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	2.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	20.8		TOTAL	4.6
													% Reduction Required	NONE

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 2

Developer: Example 4

Project: Sediment Basin

Date: 03/29/2017

County: Waukesha

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	11/01/17	08/30/18	82.0%	130	Silt Loam	0.43	2.0%	250	0.26	1.00	12.1	1.130	Sediment Basin	2.7
Seed with Mulch or Er	08/30/18	10/30/18	17.6%	130	Silt Loam	0.43	2.0%	250	0.26	0.10	0.3	1.130	Sediment Basin	0.1
End	10/30/18	-----	-----	-----	-------	-----	2.0%	250	0.26	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	2.0%	250	0.26	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	2.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	12.4		TOTAL	2.8
													% Reduction Required	NONE

Notes:

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For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/1-5/15	and	8/7-8/29	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Re-Verification Example

1. Initial soil loss and sediment discharge calculations for a construction project are conducted assuming construction will start in the fall (see Spreadsheet 1).
2. During a pre-construction meeting, it's noted that construction has been delayed to the following spring and the change in construction start date could impact the soil loss and sediment discharge calculations.
3. The soil loss and sediment discharge calculations are re-run with the revised construction start date and it's determined that the project would no longer meet the 5 tons/acre standard (see Spreadsheet 2).
4. Reducing the duration of bare soil is considered. However, it's decided to revise the erosion and sediment control plan to include a sediment control practice with a higher removal efficiency than silt fence or inlet protection (sediment basin).
5. The soil loss and sediment discharge calculations are re-run after replacing silt fence and inlet protection with sediment basin (see Spreadsheet 3).
6. Compliance with the 5 tons/acre standard is re-verified and DNR is notified of the changes and/or the changes are submitted in accordance with the requirements of the local municipality.

Spreadsheet 1

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (04-04-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Anonymous LLC

Project: Anydevelopment 1

Date: 08/15/17

County: Brown

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	09/01/17	10/01/17	10.7%	100	Silt Loam	0.43	8.0%	100	1.00	1.00	4.6	0.801	Silt Fence	2.2
Bare Ground	10/01/17	12/01/17	7.9%	100	Silt Loam	0.43	6.0%	80	0.60	1.00	2.0	0.867	Silt Fence	1.1
Seed with Mulch or Er	12/01/17	05/15/18	14.9%	100	Silt Loam	0.43	6.0%	80	0.60	0.10	0.4	0.867	Inlet Protection	0.2
End	05/15/18	-----	-----	-----	-------	-----	6.0%	80	0.60	------	-----	0.000	Inlet Protection	0.0
		-----	-----	-----	-------	-----	6.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	7.0		TOTAL	3.5
													% Reduction Required	NONE

Notes:

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For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/15-6/1	and	8/1-8/21	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Spreadsheet 2

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (04-04-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Anonymous LLC

Project: Anydevelopment 1

Date: 08/15/17

County: Brown

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/18	06/01/18	11.0%	100	Silt Loam	0.43	8.0%	100	1.00	1.00	4.7	0.801	Silt Fence	2.3
Bare Ground	06/01/18	08/01/18	43.0%	100	Silt Loam	0.43	6.0%	80	0.60	1.00	11.1	0.867	Silt Fence	5.8
Seed with Mulch or Er	08/01/18	10/01/18	28.0%	100	Silt Loam	0.43	6.0%	80	0.60	0.10	0.7	0.867	Inlet Protection	0.4
End	10/01/18	-----	-----	-----	--------	-----	6.0%	80	0.60	------	-----	0.000	Inlet Protection	0.0
		-----	-----	-----	--------	-----	6.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	--------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	16.6		TOTAL	8.5
													% Reduction Required	41%

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/15-6/1 Thaw-6/30	and	8/1-8/21	Turf, introduced grasses and legumes Native Grasses, forbs, and legumes

Designed By:	
Date	

Spreadsheet 3

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (04-04-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: Anonymous LLC

Project: Anydevelopment 1

Date: 08/15/17

County: Brown

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/18	06/01/18	11.0%	100	Silt Loam	0.43	8.0%	100	1.00	1.00	4.7	0.801	Silt Fence	2.3
Bare Ground	06/01/18	08/01/18	43.0%	100	Silt Loam	0.43	6.0%	80	0.60	1.00	11.1	0.867	Sediment Basin	1.9
Seed with Mulch or Er	08/01/18	10/01/18	28.0%	100	Silt Loam	0.43	6.0%	80	0.60	0.10	0.7	0.867	Sediment Basin	0.1
End	10/01/18	-----	-----	-----	-------	-----	6.0%	80	0.60	------	-----	0.000	Sediment Basin	0.0
		-----	-----	-----	-------	-----	6.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	16.6		TOTAL	4.3
													% Reduction Required	NONE

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/15-6/1 Thaw-6/30	and	8/1-8/21	Turf, introduced grasses and legumes Native Grasses, forbs, and legumes

Designed By:	
Date	

Appendix B

Spreadsheet Tool Supporting Documentation

Soil Loss & Sediment Discharge Calculation Tool for Construction Sites in Wisconsin

HELP PAGE

Revised 06-29-2017

The *Soil Loss & Sediment Discharge Tool for Construction Sites in Wisconsin* worksheet was developed to estimate soil loss from sheet and rill erosion and the effect of sediment control practices on sediment discharge. It does not predict soil loss and associated sediment discharge resulting from channel erosion. The worksheet uses the following variables. They are entered by the user or automatically calculated. Included below are the descriptions of the variables used.

Column #	Variable	Type
1	Activity	entered by user
2	Begin Date	entered by user
3	End Date	automatically calculated
4	Period % **R**	automatically calculated
5	Annual **R** Factor	automatically calculated
6	Sub Soil Texture	entered by user
7	Soil Erodibility **K** Factor	automatically calculated
8	Slope % **S**	entered by user
9	Slope Length **L**	entered by user
10	**LS** Factor	automatically calculated
11	Land Cover **C** Factor	automatically calculated
12	Soil Loss	automatically calculated
13	SDF	automatically calculated
14	Sediment Control Practice	entered by user
15	Sediment Discharge	automatically calculated

Variable Descriptions:

1 ***Activity*** **(pull-down menu)**

The activity relates to the type of disturbance or stabilization that is occurring on the ground. The activity inputs may be selected using the drop-down menu.

Activity Inputs	Description
Bare ground	Usually the initial disturbance occurs when the ground is left bare due to stripping vegetation, grading, or other actions that leave the soil devoid of cover.
Directional tracking or tillage	The process of creating ridges and furrows on the contour to slow sheet runoff on unvegetated slopes per DNR Technical Standard 1067.
End	Final stabilization or end of construction year. Final stabilization for the purposes of this calculation may include the installation of a hard surface that covers the disturbed ground completely such as asphalt paving, stone base coarse, or geotextile.
Mulch or erosion mat	The application of a minimum of 1.5 tons/acre straw or other comparable anchored mulch meeting DNR Technical Standard 1058 or erosion control matting meeting DNR Technical Standard 1052.
Seed with mulch or erosion mat	The application of a minimum of 1.5 tons/acre anchored straw, other comparable mulch, or installation of erosion control mat. Enter this activity if the seeding and mulching are done at the same time. It is not necessary to also enter seeding if this input is used. Requires 60 days of cover establishment during the growing season. Mulching is recommended on all disturbed areas that are to be seeded to control erosion and establish cover. See also DNR Technical Standards 1058 and 1052.
Seeding	The application of permanent or temporary seeding without the use of mulch. Not to be used with seed and mulch. Requires 60 days of cover establishment during the growing season. See also DNR Technical Standard 1059.
Sod	The installation of sod for cover establishment.
Land Applied Additive	The land application of products containing water soluable anionic polyacrylamide or other additives as temporary soil binding agents to reduce erosion per DNR Technical Standard 1050.

Date **(entered by user)**

The date the planned land disturbing activity begins, e.g. 5/15/2014. The activity is assumed to continue until the next activity is entered. A 60 day cover establishment period, during the growing season, is recommended for the establishment of seeding.

Notes:

1 If construction schedules are unknown, a start date of May 16th of the following year may be assumed.

2 Temporary stabilization activities are required by NR 151.11(8)(d) when land disturbing construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Establishment of temporary vegetation in late summer/early fall is a common means of compliance with this provision during winter shut-down. If temporary seeding is completed within the recommended dates, then 'Sod' can be used to represent the activity between the 60 day establishment period and beginning of the next land disturbing activity.

3 Recommended temporary seeding dates based on USDA Wisconsin Agronomy Technical Note 6 are:

- Oats - 4/1 to 9/1
- Annual ryegrass - 4/1 to 9/1
- Forage sorghum –5/15 to 7/15
- Sorghum - Sudangrass hybrid –5/15 to 7/15
- Sudangrass – 5/15 to 7/15
- Winter wheat - 8/1 to 10/1
- Winter cereal rye - 8/1 to 10/15

4 It is recommended that the temporary vegetation be incorporated into the soil prior to the permanent seeding application to minimize competition

5 Recommended permanent seeding dates are included on the spreadsheet page under the table for reference. These dates are based on which planting zone the project county is located in and dates in USDA Wisconsin Agronomy Technical Notes 5 and 6.

6 When the seeding dates are later than the noted recommended dates, the end of the cover establishment should be extended to May 15 of the following spring to allow for growth.

7 For periods of construction that exceed 12 months, compliance must be determined to ensure that 5 tons/acre/year is not exceeded in any given 12 month period.

2 ***Begin Date (entered by user)***

The date the activity is expected to begin.

3 ***End Date (automatically calculated based on begin date for next activity)***

4 ***Period % R*** **(automatically calculated)**

The percentage of the annual **R** factor calculated for the period from one activity to the next.

5 ***Annual R factor*** **(automatically calculated)**

The rainfall factor, **R**, is the number of erosion-index units in a normal year's rain. The erosion index is a measure of the erosive force of a specific rainfall. For example, in Dane County the rainfall factor is 150**.**

6 ***Sub Soil Texture*** **(entered by user)**

The soil texture at the exposed surface for the predominant soil type in the area of the land disturbing activity, e.g. clay. This information is available from site-specific soil borings or pits or in published county soil surveys. For areas with significant cut or fill, the soil type exposed to erosion may not be the layer immediately below the topsoil. This must be entered for line 1 in Year 1 and line 1 in Year 2 (if used). Subsequent lines default to the soil type above them.

7 ***Soil Erodibility K Factor*** **(automatically calculated)**

A factor used to express the erosiveness of the soil layer below the topsoil for a specific soil type.

8 ***Slope % S*** **(entered by user)**

The percent slope for the representative portion of the disturbed area, regarding overland flow and not channel flow, e.g. .05 or 5 (depending on version of Excel). Where small areas of steep slopes are present on the site, consider utilizing erosion control mats or other measures such that these areas do not represent the 'worst case' erosion condition.

9 ***Slope Length L*** **(entered by user)**

Slope length (in feet) measured along the overland flow path from the top to the bottom of the slope of the representative disturbed area. Channel lengths are not included in the slope length. Slope length should be limited to lengths within which sheet and rill erosion is expected to occur for the slope conditions anticipated on the site.

10 ***LS Factor*** **(automatically calculated)**

The spreadsheet calculates LS factor value based on the ratio between the percent slope and length of slope of the representative disturbed area.

11 ***Land Cover C Factor*** **(automatically calculated)**

The cover and management factor is the ratio of soil loss from an area with a specified cover and management practice to that from a unit plot of bare land. The input for the*Activity* corresponds to this factor.

12 ***Soil Loss - A*** **(automatically calculated)**

The predicted value of soil loss (tons per acre) that corresponds to the time period of each activity entered. This value is calculated using the equation: A=(%R)x(R)x(K)x(LS)x(C).

13 ***SDF-Sediment Deposition Factor*** **(automatically calculated)**

The spreadsheet calculates a correction factor (SDF) that varies based on soil type, slope, and slope length. The value approximates the difference between the USLE soil loss and the sediment discharge from RUSLE version 2.2. A 1 year bare soil time frame in Dane County was assumed to develop the values the SDF is based upon. Slopes from 0.2% to 15% and Slope Lengths from 10 feet to 1000 feet were utilized. This factor accounts for sediment deposition when it is less than 1.0 and underestimation of soil loss for short, flat slopes where it may be greater than 1.0.

Sediment Deposition Factor is estimated as follows:

Soil Type	Input Ranges	Equation (SDF=)
Sand	S<4.5%, L<25	16*(0.03+S)
	S<4.5%, L>=25	0.95+(-5)*L/300*(0.02-S)
	S>=4.5%, L<301	0.79-2.5*(S-0.09)+(0.004)*L*S
	S>=4.5%, L>=301	0.955+0.005*(S-0.045)*(L-300)-0.0001*(L-300)
Silt	L<20, S<4.5%	-917.83*S^2+48.312*S+0.4725
	L<20, S>4.5%,	0.1845*S^-0.589
	L>=20, S<1.1%	(0.5317+60.49*S)*L^(8.75*Slope-0.1635)
	L>=20, S<10%	0.66*L^0.0834-4.2*(S-0.04)
	L>=20, S>=10%	0.3682*(L^0.1649)
Clay	S<4.5%, L<40	0.206*ln(S)+1.7385+0.00005*L+10*(S-0.02)+(-4)*(S-0.04)
	S>=4.5%, L<40	28.087*S^2-8.0411*S+1.3012+5/L+(-4)*(S-0.04)
	S<2.5%,L>40	1.1038(L)^(-0.095)+28.48*(Se-0.002)-0.0006*L
	S<6.0%,L>40	[1.5038+3.914*(S-0.025)]*L^(-0.045-1.8*S)
	S>6%, L>40	(1.6408-13.342*(S-0.06))*L^(-0.153+1.59*(S-0.06))
	S>11%, L>40	(0.9737-5.45*(S-0.011)*L^(-0.059+1.1*(S-0.11))

14 ***Sediment Control Practice*** **(entered by user)**

The sediment control practice proposed down gradient of the soil disturbance to reduce the overall sediment discharge from the site. These practices include silt fence, ditch checks, inlet protection, vegetative buffers, sediment traps, sediment basins, and manufactured sediment control practices. If two practices are utilized, enter the most efficient one.

Sediment Control Practice	***Description***
Ditch Check Sediment Trap	A temporary dam constructed across a swale or drainage ditch to reduce the velocity of water flowing in the channel. See DNR Technical Standard 1062.
Inlet Protection	A temporary barrier installed around a storm drain inlet, drop inlet or curb inlet. See DNR Technical Standard 1060.
Manufactured Perimeter Control	Manufactured perimeter control and slope interruption products include a variety of products designed to detain or slow the flow of sediment-laden sheet flow runoff from small areas of disturbed soil. See DNR Technical Standard 1071 for slope length limitations based on % grade.
Sediment Basin	A sediment control device constructed with an engineered outlet, formed by excavation or embankment to intercept sediment-laden runoff and retain the sediment from drainage areas between 5 and 100 acres. See DNR Technical Standard 1064.
Sediment Trap	A temporary sediment control device formed by excavation or embankment to intercept sediment-laden runoff and retain the sediment from drainage areas less than 5 acres. See DNR Technical Standard 1063.
Silt Fence	Silt fence is a temporary sediment barrier of entrenched permeable geotextile fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff from small areas of disturbed soil. See DNR Technical Standard 1056 for slope length limitations based on % grade.
Straw Bale Barrier	A temporary sediment barrier consisting of a row of entrenched and anchored straw bales, hay bales or equivalent material used to intercept sediment-laden sheet flow from small drainage areas of disturbed soil. See DNR Technical Standard 1055.
Vegetative Buffer	An area of dense vegetation intended to slow runoff and trap sediment. Dense vegetation is defined as an existing stand of 3 – 12 inch high grassy vegetation that uniformly covers at least 90 % of a representative 1 square yard plot. Woody vegetation shall not be counted for the 90% coverage. No more than 10% of the overall buffer can be comprised of woody vegetation. See DNR Technical Standard 1054.

15 ***Sediment Discharge*** **(automatically calculated)**

The predicted value of sediment discharge (tons per acre) that corresponds to the time period of each land disturbing activity entered. The sediment discharge is the soil loss times the SDF factor described above. If a sediment control practice is specified, then the soil discharge is further reduced relative to the efficiency of the practice. For short, flat slopes, the sediment discharge may be greater than the USLE calculated soil loss because RUSLE2 calculates a larger soil loss and sediment discharge than USLE in those ranges.

Sediment Discharge = (A*SDF)*(1-Removal efficiency of the practice), where
Sediment Deposition Factor (SDF) =Approximate ratio of USLE calculated soil loss over RUSLE2 calculated discharge for the given range of slope and slope length conditions

Percent Reduction Required **(automatically calculated)**

The percentage value in the total's row corresponds to the reduction in sediment discharge necessary to comply with NR 151.11(6m)(b)2. It is required that the cumulative sediment discharge rate not exceed 5 tons per acre per year for all sites. Please note that the calculator does not correct for durations over 1 year. If construction is scheduled to exceed 1 year duration from initial ground disturbance, please complete a second spreadsheet with the subsequent years. Each year should start on the anniversary of the initial ground disturbance.

Compliance with the sediment discharge limit can be achieved by:

1. Reducing the length of time that bare soil is exposed
2. Installing additional erosion control measures
3. Implementing shorter time frames for stabilizing areas of the site with steep slopes or requiring that soil disturbance is limited to months with lower soil loss potential
4. Installing a sediment basin or other sediment control measures below the disturbed area.

Troubleshooting:

Security

On many computers, active content in the spreadsheet is disabled when first opened. Active content must be enabled for the drop-down buttons to function correctly. This can be done by clicking on the yellow Enable Content button at the top of the screen when opening.

Software

This spreadsheet was last modified using Microsoft Office Professional Plus 2010 Excel Version 14.7015.1000. Use of earlier versions may result in loss of functionality.

Data Entry

If data is entered in a random fashion, portions of the spreasheet may not function as intended. If this occurs, remove all entered data and re-enter sequentially row-by-row starting at the top.

REFERENCES:

Balousek, J.D., Roa-Espinosa, A., Bubenzer, G.D., “Predicting Erosion Rates on Construction Sites Using the Universal Soil Loss Equation in Dane County”, Urban Water Resources Conference, Chicago, IL, February 2000.

Wischmeier, W.H. and Smith, D.D., Predicting Rainfall Erosion Losses – A Guide to Conservation Planning, United States Department of Agriculture, Washington, D.C., 1978.

USDA, NRCS, Wisconsin Agronomy Technical Note 5, Establishing and Maintaining Native Grasses, Forbs, and Legumes, April 2013.

USDA, NRCS, Wisconsin Agronomy Technical Note 6, Establishing and Maintaining Introduced Grasses and Legumes, April 2013.

Appendix C

Linear Transportation Projects

A. STATEMENT OF PROBLEM BEING ADDRESSED

Transportation projects where land disturbance is limited to the right-of-way tend to be long and narrow, with more areas that require use of prescriptive compliance actions. In addition, transportation design engineers typically document the vertical dimension of the proposed work in a different format than is typically used for other types of development and redevelopment. The following discussion and examples have been prepared to assist the reader in applying the Soil Loss and Sediment Discharge Tool principles to roadway reconstruction and other linear transportation projects using the information formats common to these linear projects. Specifically, the examples contained herein focus on use of information shown on roadway plans, profiles, and typical sections. Where extensive re-grading or other construction is planned outside of right-of-way limits (such as for subdivision development), please refer to the examples included in Appendix A.

B. CLARIFICATIONS FOR TRANSPORTATION PROJECTS

1. *For roadway cross-sections where the water flows directly from the roadway to roadside ditches in all stages of construction, the cross-slope of the road (as shown on the typical sections and/or cross sections) is likely to control the 'representative worst case' because the water flows in the direction of the profile only after entering a prescriptive compliance area.*

2. *The representative worst case path should never include segments along a ditch bottom—concentrated flow is considered a prescriptive compliance area*

3. *Different portions of the road cross-section may control during different phases of construction. For instance, the roadbed may control until subbase compaction is complete and the roadside areas (if flatter than 20%) may control between subbase placement and final stabilization.*

4. *For rural to urban roadway section conversions, portions of the site may be covered by prescriptive compliance in the initial bare soil stage but not in subsequent stages if the slopes and drainage are modified during construction.*

5. *For curbed roadway sections, the controlling slopes will typically come from the profile or the roadside slopes. Where there are curb inlets, the slope length may be the distance along the slope between active curb inlets.*

6. *Small areas of steep slopes, such as driveway apron reconstruction may be considered prescriptive compliance areas as long as they are less than 10% of the total land disturbance area and no larger than 1 acre.*

7. *Evaluation should always start with existing grades so that sediment discharge is addressed during clearing, grubbing, demolition, and initial grading. The initial stages of a project generally produce the most soil loss.*

8. *WisDOT erosion control matrices may be used to select appropriate erosion control treatments, but the Soil Loss and Sediment Discharge Tool is still needed to evaluate the effect of the construction schedule on the overall sediment discharge.*

9. *It may be helpful to divide a lengthy project into segments of similar cross-section and profile.*

10. *Compacted subbase is considered a stabilized surface for the purpose of the soil loss and sediment discharge tool. If all other areas on the project are prescriptive compliance areas, note this and use the date of final subbase stabilization for the 'End' activity and omit the landscaping activities.*

11. *If the entire disturbed area is proposed to be impervious surface, the landscaping activity may be omitted and the compliance period ended at the point where bare soil is no longer exposed.*

Examples

Examples of the compliance verification procedure are provided on subsequent pages of this appendix.

Transportation Examples

Soil Loss and Sediment Discharge Calculation

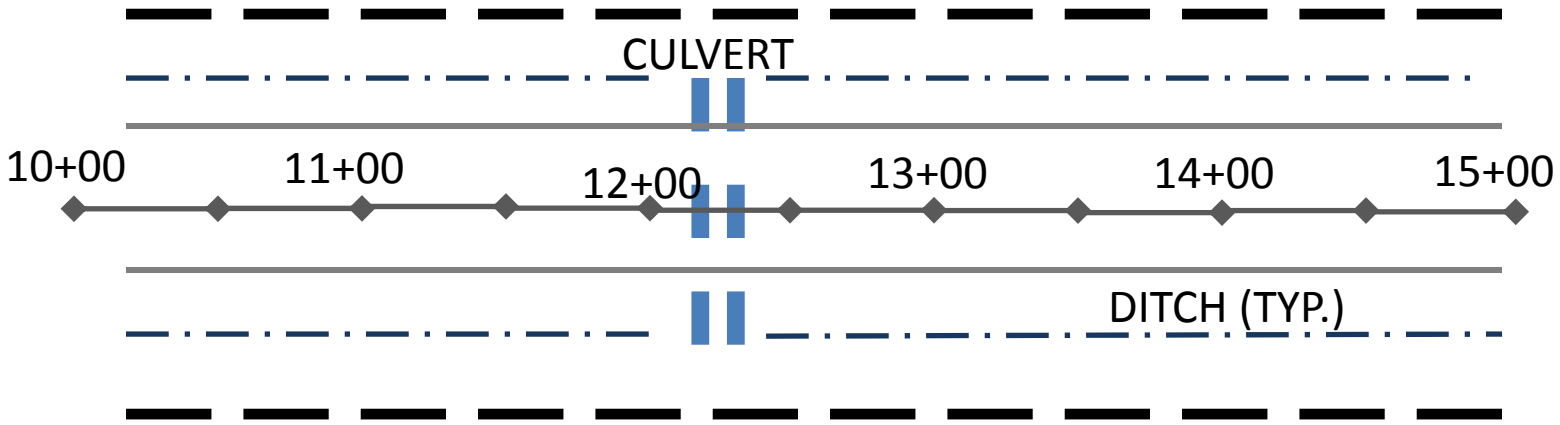
Transportation Examples

March 24, 2017

Example T1: Rural Highway Reconstruction

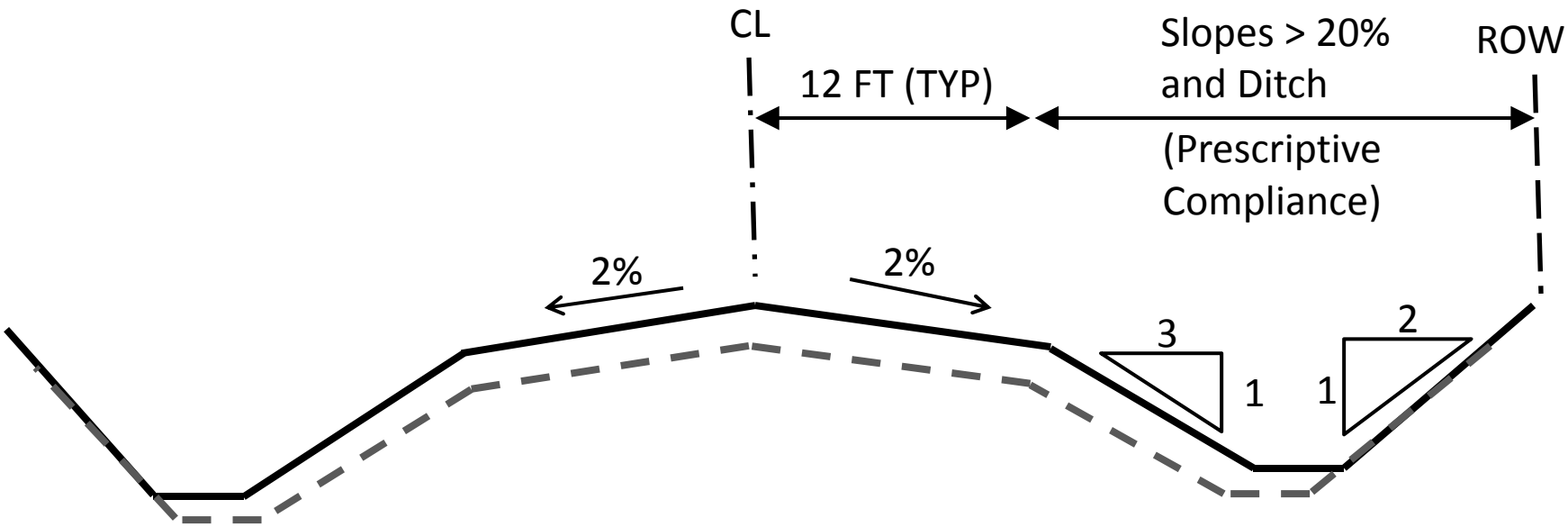
- Assumptions:
  - Brown County
  - One Year Construction
  - Subgrade Soils per Soil Borings
  - Primary water flow is in ditches, not within roadway during all phases of construction

Example T1: Rural Highway Reconstruction

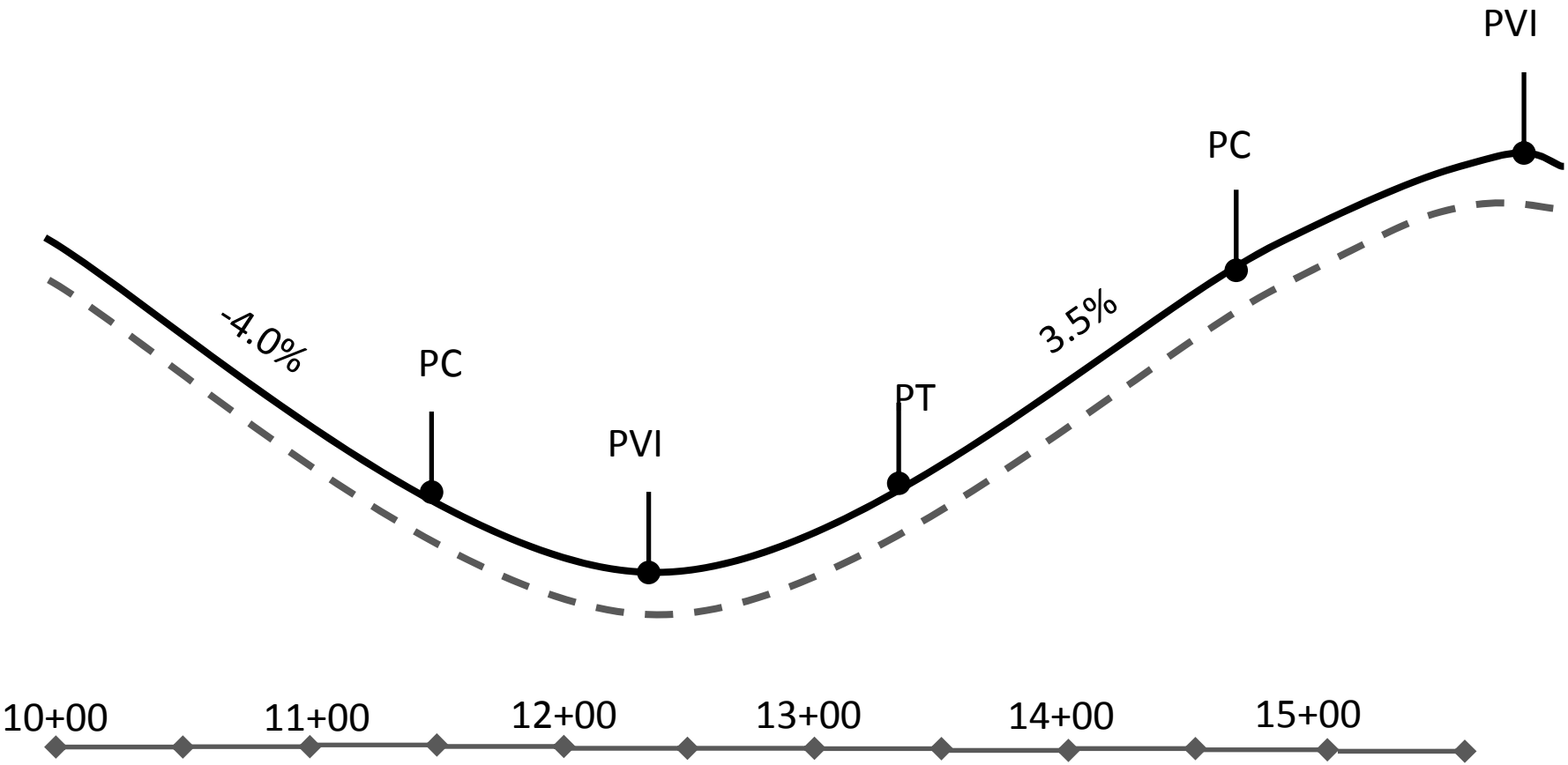


EXISTING PLAN

TYPICAL SECTION



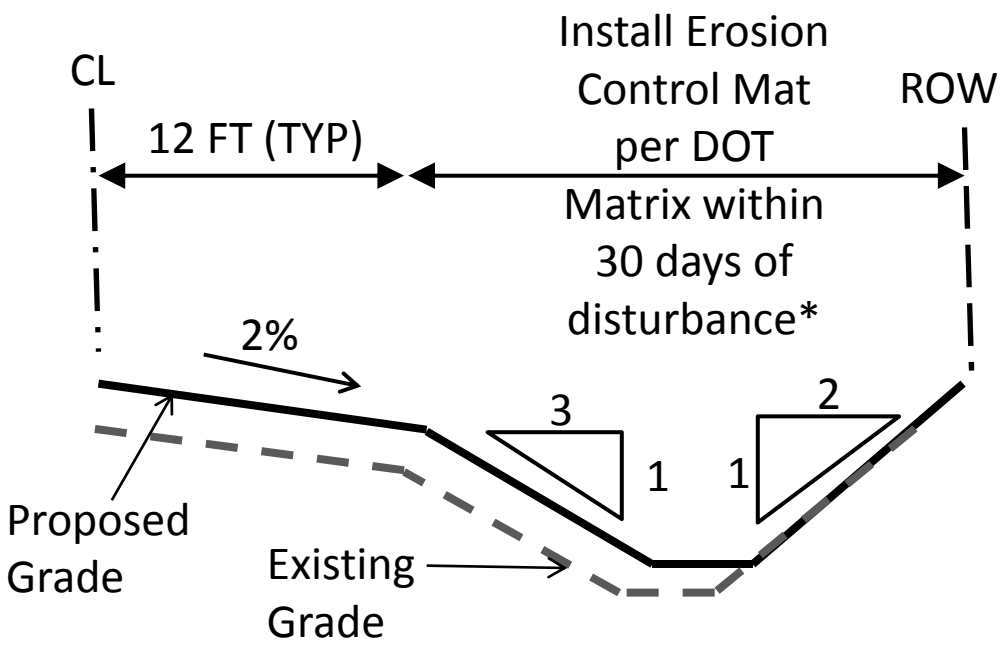
PROFILE



Activities and Initial Schedule

Description	Topography	Assumed Start Date
Pavement Removal/Initial Grading	Existing	May 1, 2016
Rough Grading/Culvert Replacement	Proposed Rough Grades	June 1, 2016
Subbase Placement/Compaction	Final Grades	July 1, 2016
Paving and Landscaping	Final Grades	July 15, 2016
Final Stabilization of Landscaped Areas	Final Grades	October 15, 2016

Prescriptive Compliance



*Disturbance may be extended to 90 days if Sediment Basin or Trap provided downstream of disturbance

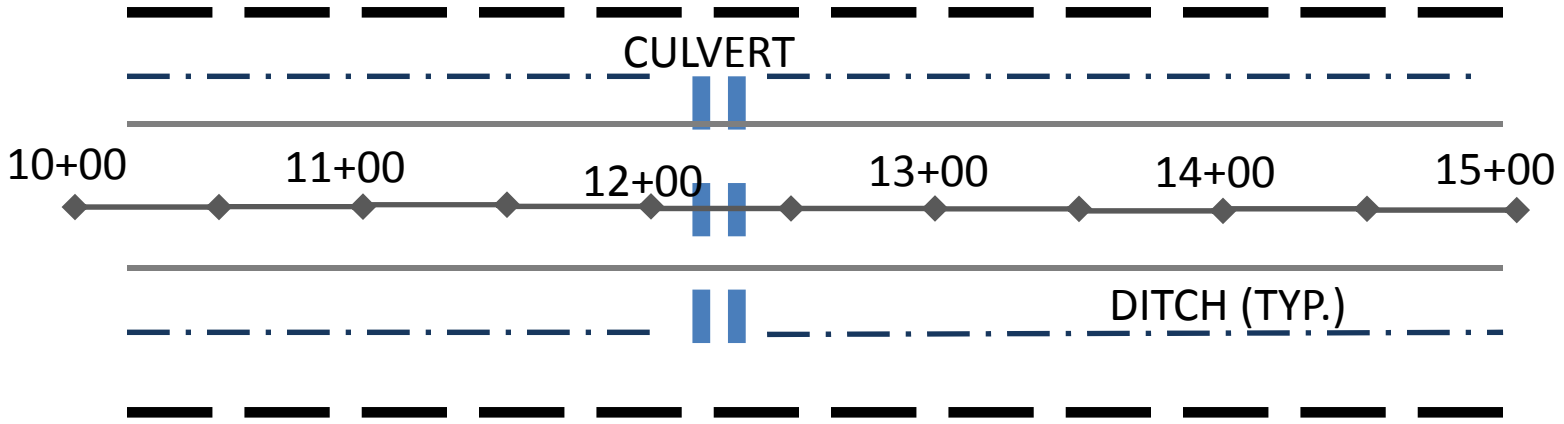
Assumptions:

- Land Disturbance between May 2nd and September 15th
- No sediment trap or sediment basin installed prior to disturbance

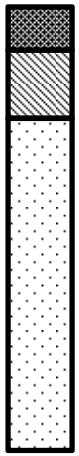
Activities and Final Schedule

Description	Topography	Assumed Start Date
Pavement Removal/Initial Grading	Existing	May 1, 2016
Rough Grading/Culvert Replacement	Proposed Rough Grades	June 1, 2016
Subbase Placement/Compaction	Final Grades	July 1, 2016
Paving and Landscaping	Final Grades	July 15, 2016
Final Stabilization of Landscaped Areas	Final Grades	October 15, 2016

SOILS DATA



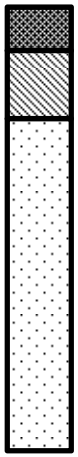
10+00



Asphalt
Gravel

Sandy Clay
Loam

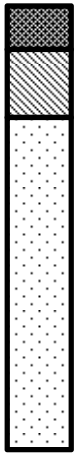
12+50



Asphalt
Gravel

Silt Loam

14+50



Asphalt
Gravel

Fine Sand

Representative Worst Case

Possibilities:

1. Road Cross Slope: 2% over 12 feet with Silt Loam
2. Slope 1: 3.5% over 350 feet with Fine Sand
3. Slope 2: 4% over 200 feet with Sandy Clay Loam

Cases 2 and 3 most likely to control. BUT—water shed to prescriptive compliance areas (ditches) and does not flow within road section during all proposed construction phases.

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: DPW

Project: Example T1

Date: 03/24/17

County: Brown

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/16	07/01/16	30.6%	100	Silt Loam	0.43	2.0%	15	0.11	1.00	1.5	1.072	Ditch Check Sedi	1.1
End	07/01/16	-----	-----	-----	-------	-----	2.0%	15	0.11	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	2.0%	15	0.11	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	2.0%	15	0.11	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	2.0%	0	-----	-----	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	-----	-----	0.000		0.0
										TOTAL	1.5		TOTAL	1.1
													% Reduction Required	NONE

Notes:

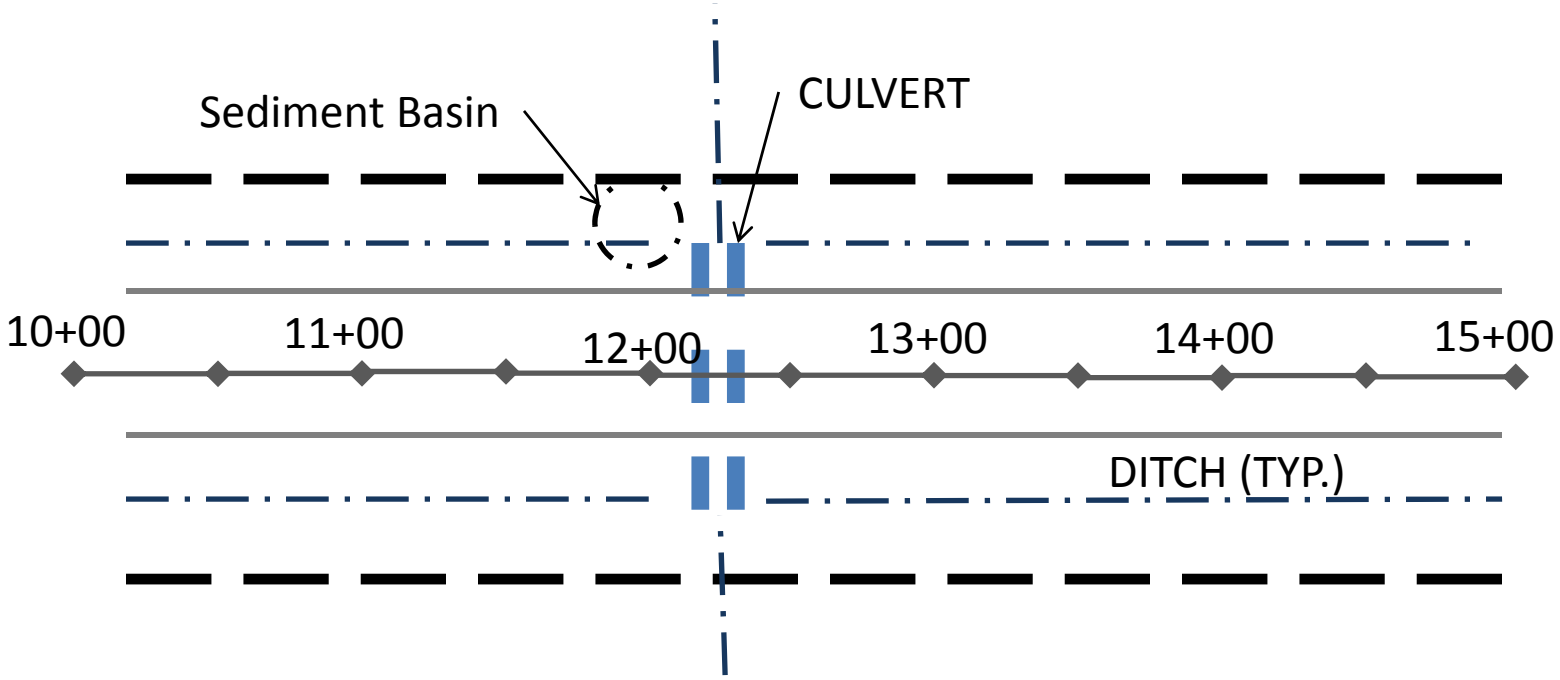
See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Example T2: Urbanization of Rural Highway

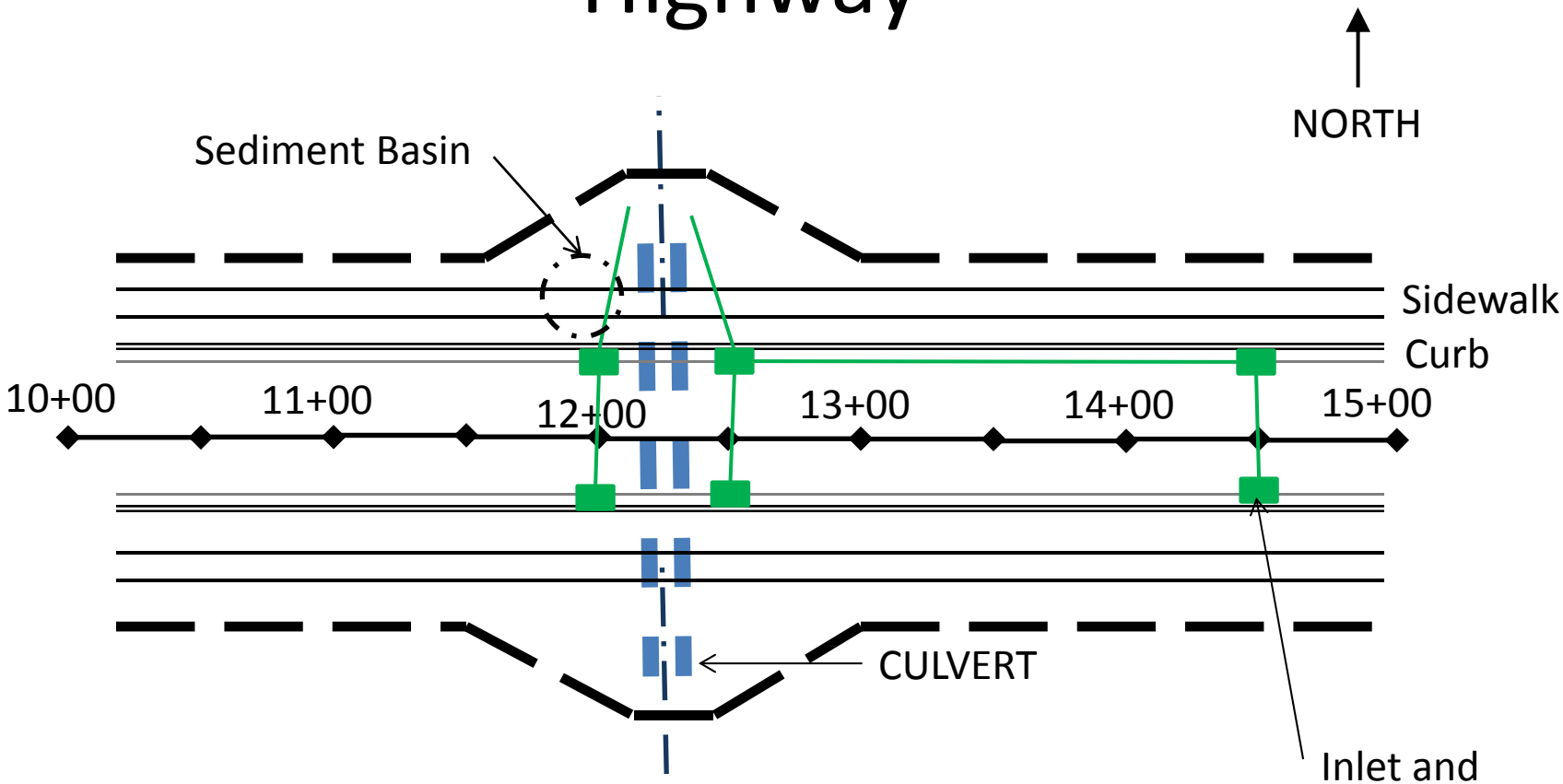
- Note: Several complexities have been introduced into this example to address situations more likely to occur on larger projects
- Assumptions:
  - Brown County
  - Convert from rural section (ditched) to urban section (closed drainage)
  - Pavement widening and sidewalk proposed
  - Two Year Construction (One Side Each Year)
  - Subgrade Soils per Soil Borings
  - Culvert replacement with a sediment basin for dewatering

Example T2: Urbanization of Rural Highway



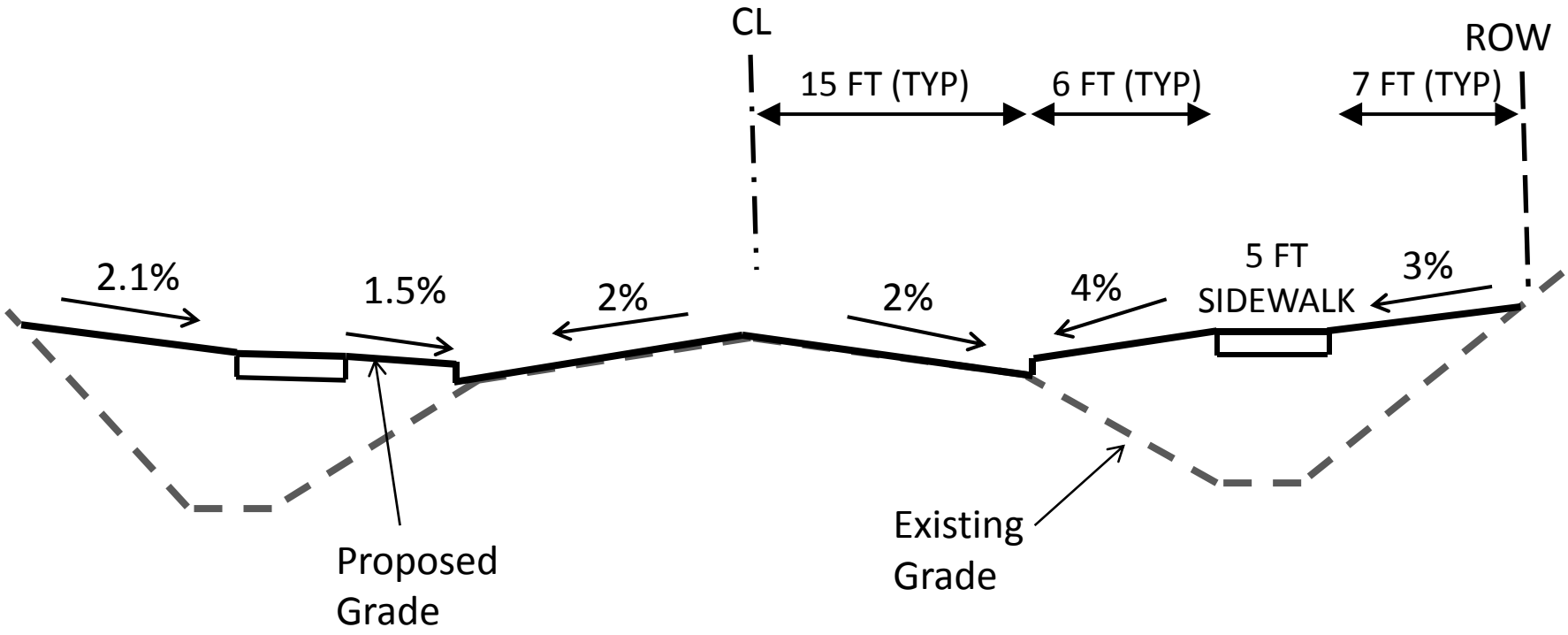
EXISTING PLAN

Example T2: Urbanization of Rural Highway

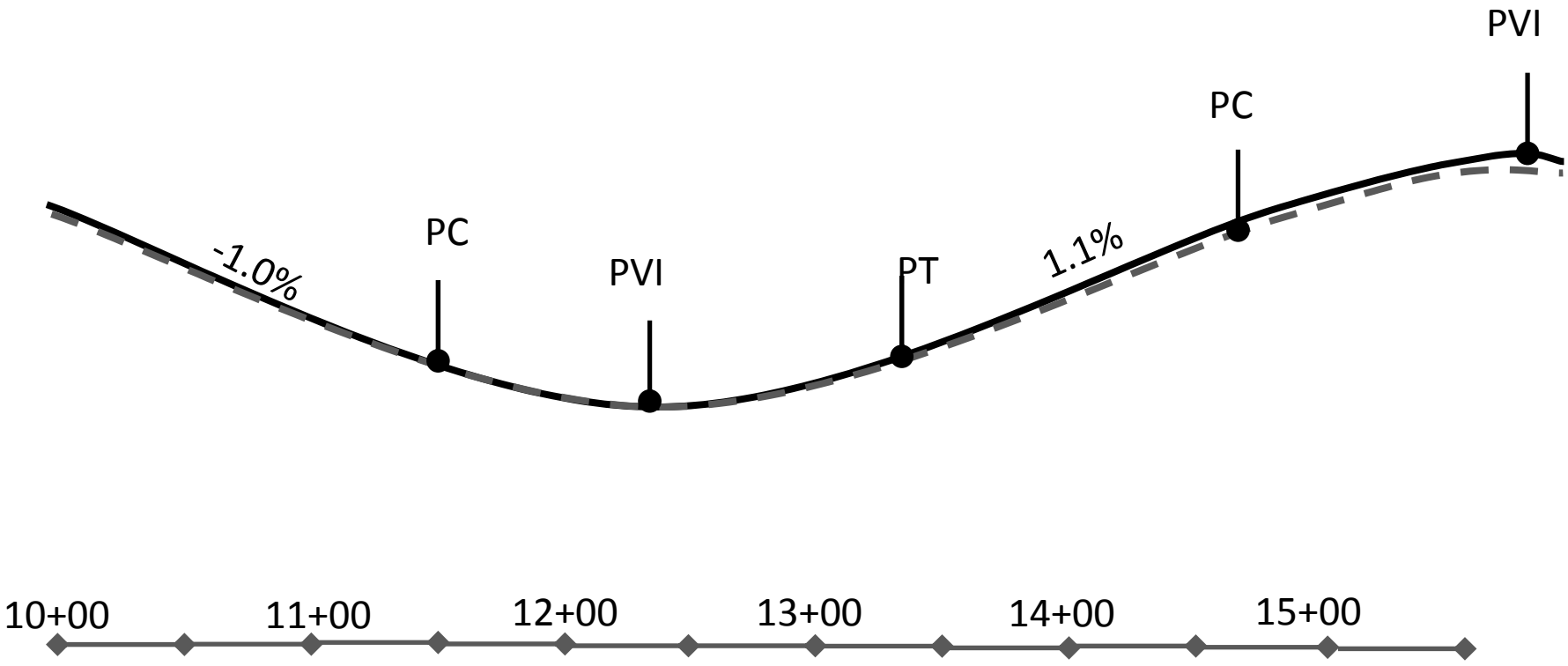


PROPOSED PLAN

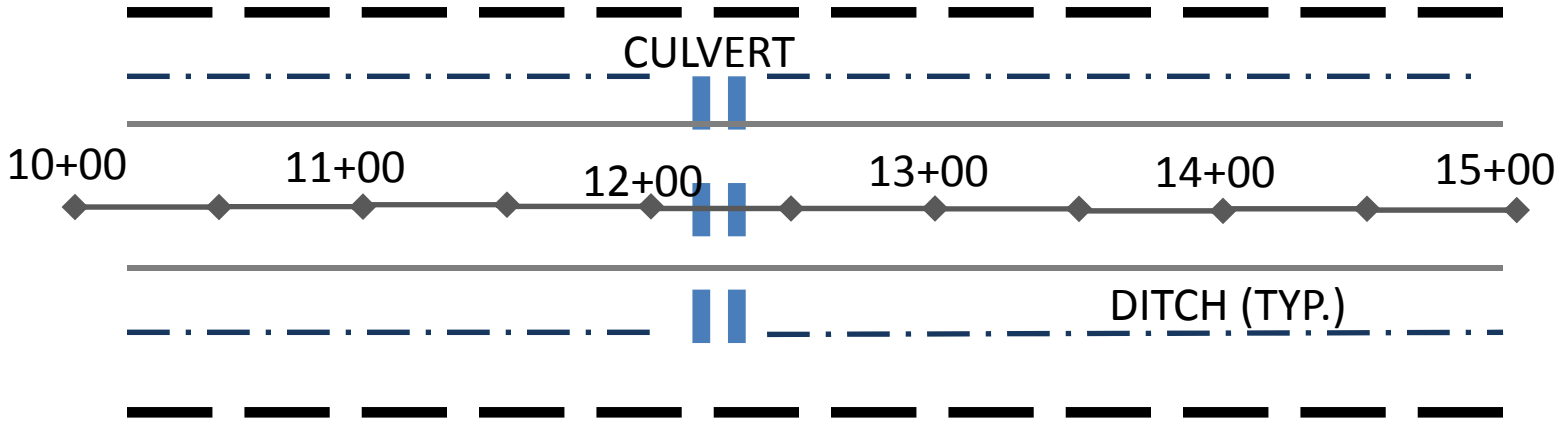
TYPICAL SECTION



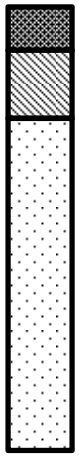
PROFILE



SOILS DATA



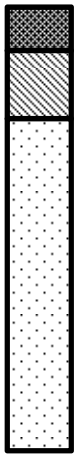
10+00



Asphalt
Gravel

Sandy Clay
Loam

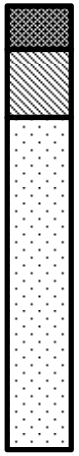
12+50



Asphalt
Gravel

Silt Loam

14+50



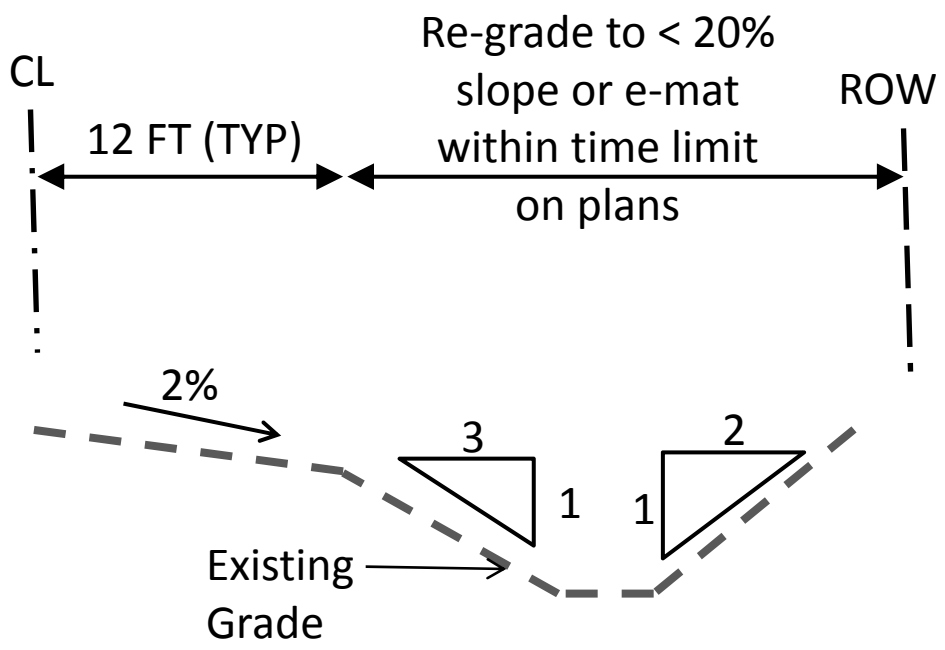
Asphalt
Gravel

Silt Loam

Activities and Initial Schedule

Description	Topography	Assumed Start Date
Start work on North Roadway	Existing	May 2016
North Base Course Placement, culvert replacement, complete site winterization	Final Grades	October 2016
Start work on South Roadway	Existing	April 2017
Final Paving and Landscaping	Final Grades	August 2017
Final Stabilization	Final Grades	October 2017

Prescriptive Compliance



*Disturbance may be extended to 90 days if Sediment Basin or Trap provided downstream of disturbance

Assumptions:

- Land Disturbance between May 2nd and September 15th
- No sediment trap or sediment basin installed prior to disturbance

Prescriptive Compliance Area Time Limits

Description	Exposure date range	Bare Soil Exposure Limit
North Side Ditch west of culvert (10+00 to 12+00 Left), drains to sediment basin also used for dewatering	May 1st-June 30th	90 days
North Side Ditch east of culvert (12+50 to 15+00 Left)	May 1st-June 30th	30 days
South Side Ditch (10+00 to 15+00 Right)	April 1st-May 1st	30 days

Representative Worst Case

Evaluate Existing Grades-Pavement Demolition and Grading

5/1/2016-7/01/2016 with Ditch Checks

Description	Typical Soils	Sediment Discharge (tons/acre)
Road Cross Slope: 2% over 15 feet	Silt Loam	1.1
Slope 1: 1.0% over 350 feet	Silt Loam	N/A-Flow in Ditch
Slope 2: 1.1% over 200 feet	Sandy Clay Loam	N/A-Flow in Ditch

Representative Worst Case

Evaluate Proposed Grades Through Subbase Compaction

7/1/2016-8/01/2016 with Inlet Protection

Description	Typical Soils	Sediment Discharge (tons/acre)
Roadside: 1.8% over 18 feet	Silt Loam	0.8
Slope 1: 1.0% over 350 feet	**Silt Loam**	**1.0**
Slope 2: 1.1% over 200 feet	Sandy Clay Loam	0.8

Assume Slope 1 condition is proposed representative worst case until Subbase compaction, then North Roadside would control

Representative Worst Case

South side representative worst case would be similar:

- 5/1/2016-7/01/2016 Road Cross Slope: 2% over 15 feet
- 7/1/2016-8/01/2016 Profile: 1.0% over 350 feet
- After subbase compaction South Roadside: Average 3.5% over 18 feet

Year 1 Schedule for Tool

Description	Controlling Topography	Assumed Start Date
North pavement removal, utility installation, and grading	Existing Cross-Slope	May 1, 2016
North Subbase, Curb and Sidewalk Placement	Rough Grades-Proposed Profile	July 1, 2016
North Roadside Landscaping	Final Grades	August 15, 2016
South Pavement Removal	Existing	April 1, 2017
End of Year 1	N/A	April 30, 2017

Year 2 Schedule for Tool

Description	Topography	Assumed Start Date
North Landscaping Stabilization (use Sod as 60 day establishment period is complete)	Final Grades	October 15, 2016
South Pavement Removal	Existing	April 1, 2017
South Subbase, Curb and Sidewalk Placement	Rough Grades	May 1, 2017
South Roadside Landscaping	Final Grades	August 15, 2017
Final Stabilization (End Year 2)	Final Grades	October 15, 2017

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 1

Developer: DPW

Project: Example T2

Date: 03/24/17

County: Brown

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Bare Ground	05/01/16	07/01/16	30.6%	100	Silt Loam	0.43	2.0%	15	0.11	1.00	1.5	1.072	Ditch Check Sedi	1.1
Bare Ground	07/01/16	08/15/16	32.5%	100	Silt Loam	0.43	1.0%	350	0.19	1.00	2.6	0.728	Inlet Protection	1.3
Mulch or Erosion Mat	08/15/16	04/01/17	31.7%	100	Silt Loam	0.43	1.8%	18	0.11	0.20	0.3	1.045	Inlet Protection	0.2
Bare Ground	04/01/17	04/30/17	4.9%	100	Silt Loam	0.43	2.0%	15	0.11	1.00	0.2	1.072	Inlet Protection	0.2
End	04/30/17	-----	-----	-----	-------	-----	2.0%	0	-----	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	------	-----	0.000		0.0
										TOTAL	4.7		TOTAL	2.9
													% Reduction Required	NONE

Notes:

See Help Page for further descriptions of variables and items in drop-down boxes.
The last land disturbing activity on each sheet must be 'End'. This is either 12 months from the start of construction or final stabilization.
For periods of construction that exceed 12 months, please demonstrate that 5 tons/acre/year is not exceeded in any given 12 month period.

NOTE: THIS TOOL ONLY ADDRESSED SOIL EROSION DUE TO SHEET FLOW. MEASURES TO CONTROL CHANNEL EROSION MAY ALSO BE REQUIRED TO MEET SEDIMENT DISCHARGE REQUIREMENTS.

Recommended Permanent Seeding Dates:

4/15-6/1	and	8/1-8/21	Turf, introduced grasses and legumes
Thaw-6/30			Native Grasses, forbs, and legumes

Designed By:	
Date	

Soil Loss & Sediment Discharge Calculation Tool

for use on Construction Sites in the State of Wisconsin

WDNR Draft Version 2.0 (03-13-2017)

WISCONSIN DEPT. OF NATURAL RESOURCES

YEAR 2

Developer: DPW

Project: Example T2

Date: 03/24/2017

County: Brown

Version 1.0

Activity (1)	Begin Date (2)	End Date (3)	Period % R (4)	Annual R Factor (5)	Sub Soil Texture (6)	Soil Erodibility K Factor (7)	Slope (%) (8)	Slope Length (ft) (9)	LS Factor (10)	Land Cover C Factor (11)	Soil loss A (tons/acre) (12)	SDF (13)	Sediment Control Practice (14)	Sediment Discharge (t/ac) (15)
Mulch or Erosion Mat	10/16/16	04/01/17	9.8%	100	Silt Loam	0.43	1.8%	18	0.11	0.20	0.1	1.045	Inlet Protection	0.1
Bare Ground	04/01/17	05/01/17	5.2%	100	Silt Loam	0.43	2.0%	15	0.11	1.00	0.3	1.072	Ditch Check Sed	0.2
Bare Ground	05/01/17	08/15/17	63.1%	100	Silt Loam	0.43	1.0%	350	0.19	1.00	5.1	0.728	Inlet Protection	2.6
Seed with Mulch or Er	08/15/17	10/15/17	21.7%	100	Silt Loam	0.43	3.5%	18	0.17	0.10	0.2	1.039	Inlet Protection	0.1
End	10/15/17	-----	-----	-----	-------	-----	3.5%	0	-----	------	-----	0.000		0.0
		-----	-----	-----	-------	-----	0.0%	0	-----	------	-----	0.000		0.0
										TOTAL	5.6		TOTAL	3.0
													% Reduction Required	NONE

Notes:

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Date	